FOREWORD

FW

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1. Foreword

A: FOREWORD

These manuals are used when performing maintenance, repair, or diagnosis of the Subaru Legacy.

Applied model: BE***** and BH***** from 2004MY.

The manuals contain the latest information at the time of publication. Changes in specifications, methods, etc. may be made without notice.

HOW TO USE THIS MANUALS

HU

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1. How to Use This Manuals

A: HOW TO USE THIS MANUALS

1. STRUCTURE

Each section consists of SCT that are broken down into SC that are divided into sections for each component. The specification, maintenance and other information for the components are included, and diagnosis information has also been added where necessary.

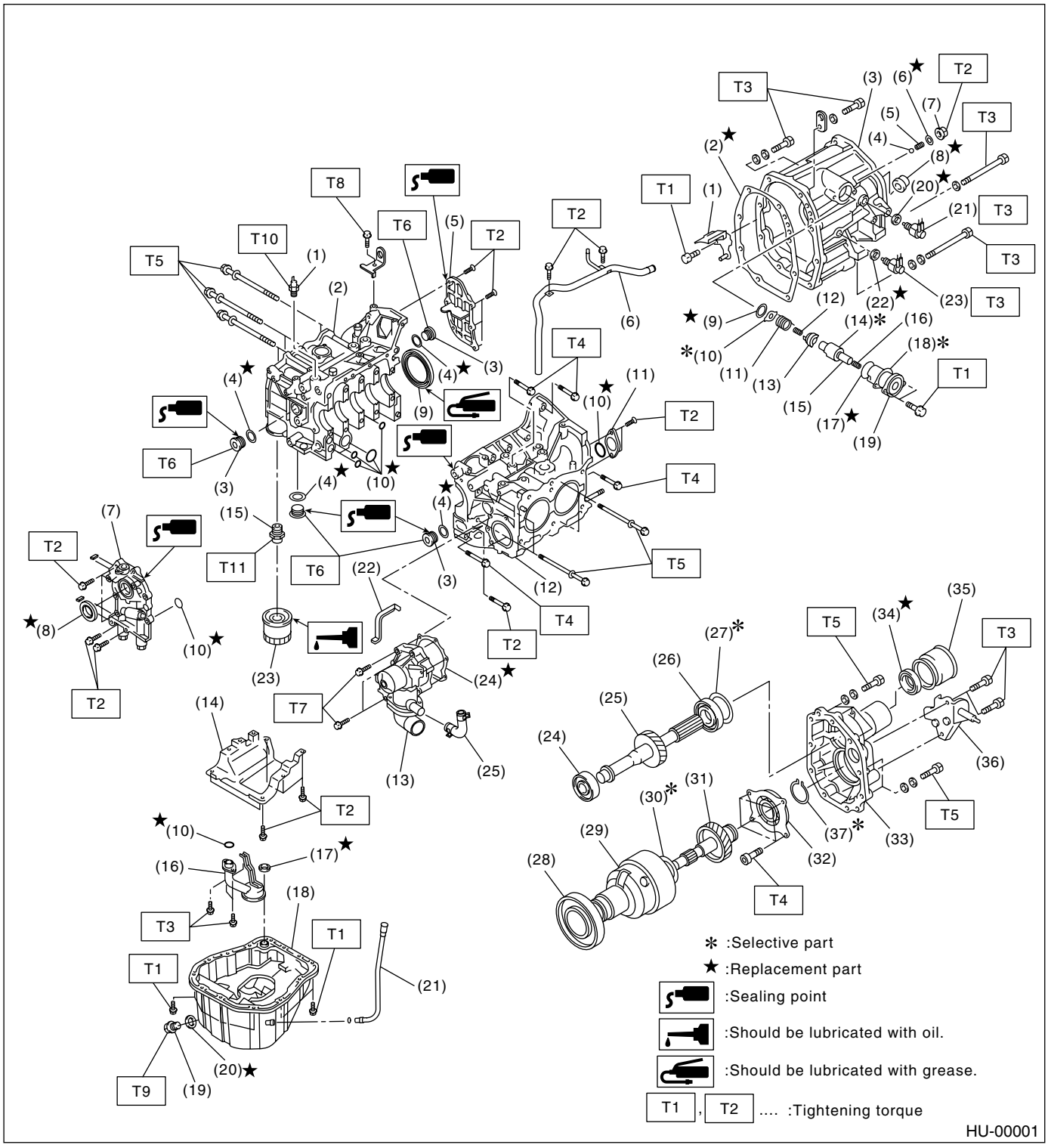
2. INDEX

The first page has an index with tabs.

3. COMPONENTS

Illustrations are listed for each component. The information necessary for repair work (tightening torque, grease up points, etc.) is described on these illustrations. Information is described using symbol. To order the parts, refer to parts catalogue.

Example:



4. SPECIFICATIONS

If necessary, specifications are also included.

5. INSPECTION

Inspections are included to be carried out before and after maintenance.

6. MAINTENANCE

• Maintenance instructions for serviceable parts describes work area and detailed steps with illustration. It also describes the use of special tool, tightening torque, cautions for each procedure.
• If many serviceable parts are included in one service procedure, appropriate reference are provided for each part.

Example:

15.Main Shaft Assembly for Single-Range ← (A)

A: REMOVAL ← (B)

1) Remove the manual transmission assembly from vehicie. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.> ← (C)

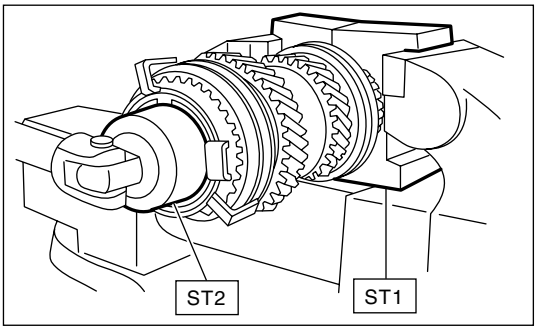
---

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE: ← (D)
Secure the lock nuts in two Places affer tightening.

ST2 499987003 SOCKET WRENCH
ST1 498937000 (E) TRANSMISSION HOLDER (F)

Tightening torque:
118 N·m (12.0 kgf-m, 86.8 ft-lb) ← (G)



← (H)

HU-00002

(A) Component
(B) Process
(C) Reference
(D) Caution
(E) Tool number of special tool
(F) Name of special tool
(G) Tightening torque
(H) Illustration

7. DIAGNOSIS

Tables showing a step-by-step process make it easy to conduct diagnosis.

8. SI UNITS

Measurements in these manuals are according to the SI units. Metric and yard/pound measurements are also included.

Example:

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

MEMO:

SPECIFICATIONS

SPC

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1. Legacy

A: DIMENSIONS

Model				Sedan	Station Wagon
				2.5 L	
				AWD	
				ALL	
Overall length			mm (in)	4,685 (184.4)	4,760 (187.4)
Overall width			mm (in)	1,745 (68.7)	1,745 (68.7)
Overall height			mm (in)	1,415 (55.7)	1,525 (60.0)*2
Compartment	Leg room	Front Max.	mm (in)	1,101 (43.3)	1,101 (43.3)
		Rear Min.	mm (in)	868 (34.2)	871 (34.3)
	Head room	Front	mm (in)	987 (38.9), 967 (38.1)*1	1,020 (40.2), 977 (38.5)*1
		Rear	mm (in)	930 (36.6)	994 (39.1), 945 (37.2)*1
	Shoulder room	Front	mm (in)	1,368 (53.9)	1,368 (53.9)
		Rear	mm (in)	1,362 (53.6)	1,362 (53.6)
Wheelbase			mm (in)	2,650 (104.3)	2,650 (104.3)
Tread		Front	mm (in)	1,460 (57.5)	1,460 (57.5)
		Rear	mm (in)	1,460 (57.5)	1,455 (57.3)
Minimum road clearance		M.L.V.W.	mm (in)	115 (4.5)	120 (4.7)
		C.W.	mm (in)	155 (6.1)	160 (6.3)

*1: With sunroof
*2: Including roof rail

B: ENGINE

Model	Sedan/Station Wagon	
Engine type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
Valve arrangement	Overhead camshaft type	
Bore × Stroke mm (in)	99.5 × 79.0 (3.917 × 3.110)	
Displacement cm^3 (cu in)	2,457 (149.9)	
Compression ratio	10.0	
Firing order	1 — 3 — 2 — 4	
Idle speed at Park/Neutral position rpm	650 (MT), 700 (AT)	
Maximum output kW (HP)/rpm	123 (165)/5,600*1	119 (160)/5,600*2
Maximum torque N·m (kgf-m, ft-lb)/rpm	226 (23.0, 166)/3,600	

*1: Except U5
*2: U5

C: ELECTRICAL

Model			Sedan/Station Wagon	
Ignition timing at idling speed		BTDC/rpm	10°±8°/650 (MT), 15°±8°/700 (AT)	
Spark plug	Type and manufacturer		CHAMPION: RC10YC4 (Standard)*1 NGK: BKR5E-11*1 NGK: BKR6E-11*1	NGK: FR5AP-11 (Standard)*2
Alternator			12V — 90A	
Battery	Reserve capacity	min	90 (MT), 110 (AT)	
	Cold cranking amperes	amp.	430 (MT), 490 (AT)	

*1: Except U5
*2: U5

D: TRANSMISSION

Model			Sedan/Station Wagon	
			AWD	
Transmission type			5MT	4AT
Clutch type			DSPD	TCC
Gear ratio		1st	3.454	2.785*1, 3.027*2
		2nd	2.062	1.545*1, 1.619*2
		3rd	1.448	1.000
		4th	1.088	0.694
		5th	0.780	—
		Reverse	3.333	2.272
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical
		Gear ratio	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	4.111*2	4.111*1, 4.444*2
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—
		Gear ratio	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid
		Gear ratio	4.111*2	4.111*1, 4.444*2

5MT: 5-forward speeds with synchromesh and 1-reverse – with center differential and viscous coupling
4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse – with hydraulically controlled transfer clutch
*1: L, L-S
*2: 2.5 GT, 2.5 GTLO
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch

E: STEERING

Type		Rack and Pinion
Turns, lock to lock		3.2
Minimum turning circle	m (ft)	Curb to curb: 11.6 (38.1), Wall to wall: 10.8 (35.4)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Multi-link type, Independent, Coil spring

G: BRAKE

Model	With ABS
Service brake system	Dual circuit hydraulic with vacuum suspended power unit
Front	Ventilated disc brake
Rear	Disc brake
Parking brake	Mechanical on rear brakes

H: TIRE

Model	15-inch wheel	16-inch wheel
Size	P205/60R15 90H	P205/55R16 89H
Type	Steel belted radial, Tubeless	

I: CAPACITY

Model		AWD	
		5MT	4AT
Fuel tank	ℓ (US gal, Imp gal)	64 (16.9, 14.1)	
Engine oil (Replacement)	ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5)	
Transmission gear oil	ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—
Automatic transmission fluid	ℓ (US qt, Imp qt)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)
AWD rear differential gear oil	ℓ (US qt, Imp qt)	0.8 (0.8, 0.7), 0.9 (0.9, 0.8)*	
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)	
Engine coolant	ℓ (US qt, Imp qt)	6.8 (7.2, 6.0)	6.7 (7.1, 5.9)

*: L

J: WEIGHT

1. U.S. SPEC. VEHICLE

Model			Sedan			
			2.5 L			
			AWD			
			L		2.5 GT	
			5MT	4AT	5MT	4AT-SS
Curb weight (C.W.)	Front	kg (lb)	823 (1,815)	848 (1,870)	857 (1,890)	880 (1,940)
	Rear	kg (lb)	660 (1,455)	662 (1,460)	683 (1,505)	685 (1,510)
	Total	kg (lb)	1,483 (3,270)	1,510 (3,330)	1,540 (3,395)	1,565 (3,450)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,007 (2,220)			
	Rear	kg (lb)	989 (2,180)			
	Total	kg (lb)	1,996 (4,400)			

Model			Station Wagon			
			2.5 L			
			AWD			
			L		2.5 GT	
			5MT	4AT	5MT	4AT-SS
Curb weight (C.W.)	Front	kg (lb)	823 (1,815)	855 (1,885)	857 (1,890)	882 (1,945)
	Rear	kg (lb)	701 (1,545)	701 (1,545)	730 (1,610)	735 (1,620)
	Total	kg (lb)	1,524 (3,360)	1,556 (3,430)	1,588 (3,500)	1,617 (3,565)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)			
	Rear	kg (lb)	1,064 (2,345)			
	Total	kg (lb)	2,066 (4,555)			

2. CANADA SPEC. VEHICLE

Model			Sedan		
			2.5 L		
			AWD		
			L	2.5 GT	
			4AT	5MT	4AT-SS
Curb weight (C.W.)	Front	kg (lb)	839 (1,850)	844 (1,860)	866 (1,910)
	Rear	kg (lb)	662 (1,460)	683 (1,505)	685 (1,510)
	Total	kg (lb)	1,501 (3,310)	1,527 (3,365)	1,551 (3,420)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,007 (2,220)		
	Rear	kg (lb)	989 (2,180)		
	Total	kg (lb)	1,996 (4,400)		

Model			Sedan	
			2.5 L	
			AWD	
			2.5 GTLO	
			5MT	4AT-SS
Curb weight (C.W.)	Front	kg (lb)	839 (1,850)	862 (1,900)
	Rear	kg (lb)	678 (1,495)	680 (1,500)
	Total	kg (lb)	1,517 (3,345)	1,542 (3,400)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,007 (2,220)	
	Rear	kg (lb)	989 (2,180)	
	Total	kg (lb)	1,996 (4,400)	

Model			Station Wagon		
			2.5 L		
			AWD		
			L		2.5 GT
			5MT	4AT	4AT-SS
Curb weight (C.W.)	Front	kg (lb)	812 (1,790)	841 (1,855)	869 (1,915)
	Rear	kg (lb)	701 (1,545)	701 (1,545)	735 (1,620)
	Total	kg (lb)	1,513 (3,335)	1,542 (3,400)	1,604 (3,535)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)		
	Rear	kg (lb)	1,064 (2,345)		
	Total	kg (lb)	2,066 (4,555)		

3. TIWAN SPEC. VEHICLE

Model			Sedan		Station Wagon	
			2.5 L			
			AWD			
			L	2.5 GT	L	L-S
			4AT	4AT-SS	4AT	
Curb weight (C.W.)	Front	kg (lb)	835 (1,840)	866 (1,910)	841 (1,855)	851 (1,875)
	Rear	kg (lb)	662 (1,460)	685 (1,510)	701 (1,545)	719 (1,585)
	Total	kg (lb)	1,497 (3,300)	1,551 (3,420)	1,542 (3,400)	662 (3,460)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,007 (2,220)		1,002 (2,210)	
	Rear	kg (lb)	989 (2,180)		1,064 (2,345)	
	Total	kg (lb)	1,996 (4,400)		2,066 (4,555)	

2. OUTBACK

A: DIMENSIONS

Model				Sedan		Wagon	
				AWD		AWD	
				2.5 L	3.0 L	2.5 L	3.0 L
Overall length			mm (in)	4,685 (184.4)		4,760 (187.4)	
Overall width			mm (in)	1,745 (68.7)		1,745 (68.7)	
Overall height			mm (in)	1,480 (58.3)		1,580 (62.2)	
Compartment	Leg room	Front Max.	mm (in)	1,101 (43.3)		1,101 (43.3)	
		Rear Min.	mm (in)	868 (34.2)		871 (34.3)	
	Head room	Front	mm (in)	987 (38.9), 967 (38.1)*1		1,020 (40.2), 977 (38.5)*1	
		Rear	mm (in)	930 (36.6)		994 (39.1), 945 (37.2)*1	
	Shoulder room	Front	mm (in)	1,368 (53.9)		1,368 (53.9)	
		Rear	mm (in)	1,362 (53.6)		1,362 (53.6)	
Wheelbase			mm (in)	2,650 (104.3)		2,650 (104.3)	
Tread		Front	mm (in)	1,470 (57.9)		1,470 (57.9)	
		Rear	mm (in)	1,465 (57.7)		1,465 (57.7)	
Minimum road clearance		M.L.V.W.	mm (in)	144 (5.7)	142 (5.6)	144 (5.7)	137 (5.4)
		C.W.	mm (in)	185 (7.3)	200 (7.8)	185 (7.3)	200 (7.9)

*1: With sunroof

B: ENGINE

Model		Sedan/Wagon	
		2.5 L	3.0 L
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
Valve arrangement		Overhead camshaft type	Double overhead camshaft type
Bore × Stroke	mm (in)	99.5 × 79.0 (3.917 × 3.110)	89.2 × 80.0 (3.512 × 3.150)
Displacement	cm^3 (cu in)	2,457 (149.9)	3,000 (183.06)
Compression ratio		10.0	10.7
Firing order		1 — 3 — 2 — 4	1 — 6 — 3 — 2 — 5 — 4
Idle speed at Park/ Neutral position	rpm	650 (MT), 700 (AT)	600
Maximum output	kW (HP)/rpm	123 (165)/5,600*1 119 (160)/5,600*2	158 (212)/6,000
Maximum torque	N·m (kgf-m, ft-lb)/rpm	226 (23.0, 166)/3,600	282 (28.8, 208)/4,400

*1: Except U5
*2: U5

C: ELECTRICAL

Model			Sedan/Wagon	
			2.5 L	3.0 L
Ignition timing at idling speed		BTDC/rpm	10°±8°/650 (MT), 15°±8°/700 (AT)	10°±8°/600
Spark plug	Type and manufacturer		CHAMPION: RC10YC4 (Standard)*1 NGK: BKR5E-11*1 NGK: BKR6E-11*1 NGK: FR5AP-11 (Standard)*2	NGK: PLFR6A-11
Alternator			12V — 90A	12V — 100A
Battery	Reserve capacity	min	90 (MT), 110 (AT)	110
	Cold cranking amperes	amp.	430 (MT), 490 (AT)	490

*1: Except U5
*2: U5

D: TRANSMISSION

Model			Sedan/Wagon		
			2.5 L		3.0 L
			AWD		
Transmission type			5MT	4AT	
Clutch type			DSPD	TCC	
Gear ratio		1st	3.454	3.027	2.785
		2nd	2.062	1.619	1.545
		3rd	1.448	1.000	
		4th	1.088	0.694	
		5th	0.871	—	
		Reverse	3.333	2.272	
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	
		Gear ratio	—	1.000	
	Final reduction	Type of gear	Hypoid		
		Gear ratio	4.111	4.444	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	
		Gear ratio	1.000	—	
	Final reduction	Type of gear	Hypoid		
		Gear ratio	4.111	4.444	4.111

5MT: 5-forward speed with synchromesh and 1-reverse – with center differential and viscous coupling
4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse – with hydraulically controlled transfer clutch
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch

E: STEERING

Type	Rack and Pinion
Turns, lock to lock	3.4
Minimum turning circle m (ft)	Curb to curb: 12.0 (39.4), Wall to wall: 11.2 (36.7)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Multi-link type, Independent, Coil spring

G: BRAKE

Model	With ABS
Service brake system	Dual circuit hydraulic with vacuum suspended power unit
Front	Ventilated disc brake
Rear	Disc brakes
Parking brake	Mechanical on rear brakes

H: TIRE

Model	16-inch wheel	
Size	P215/60R16*	P225/60R16 97H
Type	Steel belted radial, Tubeless	

*: Recommended winter (snow) tire size.

I: CAPACITY

Model		2.5 L		3.0 L
		AWD		
		5MT	4AT	
Fuel tank	ℓ (US gal, Imp gal)	64 (16.9, 14.1)		
Engine oil (Replacement)	ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5)		Approx. 5.6 (5.9, 4.9)
Transmission gear oil	ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—	
Automatic transmission fluid	ℓ (US qt, Imp qt)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)	
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)	
AWD rear differential gear oil	ℓ (US qt, Imp qt)	0.8 (0.8, 0.7)		
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)		
Engine coolant	ℓ (US qt, Imp qt)	6.8 (7.2, 6.0)	6.7 (7.1, 5.9)	7.9 (8.4, 7.0)

J: WEIGHT

1. U.S. SPEC. VEHICLE

Model		Sedan	
		2.5 L	3.0 L
		AWD	
		4AT	4AT*1
Curb weight (C.W.)	Front kg (lb)	907 (2,000)	943 (2,080)
	Rear kg (lb)	692 (1,525)	694 (1,530)
	Total kg (lb)	1,599 (3,525)	1,637 (3,610)
Gross vehicle weight (G.V.W.)	Front kg (lb)	1,007 (2,220)	1,061 (2,340)
	Rear kg (lb)	989 (2,180)	989 (2,180)
	Total kg (lb)	1,996 (4,400)	2,050 (4,520)

Model		Wagon			
		2.5 L			
		Cold weather		LTD	
		5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front kg (lb)	857 (1,890)	882 (1,945)	871 (1,920)	896 (1,975)
	Rear kg (lb)	712 (1,570)	717 (1,580)	735 (1,620)	739 (1,630)
	Total kg (lb)	1,569 (3,460)	1,599 (3,525)	1,606 (3,540)	1,635 (3,605)
Gross vehicle weight (G.V.W.)	Front kg (lb)	1,002 (2,210)			
	Rear kg (lb)	1,064 (2,345)			
	Total kg (lb)	2,066 (4,555)			

Model			Wagon			
			2.5 L		3.0 L	
			OTHERS		EXCEPT S	S
			5MT	4AT	4AT*1	
Curb weight (C.W.)	Front	kg (lb)	855 (1,885)	880 (1,940)	943 (2,080)	934 (2,060)
	Rear	kg (lb)	712 (1,570)	716 (1,580)	741 (1,635)	723 (1,595)
	Total	kg (lb)	1,563 (3,445)	1,597 (3,520)	1,684 (3,715)	1,658 (3,655)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)		1,061 (2,340)	
	Rear	kg (lb)	1,064 (2,345)		1,070 (2,360)	
	Total	kg (lb)	2,066 (4,555)		2,131 (4,700)	

*1: Excludes the weights of audio, VDC

2. CANADA SPEC. VEHICLE

Model			Sedan	
			2.5 L	3.0 L
			AWD	
			4AT	4AT*1
Curb weight (C.W.)	Front	kg (lb)	894 (1,970)	943 (2,080)
	Rear	kg (lb)	692 (1,525)	694 (1,530)
	Total	kg (lb)	1,586 (3,495)	1,637 (3,610)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,007 (2,220)	1,061 (2,340)
	Rear	kg (lb)	989 (2,180)	989 (2,180)
	Total	kg (lb)	1,996 (4,400)	2,050 (4,520)

Model			Wagon				
			2.5 L			3.0 L	
			Cold Weather		LTD	EXCEPT S	S
			5MT	4AT		4AT*1	
Curb weight (C.W.)	Front	kg (lb)	844 (1,860)	869 (1,915)	882 (1,945)	943 (2,080)	934 (2,060)
	Rear	kg (lb)	712 (1,570)	717 (1,580)	739 (1,630)	741 (1,635)	723 (1,595)
	Total	kg (lb)	1,556 (3,430)	1,586 (3,495)	1,621 (3,575)	1,684 (3,715)	1,658 (3,655)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)			1,061 (2,340)	
	Rear	kg (lb)	1,064 (2,345)			1,070 (2,360)	
	Total	kg (lb)	2,066 (4,555)			2,131 (4,700)	

*1: Excludes the weights of audio, VDC

3. TAIWAN SPEC. VEHICLE

Model			Wagon
			2.5 L
			AWD
			4AT
Curb weight (C.W.)	Front	kg (lb)	882 (1,945)
	Rear	kg (lb)	739 (1,630)
	Total	kg (lb)	1,621 (3,575)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)
	Rear	kg (lb)	1,064 (2,345)
	Total	kg (lb)	2,066 (4,555)

4. CHILE SPEC. VEHICLE

Model			Sedan	Wagon
			3.0 L	
			AWD	
			4AT	
Curb weight (C.W.)	Front	kg (lb)	950 (2,095)	950 (2,095)
	Rear	kg (lb)	694 (1,530)	741 (1,635)
	Total	kg (lb)	1,644 (3,625)	1,691 (3,730)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,061 (2,340)	1,061 (2,340)
	Rear	kg (lb)	989 (2,180)	1,070 (2,360)
	Total	kg (lb)	2,050 (4,520)	2,131 (4,700)

3. PICKUP

A: DIMENSIONS

Model				AWD	
				Non-turbo model	Turbo model
Overall length			mm (in)	4,910 (193.3)	
Overall width			mm (in)	1,780 (70.1)	
Overall height			mm (in)	1,577 (62.1)	1,590 (62.6)
Compartment	Leg room	Front Max.	mm (in)	1,101 (43.3)	
		Rear Min.	mm (in)	851 (33.50)	
	Head room	Front	mm (in)	973 (38.31)	
		Rear	mm (in)	947 (37.28)	
	Shoulder room	Front	mm (in)	1,368 (53.9)	
		Rear	mm (in)	1,362 (53.6)	
Wheelbase			mm (in)	2,650 (104.3)	
Tread		Front	mm (in)	1,470 (57.9)	
		Rear	mm (in)	1,465 (57.7)	
Minimum road clearance		M.L.V.W.	mm (in)	173 (6.81)	163 (6.42)
		C.W.	mm (in)	213 (8.39)	

B: ENGINE

Model		2.5 L	Turbo 2.5 L
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
Valve arrangement		Overhead camshaft type	DOHC
Bore × Stroke	mm (in)	99.5 × 79.0 (3.917 × 3.110)	
Displacement	cm^3 (cu in)	2,457 (149.9)	
Compression ratio		10.0	8.2±0.2
Firing order		1 — 3 — 2 — 4	
Idle speed at Park/Neutral position	rpm	MT:650 AT:700	AT:700±100 MT:700±100
Maximum output	kW (HP)/rpm	123 (165)/5,600	157(210)/5,600
Maximum torque	N·m (kgf-m, ft-lb)/rpm	226 (23.0, 166)/3,600	319 (32.5, 235)/3,600

C: ELECTRICAL

Model			2.5 L	Turbo 2.5 L
Ignition timing at idling speed		BTDC/rpm	MT:10°±8°/650, AT:15°±8°/700	MT: 13°±10°/700 AT: 17°±10°/700
Spark plug	Type and manufacturer		CHAMPION: RC10YC4 (Standard) NGK: BKR5E-11 NGK: BKR6E-11	NGK: ILFR6B
Alternator			12V — 90A	
Battery	Reserve capacity	min	90 (MT), 110 (AT)	
	Cold cranking amperes	amp.	430 (MT), 490 (AT)	

D: TRANSMISSION

Model			2.5 L Non-turbo		2.5 L Turbo	
Transmission type			5MT	4AT	5MT	4AT
Clutch type			DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.454	3.027	3.454	2.785
		2nd	2.062	1.619	1.947	1.545
		3rd	1.448	1.000	1.366	1.000
		4th	1.088	0.694	0.972	0.694
		5th	0.871	—	0.738	—
		Reverse	3.333	2.272	3.333	2.272
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid		Hypoid	
		Gear ratio	4.111	4.444	4.444	4.444
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—
		Gear ratio	1.000	—	1.000	—
	Final reduction	Type of gear	Hypoid		Hypoid	
		Gear ratio	4.111	4.444	4.444	4.444

5MT: 5-forward speed with synchromesh and 1-reverse – with center differential and viscous coupling
4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse – with hydraulically controlled transfer clutch
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch

E: STEERING

Type		Rack and Pinion
Turns, lock to lock		3.4
Minimum turning circle	m (ft)	Curb to curb: 12.0 (39.4), Wall to wall: 11.2 (36.7)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Multi-link type, Independent, Coil spring

G: BRAKE

Model	With ABS
Service brake system	Dual circuit hydraulic with vacuum suspended power unit
Front	Ventilated disc brake
Rear	Disc brakes
Parking brake	Mechanical on rear brakes

H: TIRE

Model	16-inch wheel	
Size	P215/60R16*	P225/60R16 97H
Type	Steel belted radial, Tubeless	

*: Recommended winter (snow) tire size.

I: CAPACITY

Model		AWD		AWD Turbo	
		5MT	4AT	5MT	4AT
Fuel tank	ℓ (US gal, Imp gal)	64 (16.9, 14.1)			
Engine oil (Replacement)	ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5)			
Transmission gear oil	ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—	3.5 (3.7, 3.1)	—
Automatic transmission fluid	ℓ (US qt, Imp qt)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)	—	9.3 – 9.6 (9.8 – 10.1, 8.2 – 8.4)
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)	—	1.1 – 1.3 (1.2 – 1.4, 1.0 – 1.1)
AWD rear differential gear oil	ℓ (US qt, Imp qt)	0.8 (0.8, 0.7)			
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)			
Engine coolant	ℓ (US qt, Imp qt)	6.8 (7.2, 6.0)	6.7 (7.1, 5.9)	7.7 (8.1, 6.8)	7.6 (8.0, 6.7)

J: WEIGHT

1. U.S. SPEC. VEHICLE

Model			AWD		AWD-S		AWD-B		
			5MT	4AT	5MT	4AT	5MT Non-Turbo	5MT Turbo	4AT Turbo
Curb weight (C.W.)	Front	kg (lb)	844 (1,860)	873 (1,925)	839 (1,850)	869 (1,915)	889 (1,960)	894 (1,970)	914 (2,015)
	Rear	kg (lb)	744 (1,640)	744 (1,640)	739 (1,630)	739 (1,630)	748 (1,650)	755 (1,665)	748 (1,650)
	Total	kg (lb)	1,588 (3,500)	1,617 (3,565)	1,579 (3,480)	1,608 (3,545)	1,637 (3,610)	1,649 (3,635)	1,662 (3,665)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)						
	Rear	kg (lb)	1,063 (2,345)						
	Total	kg (lb)	2,066 (4,555)						

2. CANADA SPEC. VEHICLE

Model			AWD		AWD-S		AWD-B		
			5MT	4AT	5MT	4AT	5MT Non-Turbo	5MT Turbo	4AT Turbo
Curb weight (C.W.)	Front	kg (lb)	844 (1,860)	873 (1,925)	839 (1,850)	869 (1,915)	889 (1,960)	894 (1,970)	914 (2,015)
	Rear	kg (lb)	744 (1,640)	744 (1,640)	739 (1,630)	739 (1,630)	748 (1,650)	755 (1,665)	748 (1,650)
	Total	kg (lb)	1,588 (3,500)	1,617 (3,565)	1,579 (3,480)	1,608 (3,545)	1,637 (3,610)	1,649 (3,635)	1,662 (3,665)
Gross vehicle weight (G.V.W.)	Front	kg (lb)	1,002 (2,210)						
	Rear	kg (lb)	1,063 (2,345)						
	Total	kg (lb)	2,066 (4,555)						

MEMO:

PRECAUTION

PC

Page
1. Precaution 2

1. Precaution

A: PRECAUTION

Please clearly understand and adhere to the following general precautions. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair individual parts. Doing so could prevent the ABS system from operating when needed or cause it to operate incorrectly and result in injury.

2. BRAKE FLUID

If brake fluid gets in your eyes or on your skin, do the following:

- Wash out your eyes and seek immediate medical attention.
- Wash your skin with soap and then rinse thoroughly with water.

3. ELECTRIC FAN

The electric fan may rotate without warning, even when the engine is not on. Do not place your hand, cloth, tools, or other items near the fan at any time.

4. ROAD TESTS

Always conduct road tests in accordance with traffic rules and regulations to avoid bodily injury and interrupting traffic.

5. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on airbag components or nearby, and airbag wiring harnesses or nearby.
To prevent unexpected deployment, perform one of the steps below and then wait at least 20 seconds to discharge electricity before beginning work.

- Step 1: Turn the ignition switch OFF.
- Step 2: Remove the negative battery terminal.

6. AIRBAG DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose airbag modules in the same way as other refuse. Follow all government regulations concerning disposal of refuse.

7. AIRBAG MODULE

Adhere to the following when handing and storing the airbag module to prevent bodily injury from unexpected deployment:

- Do not hold harnesses or connectors to carry the module.
- Do not face the bag in the direction that it opens towards yourself or other people.
- Do not face the bag in the direction that it opens towards the floor or walls.

8. AIRBAG SPECIAL TOOLS

To prevent unexpected deployment, only use special tools.

9. WINDOW

Always wear safety glasses when working around any glass to prevent glass fragments from damaging your eyes.

10.WINDOW ADHESIVE

Always use the specified urethane adhesive when attaching glass to prevent it from coming loose and falling, resulting in accidents and injury.

11.HOSE REMOVAL/INSTALLATION PROCEDURES

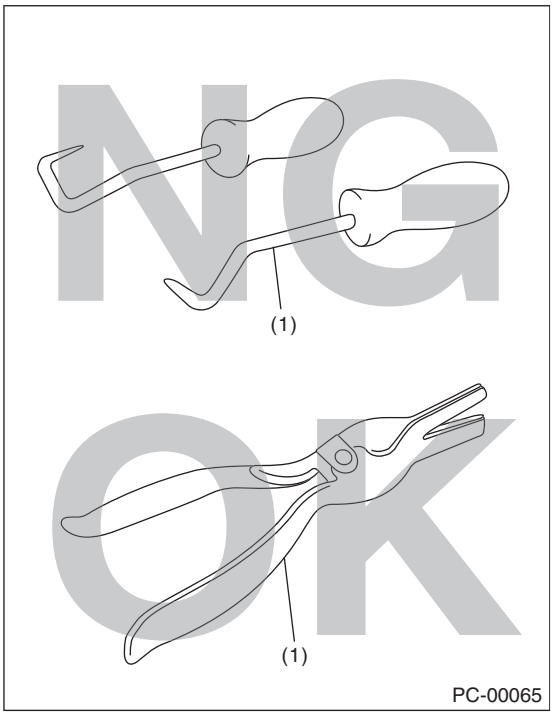
1. Hose Removal/Installation Pre-Procedures

- Be careful to inspect hoses so as not to use damaged or deformed hoses. Using such hoses could cause leakage or loss of oil, with leaked oil splashing on exhaust pipes or other hot parts, resulting in smoke or fire.
- Always remove hoses when performing work. Not removing the hoses and moving parts out of the way when performing procedures may damage the inside of hoses and cause other negative affects.

2. Hose Removal/Installation Procedures and Inspection

• Remove hoses according to the following instructions.

• If using the hose remover (general tool), do not use the sharp-pointed hose remover (hose plucker) as it may damage pipe surfaces or hoses.

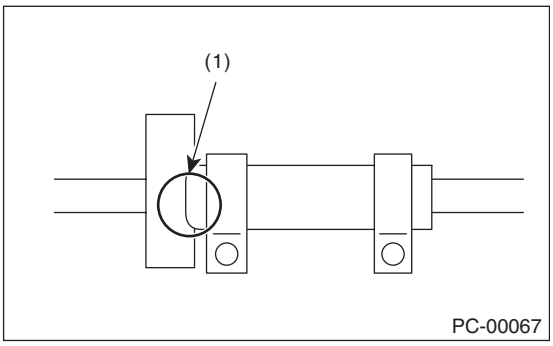


(1) Hose remover

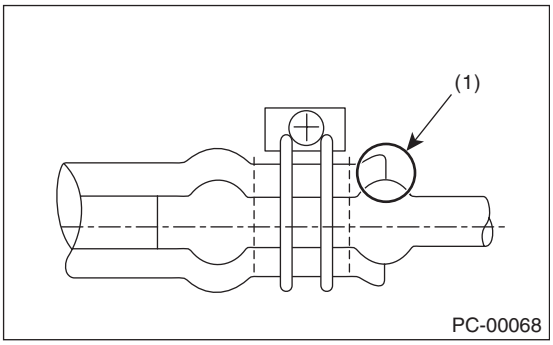
• When using pliers to make hose removal easier, always be sure to use a cloth to protect the hose, slightly rotate the hose, and then pull straight out by hand.

• Inspect the following points in continuous use, and replace any hoses that are damaged or defective with new parts.

• Replace any hoses that are riding over the stay or spool with new parts.



(1) Hose riding over a stay

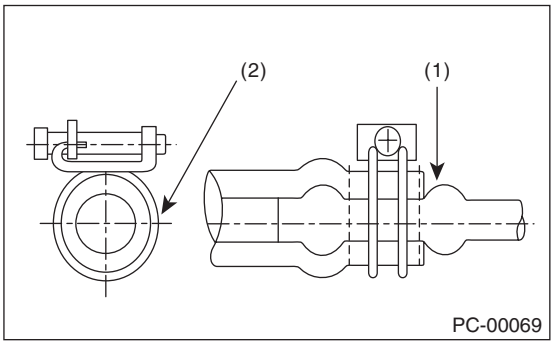


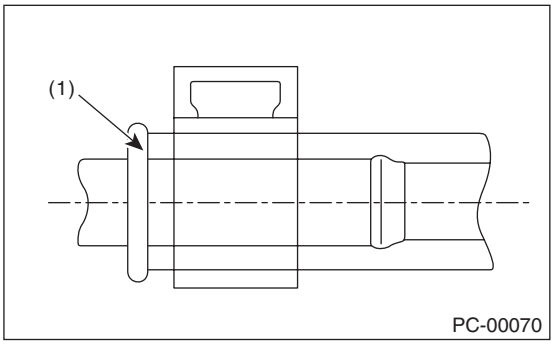
(1) Hose riding over a spool

• Check the inner and outer surfaces of the hose for damage, cracks, breakage, hardening/softening/swelling of rubber, internal peeling, and that there are no deformations caused by infiltration/adhesion of foreign matter, and no twisted hoses. Replace any defective hoses with new parts.

• Install hoses according to the following instructions.

- Carefully check the installation positions.
- Do not use any lubricants.
- Securely insert until the specified positions (until contacting spool).





(1) Contacting the spool. (Do not excessively insert the hose to prevent the hose from becoming wrinkled up.)

(2) Apply an equal clamping force all around the hose periphery.

- Check that the position and orientation of hose clamps, and the hose layout are correct. (Check that the position and orientation are matching, they are not excessively short/long, there are no differences with before performing the procedures, and that there is clearance between hoses and surrounding parts.)
- After installing, check that there are no disconnection of hoses or leakage from hoses. (Check that hoses are securely fixed by the clamps.)

• Inspect the hose clips and clamps according to the following points, and replace any parts that are damaged or defective with new parts.

- Check for deformations, rust, damage, and adhering of foreign matter.
- For clips, check that the spring functions and has clamping force.
- For clamps, check that the screw can clinch, the clamp has not become oval shaped, and the screw is not damaged.

• Inspect the pipes according to the following points, and replace any parts that are damaged or defective with new parts.

Check that the pipes do not have any damage, rust, peeling (including peeling plating), foreign matter adhering, twisting, crushing, bending, or cracks.

• Replace the following parts with new parts if the hoses have been removed or their installation positions have been changed.

ATF cooler hose, engine oil cooler hose, MT oil cooler hose, power steering suction hose, and power steering return hose.

NOTE

NT

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1. Note

A: NOTE

This is information that can improve efficiency of maintenance and assure sound work.

1. FASTENER NOTICE

Fasteners are used to prevent parts from damage and dislocation due to looseness. Fasteners must be tightened to the specified torque.
Do not apply paint, lubricant, rust retardant, or other substances to the surface around bolts, fasteners, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problems.

2. STATIC ELECTRICITY DAMAGE

Do not touch the ECM, connectors, logic boards, and other such parts when there is a risk of static electricity. Always use a static electricity prevention cord or touch grounded metal before conducting work.

3. IGNITION OFF BATTERY

When removing the battery cables, always be sure to turn the ignition off to prevent electrical damage to the ECM from rush current.

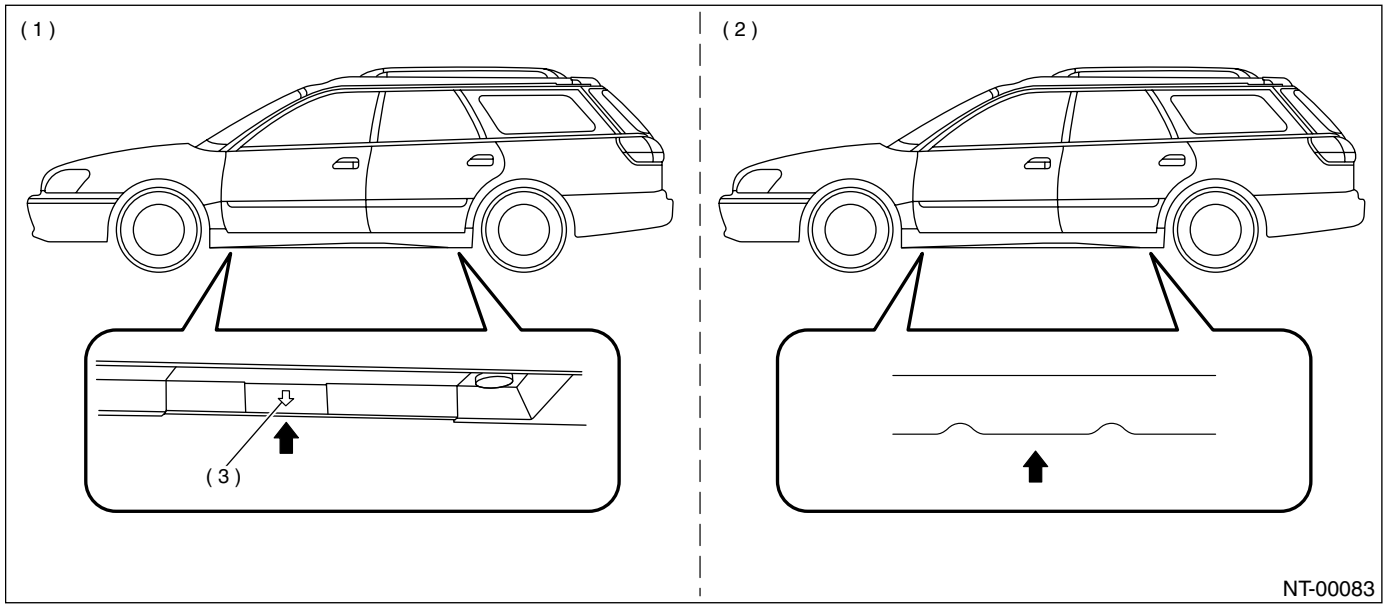
4. SERVICE PARTS

Use authentic service parts for maximum performance and maintenance, when conducting repairs. Subaru/FHI will not be responsible for poor performance resulting from the use of parts not specified by a genuine dealer.

5. LIFTS AND JACKS

When using a lift or jack-ridged rack to raise a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful to make sure the vehicle is balanced before raising it.

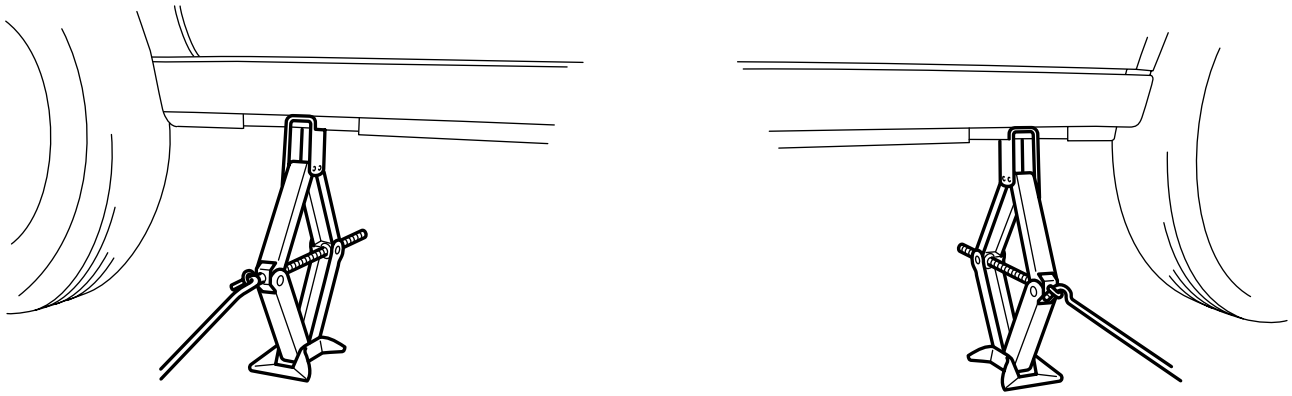
• Support locations



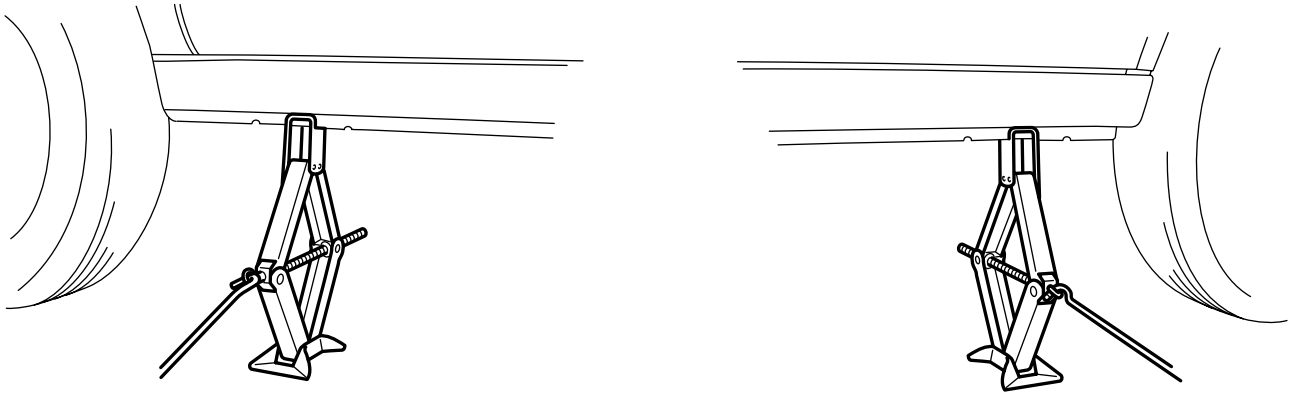
(1) Model with side sill cover
(2) Model without side sill cover
(3) Jack-up point mark

• Pantograph jack

(1)



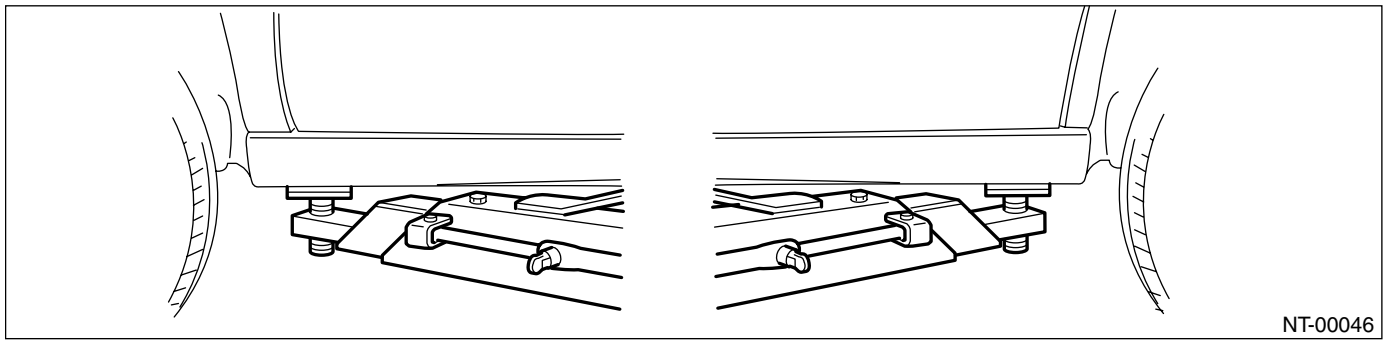
(2)



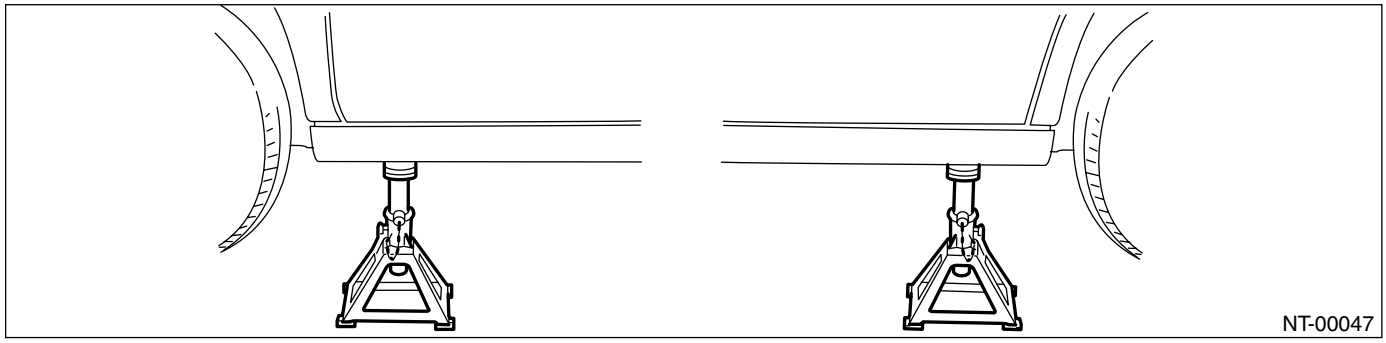
NT-00084

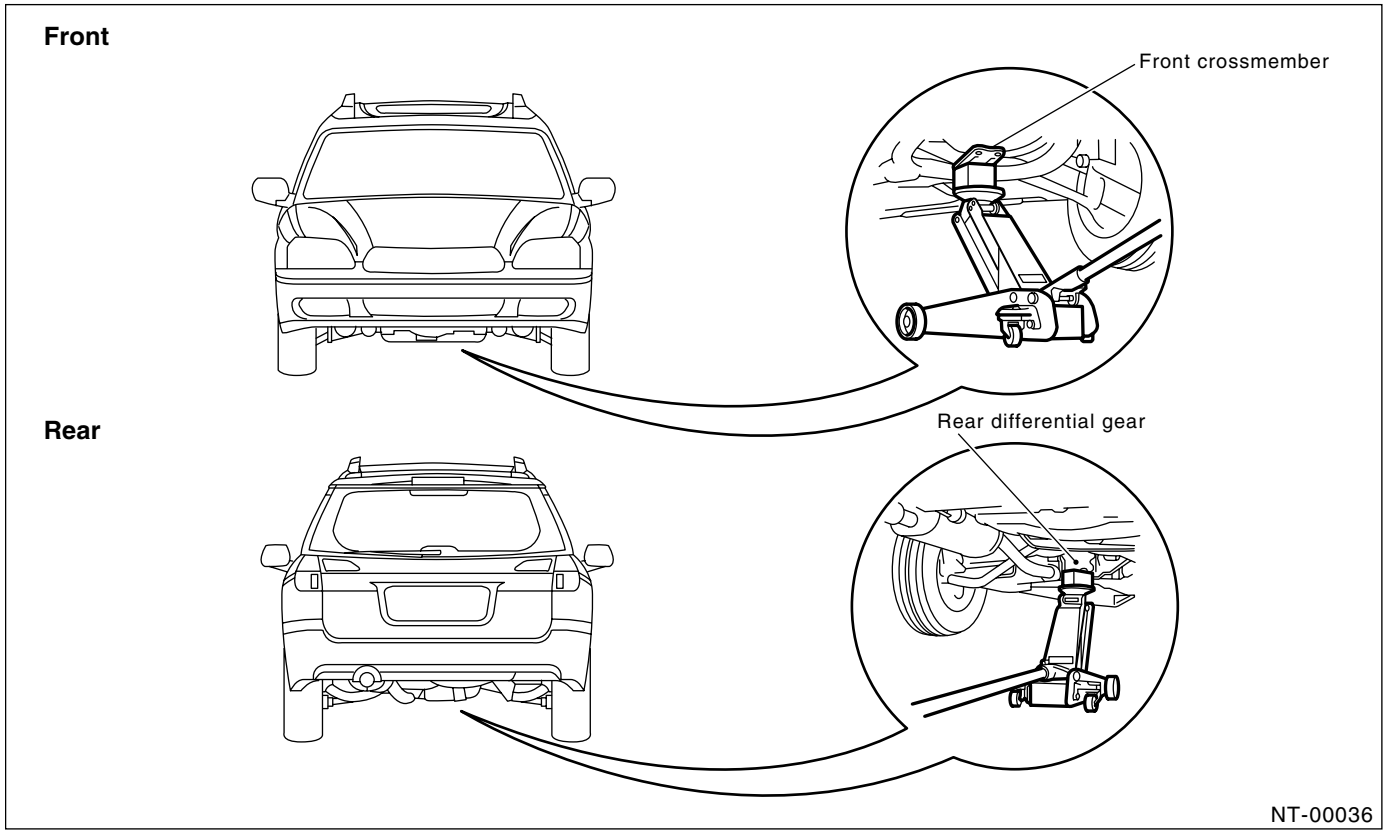
(1) Model with side sill cover
(2) Mode without side sill cover

- **Lift**



- **Safety stand**



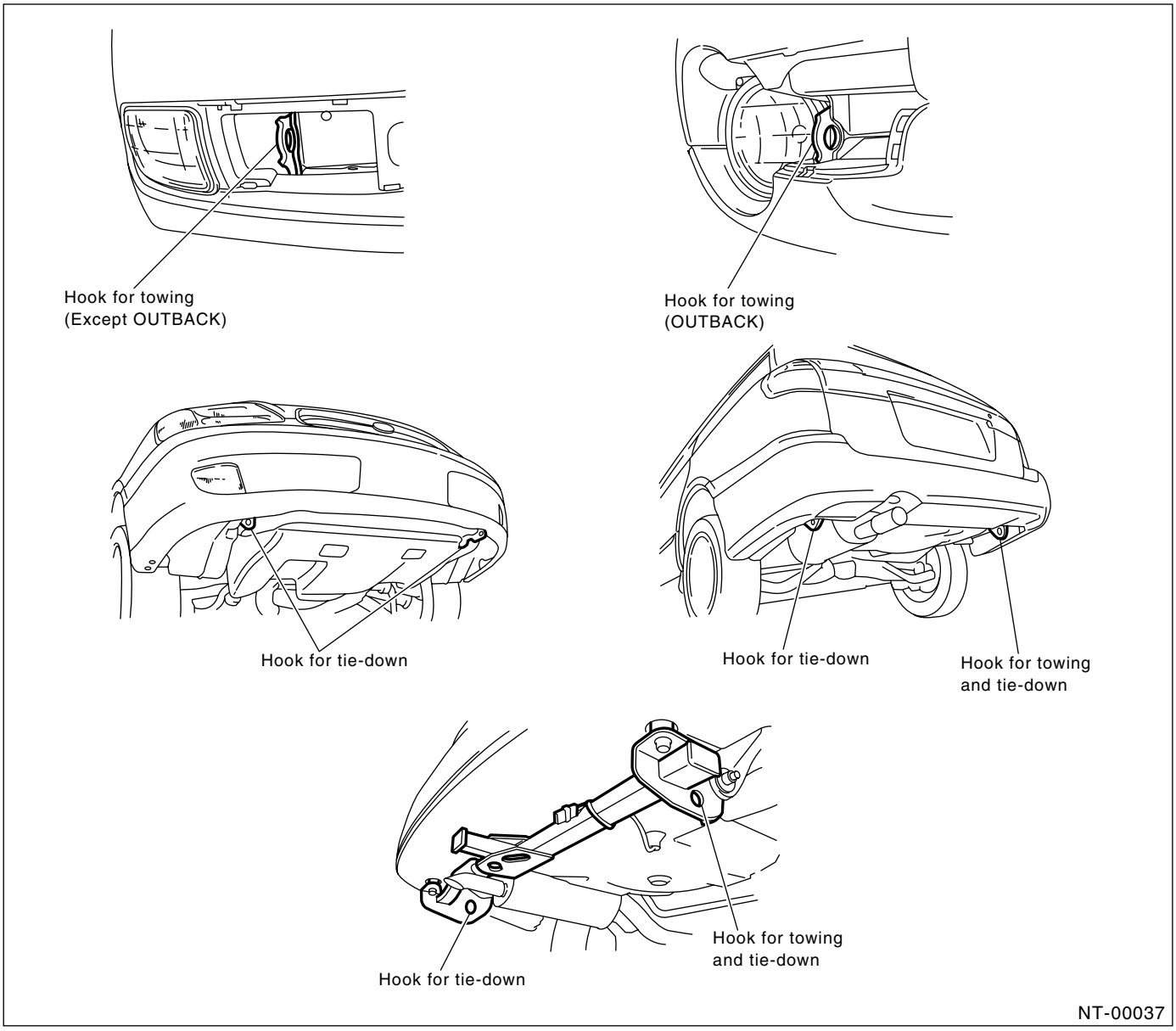


6. TIE DOWNS

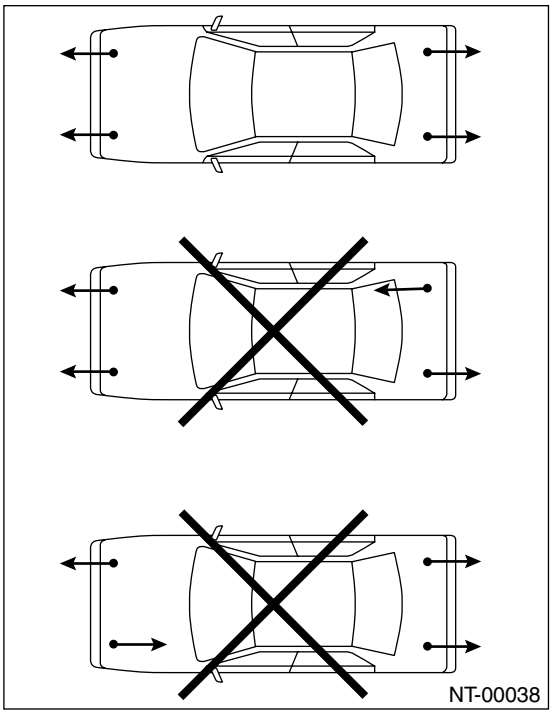
Tie-downs are used when transporting vehicles and when using the chassis dynamo.

• Tie-down points

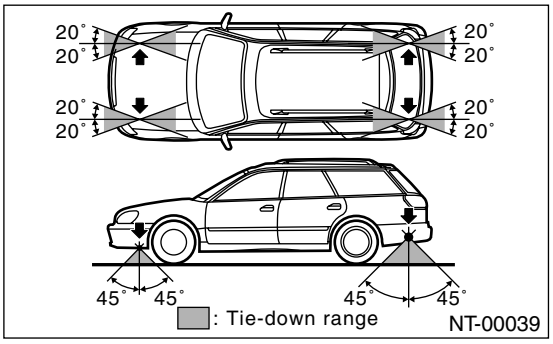
Attach tie-downs only to the specified points on the vehicle.



• Chain direction at tie-down condition

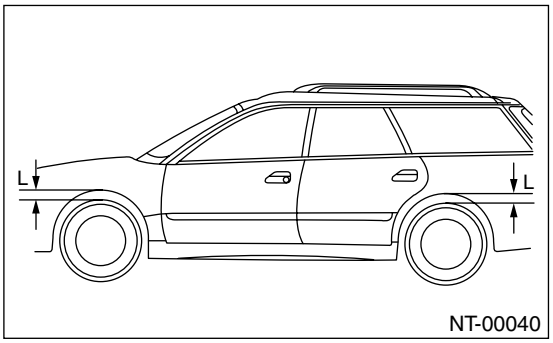


• Chain pulling range at tie-down condition



• Vehicle sinking volume at tie-down condition

Measure distance L between tire highest point to arch highest point before tie-down and after tie-down. Difference of measurement value (drop height) shall be within 50.8 mm (2.00 in). Make sure to fix a vehicle securely.



7. TOWING

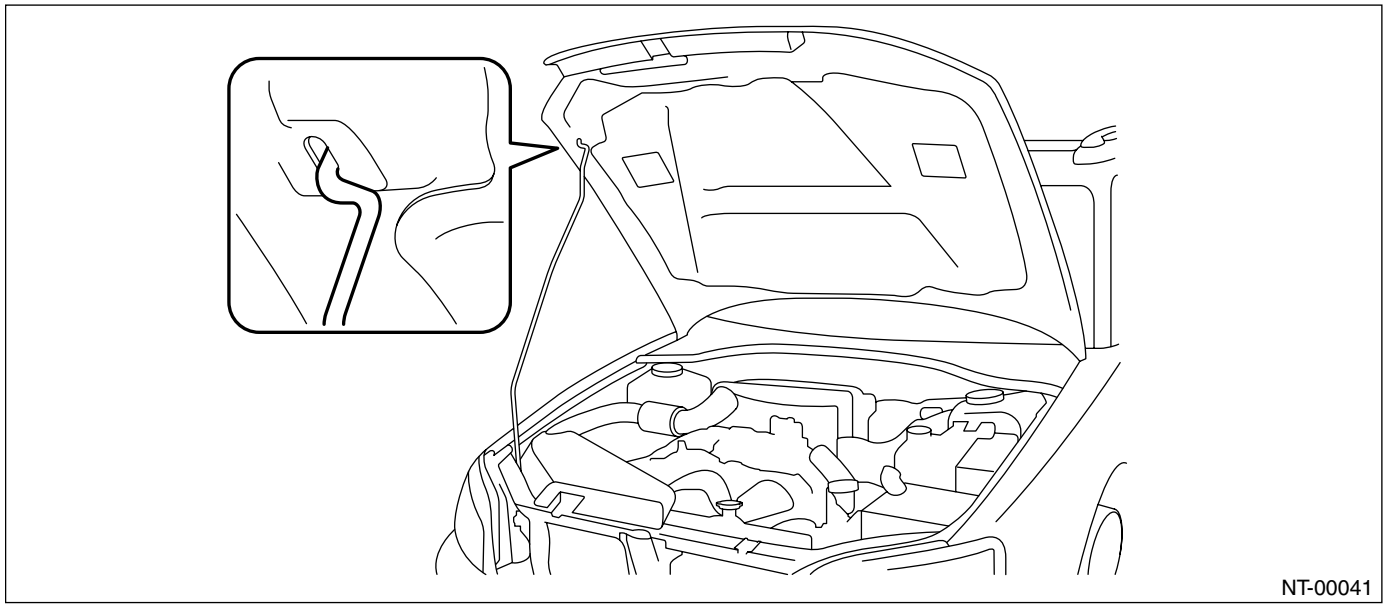
Avoid towing vehicles except when the vehicle cannot be driven. For vehicles with AWD, AT or VTD, use a loader instead of towing. When towing other vehicles, to prevent excessive weight from damaging the hook or vehicle:

• Do not tow other vehicles with a front towing hook.

• Make sure the vehicle towing is heavier that the vehicle being towed.

8. FRONT HOOD STAY INSTALLATION

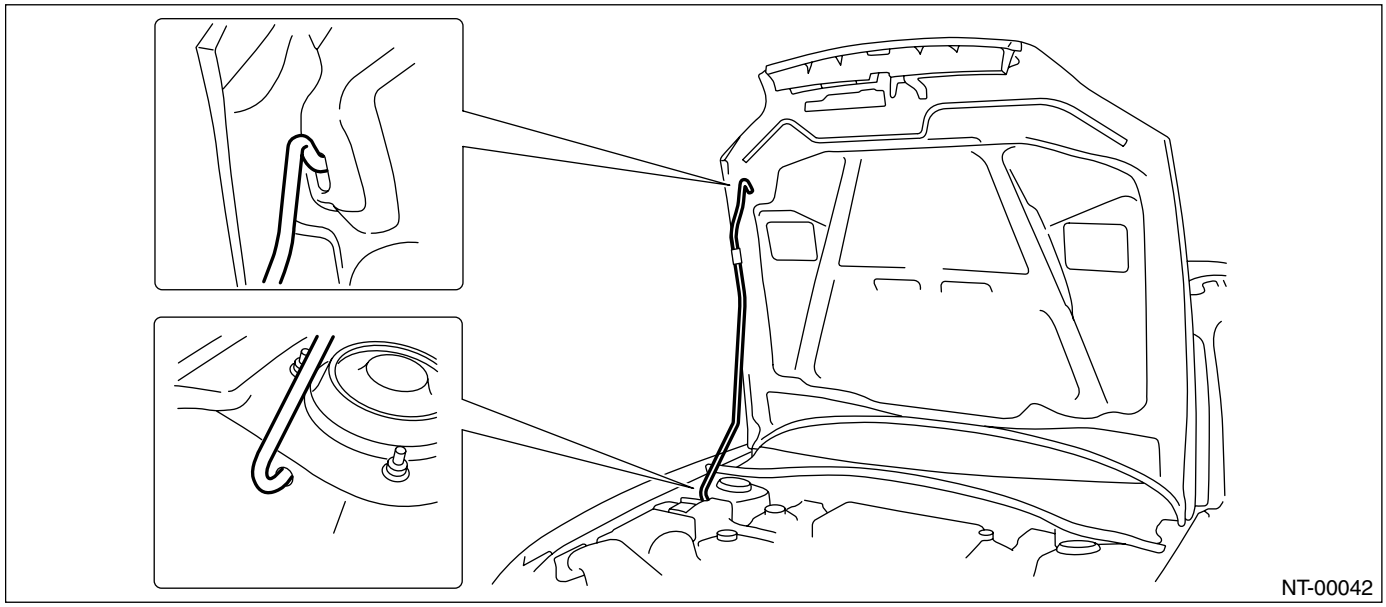
• At the check and general maintenance



• When wider hood opening is necessary

Set stay into the hole of hood inner as shown in the figure below.

NOTE:
Before setting the hood in this position, remove the windshield washer hose attaching clip from the hood.



9. TRAINING

For information about training, contact a dealer or agent.

10.GENERAL SCAN TOOL

Using general scan tools will greatly improve efficiency of repairing engine electronic controls. The Subaru Select Monitor can be used to diagnose the engine and also the ABS, the air conditioner, and other parts.

NOTE

MEMO:

IDENTIFICATION

ID

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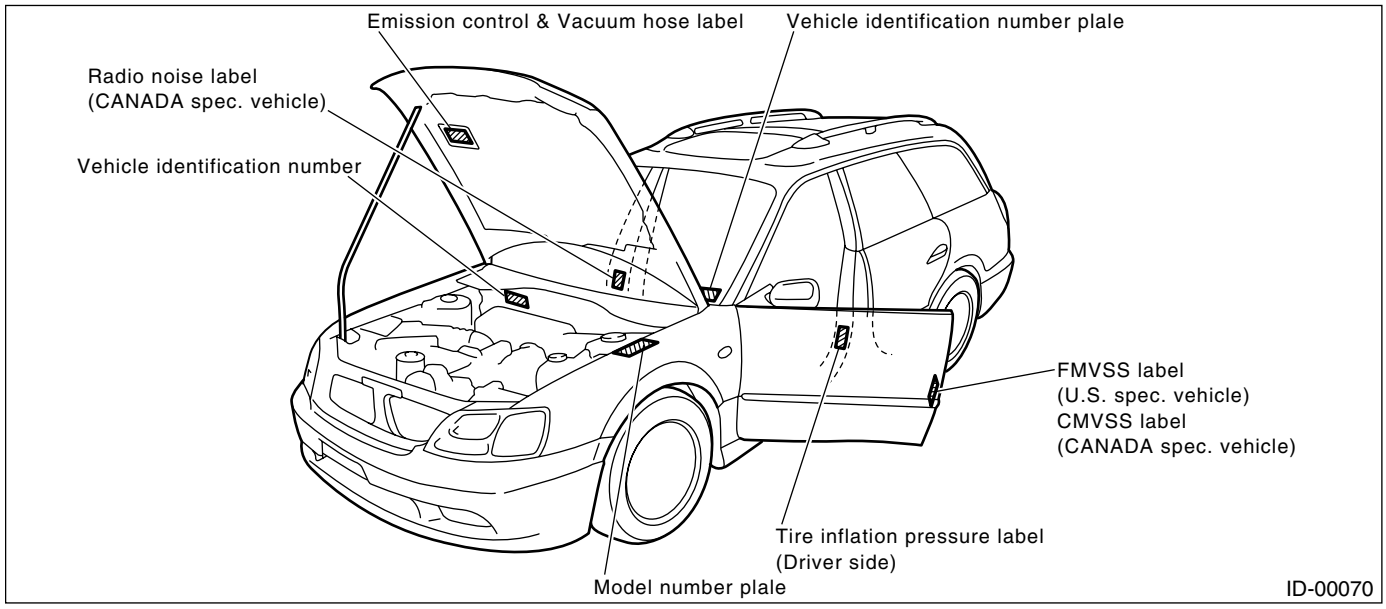
1. Identification 2

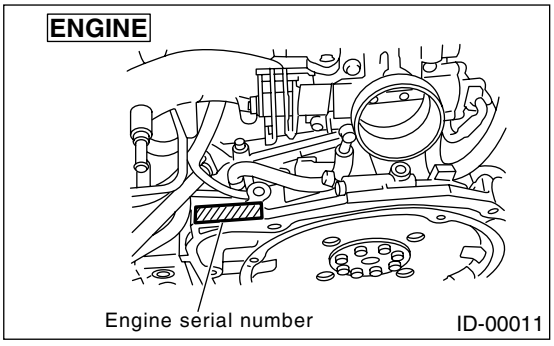
1. Identification

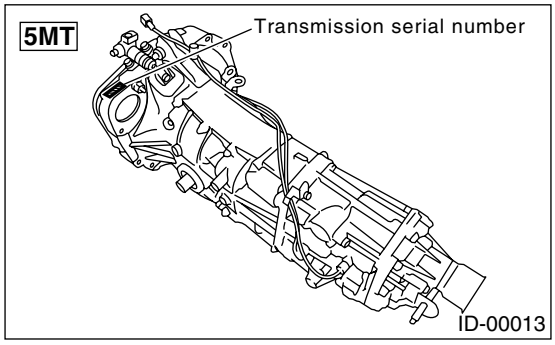
A: IDENTIFICATION

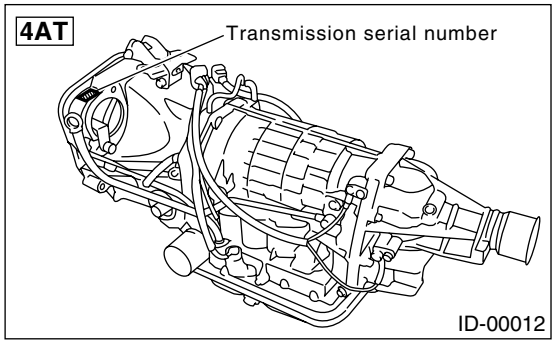
1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

The VIN (Vehicle Identification Numbers) is used to classify the vehicle.
Positioning of the plate label for identification

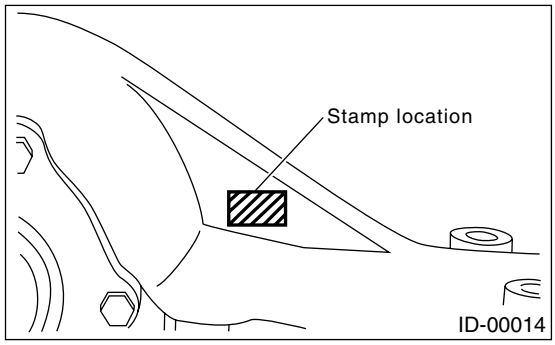




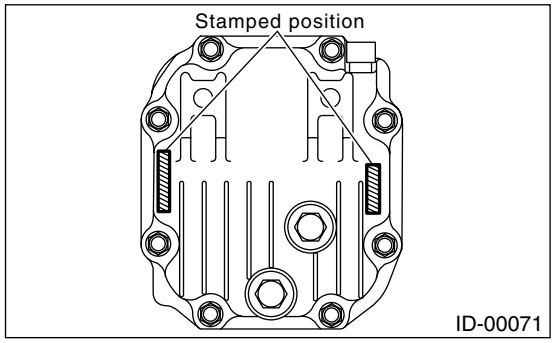




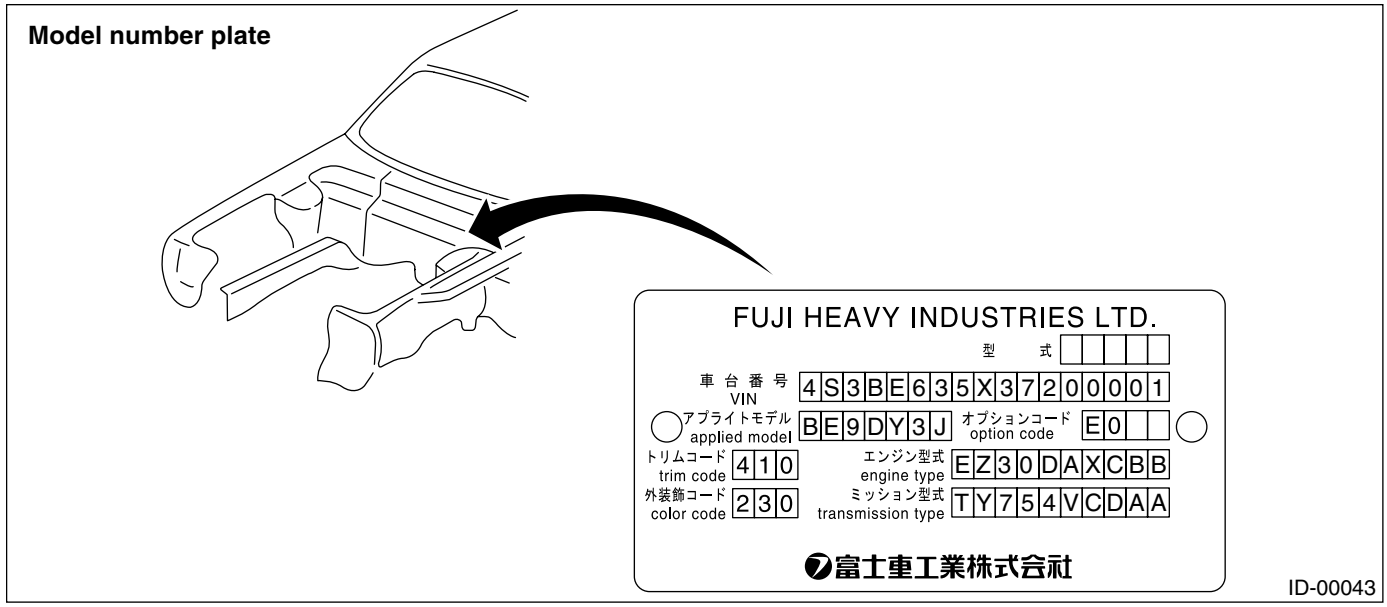
Except L, L-S and PICKUP AT models



L, L-S and PICKUP AT models



Model number plate



2. MEANING OF VIN

The meaning of the VIN is as follows:

- Legacy, OUTBACK

]4S3BE635X47200001[

The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	4S3	Manufacturer body area	Passenger car, SIA made, For US/Canada/Taiwan/Chile
4	B	Car line	Legacy/OUTBACK series
5	E	Body type	E: Sedan/OUTBACK Sedan H: Station Wagon/OUTBACK Wagon
6	6	Displacement	6: 2.5 L AWD 8: 3.0 L AWD
7	3	Grade	1: OUTBACK Sedan-6 cylinders S, OUTBACK Wagon-6 cylinders S 2: L-S 3: L 4: 2.5 GT 5: 2.5 GT LO 6: OUTBACK Wagon 7: OUTBACK Wagon-cold weather 8: OUTBACK Sedan-LTD, OUTBACK Wagon-LTD 9: OUTBACK Sedan-6 cylinders, OUTBACK Wagon-6 cylinders 0: OUTBACK-6 cylinders L.L.-Bean
8	5	Restraint	5: Manual belts, dual airbag 6: Manual belts, dual airbag, side airbag
9	X	Check digit	0 — 9 and X
10	4	Model year	4: 2004MY 5: 2005MY 6: 2006MY
11	7	Transmission type	5: Full-time AWD 4-speed AT-SS 6: Full-time AWD 5-speed MT 7: Full-time AWD 4-speed AT
12 to 17	200001	Manufacture number	From 200001: Sedan From 300001: Station Wagon From 600001: OUTBACK Wagon

- PICKUP

]4S4BT61CX46100001[

The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	4S4	Manufacturer body area	MPV, SIA made, For US/Canada
4	B	Car line	Legacy series
5	T	Body type	T:PICKUP
6	6	Displacement	6: 2.5 L AWD
7	1	Grade	1:BAJA 2:BAJA-5 3:BAJA-13
8	C	GVWR class	C: Class C (4,001 — 5,000 lb)
9	X	Check digit	0 — 9 and X
10	4	Model year	4: 2004MY 5: 2005MY 6: 2006MY
11	6	Transmission type	5: Full-time AWD 4-speed AT-SS 6: Full-time AWD 5-speed MT 7: Full-time AWD 4-speed AT
12 to 17	100001	Manufacture number	From 100001: PICKUP

3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.

BE9EY3J

Digits	Code	Meaning	Details
1	B	Series	B: Legacy/OUTBACK
2	E	Body style	E: Sedan/OUTBACK Sedan H: Station Wagon/OUTBACK Wagon T: PICKUP
3	9	Engine displacement Drive system Suspension system	9: 2.5 L AWD E: 3.0 L AWD
4	D	Minor change	E: 2004MY (SIA made)
5	Y	Destination	Y: Left-hand drive for United States, Canada and Taiwan
6	3	Grade	3: L 4: OUTBACK Wagon 7: L-S 8: OUTBACK Sedan-6 cylinders 9: OUTBACK Sedan-LTD A: OUTBACK Wagon-cold weather B: OUTBACK Wagon-LTD C: OUTBACK Wagon-6 cylinders D: OUTBACK-6 cylinders L.L.-Bean E: BAJA F: BAJA S G: 2.5 GT H: 2.5 GT LO N: OUTBACK Wagon-6 cylinders S U: BAJA B
7	J	Transmission, fuel feed system	D: DOHC MPI Turbo MT center differential AWD E: DOHC MPI 4-speed AT J: SOHC MPI center differential AWD R: SOHC MPI 4-speed AT T: DOHC MPI Turbo 4-speed AT-SS L: SOHC MPI 4-speed AT-SS

The engine and transmission type are as follows:

• Engine

EZ30DAXCBB

Digits	Code	Meaning	Details
1 and 2	EZ	Engine type	EJ: 4 cylinders EZ: 6 cylinders
3 and 4	30	Displacement	25: 2.5 L 30: 3.0 L
5	D	Fuel feed system	1: D-MPI SOHC-A phase-2 or -3 5: MPI-Turbo phase-2 or -3 9: L-MPI SOHC-B phase-2 or -3 D: D-MPI DOHC 6 cylinders phase-3
6	A	Exhaust regulations	A: For states not using California emissions standards B: For USA C: For states using California emissions standards
7	X	Transmission	W: AWD MT X: AWD AT
8 to 10	FBB	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• Transmission

TY754VCDAA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Y	Transmission type	Y: Full-time AWD MT center differential V: Full-time AWD AT VTD Z: Full-time AWD AT MPT
3 and 4	75	Classification	75: MT 1A, 1B: AT
5	4	Series	4: 5th Generation Legacy
6	V	Transmission specifications	V: Full-time AWD 5-speed MT with viscous coupling center differential single range Z: Full-time AWD 4-speed AT with MPT Y: Full-time AWD 4-speed AT with VTD
7	C	Mounted body	C: US 2.5 L SOHC H: US 2.5 L Turbo DOHC M: US 3.0 L DOHC
8 to 10	DAA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• Rear differential 1

VA1REG (XJ)

Digits	Code	Meaning	Details
1	V	For AWD	V: AWD
2	A	Type	A: A type
3	1	Hypoid gear diameter	1: 152 dia.
4	R	Installation position	R: Rear
5	E	Reduction gear ratio	E: 4.111 F: 4.444
6	G	Specification differences	G: Without LSD H: Viscous LSD

• Rear differential 2

T1

Code	Reduction gear ratio	LSD
T1	3.900	No
T2	4.111	No
JE	4.111	Viscous
CD	4.444	Viscous
J	4.111	Viscous
F	4.444	Viscous

IDENTIFICATION

MEMO:

RECOMMENDED MATERIALS

RM

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1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or a substitute of equivalent quality.

2. FUEL

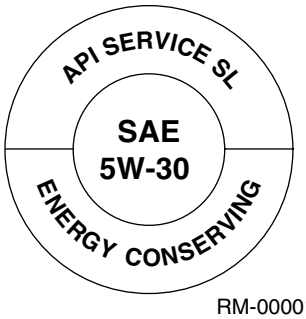
Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

• Unleaded gasoline

Use unleaded gasoline and not leaded gasoline on vehicles with catalytic converter installed to reduce air pollution. Using leaded gasoline will damage the catalytic converter.

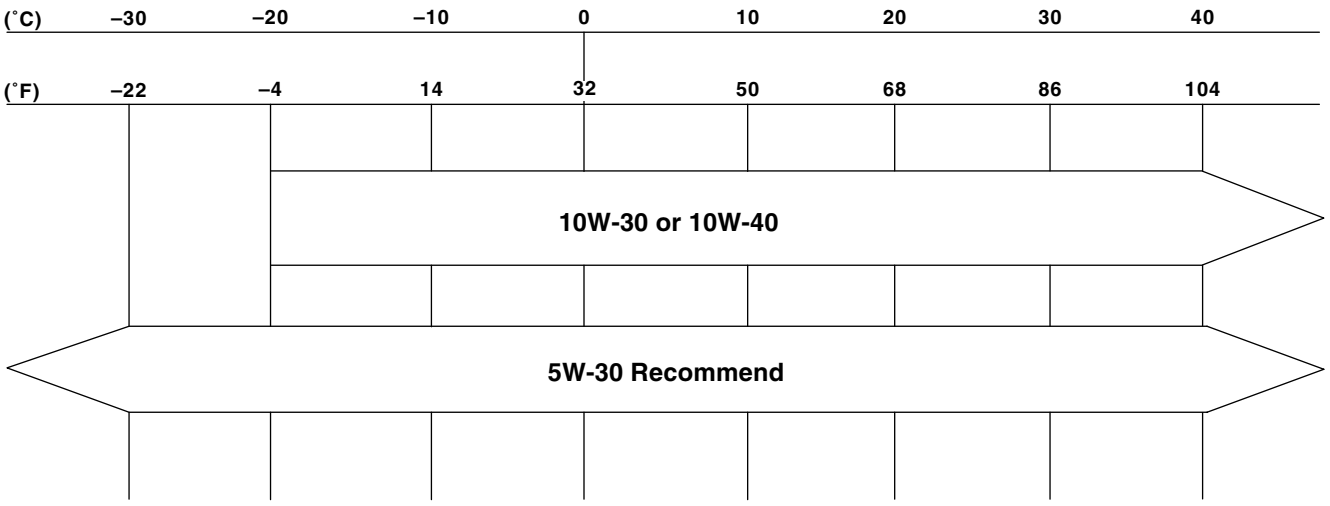
3. LUBRICANTS

Use either the lubricants in the table below or equivalent lubricants. See the table below to choose the correct SAE viscosity.

Lubricant	Recommended		Alternative
	API or ILSAC Spec.	ACEA Spec.	API Spec.
Engine oil	SL Grade “Energy conserving”  RM-00001 GF-3 (for vehicles with the stamp below) RM-00002	A1, A2 or A3	SJ
Manual transmission oil	GL-5	—	—
AT front differential gear oil	GL-5	—	—
Rear differential gear oil	GL-5	—	—

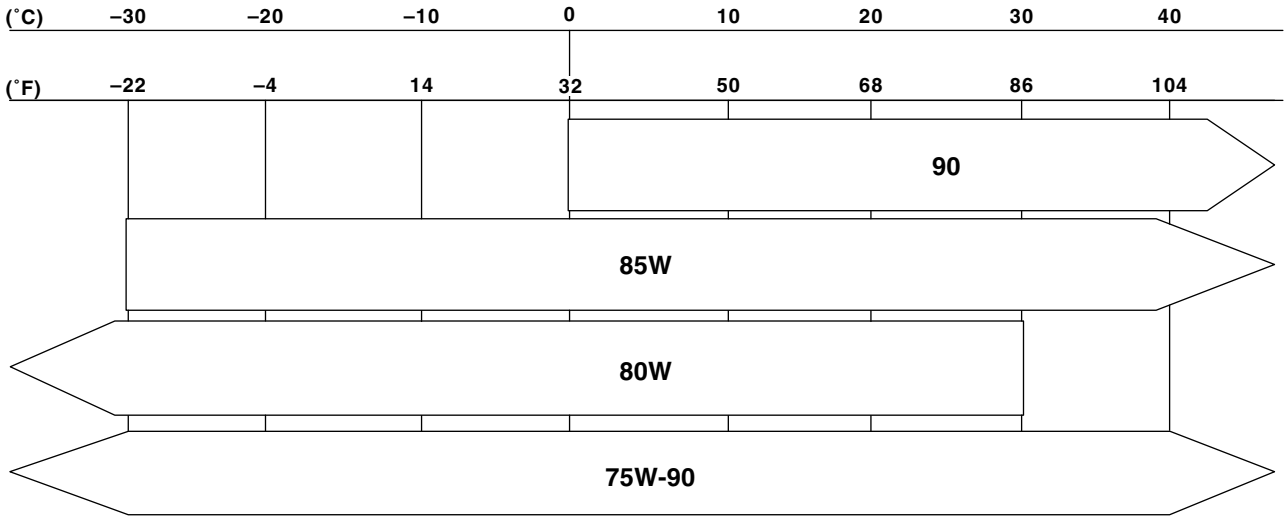
SAE viscosity No. and applicable temperature SAE J300

Engine oil



RM-00030

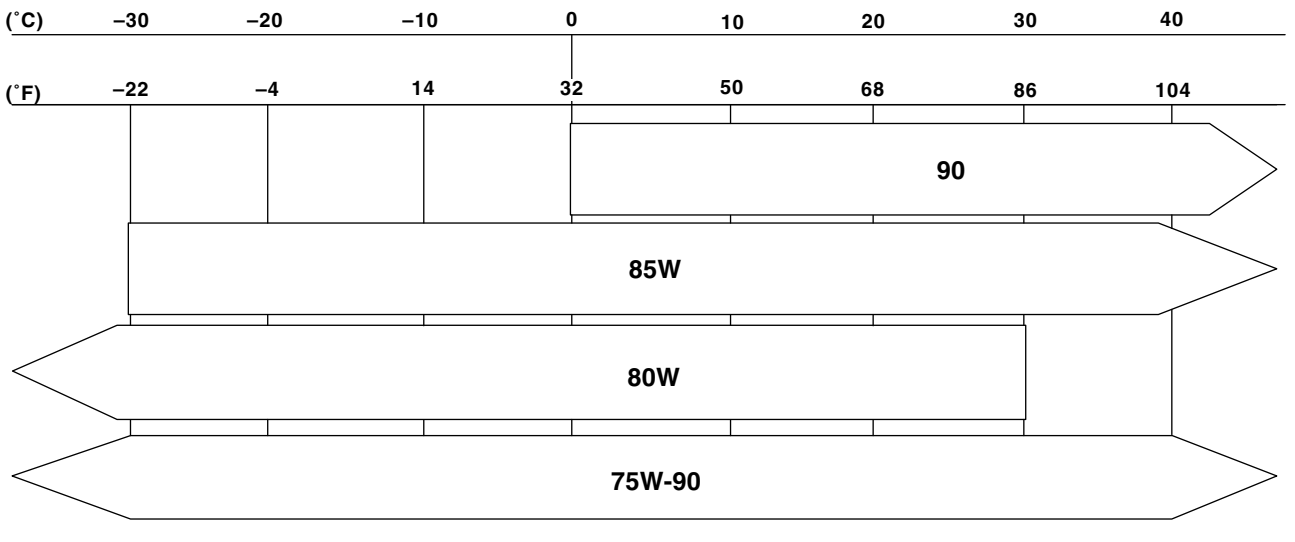
Manual transmission oil and rear differential gear oil



RM-00004

SAE viscosity No. and applicable temperature SAE J300

AT front differential gear oil



RM-00031

4. FLUID

Use the fluids specified in the table below. Do not mix two different kinds or makes of fluid.

Fluid	Recommended	Alternative	Remarks
Automatic transmission fluid	DEXRON III	—	
Power steering fluid	DEXRON III	—	
Brake fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	
Clutch fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	

5. COOLANT

Use genuine coolant to protect the engine.

Coolant	Recommended	Item number	Alternative
Coolant	SUBARU coolant	000016218	None
Water for dilution	Distilled water	—	Tap water

6. REFRIGERANT

Standard air conditioners on Subaru vehicles use HFC134a refrigerant. Do not mix it with other refrigerants. Also, do not use any air compressor oil except for ZXL200PG.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	ZXL200PG	—	None

7. GREASE

Use the grease and supplementary lubricants shown in the table below.

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	• O2 sensor • Bolts, etc.	SUBARU CRC	004301003	—
Grease	MT main shaft	FX clutch grease	000040901	—
	Clutch master cylinder push rod	Slicolube G-40M	004404003	—
	• Gear shift lever • Select lever • Clutch operating cylinder • Accelerator pedal • Clutch pedal • Brake pedal • Release bearing • Clutch release lever • Steering shaft bearing	SUNLIGHT2	003602010	—
	Steering gear box	Valiant grease M-2	003608001	—
	Disc brake	Niglube RX-2	K0779GA102	—
	Parking brake	Molykote No. 7439	003602001	—
	• Brake pad • Brake shoe	Molykote AS-880N	K0777YA010	—
	Front axle SFJ	SSG-6003	28093TA000	—
	Front axle BJ	NTG2218	28093AA000	—
	Rear axle BJ	Molylex No. 2	003601001	—
	Rear axle DOJ	VU-3A702	23223GA050	—
	Throttle cable end	Slicolube G-30M	004404002	—
	• Door latch • Door striker	Nippeko LT-0 or LT-00	—	—

8. ADHESIVES

Use the adhesives shown in the table below, or equivalent.

Adhesive	Application point	Recommended	Item number	Alternative
Adhesive	Windshield and body	Dow Automotive's Adhesive: ESSEX U-400HV Glass primer: U-401, U-402 Paint face primer: U-413	—	—
	Soft vinyl	Cemedine 540	—	3M's EC-776 EC-847 or EC-1022 (Spray type)
	Momentary sealant	Cemedine 3000	—	Armstrong's Eastman 910

9. SEAL MATERIAL

Use seal material shown in the table below, or equivalent.

Seal material	Application point	Recommended	Item number	Alternative
	• Cylinder block • Torque converter clutch case	Three Bond 1215	004403007	Dow Corning's No. 7038
	Transmission oil pan	Three Bond 1217B	K0877YA020	—
	Rear differential	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	Dow Corning's No. 7038
	Door sealing cover	Cemedine CSA-7000	000018901	Butyl Rubber sealant
	Steering adjusting screw	Three Bond 1141	004403006	—
	• Camshaft cap • H6 oil pan, chain cover	Three Bond 1280B	K0877YA018	—

MEMO:

PRE-DELIVERY INSPECTION

PI

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1. Pre-delivery Inspection

A: GENERAL

The purposes of the pre-delivery inspection (PDI) are as follows.

- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal state.
- Check if the vehicle before delivery is in a normal state.
- Check for any damage or missing parts that may have taken place during transportation or storage.
- Make sure to provide a complete vehicle to the customer.

Because of the above reasons, all dealerships must always carry out the PDIs before delivering a vehicle.

In addition, all franchised shops and PDI centers must check the status of every vehicle received to identify who is responsible for any possible defects.

B: PDI PROCEDURE

Follow the procedures shown in the table below.

Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance check	(1) If the vehicle is covered with protective film, visually check the vehicle body for damage and dents. (2) If the protective film has been removed, visually check the body paints for small areas of damage or stains. (3) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal. (4) Visually check the plated parts for any damage.
2. Tire check	(1) Check the tires for damage, abnormal conditions, and dents on the wheels. (2) Check the tire air pressure.
3. Fuse installation	(1) If the vehicle is about to be delivered to the customer, attach a fuse.
4. Connection of air conditioner relay	(1) If the vehicle is about to be delivered to the customer, connect the air conditioner relay.
5. Check the doors for lock/unlock and open/close operations.	(1) Using the key, check if the door can be locked and unlocked normally. (2) Open and close the all doors to see that there are no abnormal conditions.
6. Operation check of child lock system	(1) Inspect whether child lock system operates properly.
7. Check the trunk lid open/close operations.	(1) Operate the trunk lock release lever to check that the trunk opens normally. (2) Using the key, check if the trunk lid can be unlocked normally. (3) Open and close the trunk lid to see that there are no abnormal conditions.
8. Check the rear gate for lock/unlock and open/close operations.	(1) Using the key, check if the rear gate can be lock and unlocked normally. (2) Open and close the rear gate to see that there are no abnormal conditions. (3) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
9. Operation check of trunk lid release handle	(1) Operate the trunk lid release lever to check the trunk is unlocked normally.
10. Operation check of fuel lid opener lock release lever	(1) Operate the fuel lid opener to check that the fuel lid is unlocked normally.
11. Accessory check	Check the following accessories are provided: • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
12. Operation check of hood lock release system	(1) Operate the hood lock release lever to check that the hood opens normally.
13. Battery	(1) Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
14. Brake fluid	(1) Check the fluid amount.
15. Engine oil	(1) Check the oil amount.
16. Transmission fluid	(1) Check the fluid amount.
17. AT front differential oil	(1) Check the AT front differential oil amount.
18. Coolant	(1) Check the coolant amount.
19. Clutch fluid	(1) Check the clutch fluid amount.
20. Window washer fluid	(1) Check the window washer fluid amount.
21. Hood latch check	(1) Check that the front hood is closed and latched securely.
22. Keyless entry system	(1) Check that the keyless entry system operates normally.
23. Security system	(1) Check that the security system operates normally.

Step	Check point
24. Seat	(1) Check the seat surfaces for smears or dirt. (2) Check the seat installation conditions and functionality.
25. Seat belt	(1) Check the seat belt installation conditions and functionality.
26. Wheel alignment	(1) Check that the wheel alignments are properly adjusted.

Checks with the Engine Running

Step	Check point
1. Test mode connector	(1) Disconnect the test mode connector.
2. Operation check of shift lock system, key interlock, and starter interlock	(1) For a MT vehicle, check the starter interlock system operations. (2) For an AT vehicle, check the shift lock and key interlock system operations.
3. Starting condition	(1) Start the engine and check that the engine starts smoothly.
4. Exhaust system	(1) Check that the exhaust noise is normal and no leaks are found.
5. Indicator light	(1) Check that all the indicator lights operate normally.
6. Clock	(1) Check that the clock operate normally.
7. Radio	(1) Check that the radio system operates normally.
8. Cigarette lighter	(1) Check that the cigarette lighter operates normally.
9. Lighting system	(1) Check that the lighting systems operate normally.
10. Window washer	(1) Check that the window washer system operates normally.
11. Wiper	(1) Check that the wiper system operates normally.
12. Power window operation check	(1) Check the power window for correct operations.

Dynamic Test with the Vehicle Running

Step	Check point
1. Brake test	(1) Check that the foot brake operates normally.
2. Parking brake	(1) Check that the parking brake operates normally.
3. AT shift control	(1) Check the AT shift patterns are correct.
4. Heater & ventilation	(1) Check that the heater & ventilation system operates normally.
5. Air conditioner	(1) Check that the air conditioner operates normally.
6. Cruise control	(1) Check that the cruise control system operates normally.

Checks after Dynamic Test

Step	Check point
1. ATF level	(1) Check that the ATF level is normal.
2. Power steering fluid level	(1) Check that the power steering fluid level is normal.
3. Fluid leak check	(1) Check for fluid/oil leaks.
4. Water leak check	(1) Spray the vehicle with water and check for water leaks.
5. Appearance check 2	(1) Remove the protective film (if any). (2) Check the body paints for damage and smears. (3) Check the plated parts for damage and rust.
6. Wheel alignment	(1) If abnormal conditions are sensed in operation or stability after the dynamic test, make sure that the wheel alignment is appropriate, and adjust it if necessary.

1. APPEARANCE CHECK

1) When vehicle is covered with protective film, inspect visually for damage or dents to vehicle body surface.
2) When protective film is removed, check the body paints for small areas of damage or stains and repair as necessary.
3) Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
4) Check the plated parts, such as the grilles and door knobs, for damage or loss of gloss and repair or replace the parts as necessary.

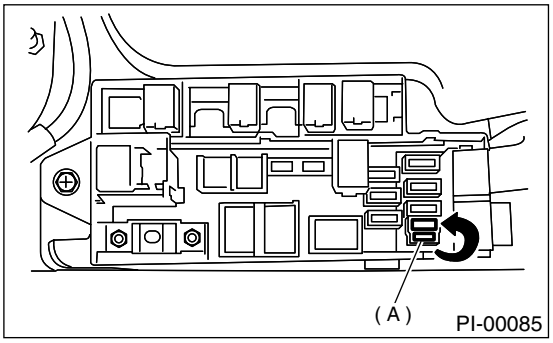
2. TIRE CHECK

- Check the tire outer faces for any damage.
- Check the tire air pressure by referring to the following table.

Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
	Front	Rear
P205/60R15	220 (2.2, 32)	210 (2.1, 30)
R205/55R16	220 (2.2, 32)	210 (2.1, 30)
P225/60R16	210 (2.1, 30)	200 (2.0, 29)

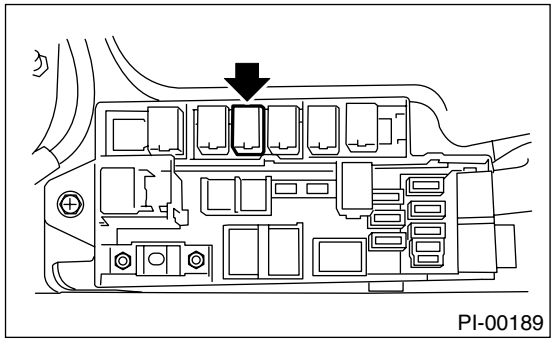
3. FUSE INSTALLATION

A vehicle just delivered has no fuses for the circuit to prevent battery discharge. Attach a 15 A fuse as shown in the figure.



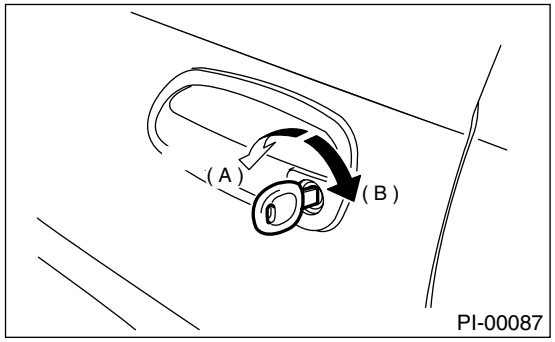
4. CONNECTION OF AIR CONDITIONER RELAY

The air conditioner relay of a vehicle just delivered is not connected to protect air conditioner compressor from unnecessary operation. Since the air conditioner relay is set upside down at the installation location in main fuse box, take it out once, and then connect it to terminal of main fuse box properly.



5. CHECK THE DOOR OPERATIONS, LOCK/UNLOCK AND OPEN/CLOSE, AS FOLLOWS.

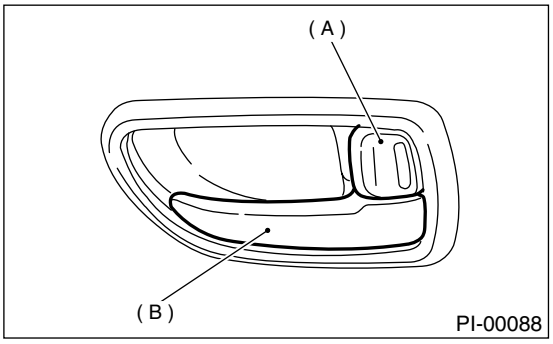
- Using the key, lock and unlock the door several times to check for normal operation.
- Open and close the door several times to verify smooth movement.



(A) Unlock
(B) Lock

• Vehicles with manual door locks:

Sit in the driver seat, close the door completely, and move the lock lever to the lock position. Then, pull the inside door handle to ensure the door will not open.

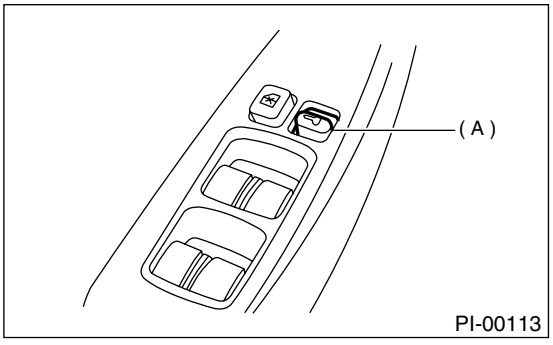


(A) Lock lever
(B) Inside door handle

• Vehicles with power door locks:

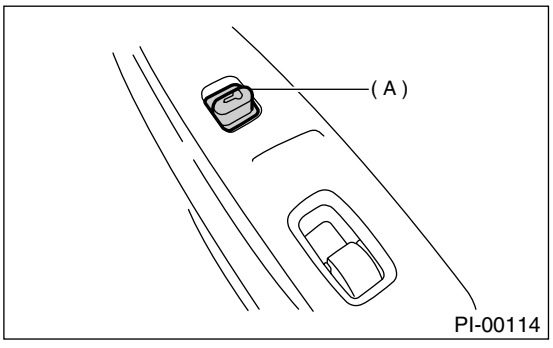
Sit in the driver seat, close the driver's door completely, and place the power door locking switch to the lock position. Then pull the all inside door handles to ensure that the all doors will not open.
Sit in the passenger seat, do the same procedure as for the driver seat.

- Driver's side



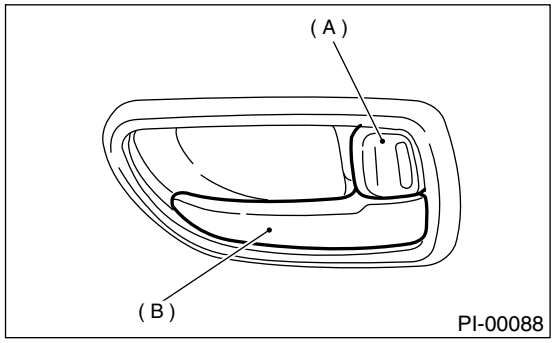
(A) Power door lock switch

- Passenger side



(A) Power door lock switch

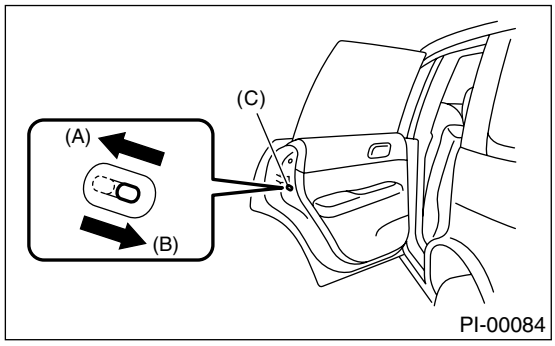
For other doors, place the lock levers to the lock positions and then pull the inside door handles to ensure that the doors will not open.



(A) Lock lever
(B) Inside door handle

6. CHECK THE OPERATION OF CHILD SAFETY LOCKS

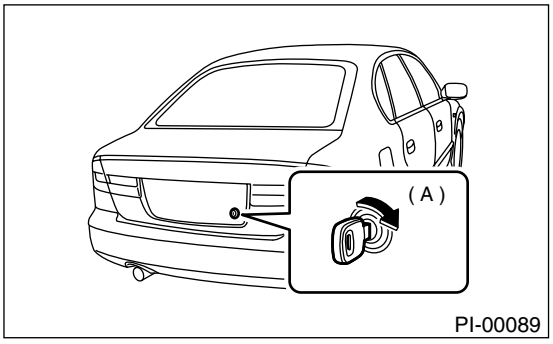
1) Set the child safety lock on both rear doors to the lock positions.
2) Close the rear doors completely.
3) Check that the lock levers of the rear doors are in the unlock positions. Then, pull the inside door handles of the rear doors to ensure that the doors will open.
4) Next, pull the outside door handles of the rear doors to ensure that the doors will open.



(A) Unlock
(B) Lock
(C) Child safety lock

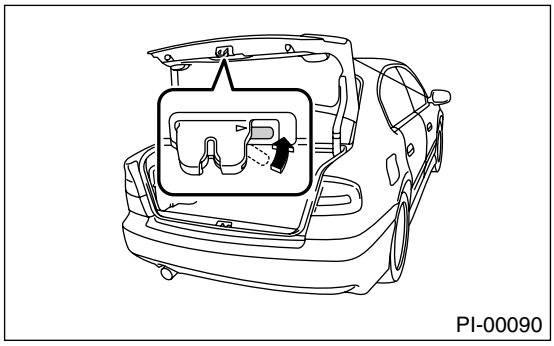
7. CHECK THE TRUNK LID OPERATIONS, OPEN/CLOSE, AS FOLLOWS.

• Operate the trunk lock release lever and verify that the trunk lid opens.
• Using the key, open the trunk lid several times to check for normal operation.
• Open and close the trunk lid several times to verify smooth movement.



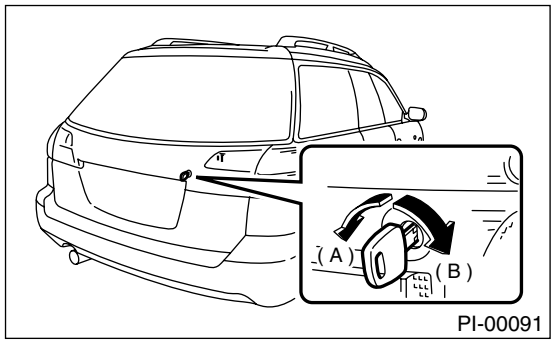
(A) Open

• Set the trunk lid release lever to the cancel position, and check that the trunk lid can only be opened with the key.



8. CHECK THE REAR GATE OPERATIONS, LOCK/UNLOCK AND OPEN/CLOSE, AS FOLLOWS.

• Using the key, lock and unlock the rear gate several times to check for normal operation.
• Open and close the rear gate several times to verify smooth movement.

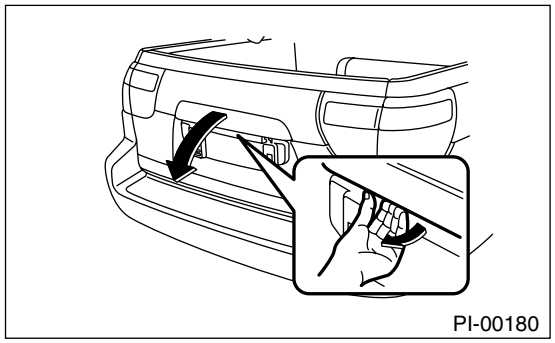


(A) Lock
(B) Unlock

• Operate the power door locking witch to check that the rear gate is locked and unlocked normally.

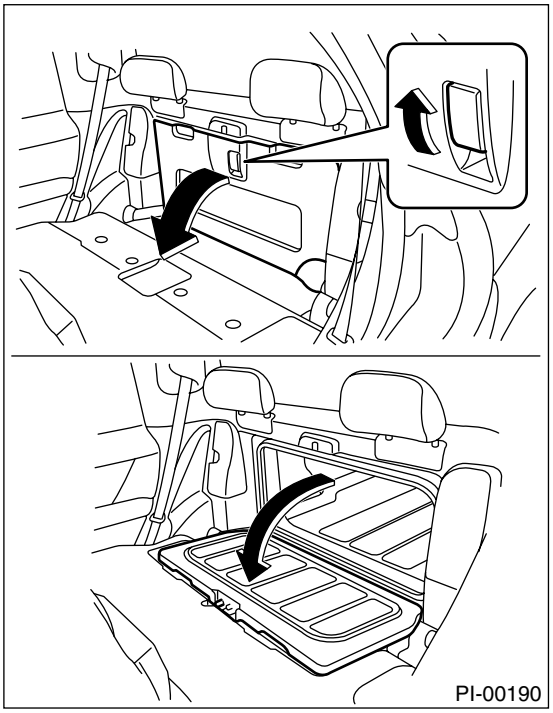
9. CHECK THE TAIL GATE OPERATIONS, OPEN/CLOSE, AS FOLLOWS.

• Operate the tail gate handle and verify that the tail gate opens.
• Make sure that right and left latches are securely engaged when the tailgate is closed.
• Open and close the tail gate several times to verify smooth movement.



10.CHECK THE SWITCH BACK OPERATIONS, OPEN/CLOSE, AS FOLLOWS.

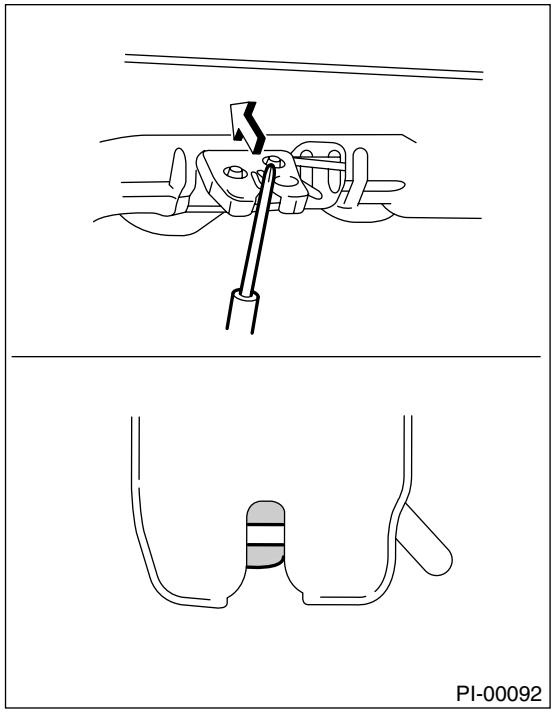
• Operate the release lock knob of switch back and verify that the switch back opens.
• Open and close the switch back several times to verify smooth movement.



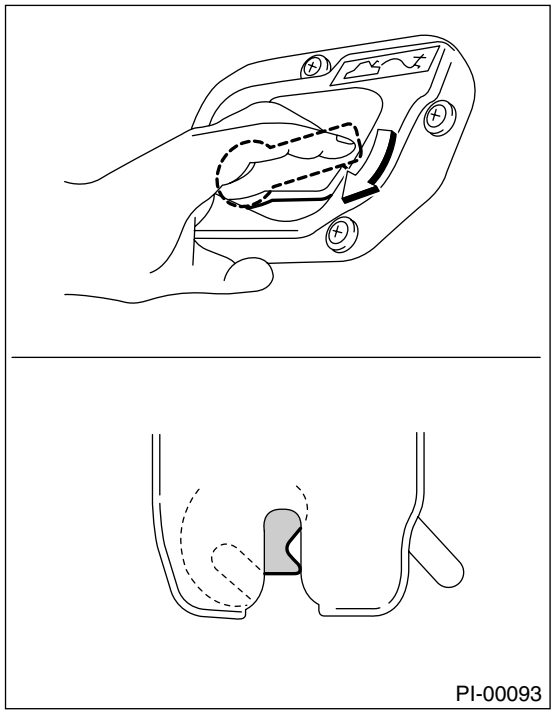
11.OPERATION CHECK OF TRUNK LID RELEASE HANDLE

1) Use a screwdriver with a thin blade. Slide the screwdriver blade from the slit aperture of the lock assembly fully to the end until you hear a click. This places the latch in the locked position.

Locked



2) Move the release handle from outside the vehicle, in the direction of the arrow to check if the latch is released.
Released



12.OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

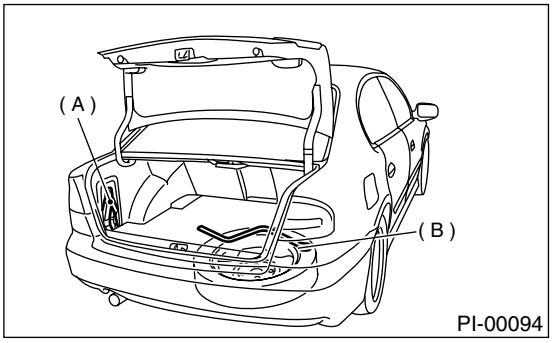
Operate the fuel lid opener and verify that the fuel lid opens normally. Check that the filler cap is securely closed.

13.ACCESSORY CHECK

Check that the following accessories are provided in the luggage compartment or cargo area.

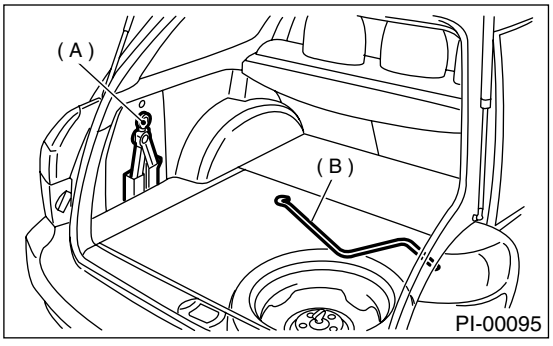
- Owner's manual
- Warranty booklet
- Service booklet
- Spare key
- Jack
- Tool set
- Spare tire

Sedan



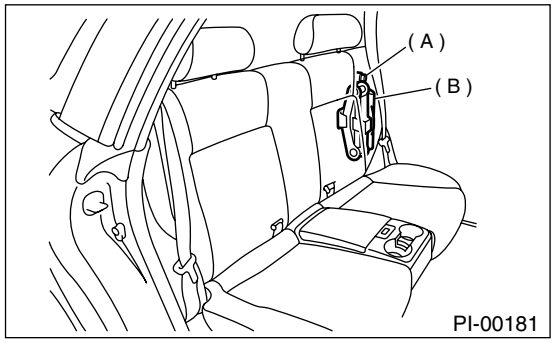
(A) Jack
(B) Jack handle

Wagon

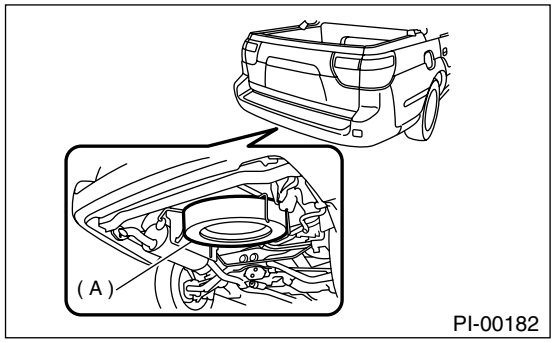


(A) Jack
(B) Jack handle

Pickup



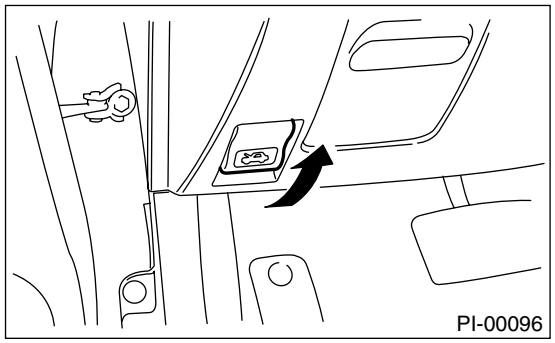
(A) Jack
(B) Jack handle



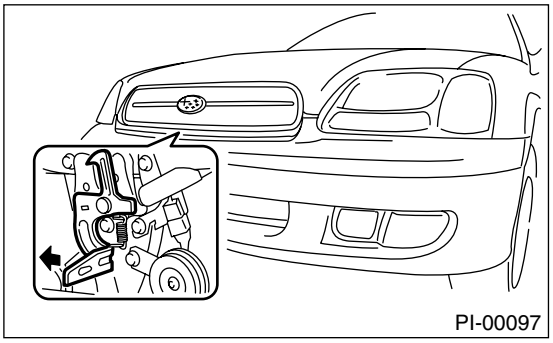
(A) Spare tire

14.OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

By operating front hood release knob, confirm front hood will unlock properly.

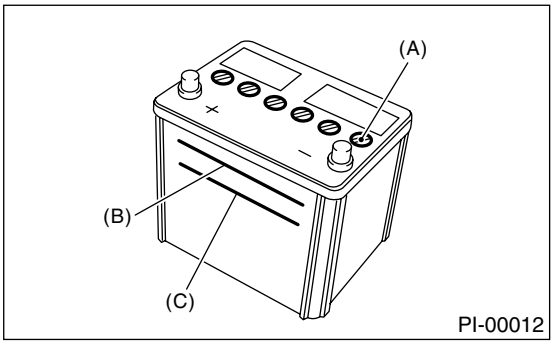


By operating lever, confirm front hood will open properly. Next, support the front hood with front hood stay.



15.BATTERY

Check the battery terminals to make sure that no rust or corrosions due to fluid leaks are found. Check that the battery cap is securely tightened.



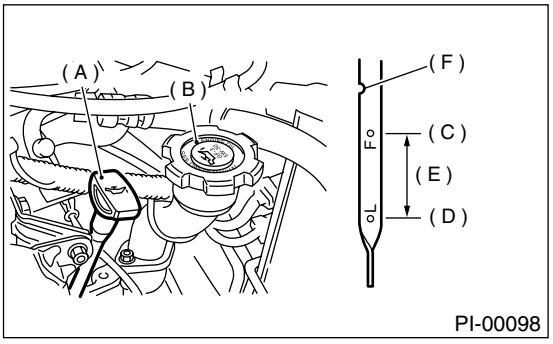
(A) Cap
(B) Upper level
(C) Lower level

16.BRAKE FLUID

Check the brake fluid amount. If the amount is insufficient, carry out a brake line test to identify brake fluid leaks and check the brake operation. After that, refill the brake fluid tank with the specified type of fluid.

17.ENGINE OIL

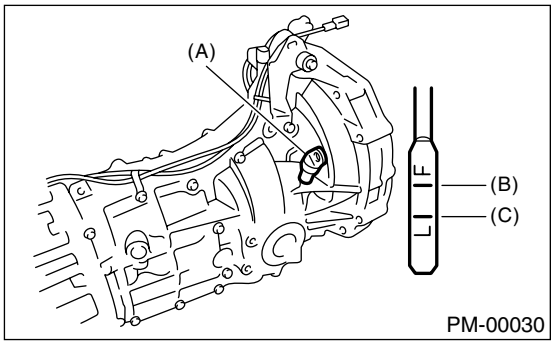
Check the engine oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)
(F) Notch mark

18.TRANSMISSION FLUID

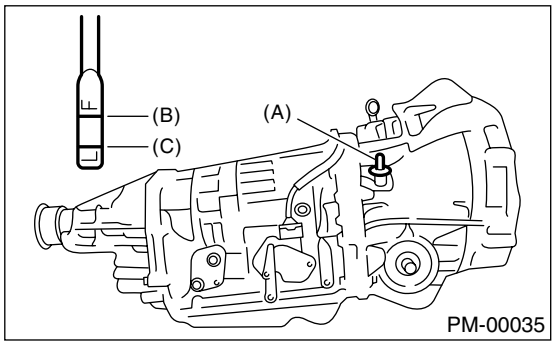
Check the transmission fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



(A) Oil level gauge
(B) Upper level
(C) Lower level

19.AT FRONT DIFFERENTIAL OIL

Check the AT front differential oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified AT front differential oil.



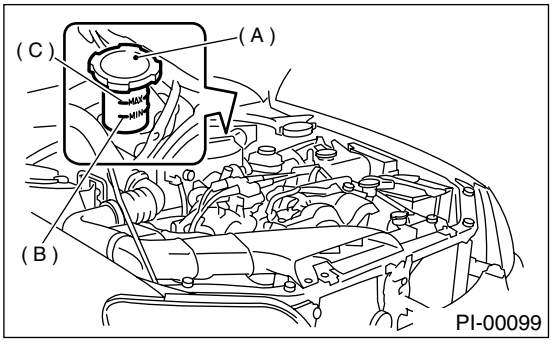
(A) Oil level gauge
(B) Upper level
(C) Lower level

20.COOLANT

Check the coolant amount on the reservoir. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of coolant with the specified concentration.

21.CLUTCH FLUID

Check the clutch fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



(A) Reservoir tank
(B) MIN level
(C) MAX level

22.WINDOW WASHER FLUID

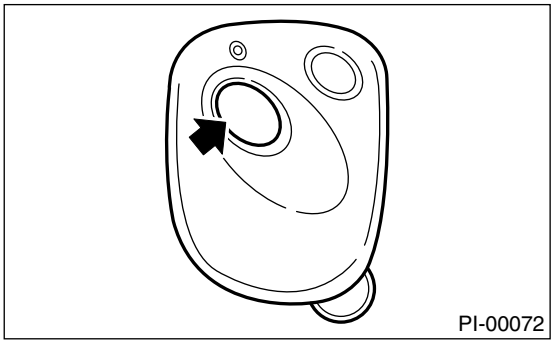
• Check the window washer fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of washer fluid commercially available.
• Use appropriate window washer liquid for outside temperature for freeze proofing.

23.FRONT HOOD LATCH CHECK

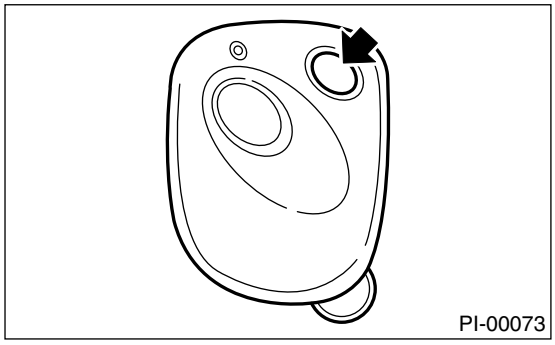
Retract the front hood stay and close the hood. Check that the front hood is securely latched.

24.KEYLESS ENTRY SYSTEM

Check the keyless entry system operations as follows:
• Fully open all the door windows.
• Remove the key from the ignition switch and close all the doors including rear gate.
• Press the “LOCK/ARM” button on the transmitter momentarily once and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.

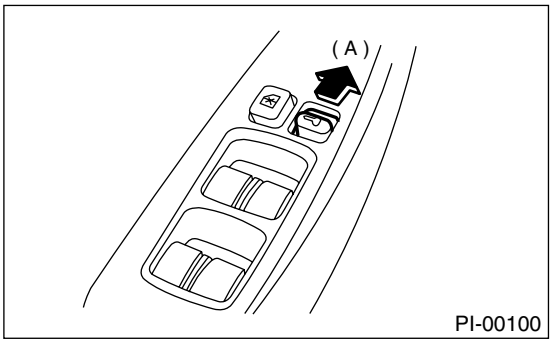


• Press the “UNLOCK/DISARM” button on the transmitter momentarily once and check if the driver’s door is unlocked, the buzzer chirps twice, and the hazard light flashes twice.



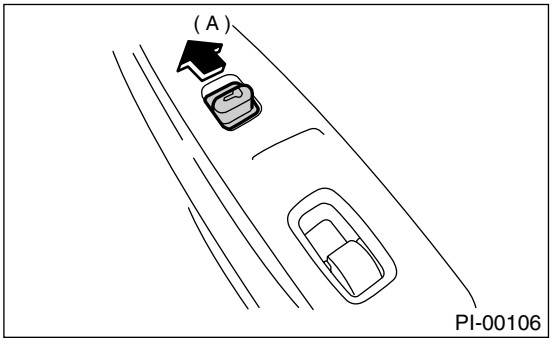
• Press the “UNLOCK/DISARM” button on the transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.
• Press the “LOCK/ARM” button on the transmitter a little bit of time (approx. 2 sec.) and check if a panicking condition occurs; the horn sounds and hazard lamp blinks continuously. Also, check if that condition lasts for 30 seconds or until any button of the transmitter is pressed.
• Press the “LOCK/ARM” button on the transmitter momentarily once with one of the doors including the rear gate and trunk lid open and check if the buzzer chirps and hazard lamp blinks five times to warn of a door ajar.

Then, bring all the doors including the rear gate and trunk lid in closed condition and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.
• Within a distance of 10 m (33 ft) from a vehicle, press transmitter's "LOCK/SET" button three times within 5 seconds. Confirm that horn rings once, hazard lamp blinks three times.
• Move the power door locking switch to “LOCK” position with any one of the doors including the rear gate open. Then, bring all the doors including the rear gate in the closed condition and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.
• Driver’s seat



(A) Lock

• Passenger seat

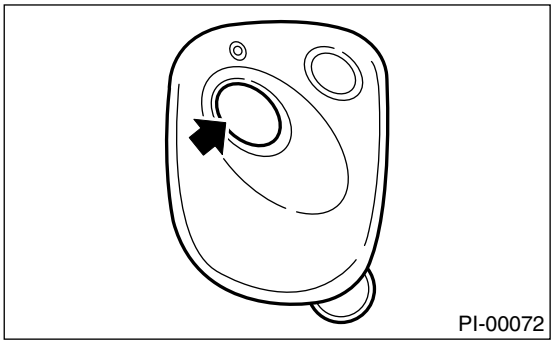


(A) Lock

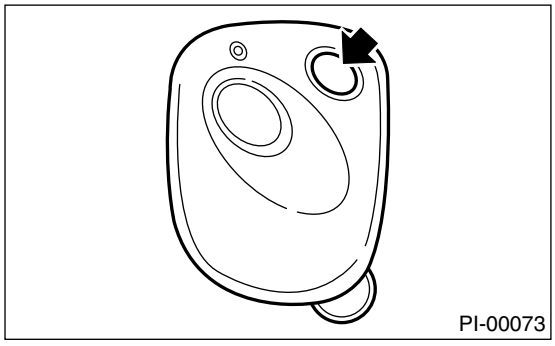
Check selecting audible buzzer operation.
• Will give you an audible buzzer when the doors lock and unlock.
If desired, you may turn the audible buzzer off.
To turn the audible buzzer off, carry out the unlocking procedure of keyless entry system, then simultaneously depress LOCK/ARM and UNLOCK/DISARM buttons for more than two seconds.
The buzzer will sound twice, and hazard light will flash twice to inform you that the audible signal has been turned off.
To turn the audible buzzer on, carry out the unlocking procedure of keyless entry system, then simultaneously depress LOCK/ARM and UNLOCK/DISARM buttons for more than two seconds.
The buzzer will sound once and hazard light will flash once to inform you that the audible buzzer has been turned on.

25.SECURITY SYSTEM

Check the security system operations as follows:
• Fully open all the door windows.
• Remove the key from the ignition switch and close all the doors including rear gate.
• Press the “LOCK/ARM” button on the transmitter momentarily once and check if all the doors are locked, the buzzer chirps once, the hazard lights flash once and the security indicator light flashes slowly to ensure that the security system has been brought into the arming state.



• Press the “UNLOCK/DISARM” button on the transmitter momentarily once and check if the driver’s door is unlocked, the buzzer chirps twice, the hazard light flash twice, the dome light illuminates and the security indicator light goes off to ensure that the system has been brought into the disarming state.



• Press the “UNLOCK/DISARM” button on the transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.
• Press the “LOCK/ARM” button on the transmitter a little bit of time (approx. 2 sec.) and check if a panicking condition occurs; the horn sounds continuously, the hazard lights flash and the security indicator light flashes rapidly. Also, check if that

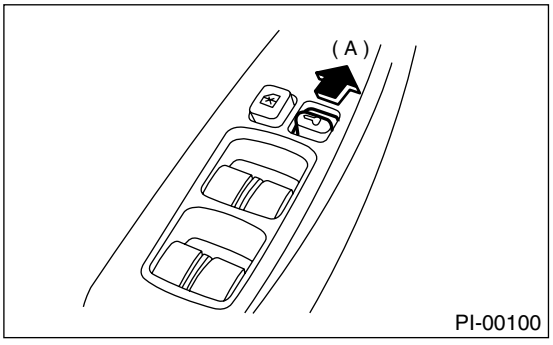
condition lasts for 30 seconds or until any button of the transmitter is pressed.

• Press the “LOCK/ARM” button on the transmitter momentarily once with one of the doors including the rear gate and trunk lid open and check if the buzzer chirps five times and hazard lamp blinks five times to warn of a door ajar.

Then, bring all the doors including the rear gate and trunk lid in closed condition and check if the arming condition is brought about; all the doors are locked, the buzzer chirps once and the hazard lights flash once.

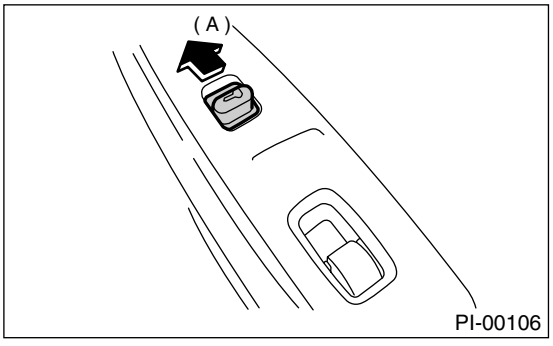
• Move the power door locking switch to “LOCK” position with any one of the doors including the rear gate open. Then, bring all the doors including the rear gate in the closed condition and check if all the doors are locked, the buzzer chirps once and the hazard lights flash once to ensure that the security system has been brought into the arming state.

• Driver’s seat



(A) Lock

• Passenger seat



(A) Lock

• Unlock a door using the lock levers or the key and open the door while the security system is in the arming state. Check to ensure that the panicking condition occurs, i.e. the horn sounds continuously, the hazard lights flash and security indicator light flashes rapidly, and that it lasts for 30 seconds or until the “UNLOCK/DISARM” button on the transmitter is pressed. Also, check to ensure that turning the ignition key to the “START” position in the arming state does not cause the starter motor to turn, thus the engine being prevented from starting.

• Apply a shock to the vehicle body with the security system in arming state, and check to ensure that the panicking condition occurs.

• Troubleshoot the security system if any one of the above-mentioned checks does not meet the requirements.

26.SEAT

Check that each seat provides full functionality in sliding and reclining. Check all available functions of the rear seat such as a trunk-through center arm rest.

27.SEAT BELT

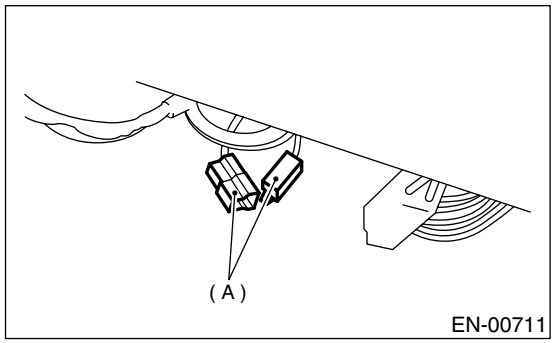
Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.

28.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-6, Wheel Alignment.>

29.TEST MODE CONNECTOR

Turn the ignition switch to ON and check that the check-engine light starts blinking. If the light blinks, return the ignition key to LOCK and disconnect the test mode connector. Then, turn the ignition key to ON again. If the check-engine light blinks at that time in spite of the disconnected test mode connector, carry out an engine diagnosis.



(A) Test mode connector (Green)

30.OPERATION CHECK OF SHIFT LOCK SYSTEM, KEY INTERLOCK, AND STARTER INTERLOCK

• For an MT vehicle, check the starter interlock system operations.

• For an AT vehicle, check the shift lock and key interlock system operations.

31.STARTING CONDITION

Start the engine and check that the engine starts smoothly. If any battery voltage problems are found, recharge or replace the battery. If any abnormal noises are observed, immediately stop the engine and check and repair the necessary components.

32.EXHAUST SYSTEM

Listen to the exhaust noise to see if no abnormal noises are observed.

33.INDICATOR LIGHT

Check that all the indicator lights are off.

34.CLOCK

Check the clock for normal operations and enough accuracy.

35.RADIO

Check the radio for full functionality and normal noise level. Also check the CD unit operations.

36.CIGARETTE LIGHTER

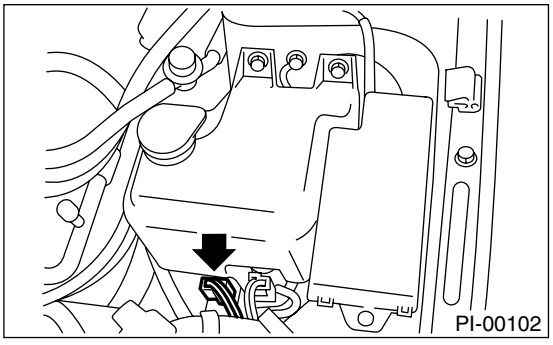
Check that the cigarette lighter operations.

37.LIGHTING SYSTEM

- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.

38.WINDOW WASHER

- Before inspection of the window washer system, connect the washer connector to the washer motor.


PI-00102

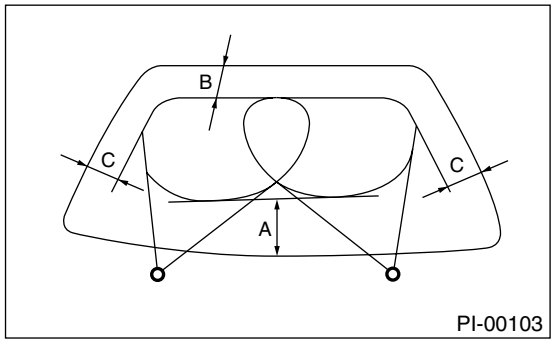
- Check that the window washer system injects washer fluid to the specified area of the windshield shown in the figure.

NOTE:
If the washer fluid does not cover the specified area, clean the nozzle.

Front

Injection position:

A: 300 mm (11.81 in)
B: 100 mm (3.94 in)
C: 200 mm (7.87 in)



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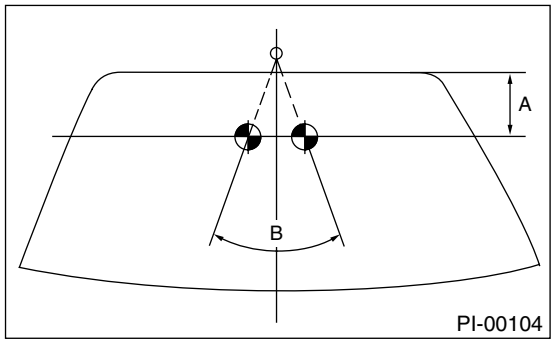
Rear

Injection position:

A: 60 mm (2.36 in)
B: 42°



PI-00104

39.WIPER

Check the front and rear wipers for normal operations.

40.POWER WINDOW OPERATION CHECK

Manipulate the power window switches one by one to check that each of the power windows goes up and down with no abnormal noises.

41.BRAKE TEST

Check the foot brake for normal operations.

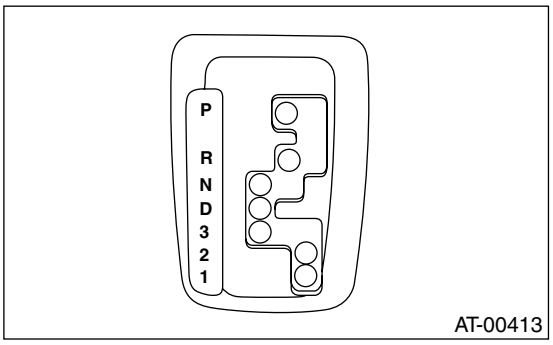
42.PARKING BRAKE

Check the parking brake for normal operations.

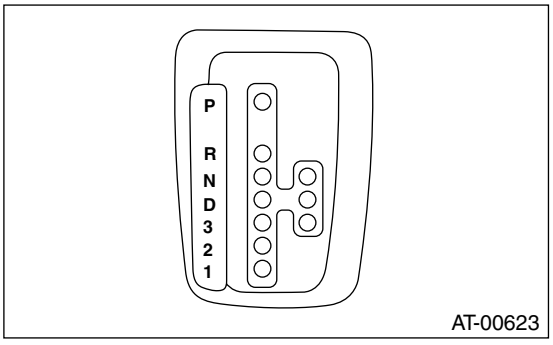
43.AT SHIFT CONTROL

Set the AT select lever to each gear position while checking that the demanded gear position is correctly attained.

- Except SPORT shift



- SPORT shift



Selector Position	Gear Position			
	1st	2nd	3rd	4th
D	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	
2		Yes		
1	Yes			
SPORT shift	Yes	Yes	Yes	Yes

44.HEATER & VENTILATION

Operate the heater and ventilation system to check for normal airflow and heating capacity.

45.AIR CONDITIONER

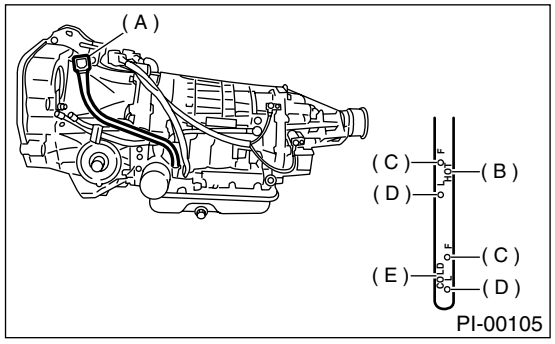
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

46.CRUISE CONTROL

Operate the cruise control system. Check that the system is activated and deactivated correctly.

47.ATF LEVEL

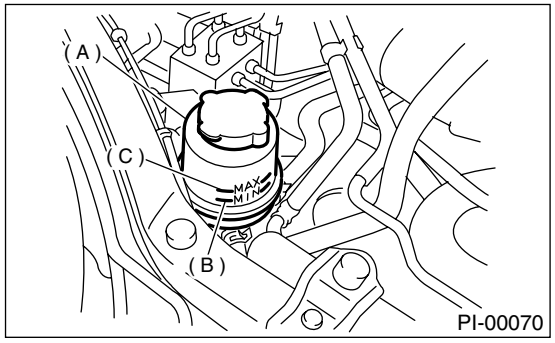
Check that the ATF level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified ATF.



(A) Level gauge
(B) “HOT” side
(C) Upper level
(D) Lower level
(E) “COLD” side

48.POWER STEERING FLUID LEVEL

Check that the power steering fluid level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified power steering fluid.



(A) Reservoir tank
(B) MIN level
(C) MAX level

49.FLUID LEAK CHECK

Check the entire areas of the vehicle for any trace of coolant/oil/fluid leaks.

50.WATER LEAK TEST

Spray the vehicle with water and check that no water enters the passenger compartment.

• Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.

• Close all of the windows completely, and then close all of the doors tightly. Close the hood and trunk lid before starting the test.

• Connect a hose to a tap, and spray water on the vehicle. The rate of water discharge must be approx. 20 to 25 liters (5.3 to 6.6 US gal, 4.4 to 5.5 Imp gal) per minute.

When spraying water on areas adjacent to the floor and wheel house, increase the pressure. When directing water on areas other than the floor portion and wheel house, decrease the pressure. But the force of water must be made strong occasionally by pressing the end of the hose.

NOTE:
Be sure to keep the hose at least 10 cm (3.9 in) from the vehicle.

- Check the following areas:
  - Front window and body framework mating portion
  - Door mating portions
  - Glass mating portions
  - Rear quarter window mating portions
  - Rear window and body framework mating portion
  - Around roof drips
- If any dampness in the compartments is discovered after the water has been applied, carefully check all areas that may have possibly contributed to the leak.

51.APPEARANCE CHECK 2

1) When vehicle body is covered with protective film, peel it off.

NOTE:

• Use of steam eases peeling off the wrap guard.

• When performing on the vehicles left for a long time, or during low temperature period, sprinkle some water heated to 50 — 60 °C (122 — 140 °F) over the vehicle to raise its surface temperature before peeling off the wrap guard.

Do not use the water heated to over 60 °C (140 °F).

• If the adhesive remains on the coated surface, rub the portion with a flannel rag, etc. soaked with a coat of coating wax or a solvent, such as oil benzene and IPA, and then wipe it off.

• Avoid adhesion of the solvent to resin or rubber components. Do not use coating wax or a solvent while the component surface temperature is high due to hot weather, etc.

• If the coated surface is swollen out due to seams or moisture, expose the vehicle to the sun light for a few hours. Otherwise, heat the portion with seams or moisture using a dryer, etc.

• Dispose of the peeled wrap guard as burnable industrial garbage.

2) Check the vehicle body paints, plated faces, glass, and lenses for any dirt or damage.

PERIODIC MAINTENANCE SERVICES

PM

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1. General Description

A: GENERAL

Be sure to perform periodic maintenance in order to maintain vehicle performance and find problems before they become serious.

2. Schedule

A: MAINTENANCE SCHEDULE 1

		MAINTENANCE INTERVAL [Number of months or km (miles), whichever occurs first]																	
	Months	3	7.5	15	22.5	**30**	37.5	45	52.5	**60**	67.5	75	82.5	**90**	97.5	105	112.5	**120**	Remarks
	× 1,000 km	4.8	12	24	36	**48**	60	72	81.4	**96**	108	120	132	**144**	156	168	180	**192**	
	× 1,000 miles	3	7.5	15	22.5	**30**	37.5	45	52.5	**60**	67.5	75	82.5	**90**	97.5	105	112.5	**120**	
1	Engine oil	R	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	
2	Engine oil filter	R	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	R	R	R	**R**	
3	Spark plugs					**R**				**R**				**R**				**R**	For 2.5 L
										R									For 2.5 L Turbo
										R								**R**	For 3.0 L
4	Drive belt(s)					**I**				**I**				**I**		**R**			
5	Camshaft Drive belt					**I**				**I**				**I**		**R**			For 2.5 L Note (1)
6	Fuel line					**(I)**				**(I)**				**(I)**				**I**	Note (2)
7	Fuel filter					**(R)**				**(R)**				**(R)**				**R**	Note (2)
8	Air cleaner element					**R**				**R**				**R**				**R**	Note (3)
9	Cooling system					**I**				**I**				**I**				**I**	
10	Coolant					**R**				**R**				**R**				**R**	
11	Clutch system			I		**I**		I		**I**		I		**I**		I		**I**	
12	Transmission oil					**I**				**I**				**I**				**I**	
13	ATF					**I**				**I**				**I**				**I**	Note (4)
14	Front & rear differential oil					**I**				**I**				**I**				**I**	
15	Brake line			I		**I**		I		**I**		I		**I**		I		**I**	
16	Brake fluid					**R**				**R**				**R**				**R**	
17	Disc brake pads & discs					**I**				**I**				**I**				**I**	
18	Parking brake			I		**I**		I		**I**		I		**I**		I		**I**	
19	Suspension			I		**I**		I		**I**		I		**I**		I		**I**	
20	Wheel bearing									**(I)**								**(I)**	
21	Axle boots & joints			I		**I**		I		**I**		I		**I**		I		**I**	
22	Tire rotation		I	I	I	**I**	I	I	I	**I**	I	I	I	**I**	I	I	I	**I**	Note (5)
23	Steering system (Power steering)			I		**I**		I		**I**		I		**I**		I		**I**	
24	Supplement restraint system	Inspect every 10 years.																	

Symbols used:
R: Replace
I: Inspection
(R) or (I): Recommended service for safe vehicle operation.

NOTE:
(1) Periodic inspection and replacement of the camshaft drive chains on the 3.0 liter models are not required.
(2) This inspection is not required to maintain emission warranty eligibility and it does not affect the manufacturer's obligations under EPA's in-use compliance program.
(3) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(4) ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.
(5) A tire should be replaced when the tread wear indicator appears as a solid band across the tread. The indicators appear when the remaining tread has been worn to 1.6 mm (0.063 in) or less.

B: MAINTENANCE SCHEDULE 2

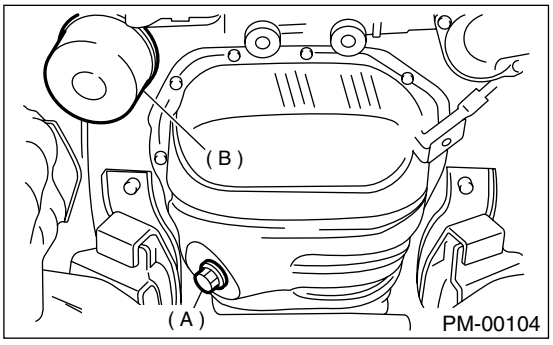
Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil	3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Engine oil filter	3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Fuel filter	15 months						
	24,000 km						
	15,000 miles						
Fuel line	15 months				I		
	24,000 km						
	15,000 miles						
Transmission oil	15 months						R
	24,000 km						
	15,000 miles						
ATF	15 months						R
	24,000 km						
	15,000 miles						
Front & rear differential oil	15 months						R
	24,000 km						
	15,000 miles						
Brake line	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Brake fluid	15 months					R	
	24,000 km						
	15,000 miles						
Disc brake pads & discs	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Parking brake	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Suspension	7.5 months		I	I	I		I
	12,000 km						
	7,500 miles						
Axle boots & joints	7.5 months	I	I	I	I		I
	12,000 km						
	7,500 miles						
Steering system (Power steering)	7.5 months	I	I	I	I		I
	12,000 km						
	7,500 miles						

3. Engine Oil

A: REPLACEMENT

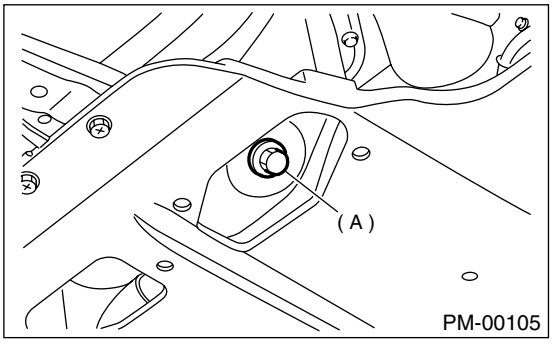
NOTE:
Replace engine oil and engine oil filter at the same time.

1) Drain engine oil by loosening engine oil drain plug.
2.5 L model



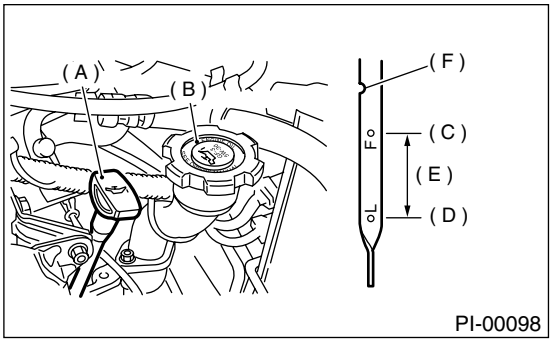
(A) Drain plug
(B) Oil filter

3.0 L model

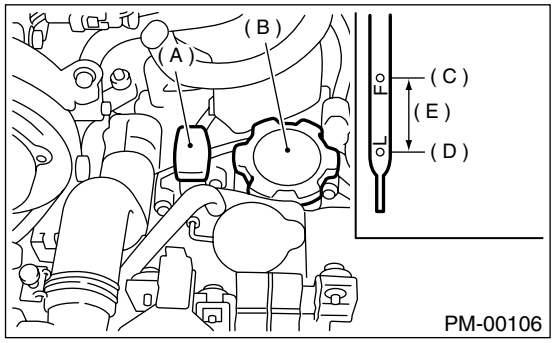


(A) Drain plug

2) Open engine oil filler cap for quick draining of the engine oil.
2.5 L model



3.0 L model



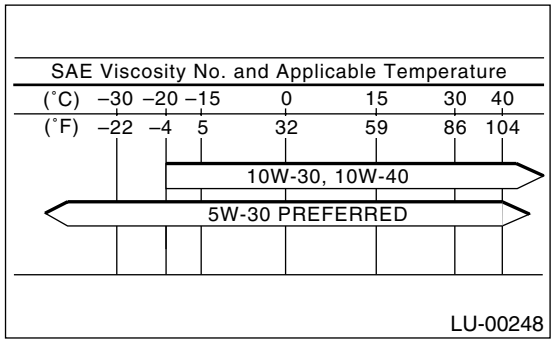
(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) About 1.0 ℓ (1.1 US qt, 0.9 imp qt)
(F) Notch

3) Replace drain plug gasket.
4) Tighten engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Engine oil amount for preparation:
2.5 L model
Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)
3.0 L model
Approx. 5.3 ℓ (5.6 US qt, 4.7 Imp qt)



The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

NOTE:

• When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the ILSAC or API classification, and SAE viscosity No. designated by SUBARU.

• If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used:

API classification: SL

ILSAC classification: GF-3

SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

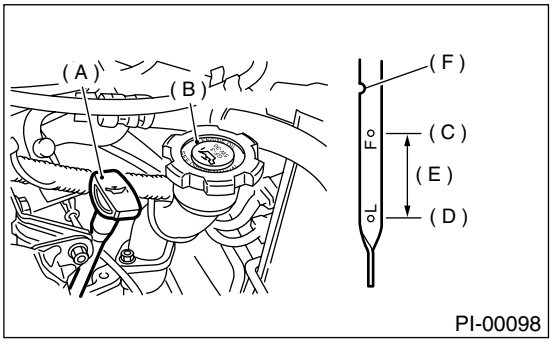
6) Close engine oil filler cap.

7) Start engine and warm it up for a time.

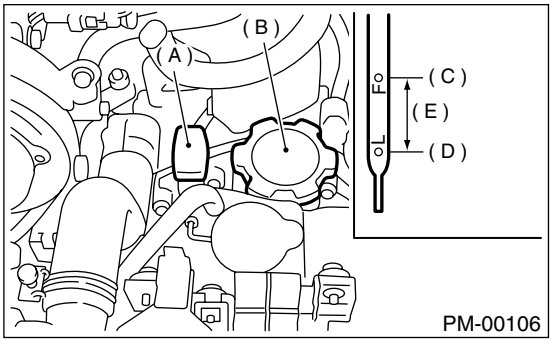
8) After engine stops, recheck the oil level.

If necessary, add engine oil up to upper level on level gauge.

2.5 L model



3.0 L model



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) About 1.0 ℓ (1.1 US qt, 0.9 imp qt)
(F) Notch mark

B: INSPECTION

1) Park vehicle on a level surface.

2) Remove oil level gauge and wipe it clean.

3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.

4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to the “F” line.

5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.

6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and the notch mark. This is caused by thermal expansion of the engine oil.

7) To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.

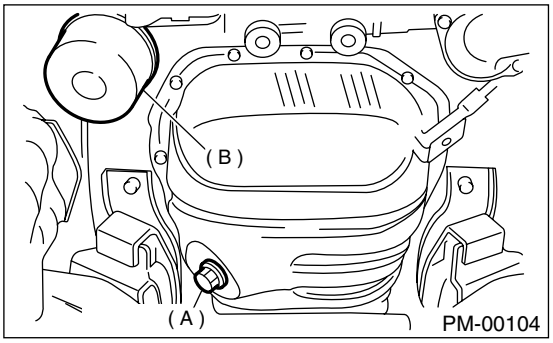
4. Engine Oil Filter

A: REPLACEMENT

1. 2.5 L MODEL

1) Remove oil filter with ST.

ST 498547000 OIL FILTER WRENCH [O. D. 80 mm (3.15 in) for oil filter]
ST 18332AA000 OIL FILTER WRENCH [O. D. 68 mm (2.68 in) for oil filter]
ST 18332AA010 OIL FILTER WRENCH [O. D. 65 mm (2.56 in) for oil filter]



(A) Drain plug
(B) Oil filter

2) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.

CAUTION:
Oil filter of O.D. 80 mm (3.15 in) is not available for TURBO model.

3) Be careful not to damage seal rubber when oil filter is turned by hand and installed.
- Oil filters with 80 mm (3.15 in) and 65 mm (2.56 in) outer diameter are further tightened (about 2/3 to 3/4 rotation) after seal rubber contacts a cylinder block or an oil cooler.
- Oil filter with 68 mm (2.68 in) outer diameter is further tightened (about 1 rotation) after seal rubber contacts a cylinder block or an oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

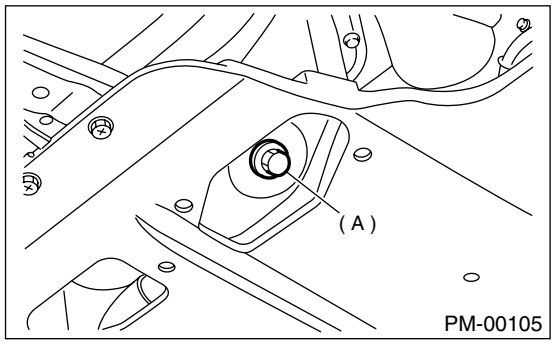
4) Run engine and make sure that no oil is leaking around seal rubber.

NOTE:
The filter element and filter case are permanently joined; therefore, interior cleaning is impossible.

5) Check the engine oil level. <Ref. to PM-6, Engine Oil.>

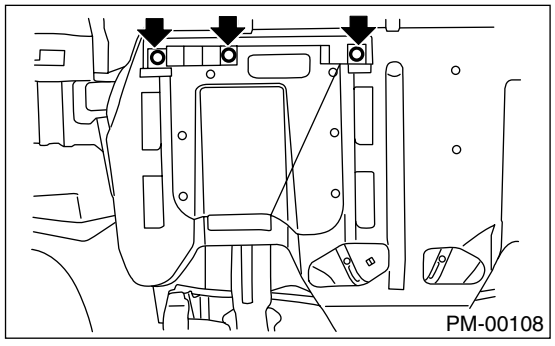
2. 3.0 L MODEL

1) Drain engine oil by loosening engine oil drain plug.

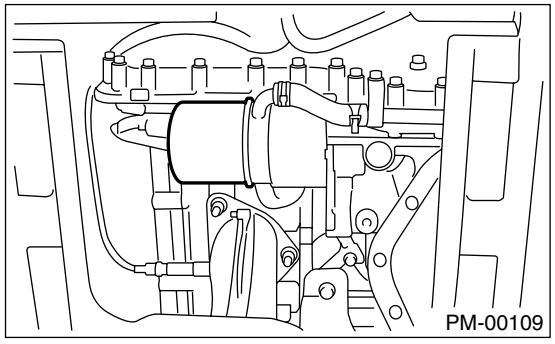


(A) Drain plug

2) Remove access lid.



3) Remove oil filter with ST.
ST 498547000 OIL FILTER WRENCH



4) Clean mounting surface of oil cooler and oil filter.
5) Get a new oil filter and apply a thin coat of engine oil to the rubber seal.
6) Install oil filter by turning it by hand, being careful not to damage rubber seal.
7) Tighten more (approximately 2/3 to 3/4 turn) after the rubber seal contacts the oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

8) Run engine and make sure that no oil is leaking around rubber seal.

NOTE:
The filter element and filter case are permanently jointed; therefore, interior cleaning is impossible.

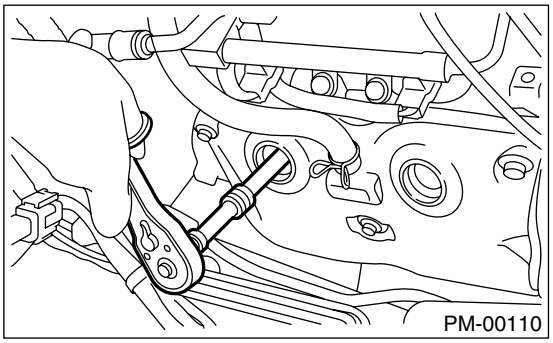
9) Check the engine oil level. <Ref. to PM-6, Engine Oil.>

5. Spark Plugs

A: REPLACEMENT

1. 2.5 L MODEL

1) Disconnect battery ground cable.
2) Remove intake duct and intake chamber.
3) Remove washer tank and put it aside.
4) Disconnect spark plug cord.
5) Remove spark plug with a plug-wrench.



6) Set new spark plug.

Recommended spark plug:
Non-TURBO model (Except U5);
CHAMPION RC10YC4
NGK BKR5E-11
NGK BKR6E-11
Non-TURBO model (U5);
NGK FR5AP-11
Spark plug gap
1.0 — 1.1 mm (0.039 — 0.043 in)
TURBO model;
NGK PFR6G
Spark plug gap
0.7 — 0.8 mm (0.028 — 0.031 in)

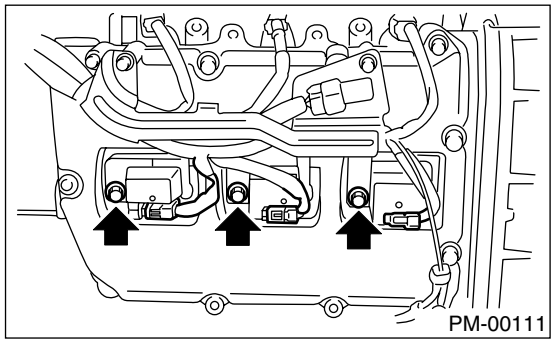
7) Tighten spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:
21 N·m (2.1 kgf-m, 15 ft-lb)

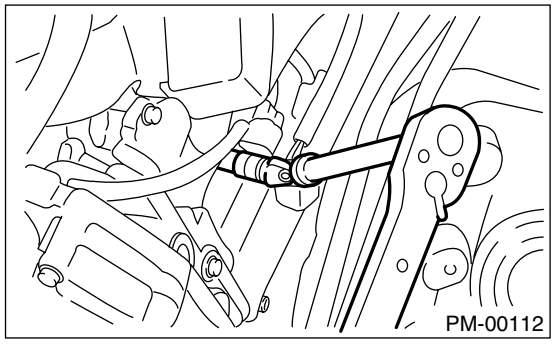
NOTE:
• Be sure to place the gasket between the cylinder head and spark plug.
• If torque wrench is not available, tighten spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

2. 3.0 L MODEL

1) Disconnect battery cables and then remove battery and battery carrier.
2) Remove washer tank and put it aside.
3) Remove air cleaner lower case.
4) Disconnect connector from ignition coil.
5) Remove ignition coil.



6) Remove spark plug with a spark plug socket.



7) Set new spark plug.

Recommended spark plug:
NGK PLFR 6A-11

8) Tighten spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:
21 N·m (2.1 kgf-m, 15 ft-lb)

9) Tighten ignition coil.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
• Be sure to place the gasket between the cylinder head and spark plug.
• If torque wrench is not available, tighten spark plug until gasket contacts cylinder head: then tighten further 1/4 to 1/2 turn.

6. Drive Belt(s)

A: INSPECTION

1. 2.5 L MODEL

Without belt tension gauge
1) Replace belts, if cracks, fraying or wear is found.
2) Check drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension

(A)

New belt: 7.0 — 9.0 mm (0.276 — 0.354 in)

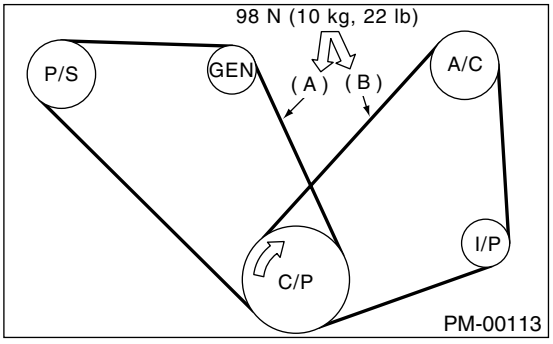
Reused: 9.0 — 11.0 mm (0.354 — 0.433 in)

(B)*

New belt: 7.5 — 8.5 mm (0.295 — 0.335 in)

Reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

*: There is no belt (B) on models without an air conditioner.



C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

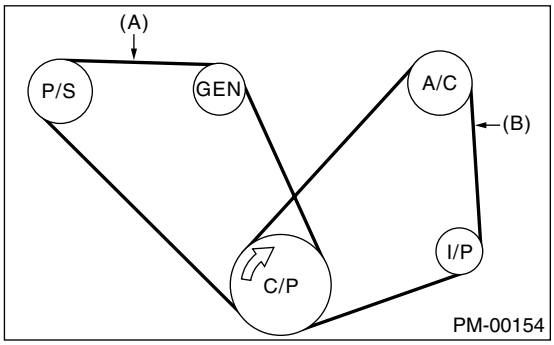
2. 2.5 L MODEL

With belt tension gauge
1) Replace belts, if cracks, fraying or wear is found.
2) Check drive belt tension and adjust it if necessary by changing generator installing position.

Belt tension

(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lb)

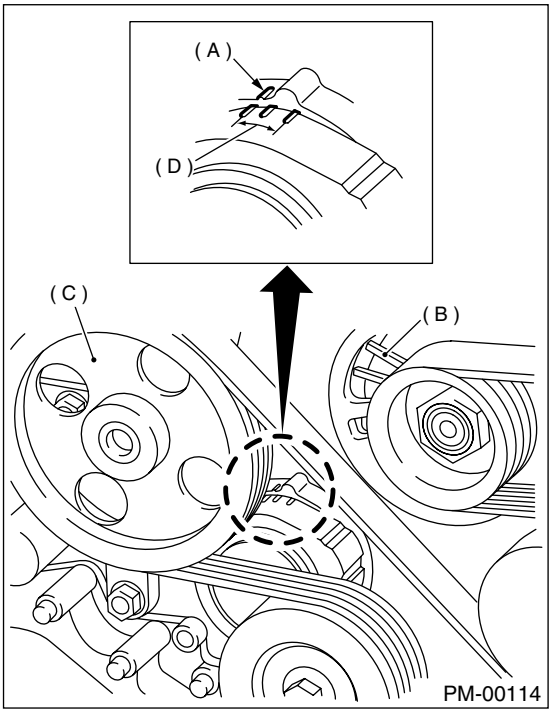
(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lb)



C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

3. 3.0 L MODEL

1) Replace belts, if cracks, fraying or wear is found.
2) Check that the V-belt automatic tensioner indicator is within the range (D).

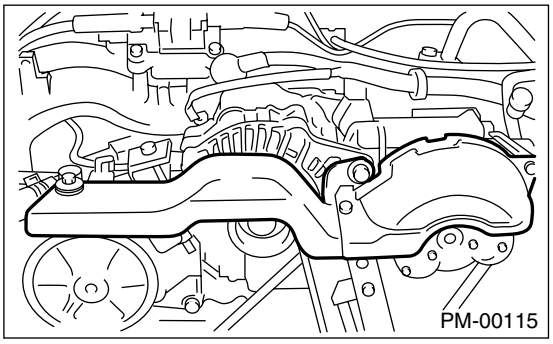


(A) Indicator
(B) Generator
(C) Power steering oil pump
(D) Service limit

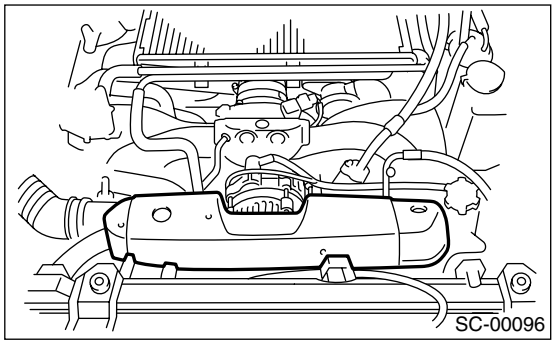
B: REPLACEMENT

1. 2.5 L MODEL

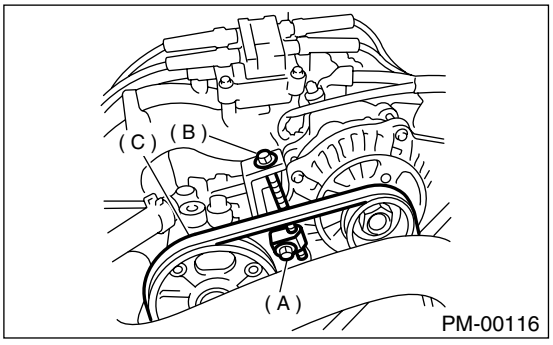
1) Remove V-belt cover.
Non-TURBO model



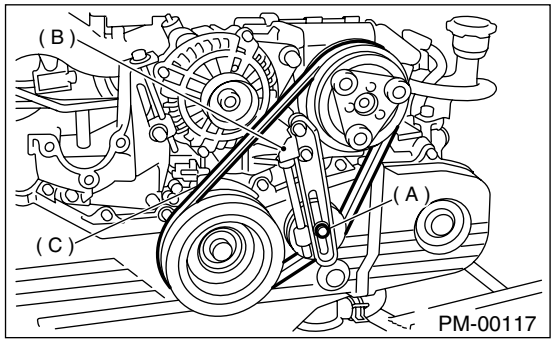
TURBO model



NOTE:
Wipe off any oil or water on the belt and pulley.
2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

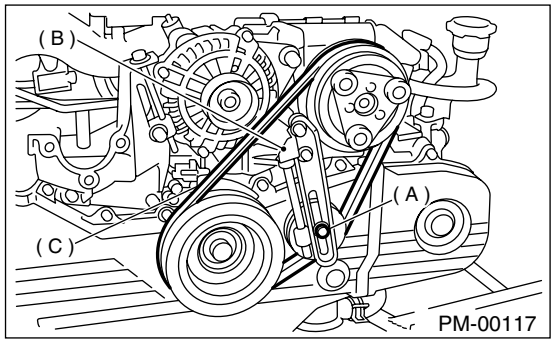


5) Loosen the lock nut (A).
6) Loosen the slider bolt (B).
7) Remove the rear side belt (C).



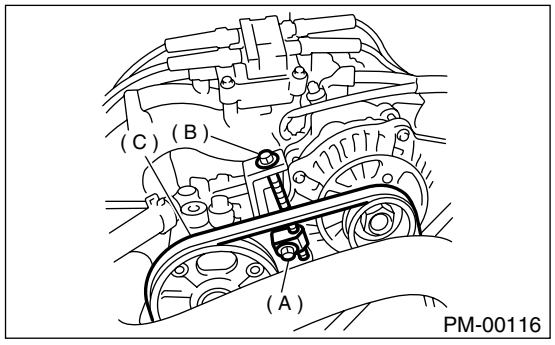
8) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
9) Tighten the slider bolt (B).
10) Tighten the lock nut (A).

Tightening torque:
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



11) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
12) Tighten the lock bolt (A).
13) Tighten the slider bolt (B).

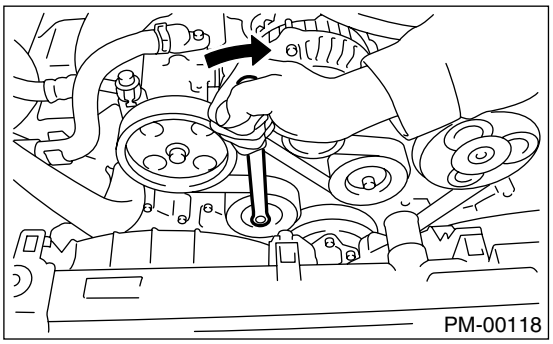
Tightening torque:
Lock bolt, through bolt:
25 N·m (2.5 kgf-m, 18 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



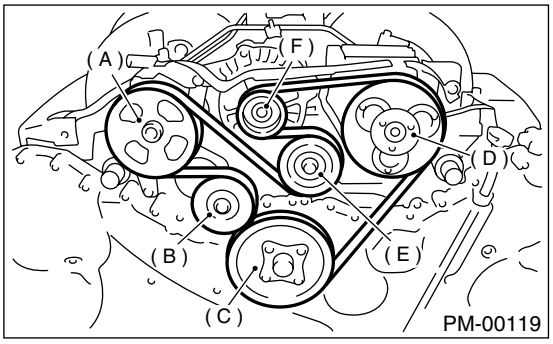
14) Install V-belt cover.

2. 3.0 L MODEL

1) Fit the tool to the belt tensioner mounting bolt.
2) Turn the tool clockwise, and loosen the V-belt to remove.



3) Install in the reverse order of removal.



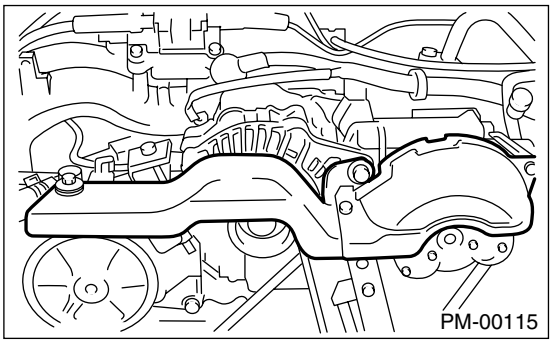
(A) Power steering oil pump
(B) Belt tension adjuster
(C) Crankshaft pulley
(D) A/C compressor
(E) Belt idler
(F) Generator

7. Camshaft Drive Belt

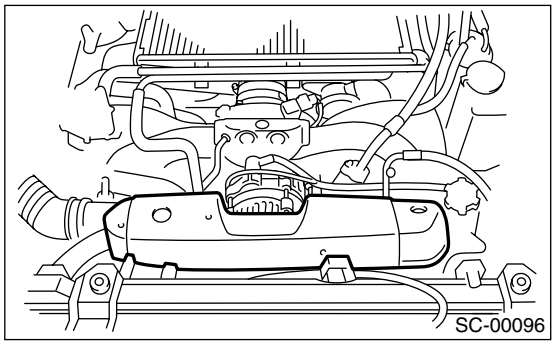
A: REPLACEMENT

1. NON-TURBO MODEL

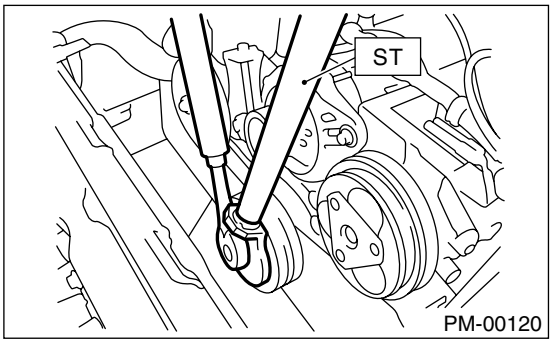
1) Remove radiator fan. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, Radiator Sub Fan and Fan Motor.>
2) Remove V-belt cover.
Non-TURBO model



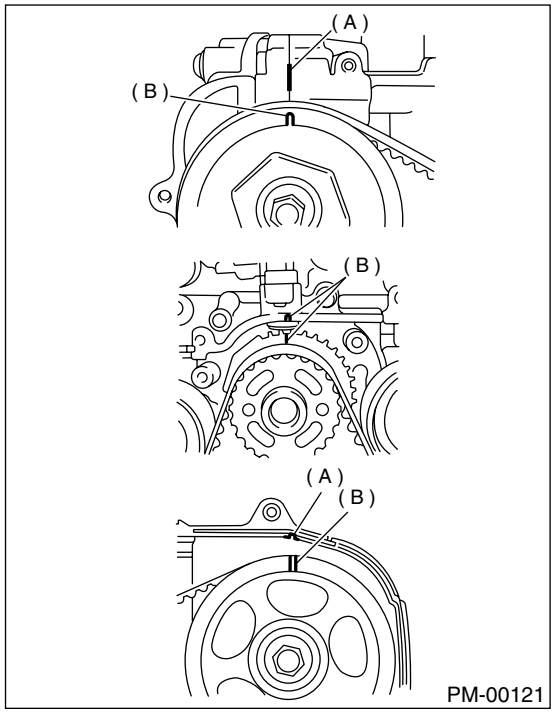
TURBO model



3) Remove V-belts. <Ref. to ME(H4SO)-43, V-belt.>
4) Remove air conditioning compressor drive belt tensioner.
5) Remove pulley bolt. To lock crankshaft use ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH

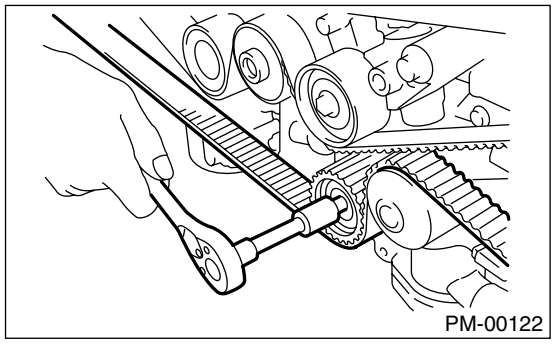


6) Remove crankshaft pulley.
7) Remove left side belt cover.
8) Remove front belt cover.
9) Turn crankshaft and align alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block:
ST 499987500 CRANKSHAFT SOCKET

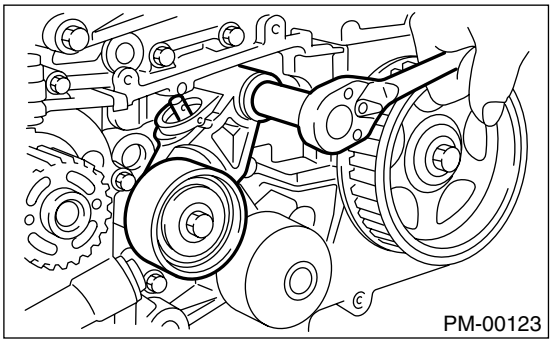


(A) Notch
(B) Alignment mark

10) Remove belt idler.
11) Remove belt idler (No. 2).



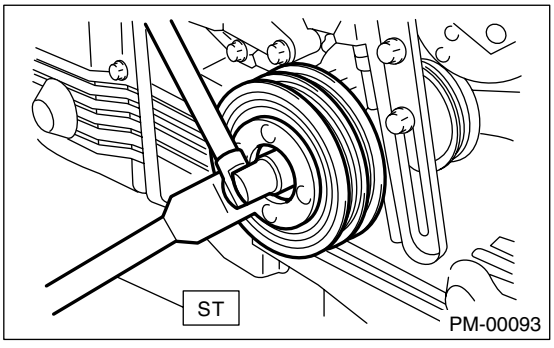
12) Remove timing belt.
13) Remove automatic belt tension adjuster assembly.



2. TURBO MODEL

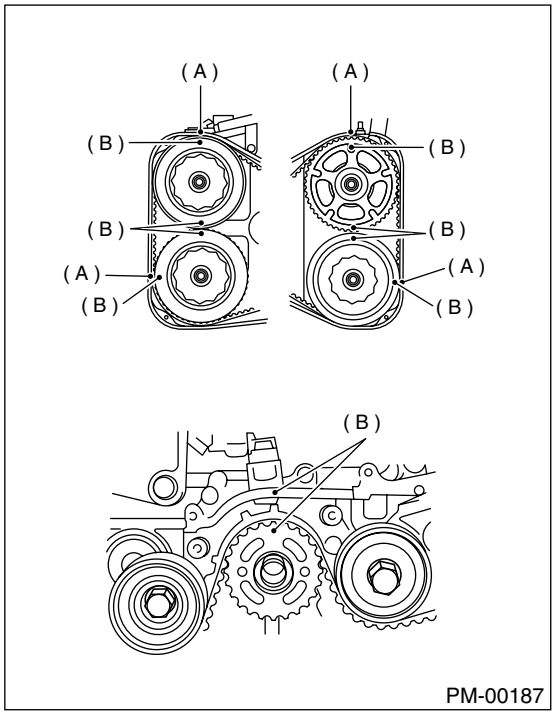
1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.>, <Ref. to CO(H4SO)-27, Radiator Sub Fan and Fan Motor.>
2) Use cardboard and blanket to protect the radiator.
3) Remove the V-belts. <Ref. to ME(H4SO)-43, V-belt.>
4) Remove the air conditioning compressor drive belt tensioner.
5) Remove the pulley bolt. To lock the crankshaft use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH



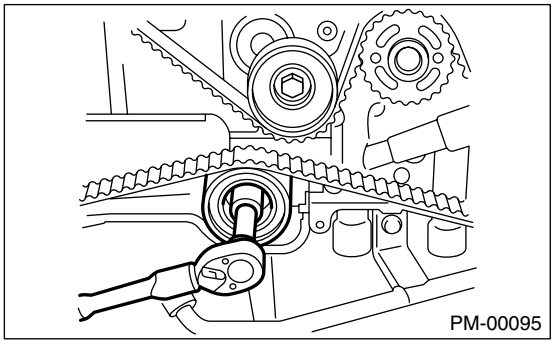
6) Remove the crankshaft pulley.
7) Remove the air conditioning compressor drive belt tensioner.
8) Remove the left side belt cover.
9) Remove the right side belt cover.
10) Remove the front belt cover.
11) Turn the crankshaft and align the alignment marks on crankshaft, and left and right camshaft sprockets with notches of belt cover and cylinder block. To turn the crankshaft, use ST:

ST 499987500 CRANKSHAFT SOCKET



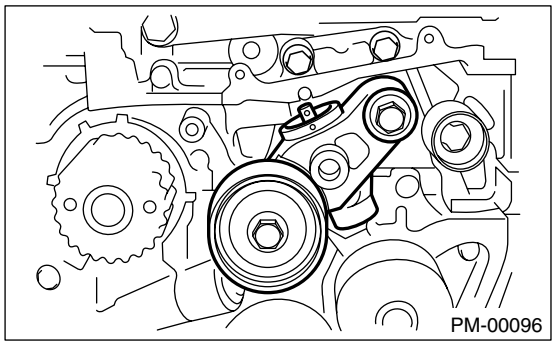
(A) Notch
(B) Alignment mark

12) Remove the belt idler.



13) Remove the timing belt.

14) Remove the automatic belt tension adjuster assembly.



15) Install in the reverse order of removal.
<Ref. to ME(H4SO)-43, V-belt.>

CAUTION:
When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets.

B: INSTALLATION

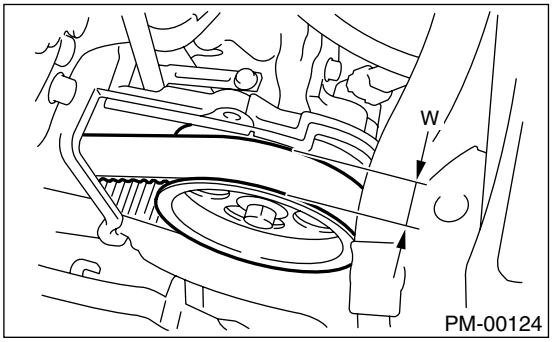
Install in the reverse order of removal.

NOTE:
When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets. If incorrectly installed, interference between pistons and valves may occur.

C: INSPECTION

1. NON-TURBO MODEL

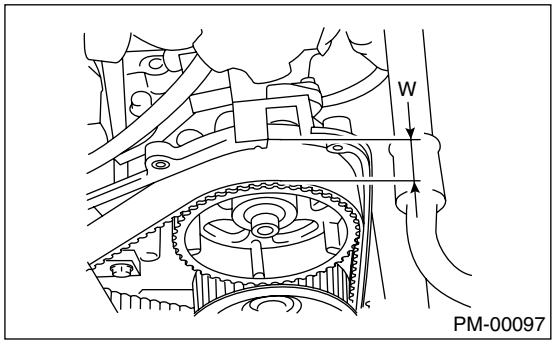
1) Remove front timing belt cover and timing belt cover (LH).
2) While cranking engine at least four rotations, check timing belt back surface for cracks or damage. Replace faulty timing belt as needed.
3) Measure timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace worn timing belt.



4) Install front timing belt cover and timing belt cover (LH).

2. TURBO MODEL

1) Remove the timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 30 mm (1.18 in), check the idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.
4) Install the timing belt cover (LH).



8. Fuel Line

A: INSPECTION

The fuel line is located mostly internally, so check pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose bands, etc. If faulty parts are found, repair or replace them. <Ref. to FU(H4SO)-72, Fuel Delivery, Return and Evaporation Lines.> or <Ref. to FU(H6DO)-75, Fuel Delivery, Return and Evaporation Lines.>

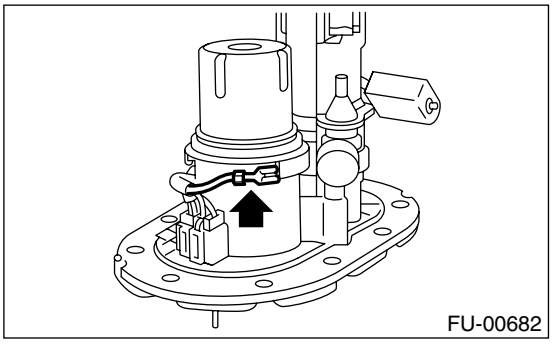
9. Fuel Filter

A: REPLACEMENT

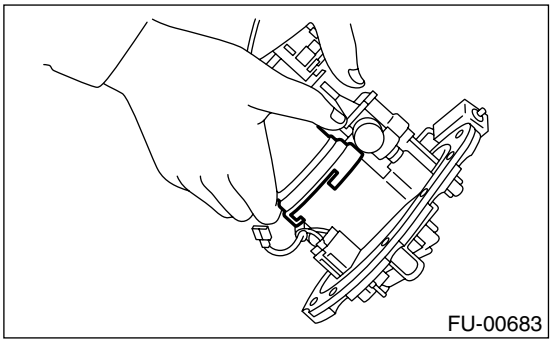
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel filter is built in fuel pump assembly.

1) Release the fuel pressure.
<Ref. to FU(H4SO)-48, OPERATION, Fuel.>
2) Remove the fuel pump assembly.
<Ref. to FU(H4SO)-66, REMOVAL, Fuel Pump.>
3) Disconnect the ground cable from filter holder.



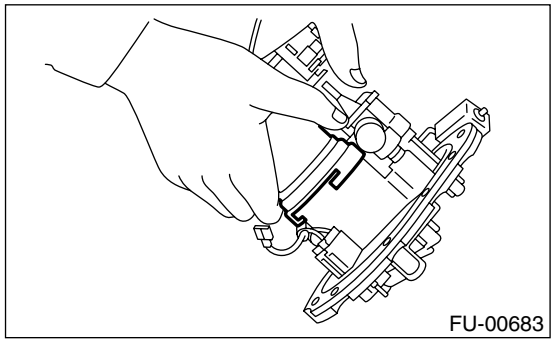
4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.



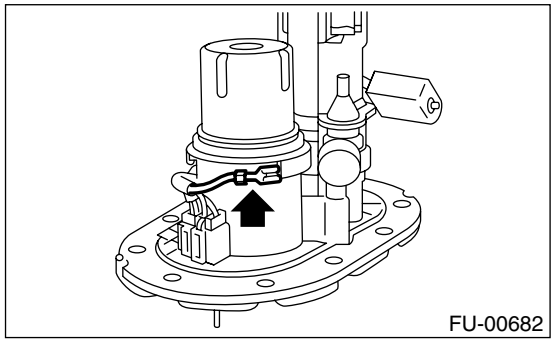
B: INSTALLATION

CAUTION:
- **If the fuel hoses are damaged at the connecting portion, replace it with a new one.**
- **If the clamps are badly damaged, replace with new ones.**
- **Replace the o-ring with new ones.**

1) Set the O-ring on the filter holder, and then install by turning to the right.



2) Connect the ground cable to filter holder.



3) Install the fuel pump assembly.
<Ref. to FU(H4SO)-67, INSPECTION, Fuel Pump.>

C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.

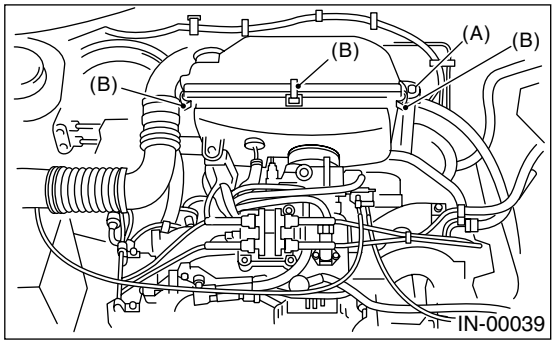
10.Air Cleaner Element

A: REPLACEMENT

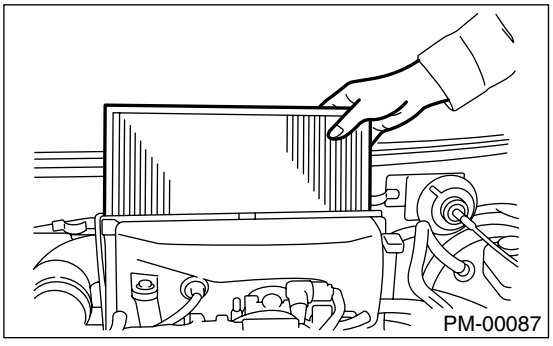
1. 2.5 L NON-TURBO MODEL

Do not attempt to clean the air cleaner element. The filter paper of the element is wetted with a special non-inflammable slow-evaporating viscous liquid. It is resistant to cold weather and has a long service life. Dirt adhering to this filter paper forms porous laminations with the viscous liquid, which function as a filtration layer to reduce dust penetration into the filter paper. If this filter paper is cleaned, the filtration layer thus formed will be lost along with the viscous liquid.

1) Remove the air intake duct from air cleaner case.
2) Remove the bolt (A) which installs air cleaner case to stays.
3) Remove the clip (B) above the air cleaner case.



4) Remove the air cleaner element.

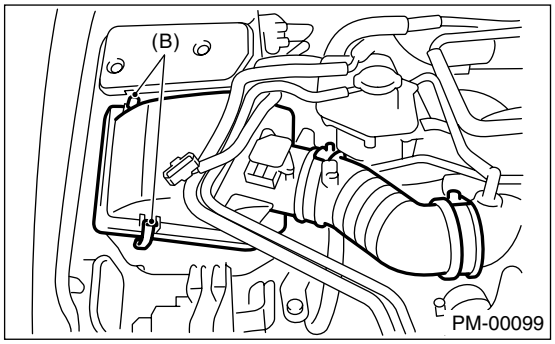


5) Install in the reverse order of removal.

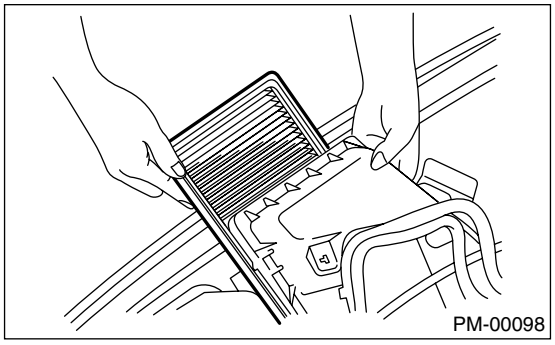
CAUTION:
Fasten with a clip after inserting the lower tab of the case.

2. 2.5 L TURBO MODEL

1) Remove the clip (B) above the air cleaner upper cover.

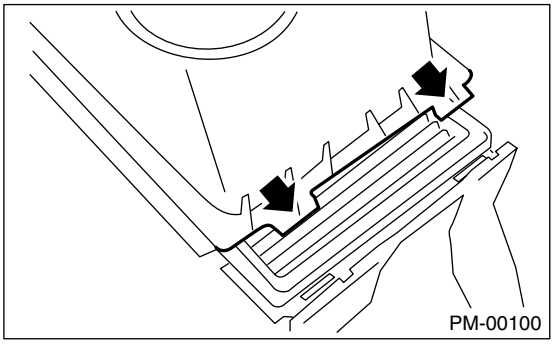


2) Remove air cleaner.



3) Install in the reverse order of removal.

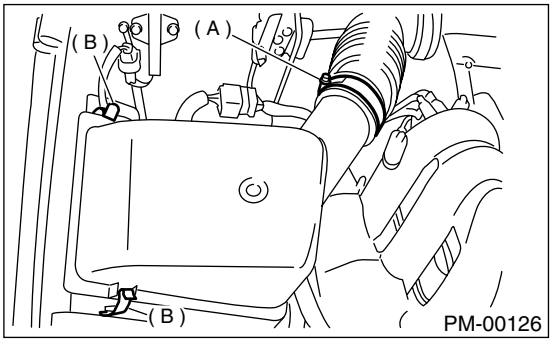
CAUTION:
Align protruding portions of air cleaner upper cover with holes of air cleaner lower case, then secure upper cover to lower case.



3. 3.0 L MODEL

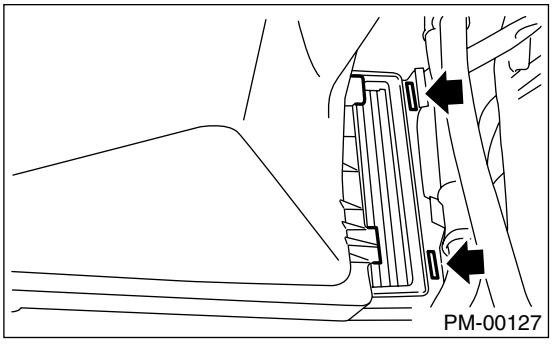
Do not attempt to clean the air cleaner element. The filter paper of the element is wetted with a special non-flammable slow-evaporating viscous liquid. It is resistant to cold weather and has a long service life. Dirt adhering to this filter paper forms porous laminations with the viscous liquid, which function as a filtration layer to reduce dust penetration into the filter paper. If this filter paper is cleaned, the filtration layer thus formed will be lost along with the viscous liquid.

1) Loosen clamp (A), and separate air cleaner upper cover and air intake boot.
2) Remove the clip (B) above the air cleaner upper cover.



3) Remove air cleaner element.
4) Install in the reverse order of removal.

CAUTION:
Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.

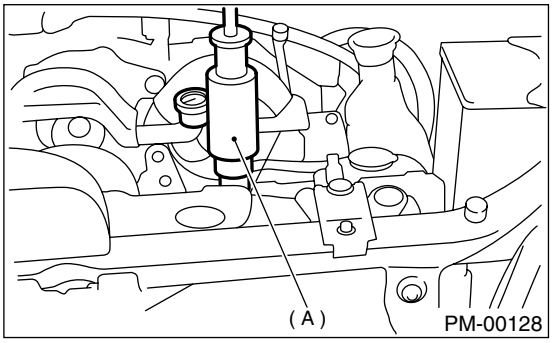


11.Cooling System

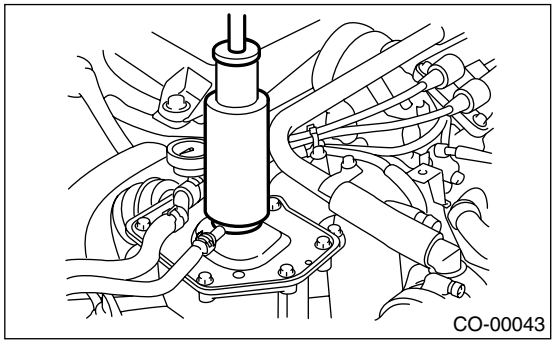
A: INSPECTION

1) Check radiator for leakage, filling it with coolant and attach radiator cap tester (A) to the filler neck. Then apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) and check the following points:
- Each portion of radiator for leakage
- Hose joints and other connections for leakage

NOTE:
• When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.
Non-TURBO model



TURBO model



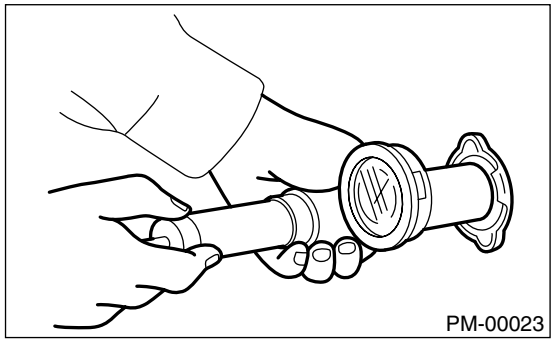
• When performing this check, be sure to keep the engine stationary and fill radiator with coolant.
• Wipe off check points before applying pressure.
• Use care not to spill coolant when detaching tester from radiator.

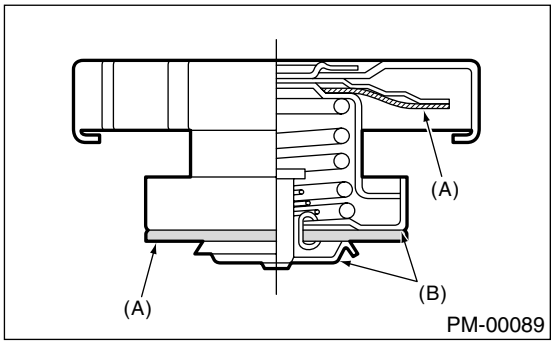
2) Check the radiator cap valve open pressure using radiator cap tester.

NOTE:
Rust or dirt on cap may prevent valve from functioning normally: be sure to clean cap before testing.

Raise the pressure until the needle of gauge stops and see if the pressure can be retained for five to six seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

Radiator cap valve open pressure
Standard value:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)
Service limit:
83 kPa (0.85 kg/cm^2, 12 psi)





(A) Check position for deformation
(B) Check position for deformation, damage and rust.

3) If the coolant temperature exceeds 76.0 to 80.0°C (169 to 176°F) while radiator is not so hot, check thermostat. If thermostat does not open at 76.0 to 80.0°C (169 to 176°F), replace it with a new one.
4) If electric fan does not operate when coolant temperature exceeds 95°C (203°F), check the electric fan system.

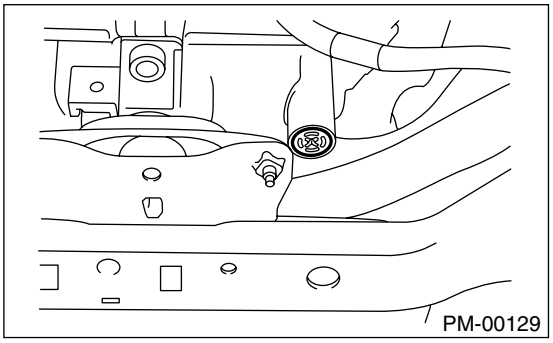
12.Coolant

A: REPLACEMENT

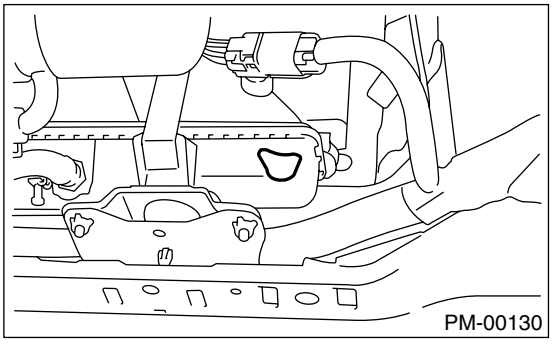
1. REPLACEMENT OF COOLANT

WARNING:
The radiator is of the pressurized type. Do not attempt to open the radiator cap immediately after the engine has been stopped.

1) Lift up the vehicle.
2) Remove under cover.
3) Place a container under drain pipe.
4) Loosen and remove drain screw to drain engine coolant into container.
2.5 L model



3.0 L model



5) For quick draining, open radiator cap.

CAUTION:
Be careful not to spill coolant on the floor.

6) Drain coolant from reservoir tank.
7) Tighten radiator drain screw securely after draining coolant.
8) Slowly pour prepared coolant from radiator filler port to neck of filler, then pour into reservoir tank up to “FULL” level.

Coolant amount for preparation

2.5 L Non-TURBO model
MT model:
Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)
AT model:
Approx. 6.7 ℓ (7.1 US qt, 5.9 Imp qt)

2.5 L TURBO model
MT model:
Approx. 7.4 ℓ (7.8 US qt, 6.5 Imp qt)
AT model:
Approx. 7.3 ℓ (7.7 US qt, 6.4 Imp qt)

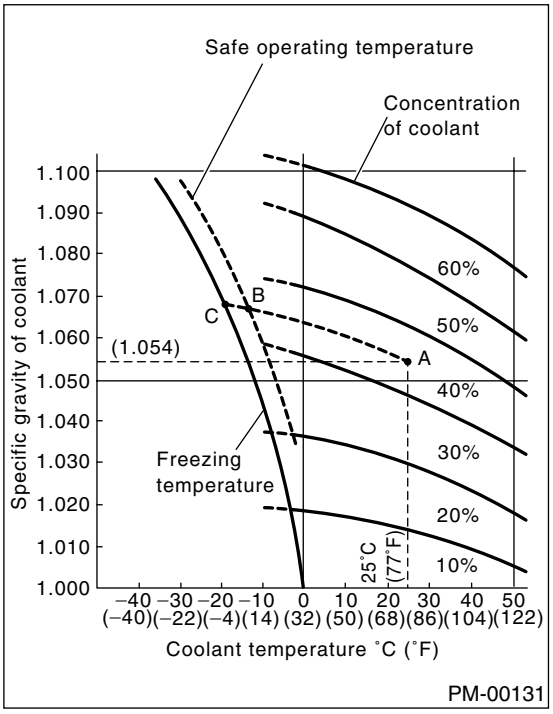
3.0 L model
Approx. 7.9 ℓ (8.4 US qt, 7.0 Imp qt)

NOTE:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

9) Securely install radiator cap.
10) Run engine for more than five minutes at 2,000 to 3,000 rpm. (Run engine until radiator becomes hot in order to purge air trapped in cooling system.)
11) Stop engine and wait until coolant temperature lowers. Then open radiator cap to check coolant level and add coolant up to radiator filler neck. Next, add coolant into reservoir tank up to “FULL” level.
12) After adding coolant, securely install radiator and reservoir tank caps.

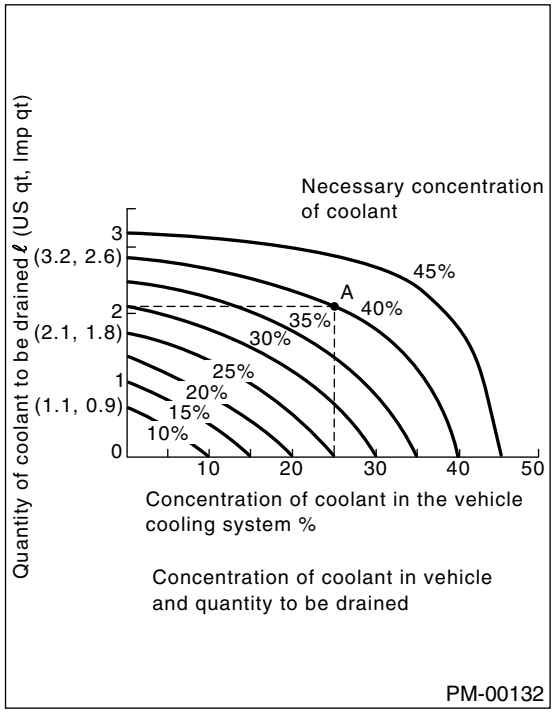
2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



3. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

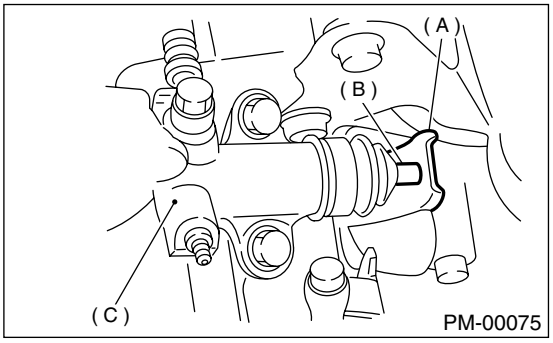


13.Clutch System

A: INSPECTION AND ADJUSTMENT

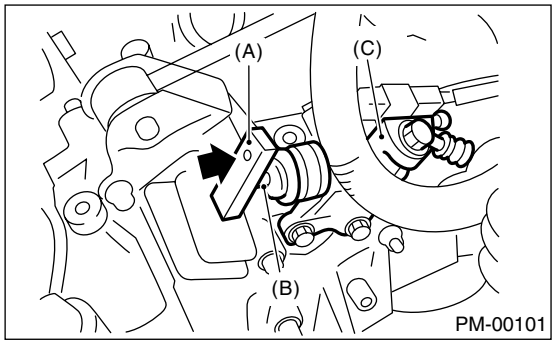
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.

Non-TURBO model



(A) Release lever
(B) Push rod
(C) Operating cylinder

TURBO model



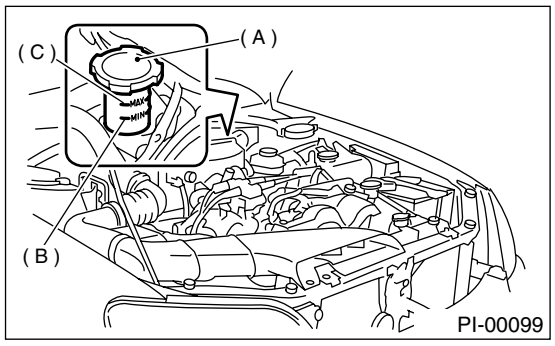
(A) Release lever
(B) Push rod
(C) Operating cylinder

2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-28, Clutch Pedal.>
4) Inspect the underside of master cylinder, clutch damper and operating cylinder for clutch system, hoses, piping and their couplings for fluid leaks.
If fluid leaks are found, correct them by retightening their fitting bolt and/or replacing their parts.

5) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below “MIN” (B), add clutch fluid to bring it up to “MAX” (C).

Recommended clutch fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

NOTE:
• Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.



(A) Reservoir tank
(B) MIN. level
(C) MAX. level

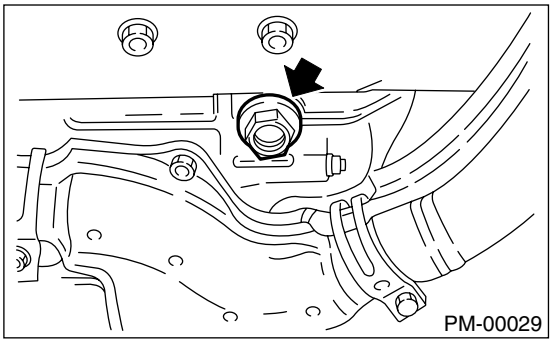
14.Transmission Oil

A: REPLACEMENT

1. MANUAL TRANSMISSION

1) Drain gear oil by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:
- Before starting work, cool off the engine well.
- If transmission gear oil splashes on exhaust pipe, wipe it clean.



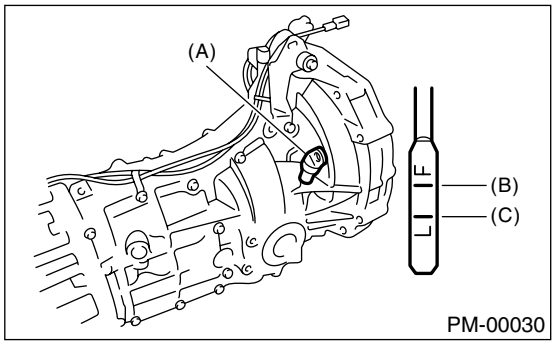
2) Reinstall drain plug after draining gear oil and tighten it to the specified torque.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

NOTE:
- Replace the gasket with a new one.
- Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

3) Fill transmission gear oil through the oil level gauge hole up to the upper point of level gauge.

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)



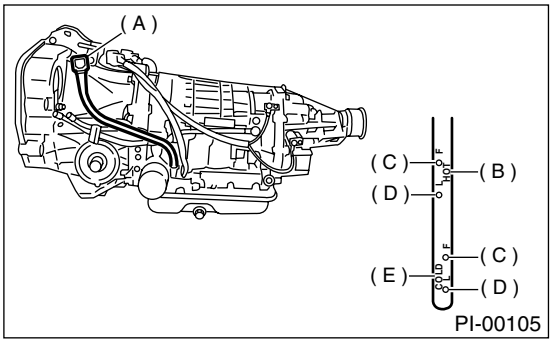
(A) Oil level gauge
(B) Upper level
(C) Lower level

15.ATF

A: INSPECTION

1) Raise ATF temperature to 70 to 80°C (158 to 176°F) from 20 to 30°C (68 to 86°F) (when cold) by driving a distance of 5 to 10 km (3 to 6 miles).

NOTE:
The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking oil level.



(A) Level gauge
(B) Check line, HOT condition
(C) Upper level
(D) Lower level
(E) Check line, COLD condition

2) Make sure the vehicle is level. After selecting all positions (P, R, N, D, 3, 2, 1), set the select leveler in “P” range. Measure fluid level with the engine idling.

NOTE:
After running, idle the engine for one or two minutes before measurement.

3) If the fluid level is below the center between upper and lower marks, add the recommended ATF until the fluid level is found within the specified range (above the center between upper and lower marks). When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

CAUTION:
• Use care not to exceed the upper limit level.
• ATF level varies with temperature. Remember that the addition of fluid to the upper limit mark when the transmission is cold will result in the overfilling of fluid.

4) Fluid temperature rising speed
• By idling the engine
Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 25 minutes
<Reference>
Time for temperature rise to 30°C (86°F) with atmospheric temperature of 0°C (32°F): Approx. 8 minutes
• By running the vehicle
Time for temperature rise to 60°C (140°F) with atmospheric temperature of 0°C (32°F): More than 10 minutes

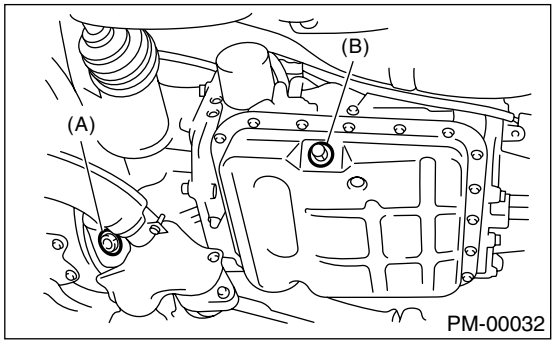
5) Method for checking fluid level upon delivery or at periodic inspection
Check fluid level after a warm-up run of approx. 10 minutes. During the warm-up period, the automatic transmission functions can also be checked.

B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain ATF (Automatic Transmission Fluid) by removing drain plug after allowing the engine to cool for 3 to 4 hours.

NOTE:
Before starting work, cool off the engine well.



(A) Front differential drain plug
(B) ATF drain plug

2) Reinstall drain plug after draining ATF, and tighten it to the specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Pour ATF into the oil charge pipe.

Recommended fluid:
Dexron III type automatic transmission fluid

ATF amount:
Refill with the same amount of ATF that was drained.

4) Check the level of the ATF. Refer to “INSPECTION”.

2. ATF FILTER

NOTE:
ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.

For the replacement procedures of the ATF filter: <Ref. to 4AT-77, ATF Filter.>

16.Front & Rear Differential Oil

A: REPLACEMENT

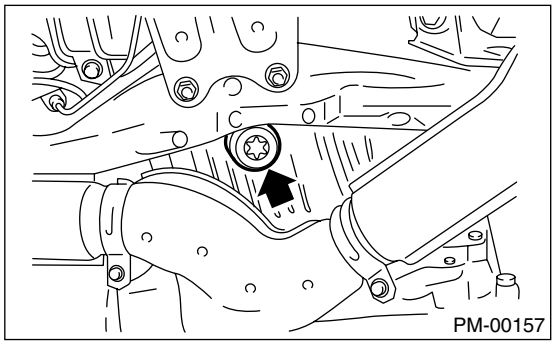
1. FRONT DIFFERENTIAL (MANUAL TRANSMISSION)

For M/T vehicle, manual transmission oil works as differential oil to lubricate differential. Refer to “Transmission Oil”. <Ref. to PM-25, MANUAL TRANSMISSION, REPLACEMENT, Transmission Oil.>

2. FRONT DIFFERENTIAL (AUTOMATIC TRANSMISSION)

1) Drain differential gear oil by removing drain plug using TORX T70.

NOTE:
• Before starting work, cool off the engine well.
• If transmission gear oil splashes on exhaust pipe, wipe it clean.



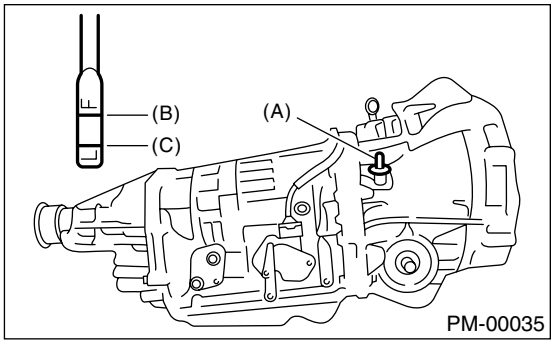
2) Reinstall drain plug after draining differential gear oil and tighten it to the specified torque.

Tightening torque:
70 N·m (7.1 kgf-m, 51.4 ft-lb)

NOTE:
• Be sure to place a gasket between the transmission case and drain plug.
• Replace the gasket with a new one.
• Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

3) Fill differential gear oil through the oil level gauge hole up to the upper point of level gauge.

Differential gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)



(A) Oil level gauge
(B) Upper level
(C) Lower level

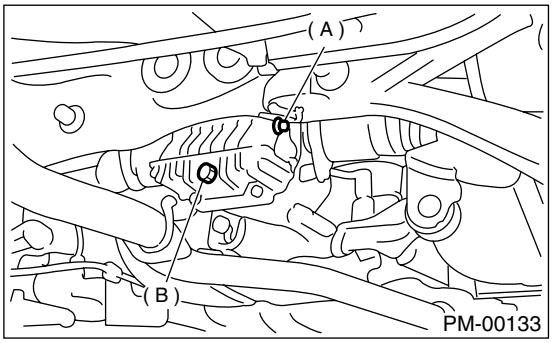
3. REAR DIFFERENTIAL

• AT model

1) Drain oil by removing drain plug.
2) Remove filler plug for quicker draining.
3) Replace drain plug gasket with a new one.
4) Tighten drain plug to the specified torque.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) After installing drain plug, fill oil fully up to the mouth of filler plug.



(A) Filler plug
(B) Drain plug

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

6) Replace filler plug gasket with a new one.
7) Install filler plug onto rear differential gear case.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

• Except AT model

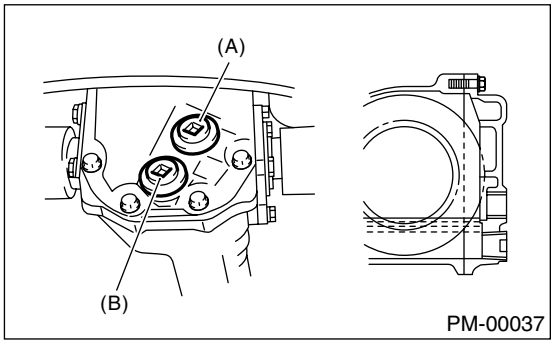
1) Drain oil by removing drain plug.
2) Remove filler plug for quicker draining.
3) Tighten drain plug after draining oil.

NOTE:
Apply fluid gasket to drain plug threads before installation.

Fluid gasket:
Three Bond 1105 (Part No. 004403010)

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

4) After installing drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler plug.



(A) Filler plug
(B) Drain plug

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

5) Install filler plug onto rear differential gear case firmly.

NOTE:
Apply fluid packing to filler plug before installation.

Fluid packing:
Three Bond 1105 (Part No. 004403010)

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

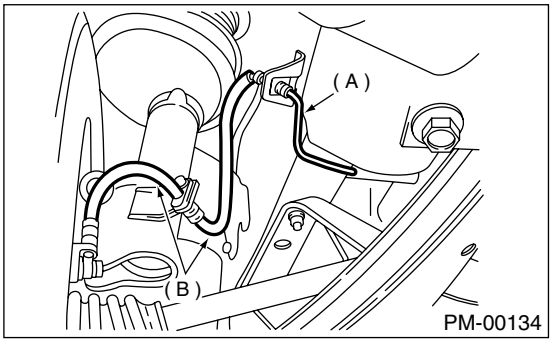
17.Brake Line

A: INSPECTION

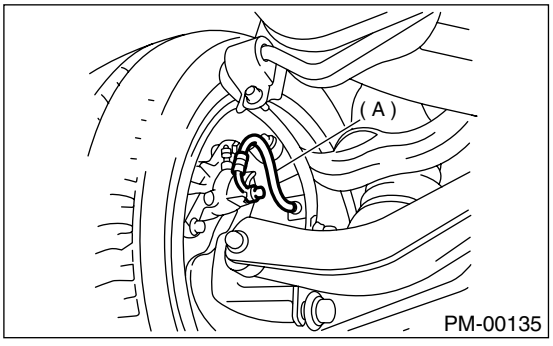
1. BRAKE LINE

1) Check scratches, swelling, corrosion and/or traces of fluid leakage on brake hoses or pipe joints.
2) Check the possibility of adjacent parts interfering with brake pipes/hoses during driving, and loose connections/clamps.
3) Check any trace of fluid leakage, scratches, etc. on master cylinder, wheel cylinder and pressure control valve.

NOTE:
• When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light on the combination meter will come on.
• Visually check brake hose (using a mirror where it is difficult to see) for any damage.



(A) Front brake pipe
(B) Front brake hose



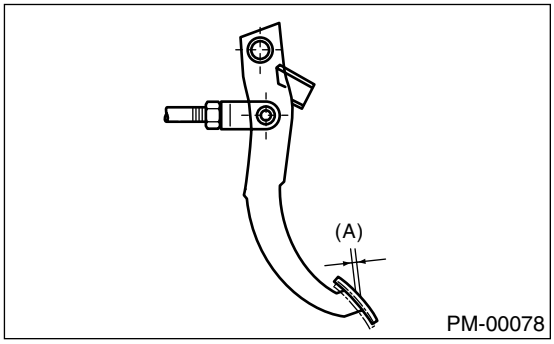
(A) Rear brake hose

B: CHECKING

1. SERVICE BRAKE

1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lb).

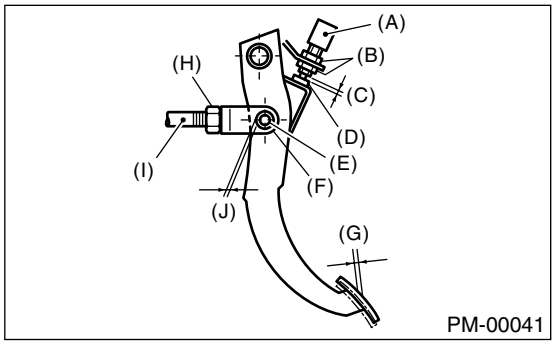
Brake pedal free play:
1 — 3 mm (0.04 — 0.12 in)



(A) Pedal play

2) If the free play is out of specifications above, adjust the brake pedal as follows:
(1) Be sure engine is off. (No vacuum is applied to brake booster.)
(2) There should be play between brake booster clevis and pin at brake pedal installing portion.
[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb) to a stroke of 1 to 3 mm (0.04 to 0.12 in).]
(3) Depress the surface of brake pad by hand.

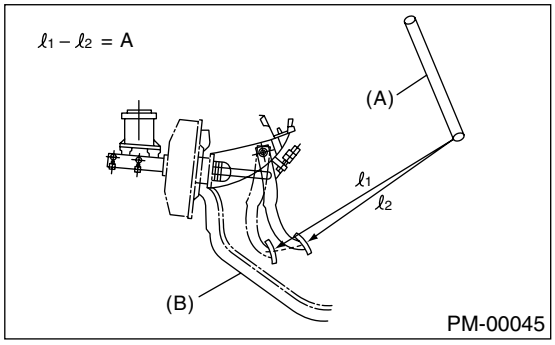
(4) If there is no free play between clevis pin and clevis, turn brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



(A) Brake switch
(B) Adjusting nut
(C) 0.3 mm (0.012 in)
(D) Stopper
(E) Clevis pin
(F) Clevis
(G) Pedal play
1 - 3 mm (0.04 - 0.12 in)
(H) Lock nut
(I) Brake booster operating nut
(J) Play at pin

3) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be less than 95 mm (3.74 in). If the distance is more than specified, there is a possibility air is in the inside of the hydraulic unit.

Brake pedal reserve distance: A
less more than 95 mm (3.74 in)/ 490 N (50 kgf, 110 lb)

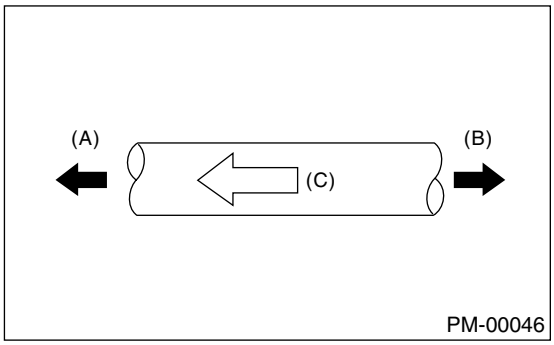


(A) Steering wheel
(B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.
5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

2. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force: Make sure the travel distance should not change.
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.
3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds: Make sure the pedal height should not change.
4) Check valve is built into vacuum hose. Disconnect vacuum hose to inspect function of check valve.
Blow air into vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into hose from engine side: Air should not flow out of hose.
Replace both check valve and vacuum hose if check valve is faulty. Engine side of vacuum hose is indicated by marking “ENGINE” as shown.



(A) Engine side
(B) Brake booster side
(C) ENG

5) Check vacuum hose for cracks or other damage.

NOTE:
When installing the vacuum hose on the engine and brake booster, do not use soapy water or lubricating oil on their connections.

6) Check vacuum hose to make sure it is tight and secure.

18.Brake Fluid

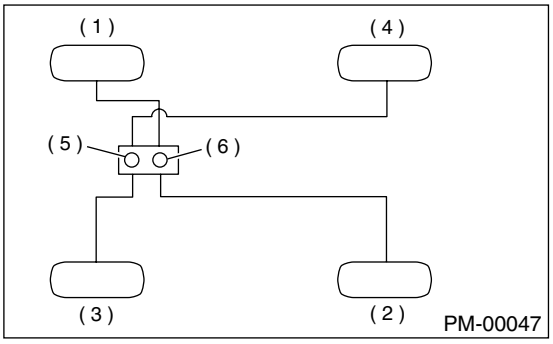
A: REPLACEMENT

1) Either jack up vehicle and place a safety stand under it, or lift up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

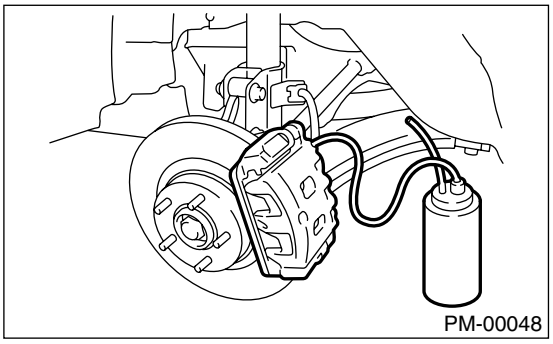
NOTE:
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

Bleeding sequence (1) → (2) → (3) → (4)



(1) Front right
(2) Rear left
(3) Front left
(4) Rear right
(5) Secondary
(6) Primary

5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



NOTE:
• Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• During bleeding operation, keep the brake reserve tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, it is advisable to have two men working.
• The amount of brake fluid required is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen bleeder screw approximately 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

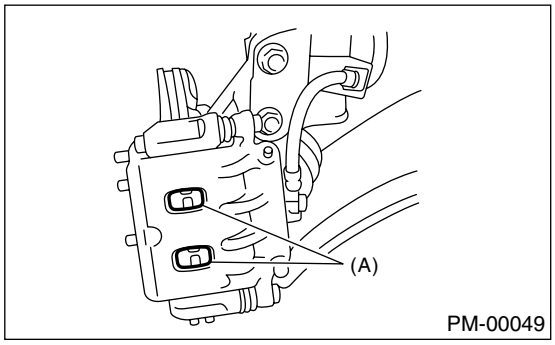
10) Bleed air from each wheel cylinder by following the previous 5 steps.
11) Depress brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it makes any unusual movement. Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install wheels, and drive vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

19.Disc Brake Pads and Discs

A: INSPECTION

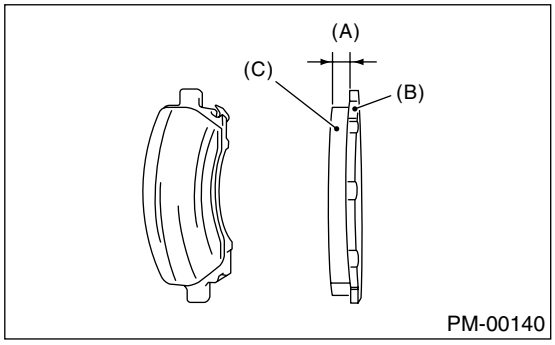
1. DISC BRAKE PAD AND DISC

1) Jack up vehicle and support with rigid racks. Then remove wheels.
2) Visually check pad thickness through inspection hole of disc brake assembly. Replace pad if necessary.



(A) Inspection hole

Pad thickness mm (in)		
	Front	Rear
Standard	11 (0.43)	9 (0.35)
Service limit	1.5 (0.059)	1.5 (0.059)



(A) Thickness of pad
(B) Back metal
(C) Lining

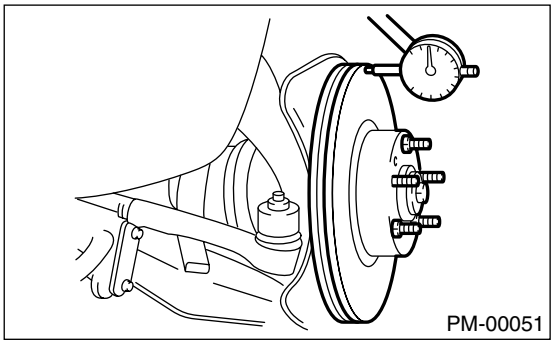
3) Check the disc rotor, and correct or replace if it is damaged or worn.

Brake disc thickness mm (in)		
	Front	Rear
Standard	24 (0.94)	10 (0.39)
Wear limit	22 (0.87)	8.5 (0.335)

4) Measure the disc rotor runout at a point less than 10 mm (0.39 in) from the outer periphery of the rotor.

Disc rotor runout limit:
Front: 0.075 mm (0.0030 in)
Rear: 0.070 mm (0.0028 in)

NOTE:
When replacing a pad, always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.



20. Parking Brake

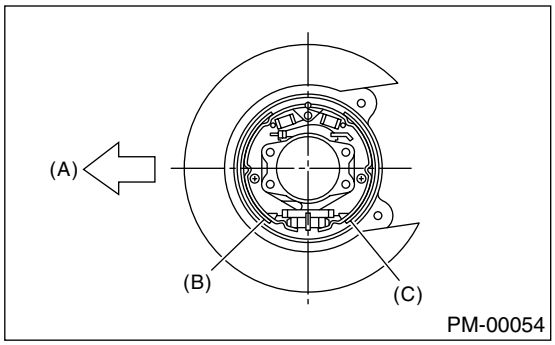
A: INSPECTION

Inspect brake linings and drums of both sides of the rear brake at the same time by removing brake drums.

1) Inspect brake shoes for damage or deformation and check brake linings for wear.

NOTE:
Always replace both primary and secondary brake shoes for the left and right wheels at the same time.

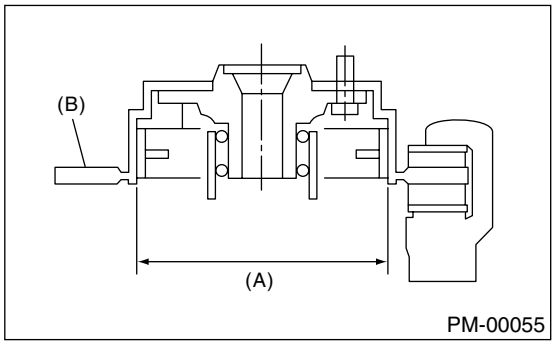
Brake lining thickness excluding back metal
Standard value: 3.2 mm (0.126 in)
Wear limit: 1.5 mm (0.059 in)



(A) Front
(B) Brake shoe (Primary)
(C) Brake shoe (Secondary)

2) Check brake drum for wear, dents or other damage. If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.

Brake drum inside diameter
Standard value: 170 mm (6.69 in)
Wear limit: 171 mm (6.73 in)



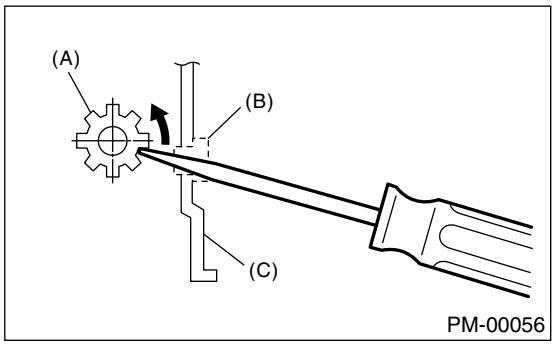
(A) Measuring inside diameter
(B) Disc

3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace them.
4) When the shoe return spring tension is excessively weakened, replace it, taking care to identify upper and lower springs.

B: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove adjusting hole cover from back plate.
2) Turn adjusting screw using a slot-type screwdriver until brake shoe is in close contact with disc rotor.

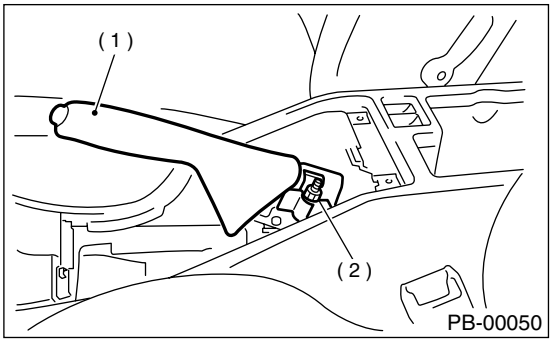


(A) Adjusting screw
(B) Cover (rubber)
(C) Back plate

3) Turn back (downward) adjusting screw 3 or 4 notches.
4) Install adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove console box lid.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 6 notches with operating force of 196 N (20 kgf, 44 lb).



(1) Parking brake lever
(2) Adjusting nut (self-locking nut)

4) Install console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

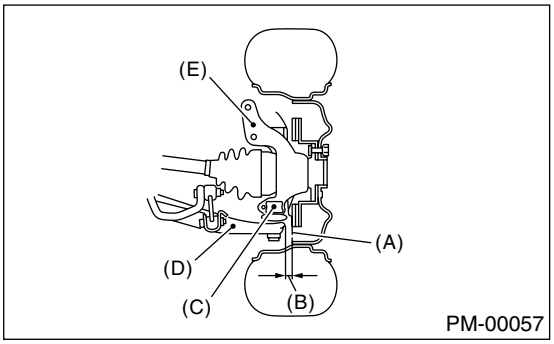
If self-locking nuts removed, replace them with new ones.

21.Suspension

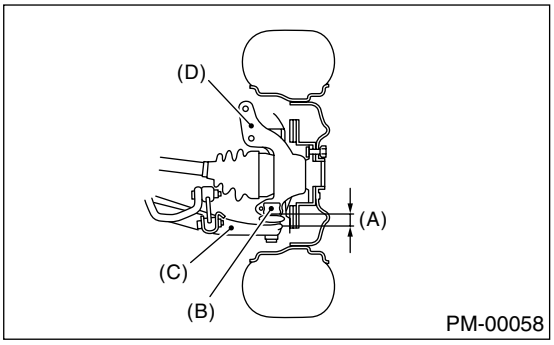
A: INSPECTION

1. SUSPENSION BALL JOINT

1) Jack up vehicle until front wheels are off ground.
2) Next, grasp bottom of tire and move it in and out. If relative movement is observed between brake disc cover and end of transverse link, ball joint may be excessively worn.
3) Next, grasp end of transverse link and move it up and down. Relative movement between housing and transverse link boss indicates ball joint may be excessively worn.
4) If relative movement is observed in the immediately preceding two steps, remove and inspect ball joint. If free play exceeds standard, replace ball joint. <Ref. to FS-17, Front Ball Joint.>



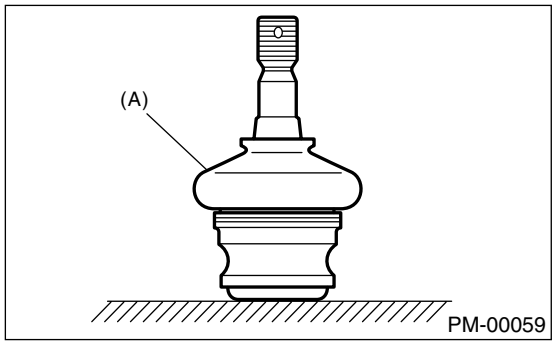
(A) Disc cover
(B) Relative movement
(C) Ball joint
(D) Transverse link
(E) Housing



(A) Relative movement
(B) Ball joint
(C) Transverse link
(D) Housing

5) Damage of dust seal
Visually inspect ball joint dust seal. If it is damaged, remove transverse link. <Ref. to FS-14, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-17, Front Ball Joint.>
(1) When looseness exceeds standard value, replace ball joint.
(2) If the dust seal is damaged, replace with the new ball joint.

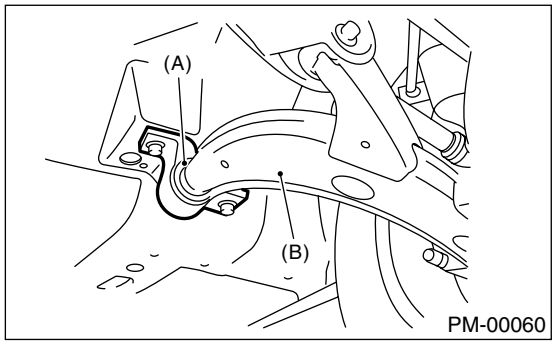
NOTE:
When transverse link ball joint has been removed or replaced, check toe-in of front wheel. If front wheel toe-in is not at tolerance value, adjust toe-in. <Ref. to FS-6, Wheel Alignment.>



(A) Dust seal

2. TRANSVERSE LINK'S REAR BUSHING

Check oil leaks at around liquid-filled bushing. If oil leaks, replace bushing.



(A) Rear bushing
(B) Transverse link

3. WHEEL ARCH HEIGHT

1) Unload cargoes and set vehicle in curb weight (empty) condition.
2) Then, check wheel arch height of front and rear suspensions to ensure that they are within specified values.
3) When wheel arch height is out of tolerance value, visually inspect following components and replace deformed parts.
• Suspension components [Front strut assembly and rear shock absorber assembly]
• Body parts to which suspensions are installed.
4) When no components are deformed, adjust wheel arch height by replacing coil spring in the suspension whose wheel arch height is out of standard. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-8, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

1) Check alignment of front suspension to ensure that following items are within tolerance value.
• Toe-in
• Camber angle
• Steering angle
<Ref. to FS-6, Wheel Alignment.>
2) When toe-in and camber are out of tolerance value, adjust them so that they conform to respective adjustment standard value.
3) When right-and-left turning angles of tire are out of standard, adjust to standard value.

5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Check alignment of rear suspension to ensure that following items are within tolerance values.
• Toe-in
• Camber angle
• Thrust angle
<Ref. to RS-8, Wheel Alignment.>
2) When camber angle does not conform to tolerance value, visually inspect parts listed below. If deformation is observed, replace damaged parts.
• Suspension components [Shock absorber, link F, link R, link UPR, arm R, sub frame, etc.]
• Body parts to which suspensions are installed.
3) When toe-in and thrust angle are out of tolerance value, adjust them so that they conform to respective adjustment standard value.

6. OIL LEAKAGE OF STRUT AND SHOCK ABSORBER

Visually inspect front strut and rear shock absorber for oil leakage as instructed. Replace front strut and rear shock absorber if oil leaks excessively.

7. TIGHTNESS OF BOLTS AND NUTS

Check bolts and nuts shown in the figure for looseness. Retighten bolts and nuts to specified torque. If self-lock nuts and bolts are removed, replace them with new ones.
Front suspension: <Ref. to FS-3, COMPONENT, General Description.>
Rear suspension: <Ref. to RS-3, COMPONENT, General Description.>

8. DAMAGE TO SUSPENSION PARTS

1) Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. If necessary, replace damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove rust and apply remedial anti-corrosion measures.
• Front suspension
  • Transverse link
  • Crossmember
  • Strut
• Rear suspension
  • Sub frame
  • Link F
  • Link R
  • Link UPR
  • Arm R
  • Shock absorber
• In the district where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

22.Wheel Bearing

A: INSPECTION

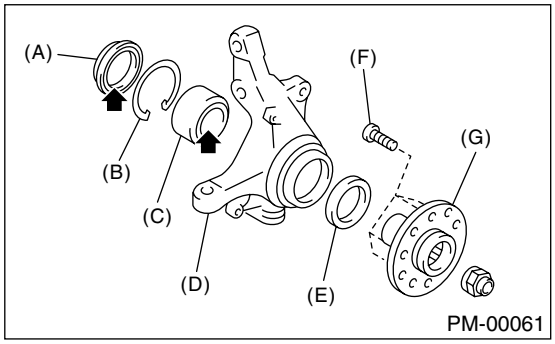
1. FRONT WHEEL BEARING

NOTE:
Inspect the condition of front wheel bearing grease.

1) Jack up the front of vehicle.
2) While holding front wheel by hand, swing it in and out to check bearing free play.
3) Loosen wheel nuts and remove front wheel.
4) If bearing free play exists in step 2) above, attach a dial gauge to hub and measure axial displacement in axial direction.

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove bolts and self-locking nuts, and extract transverse link from front crossmember.
6) While lightly hammering spring pin which secures SFJ to transmission spindle, remove it.
7) Extract SFJ from transmission spindle. <Ref. to DS-18, Front Axle.>
8) While supporting front drive shaft horizontally with one hand, turn hub with the other to check for noise or binding.
If hub is noisy or binds, disassemble front axle and check condition of oil seals, bearing, etc.



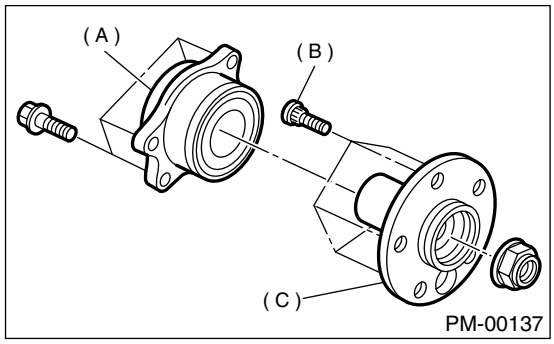
(A) Inner oil seal
(B) Snap ring
(C) Bearing
(D) Housing
(E) Outer oil seal
(F) Hub bolt
(G) Hub

2. REAR WHEEL BEARING

1) Jack up the rear of vehicle.
2) While holding rear wheel by hand, swing it in and out to check bearing free play.
3) Loosen wheel nuts and remove rear wheel.
4) If bearing free play exists in step 2) above, attach a dial gauge to hub assembly and measure axial displacement in axial direction.

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-37, Rear Drive Shaft.>
6) While supporting rear drive shaft horizontally with one hand, turn hub assembly with the other to check for noise or binding.
If hub assembly is noisy or binds, disassemble rear axle and check condition of oil seals, bearings, etc.



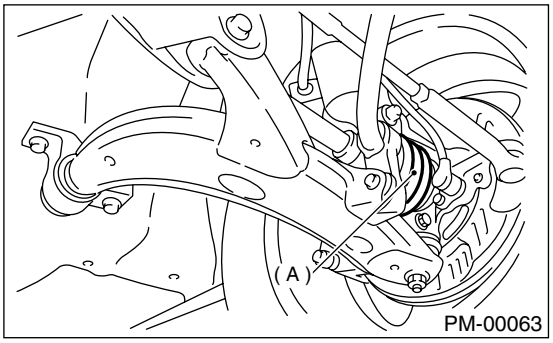
(A) Hub unit
(B) Hub bolt
(C) Hub

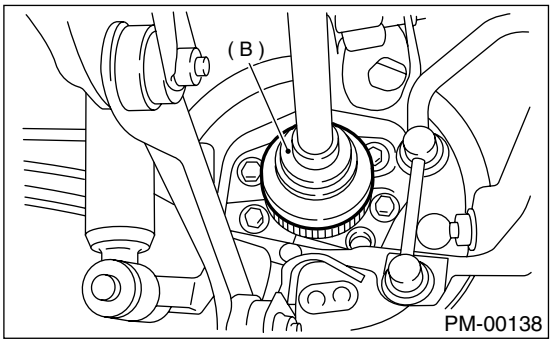
23.Axle Boots & Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-29, Front Drive Shaft.> <Ref. to DS-37, Rear Drive Shaft.>





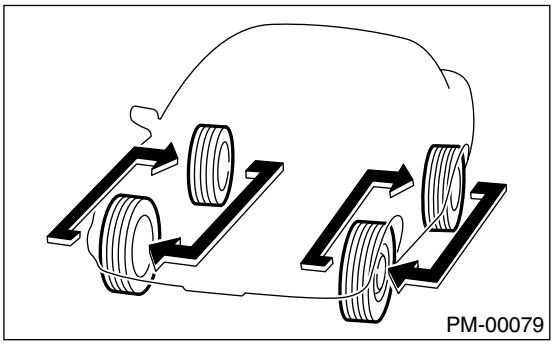
2. PROPELLER SHAFT

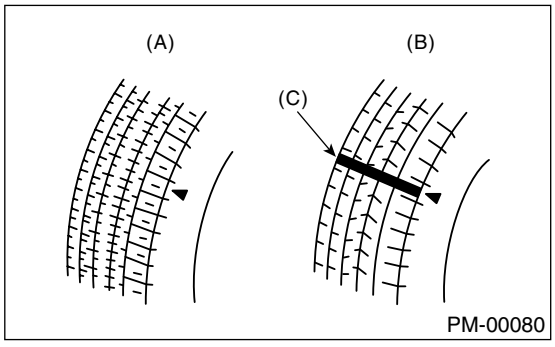
Inspect propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-15, Propeller Shaft.>

24.Tire Rotation

A: INSPECTION

1) Replace the tire if the tread depth is less than 1.6 mm (0.063 in) or if wear indicators appear across the tire tread. (It is recommended that both right and left tires are replaced as a set.)
2) Adjust the wheel alignment if abnormally uneven tire wear is found.
3) Also, rotate the tires between the front and rear tires as illustrated, in order to ensure uniform tire wear.


PM-00079



PM-00080

(A) New tread
(B) Worn tread
(C) Tread wear indicator

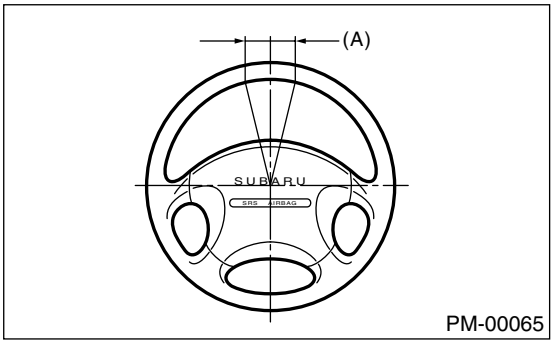
25.Steering System (Power Steering)

A: INSPECTION

1. STEERING WHEEL

1) Set steering wheel in a straight-ahead position, and check wheel spokes to make sure they are correctly set in their specified positions.
2) Lightly turn steering wheel to the left and right to determine the point where front wheels start to move.
Measure the distance of the movement of steering wheel at the outer periphery of wheel.

Steering wheel free play:
0 — 17 mm (0 — 0.67 in)



(A) Free play

Move steering wheel vertically toward the shaft to ascertain if there is play in the direction.

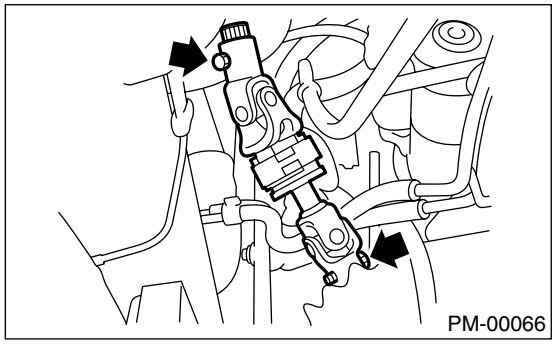
Maximum permissible play:
0.5 mm (0.020 in)

3) Drive vehicle and check the following items during operation.
(1) Steering force .....
The effort required for steering should be smooth and even at all points, and should not vary.
(2) Pull to one side .....
Steering wheel should not be pulled to either side while driving on a level surface.
(3) Wheel runout .....
Steering wheel should not show any sign of runout.
(4) Return factor .....
Steering wheel should return to its original position after it has been turned and then released.

2. STEERING SHAFT JOINT

1) When steering wheel free play is excessive, disconnect universal joint of steering shaft and check it for any play and yawing torque (at the point of the crossing direction). Also inspect for any damage to sealing or worn serrations. If the joint is loose, retighten the mounting bolts to the specified torque.

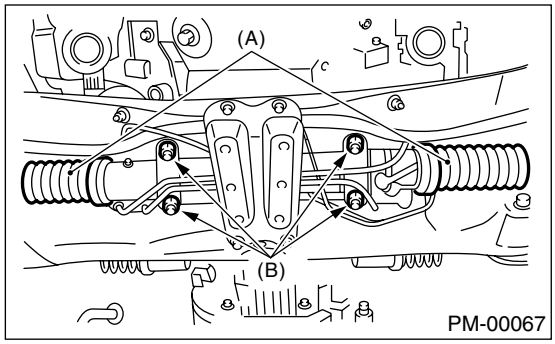
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)



3. GEARBOX

1) With wheels placed on a level surface, turn steering wheel 90° in both the left and right directions.
While wheel is being rotated, reach under vehicle and check for looseness in gearbox.

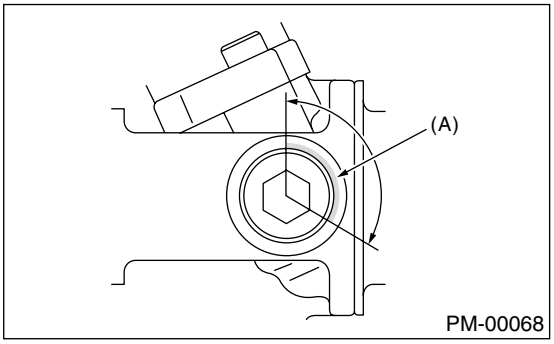
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(A) Boot
(B) Gearbox mounting bolts

2) Check boot for damage, cracks or deterioration.
3) With vehicle on a level surface, quickly turn steering wheel to the left and right.
While steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.
(1) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and then loosen. Repeat this operation twice.
(2) Retighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.

(3) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.



(A) Apply liquid packing to at least 1/3 of entire perimeter.

(4) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.

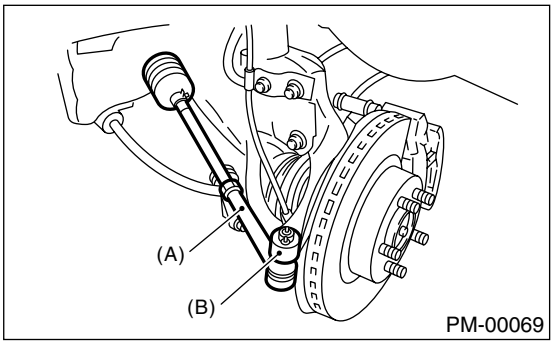
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.

4. TIE-ROD

1) Check tie-rod and tie-rod ends for bends, scratches or other damage.



(A) Tie-rod end
(B) Knuckle arm

2) Check connections of knuckle ball joints for play, inspect for damage on dust seals, and check free play of ball studs. If castle nut is loose, retighten it to the specified torque, then tighten further up to 60° until cotter pin hole is aligned.

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

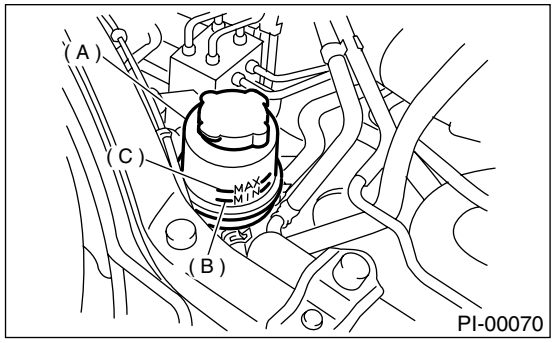
3) Check lock nut on the tie-rod end for tightness. If it is loose, retighten it to the specified torque.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

5. POWER STEERING FLUID LEVEL

NOTE:
The fluid level must be checked when the temperature of the reservoir tank surface is approximately 20°C (68°F).

1) Place vehicle with engine "off" on the flat and level surface.
2) Check the fluid level using the scale on the outside of the reservoir tank (A). If the level is below "MIN" (B), add fluid to bring it up to "MAX" (C).



NOTE:
If fluid level is at MAX level or above, drain fluid to keep the level in the specified range of indicator by using a syringe or the like.

Recommended fluid:
Dexron III

Fluid capacity:
0.7 ℓ (0.7 US qt, 0.6 Imp qt)

6. POWER STEERING FLUID FOR LEAKS

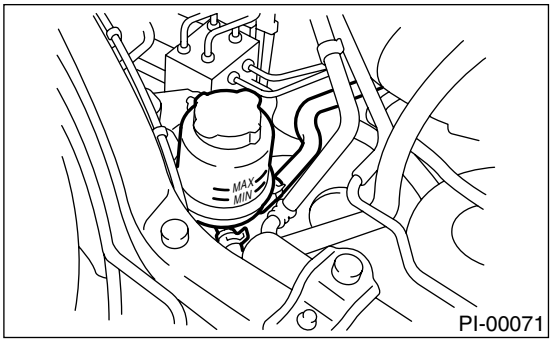
Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.
If fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

NOTE:
• Wipe the leakage fluid off after correcting fluid leaks, or a wrong diagnosis is taken later.
• Also pay attention to clearances between hoses (or pipings) and other parts when inspecting fluid leaks.

7. HOSES OF OIL PUMP FOR DAMAGES

Check pressure hose and return hose of oil pump for crack, swell or damage. Replace hose with a new one if necessary.

NOTE:
Prevent hoses from revolving and/or turning when installing hoses.



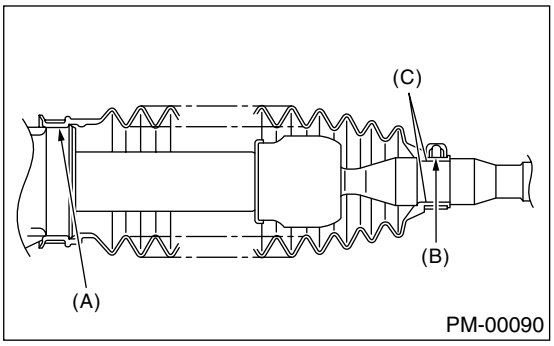
8. POWER STEERING PIPES FOR DAMAGE

Check power steering pipes for corrosion and damage.
Replace pipes with new ones if necessary.

9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.
1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (B) grooves of gearbox and the rod.
2) Clips are fitted outside of (A) and (B) positions of boot.
3) Boot does not have crack and hole.

NOTE:
Rotate (B) position of gearbox boot against twist of it produced by adjustment of toe-in, etc. Apply grease to the groove (C).



10.FITTING BOLTS AND NUTS

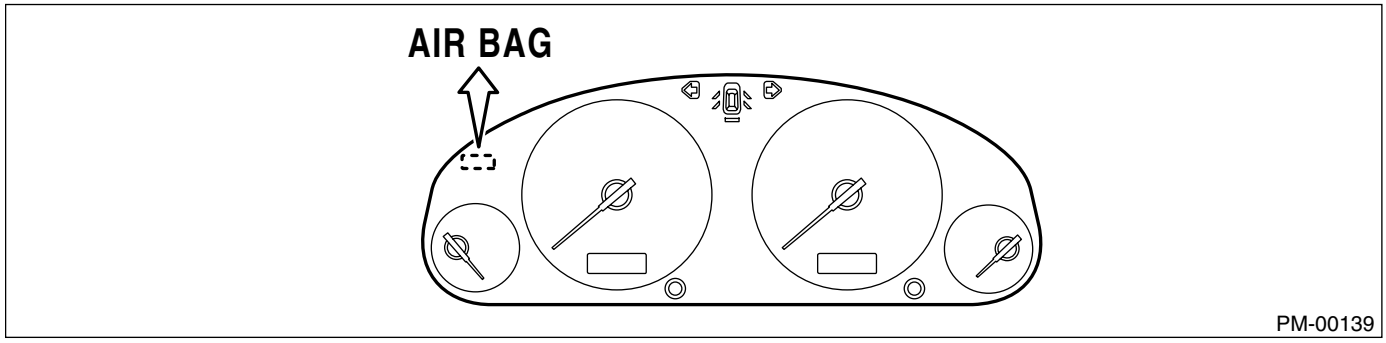
Inspect fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.
Inspect and/or retighten them when engine is cold.

26.Supplemental Restraint System

A: INSPECTION

Check the airbag system in accordance with the result of the self-diagnosis. <Ref. to AB-2, Basic Diagnostic Procedure.>

1) Ensure that airbag connectors are connected. If not, properly connect. When the ignition switch is turned ON with the connector(s) disconnected, the airbag warning light blinks to identify the fault.



2) Turn the ignition switch ON, and connect the airbag diagnosis terminal of the service connector (located below lower cover) to the ground terminal.

3) The warning light blinks to indicate a trouble code (a fault is identified). When the airbag system is in good order (no trouble codes are stored in the memory), the warning light blinks on and off at 0.6 second intervals (as long as the diagnosis terminal is connected to the ground terminal).

4) When the warning light indicates a trouble code, check the airbag system in accordance with the trouble-shooting procedure. <Ref. to AB-2, Basic Diagnostic Procedure.>

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SO)

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1. General Description

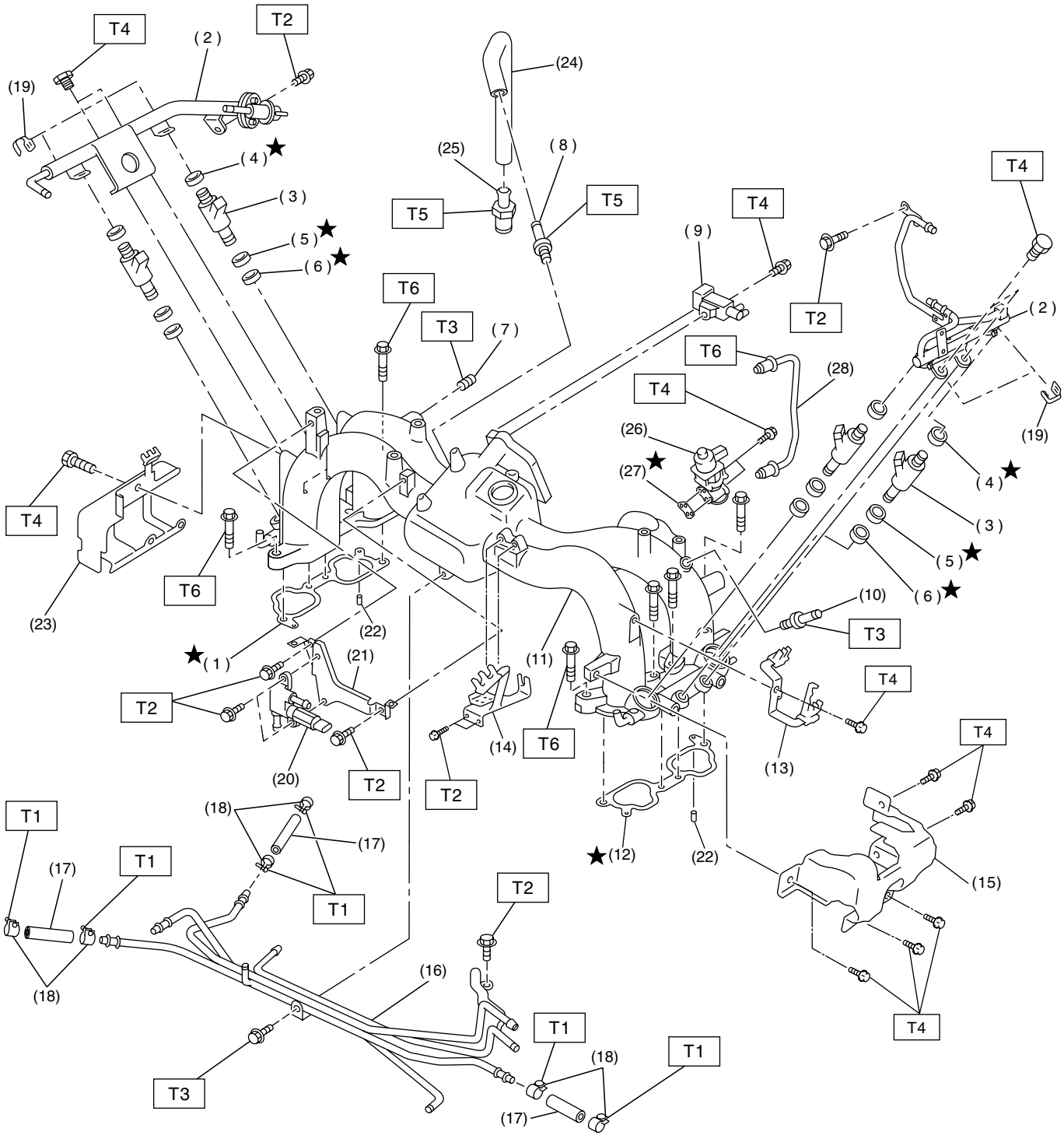
A: SPECIFICATIONS

Model		
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm^2, 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

MEMO:

B: COMPONENT

1. INTAKE MANIFOLD

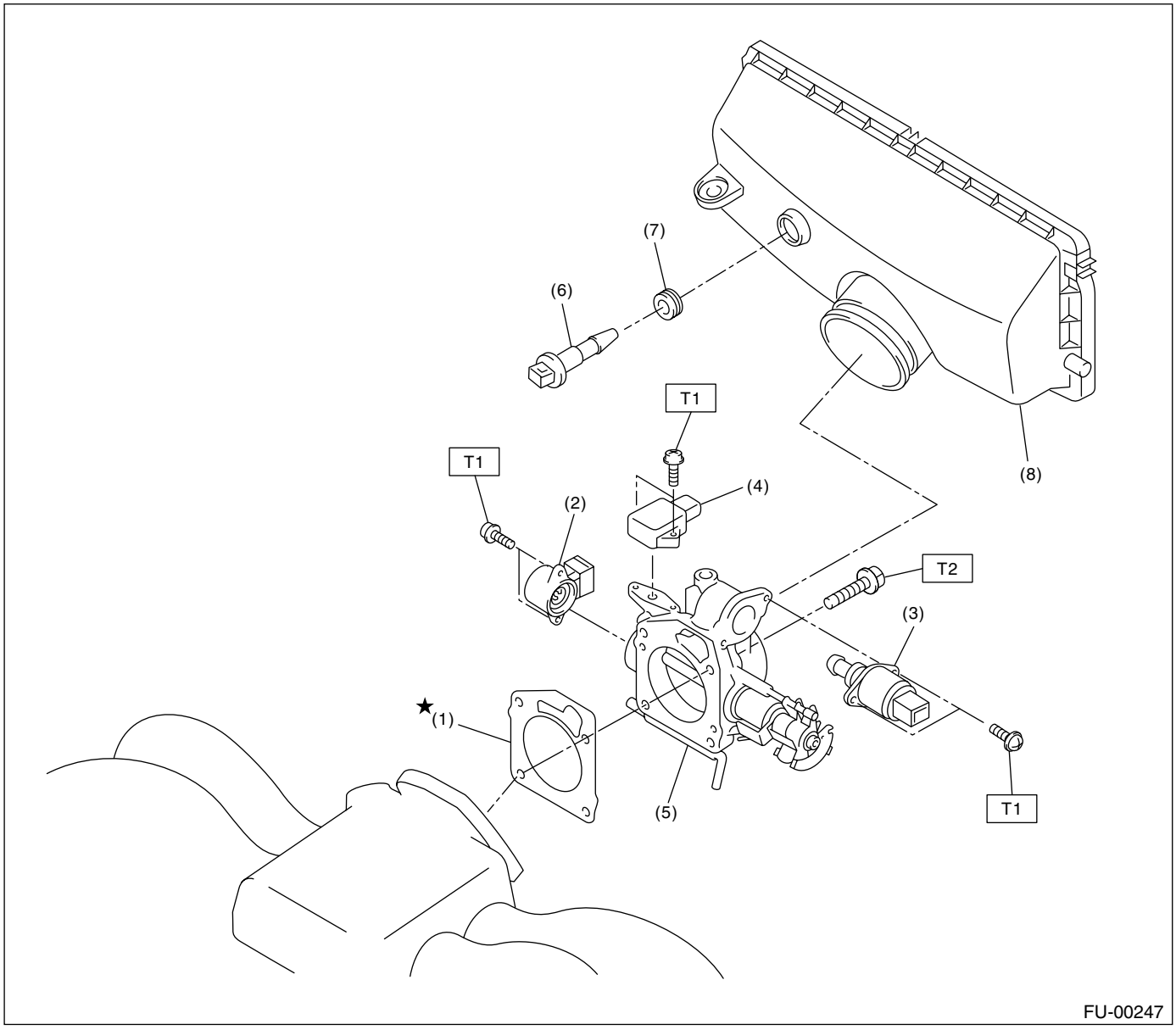


FU-00423

(1) Intake manifold gasket RH
(2) Fuel injector pipe
(3) Fuel injector
(4) O-ring
(5) O-ring
(6) O-ring
(7) Plug
(8) Nipple
(9) Purge control solenoid valve
(10) Nipple
(11) Intake manifold
(12) Intake manifold gasket LH
(13) Plug cord holder LH
(14) Accelerator cable bracket
(15) Fuel pipe protector LH
(16) Fuel pipe ASSY
(17) Fuel hose
(18) Clip
(19) Clip
(20) Air assist injector solenoid valve
(21) Air assist injector solenoid valve bracket
(22) Guide pin
(23) Fuel pipe protector RH
(24) PCV hose
(25) PCV valve
(26) EGR valve
(27) EGR valve gasket
(28) EGR pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 5.0 (0.51, 3.7)
T3: 17 (1.7, 12)
T4: 19 (0.19, 1.4)
T5: 22.5 (2.29, 16.6)
T6: 25 (2.6, 18.8)

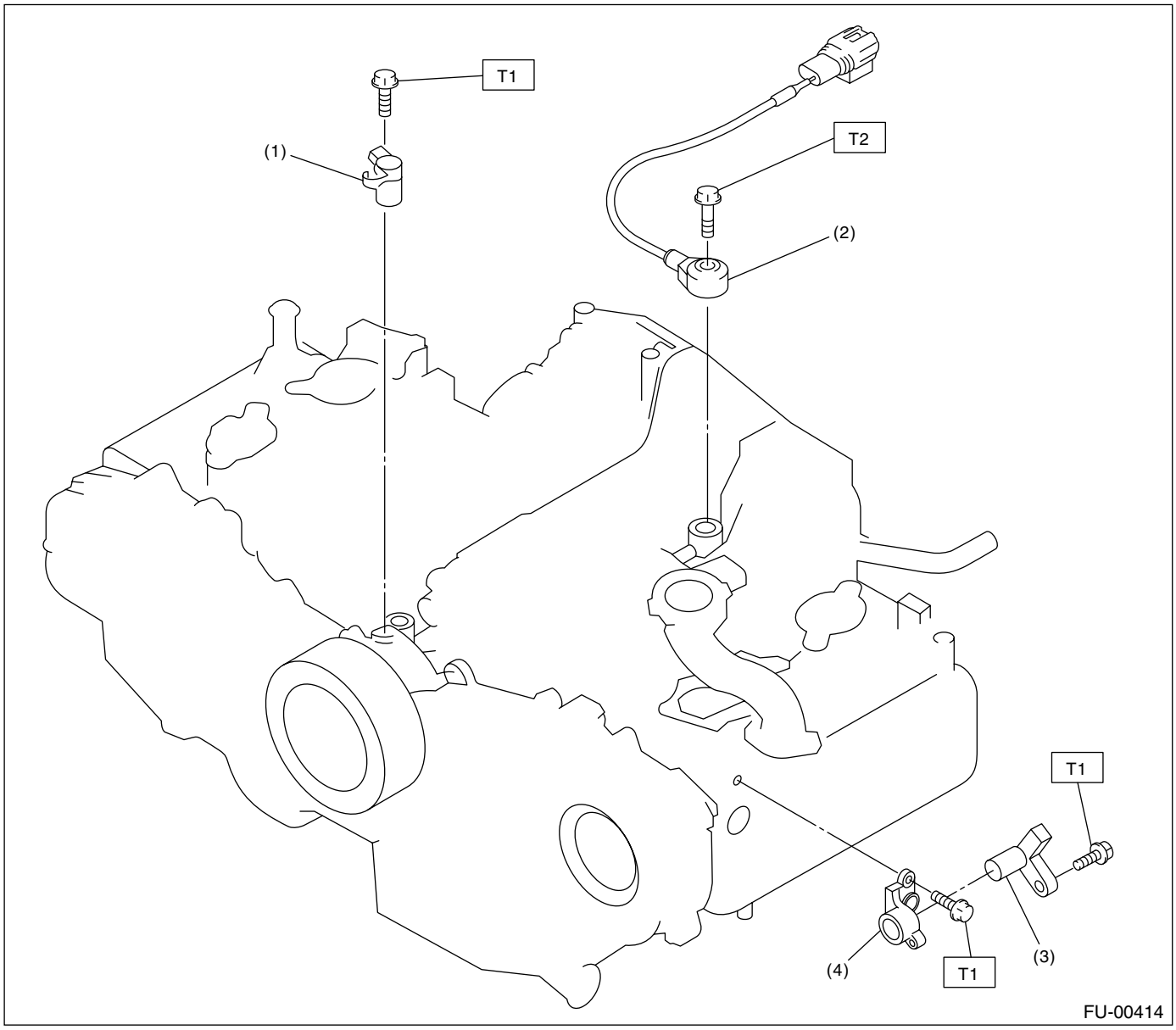
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle position sensor
(3) Idle air control solenoid valve
(4) Pressure sensor
(5) Throttle body
(6) Intake air temperature sensor
(7) Grommet
(8) Air cleaner case

Tightening torque: N·m (kgf-m, ft-lb)
T1: 2.4 (0.24, 1.7)
T2: 22 (2.2, 16)

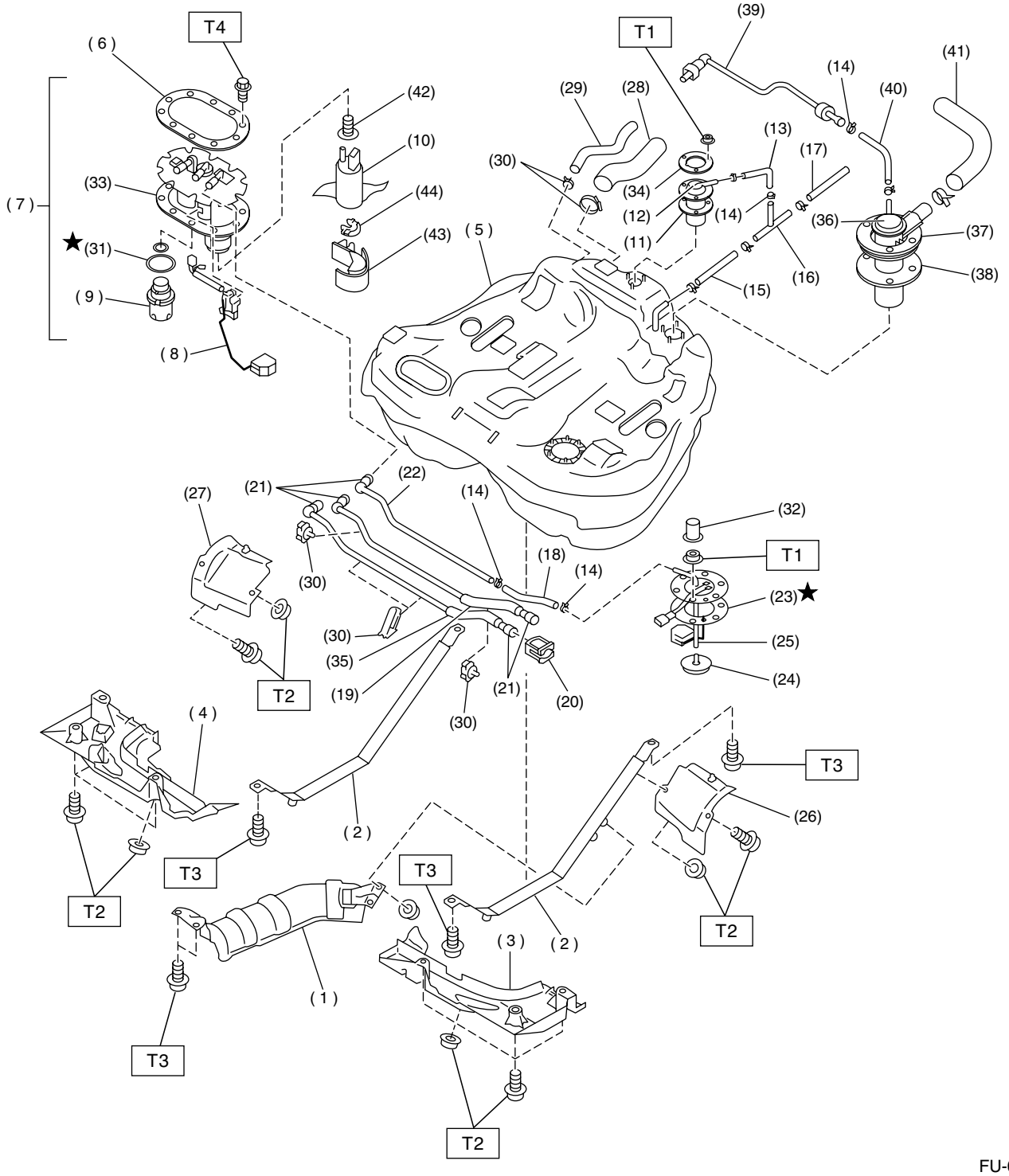
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) Camshaft position sensor support

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

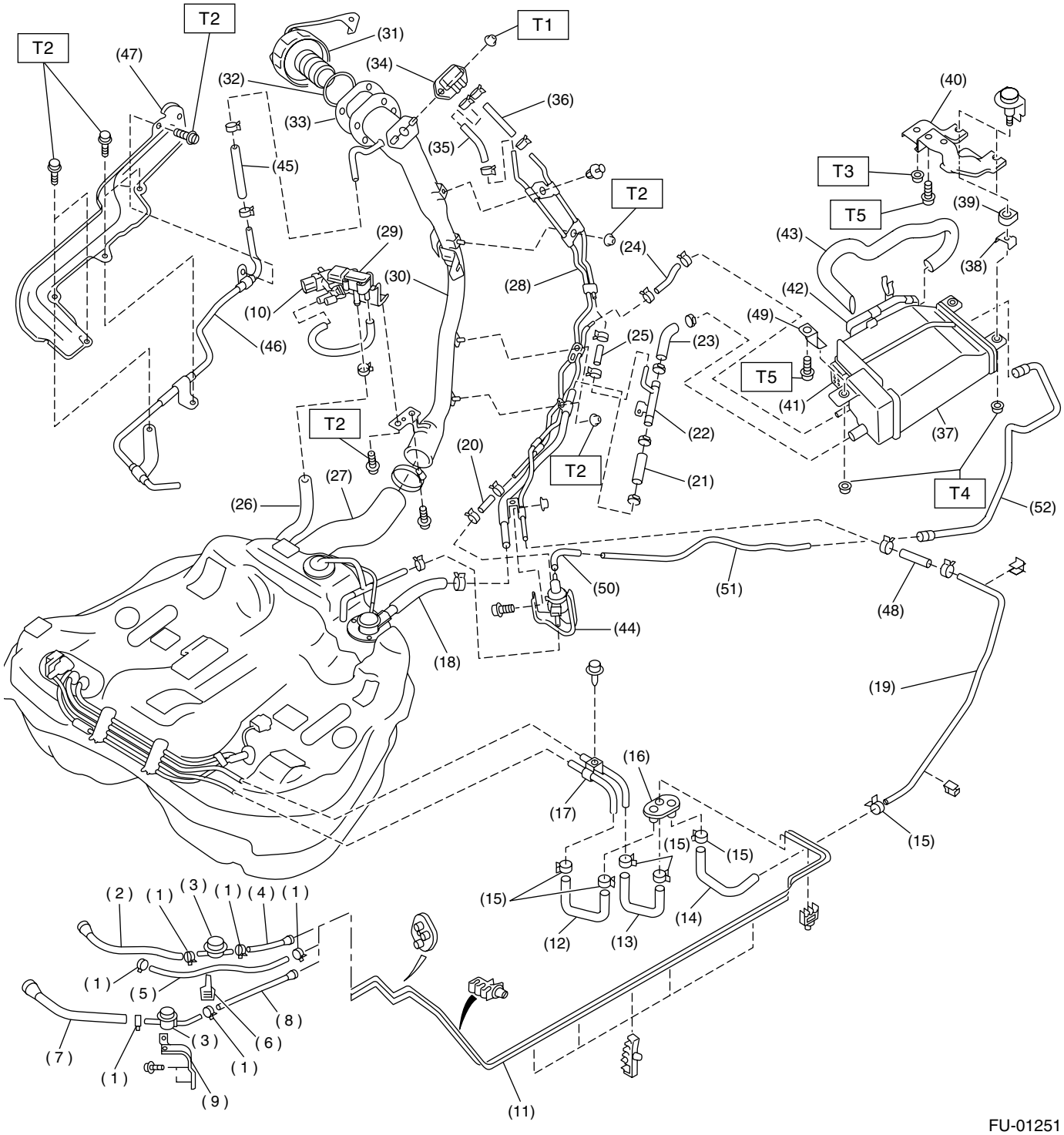


FU-02006

(1) Heat sealed cover
(2) Fuel tank band
(3) Protector LH (Front)
(4) Protector RH (Front)
(5) Fuel tank
(6) Fuel pump plate
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel filter
(10) Fuel pump
(11) Fuel cut valve gasket
(12) Fuel cut valve
(13) Evaporation hose A
(14) Clip
(15) Evaporation hose C
(16) Joint pipe
(17) Evaporation hose B
(18) Jet pump hose A
(19) Fuel return tube
(20) Retainer
(21) Quick connector
(22) Jet pump tube B
(23) Fuel sub level sensor gasket
(24) Jet pump filter
(25) Fuel sub level sensor
(26) Protector LH (Rear)
(27) Protector RH (Rear)
(28) Fuel filler hose
(29) Fuel tank pressure sensor hose
(30) Clamp
(31) Gasket
(32) Cap
(33) Gasket
(34) Fuel cut valve plate
(35) Fuel delivery tube
(36) Vent valve
(37) Vent valve plate
(38) Vent valve gasket
(39) Evaporation tube
(40) Evaporation hose D
(41) Air vent hose
(42) Seal
(43) Fuel pump holder
(44) Grommet

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)
T4: 5.9 (0.6, 4.3)

5. FUEL LINE


T1
T2
T3
T4
T5
(1)
(2)
(3)
(4)
(5)
(6)
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(9)
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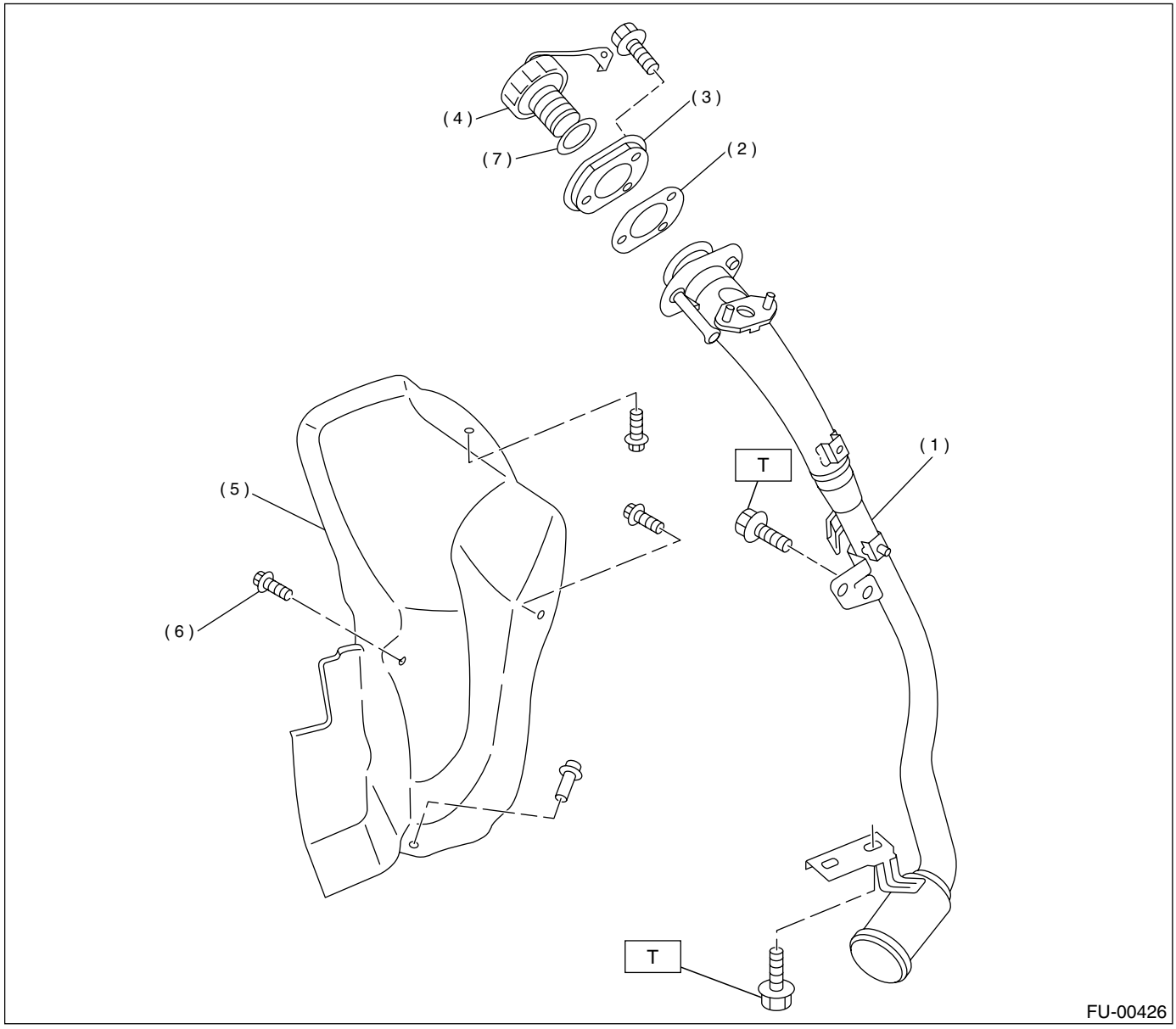
(51)
(52)
FU-01251

(1) Clamp
(2) Fuel return hose A
(3) Fuel damper valve
(4) Fuel return hose B
(5) Evaporation hose A
(6) Clip
(7) Fuel delivery hose A
(8) Fuel delivery hose B
(9) Fuel damper valve bracket
(10) Fuel tank senser control valve
(11) Fuel pipe ASSY
(12) Fuel delivery hose C
(13) Fuel return hose C
(14) Evaporation hose B
(15) Clamp
(16) Grommet
(17) Fuel pipe ASSY
(18) Air vent hose A
(19) Evaporation pipe A
(20) Evaporation hose C
(21) Air vent hose B
(22) Air vent pipe
(23) Air vent hose C
(24) Evaporation hose D
(25) Evaporation hose E
(26) Fuel tank pressure sensor hose
(27) Fuel filler hose
(28) Evaporation pipe B
(29) Fuel tank pressure sensor
(30) Fuel filler pipe
(31) Fuel filler cap
(32) Ring
(33) Packing
(34) Shut valve
(35) Evaporation hose F
(36) Evaporation hose G
(37) Canister
(38) Canister lower bracket
(39) Cushion rubber
(40) Canister upper bracket
(41) Drain valve
(42) Drain filter
(43) Drain hose
(44) Pressure control solenoid valve
(45) Evaporation hose H
(46) Evaporation pipe C
(47) Pipe protector
(48) Evaporation hose I
(49) Canister bracket (front)
(50)
(51) PCV pipe
(52) PCV tube

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.5 (0.46, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 23 (2.3, 16.6)
T5: 33 (3.4, 25)

6. FUEL FILLER PIPE



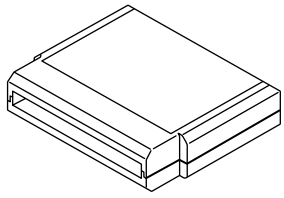
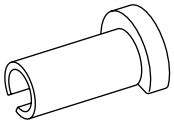
(1) Fuel filler pipe ASSY
(2) Filler pipe packing
(3) Filler ring
(4) Filler cap
(5) Filler pipe protector
(6) Clip
(7) Ring B

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.75, 5.4)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

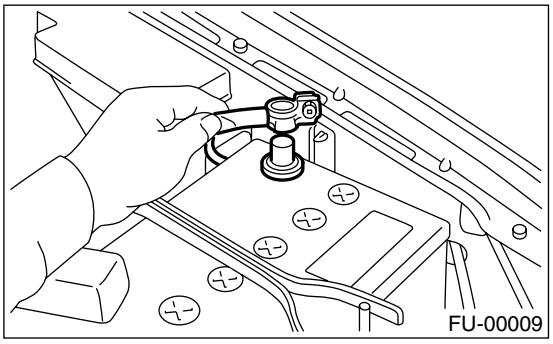
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for removing quick connector.

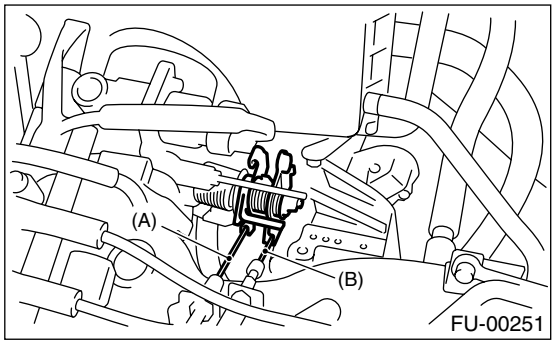
2. Throttle Body

A: REMOVAL

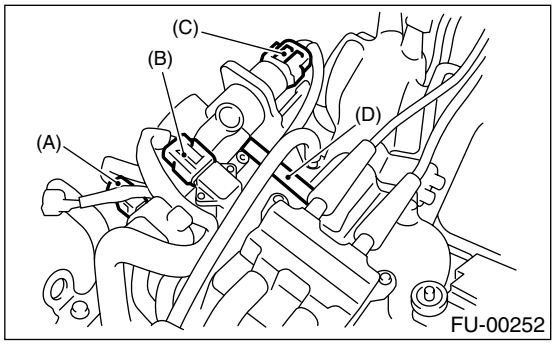
1) Disconnect ground cable from battery.



2) Remove air cleaner case.
<Ref. to IN(H4SO)-4, REMOVAL, Air Cleaner.>
3) Disconnect accelerator cable (A).
4) Disconnect cruise control cable (B). (With cruise control model)

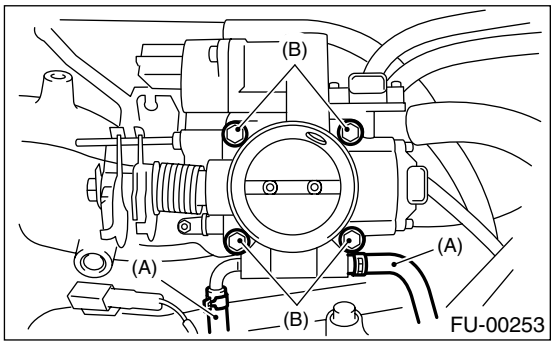


5) Disconnect connectors from idle air control solenoid valve, throttle position sensor and pressure sensor.
6) Disconnect air by-pass hose from throttle body.



(A) Throttle position sensor
(B) Pressure sensor
(C) Idle air control solenoid valve
(D) Air by-pass hose

7) Disconnect engine coolant hoses (A) from throttle body.
8) Remove bolts (B) which install throttle body to intake manifold.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Install accelerator cable.
<Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>

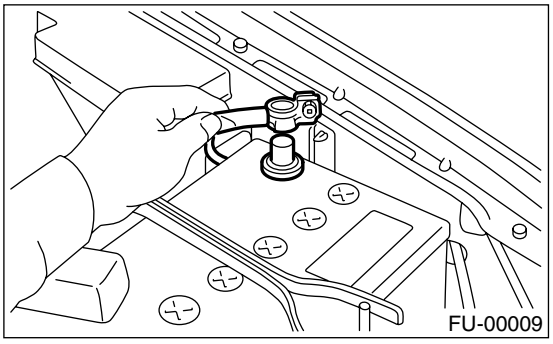
NOTE:
Always use a new gasket.

Tightening torque:
Throttle body;
22 N·m (2.2 kgf-m, 15.9 ft-lb)

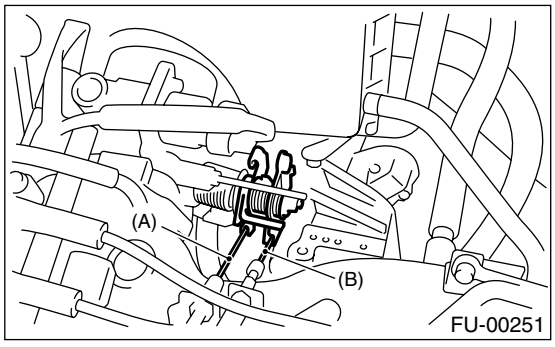
3. Intake Manifold

A: REMOVAL

1) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.

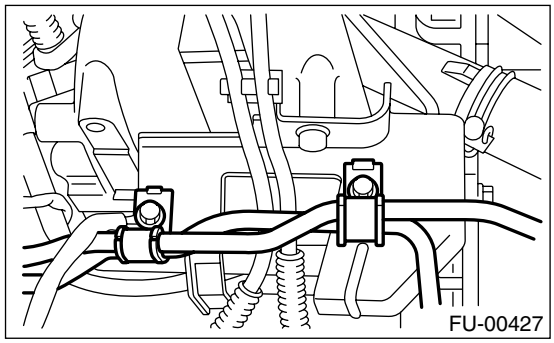


4) Remove air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
5) Disconnect accelerator cable (A).
6) Disconnect cruise control cable (B). (With cruise control model)

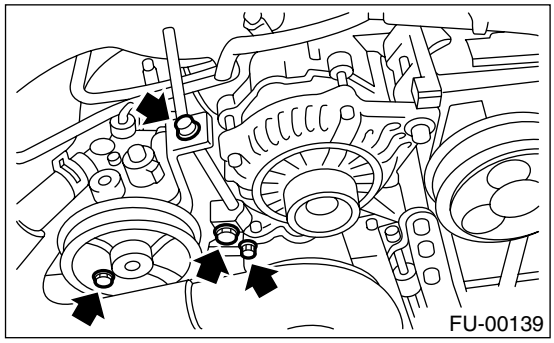


7) Remove power steering pump and tank from brackets.
(1) Remove resonator chamber.
<Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
(2) Remove front V-belt.
<Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
(3) Remove bolts which hold power steering pipes onto intake manifold protector.

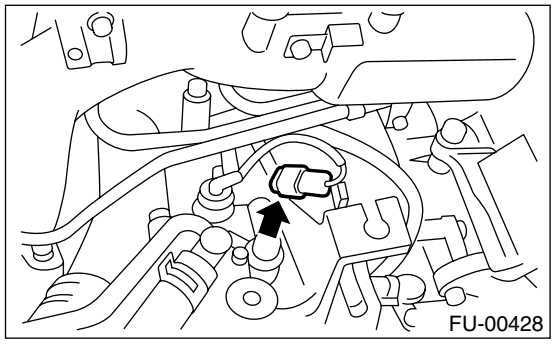
NOTE:
Do not disconnect power steering hose.



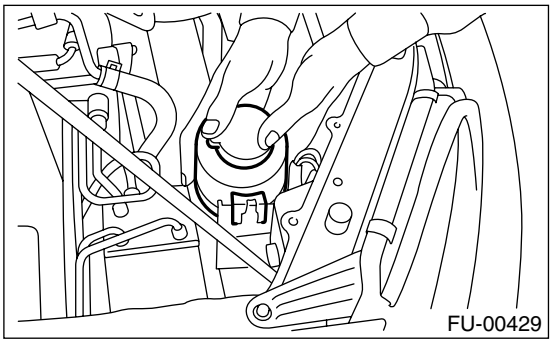
(4) Remove bolts which install power steering pump bracket.



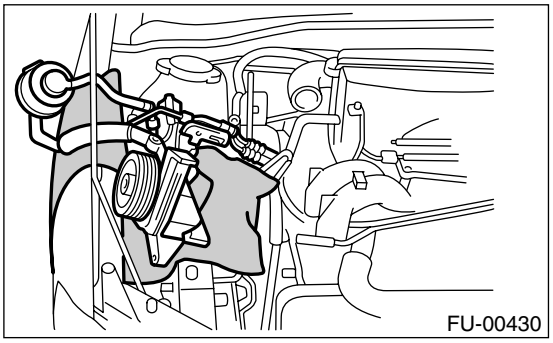
(5) Disconnect connector from power steering pump switch.



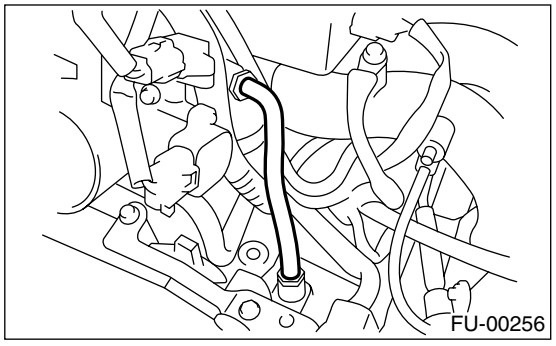
(6) Remove power steering tank from the bracket by pulling it upwards.



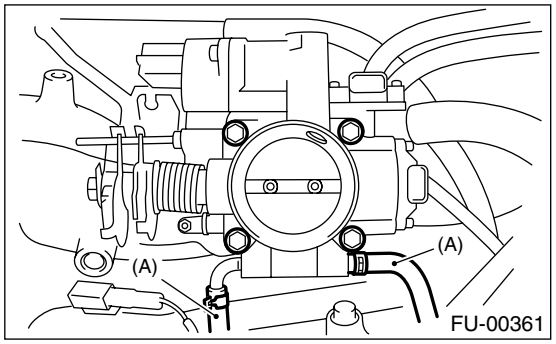
(7) Place power steering pump and tank on the right side wheel apron.



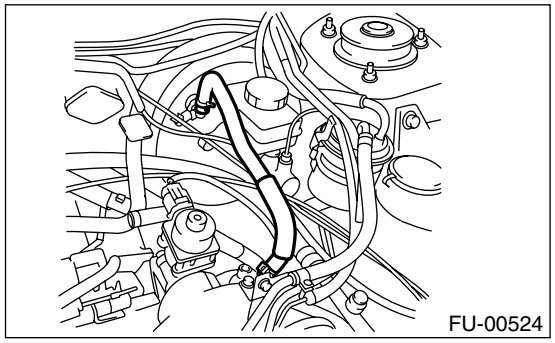
8) Disconnect spark plug cords from spark plugs.
9) Disconnect PCV hose from intake manifold.



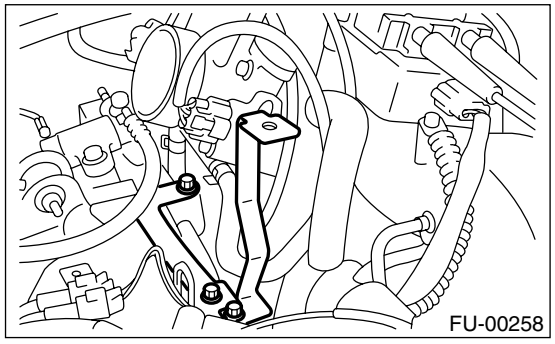
10) Disconnect engine coolant hose (A) from throttle body.



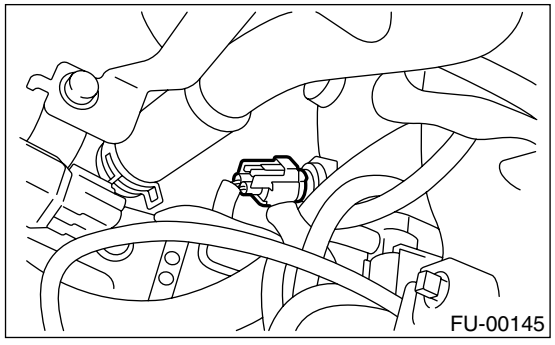
11) Disconnect brake booster hose.



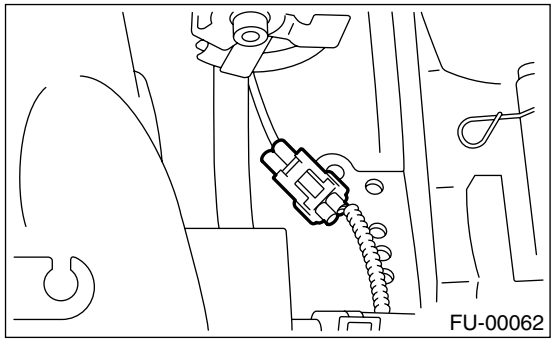
12) Remove air cleaner case stay RH and engine harness bracket, and disconnect engine harness connectors from bulkhead harness connectors.



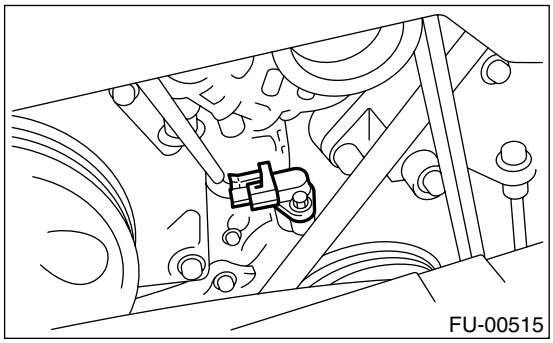
13) Disconnect connectors from engine coolant temperature sensor.



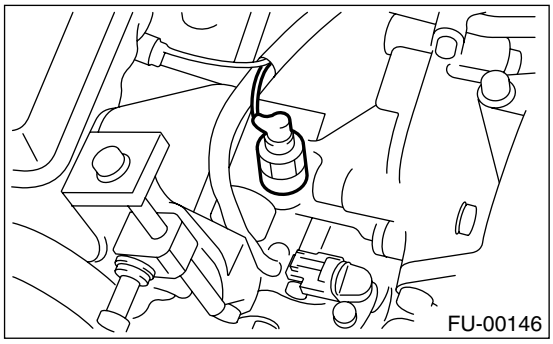
14) Disconnect knock sensor connector.



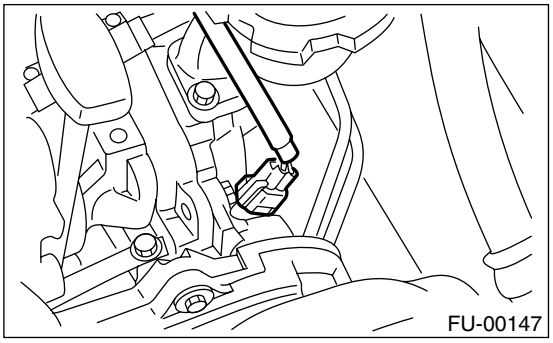
15) Disconnect connector from crankshaft position sensor.



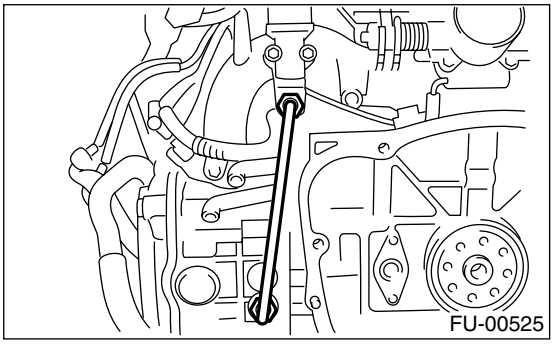
16) Disconnect connector from oil pressure switch.



17) Disconnect connector from camshaft position sensor.



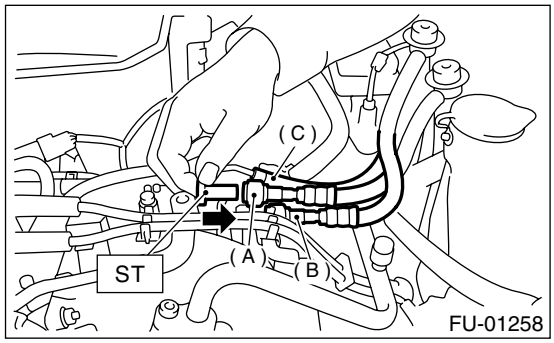
18) Remove EGR pipe from intake manifold and cylinder head.



19) Using ST, disconnect fuel hoses from fuel pipes.<Ref. to FU(H4SO)-72, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

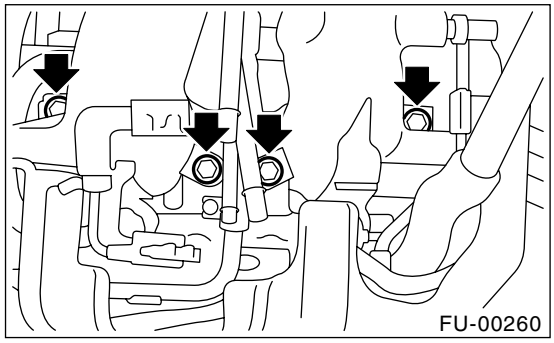
WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**

ST 42099AE000 CONNECTOR REMOVER



(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

20) Remove bolts which hold intake manifold onto cylinder heads, and remove intake manifold.

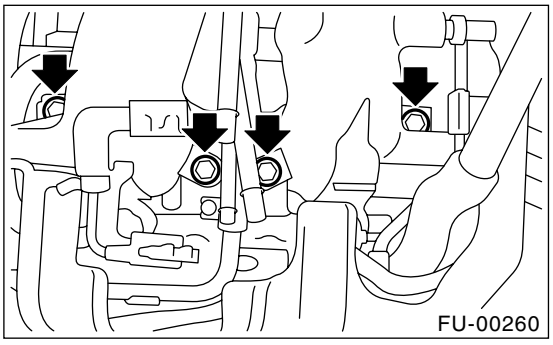


B: INSTALLATION

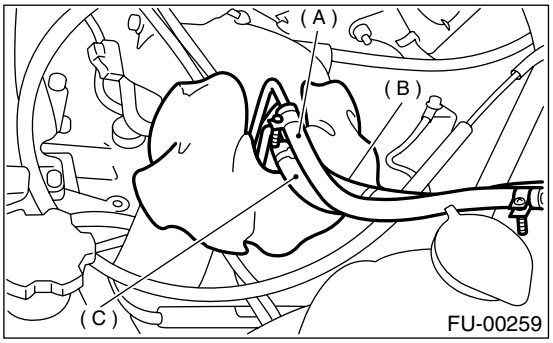
1) Install intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



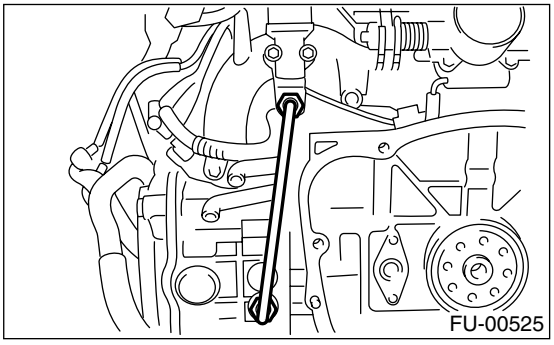
2) Connect fuel hoses.



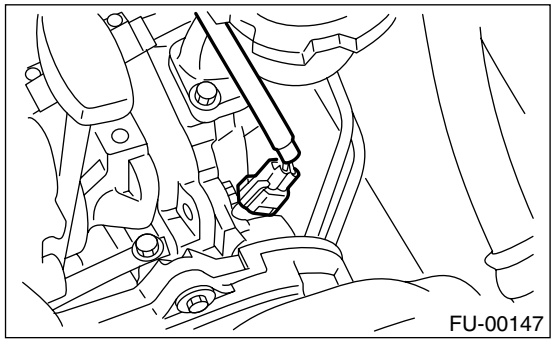
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

3) Install EGR pipe to intake manifold and cylinder head.

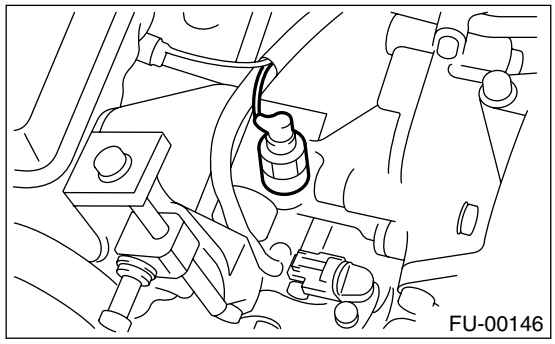
Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



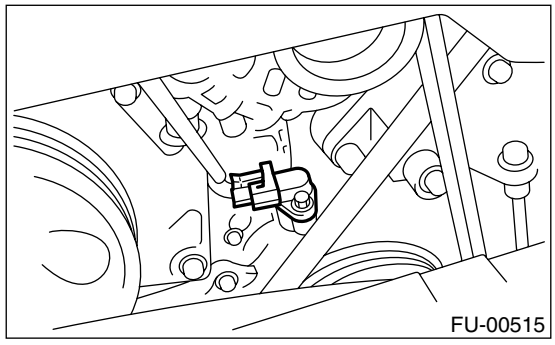
4) Connect connector to camshaft position sensor.



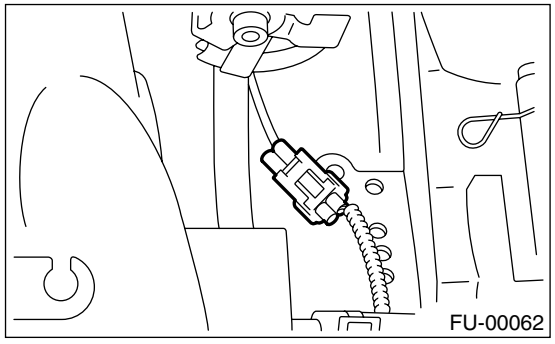
5) Connect connector to oil pressure switch.



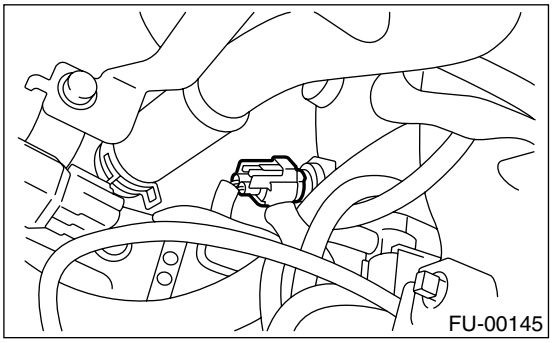
6) Connect connector to crankshaft position sensor.



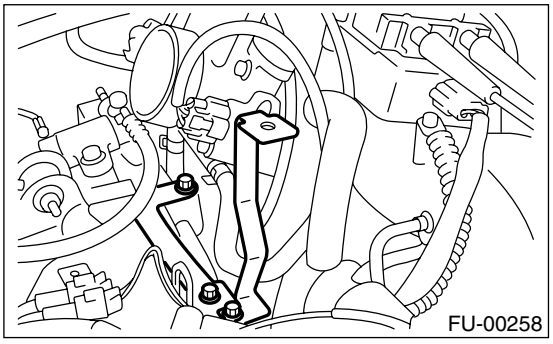
7) Connect knock sensor connector.



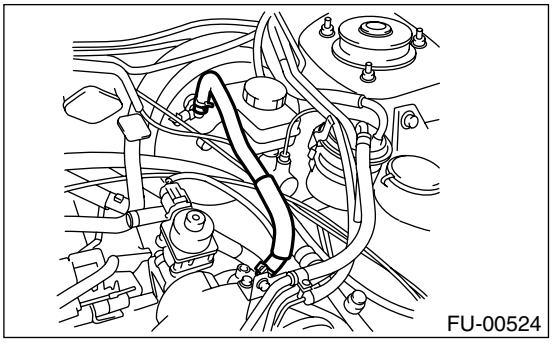
8) Connect connectors to engine coolant temperature sensor.



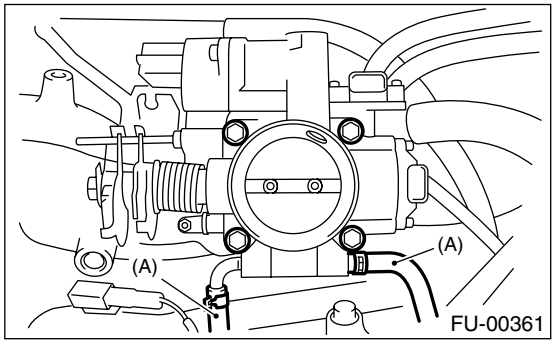
9) Install air cleaner case stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



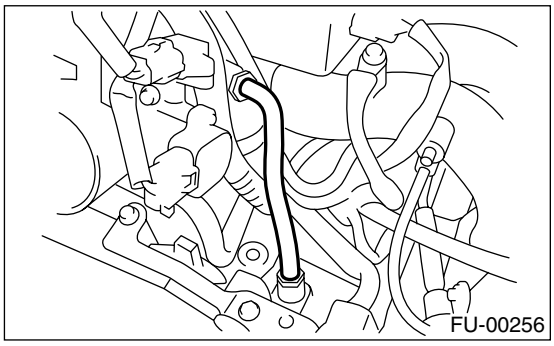
10) Connect brake booster hose.



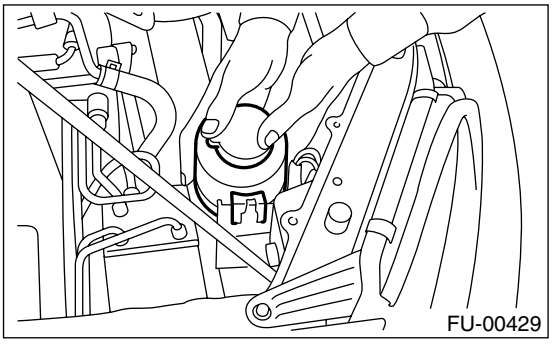
11) Connect engine coolant hose (A) to throttle body.



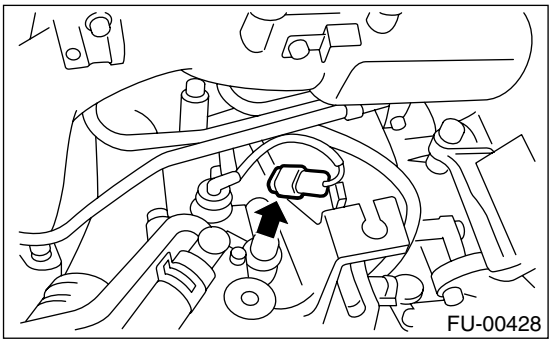
12) Connect PCV hose to intake manifold.



13) Connect spark plug cords to spark plugs.
14) Install power steering pump and tank on brackets.
(1) Install power steering tank on bracket.

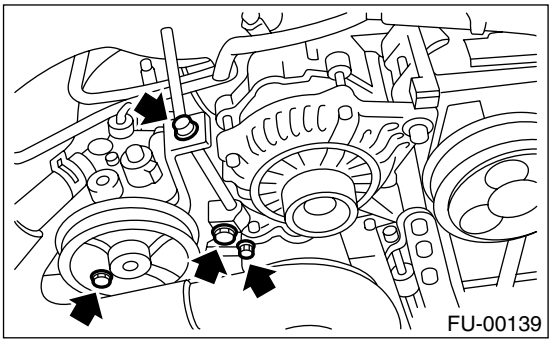


(2) Connect connector to power steering pump switch.

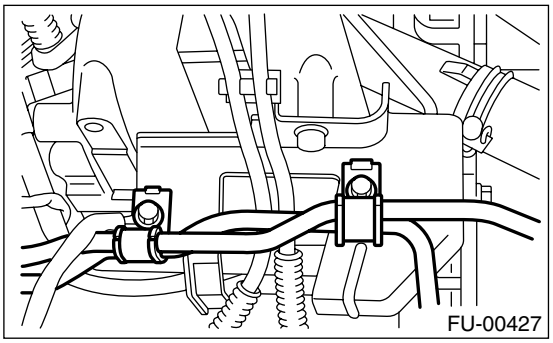


(3) Tighten bolts which install power steering pump on bracket.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

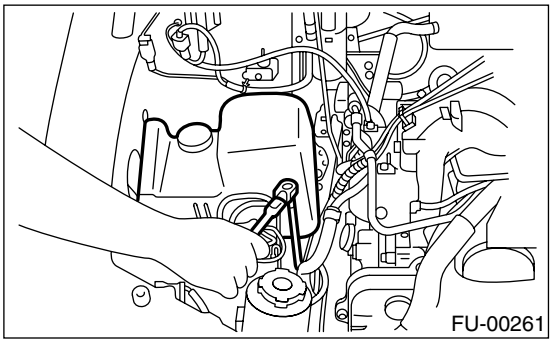


(4) Install power steering pipes onto right side intake manifold protector.

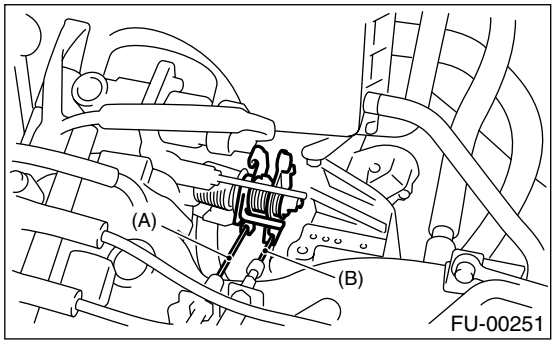


(5) Install front V-belt.
<Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>
(6) Install resonator chamber.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

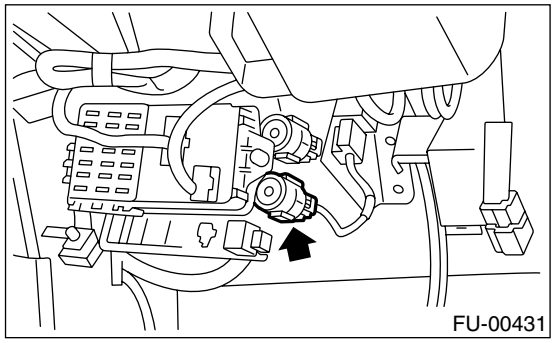


15) Connect accelerator control cable (A).
<Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>
16) Connect cruise control cable (B). (With cruise control models)

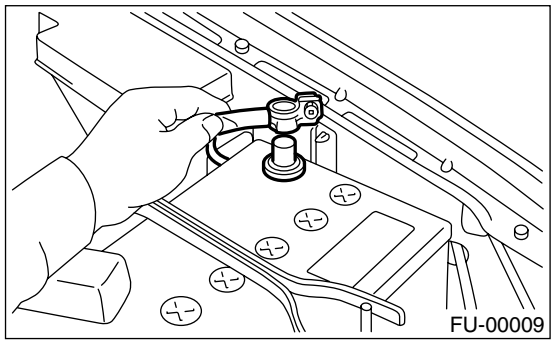


17) Install air intake duct and air cleaner case.
<Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-4, INSTALLATION, Air Cleaner.>

18) Connect connector to fuel pump relay.

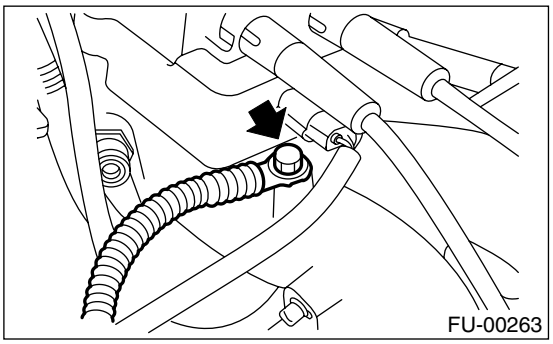


19) Connect battery ground cable.

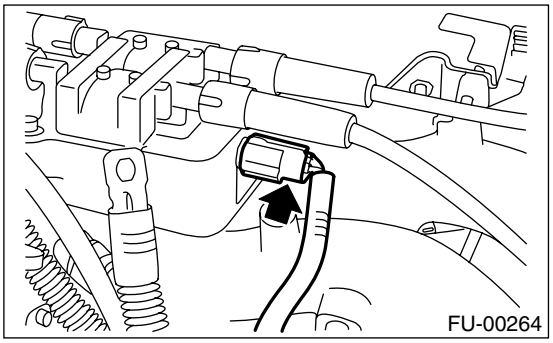


C: DISASSEMBLY

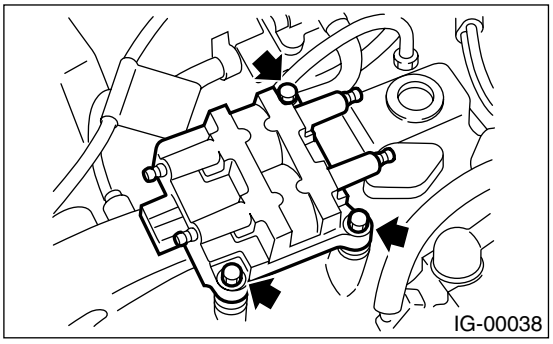
1) Disconnect engine ground terminal from intake manifold.



2) Disconnect connector from ignition coil and ignitor assembly.

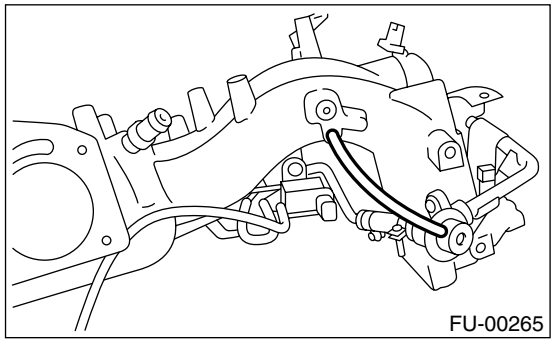


3) Remove ignition coil and ignitor assembly.

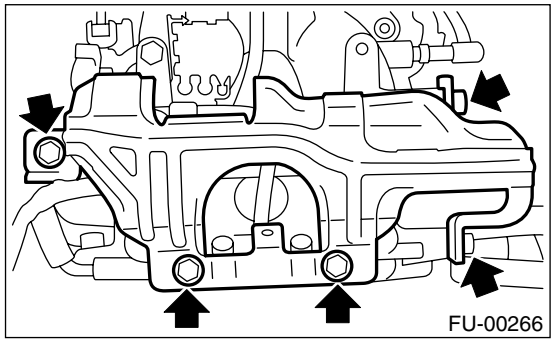


4) Remove throttle body.
<Ref. to FU(H4SO)-14, REMOVAL, Throttle Body.>
5) Remove air assist injector solenoid valve.
<Ref. to FU(H4SO)-36, REMOVAL, Air Assist Injector Solenoid Valve.>
6) Remove EGR valve.
<Ref. to FU(H4SO)-37, REMOVAL, EGR Valve.>

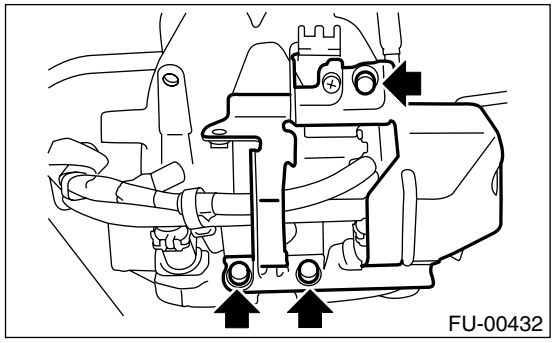
7) Disconnect pressure regulator vacuum hose from intake manifold.



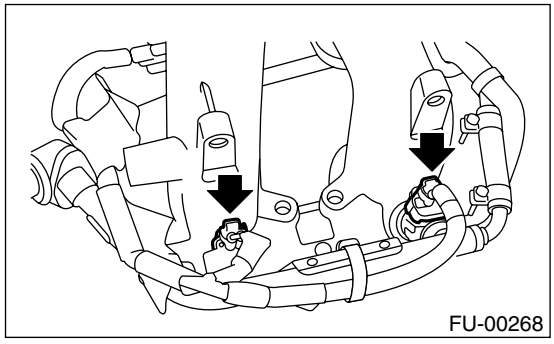
8) Remove fuel pipe protector LH.



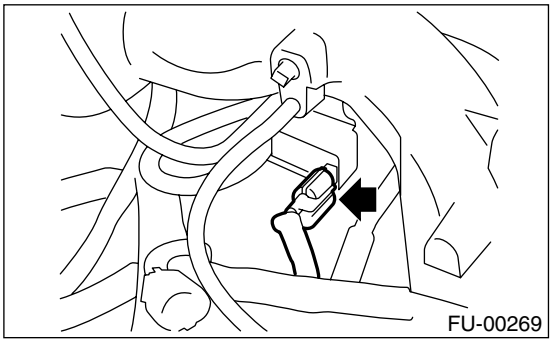
9) Remove fuel pipe protector RH.



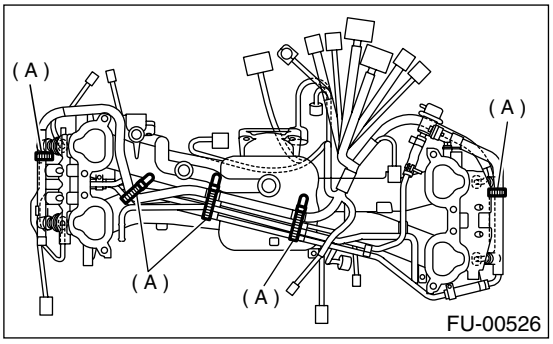
10) Disconnect connectors from fuel injectors.



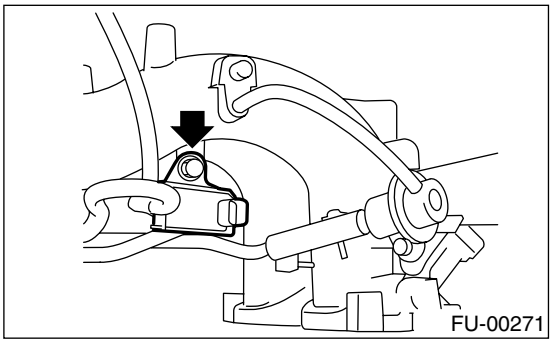
11) Disconnect connector from purge control solenoid valve.



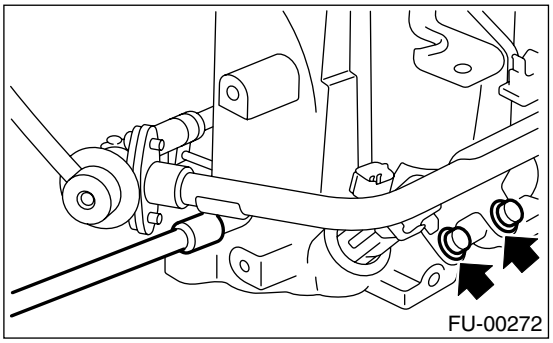
12) Disconnect air by-pass hose from purge control solenoid valve.
13) Remove harness bands (A) which hold engine harness onto intake manifold.



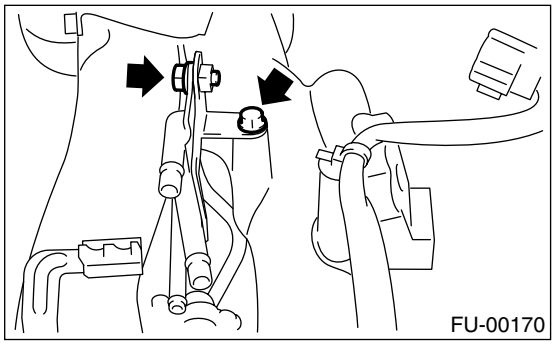
14) Remove engine harness from intake manifold.
15) Remove purge control solenoid valve.



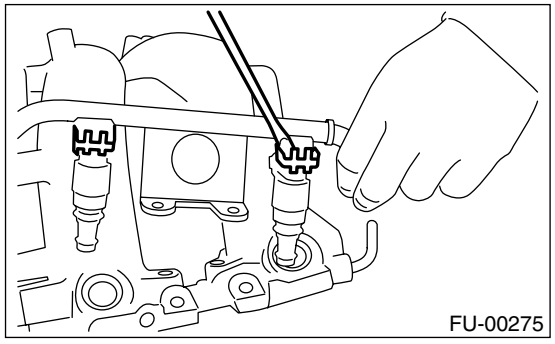
16) Remove bolt which installs injector pipe on intake manifold as shown in figure.



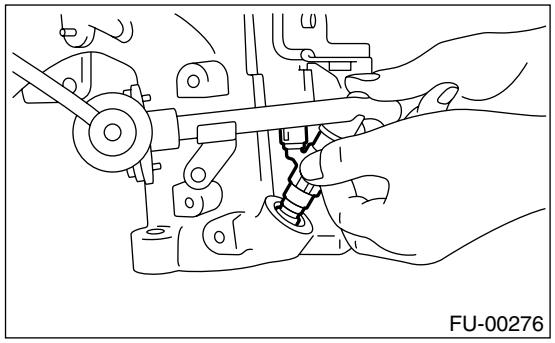
17) Remove two bolts which hold fuel pipes on the left side of intake manifold.



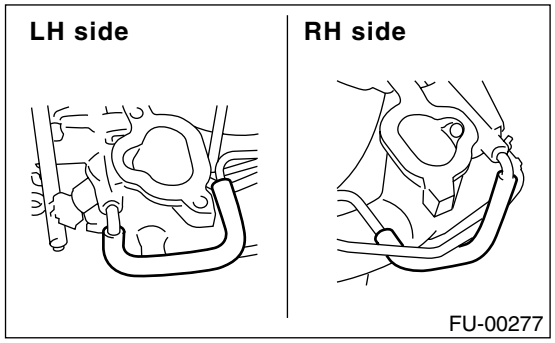
18) Remove fuel injectors.
(1) Remove fuel injector securing clip.



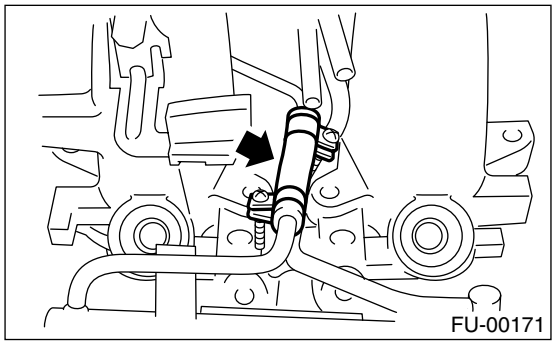
(2) Remove fuel injector while lifting up fuel injector pipe.



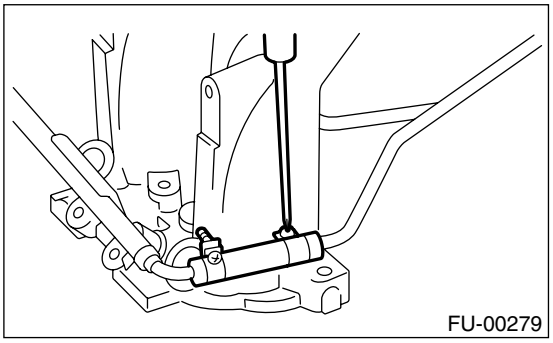
19) Disconnect air by-pass hoses from intake manifold.



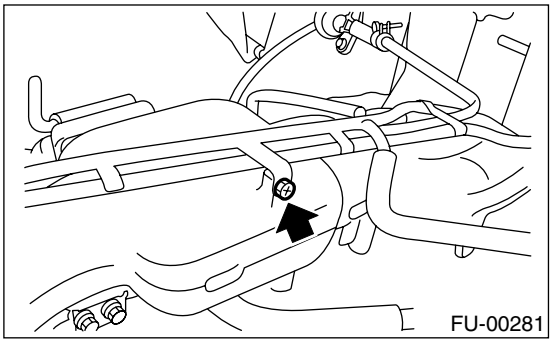
20) Loosen clamp which holds front left side fuel hose to injector pipe and remove the pipe from clamp.



21) Loosen clamp which holds front right side fuel hose to injector pipe and remove the pipe from clamp.



22) Remove fuel injector pipe.
23) Remove bolt which installs fuel pipes on intake manifold.

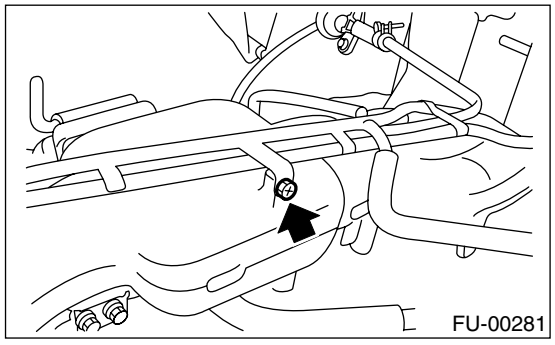


24) Remove fuel pipe assembly and pressure regulator, from intake manifold.

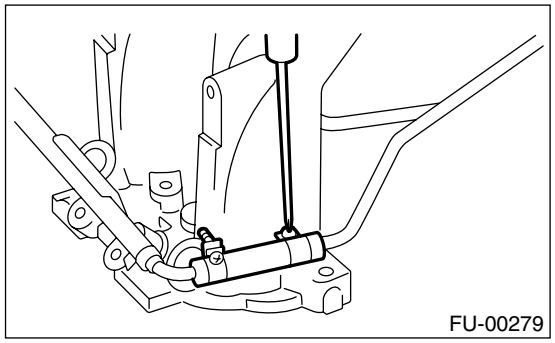
D: ASSEMBLY

1) Install fuel pipe assembly and pressure regulator, etc. to intake manifold.
2) Tighten bolt which installs fuel pipes on intake manifold.

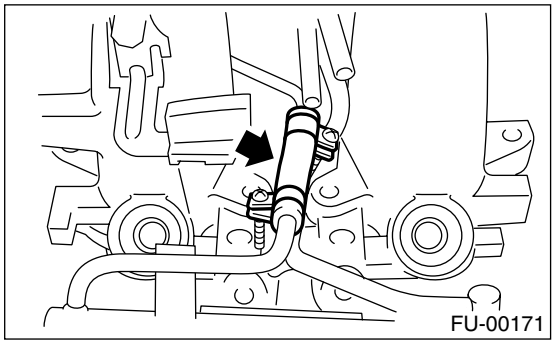
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



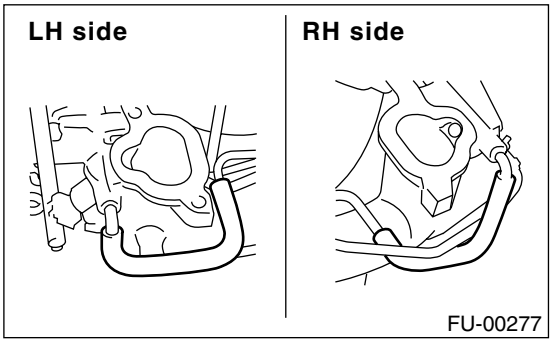
3) Connect right side fuel hose to injector pipe, and tighten clamp screw.



4) Install fuel injector pipe.
5) Connect left side fuel hose to injector pipe, and tighten clamp screw.

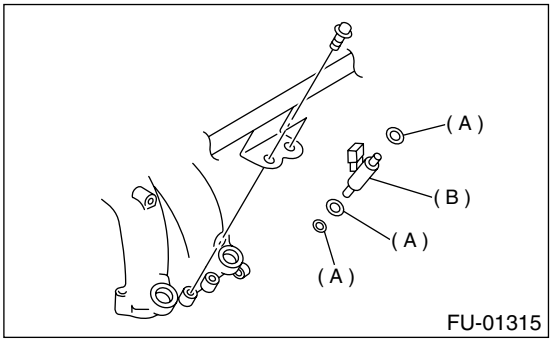


6) Connect air assist hoses.



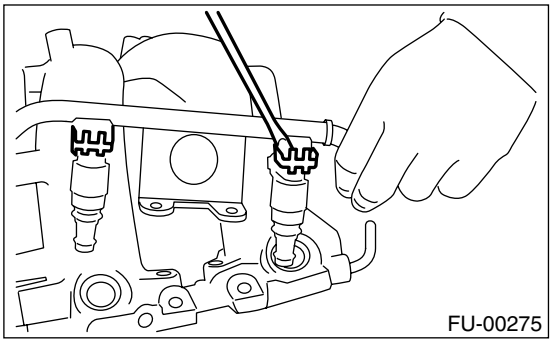
7) Install fuel injectors.

NOTE:
Always use new o-rings.



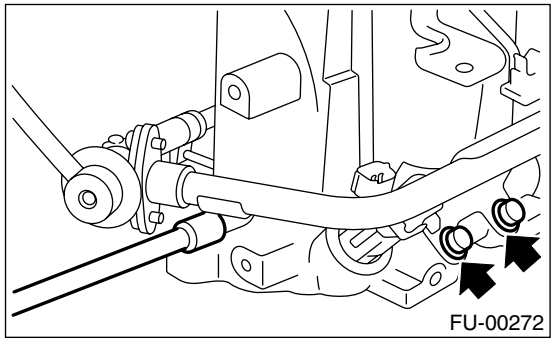
(A) O-ring
(B) Fuel injector

8) Do not forget to install the fuel injector securing clip.

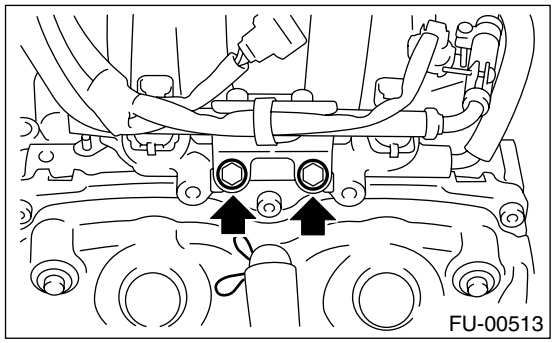


9) Tighten bolt which installs injector pipe on intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

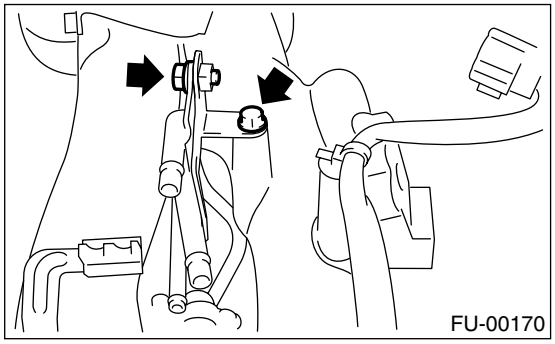


Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



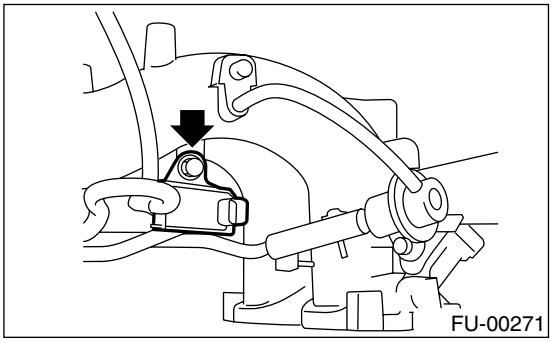
10) Tighten two bolts which install fuel pipes on the left side of intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



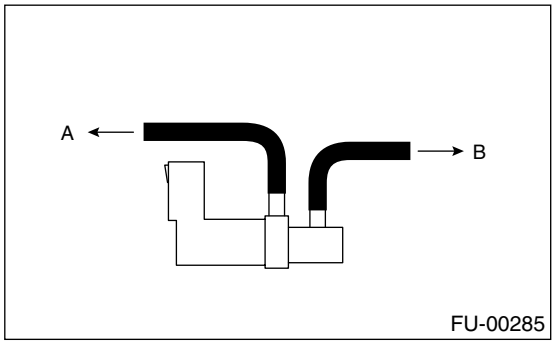
11) Install purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



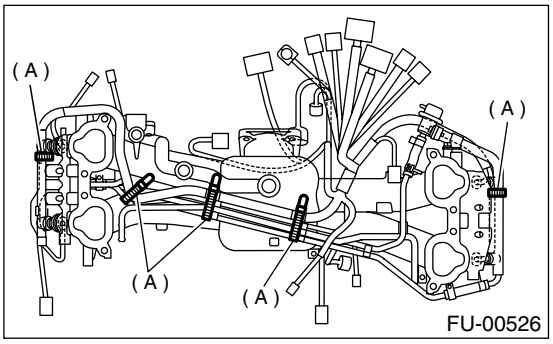
12) Connect hoses to purge control solenoid valve.

CAUTION:
Connect evaporation hoses as shown in the figure.



(A) To fuel pipe
(B) To intake manifold

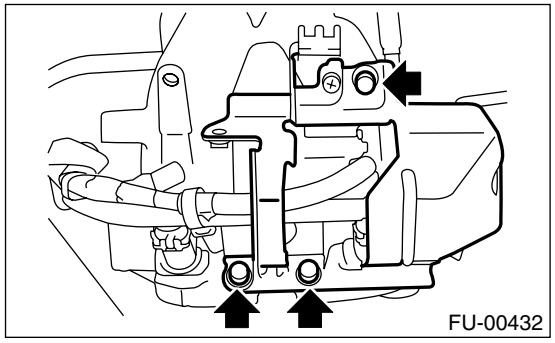
13) Install engine harness onto intake manifold.
14) Connect connectors to fuel injectors and purge control solenoid valve.
15) Hold engine harness by harness bands (A).



NOTE:
Do not use harness band on harnesses where they are supposed to be protected by the fuel pipe protector.

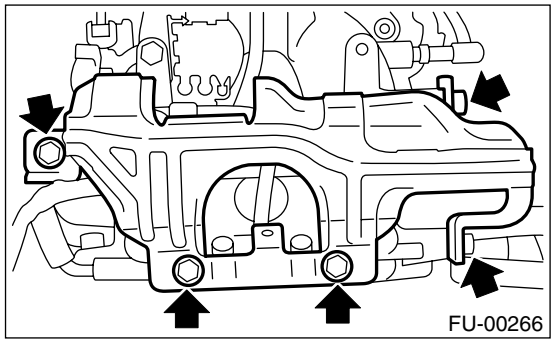
16) Install fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

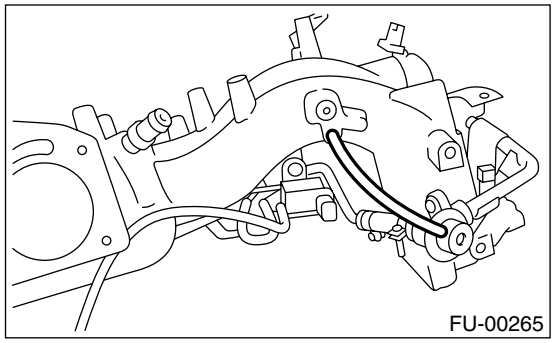


17) Install fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

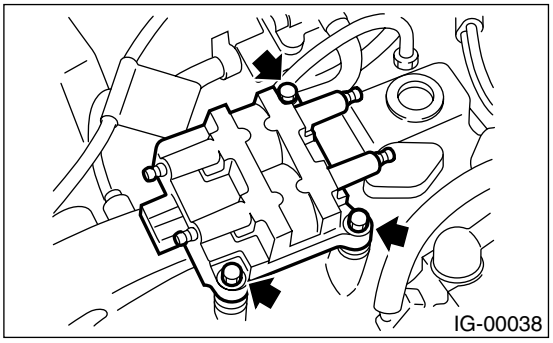


18) Connect pressure regulator vacuum hose to intake manifold.



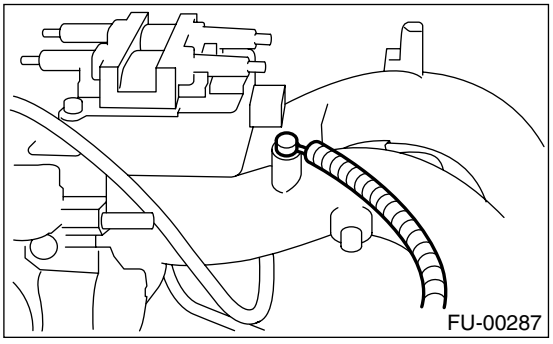
19) Install air assist injector solenoid valve to bracket.
<Ref. to FU(H4SO)-36, INSTALLATION, Air Assist Injector Solenoid Valve.>
20) Install EGR valve.
<Ref. to FU(H4SO)-37, INSTALLATION, EGR Valve.>
21) Install throttle body to intake manifold.
<Ref. to FU(H4SO)-14, INSTALLATION, Throttle Body.>
22) Install ignition coil and ignitor assembly.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



23) Connect connector to ignition coil and ignitor assembly.
24) Install engine ground terminal to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



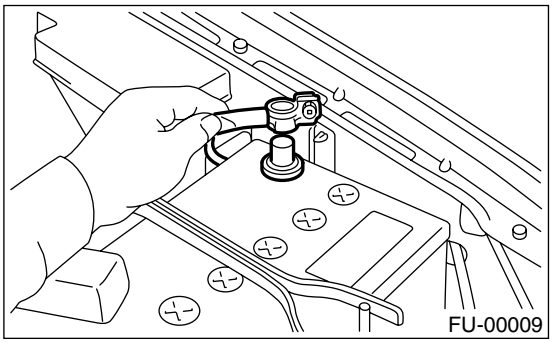
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

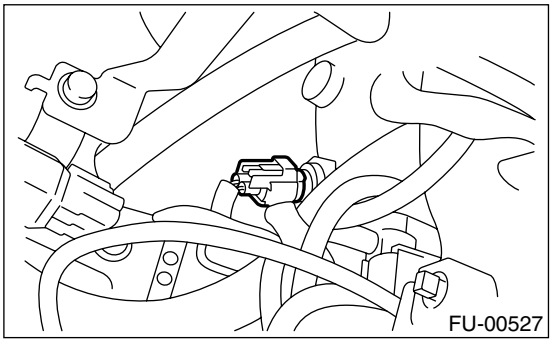
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
3) Disconnect connector from engine coolant temperature sensor.



4) Remove engine coolant temperature sensor.

B: INSTALLATION

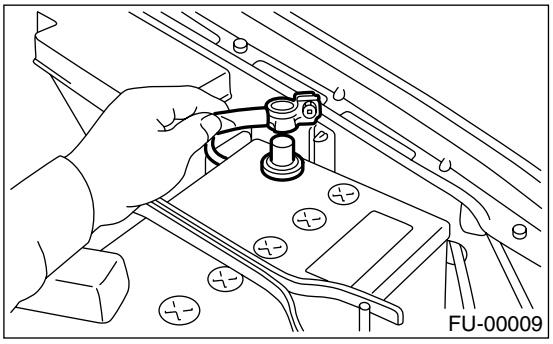
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 1.3 ft-lb)

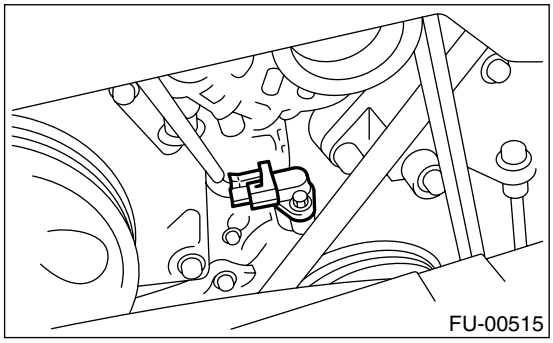
5. Crankshaft Position Sensor

A: REMOVAL

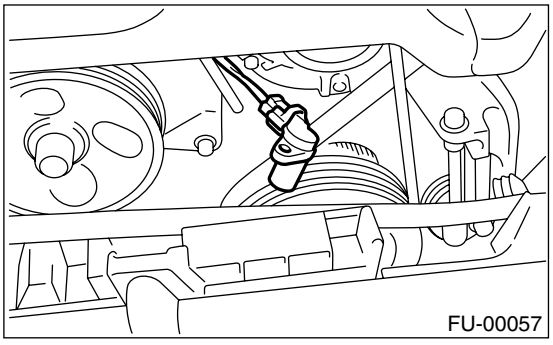
1) Disconnect ground cable from battery.



2) Remove bolt which installs crankshaft position sensor to cylinder block.



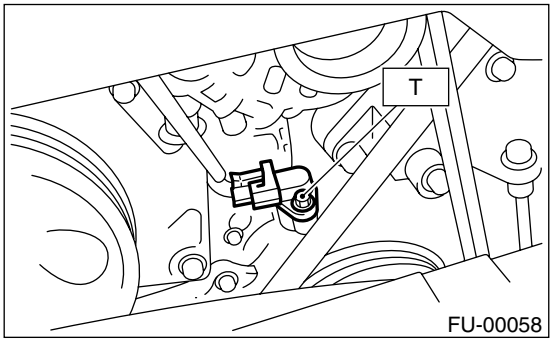
3) Remove crankshaft position sensor, and disconnect connector from it.



B: INSTALLATION

Install in the reverse order of removal.

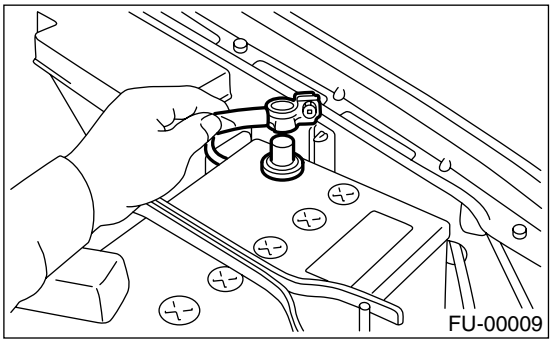
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



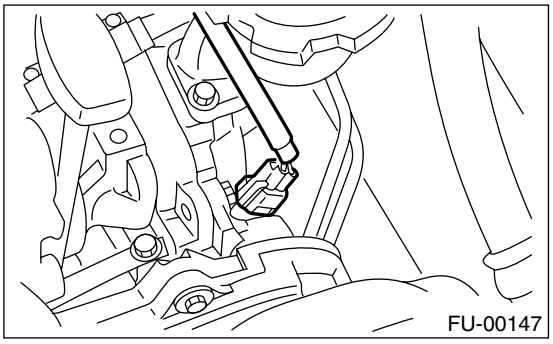
6. Camshaft Position Sensor

A: REMOVAL

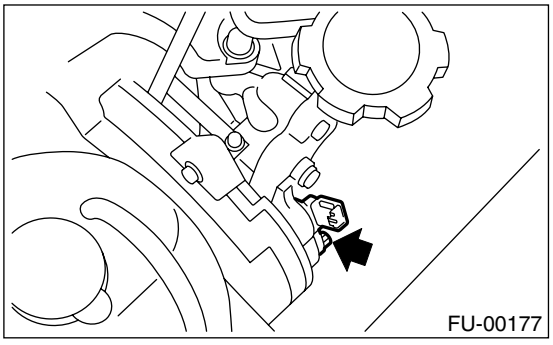
1) Disconnect ground cable from battery.



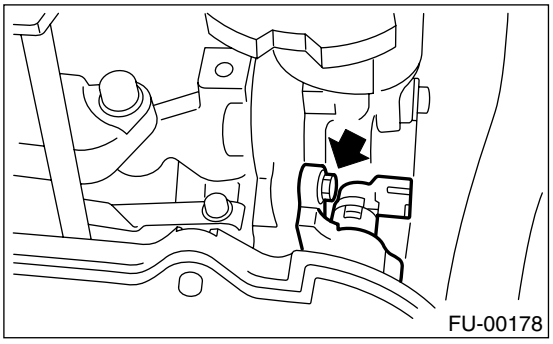
2) Disconnect connector from camshaft position sensor.



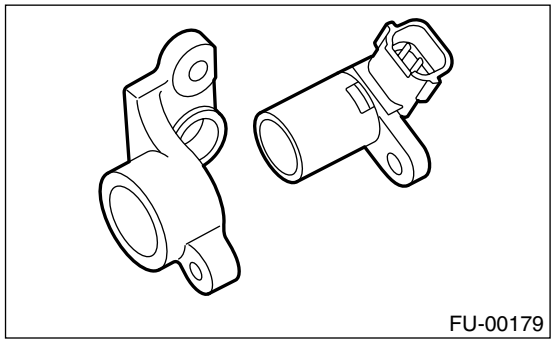
3) Remove bolt which installs camshaft position sensor to camshaft position sensor support.



4) Remove bolt which installs camshaft position sensor support to camshaft cap LH.



5) Remove camshaft position sensor and camshaft position sensor support as a unit.
6) Remove camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

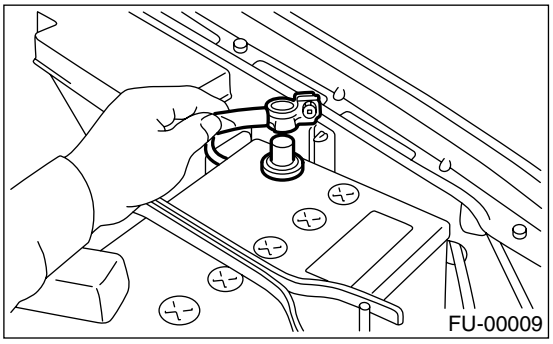
Tightening torque:

- ***Camshaft position sensor support; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***
- ***Camshaft position sensor; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***

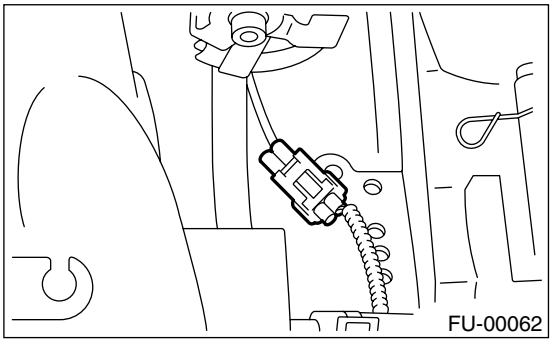
7. Knock Sensor

A: REMOVAL

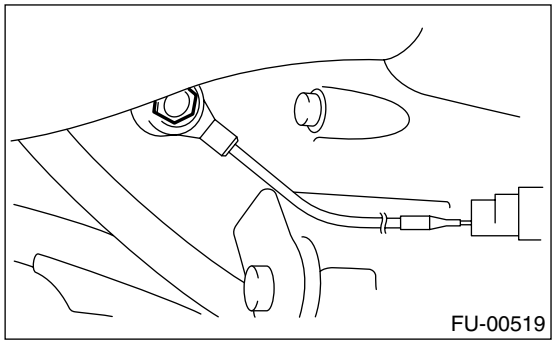
1) Disconnect ground cable from battery.



2) Remove air cleaner case.
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
3) Disconnect knock sensor connector.



4) Remove knock sensor from cylinder block.

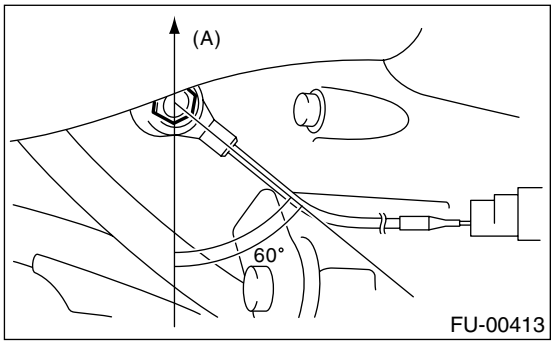


B: INSTALLATION

1) Install knock sensor to cylinder block.

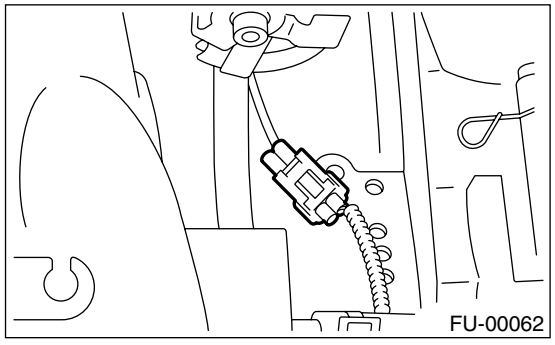
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.

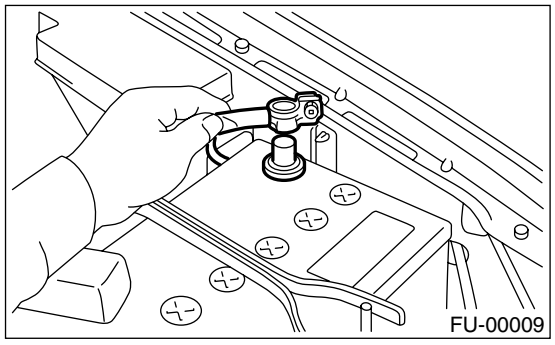


(A) Front side

2) Connect knock sensor connector.



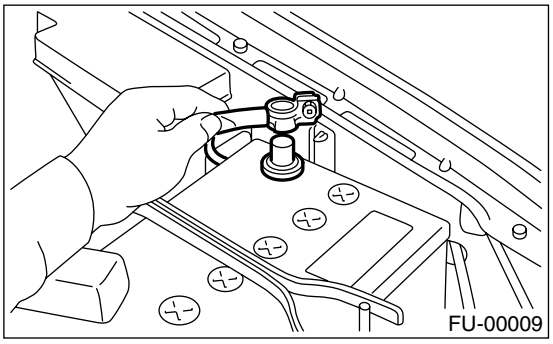
3) Install air cleaner case.
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
4) Connect battery ground cable.



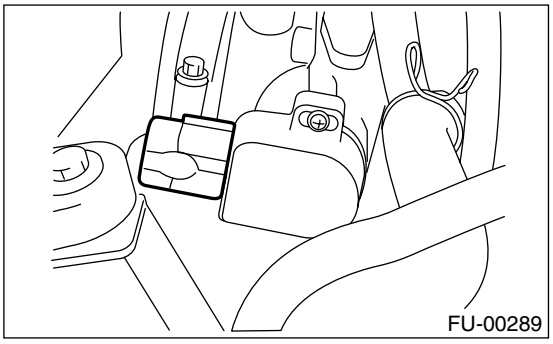
8. Throttle Position Sensor

A: REMOVAL

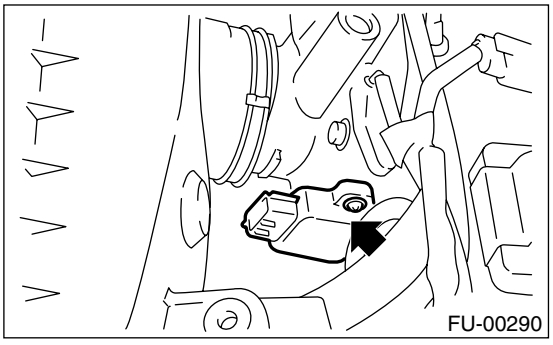
1) Disconnect ground cable from battery.



2) Disconnect connector from throttle position sensor.



3) Remove throttle position sensor holding screws, and remove it.

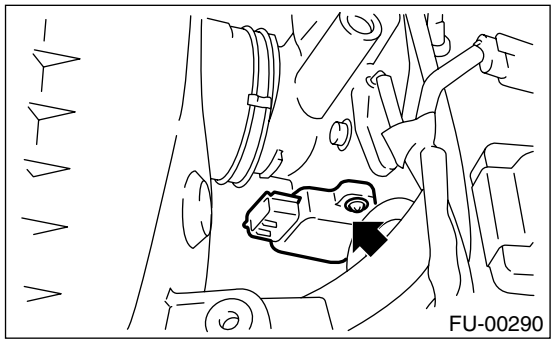


B: INSTALLATION

Install in the reverse order of removal.

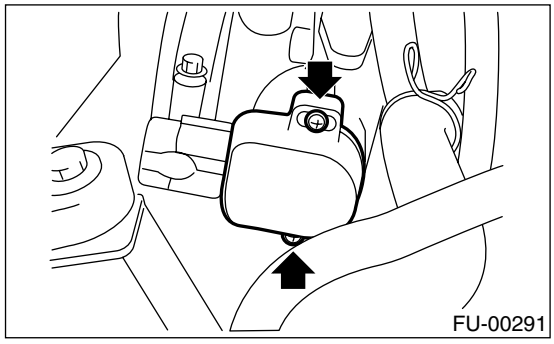
Tightening torque:
2.4 N·m (0.24 kgf-m, 1.7 ft-lb)

CAUTION:
When installing throttle position sensor, adjust to the specified data.



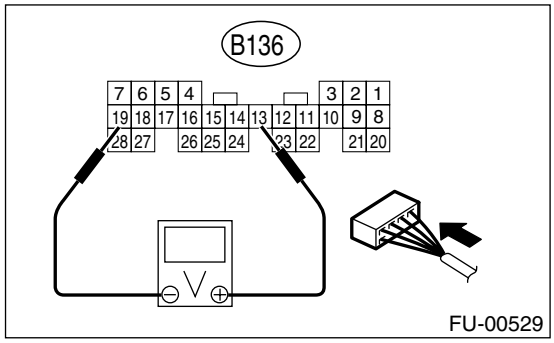
C: ADJUSTMENT

1) Turn ignition switch to OFF.
2) Loosen throttle position sensor holding screws.



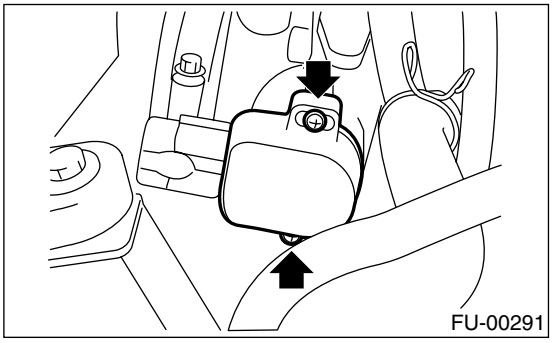
3) When using voltage meter;
   (1) Take out ECM.
   (2) Turn ignition switch to ON.
   (3) Adjust throttle position sensor to the proper position to allow the voltage signal to ECM to be in specification.

Connector & terminal / Specified voltage
(B135) No. 13 — (B135) No. 19 / 0.45 — 0.55 V
[Fully closed.]

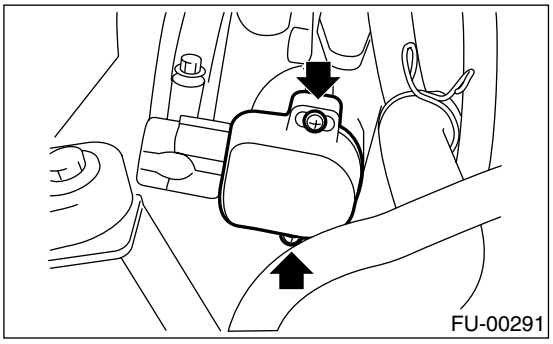


(4) Tighten throttle position sensor holding screws.

Tightening torque:
2.4 N·m (0.24 kgf-m, 1.7 ft-lb)

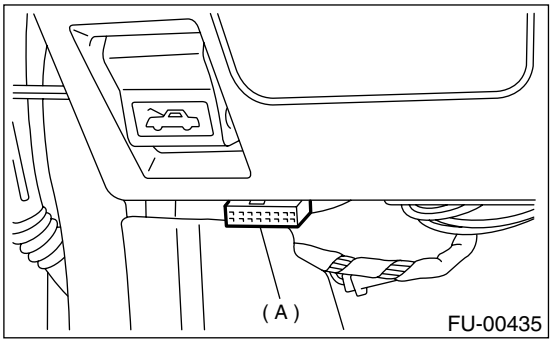


4) When using Subaru Select Monitor;
(1) Turn ignition switch to OFF.
(2) Loosen throttle position sensor holding screws.



NOTE:
For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

(3) Insert the cartridge to Subaru Select Monitor. <Ref. to FU(H4SO)-13, PREPARATION TOOL, General Description.>
(4) Connect Subaru Select Monitor to the data link connector (A).

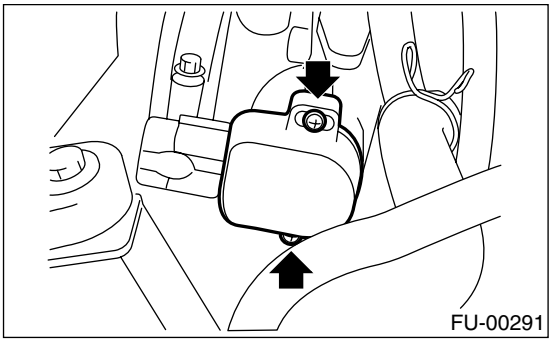


5) Turn ignition switch to ON, and Subaru Select Monitor switch to ON.
6) Select {2. Each System Check} in Main Menu.
7) Select {Engine Control System} in Selection Menu.
8) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
9) Select {1.12 Data Display} in Data Display Menu.
10) Adjust throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed
Throttle opening angle 0.00%
Throttle sensor voltage 0.50 V

11) Tighten throttle position sensor holding screws.

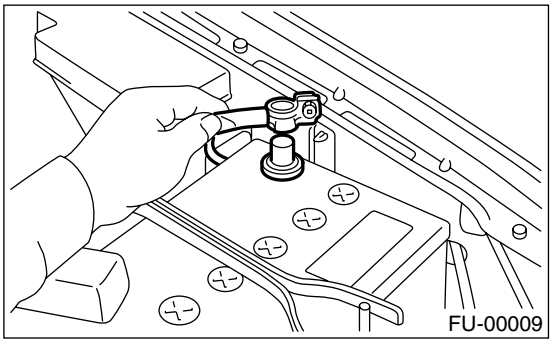
Tightening torque:
2.4 N·m (0.24 kgf-m, 1.7 ft-lb)



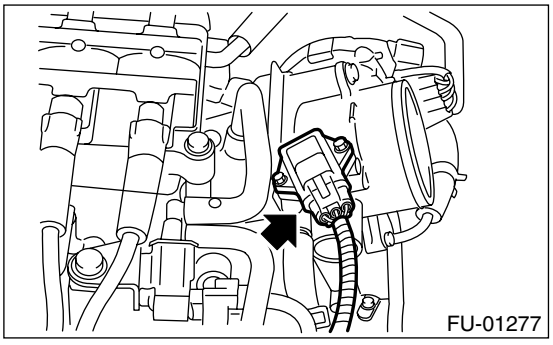
9. Pressure Sensor

A: REMOVAL

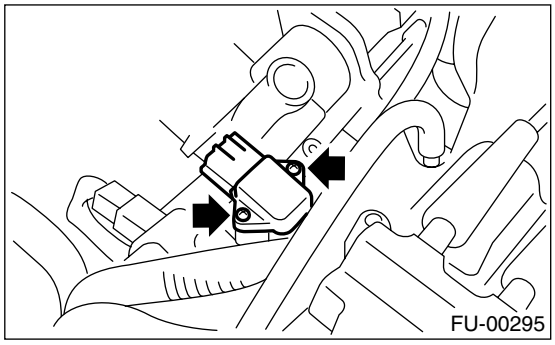
1) Disconnect ground cable from battery.



2) Disconnect connector from pressure sensor.



3) Remove pressure sensor from throttle body.

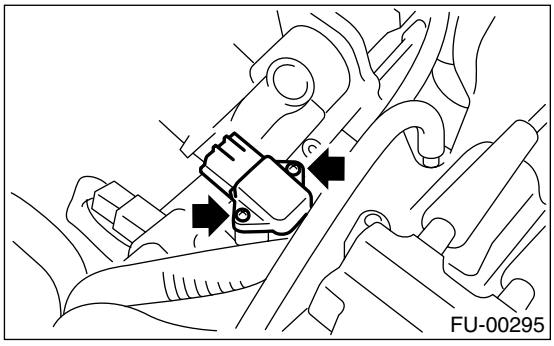


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace O-ring with a new one.

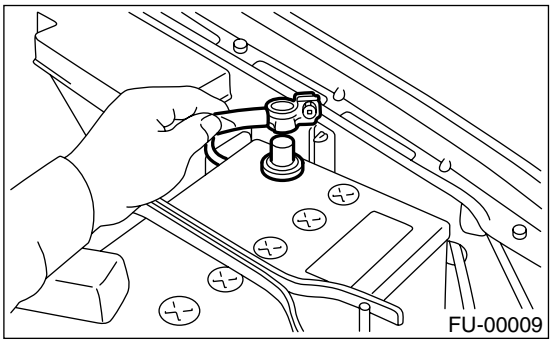
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



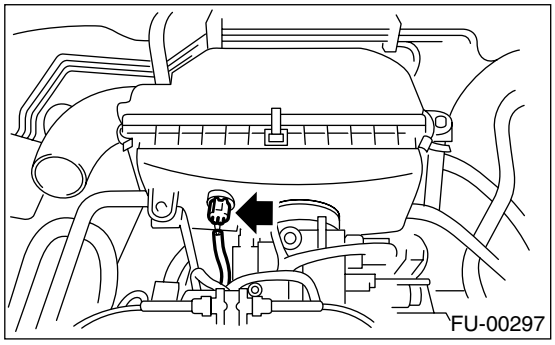
10.Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect the connector from the intake air temperature sensor.
3) Remove the intake air temperature sensor from air cleaner case.



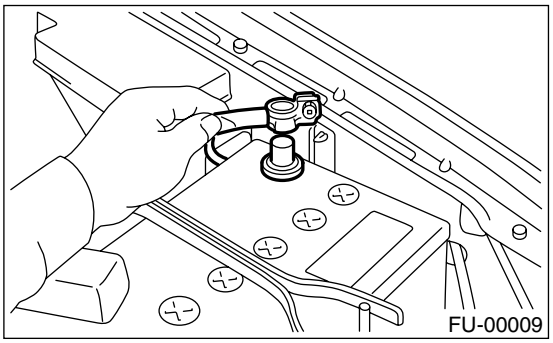
B: INSTALLATION

Install in the reverse order of removal.

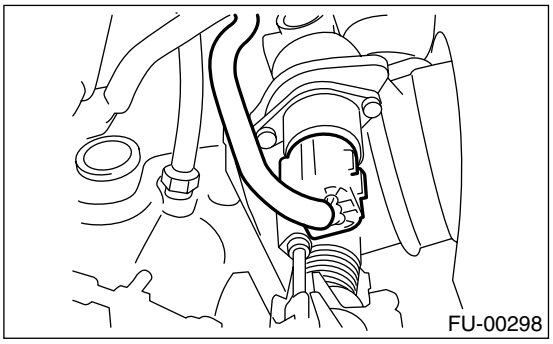
11.Idle Air Control Solenoid Valve

A: REMOVAL

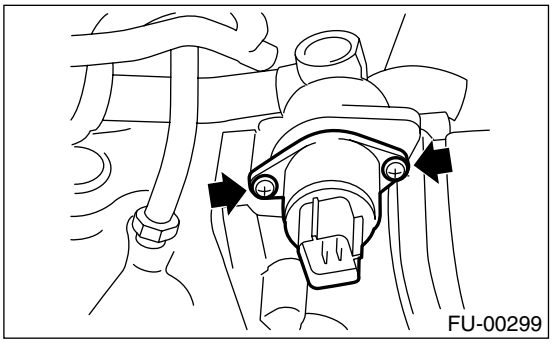
1) Disconnect ground cable from battery.



2) Disconnect connector from idle air control solenoid valve.



3) Remove idle air control solenoid valve from throttle body.

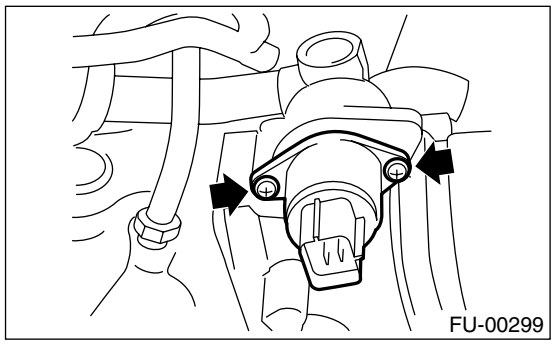


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

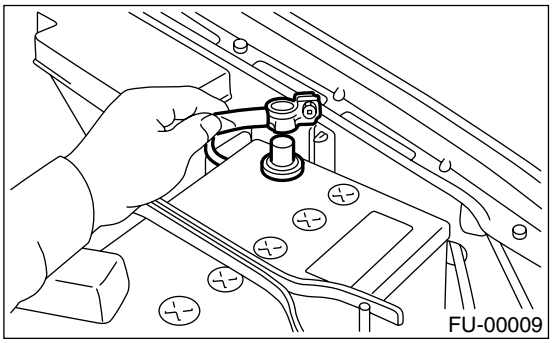
Tightening torque:
2.4 N·m (0.24 kgf-m, 1.7 ft-lb)



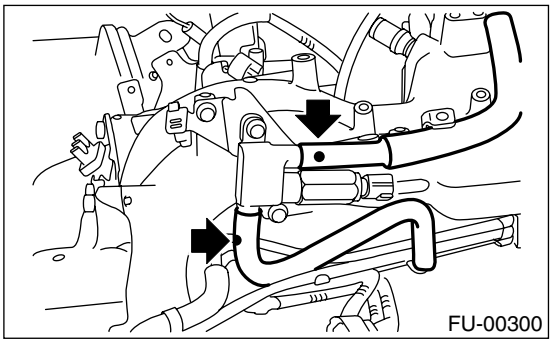
12.Air Assist Injector Solenoid Valve

A: REMOVAL

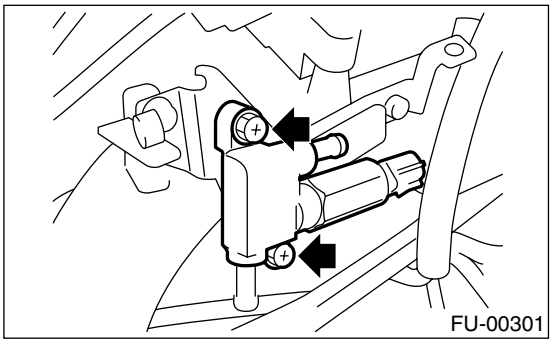
1) Disconnect ground cable from battery.



2) Disconnect connector from air assist injector solenoid valve and disconnect air by-pass hoses.



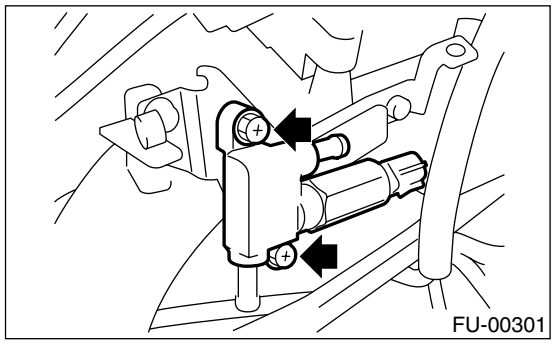
3) Remove air assist injector solenoid valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

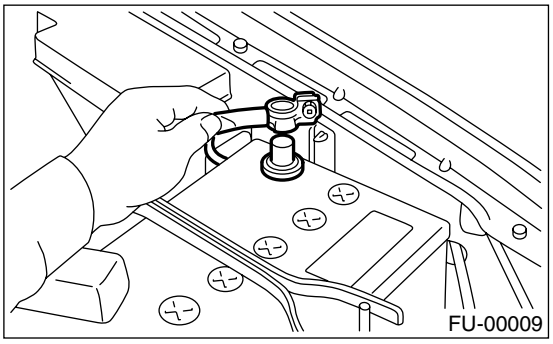
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



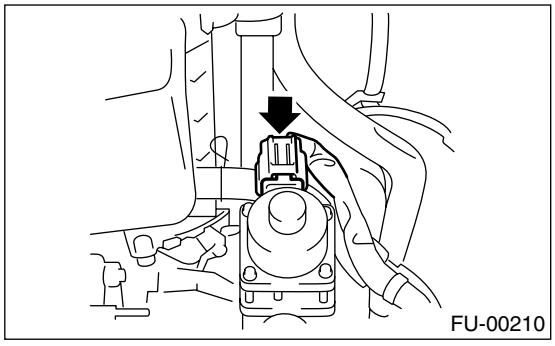
13.EGR Valve

A: REMOVAL

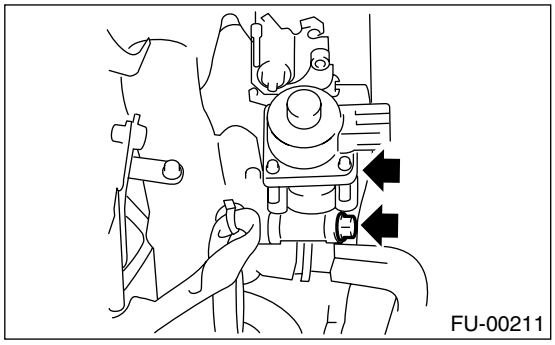
1) Disconnect ground cable from battery.



2) Disconnect connector from EGR valve.



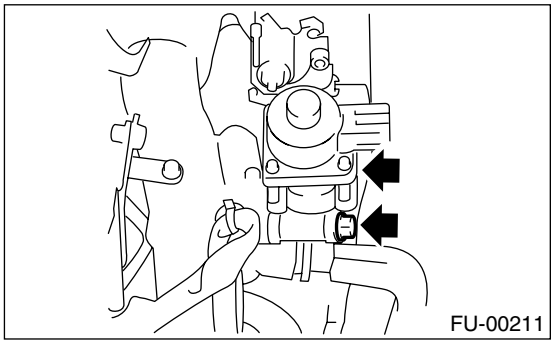
3) Remove EGR valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

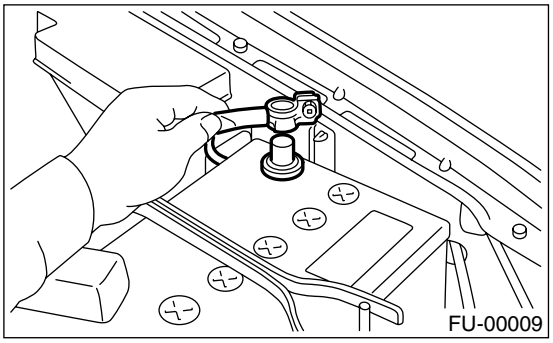


14.Fuel Injector

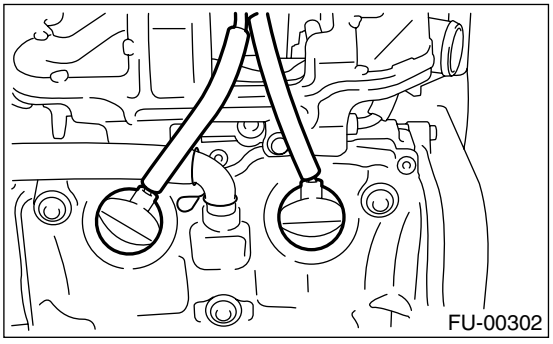
A: REMOVAL

1. RH SIDE

1) Release fuel pressure.
<Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.

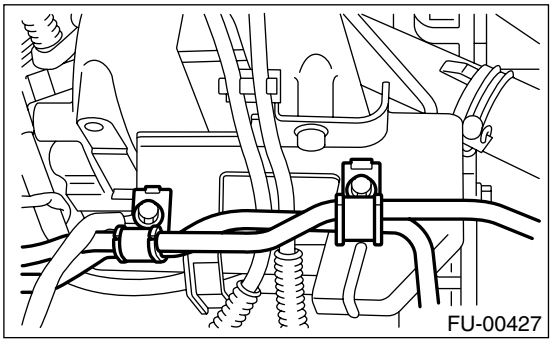

FU-00009

4) Remove resonator chamber.
<Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
5) Remove spark plug cords from spark plugs (#1 and #3 cylinders).

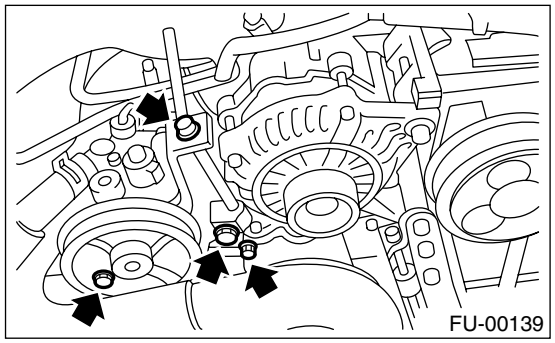

FU-00302

6) Remove power steering pump and tank from brackets.
(1) Remove front V-belt.
<Ref. to ME(H4SO)-43, REMOVAL, V-belt.>

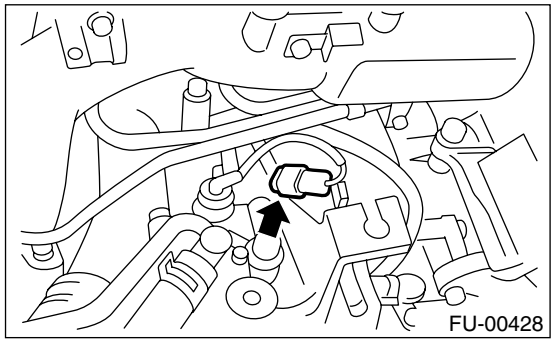
(2) Remove bolts which hold power steering pipes onto intake manifold protector.


FU-00427

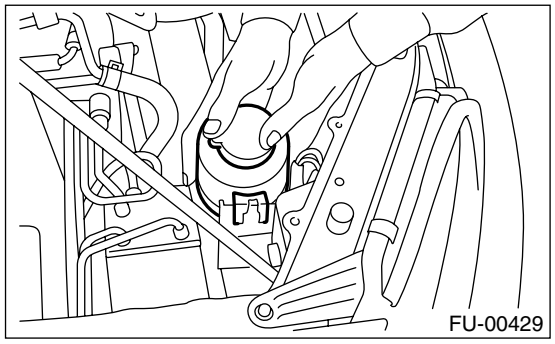
(3) Remove bolts which install power steering pump to bracket.


FU-00139

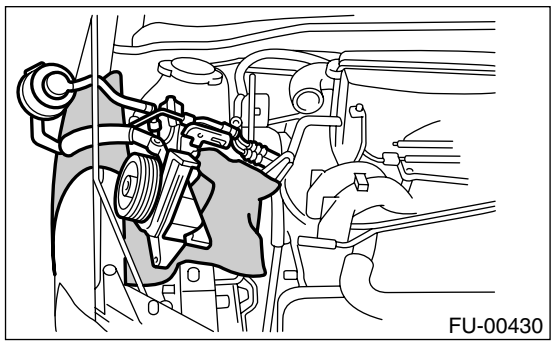
(4) Disconnect connector from power steering pump switch.


FU-00428

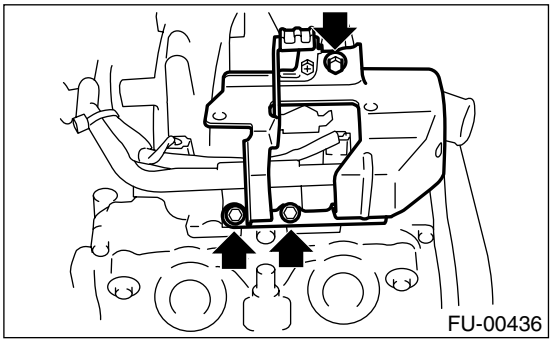
(5) Remove power steering tank from the bracket by pulling it upwards.


FU-00429

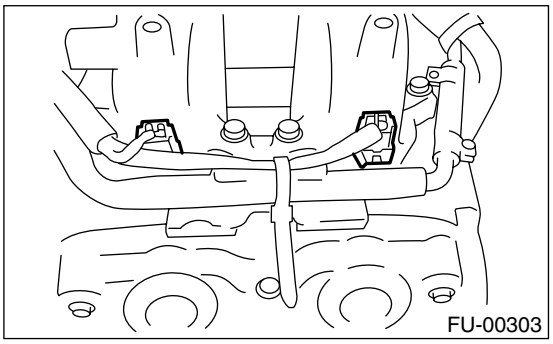
(6) Place power steering pump and tank on the right side wheel apron.


FU-00430

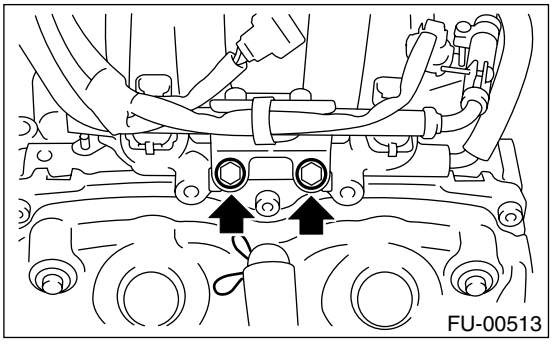
7) Remove fuel pipe protector RH.



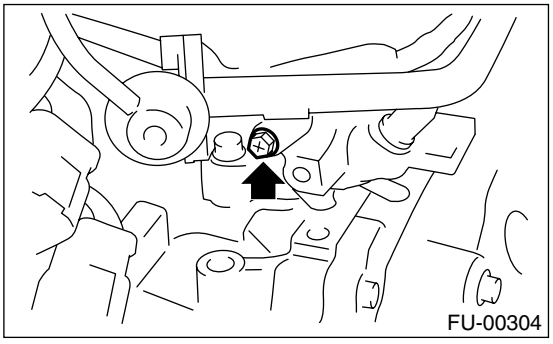
8) Disconnect connector from fuel injector.



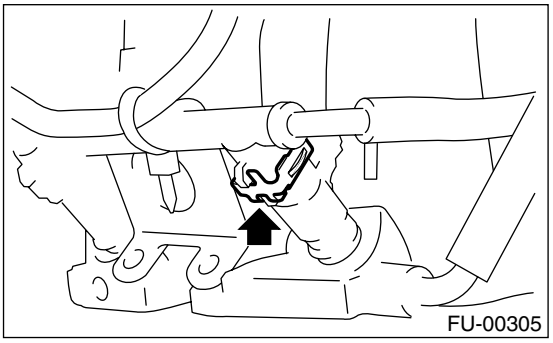
9) Remove bolts which hold injector pipe to intake manifold.



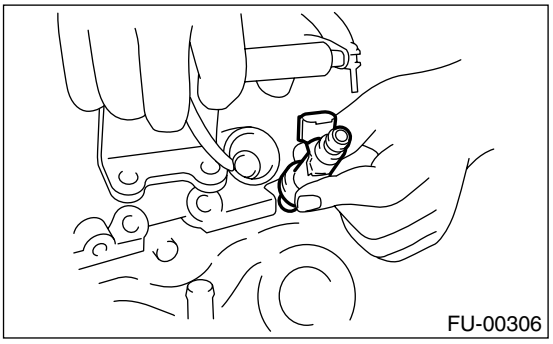
10) Remove bolt which install injector pipe to intake manifold.



11) Remove fuel injector from intake manifold.
(1) Remove fuel injector securing clip.

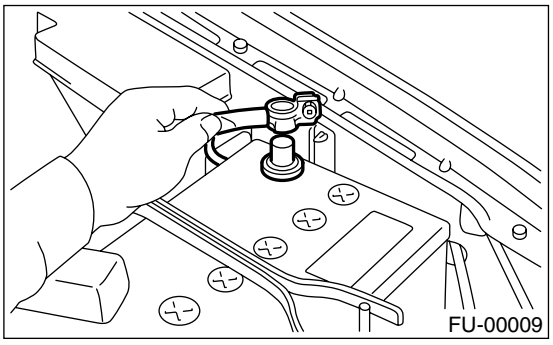


(2) Remove fuel injector while lifting up fuel injector pipe.

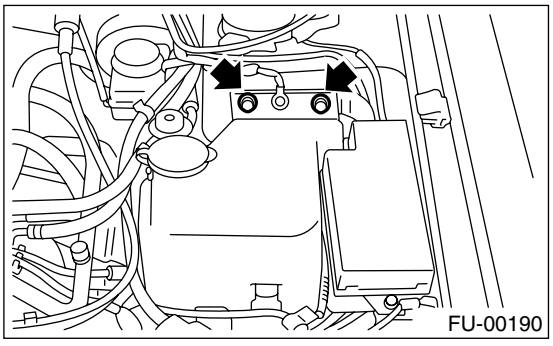


2. LH SIDE

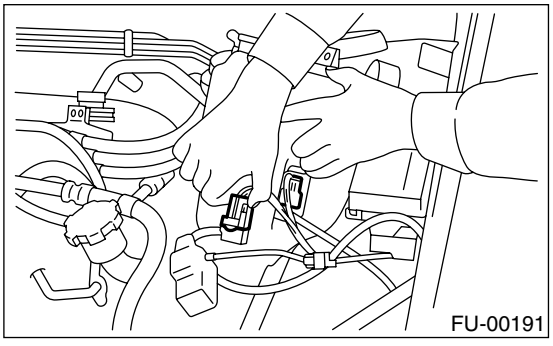
1) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



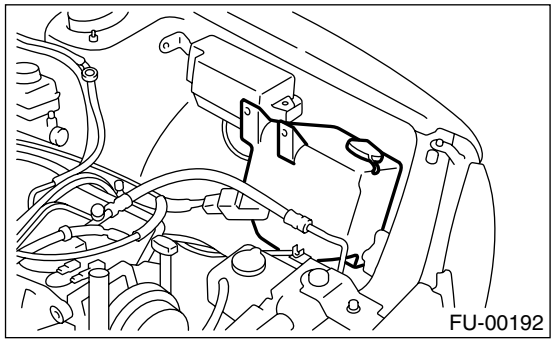
4) Remove two bolts which install washer tank on body.



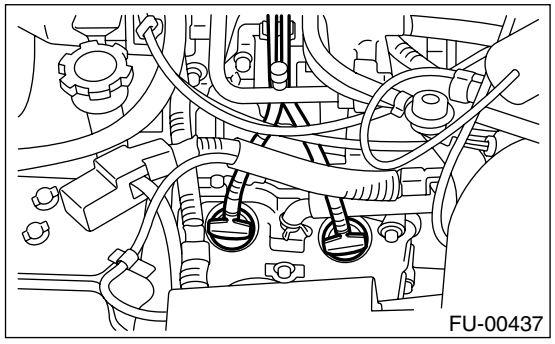
5) Disconnect connector from front window washer motor.
6) Disconnect connector from rear gate glass washer motor.



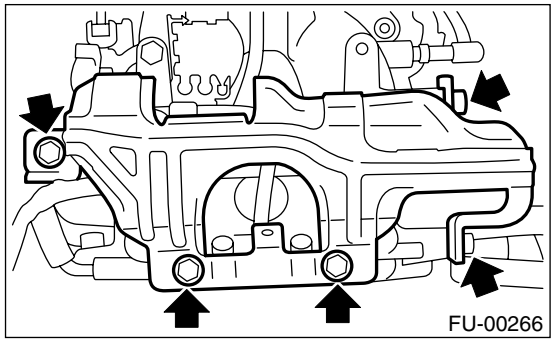
7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
8) Move washer tank, and secure it away from working area.



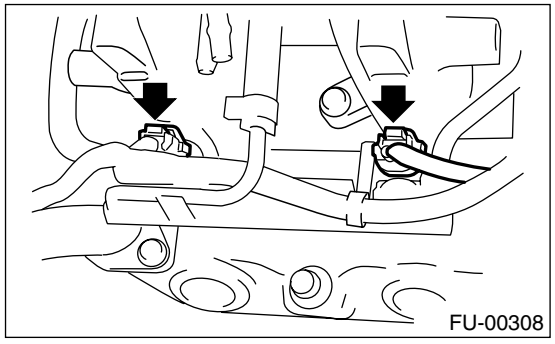
9) Remove spark plug cords from spark plugs (#2 and #4 cylinders).



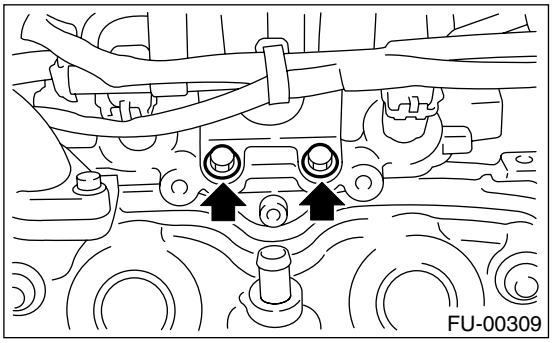
10) Remove fuel pipe protector LH.



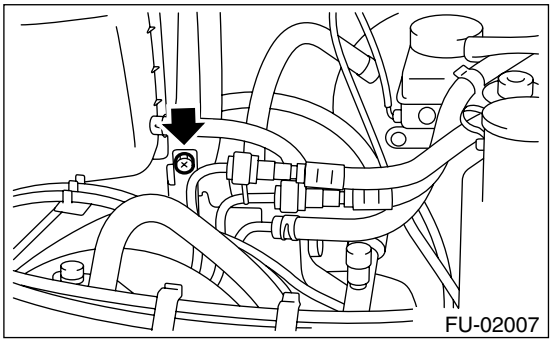
11) Disconnect connector from fuel injector.



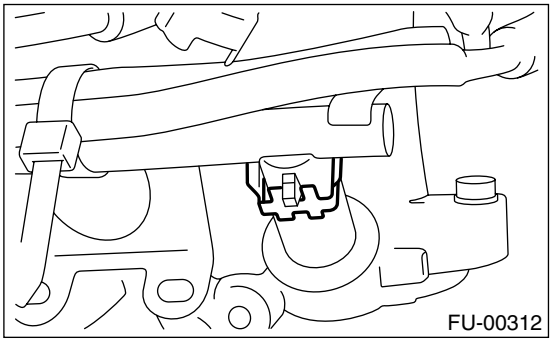
12) Remove bolt which holds injector pipe to intake manifold.



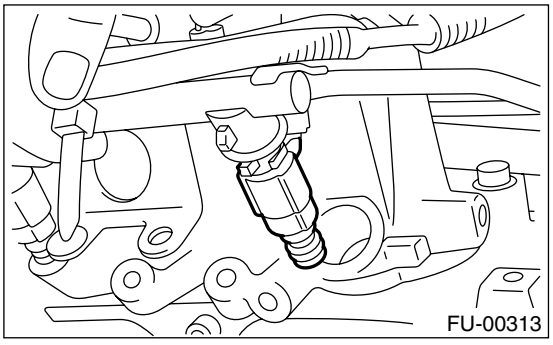
13) Remove bolt which holds fuel pipe on the left side intake manifold.



14) Remove fuel injector from intake manifold.
(1) Remove fuel injector securing clip.



(2) Remove fuel injector while lifting up fuel injector pipe.

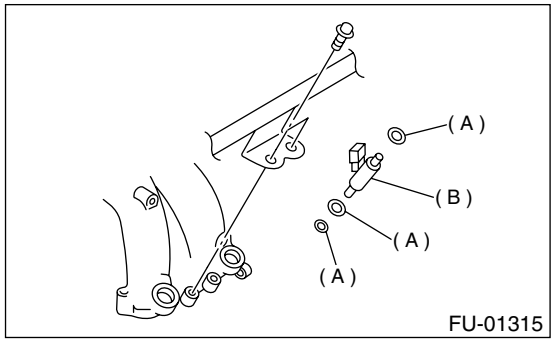


B: INSTALLATION

1. RH SIDE

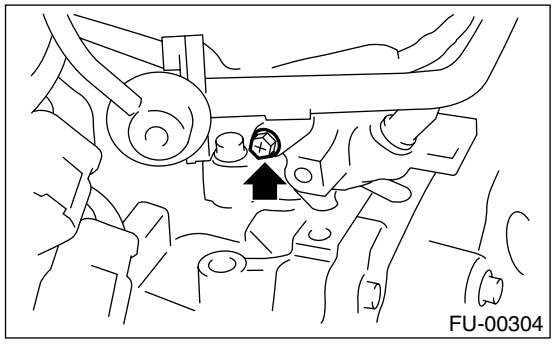
Install in the reverse order of removal.

NOTE:
Replace O-rings with new ones.

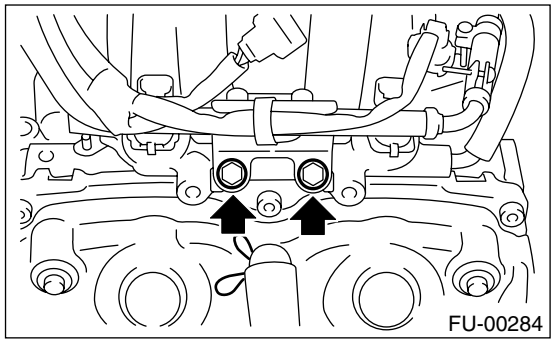


(A) O-ring
(B) Fuel injector

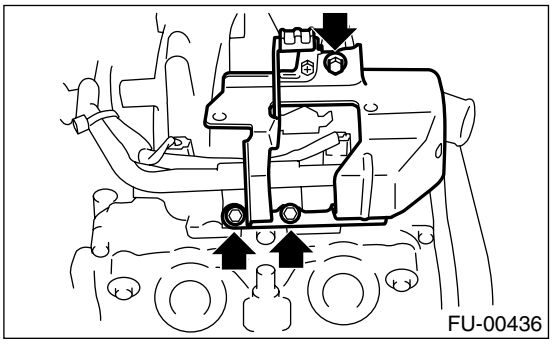
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



Tightening torque:
19 N·m (0.19 kgf-m, 1.4 ft-lb)



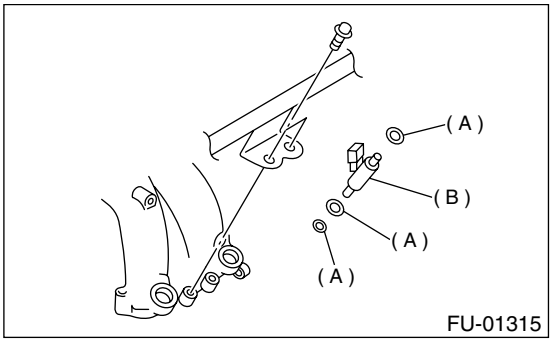
Tightening torque:
19 N·m (0.19 kgf-m, 1.4 ft-lb)



2. LH SIDE

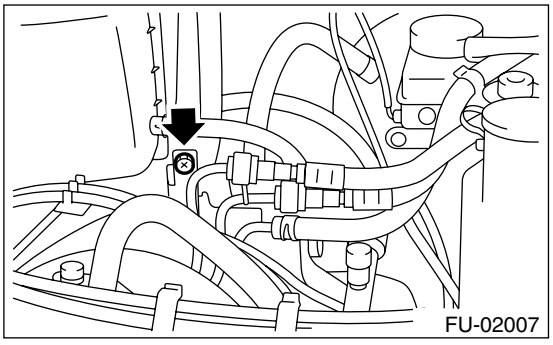
Install in the reverse order of removal.

NOTE:
Replace O-rings with new ones.

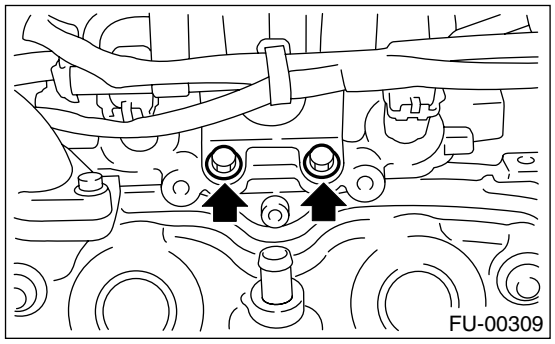


(A) O-ring
(B) Fuel injector

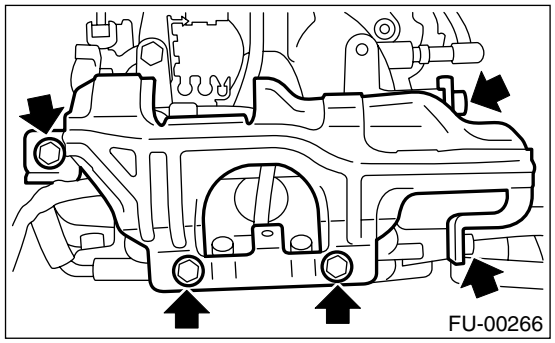
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



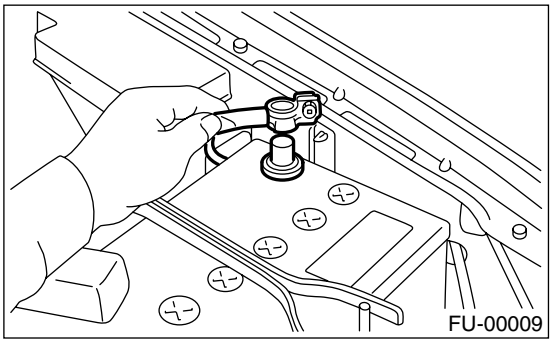
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



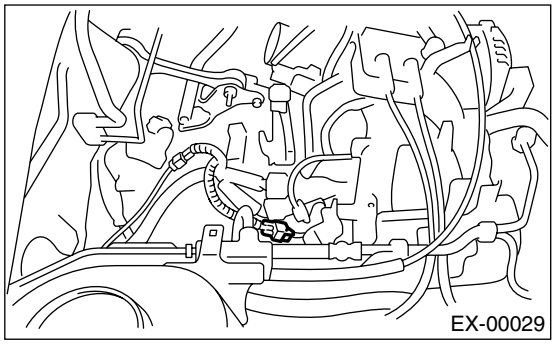
15.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connectors from engine hanger and front oxygen (A/F) sensor.

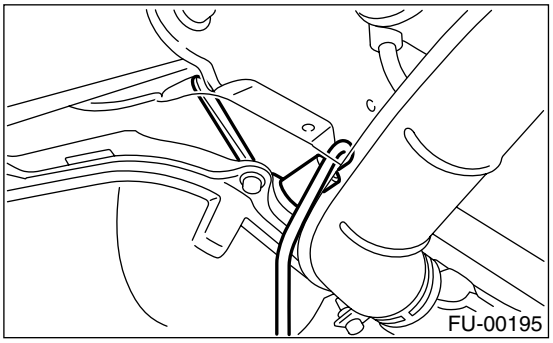


3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

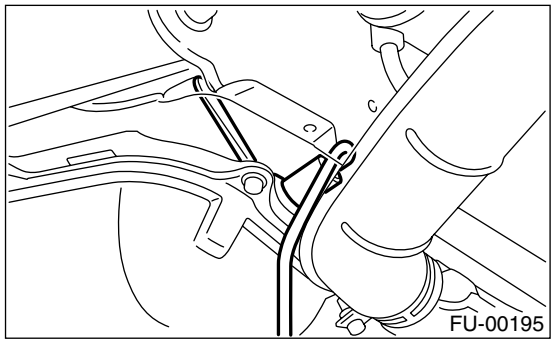
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

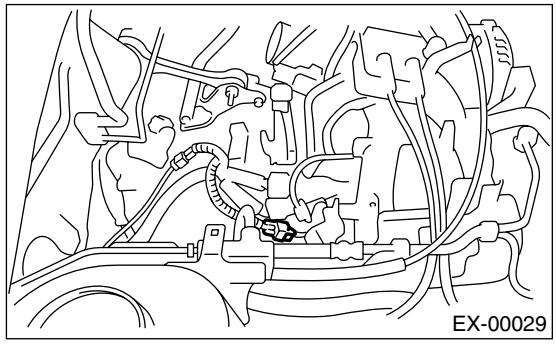
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install front oxygen (A/F) sensor.

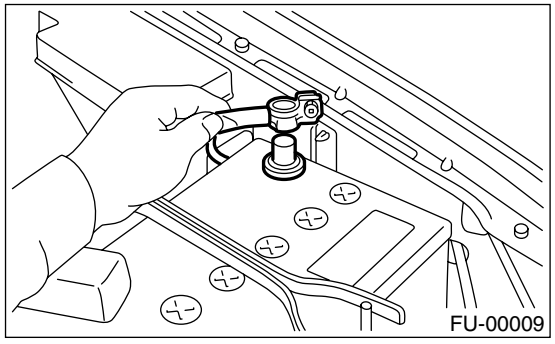
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect connector of front oxygen (A/F) sensor.



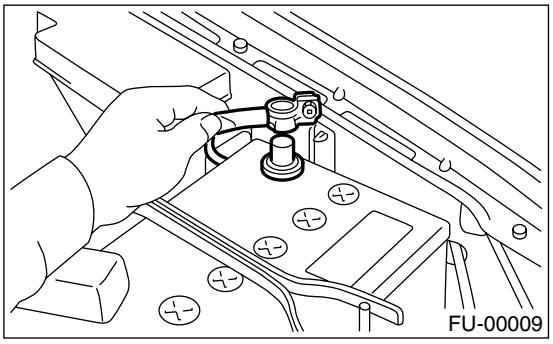
5) Connect battery ground cable.



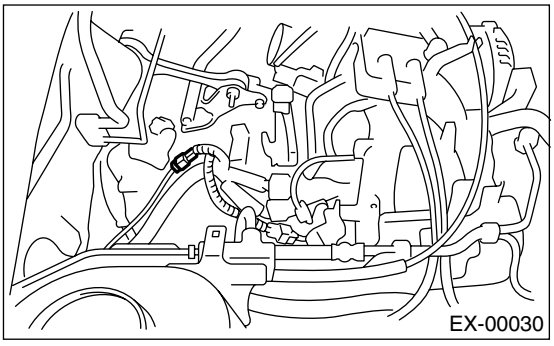
16.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connector from rear oxygen sensor.

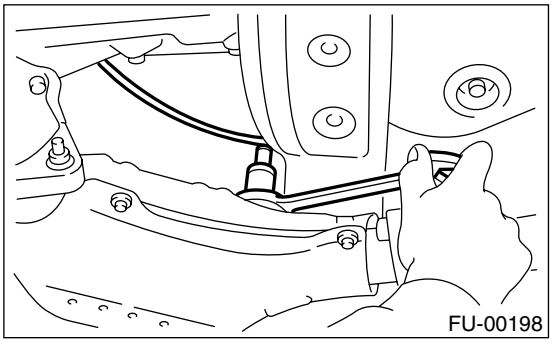


3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

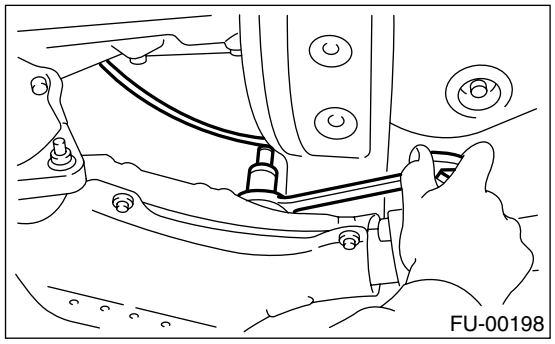
1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

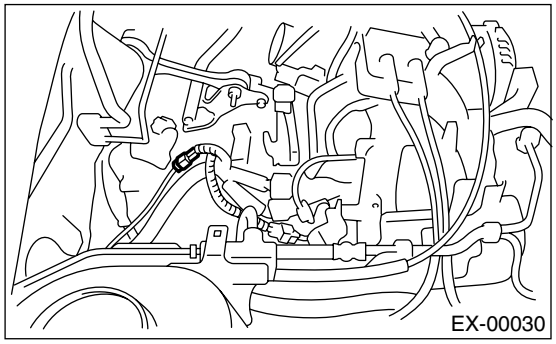
Anti-seize compound:
SS-30 by JET LUBE

2) Install rear oxygen sensor.

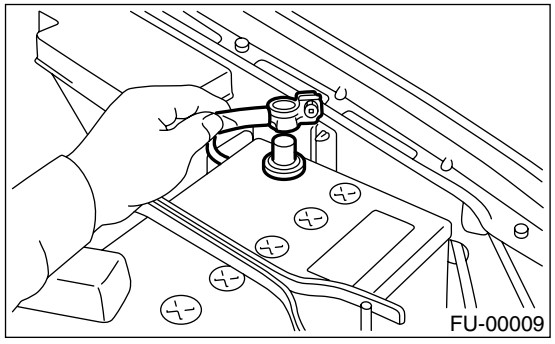
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect connector to rear oxygen sensor.



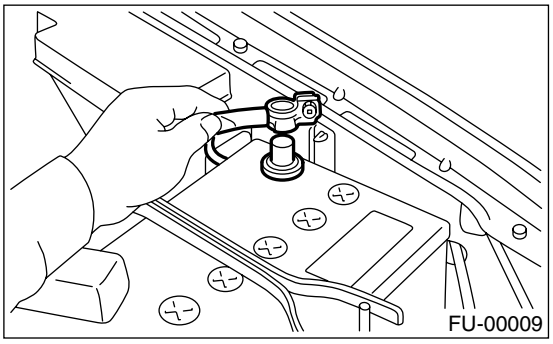
5) Connect battery ground cable.



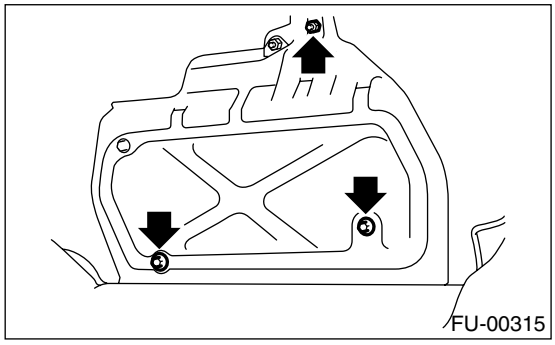
17.Engine Control Module

A: REMOVAL

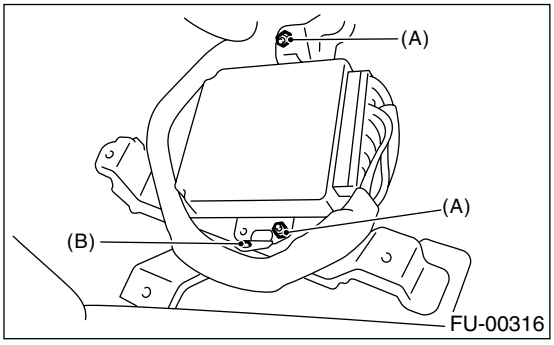
1) Disconnect ground cable from battery.



2) Remove lower inner trim of passenger side.
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of passenger seat.
4) Remove protect cover.



5) Remove nuts (A) which hold ECM to bracket.
6) Remove clip (B) from bracket.



7) Disconnect ECM connectors and take out ECM.

B: 1INSTALLATION

Install in the reverse order of removal.

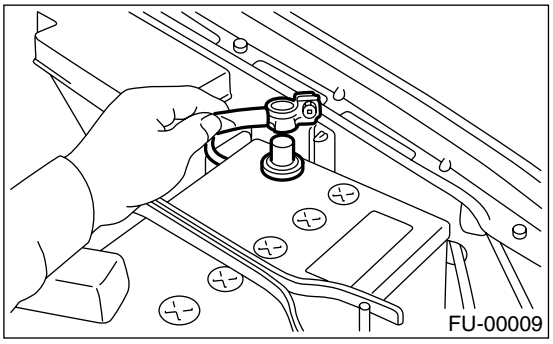
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

Tightening torque:
5 N·m (0.51 kgf-m, 3.7 ft-lb)

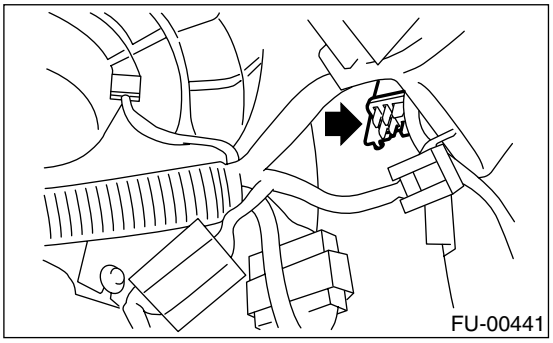
18.Main Relay

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove lower inner trim of passenger side. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Disconnect connectors from main relay.
4) Remove bolt which holds main relay bracket on body.



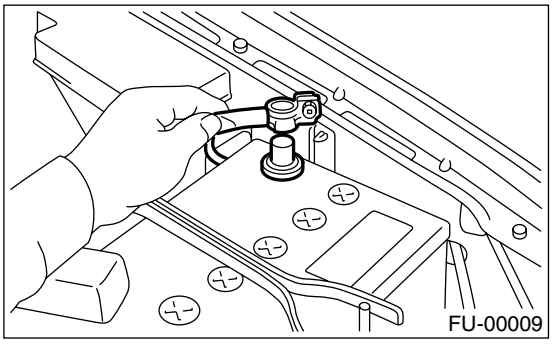
B: INSTALLATION

Install in the reverse order of removal.

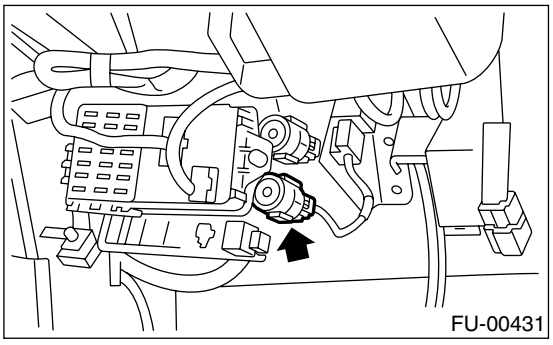
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove lower cover. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
3) Disconnect connector from fuel pump relay.



4) Remove fuel pump relay from mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

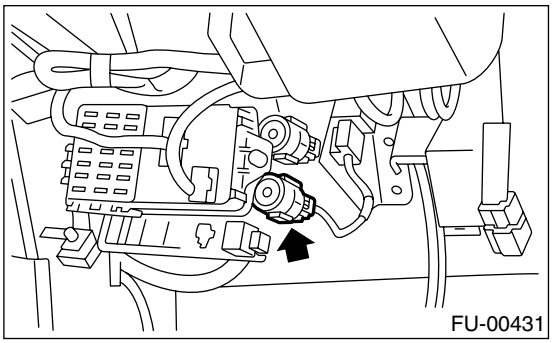
20.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect connector from fuel pump relay.

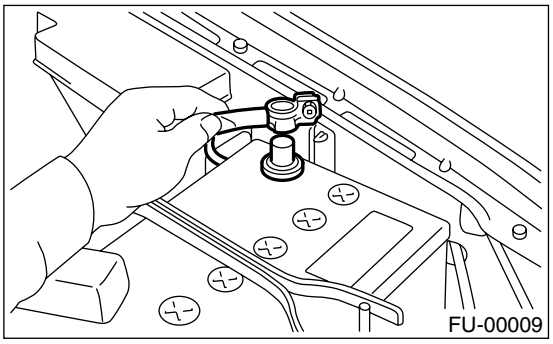


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn ignition switch to OFF.

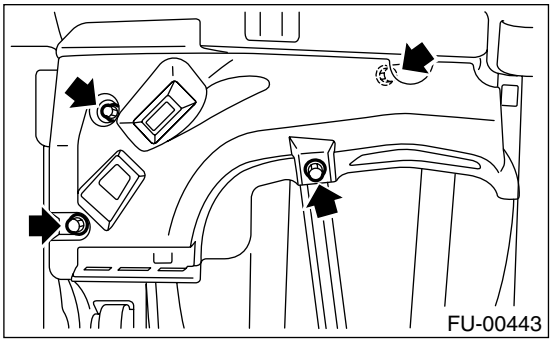
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

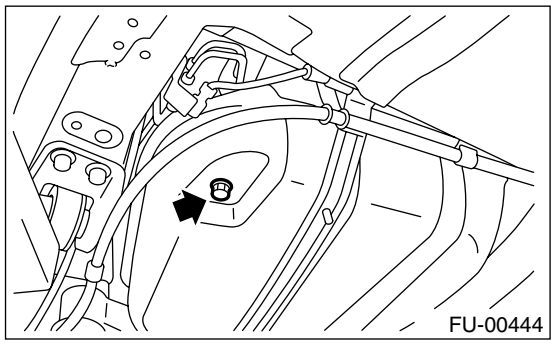
1) Set vehicle on the lift.
2) Disconnect battery ground cable.



3) Lift-up the vehicle.
4) Remove front right side fuel tank cover.

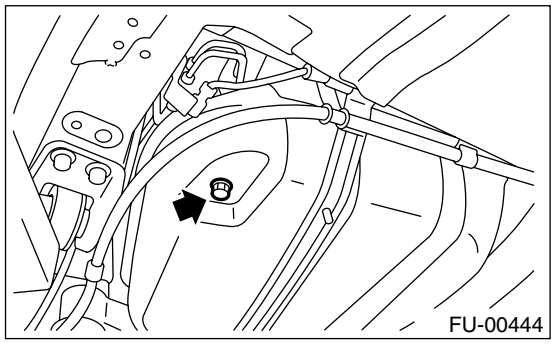


5) Drain fuel from fuel tank.
Set a container under the vehicle and remove drain plug from fuel tank.

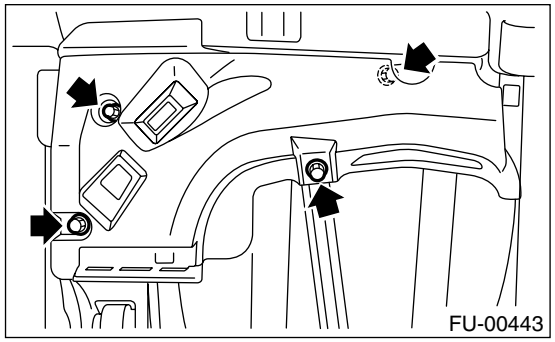


6) Tighten fuel drain plug and install front right side tank cover.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

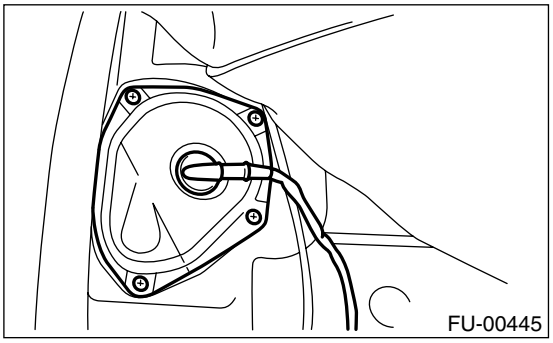


Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

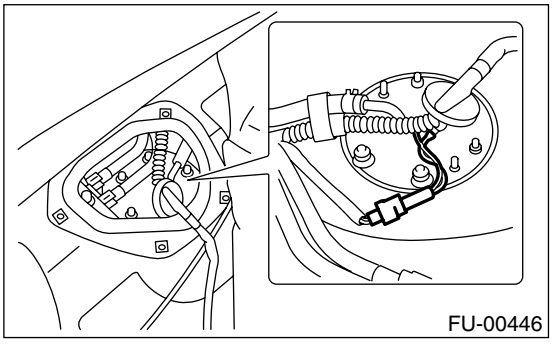


7) Lower the vehicle.

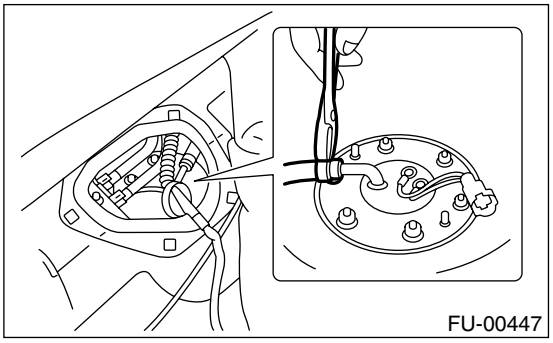
8) Remove sub service hole cover.



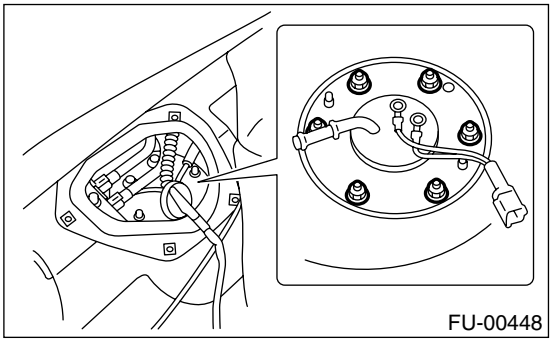
9) Disconnect connector from fuel sub level sensor.



10) Disconnect fuel jet pump hose.



11) Remove fuel sub level sensor.

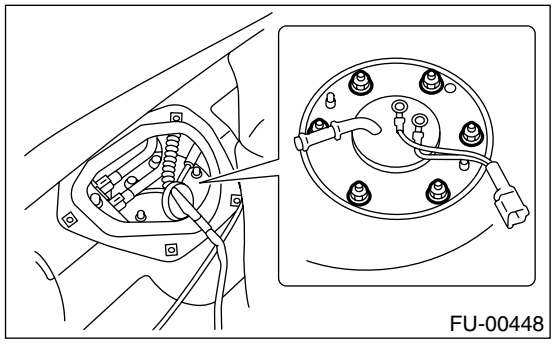


12) Drain fuel from fuel tank by using hand pump.

WARNING:
Do not use a motor pump when draining fuel.

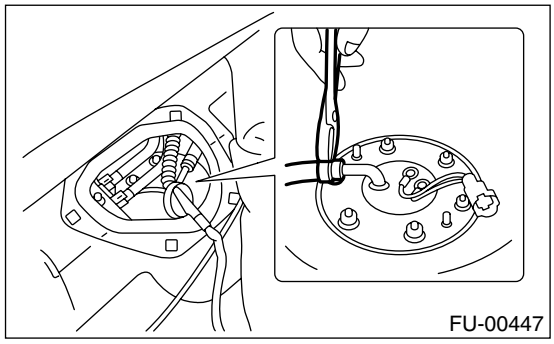
13) After draining fuel, reinstall fuel sub level sensor.

Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

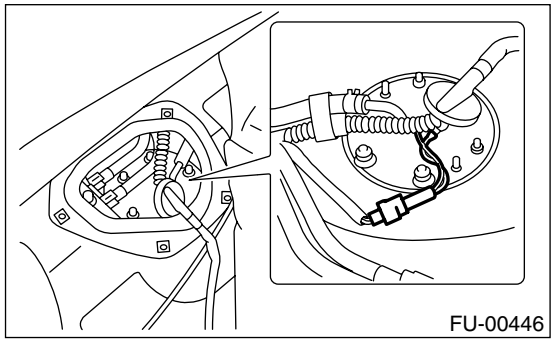


NOTE:
If you have not removed fuel tank yet, proceed with the procedure below for installation.

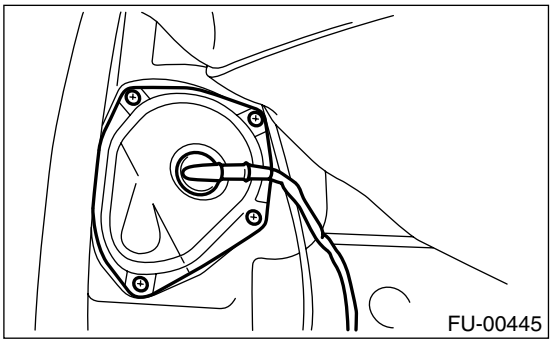
(1) Connect fuel jet pump hose.



(2) Connect connector from fuel sub level sensor.



(3) Install sub service hole cover.

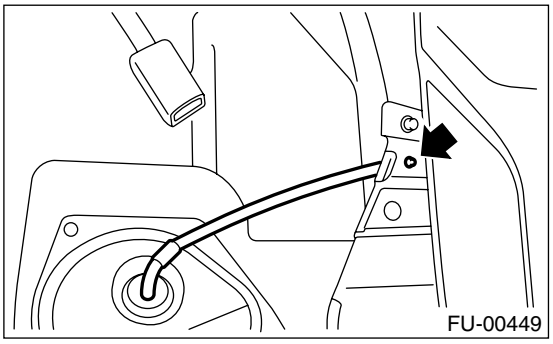


(4) Set rear seat and floor mat.

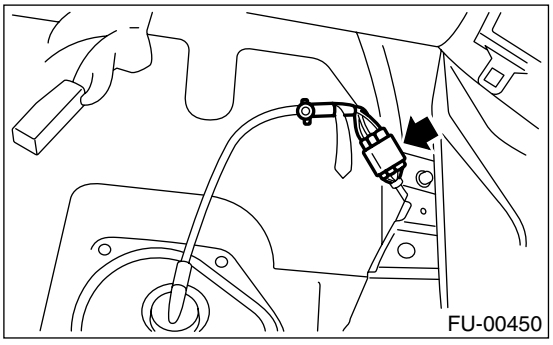
21.Fuel Tank

A: REMOVAL

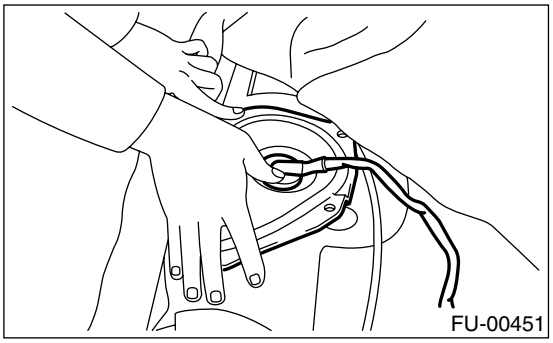
1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from fuel tank. <Ref. to FU(H4SO)-48, DRAINING FUEL, OPERATION, Fuel.>
4) Remove holder clip which secures fuel tank cord on bracket.



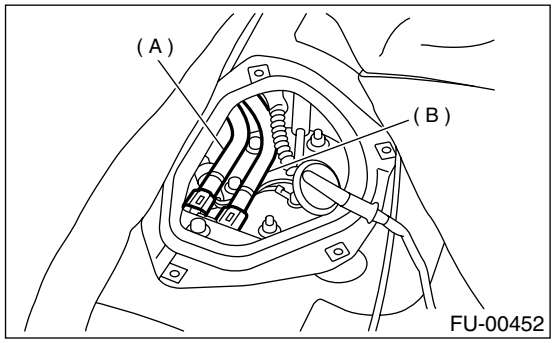
5) Disconnect connector of fuel tank cord to rear harness.



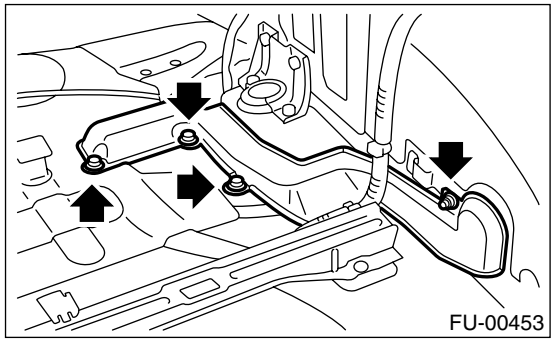
6) Push grommet which holds fuel tank cord on service hole cover into body side.



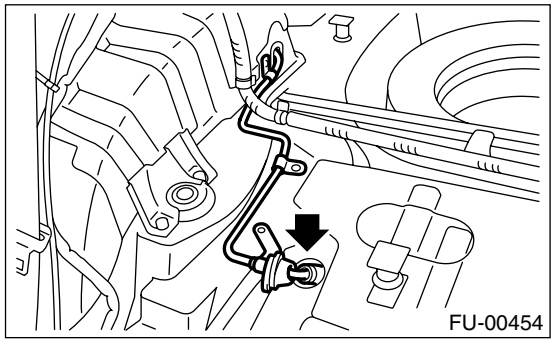
7) Using ST, separate quick connector of fuel delivery (A) and return hose (B).<Ref. to FU(H4SO)-72, REMOVAL, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
ST 42099AE000 CONNECTOR REMOVER



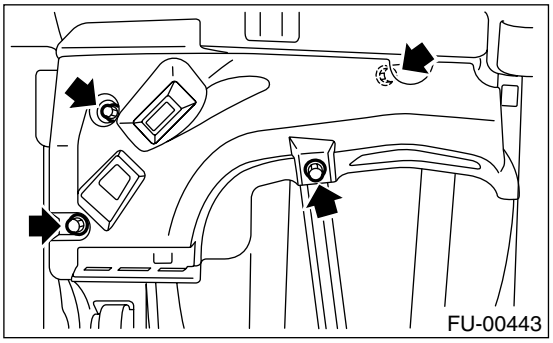
8) Remove parking brake cable.
   (1) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
   (2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-6, REMOVAL, Parking Brake Cable.>
9) Remove trunk trim. (Sedan model)
<Ref. to EI-59, REMOVAL, Trunk Trim.>
10) Remove rear quarter lower trim. (Wagon model)
<Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
11) Remove pipe protector.



12) Using ST, separate quick connector of evaporation pipe. <Ref. to FU(H4SO)-72, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
ST 42099AE000 CONNECTOR REMOVER



13) Remove wheel nuts from rear wheels.
14) Lift-up the vehicle.
15) Remove rear wheel.
16) Remove front side fuel tank cover.

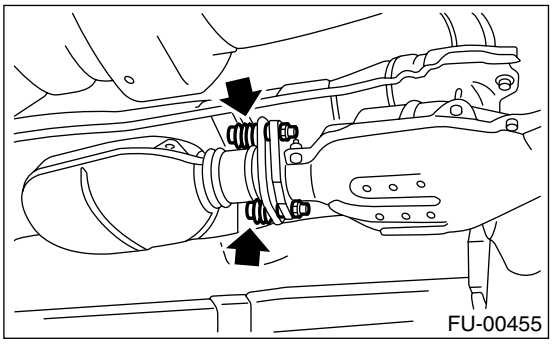


17) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

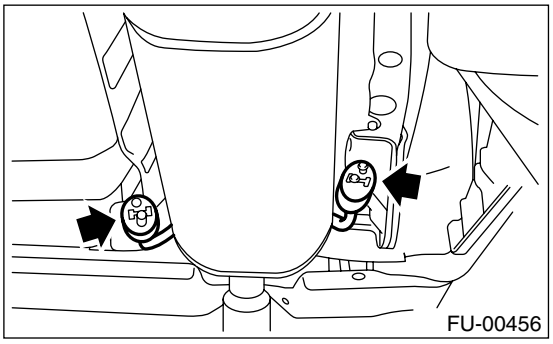
SUBARU CRC (Part No. 004301003)

(1) Separate rear exhaust pipe and center exhaust pipe.

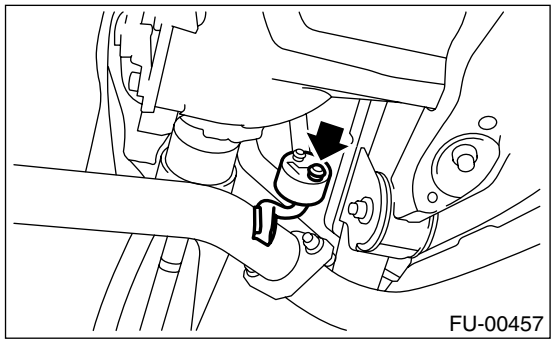


(2) Remove left and right rubber cushions.

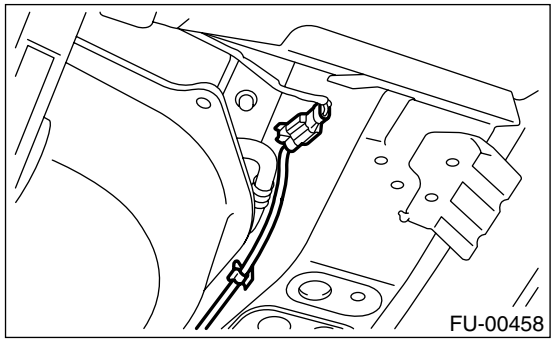
CAUTION:
Be careful not to pull down muffler.



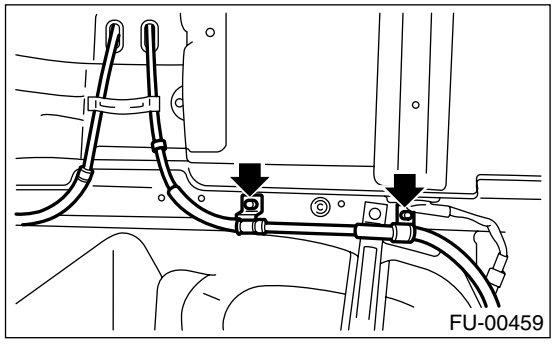
(3) Remove front rubber cushion and detach muffler assembly.



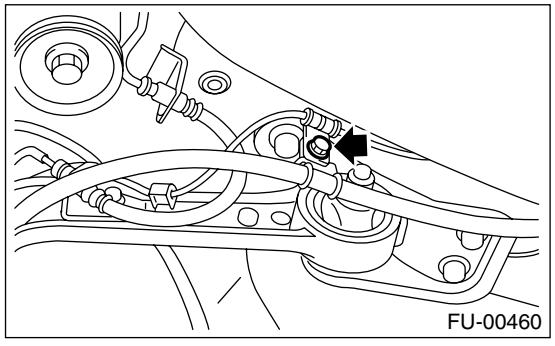
18) Remove propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
19) Disconnect connector from ABS sensor.



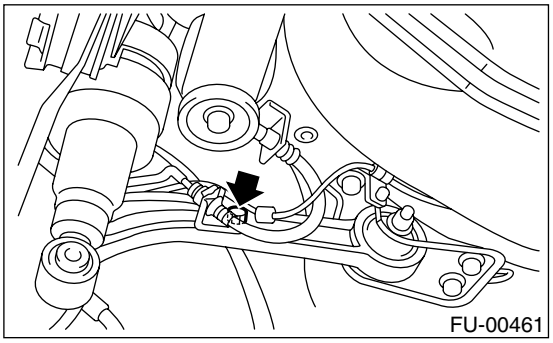
20) Remove bolts which hold parking brake cable holding bracket.
21) Remove parking brake cable from cabin by forcibly pulling it backward.



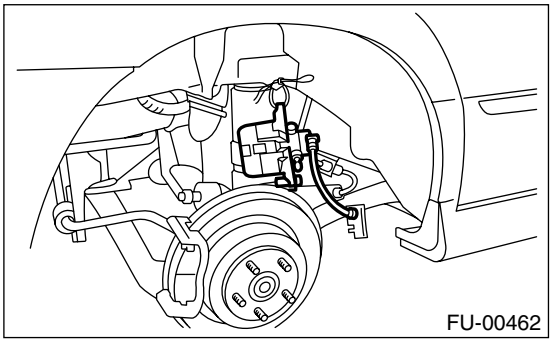
22) Remove bolts which hold parking brake cable holding bracket.



23) Remove bolts which hold rear brake hoses holding bracket.



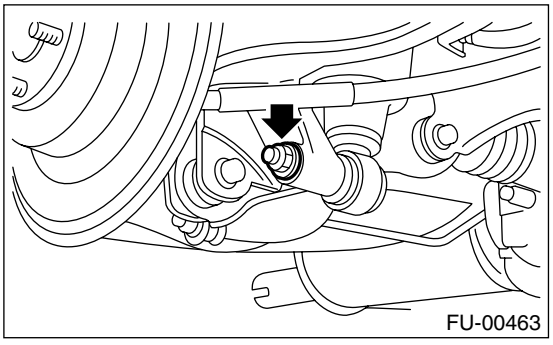
24) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.



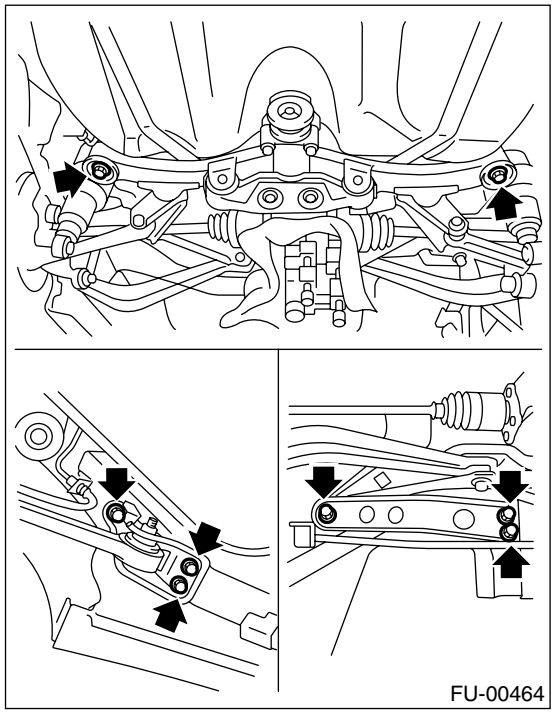
25) Remove rear suspension assembly.

WARNING:
A helper is required to perform this work.

(1) Support rear differential with transmission jack.
(2) Remove bolt which holds rear shock absorber to rear suspension arm.

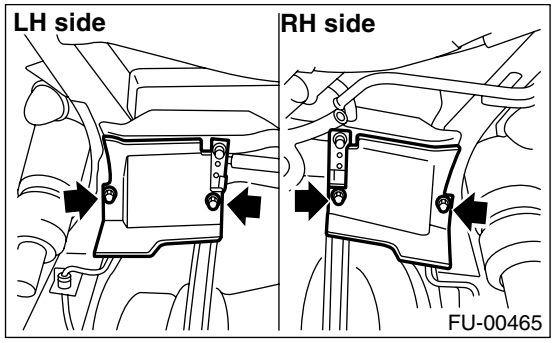


(3) Remove bolts which secure rear suspension assembly to body.

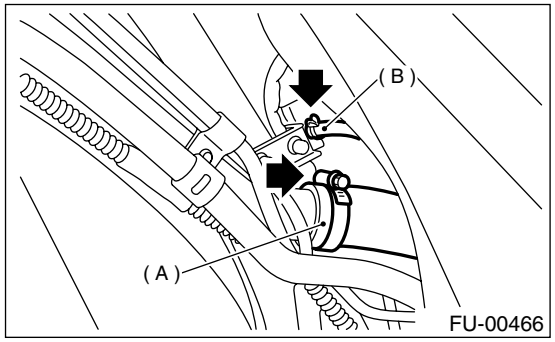


(4) Remove rear suspension assembly.

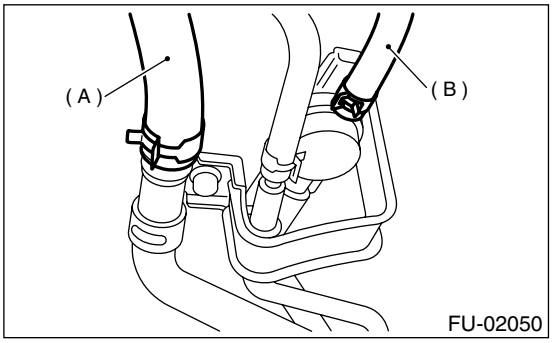
26) Remove rear side fuel tank cover.



27) Disconnect fuel filler hose (A) and fuel tank pressure sensor hose (B).

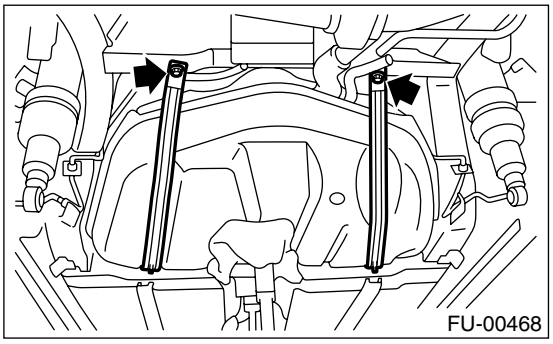


28) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (B) from pressure control solenoid valve.



29) Support fuel tank with transmission jack, remove bolts from bands and dismount fuel tank from the vehicle.

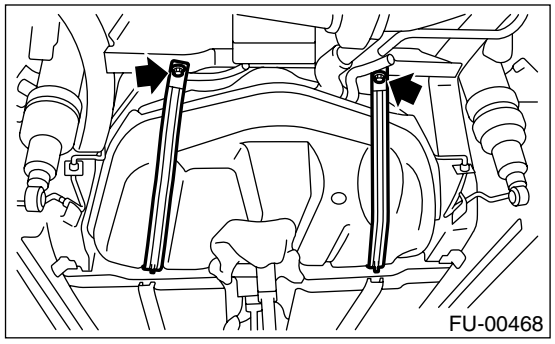
WARNING:
A helper is required to perform this work.



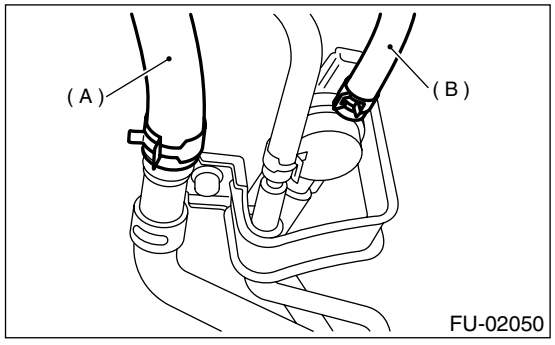
B: INSTALLATION

1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

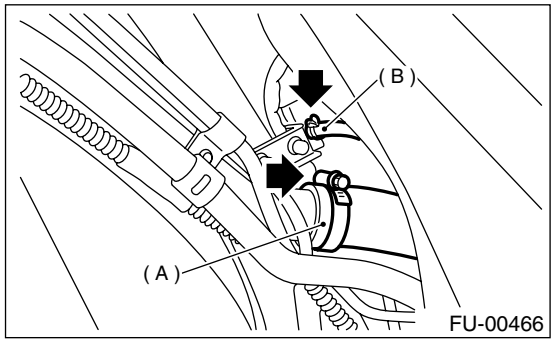
WARNING:
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (B) 10to pressure control solenoid valve.

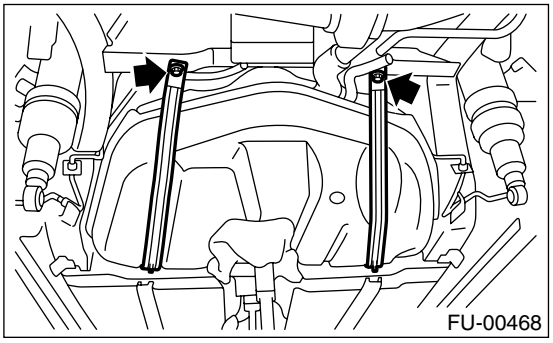


4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



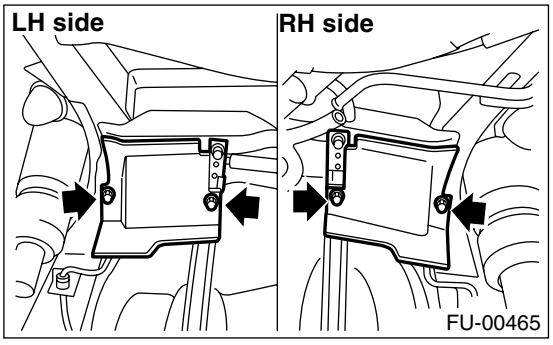
5) Tighten band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



6) Install rear side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

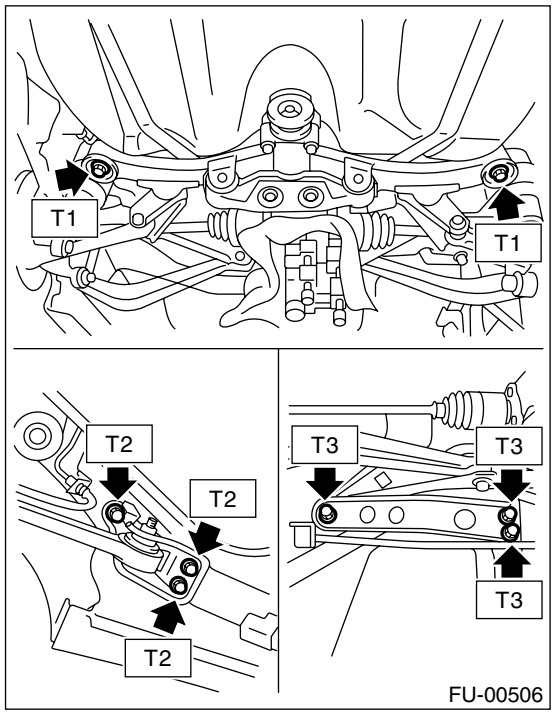


7) Install rear suspension assembly.

WARNING:
A helper is required to perform this work.

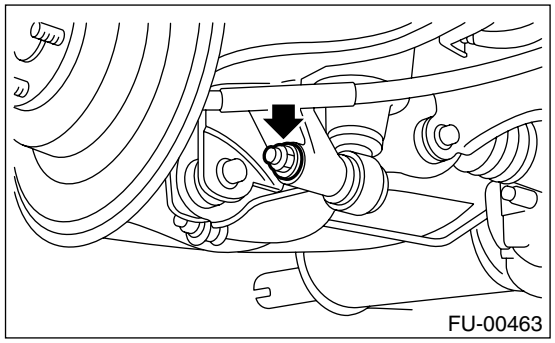
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

Tightening torque:
T1: 172 N·m (17.5 kgf-m, 127 ft-lb)
T2: 108 N·m (11.0 kgf-m, 80 ft-lb)
T3: 66 N·m (6.7 kgf-m, 48 ft-lb)

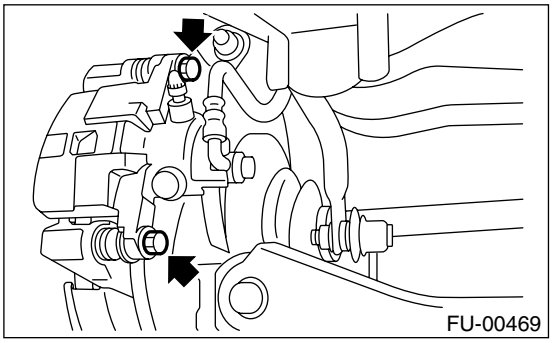


(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)

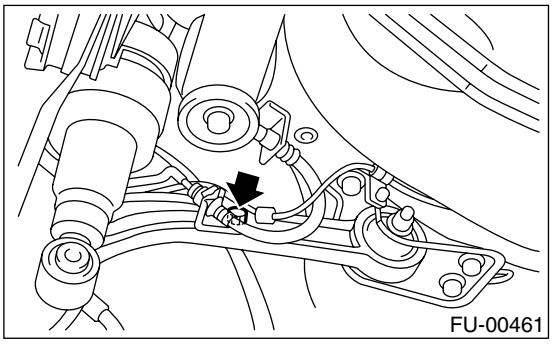


8) Install rear brake caliper. <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



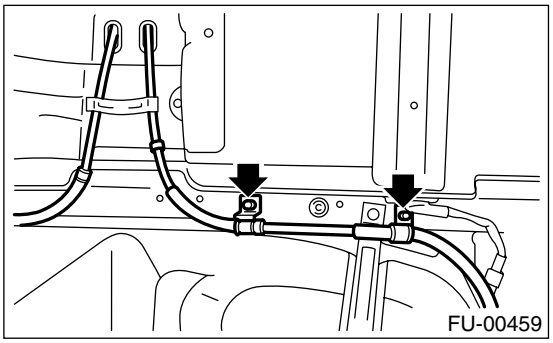
9) Tighten bolts which hold rear brake hoses holding bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

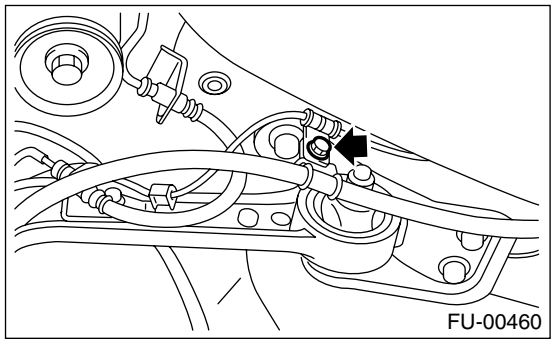


10) Install parking brake cable to cabin by forcibly pushing it forward.
11) Tighten bolts which hold parking brake cable holding bracket.

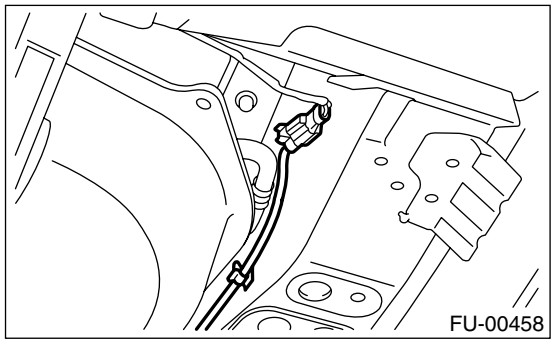
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect connector to ABS sensor.

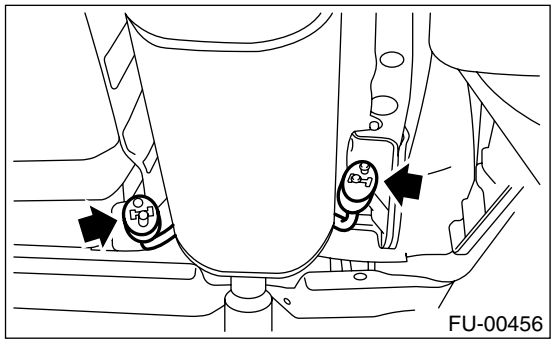


13) Install propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
14) Install rear exhaust pipe and muffler.

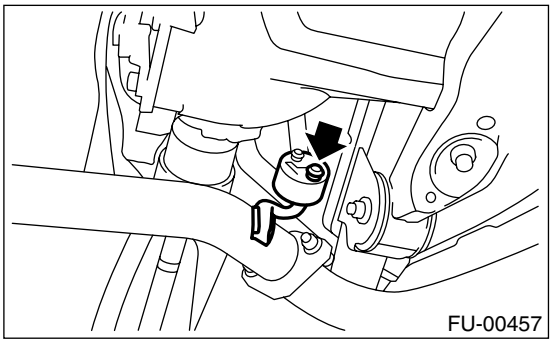
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

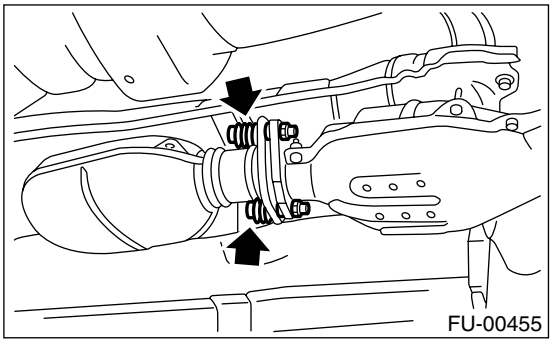


(2) Install front rubber cushion and attach muffler assembly.



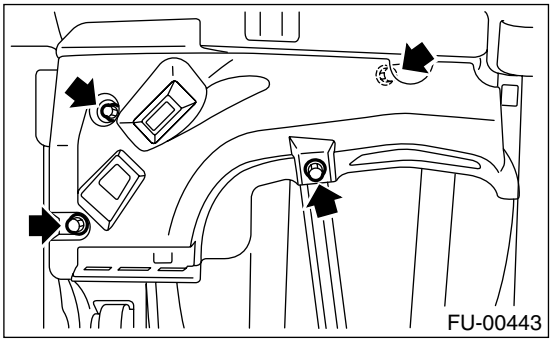
(3) Install rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



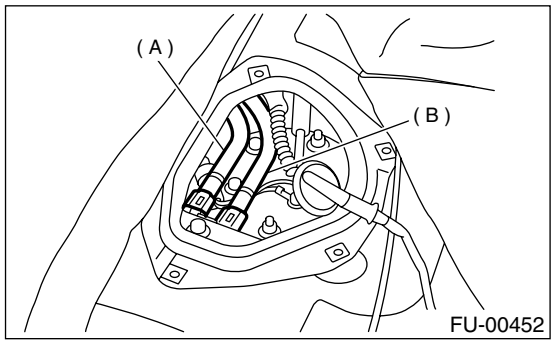
15) Install front side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



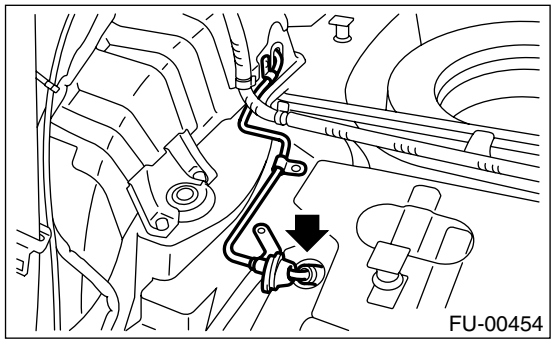
16) Install rear wheel.
17) Lower the vehicle.
18) Tighten wheel nuts to rear wheel.
19) Install parking brake cable. <Ref. to PB-5, INSTALLATION, Parking Brake Lever.>
20) Install console box. <Ref. to EI-45, INSTALLATION, Console Box.>

21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H4SO)-73, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

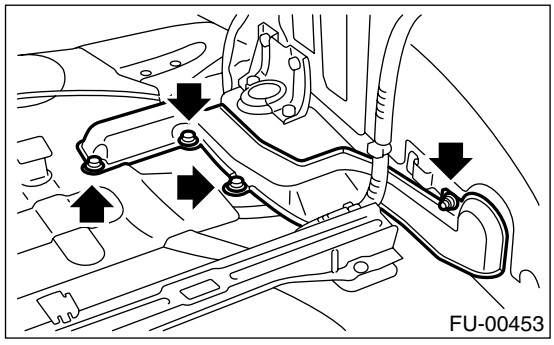


(A) Delivery hose
(B) Return hose

22) Connect evaporation pipe and hold it with quick connector. <Ref. to FU(H4SO)-73, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

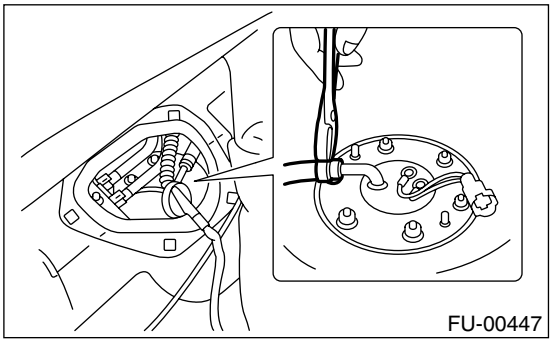


23) Install pipe protector.

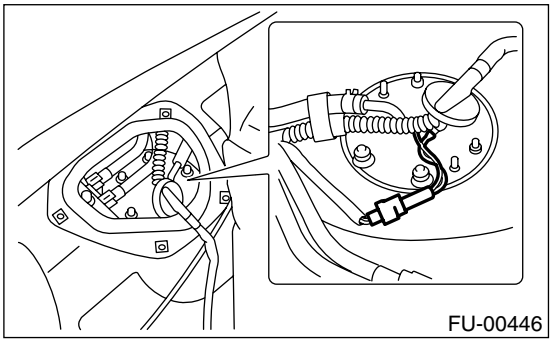


24) Install trunk room trim. (Sedan model)
25) Install luggage room trim. (Wagon model)

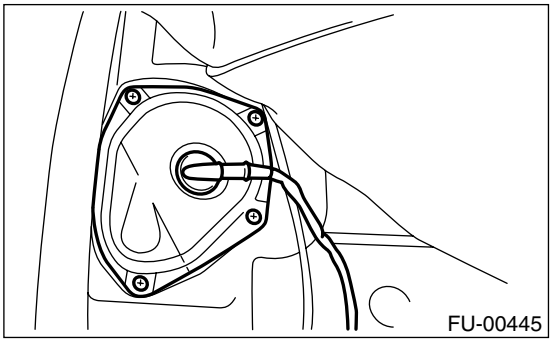
26) Connect fuel jet pump hose.



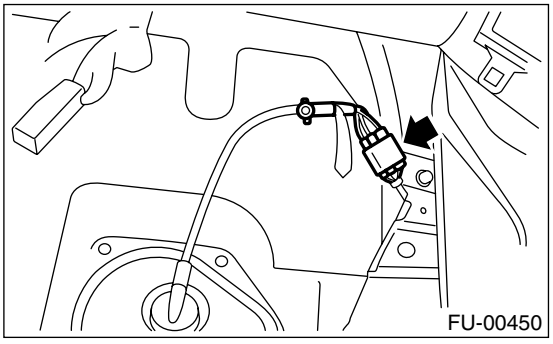
27) Connect connector to fuel sub level sensor.



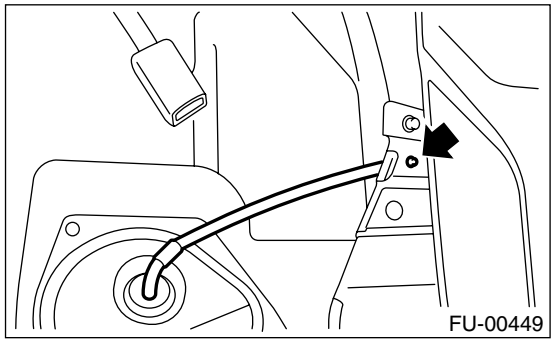
28) Install sub service hole cover.



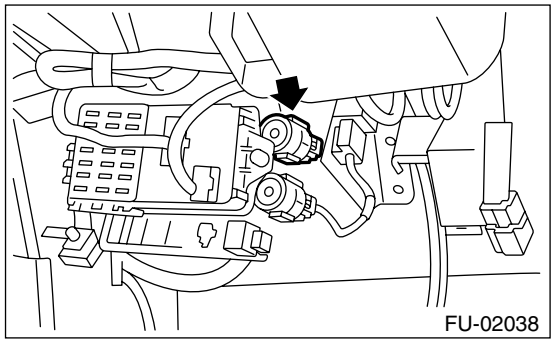
29) Connect connectors to fuel tank cord and plug service hole with grommet.



30) Install holder clip which secures fuel tank cord on bracket.



31) Set rear seat and floor mat.
32) Connect connector to fuel pump relay.



33) Adjust parking brake lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>
34) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

22.Fuel Filler Pipe

A: REMOVAL

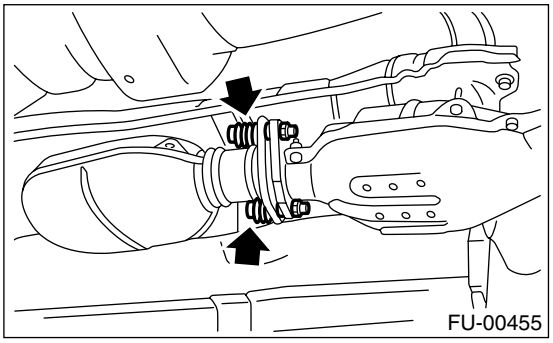
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-48, DRAINING FUEL, OPERATION, Fuel.>
2) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

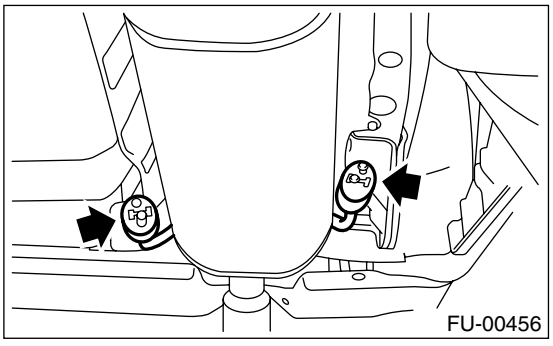
SUBARU CRC (Part No. 004301003)

(1) Separate rear exhaust pipe from center exhaust pipe.

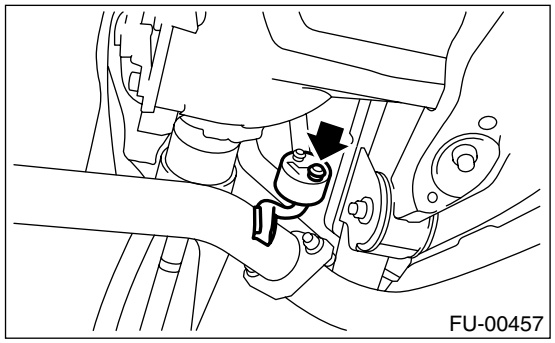

FU-00455

(2) Remove left and right rubber cushions.

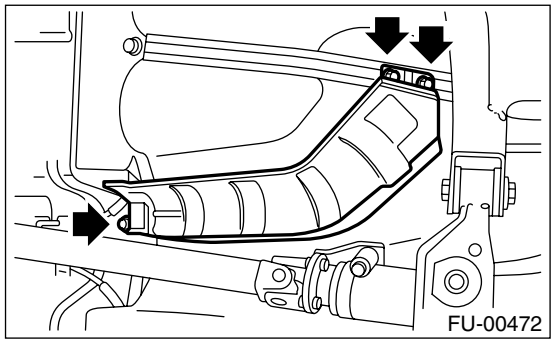
CAUTION:
Be careful not to pull down muffler.


FU-00456

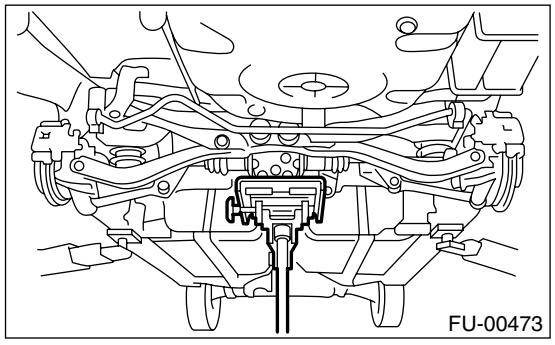
(3) Remove front rubber cushion and detach muffler assembly.


FU-00457

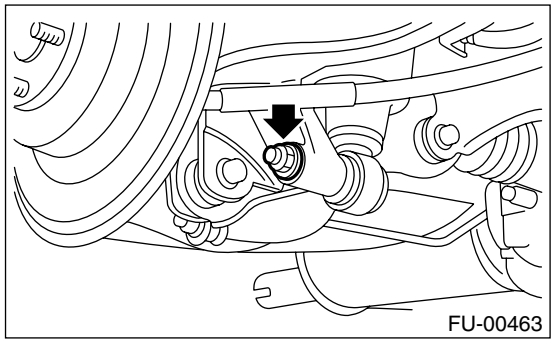
3) Remove heat sealed cover.


FU-00472

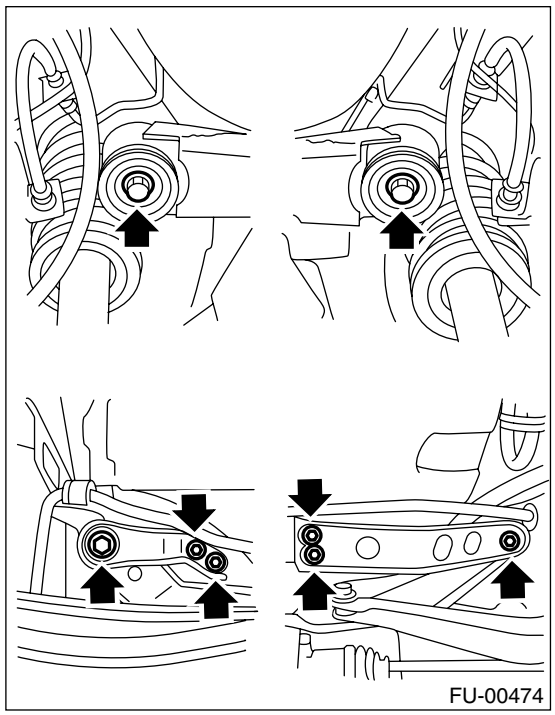
4) Place transmission jack under sub frame.


FU-00473

5) Remove bolt which holds rear shock absorber to rear suspension arm.


FU-00463

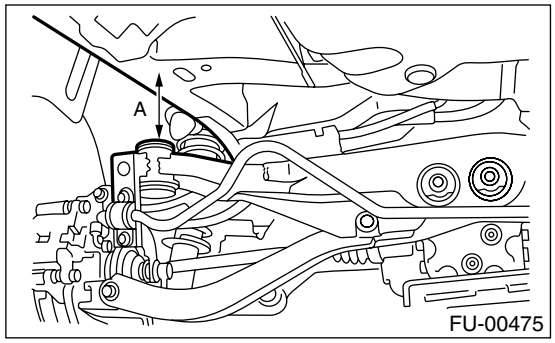
6) Remove bolts which hold rear sub frame on body.



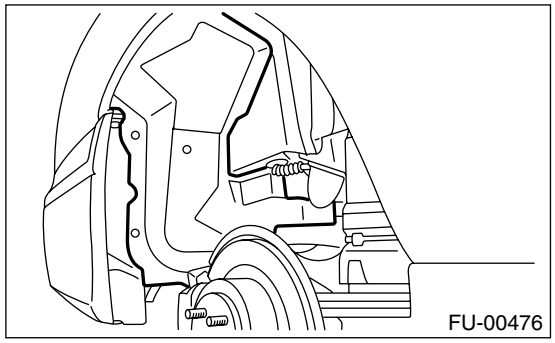
7) Lower the rear sub frame.

CAUTION:
Be sure to lower sub frame slowly.

A = 150 mm (5.91 in)

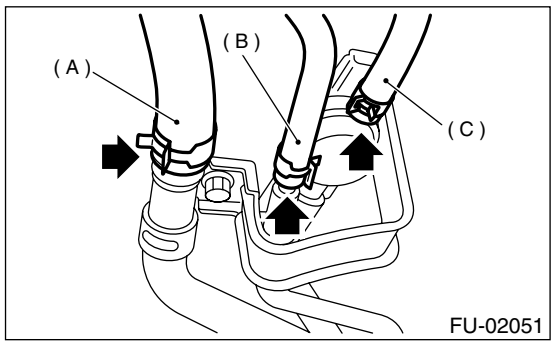


8) Remove fuel filler pipe protector.

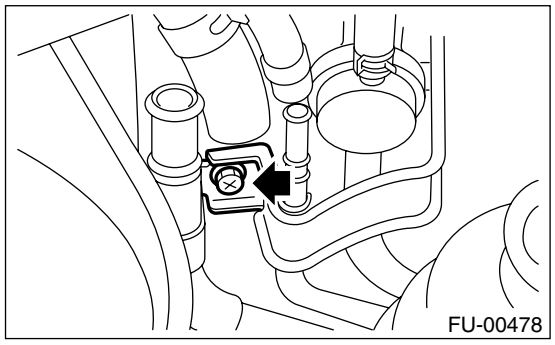


9) Disconnect air vent hose (A) and evaporation hose (B) from evaporation pipe assembly.

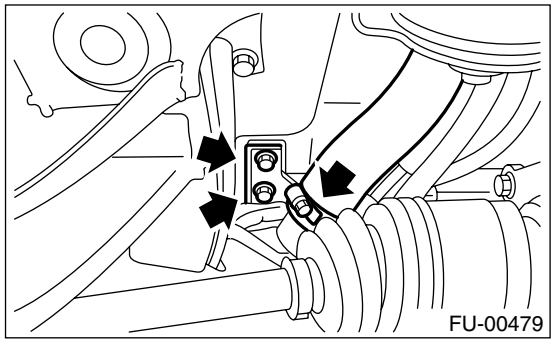
10) Disconnect evaporation hose (C) from pressure control solenoid valve.



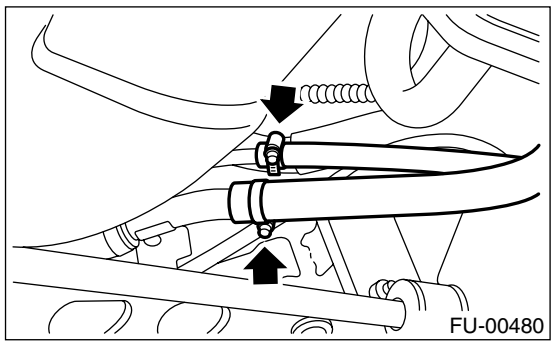
11) Remove bolt which holds evaporation pipe assembly on body.



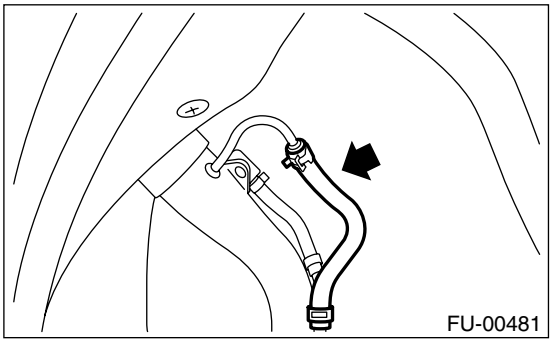
12) Disconnect fuel filler hose.
13) Remove bolt which holds fuel pressure sensor on fuel filler pipe and remove bolt which holds fuel filler pipe on body.



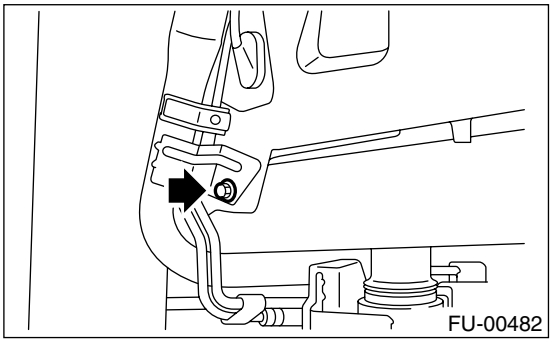
14) Disconnect canister hose from evaporation pipe assembly.



15) Disconnect evaporation hose (O) from fuel filler pipe.



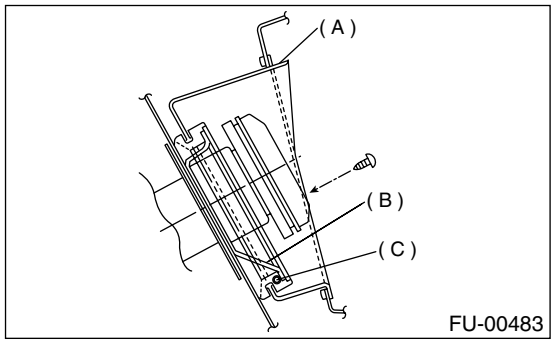
16) Remove bolt which holds fuel filler pipe to body.



17) Remove fuel filler pipe from under side of the vehicle.

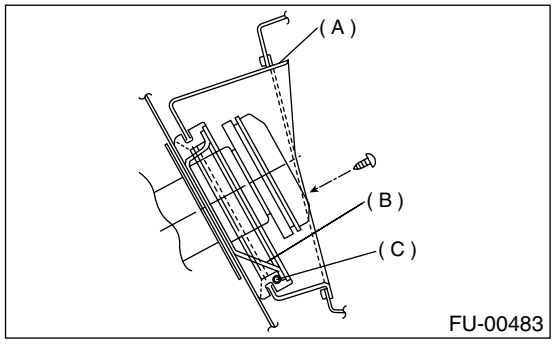
B: INSTALLATION

1) Hold fuel filler flap open.
2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



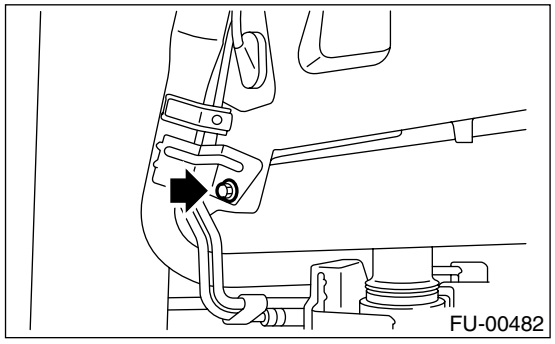
3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.

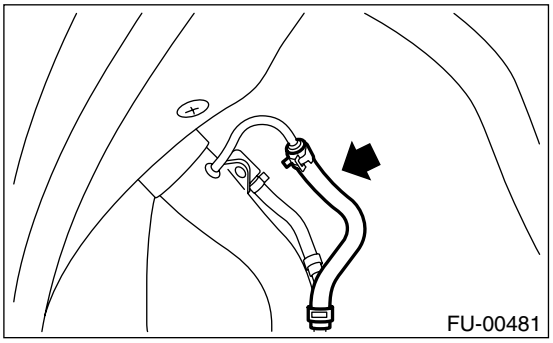


4) Tighten bolt which holds fuel filler pipe on body.

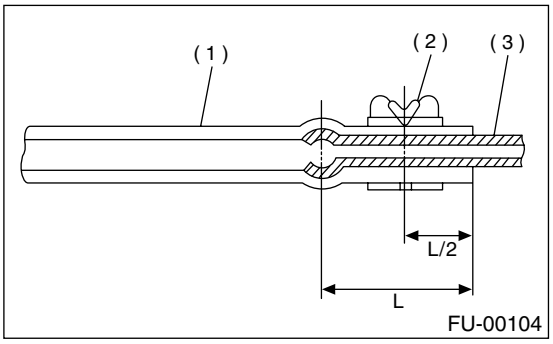
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



5) Insert evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold clip.

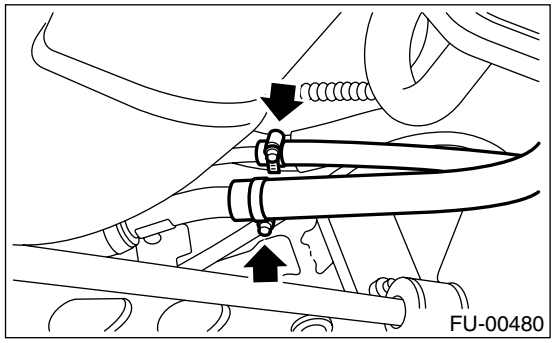


L = 27.5±2.5 mm (1.083±0.098 in)

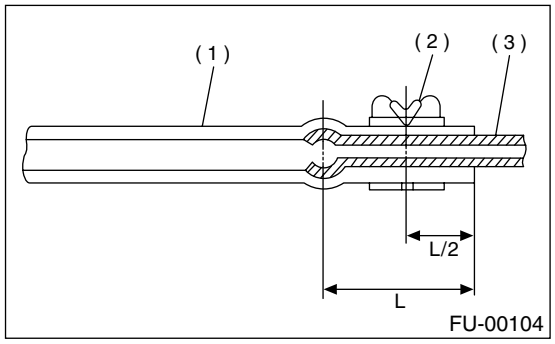


(1) Hose
(2) Clip
(3) Pipe

6) Insert canister hoses approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and tighten clamp.



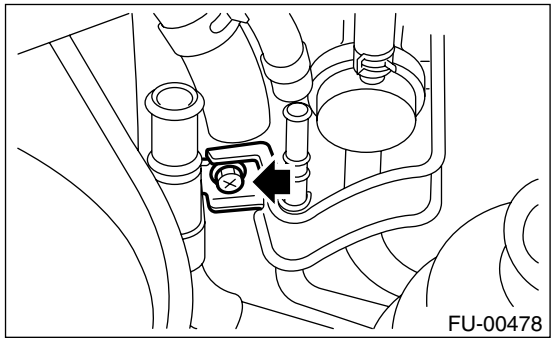
L = 27.5±2.5 mm (1.083±0.098 in)



(1) Hose
(2) Clip
(3) Pipe

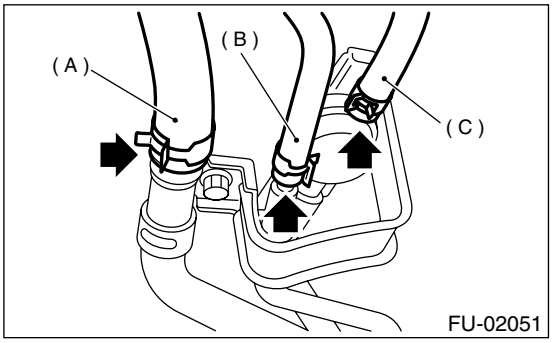
7) Tighten bolt which holds evaporation pipe assembly on body.

Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

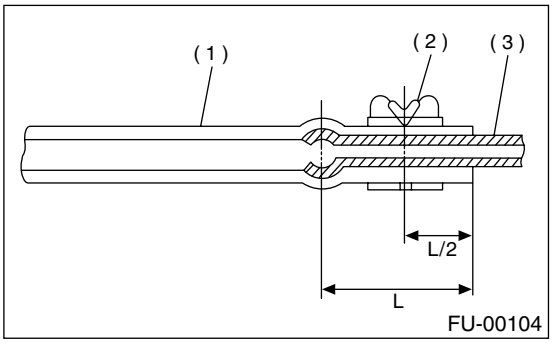


8) Insert air vent hose (A), evaporation hose (B) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and hold clip.

9) Insert evaporation hose (C) to pressure control solenoid valve and hold clip.



L = 27.5±2.5 mm (1.083±0.098 in)

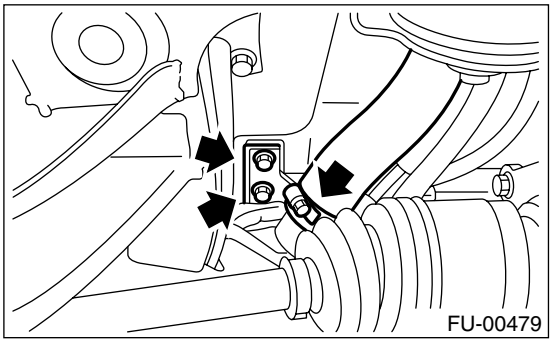


(1) Hose
(2) Clip
(3) Pipe

10) Tighten bolt which holds fuel filler pipe on body and tighten bolt which holds fuel pressure sensor on fuel filler pipe.

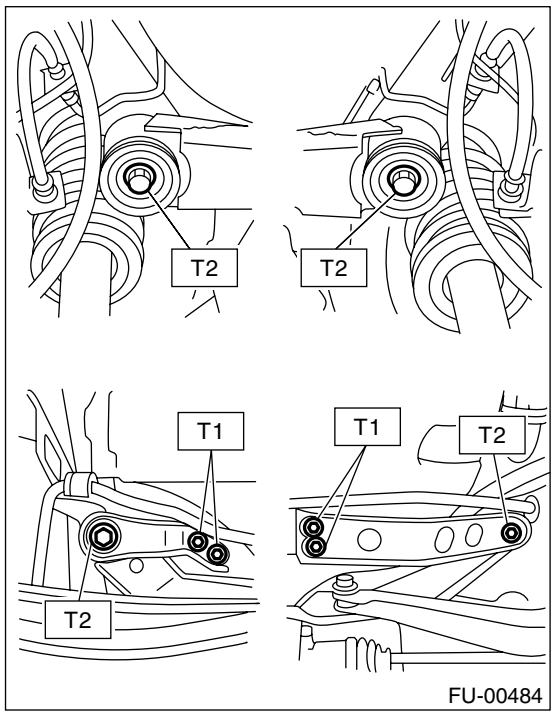
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

11) Insert fuel filler hose approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten clamp.



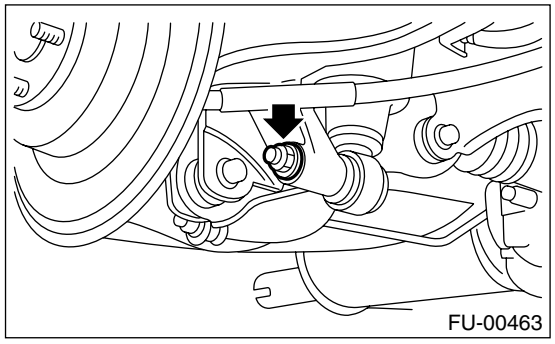
12) Jack-up the rear sub frame and tighten bolts which hold rear sub frame on body.

Tightening torque:
T1: 66 N·m (6.7 kgf-m, 48.5 ft-lb)
T2: 172 N·m (17.5 kgf-m, 127 ft-lb)

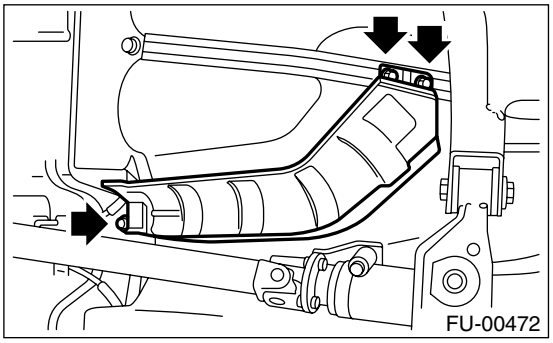


13) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-17, INSTALLATION, Rear Shock Absorber.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)



14) Install heat shield cover.

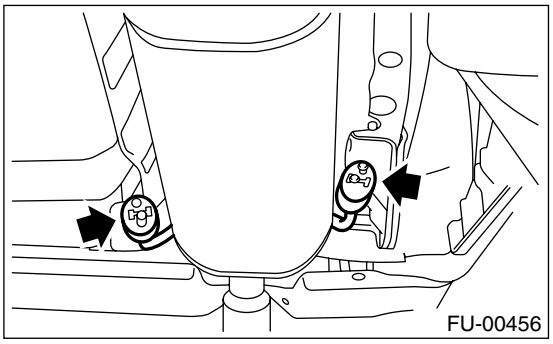


15) Install rear exhaust pipe and muffler.

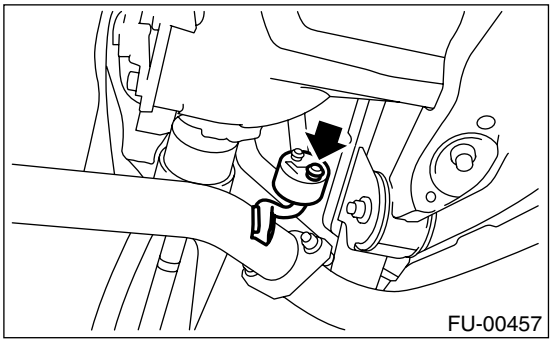
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

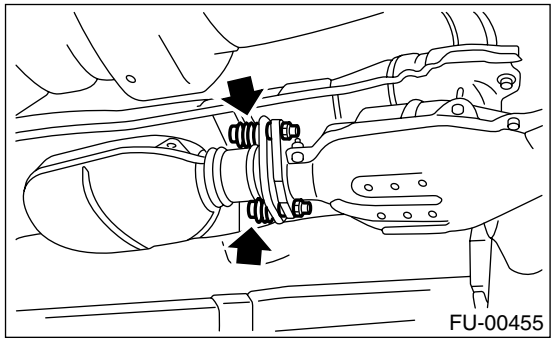


(2) Install front rubber cushion and attach muffler assembly.

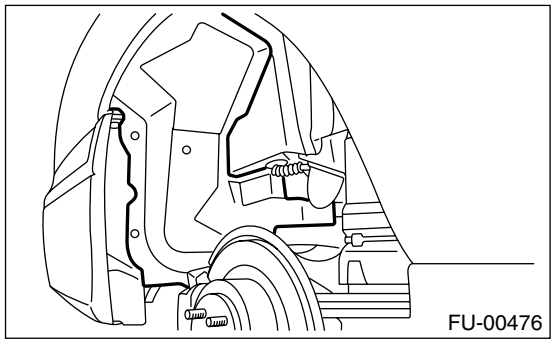


(3) Install rear exhaust pipe to center exhaust pipe.

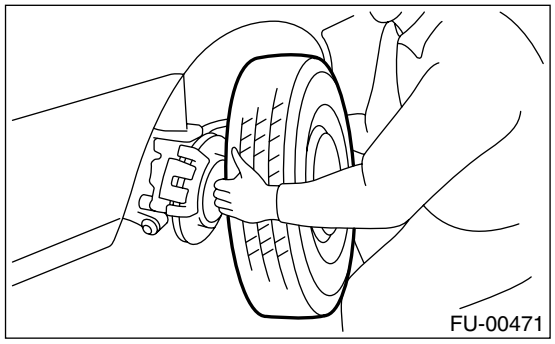
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



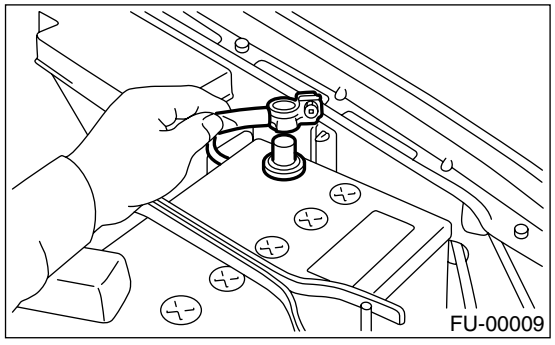
16) Install fuel filler pipe protector.



17) Install rear right wheel.



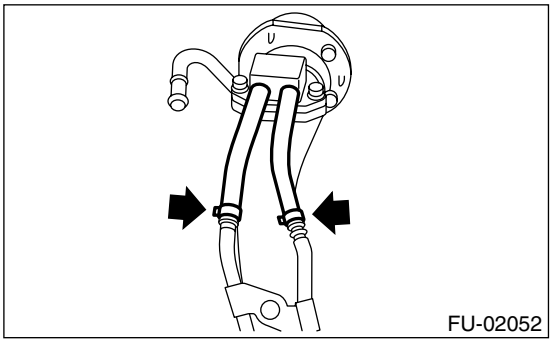
18) Lower the vehicle.
19) Tighten wheel nuts.
20) Connect battery ground cable.



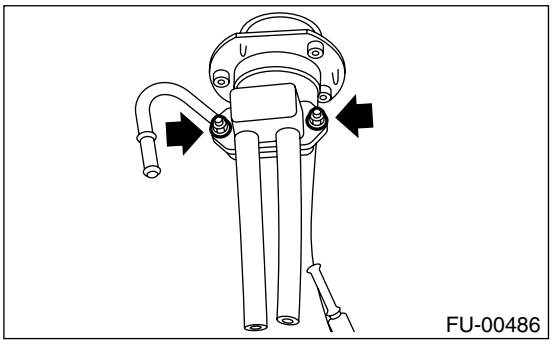
21) Remove fuel filler pipe to under side of the vehicle.

C: DISASSEMBLY

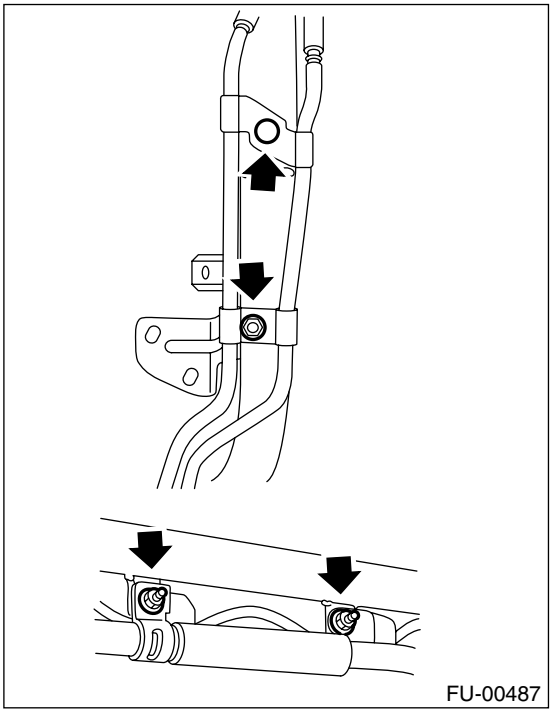
1) Disconnect evaporation hose from evaporation pipe assembly.



2) Remove shut valve from fuel filler pipe.



3) Remove nut which holds evaporation pipe assembly on fuel filler pipe.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

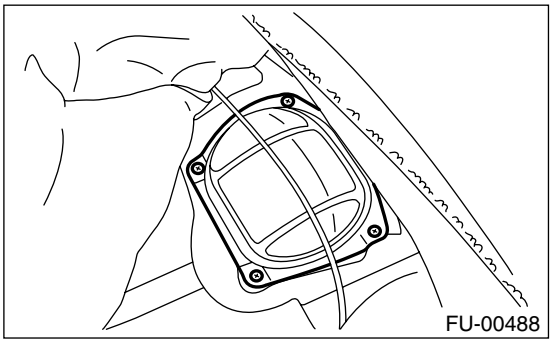
23.Fuel Pump

A: REMOVAL

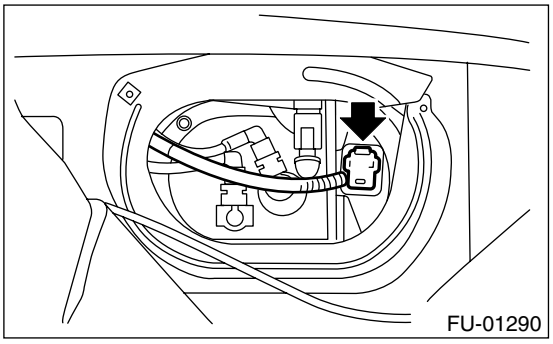
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

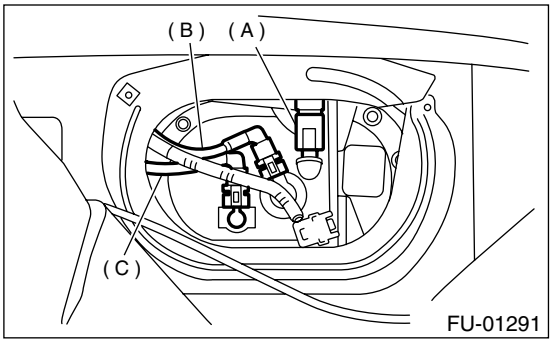
1) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-48, DRAINING FUEL, OPERATION, Fuel.>
3) Raise rear seat and turn floor mat up.
4) Remove access hole lid.


FU-00488

5) Disconnect connector from fuel pump.

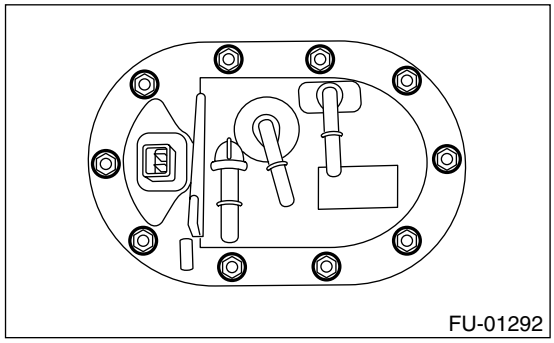

FU-01290

6) Disconnect quick connector and then disconnect fuel delivery hose (A) and return hose (B). <Ref. to FU(H4SO)-72, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



FU-01291

7) Remove nuts which install fuel pump assembly onto fuel tank.

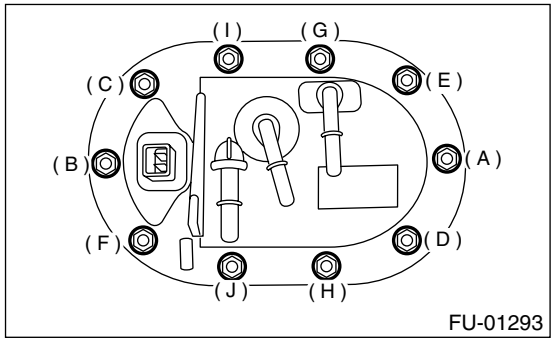

FU-01292

8) Take off fuel pump assembly from fuel tank.

B: INSTALLATION

Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

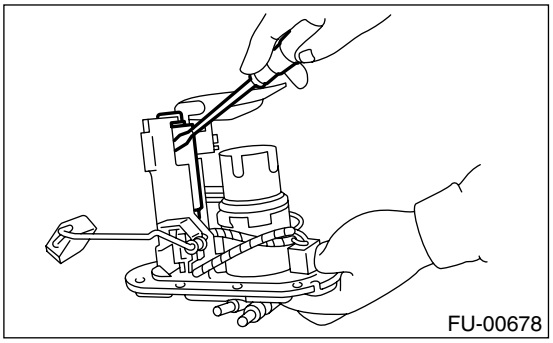


FU-01293

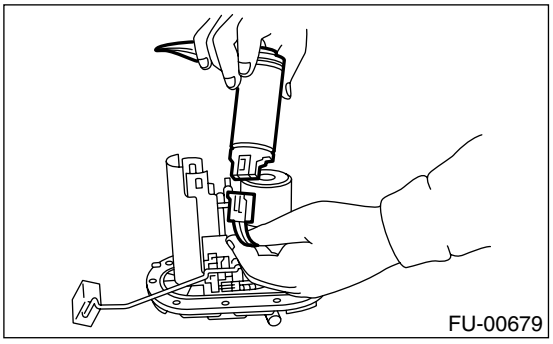
C: DISASSEMBLY

1) Remove fuel pump and pump holder.

NOTE:
When disassembling pump holder, be careful as it is installed with two pawls.



2) Disconnect connector from fuel pump.



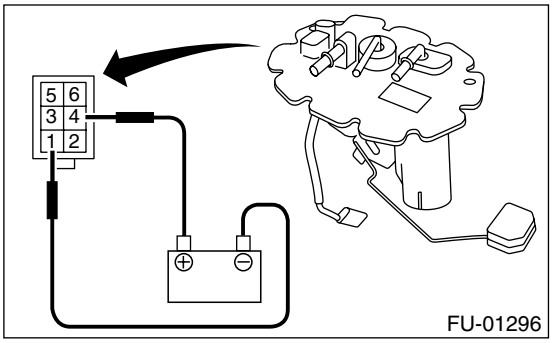
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

Connect lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

WARNING:
• Wipe off the fuel completely.
• Keep battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on the battery side.
• Do not run fuel pump for a long time under non-load condition.



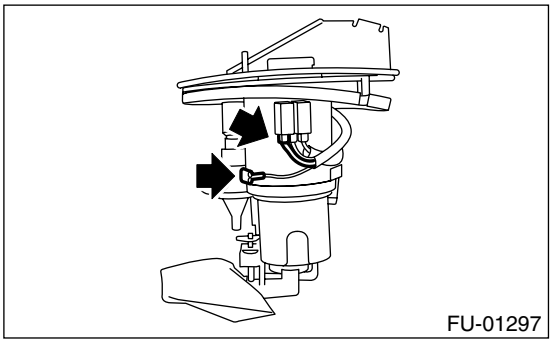
24.Fuel Level Sensor

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

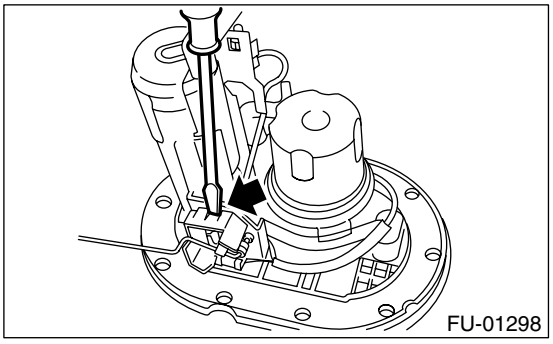
NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H4SO)-66, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.


FU-01297

3) Pushing the pawls with a screwdriver, remove fuel level sensor by pulling it downwards.

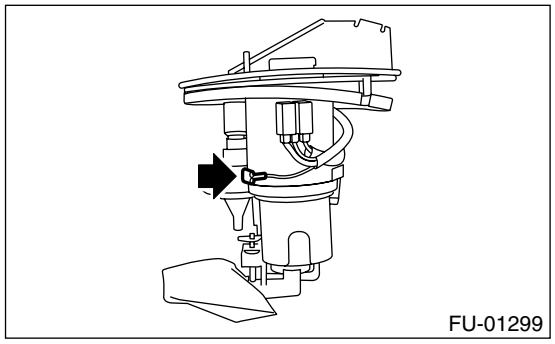
NOTE:
If the retainer pawls are broken during removal, the fuel level sensor must be replaced with a new one.


FU-01298

B: INSTALLATION

Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**

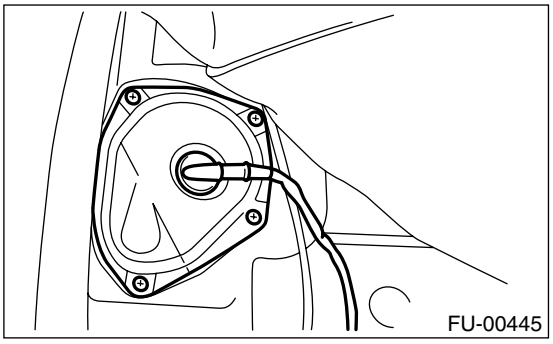

FU-01299

25.Fuel Sub Level Sensor

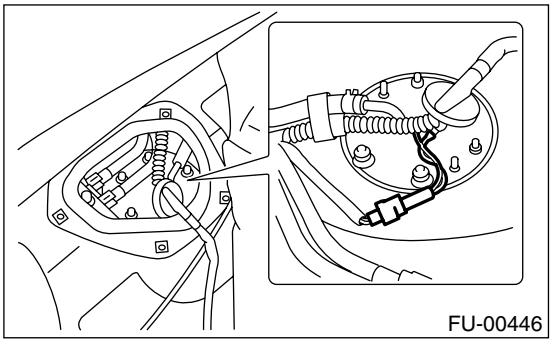
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

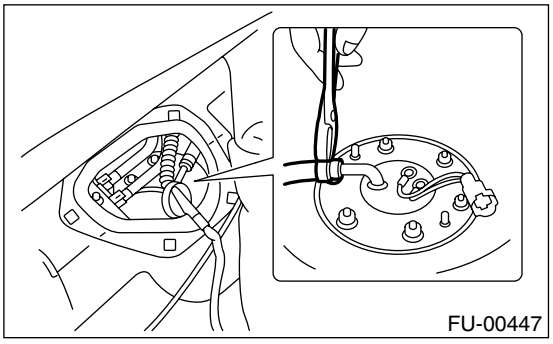
1) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-48, DRAINING FUEL, OPERATION, Fuel.>
2) Raise rear seat and turn floor mat up. (Wagon model)
3) Remove rear seat. (Sedan model)
4) Remove service hole cover.


FU-00445

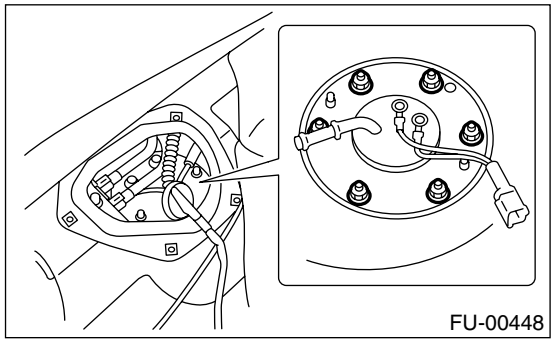
5) Disconnect connector from fuel sub level sensor.


FU-00446

6) Disconnect fuel jet pump hose.


FU-00447

7) Remove bolts which install fuel sub level sensor on fuel tank.

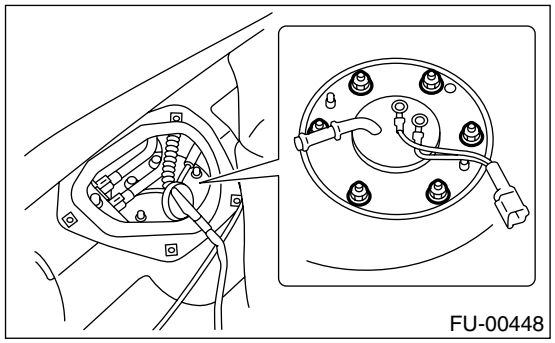

FU-00448

8) Remove fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)


FU-00448

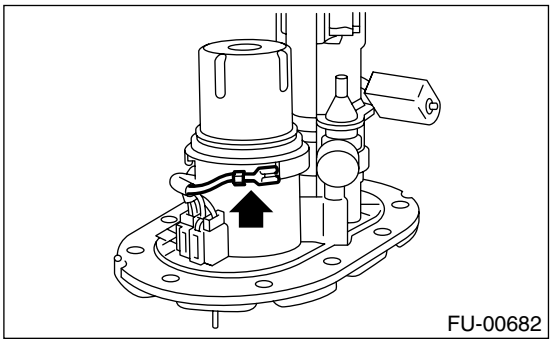
26.Fuel Filter

A: REMOVAL

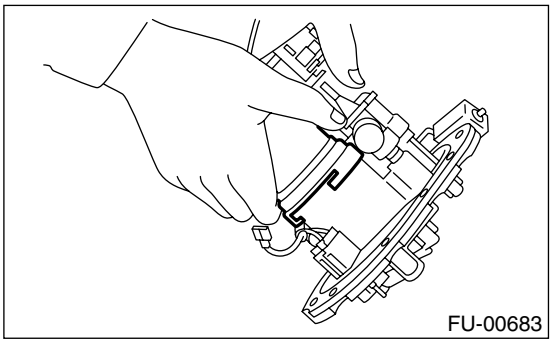
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel filter is built in fuel pump assembly.

1) Release the fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel pump assembly. <Ref. to FU(H4SO)-66, REMOVAL, Fuel Pump.>
3) Disconnect the ground cable from filter holder.


FU-00682

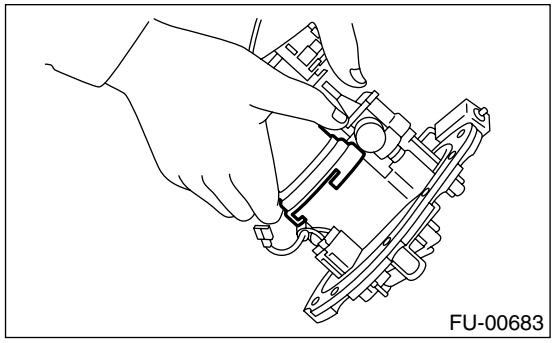
4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.


FU-00683

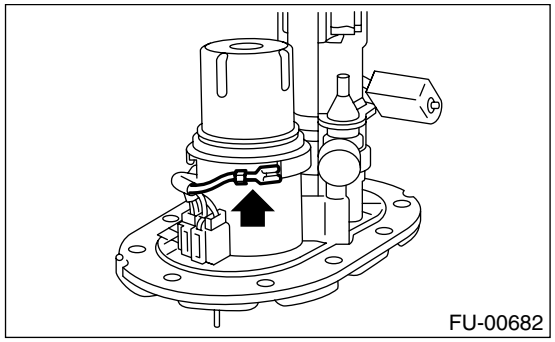
B: INSTALLATION

NOTE:
- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

1) Set the O-ring on the filter holder, and then install by turning to the right.


FU-00683

2) Connect the ground cable to filter holder.


FU-00682

3) Install the fuel pump assembly. <Ref. to FU(H4SO)-66, INSTALLATION, Fuel Pump.>

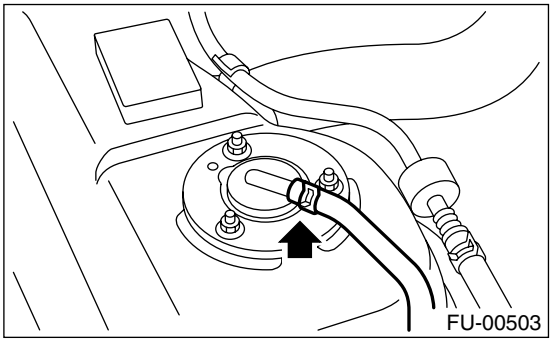
C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.

27.Fuel Cut Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H4SO)-51, REMOVAL, Fuel Tank.>
2) Move clip and disconnect evaporation hose from fuel cut valve.

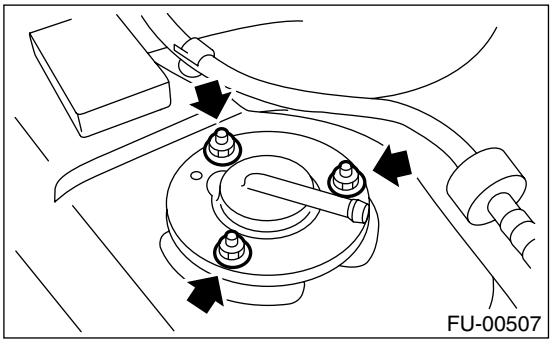


3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

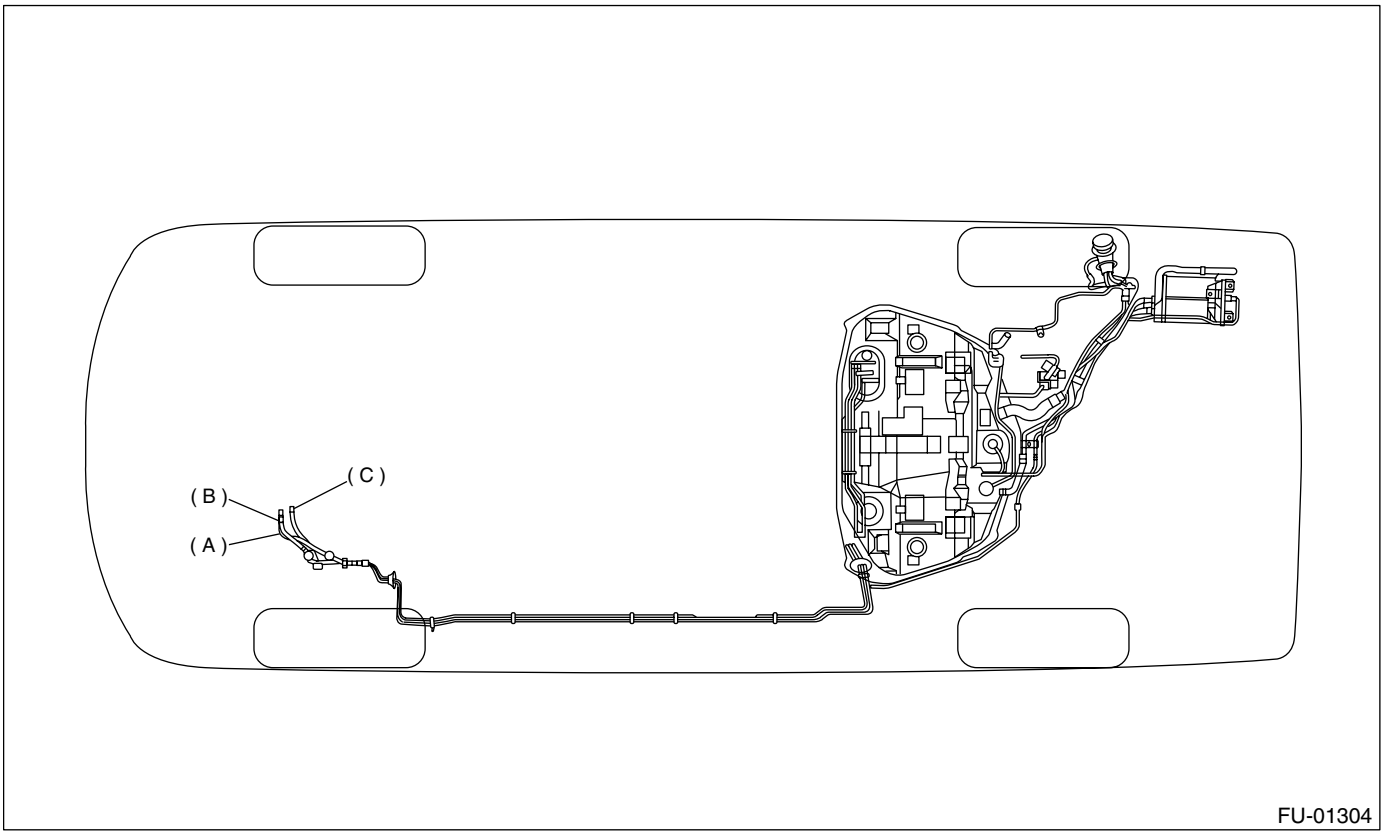
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



28.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open fuel filler flap lid and remove fuel filler cap.
4) Remove fuel tank. <Ref. to FU(H4SO)-51, REMOVAL, Fuel Tank.>
5) Remove fuel filler pipe. <Ref. to FU(H4SO)-59, REMOVAL, Fuel Filler Pipe.>
6) Remove floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
7) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

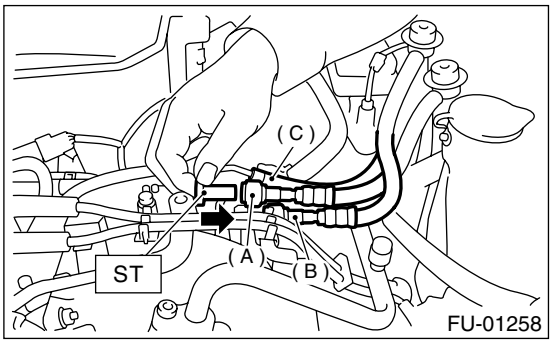


(A) Fuel delivery line
(B) Fuel return line
(C) Evaporation line

8) In engine room, detach fuel delivery hoses, return hoses and evaporation hose.

(1) Separate quick connector of fuel delivery line and return line by pushing an ST in the direction of the arrow.

(2) Remove clips, and then separate evaporation hose from pipe.



(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

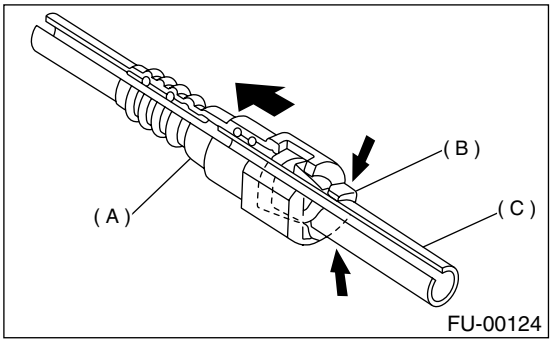
9) Separate quick connector on fuel delivery and return line.

(1) Clean pipe and connector, if they are covered with dust.

(2) Hold connector (A) and push retainer (B) down.

(3) Pull out connector (A) from retainer (B).

CAUTION:
Replace retainer with new ones.

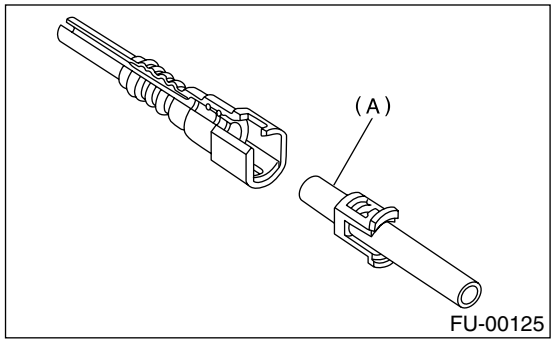


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

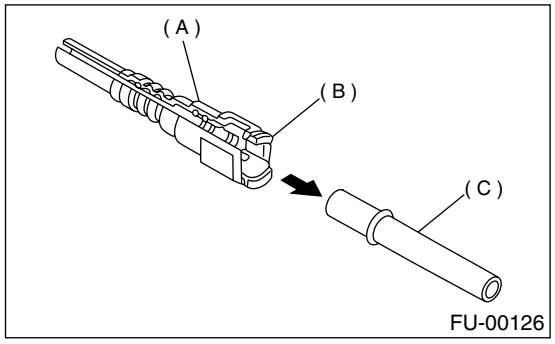
1) Connect quick connector on fuel delivery and return line.

CAUTION:
- **Always use a new retainer.**
- **Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface (A) of pipe.**



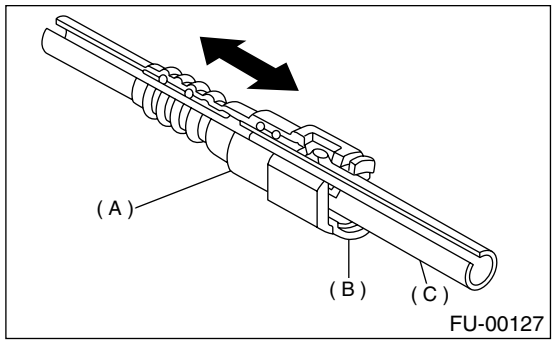
(1) Set new retainer (B) to connector (A).
(2) Push pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.
• Be sure to inspect hoses and their connections for any leakage of fuel.

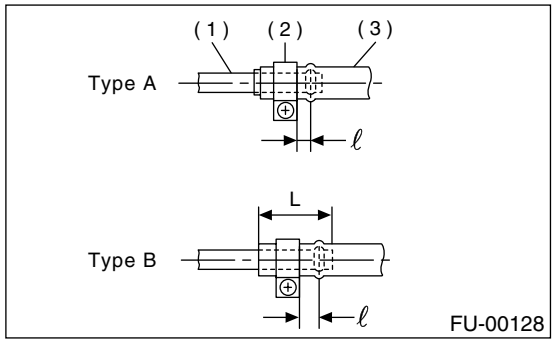


(A) Connector
(B) Retainer
(C) Pipe

2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When insertion length is specified.
Type B: When insertion length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

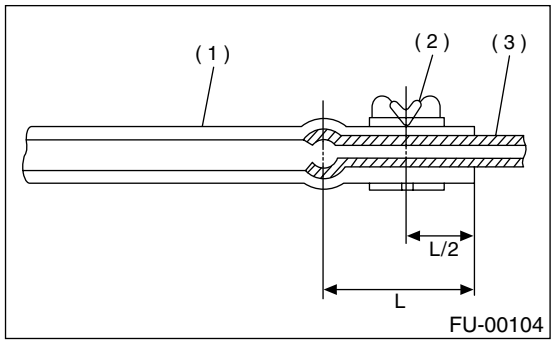


(1) Pipe
(2) Clamp
(3) Hose

3) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

29.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel level indicator		
1)	Defective operation of fuel level sensor.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation.
(1) Top off the fuel tank or drain the fuel completely.
(2) Drain water condensation from the fuel filter.
• Refilling the fuel tank.
Refill the fuel tank while there is still some fuel left in the tank.
• Protecting the fuel system against freezing and water condensation.
(1) Cold areas
In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the fuel tank. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under damaged areas below.
(2) Damaged areas
If water accumulated in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.
• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

MEMO:

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H4SO)

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3.	Rear Catalytic Converter	4
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7.	Main Fuel Level Sensor	8
8.	Fuel Temperature Sensor	9
9.	Sub Fuel Level Sensor	10
10.	Fuel Tank Pressure Sensor	11
11.	Fuel Tank Sensor Control Valve	12
12.	Pressure Control Solenoid Valve	13
13.	Drain Filter	14
14.	Vent Valve	15
15.	Shut Valve	16
16.	Drain Valve	17

1. General Description

A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Front Catalytic Converter

A: REMOVAL

1. EXCEPT U5 MODEL

Front catalyst is built in center exhaust pipe. Therefore, the removal procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, REMOVAL, Center Exhaust Pipe.>

2. U5 MODEL

Front catalyst is built in front exhaust pipe. Therefore, the removal procedure is the same as that for the front exhaust pipe. <Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

1. EXCEPT U5 MODEL

Front catalyst is built in center exhaust pipe. Therefore, the installation procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, INSTALLATION, Center Exhaust Pipe.>

2. U5 MODEL

Front catalyst is built in front exhaust pipe. Therefore, the installation procedure is the same as that for the front exhaust pipe. <Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1. EXCEPT U5 MODEL

Rear catalyst is built in center exhaust pipe. Therefore, the removal procedure is the same as that for the center exhaust pipe. <Ref. to EX(H4SO)-8, REMOVAL, Center Exhaust Pipe.>

2. U5 MODEL

Rear catalyst is built in front exhaust pipe. Therefore, the removal procedure is the same as that for the front exhaust pipe. <Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

1. EXCEPT U5 MODEL

Rear catalyst is built in center exhaust pipe. Therefore, the installation procedure is the same as that for the center exhaust pipe.<Ref. to EX(H4SO)-8, INSTALLATION, Center Exhaust Pipe.>

2. U5 MODEL

Rear catalyst is built in front exhaust pipe. Therefore, the installation procedure is the same as that for the front exhaust pipe. <Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>

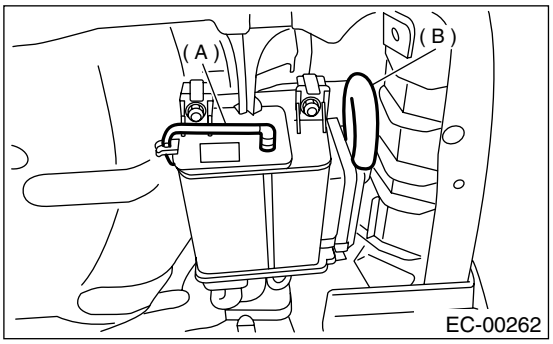
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

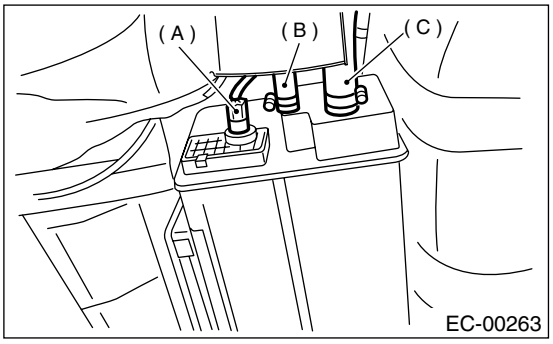
4. Canister

A: REMOVAL

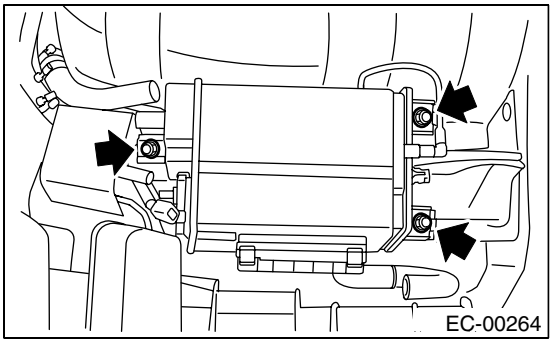
1) Lift-up the vehicle.
2) Disconnect connector (A) from drain valve.
3) Disconnect evaporation hoses (B) and (C) from canister.



4) Disconnect quick connector (A) from canister.
5) Disconnect evaporation hoses (B) and (C) from canister.



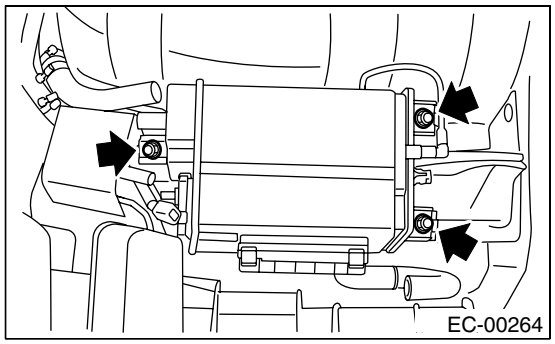
6) Remove the canister from vehicle.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

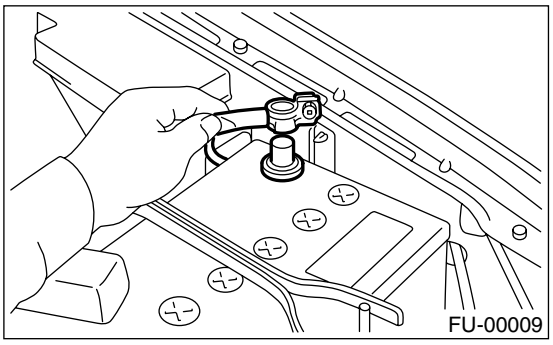
Make sure the canister and canister hoses are not cracked or loose.

5. Purge Control Solenoid Valve

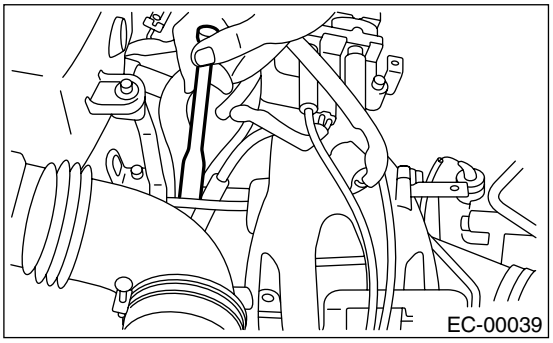
A: REMOVAL

1. EXCEPT U5 MODEL

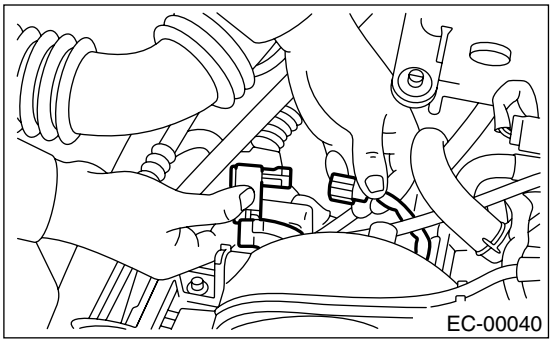
1) Disconnect battery ground cable.



2) Remove bolt which installs purge control solenoid valve onto intake manifold.

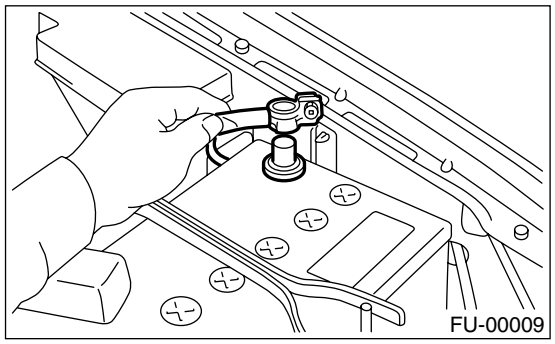


3) Take out purge control solenoid valve through the bottom of the intake manifold.
4) Disconnect connector and hoses from purge control solenoid valve.

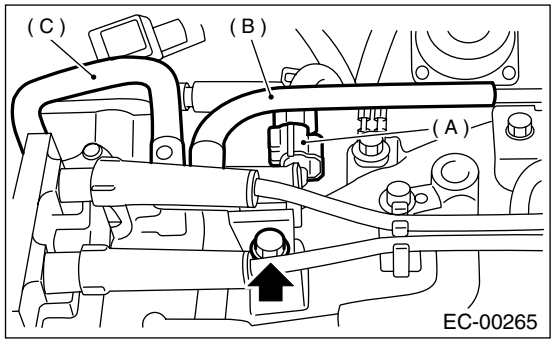


2. U5 MODEL

1) Disconnect battery ground cable.



2) Disconnect connector (A) from purge control solenoid valve.
3) Disconnect evaporation hoses (B) and (C), and remove purge control solenoid valve.

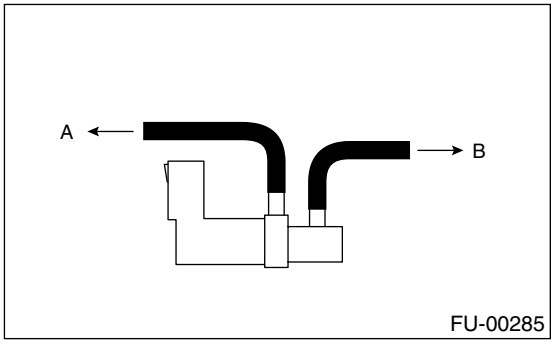


B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

CAUTION:
Connect the evaporation hoses as shown in the illustration.



(A) To fuel pipe
(B) To intake manifold

C: INSPECTION

Make sure hoses are not cracked or loose.

6. EGR Valve

A: REMOVAL

For work procedures, refer to “FU(H4SO)” section. <Ref. to FU(H4SO)-37, REMOVAL, EGR Valve.>

B: INSTALLATION

For work procedures, refer to “FU(H4SOH4SO)” section. <Ref. to FU(H4SO)-37, INSTALLATION, EGR Valve.>

7. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to “FU(H4SO)” section. <Ref. to FU(H4SO)-68, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For work procedures, refer to “FU(H4SO)” section. <Ref. to FU(H4SO)-68, INSTALLATION, Fuel Level Sensor.>

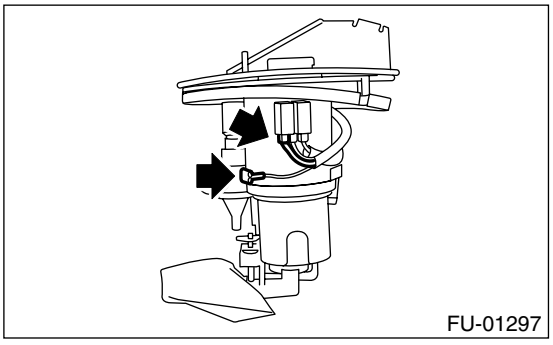
8. Fuel Temperature Sensor

A: REMOVAL

WARNING:
During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.

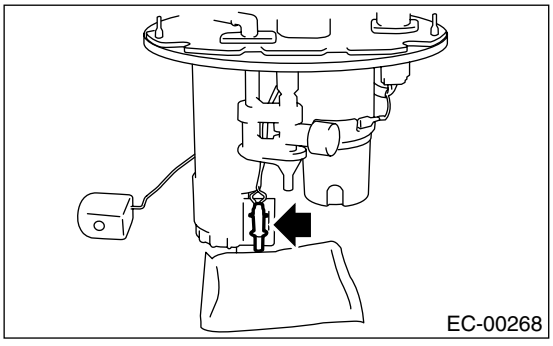
NOTE:
Fuel temperature sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H4SO)-66, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.



3) Remove fuel temperature sensor.

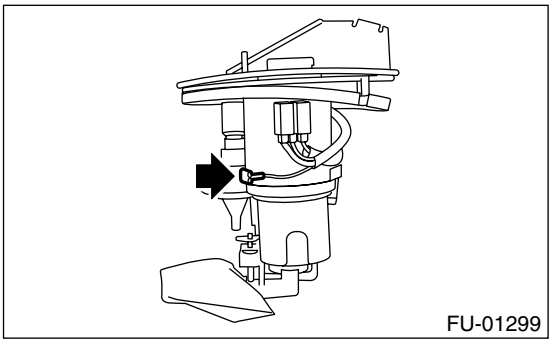
NOTE:
When replacing fuel temperature sensor, also replace fuel level sensor. <Ref. to FU(H4SO)-68, REMOVAL, Fuel Level Sensor.>



B: INSTALLATION

1) Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**



9. Sub Fuel Level Sensor

A: REMOVAL

For work procedures, refer to “FU(H4SO)” section.
<Ref. to FU(H4SO)-69, REMOVAL, Fuel Sub Level Sensor.>

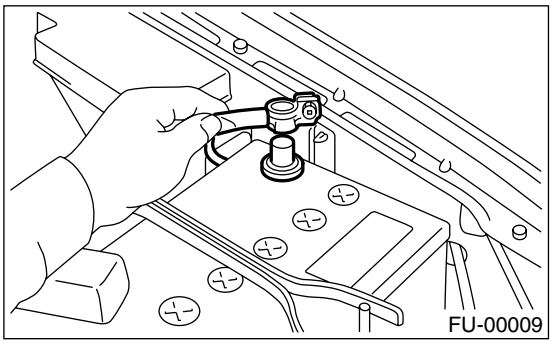
B: INSTALLATION

For work procedures, refer to “FU(H4SO)” section.
<Ref. to FU(H4SO)-69, INSTALLATION, Fuel Sub Level Sensor.>

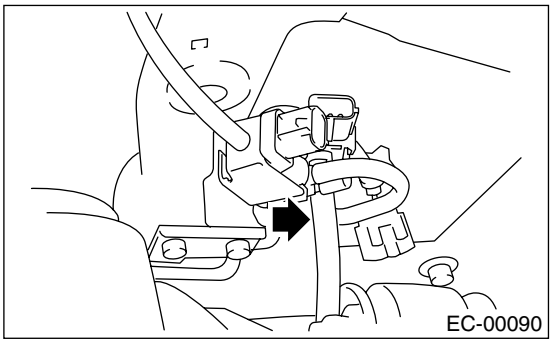
10.Fuel Tank Pressure Sensor

A: REMOVAL

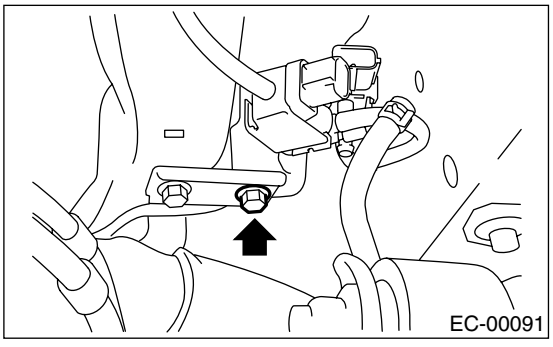
1) Set the vehicle on the lift.
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



4) Lift-up the vehicle.
5) Disconnect connector from fuel tank pressure sensor and fuel tank sensor control valve.
6) Disconnect pressure hose from fuel tank pressure sensor.

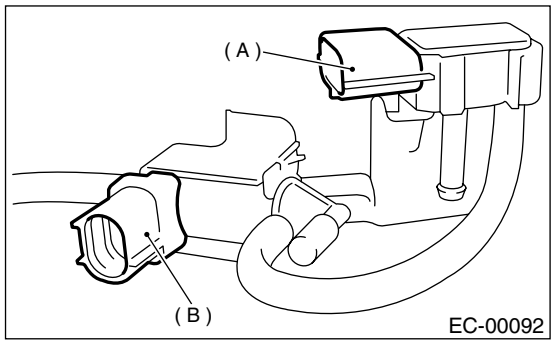


7) Remove fuel tank pressure sensor and fuel tank sensor control valve with bracket.



8) Remove fuel tank sensor control valve from bracket.

NOTE:
Fuel tank pressure sensor cannot be removed because it is integral with bracket.

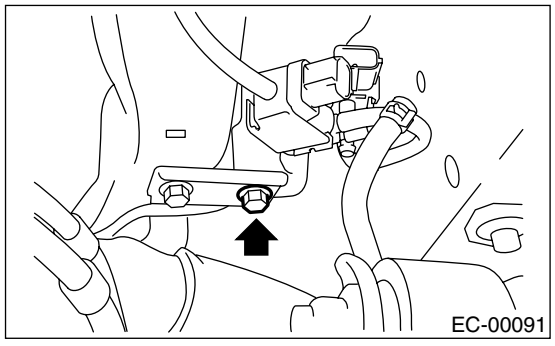


(A) Fuel tank pressure sensor
(B) Fuel tank sensor control valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



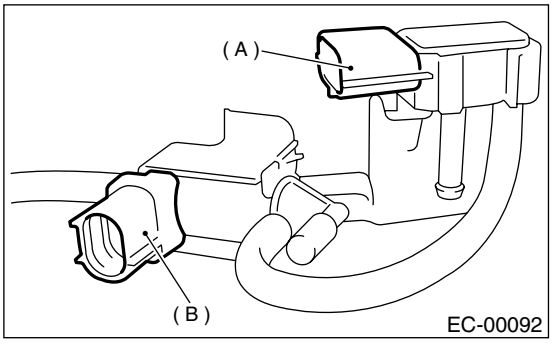
C: INSPECTION

Make sure that hoses are not cracked or loose.

11.Fuel Tank Sensor Control Valve

A: REMOVAL

1) Remove fuel tank pressure sensor. <Ref. to EC(H4SO)-11, REMOVAL, Fuel Tank Pressure Sensor.>
2) Remove fuel tank sensor control valve from bracket.



(1) Fuel tank pressure sensor
(2) Fuel tank sensor control valve

B: INSTALLATION

Install in the reverse order of removal.

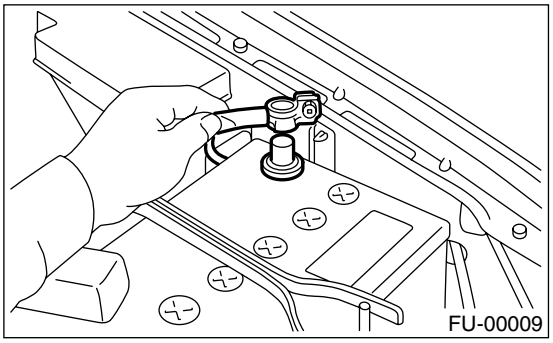
C: INSPECTION

Make sure that hoses are not cracked or loose.

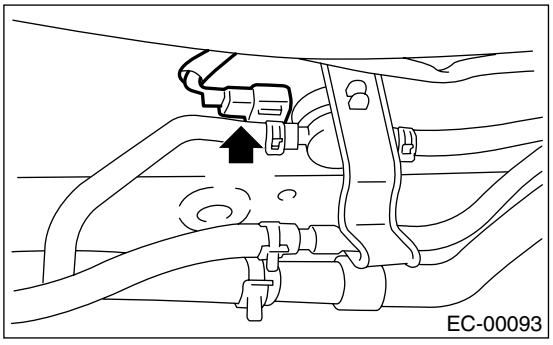
12.Pressure Control Solenoid Valve

A: REMOVAL

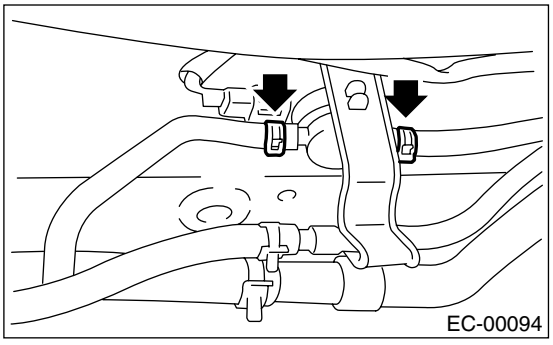
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



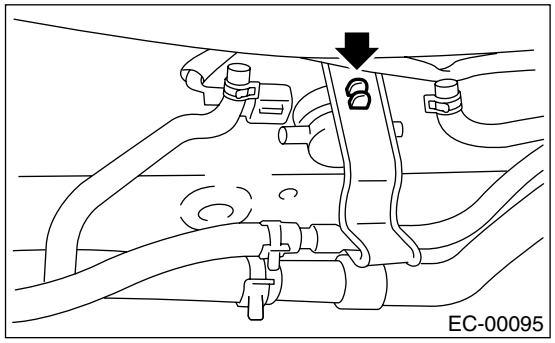
3) Lift-up the vehicle.
4) Disconnect connector from pressure control solenoid valve.



5) Disconnect two evaporation hoses from pressure control solenoid valve.



6) Remove pressure control solenoid valve from bracket.



B: INSTALLTION

Install in the reverse order of removal.

C: INSPECTION

Make sure that hoses are not cracked or loose.

13.Drain Filter

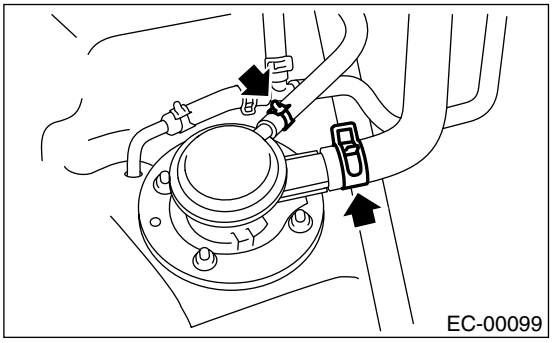
A: SPECIFICATIONS

Drain filter is built in the canister, and it is a part which cannot be disassembled.

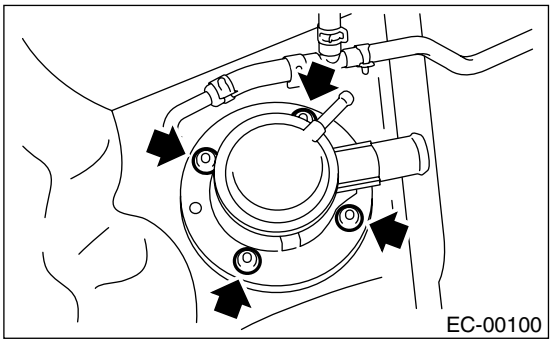
14.Vent Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H4SO)-51, REMOVAL, Fuel Tank.>
2) Move clips, and disconnect hoses from vent valve.



3) Remove nuts which install vent valve on fuel tank.

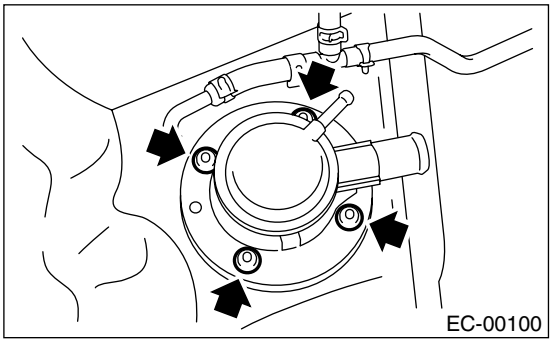


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace rubber seat with a new one.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



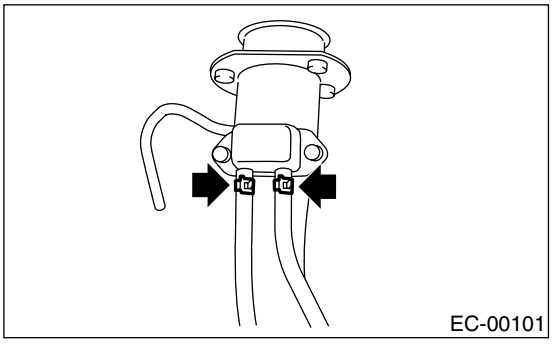
C: INSPECTION

Make sure that hoses are not cracked or loose.

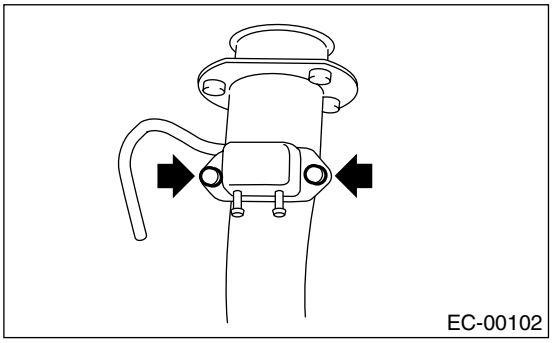
15.Shut Valve

A: REMOVAL

1) Drain fuel from fuel tank. <Ref. to FU(H4SO)-51, REMOVAL, Fuel Tank.>
2) Remove fuel filler pipe. <Ref. to FU(H4SO)-59, REMOVAL, Fuel Filler Pipe.>
3) Disconnect evaporation hoses from shut valve.



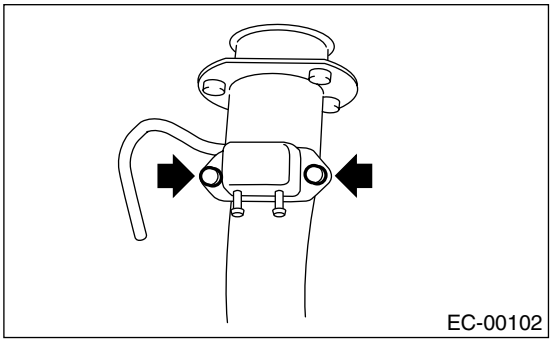
4) Remove shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



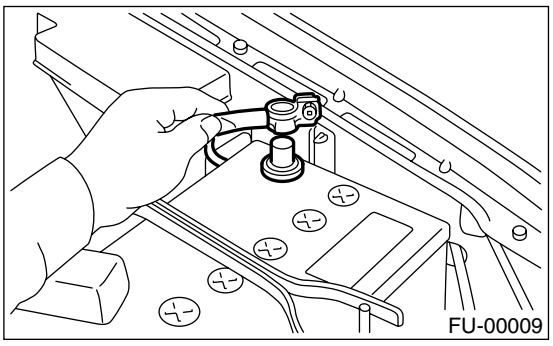
C: INSPECTION

Make sure that hoses are not cracked or loose.

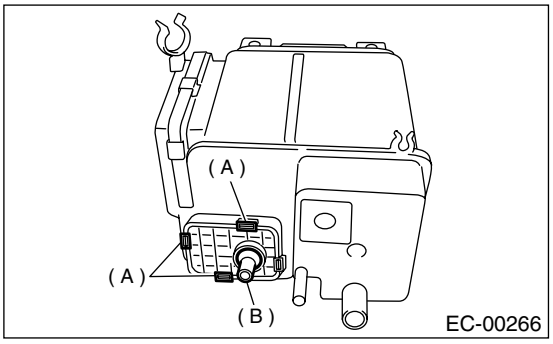
16.Drain Valve

A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



3) Lift-up the vehicle.
4) Remove canister. <Ref. to EC(H4SO)-5, REMOVAL, Canister.>
5) Remove clip (A), and then remove drain valve (B) from canister.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Make sure that all hoses are installed correctly.
2) Make sure that hoses are not cracked or loose.

MEMO:

INTAKE (INDUCTION)

IN(H4SO)

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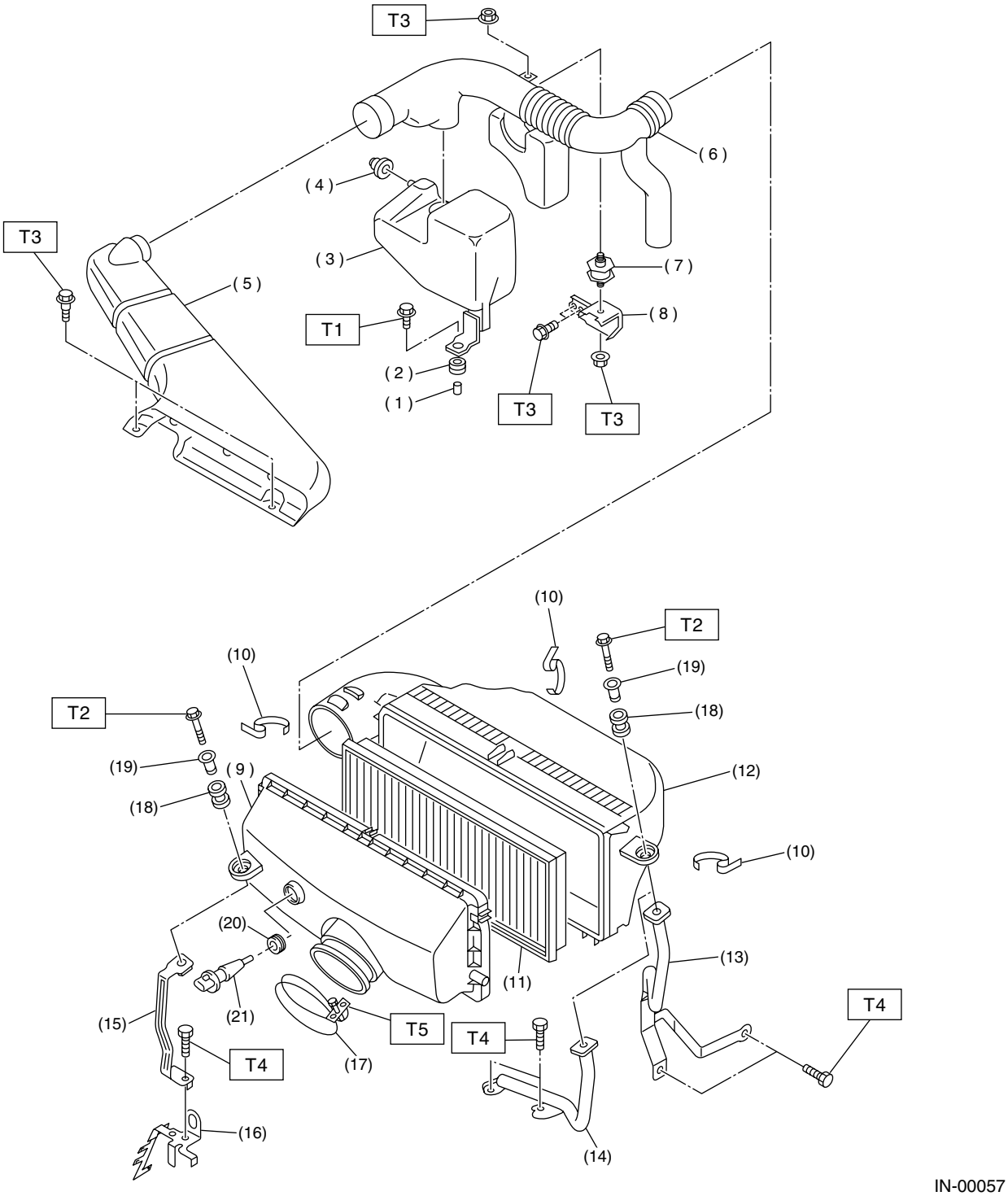
3. Air Cleaner Case....5
4. Air Intake Duct....6
5. Resonator Chamber....7

1. General Description

A: COMPONENT



IN-00057

(1) Spacer
(2) Bushing
(3) Resonator chamber
(4) Cushion rubber
(5) Air intake duct A
(6) Air intake duct B
(7) Cushion
(8) Bracket
(9) Air cleaner case A
(10) Clip
(11) Air cleaner element
(12) Air cleaner case B
(13) Air cleaner case stay LH (MT vehicles)
(14) Air cleaner case stay LH (AT vehicles)
(15) Air cleaner case stay RH
(16) Engine harness bracket
(17) Clamp
(18) Bushing
(19) Spacer
(20) Grommet
(21) Intake air temperature sensor

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*33 (3.4, 24.6)*
T2:	*6.5 (0.66, 4.8)*
T3:	*7.5 (0.76, 5.5)*
T4:	*16 (1.6, 11.6)*
T5:	*3 (0.3, 2.2)*

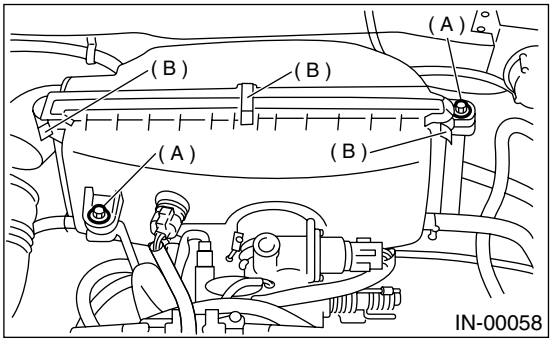
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensor or units, be sure to disconnect ground cable from battery.

2. Air Cleaner

A: REMOVAL

1) Remove bolt (A) which install air cleaner case to stays.
2) Remove the clip (B) above the air cleaner case.



3) Remove air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Fasten with a clip after inserting the lower tab of the case.

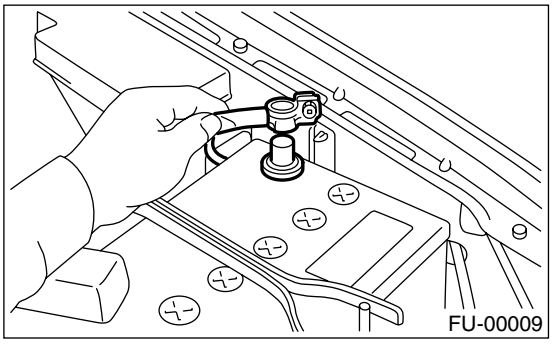
C: INSPECTION

Replace if excessively damaged or dirty.

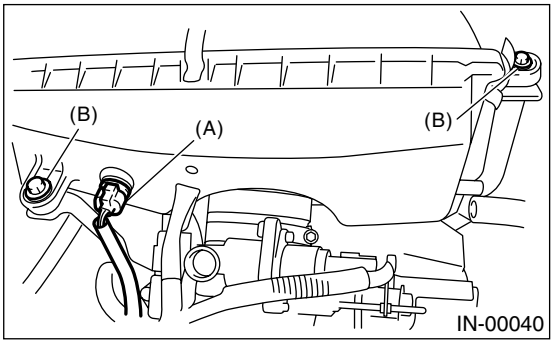
3. Air Cleaner Case

A: REMOVAL

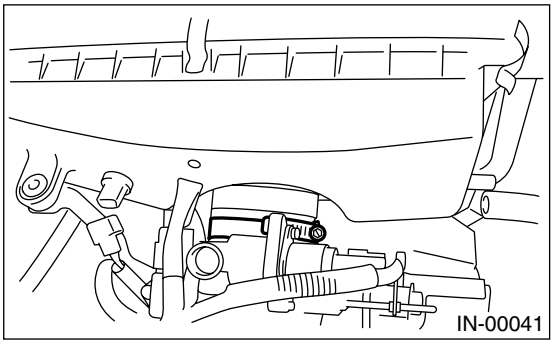
1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) of intake air temperature sensor.
3) Remove the bolts (B) which install air cleaner case to stay.



4) Disconnect the hoses and intake duct from air cleaner case.
5) Loosen the clamp which connects air cleaner case to throttle body.



6) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

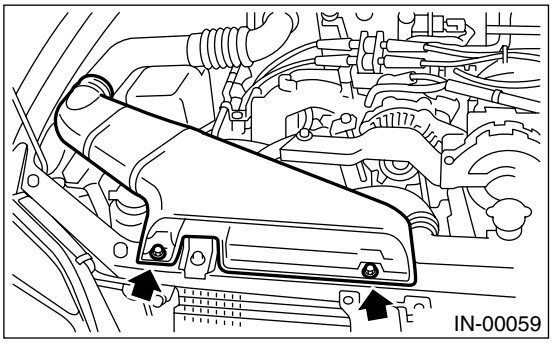
C: INSPECTION

Inspect for cracks and loose connections.

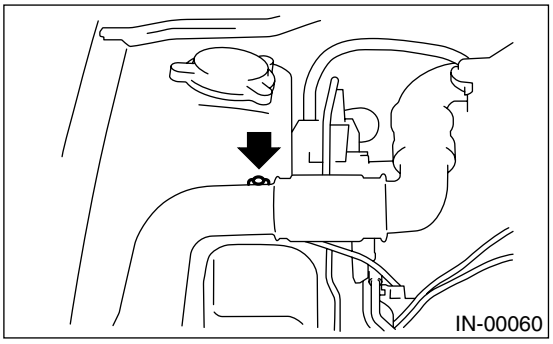
4. Air Intake Duct

A: REMOVAL

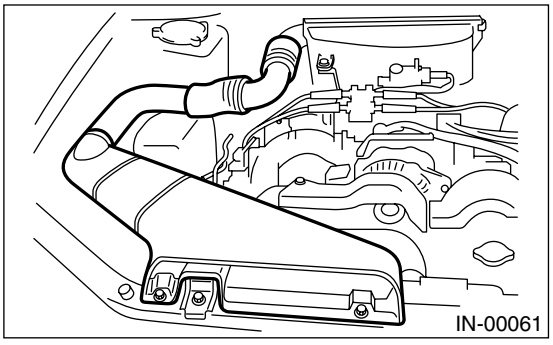
1) Remove bolts which install air intake duct on the front side of body.



2) Remove bolt which installs air intake duct on body.



3) Remove air intake ducts as a unit.



B: INSTALLATION

Install in the reverse order of removal.

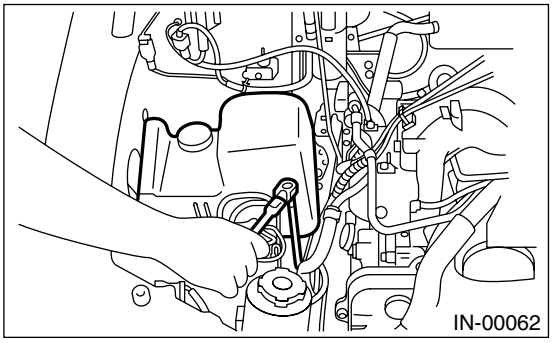
C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the air intake duct.

5. Resonator Chamber

A: REMOVAL

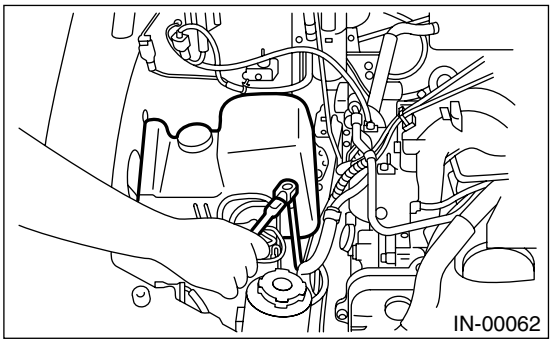
1) Remove air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove resonator chamber.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



C: INSPECTION

Inspect for cracks and loose connections.

MEMO:

MECHANICAL

ME(H4SO)

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1. General Description

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, single over-head camshaft, 4-valve/cylinder	
	Bore x Stroke		mm (in)	99.5 x 79.0 (3.917 x 3.110)	
	Displacement		cm^3 (cu in)	2,457 (150)	
	Compression ratio			10.0	
	Compression pressure (at 200 — 300 rpm)		kPa (kg/cm^2, psi)	1,079 — 1,275 (11.0 — 13.0, 156 — 185)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening		1° BTDC	
		Closing		51° ABDC	
	Exhaust valve timing	Opening		50° BBDC	
		Closing		6° ATDC*1	8° ATDC*2
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)	
		Exhaust	mm (in)	0.25±0.02 (0.0098±0.0008)	
	Idling speed [At neutral position on MT, or “P” or “N” position on AT]		rpm	MT: 650±100 (No load) AT: 700±100 (No load) 850±100 (A/C switch ON)	
	Firing order			1 → 3 → 2 → 4	
	Ignition timing		BTDC/rpm	MT: 10°±8°/650 AT: 15°±8°/700	

*1: Except U5 *2: U5

NOTE:
- STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize
- *1,*2 in tables on the following pages stand for: *1 Except U5,*2 U5 respectively

Belt tensioner adjuster	Protrusion of adjuster rod		5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.		17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bushing I.D.		18.00 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bushing	STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
		Limit	0.175 mm (0.0069 in)
	Side clearance of spacer	STD	0.20 — 0.55 mm (0.0079 — 0.0217 in)
		Limit	0.81 mm (0.0319 in)
Valve rocker arm	Clearance between shaft and arm	STD	0.020 — 0.054 mm (0.0008 — 0.0021 in)
		Limit	0.10 mm (0.0039 in)

Camshaft	Bend limit			0.025 mm (0.00098 in)
	Thrust clearance		STD	0.030 — 0.090 mm (0.0012 — 0.0035 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	39.485 — 39.585 mm (1.5545 — 1.5585 in)
			Limit	39.385 mm (1.5506 in)
		Exhaust*1	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)
			Limit	39.157 mm (1.5416 in)
		Exhaust*2	STD	39.843 — 39.943 mm (1.5686 — 1.5726 in)
			Limit	39.743 mm (1.5647 in)
	Camshaft journal O.D.			31.928 — 31.945 mm (1.2570 — 1.2577 in)
	Camshaft journal hole I.D.			32.000 — 32.018 mm (1.2598 — 1.2605 in)
	Journal clearance		STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit (mating surface with cylinder block)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			97.5 mm (3.839 in)
Valve set	Refacing angle			90°
	Contacting width	Intake	STD	1.1 mm (0.039 in)
			Limit	1.8 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.055 in)
			Limit	2.2 mm (0.083 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head		Intake	20.0 — 20.5 mm (0.787 — 0.807 in)
			Exhaust	16.5 — 17.0 mm (0.650 — 0.669 in)
Valve	Head edge thickness	Intake	STD	1.0 mm (0.039 in)
			Limit	0.6 mm (0.024 in)
		Exhaust	STD	1.2 mm (0.047 in)
			Limit	0.6 mm (0.024 in)
	Stem diameter		Intake	5.950 — 5.965 mm (0.2343 — 0.2348 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.035 — 0.062 mm (0.0014 — 0.0024 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	120.6 mm (4.75 in)
			Exhaust	121.7 mm (4.79 in)
Valve spring	Free length			54.30 mm (2.1378 in)
	Squareness			2.5°, 2.4 mm (0.094 in)
	Tension/spring height		Set	214 — 246 N (21.8 — 25.1 kgf, 48.1 — 55.3 lb)/ 45.0 mm (1.772 in)
			Lift	526 — 582 N (53.7 — 59.4 kgf, 118.2 — 130.8 lb)/ 34.7 mm (1.366 in)

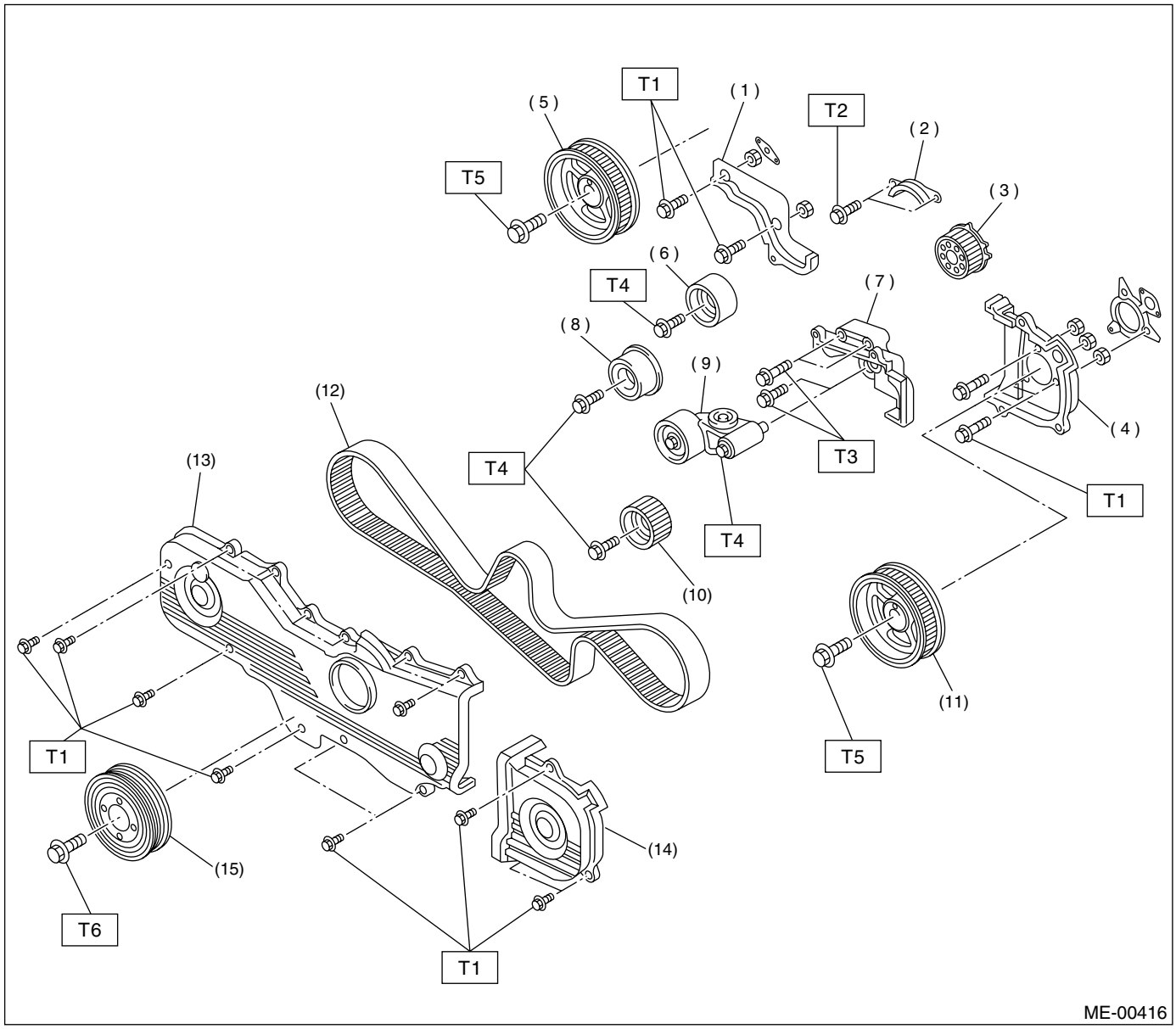
Cylinder block	Surface warpage limit (mating surface with cylinder head)				0.05 mm (0.0020 in)
	Surface grinding limit				0.1 mm (0.004 in)
	Cylinder bore		STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
				B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper			STD	0.015 mm (0.0006 in)
				Limit	0.050 mm (0.0020 in)
	Out-of-roundness			STD	0.010 mm (0.0004 in)
				Limit	0.050 mm (0.0020 in)
	Piston clearance				0.010 — 0.030 mm (0.0004 — 0.0012 in)*1 –0.010 — 0.010 (–0.0004 — 0.0004)*2
	Enlarging (boring) limit				0.5 mm (0.020 in)
Piston	Outer diameter	*1	STD	A	99.485 — 99.495 mm (3.9167 — 3.9171 in)
				B	99.475 — 99.485 mm (3.9163 — 3.9167 in)
			0.25 mm (0.0098 in) OS		99.725 — 99.735 mm (3.9262 — 3.9266 in)
			0.50 mm (0.0197 in) OS		99.975 — 99.985 mm (3.9360 — 3.9364 in)
		*2	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
				B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
			0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9278 in)
			0.50 mm (0.0197 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
	Standard inner diameter of piston pin hole				23.000 — 23.006 mm (0.9055 — 0.9057 in)
Piston pin	Outer diameter				22.994 — 23.000 mm (0.9053 — 0.9055 in)
	Standard clearance between piston pin and hole in piston				0.004 — 0.008 mm (0.0002 — 0.0003 in)
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD		0.20 — 0.35 mm (0.0079 — 0.0138 in)
			Limit		1.0 mm (0.039 in)
		Second ring	STD		0.37 — 0.52 mm (0.0146 — 0.0205 in)
			Limit		1.0 mm (0.039 in)
		Oil ring	STD		0.20 — 0.50 mm (0.0079 — 0.0197 in)
			Limit		1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD		0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit		0.15 mm (0.0059 in)
		Second ring	STD		0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit		0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit		0.10 mm (0.0039 in)
	Side clearance		STD		0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit		0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD		0.016 — 0.044 (0.0006 — 0.0017 in)
			Limit		0.05 mm (0.0020 in)
	Thickness at center portion		STD		1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US		1.504 — 1.513 mm (0.0592 — 0.0596 in)
			0.05 mm (0.0020 in) US		1.514 — 1.523 mm (0.0596 — 0.0600 in)
			0.25 mm (0.0098 in) US		1.614 — 1.623 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD		0 — 0.022 mm (0 — 0.0009 in)
			Limit		0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

MEMO:

B: COMPONENT

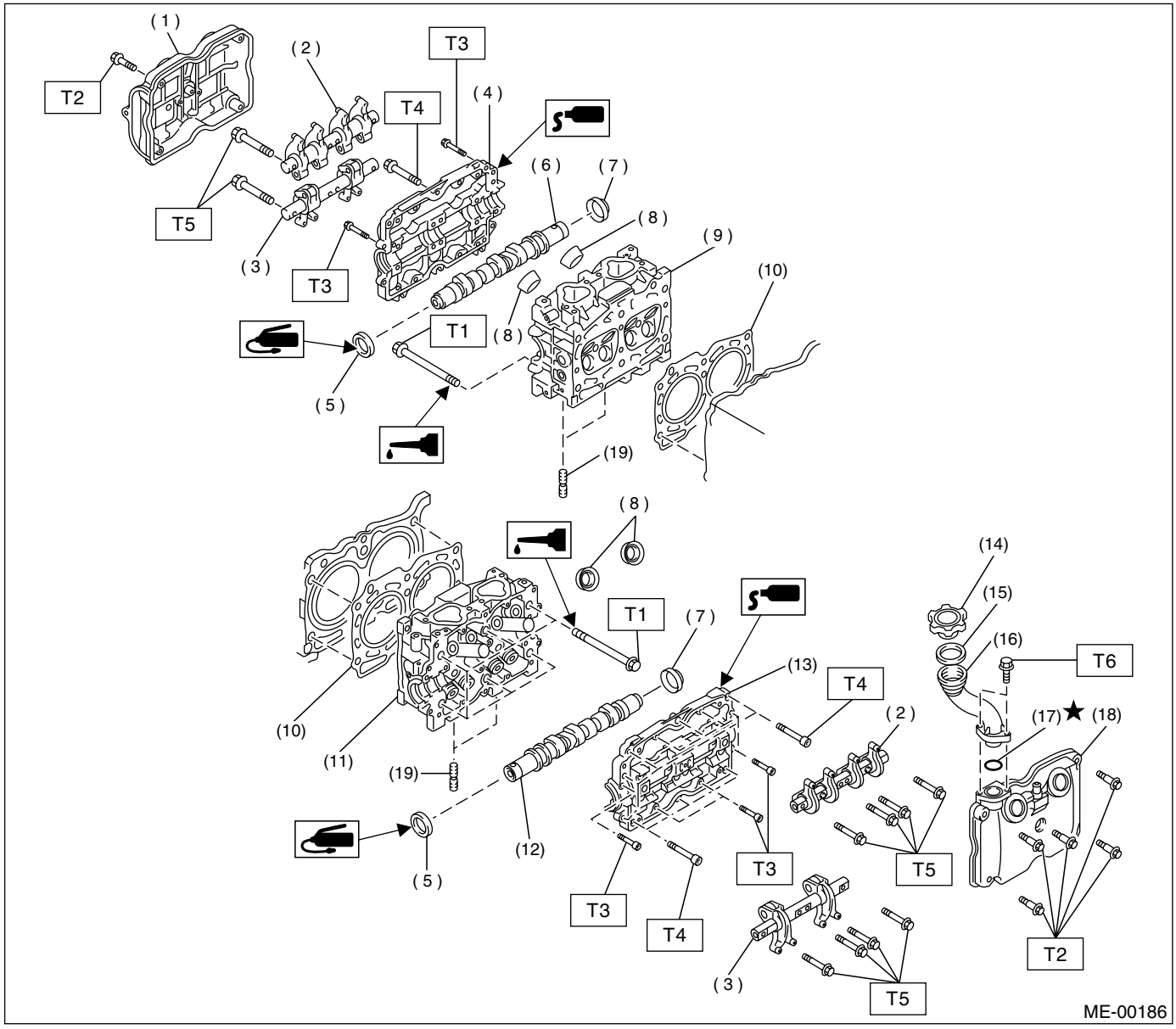
1. TIMING BELT



(1) Belt cover No. 2 (RH)
(2) Timing belt guide (MT vehicles only)
(3) Crankshaft sprocket
(4) Belt cover No. 2 (LH)
(5) Camshaft sprocket No. 1
(6) Belt idler (No. 1)
(7) Tensioner bracket
(8) Belt idler (No. 2)
(9) Automatic belt tension adjuster ASSY
(10) Belt idler No. 2
(11) Camshaft sprocket No. 2
(12) Timing belt
(13) Front belt cover
(14) Belt cover (LH)
(15) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME(H4SO)-45, INSTALLATION, CRANKSHAFT PULLEY.>

2. CYLINDER HEAD AND CAMSHAFT

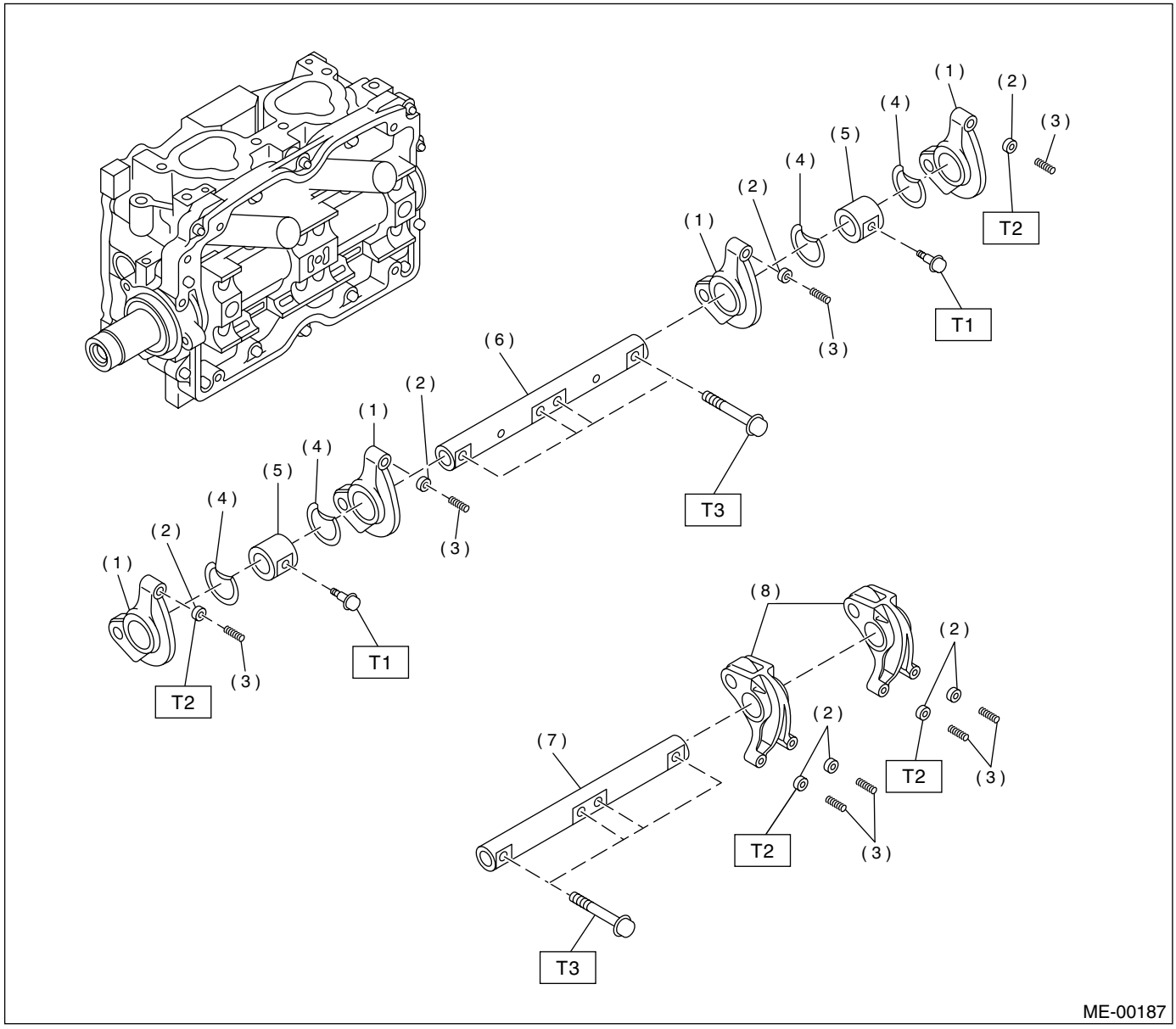


(1) Rocker cover (RH)
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Camshaft cap (RH)
(5) Oil seal
(6) Camshaft (RH)
(7) Plug
(8) Spark plug pipe gasket
(9) Cylinder head (RH)
(10) Cylinder head gasket
(11) Cylinder head (LH)
(12) Camshaft (LH)
(13) Camshaft cap (LH)
(14) Oil filler cap
(15) Gasket
(16) Oil filler duct
(17) O-ring
(18) Rocker cover (LH)
(19) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

T1: <Ref. to ME(H4SO)-61, CYLINDER HEAD, INSTALLATION, CYLINDER HEAD ASSEMBLY.>
T2: 5 (0.5, 3.6)
T3: 10 (1.0, 7.2)
T4: 18 (1.8, 13.0)
T5: 25 (2.5, 18.1)
T6: 6.4 (0.65, 4.7)
T2: 5 (0.5, 3.6)
T3: 10 (1.0, 7.2)

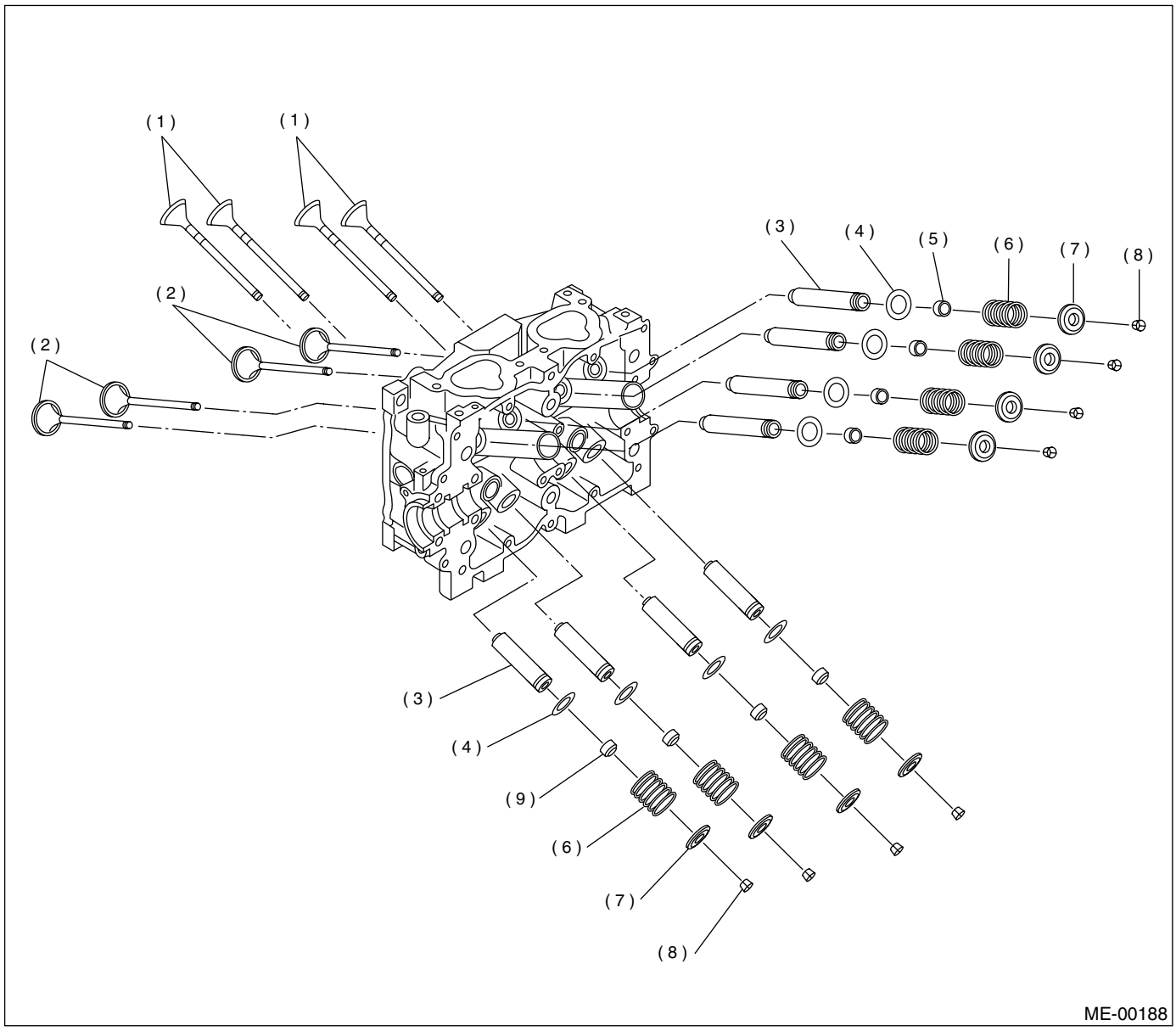
3. VALVE ROCKER ASSEMBLY



(1) Intake valve rocker arm
(2) Valve rocker nut
(3) Valve rocker adjust screw
(4) Spring
(5) Rocker shaft support
(6) Intake rocker shaft
(7) Exhaust rocker shaft
(8) Exhaust valve rocker arm

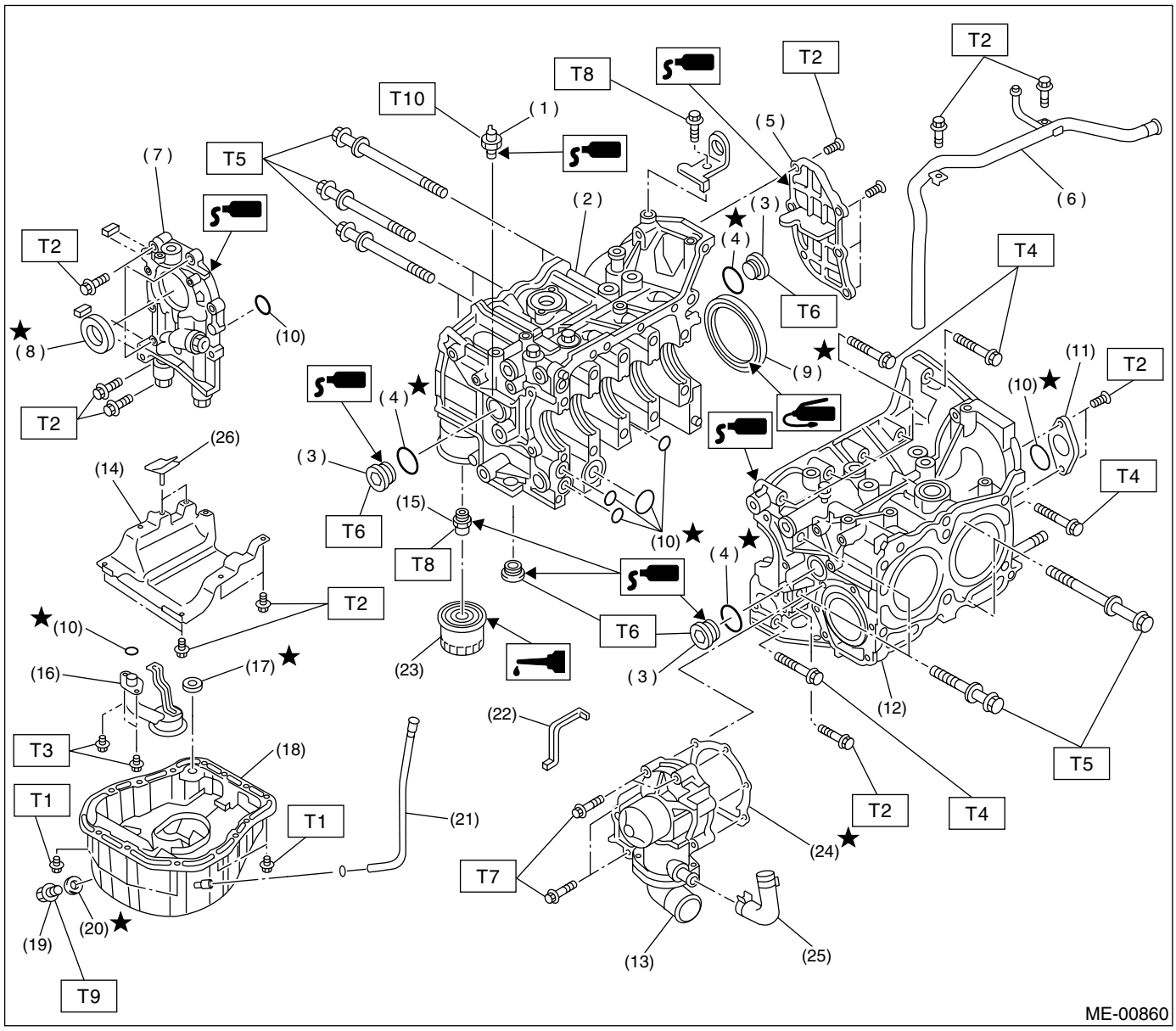
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)

4. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Valve guide
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Collet (valve)
(9) Exhaust valve oil seal

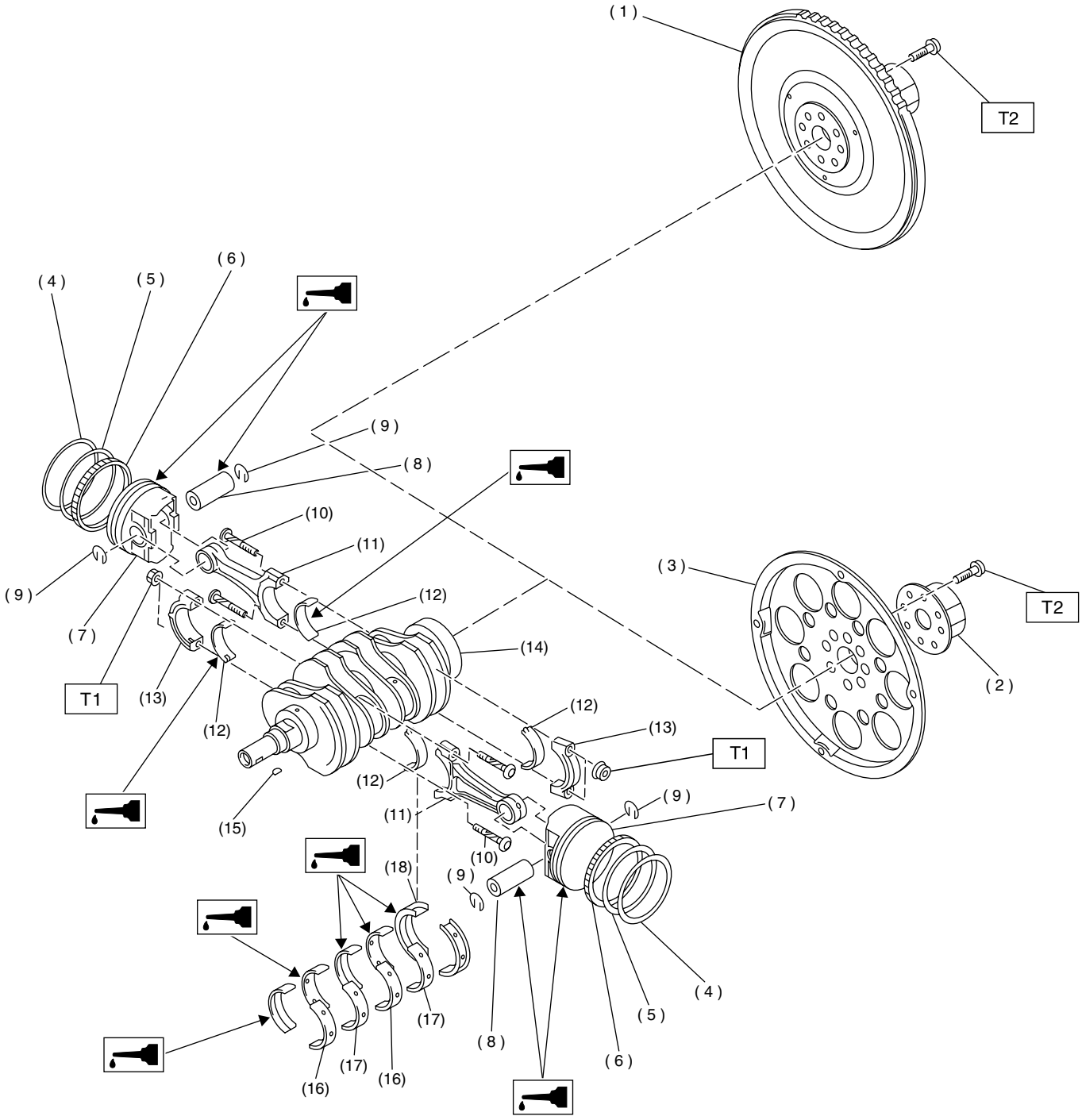
5. CYLINDER BLOCK



(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16) Oil strainer
(17) Gasket
(18) Oil pan
(19) Drain plug
(20) Metal gasket
(21) Oil level gauge guide
(22) Water pump sealing
(23) Oil filter
(24) Gasket
(25) Water pump hose
(26) Seal

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7)
T4: 25 (2.5, 18.1)
T5: 47 (4.8, 34.7)
T6: 70 (7.1, 51)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 45 (4.6, 33)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)

6. CRANKSHAFT AND PISTON

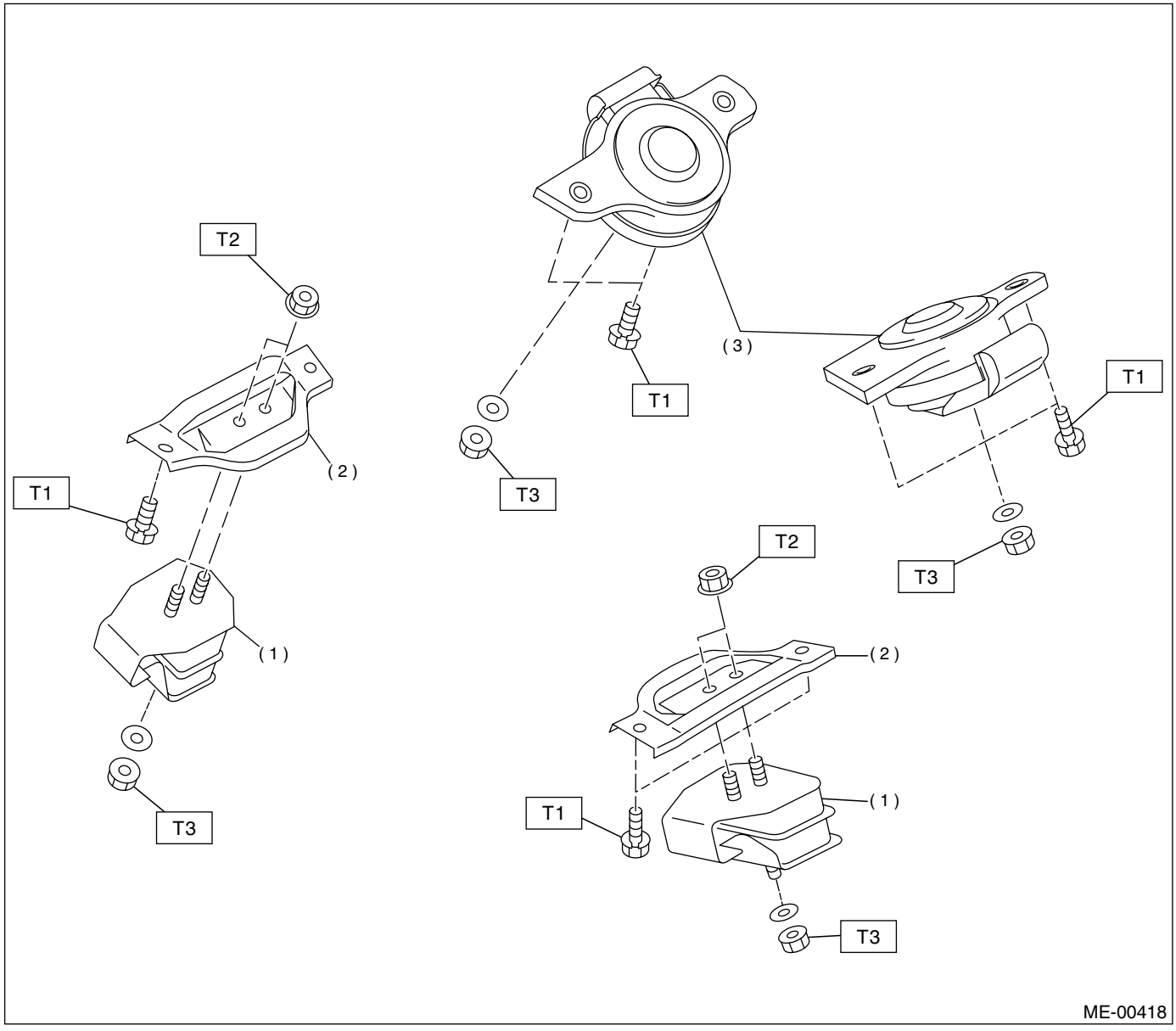


ME-00607

(1) Flywheel (MT)
(2) Reinforcement (AT)
(3) Drive plate (AT)
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Piston
(8) Piston pin
(9) Snap ring
(10) Connecting rod bolt
(11) Connecting rod
(12) Connecting rod bearing
(13) Connecting rod cap
(14) Crankshaft
(15) Woodruff key
(16) Crankshaft bearing #1, #3
(17) Crankshaft bearing #2, #4
(18) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33)
T2: 72 (7.3, 52.8)

7. ENGINE MOUNTING



(1) Front cushion rubber (BRIGHTON and L AT vehicles)
(2) Front engine mounting bracket (BRIGHTON and L AT vehicles)
(3) Front cushion rubber (Except BRIGHTON and L AT vehicles)

Tightening : N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

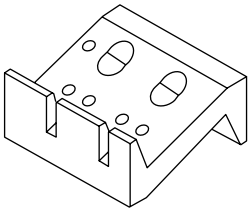
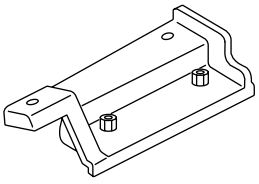
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267800	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

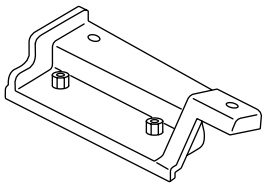
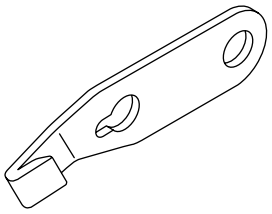
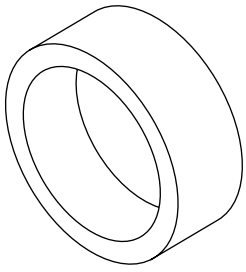
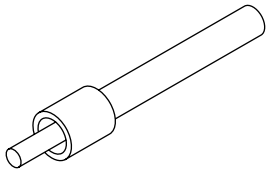
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.

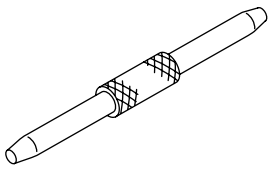
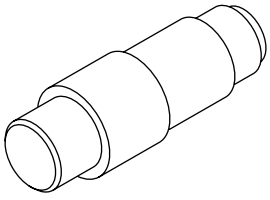
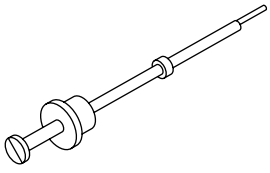
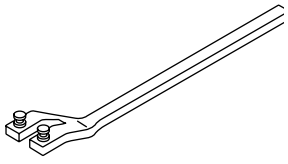
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST18231AA0	18231AA010	CAMSHAFT SPROCKET WRENCH	• Used for removing and installing camshaft sprocket. • CAMSHFT SPROCKET WRENCH (499207100) is also can be used.

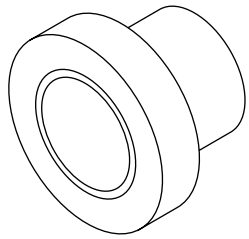
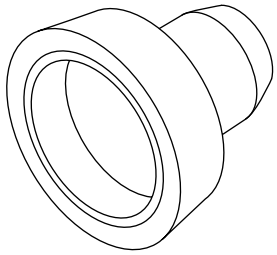
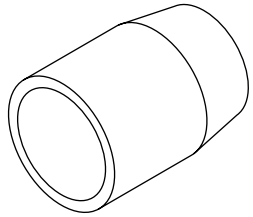
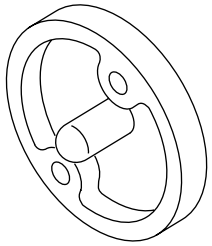
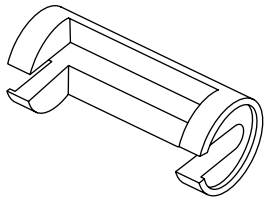
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587700	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597000	499597000	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587500).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

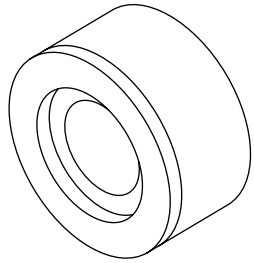
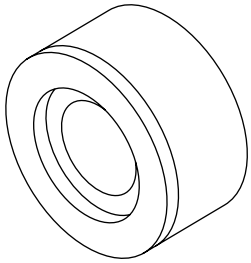
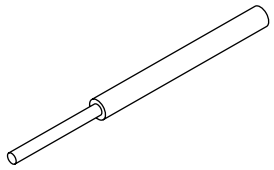
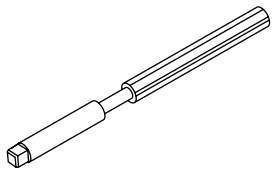
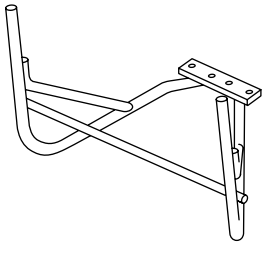
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767700	499767700 (Intake side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 ST-499767800	499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

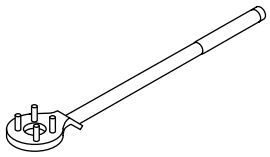
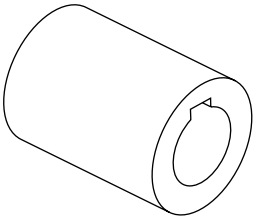
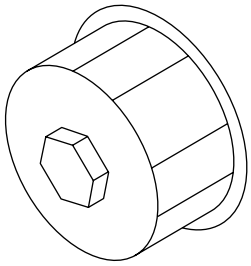
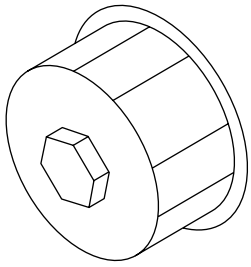
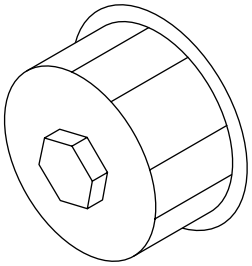
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-498547000	498547000 (Outer diameter 80 mm (3.15 in) for oil filter)	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST18332AA000	18332AA000 (Outer diameter 68 mm (2.68 in) for oil filter)	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST18332AA010	18332AA010 (Outer diameter 65 mm (2.56 in) for oil filter)	OIL FILTER WRENCH	Used for removing and installing oil filter.

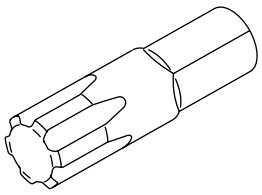
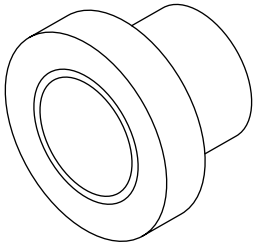
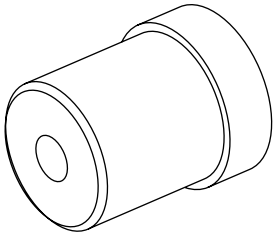
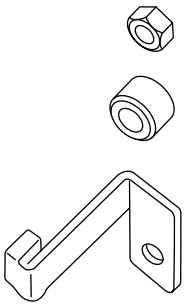
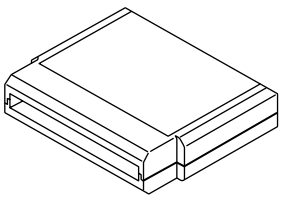
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499497000	499497000	TORX PLUS	Used for removing and installing camshaft cap.
 ST-499587500	499587500	OIL SEAL INSTALLER	Used for installing front camshaft oil seal.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

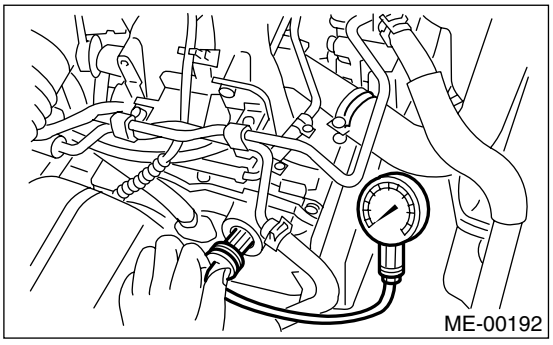
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H4SO)-4, REMOVAL, Spark Plug.>
5) Fully open throttle valve.
6) Check the starter motor for suitable performance and operation.
7) Hold the compression gauge tight against the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



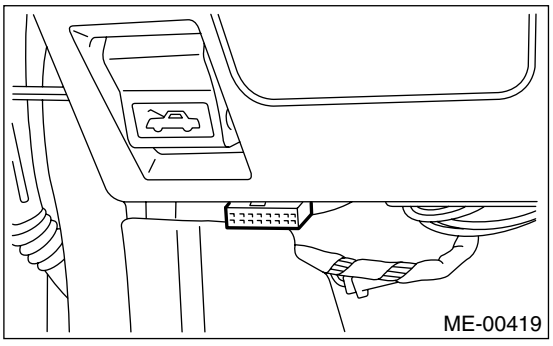
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,275 kPa (13.0 kg/cm^2, 185 psi)
Limit;
1,079 kPa (11.0 kg/cm^2, 156 psi)
Difference between cylinders;
49 kPa (0.5 kg/cm^2, 7 psi), or less

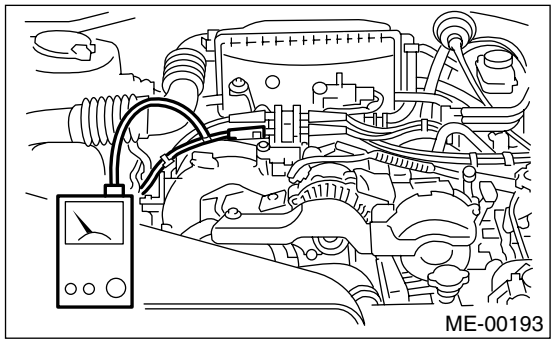
3. Idle Speed

A: INSPECTION

1) Before checking idle speed, check the following:
   (1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn ignition switch to OFF.
4) When using SUBARU SELECT MONITOR <Ref. to ME(H4SO)-15, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect SUBARU SELECT MONITOR to the data link connector.



   (3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
   (4) Select {2. Each System Check} in Main Menu.
   (5) Select {Engine Control System} in Selection Menu.
   (6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
   (7) Select {1.12 Data Display} in Data Display Menu.
   (8) Start the engine, and read engine idle speed.
5) When using tachometer (Secondary pick-up type).
   (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
   (2) Start the engine, and read engine idle speed.



NOTE:
• When using the OBD-II general scan tool, carefully read its operation manual.
• This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

6) Check idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed (No load and gears in neutral (MT), or N or P (AT) position):
MT vehicle: 650±100 rpm
AT vehicle: 700±100 rpm

7) Check idle speed when loaded. (Turn air conditioning switch to “ON” and operate compressor for at least one minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral (MT) or N or P (AT) position]:
850±100 rpm

NOTE:
The idle speed is adjusted automatically and manual adjusting cannot be performed. If idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>

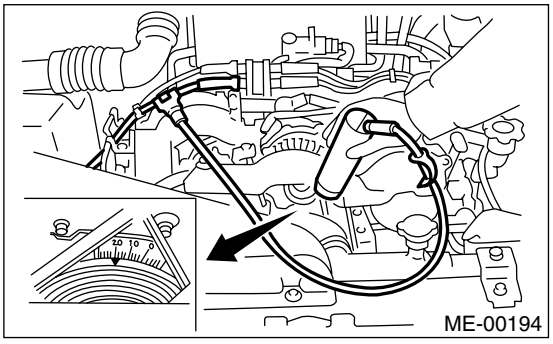
4. Ignition Timing

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Warm-up the engine.
2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with the timing light.
3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
MT vehicle: 10°±8°/650
AT vehicle: 15°±8°/700



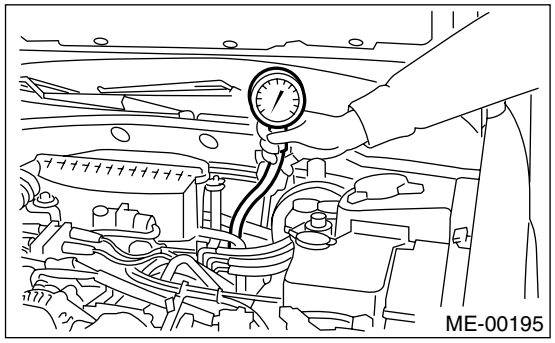
If the timing is not correct, check the ignition control system.
Refer to Engine Control System. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
3) Keep the engine at the idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



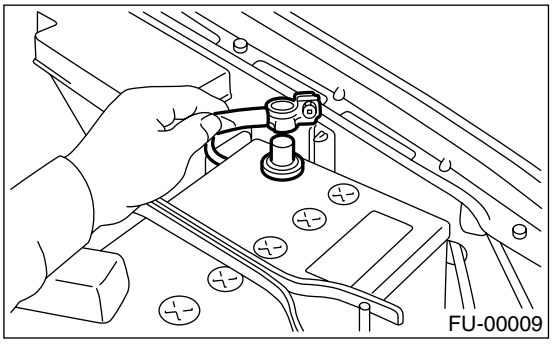
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 inHg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weakend stiffness or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or idle adjustment

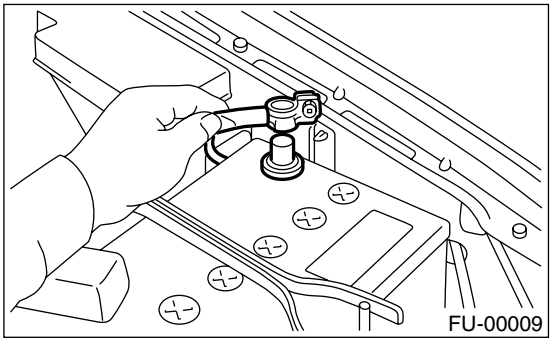
6. Engine Oil Pressure

A: INSPECTION

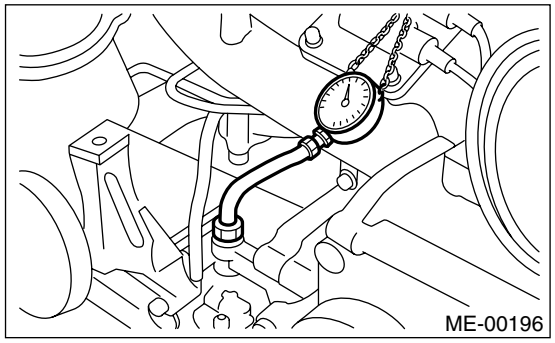
1) Disconnect battery ground cable.



2) Remove generator from bracket. <Ref. to SC(H4SO)-15, REMOVAL, Generator.>
3) Disconnect connector from oil pressure switch.
4) Remove oil pressure switch from engine cylinder block. <Ref. to LU(H4SO)-18, REMOVAL, Oil Pressure Switch.>
5) Connect oil pressure gauge hose to cylinder block.
6) Connect battery ground cable.



7) Start the engine, and measure oil pressure.



Oil pressure:
88 kPa (0.9 kg/cm^2, 13 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
• If oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-20, INSPECTION, Engine Lubrication System Trouble in General.>
• If oil pressure warning light is turned ON and oil pressure is in specification, replace oil pressure switch. <Ref. to LU(H4SO)-20, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

8) After measuring oil pressure, install oil pressure switch. <Ref. to LU(H4SO)-18, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Install generator and V-belt in the reverse order of removal, and adjust the V-belt deflection. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

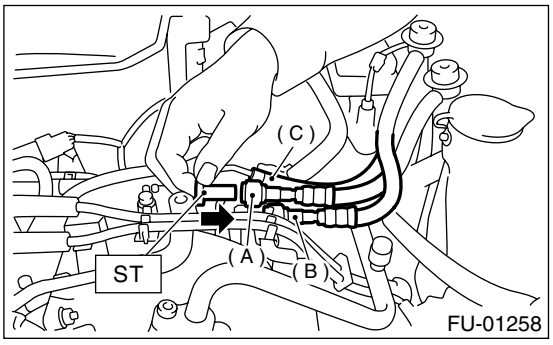
7. Fuel Pressure

A: INSPECTION

WARNING:
Before removing fuel pressure gauge, release fuel pressure.

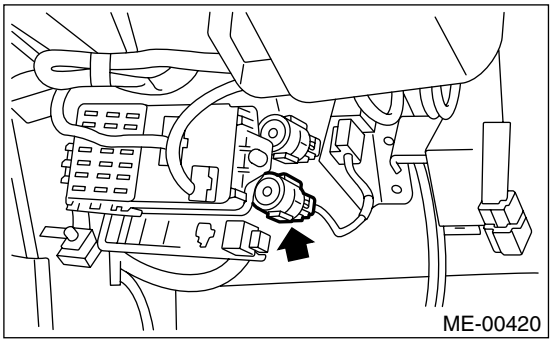
NOTE:
If out of specification, check or replace pressure regulator and pressure regulator vacuum hose.

1) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect fuel delivery hoses from fuel filter, and connect fuel pressure gauge.



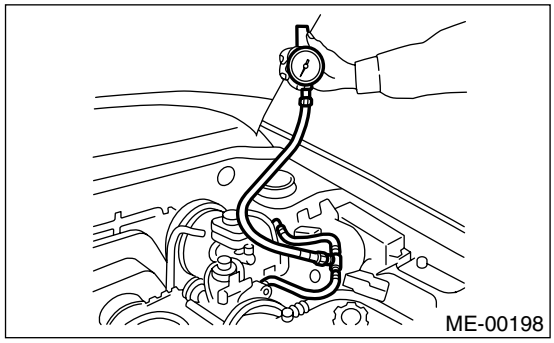
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

4) Connect connector of fuel pump relay.



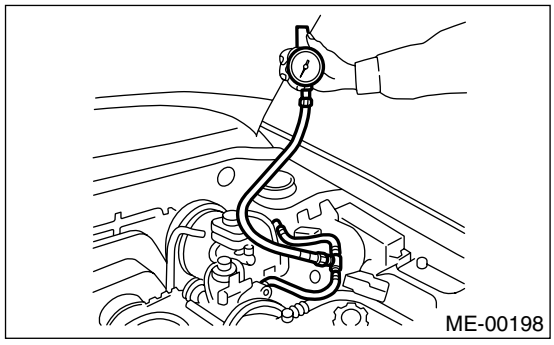
5) Start the engine.
6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)



7) After connecting pressure regulator vacuum hose, measure fuel pressure.

Fuel pressure:
Standard; 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)



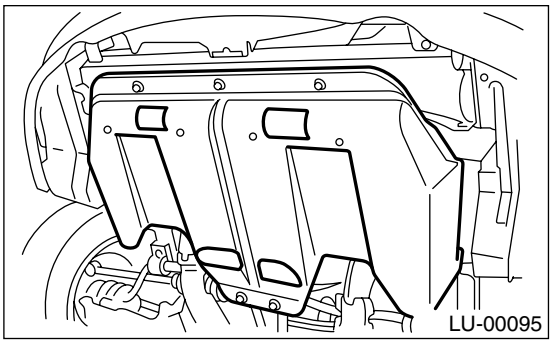
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

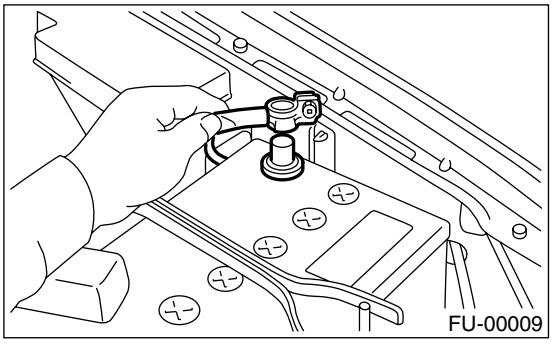
A: INSPECTION

CAUTION:
Inspection and adjustment of valve clearance should be performed while engine is cold.

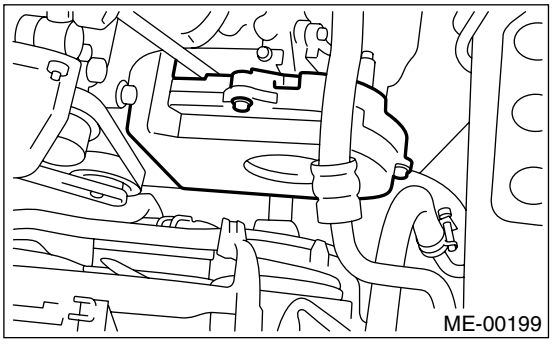
1) Set the vehicle onto the lift.
2) Lift-up the vehicle.
3) Remove under cover.



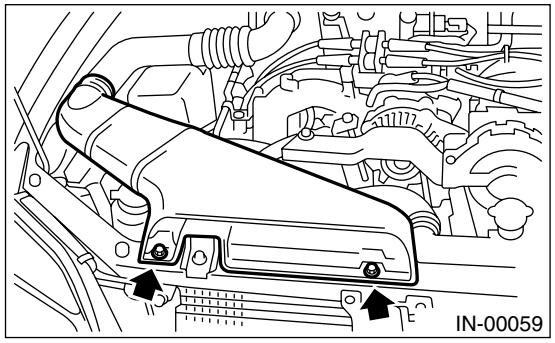
4) Lower the vehicle.
5) Disconnect battery ground cable.



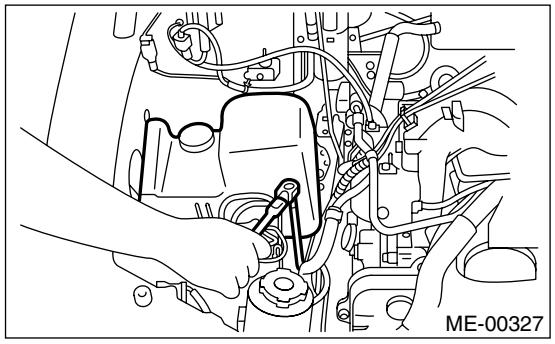
6) Remove timing belt cover (LH).



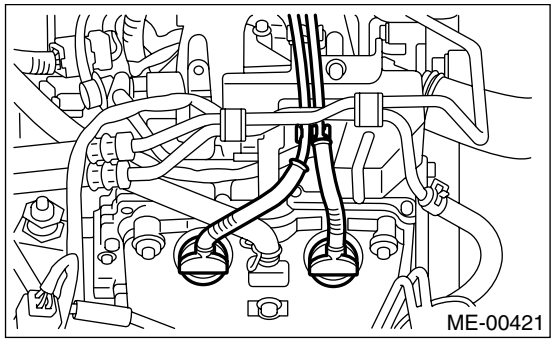
7) When inspecting #1 and #3 cylinders (Except U5);
(1) Remove air intake duct as a unit.



(2) Remove bolt, and then remove resonator chamber.

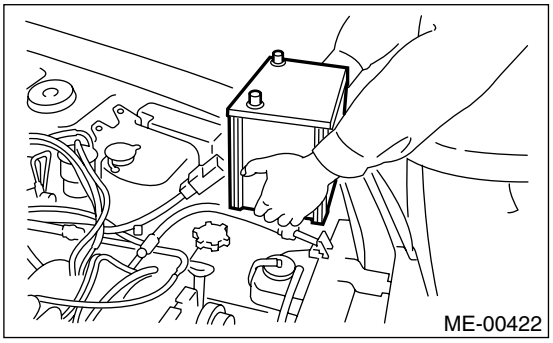


(3) Disconnect spark plug cords from spark plugs (#1 and #3 cylinders).

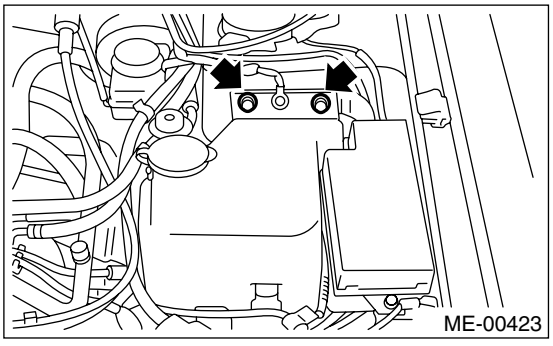


(4) Disconnect PCV hose from rocker cover (RH).
(5) Remove bolts, then remove rocker cover (RH).

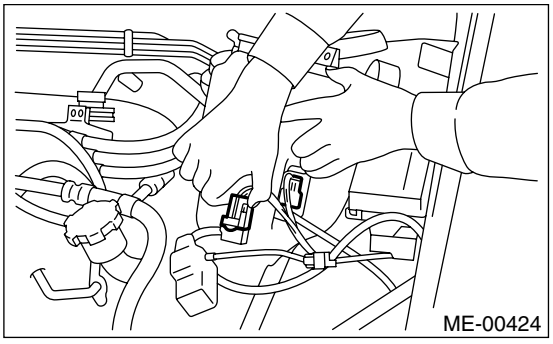
8) When inspecting #2 and #4 cylinders;
(1) Disconnect battery cables, and then remove battery and battery carrier.



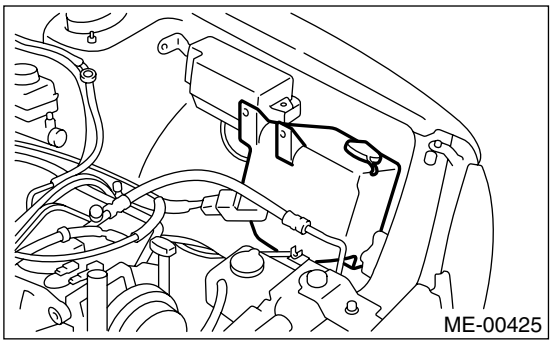
(2) Remove the two bolts which hold washer tank.



(3) Disconnect washer motor connectors.



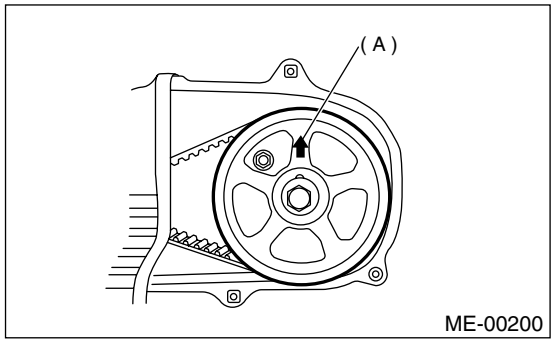
(4) Move washer tank to forward.



(5) Disconnect spark plug cords from spark plugs (#2 and #4 cylinders).
(6) Disconnect PCV hose from rocker cover (LH).
(7) Remove bolts, then remove rocker cover (LH).

9) Set #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise.

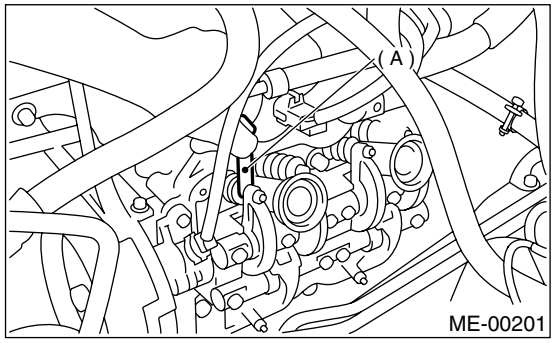
NOTE:
When arrow mark (A) on camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



10) Measure #1 cylinder valve clearance by using thickness gauge.

NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
• Measure exhaust valve clearances while lifting-up the vehicle.

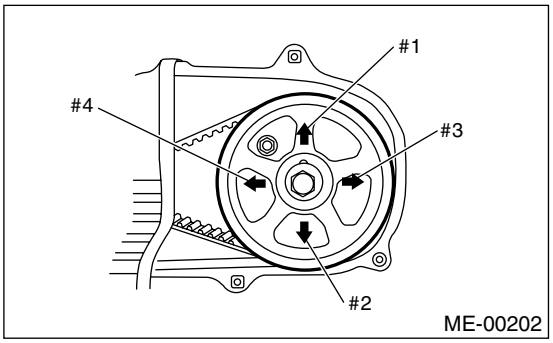
Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



(A) Thickness gauge

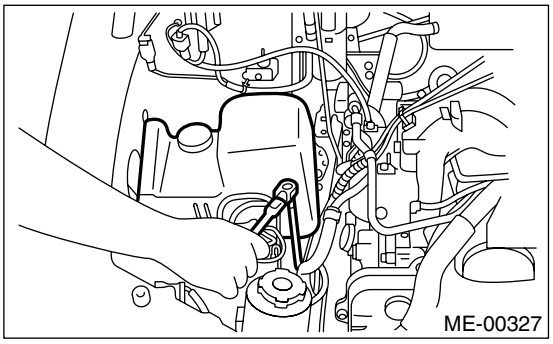
11) If necessary, adjust the valve clearance. <Ref. to ME(H4SO)-32, ADJUSTMENT, Valve Clearance.>
12) Similar to measurement procedures used for #1 cylinder, measure #2, #3 and #4 cylinder valve clearances.

NOTE:
• Be sure to set cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
• To set #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn crankshaft pulley clockwise 90° at a time starting with arrow mark on left-hand camshaft sprocket facing up.



13) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
Resonator chamber;
33 N·m (3.4 kgf-m, 24.6 ft-lb)

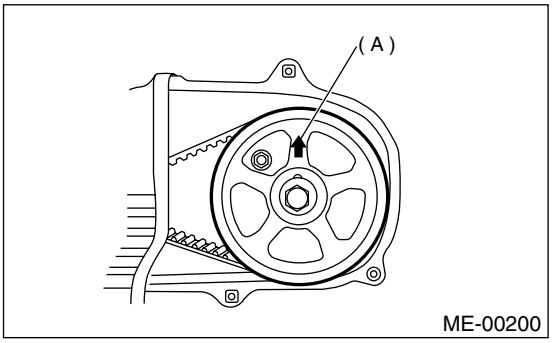


B: ADJUSTMENT

NOTE:
Adjustment of valve clearance should be performed while engine is cold.

1) Set #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise.

NOTE:
When arrow mark (A) on camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

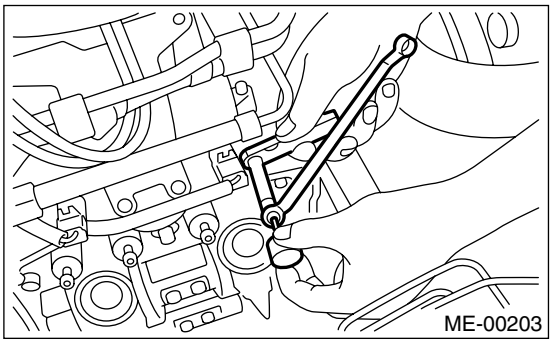


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place suitable thickness gauge.
(3) While noting valve clearance, tighten valve rocker adjust screw.
(4) When specified valve clearance is obtained, tighten valve rocker nut.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

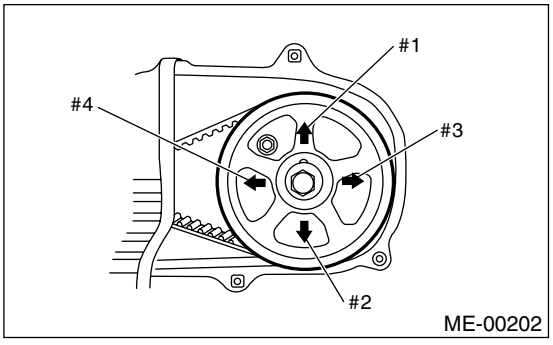
NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
• Adjust exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



3) Ensure that valve clearances are within specifications.
4) Turn crankshaft two complete rotations until #1 cylinder piston is again set to top dead center on compression stroke.
5) Ensure that valve clearances are within specifications. If necessary, readjust valve clearances.
6) Similar to adjustment procedures used for #1 cylinder, adjust #2, #3 and #4 cylinder valve clearances.

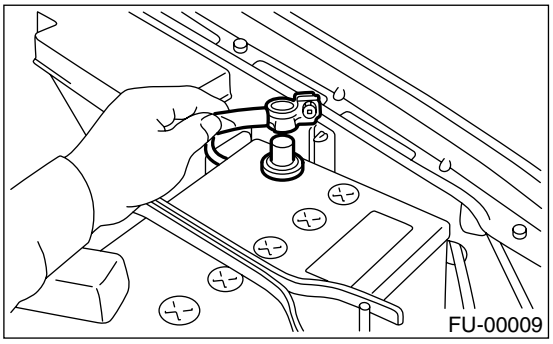
NOTE:
• Be sure to set cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
• To set #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn crankshaft pulley clockwise 90° at a time starting with arrow mark on left-hand camshaft sprocket facing up.



9. Engine Assembly

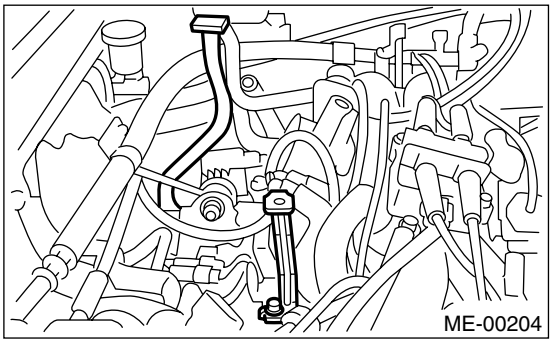
A: REMOVAL

1) Set the vehicle on lift arms.
2) Open front hood fully and support with stay.
3) Raise rear seat, and turn floor mat up.
4) Release fuel pressure. <Ref. to FU(H4SO)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
5) Remove filler cap.
6) Collect refrigerant, and remove pressure hoses. (With A/C) <Ref. to AC-38, REMOVAL, Flexible Hose.>
7) Disconnect battery ground cable.

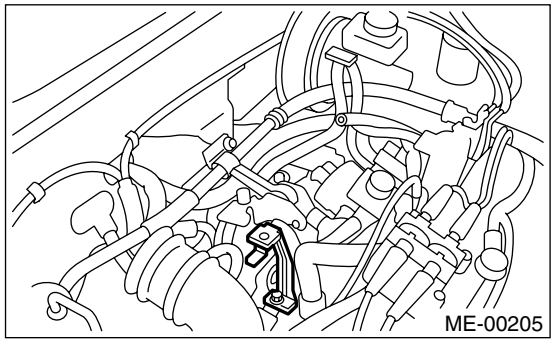

FU-00009

8) Remove air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
9) Remove under cover.
10) Remove radiator from vehicle. <Ref. to CO(H4SO)-20, REMOVAL, Radiator.>
11) Remove ATF cooler pipe from body. <Ref. to 4AT-82, REMOVAL, ATF Cooler Pipe and Hose.>
12) Remove air cleaner case stay.

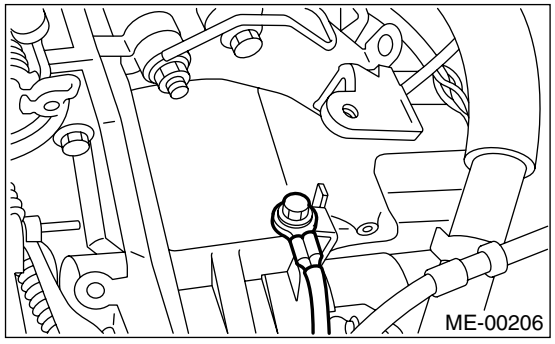
- **MT model**


ME-00204

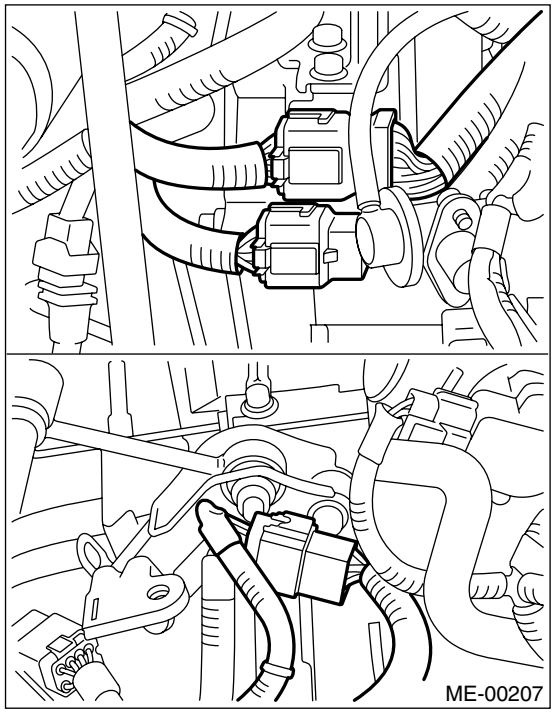
- **AT model**


ME-00205

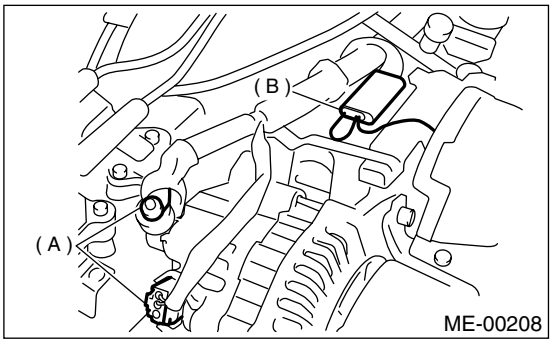
13) Disconnect the following connectors and cables.
(1) Engine ground terminal


ME-00206

(2) Engine harness connectors

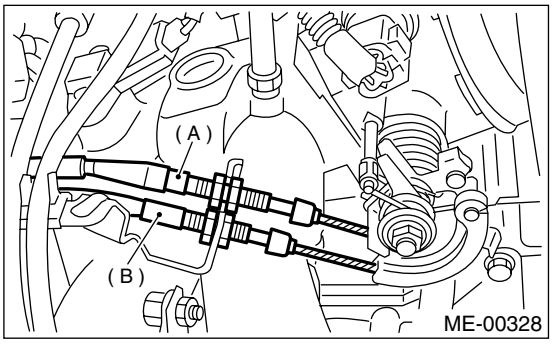

ME-00207

(3) Alternator connector, terminal and A/C compressor connector



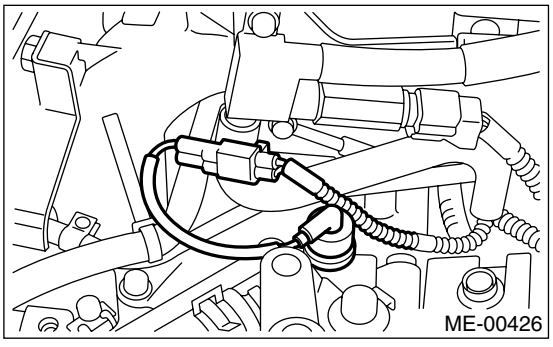
(A) Alternator connector and terminal
(B) A/C compressor connector

(4) Accelerator cable and cruise control cable



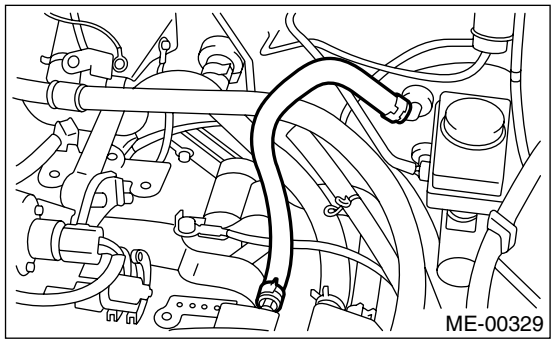
(A) Accelerator cable
(B) Cruise control cable

(5) Pressure switch

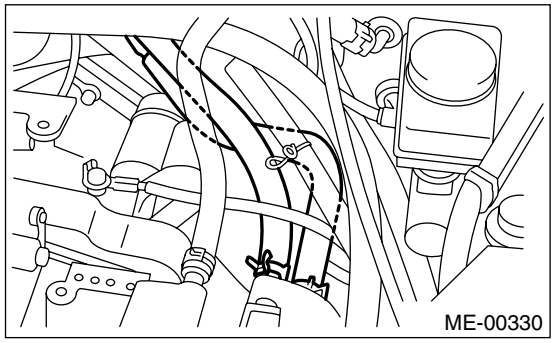


14) Disconnect the following hoses.

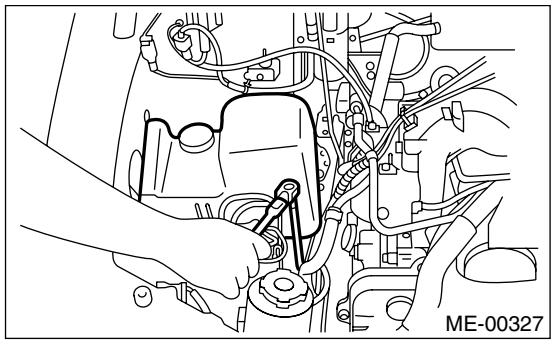
(1) Brake booster vacuum hose



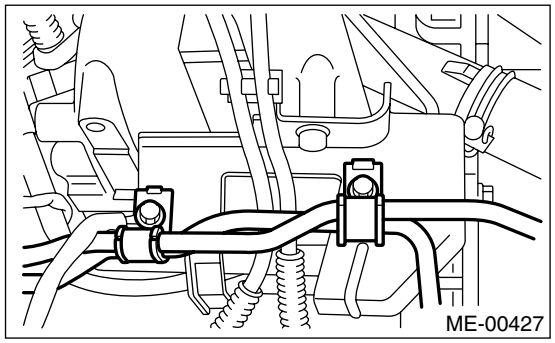
(2) Heater inlet/outlet hose



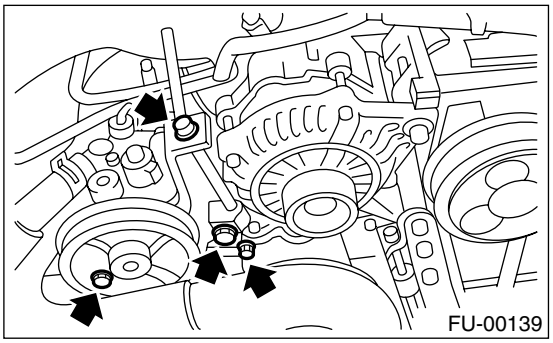
15) Remove power steering pump from bracket.
(1) Remove resonator chamber (Except U5).



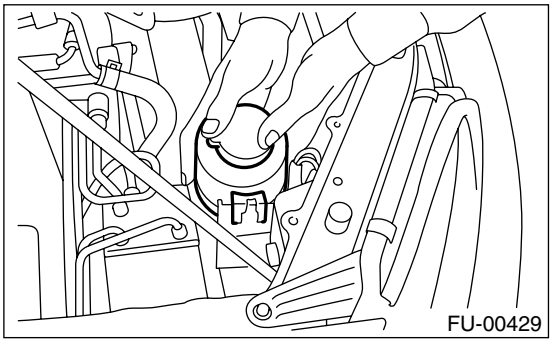
(2) Loosen lock bolt and slider bolt, and remove front side V-belt.
<Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
(3) Remove pipe with bracket.



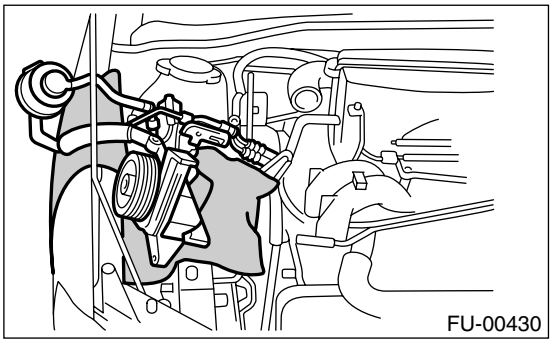
(4) Remove bolts which install power steering pump bracket.



(5) Remove power steering tank from the bracket by pulling it upward.

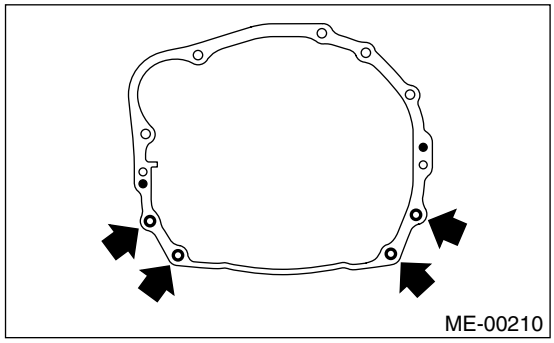


(6) Place power steering pump on the right side wheel apron.

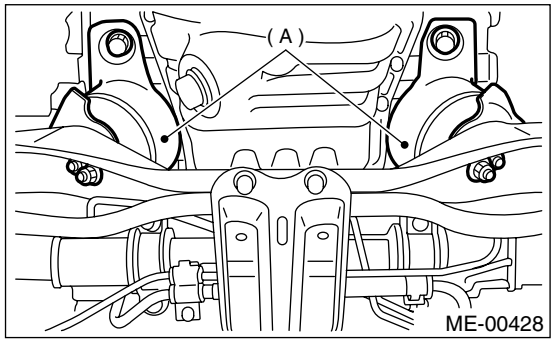


16) Remove front and center exhaust pipe.
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.> and <Ref. to EX(H4SO)-8, REMOVAL, Center Exhaust Pipe.>

17) Remove nuts which hold lower side of transmission to engine.



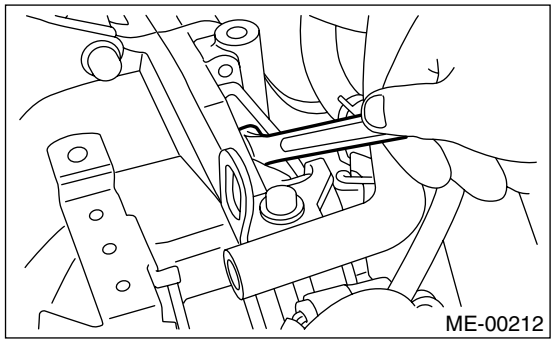
18) Remove nuts which install front cushion rubber onto front crossmember.



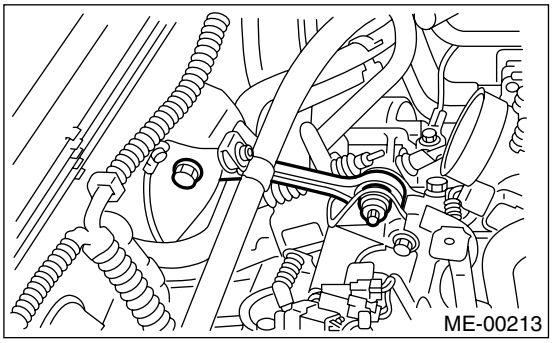
(A) Engine mount

19) Separate torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove service hole plug.
(3) Remove bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the crankshaft pulley using ST.

ST 499977100 CRANK PULLEY WRENCH

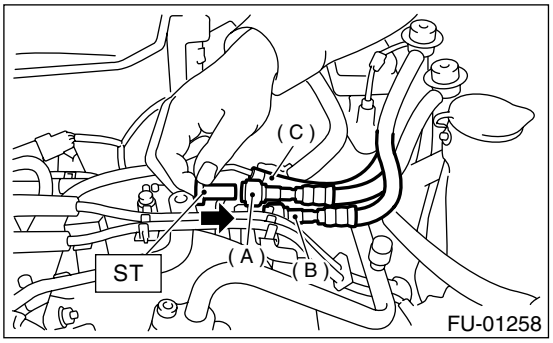


20) Remove pitching stopper.



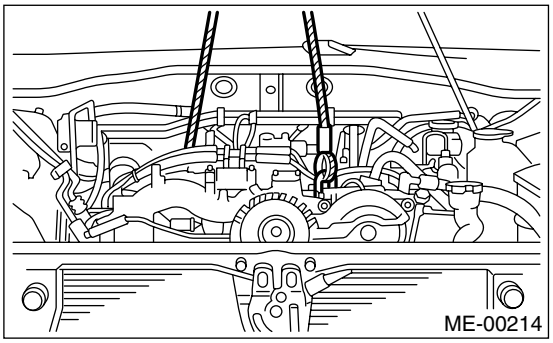
21) Disconnect fuel delivery hose, return hose and evaporation hose.

CAUTION:
• Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.
• Catch fuel from hose into container.



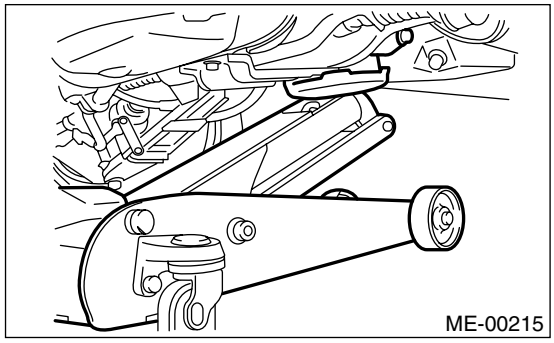
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

22) Support engine with a lifting device and wire ropes.

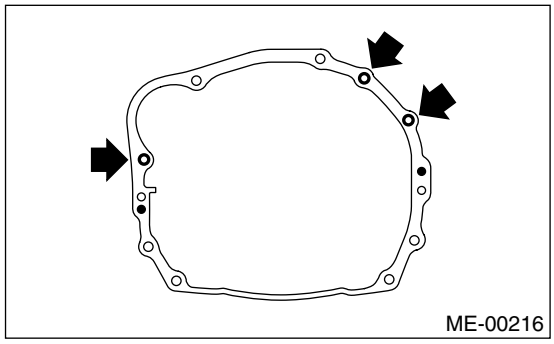


23) Support transmission with a garage jack.

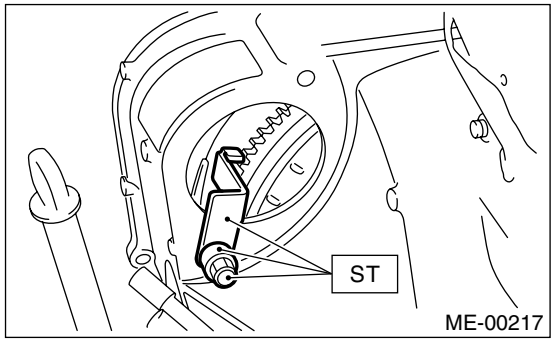
CAUTION:
Before moving engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



24) Separation of engine and transmission.
(1) Remove starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
(2) Remove bolts which hold upper side of transmission to engine.

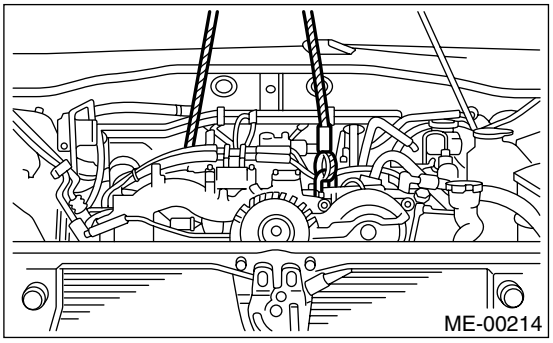


25) Install ST to torque converter clutch case. (AT model)
ST 498277200 STOPPER SET



26) Remove engine from vehicle.
(1) Slightly raise engine.
(2) Raise transmission with garage jack.
(3) Move engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move engine away from engine room.

CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



27) Remove front cushion rubbers.

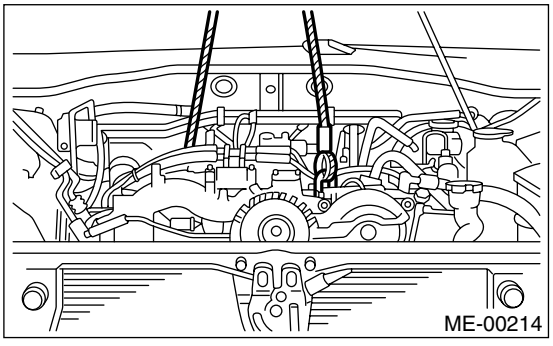
B: INSTALLATION

1) Install front cushion rubbers.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

2) Install engine onto transmission.
(1) Position engine in engine room and align it with transmission.

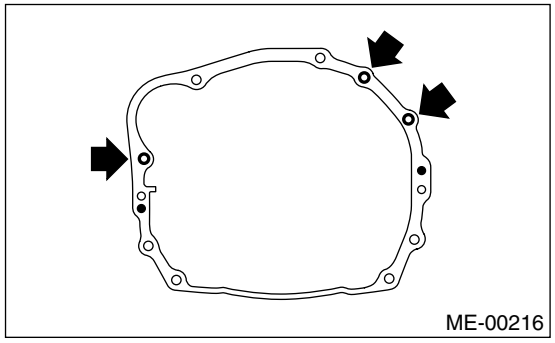
CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



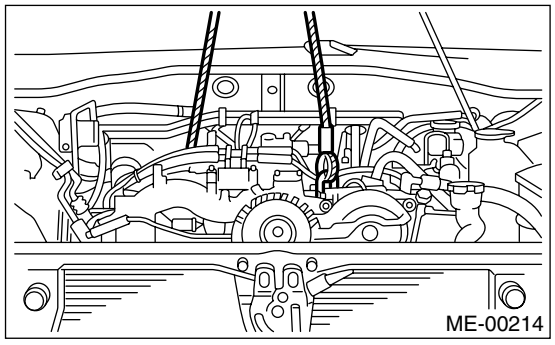
(2) Apply a small amount of grease to spline of main shaft. (MT model)

3) Tighten bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

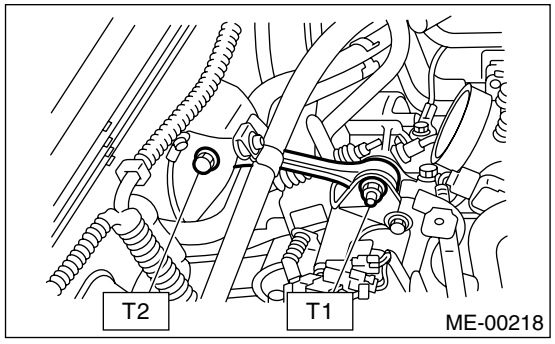


4) Remove lifting device and wire ropes.



5) Remove garage jack.
6) Install pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



7) Remove ST from torque converter clutch case. (AT model)

NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

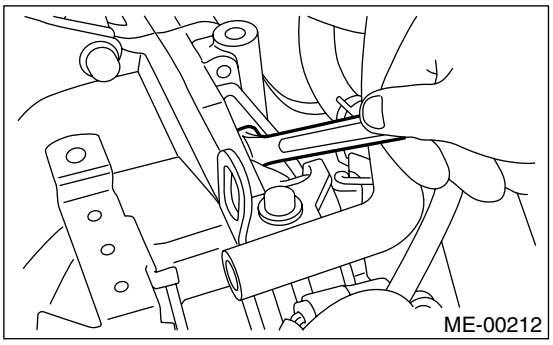
8) Install starter. <Ref. to SC(H4SO)-7, INSTALLATION, Starter.>

9) Install torque converter clutch onto drive plate. (AT model)
(1) Tighten bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the crankshaft pulley by using ST.

CAUTION:
Be careful not to drop bolts into torque converter clutch housing.

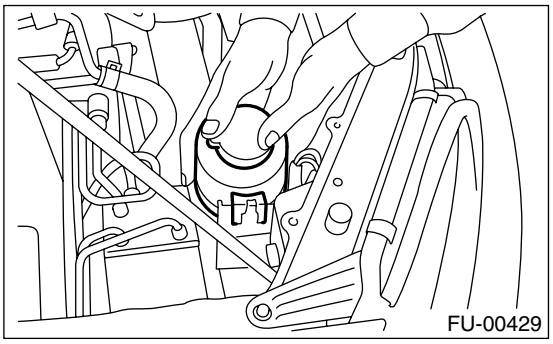
ST 499977100 CRANK PULLEY WRENCH

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)


ME-00212

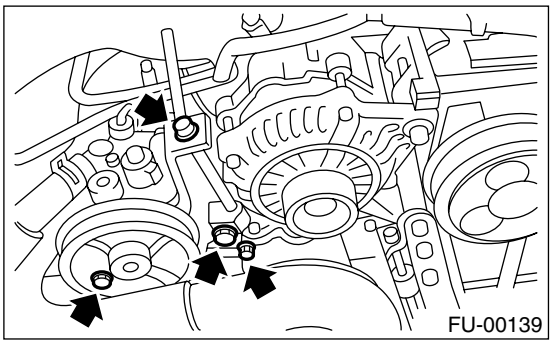
(3) Clog plug onto service hole.

10) Install power steering pump on bracket.
(1) Install power steering tank on bracket.

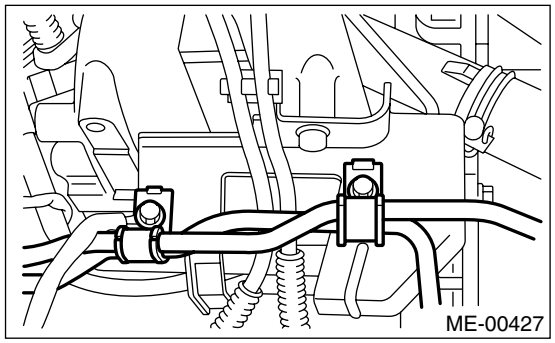

FU-00429

(2) Install power steering pump on bracket, and tighten bolts.

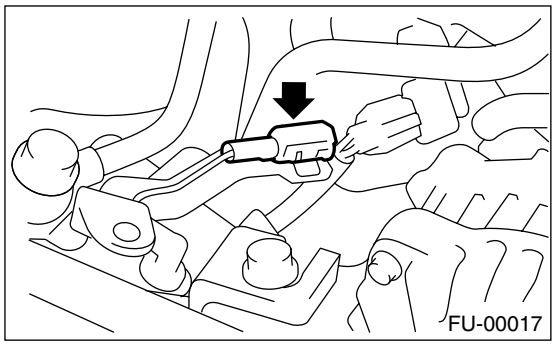
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)


FU-00139

(3) Tighten bolt which installs power steering pump bracket, and install spark plug codes.

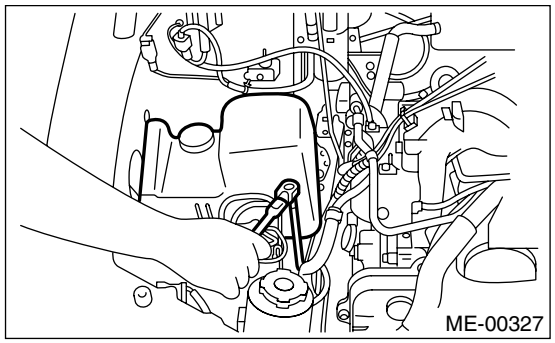

ME-00427

(4) Connect power steering switch connector.


FU-00017

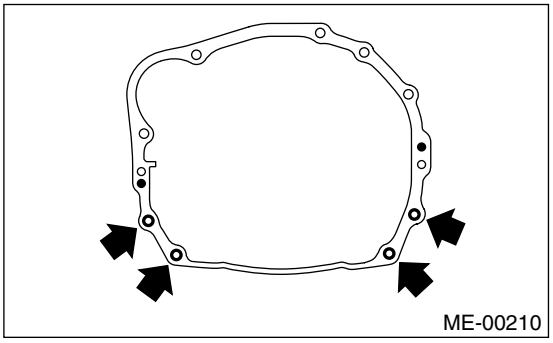
(5) Front side V-belt
Install and adjust it. <Ref. to ME(H4SO)-43, V-belt.>
(6) Install resonator chamber (Except U5).

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)


ME-00327

11) Tighten nuts which hold lower side of transmission to engine.

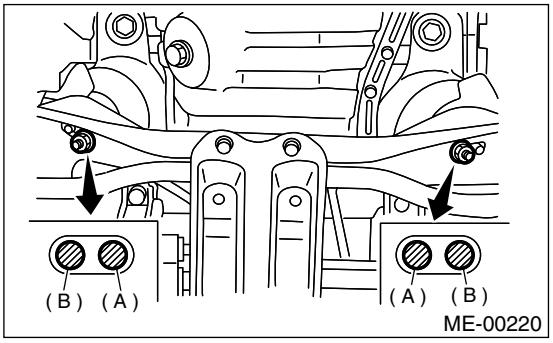
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



12) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

CAUTION:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



13) Install front and center exhaust pipe.
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.> and <Ref. to EX(H4SO)-8, INSTALLATION, Center Exhaust Pipe.>
14) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose <Ref. to FU(H4SO)-73, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
15) Connect the following connectors.
(1) Engine ground terminals

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

(2) Engine harness connectors
(3) Alternator connector and terminal
(4) A/C compressor connectors
(5) Power steering pressure switch
16) Connect the following cables.
(1) Accelerator cable
(2) Cruise control cables (With cruise control)
17) After connecting each cable, adjust them.
18) Install air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

19) Install A/C pressure hoses.
<Ref. to AC-38, INSTALLATION, Flexible Hose.>
20) Install radiator to vehicle. <Ref. to CO(H4SO)-21, INSTALLATION, Radiator.>
21) Install ATF cooler pipe to body. <Ref. to 4AT-84, INSTALLATION, ATF Cooler Pipe and Hose.>
22) Install air intake duct and cleaner case.
<Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
23) Install under cover.
24) Install battery in the vehicle, and connect cables.
25) Fill coolant.
<Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
26) Check ATF level and correct if necessary. (AT model)
<Ref. to 4AT-31, Automatic Transmission Fluid.>
27) Charge A/C system with refrigerant.
<Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>
28) Remove front hood stay, and close front hood.
29) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove engine assembly. <Ref. to ME(H4SO)-34, REMOVAL, Engine Assembly.>
2) Remove engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 26.0 ft-lb)

C: INSPECTION

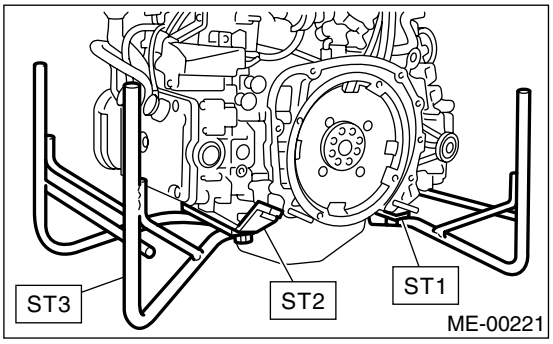
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from the body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

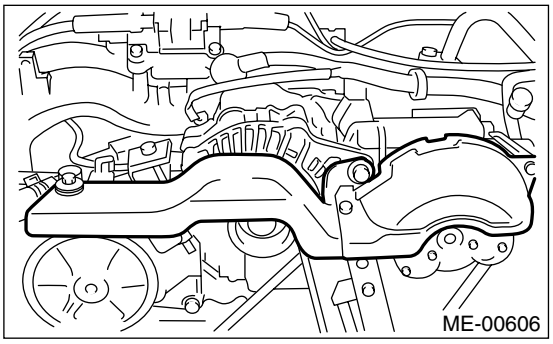
12.V-belt

A: REMOVAL

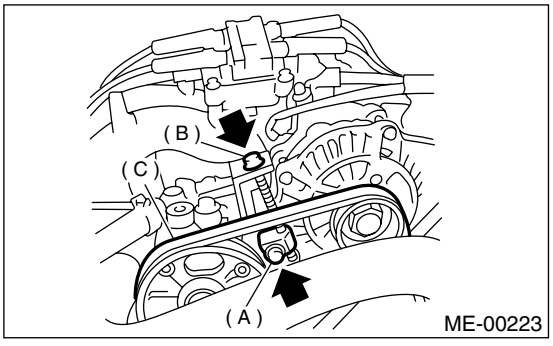
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to the body.

1) Remove V-belt cover.

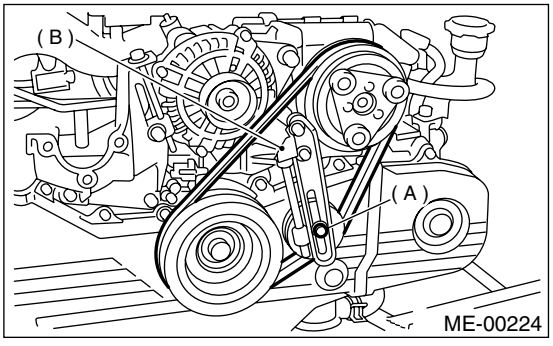


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

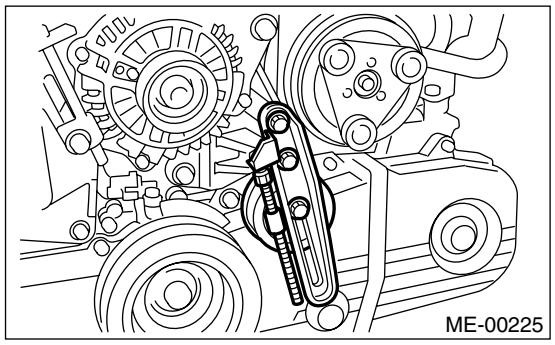


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.

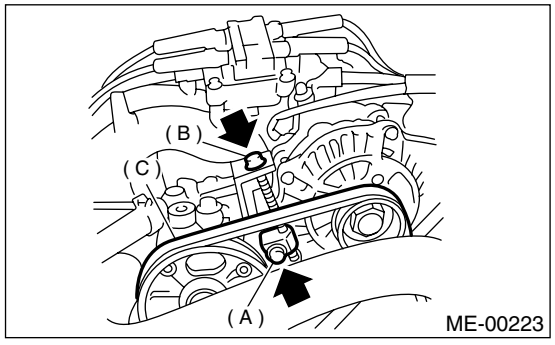


B: INSTALLATION

1. FRONT SIDE BELT

1) Wipe off any oil or water on the belt and pulley.
2) Install a belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(H4SO)-44, INSPECTION, V-belt.>
3) Tighten the lock bolt (A).
4) Tighten slider bolt (B).

Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

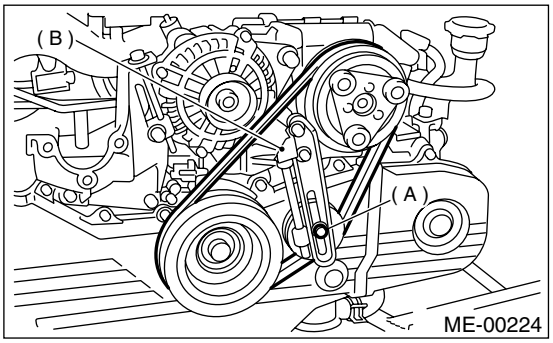


5) Install V-belt cover.

2. REAR SIDE BELT

1) Install a belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4SO)-44, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)

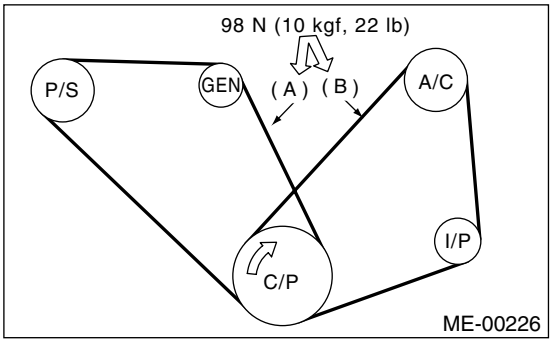


C: INSPECTION

1. WITHOUT BELT TENSION GAUGE

1) Replace belts, if cracks, fraying or wear is found.
2) Check drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension
(A)
new: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
new: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

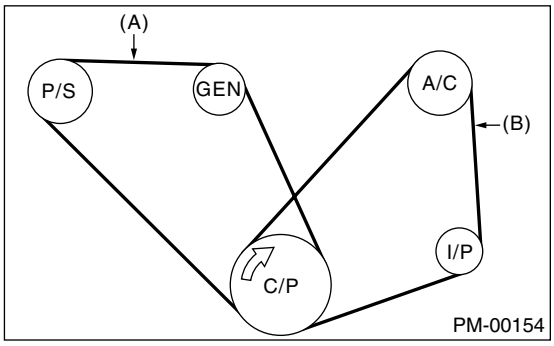


C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

2. WITH BELT TENSION GAUGE

1) Replace belts, if cracks, fraying or wear is found.
2) Check drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension
(A)
490 — 640 N (50 — 65 kgf, 110 — 144 lb)
(B)*
350 — 450 N (36 — 46 kgf, 79 — 101 lb)

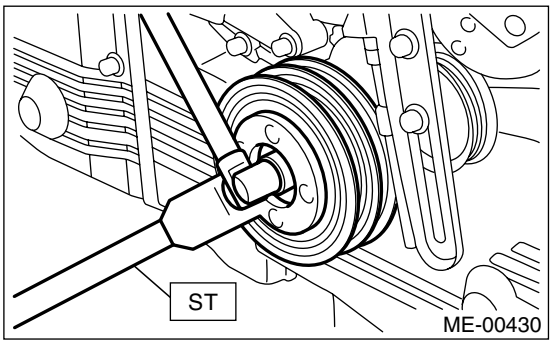


C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley bolt. To lock crankshaft, use ST.
ST 499977100
CRANKSHAFT PULLEY WRENCH

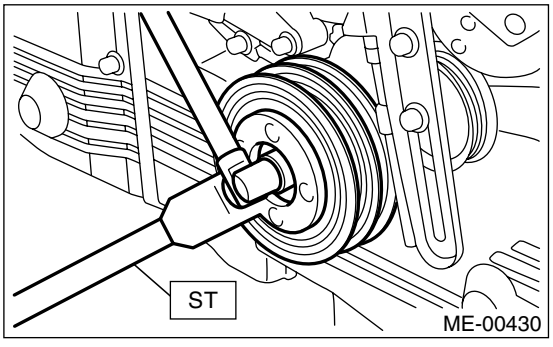


3) Remove crankshaft pulley.

B: INSTALLATION

1) Install crankshaft pulley.
2) Install pulley bolt.
To lock crankshaft, use ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH
(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
177 N·m (18.0 kgf-m, 130.2 ft-lb)



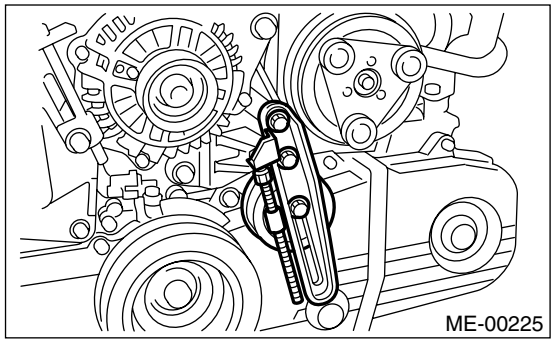
3) Confirm that the tightening angle of the crankshaft pulley bolt is 65 degrees or more. If not, conduct the following procedures (1) through (4).
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

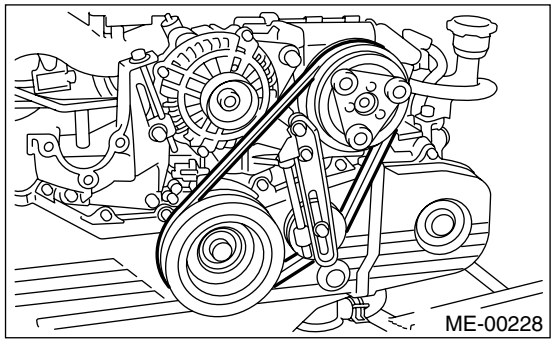
(2) Clean the crankshaft thread using an air gun.
(3) Apply engine oil to the crankshaft pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of the crankshaft pulley bolt referring to the gauge indicated on the belt cover.

4) Install A/C belt tensioner.



5) Install A/C belt.



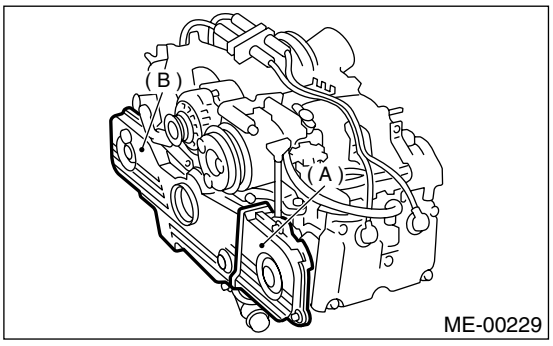
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4SO)-44, INSPECTION, V-belt.>

14.Belt Cover

A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover (LH).
4) Remove front belt cover.



(A) Belt cover (LH)
(B) Front belt cover

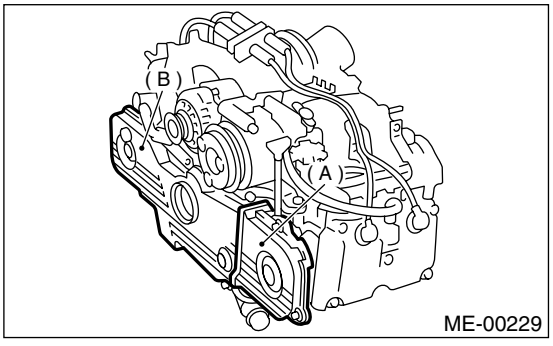
B: INSTALLATION

1) Install front belt cover.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install belt cover (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



(A) Belt cover (LH)
(B) Front belt cover

3) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
4) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

C: INSPECTION

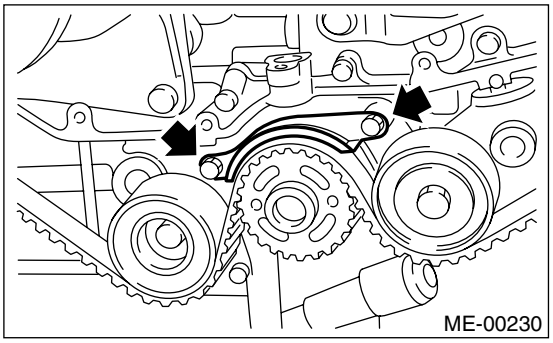
Make sure the cover is not damaged.

15.Timing Belt Assembly

A: REMOVAL

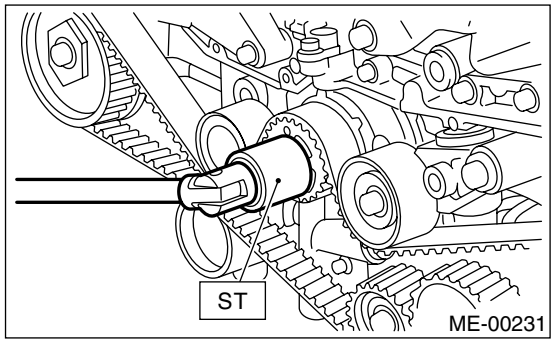
1. TIMING BELT

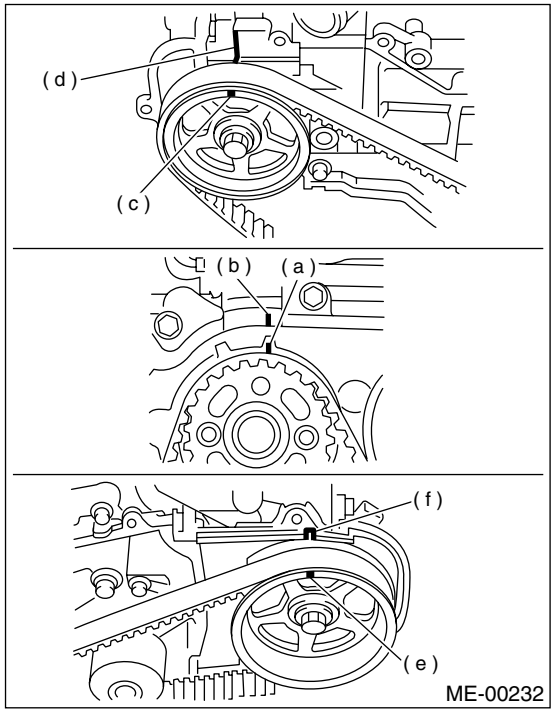
1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
4) Remove timing belt guide. (MT vehicle only)



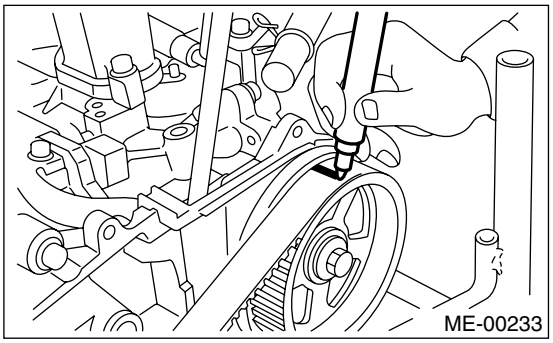
5) If alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing timing belt as shown in procedures below.
   (1) Turn crankshaft using ST. Align mark (a) of sprocket to cylinder block notch (b) and ensure that right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET

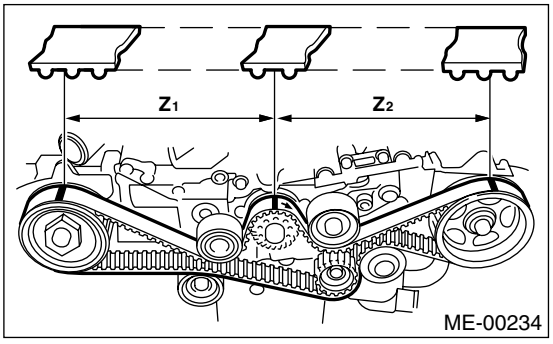




(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the crank sprocket and cam sprockets.

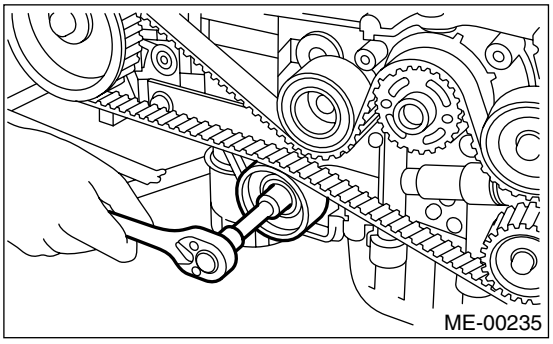

ME-00233

Specified data:
Z_1: 46.8 tooth length
Z_2: 43.7 tooth

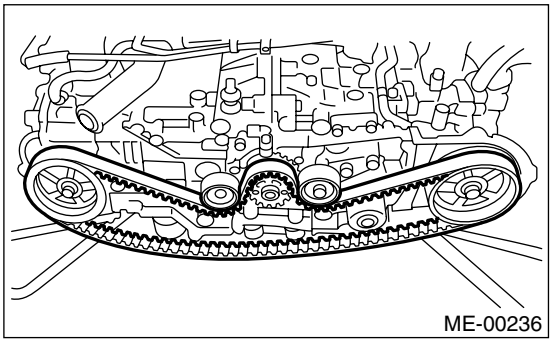


ME-00234

6) Remove belt idler (No. 2).
7) Remove belt idler No. 2.

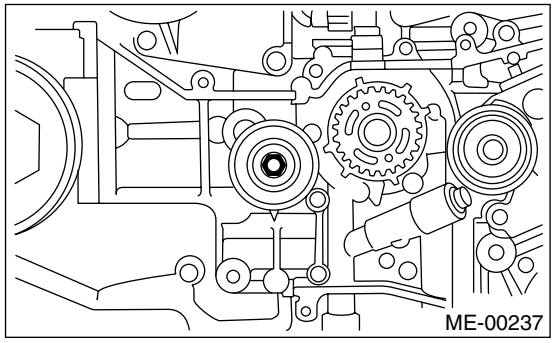

ME-00235

8) Remove timing belt.

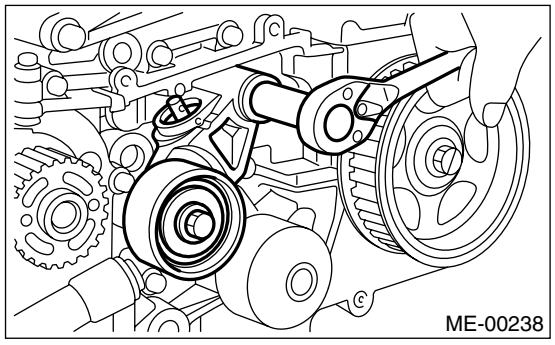

ME-00236

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove belt idler (No. 1).


ME-00237

2) Remove automatic belt tension adjuster assembly.


ME-00238

B: INSTALLATION

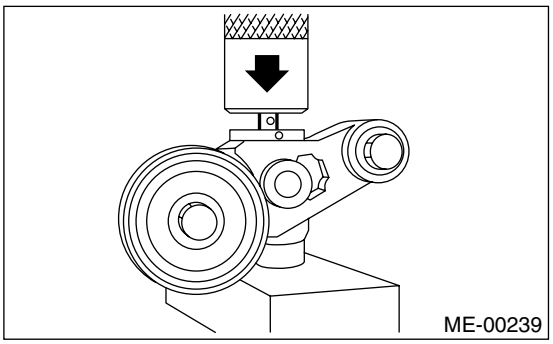
1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Preparation for installation of automatic belt tension adjuster assembly;

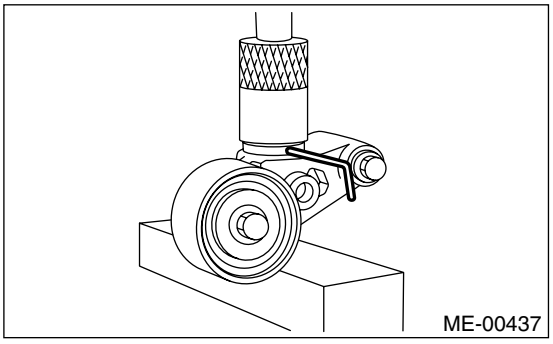
CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push adjuster rod vertically.
• Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
• Press-in the push adjuster rod gradually taking more than three minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

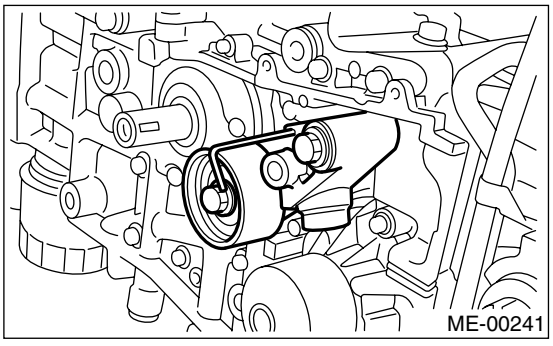


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



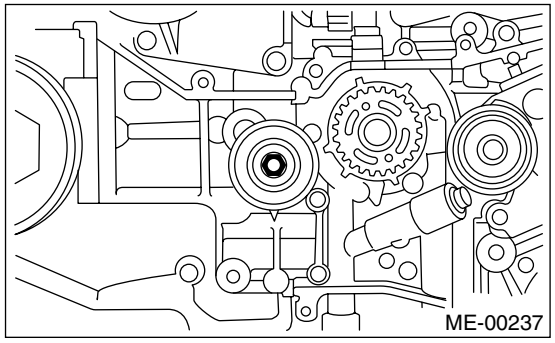
2) Install automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install belt idler (No. 1).

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



2. TIMING BELT

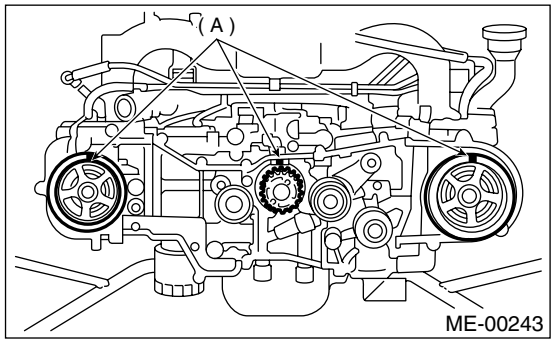
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4SO)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Installation of timing belt

(1) Turn camshaft sprocket No. 2 using ST1, and turn camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

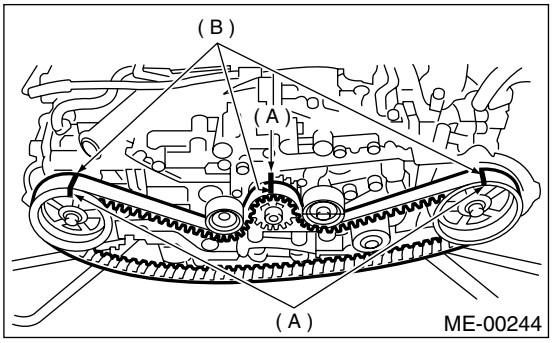
ST1 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
CAMSHAFT SPROCKET WRENCH (499207100) is also can be used.



(2) While aligning alignment mark (B) on timing belt with marks on sprockets (A), position timing belt properly.

NOTE:
Ensure belt's rotating direction is correct.

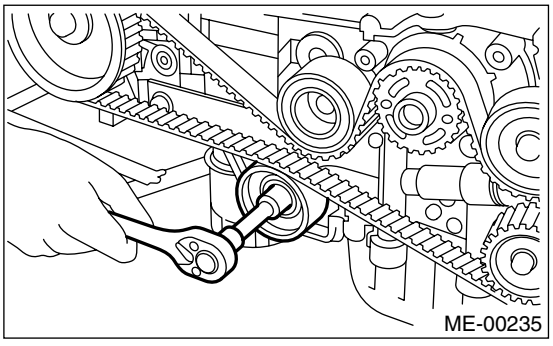


3) Install belt idler No. 2.

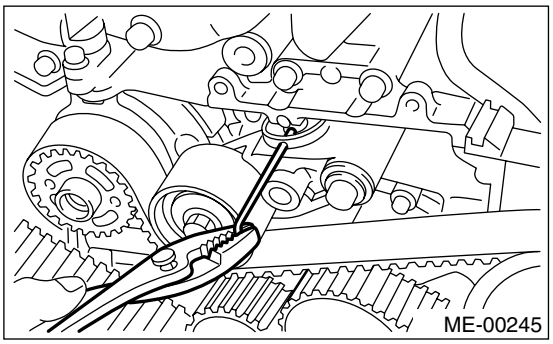
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

4) Install belt idler (No. 2).

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

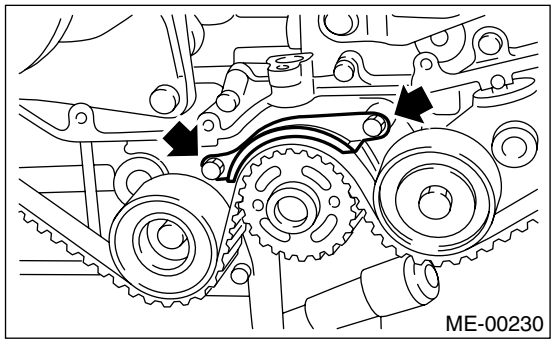


5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove stopper pin from belt tensioner adjuster.



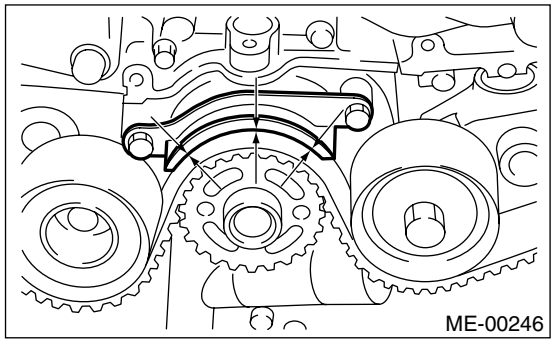
6) Install timing belt guide. (MT vehicles only)

(1) Temporarily tighten bolts.



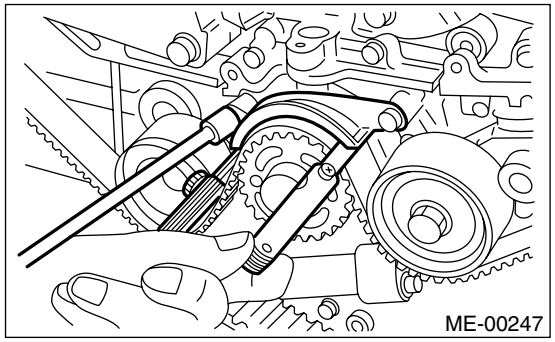
(2) Check and adjust clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



(3) Tighten bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



7) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
8) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
9) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

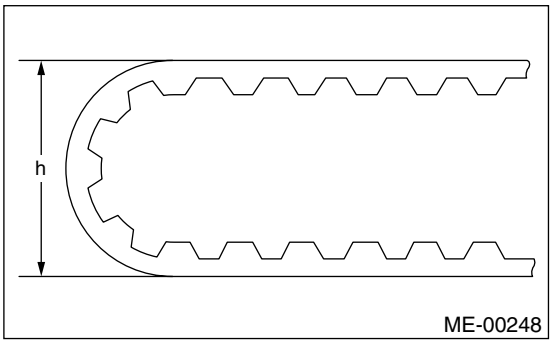
C: INSPECTION

1. TIMING BELT

1) Check timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
2) Check the condition of back side of belt; if any crack is found, replace belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



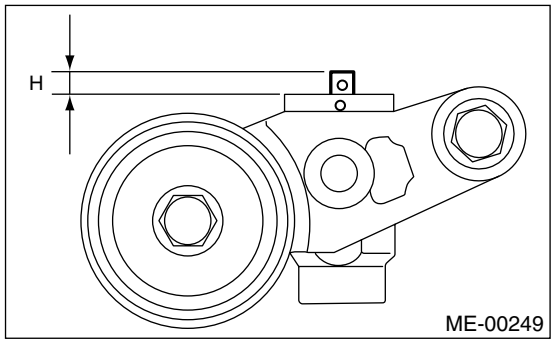
2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.
2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than three minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace automatic belt tension adjuster assembly if faulty.
2) Check tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check tension pulley for grease leakage.

4. BELT IDLER

1) Check belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check belt idler for grease leakage.

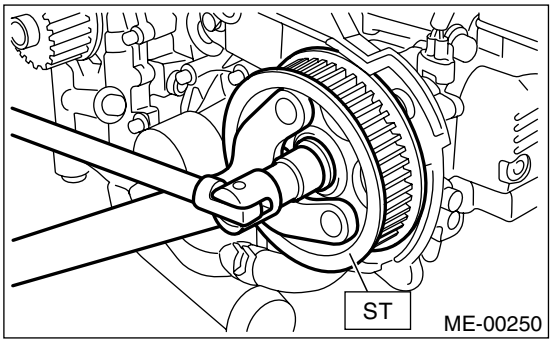
16.Camshaft Sprocket

A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
4) Remove timing belt assembly. <Ref. to ME(H4SO)-47, REMOVAL, Timing Belt Assembly.>
5) Remove camshaft position sensor. <Ref. to FU(H4SO)-29, REMOVAL, Camshaft Position Sensor.>
6) Remove camshaft sprocket No. 1 and No. 2. To lock camshaft, use ST.

ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
CAMSHAFT SPROCKET WRENCH (499207100) is also can be used.



B: INSTALLATION

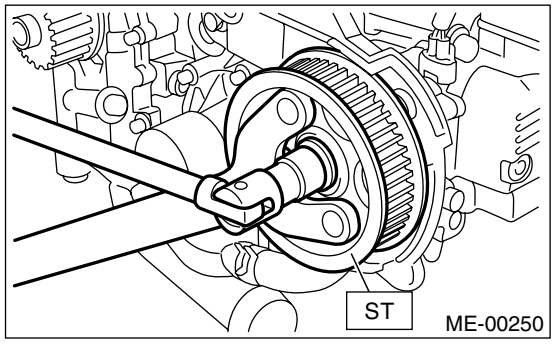
1) Install camshaft sprocket No. 1 and No. 2. To lock camshaft, use ST.

ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
CAMSHAFT SPROCKET WRENCH (499207100) is also can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

CAUTION:
Do not confuse left and right side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



2) Install timing belt assembly. <Ref. to ME(H4SO)-48, INSTALLATION, Timing Belt Assembly.>
3) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
4) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
5) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

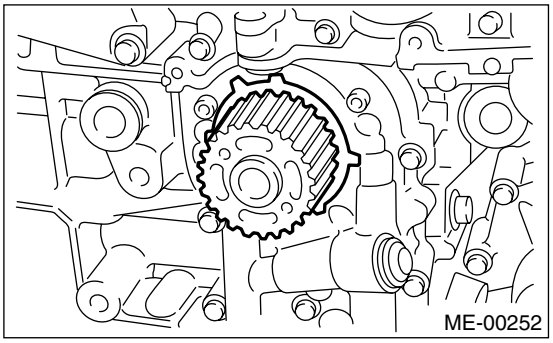
C: INSPECTION

1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

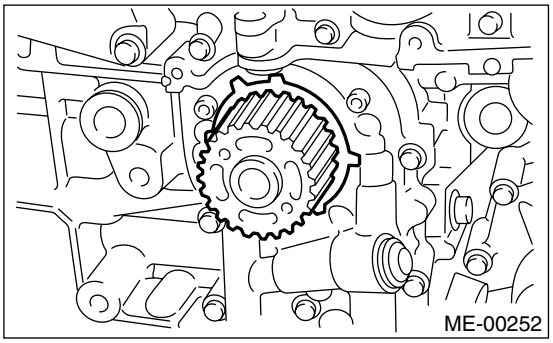
A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
4) Remove timing belt assembly. <Ref. to ME(H4SO)-47, REMOVAL, Timing Belt Assembly.>
5) Remove camshaft sprocket. <Ref. to ME(H4SO)-52, REMOVAL, Camshaft Sprocket.>
6) Remove crankshaft sprocket.



B: INSTALLATION

1) Install crankshaft sprocket.



2) Install camshaft sprocket. <Ref. to ME(H4SO)-52, INSTALLATION, Camshaft Sprocket.>
3) Install timing belt assembly. <Ref. to ME(H4SO)-48, INSTALLATION, Timing Belt Assembly.>
4) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
5) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
6) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

C: INSPECTION

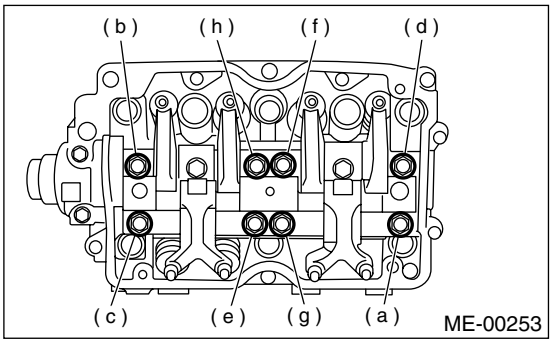
1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

18.Valve Rocker Assembly

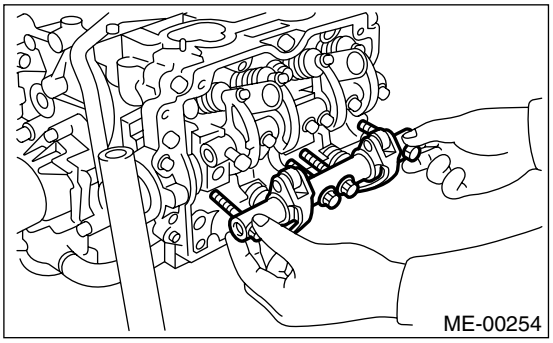
A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
4) Remove timing belt assembly. <Ref. to ME(H4SO)-47, REMOVAL, Timing Belt Assembly.>
5) Remove camshaft sprocket. <Ref. to ME(H4SO)-52, REMOVAL, Camshaft Sprocket.>
6) Disconnect PCV hose and remove rocker cover.
7) Removal of valve rocker assembly
   (1) Remove bolts (a) through (h) in alphabetical sequence.

NOTE:
Leave two or three threads of bolts (g and h) engaged to retain valve rocker assembly.



(2) Remove valve rocker assembly.



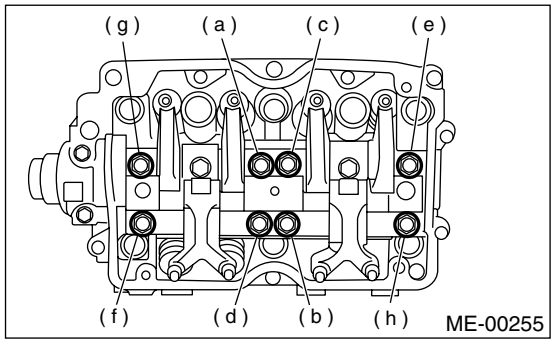
B: INSTALLATION

1) Installation of valve rocker assembly
   (1) Temporarily tighten bolts (a) through (d) in alphabetical order equally as shown in figure.

NOTE:
Do not allow valve rocker assembly to gouge knock pins.

   (2) Tighten bolts (e) through (h) in alphabetical order to specified torque.
   (3) Tighten bolts (a) through (d) in alphabetical order to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Adjust the valve clearances. <Ref. to ME(H4SO)-32, ADJUSTMENT, Valve Clearance.>
3) Install rocker cover and connect PCV hose.
4) Install camshaft sprocket. <Ref. to ME(H4SO)-52, INSTALLATION, Camshaft Sprocket.>
5) Install timing belt assembly. <Ref. to ME(H4SO)-48, INSTALLATION, Timing Belt Assembly.>
6) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
7) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
8) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Remove bolts which secure rocker shaft.
2) Extract rocker shaft. Remove valve rocker arms, springs, plates and shaft supports from rocker shaft.

NOTE:
Arrange all removed parts in order so that they can be installed in their original positions.

3) Remove nut and adjuster screw from valve rocker.

D: ASSEMBLY

1) Install adjuster screw and nut to valve rocker.
2) Arrange valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):
5 N·m (0.5 kgf-m, 3.6 ft-lb)

NOTE:
Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure parts with same markings are properly assembled.

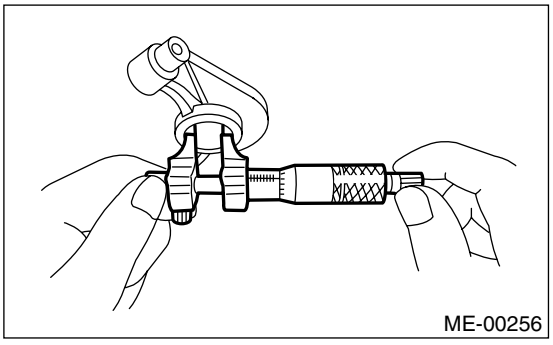
3) Install valve rocker shaft securing bolts.

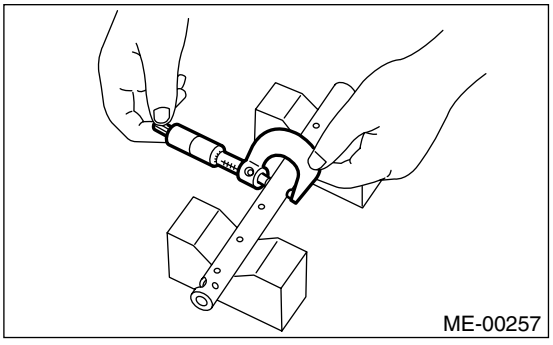
E: INSPECTION

1. VALVE ROCKER ARM AND ROCKER SHAFT

1) Measure inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:
Standard
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit
0.10 mm (0.0039 in)


ME-00256


ME-00257

2) If oil clearance exceeds the limit, replace valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

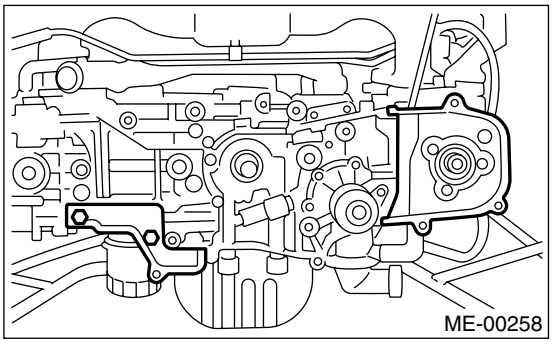
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace valve rocker arm.
4) Check that valve rocker arm roller rotates smoothly. If not, replace valve rocker arm.

19.Camshaft

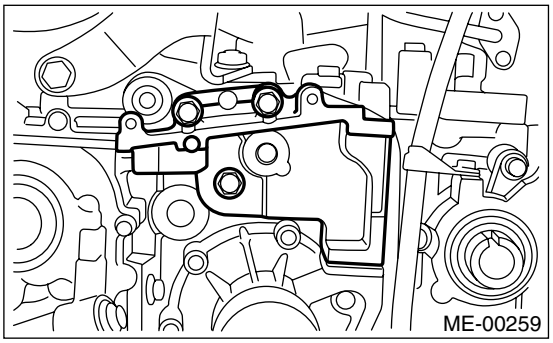
A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
4) Remove timing belt assembly. <Ref. to ME(H4SO)-47, REMOVAL, Timing Belt Assembly.>
5) Remove camshaft sprocket. <Ref. to ME(H4SO)-52, REMOVAL, Camshaft Sprocket.>
6) Remove crankshaft sprocket. <Ref. to ME(H4SO)-53, REMOVAL, Crankshaft Sprocket.>
7) Remove belt cover No. 2 (LH).
8) Remove belt cover No. 2 (RH).

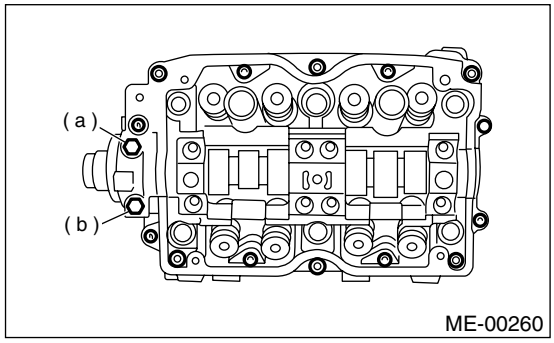
NOTE:
Do not damage or lose the seal rubber when removing belt covers.


ME-00258

9) Remove tensioner bracket.

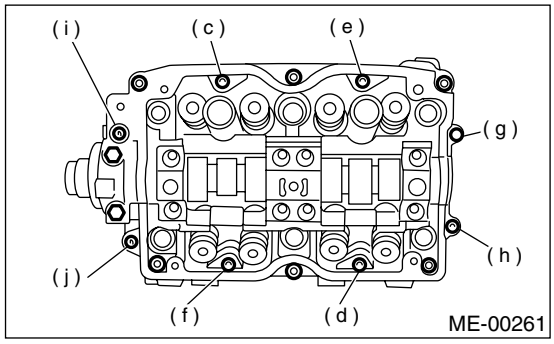

ME-00259

10) Remove camshaft position sensor support. (LH side only)
11) Remove oil level gauge guide. (LH side only)
12) Remove valve rocker assembly. <Ref. to ME(H4SO)-54, REMOVAL, Valve Rocker Assembly.>
13) Remove camshaft cap.
(1) Remove bolts (a) through (b) in alphabetical sequence.



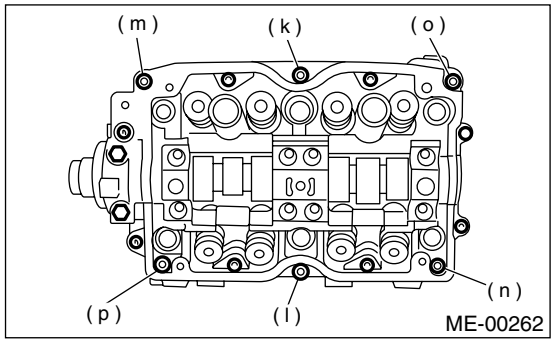
ME-00260

(2) Equally loosen bolts (c) through (j) all the way in alphabetical sequence.



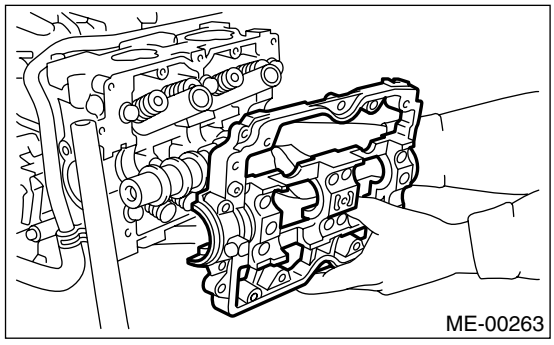
ME-00261

(3) Remove bolts (k) through (p) in alphabetical sequence using ST.
ST 499497000 TORX PLUS



ME-00262

(4) Remove camshaft cap.


ME-00263

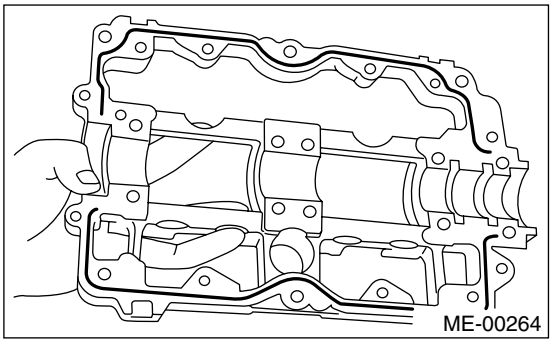
14) Remove camshaft.
15) Remove oil seal.
16) Remove plug from rear side of camshaft.

NOTE:
• Do not remove oil seal unless necessary.
• Do not scratch journal surface when removing oil seal.

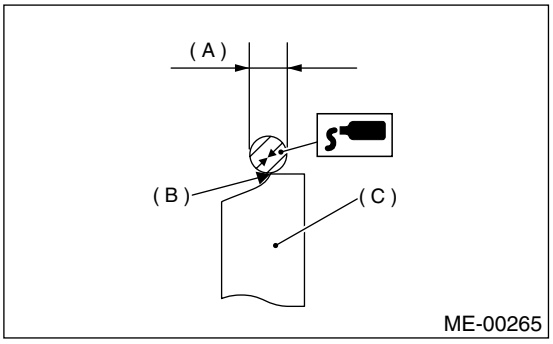
B: INSTALLATION

1) Apply a coat of engine oil to camshaft journals and install camshaft.
2) Install camshaft cap.
   (1) Apply liquid gasket on the around of camshaft cap.

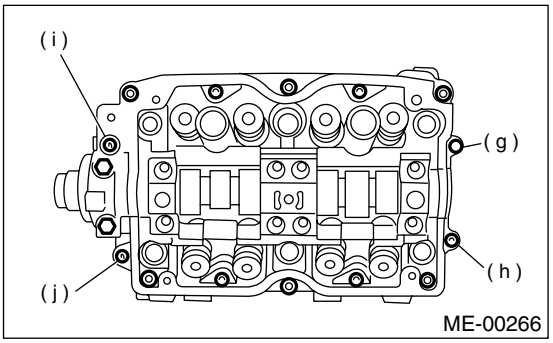
Liquid gasket:
THREE BOND 1280B
P/N K0877YA018



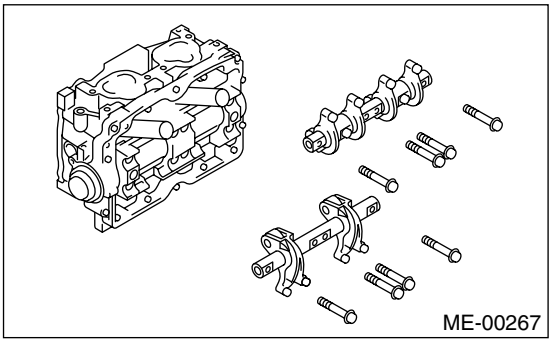
NOTE:
Thinly apply a 3 mm (0.12 in) diameter (A) continuous strip of liquid gasket along edge (B) of camshaft cap (C) mating surface.



(2) Temporarily tighten bolts (g) through (j) in alphabetical sequence.

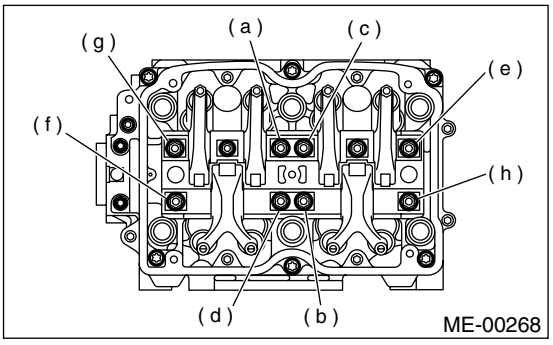


(3) Install valve rocker assembly.



(4) Tighten bolts (a) through (h) in alphabetical sequence.

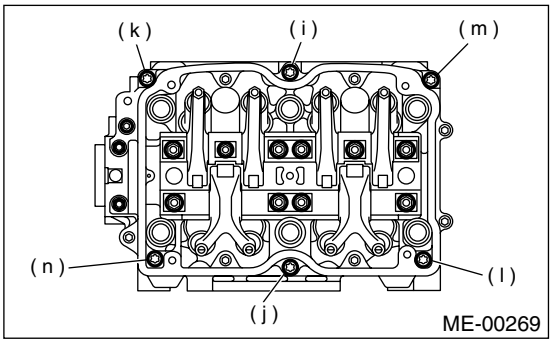
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(5) Tighten TORX bolts (i) through (n) in alphabetical sequence using ST.

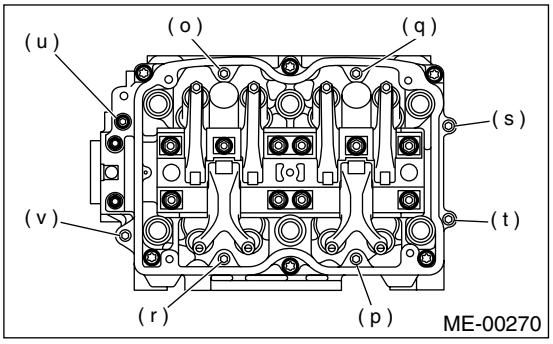
ST 499497000 TORX PLUS

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



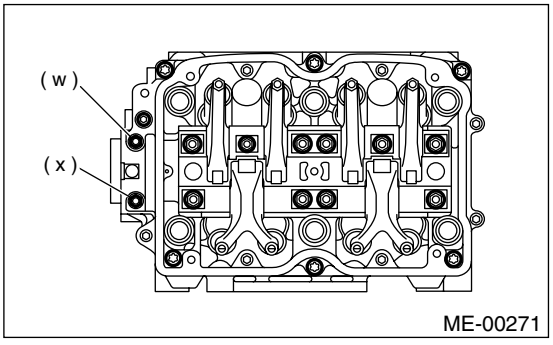
(6) Tighten bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



(7) Tighten bolts (w) through (x) in alphabetical sequence.

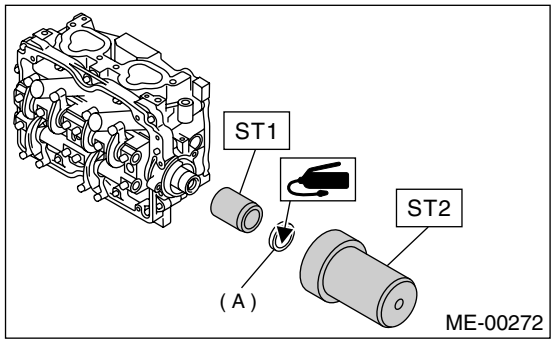
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Apply a coat of grease to oil seal lips and install oil seal (A) on camshaft using ST1 and ST2.

NOTE:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587500 OIL SEAL INSTALLER



4) Install plug using ST.

ST 499587700 OIL SEAL INSTALLER

5) Adjust the valve clearance. <Ref. to ME(H4SO)-32, ADJUSTMENT, Valve Clearance.>

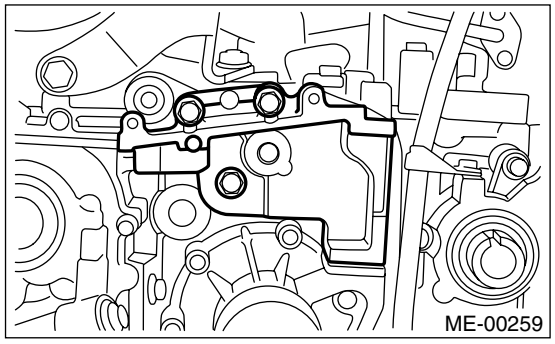
6) Install rocker cover and connect PCV hose.

7) Install oil level gauge guide. (LH side only)

8) Install camshaft position sensor support. (LH side only)

9) Install tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

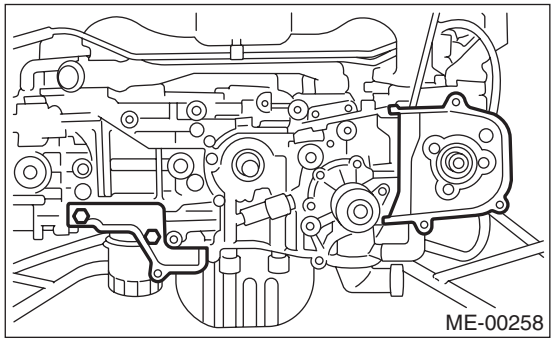


10) Install belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

11) Install belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



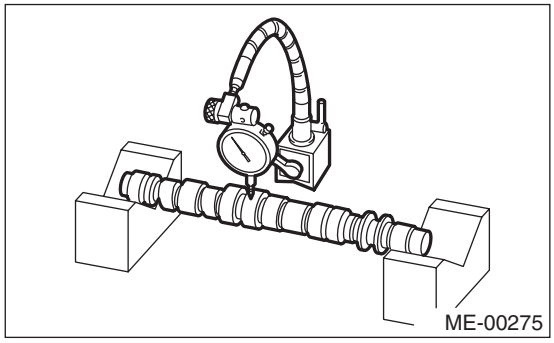
12) Install crankshaft sprocket. <Ref. to ME(H4SO)-53, INSTALLATION, Crankshaft Sprocket.>
13) Install camshaft sprocket. <Ref. to ME(H4SO)-52, INSTALLATION, Camshaft Sprocket.>
14) Install timing belt assembly. <Ref. to ME(H4SO)-48, INSTALLATION, Timing Belt Assembly.>
15) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
16) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
17) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:
0.025 mm (0.00098 in)



2) Check journal for damage and wear. Replace if faulty.

3) Measure outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between the two (= oil clearance). If oil clearance exceeds specifications, replace camshaft or cylinder head as necessary.

		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

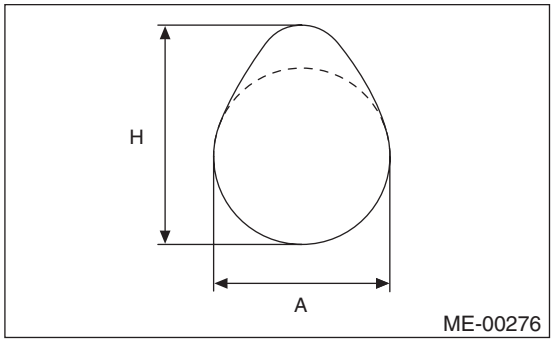
4) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Item		Unit: mm (in)
Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
	Limit	39.385 (1.5506)
Exhaust*1	STD	39.257 — 39.357 (1.5455 — 1.5495)
	Limit	39.157 (1.5416)
Exhaust*2	STD	39.843 — 39.943 (1.5686 — 1.5726)
	Limit	39.743 (1.5647)

*1: Except U5
*2: U5

Cam base circle diameter A:
IN: 34.00 mm (1.3386 in)
EX: 34.00 mm (1.3386 in)



2. CAMSHAFT SUPPORT

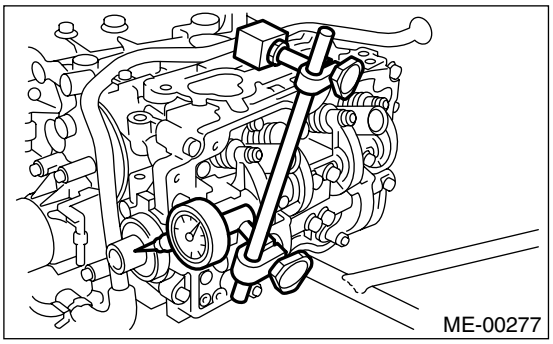
Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace camshaft support.

Standard:

0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:

0.10 mm (0.0039 in)

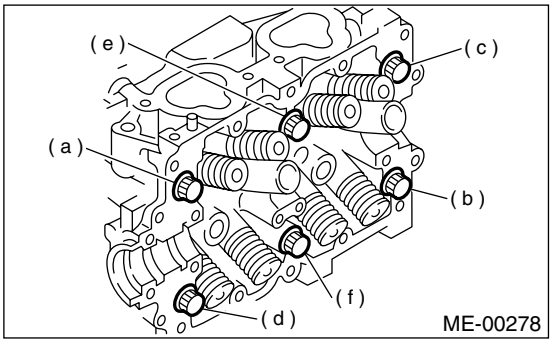


20.Cylinder Head Assembly

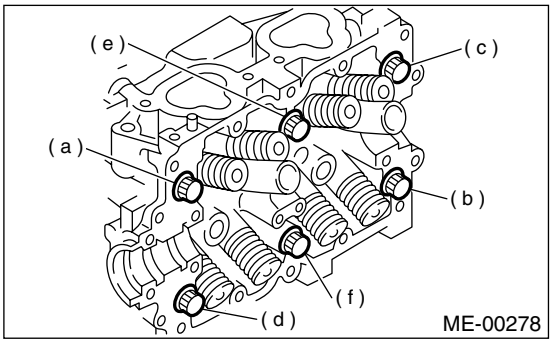
A: REMOVAL

1) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
2) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
3) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
4) Remove timing belt assembly. <Ref. to ME(H4SO)-47, REMOVAL, Timing Belt Assembly.>
5) Remove camshaft sprocket. <Ref. to ME(H4SO)-52, REMOVAL, Camshaft Sprocket.>
6) Remove intake manifold. <Ref. to FU(H4SO)-15, REMOVAL, Intake Manifold.>
7) Remove bolt which installs A/C compressor bracket on cylinder head.
8) Remove valve rocker assembly. <Ref. to ME(H4SO)-54, REMOVAL, Valve Rocker Assembly.>
9) Remove camshaft. <Ref. to ME(H4SO)-56, REMOVAL, Camshaft.>
10) Remove cylinder head bolts in alphabetical sequence shown in figure.

NOTE:
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



11) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
12) Remove bolts (a) through (c) to remove cylinder head.



13) Remove cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove right side cylinder head.

B: INSTALLATION

1. CYLINDER HEAD

1) Install cylinder head and gaskets on cylinder block.

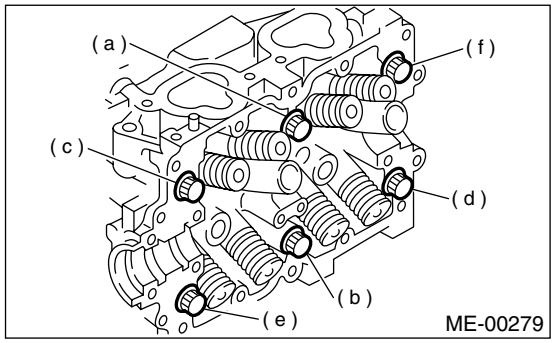
CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder block and cylinder head.**

2) Tighten cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° with reversing order of assembly and after that back them off by 180° again.
(4) Tighten bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
(5) Tighten bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence shown in figure below.

CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



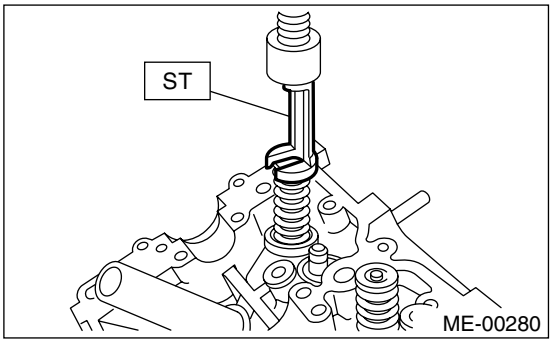
3) Install camshaft. <Ref. to ME(H4SO)-57, INSTALLATION, Camshaft.>
4) Install valve rocker assembly. <Ref. to ME(H4SO)-54, INSTALLATION, Valve Rocker Assembly.>

5) Install A/C compressor bracket on cylinder head.
6) Install intake manifold. <Ref. to FU(H4SO)-18, INSTALLATION, Intake Manifold.>
7) Install camshaft sprocket. <Ref. to ME(H4SO)-52, INSTALLATION, Camshaft Sprocket.>
8) Install timing belt assembly. <Ref. to ME(H4SO)-48, INSTALLATION, Timing Belt Assembly.>
9) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
10) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
11) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>

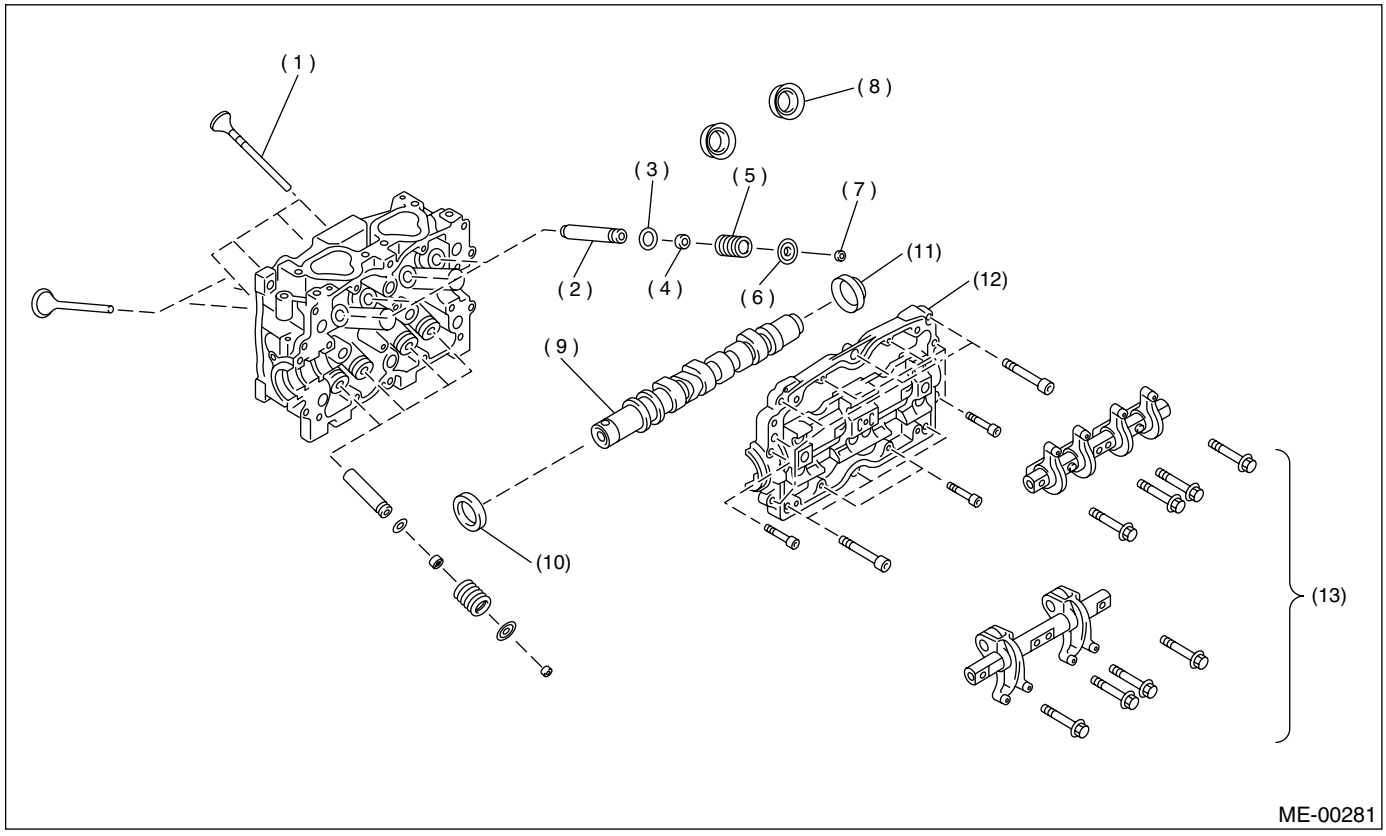
C: DISASSEMBLY

1) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
2) Set ST on valve spring. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

NOTE:
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



D: ASSEMBLY



(1) Valve
(2) Valve guide
(3) Valve spring seat
(4) Oil seal
(5) Valve spring
(6) Retainer
(7) Collet (valve)
(8) Spark plug pipe gasket
(9) Camshaft
(10) Oil seal
(11) Plug
(12) Camshaft cap
(13) Valve rocker ASSY

1) Installation of valve spring and valve
(1) Place cylinder head on ST.

ST 498267800 CYLINDER HEAD TABLE

(2) Coat stem of each valve with engine oil and insert valve into valve guide.

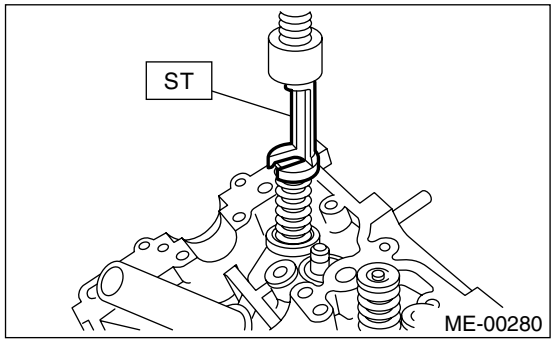
NOTE:
When inserting valve into valve guide, use special care not to damage the oil seal lip.

(3) Install valve spring and retainer.

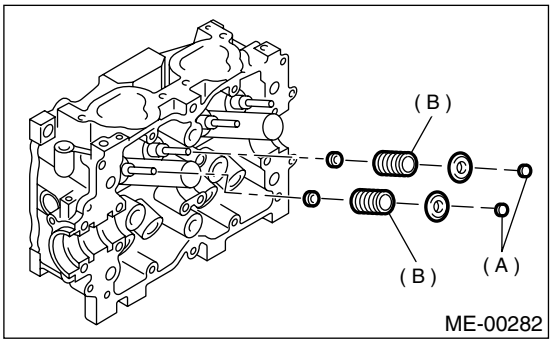
NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(4) Set ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



(5) Compress valve spring and fit collet (valve).



(A) Collet (valve)
(B) Painted face

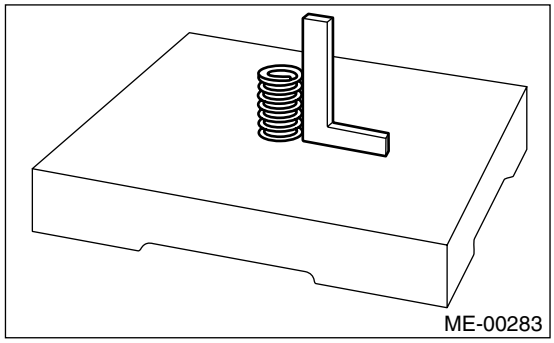
(6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.

E: INSPECTION

1. VALVE SPRING

1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.
2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in)
Tension/spring height	214 — 246 N (21.8 — 25.1 kgf, 48.1 — 55.3 lb)/ 45.0 mm (1.772 in)
	526 — 582 N (53.7 — 59.4 kgf, 118.2 — 130.8 lb)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

If following conditions are found, use pliers to pinch oil seal and remove it from valve, and replace it new one.
- Lip is damaged
- Spring out of place
- Reconditioning of surfaces for valve and valve seat is necessary
- Replacement of valve guide is necessary

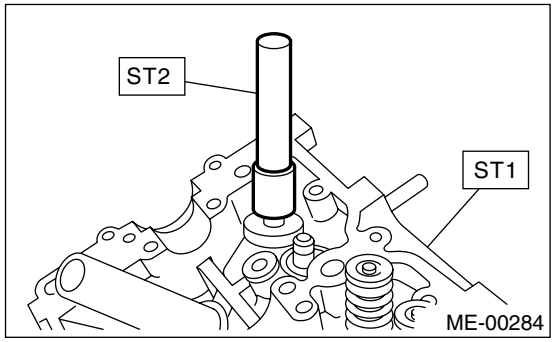
1) Place cylinder head on ST1.
2) Press-fit oil seal to the specified dimension indicated in the figure using ST2.

CAUTION:
- **Apply engine oil to oil seal before press-fitting.**
- **When press-fitting oil seal, do not use hammer or strike in.**
- **Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.**

ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

Color of rubber part:
Intake [Black]
Exhaust [Brown]

Color of spring part:
Intake [Silver]
Exhaust [Silver]



F: ADJUSTMENT

1. CYLINDER HEAD

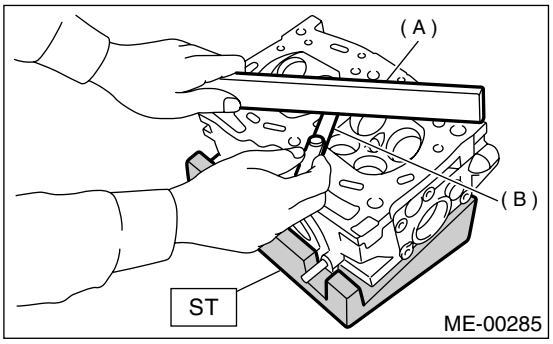
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

NOTE:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

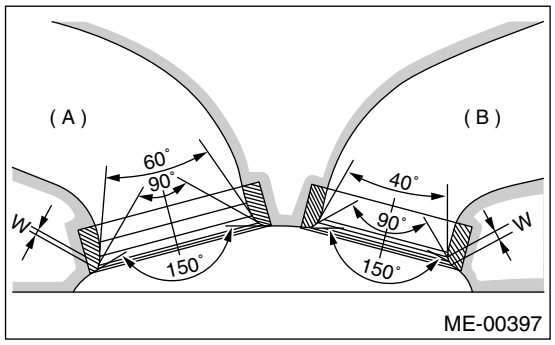


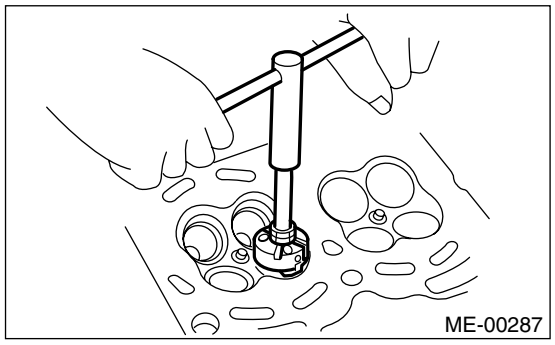
(A) Straight edge
(B) Thickness gauge

2. VALVE SEAT

Inspect intake and exhaust valve seats, and correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake (A)
Standard 1.1 mm (0.043 in)
Limit 1.8 mm (0.071 in)
Exhaust (B)
Standard 1.5 mm (0.059 in)
Limit 2.2 mm (0.087 in)

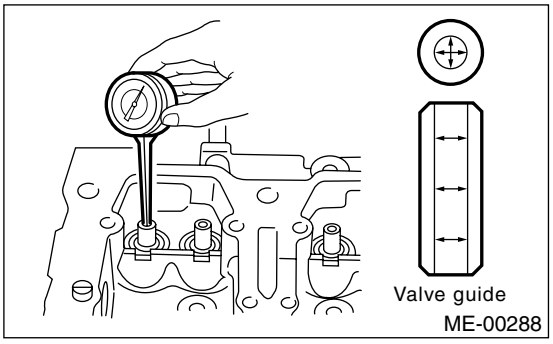


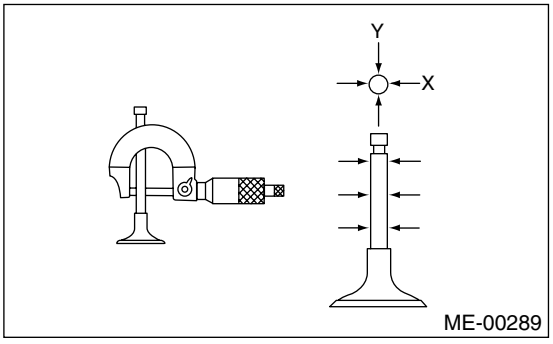


3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:
Standard
Intake 0.035 — 0.062 mm (0.0014 — 0.0024 in)
Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)
Limit
0.15 mm (0.0059 in)





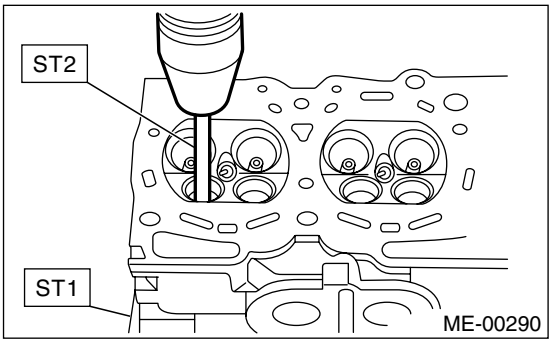
2) If the clearance between valve guide and stem exceeds the limit, replace valve guide or valve itself whichever shows greater amount of wear. See following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

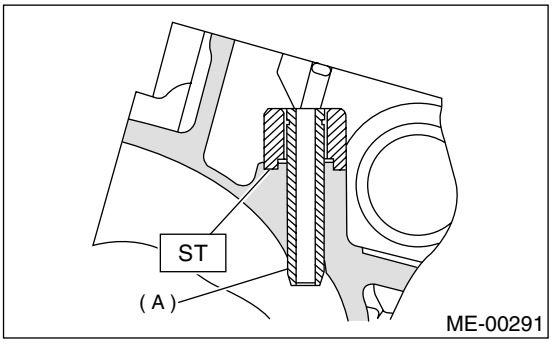
(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn cylinder head upside down and place ST as shown in the figure.

Intake side:
ST 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST 499767800 VALVE GUIDE ADJUSTER

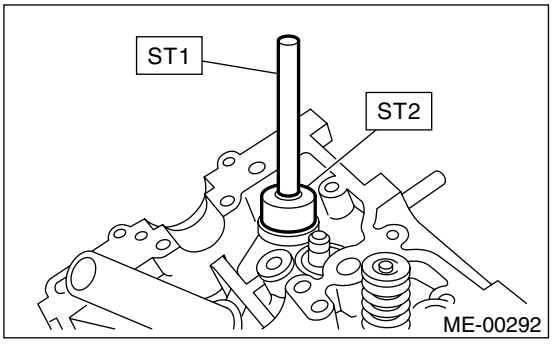


(A) Valve guide

(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

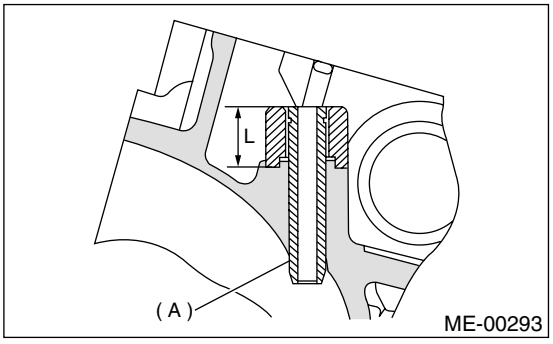
(5) Put new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
Intake side:
ST2 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
Intake
20.0 — 20.5 mm (0.787 — 0.807 in)
Exhaust
16.5 — 17.0 mm (0.650 — 0.669 in)

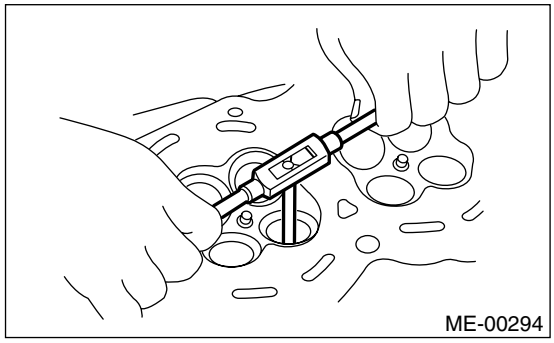


(A) Valve guide

(7) Ream the inside of valve guide with ST. Slowly rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



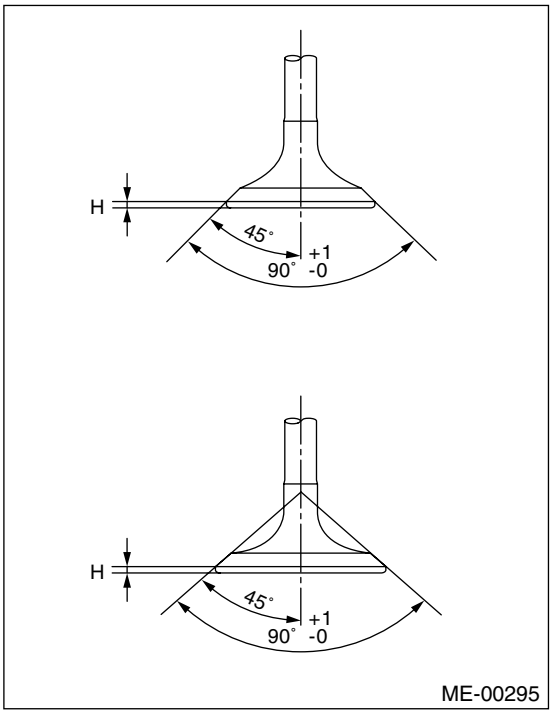
(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake
Standard 1.0 mm (0.039 in)
Limit 0.6 mm (0.024 in)
Exhaust
Standard 1.2 mm (0.047 in)
Limit 0.6 mm (0.024 in)

Valve overall length:
Intake
120.6 mm (4.75 in)
Exhaust
121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(H4SO)-65, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

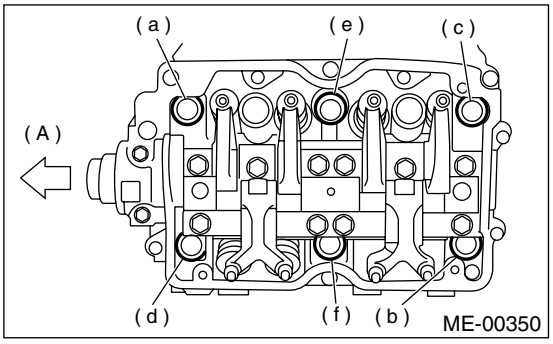
21.Cylinder Block

A: REMOVAL

NOTE:
Before conducting this procedure, drain engine oil completely.

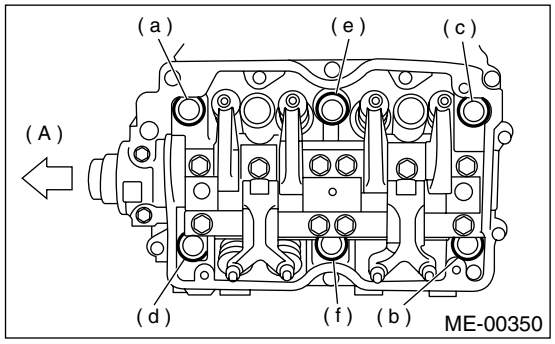
1) Remove intake manifold. <Ref. to FU(H4SO)-15, REMOVAL, Intake Manifold.>
2) Remove V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
3) Remove crankshaft pulley. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
4) Remove belt cover. <Ref. to ME(H4SO)-46, REMOVAL, Belt Cover.>
5) Remove timing belt assembly. <Ref. to ME(H4SO)-47, REMOVAL, Timing Belt Assembly.>
6) Remove camshaft sprocket. <Ref. to ME(H4SO)-52, REMOVAL, Camshaft Sprocket.>
7) Remove crankshaft sprocket. <Ref. to ME(H4SO)-45, REMOVAL, Crankshaft Pulley.>
8) Remove generator and A/C compressor with their brackets.
9) Remove rocker cover.
10) Remove cylinder head bolts in alphabetical sequence shown in figure.

NOTE:
Leave bolts (a) and (b) engaged by three or four threads to prevent cylinder head from falling.



(A) Front side

11) While tapping cylinder head with a plastic hammer, separate it from cylinder block.
12) Remove bolts (a) through (c) to remove cylinder head.

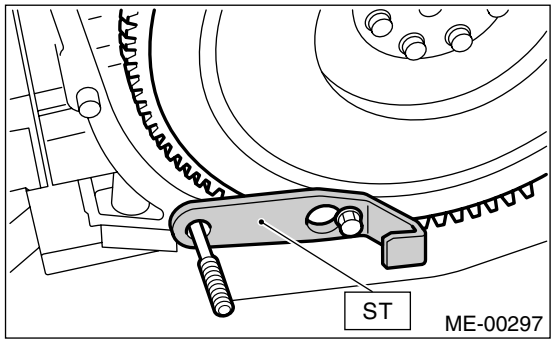


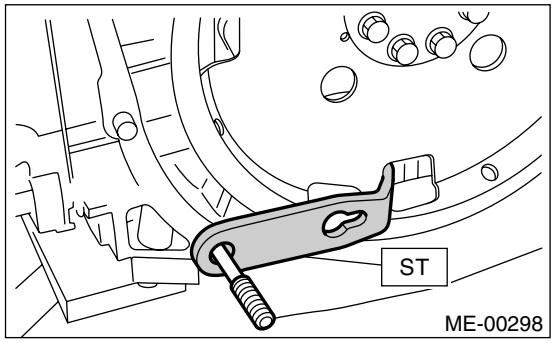
(A) Front side

13) Remove cylinder head gasket.

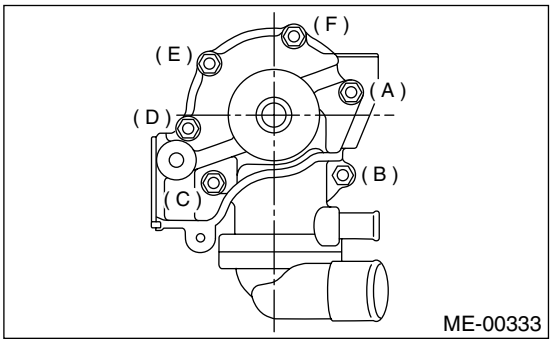
NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove right side cylinder head.
15) Remove clutch housing cover (MT vehicles only).
16) Remove flywheel (MT vehicles only) or drive plate (AT vehicles only).
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



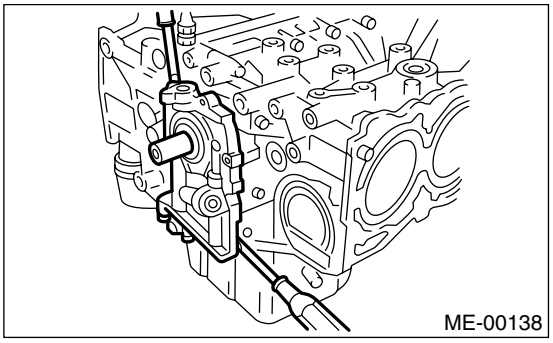


17) Remove oil separator cover.
18) Remove water by-pass pipe for heater.
19) Loosen bolts in alphabetical sequence as shown in figure and remove water pump.



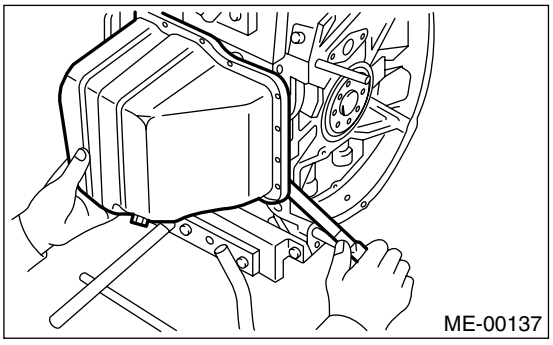
20) Remove oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in figure when removing oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.



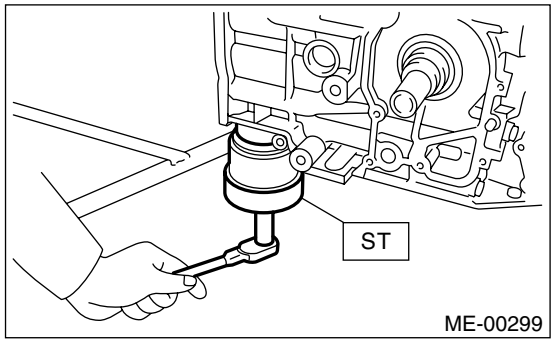
21) Removal of oil pan
(1) Turn cylinder block with #2 and #4 piston sides facing upward.
(2) Remove bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

NOTE:
Do not use a screwdriver or similar tool in place of oil pan cutter.

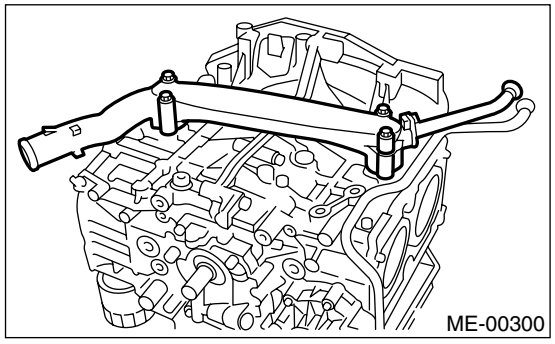


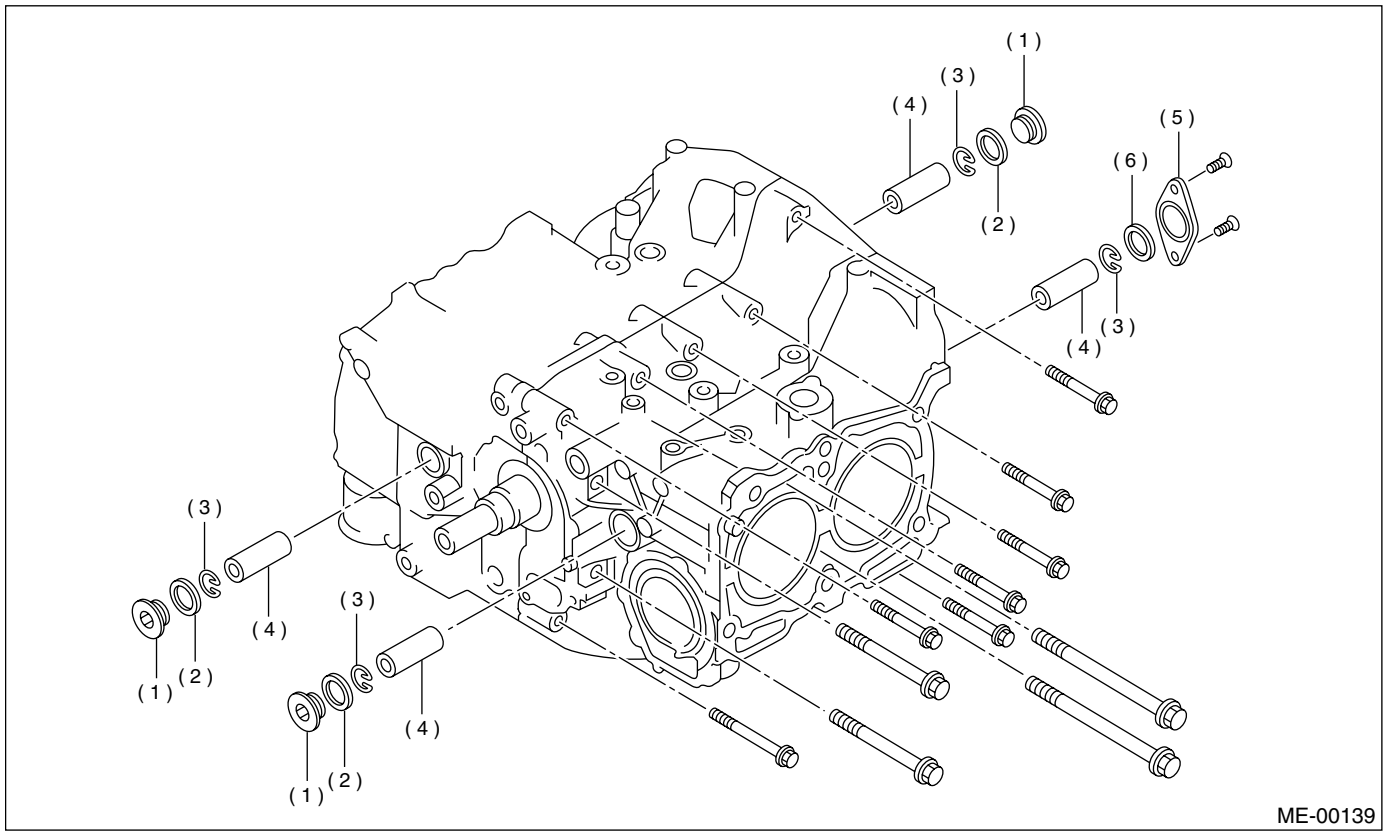
22) Remove oil strainer stay.
23) Remove oil strainer.
24) Remove baffle plate.
25) Remove oil filter using ST.

ST	498547000	OIL FILTER WRENCH [outer diameter 80 mm (3.15 in) for oil filter]
ST	18332AA000	OIL FILTER WRENCH [outer diameter 68 mm (2.68 in) for oil filter]
ST	18332AA010	OIL FILTER WRENCH [outer diameter 65 mm (2.56 in) for oil filter]



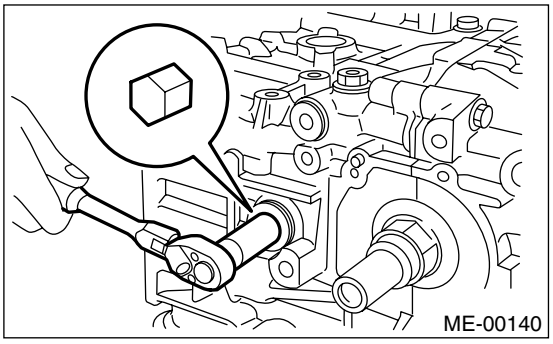
26) Remove water pipe.



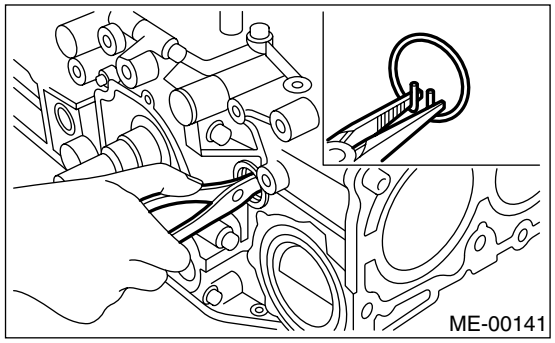


(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring

27) Remove service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

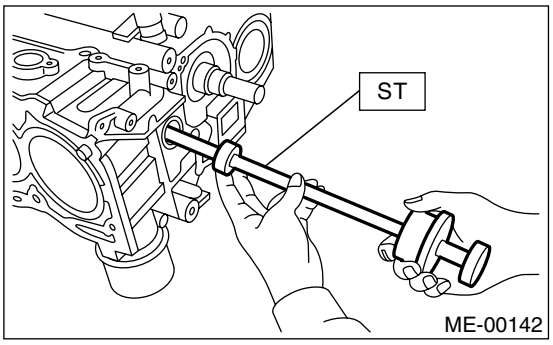


28) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston snap ring through service hole of #1 and #2 cylinders.



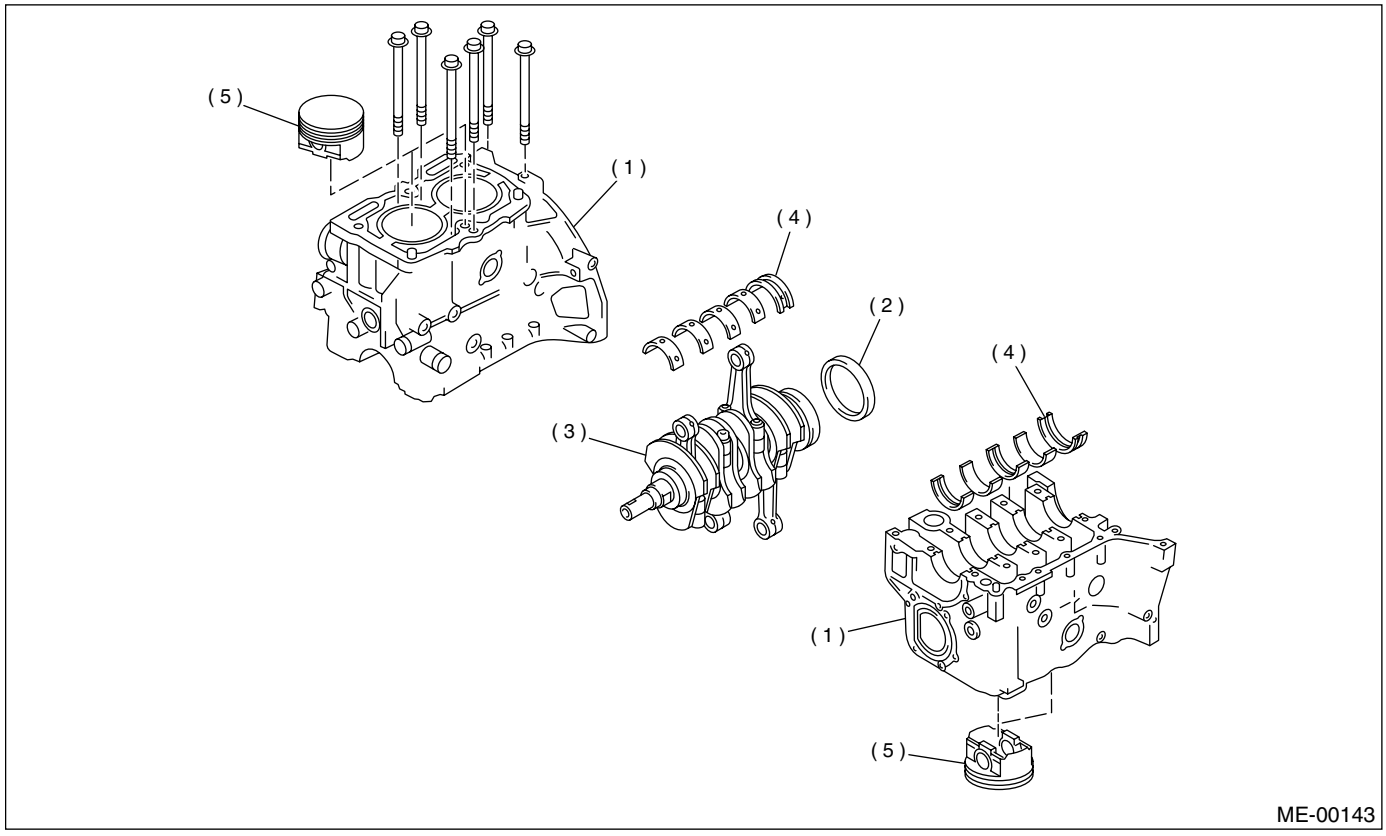
29) Draw out piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse original combination of piston, piston pin and cylinder.



30) Similarly remove piston pins from #3 and #4 pistons.
31) Remove bolts which connect cylinder block on the side of #2 and #4 cylinders.
32) Loosen bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
33) Set up cylinder block so that #1 and #3 cylinders are on the upper side, then remove cylinder block connecting bolts.
34) Separate left-hand and right-hand cylinder blocks.

NOTE:
When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

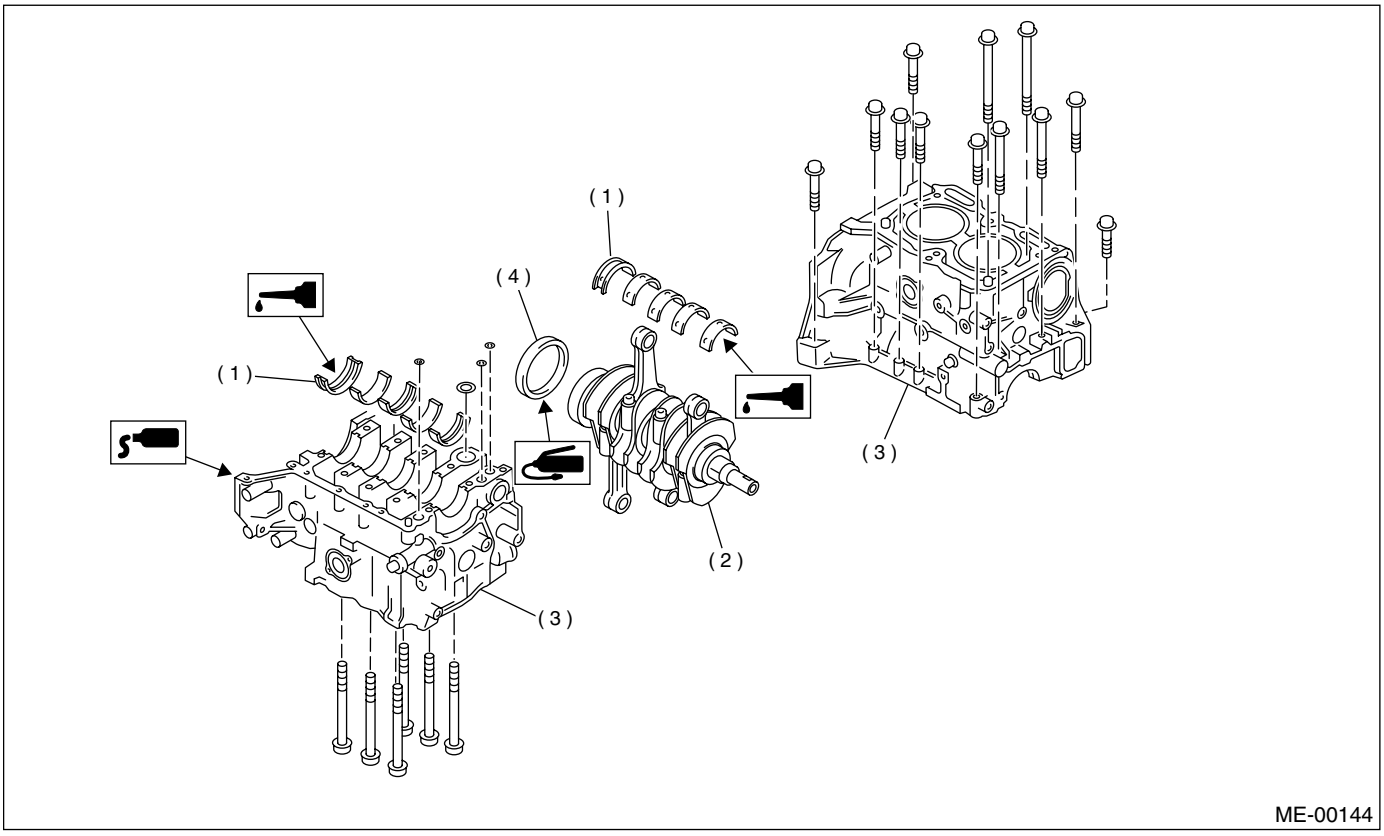
35) Remove rear oil seal.
36) Remove crankshaft together with connecting rod.
37) Remove crankshaft bearings from cylinder block using hammer handle.

NOTE:
Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

38) Remove pistons from cylinder block using hammer handle.

NOTE:
Do not confuse combination of pistons and cylinders.

B: INSTALLATION



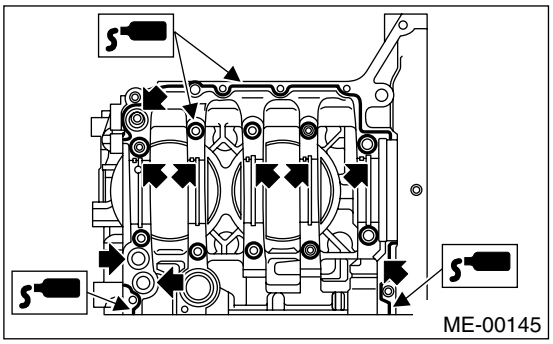
(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

NOTE:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

1) Position crankshaft on the #2 and #4 cylinder block.
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

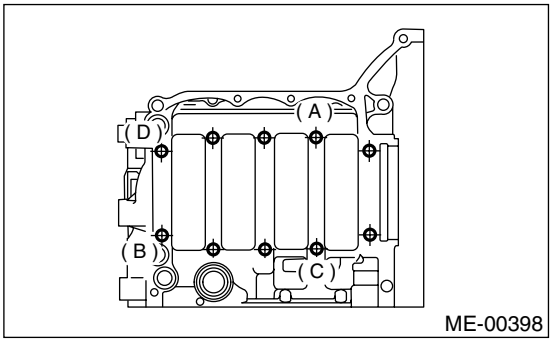
Fluid packing:
Part number 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.


ME-00145

3) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure. (LH side)

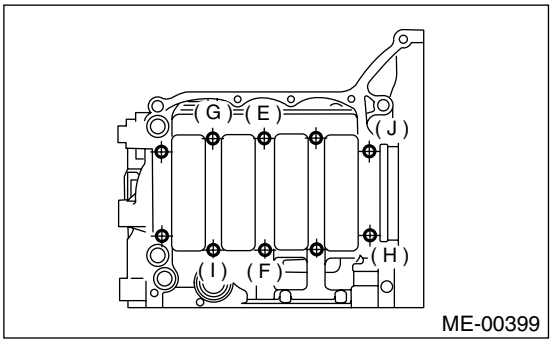
Tightening torque:
15 N·m (1.5 kgf-m, 11 ft-lb)



ME-00398

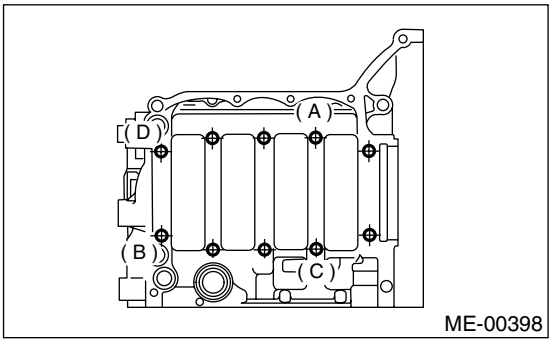
4) Tighten 10 mm cylinder block connecting bolts in alphabetical sequence shown in figure. (RH side)

Tightening torque:
15 N·m (1.5 kgf-m, 11 ft-lb)



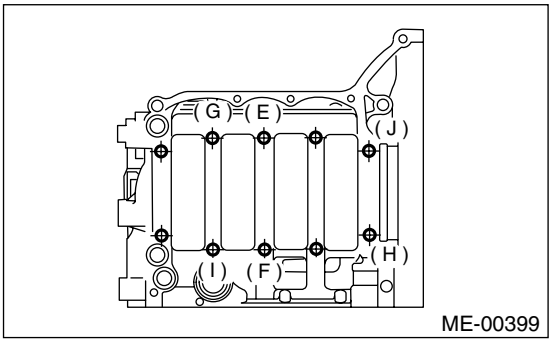
ME-00399

5) Tighten bolts (A to D) on left side of cylinder block more 90° in alphabetical sequence.



ME-00398

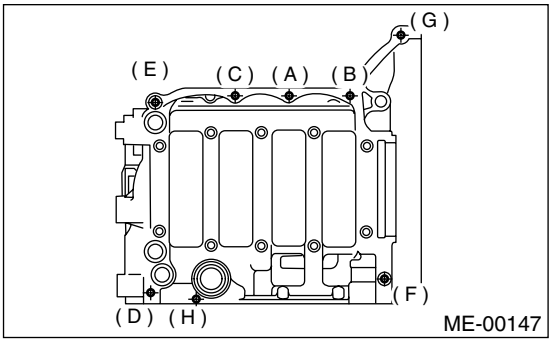
6) Tighten bolts (E to J) on right side of cylinder block more 90° in alphabetical sequence.



ME-00399

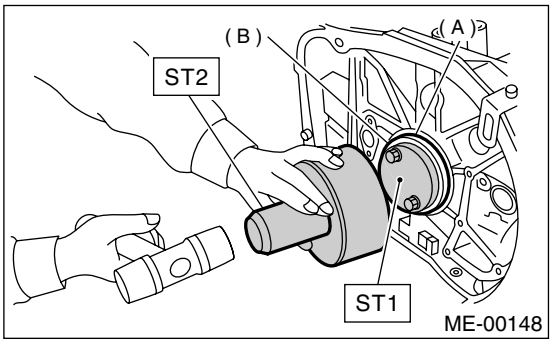
7) Tighten 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



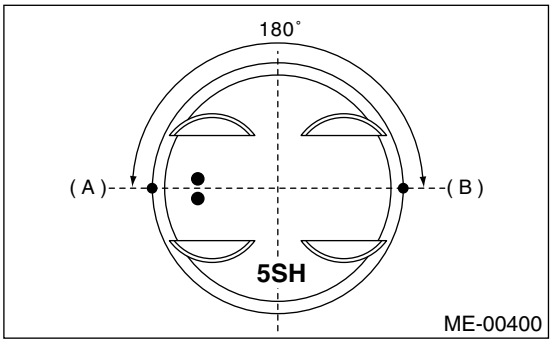
ME-00147

8) Install rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER

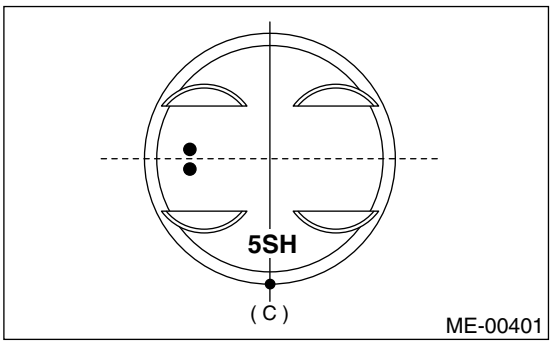


(A) Rear oil seal
(B) Flywheel attaching bolt

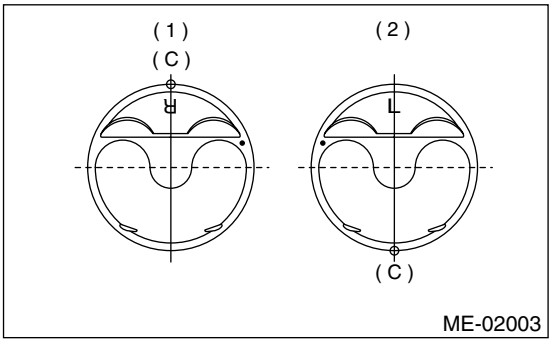
9) Position the top ring gap at (A) or (B) in the figure.
10) Position the second ring gap at 180° on the reverse side for the top ring gap.



11) Position the expander gap at (C) in the figure.
Except U5

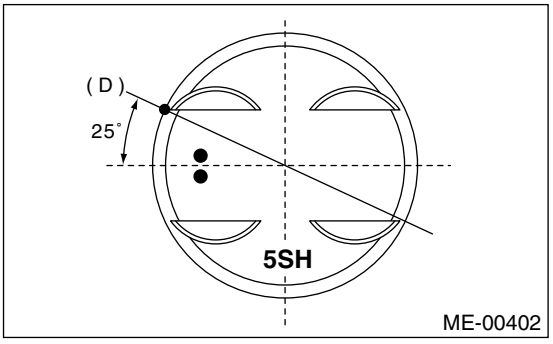


U5

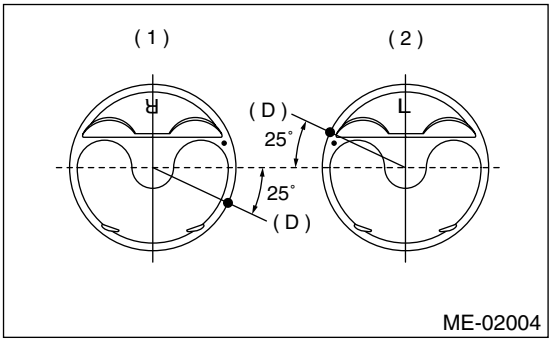


(1) Right side
(2) Left side

12) Position the lower rail gap at (D) in the figure.
Except U5

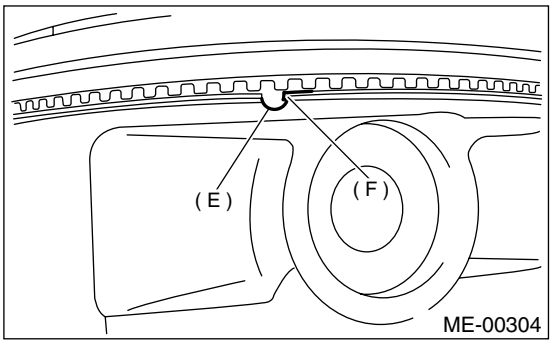


U5

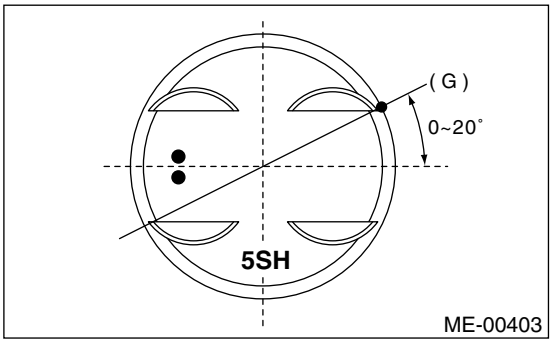


(1) Right side
(2) Left side

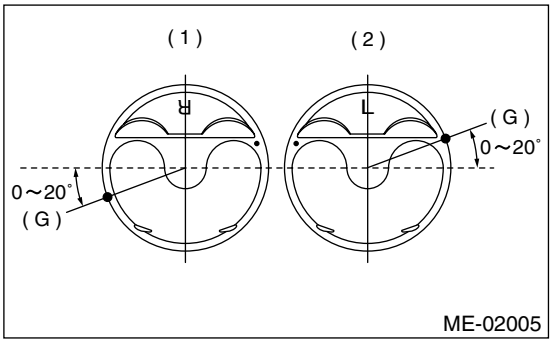
NOTE:
Align lower rail spin stopper (F) with piston side surface hole (E).



13) Position the upper rail gap at (G) in the figure.
Except U5



U5

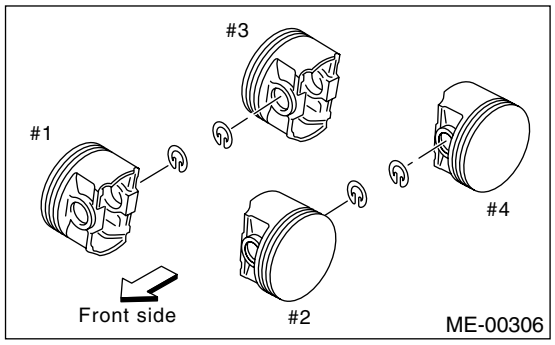


(1) Right side
(2) Left side

CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

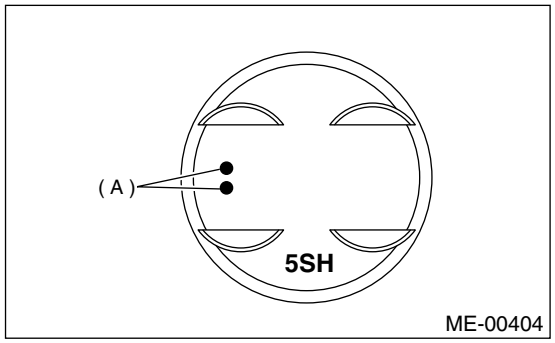
14) Install snap ring.
Install snap rings in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new snap rings.

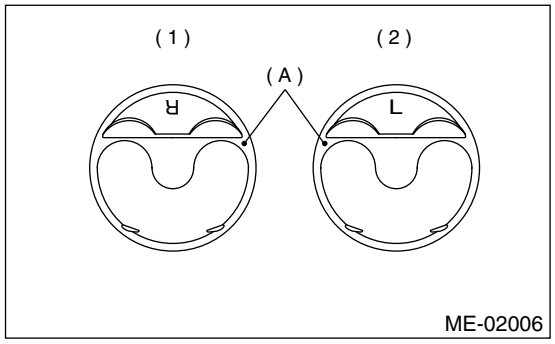


NOTE:
Piston front mark (A) faces towards the front of the engine.

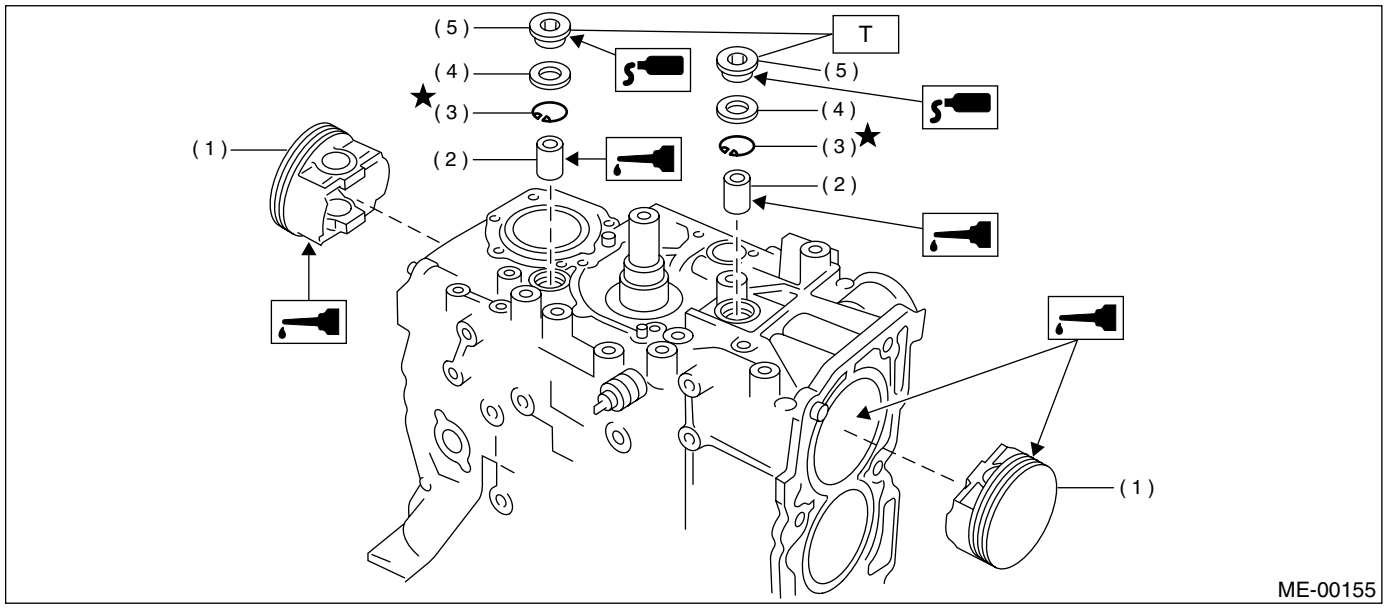
Except U5



U5



(1) Right side
(2) Left side



(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug

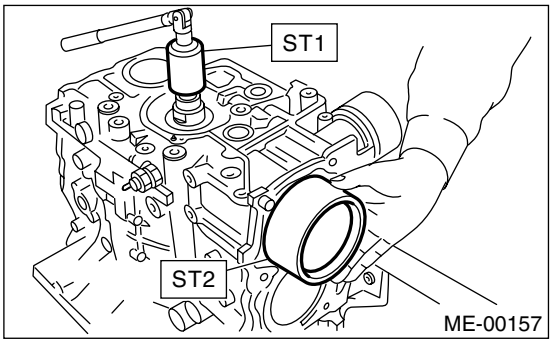
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51)

15) Installing piston
(1) Turn cylinder block so that #1 and #2 cylinders face upward.
(2) Using ST1, turn crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

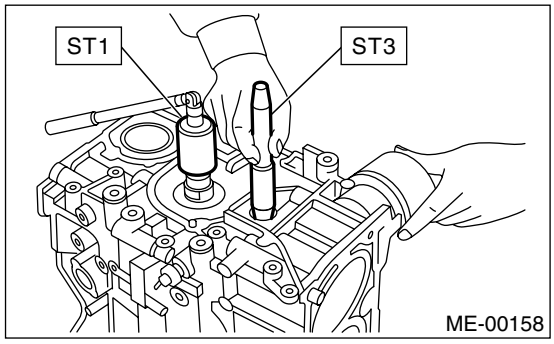
(3) Apply a coat of engine oil to pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



16) Installing piston pin
(1) Apply a coat of engine oil to ST3.
(2) Insert ST3 into service hole to align piston pin hole with connecting rod small end.

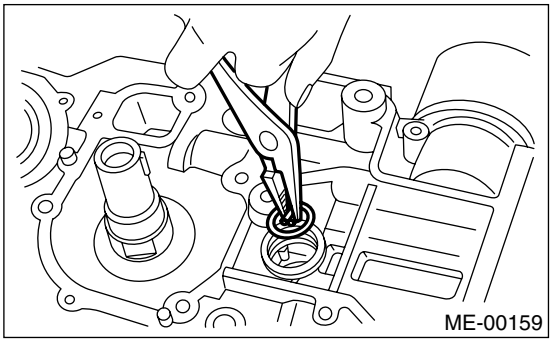
ST3 499017100 PISTON PIN GUIDE



(3) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod through service hole.

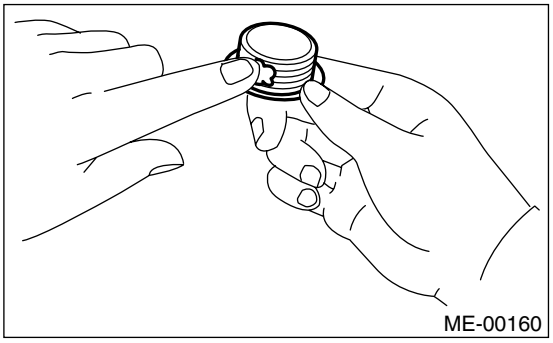
(4) Install snap ring.

NOTE:
Use new snap rings.



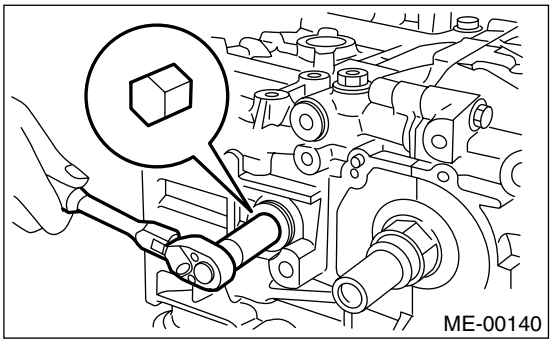
(5) Apply fluid packing around the service hole plug.

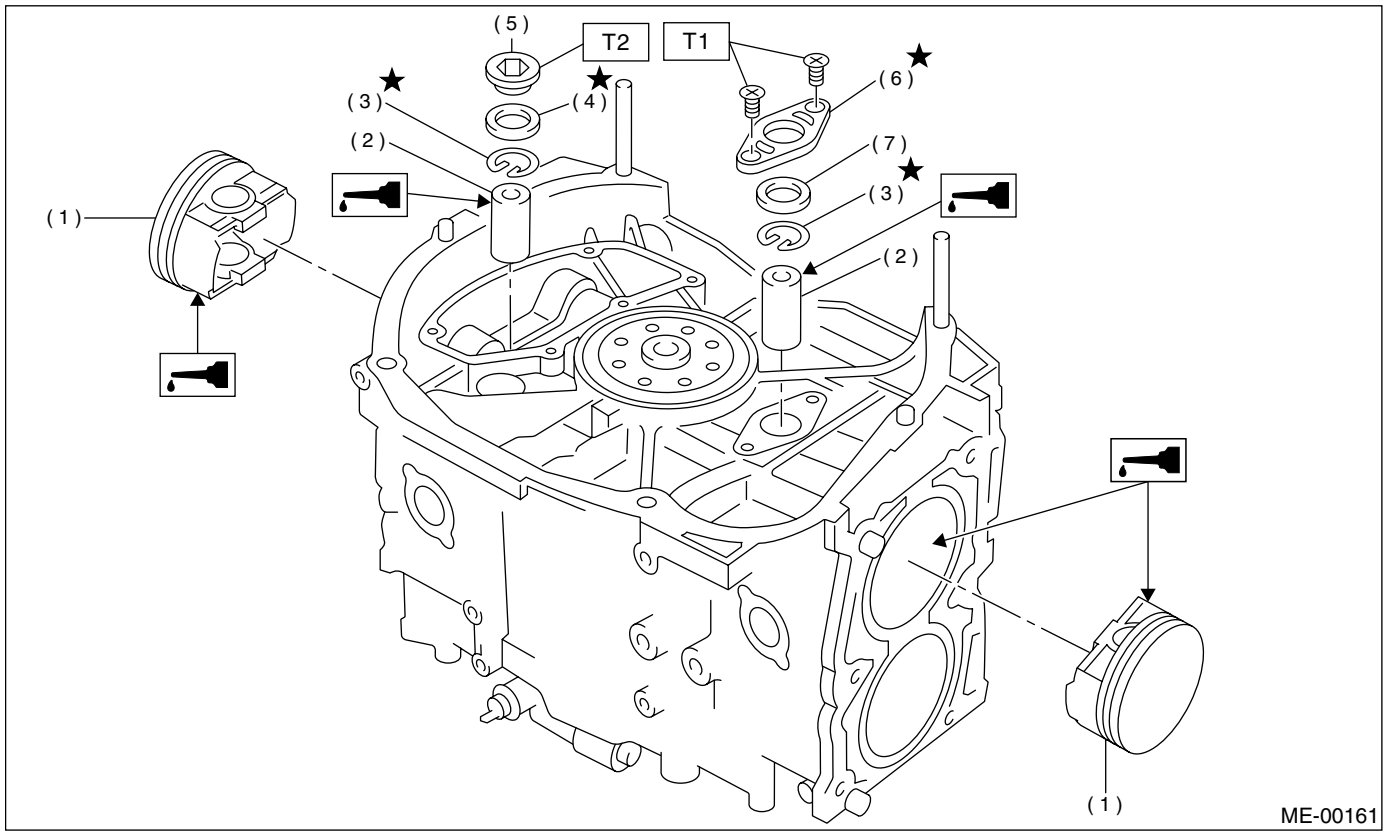
Fluid packing:
Part number 004403007
THREE BOND 1215 or equivalent



(6) Install service hole plug and gasket.

NOTE:
Use a new gasket.



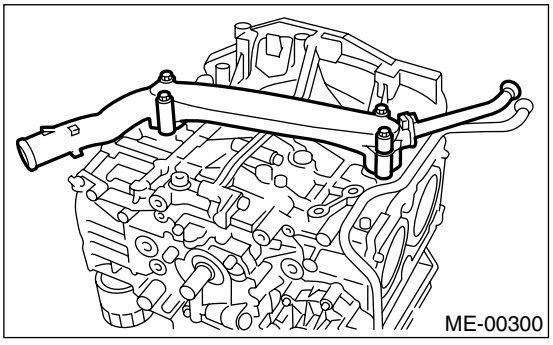


(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51)

(7) Turn cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install pistons and piston pins.

17) Install water pipe.



18) Install baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

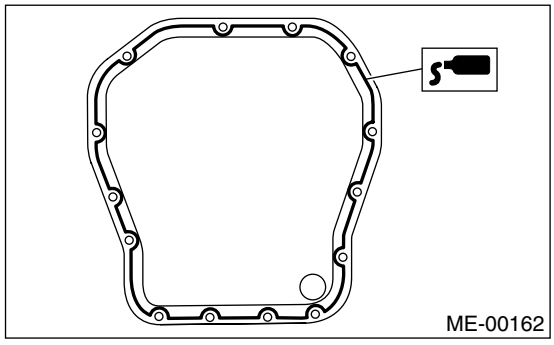
19) Install oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

20) Install oil strainer stay.

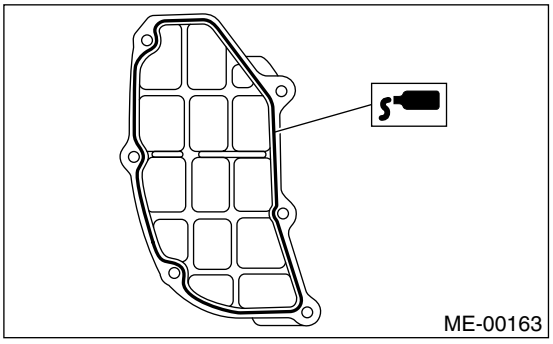
21) Apply fluid packing to matching surfaces and install oil pan.

Fluid packing:
Part number 004403007
THREE BOND 1215 or equivalent



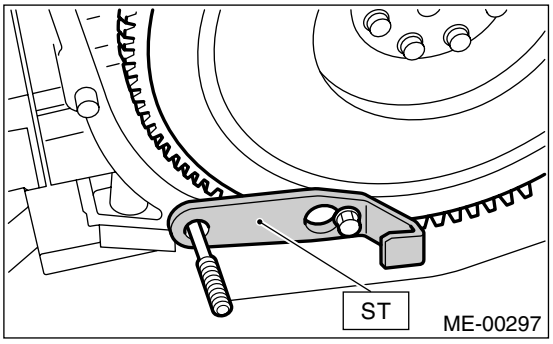
22) Apply fluid packing to matching surfaces and install oil separator cover.

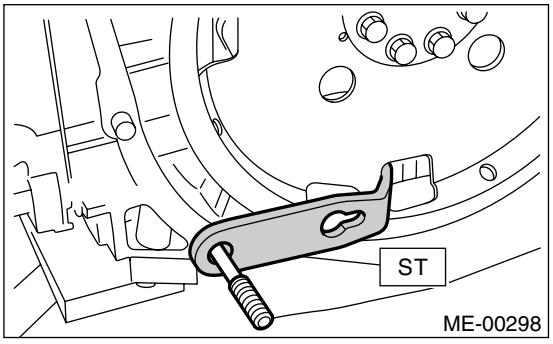
Fluid packing:
Part number 004403007
THREE BOND 1215 or equivalent



23) Install flywheel or drive plate.
To lock crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

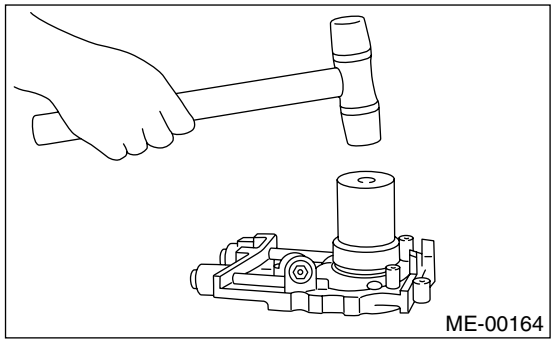
Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)





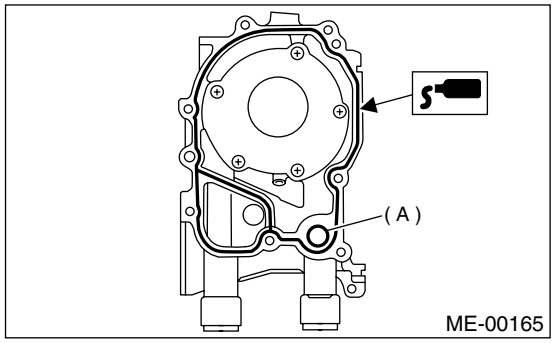
24) Install housing cover.

25) Installation of oil pump
(1) Discard front oil seal after removal. Replace with a new one using ST.
ST 499587100 OIL SEAL INSTALLER



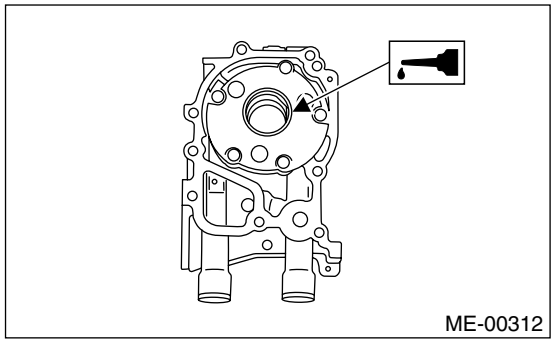
(2) Apply fluid packing to matching surface of oil pump.

Fluid packing:
Part number 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install oil pump on cylinder block. Be careful not to damage oil seal during installation.

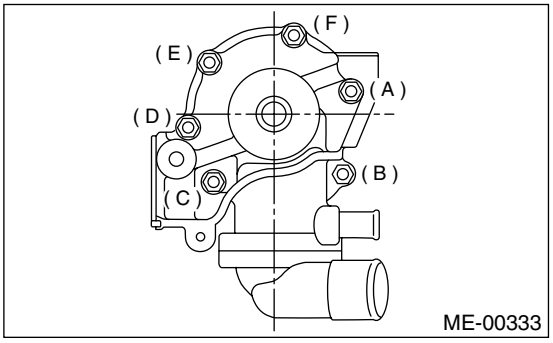
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
• Do not forget to install O-ring and seal when installing oil pump.
• Align flat surface of oil pump's inner rotor with crankshaft before installation.

26) Install water pump and gasket.

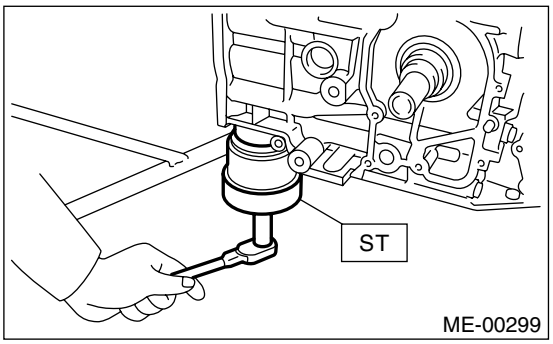
Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:
• Be sure to use a new gasket.
• When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.



27) Install water by-pass pipe for heater.
28) Install oil filter by turning it by hand, being careful not to damage seal rubber.
• Further tighten (approximately 2/3 to 3/4 turn) the oil filter with outer diameter of 80 mm (3.15 in) after the seal rubber contacts the cylinder block or the oil cooler.
• Further tighten (approximately 1 turn) the oil filter with outer diameter of 68 mm (2.68 in) or 65 mm (2.56 in) after the seal rubber contacts the cylinder block.

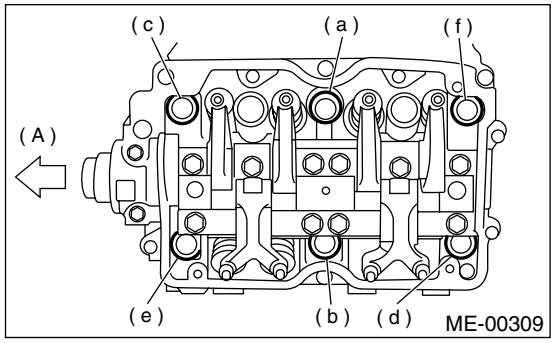
CAUTION:
• Oil filter with outer diameter of 80 mm (3.15 in) is not available for turbo model.
• Do not tighten excessively, or oil may leak.



29) Tighten cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again.
(4) Tighten bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
(5) Tighten bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.
(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

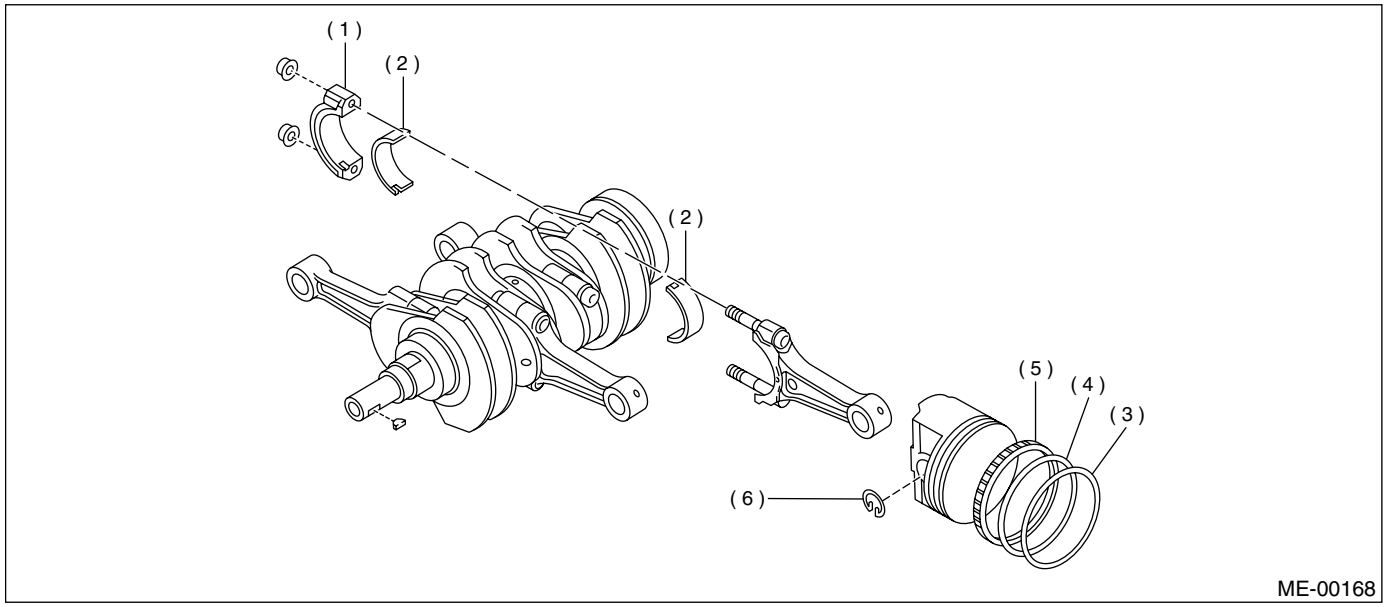
CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180º.



(A) Frotn side

30) Install oil level gauge guide and tighten attaching bolt (left side only).
31) Install rocker cover.
32) Install crankshaft sprocket. <Ref. to ME(H4SO)-53, INSTALLATION, Crankshaft Sprocket.>
33) Install camshaft sprocket. <Ref. to ME(H4SO)-52, INSTALLATION, Camshaft Sprocket.>
34) Install timing belt assembly. <Ref. to ME(H4SO)-48, INSTALLATION, Timing Belt Assembly.>
35) Install belt cover. <Ref. to ME(H4SO)-46, INSTALLATION, Belt Cover.>
36) Install crankshaft pulley. <Ref. to ME(H4SO)-45, INSTALLATION, Crankshaft Pulley.>
37) Install generator and A/C compressor brackets on cylinder head.
38) Install V-belt. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>
39) Install intake manifold. <Ref. to FU(H4SO)-18, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring

1) Remove connecting rod cap.
2) Remove connecting rod bearing.

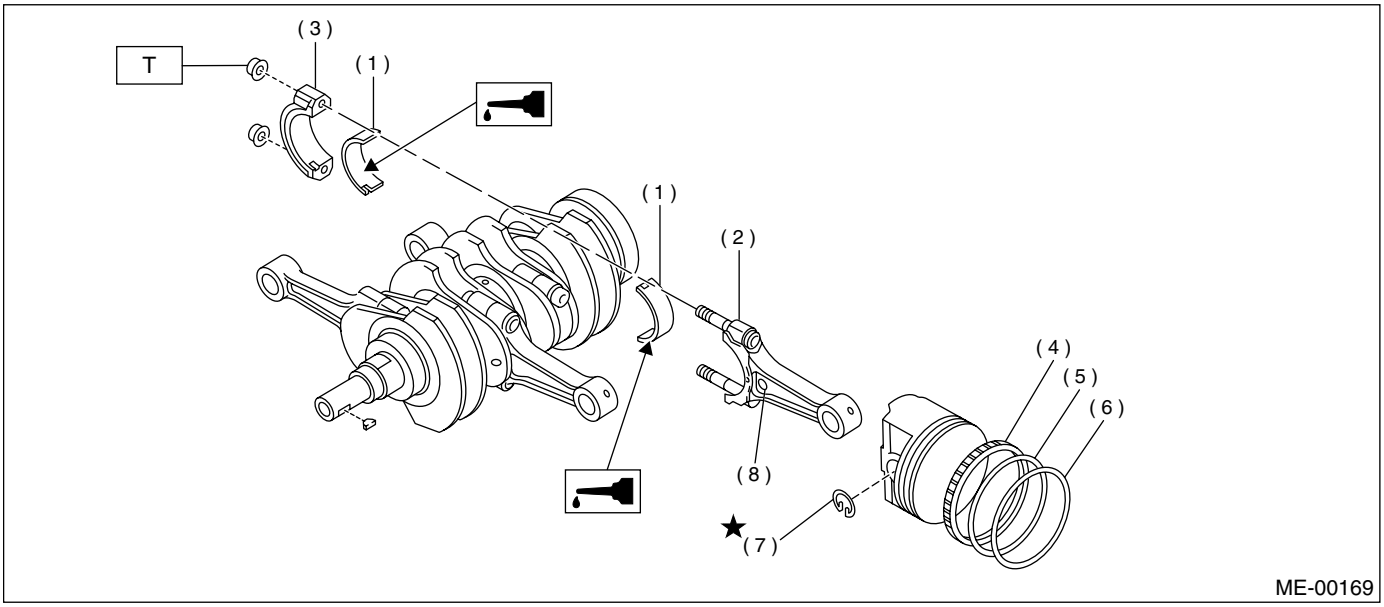
NOTE:
Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove snap ring.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings.
2) Install connecting rod bearings on connecting rods and connecting rod caps.
3) Position each connecting rod with the side marked facing forward, and install connecting rod on crankshaft.
4) Install connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

5) Install oil ring spacer, lower rail and upper rail in this order by hand. Then install second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

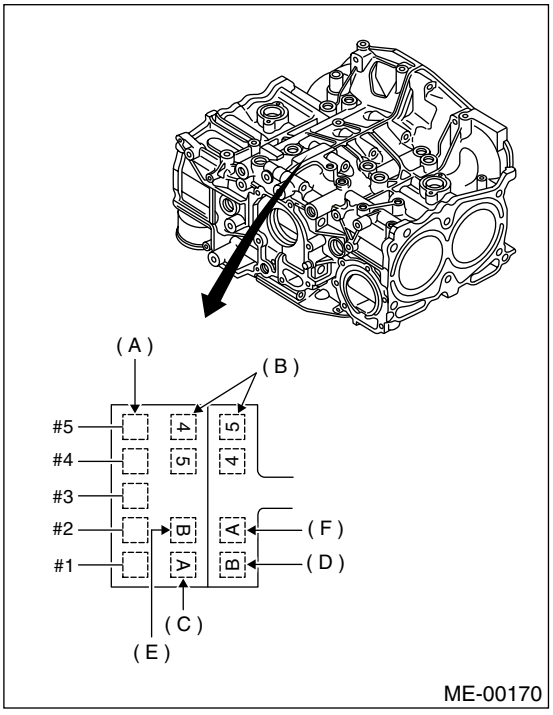
2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

CAUTION:
Measurement should be performed at a temperature 20°C (68°F).

NOTE:
Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



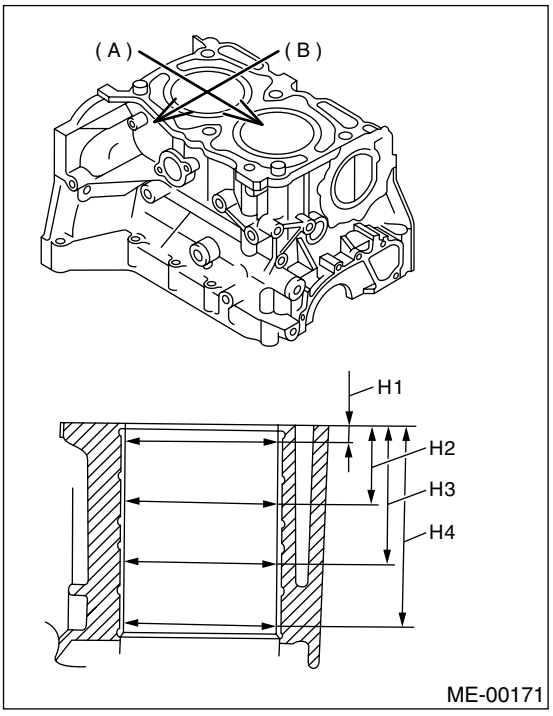
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



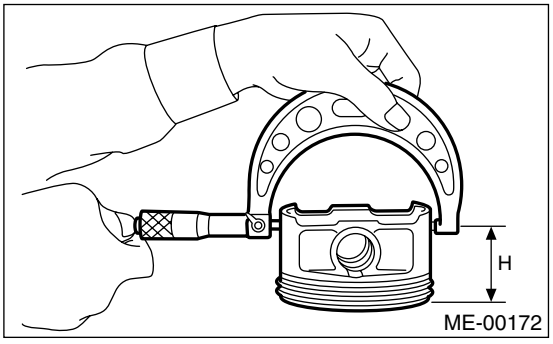
(A) Piston pin direction
(B) Thrust direction
H1 10 mm (0.39 in)
H2 45 mm (1.77 in)
H3 80 mm (3.15 in)
H4 115 mm (4.53 in)

3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
37.0 mm (1.457 in)

Piston outer diameter:
Except U5
Standard
A: 99.485 — 99.495 mm
(3.9167 — 3.9171 in)
B: 99.475 — 99.485 mm
(3.9163 — 3.9167 in)
0.25 mm (0.0098 in) oversize
99.725 — 99.735 mm
(3.9262 — 3.9266 in)
0.50 mm (0.0197 in) oversize
99.975 — 99.985 mm
(3.9360 — 3.9364 in)
U5
Standard
(3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm
(3.9171 — 3.9175 in)
0.25 mm (0.0098 in) oversize
99.745 — 99.765 mm
(3.9270 — 3.9278 in)
0.50 mm (0.0197 in) oversize
99.995 — 100.015 mm
(3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Except U5
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
U5
Standard
–0.010 — 0.010 mm (0.0004 — 0.0004 in)

6) Boring and honing
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

NOTE:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

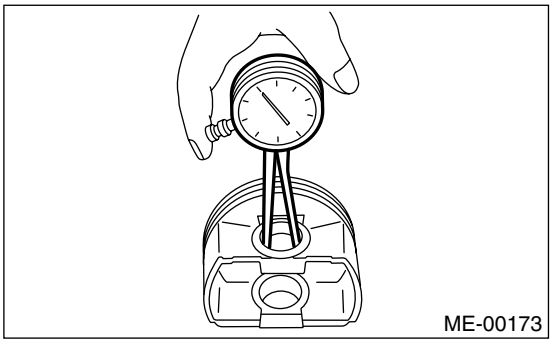
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

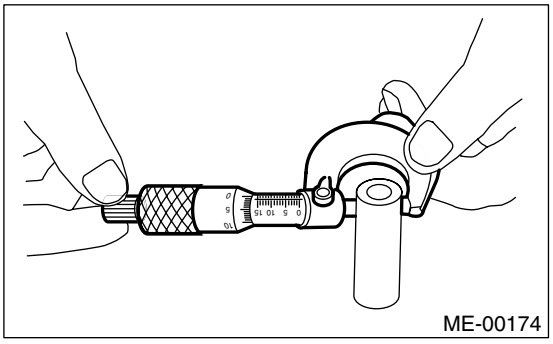
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

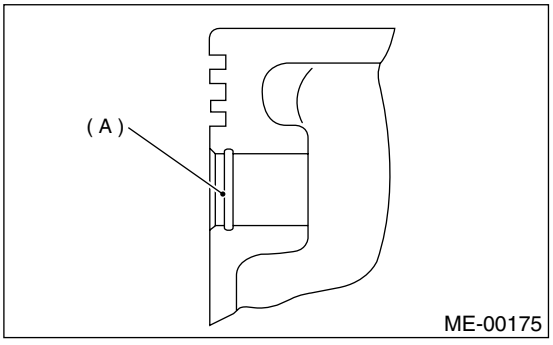
1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4SO)-84, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check snap ring installation groove on the piston for burr. If necessary, remove burr (A) from the groove so that piston pin can lightly move.



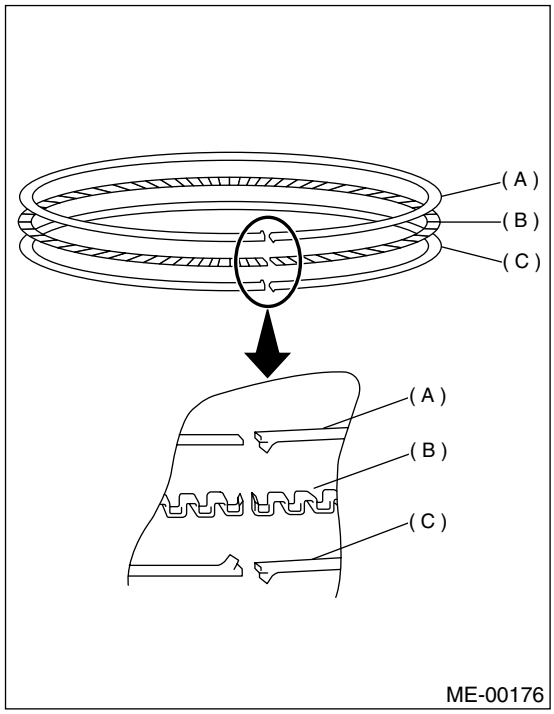
ME-00175

5) Check piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of the top and second rings. When installing the rings to the piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



ME-00176

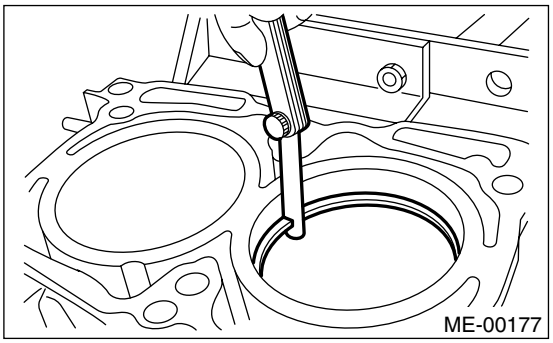
(A) Upper rail
(B) Expander
(C) Lower rail

2) Clean piston ring grove and piston ring.

3) Squarely place piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

Unit: mm (in)

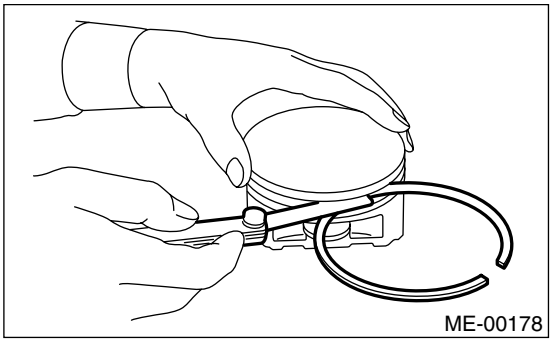
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.0146 — 0.0205)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)


ME-00177

4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

Unit: mm (in)

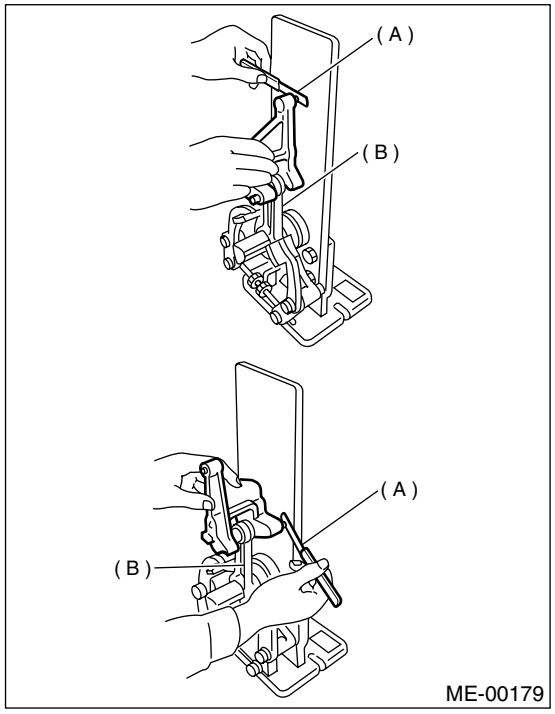
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

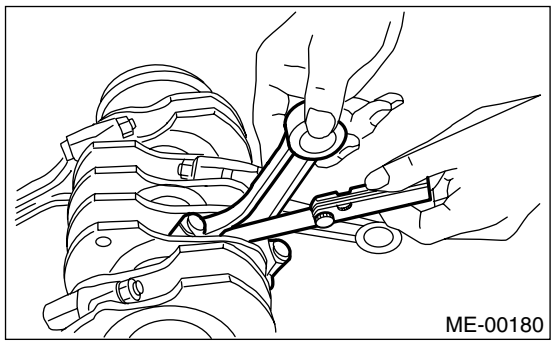


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.4 mm (0.016 in)


ME-00180

4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

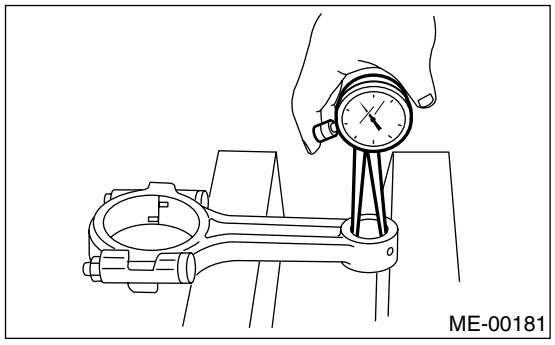
Connecting rod oil clearance:
Standard
0.016 — 0.044 mm (0.0006 — 0.0017 in)
Limit
0.050 mm (0.0020 in)

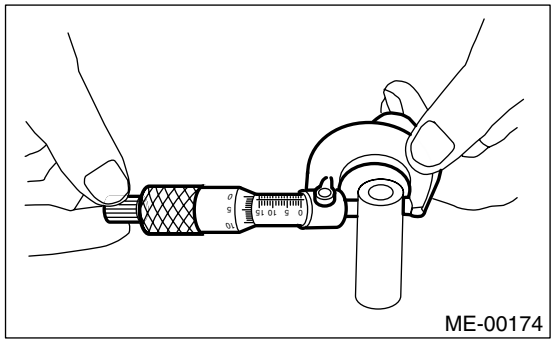
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.513 (0.0592 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.523 (0.0596 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

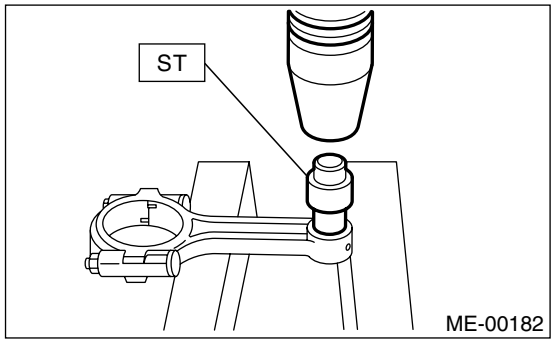
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows.
(1) Remove bushing from connecting rod with ST and press.
(2) Press bushing with ST and press after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

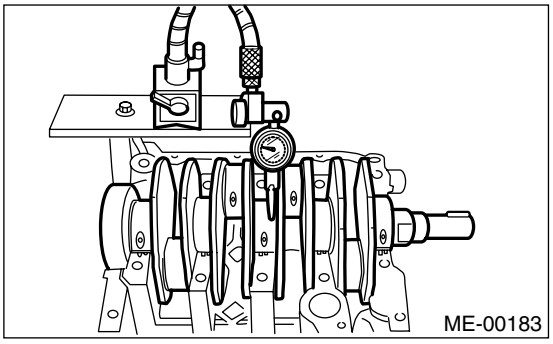
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

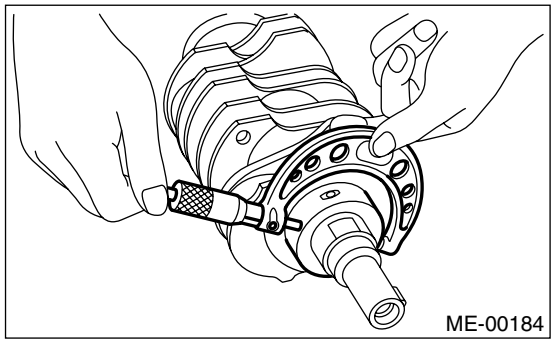
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.020 mm (0.0008 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)


ME-00184

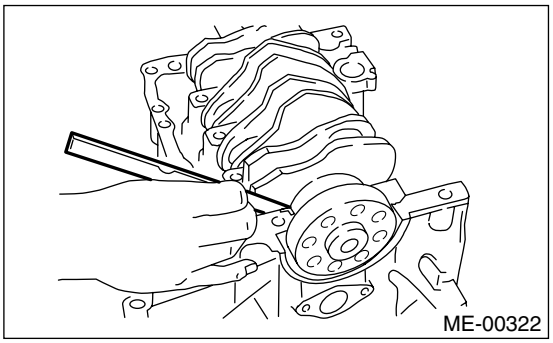
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.513 (0.0592 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.523 (0.0596 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.623 (0.0635 — 0.0639)

O.D. ... Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

Crankshaft	Oil clearance	#1	Standard	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	Standard	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 (0.0018 in)
		#3	Standard	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	Standard	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#5	Standard	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

22.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refer to the possibility of reason for the trouble in order ("Very often" to "Rarely")
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
3) Initial combustion occur.	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
	• Cooling system	• Overheating	C
		• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	A
4. Surging	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	C
8. Knocking	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filler seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Dirty air cleaner element	A
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	B
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Accelerator cable out of adjustment	B

23.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4SO)-50, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)-42, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX(H4SO)

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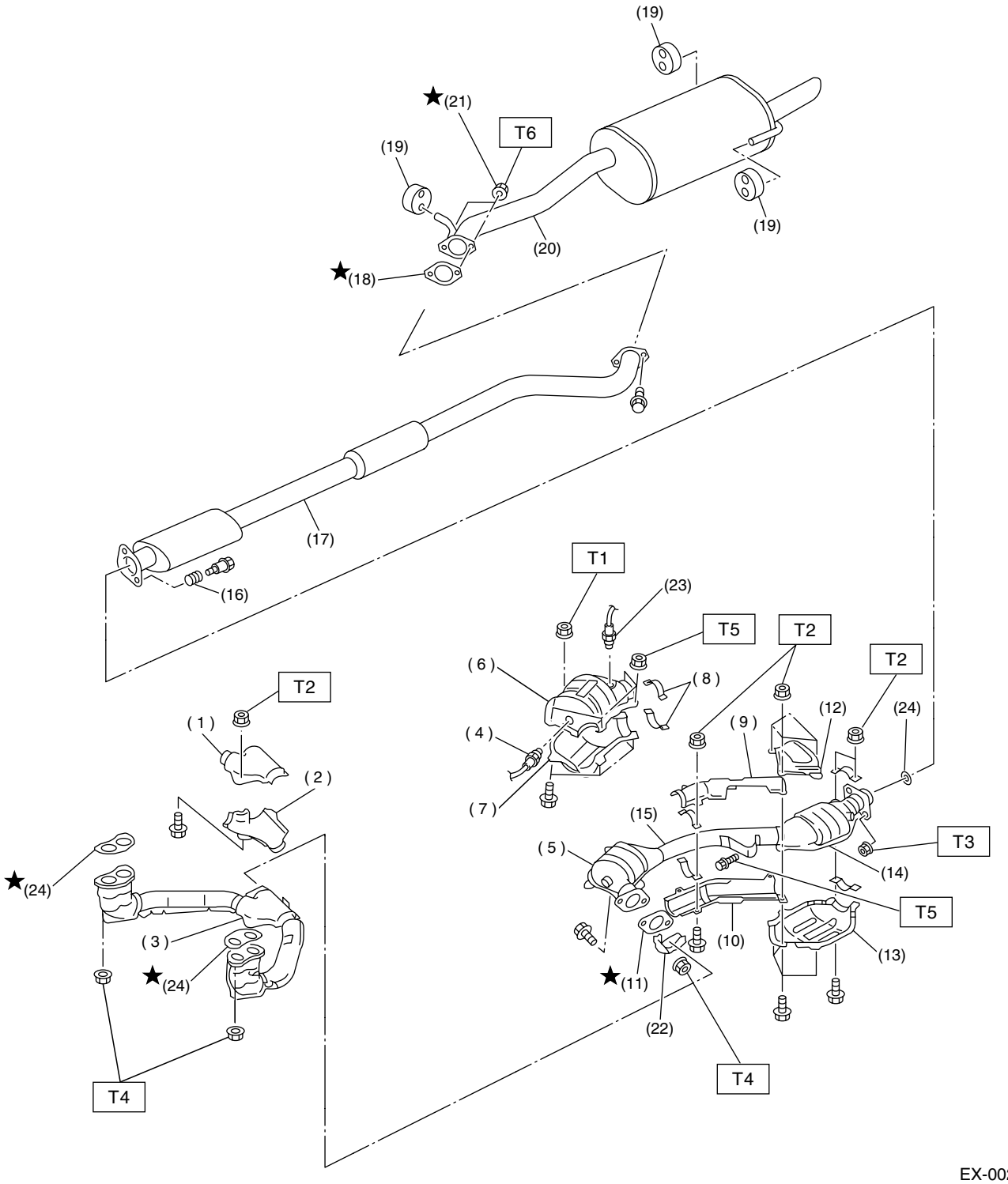
2. Front Exhaust Pipe....5
3. Center Exhaust Pipe 8
4. Rear Exhaust Pipe 9
5. Muffler 10

1. General Description

A: COMPONENT



EX-00251

(1) Upper front exhaust pipe cover CTR
(2) Lower front exhaust pipe cover CTR
(3) Front exhaust pipe
(4) Front oxygen (A/F) sensor
(5) Front catalytic converter
(6) Upper front catalytic converter cover
(7) Lower front catalytic converter cover
(8) Clamp
(9) Upper center exhaust pipe cover
(10) Lower center exhaust pipe cover
(11) Gasket
(12) Upper rear catalytic converter cover
(13) Lower rear catalytic converter cover (Except PICKUP)
(14) Rear catalytic converter
(15) Center exhaust pipe
(16) Spring
(17) Rear exhaust pipe
(18) Gasket
(19) Cushion rubber
(20) Muffler
(21) Self-locking nut
(22) Protector
(23) Rear oxygen sensor
(24) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 30 (3.1, 22.4)
T5: 35 (3.6, 26.0)
T6: 48 (4.9, 35.4)

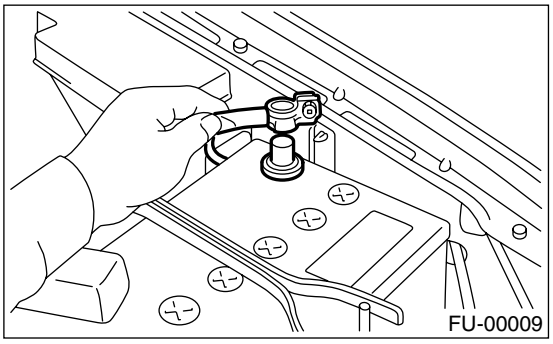
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

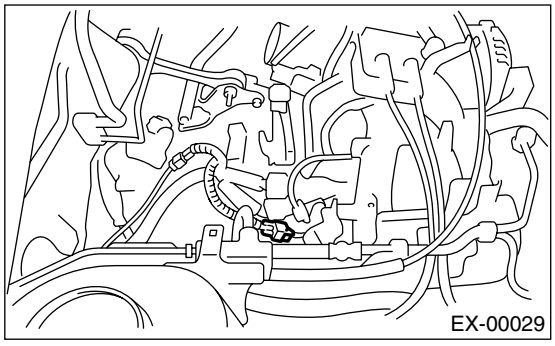
2. Front Exhaust Pipe

A: REMOVAL

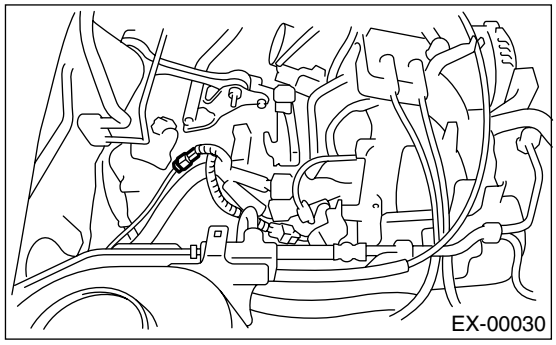
1) Disconnect battery ground cable.



2) Disconnect front oxygen (A/F) sensor connector.



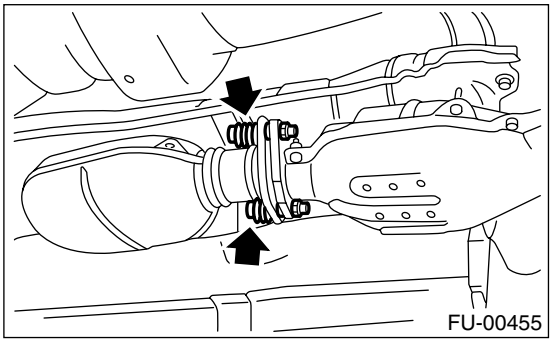
3) Disconnect rear oxygen sensor connector.



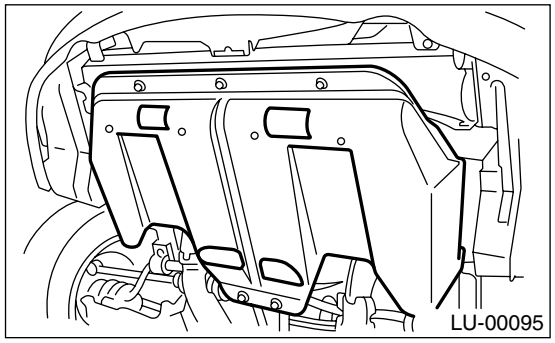
4) Lift-up the vehicle.

5) Separate front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.

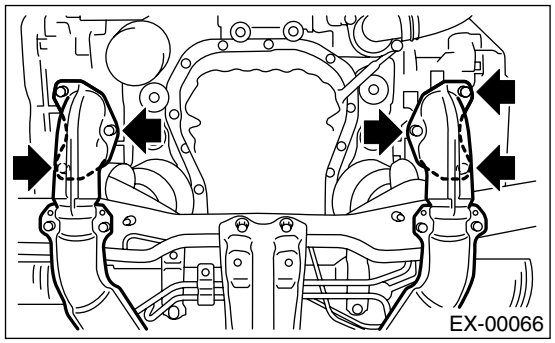


6) Remove under cover.

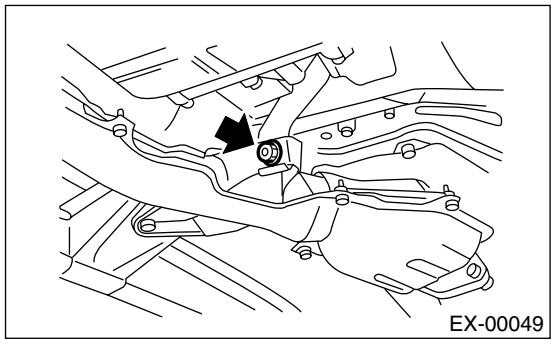


7) Remove nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to pull down front and center exhaust pipe assembly.



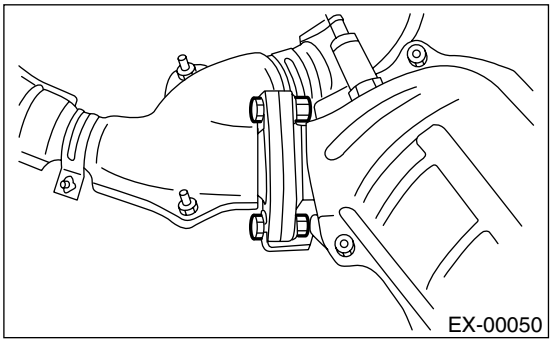
8) Remove bolt which installs front and center exhaust pipe assembly to hanger bracket.



9) Remove front and center exhaust pipe assembly from the vehicle.

CAUTION:
- **Be careful not to let front and center exhaust pipe assembly fall off when removing as it is quite heavy.**
- **After removing front and center exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.**

10) Separate front exhaust pipe from center exhaust pipe.

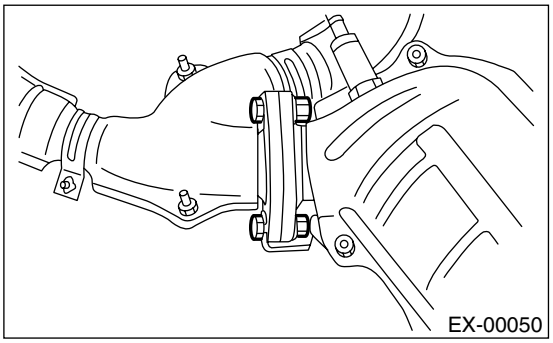


B: INSTALLATION

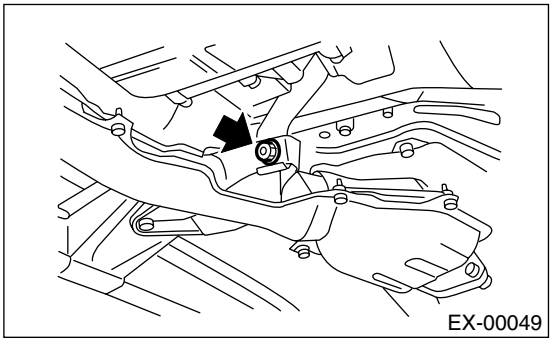
1) Install front exhaust pipe to center exhaust pipe.

NOTE:
Replace gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

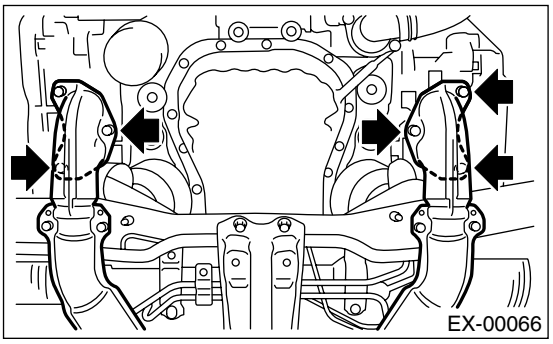


2) Install front and center exhaust pipe assembly to the vehicle.
3) Temporarily tighten bolt which installs front and center exhaust pipe assembly to hanger bracket.



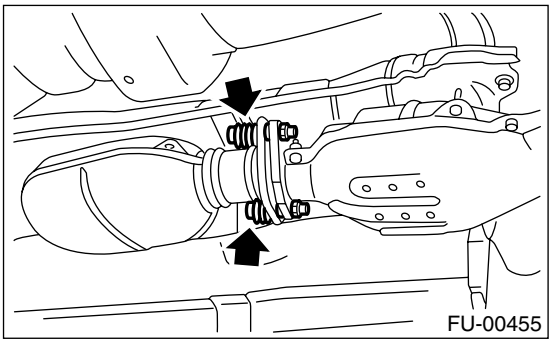
4) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



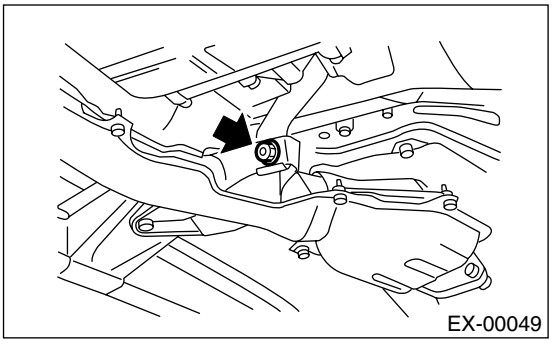
5) Install under cover.
6) Tighten bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



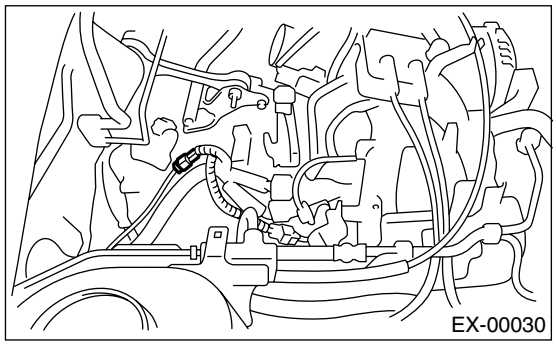
7) Tighten bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

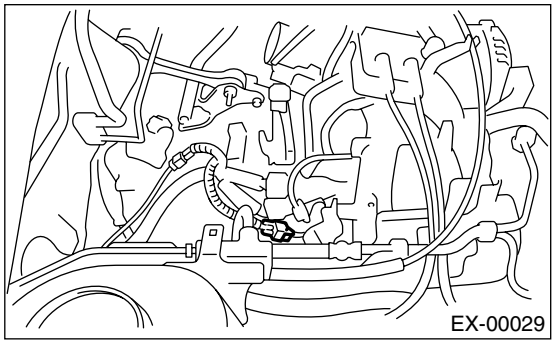


8) Lower the vehicle.

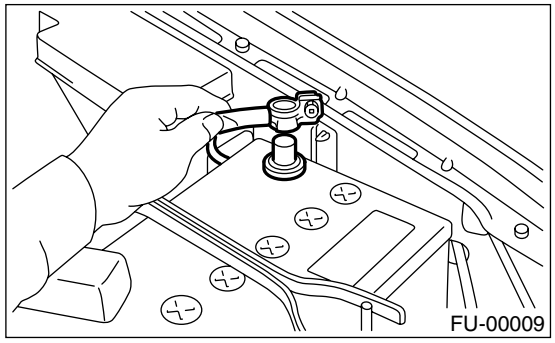
9) Connect rear oxygen sensor connector.



10) Connect front oxygen (A/F) sensor connector.



11) Connect battery ground cable.



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

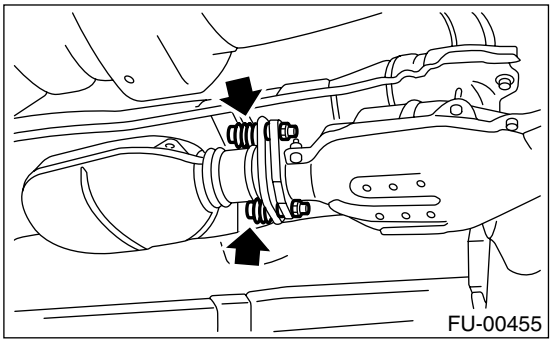
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Rear Exhaust Pipe

A: REMOVAL

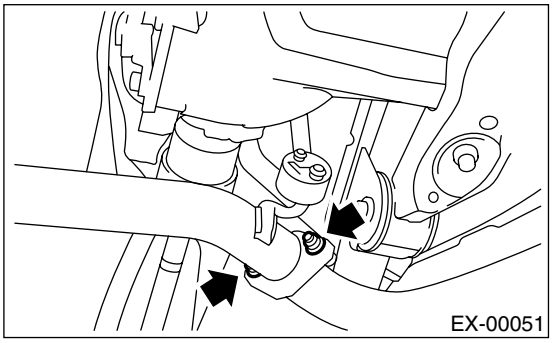
1) Separate rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down rear exhaust pipe.



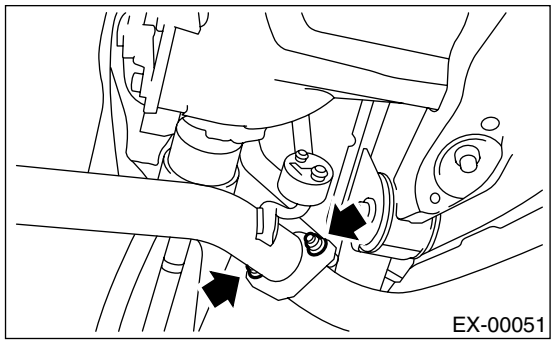
3) Remove rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace gaskets and self-locking nuts with new ones.

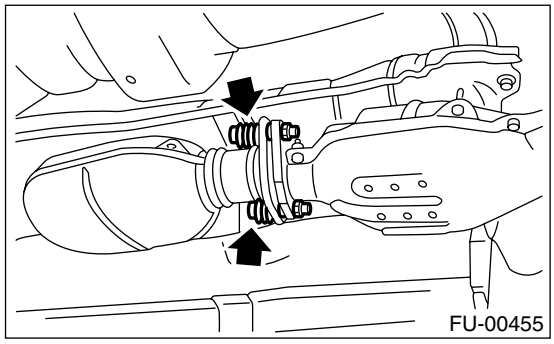
1) Install rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

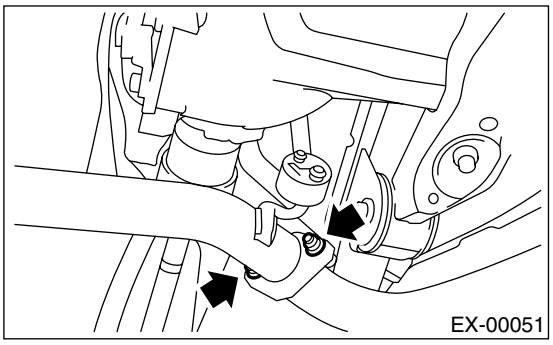
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

5. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

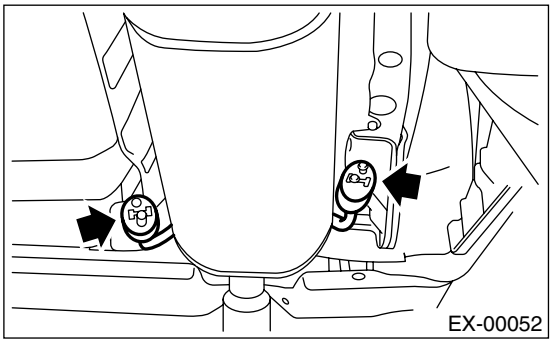


2) Remove left and right cushion rubbers.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of cushion rubbers in advance.

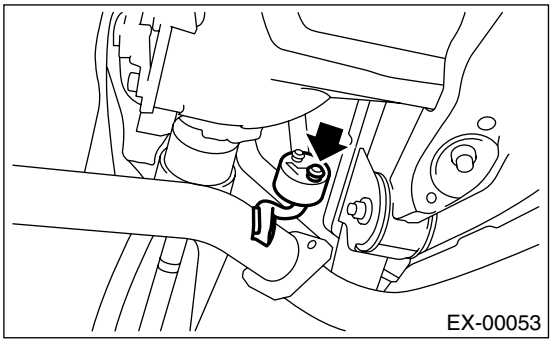
SUBARU CRC (Part No. 004301003)



3) Remove front cushion rubber, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of cushion rubber in advance.

SUBARU CRC (Part No. 004301003)

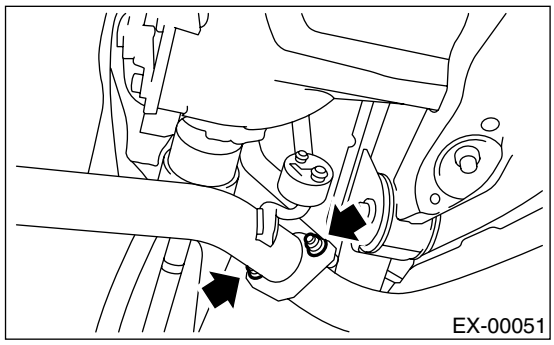


B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace gasket and self-locking nuts with new ones.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4SO)

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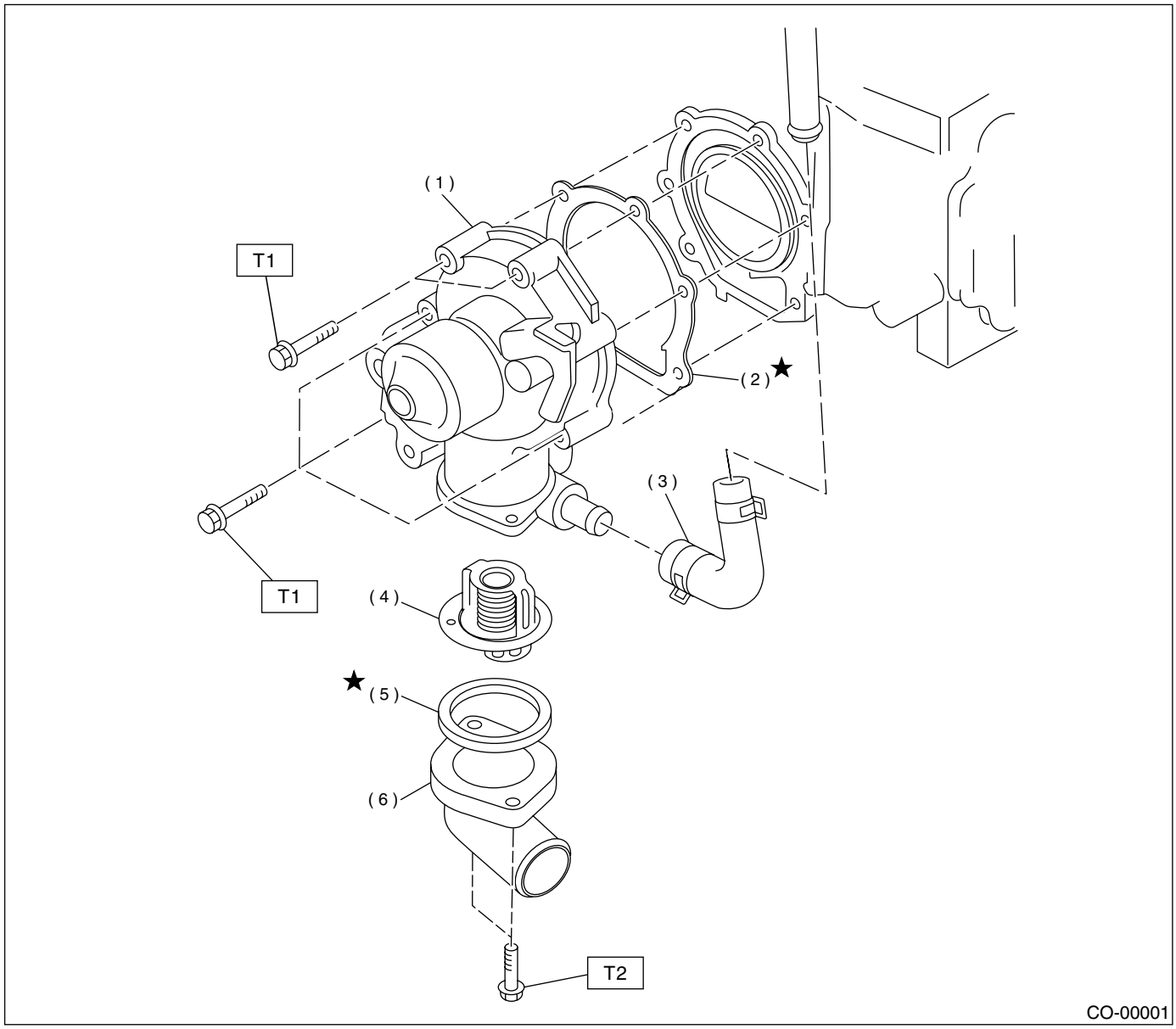
1. General Description

A: SPECIFICATIONS

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			MT: Approx. 6.8 (7.2, 6.0) AT: Approx. 6.7 (7.1, 5.9)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	18 ℓ (4.8 US gal, 4.0 Imp gal)/min.
		Pump speed—pressure leak	1,000 rpm — 0.7 mAq (2.3 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	70 ℓ (18.5 US gal, 15.4 Imp gal)/min.
		Pump speed—pressure leak	3,000 rpm — 5.6 mAq (18.4 ftAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	153 ℓ (40.4 US gal, 33.7 Imp gal)/min.
		Pump speed—pressure leak	6,000 rpm — 22.1 mAq (72.5 ftAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		74 mm (2.91 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	"Thrust" runout of impeller end		0.5 mm (0.020 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor		75 W (main fan) 75 W (sub fan)
	Fan diameter × Blade		300 mm (11.81 in) × 5 (main fan) 300 mm (11.81 in) × 4 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions		691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)
	Pressure range in which cap valve is open or closed		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: –1.0 to –4.9 kPa (–0.01 to –0.05 kg/cm^2, –0.1 to –0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

B: COMPONENT

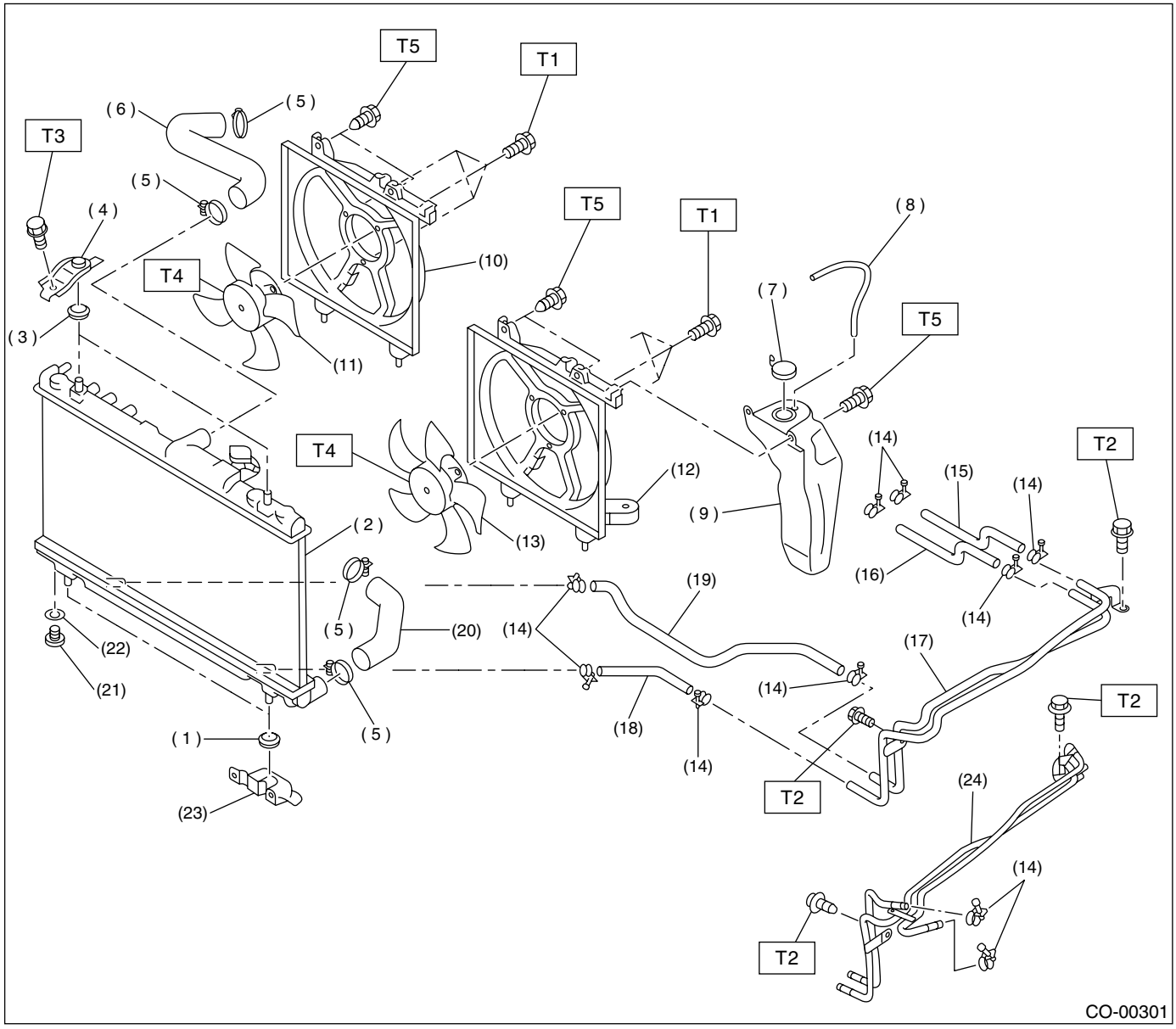
1. WATER PUMP



(1) Water pump ASSY
(2) Gasket
(3) Heater by-pass hose
(4) Thermostat
(5) Gasket
(6) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.5 (0.66, 4.8)

2. RADIATOR AND RADIATOR FAN



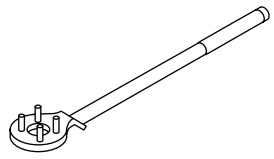
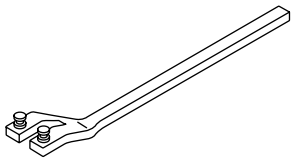
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Overflow hose
(9) Engine coolant reservoir tank
(10) Sub fan shroud
(11) Radiator sub fan and sub fan motor ASSY
(12) Main fan shroud
(13) Radiator main fan and main fan motor ASSY
(14) ATF hose clamp (AT vehicles only)
(15) ATF inlet hose (AT vehicles only)
(16) ATF outlet hose (AT vehicles only)
(17) ATF pipe (AT vehicles except U5 only)
(18) ATF outlet hose B (AT vehicles only)
(19) ATF inlet hose B (AT vehicles only)
(20) Radiator outlet hose
(21) Radiator drain plug
(22) O-ring
(23) Radiator lower bracket
(24) ATF pipe (AT vehicles for U5 only)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 12 (1.2, 8.7)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)
T5: 4.9 (0.50, 3.6)

C: CAUTION

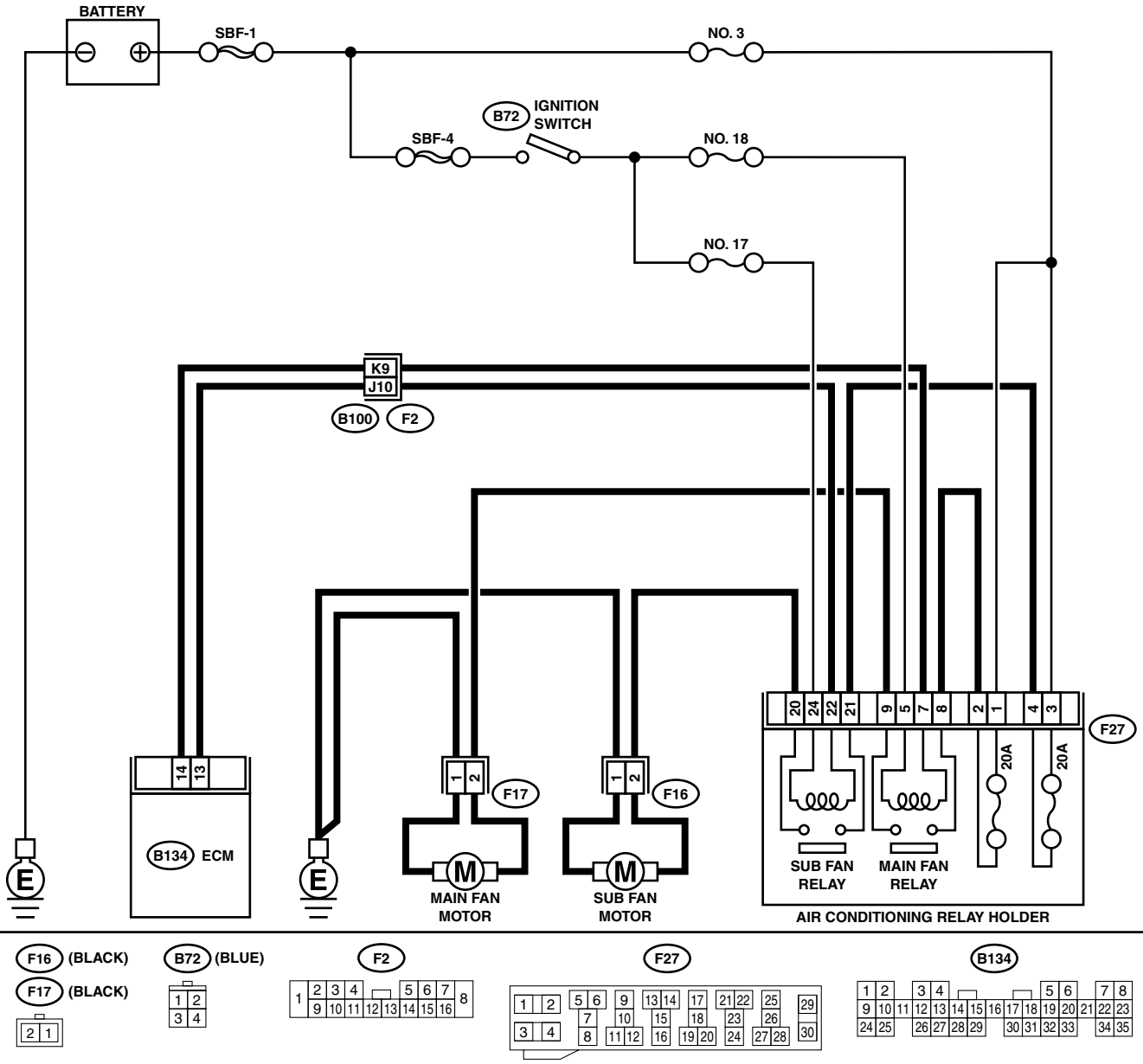
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for fixing crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	• Used for removing and installing camshaft sprocket. • Camshaft sprocket wrench (499207100) is also available.

2. Radiator Main Fan System

A: SCHEMATIC



EN-02171

B: INSPECTION

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.

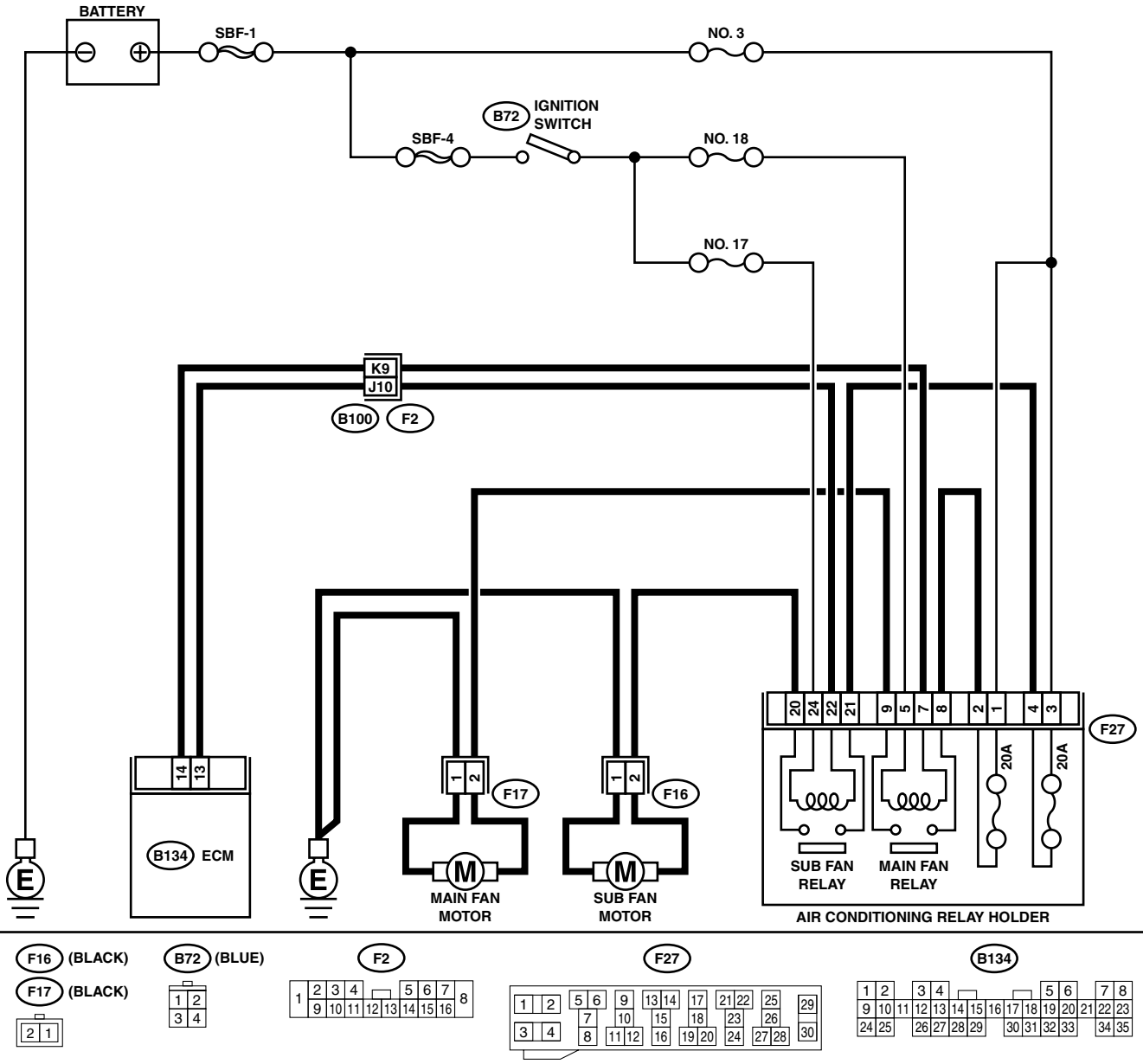
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **5.**
2	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between main fan motor connector and chassis ground.
3	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step **4.**
4	**CHECK MAIN FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
5	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove main fan relay from A/C relay holder. 3) Measure voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Go to step **7.**
6	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **10.**	Go to step **9.**
7	**CHECK 20 A FUSE.** 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair open circuit in harness between 20 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.
9	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
10	**CHECK MAIN FAN RELAY.** 1) Turn ignition switch to OFF. 2) Measure resistance of main fan relay. ***Terminal*** ***No. 8 — No. 9:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace main fan relay.
11	**CHECK MAIN FAN RELAY.** 1) Connect battery to terminals No. 5 and No. 7 of main fan relay. 2) Measure resistance of main fan relay. ***Terminal*** ***No. 8 — No. 9:***	Is the measured value less than 1 Ω?	Go to step **12.**	Replace main fan relay.
12	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure resistance of harness between main fan motor connector and main fan relay terminal. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 9:***	Is the measured value less than 1 Ω?	Go to step **13.**	Repair open circuit in harness between main fan motor connector and main fan relay terminal.
13	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 7 — (B134) No. 14:***	Is the measured value less than 1 Ω?	Go to step **14.**	Repair open circuit in harness between main fan relay and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact?	Repair poor contact connector.	Contact with SOA (distributor) service.

NOTE:
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan System

A: SCHEMATIC



EN-02171

B: INSPECTION

NOTE:
Radiator sub fan system is for model with A/C.

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 100°C (212°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under conditions (1) and (2) above.

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor and main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **5.**
2	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between sub fan motor connector and chassis ground.
3	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step **4.**
4	**CHECK SUB FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
5	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay from A/C relay holder. 3) Measure voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 21 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Go to step **7.**

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 24 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **10.**	Go to step **9.**
7	**CHECK 20 A FUSE.** 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step **8.**
8	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair open circuit in harness between main fuse box connector and 20 A fuse terminal.
9	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 17 from joint box. 3) Check condition of fuse. Is the fuse blown-out?	Is the fuse blown-out?	Replace fuse.	Repair open circuit in harness between sub fan relay and ignition switch.
10	**CHECK SUB FAN RELAY.** 1) Turn ignition switch to OFF. 2) Measure resistance of sub fan relay. ***Terminal*** ***No. 20 — No. 21:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace sub fan relay.
11	**CHECK SUB FAN RELAY.** 1) Connect battery to terminals No. 22 and No. 24 of sub fan relay. 2) Measure resistance of sub fan relay. ***Terminal*** ***No. 20 — No. 21:***	Is the measured value less than 1 Ω?	Go to step **12.**	Replace sub fan relay.
12	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure resistance of harness between sub fan motor connector and sub fan relay terminal. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 20:***	Is the measured value less than 1 Ω?	Go to step **13.**	Repair open circuit in harness between sub fan motor and sub fan relay connector.
13	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 22 — (B134) No. 13:***	Is the measured value less than 1 Ω?	Go to step **14.**	Repair open circuit in harness between sub fan relay and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

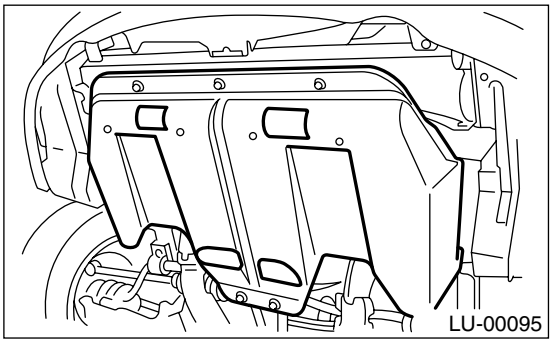
NOTE:
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

4. Engine Coolant

A: REPLACEMENT

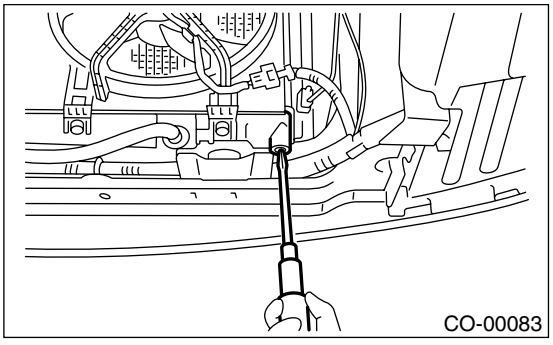
1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove under cover.



3) Remove drain cock to drain engine coolant from radiator.

NOTE:
Remove radiator cap so that engine coolant will drain faster.



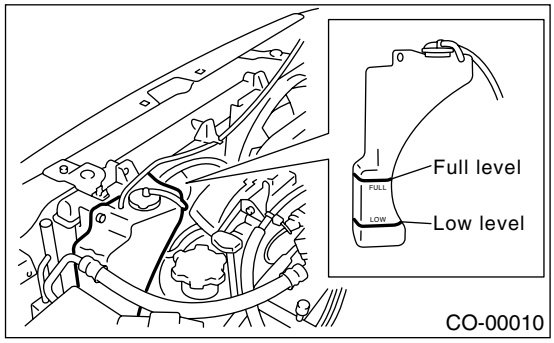
2. FILLING OF ENGINE COOLANT

1) Fill engine coolant into radiator up to filler neck position.

Engine coolant amount for refill:
MT model;
Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)
AT model;
Approx. 6.7 ℓ (7.1 US qt, 5.9 Imp qt)

CAUTION:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

2) Fill engine coolant into reservoir tank up to upper level.

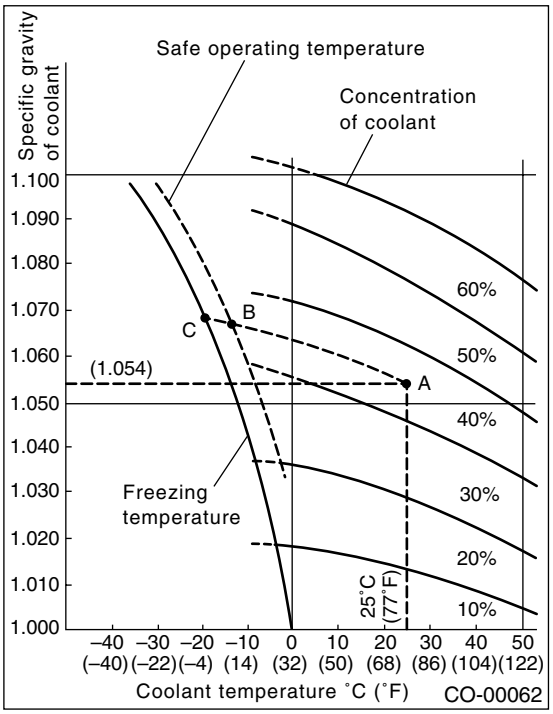


3) Attach radiator cap and reservoir tank cap properly.
4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
7) Attach radiator cap and reservoir tank cap properly.

B: INSPECTION

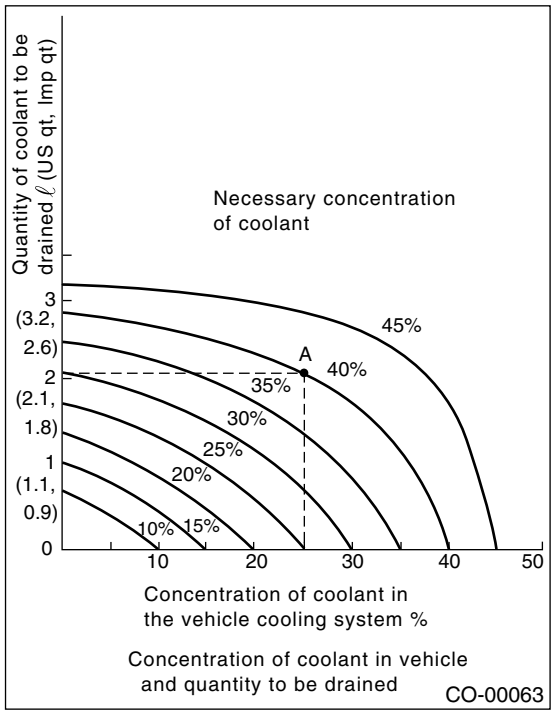
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

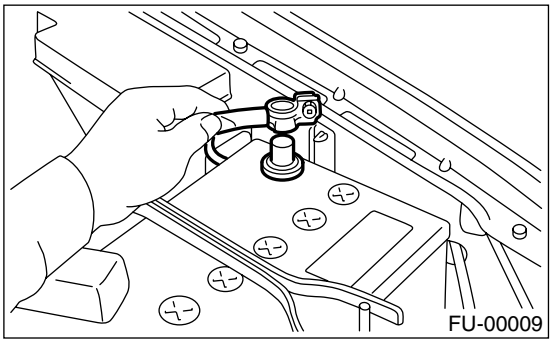
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



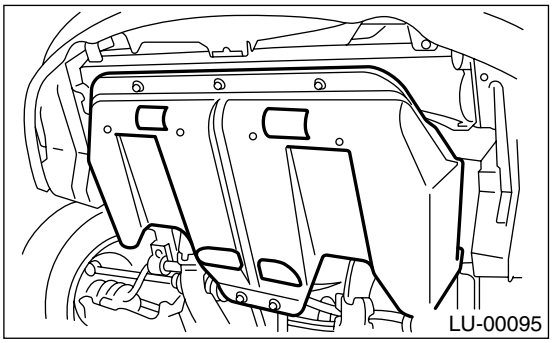
5. Water Pump

A: REMOVAL

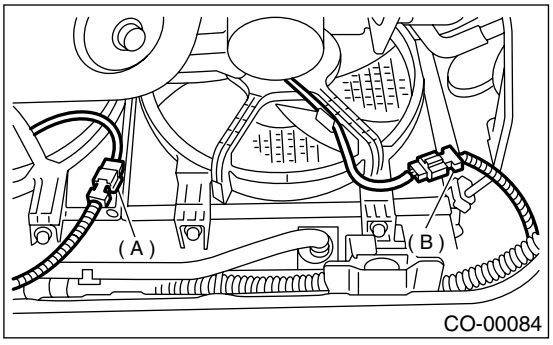
1) Disconnect ground cable from battery.



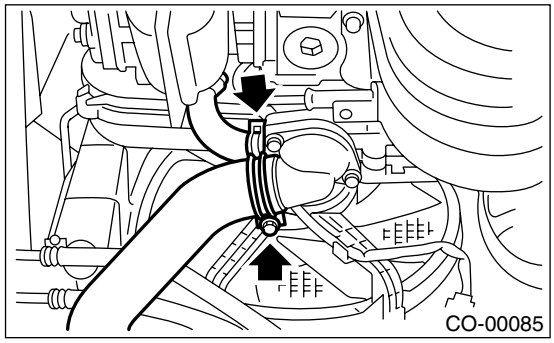
2) Lift-up the vehicle.
3) Remove under cover.



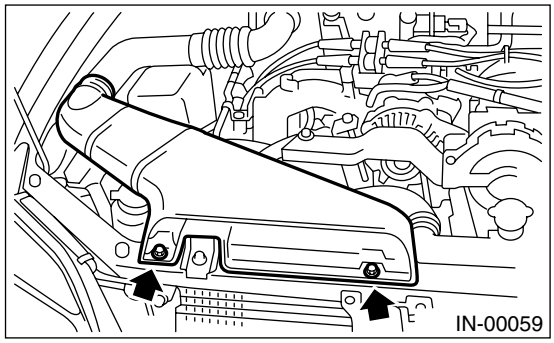
4) Drain engine coolant completely.
<Ref. to CO(H4SO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect connectors from radiator main fan (A) and sub fan (B) motors.



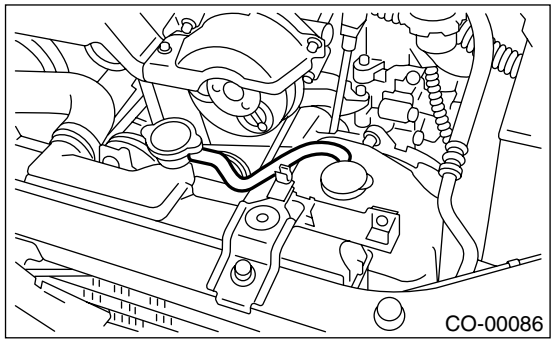
6) Disconnect radiator outlet hose and heater by-pass hose from water pump.



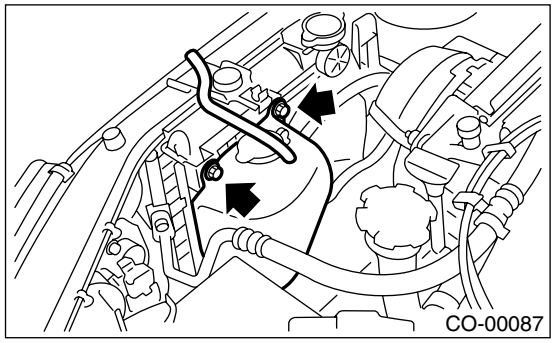
7) Lower the vehicle.
8) Remove air intake duct.



9) Disconnect overflow hose.

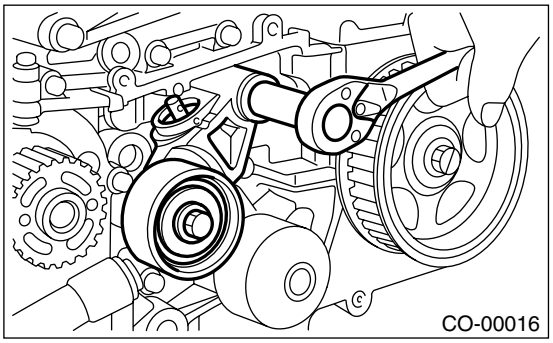


10) Remove reservoir tank.

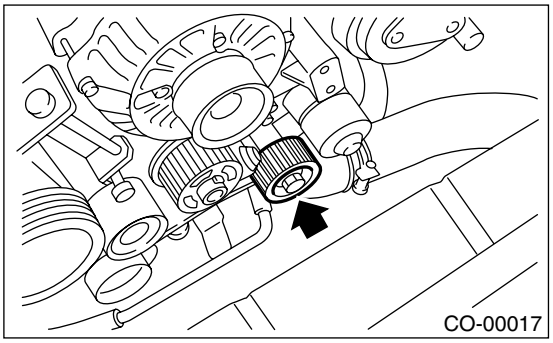


11) Remove radiator main fan and sub fan assemblies. <Ref. to CO(H4SO)-25, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, REMOVAL, Radiator Sub Fan and Fan Motor.>

12) Remove V-belts.
<Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
13) Remove timing belt.
<Ref. to ME(H4SO)-47, TIMING BELT, REMOVAL, Timing Belt Assembly.>
14) Remove automatic belt tension adjuster.

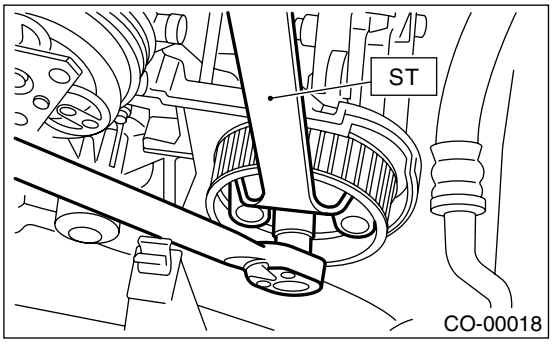


15) Remove belt idler No. 2.

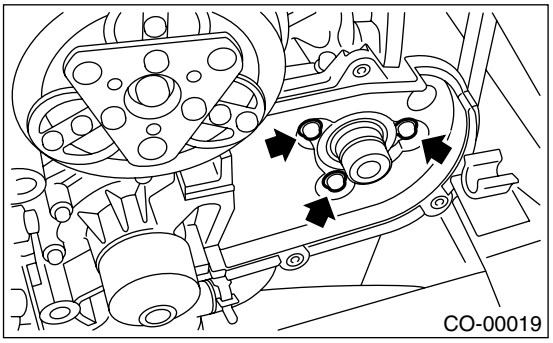


16) Remove left-hand camshaft sprocket by using ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

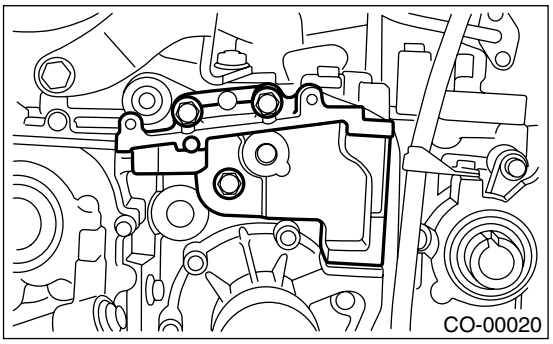
NOTE:
Camshaft sprocket wrench (499207100) is also available.



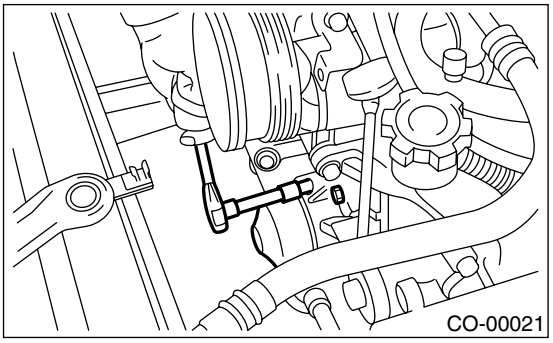
17) Remove left-hand belt cover No. 2.



18) Remove tensioner bracket.



19) Remove water pump.

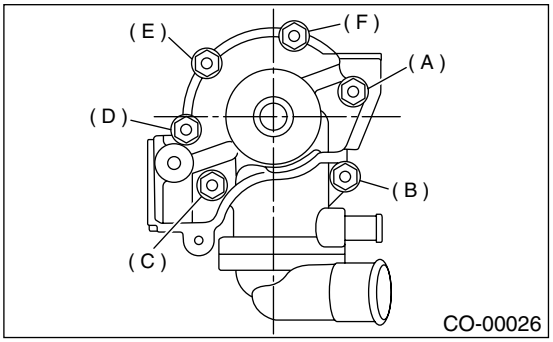


B: INSTALLATION

1) Install water pump onto left-hand cylinder block.

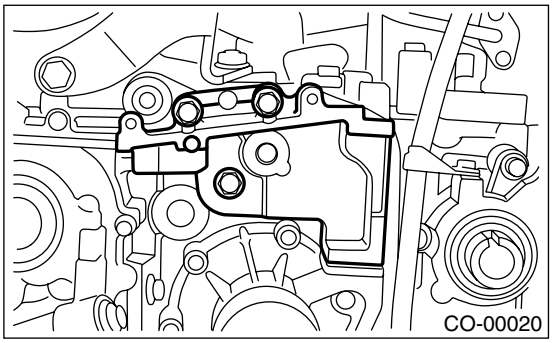
NOTE:
- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



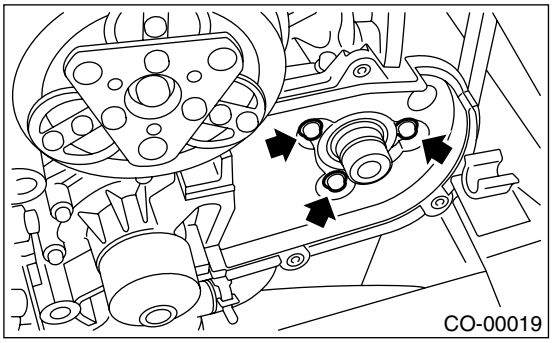
2) Install tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Install left-hand belt cover No. 2.

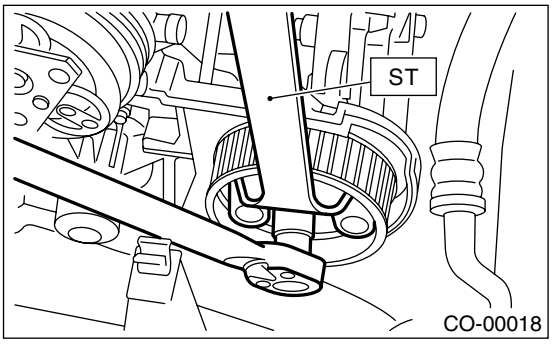
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install left-hand camshaft sprockets by using ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

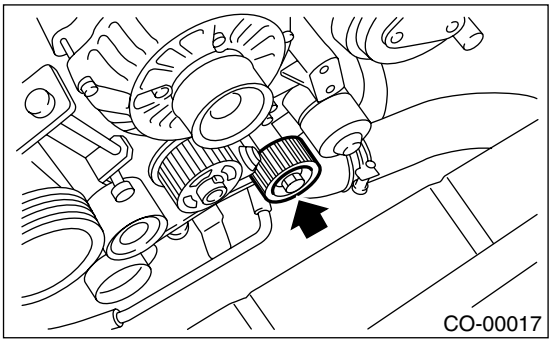
NOTE:
Camshaft sprocket wrench (499207100) is also available.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



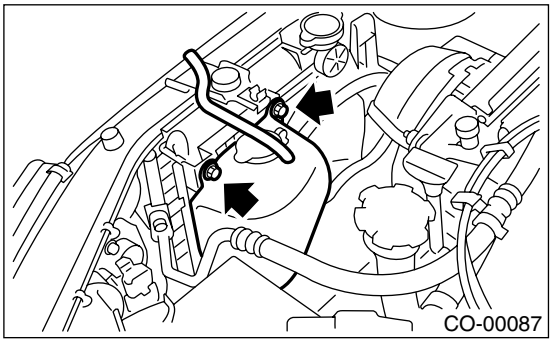
5) Install belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

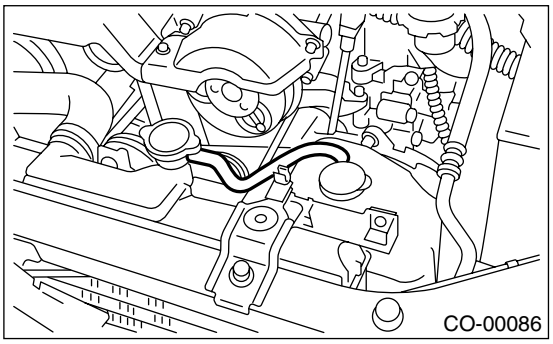


6) Install automatic belt tension adjuster which tension rod is held with pin. <Ref. to ME(H4SO)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>
7) Install timing belt. <Ref. to ME(H4SO)-49, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
8) Install V-belts. <Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>
9) Install radiator main fan and sub fan motor assemblies. <Ref. to CO(H4SO)-25, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, INSTALLATION, Radiator Sub Fan and Fan Motor.>

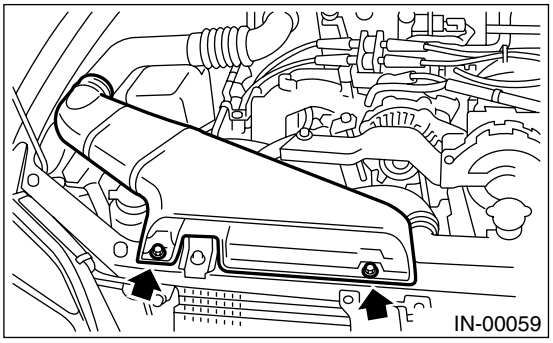
10) Install reservoir tank.



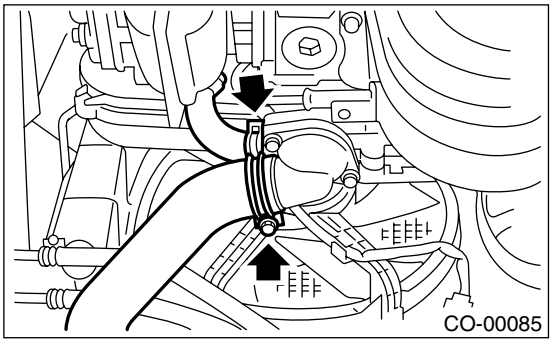
11) Connect overflow hose.



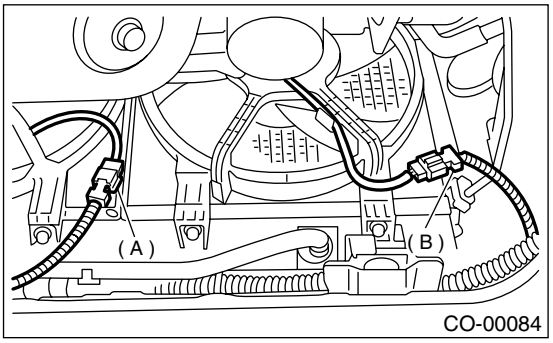
12) Install air intake duct.



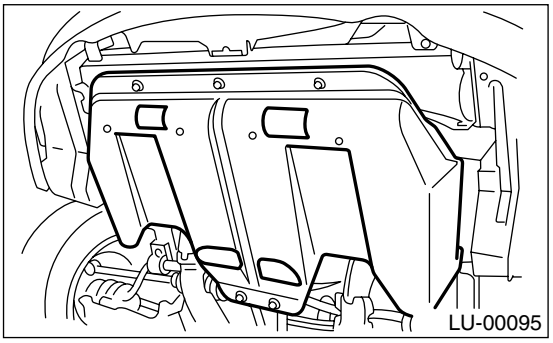
13) Lift-up the vehicle.
14) Connect radiator outlet hose and heater by-pass hose to water pump.



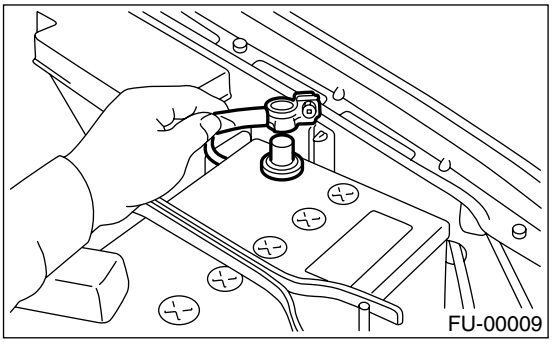
15) Connect connectors to radiator main fan (A) and sub fan (B) motors.



16) Install under cover.



17) Lower the vehicle.
18) Connect battery ground cable.

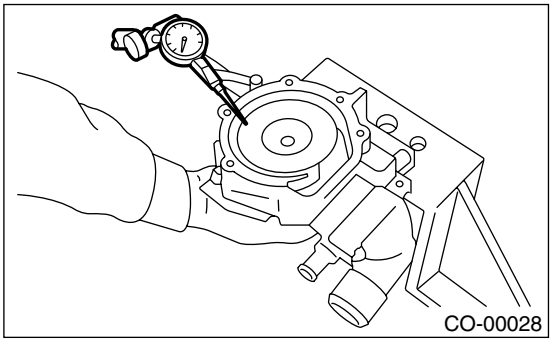


19) Fill coolant. <Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

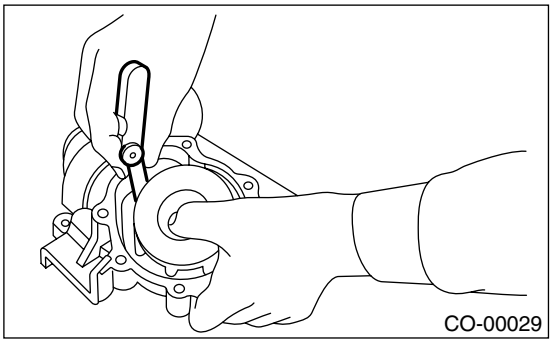
1) Check water pump bearing for smooth rotation.
2) Check water pump pulley for abnormalities.
3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

"Thrust" runout limit:
0.5 mm (0.020 in)



4) Check clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

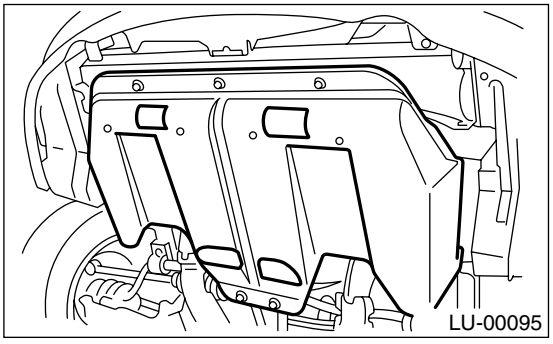


5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace water pump assembly.

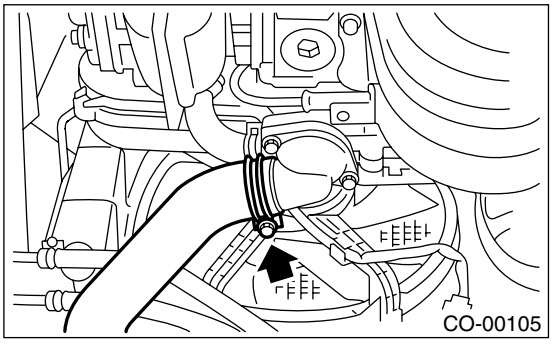
6. Thermostat

A: REMOVAL

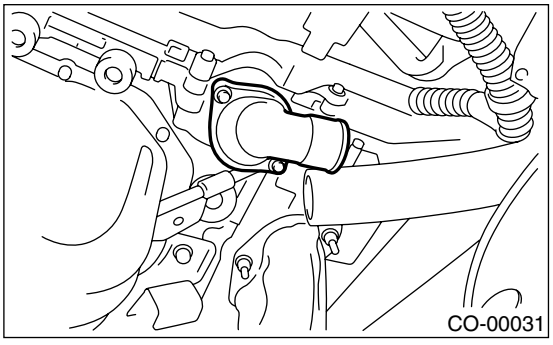
1) Lift-up the vehicle.
2) Remove under cover.



3) Drain engine coolant completely. <Ref. to CO(H4SO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect radiator outlet hose from thermostat cover.



5) Remove thermostat cover and gasket, and pull out the thermostat.

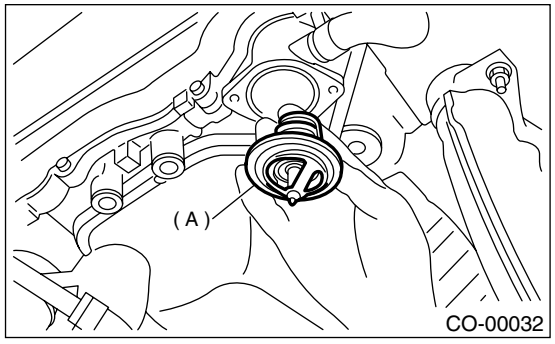


B: INSTALLATION

1) Install the thermostat in the water pump, and install the thermostat cover together with a gasket.

NOTE:
- Replace gasket with a new one.
- Thermostat must be installed with jiggle pin (A) facing the front side.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

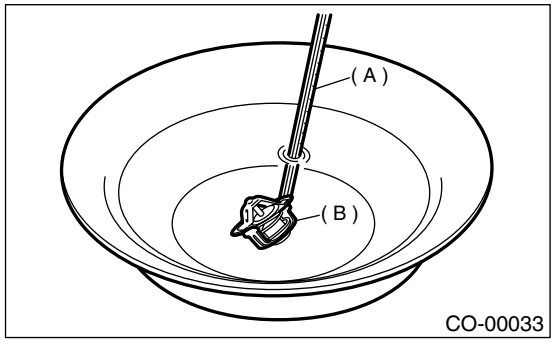


2) Fill coolant. <Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. If the measured temperature is within the specified range, the condition of thermostat is normal.

Specified value:
Starts to open:
76.0 — 80.0°C (169 — 176°F)
Fully opens:
91°C (196°F)

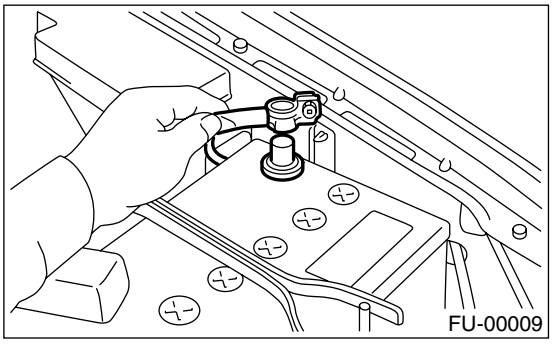


(A) Thermometer
(B) Thermostat

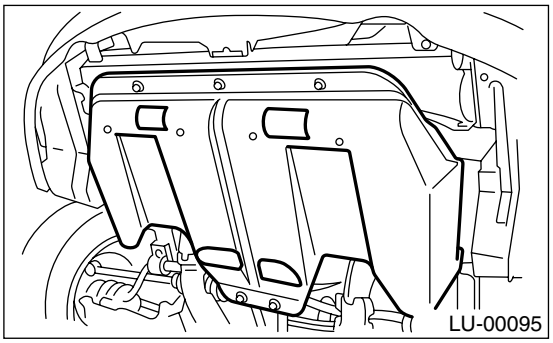
7. Radiator

A: REMOVAL

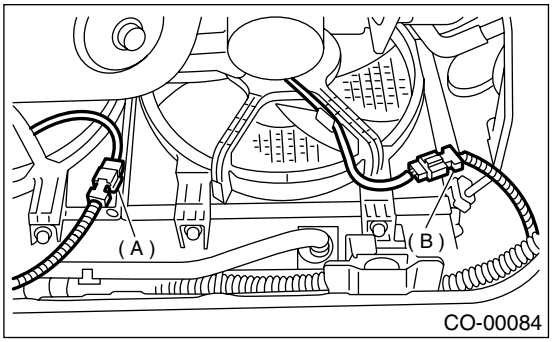
1) Disconnect battery ground cable.



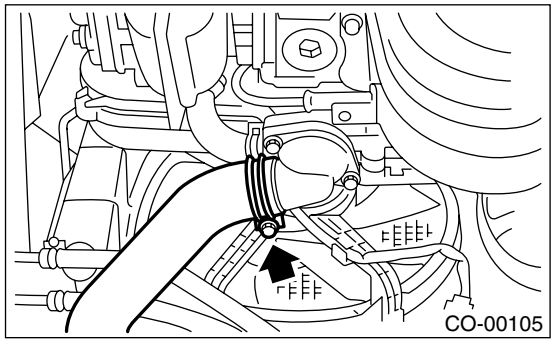
2) Lift-up the vehicle.
3) Remove under cover.



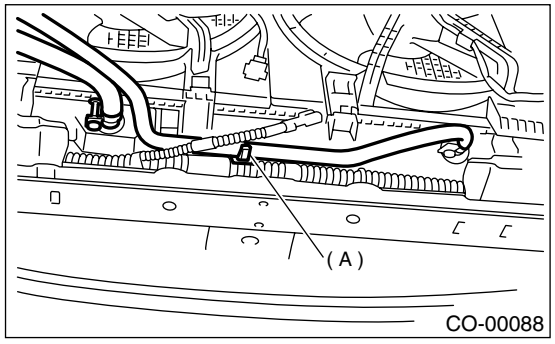
4) Drain engine coolant completely. <Ref. to CO(H4SO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect connectors of radiator main fan (A) and sub fan (B) motor.



6) Disconnect radiator outlet hose from thermostat cover.

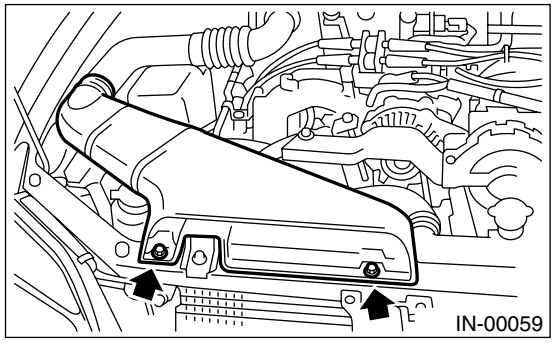


7) Disconnect ATF cooler hoses from radiator. (AT vehicles only)

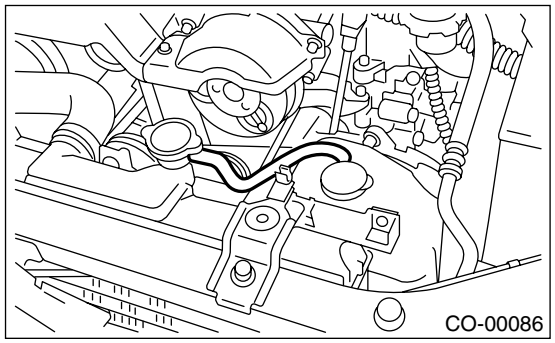


(A) Clip

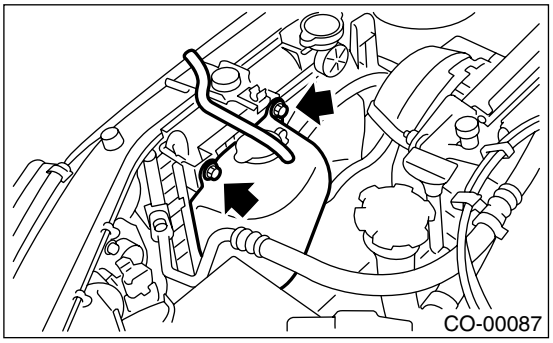
8) Lower the vehicle.
9) Remove air intake duct.



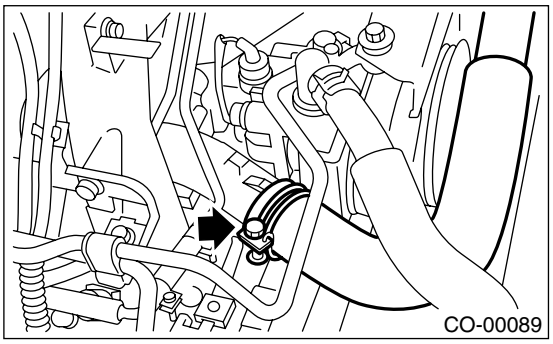
10) Disconnect overflow hose.



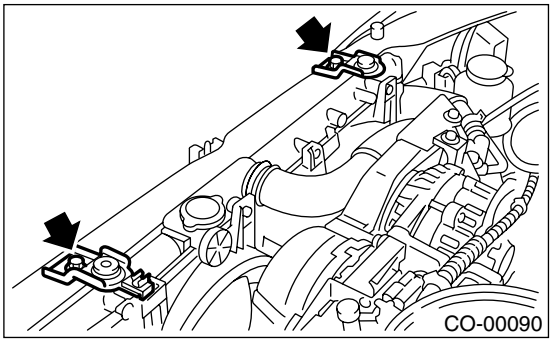
11) Remove reservoir tank.



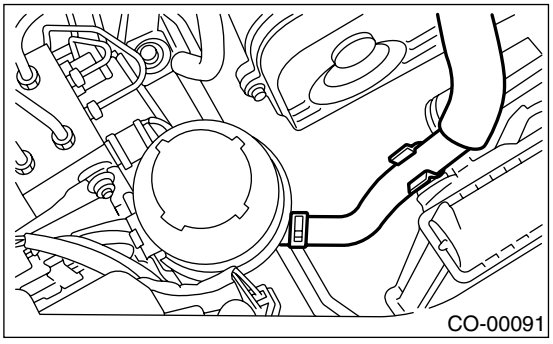
12) Disconnect radiator inlet hose from engine.



13) Remove radiator upper brackets.

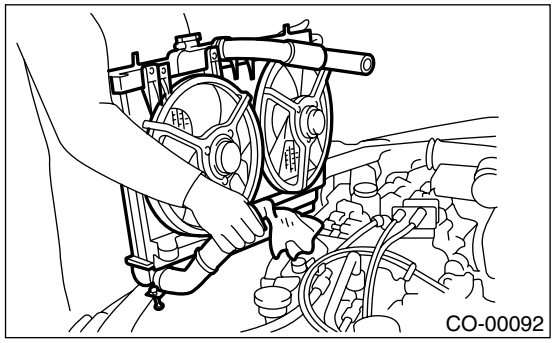


14) Detach power steering hose from the clip on the radiator.



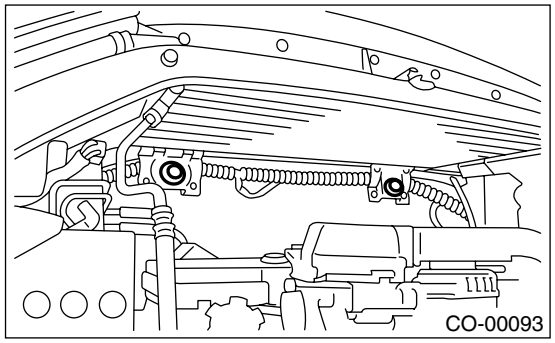
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.



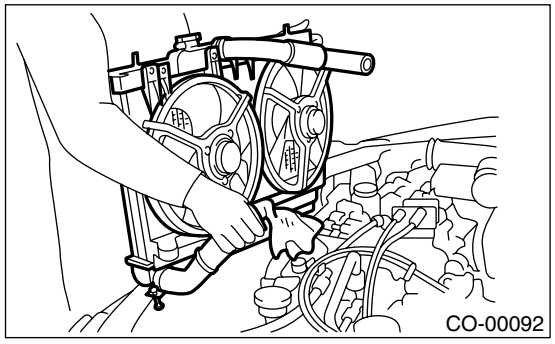
B: INSTALLATION

1) Attach radiator mounting cushions to holes on the vehicle.



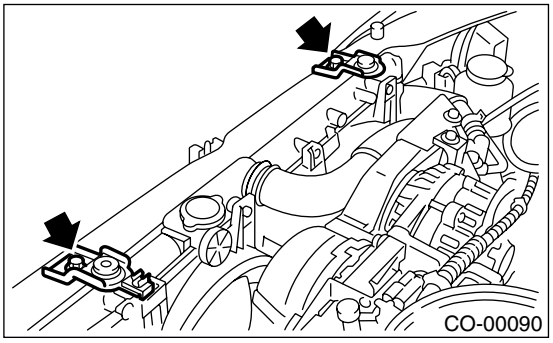
2) Install radiator while fitting radiator pins to cushions.

NOTE:
Fit pins on lower side of radiator into cushions on body side.

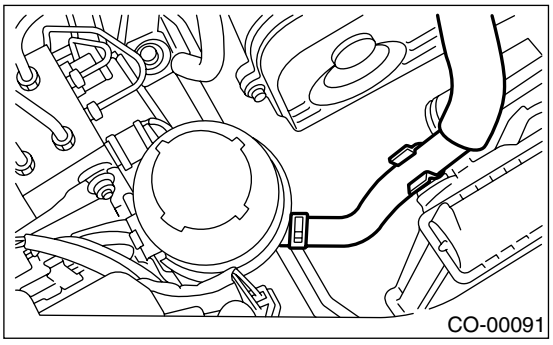


3) Install radiator brackets and tighten bolts.

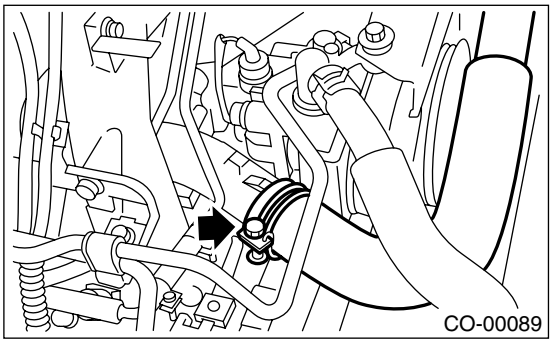
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Attach power steering hose to the radiator.

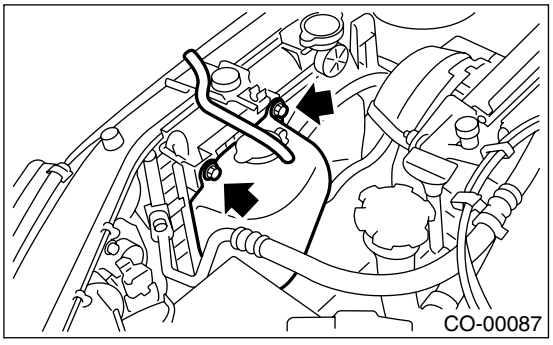


5) Connect radiator inlet hose.

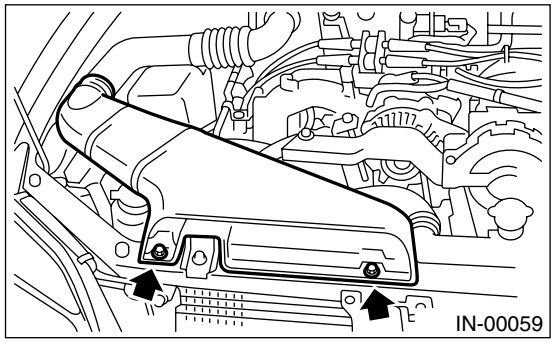


6) Install reservoir tank.

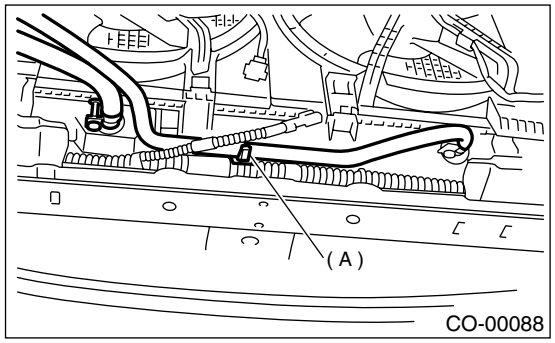
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



7) Install air intake duct.

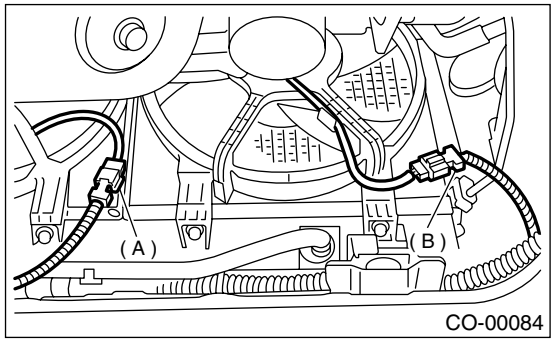


8) Lift-up the vehicle.
9) Connect ATF cooler hoses. (AT vehicles only)

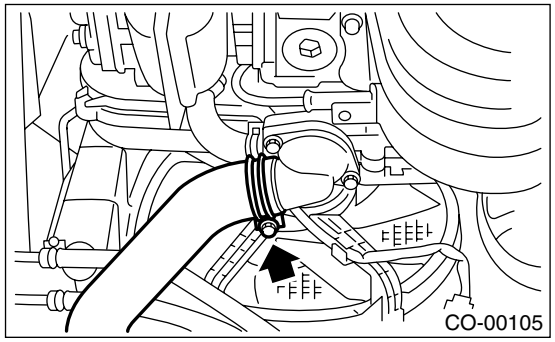


(A) Clip

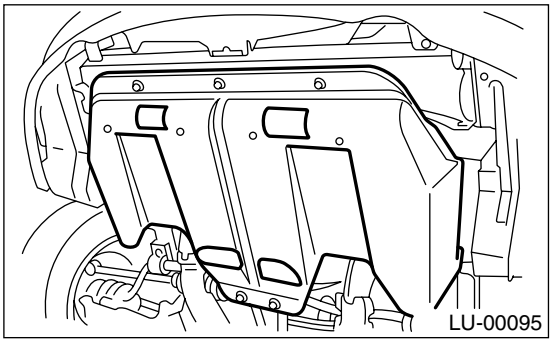
10) Connect connectors to radiator main fan motor (A) and sub fan motor (B).



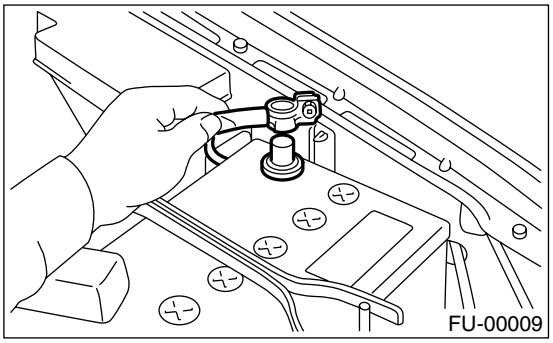
11) Connect radiator outlet hose.



12) Install under cover.



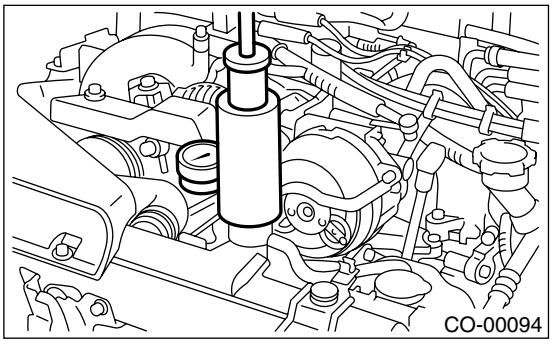
13) Lower the vehicle.
14) Connect battery ground cable.



15) Fill coolant. <Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Check ATF level. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



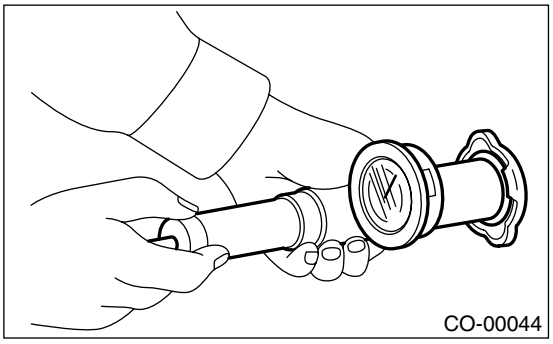
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

CAUTION:
• Engine should be off.
• Wipe engine coolant from check points in advance.
• Be careful to prevent engine coolant from spurting out when removing tester.
• Be careful not to deform filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

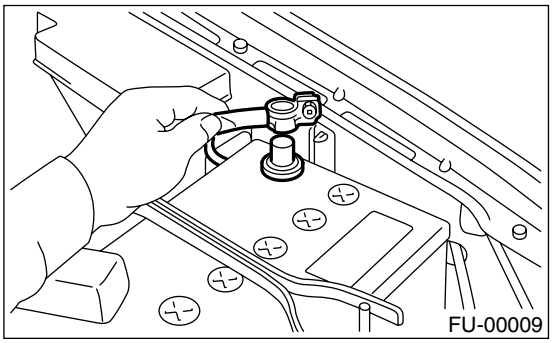
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap before installing tester. Otherwise, results of pressure test will be incorrect.

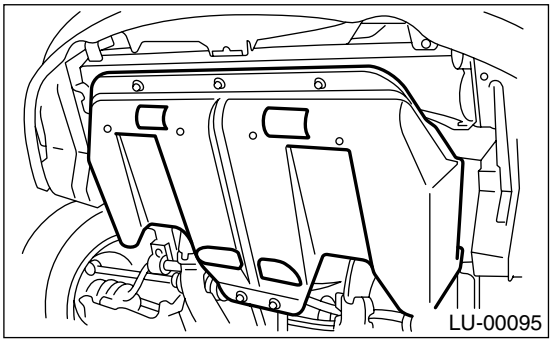
9. Radiator Main Fan and Fan Motor

A: REMOVAL

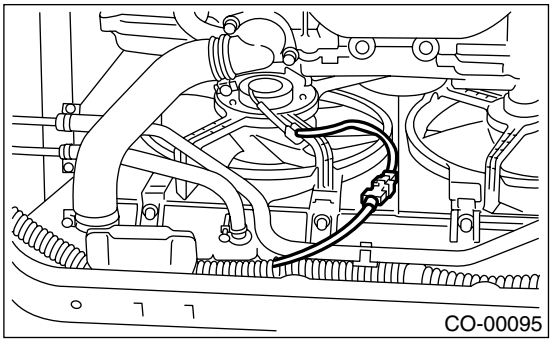
1) Disconnect battery ground cable.



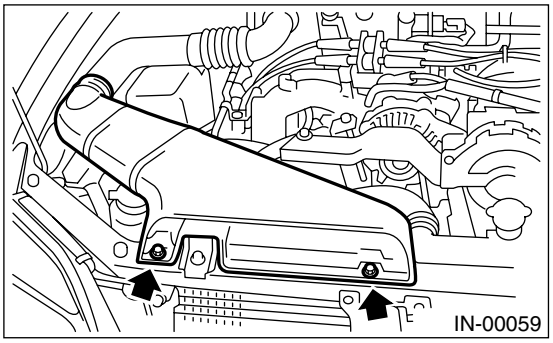
2) Lift-up the vehicle.
3) Remove under cover.



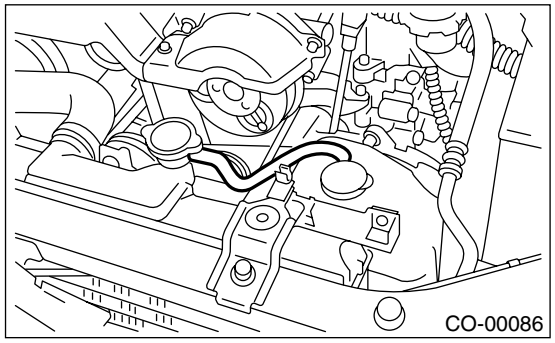
4) Disconnect connector of main fan motor.



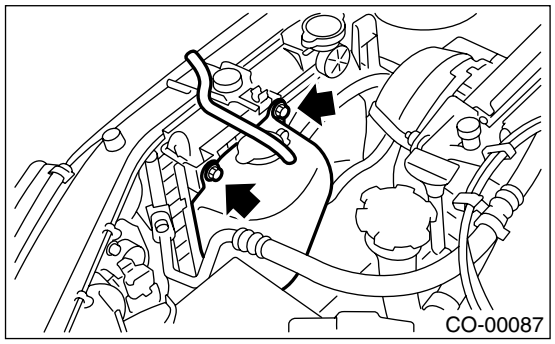
5) Lower the vehicle.
6) Remove air intake duct.



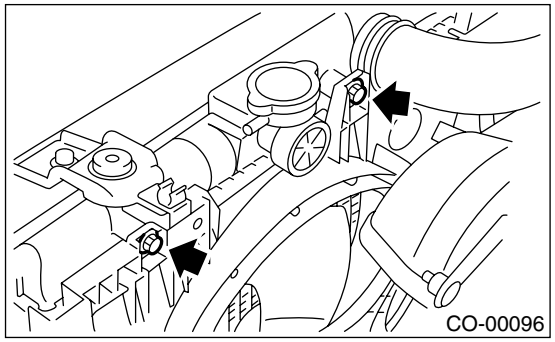
7) Disconnect overflow hose.



8) Remove reservoir tank.



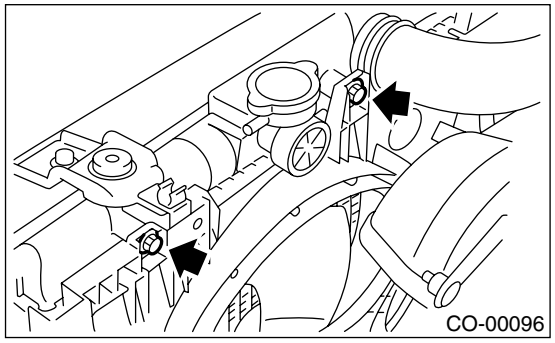
9) Remove radiator main fan motor assembly.



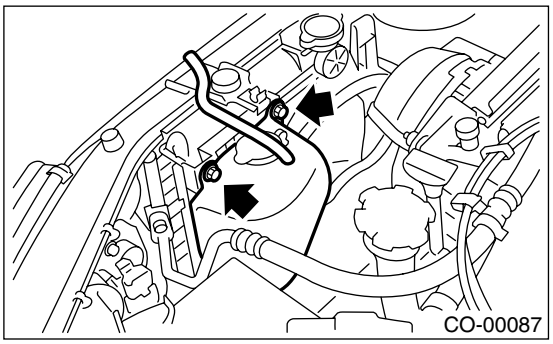
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

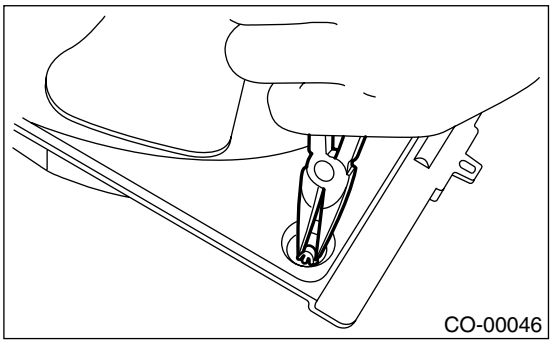


Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

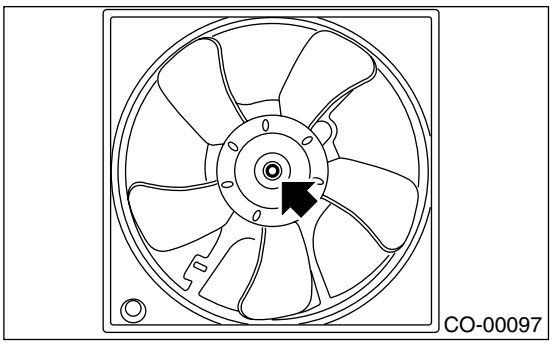


C: DISASSEMBLY

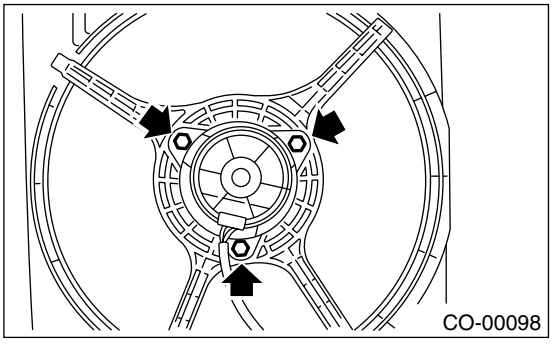
1) Remove clip which holds motor connector onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



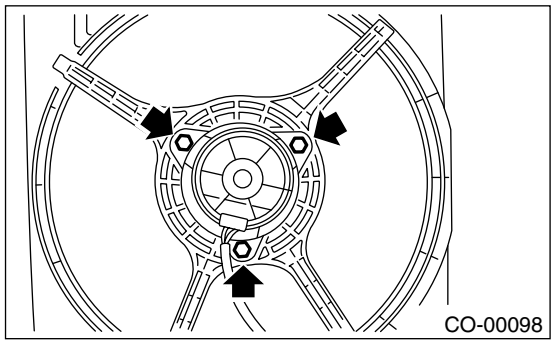
3) Remove bolts which install fan motor onto shroud.



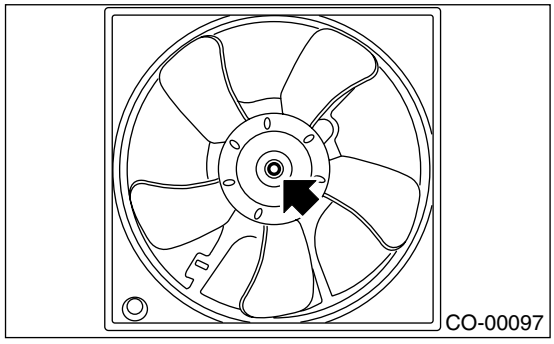
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

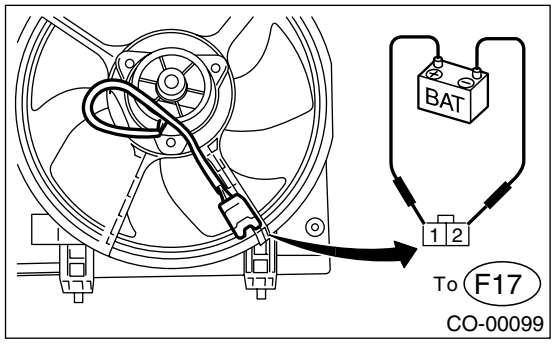


Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



E: INSPECTION

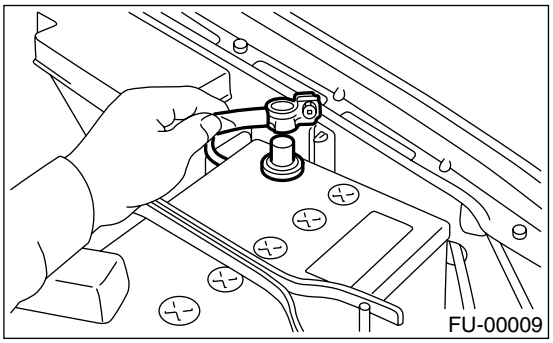
1) Connect battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of main fan motor connector.
2) Make sure the main fan motor operates properly. Replace it if it doesn't.



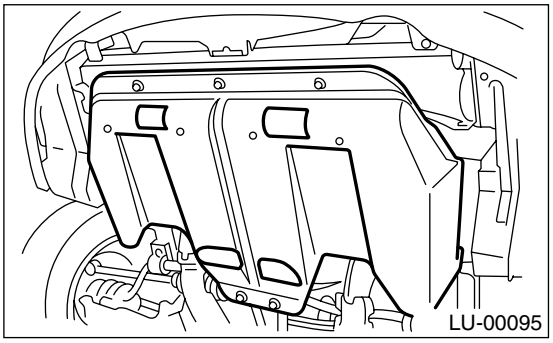
10.Radiator Sub Fan and Fan Motor

A: REMOVAL

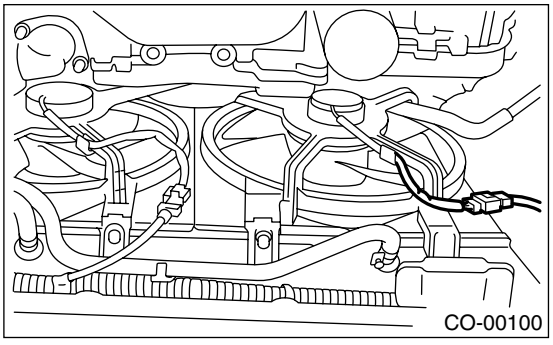
1) Disconnect battery ground cable.



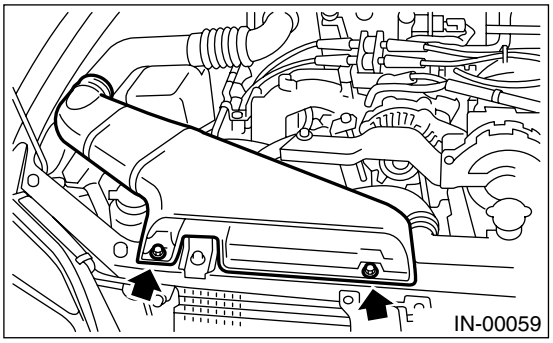
2) Lift-up the vehicle.
3) Remove under cover.



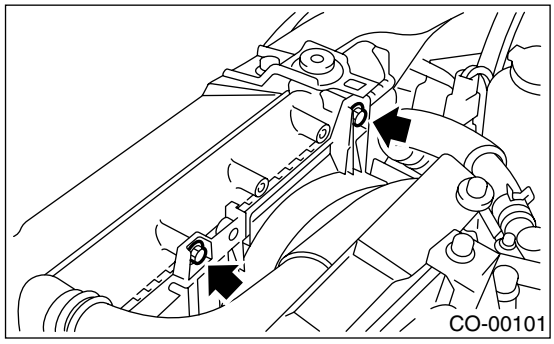
4) Disconnect connector of sub fan motor.



5) Lower the vehicle.
6) Remove air intake duct.



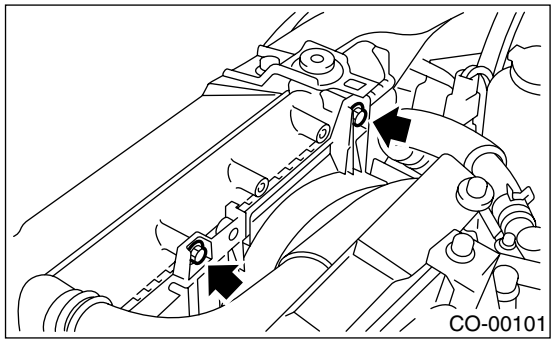
7) Remove bolts which hold sub fan shroud to radiator.
8) Remove radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

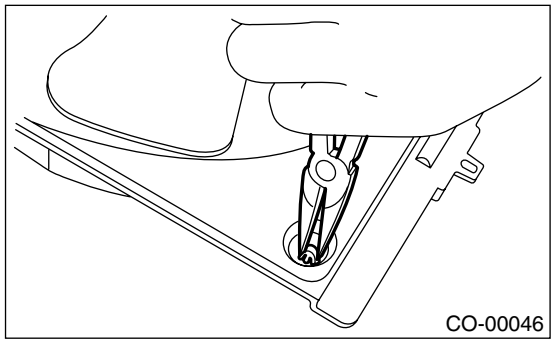
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

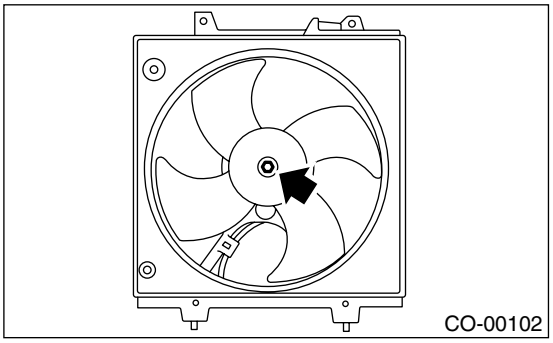


C: DISASSEMBLY

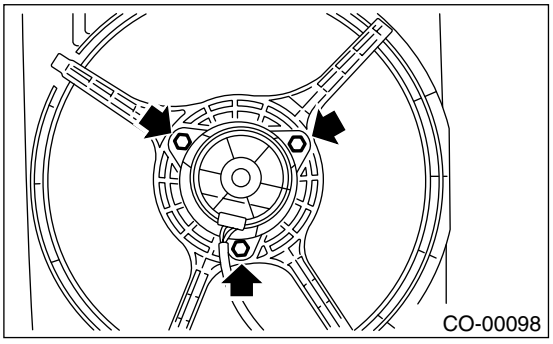
1) Remove clip which holds motor harness onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



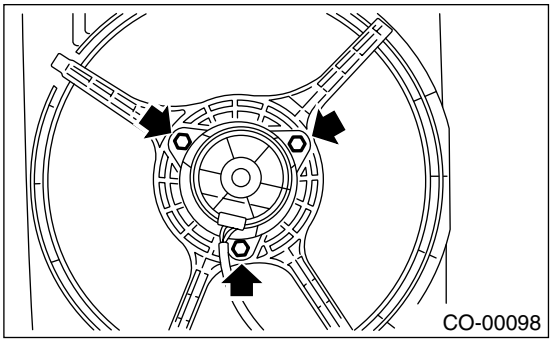
3) Remove bolts which install fan motor onto shroud.



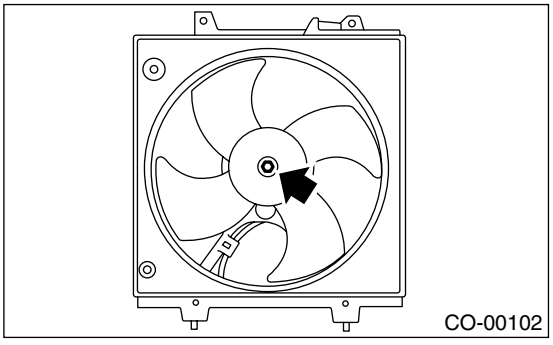
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

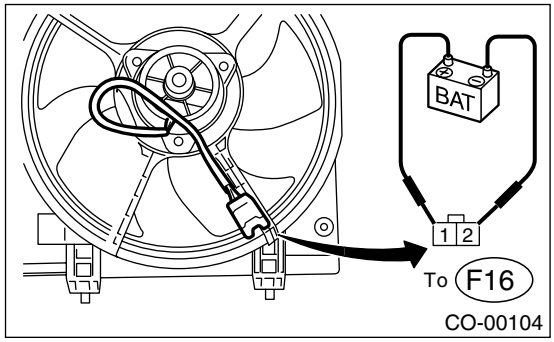


Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



E: INSPECTION

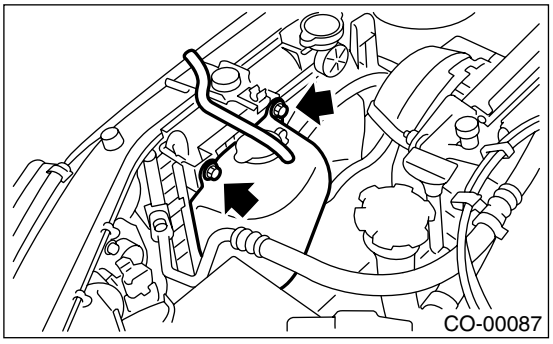
1) Connect battery positive (+) terminal to terminal No. 2, and negative (–) terminal to terminal No. 1 of sub fan motor connector.
2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.



11.Reservoir Tank

A: REMOVAL

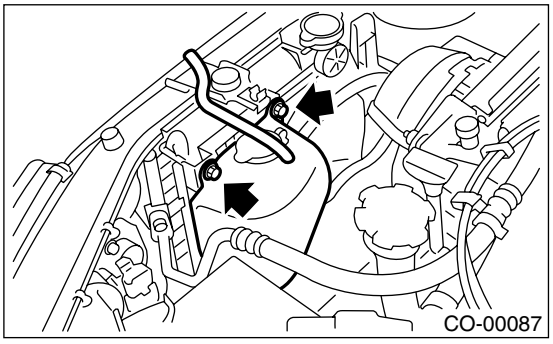
1) Disconnect overflow hose from radiator filler neck position.
2) Remove bolts which install reservoir tank onto radiator main fan shroud.
3) Remove reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble		Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H4SO)-2, ENGINE, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Engine oil mixed in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H4SO)-2, ENGINE, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Improper transmission oil	Replace.
	p. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Malfunction of thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H4SO)

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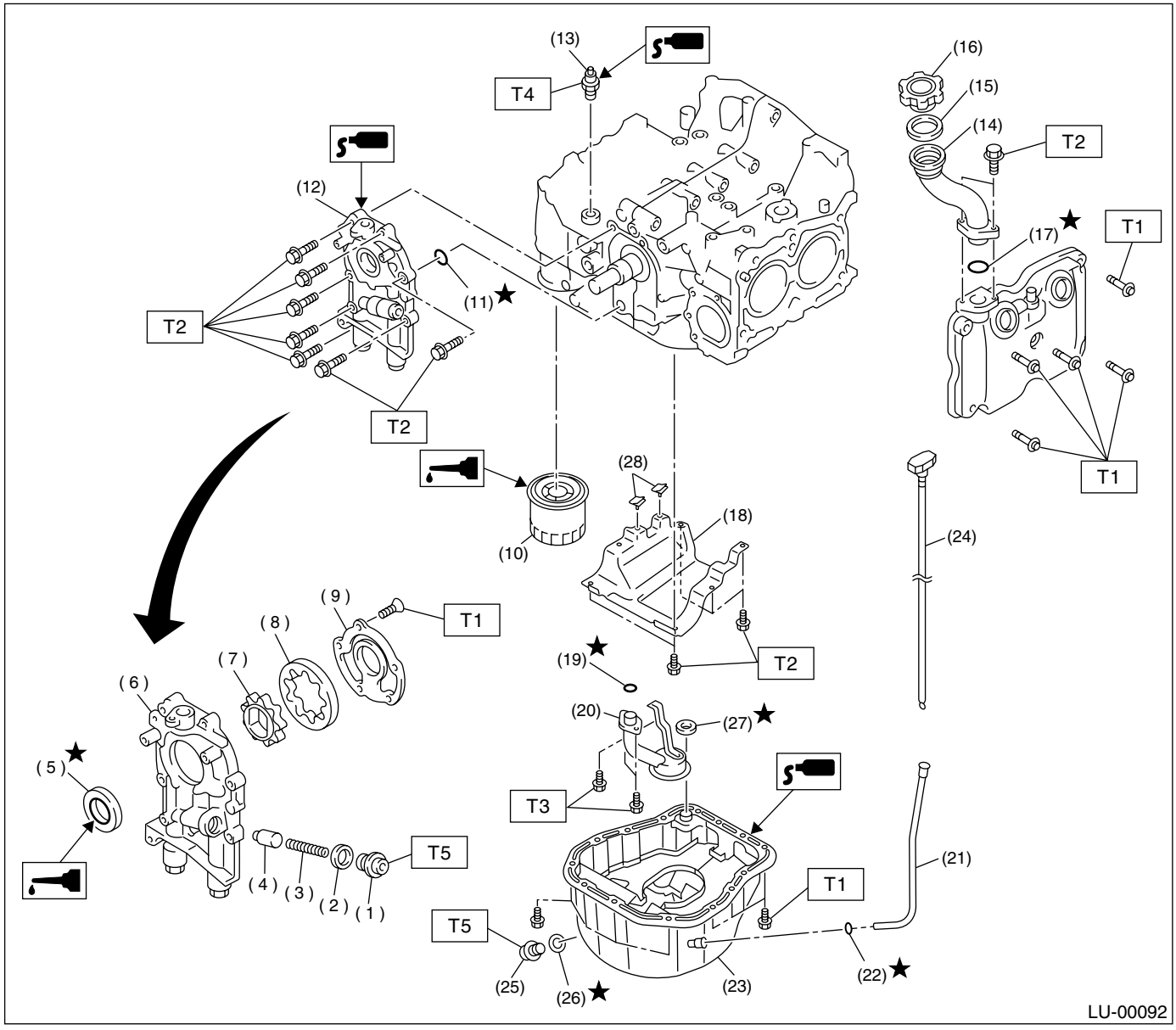
4. Oil Pump 10
5. Oil Pan and Strainer....14
6. Oil Pressure Switch....18
7. Engine Oil Filter....19
8. Engine Lubrication System Trouble in General....20

1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth		Inner rotor	9
			Outer rotor	10
	Outer rotor diameter × thickness			78 × 7 mm (3.07 × 0.28 in)
	Tip clearance between inner and outer rotor		STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
			LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case		STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
			LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case		STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
			LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	- Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
			- Discharge quantity	3.2 ℓ (3.4 US qt, 2.8 Imp qt)/min.
		5,000 rpm	- Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
			- Discharge quantity	32.6 ℓ (8.61 US gal, 7.17 Imp gal)/min.
	Relief valve operation pressure			490 kPa (5.0 kg/cm^2, 71 psi)
Oil filter	Type			Full-flow filter type
	Filtration area			910 cm^2 (141 sq in)
	By-pass valve opening pressure			157 kPa (1.6 kg/cm^2, 23 psi)
	Outer diameter × width			80 × 75 mm (3.15 × 2.95 in)
	Installation screw type			M 20 × 1.5
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure			14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure			More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (when replacing oil)				Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) O-ring
(12) Oil pump ASSY
(13) Oil pressure switch
(14) Oil filler duct
(15) O-ring
(16) Oil filler cap
(17) O-ring
(18) Baffle plate
(19) O-ring
(20) Oil strainer
(21) Oil level gauge guide
(22) O-ring
(23) Oil pan
(24) Oil level gauge
(25) Drain plug
(26) Metal gasket
(27) Gasket
(28) Seal

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: 44 (4.5, 33)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

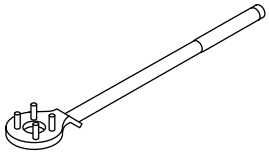
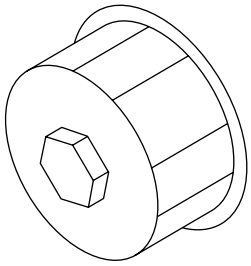
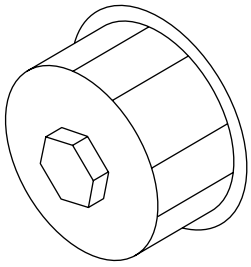
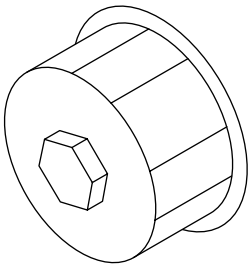
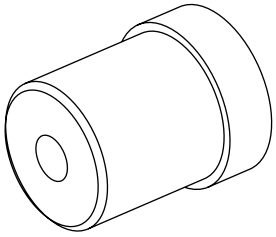
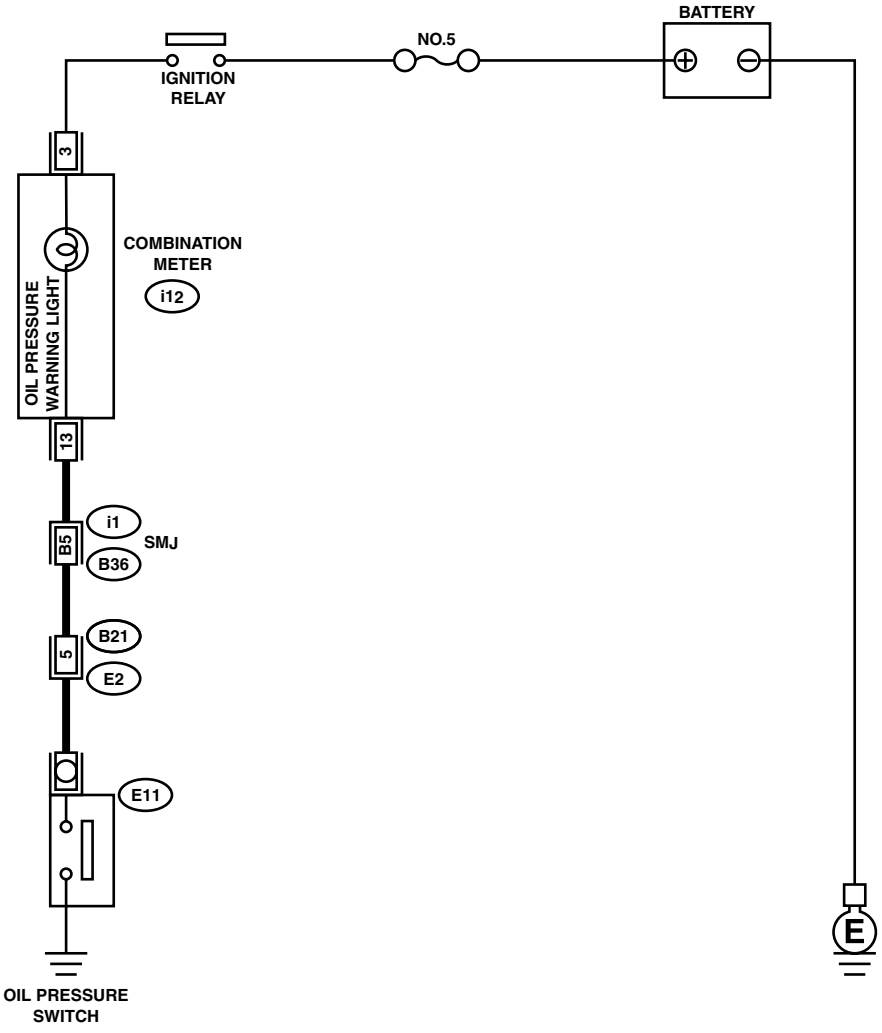
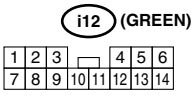
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000 [Outer diameter 80 mm (3.15 in) for oil filter]	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST18332AA000	18332AA000 [Outer diameter 68 mm (2.68 in) for oil filter]	OIL FILTER WRENCH	Used for removing and installing oil filter.

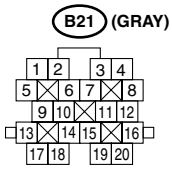
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010 [Outer diameter 65 mm (2.56 in) for oil filter]	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

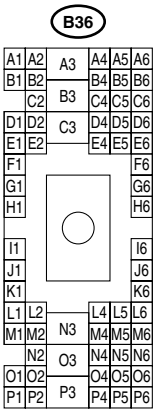
2. Oil Pressure System

A: SCHEMATIC









LU-00093

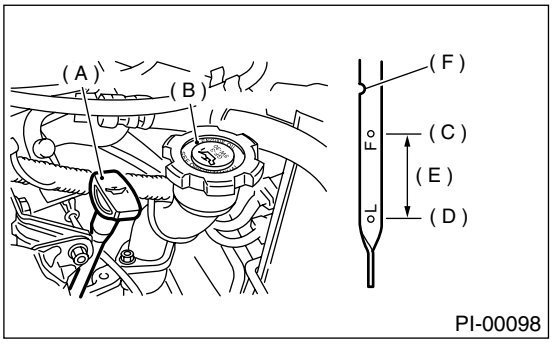
B: INSPECTION

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights.	Does the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 — Chassis ground:***	Is the measured value more than 10 V?	Replace oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. ***Terminal*** ***No. C13 — No. C3:***	Is the measured value less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

3. Engine Oil

A: INSPECTION

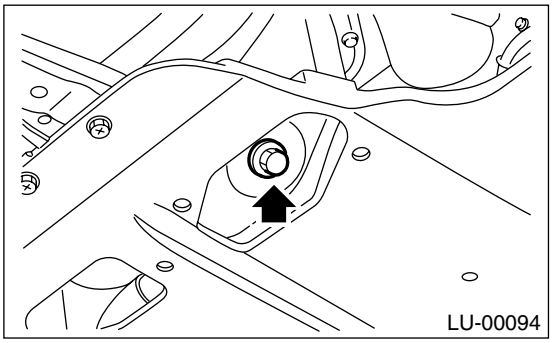
1) Park vehicle on a level surface.
2) Remove oil level gauge and wipe it clean.
3) Reinsert oil level gauge. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and the notch mark. This is caused by thermal expansion of the engine oil.
7) To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)
(F) Notch mark

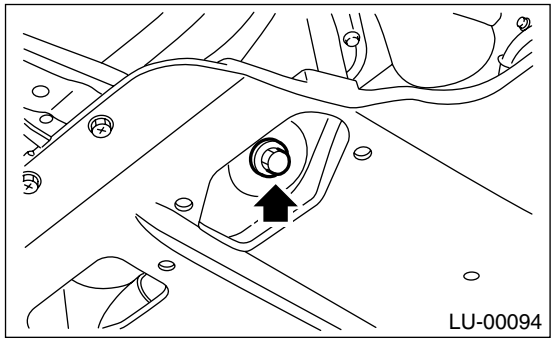
B: REPLACEMENT

1) Open engine oil filler cap for quick draining of the engine oil.
2) Drain engine oil by loosening engine oil drain plug.



3) Replace drain plug gasket.
4) Tighten engine oil drain plug after draining engine oil.

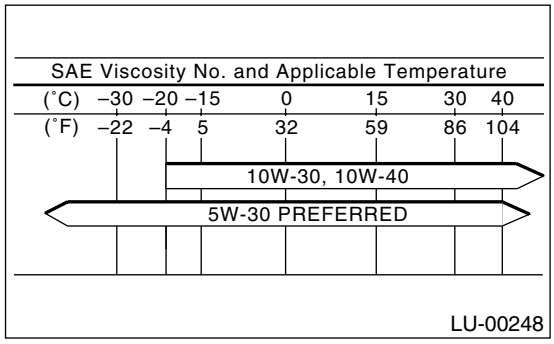
Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



5) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark)
API classification SL with the words “ENERGY CONSERVING” (if you cannot obtain the oil with SL grade, you may use SJ grade “ENERGY CONSERVING” oil)
ACEA specification A1, A2 or A3

Oil amount for preparation (when replacing engine oil):
Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)

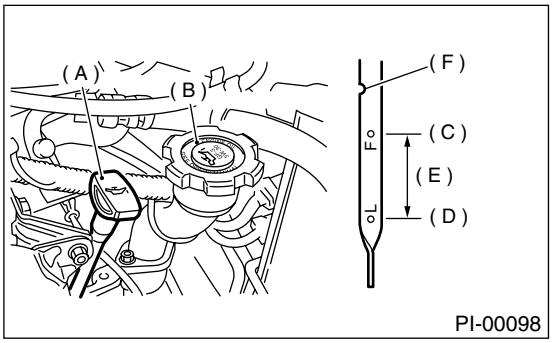


The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the ILSAC or API classification and SAE viscosity No. designated by SUBARU.

NOTE:
If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: ILSAC classification: GF-3 or API classification: SL
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

6) Close engine oil filler cap.
7) Start engine and warm it up for a time.
8) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.

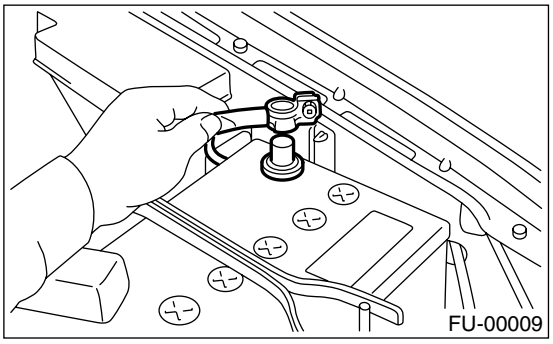


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)
(F) Notch mark

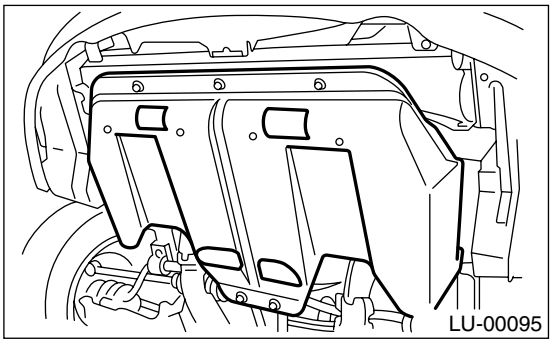
4. Oil Pump

A: REMOVAL

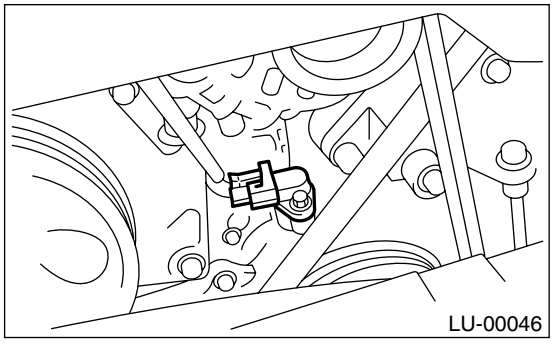
1) Disconnect ground cable from battery.



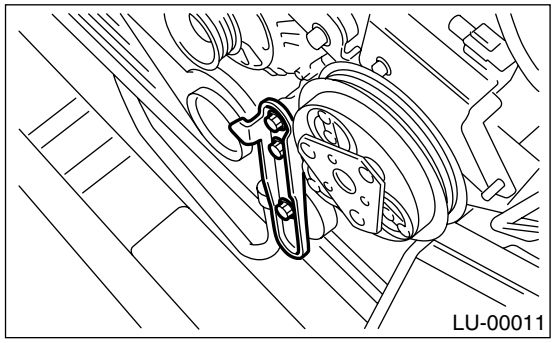
2) Lift-up the vehicle.
3) Remove undercover.



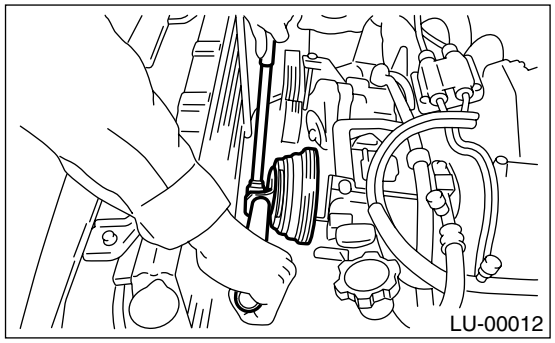
4) Lower the vehicle.
5) Remove radiator. <Ref. to CO(H4SO)-20, REMOVAL, Radiator.>
6) Remove crankshaft position sensor.



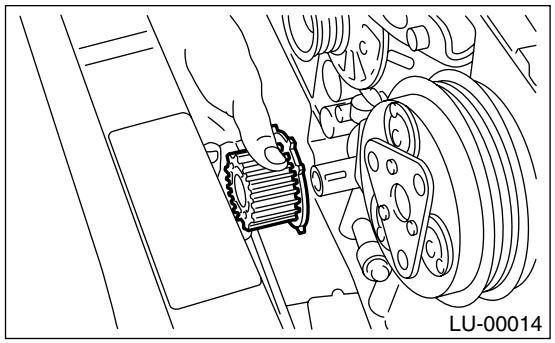
7) Remove V-belts. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
8) Remove rear side V-belt tensioner.



9) Remove crankshaft pulley by using ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH

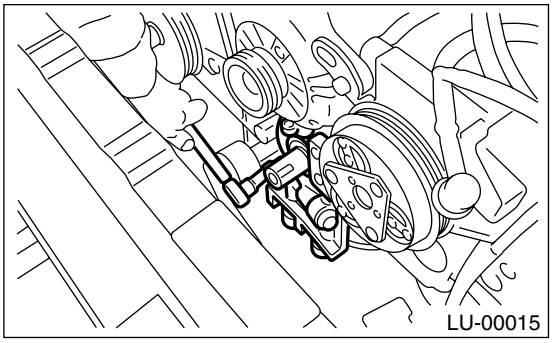


10) Remove water pump. <Ref. to CO(H4SO)-14, REMOVAL, Water Pump.>
11) Remove timing belt guide. (MT vehicle)
12) Remove crankshaft sprocket.



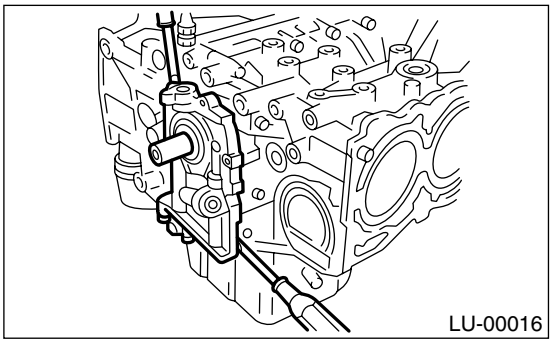
13) Remove bolts which install oil pump onto cylinder block.

NOTE:
To disassemble and check oil pump, loosen relief valve plug before removing the pump.



14) Remove oil pump by using flat bladed screwdriver.

CAUTION:
Be careful not to scratch mating surfaces of cylinder block and oil pump.

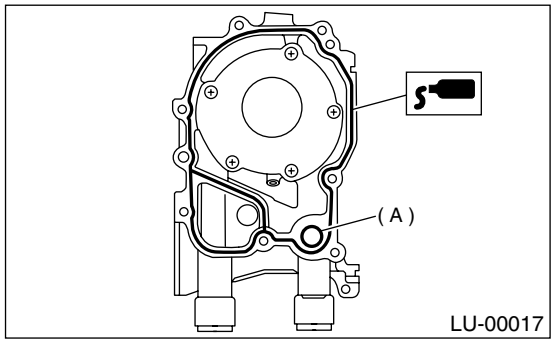


B: INSTALLATION

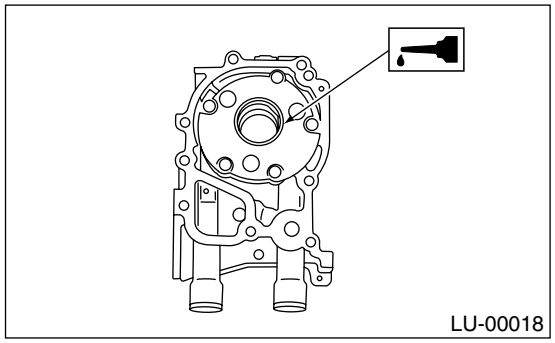
Install in the reverse order of removal.
Do the following:
1) Apply fluid gasket to matching surfaces of oil pump.

Fluid gasket:
Part No. 004403007
THREE BOND 1215 or equivalent

2) Replace O-ring (A) with a new one.



3) Apply engine oil to the inside of the oil seal.

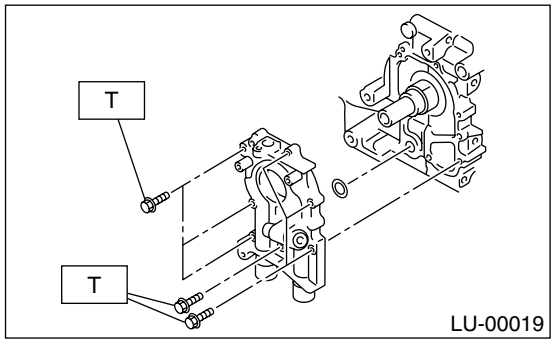


4) Be careful not to scratch oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with the crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

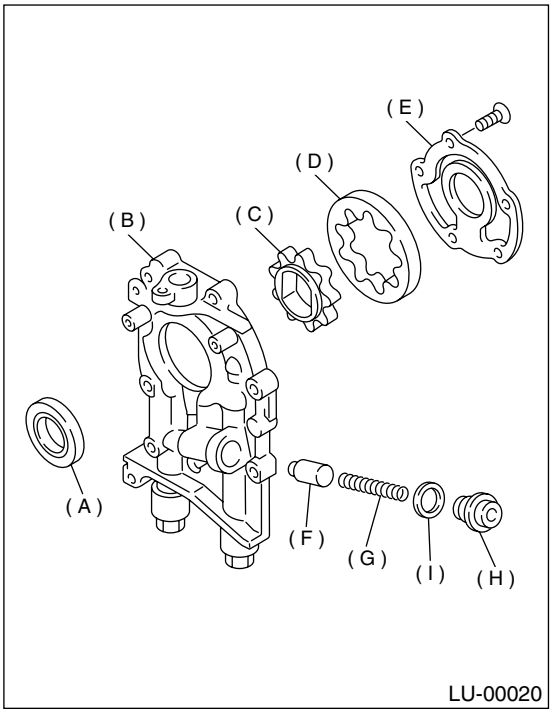
6) Install oil pump.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



C: DISASSEMBLY

Remove screws which secure oil pump cover and disassemble oil pump. Inscribe alignment marks on inner and outer rotors so that they can be replaced in their original positions during reassembly.

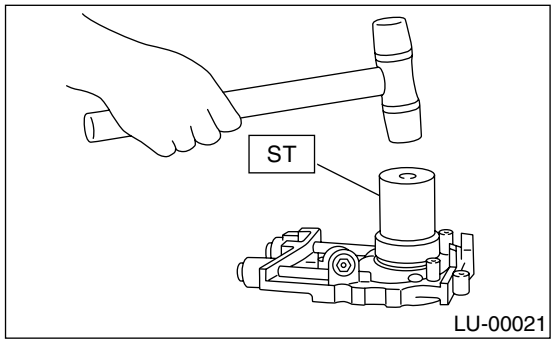


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

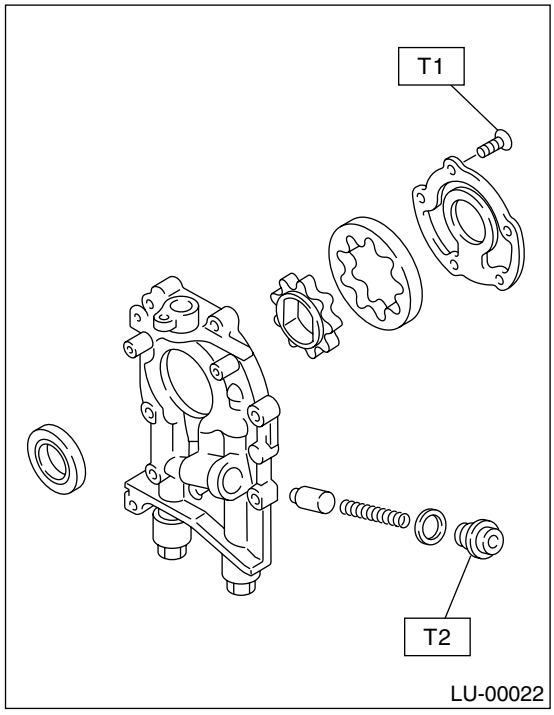
1) Install front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.



2) Apply engine oil to inner and outer rotors.
3) Install inner and outer rotors in their original positions.
4) Install oil relief valve and relief valve spring.
5) Install oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 33 ft-lb)

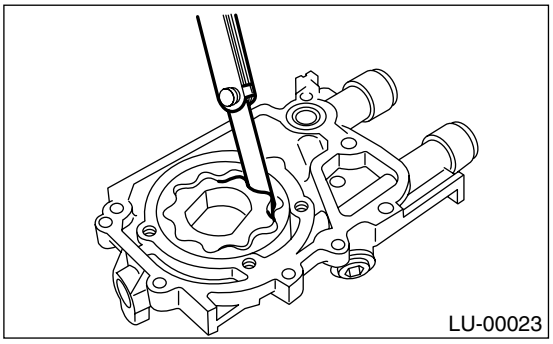


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a set.

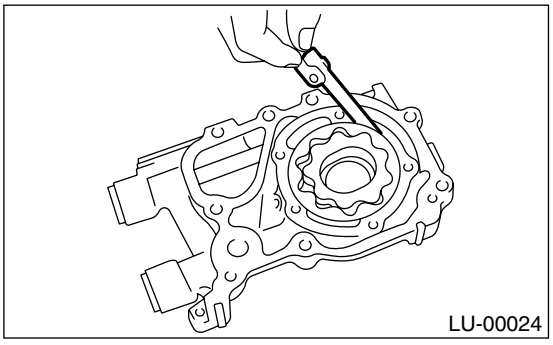
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the cylinder block rotor housing. If the clearance exceeds the limit, replace the rotor.

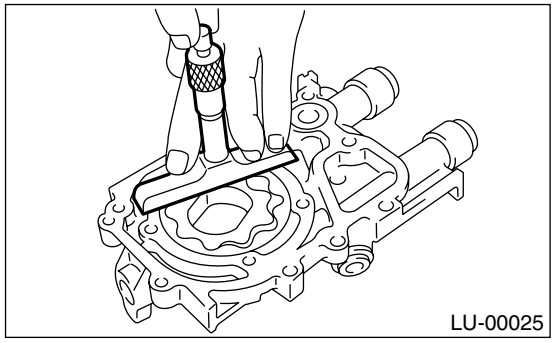
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and pump cover. If the clearance exceeds the limit, replace rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Free length
72.8 mm (2.866 in)
Installed length
54.7 mm (2.154 in)
Load when installed
81.3 N (8.29 kgf, 18.28 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

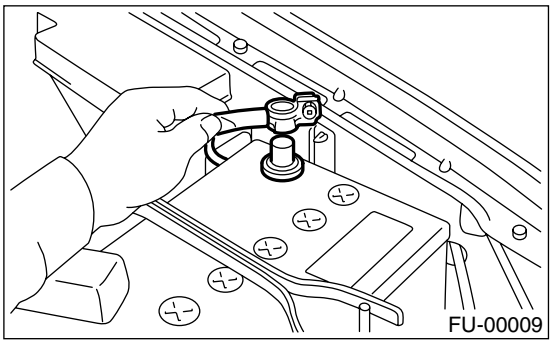
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

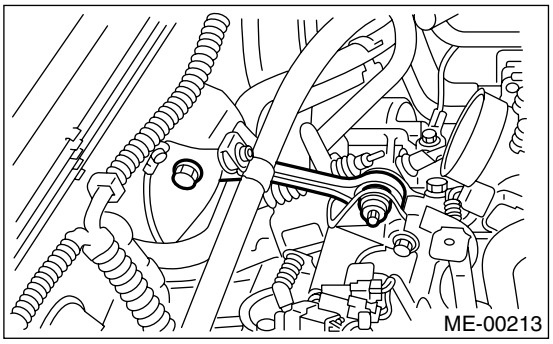
5. Oil Pan and Strainer

A: REMOVAL

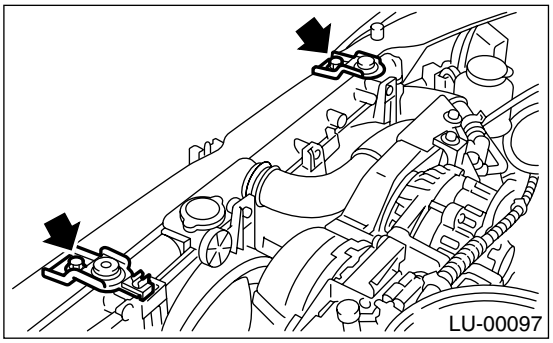
1) Set the vehicle on lift arms.
2) Remove front wheels.
3) Disconnect ground cable from battery.



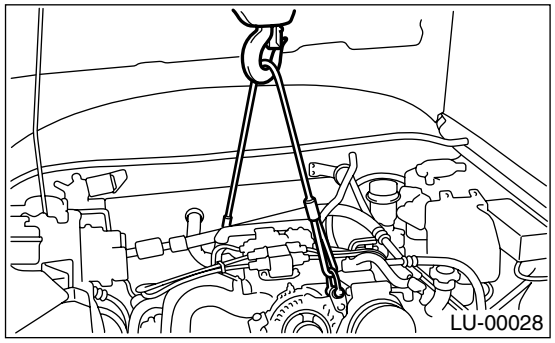
4) Remove air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
5) Remove pitching stopper.



6) Remove radiator upper brackets.



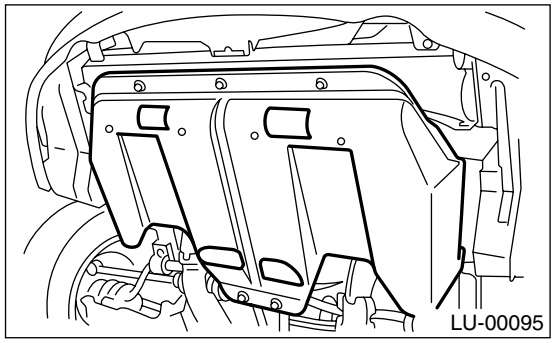
7) Support engine with a lifting device and wire ropes.



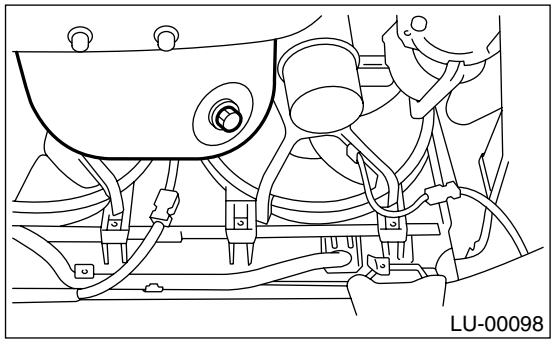
8) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, wire rope must be raised at the same time.

9) Remove under cover.

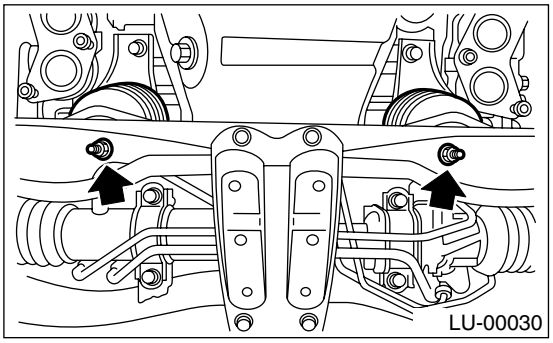


10) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



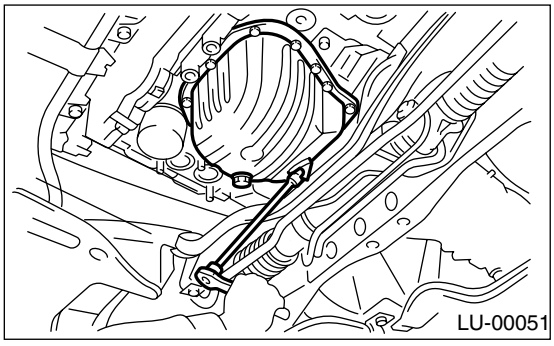
11) Remove front and center exhaust pipes. <Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

12) Remove nuts which secure front cushion rubber onto front crossmember.

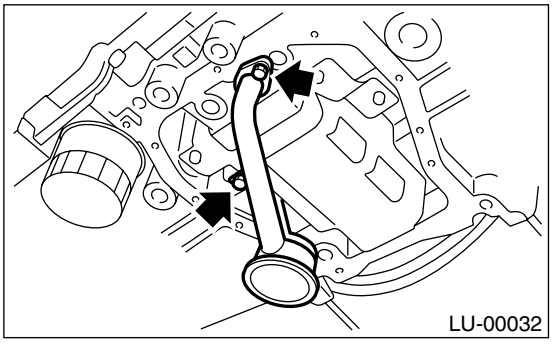


13) Remove bolts which secure oil pan on cylinder block while raising up engine.
14) Insert oil pan cutter blade between cylinder block-to-oil pan clearance.

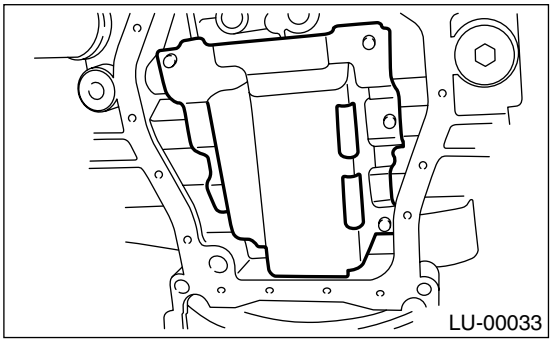
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



15) Remove oil strainer.



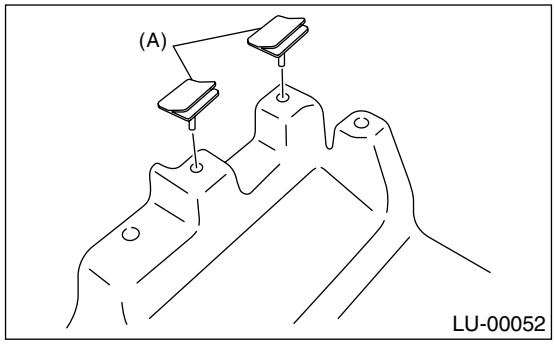
16) Remove baffle plate.



B: INSTALLATION

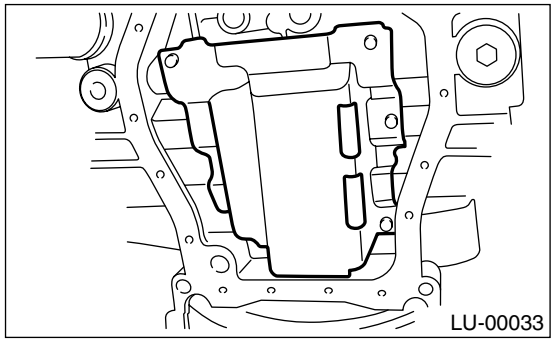
CAUTION:
Before installing oil pan, clean sealant from oil pan and engine block.

1) Make sure seal (A) is facing to the direction shown in the figure below and installed on baffle plate securely.



2) Install baffle plate.

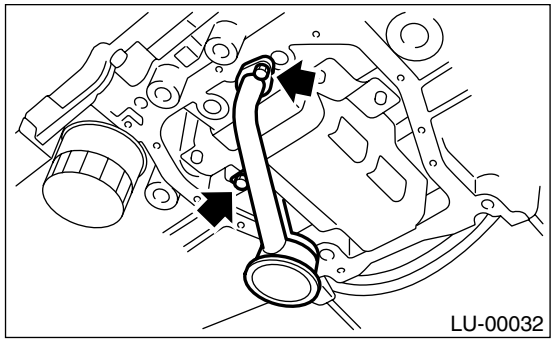
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



3) Install oil strainer onto baffle plate.

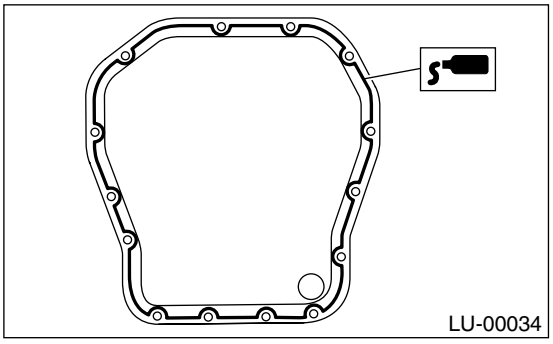
CAUTION:
Replace O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

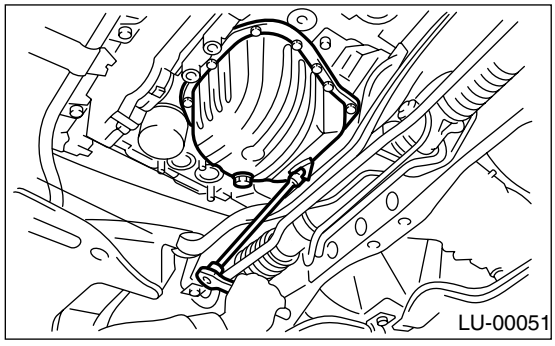


4) Apply fluid gasket to mating surfaces and install oil pan.

Fluid gasket:
Part No. 004403007
THREE BOND 1215 or equivalent

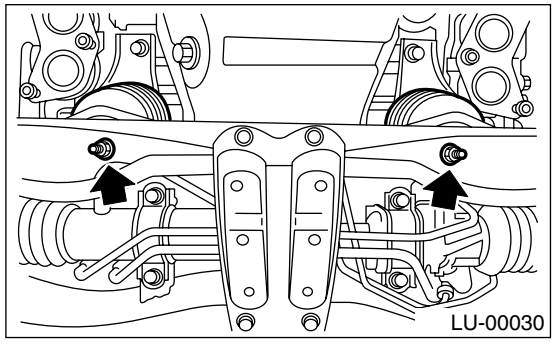


Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



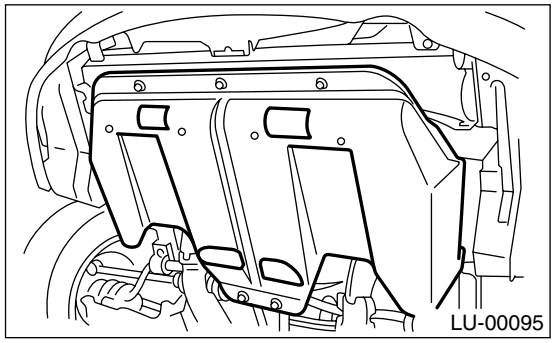
5) Lower engine onto front crossmember.
6) Tighten nuts which secure front cushion rubber onto front crossmember.

Tightening torque:
69 N·m (7.0 kgf-m, 51 ft-lb)



7) Install front and center exhaust pipes.
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

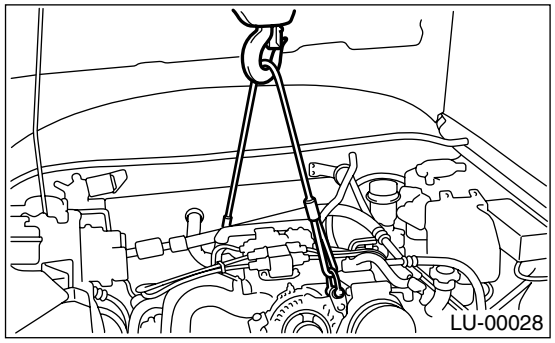
8) Install under cover.



9) Lower the vehicle.

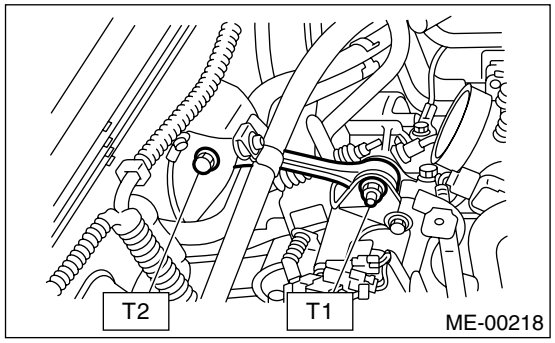
CAUTION:
When lowering vehicle, wire rope must be released at the same time.

10) Remove lifting device and steel cables.

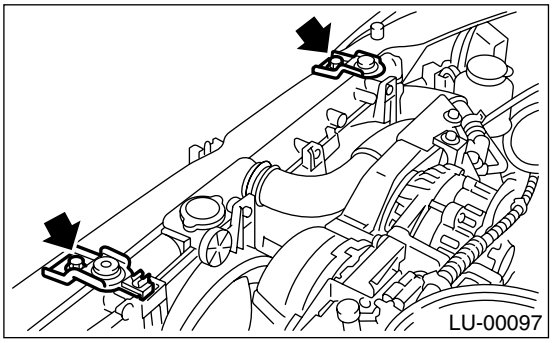


11) Install pitching stopper.

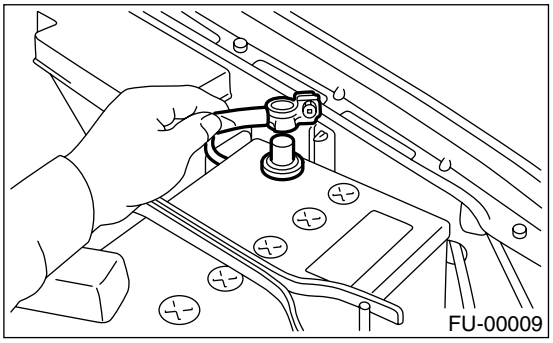
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



12) Install radiator upper brackets.



13) Install air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
14) Install front wheels.
15) Connect battery ground cable.



16) Fill engine oil. <Ref. to LU(H4SO)-8, INSPECTION, Engine Oil.>

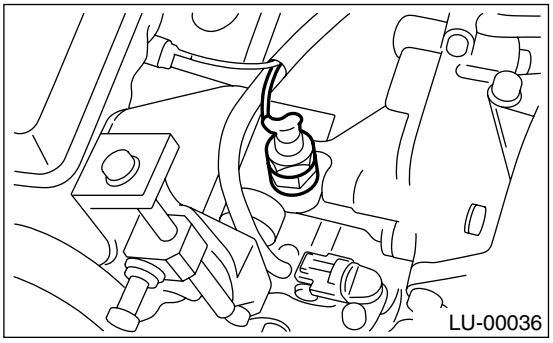
C: INSPECTION

By visual check make sure oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

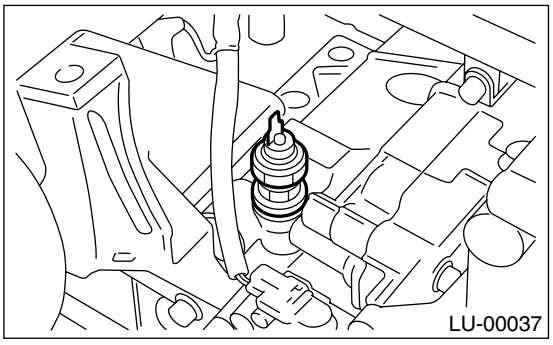
6. Oil Pressure Switch

A: REMOVAL

1) Remove generator from bracket. <Ref. to SC(H4SO)-15, REMOVAL, Generator.>
2) Disconnect terminal from oil pressure switch.



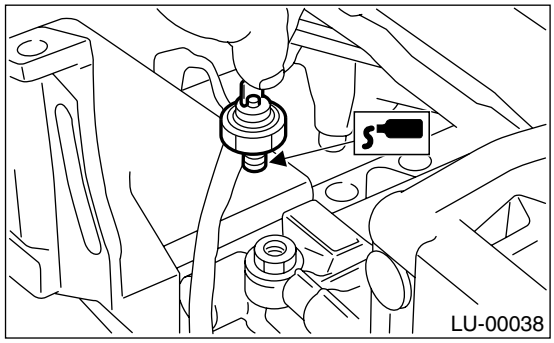
3) Remove oil pressure switch.



B: INSTALLATION

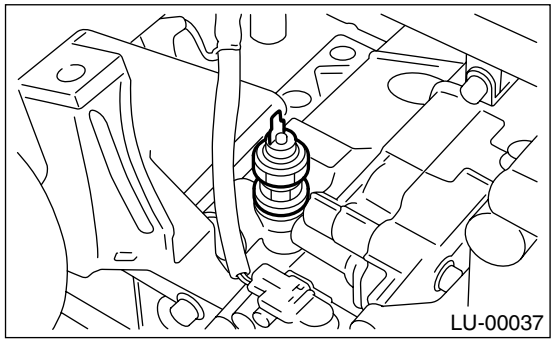
1) Apply fluid gasket to oil pressure switch threads.

Fluid gasket:
Part No. 004403042
THREE BOND 1324 or equivalent

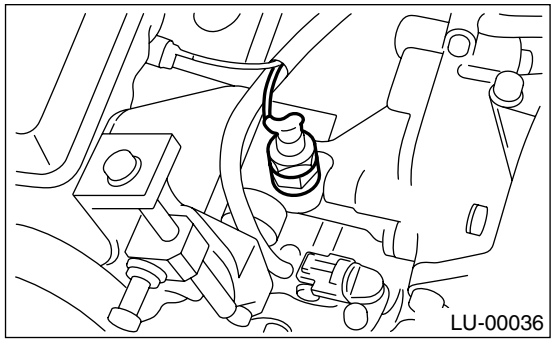


2) Install oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect terminal of oil pressure switch.



4) Install generator on bracket. <Ref. to SC(H4SO)-15, INSTALLATION, Generator.>

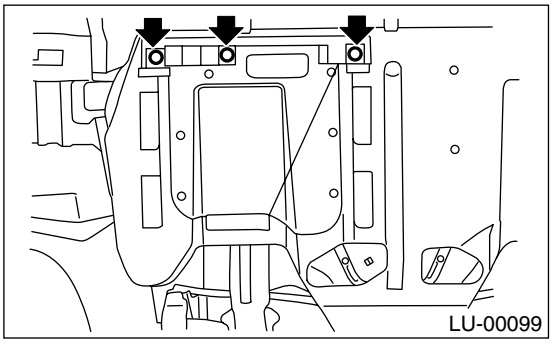
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Filter

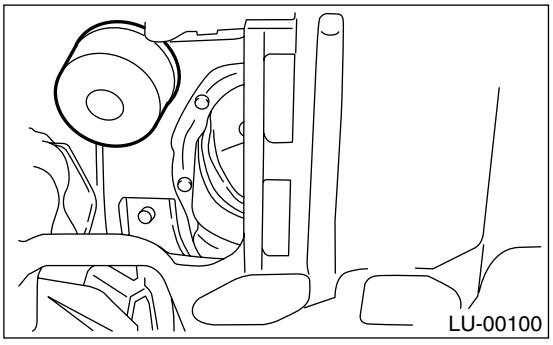
A: REMOVAL

1) Remove access lid.



2) Remove oil filter with ST.

ST	498547000	OIL FILTER WRENCH [Outer diameter 80 mm (3.15 in) for oil filter]
ST	18332AA000	OIL FILTER WRENCH [Outer diameter 68 mm (2.68 in) for oil filter]
ST	18332AA010	OIL FILTER WRENCH [Outer diameter 65 mm (2.56 in) for oil filter]



B: INSTALLATION

1) Clean oil filter mounting surface of cylinder block or oil cooler.
2) Thinly apply engine oil to the seal rubber of new oil filter.
3) Be careful not to damage seal rubber when oil filter is turned by hand and installed.

- Oil filters with 80 mm (3.15 in) and 65 mm (2.56 in) outer diameter are further tightened (about 2/3 to 3/4 rotation) after seal rubber contacts a cylinder block.
- Oil filter with 68 mm (2.68 in) outer diameter is further tightened (about 1 rotation) after seal rubber contacts a cylinder block.

CAUTION:
Do not tighten excessively, or oil may leak.

C: INSPECTION

1) After installing oil filter, run engine and make sure that no oil is leaking around seal rubber.

NOTE:
The filter element and filter case cannot be disassembled therefore, interior cleaning is not impossible.

2) Check the engine oil level. <Ref. to LU(H4SO)-8, INSPECTION, Engine Oil.>

8. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Burn-out bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2).

SPEED CONTROL SYSTEMS

SP(H4SO)

Page

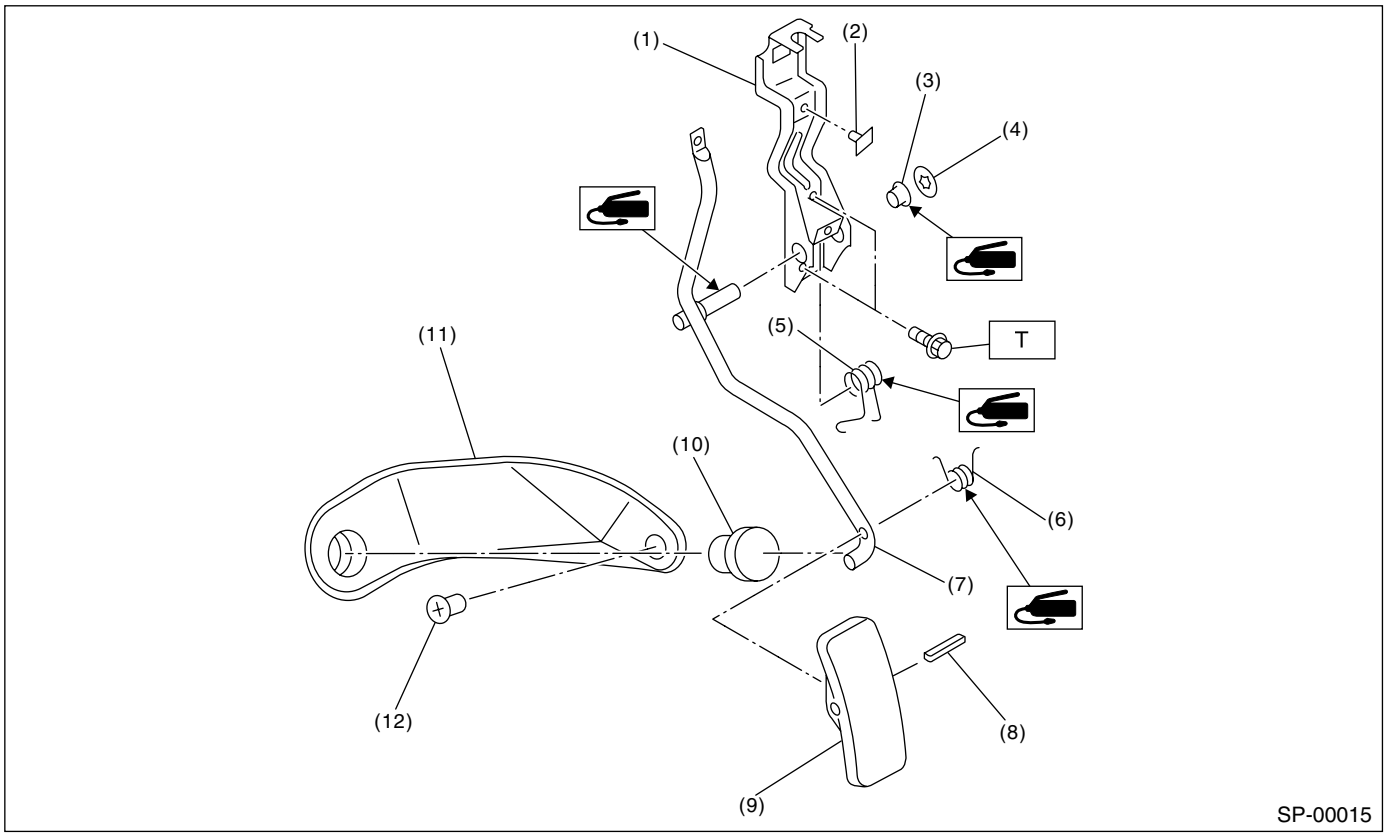
1. General Description 2
2. Accelerator Pedal 3
3. Accelerator Control Cable 6

1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0.04 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

B: COMPONENT



(1) Accelerator bracket
(2) Stopper
(3) Bushing
(4) Clip
(5) Accelerator spring
(6) Accelerator pedal spring
(7) Accelerator pedal lever
(8) Spring pin
(9) Accelerator pedal
(10) Accelerator stopper
(11) Accelerator plate
(12) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

C: CAUTION

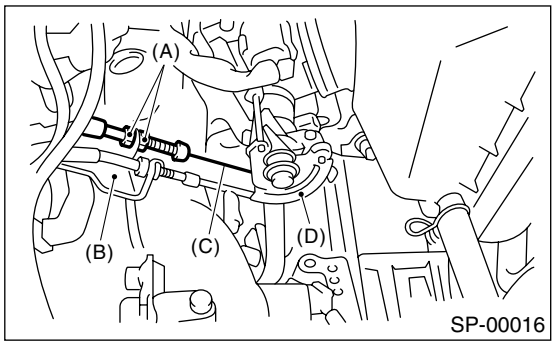
• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

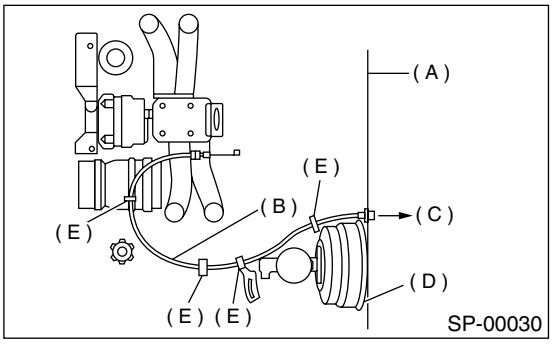
1) Disconnect ground cable from battery.
2) Remove lock nut from accelerator cable bracket.
3) Remove accelerator cable from bracket.
4) Remove accelerator cable end from throttle cam.

NOTE:
Be careful not to kink accelerator cable.



(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

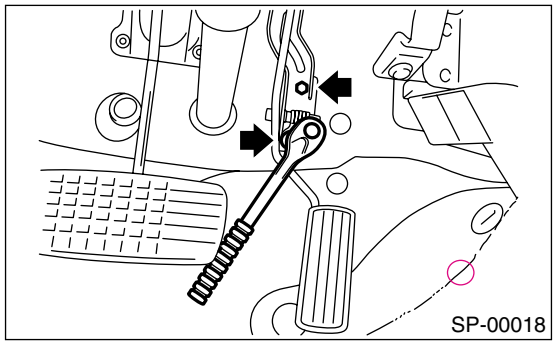
5) Remove clip inside engine compartment.



(A) Toe board
(B) Accelerator cable
(C) Accelerator pedal
(D) Brake booster
(E) Clip

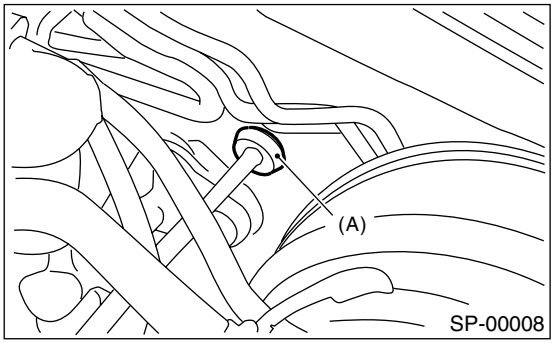
6) Remove instrument panel lower cover from instrument panel, and connector.

7) Remove accelerator pedal connecting bolt from accelerator pedal bracket.



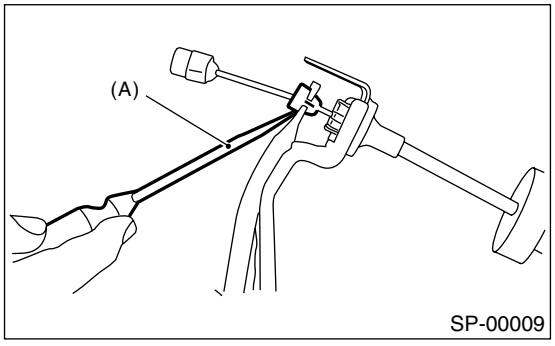
8) Disconnect grommet (A) from toe board.

NOTE:
From engine room side, push grommet (A) into hole.



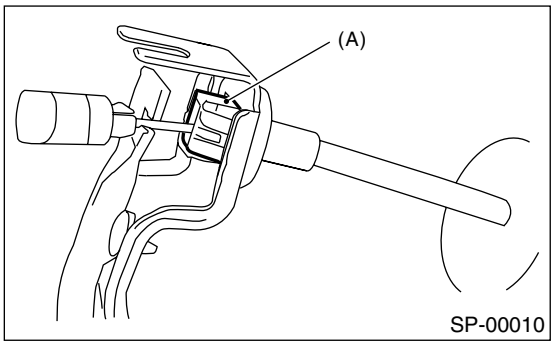
(A) Grommet

9) Pull out the cable from the toe board hole.
10) Disconnect accelerator cable bushing from accelerator pedal lever.



(A) Flat-bladed screwdriver

11) Disconnect accelerator cable stopper (A) from bracket.



(A) Accelerator cable stopper

12) Remove accelerator cable and bracket.

B: INSTALLATION

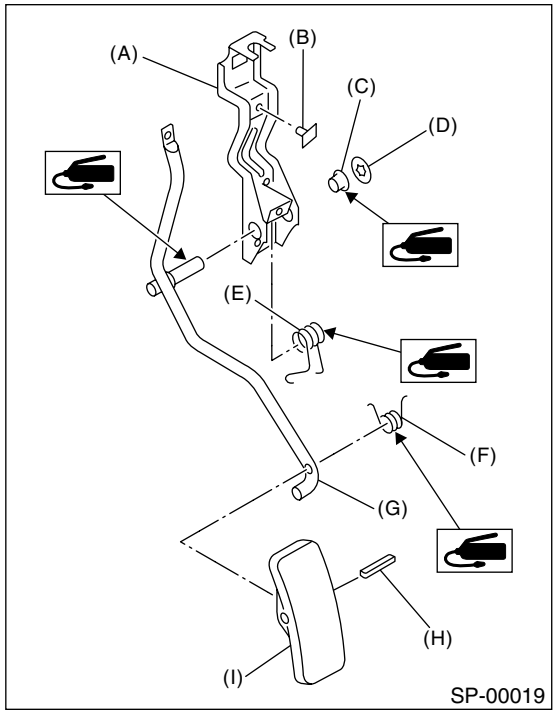
1) Install in the reverse order of removal.

NOTE:
- If cable clamp is damaged, replace it with a new one.
- Never fail to cover outer cable end with boot.
- Be careful not to kink accelerator cable.

2) Adjust after pedal installation. <Ref. to SP(H4SO)-5, ADJUSTMENT, Accelerator Pedal.>

C: DISASSEMBLY

1) Remove the clip, and then remove the accelerator pedal from the bracket.
2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.



(A) Bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal

D: ASSEMBLY

Assemble in the reverse order of disassembly.

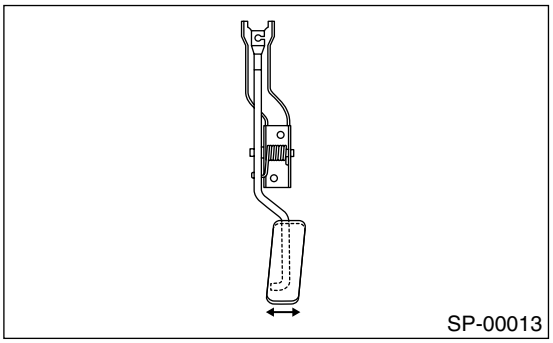
NOTE:
Clean areas as shown in the illustration and apply grease.

Grease:
Part No. 003602010 (SUNLIGHT No. 2)

E: INSPECTION

1) Lightly move pedal pad in lateral the direction to ensure pedal deflection is in specified range.
2) If excessive deflection is noted, replace bushing and clip with new ones.

Deflection of accelerator pedal:
Service limit
±2.0 mm (±0.079 in) or less

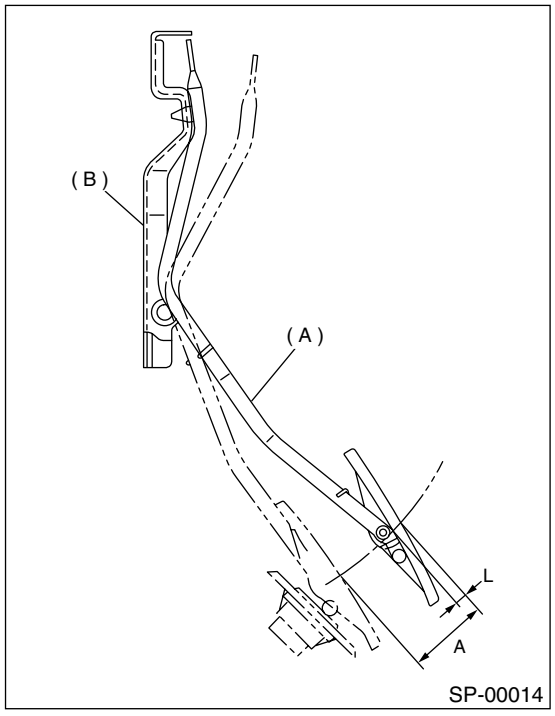


F: ADJUSTMENT

1) Check pedal stroke and free play by operating accelerator pedal by hand.
2) If it is not within specified value, adjust it by turning accelerator cable lock nut.

Free play at pedal pad: L
0 — 4 mm (0 — 0.16 in)

Stroke at pedal pad: A
50 — 55 mm (1.97 — 2.17 in)



(A) Accelerator pedal lever
(B) Accelerator pedal bracket

Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

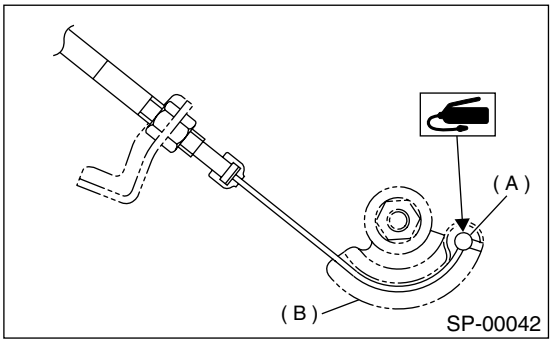
3. Accelerator Control Cable

A: REMOVAL

1) Remove accelerator pedal. <Ref. to SP(H4SO)-3, REMOVAL, Accelerator Pedal.>
2) Separate accelerator cable and accelerator pedal.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to the point (accelerator cable end on engine side) shown in the figure below.
Part No. 004404002 (Slico lube G-30M)



(A) Cable end
(B) Throttle cam

CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.
• Do not apply grease except for special area.

3) Adjustment after pedal installation <Ref. to SP(H4SO)-4, INSTALLATION, Accelerator Pedal.>

C: INSPECTION

1) Make sure the inner cable is not twisted or frayed.
2) Make sure the outer cable is not cracked.

IGNITION

IG(H4SO)

Page

1. General Description 2
2. Spark Plug....4
3. Ignition Coil and Ignitor Assembly....7
4. Spark Plug Cord....8

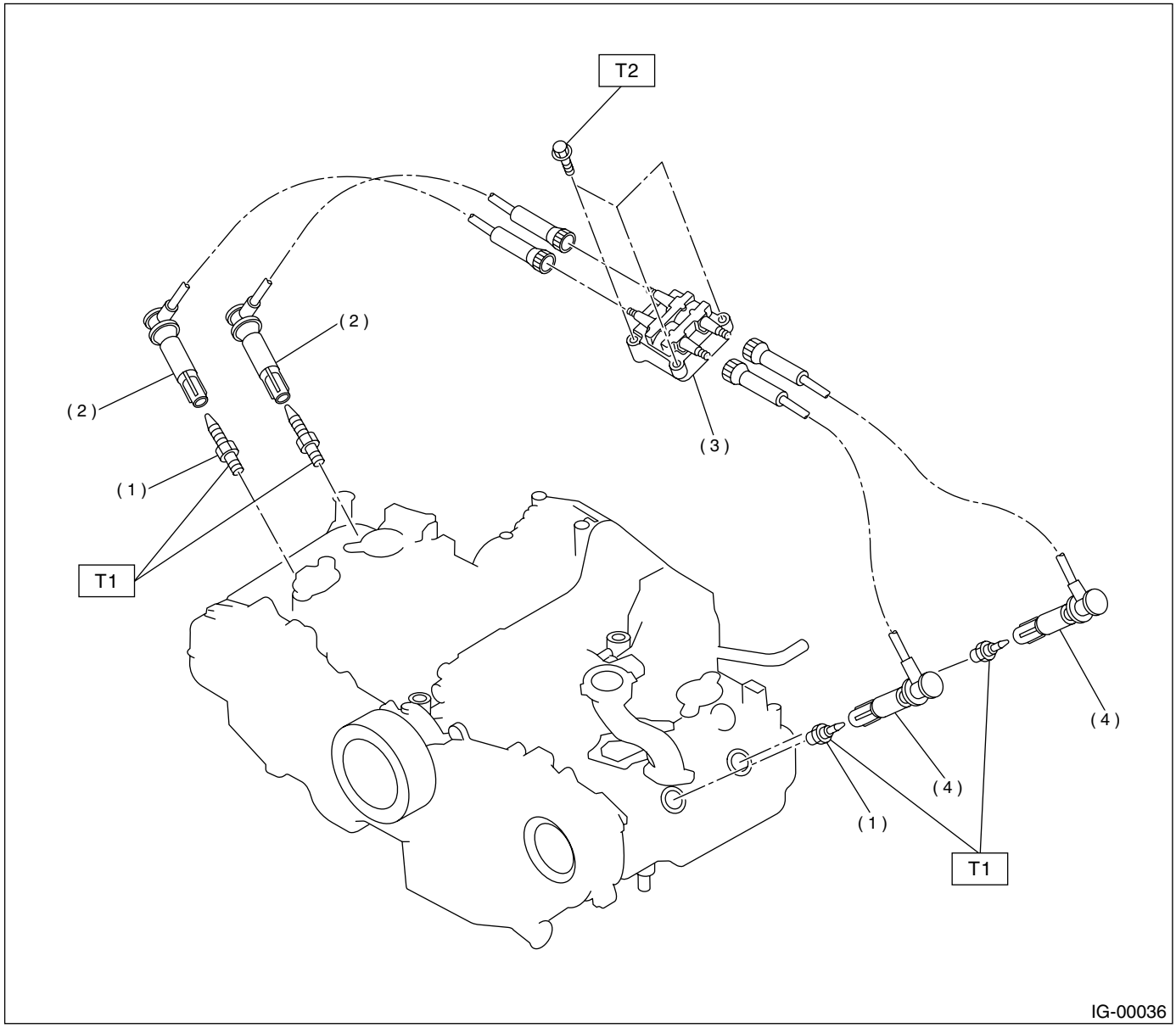
1. General Description

A: SPECIFICATIONS

Item			Designation	
Ignition coil and ignitor assembly	Model		FH0137	
	Manufacturer		DEMCO	
	Secondary coil resistance		12.8 kΩ±15%	
Spark plug	Type and manufacturer		RC10YC4 ..... CHAMPION	
			Alternate	BKR5E-11 ..... NGK BKR6E-11 ..... NGK
			*FR5AP-11 ..... NGK	
	Thread size	mm	14, P = 1.25	
	Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)	

*:Carifornia

B: COMPONENT



(1) Spark plug
(2) Spark plug cord (#1, #3)
(3) Ignition coil and ignitor ASSY
(4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf-m, ft-lb)
T1*: *21 (2.1, 15)
T2*: *6.4 (0.65, 4.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Spark Plug

A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

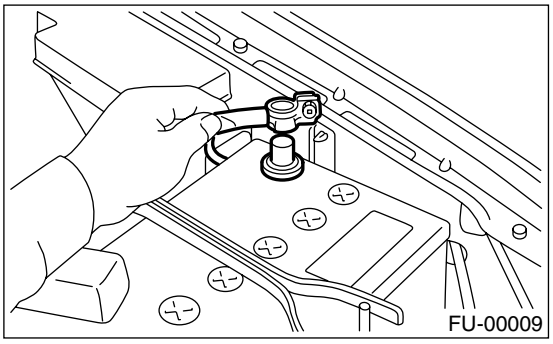
Spark plug:

Spark plug	
CHAMPION : RC10YC4	
Alternate	NGK : BKR5E-11 NGK : BKR6E-11
*NGK : FR5AP-11	

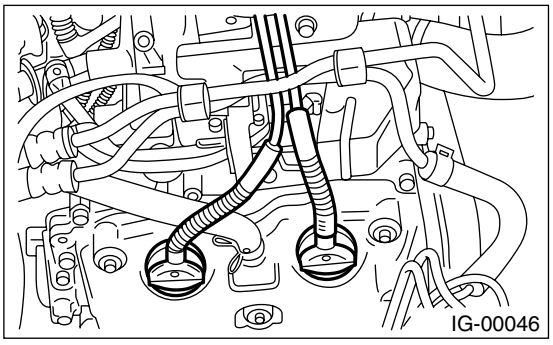
*:Carifornia

1. RH SIDE

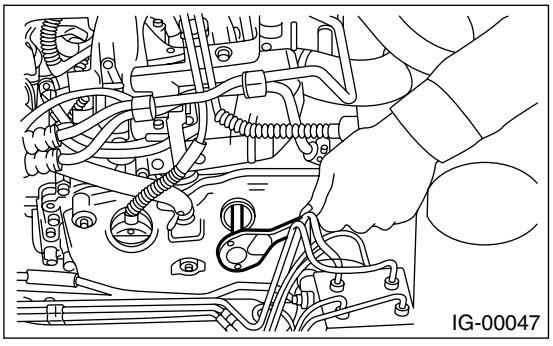
1) Disconnect ground cable from battery.



2) Remove air cleaner case. <Ref. to IN(H4SO U5)-5, REMOVAL, Air Cleaner Case.>
3) Remove spark plug cords by pulling boot, not cord itself.

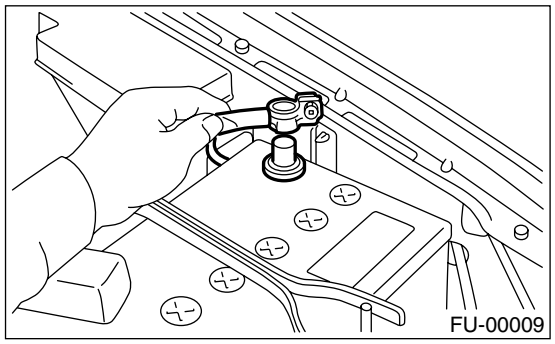


4) Remove spark plugs with the spark plug socket.

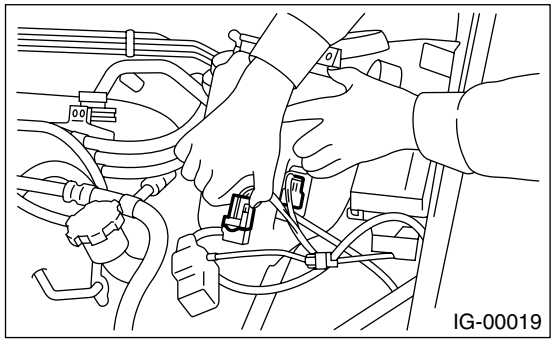


2. LH SIDE

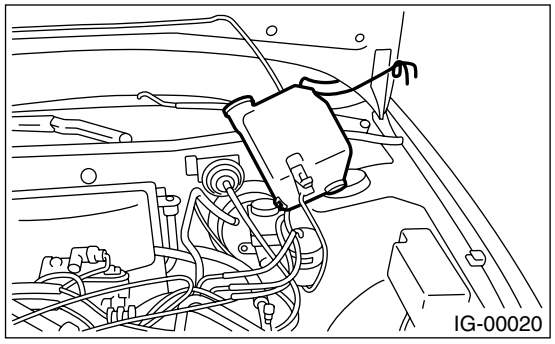
1) Disconnect battery ground cable.



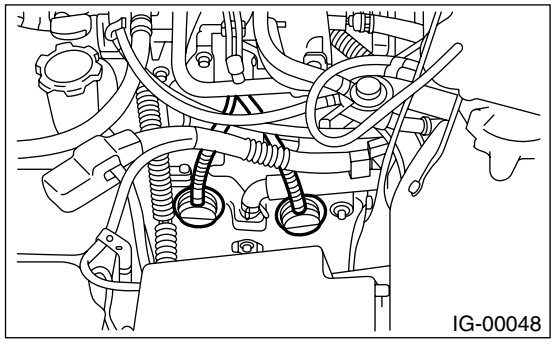
2) Disconnect washer motor connector.



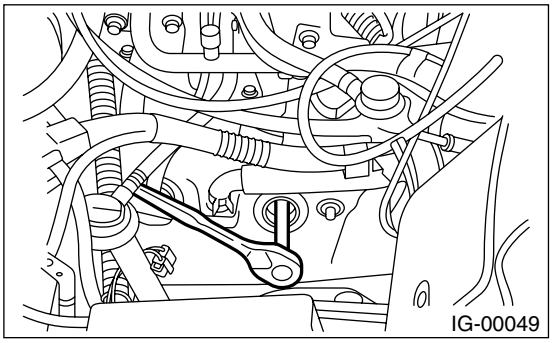
3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



5) Remove spark plugs cord by pulling boot, not cord itself.



6) Remove spark plug with the spark plugs socket.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Air cleaner case):
33 N·m (3.4 kgf-m, 24.6 ft-lb)

2. LH SIDE

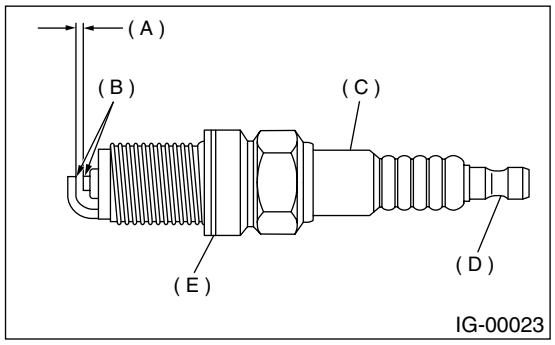
1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

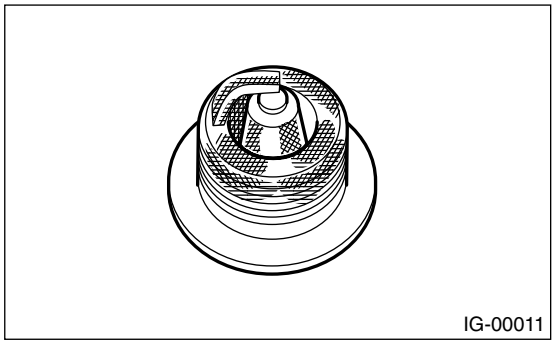
C: INSPECTION

Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

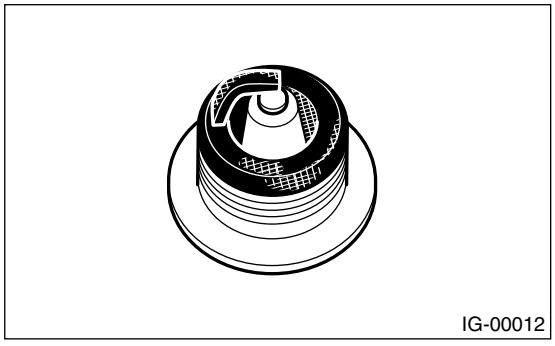


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

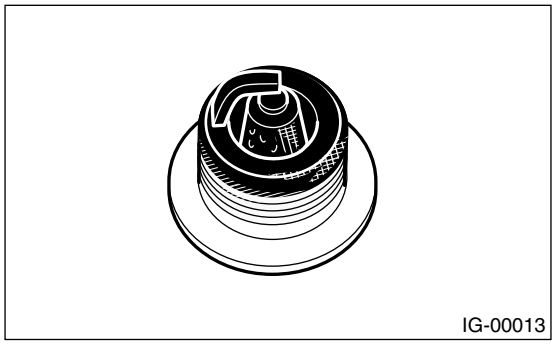
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



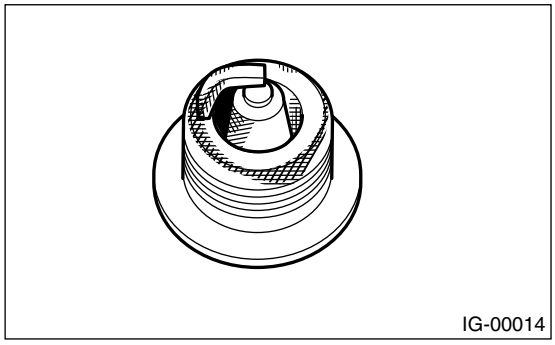
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.



3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.


IG-00013

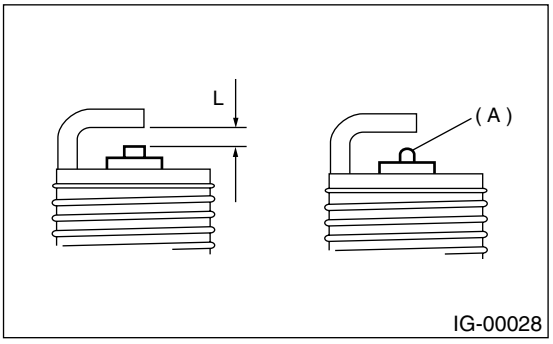
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.


IG-00014

D: CLEANING
Clean spark plugs in a sand blast type cleaner.
Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace plugs.

E: ADJUSTMENT
Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)



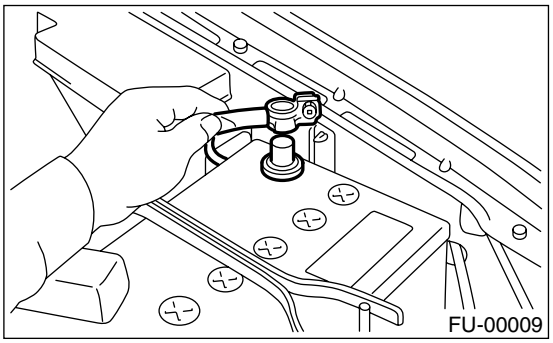
IG-00028

NOTE:
Replace with new spark plug if this area is worn to “ball” (A) shape.

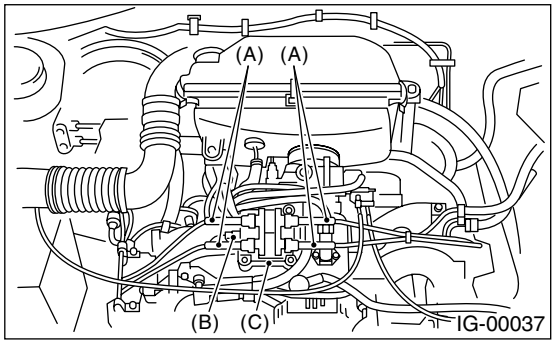
3. Ignition Coil and Ignitor Assembly

A: REMOVAL

1) Disconnect ground cable from battery.

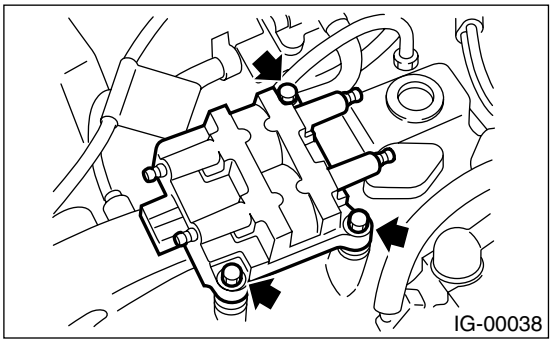


2) Disconnect spark plug cords from ignition coil and ignitor assembly.
3) Disconnect connector from ignition coil and ignitor assembly.



(A) Spark plug cord
(B) Connector
(C) Ignition coil and ignitor ASSY

4) Remove ignition coil and ignitor assembly.

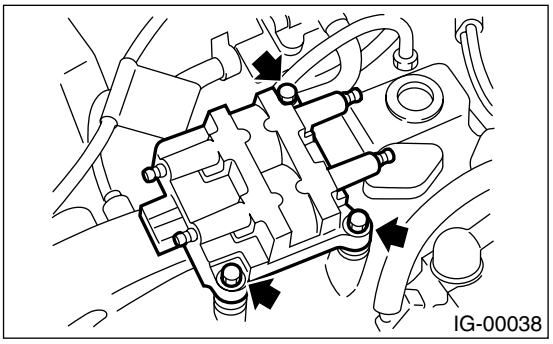


B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:
Be sure to connect spark plug cords to their proper positions. Failure to do so will damage unit.



C: INSPECTION

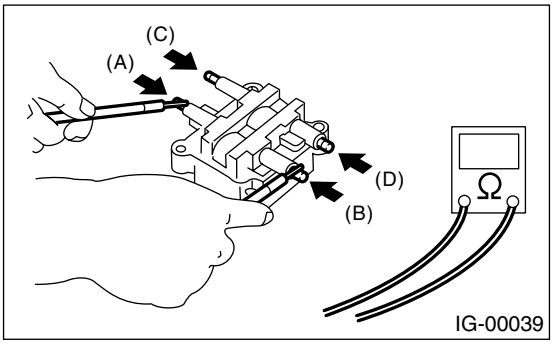
Using tester, inspect the following items, and replace if defective.

- Secondary coil resistance

CAUTION:
• If the resistance is extremely low, there is a short citcuit.
• Ignitor is built-in the coil. Therefore, the resistance of the primary coil cannot be measured.

Specified resistance:

[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%



4. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, burning or rust formation of terminals
2) Resistance values of cords

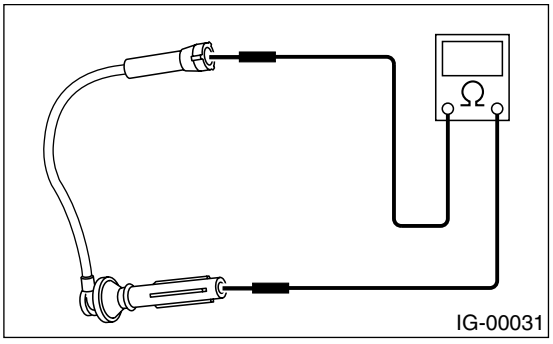
Resistance value:

Except California model

#1 cord: 5.6 — 10.6 kΩ
#2 cord: 7.3 — 13.7 kΩ
#3 cord: 5.9 — 11.1 kΩ
#4 cord: 7.3 — 13.7 kΩ

California model

#1 cord: 7.6 — 12.7 kΩ
#2 cord: 7.6 — 12.7 kΩ
#3 cord: 7.5 — 12.7 kΩ
#4 cord: 7.5 — 12.7 kΩ



STARTING/CHARGING SYSTEMS

SC(H4SO)

Page

1. General Description 2
2. Starter 7
3. Generator 15
4. Battery 21

1. General Description

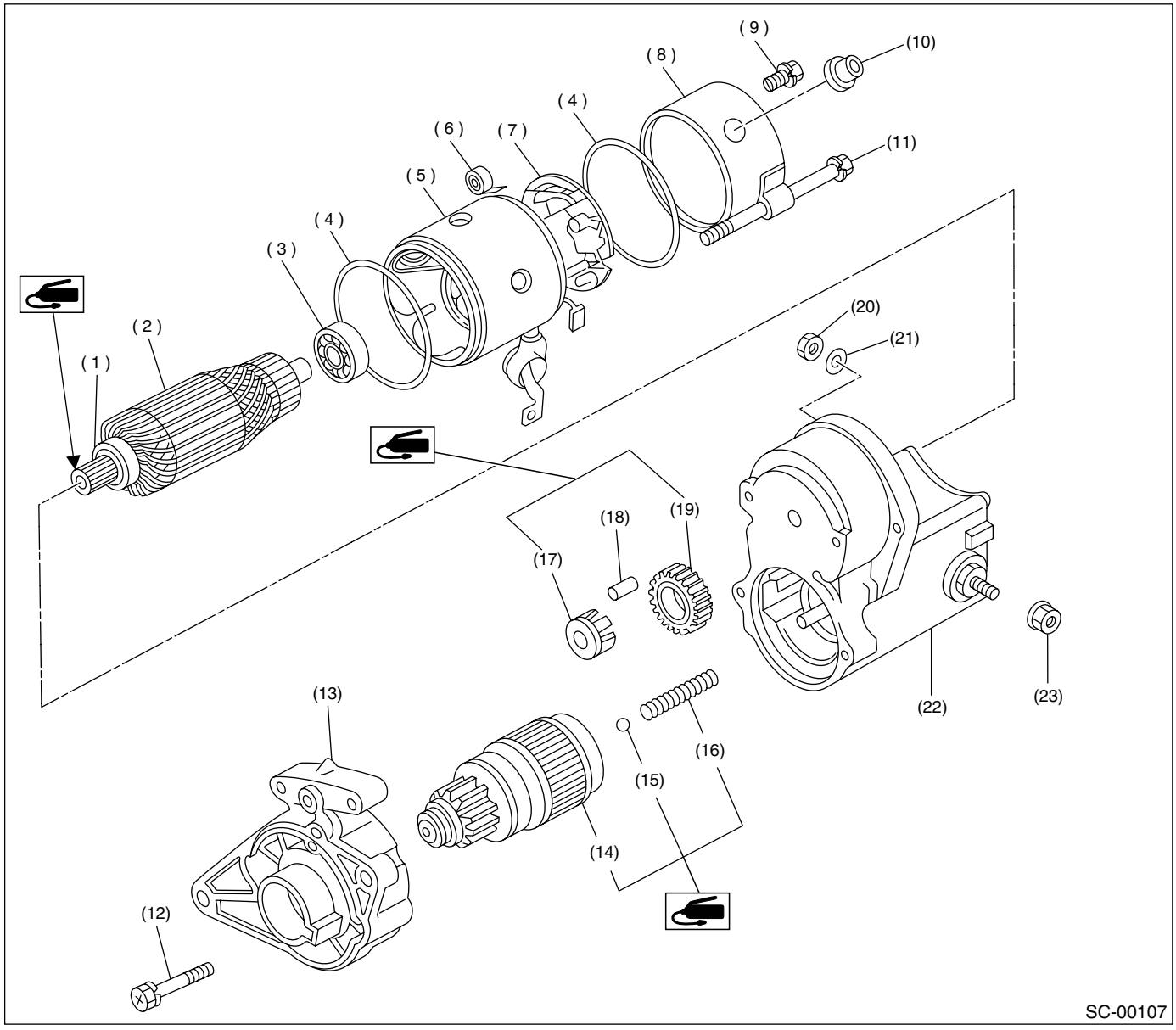
A: SPECIFICATIONS

Item			Designation	
			MT	AT
Starter	Type		Reduction type	
	Model		228000-7131	228000-7141
	Manufacturer		DENSO CORPORATION	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		9	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	3,000 rpm or more	2,900 rpm or more
	Load characteristics	Voltage	8 V	
		Current	280 A or less	370 A or less
		Torque	9.8 N·m (1.0 kgf-m, 7.2 ft-lb)	13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
		Rotating speed	900 rpm or more	880 rpm or more
	Lock characteristics	Voltage	5 V	
		Current	800 A or less	1,050 A or less
		Torque	27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more	
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type	
	Model		A002TB2891ZC	
	Manufacturer		MITSUBISHI ELECTRIC	
	Voltage and output		12 V — 90 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (when observed from pulley side.)	
	Armature connection		3-phase Y-type	
	Output current		1,500 rpm — 36 A or more 2,500 rpm — 65A or more 5,000 rpm — 86 A or more	
	Regulated voltage		14.1 - 14.8 V [20°C (68°F)]	
Battery	Reserve capacity	amps min.	90	110
	Cold cranking	amp.	430	490

B: COMPONENT

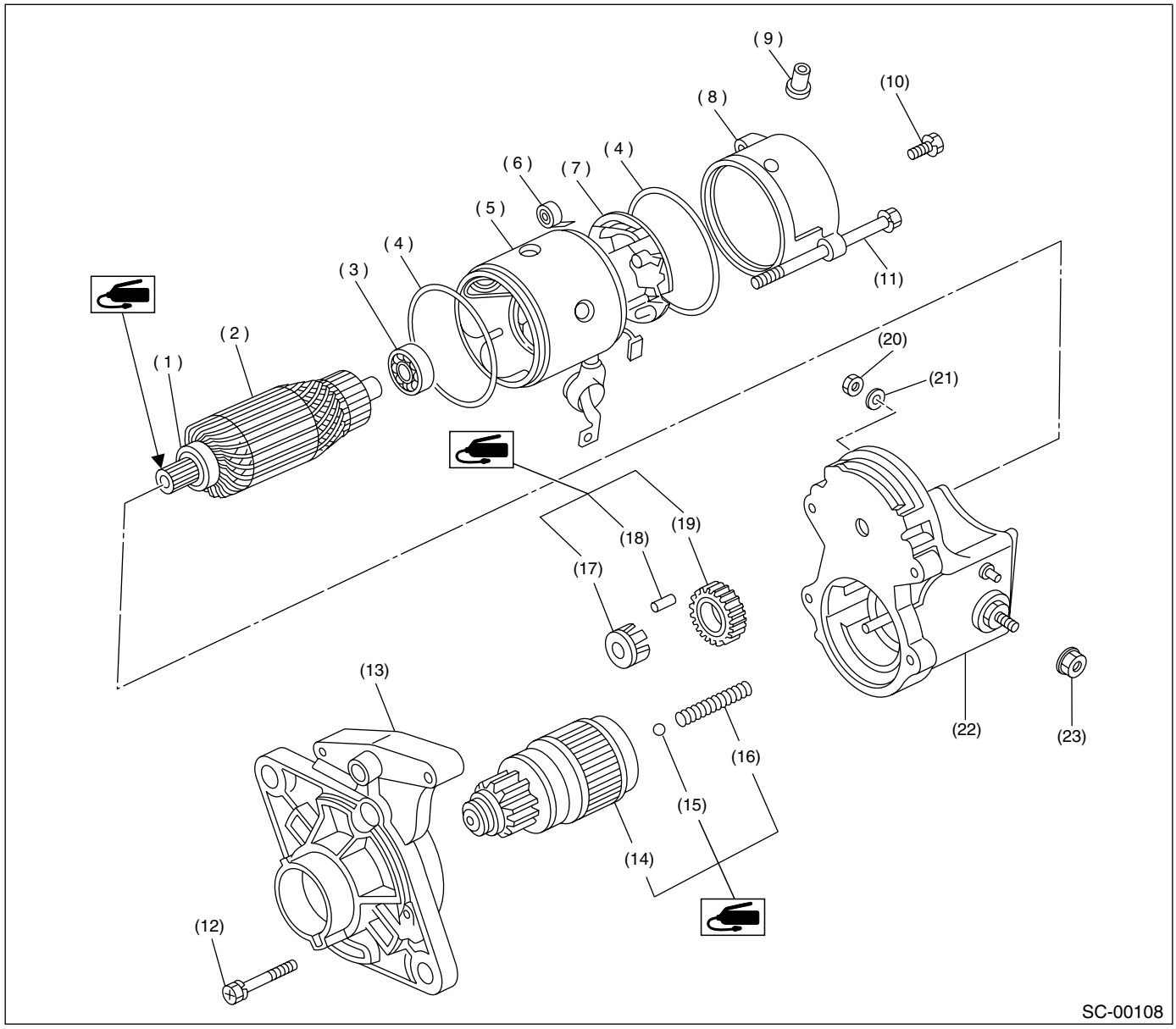
1. STARTER

- MT VEHICLES



(1) Front ball bearing
(2) Armature
(3) Rear ball bearing
(4) O-ring
(5) Yoke
(6) Brush spring
(7) Brush holder
(8) End frame
(9) Screw
(10) Cover
(11) Through bolt
(12) Screw & washer
(13) Starter housing
(14) Overrunning clutch
(15) Steel ball
(16) Spring
(17) Retainer
(18) Roller
(19) Idle gear
(20) Nut
(21) Spring washer
(22) Magnetic switch
(23) Nut

- AT VEHICLES



(1) Front ball bearing
(2) Armature
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(20) Nut
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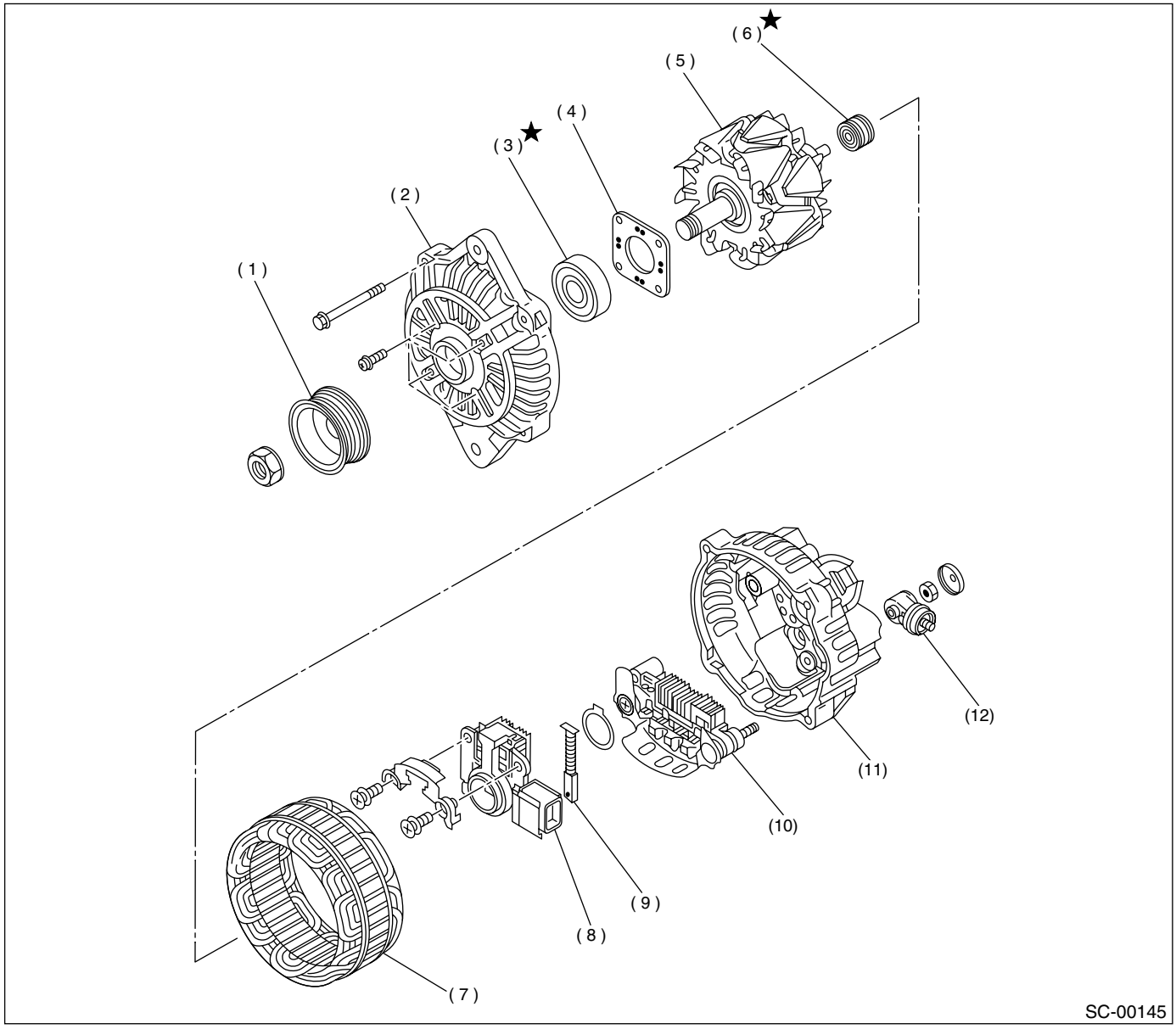
(22) Magnetic switch
(23) Nut

2. GENERATOR



(1) Pulley
(2) Front cover
(3) Ball bearing
(4) Bearing retainer
(5) Rotor
(6) Bearing
(7) Stator coil
(8) IC regulator with brush
(9) Brush
(10) Rectifier
(11) Rear cover
(12) Terminal

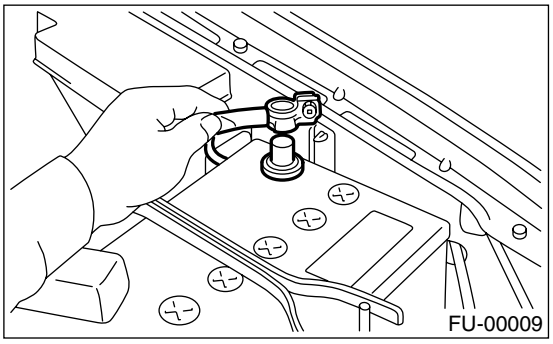
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Starter

A: REMOVAL

1) Disconnect ground cable from battery.

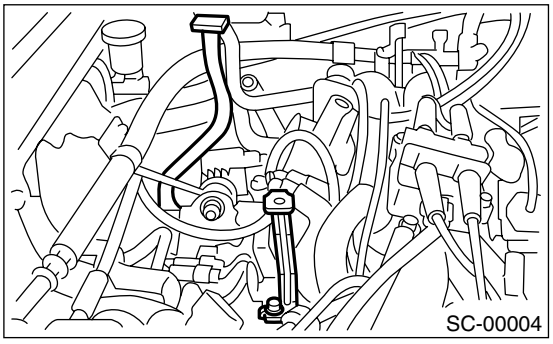


2) Remove air cleaner case. (Non-Turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

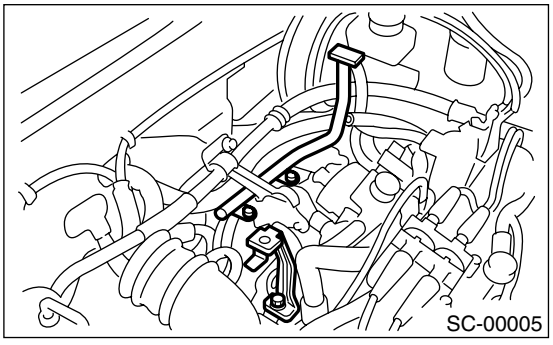
3) Remove intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

4) Remove air cleaner case stay.

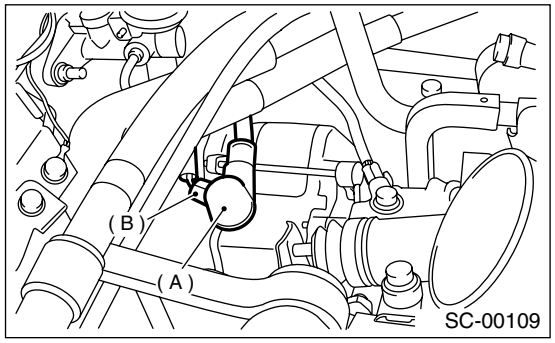
- MT vehicles



- AT vehicles



5) Disconnect connector and terminal from starter.



(A) Terminal
(B) Connector

6) Remove starter from transmission.

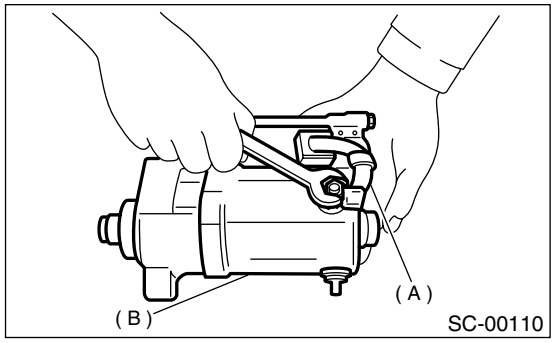
B: INSTALLATION

Install in the reverse order of removal.

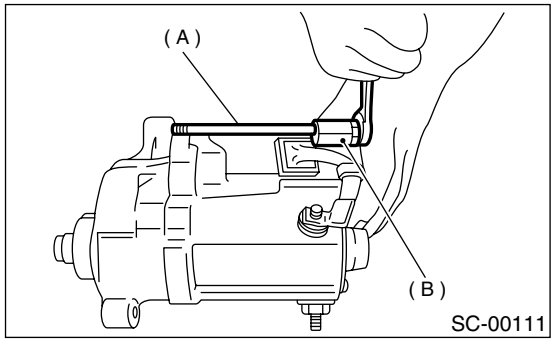
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

C: DISASSEMBLY

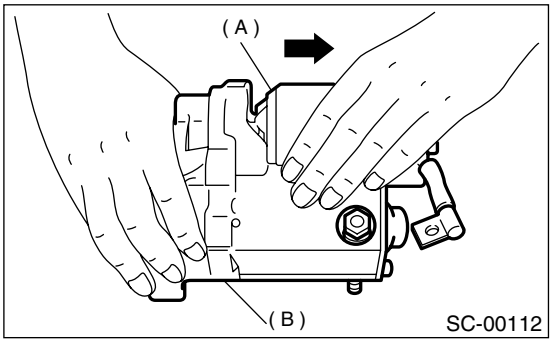
1) Disconnect lead wire (A) from magnetic switch (B).



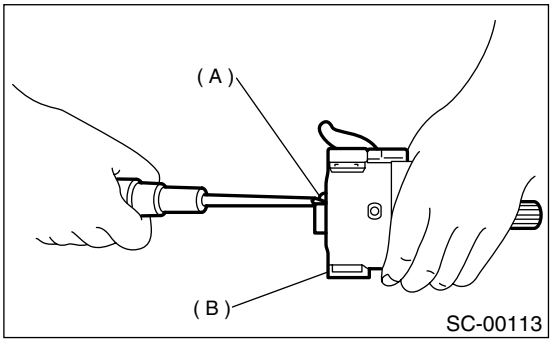
2) Remove through-bolts (A) from end frame (B).



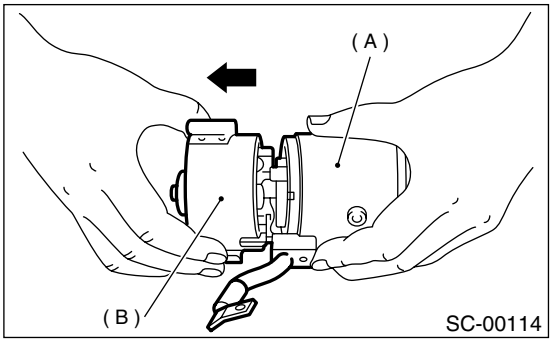
3) Remove yoke (A) from magnetic switch (B).



4) Remove screws (A) securing brush holder to end frame (B).

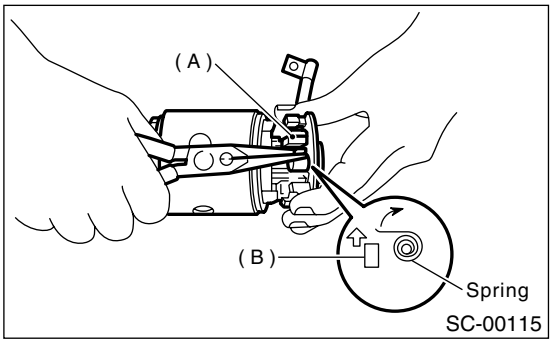


5) Separate yoke (A) from end frame (B).

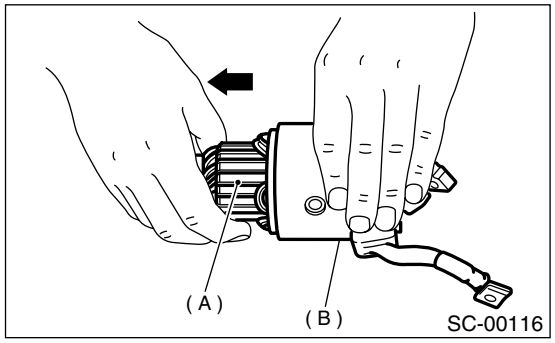


6) Remove brush (A) by lifting up positive (+) side brush spring (B) using long-nose pliers.

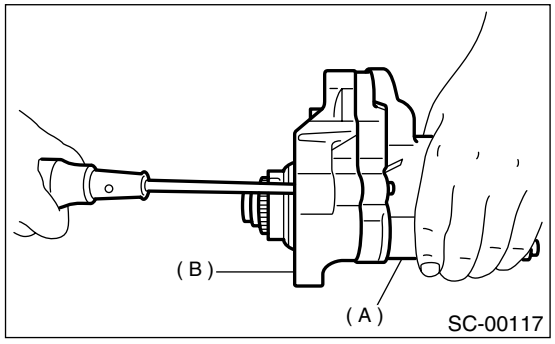
CAUTION:
Be careful not to damage brush and commutator.



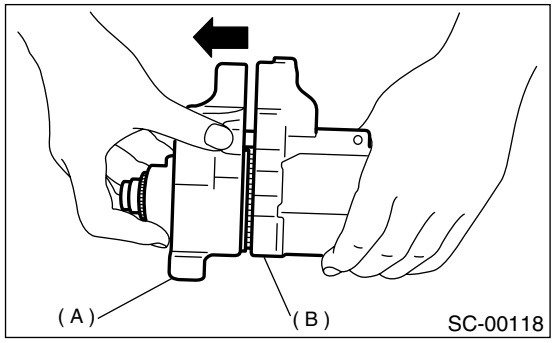
7) Remove armature (A) from yoke (B).



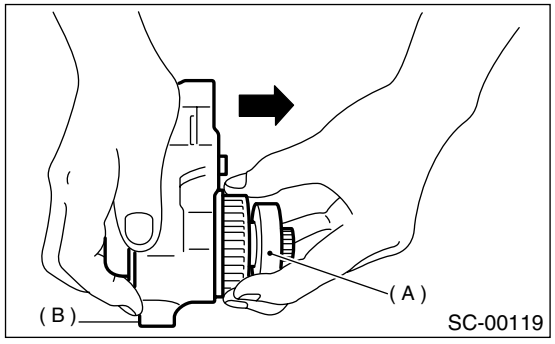
8) Remove screws securing magnetic switch (A) to housing (B).



9) Remove housing (A) from magnetic switch (B).

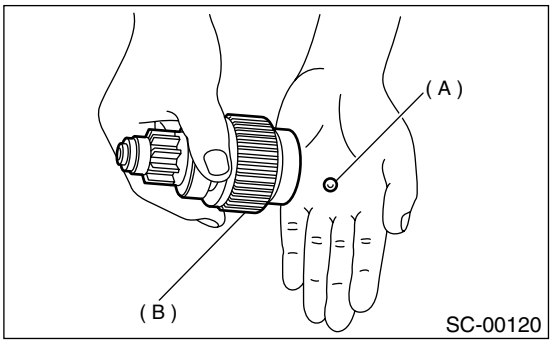


10) Remove clutch (A) from housing (B).

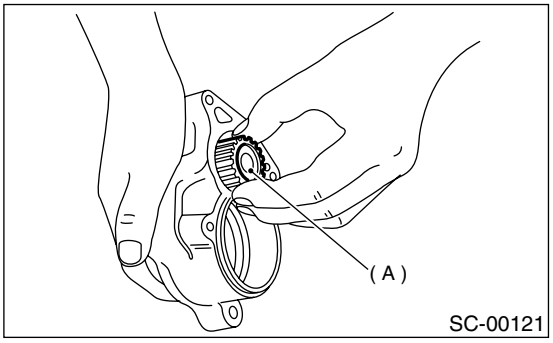


11) Take out steel ball (A) from clutch (B).

CAUTION:
Be careful not to lose steel ball.

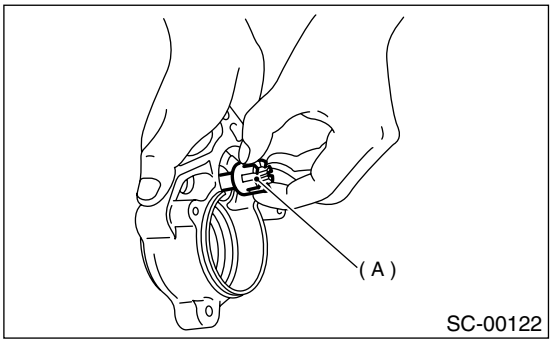


12) Remove idle gear (A) from housing.

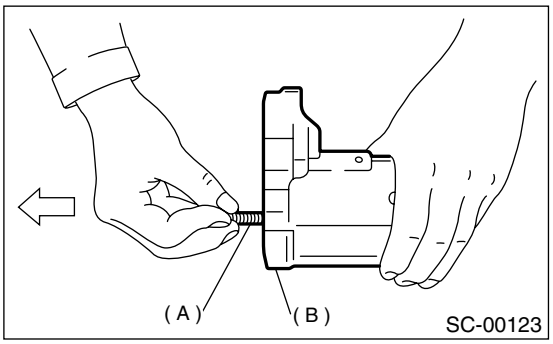


13) Remove retainer and roller (A) from housing.

CAUTION:
Be careful not to drop retainer and roller.



14) Remove coil spring (A) from magnetic switch (B).



D: ASSEMBLY

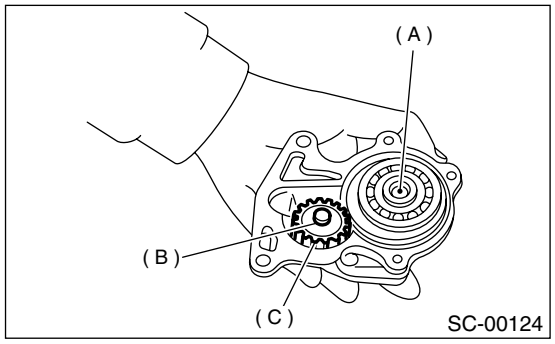
Assemble in the reverse order of disassembly. Observe the following:

1) Before assembling, apply grease to the points shown in “COMPONENT PARTS”. <Ref. to SC(H4SO)-3, COMPONENT, General Description.>

2) Assembling magnetic switch, clutch, and housing

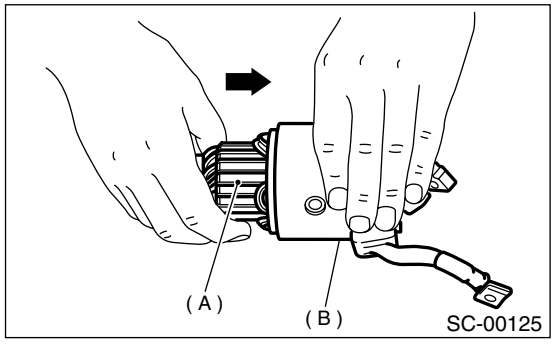
To assemble, first install clutch to magnetic switch, then install idle gear, and finally install clutch.

CAUTION:
• Do not forget to install steel ball and coil spring to clutch.
• Attach bearing to idle gear beforehand.

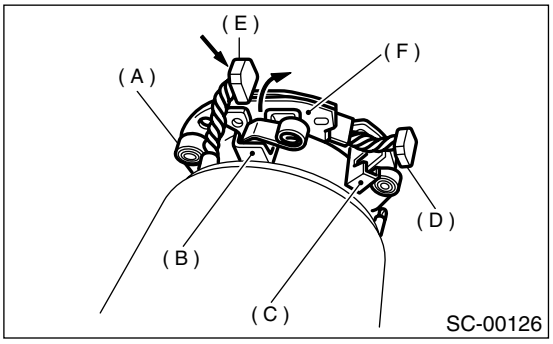


(A) Steel ball
(B) Retainer
(C) Idle gear

3) Installing armature (A) to yoke (B)

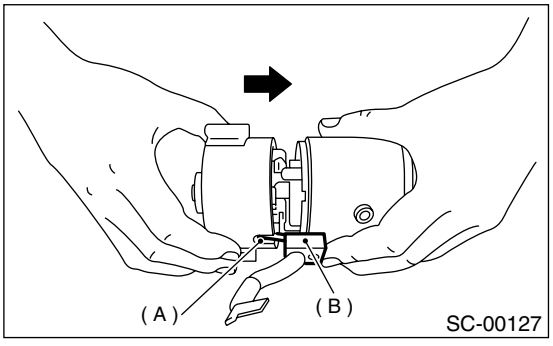


4) Installing brushes
Assemble brush holder to yoke as shown, then assemble two yoke-side brushes to brush holder.

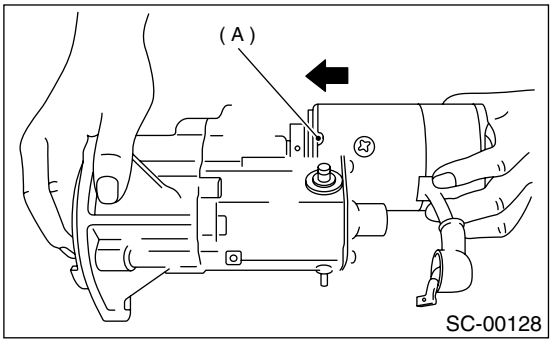


(A) Brush spring
(B) Brush holder hole (+)
(C) Brush holder hole (–)
(D) Brush (–)
(E) Brush (+)
(F) Insulator

5) Installing end frame
When assembling end frame to yoke, align notched portion (A) of end frame with lead wire grommet (B).



6) Installing yoke
When installing yoke to magnetic switch, align notch (A) of yoke with groove of magnetic switch.

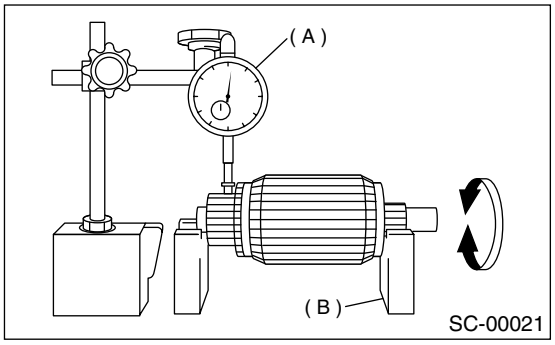


E: INSPECTION

1. ARMATURE

1) Check commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test
Check the commutator run-out and replace if it exceeds the limit.

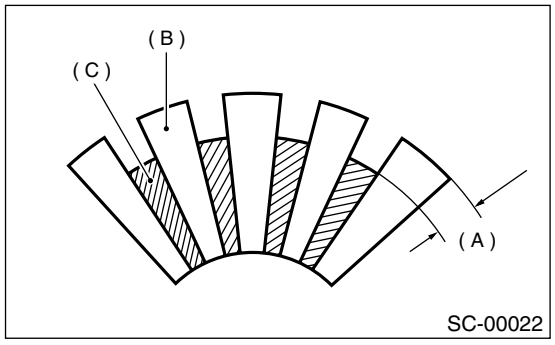
Commutator run-out:
Standard
0.02 mm (0.0008 in), or less
Service limit
Less than 0.05 mm (0.0020 in)



(A) Dial gauge
(B) V-block

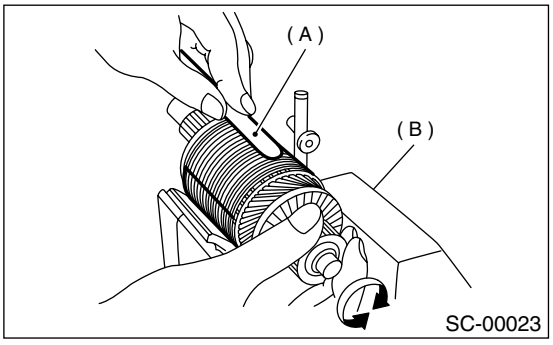
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.6 mm (0.024 in)
Limit
0.2 mm (0.008 in)



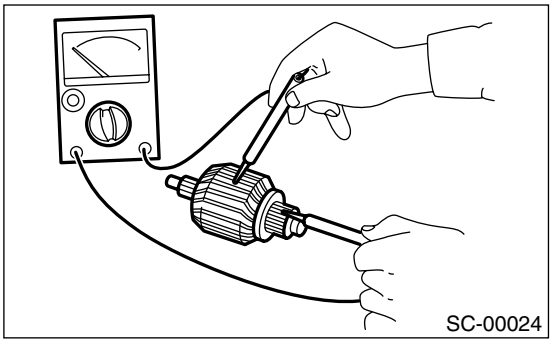
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Check armature for short-circuit by placing it on growler tester. Hold a iron sheet against armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Growler tester

5) Armature ground test
Using circuit tester, touch one probe to the commutator segment and the other to shaft. If there is no continuity, it is normal. If there is a continuity armature is grounded. Replace armature if it is grounded.



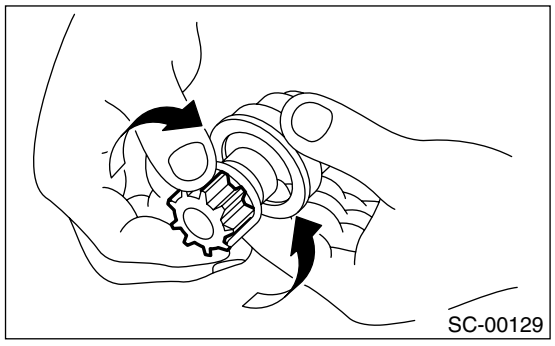
2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate pinion in correct direction of rotation (counter clockwise). It should rotate smoothly. But in opposite direction, it should be locked.

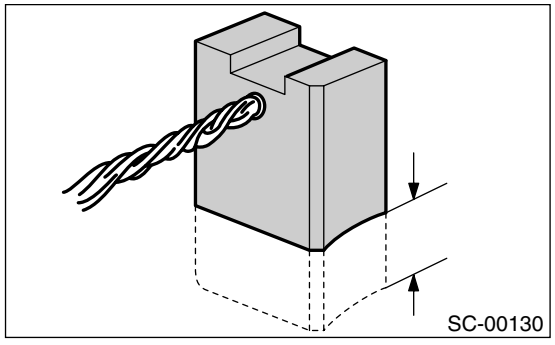
CAUTION:
Do not clean overrunning clutch with oil to prevent grease from flowing out.



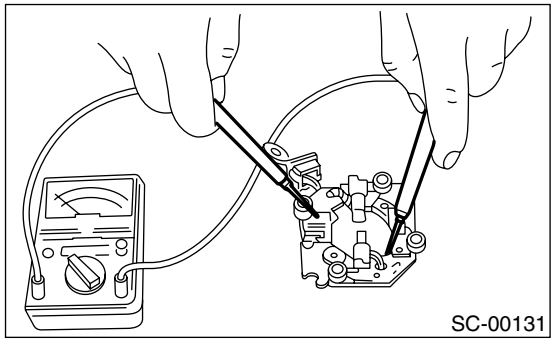
4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length and replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard
15 mm (0.59 in)
Service limit
10 mm (0.39 in)



2) Brush movement
Be sure brush moves smoothly inside brush holder.
3) Insulation resistance of brush holder
Be sure there is no continuity between brush holder and its plate.

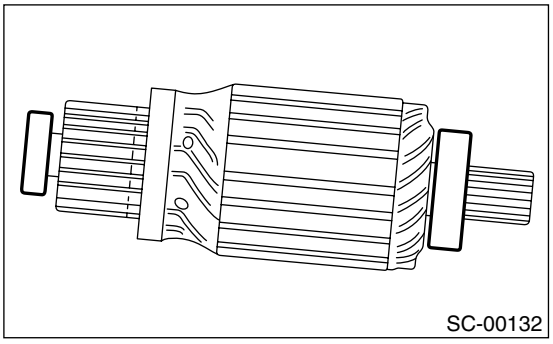


4) Brush spring force
Measure brush spring force with a spring scale. If it is less than the service limit, replace brush spring.

Brush spring force:
Standard
18.6 N (1.9 kgf, 4.2 lb) (when new)
Service limit
6.9 N (0.7 kgf, 1.5 lb)

5. BEARING

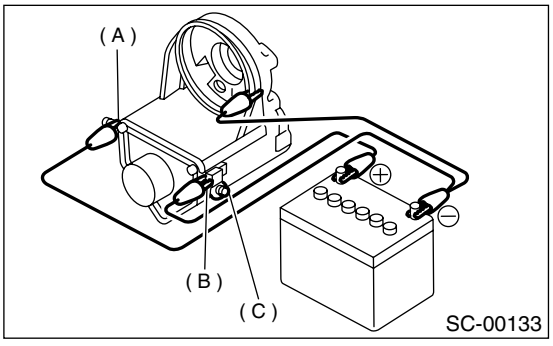
1) Rotate bearing by hand; no binding should exist.
2) Rotate bearing rapidly; no abnormal noise should be heard.


SC-00132

6. MAGNETIC SWITCH

CAUTION:
• The following magnetic switch tests should be performed with specified voltage applied.
• Each test should be conducted within 3 to 5 seconds. Power to be furnished should be one-half the rated voltage.

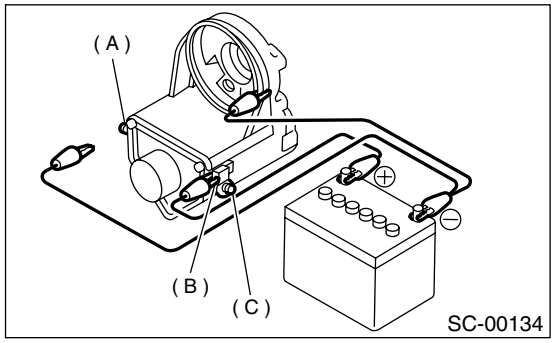
1) Pull-in test
Connect two battery negative leads onto magnetic switch body and terminal C respectively. Then connect battery positive lead onto terminal 50. Pinion should extend when lead connections are made.



SC-00133

(A) Terminal C
(B) Terminal 50
(C) Terminal M

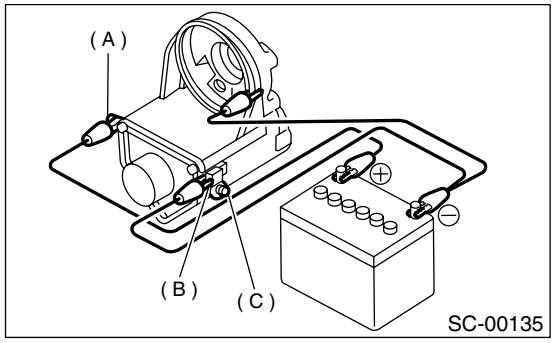
2) Holding-in test
Disconnect lead from terminal C with pinion extended. Pinion should be held in the extended position.



SC-00134

(A) Terminal C
(B) Terminal 50
(C) Terminal M

3) Return test
Connect two battery negative leads onto terminal 50 and onto switch body respectively. Then connect battery positive lead onto terminal C. Next, disconnect lead from terminal 50. Pinion should return immediately.



SC-00135

(A) Terminal C
(B) Terminal 50
(C) Terminal M

7. PERFORMANCE TEST

The starter is required to produce a large torque and high rotating speed, but these starter characteristics vary with the capacity of the battery. It is therefore important to use a battery with the specified capacity whenever testing the starter.
The starter should be checked for the following three items:
• No-load test
Measure the maximum rotating speed and current under a no-load state.
• Load test
Measure the magnitude of current needed to generate the specified torque and rotating speed.

• Stall test

Measure the torque and current when the armature is locked.

1) No-load test

Under no-load state, measure its rotating speed and current, using the specified battery. Measured values must meet the following standards:

No-load test (Standard):

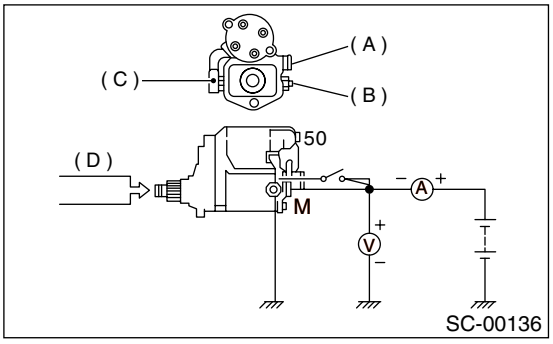
Voltage/Current

11 V/90 A, or more

Rotating speed

228000-7131: 3,000 rpm, or more

228000-7141: 2,900 rpm, or more



(A) Terminal 50
(B) Terminal M
(C) Terminal C
(D) Tachometer

2) Load test (For reference)

Perform this test to check maximum output of starter. Use test bench which is able to apply load (brake) to starter. Measure torque value and rotating speed under the specified voltage and current conditions while controlling braking force applied to starter.

CAUTION:
Change engagement position of overrunning clutch and make sure it is not slipping.

Load test (Standard):

228000-7131

Voltage/Load

8 V/9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

Current/Speed

280 A, or less/900 rpm , or more

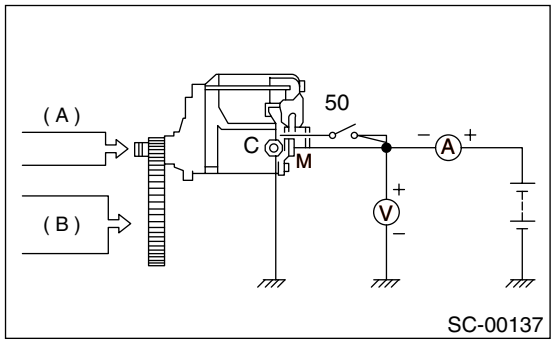
228000-7141

Voltage/Load

8 V/13.7 N·m (1.4 kgf-m, 10.1 ft-lb)

Current/Speed

370 A, or less/880 rpm, or more



(A) Tachometer
(B) Torque gauge

3) Stall test

Using the same test equipment used for load test, apply brake to lock starter armature. Then measure voltage, current, and torque values.

Measured values must meet the following standard.

Stall test (Standard):

228000-7131

Voltage/Current

5 V/800 A, or less

Torque

27.5 N·m (2.8 kgf-m, 20.3 ft-lb), or more

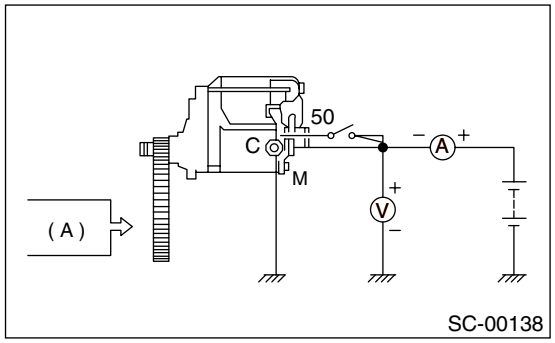
228000-7141

Voltage/Current

5 V/1,050 A, or less

Torque

27.5 N·m (2.8 kgf-m, 20.3 ft-lb), or more



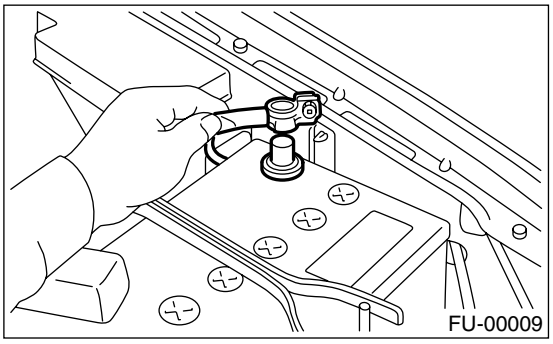
(A) Torque gauge

NOTE:
Low rotating speed or excessive current during no-load test may be attributable to high rotating resistance of starter due to improper assembling.
Small current and no torque during stall test may be attributable to excessive contact resistance between brush and commutator; whereas, normal current and insufficient torque may be attributable to shorted commutator or poor insulation.
Starter can be considered normal if it passes no-load and stall tests; therefore, load test may be omitted.

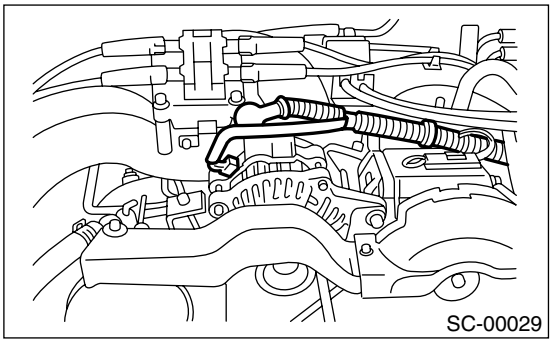
3. Generator

A: REMOVAL

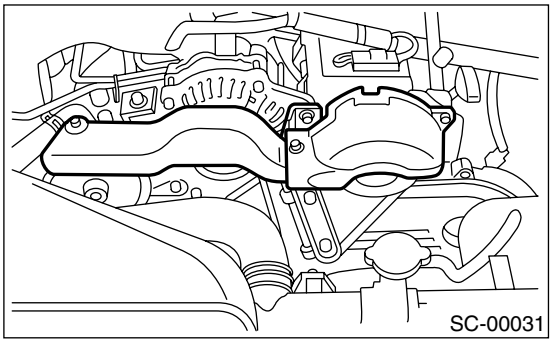
1) Disconnect ground cable from battery.



2) Disconnect the connector and terminal from generator.

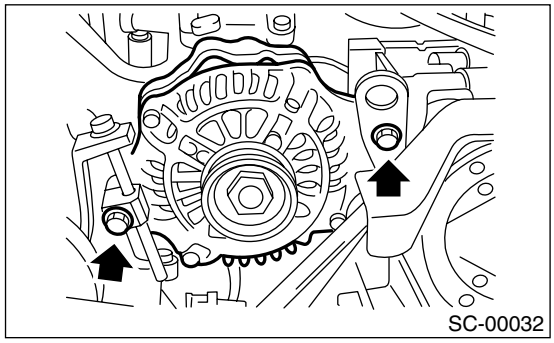


3) Remove the V-belt cover.



4) Remove the front side V-belt.
<Ref. to ME(H4SO)-43, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(H4DOTC)-45, FRONT SIDE BELT, REMOVAL, V-belt.>

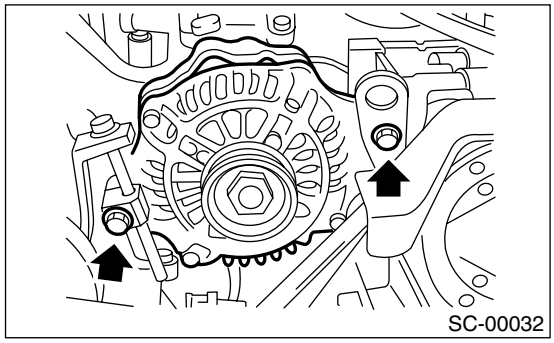
5) Remove the bolts which install generator onto bracket.



B: INSTALLATION

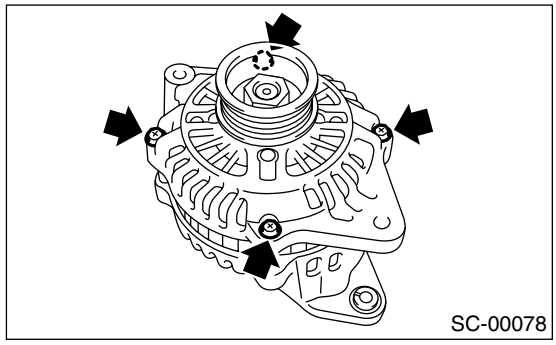
Install in the reverse order of removal.

CAUTION:
Check and adjust the V-belt tension. <Ref. to ME(H4SO)-44, INSPECTION, V-belt.> or <Ref. to ME(H4DOTC)-46, INSPECTION, V-belt.>

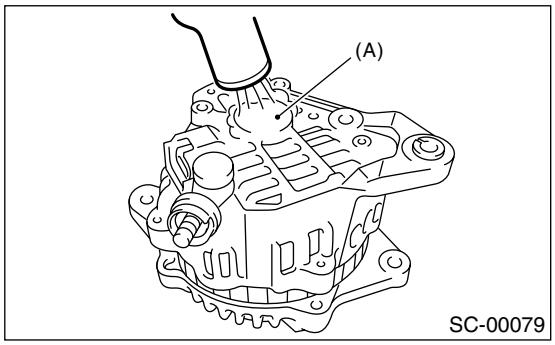


C: DISASSEMBLY

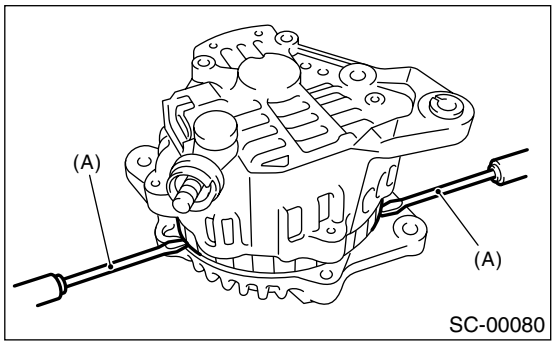
1) Remove the four through-bolts.



2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

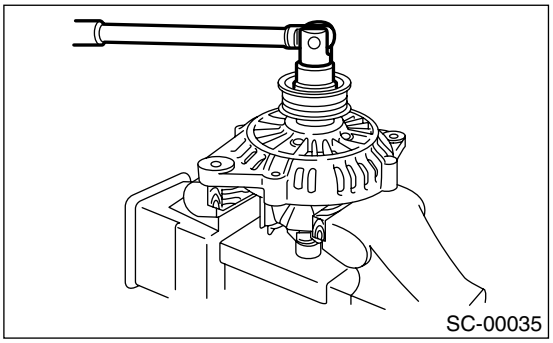


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

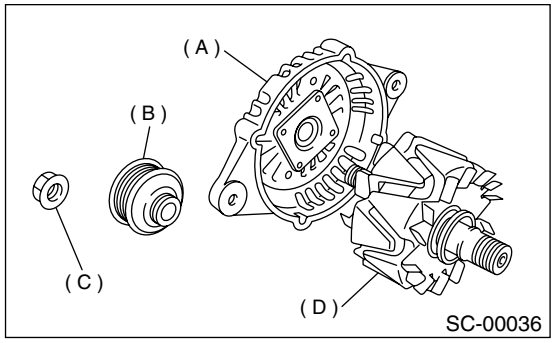


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.

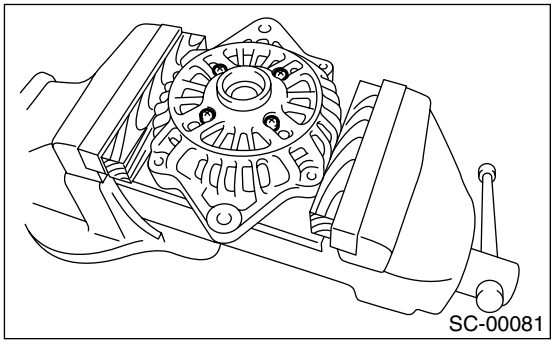


CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.

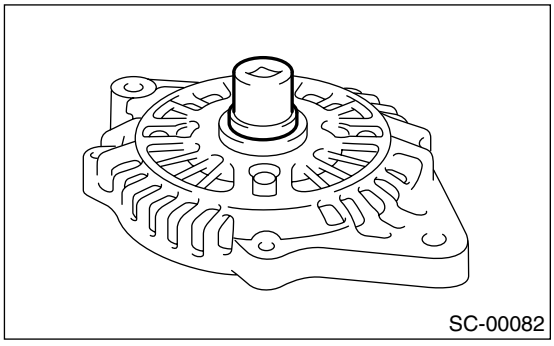


(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Remove the ball bearing as follows.
(1) Remove the bolt, and then remove the bearing retainer.

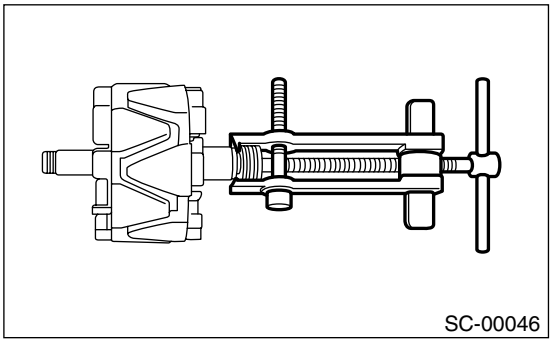


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



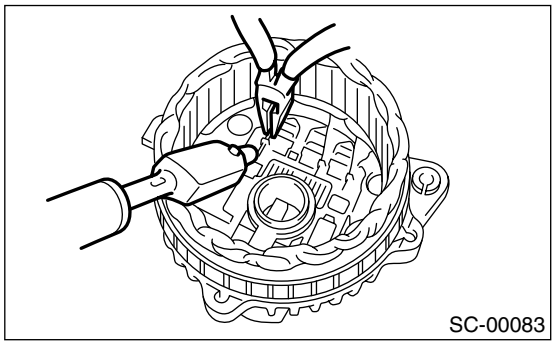
(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.

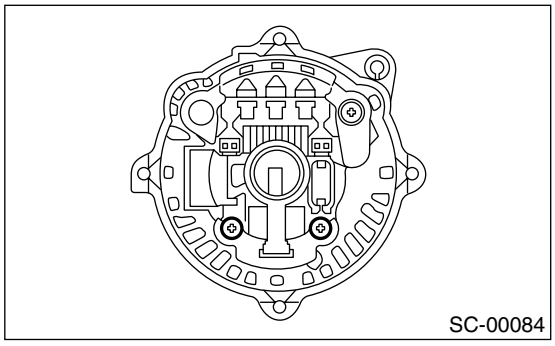

SC-00046

7) Unsolder connection between rectifier and stator coil to remove the stator coil.

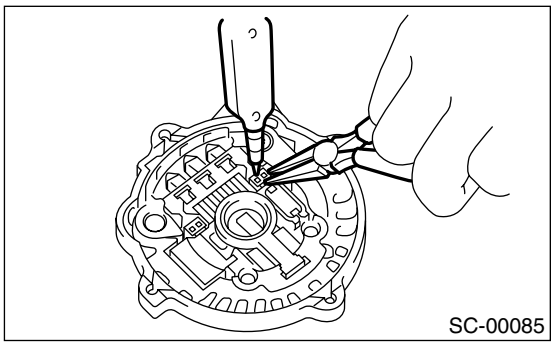
CAUTION:
Do not allow the 180 — 270 W solding bit to contact the terminals for more than 5 seconds at a time because the rectifier cannot withstand heat very well.


SC-00083

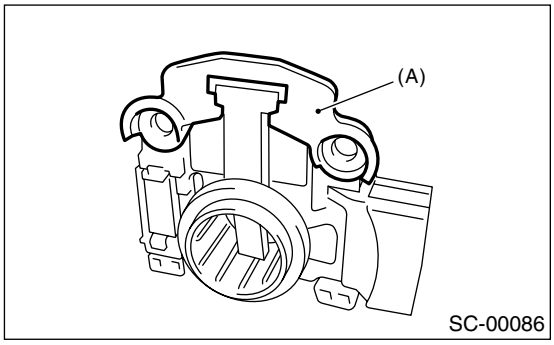
8) Remove the IC regulator as follows.
(1) Remove the screws which secure IC regulator to rear cover.


SC-00084

(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.


SC-00085

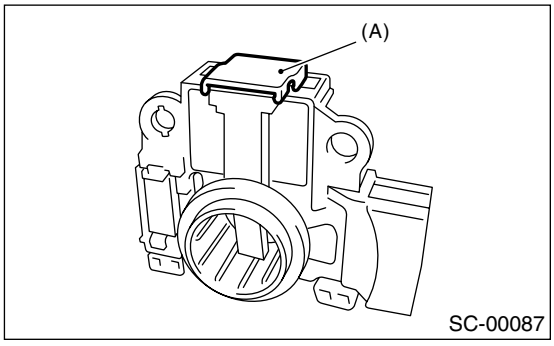
9) Remove the brush as follows.
(1) Remove cover A.



SC-00086

(A) Cover A

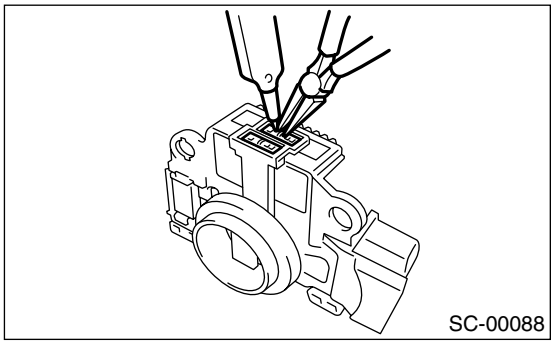
(2) Remove the cover B.



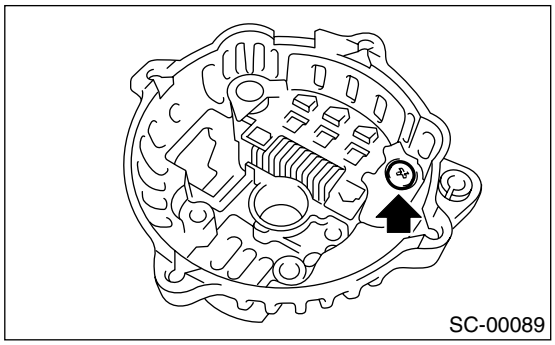
SC-00087

(A) Cover B

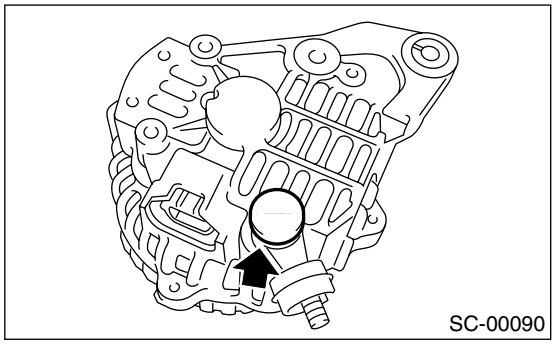
(3) Separate the brush from connection to remove.


SC-00088

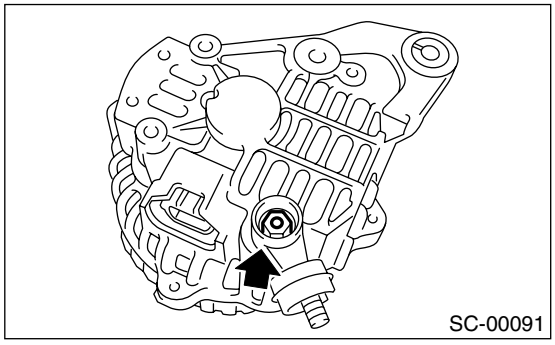
10) Remove the rectifier as follows.
(1) Remove the bolts which secure the rectifier.


SC-00089

(2) Remove the cover of terminal B.


SC-00090

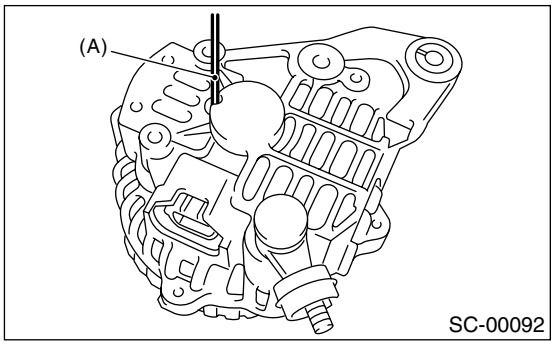
(3) Remove the nut of terminal B, and then remove the rectifier.


SC-00091

D: ASSEMBLY

To assemble, reverse order of disassembly.
1) Pulling up brush
Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



SC-00092

(A) Wire

2) Install the ball bearing.
(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
(2) Press the ball bearing into the specified position using a press.
(3) Install the bearing retainer.
3) Press the bearing (rear side) into the rotor shaft using a press to install.
4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing.
Remove the oil completely if it is found on bearing box.

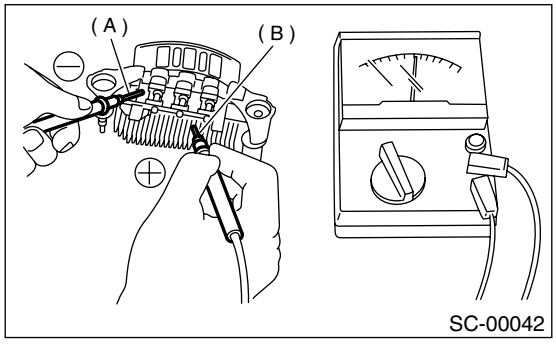
5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

E: INSPECTION

1. DIODE

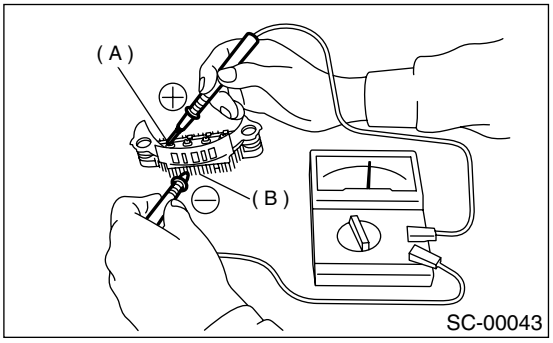
CAUTION:
Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode
Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.



(A) Diode lead
(B) Heat sink (Positive side)

2) Checking negative diode
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



(A) Diode lead
(B) Heat sink (Negative side)

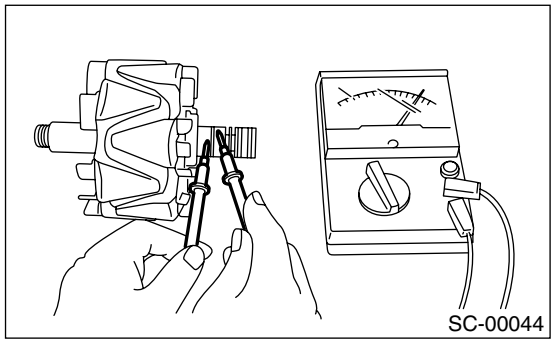
2. ROTOR

1) Slip ring surface
Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Slip ring outer diameter
Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

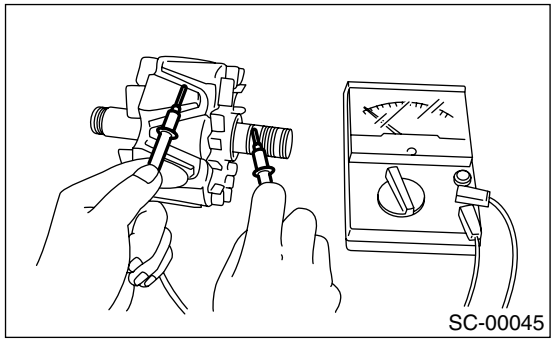
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test
Check the resistance between slip rings using circuit tester.
If the resistance is not within specification, replace the rotor assembly.

Specified resistance:
Approx. 1.8 — 2.2 Ω



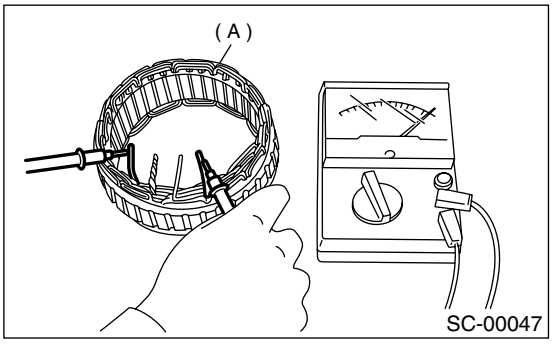
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)
Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

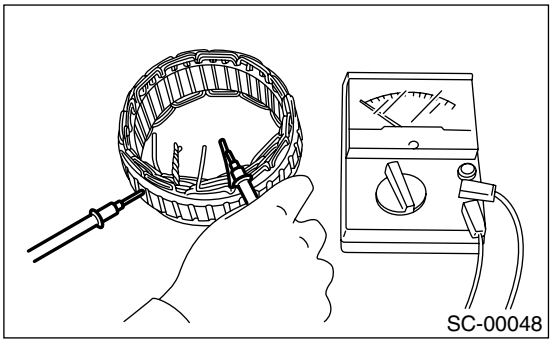
3. STATOR

1) Continuity test
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

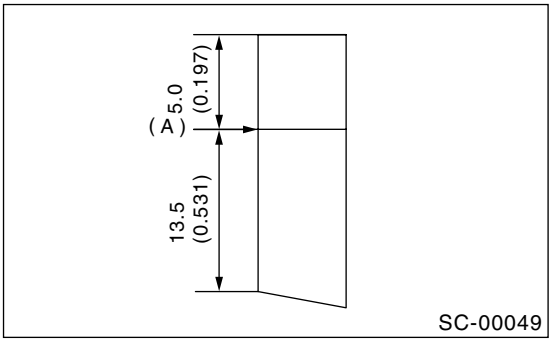
2) Insulation test
Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



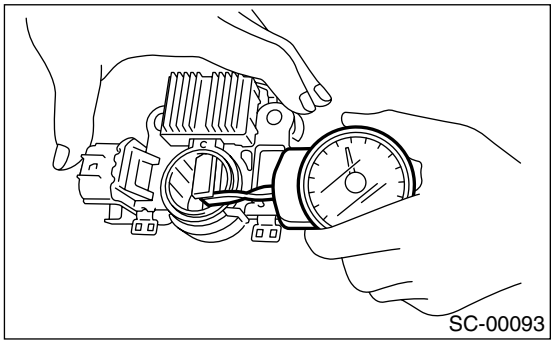
4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

Brush length:
Standard
18.5 mm (0.728 in)
Service limit
5.0 mm (0.197 in)



2) Checking brush spring for proper pressure
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



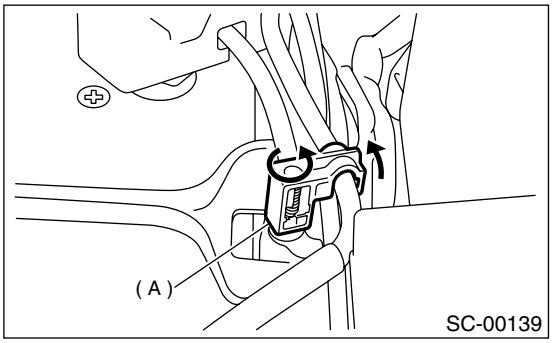
5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

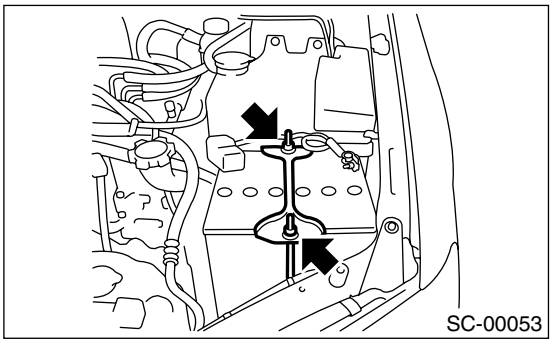
4. Battery

A: REMOVAL

1) Remove battery cable holder (A) from battery rod.



2) Disconnect the positive (+) cable after disconnecting the negative (–) cable of battery.
3) Remove flange nuts from battery rods and take off battery holder.



4) Remove battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:
• Clean battery cable terminals and apply grease to prevent corrosion.
• Connect the positive (+) cable of battery and then the negative (–) cable of the battery.

C: INSPECTION

WARNING:
• Electrolyte has toxicity; be careful handling the fluid.
• Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
• Batteries produce explosive gases. Keep sparks, flame, cigarettes away.
• Ventilate when charging or using in enclosed space.
• For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
• Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
• To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

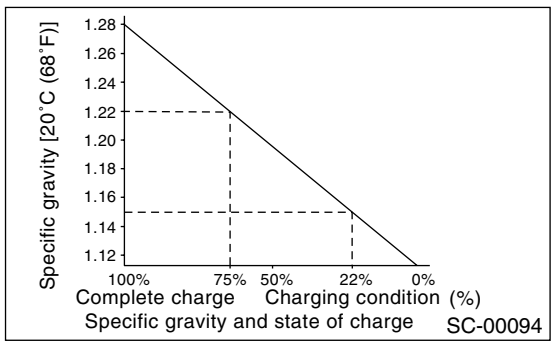
2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

S_{20} = St + 0.0007 × (t – 20)
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St : Measured specific gravity
t : Measured temperature (°C)
Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

D: MEASUREMENT

WARNING:
• Do not bring an open flame close to the battery at this time.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
• Be careful since battery electrolyte overflows while charging the battery.
• Observe instructions when handling battery charger.
• Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)
*: Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
Never use more than 10 amperes when charging the battery because that will shorten battery life.

ENGINE (DIAGNOSTICS)

EN(H4SO)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4SO)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4SO)-64, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).**	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(H4SO)-367, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read DTC on the Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H4SO)-53, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H4SO)-92, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Carry out the basic check, only when DTC about automatic transmission is shown on display. <Ref. to EN(H4SO)-41, Read Diagnostic Trouble Code.> 2) Repair the trouble cause. 3) Perform the clear memory mode. <Ref. to EN(H4SO)-50, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to EN(H4SO)-42, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H4SO)-92, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.
1) ATF level check <Ref. to 4AT-31, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-32, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-31, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-32, Differential Gear Oil.>
5) Stall test <Ref. to 4AT-34, Stall Test.>
6) Line pressure test <Ref. to 4AT-36, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to 4AT-38, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to 4AT-35, Time Lag Test.>
9) Road test <Ref. to 4AT-33, Road Test.>
10) Shift characteristics <Ref. to 4AT-38, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	❏ Fine ❏ Cloudy ❏ Rainy ❏ Snowy ❏ Various/Others:		
Outdoor temperature	°F (°C)		
	❏ Hot ❏ Warm ❏ Cool ❏ Cold		
Place	❏ Highway ❏ Suburbs ❏ Inner city ❏ Uphill ❏ Downhill ❏ Rough road ❏ Others:		
Engine temperature	❏ Cold ❏ Warming-up ❏ After warming-up ❏ Any temperature ❏ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❏ Not affected ❏ At starting ❏ While idling ❏ At racing ❏ While accelerating ❏ While cruising ❏ While decelerating ❏ While turning (RH/LH)		
Headlight	❏ ON/❏ OFF	Rear defogger	❏ ON/❏ OFF
Blower	❏ ON/❏ OFF	Radio	❏ ON/❏ OFF
A/C compressor	❏ ON/❏ OFF	CD/Cassette	❏ ON/❏ OFF
Cooling fan	❏ ON/❏ OFF	Car phone	❏ ON/❏ OFF
Front wiper	❏ ON/❏ OFF	CB	❏ ON/❏ OFF
Rear wiper	❏ ON/❏ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ VDC warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

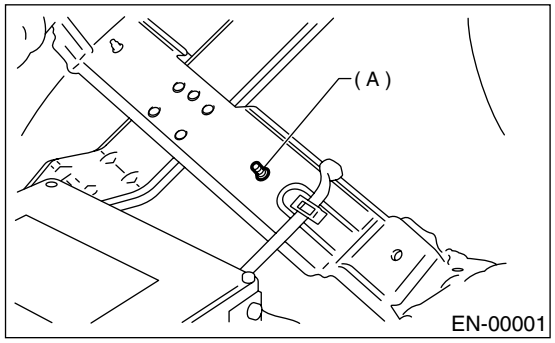
CAUTION:
• All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.
3) Do not disconnect the battery terminals while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.
4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.
6) Before removing ECM from the located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

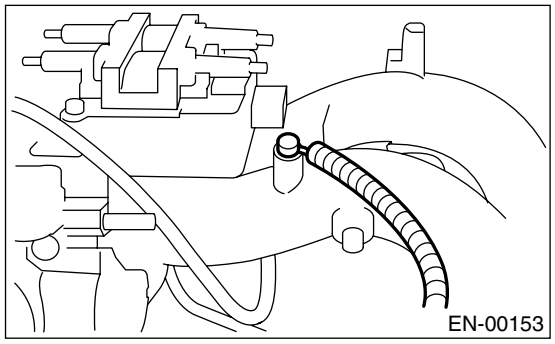
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.

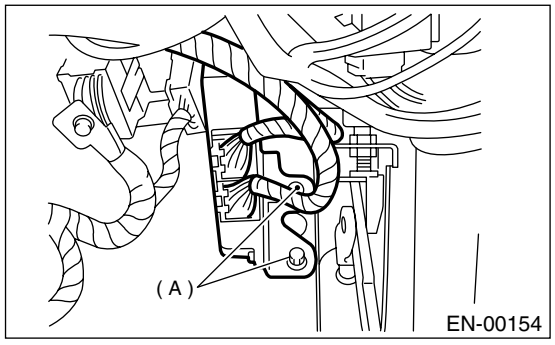


(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.
12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

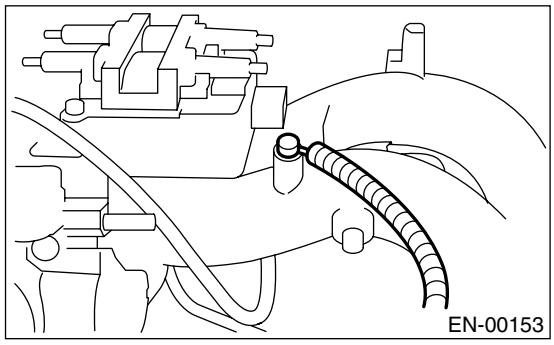
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, MIL is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

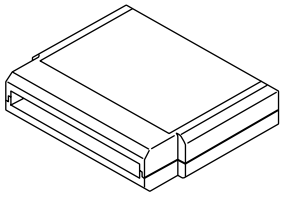
• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

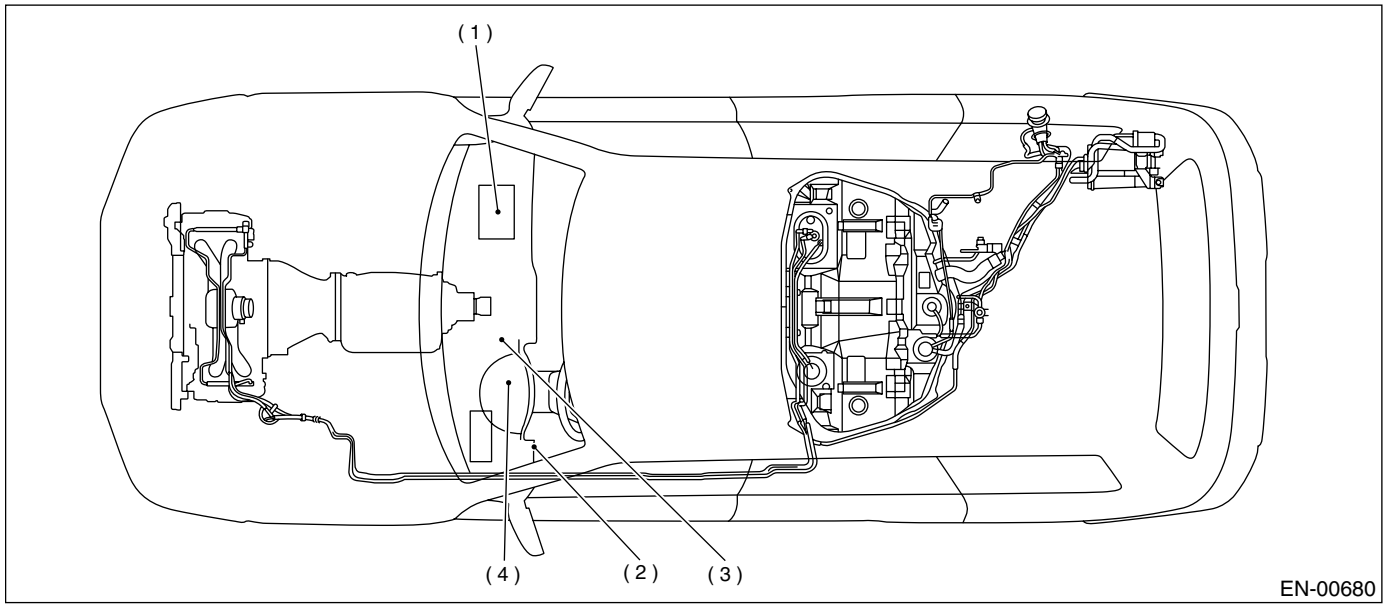
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

4. Electrical Components Location

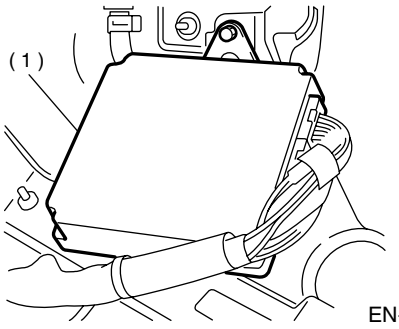
A: LOCATION

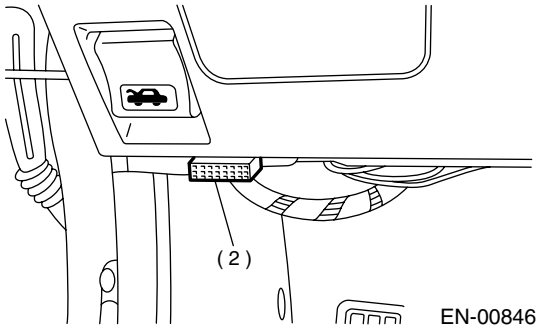
1. ENGINE

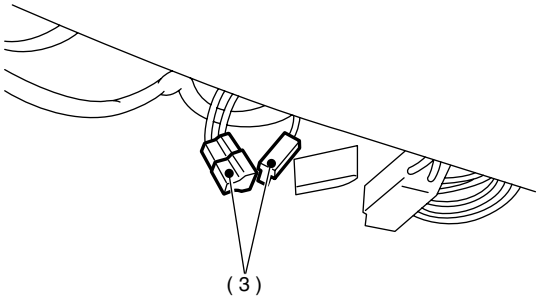
• MODULE

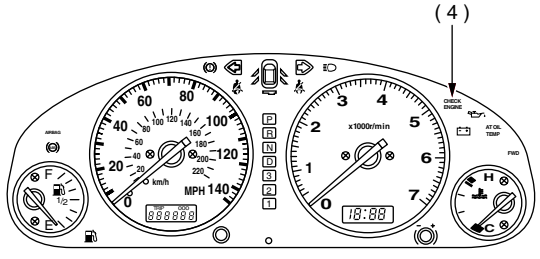


(1) Engine control module (ECM)
(2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool)
(3) Test mode connector
(4) CHECK ENGINE malfunction indicator lamp (MIL)

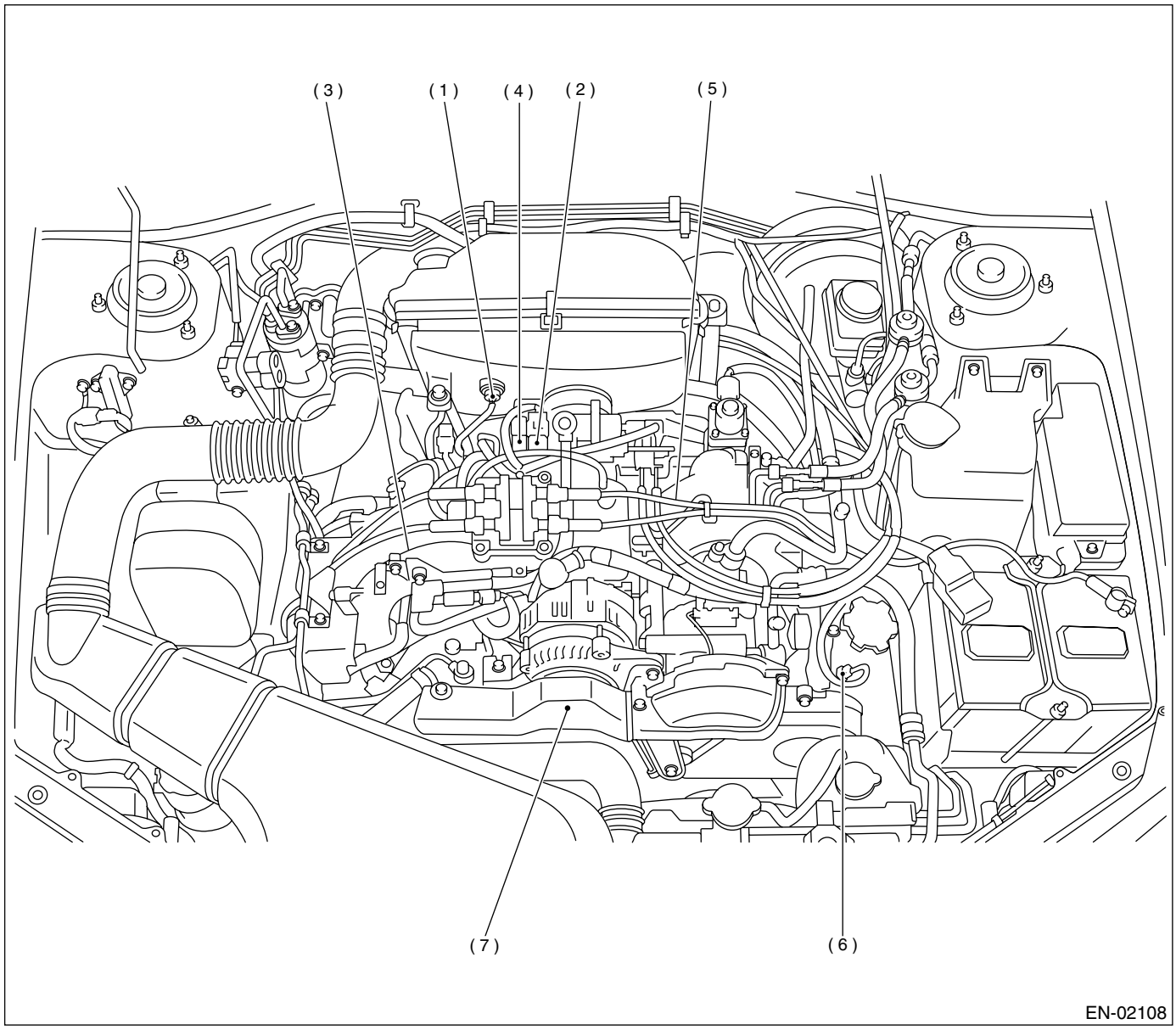






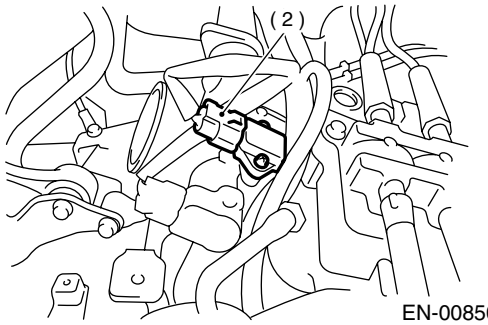


• SENSOR



(1) Intake air temperature sensor
(2) Pressure sensor
(3) Engine coolant temperature sensor
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor

(1)
EN-00849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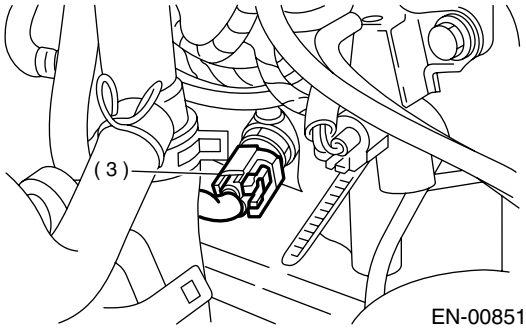
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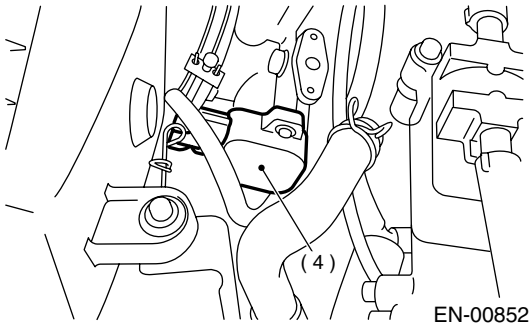
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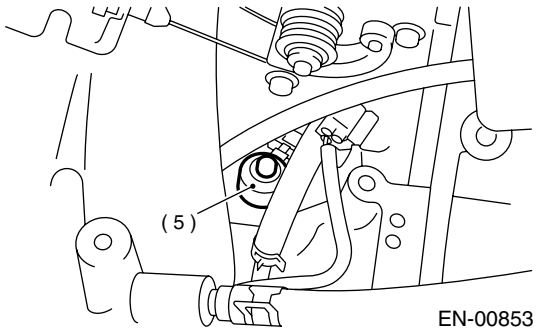
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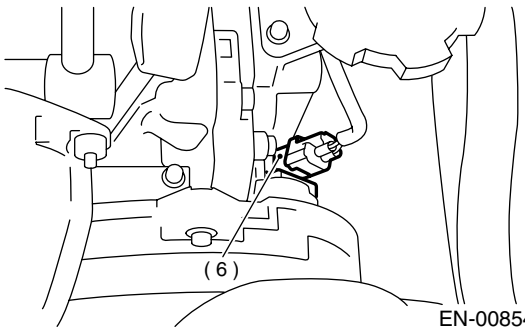
(6)
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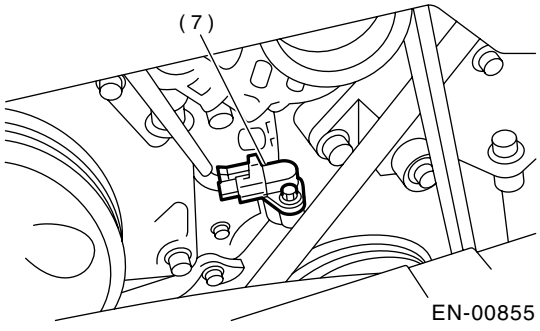
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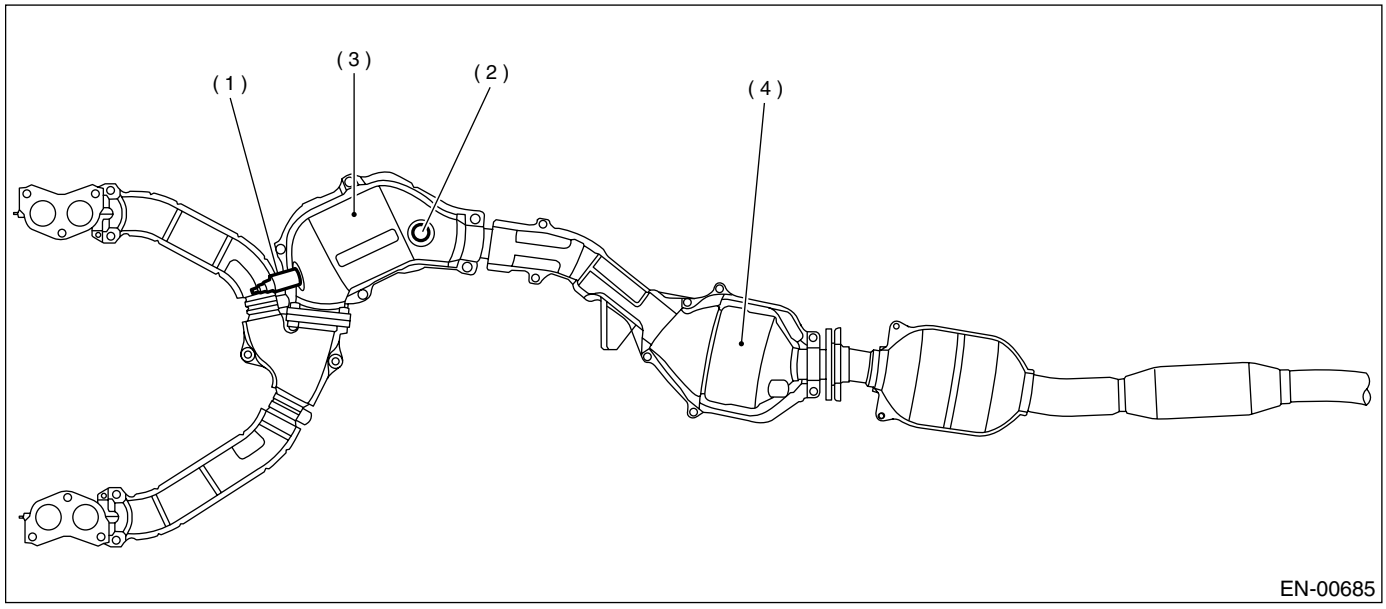
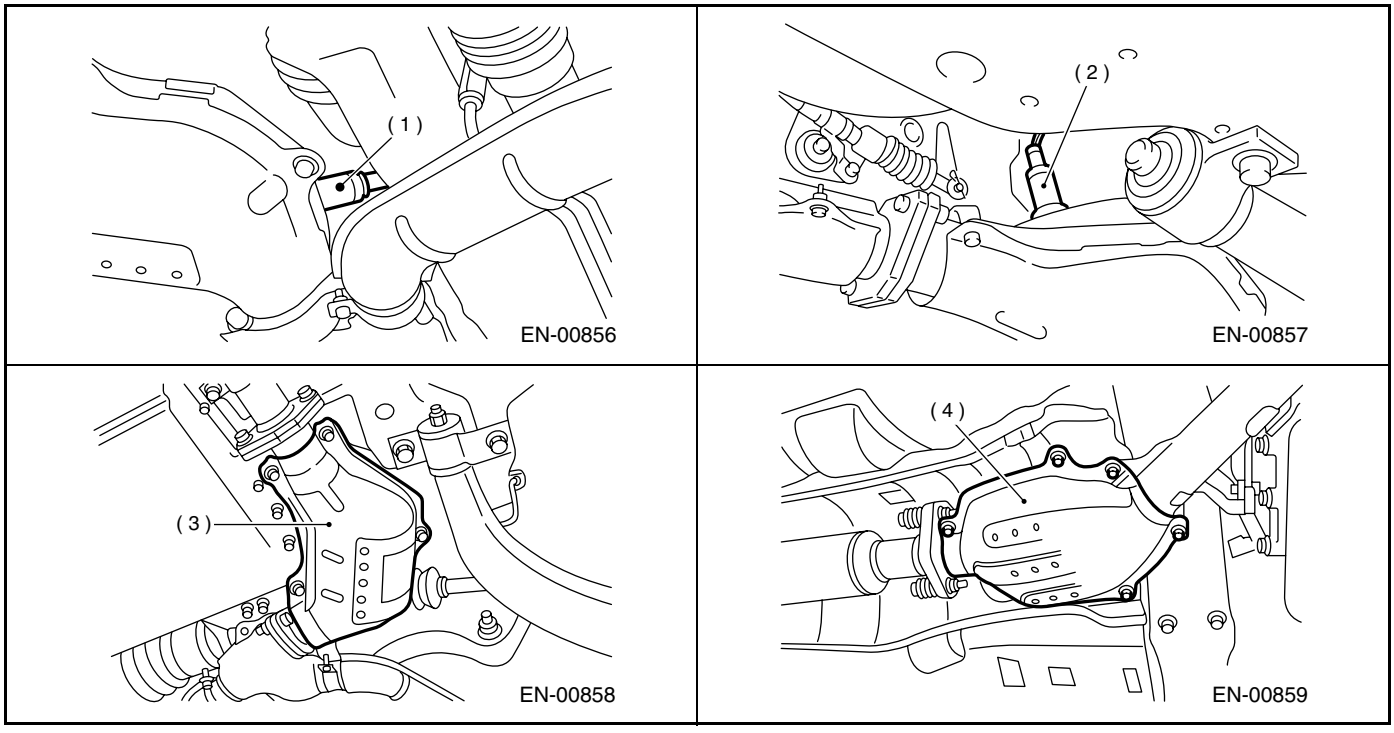
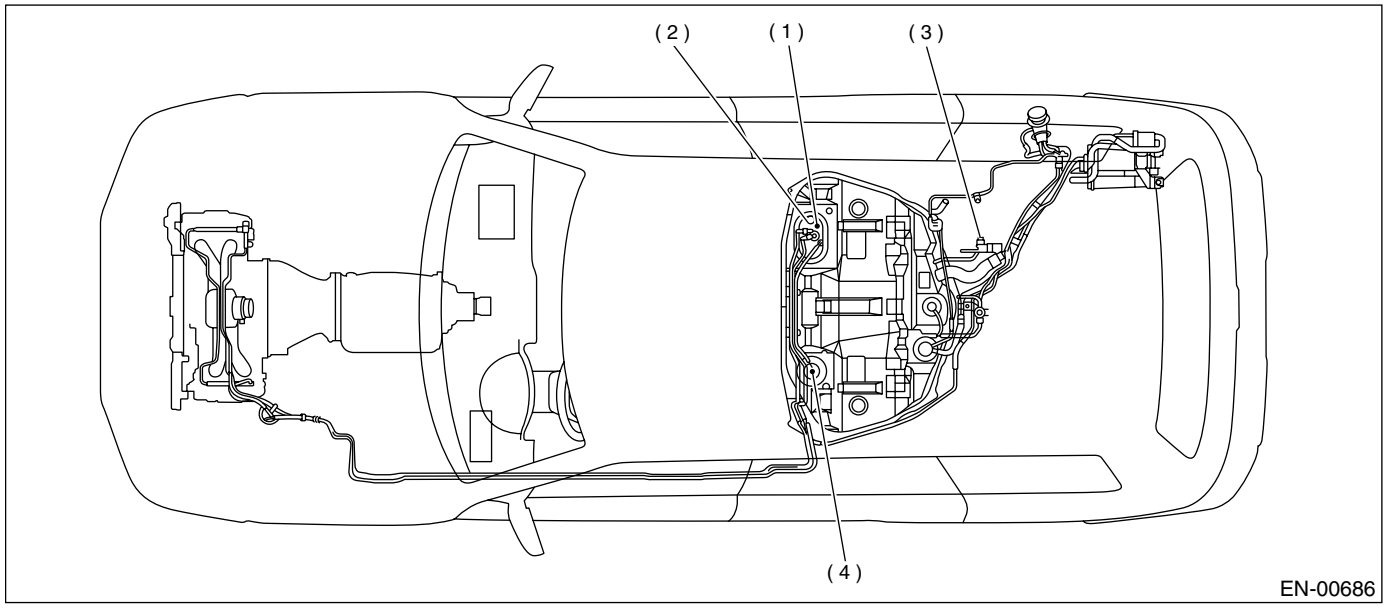
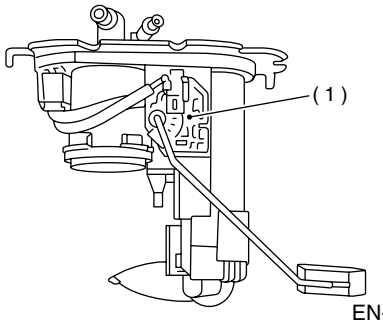


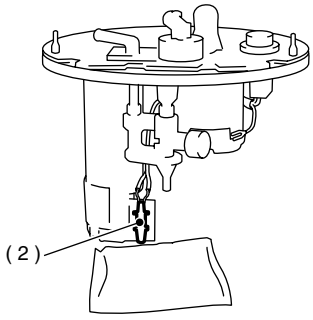
(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Front catalytic converter
(4) Rear catalytic converter

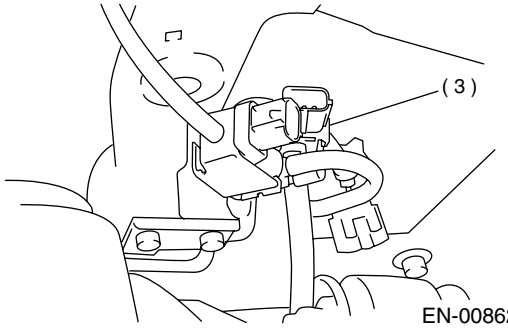


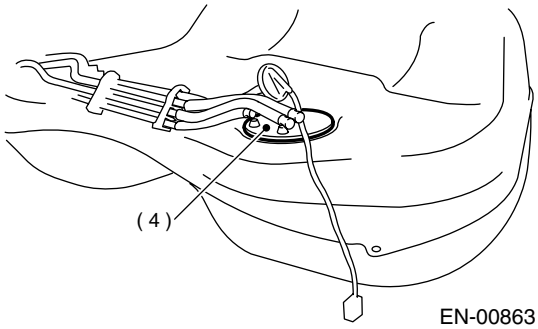


(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor

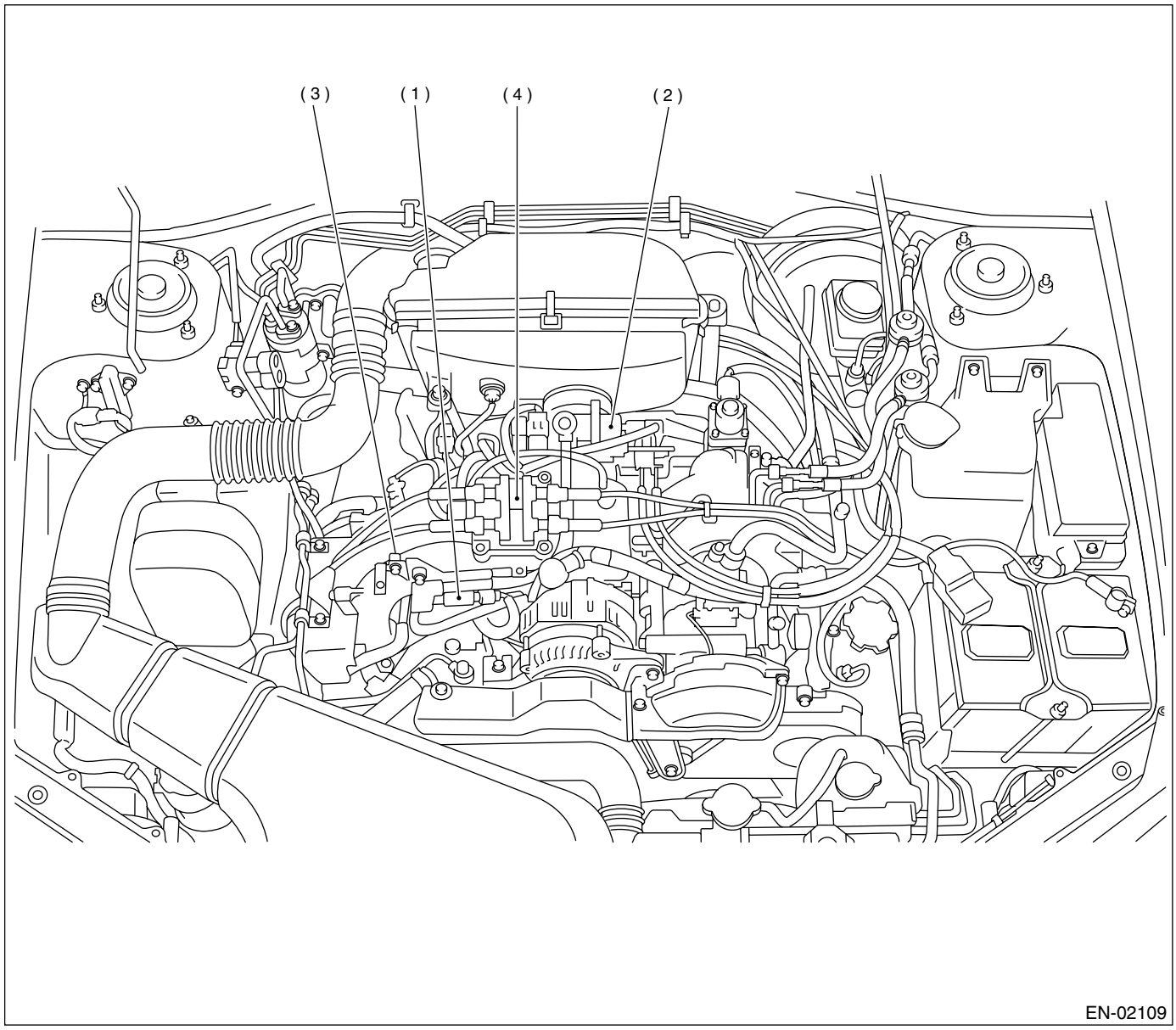




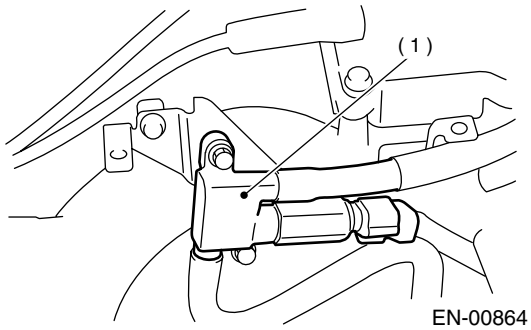




• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



(1) Air assist injector solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil & ignitor ASSY



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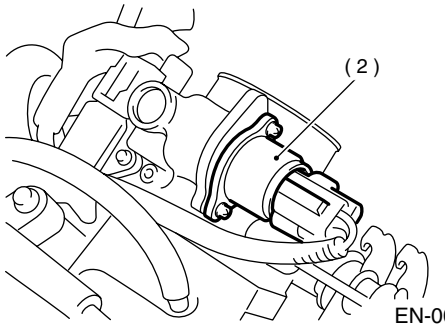

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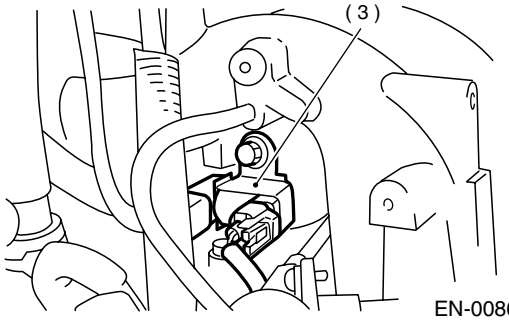

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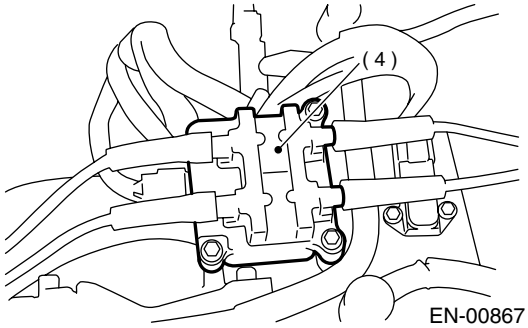
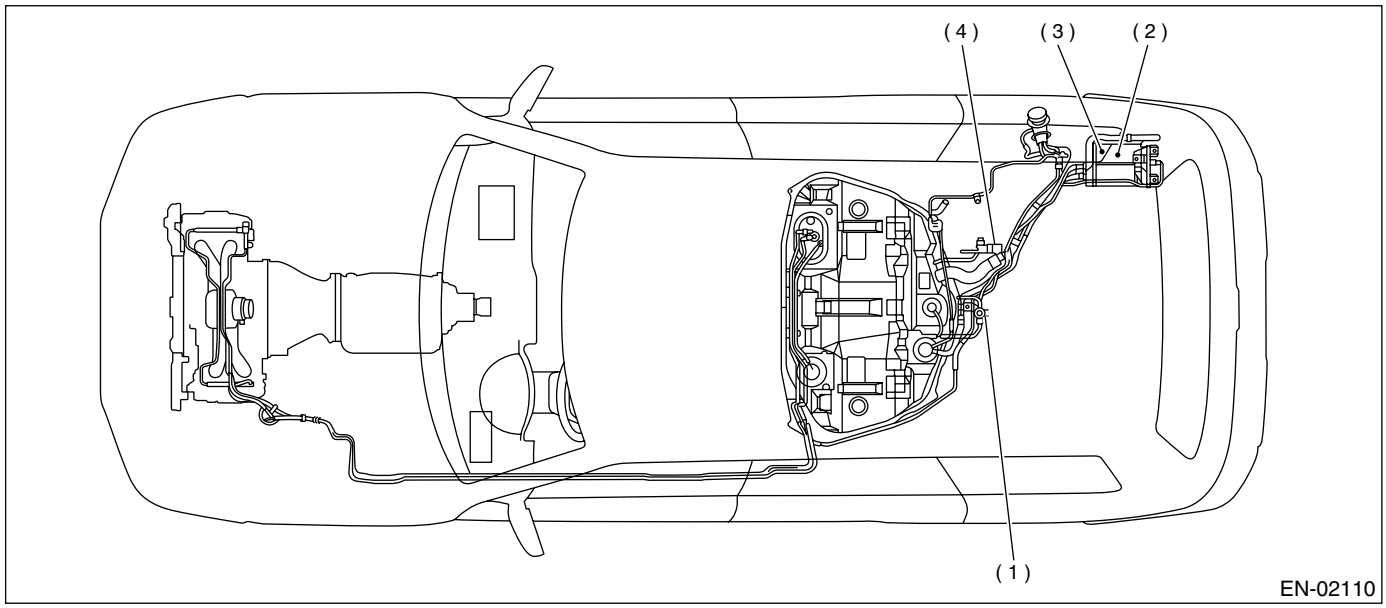
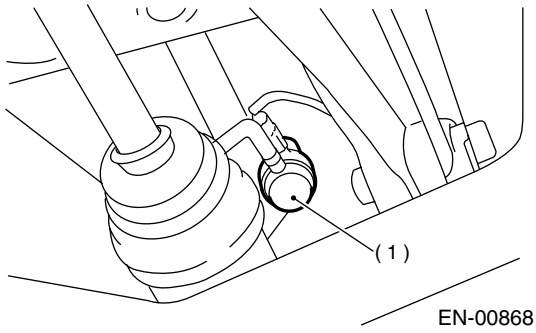
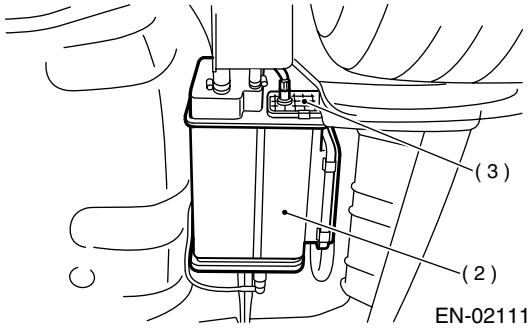


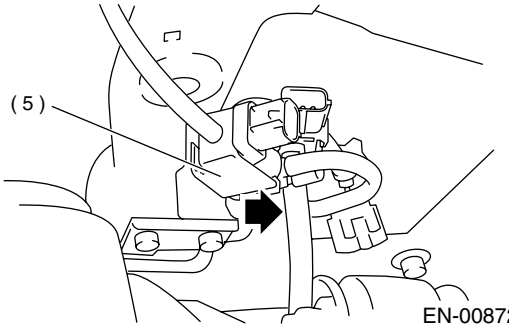
EN-00867



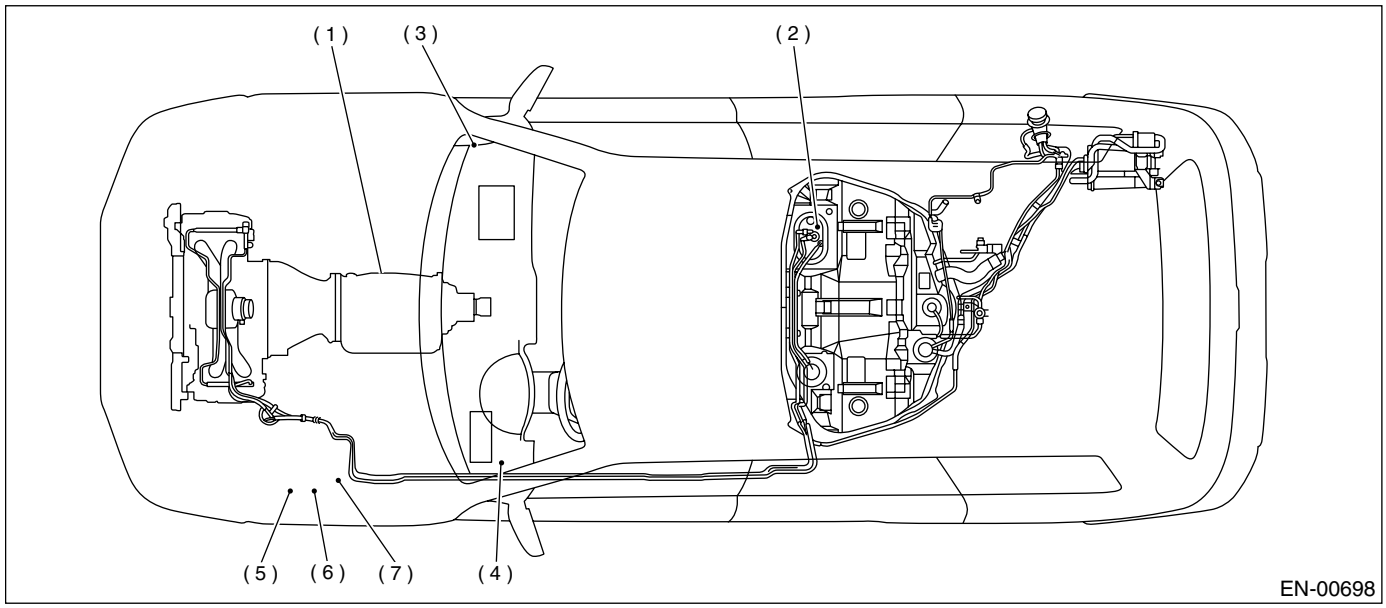
(1) Pressure control solenoid valve
(2) Canister (built-in drain filter)
(3) Drain valve (integrated with canister)
(4) Fuel tank sensor control valve



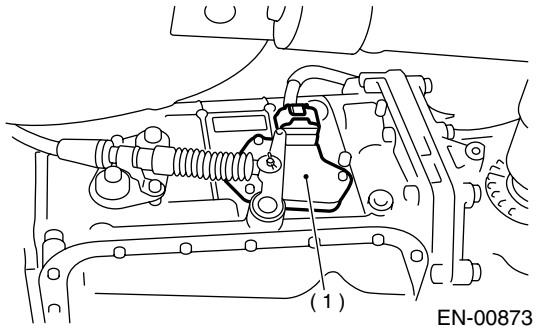




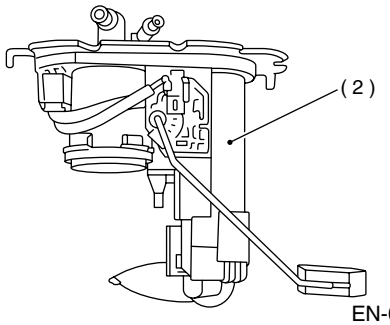
MEMO:



(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Starter



EN-00873



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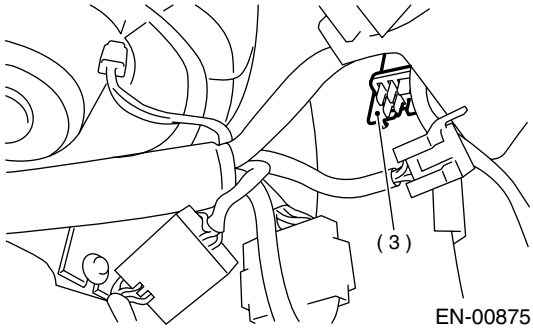

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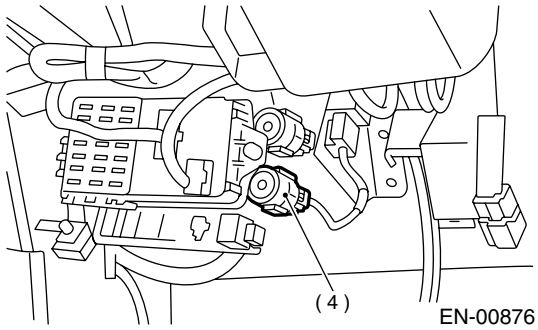
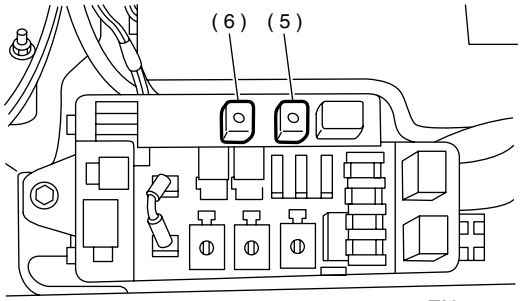
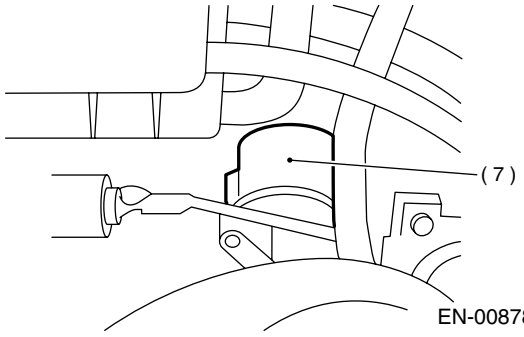


EN-00876



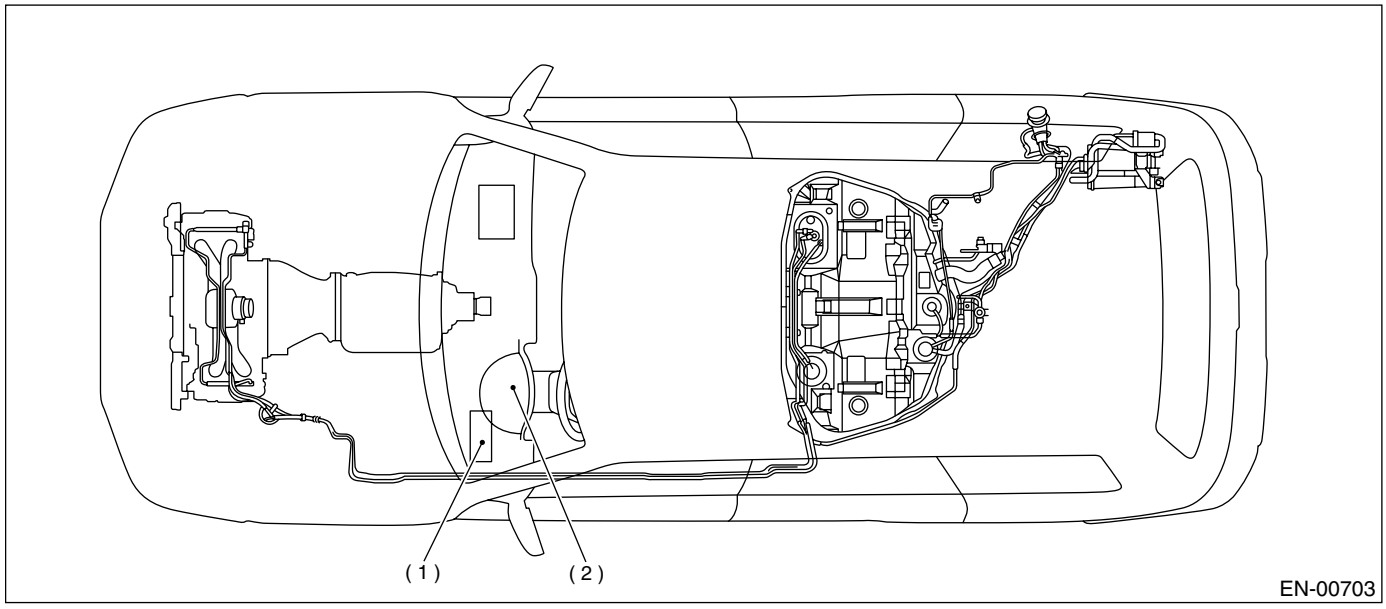
EN-00877



EN-00878

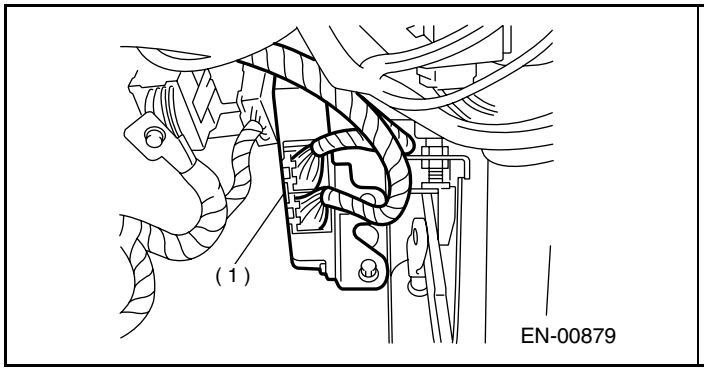
2. TRANSMISSION

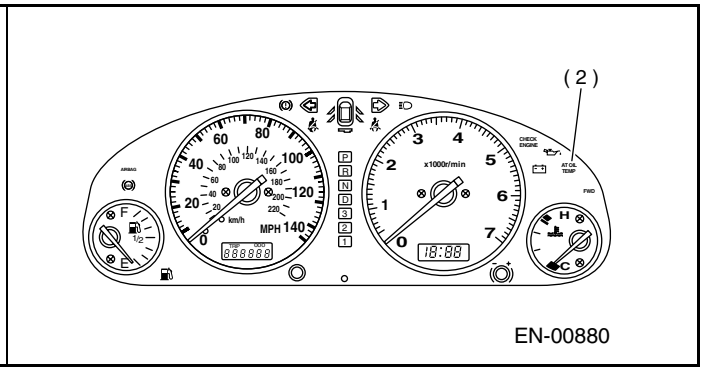
• MODULE



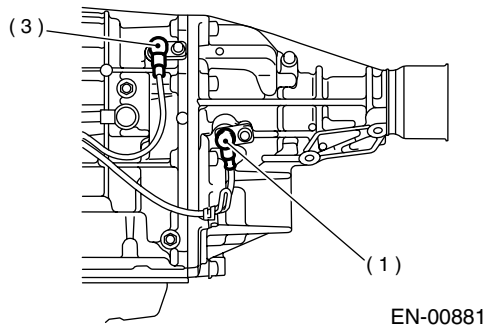
(1) Transmission Control Module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)

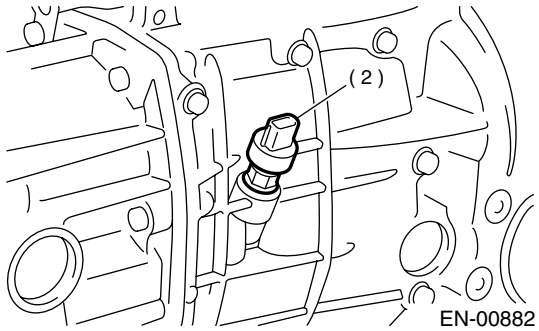




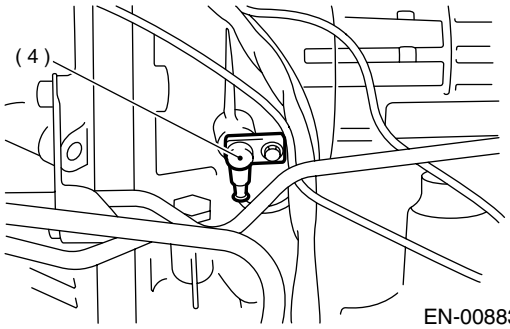
• SENSOR



EN-00881



EN-00882



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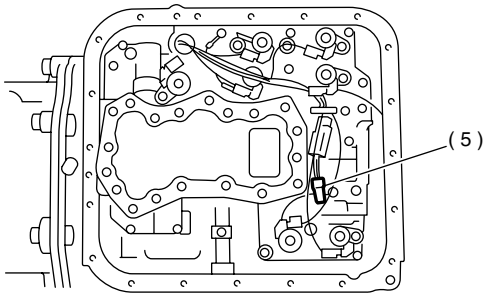

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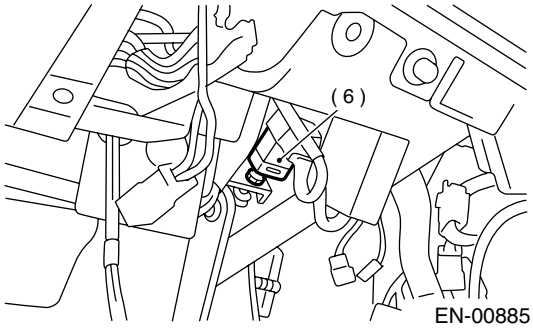
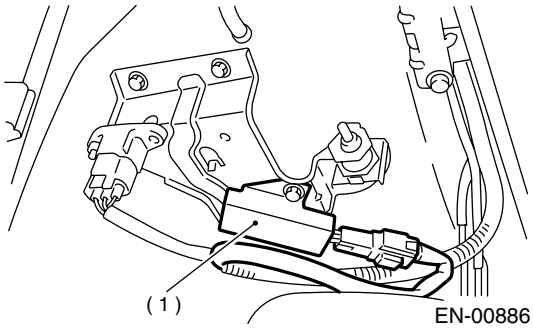


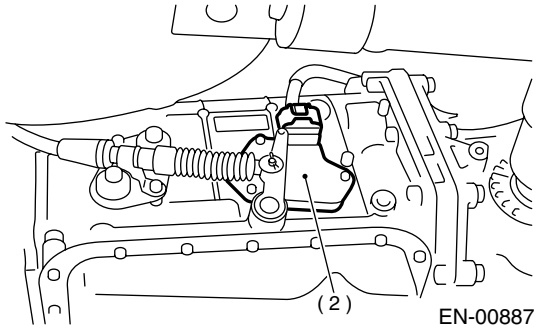
EN-00885

(1) Rear vehicle speed sensor (for AT vehicles)
(2) Front vehicle speed sensor (for MT vehicles)
(3) Front vehicle speed sensor (for AT vehicles)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

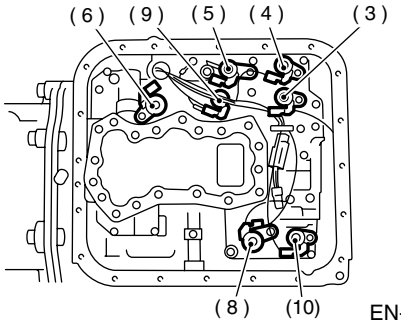
• SOLENOID VALVE AND SWITCH (AT VEHICLES)



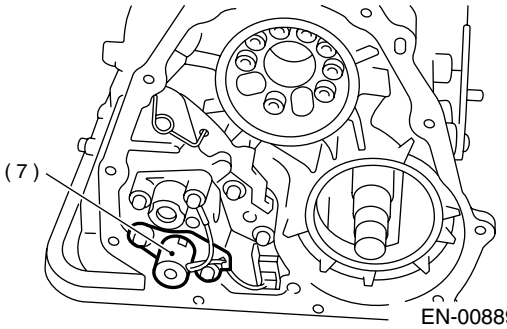
EN-00886



EN-00887



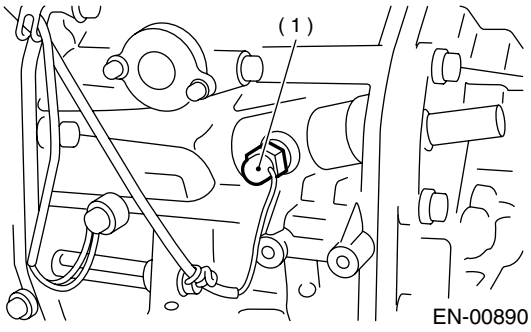
EN-00888



EN-00889

(1) Dropping resistor
(2) Inhibitor switch
(3) Shift solenoid valve 1
(4) Shift solenoid valve 2
(5) Line pressure duty solenoid
(6) Lock-up duty solenoid
(7) Transfer duty solenoid
(8) 2-4 brake duty solenoid
(9) Low clutch timing solenoid valve
(10) 2-4 brake timing solenoid valve

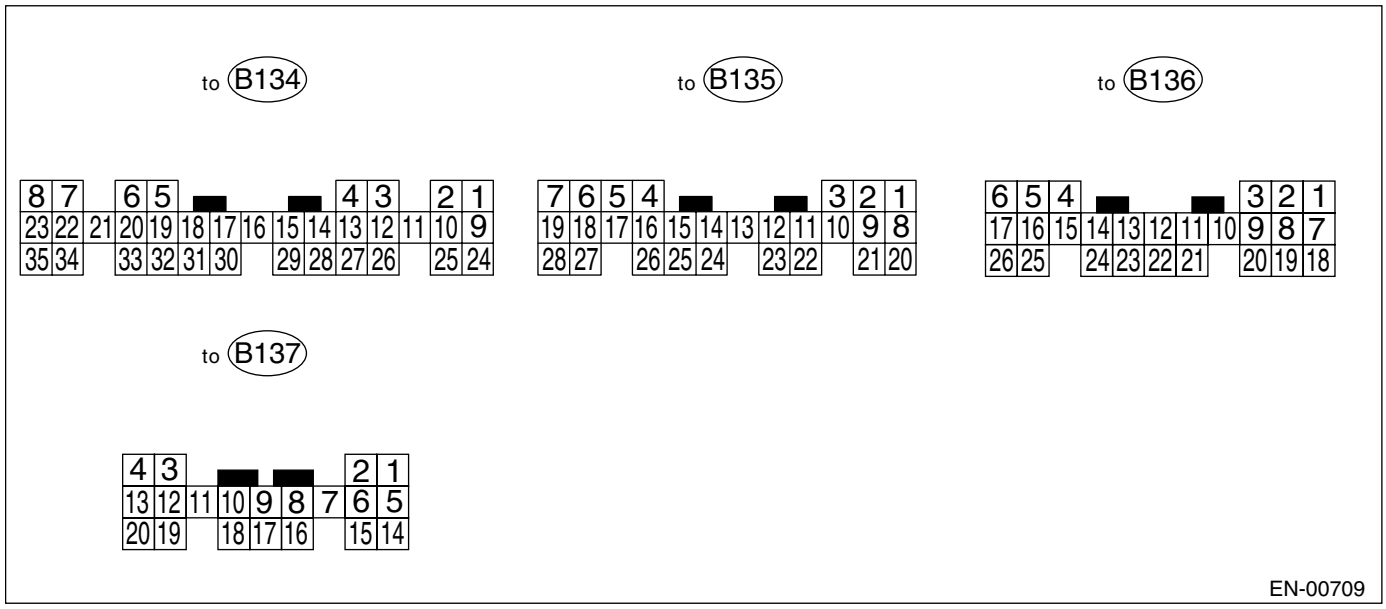
• SOLENOID VALVE AND SWITCH (MT VEHICLES)



(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	7	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	17	0	0	—
	Shield	B135	28	0	0	—
Camshaft position sensor	Signal (+)	B135	6	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	18	0	0	—
	Shield	B135	20	0	0	—
Throttle position sensor	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	3	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	14	0	0 — 0.9	—
	Shield	B137	15	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	6	0 — 1.0	0 — 1.0	—
	Signal 2	B136	17	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	4	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	12	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B137	10	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Starter switch		B136	20	0	0	Cranking: 8 — 14

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
A/C switch		B136	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B136	10	10 — 13	13 — 14	—
Neutral position switch (MT)		B136	21	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
Neutral position switch (AT)		B136	21	ON: 0 OFF: 12±0.5		Switch is ON when shift is in “N” or “P” position.
Test mode connector		B136	3	5	5	When connected: 0
Knock sensor	Signal	B135	16	2.8	2.8	—
	Shield	B135	27	0	0	—
Back-up power supply		B135	9	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B135	1	10 — 13	13 — 14	—
		B135	2	10 — 13	13 — 14	—
Sensor power supply		B135	3	5	5	—
Ignition control	#1, #2	B134	33	0	1 — 3.4	Waveform
	#3, #4	B134	32	0	1 — 3.4	Waveform
Fuel injector	#1	B134	34	10 — 13	1 — 14	Waveform
	#2	B134	23	10 — 13	1 — 14	Waveform
	#3	B134	22	10 — 13	1 — 14	Waveform
	#4	B134	8	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal 1	B134	20	—	1 — 13	Waveform
	Signal 2	B134	6	—	1 — 13	Waveform
	Signal 3	B134	5	—	1 — 13	Waveform
	Signal 4	B134	19	—	1 — 13	Waveform
Fuel pump relay control		B134	11	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B134	9	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B134	14	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B134	13	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Self-shutoff control		B136	12	10 — 13	13 — 14	—
Malfunction indicator lamp		B134	28	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B134	10	—	0 — 13, or more	Waveform
Torque control 1 signal		B136	1	5	5	—
Torque control 2 signal		B136	18	5	5	—
Torque control cut signal		B136	15	8	8	—
Purge control solenoid valve		B134	29	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel temperature sensor		B137	5	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor	Signal	B135	26	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	Power supply	B135	3	5	5	—
	GND (sensor)	B135	19	0	0	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Pressure control solenoid valve		B134	4	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Drain valve		B134	3	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel tank sensor control valve		B134	1	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
EGR solenoid valve	Signal 1	B134	18	0 or 10 — 13	0 or 10 — 13	—
	Signal 2	B134	17	0 or 10 — 13	0 or 10 — 13	—
	Signal 3	B134	16	0 or 10 — 13	0 or 10 — 13	—
	Signal 4	B134	15	0 or 10 — 13	0 or 10 — 13	—
AT diagnosis input signal		B137	19	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
Small light switch		B137	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B137	4	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal 1		B136	13	—	2.05 — 2.25	—
Front oxygen (A/F) sensor signal 2		B136	22	—	1.75 — 1.95	—
Pressure sensor		B135	15	4.0 — 4.8	1.1 — 1.9	—
Intake air temperature sensor		B137	6	3.15 — 3.33	3.15 — 3.33	Intake air temperature: 25°C (75°F)
SSM/GST communication line		B137	16	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)		B135	19	0	0	—
GND (injectors)		B134	35	0	0	—
GND (ignition system)		B136	26	0	0	—
GND (power supply)		B134	7	0	0	—
GND (control systems)		B137	14	0	0	—
		B135	21	0	0	—
GND (oxygen sensor heater 1)		B136	5	0	0	—
GND (oxygen sensor heater 2)		B136	16	0	0	—

6. Engine Condition Data

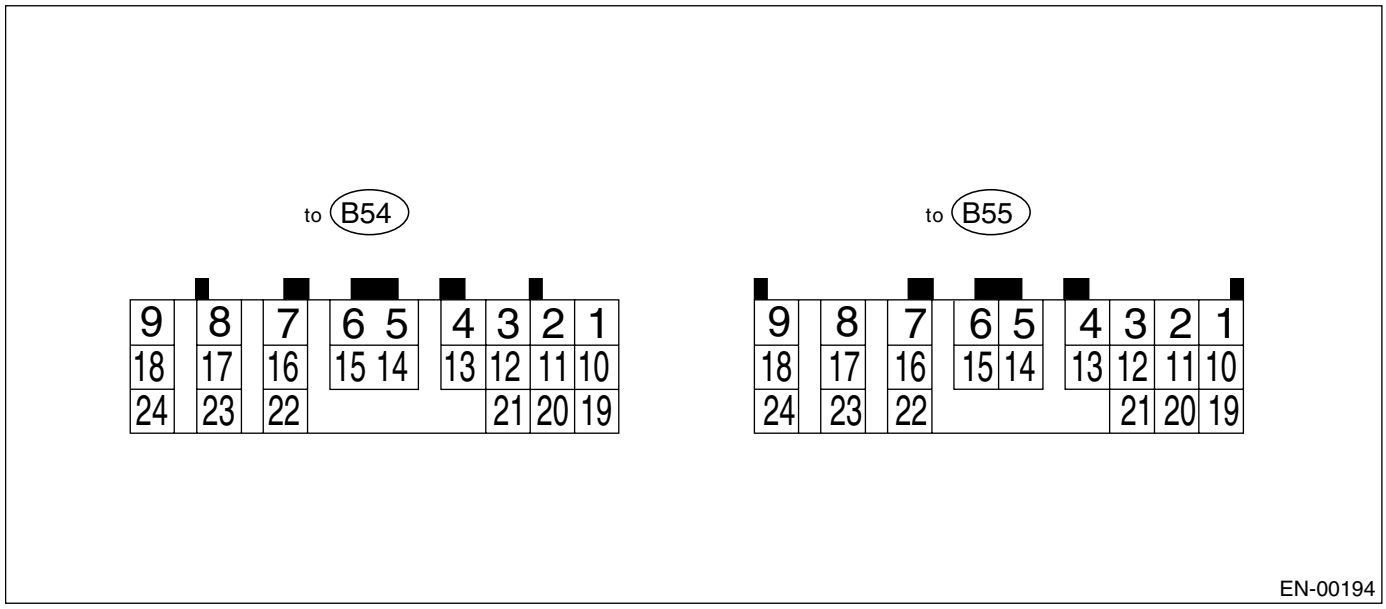
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:
Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)
Back-up power supply		B55	6	Ignition switch OFF	10 — 16
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 16
		B54	24		
Inhibitor switch	“P” range switch	B55	23	Selector lever in “P” range	Less than 1
				Selector lever in any other than “P” range	More than 8
	“N” range switch	B55	22	Selector lever in “N” range	Less than 1
				Selector lever in any other than “N” range	More than 8
	“R” range switch	B55	17	Selector lever in “R” range	Less than 1
				Selector lever in any other than “R” range	More than 9.5
	“D” range switch	B55	8	Selector lever in “D” range	Less than 1
				Selector lever in any other than “D” range	More than 9.5
	“3” range switch	B55	18	Selector lever in “3” range	Less than 1
				Selector lever in any other than “3” range	More than 9.5
	“2” range switch	B54	10	Selector lever in “2” range	Less than 1
				Selector lever in any other than “2” range	More than 9.5
	“1” range switch	B54	1	Selector lever in “1” range	Less than 1
				Selector lever in any other than “1” range	More than 9.5
Brake switch		B55	24	Brake pedal depressed	More than 10.5
				Brake pedal released	Less than 1
ABS signal		B54	19	ABS switch ON	Less than 1
				ABS switch OFF	More than 6.5

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B55	1	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.3 — 4.9	
Throttle position sensor power supply	B55	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B55	11	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	1.0 — 1.4	275 — 375
Rear vehicle speed sensor	B55	3	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	5	Vehicle speed at most 10 km/h (6 MPH)	Less than 1←→More than 4	—
Torque converter turbine speed sensor	B55	12	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Vehicle speed output signal	B55	13	Vehicle speed at most 10 km/h (6 MPH)	Less than 1←→More than 4	—
Engine speed signal	B55	4	Ignition switch ON (with engine OFF).	More than 10.5	—
			Ignition switch ON (with engine ON).	8 — 11	
Cruise set signal	B54	11	When cruise control is set (SET lamp ON).	Less than 1	—
			When cruise control is not set (SET lamp OFF).	More than 6.5	
Torque control 1 signal	B54	13	Ignition switch ON (with engine ON)	More than 9	—
Torque control 2 signal	B54	21	Ignition switch ON (with engine ON)	More than 9	—
Torque control cut signal	B54	2	Ignition switch ON	8	—
AT load signal	B55	20	Engine idling after warm-up	1.2 — 1.8	—
Shift solenoid 1	B54	7	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	6	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Dropping resistor	B54	18	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	16	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	15	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	

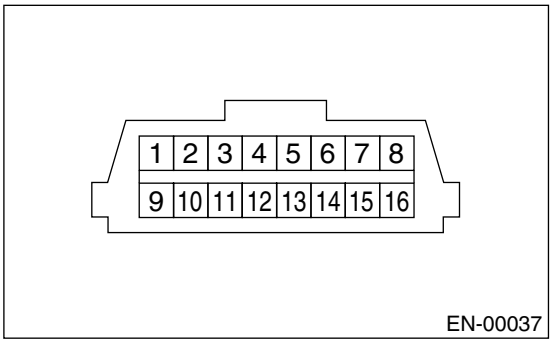
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
2-4 brake duty solenoid	B54	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake duty solenoid resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	5	3rd gear	More than 9	10 — 16
			1st gear	Less than 1	
Low clutch timing solenoid	B54	14	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line 1	B55	10	—	0	Less than 1
Sensor ground line 2	B55	21	—	0	Less than 1
System ground line	B55	9	—	0	Less than 1
		19			
FWD switch	B55	14	Fuse removed.	6 — 9.1	—
			Fuse installed.	Less than 1	
FWD indicator lamp	B54	12	Fuse on FWD switch	Less than 1	—
			Fuse removed from FWD switch.	More than 9	
Data link signal (Subaru Select Monitor)	B55	7	—	—	—
		16	—	—	
AT diagnosis signal	B54	4	Ignition switch ON	Less than 1 ←→ More than 4	—

8. Data Link Connector

A: NOTE

1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



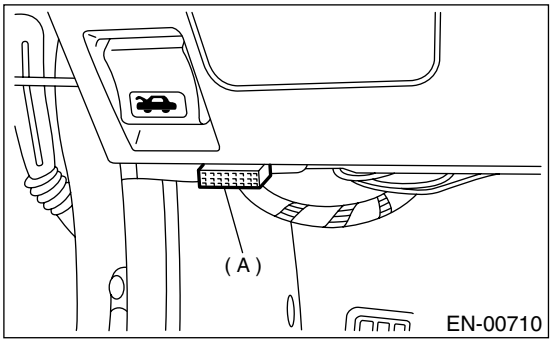
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Flash Write	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to the data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information
Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF and number
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H4SO)-41, Read Diagnostic Trouble Code.>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

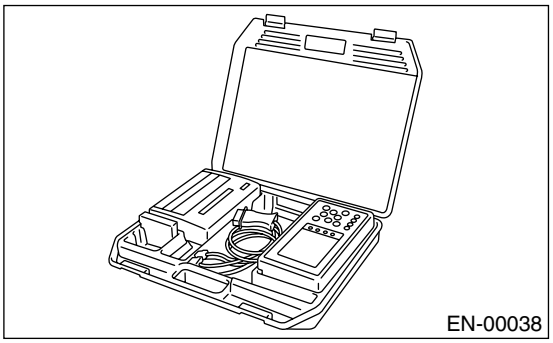
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10. Subaru Select Monitor

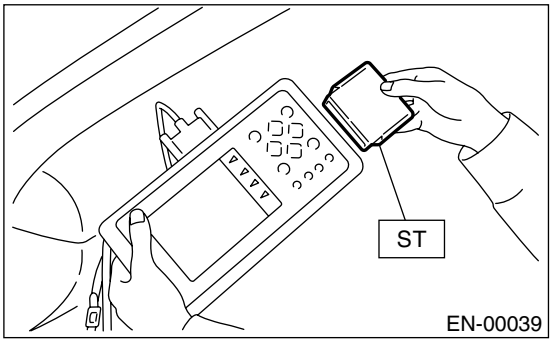
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare Subaru Select Monitor kit. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>

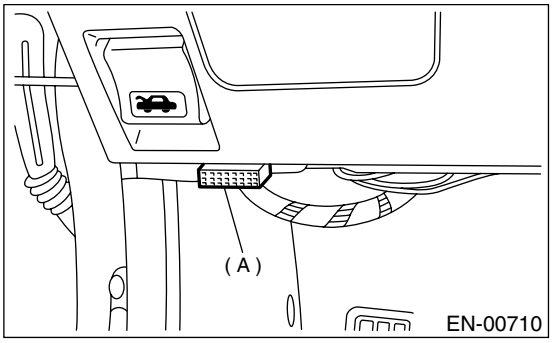


2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

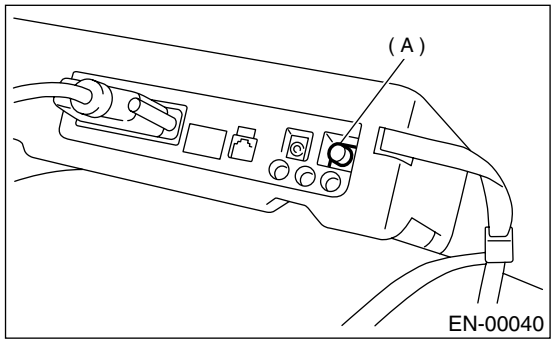
(1) Data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4SO)-41, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H4SO)-41, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection Width Pulse	ms
Idle air control signal	ISC Valve Step	STEP
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Front oxygen (A/F) sensor resistance value	A/F Sensor #1 resistance	ohm
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	Front O2 Heater #1	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	A
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psig
Fuel temperature signal	Fuel Temp.	°C or °F
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
EGR control signal	No. of EGR Steps	STEP
Identification signal of AT vehicle	AT vehicle ID Signal	AT/MT
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning compressor signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF

Contents	Display	Unit of measure
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	Rich/lean
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF
Drain valve	Vent. Solenoid Valve	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Fuel tank sensor control valve signal	Fuel tank sensor control valve	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger Switch	ON or OFF
Blower fan switch signal	Blower Fan Switch	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Air assist injector solenoid valve signal	Assist Air Sol. Valve	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF

NOTE:
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diag. Code	—
Malfunction indicator lamp status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O2 Heater Diagnosis	Complete or incomplete
Air fuel ratio control system for bank 1	Fuel System for Bank 1	ON or OFF
Engine load data	Calculated load valve	—
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount signal	Mass Air Flow	g/s
EGR signal	EGR System	No support
Throttle position signal	Throttle Opening Angle	%
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Front oxygen (A/F) sensor equipment	Oxygen sensor #11	Supported
Oxygen sensor equipment	Oxygen sensor #12	Supported
Front oxygen (A/F) sensor output signal	A/F Sensor #11	V

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank 1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED “ON” requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Front oxygen (A/F) sensor rich signal	Front O2 Rich Signal #1	ON or OFF	When front oxygen (A/F) sensor mixture ratio is rich.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF	When pressure control solenoid valve is in function.
Drain valve	Vent. Solenoid Valve	ON or OFF	When drain valve is in function.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT.

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
For select monitor display details, refer to the following.

11.Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE $03).

12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H4SO)-48, Drive Cycle.>

DTC No.	Item
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)
P0066	Air assisted injector control circuit or circuit low
P0067	Air assisted injector control circuit high
P0068	Manifold absolute pressure/barometric pressure circuit range/performance
P0107	Manifold absolute pressure/barometric pressure circuit low input
P0108	Manifold absolute pressure/barometric pressure circuit high input
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0122	Throttle/pedal position sensor/switch “A” circuit low input
P0123	Throttle/pedal position sensor/switch “A” circuit high input
P0129	Barometric pressure too low
P0131	O2 sensor circuit low voltage (Bank 1 Sensor 1)
P0132	O2 sensor circuit high voltage (Bank 1 Sensor 1)
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)
P0182	Fuel temperature sensor “A” circuit low input
P0183	Fuel temperature sensor “A” circuit high input
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)
P0335	Crankshaft position sensor “A” circuit
P0336	Crankshaft position sensor “A” circuit range/performance
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single sensor)
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single sensor)
P0447	Evaporative emission control system vent control circuit open
P0448	Evaporative emission control system vent control circuit shorted
P0452	Evaporative emission control system pressure sensor low input
P0458	Evaporative emission control system purge control valve circuit low
P0461	Fuel level sensor circuit range/performance
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0502	Vehicle speed sensor circuit low input
P0503	Vehicle speed sensor intermittent/erratic/high
P0512	Starter request circuit
P0519	Idle air control circuit system performance
P0565	Cruise control on signal
P0604	Internal control module random access memory (RAM) error
P0691	Cooling fan 1 control circuit low
P0692	Cooling fan 1 control circuit high
P0703	Torque converter/brake switch “B” circuit

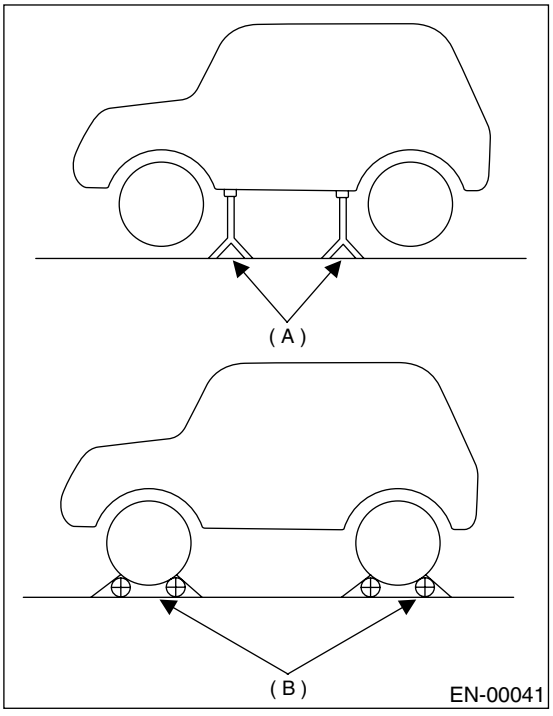
DTC No.	Item
P0705	Transmission range sensor circuit (PRNDL input)
P0710	Transmission fluid temperature sensor circuit
P0716	Input/turbine speed sensor circuit range/performance
P0720	Output speed sensor circuit
P0726	Engine speed input circuit range/performance
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0743	Torque converter clutch circuit electrical
P0748	Pressure control solenoid “A” electrical
P0753	Shift solenoid “A” electrical
P0758	Shift solenoid “B” electrical
P0771	Shift solenoid “E” performance or stuck off
P0778	Pressure control solenoid “B” electrical
P0785	Shift/timing solenoid
P0851	Neutral switch input circuit low
P0852	Neutral switch input circuit high
P0864	TCM communication circuit range/performance
P0865	TCM communication circuit low
P0866	TCM communication circuit high
P1110	Atmospheric pressure sensor circuit malfunction (low input)
P1111	Atmospheric pressure sensor circuit malfunction (high input)
P1134	A/F sensor micro-computer problem
P1400	Fuel tank pressure control solenoid valve circuit low
P1420	Fuel tank pressure control solenoid valve circuit high
P1446	Fuel tank sensor control valve circuit low
P1447	Fuel tank sensor control valve circuit high
P1492	EGR solenoid valve signal #1 circuit malfunction (low input)
P1493	EGR solenoid valve signal #1 circuit malfunction (high input)
P1494	EGR solenoid valve signal #2 circuit malfunction (low input)
P1495	EGR solenoid valve signal #2 circuit malfunction (high input)
P1496	EGR solenoid valve signal #3 circuit malfunction (low input)
P1497	EGR solenoid valve signal #3 circuit malfunction (high input)
P1498	EGR solenoid valve signal #4 circuit malfunction (low input)
P1499	EGR solenoid valve signal #4 circuit malfunction (high input)
P1510	ISC solenoid valve signal #1 circuit malfunction (low input)
P1511	ISC solenoid valve signal #1 circuit malfunction (high input)
P1512	ISC solenoid valve signal #2 circuit malfunction (low input)
P1513	ISC solenoid valve signal #2 circuit malfunction (high input)
P1514	ISC solenoid valve signal #3 circuit malfunction (low input)
P1515	ISC solenoid valve signal #3 circuit malfunction (high input)
P1516	ISC solenoid valve signal #4 circuit malfunction (low input)
P1517	ISC solenoid valve signal #4 circuit malfunction (high input)
P1518	Starter switch circuit low input
P1560	Back-up voltage circuit malfunction
P1698	Engine torque control cut signal circuit malfunction (low input)
P1699	Engine torque control cut signal circuit malfunction (high input)
P1700	Throttle position sensor circuit malfunction for AT

DTC No.	Item
P1711	Engine torque control signal #1 circuit malfunction
P1712	Engine torque control signal #2 circuit malfunction

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

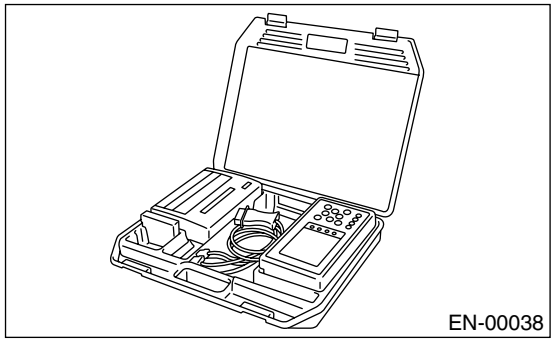
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



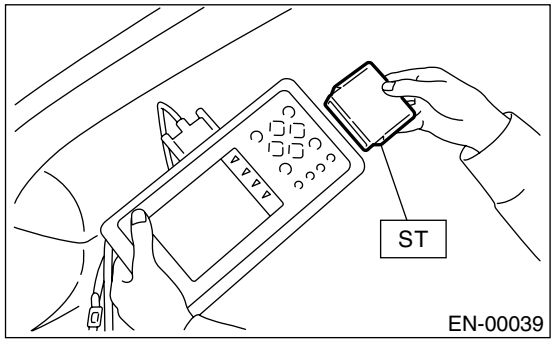
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

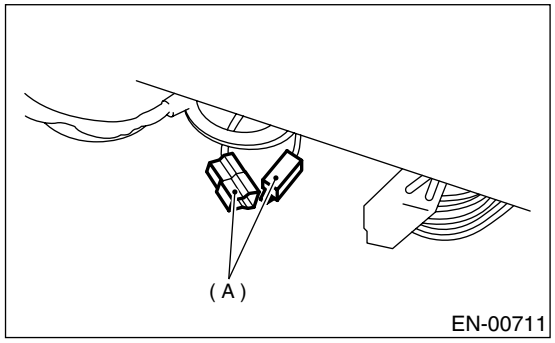
1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)-50, Clear Memory Mode.>
2) Warm up engine.
3) Prepare Subaru Select Monitor kit. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



4) Connect diagnosis cable to Subaru Select Monitor.
5) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>

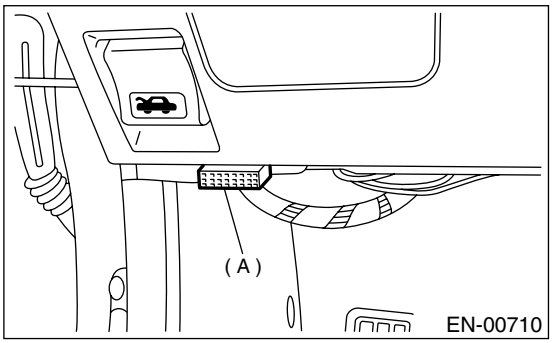


6) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



7) Connect Subaru Select Monitor to data link connector.

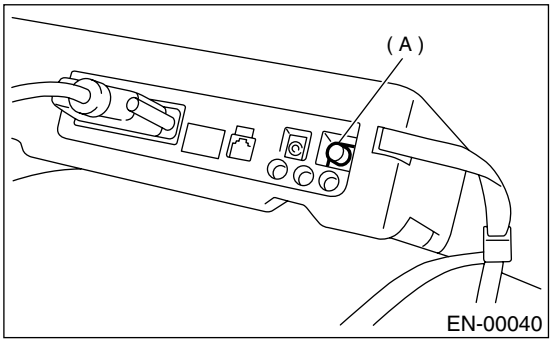
(1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

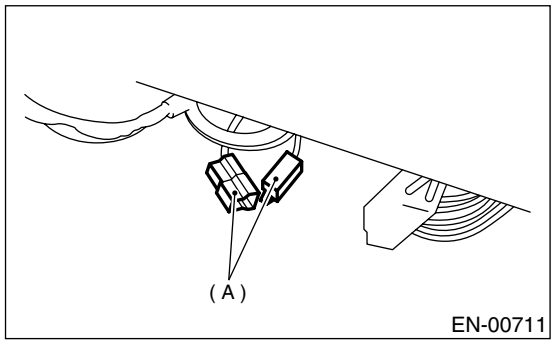
9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
11) Press the [YES] key after displayed the information of engine type.
12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
13) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.

• If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

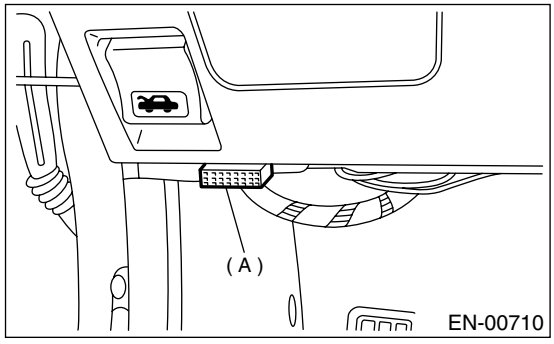
3. OBD-II GENERAL SCAN TOOL

1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data: <Ref. to EN(H4SO)-50, Clear Memory Mode.>
2) Warm up engine.
3) Connect test mode connector (A) at the lower side of the instrument panel (on the driver's side), to the side of the center console box.



4) Connect the OBD-II general scan tool to its data link connector (A) in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



5) Start the engine.

NOTE:
• Ensure the selector lever is placed in the “P” position before starting. (AT vehicles)
• Depress clutch pedal when starting the engine. (MT vehicles)

6) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.
7) Depress the brake pedal to turn the brake switch ON. (AT vehicles)
8) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
9) Place the selector lever or shift lever in the “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are 3 drive patterns for trouble diagnosis. Driving in the specified pattern allows to diagnose the malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) After performing diagnostics and cleaning the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)-50, Clear Memory Mode.>
3) Separate test mode connector.

NOTE:
• Except for water temperature specified items at starting, diagnosis is carried out after engine warm up.
• Carry out diagnosis which is marked * on DTC twice, Then, after finishing 1st diagnosis, stop engine and do the second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

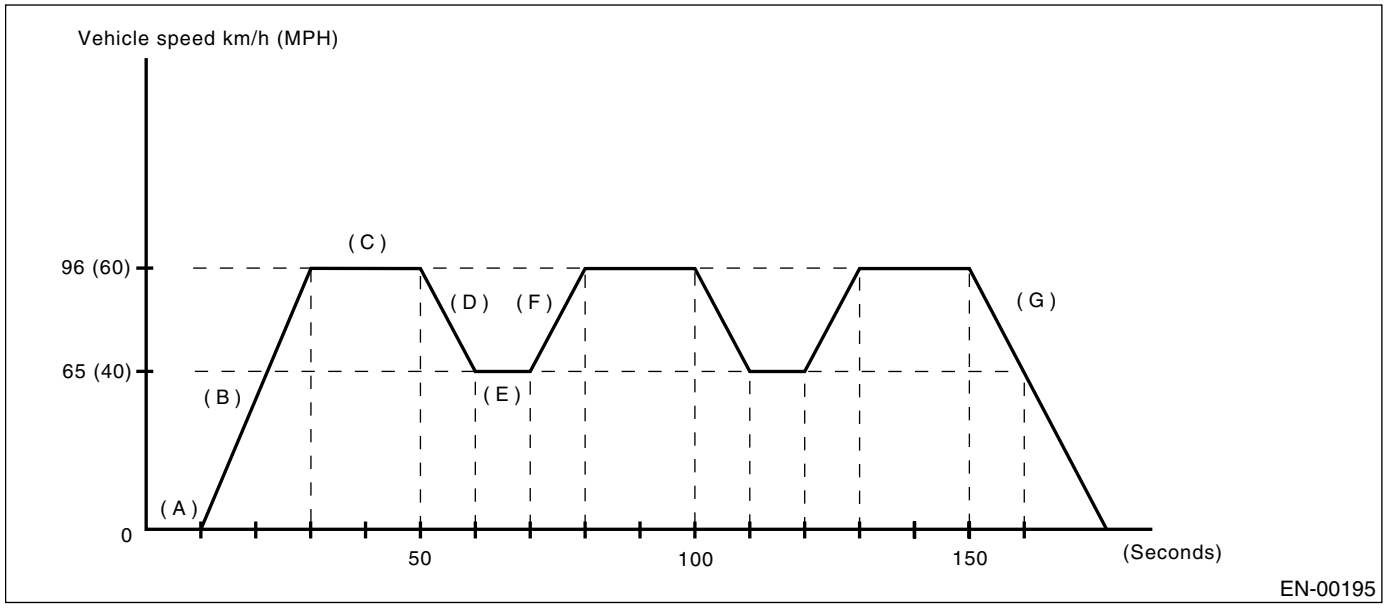
DTC No.	Item	Condition
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	—
*P0111	Intake air temperature circuit range/performance	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	Coolant temperature at start is less than 55°C (131°F).
*P0130	O2 Sensor circuit (Bank 1 Sensor 1)	—
*P0133	O2 Sensor circuit slow response (Bank 1 Sensor 1)	—
*P0181	Fuel temperature sensor “A” circuit range/performance	—
*P0420	Catalyst system efficiency below threshold (Bank 1)	—
*P0442	Evaporative emission control system leak detected (small leak)	—
*P0451	Evaporative emission control system pressure sensor range/performance	—
P0453	Evaporative emission control system pressure sensor high input	—
*P0456	Evaporative emission control system leak detected (very small leak)	—
*P0457	Evaporative emission control system leak detected (fuel cap loose/off)	—
*P0459	Evaporative emission control system purge control valve circuit high	—
*P0461	Fuel level sensor circuit range/performance	—
*P0464	Fuel level sensor circuit intermittent	—
*P1137	O2 Sensor circuit (Bank 1 Sensor 1)	—
P1443	Vent control solenoid valve function problem	—
*P1448	Fuel tank sensor control valve range/performance	—

3. IDLE FOR 10 MINUTES

NOTE:
Before diagnosis, drive vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan rationality check	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 1 minute.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC No.	Item	Condition
*P0065	Air assisted injector control range/performance	—
*P0121	Throttle/pedal position sensor/switch “A” circuit range/performance	—
*P0139	O2 Sensor circuit slow response (Bank 1 Sensor 2)	—
*P0171	System too lean (Bank 1)	—
*P0172	System too rich (Bank 1)	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P0400	Exhaust gas recirculation flow	—
*P2096	Post catalyst fuel trim system too lean bank 1	—
*P2097	Post catalyst fuel trim system too rich bank 1	—

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine. (AT vehicles only)
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the `Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

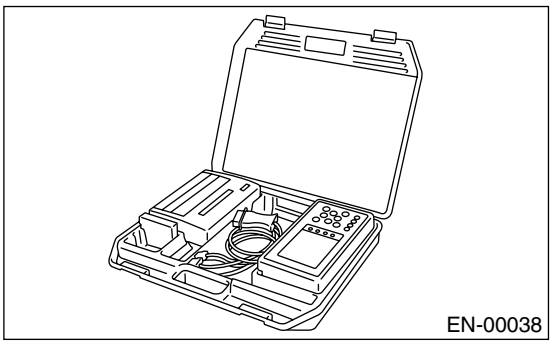
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.
After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.

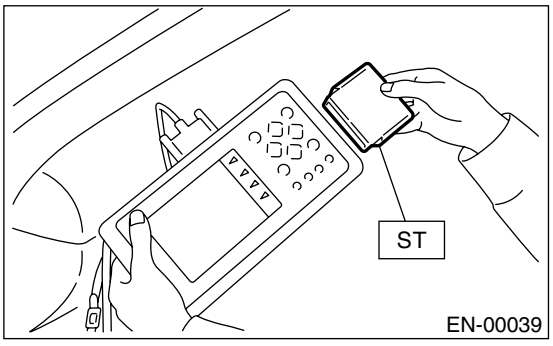
15.Compulsory Valve Operation Check Mode

A: OPERATION

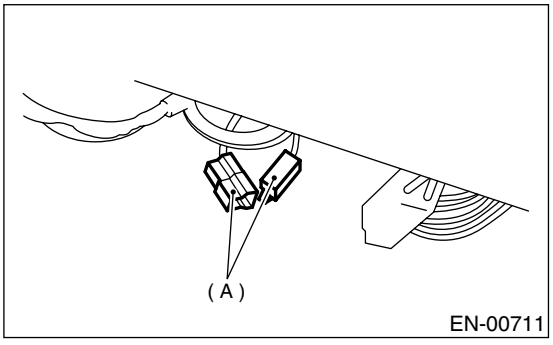
1) Prepare Subaru Select Monitor kit. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



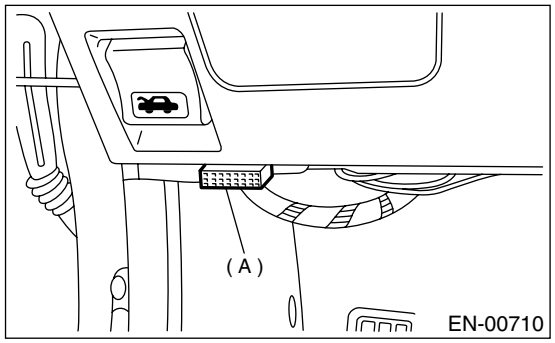
2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)-8, PREPARATION TOOL, General Description.>



4) Connect test mode connector (A) at the lower portion of instrument panel (on the driver's side), to the side of the center console box.



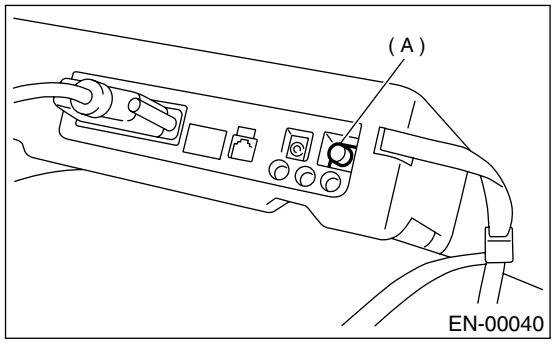
5) Connect Subaru Select Monitor to data link connector.
(1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory air assist injector solenoid valve operation check	AAI Solenoid Valve
Compulsory fuel tank pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent Control Solenoid Valve
Fuel tank sensor control valve operation check	Fuel Tank Sensor Control Valve

NOTE:

- The following parts will be displayed but not functional.

Display
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Turbo Pressure Control Solenoid
Exhaust Bypass Valve
EGR Valve Solenoid

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Engine Malfunction Indicator Lamp (MIL)

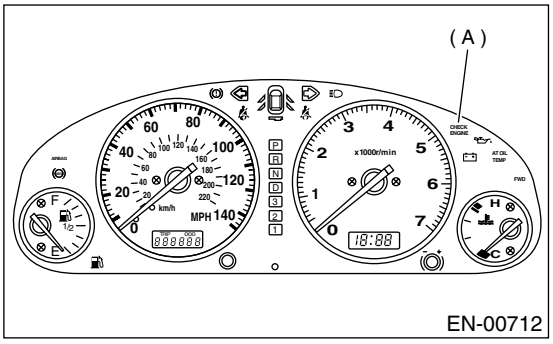
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(H4SO)-54, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(H4SO)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(H4SO)-58, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(H4SO)-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(H4SO)-62, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

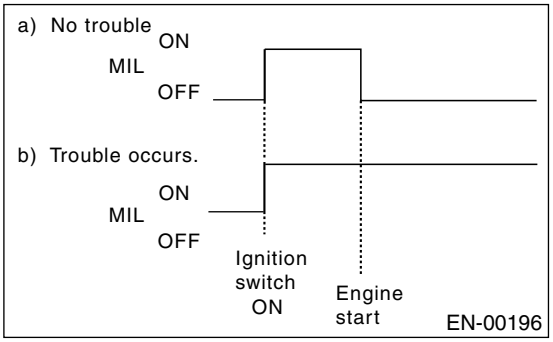
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H4SO)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>

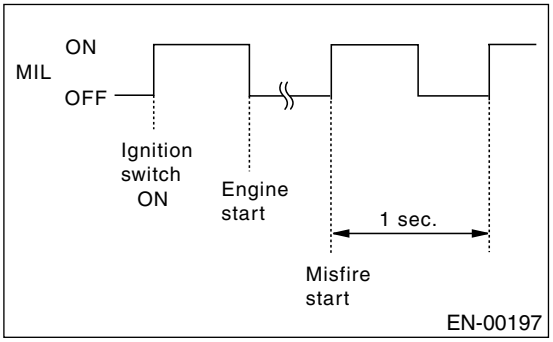


(A) Malfunction indicator lamp (MIL)

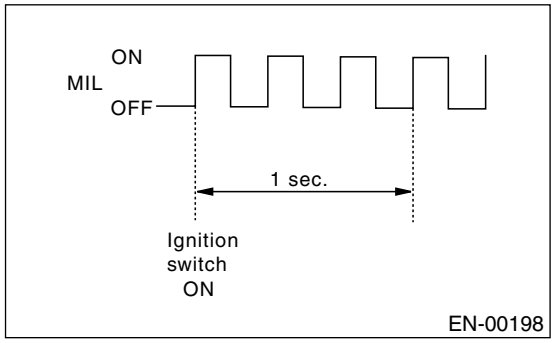
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.



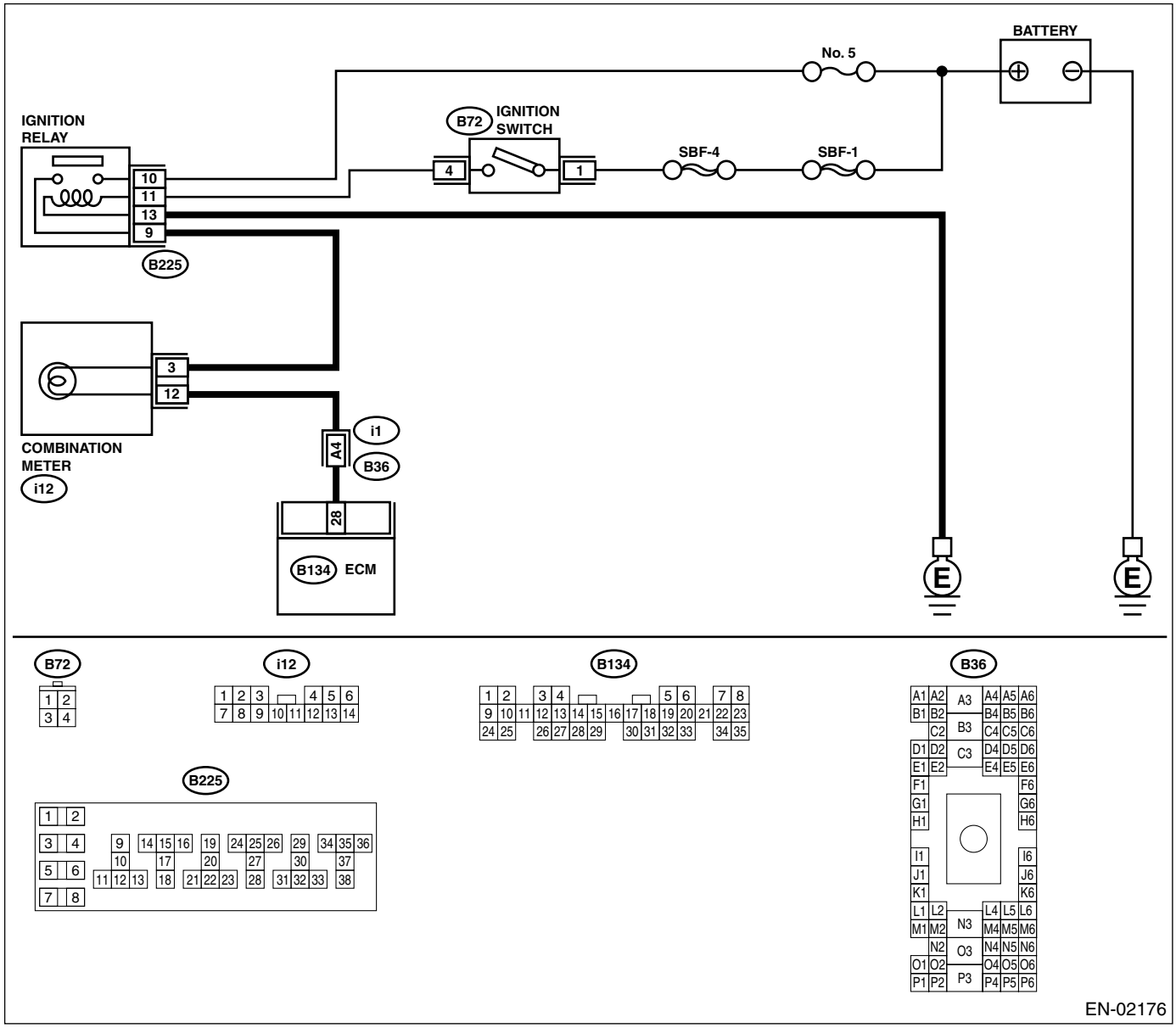
4) When ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



MEMO:

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
  - When ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**

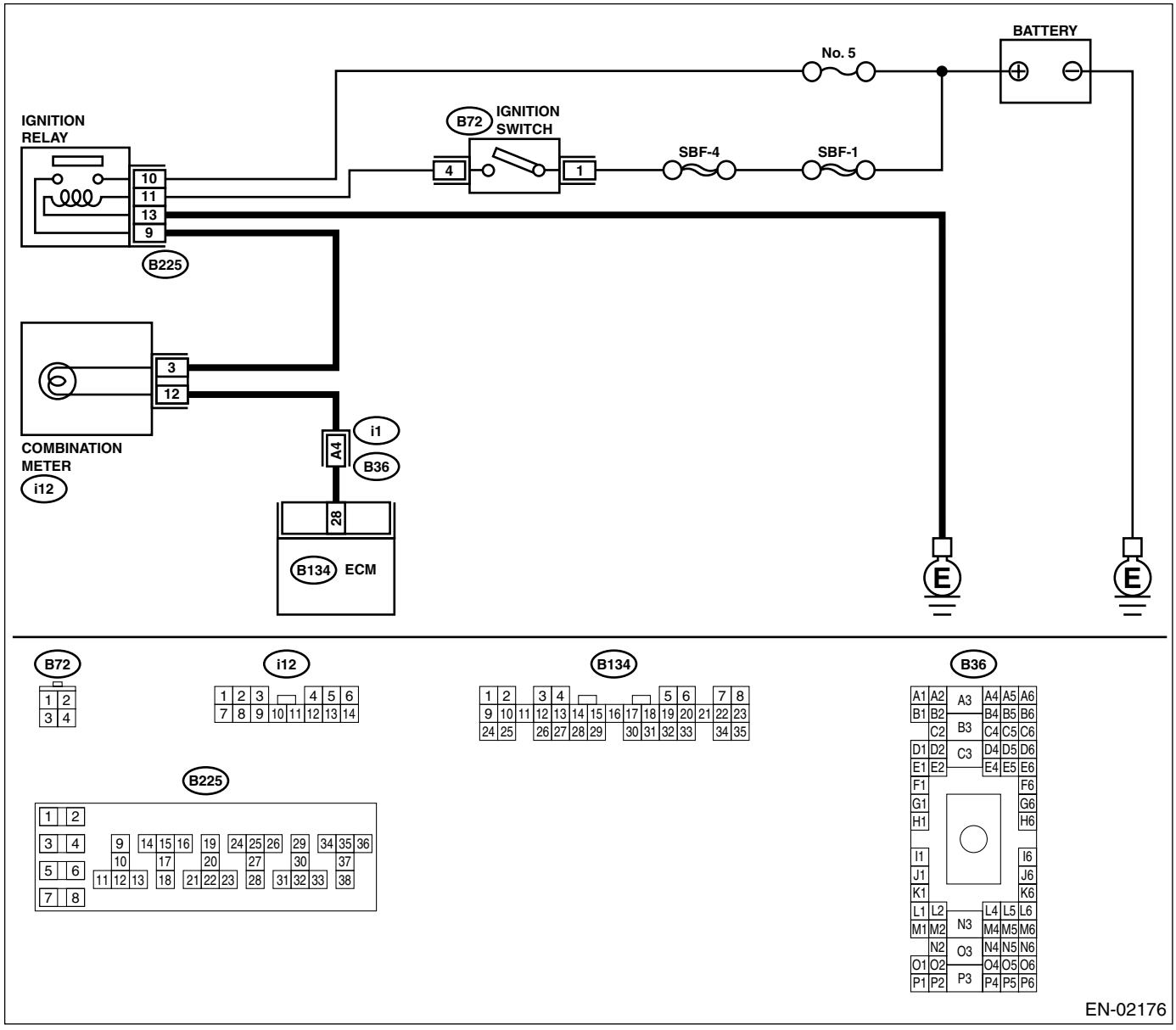


Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 28 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.**	Is ECM connector correctly connected?	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-13, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 28 — (i12) No. 12:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Check the following and repair if necessary. NOTE: • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7	**CHECK LAMP BULB.** Remove engine malfunction indicator lamp bulb.	Is lamp bulb condition OK?	Repair combination meter connector.	Replace lamp bulb.

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**

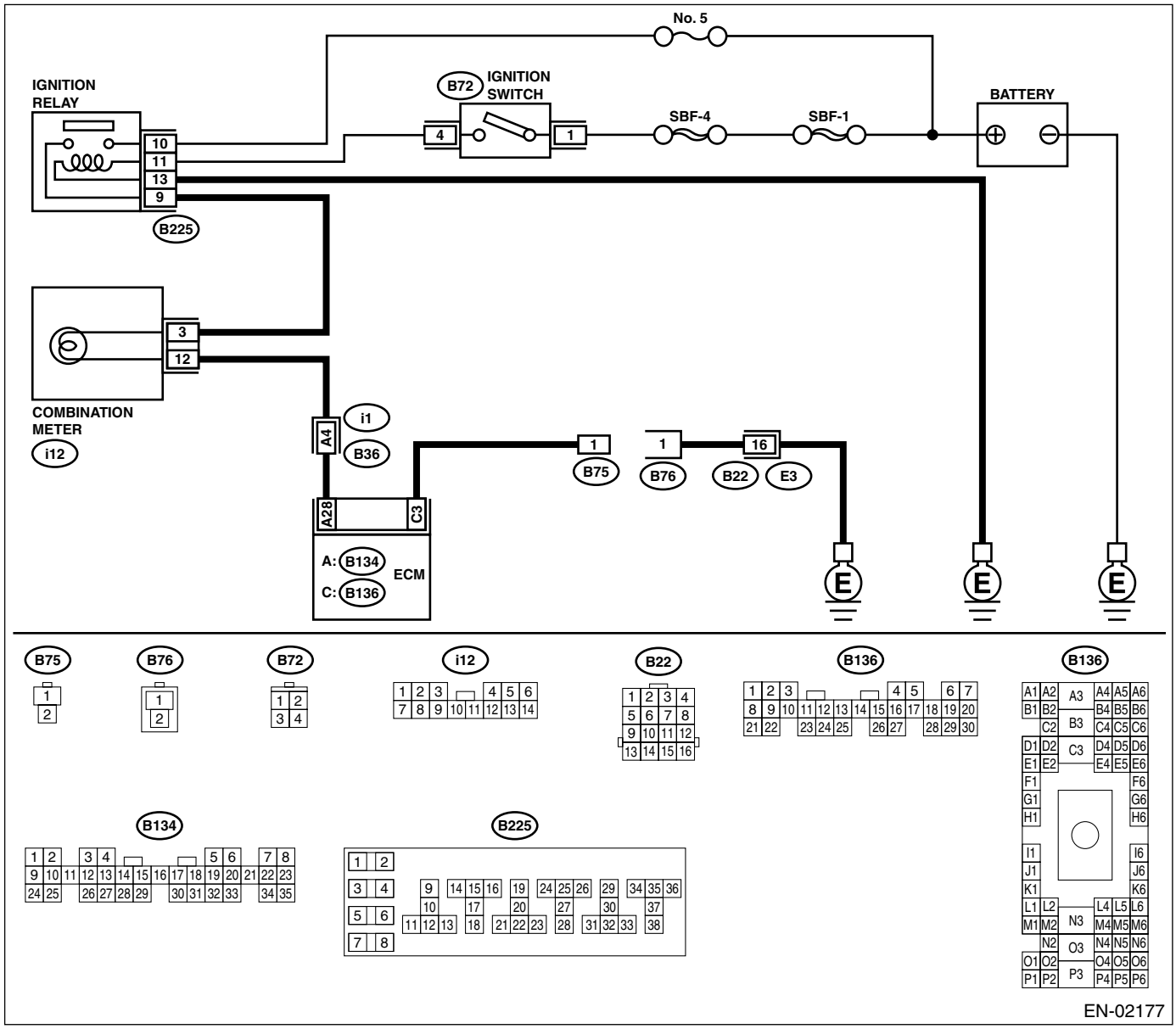


Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

MEMO:

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

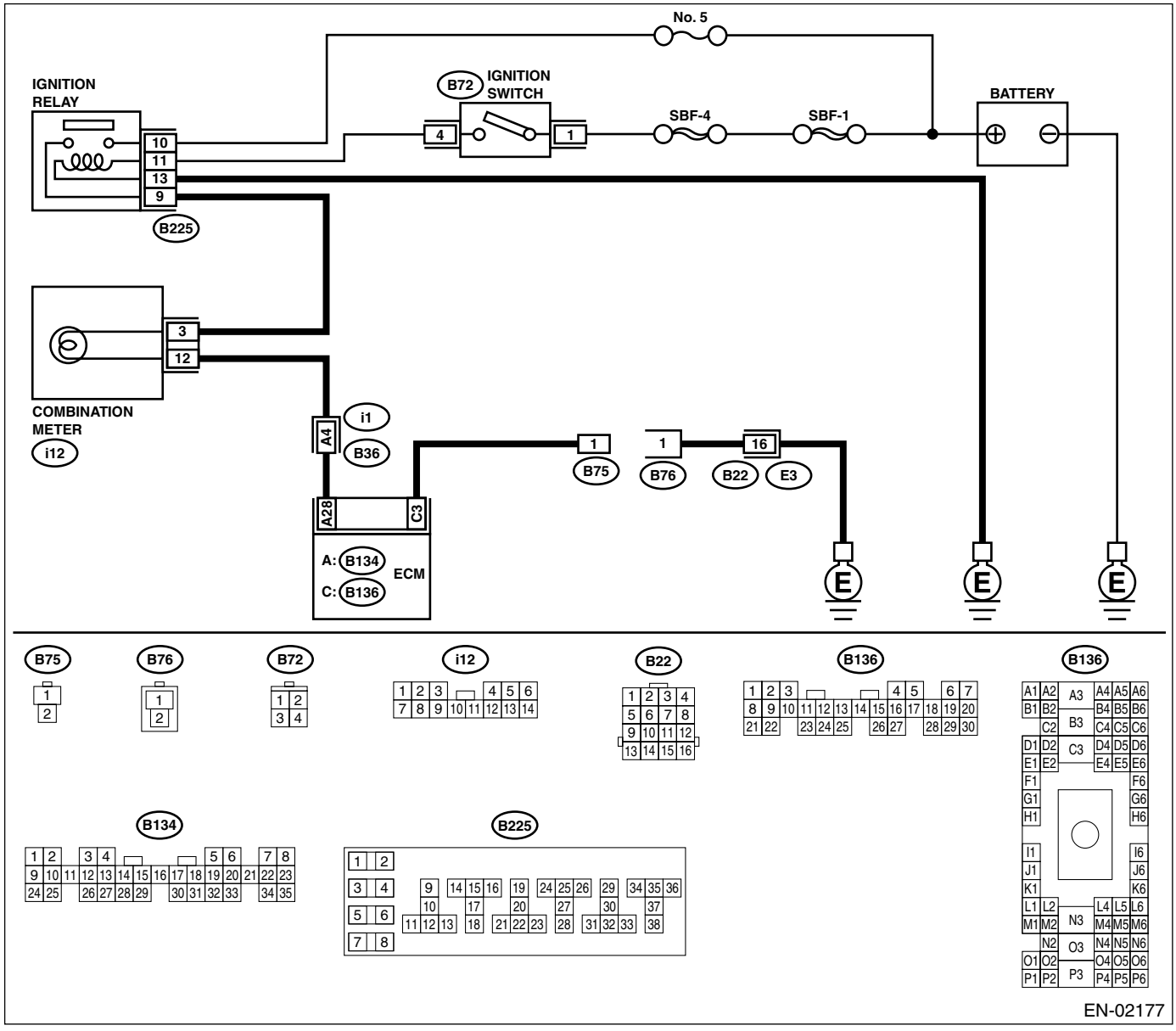
- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is in open.
- **TROUBLE SYMPTOM:**
  - When inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(H4SO)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect test mode connector. 2) Turn ignition switch to ON.	Does MIL flash on and off?	Go to step **2.**	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Repair short circuit in harness between ECM and test mode connector.

17.Diagnostics for Engine Starting Failure

A: Procedure

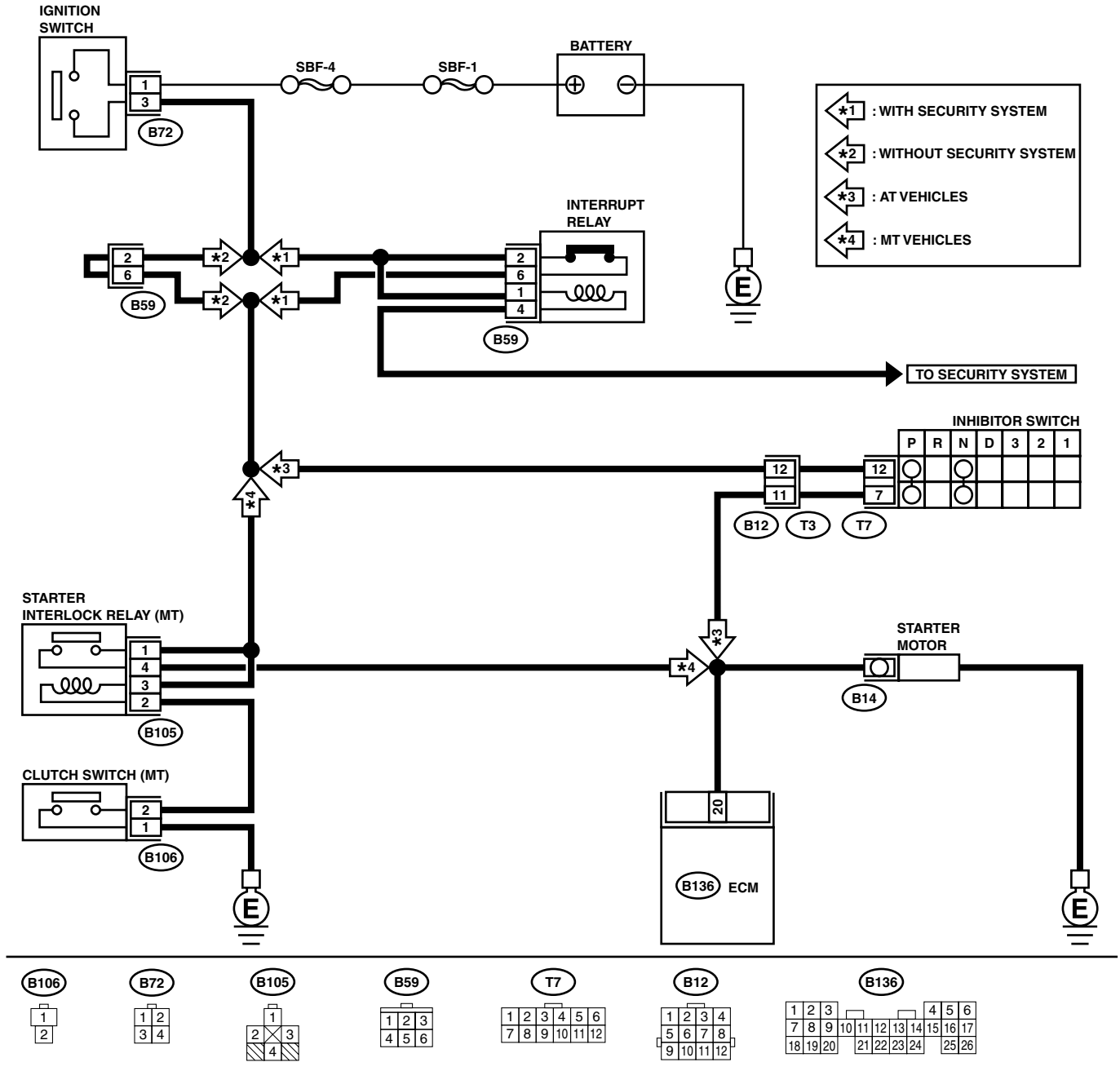
1. Inspection of starter motor circuit. <Ref. to EN(H4SO)-66, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO)-70, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4SO)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4SO)-78, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4SO)-82, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

MEMO:

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of malfunctioning parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)-50, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00715

	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operates, when turning the ignition switch START?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Repair poor contact in ECM connector.
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: •On AT vehicles, place the selector lever in the "P" or "N" position. •On MT vehicles, depress the clutch pedal.	Is the measured value more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the measured value less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. ***Terminals*** ***No. 1 — No. 3:***	Is the measured value less than 5 Ω?	Go to step **7.**	Replace the ignition switch.
7	**CHECK TRANSMISSION TYPE.**	Is the target AT vehicle?	Go to step **8.**	Go to step **10.**

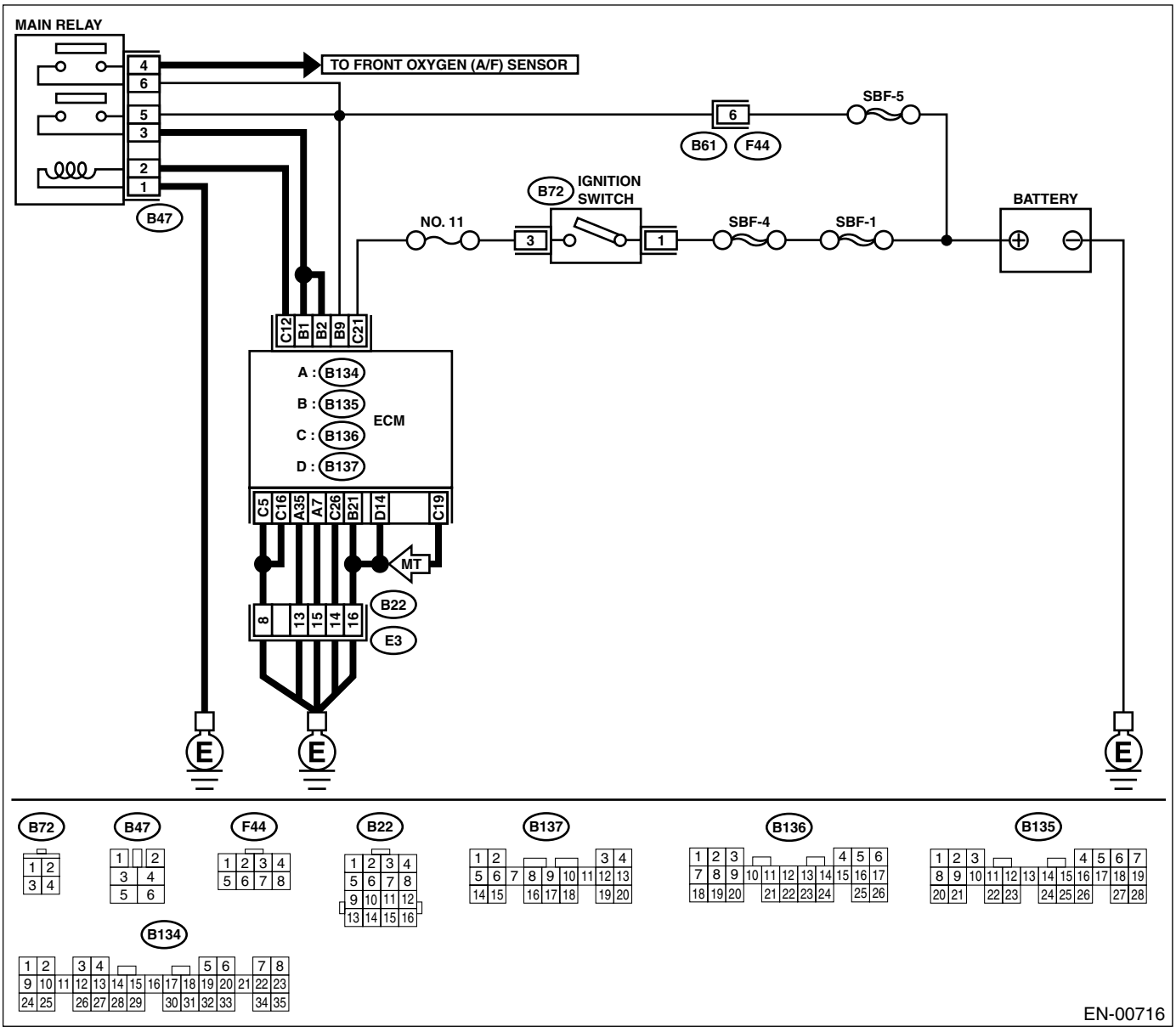
	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **9.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-25, INSPECTION, Security System.>
9	**CHECK INHIBITOR SWITCH.** 1) Place the selector lever in the “P” or “N” position. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the measured value less than 1 Ω?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-52, REMOVAL, Inhibitor Switch.>
10	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to ST. ***Connector & terminal*** ***(B225) No. 28 (+) — Chassis ground (–):*** ***(B225) No. 26 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **11.**	Repair open or ground short circuit in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-25, INSPECTION, Security System.>
11	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 27 — No. 28:***	Is the measured value less than 1 Ω?	Go to step **12.**	Replace the starter interlock relay.
12	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **13.**	Repair open circuit of ground cable.
13	**CHECK CLUTCH SWITCH.** 1) Measure the resistance between clutch switch terminal while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **14.**	Replace the clutch switch. <Ref. to CL-32, REMOVAL, Clutch Switch.>

	Step	Check	Yes	No
14	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B225) No. 24 — Chassis ground:***	Is the measured value less than 1 Ω?	Repair ground short circuit in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode. <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove main relay. 3) Connect battery to main relay terminals No. 1 and No. 2. 4) Measure resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the measured value less than 10 Ω?	Go to step **2.**	Replace main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 35 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 26— Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** ***(B136) No. 19 — Chassis ground (MT):***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 21(+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector.
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Replace ECM.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Repair open circuit in harness between ECM connector and main relay connector.

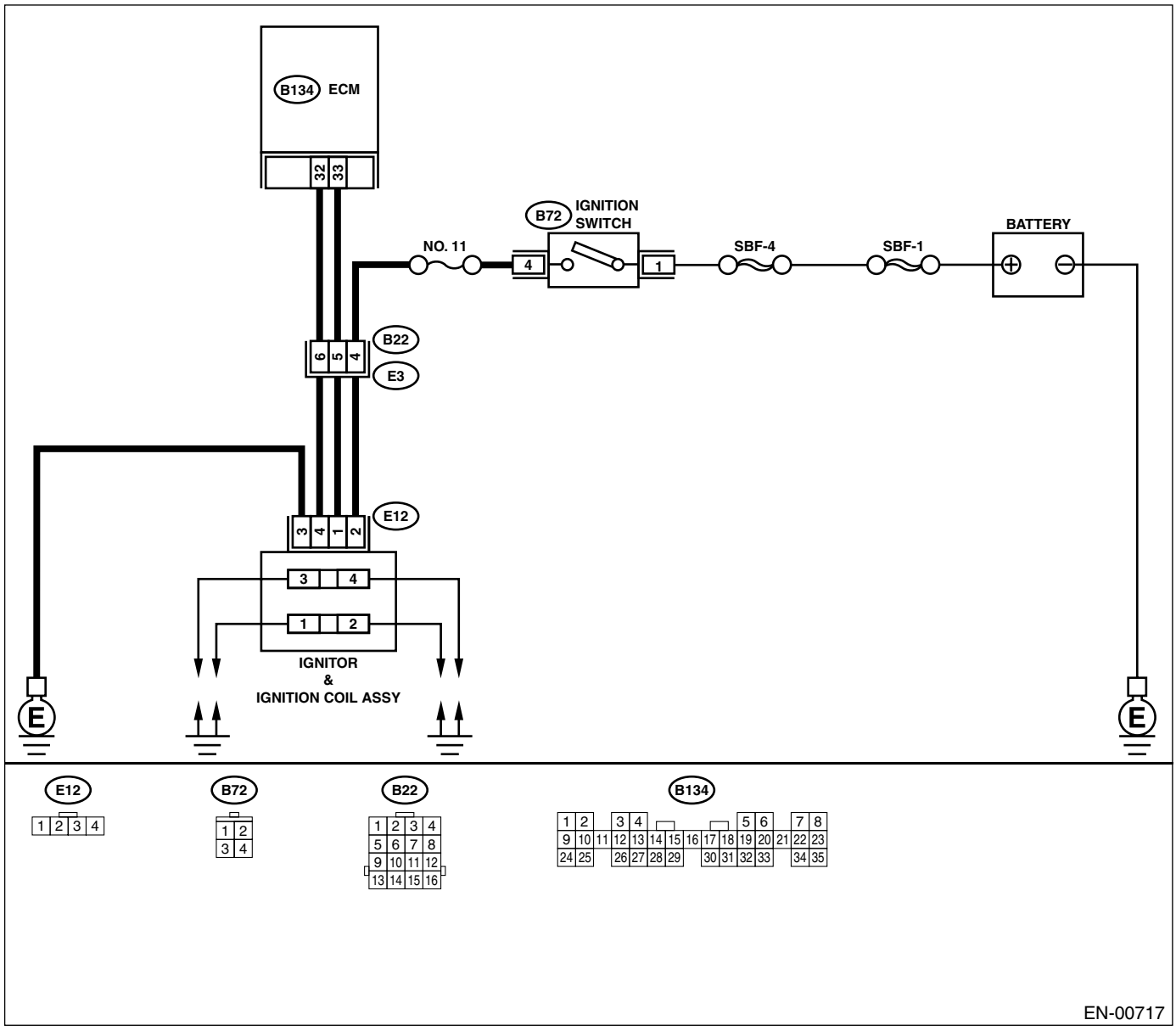
	Step	Check	Yes	No
8	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1) Turn ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.
10	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Check ignition control system. <Ref. to EN(H4SO)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

MEMO:

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4SO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4SO)-5, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.

	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Remove plug cord cap from each spark plug. 2) Install new spark plug on plug cord cap. **CAUTION:** **Do not remove spark plug from engine.** 3) Contact spark plug's thread portion on engine. 4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4SO)-78, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ignition coil & ignitor assembly. 3) Turn ignition switch to ON. 4) Measure power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E12) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn ignition switch to OFF. 2) Measure resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E12) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5	**CHECK IGNITION COIL & IGNITOR ASSEMBLY.** 1) Remove spark plug cords. 2) Measure resistance between spark plug cord contact portions to check secondary coil. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 4:***	Is the measured value within 10 to 15 kΩ?	Go to step **6.**	Replace ignition coil & ignitor assembly. <Ref. to IG(H4SO)-7, Ignition Coil and Ignitor Assembly.>
6	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Connect connector to ignition coil & ignitor assembly. 2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E12) No. 1 (+) — Engine ground (–):*** ***(E12) No. 4 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Replace ignition coil & ignitor assembly. <Ref. to IG(H4SO)-7, Ignition Coil and Ignitor Assembly.>

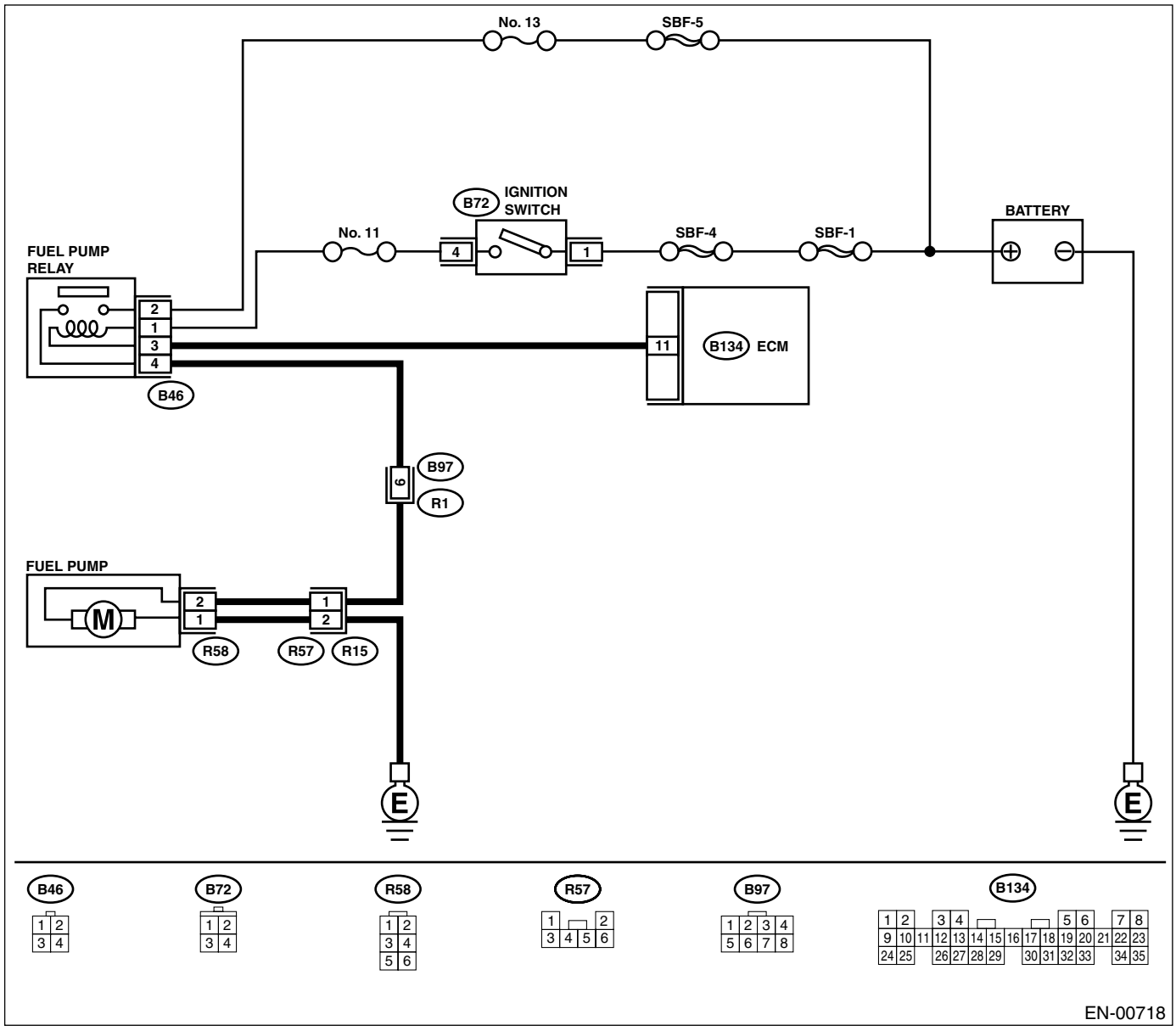
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Disconnect connector from ignition coil & ignitor assembly. 4) Measure resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B134) No. 33 — (E12) No. 1:*** ***(B134) No. 32 — (E12) No. 4:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B134) No. 32 — Engine ground:*** ***(B134) No. 33 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
9	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4SO)-78, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

MEMO:

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



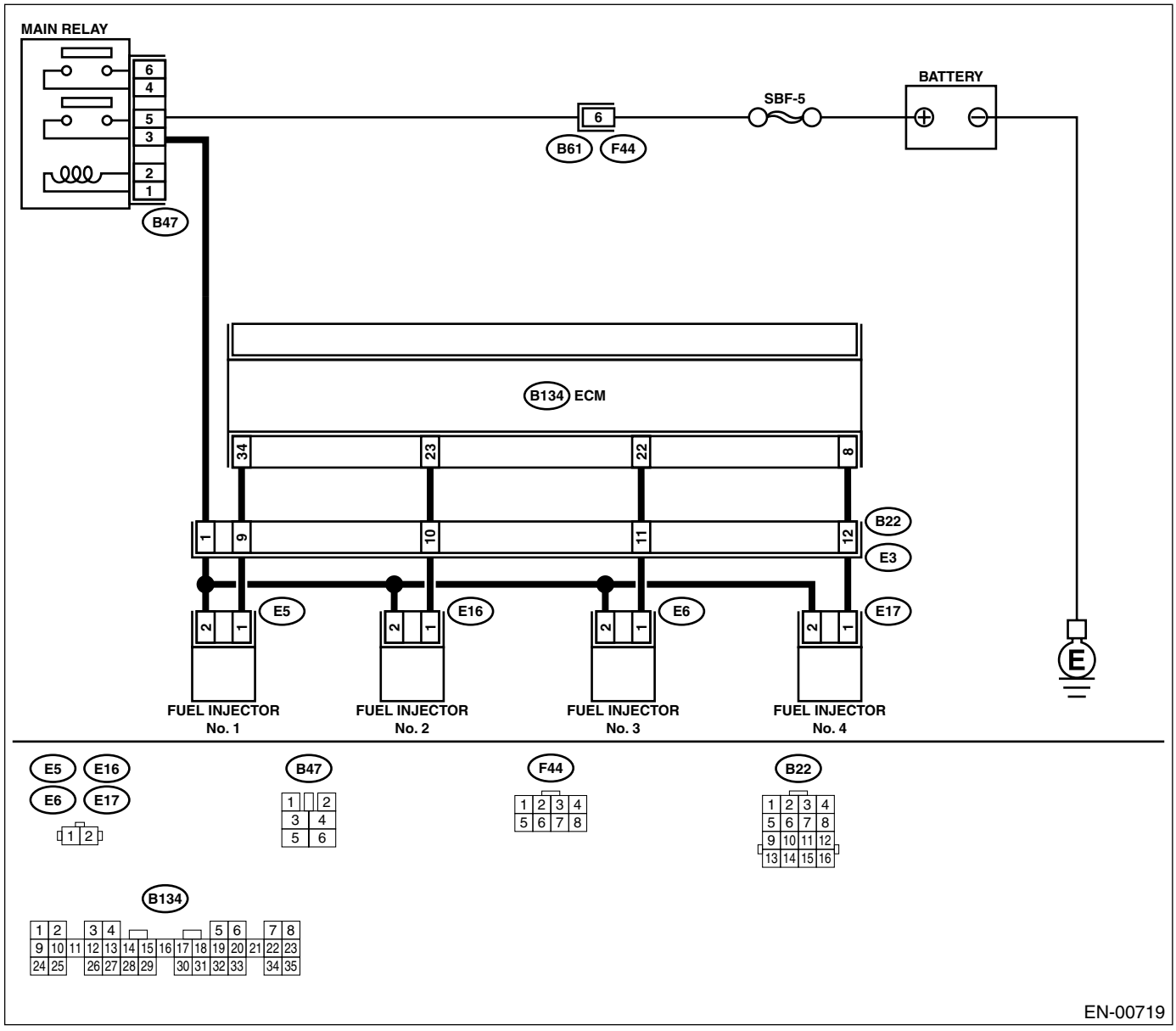
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(H4SO)-82, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1) Turn ignition switch to OFF. 2) Remove fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon). 3) Disconnect connector from fuel pump. 4) Measure resistance of harness connector between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
3	**CHECK POWER SUPPLY TO FUEL PUMP.** 1) Turn ignition switch to ON. 2) Measure voltage of power supply circuit between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace fuel pump. <Ref. to FU(H4SO)-66, Fuel Pump.>	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness connector between fuel pump and fuel pump relay. ***Connector & terminal*** ***(R58) No. 2 — (B46) No. 4:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure resistance of harness between fuel pump and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between fuel pump and fuel pump relay connector.

	Step	Check	Yes	No
6	**CHECK FUEL PUMP RELAY.** 1) Disconnect connectors from fuel pump relay and main relay. 2) Remove fuel pump relay and main relay with bracket. 3) Connect battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure resistance between connector terminals of fuel pump relay. ***Terminals*** ***No. 2 — No. 4:***	Is the measured value less than 10 Ω?	Go to step **7.**	Replace fuel pump relay. <Ref. to FU(H4SO)-47, Fuel Pump Relay.>
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1) Disconnect connectors from ECM. 2) Measure resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal*** ***(B134) No. 11 — (B46) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and fuel pump relay connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(H4SO)-82, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

MEMO:

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only malfunctioning parts.**
- **After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode. <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.>**
- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector produce “operating” sound?	Check fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect connector from ECM and fuel injector. 2) Measure resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 34 — (E5) No. 1:*** ***(B134) No. 23 — (E16) No. 1:*** ***(B134) No. 22 — (E6) No. 1:*** ***(B134) No. 8 — (E17) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 34 — Chassis ground:*** ***(B134) No. 23 — Chassis ground:*** ***(B134) No. 22 — Chassis ground:*** ***(B134) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4SO)-367, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-92, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-94, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-98, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-100, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-104, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0065	Air assisted injector control range/performance	<Ref. to EN(H4SO)-106, DTC P0065 — AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0066	Air assisted injector control circuit or circuit low	<Ref. to EN(H4SO)-108, DTC P0066 — AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0067	Air assisted injector control circuit high	<Ref. to EN(H4SO)-110, DTC P0067 — AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold absolute pressure/barometric pressure circuit range/performance	<Ref. to EN(H4SO)-112, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold absolute pressure/barometric pressure circuit low input	<Ref. to EN(H4SO)-114, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold absolute pressure/barometric pressure circuit high input	<Ref. to EN(H4SO)-118, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature circuit range/performance	<Ref. to EN(H4SO)-122, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature circuit low input	<Ref. to EN(H4SO)-124, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature circuit high input	<Ref. to EN(H4SO)-126, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature circuit low input	<Ref. to EN(H4SO)-130, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature circuit high input	<Ref. to EN(H4SO)-132, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0121	Throttle/pedal position sensor/switch “A” circuit range/performance	<Ref. to EN(H4SO)-136, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/pedal position sensor/switch “A” circuit low input	<Ref. to EN(H4SO)-138, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/pedal position sensor/switch “A” circuit high input	<Ref. to EN(H4SO)-142, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(H4SO)-144, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	<Ref. to EN(H4SO)-146, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Barometric pressure too low	<Ref. to EN(H4SO)-147, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-148, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 sensor circuit low voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-152, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 sensor circuit high voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-154, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-156, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-158, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-160, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-162, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	<Ref. to EN(H4SO)-166, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too lean (Bank 1)	<Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too rich (Bank 1)	<Ref. to EN(H4SO)-168, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel temperature sensor “A” circuit range/performance	<Ref. to EN(H4SO)-172, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel temperature sensor “A” circuit low input	<Ref. to EN(H4SO)-174, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0183	Fuel temperature Sensor “A” circuit high input	<Ref. to EN(H4SO)-176, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H4SO)-179, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H4SO)-179, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H4SO)-179, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H4SO)-180, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor 1 circuit low input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-188, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor 1 circuit high input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-190, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor “A” circuit	<Ref. to EN(H4SO)-192, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor “A” circuit range/performance	<Ref. to EN(H4SO)-194, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-196, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)-198, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust gas recirculation flow	<Ref. to EN(H4SO)-202, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst system efficiency below threshold (Bank 1)	<Ref. to EN(H4SO)-206, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative emission control system leak detected (small leak)	<Ref. to EN(H4SO)-209, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative emission control system vent control circuit open	<Ref. to EN(H4SO)-214, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative emission control system vent control circuit shorted	<Ref. to EN(H4SO)-218, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative emission control system pressure sensor range/performance	<Ref. to EN(H4SO)-220, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0452	Evaporative emission control system pressure sensor low input	<Ref. to EN(H4SO)-222, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative emission control system pressure sensor high input	<Ref. to EN(H4SO)-226, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative emission control system leak detected (very small leak)	<Ref. to EN(H4SO)-229, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative emission control system leak detected (fuel cap loose/off)	<Ref. to EN(H4SO)-233, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low	<Ref. to EN(H4SO)-238, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high	<Ref. to EN(H4SO)-242, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance	<Ref. to EN(H4SO)-244, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(H4SO)-246, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(H4SO)-250, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor circuit intermittent	<Ref. to EN(H4SO)-254, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan rationality check	<Ref. to EN(H4SO)-257, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle speed sensor circuit low input	<Ref. to EN(H4SO)-260, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle speed sensor intermittent/erratic/high	<Ref. to EN(H4SO)-260, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(H4SO)-262, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle control system RPM higher than expected	<Ref. to EN(H4SO)-264, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter request circuit	<Ref. to EN(H4SO)-266, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle air control circuit system performance	<Ref. to EN(H4SO)-268, DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0565	Cruise control on signal	<Ref. to EN(H4SO)-270, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal control module random access memory (RAM) error	<Ref. to EN(H4SO)-272, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling fan 1 control circuit low	<Ref. to EN(H4SO)-275, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling fan 1 control circuit high	<Ref. to EN(H4SO)-279, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque converter/brake switch “B” circuit	<Ref. to EN(H4SO)-282, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit (PRNDL Input)	<Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit	<Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Input/turbine speed sensor circuit range/performance	<Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor circuit	<Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine speed input circuit range/performance	<Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(H4SO)-284, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(H4SO)-284, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(H4SO)-284, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(H4SO)-285, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch circuit performance or stuck off	<Ref. to EN(H4SO)-286, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch circuit electrical	<Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid “A” electrical	<Ref. to 4AT(H4SO)-102, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid “A” electrical	<Ref. to 4AT(H4SO)-86, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid “B” electrical	<Ref. to 4AT(H4SO)-90, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0771	Shift solenoid “E” performance or stuck off	<Ref. to 4AT(H4SO)-94, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure control solenoid “B” electrical	<Ref. to 4AT(H4SO)-108, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/timing solenoid	<Ref. to 4AT(H4SO)-108, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral switch input circuit low	<Ref. to EN(H4SO)-288, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to EN(H4SO)-290, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral switch input circuit high	<Ref. to EN(H4SO)-292, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and<Ref. to EN(H4SO)-296, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM communication circuit range/performance	<Ref. to EN(H4SO)-300, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM communication circuit low	<Ref. to EN(H4SO)-302, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM communication circuit high	<Ref. to EN(H4SO)-304, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit malfunction (low input)	<Ref. to EN(H4SO)-147, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit malfunction (high input)	<Ref. to EN(H4SO)-306, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F sensor micro-computer problem	<Ref. to EN(H4SO)-307, DTC P1134 — A/F SENSOR MICROCOMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1137	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)-310, DTC P1137 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel tank pressure control solenoid valve circuit low	<Ref. to EN(H4SO)-314, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel tank pressure control solenoid valve circuit high	<Ref. to EN(H4SO)-318, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent control solenoid valve function problem	<Ref. to EN(H4SO)-320, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel tank sensor control valve circuit low	<Ref. to EN(H4SO)-322, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1447	Fuel tank sensor control valve circuit high	<Ref. to EN(H4SO)-326, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel tank sensor control valve range/performance	<Ref. to EN(H4SO)-328, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR solenoid valve signal #1 circuit malfunction (low input)	<Ref. to EN(H4SO)-330, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR solenoid valve signal #1 circuit malfunction (high input)	<Ref. to EN(H4SO)-330, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR solenoid valve signal #2 circuit malfunction (low input)	<Ref. to EN(H4SO)-330, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR solenoid valve signal #2 circuit malfunction (high input)	<Ref. to EN(H4SO)-330, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR solenoid valve signal #3 circuit malfunction (low input)	<Ref. to EN(H4SO)-330, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)— , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR solenoid valve signal #3 circuit malfunction (high input)	<Ref. to EN(H4SO)-330, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR solenoid valve signal #4 circuit malfunction (low input)	<Ref. to EN(H4SO)-332, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR solenoid valve signal #4 circuit malfunction (high input)	<Ref. to EN(H4SO)-334, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	ISC solenoid valve signal #1 circuit malfunction (low input)	<Ref. to EN(H4SO)-260, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	ISC solenoid valve signal #1 circuit malfunction (high input)	<Ref. to EN(H4SO)-336, DTC P1511 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	ISC solenoid valve signal #2 circuit malfunction (low input)	<Ref. to EN(H4SO)-336, DTC P1512 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	ISC solenoid valve signal #2 circuit malfunction (high input)	<Ref. to EN(H4SO)-336, DTC P1513 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	ISC solenoid valve signal #3 circuit malfunction (low input)	<Ref. to EN(H4SO)-336, DTC P1514 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1515	ISC solenoid valve signal #3 circuit malfunction (high input)	<Ref. to EN(H4SO)-336, DTC P1515 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	ISC solenoid valve signal #4 circuit malfunction (low input)	<Ref. to EN(H4SO)-338, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	ISC solenoid valve signal #4 circuit malfunction (high input)	<Ref. to EN(H4SO)-340, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(H4SO)-343, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(H4SO)-346, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit malfunction (low input)	<Ref. to EN(H4SO)-348, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit malfunction (high input)	<Ref. to EN(H4SO)-350, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for AT	<Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal #1 circuit malfunction	<Ref. to EN(H4SO)-352, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine torque control signal #2 circuit malfunction	<Ref. to EN(H4SO)-354, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post catalyst fuel trim system too lean bank 1	<Ref. to EN(H4SO)-356, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post catalyst fuel trim system too rich bank 1	<Ref. to EN(H4SO)-362, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

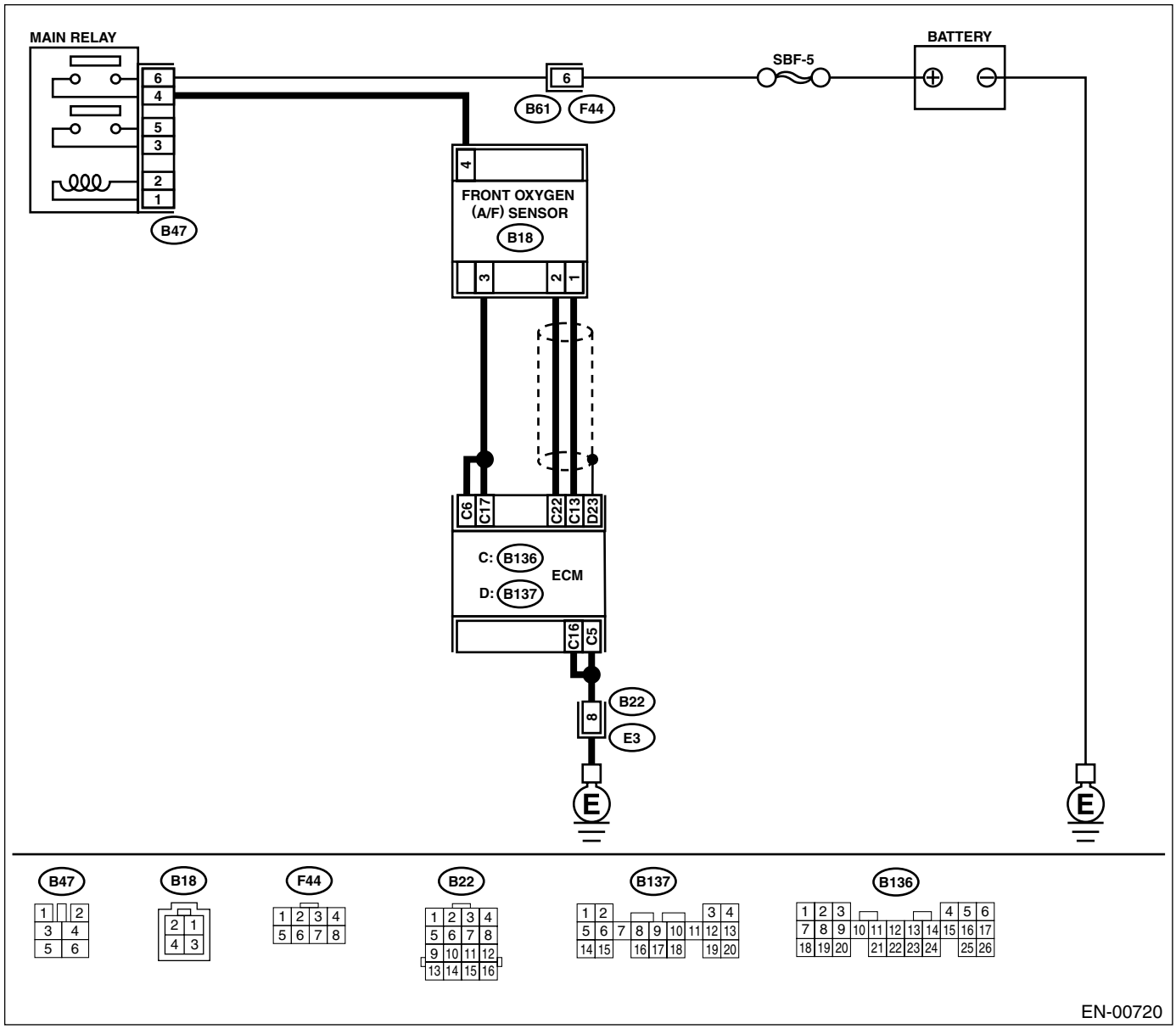
19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



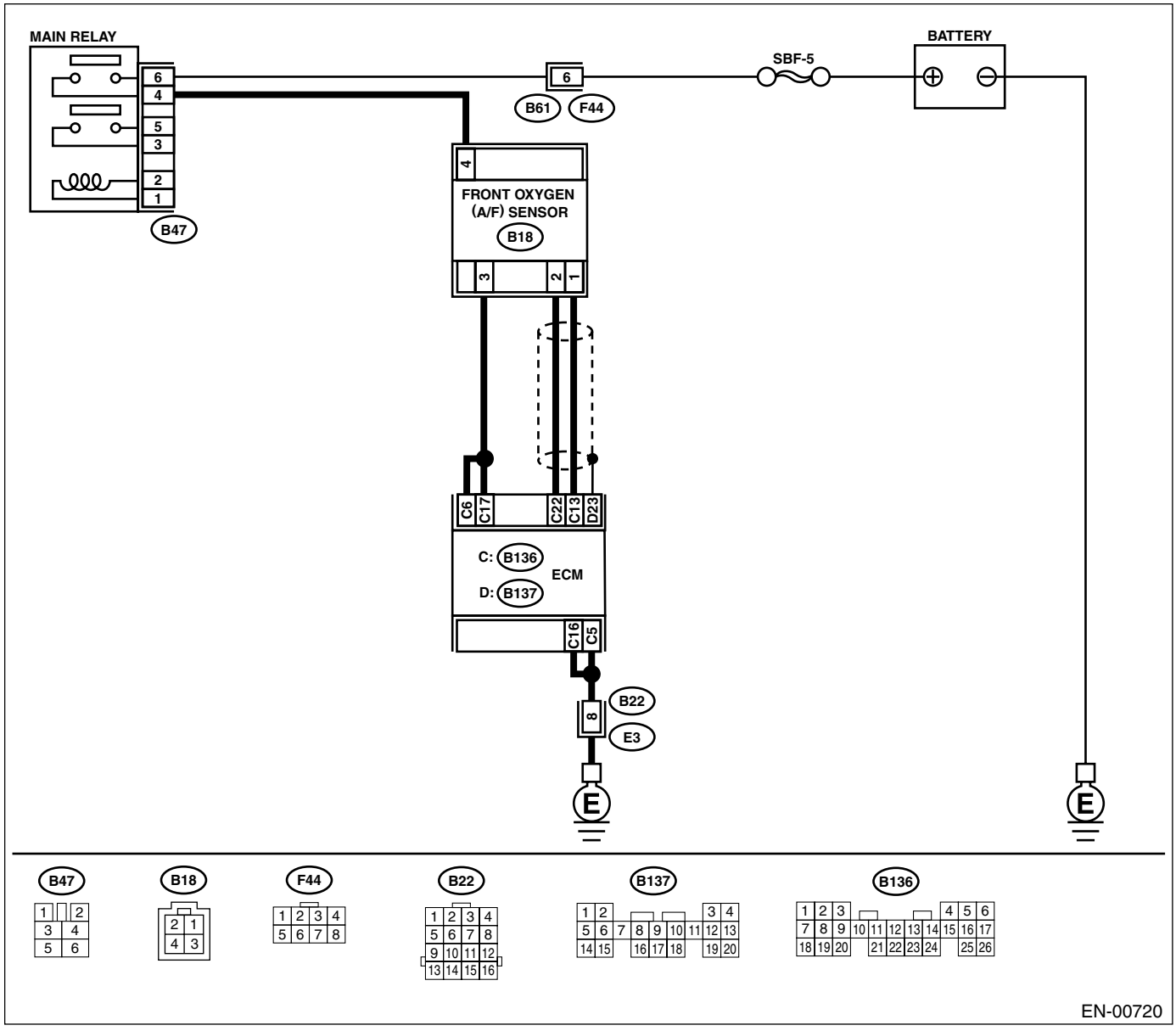
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm-up engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure harness resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 6 - (B18) No. 3:*** ***(B136) No. 17 - (B18) No. 3:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair open circuit between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure harness resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 - (B18) No. 1:*** ***(B136) No. 22 - (B18) No. 2:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair open circuit between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure harness resistance between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure resistance between terminals in front oxygen (A/F) sensor connector. ***Terminal*** ***No.3 - No.4:***	Is the measured value less than 5 Ω?	Go to step **5.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check ECM and front oxygen (A/F) sensor connector for poor contact.	Is there any poor contact in ECM and front oxygen (A/F) sensor connector.	Repair poor contact in ECM and front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1132 and P0141 at the same time?	Go to step **2.**	Go to step **5.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 4 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3	**CHECK GROUND CIRCUIT OF ECM.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector Poor contact in coupling connector
4	**CHECK CURRENT DATA.** 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Go to step **7.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3— No. 4:***	Is the measured value less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>

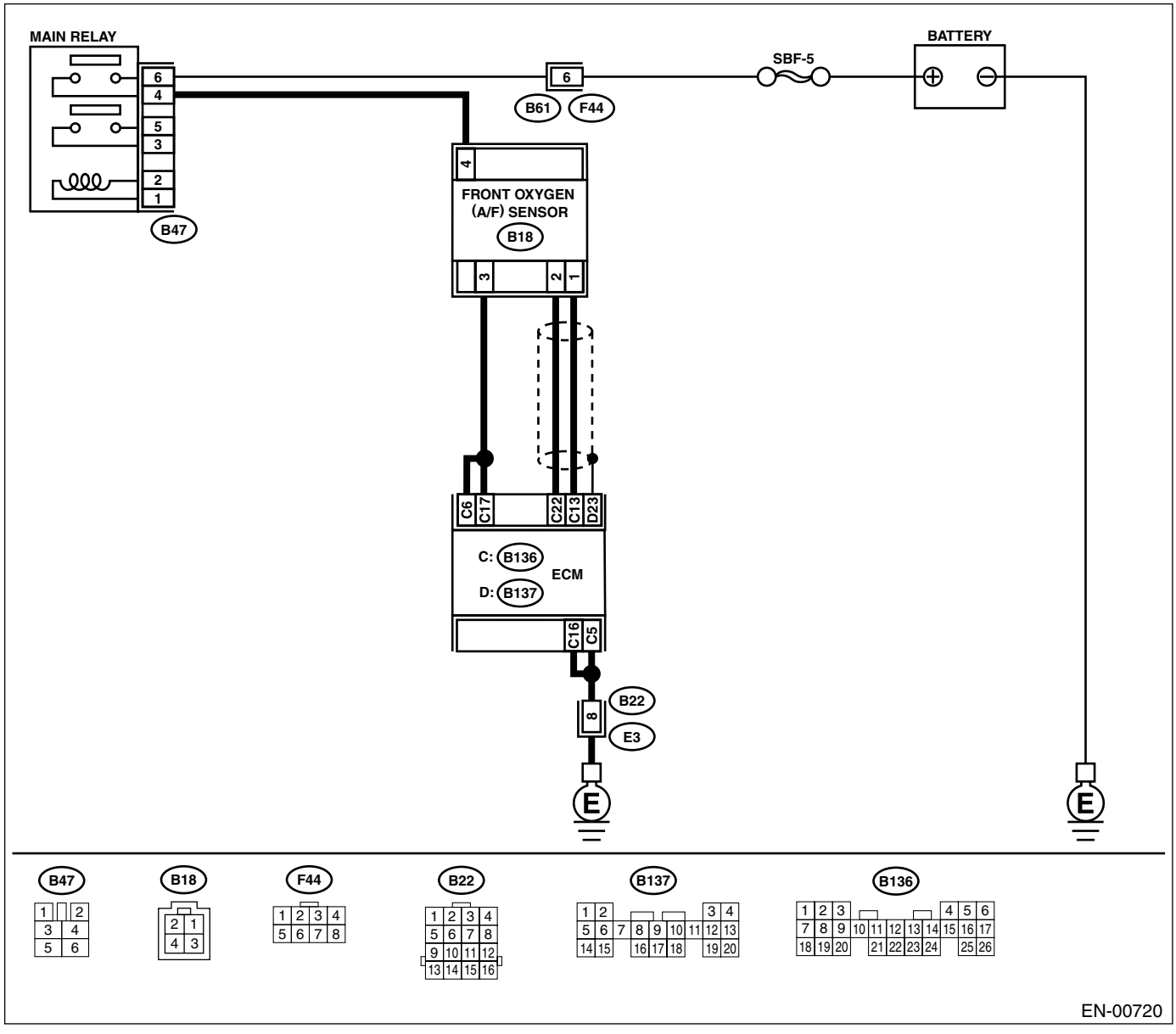
MEMO:

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



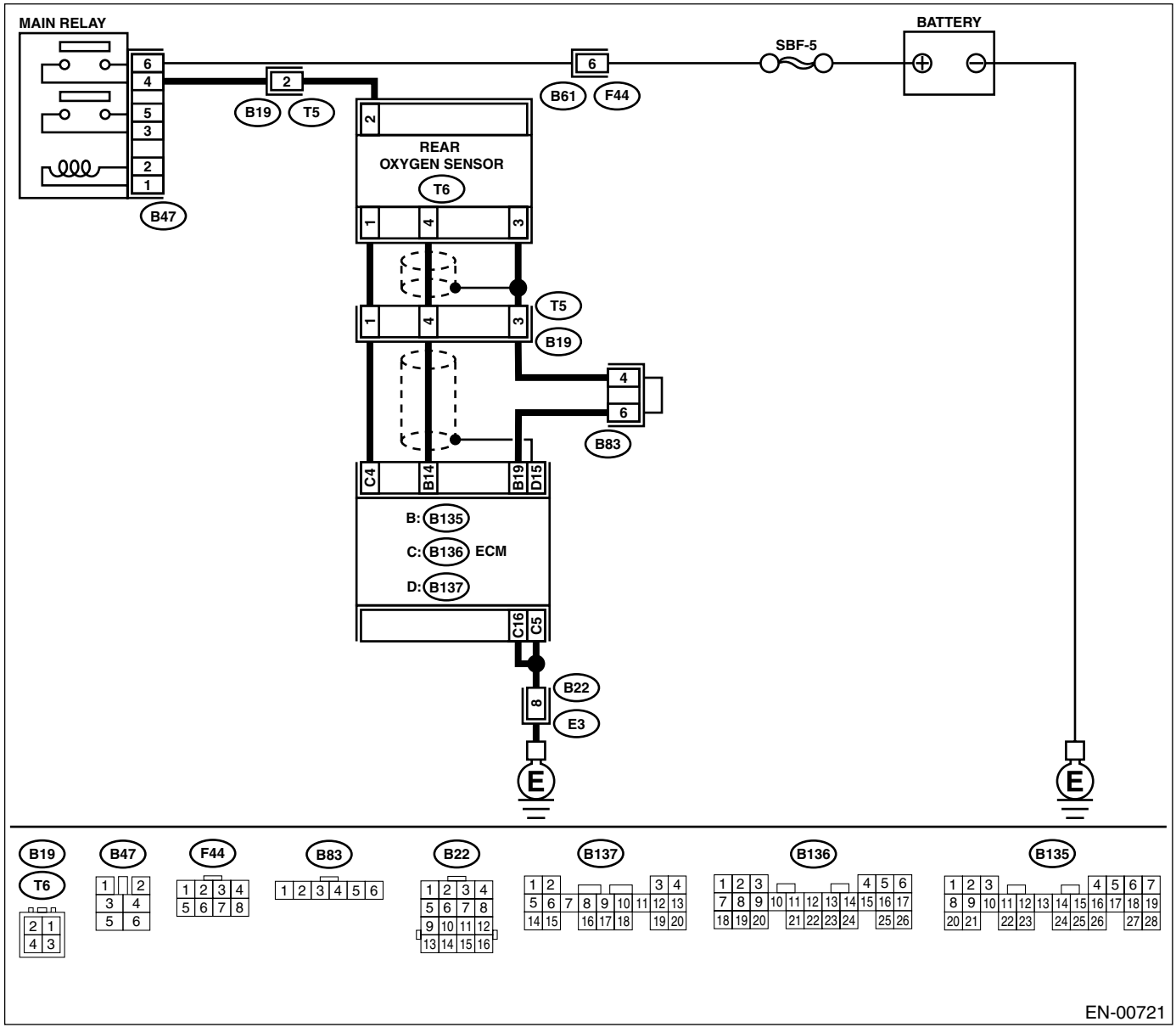
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.3 A?	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value more than 8 V when shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect connector from rear oxygen sensor. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace rear oxygen sensor. <Ref. to FU(H4SO)-44, Rear Oxygen Sensor.>

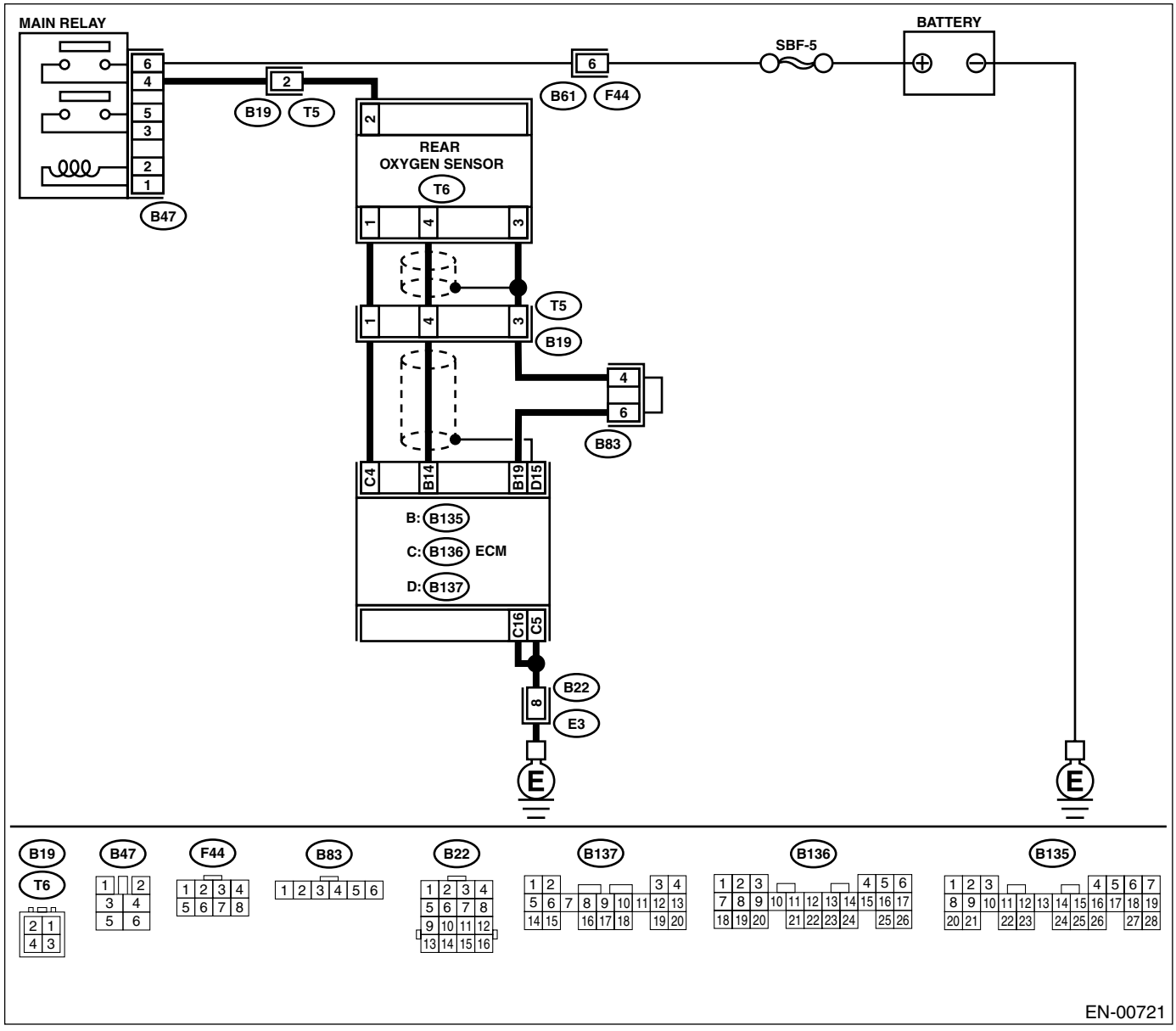
MEMO:

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**

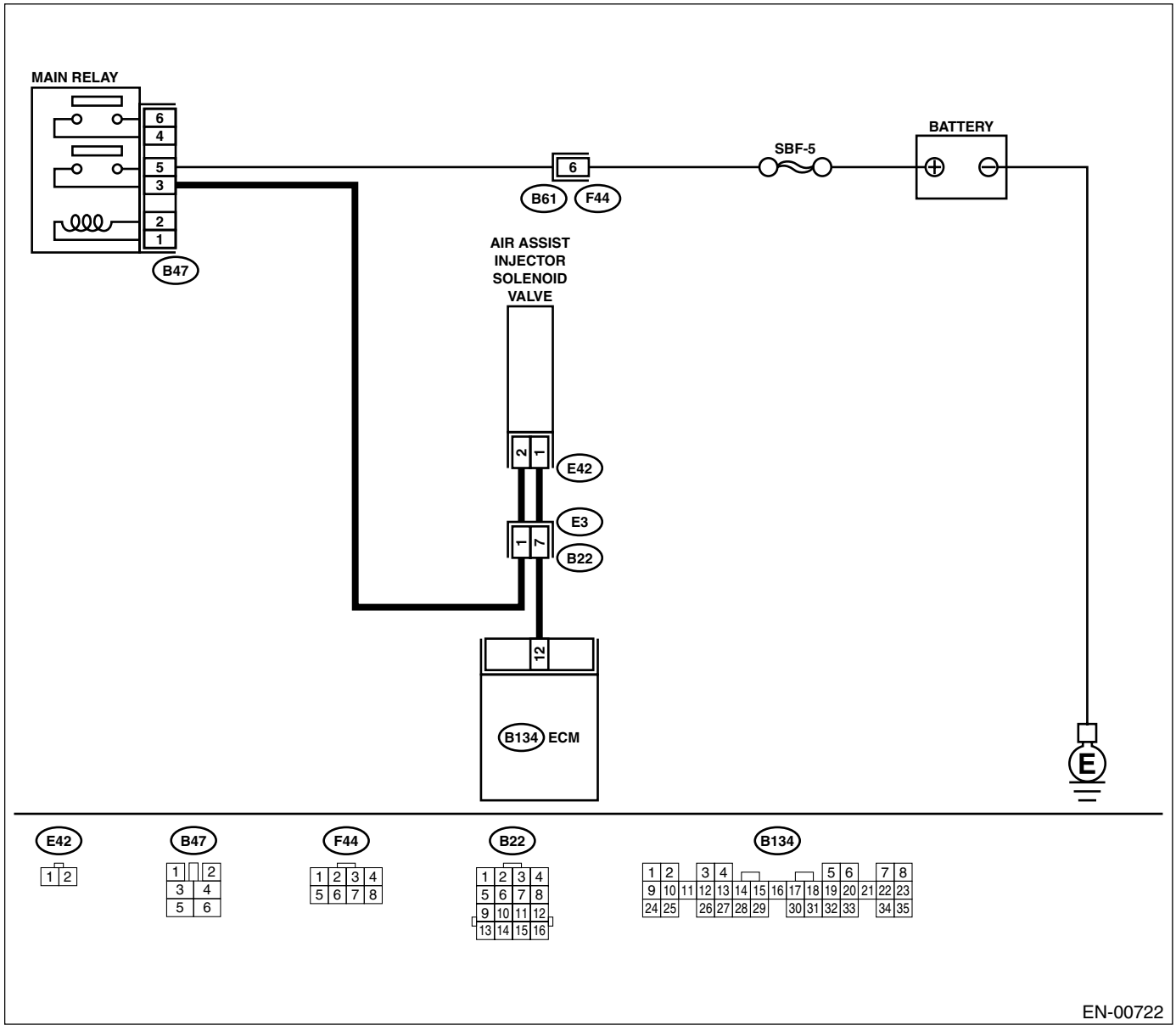
	Step	Check	Yes	No
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn ignition switch to ON. 4) Read data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 7 A?	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

F: DTC P0065 — AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



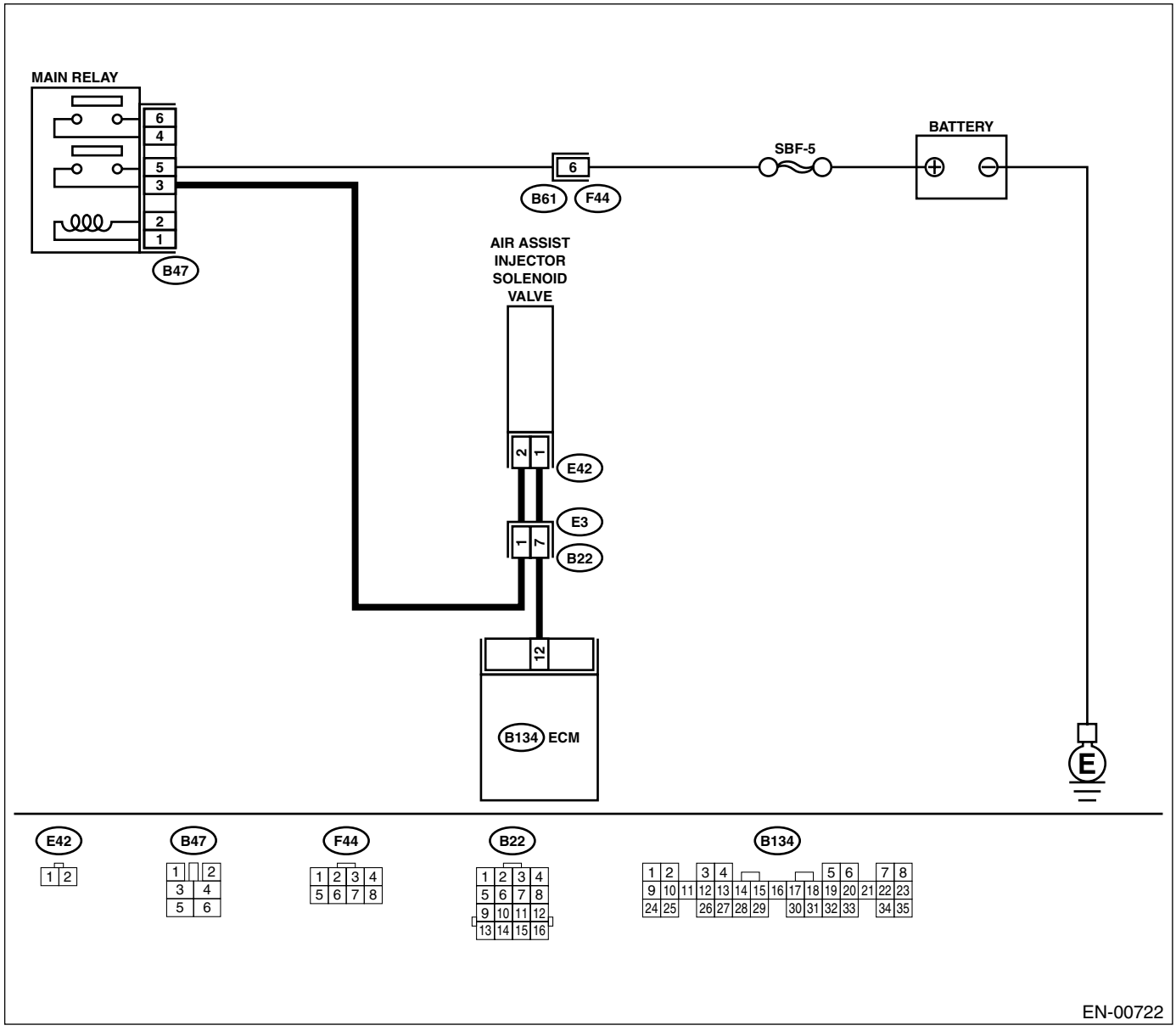
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR ASSIST INJECTOR SOLENOID VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) Operate air assist injector solenoid valve. NOTE: Air assist injector solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does air assist injector solenoid valve produce operating sound?	Go to step **3.**	Replace air assist injector solenoid valve. <Ref. to FU(H4SO)-36, Air Assist Injector Solenoid Valve.>
3	**CHECK AIR BY-PASS HOSES.** Use your mouth to blow through air by-pass hose to make sure that there is a smooth air flow (no clogging).	Is air by-pass hose clogged?	Repair or replace air by-pass hoses.	Go to step **4.**
4	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove fuel injector. <Ref. to FU(H4SO)-38, Fuel Injector.> 3) Check for clogged fuel injectors.	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H4SO)-38, Fuel Injector.>	Replace air assist injector solenoid valve. <Ref. to FU(H4SO)-36, Air Assist Injector Solenoid Valve.>

G: DTC P0066 — AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



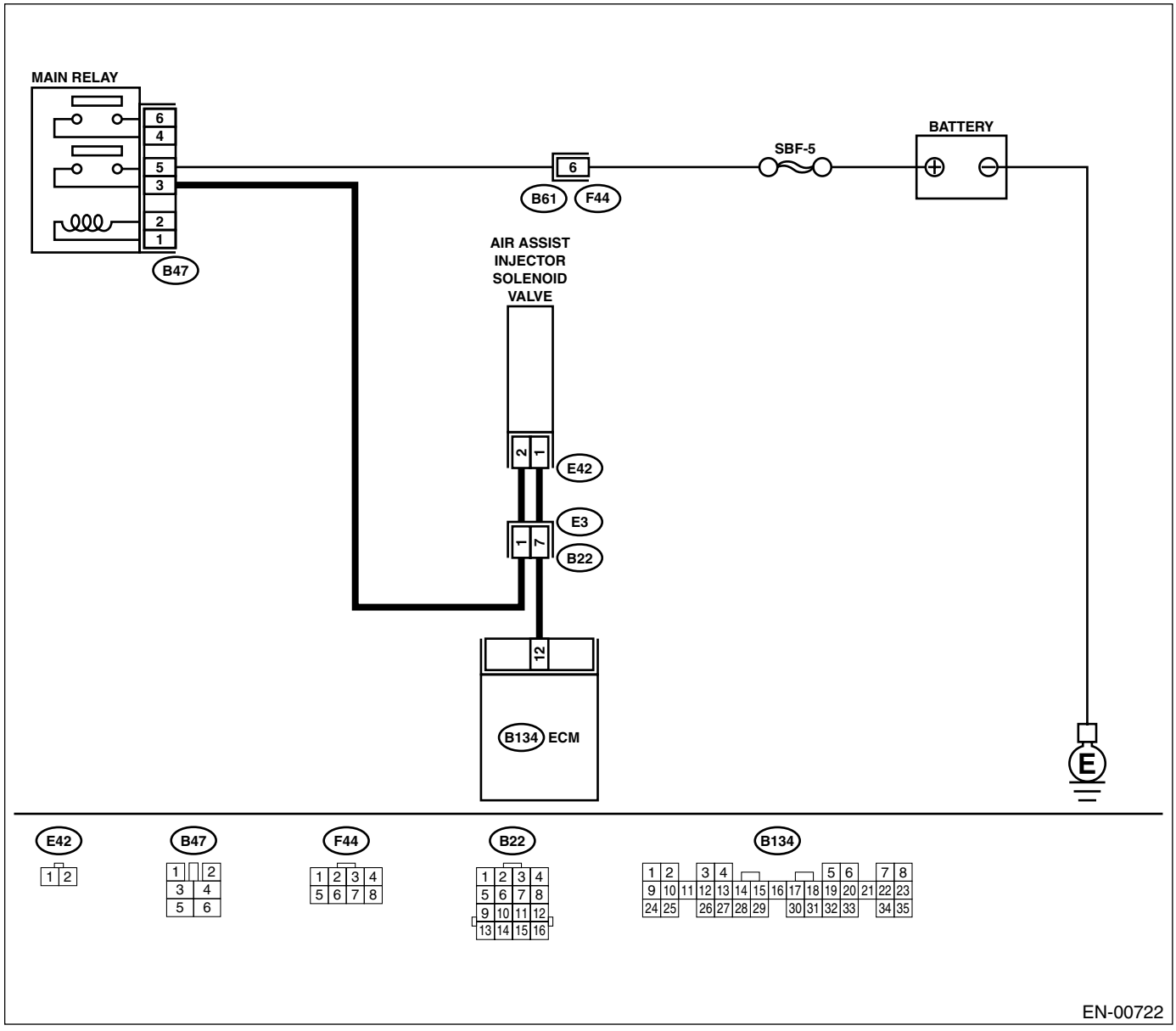
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO AIR ASSIST INJECTOR SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from air assist injector solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between air assist injector solenoid valve and engine ground. ***Connector & terminal*** ***(E42) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between air assist injector solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and air assist injector solenoid valve connector. ***Connector & terminal*** ***(B134) No. 12 — (E42) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and air assist injector solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and air assist injector solenoid valve connector.
5	**CHECK POOR CONTACT.** Check poor contact in ECM and air assist injector solenoid valve connectors.	Is there poor contact in ECM and air assist injector solenoid valve connectors?	Repair poor contact in ECM and air assist injector solenoid valve connectors.	Replace air assist injector solenoid valve. <Ref. to FU(H4SO)-36, Air Assist Injector Solenoid Valve.>

H: DTC P0067 — AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



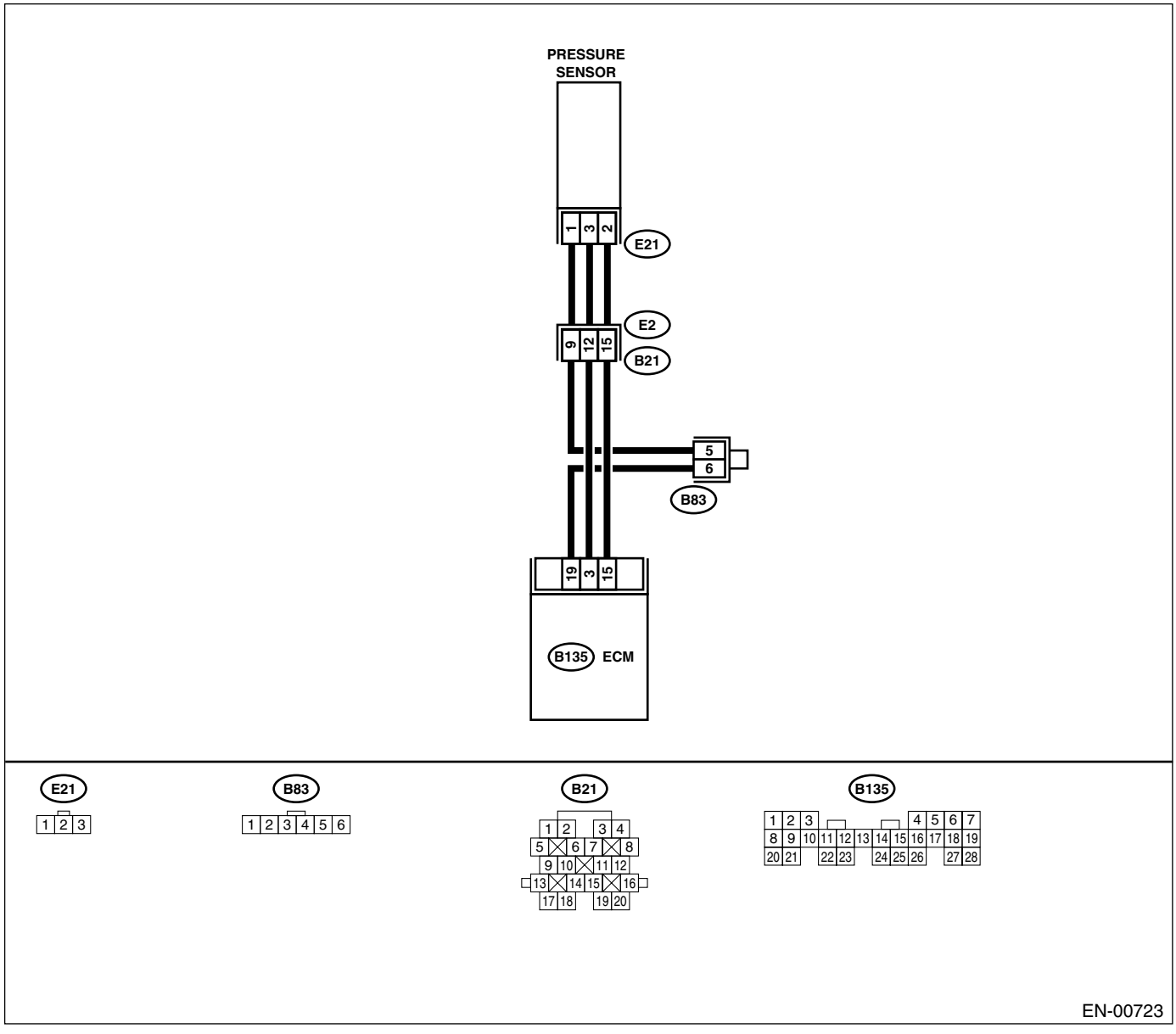
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from air assist injector solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Replace air assist injector solenoid valve <Ref. to FU(H4SO)-36, Air Assist Injector Solenoid Valve.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>
3	**CHECK INPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12(+) — Chassis ground (–):*** Does the measured value exceed the specified value by shaking harness and connector of ECM while monitoring the value with voltage meter?	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

I: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



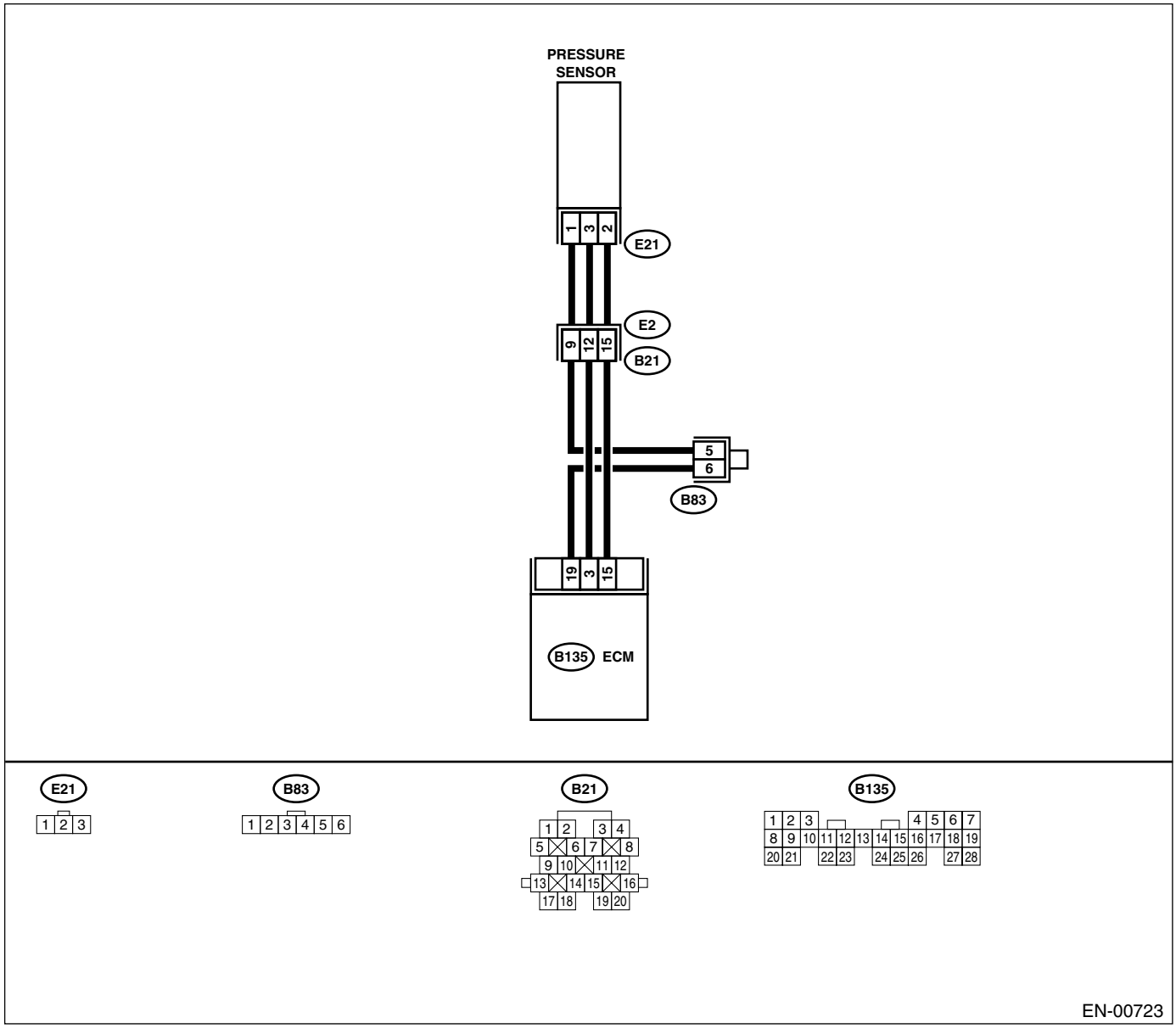
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in the selector lever in "N" or "P" position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. Is the measured value within the specified range? NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual. Specification:	Is the measured value within 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) when turning ignition switch ON, or within 20.0 to 46.7 kPa (150 to 350 mmHg, 5.91 to 13.78 inHg) when idling?	Go to step **4.**	Replace intake air temperature sensor and pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 5% when throttle is fully closed?	Go to step **5.**	Adjust or replace throttle position sensor. <Ref. to FU(H4SO)-31, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.**	Is the measured value more than 85% when throttle is fully open.	Replace pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>	Replace throttle position sensor. <Ref. to FU(H4SO)-31, Throttle Position Sensor.>

J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and pressure sensor connector.	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake air temperature sensor and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **8.**	Repair open circuit in harness between ECM and pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 1:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and pressure sensor connector.
9	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** Measure resistance of harness between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 2 — Engine ground:***	Is the measured value more than 500 kΩ?	Go to step **10.**	Repair ground short circuit in harness between ECM and intake air temperature and pressure sensor connector.
10	**CHECK POOR CONTACT.** Check poor contact in intake manifold pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>

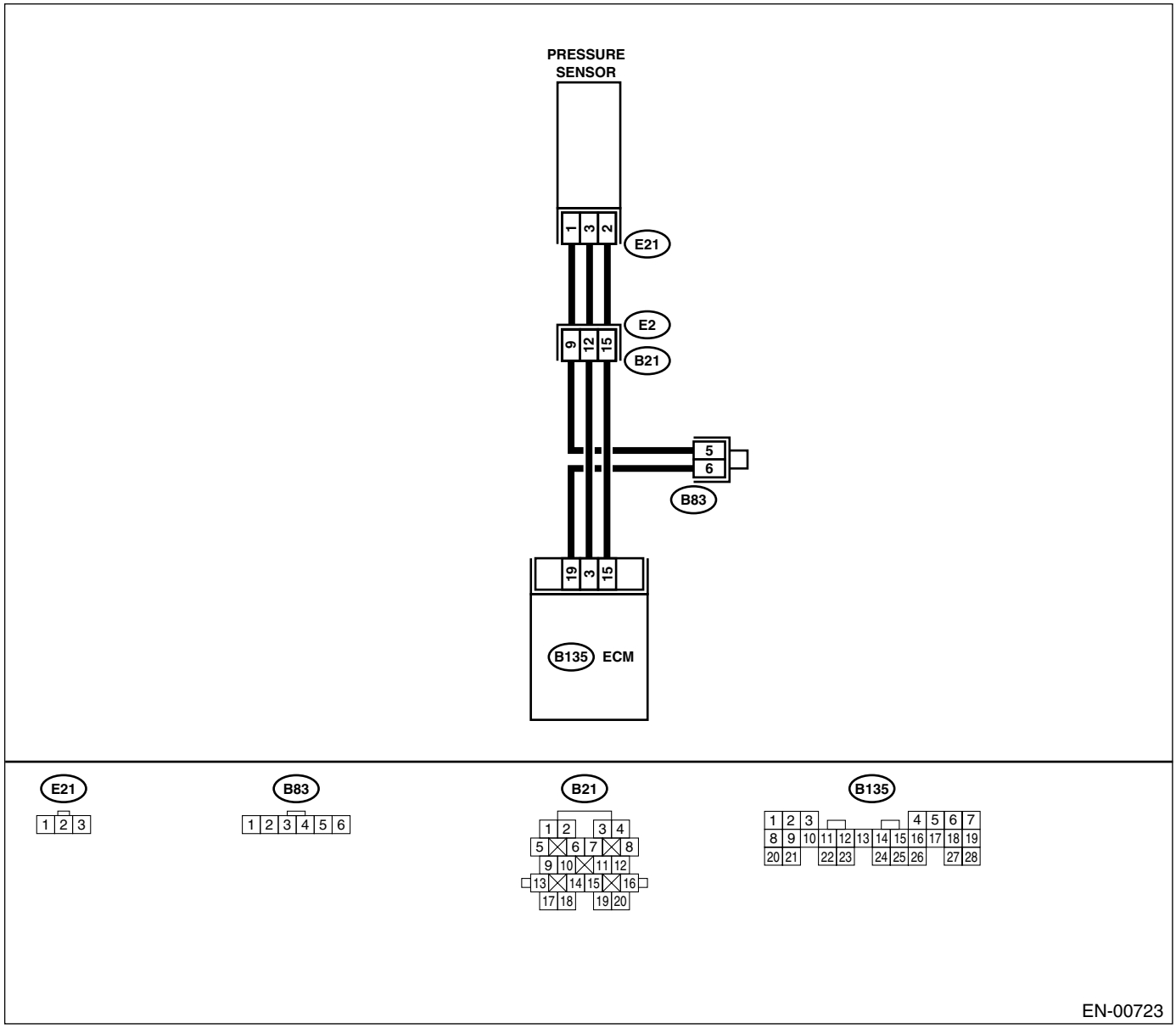
MEMO:

K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Go to step **9.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair open circuit in harness between ECM and pressure sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and pressure sensor connector. ***Connector & terminal*** ***(B135) No. 15 — (E21) No. 2:*** ***(B135) No. 1 — (E21) No. 1:***	Is the measured value more than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and pressure sensor connector.
8	**CHECK POOR CONTACT.** Check poor contact in pressure sensor connector.	Is there poor contact in pressure sensor connector?	Repair poor contact in pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>
9	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Repair battery short circuit in harness between ECM and pressure sensor connector.	Replace pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>

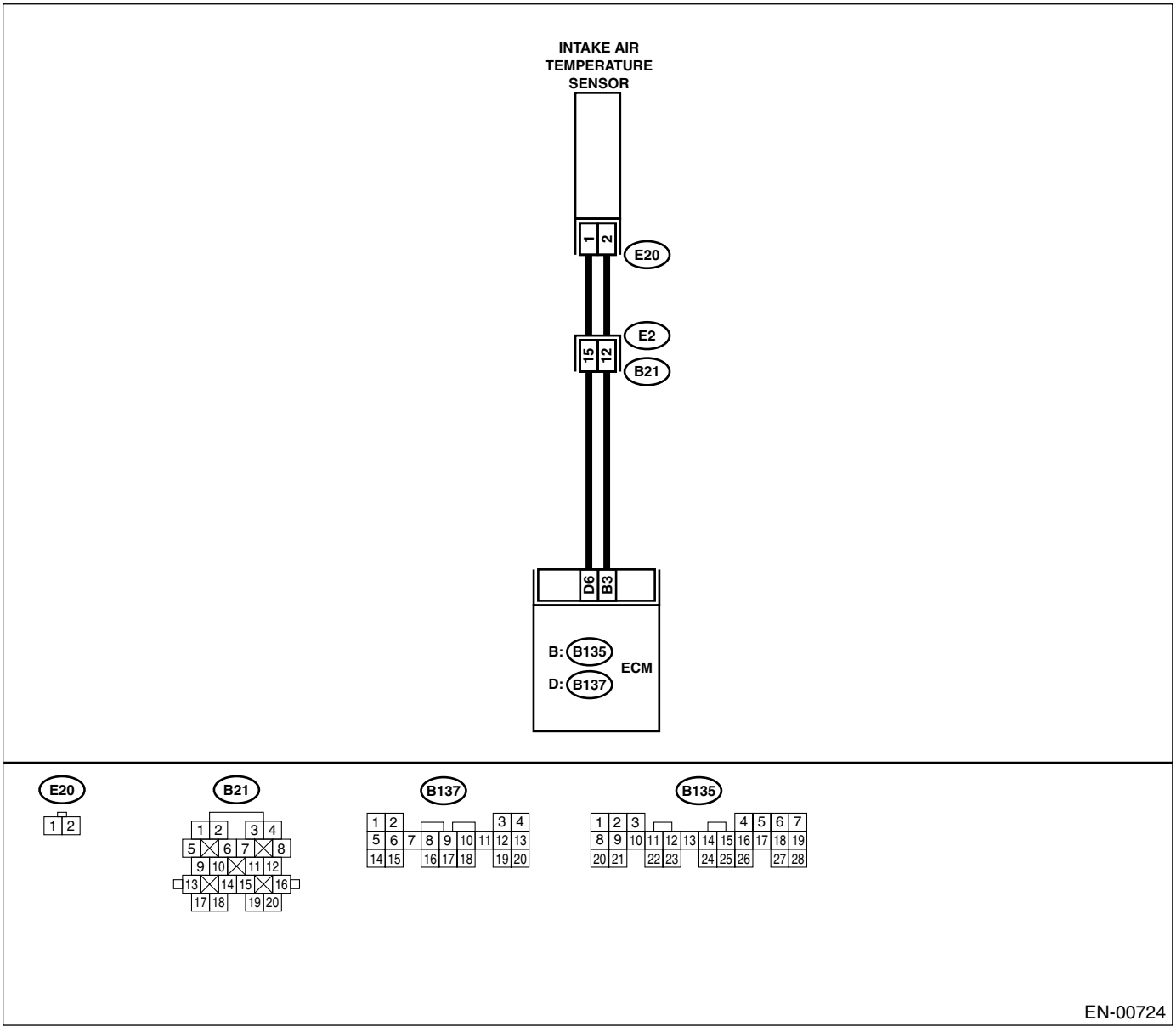
MEMO:

L: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



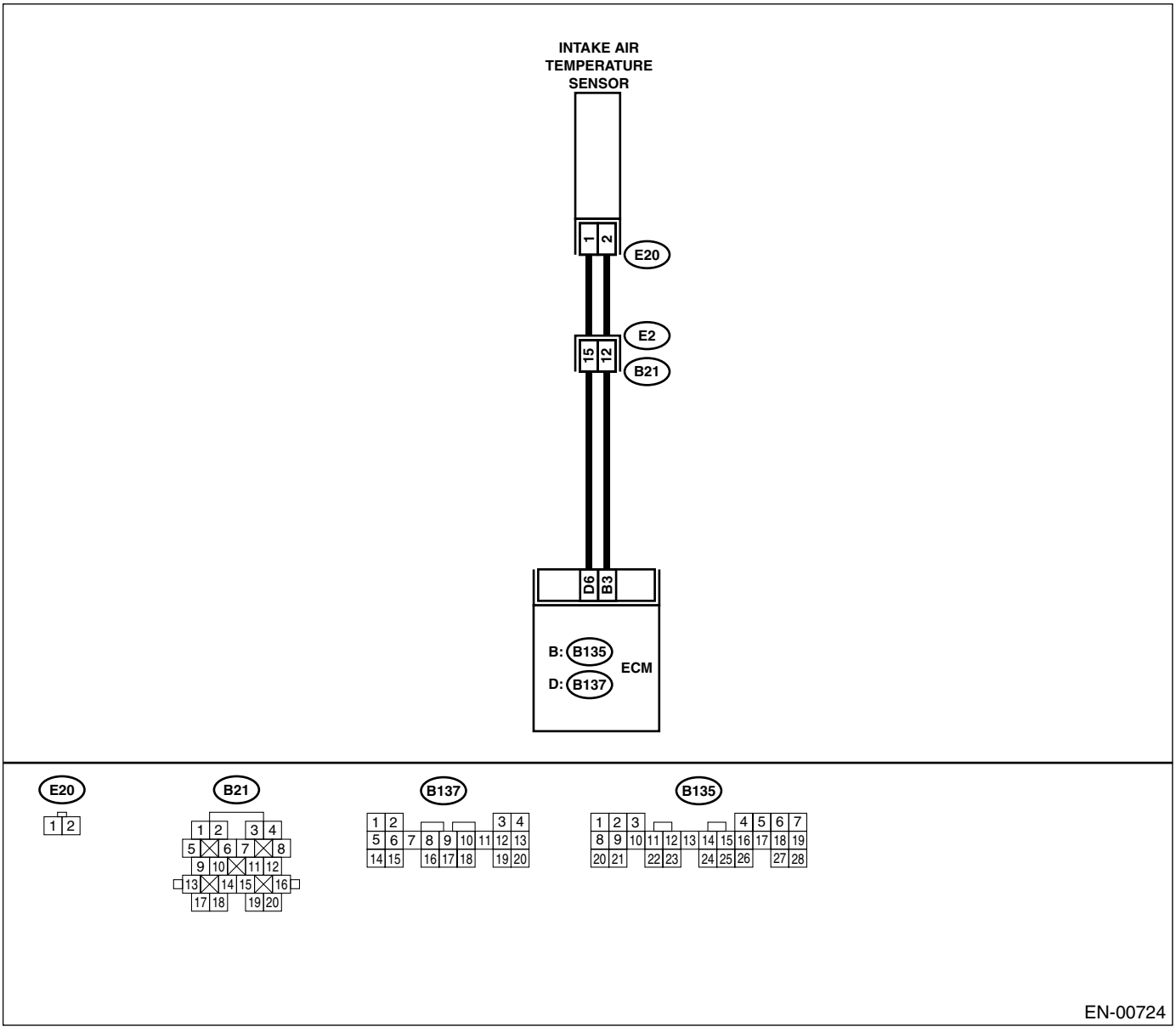
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm it up completely. 2) Measure engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 75 to 95°C (167 to 203°F)?	Replace intake air temperature sensor. <Ref. to FU(H4SO)-34, REMOVAL, Intake Air Temperature Sensor.>	Inspect DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>

M: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



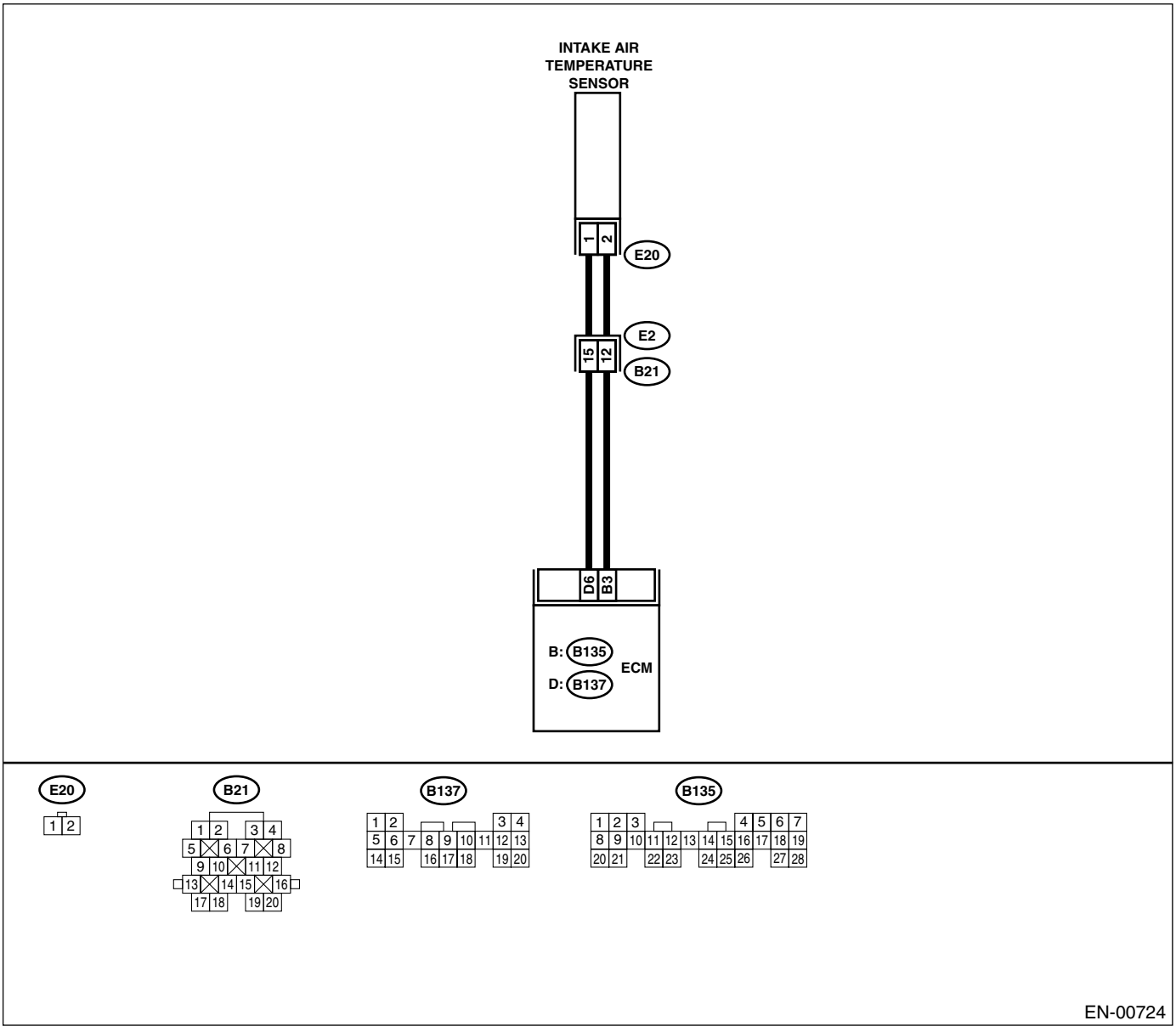
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature and pressure sensor. 3) Turn ignition switch to ON. 4) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace intake air temperature sensor. <Ref. to FU(H4SO)-34, REMOVAL, Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

N: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):***	Is the measured value more than 3 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature and pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Replace intake air temperature sensor. <Ref. to FU(H4SO)-34, REMOVAL, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

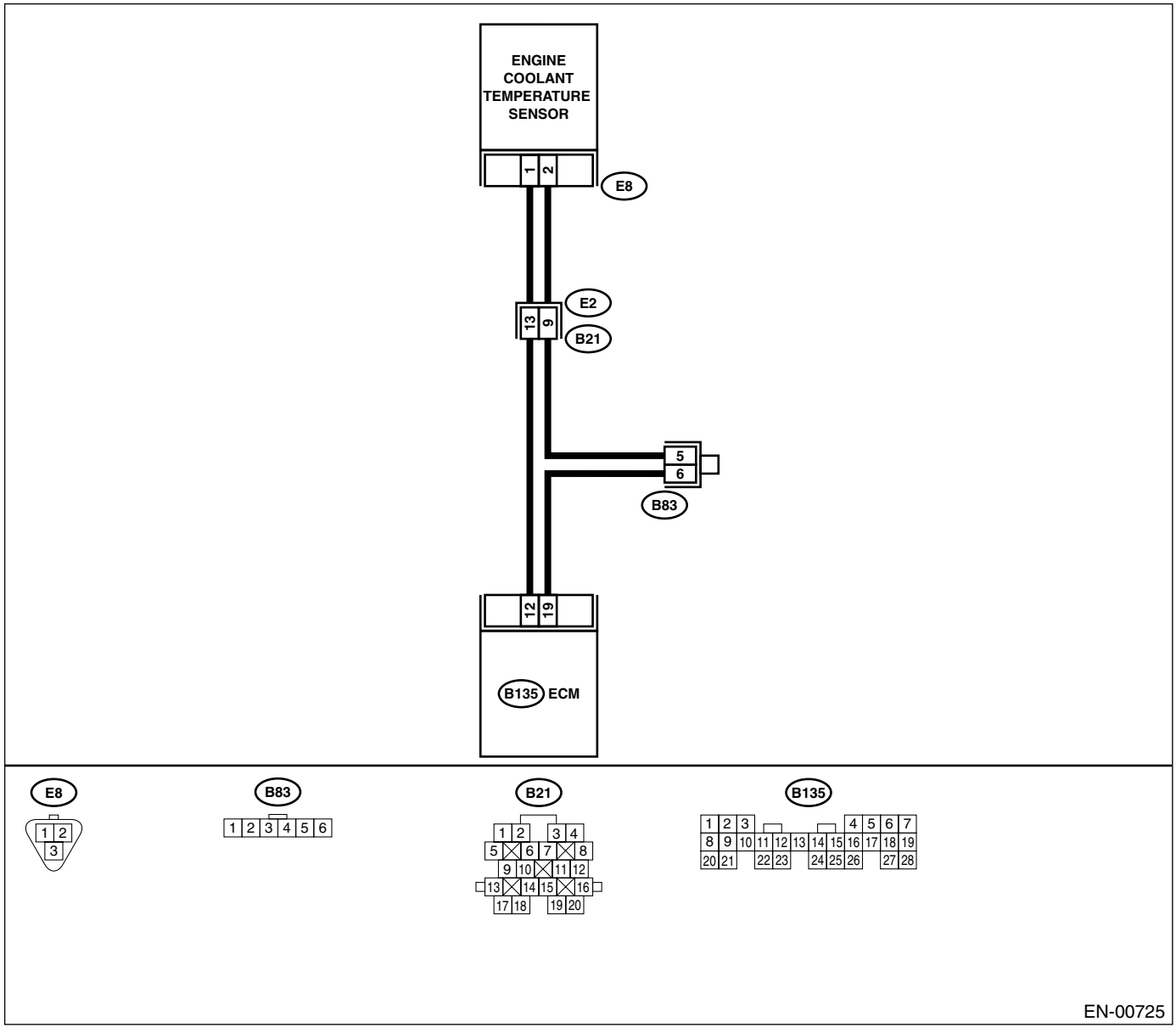
MEMO:

O: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



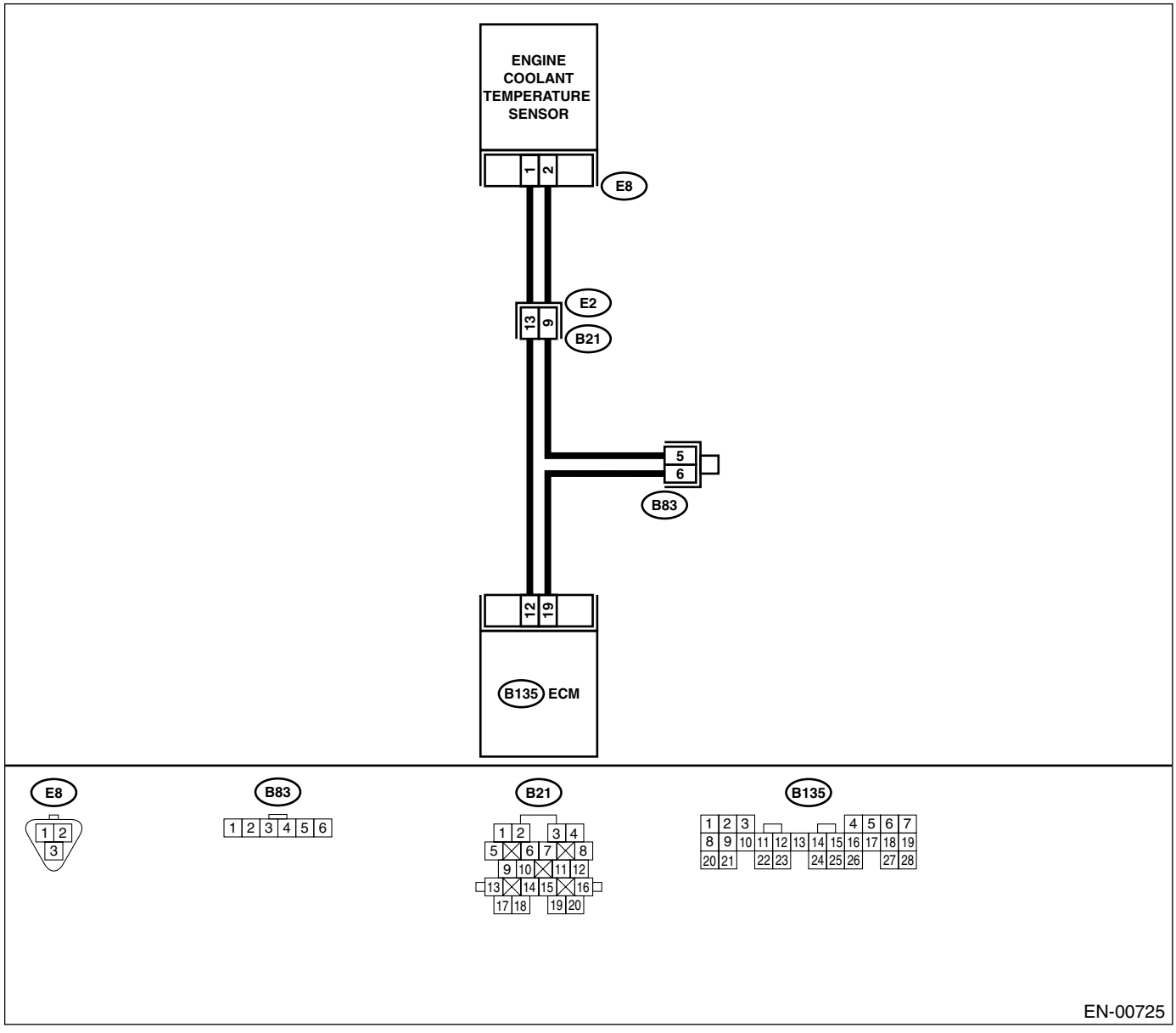
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Turn ignition switch to ON. 4) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-27, REMOVAL, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

P: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-27, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

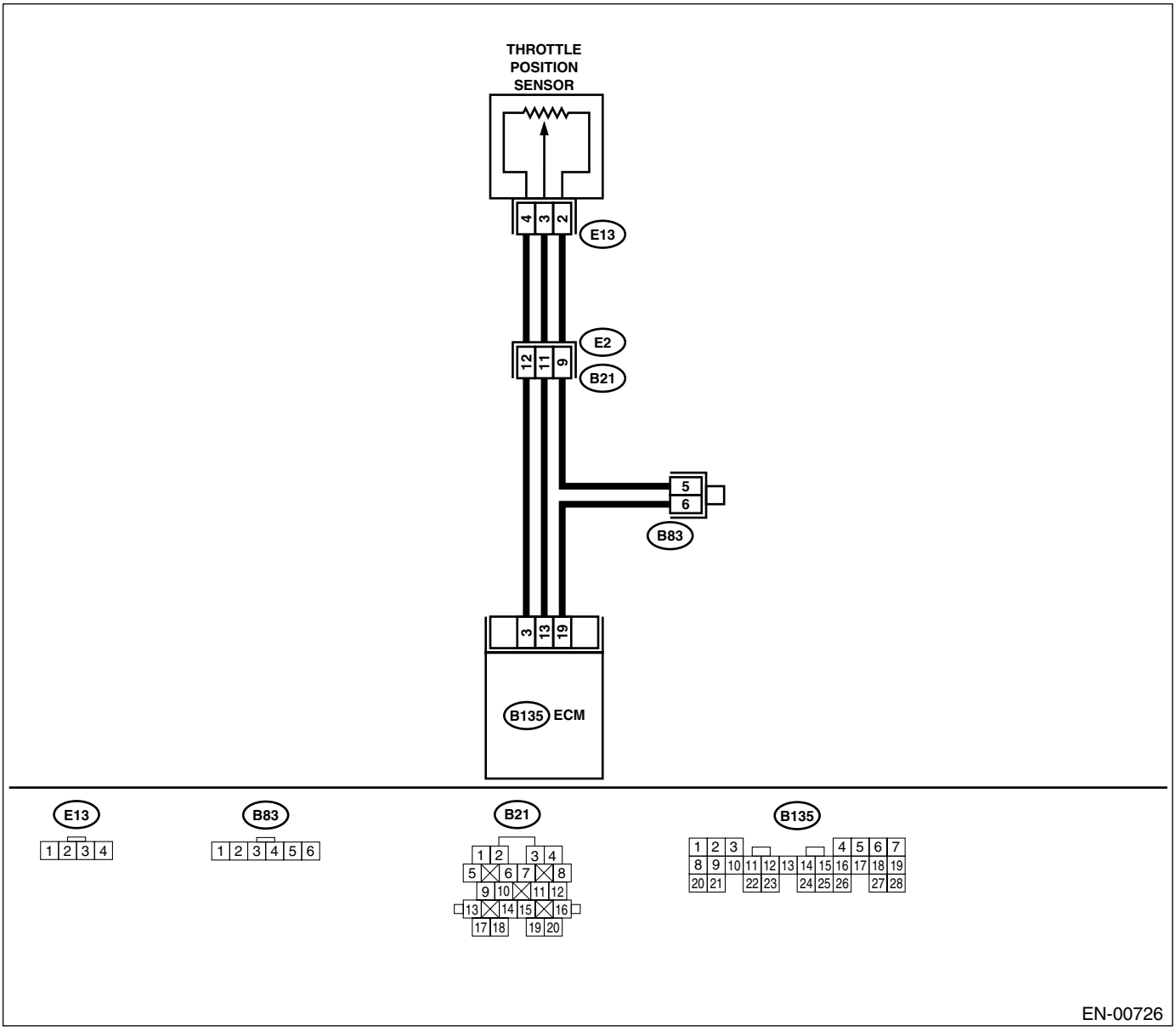
MEMO:

Q: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



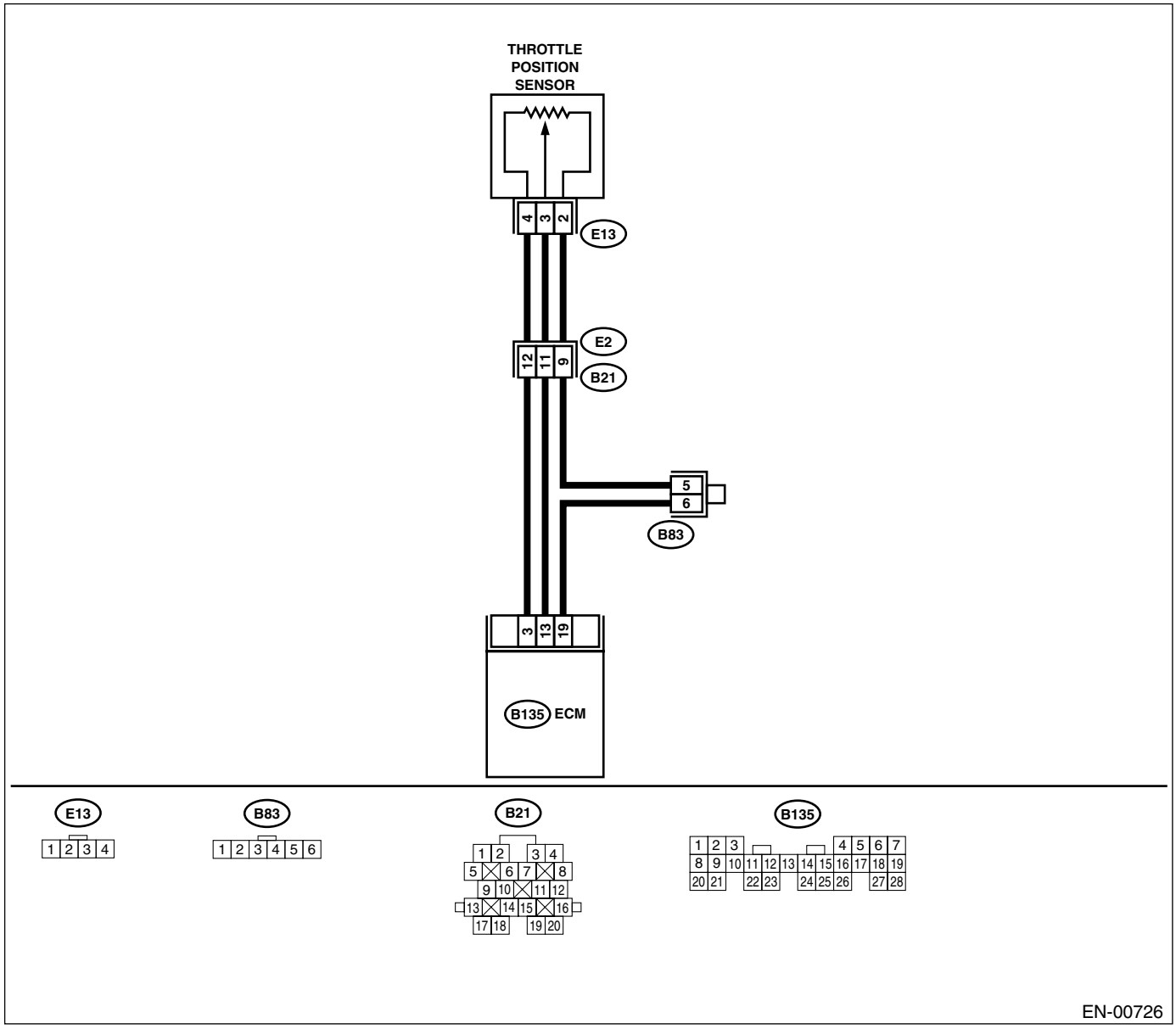
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace throttle position sensor. <Ref. to FU(H4SO)-31, Throttle Position Sensor.>

R: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 0.1 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure voltage between ECM connector and chassis ground.	Is the measured value more than 0.1 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from throttle position sensor. 3) Turn ignition switch to ON. 4) Measure voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 4 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 13 — (E13) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(H4SO)-31, Throttle Position Sensor.>

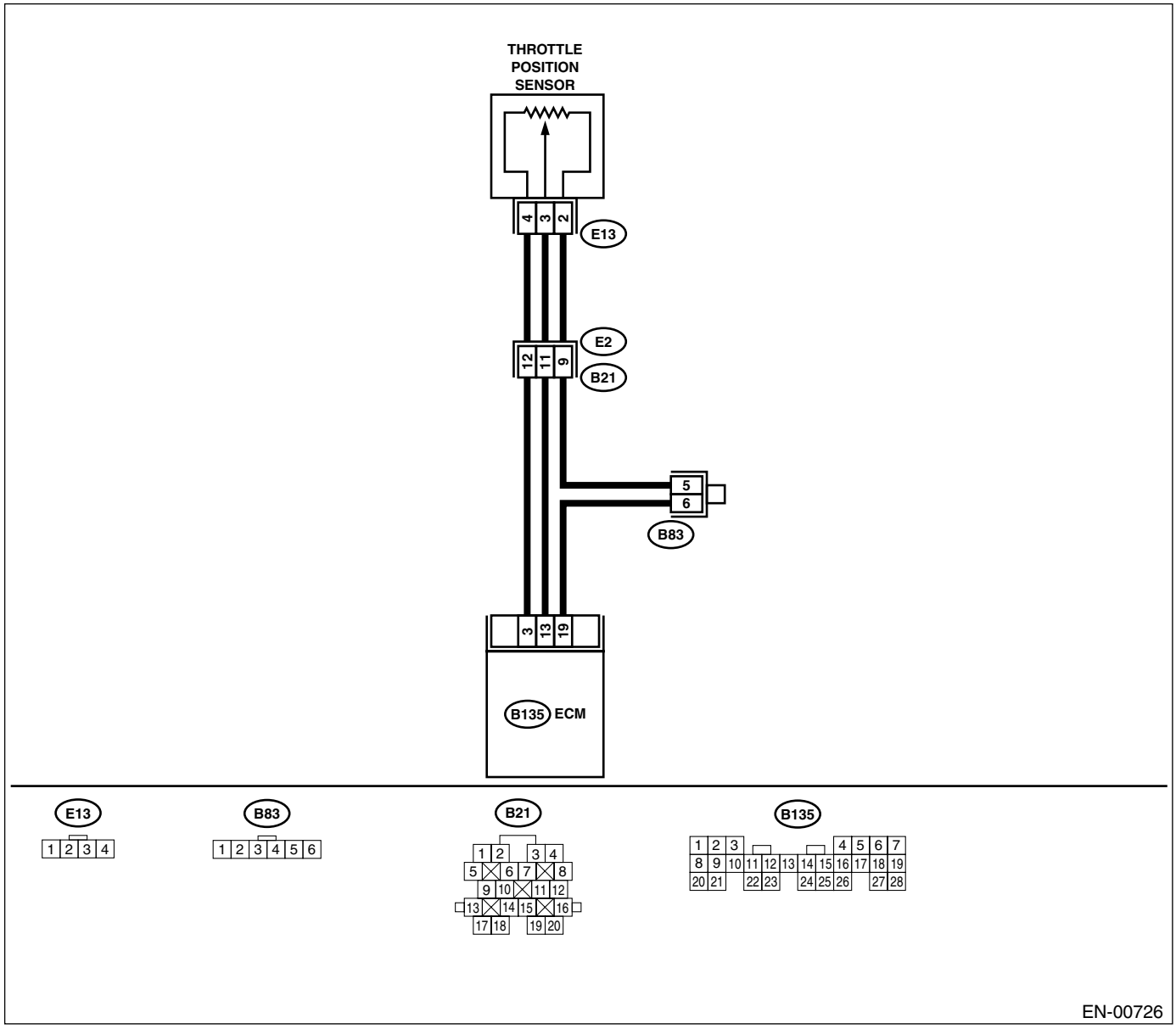
MEMO:

S: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



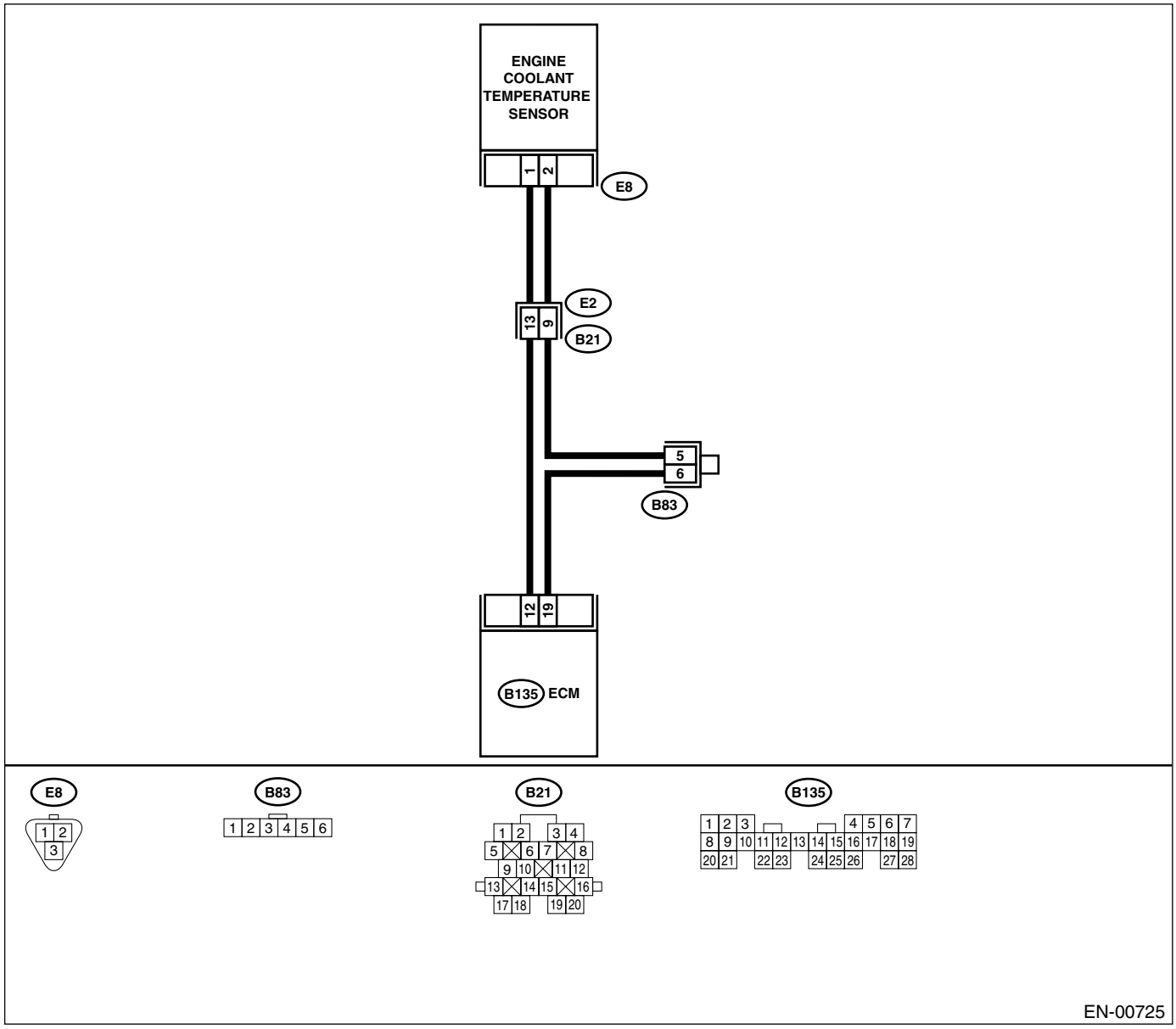
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 4.9 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from throttle position sensor. 3) Measure resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Replace throttle position sensor. <Ref. to FU(H4SO)-31, Throttle Position Sensor.>

T: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Engine would not return to idling.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK THERMOSTAT.**	Does thermostat remain opened?	Replace thermostat. <Ref. to CO(H4SO)-19, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-27, Engine Coolant Temperature Sensor.>

U: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Has engine operated at idle or has vehicle been driven with part of engine submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK TIRE SIZE.**	Are all four wheels same as the specified size?	Go to step **4.**	Replace tire.
4	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to anti-freeze solution correct?	Go to step **5.**	Replace engine coolant. <Ref. to CO(H4SO)-12, REPLACEMENT, Engine Coolant.>
5	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, Radiator Sub Fan and Fan Motor.>	Replace thermostat. <Ref. to CO(H4SO)-19, Thermostat.>

V: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

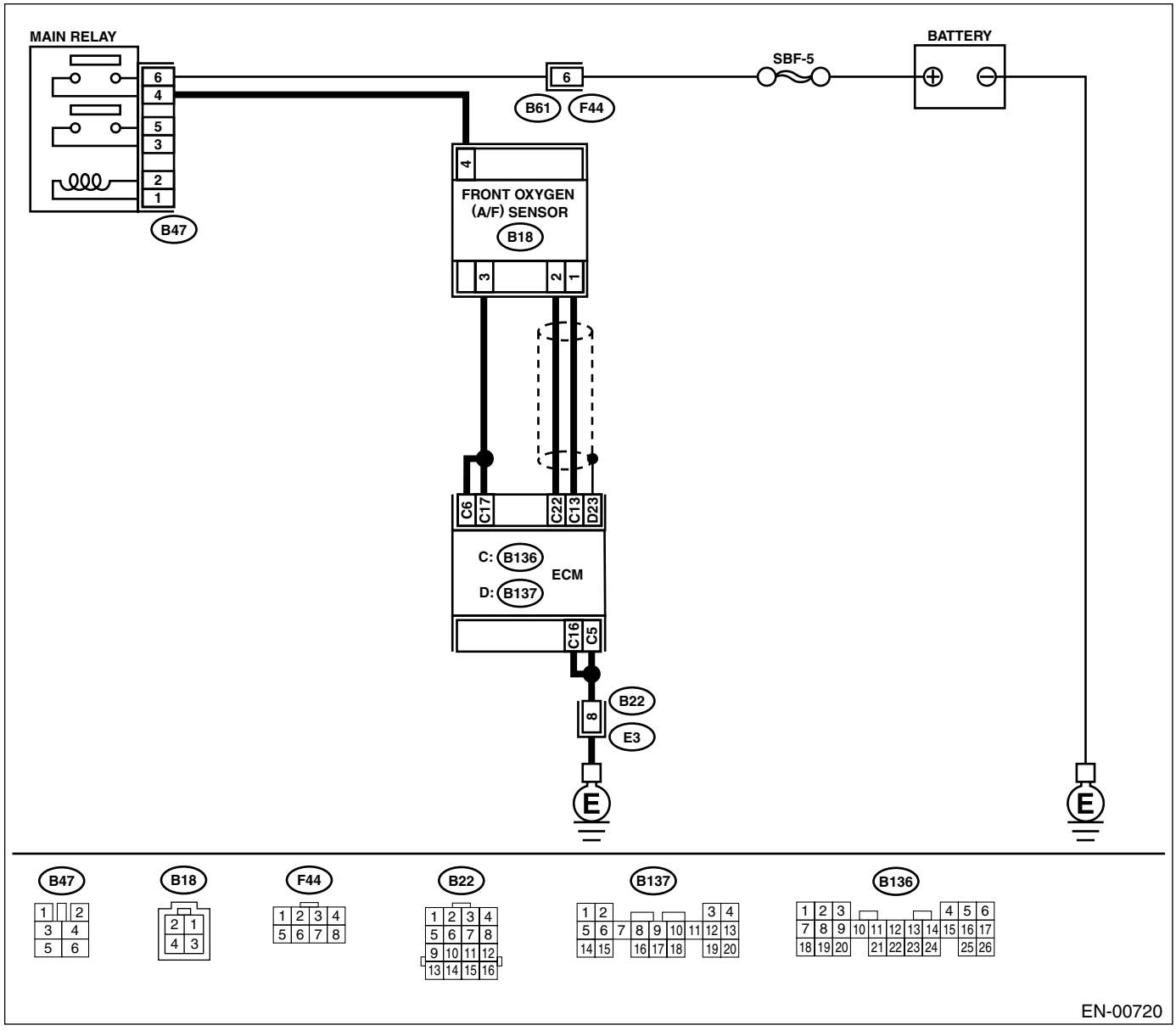
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the related DTC using List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0129.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

W: DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.85 to 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. 2) Read data of front oxygen (A/F) sensor signal during racing using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Normally, A/F mixture ratio is rich with racing engine. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the measured value more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22— (B18) No. 2:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any malfunction in exhaust system?	Repair or replace malfunctioning parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>

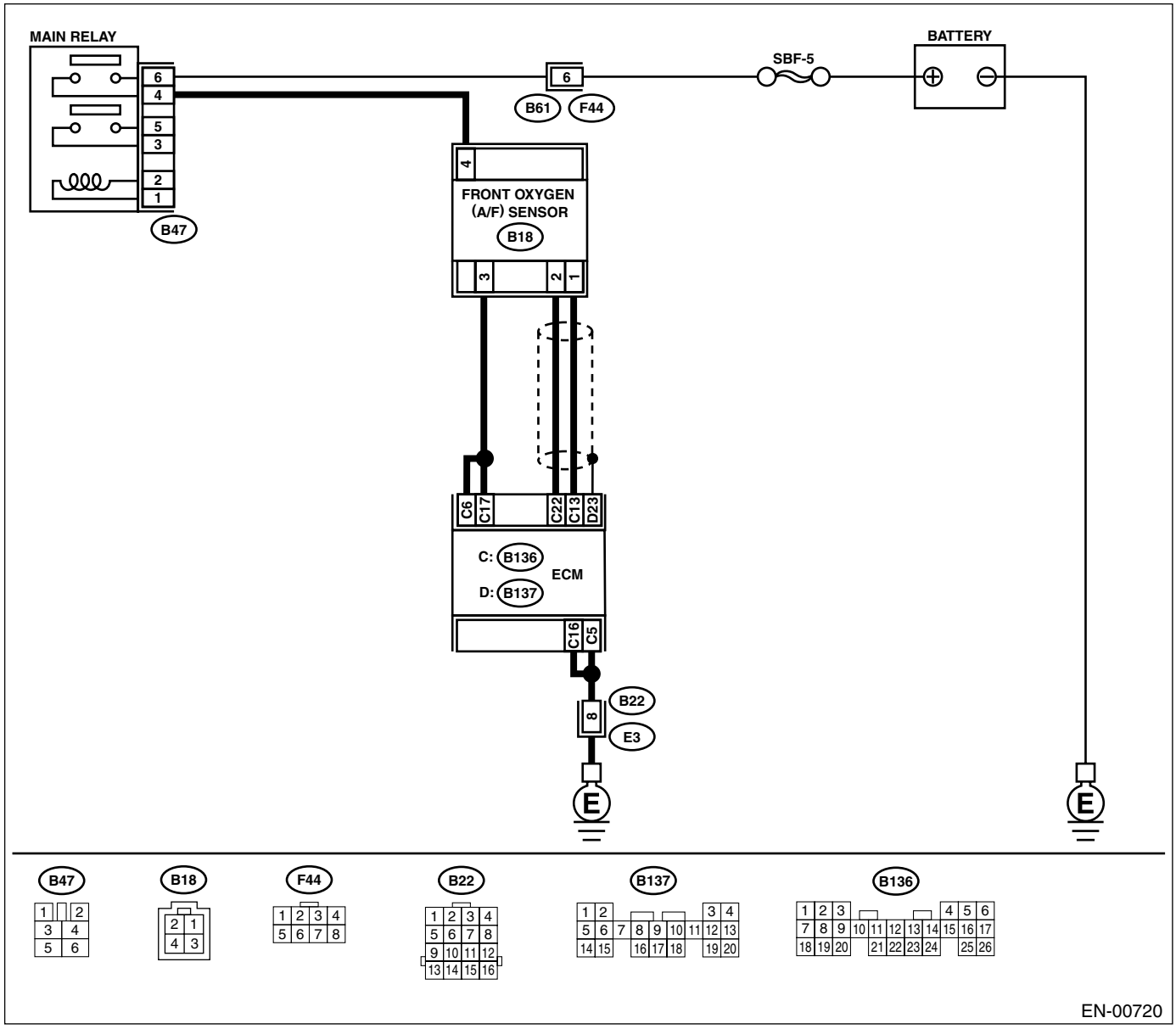
MEMO:

X: DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



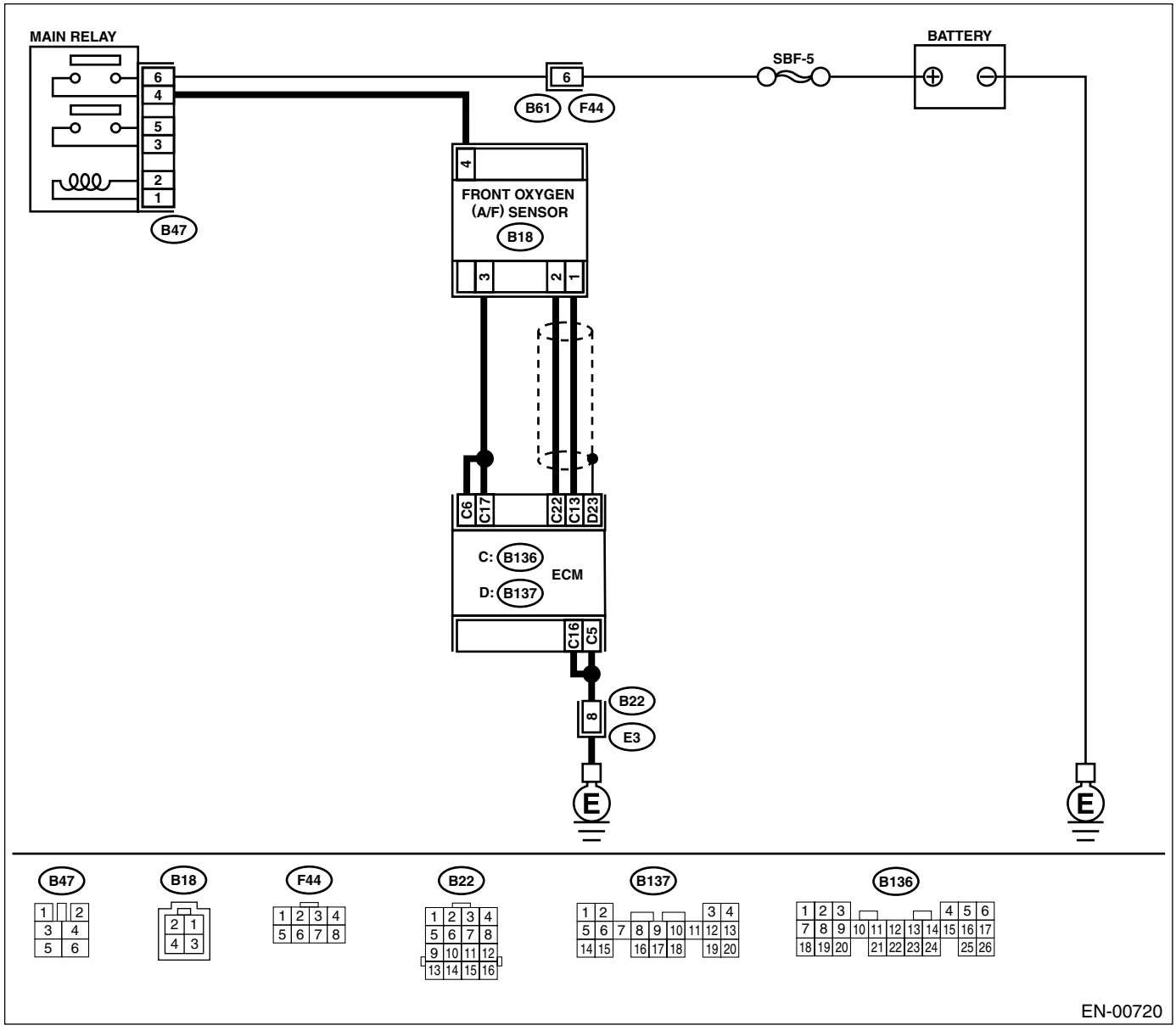
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>	Repair short circuit between ECM and front oxygen (A/F) sensor connector.

Y: DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



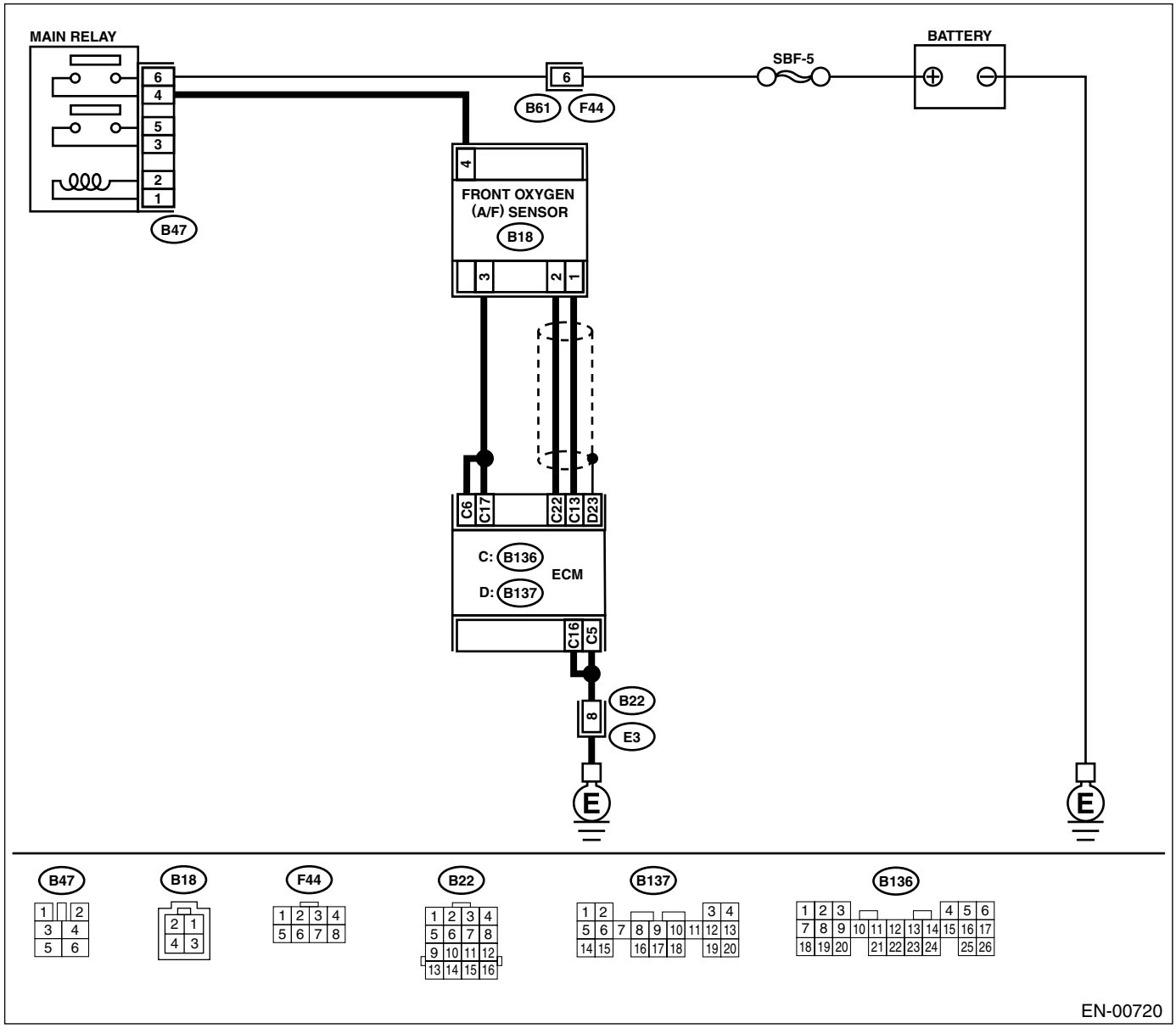
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (-):*** ***(B136) No. 22 (+) — Chassis ground (-):***	Is the measured value more than 8 V?	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

Z: DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



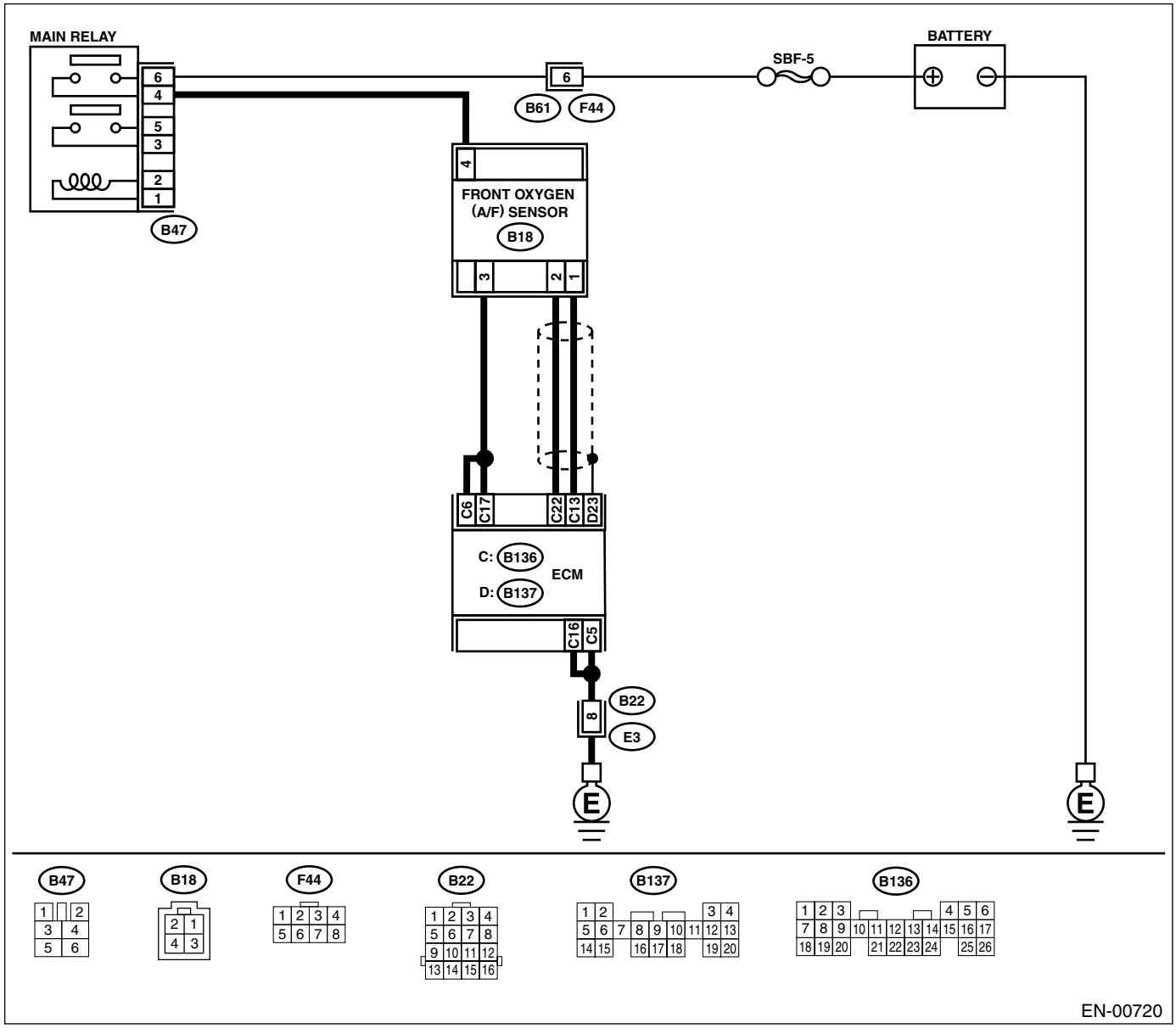
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole	Is there any malfunction in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>

AA:DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



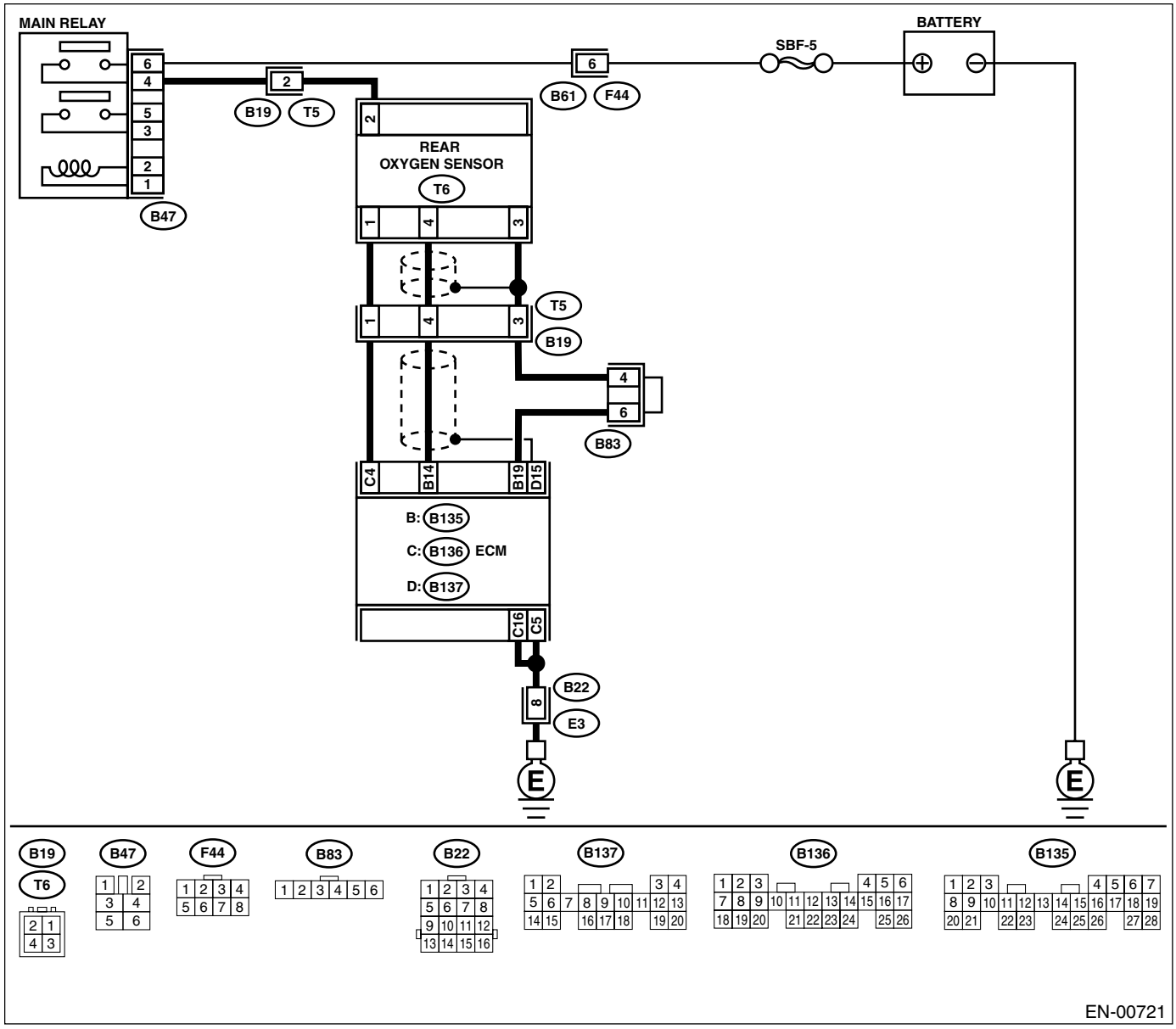
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (E18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fornt oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Chack poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>

AB:DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



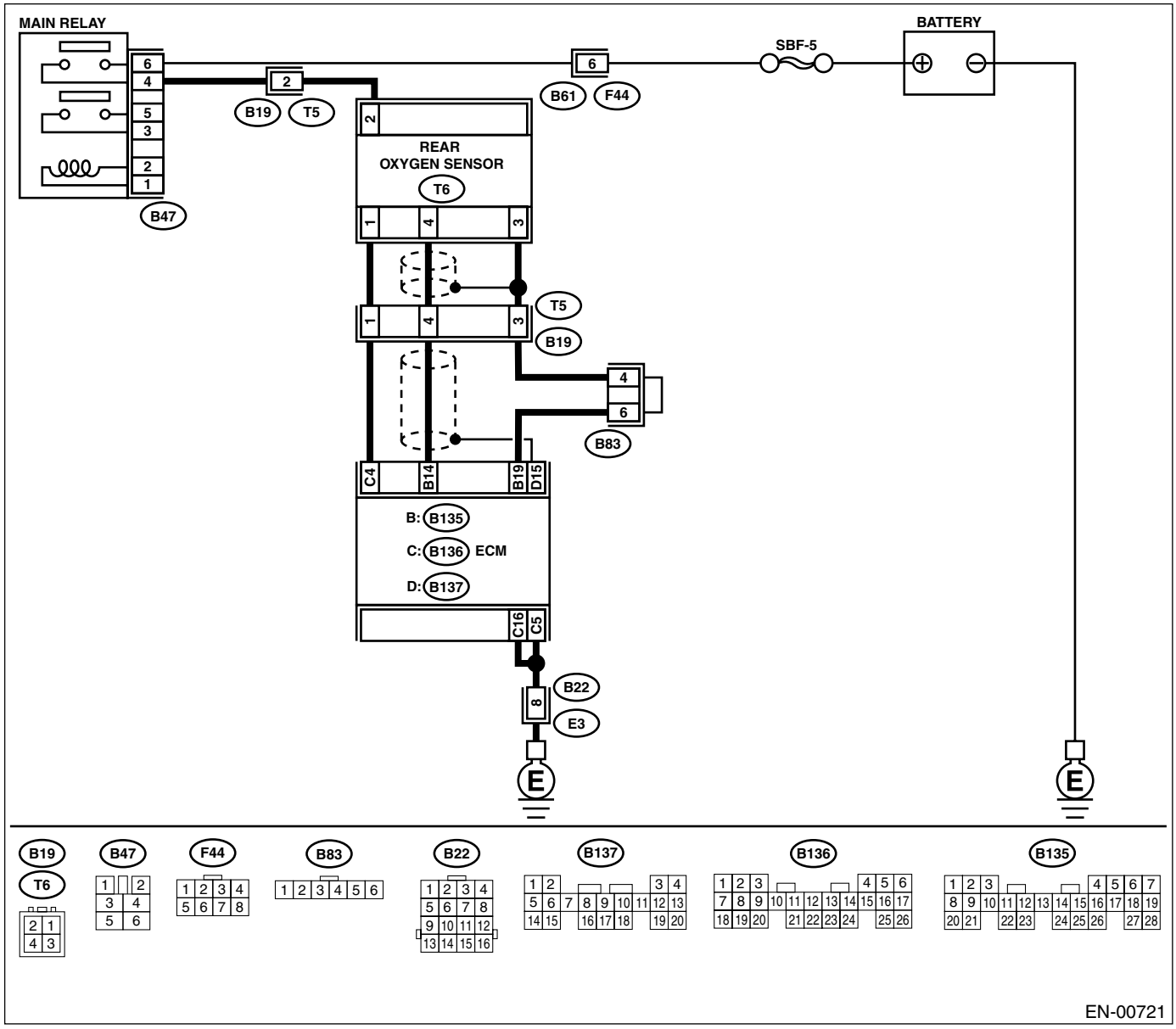
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0131, P0132 or P0134?	Repair referring procedure for P0131, P0132 and P0134. NOTE: In this case, checking procedure for P0137 is not necessary.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm for two minutes. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (T6) No. 4:*** ***(B135) No. 19 — (T6) No. 3:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace rear oxygen sensor. <Ref. to FU(H4SO)-44, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any malfunction in exhaust system?	Repair or replace malfunctioning parts.	Replace rear oxygen sensor. <Ref. to FU(H4SO)-44, Rear Oxygen Sensor.>

AC:DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTCX displayed?	Check DTC referring "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, CHECKING procedure for P0138 is not necessary.	Go to step **3.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and race engine until the engine speed reaches to 5,000 rpm and release accelerator pedal rapidly. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (T6) No. 4:*** ***(B135) No. 19 — (T6) No. 3:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace rear oxygen sensor. <Ref. to FU(H4SO)-44, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any malfunction in exhaust system?	Repair or replace malfunctioning parts.	Replace rear oxygen sensor. <Ref. to FU(H4SO)-44, Rear Oxygen Sensor.>

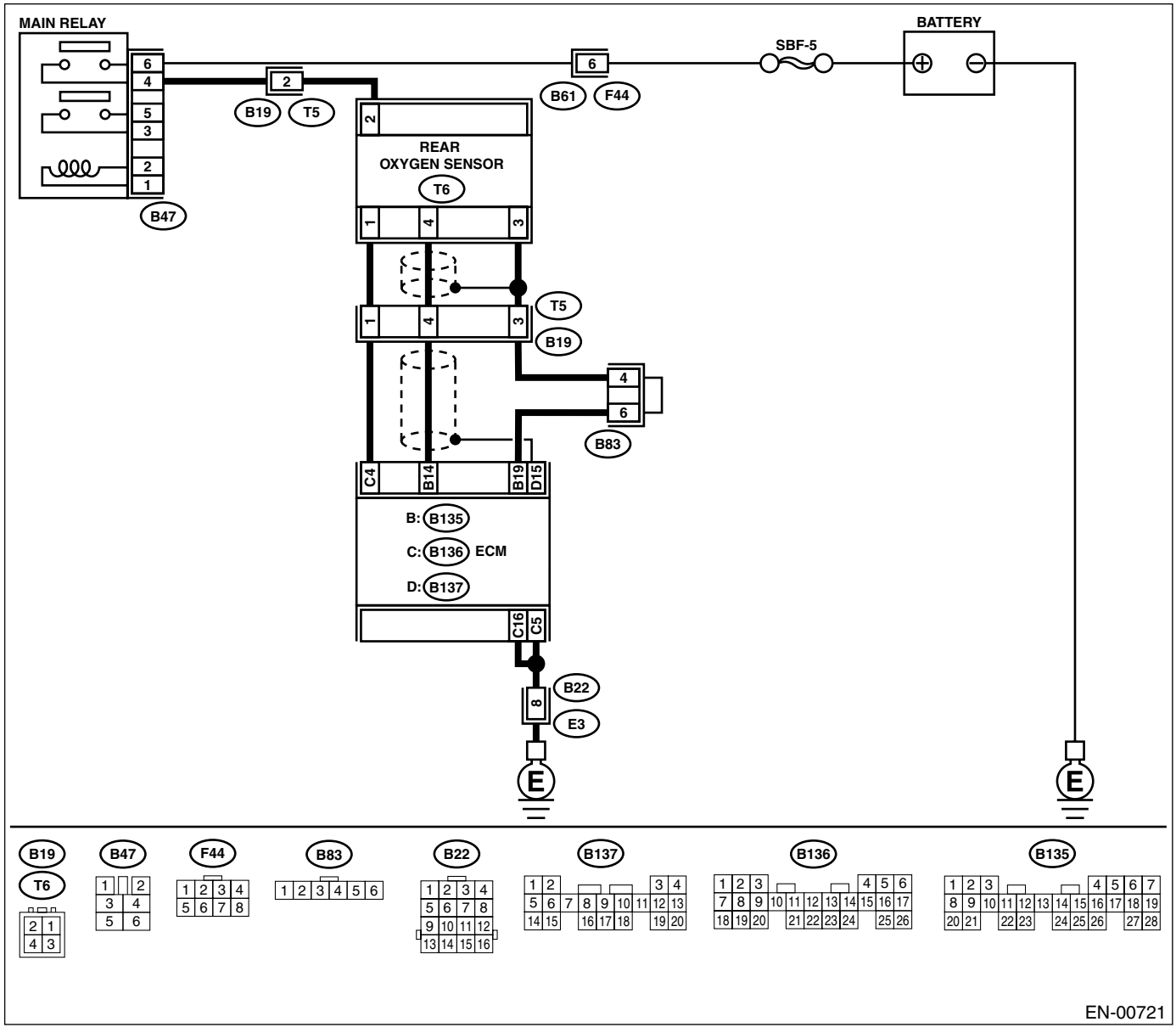
MEMO:

AD:DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace rear oxygen sensor. <Ref. to FU(H4SO)-44, Rear Oxygen Sensor.>

AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4SO)-168, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **3.**
3	**CHECK EGR VALVE.**	Is EGR valve clogged?	Replace EGR valve.	Go to step **4.**
4	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.**	Is purge control solenoid valve clogged?	Replace purge control solenoid valve.	Go to step **6.**
6	**CHECK PCV VALVE.**	Is PCV valve clogged?	Replace PCV valve.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release fuel pressure. (1) Disconnect connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **8.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, release fuel pressure.** NOTE: •If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **9.**	Repair the following items. **Fuel pressure too high** • Malfunctioning pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Malfunctioning pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
9	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 70 to 100°C (158 to 212°F)?	Go to step **10.**	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-27, Engine Coolant Temperature Sensor.>
10	**CHECK INTAKE MANIFOLD PRESSURE SENSOR SIGNAL.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the selector lever in "N" or "P" position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) when idling or within 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) when turning ignition switch ON?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace intake air temperature and pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>

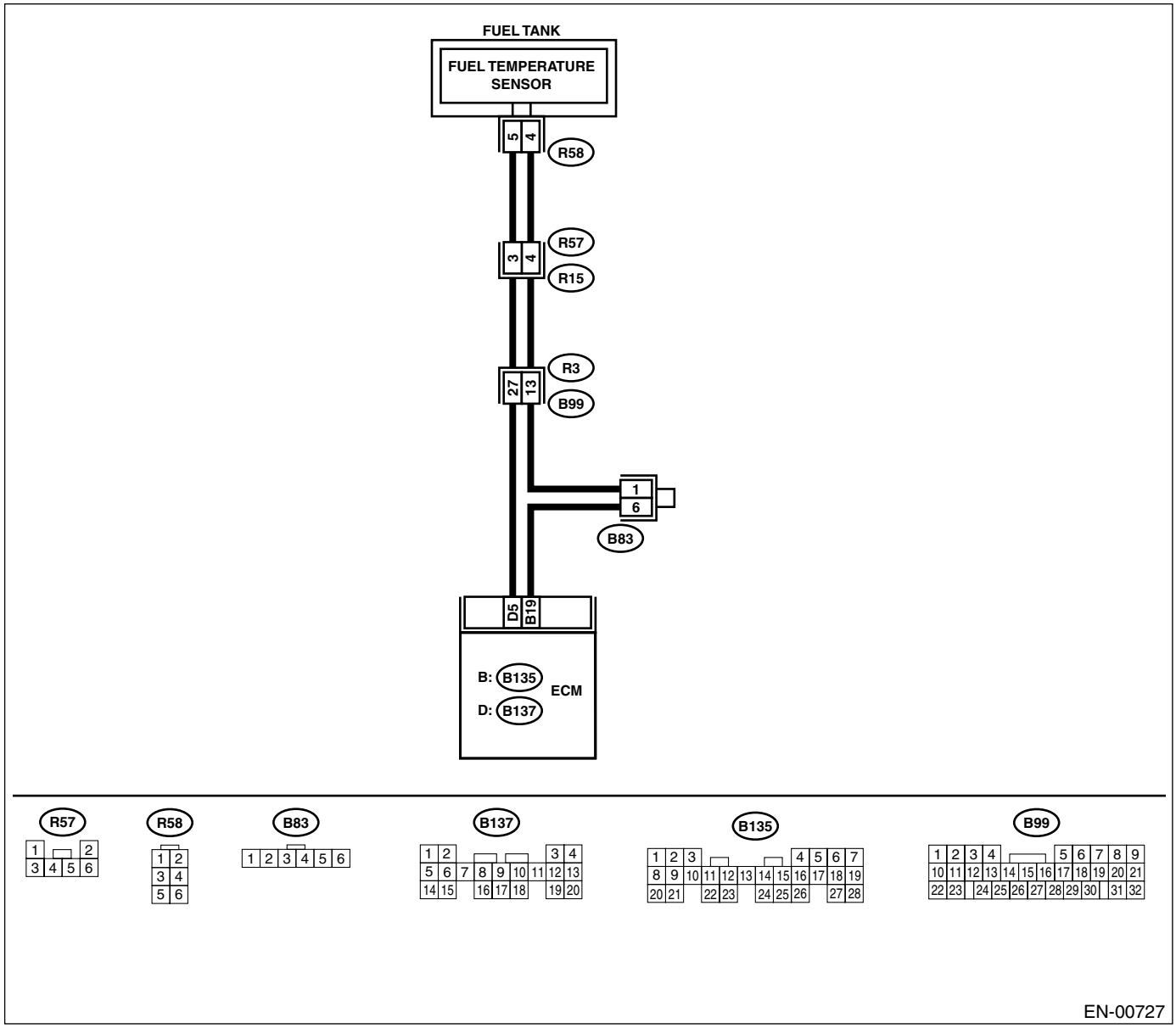
MEMO:

AG:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



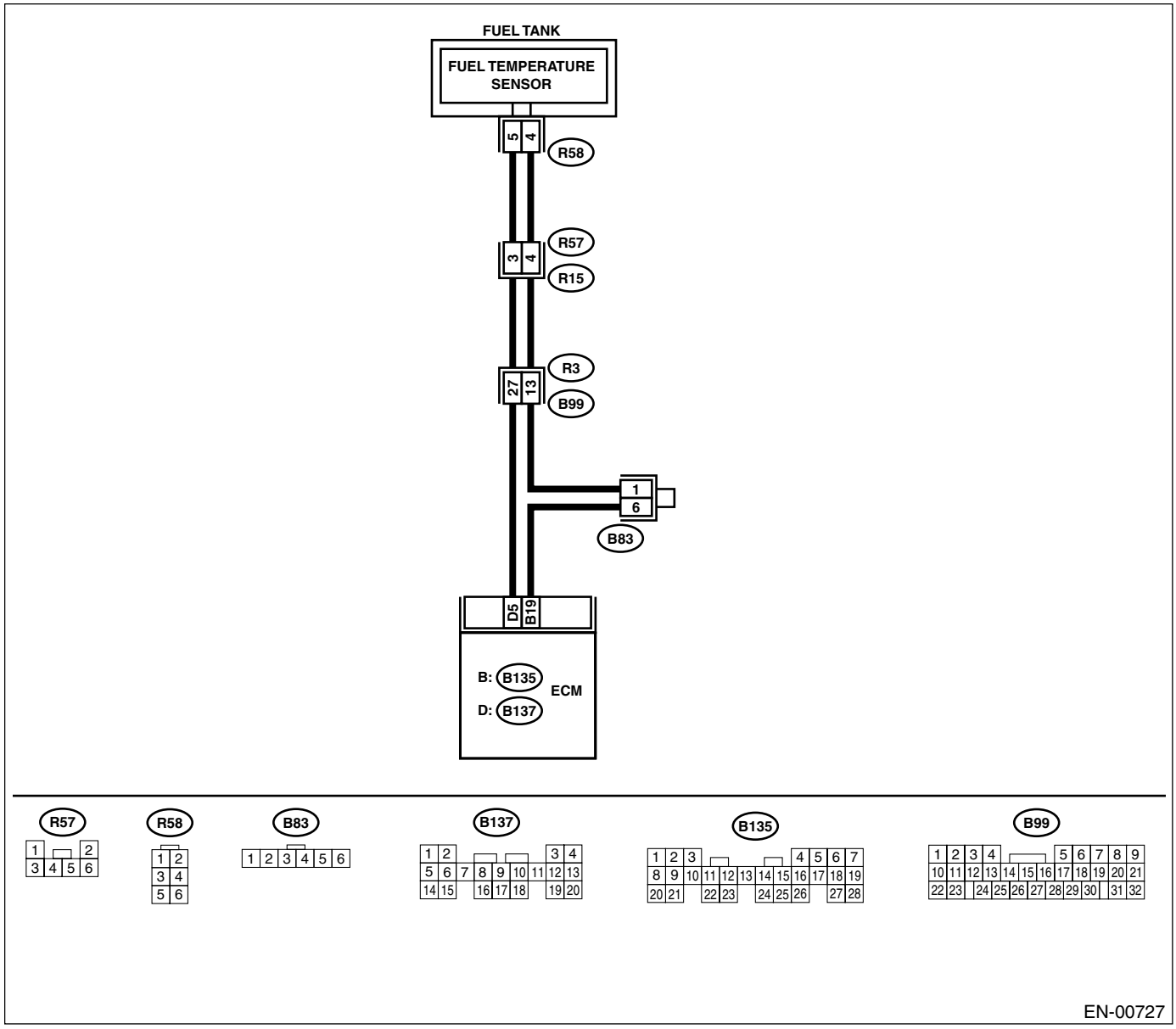
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>

AH:DTC P0182 — FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



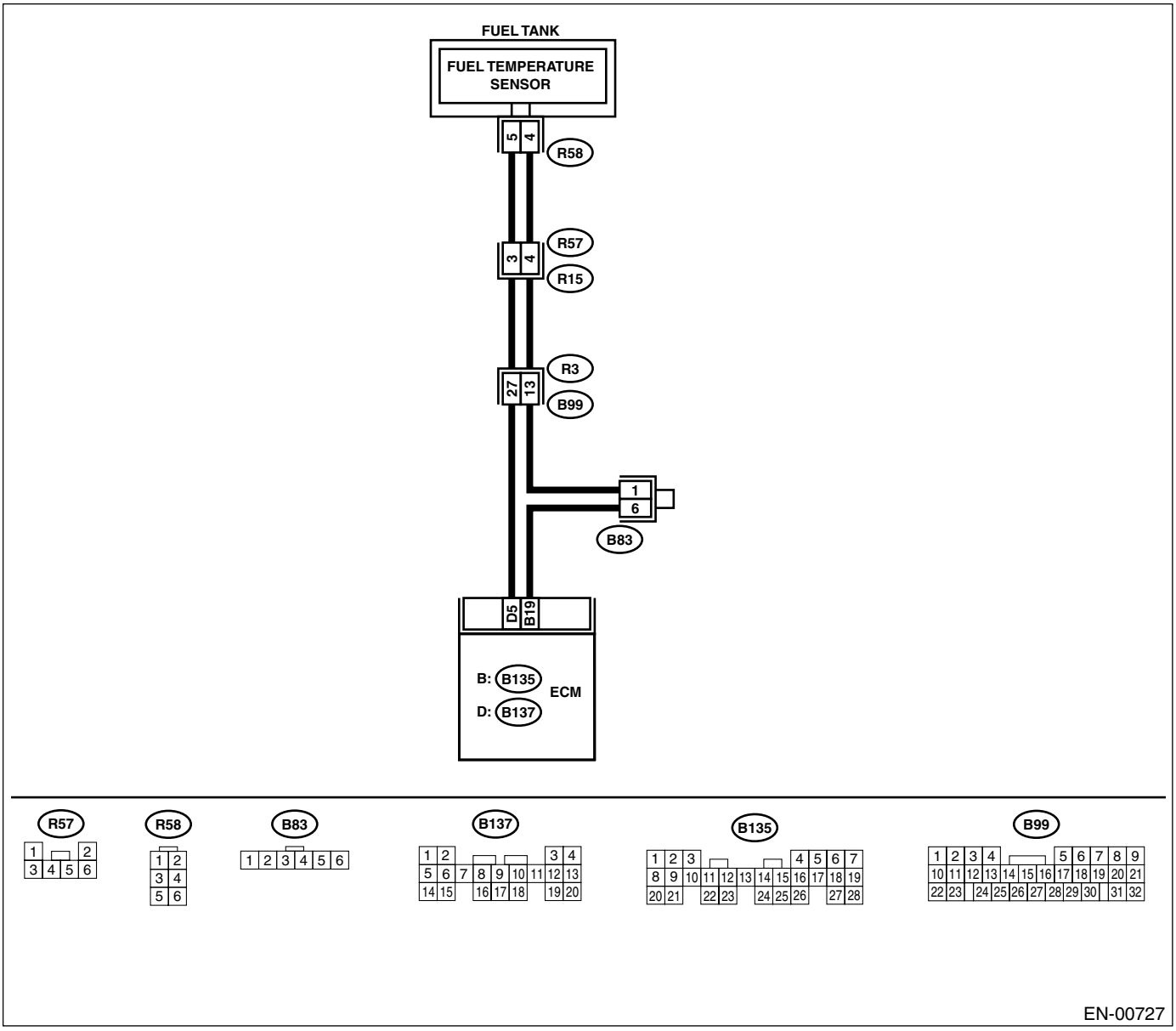
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 150°C (302°F)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Turn ignition switch to ON. 5) Read data of fuel temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>	Repair ground short circuit in harness between fuel pump and ECM connector.

AI: DTC P0183 — FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:***	Is the measured value less than 5 Ω?	Replace fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors • Poor contact in joint connector

AJ:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)-180, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AK:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)-180, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AL:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

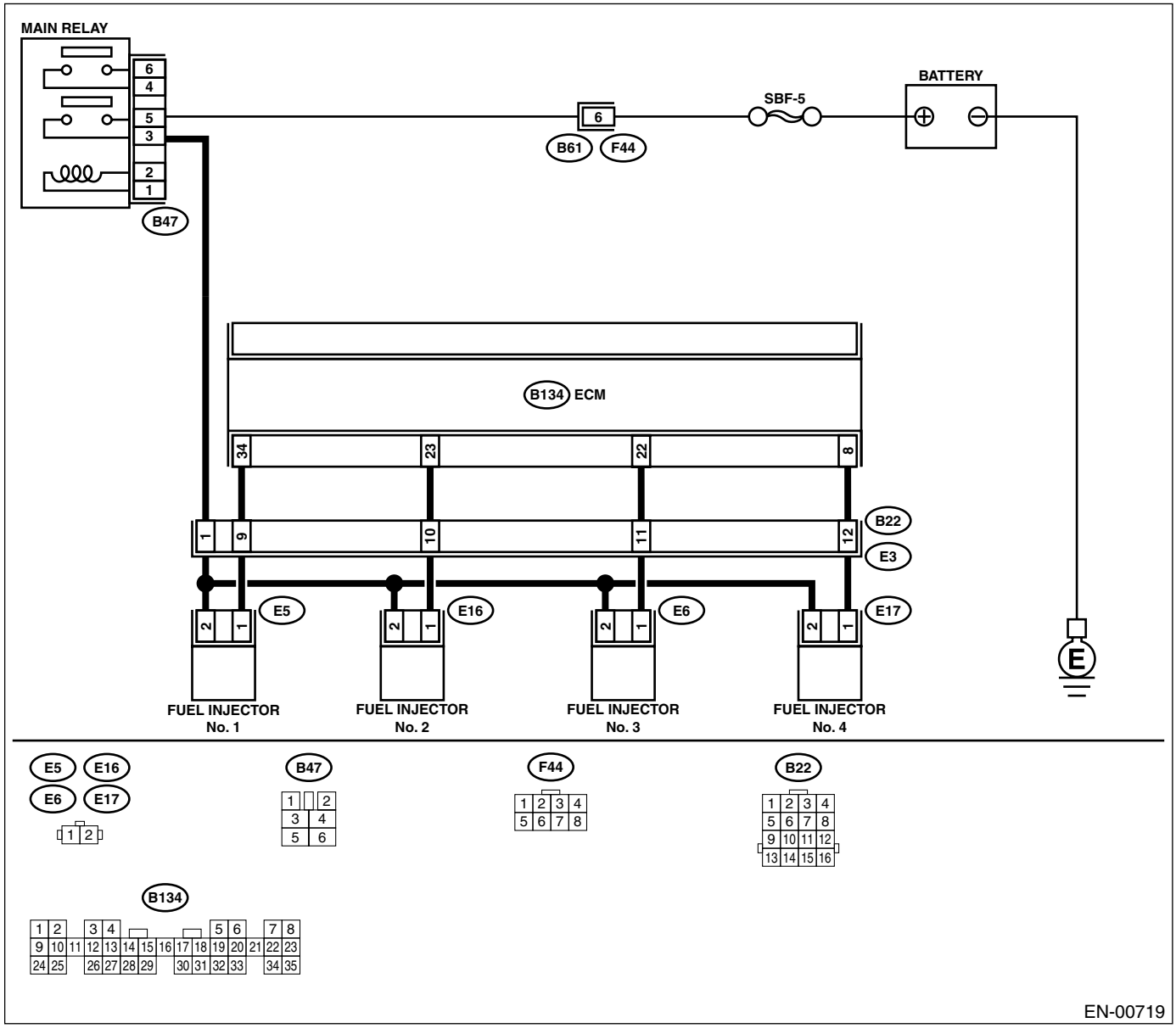
NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)-180, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AM:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
  - Detected simultaneously at occurrence of malfunction. (When a misfire which could damage catalyst occurs.)
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground on malfunctioning cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on malfunctioning cylinders. 3) Measure voltage between ECM connector and engine ground on malfunctioning cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure resistance of harness connector between ECM connector and fuel injector on malfunctioning cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 18 — (E17) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure resistance between fuel injector terminals on malfunctioning cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace faulty fuel injector. <Ref. to FU(H4SO)-38, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel injector and engine ground on malfinctioning cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on malfunctioning cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on malfunctioning cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on malfunctioning cylinder. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground on malfunctioning cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):*** Does the measured value exceed the specified value?	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel injector terminals on malfunctioning cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace malfunctioning fuel injector <Ref. to FU(H4SO)-38, Fuel Injector.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is camshaft position sensor or crankshaft position sensor loosely installed?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove timing belt cover.	Is crankshaft sprocket rusted or does it have broken teeth?	Replace crankshaft sprocket. <Ref. to ME(H4SO)-53, Crankshaft Sprocket.>	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-47, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**
13	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Clear memory using Subaru Select Monitor. <Ref. to EN(H4SO)-50, Clear Memory Mode.> 2) Start engine, and drive the vehicle more than 10 minutes.	Is the MIL coming on or blinking?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.** NOTE: Disconnected spark plug code, etc.	Was the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	(1) Repair poor contact. NOTE: In this case, repair the following: • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on malfunctioning cylinders • Poor contact in ECM connector • Poor contact in coupling connector (2) If there is no poor contact, contact SOA (distributor). Before contacting, the following items must be checked: • Fuel for condition • Fuel additives • Spark plug for condition • Plug code for condition • Engine oil for condition

Step		Check	Yes	No
15	**CHECK AIR INTAKE SYSTEM.**	Is there any malfunction in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK MISFIRE SYMPTOM.** 1) Turn ignition switch to ON. 2) Read diagnostic trouble code (DTC). •Subaru Select Monitor <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Go to step **21.**	Go to step **17.**
17	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step **22.**	Go to step **18.**
18	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step **23.**	Go to step **19.**
19	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0303?	Go to step **24.**	Go to step **20.**
20	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302 and P0304?	Go to step **25.**	Go to step **26.**
21	**ONLY ONE CYLINDER**	Is there any malfunction in that cylinder?	Repair or replace malfunctioning parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
22	GROUP OF #1 AND #2 CYLINDERS	Are there malfunctions in #1 and #2 cylinders?	Repair or replace malfunctioning parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H4SO)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	GROUP OF #3 AND #4 CYLINDERS	Are there malfunctions in #3 and #4 cylinders?	Repair or replace malfunctioning parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for “16. D: IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to EN(H4SO)-74, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	GROUP OF #1 AND #3 CYLINDERS	Are there malfunctions in #1 and #3 cylinders?	Repair or replace malfunctioning parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
25	GROUP OF #2 AND #4 CYLINDERS	Are there malfunctions in #2 and #4 cylinders?	Repair or replace malfunctioning parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	CYLINDER AT RANDOM	Is the engine idle unstable?	Go to DTC P0171. <Ref. to EN(H4SO)-168, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace malfunctioning parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

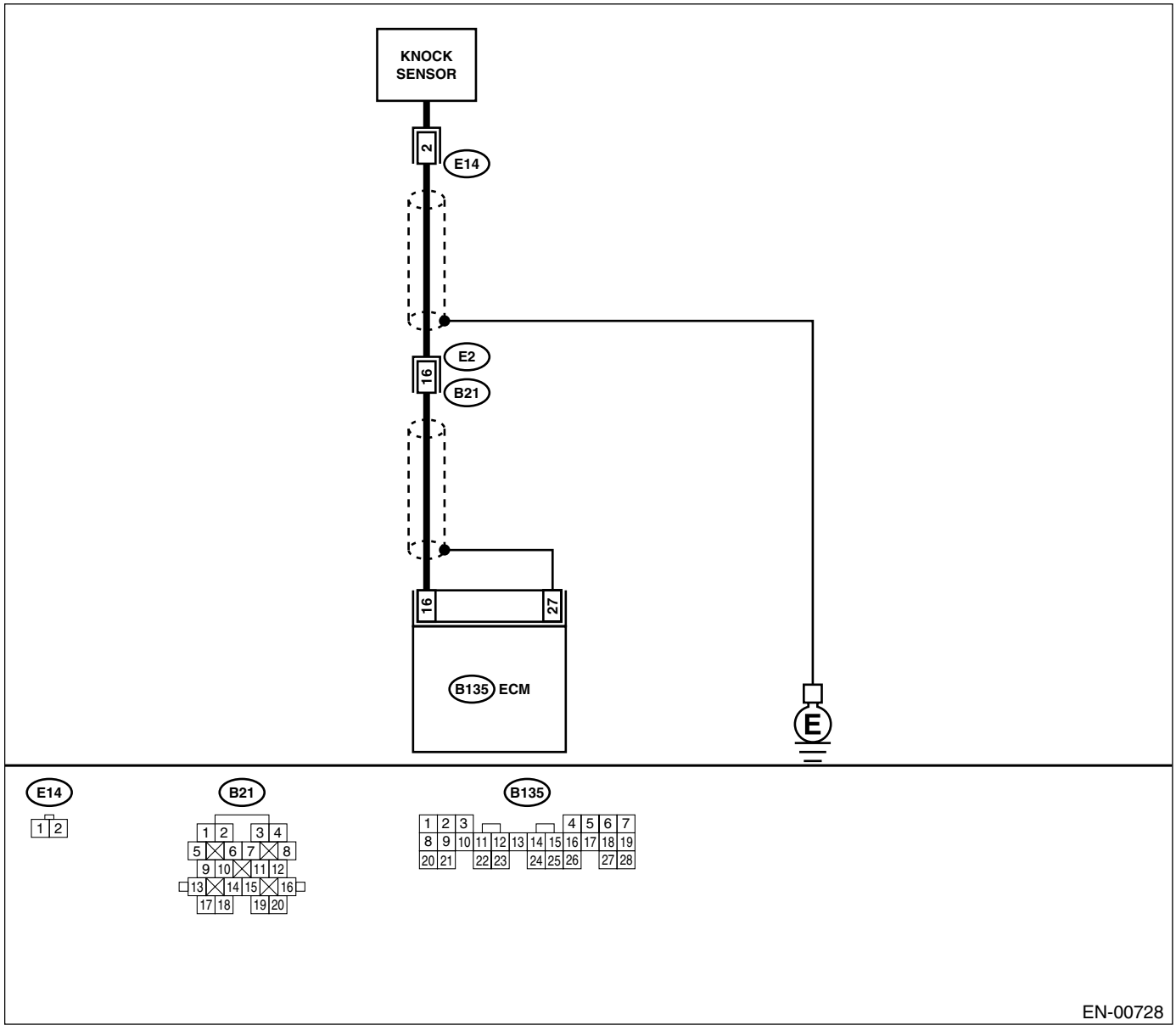
MEMO:

AN:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



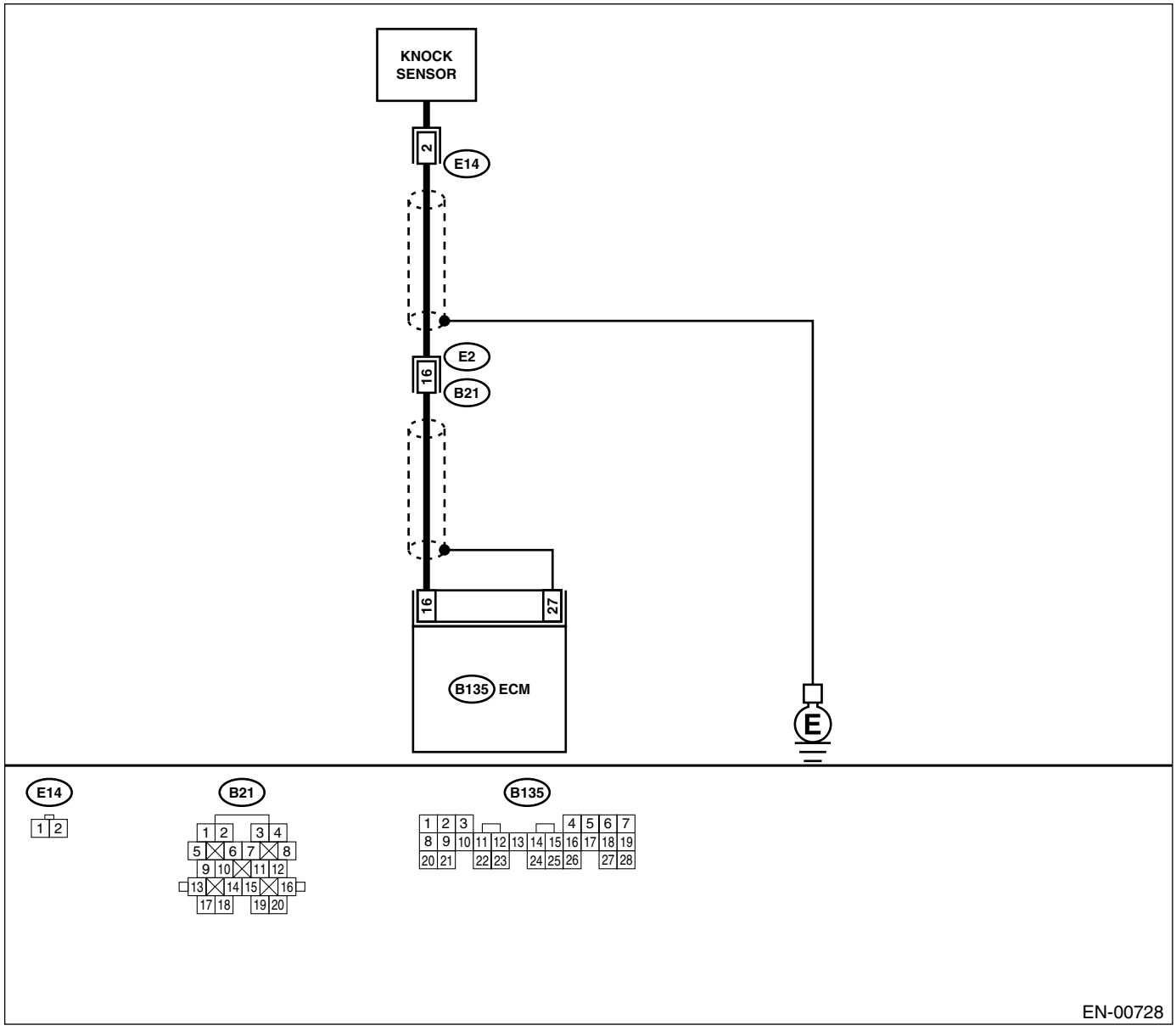
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the measured value more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect connector from knock sensor. 2) Measure resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the measured value more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace knock sensor. <Ref. to FU(H4SO)-30, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AO:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



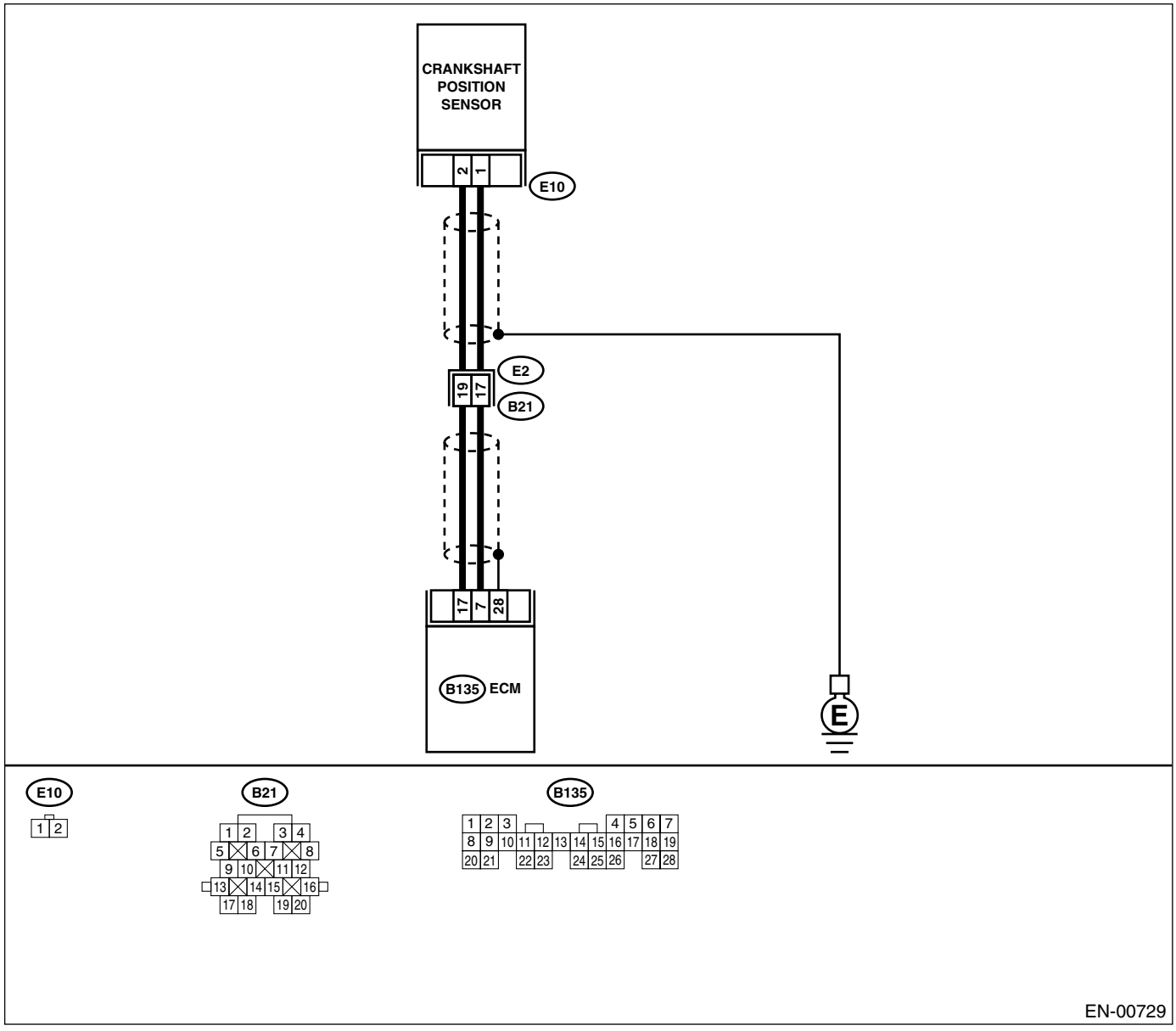
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the measured value less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect connector from knock sensor. 2) Measure resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the measured value less than 400 kΩ?	Replace knock sensor. <Ref. to FU(H4SO)-30, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect connectors to ECM and knock sensor. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 2 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AP:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Engine does not start.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



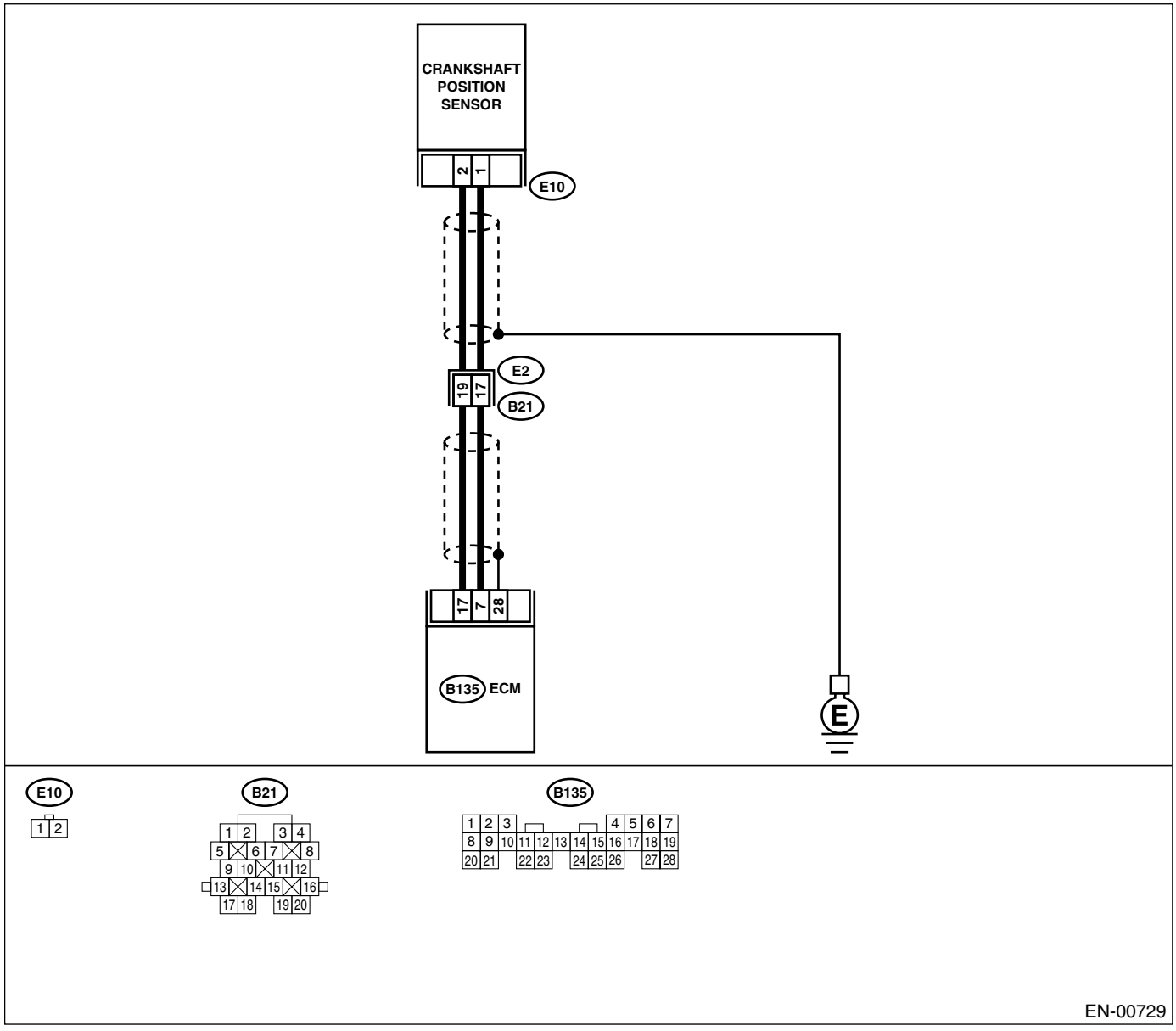
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from crankshaft position sensor. 3) Measure resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove crankshaft position sensor. 2) Measure resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace crankshaft position sensor. <Ref. to FU(H4SO)-28, Crankshaft Position Sensor.>

AQ:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Engine does not start.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



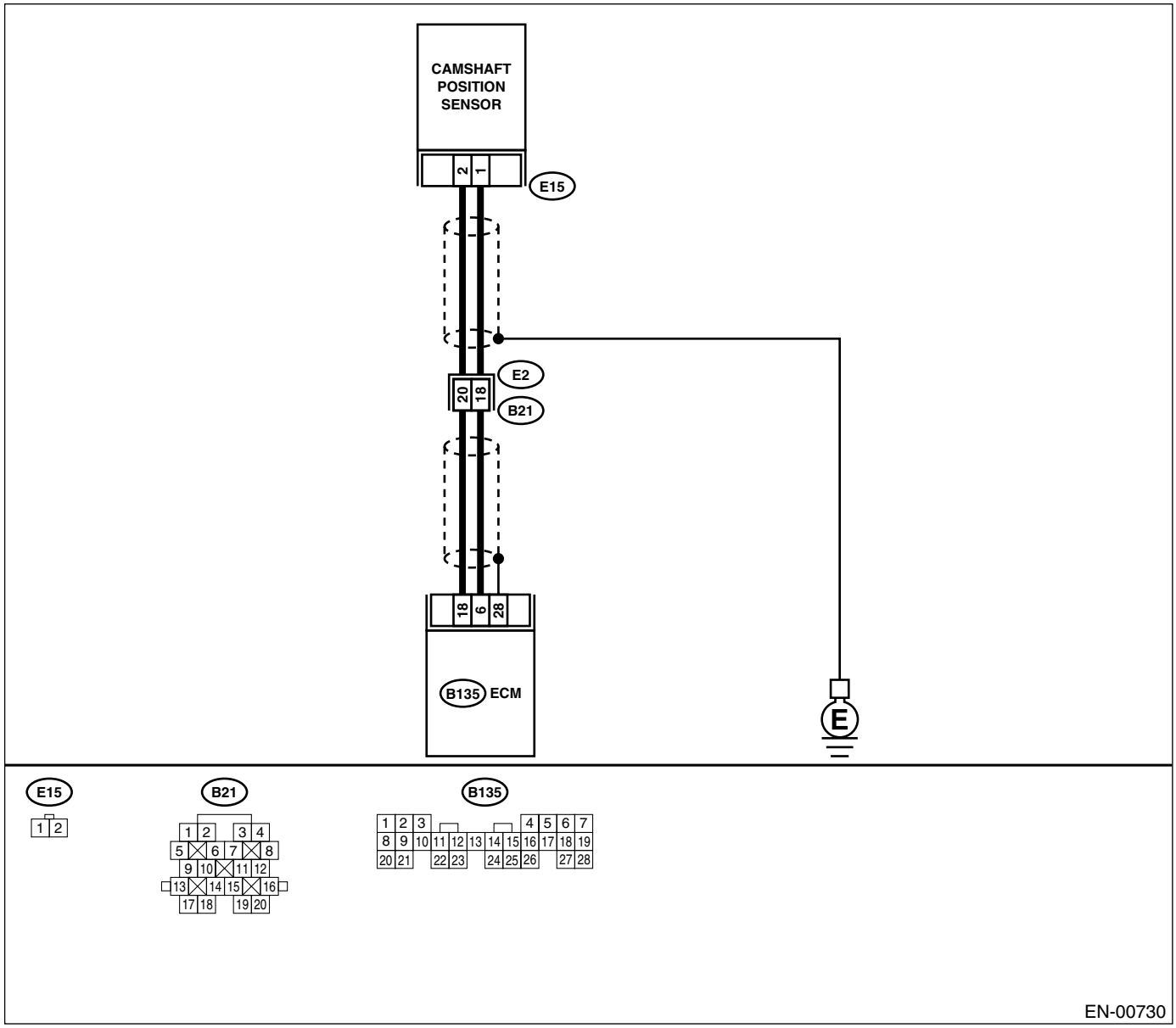
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0335 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove front belt cover.	Are crankshaft sprocket teeth cracked or damaged?	Replace crankshaft sprocket. <Ref. to ME(H4SO)-53, Crankshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-47, Timing Belt Assembly.>	Replace crankshaft position sensor. <Ref. to FU(H4SO)-28, Crankshaft Position Sensor.>

AR:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Engine does not start.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



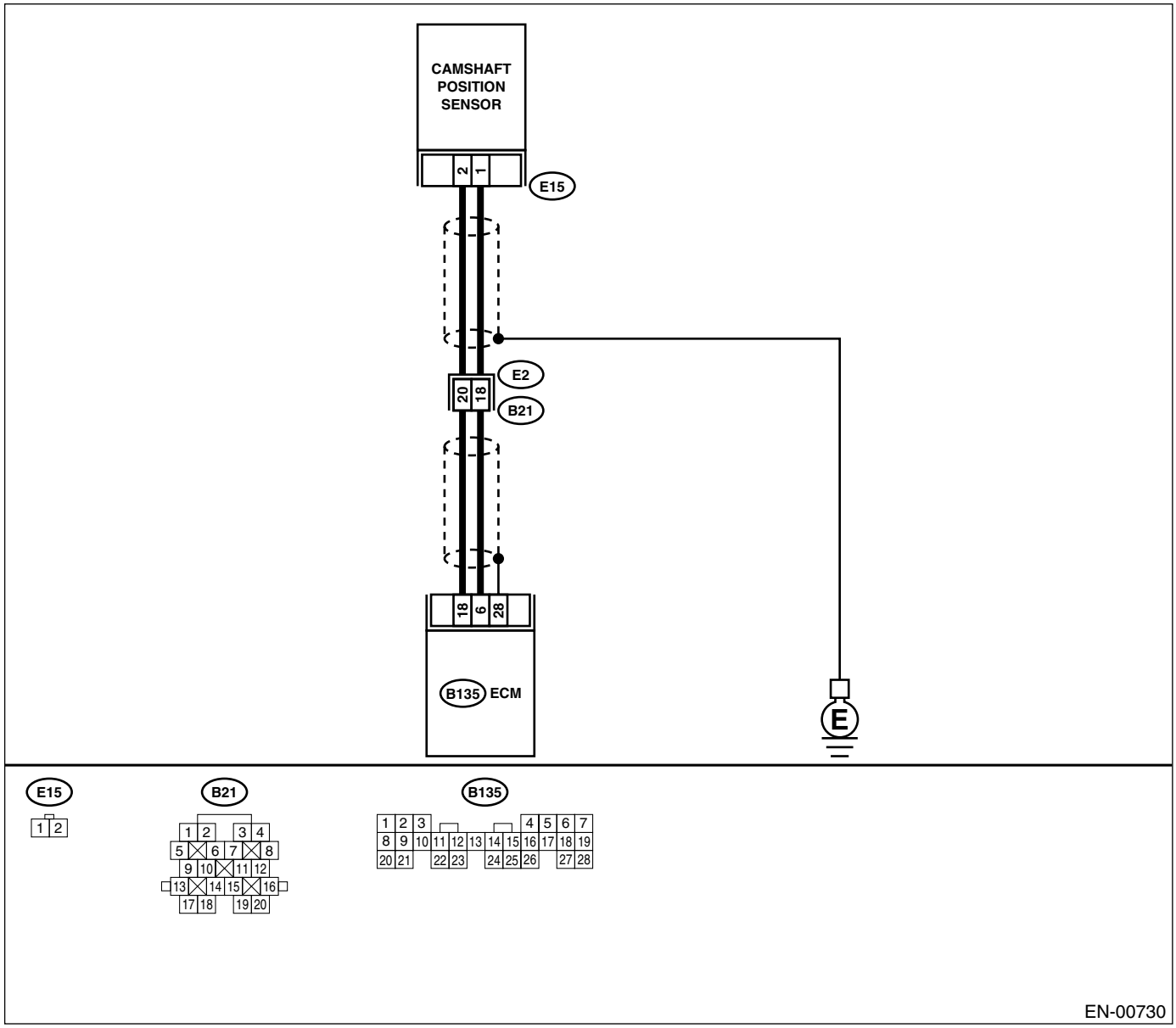
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove camshaft position sensor. 2) Measure resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace camshaft position sensor. <Ref. to FU(H4SO)-29, Camshaft Position Sensor.>

AS:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Engine does not start.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0340 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.

Step		Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove camshaft position sensor. 2) Measure resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Go to step **7.**	Replace camshaft position sensor. <Ref. to FU(H4SO)-29, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove front belt cover.	Are camshaft sprocket teeth cracked or damaged?	Replace camshaft sprocket. <Ref. to ME (H4SO)-, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH.	Is timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-47, Timing Belt Assembly.>	Replace camshaft position sensor. <Ref. to FU(H4SO)-29, Camshaft Position Sensor.>

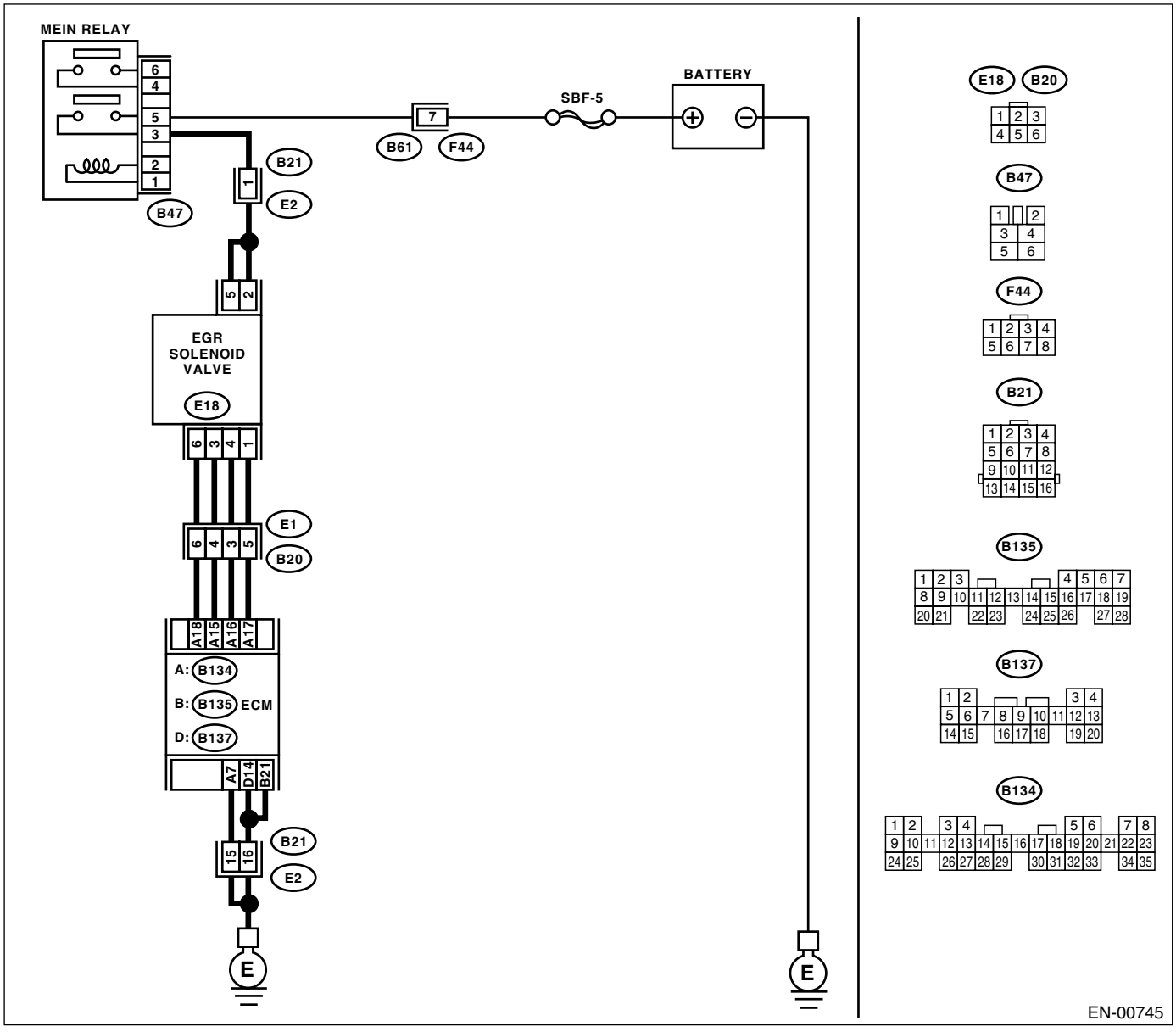
MEMO:

AT:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Poor driving performance on low engine speed
  - Erroneous idling
  - Poor driving performance.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start engine. 2) Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 53.3 kPa (400 mmHg, 15.75 inHg)?	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step **3.**
3	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch to ON. 3) Measure voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:***	Is the measured value more than 10 V?	Go to step **4.**	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4	**CHECK EGR SOLENOID VALVE.** Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:***	Is the measured value within 20 to 30 Ω?	Go to step **5.**	Replace EGR solenoid valve. <Ref. to FU(H4SO)-37, EGR Valve.>
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:***	Does the measured value change within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from EGR solenoid valve and ECM. 3) Measure resistance of harness between EGR solenoid valve and ECM connector. ***Connector & terminal*** ***(B134) No. 18 — (E18) No. 6:*** ***(B134) No. 17 — (E18) No. 1:*** ***(B134) No. 16 — (E18) No. 4:*** ***(B134) No. 15 — (E18) No. 3:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between ECM and EGR solenoid valve connector.
7	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between EGR solenoid valve and chassis ground. ***Connector & terminal*** ***(B137) No. 25 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:*** ***(B137) No. 13 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair short circuit in harness between main relay and EGR solenoid valve connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector.	Is there poor contact in ECM and EGR solenoid valve connector?	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.

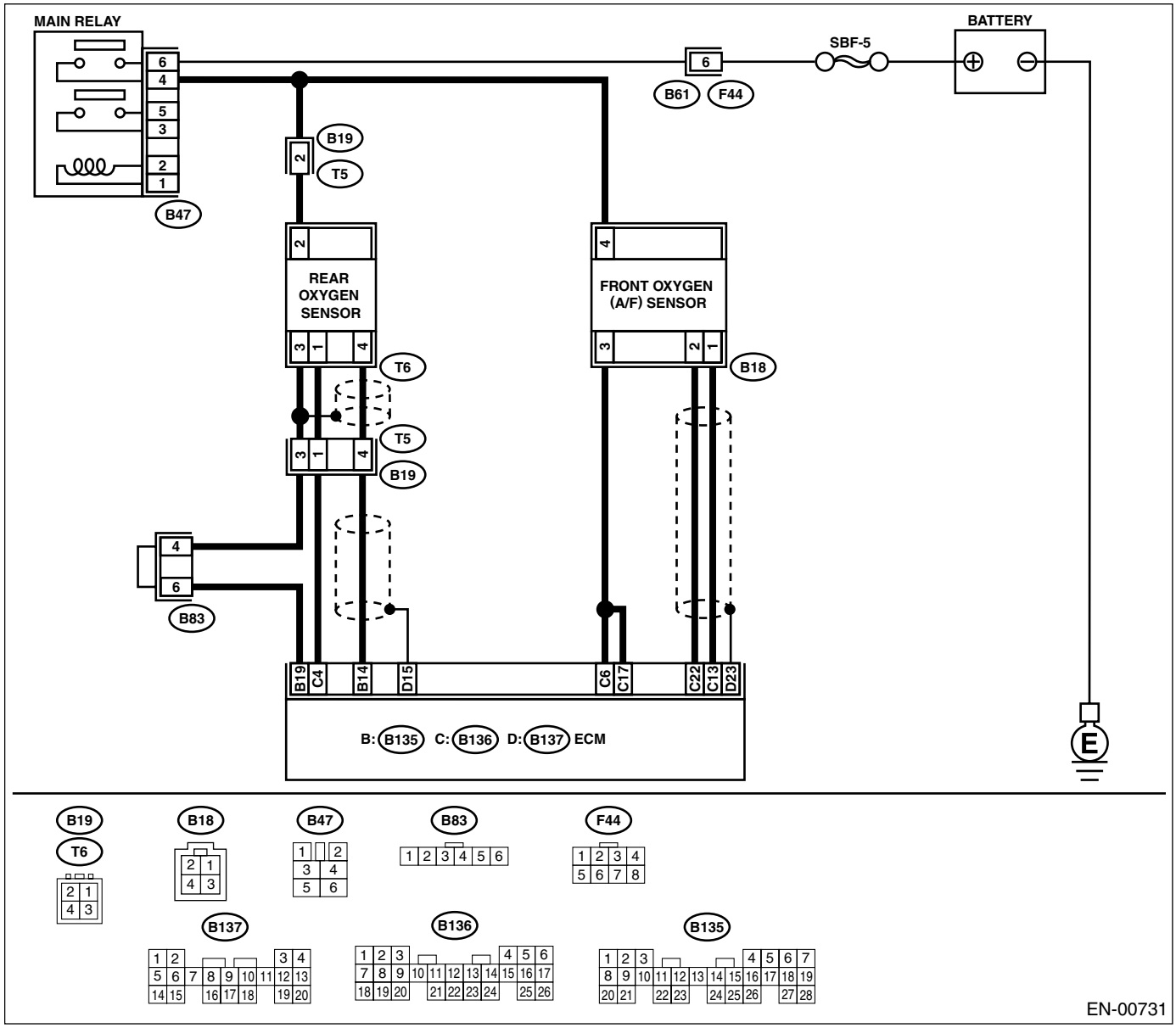
MEMO:

AU:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter	Is there any fault in exhaust system?	Repair or replace exhaust system. <Ref. to EX(H4SO)-2, General Description.>	Go to step **3.**
3	**CHECK CATALYTIC CONVERTER.**	Is there any damage at catalyst?	Replace front catalytic converter. <Ref. to EC(H4SO)-3, Front Catalytic Converter.>	Go to step **4.**
4	**CHECK REAR OXYGEN SENSOR CIRCUIT.** 1) Disconnect rear oxygen sensor connector. 2) Measure the resistance between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 19 - (T6) No. 3***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open harness between ECM and rear oxygen sensor.
5	**CHECK SEALED WIRE.**	Is the sealed wire connected?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair sealed wire.

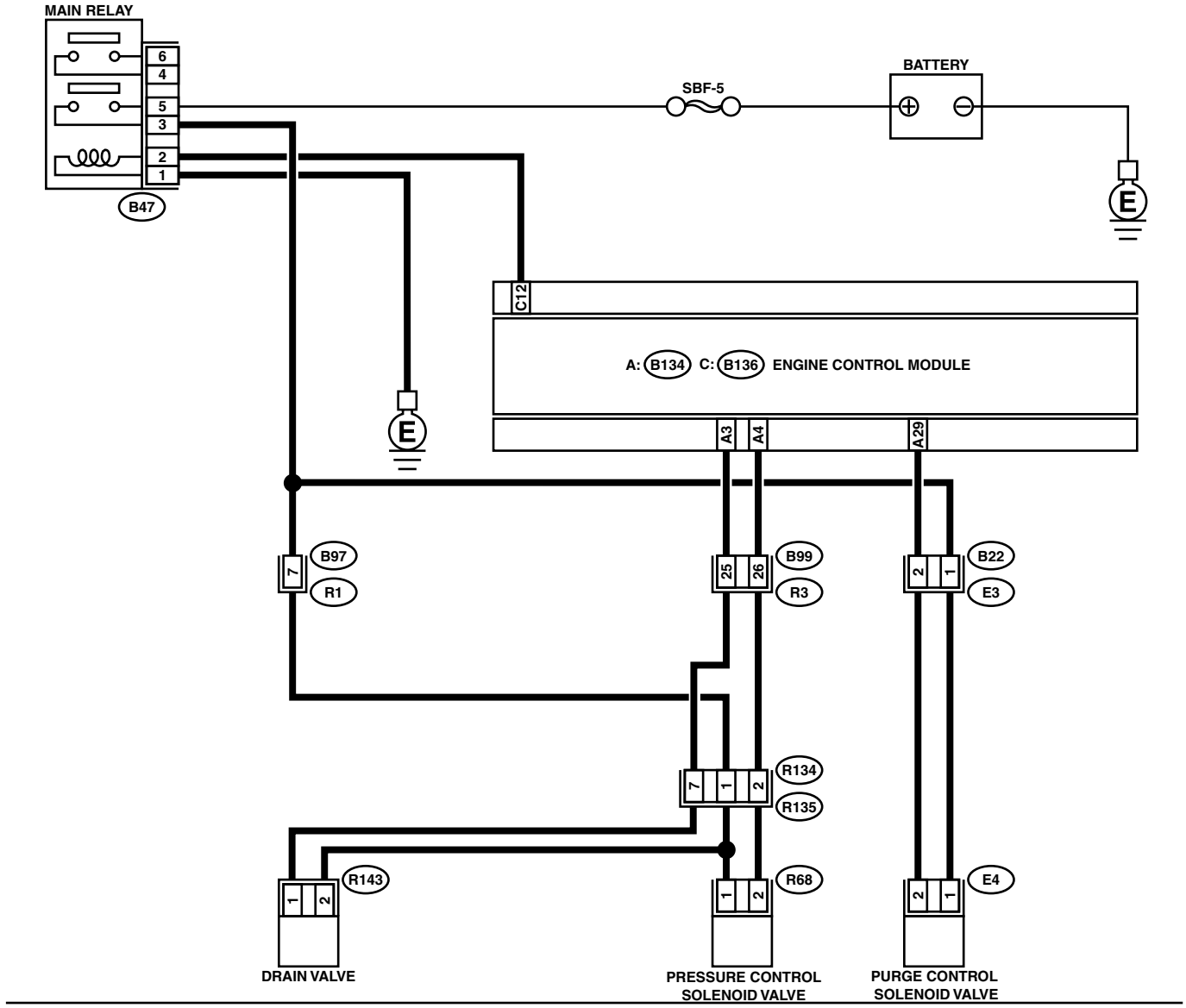
MEMO:

AV:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-02112

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any other DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the genuine fuel filler cap used?	Go to step **4.**	Replace with a genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-59, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step **6.**	Replace drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step **7.**	Replace purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step **8.**	Replace pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporative emission control system line?	Repair or replace fuel line. <Ref. to FU(H4SO)-72, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**

Step		Check	Yes	No
9	**CHECK CANISTER.**	Is canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H4SO)-51, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H4SO)-51, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

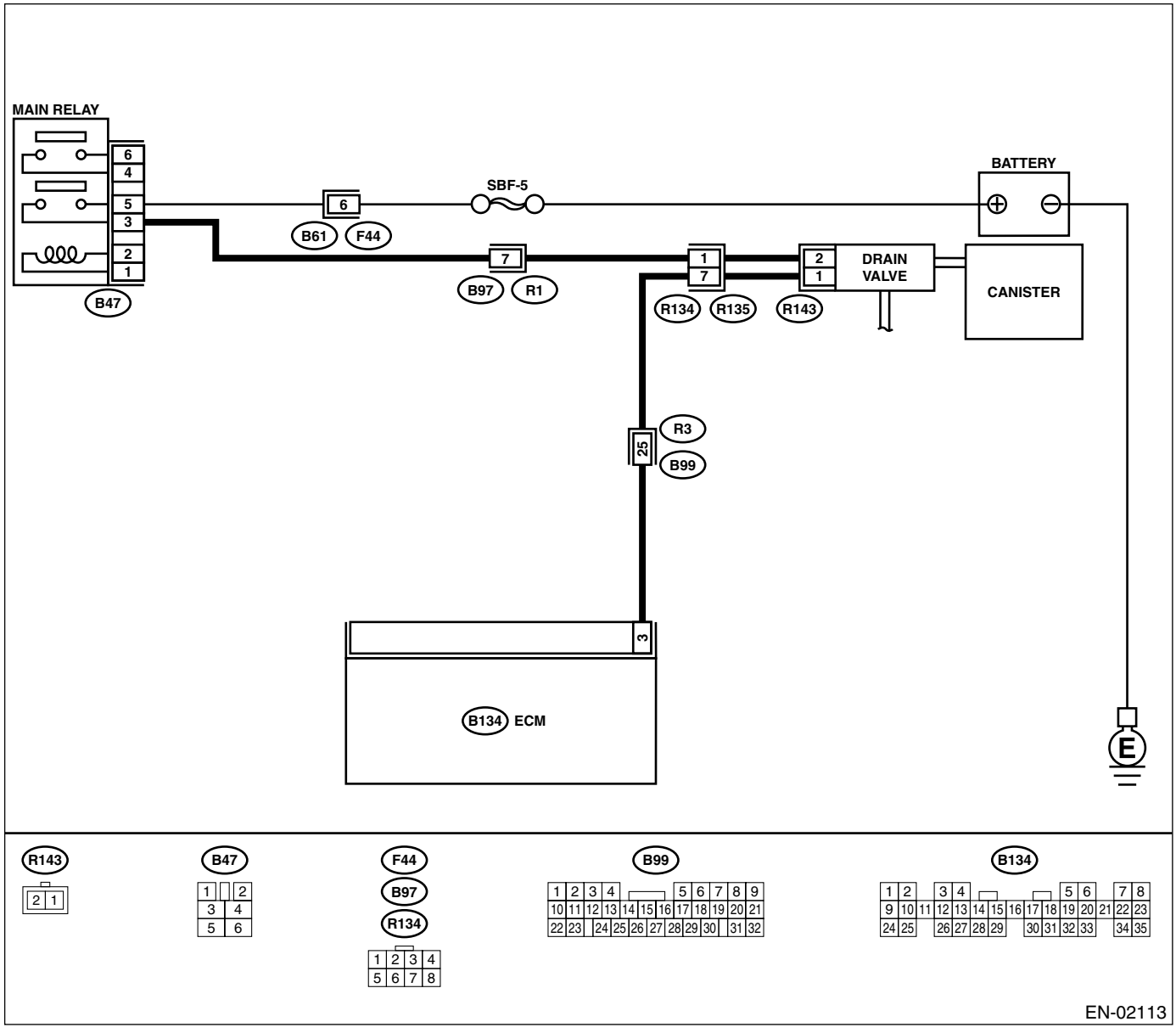
MEMO:

AW:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connectors
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from drain valve and ECM. 3) Measure resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R143) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B134) No. 3 — (R143) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connectors
5	**CHECK DRAIN VALVE.** Measure resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

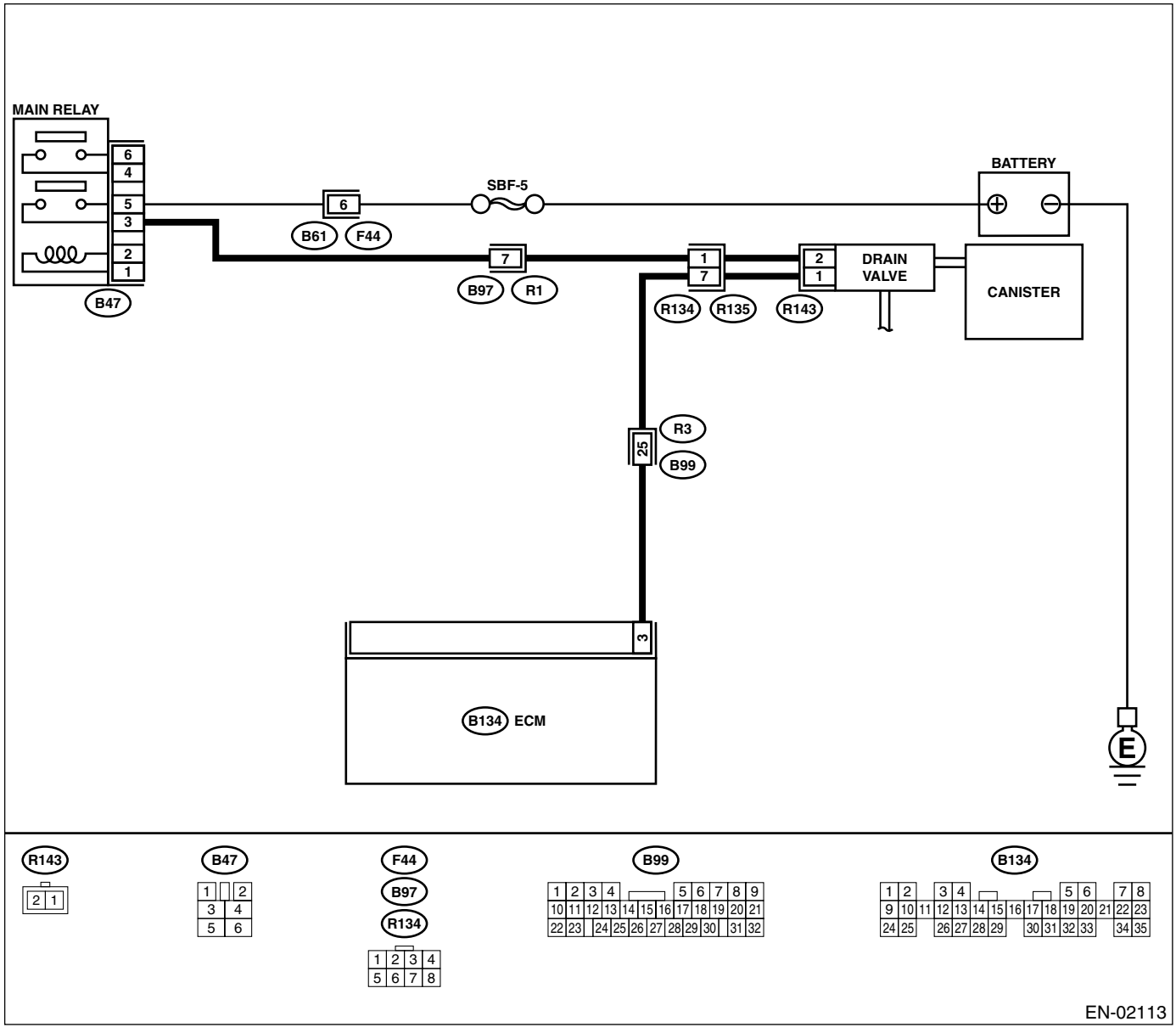
MEMO:

AX:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



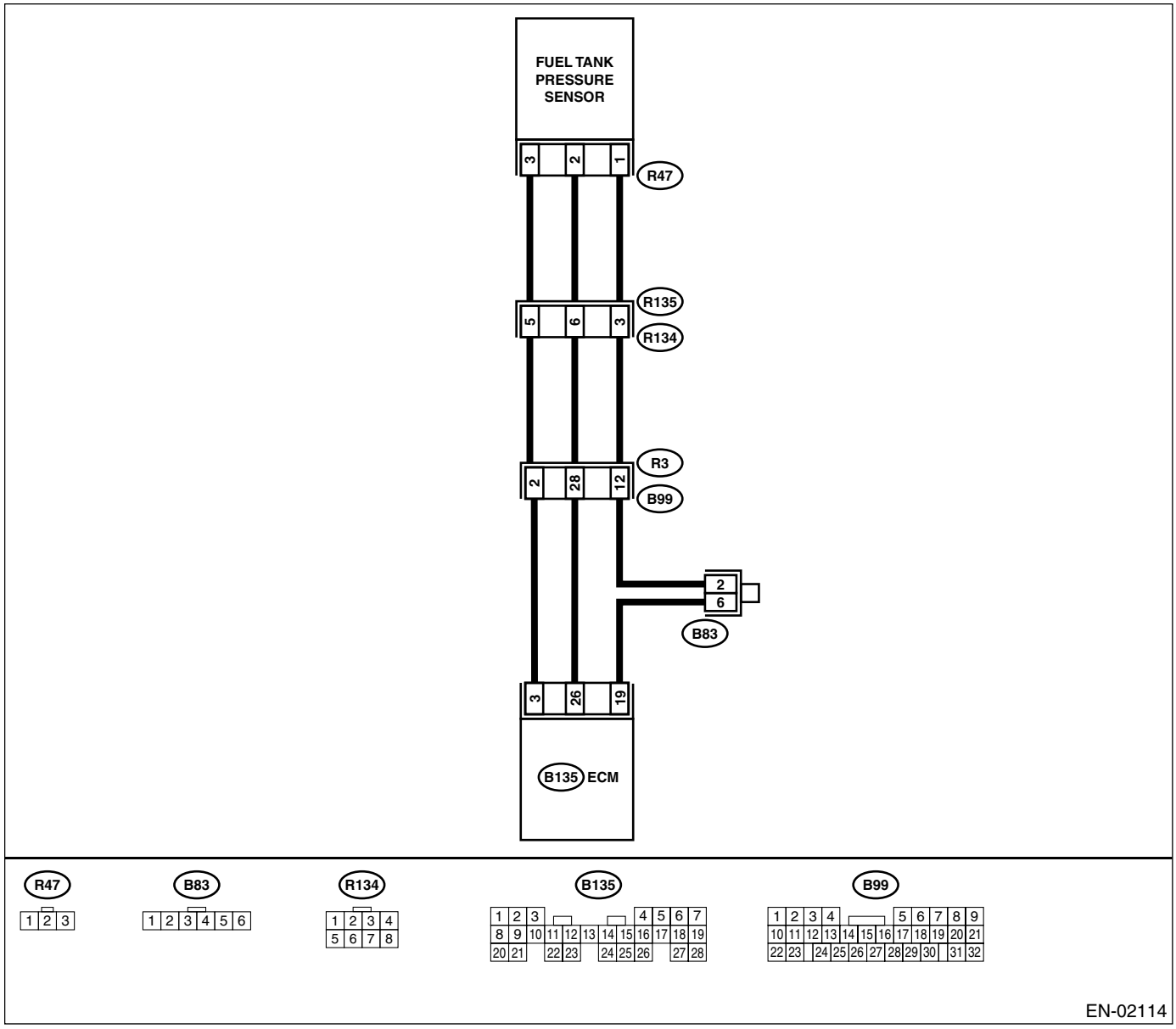
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from drain valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and drain valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace drain valve <Ref. to EC(H4SO)-17, Drain Valve.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

AY:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



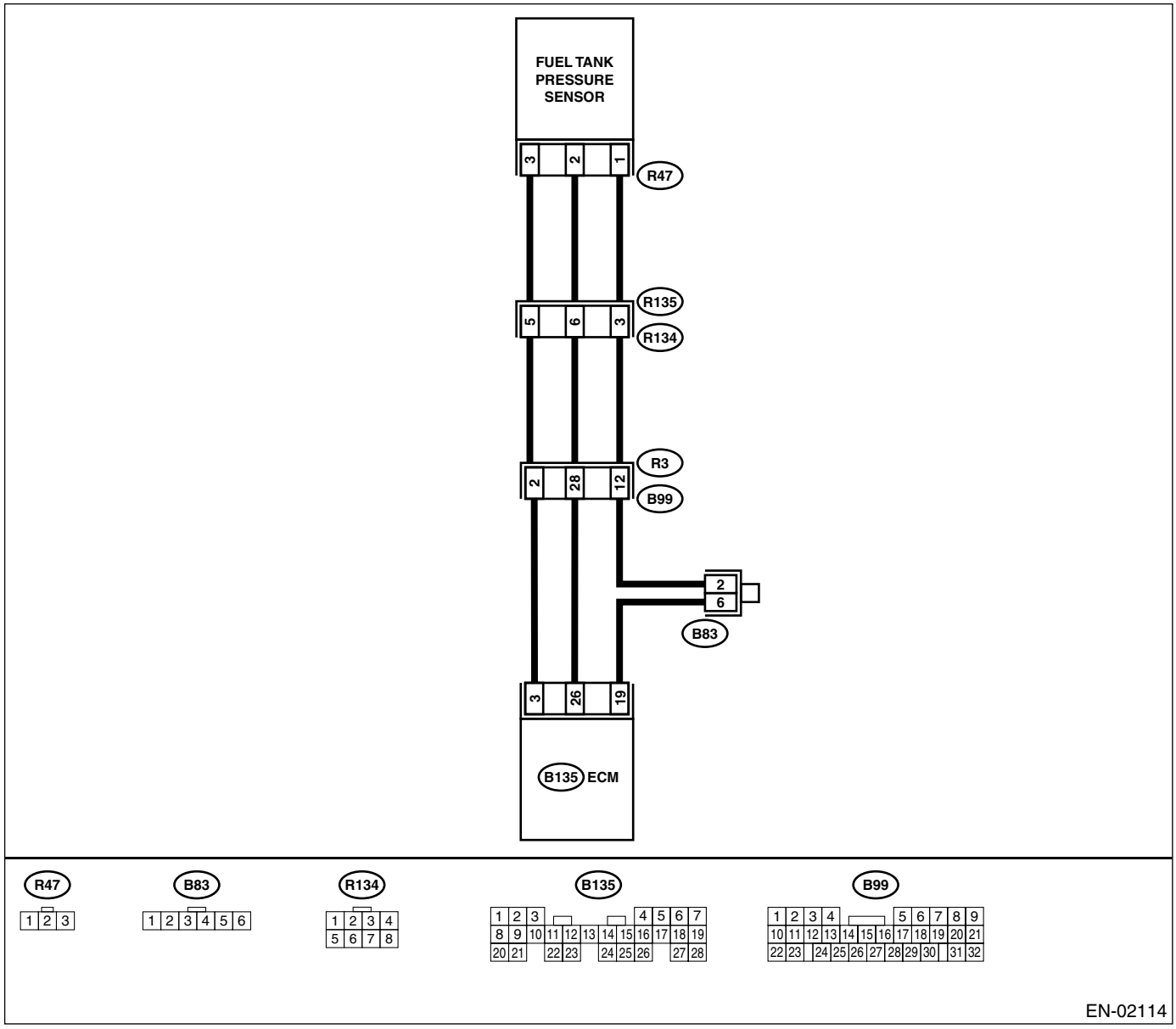
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank •Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there any malfunction in pressure/vacuum line?	Repair or replace hoses and pipes.	Replace fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

AZ:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.>	Does the measured value change when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 19 — (R134) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 5 — (R47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure resistance of harness between fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair ground short circuit in fuel tank cord.
12	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

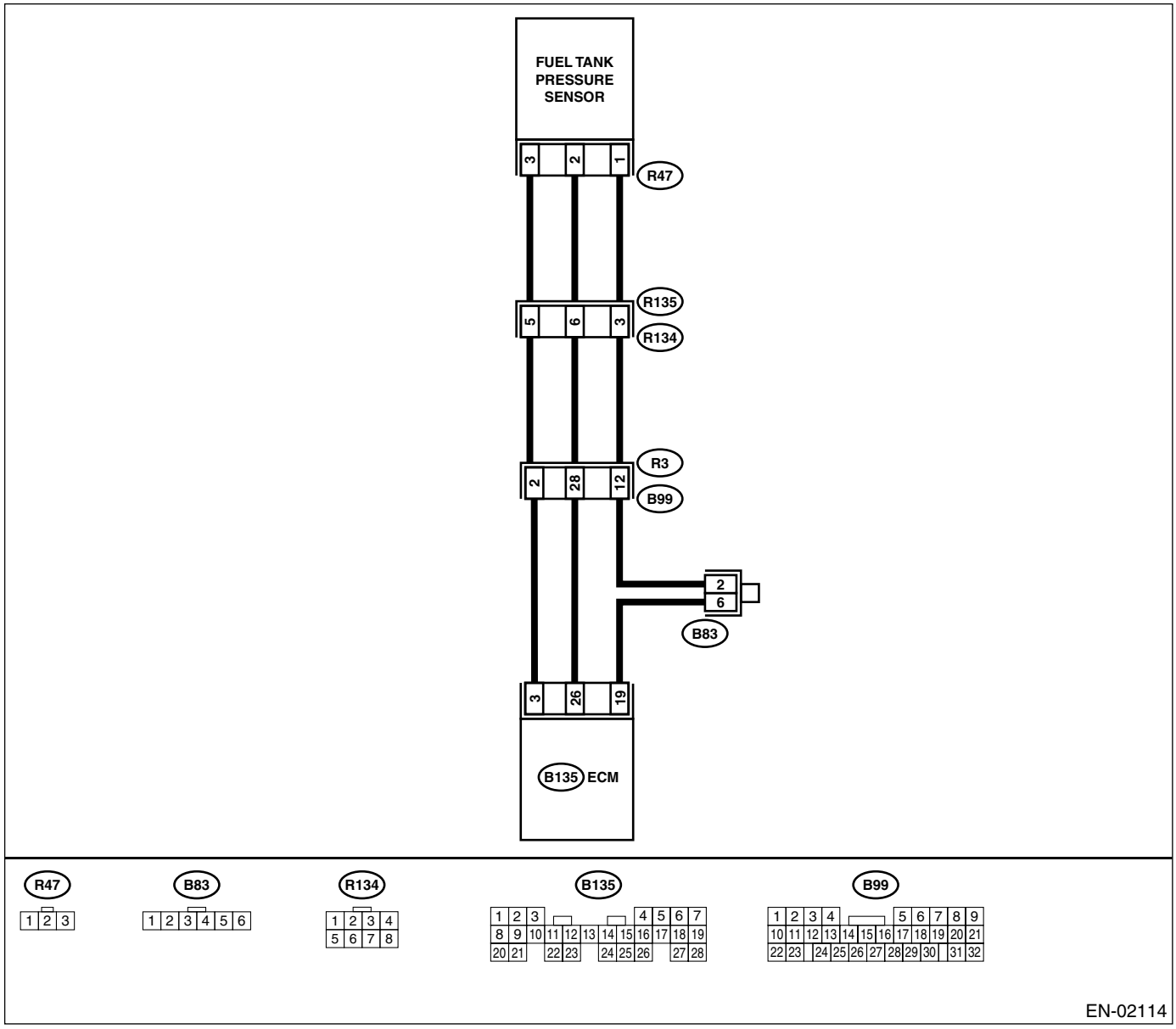
MEMO:

BA:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step **12.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.>	Does the measured value change when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

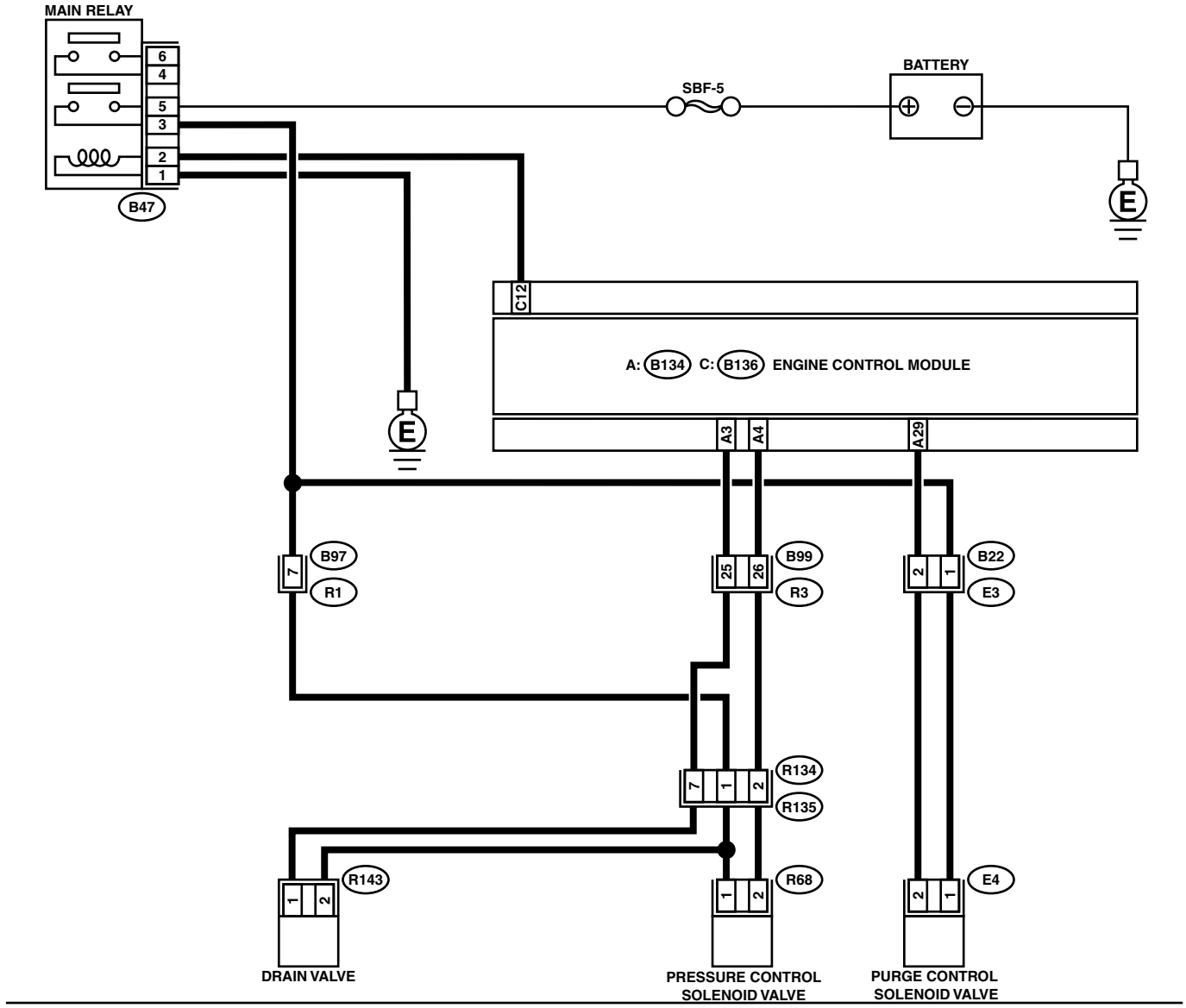
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 26 — (R134) No. 6:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — (R134) No. 3:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 6 — (R47) No. 2:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>
12	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

BB:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-02112

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the genuine fuel filler cap used?	Go to step **4.**	Replace with a genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-59, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step **6.**	Replace drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step **7.**	Replace purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step **8.**	Replace pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>

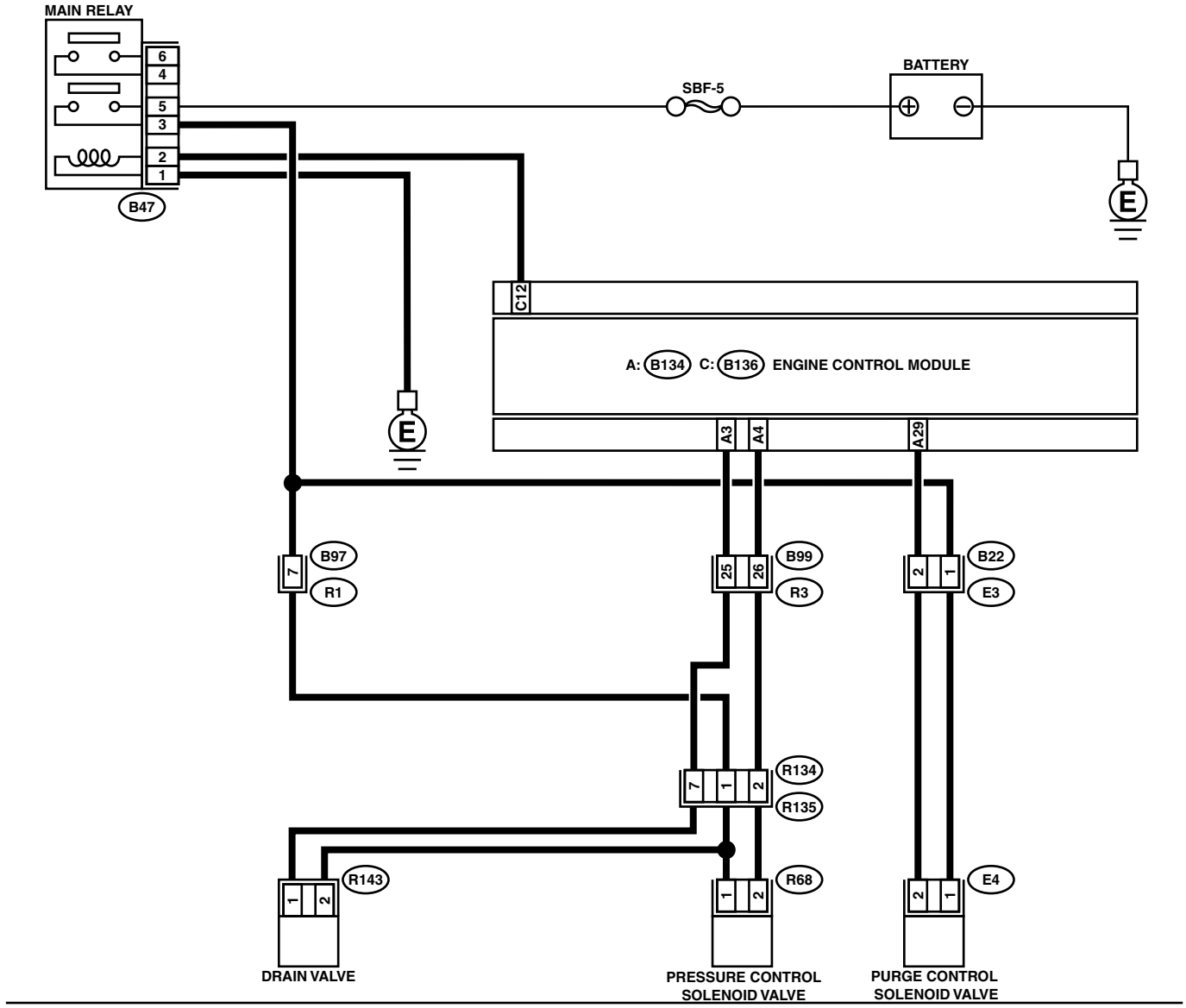
	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporative emission control system line?	Repair or replace fuel line. <Ref. to FU(H4SO)-72, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H4SO)-51, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H4SO)-51, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BC:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - Fuel filler cap loose or missing

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-02112

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the genuine fuel filler cap used?	Go to step **4.**	Replace with a genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-59, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step **6.**	Replace drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step **7.**	Replace purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step **8.**	Replace pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>
8	**CHECK CANISTER.**	Is canister damaged?	Repair or replace canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **9.**

Step		Check	Yes	No
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H4SO)-51, Fuel Tank.>	Is fuel tank damaged?	Repair or replace fuel tank. <Ref. to FU(H4SO)-51, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

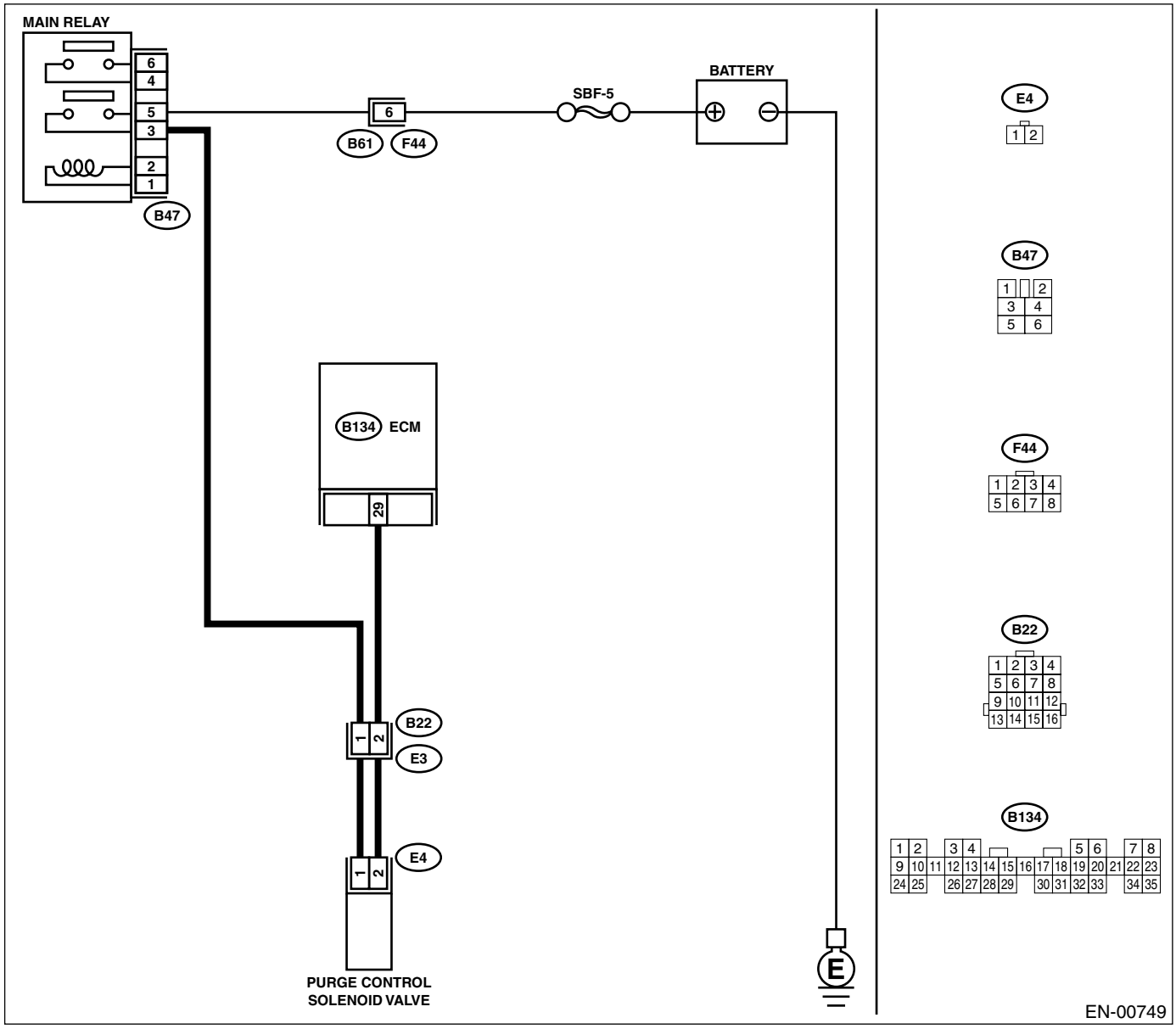
MEMO:

BD:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from purge control solenoid valve and ECM. 3) Measure resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 29 — (E4) No. 2:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove purge control solenoid valve. 2) Measure resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **5.**	Replace purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

Step		Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

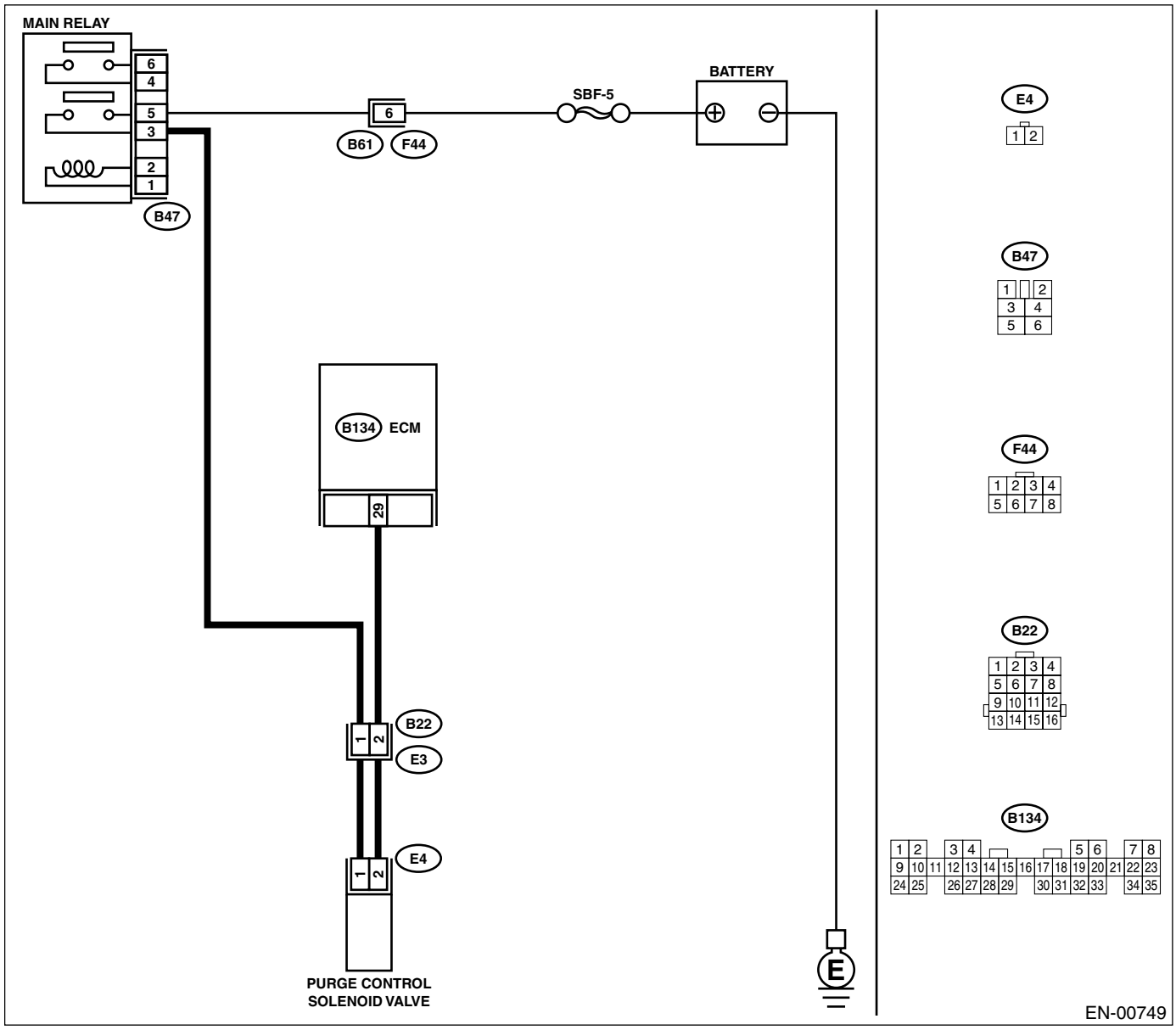
MEMO:

BE:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



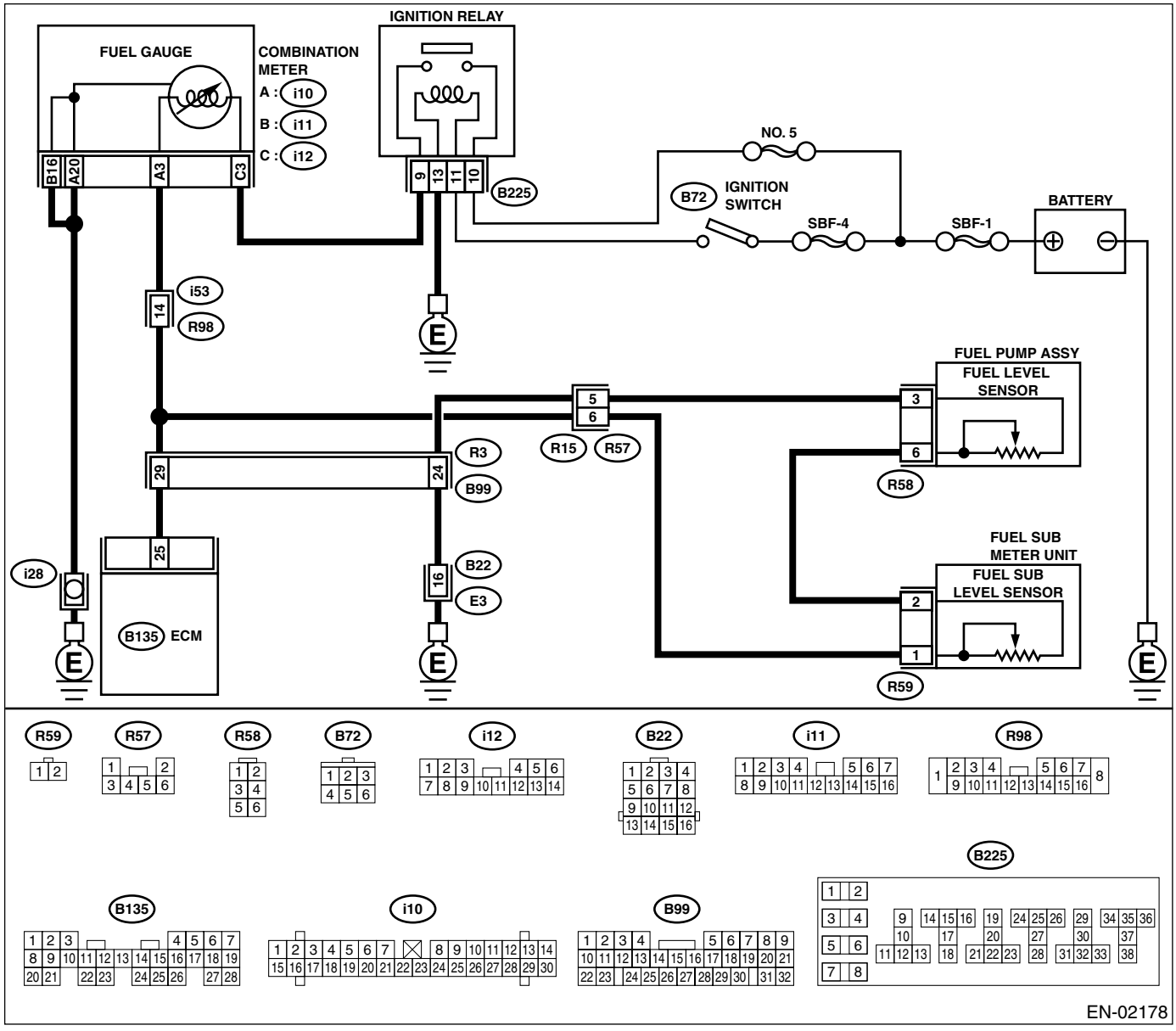
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from purge control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace purge control solenoid valve <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

BF:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



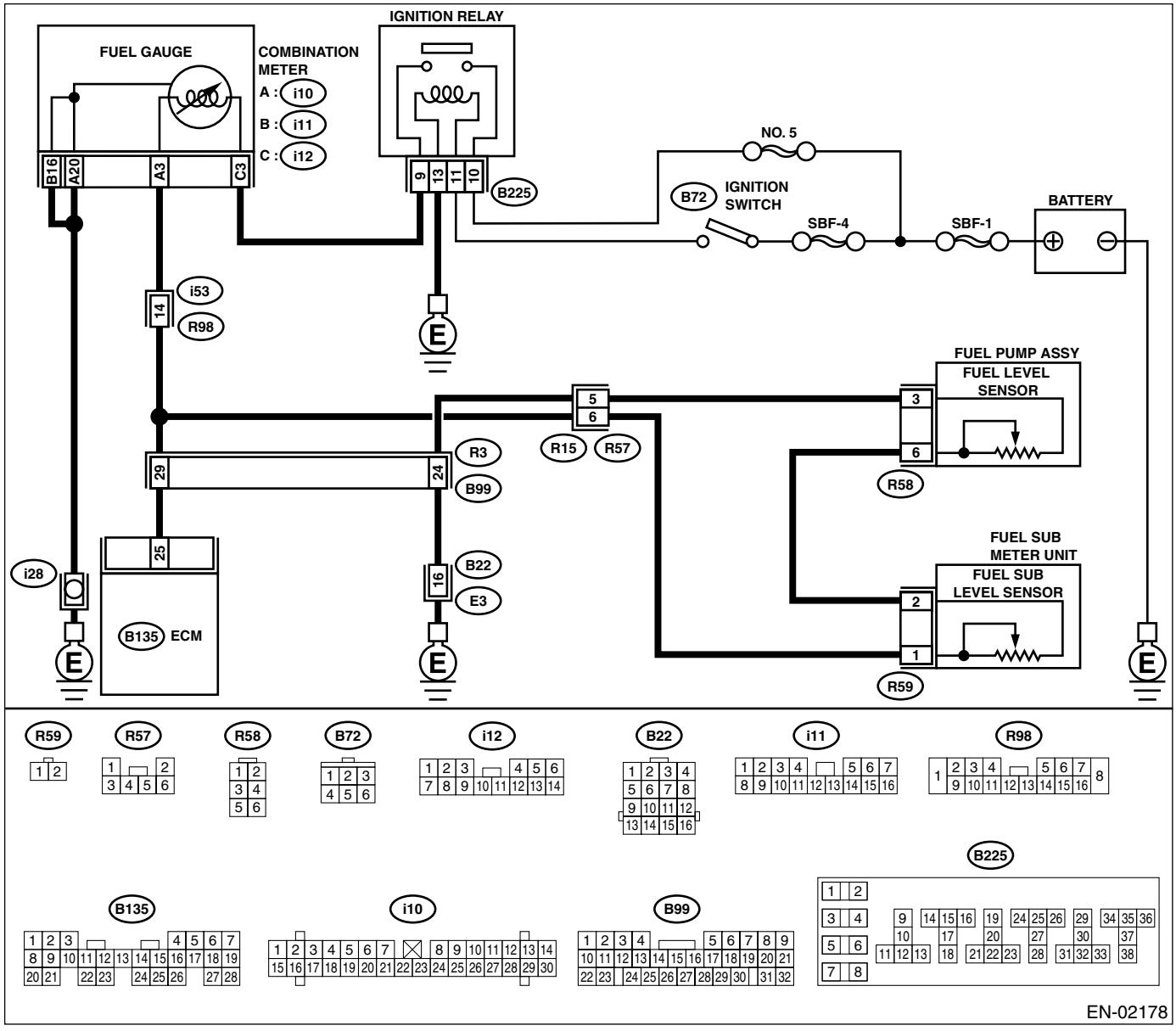
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace fuel level sensor <Ref. to FU(H4SO)-68, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO)-69, Fuel Sub Level Sensor.>

BG:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value less than 0.12 V?	Go to step **6.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel level sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.>	Is the measured value less than 0.12 V when shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 0.12 V?	Go to step **4.**	Go to step **7.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from connector (i10) and ECM connector. 3) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i10) No. 3:***	Is the measured value less than 10 Ω?	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel sub level sensor. 3) Measure resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in fuel tank cord.

	Step	Check	Yes	No
8	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel pump assembly. 2) Measure resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel pump assembly. <Ref. to FU(H4SO)-66, Fuel Pump.> 2) Measure resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value within 0.5 to 2.5 Ω?	Go to step **10.**	Replace fuel level sensor.
10	**CHECK FUEL SUB LEVLE SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel sub level sensor. <Ref. to FU(H4SO)-69, Fuel Sub Level Sensor.> 2) Measure resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 0.5 to 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

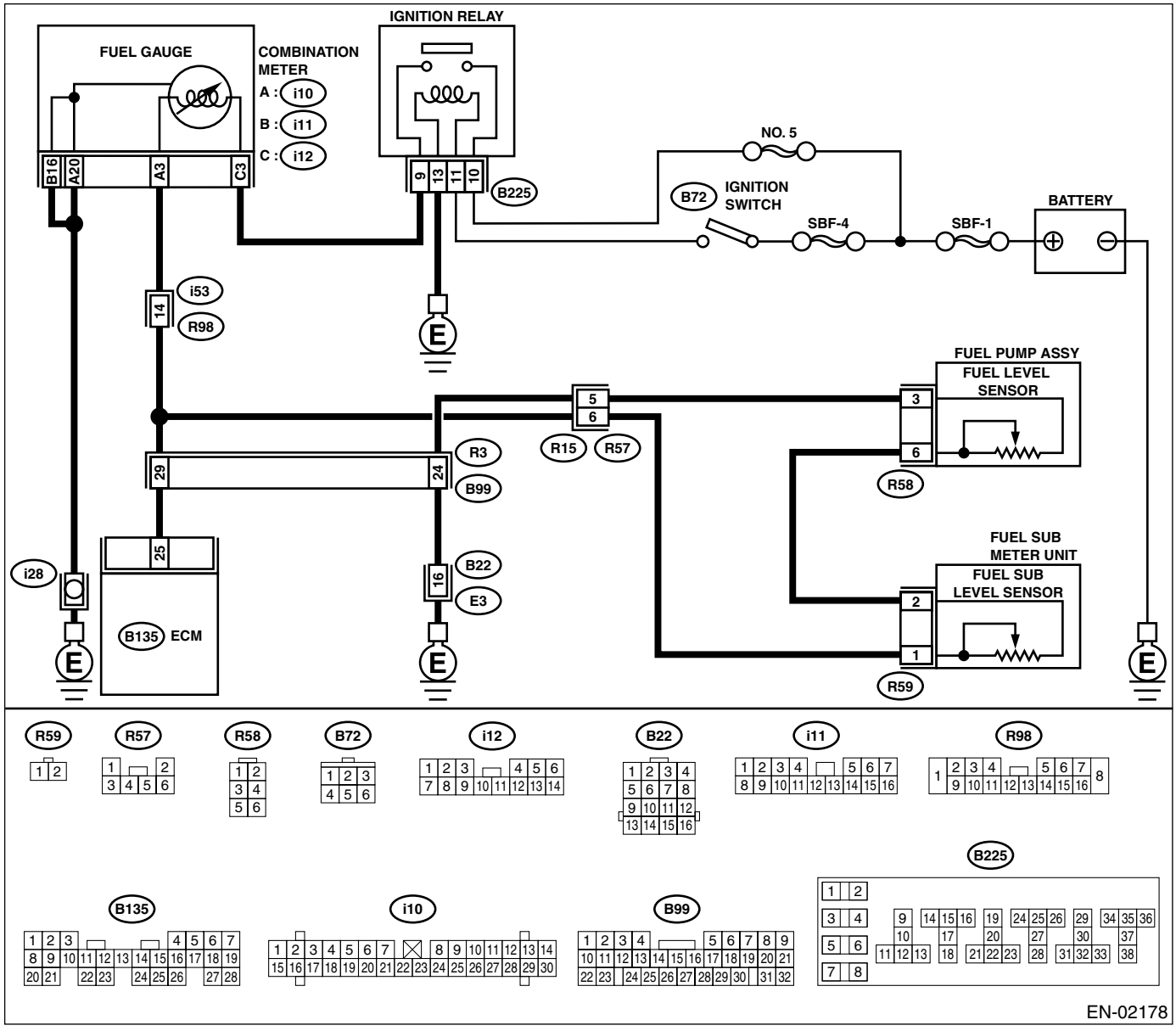
MEMO:

BH:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace combination meter. <Ref. to IDI-4, Combination Meter System.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **3.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to OFF. 2) Disconnect combination meter connector (i10) and ECM connector. 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Repair battery short circuit between ECM and combination meter connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 6:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 5 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel level sensor. 2) Measure resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 5 — (R58) No. 3:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.
7	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel sub level sensor. 2) Measure resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 6 — (R59) No. 2:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.

	Step	Check	Yes	No
8	**CHECK FUEL TANK CORD.** Measure resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R59) No. 1:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel pump assembly. <Ref. to FU(H4SO)-66, Fuel Pump.> 2) While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value more than 54.5 Ω?	Replace fuel level sensor. <Ref. to FU(H4SO)-68, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel sub level sensor. <Ref. to FU(H4SO)-69, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value more than 41.5 Ω?	Replace fuel sub level sensor. <Ref. to FU(H4SO)-69, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-13, Combination Meter Assembly.>

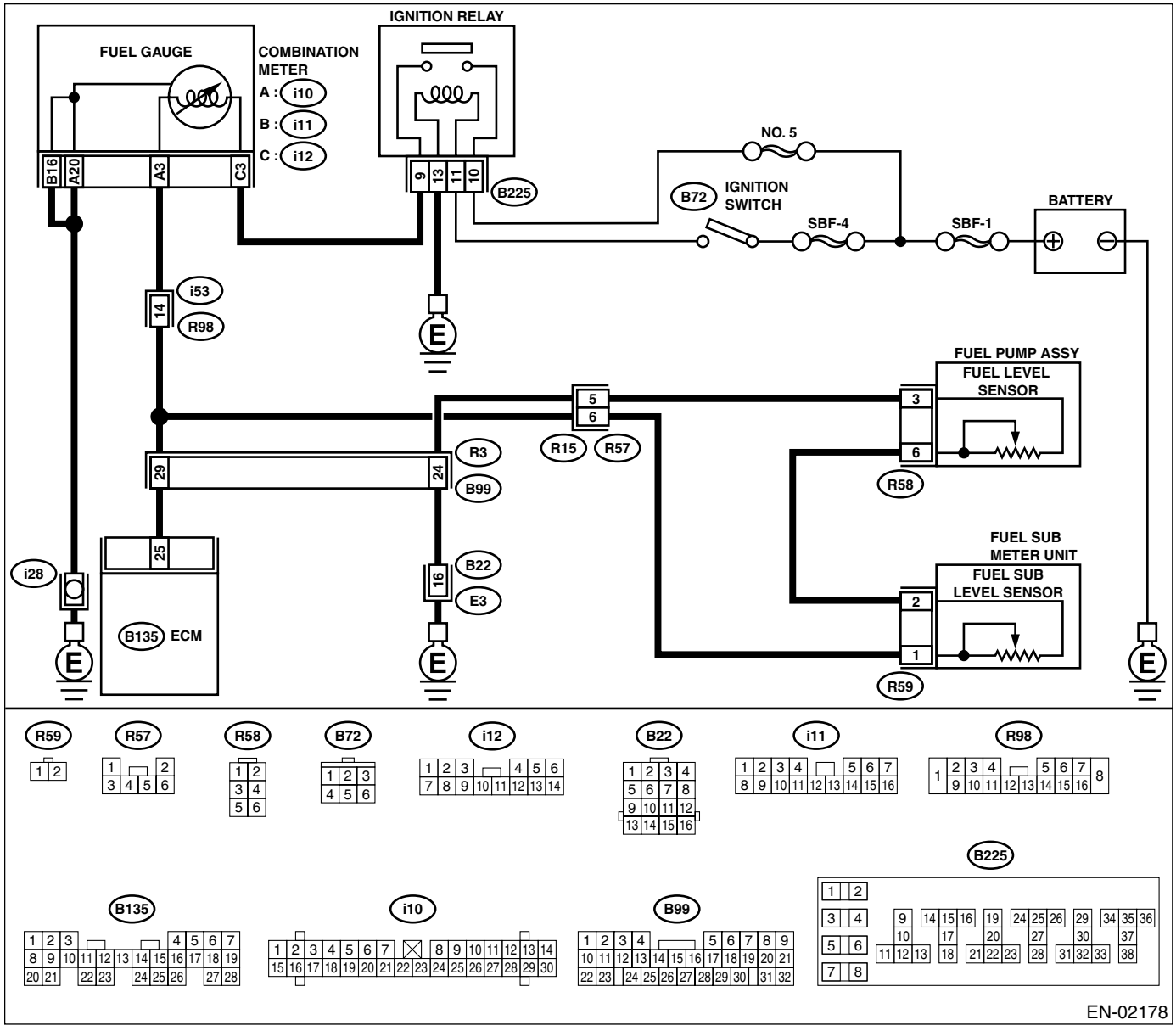
MEMO:

BI: DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel pump assembly. <Ref. to FU(H4SO)-66, Fuel Pump.> 2) While moving fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 6:***	Does the resistance change smoothly?	Go to step **3.**	Replace fuel level sensor. <Ref. to FU(H4SO)-68, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel sub level sensor. <Ref. to FU(H4SO)-69, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace fuel sub level sensor. <Ref. to FU(H4SO)-69, Fuel Sub Level Sensor.>

MEMO:

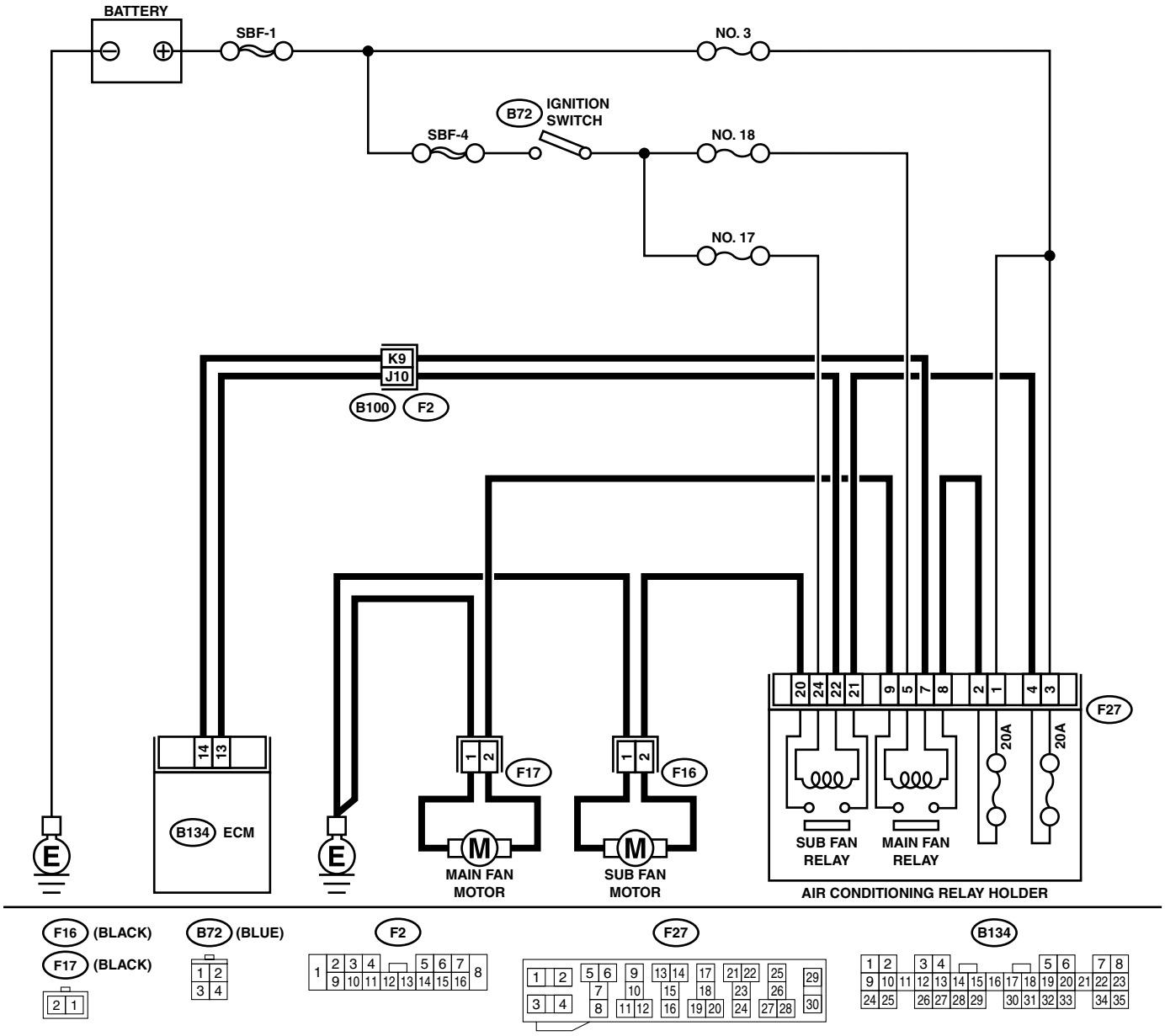
BJ:DTC P0483 — COOLING FAN RATIONALITY CHECK —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**



EN-02171

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, Radiator Sub Fan and Fan Motor.>

BK:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

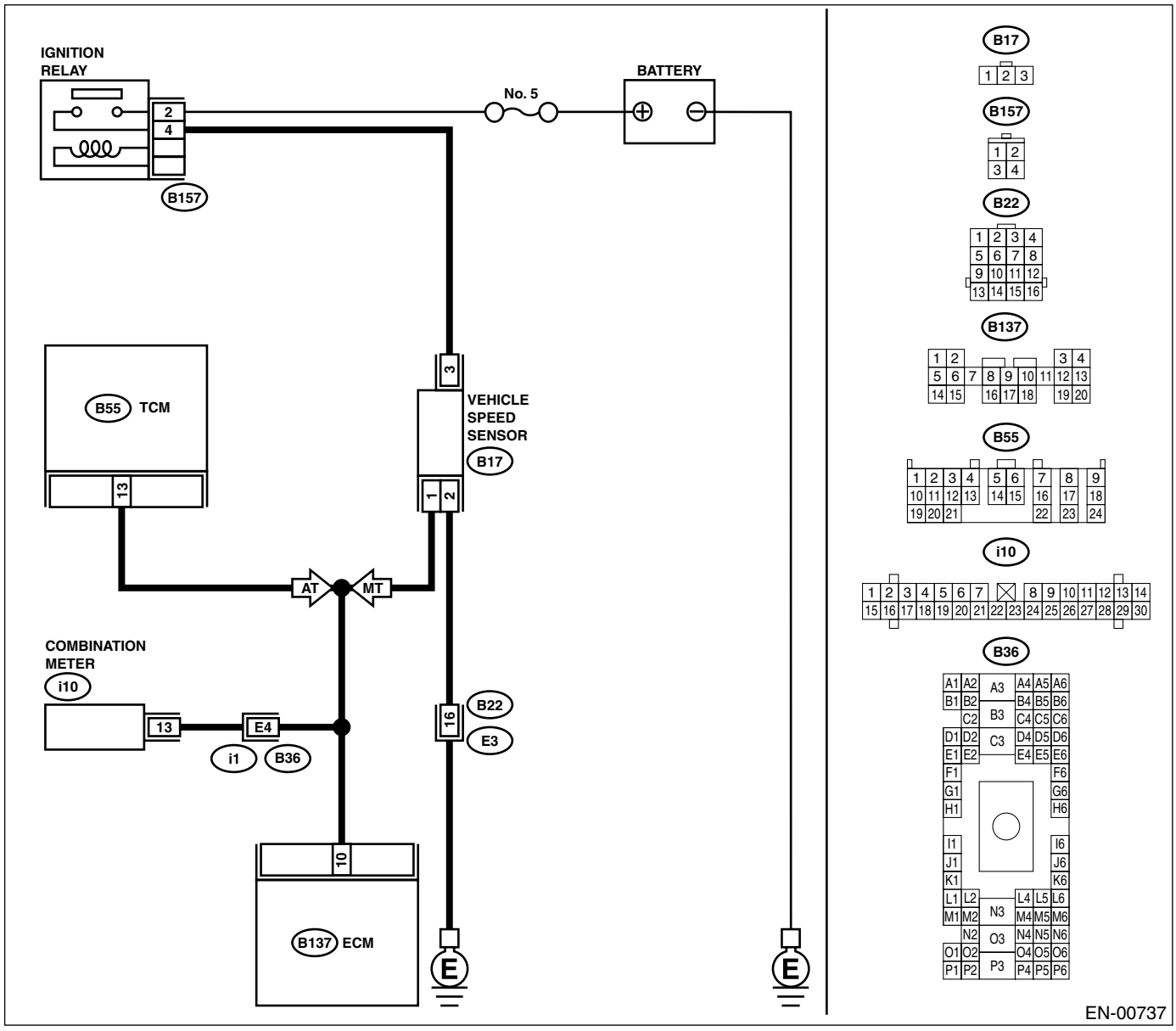
NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO)-260, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BL:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



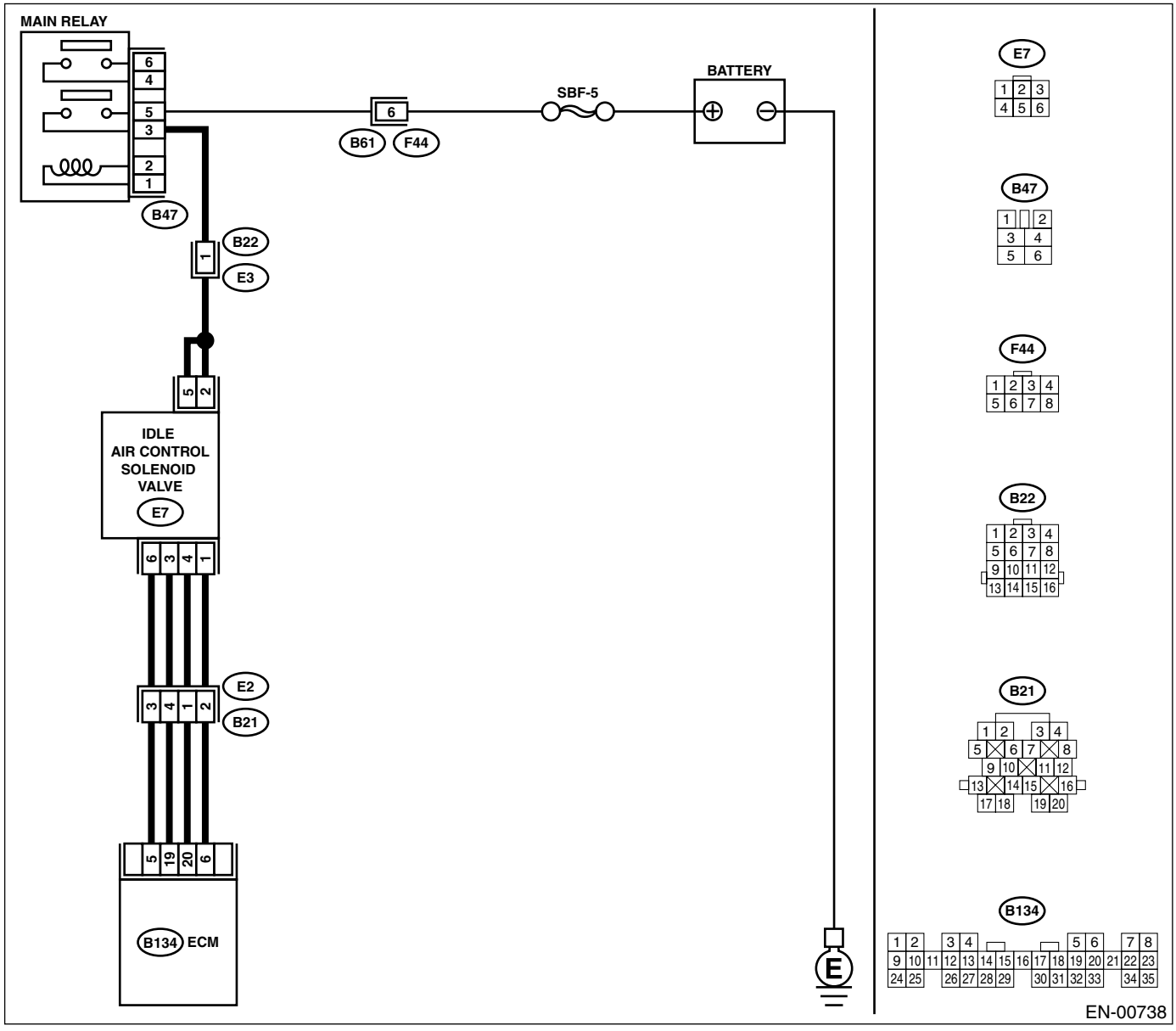
	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-15, Speedometer.> and <Ref. to 4AT-55, Front Vehicle Speed Sensor.> and <Ref. to 4AT-60, Rear Vehicle Speed Sensor.> and <Ref. to 4AT-61, Torque Converter Turbine Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between ECM and combination meter. ***Connector & terminal*** ***(B137) No. 10 — (i10) No. 13:***	Is the measured value less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

BM:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



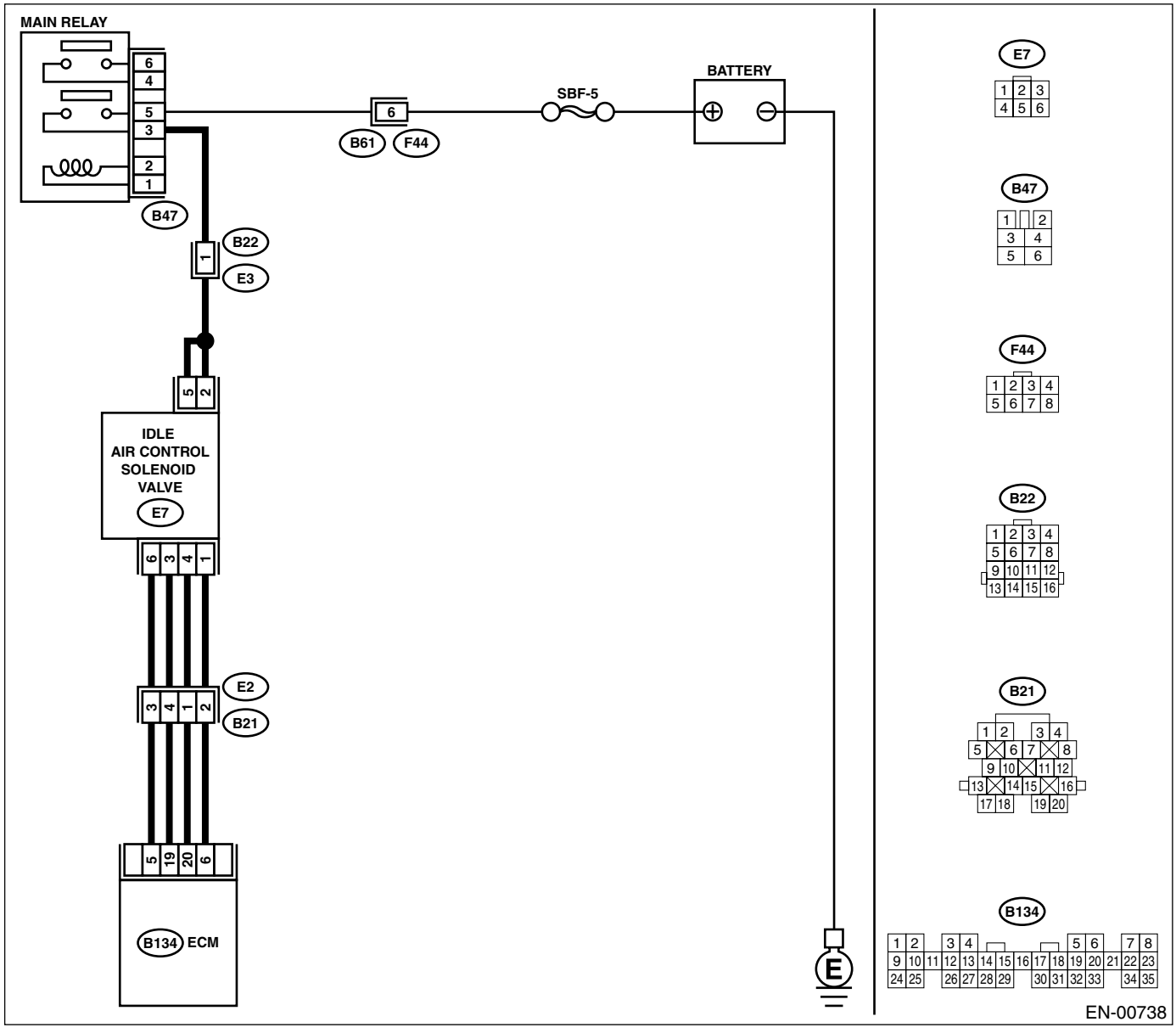
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3) Remove throttle body from intake manifold. <Ref. to FU(H4SO)-14, REMOVAL, Throttle Body.> 4) Using an air gun, force air into idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior.	Does air flow out?	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-35, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H4SO)-14, INSTALLATION, Throttle Body.>

BN:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



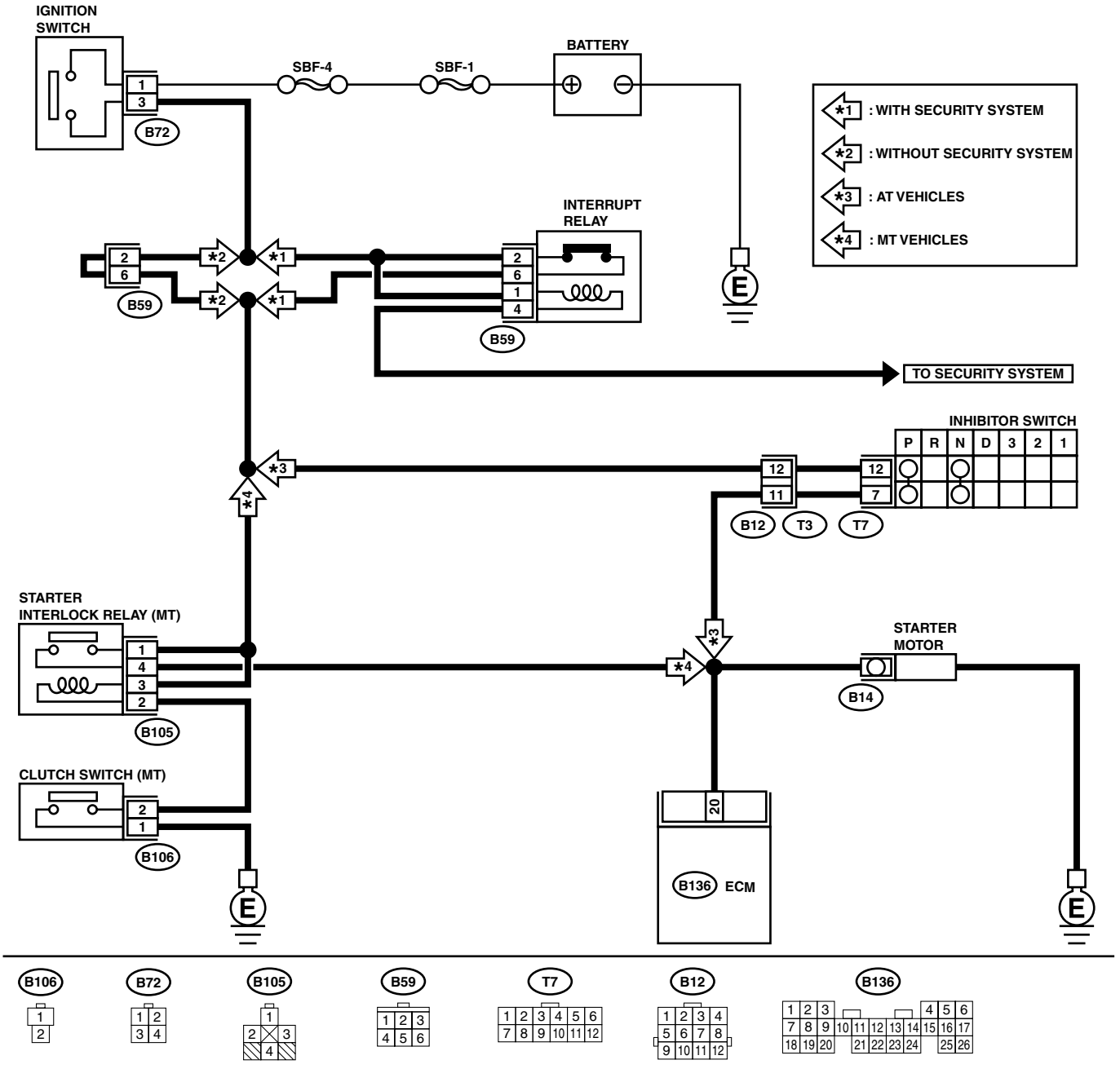
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-6, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-35, Idle Air Control Solenoid Valve.>

BO:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00715

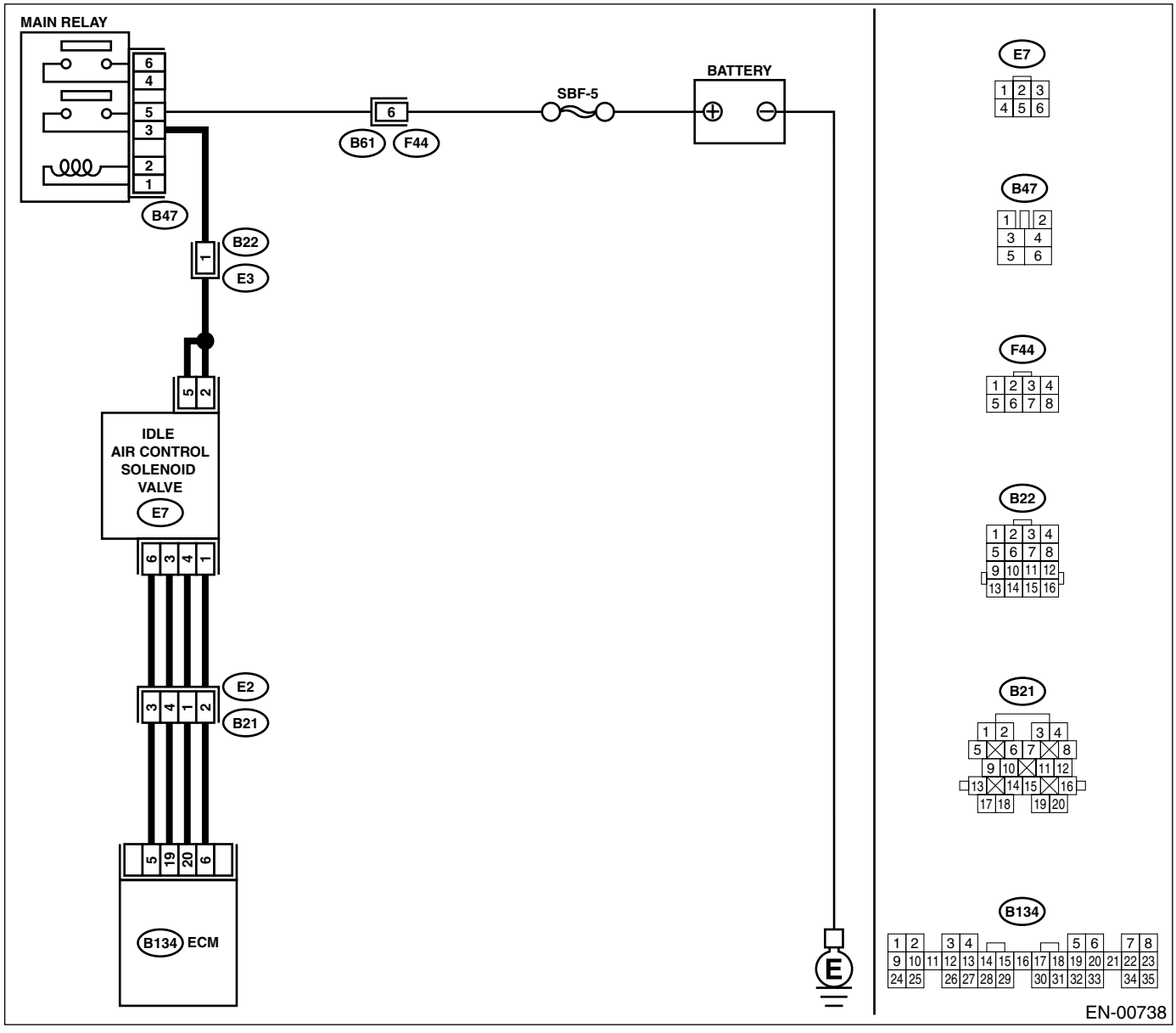
Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in “P” or “N” position (AT). Depress the clutch pedal (MT).	Does starter motor operate when ignition switch to “ON”?	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H4SO)-64, Diagnostics for Engine Starting Failure.>

BP:DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



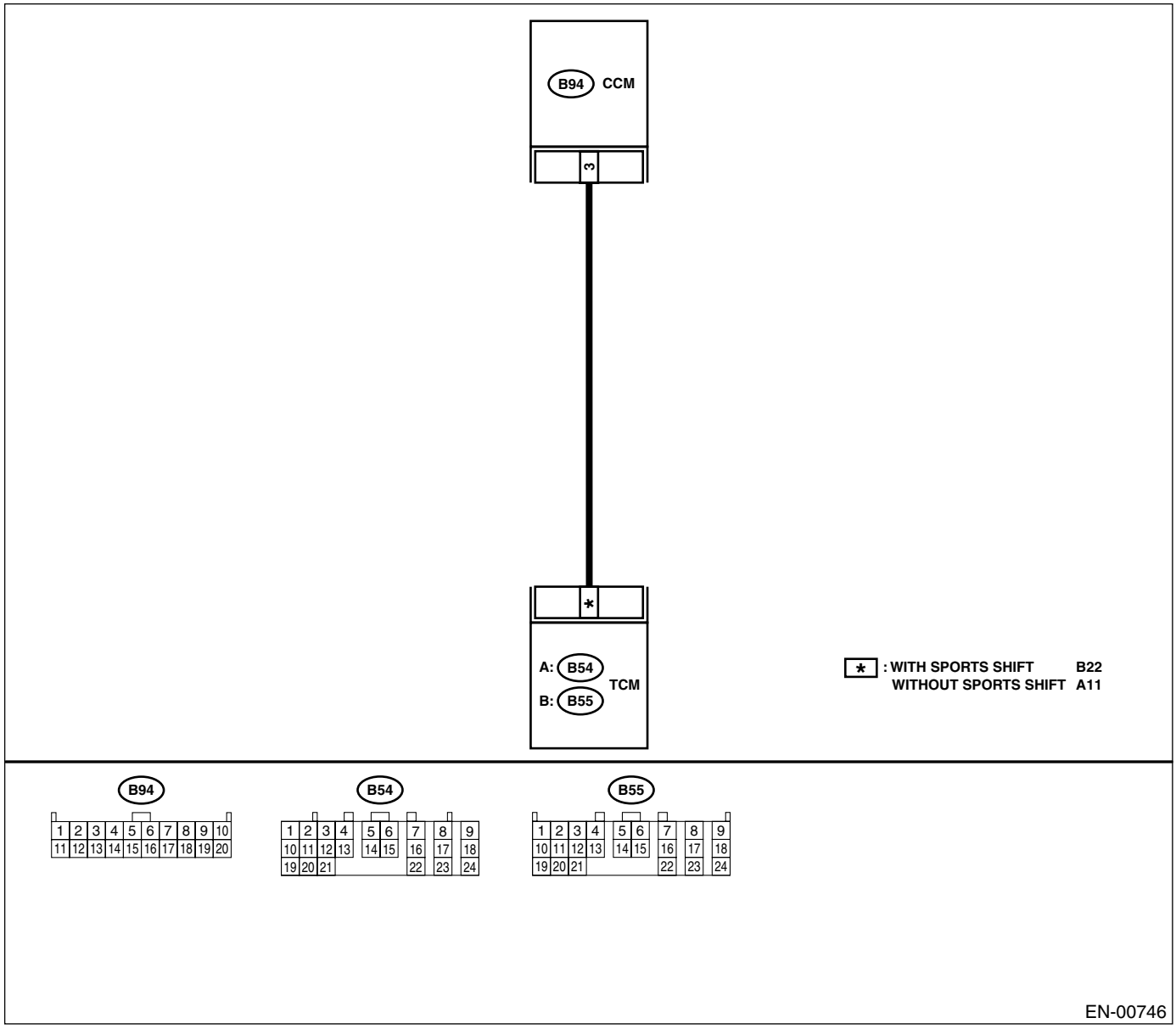
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there any malfunction in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-6, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-35, REMOVAL, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-35, Idle Air Control Solenoid Valve.>

BQ:DTC P0565 — CRUISE CONTROL ON SIGNAL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



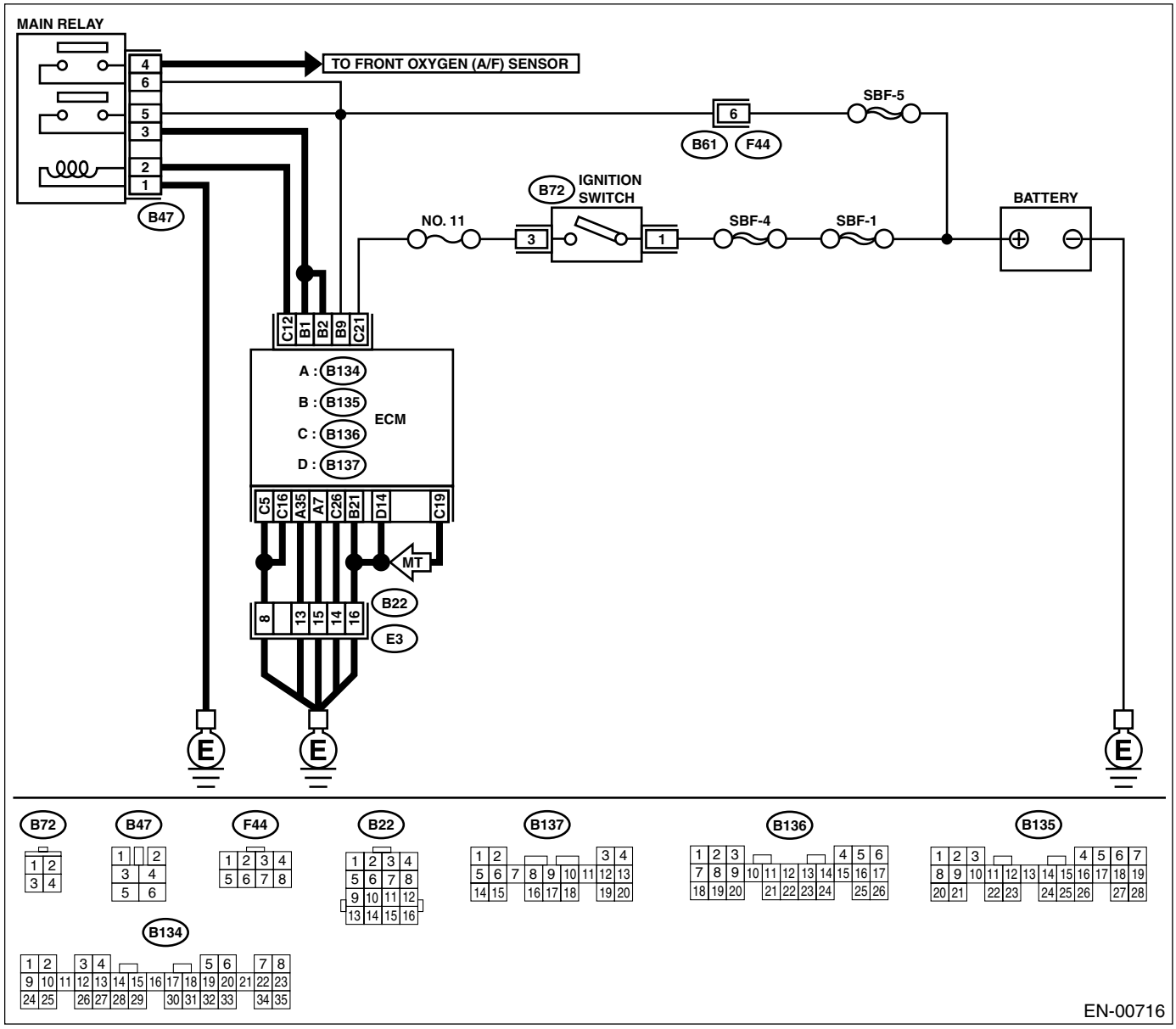
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and CCM. 3) Measure resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B55) No. 22 - (B94) No. 3: (with SPORT shift)*** ***(B54) No. 11 - (B94) No. 3: (without SPORT shift)***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 - Chassis ground: (with SPORT shift)*** ***(B54) No. 11 - Chassis ground: (without SPORT shift)***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair short circuit in harness between TCM and CCM connector.
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3) Start the engine. 4) Cruise control main switch to ON. 5) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 - Chassis ground: (with SPORT shift)*** ***(B54) No. 11 - Chassis ground: (without SPORT shift)***	Is the measured value less than 1 V?	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-8, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

BR:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the related DTC using List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	A temporary poor contact.

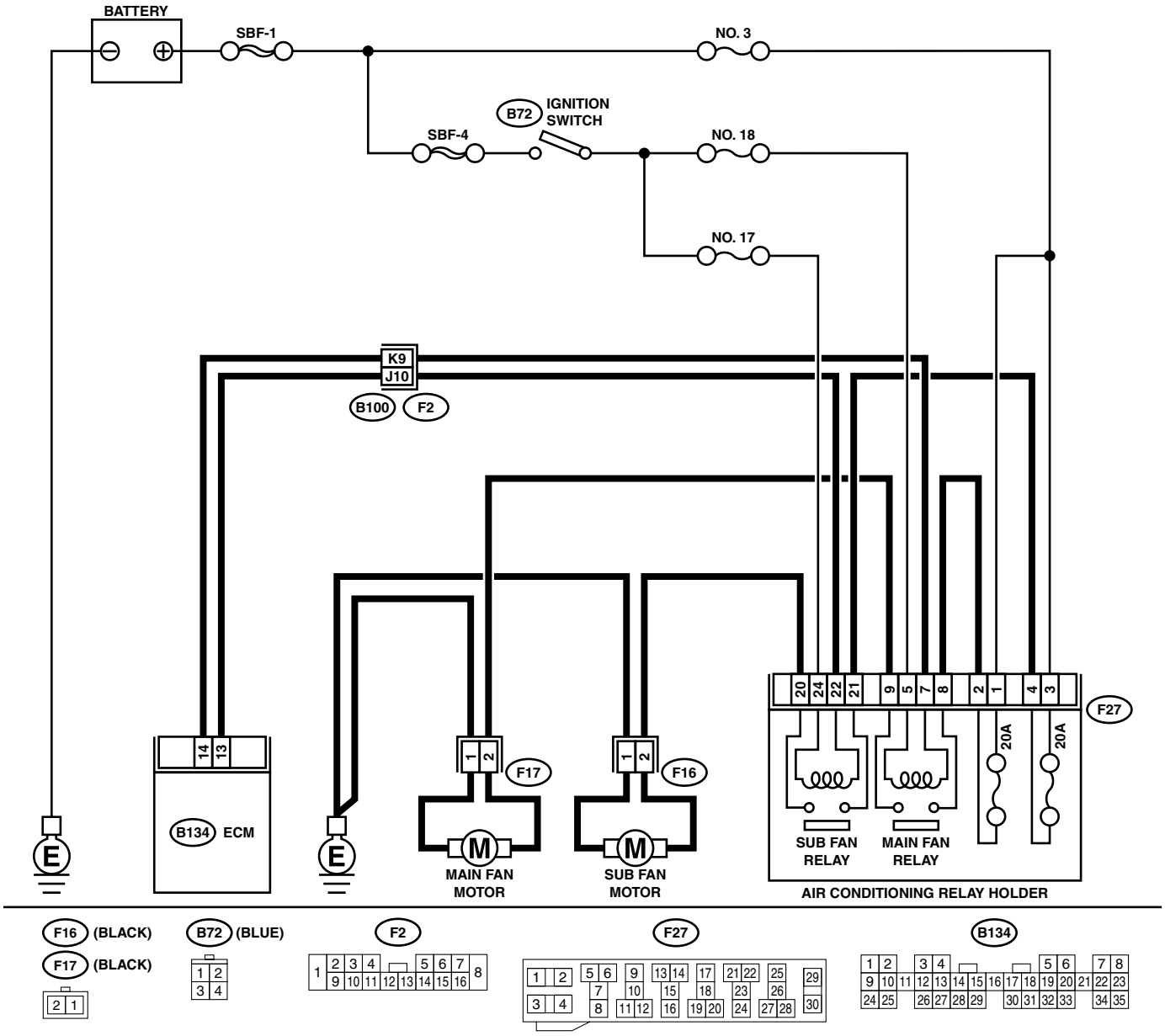
MEMO:

BS:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-02171

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-34, Subaru Select Monitor.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and remove main fan relay from A/C relay holder. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay 1 control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals. ***Terminal*** ***No. 5 — No. 7:***	Is the measured value within 87 to 107 Ω?	Go to step **5.**	Replace main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure resistance of harness between ECM and main fan relay connector. ***Connector & terminal*** ***(B134) No. 14 — (F27) No. 7:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or main fan relay connector.	Is there poor contact in ECM or main fan relay connector?	Repair poor contact in ECM or main fan relay connector.	Contact with SOA service center.

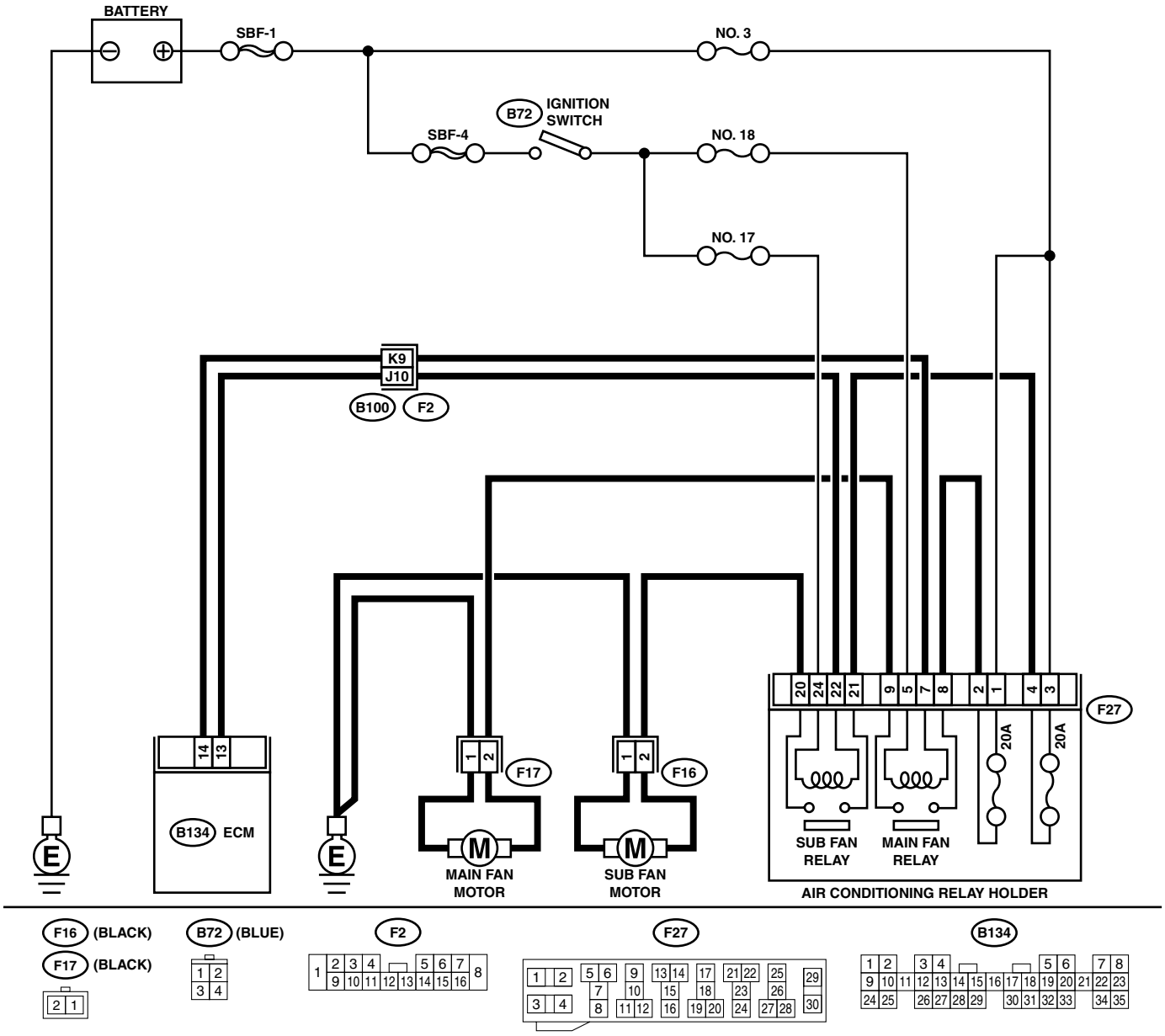
MEMO:

BT:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-02171

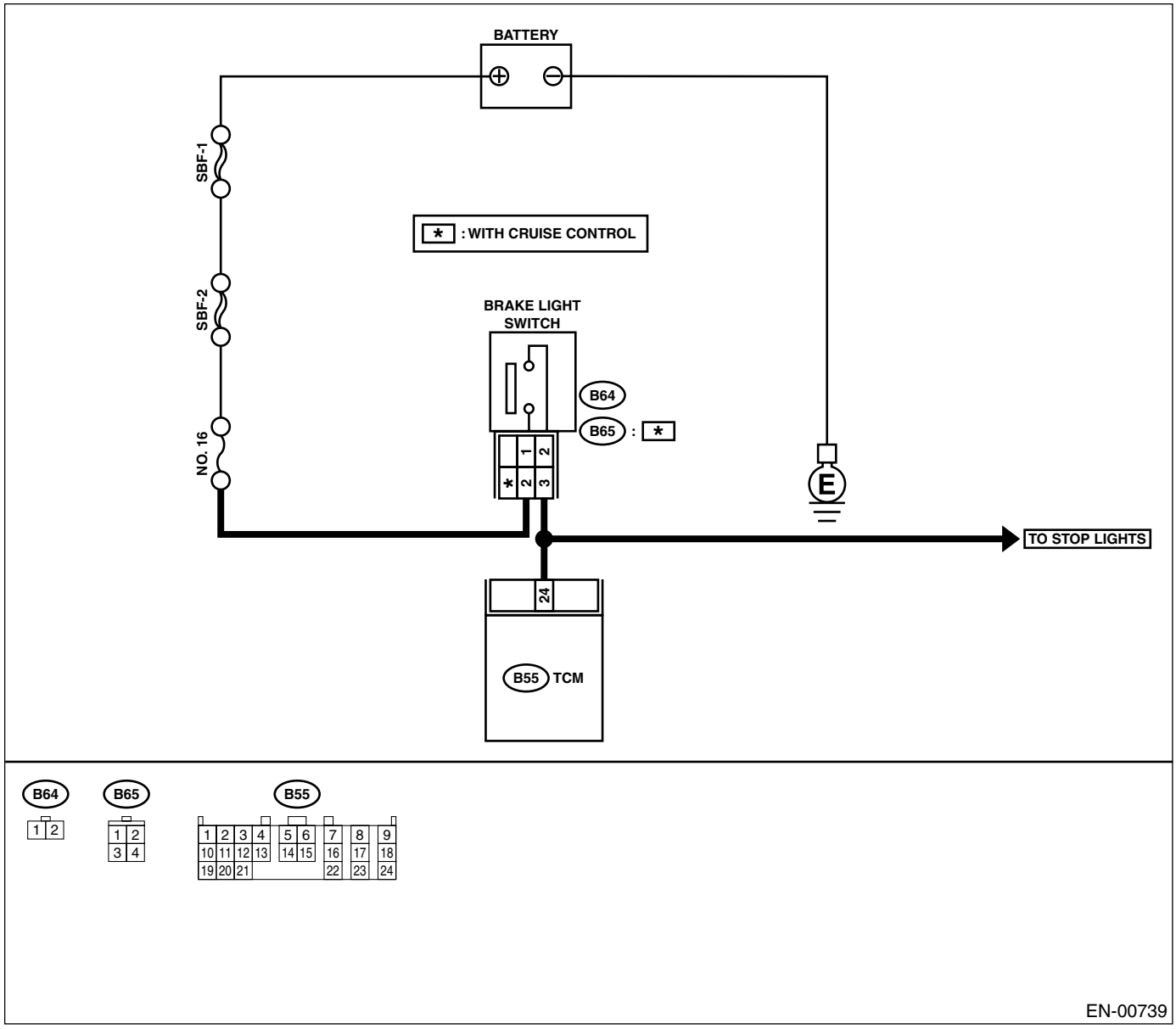
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn ignition switch to OFF. 2) Remove main fan relay and sub fan relay. (with A/C models) 3) Disconnect test mode connector. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in radiator fan relay control circuit.	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance between main fan relay terminals. ***Terminal*** ***No. 5 — No. 7:***	Is the measured value less than 1 Ω?	Replace main fan relay.	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals. ***Terminal*** ***No. 22 — No. 24***	Is the measured value less than 1 Ω?	Replace sub fan relay.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

BU:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	CHECK OPERATION OF BRAKE LIGHT.	Does brake light come on when depressing the brake pedal?	Go to step **2.**	Repair or replace brake light circuit.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect connectors from TCM and brake light switch. 2) Measure resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***(B55) No. 24 — (B64) No. 2:*** ***(B55) No. 24 — (B65) No. 3 (With cruise control):***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair or replace harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connectors to TCM and brake light switch. 2) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Adjust or replace brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 (+) — Chassis ground (–):***	Is the measured value more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

BV:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)-285, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BW:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)-285, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)-285, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BY:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in throttle position sensor circuit?	Repair or replace throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in vehicle speed sensor 2 circuit?	Repair or replace vehicle speed sensor 2 circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in torque converter turbine speed sensor circuit?	Repair or replace torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace automatic transmission. <Ref. to 4AT-33, INSPECTION, Road Test.>	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

BZ:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner “braking”

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in lock-up duty solenoid circuit?	Repair or replace lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in throttle position sensor circuit?	Repair or replace throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in torque converter turbine speed sensor circuit?	Repair or replace torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in engine speed input circuit?	Repair or replace engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any malfunction in inhibitor switch circuit?	Repair or replace inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to 4AT(H4SO)-146, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any malfunction in brake light switch circuit?	Repair or replace brake light switch circuit.	Go to step **8.**

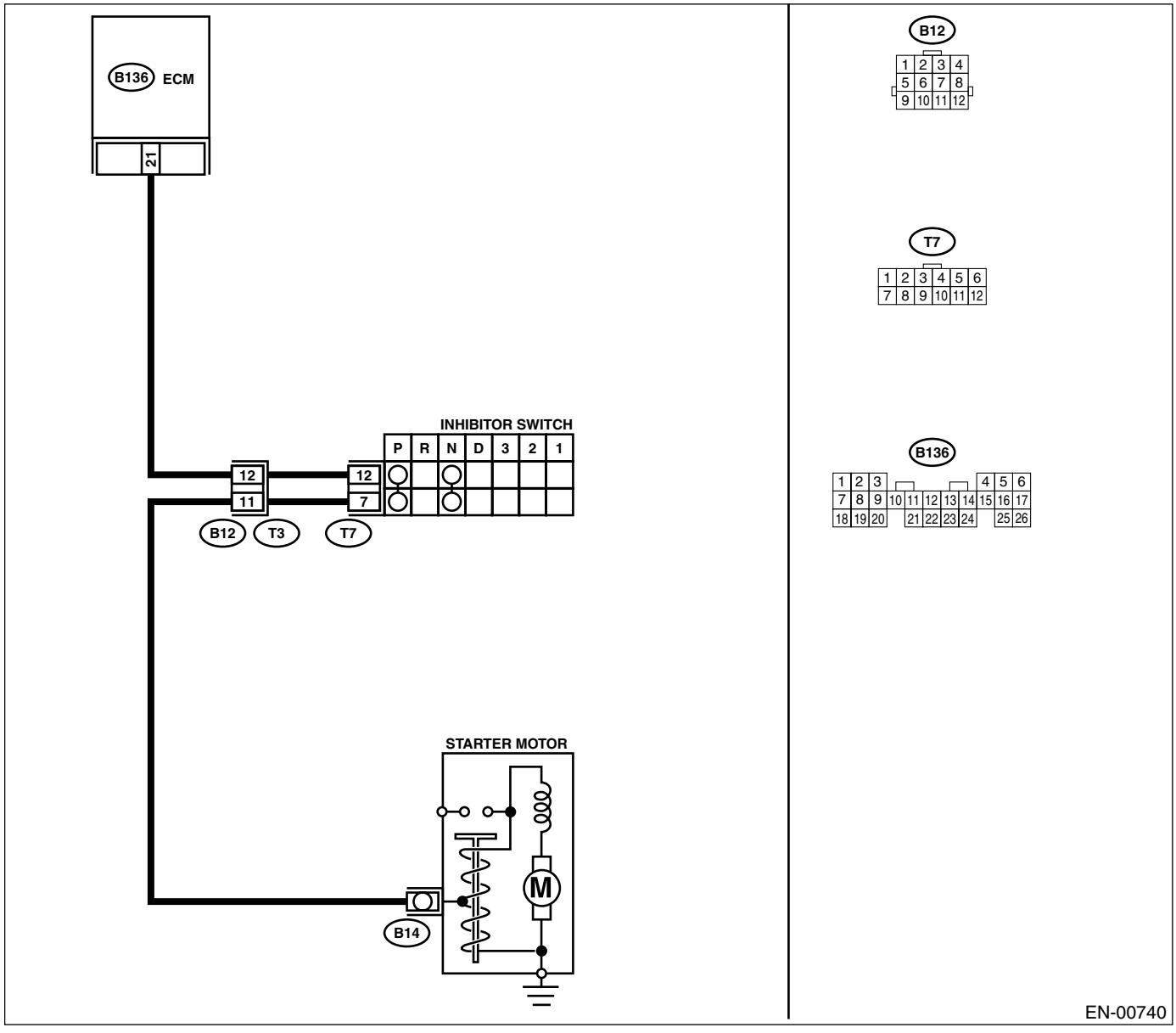
	Step	Check	Yes	No
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any malfunction in ATF temperature sensor circuit?	Repair or replace ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical malfunction in automatic transmission?	Repair or replace automatic transmission. <Ref. to 4AT-33, INSPECTION, Road Test.>	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CA:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



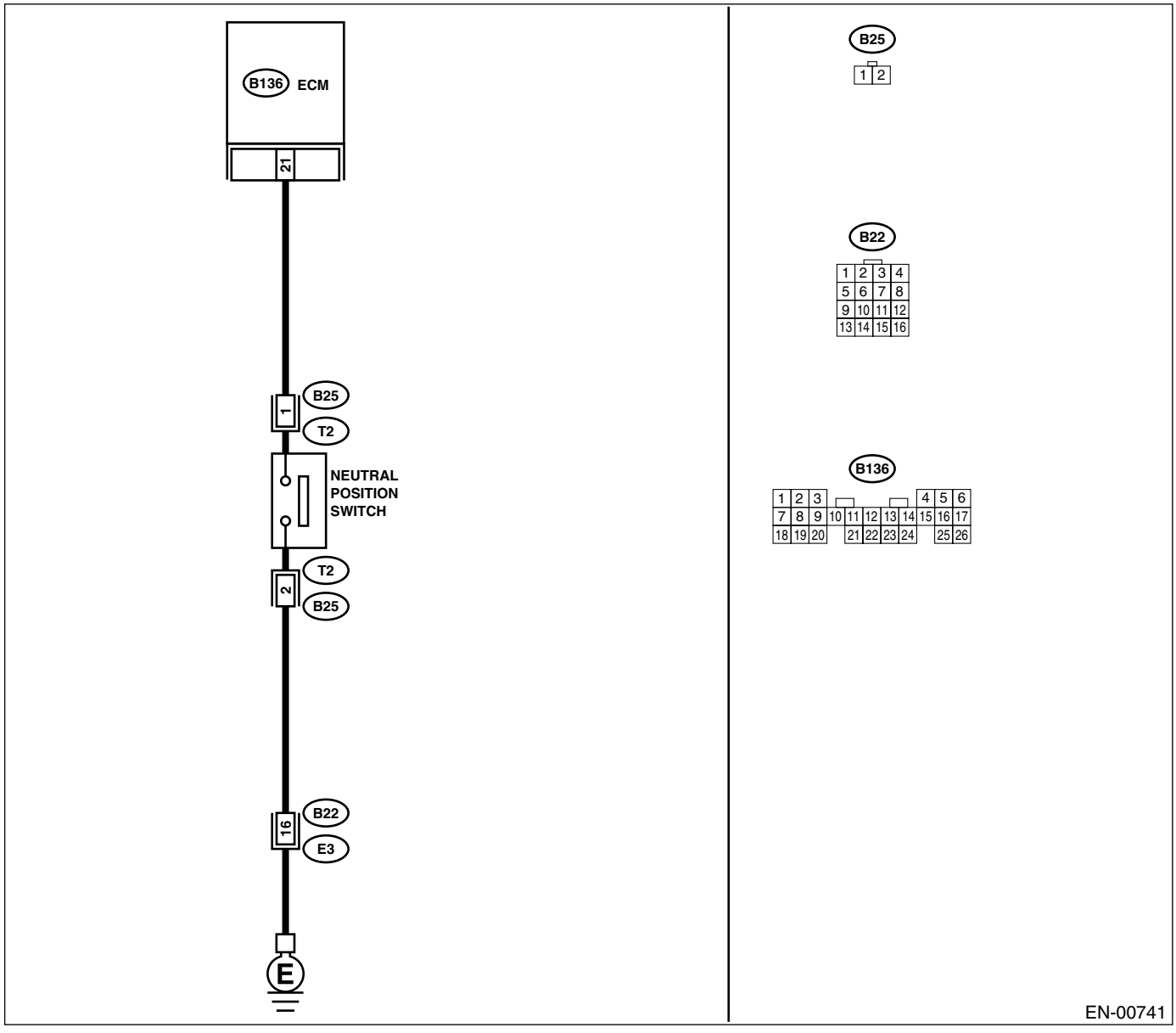
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostics Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the select lever in any other than "P" or "N" range. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value within 4.5 to 5.5 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure resistance between inhibitor switch connector terminals in select lever in any other than "P" or "N" position. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Replace inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any malfunction in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-31, Select Cable.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CB:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



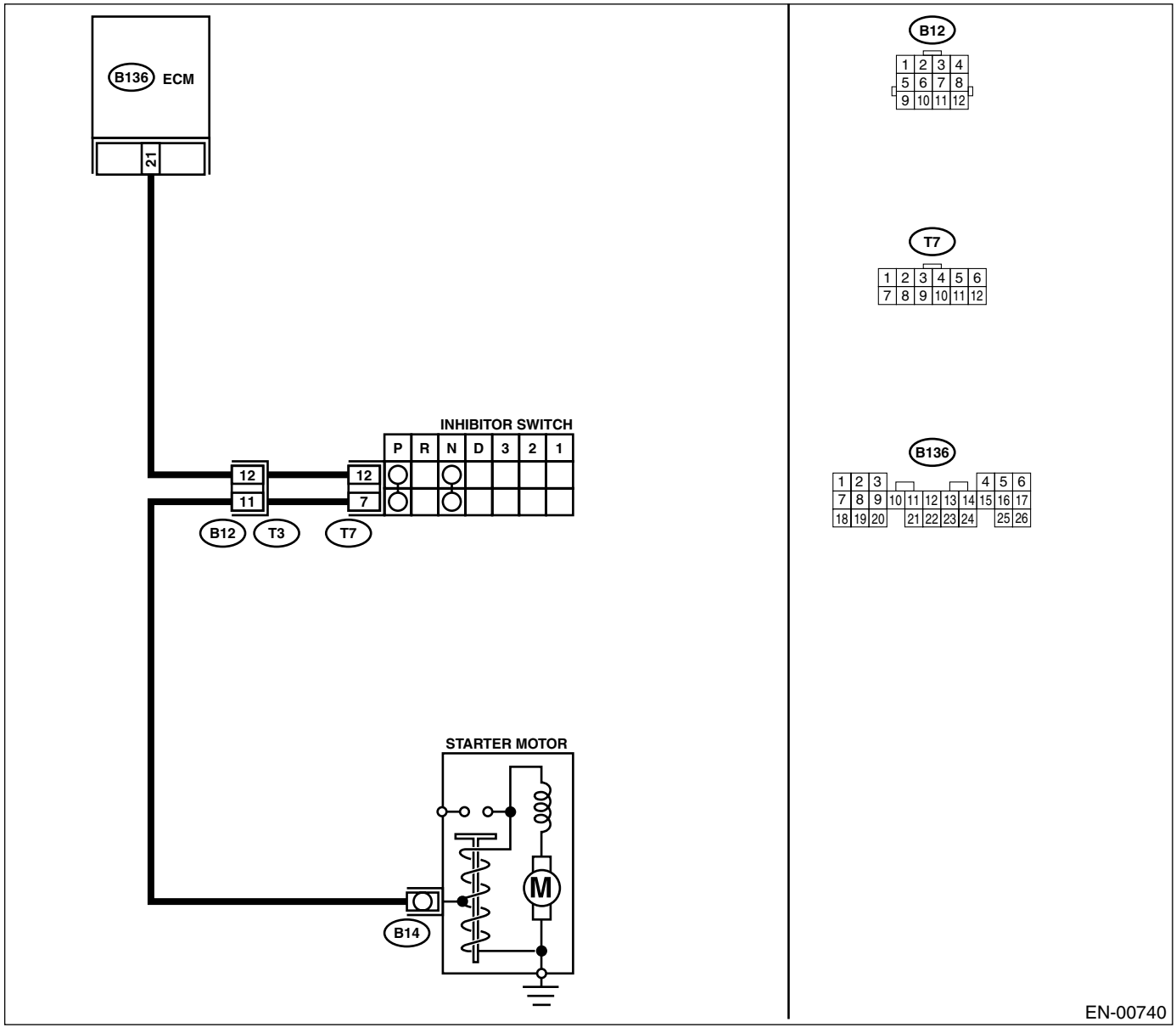
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the shift lever in neutral position. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in any other than neutral position. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission harness. 3) Place the shift lever in neutral position. 4) Measure resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and transmission harness connector.
6	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CC:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostics Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in select level "N" and "P" positions. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground in select level "N" and "P" positions. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground***	Is the measured value within 4.5 to 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector.	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B136) No. 21 — (T7) No. 12:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **7.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor grond line • Poor contact in satrter motor connector • Poor contact in starter motor ground • Starter motor
7	**CHECK INHIBITOR SWITCH.** Measure resistance between inhibitor switch connector terminals in select level “N” and “P” positions. ***Terminal*** ***No. 7 — No. 12:***	Is the measured value less than 1 Ω?	Go to step **8.**	Replace inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
8	**CHECK SELECTOR CABLE CONNECTION.**	Is there any malfunction in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-31, Select Cable.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

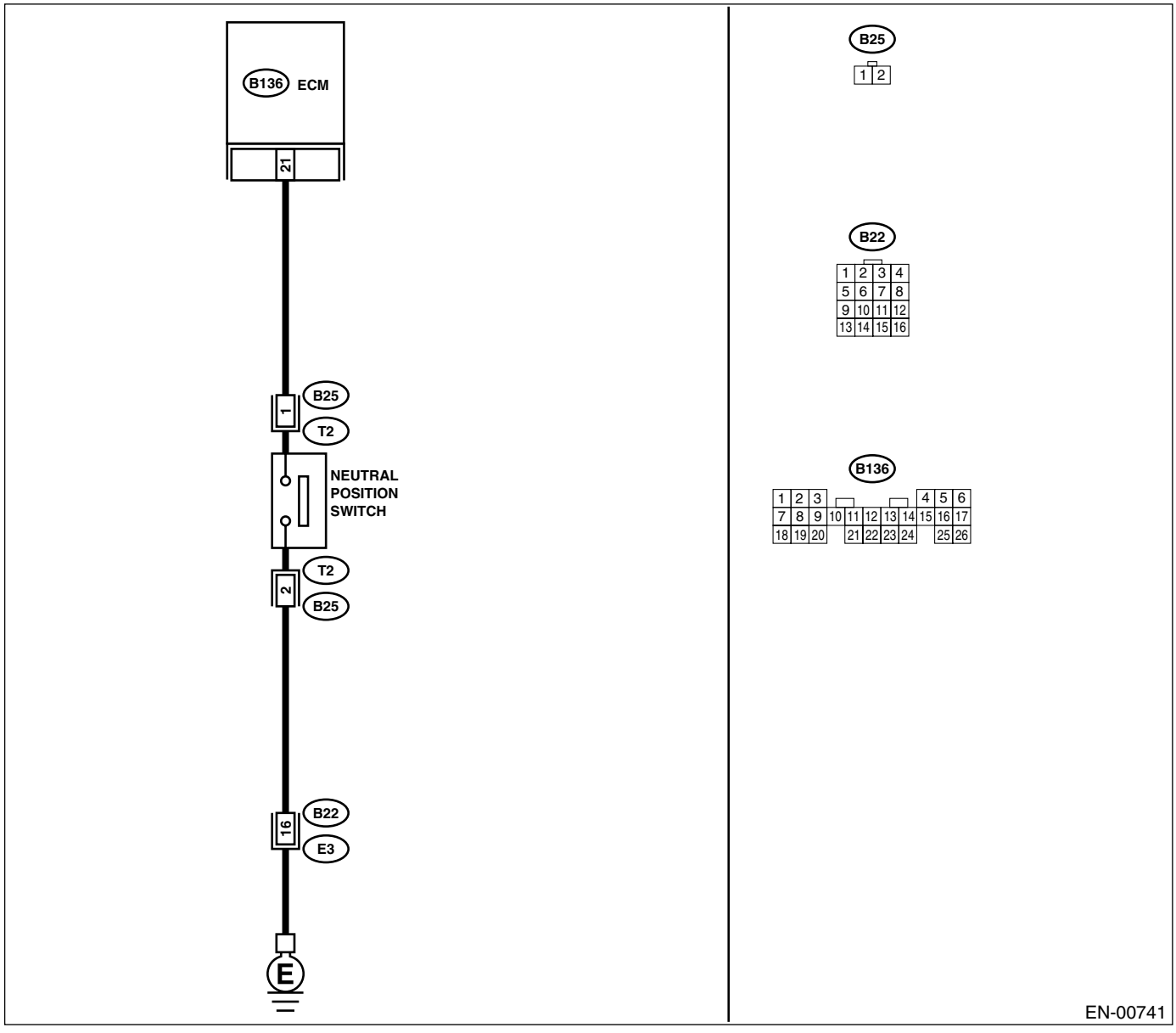
MEMO:

CD:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the shift lever in neutral position. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in any other than neutral position. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in any other than neutral position. 2) Measure resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open circuit in transmission harness or replace neutral position switch.
5	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B136) No. 21 — (B25) No. 1:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and transmission harness connector.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between transmission harness connector and engine grounding terminal • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

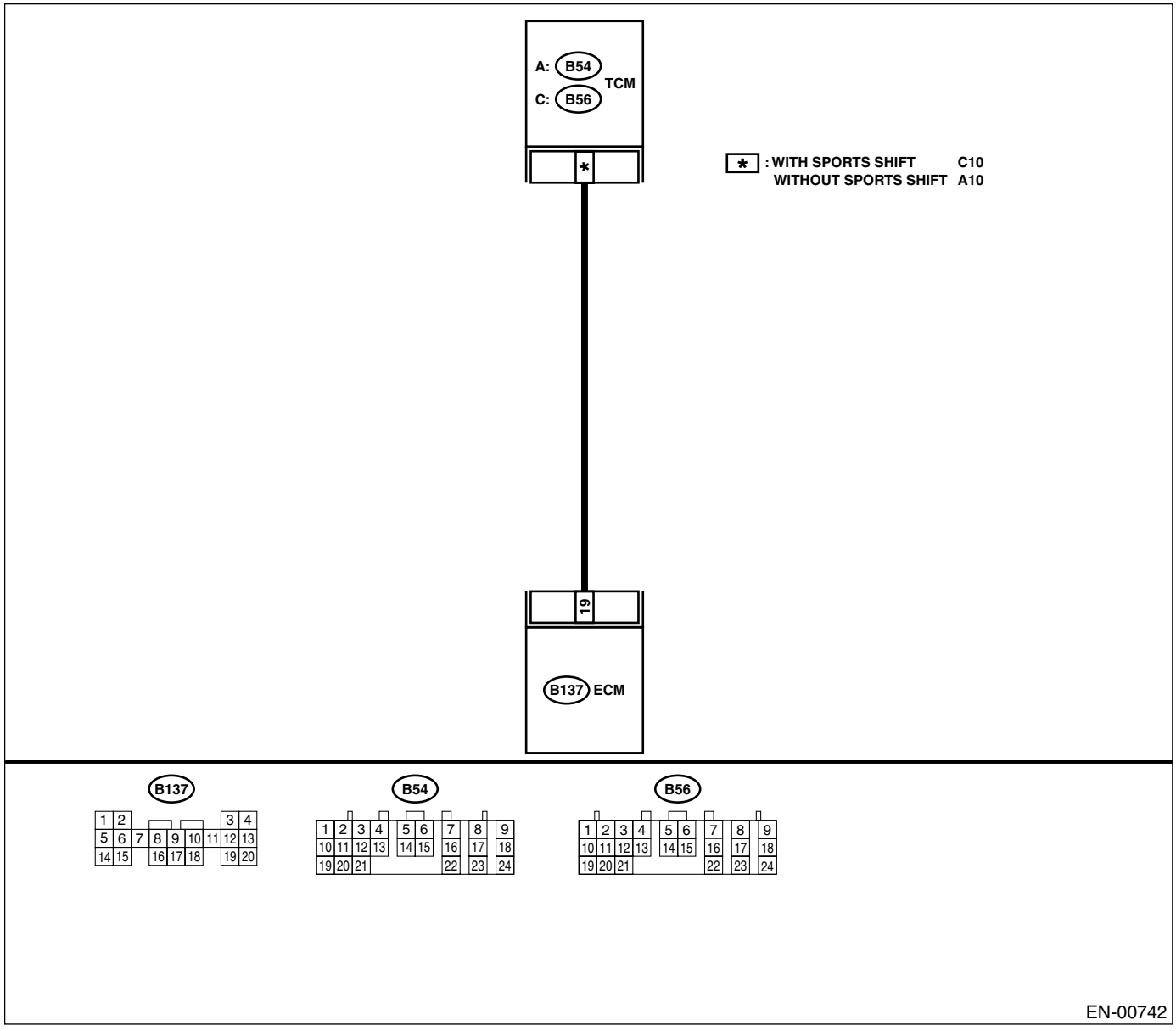
MEMO:

CE:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is AT shift control functioning properly?	Go to step **2.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

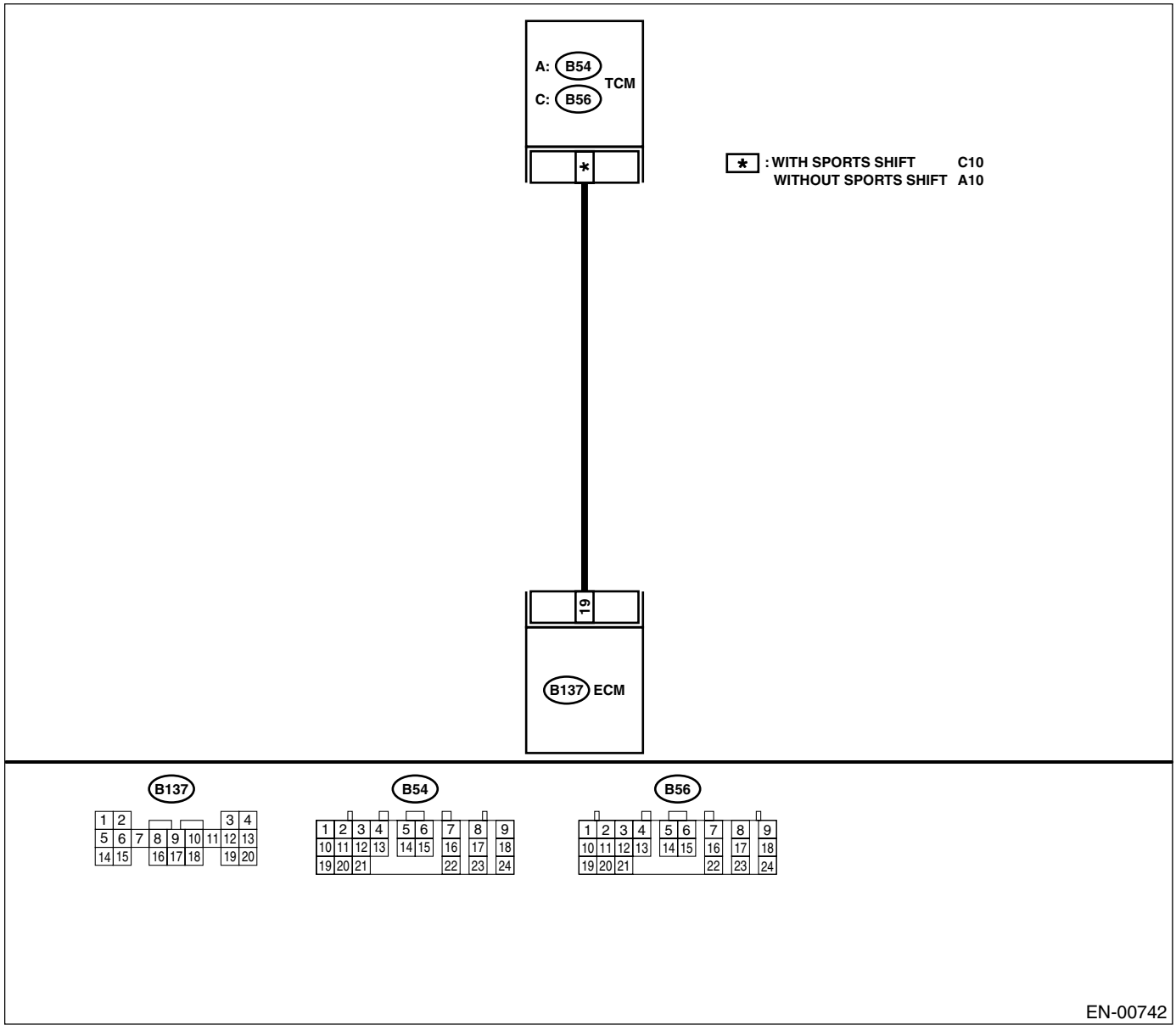
Step		Check	Yes	No
2	CHECK ACCESSORY.	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CF:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



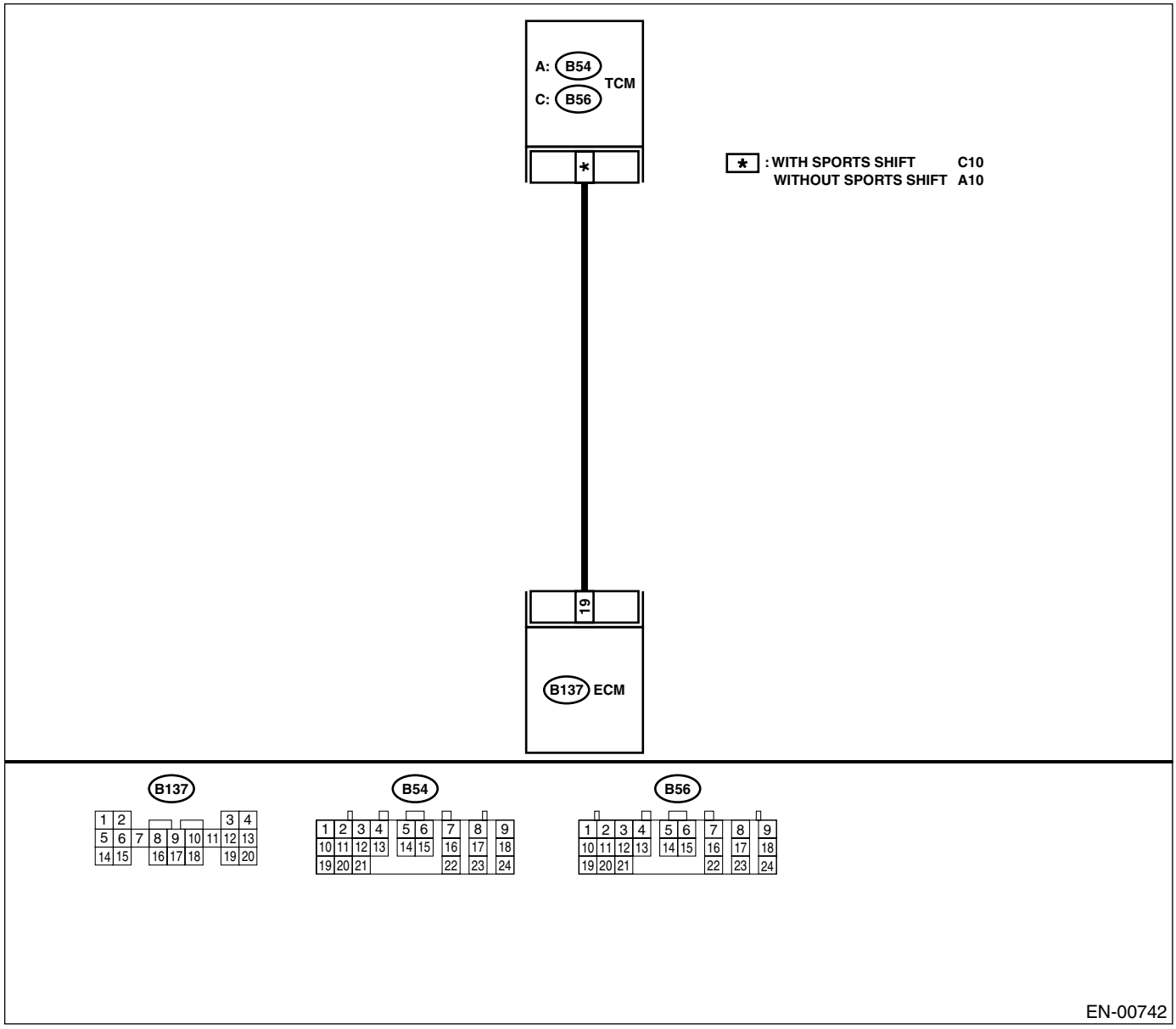
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.** Read trouble code for automatic transmission. <Ref. to 4AT(H4SO)-30, Read Diagnostic Trouble Code (DTC).>	Does trouble code appear for automatic transmission?	Inspect trouble code for automatic transmission. <Ref. to 4AT(H4SO)-50, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CG:DTC P0866 — TCM Communication circuit high —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value within 1 to 4 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 10 (+) - Chassis ground (-): (with SPORT shift)*** ***(B54) No. 10 (+) - Chassis ground (-): (without SPORT shift)***	Is the measured value more than 4 V?	Go to step **6.**	Repair open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

CH:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1110.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

CI: DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

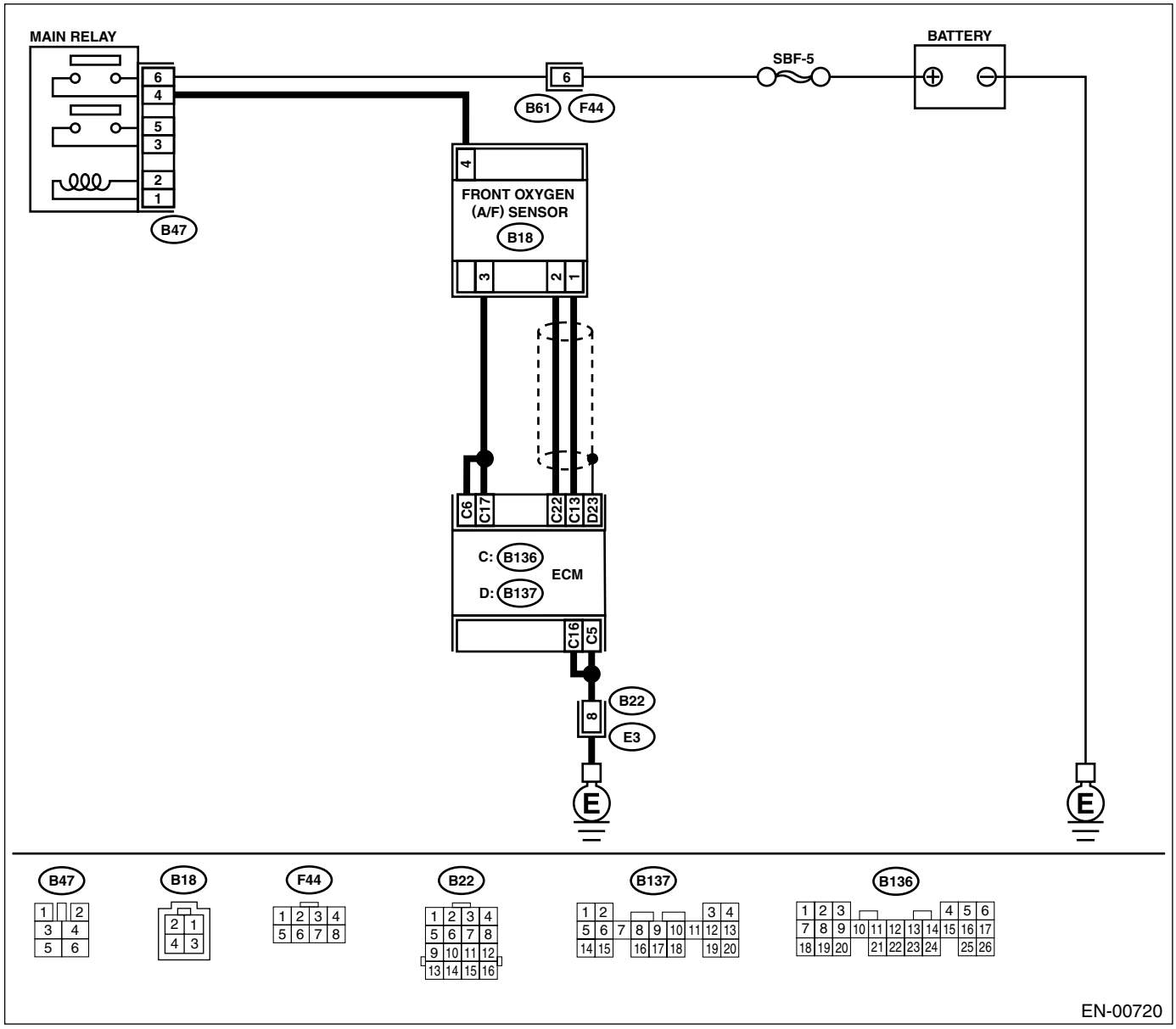
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1111.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

CJ:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the related DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1134.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

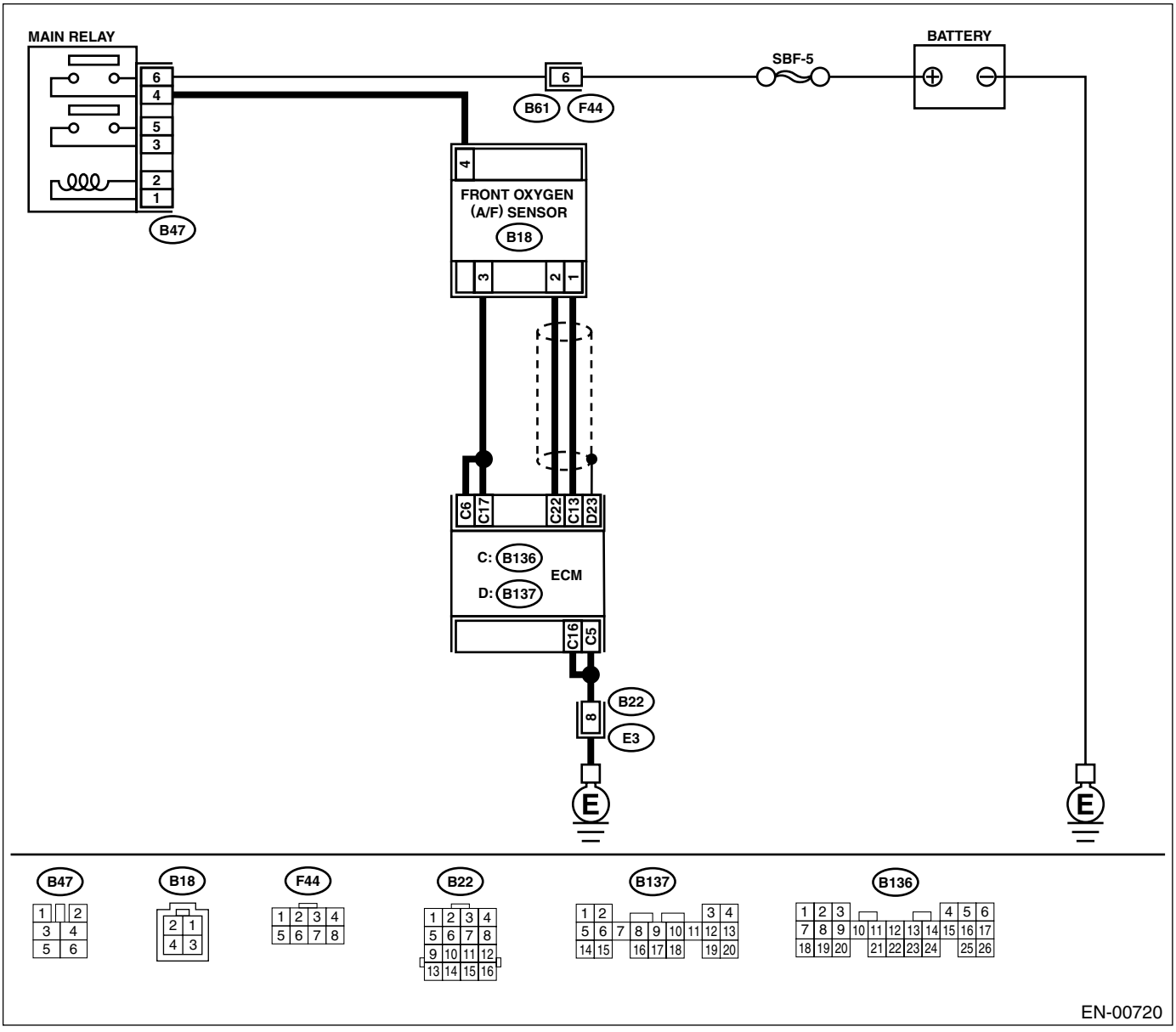
MEMO:

CK:DTC P1137 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.85 to 1.15?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: •Normally, A/F mixture ratio is rich with racing engine. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the measured value more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any malfunction in exhaust system?	Repair or replace malfunctioning parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>

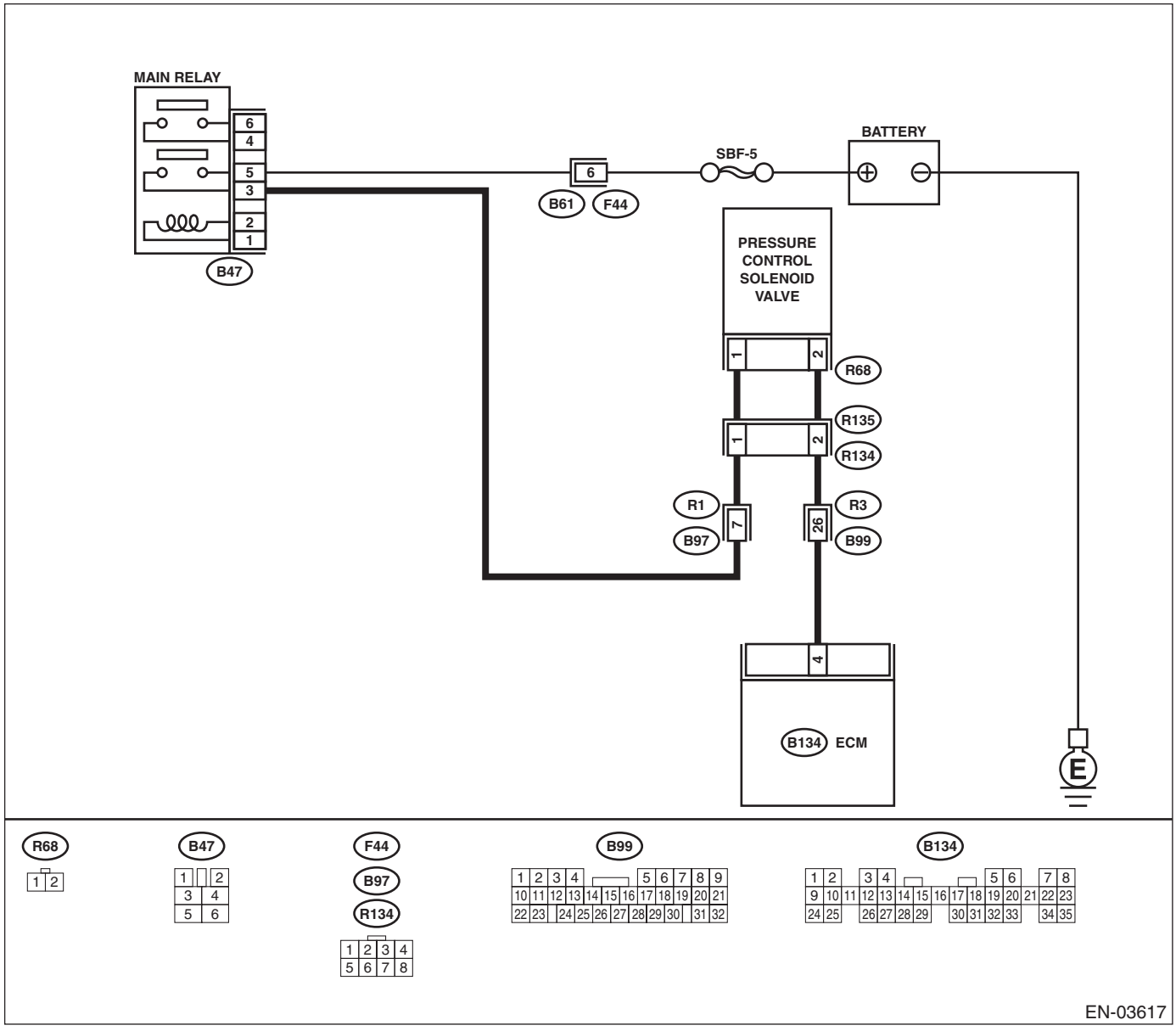
MEMO:

CL:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from pressure control solenoid valve and ECM. 3) Measure resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and pressure control solenoid valve connector.
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 4 — (R68) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connectors
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

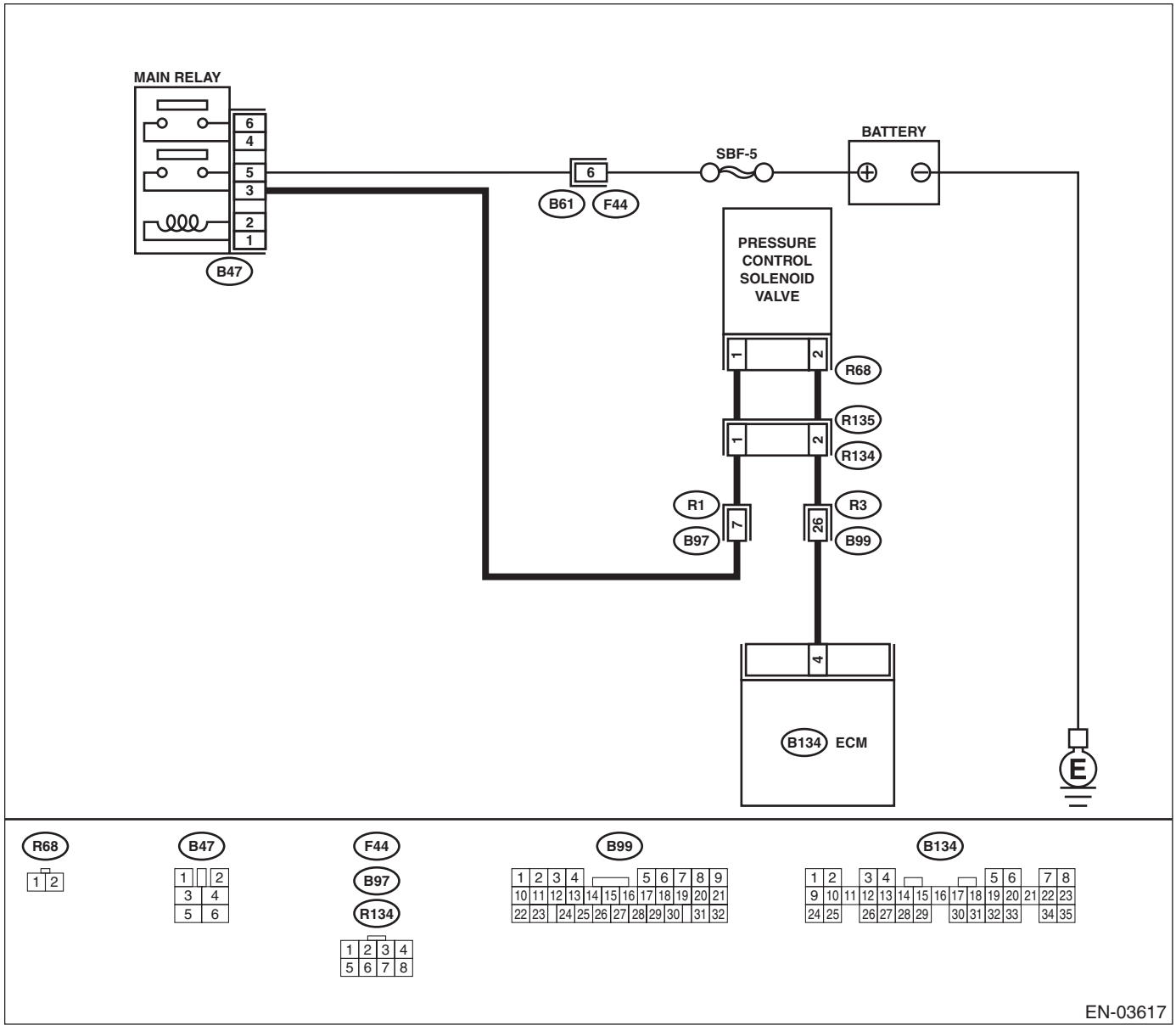
MEMO:

CM:DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



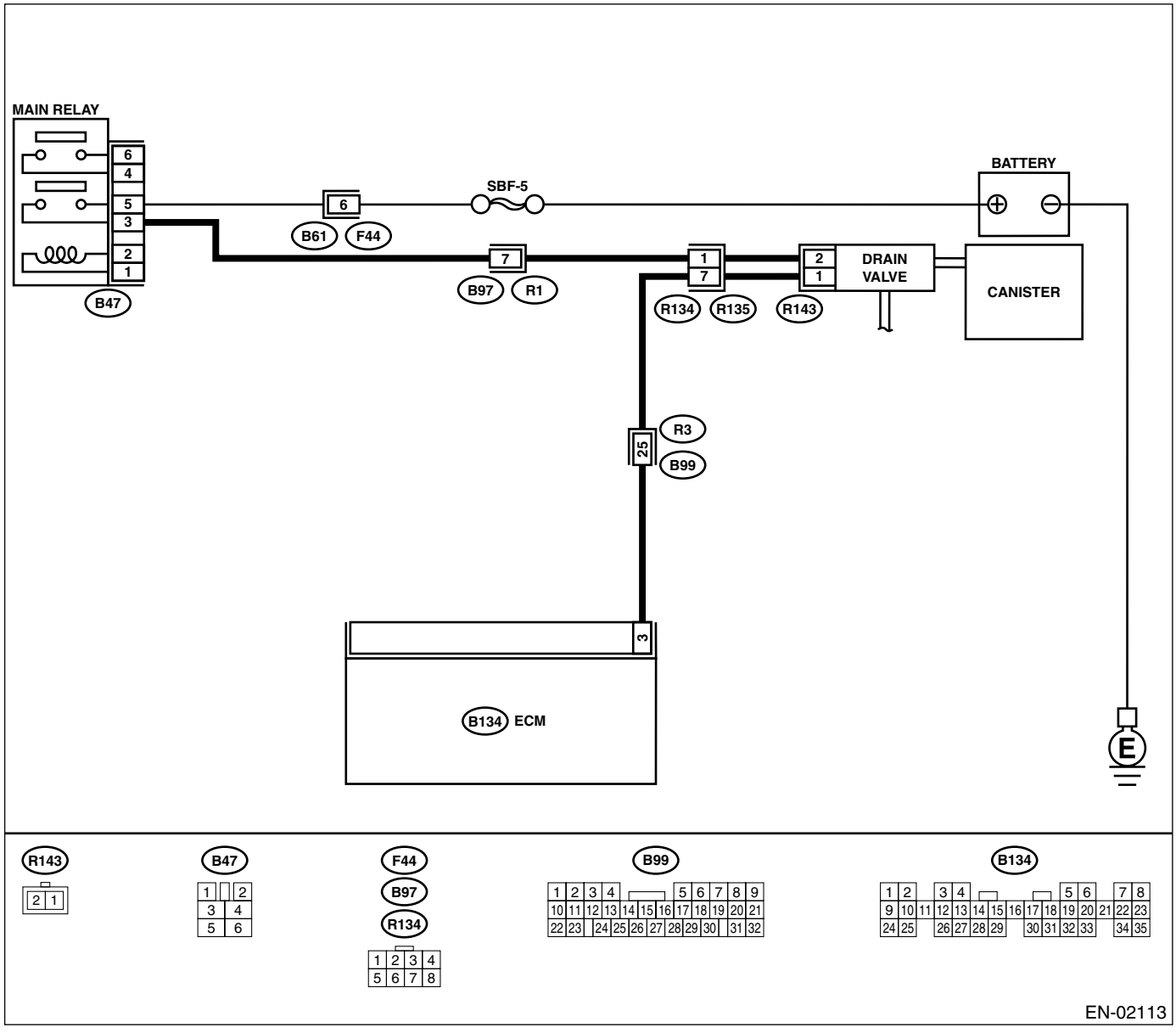
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Go to step **2.**	Even if MIL light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and pressure control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace pressure control solenoid valve <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

CN:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



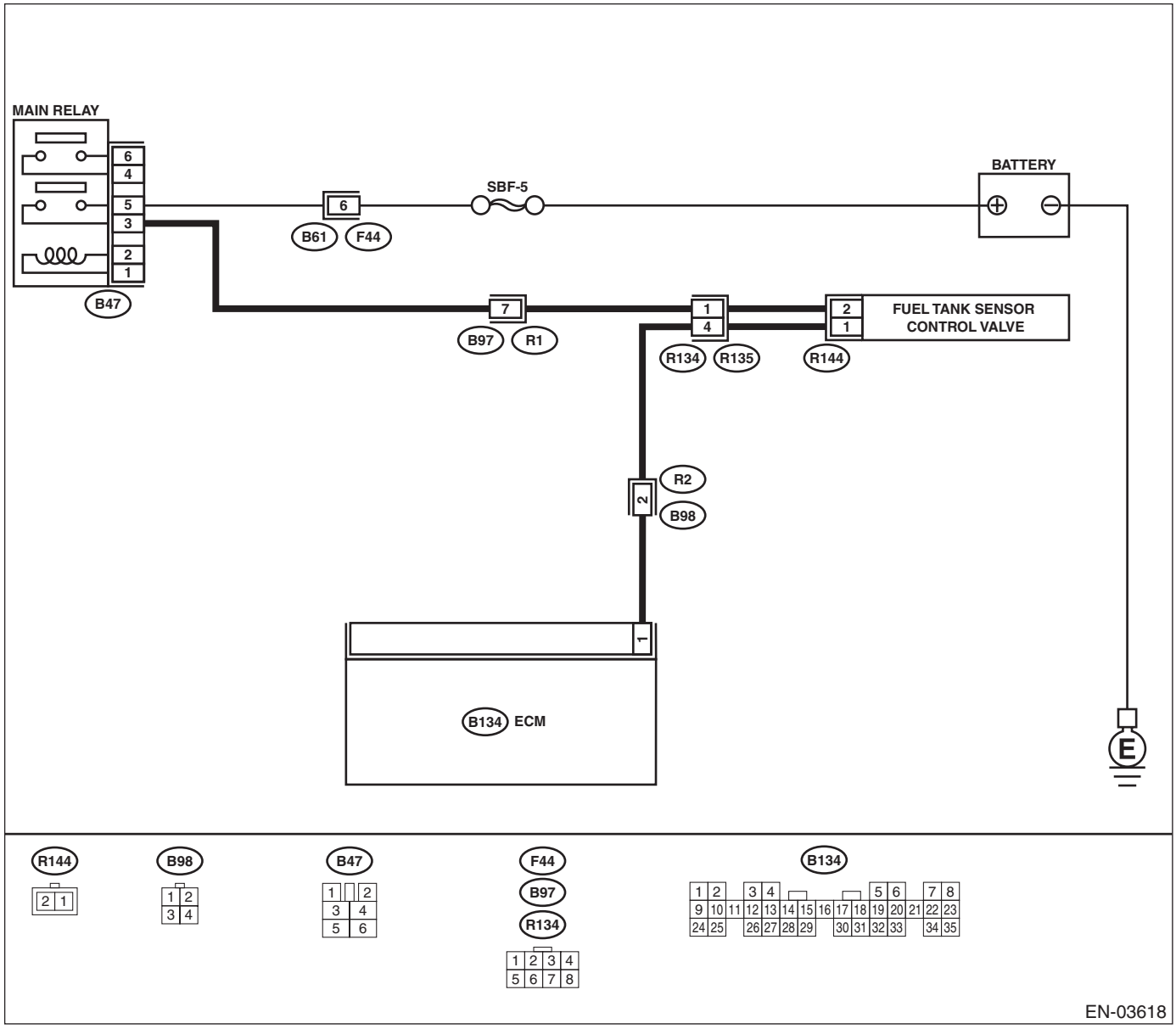
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK DRAIN HOSE.** Check the following items. •Clogging of canister drain hose	Is drain hose clogged?	Repair or replace the malfunctioning part.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode".<Ref. to EN(H4SO)-51, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>

CO:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connectors
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from fuel tank sensor control valve and ECM. 3) Measure resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and fuel tank control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 1 — (R144) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connectors
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace fuel tank control solenoid valve. <Ref. to EC(H4SO)-12, Fuel Tank Sensor Control Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

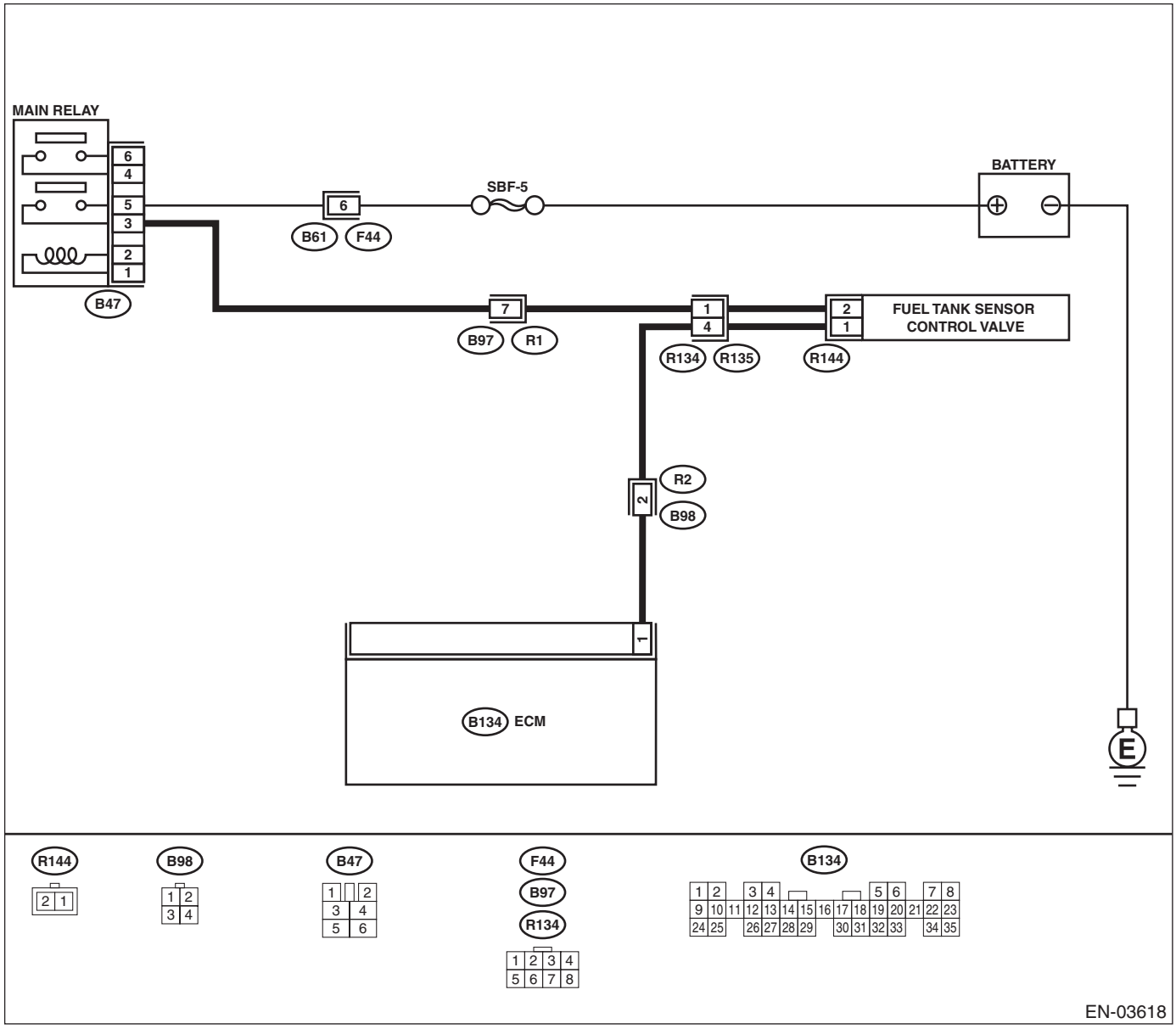
MEMO:

CP:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



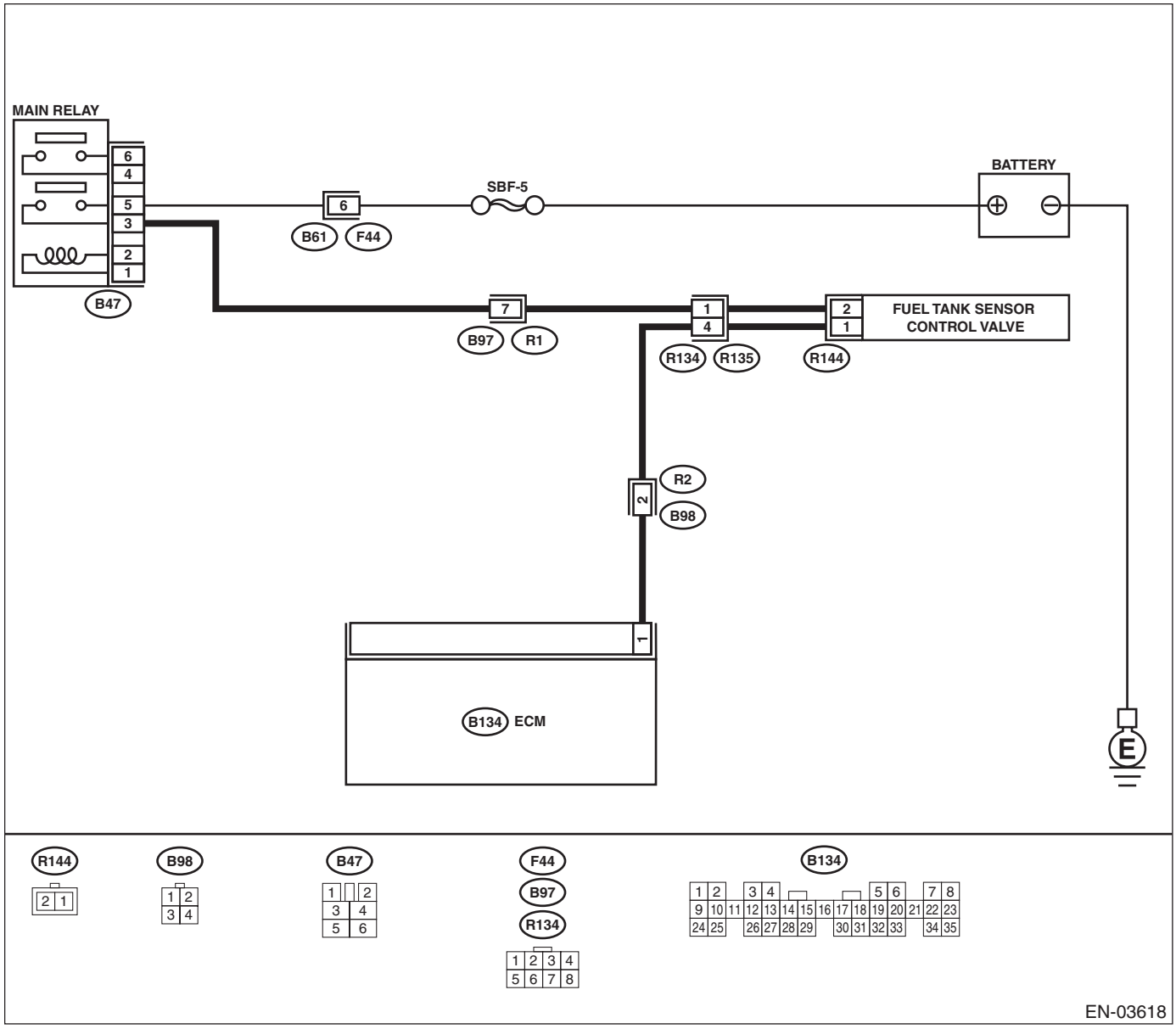
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel tank sensor control valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace fuel tank sensor control valve <Ref. to EC(H4SO)-12, Fuel Tank Sensor Control Valve.> and ECM <Ref. to FU(H4SO)-45, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

CQ:DTC P1448 — Fuel tank sensor control valve range/performance —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank •Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there any malfunction in pressure/vacuum line?	Repair or replace hoses and pipes.	Replace fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

CR:DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)-332, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CS:DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)-334, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CT:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)-332, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CU:DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)-334, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CV:DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)—

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)-332, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CW:DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)-334, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

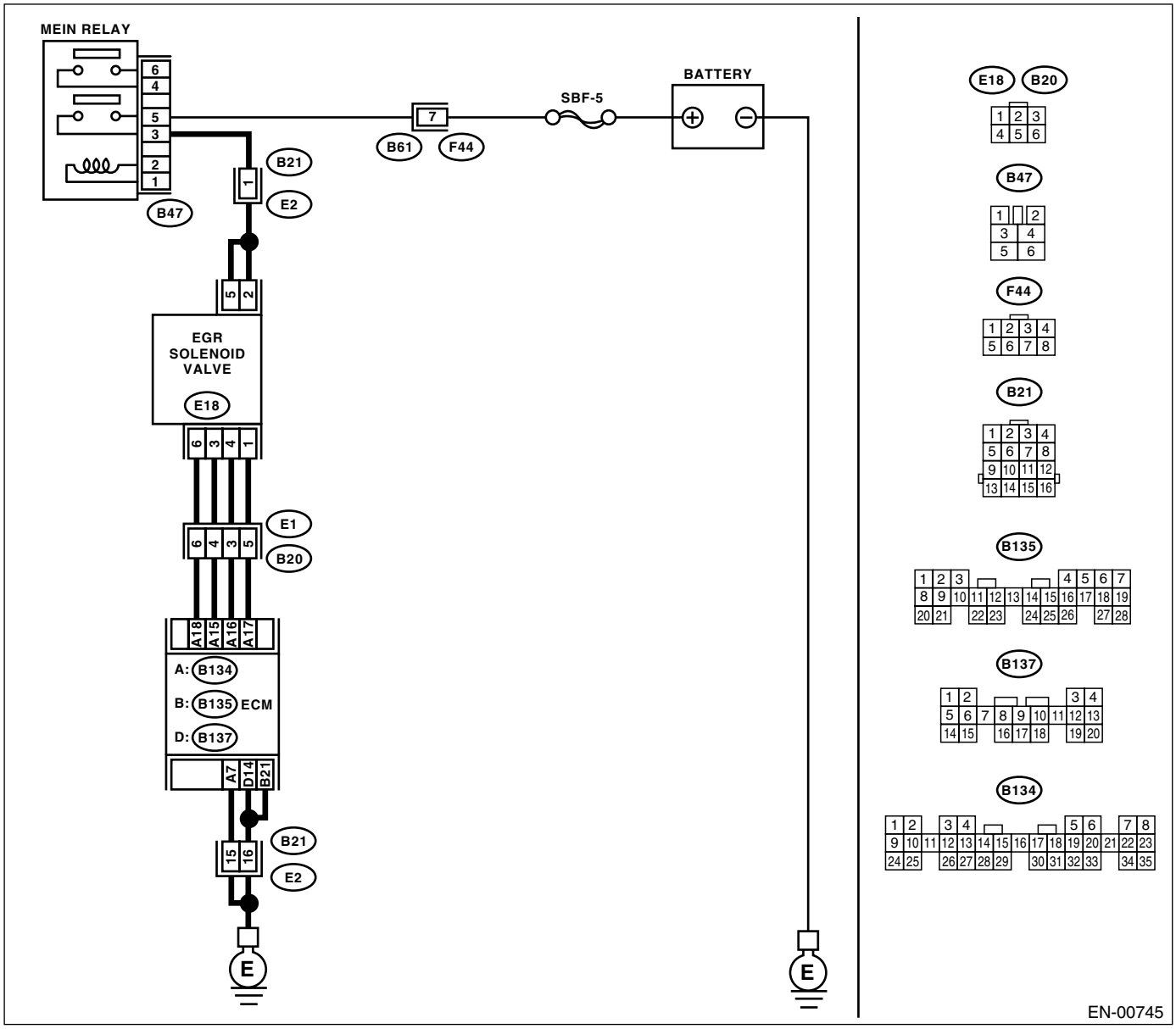
MEMO:

CX:DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



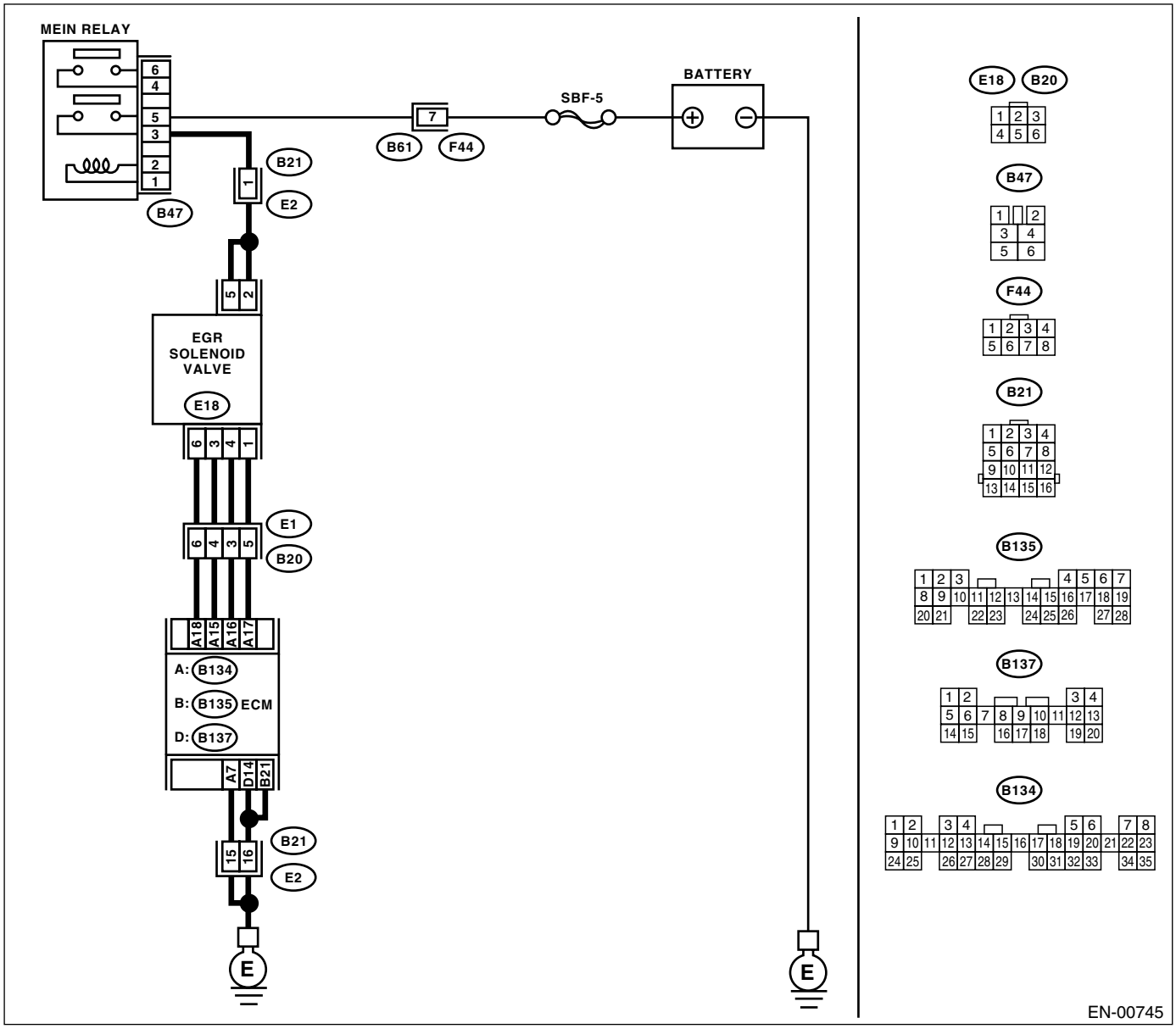
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between EGR solenoid valve connector and engine ground. ***Connector & terminal*** ***(E18) No. 2 (+) - Engine ground (-):*** ***(E18) No. 5 (+) - Engine ground (-):***	Is the measured value more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between EGR solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and EGR solenoid valve connector. ***Connector & terminal*** ***DTC P1492; (B134) No. 18 - (E18) No. 6:*** ***DTC P1494; (B134) No. 17 - (E18) No. 1:*** ***DTC P1496; (B134) No. 16 - (E18) No. 4:*** ***DTC P1498; (B134) No. 15 - (E18) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and EGR solenoid valve connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1492; (B134) No. 18 - Chassis ground:*** ***DTC P1494; (B134) No. 17 - Chassis ground:*** ***DTC P1496; (B134) No. 16 - Chassis ground:*** ***DTC P1498; (B134) No. 15 - Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit between ECM and EGR solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact between ECM connector and EGR solenoid valve connector.	Is there poor contact of ECM connector or EGR solenoid valve connector?	Repair poor contact of ECM connector or EGR solenoid valve connector.	Replace EGR solenoid valve. <Ref. to FU(H4SO)-37, EGR Valve.>

CY:DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any DTC on display?	Go to step **2.**	Go to step **3.**
2	**CHECK ECM GROUND CIRCUIT.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 - Chassis ground:*** ***(B137) No. 14 - Chassis ground:*** ***(B135) No. 21 - Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1493; (B134) No. 18 - Chassis ground:*** ***DTC P1495; (B134) No. 17 - Chassis ground:*** ***DTC P1497; (B134) No. 16 - Chassis ground:*** ***DTC P1499; (B134) No. 15 - Chassis ground:***	Is the measured value more than 10 V?	Repair ground short circuit between ECM and EGR solenoid valve connector. After completion of repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

CZ:DTC P1510 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)-338, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DA:DTC P1511 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)-340, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DB:DTC P1512 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)-338, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DC:DTC P1513 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)-340, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DD:DTC P1514 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)-338, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DE:DTC P1515 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)-340, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

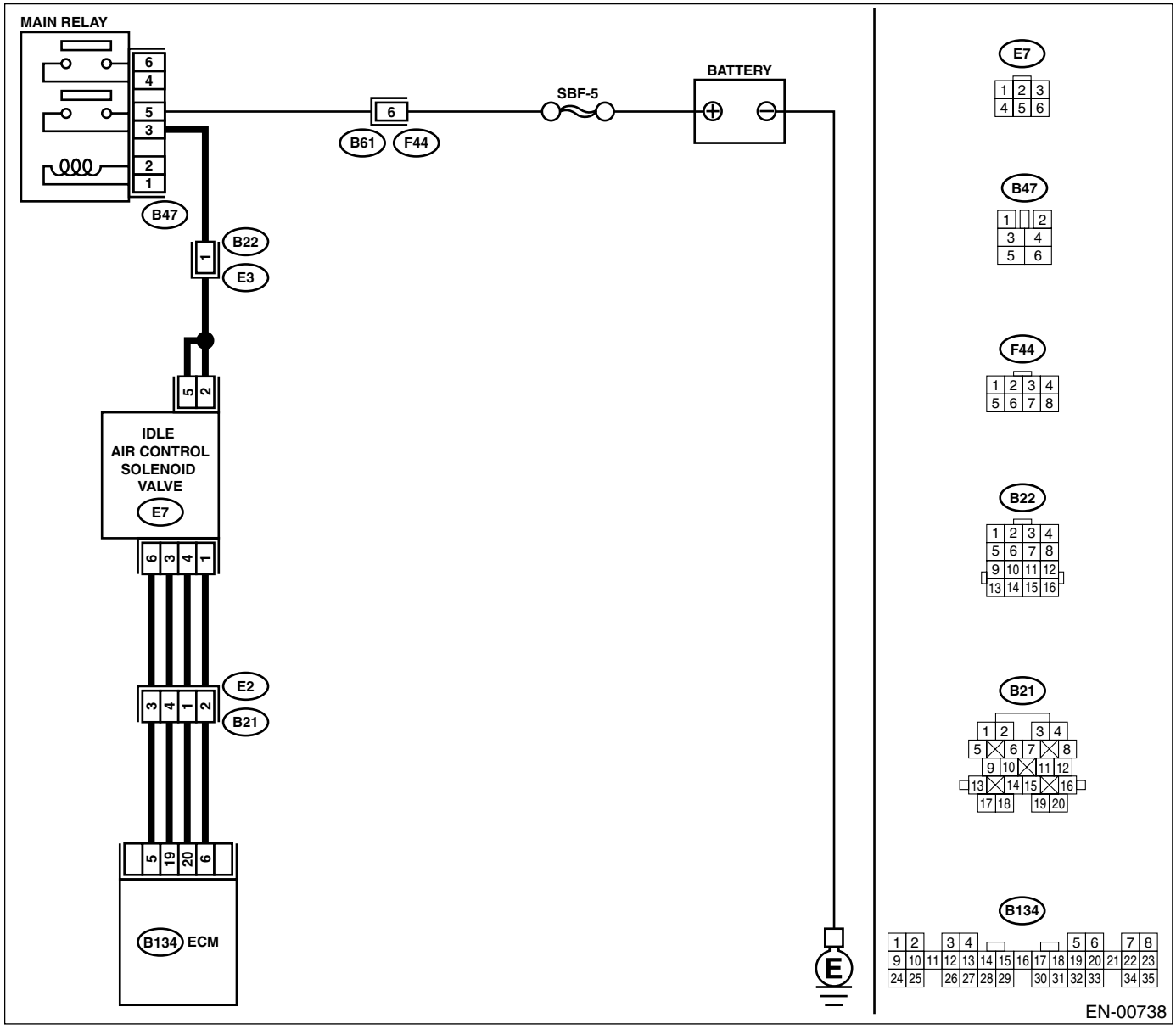
MEMO:

DF:DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



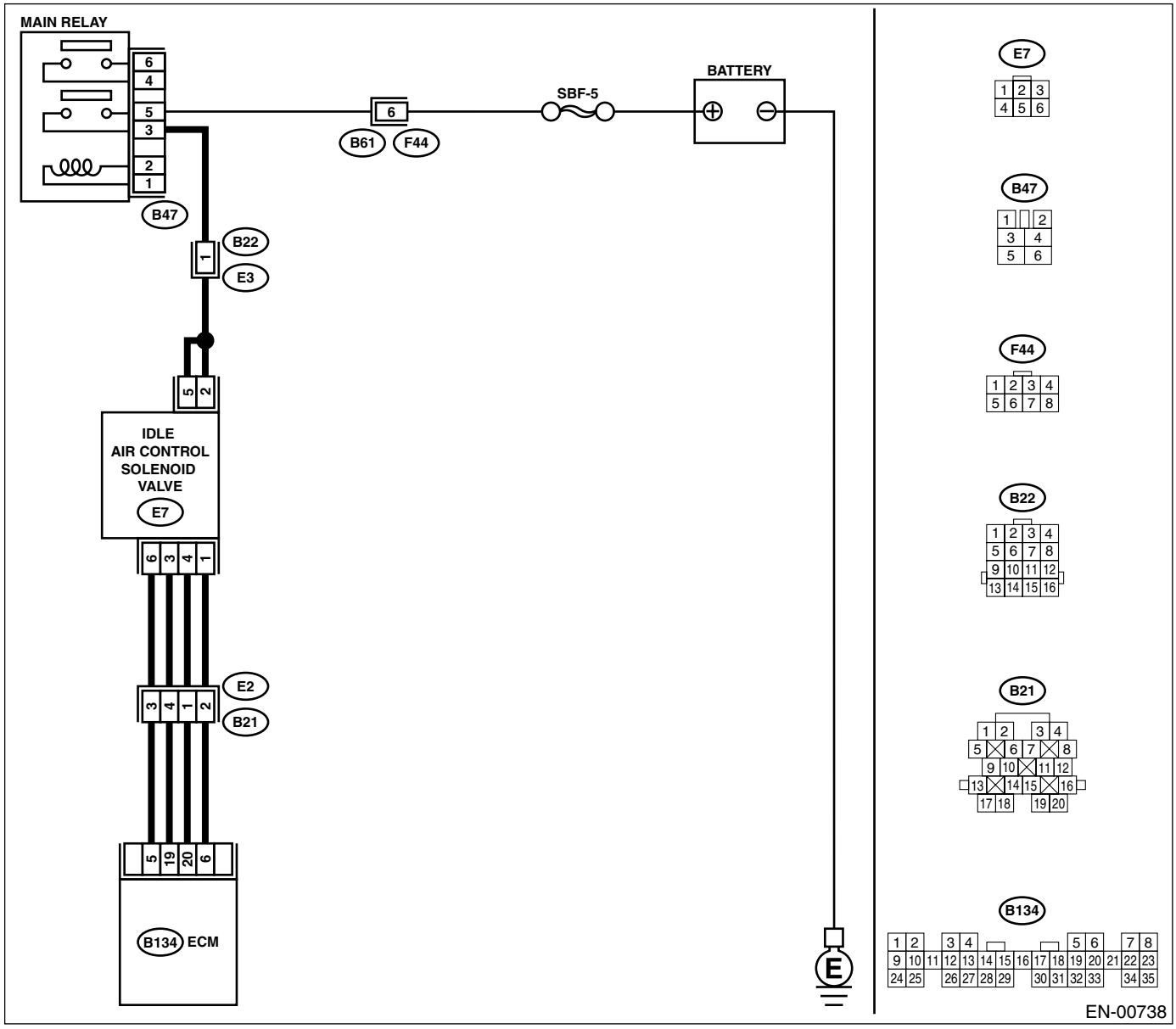
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (–):*** ***(E7) No. 5 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** Measure voltage between idle air control solenoid valve connector and engine ground.	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — (E7) No. 4:*** ***DTC P1512; (B134) No. 6 — (E7) No. 1:*** ***DTC P1514; (B134) No. 5 — (E7) No. 6:*** ***DTC P1516; (B134) No. 19 — (E7) No. 3:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — Chassis ground:*** ***DTC P1512; (B134) No. 6 — Chassis ground:*** ***DTC P1514; (B134) No. 5 — Chassis ground:*** ***DTC P1516; (B134) No. 19 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector and idle air control solenoid valve connector.	Is there poor contact in ECM connector or idle air control solenoid valve connector?	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Replace idle air control solenoid valve. <Ref. to FU(H4SO)-35, Idle Air Control Solenoid Valve.>

DG:DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.
- **TROUBLE SYMPTOM:**
  - Rough idling
  - Engine stalls.
  - Engine speed varies.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the related DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1511; (B134) No. 20 (+) — Chassis ground (–):*** ***DTC P1513; (B134) No. 6 (+) — Chassis ground (–):*** ***DTC P1515; (B134) No. 5 (+) — Chassis ground (–):*** ***DTC P1517; (B134) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>

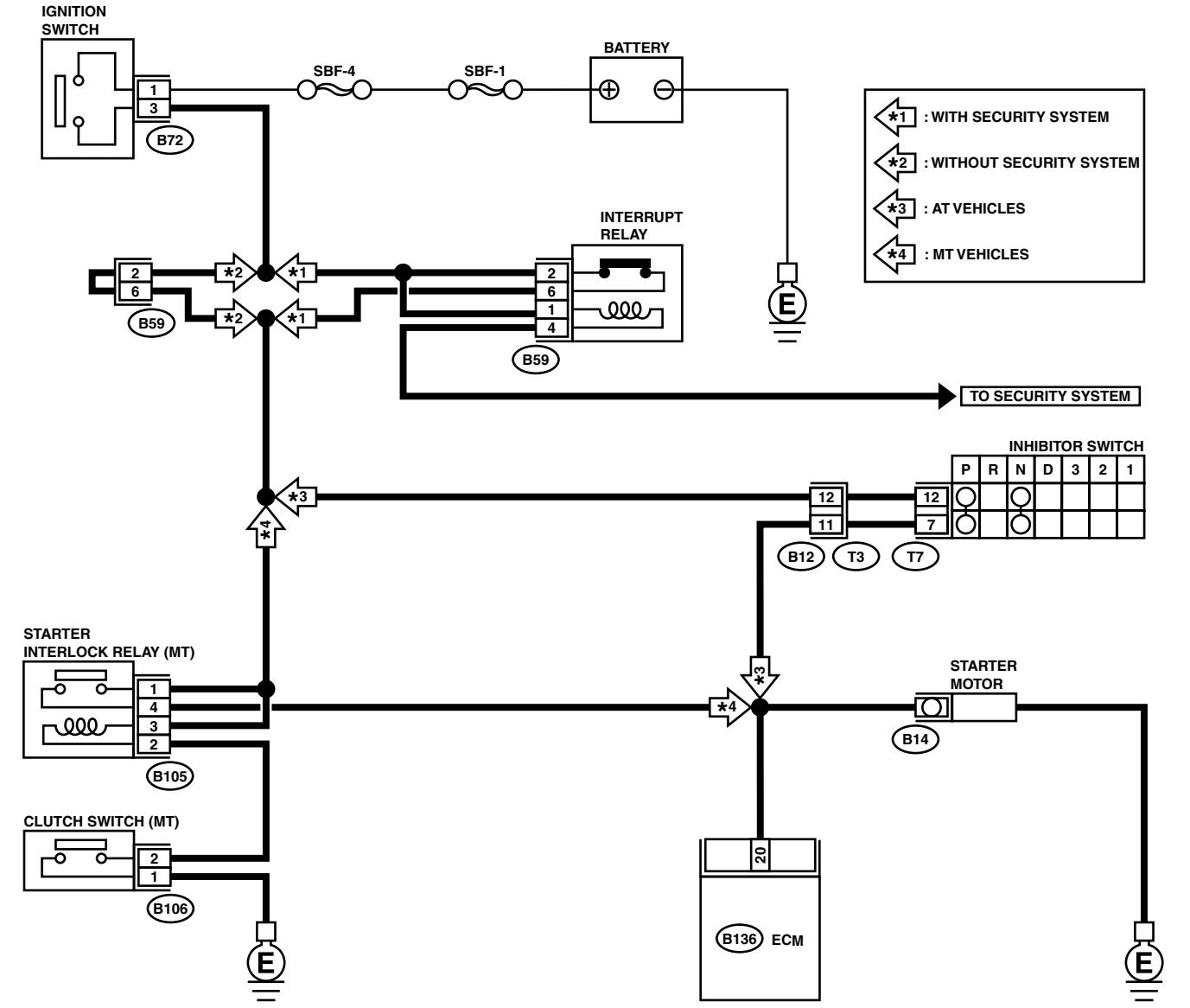
MEMO:

DH:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN-00715

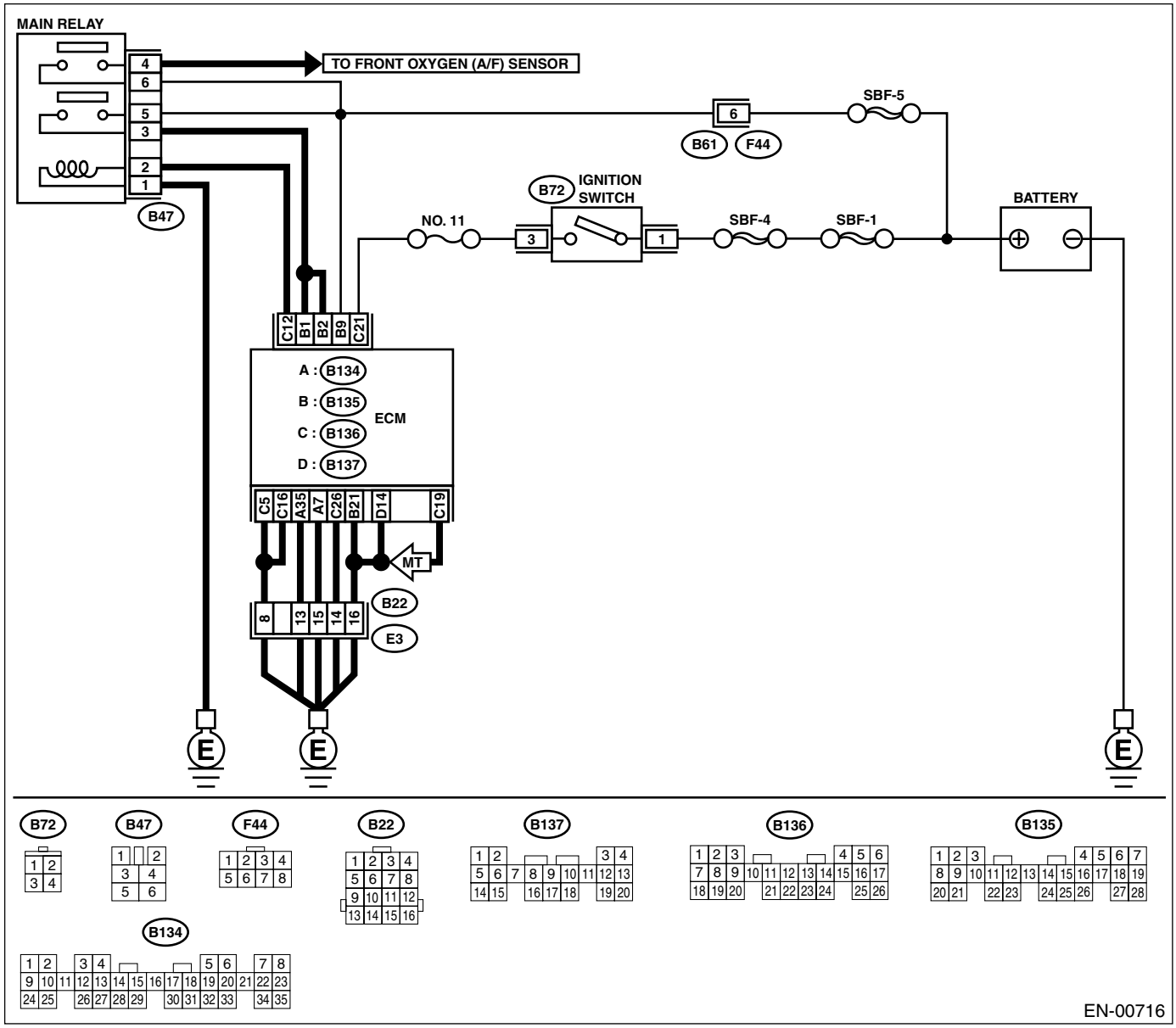
Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: •Place the inhibitor switch in the “P” or “N” position. (AT) •Depress the clutch pedal. (MT)	Does starter motor operate when turning ignition switch to “ST”?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4SO)-66, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DI: DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at occurrence of malfunction.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



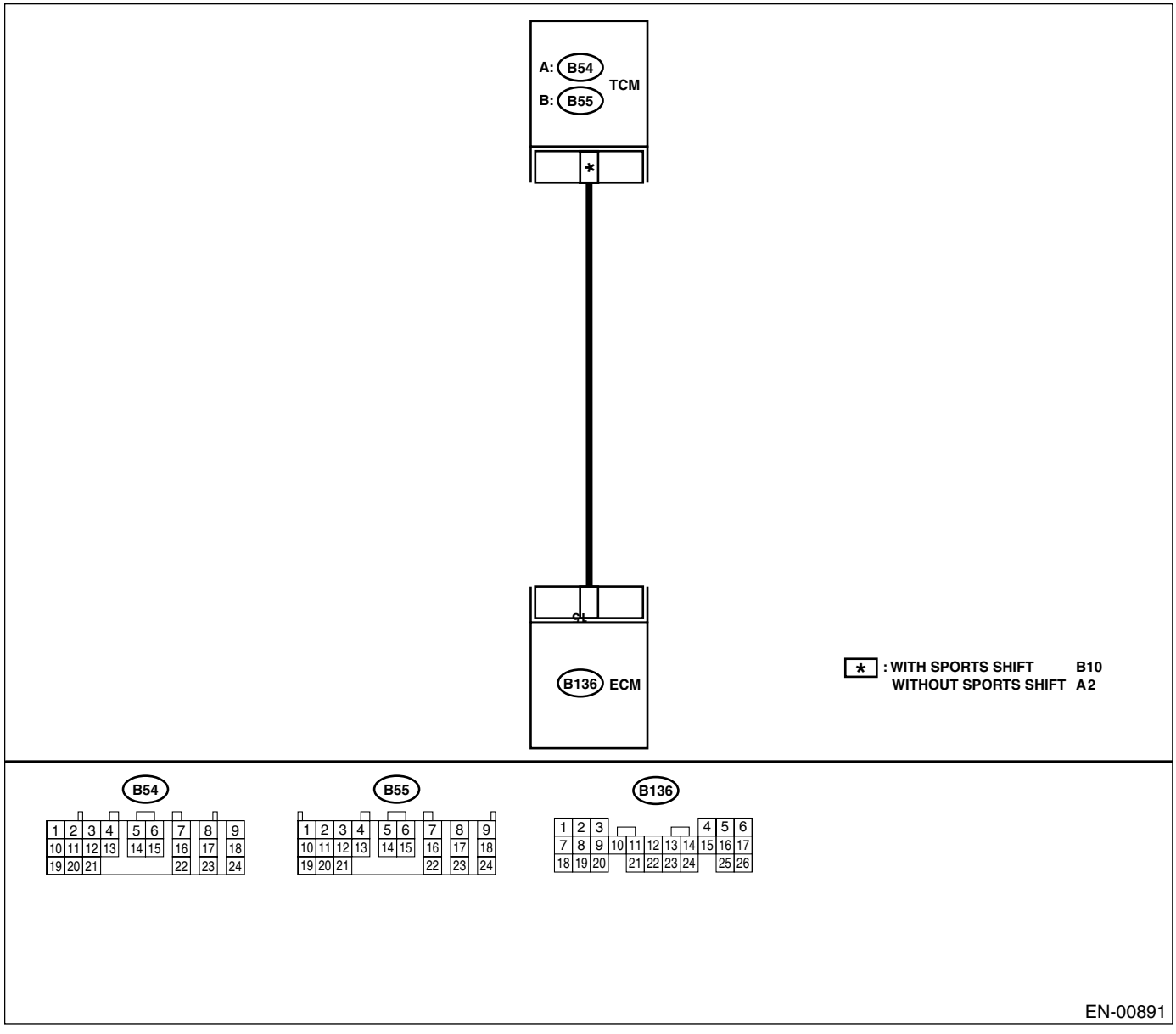
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM connector and battery terminal.
3	**CHECK FUSE SBF-5.**	Is fuse blown out?	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DJ:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



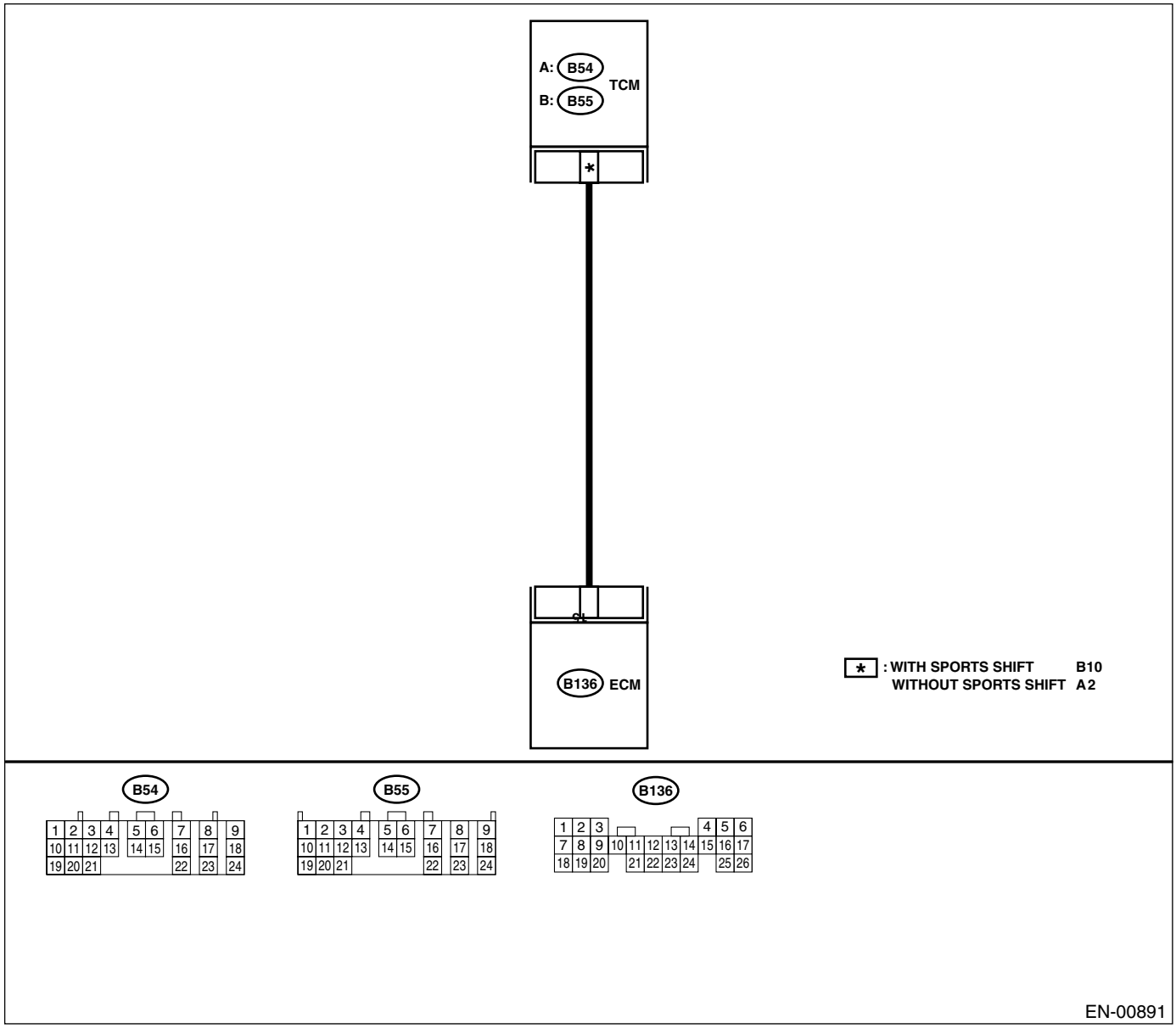
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the measured value more than 3 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 15 — (B55) No. 10: (with SPORT shift)*** ***(B136) No. 15 — (B54) No. 2: (without SPORT shift)***	Is the measured value less than 1 Ω?	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DK:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



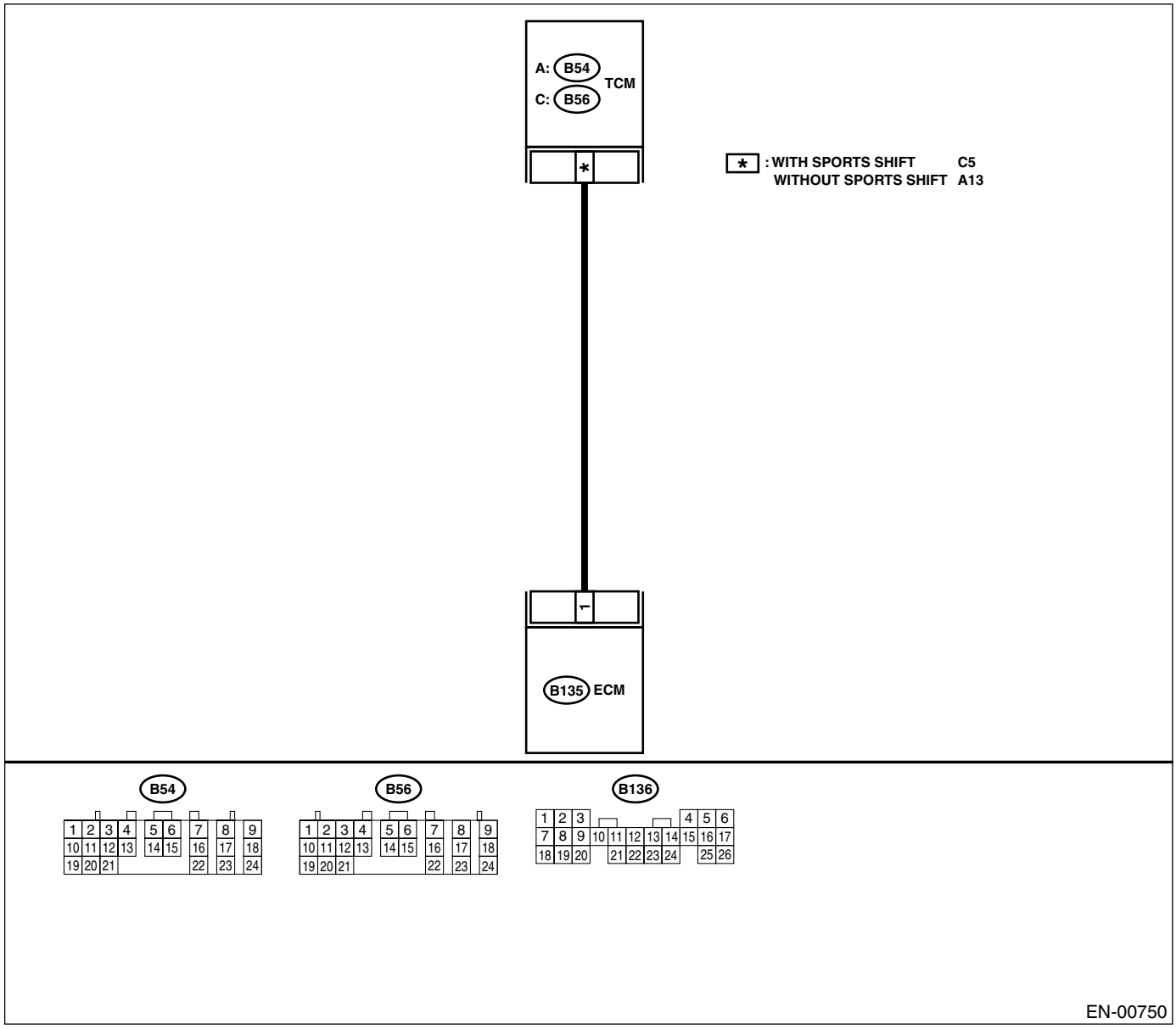
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connector from TCM. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 3 V?	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the measured value more than 10 V when shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H4SO)-45, Engine Control Module.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DL:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



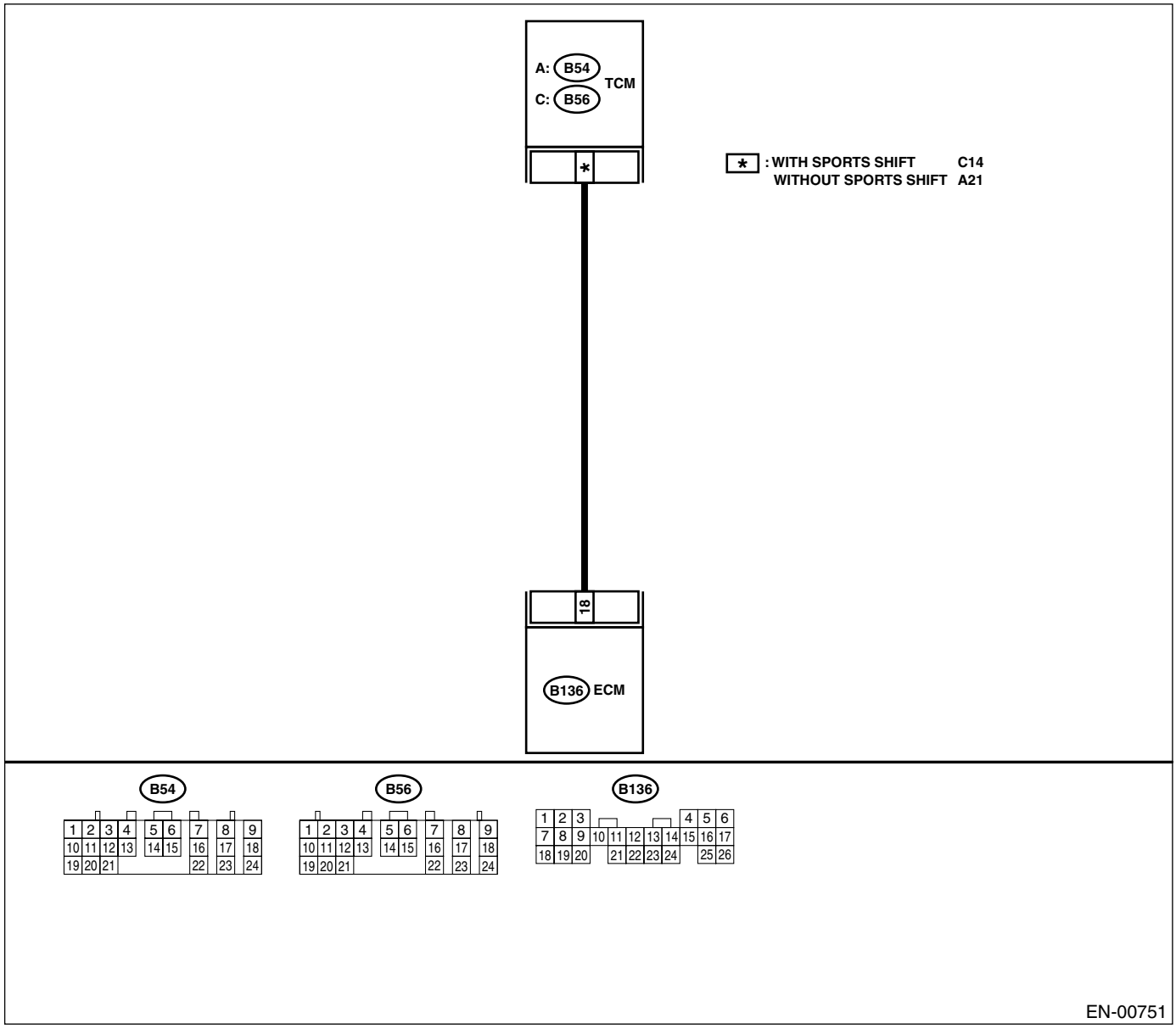
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B135) No. 1 — (B56) No. 5: (without SPORT shift)*** ***(B135) No. 1 — (B54) No. 13: (without SPORT shift)***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DM:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with malfunction
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



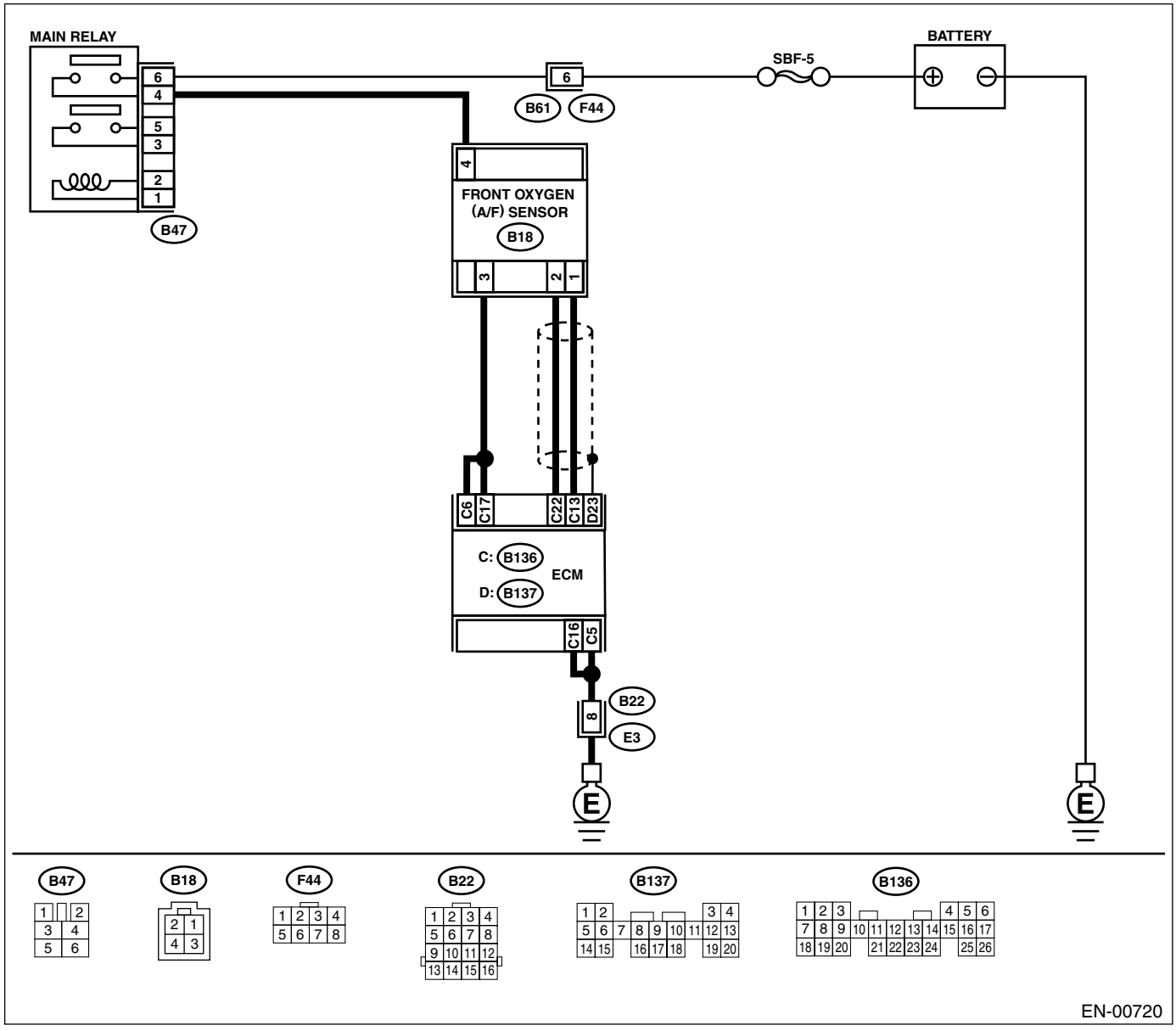
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 18 — (B56) No. 14: (without SPORT shift)*** ***(B136) No. 18 — (B54) No. 21: (with SPORT shift)***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:***	Is the measured value less than 10 Ω?	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DN:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

- **DTC DETECTING CONDITION:**
  - Detected when a malfunction occurs in two consecutive driving cycles.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.85 to 1.15?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: •Normally, A/F mixture ratio is rich with racing engine. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the measured value more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace malfunctioning parts.	Go to step **7.**
7	**CHECK EGR VALVE.**	Is EGR valve clogged?	Replace EGR valve.	Go to step **8.**
8	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **9.**
9	**CHECK PURGE CONTROL SOLENOID VALVE.**	Is purge control solenoid valve clogged?	Replace purge control solenoid valve.	Go to step **10.**
10	**CHECK PCV VALVE.**	Is PCV valve clogged?	Replace PCV valve.	Go to step **11.**
11	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release fuel pressure. (1) Disconnect connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **12.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
12	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, release fuel pressure.** NOTE: •If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **13.**	Repair the following items. **Fuel pressure too high** • Malfunctioning pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Malfunctioning pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
13	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 70 to 100°C (158 to 212°F)?	Go to step **14.**	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-27, Engine Coolant Temperature Sensor.>
14	**CHECK INTAKE MANIFOLD PRESSURE SENSOR SIGNAL.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the selector lever in "N" or "P" position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) when idling or within 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) when turning ignition switch ON?	Go to step **15.**	Replace intake air temperature and pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>	Repair short circuit between ECM and front oxygen (A/F) sensor connector.

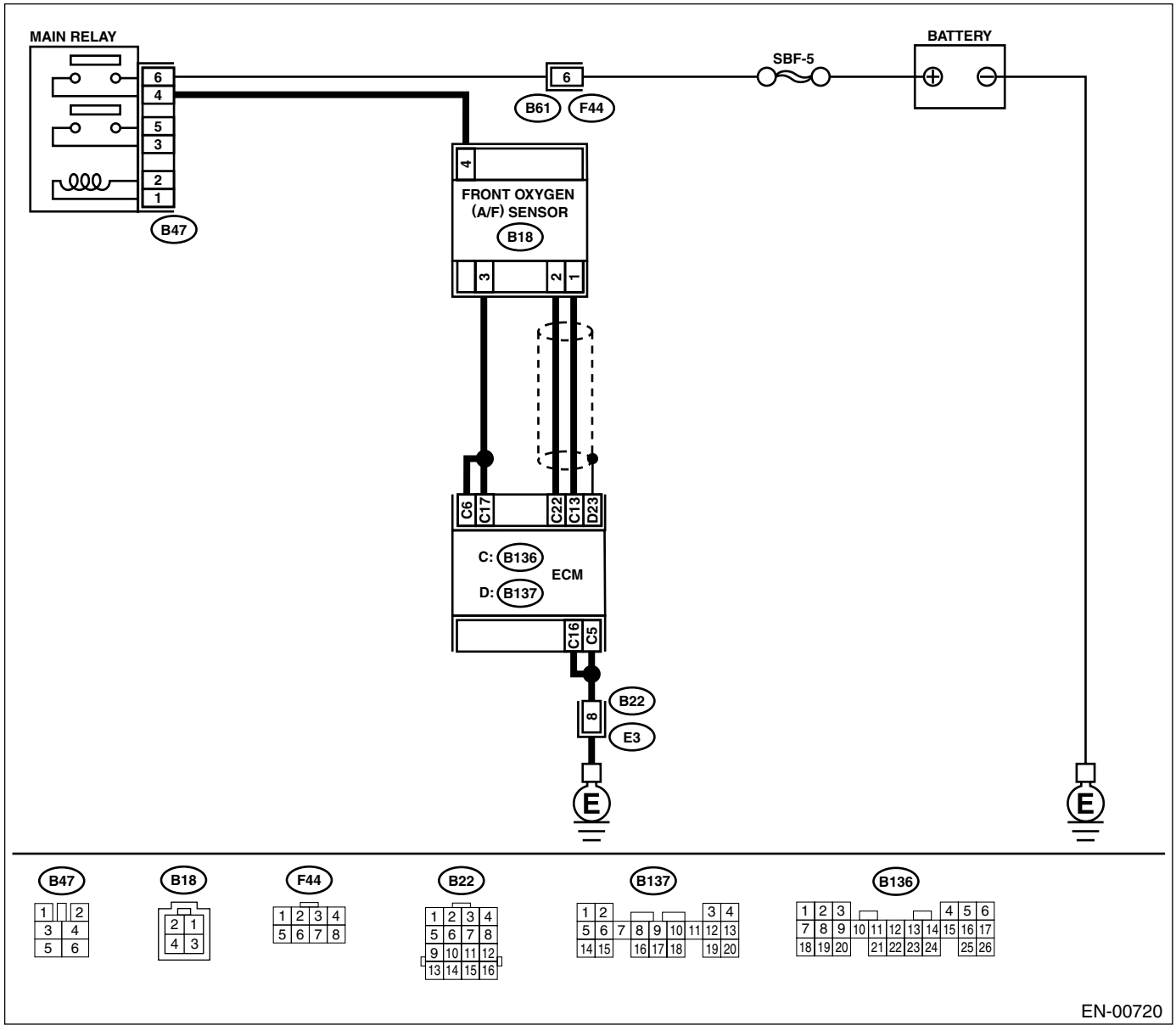
MEMO:

DO:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

- **DTC DETECTING CONDITION:**
  - Detected when a malfunction occurs in two consecutive driving cycles.

CAUTION:
After repair or replacement of malfunctioning parts, conduct Clear Memory Mode <Ref. to EN(H4SO)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)-84, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.85 to 1.15?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: •Normally, A/F mixture ratio is rich with racing engine. •To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the measured value more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace malfunctioning parts.	Go to step **7.**
7	**CHECK EGR VALVE.**	Is EGR valve clogged?	Replace EGR valve.	Go to step **8.**
8	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **9.**
9	**CHECK PURGE CONTROL SOLENOID VALVE.**	Is purge control solenoid valve clogged?	Replace purge control solenoid valve.	Go to step **10.**
10	**CHECK PCV VALVE.**	Is PCV valve clogged?	Replace PCV valve.	Go to step **11.**
11	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release fuel pressure. (1) Disconnect connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **12.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
12	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, release fuel pressure.** NOTE: •If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **13.**	Repair the following items. **Fuel pressure too high** • Malfunctioning pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Malfunctioning pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
13	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 70 to 100°C (158 to 212°F)?	Go to step **14.**	Replace engine coolant temperature sensor. <Ref. to FU(H4SO)-27, Engine Coolant Temperature Sensor.>
14	**CHECK INTAKE MANIFOLD PRESSURE SENSOR SIGNAL.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the selector lever in "N" or "P" position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) when idling or within 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) when turning ignition switch ON?	Go to step **15.**	Replace intake air temperature and pressure sensor. <Ref. to FU(H4SO)-33, Pressure Sensor.>

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace front oxygen (A/F) sensor. <Ref. to FU(H4SO)-43, Front Oxygen (A/F) Sensor.>	Repair short circuit between ECM and front oxygen (A/F) sensor connector.

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-91, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Ignition parts (*1) 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Engine coolant temperature sensor (*2) 6) Ignition parts (*1) 7) Air intake system (*5) 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Crankshaft position sensor (*3) 11) Camshaft position sensor (*3) 12) Oxygen sensor 13) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Intake manifold pressure sensor 6) Intake air temperature sensor 7) Intake air temperature and pressure sensor
4. Poor acceleration	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Throttle position sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) Engine coolant temperature sensor (*2) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) A/C switch and A/C cut relay 11) Engine torque control signal circuit 12) Ignition parts (*1)
5. Engine stalls or engine speed drops or hesitates at acceleration.	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Purge control solenoid valve 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(H4SO)-2, Basic Diagnostic Procedure.>

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1. List of Diagnostic Trouble Code (DTC)

A: List

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-10, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-12, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-14, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-16, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-18, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0065	Air Assisted Injector Control Range/ Performance	<Ref. to GD(H4SO)-20, DTC P0065 — AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0066	Air Assisted Injector Control Circuit or Circuit Low	<Ref. to GD(H4SO)-24, DTC P0066 — AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0067	Air Assisted Injector Control Circuit High	<Ref. to GD(H4SO)-26, DTC P0067 — AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Pressure Sensor Range/ Performance	<Ref. to GD(H4SO)-28, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4SO)-30, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4SO)-32, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4SO)-34, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4SO)-36, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4SO)-38, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4SO)-40, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4SO)-42, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to GD(H4SO)-44, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H4SO)-48, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H4SO)-50, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H4SO)-52, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4SO)-54, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Barometric Pressure Too Low	<Ref. to GD(H4SO)-56, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-58, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-60, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-62, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-64, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-68, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-70, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-72, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-74, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4SO)-78, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4SO)-80, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO)-82, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H4SO)-84, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H4SO)-86, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4SO)-88, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4SO)-94, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4SO)-94, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4SO)-94, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-96, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-98, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4SO)-100, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO)-102, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-104, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-106, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	EGR System	<Ref. to GD(H4SO)-108, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4SO)-112, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4SO)-116, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4SO)-140, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4SO)-142, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4SO)-144, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4SO)-148, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4SO)-150, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4SO)-152, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4SO)-152, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4SO)-154, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4SO)-156, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4SO)-158, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4SO)-160, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4SO)-162, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4SO)-164, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4SO)-168, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4SO)-170, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to GD(H4SO)-171, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4SO)-172, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4SO)-174, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4SO)-176, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4SO)-177, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0565	Cruise Control On Signal	<Ref. to GD(H4SO)-178, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4SO)-179, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4SO)-180, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4SO)-181, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to GD(H4SO)-182, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to GD(H4SO)-183, DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to GD(H4SO)-185, DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to GD(H4SO)-186, DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0720	Output Speed Sensor Circuit	<Ref. to GD(H4SO)-187, DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to GD(H4SO)-188, DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0731	Gear 1 Incorrect Ratio	<Ref. to GD(H4SO)-189, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0732	Gear 2 Incorrect Ratio	<Ref. to GD(H4SO)-190, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0733	Gear 3 Incorrect Ratio	<Ref. to GD(H4SO)-191, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0734	Gear 4 Incorrect Ratio	<Ref. to GD(H4SO)-192, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to GD(H4SO)-193, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to GD(H4SO)-194, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to GD(H4SO)-195, DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0753	Shift Solenoid “A” Electrical	<Ref. to GD(H4SO)-196, DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0758	Shift Solenoid “B” Electrical	<Ref. to GD(H4SO)-197, DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0771	Shift Solenoid “E” Performance or Stuck Off	<Ref. to GD(H4SO)-198, DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to GD(H4SO)-199, DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0785	Shift/Timing Solenoid	<Ref. to GD(H4SO)-200, DTC P0785 — SHIFT/TIMING SOLENOID —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(H4SO)-201, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(H4SO)-204, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0864	TCM Communication Circuit Range/Performance	<Ref. to GD(H4SO)-206, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0865	TCM Communication Circuit Low	<Ref. to GD(H4SO)-207, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0866	TCM Communication Circuit High	<Ref. to GD(H4SO)-208, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-209, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-210, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to GD(H4SO)-212, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-214, DTC P1137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4SO)-216, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4SO)-218, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4SO)-220, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4SO)-222, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4SO)-224, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(H4SO)-226, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR solenoid valve signal #1 circuit malfunction (low input)	<Ref. to GD(H4SO)-230, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1493	EGR solenoid valve signal #1 circuit malfunction (high input)	<Ref. to GD(H4SO)-232, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1494	EGR solenoid valve signal #2 circuit malfunction (low input)	<Ref. to GD(H4SO)-234, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1495	EGR solenoid valve signal #2 circuit malfunction (high input)	<Ref. to GD(H4SO)-236, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1496	EGR solenoid valve signal #3 circuit malfunction (low input)	<Ref. to GD(H4SO)-238, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1497	EGR solenoid valve signal #3 circuit malfunction (high input)	<Ref. to GD(H4SO)-240, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1498	EGR solenoid valve signal #4 circuit malfunction (low input)	<Ref. to GD(H4SO)-242, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1499	EGR solenoid valve signal #4 circuit malfunction (high input)	<Ref. to GD(H4SO)-244, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-246, DTC P1510 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-248, DTC P1511 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-250, DTC P1512 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-252, DTC P1513 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-254, DTC P1514 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-256, DTC P1515 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-258, DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-260, DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4SO)-262, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4SO)-263, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-264, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-265, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1700	Throttle Position Sensor Circuit Malfunction For AT	<Ref. to GD(H4SO)-266, DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to GD(H4SO)-268, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to GD(H4SO)-269, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4SO)-270, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4SO)-272, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

MEMO:

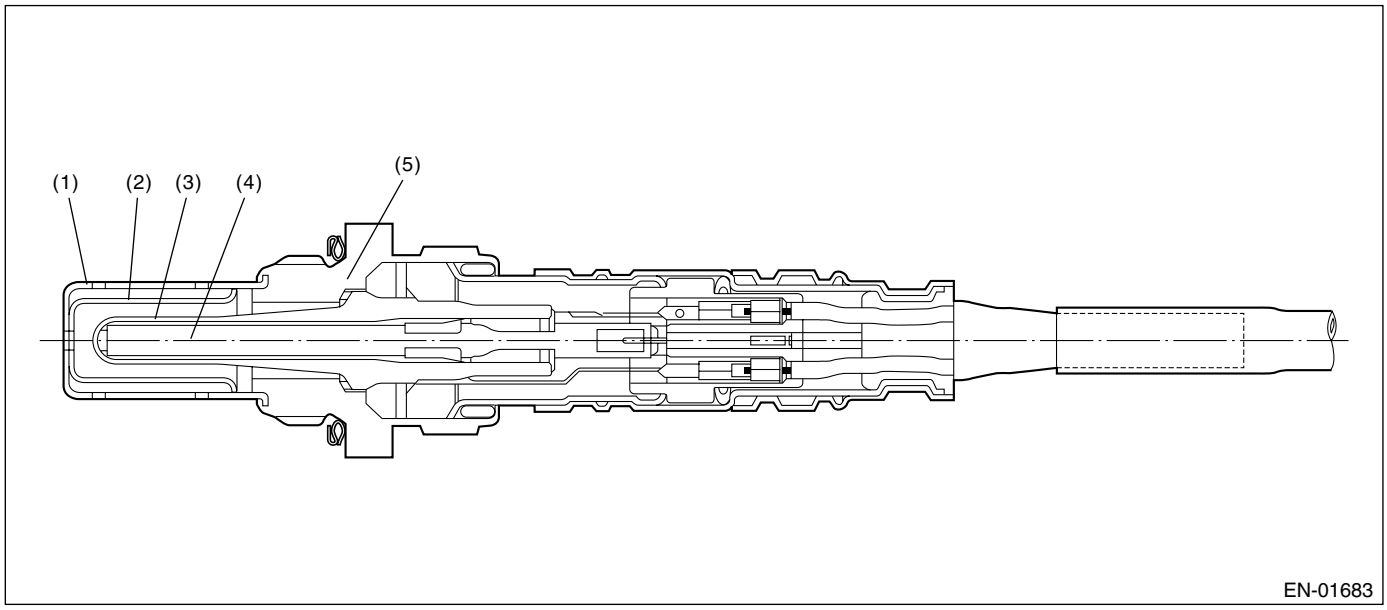
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of heater malfunction NG is transmitted.
Judge NG when the front oxygen (A/F) sensor element impedance is out of the standard value.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After heater control starting	More than 30 seconds
After fuel shut-off	More than 20 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 30 seconds after the heater continuity starting, and complete the diagnosis if making a NG judgment.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when one of the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	< 10 Ω or > 40 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when all of the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	10 Ω — 40 Ω

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

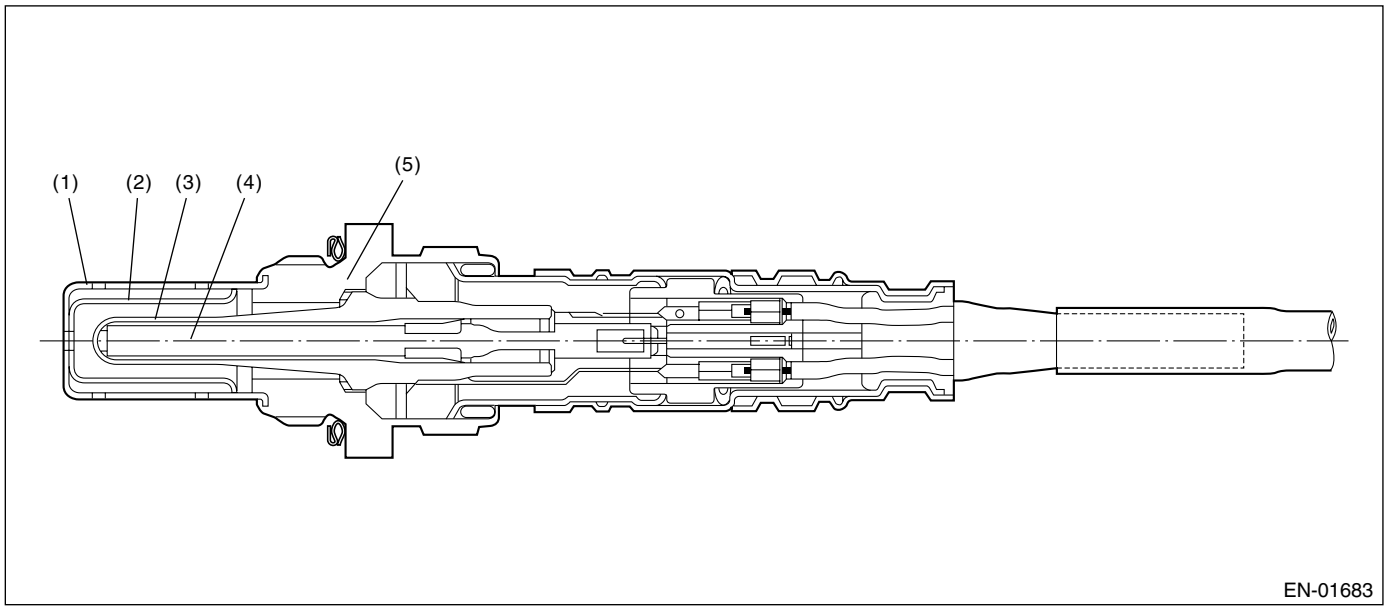
Memorize the freeze frame data. (For test mode $02)

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of open circuit and shortage NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	10.9 V or more
Heater control	In operation

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open or short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing all the malfunction criteria below becomes more then 4.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	ON
Heater both edge voltage	< 5 V
Heater current	< 1.5 A

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

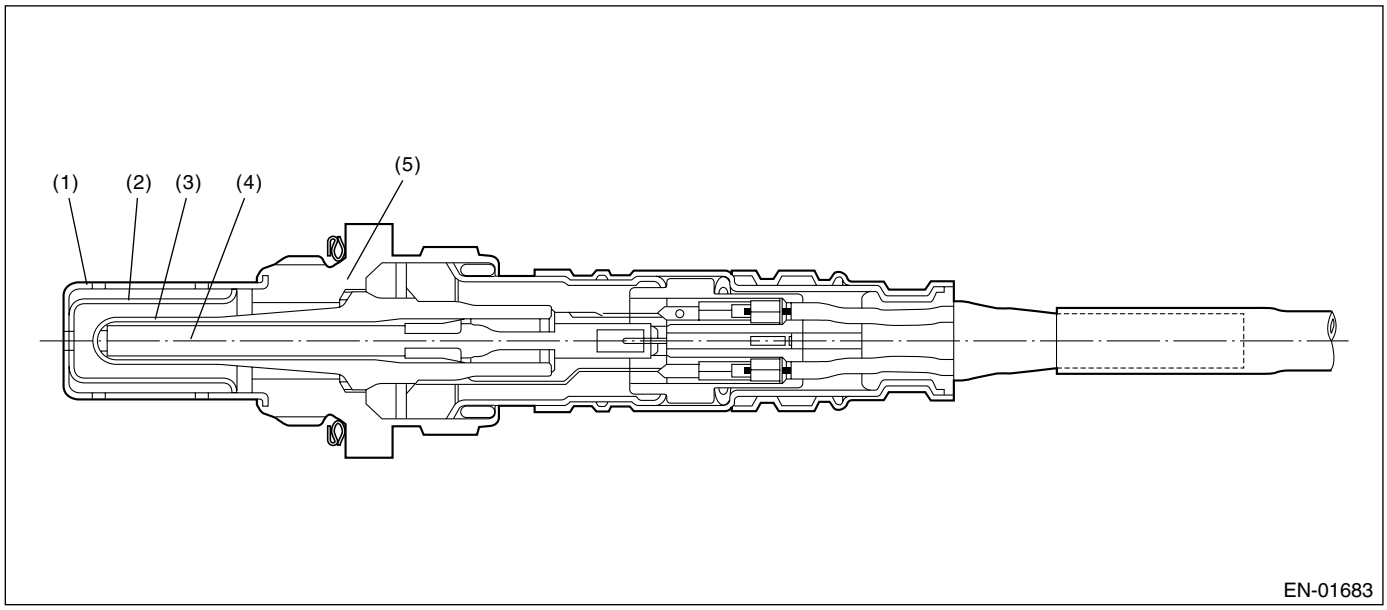
Memorize the freeze frame data. (For test mode $02)

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of open circuit and shortage NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	10.9 V or more
Heater control	In operation

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open or short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when one of the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	ON
Heater both edge voltage	< 5 V
Heater current	< 1.5 A
Heater current	≥ 23 A

Time Needed for Diagnosis: 4.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

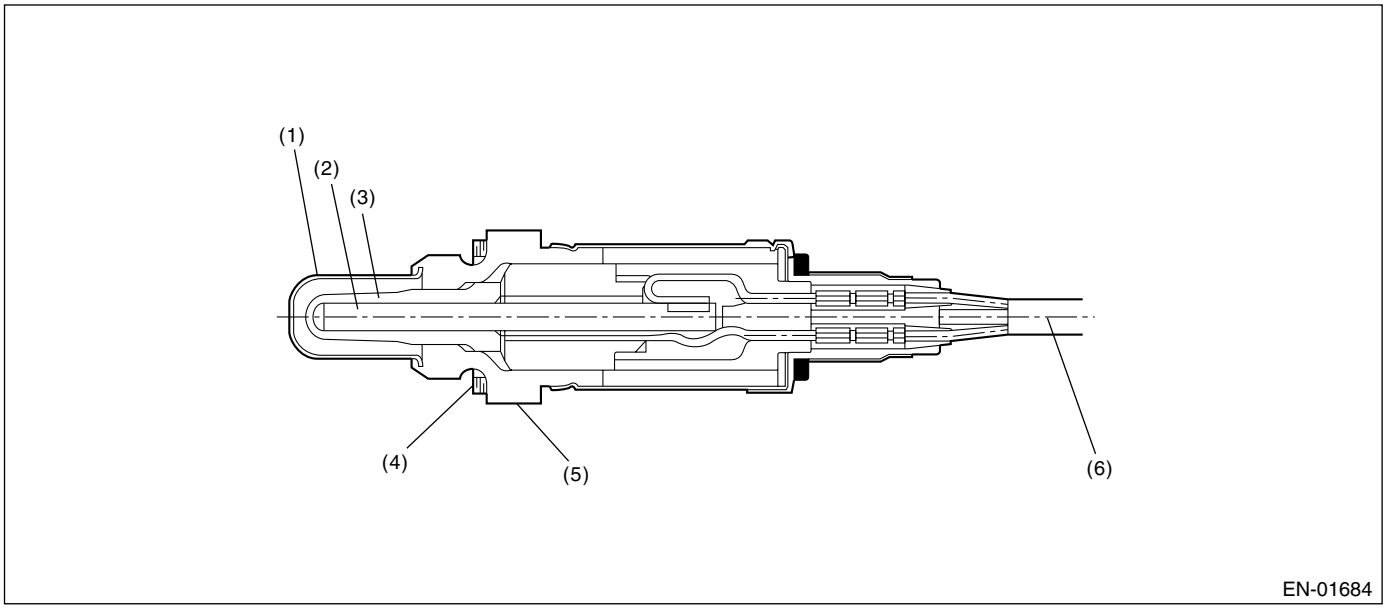
Memorize the freeze frame data. (For test mode $02)

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor heater.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Ceramic heater
(3) Zirconium tube
(4) Gasket
(5) Sensor housing
(6) Harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Engine speed	≥ 500 rpm
After engine starting	10 seconds or more
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

In 10 seconds after starting the engine, perform the diagnosis just once.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes 10 seconds or more. Judge OK when the continuous time until completing none of the malfunction criteria below becomes 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Calculated electric power	< 6 W

Time needed for diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

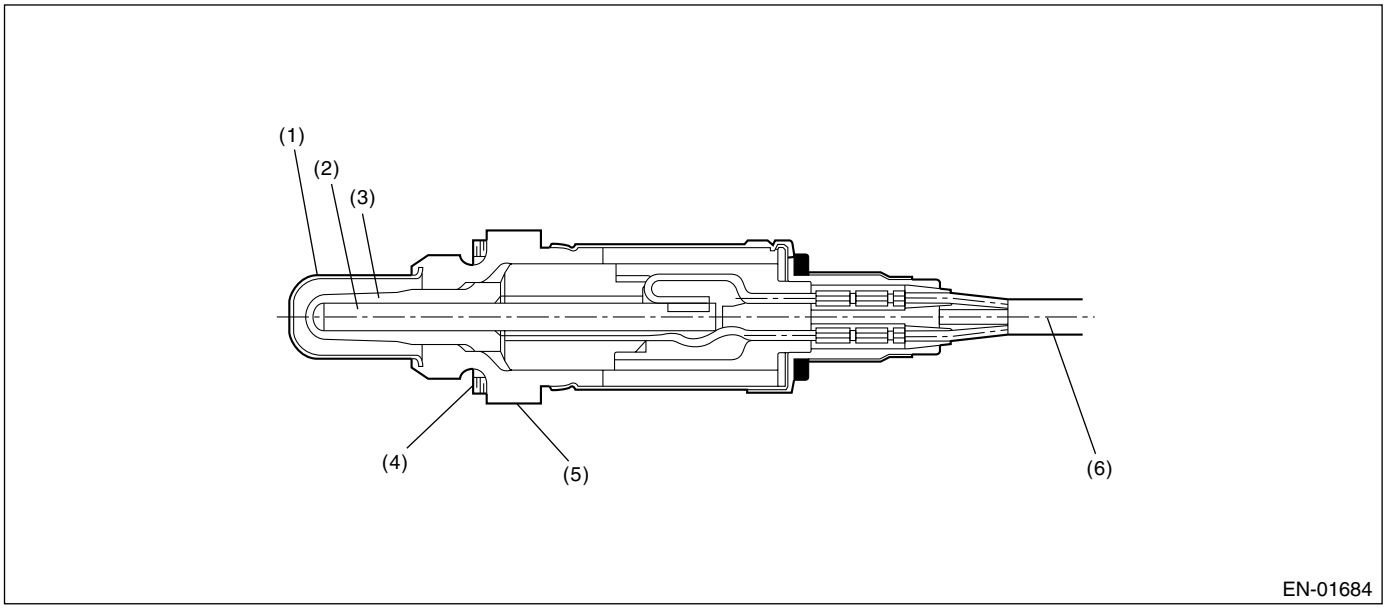
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor heater.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Ceramic heater
(3) Zirconium tube
(4) Gasket
(5) Sensor housing
(6) Harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Engine speed	≥ 500 rpm
After engine starting	10 seconds or more
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

In 10 seconds after starting the engine, perform the diagnosis just once.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes 10 seconds or more. Judge OK when the continuous time until completing none of the malfunction criteria below becomes 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Calculated electric power	≥ 50 W

Time needed for diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

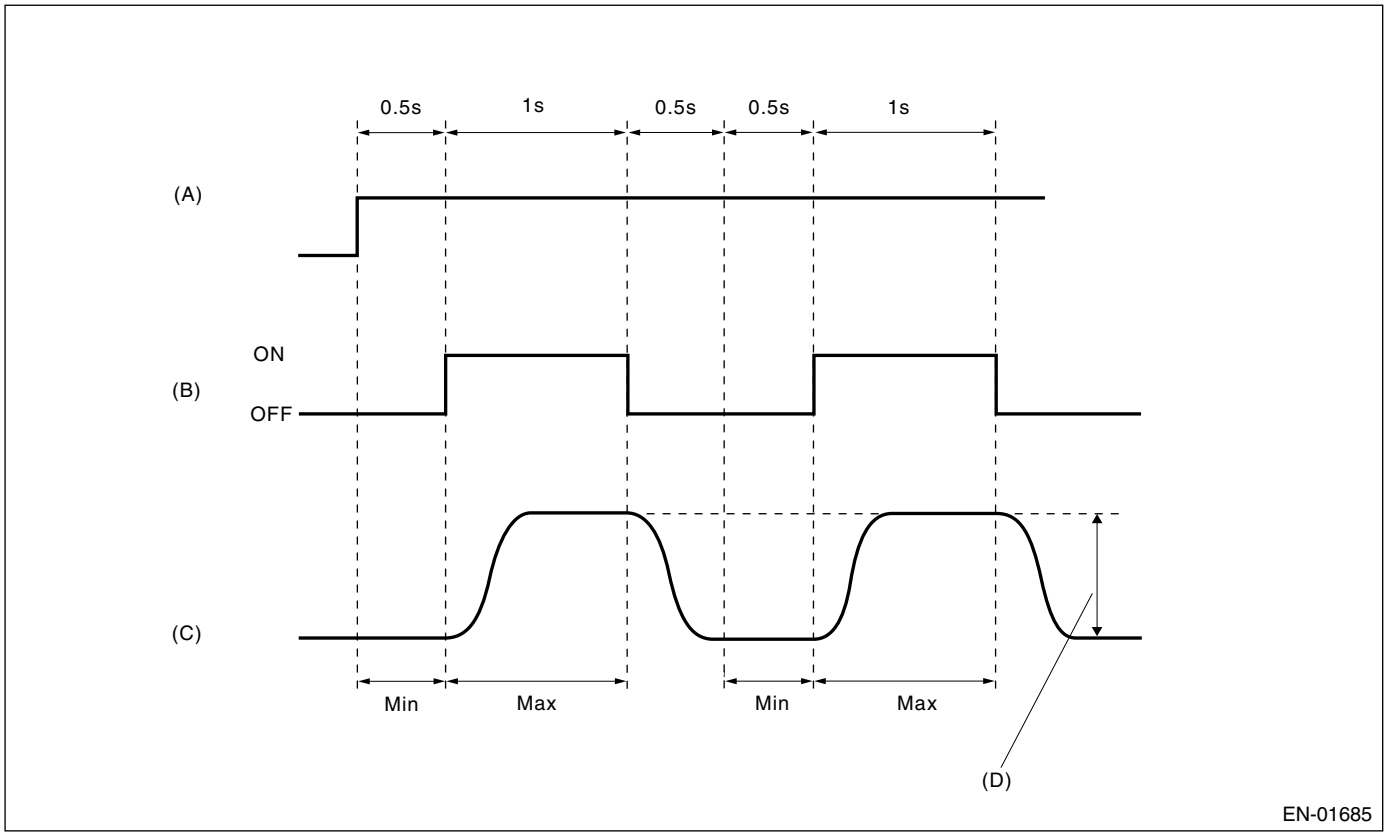
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

F: DTC P0065 — AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE —

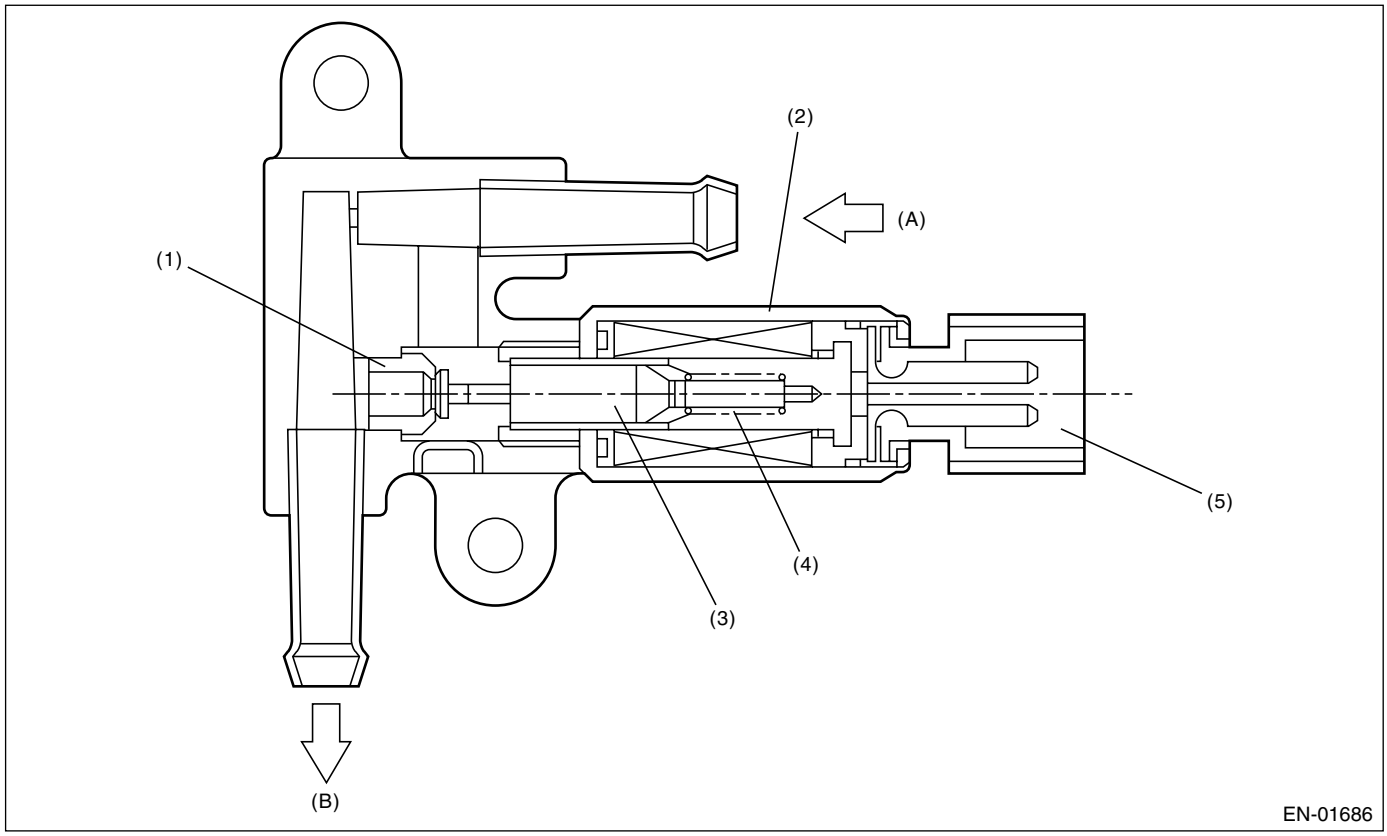
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AAI solenoid valve.
Intake manifold pressure (negative pressure) is constant because the throttle valve is fully closed during fuel cut at deceleration. At this time, opening AAI solenoid valve makes the intake manifold pressure larger. For AAI solenoid valve function diagnosis, judge OK or NG by the amount of change of intake manifold pressure when opening and closing the AAI solenoid valve.
Max. value with the valve open - Min. value with the valve closed < Threshold value → NG
Max. value with the valve open - Min. value with the valve closed ≥ Threshold value → OK



(A) Conditions executed for diagnosis
(B) AAI solenoid valve
(C) Intake manifold pressure (At normal condition)
(D) Diagnostic value

2. COMPONENT DESCRIPTION



(1) Valve seat
(2) Solenoid
(3) Plunger and valve
(4) Spring
(5) Connector
(A) From idle air control solenoid valve
(B) To injector

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1300 ←→ 2300 rpm
Vehicle speed	≥ 60 km/h (37 MPH)
Atmospheric pressure	≥ 86 kPa (642 mmHg, 25 inHg)
Atmospheric-MAP	≥ 53 kPa (400 mmHg, 16 inHg)
Fuel cut event by coasting	In operation
AAI solenoid valve position	OFF (closed)

4. GENERAL DRIVING CYCLE

Conduct a serial diagnosis during fuel cut at deceleration from approx. 100 km/h (62 MPH).
Be careful for vehicle speed and engine speed. (Diagnosis may not finish if the vehicle speed and engine speed conditions become out of specification.)

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 2 times in a row. Judge OK and clear the NG if not completed once

Judgment Value

Malfunction Criteria	Threshold Value
Paai1 – Paai2	
Paai1; max. MAP value during AAI solenoid valve ON signal	0.7 kPa (5 mmHg, 0.2 inHg) [101 kPa (760 mmHg, 30 inHg) in atmospheric pressure]
Paai2; min. MAP value during 0.5 seconds just before changing the valve from OFF to ON	0.05 kPa (0.4mm, 0.016 inHg) [86 kPa (642 mmHg, 25 inHg) in atmospheric pressure]

Time needed for diagnosis: 9 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

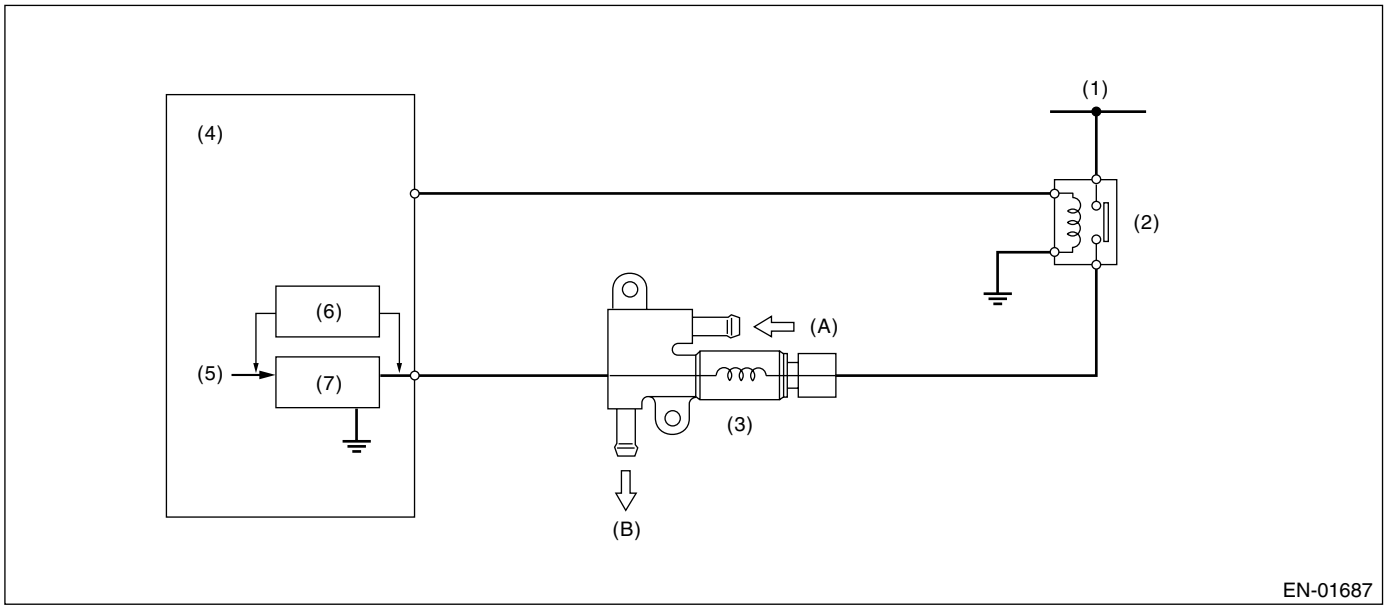
MEMO:

G: DTC P0066 — AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of AAI solenoid valve. Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Battery
(2) Main relay
(3) AAI solenoid valve
(4) Engine control module (ECM)
(5) CPU
(6) Detecting circuit
(7) Switching circuit
(A) From idle air control solenoid valve
(B) To injector

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

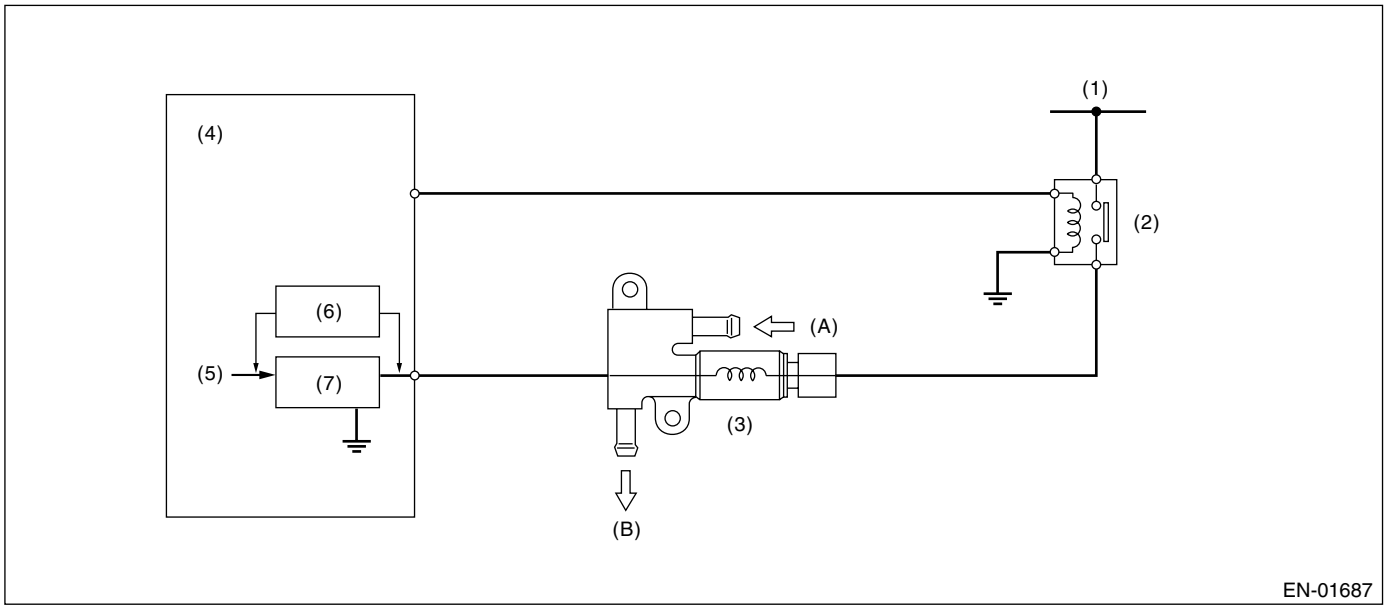
Memorize the freeze frame data. (For test mode $02)

H: DTC P0067 — AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of AAI solenoid valve. Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Battery
(2) Main relay
(3) AAI solenoid valve
(4) Engine control module (ECM)
(5) CPU
(6) Detecting circuit
(7) Switching circuit
(A) From idle air control solenoid valve
(B) To injector

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

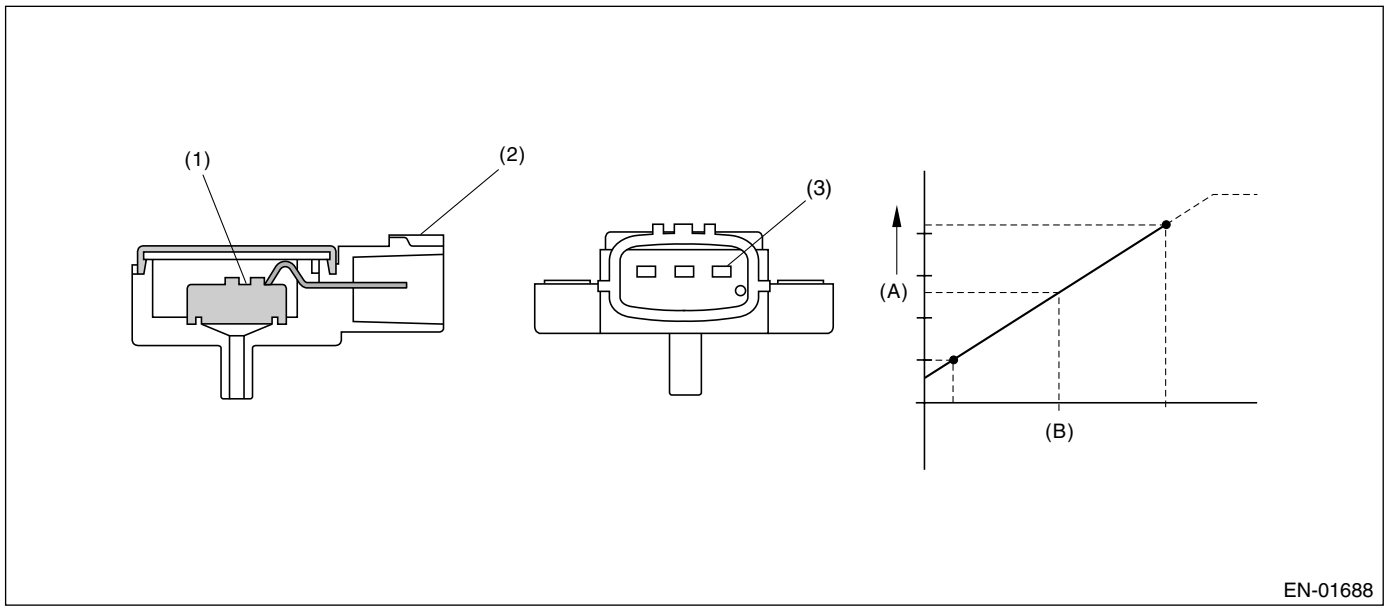
Memorize the freeze frame data. (For test mode $02)

I: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property.
Judge NG when the intake manifold pressure is small (voltage is low) regardless of the driving situation that the intake manifold pressure may be thought larger than engine speed and throttle opening. (Low side)
On the other hand, judge NG when the intake manifold pressure is large (voltage is high) regardless of the driving situation that the intake manifold pressure may be thought smaller than engine speed and throttle opening. (High side)

2. COMPONENT DESCRIPTION



(1) Pressure detecting part
(2) Connector
(3) Terminal
(A) Output voltage
(B) Input voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria of Low side or High side below becomes more than the time (3 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Engine speed	> 2500 rpm
Throttle position	> 15°
Output voltage	≤ 0.985 V
(High side)	
Engine speed	600 ←→ 900 rpm
Throttle position	≤ 2°
Output voltage	> 2.81 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria of Low side or High side are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Engine speed	> 2500 rpm
Throttle position	> 15°
Output voltage	> 0.985 V
(High side)	
Engine speed	600 ←→ 900 rpm
Throttle position	≤ 2°
Output voltage	≤ 2.81 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

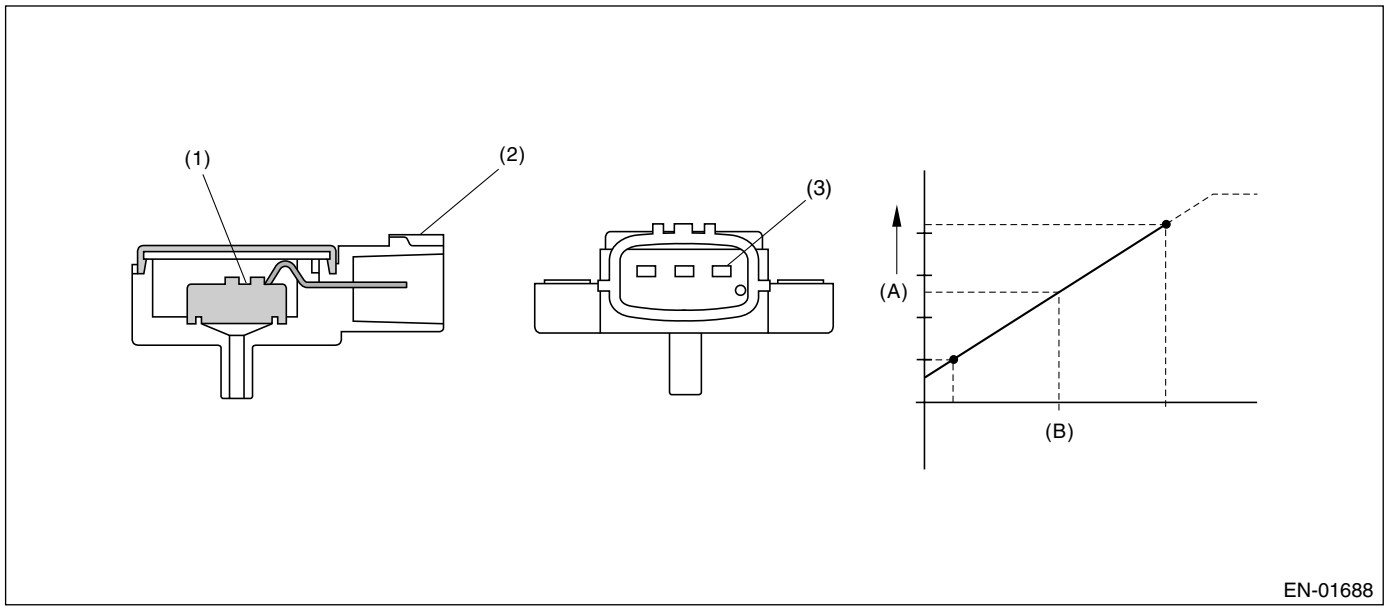
Memorize the freeze frame data. (For test mode $02)

J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Pressure detecting part
(2) Connector
(3) Terminal
(A) Output voltage
(B) Input voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.14 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHTCLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Calculate the manifold absolute pressure using the map figured by engine speed and throttle opening grid.

9. ECM OPERATION AT DTC SETTING

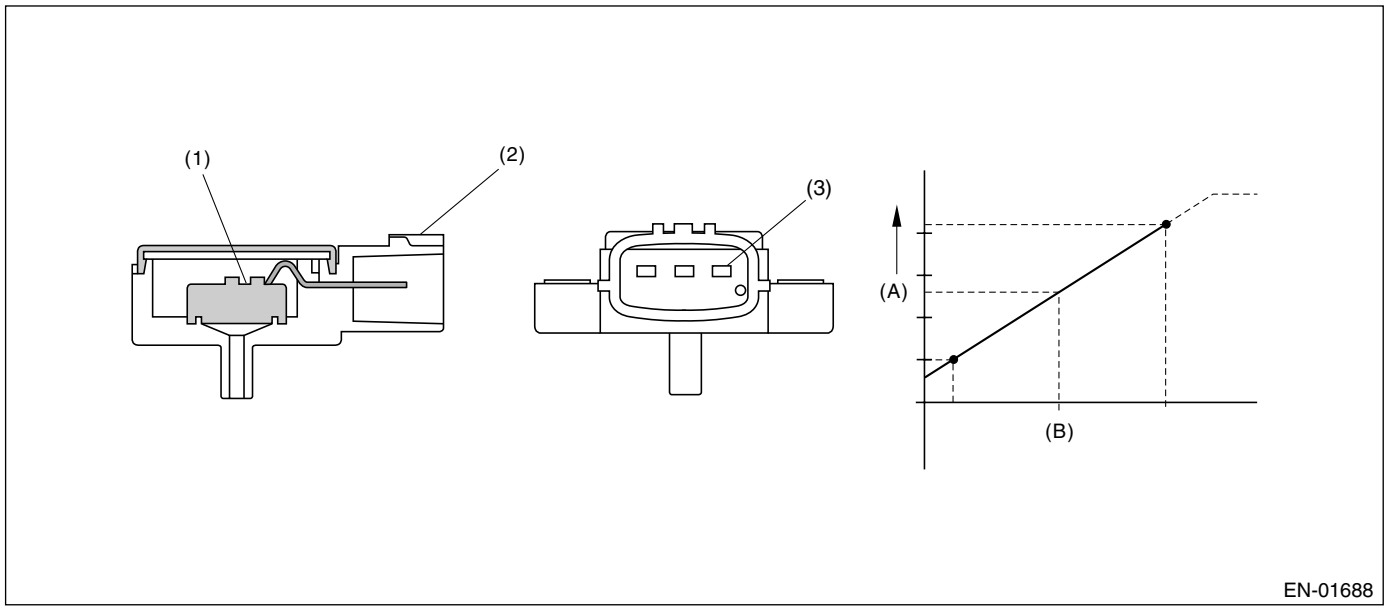
Memorize the freeze frame data. (For test mode $02)

K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Pressure detecting part
(2) Connector
(3) Terminal
(A) Output voltage
(B) Input voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.88 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Calculate the intake manifold pressure using the map figured by engine speed and throttle opening grid.

9. ECM OPERATION AT DTC SETTING

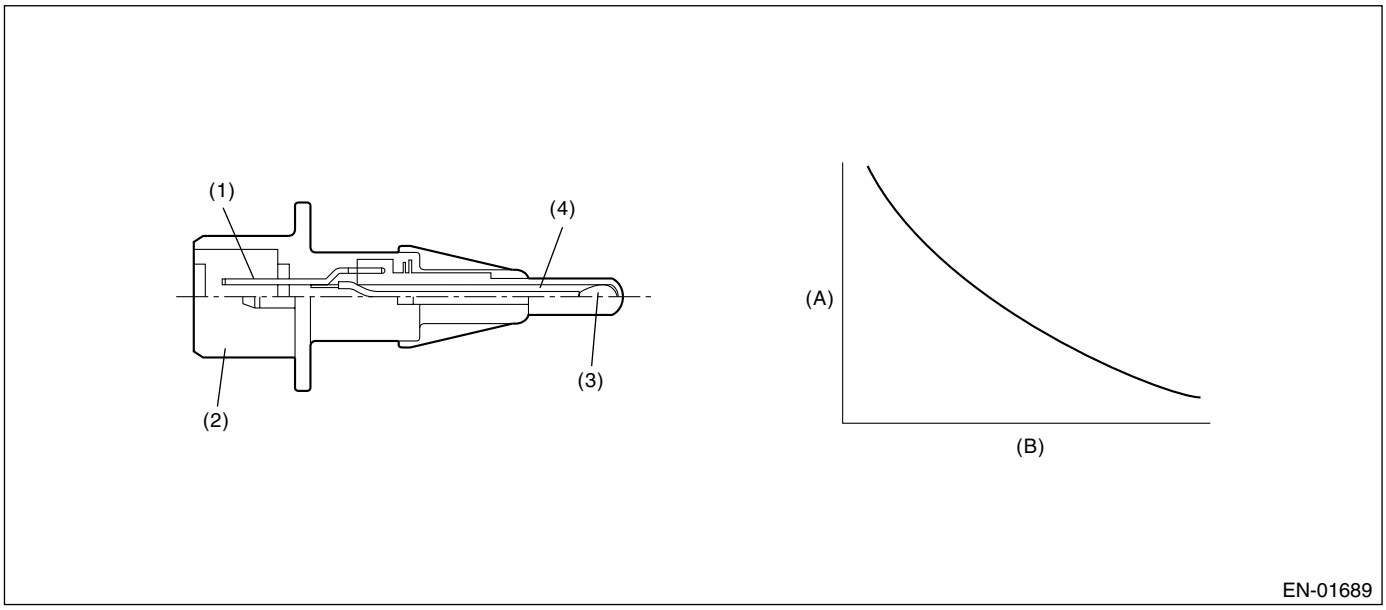
Memorize the freeze frame data. (For test mode $02)

L: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.
Judge NG when the intake air temperature is high regardless of the driving condition that the intake air temperature may be low.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance value (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all the malfunction criteria below becomes more than the time (3 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 40°C (104°F)
Fuel temperature	< 40°C (104°F)
Fuel level	10 ℓ (2.6 US gal, 2.2 Imp gal)
Intake air temperature	≥ 80°C (176°F)

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Intake air temperature	< 80°C (176°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the intake air temperature 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

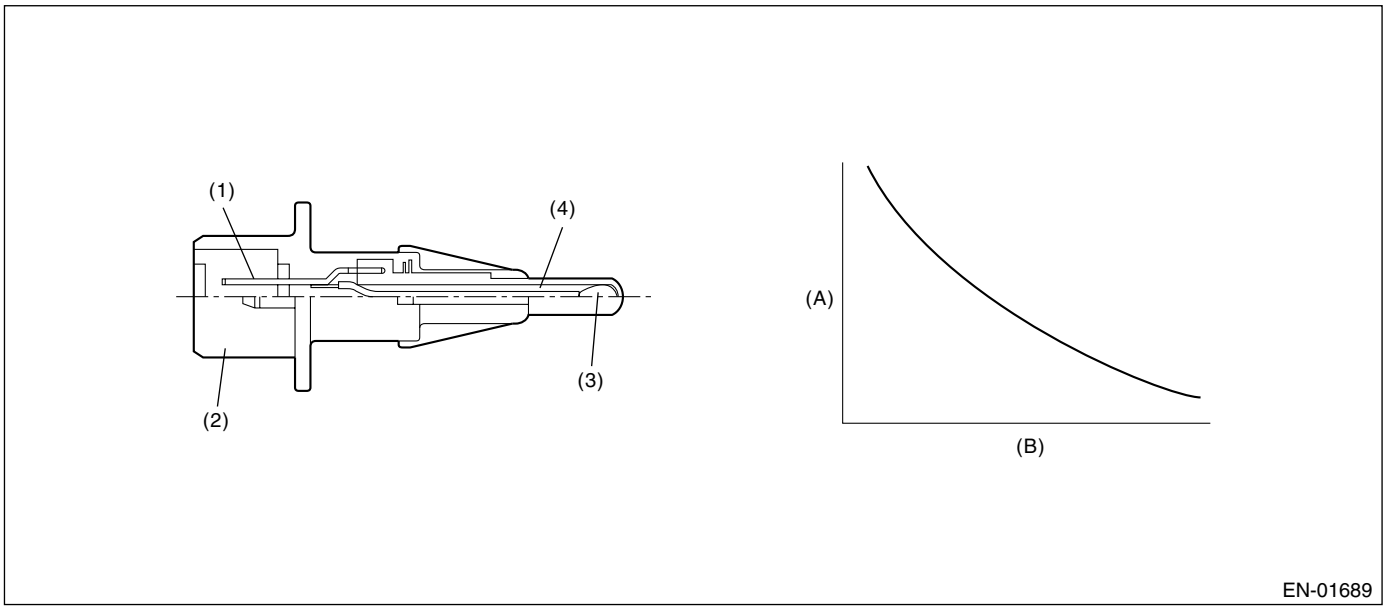
Memorize the freeze frame data. (For test mode $02)

M: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance value (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the intake air temperature 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

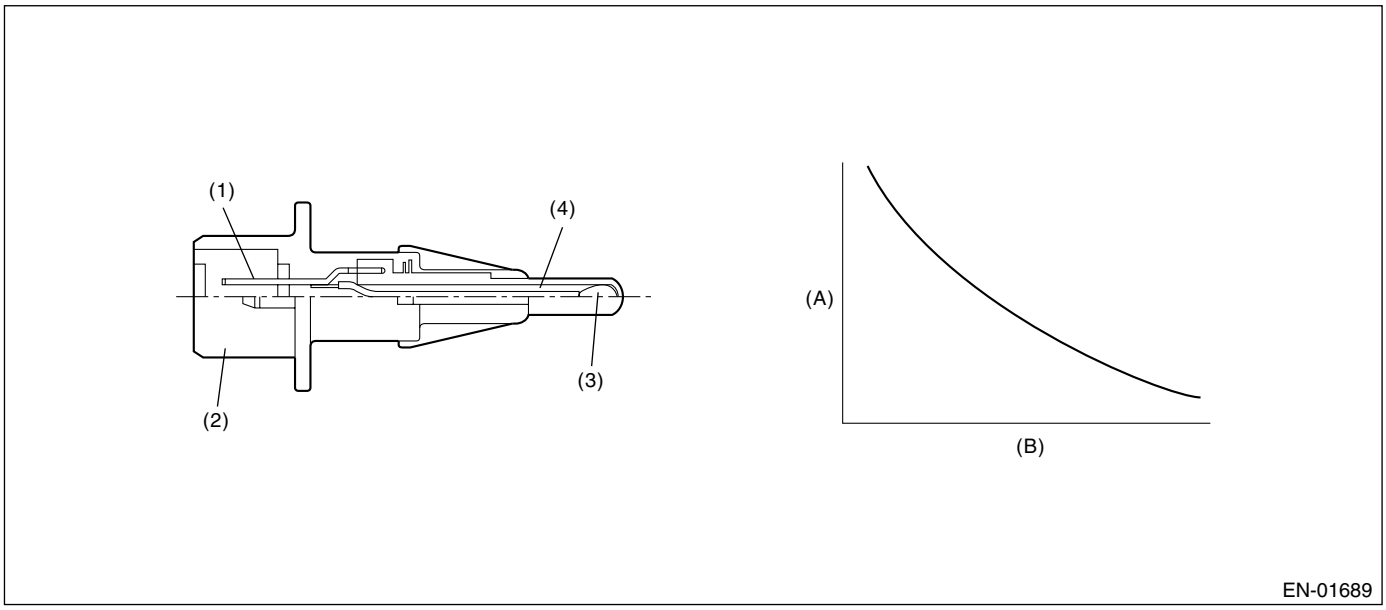
Memorize the freeze frame data. (For test mode $02)

N: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance value (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the intake air temperature 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

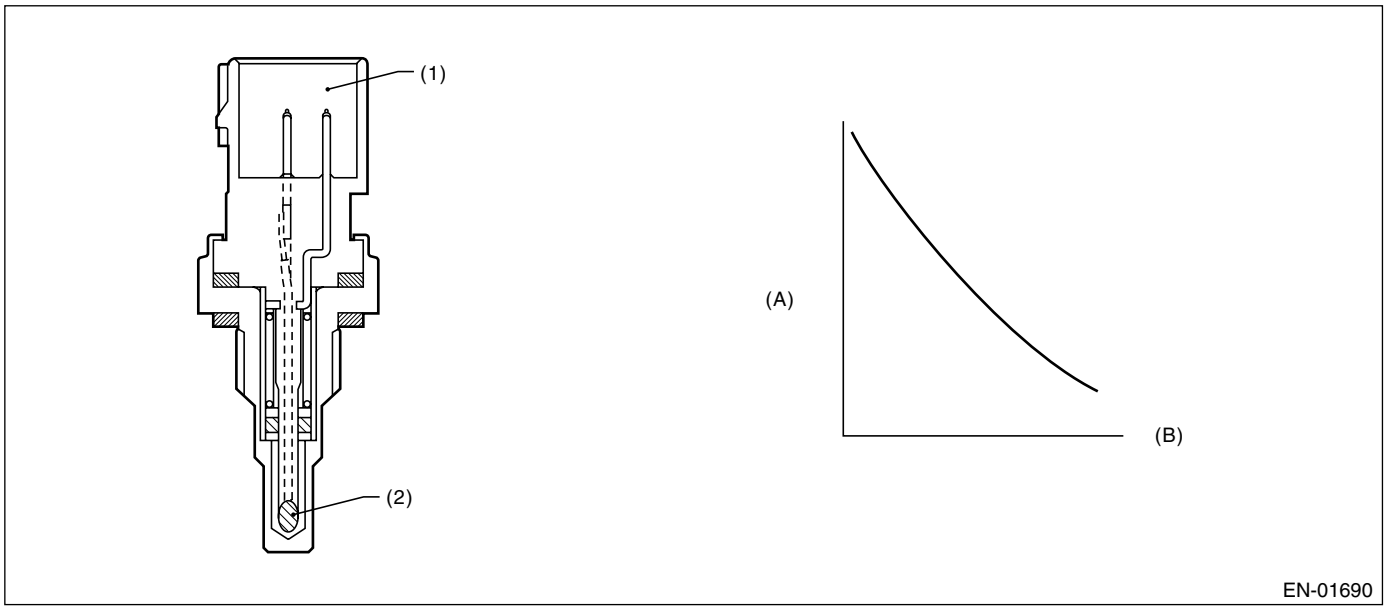
Memorize the freeze frame data. (For test mode $02)

O: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.2 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Keep the engine coolant temperature at 70°C (158°F).

9. ECM OPERATION AT DTC SETTING

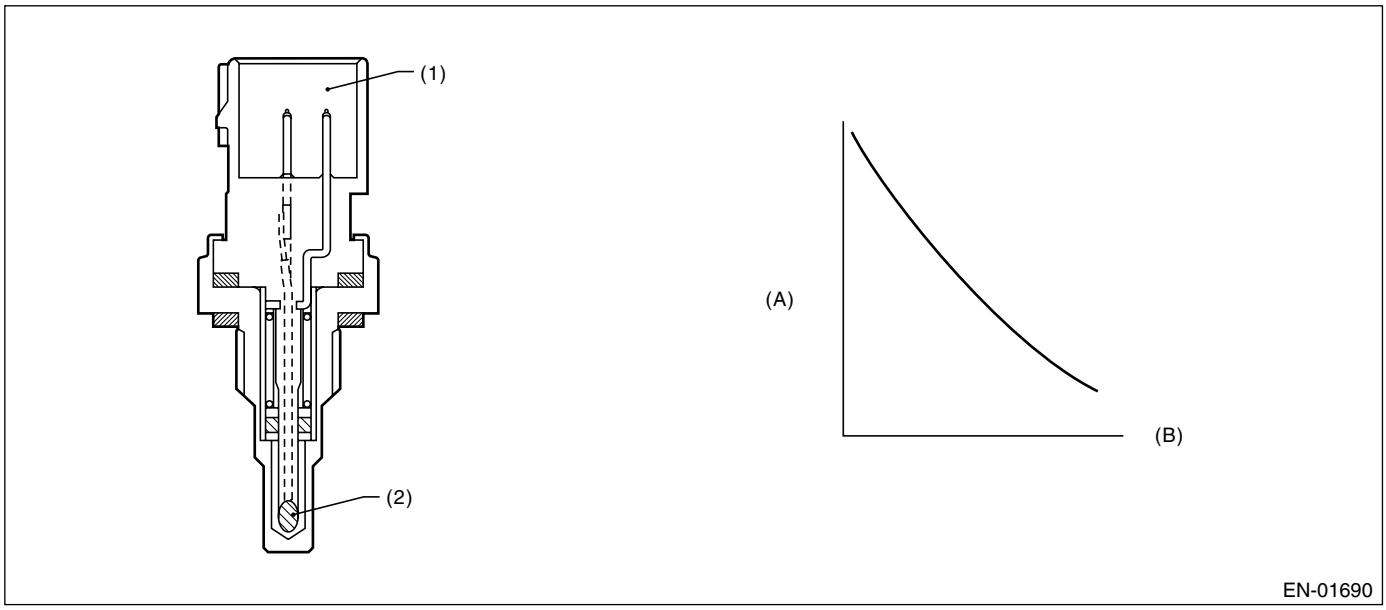
Memorize the freeze frame data. (For test mode $02)

P: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.2 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Keep the engine coolant temperature at 70°C (158°F).

9. ECM OPERATION AT DTC SETTING

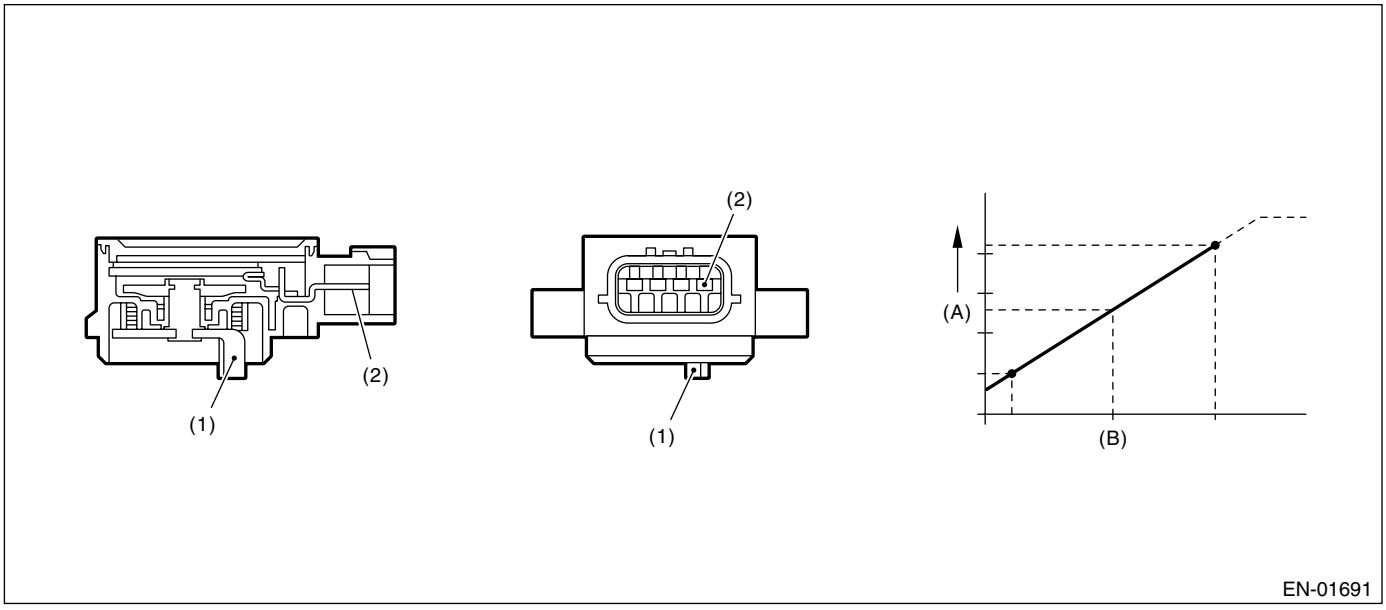
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of throttle position sensor output property.
Judge NG when the throttle position value is low in spite of the driving condition that accelerator pedal seems to be depressed, or when the throttle position value is high in spite of the driving condition that accelerator pedal seems to be released from engine appearance.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously after starting engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria of Low side or High side below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Output voltage	≤ 0.75 V
Engine speed	≥ 1000 rpm
Amount of intake air	≥ 90 kg (198 lb)/h
Intake manifold pressure	≥ 80 kPa (600 mmHg, 24 inHg)
(High side)	
Output voltage	≥ 1.6 V
Engine speed	600 — 1500 rpm
Amount of intake air	≤ 25 kg (55 lb)/h
Intake manifold pressure	≤ 47 kPa (352 mmHg, 14 inHg)

• Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Output voltage	> 0.75 V
Engine speed	≥ 1000 rpm
Amount of intake air	≥ 90 kg (198 lb)/h
Intake manifold pressure	≥ 80 kPa (600 mmHg, 24 inHg)
(High side)	
Output voltage	≤ 1.6 V
Engine speed	600 — 1500 rpm
Amount of intake air	≤ 25 kg (55 lb)/h
Intake manifold pressure	≤ 47 kPa (352 mmHg, 14 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle position to 6.4°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

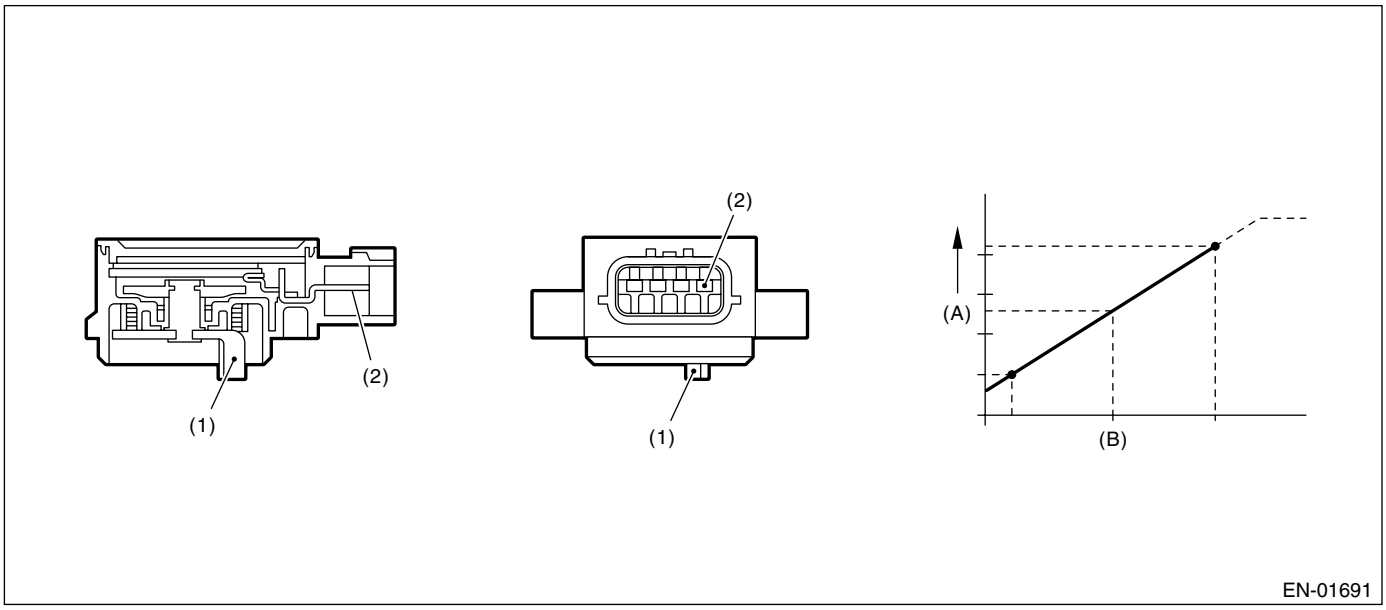
MEMO:

R: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage — closed	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle position to 6.4°.

9. ECM OPERATION AT DTC SETTING

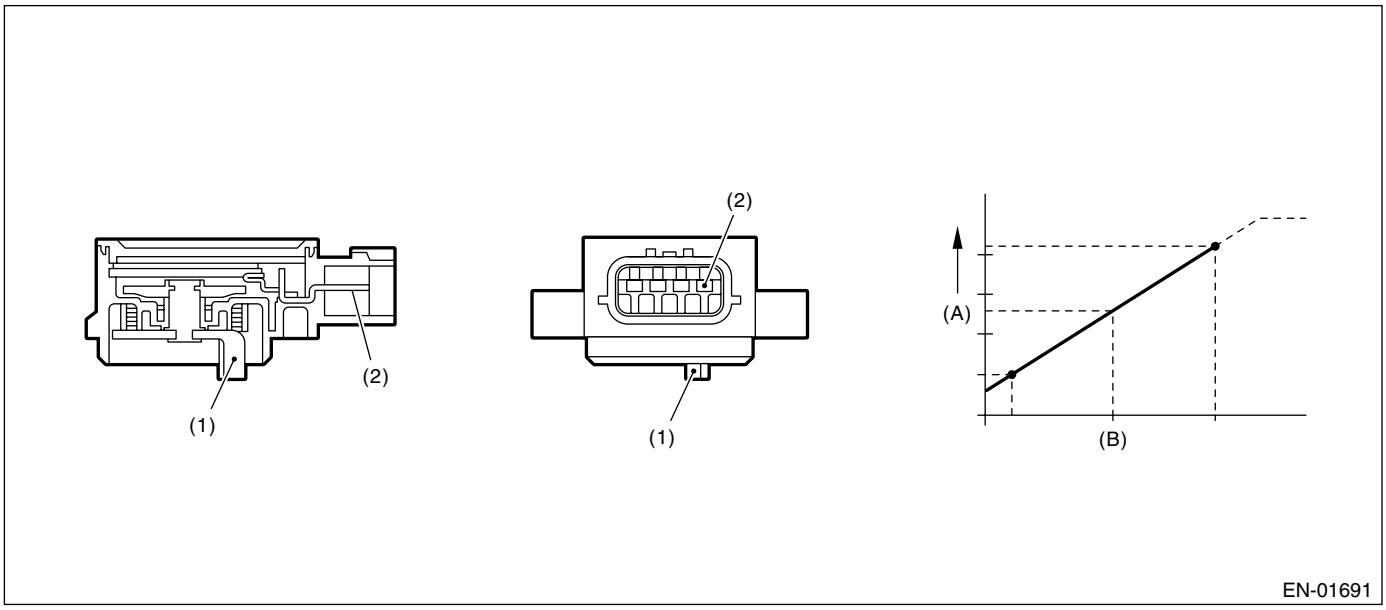
Memorize the freeze frame data. (For test mode $02)

S: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage — WOT	≥ 4.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle position to 6.4°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

T: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature sensor output property. Judge NG when the engine coolant temperature does not increase after engine starting in spite of the driving condition that it seems to increase.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVE CYCLE

Always perform the diagnosis until the engine coolant temperature becomes 20°C (68°F) after starting engine with cooled condition or until NG is judged once.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the engine coolant temperature is more than 20°C (68°F) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.38 V
Timer after starting the engine except fuel cut a) Timer OFF of fuel cut mode. b) The timer is counted more than 50ms + TWCNT milliseconds per 50 milliseconds under driving condition without above. TWCNT is determined as following. • Idle switch ON: TWCNT = 0 • Idle switch OFF: Refer to Map 1	≥ Judgment time

Map 1

	Vehicle speed 10 km/h (6 MPH)	Vehicle speed 24 km/h (15 MPH)	Vehicle speed 40 km/h (25 MPH)	Vehicle speed 56 km/h (35 MPH)
Temperature –20°C (–4°F)	0 ms	5 ms	10 ms	20 ms
Temperature –7°C (19°F)	0 ms	30 ms	60 ms	60 ms
Temperature 10°C (50°F)	0 ms	90 ms	180 ms	180 ms
Temperature 20°C (68°F)	0 ms	90 ms	180 ms	180 ms

Judgment time: Find from minimum engine coolant temperature.

Minimum engine coolant temperature °C (°F)	–30 (–22)	0 (32)	30 (86)	60 (140)	64.25 (147.65)
Judgment time (second)	630.05	429.5	228.95	28.4	0

Time Needed for Diagnosis: Change at minimum engine coolant temperature.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Keep engine coolant temperature at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

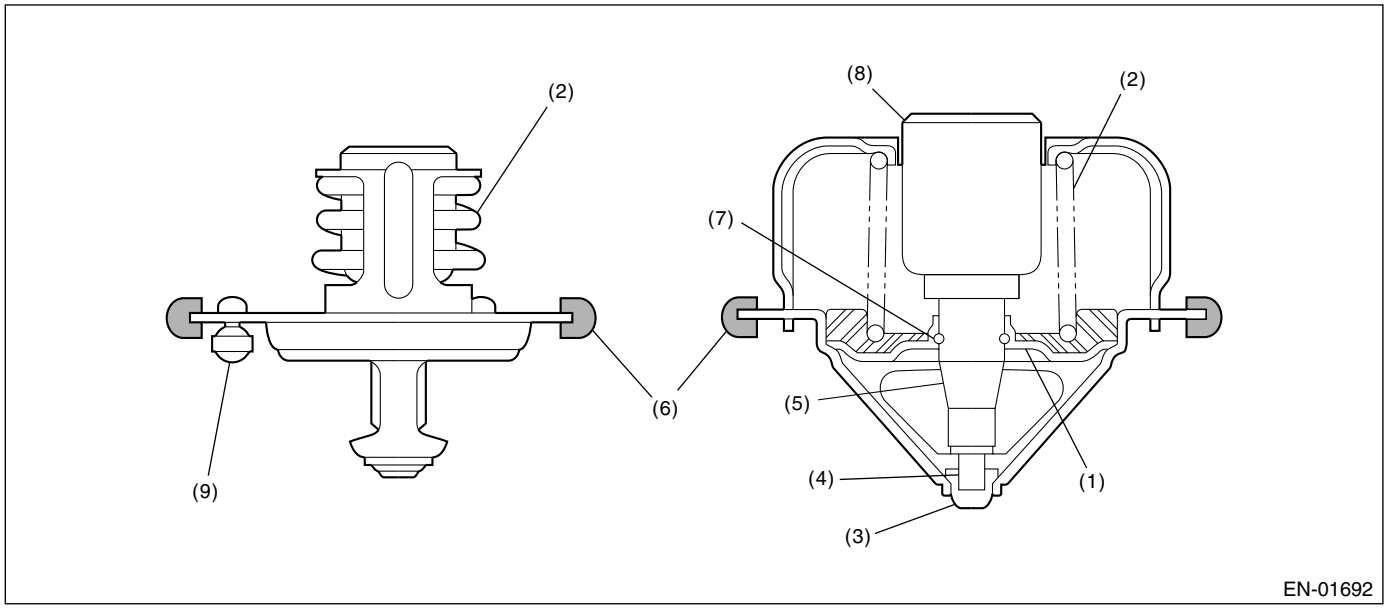
Memorize the freeze frame data. (For test mode $02)

U: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat.
Thermostat open fixing may result in overcooling. Therefore, engine coolant temperature becomes low and the control is unable under theoretical air fuel ratio, so the exhaust deteriorate. Furthermore, it is impossible to perform the other diagnosis if the engine coolant temperature does not rise. For these reasons, thermostat open fixing diagnosis should be conducted.
Judge NG when the estimated engine coolant temperature is higher than engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ambient air temperature	≥ –7°C (19°F)
Engine coolant temperature at engine starting	< 55°C (131°F)

4. GENERAL DRIVING CYCLE

After starting the engine at cool condition, always perform the diagnosis until the engine coolant temperature becomes more than 75°C (167°F).

5. DIAGNOSTIC METHOD

Judge NG when the estimated engine coolant temperature comes to 75°C (167°F) before the engine coolant temperature becomes 75°C (167°F) and the difference between them becomes more than 30°C (86°F). Judge OK when the engine coolant temperature comes to 75°C (167°F) before judging NG.

• Abnormality Judgment

Judge NG when the cumulative time becomes more than 30 seconds after completing all the malfunction criteria below.

• Judgment Value

Malfunction Criteria	Threshold Value
(Estimated-measured) coolant temperature	> 30°C (86°F)
Engine coolant temperature	< 75°C (167°F)
Estimated coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 40 km/h (25 MPH)
Injector pulse	≥ 1.92 milliseconds

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
(Estimated-measured) coolant temperature	≤ 30°C (86°F)
Engine coolant temperature	≥ 75°C (167°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

V: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property.
Intake manifold pressure and atmospheric pressure are the same from turning the IG key to ON to turning the start SW to ON. Therefore, compare the pressure from intake manifold pressure and atmospheric pressure sensors, and then judge NG when their difference is large.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Neutral switch	ON
Engine speed	< 500 rpm
Vehicle speed	< 2 km/h (1 MPH)
(Max-min) manifold absolute pressure output	< 1.2 kPa (9 mmHg, 0.4 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once from the IG key turned to ON to the start SW turned to ON.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.2 seconds) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
| Atmospheric-manifold absolute pressure |	≥ 27 kPa (200 mmHg, 8 inHg)

Time Needed for Diagnosis: 0.2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the atmospheric pressure 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

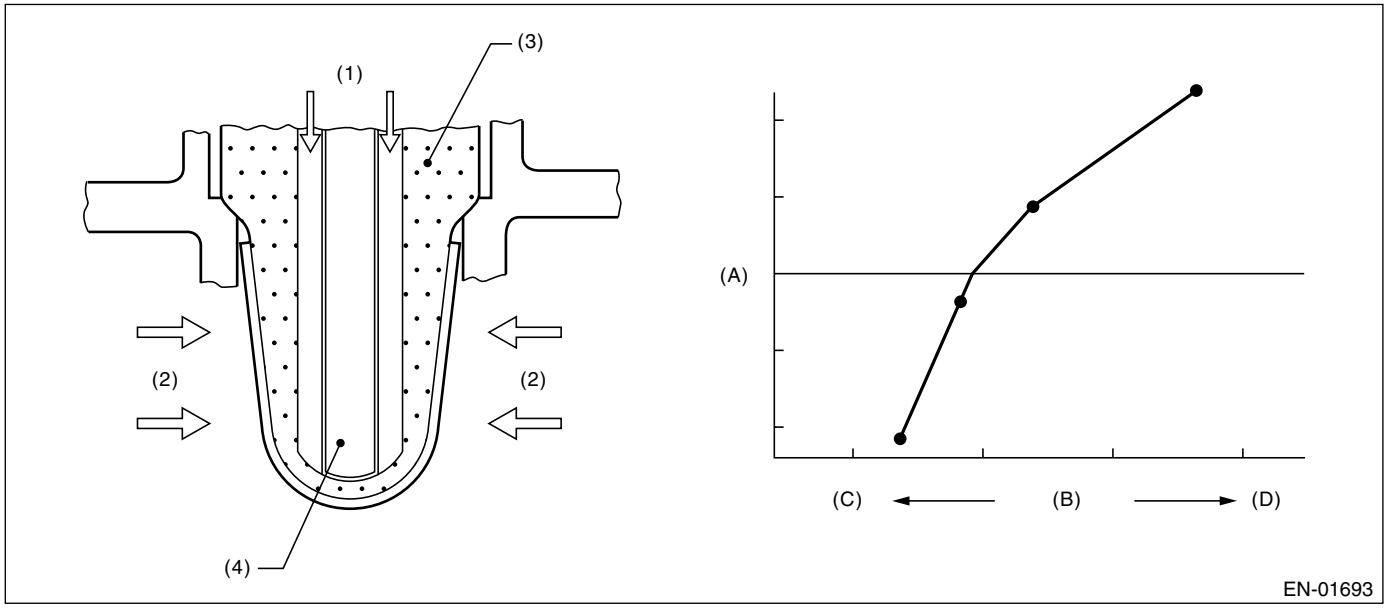
MEMO:

W: DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor output property.
Judge NG when the front oxygen (A/F) sensor output continues to be lean.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control	In operation
Fuel shut-off event	Not in operation
Misfire rate during 200 engine revs.	≤ 1.0%
After engine starting	230 seconds or more
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 230 seconds after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis

• Judgment Value

Malfunction Criteria	Threshold Value
A/F sensor output (VAF) Lambda fudge factor (LAMBDA)	> 2.3 V (lean) = Rich clamp at MAX limiter (1.375)

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis

• Judgment Value

Malfunction Criteria	Threshold Value
A/F sensor output (VAF)	≤ 2.3 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

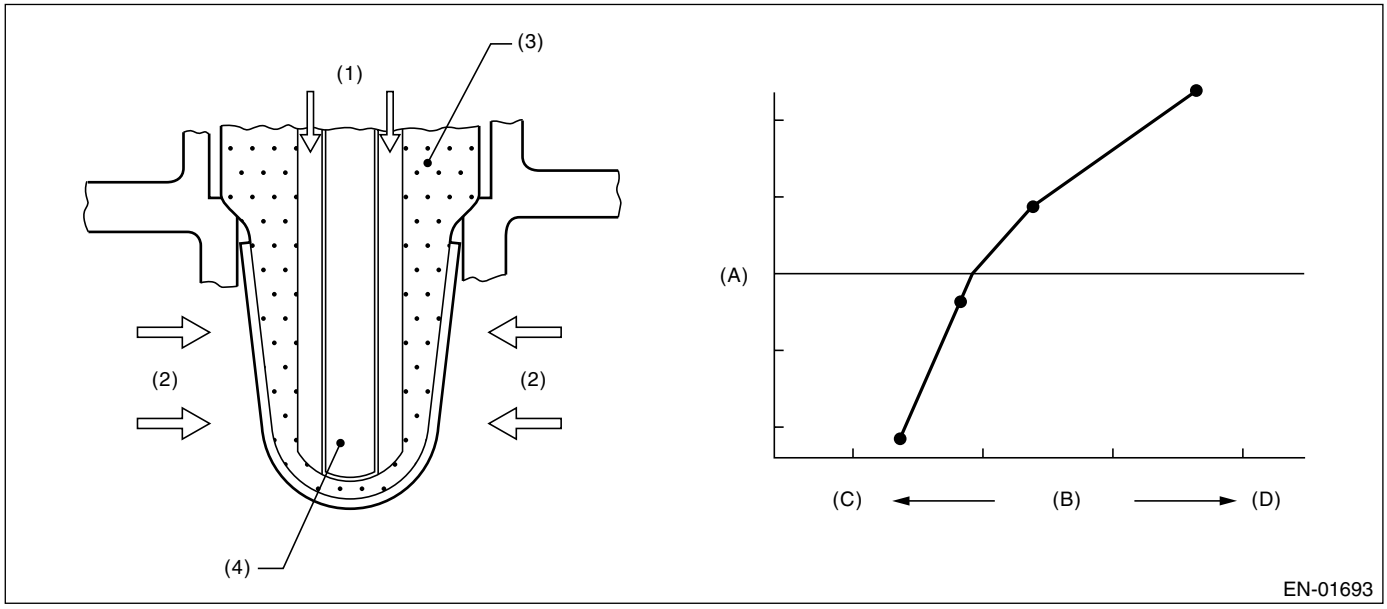
Memorize the freeze frame data. (For test mode $02)

X: DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the low voltage short circuit of front oxygen (A/F) sensor.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of low voltage short circuit NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open circuit, low voltage short circuit or high voltage short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
AFC voltage	< 3.5 V
AFV voltage	< 2.5 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

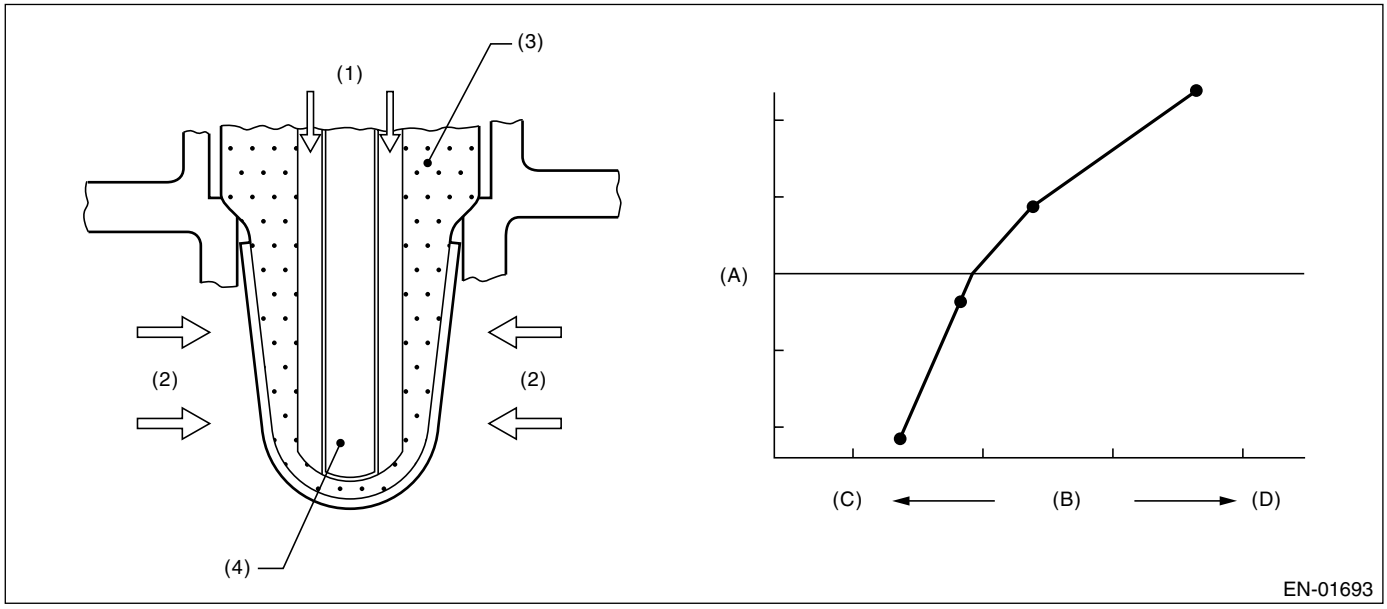
Memorize the freeze frame data. (For test mode $02)

Y: DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the high voltage short circuit of front oxygen (A/F) sensor.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of high voltage short circuit NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open circuit, low voltage short circuit or high voltage short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
AFC voltage	> 4.5 V
AFV voltage	> 5.0 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

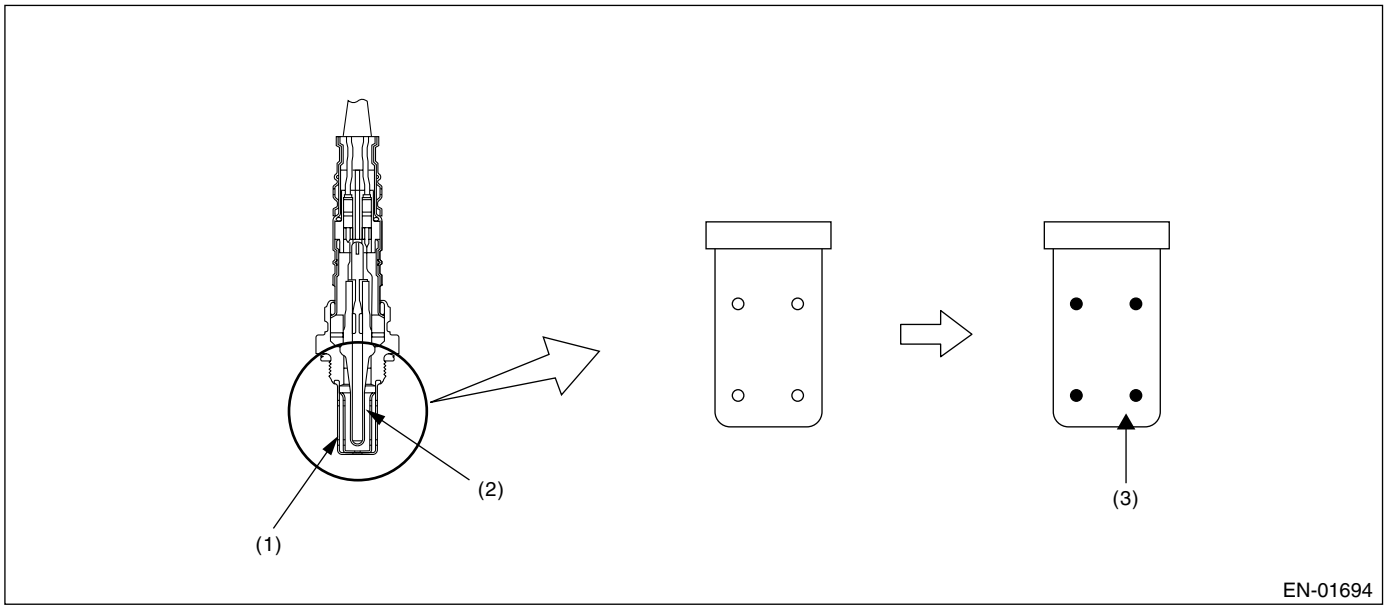
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

Z: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

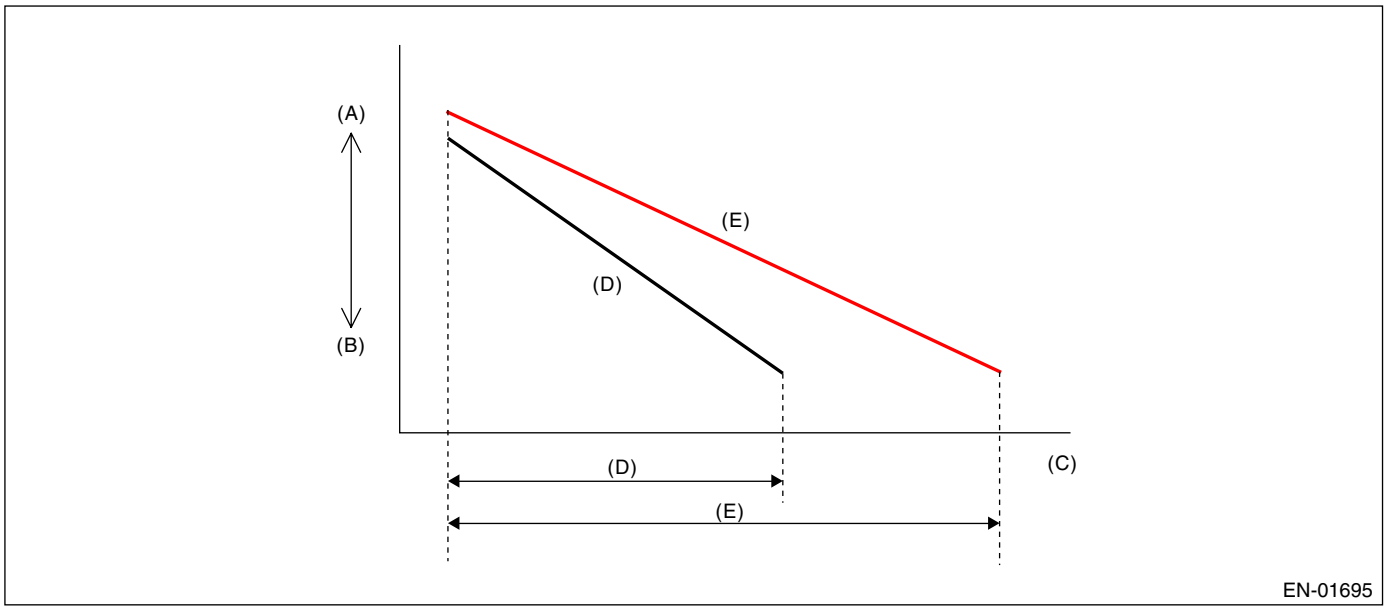
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.
Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.
When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



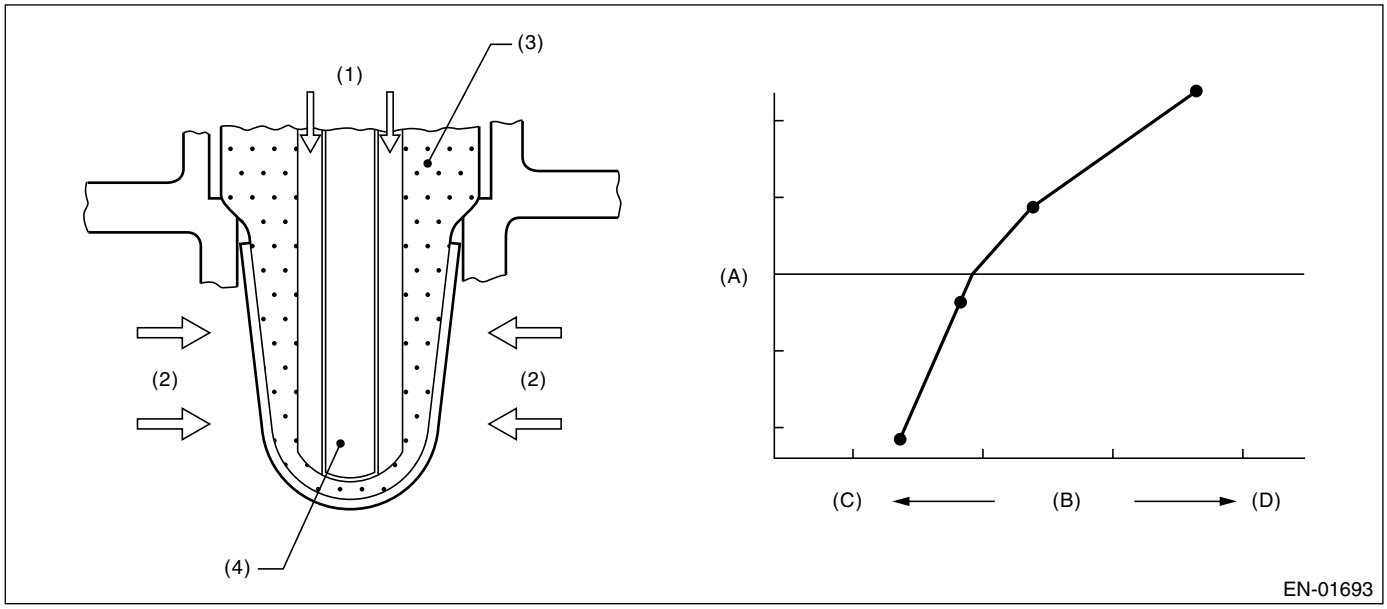
(1) Cover (2) Zirconia (3) Clogging

When abnormal, the variation period from rich to lean is longer than when normal, as shown in the figure below.
When the condition is completed, the variation time from rich to lean and vice versa is calculated by varying the desired A/F value. Judge NG when the period is long.



(A) Rich
(B) Lean
(C) Time
(D) Normal
(E) Malfunction

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Closed loop control	In operation
Average lambda	0.703 ←→ 1.375
After starting the engine	225 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Injector pulse	1.792 ←→ 4.032 milliseconds
Engine speed	1800 ←→ 3000 rpm
Vehicle speed	≥ 76 km/h (47 MPH)
Atmospheric air pressure	≥ 76 kPa (568 mmHg, 22 inHg)
Throttle position change for 90 milliseconds	< 1.60°
Impedance of lambda sensor	10 ←→ 40 Ω
Misfire rate at engine 200 rev.	≤ 1.0%

4. GENERAL DRIVING CYCLE

Perform diagnosis constantly at greater than 76 km/h (47 MPH) just once in 225 seconds after starting the engine.

5. DIAGNOSTIC METHOD

When enable conditions are completed, measure the A/F sensor output A/F value variation period by changing air fuel ratio desired value to lean and rich. Judge NG when this period is long. Judge OK when this period is short.
Judge NG when the malfunction criteria below is completed. Judge OK when the malfunction criteria below is not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Average time of 5 changes from rich to lean, and from lean to rich Response time when noise is detected is not used as data.	> See Map 5

Map 5

Engine Speed (Ne) (rpm)	1.75 — 2.25 (milliseconds)	2.25 — 2.75 (milliseconds)	2.75 — 3.19 (milliseconds)	3.19 — (milliseconds)
1800 ≤ Ne < 2100	1828	1825	1828	1828
2100 ≤ Ne < 2500	1167	976	976	911
2500 ≤ Ne < 3000	1095	976	976	911
3000 ≤ Ne	1095	872	825	825

Time Needed for Diagnosis: 2 to 12 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

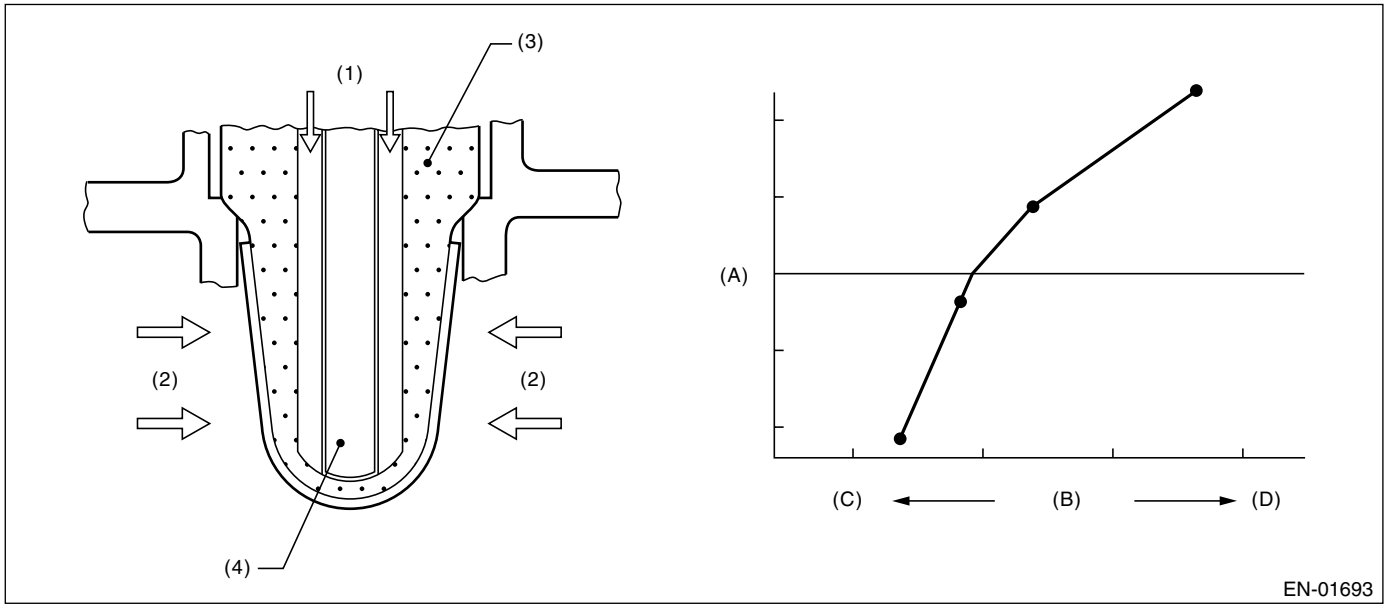
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AA: DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of front oxygen (A/F) sensor.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of open circuit NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open circuit, low voltage short circuit or high voltage short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than the time (5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Heater control	In operation
Resistance of front oxygen (A/F) sensor	> 500 Ω

Time Needed for diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

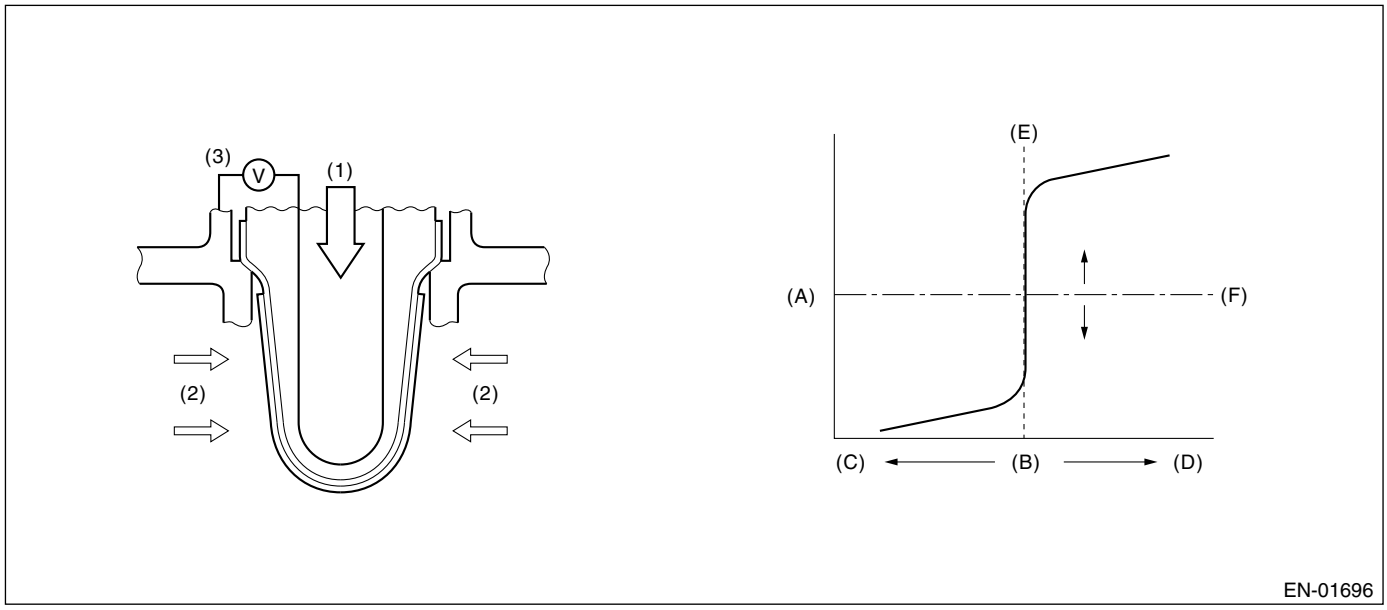
Memorize the freeze frame data. (For test mode $02)

AB:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control	In operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once during the closed loop.

5. DIAGNOSTIC METHOD

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage	< 490 mV
Coolant temperature	≥ 75°C (167°F)
Injector pulse	≥ 2.24 milliseconds
Engine speed	≥ 1500 rpm
2 seconds or more fuel shut-off in decel.	Experienced
Vehicle speed	≥ 32 km/h (20 MPH)
Engine misfire	None

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
maximum output voltage	≥ 490 mV

6. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

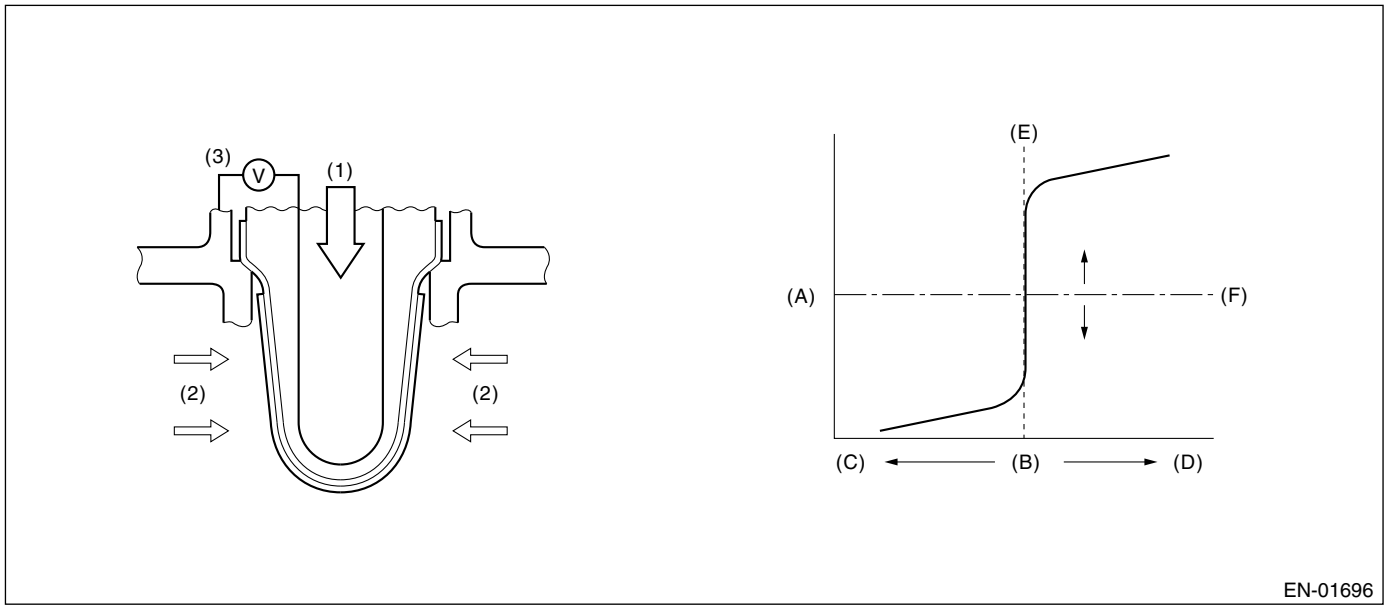
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AC:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control	In operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once during the closed loop.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing all the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	> 250 mV
Coolant temperature	≥ 75°C (167°F)
Injector pulse	≥ 2.24 milliseconds
Engine speed	≥ 1500 rpm
2 seconds or more fuel shut-off in decel.	Experienced
Vehicle speed	≥ 32 km/h (20 MPH)
Engine misfire	None

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

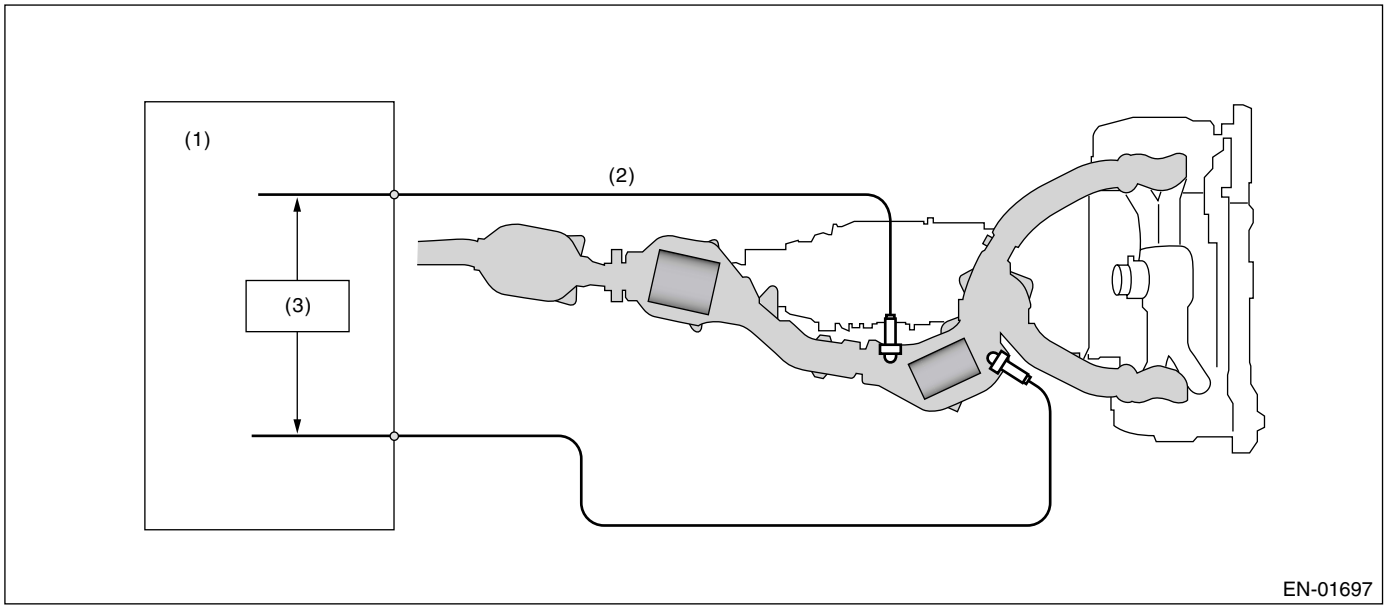
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AD:DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

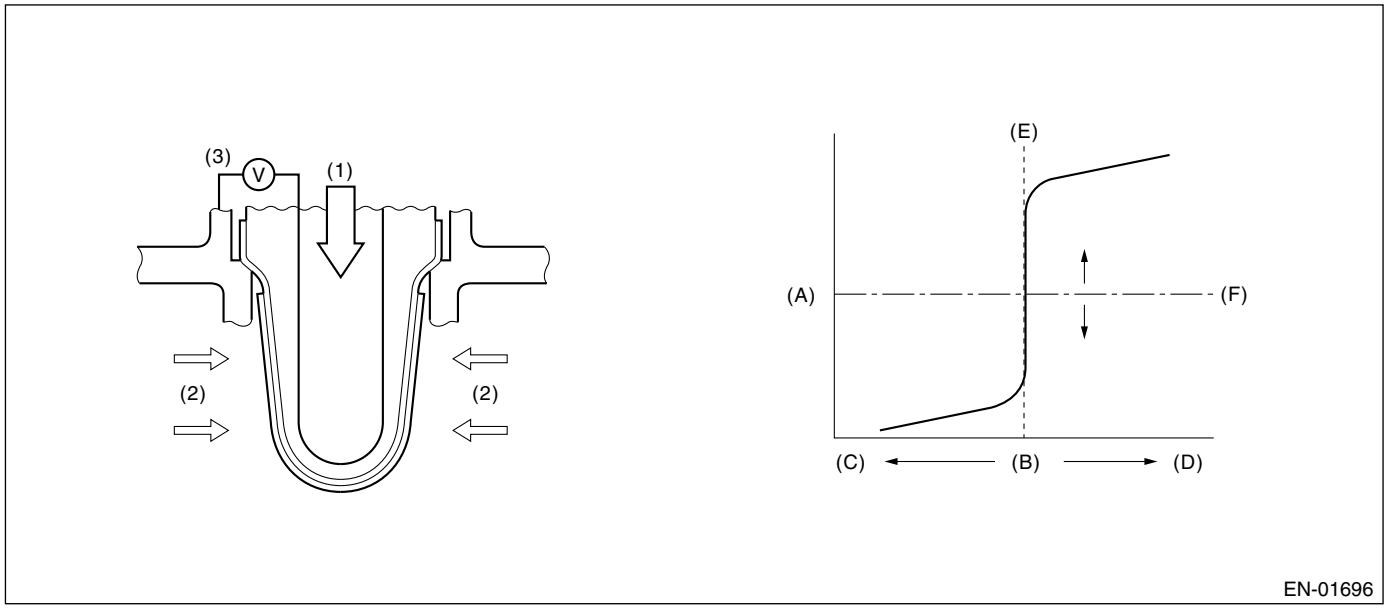
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.
Calculate the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And carry out the diagnosis comparing the calculated response time with the threshold value.



(1) Engine control module (ECM)
(2) Rear oxygen sensor
(3) Diagnosis circuit

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control with rear oxygen sensor	In operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once during fuel cut at deceleration from the rapid acceleration. (Pay attention to oxygen sensor voltage when deciding the deceleration timing to calculate the diagnostic value.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.15 V (lean), carry out calculation regarding the response time of the output change from 0.45 V to 0.2 V as diagnostic value. When the rear oxygen sensor output voltage does not change from 0.5 V to 0.15 V, do not carry out calculation even if the output changes from 0.45 V to 0.2 V.

• Abnormality Judgment

Judge NG when the rear oxygen sensor output change response time (diagnostic value) exceeds the threshold value.
Response time > 2 seconds (threshold value) → Abnormal
Judge NG when all of the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (450 mV oxygen output) to lean (200 mV) if voltage reduces from 500 mV to 150 mV	≥ 0.53 seconds
2 seconds or more fuel shut-off in decel.	Experienced
After fuel shut-off	2 seconds or more

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

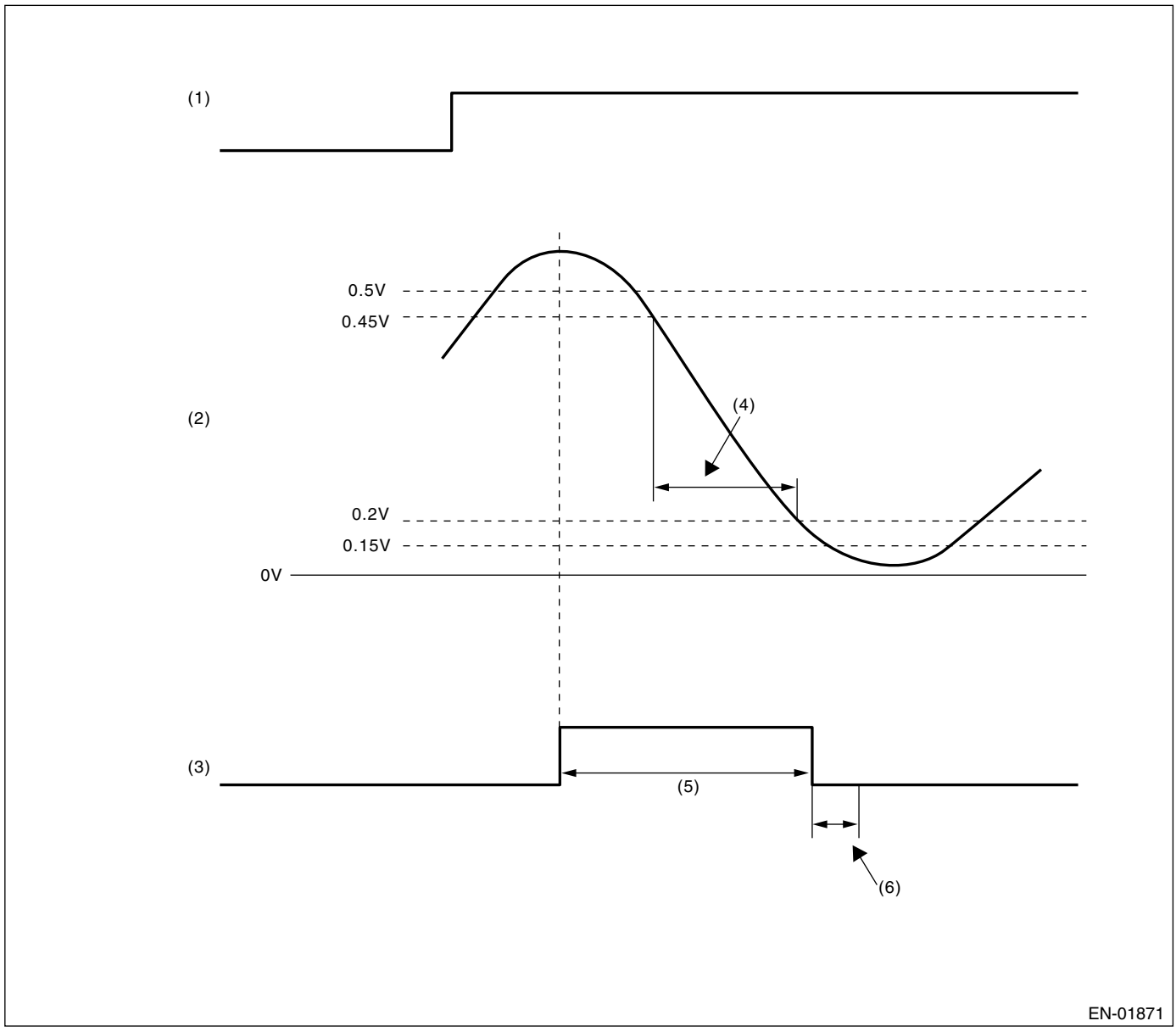
• Normality Judgment

Judge OK when the rear oxygen sensor output change response time (diagnostic value) is below the threshold value.
Response time ≤ 2 seconds (threshold value) → Normal
Judge NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change	≤ 0.53 seconds

NOTE:
Response time is calculated during the deceleration fuel cut in case of abnormal judgment. However, in order to make a normal judgment quickly, diagnosis is performed without deceleration fuel cut.



(1) Diagnosis execution condition
(2) Rear oxygen sensor (V)
(3) Fuel cut on deceleration
(4) Measure the response time
(5) More than 2 seconds
(6) Execute the malfunction judgment in 2 seconds from the recovery of fuel cut on deceleration.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

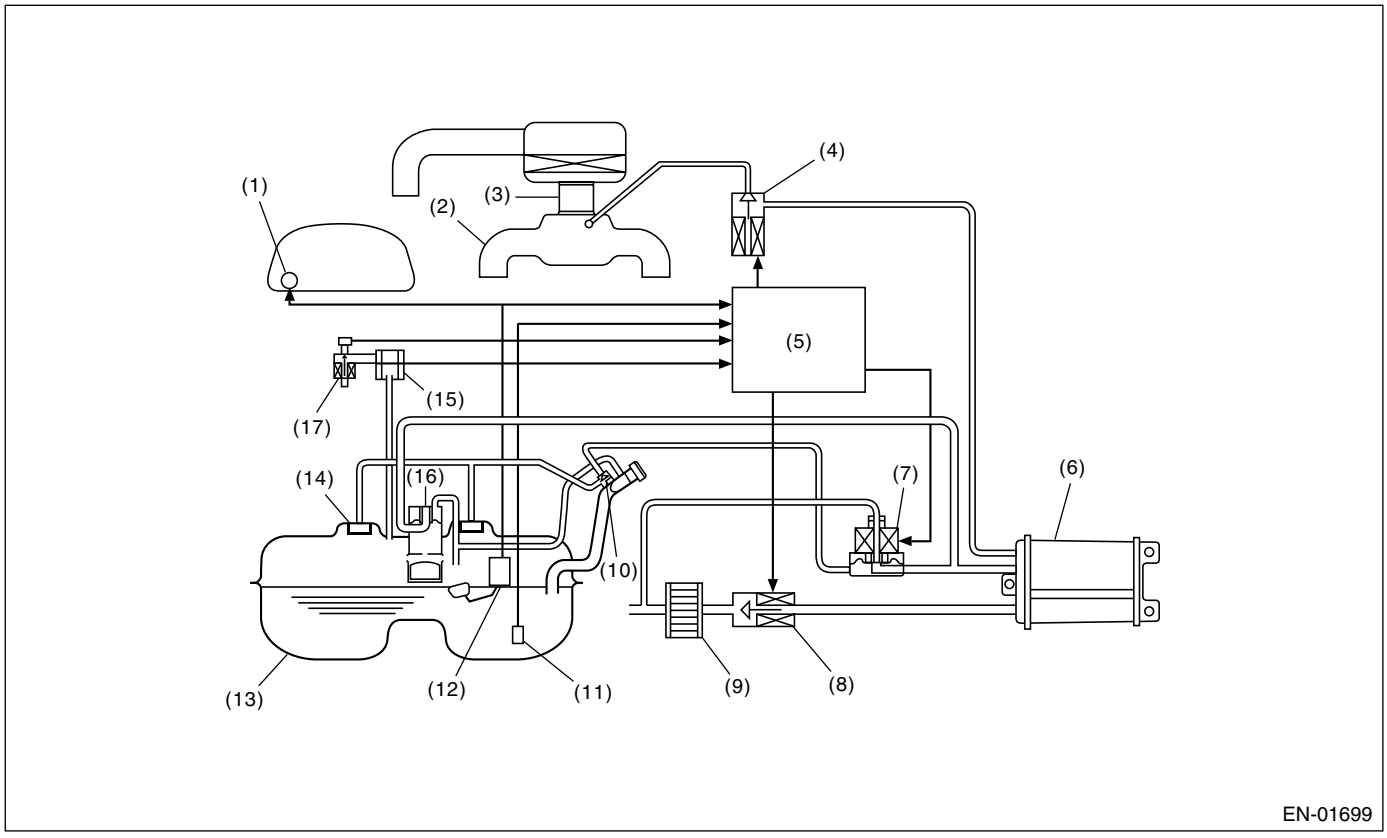
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system by the amount of main feedback control.



(1) Fuel meter
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) Drain valve
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve
(17) Tank pressure switching solenoid valve

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel learning system	In operation
Engine coolant temperature	75 ←→ 110°C (167 ←→ 230°F)
Intake manifold pressure change during 50 msecs	≤ 1.95 kPa (14.6 mmHg, 0.575 inHg)
Learning value of EVAP conc. during purge	≤ 1.0
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	10 seconds or more
Intake air pressure	≥ Map 3

Map 3

Engine speed (rpm)	idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Pressure kPa (mmHg, inHg)	ha	24.0 (180, 7.09)	27.2 (204, 8.03)	27.2 (204, 8.03)	28.3 (212, 8.35)	29.9 (224, 8.82)	32.5 (244, 9.61)	34.1 (256, 10.08)	34.1 (256, 10.08)	33.1 (248, 9.76)	33.1 (248, 9.76)

3. GENERAL DRIVING CYCLE

Perform the serial diagnoses with idling or a constant vehicle speed after engine starting.

4. DIAGNOSTIC METHOD

Judge that the malfunction occurred in fuel system when the malfunction criteria are completed for 50 seconds or more by comparing the diagnostic value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc aflmd = measured lambda lambda = short term fuel trim kblrc = long term fuel trim	≥ fsobdL1 See Map 2 fsobdL1 = lean side threshold value of fsobd

Map 2: Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 5 times
Malfunction Indicator Light Illumination: 2 continuous driving cycles.
Judge OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When diagnosed OK with the similar driving for 3 driving cycles in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

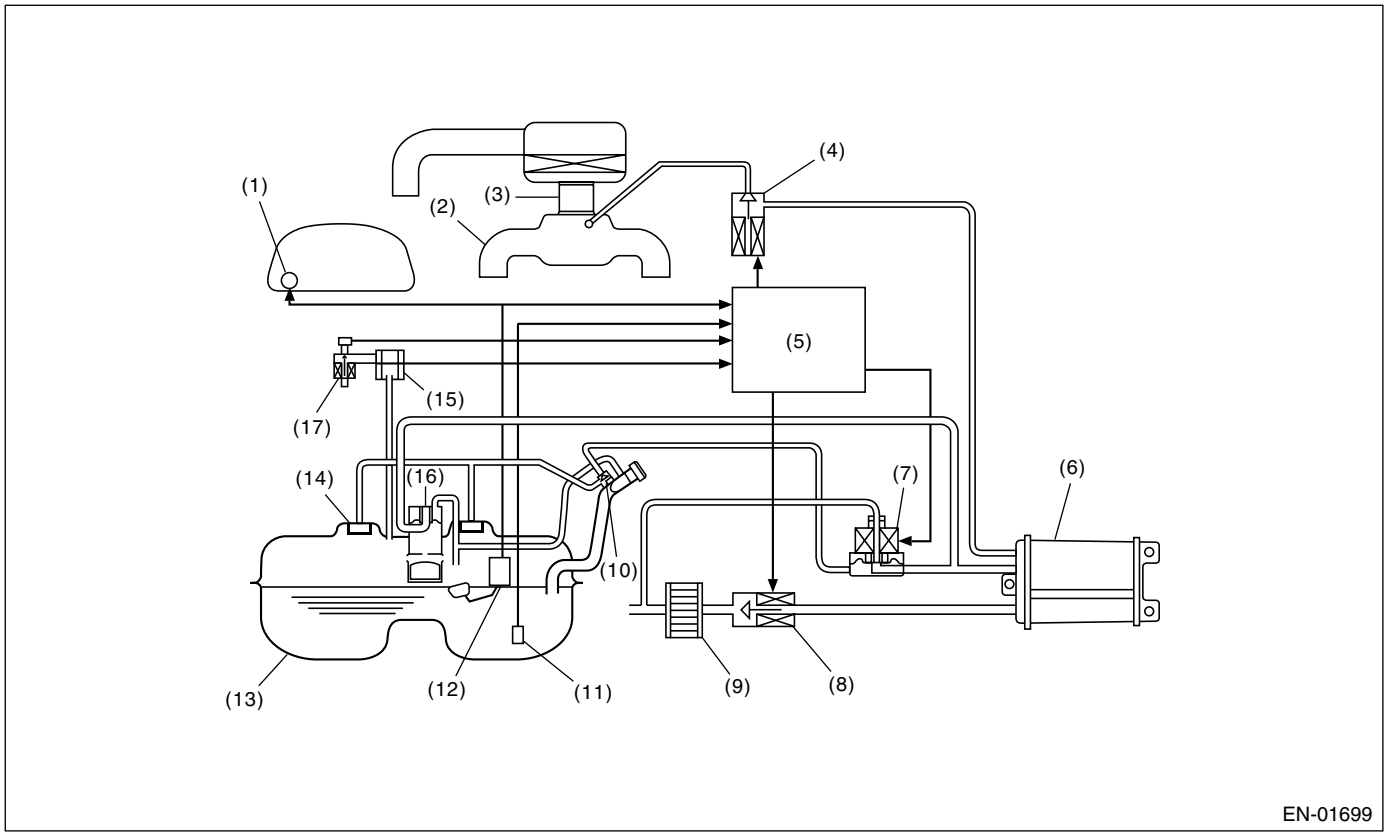
8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system by the amount of main feedback control.



(1) Fuel meter
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) Drain valve
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve
(17) Tank pressure switching solenoid valve

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel learning system	In operation
Engine coolant temperature	75 ←→ 110°C (167 ←→ 230°F)
Intake manifold pressure change during 50 msecs	≤ 1.95 kPa (14.6 mmHg, 0.575 inHg)
Learning value of EVAP conc. during purge	≤ 1.0
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	10 seconds or more

Map 3

Engine speed (rpm)	idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Pressure kPa (mmHg, inHg)	ha	24.0 (180, 7.09)	27.2 (204, 8.03)	27.2 (204, 8.03)	28.3 (212, 8.35)	29.9 (224, 8.82)	32.5 (244, 9.61)	34.1 (256, 10.08)	34.1 (256, 10.08)	33.1 (248, 9.76)	33.1 (248, 9.76)

3. GENERAL DRIVING CYCLE

Perform the serial diagnoses.

4. DIAGNOSTIC METHOD

Judge that the malfunction occurred in fuel system when the malfunction criteria are completed for 50 seconds or more by comparing the diagnostic value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc aflmd = measured lambda lambda = short term fuel trim kblrc = long term fuel trim	≤ fsobdR1 See Map 2 fsobdR1 = rich side threshold value of fsobd

Map 2: Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdR1 (%)	–45	–45	–36	–26.5	–26.5	–26.5	–26.5

Time Needed for Diagnosis: 10 seconds × 5 times
Malfunction Indicator Light Illumination: 2 continuous driving cycles.
Judge OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc	≥ –20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When diagnosed OK with the similar driving for 3 driving cycles in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

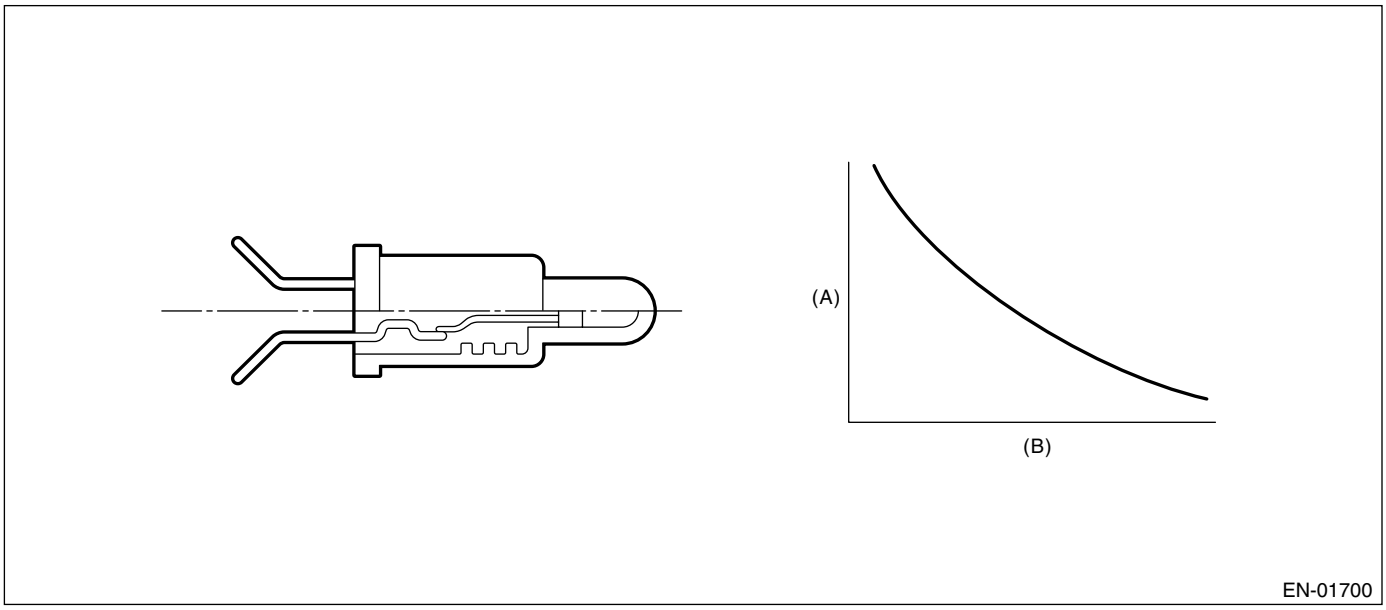
Memorize the freeze frame data. (For test mode $02)

AG:DTC P0181 — FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property.
Diagnosis is performed in two methods; namely, drift diagnosis and stuck diagnosis.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)
(B) Fuel temperature °C (°F)

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and NG judgment is done.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel level	≥ 10 ℓ (2.6 US gal, 2.2 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature difference from engine start	> −8°C (18°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the engine coolant temperature increases more than −8 degrees (18 degrees of Fahrenheit) from the temperature of engine starting in 20 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (120 seconds) needed for diagnosis. Also, judge OK when the malfunction criteria below is not completed. And then, clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel temperature-engine coolant temperature	≥10°C (50°F)

Time Needed for Diagnosis: 120 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Stuck Diagnosis
If the fuel temperature which must increase along with engine idling does not increase, the engine is considered to be stuck and NG judgment is done.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds and more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all of the malfunction criteria below is completed.

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1213 lb)
Fuel temperature difference between max and min	< 3°C (37°F)

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Malfunction Criteria	Threshold Value
Fuel temperature difference between max. and min.	≥ 3°C (37°F)

Time Needed for Diagnosis: Not fixed
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

9. DTC CLEAR CONDITION

- When the OK idling was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

Fix the fuel temperature at 40°C (104°F).

12.ECM OPERATION AT DTC SETTING

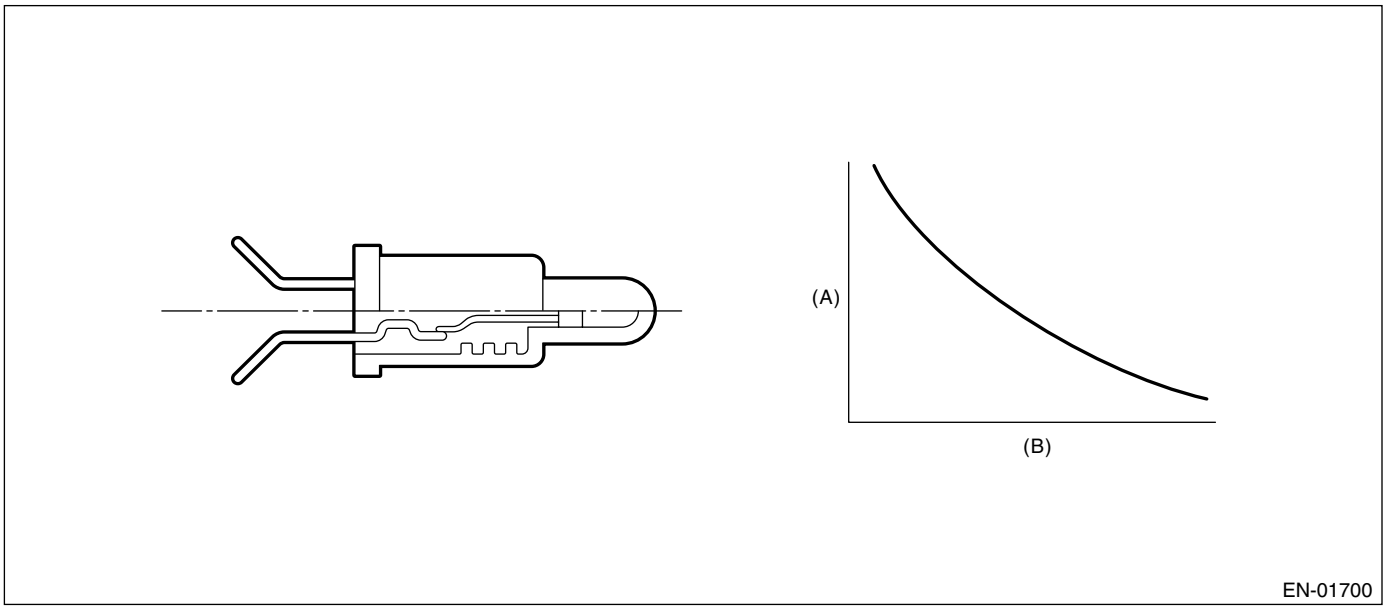
Memorize the freeze frame data. (For test mode $02)

AH:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel temperature for control at 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

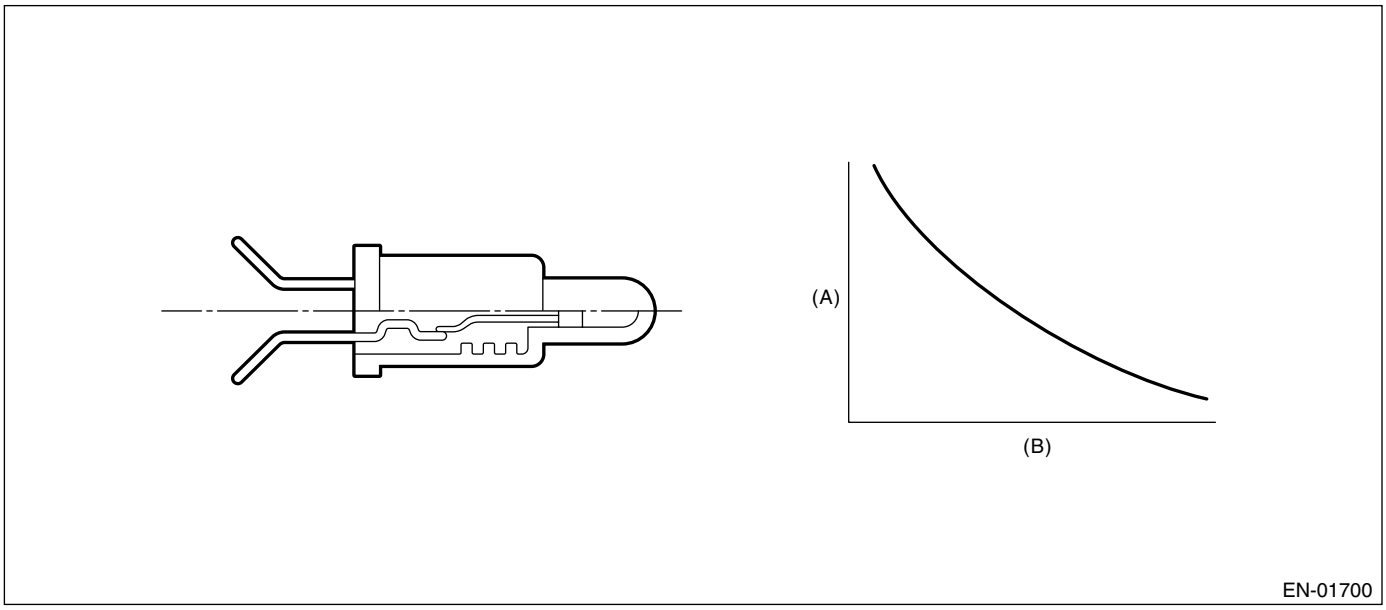
Memorize the freeze frame data. (For test mode $02)

AI: DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than time (2.5 seconds) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel temperature for control at 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AJ:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence.
Monitoring Misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.
- Intermittent misfire (Different cylinders misfire intermittently.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): Catalyst damage misfire, FTP 1.5 times misfire
- Opposed misfire (Dual ignition equipped model as #1, #2 simultaneously ignite. NA model only.): Catalyst damage misfire, FTP 1.5 times misfire

The following detecting methods are adopted for these detection.
(1) Intermittent misfire: FTP 1.5 times misfire
- 180° Interval Difference Method (3,550 rpm or less)
- 720° Interval Difference Method (2,950 rpm or less)

(2) Every time misfire: Catalyst damage misfire, FTP 1.5 times misfire
- 180° Interval Difference Method (3,550 rpm or less)
- Pattern Recognition Method (2,950 rpm or more)

(3) Opposed misfire: Catalyst damage misfire, FTP 1.5 times misfire
- 180° Interval Difference Method (3,550 rpm or less)
- Pattern Recognition Method (2,950 rpm or more)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Injector pulse	≥ 1.00 milliseconds
Engine speed	450 — 6200 rpm
Fuel shut-off function	Not in operation
Fuel parameter determination	Not as extremely low volatility
Engine speed change	≥ Misfire level × –4.00
After fuel shut-off finished	15 revs. or more
(Weighted avg. value / given amount) of intake air –1.0	–0.5 ←→ 1.9
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)
Crankshaft position learning	Complete
Intake manifold pressure	> Value from Map 4
The change in torque during shifting	Not in operation
Throttle position change during 30 milli-seconds	–20° ←→ 20°
Engine speed (Misfire detection by oxy-gen sensor)	> 4600 rpm

Map 4

rpm	0	400	800	1200	1600	2000	2400	2800
MT (V. Speed < 64 km/h (40 MPH))	21.9 (164, 6.46)	21.9 (164, 6.46)	21.9 (164, 6.46)	19.2 (144, 5.67)	18.7 (140, 5.51)	19.2 (144, 5.67)	18.7 (140, 5.51)	19.7 (148, 5.83)
(V. Speed ≥ 64 km/h (40 MPH)) kPa (mmHg, inHg)	21.9 (164, 6.46)	21.9 (164, 6.46)	21.9 (164, 6.46)	25.6 (192, 7.56)	25.1 (188, 7.40)	25.6 (192, 7.56)	24.5 (184, 7.24)	31.5 (236, 9.29)
AT kPa (mmHg, inHg)	22.9 (172, 6.77)	22.9 (172, 6.77)	22.9 (172, 6.77)	20.3 (152, 5.98)	20.3 (152, 5.98)	21.3 (160, 6.30)	20.3 (152, 5.98)	21.9 (164, 6.46)

rpm	3200	3600	4000	4400	4800	5200	5600	6000
MT (V. Speed < 64 km/h (40 MPH))	22.9 (172, 6.77)	25.1 (188, 7.40)	28.3 (212, 8.35)	31.5 (236, 9.29)	34.7 (260, 10.24)	38.4 (288, 11.34)	41.6 (312, 12.28)	44.8 (336, 13.23)
(V. Speed ≥ 64 km/h (40 MPH)) kPa (mmHg, inHg)	32.5 (244, 9.61)	31.5 (236, 9.59)	31.5 (236, 9.59)	31.5 (236, 9.59)	34.7 (260, 10.24)	38.4 (288, 11.34)	41.6 (312, 12.28)	44.8 (336, 13.23)
AT kPa (mmHg, inHg)	25.1 (188, 7.40)	28.8 (216, 8.50)	32.0 (240, 9.45)	35.2 (264, 10.39)	37.9 (284, 11.18)	41.1 (308, 12.13)	44.3 (332, 13.07)	47.5 (356, 14.02)

3. GENERAL DRIVING CYCLE

If the condition matched, detecting misfire is possible in the engine speed of idling to high revolution.

4. DIAGNOSTIC METHOD

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed, and judge whether the misfire occurs or not comparing the calculated result with judgment value.

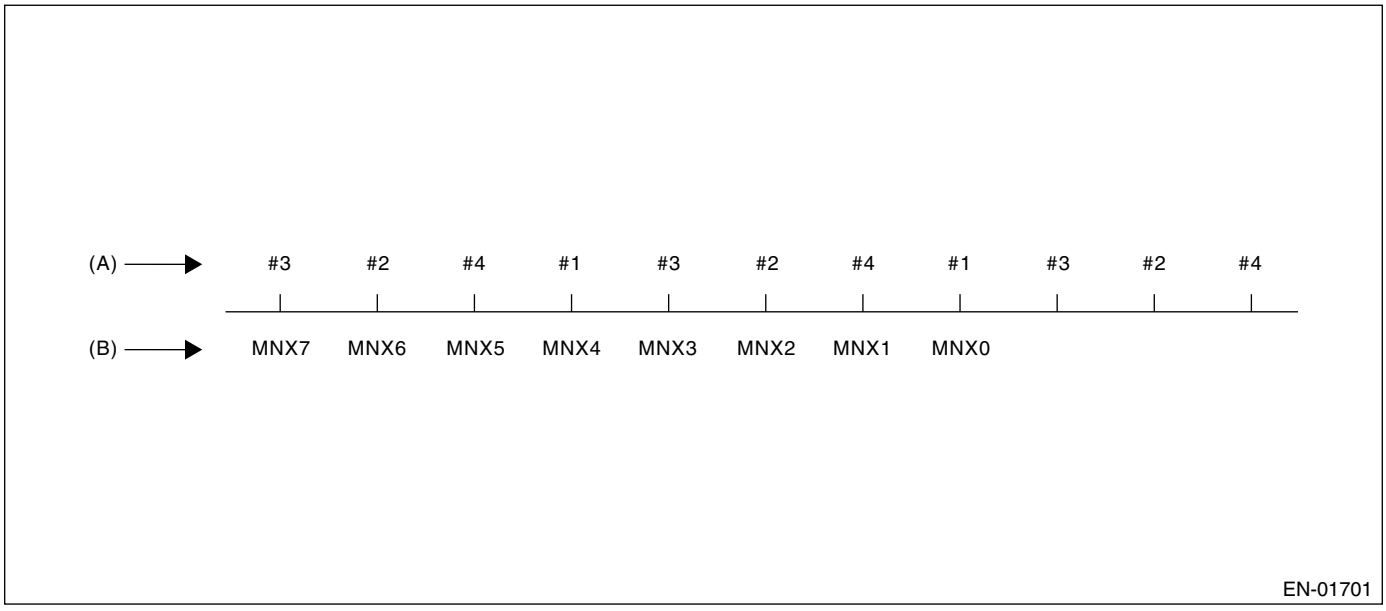
Calculate the diagnostic value (from crankshaft position speed) → Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
- 720° Interval Difference Method
- Pattern Recognition Method

→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
- Catalyst damage misfire NG judgment

For misfire detection, there are three methods such as 180° Interval Difference Method, 720° Interval Difference Method and Pattern Recognition Method.

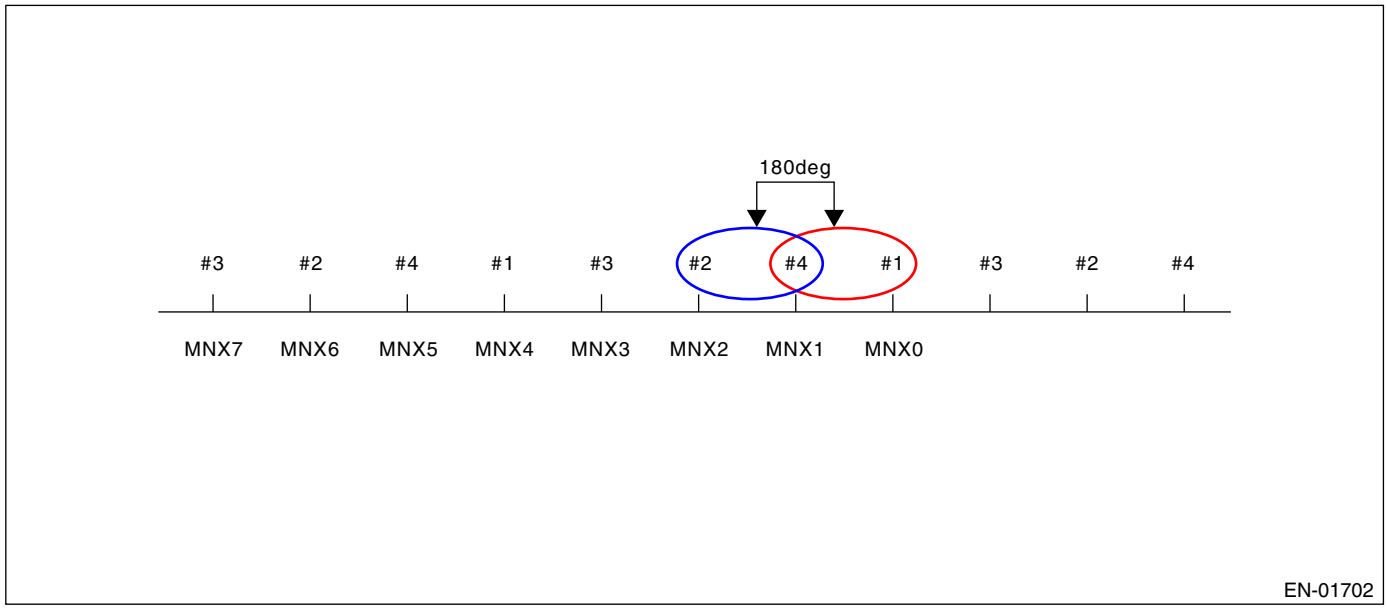
• 180° Interval Difference Method, 720° Interval Difference Method

Transform the time needed for crankshaft movement from BTDC65° to BTDC10° into revolution. As the following, regard the revolution as MNX0. And then regard the former revolution as MNX1, the second former revolution as MNX2, and the third as MNX3, etc.
Use the detecting method below for misfire patterns, and judge misfire occurrence when the result calculated from the formula is out of threshold value.



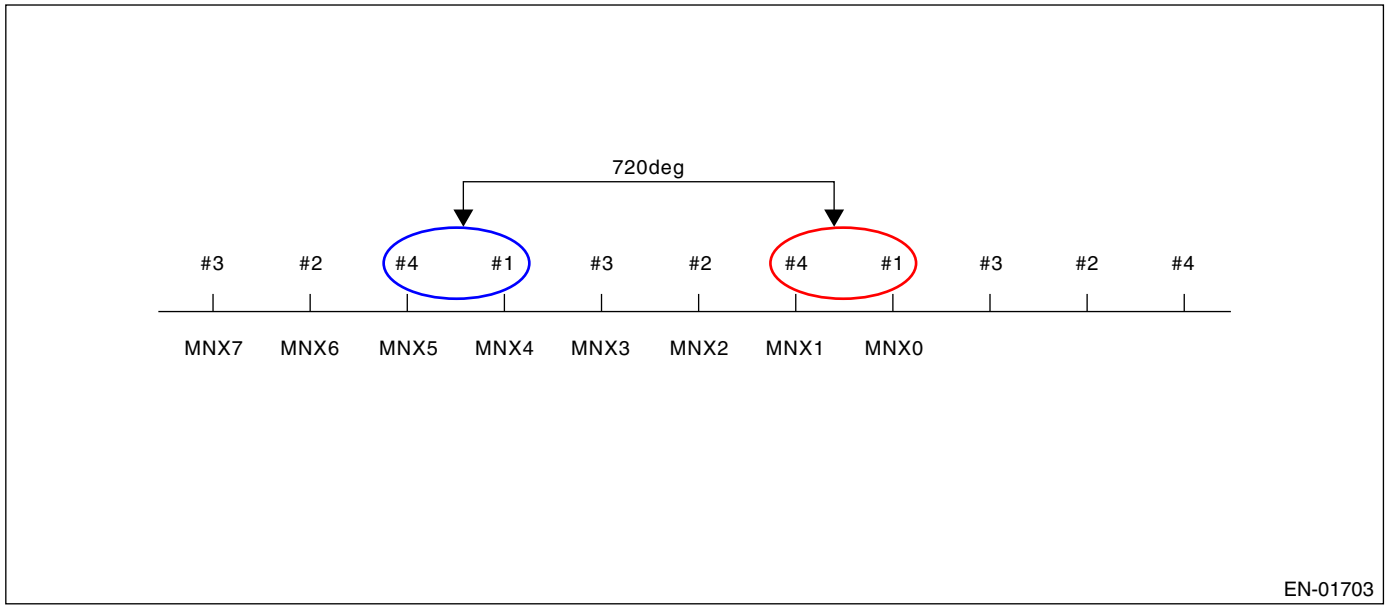
(A) Ignition order (B) Engine speed (rpm)

180° Interval Difference Method (DDNCON0)



(1) DDNCON1 = (MNX 1 – MNX 2) – (MNX 2 – MNX 3) ≤ Threshold value
(2) DDNCON0 = (MNX 0 – MNX 1) – (MNX 1 – MNX 2) ≥ Threshold value
Judge misfire when the (1) and (2) above are completed.

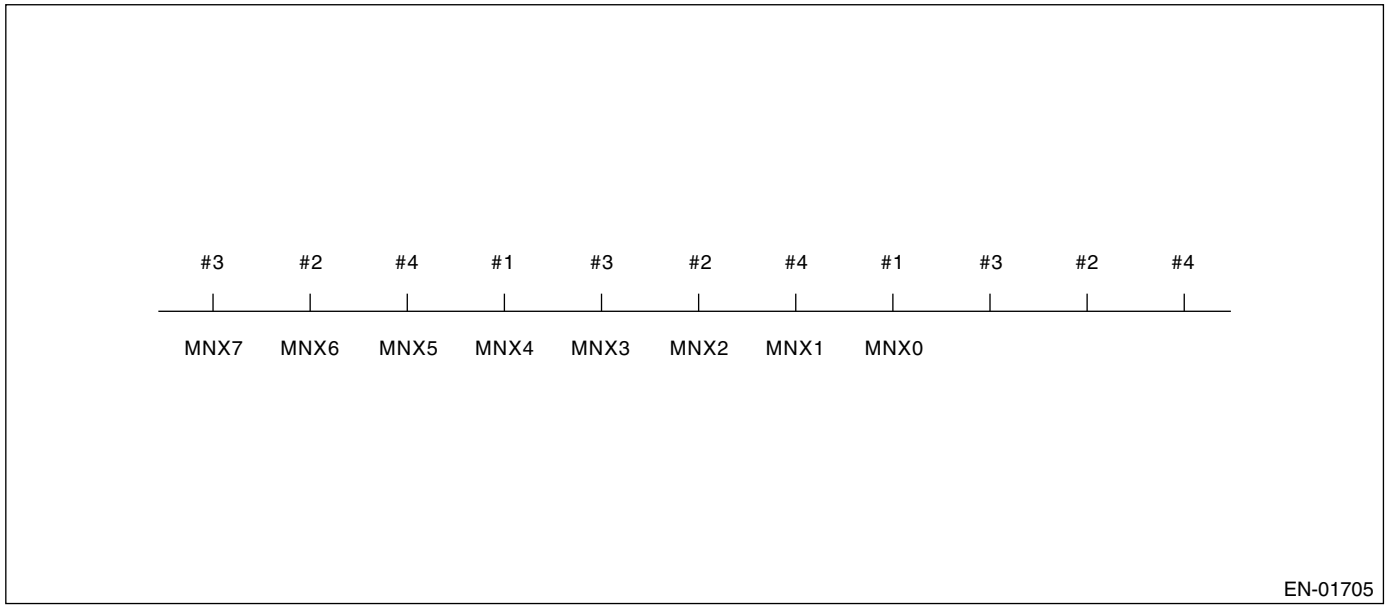
720° Interval Difference Method (DDNCYL0)



(1) DDNCYL4 = (MNX 4 – MNX 5) – (MNX 8 – MNX 9) ≤ Threshold value
(2) DDNCYL0 = (MNX 0 – MNX 1) – (MNX 4 – MNX 5) ≥ Threshold value
Judge misfire when the (1) and (2) above are completed.

• Pattern Recognition Method

Pattern Recognition Method has two patterns such as every time misfire on one cylinder and continuous misfire on two cylinders.



Every time misfire on one cylinder

Calculate the simple average (calculate MNX 0 – MNX 1) per one hundred ignitions for one cylinder (per four hundred ignitions for four cylinder).

Regard the value calculated for #1 cylinder as AVE1, #2 cylinder as AVE2, and as AVE3, AVE4 like the same way. Judge misfire occurrence when the value calculated from the following formula is larger than threshold value.

(Max. value of AVE1 to AVE4) – AVEn (n=1,2,3,4) ≥ threshold value → Judge that misfire occurs.

Continuous misfire on two cylinders

(1) Two continuous ignitions with "MNX 0 – MNX 1 ≥ threshold value" occurs.

(2) Two continuous ignitions with "MNX 0 – MNX 1 ≤ – (threshold value)" occurs.

Judge misfire occurrence on continuous two cylinders when the judgment criteria (1) and (2) above repeated for four hundred ignition.

• FTP 1.5 times Misfire (Misfire occurrence level which influences exhaust gas)

• Judgment Value

Judge malfunction when the misfire rate in 1000 revs. is large.

Malfunction Criteria	Threshold Value
FTP emission	> 1.2% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

Malfunction Indicator Light Illumination: 2 continuous driving cycles.

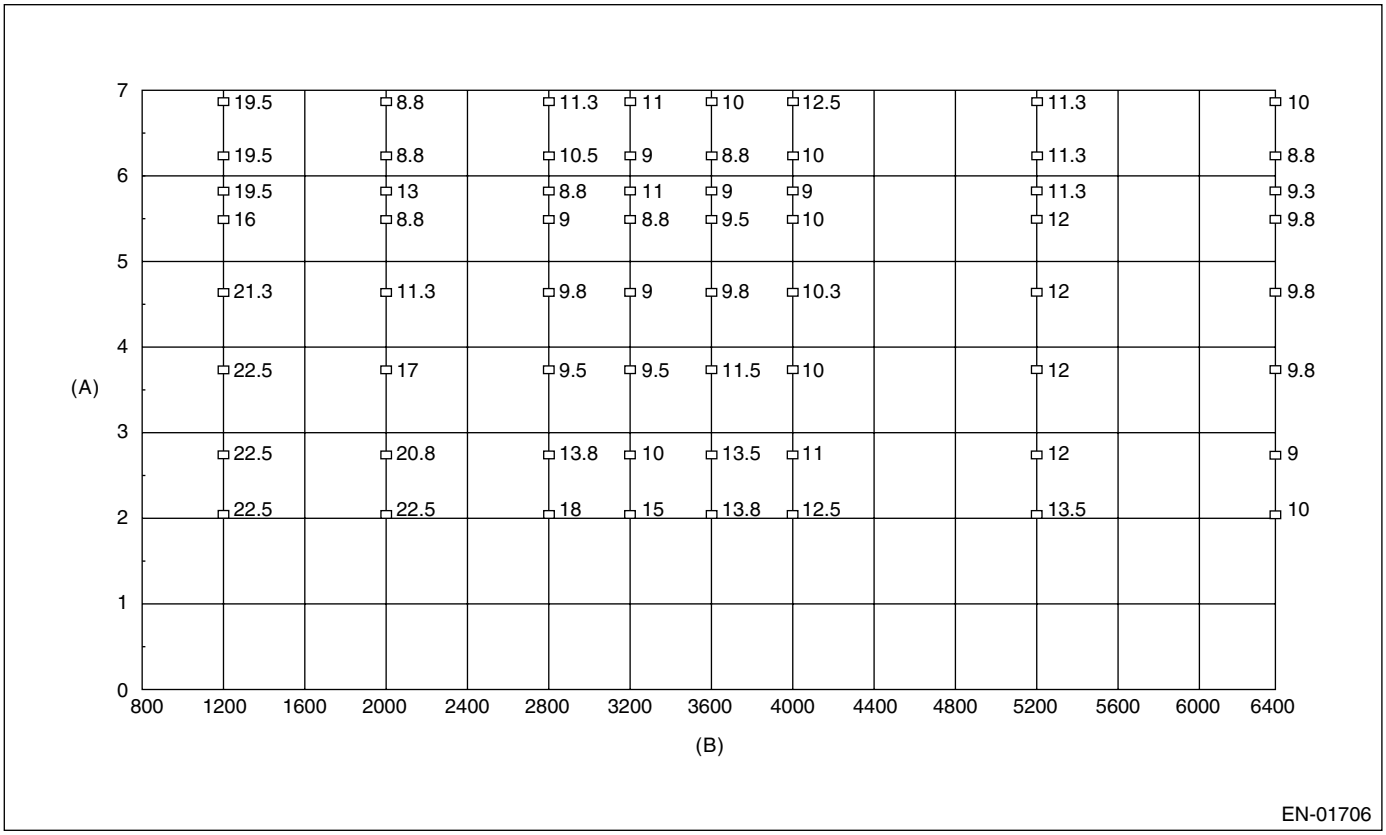
• Catalyst Damage Misfire (Misfire occurrence level which results in catalyst damage)

• Judgment Value

Judge malfunction when the misfire rate in 200 revs (400 ignitions) is large.

Malfunction Criteria	Threshold Value
Catalyst damage	> See Map 1

• Map 1 Fault criteria limit for misfire which would result in catalyst damage



(A) Basic injection pulse (millisecond) (B) Engine speed (rpm)

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When diagnosed OK with the similar driving for 3 driving cycles in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

AK:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

For detecting criteria, refer to DTC P0301 — CYLINDER 1 MISFIRE DETECTED —. <Ref. to GD(H4SO)-88, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AL:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

For detecting criteria, refer to DTC P0301 — CYLINDER 1 MISFIRE DETECTED —. <Ref. to GD(H4SO)-88, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AM:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

For detecting criteria, refer to DTC P0301 — CYLINDER 1 MISFIRE DETECTED —. <Ref. to GD(H4SO)-88, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

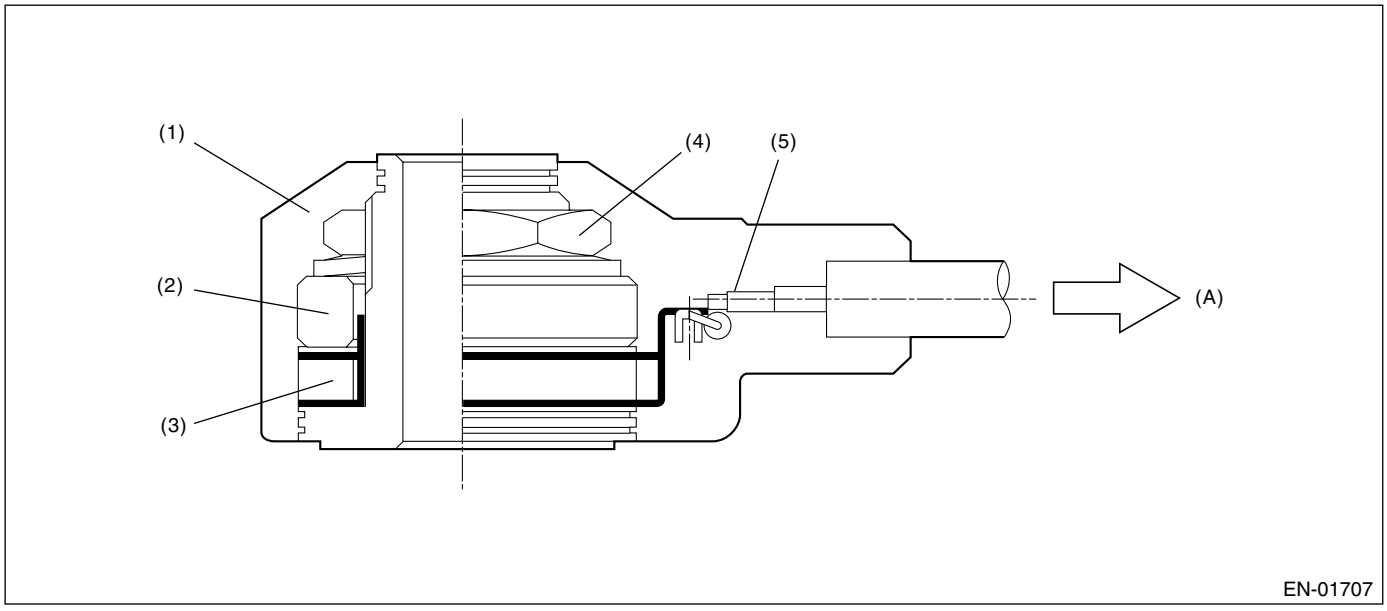
MEMO:

AN:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (1 second) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.6 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

(1) Stop whole compensation, partial compensation, knock cancel compensation in ignition timing calculation at normal.
(2) Knock cancel compensation of low engine coolant temperature is fixed value (7°CA).
(3) Stop partial compensation calculation of ignition leaning.

9. ECM OPERATION AT DTC SETTING

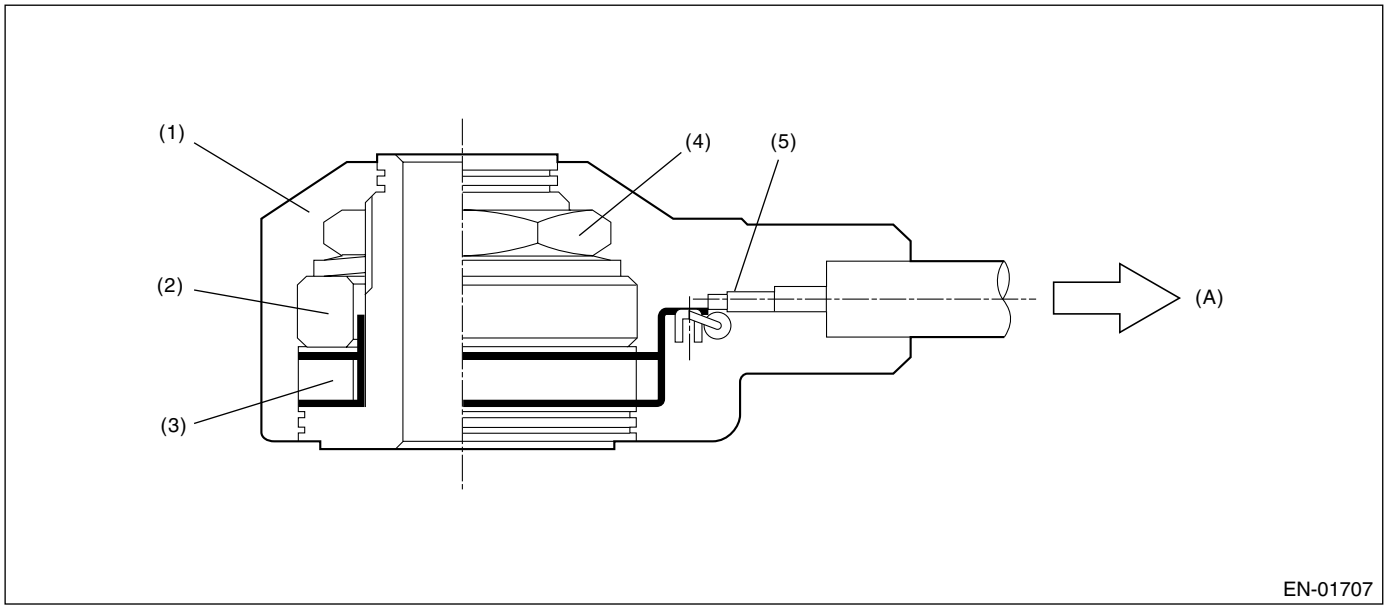
Memorize the freeze frame data. (For test mode $02)

AO:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (1 second) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 3.5 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

(1) Stop whole compensation, partial compensation, knock cancel compensation in ignition timing calculation at normal.
(2) Knock cancel compensation of low engine coolant temperature is fixed value (7°CA).
(3) Stop partial compensation calculation of ignition leaning.

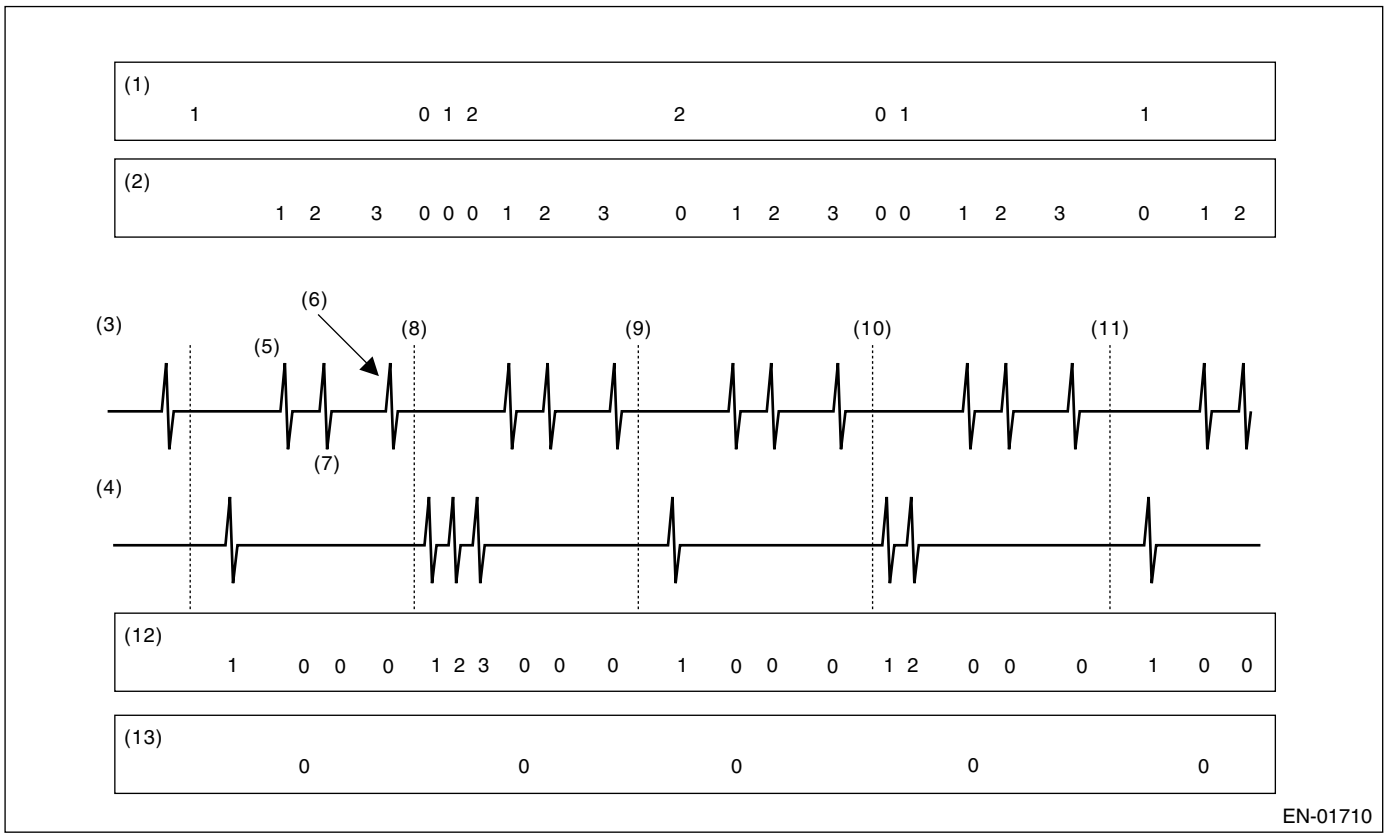
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AP:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor.
Normally, the crankshaft position sensor signal and camshaft position sensor signal are input as shown below. But judge NG when continuing not to input the crankshaft position sensor signal.



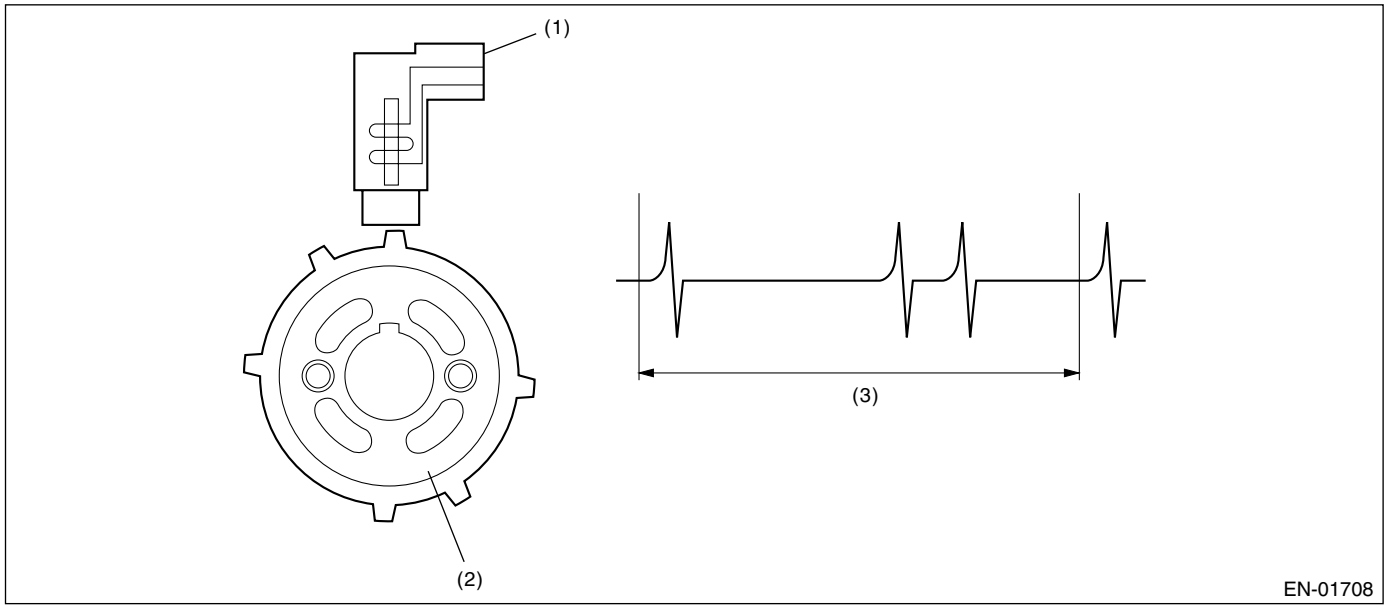
(1) NG counter of crankshaft position sensor
(2) Signal count of crankshaft position sensor
(3) Crankshaft position sensor signal
(4) Camshaft position sensor signal
(5) BTDC 97° CA
(6) BTDC 10° CA
(7) BTDC 65° CA
(8) #1 compression TDC
(9) #3 compression TDC
(10) #2 compression TDC
(11) #4 compression TDC
(12) Signal count of camshaft position sensor
(13) NG counter of relative position

• Cylinder judgment method

When inputting BTDC97°CA crankshaft position sensor signal, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Crankshaft position sensor (2) Crankshaft sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 24
Crankshaft position sensor signal	Detect in warm-up condition

When the crankshaft position sensor signal is input, clear the above camshaft position sensor signal.
Time Needed for Diagnosis: 7 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

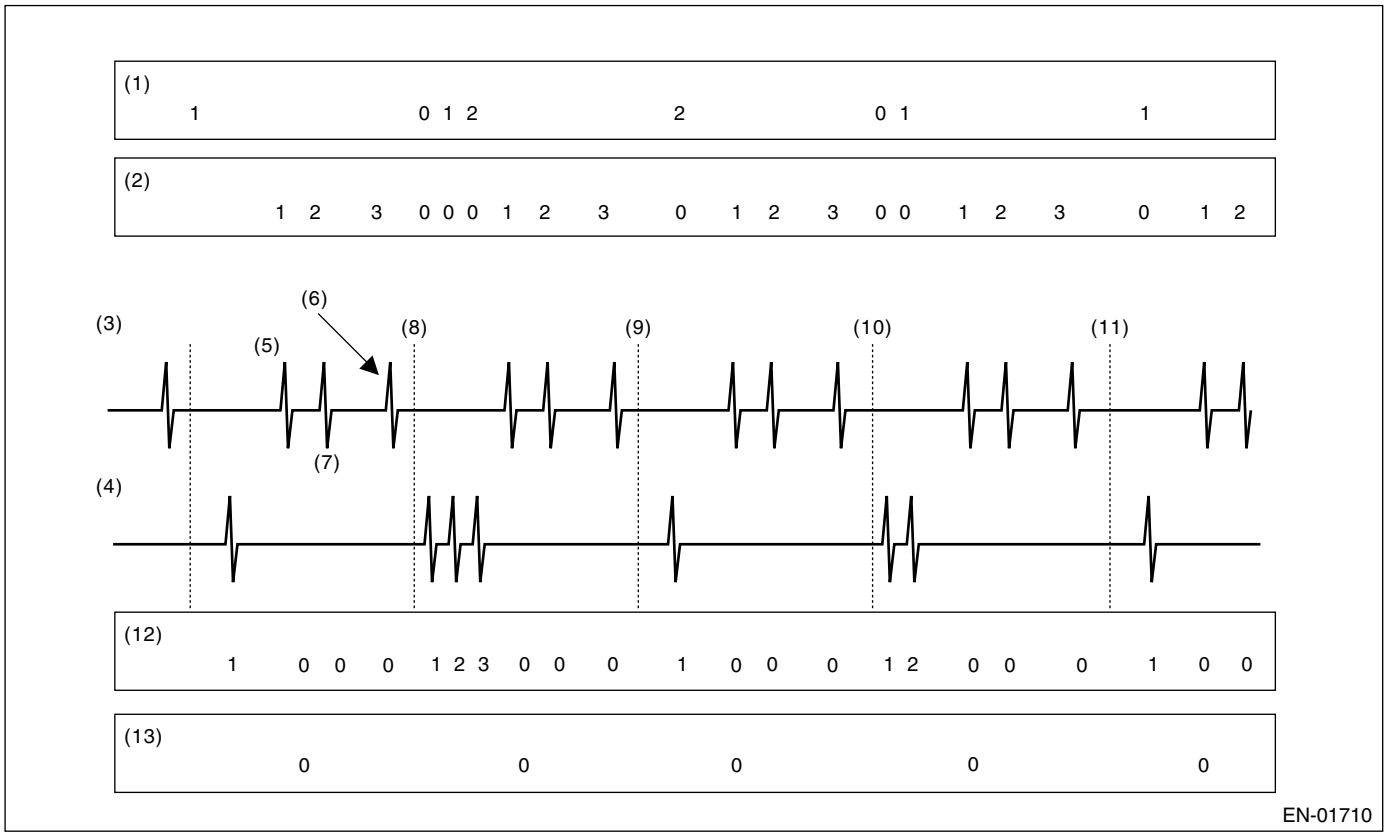
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AQ:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property.
Compare the normal crankshaft position sensor signal with normal camshaft position sensor signal. When each input number does not correspond, judge NG.



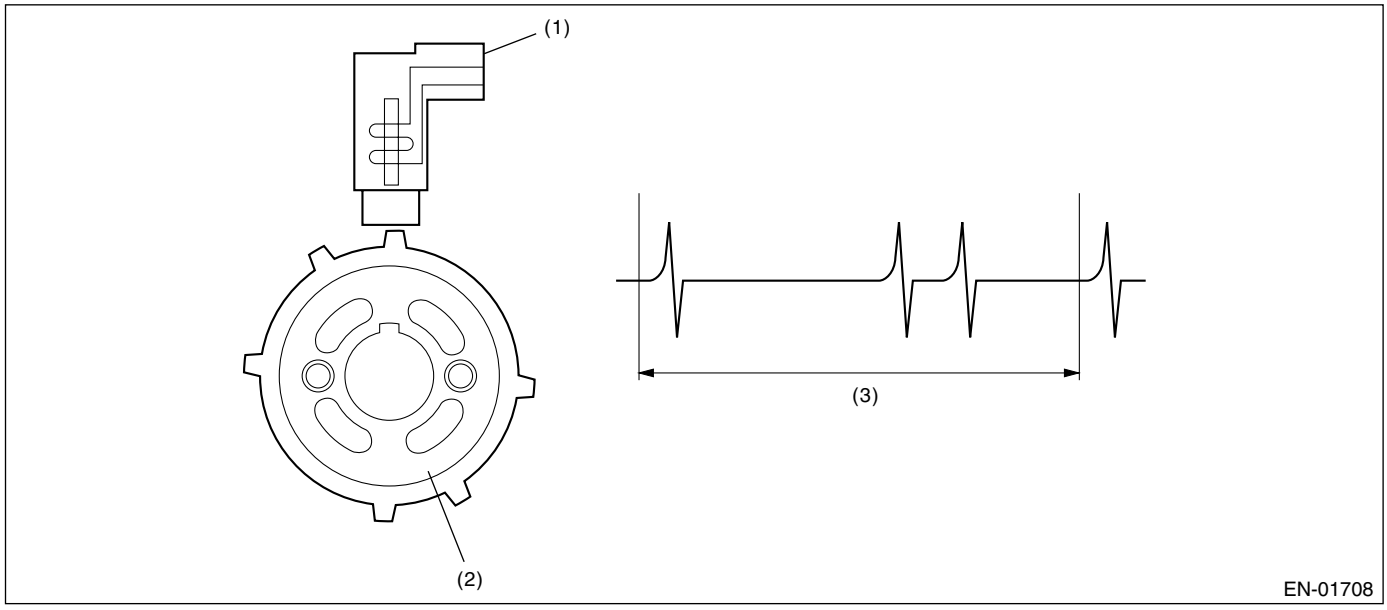
(1) NG counter of crankshaft position sensor
(2) Signal count of crankshaft position sensor
(3) Crankshaft position sensor signal
(4) Camshaft position sensor signal
(5) BTDC 97° CA
(6) BTDC 10° CA
(7) BTDC 65° CA
(8) #1 compression TDC
(9) #3 compression TDC
(10) #2 compression TDC
(11) #4 compression TDC
(12) Signal count of camshaft position sensor
(13) NG counter of relative position

• Cylinder judgment method

When BTDC97°CA crankshaft position sensor signal is input, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Crankshaft position sensor (2) Crankshaft sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When the camshaft position sensor signal is input, compare the total crankshaft position sensor signal number from occasion of previous camshaft position sensor signal input to now with crankshaft position sensor signal number at normal. Increase NG judgment counter when each number does not correspond at once. Judge NG when each number does not correspond sequentially (NG counter ≥ 32). Judge OK and clear NG when the crankshaft position sensor signal number corresponds (NG counter = 0).

Judgment Value

Malfunction Criteria	Threshold Value
Fault counter	≥ 32

Time Needed for Diagnosis: 10 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

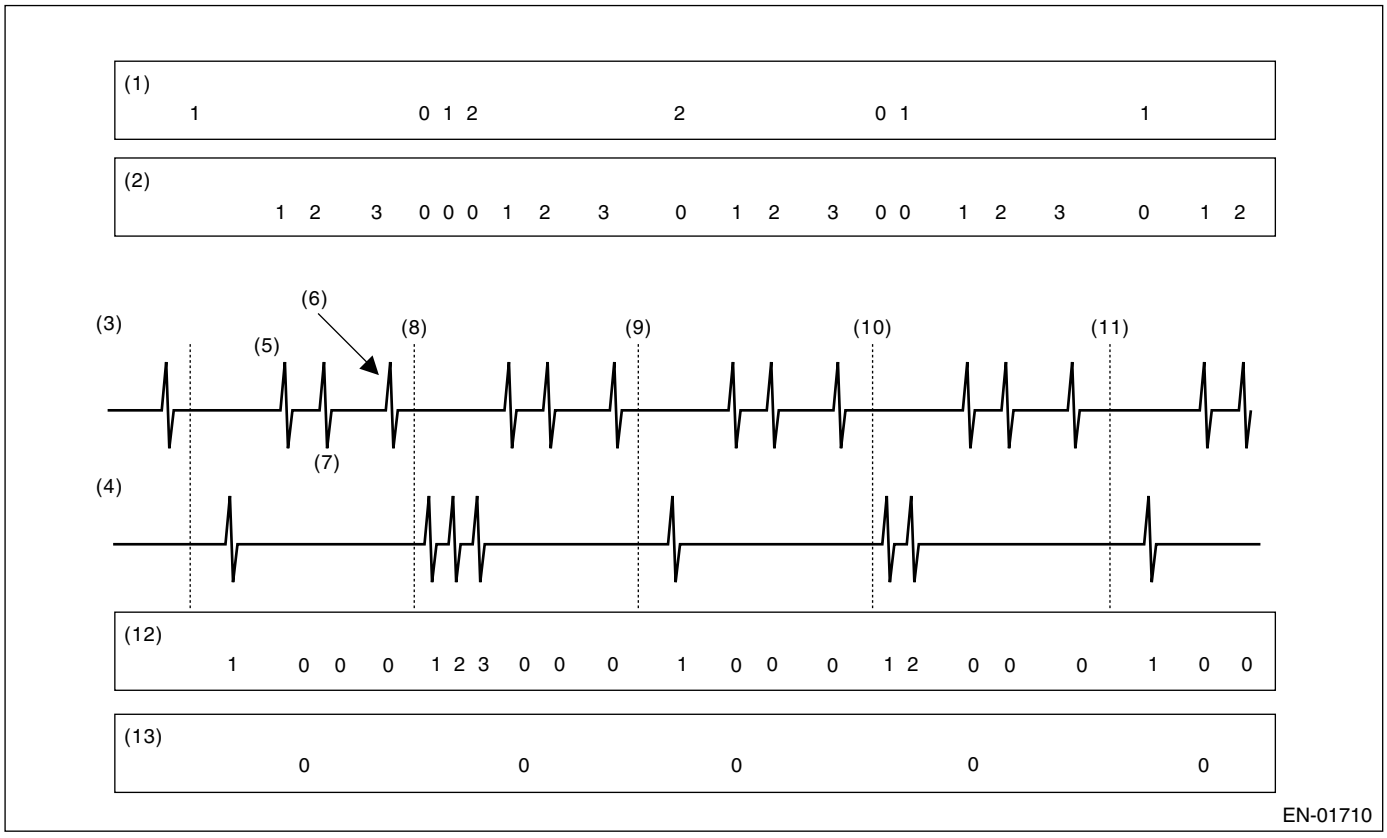
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AR:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property.
Judge NG when continuing not to input the camshaft position sensor signal.



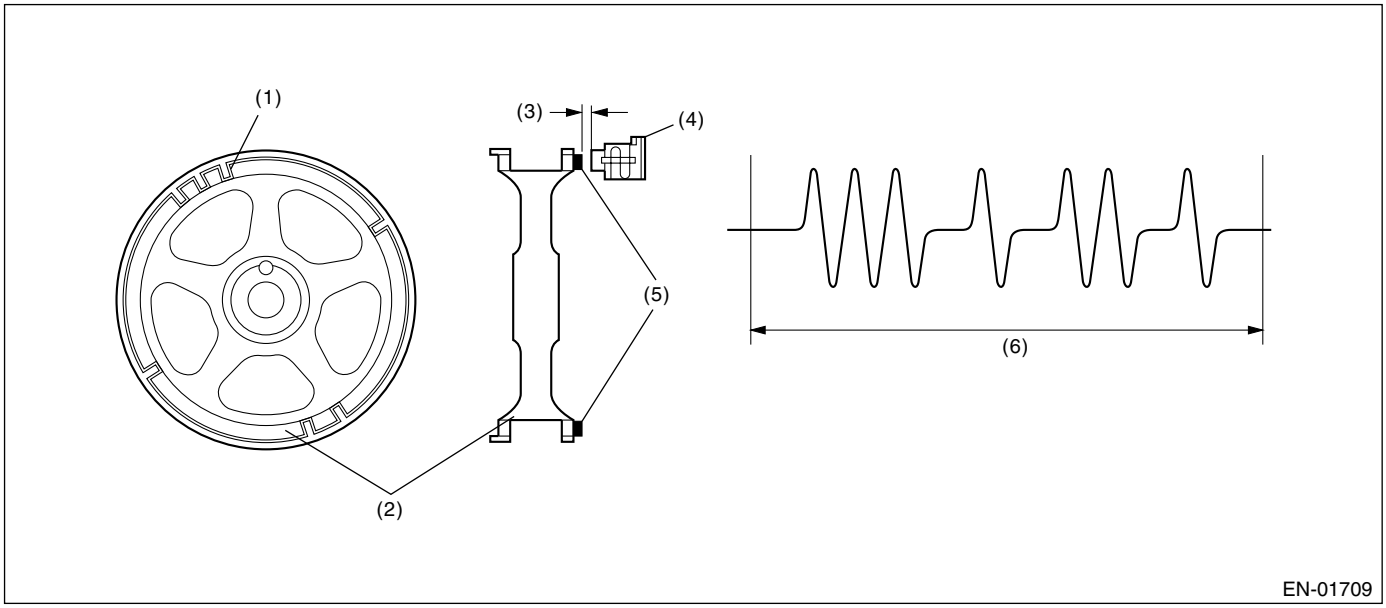
(1) NG counter of crankshaft position sensor
(2) Signal count of crankshaft position sensor
(3) Crankshaft position sensor signal
(4) Camshaft position sensor signal
(5) BTDC 97° CA
(6) BTDC 10° CA
(7) BTDC 65° CA
(8) #1 compression TDC
(9) #3 compression TDC
(10) #2 compression TDC
(11) #4 compression TDC
(12) Signal count of camshaft position sensor
(13) NG counter of relative position

• Cylinder judgment method

When BTDC97°CA crankshaft position sensor signal is input, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Boss
(6) Camshaft one turn (Crankshaft two turns)

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When many crankshaft position sensor signals were input without camshaft position sensor signal input, judge OK and clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	≥ 36
Camshaft position sensor signal	Detect in warm-up condition

Time Needed for Diagnosis: 6 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

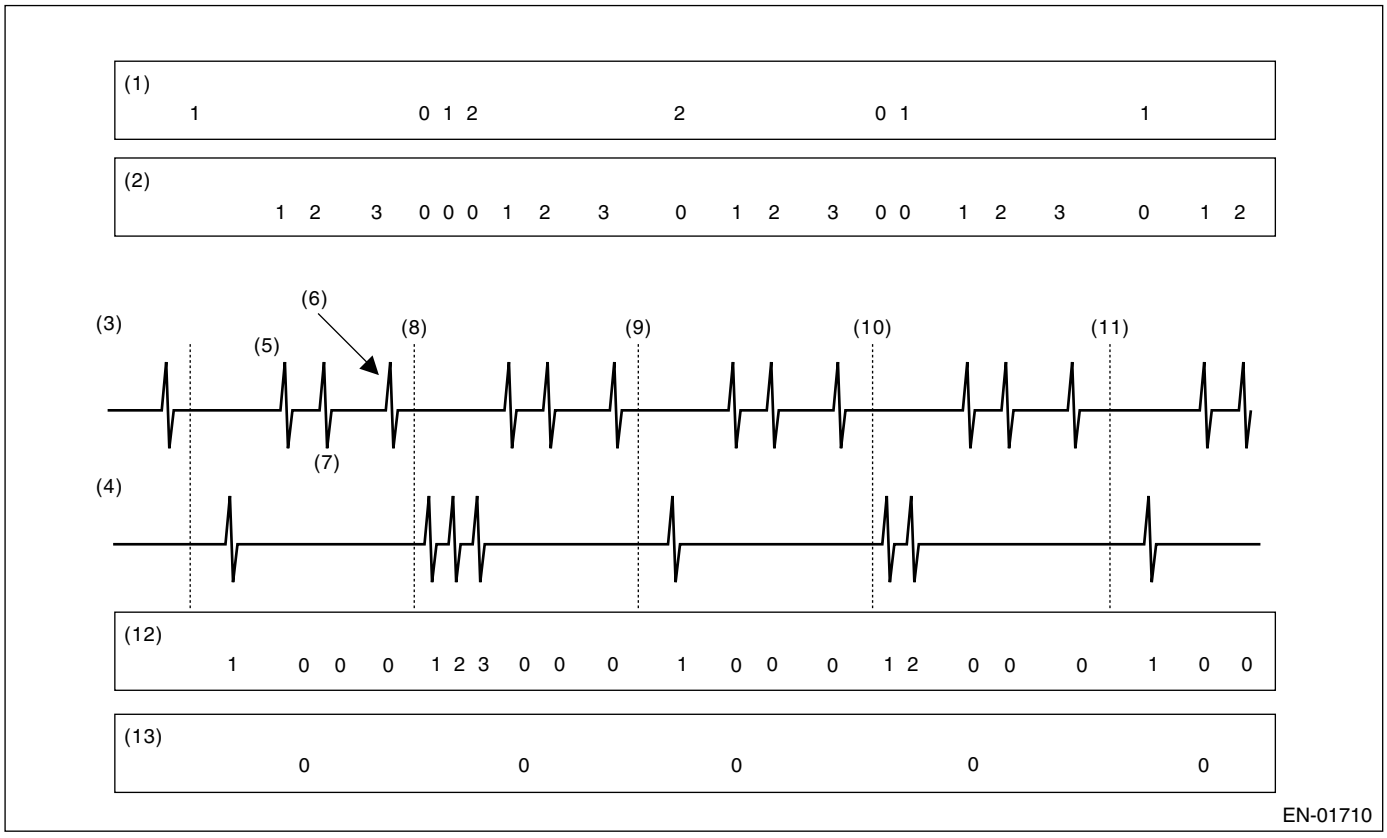
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AS:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property.
Compare the normal crankshaft position sensor signal with normal camshaft position sensor signal. When each input number does not correspond, judge NG.



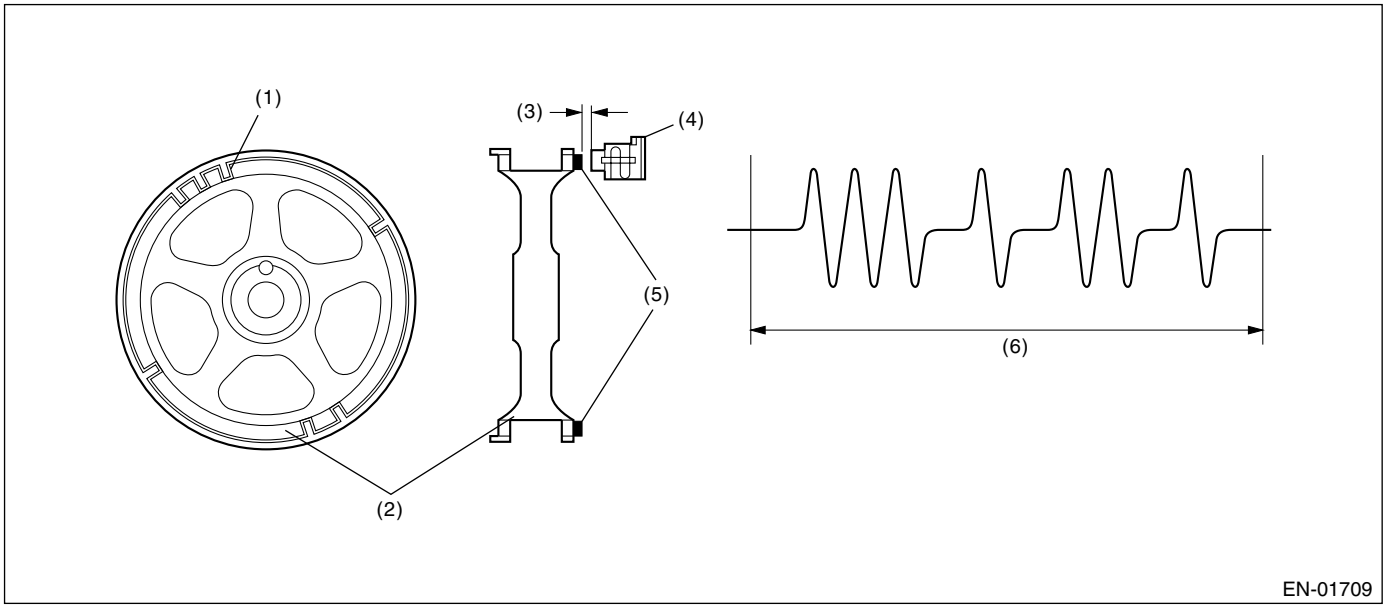
(1) NG counter of crankshaft position sensor
(2) Signal count of crankshaft position sensor
(3) Crankshaft position sensor signal
(4) Camshaft position sensor signal
(5) BTDC 97° CA
(6) BTDC 10° CA
(7) BTDC 65° CA
(8) #1 compression TDC
(9) #3 compression TDC
(10) #2 compression TDC
(11) #4 compression TDC
(12) Signal count of camshaft position sensor
(13) NG counter of relative position

• Cylinder judgment method

When BTDC97°CA crankshaft position sensor signal is input, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Boss
(6) Camshaft one turn (Crankshaft two turns)

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When BTDC97°CA crankshaft position sensor signal is input, compare the camshaft position sensor signal number in past 4 times with camshaft position sensor signal number at normal. Increase NG judgment counter when each number does not correspond at once, judge OK and clear NG when the camshaft position sensor signal is normal.

Judgment Value

Malfunction Criteria	Threshold Value
Fault counter	≥ 32

Time Needed for Diagnosis: 6 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

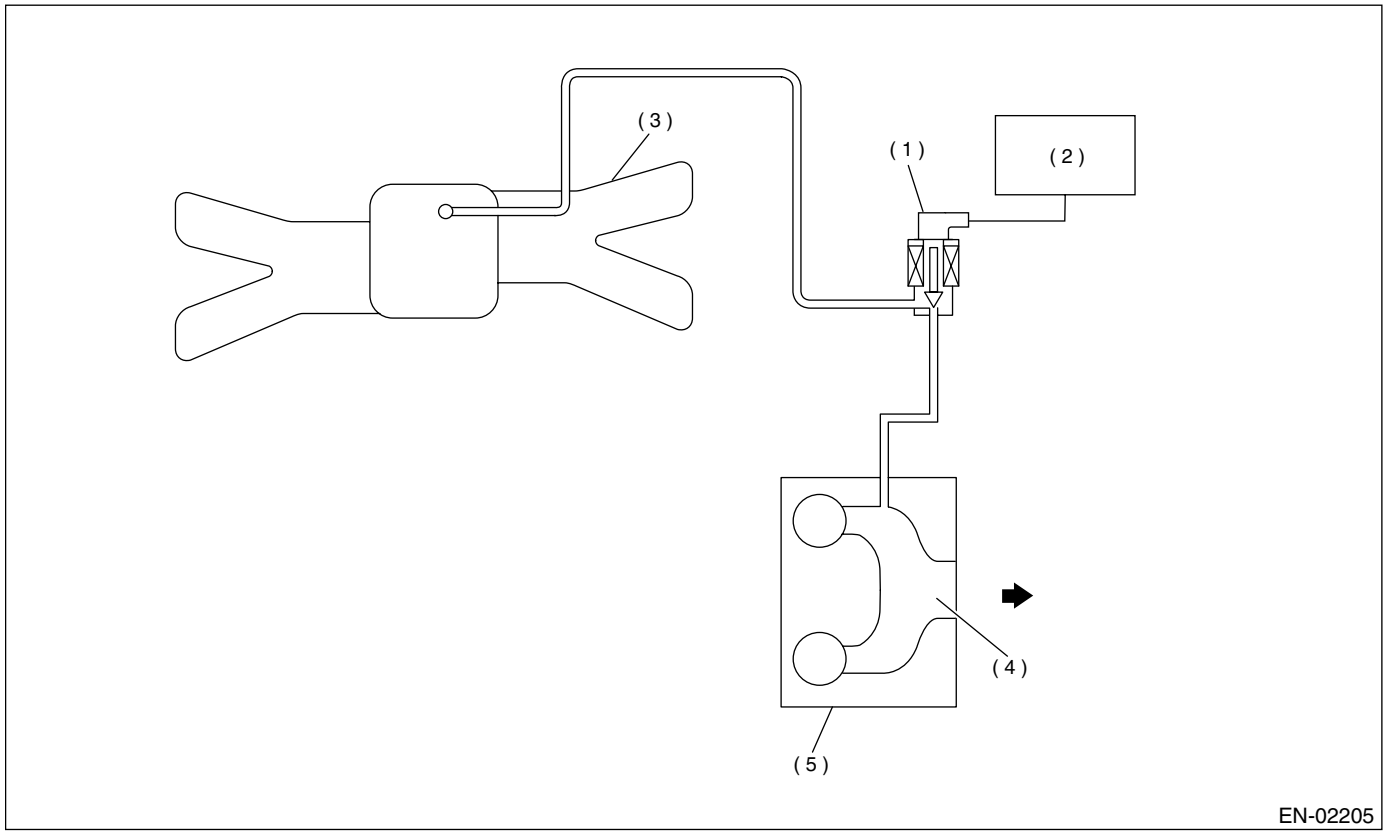
Memorize the freeze frame data. (For test mode $02)

AT:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of EGR system.
Intake manifold pressure (negative pressure) is stable because the throttle valve is fully closed during the fuel shut-off in deceleration. In this case, the intake manifold pressure changes when EGR valve is opened or closed. Judge EGR system is OK or NG according to intake manifold pressure change amount.

2. COMPONENT DESCRIPTION



(1) EGR valve
(2) Engine control module (ECM)
(3) Intake manifold
(4) Export port
(5) Cylinder head LH

3. ENABLE CONDITION

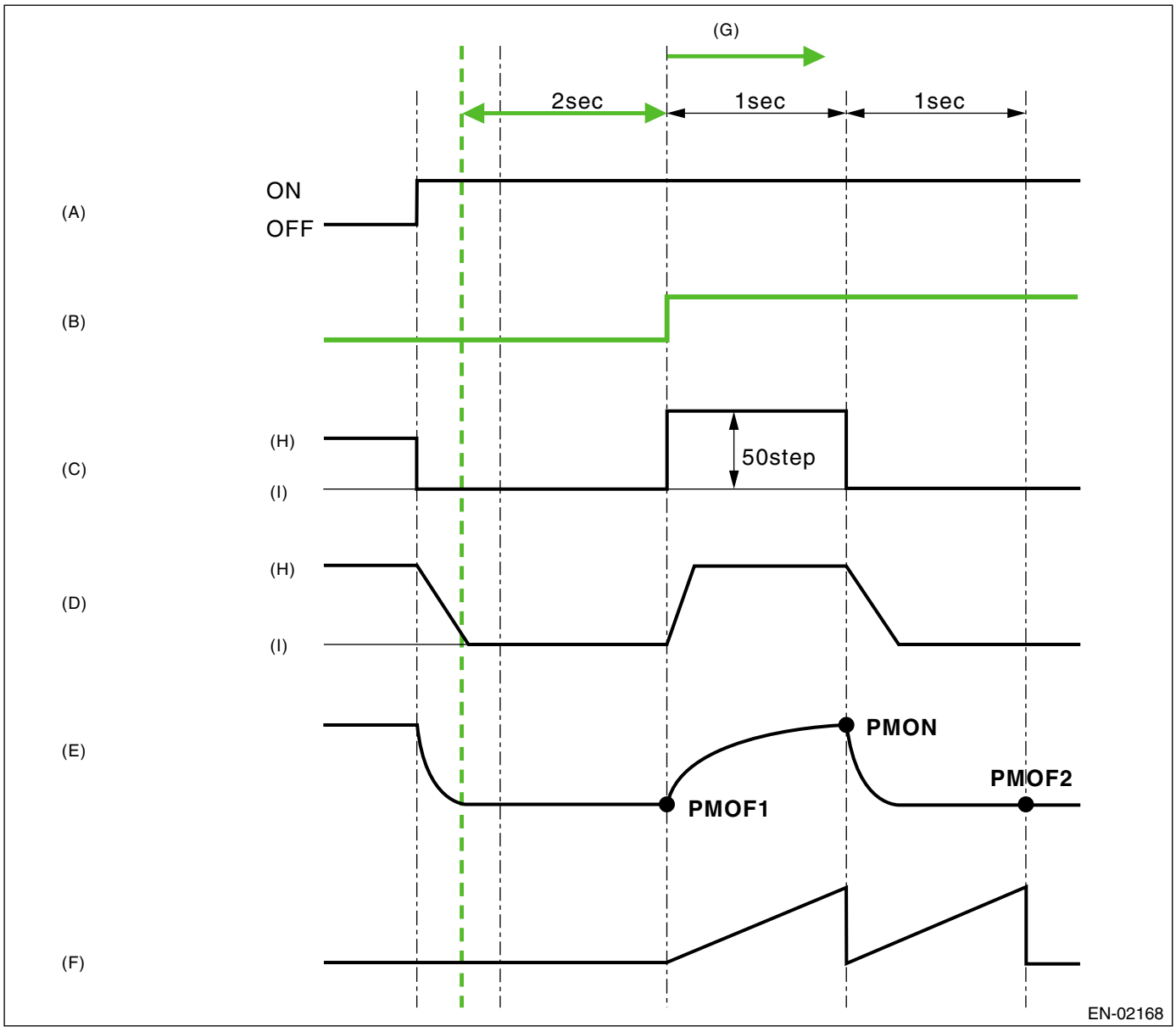
Secondary Parameters	Enable Conditions
After engine starting	40 secs. or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1,200 — 3,000 rpm
Intake manifold pressure	13.3 — 36.0 kPa (100 — 270 mmHg, 3.94 — 10.63 inHg)
Estimated ambient temperature	≥ 5°C (41°F)
Throttle position	< 0.25°
Battery voltage	> 10.9 V
Atmospheric pressure	≥ 75.7 kPa (568 mmHg, 22.36 inHg)
Vehicle speed	≥ 53 km/h (33 MPH)
Fuel shut-off function	In operation
Neutral switch	OFF or 1 seconds changing from “ON” to “OFF”
After load input switch operation (air conditioner, power steering, lights, rear defroster, heater fun and radiator fan)	5 secs. or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at the fuel shut-off in deceleration in vehicle speed more than 40 km/h (25 MPH). Pay attention to vehicle speed and engine speed. (The diagnosis is not completed if vehicle speed and engine speed are out of condition due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure in the following procedures when the enable conditions are completed, and then diagnosis by calculating the result.
(1) PMOF1 is equal to the intake manifold pressure at enable condition completed, and EGR target step is set to 50 steps (almost fully opened).
(2) PMON is equal to the intake manifold pressure in 1 second after EGR target step is set 50 steps (when enable conditions are completed), and EGR target step is set to 0 step.
(3) PMOF2 is equal to the intake manifold pressure in 1 second after EGR target step is set to 0 step (in 2 seconds after enable conditions are completed).



(A) Fuel shut-off in deceleration
(B) Diagnosis enable condition
(C) EGR target step
(D) EGR actual step
(E) Intake manifold pressure (At normal condition)
(F) Diagnosis mode timer
(G) Diagnosis starts.
(H) Open
(I) Close

(4) Calculate the judged value using the following formula.
Judged value = [PMON - (PMOF1 + PMOF2)/2]
Judge NG when the malfunction criteria bellows are completed. Judge OK and clear NG when the malfunction criteria bellows are not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Judged value	< 2.48 kPa (18.63 mmHg, 0.733 inHg) ≥ 146.6 kPa (1,100 mmHg, 43.31 inHg)	P0400

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

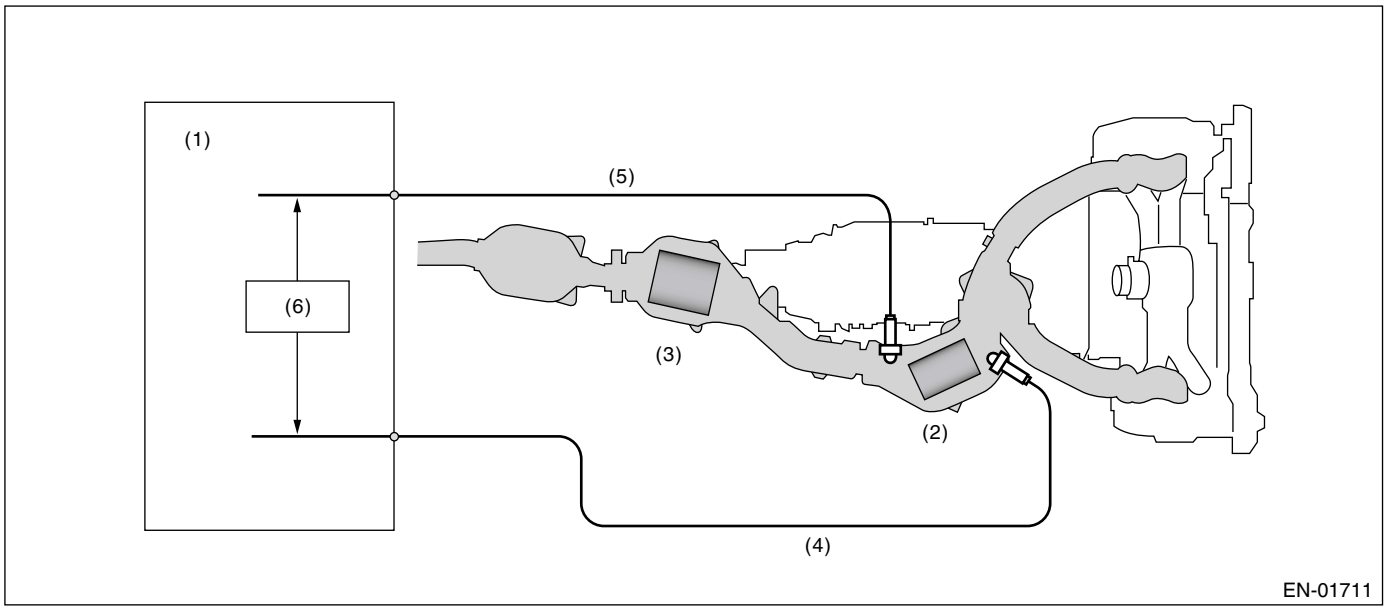
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

AU:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

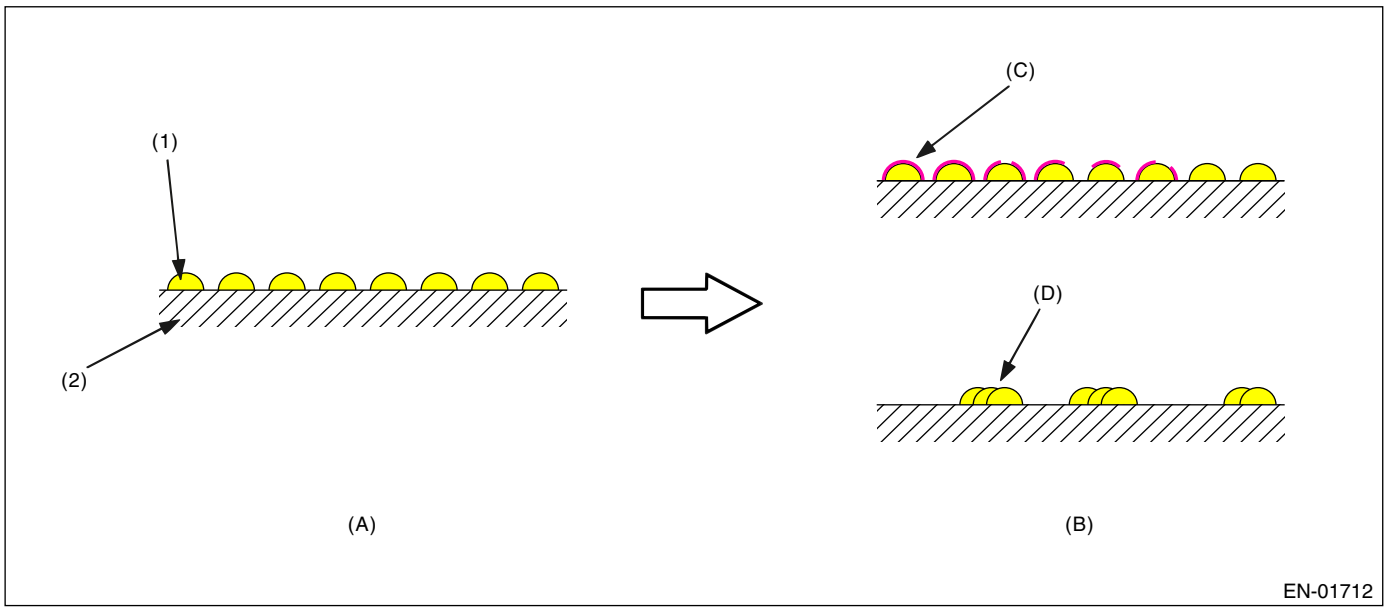
1. OUTLINE OF DIAGNOSIS

Check the catalyst efficiency deterioration.
Generally, the catalytic converter exhaust gas conversion efficiency and oxygen absorbing/removing function are inter-related. The front A/F sensor and rear oxygen sensor are therefore utilized to monitor the oxygen absorbing/removing function, and the results are used to monitor the conversion efficiency.



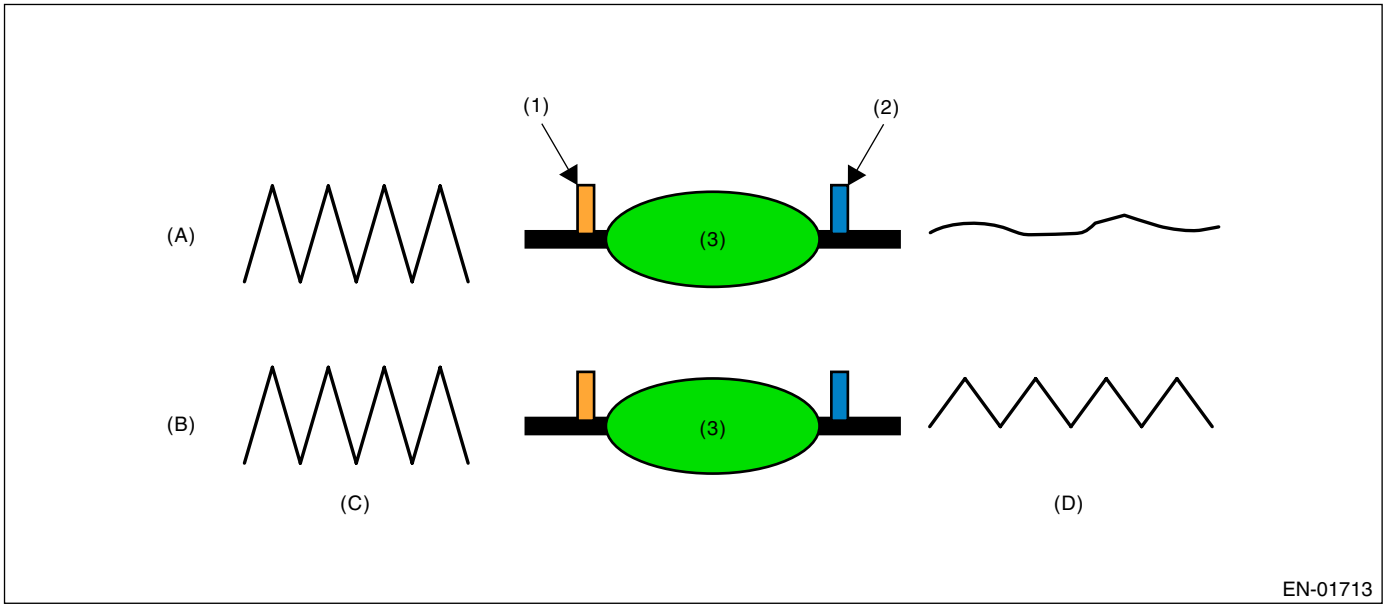
(1) Engine control module (ECM)
(2) Front catalyst converter
(3) Rear catalyst converter
(4) Front oxygen (A/F) sensor
(5) Rear oxygen sensor
(6) Diagnosis circuit

Oil adherence to the catalytic metal (an alloy of platinum and rhodium, or an alloy of platinum, rhodium and palladium) in catalyst converter or metal melting by extraordinary high temperature result in the decrease of metal surface area contacting exhaust gas. Eventually, catalytic conversion efficiency blunted and oxygen density of catalyst downstream may change.



(1) Metal (catalytic function)
(2) Monolith
(A) Normal
(B) Deterioration
(C) Oil adherence
(D) Metal melting by high temperature

Output of rear oxygen sensor changes gradually with a new catalyst, but the blunted catalyst efficiency mentioned above makes sensor output larger and inverse time shorter.
Therefore, catalyst diagnosis is conducted by monitoring the rear oxygen sensor output and comparing its output with the front A/F sensor output.



(1) Front oxygen (A/F) sensor
(2) Rear catalyst converter
(3) Catalytic converter
(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the rear oxygen sensor

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Idle switch off after coolant temp 71°C (160°F)	180 seconds
Closed loop control continuous 5 seconds	Not in standstill
Vehicle speed	24 — 140 km/h (15 — 87 MPH)
Injector pulse (AT)	0.832 — 4.096 milliseconds
(MT)	0.384 — 3.840 milliseconds
Closed loop control rear oxygen sensor	In operation
Engine misfire during 400 ignitions	≤ 5 times
Lambda	0.625 — 1.375
Engine speed (AT)	600 — 3000 rpm
(MT)	1000 — 3300 rpm
Neutral position	OFF
Engine coolant temperature	≥ 75°C (167°F)
Throttle position (AT)	< 14.72°
(MT)	< 17.60°
Average AIA during diagnosis	≥ 27.0 kg (60 lb)/h
Integrated fluctuating AIA during diagnosis	> 160 kg (353 lb)/h
After fuel shut-off finished	1 seconds or more
Accumulated amount of intake air (AIA) (start condition)	0.84 kg (1.85 lb)/60 seconds
Vehicle speed (continuous 80 seconds) (start condition)	≥ 20 km/h (12 MPH)
Injector pulse (continuous 40 seconds) (start condition)	1.34 — 4.22 milliseconds
Vehicle speed (continuous 70 seconds) (start condition)	≥ 74 km/h (46 MPH)

3. GENERAL DRIVING CYCLE

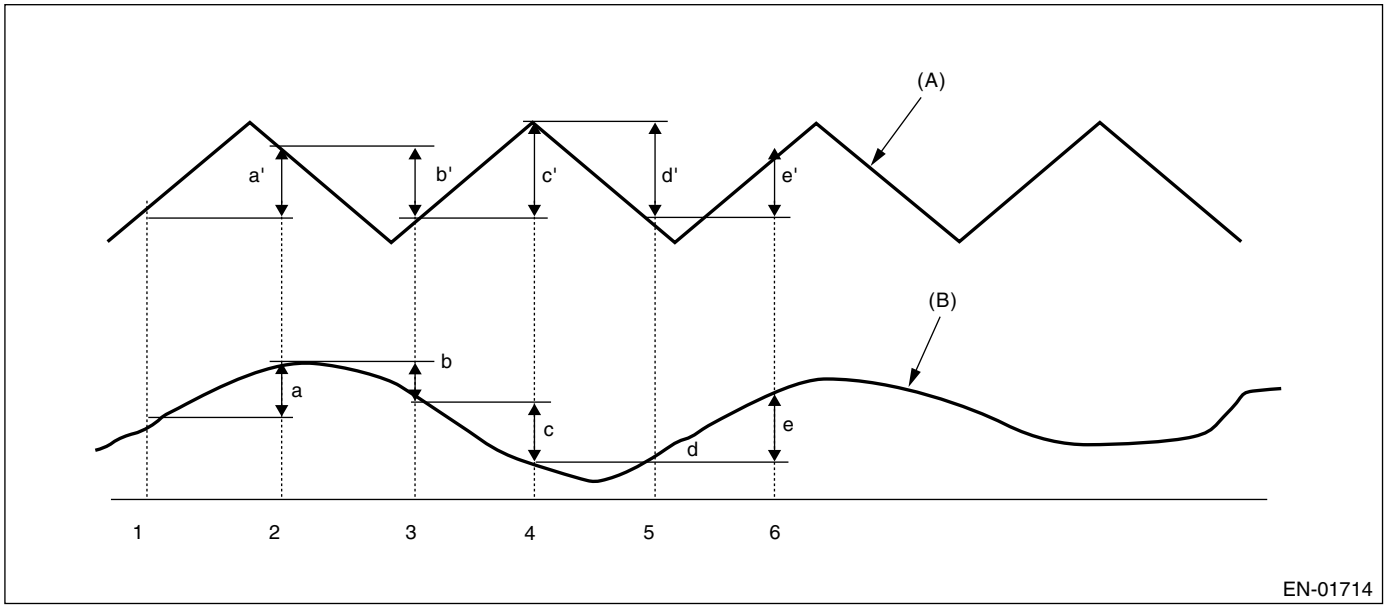
Perform the diagnosis once with a constant vehicle speed 74 km/h (40 MPH).

4. DIAGNOSTIC METHOD

• Output fluctuation accumulate method

The accumulated value of front A/F sensor output changes and the accumulated value of rear oxygen sensor output changes are determined, and the diagnostic value is calculated using the following formula.
Diagnostic value = Accumulated value of rear oxygen sensor output changes / Accumulated value of front A/F sensor output changes

• For example



(A) Front oxygen (A/F) sensor output waveform

(B) Rear oxygen sensor output waveform

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output Voltage of rear oxygen sensor per 50 milliseconds divided by accumulated Variation of output voltage of front lambda sensor per 50 milliseconds	≥ 1.4

Time Needed for Diagnosis: 45 seconds
Malfunction Indicator Light Illumination: 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

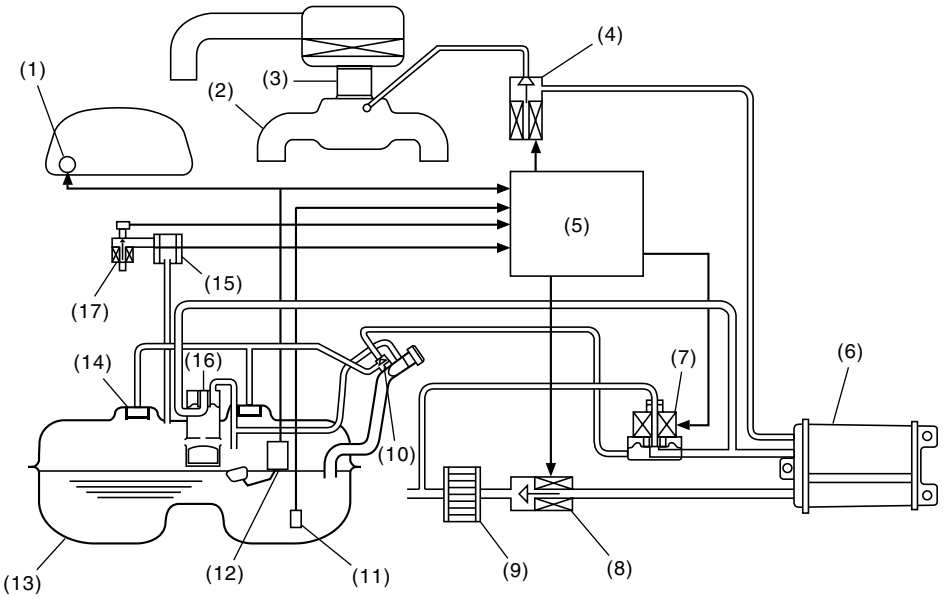
8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

AV:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.

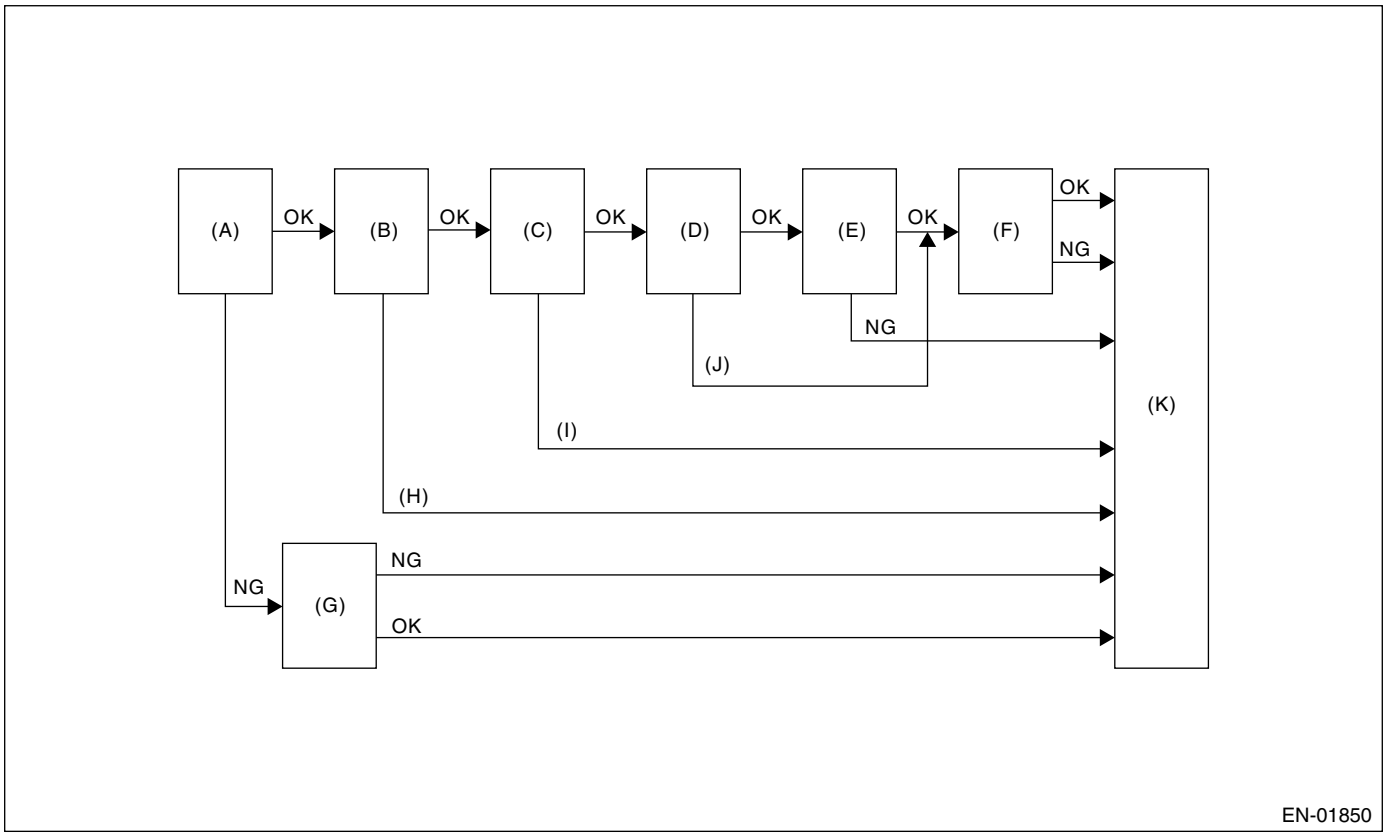


EN-01699

(1) Fuel gauge
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) CCV
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve
(17) Tank pressure switching solenoid valve

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure, and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

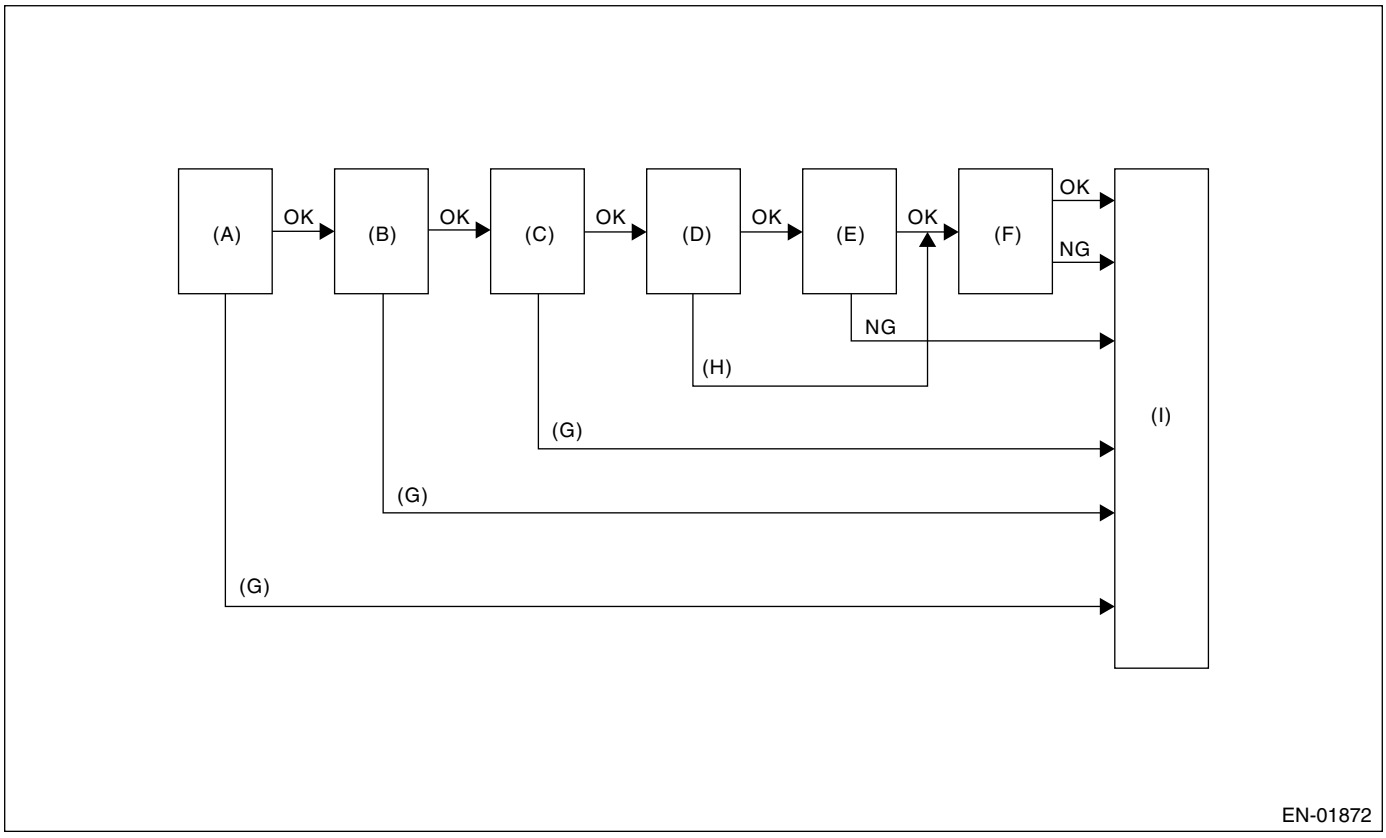
• 0.04-inch Diagnosis



(A) Mode Z
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Mode Z Extend
(H) Cancel
(I) Large leakage judgement
(J) Early OK
(K) END

Mode	Mode Description	Diagnosis Period
Mode Z (CCV abnormal close diagnosis)	Carry out CCV close trouble diagnosis according to tank pressure change amount after the diagnosis has started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	7 — 15.5 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leakage.	5 — 35 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure becomes P2 calculation start pressure. If the tank pressure does not become the value, make advanced OK judgment.	4 — 16 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	7 — 15.5 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leakage diagnosis has finished.	4 seconds

• 0.02-inch Diagnosis



(A) Mode Y
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Cancel
(H) Early OK
(I) END

Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	0.1 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	26 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 62 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure becomes P2 calculation start pressure. If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	22 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leak diagnosis has finished.	4 seconds

• Mode Table for Evaporative Emission Control System Diagnosis

• 0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CCV is judged to be stuck closed.	P1443
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.		
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage judgment	P0457
Mode C	Target pressure is reached.		
Mode D	Pressure change is small.	Evaporation system is judged to have large leak [1.0 mm (0.04 in)].	P0442
Mode E	Return to atmosphere	CCV property judgment	P1443

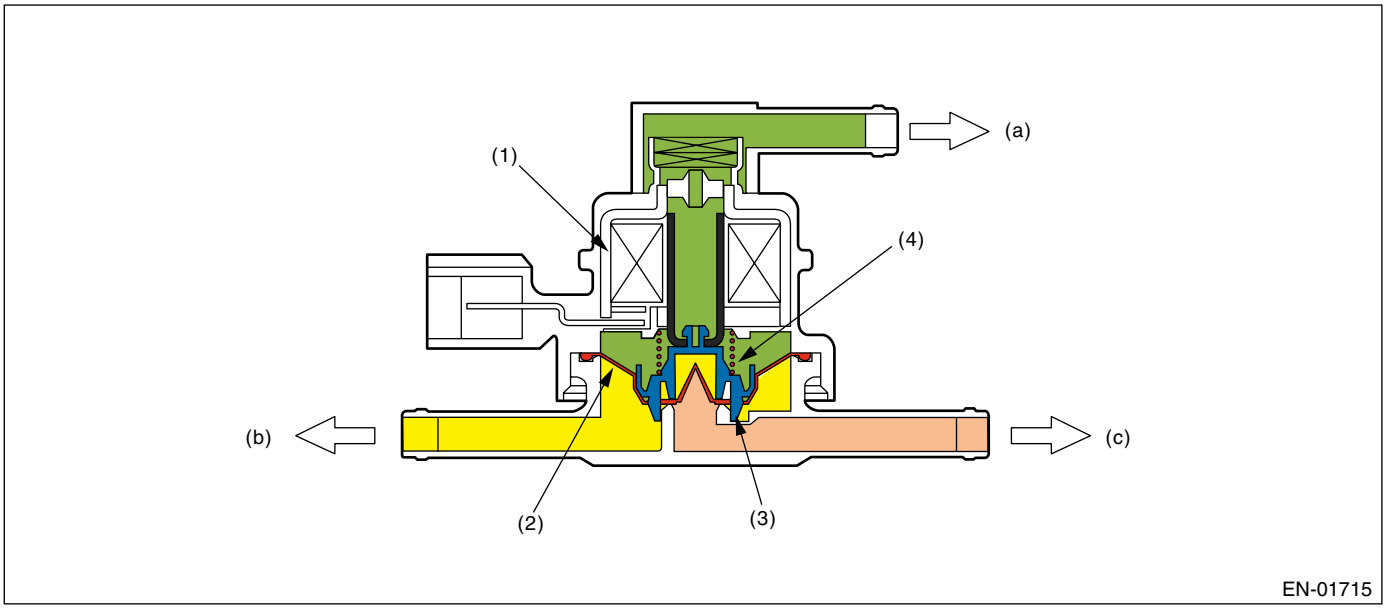
• 0.02-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere		
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.		
Mode B	Negative pressure is formed due to intake manifold negative pressure		
Mode C	Target pressure is reached.		
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in)].	P0456
Mode E	Return to atmosphere	CCV property judgment	P1443

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

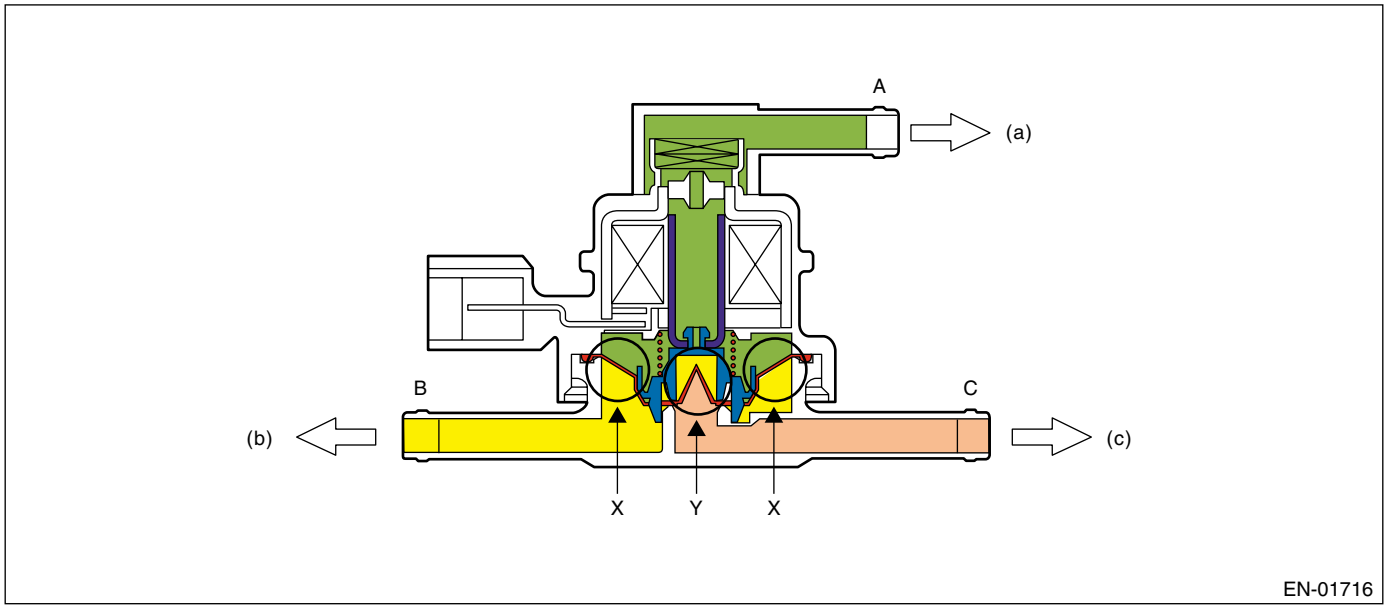
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
Also the valve is able to forcibly opened by setting the solenoid to ON.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

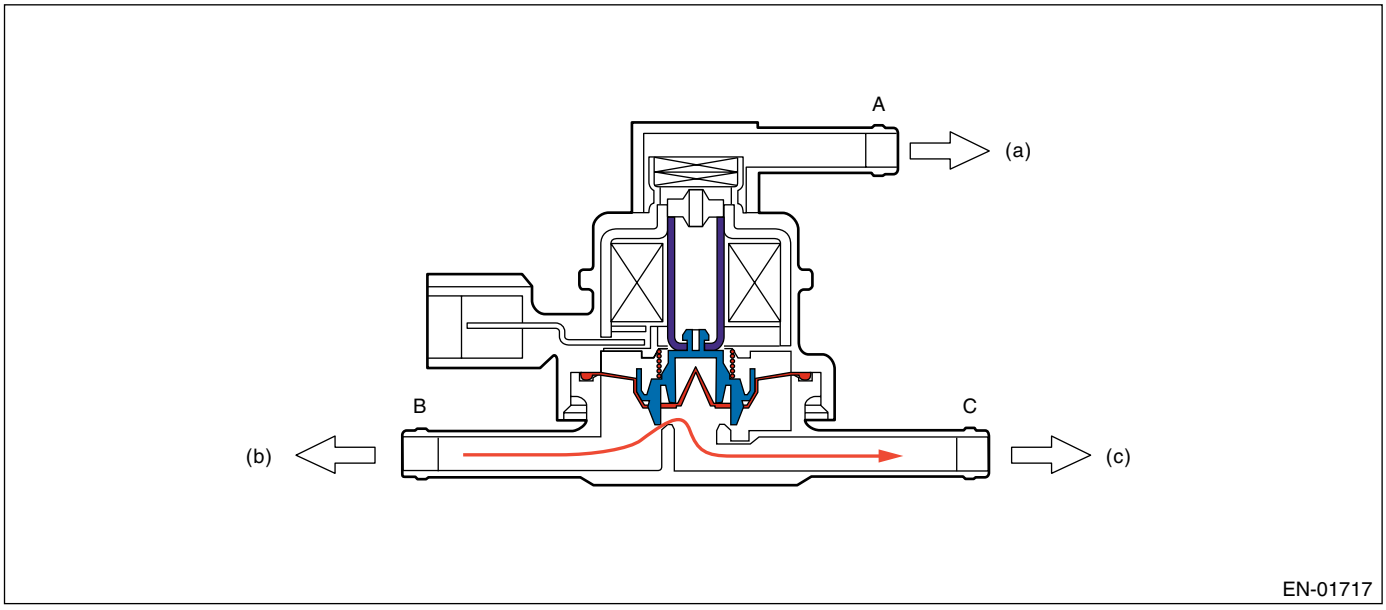
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Atmospheric pressure (b) Fuel tank (c) Canister

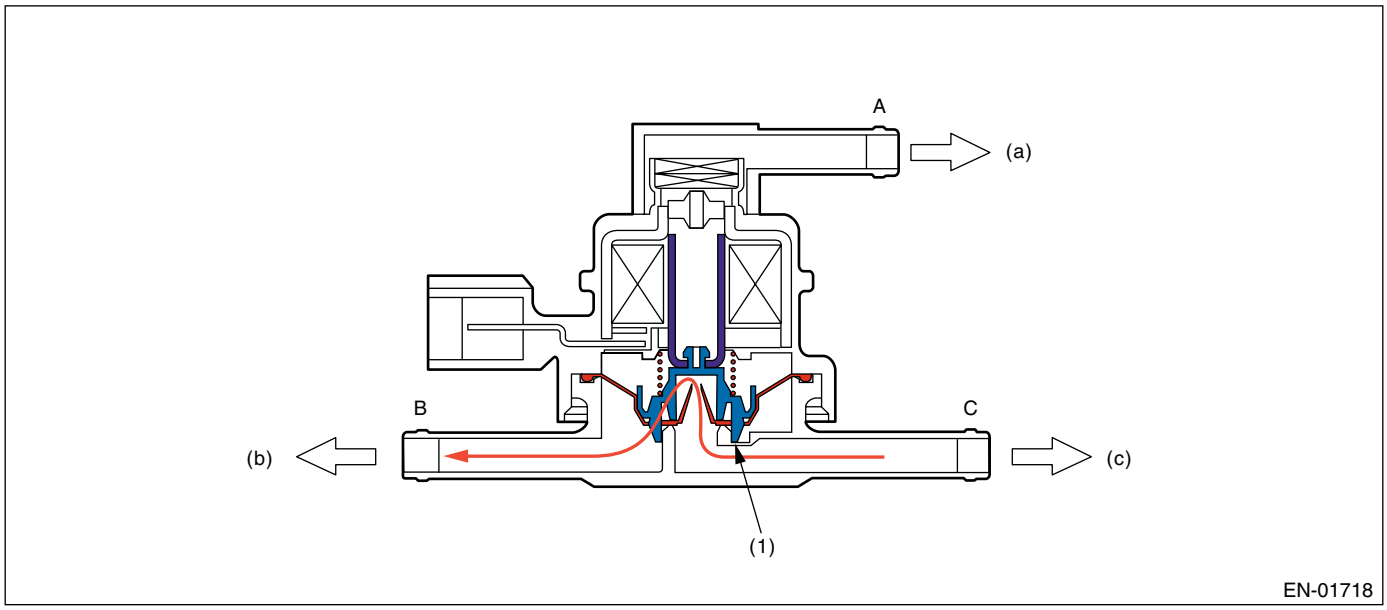
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



(a) Atmospheric pressure (b) Fuel tank (c) Canister

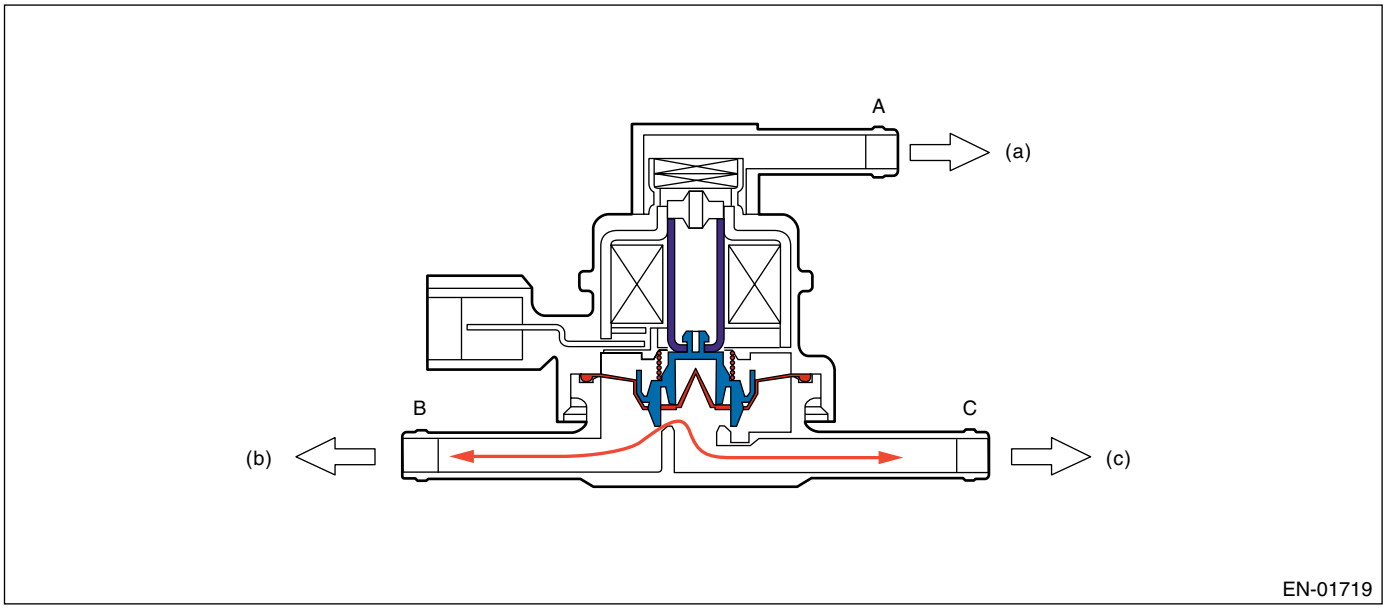
• When B < C (Solenoid OFF)



(1) Atmospheric pressure

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• When Solenoid is ON



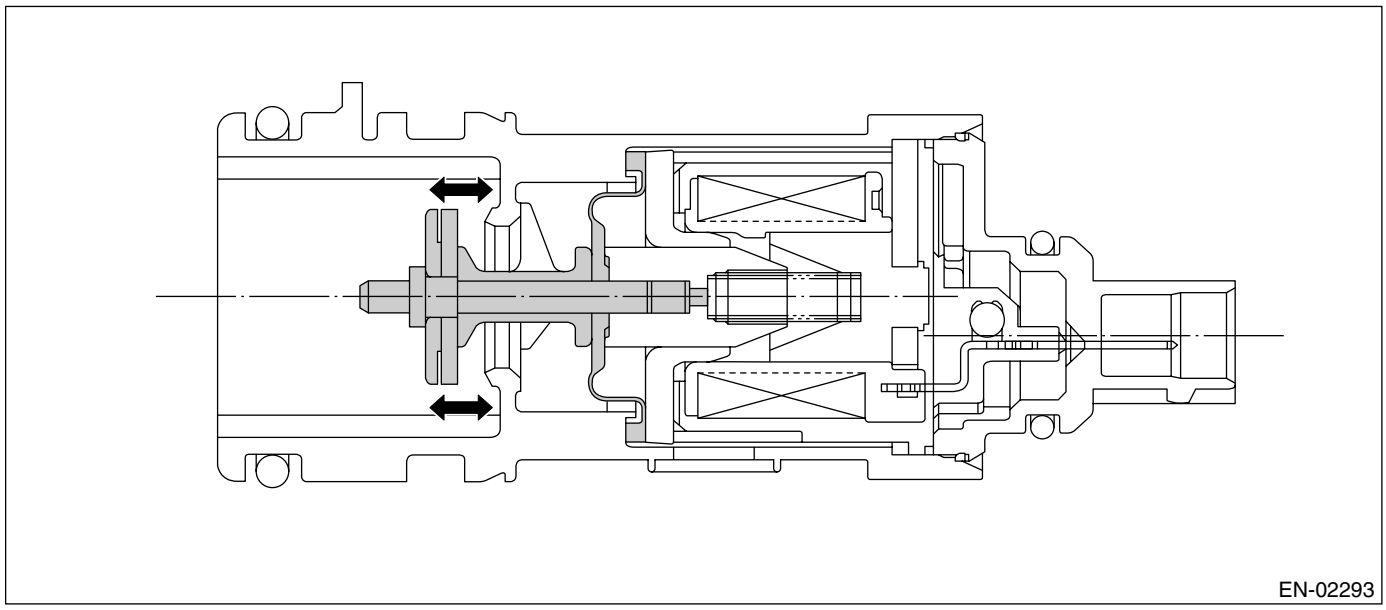
(a) Atmospheric pressure

(b) Fuel tank

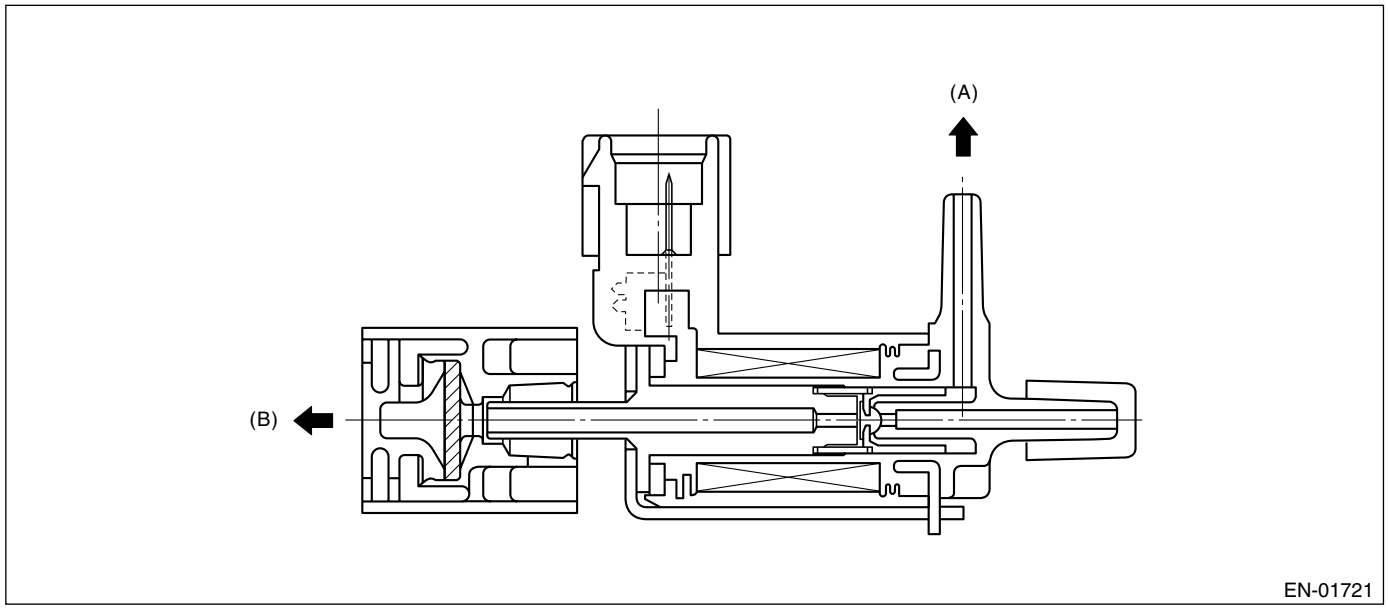
(c) Canister

• CCV

In normal condition, drain valve opens when solenoid is turning OFF, and the solenoid is turned ON when diagnosis and the valve close.



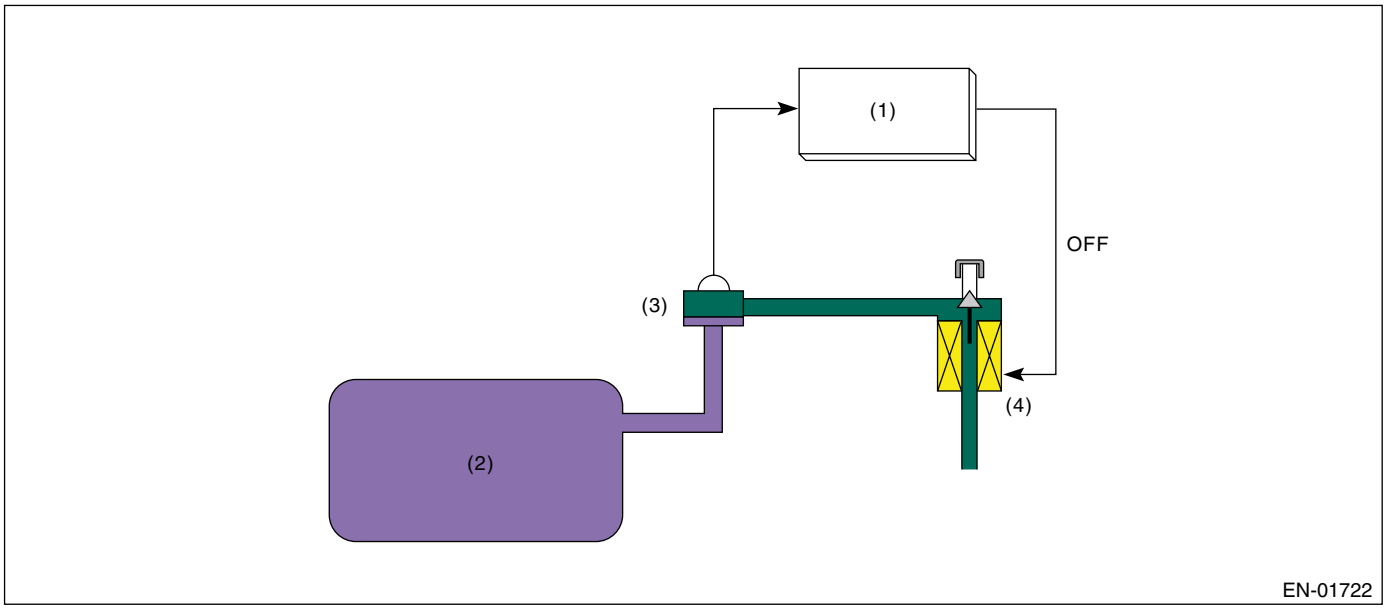
• Tank Pressure Switching Solenoid



(A) Fuel tank pressure sensor (B) Atmosphere

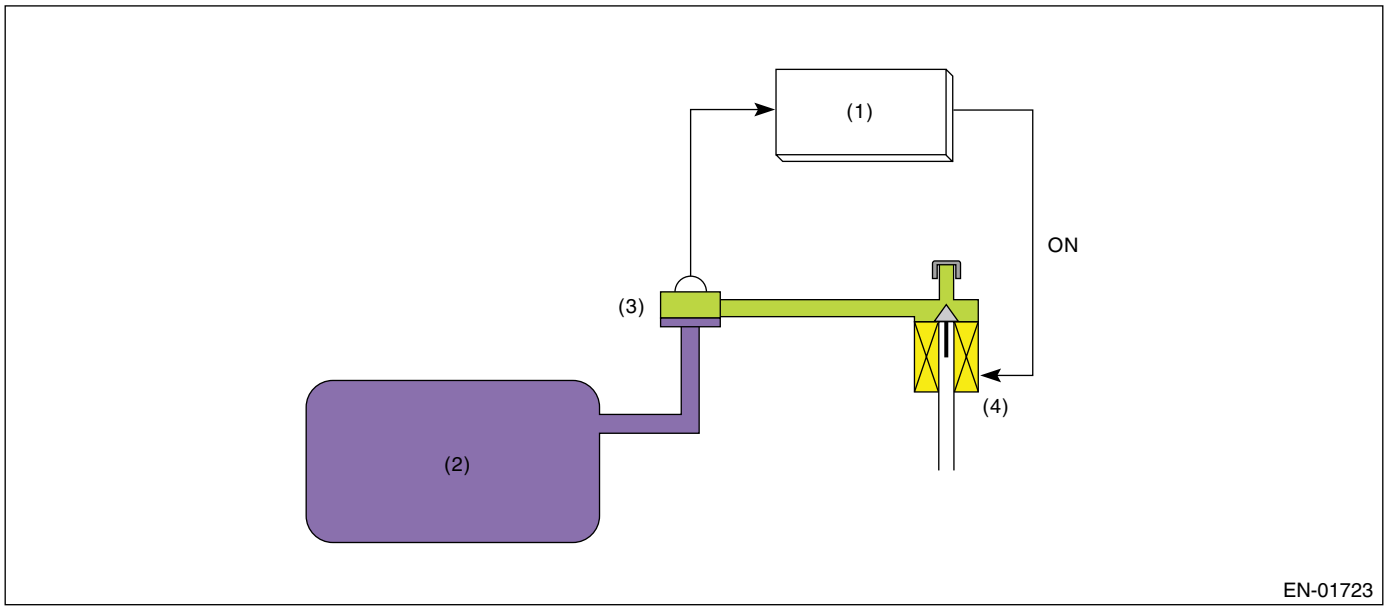
• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.
Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Closed air fuel ratio	In operation
Throttle angle	0.96 — 14.08°
Canister purge cumulative time	≥ 120 seconds
Engine speed	≥ 1500 rpm
Fuel tank pressure at Evap. monitoring starting	≥ –1.0 — 1.6 kPa (–7.5 — 12 mmHg, –0.295 — 0.472 inHg)
Intake manifold relative pressure	≤ –26.7 kPa (–200 mmHg, –7.87 inHg)
Vehicle speed	≥ 48 km/h (30 MPH)
Fuel level	9.6 — 48 ℓ (2.54 — 10.68 US gal, 2.11 — 10.56 Imp gal)
After engine started	More than 454 seconds
Barometric pressure	≥ 75.7 kPa (568 mmHg, 22.36 inHg)
Fuel temperature	–10 — 45°C (14 — 113°F)

Cancel Conditions

Secondary Parameters	Enable Conditions
Change of fuel level	≥ 5 ℓ (1.3 US gal, 1.1 Imp gal)/200 milliseconds
Throttle angle	≤ 0.640°
Engine speed	≤ 1300 rpm
Intake manifold relative pressure	≤ –16 kPa (–120 mmHg, –4.7 inHg)
Vehicle speed	≤ 48 km/h (30 MPH)
Compensation factor of air fuel ratio	≤ –30%
Tank pressure variation amount	≥ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Pressure difference between max. and min. per 1 second while monitoring	< 0.09 kPa (0.656 mmHg, 0.026 inHg)
Time after finishing the previous 0.04-inch leakage diagnosis	> 180 seconds

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
Continuous time of completing the all conditions below.	≥ 5 seconds
Fuel tank pressure at vacuum starting	0 — 1.26 kPa (0 — 9.45 mmHg, 0 — 0.0372 inHg)
Since last incomplete diagnosis event of 0.02 inches leak	> 180 seconds
Total time of operating canister purge	More than 120 seconds
After engine started	More than 325 seconds
Fuel tank pressure below −3050 Pa (−22.87 mmHg, −0.9007 inHg) during same driving cycle	< 2 times
Fuel temperature	−10 — 35°C (14 — 95°F)
After engine start with coolant temperature of 40°C or below	< 2400 seconds
Fuel level	96 — 48 ℓ (2.54 — 10.68 US gal, 2.11 — 10.56 Imp gal)
Atmospheric pressure	≥ 75.7 kPa (568 mmHg, 22.3 inHg)
Ambient temperature	≥ −10°C (14°F)
(Ambient-fuel) temperature	< 1°C (34°F)
Closed air fuel ratio control	In operation

Cancel Conditions

Secondary Parameters	Enable Conditions
Lambda factor	< 0.75
P1	≥ 125 Pa (0.94 mmHg, 0.04 inHg)
P1	< −87.5 kPa (−0.66 mmHg, −0.03 inHg)
Change of fuel level	≥ 3.5 ℓ (3.7 US gal, 3.1 Imp gal)
Pressure difference between max. and min. per 1 second while monitoring	≥ 87.5 Pa (0.62 mmHg, 0.024 inHg)
Change of atmospheric pressure during calculation of P1	≥ 137.5 kPa (0.97 mmHg, 0.038 inHg)
Change of atmospheric pressure during calculation of P2	≥ 225 Pa (1.58 mmHg, 0.062 inHg)
Change of fuel level after engine starting (8 ℓ or more)	≤ 0 times
Change of engine speed after starting the diagnosis	≥ 600 rpm
Change of manifold absolute pressure after starting the diagnosis	≥ 40.0 kPa (300 mmHg, 11.81 inHg)

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

• Perform the diagnosis only once in more than 454 seconds after the engine start at the constant driving speed of 48 km/h (30 MPH) or more.
• Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

• Perform diagnosis in more than 325 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
• If not judged OK or NG, repeat the diagnosis until judged OK or NG.
• Pay attention to the fuel temperature and fuel level.

5. DIAGNOSTIC METHOD

• MODE Y (Tank pressure stabilization)

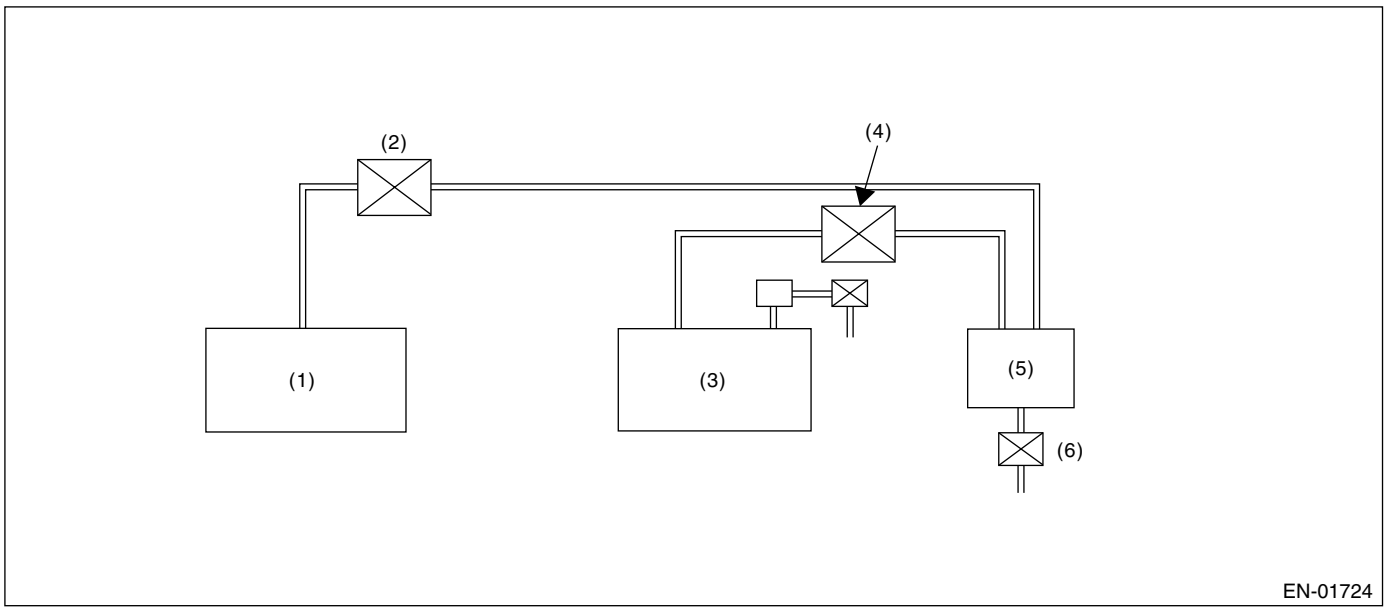
Perform the diagnosis under the conditions, and return the tank pressure to atmosphere.
Tank pressure > 0.9 kPa (67.5 mmHg, 2.7 inHg) after 0.1 seconds:
Cancel the leak check. (Change to Mode A, Tank pressure ≤ 0.9 kPa (67.5 mmHg, 2.7 inHg).)

• MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

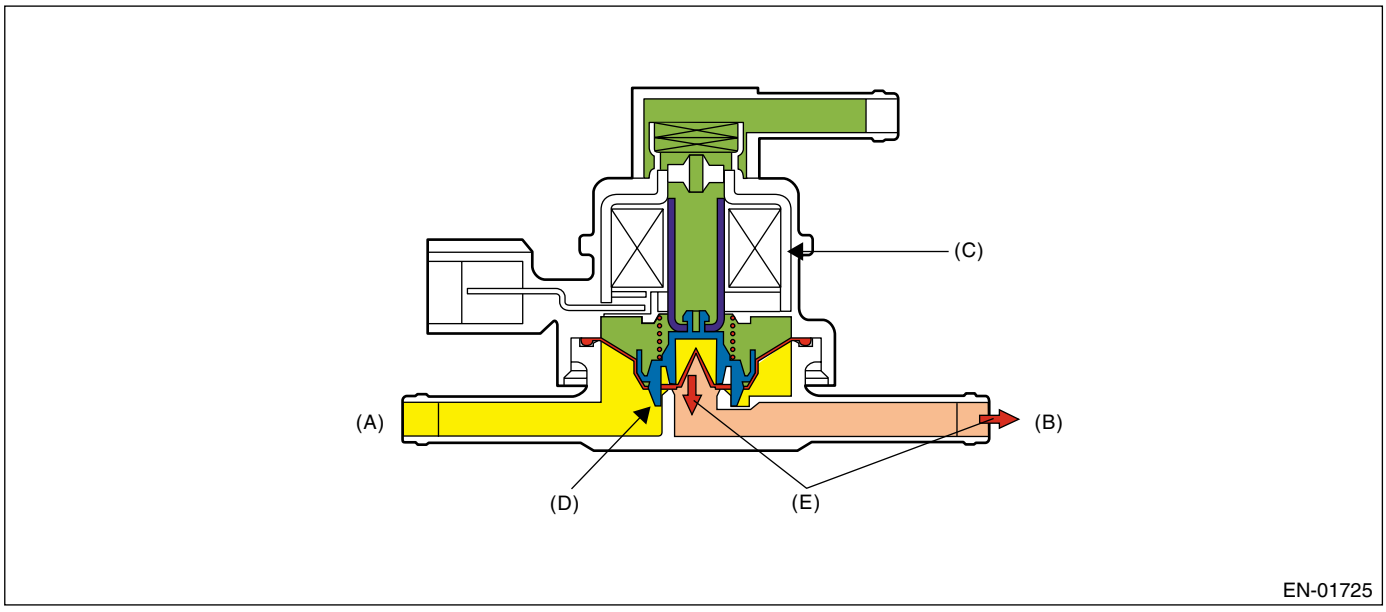
DTC P0457
DTC P1443

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.
If the CCV closed fixation trouble or CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.
If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. Under this condition, the valve cannot be opened for the pressure control solenoid valve structure if the negative pressure is larger than electromagnetic force when pressure control solenoid valve solenoid is set to ON in order to open the valve.



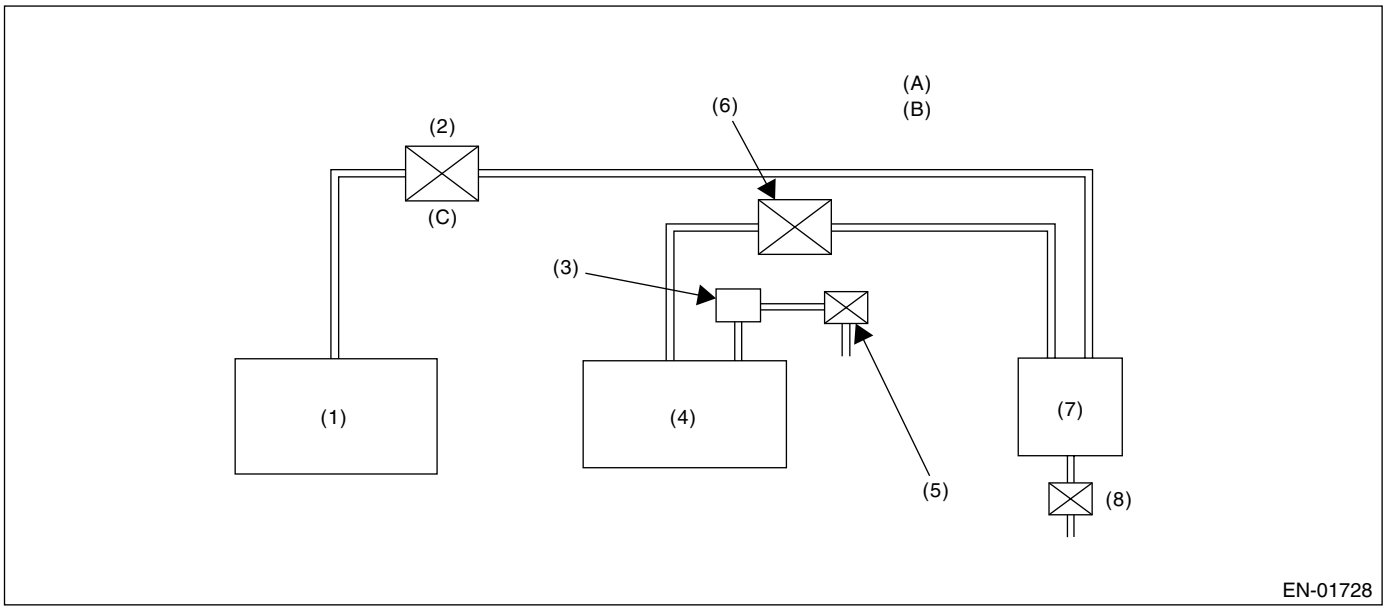
(1) Engine
(2) Purge control solenoid valve open
(3) Fuel tank
(4) Pressure control solenoid valve close
(5) Canister
(6) CCV stuck close



(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

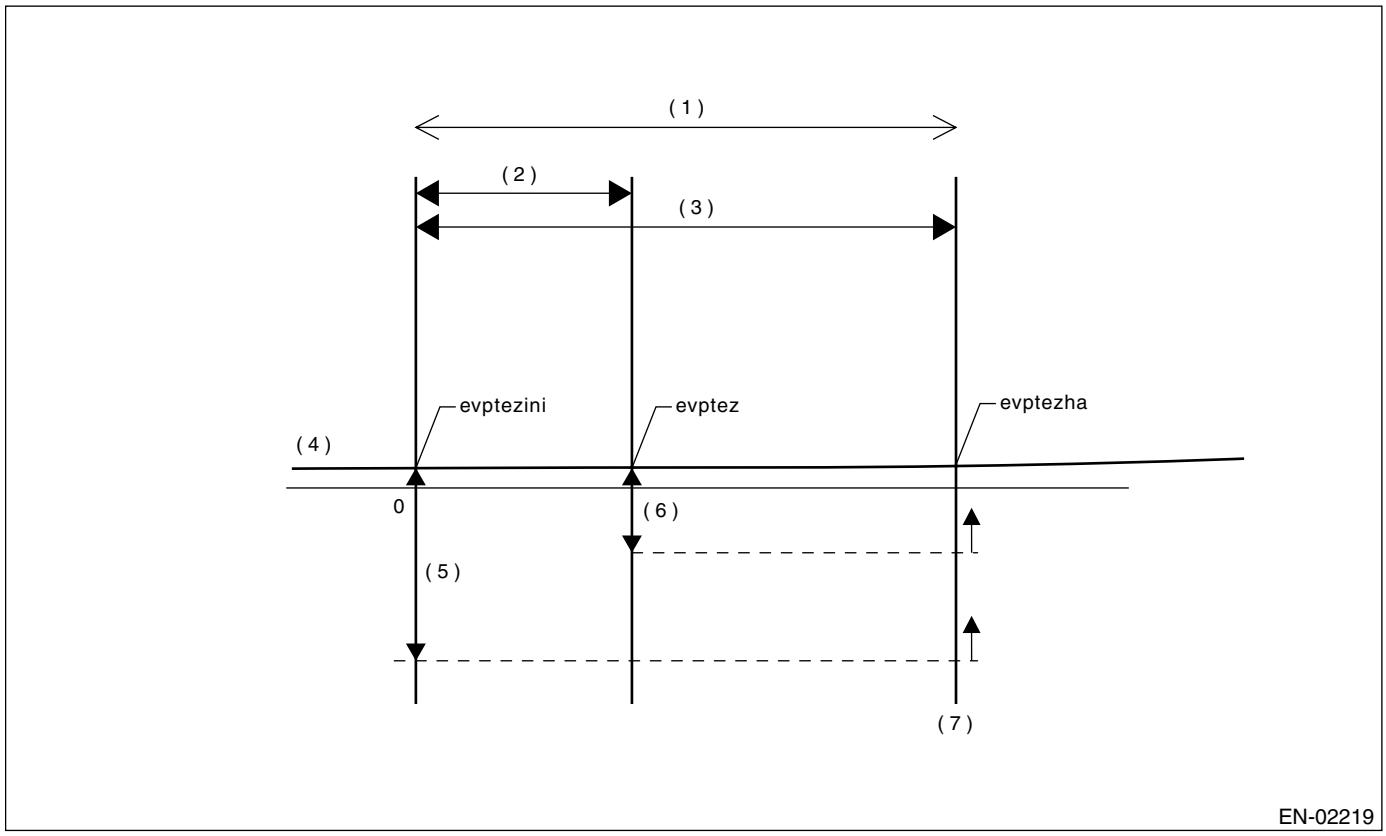
• Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Tank pressure switching solenoid valve
(A) Normal condition: mechanical control
(B) Under the diagnosis: electronic control

• Normal Operation

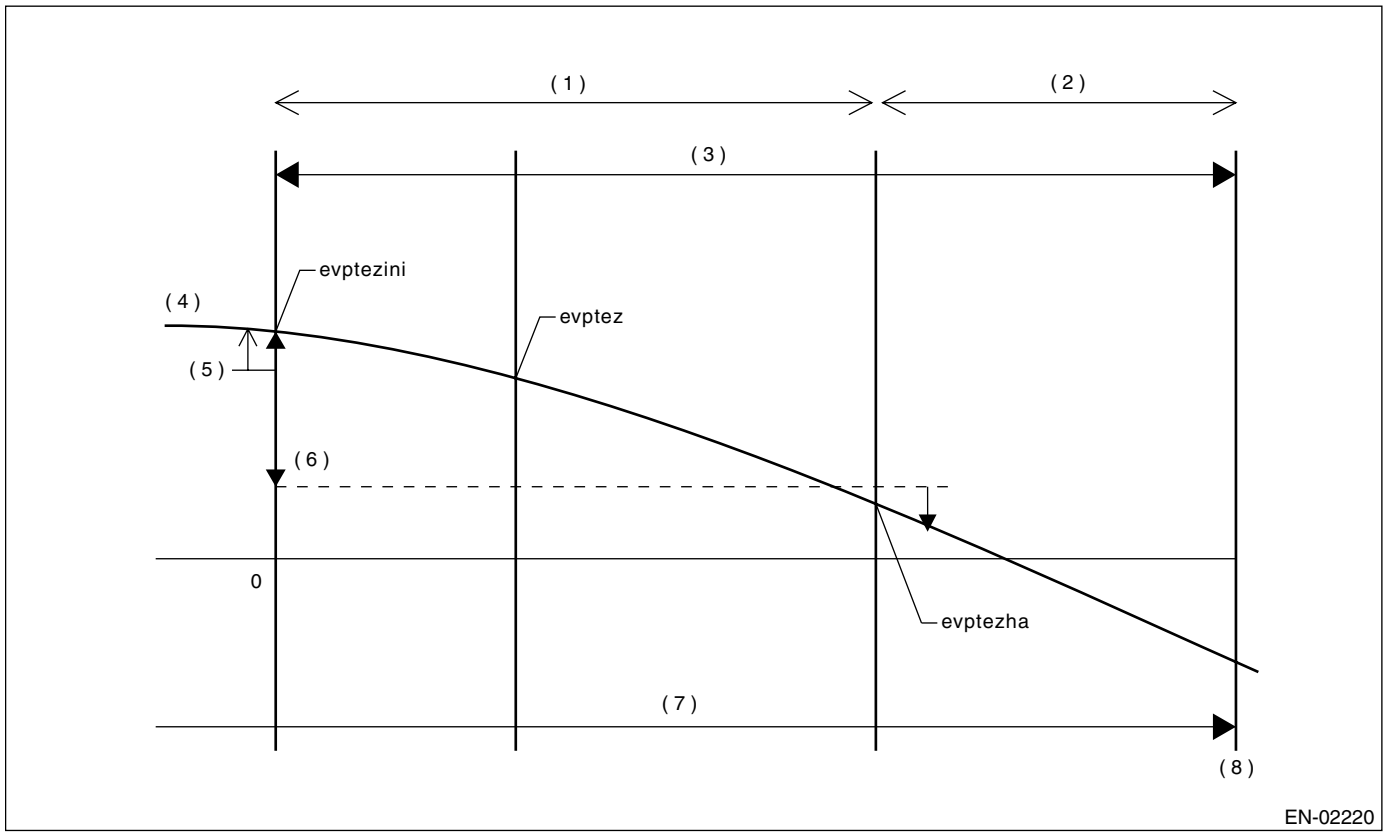


(1) Mode Z
(2) 1 second
(3) 3 seconds
(4) Fuel tank pressure
(5) 1.0 kPa (7.5 mmHg, 0.295 inHg)
(6) 0.4 kPa (3.0 mmHg, 0.12 inHg)
(7) Ok judgment

- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini – evptezha ≤ 1.0 kPa (7.5 mmHg, 0.295 inHg)

Judge normal when these calculations are completed.

• Drain valve close fixation



(1) Mode Z
(2) Extended Mode Z
(3) 10 seconds
(4) Fuel tank pressure
(5) 1.0 kPa (7.5 mmHg, 0.177 inHg)
(6) 0.6 kPa (4.5 mmHg, 0.295 inHg)
(7) No fuel rolling for more than 35 seconds
(8) NG judgment

- evptezini – evptezha > 0.6 kPa (4.5 mmHg, 0.177 inHg)
- evptezini > 1.0 kPa (7.5 mmHg, 0.295 inHg)

Judge normal when these calculations are completed.

• Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation in Mode Z.

Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after starting Mode Z) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 1.0 kPa (7.5 mmHg, 0.295 inHg)	

Abnormality Judgment
If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when Mode Z started	> 1.0 kPa (7.5 mmHg, 0.295 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Finish the evaporative emission control system diagnosis when making NG judgment for drain valve close fixation.
Cancel the evaporative emission control system diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.
• Leak Diagnosis

DTC P0442
DTC P0456
DTC P0457
• Diagnostic method

• The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
• The diagnosis is divided into the following five phases.
Mode A:
Calculate the tank pressure variation amount (P1) in Mode A. After calculating P1, change to Mode B.
Mode B:
Introduce the negative pressure in the intake manifold to the tank.
Approx. 0 → –1.4 kPa (0 → –10.5 mmHg, 0 → –0.41 inHg) (0.04-in diagnosis)
Approx. 0 → –3.05 kPa (0 → –22.9 mmHg, 0 → –0.9 inHg) (0.02-in diagnosis)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.
Judge NG when the malfunction criteria below is completed.
Finish the Evap. diagnosis when judging large leak (35 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (62 seconds) in 0.02-inch diagnosis.
Abnormality Judgment
Judge NG (large leak) when the criteria below are completed in the specified time.
Specified Time
High vehicle speed mode (Vehicle speed ≥ 72 km/h (45 MPH)); 35 seconds
Low vehicle speed mode (Vehicle speed < 72 km/h (45 MPH)); 18 seconds
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) (Tank pressure when Mode Z started) – (Min. value of tank pressure during Mode B)	< 0.3 kPa (2.25 mmHg, 0.089 inHg)	P0457

Cancel the diagnosis when the NG judgment does not completed in the specified time.
Mode C:
Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D when the tank pressure returns to the start level of P2 calculation.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Tank pressure when P2 calculation started	Time for immediate OK judgment
0.04-inch diagnosis	–1.3 kPa (–9.75 mmHg, –0.38 inHg)	16 seconds
0.02-inch diagnosis	–3 kPa (–22.5 mmHg, –0.89 inHg)	20 seconds

Mode D:
Monitor the pressure variation in the tank in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

• After Diagnosis

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

Abnormality Judgment
Judge NG when the criteria below are completed and judge OK when not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – * × P1 P2 = Tank pressure varying at a specified time in mode D. P1 = Tank pressure varying at a specified time in mode A.	Map 1	P0442

* P1 ≥ 0: 1.5
P1 < 0: 1

• Map 1

	Fuel temperature 25°C (77°F)	Fuel temperature 30°C (86°F)	Fuel temperature 35°C (95°F)	Fuel temperature 40°C (104°F)	Fuel temperature 45°C (113°F)
Fuel remaining 10 ℓ (2.6 US gal, 2.2 Imp gal)	0.34 kPa (2.53 mmHg, 0.10 inHg)	0.36 kPa (2.72 mmHg, 0.11 inHg)	0.44 kPa (3.28 mmHg, 0.13 inHg)	0.45 kPa (3.38 mmHg, 0.13 inHg)	0.46 kPa (3.47 mmHg, 0.14 inHg)
Fuel remaining 20 ℓ (5.3 US gal, 4.4 Imp gal)	0.44 kPa (3.28 mmHg, 0.13 inHg)	0.49 kPa (3.65 mmHg, 0.14 inHg)	0.53 kPa (3.94 mmHg, 0.14 inHg)	0.53 kPa (3.94 mmHg, 0.14 inHg)	0.53 kPa (3.94 mmHg, 0.14 inHg)
Fuel remaining 50 ℓ (13.2 US gal, 11.0 Imp gal)	0.53 kPa (3.94 mmHg, 0.14 inHg)	0.54 kPa (4.03 mmHg, 0.16 inHg)	0.56 kPa (4.22 mmHg, 0.17 inHg)	0.64 kPa (4.78 mmHg, 0.19 inHg)	0.66 kPa (4.97 mmHg, 0.2 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment
Judge NG when the criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – * × P1 P2 = Tank pressure varying at a specified time in mode D. P1 = Tank pressure varying at a specified time in mode A.	Map 2	P0456

* P1 ≥ 0: 1.5
P1 < 0: 1

• Map 2

	Fuel temperature 20°C (68°F)	Fuel temperature 25°C (77°F)	Fuel temperature 30°C (86°F)	Fuel temperature 35°C (95°F)	Fuel temperature 40°C (104°F)
Fuel remaining 10 ℓ (2.6 US gal, 2.2 Imp gal)	0.46 kPa (3.47 mmHg, 0.14 inHg)	0.46 kPa (3.47 mmHg, 0.14 inHg)	0.46 kPa (3.47 mmHg, 0.14 inHg)	0.46 kPa (3.47 mmHg, 0.14 inHg)	0.80 kPa (6.00 mmHg, 0.24 inHg)
Fuel remaining 30 ℓ (7.9 US gal, 6.6 Imp gal)	0.53 kPa (3.94 mmHg, 0.15 inHg)	0.53 kPa (3.94 mmHg, 0.15 inHg)	0.59 kPa (4.41 mmHg, 0.17 inHg)	0.66 kPa (4.97 mmHg, 0.2 inHg)	1.14 kPa (8.53 mmHg, 0.34 inHg)
Fuel remaining 50 ℓ (13.2 US gal, 11.0 Imp gal)	0.54 kPa (4.03 mmHg, 0.16 inHg)	0.59 kPa (4.41 mmHg, 0.17 inHg)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.88 mmHg, 0.19 inHg)	1.11 kPa (8.34 mmHg,0.33 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

• Judgment Value

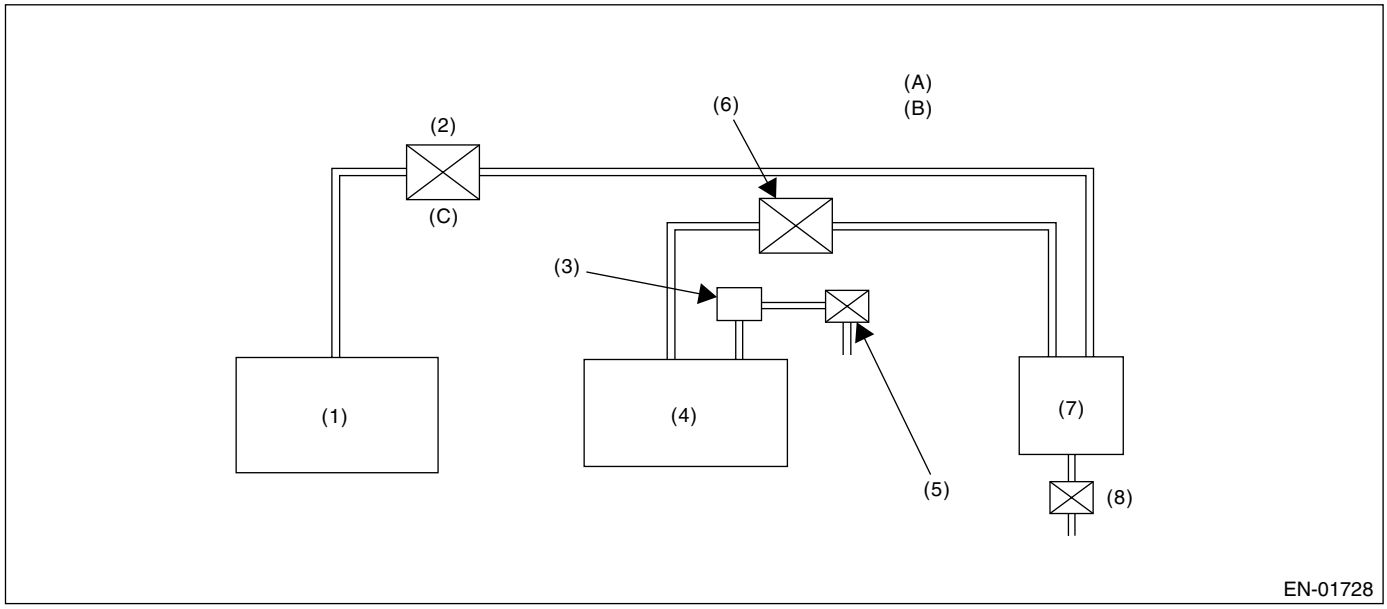
Malfunction Criteria	Threshold Value	DTC
P2 – * × P1	Map 3	P0456

* P1 ≥ 0: 1.5
P1 < 0: 1

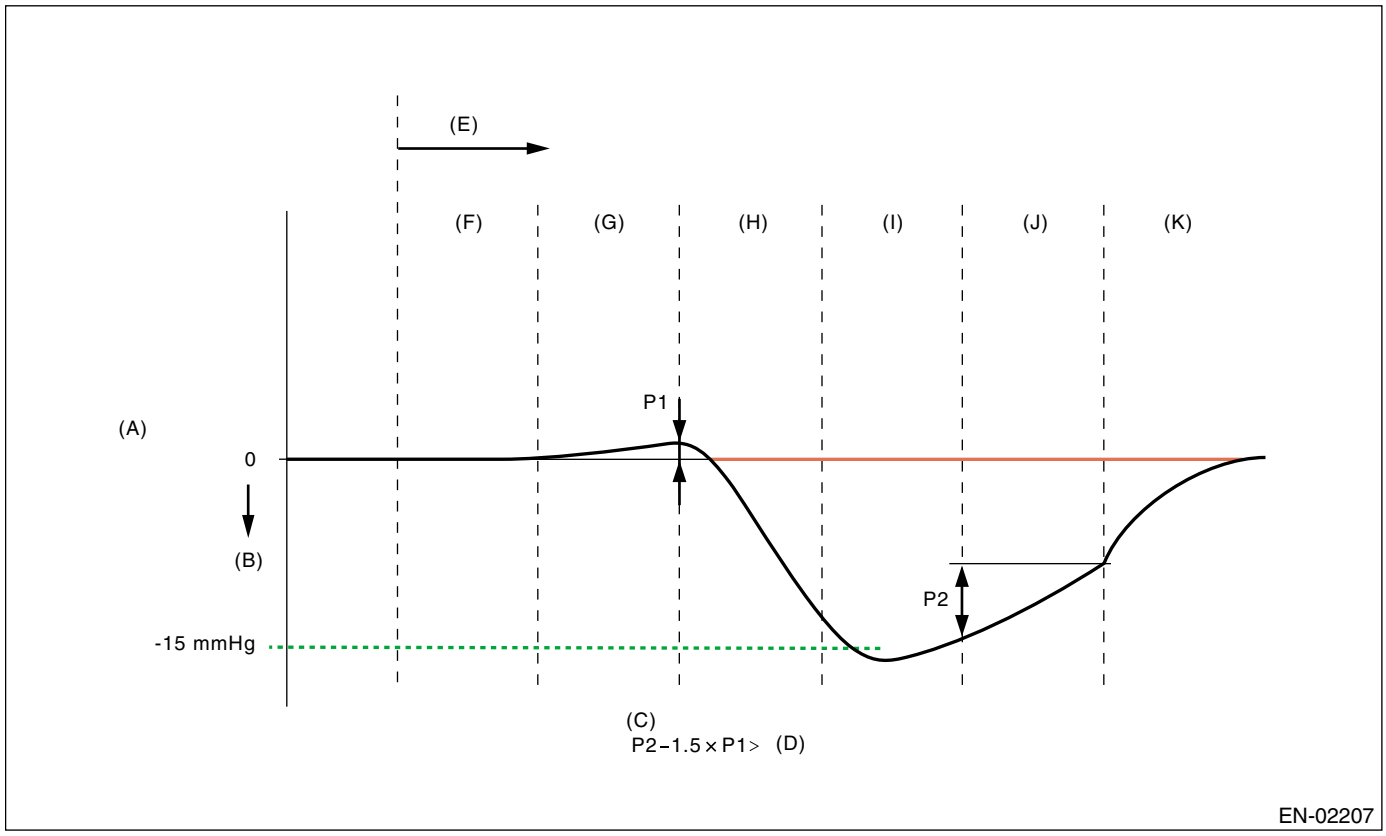
• Map 3

	Fuel temperature 20°C (68°F)	Fuel temperature 25°C (77°F)	Fuel temperature 30°C (86°F)	Fuel temperature 35°C (95°F)	Fuel temperature 40°C (104°F)
Fuel remaining 10 ℓ (2.6 US gal, 2.2 Imp gal)	0.32 kPa (2.43 mmHg, 0.096 inHg)	0.32 kPa (2.43 mmHg, 0.096 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)
Fuel remaining 30 ℓ (7.9 US gal, 6.6 Imp gal)	0.31 kPa (2.34 mmHg, 0.092 inHg)	0.36 kPa (272 mmHg, 0.107 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)
Fuel remaining 50 ℓ (13.2 US gal, 11.0 Imp gal)	0.31 kPa (2.34 mmHg, 0.092 inHg)	0.36 kPa (272 mmHg, 0.107 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)	0.39 kPa (2.91 mmHg, 0.115 inHg)

If not judged OK or NG, repeat the diagnosis.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve
(A) Normal condition: mechanical control
(B) Under the diagnosis: electronic control
(C) Duty control



(A) Fuel tank internal pressure
(B) Negative pressure
(C) Small leakage
(D) Threshold value
(E) Diagnosis start
(F) Mode Z
(G) Mode A
(H) Mode B
(I) Mode C
(J) Mode D
(K) Mode E

• CCV Property Diagnosis [P1443]

Mode E:
The tank pressure must become again as high as the atmospheric air pressure after the evaporation diagnosis. If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later	< 0.4 kPa (3.0 mmHg, 0.118 inHg)	P1443

• Time Needed for Diagnosis:

0.04-inch: 30 — 70 seconds
0.02-inch: 45 — 90 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

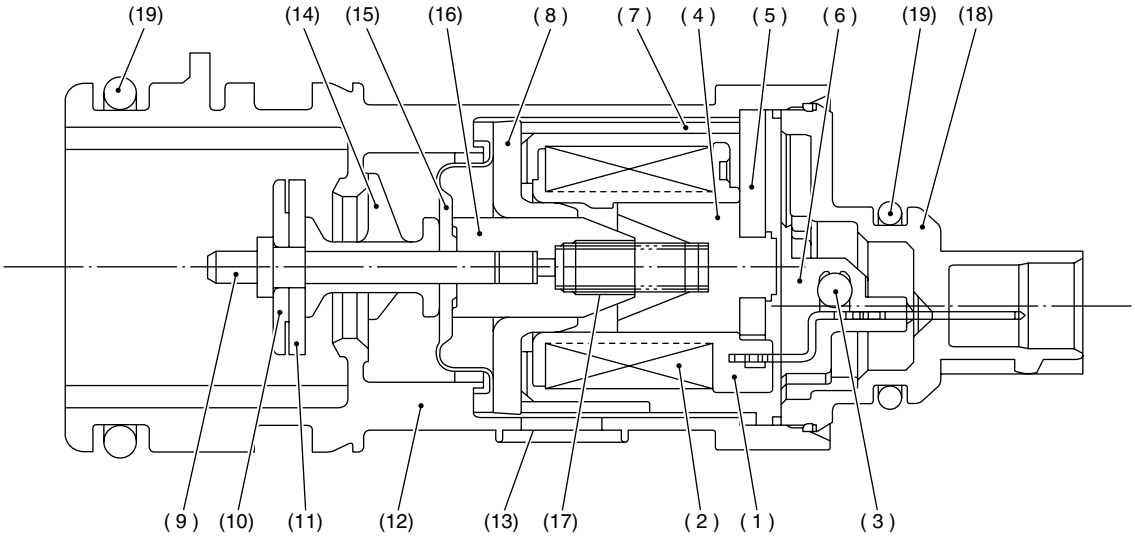
MEMO:

AW:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is not equal to the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Moving core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After starting the engine	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after string the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below become more than time (2.5 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal.	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal.	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Open PCV solenoid.

9. ECM OPERATION AT DTC SETTING

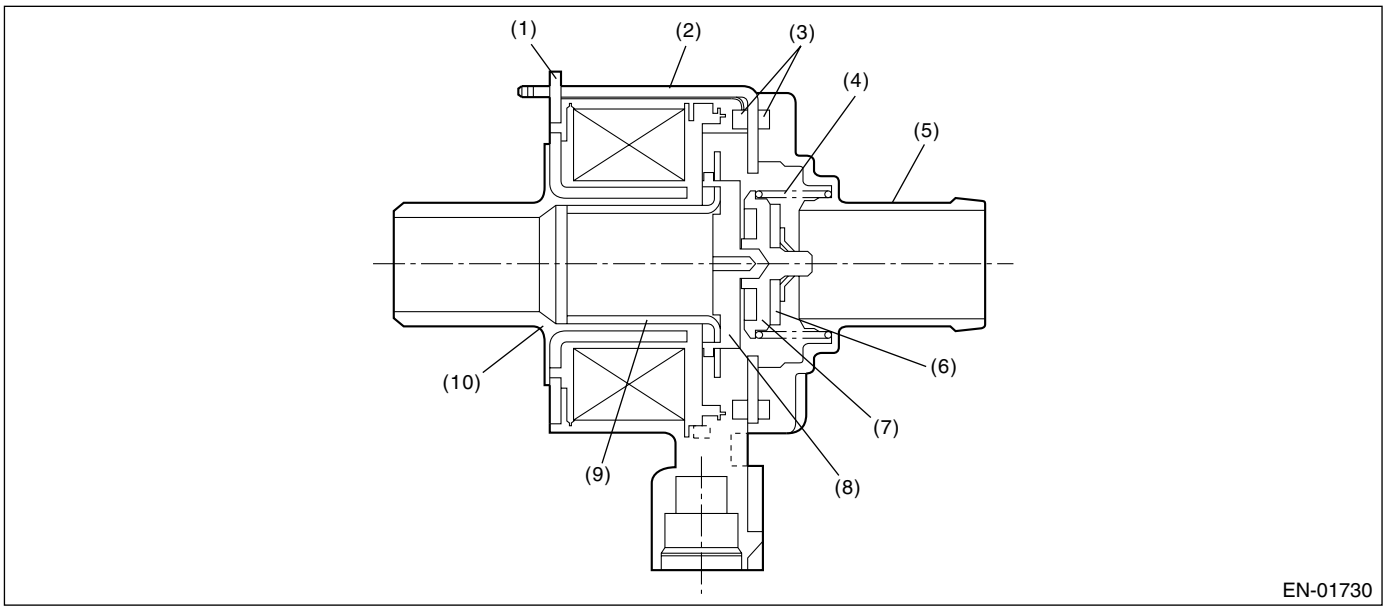
Memorize the freeze frame data. (For test mode $02)

AX:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

1. OUTLINE OF DIAGNOSIS

Detect the short circuit of drain valve.
Judge NG when the ECU output level is not equal to the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After starting the engine	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below become more than time (2.5 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal.	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal.	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Open PCV solenoid.

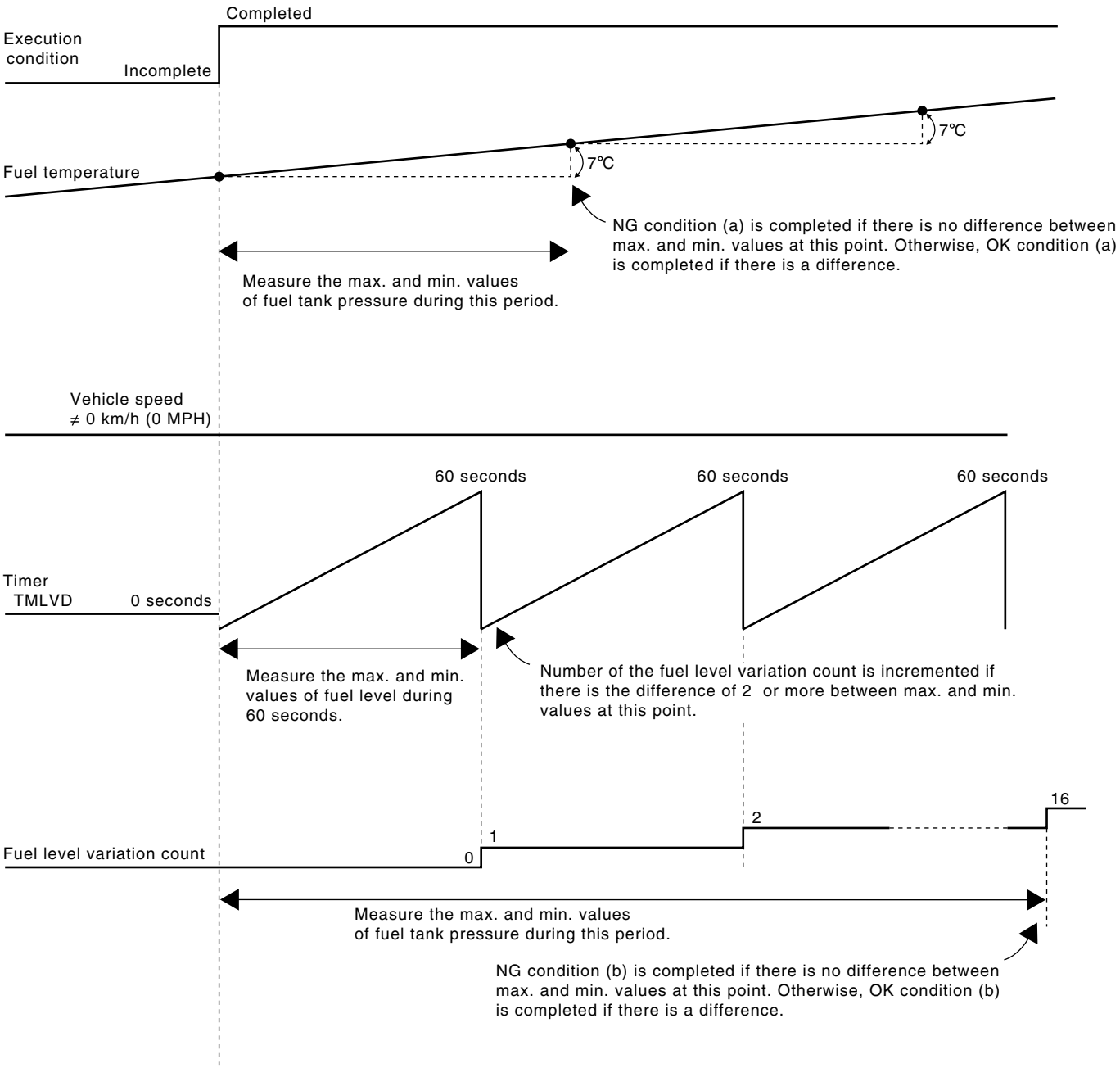
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AY:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tank pressure sensor output property.
Judge NG when there is little variation in the fuel tank pressure even if the vehicle is in driving status where there must be variation in the fuel tank pressure considering the fuel temperature and fuel level.



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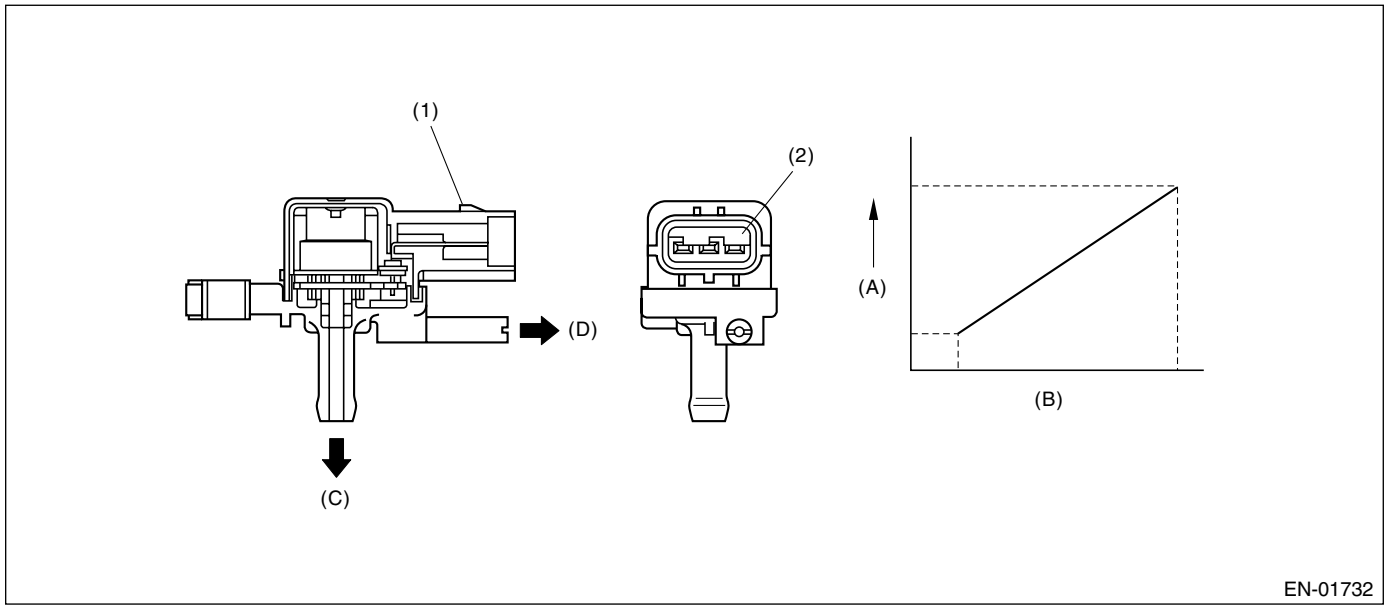
• If NG condition (a) & (b) are experienced, NG results.
(If there is OK, NG experience becomes unexperienced.)
• If OK conditions (a) & (b) are experienced, OK results.
(If there is NG, OK experience becomes unexperienced.)

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To tank pressure switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Timer after starting the engine	≥ 30 seconds
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 30 seconds after starting the engine.

5. DIAGNOSTIC METHOD

(1) There is no tank pressure variation when there is fuel temperature variation of 7°C (45°F).
(2) There is no tank pressure variation even when there is fuel level variation of 2 ℓ (0.5 US gal, 0.4 Imp gal) or more every 60 seconds.
Judge NG when both of the conditions above are experienced.

• Abnormality Judgment

Judge NG when both of the conditions below are experienced.

• Judgment Value

Malfunction Criteria	Threshold Value
Change of fuel temperature	≥ 7°C (45°F)
Max. – min. tank pressure	≤ 100 Pa (0.75 mmHg, 0.03 inHg)
Total time lapse where there is fuel level variation of 2 ℓ (0.5 US gal, 0.4 Imp gal) or more per minute.	≥ 16 minutes

Time Needed for Diagnosis: 10 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when both of the conditions below are experienced, and clear NG.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – min. tank pressure (During fuel temperature variation of 7°C (45°F))	> 100 Pa (0.75 mmHg, 0.03 inHg)
Change of fuel temperature	≥ 7°C (45°F)

Malfunction Criteria	Threshold Value
Max. – min. tank pressure (During time lapse below)	> 100 Pa (0.75 mmHg, 0.03 inHg)
Total time lapse where there is fuel level variation of 2 ℓ (0.5 US gal, 0.4 Imp gal) or more per minute.	≥ 10 minutes

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel tank pressure at 0 kPa (0 mmHg, 0 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

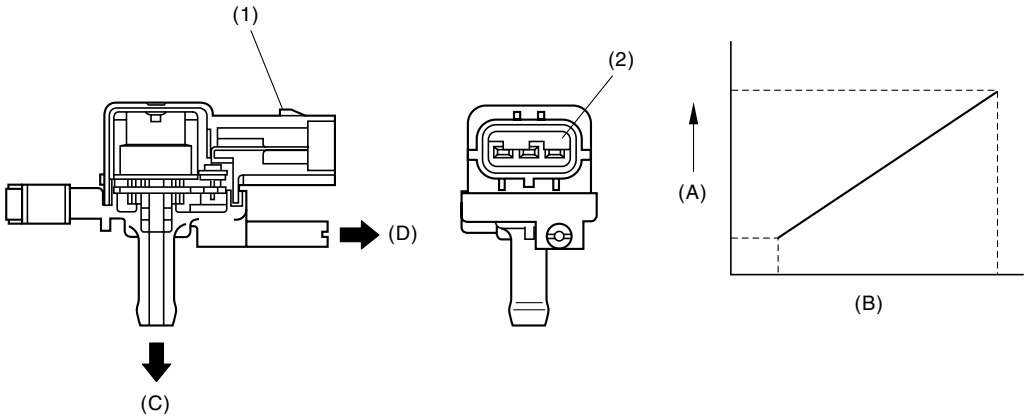
MEMO:

AZ:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To tank pressure switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
After engine starting	2 seconds or more
Pressure control solenoid valve	Opened
Vent control solenoid valve	Closed
Canister purge control solenoid valve duty ratio	≤ 0%

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all of the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.2 V

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.2 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel tank pressure at 0 kPa (0 mmHg, 0 inHg).

9. ECM OPERATION AT DTC SETTING

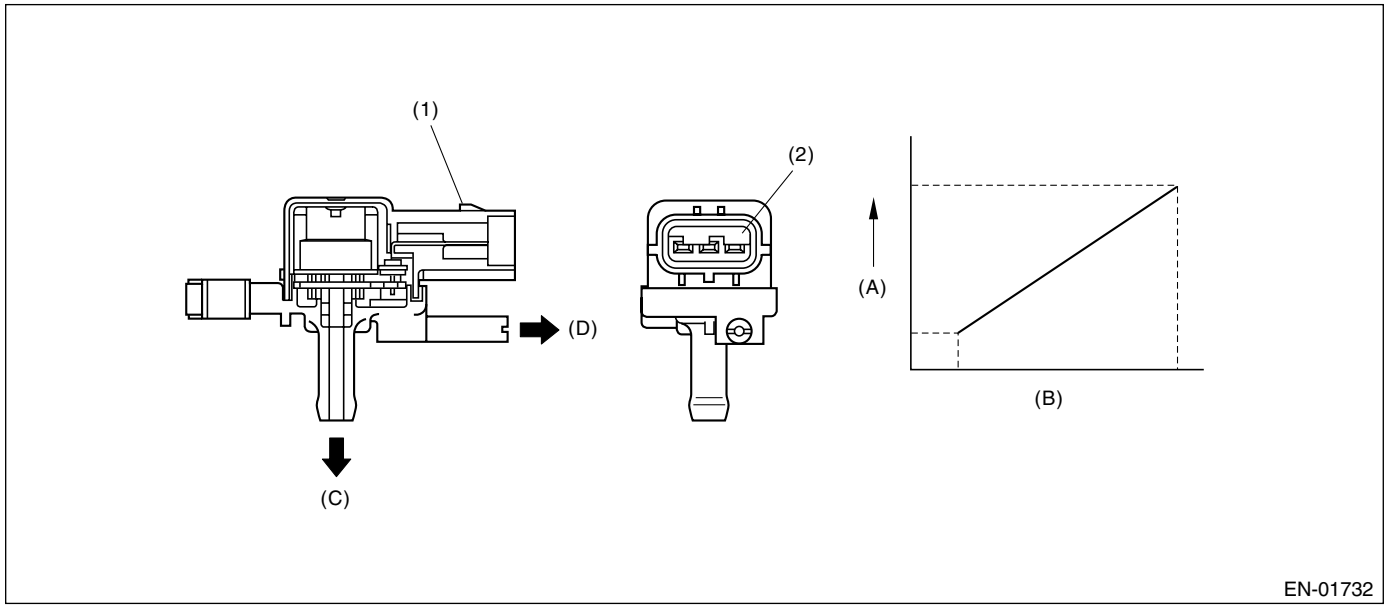
Memorize the freeze frame data. (For test mode $02)

BA:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To tank pressure switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
After engine starting	2 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing all of the malfunction criteria below becomes more than the time (20 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.8 V
Fuel temperature	< 35°C (95°F)
Barometric pressure	≥ 76 kPa (568 mmHg, 22.4 inHg)

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel tank pressure at 0 kPa (0 mmHg, 0 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BB:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-116, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BC:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-116, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

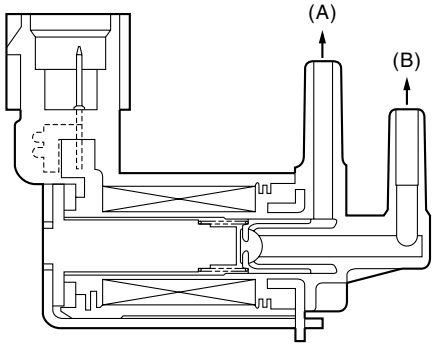
MEMO:

BD:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



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(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing all the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	< 75%
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the cumulative time until completing all the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	< 75%
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

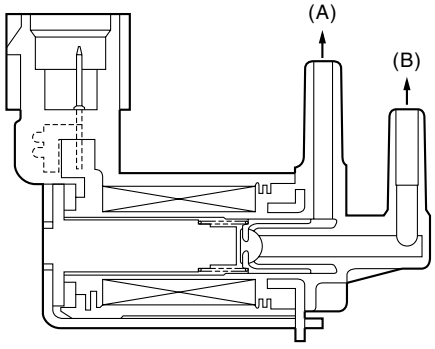
Memorize the freeze frame data. (For test mode $02)

BE:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



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(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	> 25%
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	> 25%
Terminal output voltage when ECM outputs OFF signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

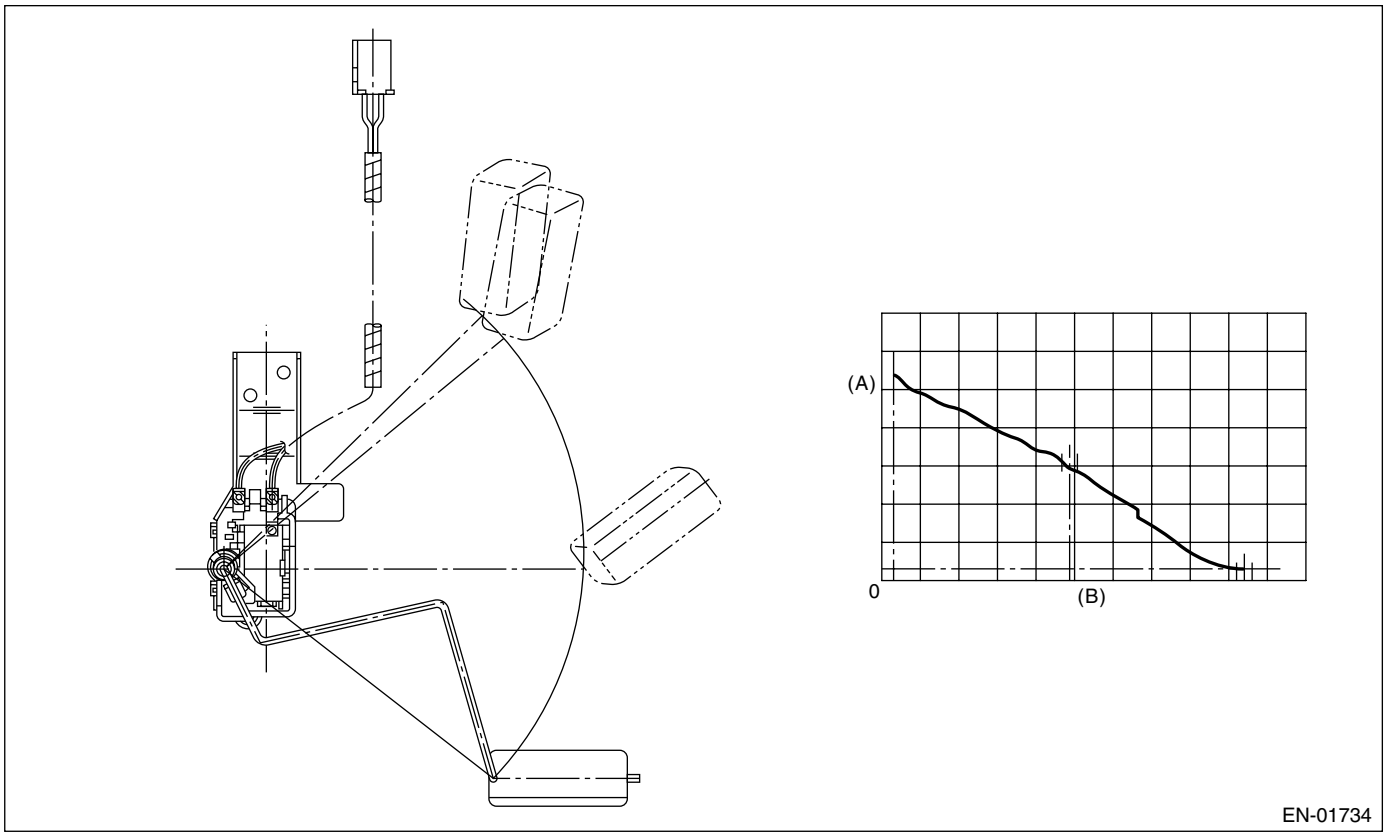
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG by the difference between max. and min. value of fuel level during every 160 km (100 miles) driving distance converted from vehicle speed.

2. COMPONENT DESCRIPTION



(A) Fuel level (L)
(B) Resistance (Ω)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – min. fuel level	< 10 ℓ (2.6 US gal, 2.2 Imp gal)
Trip distance from last fill up	≥ 160 km (100 miles)

Time Needed for Diagnosis: Not determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – min. fuel level	≥ 10 ℓ (2.6 US gal, 2.2 Imp gal)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

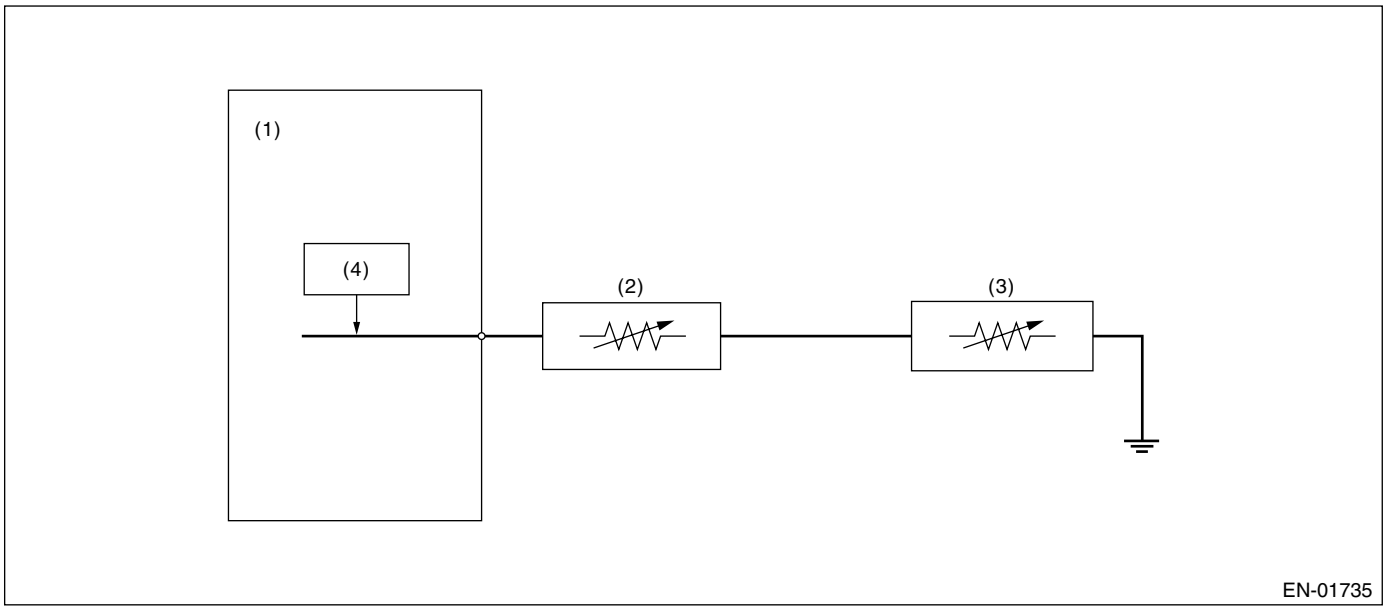
Memorize the freeze frame data. (For test mode $02)

BG:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	8 — 16 V
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis, and then judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.02 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

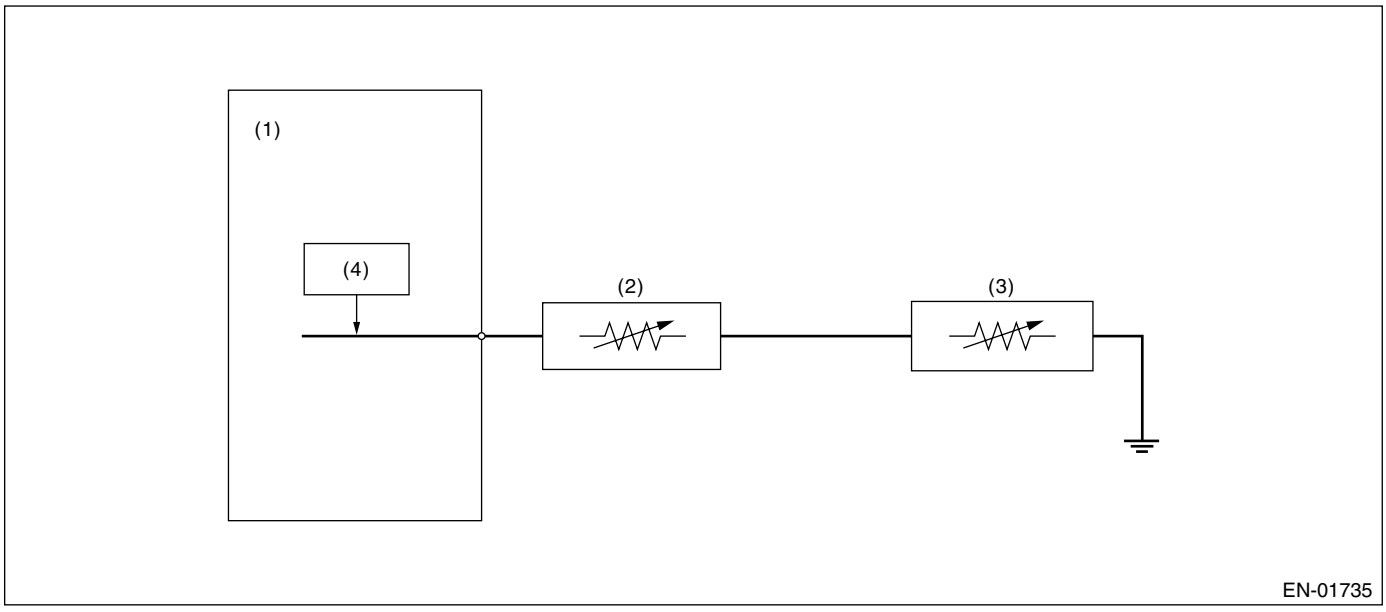
Memorize the freeze frame data. (For test mode $02)

BH:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameter	Enable Conditions
Battery voltage	8 — 16 V
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis, and then judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.90 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BI: DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor because of noise.
Judge NG by comparing the max value and cumulative value of the amount of output voltage variation from fuel level sensor with threshold value.

2. ENABLE CONDITION

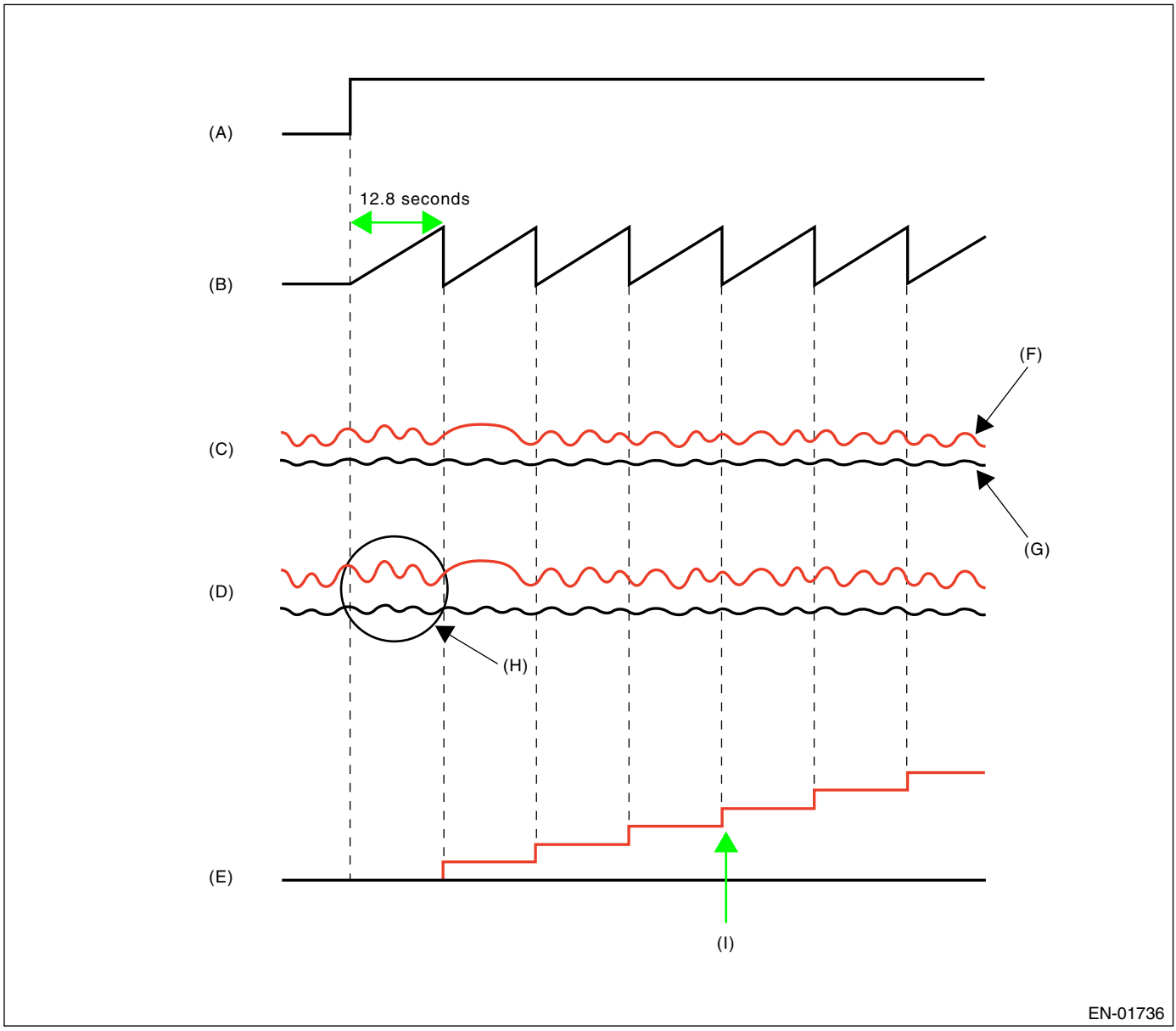
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V
After engine starting	1 second or more
Idle switch	ON
Fuel level	9.6 — 48 ℓ (2.54 — 12.68 US gal, 2.11 — 10.56 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more
Ignition switch	ON
Difference between max. value and min. value of fuel tank pressure (12.8 seconds)	< 0.05 kPa (0.4 mmHg, 0.016 inHg)
Difference between max. value and min. value of battery voltage (12.8 seconds)	< 0.4 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling.

4. DIAGNOSTIC METHOD

Calculate the max. value of the amount of output voltage variation from fuel level sensor and cumulative value during 12.8 seconds. Comparing the max value and cumulative value with the threshold value, and judge OK when the both do not go over the threshold value. Otherwise, when one of them goes over the threshold, count the counter up. Judge the ECM is troubled when the counter increased 4 times in a row.



(A) Diagnosis condition
(B) Diagnosis timer
(C) Fuel level sensor A/D value
(D) Amount of Fuel level output voltage variation
(E) Diagnosis counter
(F) Malfunction
(G) Normal
(H) Regard the Max. value as delvflmx and the cumulative value as sumvfl.
(I) NG at 4 counts

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, • DVFLMAX ≥ 0.88 V • SUMVFL ≥ 14.08 V DVFLMAX is max. value of sensor output during 12.8 seconds. SUMVFL is cumulative value of sensor output deviation during 12.8 seconds.	≥ 4 times

Time Needed for Diagnosis: 12.8 seconds × 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
DVFLMAX	< 0.88 V
SUMVFL	< 14.08 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

BJ:DTC P0483 — COOLING FAN RATIONALITY CHECK —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of radiator fun.
Judge NG when the engine coolant temperature decreases slowly even if the radiator fan started rotating.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 100°C (212°F)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the engine coolant temperature is very high (more than 100°C (212°F)).

4. DIAGNOSTIC METHOD

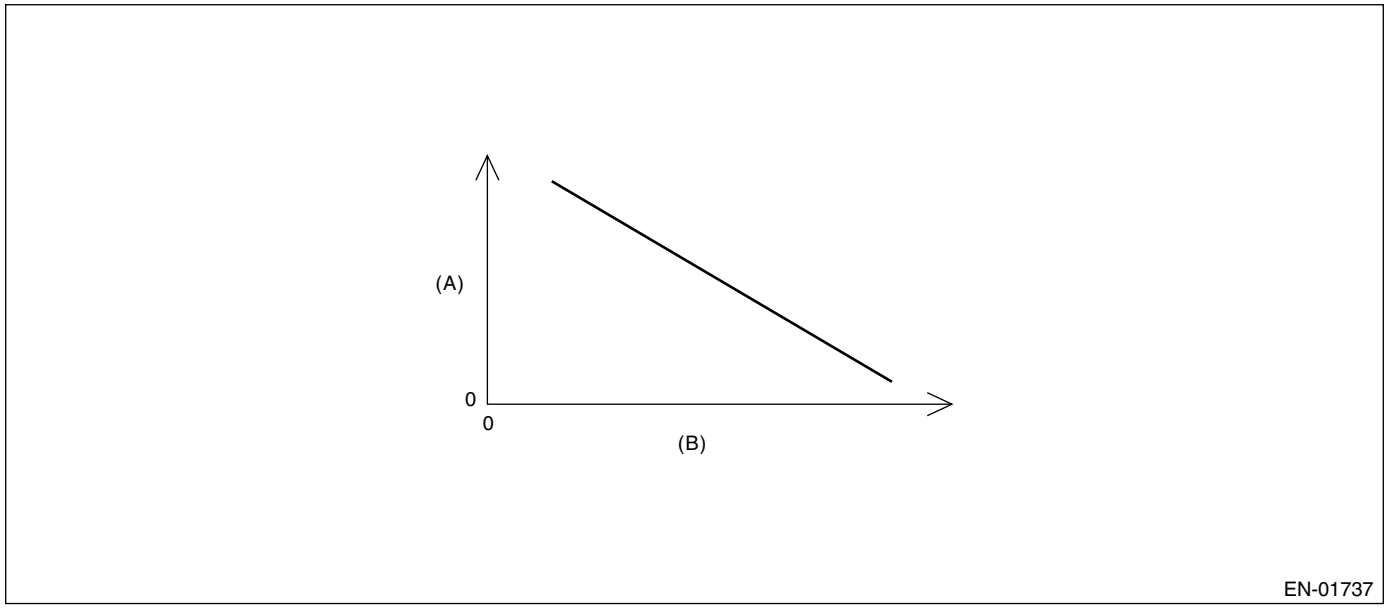
Check the engine coolant temperature (A/D value) when the radiator fan is ON since the radiator fan output turns from OFF to ON with all of the malfunction conditions below completed.

Secondary Parameters	Enable Conditions
Engine speed	600 — 900 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (5 minutes) needed for diagnosis. Also Judge OK when the malfunction criteria below is not completed. And then clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan signal switching	OFF to ON
Engine coolant temperature	≥ 105°C (221°F)
Engine coolant temperature	Not decreased



(A) Engine coolant temperature °C (°F)
(B) A/D value (V)

Time Needed for Diagnosis: 5 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR METHOD

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BK:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

- Detect the open or short circuit of vehicle speed.
- Judge NG when the vehicle speed is low while the vehicle speed is assumed to be high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the time of completing the malfunction criteria below becomes more than time needed for diagnosis. Judge OK when the vehicle speed is more than 4 km/h (2.5 MPH) and less than 224 km/h (140 MPH).

Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis (1)	
Cumulative time when the malfunction criteria below are completed	≥ 20 seconds
Idle switch	OFF
Injector pulse	≥ 2.5 milliseconds
Engine speed	≥ 2800 rpm
Neutral switch	OFF
Vehicle speed signals count (353 ms)	< 1

Time Needed for Diagnosis:

Low side 20 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row.
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BL:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

1. OUTLINE OF DIAGNOSIS

- Detect the open or short circuit of vehicle speed.
- Judge NG when the vehicle speed is high while the vehicle speed is assumed to be low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the time of completing the malfunction criteria below becomes more than time needed for diagnosis. Judge OK when the vehicle speed is more than 4 km/h (2.5 MPH) and less than 224 km/h (140 MPH).

Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis	
Cumulative time when the malfunction criteria below are completed	≥ 5 seconds
Idle switch	OFF
Injector pulse	≤ 2.0 milliseconds
Engine speed	≤ 2100 rpm
Neutral switch	OFF
Vehicle speed signals count (353 ms)	≥ 56

Time Needed for Diagnosis:

High 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

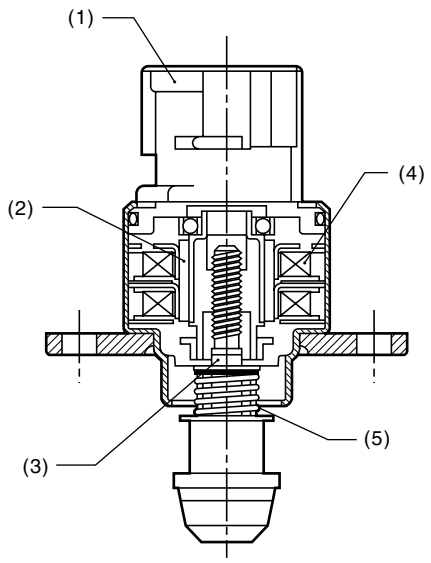
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that the engine speed does not approach to the target engine speed at idling.
Judge NG when the engine speed is lower than target engine speed and does not increase to target engine speed even though idle air control solenoid valve is opened.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Permanent magnet
(3) Shaft
(4) Coil
(5) Spring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed control in ISC	In operation
Dashpot function	0
Vehicle speed	= 0 km/h (0 MPH)
Coolant temperature	≥ 75°C (167°F)
Battery voltage	> 10.9 V
AT model or AT model neutral gear	

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously at idling after warming up engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≤ 100 rpm

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (2 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	> 100 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

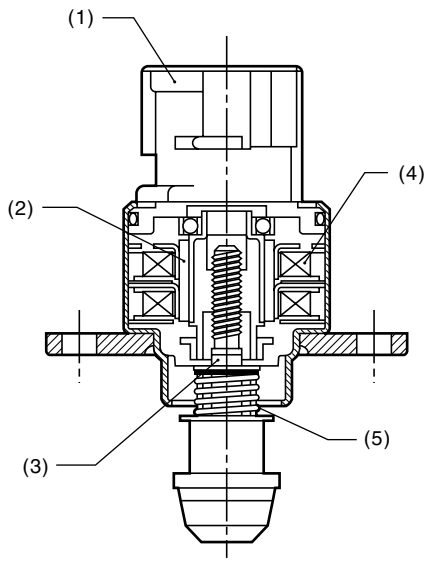
Memorize the freeze frame data. (For test mode $02)

BN:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that the engine speed does not approach to the target engine speed at idling.
Judge NG when the engine speed is higher than target engine speed and does not decrease to target engine speed even though idle air control solenoid valve is closed.

2. COMPONENT DESCRIPTION



EN-01739

(1) Connector
(2) Permanent magnet
(3) Shaft
(4) Coil
(5) Spring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed control in ISC	In operation
Dashpot function	0
Vehicle speed	= 0 km/h (0 MPH)
Coolant temperature	≥ 75°C (167°F)
Battery voltage	> 10.9 V
AT model or AT model neutral gear	

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously at idling after warming up engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ 200 rpm

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the continuous time until completing all the malfunction criteria below becomes more than the time (2 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< 200 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BO:DTC P0512 — STARTER REQUEST CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of starter switch.
Judge ON NG when the starter signal remains OFF after starting engine from engine stall condition.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine	Run

3. GENERAL DRIVING CYCLE

Always perform diagnosis continuously after starting engine.

4. DIAGNOSTIC METHOD

Judge NG when completing the malfunction criteria below. Judge OK and clear the NG when the starter switch is turned to ON.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≥ 0 — 700 rpm
Vehicle speed	≥ 0 km/h (0 MPH)
Starter “ON” signal	Not detected

Time Needed for Diagnosis:

ON side 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BP:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

1. OUTLINE OF DIAGNOSIS

- Detect the malfunction of engine speed increase at idling.
- Judge NG when the engine speed is higher than and too far from the target engine speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Dashpot function at closed idle control	0

3. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously at idle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ 800 rpm
ISC closed loop compensation value	= MIN value

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when one of the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
ISC closed loop compensation value	≠ MIN value
Cumulative time (actual – target engine speed) < 100 rpm	≥ 2 seconds
Cumulative time (engine speed < target idle speed)	≥ 2 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0565 — CRUISE CONTROL ON SIGNAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the vehicle speed is less than 20 km/h (12 MPH) and cruise control set signal remains ON for limited time.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≤ 20 km/h (12 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis with less than 20 km/h (12 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Canceling signal	No signal

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BR:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

1. OUTLINE OF DIAGNOSIS

- Detect the malfunction of micro-computer (RAM).
- Zero clear the all normal RAM on initial routine, and judge NG when the sum of cleared RAM is not “0”.

2. ENABLE CONDITION

Perform the diagnosis without condition by initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once immediately after the IG key is turned to ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed, and judge OK at the IG key turned to ON.
Judgment Value

Malfunction Criteria	Threshold Value
Sum on RAM data after data cleared operation	Not to zero

Time Needed for Diagnosis: Not determined
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BS:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of radiator fan circuit.
- Judge NG when the ECM output level and the actual terminal level are different.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis, and also judge OK when the malfunction criteria below is not completed. And then clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BT:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of radiator fan circuit.
- Judge NG when the ECM output level and the actual terminal level are different.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis, and also judge OK when the malfunction criteria below is not completed. And then clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BU:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the AT break SW circuit is battery short, ground short or open.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed change	30 to 0 km/h (18.6 to 0 MPH) 0 to 30 km/h (0 to 18.6 MPH)

3. GENERAL DRIVING CYCLE

Perform diagnosis from 30 to 0 km/h (from 18.6 to 0 MPH) of vehicle speed.
Perform diagnosis from 0 to 30 km/h (from 0 to 18.6 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
ON signal	No signal
OFF signal	No signal

Time Needed for Diagnosis: 150 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BV:DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the “D” range switch becomes ground short or open circuit.

2. COMPONENT DESCRIPTION

Inhibitor switch ensures the safety at engine start. This switch is installed to the right side of transmission case, and operated by selector lever. When the selector lever is in the “P” or “N” range, the engine will start because the electric circuit in inhibitor switch is closed and the starter circuit is connected. When the selector lever is in the “R”, “D”, “3”, “2” or “1” range, the electric circuit in inhibitor switch is open; therefore, the engine cannot be cranked. In the “R” range, the back-up light will illuminate because the back-up light circuit in the switch is connected. In addition to the functions above, the inhibitor switch has the circuit which detects the selected range position at the present and transmits the range signal to the TCM.

3. ENABLE CONDITION

- Enable condition A

Secondary Parameters	Enable Conditions
Shift	“N” to “3”
Vehicle speed	≥ 60 km/h (37 MPH)

- Enable condition B

Secondary Parameters	Enable Conditions
Engine speed	> 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when shifting selector lever from Neutral to 3rd at vehicle speed of 60 km/h (37 MPH). (For Enable condition A)
Perform the diagnosis continuously after engine start (For Enable condition B).

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
“D” signal continuously (For Enable condition A)	Not detected
Simultaneous signal (For Enable condition B)	≥ 2

Time Needed for Diagnosis:
- 63.75 seconds (For Enable condition A)
- 10 seconds (For Enable condition B)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BW:DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

- Judge NG when the ATF temperature sensor is open, battery short or ground short.
- Judge NG when the ATF sensor is detective.

2. COMPONENT DESCRIPTION

ATF temperature sensor is installed to the hydraulic control valve body of transmission as a unit with transmission harness. This sensor detects ATF temperature and outputs it as electric resistance signal.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V
Output at ≥ 80km/h (50 MPH) after 5 minutes from reaching more than 4.8 V	≥ 4.7 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control ATF temperature at a constant temperature 80°C (176°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BX:DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the turbine speed signal is not transmitted for some reasons.

2. COMPONENT DESCRIPTION

Torque converter turbine speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the turbine speed of torque converter by the peripheral speed of high clutch drum connected to input shaft. And then it transmits the sine wave signal (32 pulses per rev.) to TCM. TCM calculates the ratio of the input shaft speed to vehicle speed, and then makes a judgment whether to shift or not.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 1500 rpm
Vehicle speed	≥ 40 km/h (25 MPH)
Range switch	“D”, “3”, “2” or “1”

4. GENERAL DRIVING CYCLE

Perform the diagnosis at engine speed of more than 1,500 rpm and vehicle speed of more than 40 km/h (25 MPH).

5. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below were continued for 2 seconds.
(1) Except “P”, “N”, “R” ranges and inhibitor switch is normal.
(2) Engine speed is more than 3000 rpm.
(3) Vehicle speed is 30 km/h (19 MPH) and vehicle speed sensor is normal.
(4) Turbine speed is more than 600 rpm.

Judgment Value

Malfunction Criteria	Threshold Value
Output from turbine shaft speed	< 600 rpm

Time Needed for Diagnosis: Illuminates at occurrence of trouble
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BY:DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when an abnormal large signal is input to the front vehicle speed sensor, or no signal is input to the rear vehicle speed sensor.

2. COMPONENT DESCRIPTION

This vehicle speed sensor (output shaft speed sensor) is installed to the outside of transmission case.
This sensor detects the front wheel speed, and transmits the sine wave signal (16 pulses per rev.) to TCM.
TCM converts the signal to pulse signal, and transmits to both of the ECM and the combination meter.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 20 km/h (12 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously with more than 20 km/h (12 MPH) vehicle speed.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Number of vehicle speed sensor signals per 1 second	≥ 4698 or no signal

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Use the normal vehicle speed sensor signal when either of them is normal.
- Use the vehicle speed calculated from the current gear position and turbine speed when both front and rear wheels are troubled.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BZ:DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is not input in the status of running the engine.

2. COMPONENT DESCRIPTION

Engine speed sensor is installed to the outside of engine body and crank part. This sensor detects the crank speed, and transmits the sine wave signal (2 pulses per rev.) to TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Output from mass air flow sensor	≥ 1.0 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine start.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≤ 400 rpm

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA:DTC P0731 — GEAR 1 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Continuously perform the diagnosis while depressing accelerator pedal with more than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (1st gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB:DTC P0732 — GEAR 2 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Continuously perform the diagnosis while depressing accelerator pedal with more than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (2nd gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC:DTC P0733 — GEAR 3 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Continuously perform the diagnosis while depressing accelerator pedal with more than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (3rd gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CD:DTC P0734 — GEAR 4 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Continuously perform the diagnosis while depressing accelerator pedal with more than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (4th gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is different from the turbine speed for some reasons at AT lock-up.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
In 4th gear position, duty ratio for duty solenoid valve	≥ 90%

3. GENERAL DRIVING CYCLE

Perform the diagnosis at 4th gear lock-up.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed ≥ (output shaft speed × 4th gear ratio × 9/8)	

Time Needed for Diagnosis: 10.2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Not allowed to lock up.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CF:DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the lock-up duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Lock-up duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows the lock-up clutch to be connected or released smoothly by controlling the lock-up control valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0748 — PRESSURE CONTROL SOLENOID "A" ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the line pressure duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Line pressure duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows controlling the pressure modifier valve and accumulator control valve A, and allows the line pressure to be adjusted to the pressure appropriate for driving condition.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at "ON" signal from ECM	Low
Vc at "OFF" signal from ECM	High

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 1 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 1 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 2 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 2 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CJ:DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the low clutch timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Low clutch timing solenoid Low clutch timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the low clutch timing valve B and reverse inhibitor valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CK:DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This solenoid decreases the change gear shock by adjusting the 2-4 brake pressure during 2-4 brake operation.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL:DTC P0785 — SHIFT/TIMING SOLENOID —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the 2-4 brake timing valve B and decreases the change gear shock.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CM:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of neutral switch.
- AT: Judge NG when ECM neutral terminal input is different from reception data from TCM.
- MT: Judge NG when the neutral switch does not respond even though shift lever is changed (neutral switch is turned on or off by vehicle and engine speed).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Starter switch	OFF
Battery voltage	≥ 8 V
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

AT: Judge NG when the continuous time of condition which satisfies the malfunction criteria below becomes more than time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	ON (Low)
“P” range / “N” range on AT	OFF
Any other switches on AT	ON

• Normality Judgment

AT: Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	OFF (High)
“P” range / “N” range on AT	OFF
Any other switches on AT	ON

MT: Judge NG when the number of times until completing the malfunction criteria below continue 3 times in a row, judge OK when turning to OFF or ON.

• Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch on MT	ON not detected
Driving condition change a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm b) Vehicle speed 64 — 106 km/h (40 — 66 MPH) & engine speed 1600 — 2550 rpm	Change a) to b)

Time Needed for Diagnosis:

AT: Normal reception from AT is 5 seconds

MT: 3 monitoring on MT

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

CN:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of neutral switch.
- AT: Judge NG when ECM neutral terminal input is different from reception data from TCM.
- MT: Judge NG when the neutral switch does not respond even though shift lever is changed (neutral switch is turned on or off by vehicle and engine speed).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Starter switch	Turn OFF
Battery voltage	≥ 8 V
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

AT: Judge NG when the continuous time of condition which satisfies the malfunction criteria below becomes more than time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	OFF (High)
“P” range / “N” range on AT	ON
Any other switches on AT	OFF

• Normality Judgment

AT: Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	ON (Low)
“P” range / “N” range on AT	ON
Any other switches on AT	OFF

MT: Judge NG when the number of times until completing the malfunction criteria below continue 3 times in a row, judge OK when turning to OFF or ON.

• Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch on MT Driving condition change a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm b) Vehicle speed 64 — 106 km/h (40 — 66 MPH) & engine speed 1600 — 2550 rpm	Not detected Change a) to b)

Time Needed for Diagnosis:
AT: 5 seconds
MT: 3 monitoring on MT

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CO:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

- Detect the communication malfunction of AT diagnosis.
- Judge NG when the communication format does not correspond.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8.0 V
Engine speed	≥ 500 rpm
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time communication format does not correspond continued for time needed for diagnosis. Judge OK and clear the NG when the communication format corresponds.

Judgment Value

Malfunction Criteria	Threshold Value
Incorrect pattern in wiring harness for communication	≥ 60 seconds

Time Needed for Diagnosis: 60 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT diagnosis line.
- Judge NG when the signal remains Low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8.0 V
Engine speed	≥ 500 rpm
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the signal is turned over.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of signal line low	≥ 3 seconds

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT diagnosis line.
- Judge NG when the signal remains High.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8.0 V
Engine speed	≥ 500 rpm
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the signal is turned over.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of signal line high	≥ 3 seconds

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of atmospheric pressure sensor.
- Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the atmospheric pressure 101 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CS:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of atmospheric pressure sensor.
- Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the atmospheric pressure 101 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

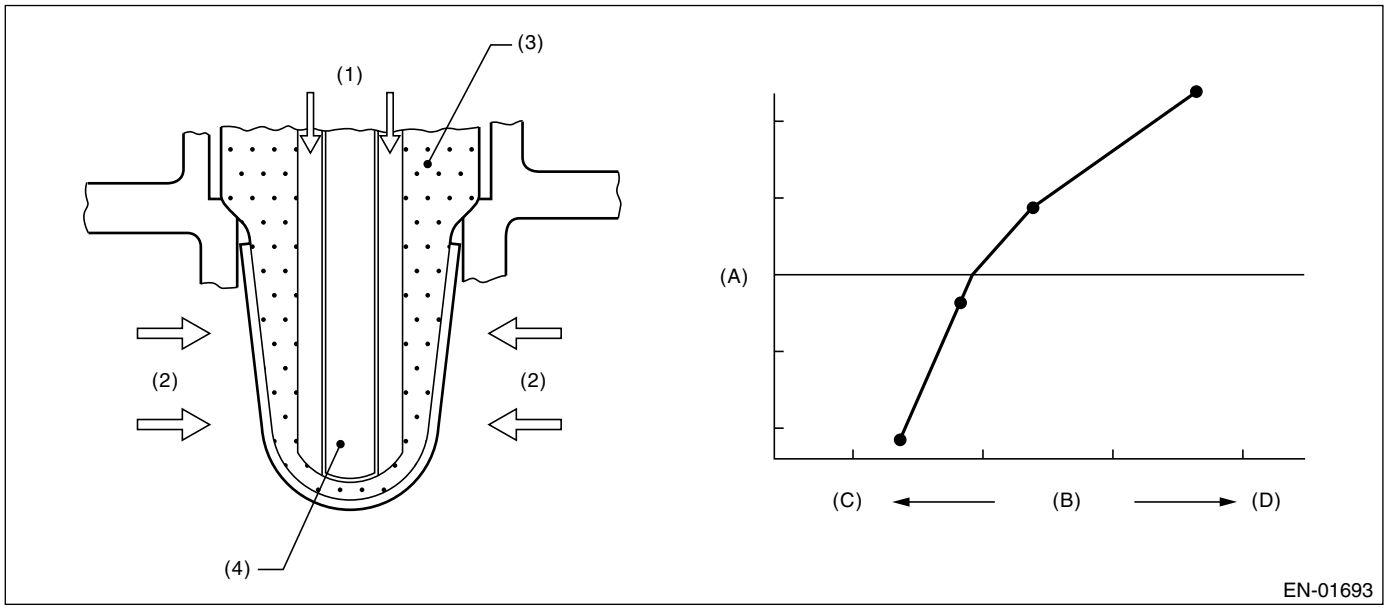
MEMO:

CT:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

1. OUTLINE OF DIAGNOSIS

- Detect the malfunction of IC communication.
- Judge NG when the communication to front oxygen (A/F) sensor control IC is unable.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
After engine starting	≥ 140 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 140 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Communication error to main CPU	≥ 250 times

Time Needed for Diagnosis: 12.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Error	None

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

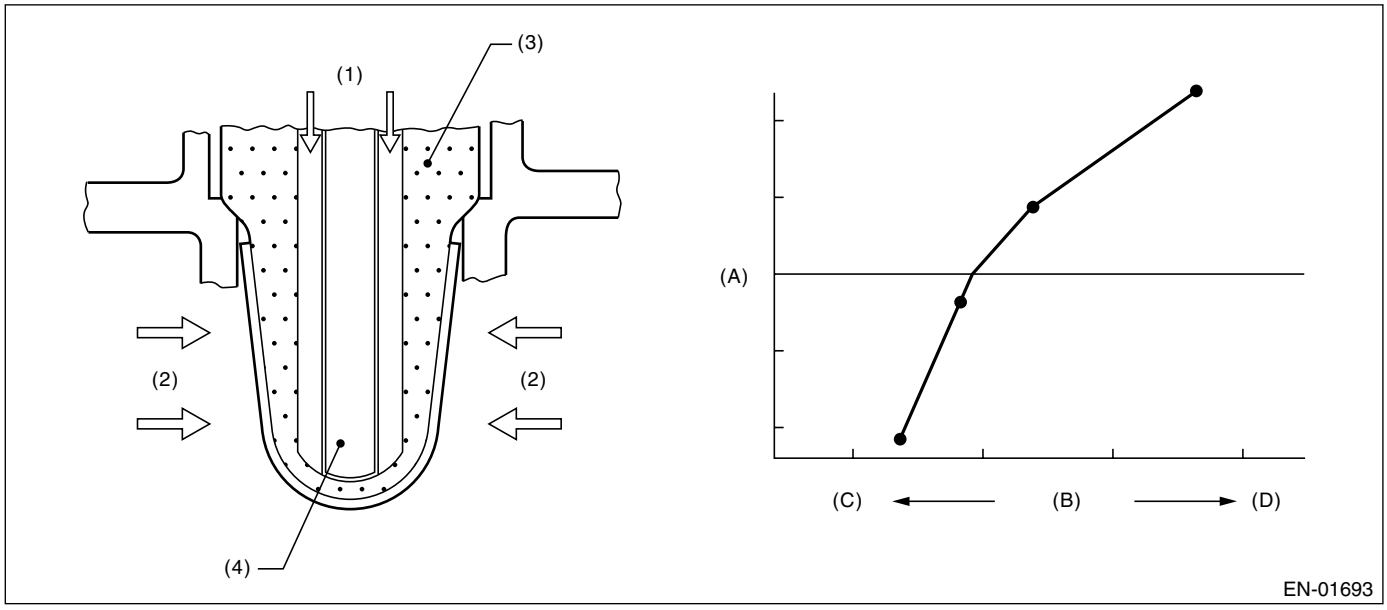
Memorize the freeze frame data. (For test mode $02)

CU:DTC P1137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) — Middle Electric Potential

1. OUTLINE OF DIAGNOSIS

- Detect the output property malfunction of from oxygen (A/F) sensor.
- Judge NG when output voltage does not move to lean side or rich side.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameter	Enable Conditions
A/F sensor response diagnosis	Under diagnosis

4. GENERAL DRIVING CYCLE

Perform the diagnosis just once in 225 seconds or more after starting the engine constantly at 76 km/h (47 MPH) of vehicle speed (Same as A/F sensor response diagnosis).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when one of the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of output voltage > 2.065 V (λ = 0.98)	3.4 seconds or more
Continuous time of output voltage < 2.180 V (λ = 1.0)	3.4 seconds or more

Time needed for diagnosis: 3.4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Cumulative time of output voltage ≤ 2.065 V	0.2 seconds or more
Cumulative time of output voltage ≥ 2.180 V	0.2 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

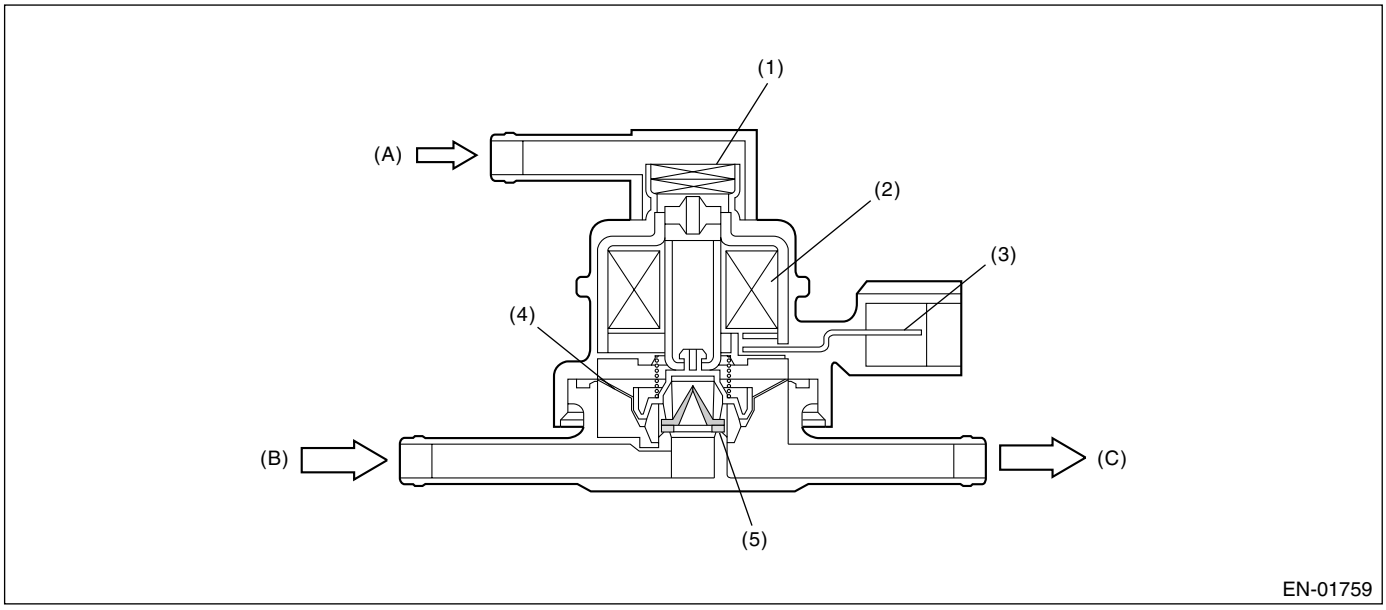
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

CV:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of pressure control solenoid valve.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

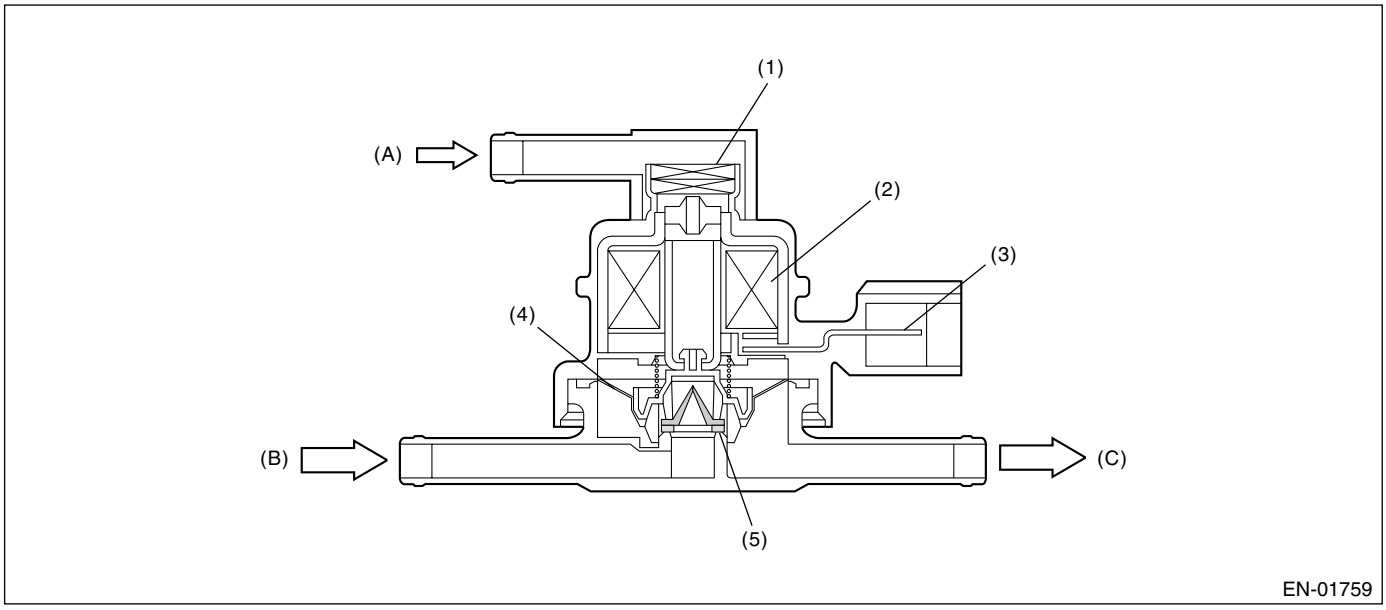
Memorize the freeze frame data. (For test mode $02)

CW:DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of pressure control solenoid valve.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CX:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect vent control solenoid valve function problem (closed sticking). Judged NG when fuel tank pressure is low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.7 kPa (568 mmHg, 22.36 inHg)
Fuel tank pressure when engine starts	–0.7 — 1.5 kPa (–5 —11 mmHg, –0.20 — 0.43 inHg)
Vent control solenoid valve	Open

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of condition which satisfies the malfunction criteria below becomes more than time needed for diagnosis (3 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ –3.50 kPa (–26.25 mmHg, –1.03 inHg)

Time Needed for Diagnosis:3 seconds
Malfunction Indicator Light Illumination: Illuminate when malfunction is detected.

• Normality Judgment

Judge OK when all the malfunction criteria below are completed, and then NG are cleared.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> -3.50 kPa (-26.25 mmHg, -1.03 inHg)
Accumulation time when all satisfy the following conditions.	≥ 305
CPC duty ratio	≠0
Fuel temperature	–10 — 45°C (14 — 113°F)
Relative pressure of suction pipe	≤ 26.7 kPa (-200 mmHg, -7.87 inHg)

5. DTC CLEAR CONDITION

- When the OK warm up cycle was completed 40 consecutive times
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times
- When “Clear Memory” was performed

7. FAIL SAFE

PCV control: Open PCV solenoid valve

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $O2)

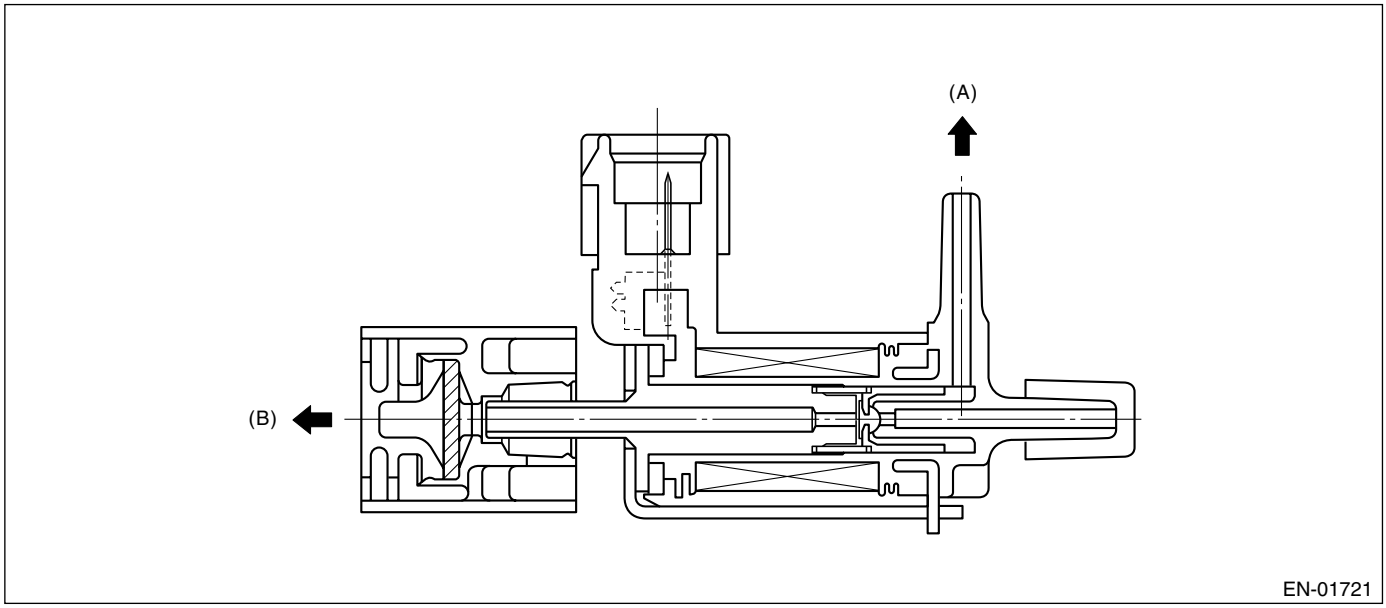
MEMO:

CY:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of fuel tank sensor control valve.
- Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) External air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM sent OFF signals	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

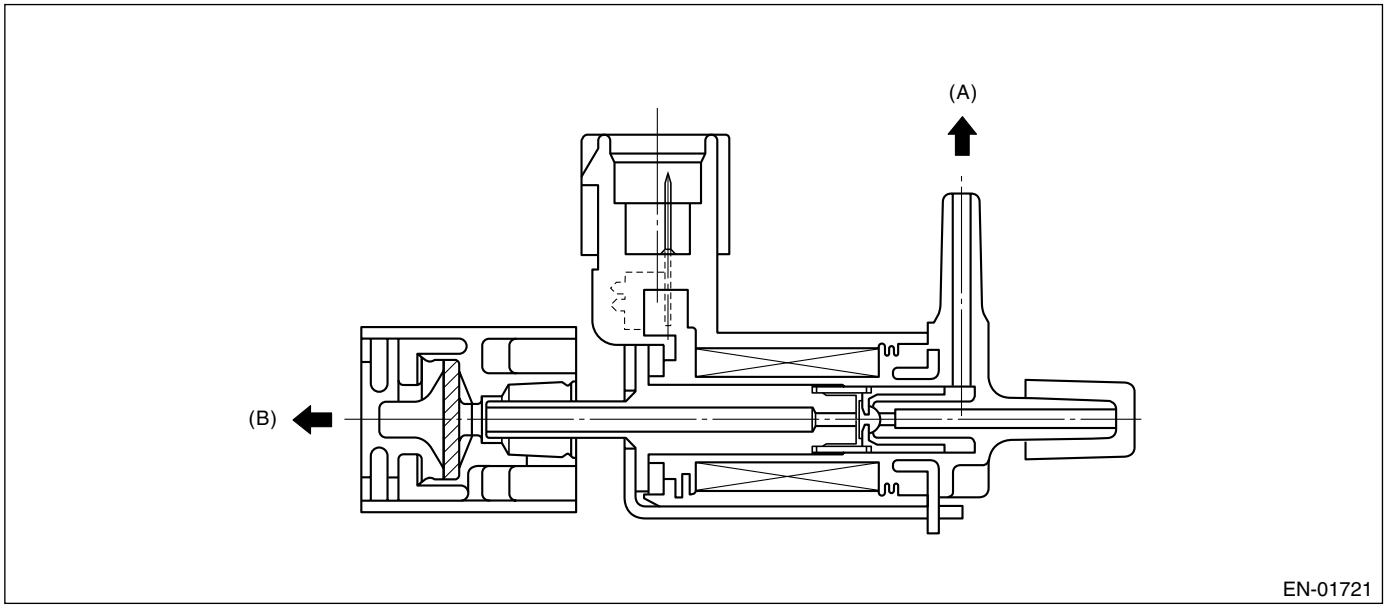
Memorize the freeze frame data. (For test mode $02)

CZ:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of fuel tank sensor control valve.
- Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) External air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM sent ON signals	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

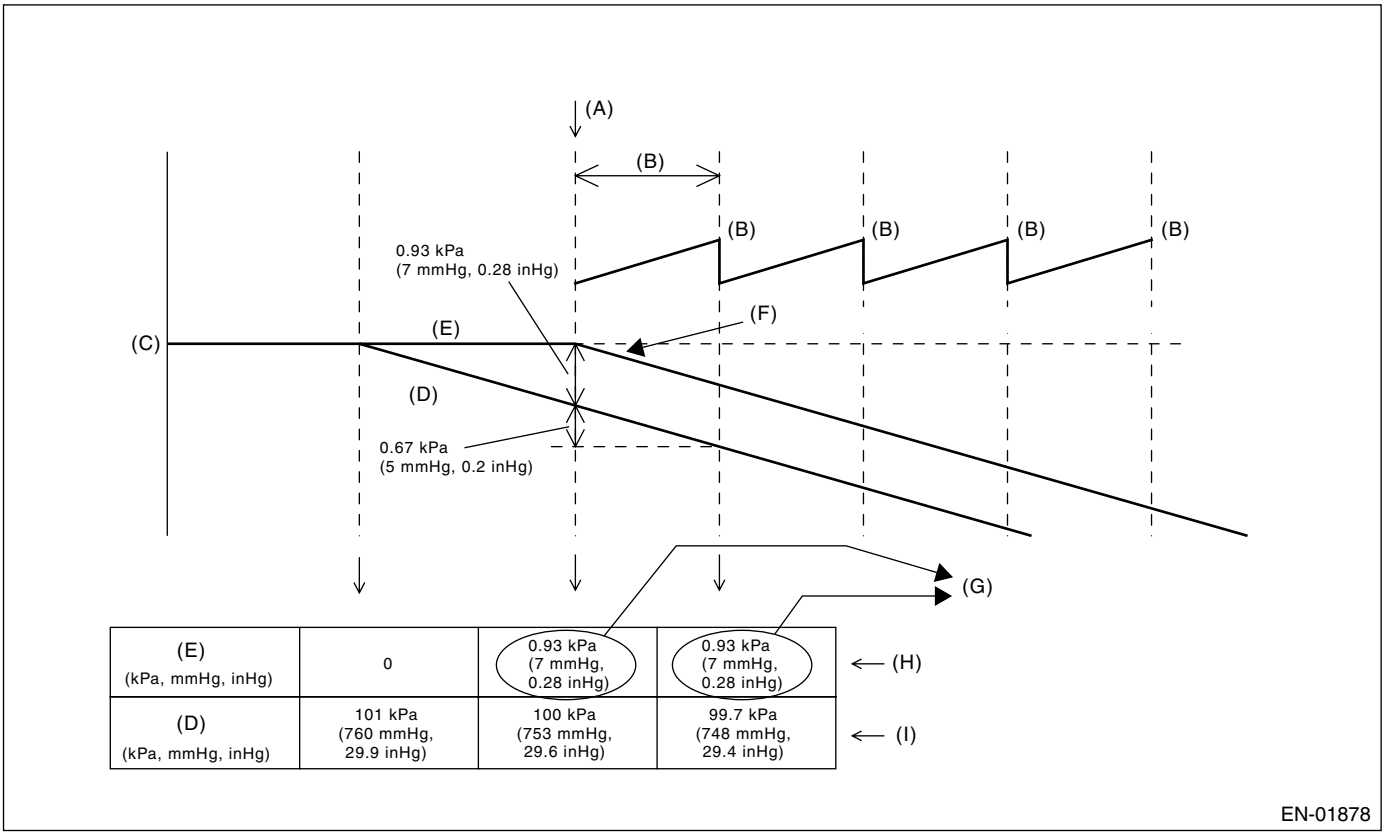
DA:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE—

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

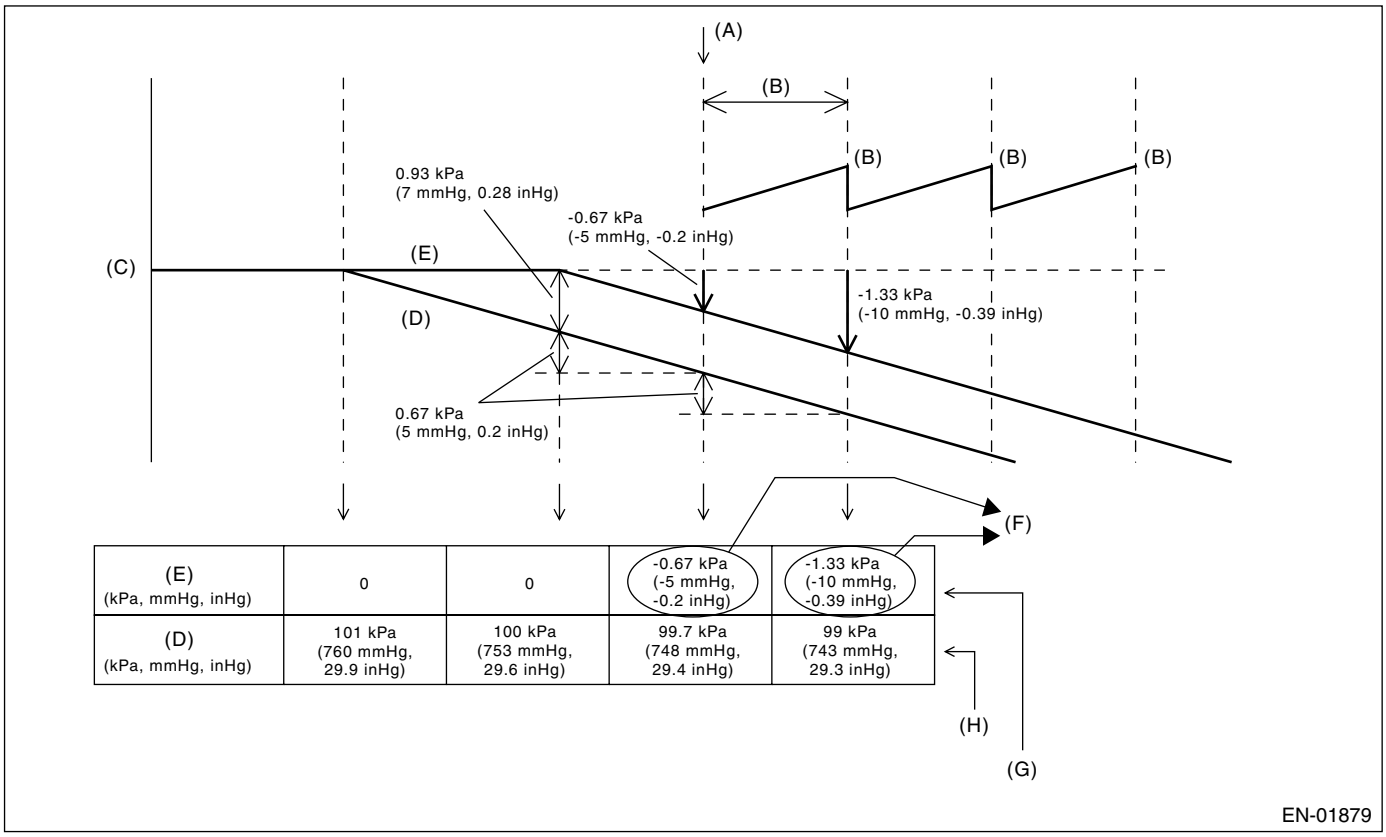
• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.



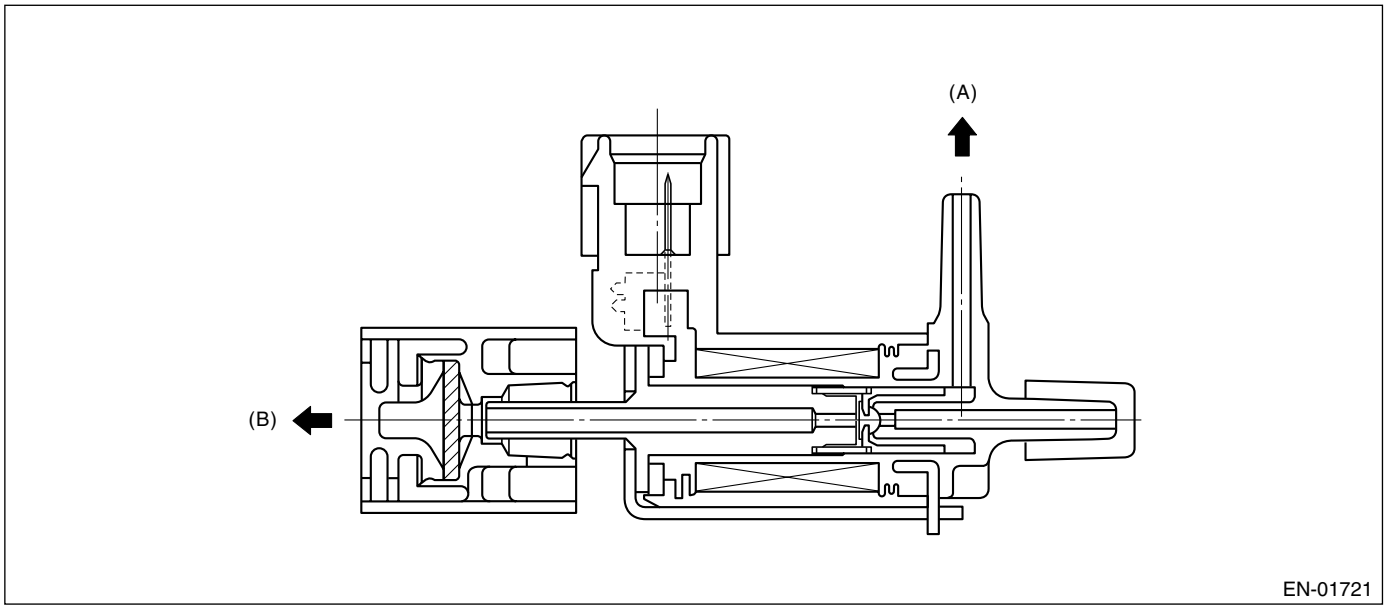
• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



(E) (kPa, mmHg, inHg)	0	0	-0.67 kPa (-5 mmHg, -0.2 inHg)	-1.33 kPa (-10 mmHg, -0.39 inHg)
(D) (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100 kPa (753 mmHg, 29.6 inHg)	99.7 kPa (748 mmHg, 29.4 inHg)	99 kPa (743 mmHg, 29.3 inHg)

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) External air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	≥ 80 seconds
Fuel level	9.6 — 48 ℓ (2.54 — 12.68 US gal, 2.11 — 10.56 Imp gal)
Fuel tank pressure	< 0 or > 1.26 kPa (< 0 or > 9.45 mmHg, < 0 or > 0.372 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 80 seconds after starting the engine. (Do not diagnose during evaporative emission control system diagnosis.)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Count the counter up when the malfunction criteria below are completed by checking the change such as tank pressure, atmospheric pressure and fuel level during every 80 seconds. Judge NG when the count comes to the specified number (3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Change of tank pressure during 80 seconds	≥ 0.6 kPa (4.5 mmHg, 0.2 inHg)
Change of atmospheric pressure during 80 seconds	≥ 0.6 kPa (4.5 mmHg, 0.2 inHg)
Change of fuel level during 80 seconds	< 8 ℓ (2.1 US gal, 1.8 Imp gal)

Time Needed for Diagnosis: 80 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Change of tank pressure during 80 seconds	≥ 0.6 kPa (4.5 mmHg, 0.2 inHg)
Change of atmospheric pressure during 80 seconds	< 0.6 kPa (4.5 mmHg, 0.2 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

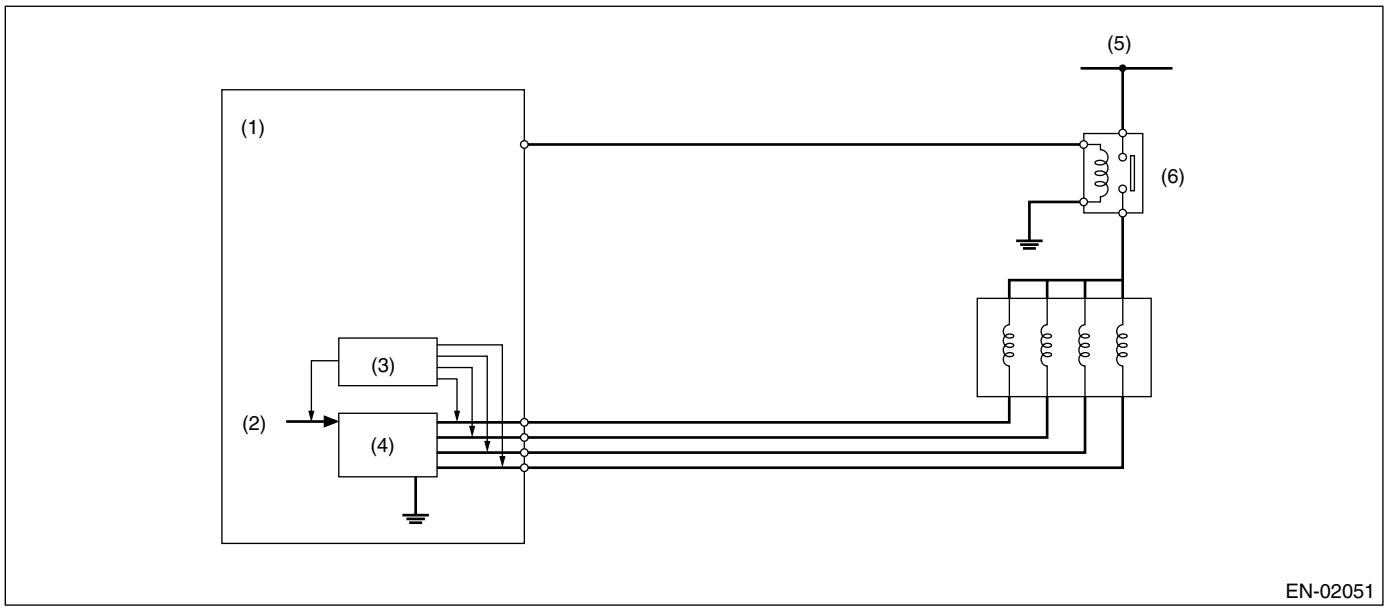
MEMO:

DB:DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1492 P1494 P1496 P1498
Terminal voltage level when ECM outputs ON signal	High level	P1493 P1495 P1497 P1499

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

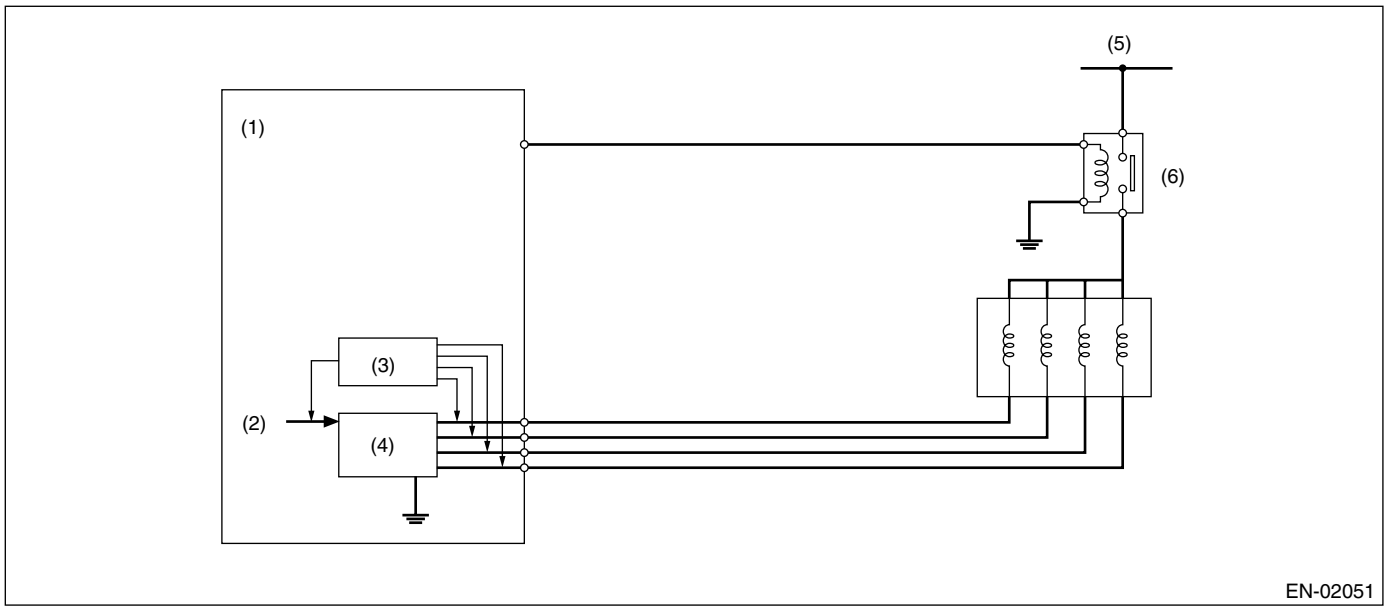
Memorize the freeze frame data. (For test mode $02)

DC:DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1492 P1494 P1496 P1498
Terminal voltage level when ECM outputs ON signal	High level	P1493 P1495 P1497 P1499

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

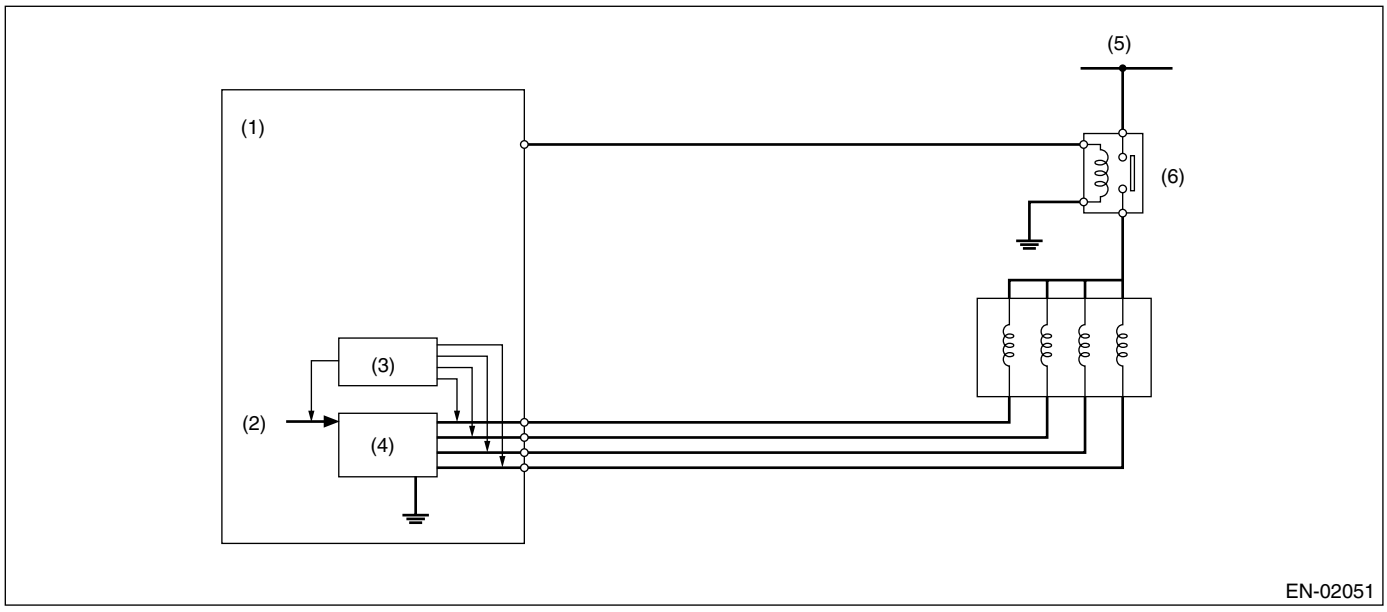
Memorize the freeze frame data. (For test mode $02)

DD:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1292 P1294 P1296 P1298
Terminal voltage level when ECM outputs ON signal	High level	P1293 P1295 P1297 P1299

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

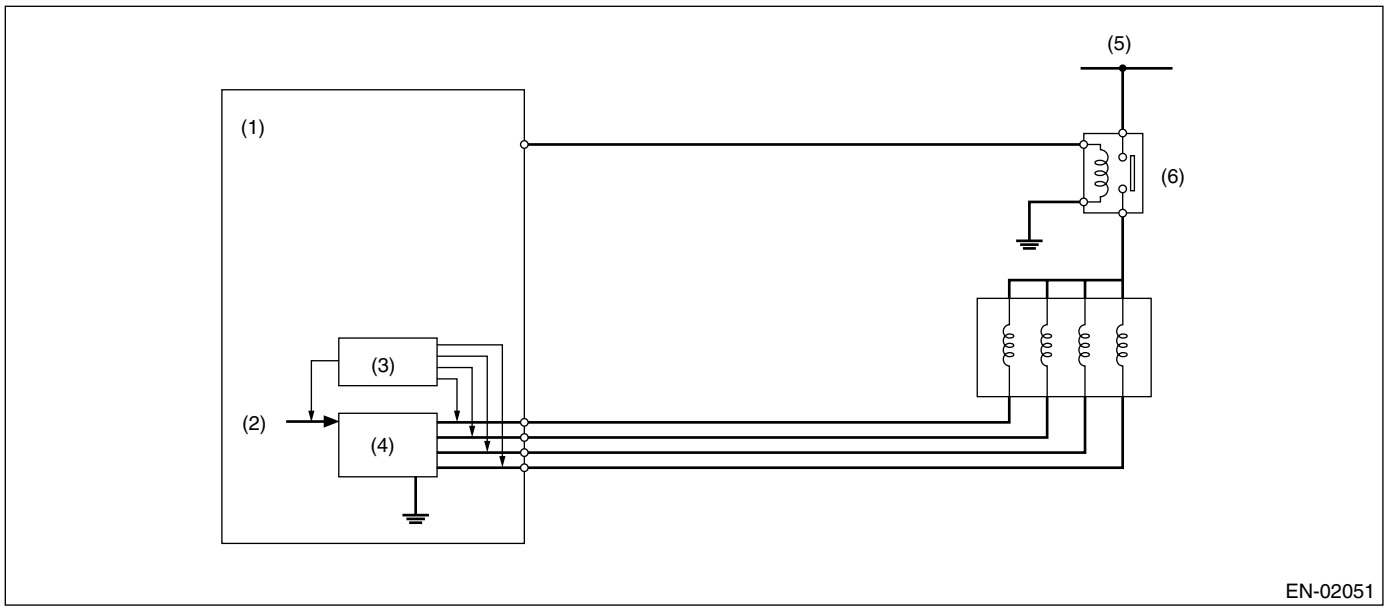
Memorize the freeze frame data. (For test mode $02)

DE:DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1292 P1294 P1296 P1298
Terminal voltage level when ECM outputs ON signal	High level	P1293 P1295 P1297 P1299

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

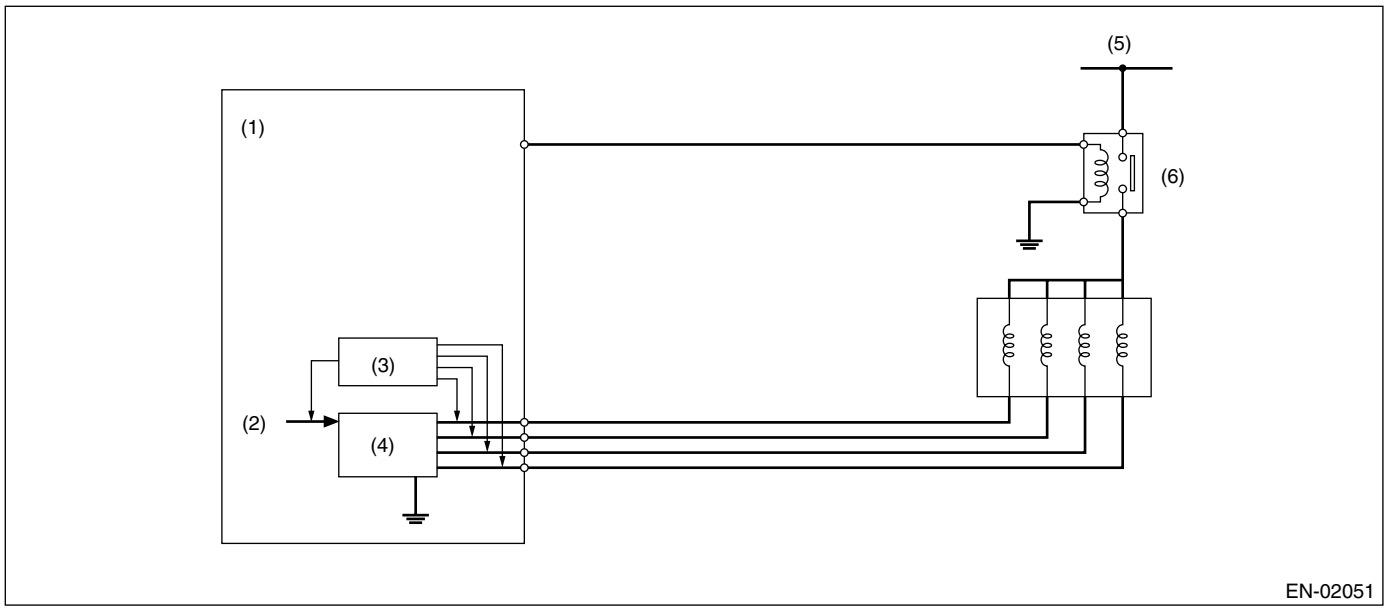
Memorize the freeze frame data. (For test mode $02)

DF:DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1292 P1294 P1296 P1298
Terminal voltage level when ECM outputs ON signal	High level	P1293 P1295 P1297 P1299

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

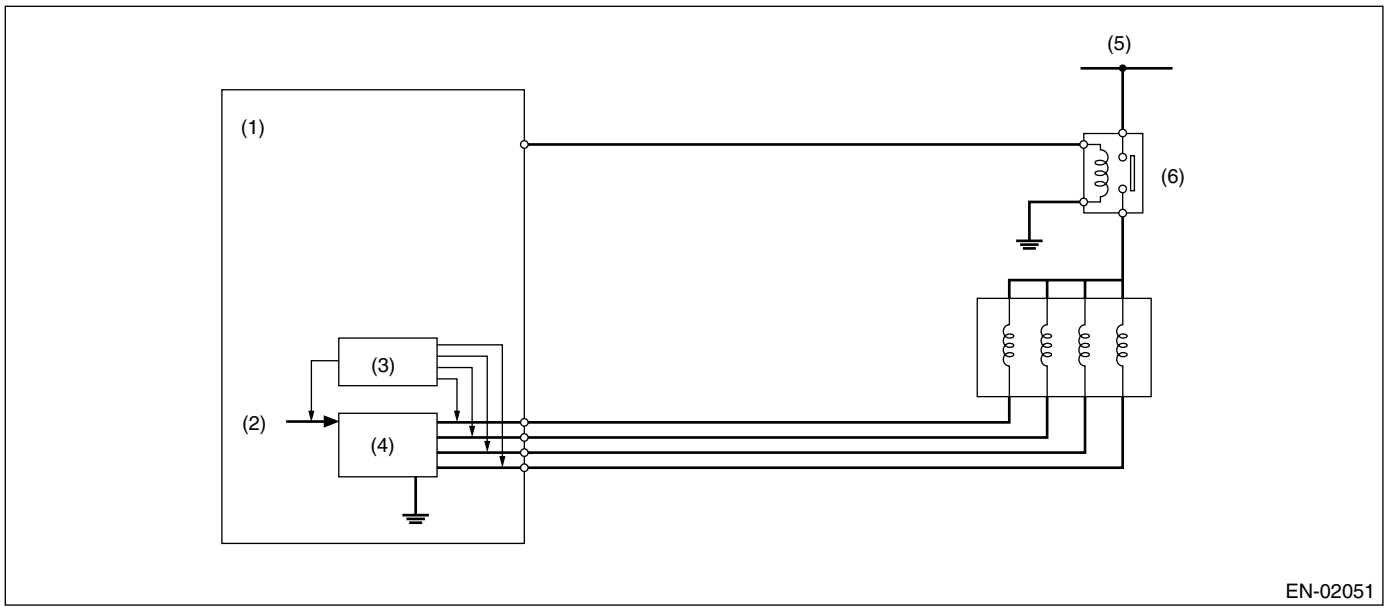
Memorize the freeze frame data. (For test mode $02)

DG:DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1292 P1294 P1296 P1298
Terminal voltage level when ECM outputs ON signal	High level	P1293 P1295 P1297 P1299

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

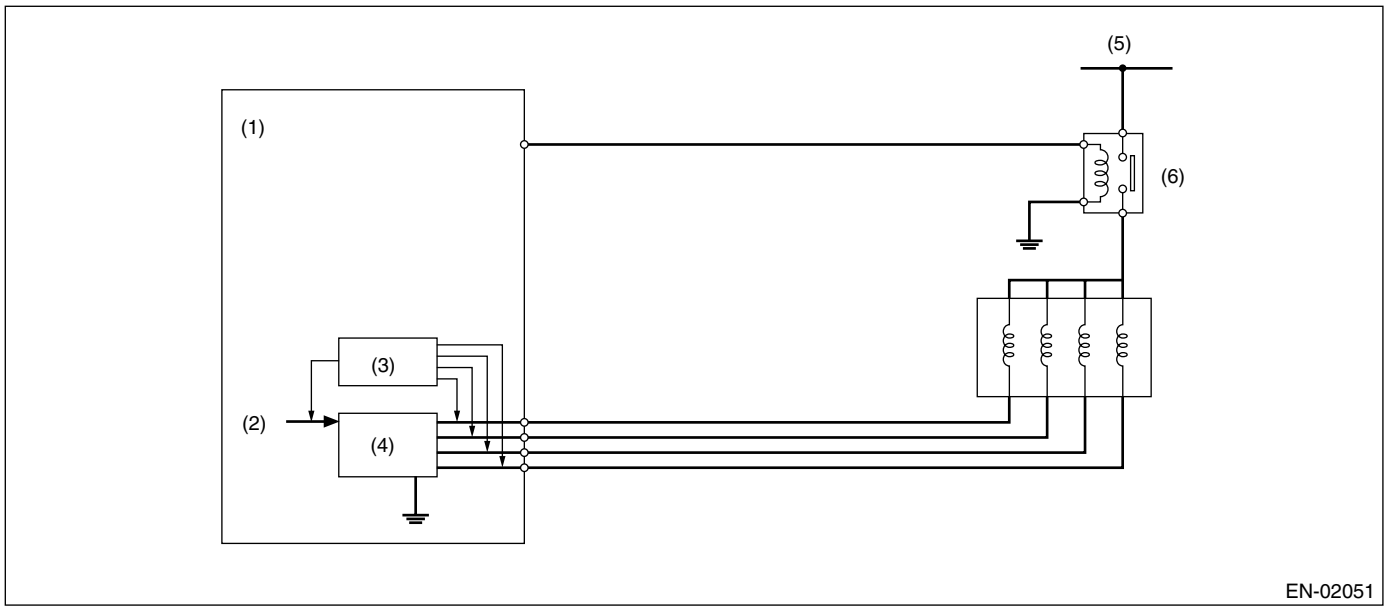
Memorize the freeze frame data. (For test mode $02)

DH:DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1292 P1294 P1296 P1298
Terminal voltage level when ECM outputs ON signal	High level	P1293 P1295 P1297 P1299

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

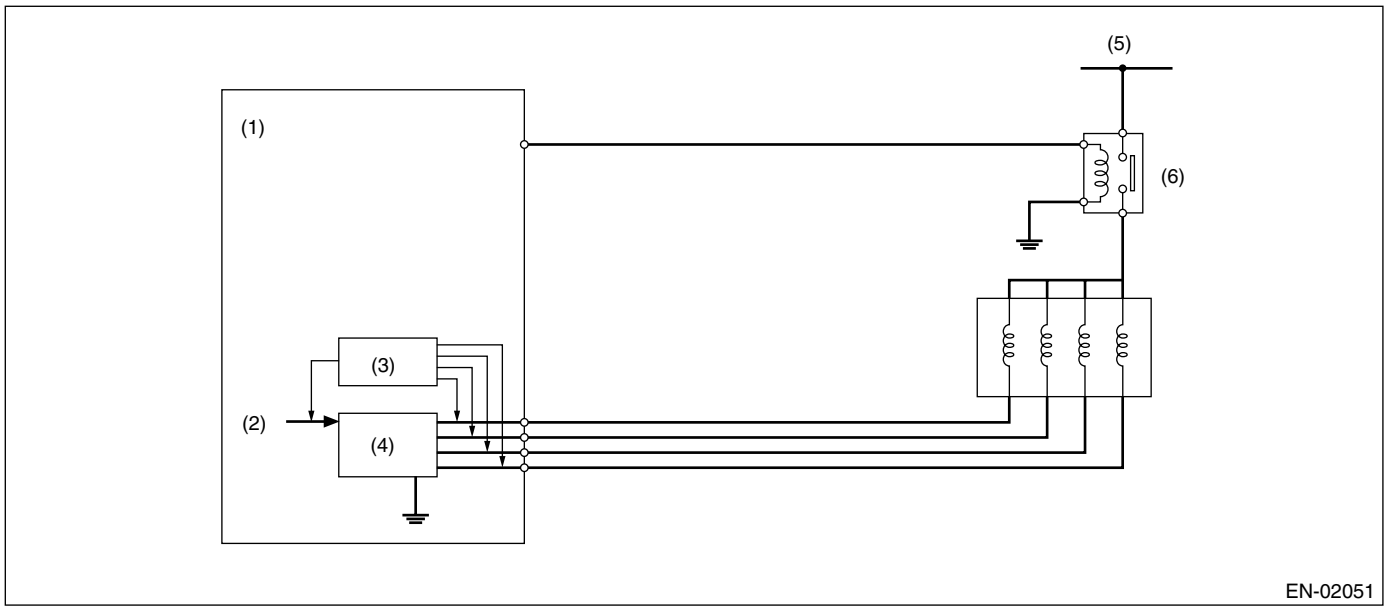
Memorize the freeze frame data. (For test mode $02)

DI: DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Terminal voltage level when ECM outputs OFF signal	Low level	P1292 P1294 P1296 P1298
Terminal voltage level when ECM outputs ON signal	High level	P1293 P1295 P1297 P1299

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

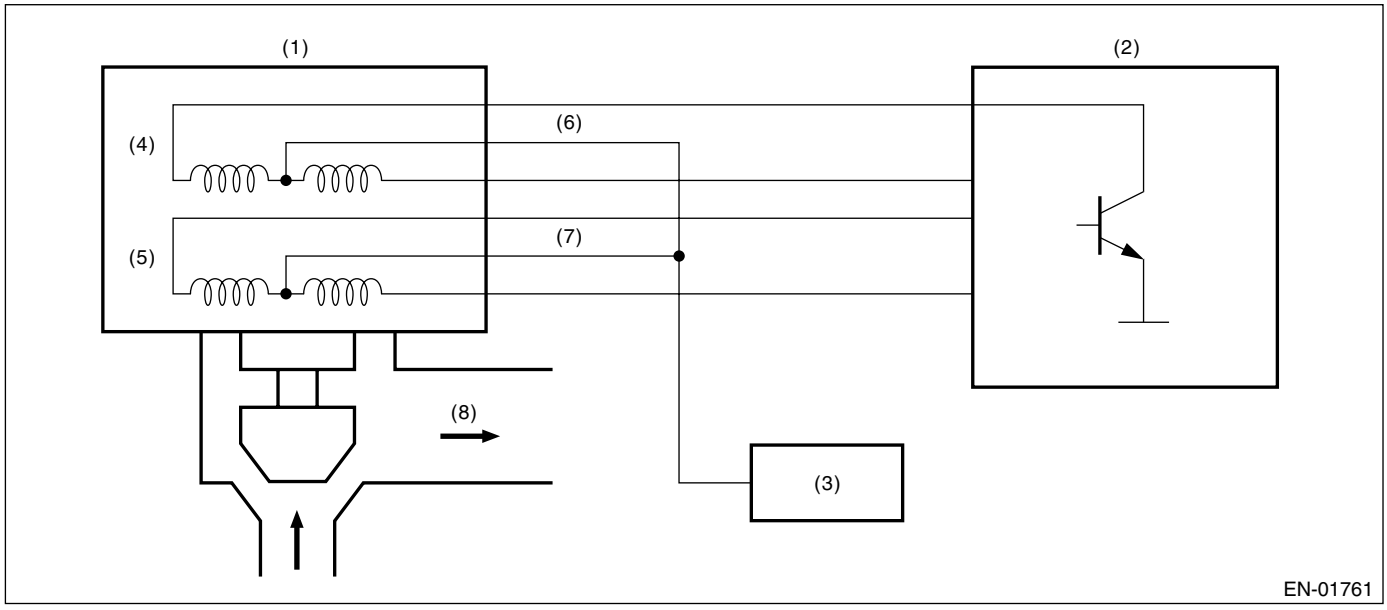
Memorize the freeze frame data. (For test mode $02)

DJ:DTC P1510 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

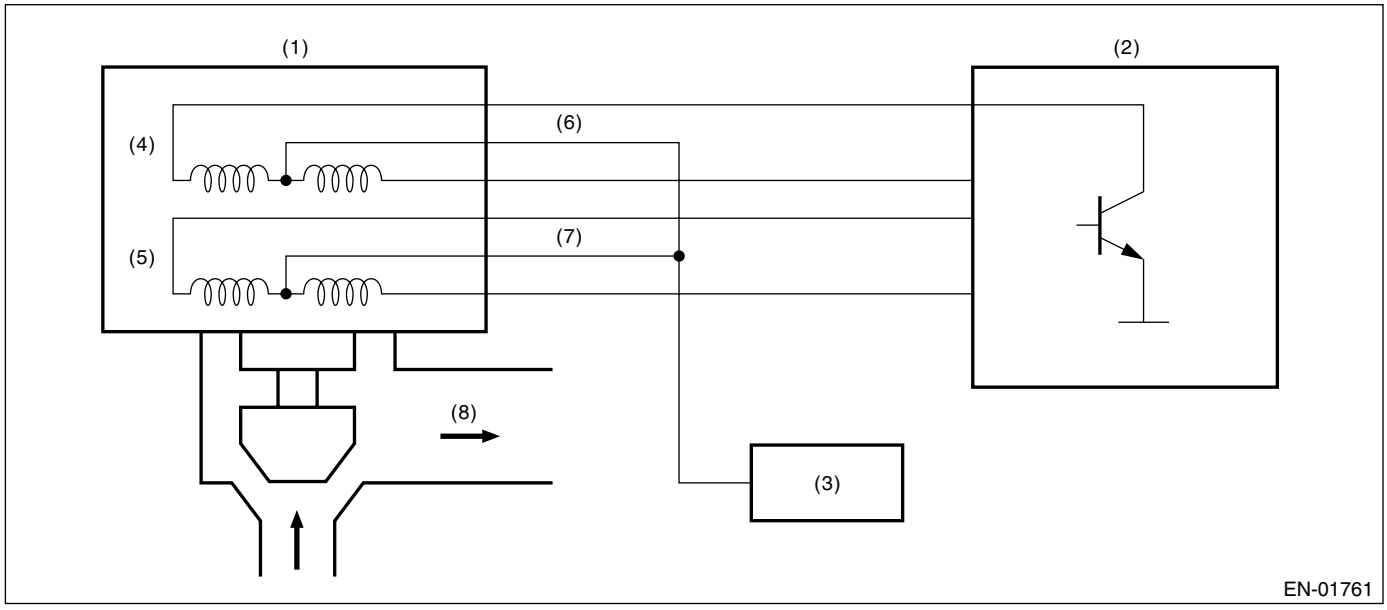
Memorize the freeze frame data. (For test mode $02)

DK:DTC P1511 — ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time needed for diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

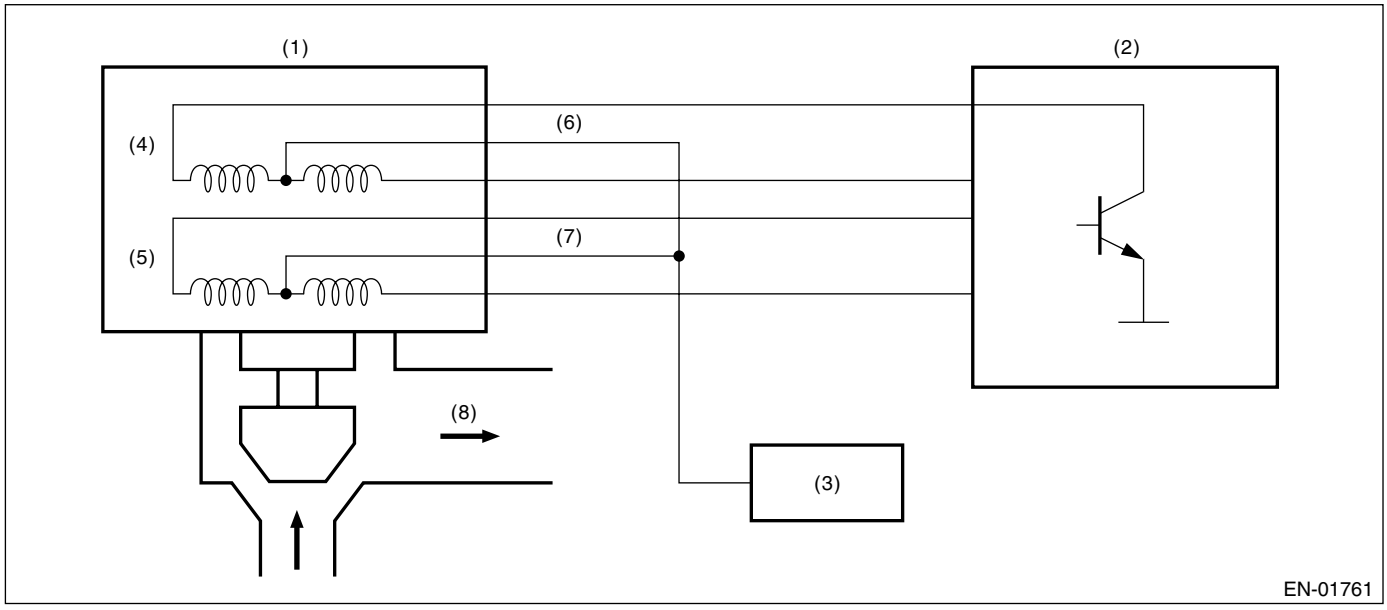
Memorize the freeze frame data. (For test mode $02)

DL:DTC P1512 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

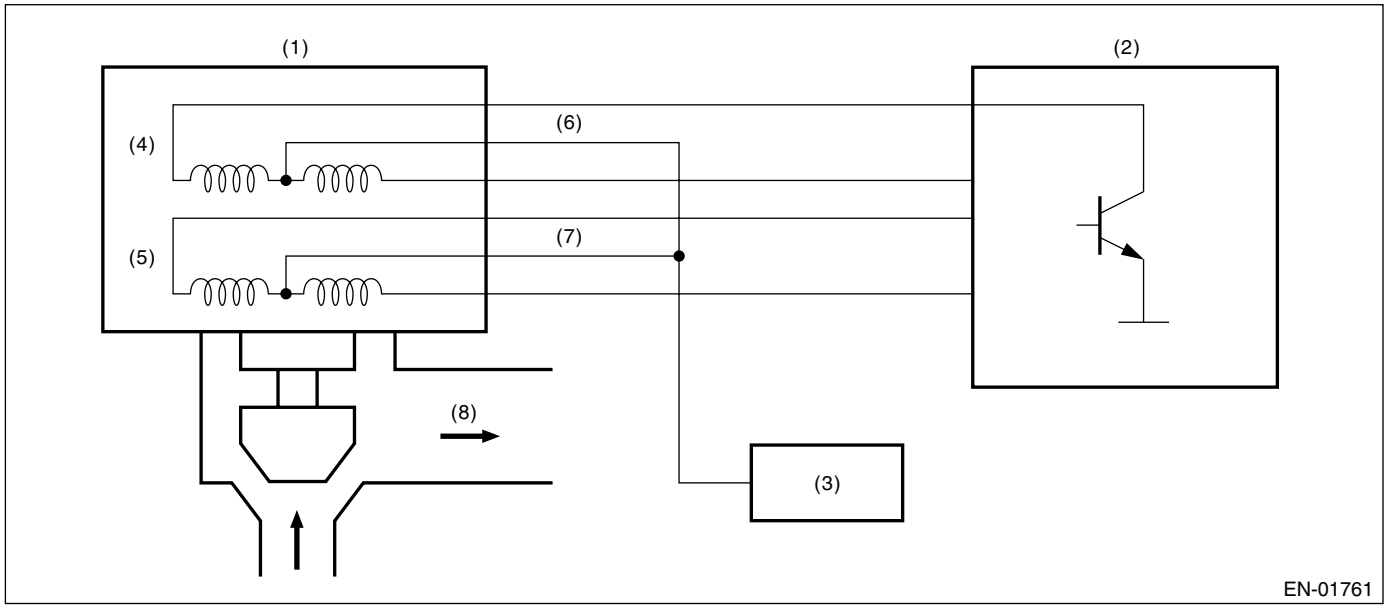
Memorize the freeze frame data. (For test mode $02)

DM:DTC P1513 — ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

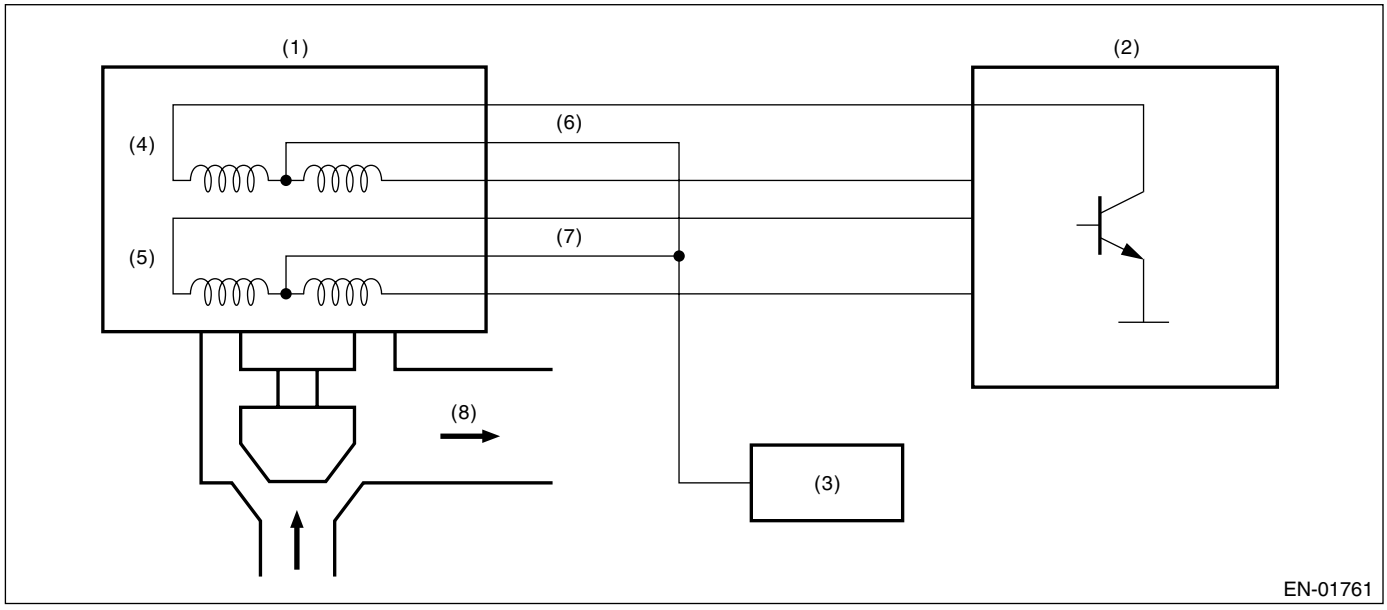
Memorize the freeze frame data. (For test mode $02)

DN:DTC P1514 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

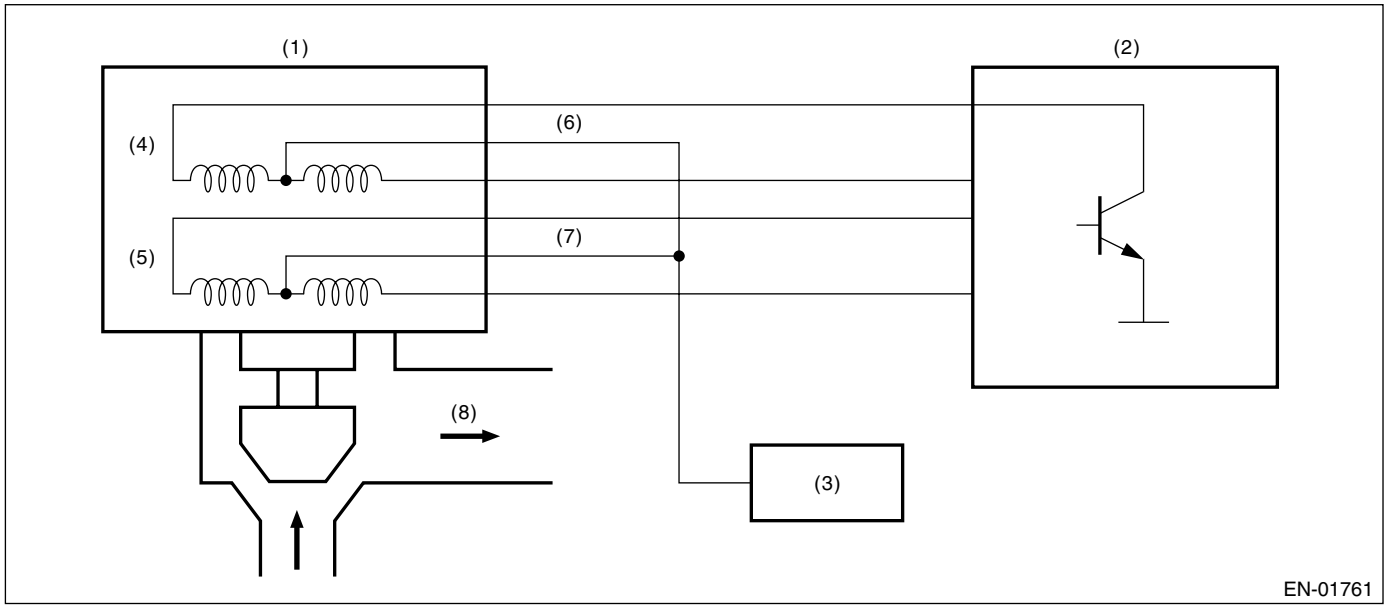
Memorize the freeze frame data. (For test mode $02)

DO:DTC P1515 — ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

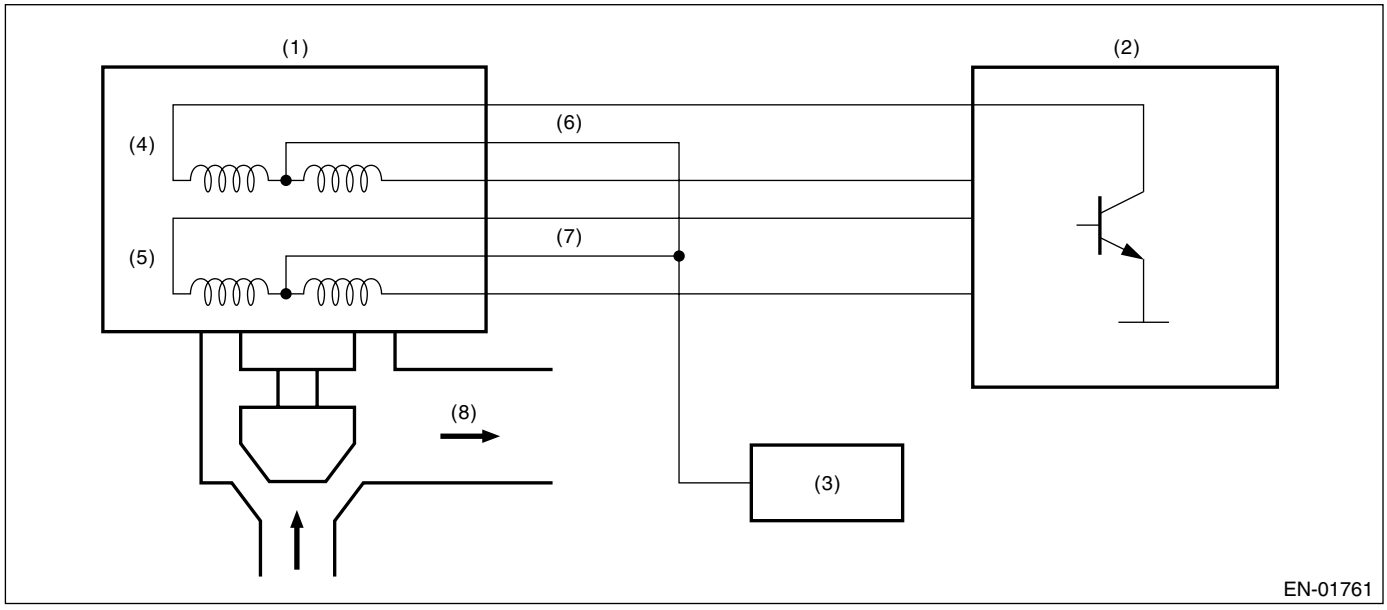
Memorize the freeze frame data. (For test mode $02)

DP:DTC P1516 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

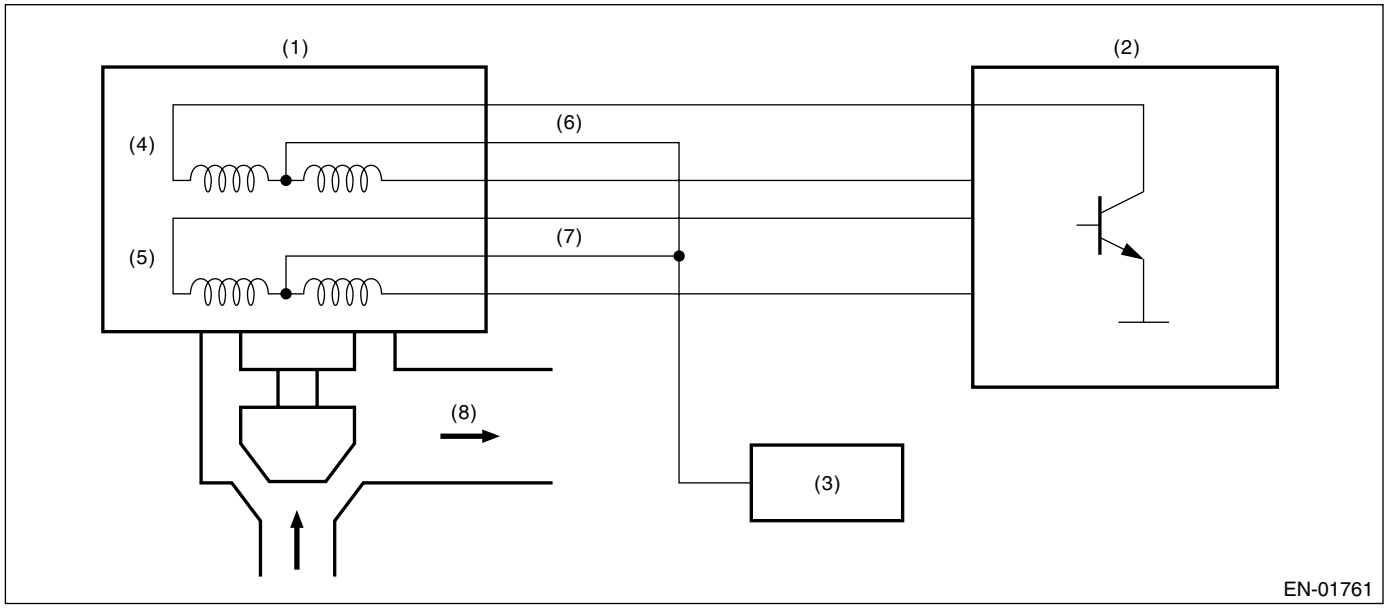
Memorize the freeze frame data. (For test mode $02)

DQ:DTC P1517 — ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DR:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of starter switch.
- Judge OFF NG when the starter signal remains ON even though engine speed and vehicle speed are high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine	Run

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting engine.

4. DIAGNOSTIC METHOD

Judge NG when all the malfunction criteria below are completed after more than 10 seconds.
Judge OK when the starter switch is turned from ON to OFF, and then NG are cleared.

Judgment value

Malfunction Criteria	Threshold Value
Engine speed	≥ 1500 rpm
Vehicle speed	≥ 30 km/h (19 MPH)
Starter “OFF” signal	Not detected

Time Needed for Diagnosis

OFF side 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DS:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of back-up power supply circuit.
- Judge NG when the back-up power supply does not come to ECM regardless of the battery voltage coming.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Self-diagnosis timer after starting the engine	≥ 5 seconds
Battery voltage MVB	≥ 9.2 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously in 5 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG and clear the NG when the cumulative time until completing the malfunction criteria below becomes more than the time (5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Battery back-up voltage	Battery voltage × 0.7

Time Needed for Diagnosis: 5 seconds
Malfunction indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DT:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT cooperative signal line.
- Judge NG when ECM output level is different from actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8.0 V
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.5 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DU:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT cooperative signal line.
- Judge NG when ECM output level is different from actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8.0 V
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.5 seconds) needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

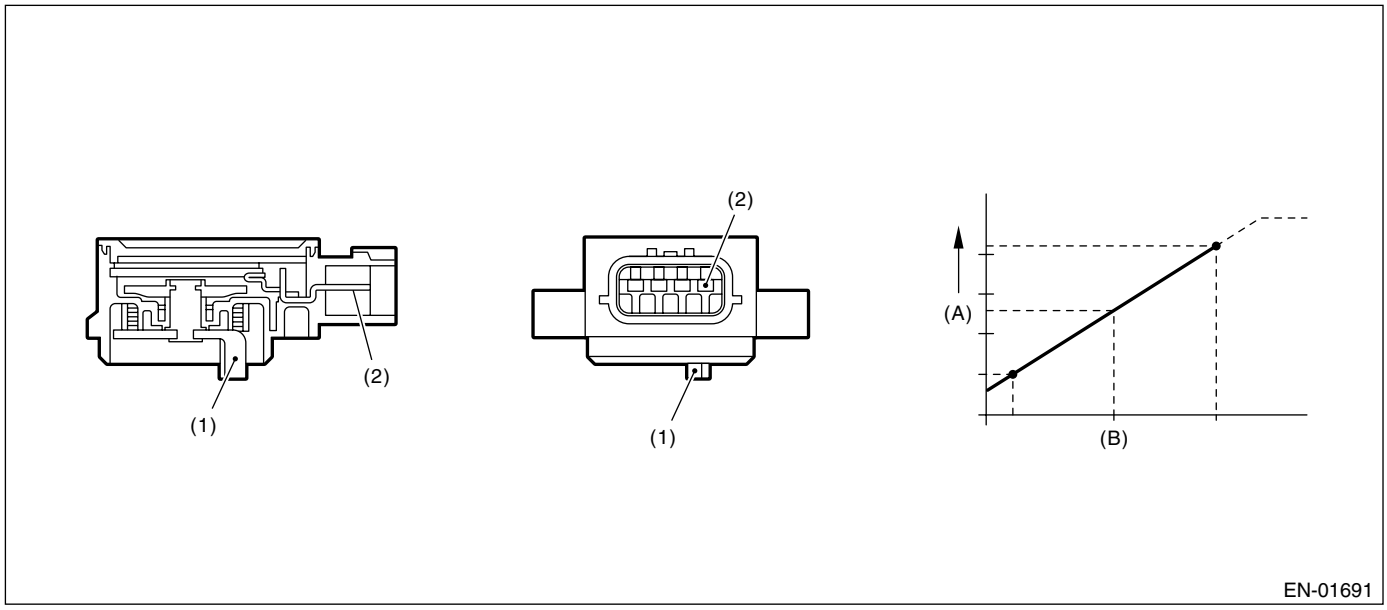
Memorize the freeze frame data. (For test mode $02)

DV:DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the voltage from throttle sensor is out of specified value.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle valve angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 or ≥ 4.6 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the throttle angle to 3/8 open, and the line pressure and 2-4B pressure to maximum.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DW:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) at “ON” signal from TCM	High level
Collector voltage of transistor (Vc) at “OFF” signal from ECM	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DX:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	High
Vc at “OFF” signal from ECM	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

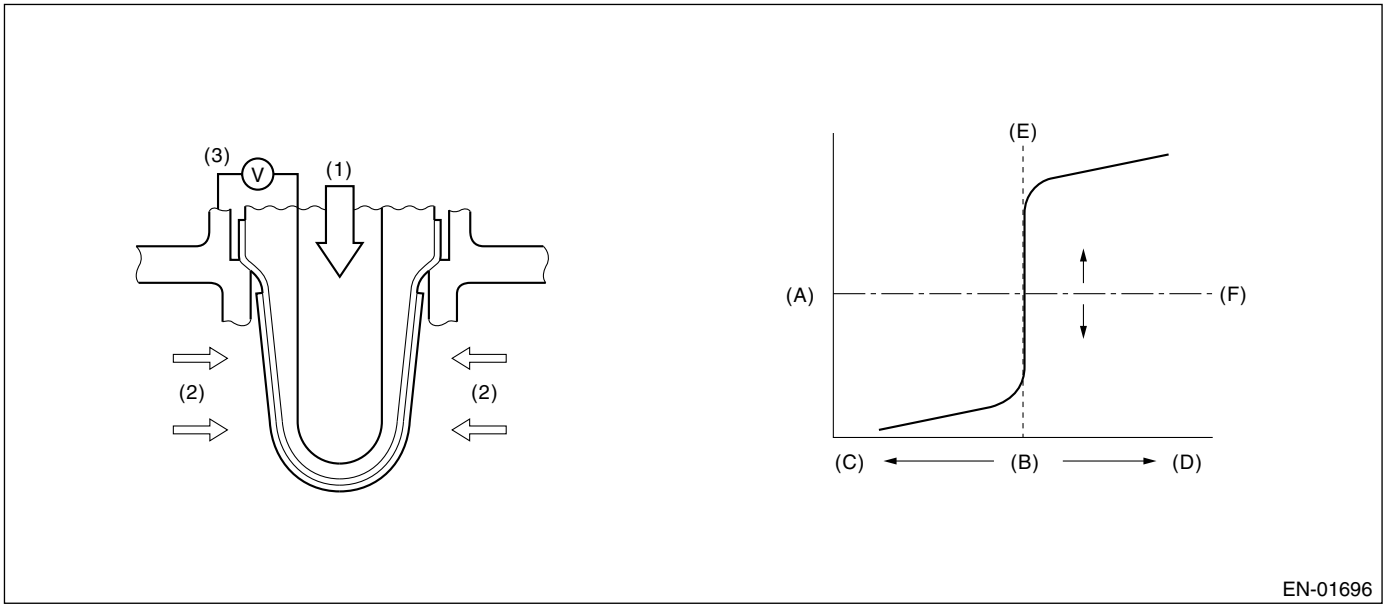
Memorize the freeze frame data. (For test mode $02)

DY:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Judge NG when the rear oxygen sensor output does not approach to the slice level (target voltage) with the control amount sticks to rich or lean side while operating the sub feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel system monitoring with primary oxygen sensor	In operation
Target lambda with primary oxygen sensor	1.0
Closed loop control with secondary oxygen sensor	In operation
Amount of intake air	≥ 20 kg (0.71 oz)/h
Feed back control with secondary oxygen sensor	Reached to the limit value

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of more than 20 km/h (12 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich or lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and slice level (target voltage).
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

• Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 – rsl) where: rvo2 = sensing voltage of secondary oxygen sensor rsl = target voltage of secondary oxygen sensor	< –8000 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

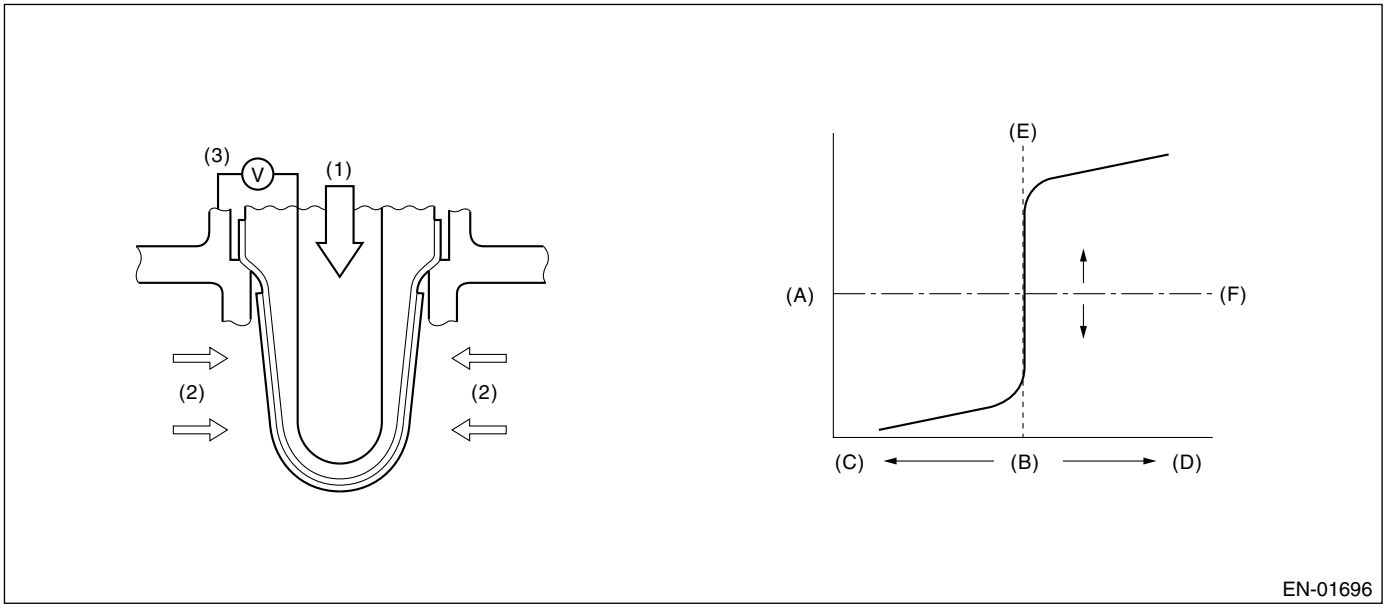
Memorize the freeze frame data. (For test mode $02)

DZ:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Judge NG when the rear oxygen sensor output does not approach to the slice level (target voltage) with the control amount sticks to rich or lean side while operating the sub feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel system monitoring with primary oxygen sensor	In operation
Target lambda with primary oxygen sensor	1.0
Closed loop control with secondary oxygen sensor	In operation
Amount of intake air	≥ 20 kg (0.71 oz)/h
Feed back control with secondary oxygen sensor	Reached to the limit value

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich or lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and slice level (target voltage).
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

• Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 – rsl) where: rvo2 = sensing voltage of secondary oxygen sensor rsl = target voltage of secondary oxygen sensor	> 2300 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SO U5)

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1. General Description

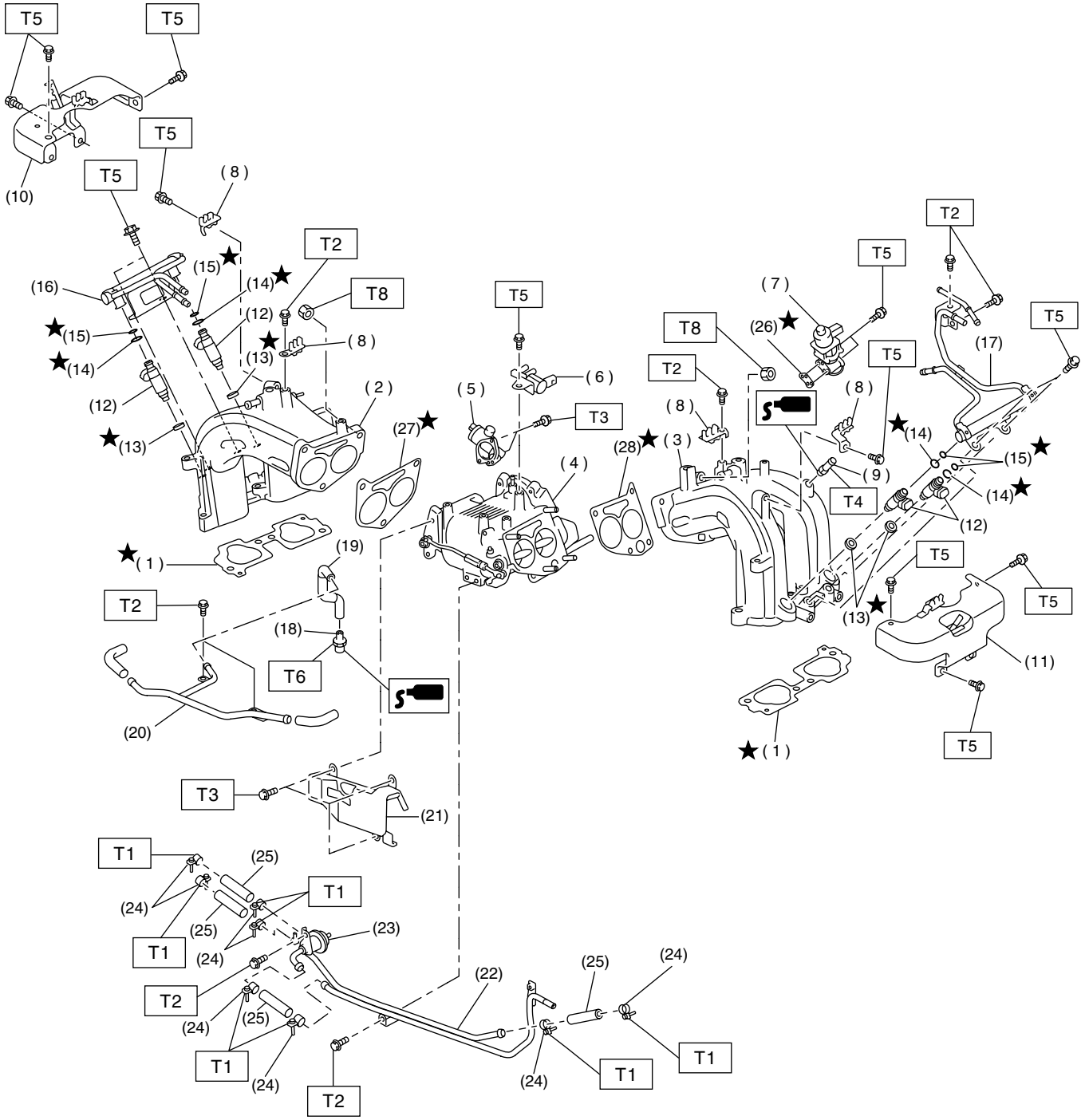
A: SPECIFICATIONS

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm^2, 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

MEMO:

B: COMPONENT

1. INTAKE MANIFOLD



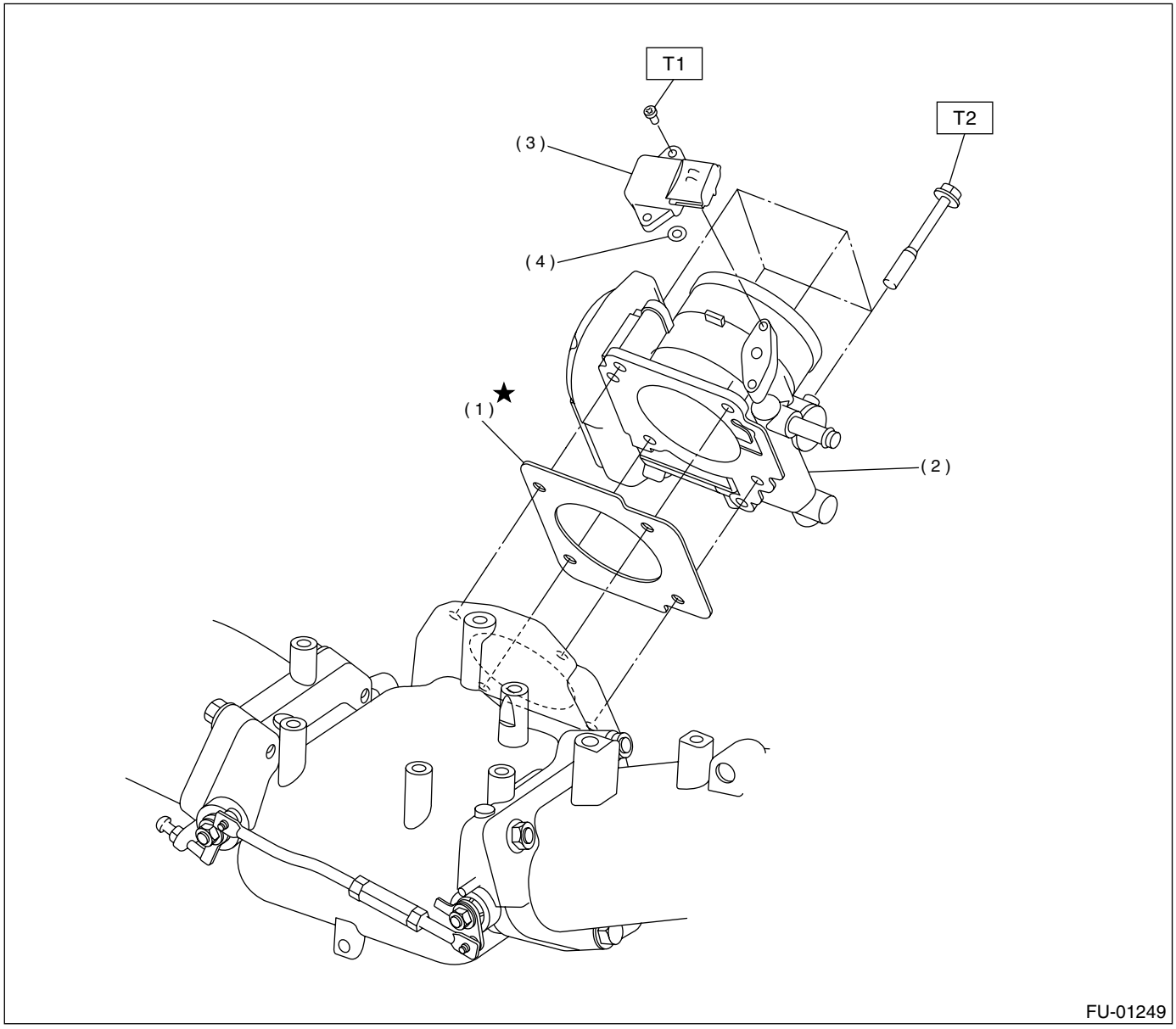
FU-01248

(1) Intake manifold gasket
(2) Intake manifold RH
(3) Intake manifold LH
(4) Tumble generator valve ASSY
(5) Tumble generator valve actuator
(6) Purge control solenoid valve
(7) EGR valve
(8) Plug code holder
(9) Nipple
(10) Fuel pipe protector RH
(11) Fuel pipe protector LH
(12) Fuel injector
(13) O-ring
(14) O-ring
(15) O-ring
(16) Fuel injector pipe RH
(17) Fuel injector pipe LH
(18) PCV valve
(19) PCV hose
(20) PCV pipe
(21) Protector
(22) Fuel pipe ASSY
(23) Pressure regulator
(24) Clamp
(25) Fuel hose
(26) EGR valve gasket
(27) Tumble generator valve gasket RH
(28) Tumble generator valve gasket LH

Tightening torque: N·m ***(kgf-m, ft-lb)***

T1:	***1.5 (0.15, 1.1)***
T2:	***5.0 (0.51, 3.7)***
T3:	***5.9 (0.60, 4.3)***
T4:	***17 (1.7, 12)***
T5:	***19 (0.19, 1.4)***
T6:	***22.5 (2.29, 16.6)***
T7:	***25 (2.6, 18.8)***
T8:	***<Ref. to FU(H4SO U5)-23, ASSEMBLY, INTAKE MANIFOLD.>***

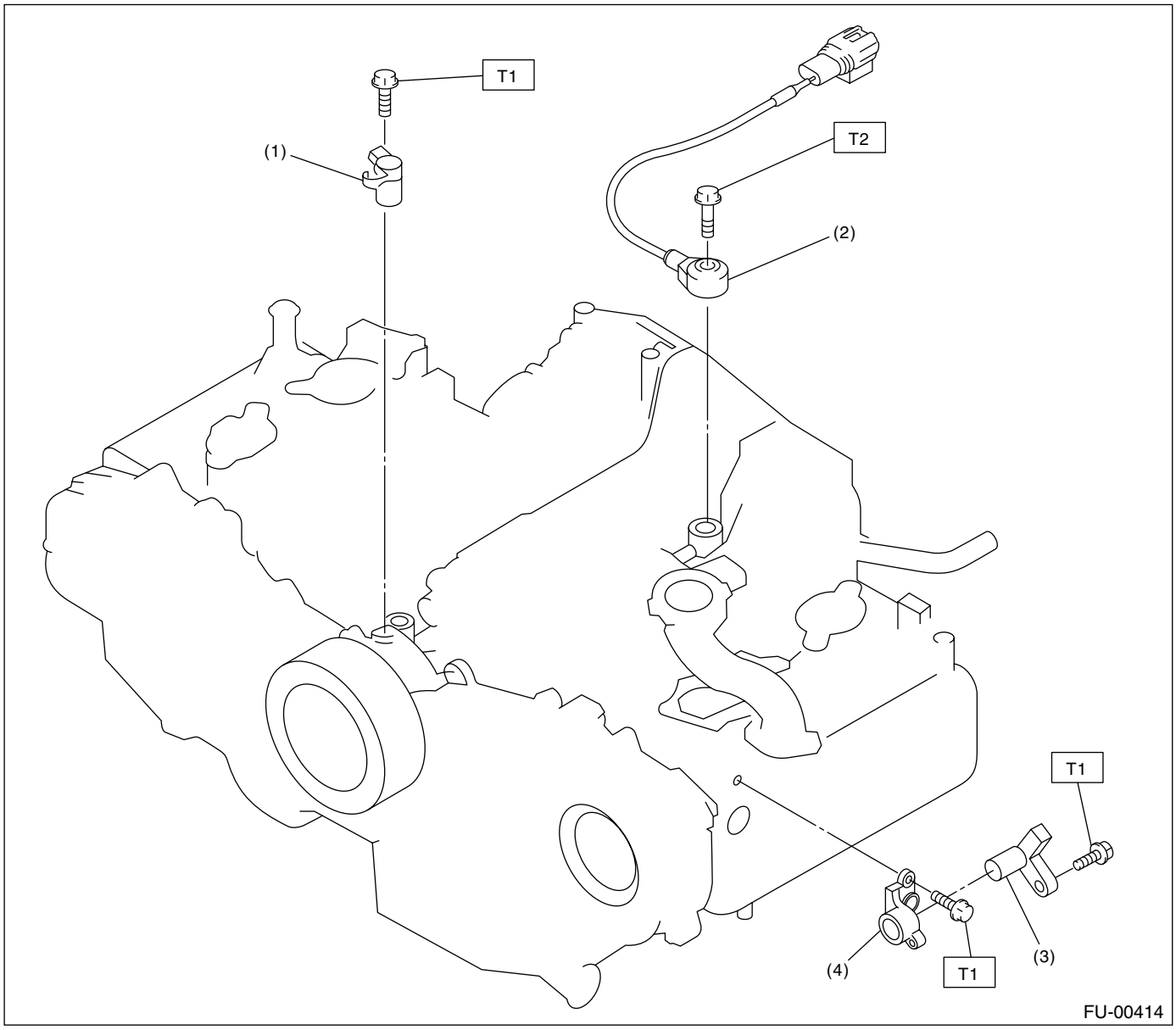
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle body
(3) Pressure sensor
(4) O-ring

Tightening torque: N·m ***(kgf-m, ft-lb)***
T1: 1.6 (0.16, 1.2)
T2: 8 (0.8, 5.8)

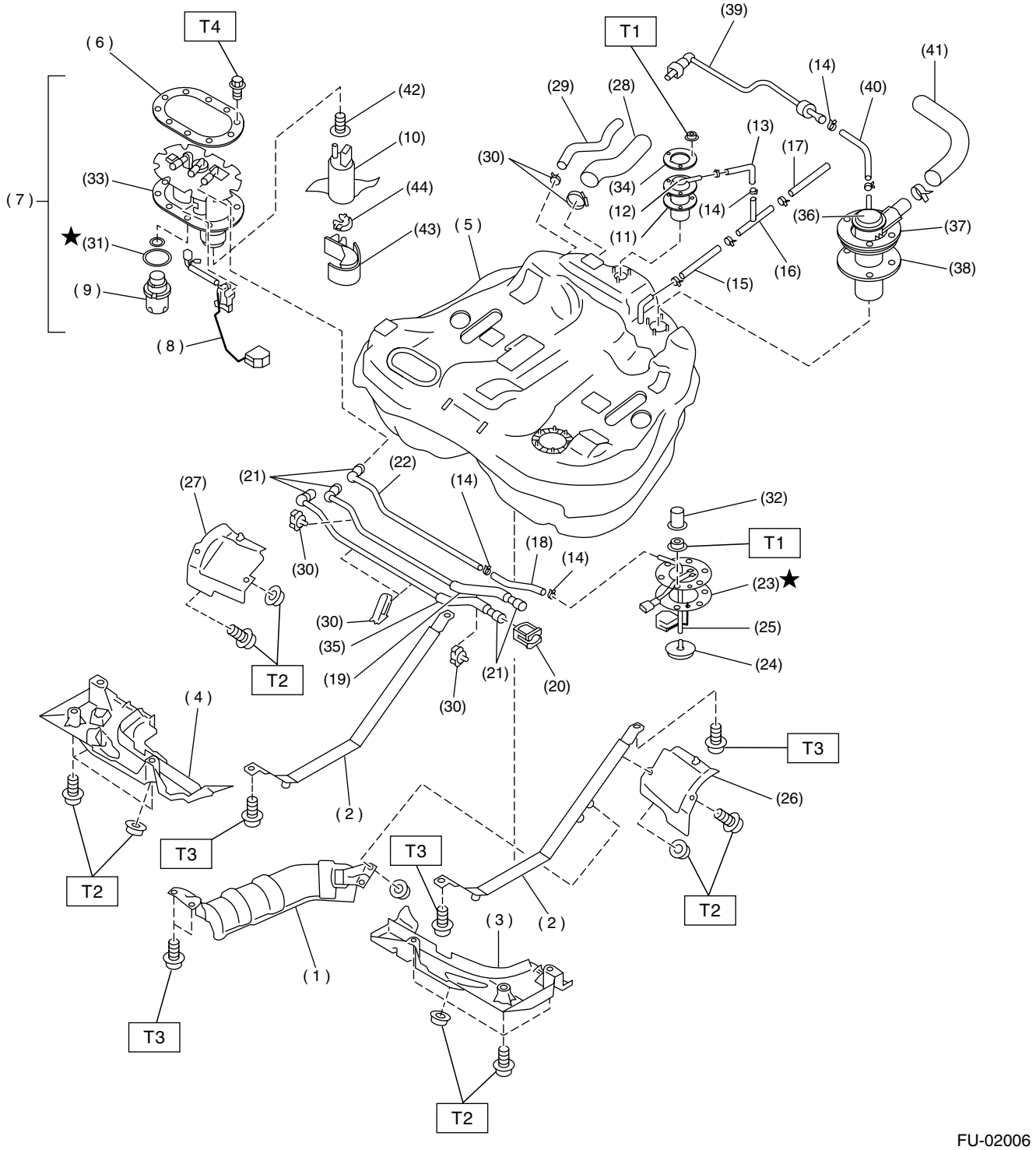
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) Camshaft position sensor support

Tightening torque: N·m ***(kgf-m, ft-lb)***
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

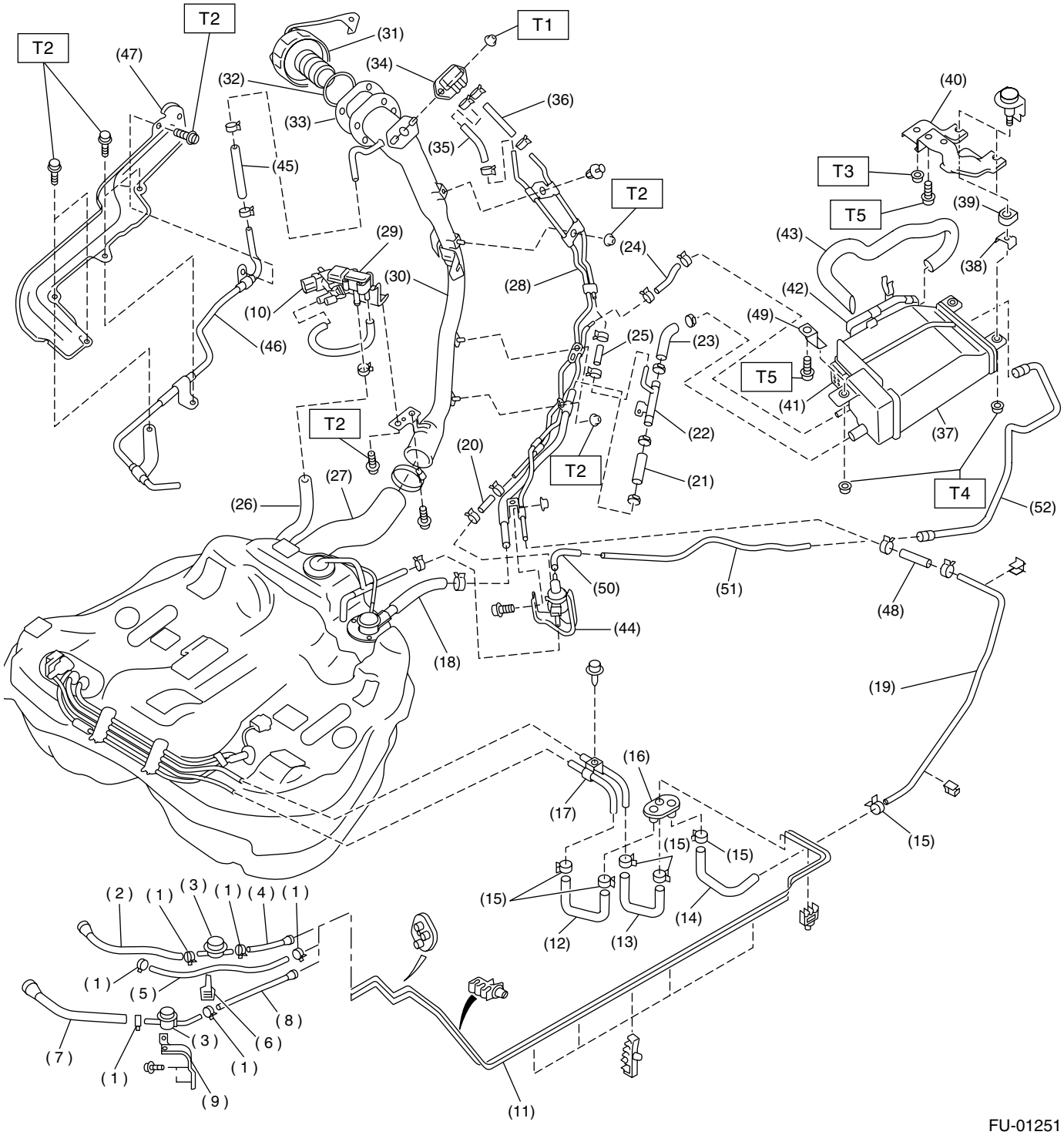


FU-02006

(1) Heat sealed cover
(2) Fuel tank band
(3) Protector LH (Front)
(4) Protector RH (Front)
(5) Fuel tank
(6) Fuel pump plate
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel filter
(10) Fuel pump
(11) Fuel cut valve gasket
(12) Fuel cut valve
(13) Evaporation hose A
(14) Clip
(15) Evaporation hose C
(16) Joint pipe
(17) Evaporation hose B
(18) Jet pump hose
(19) Fuel return tube
(20) Retainer
(21) Quick connector
(22) Jet pump tube
(23) Fuel sub level sensor gasket
(24) Jet pump filter
(25) Fuel sub level sensor
(26) Protector LH (Rear)
(27) Protector RH (Rear)
(28) Fuel filler hose
(29) Fuel tank pressure sensor hose
(30) Clamp
(31) Gasket
(32) Cap
(33) Gasket
(34) Fuel cut valve plate
(35) Fuel delivery tube
(36) Vent valve
(37) Vent valve plate
(38) Vent valve gasket
(39) Evaporation tube
(40) Evaporation hose D
(41) Air vent hose
(42) Seal
(43) Fuel pump holder
(44) Grommet

Tightening torque: N·m ***(kgf-m, ft-lb)***
T1: 4.4 (0.45, 3.3)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)
T4: 5.9 (0.6, 4.3)

5. FUEL LINE


T1
T2
T3
T4
T5
(1)
(2)
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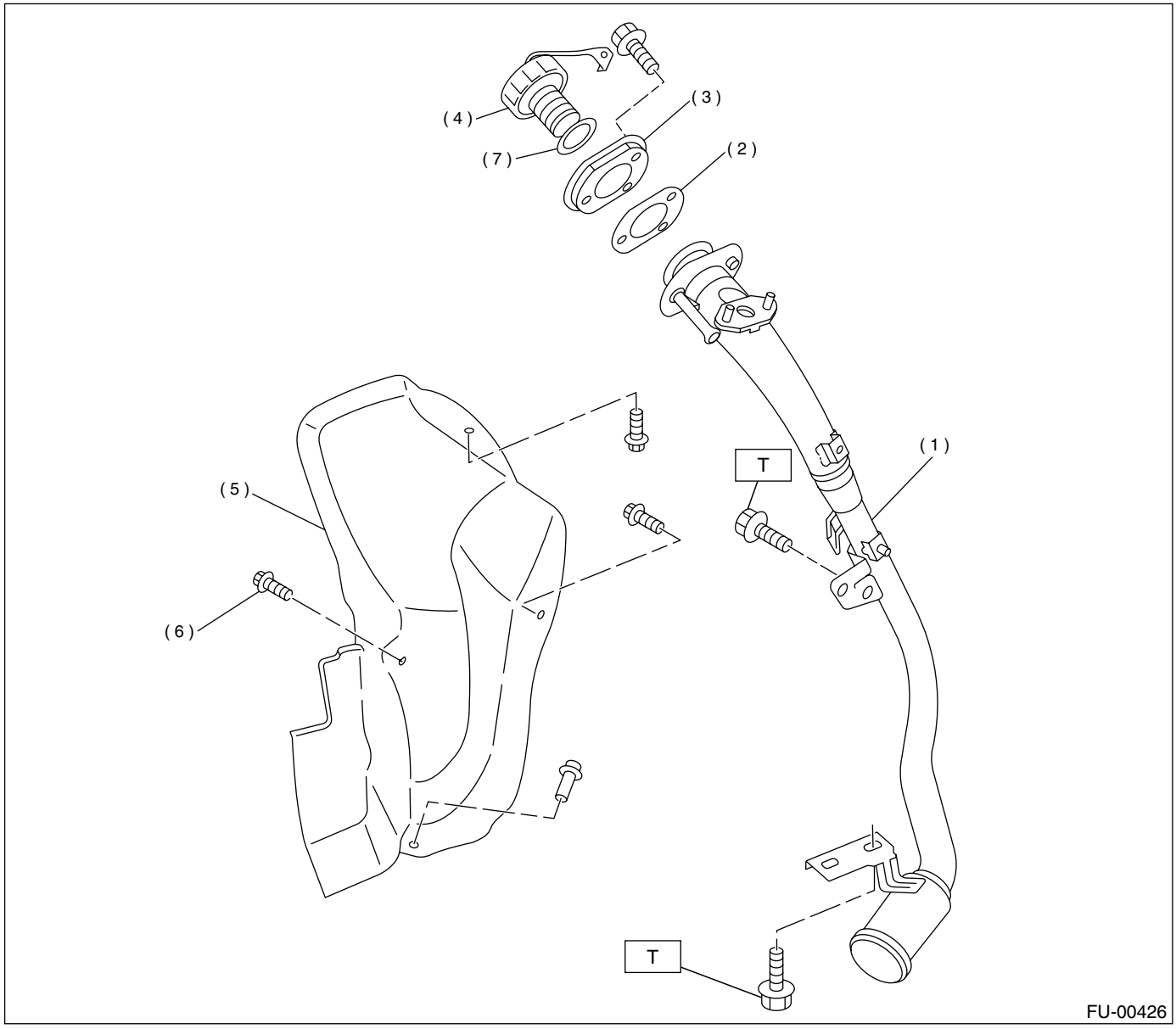
FU-01251

(1) Clamp
(2) Fuel return hose A
(3) Fuel damper valve
(4) Fuel return hose B
(5) Evaporation hose A
(6) Clip
(7) Fuel delivery hose A
(8) Fuel delivery hose B
(9) Fuel dumper valve bracket
(10) Fuel tank sensor control valve
(11) Fuel pipe ASSY
(12) Fuel delivery hose C
(13) Fuel return hose C
(14) Evaporation hose B
(15) Clamp
(16) Grommet
(17) Fuel pipe ASSY
(18) Air vent hose A
(19) Evaporation pipe A
(20) Evaporation hose C
(21) Air vent hose B
(22) Air vent pipe
(23) Air vent hose C
(24) Evaporation hose D
(25) Evaporation hose E
(26) Fuel tank pressure sensor hose
(27) Fuel filler hose
(28) Evaporation pipe B
(29) Fuel tank pressure sensor
(30) Fuel filler pipe
(31) Fuel filler cap
(32) Ring
(33) Packing
(34) Shut valve
(35) Evaporation hose F
(36) Evaporation hose G
(37) Canister
(38) Canister lower bracket
(39) Cushion rubber
(40) Canister upper bracket
(41) Drain valve
(42) Drain filter
(43) Drain hose
(44) Pressure control solenoid valve
(45) Evaporation hose H
(46) Evaporation pipe C
(47) Pipe protector
(48) Evaporation hose I
(49) Canister bracket (front)
(50) PCV hose
(51) PCV pipe
(52) PCV tube

Tightening torque: N·m ***(kgf-m, ft-lb)***
T1: 4.5 (0.46, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 23 (2.3, 16.6)
T5: 33 (3.4, 25)

6. FUEL FILLER PIPE



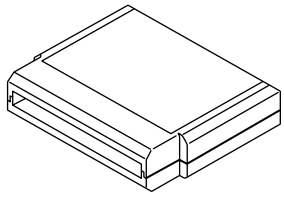
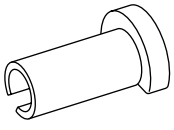
(1) Fuel filler pipe ASSY
(2) Filler pipe packing
(3) Filler ring
(4) Filler cap
(5) Filler pipe protector
(6) Clip
(7) O-ring

Tightening torque: N·m ***(kgf-m, ft-lb)***
T: 7.5 (0.75, 5.4)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

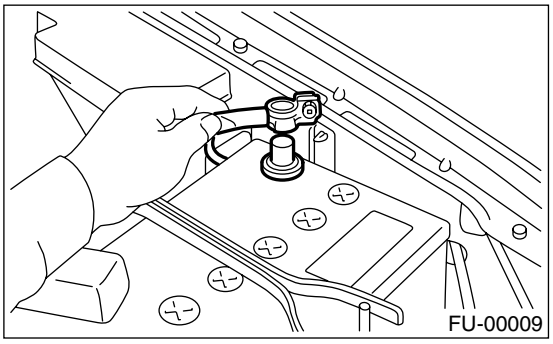
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for removing quick connector in engine room.

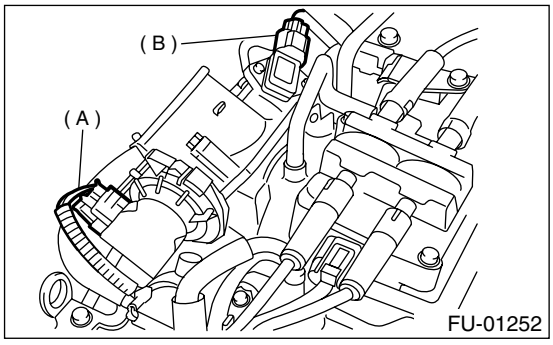
2. Throttle Body

A: REMOVAL

1) Disconnect battery ground cable.

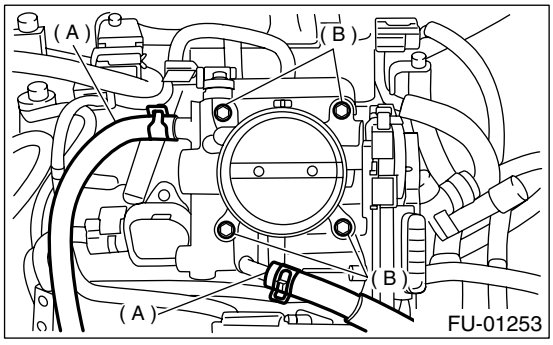


2) Remove air intake chamber.
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3) Disconnect connectors from throttle position sensor and pressure sensor.



(A) Throttle position sensor
(B) Pressure sensor

4) Disconnect engine coolant hoses (A) from throttle body.
5) Remove bolts (B) which install throttle body to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

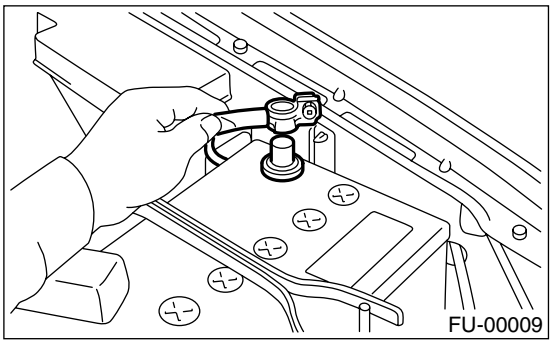
NOTE:
Always use a new gasket.

Tightening torque:
Throttle body;
8 N·m (0.8 kgf-m, 5.8 ft-lb)

3. Intake Manifold

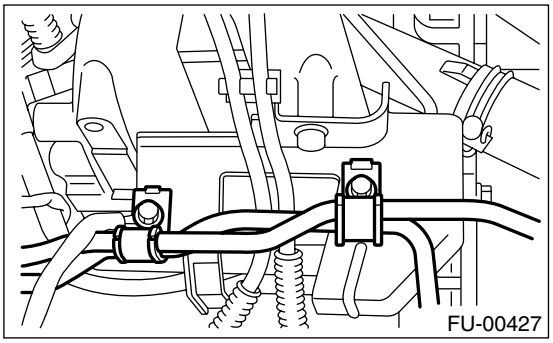
A: REMOVAL

1) Release fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.

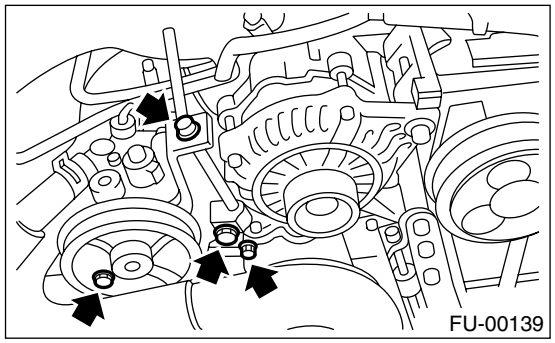


4) Remove air cleaner case and air intake chamber. <Ref. to IN(H4SO U5)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
5) Remove power steering pump and tank from brackets.
   (1) Remove air intake duct. <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
   (2) Remove front V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
   (3) Remove bolts which hold power steering pipes onto intake manifold protector.

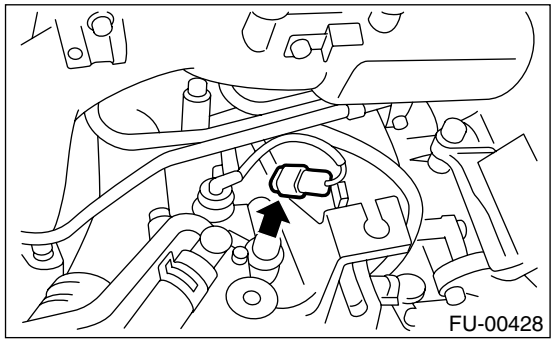
NOTE:
Do not disconnect power steering hose.



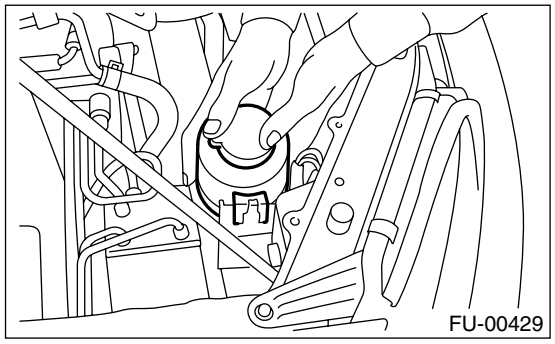
(4) Remove bolts which install power steering pump bracket.



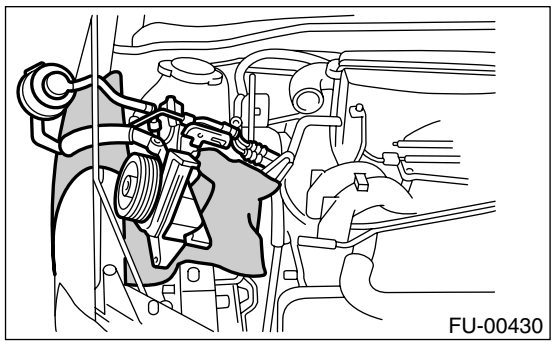
(5) Disconnect connector from power steering pump switch.



(6) Remove power steering tank from the bracket by pulling it upwards.

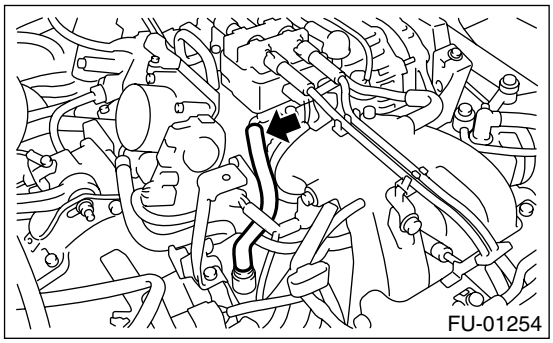


(7) Place power steering pump and tank on the right side wheel apron.

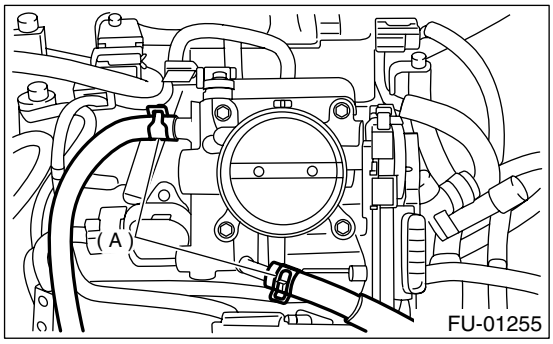


6) Disconnect spark plug cords from spark plugs.

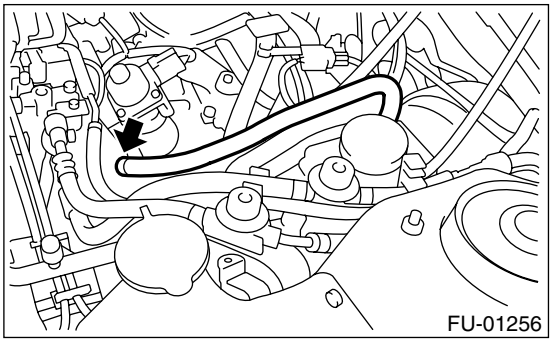
7) Disconnect PCV hose from intake manifold.



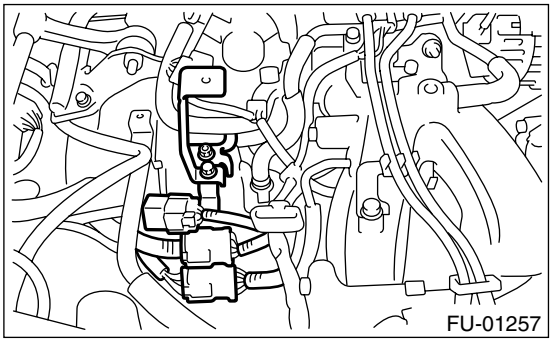
8) Disconnect engine coolant hose (A) from throttle body.



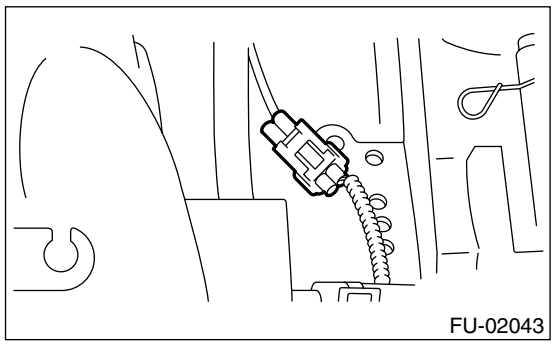
9) Disconnect brake booster hose.



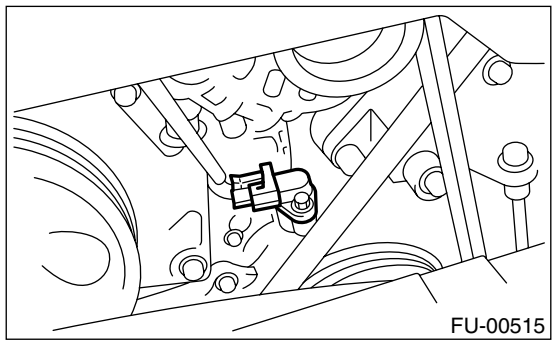
10) Remove air intake chamber stay RH and engine harness bracket, and disconnect engine harness connectors from bulkhead harness connectors.



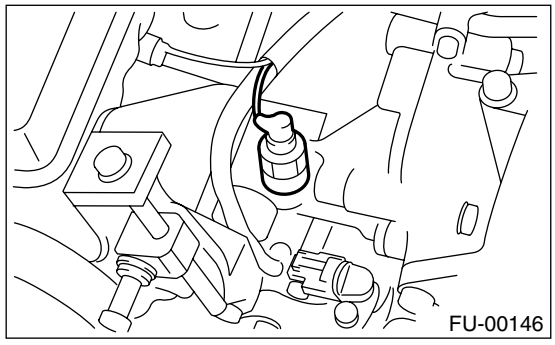
11) Disconnect knock sensor connector.



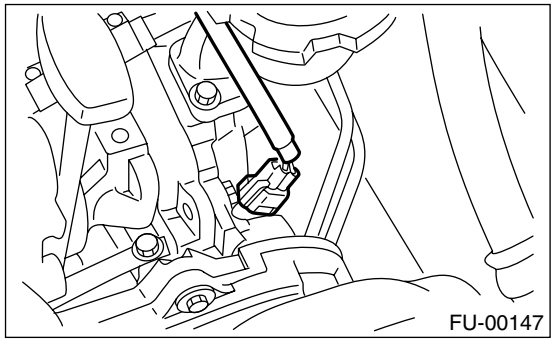
12) Disconnect connector from crankshaft position sensor.



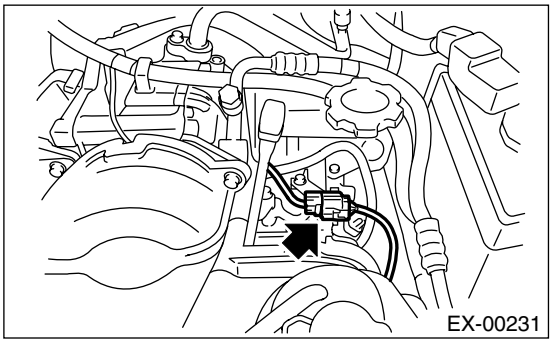
13) Disconnect connector from oil pressure switch.



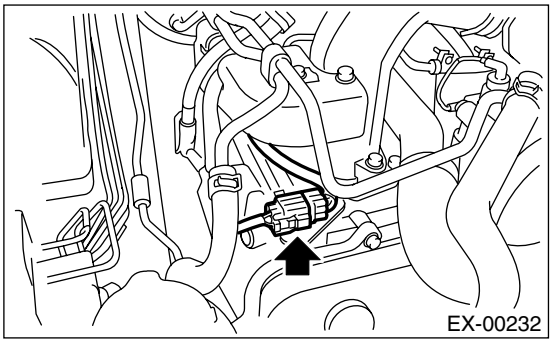
14) Disconnect connector from camshaft position sensor.



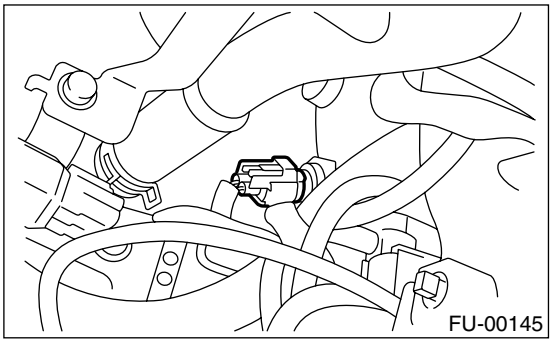
15) Disconnect connectors from front oxygen (A/F) sensor.
- LH side



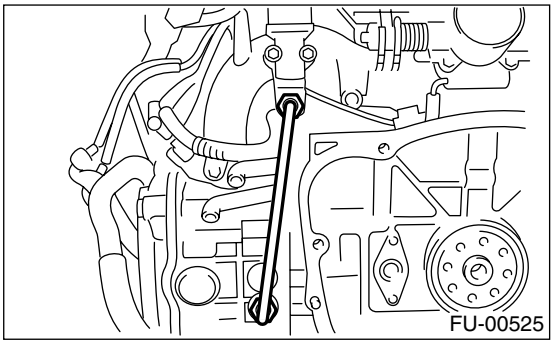
- RH side



16) Disconnect connectors from engine coolant temperature sensor.



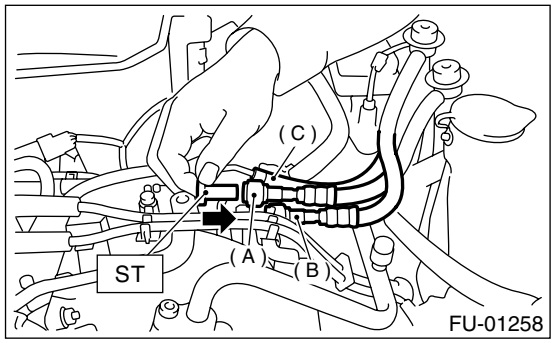
17) Remove EGR pipe from intake manifold and cylinder head.



18) Using the ST, disconnect fuel hoses from fuel pipes.

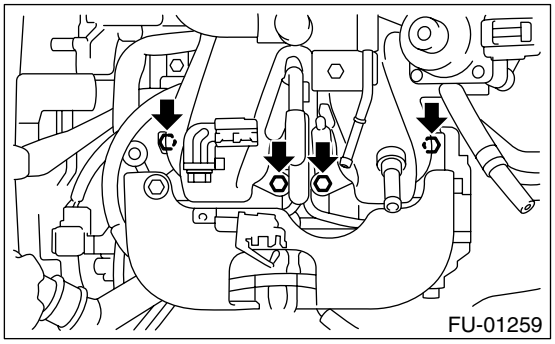
WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**

ST 42099AE000 CONNECTOR REMOVER



(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

19) Remove bolts which hold intake manifold onto cylinder heads, and remove intake manifold.

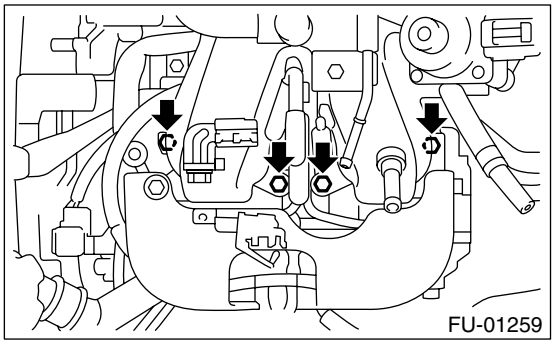


B: INSTALLATION

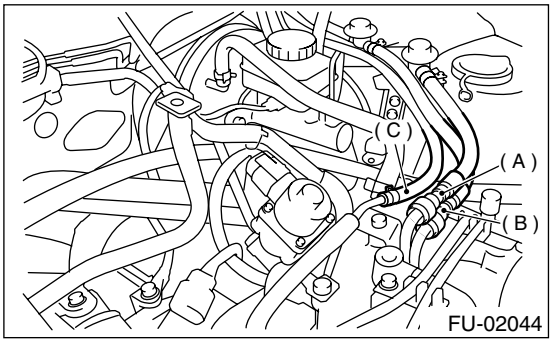
1) Install intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



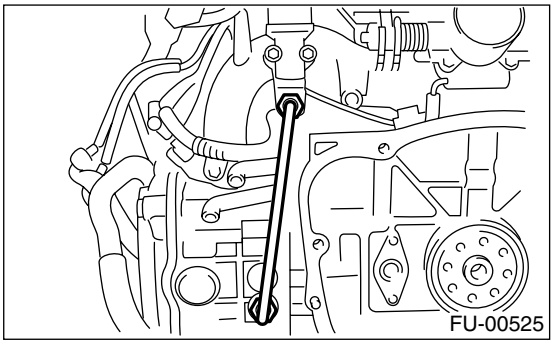
2) Connect fuel hoses.



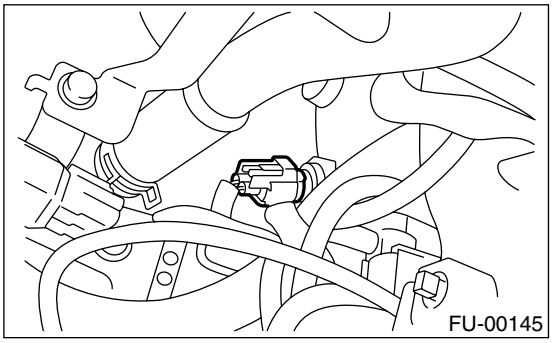
(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

3) Install EGR pipe to intake manifold and cylinder head.

Tightening torque:
34 N·m (3.5 kgf-m, 25 ft-lb)

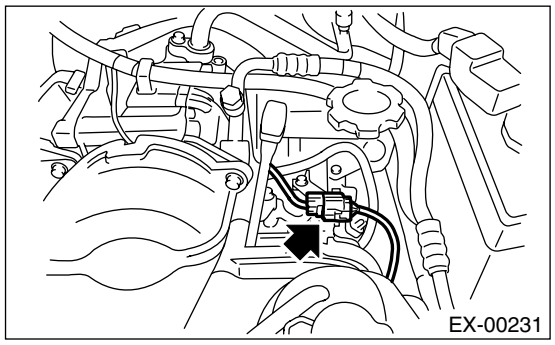


4) Connect connectors to engine coolant temperature sensor.

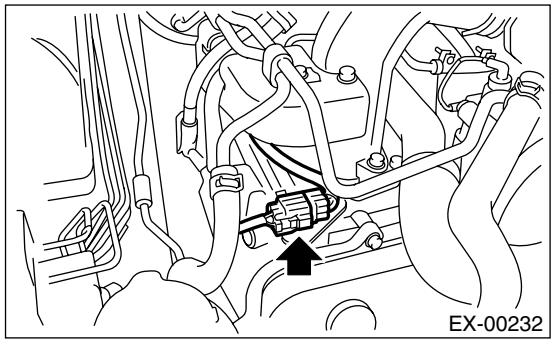


5) Connect connectors to front oxygen (A/F) sensor.

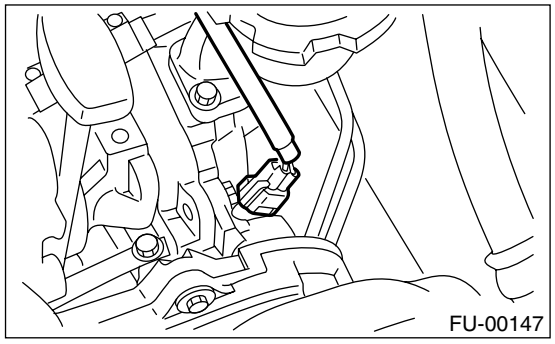
- LH side



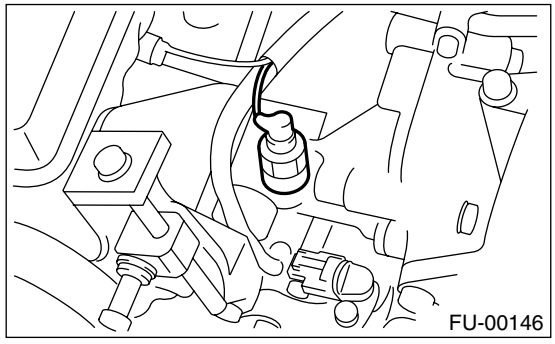
- RH side



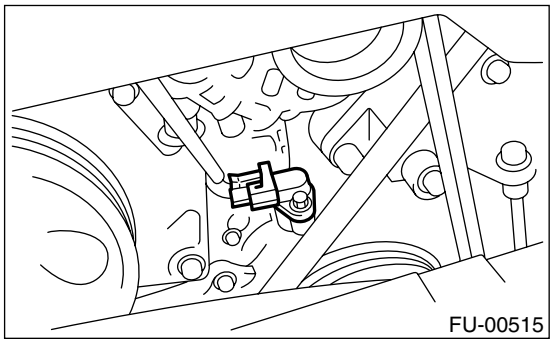
6) Connect connector to camshaft position sensor.



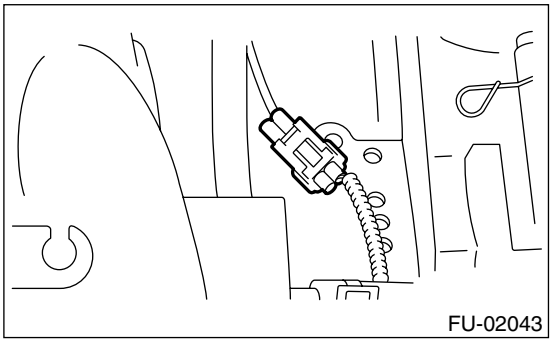
7) Connect connector to oil pressure switch.



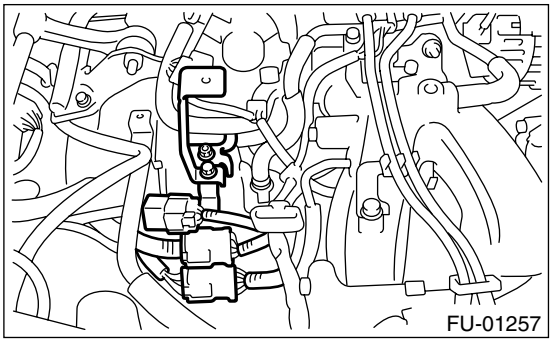
8) Connect connector to crankshaft position sensor.



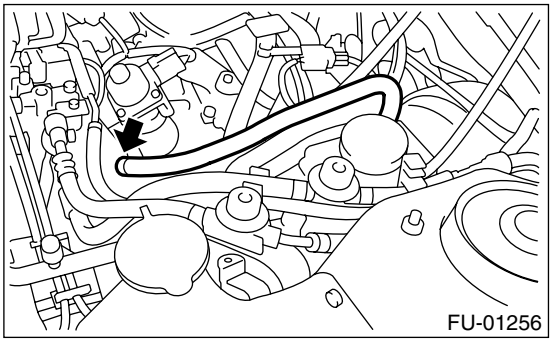
9) Connect knock sensor connector.



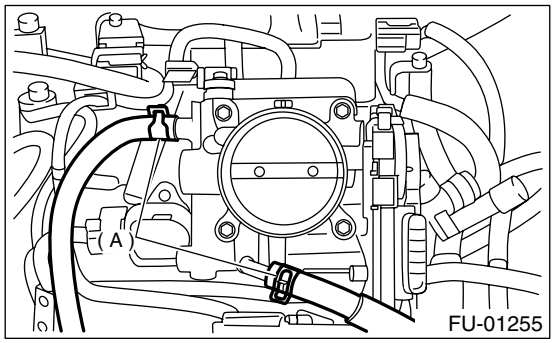
10) Install air intake chamber stay RH and engine harness bracket, and connect engine harness connectors to bulkhead connectors.



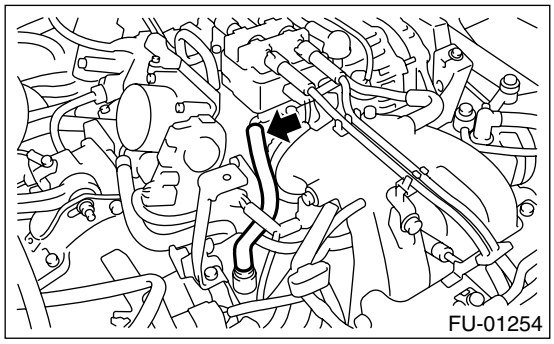
11) Connect brake booster hose.



12) Connect engine coolant hose (A) to throttle body.



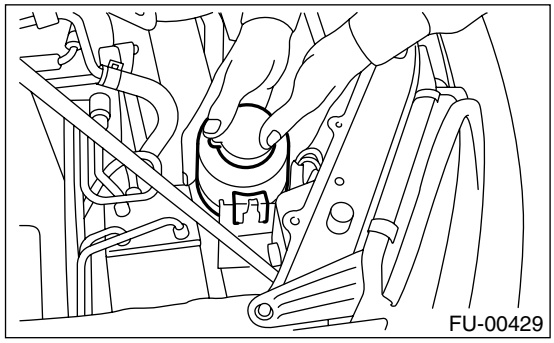
13) Connect PCV hose to intake manifold.



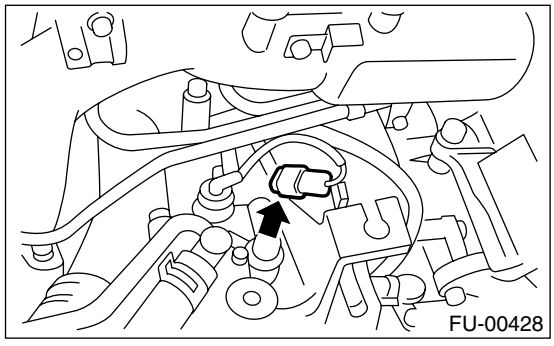
14) Connect spark plug cords to spark plugs.

15) Install power steering pump and tank on brackets.

(1) Install power steering tank on bracket.

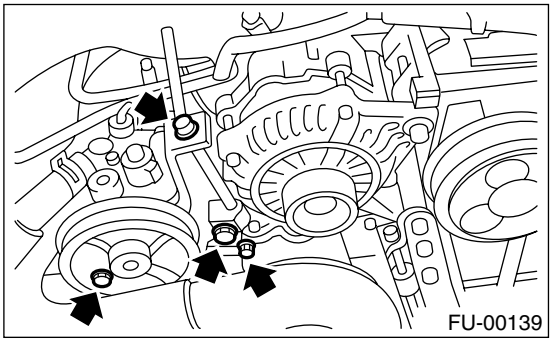


(2) Connect connector to power steering pump switch.

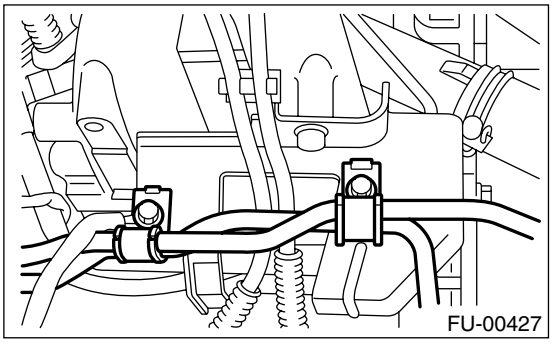


(3) Tighten bolts which install power steering pump on bracket.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

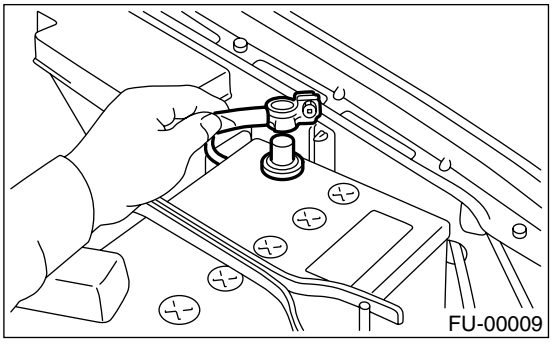

FU-00139

(4) Install power steering pipes onto right side intake manifold protector.


FU-00427

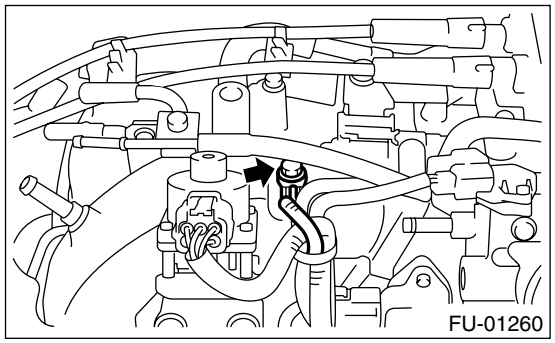
(5) Install front V-belt.
<Ref. to ME(H4SO)-43, INSTALLATION, V-belt.>
(6) Install air intake duct.

16) Install air cleaner case and air intake chamber. <Ref. to IN(H4SO U5)-5, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
17) Connect connector to fuel pump relay.
18) Connect battery ground cable.

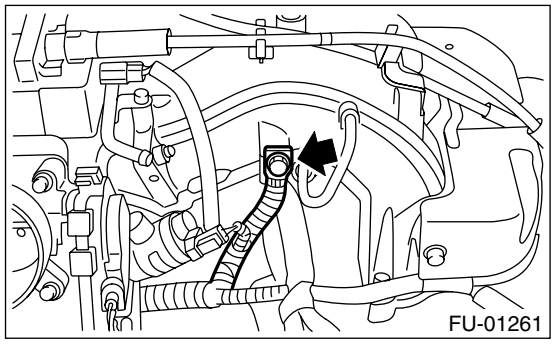

FU-00009

C: DISASSEMBLY

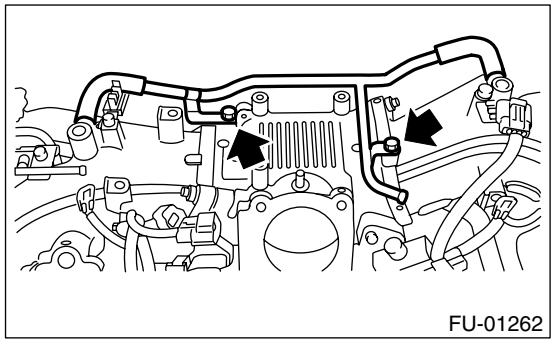
1) Disconnect engine ground terminal from intake manifold.
- LH side


FU-01260

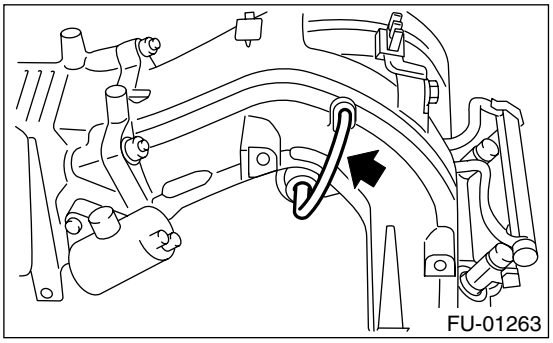
- RH side


FU-01261

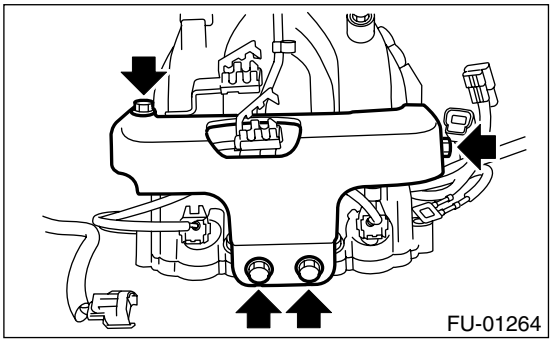
2) Remove ignition coil and ignitor assembly. <Ref. to IG(H4SO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>
3) Remove throttle body.
<Ref. to FU(H4SO U5)-14, REMOVAL, Throttle Body.>
4) Remove EGR valve.
<Ref. to FU(H4SO U5)-37, REMOVAL, EGR Valve.>
5) Remove PCV pipe.


FU-01262

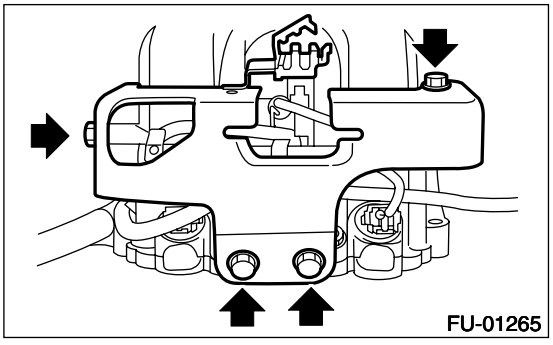
6) Disconnect pressure regulator vacuum hose from intake manifold.



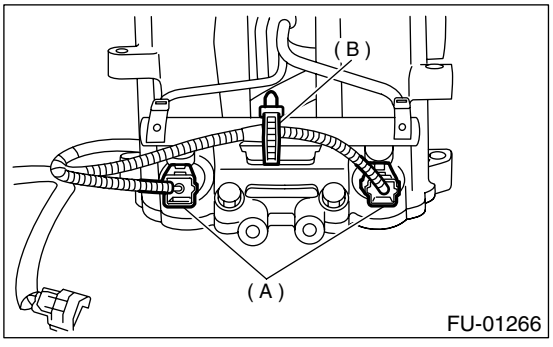
7) Remove fuel pipe protector LH.



8) Remove fuel pipe protector RH.

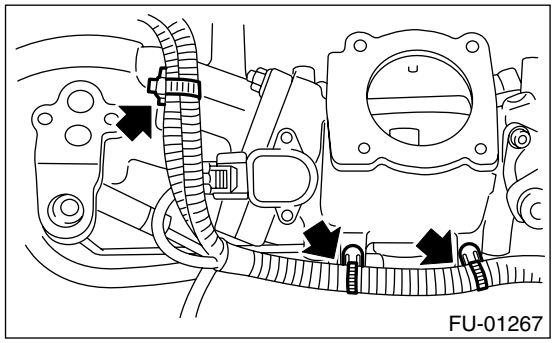


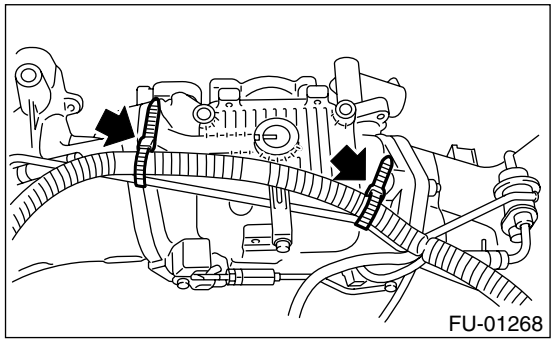
9) Disconnect connector (A) from fuel injector.
10) Remove harness band (B) which holds engine harness onto injector pipe.



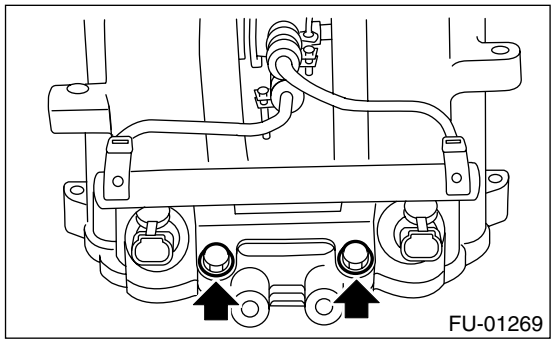
11) Remove tumble generator valve actuator. <Ref. to FU(H4SO U5)-35, REMOVAL, Tumble Generator Valve Actuator.>

12) Remove purge control solenoid valve. <Ref. to EC(H4SO)-6, REMOVAL, Purge Control Solenoid Valve.>
13) Remove harness bands which hold engine harness onto intake manifold.

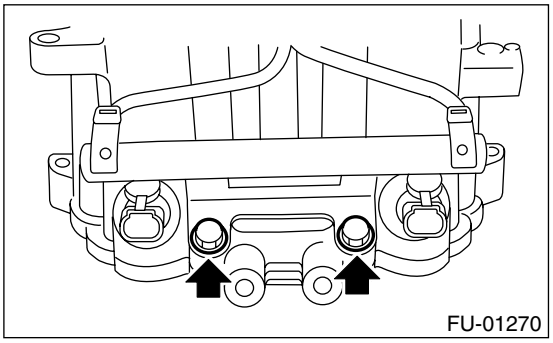


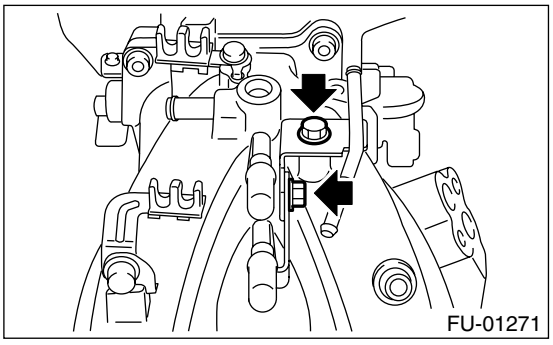


14) Remove engine harness from intake manifold.
15) Remove bolt which installs injector pipe on intake manifold as shown in figure.
- RH side

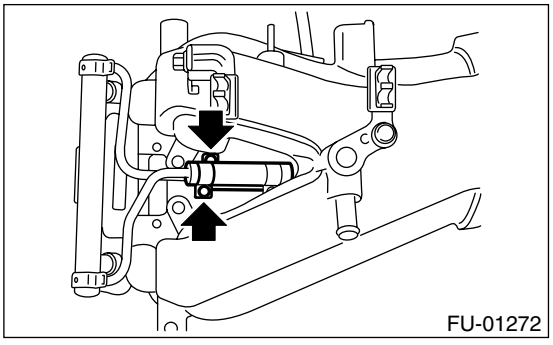


- LH side

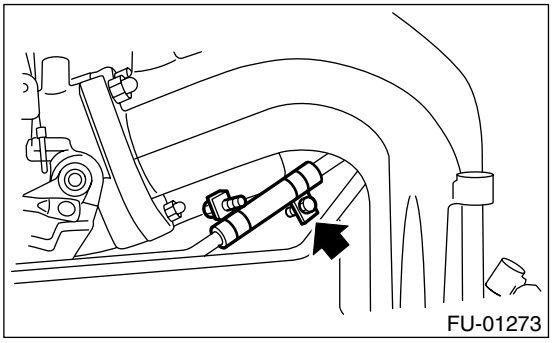




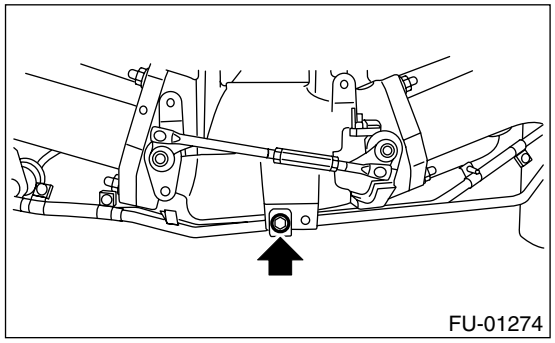
16) Remove fuel injectors.
17) Loosen the clamp which holds fuel injector pipe RH onto fuel hose, and disconnect the pipe from fuel hose.



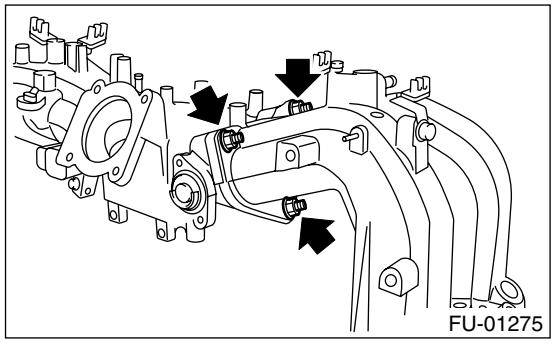
18) Loosen the clamp which holds fuel injector pipe LH onto fuel hose, and disconnect the pipe from fuel hose.



19) Remove bolt which installs fuel pipe on intake manifold.



20) Remove bolt which install pressure regulator to intake manifold.
21) Remove intake manifold RH from tumble generator valve assembly.



22) Similarly, remove intake manifold LH.

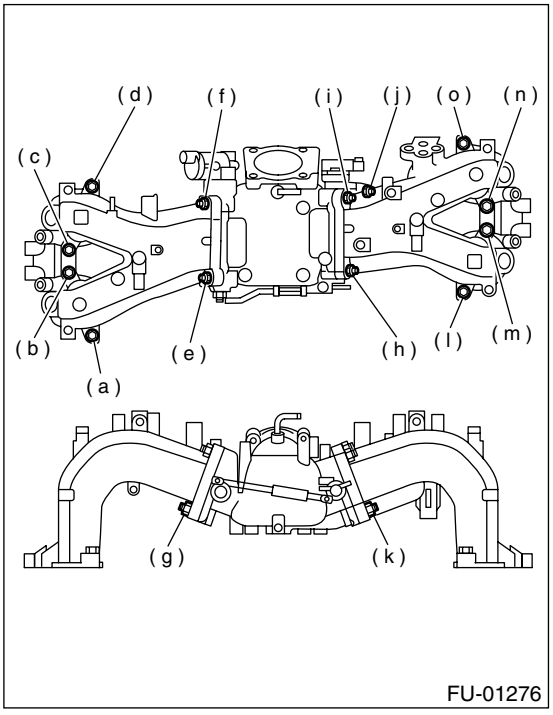
D: ASSEMBLY

1) Install intake manifold RH and LH to tumble generator valve assembly.

NOTE:
Always use a new gasket.

CAUTION:
This work should be done on cylinder head. (Do not use gasket for the mating surface of cylinder head and intake manifold at this time.)

(1) Temporarily tighten (a) - (o) in alphabetical order.
(2) Tighten (e) - (k) to 5 N·m (0.5 kgf-m, 4 ft-lb).
(3) Tighten (a) - (d) and (l) - (o) to 10 N·m (1.0 kgf-m, 7 ft-lb).
(4) Tighten (e) - (g) to 25 N·m (2.6 kgf-m, 18 ft-lb).
(5) Tighten (h) - (k) to 25 N·m (2.6 kgf-m, 18 ft-lb).
(6) Loosen (a) - (d) and (l) - (o) to remove.



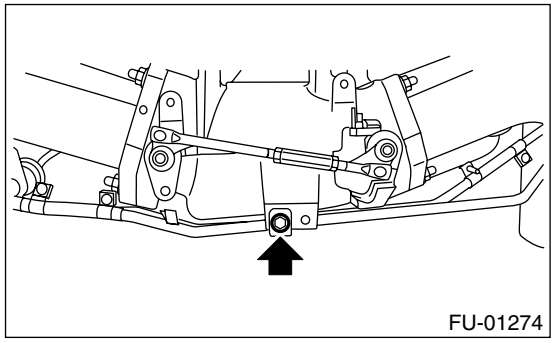
FU-01276

2) Tighten bolt which pressure regulator to intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

3) Tighten bolt which installs fuel pipes on intake manifold.

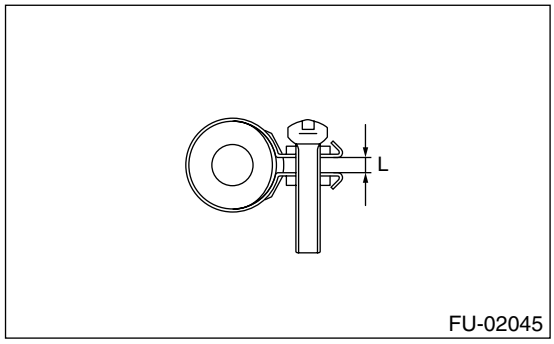
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)


FU-01274

4) Connect fuel injector pipe to fuel hose, and tighten clamp screw.

NOTE:
Tighten clamp screw as shown in the Figure below.

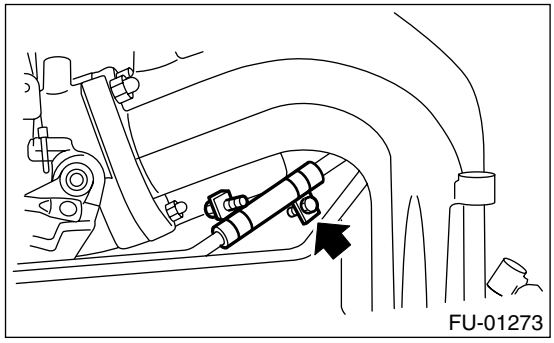
L: 2 — 5 mm (0.08 — 0.20 in)



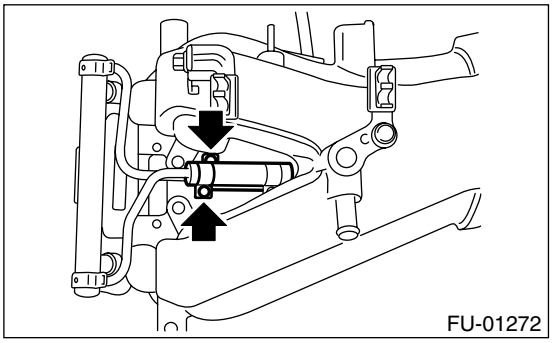
FU-02045

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)

- LH side

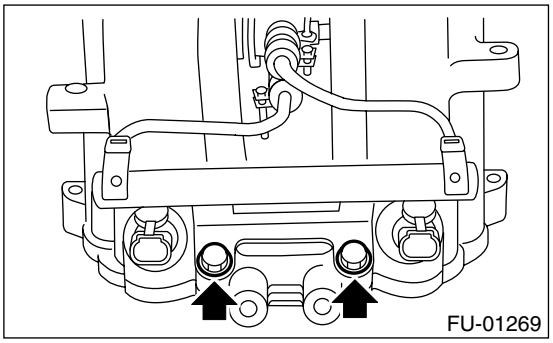

FU-01273

• RH side



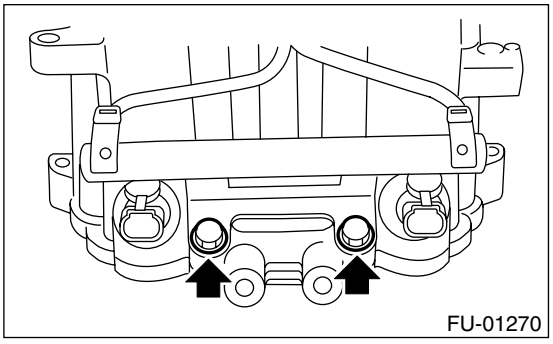
5) Install fuel injectors.
6) Tighten bolt which installs injector pipe on intake manifold.
• RH side

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

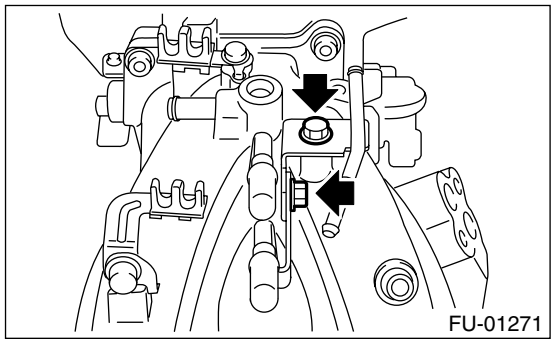


• LH side

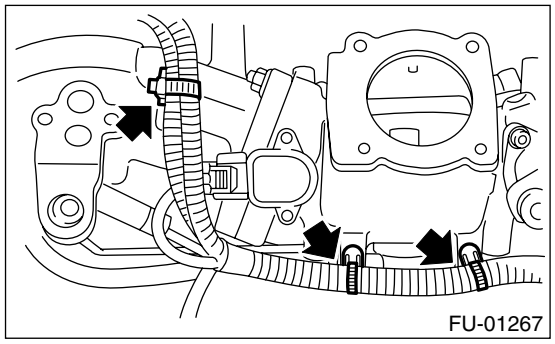
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

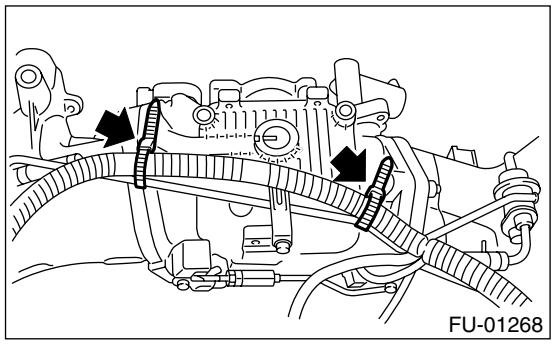


Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



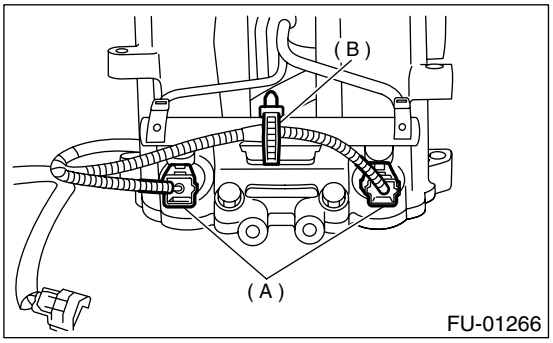
7) Hold engine harness by harness bands.





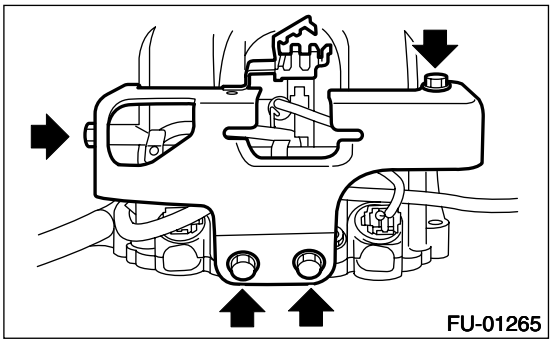
8) Install purge control solenoid valve. <Ref. to EC(H4SO)-6, INSTALLATION, Purge Control Solenoid Valve.>
9) Install tumble generator valve actuator. <Ref. to FU(H4SO U5)-35, INSTALLATION, Tumble Generator Valve Actuator.>
10) Connect connector (A) to fuel injector.

11) Secure engine harness on injector pipe by harness band (B).



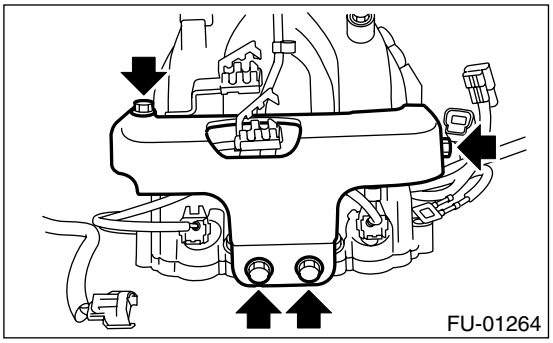
12) Install fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

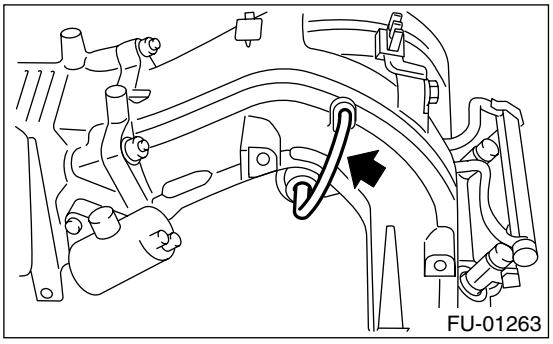


13) Install fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

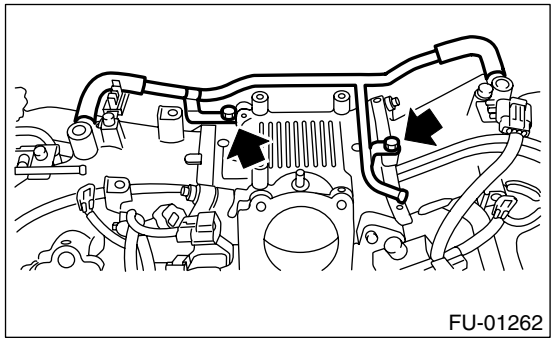


14) Connect pressure regulator vacuum hose to intake manifold.



15) Install PCV pipe.

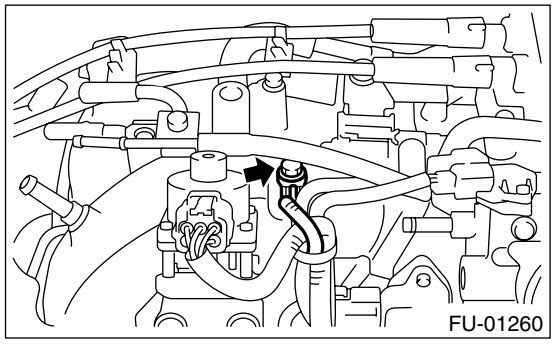
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



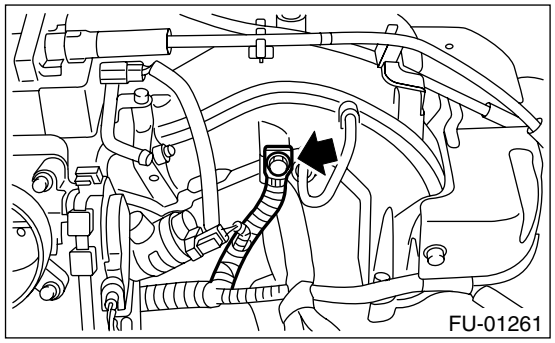
16) Install EGR valve.
<Ref. to FU(H4SO U5)-37, INSTALLATION, EGR Valve.>
17) Install throttle body to intake manifold.
<Ref. to FU(H4SO U5)-14, INSTALLATION, Throttle Body.>
18) Install ignition coil and ignitor assembly. <Ref. to IG(H4SO)-7, INSTALLATION, Ignition Coil and Ignitor Assembly.>
19) Install engine ground terminal to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

- LH side



- RH side



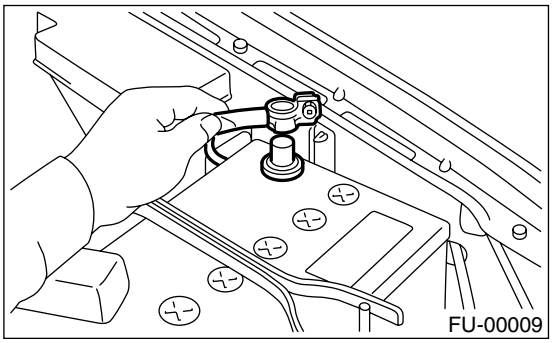
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

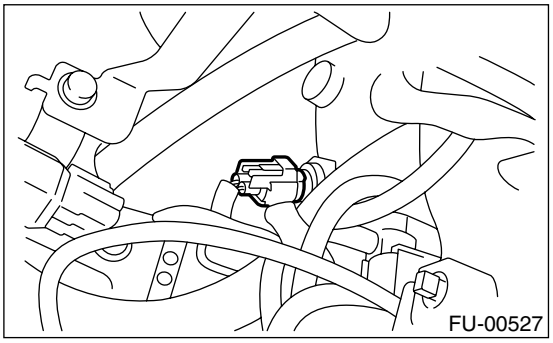
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect battery ground cable.



2) Remove air intake chamber. <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3) Disconnect connector from engine coolant temperature sensor.



4) Remove engine coolant temperature sensor.

B: INSTALLATION

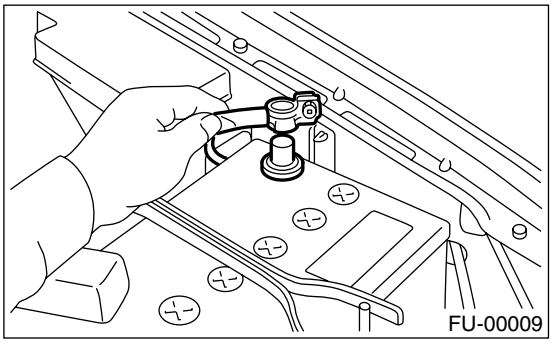
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 1.3 ft-lb)

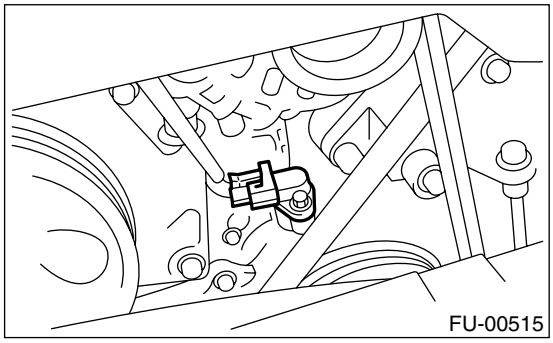
5. Crankshaft Position Sensor

A: REMOVAL

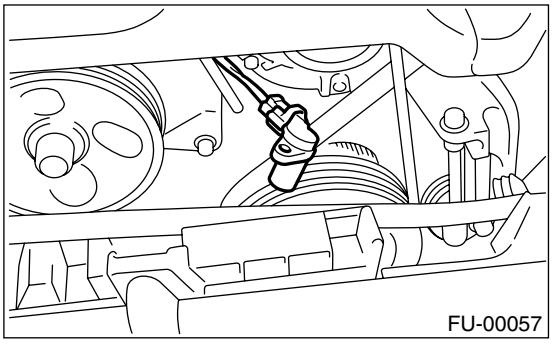
1) Disconnect battery ground cable.



2) Remove bolt which installs crankshaft position sensor to cylinder block.



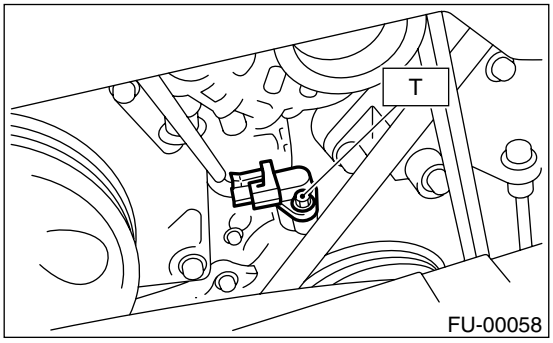
3) Remove crankshaft position sensor, and disconnect connector from it.



B: INSTALLATION

Install in the reverse order of removal.

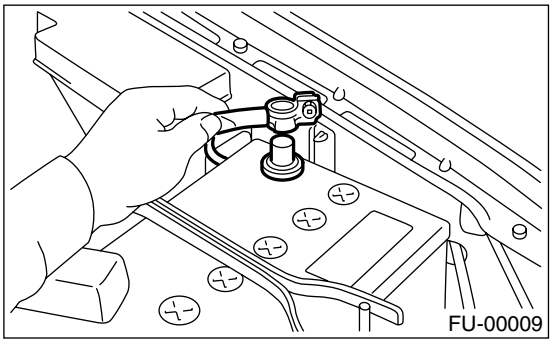
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



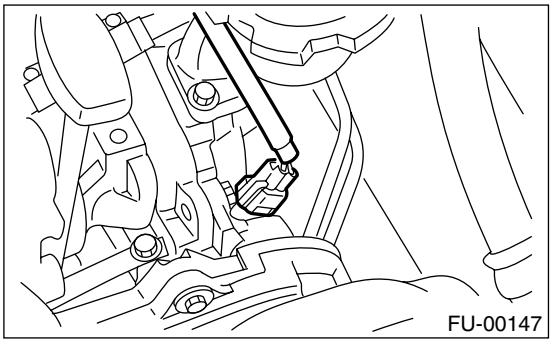
6. Camshaft Position Sensor

A: REMOVAL

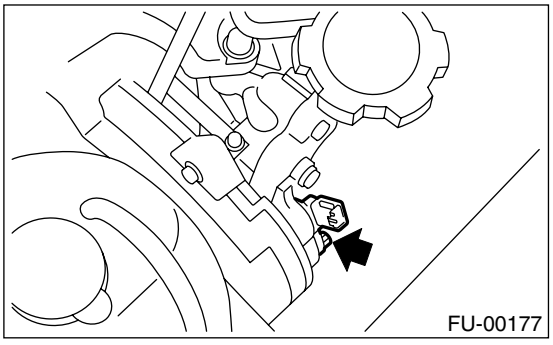
1) Disconnect battery ground cable.



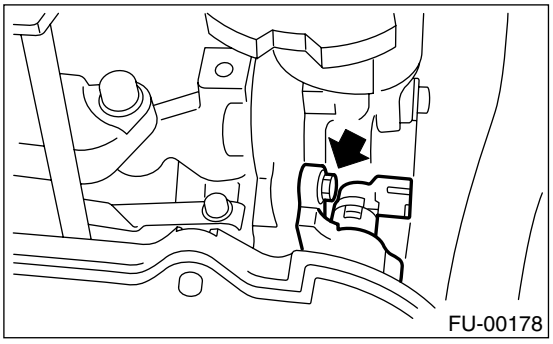
2) Disconnect connector from camshaft position sensor.



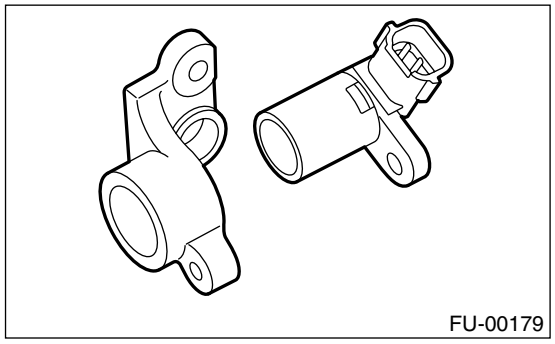
3) Remove bolt which installs camshaft position sensor to camshaft position sensor support.



4) Remove bolt which installs camshaft position sensor support to camshaft cap LH.



5) Remove camshaft position sensor and camshaft position sensor support as a unit.
6) Remove camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

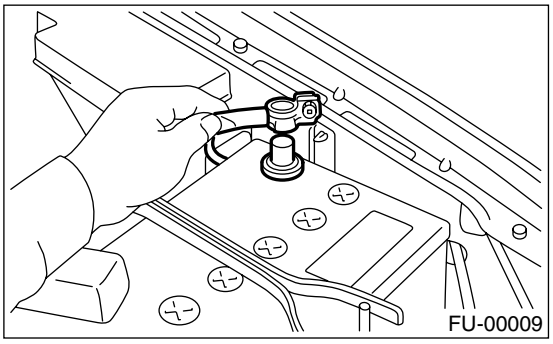
Tightening torque:

- ***Camshaft position sensor support; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***
- ***Camshaft position sensor; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***

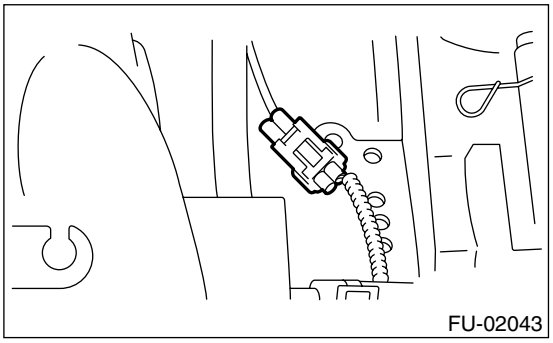
7. Knock Sensor

A: REMOVAL

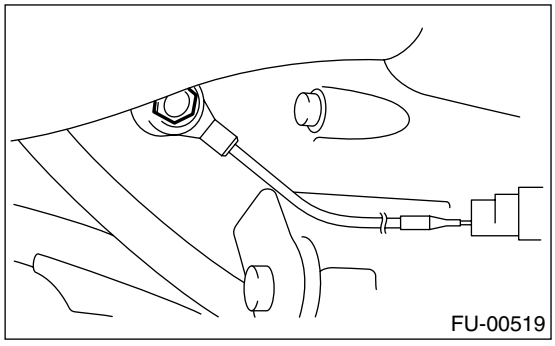
1) Disconnect battery ground cable.



2) Remove air intake chamber.
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3) Disconnect knock sensor connector.



4) Remove knock sensor from cylinder block.

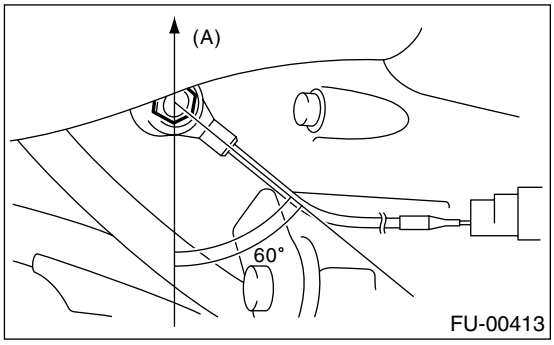


B: INSTALLATION

1) Install knock sensor to cylinder block.

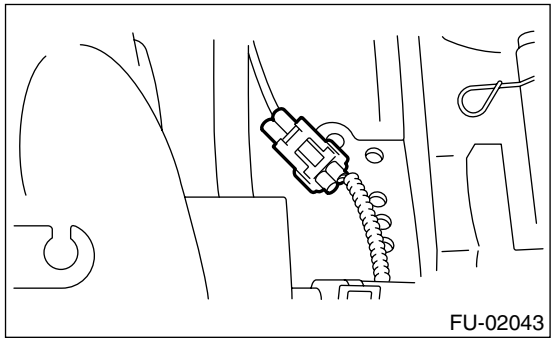
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.

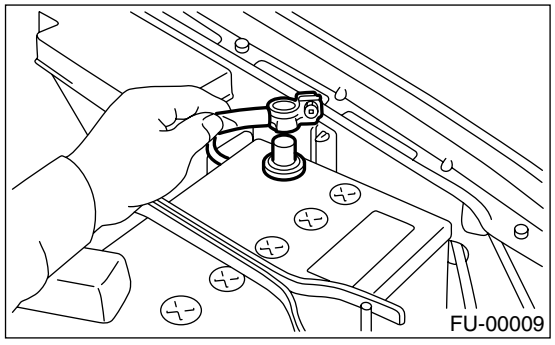


(A) Front side

2) Connect knock sensor connector.



3) Install air intake chamber.
<Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
4) Connect battery ground cable.



8. Throttle Position Sensor

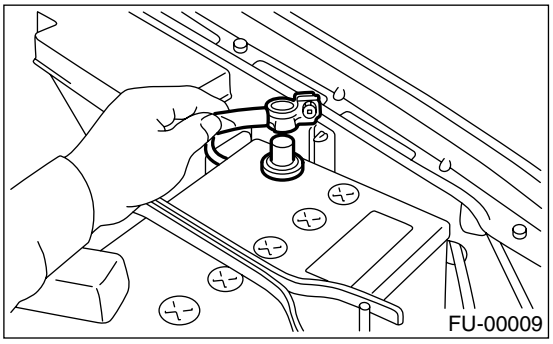
A: SPECIFICATIONS

Do not remove throttle sensor from throttle body because throttle body should not be disassembled. For removal and installation, refer to “Throttle Body”. <Ref. to FU(H4SO U5)-14, REMOVAL, Throttle Body.> and <Ref. to FU(H4SO U5)-14, INSTALLATION, Throttle Body.>

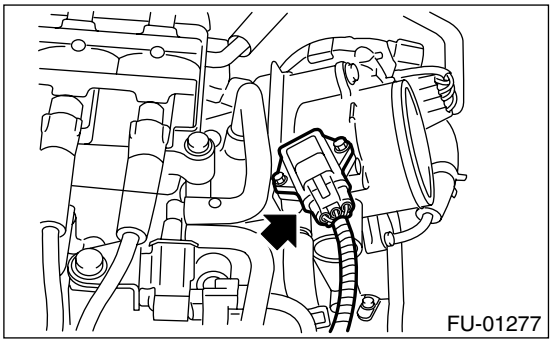
9. Pressure Sensor

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect connector from pressure sensor.



3) Remove pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

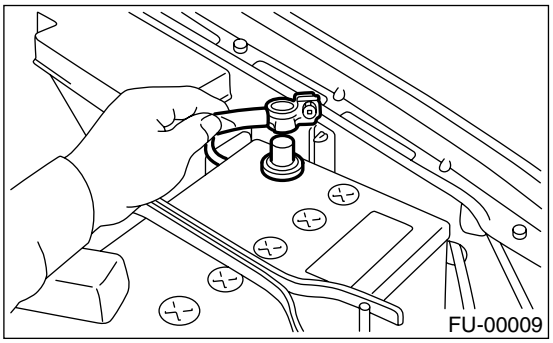
NOTE:
Replace O-ring with a new one.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

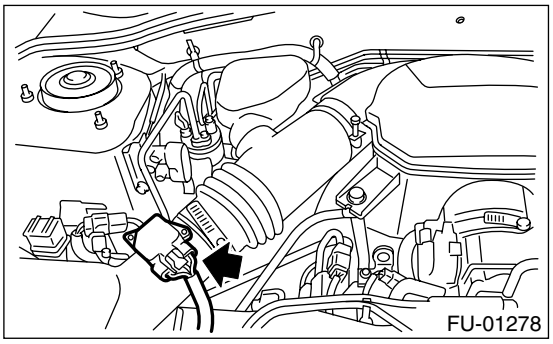
10.Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the air flow and intake air temperature sensor.



3) Remove the air flow and intake air temperature sensor from air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
1.0 N·m (0.10 kgf-m, 0.7 ft-lb)

11.Tumble Generator Valve Assembly

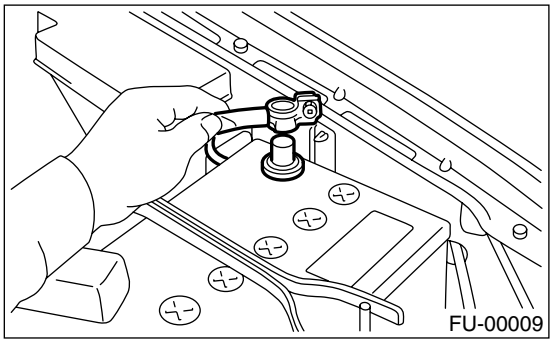
A: SPECIFICATIONS

For removal and installation, refer to “Intake Manifold”. <Ref. to FU(H4SO U5)-15, REMOVAL, Intake Manifold.> and <Ref. to FU(H4SO U5)-17, INSTALLATION, Intake Manifold.>

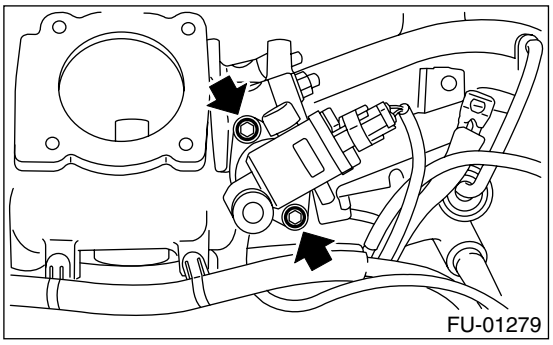
12.Tumble Generator Valve Actuator

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Remove the throttle body. <Ref. to FU(H4SO U5)-14, REMOVAL, Throttle Body.>
5) Disconnect the connector from tumble generator valve actuator.
6) Remove the tumble generator valve actuator.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5.9 N·m (0.60 kgf-m, 4.3 ft-lb)

13.Tumble Generator Valve Position Sensor

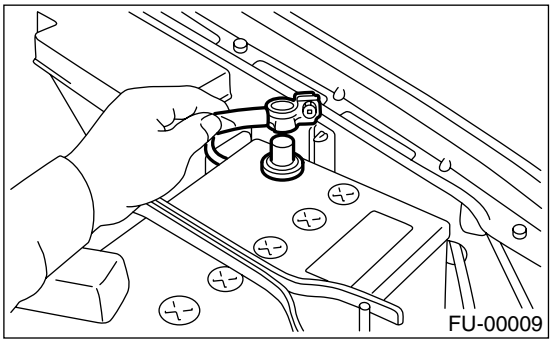
A: SPECIFICATIONS

Do not remove tumble generator valve position sensor from tumble generator valve assembly because the sensor cannot be adjusted when installing. For removal and installation, refer to “Tumble Generator Valve Assembly”. <Ref. to FU(H4SO U5)-34, SPECIFICATIONS, Tumble Generator Valve Assembly.>

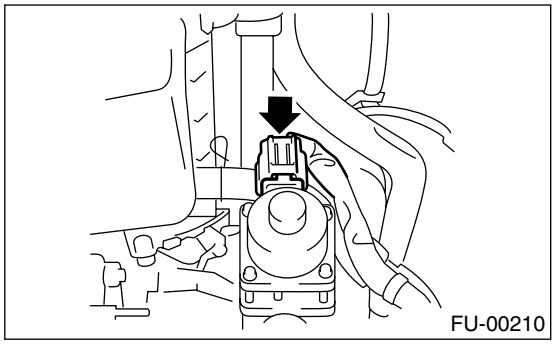
14.EGR Valve

A: REMOVAL

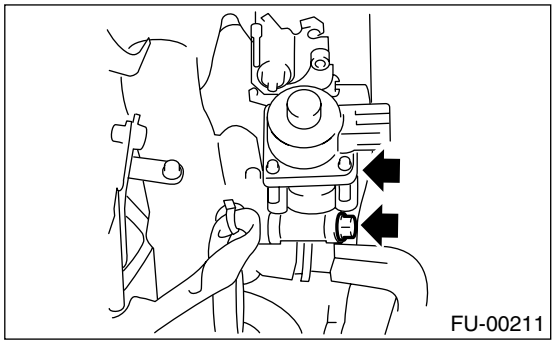
1) Disconnect battery ground cable.



2) Disconnect connector from EGR valve.



3) Remove EGR valve from intake manifold.

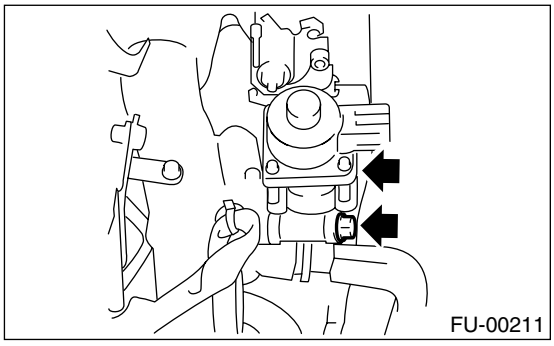


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

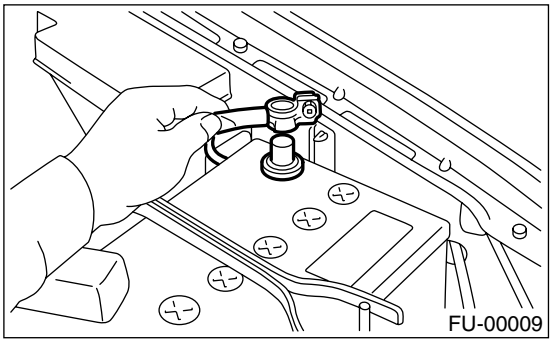


15.Fuel Injector

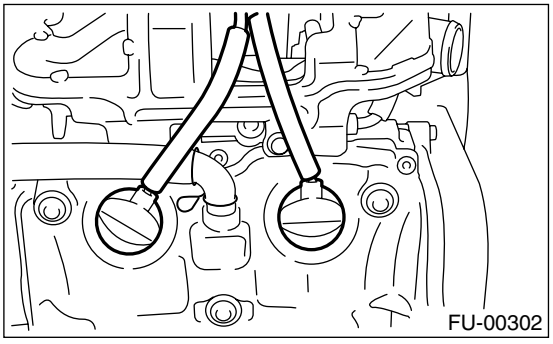
A: REMOVAL

1. RH SIDE

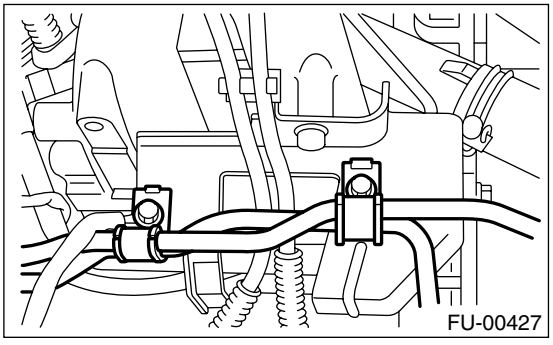
1) Release fuel pressure.
<Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



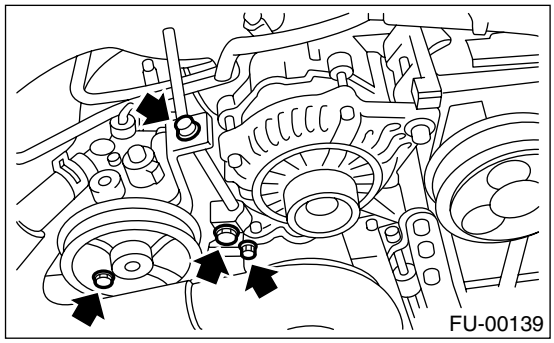
4) Remove air cleaner case.
<Ref. to IN(H4SO U5)-5, REMOVAL, Air Cleaner Case.>
5) Remove spark plug cords from spark plugs (#1 and #3 cylinders).



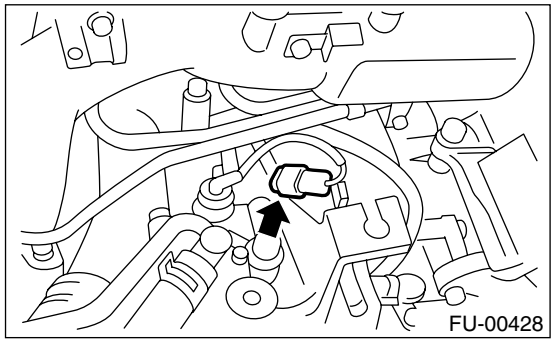
6) Remove power steering pump and tank from brackets.
(1) Remove front V-belt.
<Ref. to ME(H4SO)-43, REMOVAL, V-belt.>
(2) Remove bolts which hold power steering pipes onto intake manifold protector.



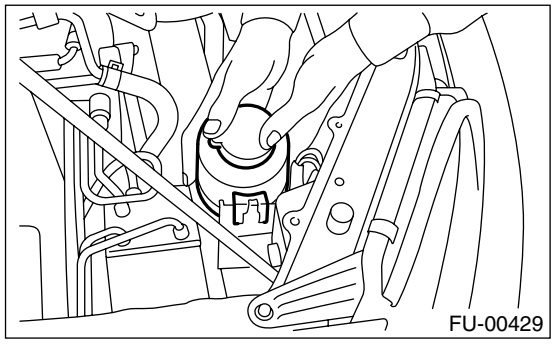
(3) Remove bolts which install power steering pump to bracket.



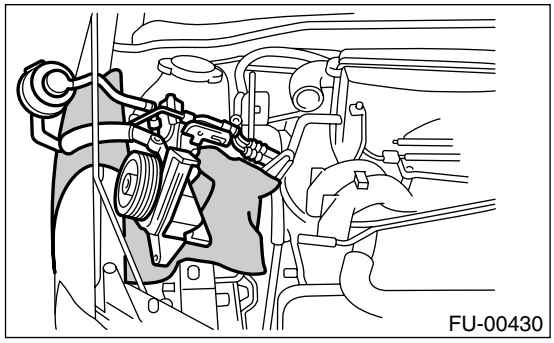
(4) Disconnect connector from power steering pump switch.



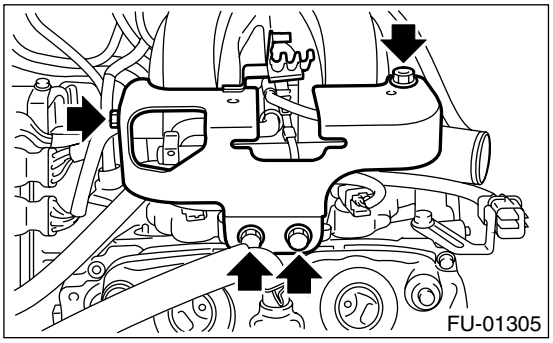
(5) Remove power steering tank from the bracket by pulling it upwards.



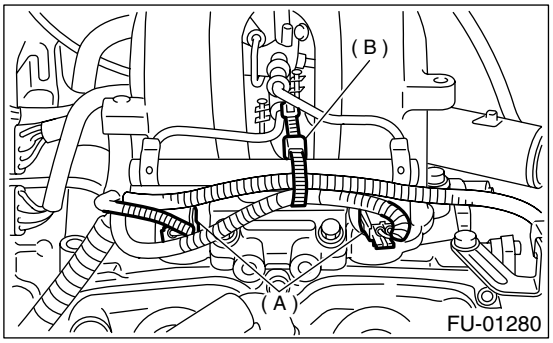
(6) Place power steering pump and tank on the right side wheel apron.



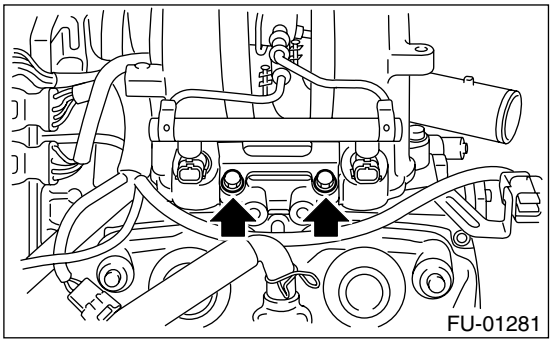
7) Remove fuel pipe protector RH.



8) Disconnect connector (A) from fuel injector.
9) Remove harness band (B) which holds engine harness onto injector pipe.



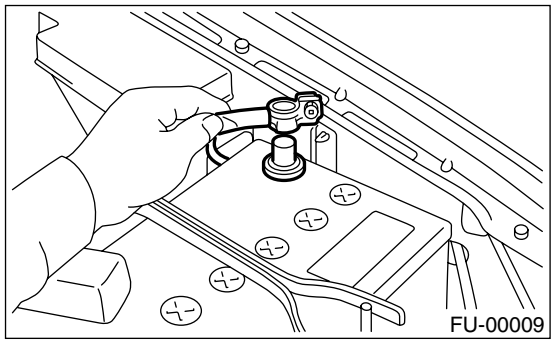
10) Remove bolts which hold injector pipe to intake manifold.



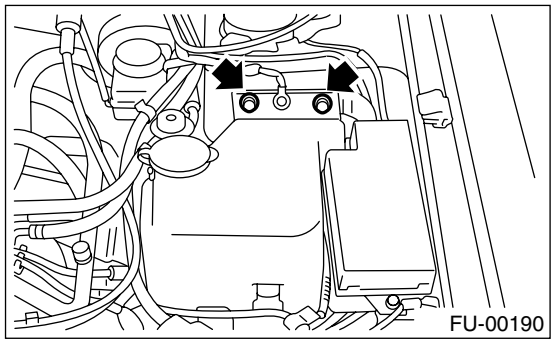
11) Lift up fuel injector pipe, and remove fuel injector.

2. LH SIDE

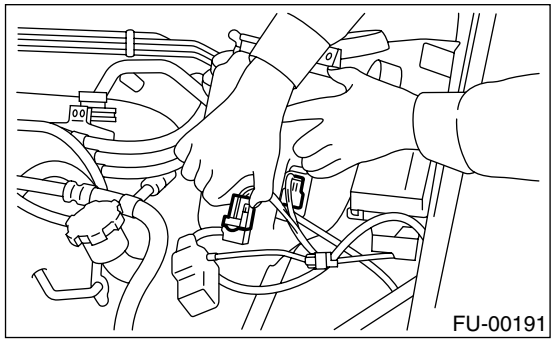
1) Release fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



4) Remove two bolts which install washer tank on body.

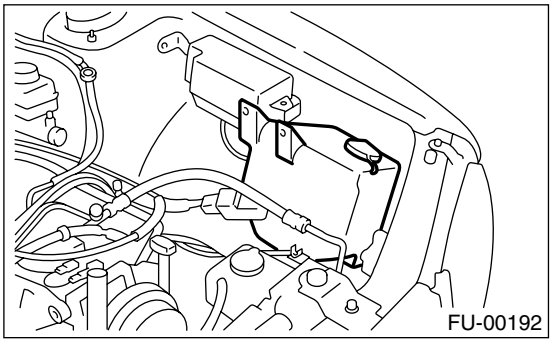


5) Disconnect connector from front window washer motor.
6) Disconnect connector from rear gate glass washer motor.

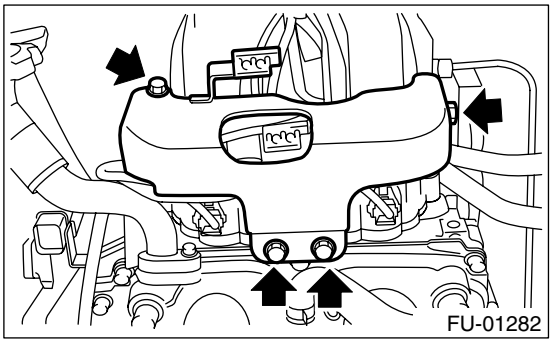


7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

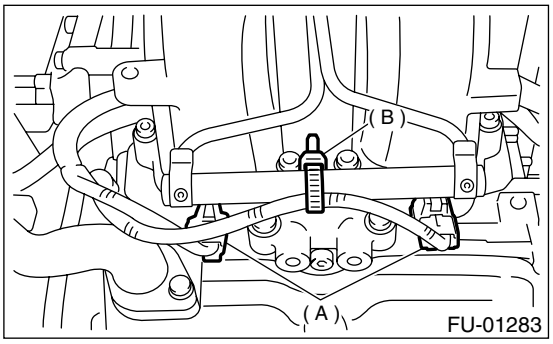
8) Move washer tank, and secure it away from working area.


FU-00192

9) Remove spark plug cords from spark plugs (#2 and #4 cylinders).
10) Remove fuel pipe protector LH.

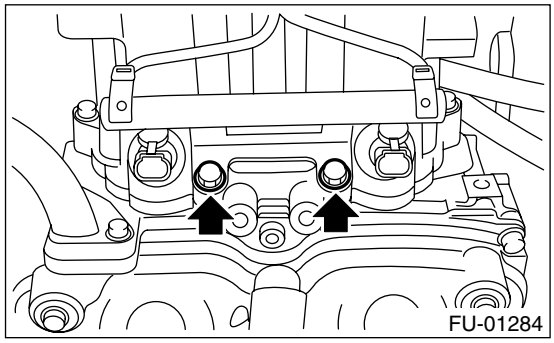

FU-01282

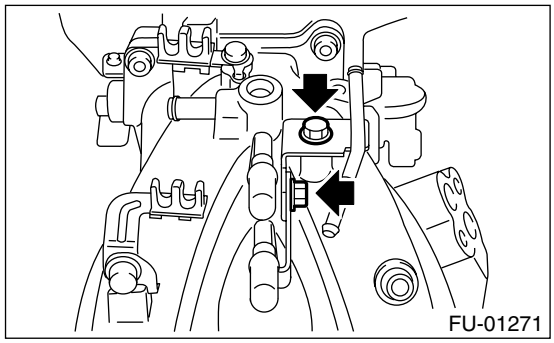
11) Disconnect connector (A) from fuel injector.
12) Remove harness band (B) which holds engine harness onto injector pipe.



FU-01283

13) Remove bolt which holds injector pipe to intake manifold.


FU-01284


FU-01271

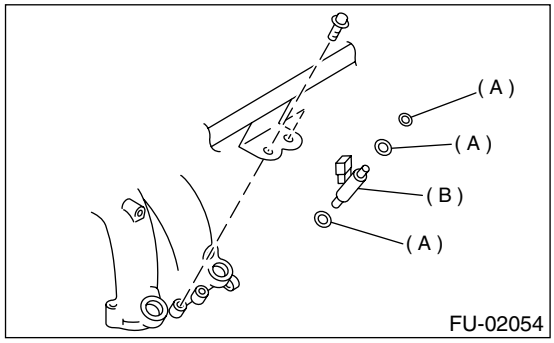
14) Lift up fuel injector pipe, and remove fuel injector.

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

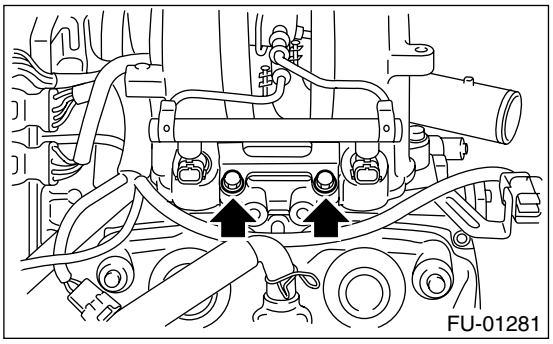
NOTE:
Replace O-rings with new ones.



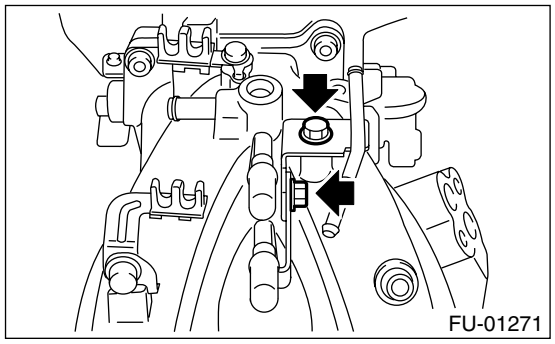
FU-02054

(A) O-ring
(B) Fuel injector

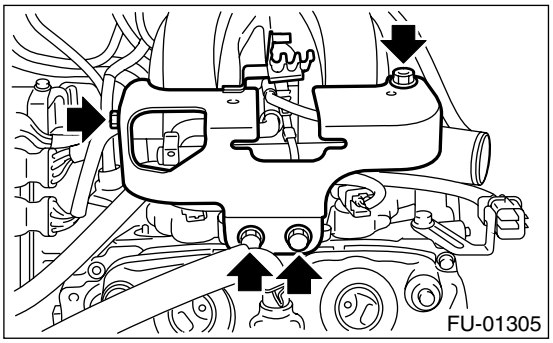
Tightening torque:
19 N·m (0.19 kgf-m, 1.4 ft-lb)



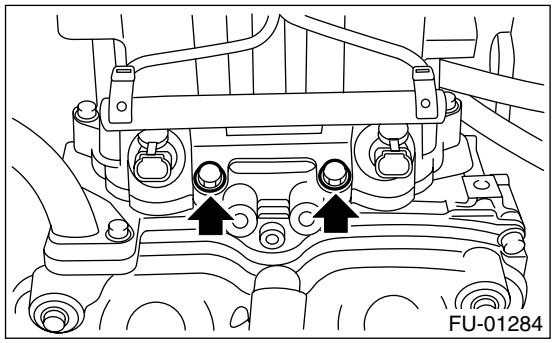
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



Tightening torque:
19 N·m (0.19 kgf-m, 1.4 ft-lb)



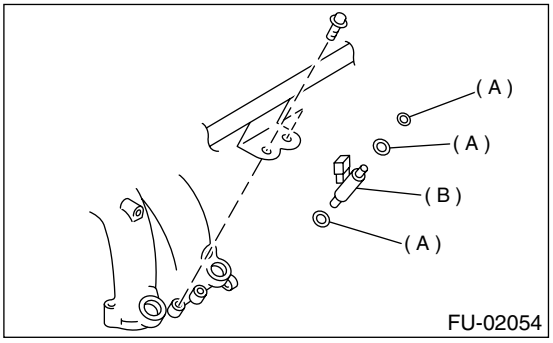
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



2. LH SIDE

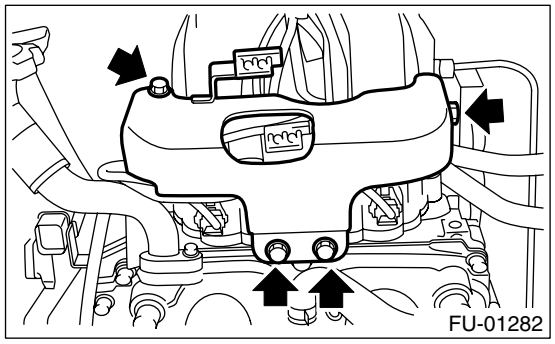
Install in the reverse order of removal.

NOTE:
Replace O-rings with new ones.



(A) O-ring
(B) Fuel injector

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

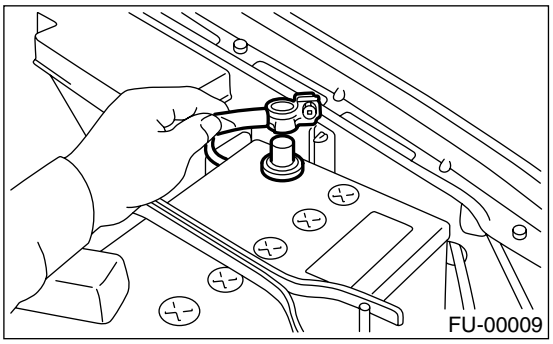


16.Front Oxygen (A/F) Sensor

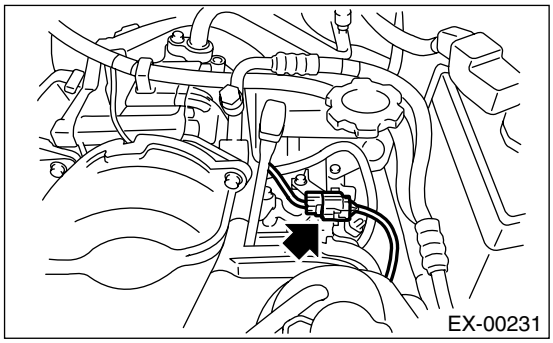
A: REMOVAL

1. LH SIDE

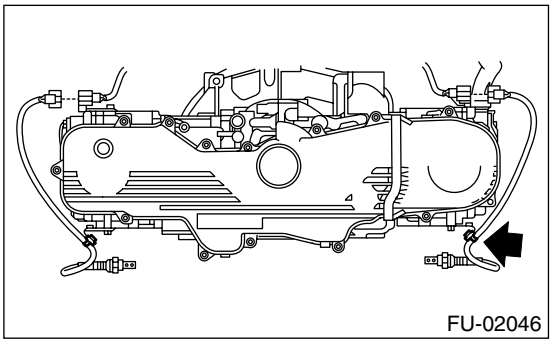
1) Disconnect battery ground cable.



2) Disconnect connectors from bracket and front oxygen (A/F) sensor.



3) Lift-up the vehicle.
4) Remove undercover.
5) Remove front oxygen (A/F) sensor harness from bracket.

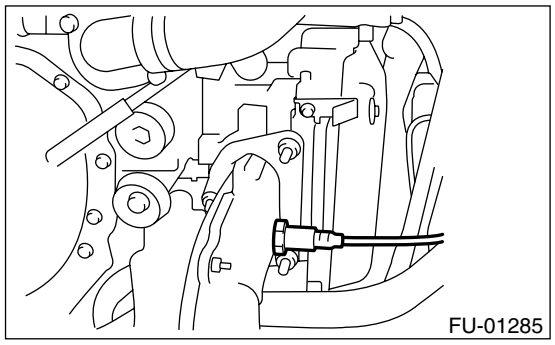


6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

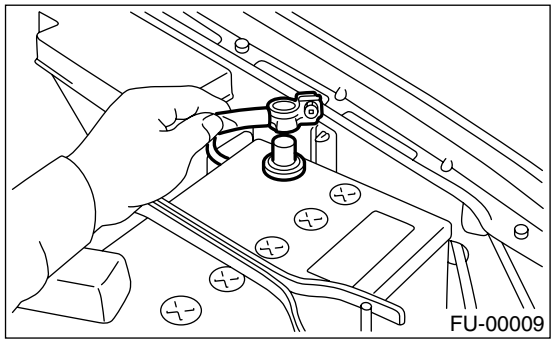
7) Remove front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

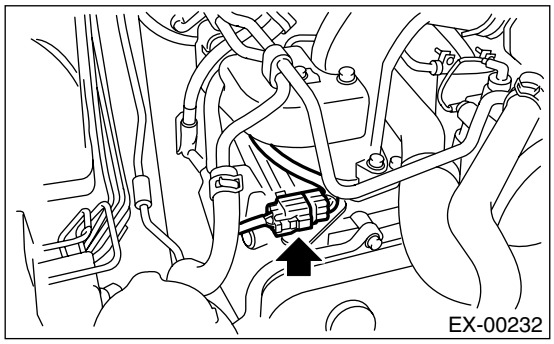


2. RH SIDE

1) Disconnect battery ground cable.

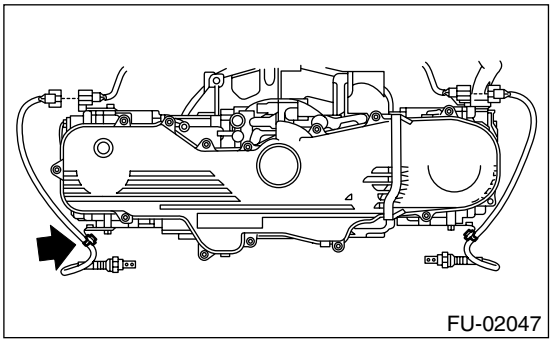


2) Disconnect connectors from bracket and front oxygen (A/F) sensor.



3) Lift-up the vehicle.
4) Remove undercover.

5) Remove front oxygen (A/F) sensor harness from bracket.

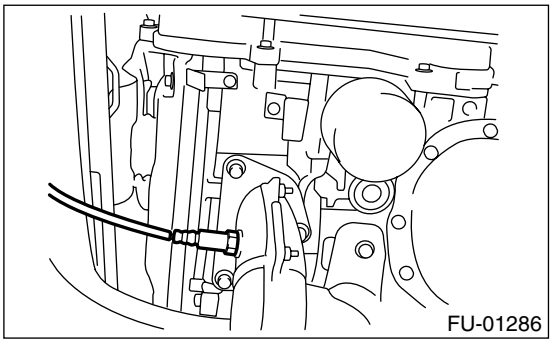

FU-02047

6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

7) Remove front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.


FU-01286

B: INSTALLATION

1. LH SIDE

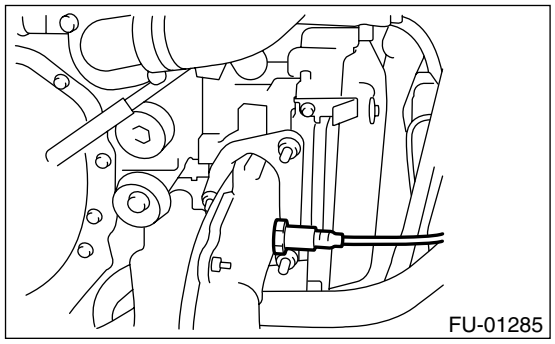
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

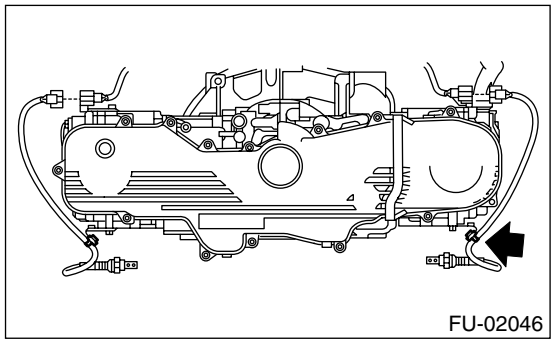
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install front oxygen (A/F) sensor.

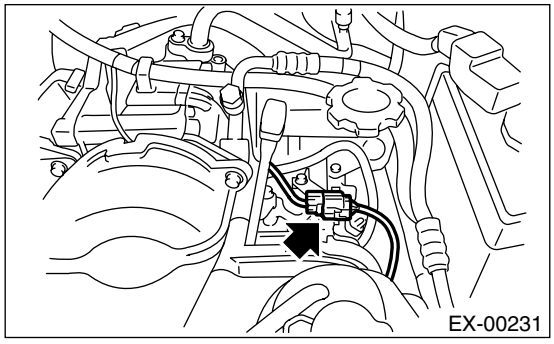
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)


FU-01285

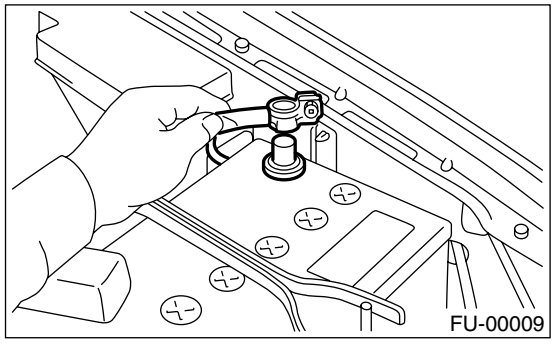
3) Install front oxygen (A/F) sensor harness to bracket.


FU-02046

4) Install undercover.
5) Lower the vehicle.
6) Connect connector of front oxygen (A/F) sensor, and install connector to bracket.


EX-00231

7) Connect battery ground cable.


FU-00009

2. RH SIDE

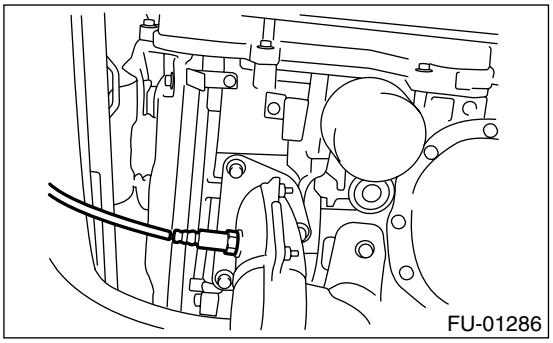
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

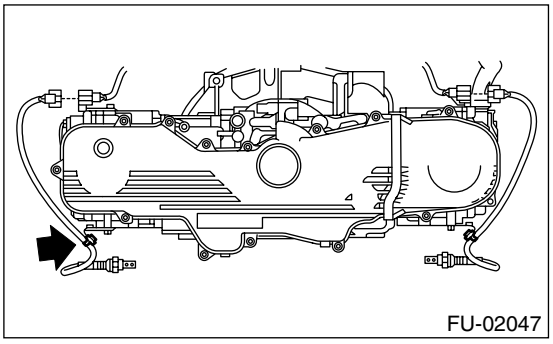
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install front oxygen (A/F) sensor.

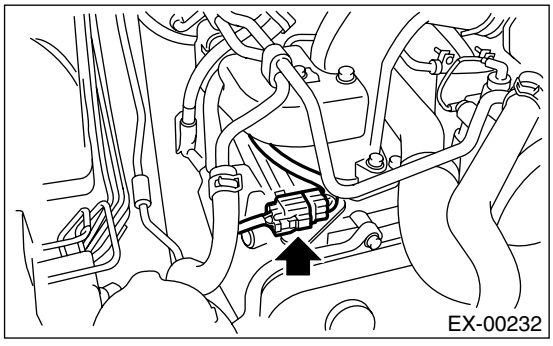
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)


FU-01286

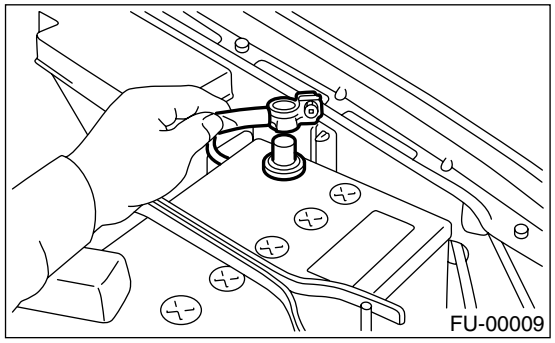
3) Install front oxygen (A/F) sensor harness to bracket.


FU-02047

4) Install undercover.
5) Lower the vehicle.
6) Connect connector of front oxygen (A/F) sensor.


EX-00232

7) Connect battery ground cable.

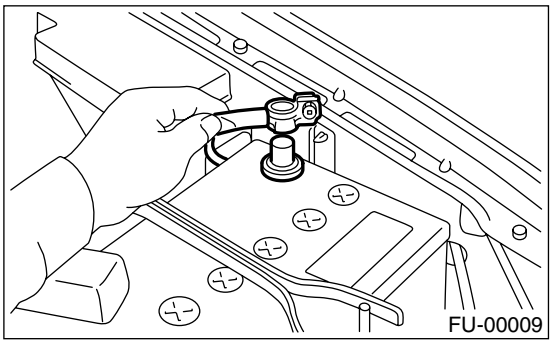

FU-00009

17.Front Oxygen Sensor

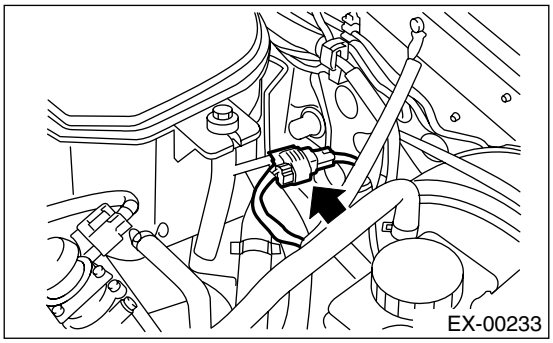
A: REMOVAL

1. LH SIDE

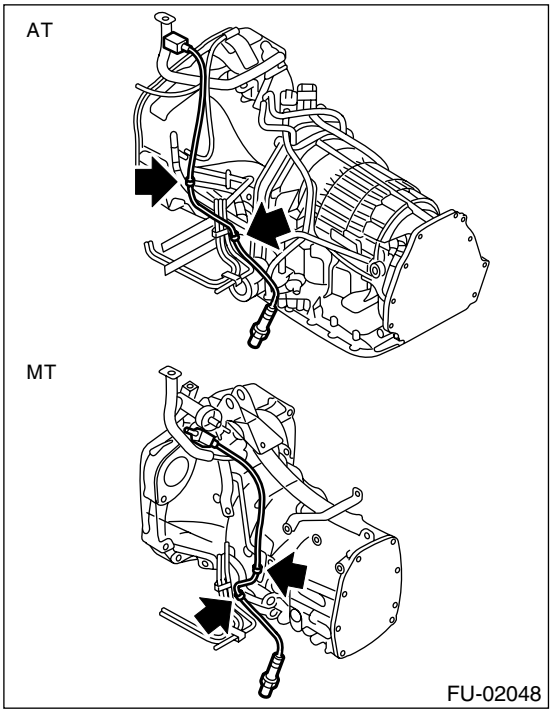
1) Disconnect battery ground cable.



2) Disconnect connector from front oxygen sensor.



3) Lift-up the vehicle.
4) Remove front oxygen sensor harness from bracket.

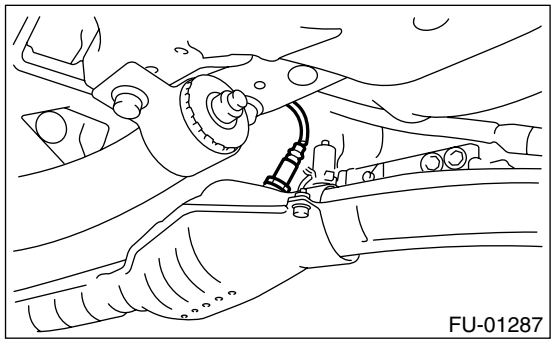


5) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

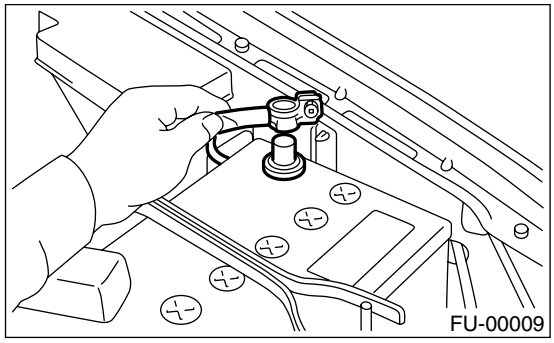
6) Remove front oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

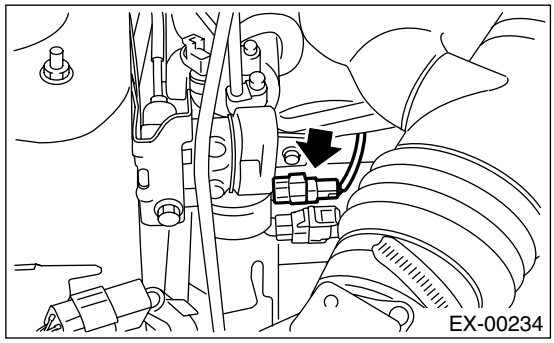


2. RH SIDE

1) Disconnect battery ground cable.

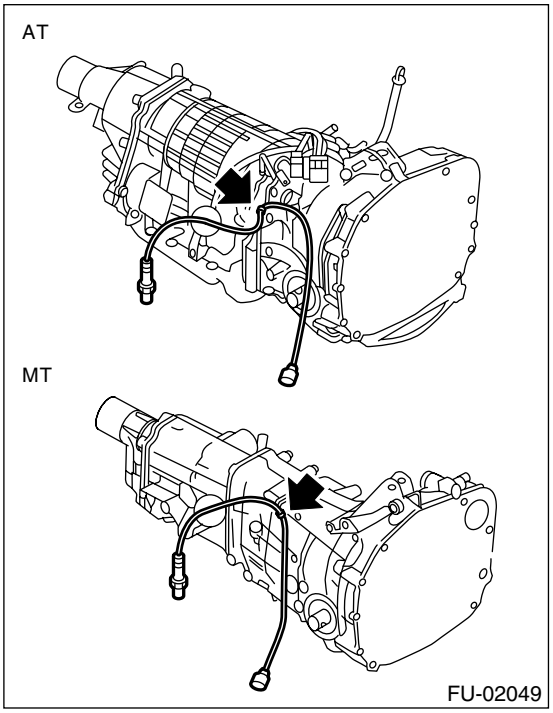


2) Disconnect connector from front oxygen sensor.



3) Lift-up the vehicle.

4) Remove front oxygen sensor harness from bracket.

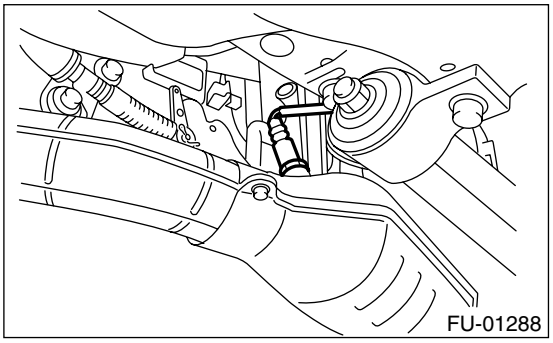


5) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove front oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

1. LH SIDE

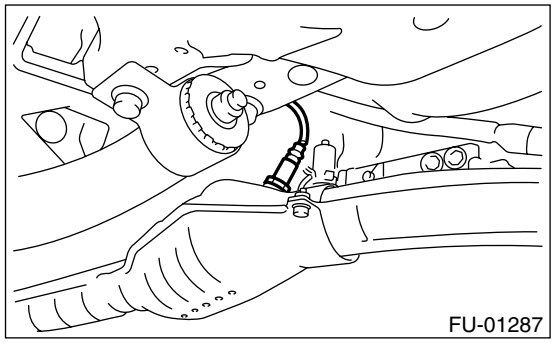
1) Before installing front oxygen sensor, apply anti-seize compound only to threaded portion of front oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

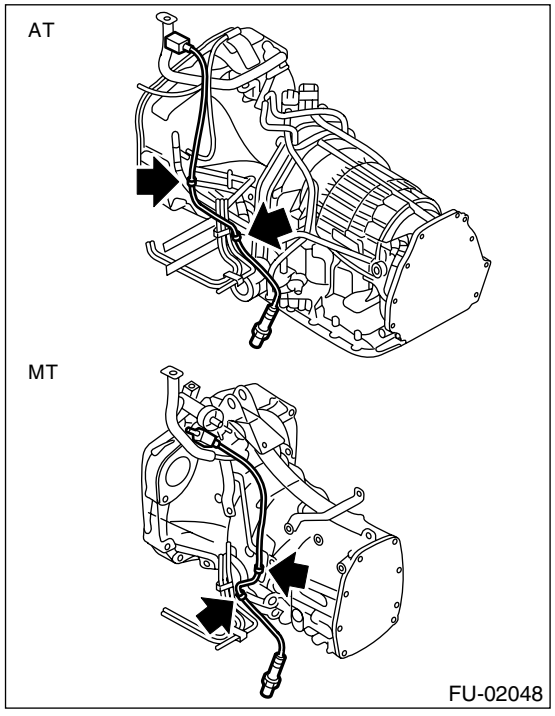
Anti-seize compound:
SS-30 by JET LUBE

2) Install front oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

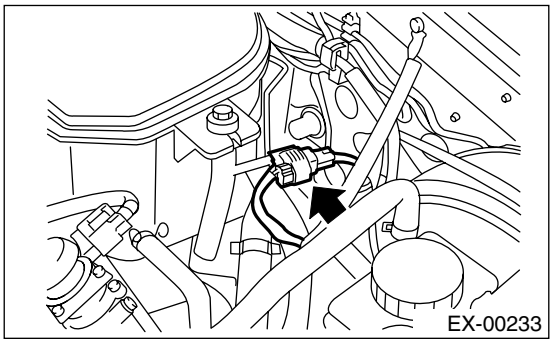


3) Install front oxygen sensor harness to bracket.

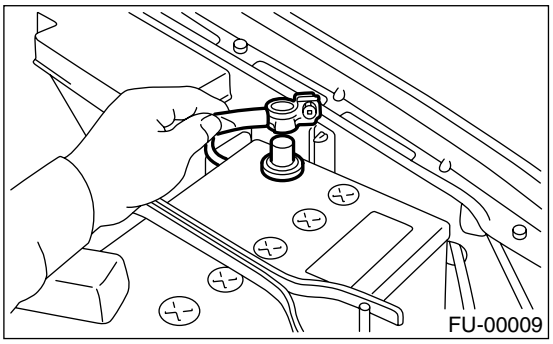


4) Lower the vehicle.

5) Connect connector to front oxygen sensor.



6) Connect battery ground cable.



2. RH SIDE

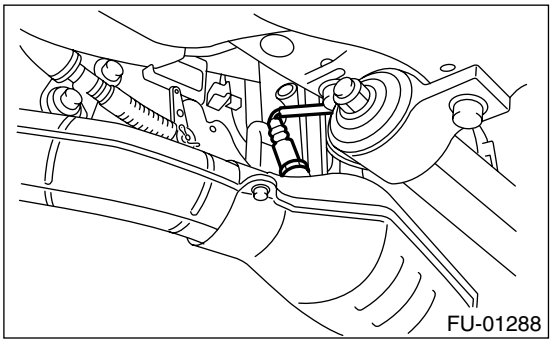
1) Before installing front oxygen sensor, apply anti-seize compound only to threaded portion of front oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of front oxygen sensor.

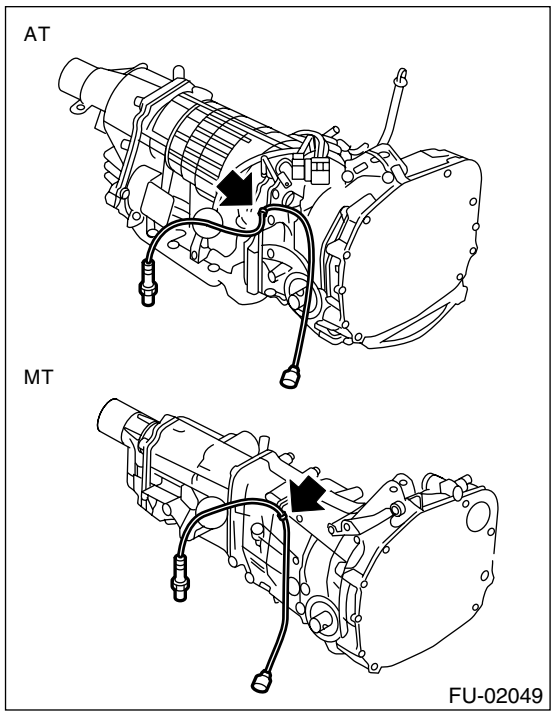
Anti-seize compound:
SS-30 by JET LUBE

2) Install front oxygen sensor.

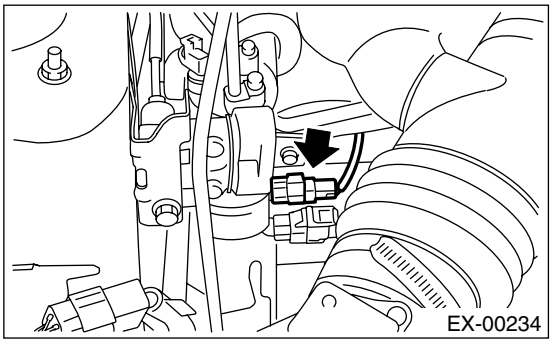
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



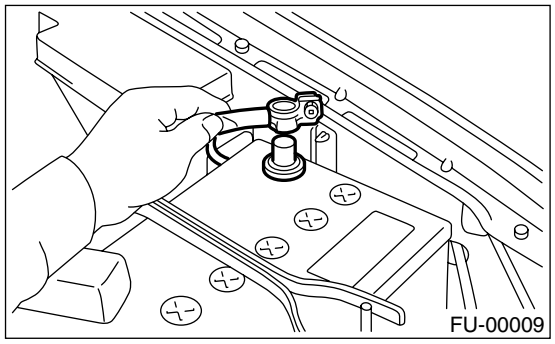
3) Install front oxygen sensor harness to bracket.



4) Lower the vehicle.
5) Connect connector to front oxygen sensor.



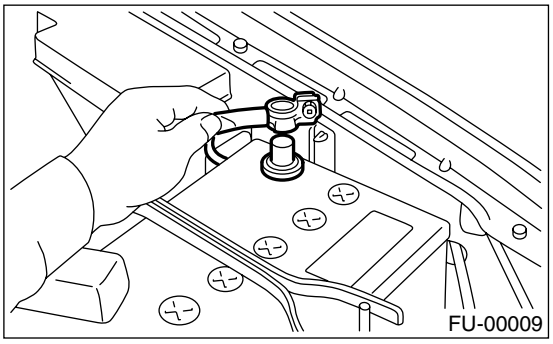
6) Connect battery ground cable.



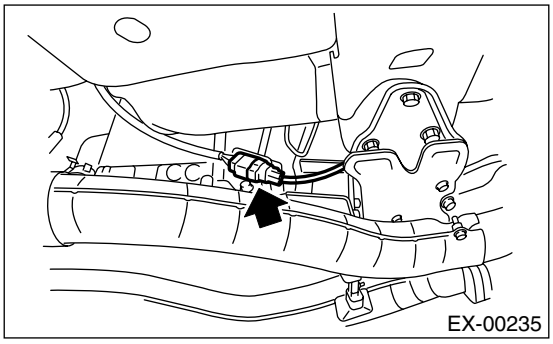
18.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Disconnect connector from rear oxygen sensor.

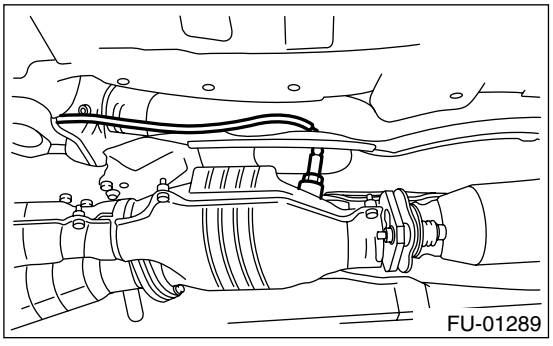


4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

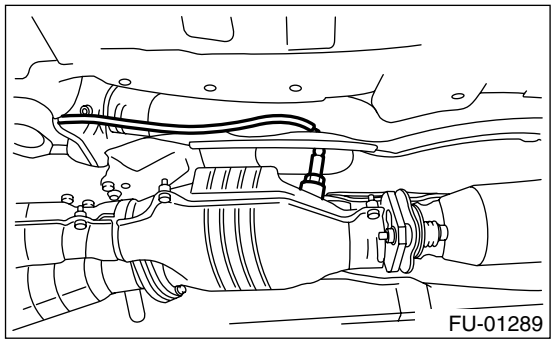
1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

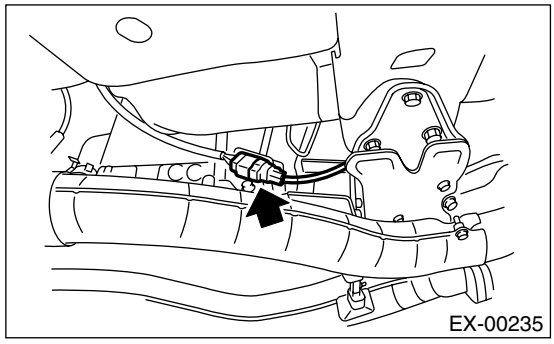
Anti-seize compound:
SS-30 by JET LUBE

2) Install rear oxygen sensor.

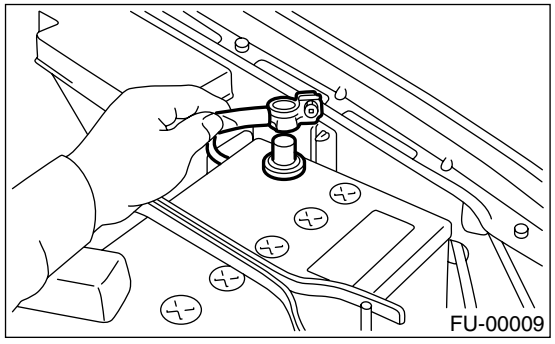
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Connect connector to rear oxygen sensor.



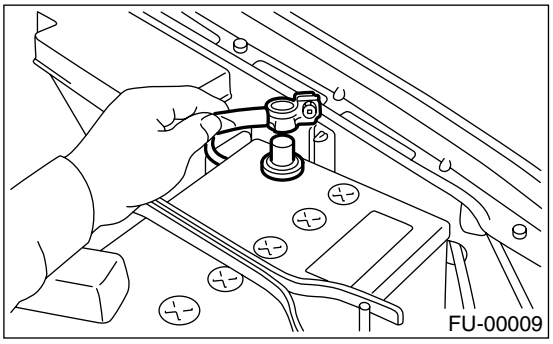
4) Lower the vehicle.
5) Connect battery ground cable.



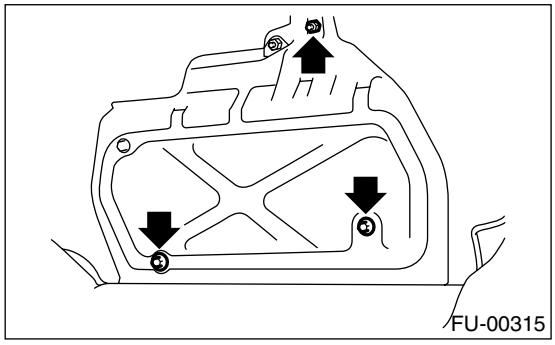
19.Engine Control Module

A: REMOVAL

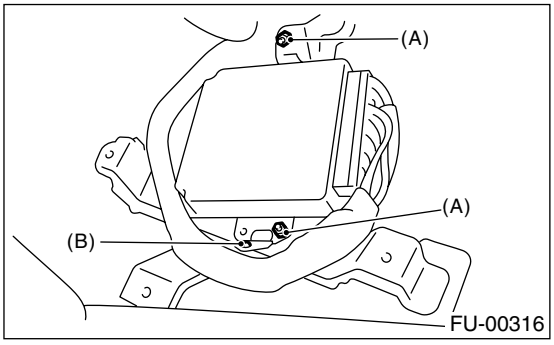
1) Disconnect battery ground cable.



2) Remove lower inner trim of passenger side.
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of passenger seat.
4) Remove protect cover.



5) Remove nuts (A) which hold ECM to bracket.
6) Remove clip (B) from bracket.



7) Disconnect ECM connectors and take out ECM.

B: INSTALLATION

Install in the reverse order of removal.

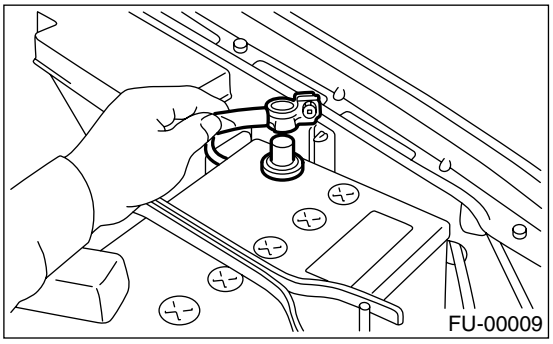
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

Tightening torque:
5 N·m (0.51 kgf-m, 3.7 ft-lb)

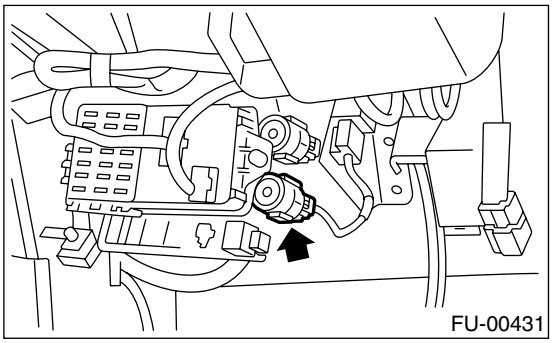
20.Main Relay

A: REMOVAL

1) Disconnect battery ground cable.



2) Remove lower cover of driver side.
3) Disconnect connectors from main relay.



4) Remove main relay from bracket.

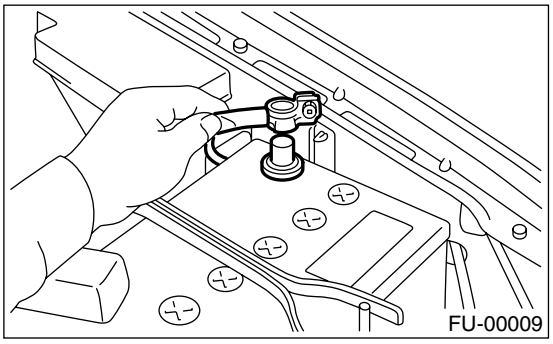
B: INSTALLATION

Install in the reverse order of removal.

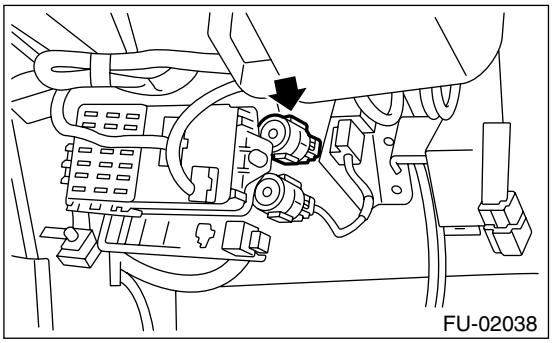
21.Fuel Pump Relay

A: REMOVAL

1) Disconnect battery ground cable.



2) Remove lower cover of driver side.
3) Disconnect connector from fuel pump relay.



4) Remove fuel pump relay from bracket.

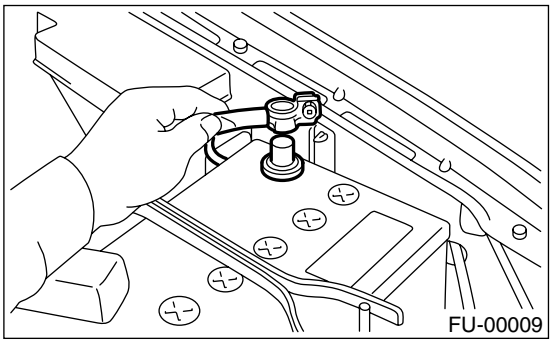
B: INSTALLATION

Install in the reverse order of removal.

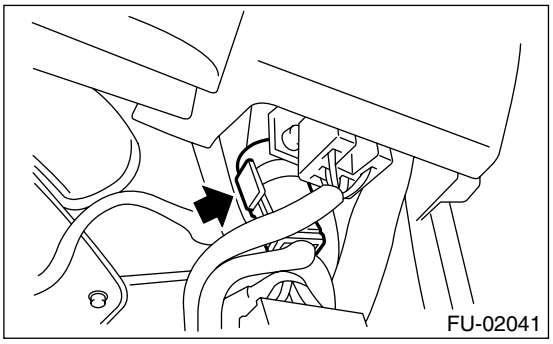
22.Electronic Control Throttle Relay

A: REMOVAL

1) Disconnect battery ground cable.



2) Disconnect connector from electronic control throttle relay of passenger side.



B: INSTALLATION

Install in the reverse order of removal.

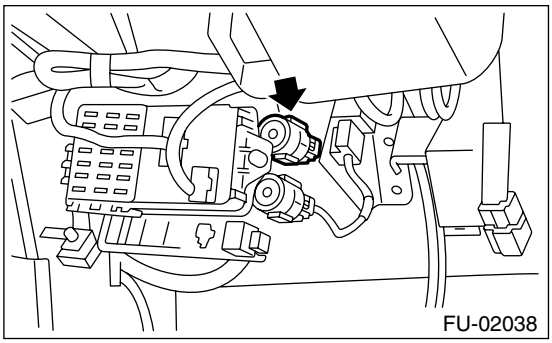
23.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect connector from fuel pump relay.

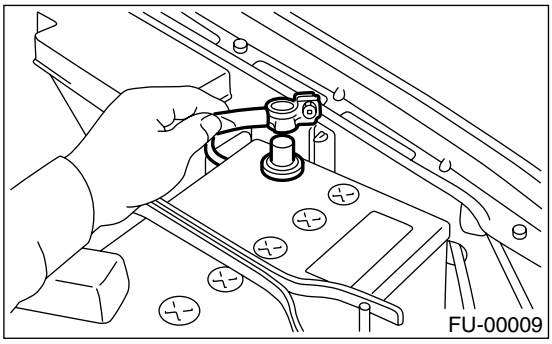

FU-02038

2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn ignition switch to OFF.

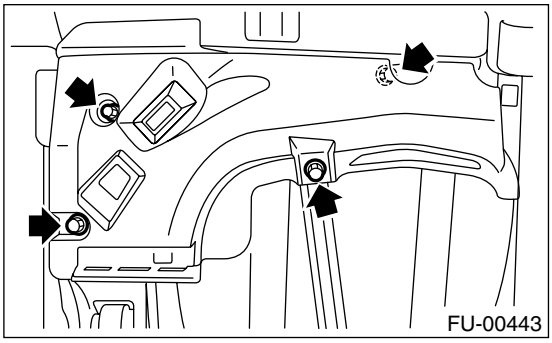
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

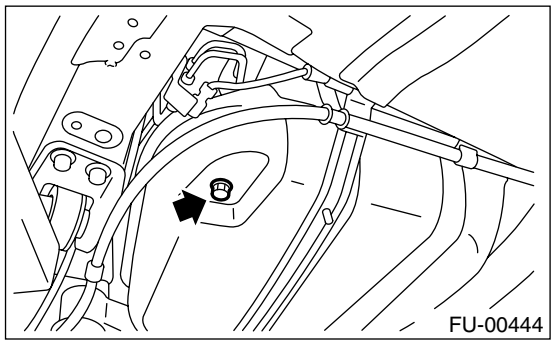
1) Set vehicle on the lift.
2) Disconnect battery ground cable.


FU-00009

3) Lift-up the vehicle.
4) Remove front right side fuel tank cover.


FU-00443

5) Drain fuel from fuel tank.
Set a container under the vehicle and remove drain plug from fuel tank.


FU-00444

6) Tighten fuel drain plug.

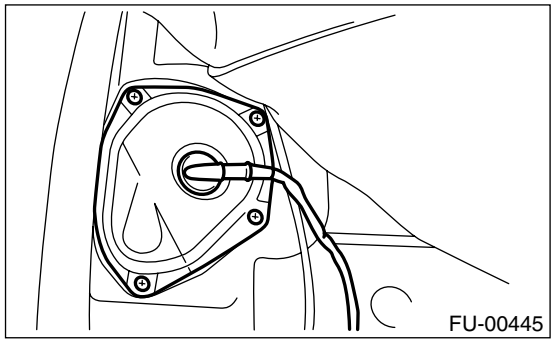
NOTE:
Always use new gaskets.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

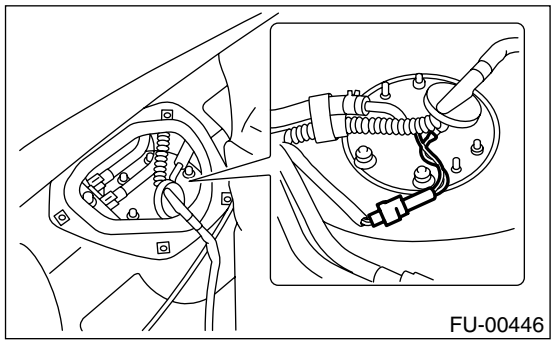
7) Install front right side tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

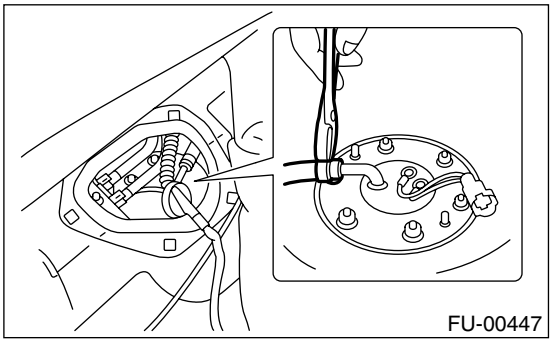
8) Lower the vehicle.
9) Remove sub service hole cover.


FU-00445

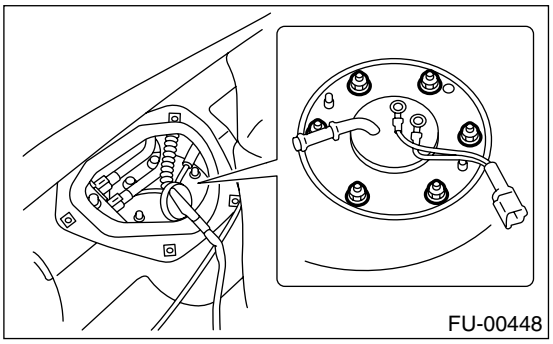
10) Disconnect connector from fuel sub level sensor.


FU-00446

11) Disconnect fuel jet pump hose.



12) Remove fuel sub level sensor.

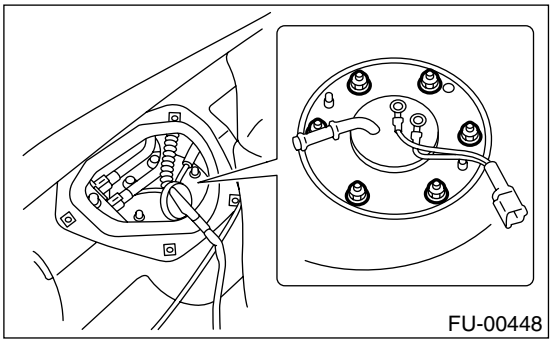


13) Drain fuel from fuel tank by using hand pump.

WARNING:
Do not use a motor pump when draining fuel.

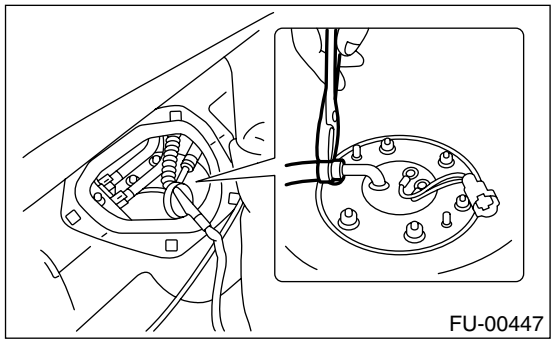
14) After draining fuel, reinstall fuel sub level sensor.

Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

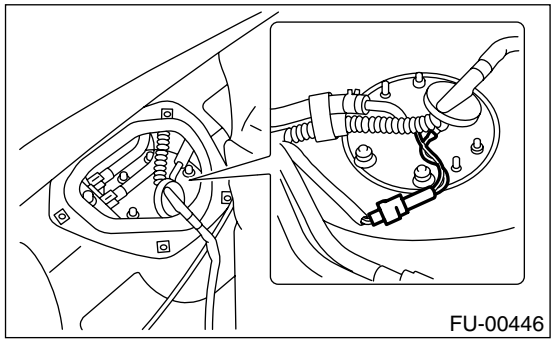


NOTE:
If you have not removed fuel tank yet, proceed with the procedure below for installation.

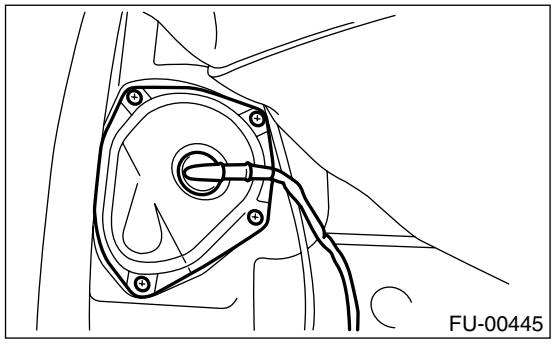
(1) Connect fuel jet pump hose.



(2) Connect connector from fuel sub level sensor.



(3) Install sub service hole cover.

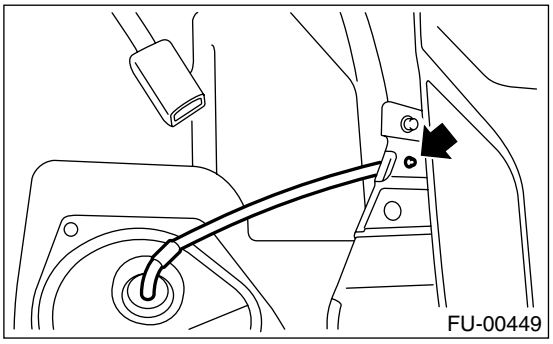


(4) Set rear seat and floor mat.

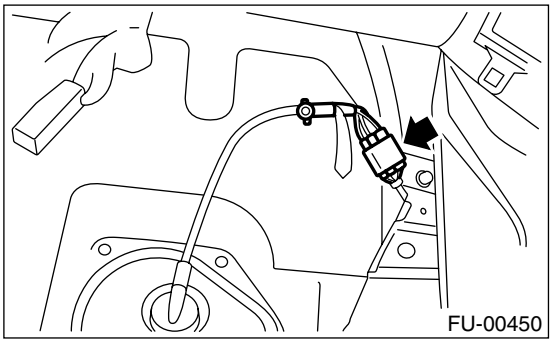
24.Fuel Tank

A: REMOVAL

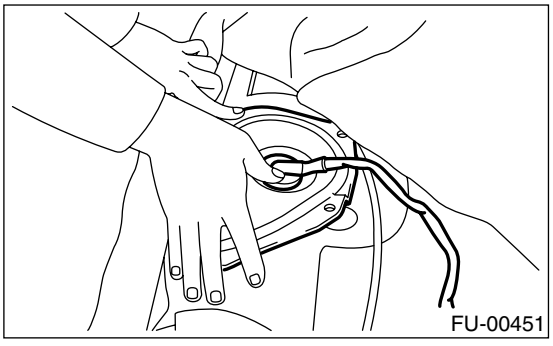
1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from fuel tank. <Ref. to FU(H4SO U5)-53, DRAINING FUEL, OPERATION, Fuel.>
4) Remove holder clip which secures fuel tank cord on bracket.



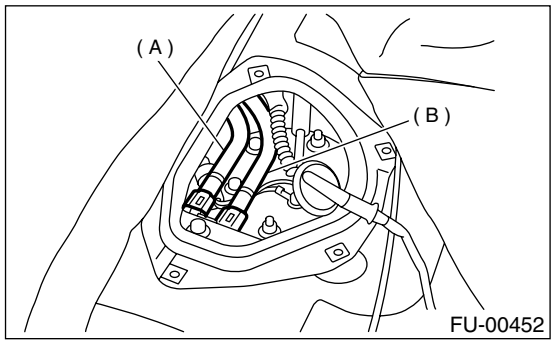
5) Disconnect connector of fuel tank cord to rear harness.



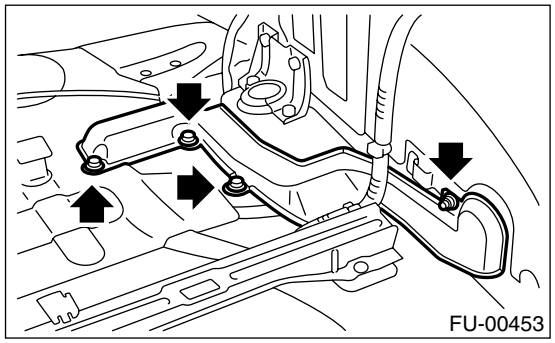
6) Push grommet which holds fuel tank cord on service hole cover into body side.



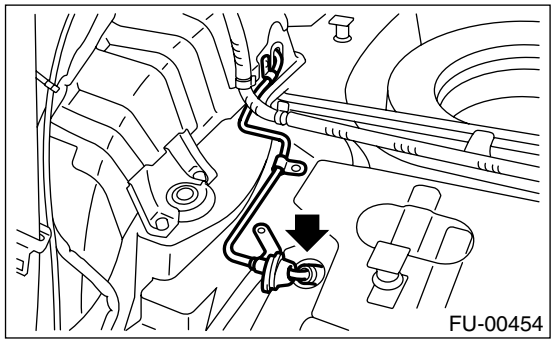
7) Separate quick connector of fuel delivery (A) and return hose (B).<Ref. to FU(H4SO U5)-77, REMOVAL, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



8) Remove parking brake cable.
   (1) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
   (2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-6, REMOVAL, Parking Brake Cable.>
9) Remove trunk trim. (Sedan model)
<Ref. to EI-59, REMOVAL, Trunk Trim.>
10) Remove rear quarter lower trim. (Wagon model)
<Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
11) Remove pipe protector.

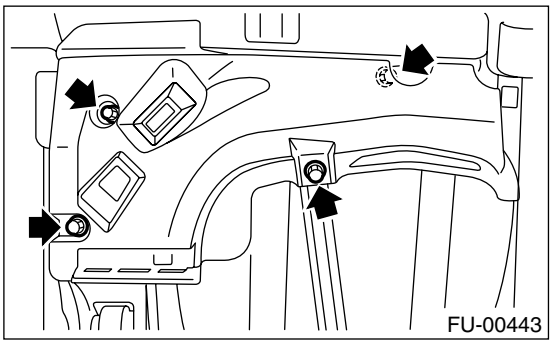


12) Separate quick connector of evaporation pipe. <Ref. to FU(H4SO U5)-77, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove wheel nuts from rear wheels.
14) Lift-up the vehicle.

15) Remove rear wheel.
16) Remove front side fuel tank cover.

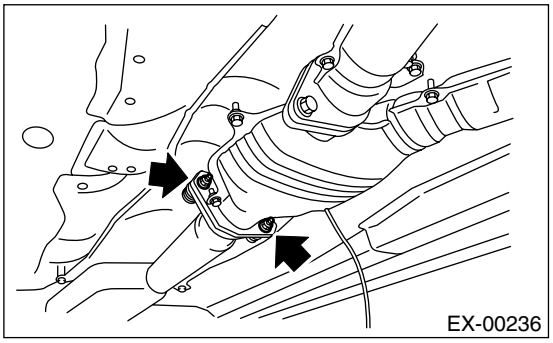

FU-00443

17) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

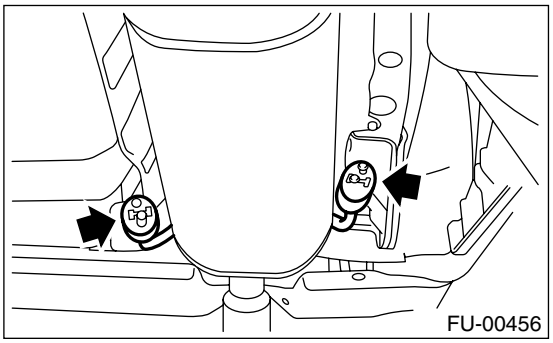
SUBARU CRC (Part No. 004301003)

(1) Separate front exhaust pipe and rear exhaust pipe.

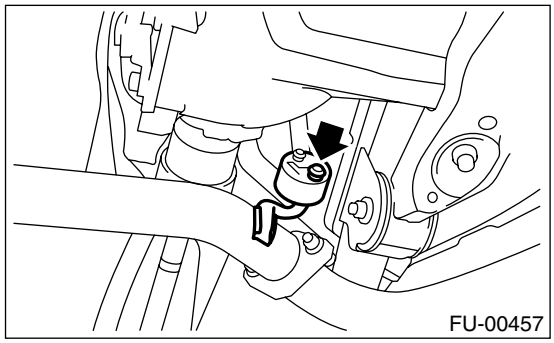

EX-00236

(2) Remove left and right rubber cushions.

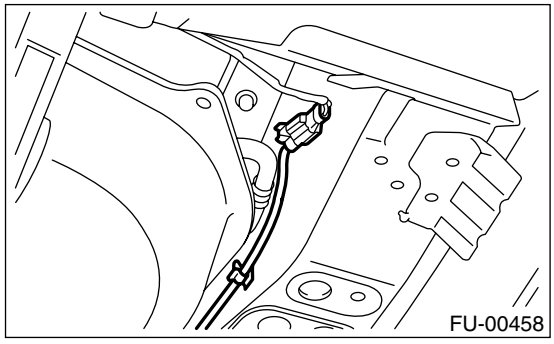
CAUTION:
Be careful not to pull down muffler.


FU-00456

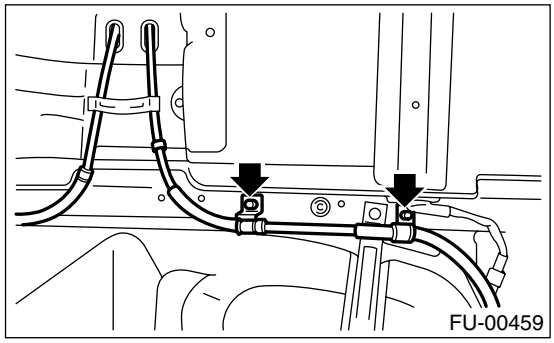
(3) Remove front rubber cushion and detach muffler assembly.


FU-00457

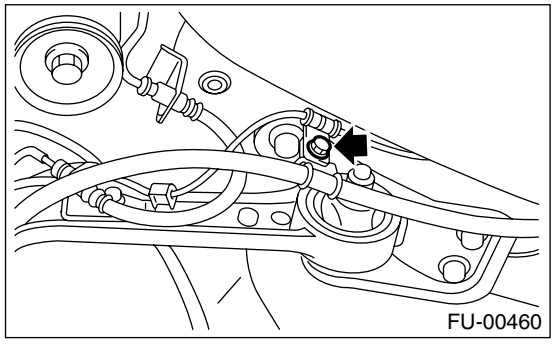
18) Remove propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
19) Disconnect connector from ABS sensor.


FU-00458

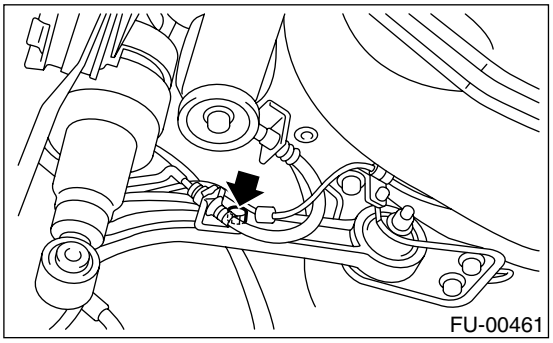
20) Remove bolts which hold parking brake cable holding bracket.
21) Remove parking brake cable from cabin by forcibly pulling it backward.


FU-00459

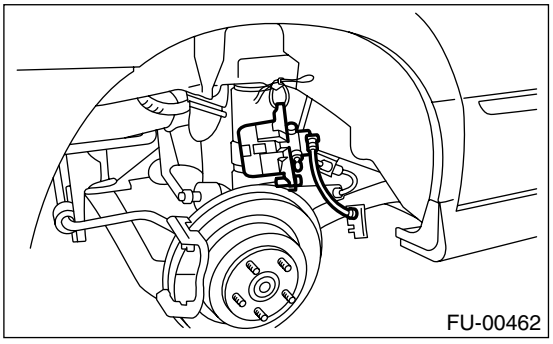
22) Remove bolts which hold parking brake cable holding bracket.


FU-00460

23) Remove bolts which hold rear brake hoses holding bracket.



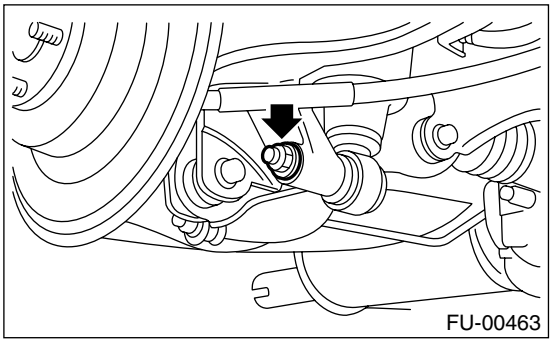
24) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.



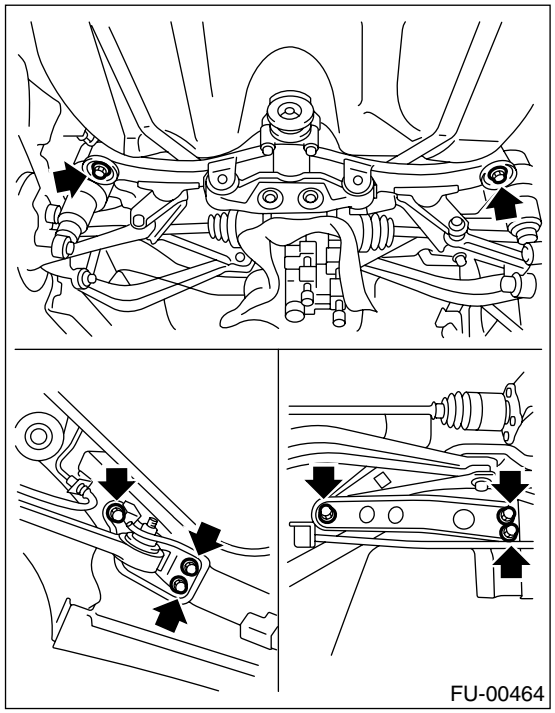
25) Remove rear suspension assembly.

WARNING:
A helper is required to perform this work.

(1) Support rear differential with transmission jack.
(2) Remove bolt which holds rear shock absorber to rear suspension arm.

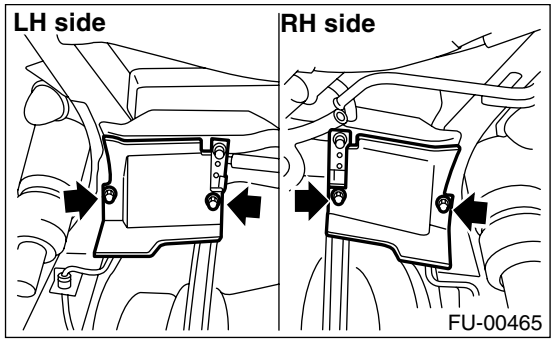


(3) Remove bolts which secure rear suspension assembly to body.

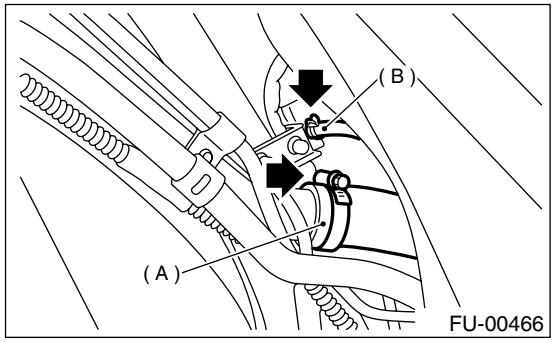


(4) Remove rear suspension assembly.

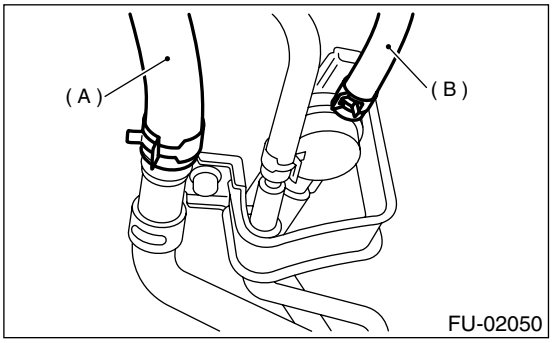
26) Remove rear side fuel tank cover.



27) Disconnect fuel filler hose (A) and fuel tank pressure sensor hose (B).

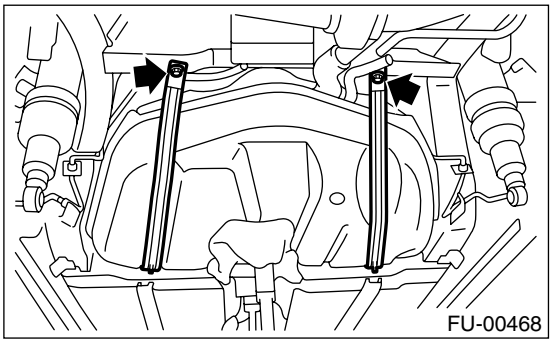


28) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (B) from pressure control solenoid valve.



29) Support fuel tank with transmission jack, remove bolts from bands and dismount fuel tank from the vehicle.

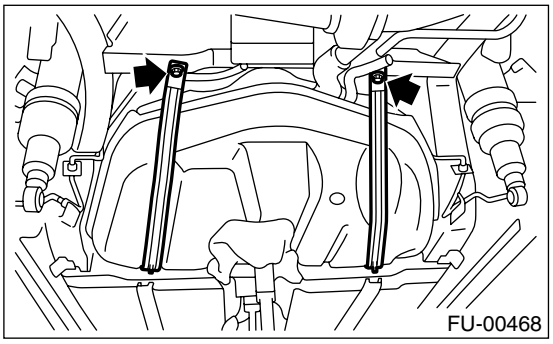
WARNING:
A helper is required to perform this work.



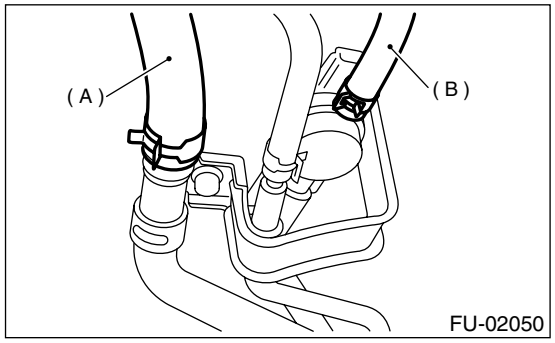
B: INSTALLATION

1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

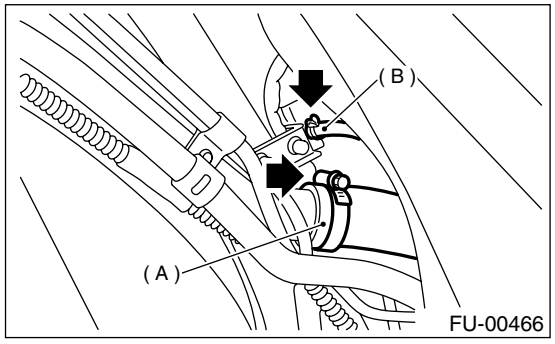
WARNING:
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (B) to pressure control solenoid valve.

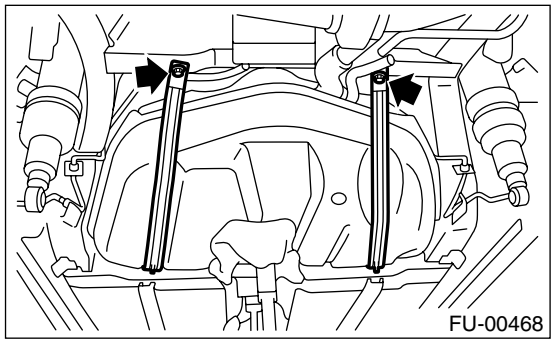


4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



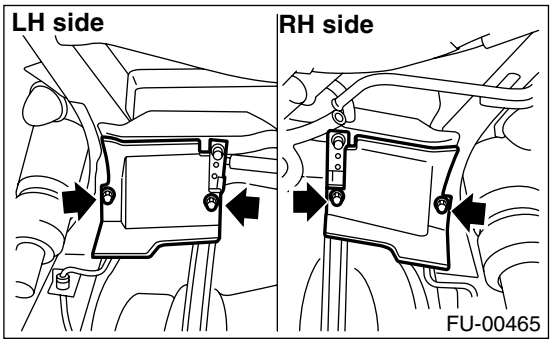
5) Tighten band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



6) Install rear side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

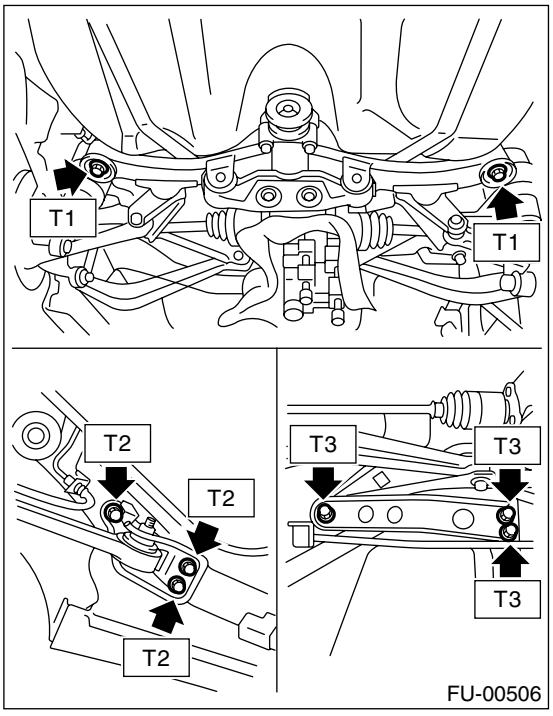


7) Install rear suspension assembly.

WARNING:
A helper is required to perform this work.

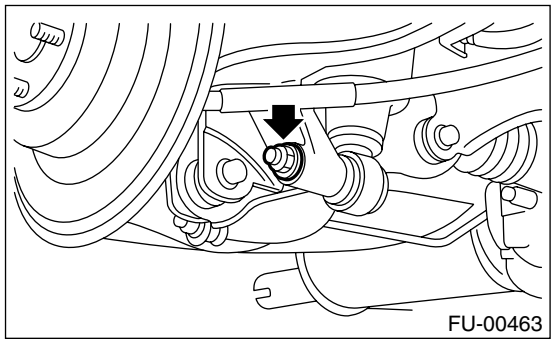
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

Tightening torque:
T1: 172 N·m (17.5 kgf-m, 127 ft-lb)
T2: 108 N·m (11.0 kgf-m, 80 ft-lb)
T3: 66 N·m (6.7 kgf-m, 48 ft-lb)

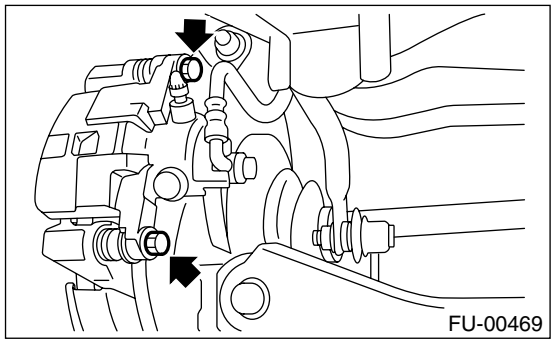


(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)

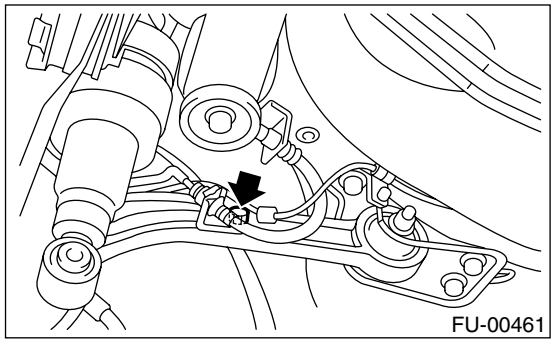


8) Install rear brake caliper. <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



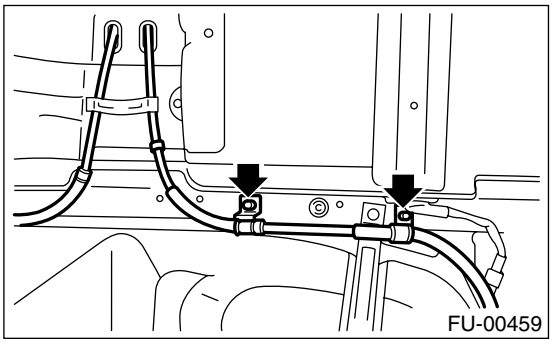
9) Tighten bolts which hold rear brake hoses holding bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

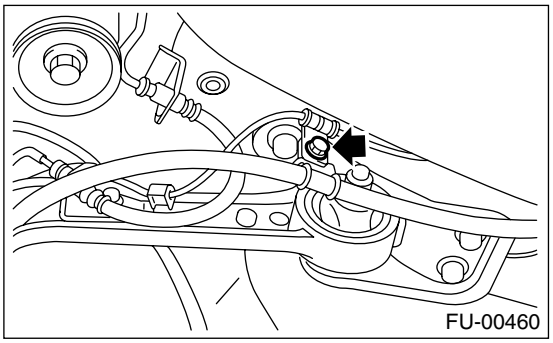


10) Install parking brake cable to cabin by forcibly pushing it forward.
11) Tighten bolts which hold parking brake cable holding bracket.

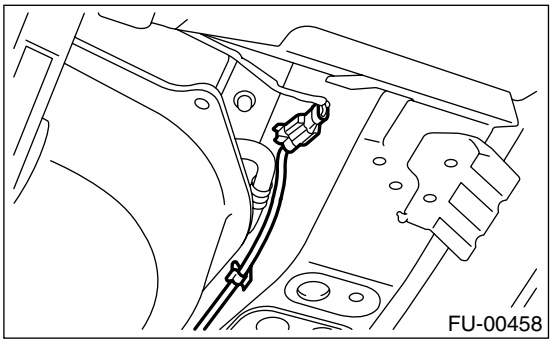
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect connector to ABS sensor.

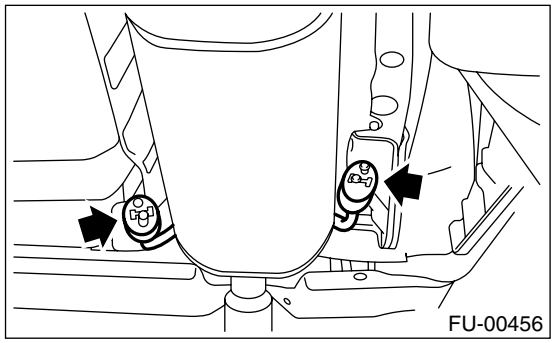


13) Install propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
14) Install rear exhaust pipe and muffler.

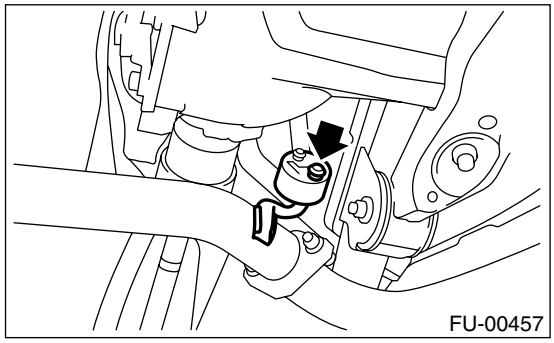
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

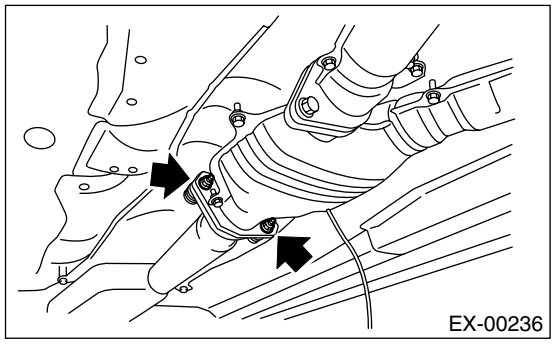


(2) Install front rubber cushion and attach muffler assembly.



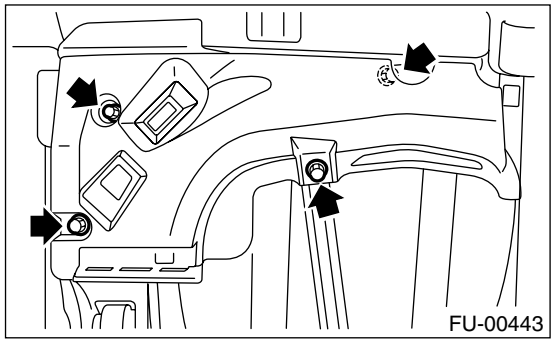
(3) Install rear exhaust pipe to front exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

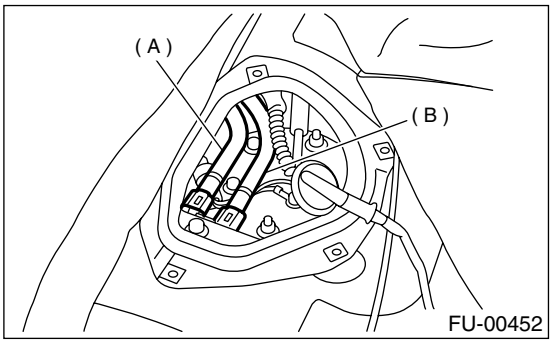


15) Install front side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

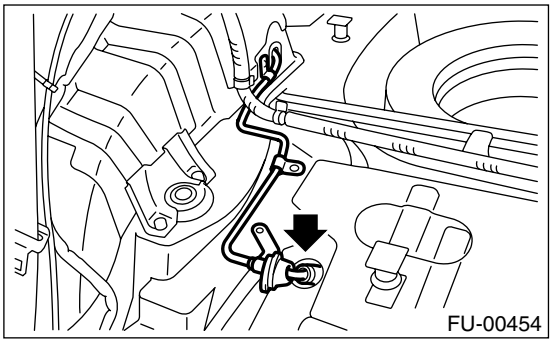


16) Install rear wheel.
17) Lower the vehicle.
18) Tighten wheel nuts to rear wheel.
19) Install parking brake cable. <Ref. to PB-5, INSTALLATION, Parking Brake Lever.>
20) Install console box. <Ref. to EI-45, INSTALLATION, Console Box.>
21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H4SO U5)-78, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

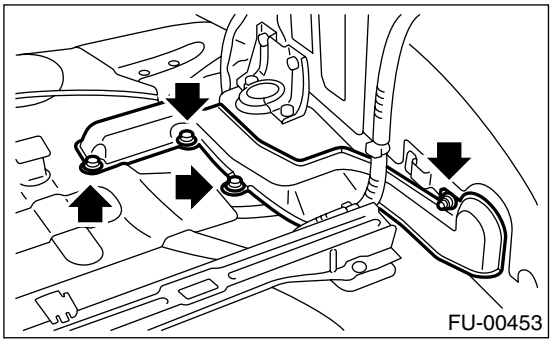


(A) Delivery hose
(B) Return hose

22) Connect evaporation pipe and hold it with quick connector. <Ref. to FU(H4SO U5)-78, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

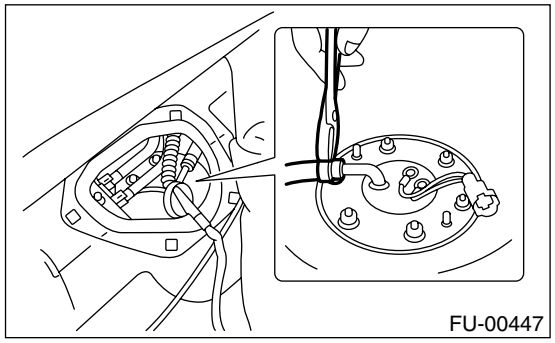


23) Install pipe protector.

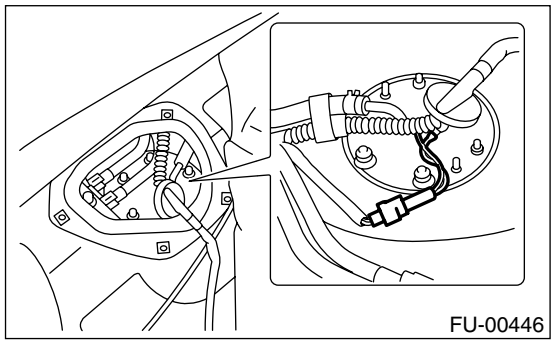


24) Install trunk room trim. (Sedan model)
25) Install luggage room trim. (Wagon model)

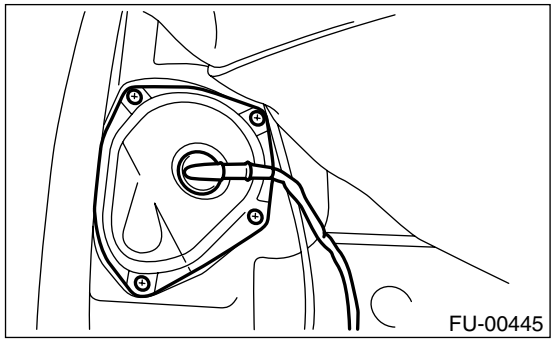
26) Connect fuel jet pump hose.



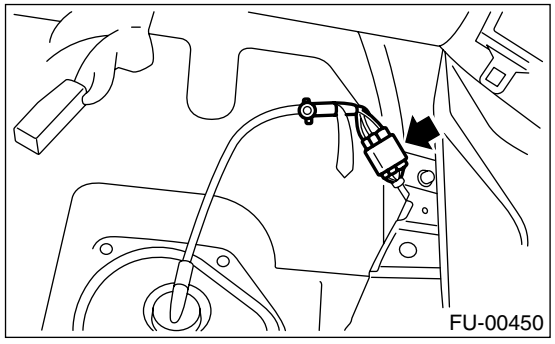
27) Connect connector to fuel sub level sensor.



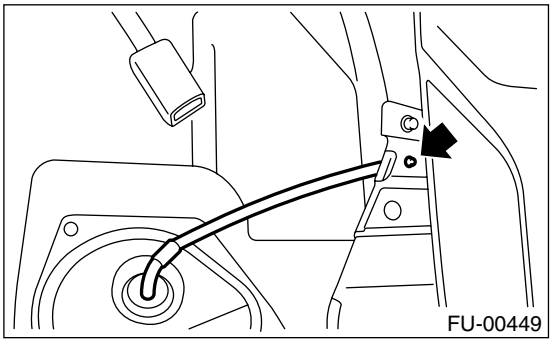
28) Install sub service hole cover.



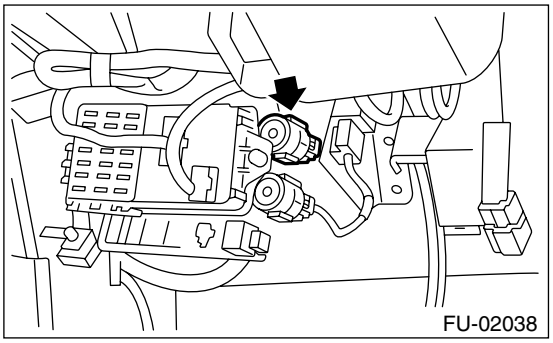
29) Connect connectors to fuel tank cord and plug service hole with grommet.



30) Install holder clip which secures fuel tank cord on bracket.



31) Set rear seat and floor mat.
32) Connect connector to fuel pump relay.



33) Adjust parking brake lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>
34) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

25.Fuel Filler Pipe

A: REMOVAL

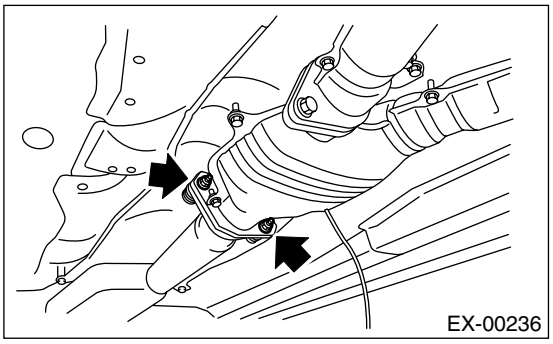
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Drain fuel from fuel tank. <Ref. to FU(H4SO U5)-53, DRAINING FUEL, OPERATION, Fuel.>
2) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

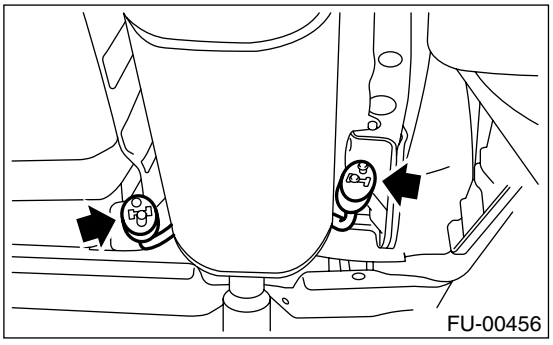
SUBARU CRC (Part No. 004301003)

(1) Separate front exhaust pipe and rear exhaust pipe.

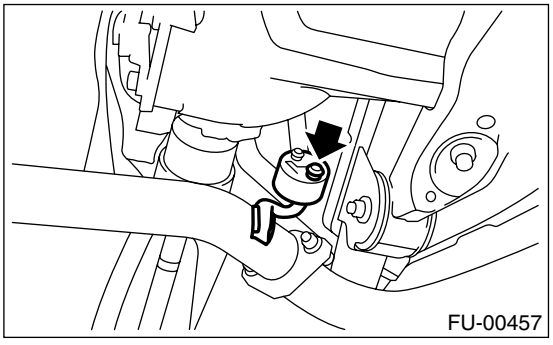


(2) Remove left and right rubber cushions.

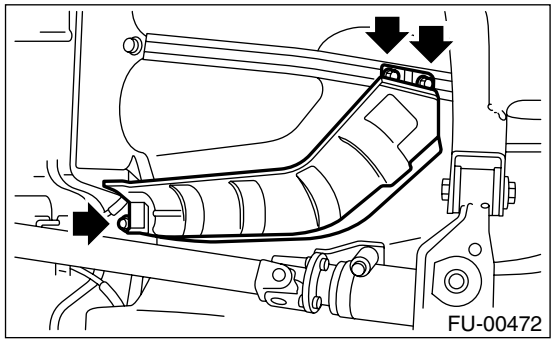
CAUTION:
Be careful not to pull down muffler.



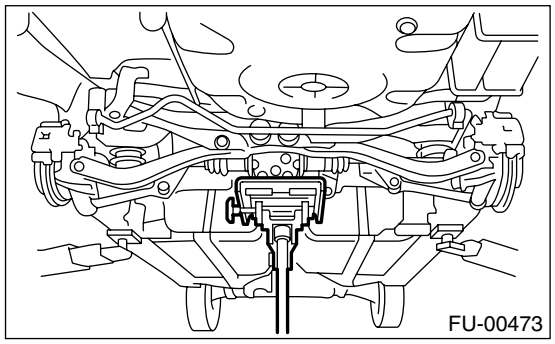
(3) Remove front rubber cushion and detach muffler assembly.



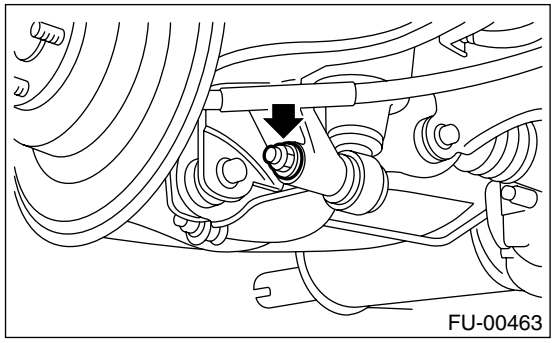
3) Remove heat sealed cover.



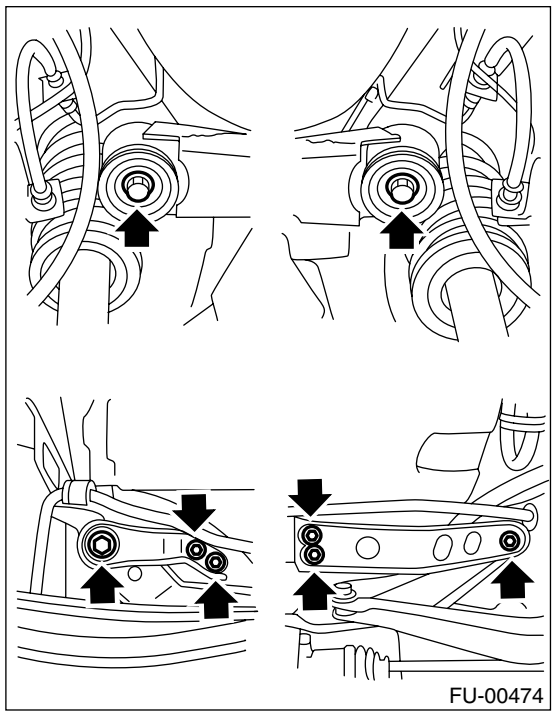
4) Place transmission jack under sub frame.



5) Remove bolt which holds rear shock absorber to rear suspension arm.



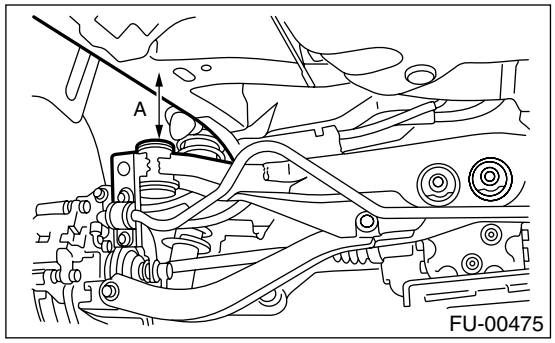
6) Remove bolts which hold rear sub frame on body.



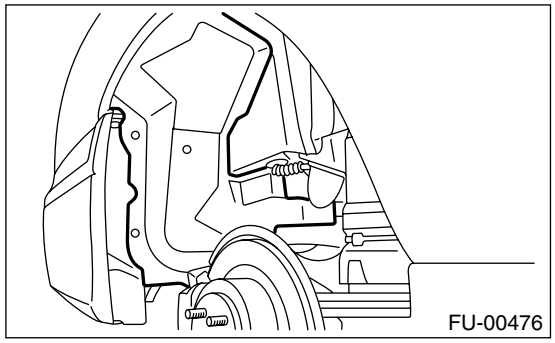
7) Lower the rear sub frame.

CAUTION:
Be sure to lower sub frame slowly.

A = 150 mm (5.91 in)

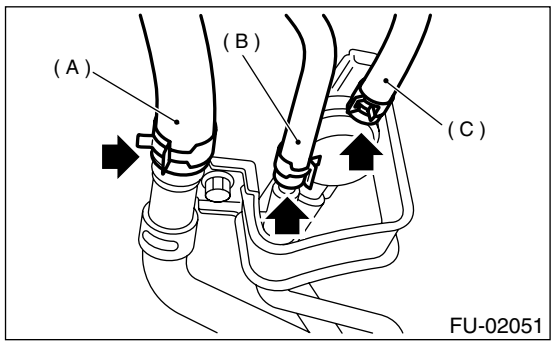


8) Remove fuel filler pipe protector.

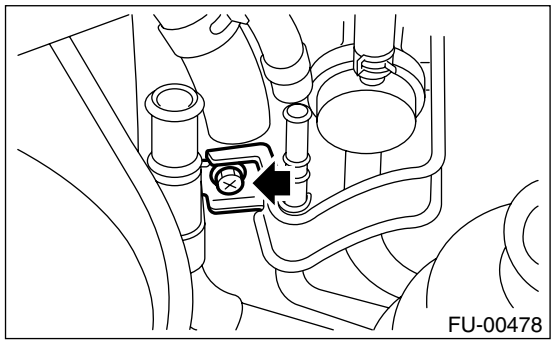


9) Disconnect air vent hose (A) and evaporation hose (P) from evaporation pipe assembly.

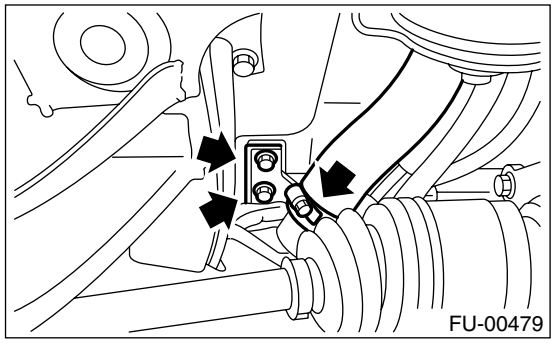
10) Disconnect evaporation hose (C) from pressure control solenoid valve.



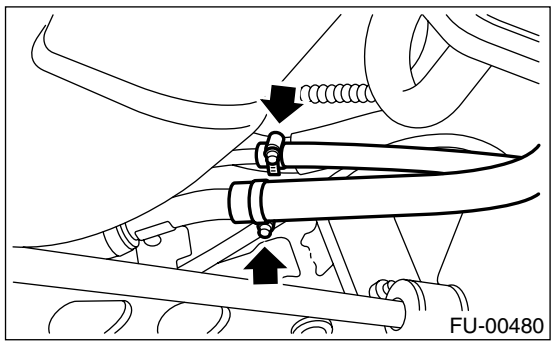
11) Remove bolt which holds evaporation pipe assembly on body.



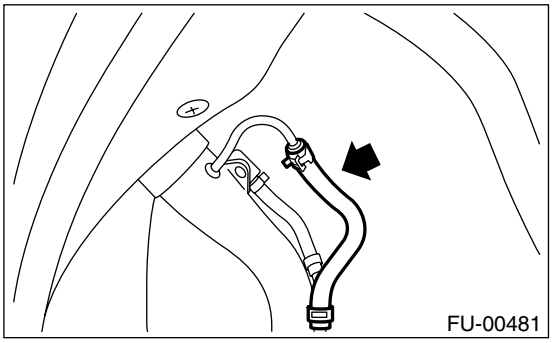
12) Disconnect fuel filler hose.
13) Remove bolt which holds fuel pressure sensor on fuel filler pipe and remove bolt which holds fuel filler pipe on body.



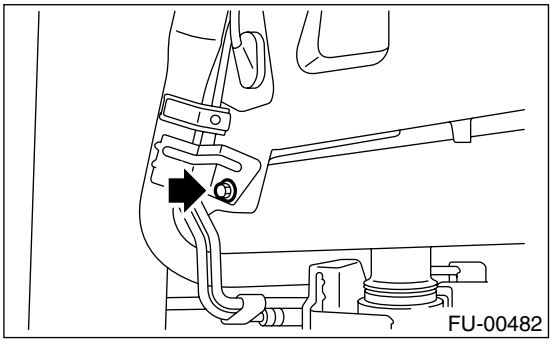
14) Disconnect canister hose from evaporation pipe assembly.



15) Disconnect evaporation hose from fuel filler pipe.



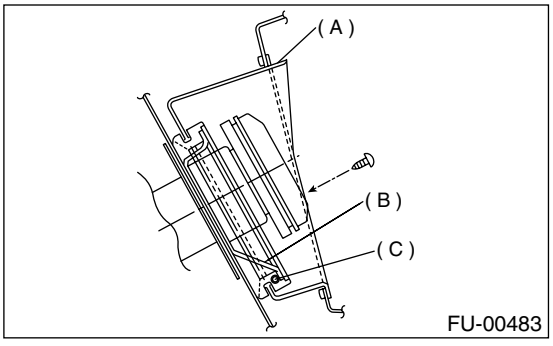
16) Remove bolt which holds fuel filler pipe to body.



17) Remove fuel filler pipe from under side of the vehicle.

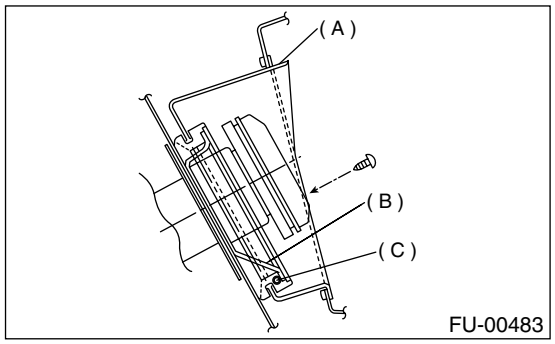
B: INSTALLATION

1) Hold fuel filler flap open.
2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



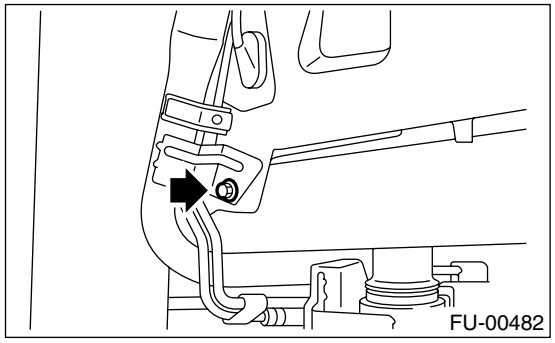
3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.

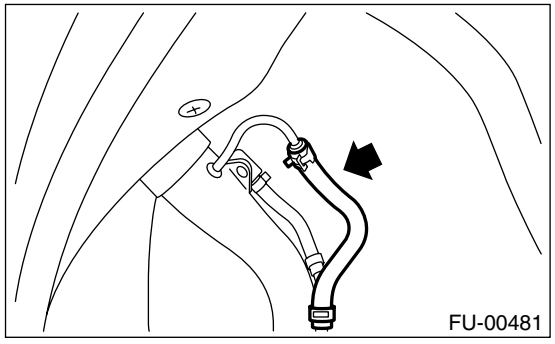


4) Tighten bolt which holds fuel filler pipe on body.

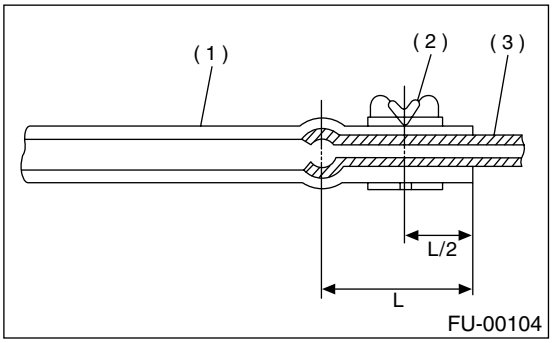
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



5) Insert evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold clip.

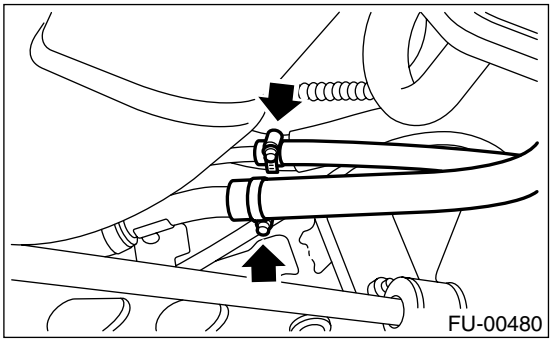


L = 27.5±2.5 mm (1.083±0.098 in)

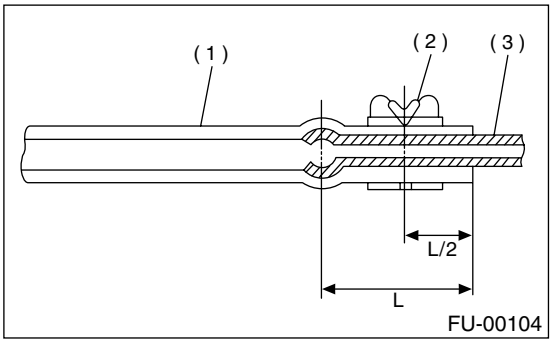


(1) Hose
(2) Clip
(3) Pipe

6) Insert canister hoses approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and tighten clamp.



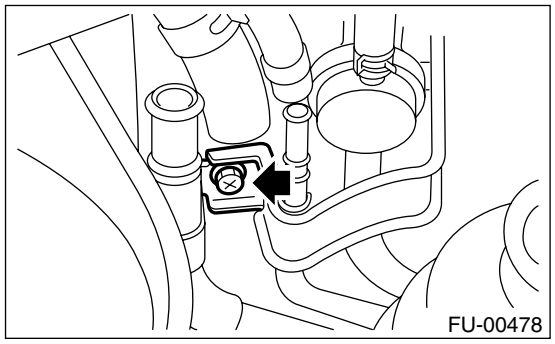
L = 27.5±2.5 mm (1.083±0.098 in)



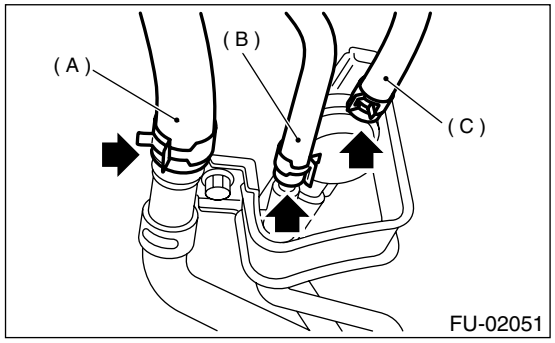
(1) Hose
(2) Clip
(3) Pipe

7) Tighten bolt which holds evaporation pipe assembly on body.

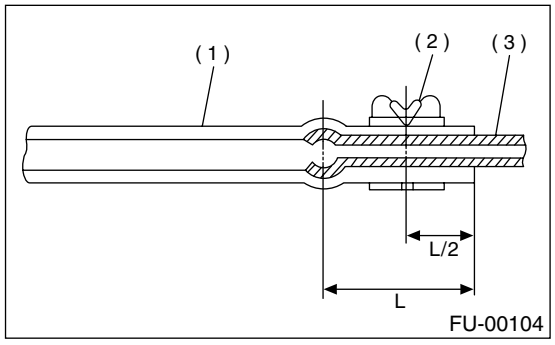
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



8) Insert air vent hose (A), evaporation hose (B) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and hold clip.
9) Insert evaporation hose (C) to pressure control solenoid valve and hold clip.



L = 27.5±2.5 mm (1.083±0.098 in)

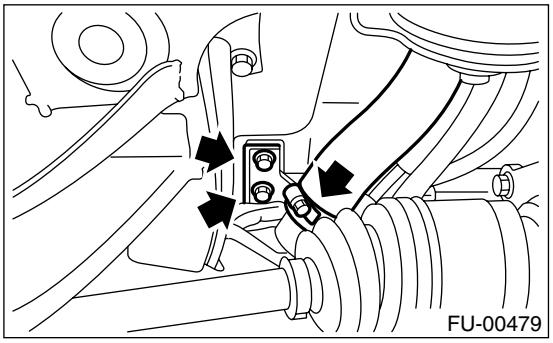


(1) Hose
(2) Clip
(3) Pipe

10) Tighten bolt which holds fuel filler pipe on body and tighten bolt which holds fuel pressure sensor on fuel filler pipe.

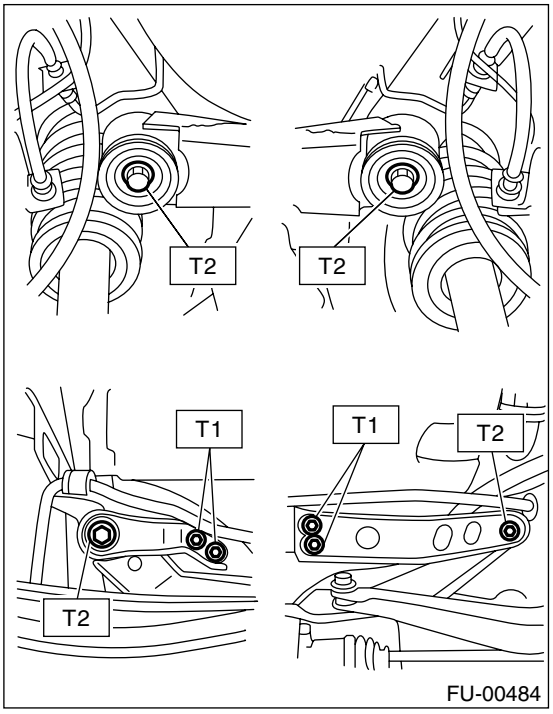
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

11) Insert fuel filler hose approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten clamp.



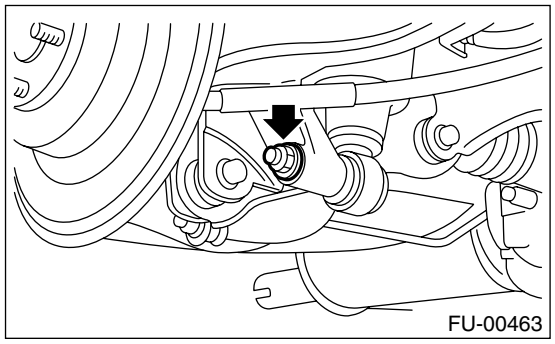
12) Jack-up the rear sub frame and tighten bolts which hold rear sub frame on body.

Tightening torque:
T1: 66 N·m (6.7 kgf-m, 48.5 ft-lb)
T2: 172 N·m (17.5 kgf-m, 127 ft-lb)

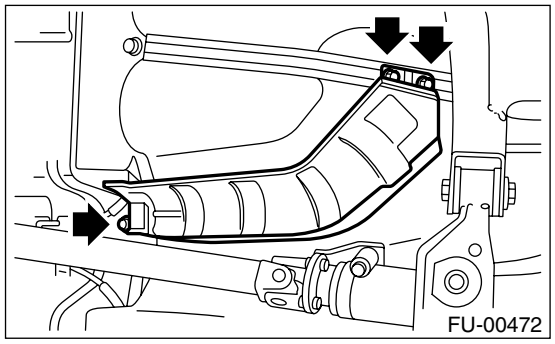


13) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-17, INSTALLATION, Rear Shock Absorber.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)



14) Install heat shield cover.

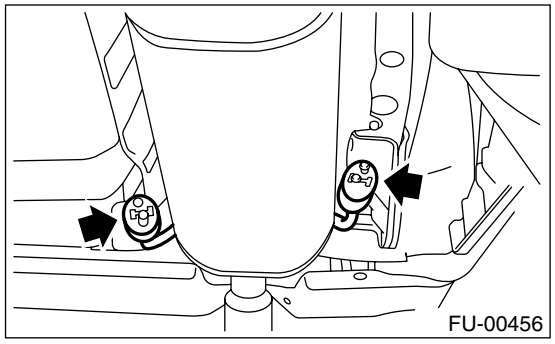


15) Install rear exhaust pipe and muffler.

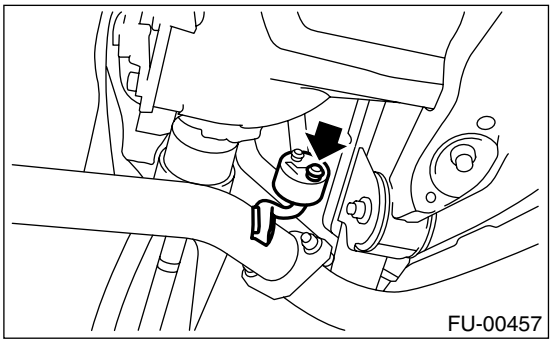
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

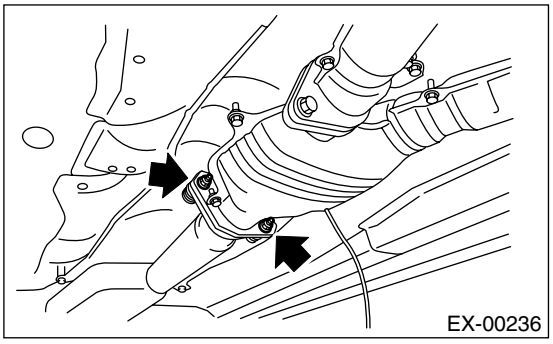


(2) Install front rubber cushion and attach muffler assembly.

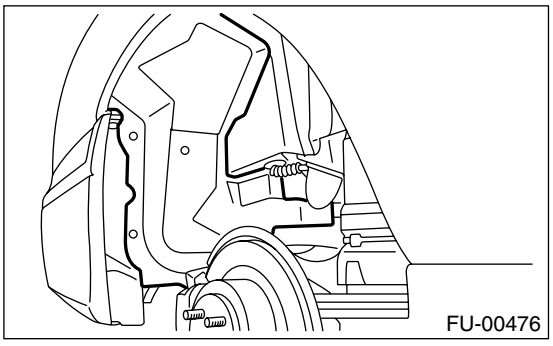

FU-00457

(3) Install rear exhaust pipe to front exhaust pipe.

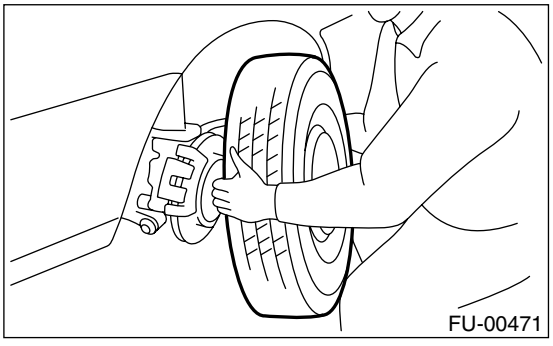
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)


EX-00236

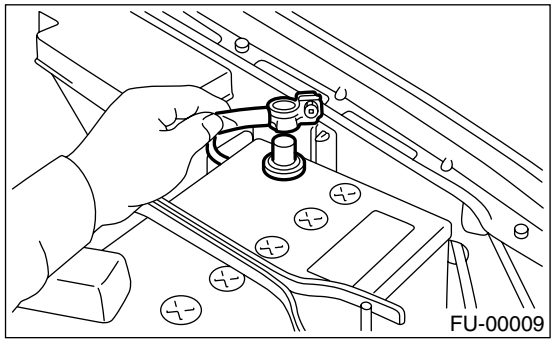
16) Install fuel filler pipe protector.


FU-00476

17) Install rear right wheel.


FU-00471

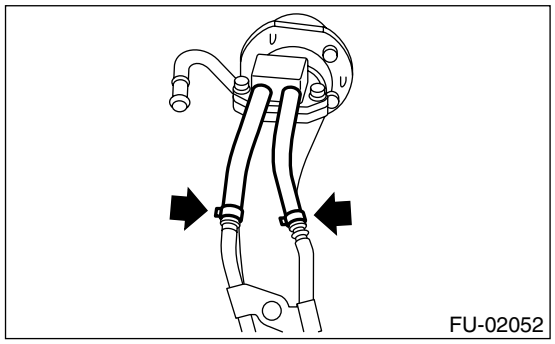
18) Lower the vehicle.
19) Tighten wheel nuts.
20) Connect battery ground terminal.


FU-00009

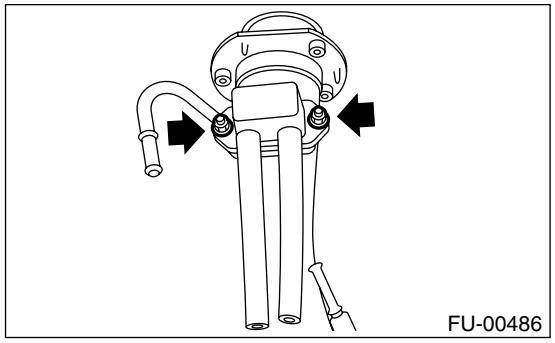
21) Remove fuel filler pipe to under side of the vehicle.

C: DISASSEMBLY

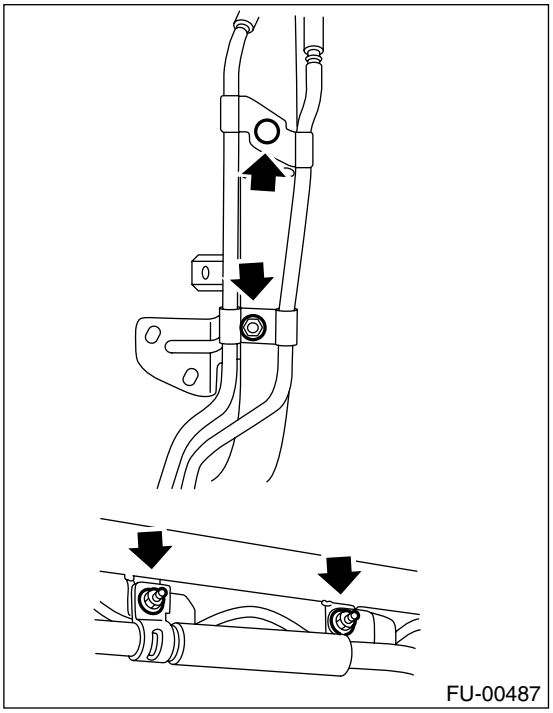
1) Disconnect evaporation hose from evaporation pipe assembly.


FU-02052

2) Remove shut valve from fuel filler pipe.


FU-00486

3) Remove nut which holds evaporation pipe assembly on fuel filler pipe.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

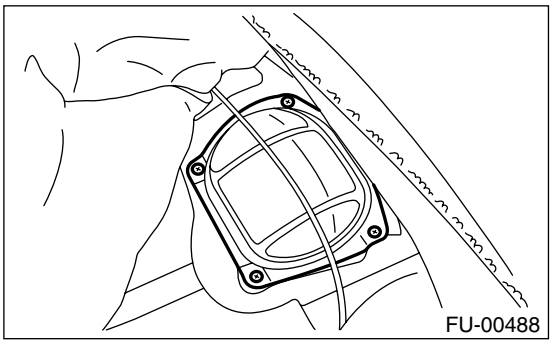
26.Fuel Pump

A: REMOVAL

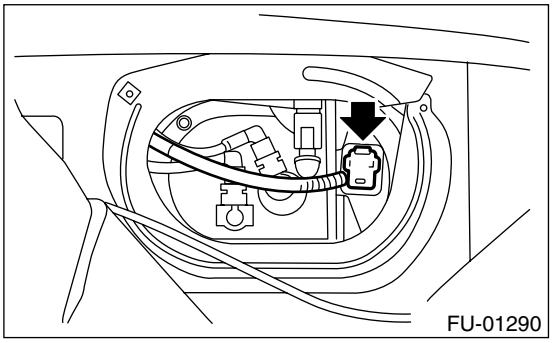
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

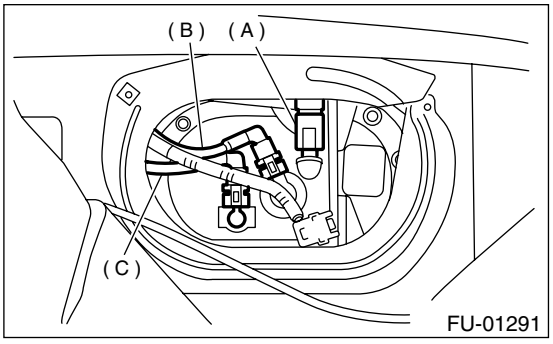
1) Release fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Drain fuel from fuel tank. <Ref. to FU(H4SO U5)-53, DRAINING FUEL, OPERATION, Fuel.>
3) Raise rear seat and turn floor mat up.
4) Remove access hole lid.


FU-00488

5) Disconnect connector from fuel pump.

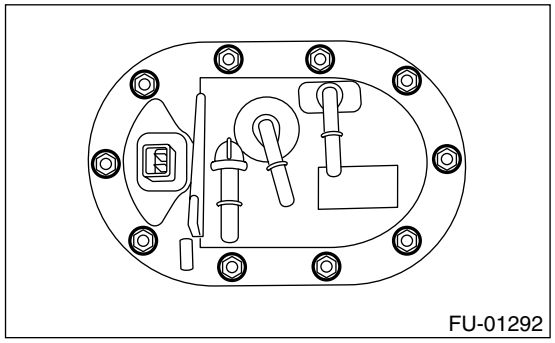

FU-01290

6) Disconnect quick connector, and then disconnect fuel delivery hose (A), return hose (B) and jet pump hose. <Ref. to FU(H4SO U5)-77, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



FU-01291

7) Remove nuts which install fuel pump assembly onto fuel tank.

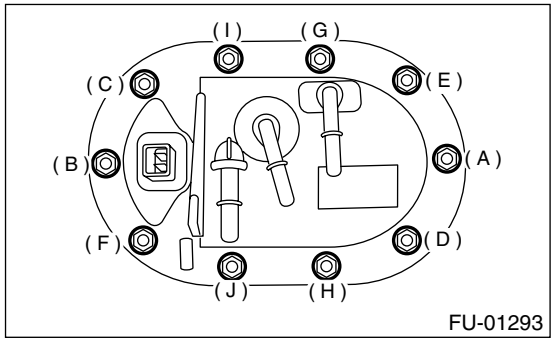

FU-01292

8) Remove fuel pump assembly from fuel tank.

B: INSTALLATION

Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

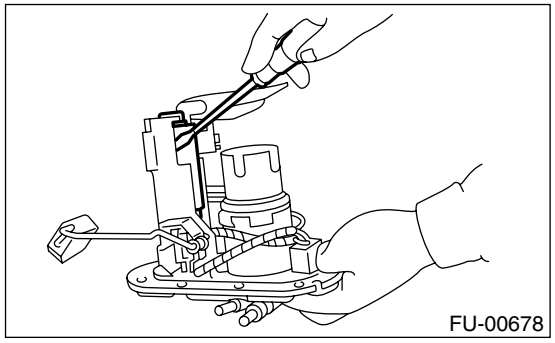


FU-01293

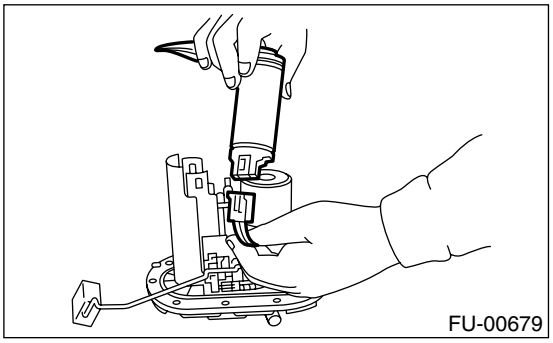
C: DISASSEMBLY

1) Remove fuel pump and pump holder.

NOTE:
When disassembling pump holder, be careful as it is installed with two pawls.


FU-00678

2) Disconnect connector from fuel pump.



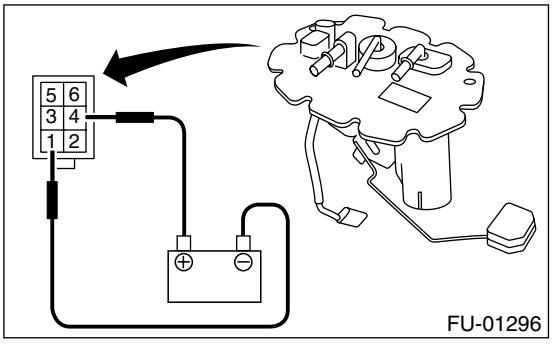
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

Connect lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

WARNING:
• Wipe off the fuel completely.
• Keep battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on the battery side.
• Do not run fuel pump for a long time under non-load condition.



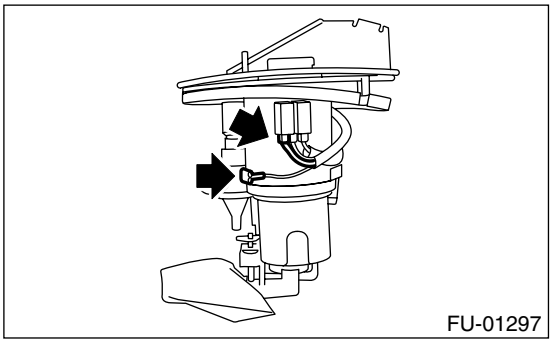
27.Fuel Level Sensor

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

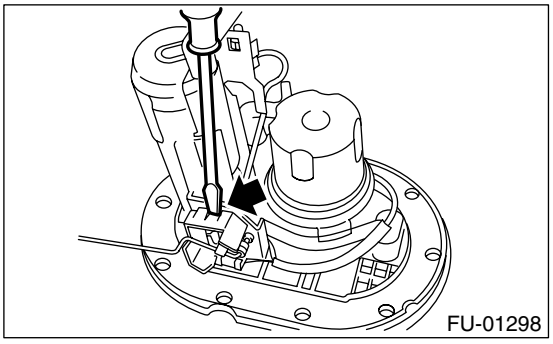
NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H4SO U5)-70, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.


FU-01297

3) Pushing the pawls with a screwdriver, remove fuel level sensor by pulling it downwards.

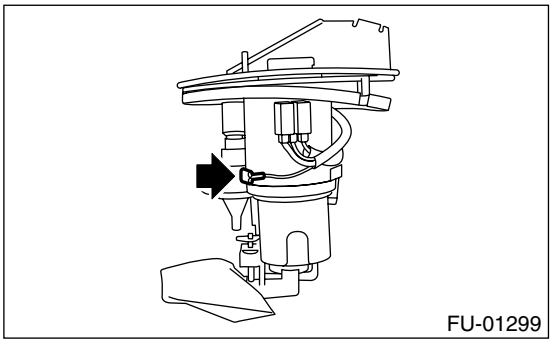
NOTE:
If the retainer pawls are broken during removal, the fuel level sensor must be replaced with a new one.


FU-01298

B: INSTALLATION

Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**

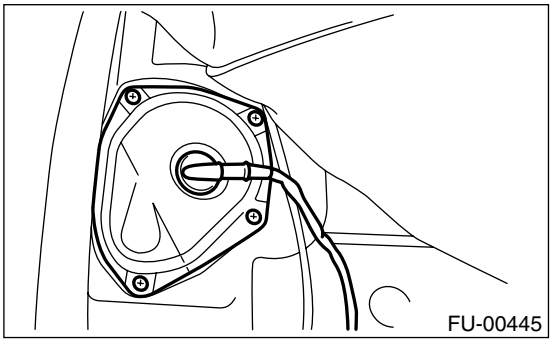

FU-01299

28.Fuel Sub Level Sensor

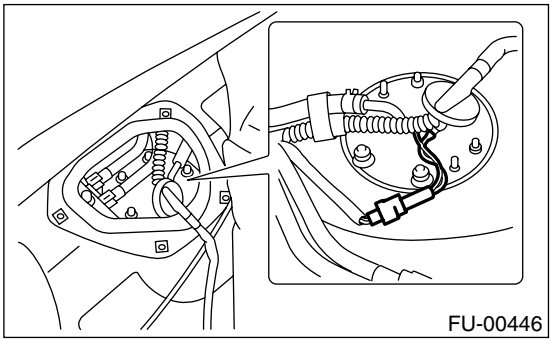
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

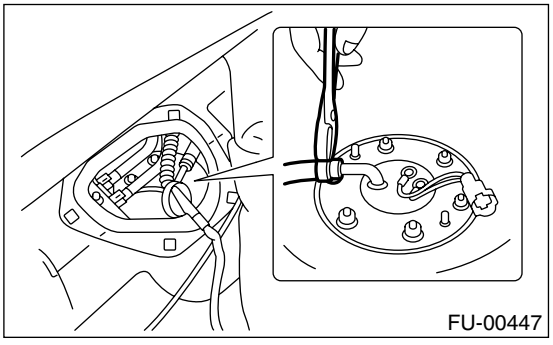
1) Drain fuel from fuel tank. <Ref. to FU(H4SO U5)-53, DRAINING FUEL, OPERATION, Fuel.>
2) Raise rear seat and turn floor mat up. (Wagon model)
3) Remove rear seat. (Sedan model)
4) Remove service hole cover.



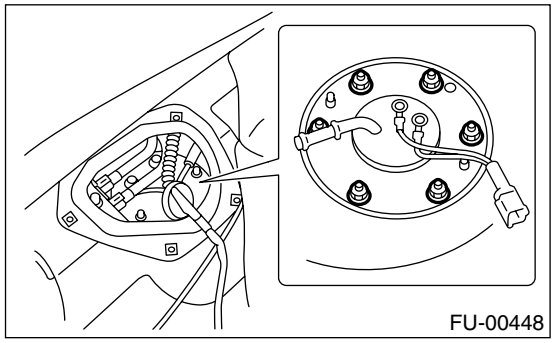
5) Disconnect connector from fuel sub level sensor.



6) Disconnect fuel jet pump hose.



7) Remove bolts which install fuel sub level sensor on fuel tank.

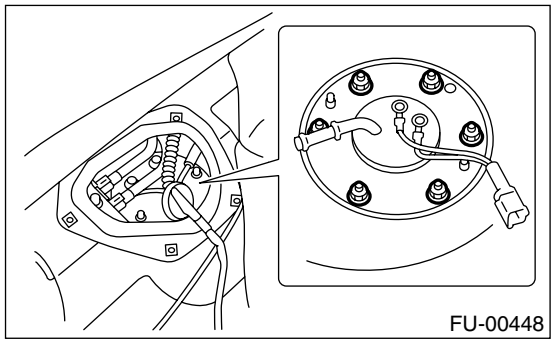


8) Remove fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



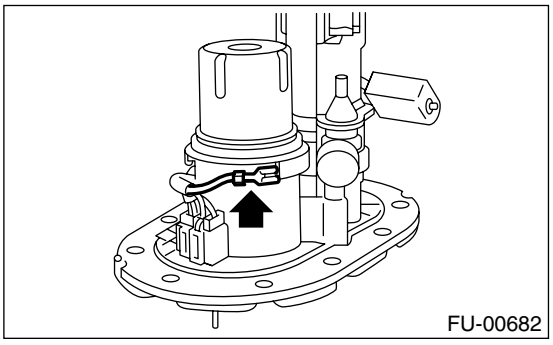
29.Fuel Filter

A: REMOVAL

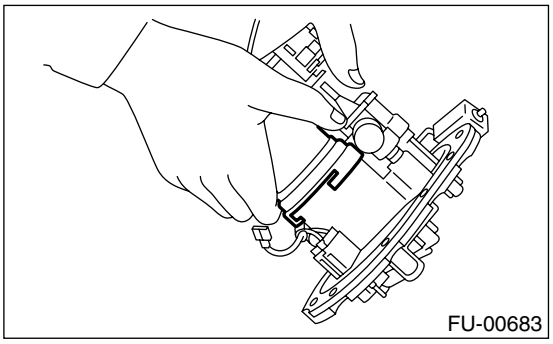
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel filter is built in fuel pump assembly.

1) Release the fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel pump assembly. <Ref. to FU(H4SO U5)-70, REMOVAL, Fuel Pump.>
3) Disconnect the ground cable from filter holder.


FU-00682

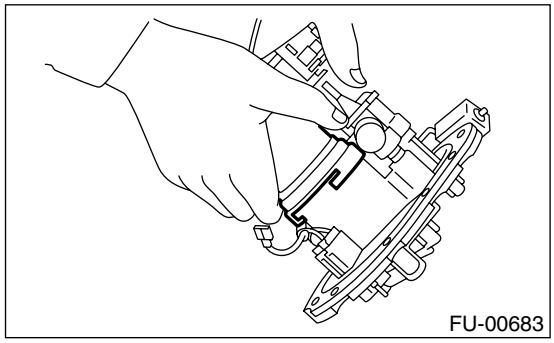
4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.


FU-00683

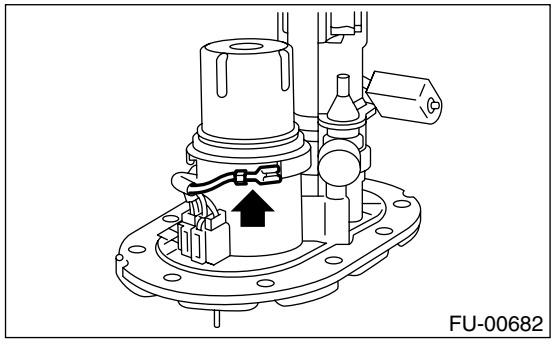
B: INSTALLATION

NOTE:
- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

1) Set the O-ring on the filter holder, and then install by turning to the right.


FU-00683

2) Connect the ground cable to filter holder.


FU-00682

3) Install the fuel pump assembly. <Ref. to FU(H4SO U5)-70, INSTALLATION, Fuel Pump.>

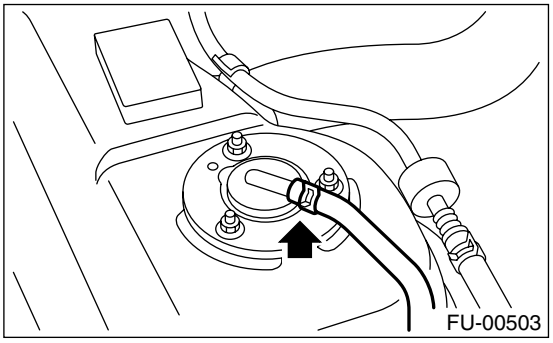
C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.

30.Fuel Cut Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H4SO U5)-55, REMOVAL, Fuel Tank.>
2) Move clip and disconnect evaporation hose from fuel cut valve.

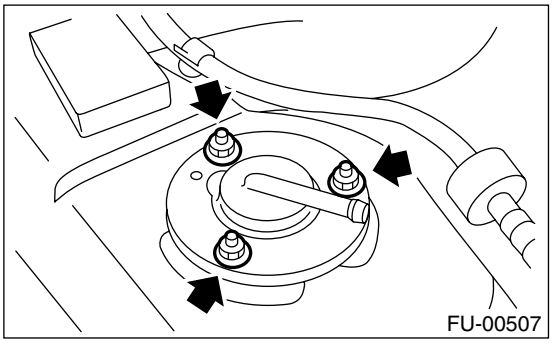


3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

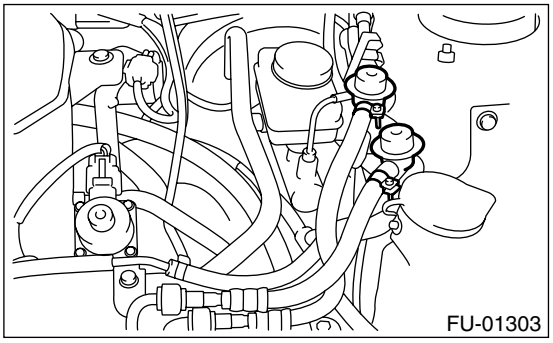
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



31.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from the fuel delivery line and return line.



B: INSTALLATION

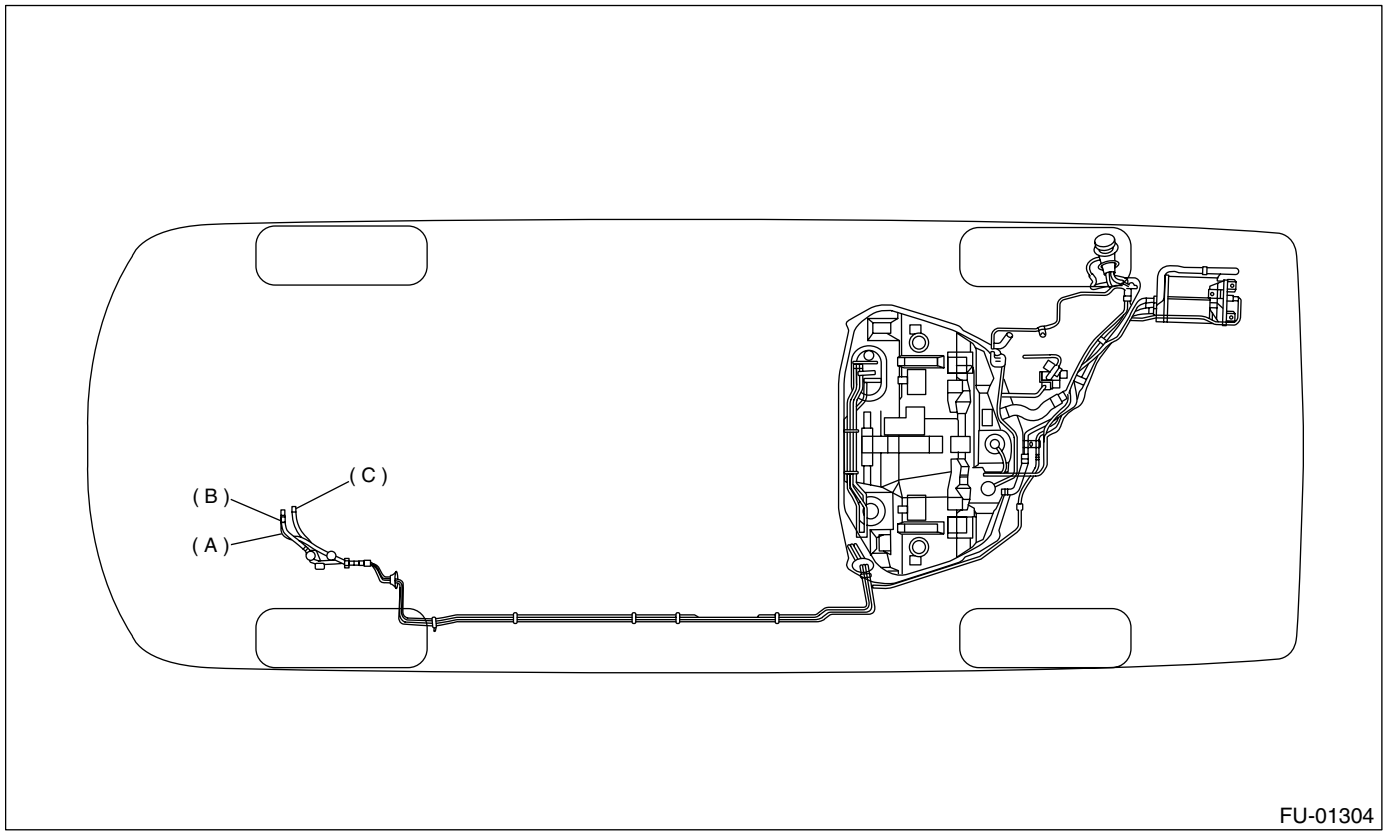
Install in the reverse order of removal.

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)

32. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H4SO U5)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open fuel filler flap lid and remove fuel filler cap.
4) Remove fuel tank. <Ref. to FU(H4SO U5)-55, REMOVAL, Fuel Tank.>
5) Remove fuel filler pipe. <Ref. to FU(H4SO U5)-63, REMOVAL, Fuel Filler Pipe.>
6) Remove floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
7) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



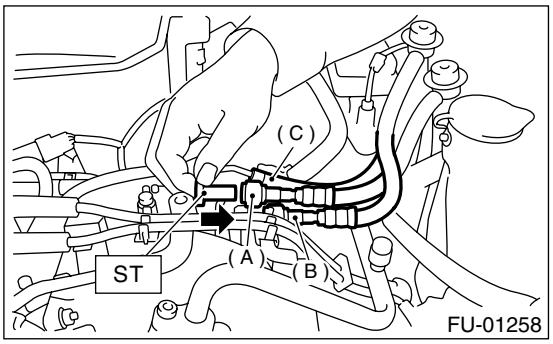
(A) Fuel delivery line
(B) Fuel return line
(C) Evaporation line

8) In engine room, detach fuel delivery hoses, return hoses and evaporation hose.

(1) Separate quick connector of fuel delivery line and return line by pushing the ST in the direction of the arrow. Separate quick connector of fuel delivery line and return line by pushing in the direction of the arrow using an ST.

ST 42099AE000 CONNECTOR REMOVER

(2) Remove clip, and separate evaporation hose from pipe.

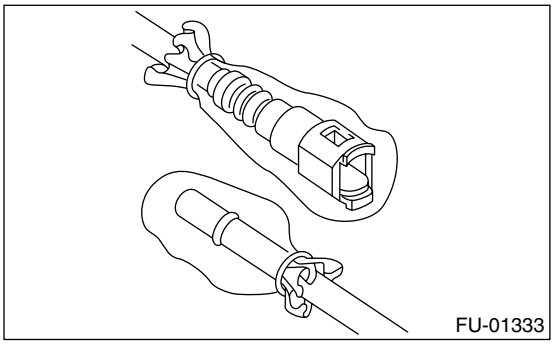


(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

9) Separate quick connector on fuel delivery and return line.

(1) Clean pipe and connector, if they are covered with dust.

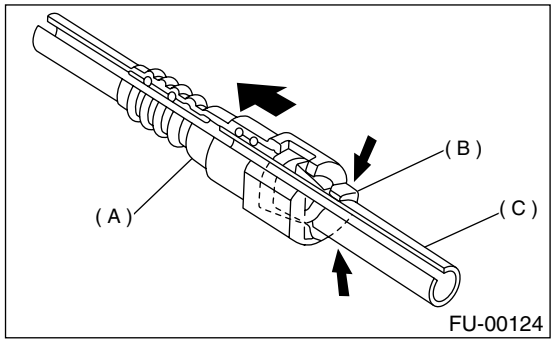
(2) Cover pipe and connector with vinyl bag to prevent scratch and contamination.



(3) Hold connector (A) and push retainer (B) down.

(4) Pull out connector (A) from retainer (B).

CAUTION:
Replace retainer with new ones.

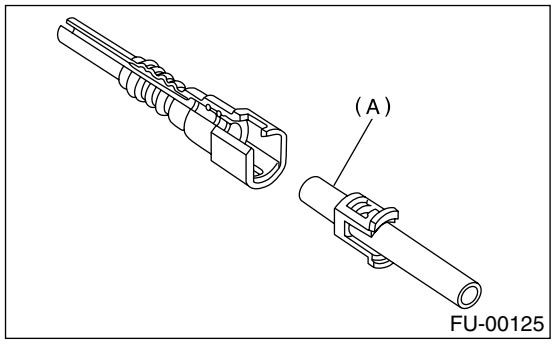


(A) Connector
(B) Retainer
(C) Pipe

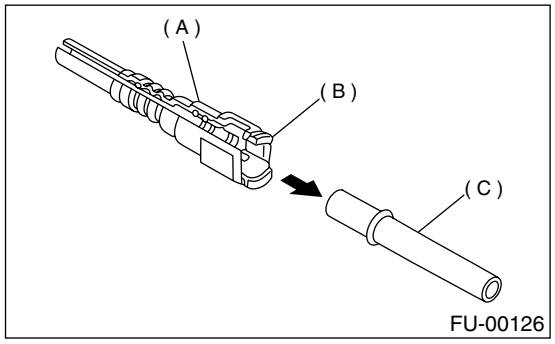
B: INSTALLATION

1) Connect quick connector on fuel delivery and return line.

CAUTION:
- **Always use a new retainer.**
- **Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface (A) of pipe.**

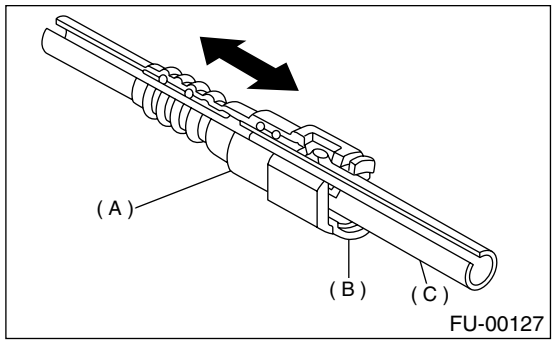


(1) Set new retainer (B) to connector (A).
(2) Push pipe into connector completely.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.
• Be sure to inspect hoses and their connections for any leakage of fuel.

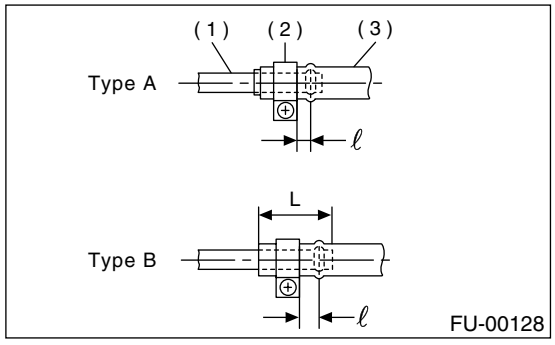


(A) Connector
(B) Retainer
(C) Pipe

2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When insertion length is specified.
Type B: When insertion length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

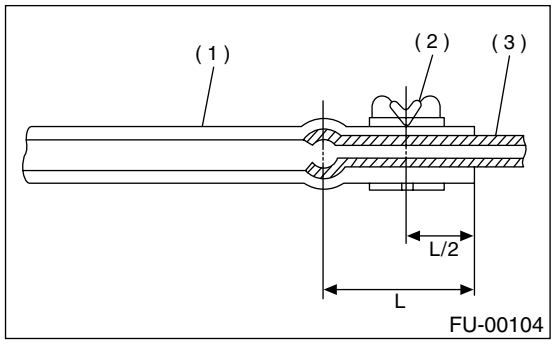


(1) Pipe
(2) Clamp
(3) Hose

3) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

33.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel level indicator		
1)	Defective operation of fuel level sensor.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation.
(1) Top off the fuel tank or drain the fuel completely.
(2) Drain water condensation from the fuel filter.
• Refilling the fuel tank.
Refill the fuel tank while there is still some fuel left in the tank.
• Protecting the fuel system against freezing and water condensation.
(1) Cold areas
In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the fuel tank. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under damaged areas below.
(2) Damaged areas
If water accumulated in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.
• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

MEMO:

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H4SO U5)

Page
1. General Description 2

1. General Description

A: SPECIFICATIONS

Specifications for U5 model with SOHC are described in EC(H4SO) section. <Ref. to EC(H4SO)-2, General Description.>

INTAKE (INDUCTION)

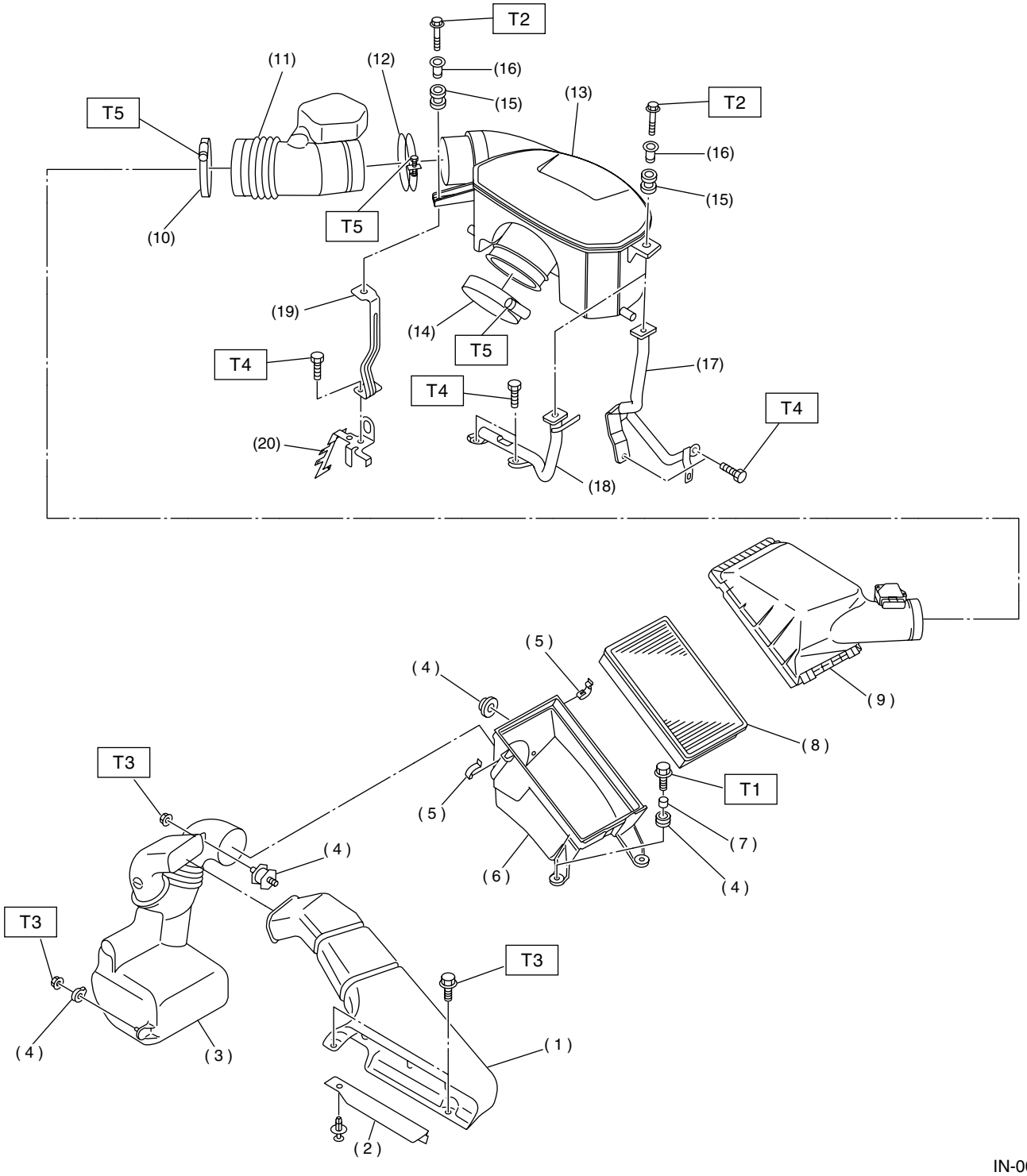
IN(H4SO U5)

Page

1. General Description 2
2. Air Cleaner Element 4
3. Air Cleaner Case 5
4. Air Intake Chamber 6
5. Air Intake Duct 7
6. Resonator Chamber 8

1. General Description

A: COMPONENT



IN-00240

(1) Air intake duct
(2) Plate
(3) Resonator chamber
(4) Cushion
(5) Clip
(6) Air cleaner lower case
(7) Spacer
(8) Air cleaner element
(9) Air cleaner upper cover
(10) Clamp
(11) Air intake boot
(12) Clamp
(13) Air intake chamber
(14) Clamp
(15) Bushing
(16) Spacer
(17) Air intake chamber stay LH (MT models)
(18) Air intake chamber stay LH (AT models)
(19) Air intake chamber stay RH
(20) Engine harness bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24.6)
T2: 6.5 (0.66, 4.8)
T3: 7.5 (0.76, 5.5)
T4: 16 (1.6, 11.6)
T5: 3 (0.3, 2.2)

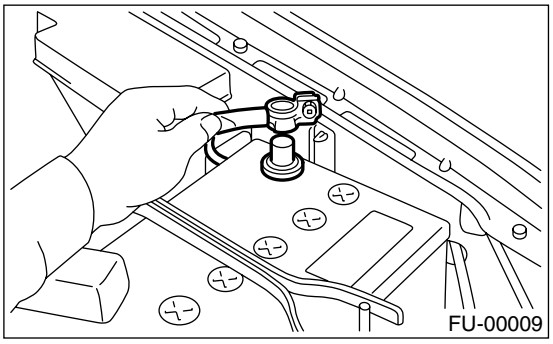
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

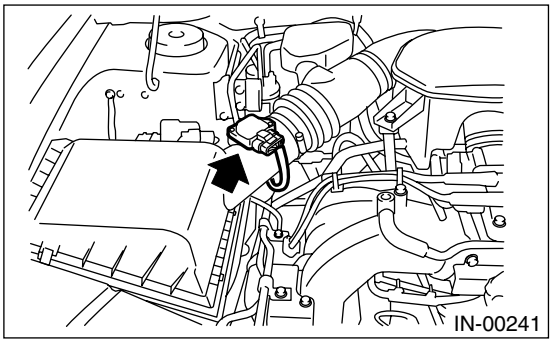
2. Air Cleaner Element

A: REMOVAL

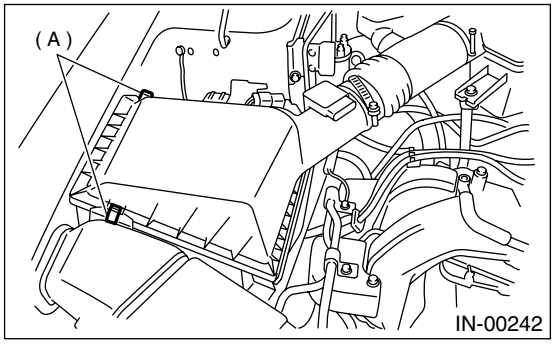
1) Disconnect ground cable from battery.



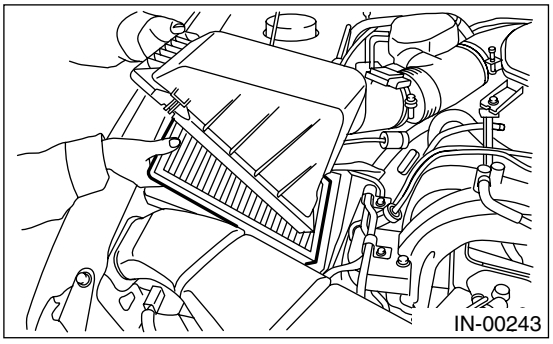
2) Disconnect connector from air flow sensor.



3) Remove the clip (A) above the air cleaner case.



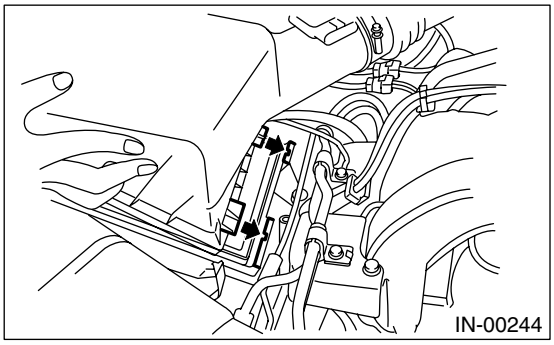
4) Raise air cleaner upper cover and remove air cleaner element.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Before installing air cleaner upper cover,align protruding portions with holes of air cleaner lower case, then secure uppe cover to lower case.



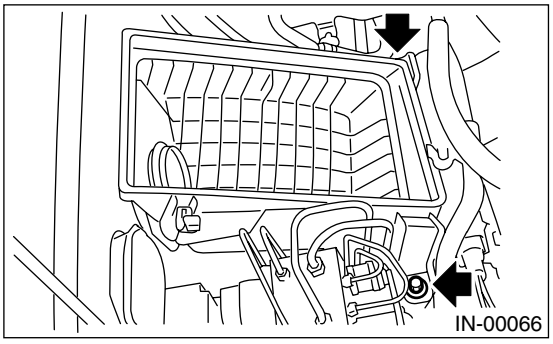
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Cleaner Case

A: REMOVAL

1) Remove air intake duct. <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
2) Remove air cleaner element. <Ref. to IN(H4SO U5)-4, REMOVAL, Air Cleaner Element.>
3) Remove bolt which installs air cleaner case to body.

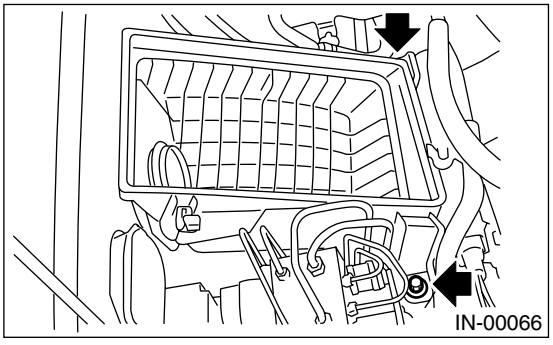


4) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



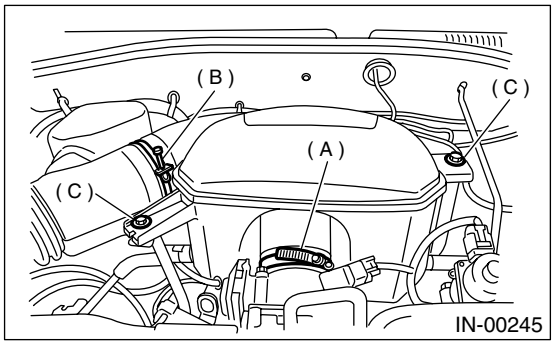
C: INSPECTION

Check for cracks and loose connections.

4. Air Intake Chamber

A: REMOVAL

1) Loosen clamp (A) which connects air intake chamber and throttle body.
2) Loosen clamp (B) which connects air intake boot and air intake chamber.
3) Remove bolt (C) which secures air intake chamber to stay.



4) Disconnect blow-by hoses (2 places) and then, remove air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

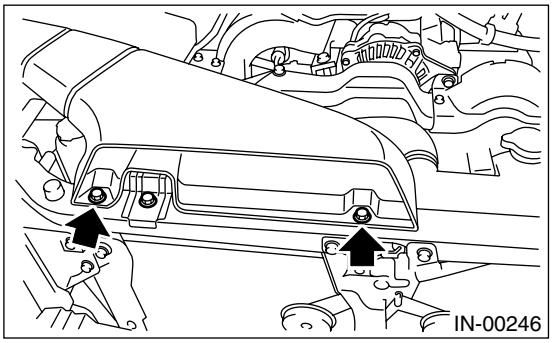
C: INSPECTION

1) Check for cracks and loose connections.
2) Make sure that no foreign objects are mixed in the air intake chamber.

5. Air Intake Duct

A: REMOVAL

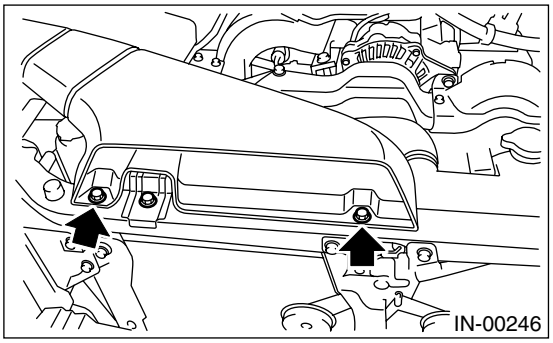
1) Remove bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



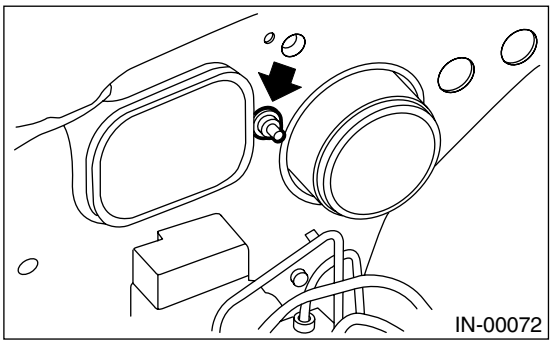
C: INSPECTION

Check for cracks and loose connections. Make sure that no foreign objects are mixed in the air intake duct.

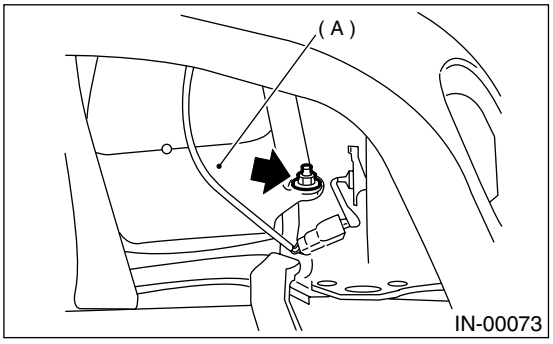
6. Resonator Chamber

A: REMOVAL

1) Set vehicle on a lift.
2) Remove air intake duct. <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
3) Remove air cleaner case. <Ref. to IN(H4SO U5)-5, REMOVAL, Air Cleaner Case.>
4) Remove the resonator chamber mounting bolt on the right of engine compartment.



5) Remove the front right tire, and lift the vehicle.
6) Remove front mudguard RH.
7) Remove the resonator chamber (A) from the inside front fender.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for cracks and loose connections. Make sure that no foreign objects are mixed in the resonator chamber.

MECHANICAL

ME(H4SO U5)

Page
1. General Description 2

1. General Description

A: SPECIFICATIONS

Specifications for U5 model with SOHC are described in ME(H4SO) section. <Ref. to ME(H4SO)-2, General Description.>

EXHAUST

EX(H4SO U5)

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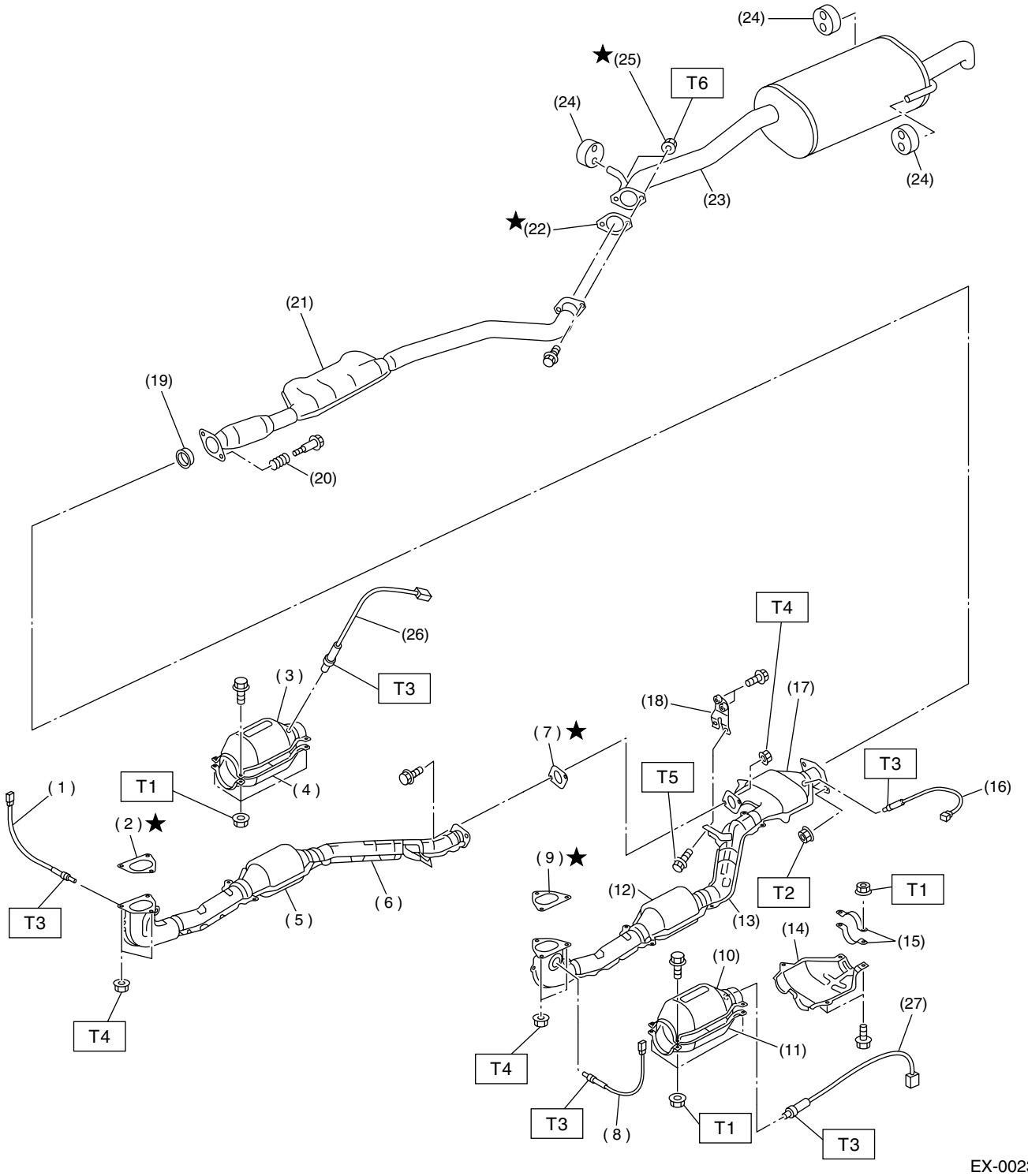
2. Front Exhaust Pipe....5
3. Rear Exhaust Pipe 9
4. Muffler 10

1. General Description

A: COMPONENT



EX-00230

(1) Front oxygen (A/F) sensor (RH)
(2) Gasket
(3) Upper front catalyst cover (RH)
(4) Lower front catalyst cover (RH)
(5) Front catalyst converter (RH)
(6) Front exhaust pipe (RH)
(7) Gasket
(8) Front oxygen (A/F) sensor (LH)
(9) Gasket
(10) Upper front catalyst cover (LH)
(11) Lower front catalyst cover (LH)
(12) Front catalyst (LH)
(13) Front exhaust pipe (LH)
(14) Lower rear catalyst cover
(15) Clamp
(16) Rear oxygen sensor
(17) Rear catalyst
(18) Bracket
(19) Gasket
(20) Spring
(21) Rear exhaust pipe
(22) Gasket
(23) Muffler
(24) Cushion rubber
(25) Self-locking nut
(26) Front oxygen sensor (RH)
(27) Front oxygen sensor (LH)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 21 (2.1, 15)
T4: 30 (3.1, 22.4)
T5: 35 (3.6, 26.0)
T6: 48 (4.9, 35.4)

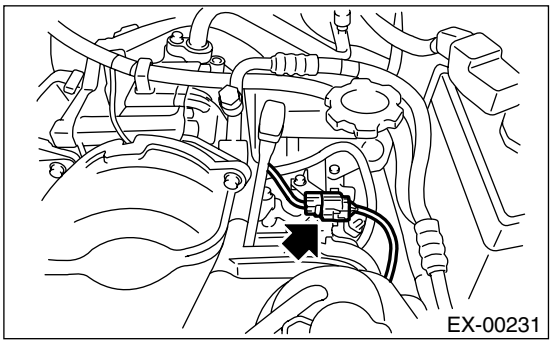
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

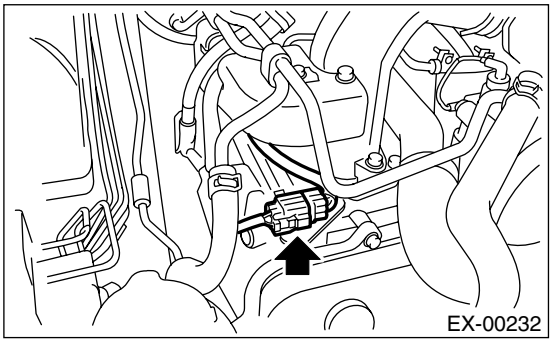
2. Front Exhaust Pipe

A: REMOVAL

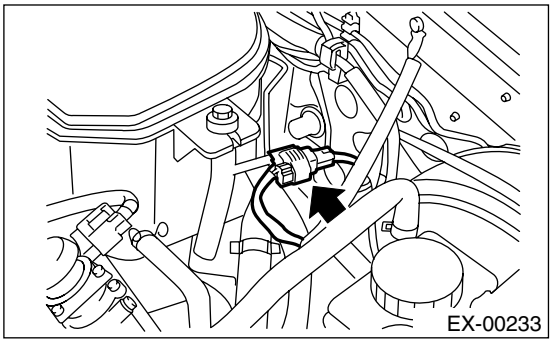
1) Disconnect ground cable from battery.
2) Disconnect front oxygen (A/F) sensor connector.
• LH side



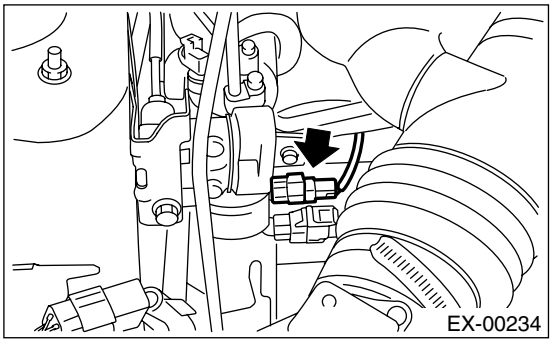
• RH side



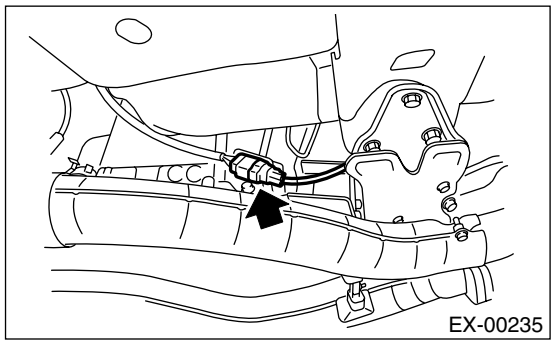
3) Disconnect front oxygen sensor connector.
• LH side



• RH side

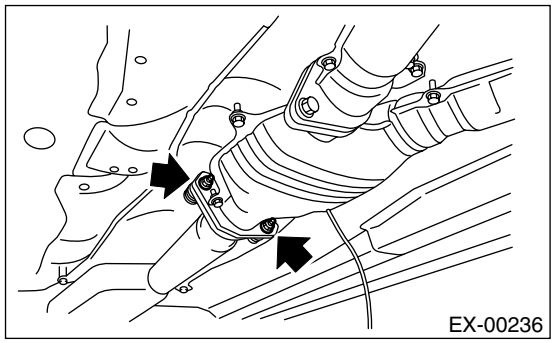


4) Lift-up the vehicle.
5) Remove under cover.
6) Disconnect rear oxygen sensor connector.



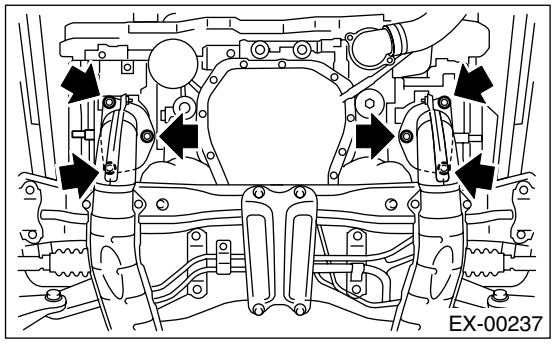
7) Separate front exhaust pipe assembly from rear exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.

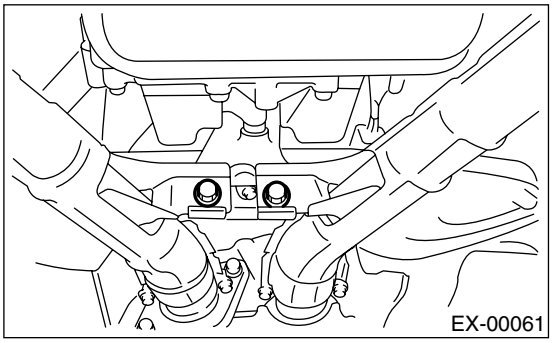


8) Remove nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to pull down front exhaust pipe assembly.



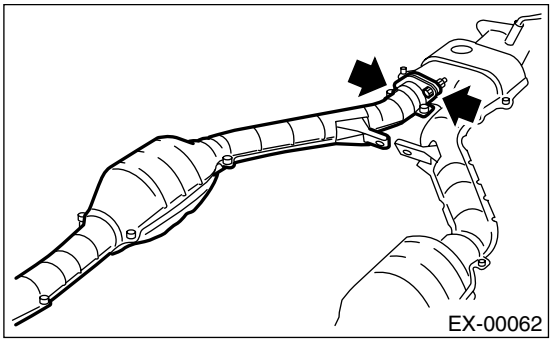
9) Remove bolt which secures front exhaust pipe assembly to hanger bracket.



10) Remove front exhaust pipe from the vehicle.

CAUTION:
• Disconnect front oxygen (A/F) sensor, front oxygen sensor and rear oxygen sensor harness from bracket.
• Be careful not to let front exhaust pipe assembly fall off when removing as it is quite heavy.
• After removing front exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.

11) Separate front exhaust pipe (RH) from front exhaust pipe assembly.



12) Disconnect front oxygen (A/F) sensor, front oxygen sensor and rear oxygen sensor. <Ref. to FU(H4SO U5)-42, REMOVAL, Front Oxygen (A/F) Sensor.>, <Ref. to FU(H4SO U5)-45, REMOVAL, Front Oxygen Sensor.> and <Ref. to FU(H4SO U5)-48, REMOVAL, Rear Oxygen Sensor.>

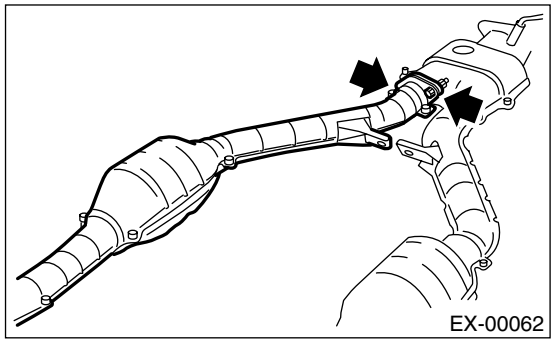
B: INSTALLATION

1) Install front oxygen (A/F) sensor, front oxygen sensor and rear oxygen sensor. <Ref. to FU(H4SO U5)-43, INSTALLATION, Front Oxygen (A/F) Sensor.>, <Ref. to FU(H4SO U5)-46, INSTALLATION, Front Oxygen Sensor.> and <Ref. to FU(H4SO U5)-48, INSTALLATION, Rear Oxygen Sensor.>

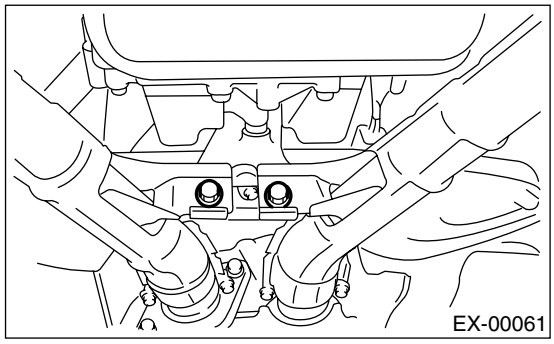
2) Install front exhaust pipe (RH) to front exhaust pipe assembly.

NOTE:
Replace gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

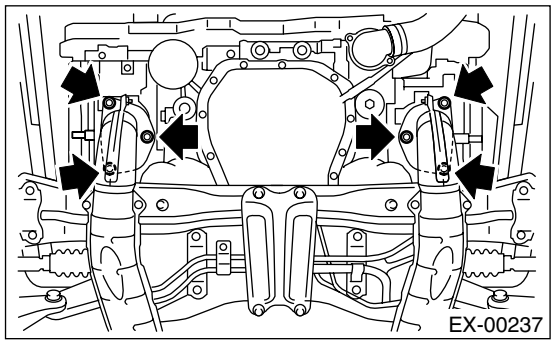


3) Install front exhaust pipe assembly to the vehicle.
4) Temporarily tighten bolt which installs front exhaust pipe assembly to hanger bracket.



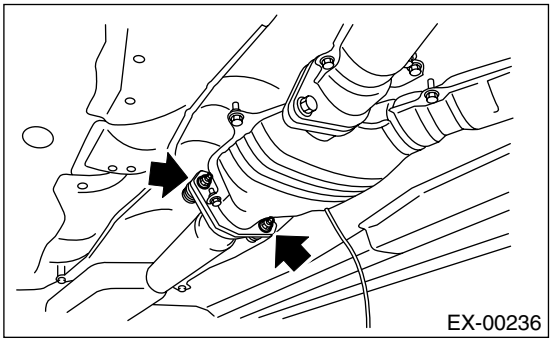
5) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



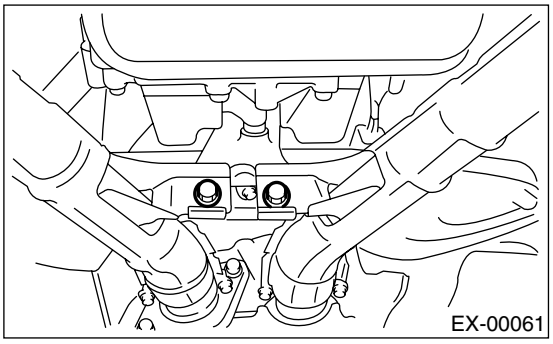
6) Tighten bolts which install front exhaust pipe to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

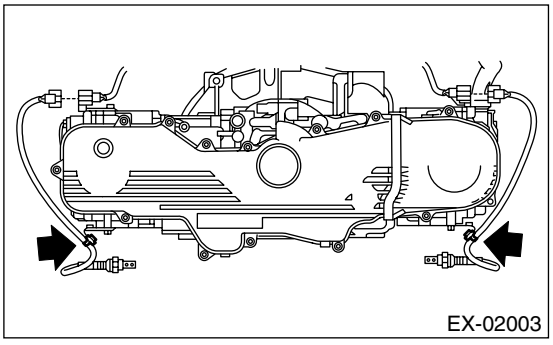


7) Tighten bolt which holds front exhaust pipe assembly to hanger bracket.

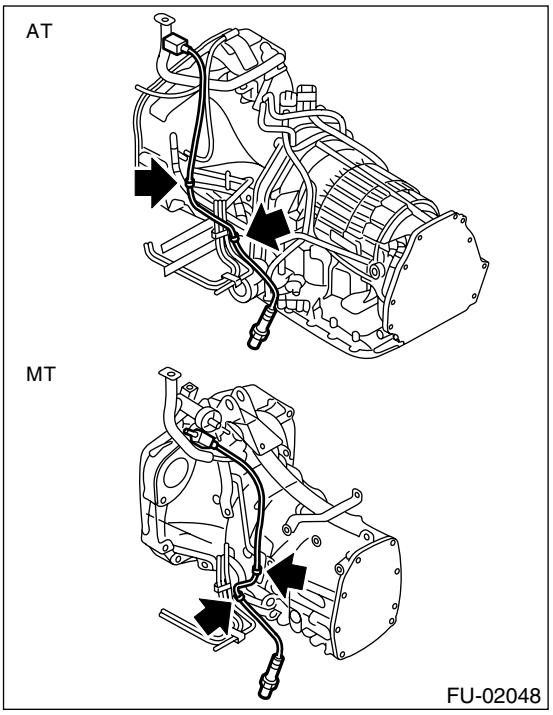
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



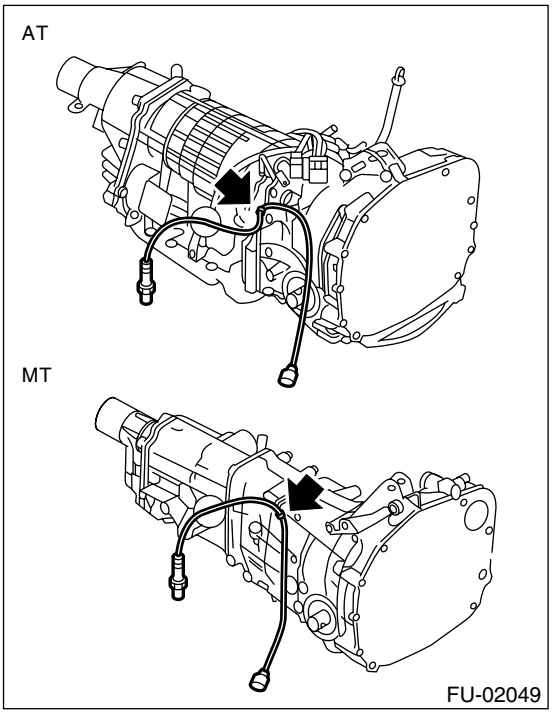
8) Install front oxygen (A/F) sensor harness to bracket.



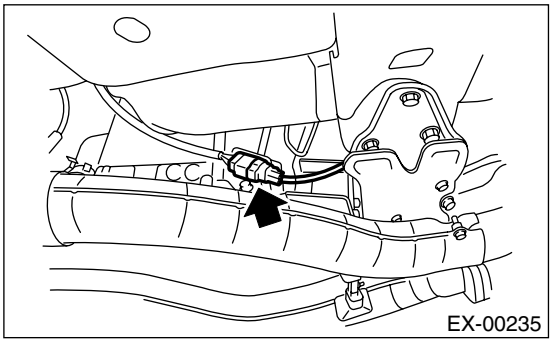
9) Install front oxygen sensor harness to bracket.
- LH side



- RH side

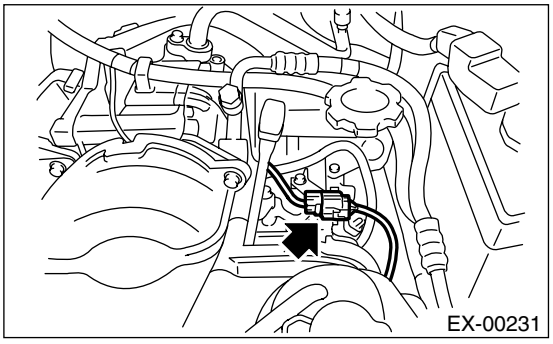


10) Connect rear oxygen sensor connector.

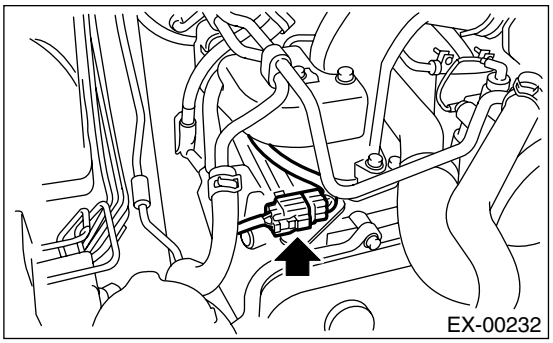


11) Install under cover.
12) Lower the vehicle.
13) Disconnect front oxygen (A/F) sensor connector.

- LH side

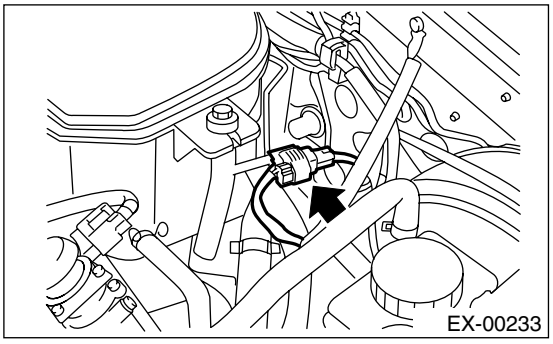


- RH side

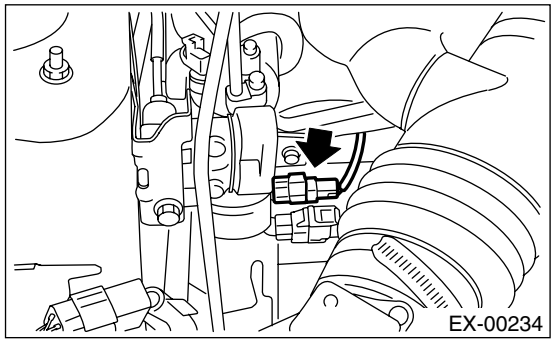


14) Connect front oxygen sensor connector.

- LH side



- RH side



15) Install battery.

C: INSPECTION

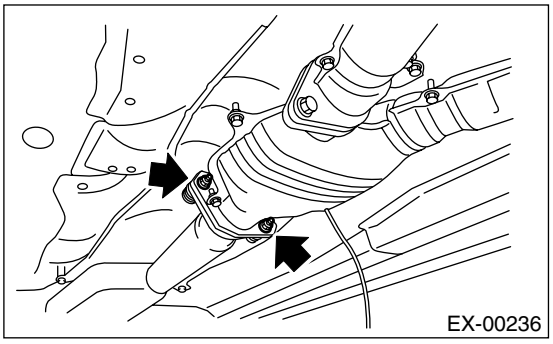
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Exhaust Pipe

A: REMOVAL

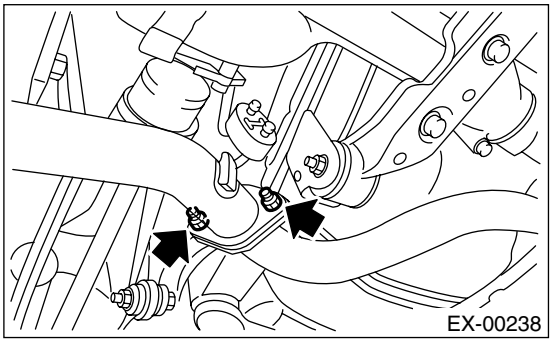
1) Separate rear exhaust pipe from front exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down rear exhaust pipe.



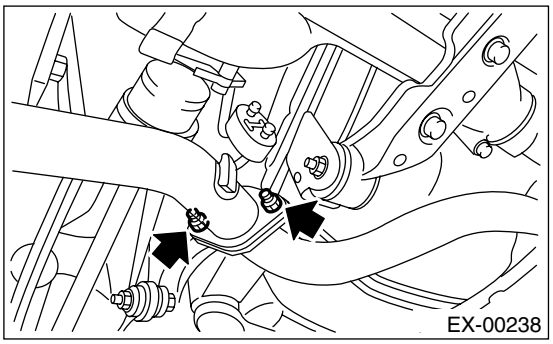
3) Remove rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace gaskets and self-lock nut with new ones.

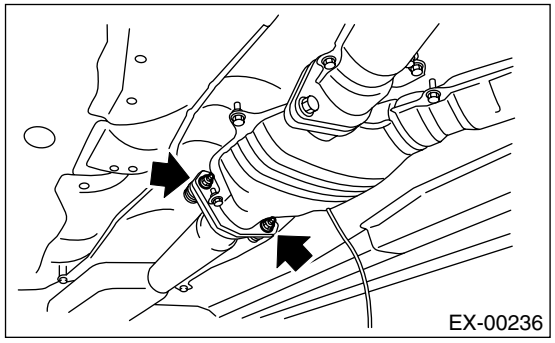
1) Install rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install rear exhaust pipe to front exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

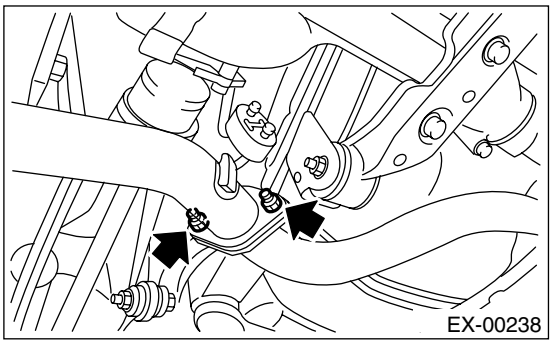
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

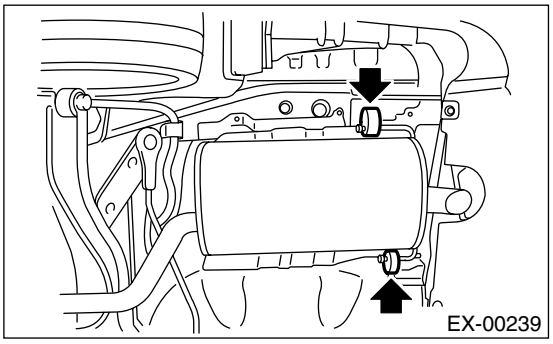


2) Remove left and right rubber cushions.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

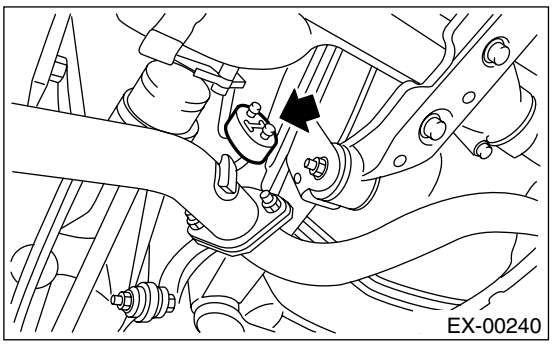
SUBARU CRC (Part No. 004301003)



3) Remove front rubber cushion, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)

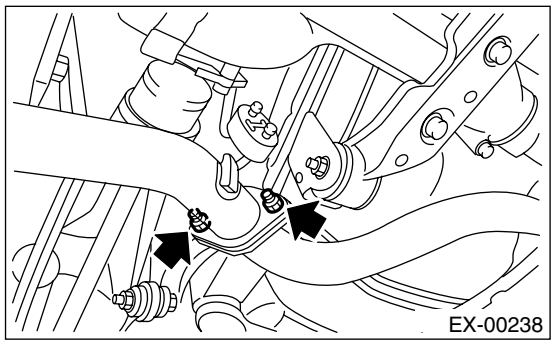


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace gasket and self-lock nut with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4SO U5)

Page
1. General Description 2

1. General Description

A: SPECIFICATIONS

Specifications for U5 model with SOHC are described in CO(H4SO). <Ref. to CO(H4SO)-2, General Description.>

LUBRICATION

LU(H4SO U5)

Page
1. General Description 2

1. General Description

A: SPECIFICATIONS

Specifications for U5 model with SOHC are described in LU(H4SO). <Ref. to LU(H4SO)-2, General Description.>

SPEED CONTROL SYSTEMS

SP(H4SO U5)

Page

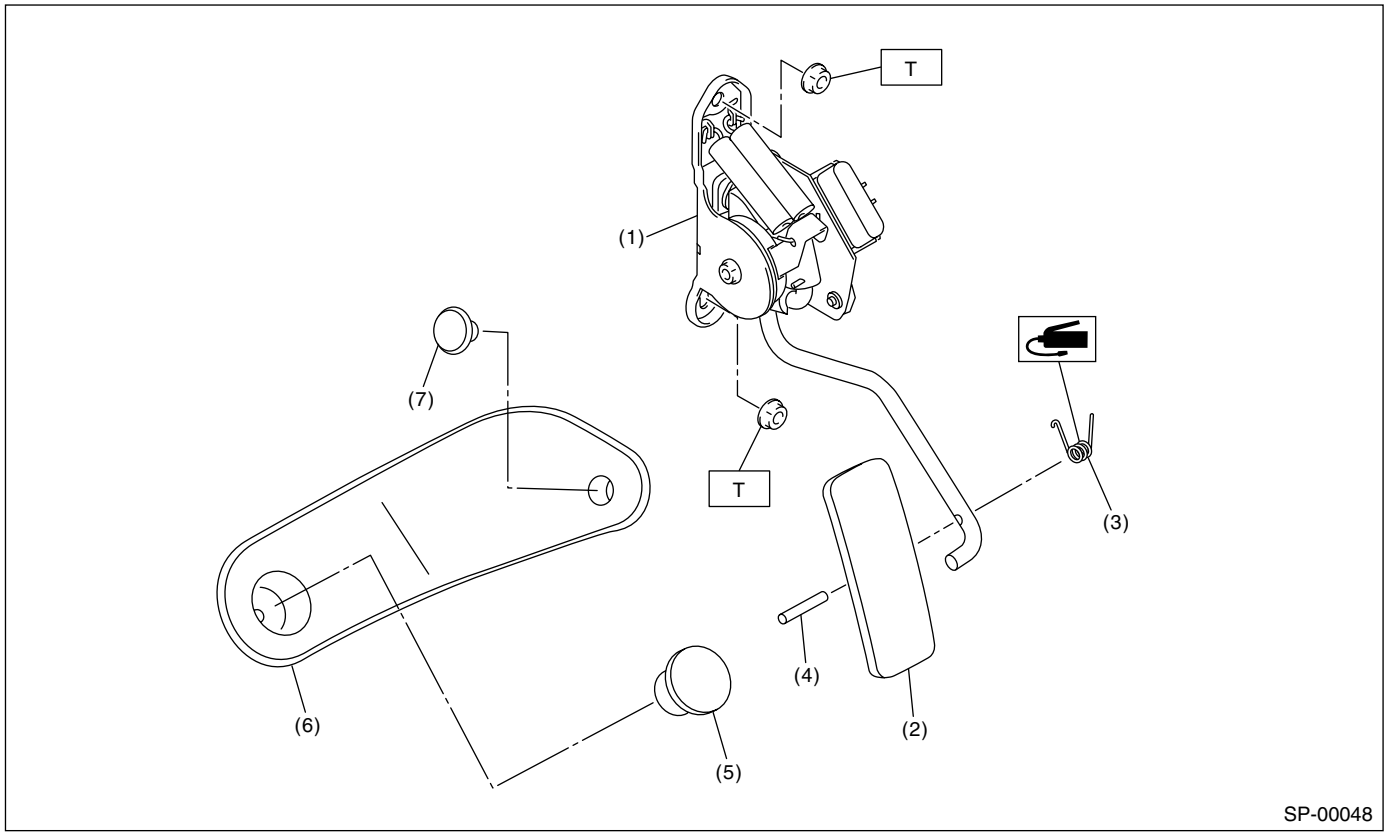
1. General Description 2
2. Accelerator Pedal 3

1. General Description

A: SPECIFICATION

Accelerator pedal	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT



(1) Accelerator pedal ASSY
(2) Accelerator pedal
(3) Accelerator pedal spring
(4) Spring pin
(5) Accelerator stopper
(6) Accelerator plate
(7) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

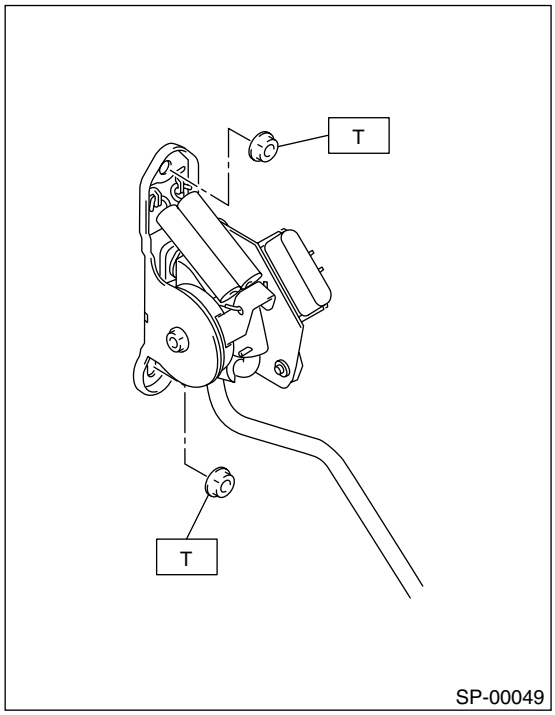
C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

1) Disconnect ground cable from battery.
2) Disconnect the connector.
3) Remove the nuts which securing accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: DISASSEMBLY

NOTE:
Accelerator pedal for model with electronic throttle control system cannot be disassembled.

MEMO:

IGNITION

IG(H4SO U5)

Page
1. General Description 2

1. General Description

A: SPECIFICATIONS

Specifications for U5 model with SOHC are described in IG(H4SO) section. <Ref. to IG(H4SO)-2, General Description.>

STARTING/CHARGING SYSTEMS

SC(H4SO U5)

Page

1. General Description 2

1. General Description

A: SPECIFICATIONS

Specifications for U5 model with SOHC are described in SC(H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4SO U5)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the check list for interview. <Ref. to EN(H4SO U5)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4SO U5)-72, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(H4SO U5)-488, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read the DTC on the Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4SO U5)-61, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(H4SO U5)-58, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4SO U5)-49, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When the DTC about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to 4AT-31, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-32, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-31, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-32, Differential Gear Oil.>
5) Stall test <Ref. to 4AT-34, Stall Test.>
6) Line pressure test <Ref. to 4AT-36, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to 4AT-38, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to 4AT-35, Time Lag Test.>
9) Road test <Ref. to 4AT-33, Road Test.>
10) Shift characteristics <Ref. to 4AT-38, Transfer Clutch Pressure Test, .>

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
VIN No.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/o OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Radio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Radiator fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	CB	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge: • The fuel has completely emptied in the past: ❑ Yes/❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

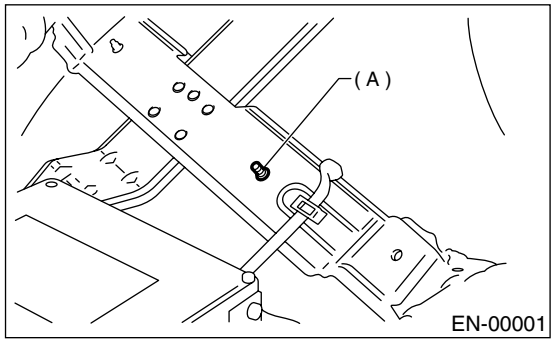
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from the located position, disconnect two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

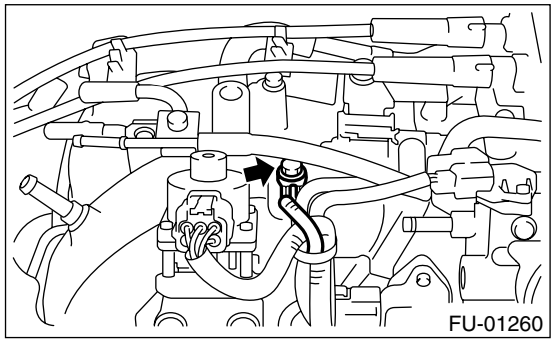
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.

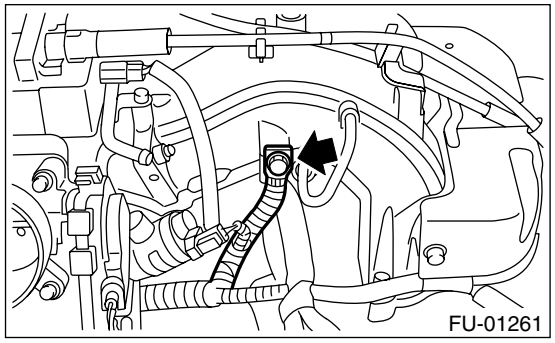


(A) Stud bolt

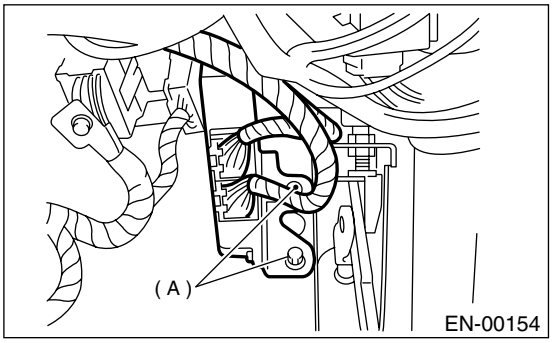
9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.
• LH side



• RH side



10) Use TCM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.
12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT models, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
17) On models with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

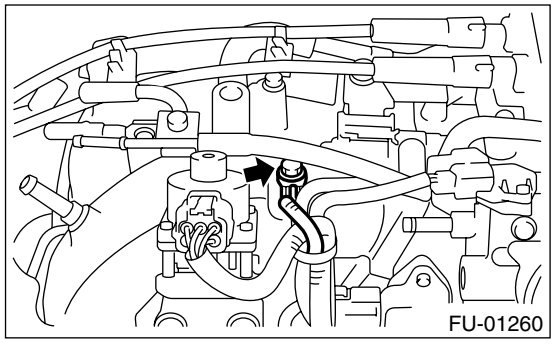
Standard voltage: 12 V

Specific gravity: Above 1.260

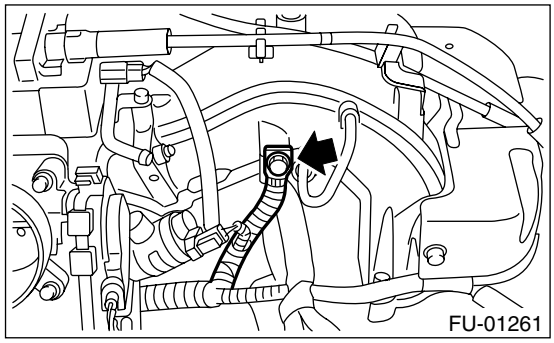
2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.
• LH side



• RH side



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting the models with OBD-II, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

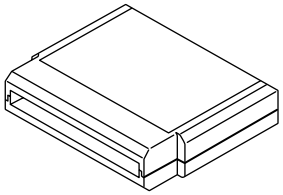
2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduction in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, the TCM and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

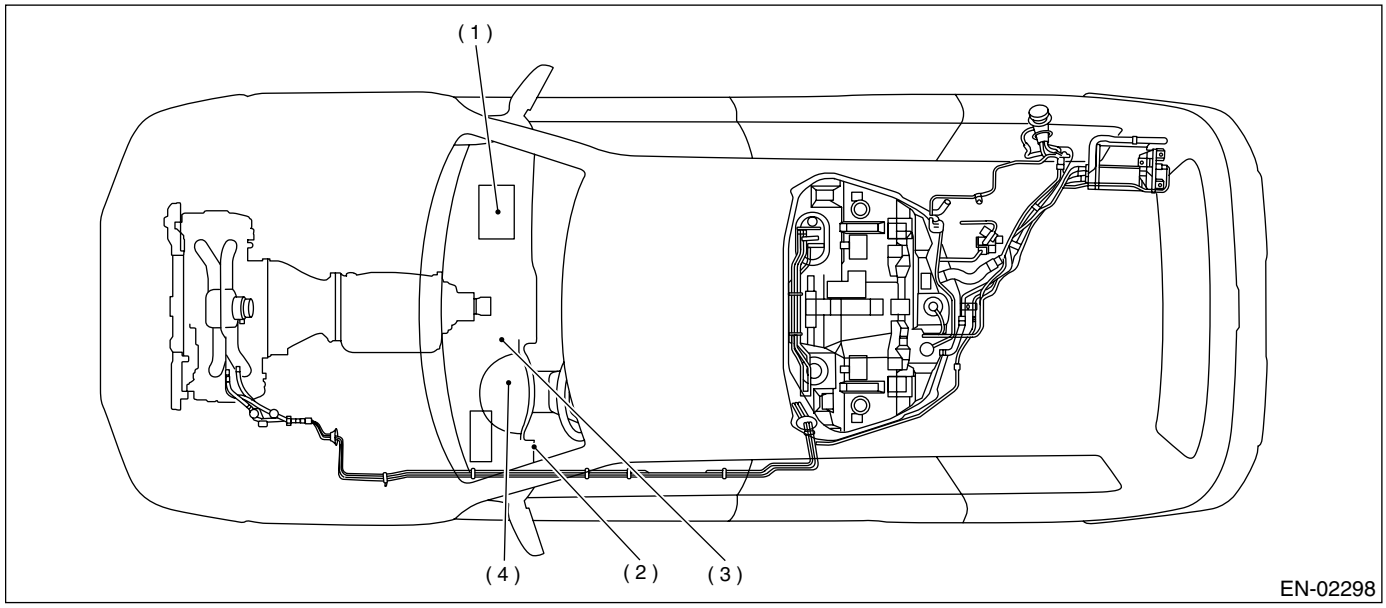
MEMO:

4. Electrical Components Location

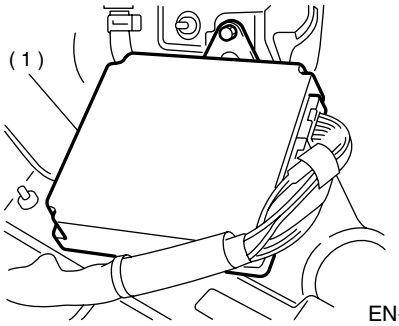
A: LOCATION

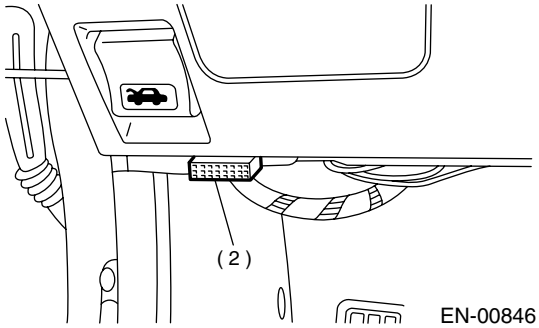
1. ENGINE

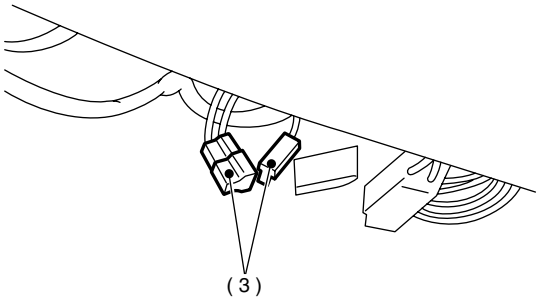
• MODULE

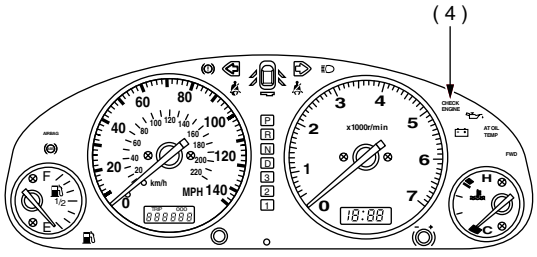


(1) Engine control module (ECM)
(2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool)
(3) Test mode connector
(4) CHECK ENGINE malfunction indicator lamp (MIL)

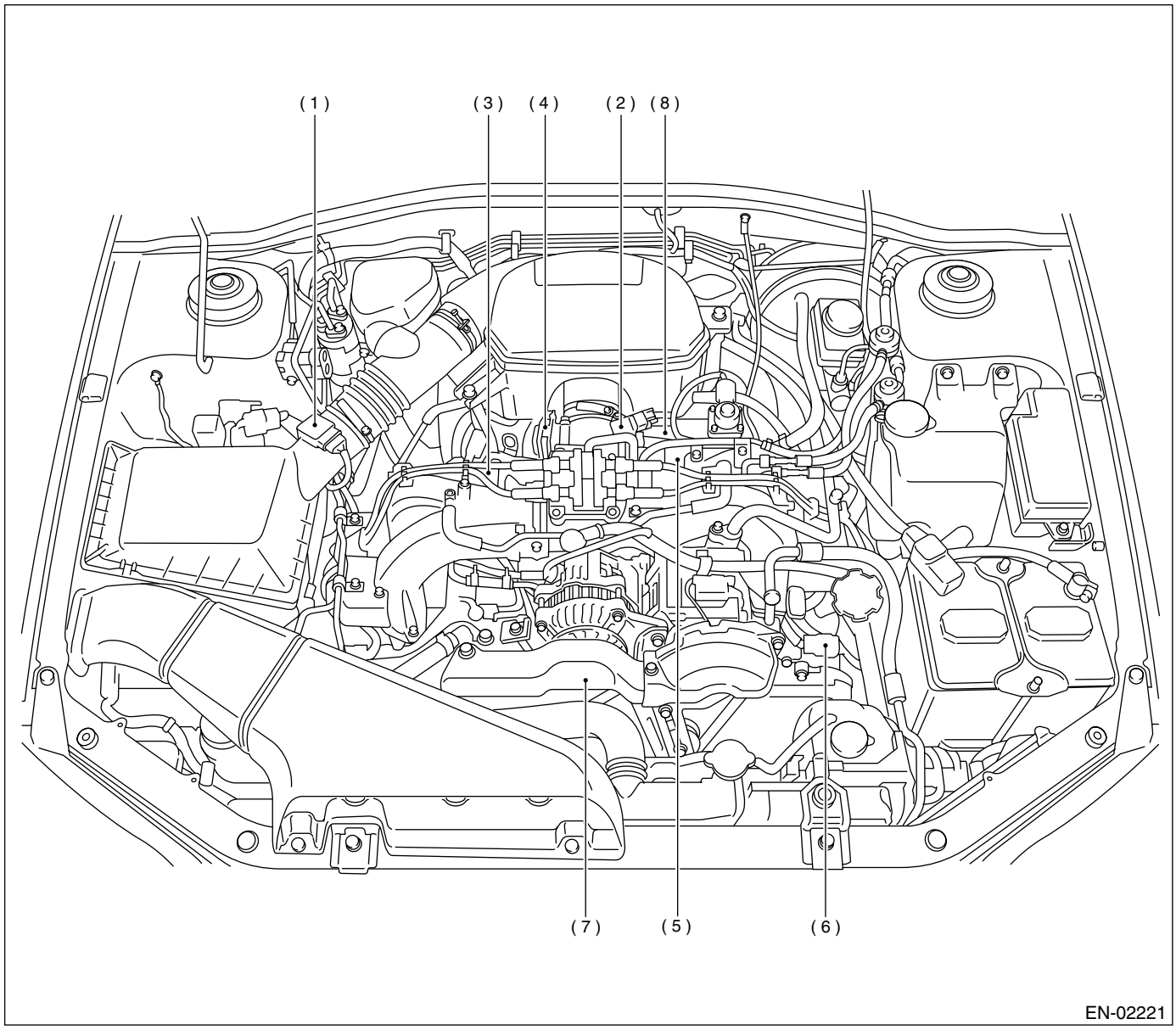




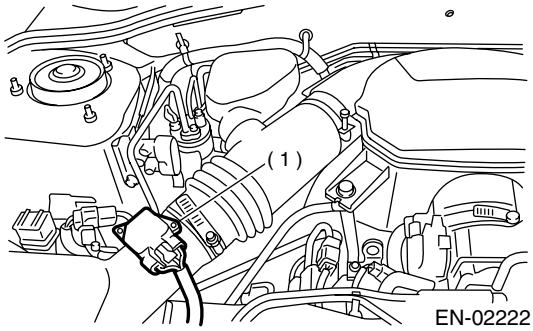




• SENSOR



(1) Air flow & intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Engine coolant temperature sensor
(4) Electronic control throttle
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor
(8) Tumble generator valve position sensor



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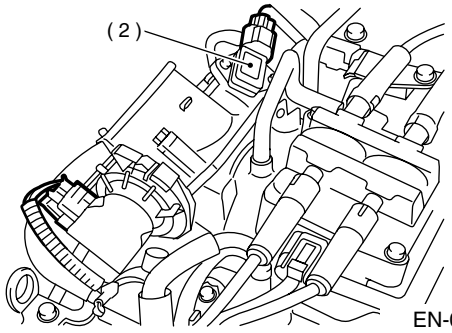

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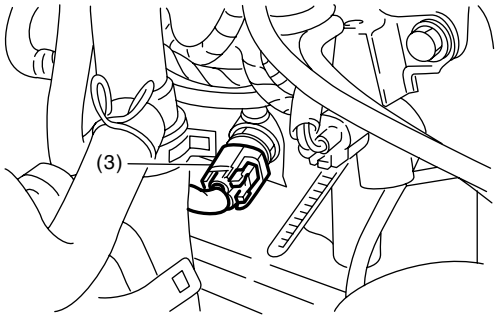
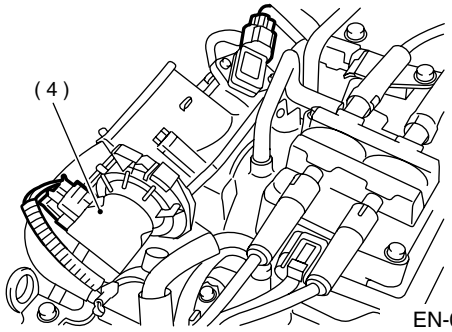
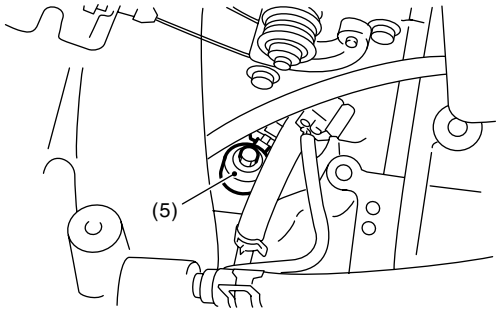


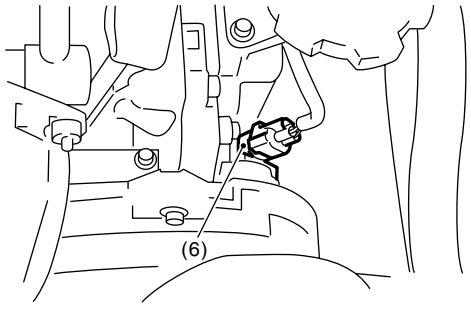
EN-00008



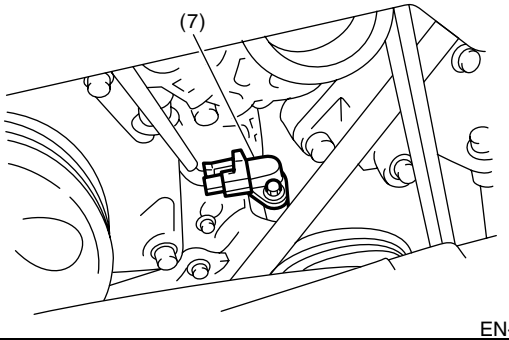
EN-02224



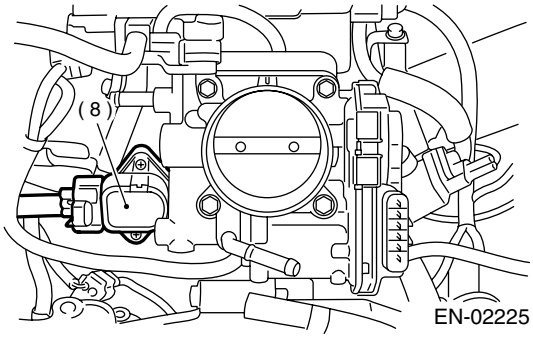
EN-00010



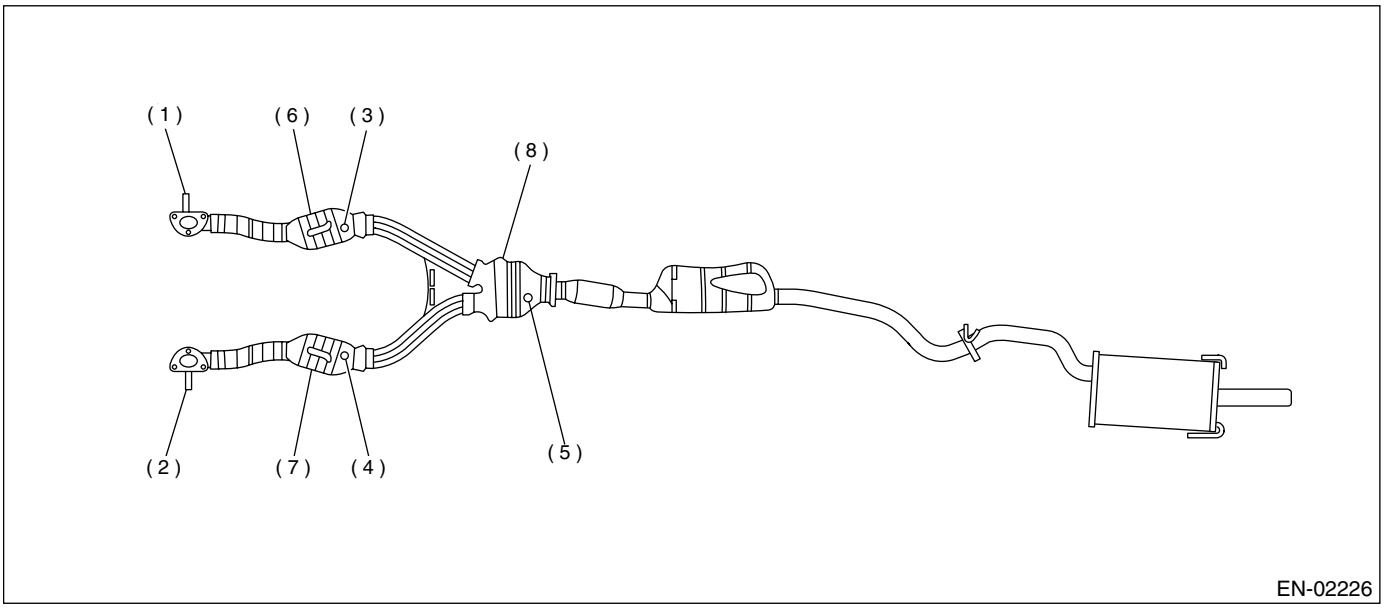
EN-00011



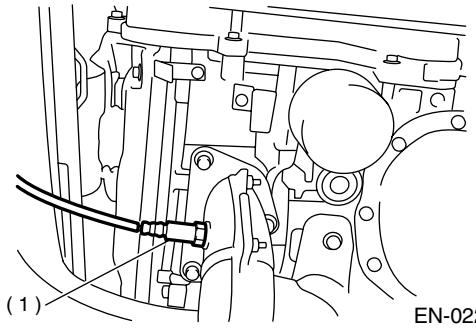
EN-00012



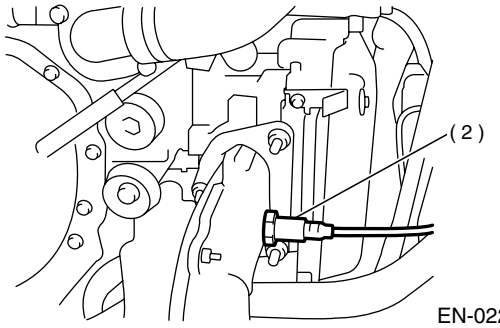
EN-02225



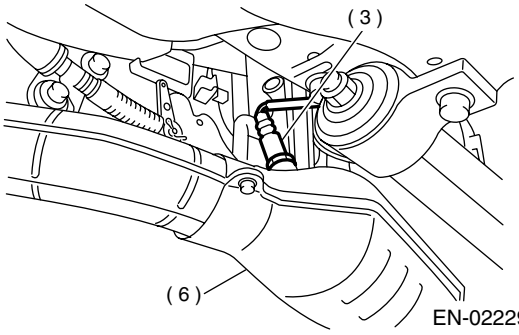
(1) Front oxygen (A/F) sensor RH
(2) Front oxygen (A/F) sensor LH
(3) Front oxygen sensor RH
(4) Front oxygen sensor LH
(5) Rear oxygen sensor
(6) Front catalytic converter RH
(7) Front catalytic converter LH
(8) Rear catalytic converter



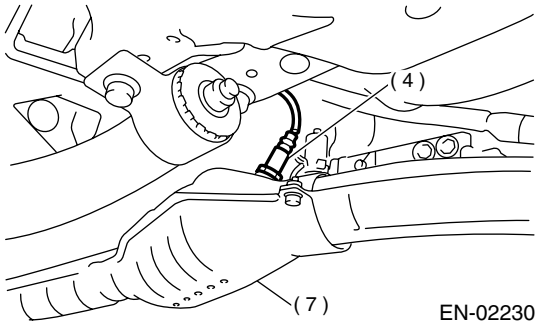
EN-02227



EN-02228



EN-02229



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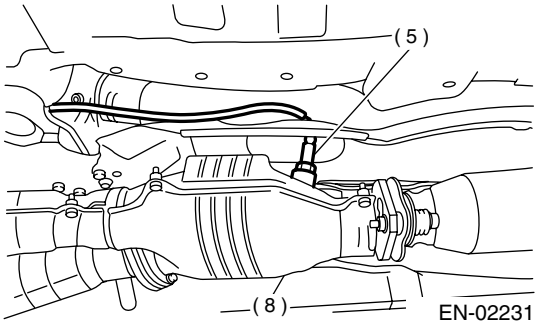
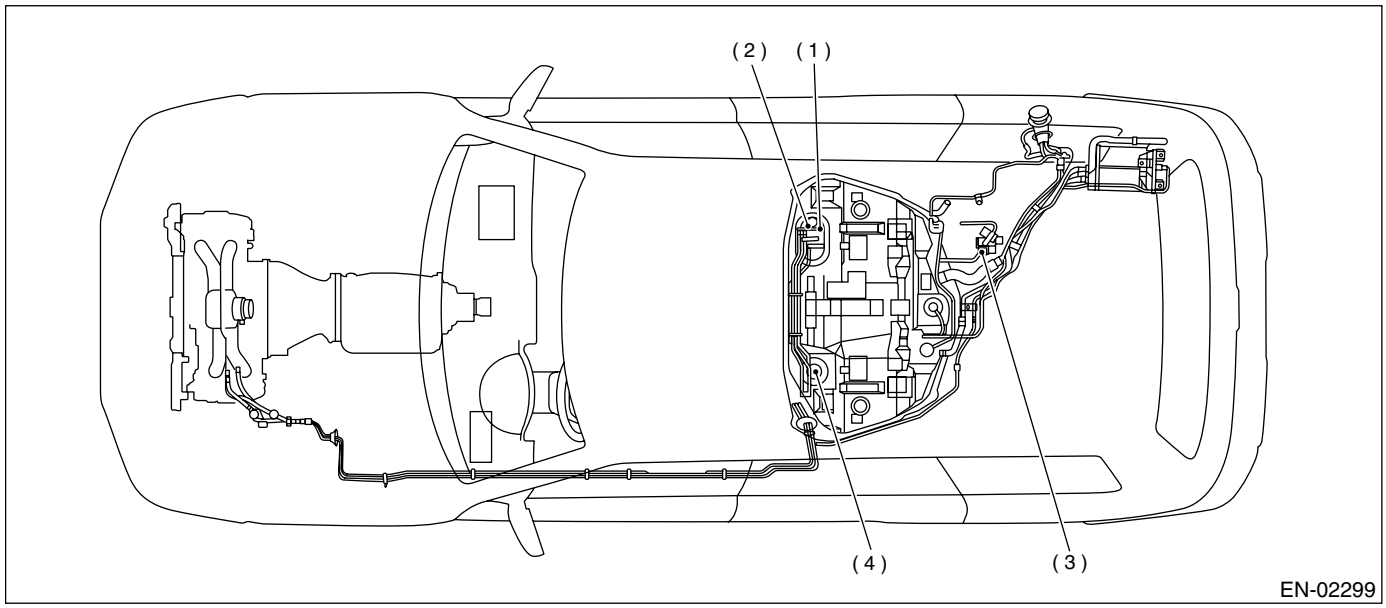
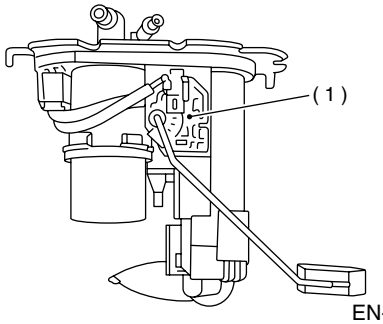
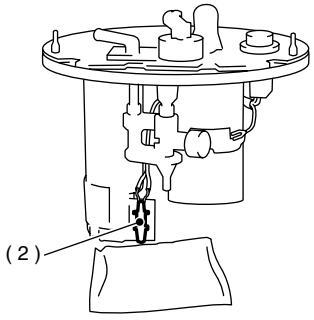


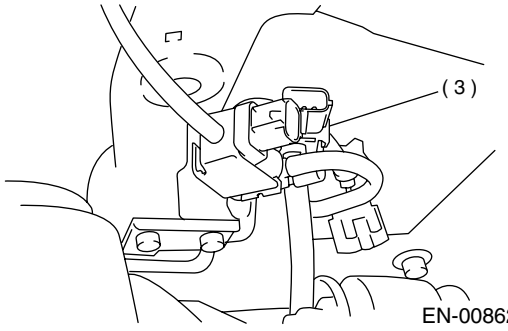
EN-02231

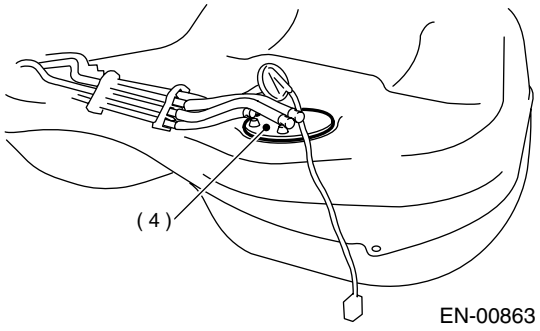


(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



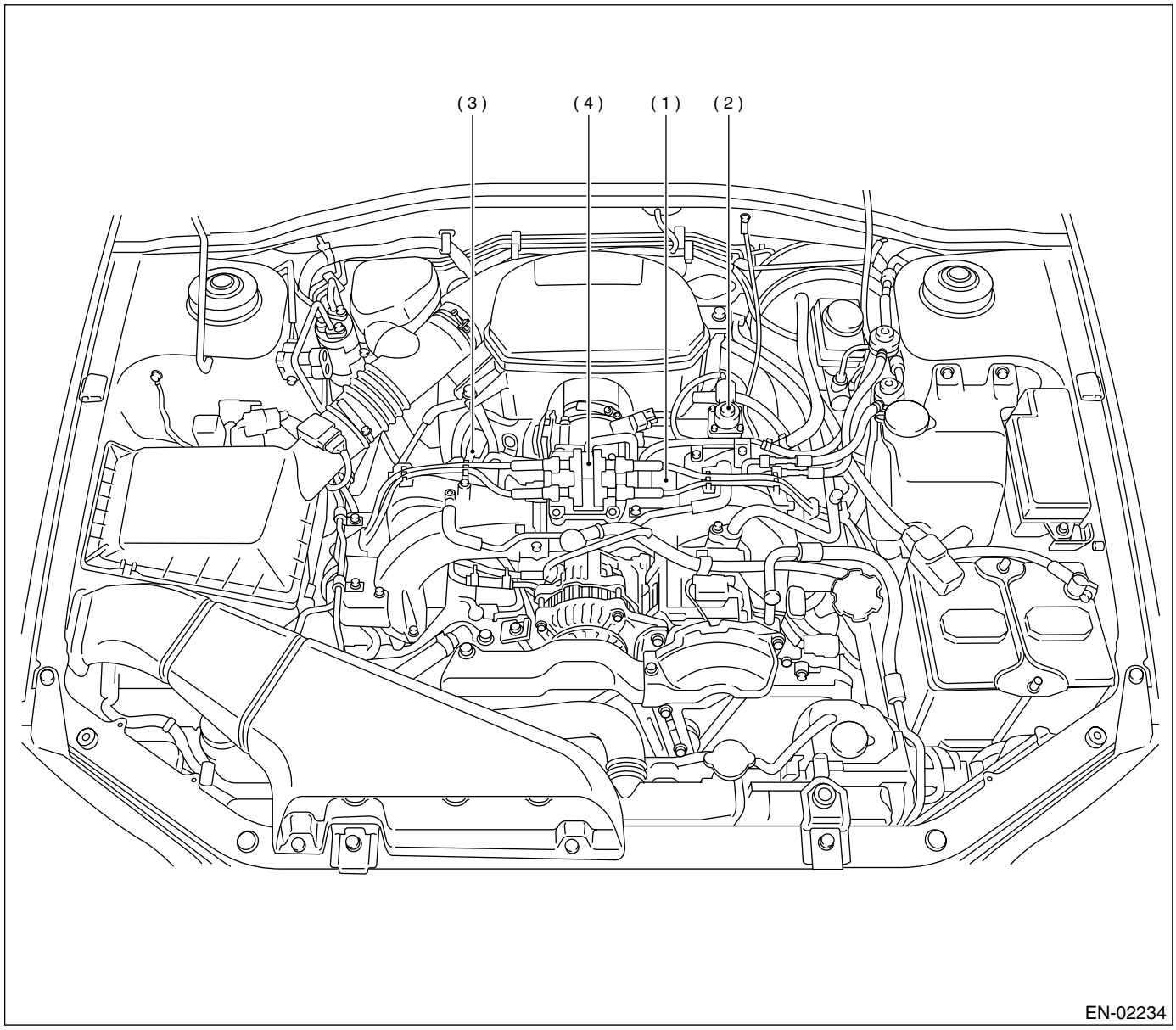




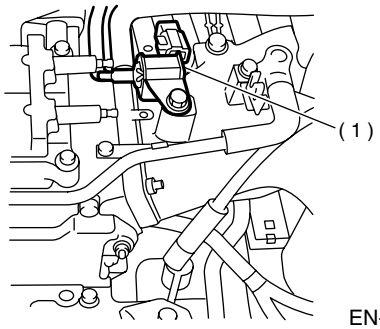


MEMO:

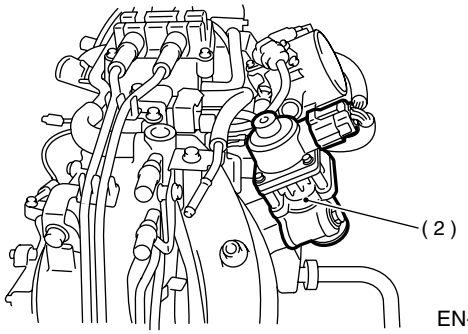
• SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



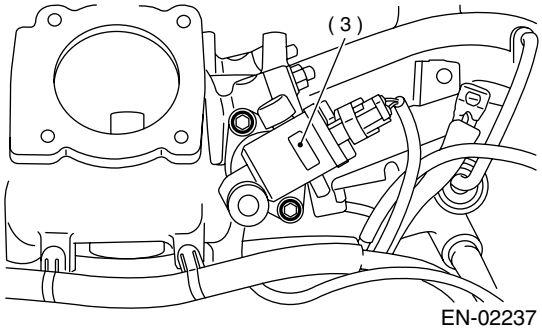
(1) Purge control solenoid valve
(2) EGR valve
(3) Tumble generator valve actuator
(4) Ignition coil & ignitor ASSY



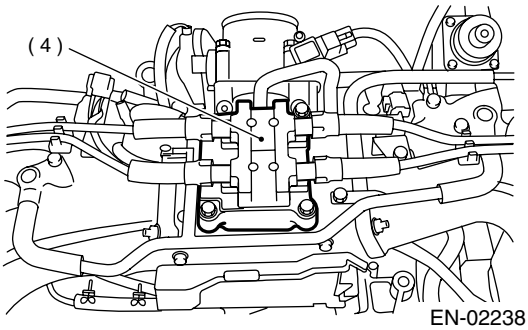
EN-02235



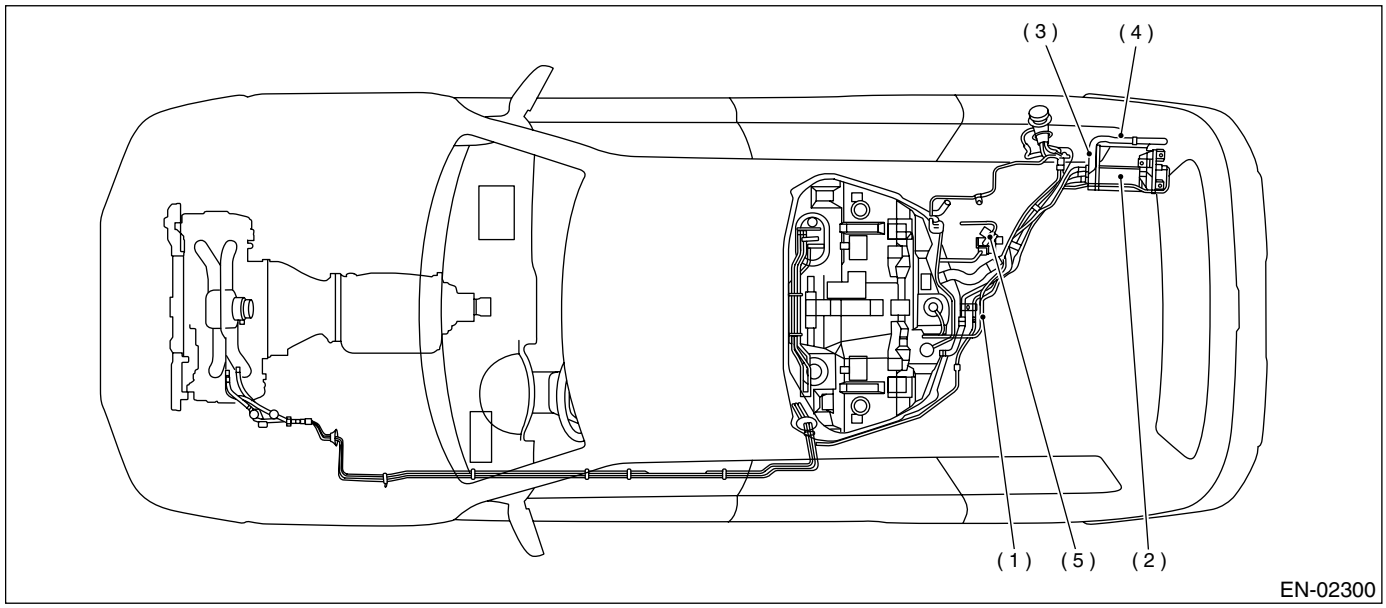
EN-02236



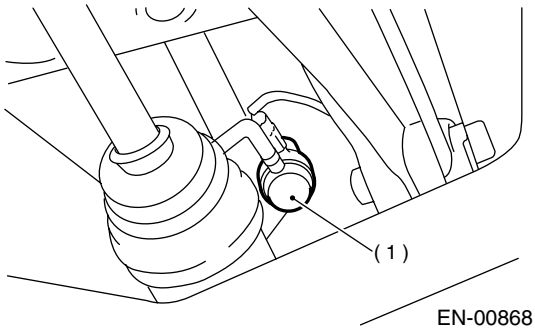
EN-02237

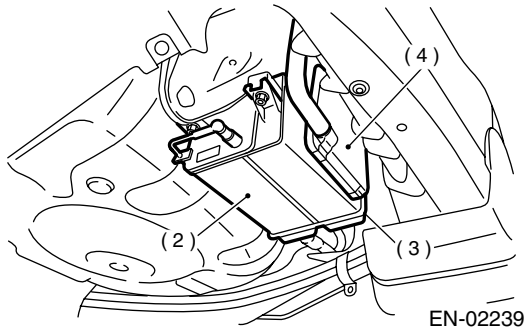


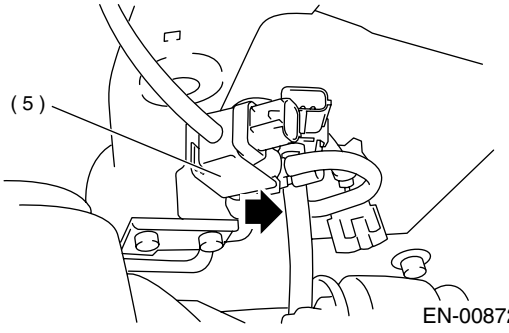
EN-02238



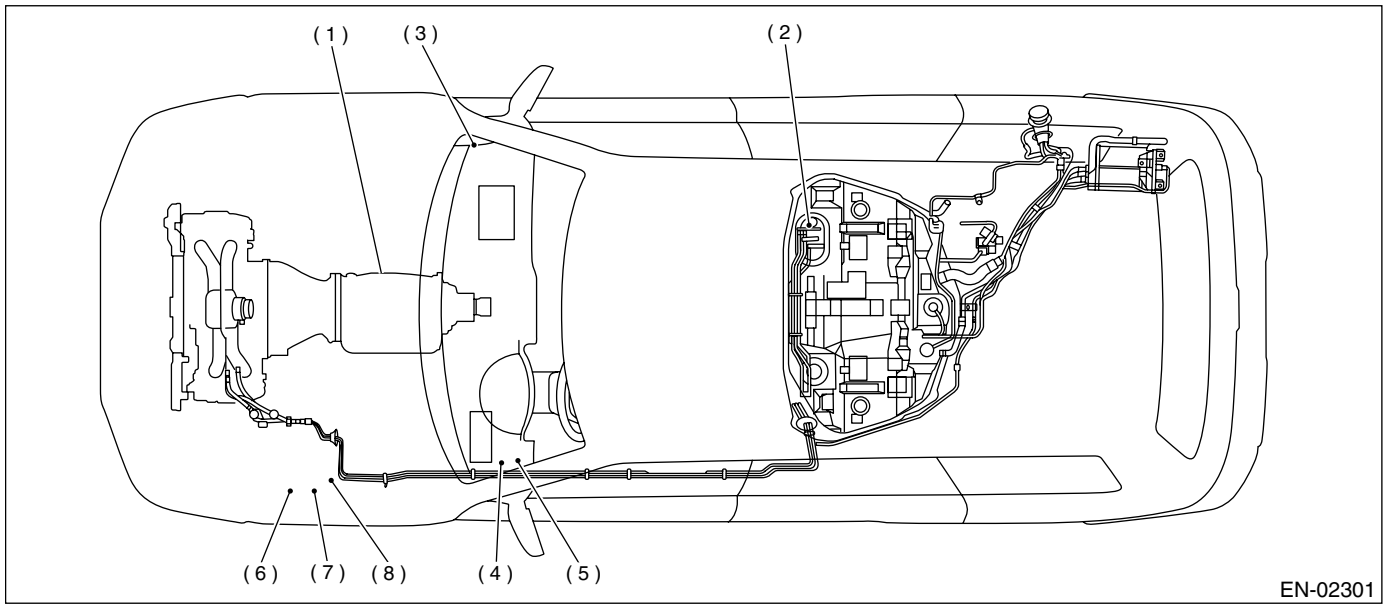
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter
(5) Fuel tank sensor control valve



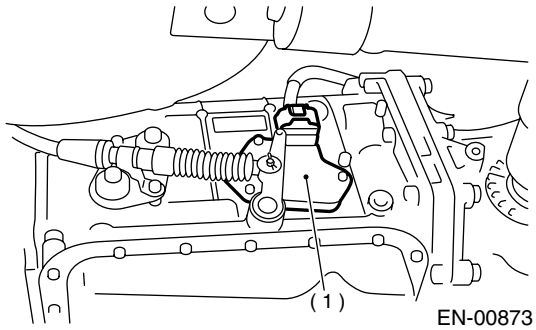




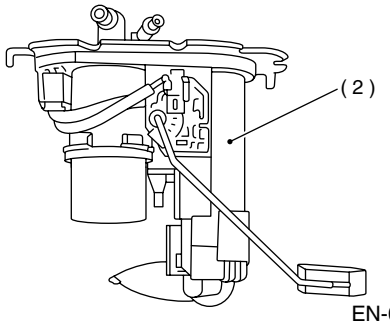
MEMO:



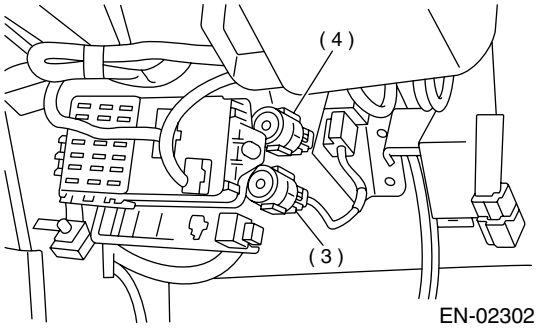
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic control throttle relay
(6) Radiator main fan relay
(7) Radiator sub fan relay
(8) Starter



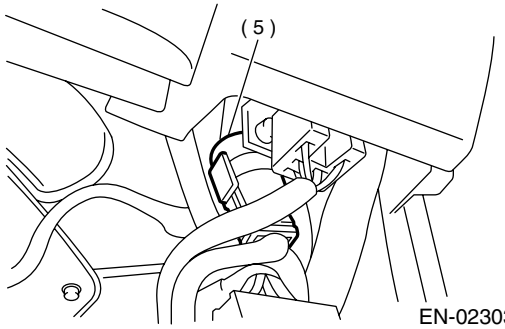
EN-00873



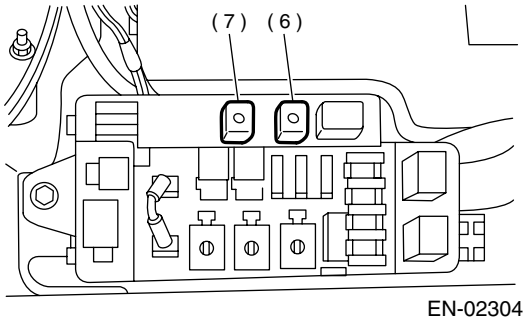
EN-02240



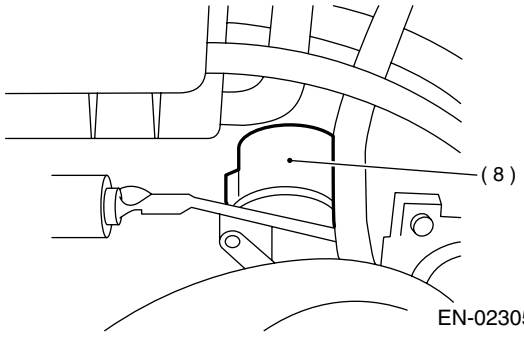
EN-02302



EN-02303



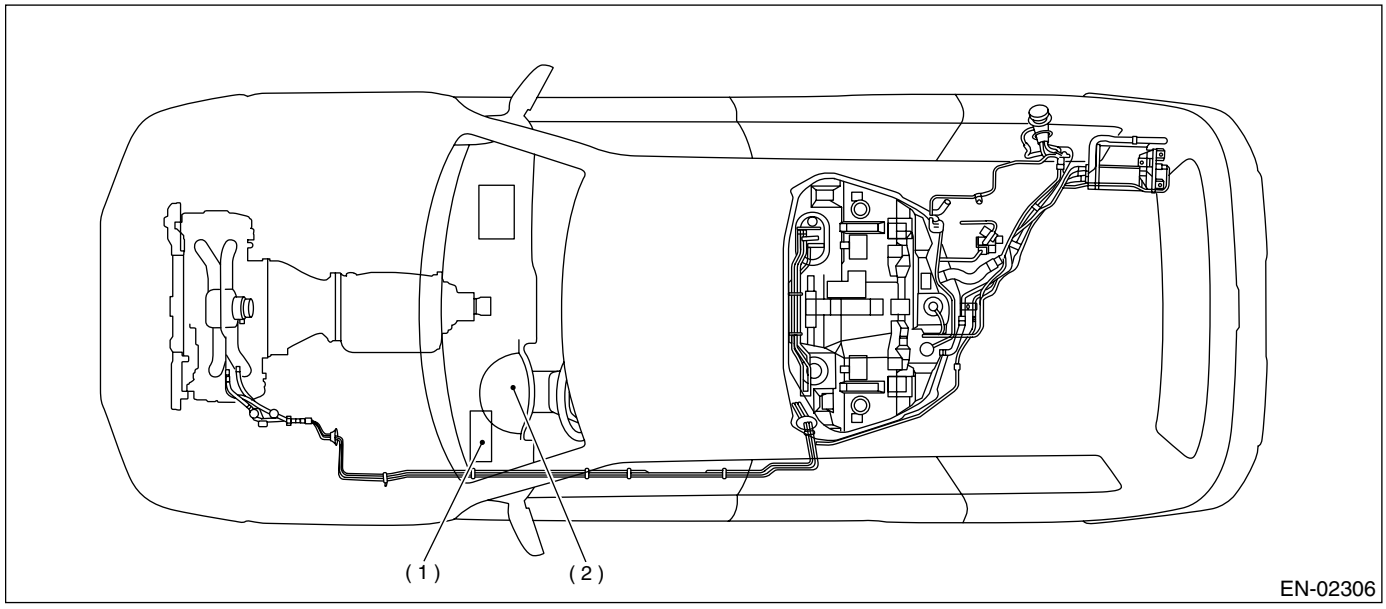
EN-02304



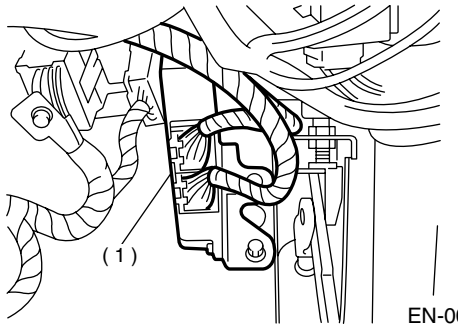
EN-02305

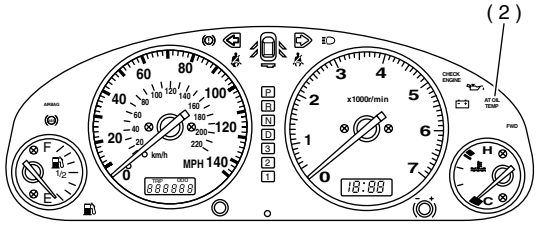
2. TRANSMISSION

• MODULE

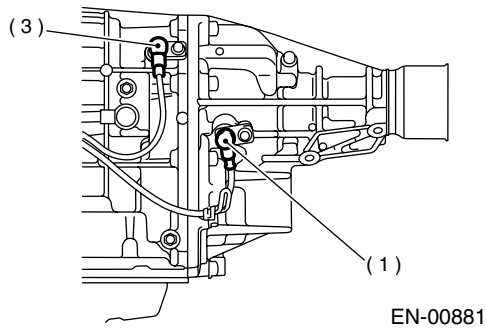


(1) Transmission Control Module (TCM) (for AT vehicles)
(2) AT diagnostic indicator light (for AT vehicles)

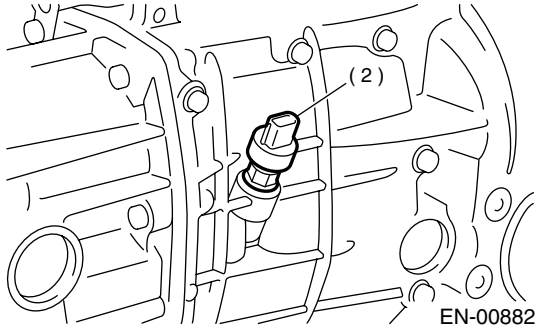




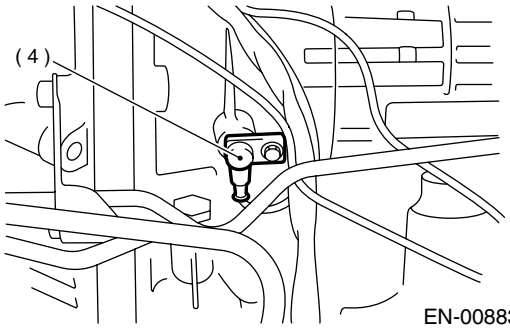
• SENSOR



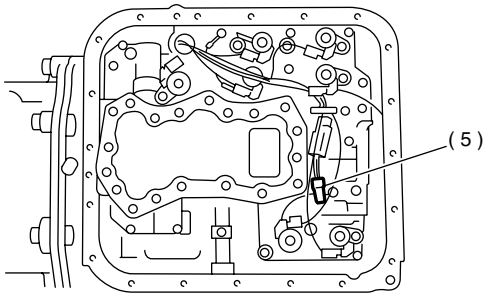
EN-00881



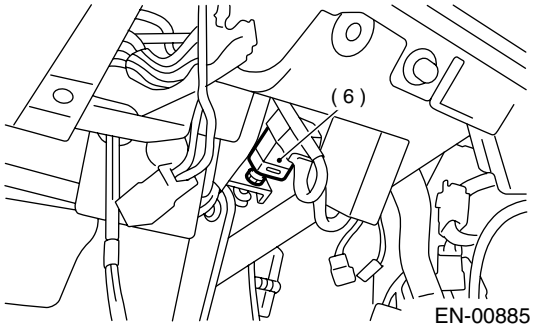
EN-00882



EN-00883



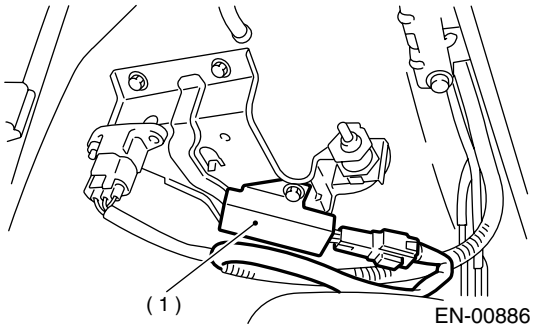
EN-00884



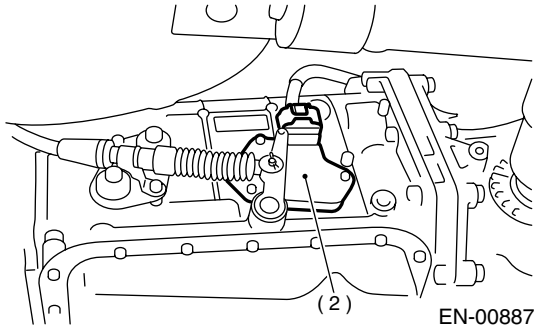
EN-00885

(1) Rear vehicle speed sensor (for AT vehicles)
(2) Front vehicle speed sensor (for MT vehicles)
(3) Front vehicle speed sensor (for AT vehicles)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

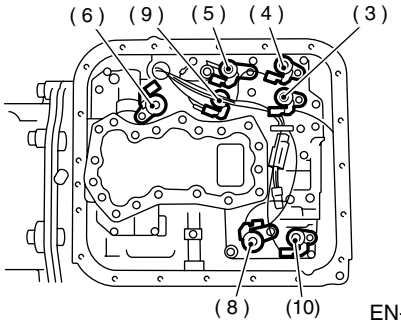
• SOLENOID VALVE AND SWITCH (AT MODELS)



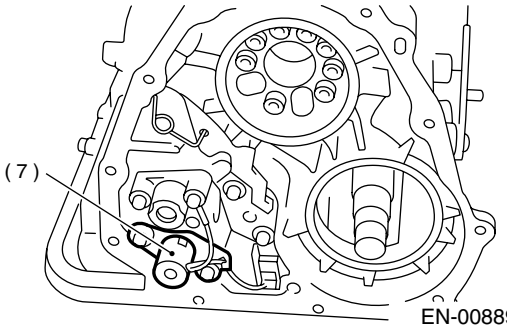
EN-00886



EN-00887



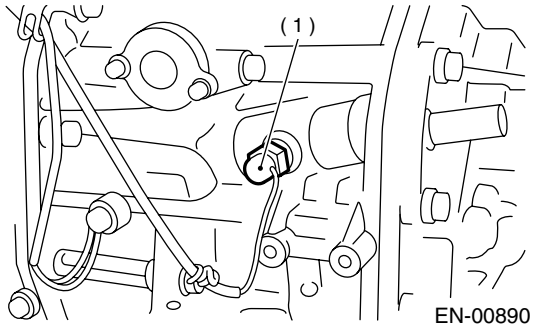
EN-00888



EN-00889

(1) Dropping resistor
(2) Inhibitor switch
(3) Shift solenoid valve 1
(4) Shift solenoid valve 2
(5) Line pressure duty solenoid
(6) Lock-up duty solenoid
(7) Transfer duty solenoid
(8) 2-4 brake duty solenoid
(9) Low clutch timing solenoid valve
(10) 2-4 brake timing solenoid valve

• SOLENOID VALVE AND SWITCH (MT MODELS)



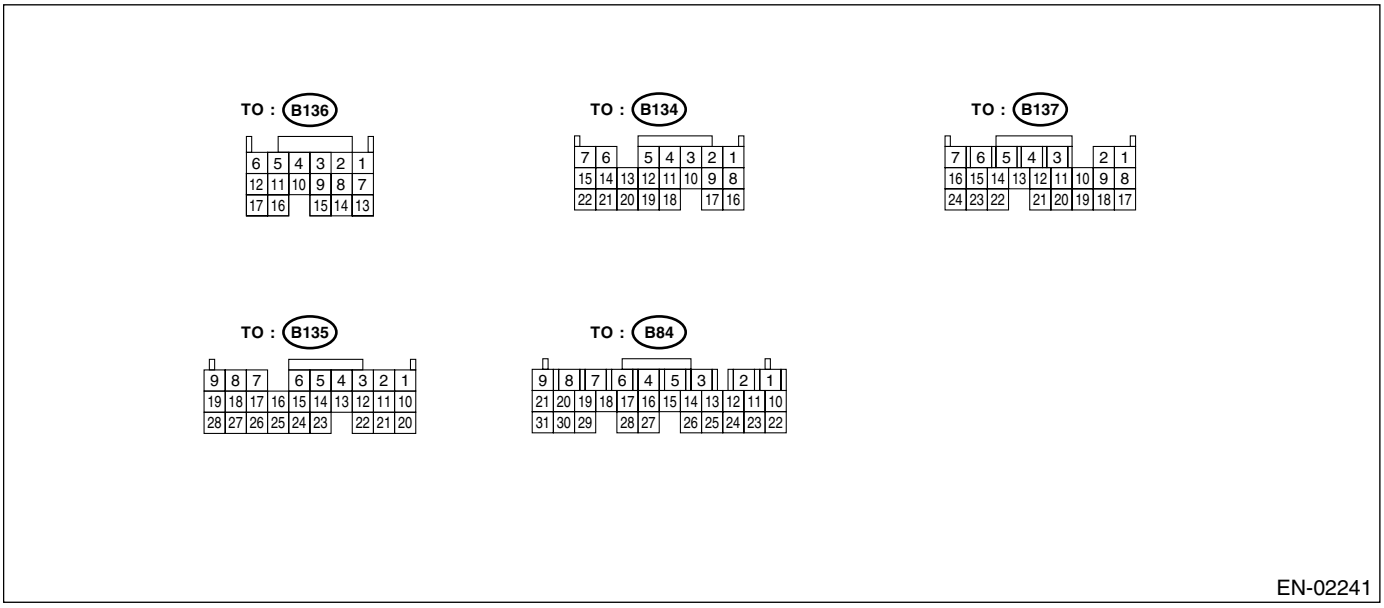
EN-00890

(1) Neutral position switch

MEMO:

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	1	0	–7 to +7	Sensor output waveform
	Signal (–)	B135	10	0	0	—
	Shield	B135	20	0	0	—
Camshaft position sensor	Signal (+)	B135	2	0	–7 to +7	Sensor output waveform
	Signal (–)	B135	11	0	0	—
	Shield	B135	20	0	0	—
Electric throttle	Main	B136	3	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine warm-up)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B136	9	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine warm-up)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B135	9	5	5	—
	GND	B135	9	0	0	—
Electric throttle motor (+)		B134	15	Duty waveform	Duty waveform	Driving frequency: 500Hz
Electric throttle motor (–)		B134	22	Duty waveform	Duty waveform	Driving frequency: 500Hz
Electric throttle motor power supply		B134	1	10 — 13	13 — 14	—
Electric throttle motor relay		B137	24	ON: 010 OFF: — 13	ON: 0 OFF: 13 — 14	When ignition switch is ON: ON
Accelerator position sensor	Main	B136	2	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Sub	B136	8	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Power supply	B135	8	5	5	—
	GND	B135	18	0	0	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Front oxygen (A/F) sensor RH	Signal (+)	B84	29	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B84	19	2.4 — 2.7	2.4 — 2.7	—
	Shield	B84	18	0	0	
Front oxygen (A/F) sensor heater RH	Signal 1	B84	5	0 — 1.0	—	Sensor output waveform
	Signal 2	B84	4	0 — 1.0	—	Sensor output waveform
Front oxygen (A/F) sensor LH	Signal (+)	B84	30	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B84	20	2.4 — 2.7	2.4 — 2.7	—
	Shield	B84	18	0	0	
Front oxygen (A/F) sensor heater LH	Signal 1	B84	7	0 — 1.0	—	Sensor output waveform
	Signal 2	B84	6	0 — 1.0	—	Sensor output waveform
Front oxygen sensor RH	Signal	B135	7	0	0 — 0.9	—
	Shield	B135	25	0	0	—
Front oxygen sensor heater RH signal		B136	17	0 — 1.0	—	Sensor output waveform
Front oxygen sensor LH	Signal	B135	17	0	0 — 0.9	—
	Shield	B135	25	0	0	—
Front oxygen sensor heater LH signal		B136	16	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor	Signal	B135	26	0	0 — 0.9	—
	Shield	B135	25	0	0	—
Rear oxygen sensor heater signal		B136	4	0 — 1.0	—	Sensor output waveform
GND (Front oxygen (A/F) sensor heater RH 1)		B84	9	0	0	—
GND (Front oxygen (A/F) sensor heater RH 2)		B84	8	0	0	—
GND (Front oxygen (A/F) sensor heater LH 1)		B84	31	0	0	—
GND (Front oxygen (A/F) sensor heater LH 2)		B84	21	0	0	—
Engine coolant temperature sensor		B135	28	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
Mass air flow sensor	Signal	B136	1	—	0.3 — 4.5	—
	Shield	B136	13	0	0	—
	GND	B136	7	0	0	—
Intake air temperature sensor signal		B135	27	0.3 — 4.6	0.3 — 4.6	—
EGR solenoid valve	Signal 1	B136	5	0 or 10 — 13	0 or 10 — 13	—
	Signal 2	B136	6	0 or 10 — 13	0 or 10 — 13	—
	Signal 3	B136	11	0 or 10 — 13	0 or 10 — 13	—
	Signal 4	B136	12	0 or 10 — 13	0 or 10 — 13	—
Tumble generator valve position sensor		B135	3	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
Tumble generator valve (open)		B137	20	0 or 10 — 13	0 or 13 — 14	Sensor output waveform

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Tumble generator valve (close)		B137	11	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Vehicle speed signal		B134	14	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Starter switch		B134	2	0	0	Cranking: 8 — 14
A/C switch		B134	9	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	13	10 — 13	13 — 14	—
Neutral position switch	MT	B134	16	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
	AT	B134	16	ON: 0 OFF: 12±0.5		Switch is ON when shift is in "N" or "P" position.
Test mode connector		B135	22	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B135	4	2.8	2.8	—
	Shield	B135	13	0	0	—
Back-up power supply		B84	10	10 — 13	13 — 14	Ignition switch "OFF": 10 — 13
Control unit power supply		B84	3	10 — 13	13 — 14	—
		B84	2	10 — 13	13 — 14	—
Sensor power supply		B135	9	5	5	—
Ignition control	#1, #2	B137	15	0	1 — 3.4	Waveform
	#3, #4	B137	13	0	1 — 3.4	Waveform
	GND	B137	18	0	0	—
Fuel injector	#1	B137	6	10 — 13	1 — 14	Waveform
	#2	B137	5	10 — 13	1 — 14	Waveform
	#3	B137	4	10 — 13	1 — 14	Waveform
	#4	B137	3	10 — 13	1 — 14	Waveform
	GND	B137	8	0	0	—
Fuel pump relay control		B137	7	ON: 0.5 or less OFF: 10 — 13	0.5 or less	—
A/C relay control		B137	23	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Starter relay control		B137	16	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	
Fan control 1		B84	17	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Fan control 2		B84	28	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Models with A/C
Self-shutoff control		B137	2	10 — 13	13 — 14	—
Malfunction indicator light		B137	22	—	—	Light "ON": 1 or less Light "OFF": 10 — 14
Purge control solenoid valve		B84	16	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Power steering switch		B135	24	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel tank sensor control valve		B137	21	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 10 — 13	—
Fuel temperature sensor		B135	6	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor		B135	15	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor		B135	14	2.3 — 2.7	2.3 — 2.7	The valve obtained after the fuel filler cap was removed once and recapped.

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Pressure control solenoid valve	B84	22	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Drain valve	B84	11	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Cruise control set light	B84	27	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Main light	B84	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Clutch switch	B134	12	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 13 — 14	—
SET/COAST switch	B84	14	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Brake switch 1	B84	25	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2	B84	24	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
RESUME/ACCEL switch	B84	26	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Main switch	B84	13	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
AT diagnosis input signal	B134	4	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
Small light switch	B134	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch	B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch	B135	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Manifold absolute pressure sensor	B135	23	4.0 — 4.8	1.1 — 1.9	—
SSM/GST communication line	B134	19	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)	B135	19	0	0	—
GND (power supply)	B84	1	0	0	—
	B137	17	0	0	
GND (control systems)	B137	1	0	0	—
	B134	7	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.9 — 3.2 (%): Idling
	6.0 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After the engine is warmed-up.
- Gear position is in “N” or “P” range.
- A/C is turned OFF.
- All accessory switches are turned OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

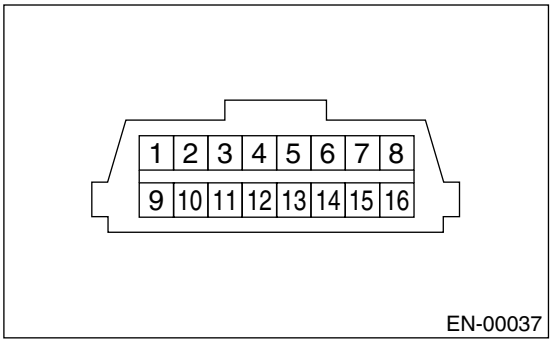
For electrical specification of TCM I/O signal, refer to 4AT section. <Ref. to 4AT(H4SO)-13, ELECTRICAL SPECIFICATION, Transmission Control Module (TCM) I/O Signal.>

8. Data Link Connector

A: NOTE

This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



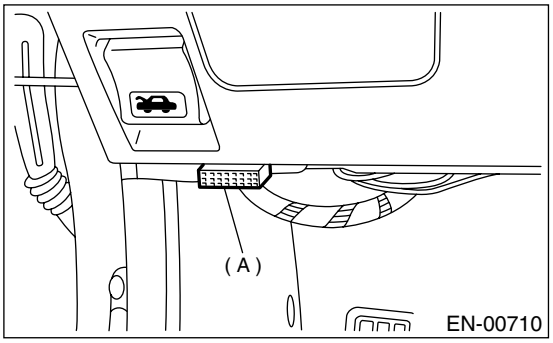
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Test mode check signal 1	14	Blank
7	Blank	15	Blank
8	Test mode check signal 2	16	Blank

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up DTC and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request on-board monitoring test results for non-continuously monitored systems
(6) MODE $07: Request on-board monitoring test results for continuously monitored systems
(7) MODE $09: Request vehicle information
Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status (Bank 1, 2)	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
16	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 1,sensor 3)	V and %
19	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 2,sensor 2)	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V
28	A/F value and A/F sensor output voltage (Bank 2 sensor 2)	— and V
34	A/F value and A/F sensor current (Bank 1 sensor 1)	— and V
38	A/F value and A/F sensor current (Bank 2 sensor 1)	— and V

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status (Bank 1, 2)	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 1,sensor 2)	V and %
16	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 1,sensor 3)	V and %
19	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 2,sensor 2)	V and %

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4SO U5)-48, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit
$01	$01	Catalyst system efficiency below threshold
$02	$01	Exhaust gas recirculation control circuit range/performance
	$02	
$03	$01	Evaporative emission control system (Large leak)
	$02	Evaporative emission control system (Small leak)
	$03	Evaporative emission control system (Very small leak)
$05	$01	O_2 sensor circuit slow response (Bank 1 Sensor 1)
$06	$01	O_2 sensor circuit (Bank 1 Sensor 2) <$81 or $02>
	$02	
$07	$01	O_2 sensor circuit slow response (Bank 1 Sensor 2)
$08	$01	O_2 sensor response (Bank 2 Sensor 1)
$0C	$01	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
$11	$01	Oxygen sensor voltage malfunction (Bank 1 sensor 3)
	$02	
$13	$01	Oxygen sensor voltage malfunction (Bank 2 sensor 2)
	$02	
$14	$01	Oxygen sensor voltage malfunction (Bank 2 sensor 2)

7. MODE $07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE $09

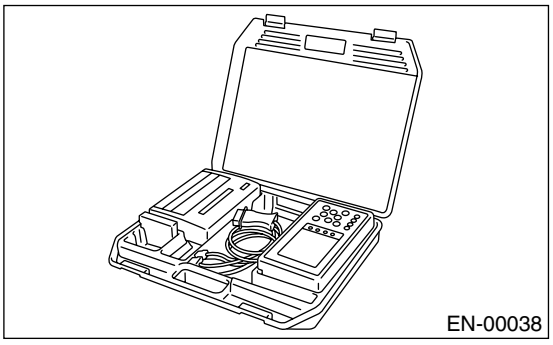
Refer to data of vehicle specification (VIN, calibration ID, etc.).

10.Subaru Select Monitor

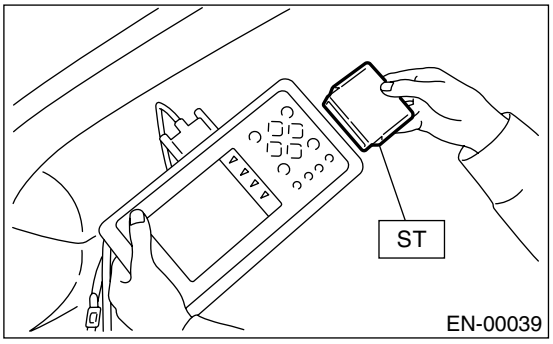
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

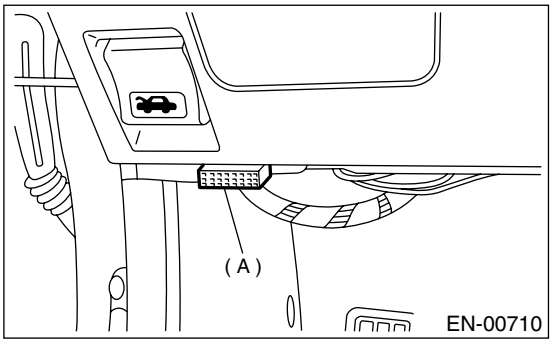
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO U5)-9, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO U5)-9, PREPARATION TOOL, General Description.>



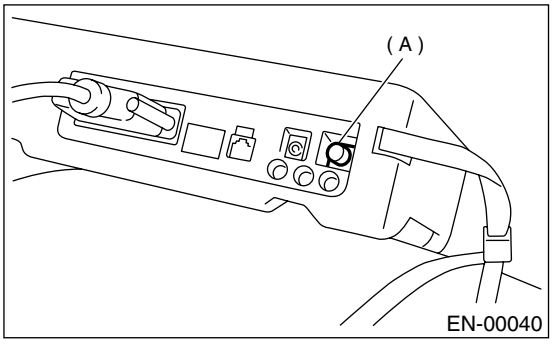
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4SO U5)-48, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4SO U5)-48, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

• A list of support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Injection pulse width 1	Fuel Injection #1 Pulse	ms
Injection pulse width 2	Fuel Injection #2 Pulse	ms
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal #1	A/F Sensor #1	—
Front oxygen sensor (A/F) sensor output signal #1	A/F sensor #2	—
Front oxygen (A/F) sensor resistance #2	A/F Sensor #1 Resistance	ohm
Front oxygen sensor (A/F) sensor resistance #2	A/F sensor #2 Resistance	ohm
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim #1	A/F Correction #1	%
Short term fuel trim #2	A/F Correction #2	%
Knock compensation	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg, kPa, inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term fuel trim #1	A/F Learning #1	%
Long term fuel trim #2	A/F Learning #2	%
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel Level	V
Fuel temperature signal	Fuel Temp	°C or °F
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Ignition Timing	deg
Intake air amount	Mass Air Flow	g/s
Front oxygen sensor voltage #1	Front O_2 sensor #1	V
Front oxygen sensor voltage #2	Front O_2 sensor #2	V
Mass air flow sensor voltage	Air Flow Sensor Voltage	V
Accelerator opening angle	Accel. Opening Angle	%
Tumble generator valve position sensor signal	TGV Position Sensor R	V
EGR step count	No. of EGR steps	STEP
A/F sensor current value 1	A/F sensor #1 Current	mA
A/F sensor current value 2	A/F sensor #2 Current	mA
A/F learning 3	A/F Leaning #3	%
Throttle motor duty	Throttle Motor Duty	%
Throttle power supply voltage	Throttle Motor Voltage	V

Contents	Display	Unit of measure
Sub throttle sensor voltage	Sub-Throttle Sensor	V
Main throttle sensor voltage	Main-Throttle Sensor	V
Sub accelerator sensor voltage	Sub-Accelerator Sensor	V
Main accelerator sensor voltage	Main-Accelerator Sensor	V
Memorized cruise speed	Memorized Cruise Speed	km/h
A/F compensation 4	A/F Correction #4	%
A/F learning 4	A/F Learning #4	%
#1 cylinder roughness monitor	Roughness Monitor #1	—
#2 cylinder roughness monitor	Roughness Monitor #2	—
#3 cylinder roughness monitor	Roughness Monitor #3	—
#4 cylinder roughness monitor	Roughness Monitor #4	—
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch Signal	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger Switch	ON or OFF
Blower fan switch signal	Blower Fan Switch	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Air assisted injector solenoid valve signal	Assist Air Sol. Valve	ON or OFF
AT/MT identification terminal	AT Model ID Signal	ON or OFF
Pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF
Vent control solenoid valve signal	Vent. Solenoid Valve	ON or OFF
Fuel tank sensor control valve signal	Tank Sensor Cntl Valve	ON or OFF
Front oxygen sensor monitor 1	Front O_2 #1 Rich Signal	ON or OFF
Front oxygen sensor monitor 2	Front O_2 #2 Rich Signal	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF
Tumble generator valve drive signal	TGV Drive	ON or OFF
Electronic control throttle motor relay	ETC Motor Relay	ON or OFF
Clutch switch signal	Clutch Switch	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
SET/COAST switch signal	SET/COAST Switch	ON or OFF
RESUME/ACCEL switch signal	RESUME/ACCEL Switch	ON or OFF
Brake switch signal	Brake Switch	ON or OFF
Main switch signal	Main Switch	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.

• A list of support data is shown in the following table.

Contents	Display	Unit of measure
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalytic converter	Catalyst Diagnosis	Complete or incomplete
Test of heated catalytic converter	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system (Bank 1)	Fuel System for Bank 1	—
Air fuel ratio control system (Bank 2)	Fuel System for Bank 2	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor (Bank 2)	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 2)	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Rear oxygen sensor output signal #12	Oxygen Sensor #12	V
Oxygen sensor output signal #13	Oxygen sensor #13	V
Oxygen sensor output signal #22	Oxygen sensor #22	V
Air fuel ratio compensation by rear oxygen sensor #12	Short term fuel trim #12	%
Air fuel ratio compensation by oxygen sensor #13	Short term fuel trim #13	%
Air fuel ratio compensation by oxygen sensor #22	Short term fuel trim #22	%
On-board diagnostic system	OBD System	—
Oxygen sensor #11	Oxygen sensor #11	—
Oxygen sensor #12	Oxygen sensor #12	—
Oxygen sensor #13	Oxygen sensor #13	—
Oxygen sensor #21	Oxygen sensor #21	—
Oxygen sensor #22	Oxygen sensor #22	—
A/F sensor #11	A/F sensor #11	—

Contents	Display	Unit of measure
A/F sensor #21	A/F sensor #21	—
A/F sensor #11	A/F sensor #11	V
A/F sensor #21	A/F sensor #21	V
A/F sensor #11	A/F sensor #11	—
A/F sensor #21	A/F sensor #21	mA

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system (Bank 1)	Fuel system for Bank1	—
Air fuel ratio control system (Bank 2)	Fuel system for Bank2	—
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor (Bank 2)	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 2)	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing signal	Ignition Timing	°
Intake air volume	Mass Air Flow	g/sec
Intake air temperature signal	Intake Air Temp	°C
Throttle position signal	Throttle Opening Angle	%

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permission	ON or OFF	When engine torque control permission signal is entered.
Front oxygen sensor rich signal #1	Front O_2 #1 Rich Signal	ON or OFF	When front oxygen sensor mixture ratio is rich
Front oxygen sensor rich signal #2	Front O_2 #2 Rich Signal	ON or OFF	When front oxygen sensor mixture ratio is rich
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch signal is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
AT/MT identification terminal	AT Model ID Signal	ON or OFF	ON when vehicle is AT.
Pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF	When pressure control valve signal is operated.
Vent control solenoid valve signal	Vent Solenoid Valve	ON or OFF	When vent control valve signal is operated.
Fuel tank sensor control valve signal	Fuel Tank Sensor Cntl Valve	ON or OFF	When fuel tank sensor control signal entered.
Tumble generator valve output signal	TGV Output	ON or OFF	When TGV actuator signal entered.
Tumble generator valve drive signal	TGV Drive	ON or OFF	When TGV moves, and the valve is open.
Electronic control throttle motor relay	ETC Motor Relay	ON or OFF	When electronic control throttle relay is in function.

Contents	Display	Message	LED “ON” requirements
Clutch switch signal	Clutch Switch	ON or OFF	When clutch switch is ON.
Stop light switch signal	Stop Light Switch	ON or OFF	When stop light switch is ON.
SET/COAST switch signal	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned ON.
RESUME/ACCEL switch signal	RESUME/ACCEL Switch	ON or OFF	When RESUME/ACCEL switch is turned ON.
Brake switch signal	Brake switch	ON or OFF	When brake switch is ON.
Main switch signal	Main Switch	ON or OFF	When main switch is turned ON.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Manifold absolute pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Stop light switch signal	Stop light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator light	AT Diagnosis light	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

11.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
5) On «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
6) Make sure that a DTC is shown on display screen.

NOTE:
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE $03).

12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H4SO U5)-55, Drive Cycle.>

DTC	Item
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)
P0043	HO2S Heater Control Circuit Low (Bank 1 Sensor 3)
P0044	HO2S Heater Control Circuit High (Bank 1 Sensor 3)
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem
P0101	Mass or Volume Air Flow Circuit Range/Performance
P0102	Mass or Volume Air Flow Circuit Low Input
P0103	Mass or Volume Air Flow Circuit High Input
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input
P0129	Atmospheric Pressure Sensor Circuit Range/Performance
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)
P0143	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 3)
P0144	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 3)
P0151	O_2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)
P0152	O_2 Sensor Circuit High Voltage (Bank 2 Sensor 1)
P0154	O_2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)
P0157	O_2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)
P0158	O_2 Sensor Circuit High Voltage (Bank 2 Sensor 2)
P0182	Fuel Temperature Sensor “A” Circuit Low Input
P0183	Fuel Temperature Sensor “A” Circuit High Input
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low Input
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High Input
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
P0335	Crankshaft Position Sensor “A” Circuit

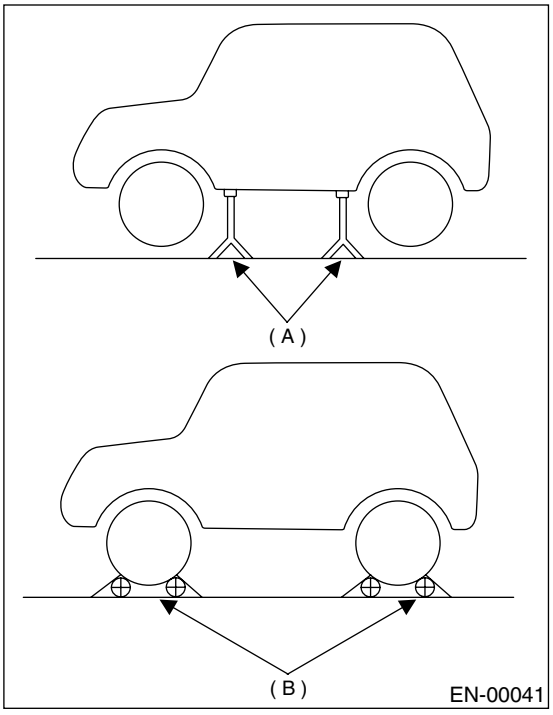
DTC	Item
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)
P0447	Evaporative Emission Control System Vent Control Circuit Open
P0448	Evaporative Emission Control System Vent Control Circuit Shorted
P0452	Evaporative Emission Control System Pressure Sensor Low Input
P0453	Evaporative Emission Control System Pressure Sensor High Input
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low
P0462	Fuel Level Sensor Circuit Low Input
P0463	Fuel Level Sensor Circuit High Input
P0502	Vehicle Speed Sensor Circuit Low Input
P0503	Vehicle Speed Sensor Intermittent/Erratic/High
P0512	Starter Request Circuit
P0600	CAN Communication Circuit
P0604	Internal Control Module Random Access Memory (RAM) Error
P0605	Internal Control Module Read Only Memory (ROM) Error
P0607	Control Module Performance
P0638	Throttle Actuator Control Range/Performance (Bank 1)
P0691	Cooling Fan 1 Control Circuit Low
P0703	Torque Converter/Brake Switch “B” Circuit
P0705	Transmission Range Sensor Circuit (PRNDL Input)
P0710	Transmission Fluid Temperature Sensor Circuit
P0716	Torque Converter Turbine Speed Sensor
P0720	Output Speed Sensor Circuit
P0726	Engine Speed Input Circuit Range/Performance
P0731	Gear 1 Incorrect Ratio
P0732	Gear 2 Incorrect Ratio
P0733	Gear 3 Incorrect Ratio
P0734	Gear 4 Incorrect Ratio
P0741	Torque Converter Clutch Circuit Performance or Stuck Off
P0743	Torque Converter Clutch Circuit Electrical
P0748	Pressure Control Solenoid “A” Electrical
P0753	Shift Solenoid “A” Electrical
P0758	Shift Solenoid “B” Electrical
P0771	Low Clutch Timing Solenoid
P0778	Pressure Control Solenoid “B” Electrical
P0785	Shift/Timing Solenoid
P0851	Neutral Switch Input Circuit Low
P0852	Neutral Switch Input Circuit High
P0864	TCM Communication Circuit Range/Performance
P0865	TCM Communication Circuit Low
P0866	TCM Communication Circuit High
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low
P1089	Tumble Generated Valve Position Sensor 1 Circuit High
P1091	Tumble Generated Valve System 1 (Valve Close)
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)

DTC	Item
P1154	O_2 Sensor Circuit Range/Performance (Low) (Bank2 Sensor1)
P1155	O_2 Sensor Circuit Range/Performance (High) (Bank2 Sensor1)
P1160	Return Spring Failure
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low
P1420	Fuel Tank Pressure Control Solenoid Valve Circuit High
P1446	Fuel Tank Sensor Control Valve Circuit Low
P1447	Fuel Tank Sensor Control Valve Circuit High
P1518	Starter Switch Circuit Low Input
P1560	Back-up Voltage Circuit Malfunction
P1700	Throttle Position Sensor
P2101	Throttle Actuator Control Motor Circuit Range/Performance
P2102	Throttle Actuator Control Motor Circuit Low
P2103	Throttle Actuator Control Motor Circuit High
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input
P2135	Throttle/Pedal Position Sensor/Switch “A” / “B” Voltage Rationality
P2138	Throttle/Pedal Position Sensor/Switch “D” / “E” Voltage Rationality

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

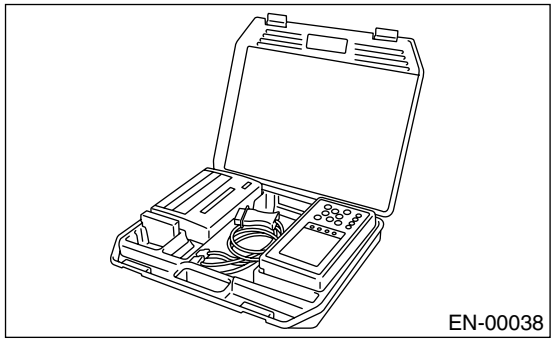
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure nobody goes in front of the vehicle.



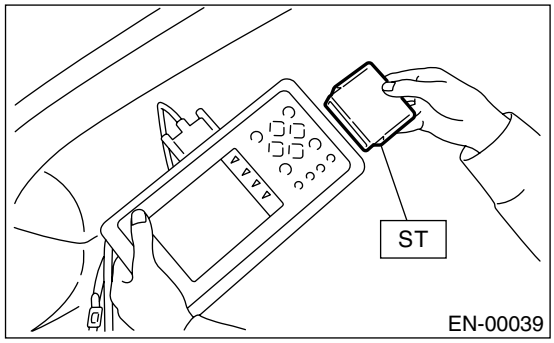
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

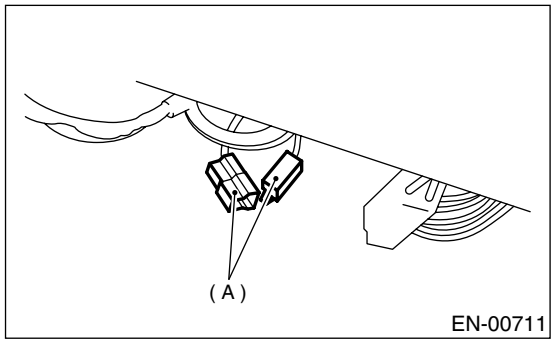
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO U5)-58, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO U5)-9, PREPARATION TOOL, General Description.>



4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO U5)-9, PREPARATION TOOL, General Description.>

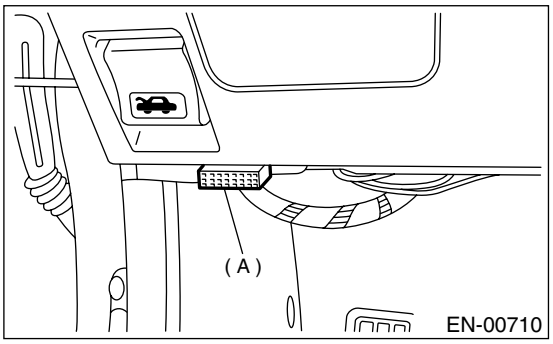


6) Connect the test mode connector (A) at the lower portion of instrument panel (on driver's side).



7) Connect the Subaru Select Monitor to data link connector.

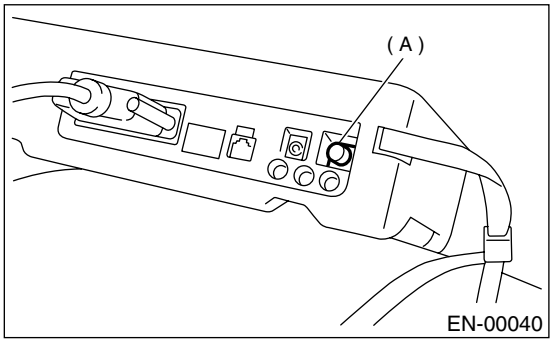
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



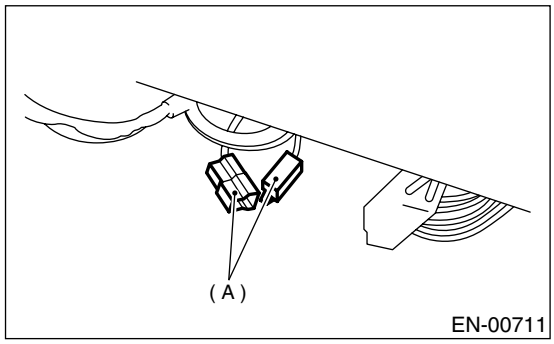
(A) Power switch

9) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
10) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
11) Press the [YES] key after the information of engine type is displayed.
12) On «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
13) When the "Perform Inspection (Dealer Check) Mode?" is shown on display screen, press the [YES] key.
14) Perform subsequent procedures as instructed on display screen.
• If trouble still remains in memory, the corresponding DTC appears on display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

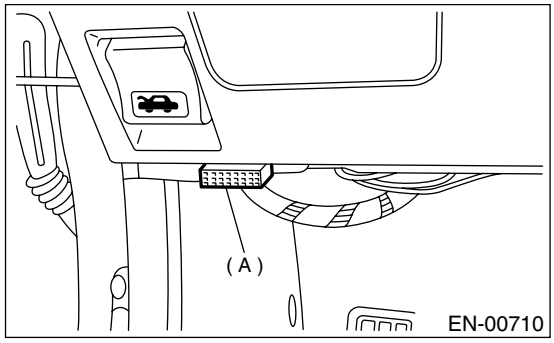
3. OBD-II GENERAL SCAN TOOL

1) After clearing memory, check for any remaining unresolved trouble data: <Ref. to EN(H4SO U5)-58, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



4) Connect the OBD-II general scan tool to its data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



5) Start the engine.

NOTE:
• Ensure the selector lever is placed in “P” position before starting. (AT models)
• Depress the clutch pedal when starting engine. (MT models)

6) Using the selector lever or shift lever, turn the “P” position switch and “N” position switch to ON.
7) Depress the brake pedal to turn brake switch ON. (AT models)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Place the selector lever or shift lever in “D” position (AT models) or “1st” gear (MT models) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO U5)-58, Clear Memory Mode.>
3) Separate the test mode connector.

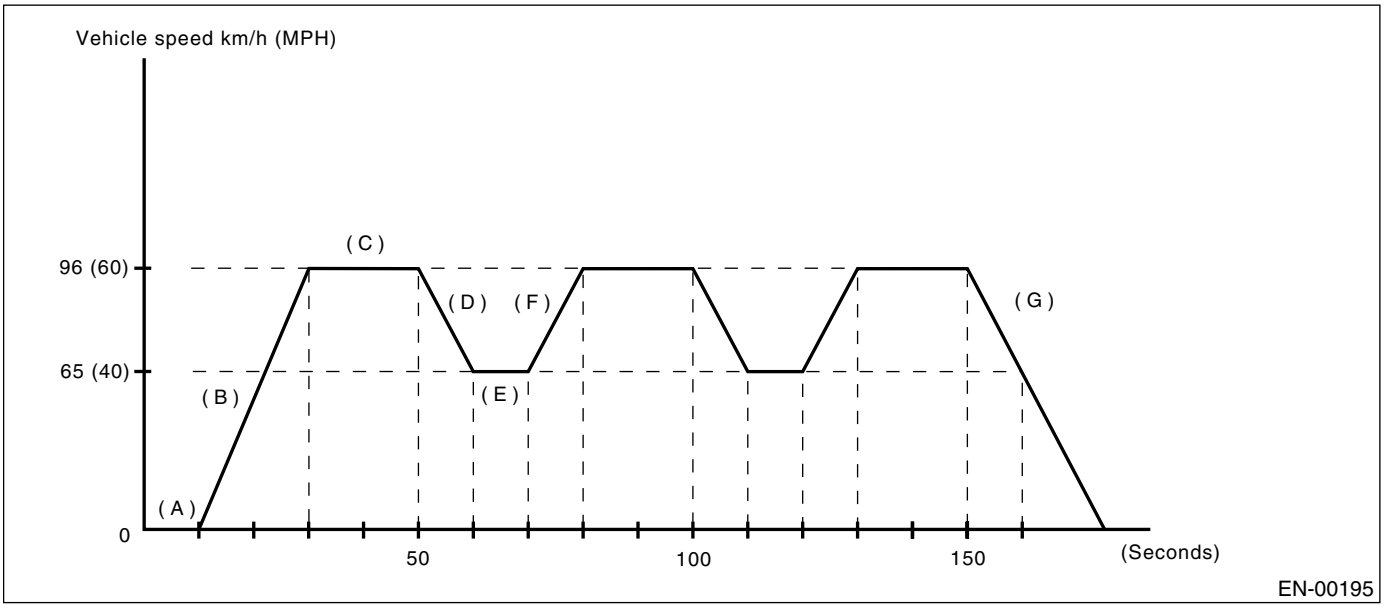
NOTE:
• Except for the water temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0153	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	—
*P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	—
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	—
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	—
*P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
*P0461	Fuel Level Sensor Circuit Range/Performance	—
*P0692	Cooling Fan 1 Control Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P1448	Fuel Tank Sensor Control Valve Range/Performance Problem	—
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	—
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	—
*P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	—
*P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	—

DRIVE CYCLE

3. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 1 minute.
(B) Accelerate to 96 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 96 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 65 km/h (40 MPH).
(E) Drive vehicle at 65 km/h (40 MPH) for 10 seconds.
(F) Accelerate to 96 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC	Item	Condition
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0159	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0302	Cylinder 2 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0303	Cylinder 3 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0304	Cylinder 4 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0400	Exhaust Gas Recirculation	—
P1090	Tumble Generated Valve System 1 (Valve Open)	—
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	—
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	—
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	—
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	—
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	—
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	—
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	—
P1499	EGR Solenoid Valve Signal #5 Circuit Malfunction (High Input)	—

4. TEN MINUTES IDLING

NOTE:
Drive the vehicle at 10 km/h (6 MPH) or more before diagnosis.

DTC	Item	Condition
*P0111	Intake Air Temperature Circuit Range/Performance	Coolant temperature at start is less than 30°C (86°F).
*P0171	System Too Lean (Bank 1)	
*P0172	System Too Rich (Bank 1)	
*P0174	System Too Lean (Bank 2)	
*P0175	System Too Rich (Bank 2)	
*P0464	Fuel Level Sensor Circuit Intermittent	
*P0483	Cooling Fan Rationality Check	
*P0506	Idle Control System RPM Lower Than Expected	
*P0507	Idle Control System RPM Higher Than Expected	

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

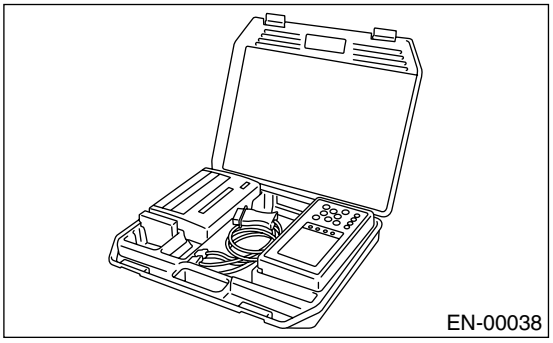
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to OBD-II General Scan Tool Instruction Manual.
After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.

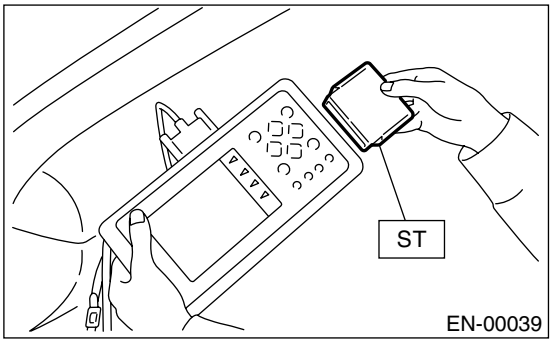
15.Compulsory Valve Operation Check Mode

A: OPERATION

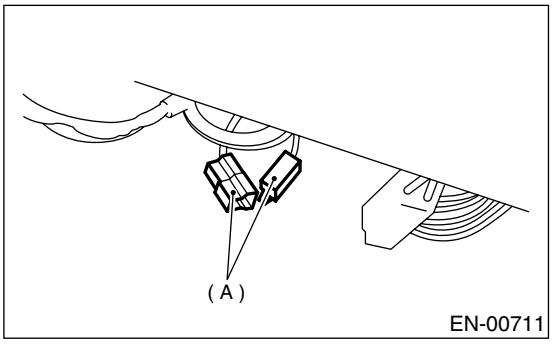
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO U5)-9, PREPARATION TOOL, General Description.>



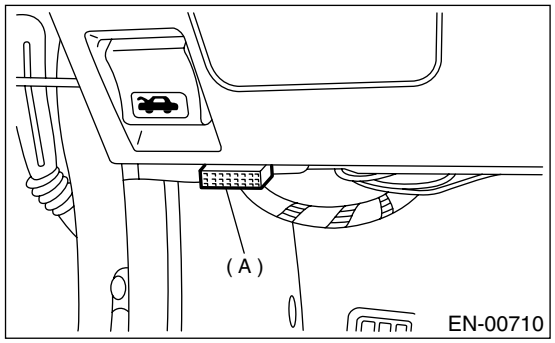
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO U5)-9, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on driver's side).



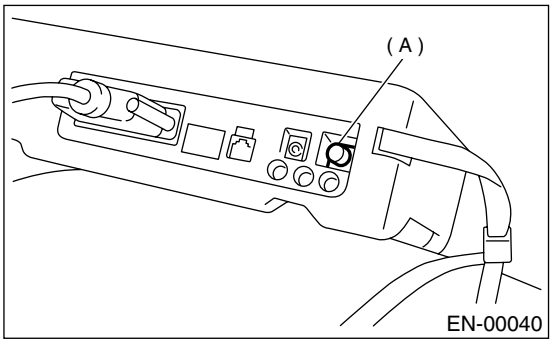
5) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type is displayed.
10) On «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory air assist vent control solenoid valve operation check	Vent Control Solenoid Valve
Compulsory fuel tank sensor control solenoid valve operation check	Fuel Tank Sensor Control Valve

NOTE:

• The following parts will be displayed but not functional.

Display
EGR Solenoid Valve
AAI Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Turbocharger Wastegate Solenoid
EXH. Bypass Control Permit Flag

• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

16.Malfunction Indicator Light

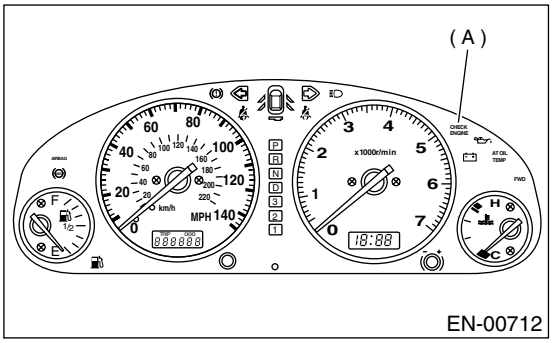
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4SO U5)-62, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4SO U5)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4SO U5)-66, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4SO U5)-68, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4SO U5)-70, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

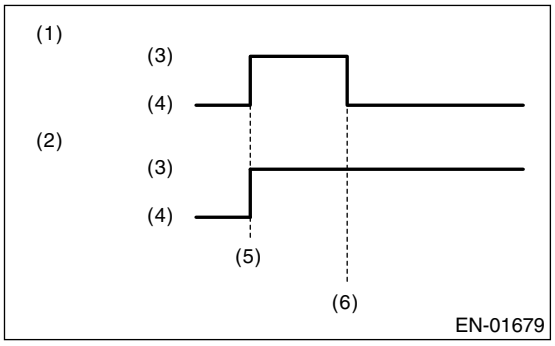
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light (A) in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4SO U5)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Malfunction Indicator Light.>

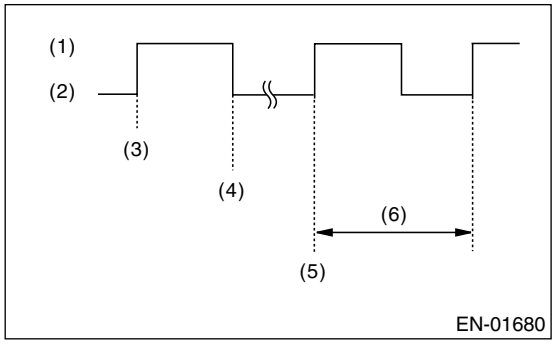


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



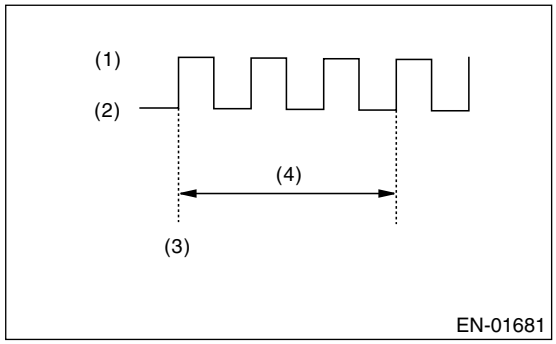
(1) No trouble
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) When the ignition switch is turned to ON (engine off) or to “START” with test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.

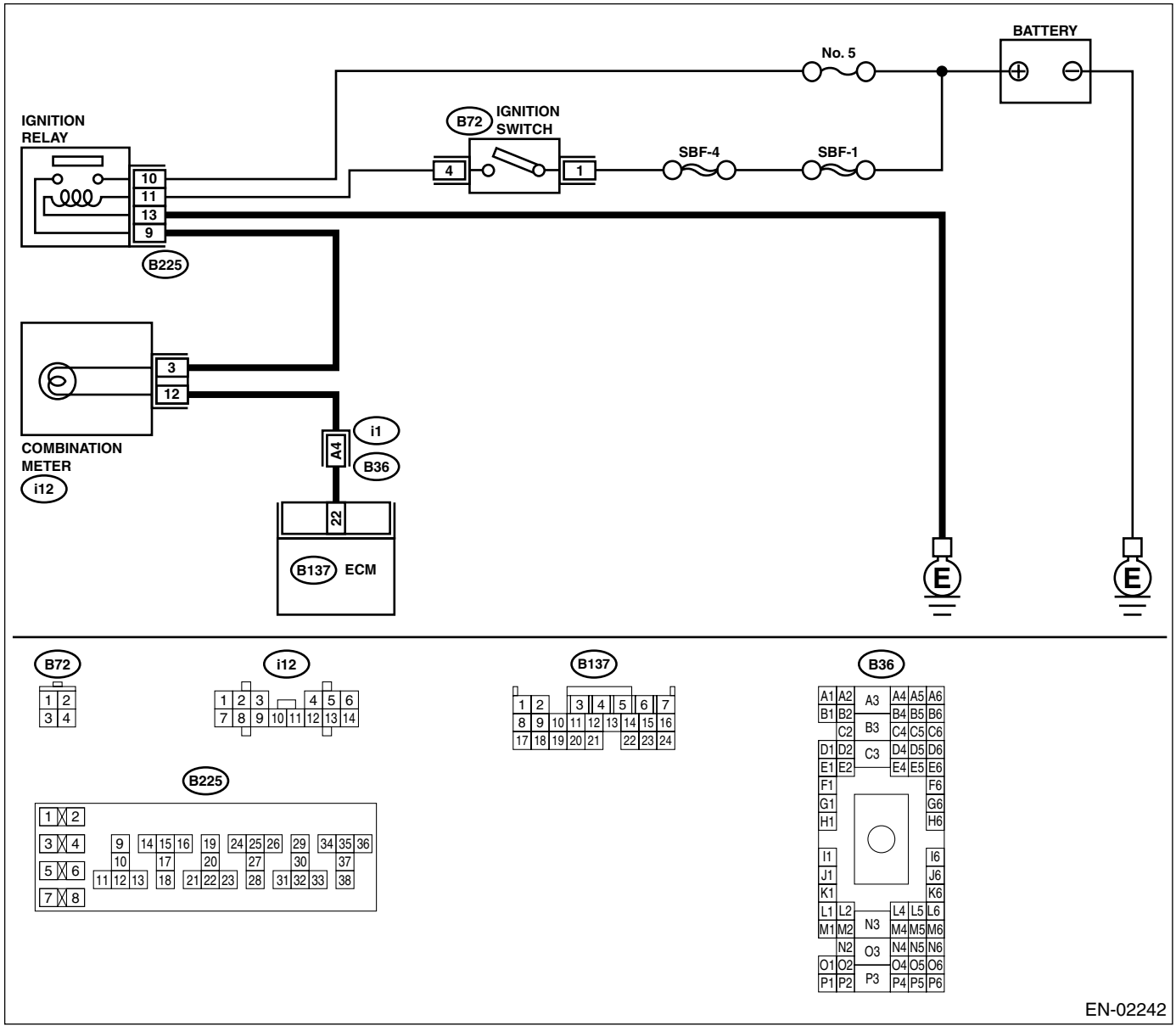


(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

MEMO:

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
  - When ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**

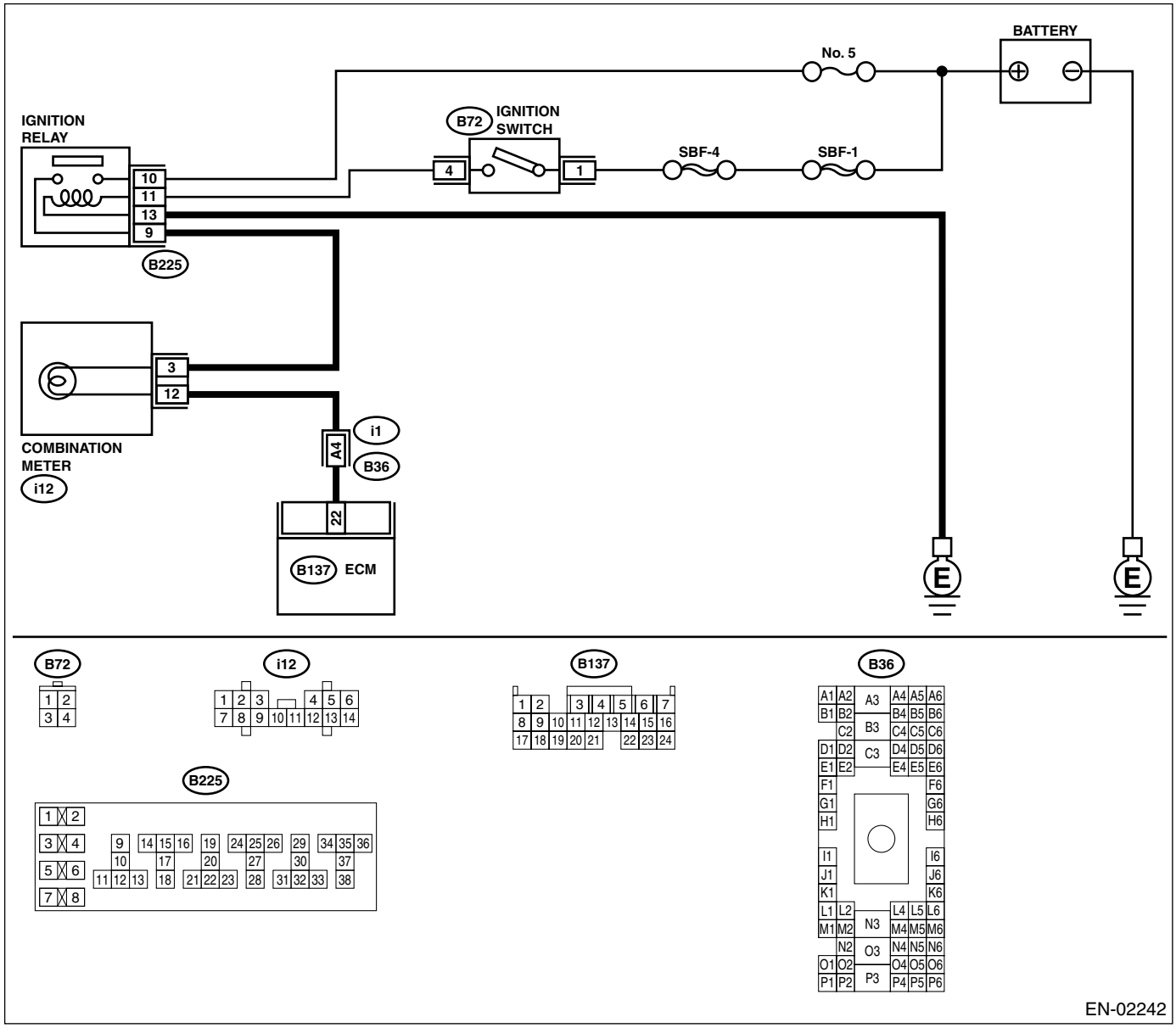


Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact by shaking or pulling ECM connector and harness.	Does the MIL come on?	Repair poor contact in ECM connector.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.** Check if ECM connector is correctly connected.	Is ECM connector correctly connected?	Replace ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-13, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B137) No. 22 — (i12) No. 12:***	Ισ τηε μεασυρεδ ϖαλυε λεσσ τηαν 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Check the following and repair if necessary. NOTE: • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7	**CHECK LAMP BULB.** Remove malfunction indicator lamp bulb.	Is lamp bulb condition OK?	Repair combination meter connector.	Replace lamp bulb.

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**

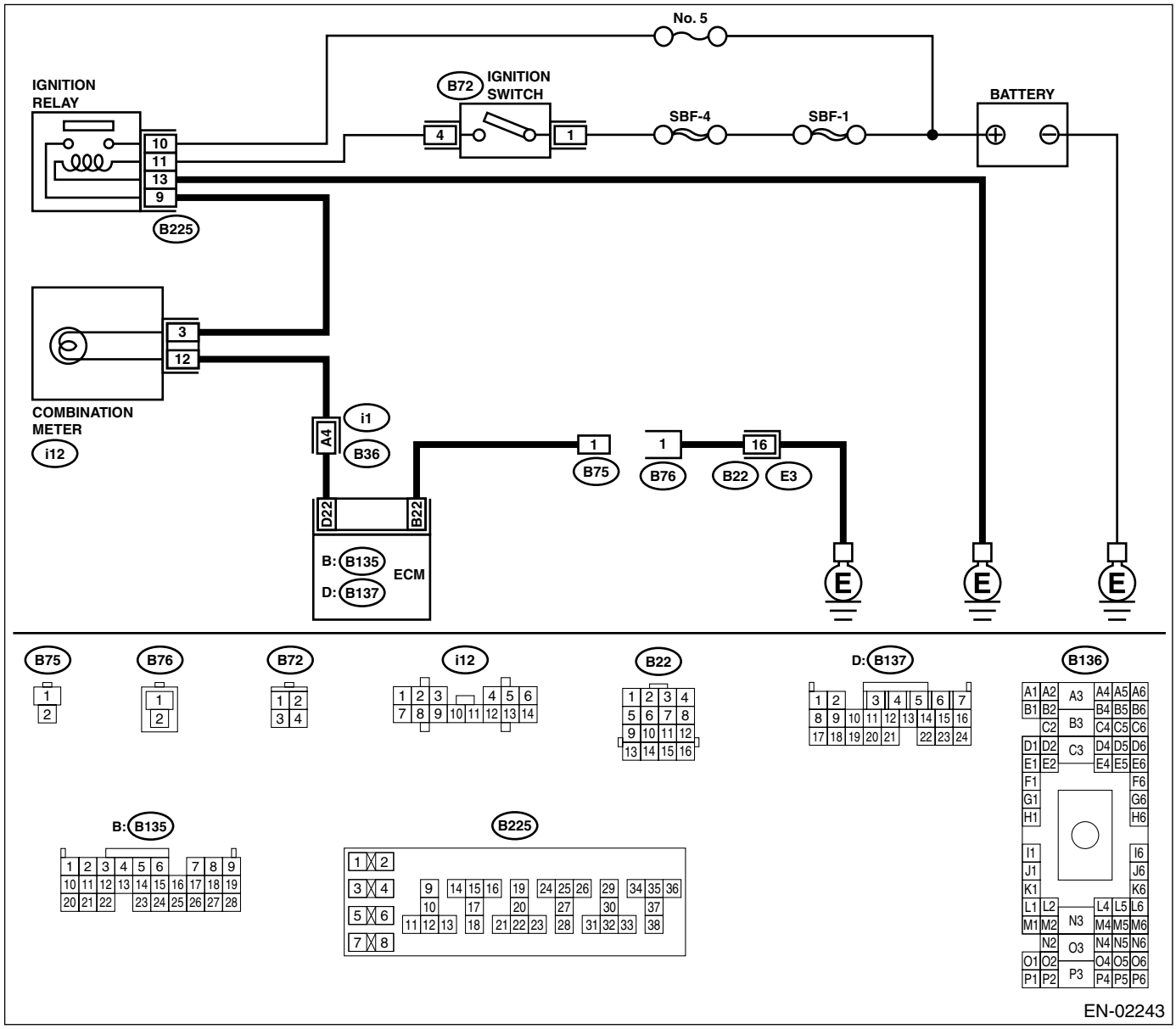


Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

MEMO:

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is in open.
- **TROUBLE SYMPTOM:**
  - When inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**



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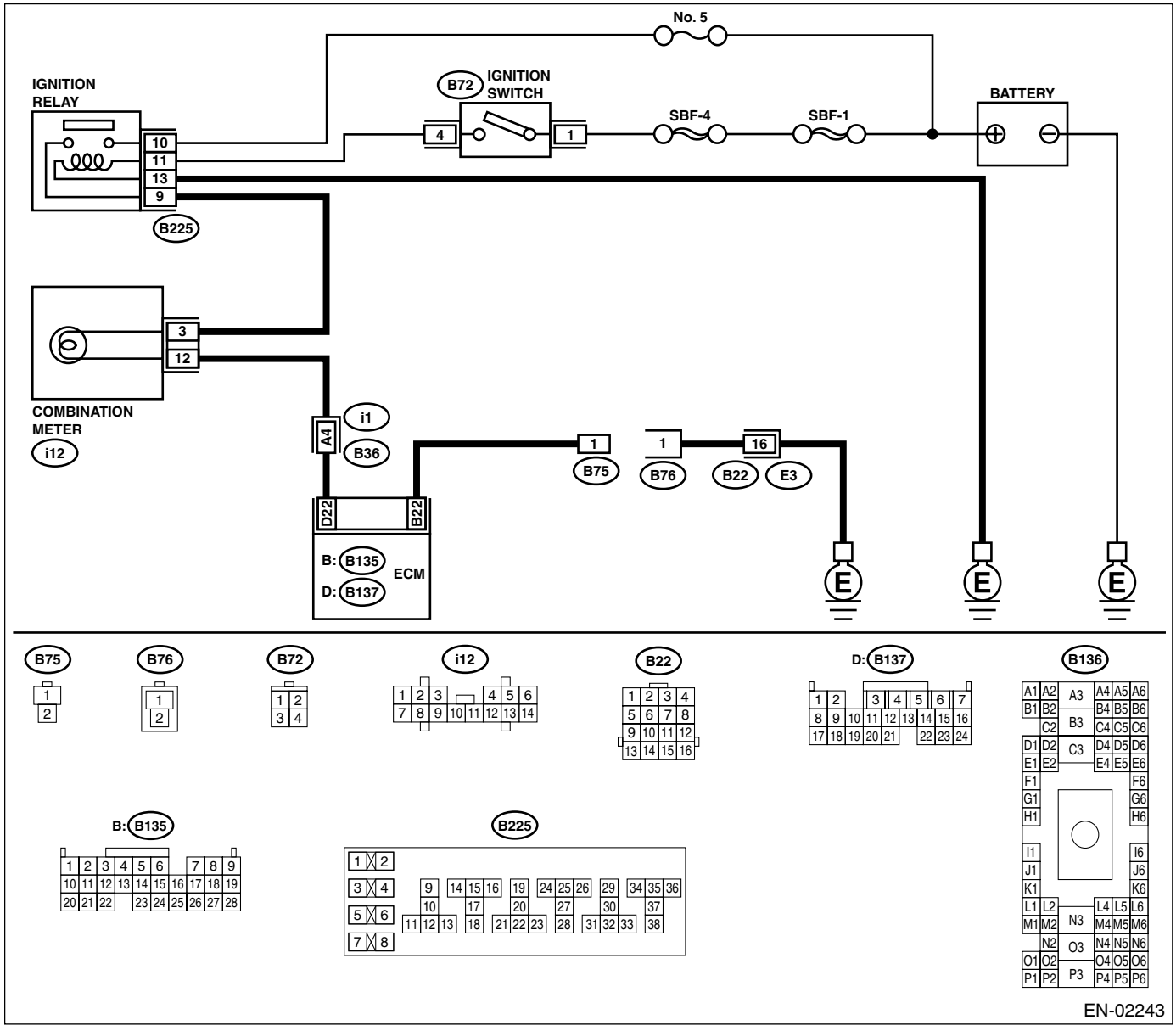
	Step	Check	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(H4SO U5)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 22 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect test mode connector. 2) Turn ignition switch to ON.	Does MIL flash on and off?	Go to step **2.**	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 22 — Chassis ground:***	Is the measured value less than 5 Ω?	Repair short circuit in harness between ECM and test mode connector.	Replace ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

17.Diagnostics for Engine Starting Failure

A: PROCEDURE

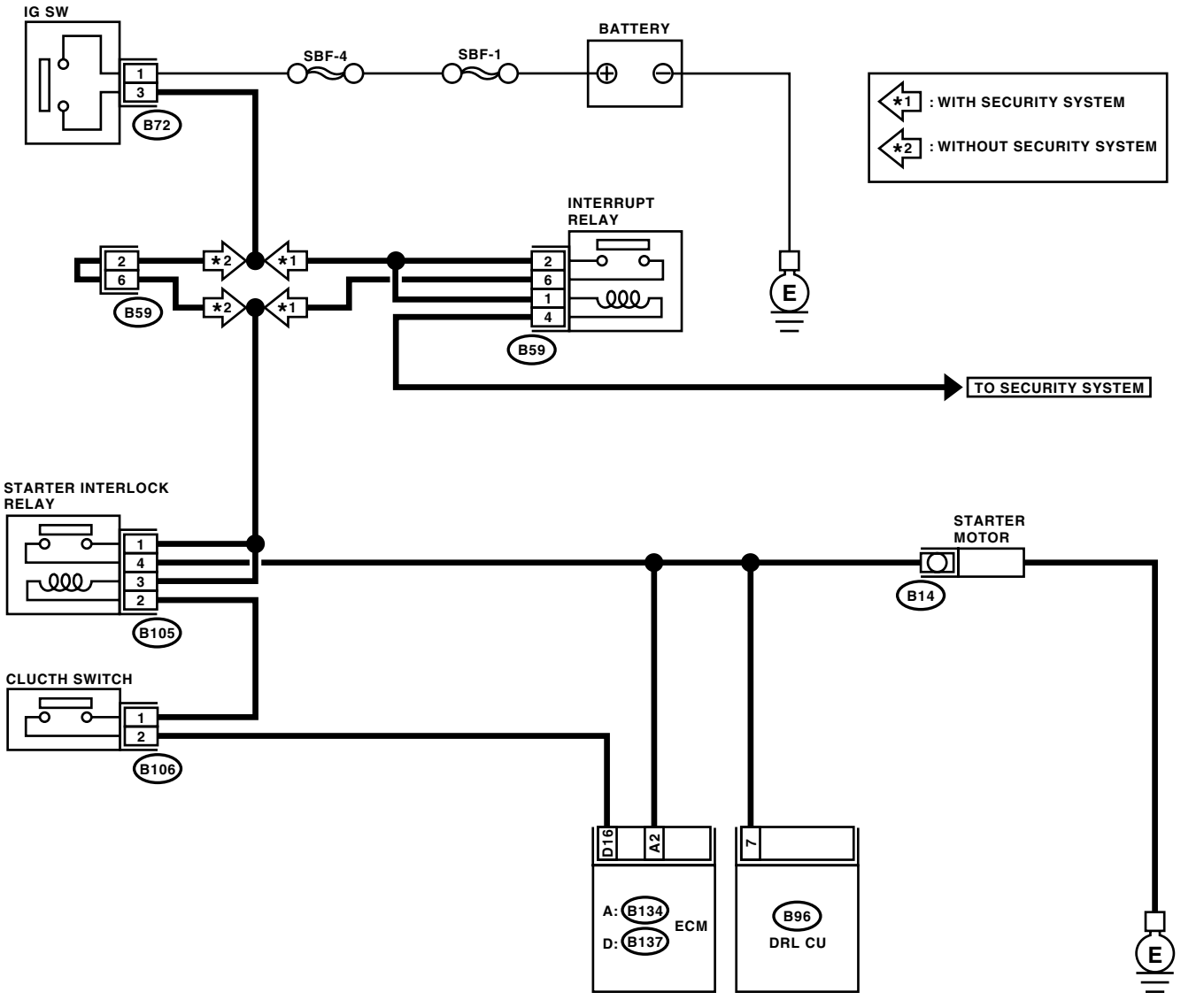
1. Inspection of starter motor circuit. <Ref. to EN(H4SO U5)-73, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO U5)-78, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4SO U5)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4SO U5)-84, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4SO U5)-88, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

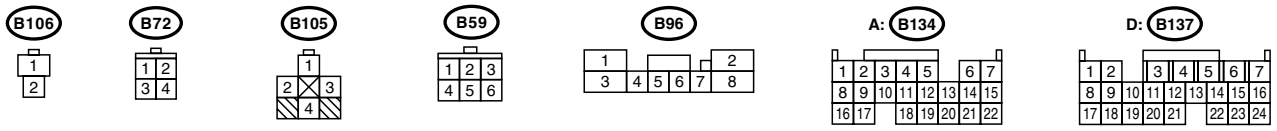
B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

MT model





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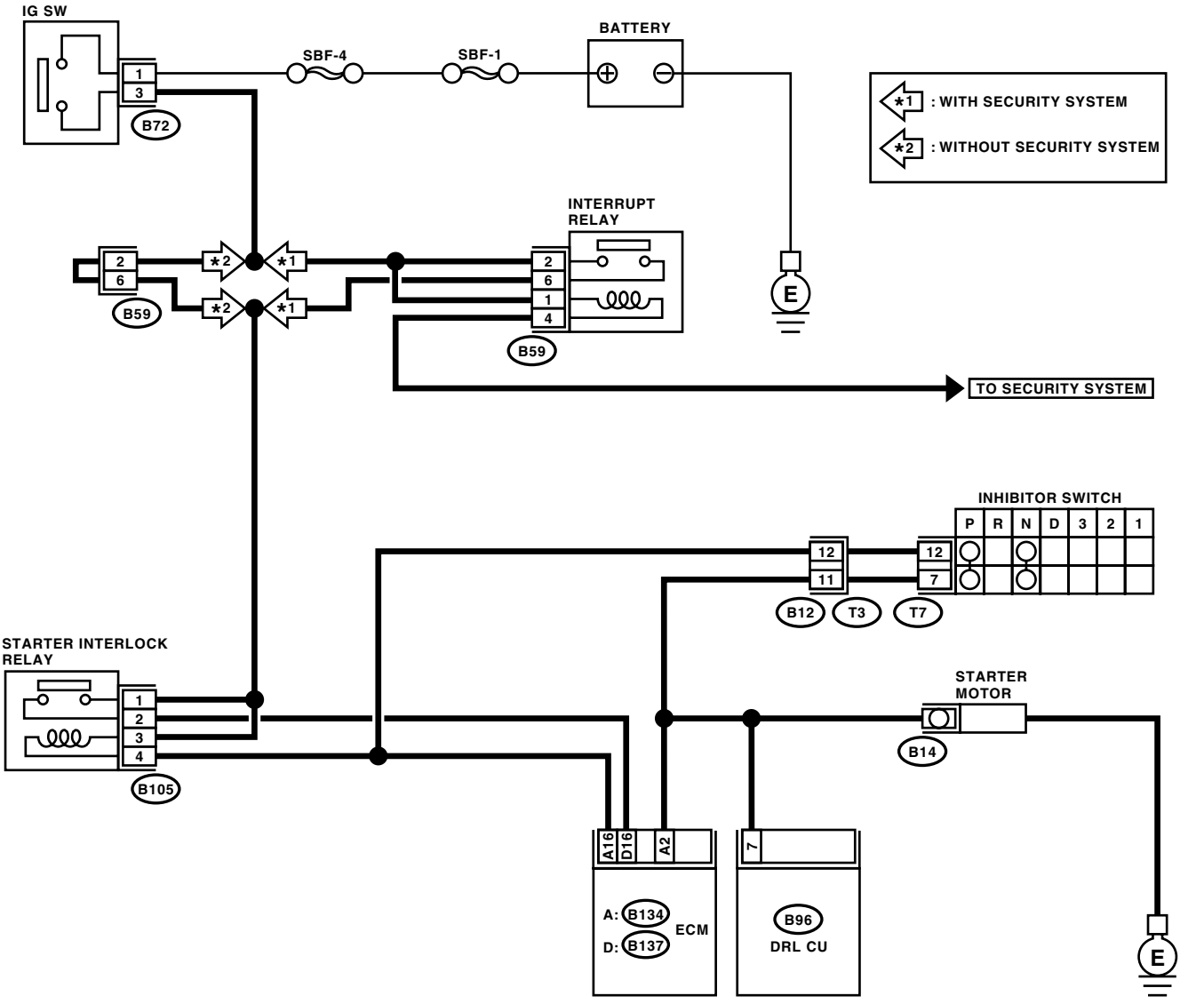
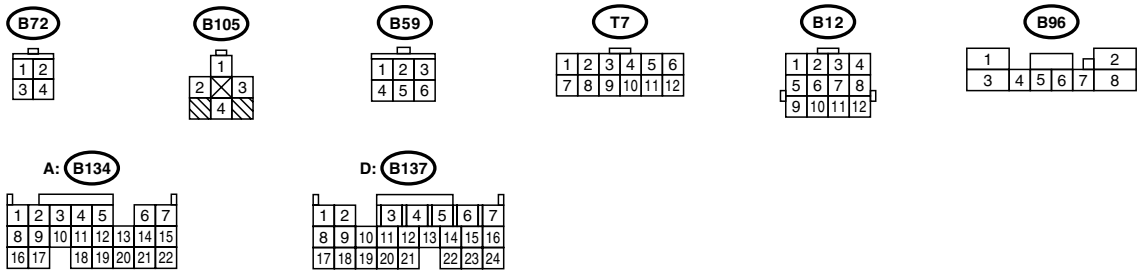
AT model





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	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the measured value more than 12 V?	Go to step **2.**	Charge or replace the battery.
2	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: •On AT models, place the select lever in the "P" or "N" range. •On MT models, depress the clutch pedal.	Is the measured value more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the measured value less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair open circuit of ground cable.
4	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
5	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. ***Terminals*** ***No. 1 — No. 3:***	Is the measured value less than 5 Ω?	Go to step **6.**	Replace the ignition switch.
6	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to ST. ***Connector & terminal*** ***(B105) No. 1 (+) — Chassis ground (–):*** ***(B105) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-24, Security System.>

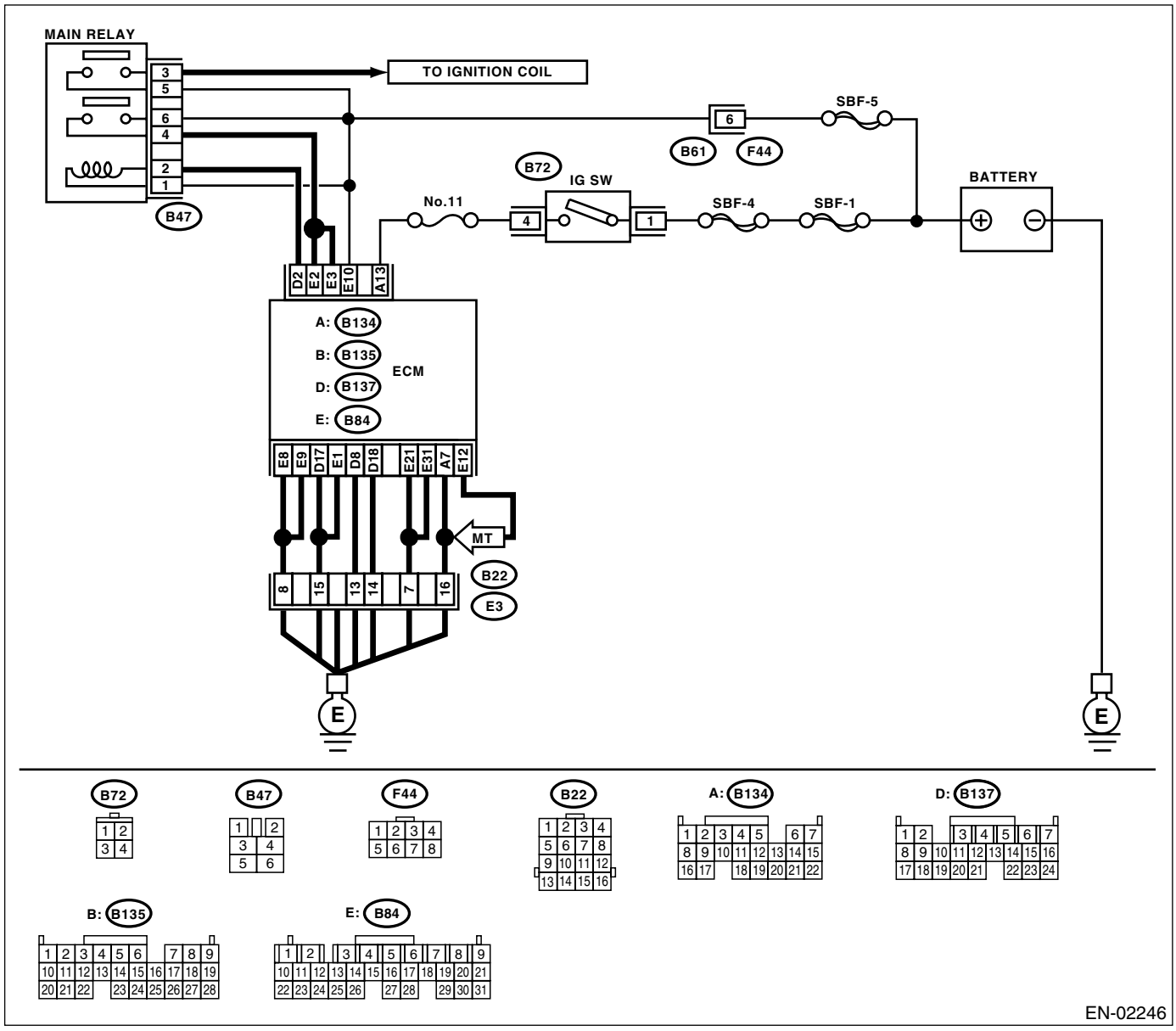
	Step	Check	Yes	No
7	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals. ***MT: No. 2 and No. 3*** ***AT: No. 3 and No. 4*** 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***MT: No. 1 - No. 4:*** ***AT: No. 1 - No. 2:***	Is the measured value less than 1 Ω?	Go to step **8.**	Replace the starter interlock relay.
8	**CHECK TRANSMISSION TYPE.**	Is the target AT model?	Go to step **9.**	Go to step **11.**
9	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-24, Security System.>
10	**CHECK INHIBITOR SWITCH.** 1) Place the select lever in the “P” or “N” range. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the measured value less than 1 Ω?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
11	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 2 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **12.**	Repair open circuit of ground cable.
12	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **13.**	Replace the clutch switch. <Ref. to CL-32, Clutch Switch.>
13	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B105) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 Ω?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

MEMO:

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

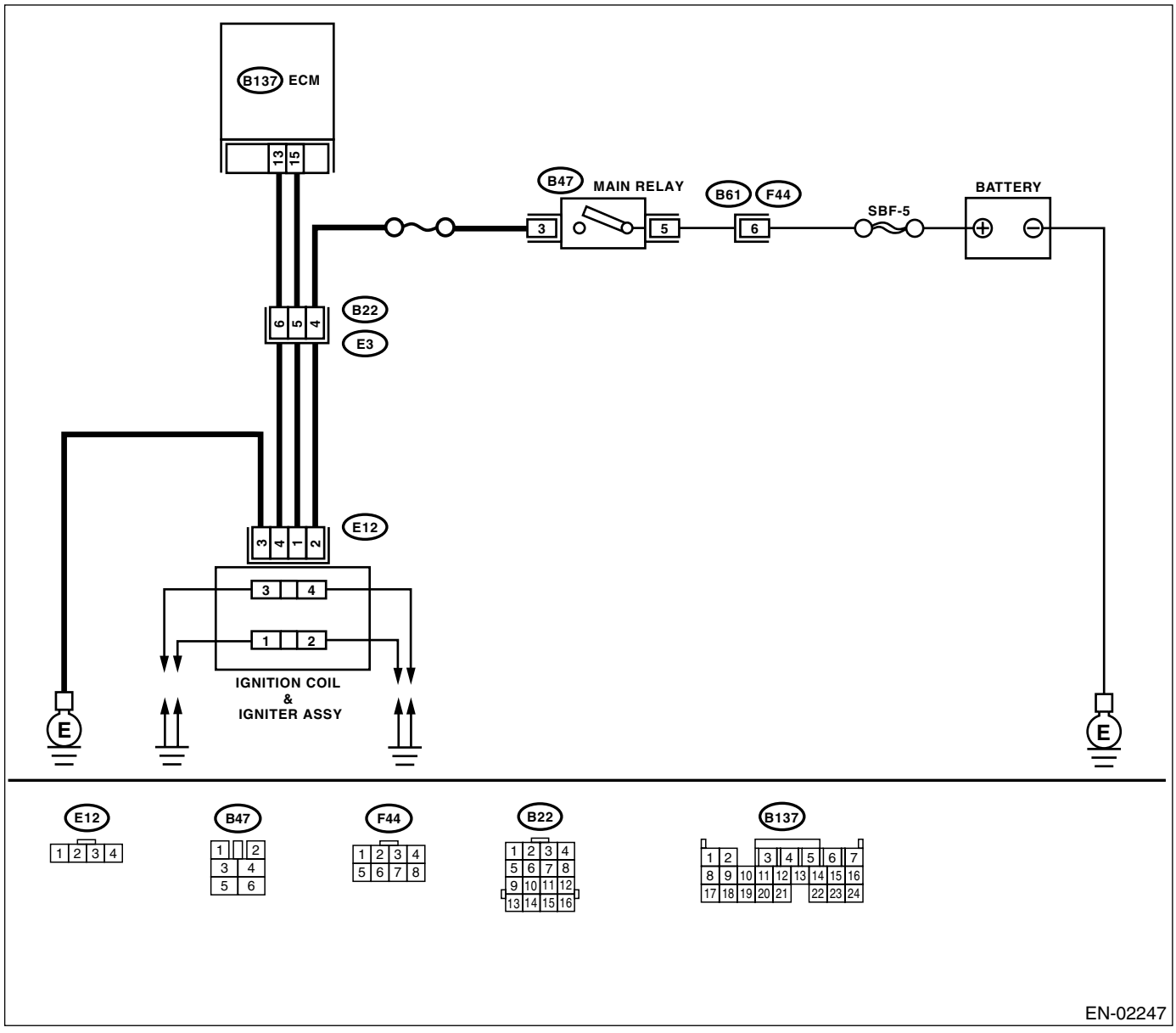


	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the measured value less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 17 — Chassis ground:*** ***(B137) No. 18 — Chassis ground:*** ***(B84) No. 1 — Chassis ground:*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — Chassis ground:*** ***(B84) No. 12 — Chassis ground: (MT model)*** ***(B84) No. 21 — Chassis ground:*** ***(B84) No. 31 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (–):*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair open or ground short circuit in harness of power supply circuit.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 2 (+) — Chassis ground (–):*** ***(B84) No. 3 (+) — Chassis ground (–):*** ***(B137) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Check ignition control system. <Ref. to EN(H4SO U5)-80, IGNITION CONTROL SYSTEM.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Remove the plug cord cap from each spark plug. 2) Install the new spark plug on plug cord cap. **CAUTION:** **Do not remove the spark plug from engine.** 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4SO U5)-84, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor ASSY. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor ASSY, and ignition switch connector • Poor contact in coupling connectors
3	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor ASSY connector and engine grounding terminal
4	**CHECK IGNITION COIL & IGNITOR ASSY.** 1) Remove the spark plug cords. 2) Measure the resistance between spark plug cord contact portions to check secondary coil. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 4:***	Is the measured value 10 to 15 kΩ?	Go to step **5.**	Replace the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, Ignition Coil and Ignitor Assembly.>
5	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSY.** 1) Connect the connector to ignition coil & ignitor ASSY. 2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 1 (+) — Engine ground (–):*** ***(E12) No. 4 (+) — Engine ground (–):***	Does the voltage vary more than 10 V?	Go to step **6.**	Replace the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, Ignition Coil and Ignitor Assembly.>

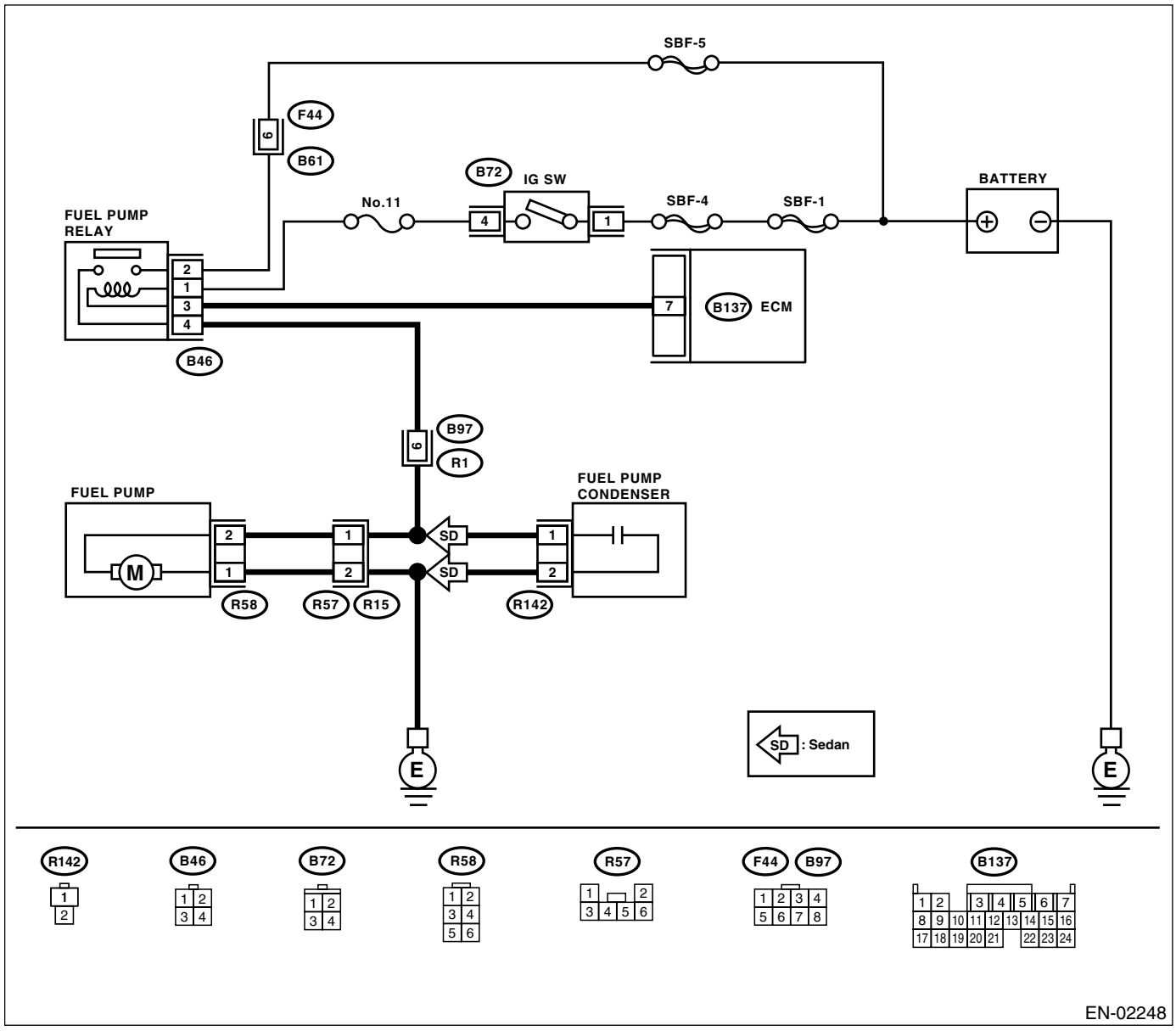
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor ASSY. 4) Measure the resistance of harness between ECM and ignition coil & ignitor ASSY connector. ***Connector & terminal*** ***(B137) No. 15 — (E12) No. 1:*** ***(B137) No. 13 — (E12) No. 4:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor ASSY connector • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B137) No. 15 — Engine ground:*** ***(B137) No. 13 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor ASSY connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4SO U5)-84, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

MEMO:

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02248

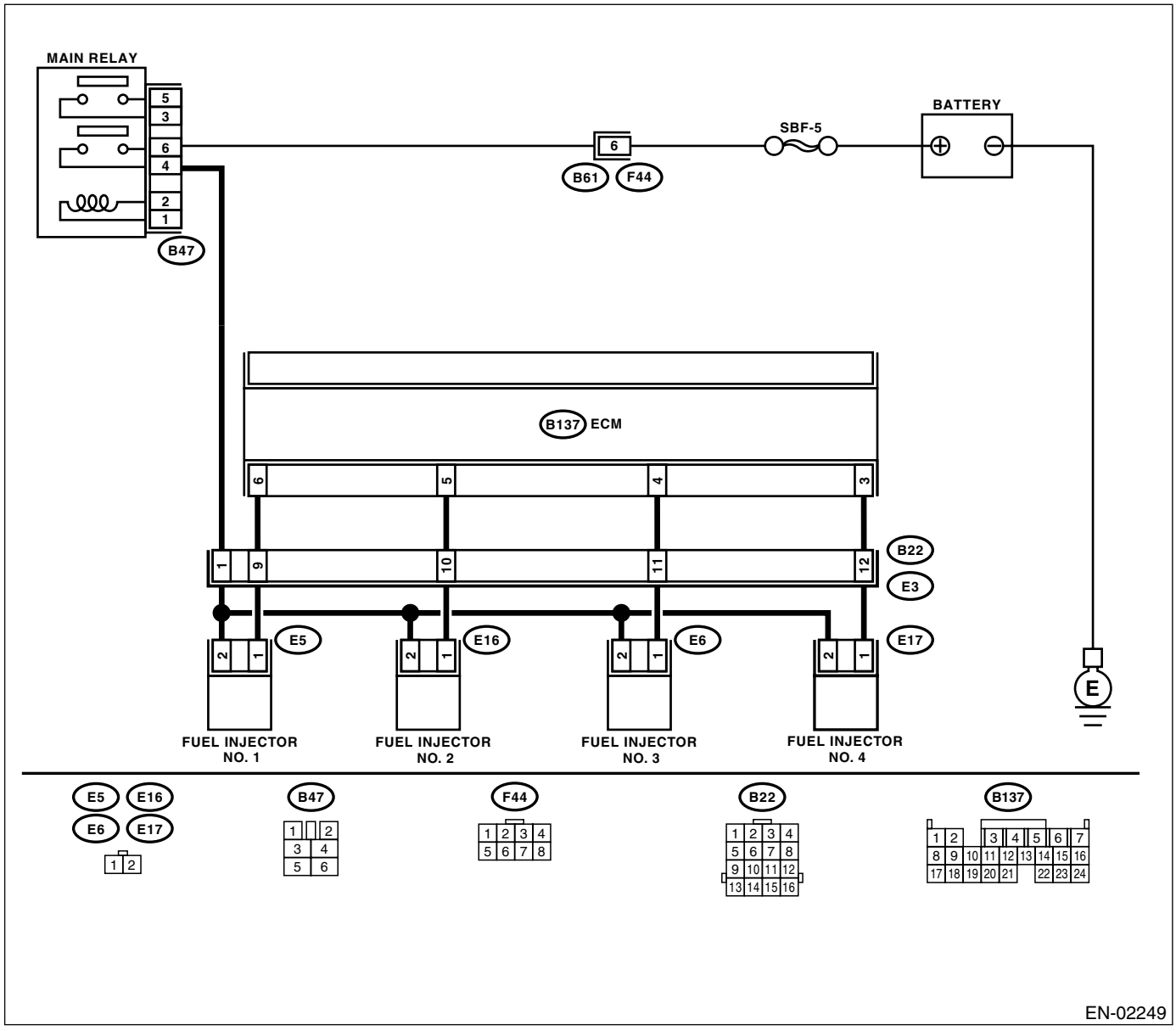
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(H4SO U5)-88, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1) Turn the ignition switch to OFF. 2) Remove the fuel pump access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the resistance of harness connector between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 1— Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
3	**CHECK POWER SUPPLY TO FUEL PUMP.** 1) Turn the ignition switch to ON. 2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace the fuel pump. <Ref. to FU(H4SO U5)-70, Fuel Pump.>	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness connector between fuel pump and fuel pump relay. ***Connector & terminal*** ***(R58) No. 2 — (B46) No. 4:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure the resistance of harness between fuel pump and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between fuel pump and fuel pump relay connector.

	Step	Check	Yes	No
6	**CHECK FUEL PUMP RELAY.** 1) Disconnect the connectors from fuel pump relay and main relay. 2) Remove the fuel pump relay and main relay with bracket. 3) Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure the resistance between connector terminals of fuel pump relay. ***Terminals*** ***No. 2 — No. 4:***	Is the measured value less than 10 Ω?	Go to step **7.**	Replace the fuel pump relay. <Ref. to FU(H4SO U5)-51, Fuel Pump Relay.>
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal*** ***(B137) No. 7— (B46) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and fuel pump relay connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(H4SO U5)-88, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

MEMO:

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.**
- **WIRING DIAGRAM:**



EN-02249

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to the injector for this check.	Dose the fuel injector operate?	Check the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B137) No. 6 — (E5) No. 1:*** ***#2 (B137) No. 5 — (E16) No. 1:*** ***#3 (B137) No. 4 — (E6) No. 1:*** ***#4 (B137) No. 3 — (E17) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B137) No. 6 — Chassis ground:*** ***#2 (B137) No. 5 — Chassis ground:*** ***#3 (B137) No. 4 — Chassis ground:*** ***#4 (B137) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value 5 to 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4SO U5)-488, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-100, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-102, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-104, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4SO U5)-106, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4SO U5)-110, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0043	HO2S Heater Control Circuit Low (Bank 1 Sensor 3)	<Ref. to EN(H4SO U5)-112, DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0044	HO2S Heater Control Circuit High (Bank 1 Sensor 3)	<Ref. to EN(H4SO U5)-116, DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-118, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-120, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-122, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to EN(H4SO U5)-124, DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to EN(H4SO U5)-128, DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem	<Ref. to EN(H4SO U5)-130, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4SO U5)-132, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4SO U5)-134, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4SO U5)-138, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4SO U5)-140, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4SO U5)-144, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(H4SO U5)-148, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4SO U5)-150, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4SO U5)-152, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4SO U5)-156, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4SO U5)-158, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4SO U5)-161, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(H4SO U5)-165, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4SO U5)-168, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4SO U5)-170, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4SO U5)-171, DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-172, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-174, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-176, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4SO U5)-178, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO U5)-180, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO U5)-184, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4SO U5)-188, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0143	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 3)	<Ref. to EN(H4SO U5)-190, DTC P0143 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0144	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 3)	<Ref. to EN(H4SO U5)-194, DTC P0144 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0151	O_2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-198, DTC P0151 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0152	O_2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-200, DTC P0152 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-202, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0154	O_2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-204, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0157	O_2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to EN(H4SO U5)-206, DTC P0157 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0158	O_2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to EN(H4SO U5)-210, DTC P0158 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0159	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	<Ref. to EN(H4SO U5)-214, DTC P0159 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(H4SO U5)-216, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0174	System too Lean (Bank 2)	<Ref. to EN(H4SO U5)-216, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	System too Rich (Bank 2)	<Ref. to EN(H4SO U5)-217, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4SO U5)-220, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H4SO U5)-222, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H4SO U5)-224, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to EN(H4SO U5)-227, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to EN(H4SO U5)-231, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4SO U5)-234, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4SO U5)-234, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4SO U5)-234, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4SO U5)-236, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO U5)-244, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO U5)-246, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4SO U5)-248, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4SO U5)-250, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4SO U5)-252, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(H4SO U5)-254, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation	<Ref. to EN(H4SO U5)-258, DTC P0400 — EXHAUST GAS RECIRCULATION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4SO U5)-261, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to EN(H4SO U5)-263, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4SO U5)-268, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4SO U5)-272, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(H4SO U5)-274, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4SO U5)-276, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4SO U5)-280, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to EN(H4SO U5)-283, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to EN(H4SO U5)-287, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4SO U5)-292, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4SO U5)-296, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(H4SO U5)-298, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4SO U5)-300, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4SO U5)-304, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4SO U5)-308, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4SO U5)-311, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4SO U5)-314, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to EN(H4SO U5)-316, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(H4SO U5)-319, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(H4SO U5)-323, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4SO U5)-326, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4SO U5)-331, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	CAN Communication Circuit	<Ref. to EN(H4SO U5)-334, DTC P0600 — CAN COMMUNICATION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4SO U5)-336, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4SO U5)-338, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4SO U5)-340, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4SO U5)-342, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4SO U5)-343, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4SO U5)-347, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(H4SO U5)-350, DTC P0703 — TORQUE CONVERTER/ BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to EN(H4SO U5)-352, DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to EN(H4SO U5)-352, DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0716	Torque Converter Turbine Speed Sensor	<Ref. to EN(H4SO U5)-352, DTC P0716 — OUTPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	<Ref. to EN(H4SO U5)-352, DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to EN(H4SO U5)-352, DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	<Ref. to EN(H4SO U5)-352, DTC P0731 — GEAR 1 INCORRECT RATIO — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	<Ref. to EN(H4SO U5)-352, DTC P0732 — GEAR 2 INCORRECT RATIO — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	<Ref. to EN(H4SO U5)-352, DTC P0733 — GEAR 3 INCORRECT RATIO — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	<Ref. to EN(H4SO U5)-353, DTC P0734 — GEAR 4 INCORRECT RATIO — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(H4SO U5)-354, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to EN(H4SO U5)-356, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to EN(H4SO U5)-356, DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to EN(H4SO U5)-356, DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to EN(H4SO U5)-356, DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift Solenoid “E” Performance or Stuck Off	<Ref. to EN(H4SO U5)-356, DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to EN(H4SO U5)-356, DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to EN(H4SO U5)-356, DTC P0785 — SHIFT/TIMING SOLENOID —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4SO U5)-358, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO U5)-358, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4SO U5)-364, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO U5)-364, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/ Performance	<Ref. to EN(H4SO U5)-372, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM Communication Circuit Low	<Ref. to EN(H4SO U5)-374, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM Communication Circuit High	<Ref. to EN(H4SO U5)-376, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(H4SO U5)-378, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(H4SO U5)-382, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(H4SO U5)-384, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(H4SO U5)-384, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4SO U5)-386, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4SO U5)-388, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4SO U5)-390, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4SO U5)-390, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4SO U5)-392, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4SO U5)-394, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	O_2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-396, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK2 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1155	O_2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to EN(H4SO U5)-398, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK2 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4SO U5)-400, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4SO U5)-402, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Solenoid Valve Circuit High	<Ref. to EN(H4SO U5)-406, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4SO U5)-408, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to EN(H4SO U5)-410, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to EN(H4SO U5)-414, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance Problem	<Ref. to EN(H4SO U5)-416, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO U5)-418, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H4SO U5)-418, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO U5)-418, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H4SO U5)-418, DTC P1495 — EGR SOLENOID VALVE SIGNAL # 2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO U5)-418, DTC P1496 — EGR SOLENOID VALVE SIGNAL # 3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H4SO U5)-418, DTC P1497 — EGR SOLENOID VALVE SIGNAL # 3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO U5)-419, DTC P1498 — EGR SOLENOID VALVE SIGNAL # 4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H4SO U5)-423, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low input	<Ref. to EN(H4SO U5)-426, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4SO U5)-430, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor	<Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4SO U5)-434, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4SO U5)-440, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	<Ref. to EN(H4SO U5)-446, DTC P2098 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	<Ref. to EN(H4SO U5)-452, DTC P2099 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4SO U5)-457, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4SO U5)-463, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4SO U5)-466, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to EN(H4SO U5)-468, DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H4SO U5)-470, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to EN(H4SO U5)-472, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to EN(H4SO U5)-474, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(H4SO U5)-476, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGHT INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to EN(H4SO U5)-479, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to EN(H4SO U5)-484, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

MEMO:

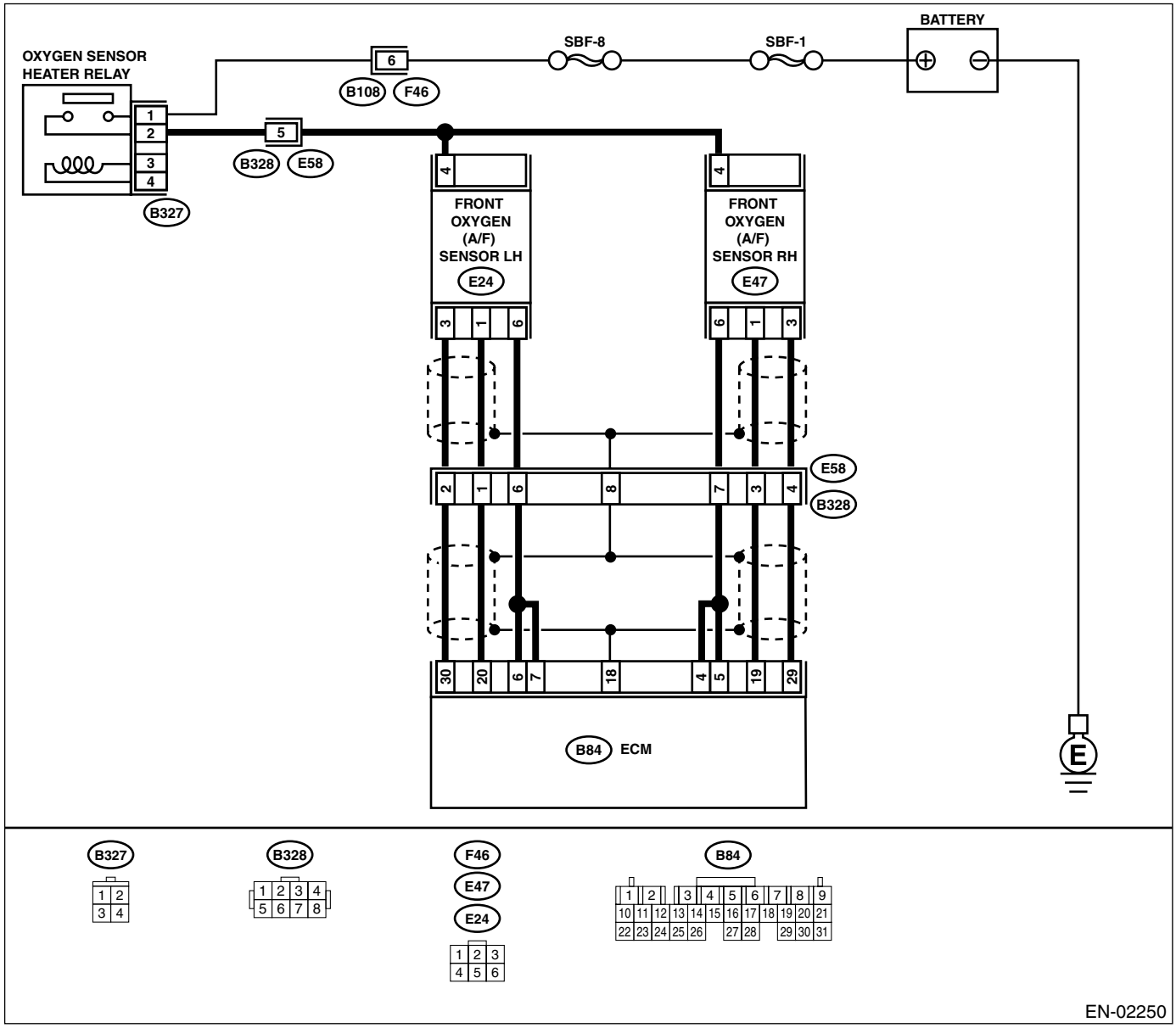
19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-12, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



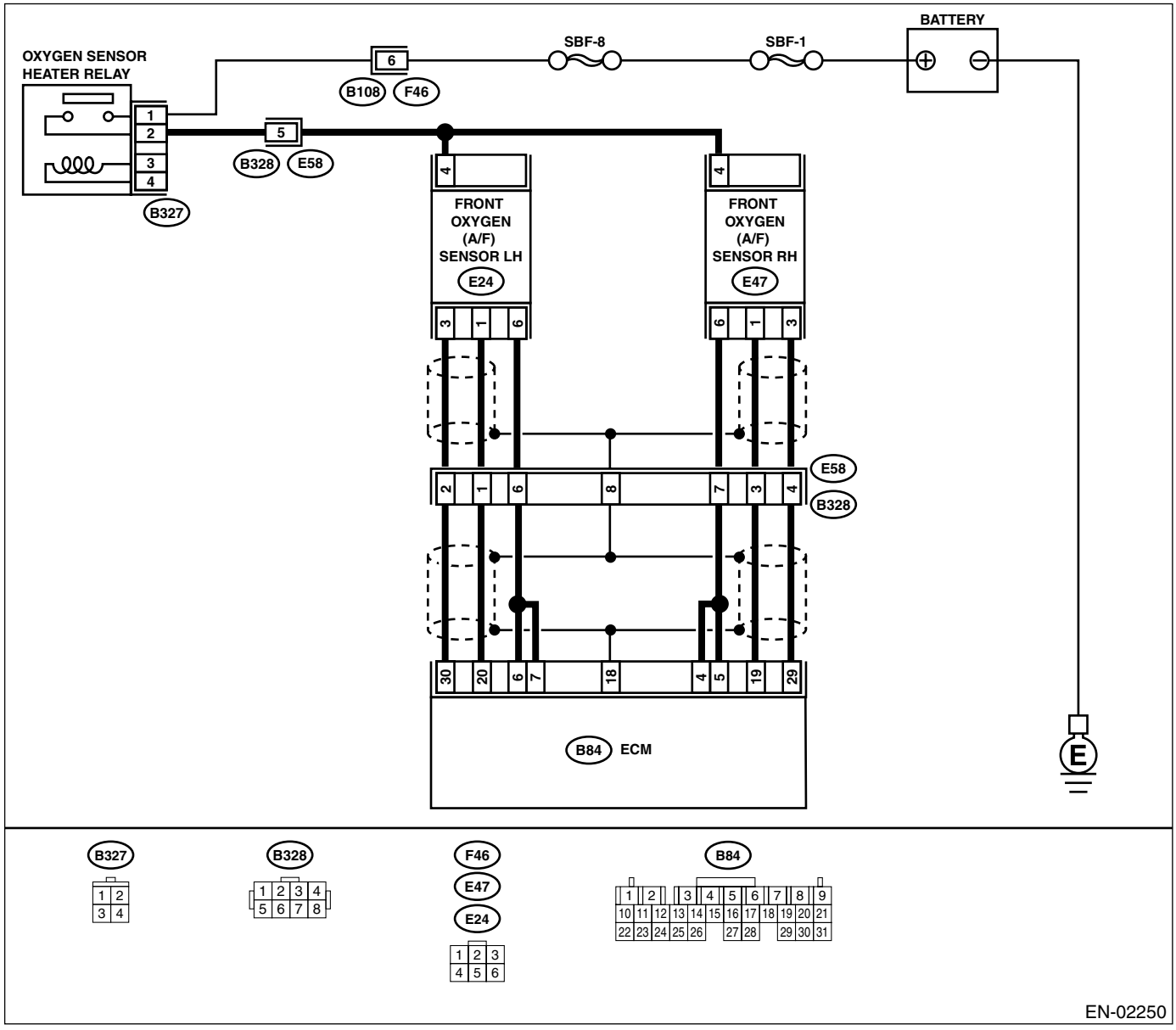
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 4 — (E47) No. 6:*** ***(B84) No. 5 — (E47) No. 6:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — (E47) No. 1:*** ***(B84) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 2 — (E47) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 6 — No. 4:***	Is the measured value less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-14, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



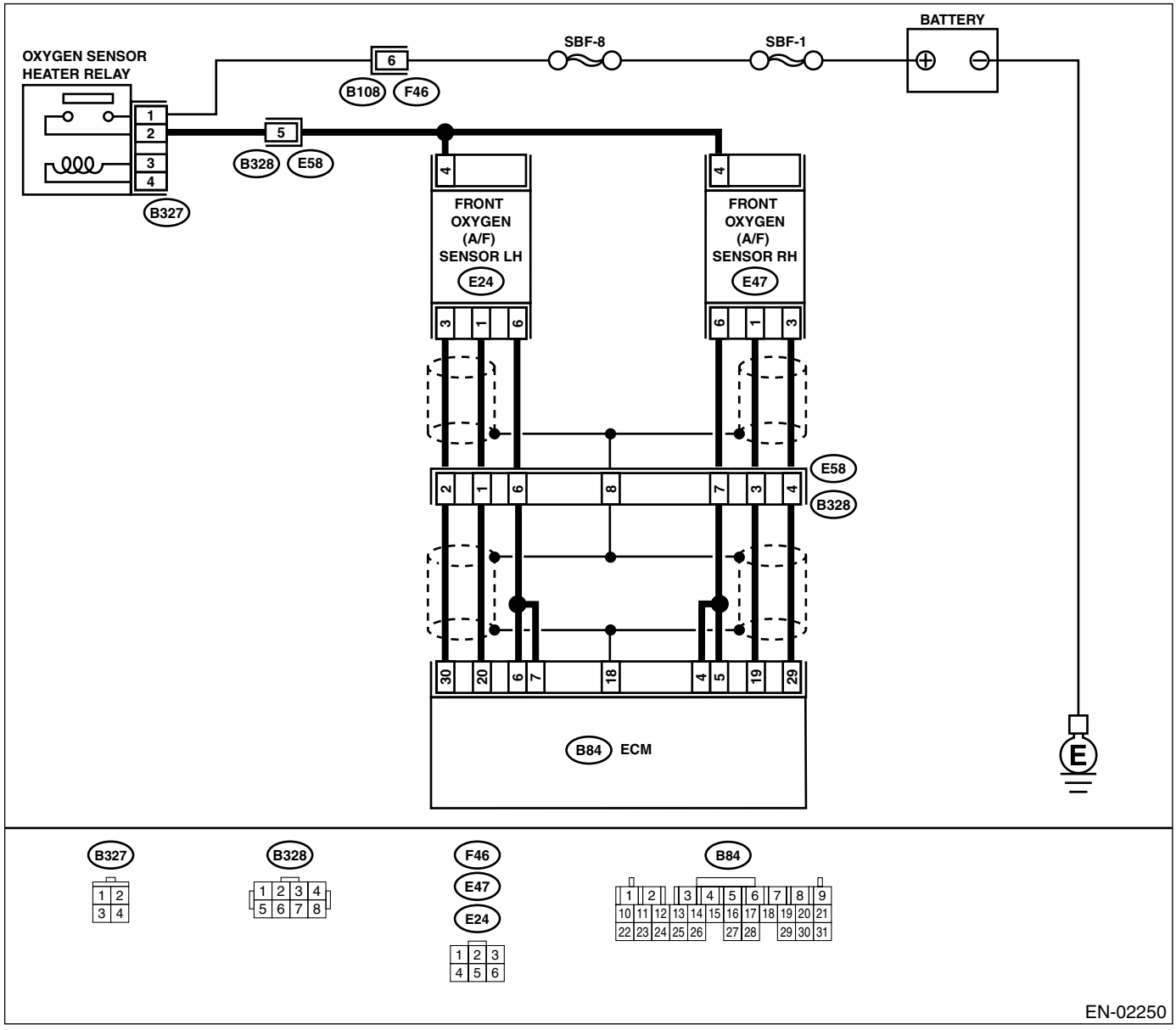
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Go to step **2.**	Go to step **5.**
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E47) No. 4 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK INPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 6 — No. 4:***	Is the measured value less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-16, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



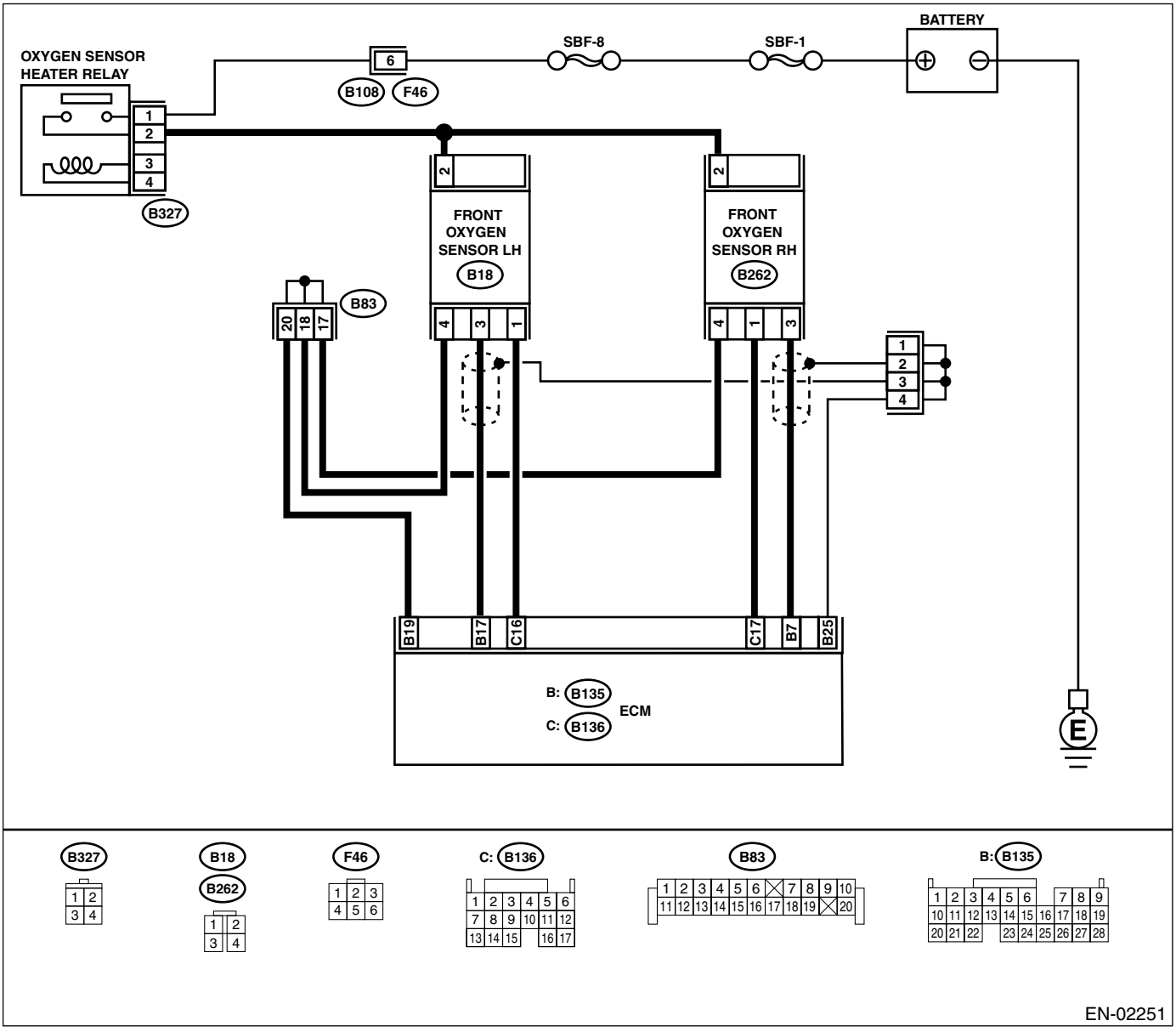
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.3 A?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-18, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in front oxygen sensor connector • Poor contact in front oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from front oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair battery short circuit in harness between ECM and front oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
5	**CHECK POWER SUPPLY TO FRONT OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B262) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen sensor connector • Poor contact in front oxygen sensor connector • Poor contact in coupling connector

	Step	Check	Yes	No
6	**CHECK FRONT OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between front oxygen sensor and ECM connector • Poor contact in front oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

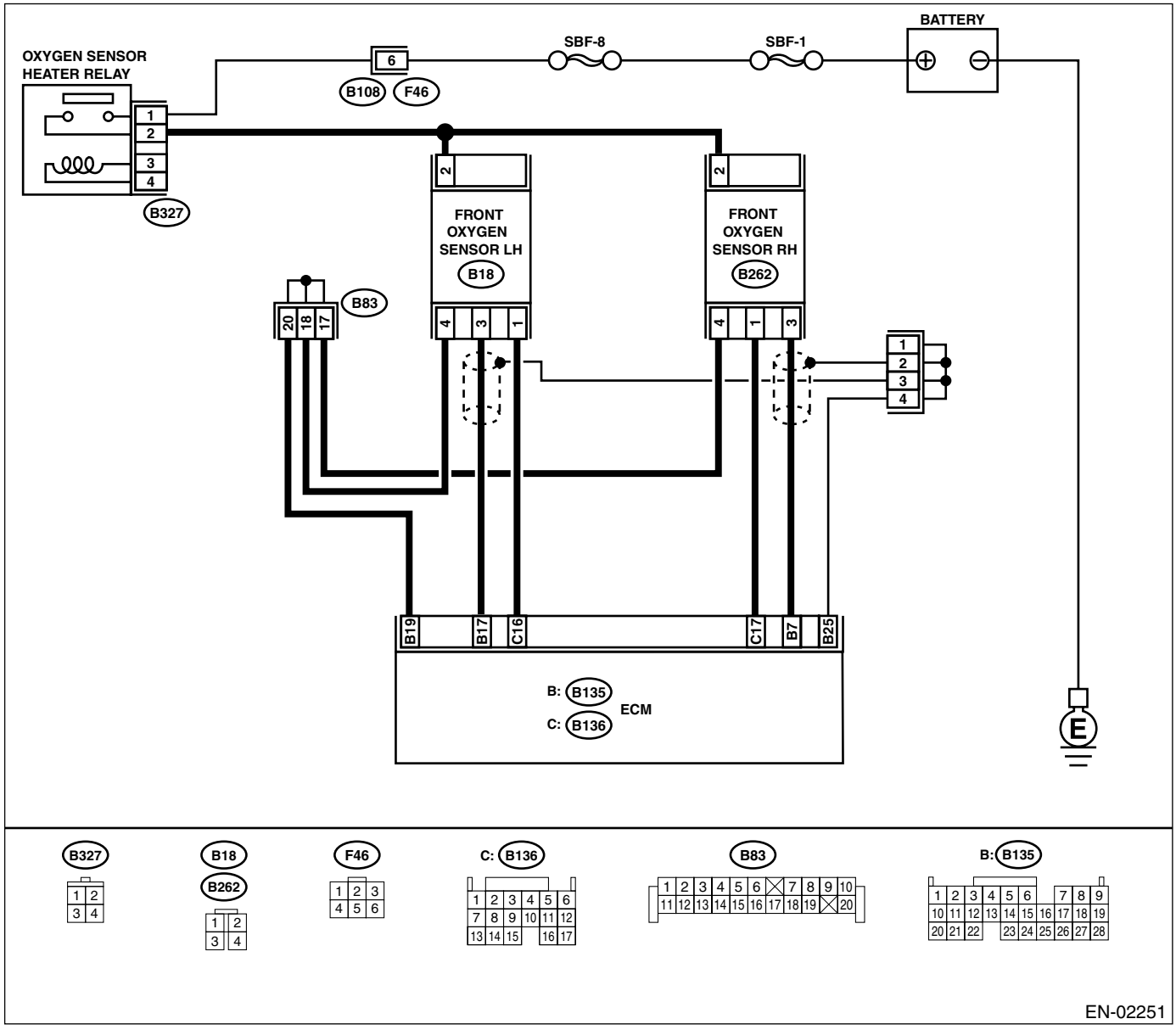
MEMO:

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



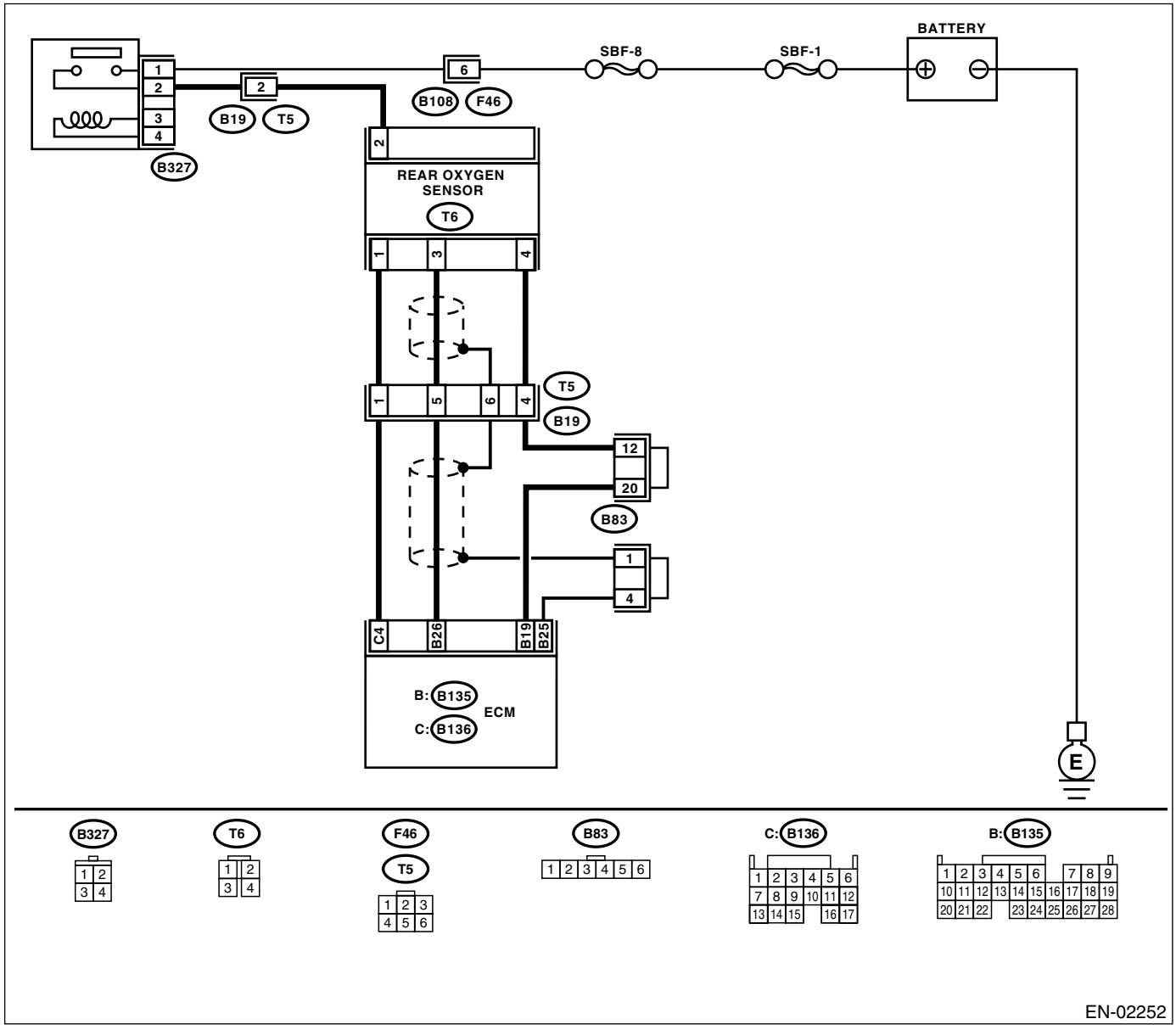
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 7 A?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

F: DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-22, DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
5	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector

Step		Check	Yes	No
6	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4SO U5)-48, Rear Oxygen Sensor.>

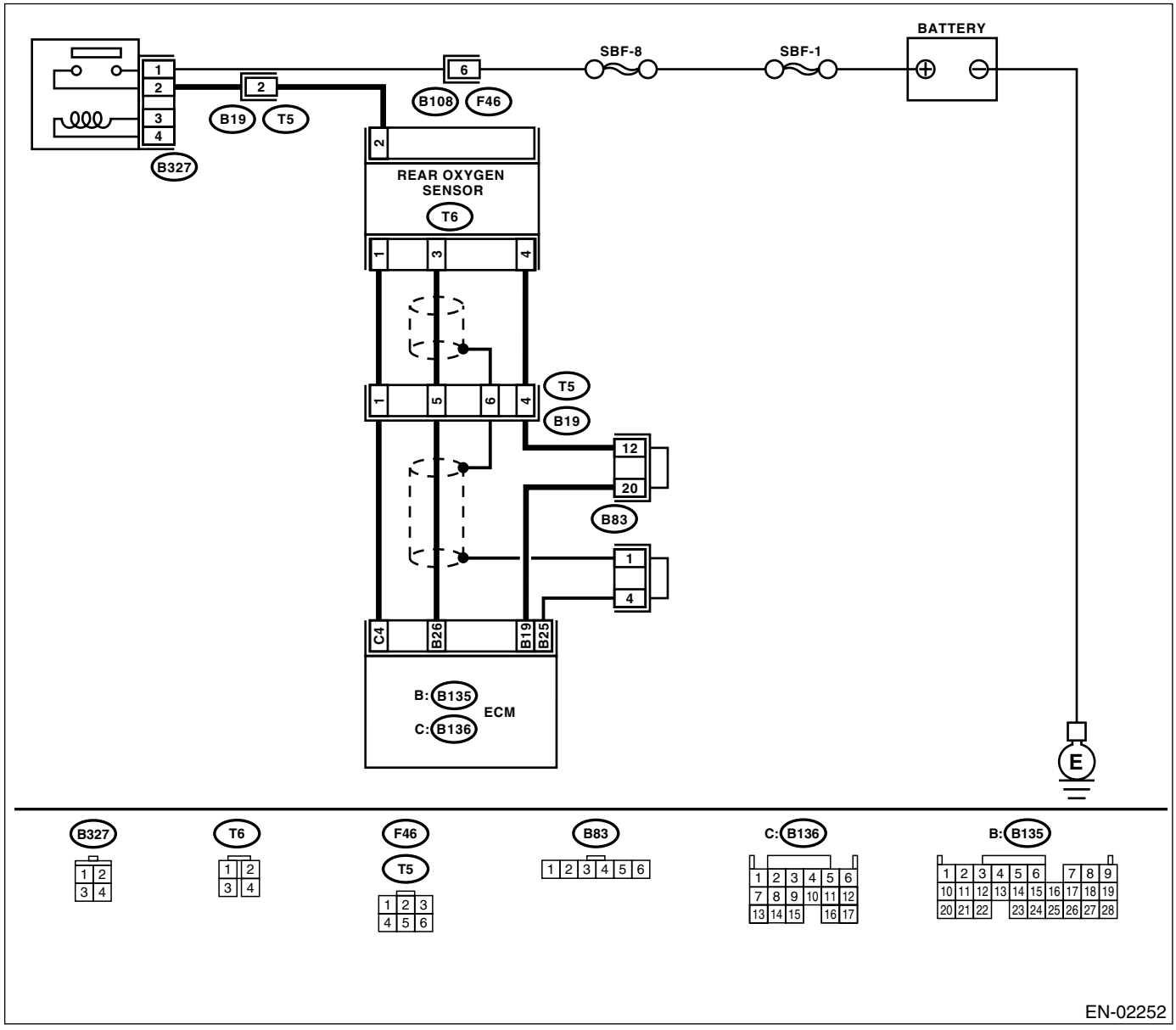
MEMO:

G: DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-24, DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



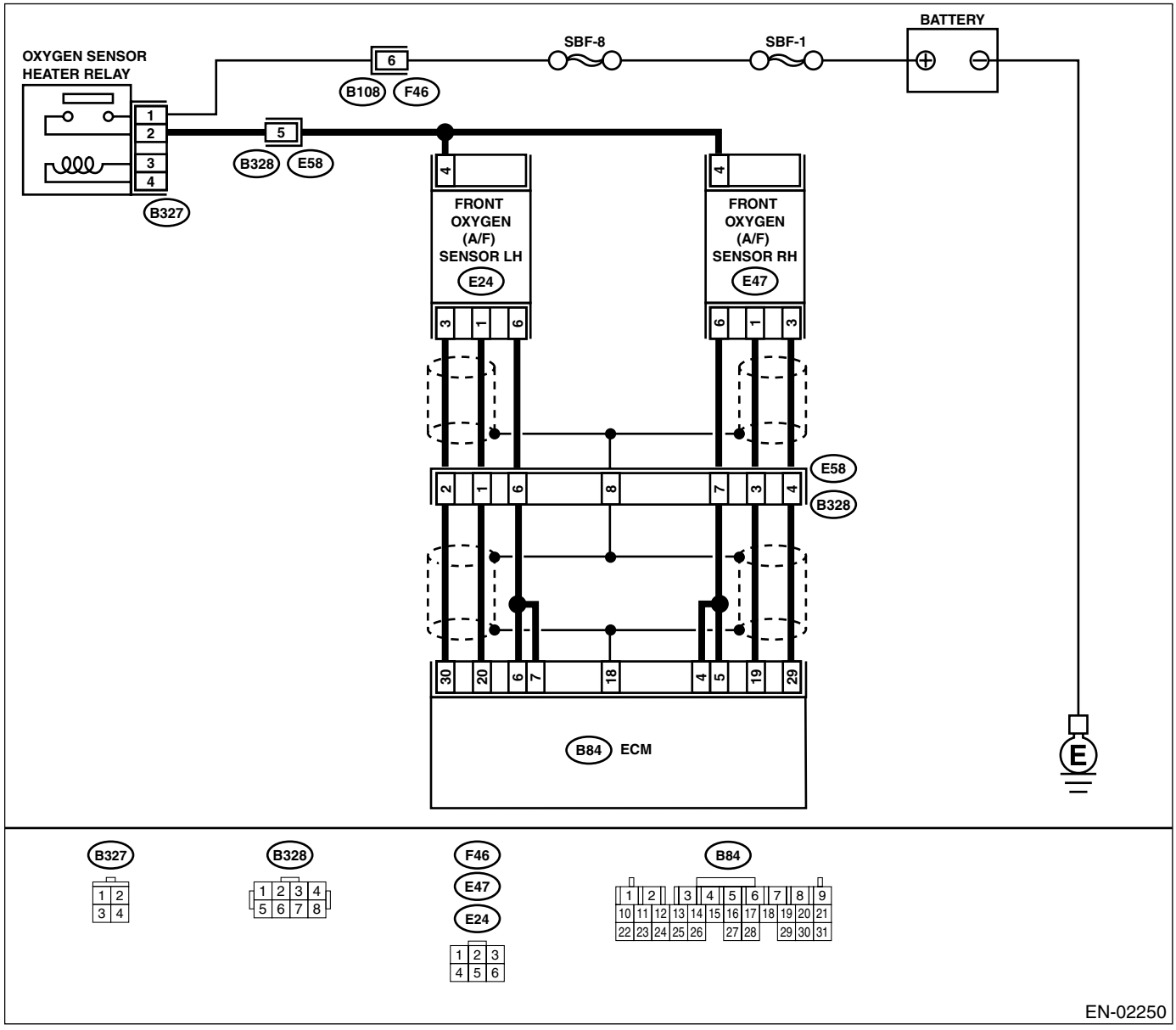
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 7 A?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

H: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-26, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



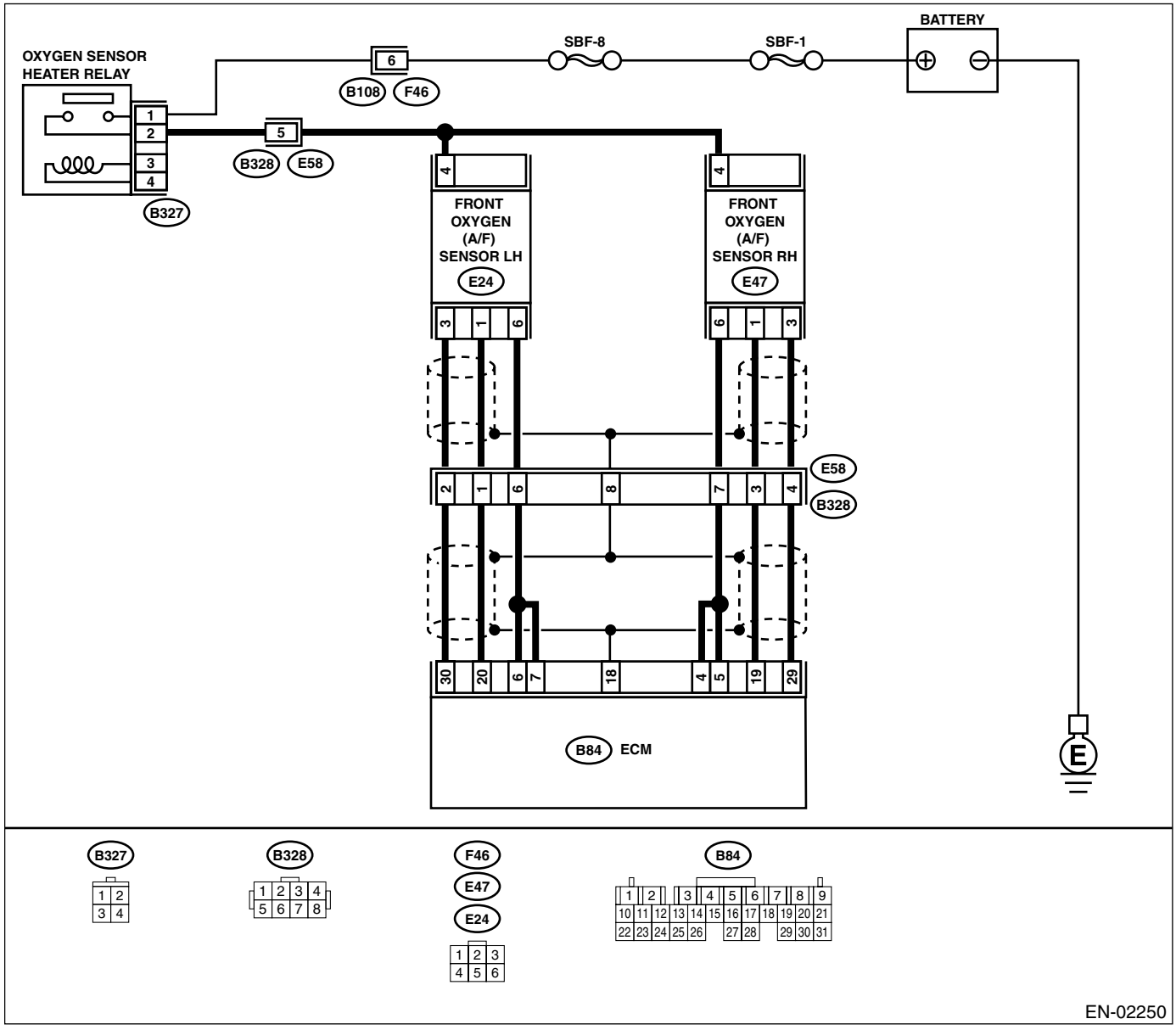
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 6 — (E24) No. 6:*** ***(B84) No. 7 — (E24) No. 6:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 20 — (E24) No. 1:*** ***(B84) No. 30 — (E24) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 2 — (E24) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 6 — No. 4:***	Is the measured value less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

I: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-26, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



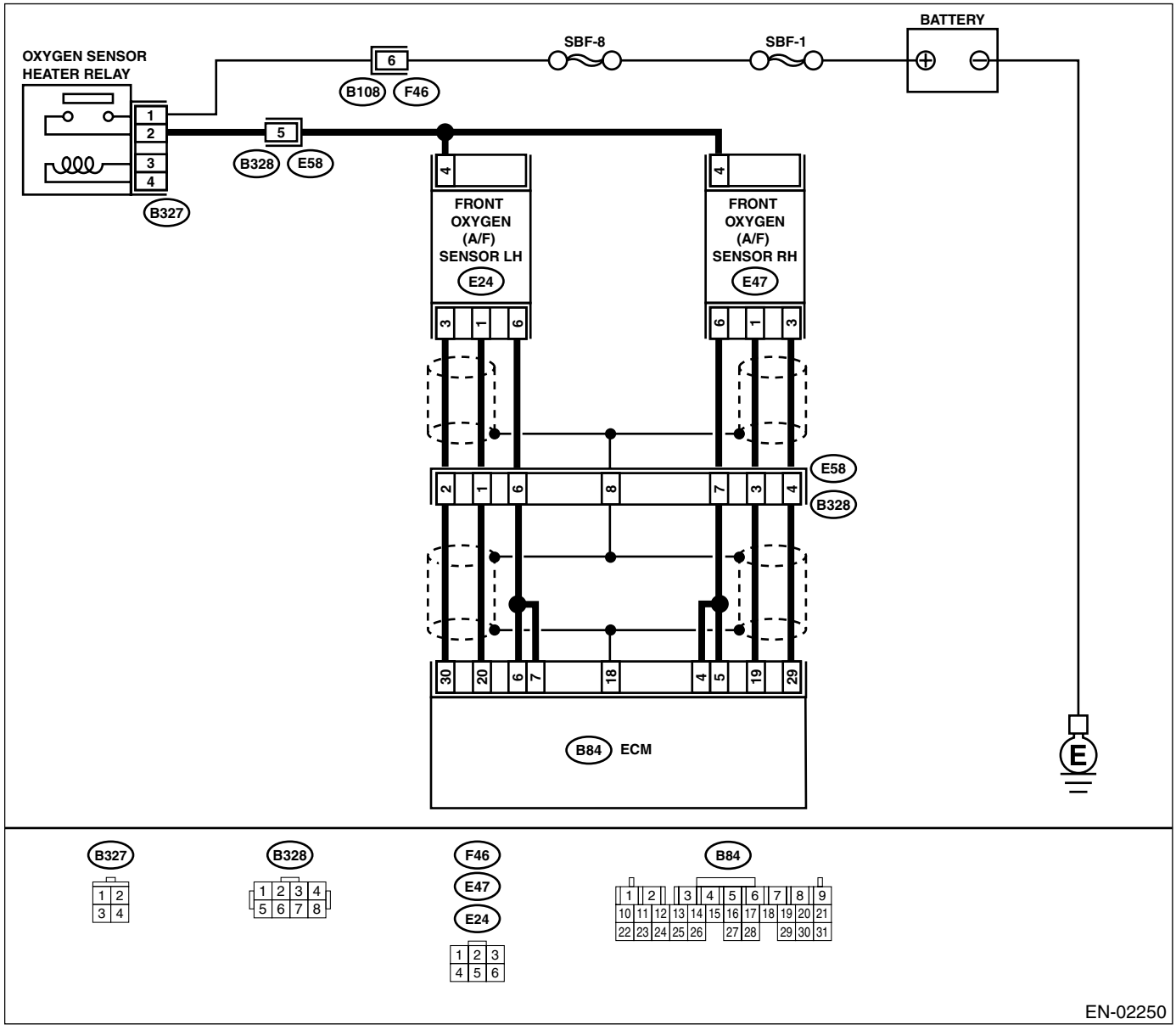
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Go to step **2.**	Go to step **5.**
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E24) No. 4 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK INPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 6 (+) — Chassis ground (–):*** ***(B84) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 6 (+) — Chassis ground (–):*** ***(B84) No. 7 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 6 — No. 4:***	Is the measured value less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

J: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-26, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



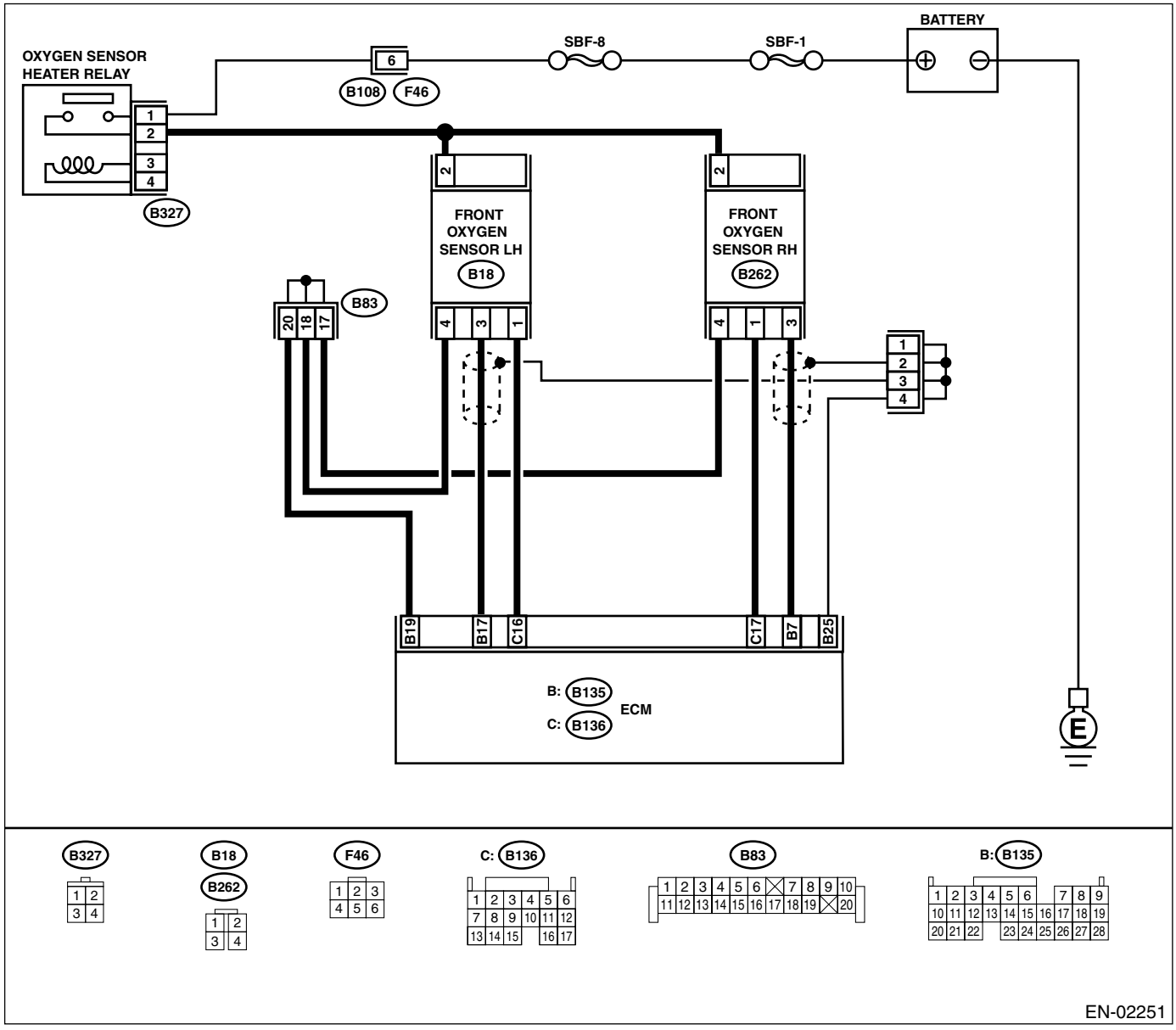
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 6 (+) — Chassis ground (–):*** ***(B84) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.3 A?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 6 (+) — Chassis ground (–):*** ***(B84) No. 7 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

K: DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-26, DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in front oxygen sensor connector • Poor contact in front oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from front oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair battery short circuit in harness between ECM and front oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
5	**CHECK POWER SUPPLY TO FRONT OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen sensor connector • Poor contact in front oxygen sensor connector • Poor contact in coupling connector

Step		Check	Yes	No
6	**CHECK FRONT OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between front oxygen sensor and ECM connector • Poor contact in front oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

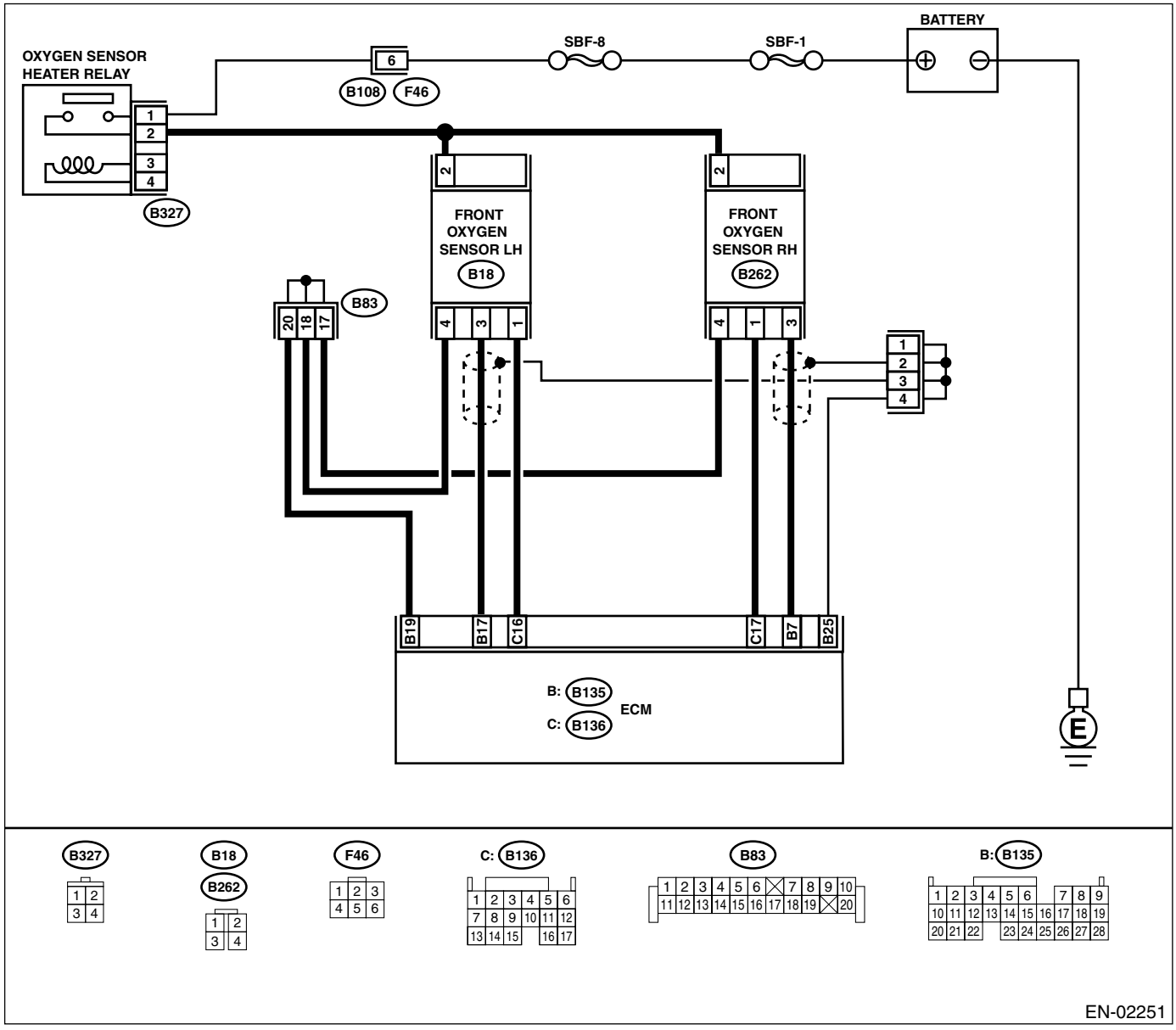
MEMO:

L: DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-26, DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



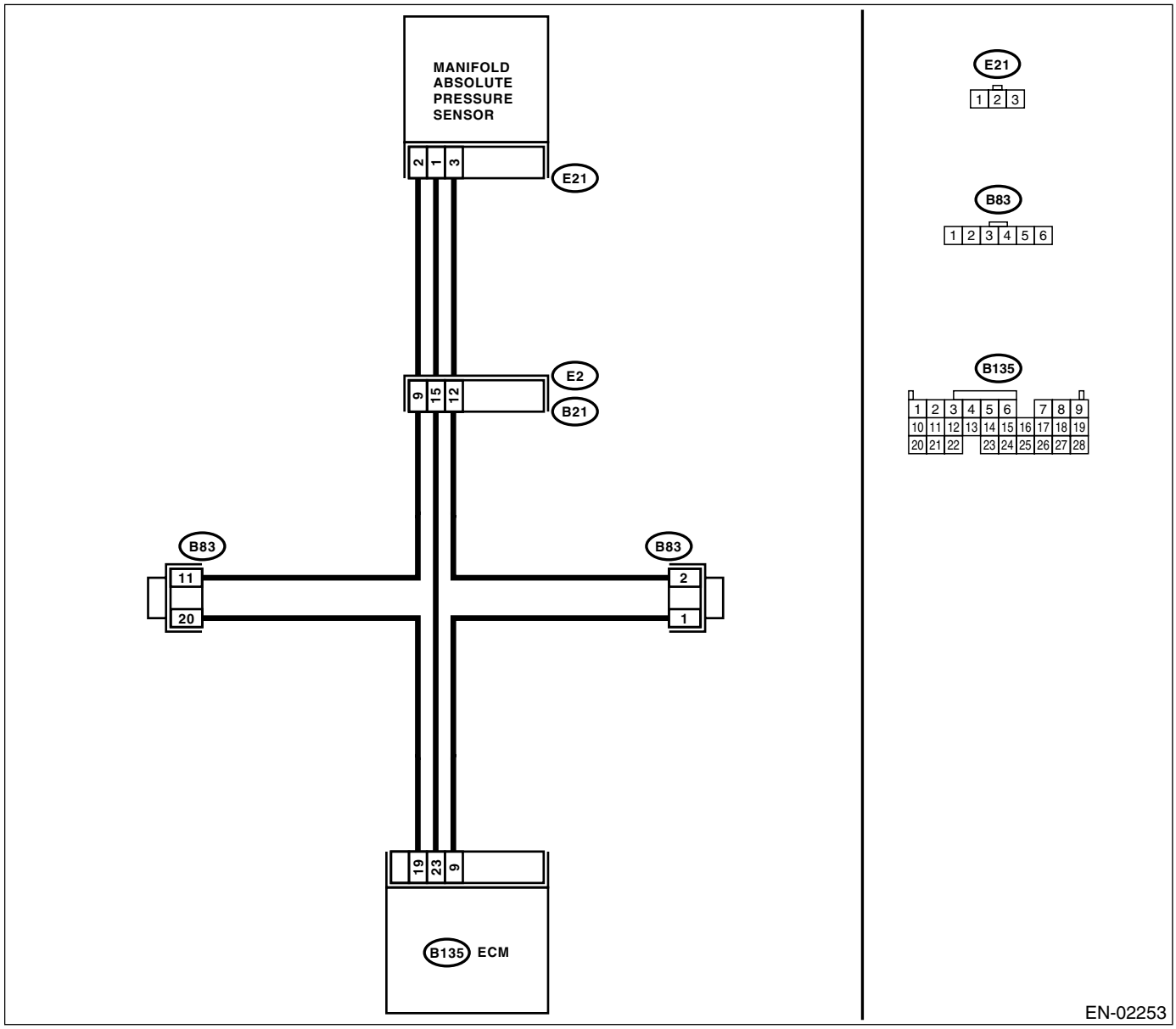
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 7 A?	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

M: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-28, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



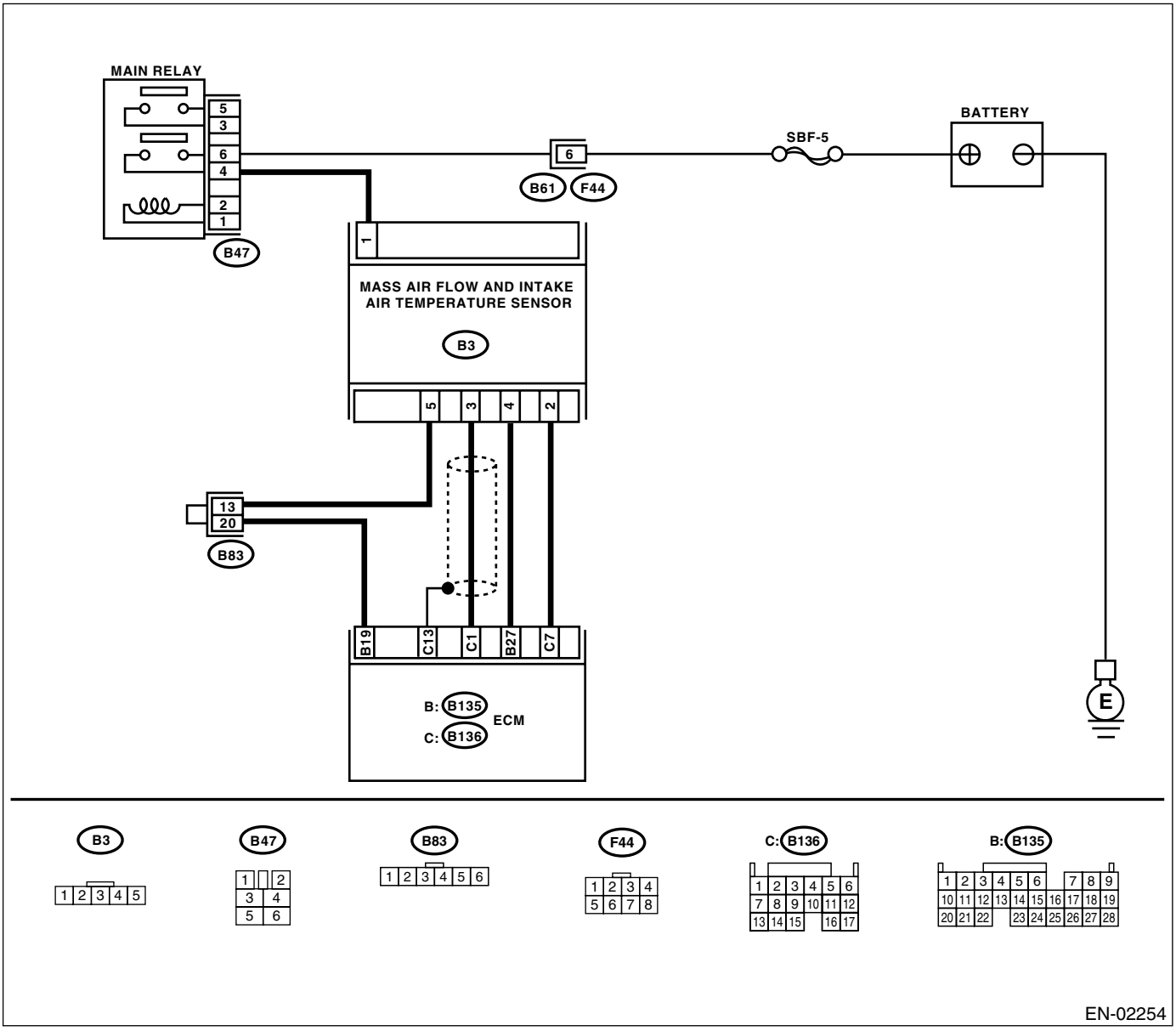
	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2.**	Check the throttle position sensor circuit. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0068.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0068.	Go to step **3.**
3	**CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.**	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step **4.**	Tighten the manifold absolute pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO U5)-32, PRESSURE SENSOR, .>	Tighten the throttle body installation bolt securely.

N: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-30, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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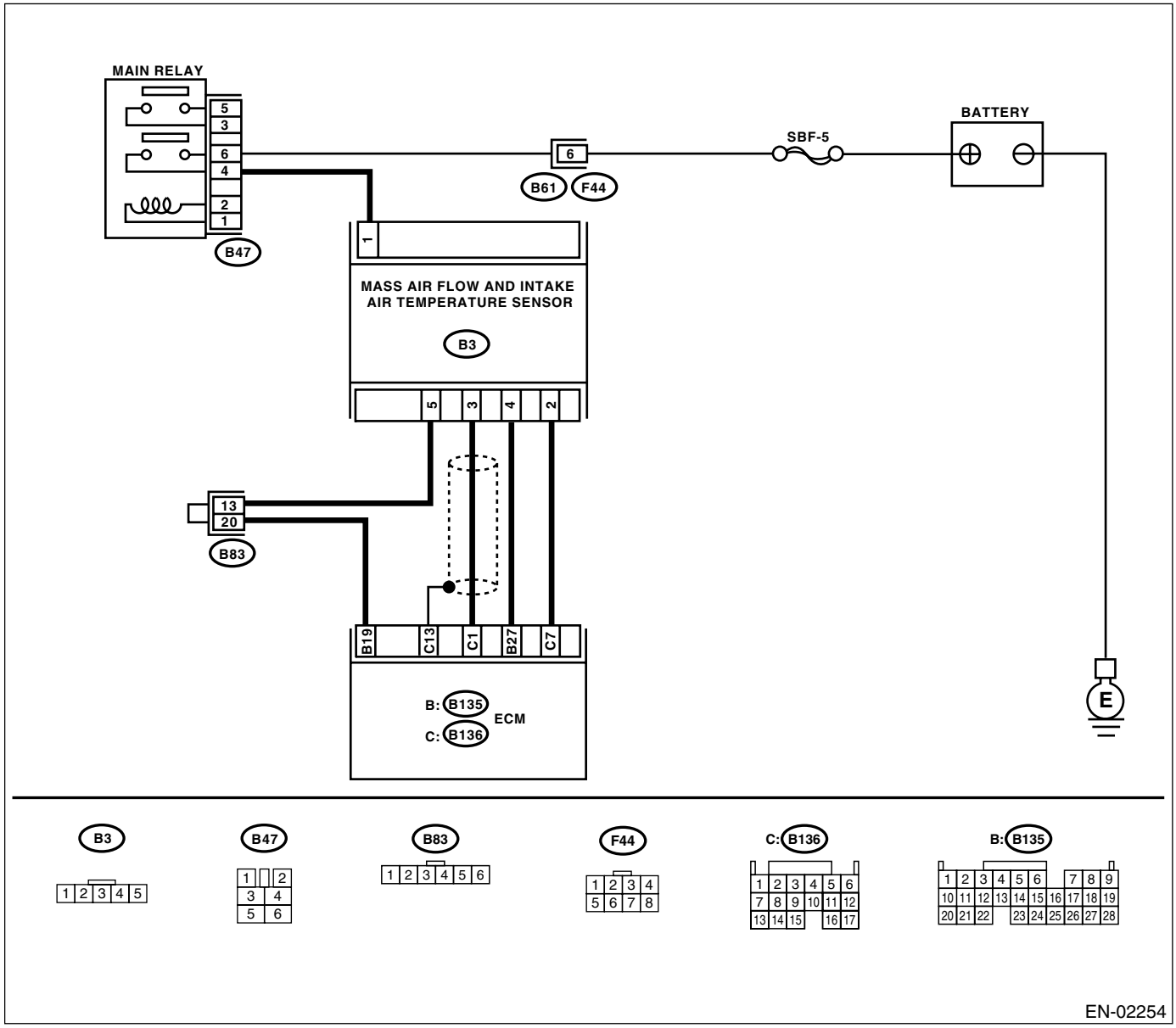
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

O: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-34, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.2 to 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 1 — (B3) No. 3:*** ***(B136) No. 7 — (B3) No. 2:*** ***(B135) No. 19 — (B3) No. 5:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:*** ***(B135) No. 19 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

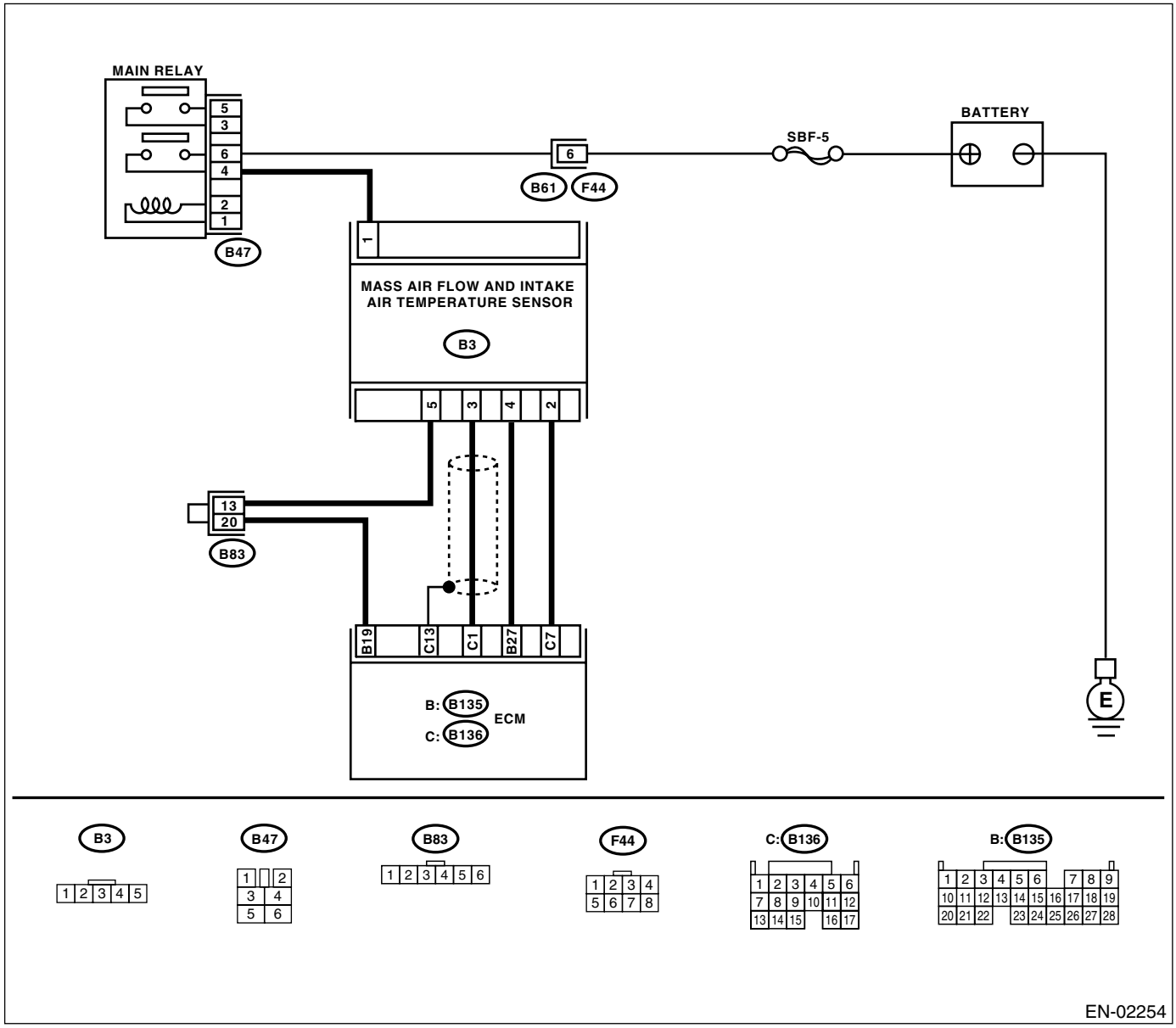
MEMO:

P: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-36, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



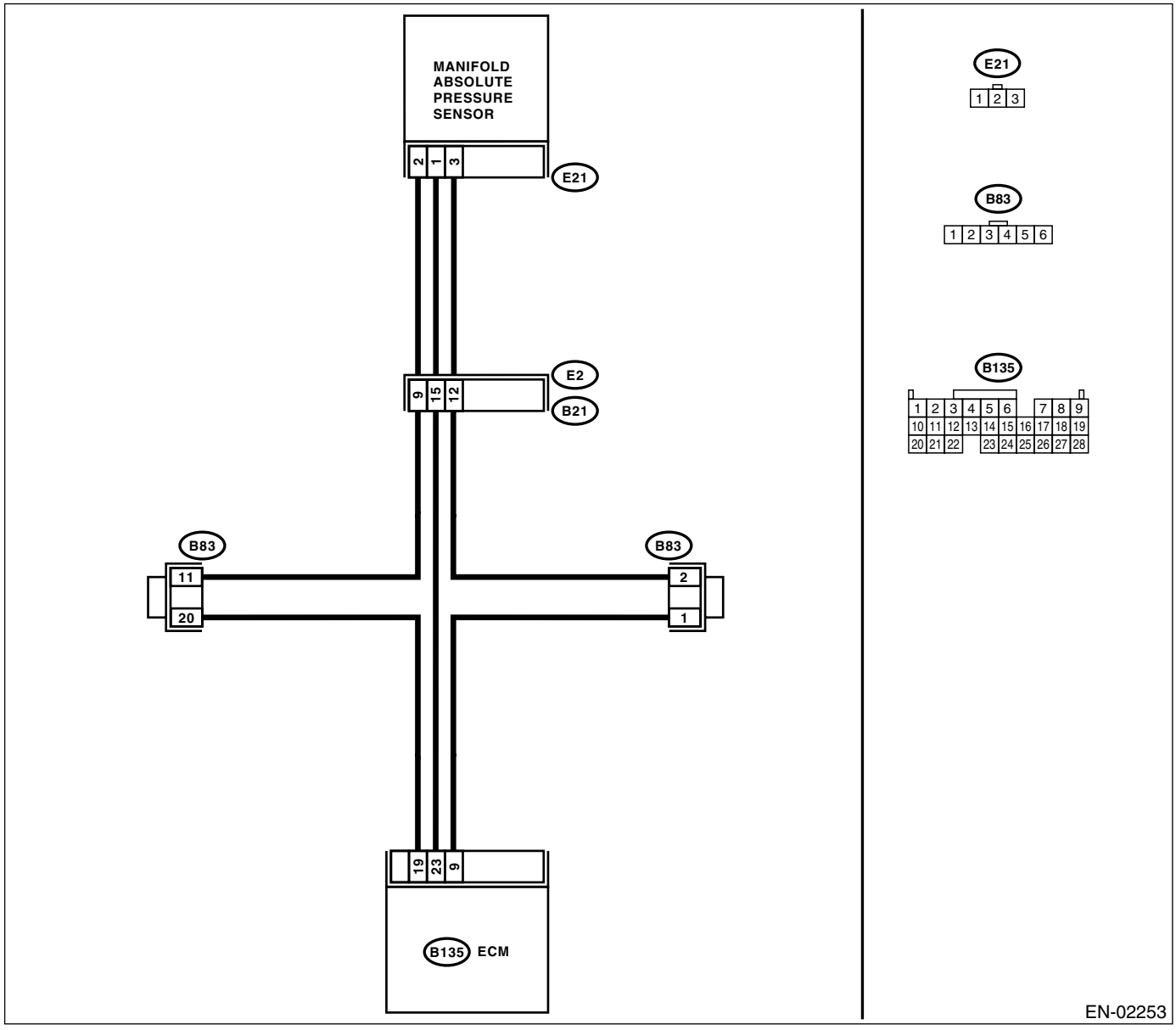
	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.2 to 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Repair the battery short of harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 7:***	Is the measured value less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow sensor connector and ECM connector.

Q: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-38, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and manifold absolute pressure sensor connector.	Is there poor contact in ECM or manifold absolute pressure sensor connector?	Repair poor contact in ECM or manifold absolute pressure sensor connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **7.**

Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **8.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
8	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO U5)-32, Pressure Sensor.>

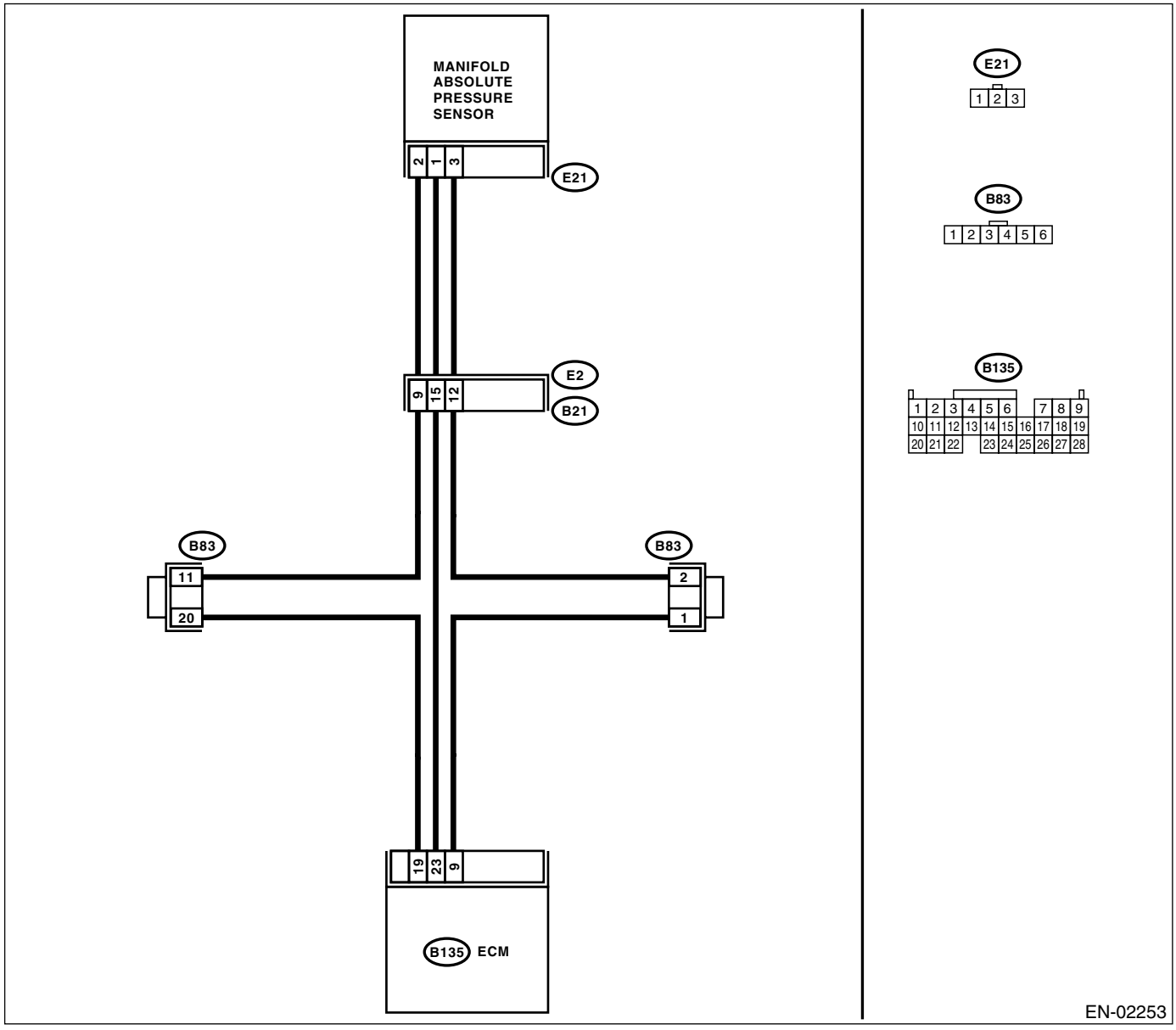
MEMO:

R: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-40, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Go to step **10.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (E21) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
8	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO U5)-32, Pressure Sensor.>
10	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Repair battery short circuit in harness between ECM and manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO U5)-32, Pressure Sensor.>

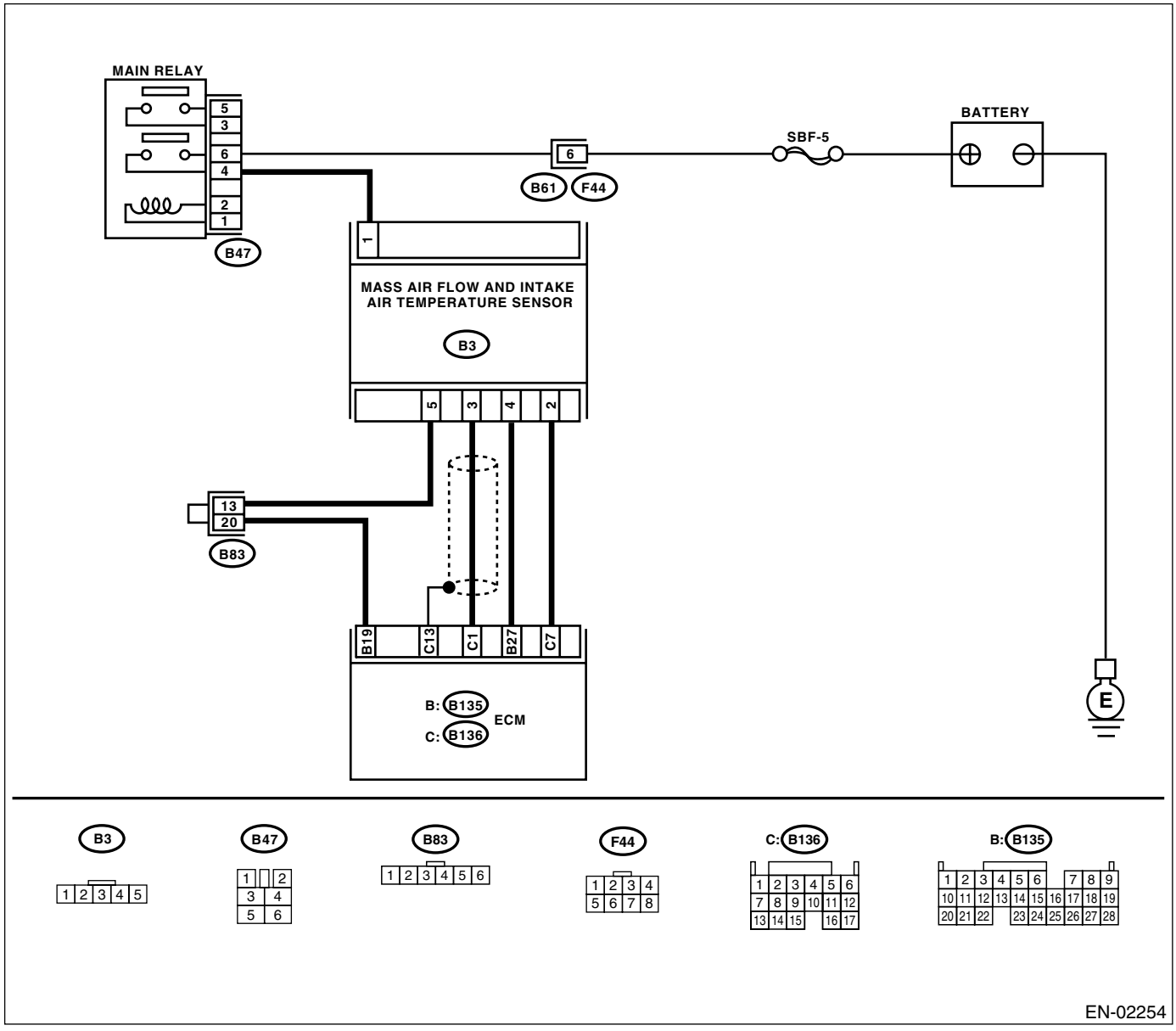
MEMO:

S: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-42, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



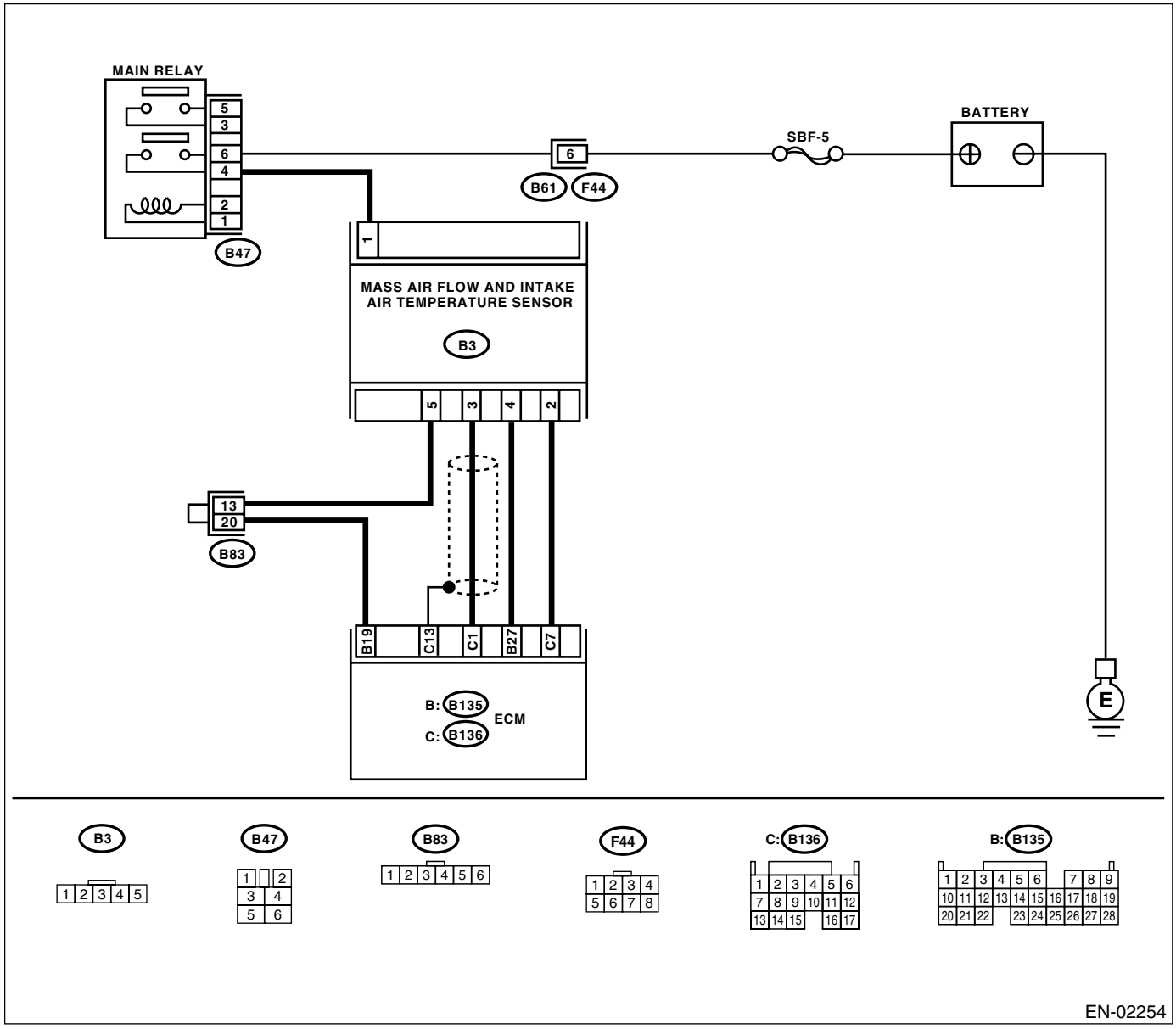
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace the intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

T: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-44, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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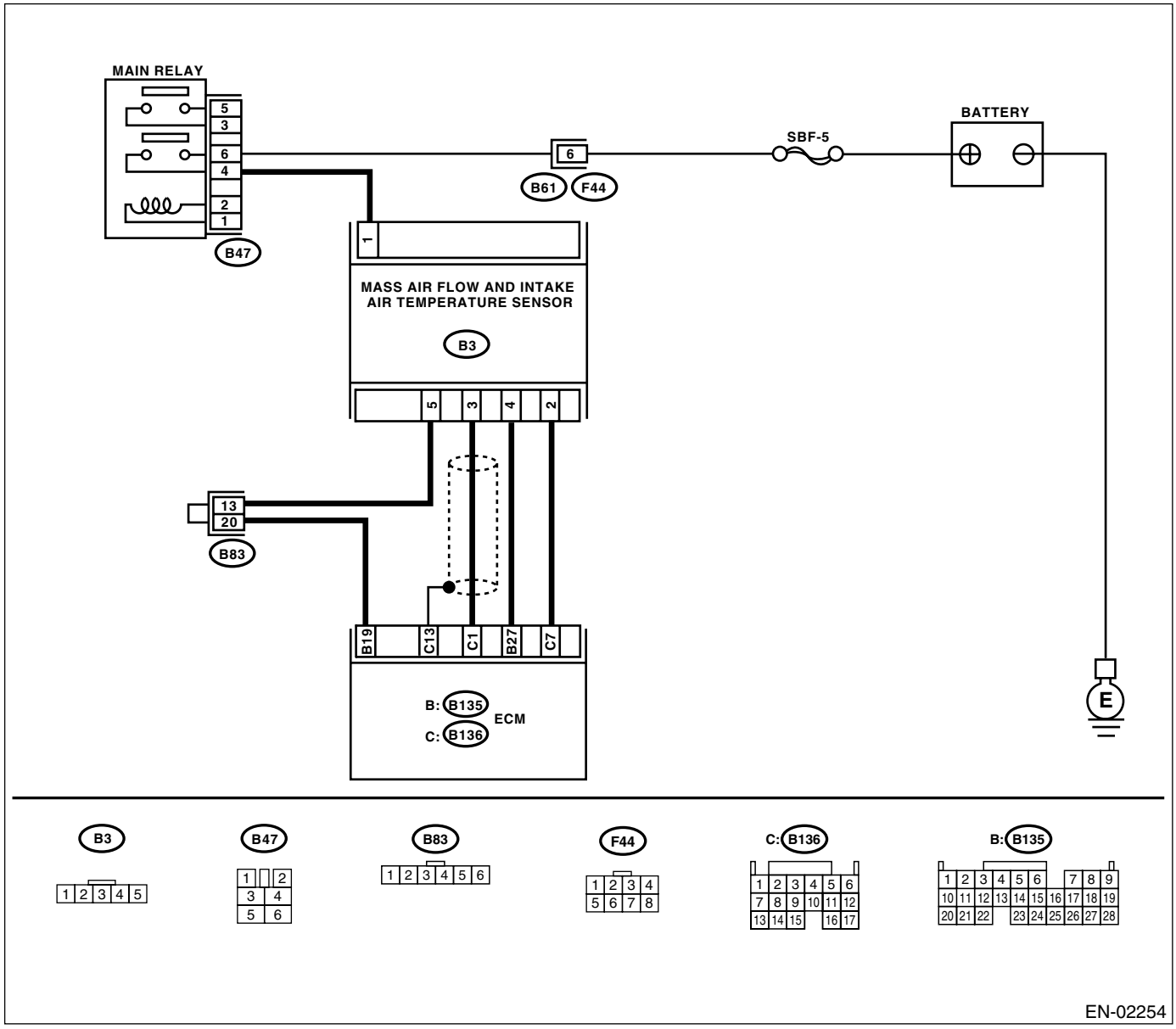
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace the intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

U: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-46, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from intake air temperature sensor. 3) Measure the voltage between intake air temperature and manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the measured value more than 3 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the measured value less than 5 Ω?	Replace the intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

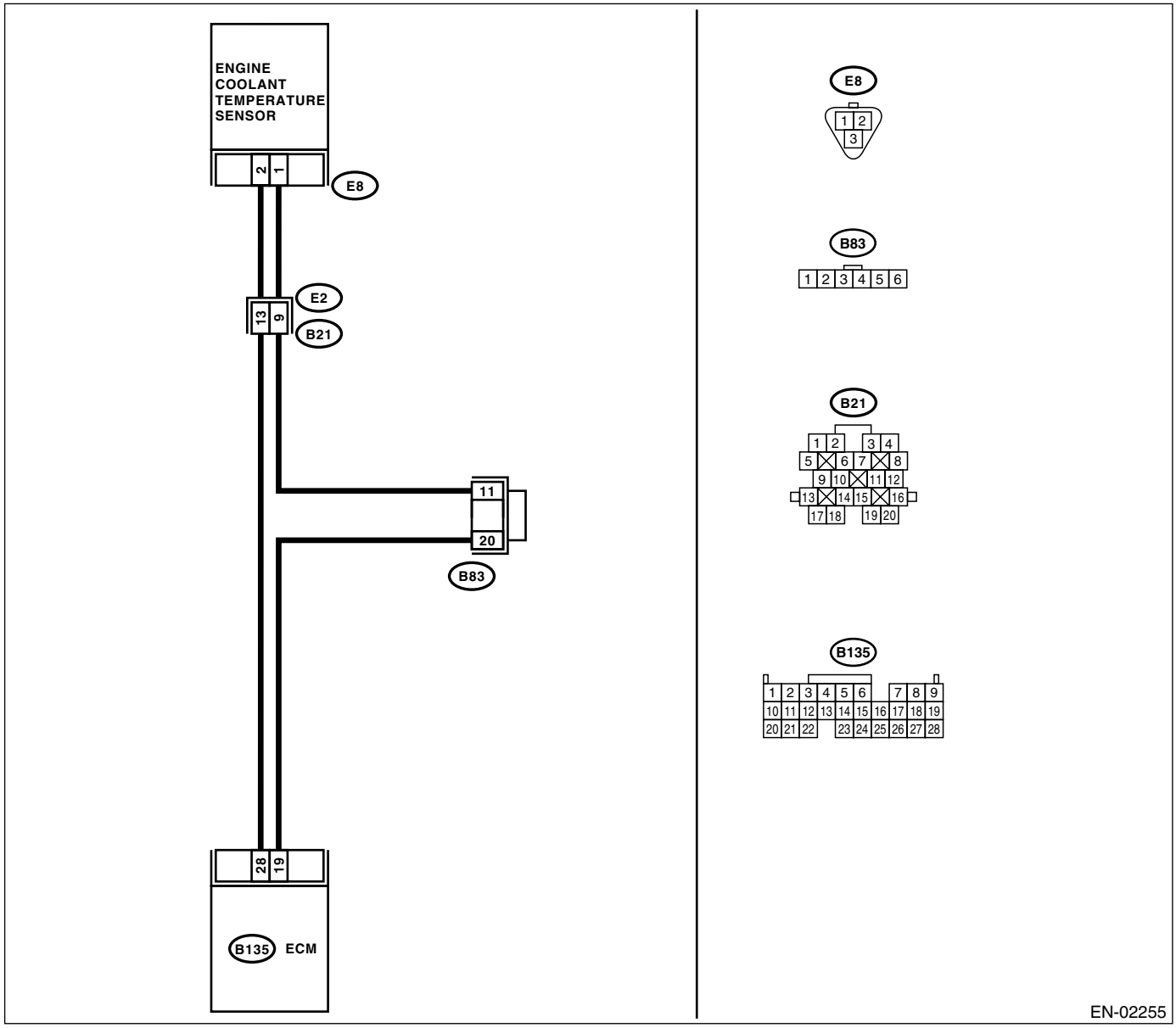
MEMO:

V: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-48, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



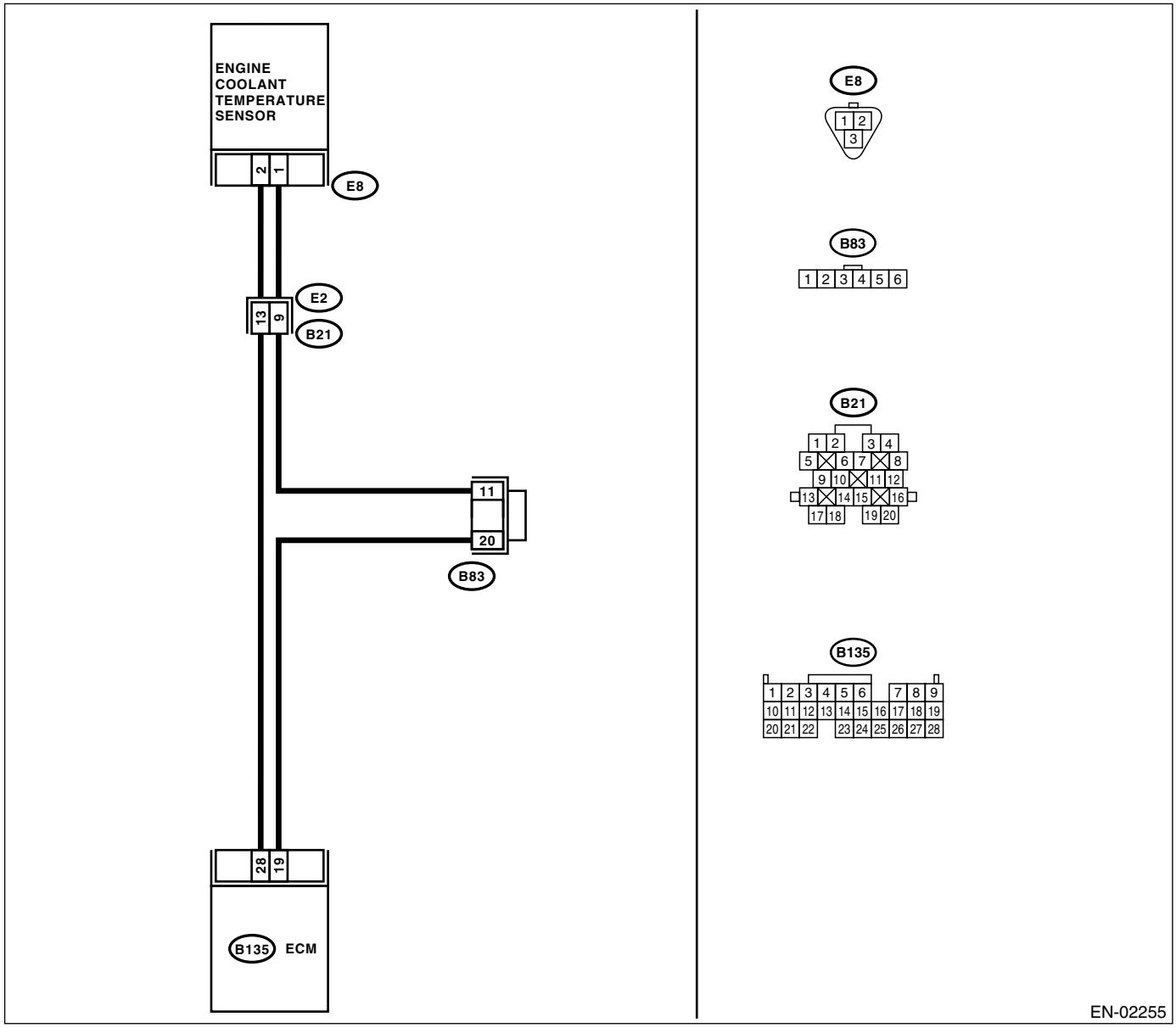
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 150°C (302°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

W: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-50, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



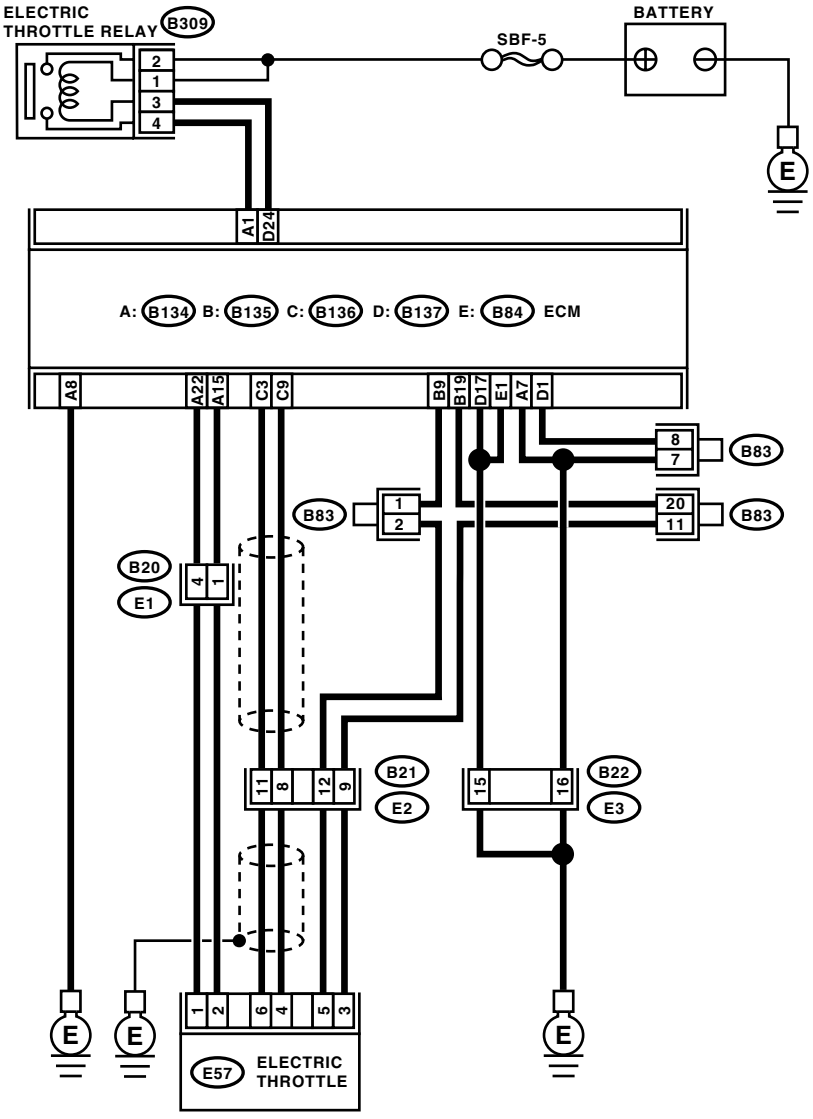
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

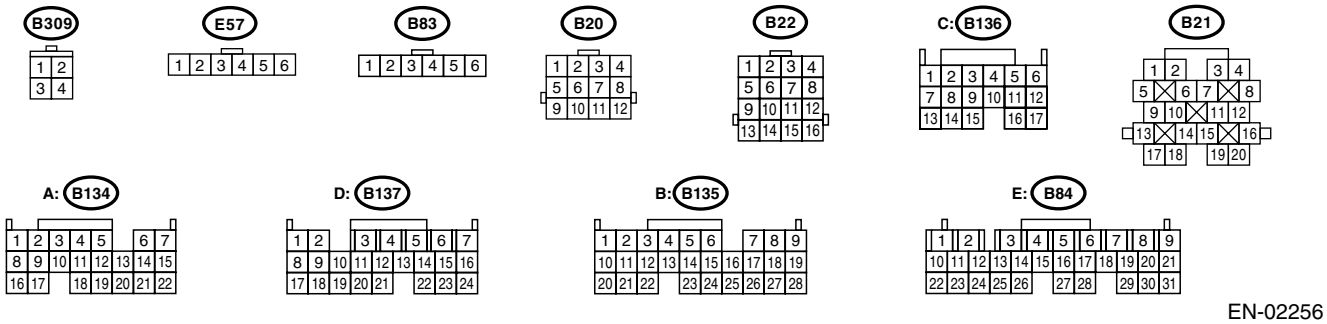
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the measured value less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

X: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-52, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

- **WIRING DIAGRAM:**





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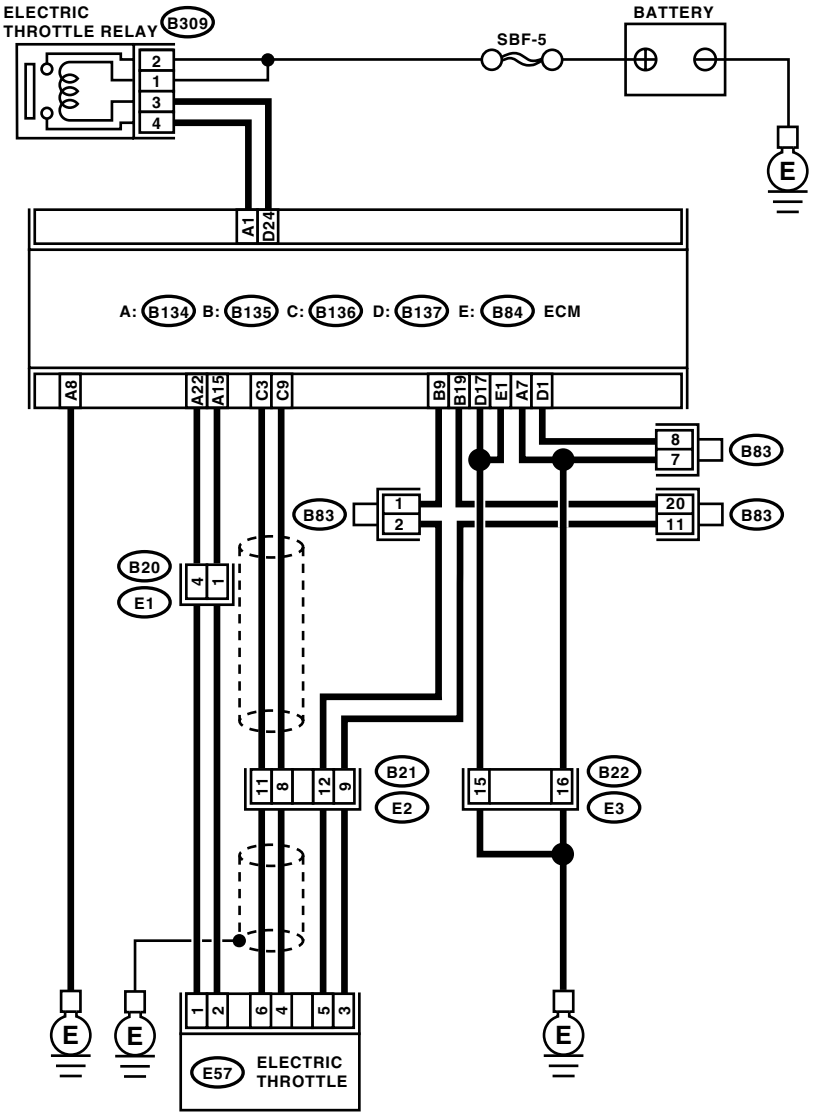
	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read data of main throttle sensor signal using Subaru Select Monitor.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 3 — (E57) No. 6:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the chassis short of harness.
5	**CHECK POWER SURPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
6	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the measured value more than 10 Ω?	Repair the poor contact in electric throttle connector. If problem persists, replace the accelerator position sensor.	Repair the poor the contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

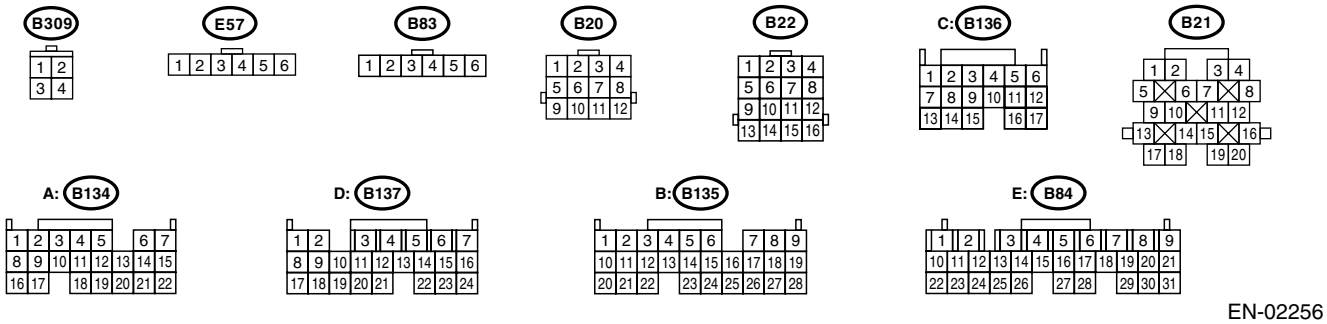
MEMO:

Y: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-54, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

- **WIRING DIAGRAM:**





EN-02256

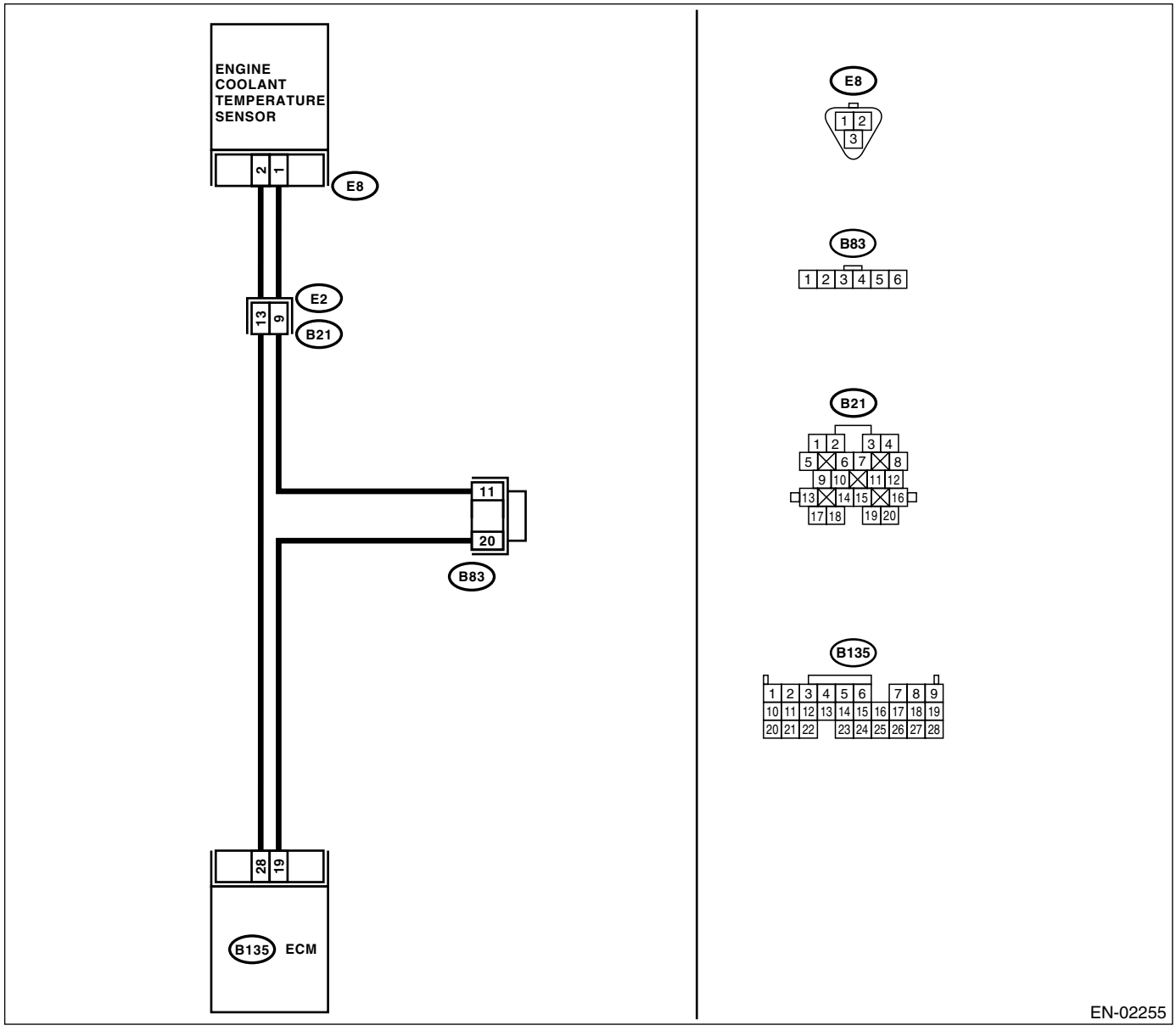
	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signals, using the Subaru Select Monitor.	Is the measured value less than 4.63 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 3 — (E57) No. 6:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and electric throttle connector.
6	**CHECK POWER SUPPLY TO SENSOR.** 1) Measure the voltage between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):***	Is the measured value less than 10 V?	Go to step **7.**	Repair the short of harness between ECM connector and electric throttle connector.
7	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 3 — (B135) No. 9:***	Is the measured value more than 1 MΩ?	Repair the poor contact in harness. Replace the electric throttle.	Repair the short of harness of power supply to sensor.

Z: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-56, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine would not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4SO)-19, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>

AA:DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-58, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to antifreeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref. to CO(H4SO)-12, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, Radiator Sub Fan and Fan Motor.>.	Replace the thermostat. <Ref. to CO(H4SO)-19, Thermostat.>

AB:DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-60, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

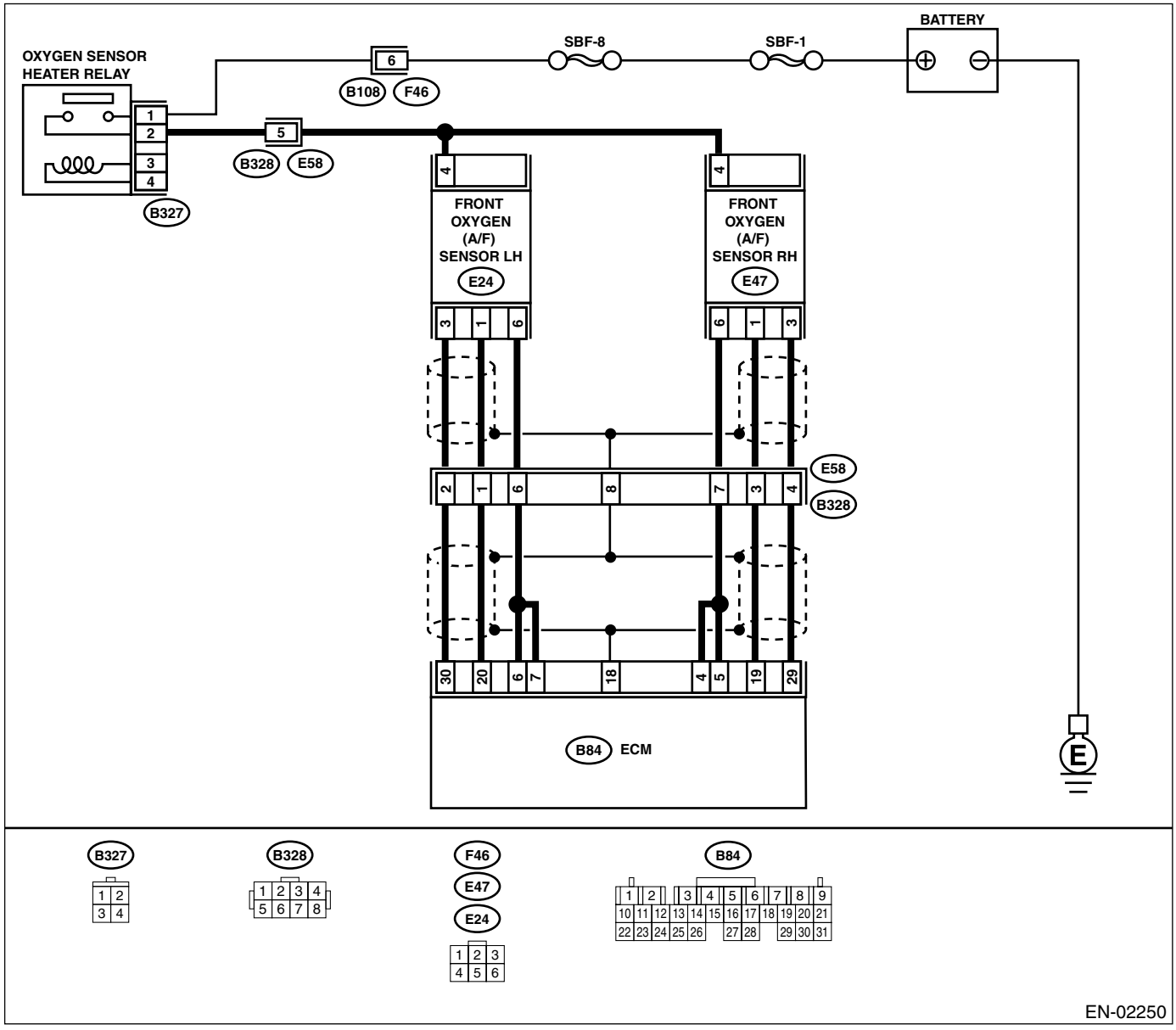
Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P0129.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

AC:DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-62, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



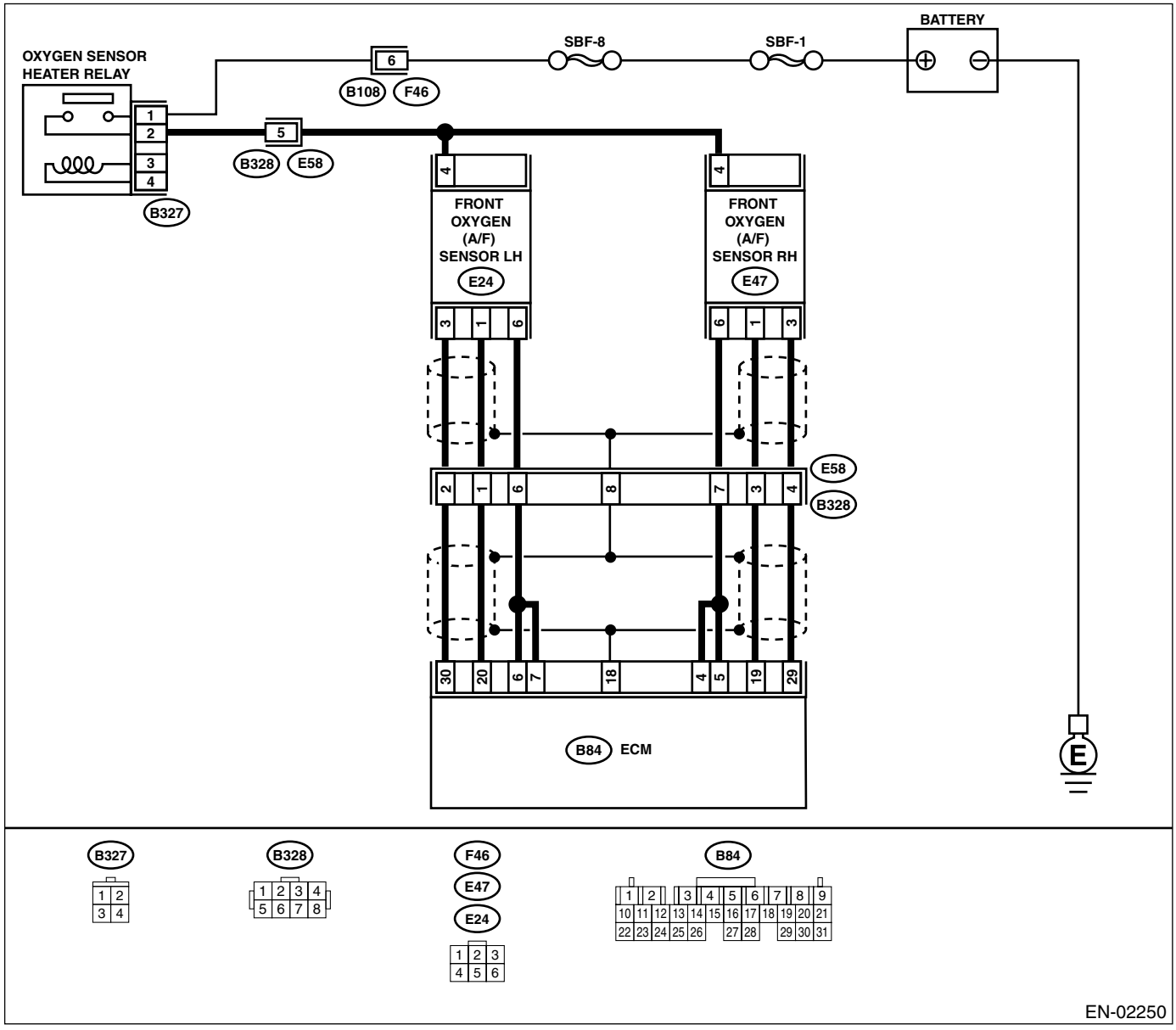
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — Chassis ground:*** ***(B84) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

AD:DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-64, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



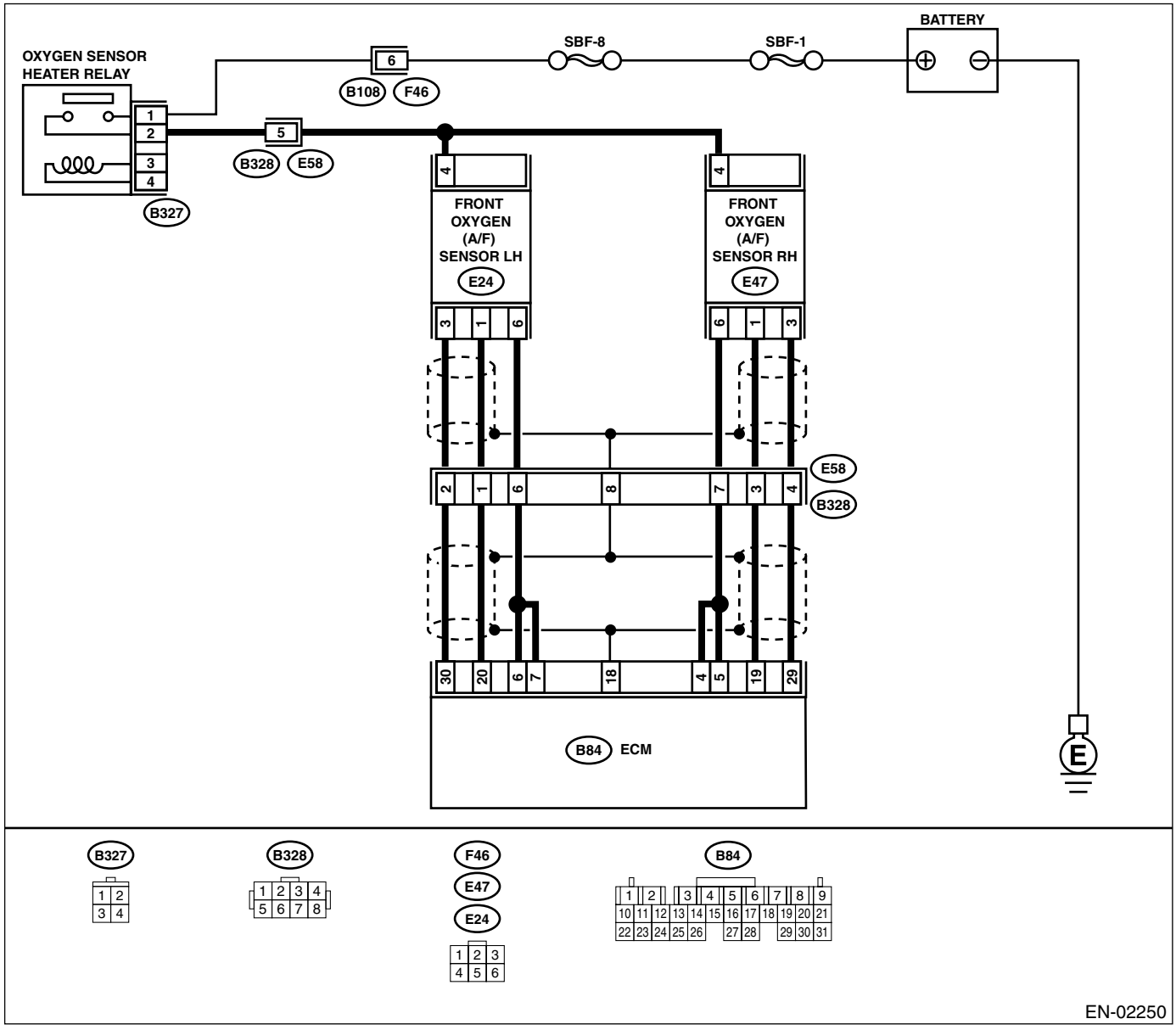
Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

AE:DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-66, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.>.

- **WIRING DIAGRAM:**



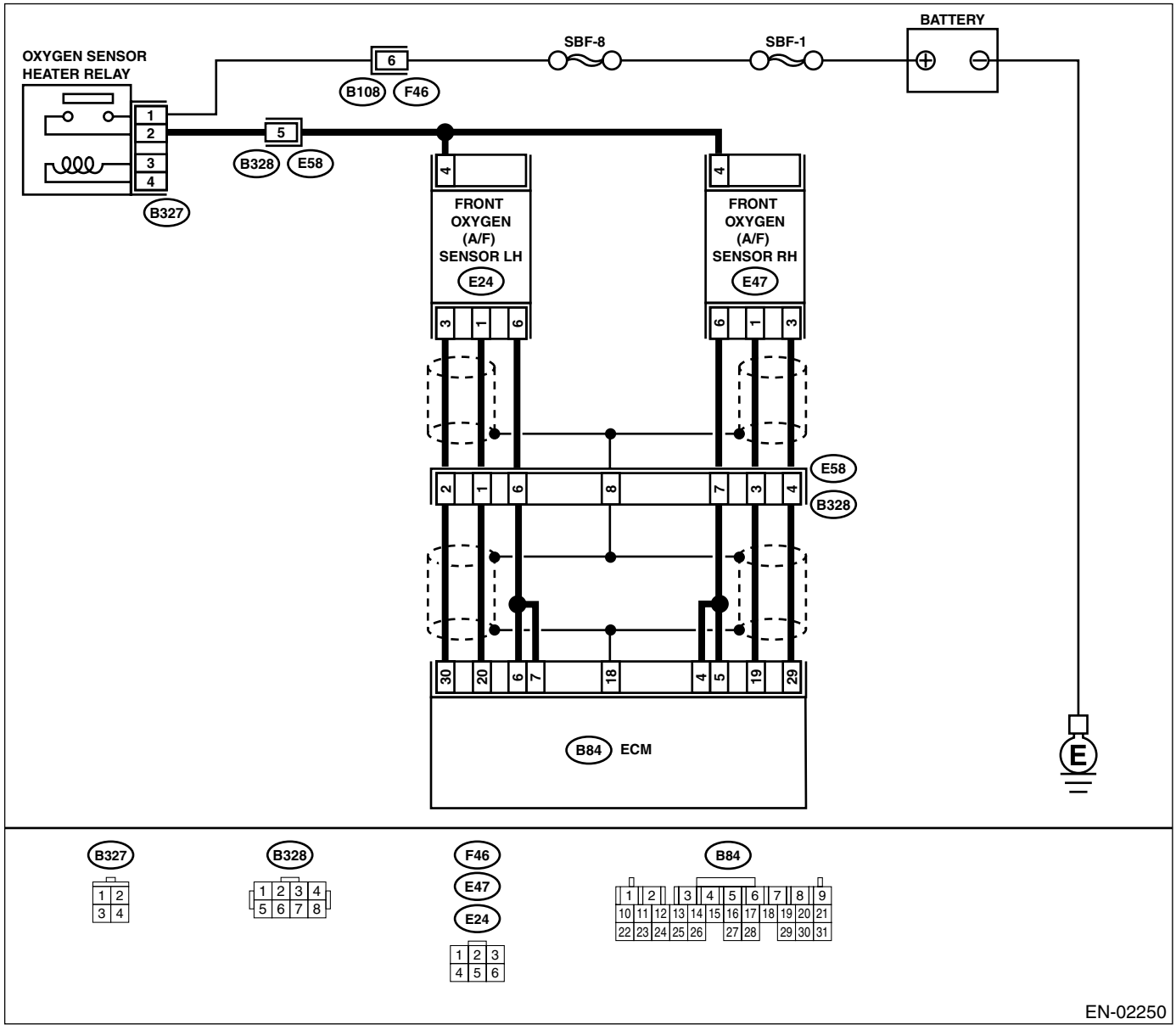
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

AF:DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-70, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



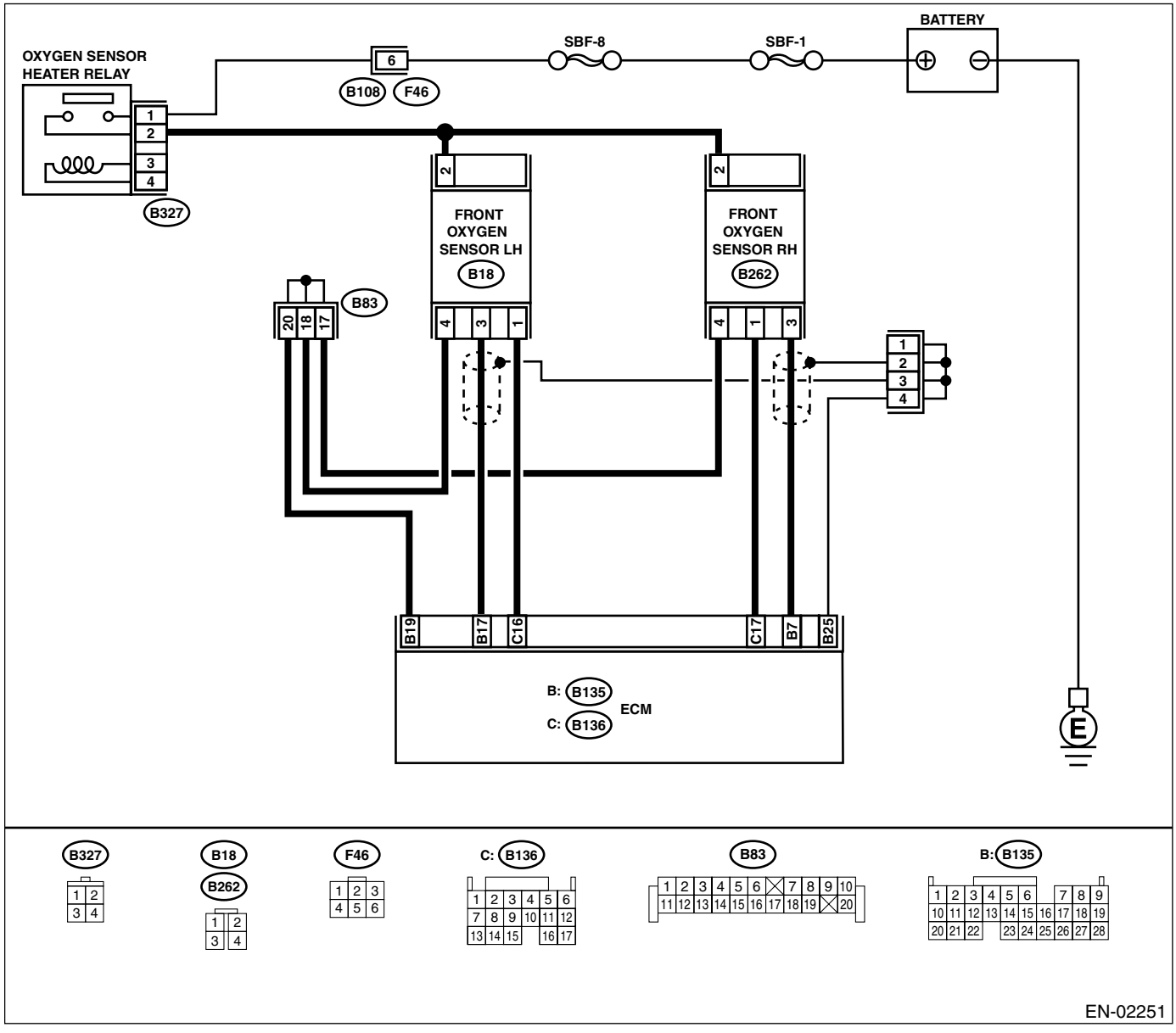
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — (E47) No. 1:*** ***(B84) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

AG:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-72, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK FRONT OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of front oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen sensor. 3) Measure the resistance of harness between ECM and front oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 7 — (B262) No. 3:*** ***(B135) No. 19 — (B262) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and front oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FRONT OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B262) No. 3 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between front oxygen sensor and ECM connector • Poor contact in front oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

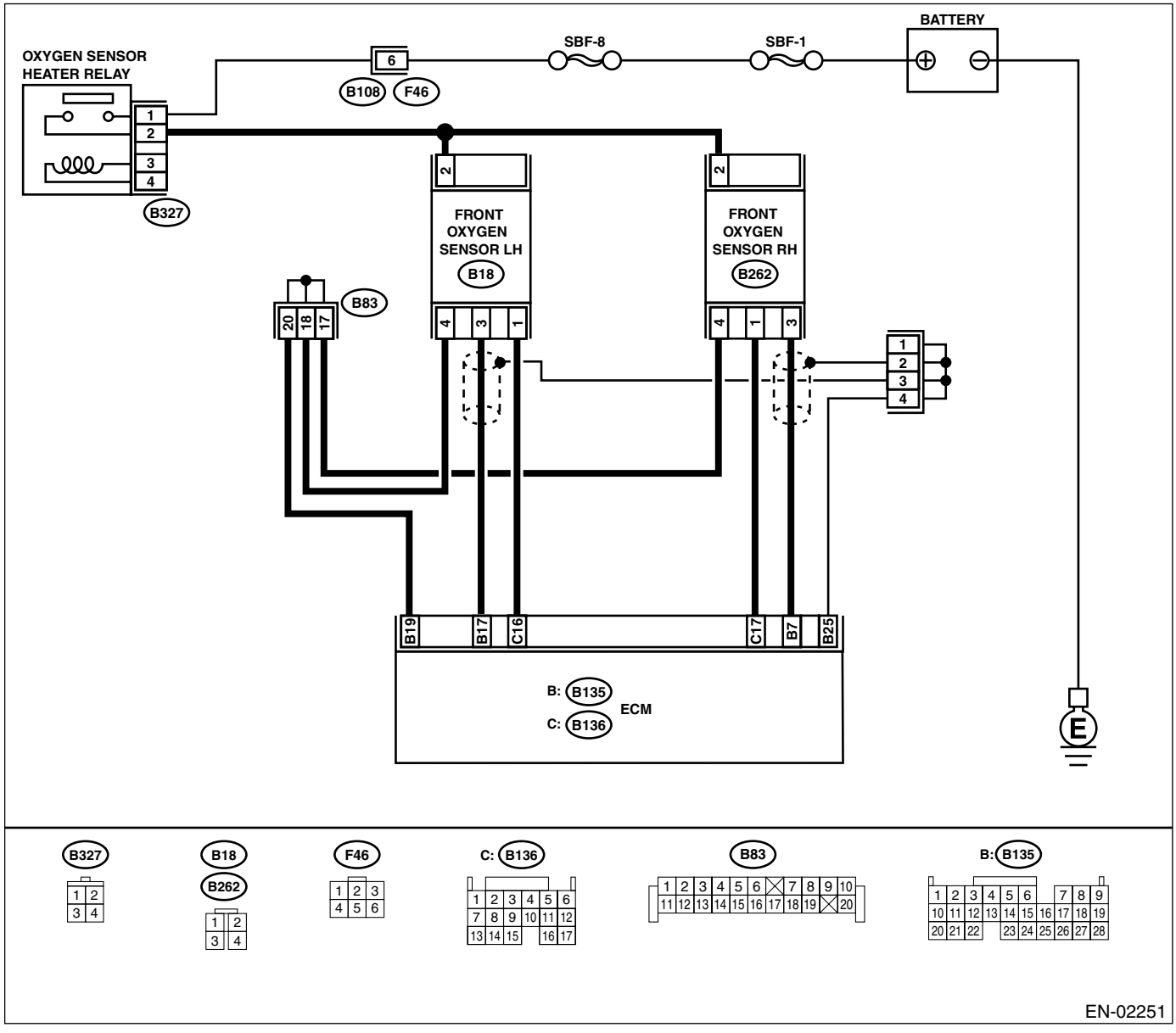
MEMO:

AH:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-74, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK FRONT OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 5,000 rpm. 2) Read the data of front oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen sensor. 3) Measure the resistance of harness between ECM and front oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 7 — (B262) No. 3:*** ***(B135) No. 19 — (B262) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and front oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FRONT OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B262) No. 3 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between front oxygen sensor and ECM connector • Poor contact in front oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

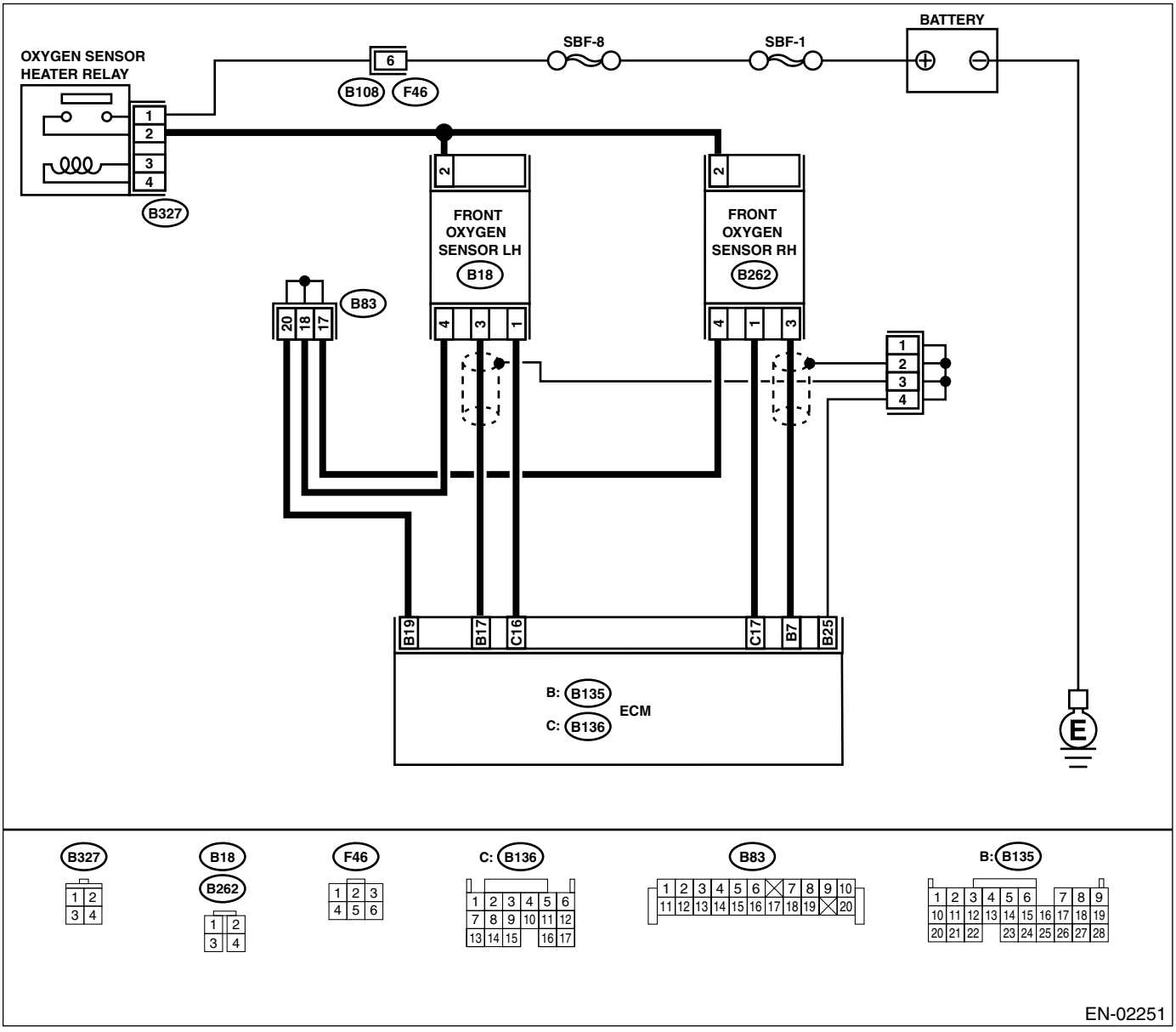
MEMO:

AI: DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-76, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



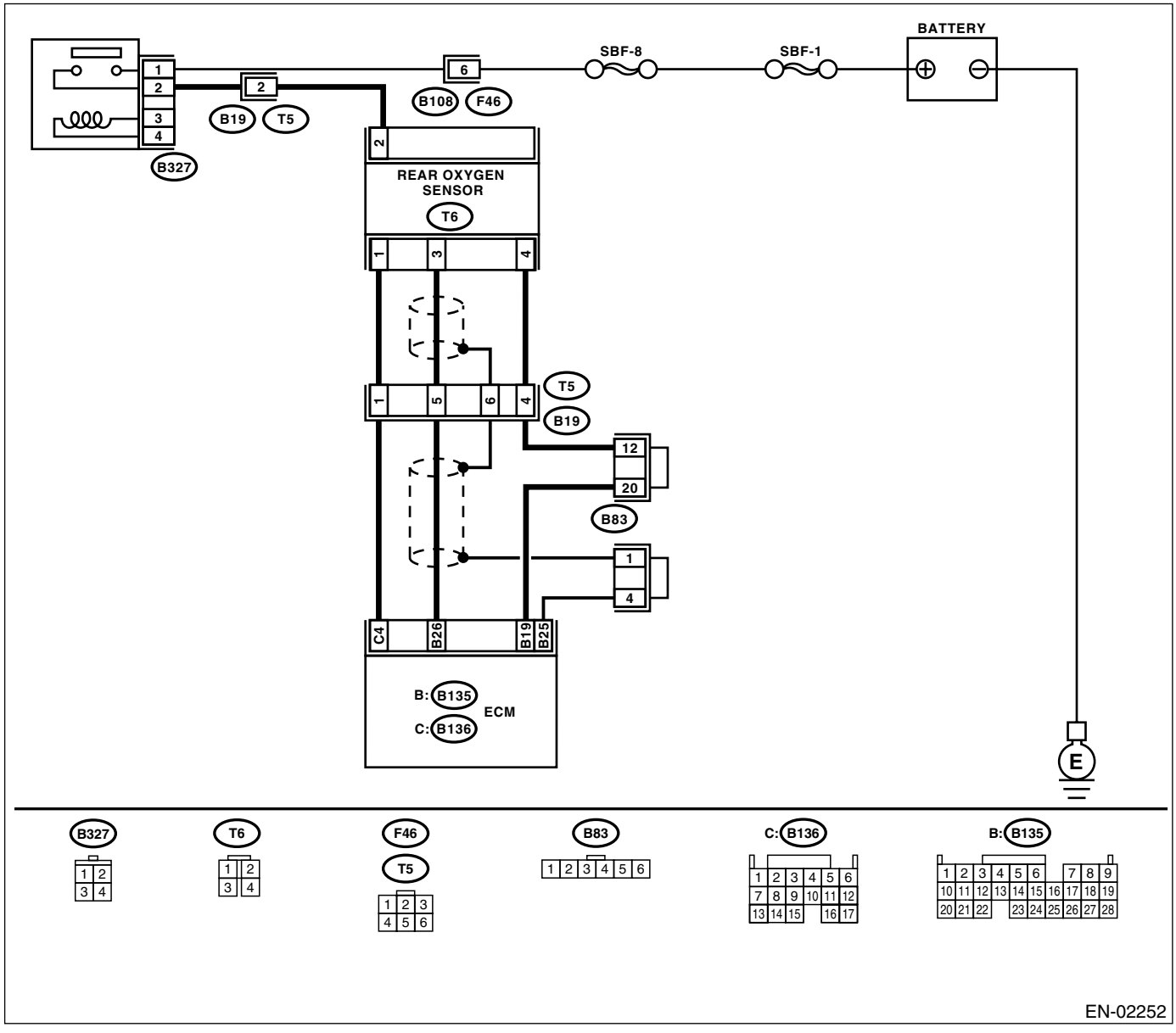
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

AJ:DTC P0143 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-82, DTC P0143 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0143.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 26 — (T6) No. 3:*** ***(B135) No. 19 — (T6) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO U5)-48, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4SO U5)-48, Rear Oxygen Sensor.>

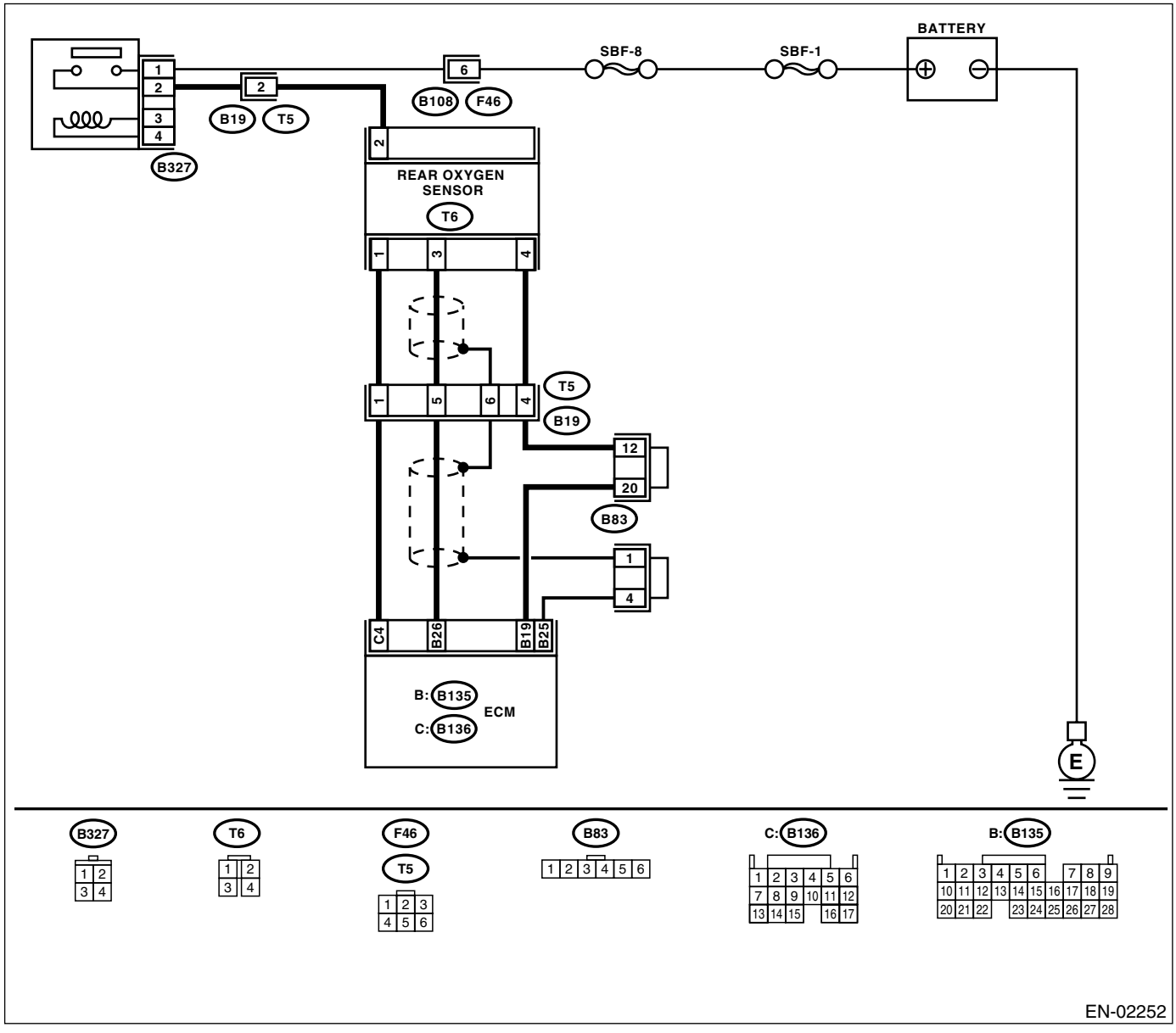
MEMO:

AK:DTC P0144 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-84, DTC P0144 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0144.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 26 — (T6) No. 3:*** ***(B135) No. 19 — (T6) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO U5)-48, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4SO U5)-48, Rear Oxygen Sensor.>

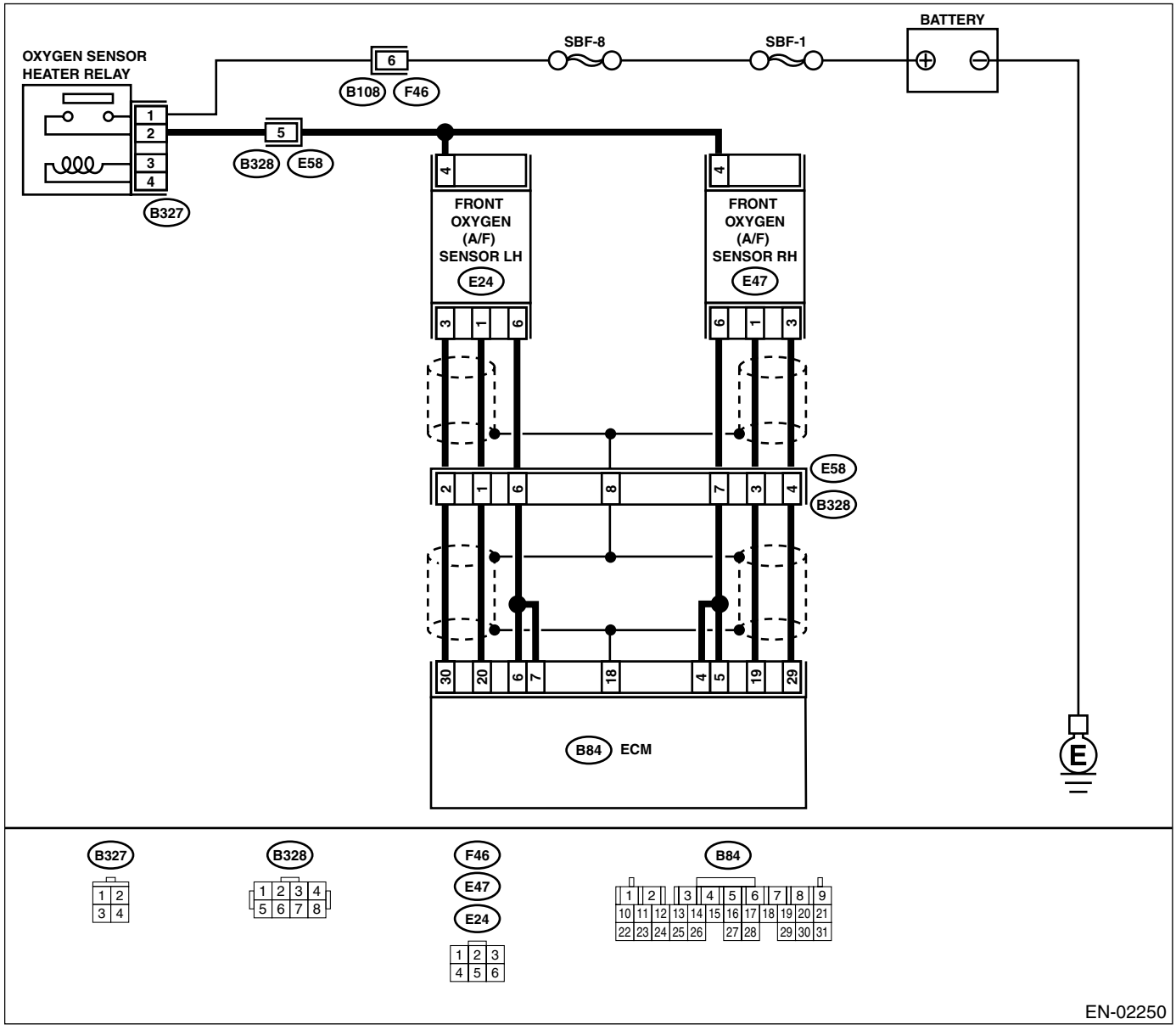
MEMO:

AL:DTC P0151 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0151 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



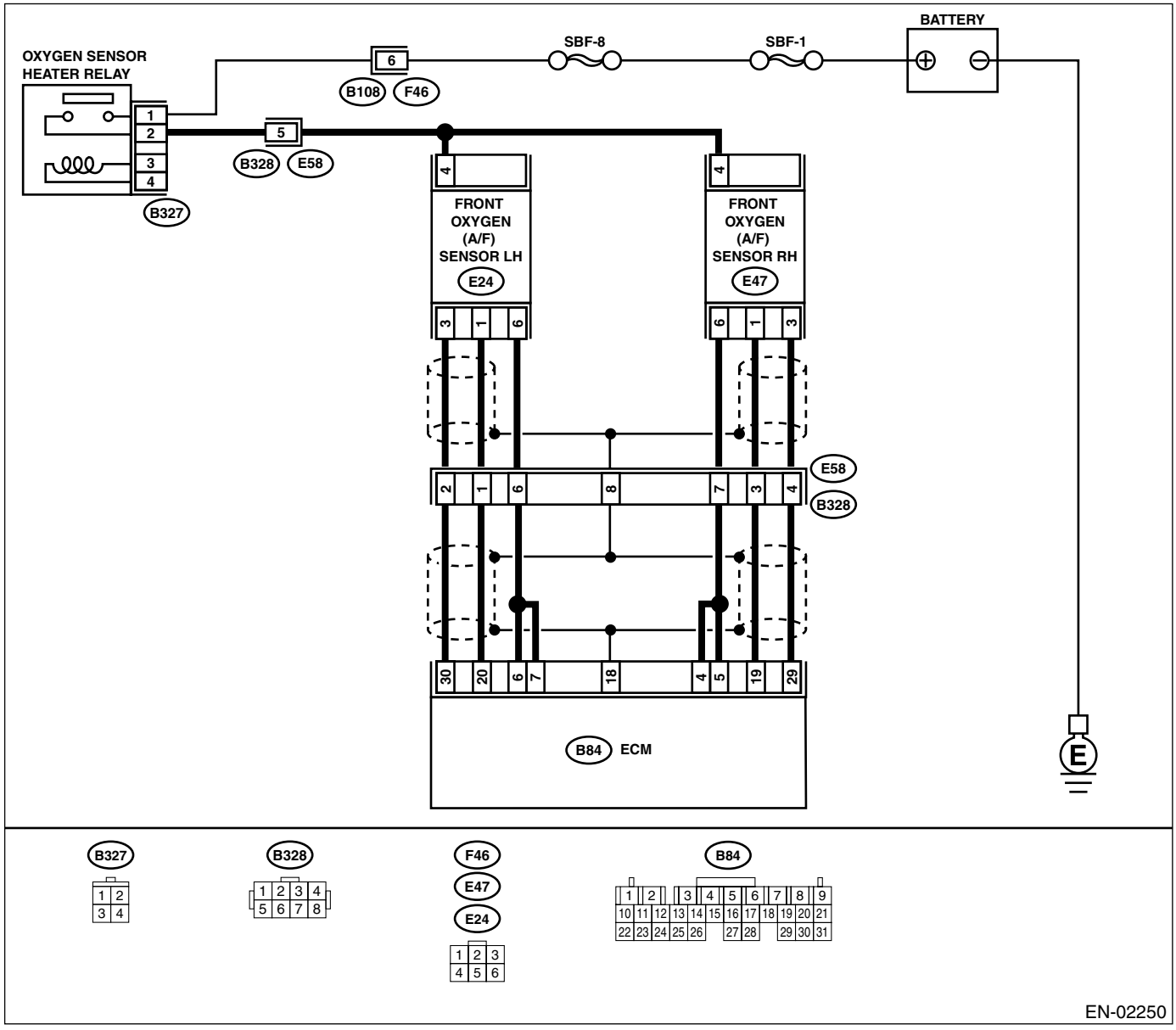
Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 20 — Chassis ground:*** ***(B84) No. 30 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-48, Rear Oxygen Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

AM:DTC P0152 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0152 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



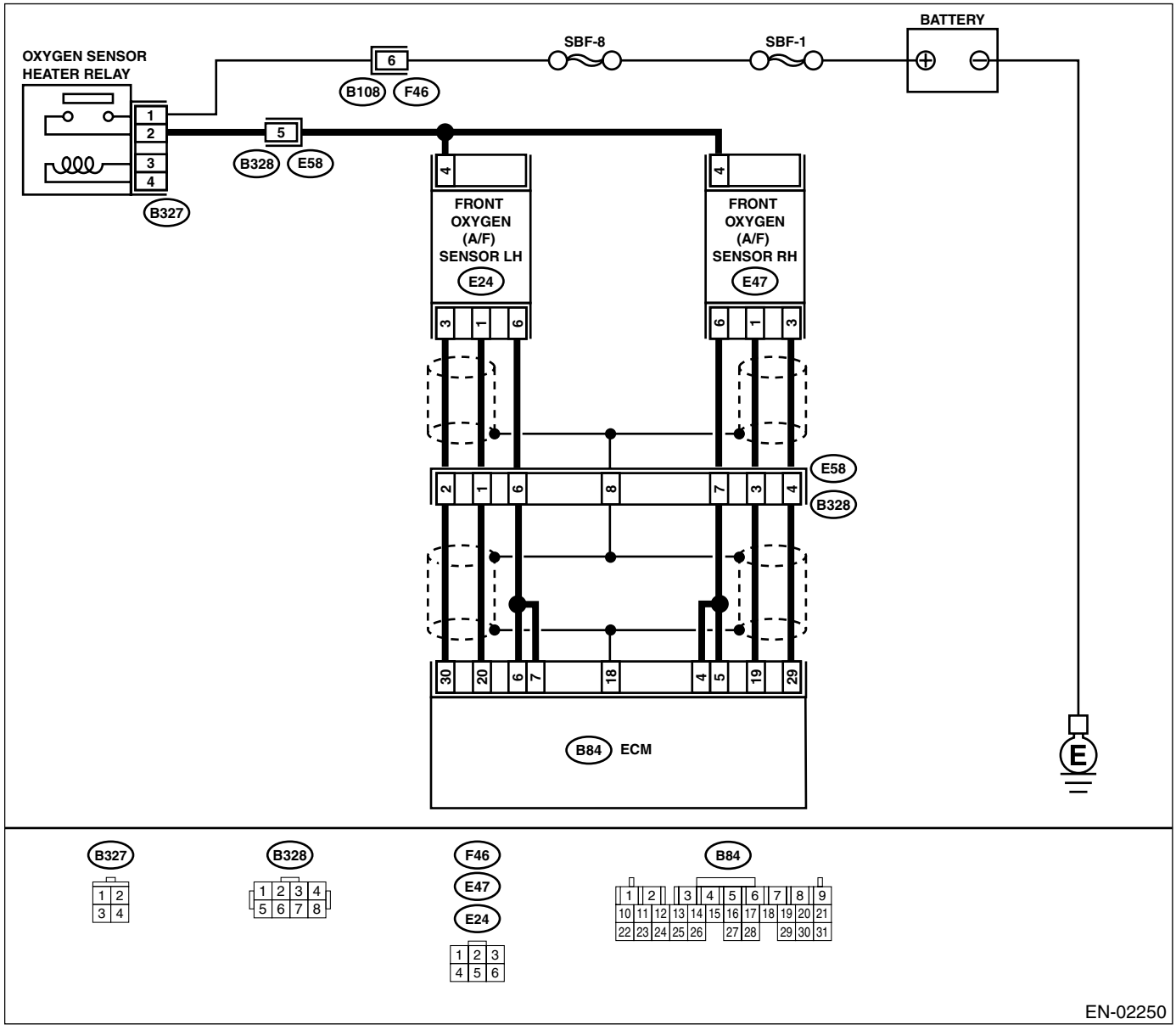
Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

AN:DTC P0153 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



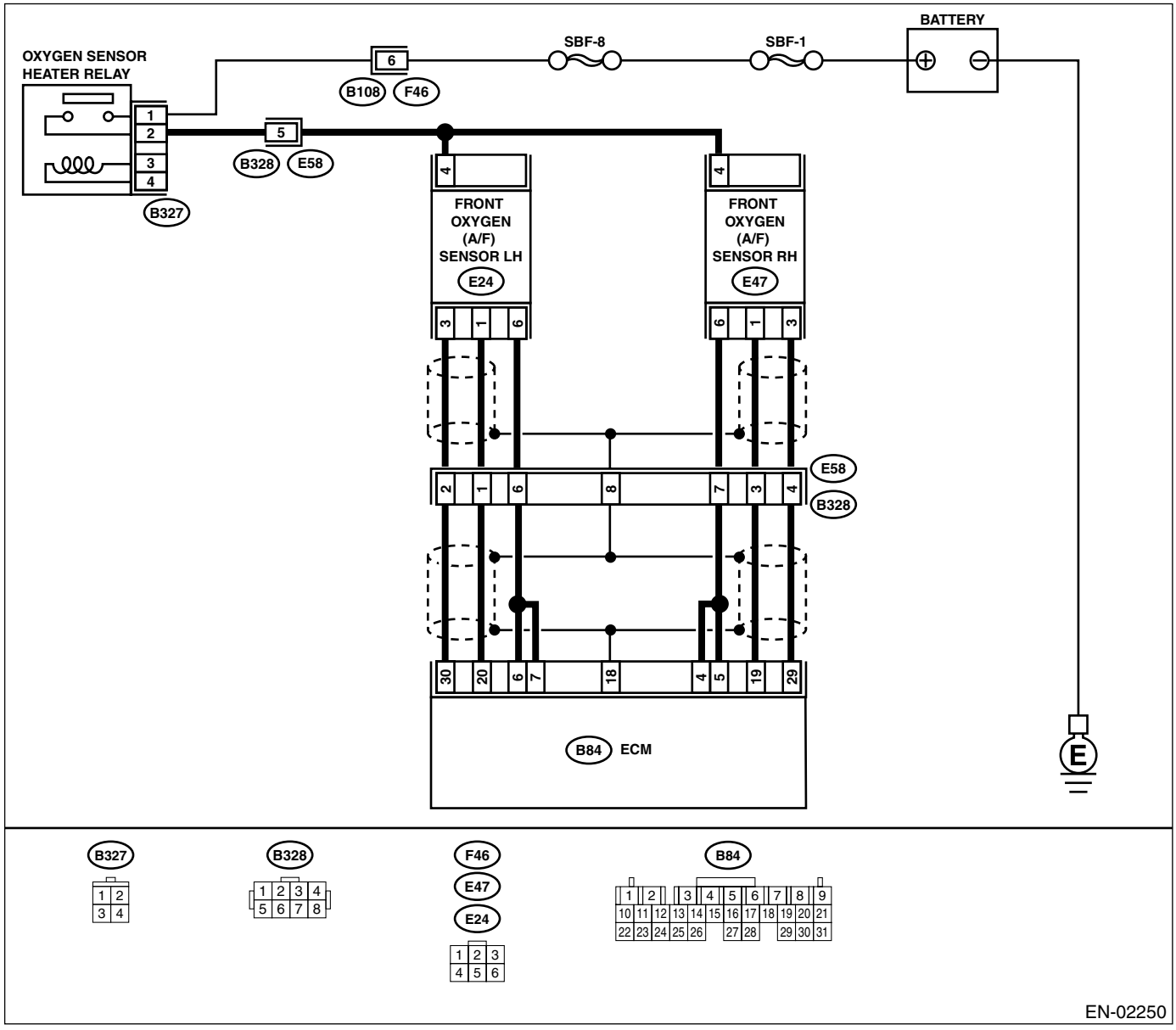
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0153.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

AO:DTC P0154 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



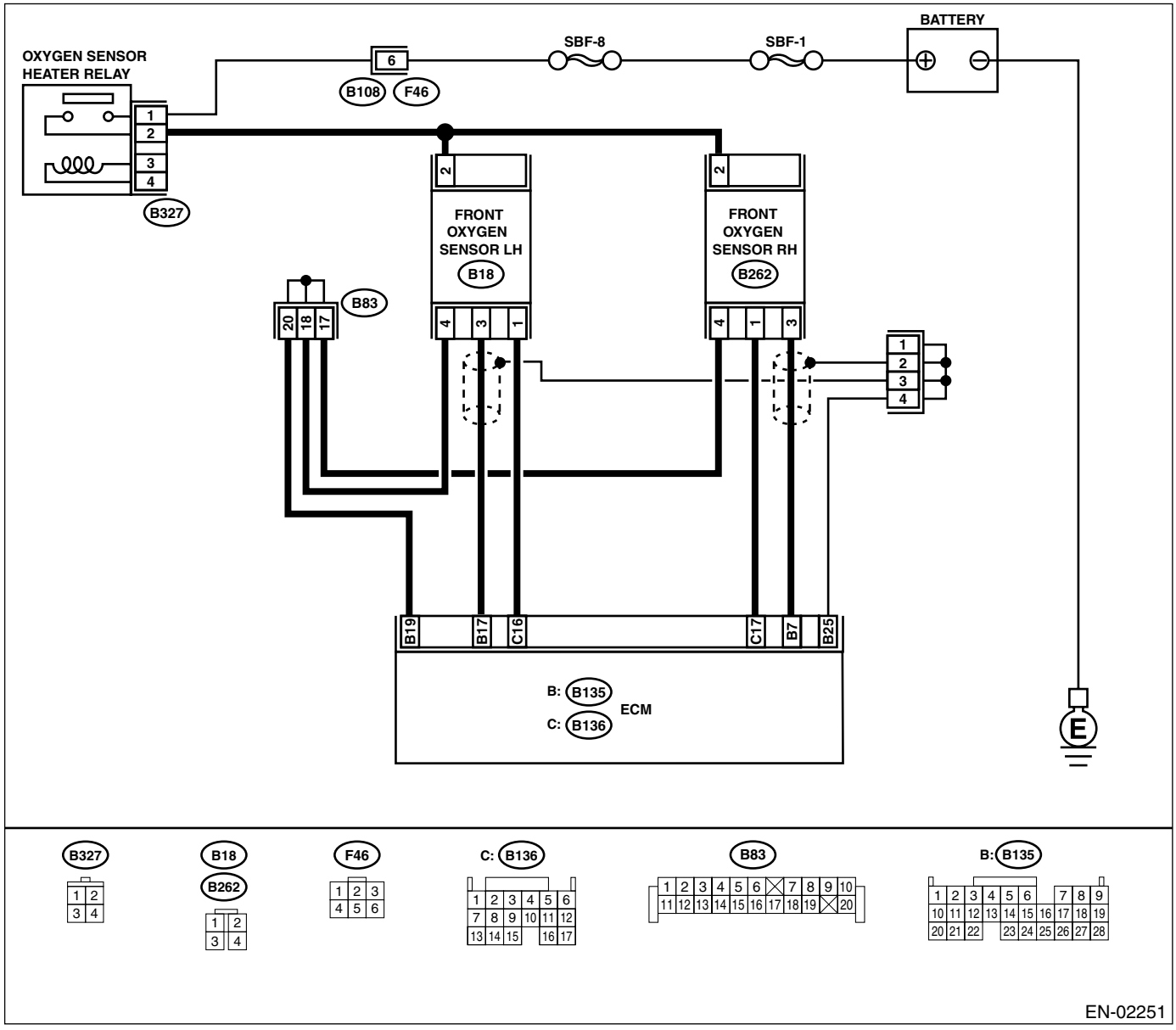
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 20 — (E24) No. 1:*** ***(B84) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

AP:DTC P0157 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0157 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0157.	Go to step **2.**
2	**CHECK FRONT OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of front oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen sensor. 3) Measure the resistance of harness between ECM and front oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (B18) No. 3:*** ***(B135) No. 19 — (B18) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and front oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FRONT OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between front oxygen sensor and ECM connector • Poor contact in front oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

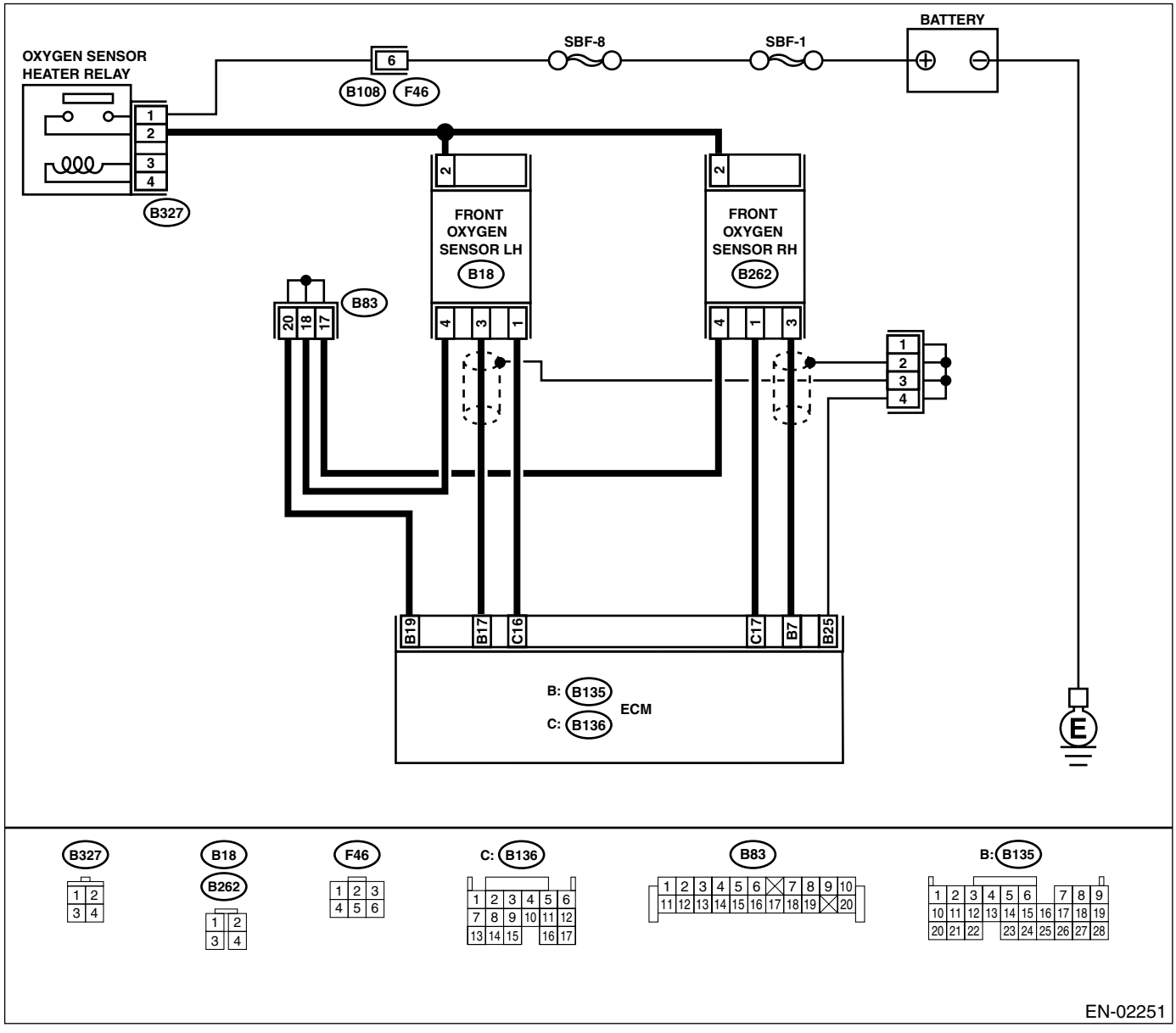
MEMO:

AQ:DTC P0158 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0158 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0158.	Go to step **2.**
2	**CHECK FRONT OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 5,000 rpm. 2) Read the data of front oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen sensor. 3) Measure the resistance of harness between ECM and front oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (B18) No. 3:*** ***(B135) No. 19 — (B18) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and front oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FRONT OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Engine ground (–):***	Is the measured value within 0.2 to 0.5 V?	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between front oxygen sensor and ECM connector • Poor contact in front oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

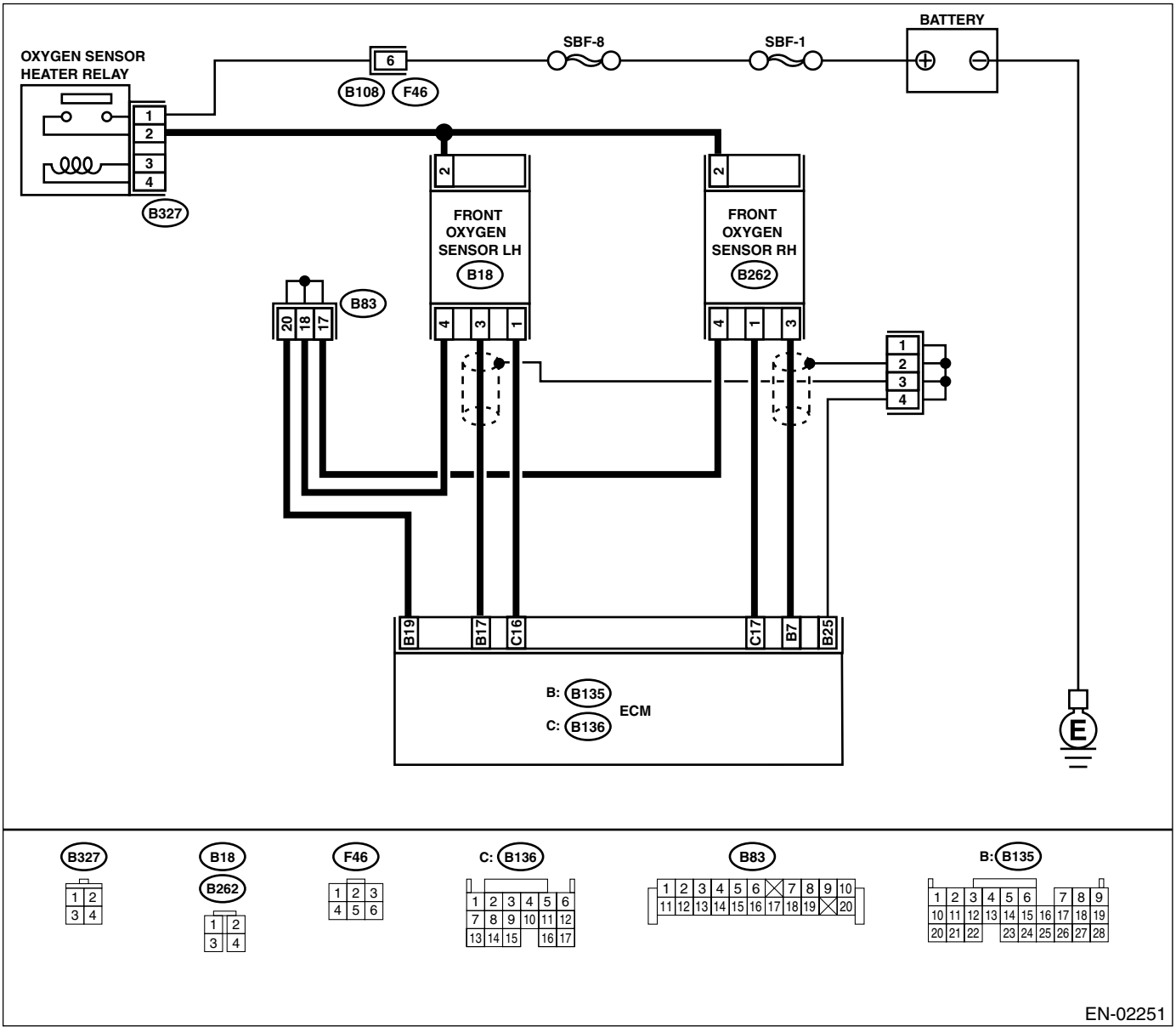
MEMO:

AR:DTC P0159 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-86, DTC P0159 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0159.	Replace the front oxygen sensor. <Ref. to FU(H4SO U5)-45, Front Oxygen Sensor.>

AS:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H4SO U5)-217, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H4SO U5)-217, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AU:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H4SO U5)-217, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC P0175 — SYSTEM TOO RICH (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-88, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —.> <Ref. to GD(H4SO U5)-92, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-95, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO U5)-95, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

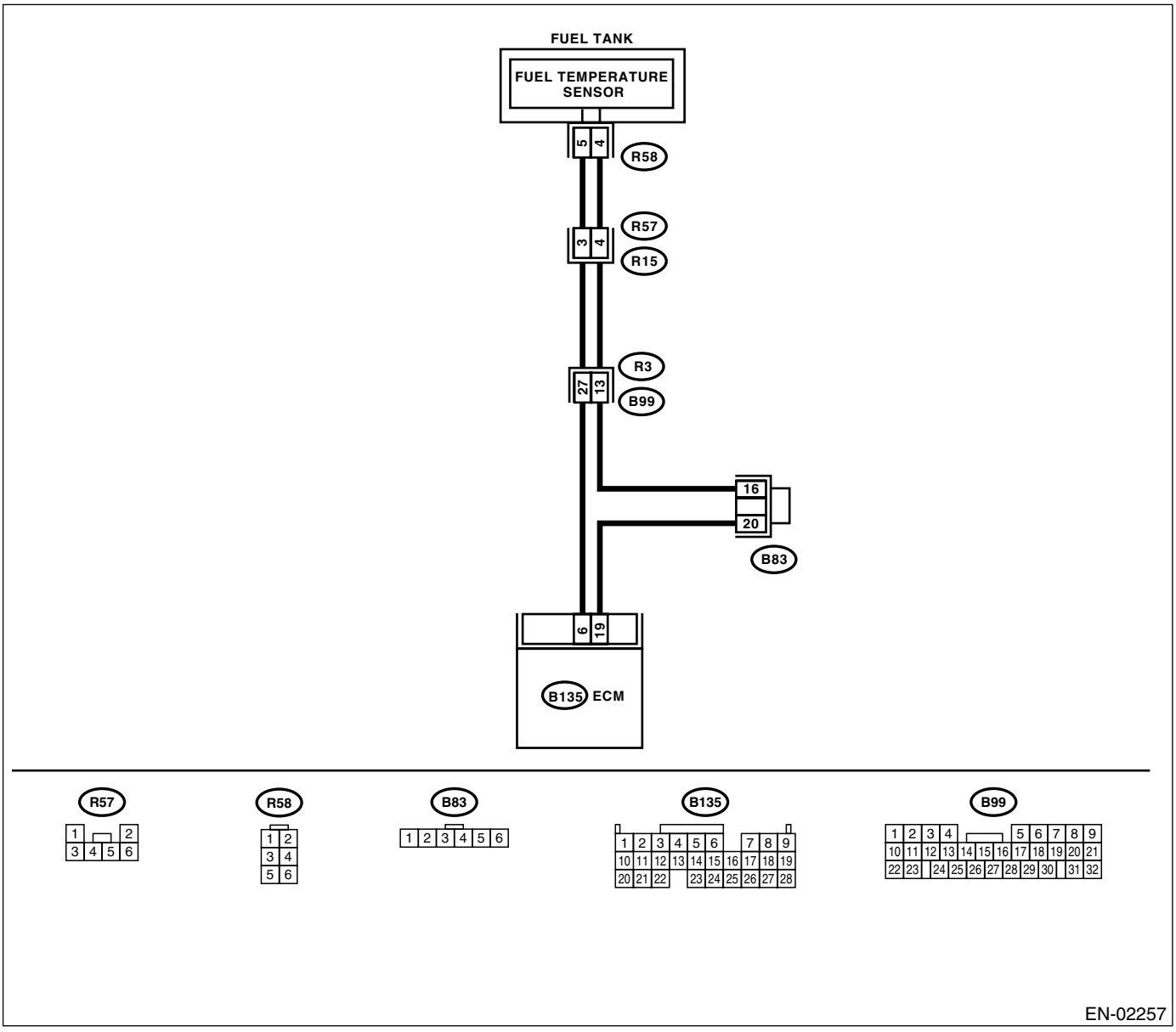
	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

AW:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Fault occurs in two consecutive driving cycles
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-96, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



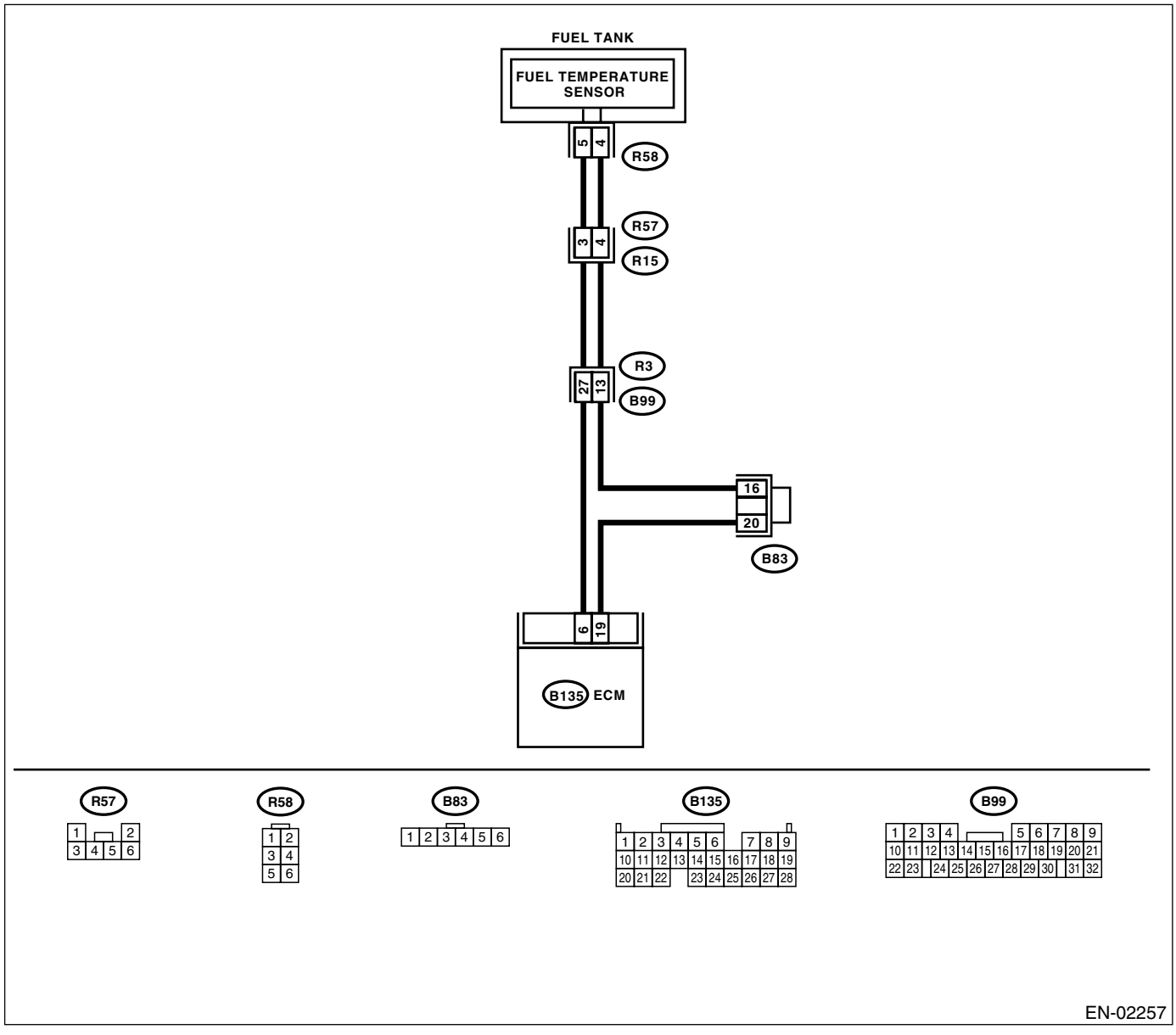
Step		Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>

AX:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-100, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



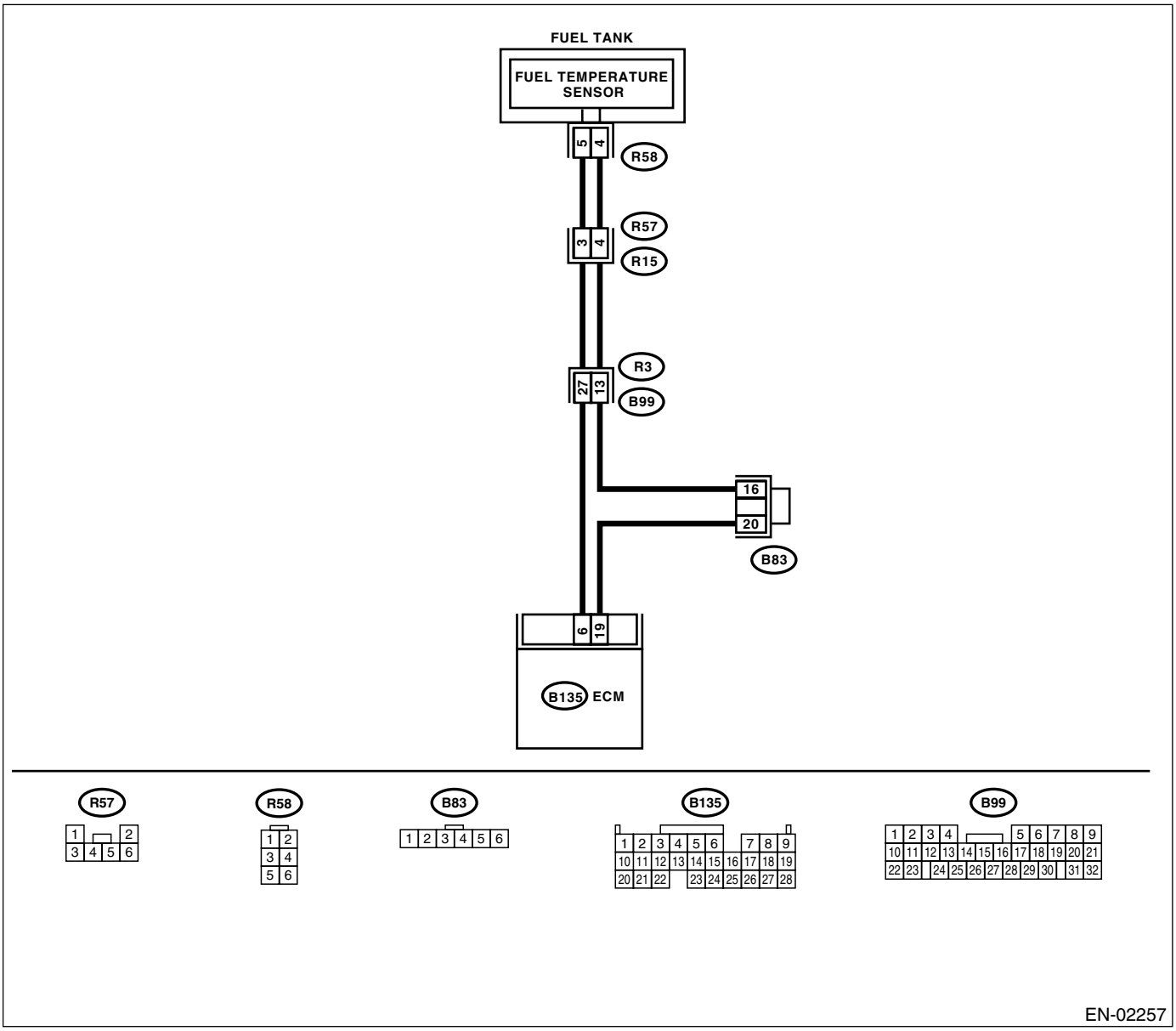
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 150°C (302°F)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value –40°C (–40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

AY:DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-102, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



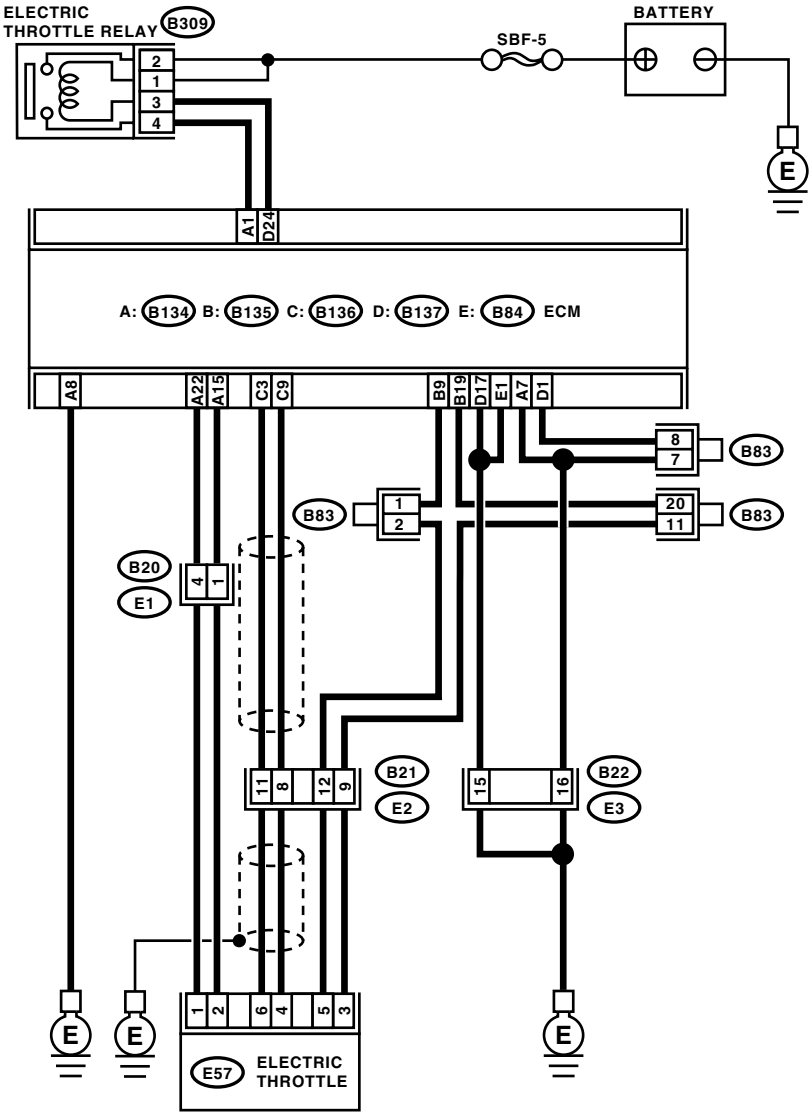
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value –40°C (–40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

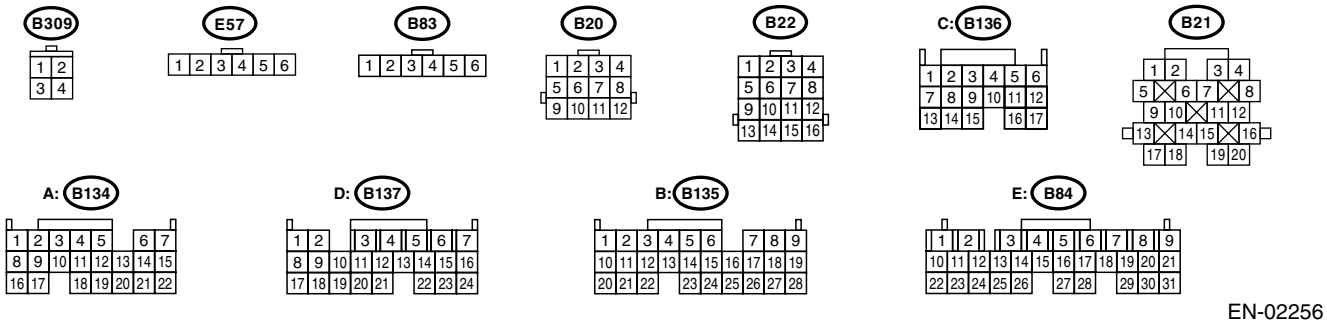
Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 4 — (B135) No. 19:***	Is the measured value less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

AZ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “b” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-104, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

- **WIRING DIAGRAM:**





EN-02256

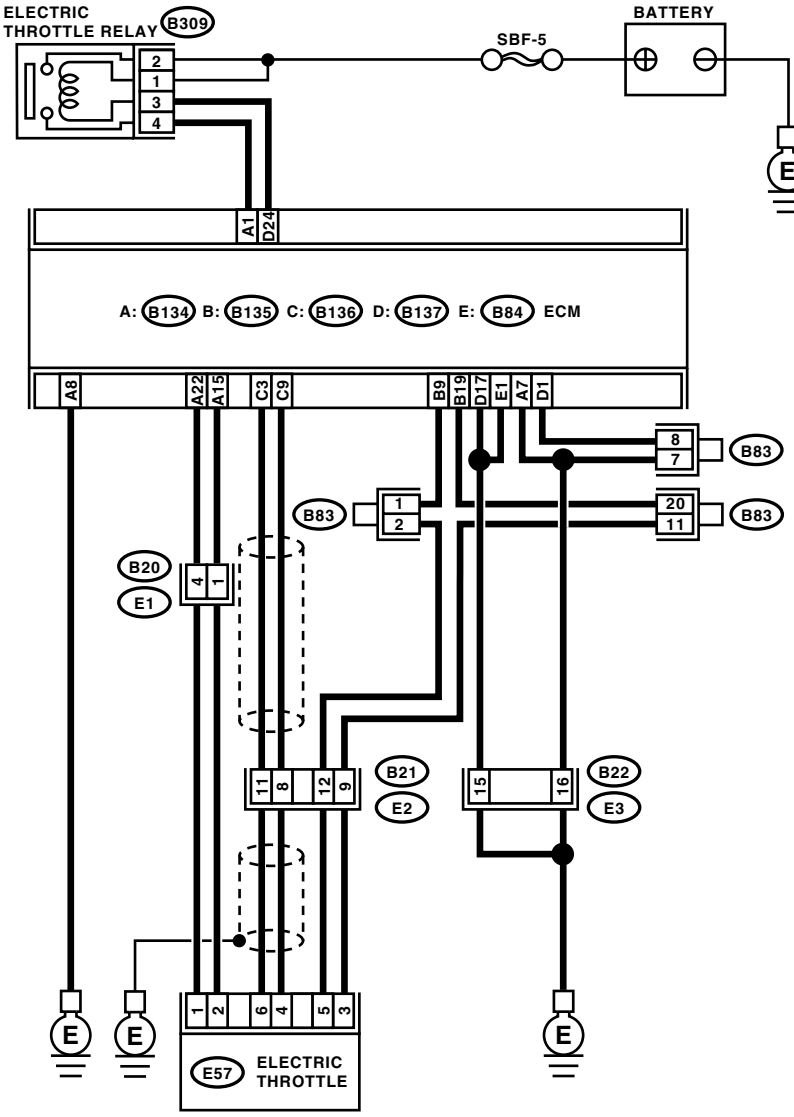
	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read data of sub throttle sensor signal using Subaru Select Monitor.	Is the measured value more than 0.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in the connectors between the ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between the ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 9 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Check the resistance between the ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 9 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the chassis short of harness.
5	**CHECK POWER SURPLY TO SENSOR.** 1) Connect the ECM connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (-):***	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
6	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the measured value more than 10 Ω?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

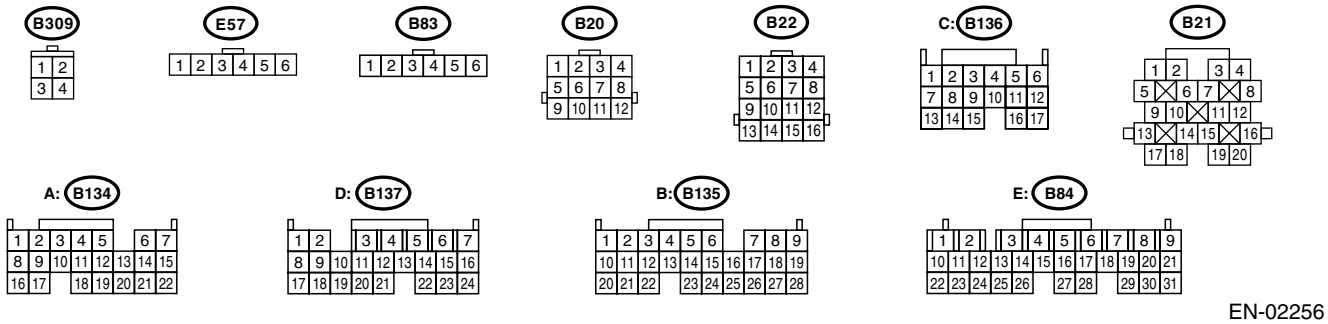
MEMO:

BA:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “b” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-106, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor.	Is the measured value less than 4.73 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 9 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 — Engine ground:***	Is the measured value more than 10 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and electric throttle connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the measured value less than 10 V?	Go to step **7.**	Repair the short of harness between ECM connector and electric throttle connector.
7	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between connectors. ***Connector & terminal*** ***(B136) No. 9 — (B135) No. 9:***	Is the measured value more than 1 MΩ?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Short circuit of sensor power supply may be the cause.

BB:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO U5)-236, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO U5)-236, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BD:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO U5)-236, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

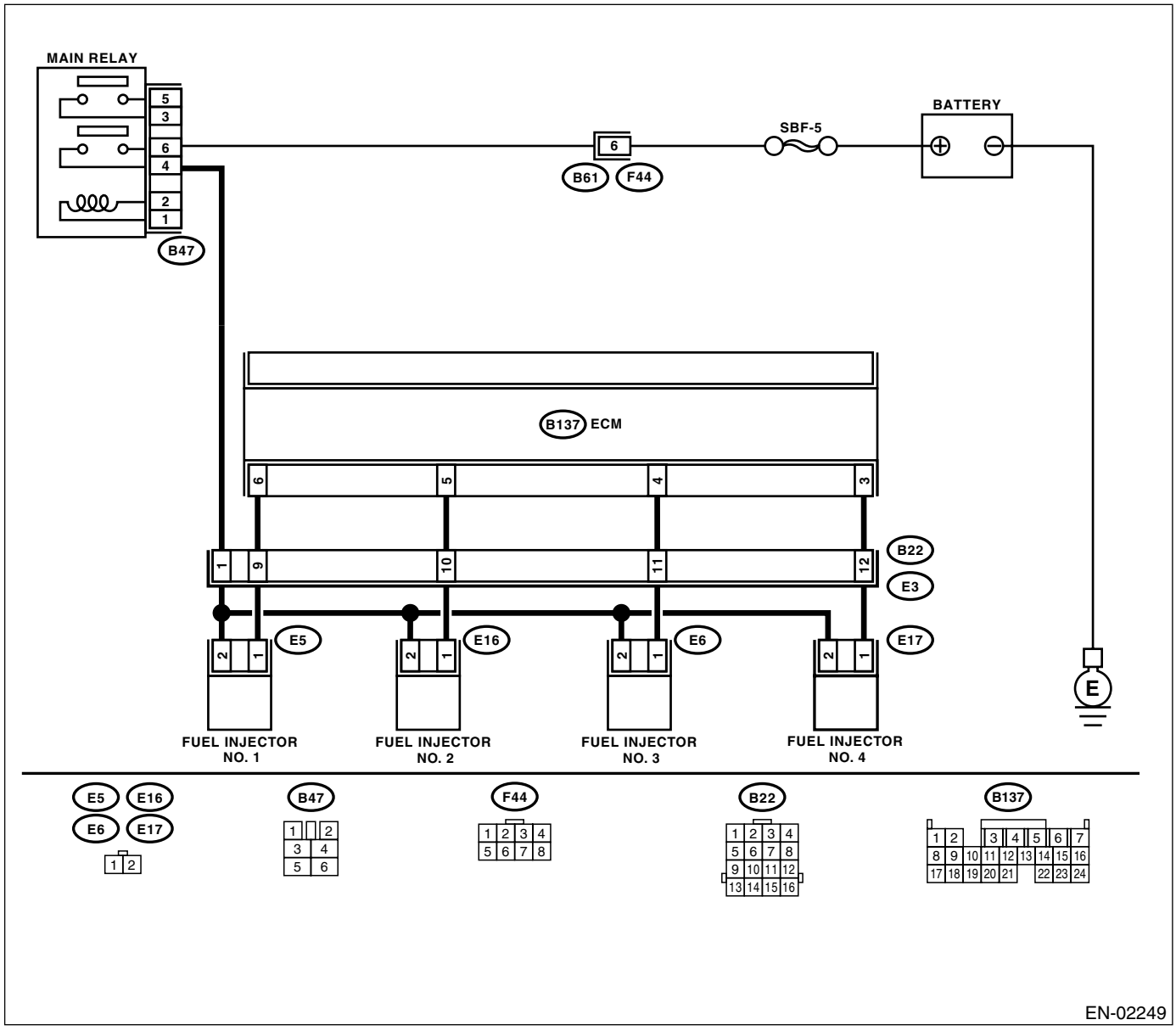
MEMO:

BE:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Immediately at fault recognition (A misfire which could damage catalyst occurs.)
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-113, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 6 (+) — Chassis ground (–):*** ***#2 (B137) No. 5 (+) — Chassis ground (–):*** ***#3 (B137) No. 4 (+) — Chassis ground (–):*** ***#4 (B137) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 6 — (E5) No. 1:*** ***#2 (B137) No. 5 — (E16) No. 1:*** ***#3 (B137) No. 4 — (E6) No. 1:*** ***#4 (B137) No. 3 — (E17) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H4SO U5)-38, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 6 (+) — Chassis ground (–):*** ***#2 (B137) No. 5 (+) — Chassis ground (–):*** ***#3 (B137) No. 4 (+) — Chassis ground (–):*** ***#4 (B137) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H4SO U5)-38, Fuel Injector.> and ECM <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(H4SO)-53, Crankshaft Sprocket.>	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-47, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4SO U5)-58, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **16.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire identified when the engine is running? Ex. Disconnection of spark plug cord.	Finish diagnostics operation, if the engine has no abnormality.	Go to step **15.**
15	**CHECK FOR POOR CONTACT.**	Is there poor contact in the ignition coil, fuel injector, ECM and coupling connector?	Repair poor contact.	Contact your SOA Service Center after checking followings. NOTE: In this case, check the following: • Condition of fuel • Fuel additive used or not • Visually check spark plug • Visually check spark plug cord • Condition of engine oil
16	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **17.**

	Step	Check	Yes	No
17	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Read the DTC. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Does the Subaru Select Monitor or OBD-II general scan tool display only one DTC?	Go to step **22.**	Go to step **18.**
18	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step **23.**	Go to step **19.**
19	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step **24.**	Go to step **20.**
20	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0303?	Go to step **25.**	Go to step **21.**
21	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302 and P0304?	Go to step **26.**	Go to step **27.**
22	**ONLY ONE CYLINDER**	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
23	GROUP OF #1 AND #2 CYLINDERS	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H4SO U5)-80, IGNITION CONTROL SYSTEM.>	Go to DTC P0171. <Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	GROUP OF #3 AND #4 CYLINDERS	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to EN(H4SO U5)-80, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	GROUP OF #1 AND #3 CYLINDERS	Are there faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
26	GROUP OF #2 AND #4 CYLINDERS	Are there faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	CYLINDER AT RANDOM	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4SO U5)-216, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

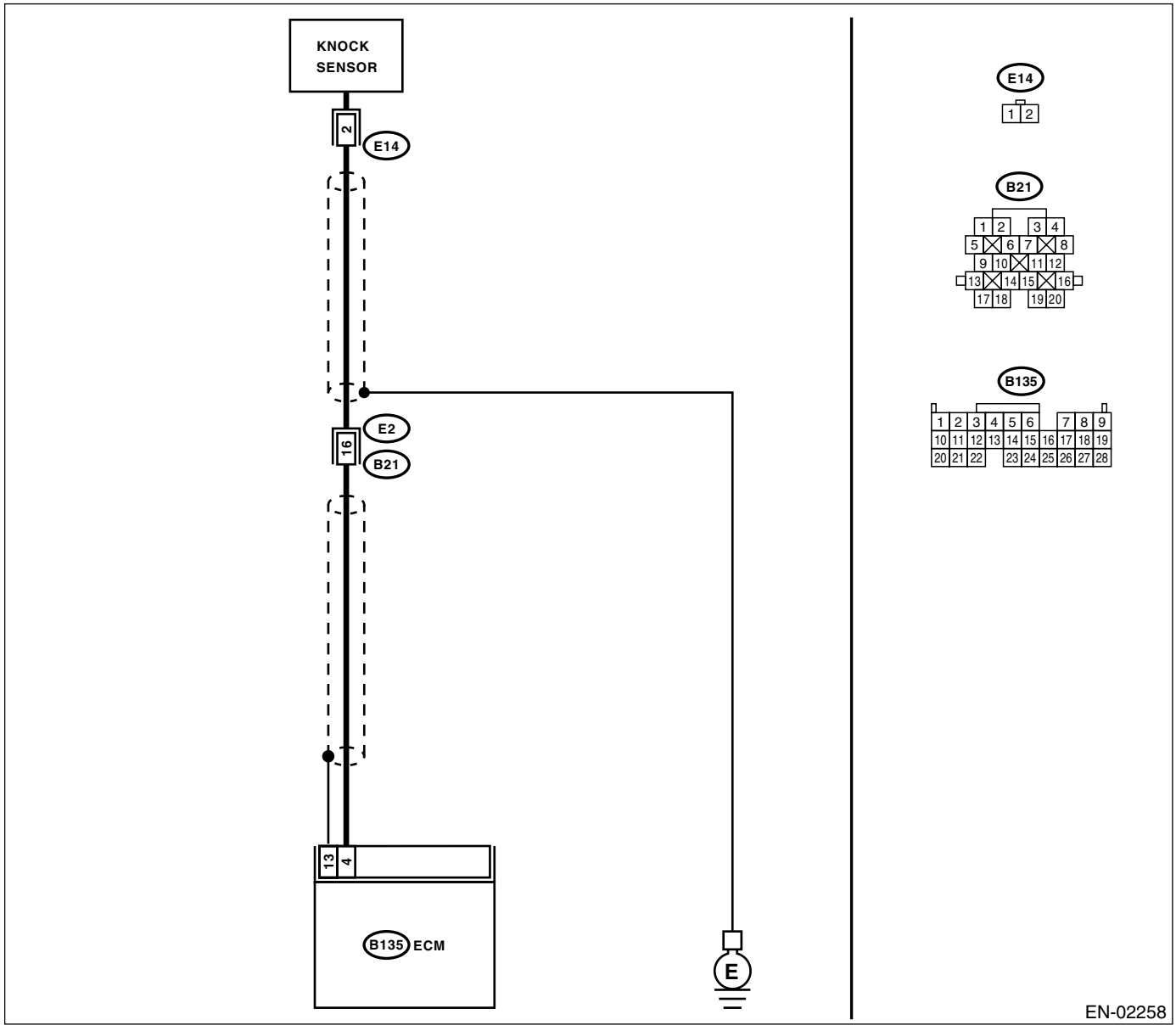
MEMO:

BF:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-114, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



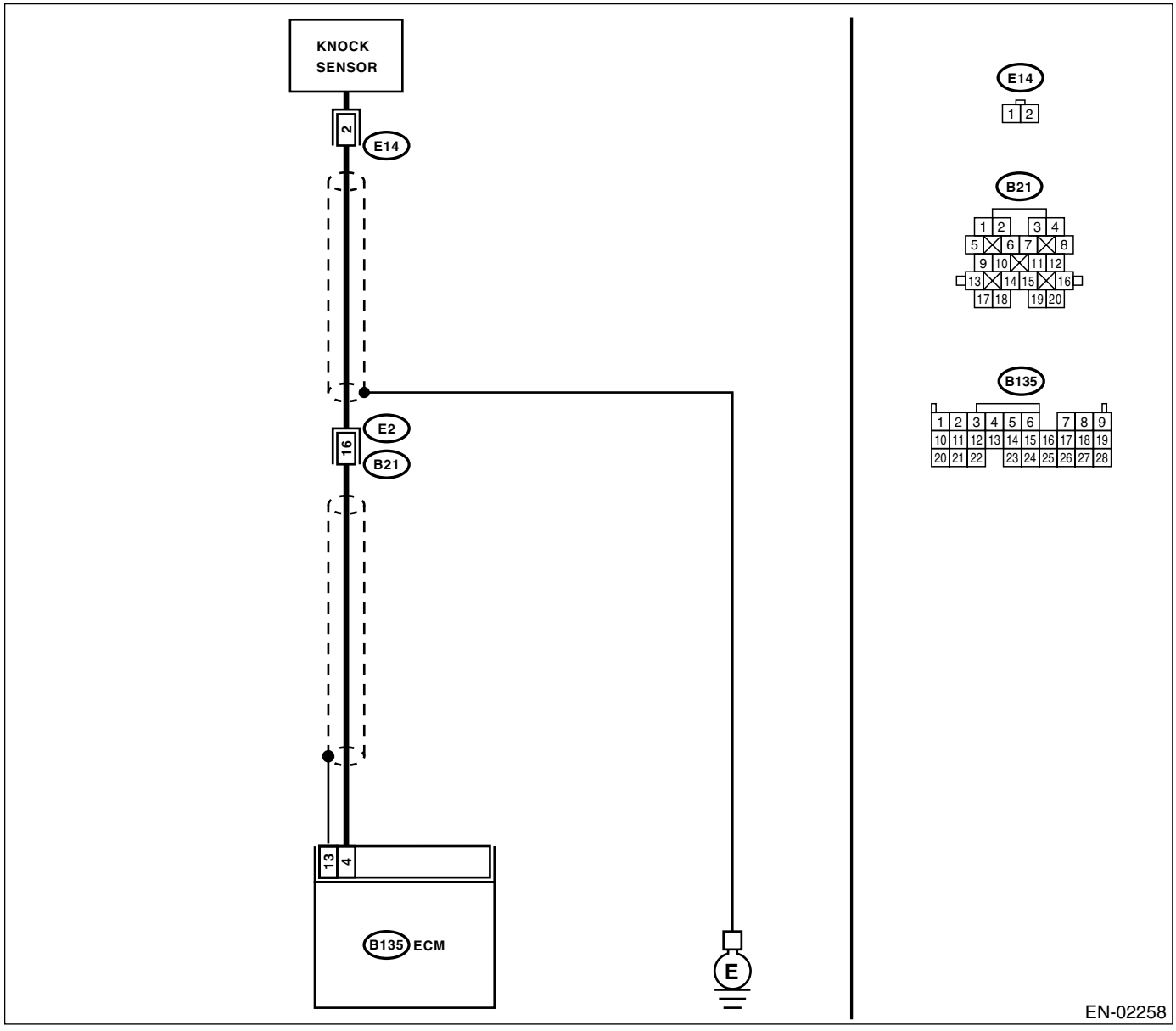
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the measured value more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the measured value more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4SO U5)-30, Knock Sensor.>	Tighten knock sensor installation bolt securely.

BG:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-116, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



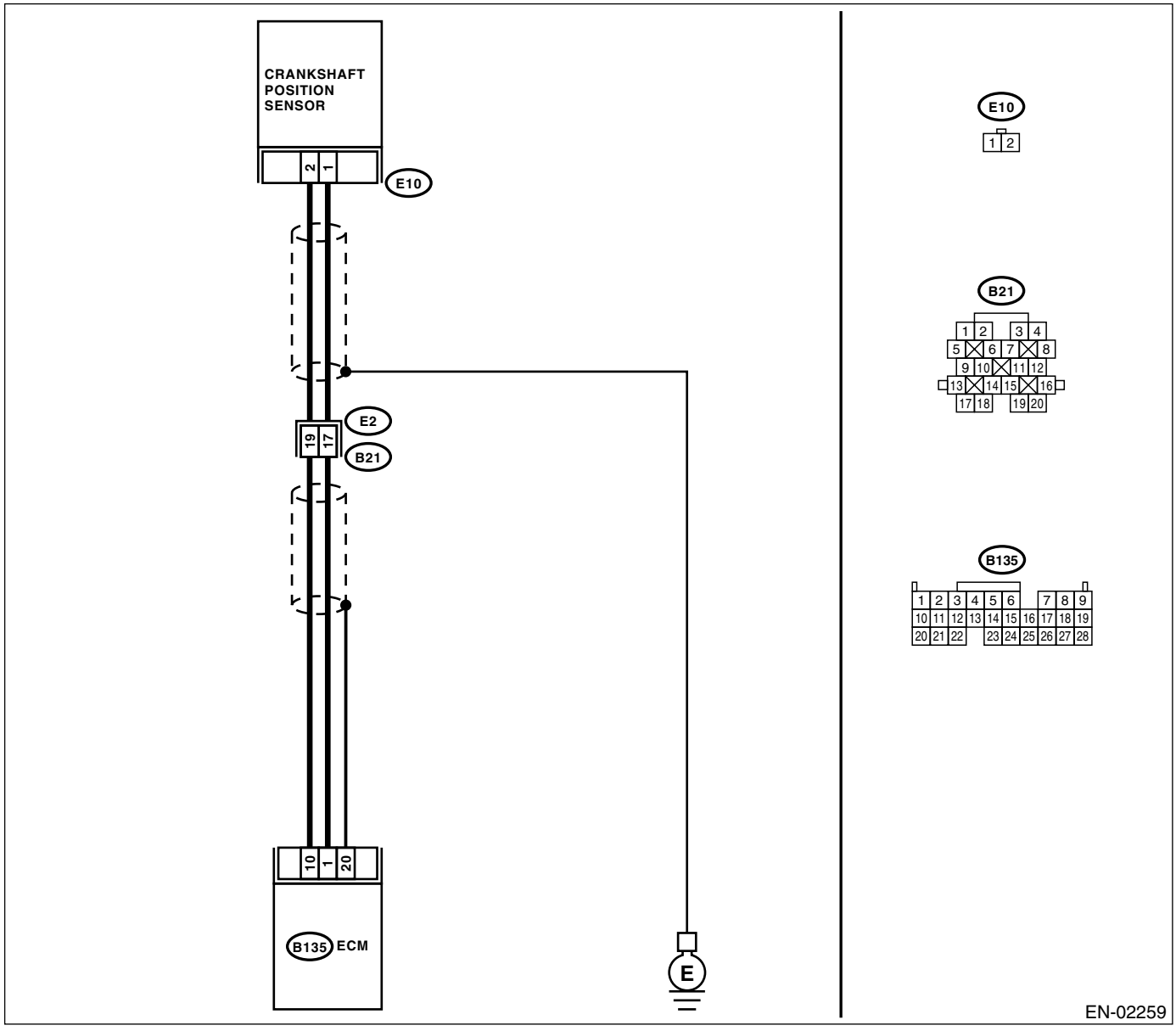
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the measured value less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the measured value less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4SO U5)-30, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

BH:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-118, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.>.

- **WIRING DIAGRAM:**



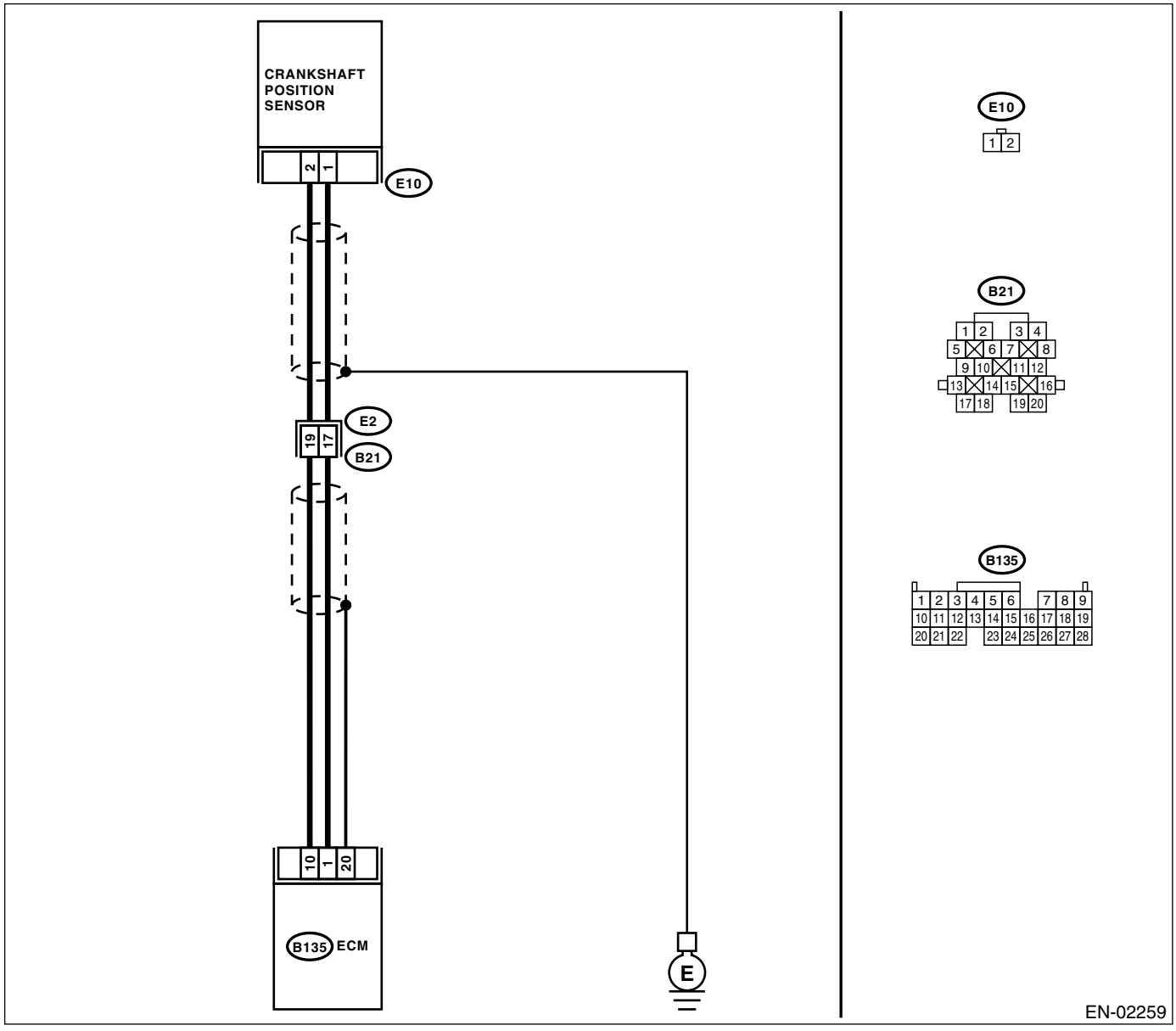
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4SO U5)-28, Crankshaft Position Sensor.>

BI: DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-120, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



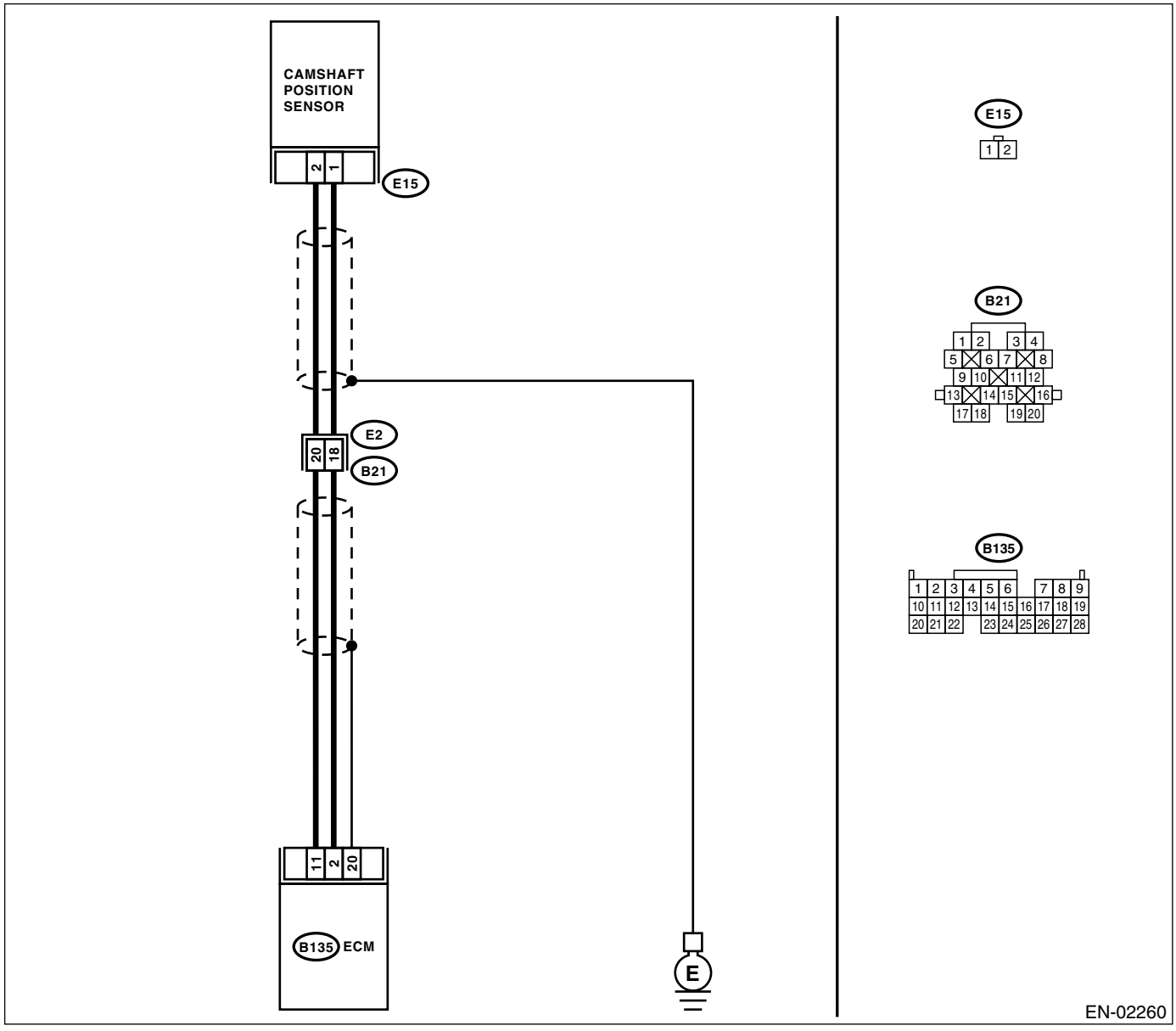
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Are crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to ME(H4SO)-53, Crankshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-47, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H4SO U5)-28, Crankshaft Position Sensor.>

BJ:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-122, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



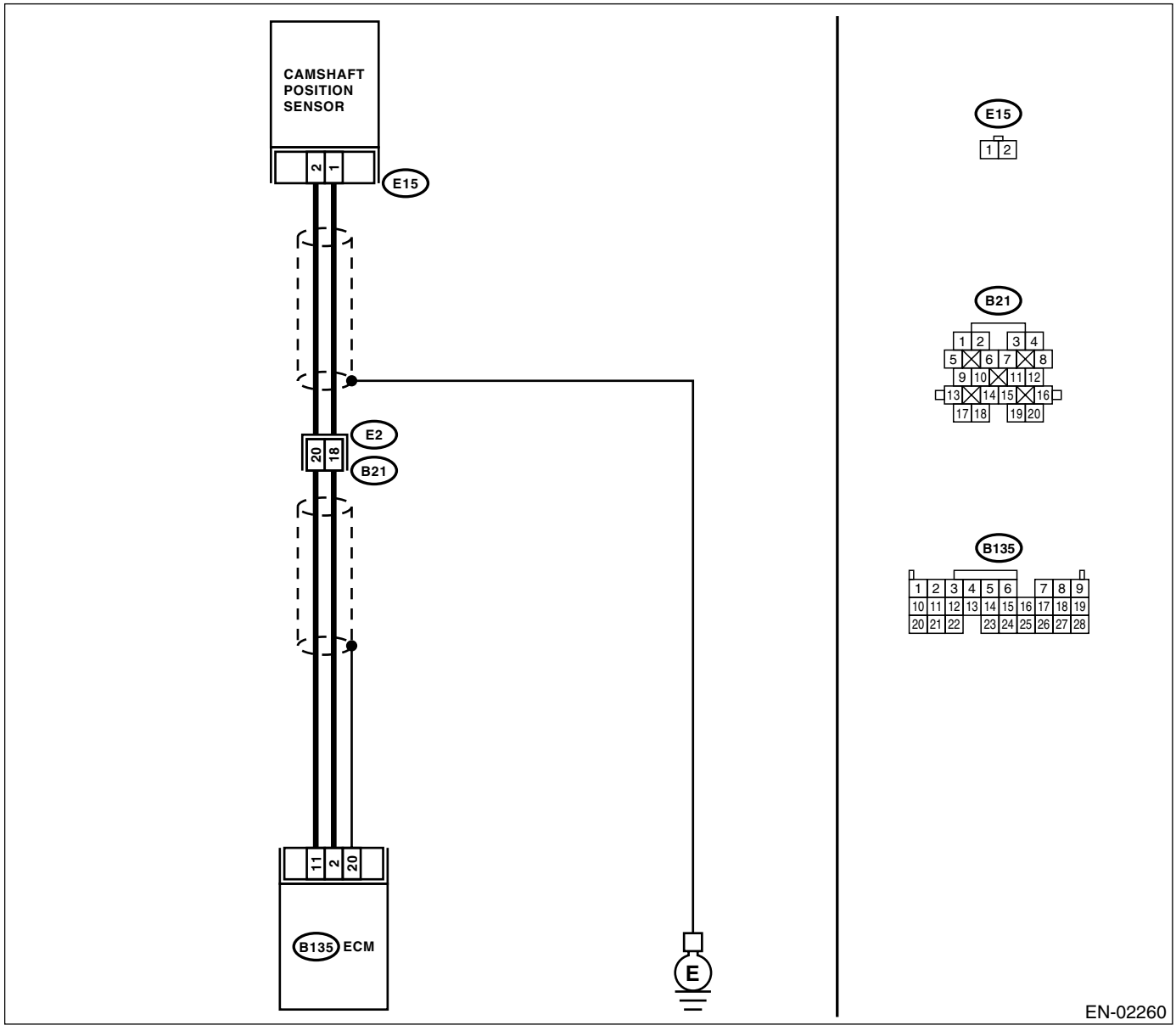
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4SO U5)-29, Camshaft Position Sensor.>

BK:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-124, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(H4SO U5)-29, Camshaft Position Sensor.>

	Step	Check	Yes	No
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the timing belt cover. <Ref. to ME(H4SO)-46, Belt Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME(H4SO)-52, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. ST 499987500 CAMSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-47, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(H4SO U5)-29, Camshaft Position Sensor.>

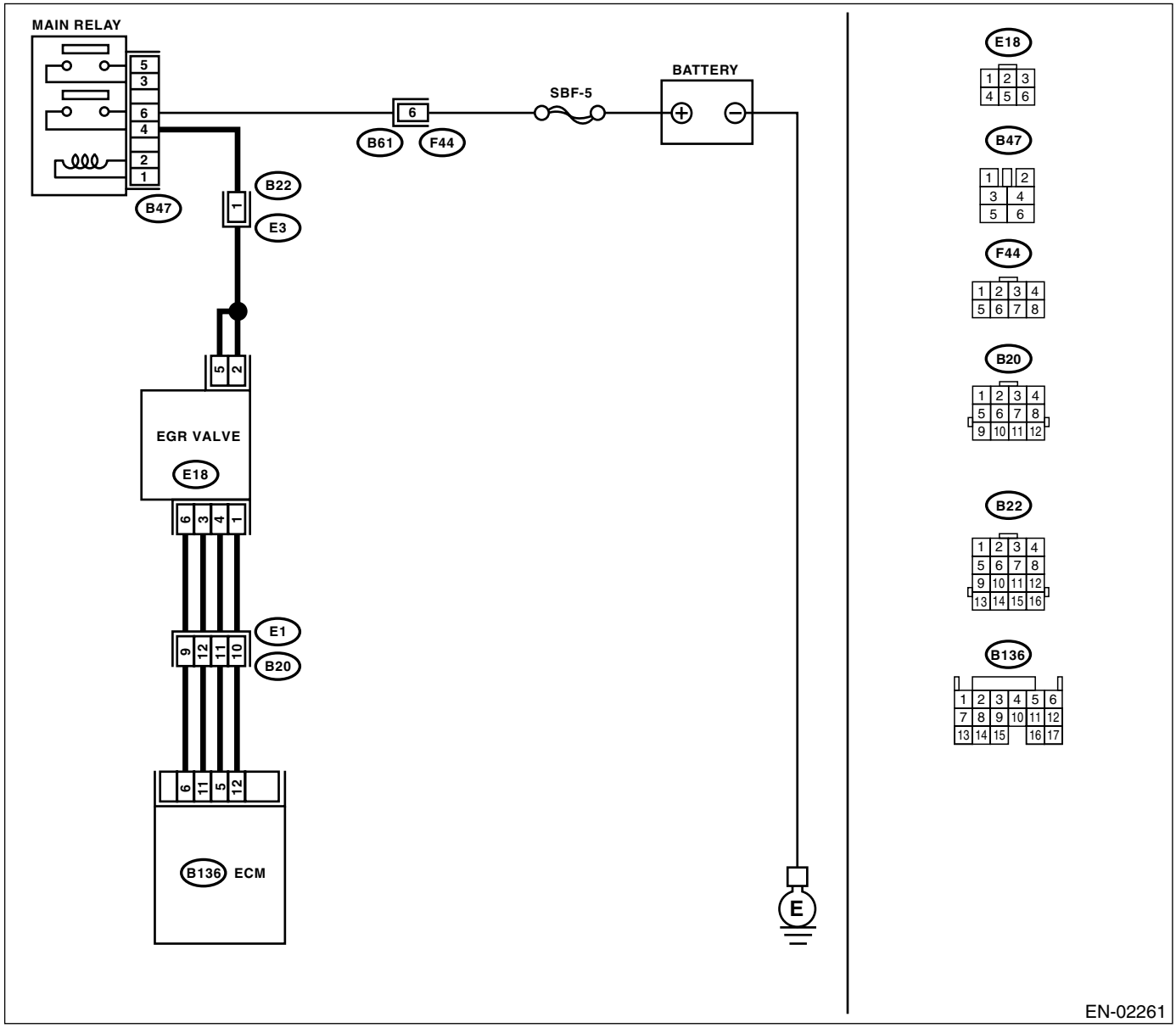
MEMO:

BL:DTC P0400 — EXHAUST GAS RECIRCULATION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-<Ref. to GD(H4SO U5)-126, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Poor driving performance at low engine speed
  - Faulty idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 53.3 kPa (400 mmHg, 15.75 inHg)?	Make sure that EGR valve, manifold pressure sensor and throttle body are securely installed.	Go to step **3.**
3	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch ON. 3) Measure voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:***	Is the measured value more than 10 V?	Go to step **4.**	Repair the open circuit in harness between main relay and EGR solenoid valve connector.
4	**CHECK EGR SOLENOID VALVE.** Measure resistance between EGR solenoid valve terminals. NOTE: Measure resistance between EGR solenoid valve terminals. ***Connector & terminal*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:***	Is the measured value within 20 to 30 Ω?	Go to step **5.**	Replace EGR solenoid valve. <Ref. to FU(H4SO U5)-37, EGR Valve.>
5	**OUTPUT SIGNAL FROM ECM** 1) Turn ignition switch OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from EGR solenoid valve and ECM. 3) Measure resistance of harness between EGR solenoid valve and ECM connector. ***Connector & terminal*** ***(B136) No. 5 (+) — (E18) No. 4:*** ***(B136) No. 6 (+) — (E18) No. 6:*** ***(B136) No. 11 (+) — (E18) No. 3:*** ***(B136) No. 12 (+) — (E18) No. 1:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between ECM and EGR solenoid valve connector.<Ref. to FU(H4SO U5)-37, EGR Valve.>
7	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between EGR solenoid valve and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 11 — Chassis ground:*** ***(B136) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair short circuit in harness between main relay and EGR solenoid valve connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector.	Is there poor contact in ECM and EGR solenoid valve connector?	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.

BM:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-130, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4SO U5)-2, General Description.>	Go to step **3.**
3	**CHECK CATALYTIC CONVERTER.**	Is there damage at rear face or front face of front catalyst?	Replace the catalytic converter. <Ref. to EC(H4SO)-3, Front Catalytic Converter.>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

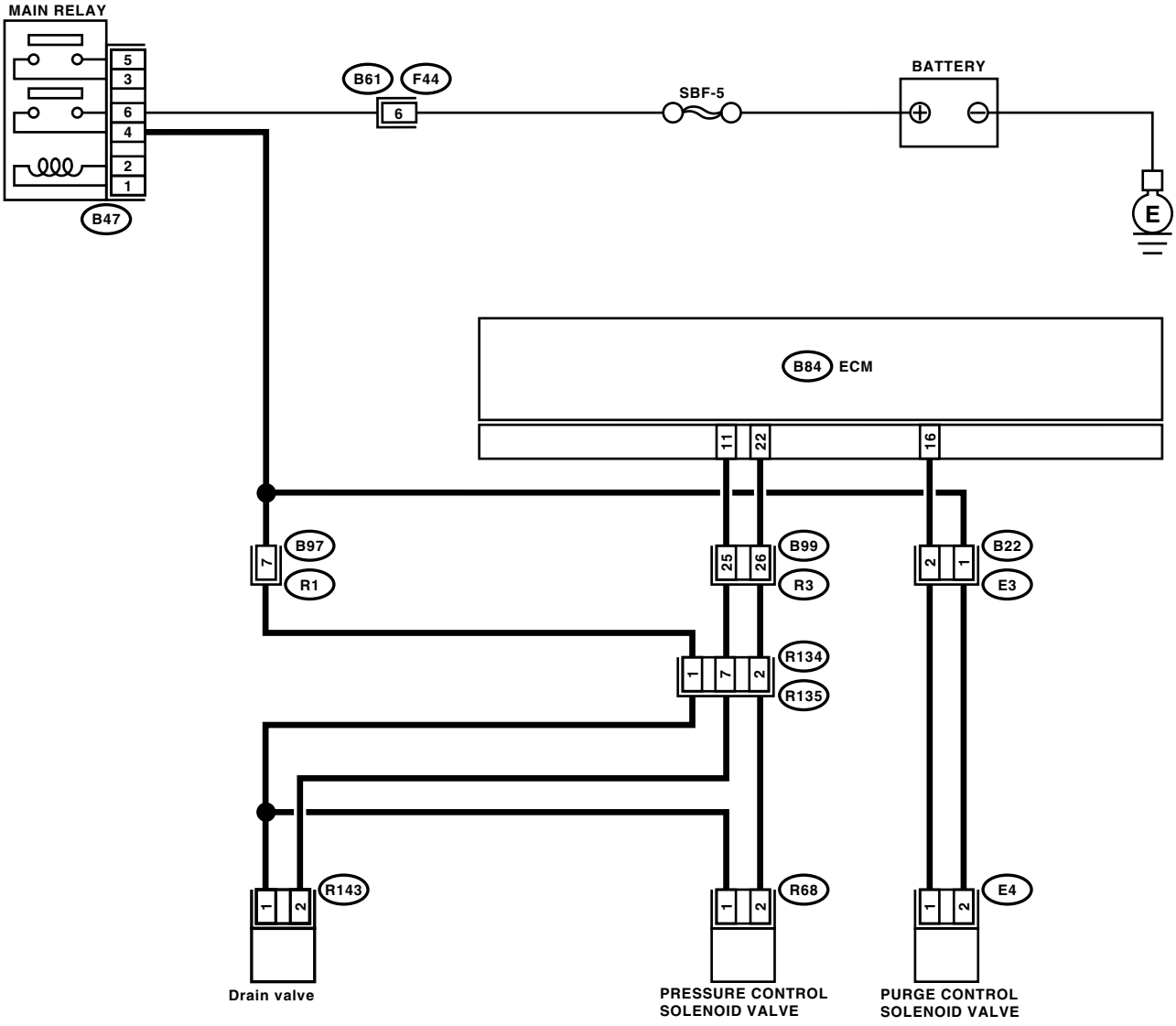
MEMO:

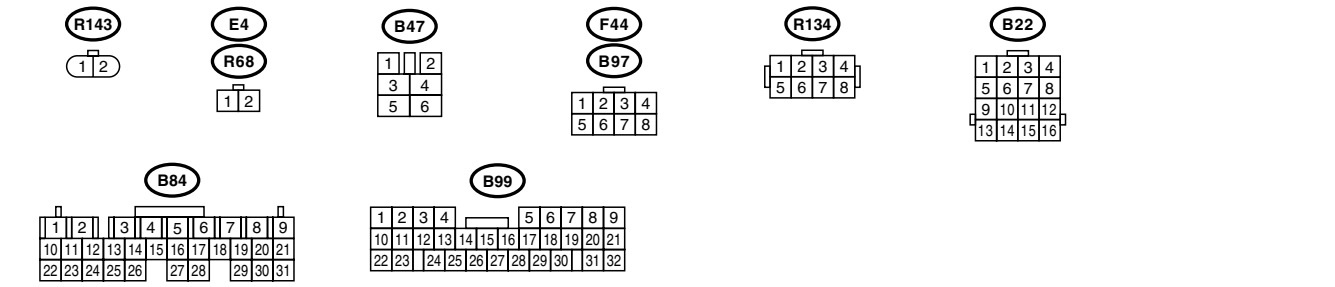
BN:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Fuel odor
  - There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO U5)-63, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4SO U5)-77, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4SO U5)-55, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4SO U5)-55, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

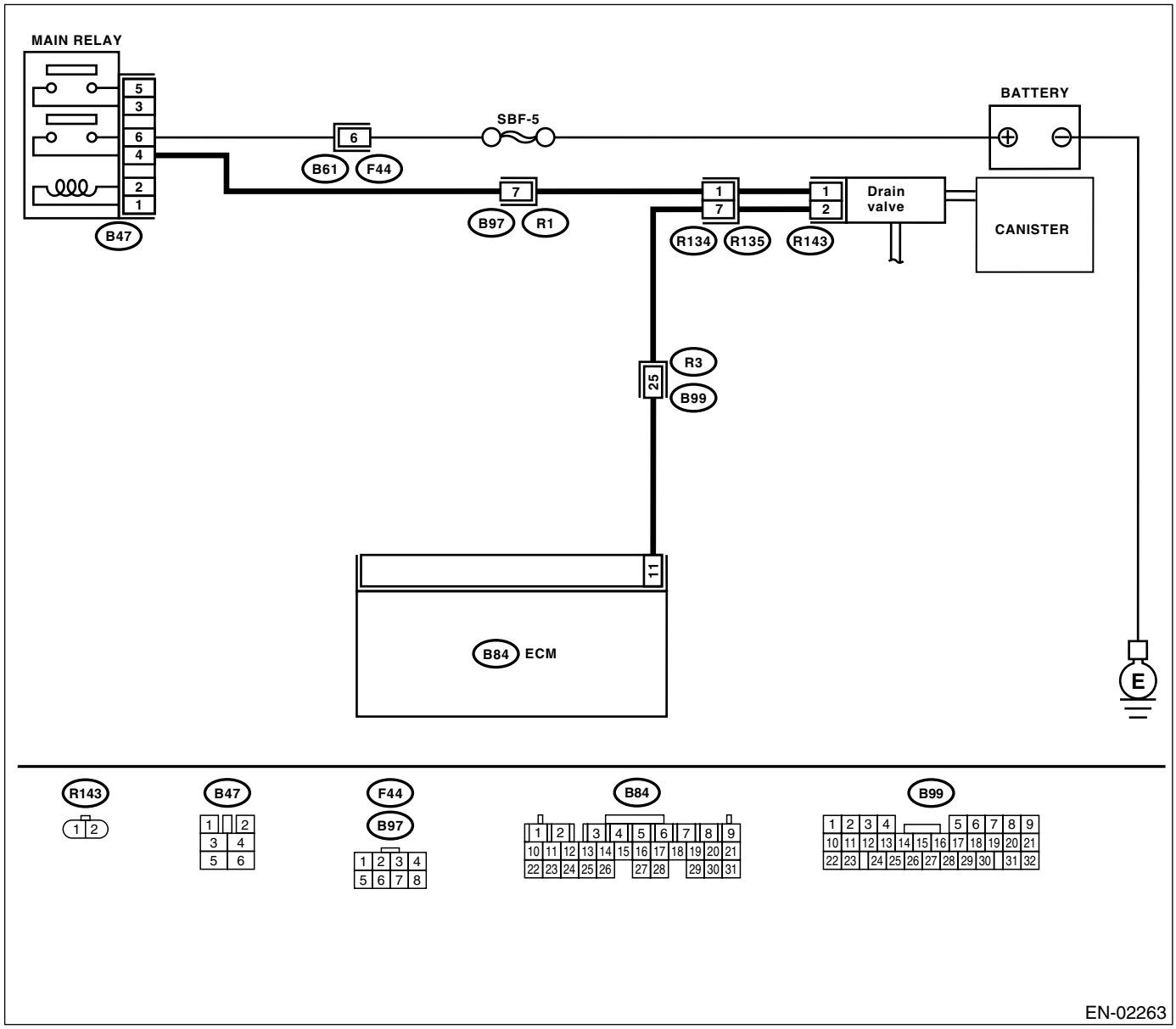
MEMO:

BO:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-156, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R143) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B84) No. 11 — (R143) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value 10 — 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

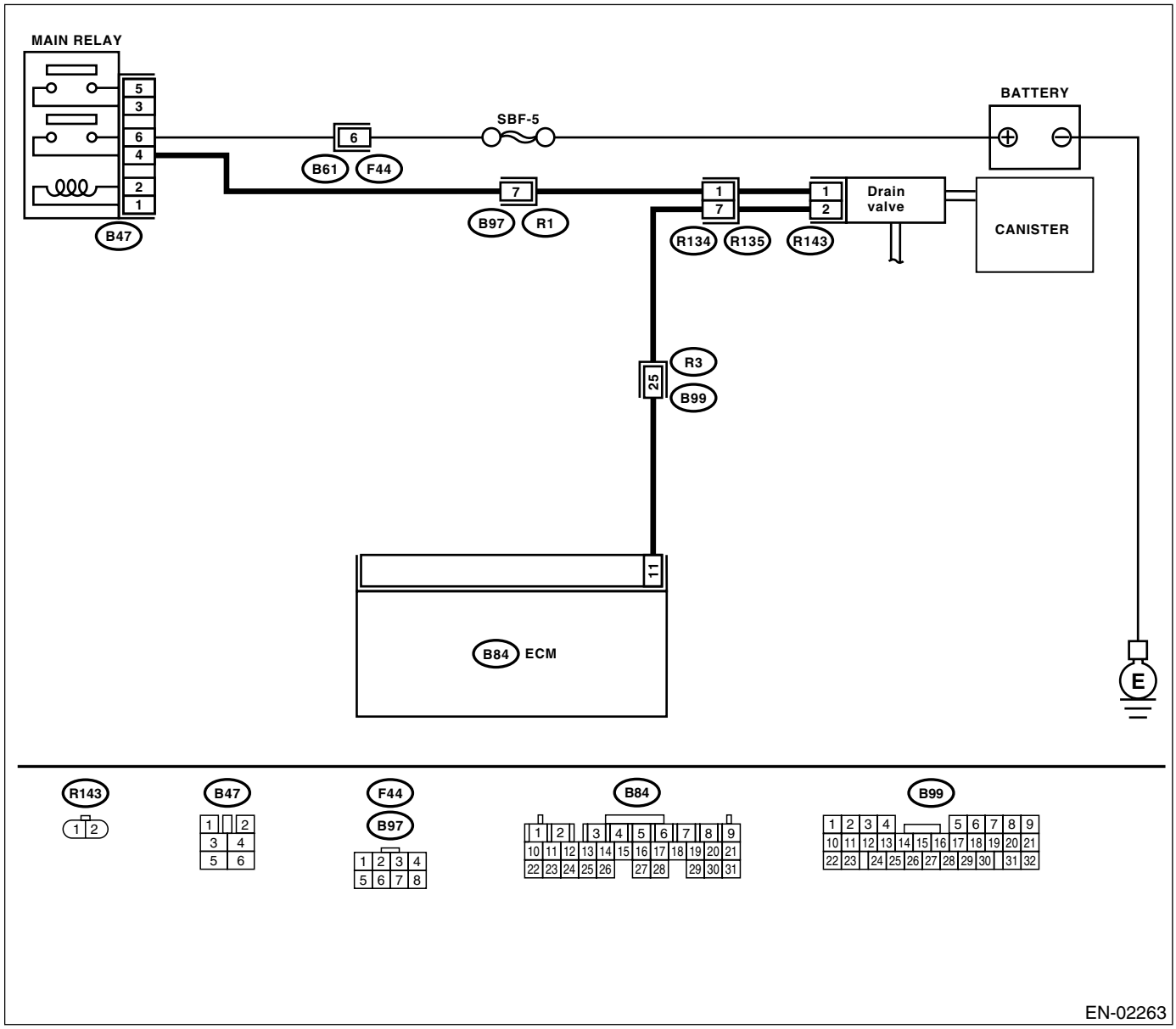
MEMO:

BP:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-158, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



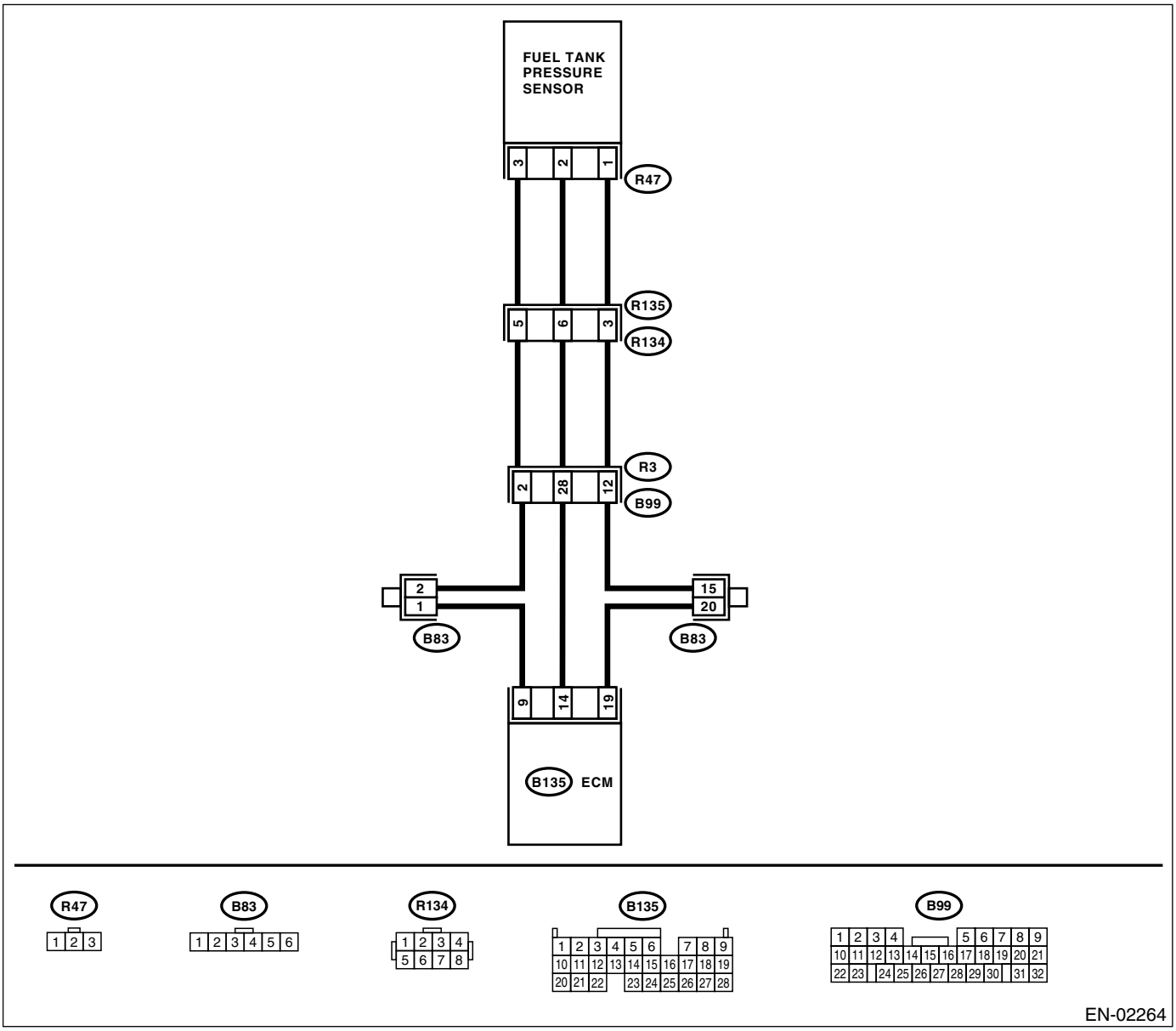
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Is the measured value 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(H4SO)-17, Drain Valve.> and ECM <Ref. to FU(H4SO U5)-49, Engine Control Module.>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

BQ:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-160, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02264

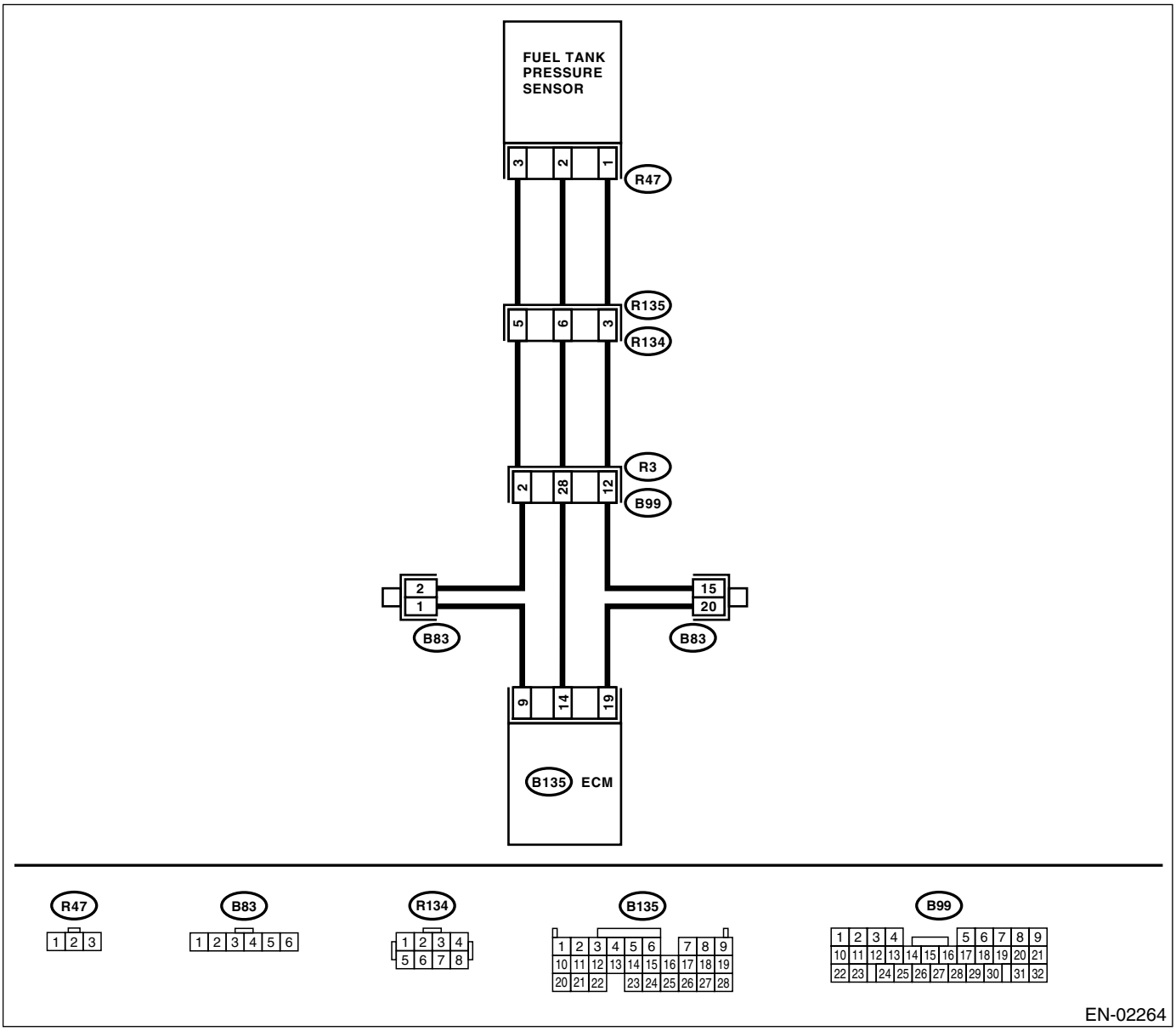
	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank •Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

BR:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-162, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02264

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.>	Does the measured value change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 19 — (R134) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 3 (+) — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 5 — (R47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair short circuit to ground in fuel tank cord.
12	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

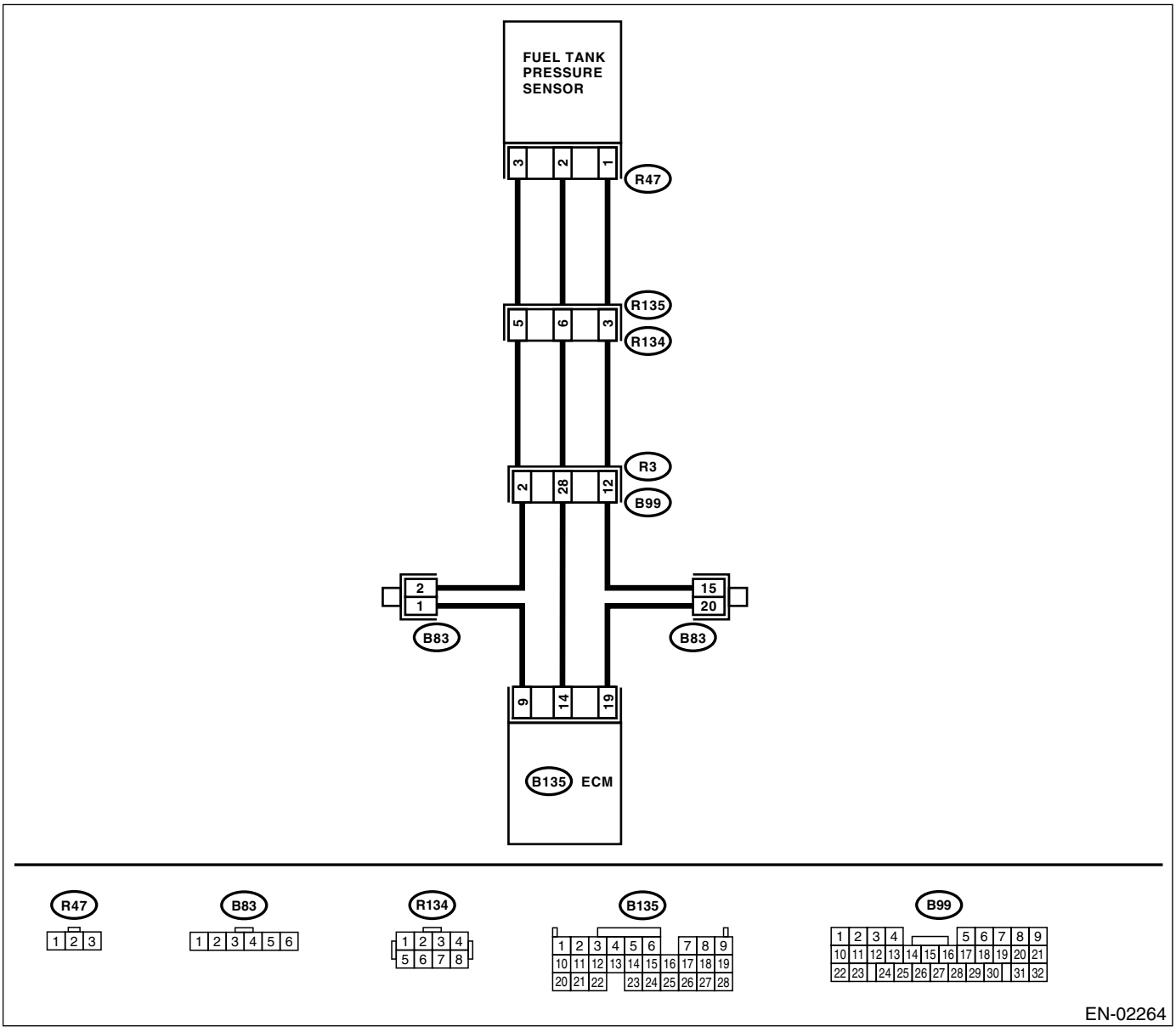
MEMO:

BS:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-164, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step **11.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.>	Does the measured value change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

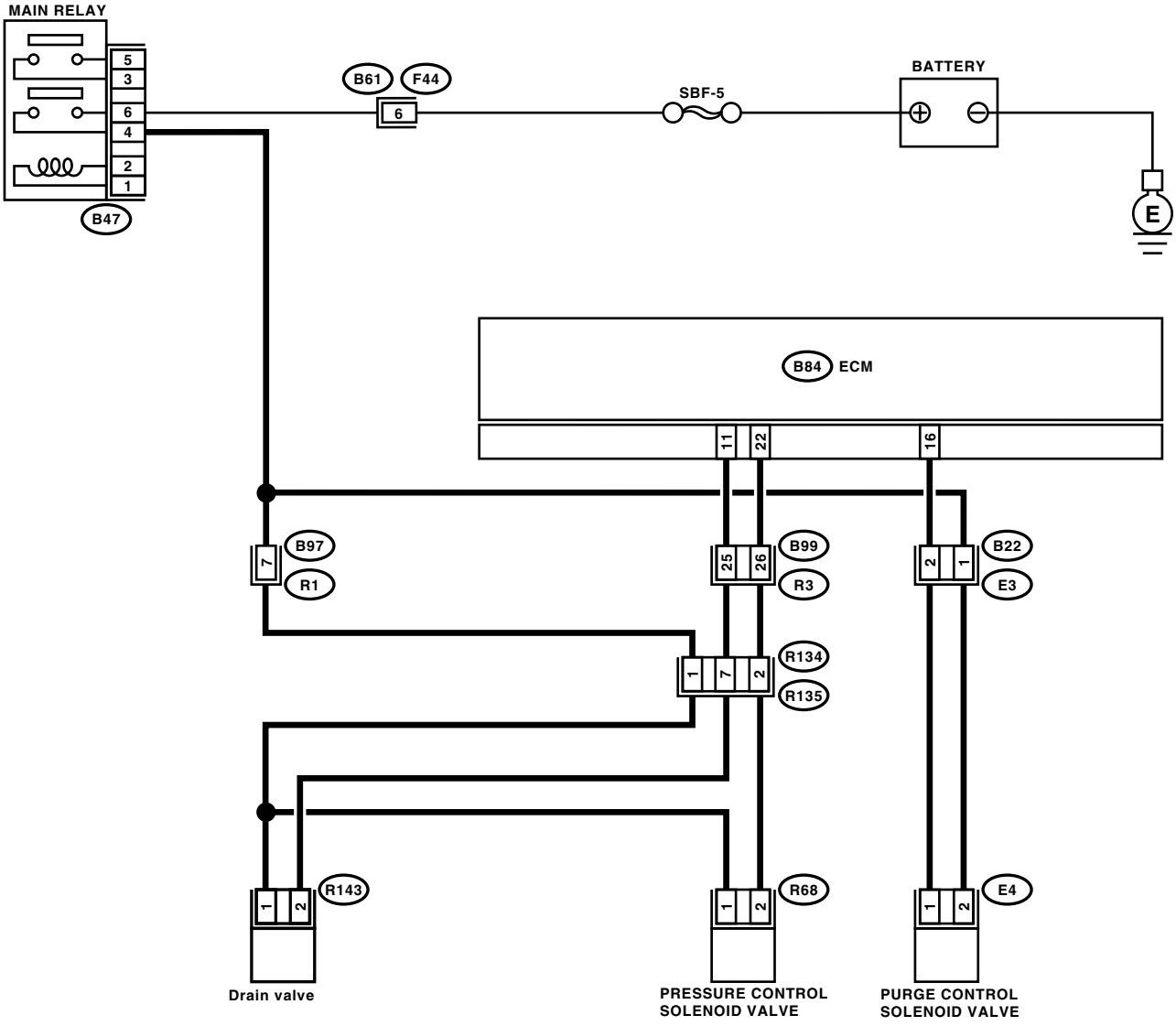
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 14 — (R134) No. 6:*** ***(B135) No. 19 — (R134) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 6 — (R47) No. 2:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

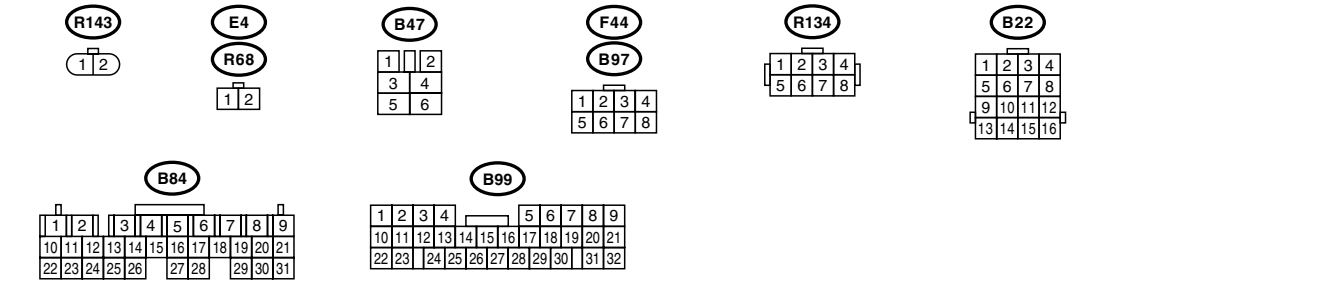
BT:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-166, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Fuel odor
  - There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02262

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO U5)-63, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>

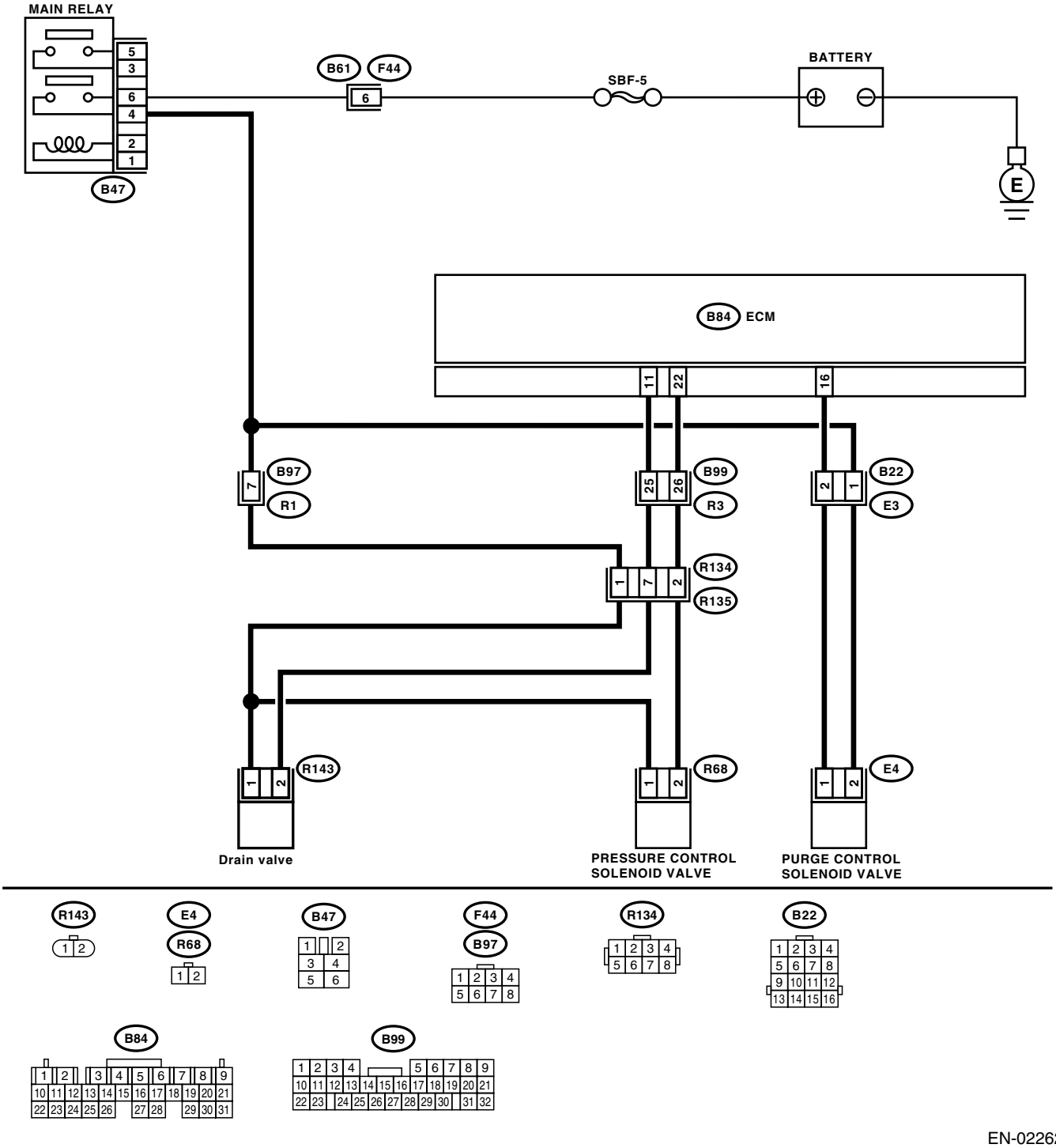
	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4SO U5)-77, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4SO U5)-55, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4SO U5)-55, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BU:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-166, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Fuel odor
  - Fuel filler cap is loose or not installed.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02262

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO U5)-63, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4SO U5)-55, Fuel Tank, .>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4SO U5)-55, Fuel Tank, .>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

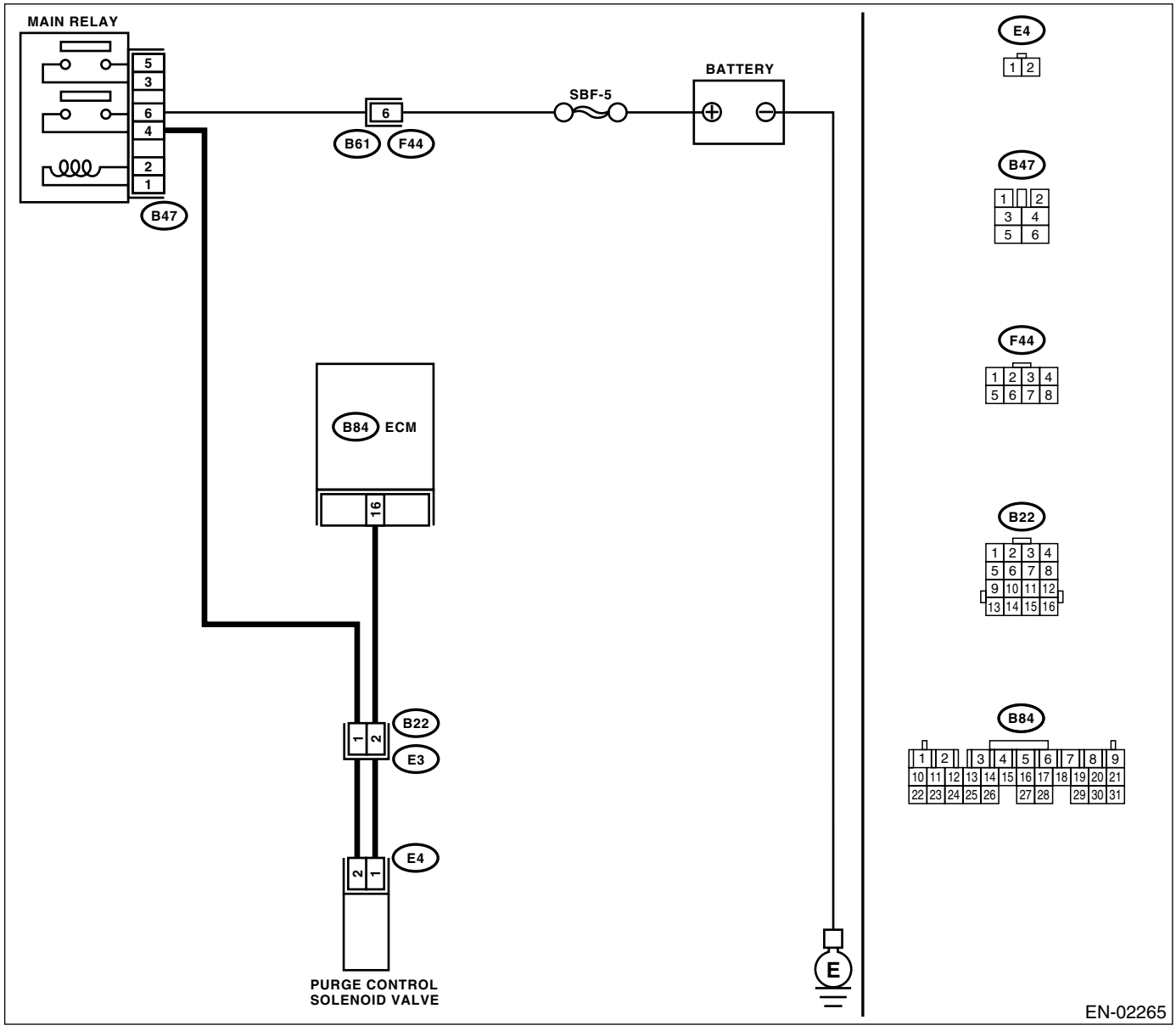
MEMO:

BV:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-168, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B84) No. 16 — (E4) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

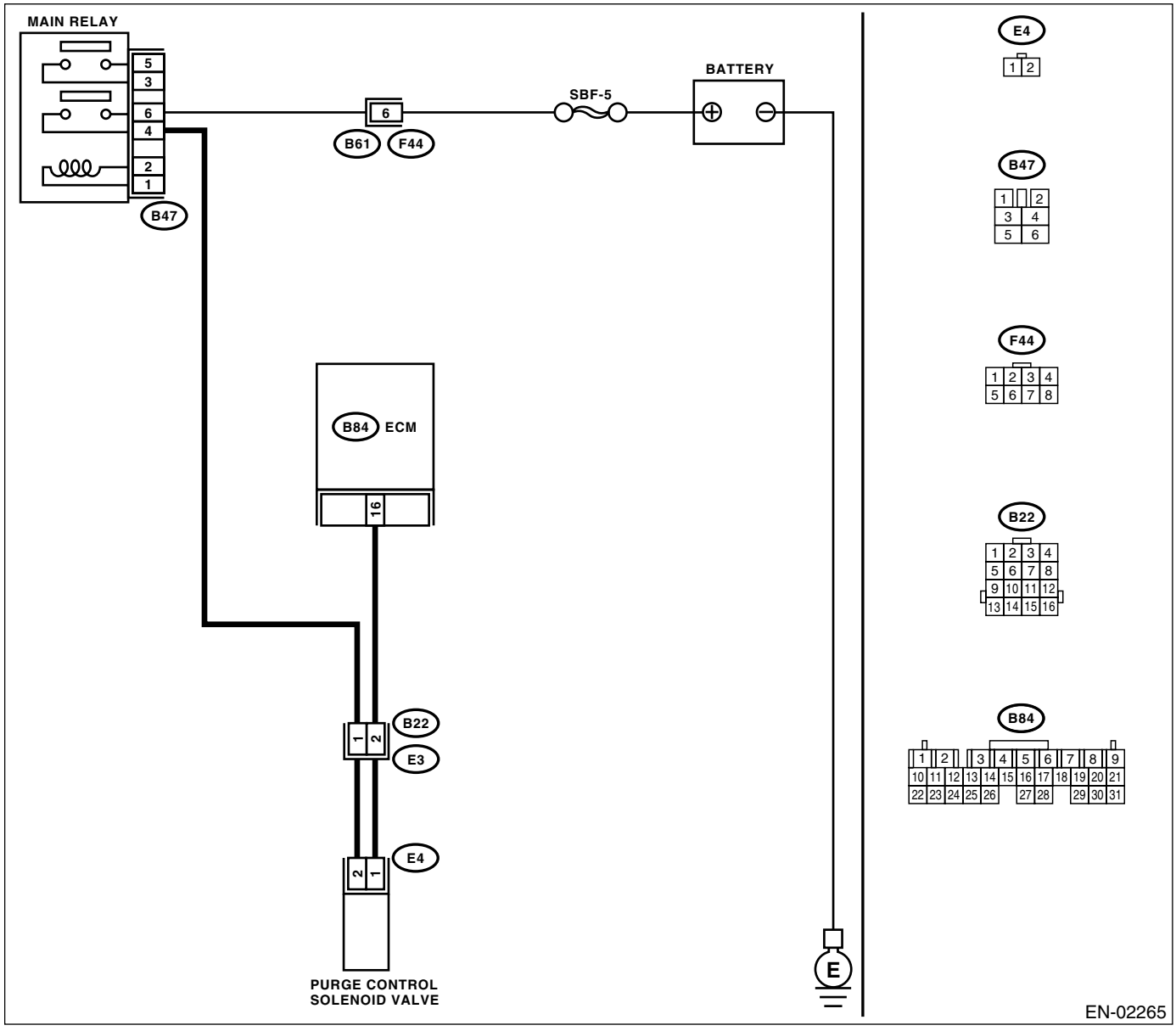
MEMO:

BW:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-170, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



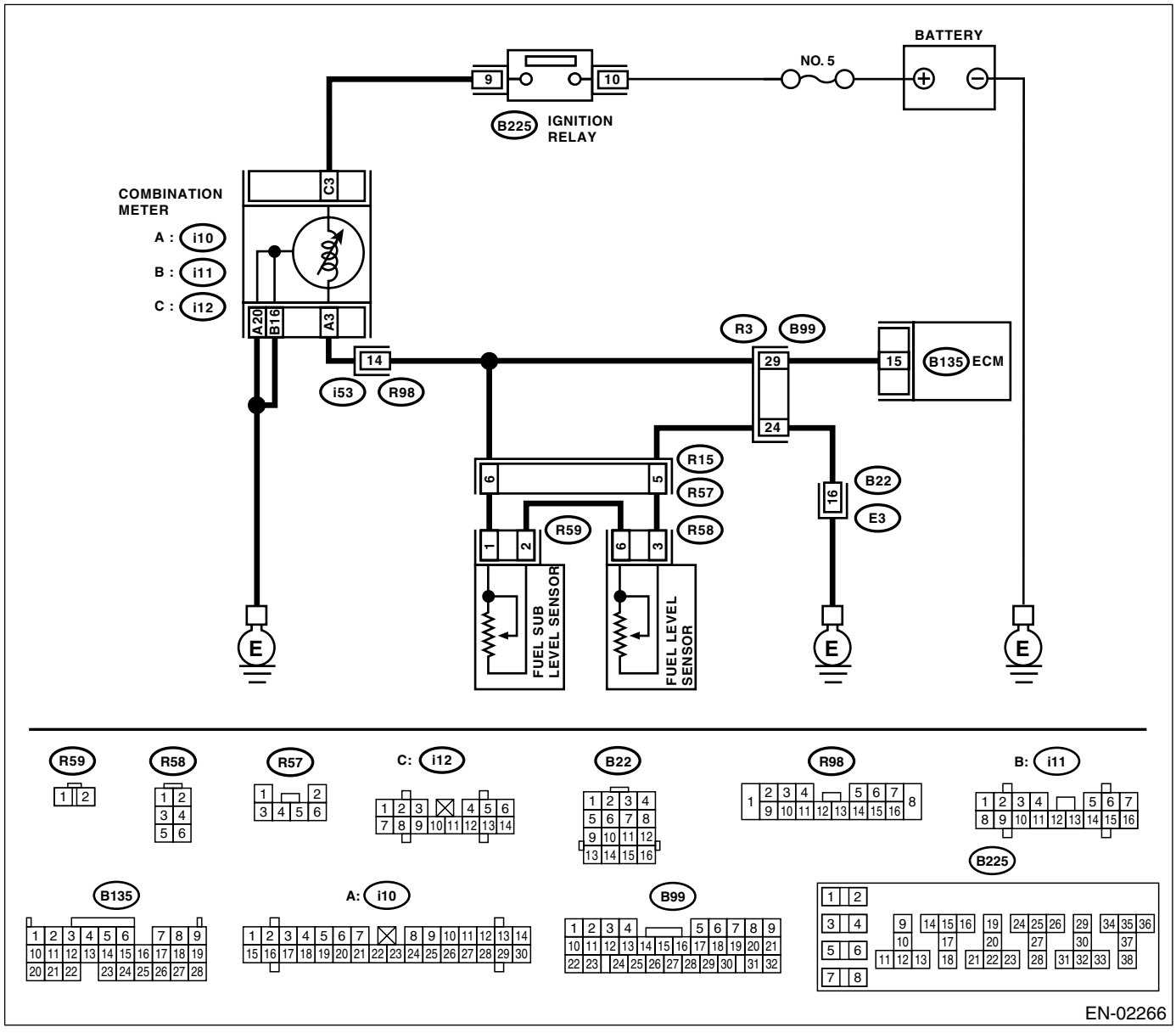
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Go to step **2.**	Even if malfunction indicator light light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

BX:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-172, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



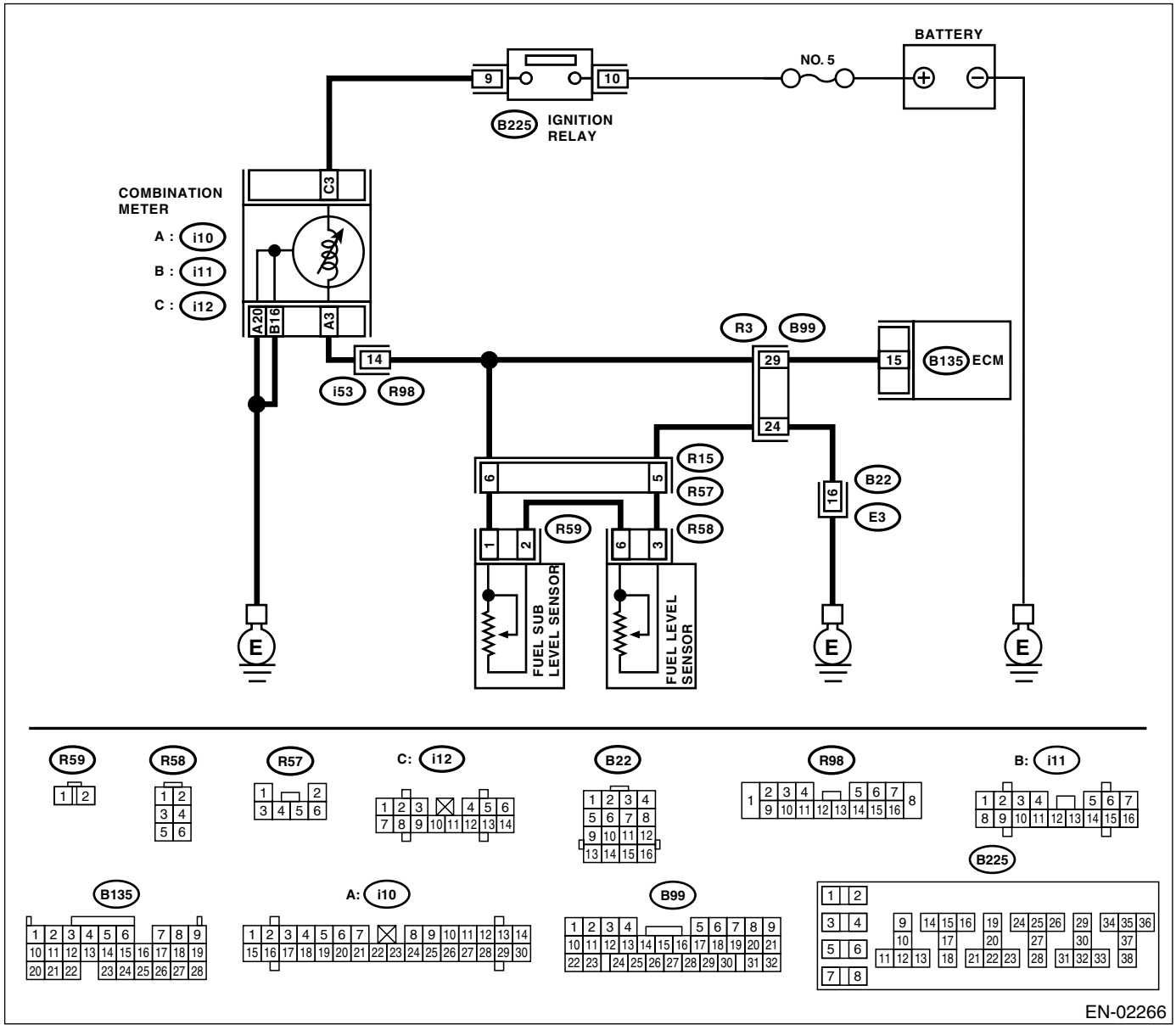
Step		Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(H4SO U5)-72, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO U5)-73, Fuel Sub Level Sensor.>

BY:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-174, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.>	Is the measured value less than 0.12 V by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i10) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and combination meter connector.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 15 — (i10) No. 3:***	Is the measured value less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair short circuit to ground in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO U5)-70, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO U5)-73, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value 0.5 — 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

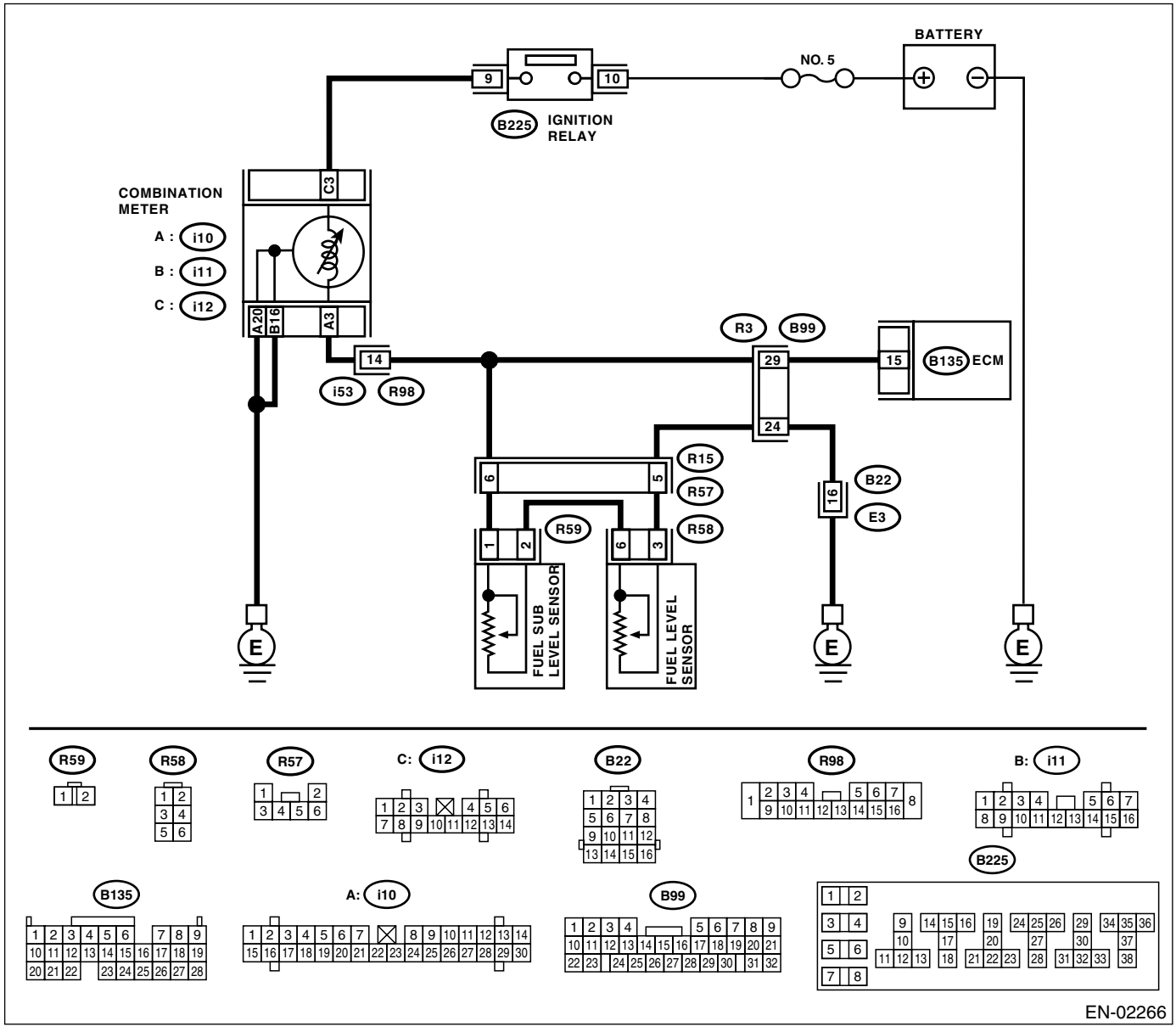
MEMO:

BZ:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-176, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **3.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i12) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 15 — (R15) No. 6:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 5 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 5 — (R58) No. 3:***	Is the measured value less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 6 — (R59) No. 2:***	Is the measured value less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R59) No. 1:***	Is the measured value less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO U5)-70, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value more than 54.5 Ω?	Replace the fuel level sensor. <Ref. to FU(H4SO U5)-72, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO U5)-73, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value more than 41.5 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4SO U5)-73, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-4, Combination Meter System.>

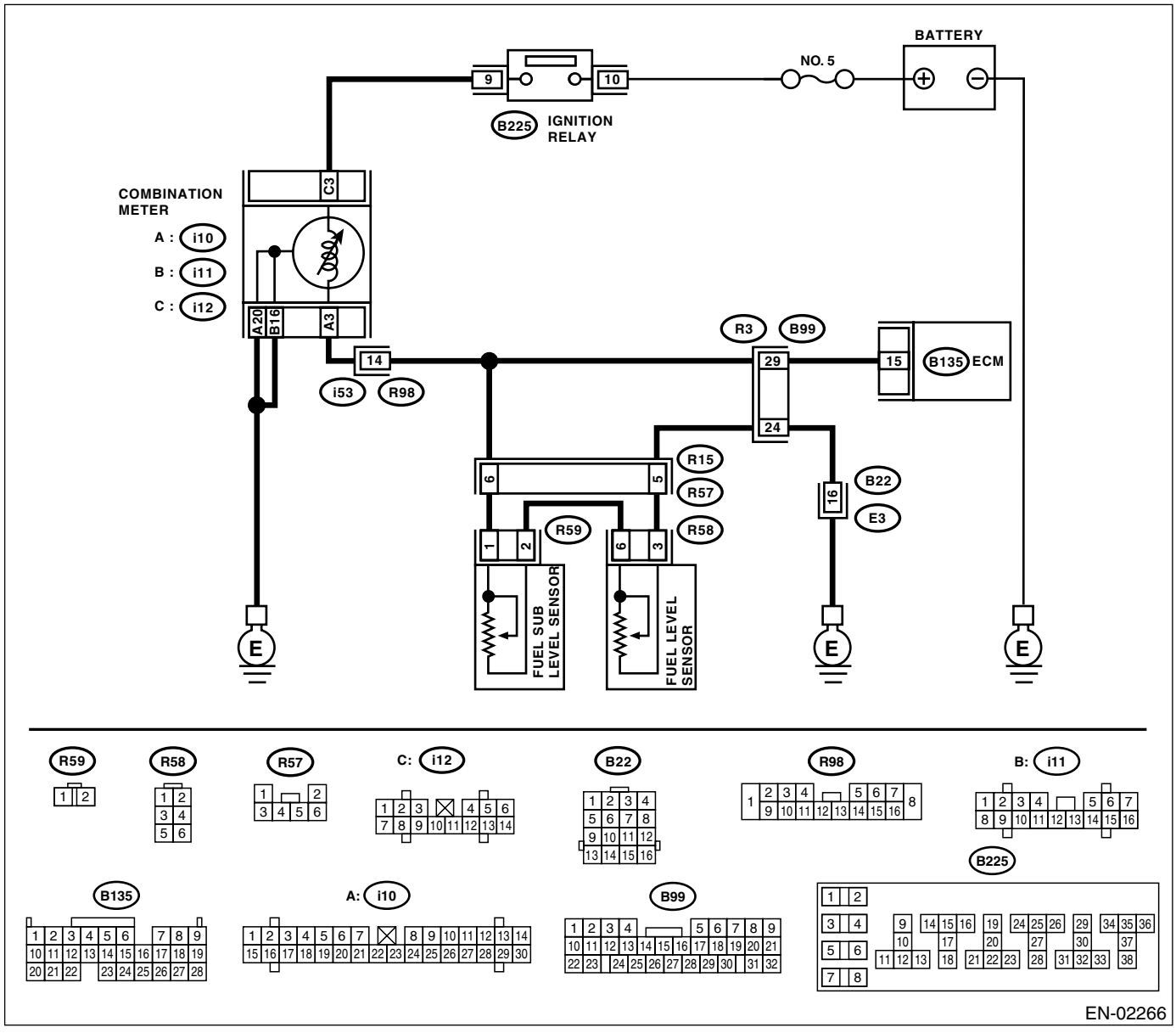
MEMO:

CA:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-178, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0462 or P0463 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO U5)-70, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 6:***	Does the resistance change smoothly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(H4SO U5)-72, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO U5)-73, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4SO U5)-73, Fuel Sub Level Sensor.>

MEMO:

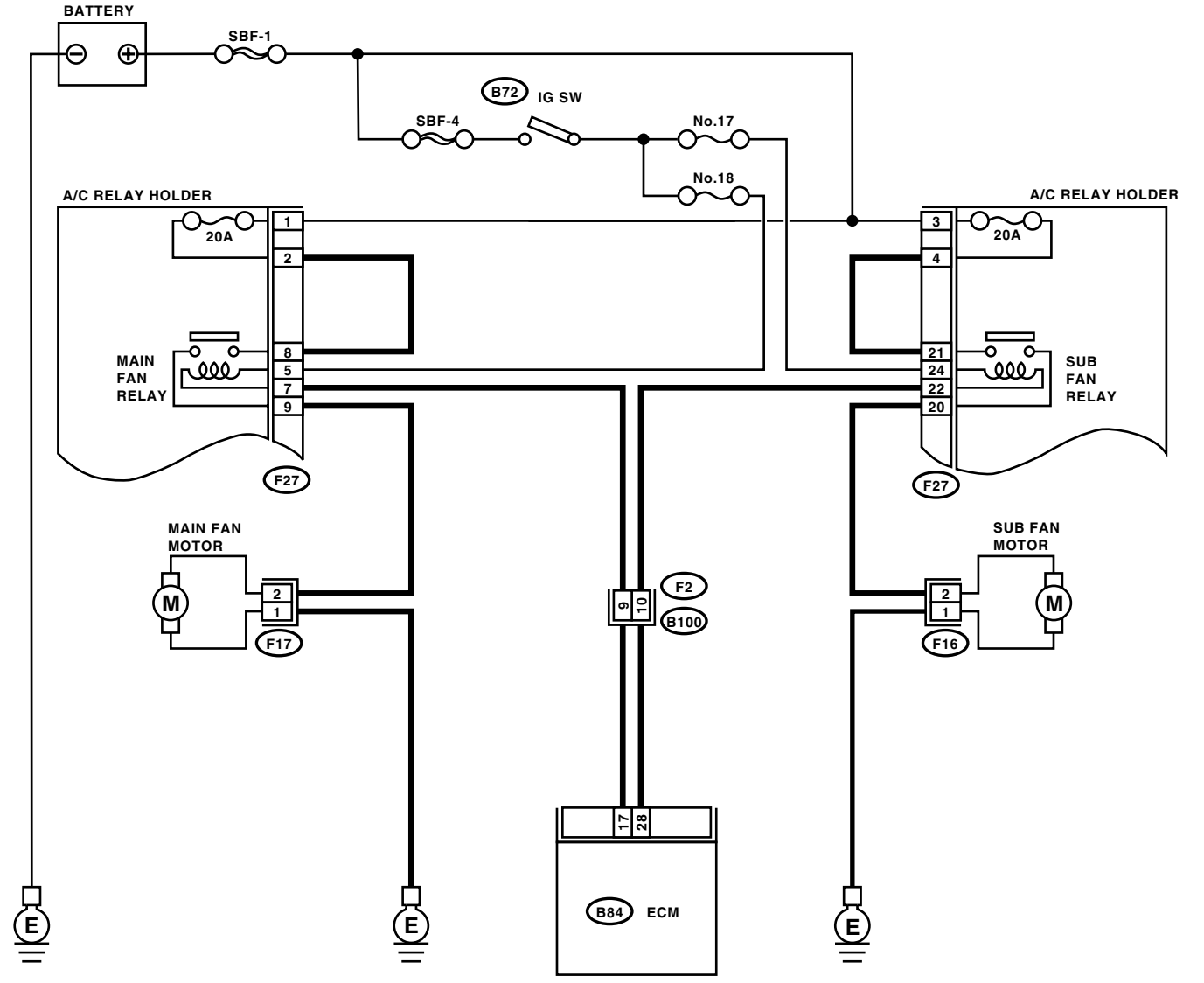
CB:DTC P0483 — COOLING FAN RATIONALITY CHECK —

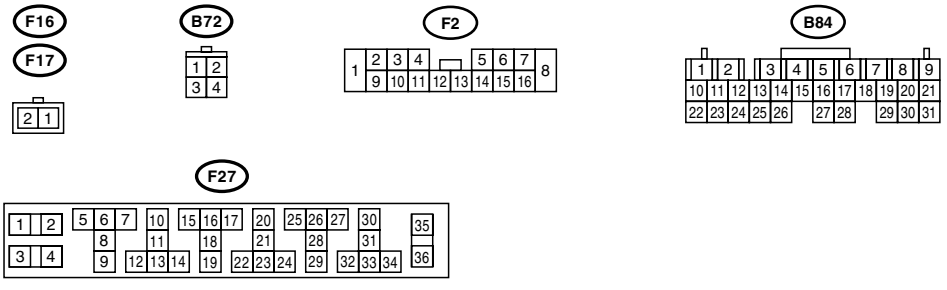
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-181, DTC P0483 — COOLING FAN RATIONALITY CHECK —.>
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**





EN-02267

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-27, Radiator Sub Fan and Fan Motor.>

CC:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO U5)-316, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

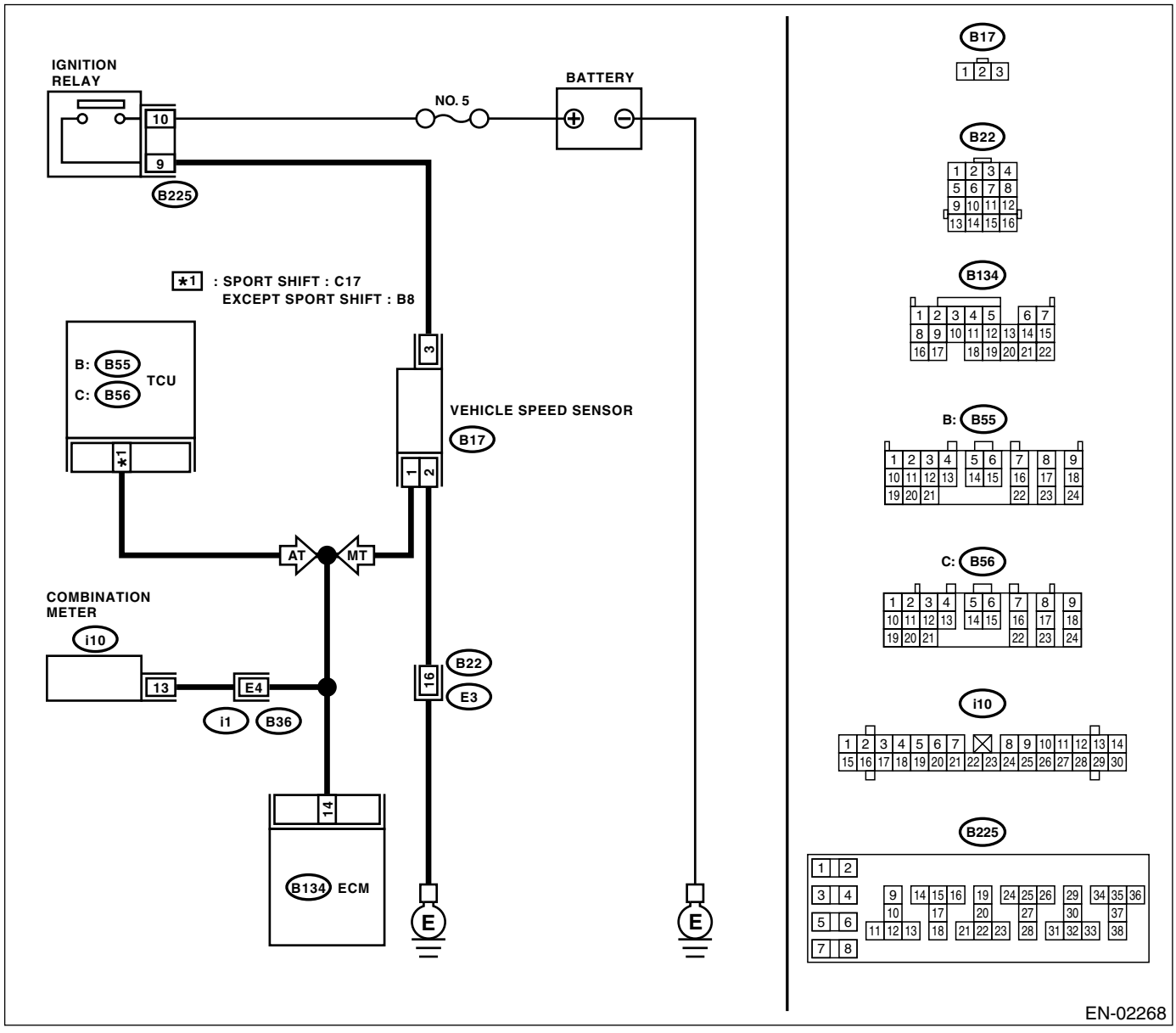
MEMO:

CD:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-182, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-184, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02268

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the target AT model?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-15, Speedometer.>, <Ref. to 4AT-55, Front Vehicle Speed Sensor.>, <Ref. to 4AT-60, Rear Vehicle Speed Sensor.> and <Ref. to 4AT-61, Torque Converter Turbine Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B134) No. 14 — (i10) No. 13:***	Is the measured value less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

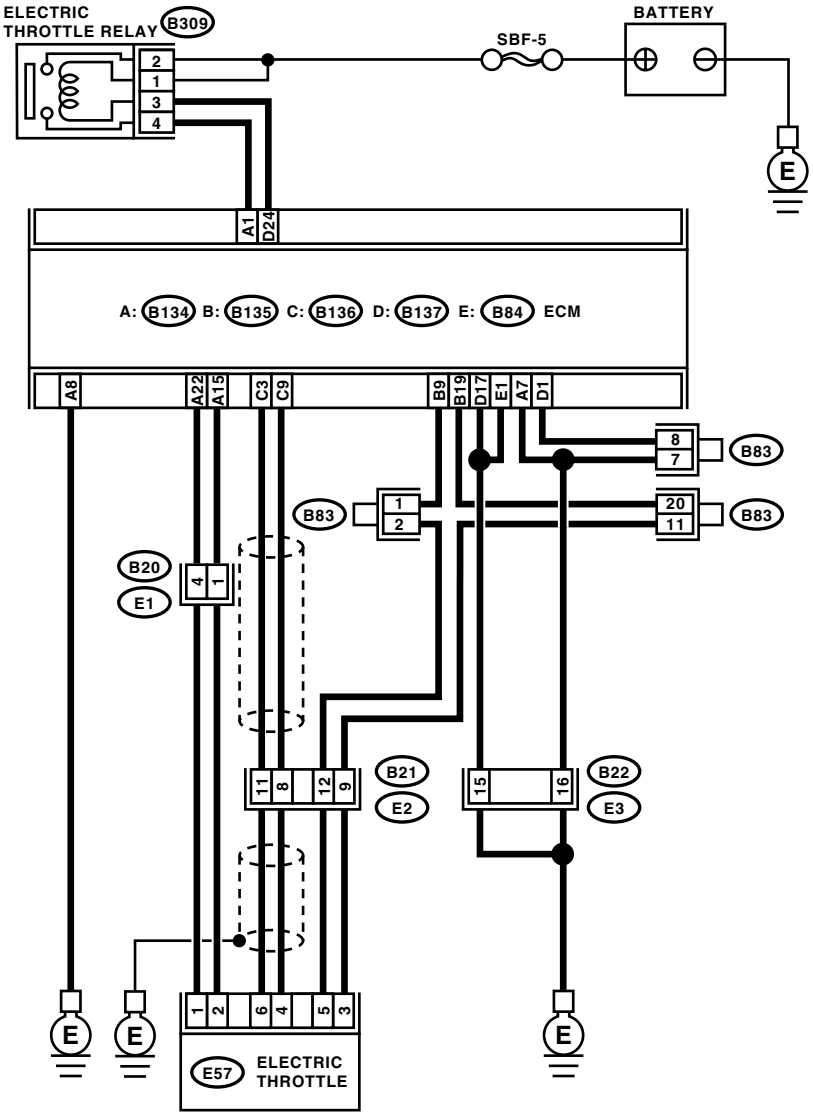
MEMO:

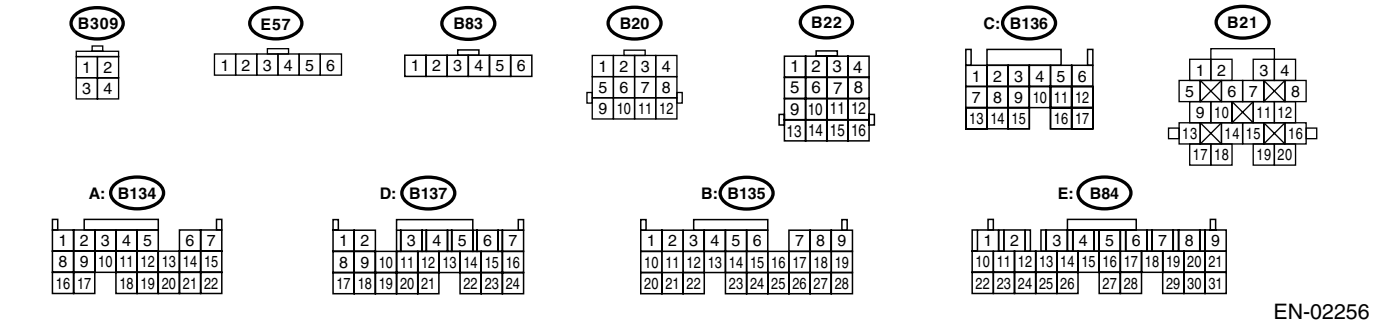
CE:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-186, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02256

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check air cleaner element.	Is there excessive clogging on air cleaner element.	Replace the air cleaner element. <Ref. to IN(H4SO U5)-4, Air Cleaner Element.>	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2101.

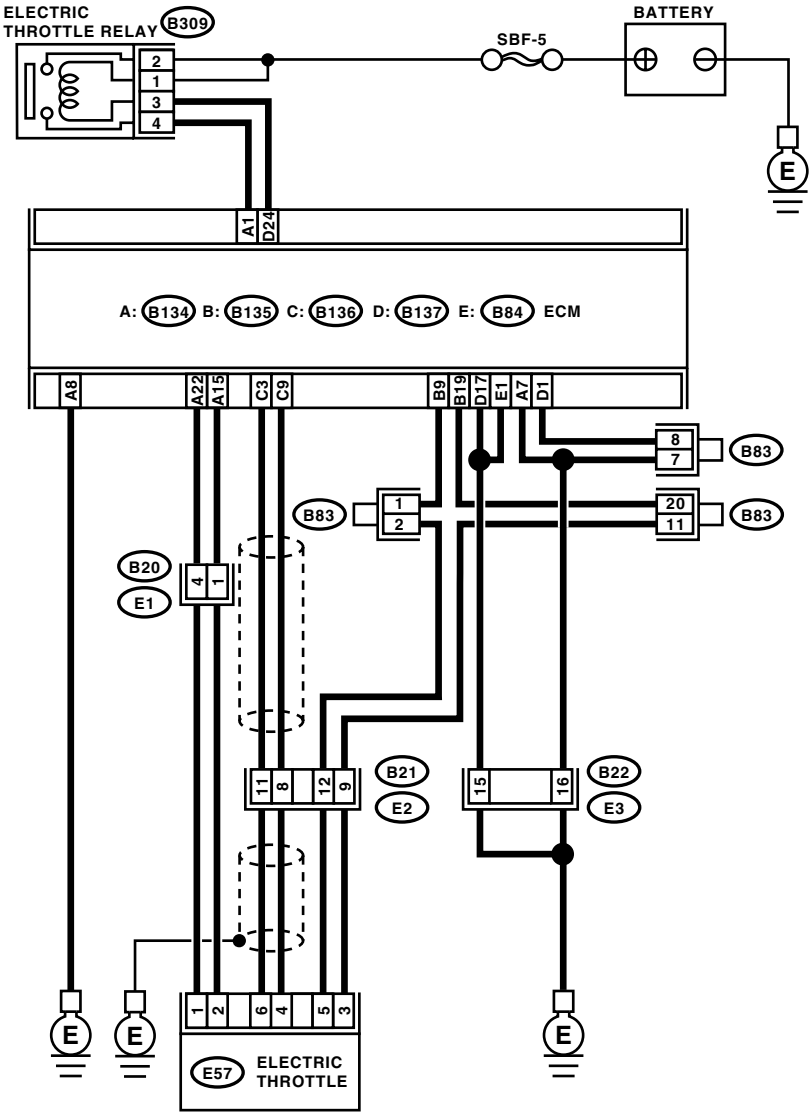
MEMO:

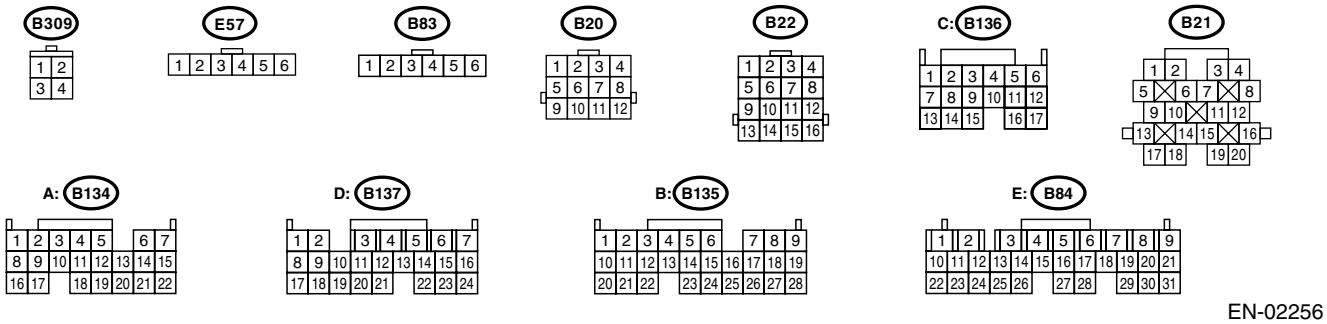
CF:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-188, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02256

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. •Loose installation of intake manifold and throttle body •Cracks of intake manifold gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2102.

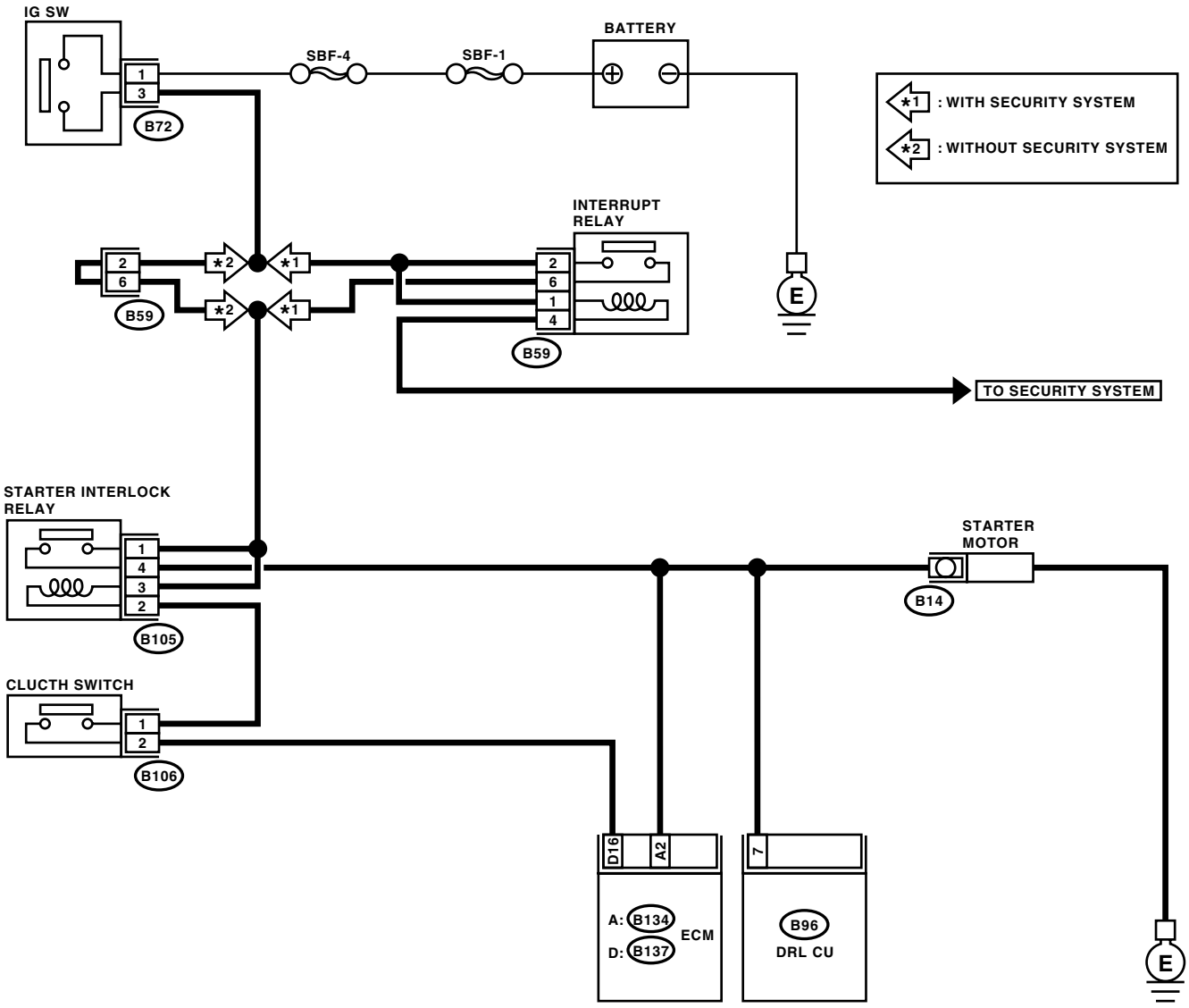
CG:DTC P0512 — STARTER REQUEST CIRCUIT —

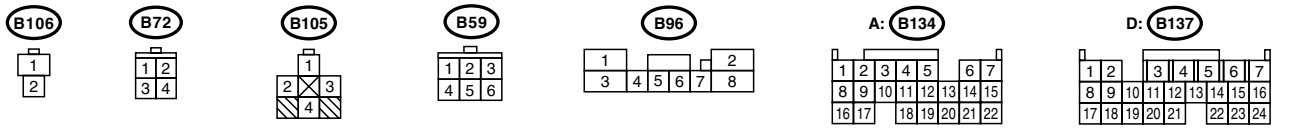
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-190, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

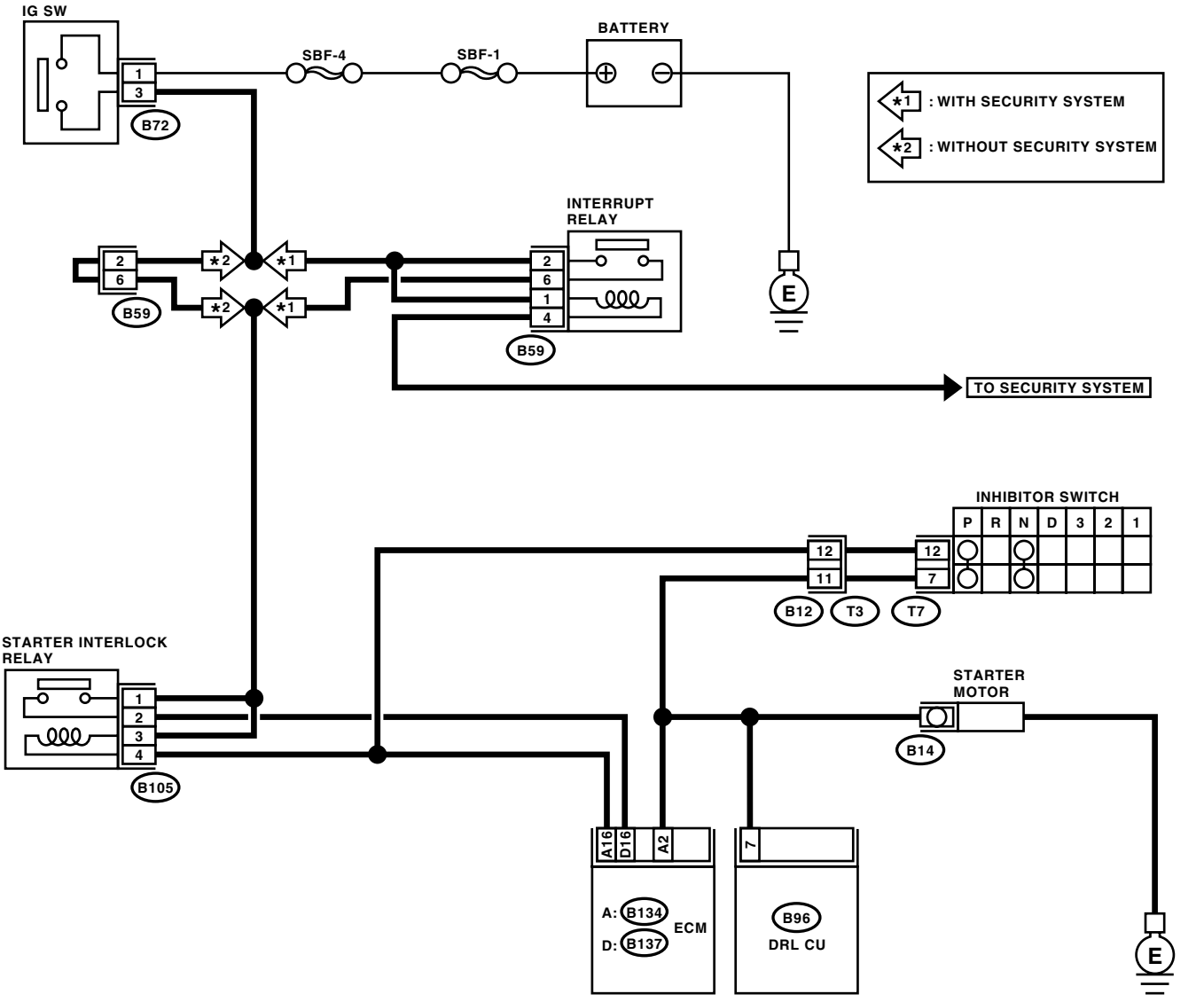
MT model

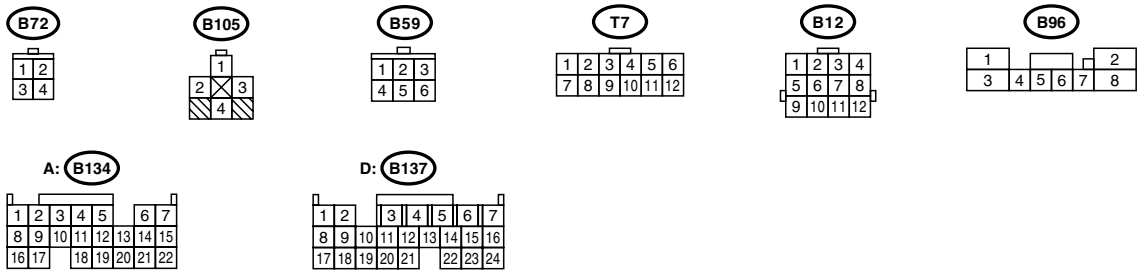




EN-02244

AT model





EN-02245

	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Turn the ignition switch to ON. NOTE: Place the inhibitor switch in each position. (AT model) Depress or release the clutch pedal. (MT model)	Dose the starter motor operate?	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H4SO U5)-73, STARTER MOTOR CIRCUIT.>

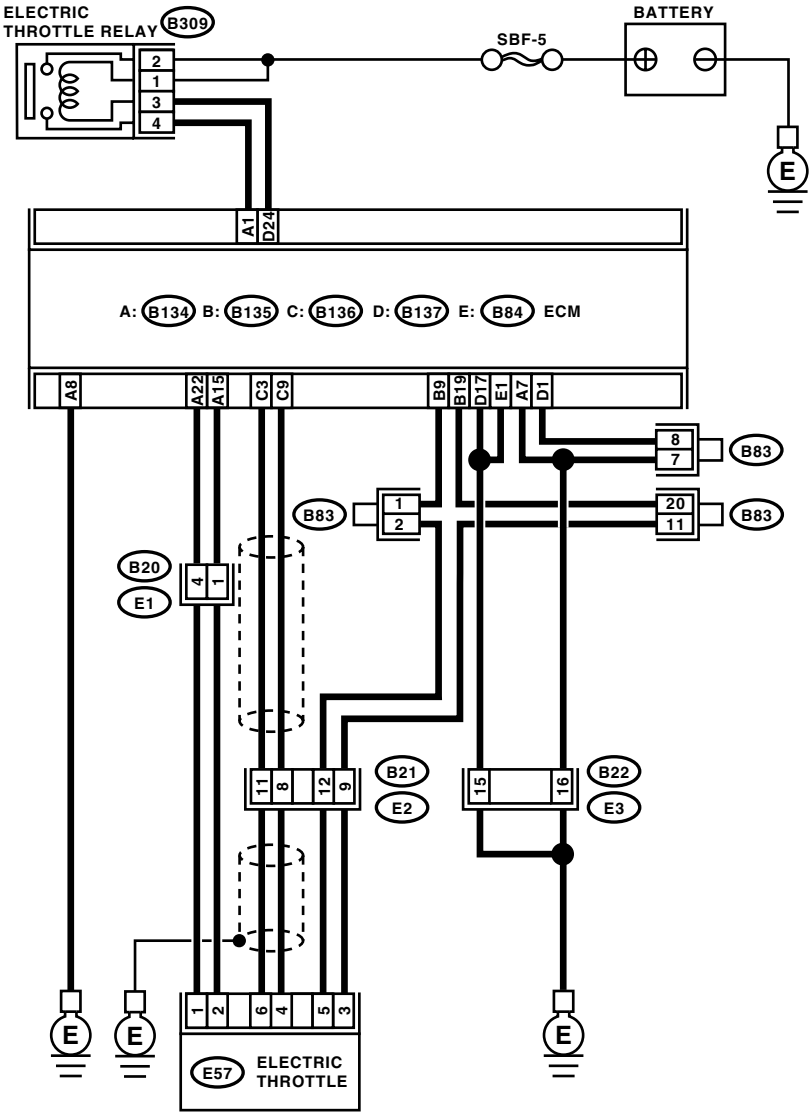
MEMO:

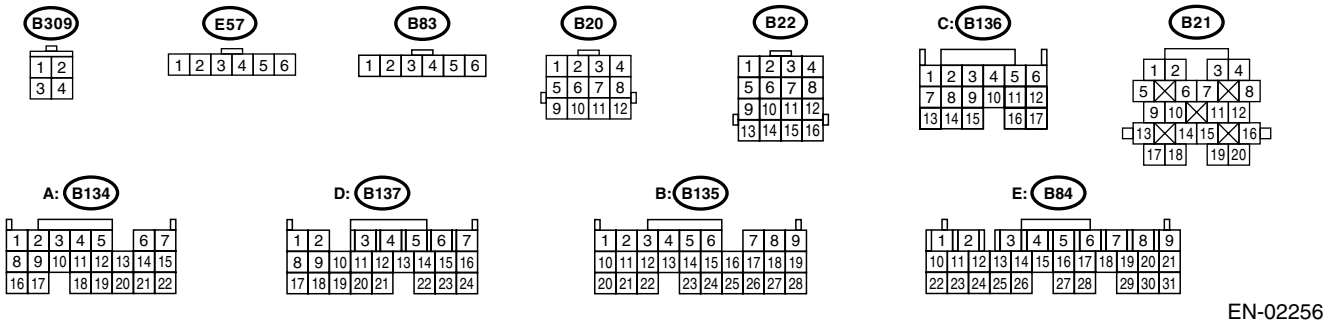
CH:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-191, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.
  - Fuel is cut according to fail-safe function.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02256

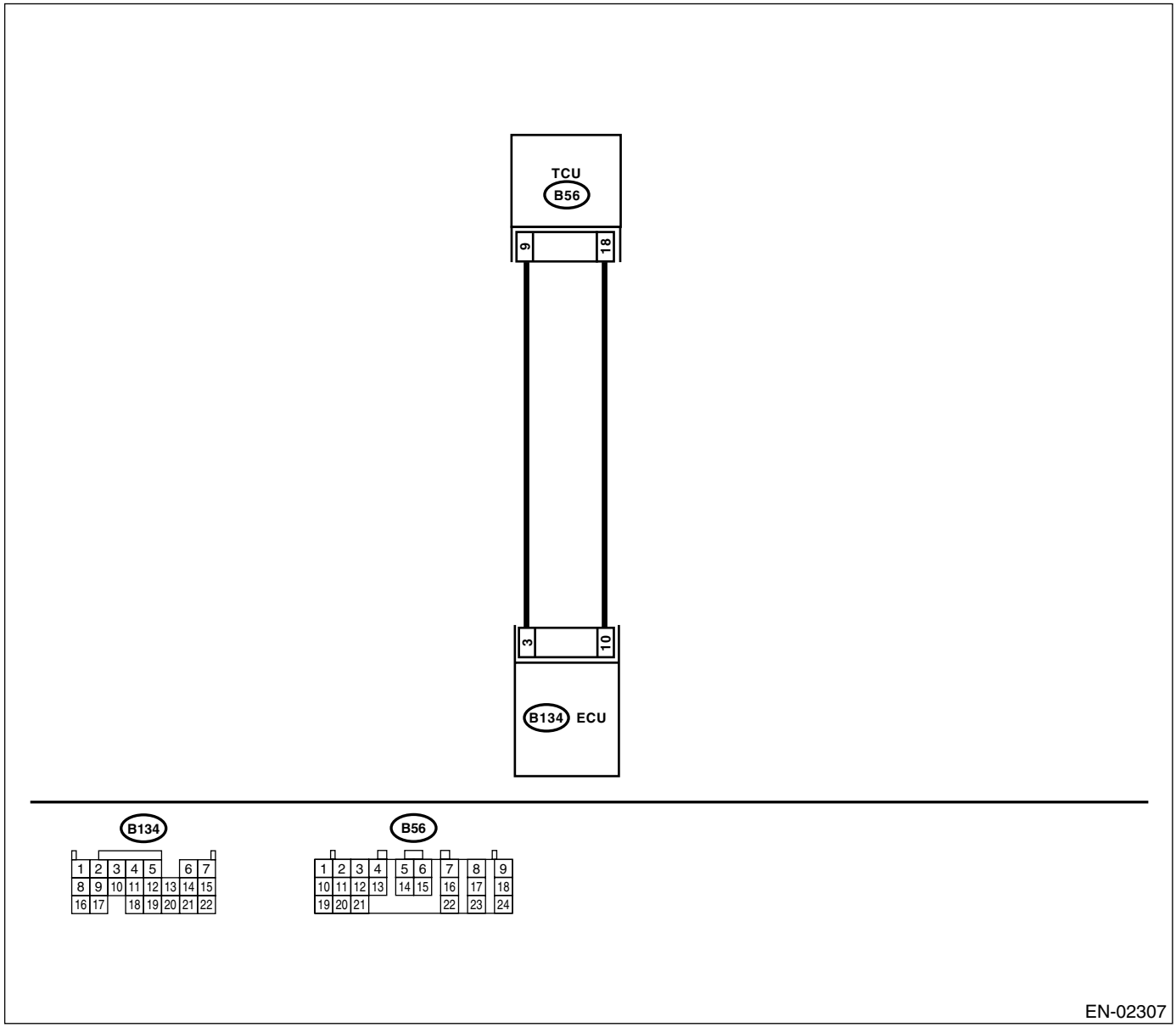
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. •Loose installation of intake manifold and throttle body •Cracks of intake manifold gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2102.

CI: DTC P0600 — CAN COMMUNICATION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-193, DTC P0600 — CAN COMMUNICATION CIRCUIT—, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



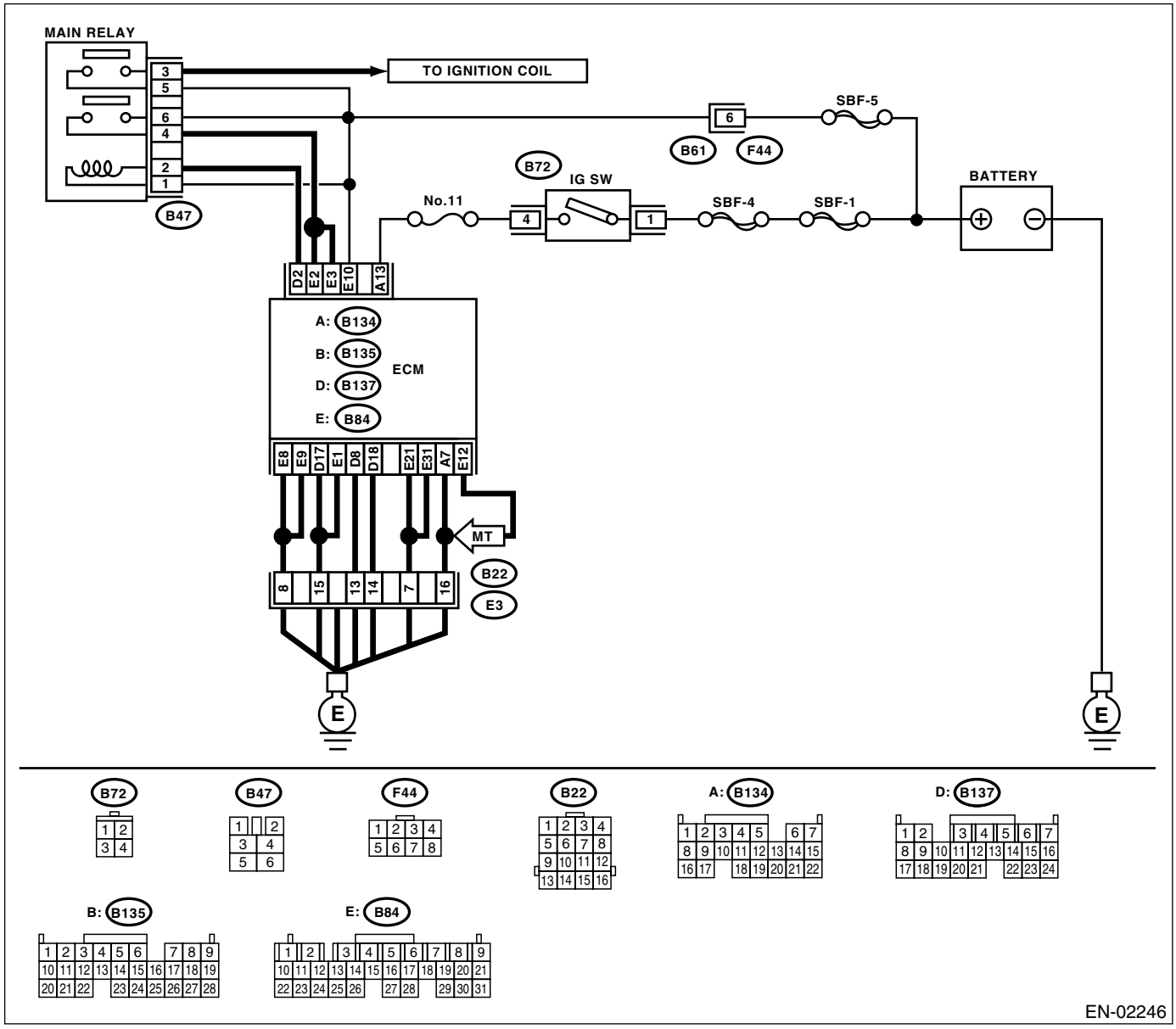
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from ECM. 3) Disconnect the connector from TCM. 4) Measure the resistance between ECM and TCM. ***Connector & terminal*** ***(B134) No. 3 — (B56) N0. 9:*** ***(B134) No. 10 — (B56) N0. 18:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the harness or connector.
2	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 10 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the harness or connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM.** Check the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 3 — (B13) N0. 10:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair the harness or connector.
4	**CHECK STATUS OF AT SYSTEM.** Perform AT diagnosis using Subaru Select Monitor. Check if DTC 86 is displayed. ***Connector & terminal*** ***(B134) No. 3 — (B56) N0. 9:*** ***(B134) No. 10 — (B56) N0. 18:***	Is DTC 86 displayed?	Check AT system.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

CJ:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-194, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the relevant DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	A temporary poor contact occurs.

CK:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4SO U5)-340, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

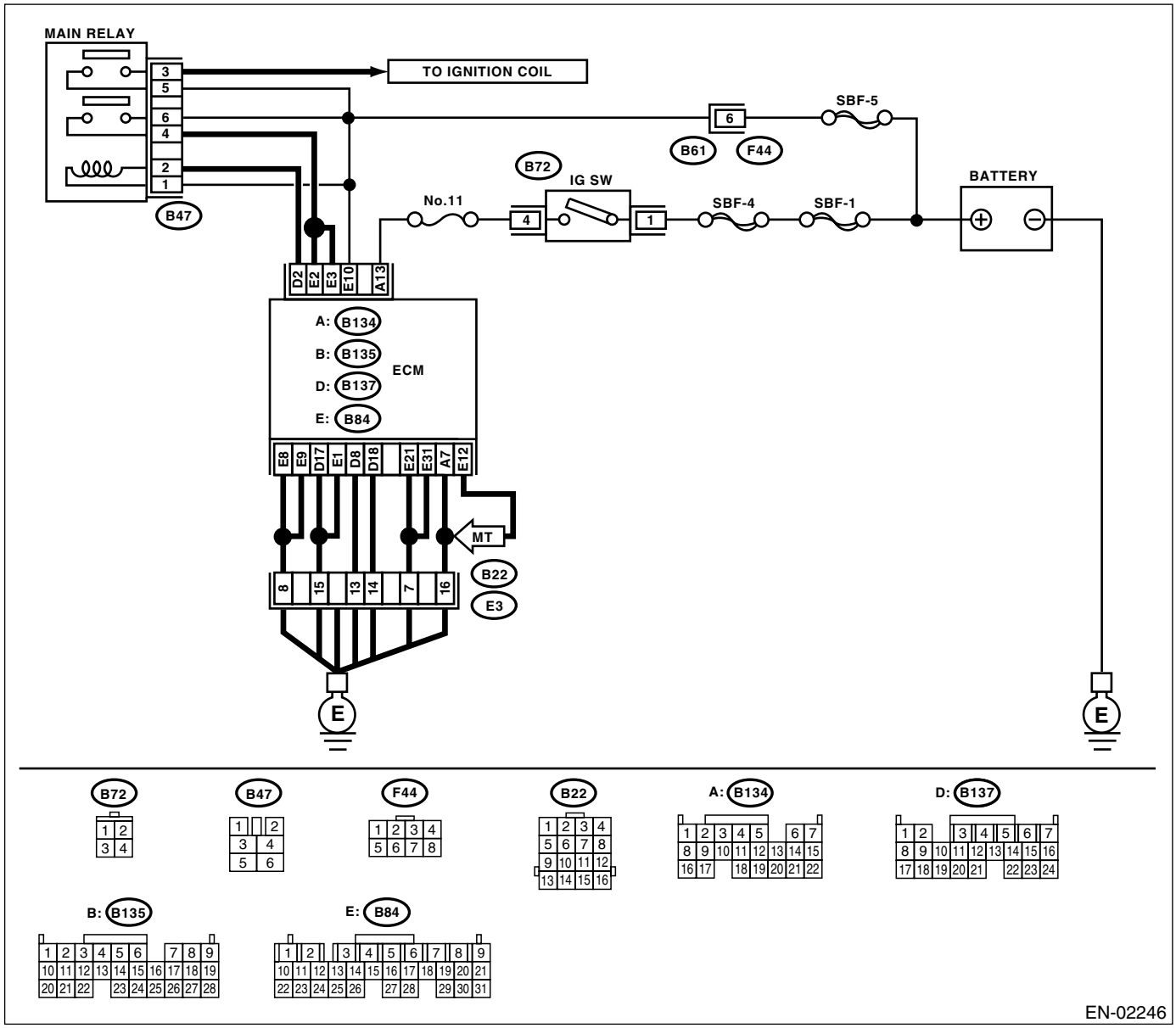
MEMO:

CL:DTC P0607 — CONTROL MODULE PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-196, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-198, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B84) No. 2 (+) — Chassis ground (–):*** ***(B84) No. 3 (+) — Chassis ground (–):***	Is the measured value 10 — 13 V?	Go to step **2.**	Repair the open circuit or ground short of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM** 1) Start the engine. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B84) No. 2 (+) — Chassis ground (–):*** ***(B84) No. 3 (+) — Chassis ground (–):***	Is the measured value 13 — 15 V?	Go to step **3.**	Repair the open circuit or ground short of power supply circuit.
3	**CHECK GROUND HARNESS OF ECM** Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Repair poor contact of ECM connector. If poor contact occur, replace the ECM.	Retighten the engine ground terminal.

CM:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

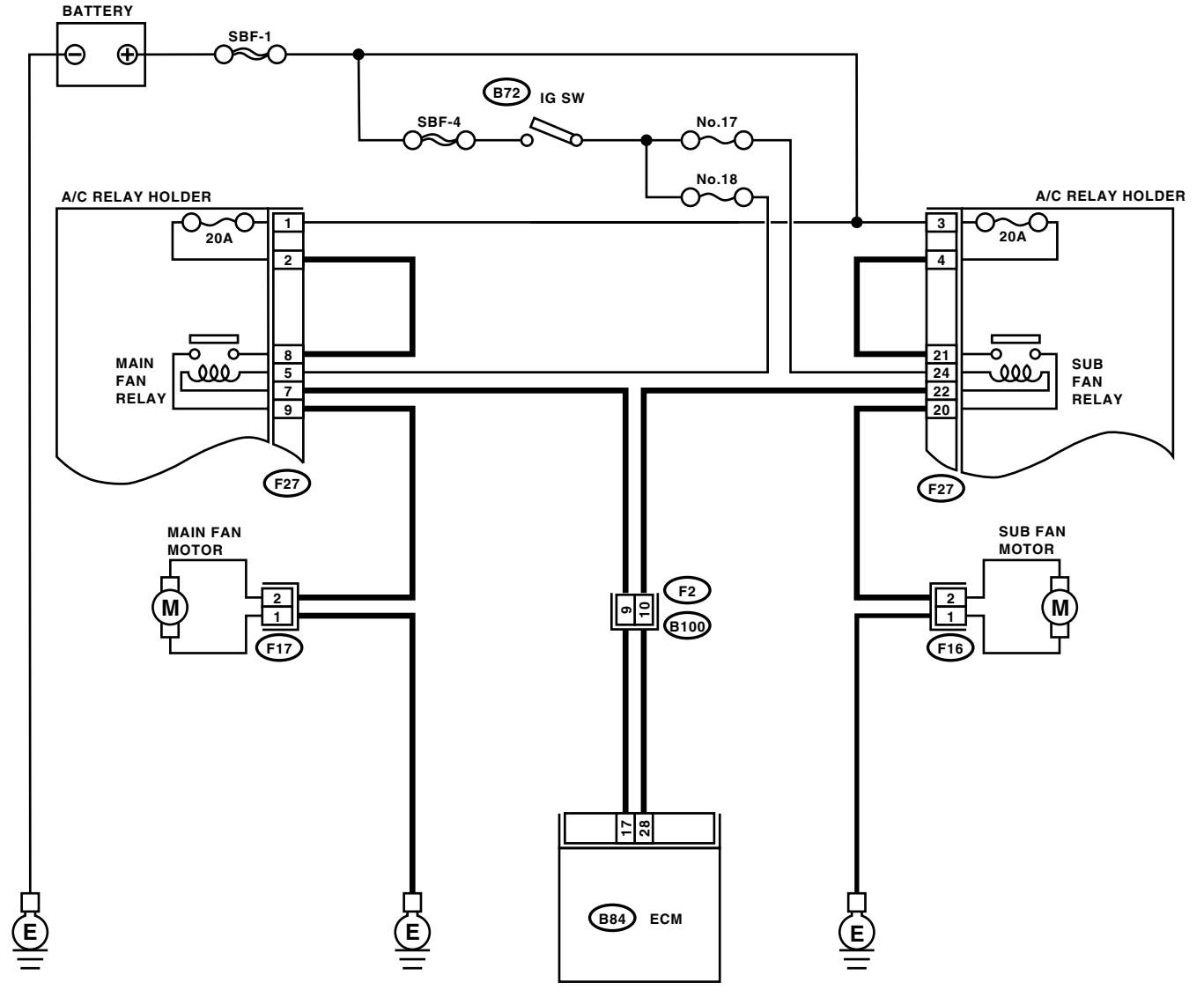
NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO U5)-457, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

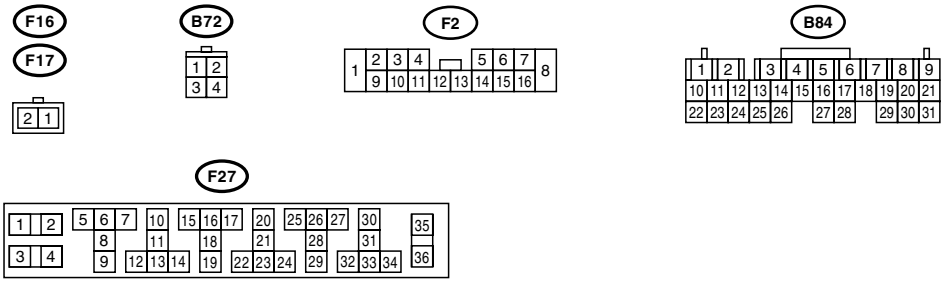
CN:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-206, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02267

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (–):*** ***(B84) No. 28 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 17 — Chassis ground:*** ***(B84) No. 28 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in radiator fan relay control circuit.	Go to step **3.**
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the radiator fan relay from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 24 (+) — Chassis ground (–):*** ***(F27) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK RADIATOR FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between radiator fan relay terminals. ***Terminals*** ***No. 22 — No. 24:*** ***No. 5 — No. 7:***	Is the measured value within 87 to 107 Ω?	Go to step **5.**	Replace the radiator fan relay.
5	**CHECK OPEN CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and radiator fan relay connector. ***Connector & terminal*** ***(B84) No. 17 — (F27) No. 7:*** ***(B84) No. 28 — (F27) No. 22:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and radiator fan relay connector • Poor contact in coupling connector

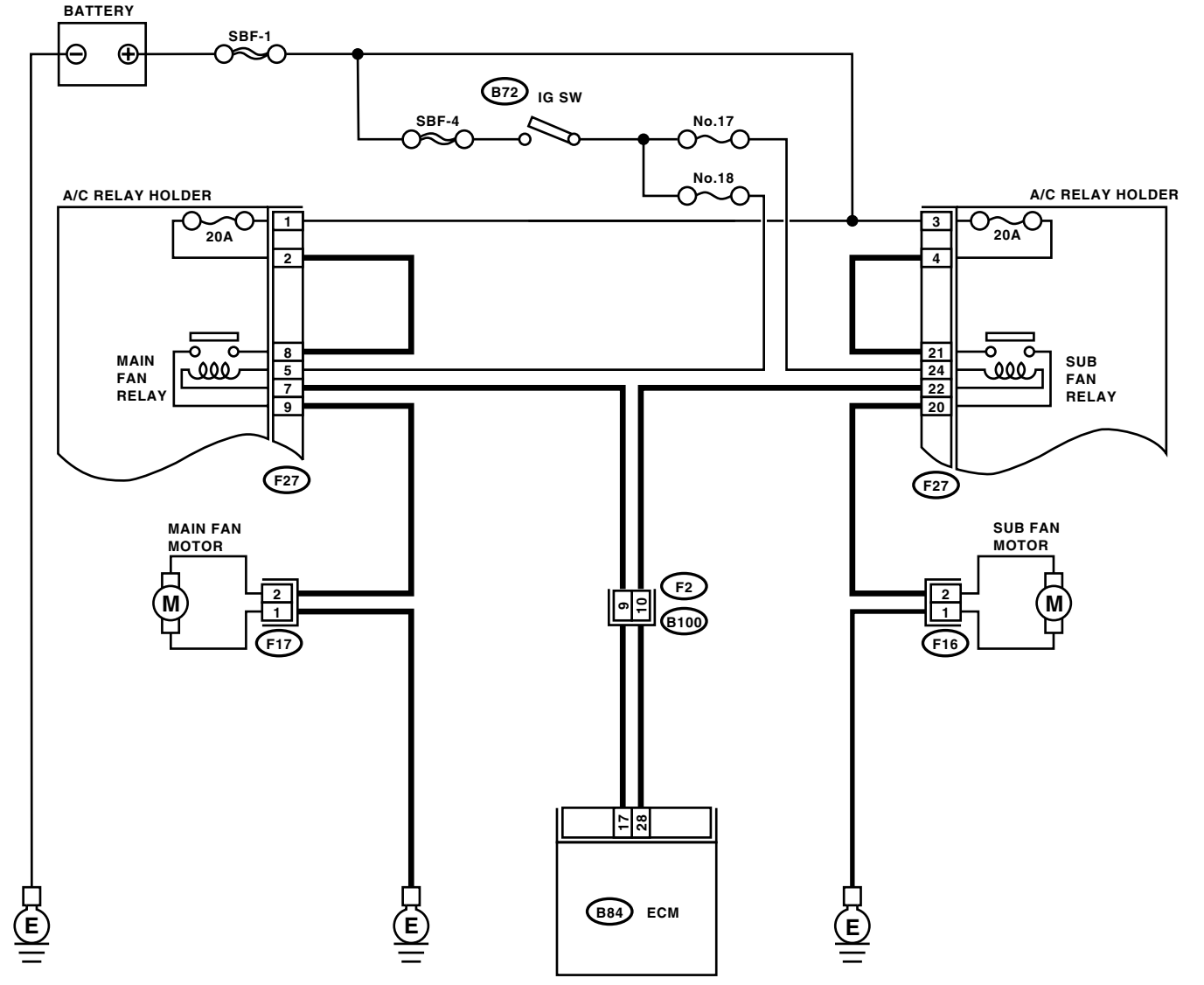
	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM or radiator fan relay connector.	Is there poor contact in ECM or radiator fan relay connector?	Repair poor contact in ECM or radiator fan relay connector.	Contact SOA Service Center.

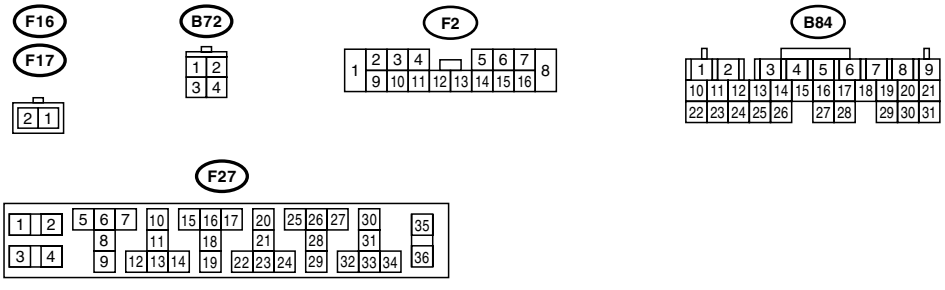
CO:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-207, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02267

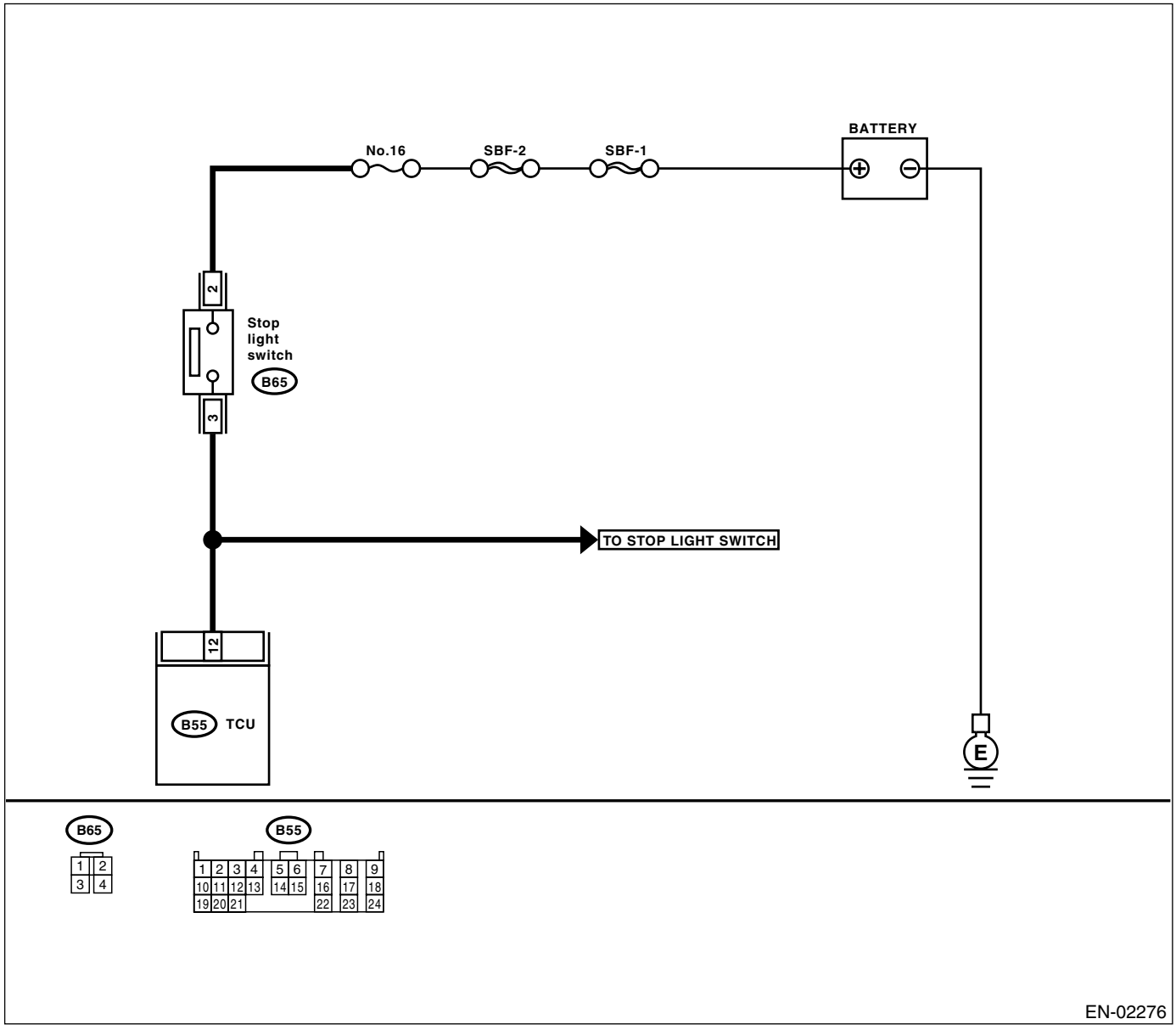
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the drive's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (–):*** ***(B84) No. 28 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay and sub fan relay. (with A/C models) 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (–):*** ***(B84) No. 28 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 8 — No. 9:***	Is the measured value less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the measured value less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

CP:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-208, DTC P0703 — TORQUE CONVERTER/ BRAKE SWITCH “B” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.**	Does the brake light illuminate when depressing the brake pedal?	Go to step **2.**	Repair or replace the brake light circuit.
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect the connectors from TCM and brake light switch. 2) Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***(B54) No. 12 — (B65) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and brake light switch. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CQ:DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-209, DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>

CR:DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-210, DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CS:DTC P0716 — OUTPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-211, DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CT:DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-212, DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CU:DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-213, DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CV:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO U5)-353, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CW:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO U5)-353, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CX:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO U5)-353, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CY:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-214, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-214, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-215, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-216, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the front vehicle speed sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-33, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CZ:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-218, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step **7.**

Step		Check	Yes	No
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to 4AT(H4SO)-146, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-33, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DA:DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-219, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DB:DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-220, DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-102, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DC:DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-221, DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-86, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DD:DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-223, DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-90, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DE:DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-223, DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-94, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DF:DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-224, DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-108, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DG:DTC P0785 — SHIFT/TIMING SOLENOID —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-225, DTC P0785 — SHIFT/TIMING SOLENOID —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-98, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

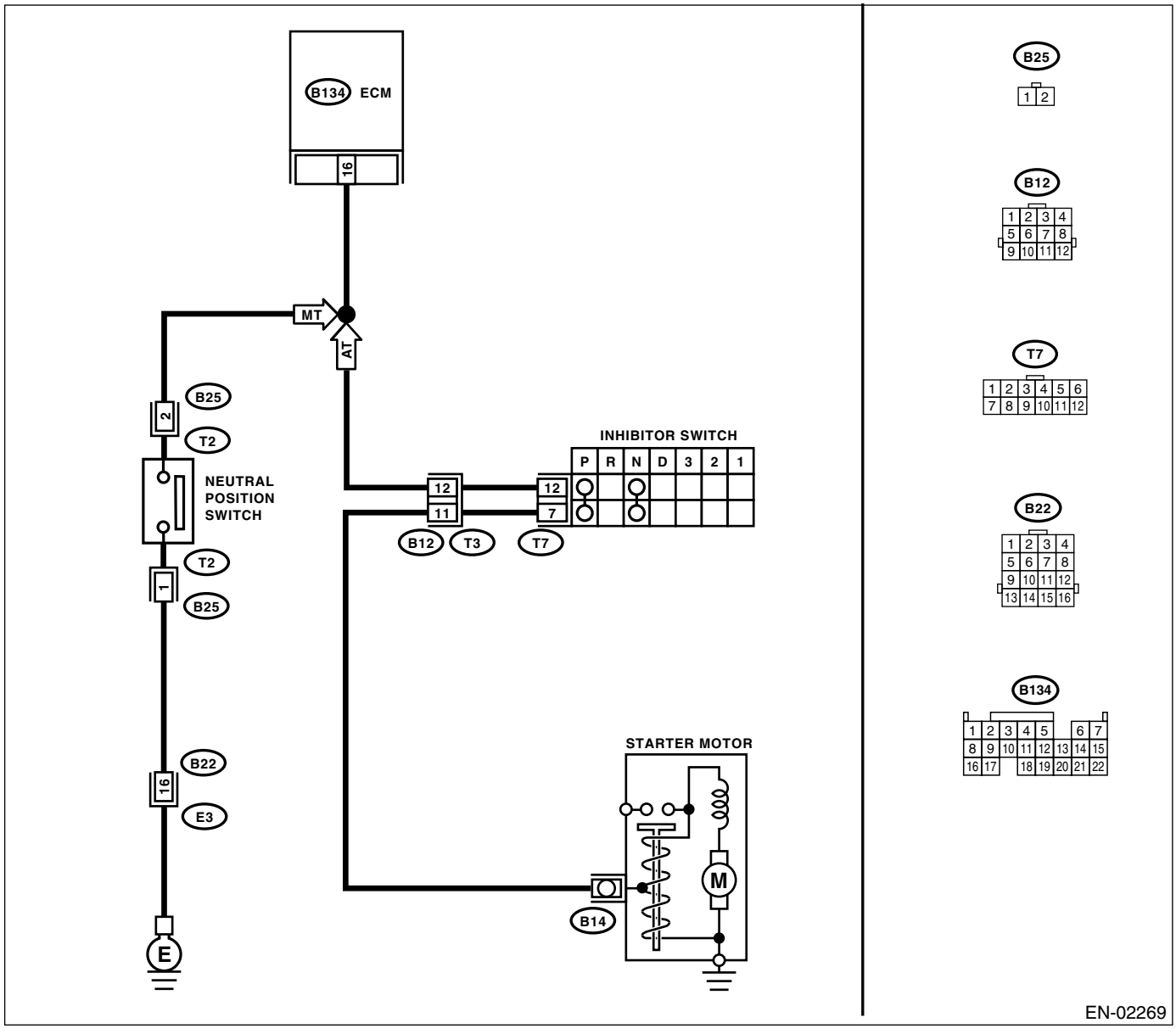
MEMO:

DH:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)—

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-226, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



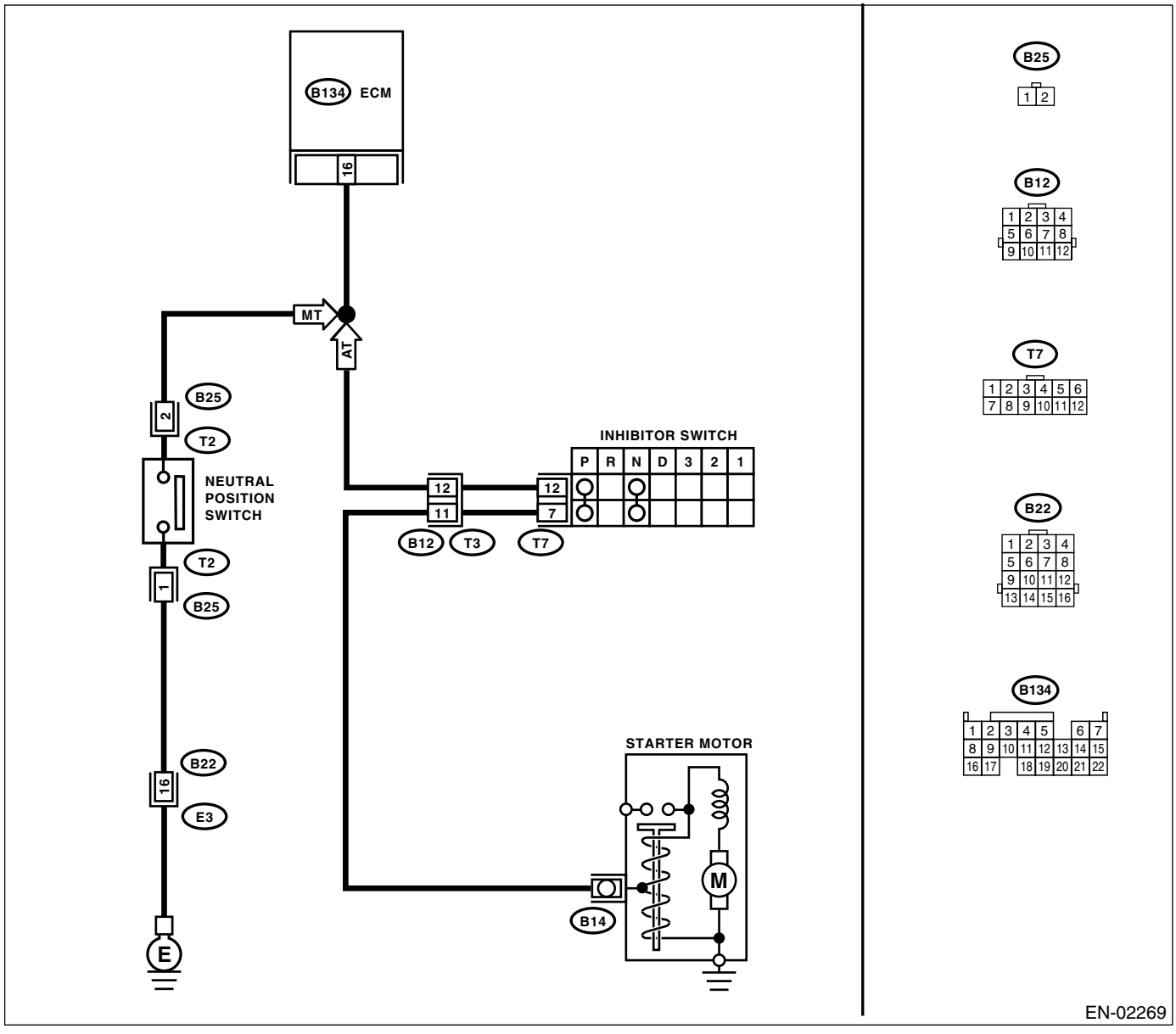
	Step	Check	Yes	No
1	**CHECK OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the select lever except for "N" and "P" ranges. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value within 4.5 to 5.5 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and chassis ground. ***Connector & terminal*** ***(T3) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in select lever except for "N" and "P" range. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Replace the inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DI: DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-227, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B134) No. 16 — (B25) No. 2:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and chassis ground. ***Connector & terminal*** ***(B25) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and chassis ground terminal.

Step		Check	Yes	No
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact SOA Service Center.

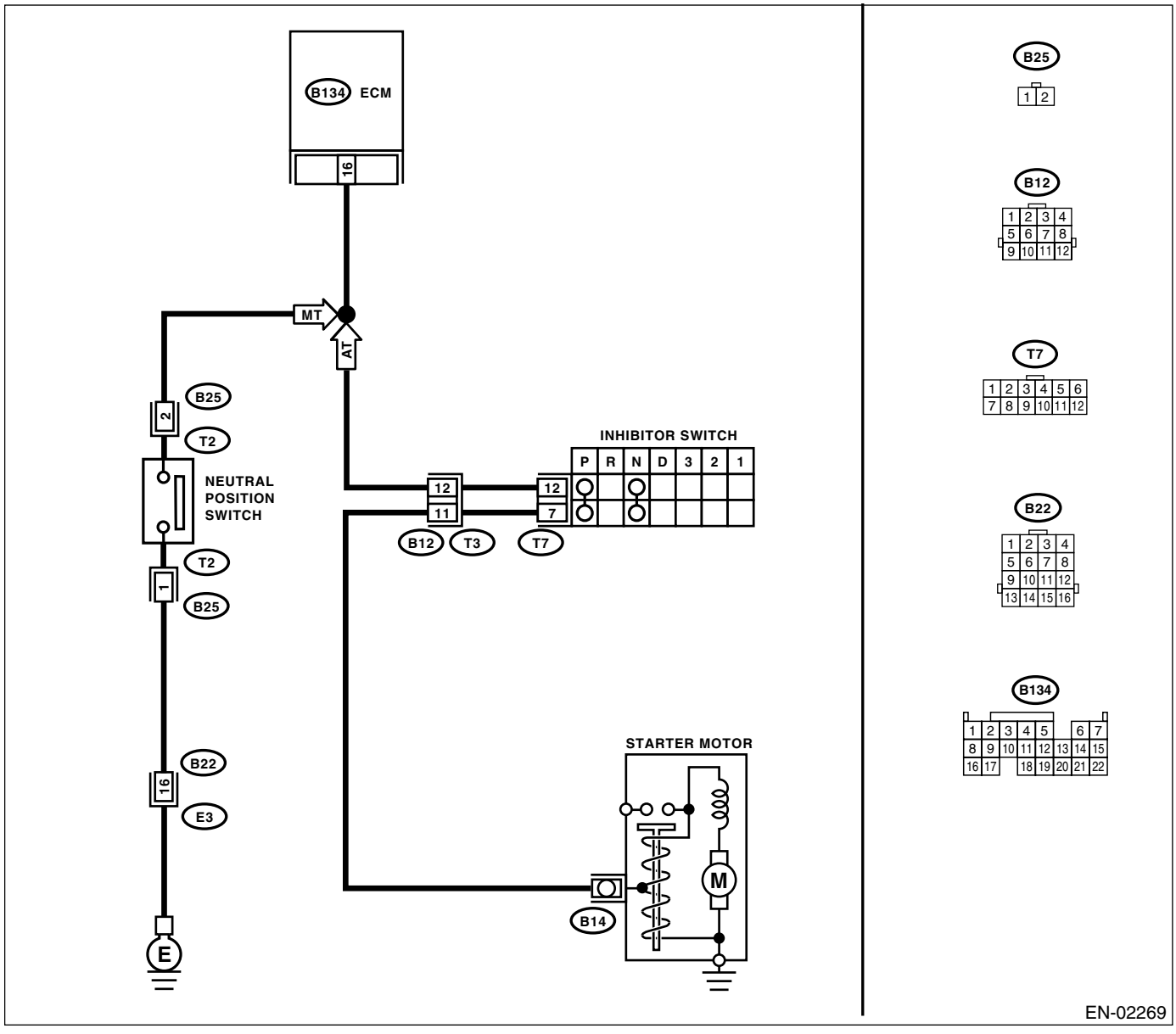
MEMO:

DJ:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-228, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground in select lever "N" and "P" ranges. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in select lever except for "N" and "P" ranges. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value within 4.5 to 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B134) No. 16 — (T7) No. 12:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and chassis ground. ***Connector & terminal*** ***(T7) No. 12 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in select lever "N" and "P" ranges. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

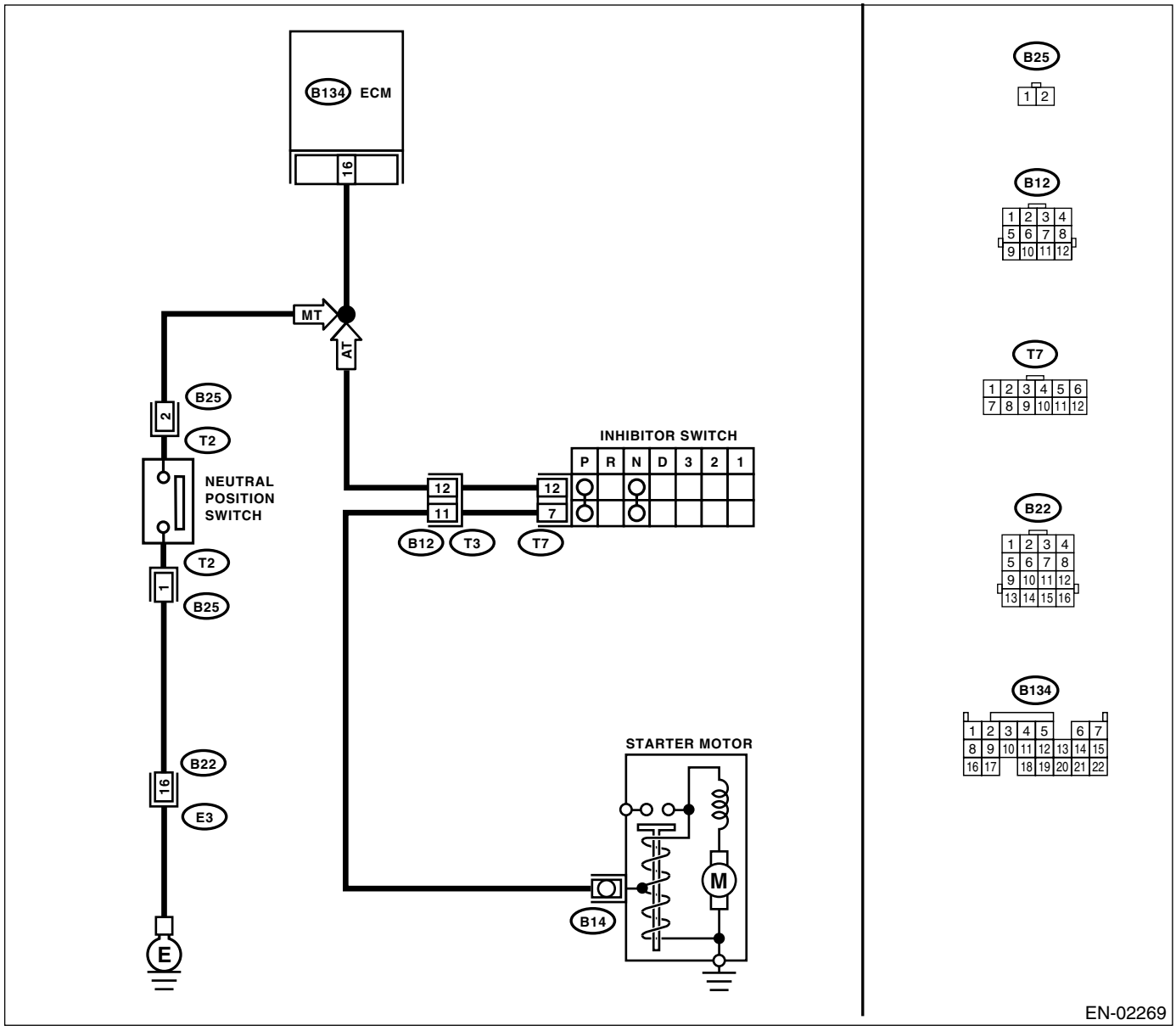
MEMO:

DK:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-229, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK NEUTRAL SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open circuit in transmission harness or replace neutral switch.
5	**CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B134) No. 16 — (B25) No. 2:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and transmission harness connector.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and chassis ground. ***Connector & terminal*** ***(B25) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between transmission harness connector and chassis ground. • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FOR POOR CONTACT.** Check for poor contact in transmission harness connector.	Is there a poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

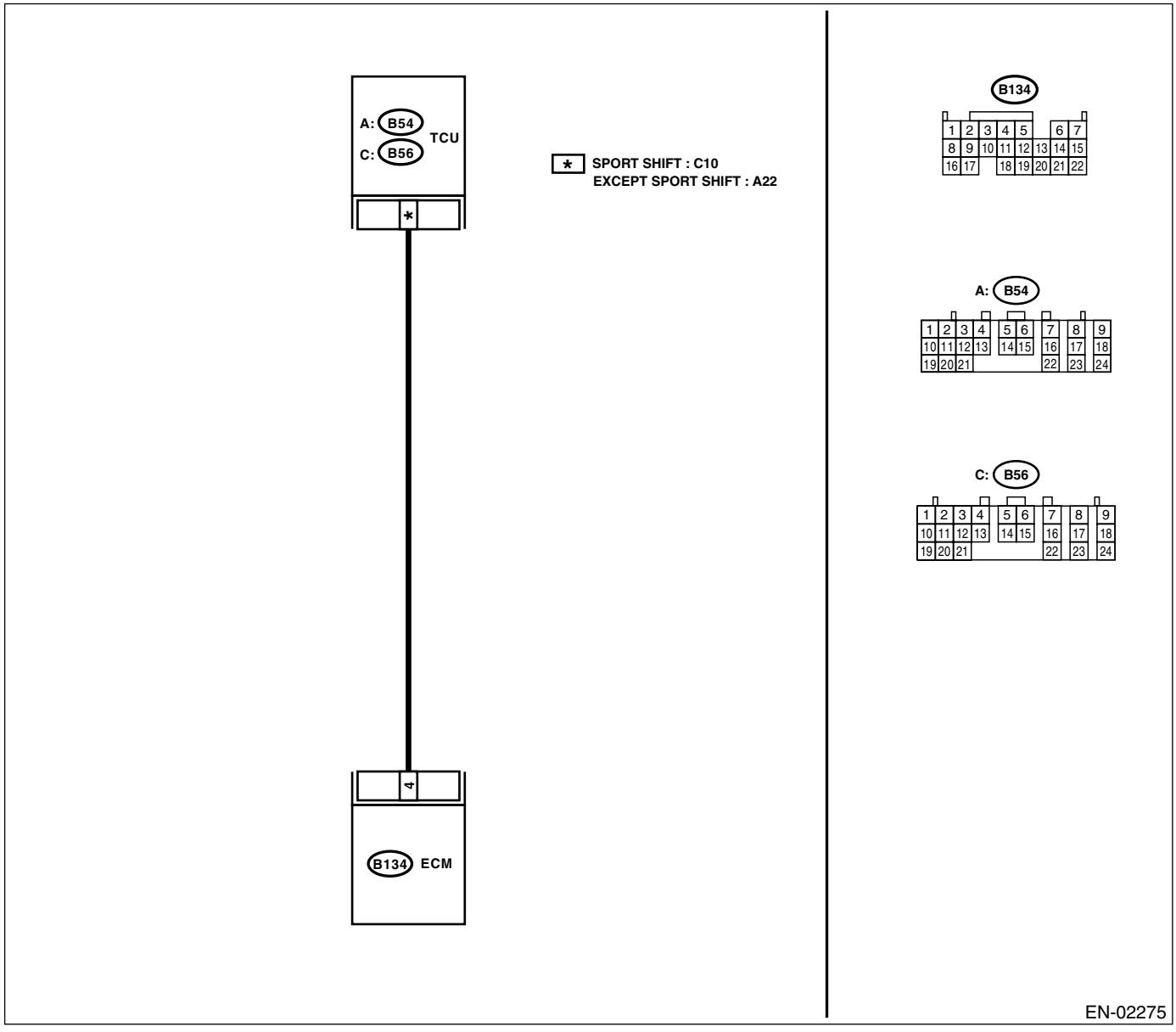
MEMO:

DL:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-230, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



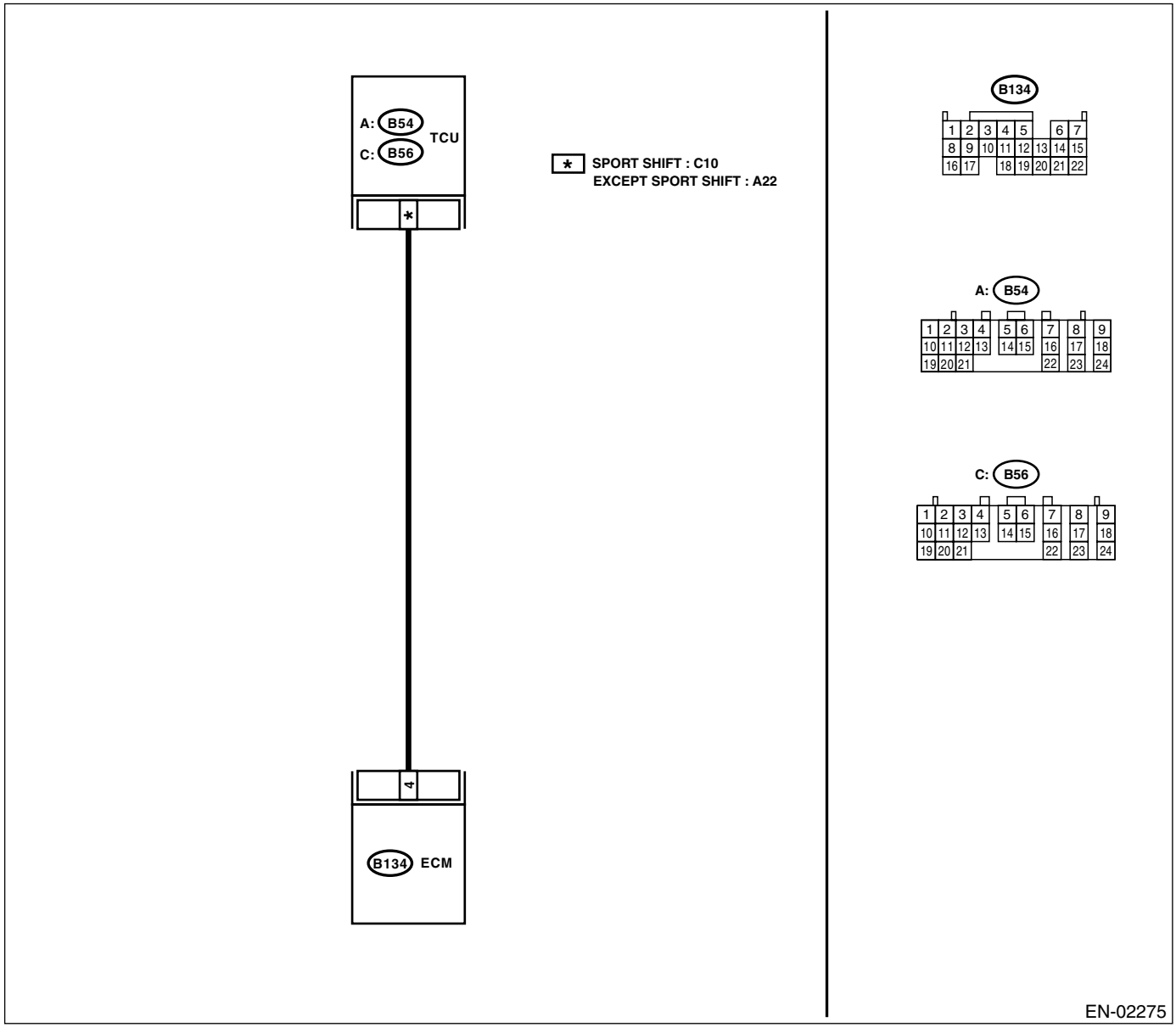
Step		Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is the AT shift control functioning properly?	Go to step **2.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
2	**CHECK ACCESSORY.**	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DM:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-231, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



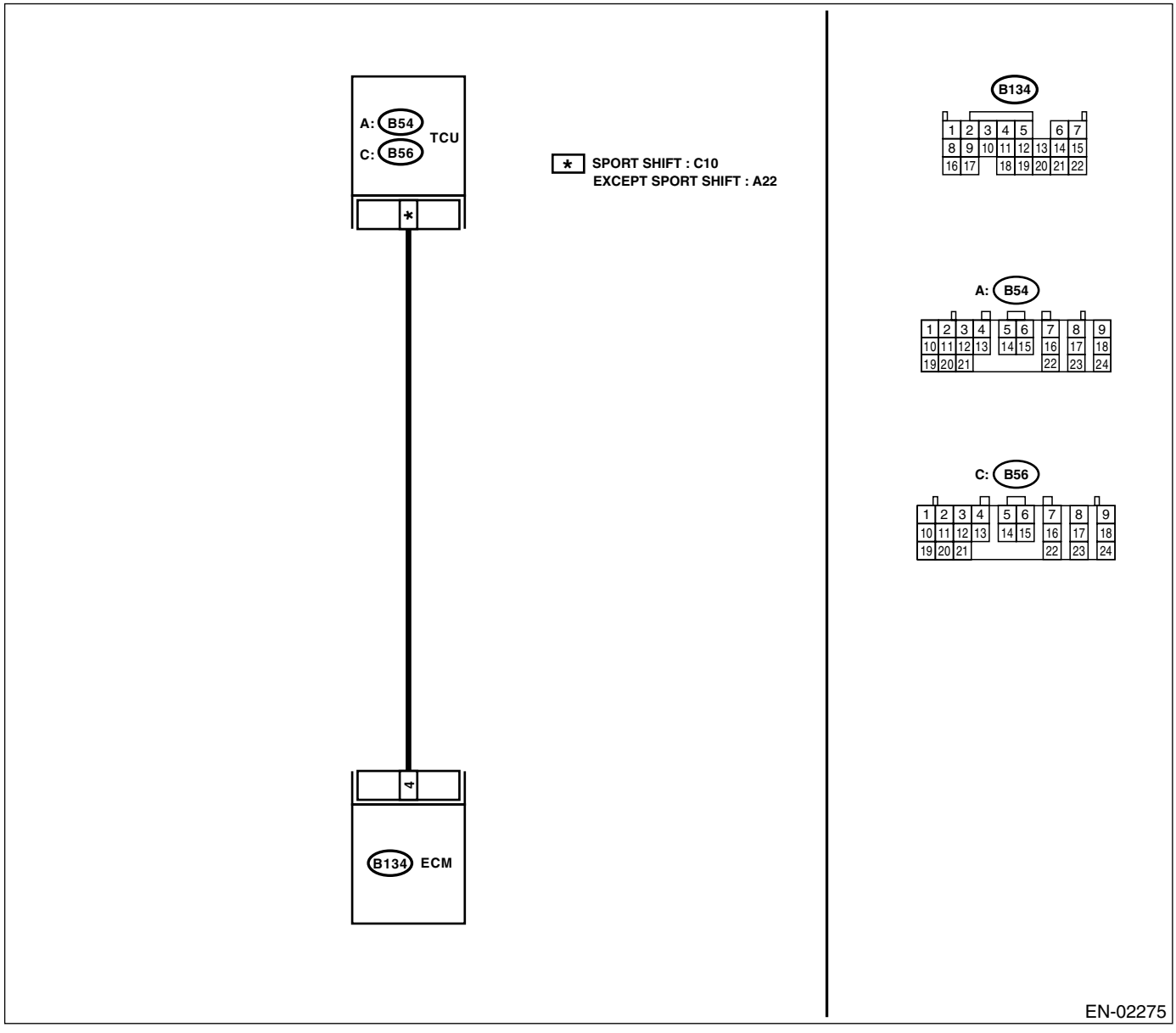
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK DTC FOR AUTOMATIC TRANSMISSION.** Read the DTC for automatic transmission. <Ref. to 4AT(H4SO)-30, Read Diagnostic Trouble Code (DTC).>	Does the DTC appear for automatic transmission?	Check DTC for automatic transmission. <Ref. to 4AT(H4SO)-50, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DN:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-232, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



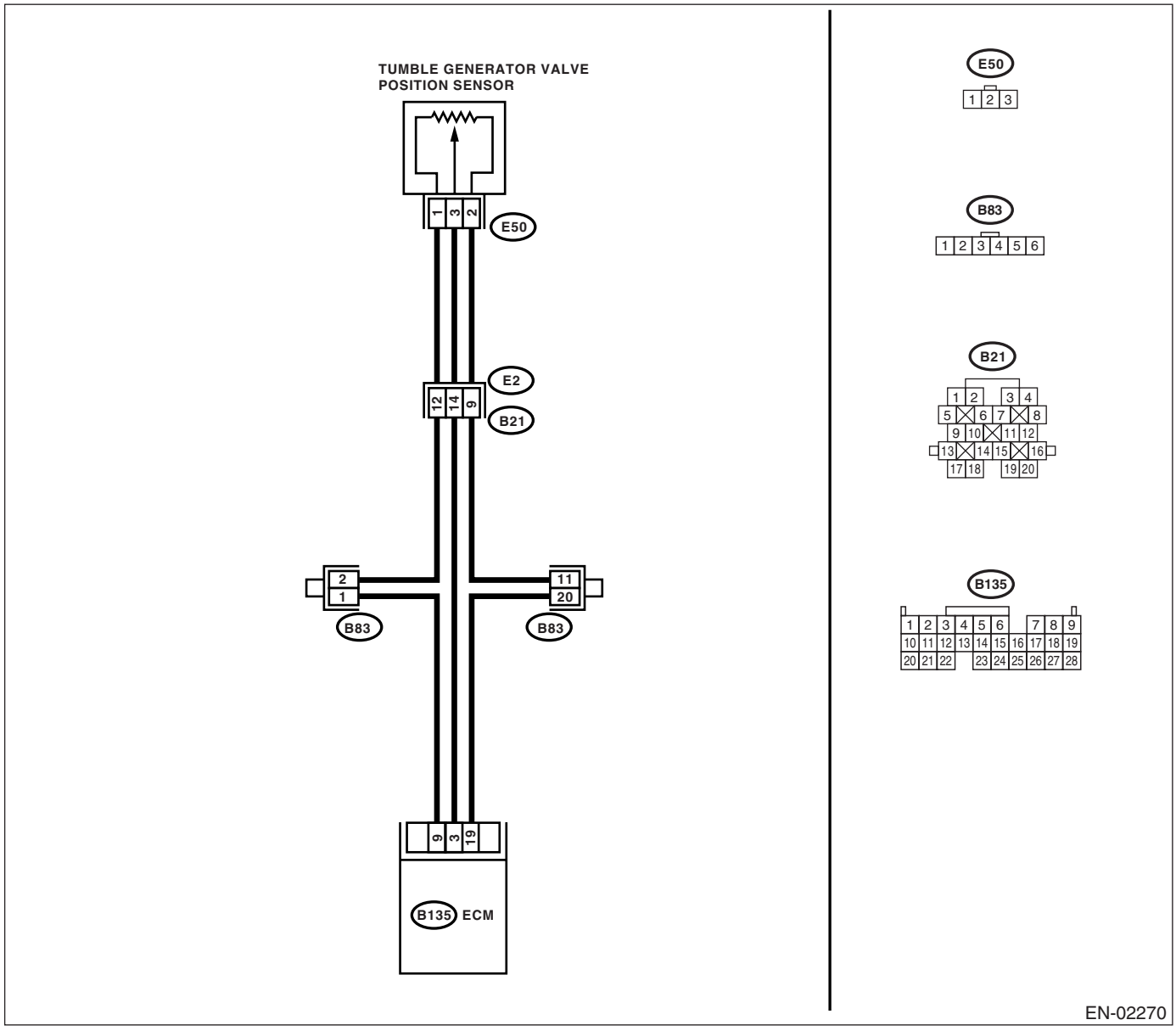
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value within 1 to 4 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***With SPORT shift:*** ***(B56) No. 10 (+) — Chassis ground (–):*** ***Without SPORT shift:*** ***(B54) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **6.**	Repair open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

DO:DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-234, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B135) No. 3 — (E50) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4SO U5)-36, Tumble Generator Valve Position Sensor.>

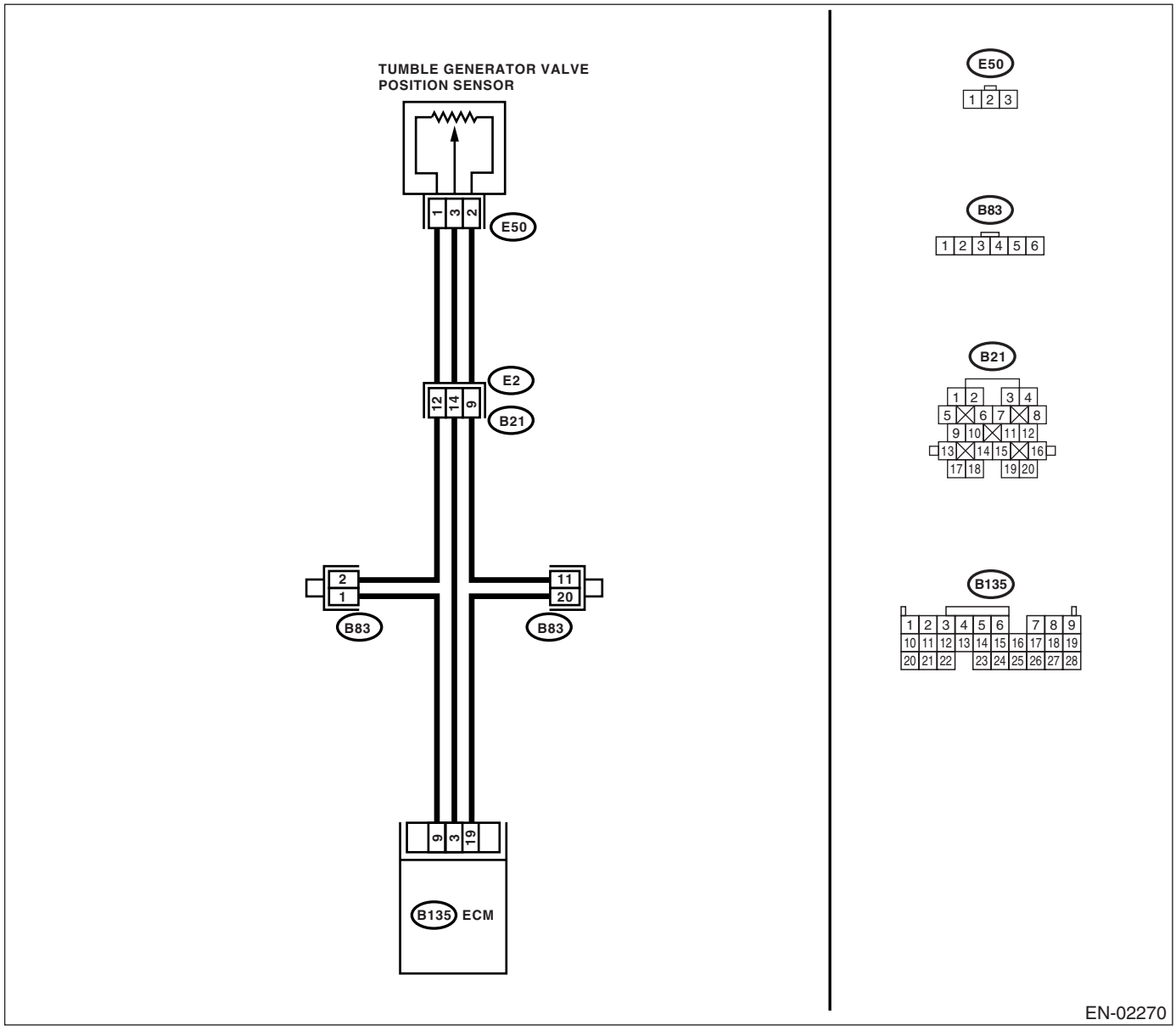
MEMO:

DP:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-236, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Replace the tumble generator valve position sensor. <Ref. to FU(H4SO U5)-36, Tumble Generator Valve Position Sensor.>

DQ:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-238, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE ASSEMBLY.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4SO U5)-34, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DR:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-239, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE ASSEMBLY.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4SO U5)-34, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

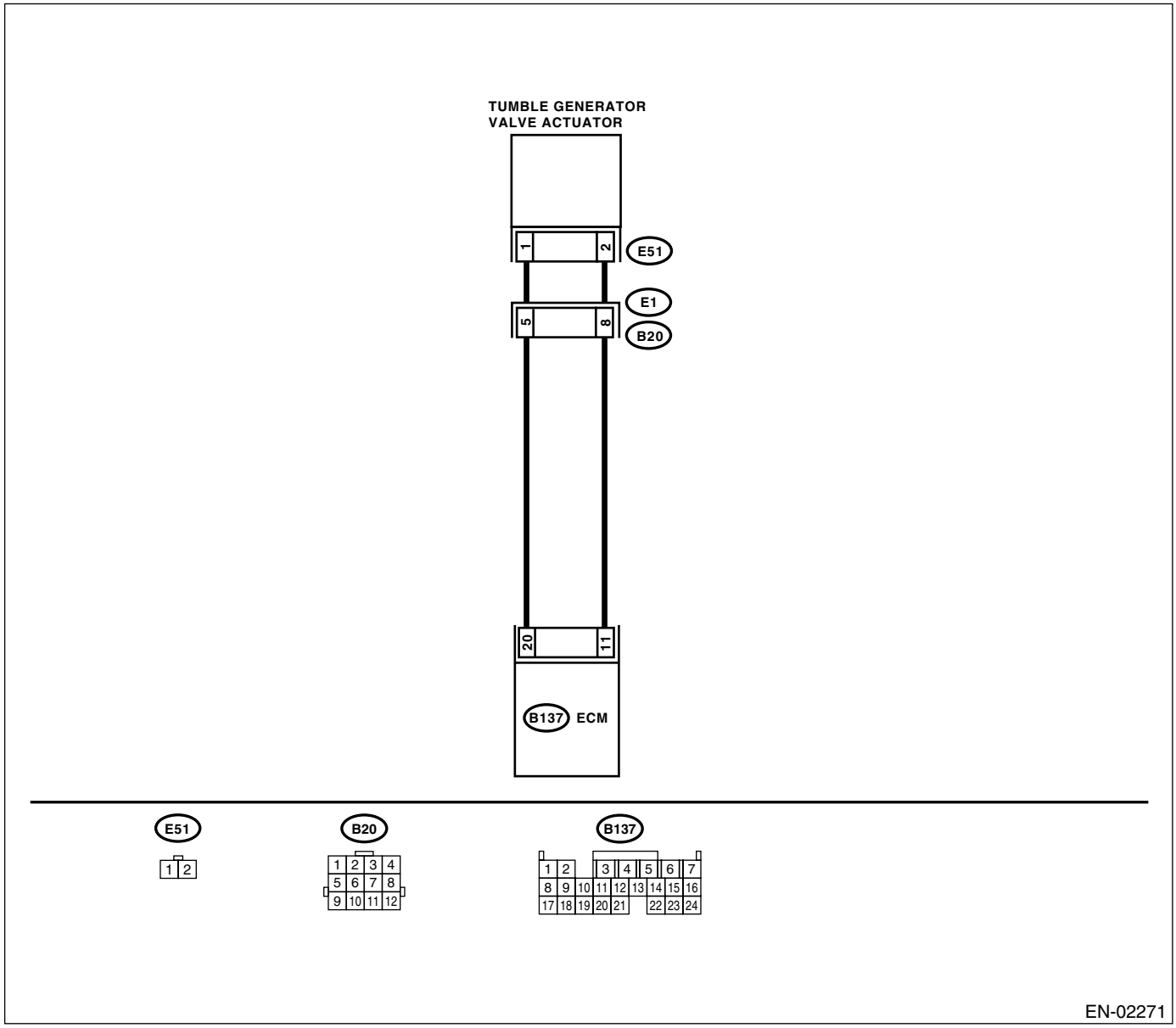
MEMO:

DS:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-242, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



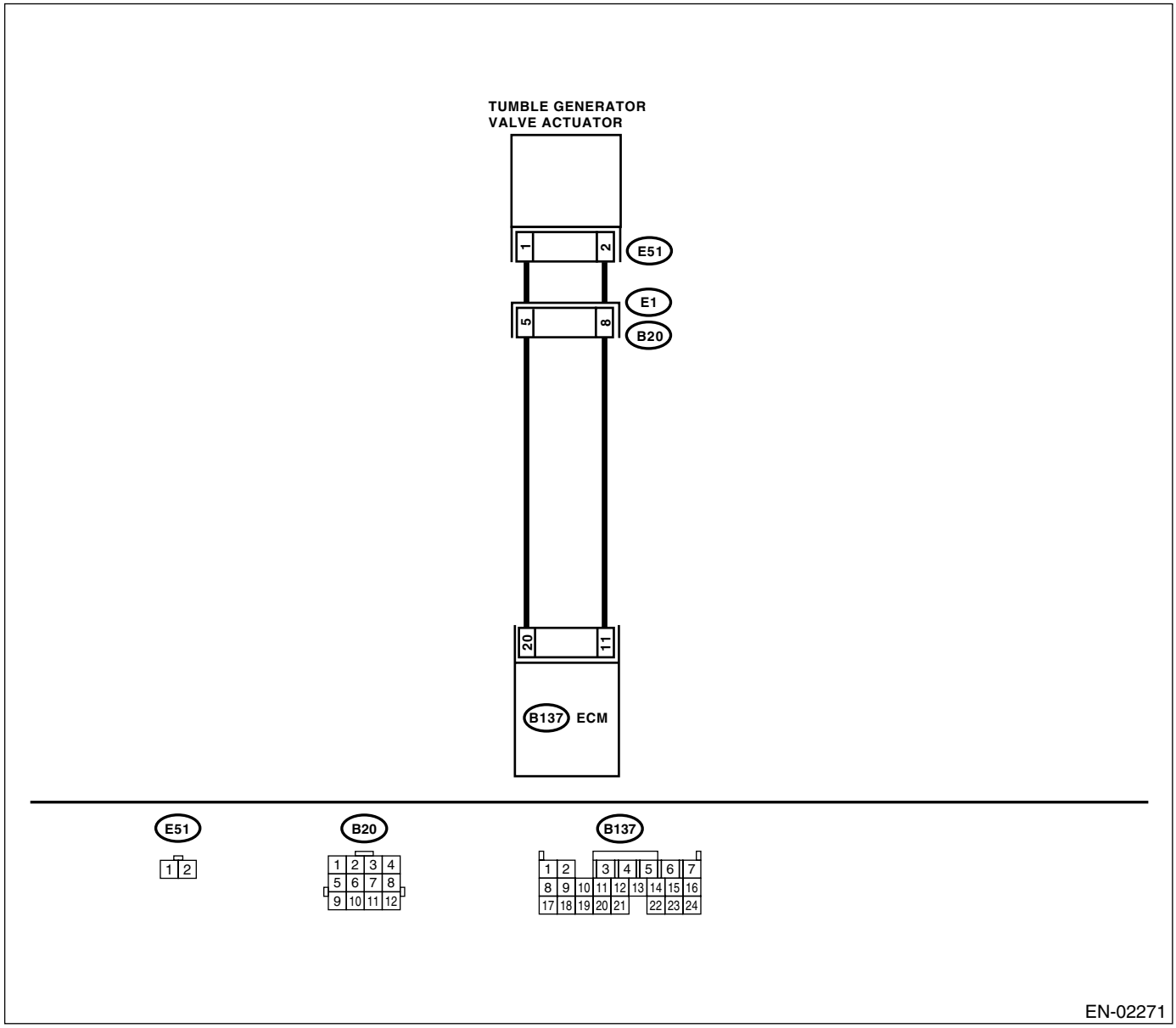
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B137) No. 20:*** ***(E51) No. 2 — (B137) No. 11:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4SO U5)-35, Tumble Generator Valve Actuator.>

DT:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-244, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (–):*** ***(E51) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4SO U5)-35, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DU:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-246, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1110.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

DV:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-247, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1111.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

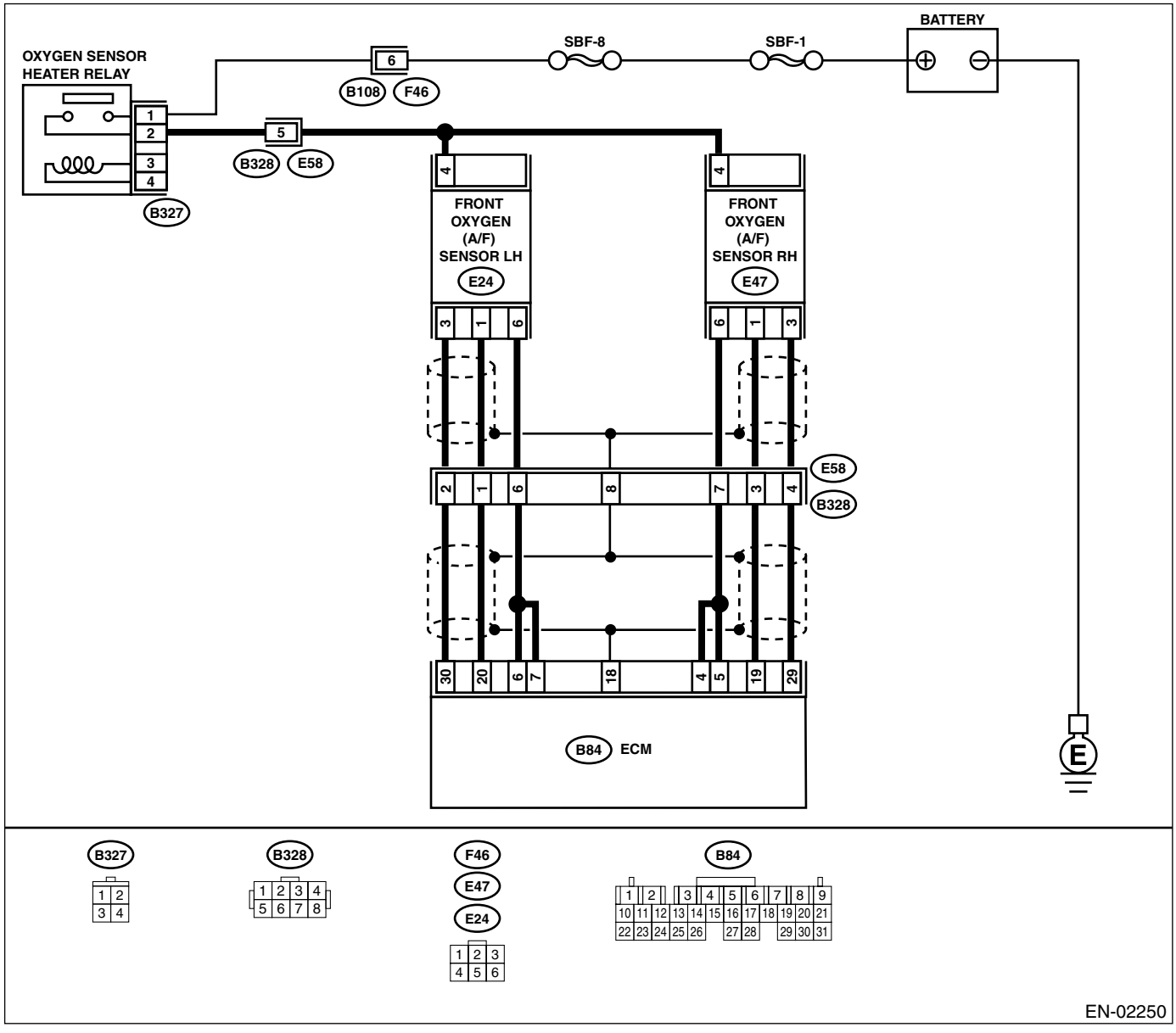
MEMO:

DW:DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-248, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



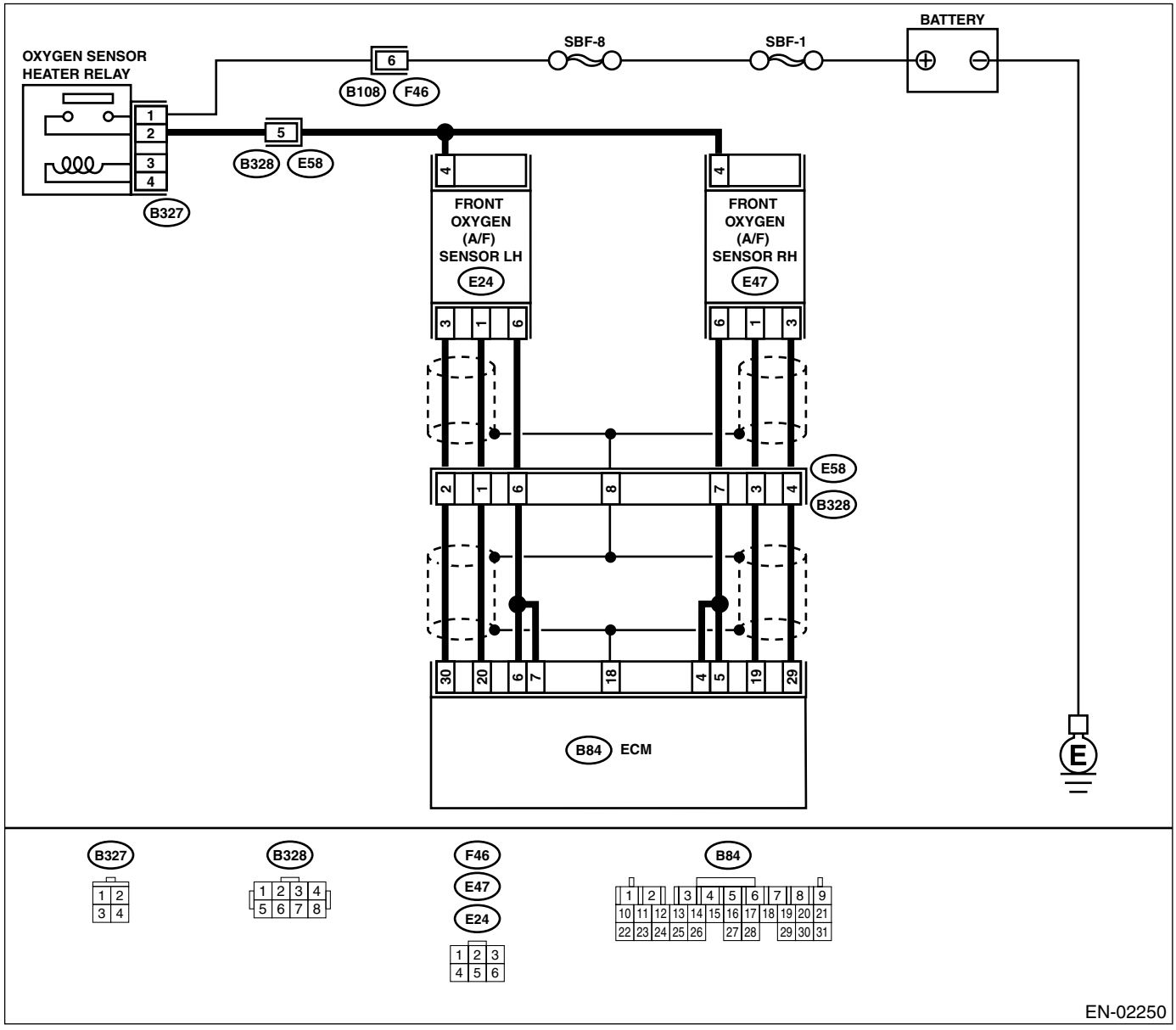
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — (E47) No. 1:*** ***(B84) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

DX:DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-252, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



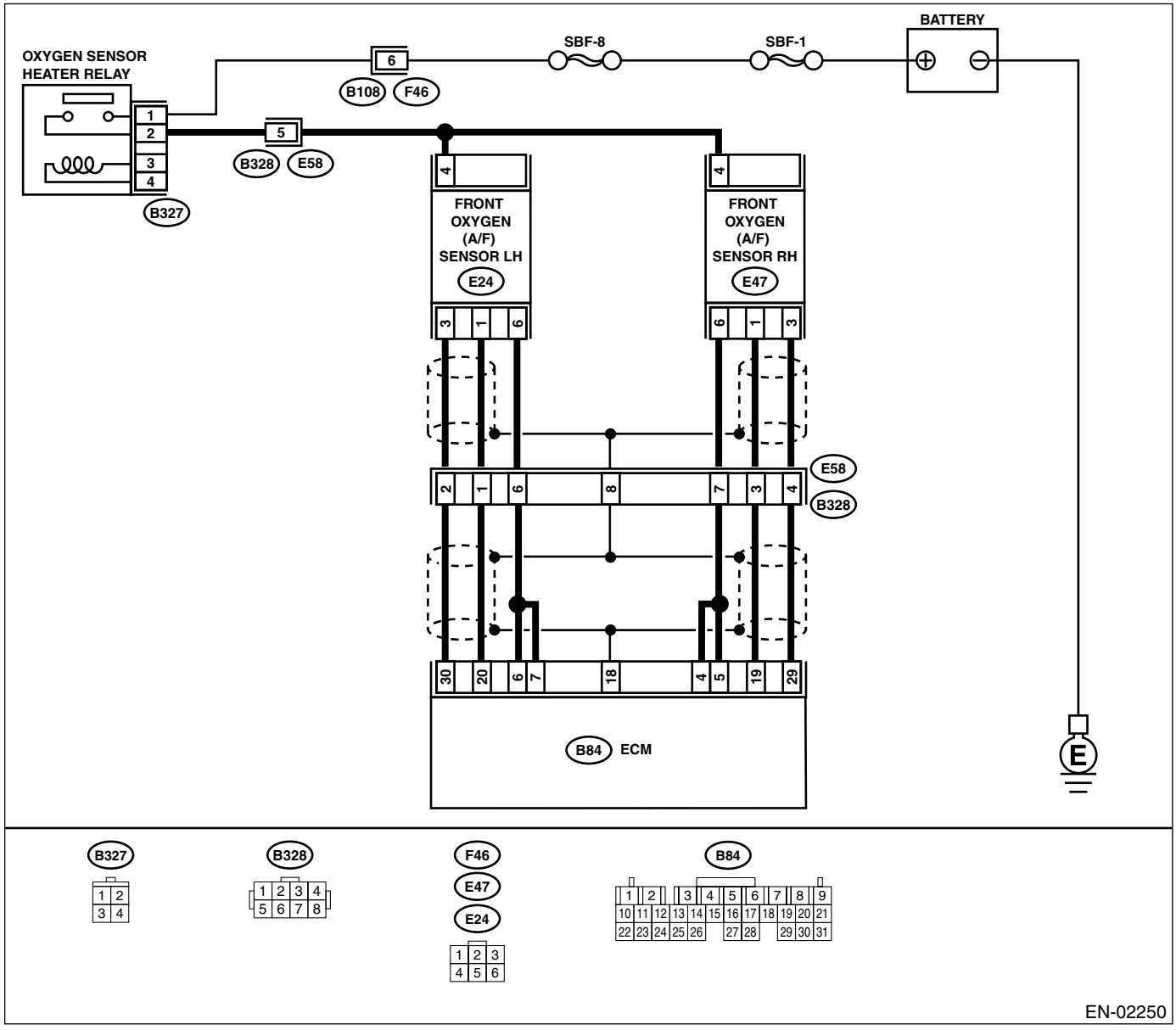
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.

DY:DTC P1154 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK2 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-255, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



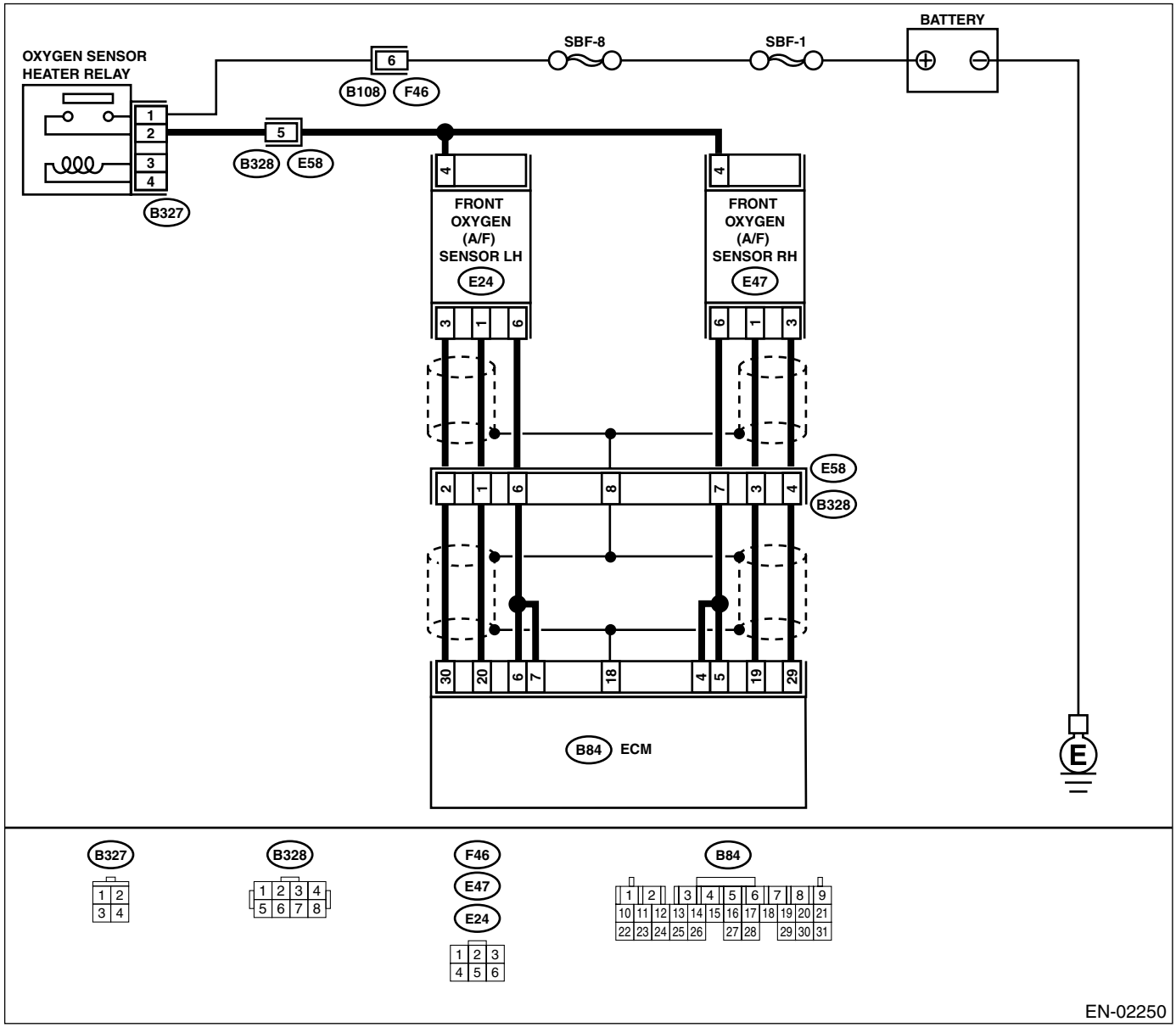
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 20 — (E24) No. 1:*** ***(B84) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>

DZ:DTC P1155 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK2 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-255, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)—, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO U5)-42, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.

EA:DTC P1160 — RETURN SPRING FAILURE —

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO U5)-457, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

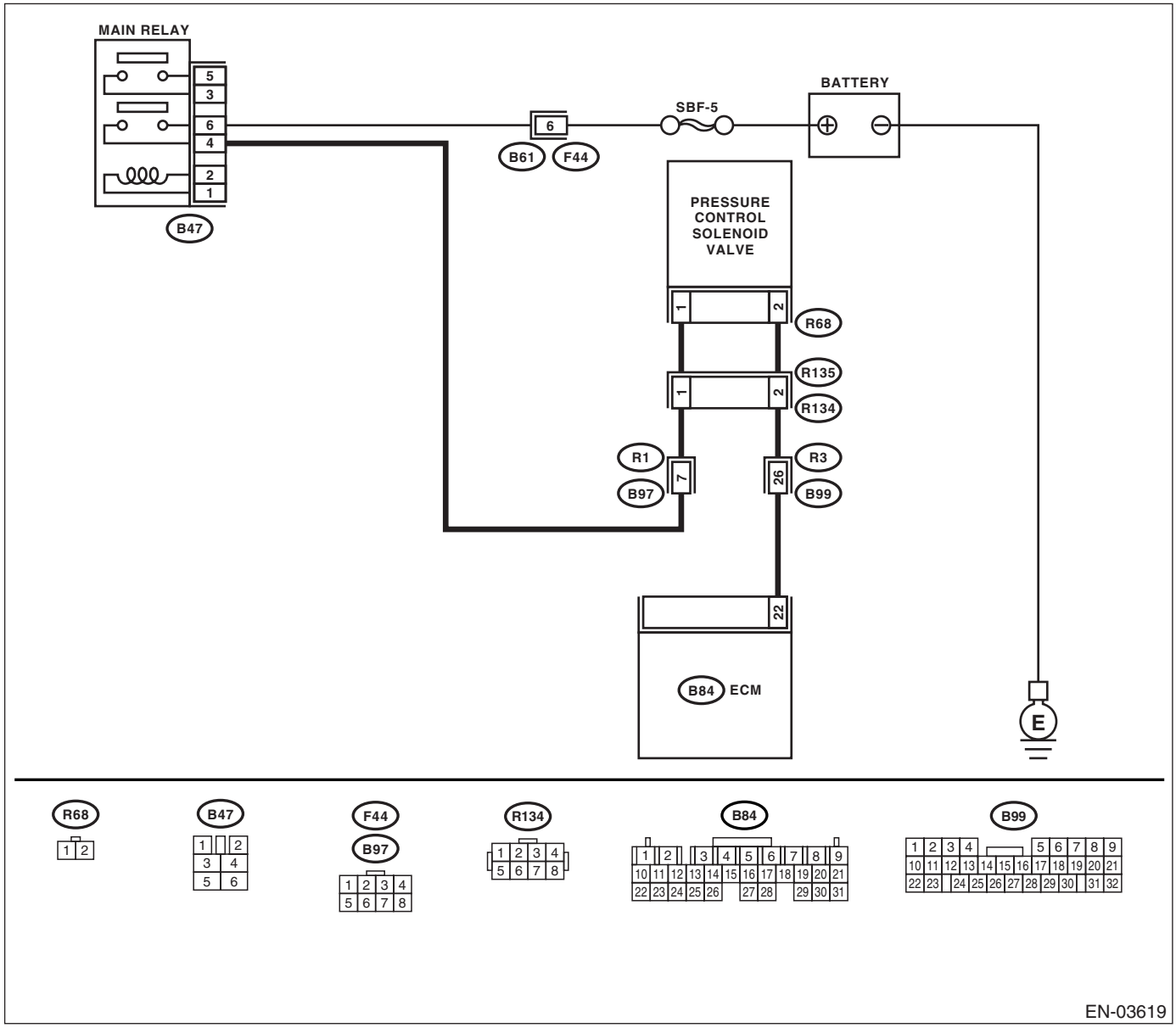
MEMO:

EB:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-258, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B84) No. 22 — (R68) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.>
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

	Step	Check	Yes	No
7	**CHECK FOR POOR CONTACT.** Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

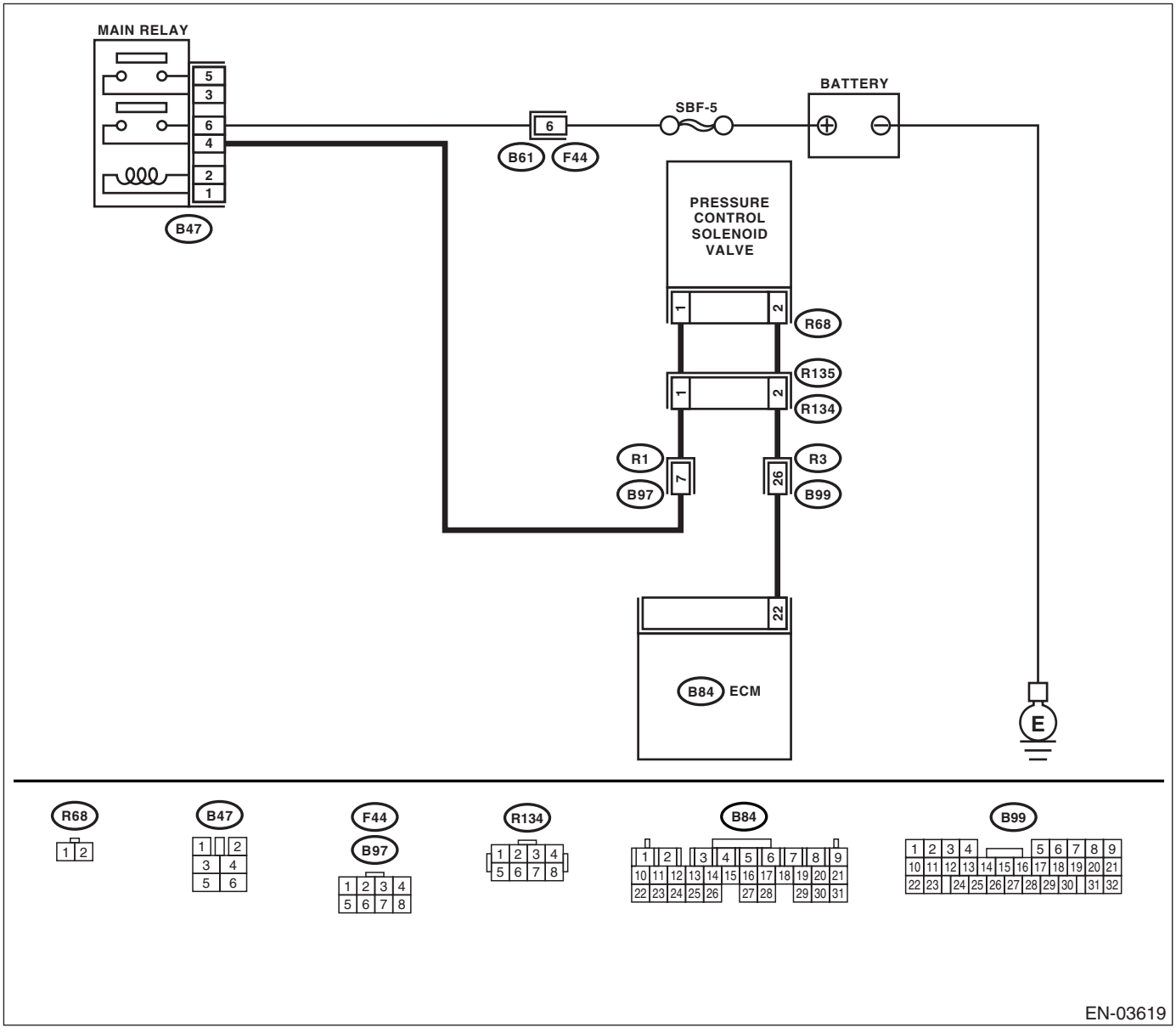
MEMO:

EC:DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-260, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



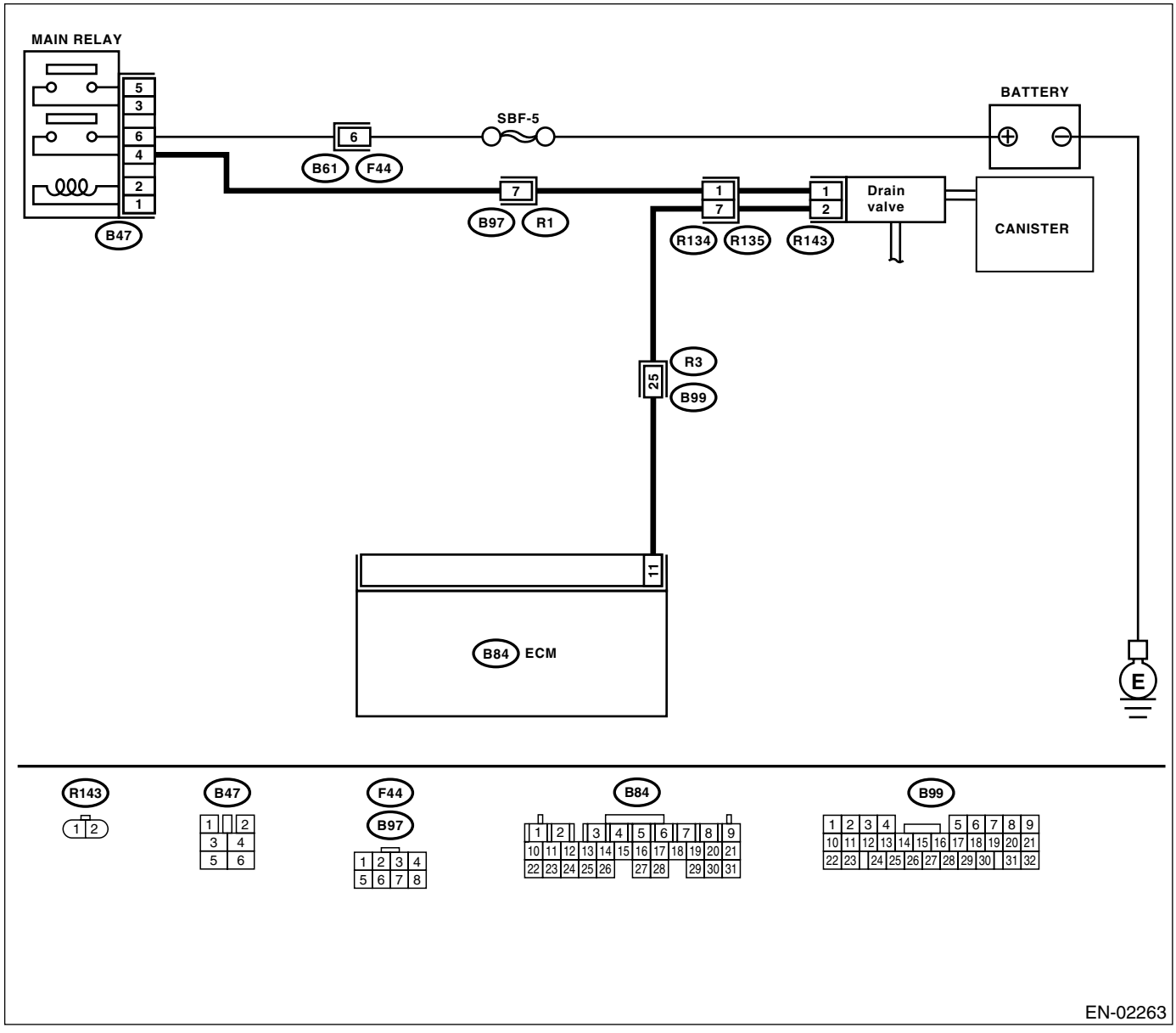
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the pressure control solenoid valve <Ref. to EC(H4SO)-13, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4SO U5)-49, Engine Control Module.>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

ED:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-262, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



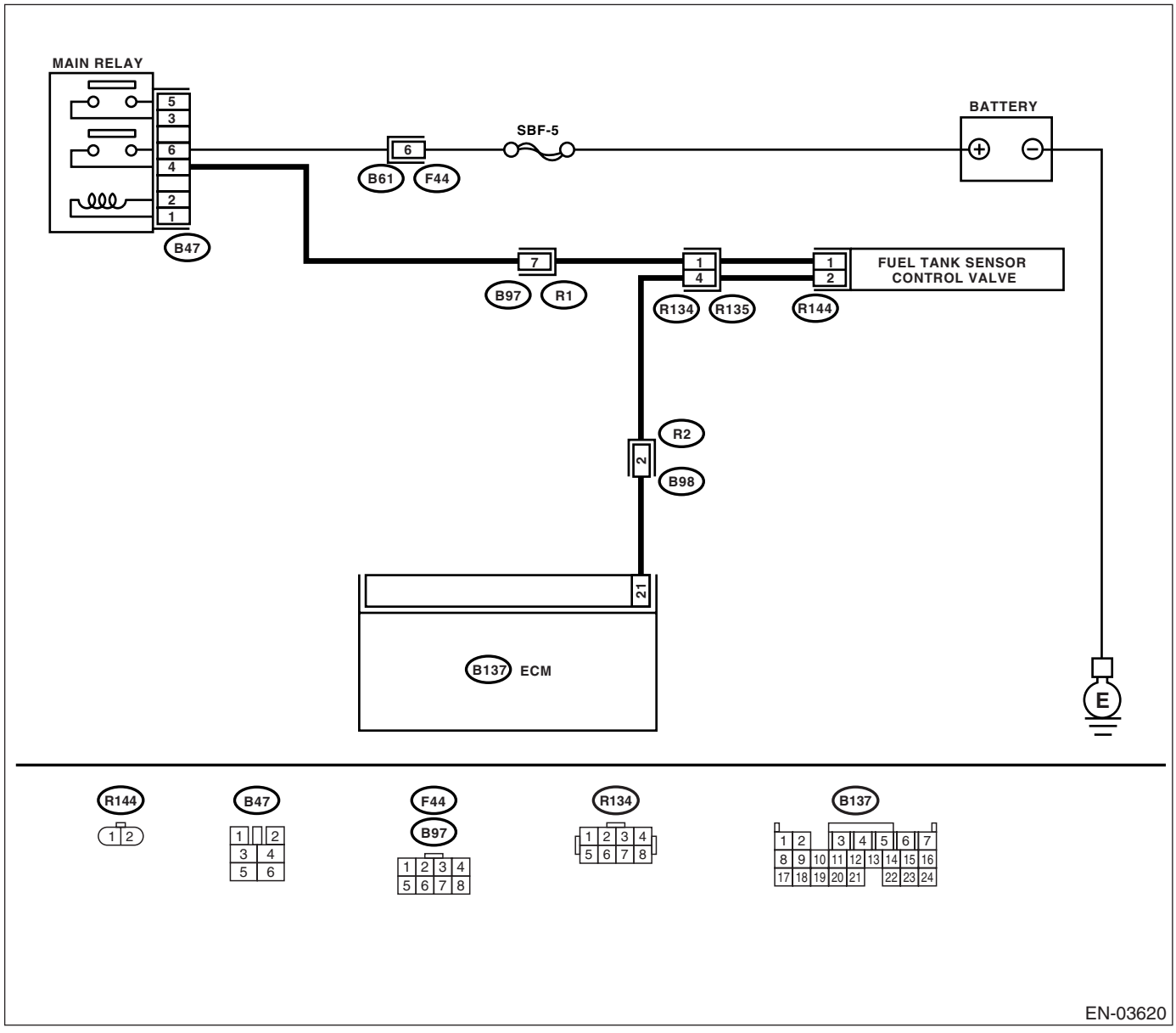
	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK DRAIN HOSES.** Check drain hoses for clogging.	Is there a clogging in a drain hose?	Repair or replace the drain hose.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO U5)-59, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>

EE:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-264, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from fuel tank sensor control valve and ECM. 3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B137) No. 21 — (R144) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connector
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the fuel tank sensor control valve. <Ref. to EC(H4SO)-12, Fuel Tank Sensor Control Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

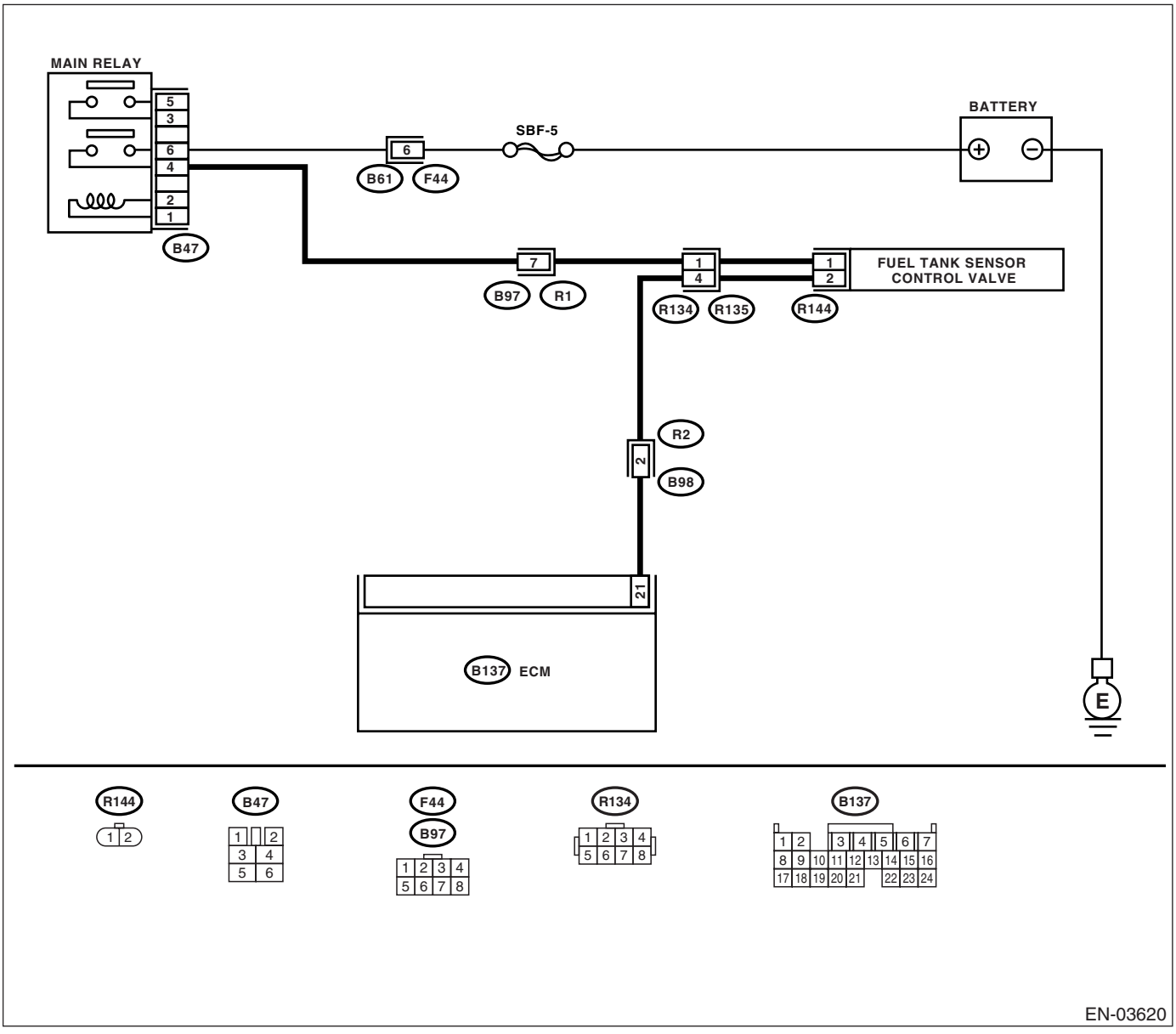
MEMO:

EF:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-266, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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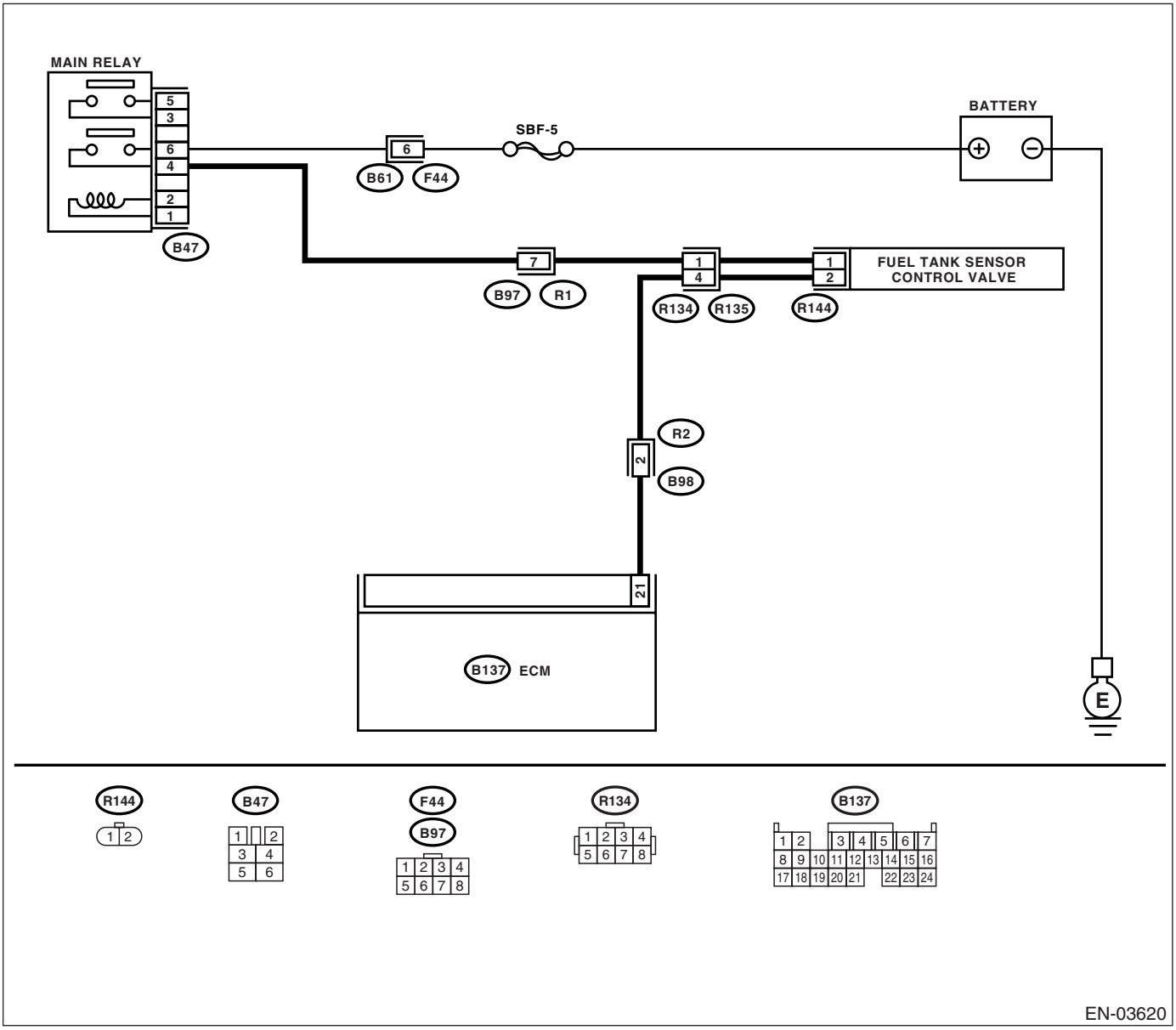
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the fuel tank sensor control valve <Ref. to EC(H4SO)-12, Fuel Tank Sensor Control Valve.> and the ECM <Ref. to FU(H4SO U5)-49, Engine Control Module.>.	Go to step **5.**
5	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

EG:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-268, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK EVAPORATIVE EMISSION LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank. •Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank.	Is there any trouble in evaporation line?	Repair the hoses and pipes.	Replace the fuel tank pressure sensor.

EH:DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
Refer to DTC P1498 for diagnostic procedure. <Ref. to EN(H4SO U5)-419, DTC P1498 — EGR SOLENOID VALVE SIGNAL # 4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EI: DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
Refer to DTC P1499 for diagnostic procedure. <Ref. to EN(H4SO U5)-423, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EJ:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
Refer to DTC P1498 for diagnostic procedure. <Ref. to EN(H4SO U5)-419, DTC P1498 — EGR SOLENOID VALVE SIGNAL # 4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EK:DTC P1495 — EGR SOLENOID VALVE SIGNAL # 2 CIRCUIT MALFUNCTION (HIGH INPUT) —

NOTE:
Refer to DTC P1499 for diagnostic procedure. <Ref. to EN(H4SO U5)-423, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EL:DTC P1496 — EGR SOLENOID VALVE SIGNAL # 3 CIRCUIT MALFUNCTION (LOW INPUT) —

NOTE:
Refer to DTC P1498 for diagnostic procedure. <Ref. to EN(H4SO U5)-419, DTC P1498 — EGR SOLENOID VALVE SIGNAL # 4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EM:DTC P1497 — EGR SOLENOID VALVE SIGNAL # 3 CIRCUIT MALFUNCTION (HIGH INPUT) —

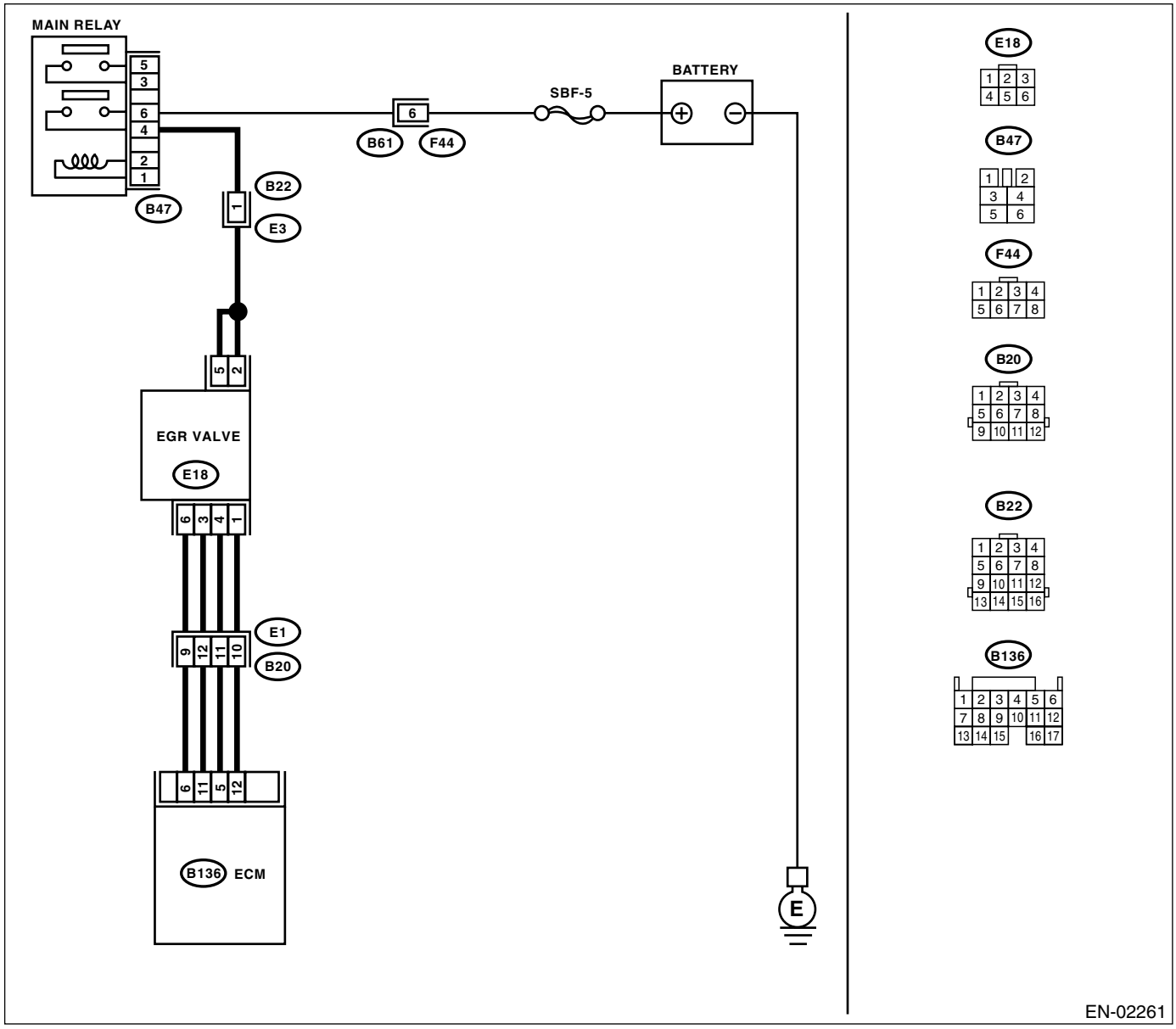
NOTE:
Refer to DTC P1499 for diagnostic procedure. <Ref. to EN(H4SO U5)-423, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EN:DTC P1498 — EGR SOLENOID VALVE SIGNAL # 4 CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition.
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-272, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-276, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-280, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-284, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure the power supply voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 (+) — Engine ground (–):*** ***(E18) No. 5 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between EGR solenoid valve connector and main relay connector. • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and EGR solenoid valve connector. ***Connector & terminal*** ***DTC P1492; (B136) No. 5 — (E18) No. 4:*** ***DTC P1494; (B136) No. 6 — (E18) No. 6:*** ***DTC P1496; (B136) No. 11 — (E18) No. 3:*** ***DTC P1498; (B136) No. 12 — (E18) No. 1:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between EGR solenoid valve connector and main relay connector. • Poor contact in coupling connector.
3	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE.** 1) Disconnect connector from ECM. 2) Measure resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1492; (B136) No. 5 — (E18) No. 4:*** ***DTC P1494; (B136) No. 6 — (E18) No. 6:*** ***DTC P1496; (B136) No. 11 — (E18) No. 3:*** ***DTC P1498; (B136) No. 12 — (E18) No. 1:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair open or ground short circuit in harness between ECM and EGR solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector.	Is there poor contact in ECM or EGR solenoid valve connector?	Repair poor contact in ECM or EGR solenoid valve connector.	Replace EGR solenoid valve. <Ref. to FU(H4SO U5)-37, EGR Valve.>

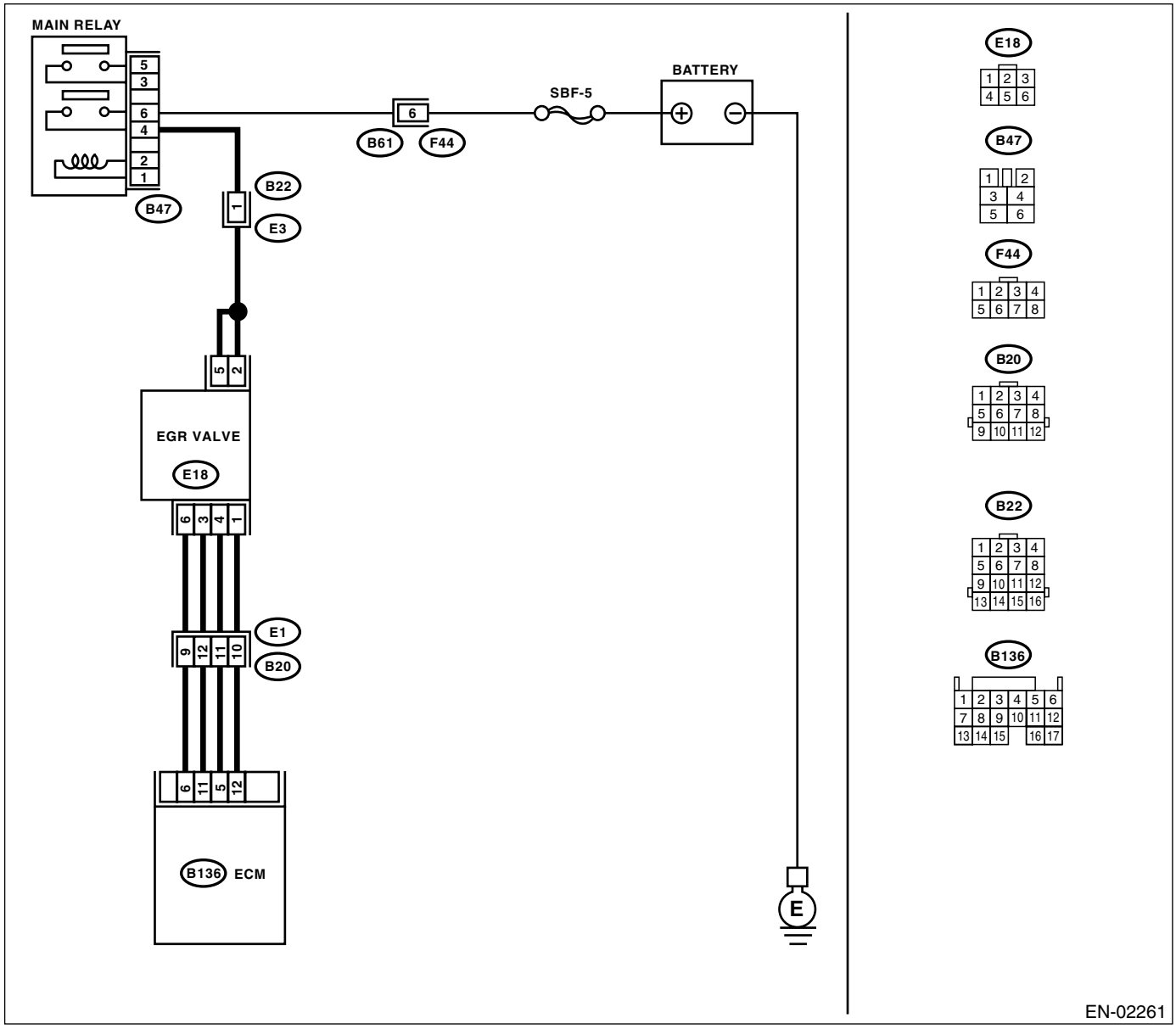
MEMO:

EO:DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition.
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-274, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-278, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-282, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-286, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from EGR solenoid valve. 3) Turn ignition switch to OFF. 4) Measure voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***DTC P1493; (B136) No. 5 (+) — Chassis ground (–):*** ***DTC P1495; (B136) No. 6 (+) — Chassis ground (–):*** ***DTC P1497; (B136) No. 11 (+) — Chassis ground (–):*** ***DTC P1499; (B136) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair ground short circuit between ECM and EGR solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Replace ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>

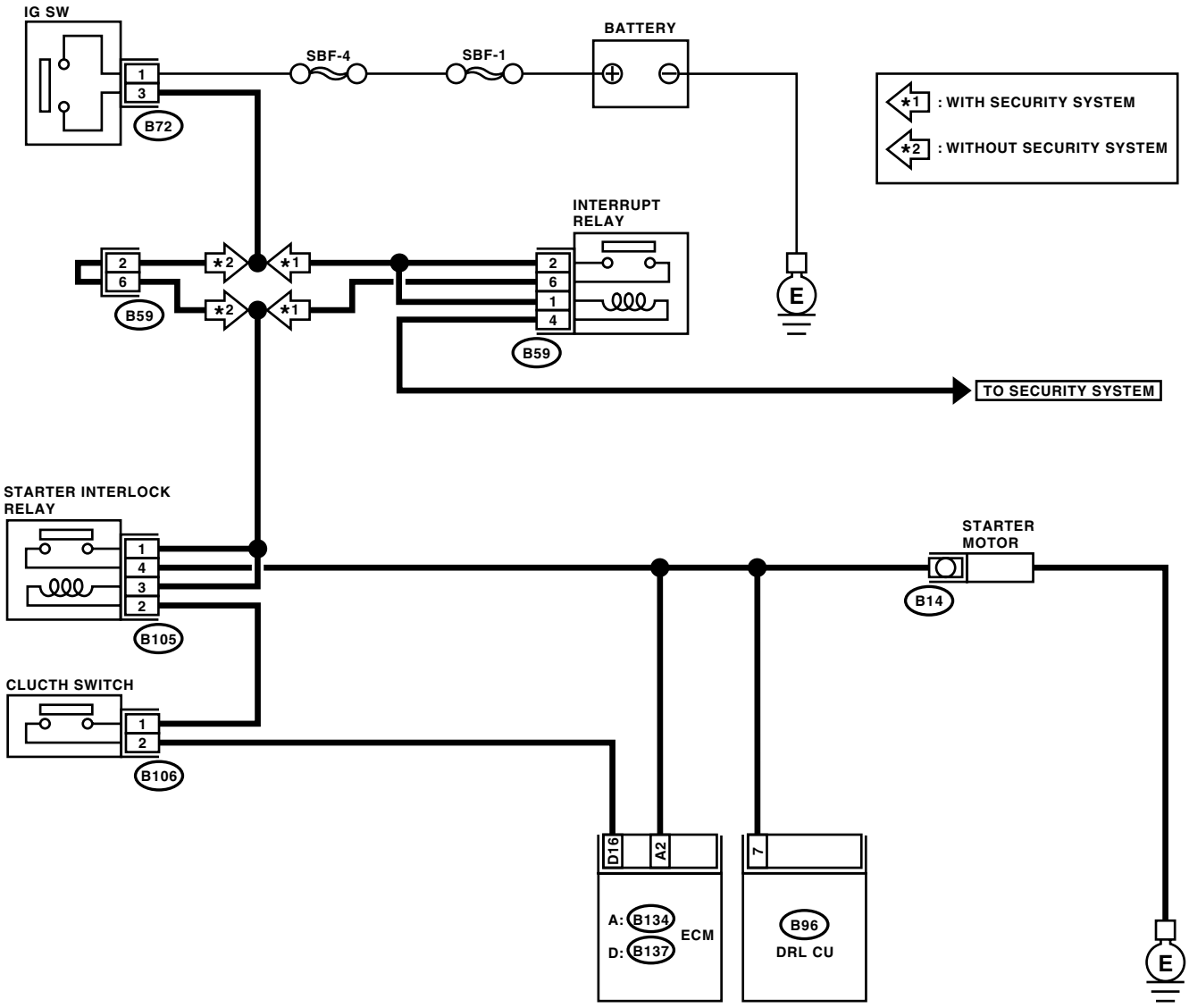
EP:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

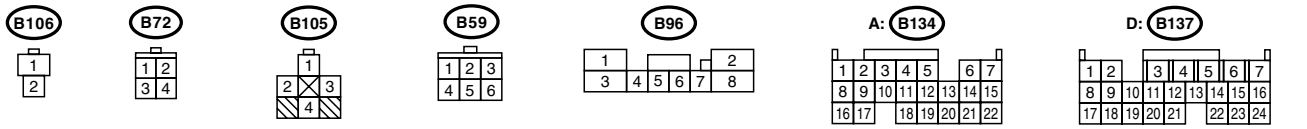
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-288, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

MT model





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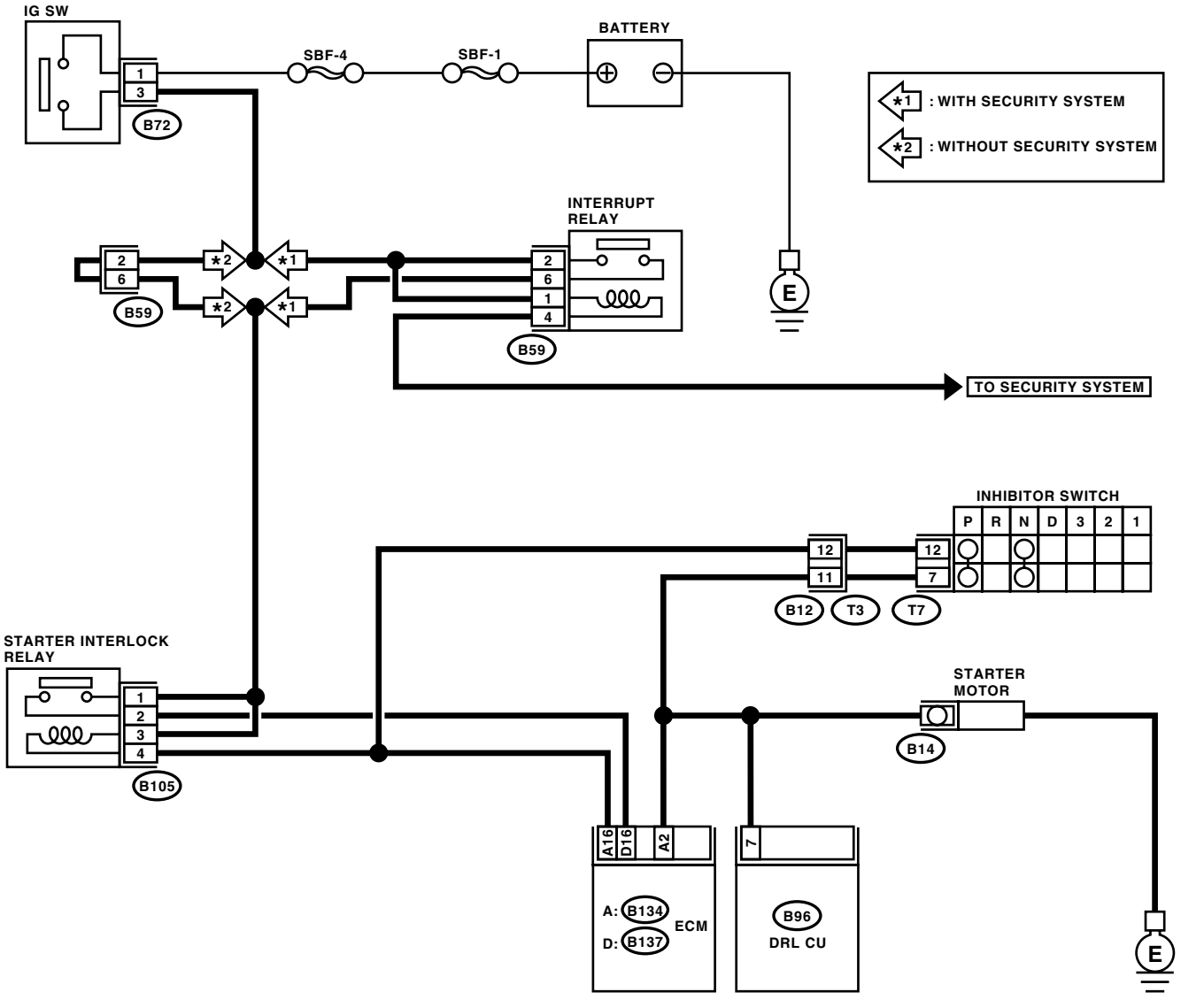
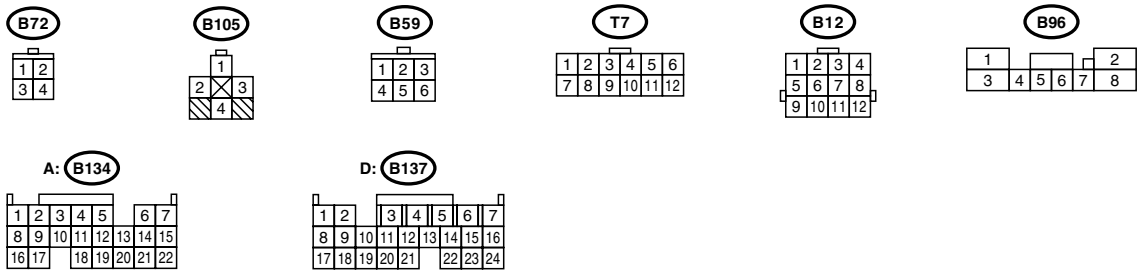
AT model





EN-02245

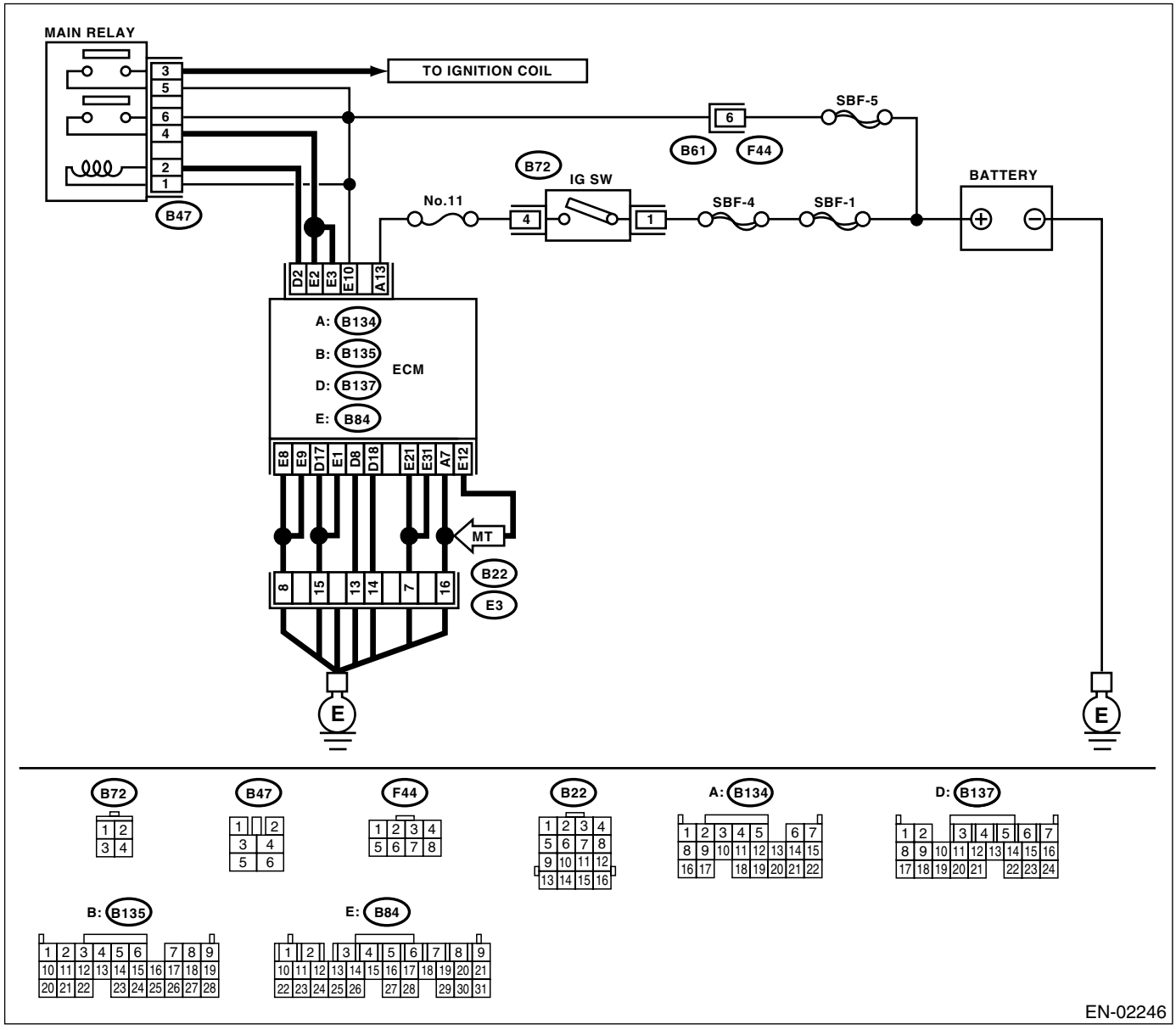
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Place the inhibitor switch in the “P” or “N” range. (AT model) Depress the clutch pedal. (MT model)	Does the starter motor operate when ignition switch is turned to “ST”?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4SO U5)-73, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

EQ:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-289, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 10 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown out?	Replace the fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

ER:DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —

• GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-290, DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

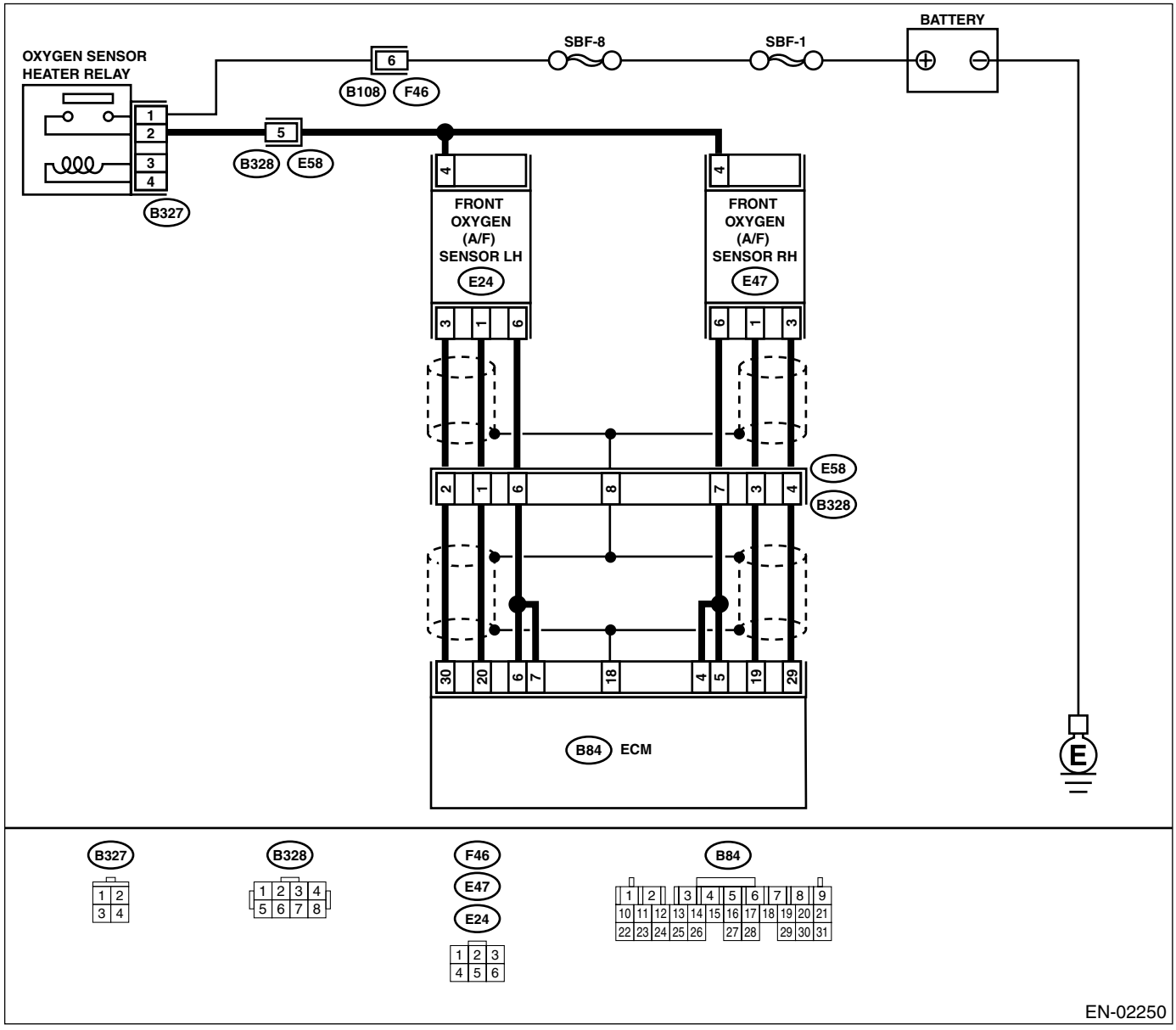
MEMO:

ES:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-292, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — (E47) No. 1:*** ***(B84) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 — Chassis ground:*** ***(B84) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **7.**	Go to step **8.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9.**
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10.**
10	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **11.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **12.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **13.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **14.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

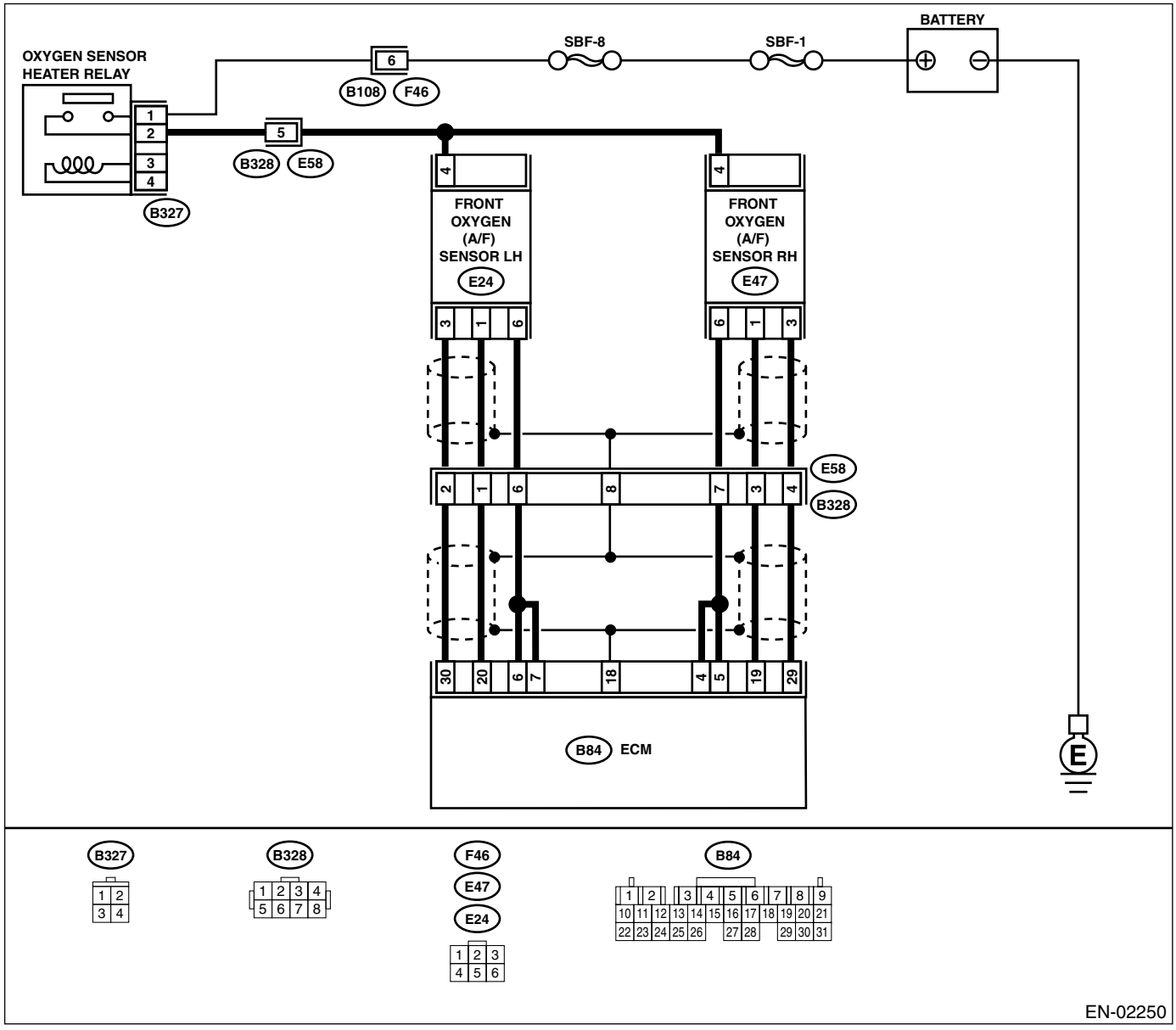
MEMO:

ET:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-294, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — (E47) No. 1:*** ***(B84) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 — Chassis ground:*** ***(B84) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **7.**	Go to step **8.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **7.**
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10.**
10	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **11.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **12.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **13.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **14.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

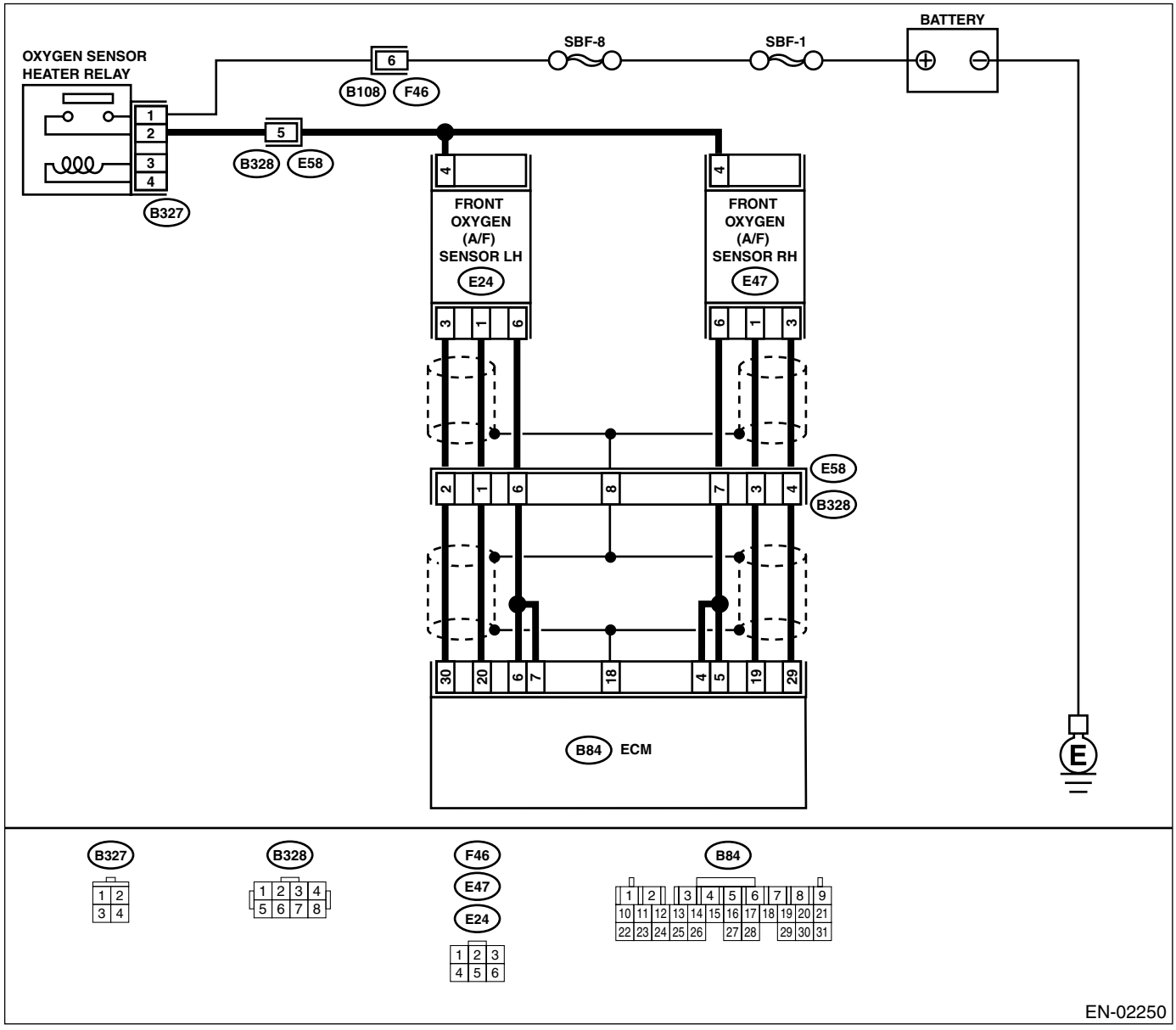
MEMO:

EU:DTC P2098 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-296, DTC P2098 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 20 — (E24) No. 1:*** ***(B84) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 — Chassis ground:*** ***(B84) No. 30 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **7.**	Go to step **8.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9.**
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10.**
10	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **11.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **12.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **13.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **14.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

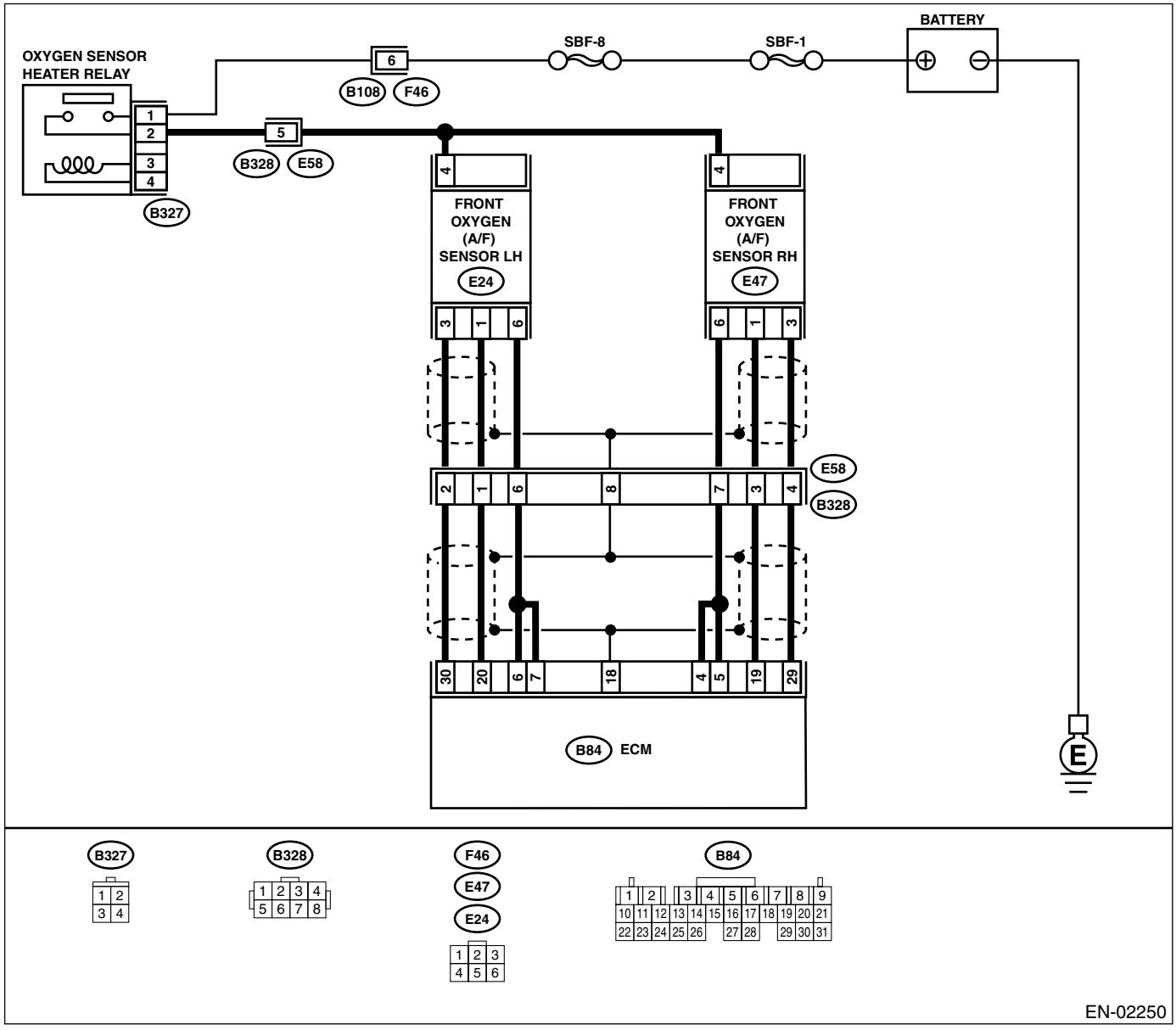
MEMO:

EV:DTC P2099 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-296, DTC P2099 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-49, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO U5)-90, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 20 — (E24) No. 1:*** ***(B84) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 — Chassis ground:*** ***(B84) No. 30 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **7.**	Go to step **8.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9.**
9	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **10.**
10	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **11.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

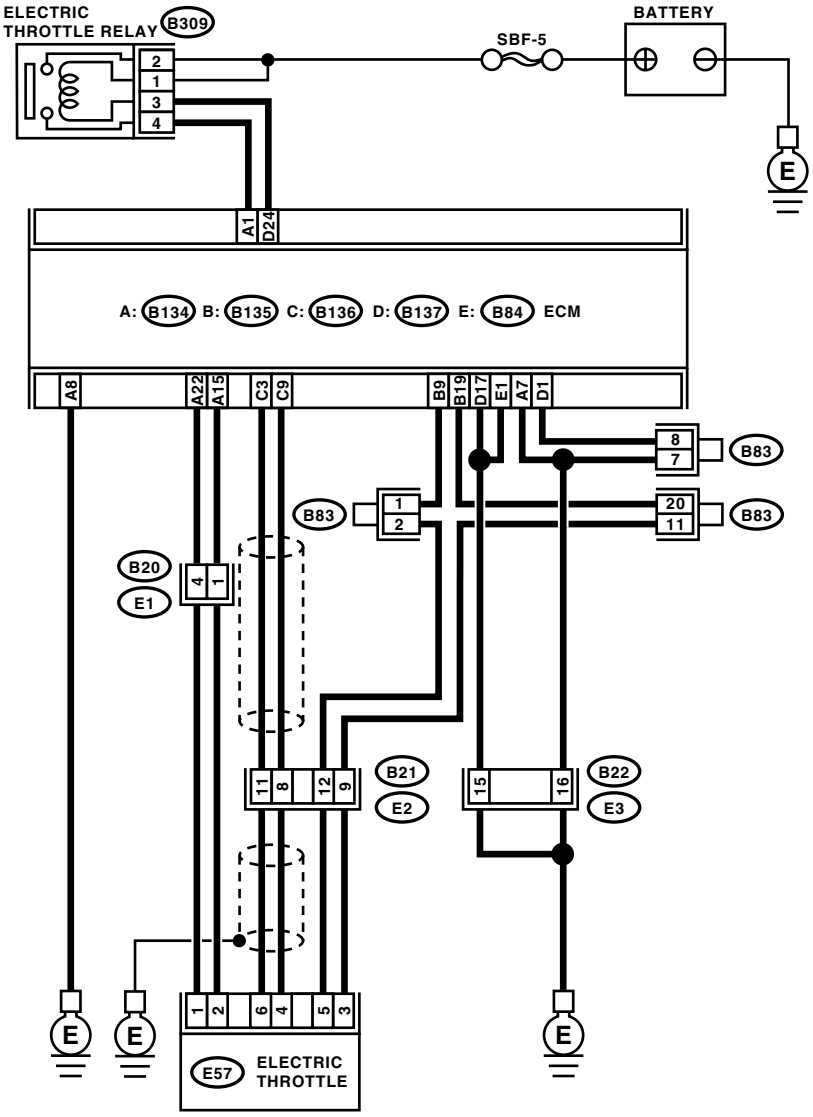
	Step	Check	Yes	No
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **12.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **13.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO U5)-27, Engine Coolant Temperature Sensor.>
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **14.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

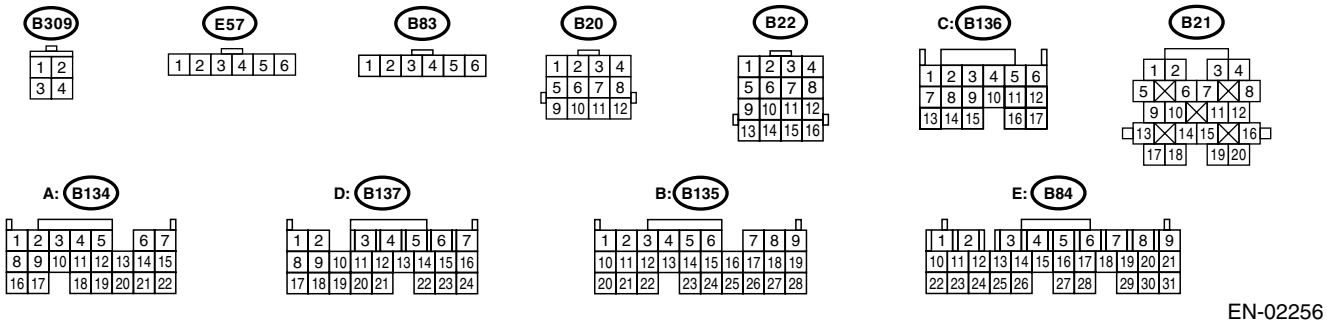
	Step	Check	Yes	No
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO U5)-39, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO U5)-33, Air Flow and Intake Air Temperature Sensor.>

EW:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-202, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4SO U5)-256, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO U5)-304, DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

- **WIRING DIAGRAM:**





EN-02256

Step		Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Connect the battery to electric throttle relay terminal No. 1 and No. 3. 4) Measure the resistance between electric throttle relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK POWER SUPPLY TO ELECTRIC THROTTLE RELAY.** Measure the voltage between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Chassis ground (–):*** ***(B309) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the open power supply circuit or ground short.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Go to step **4.**	Repair short of the power supply circuit between ECM and electric throttle.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Chassis ground:*** ***(B309) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness between ECM and electric throttle relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and electric throttle relay connector. ***Connector & terminal*** ***(B137) No. 24 — (B309) No. 3:*** ***(B134) No. 1 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and electric throttle relay.
6	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.	Is the voltage more than 0.4 V?	Go to step **7.**	Go to step **9.**
7	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of sub throttle sensor signal, using the Subaru Select Monitor.	Is the voltage more than 0.8 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POOR CONTACT.** Check poor contact between ECM connector and electric throttle connector.	Is there poor contact between ECM connector and electric throttle connector?	Repair the poor contact.	Go to step **13.**

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 3 — (E57) No. 6:*** ***(B136) No. 9 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open harness connector.
10	**CHECK THE HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:*** ***(B136) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the ground short of harness.
11	**CHECK POWER SUPPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No.5 (+) — Engine ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **12.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
12	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
13	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal, using the Subaru Select Monitor.	Is the voltage less than 4.63 V?	Go to step **14.**	Go to step **16.**
14	**CHECK OUTPUT VOLTAGE OF SENSOR.** Read the data of sub throttle sensor signal, using the Subaru Select Monitor.	Is the voltage less than 4.73 V?	Go to step **15.**	Go to step **16.**
15	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle?	Is there poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **21.**
16	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 3 — (E57) No. 6:*** ***(B136) No. 9 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **17.**	Repair the open harness connector.

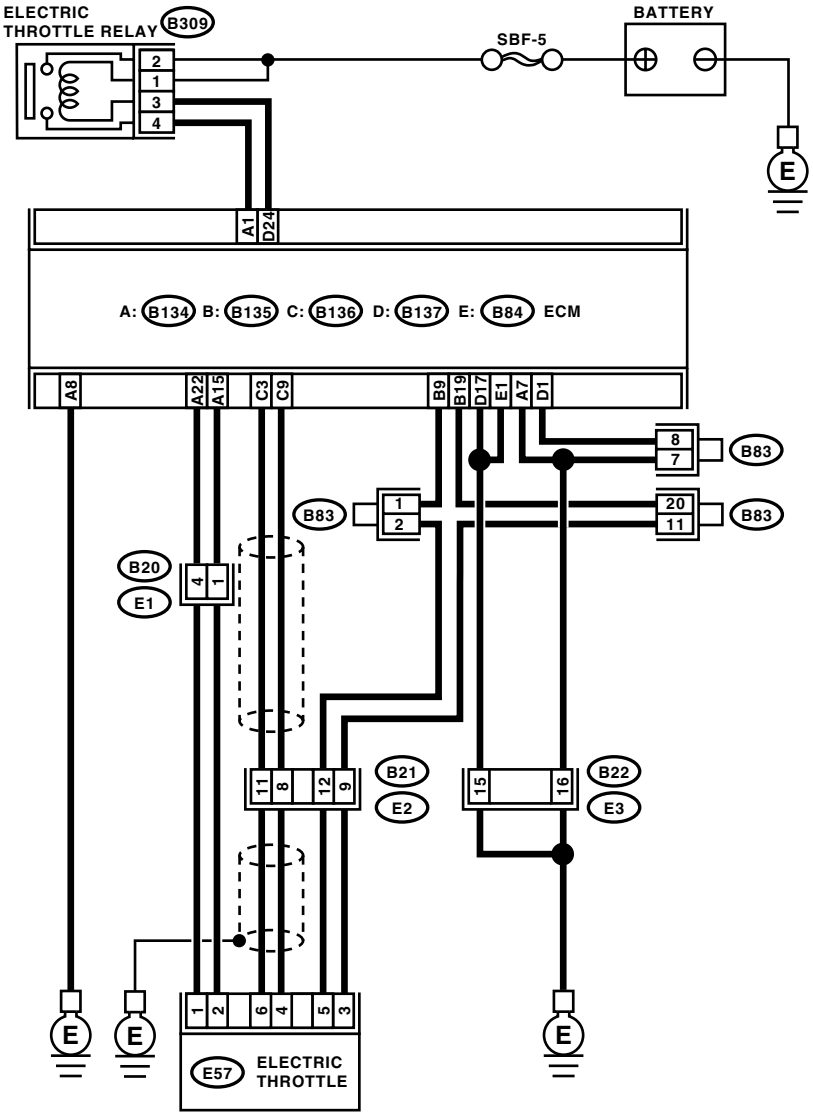
	Step	Check	Yes	No
17	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **18.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
18	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the voltage less than 10 V?	Go to step **19.**	Repair the battery short of harness between ECM connector and electric throttle connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage less than 10 V?	Go to step **20.**	Repair the short of harness between ECM connector and electric throttle connector.
20	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the voltage between ECM connectors. ***Connector & terminal*** ***(B136) No. 3 — (B135) No. 9:*** ***(B136) No. 9 — (B135) No. 9:***	Is the resistance more than 1 MΩ?	Go to step **21.**	Repair the short of sensor power supply.
21	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors except electric throttle replay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signals, using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step **22.**	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.
22	**CHECK OUTPUT VOLTAGE OF SENSOR.** Read the data of sub throttle sensor signals, using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step **23.**	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B134) No. 15 — (E57) No. 2:*** ***(B134) No. 22 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open harness connector.

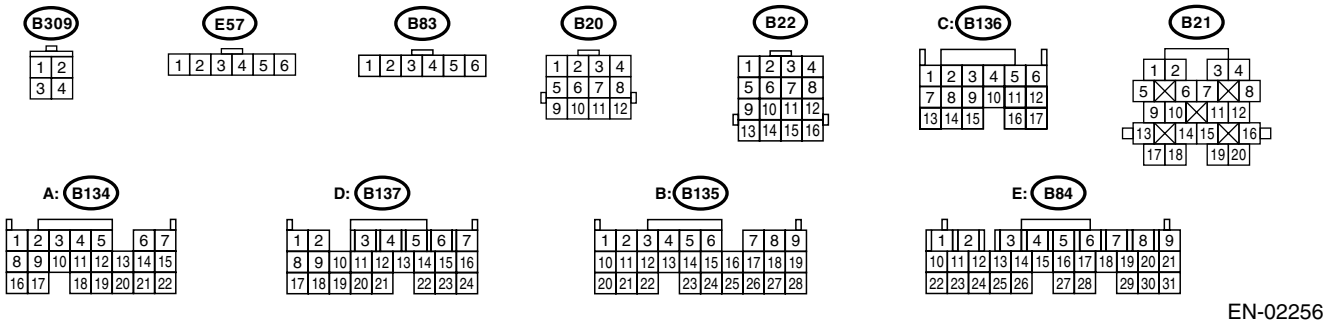
Step		Check	Yes	No
24	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Connect the connectors to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the voltage less than 5 V?	Go to step **25.**	Repair the short of harness to power supply circuit between ECM and electric throttle.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Repair the short of harness.
26	**CHECK ELECTRIC THROTTLE MOTOR HARNESS.** Measure the resistance between electric throttle connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **27.**	Repair the short of harness.
27	**CHECK ELECTRIC THROTTLE GROUND CIRCUIT.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **28.**	Repair the open circuit harness.
28	**CHECK ELECTRIC THROTTLE.** Measure the resistance between electric throttle terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **29.**	Replace the electric throttle.
29	**CHECK ELECTRIC THROTTLE.** Open and close the throttle valve to its full width with finger.	Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>	Replace the electric throttle.

EX:DTC P2102 — THROTTLE ACTUATOR CONTROL Motor Circuit Low —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-300, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

- **WIRING DIAGRAM:**





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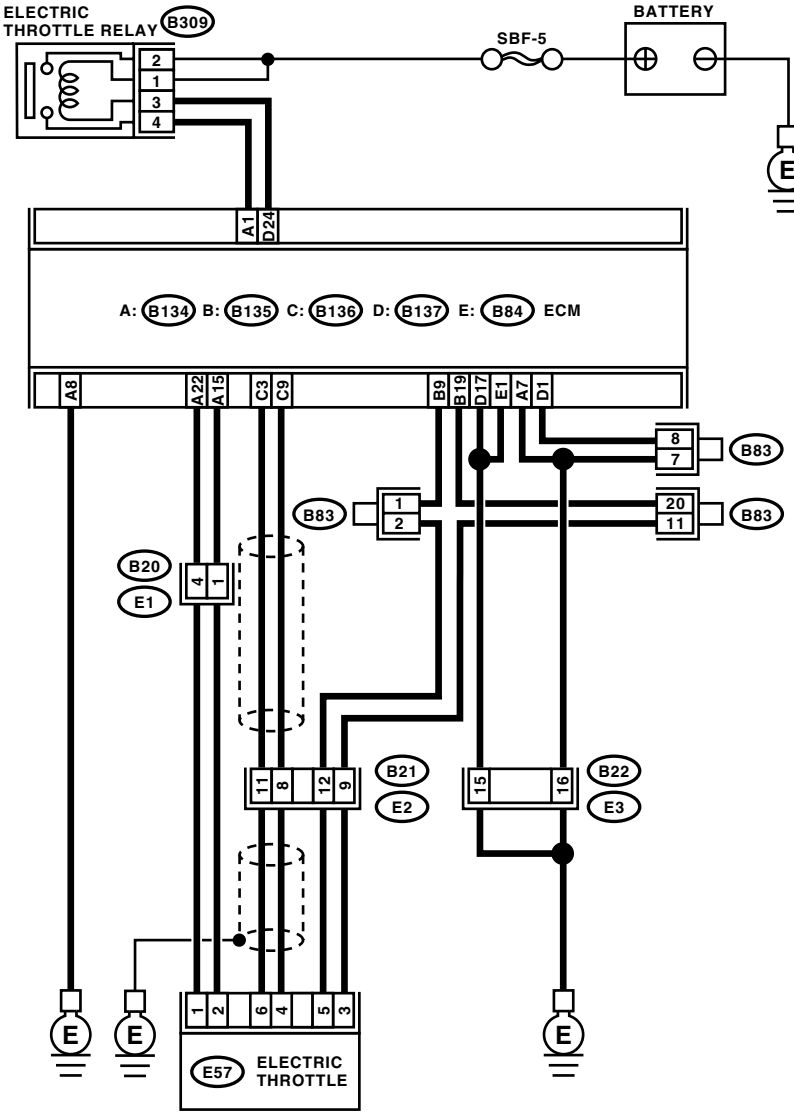
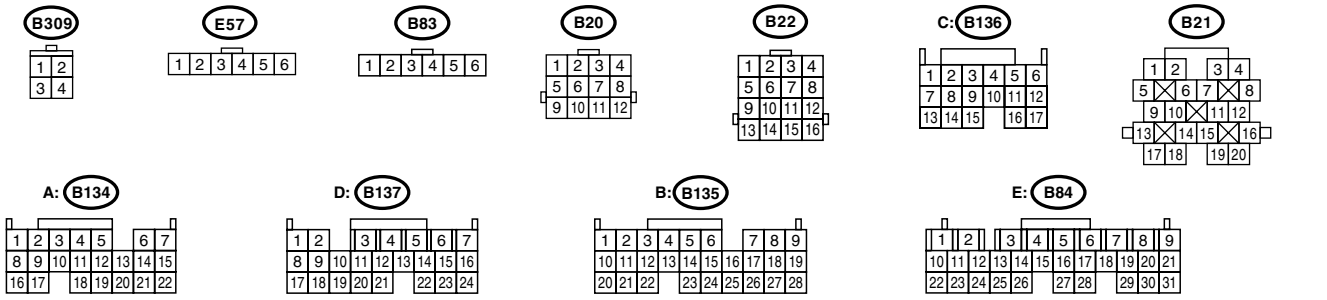
Step		Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Connect the battery to electric throttle relay terminal No. 1 and No. 3. 4) Measure the resistance between electric throttle terminals. ***Connector & terminal*** ***No. 2 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK POWER TO ELECTRIC THROTTLE RELAY** Measure the voltage between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Chassis ground (–):*** ***(B309) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the open power supply circuit or ground short.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Go to step **4.**	Repair the short of power supply circuit between ECM and electric throttle.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Chassis ground:*** ***(B309) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness between ECM and electric throttle relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** Measure the resistance between ECM connector and electric throttle relay connector. ***Connector & terminal*** ***(B137) No. 24 — (B309) No. 3:*** ***(B134) No. 1 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the open harness between ECM and electric throttle relay.

EY:DTC P2103 — THROTTLE ACTUATOR CONTROL Motor Circuit High —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-302, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Measure the resistance between electric throttle relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK SHORT OF ELECTRIC THROTTLE RELAY POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the short of power supply to harness between ECM and electric throttle relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B137) No. 24 — Engine ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the ground short of harness between ECM and electric throttle relay.

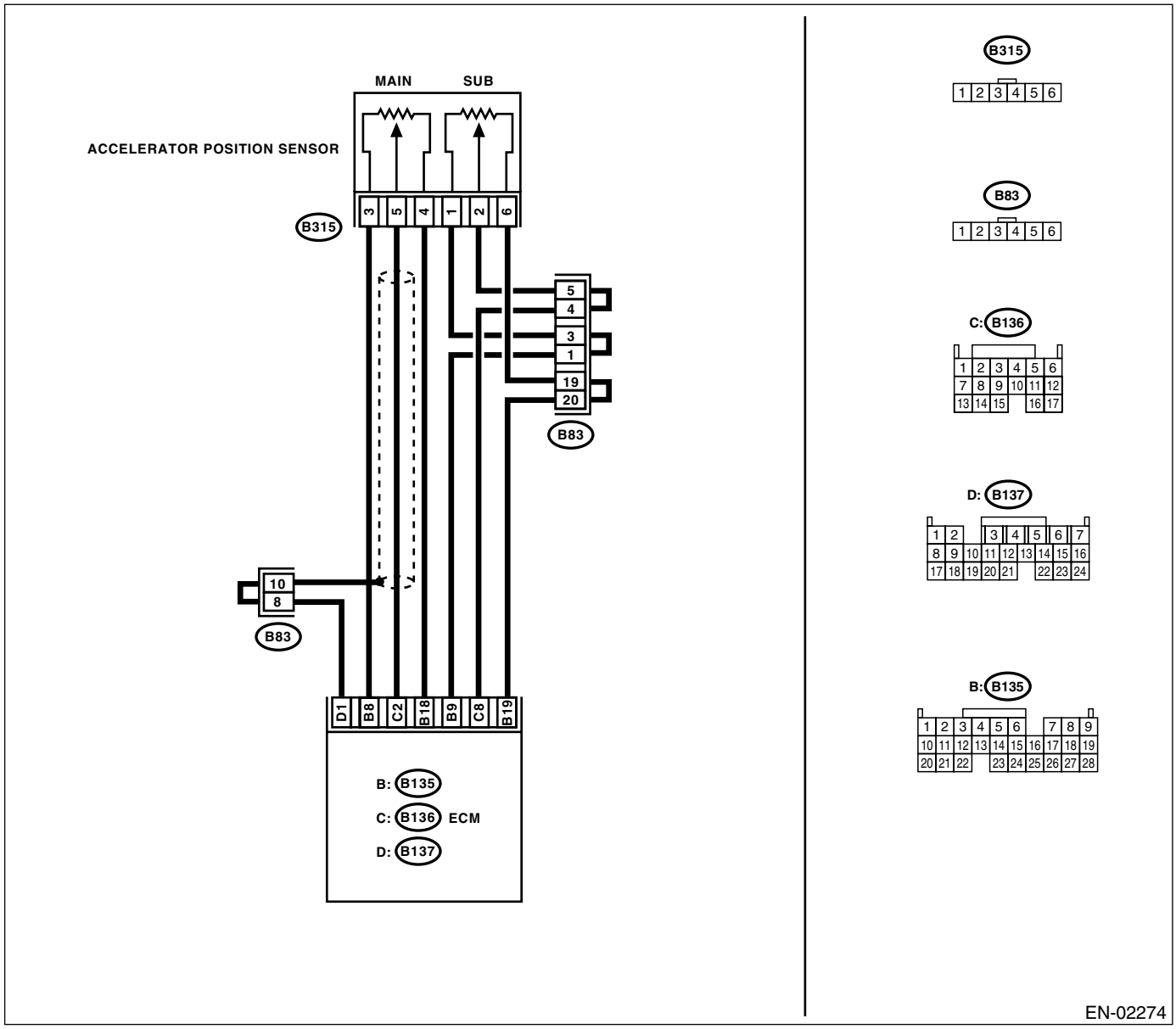
EZ:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO U5)-457, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

MEMO:

FA:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT —

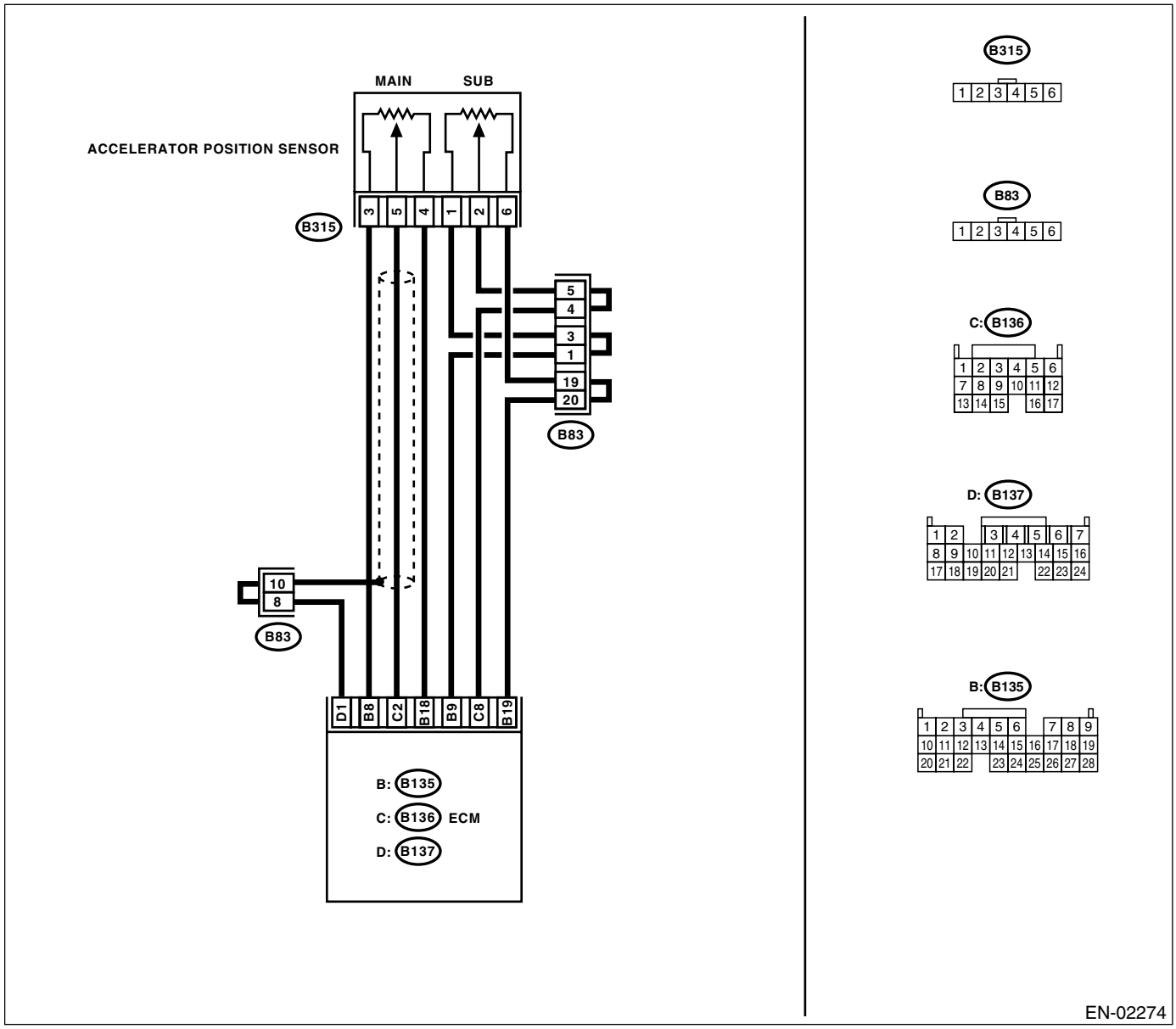
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-306, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator position sensor signal using Subaru Select Monitor. ***Connector & terminal*** ***(B136) No. 2 (+) — (B135) No. 18 (–):***	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 2 — (B315) No. 5:*** ***(B135) No. 8 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 — Chassis ground:*** ***(B135) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the open harness connector.
5	**CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when accelerator pedal is released. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.2 — 1.0 kΩ?	Go to step **8.**	Replace the accelerator position sensor.
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when acceleration pedal is being depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.5 — 2.5 kΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Replace the accelerator position sensor.

FB:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT —

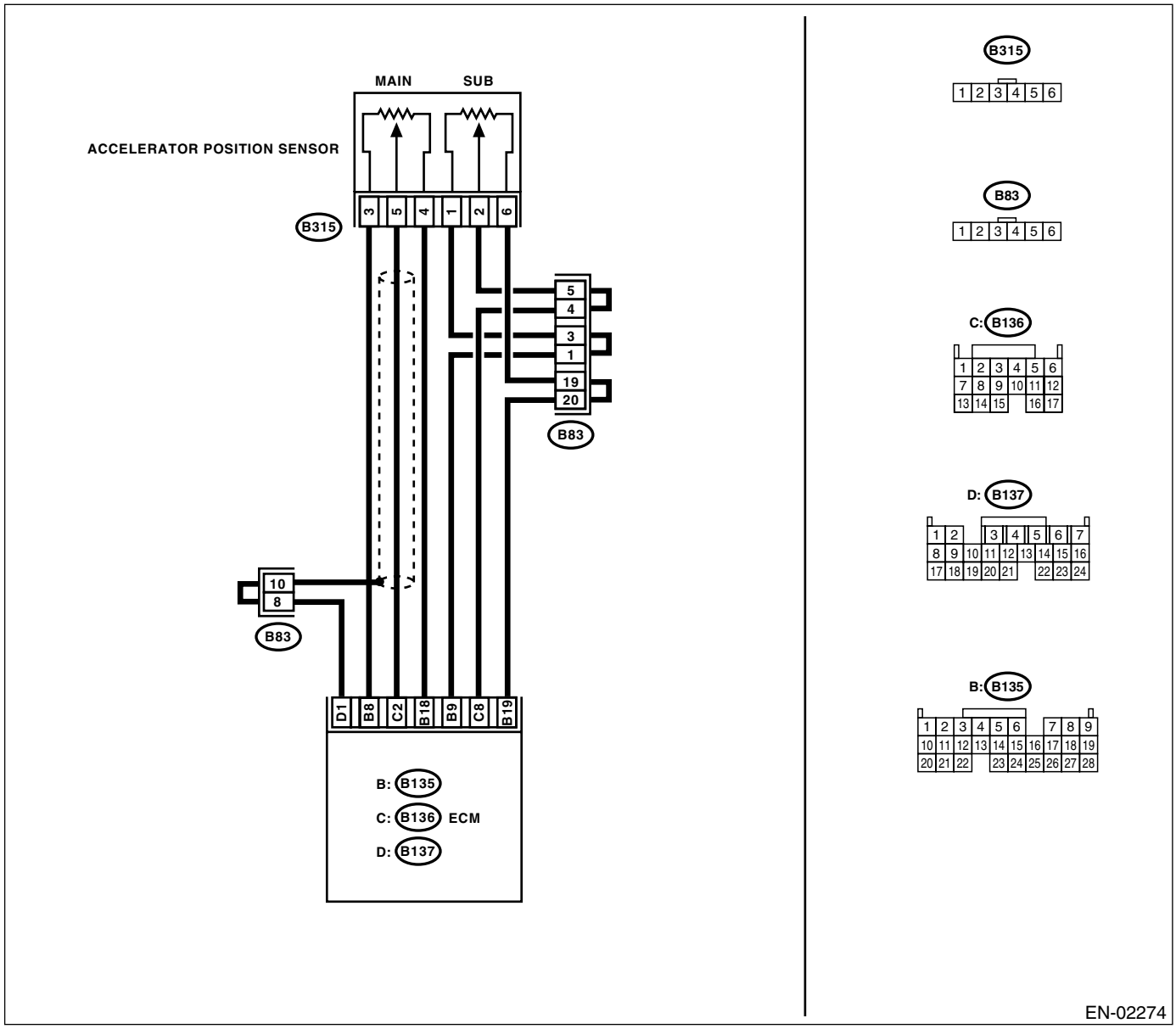
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-308, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator position sensor signals, using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B135) No. 18 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor and chassis ground. ***Connector & terminal*** ***(B315) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and accelerator position sensor.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 2 (+) — (B135) No. 8:*** ***(B136) No. 2 (+) — (B135) No. 9:***	Is the resistance more than 1 MΩ?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Repair the short to sensor power supply.

FC:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —

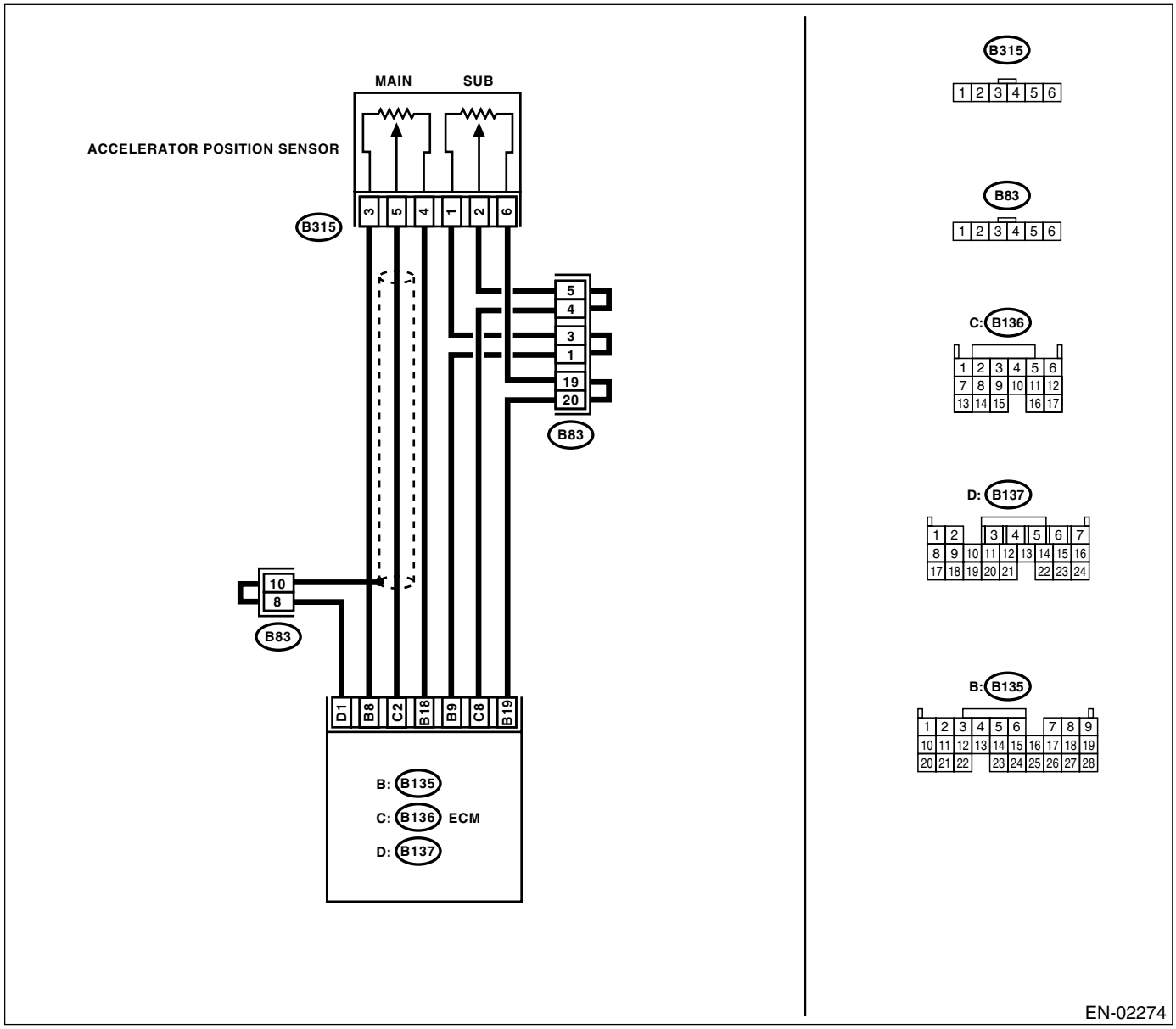
- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-310, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator position sensor signal using Subaru Select Monitor.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 8 — (B315) No. 2:*** ***(B135) No. 9 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 8 — Chassis ground:*** ***(B135) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when accelerator pedal is released. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **8.**	Replace the accelerator position sensor.
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when acceleration pedal is being depressed. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.28 — 1.68 kΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Replace the accelerator position sensor.

FD:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGHT INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-312, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator position sensor signals, using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B135) No. 19 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and accelerator position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 2 (+) — (B135) No. 8:*** ***(B136) No. 2 (+) — (B135) No. 9:***	Is the voltage 4.8 V?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Repair the short to sensor power supply.

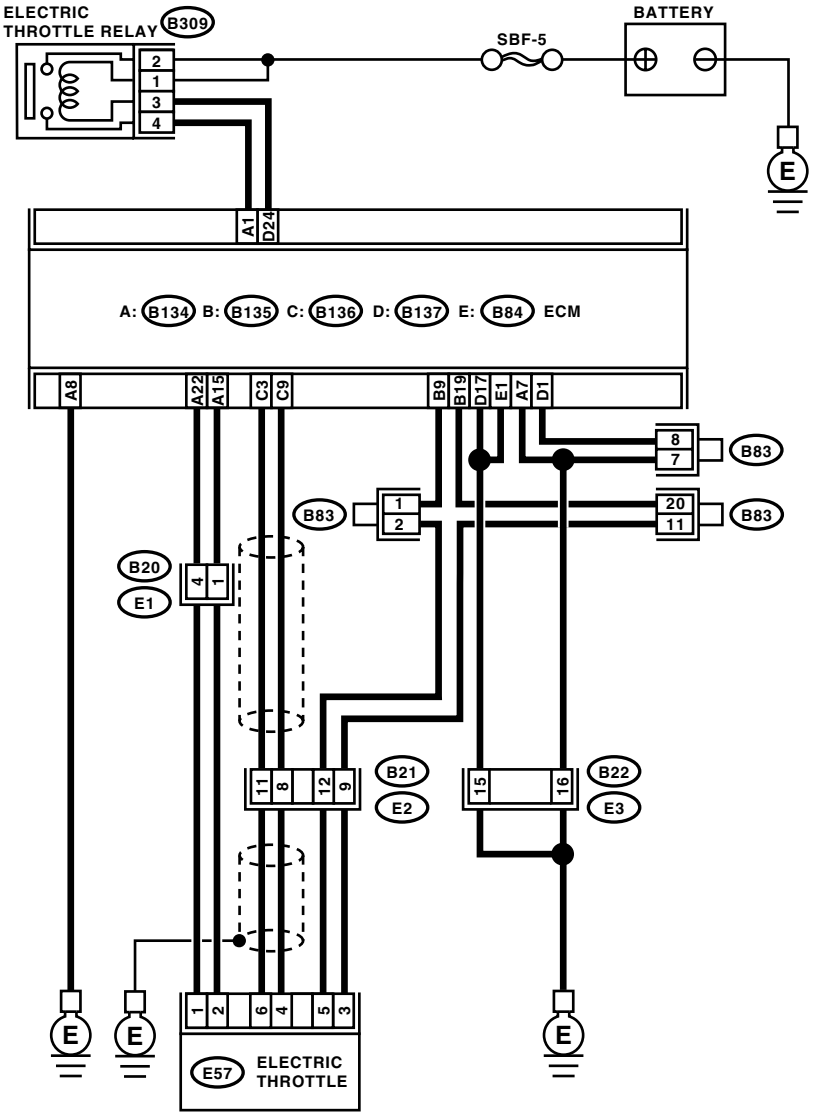
MEMO:

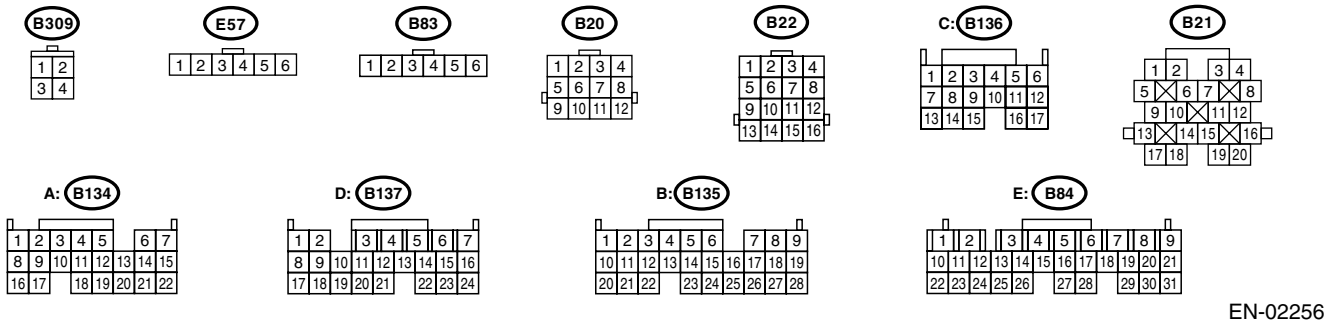
FE:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-314, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO U5)-58, OPERATION, Clear Memory Mode.>.

- **WIRING DIAGRAM:**





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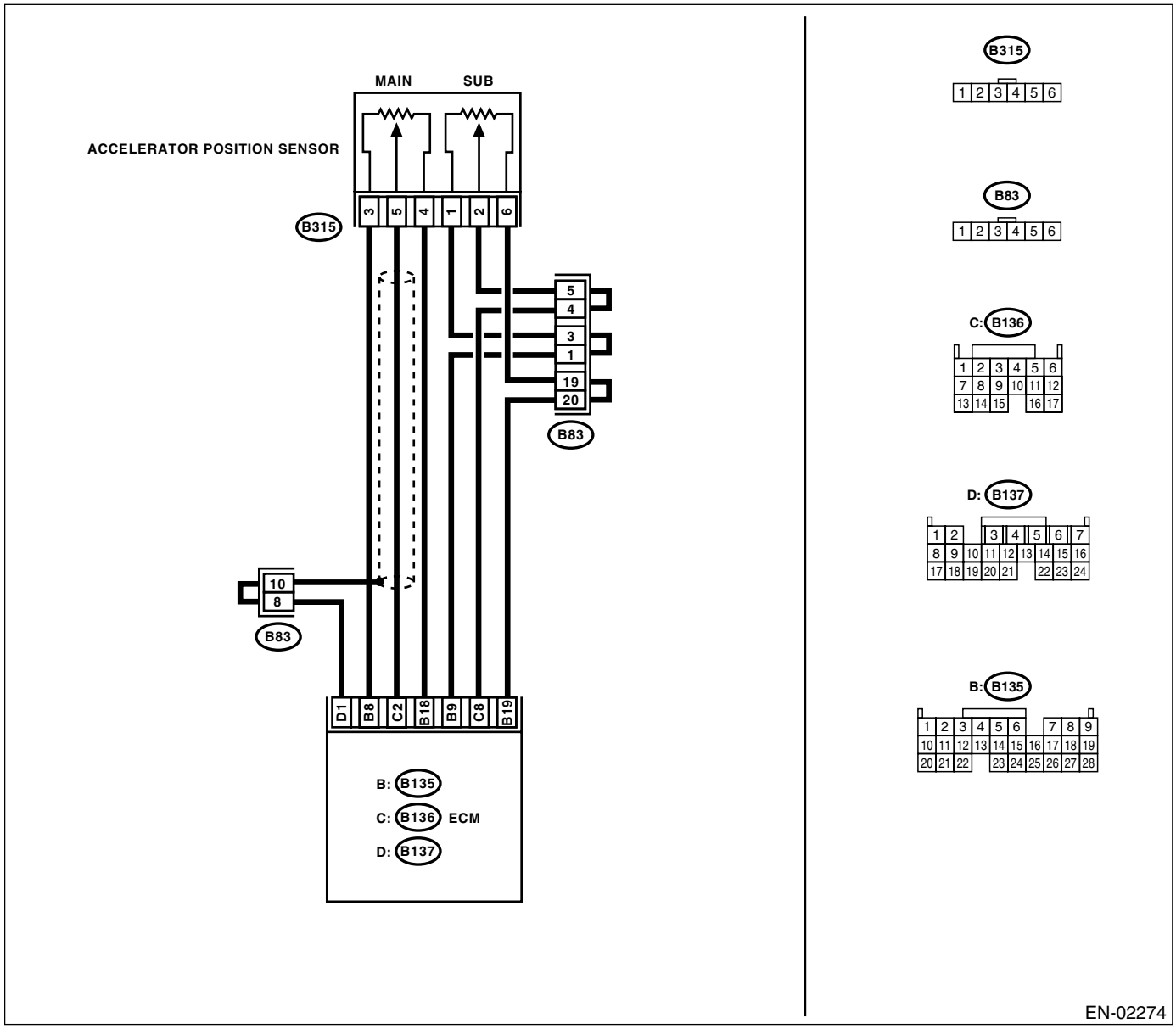
	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal, using Subaru Select Monitor.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **4.**
2	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** Read the data of sub throttle sensor signal, using Subaru Select Monitor.	Is the measured value more than 0.8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **14.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 3 — (E57) No. 6:*** ***(B136) No. 9 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair the open harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:*** ***(B136) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short of harness.
6	**CHECK POWER SUPPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the measured value within 4.5 to 5.5 V?	Go to step **7.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
7	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the measured value more than 10 Ω?	Go to step **8.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4SO U5)-49, Engine Control Module.>
8	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signals, using Subaru Select Monitors.	Is the measured value less than 4.63 V?	Go to step **9.**	Go to step **11.**
9	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** Read the data of sub throttle sensor signals, using Subaru Select Monitors.	Is the measured value less than 4.73 V?	Go to step **10.**	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 3 — (E57) No. 6:*** ***(B136) No. 9 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **12.**	Repair the open harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
13	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):***	Is the measured value less than 10 V?	Go to step **14.**	Repair the battery short of harness between ECM connector and electric throttle connector.
14	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the measured value less than 10 V?	Go to step **15.**	Repair the short of harness between ECM connector and electric throttle connector.
15	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the electric throttle connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 3 (+) — (B135) No. 9 (–):*** ***(B136) No. 9 (+) — (B135) No. 9 (–):***	Is the measured value more than 1 MΩ?	Go to step **16.**	Repair the short of power supply sensor.
16	**CHECK ELECTRIC THROTTLE HARNESS.** 1) Disconnect the connector from ECM. 2) Disconnect the connector from electric throttle. 3) Measure the resistance between electric throttle connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the measured value more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness.

MEMO:

FF: DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4SO U5)-316, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main and sub accelerator position sensor signals using Subaru Select Monitor.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **9.**
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor connector. ***Connector & terminal*** ***(B136) No. 2 — (B315) No. 5:*** ***(B135) No. 8 — (B315) No. 3:*** ***(B136) No. 8 — (B315) No. 2:*** ***(B135) No. 9 — (B315) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 — Chassis ground:*** ***(B135) No. 8 — Chassis ground:*** ***(B136) No. 8 — Chassis ground:*** ***(B135) No. 9 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** ***(B315) No. 1 (+) — Engine ground (–):***	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the measured value within 1.2 to 4.8 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the measured value within 0.75 to 3.15 kΩ?	Go to step **8.**	Replace the accelerator position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is released. ***Terminals*** ***No. 5 — No. 4:***	Is the measured value within 0.2 to 0.8 kΩ?	Go to step **9.**	Replace the accelerator position sensor.
9	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is released. ***Connector & terminal*** ***No. 2 — No. 6:***	Is the measured value within 0.15 to 0.63 kΩ?	Go to step **10.**	Replace the accelerator position sensor.
10	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is being depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the measured value within 0.5 to 2.5 kΩ?	Go to step **11.**	Replace the accelerator position sensor.
11	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is being depressed. ***Terminals*** ***No. 2 — No. 6: (Sub)***	Is the measured value within 0.28 to 1.68 kΩ?	Go to step **12.**	Replace the accelerator position sensor.
12	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main accelerator position sensor signals and sub accelerator position sensor signals, using Subaru Select Monitor.	Is the measured value less than 4.8 V?	Go to step **13.**	Go to step **14.**
13	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **18.**
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor connector. ***Connector & terminal*** ***(B135) No. 18 — (B315) No. 4:*** ***(B135) No. 19 — (B315) No. 6:***	Is the measured value less than 1 Ω?	Go to step **15.**	Repair the open harness connector.
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor and chassis ground. ***Connector & terminal*** ***(B315) No. 4 — Chassis ground:*** ***(B315) No. 6 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **16.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.

	Step	Check	Yes	No
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor and chassis ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Chassis ground (–):*** ***(B315) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 6 V?	Go to step **17.**	Repair the battery short of harness between ECM connector and accelerator position sensor.
17	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 2 (+) — (B135) No. 8:*** ***(B136) No. 2 (+) — (B135) No. 9:*** ***(B136) No. 8 (+) — (B135) No. 8:*** ***(B136) No. 8 (+) — (B135) No. 9:***	Is the measured value more than 1 MΩ?	Go to step **18.**	Repair the short to sensor power supply.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between terminals of accelerator position sensor connector. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the measured value more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness between accelerator position sensor connector and accelerator position sensor connector.

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-91, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Manifold absolute pressure sensor 2) Intake air temperature sensor 3) Air flow and ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4)
2. Rough idling	1) Manifold absolute pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Air flow and ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Electronic control throttle 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay 12) EGR valve
3. Engine does not return to idle.	1) Engine coolant temperature sensor 2) Throttle position sensor 3) Manifold absolute pressure sensor 4) Air flow and intake air temperature sensor 5) EGR valve
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Air flow and intake air temperature sensor 3) Electronic control throttle 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) EGR valve 13) Tumble generator valve
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Electronic control throttle 9) Fuel pump and fuel pump relay 10) EGR valve 11) Tumble generator valve

Symptom	Problem parts
6. Surge	1) Air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Electronic control throttle 8) Fuel pump and fuel pump relay 9) EGR valve 10) Tumble generator valve
7. Spark knock	1) Intake manifold pressure sensor 2) Air flow and intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay 8) EGR valve 9) Tumble generator valve
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Air flow and intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.

2. AUTOMATIC TRANSMISSION

NOTE:
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(H4SO)-2, Basic Diagnostic Procedure.>

MEMO:

GENERAL DESCRIPTION

GD(H4SO U5)

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2. Diagnostic Trouble Code (DTC) Detecting Criteria 12

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-12, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-14, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-16, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-18, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0043	HO2S Heater Control Circuit Low (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-22, DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0044	HO2S Heater Control Circuit High (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-24, DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-26, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-26, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-26, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-26, DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-26, DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to GD(H4SO U5)-28, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4SO U5)-30, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4SO U5)-34, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4SO U5)-36, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4SO U5)-38, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4SO U5)-40, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4SO U5)-42, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4SO U5)-44, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4SO U5)-46, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4SO U5)-48, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4SO U5)-50, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H4SO U5)-52, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H4SO U5)-54, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4SO U5)-56, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4SO U5)-58, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4SO U5)-60, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-62, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-64, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-66, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-70, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-72, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-74, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-76, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0143	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-82, DTC P0143 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0144	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-84, DTC P0144 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0151	O_2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0151 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0152	O_2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0152 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0153	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0154	O_2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0157	O_2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-86, DTC P0157 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0158	O_2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-86, DTC P0158 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0159	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-86, DTC P0159 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(H4SO U5)-88, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(H4SO U5)-92, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System too Lean (Bank 2)	<Ref. to GD(H4SO U5)-95, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System too Rich (Bank 2)	<Ref. to GD(H4SO U5)-95, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO U5)-96, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H4SO U5)-100, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H4SO U5)-102, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to GD(H4SO U5)-104, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to GD(H4SO U5)-106, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 misfire detected	<Ref. to GD(H4SO U5)-113, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(H4SO U5)-113, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(H4SO U5)-113, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-114, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-116, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4SO U5)-118, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO U5)-120, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-122, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-124, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H4SO U5)-126, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4SO U5)-130, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4SO U5)-156, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4SO U5)-158, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4SO U5)-160, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4SO U5)-162, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4SO U5)-164, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to GD(H4SO U5)-166, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to GD(H4SO U5)-166, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4SO U5)-168, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4SO U5)-170, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4SO U5)-172, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4SO U5)-174, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4SO U5)-176, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4SO U5)-178, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4SO U5)-181, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4SO U5)-182, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to GD(H4SO U5)-184, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4SO U5)-186, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4SO U5)-188, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4SO U5)-190, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4SO U5)-191, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0565	Cruise Control On Signal	<Ref. to GD(H4SO U5)-192, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4SO U5)-193, DTC P0600 — CAN COMMUNICATION CIRCUIT—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4SO U5)-194, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4SO U5)-196, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4SO U5)-198, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4SO U5)-202, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4SO U5)-206, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4SO U5)-207, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to GD(H4SO U5)-208, DTC P0703 — TORQUE CONVERTER/ BRAKE SWITCH “B” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to GD(H4SO U5)-209, DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to GD(H4SO U5)-210, DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to GD(H4SO U5)-211, DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0720	Output Speed Sensor Circuit	<Ref. to GD(H4SO U5)-212, DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to GD(H4SO U5)-213, DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0731	Gear 1 Incorrect Ratio	<Ref. to GD(H4SO U5)-214, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0732	Gear 2 Incorrect Ratio	<Ref. to GD(H4SO U5)-215, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0733	Gear 3 Incorrect Ratio	<Ref. to GD(H4SO U5)-216, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0734	Gear 4 Incorrect Ratio	<Ref. to GD(H4SO U5)-217, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0741	Torque Converter Clutch Circuit Performance or Stuck	<Ref. to GD(H4SO U5)-218, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to GD(H4SO U5)-219, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to GD(H4SO U5)-220, DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0753	Shift Solenoid “A” Electrical	<Ref. to GD(H4SO U5)-221, DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0758	Shift Solenoid “B” Electrical	<Ref. to GD(H4SO U5)-222, DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0771	Shift Solenoid “E” Performance or Stuck Off	<Ref. to GD(H4SO U5)-223, DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to GD(H4SO U5)-224, DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0785	Shift/Timing Solenoid	<Ref. to GD(H4SO U5)-225, DTC P0785 — SHIFT/TIMING SOLENOID —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(H4SO U5)-226, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(H4SO U5)-228, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO U5)-229, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0864	TCM Communication Circuit Range/ Performance	<Ref. to GD(H4SO U5)-230, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0865	TCM Communication Circuit Low	<Ref. to GD(H4SO U5)-231, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0866	TCM Communication Circuit High	<Ref. to GD(H4SO U5)-232, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to GD(H4SO U5)-234, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to GD(H4SO U5)-236, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to GD(H4SO U5)-238, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to GD(H4SO U5)-239, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to GD(H4SO U5)-242, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to GD(H4SO U5)-244, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-246, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-247, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-248, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-252, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1154	O_2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-255, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1155	O_2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-255, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4SO U5)-256, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4SO U5)-258, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4SO U5)-260, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4SO U5)-262, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4SO U5)-264, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4SO U5)-266, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(H4SO U5)-268, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-272, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-274, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-276, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-278, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-280, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-282, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-284, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-286, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4SO U5)-288, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4SO U5)-289, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1700	Throttle Position Sensor Circuit Malfunction for AT	<Ref. to GD(H4SO U5)-290, DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4SO U5)-292, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4SO U5)-294, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —.>
P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	<Ref. to GD(H4SO U5)-296, DTC P2098 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	<Ref. to GD(H4SO U5)-296, DTC P2099 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4SO U5)-298, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4SO U5)-300, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4SO U5)-302, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to GD(H4SO U5)-304, DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to GD(H4SO U5)-306, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to GD(H4SO U5)-308, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to GD(H4SO U5)-310, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to GD(H4SO U5)-312, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to GD(H4SO U5)-314, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to GD(H4SO U5)-316, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

MEMO:

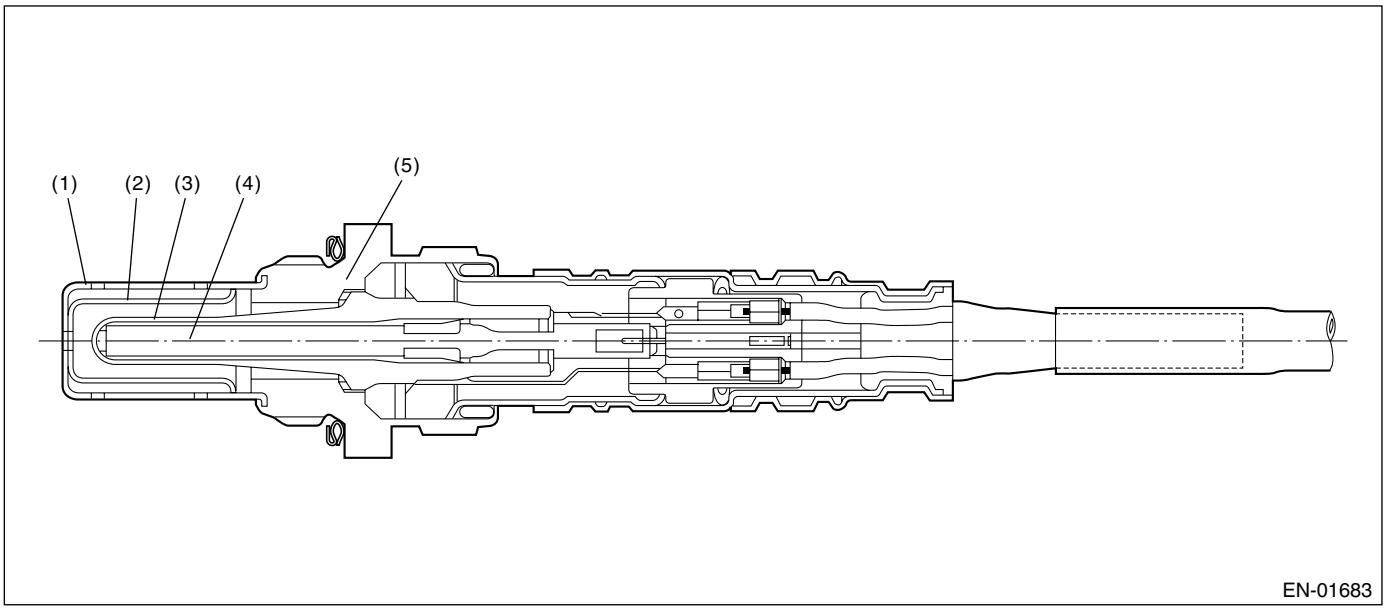
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



(1) Element cover (Outer)
(2) Element cover (Inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time which all the following conditions were filled.	50 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 50 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (20 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (20 seconds).
Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning correction: Do not calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

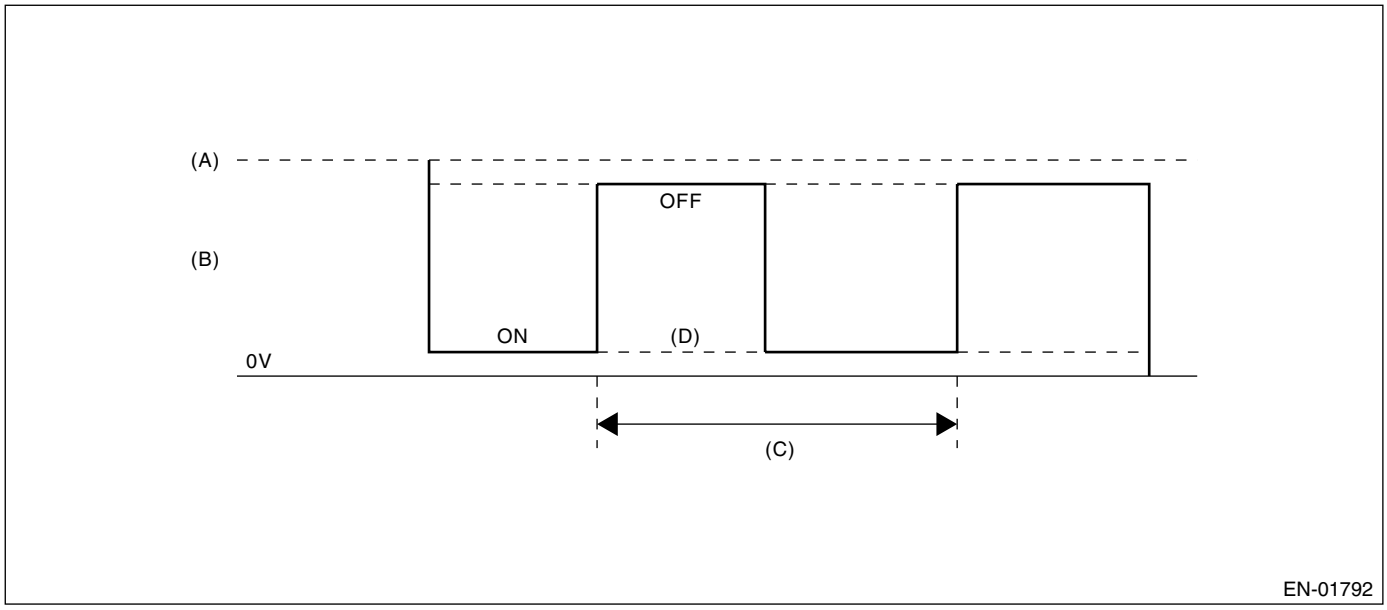
Memorize the freeze frame data. (For test mode $02)

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) Low abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

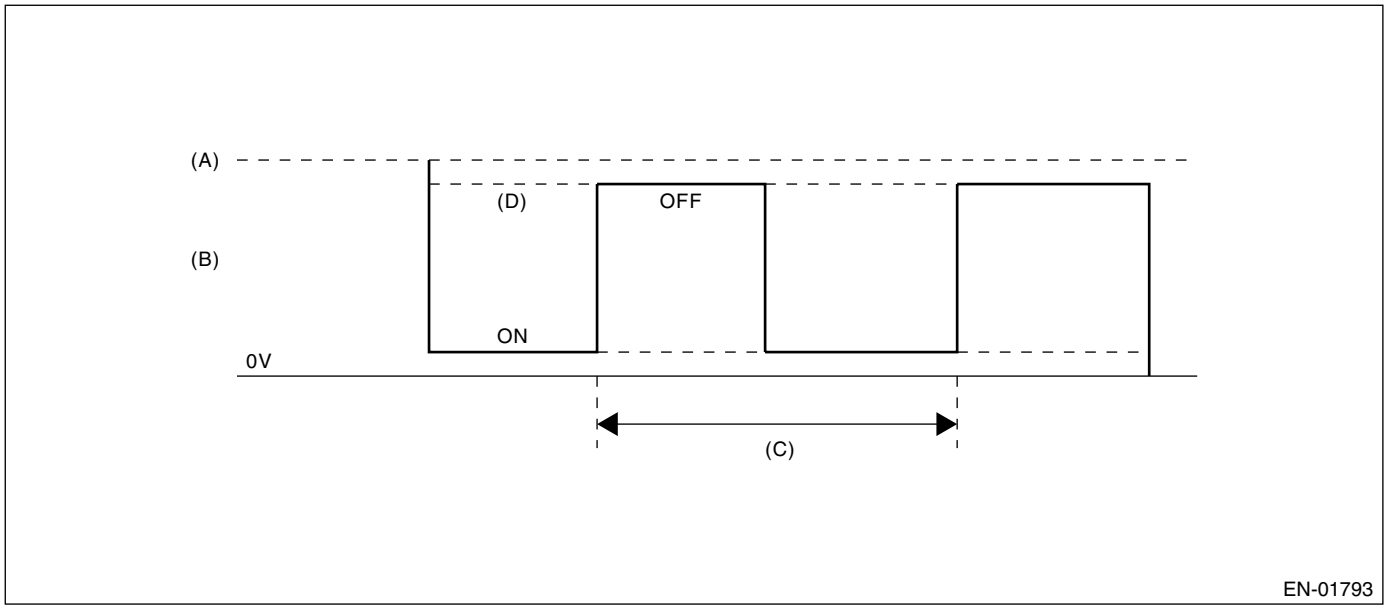
Memorize the freeze frame data. (For test mode $02)

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	High ≥ 12.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

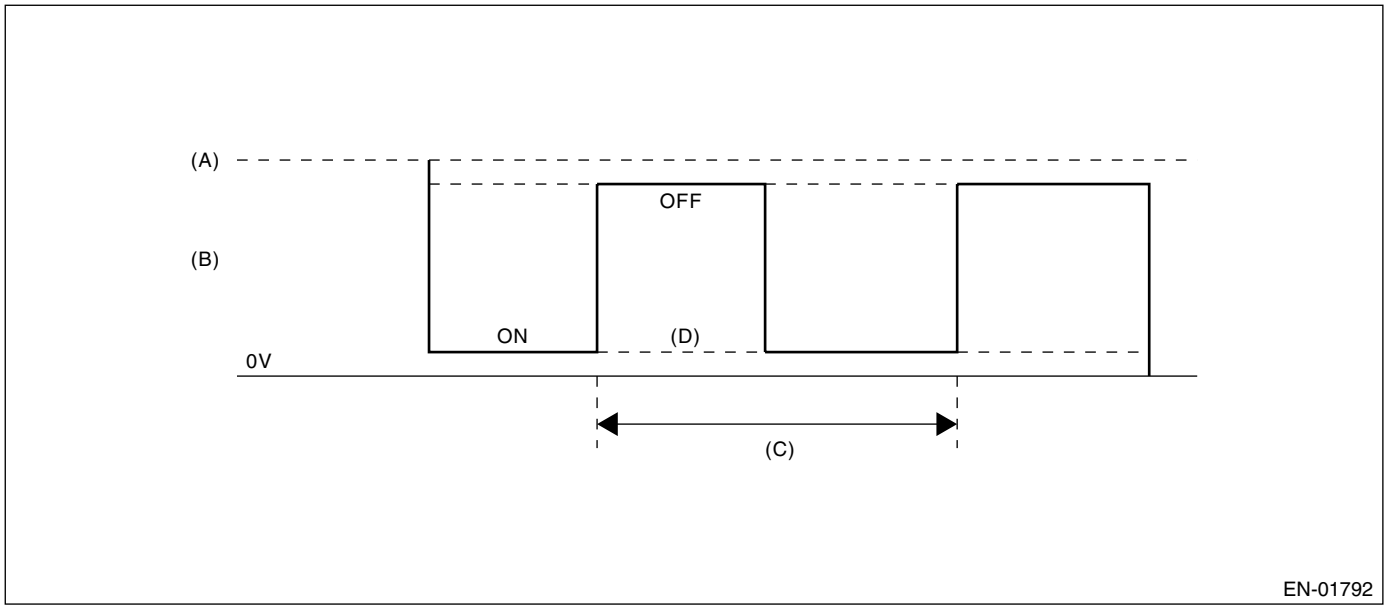
Memorize the freeze frame data. (For test mode $02)

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen sensor heater.
Oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 millisecond (10 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

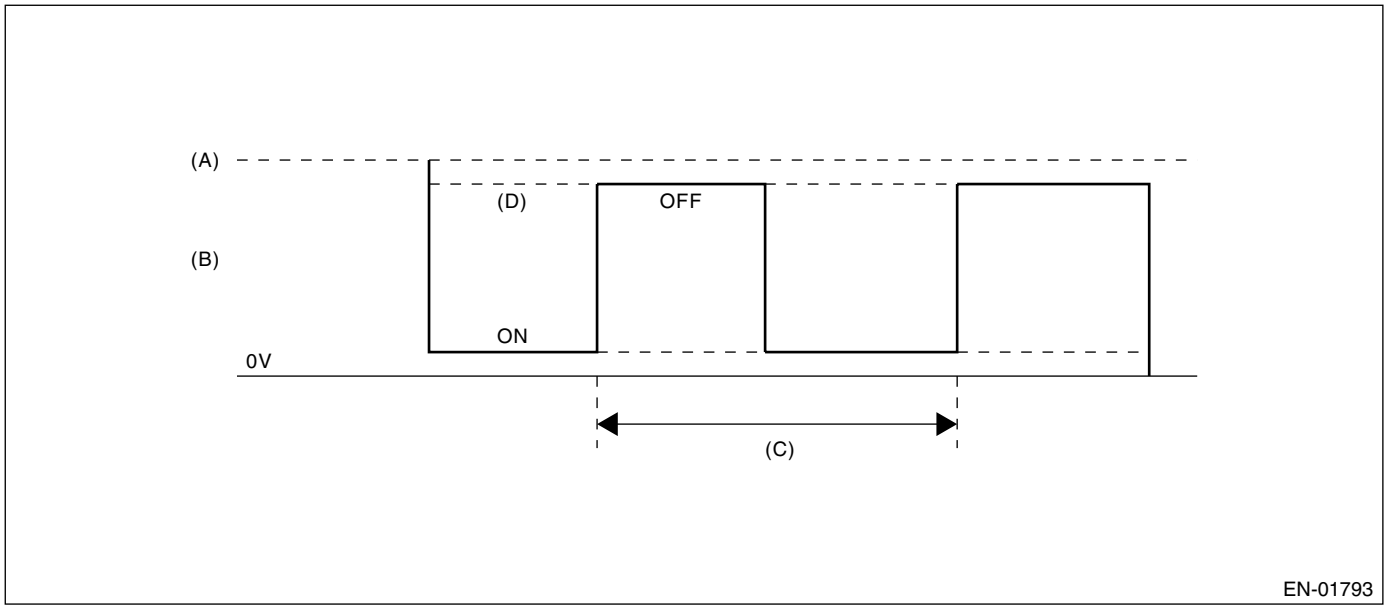
Memorize the freeze frame data. (For test mode $02)

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen heater.
Oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 milliseconds (10 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Oxygen sensor heater control duty	≥ 20%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

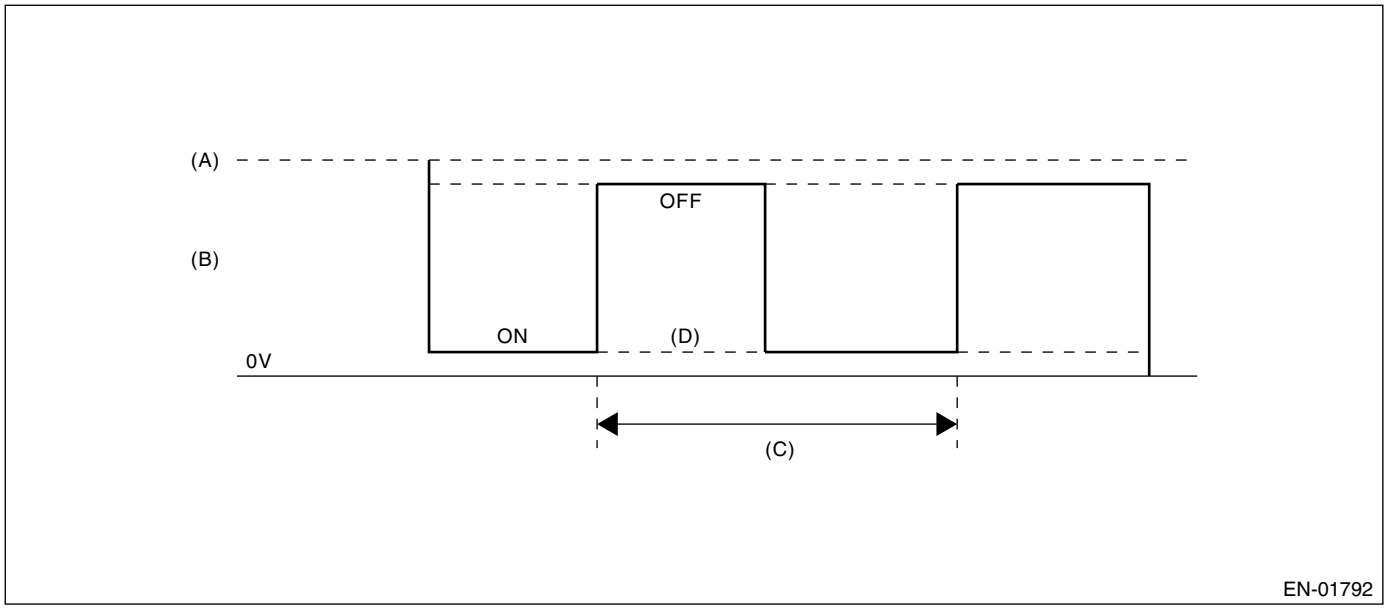
Memorize the freeze frame data. (For test mode $02)

F: DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen sensor heater.
Oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Ignition switch	ON
Engine speed	≤ 4500 rpm
Heater output duty ratio	19.9 ←→79.6 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 5 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Maximum heater output	< 10.12 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Maximum heater voltage	≥ 10.12 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

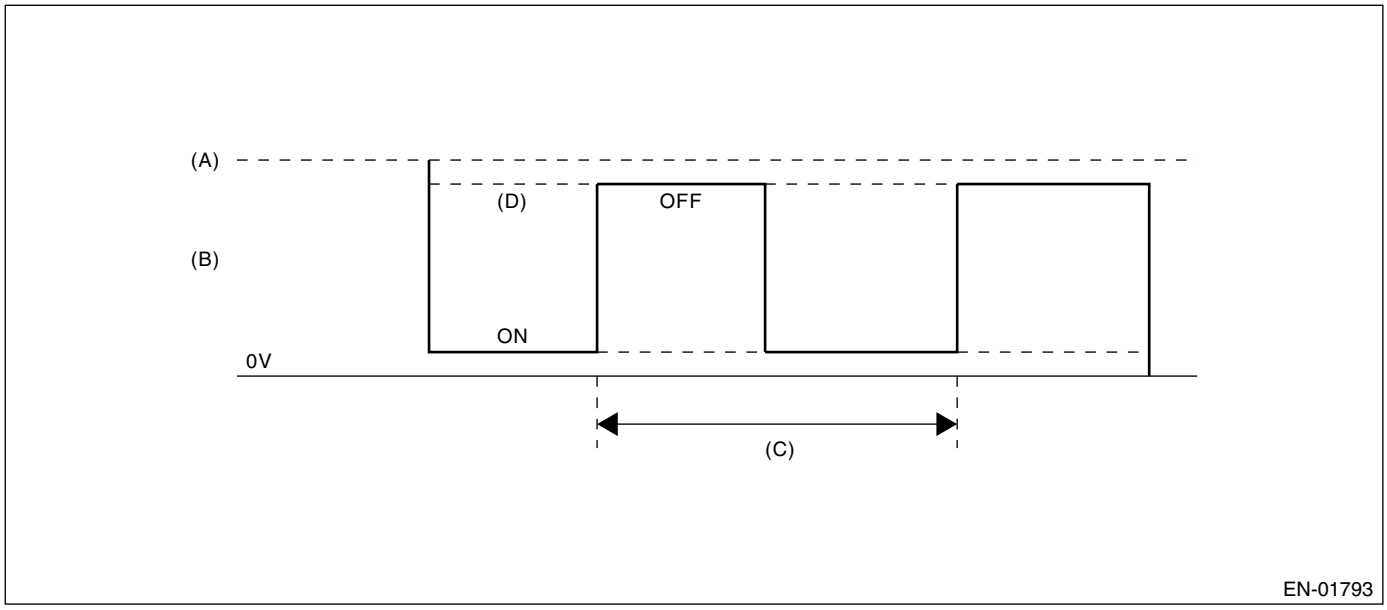
Memorize the freeze frame data. (For test mode $02)

G: DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen heater.
Oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Ignition switch	ON
Engine speed	≤ 4500 rpm
Heater output duty ratio	19.9 ←→79.6 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Mimimum heater voltage	> 1.92 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Minimum heater voltage	≤ 1.92 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

H: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0030. <Ref. to GD(H4SO U5)-12, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

I: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0031. <Ref. to GD(H4SO U5)-14, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

J: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0032. <Ref. to GD(H4SO U5)-16, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

K: DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) —

NOTE:
For the detection standard, refer to P0037. <Ref. to GD(H4SO U5)-18, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

L: DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —

NOTE:
For the detection standard, refer to P0038. <Ref. to GD(H4SO U5)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

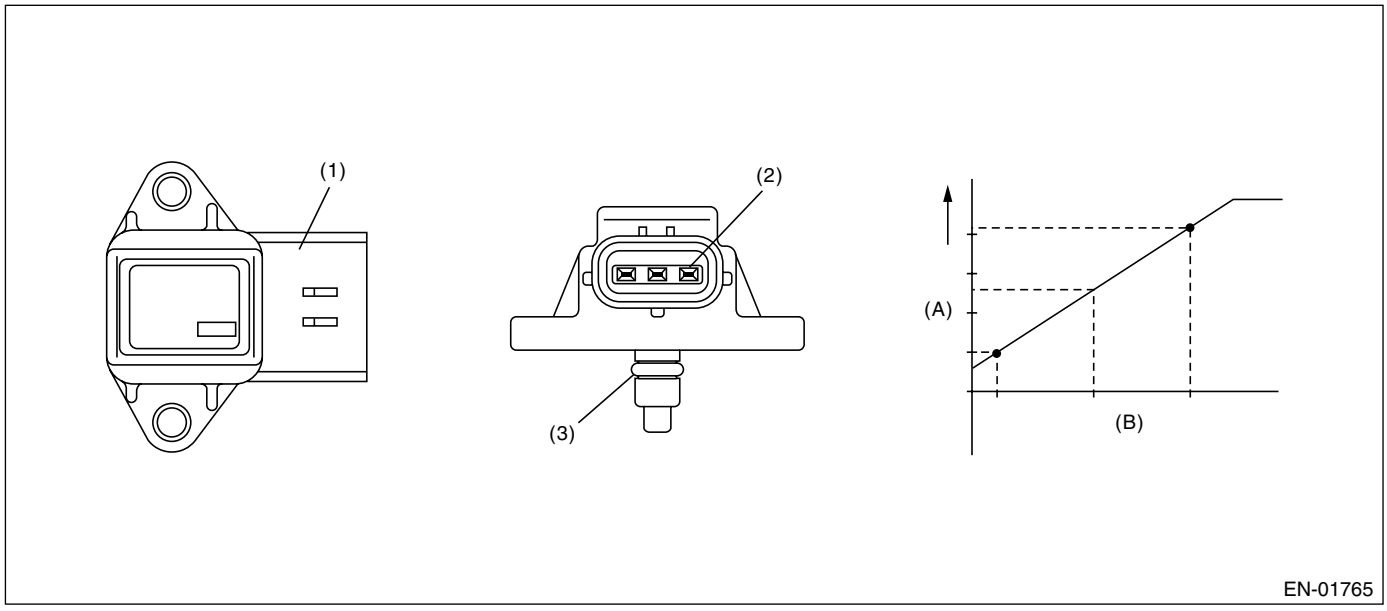
MEMO:

M: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than the predetermined time.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2600 rpm
Throttle position	≥ 13°
Intake air amount per engine 0.5 rev.	≥ 0.8 g (0.028 oz)/rev
Output voltage	< 1.3 V
High side	
Engine speed	< 600 ←→ 900 rpm
Throttle position	< 2.44°
Intake air amount per engine 0.5 rev.	< 0.5 g (0.018 oz)/rev
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: Low side 3 seconds, high side 7 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2600 rpm
Throttle position	≥ 13°
Intake air amount per engine 0.5 rev.	≥ 8 g (0.28 oz)/rev
Output voltage	≥ 1.3 V
High side	
Engine speed	< 600 ←→ 900 rpm
Throttle position	< 2.44°
Intake air amount per engine 0.5 rev.	< 0.5 g (0.018 oz)/rev
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Perform fuel cut when intake manifold pressure sensor is NG. (When fuel injection is large.)

9. ECM OPERATING AT DTC SETTING

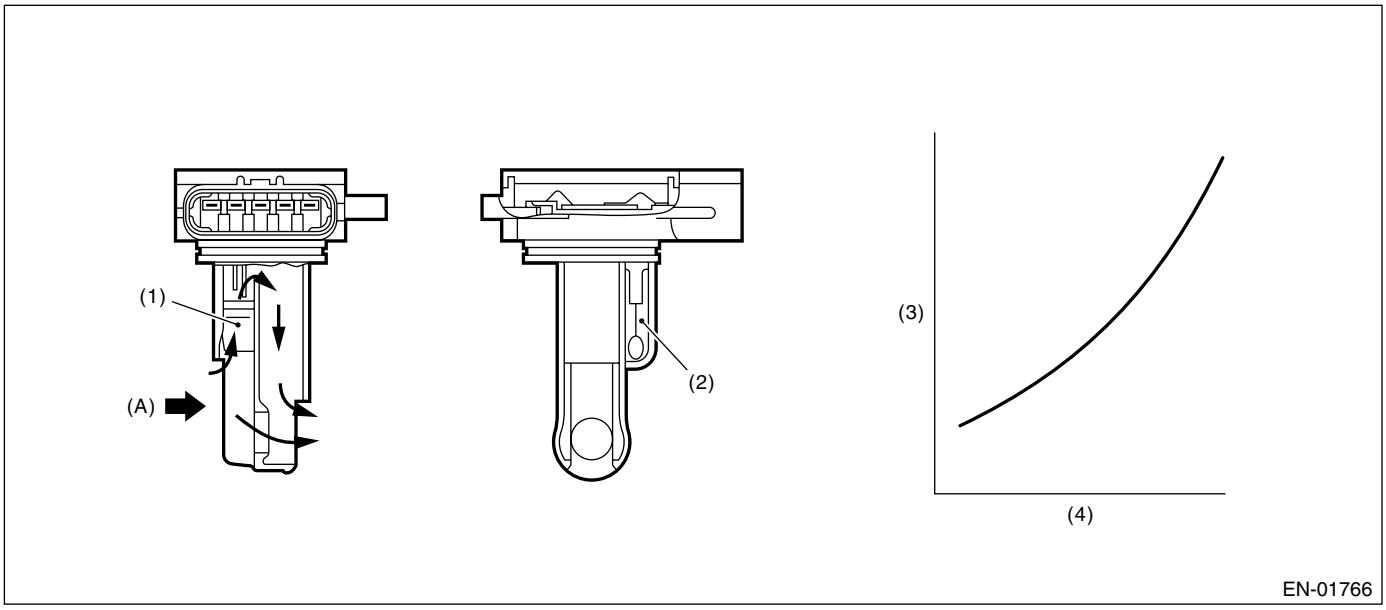
Memorize the freeze frame data. (For test mode $02)

N: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.2 V
Engine speed	≥ 2000 rpm
Throttle angle	≥ 13°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	≥ 2.66 V
Engine speed	600 ←→ 900 rpm
Throttle angle	< 2.44°
Intake manifold pressure	< 40.0 kPa (360 mmHg, 11.8 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.2 V
Engine speed	≥ 2000 rpm
Throttle angle	≥ 13°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 2.66 V
Engine speed	600 ←→ 900 rpm
Throttle angle	< 2.44°
Intake manifold pressure	< 40.0 kPa (300 mmHg, 11.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – At normal: learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing
  – At trouble: learned ignition timing value = –3°CA (retard 3°CA)
  knock F/B timing value = 0°CA
  – Whole learning is not allowed.
  – Partial learning is not allowed.
• ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

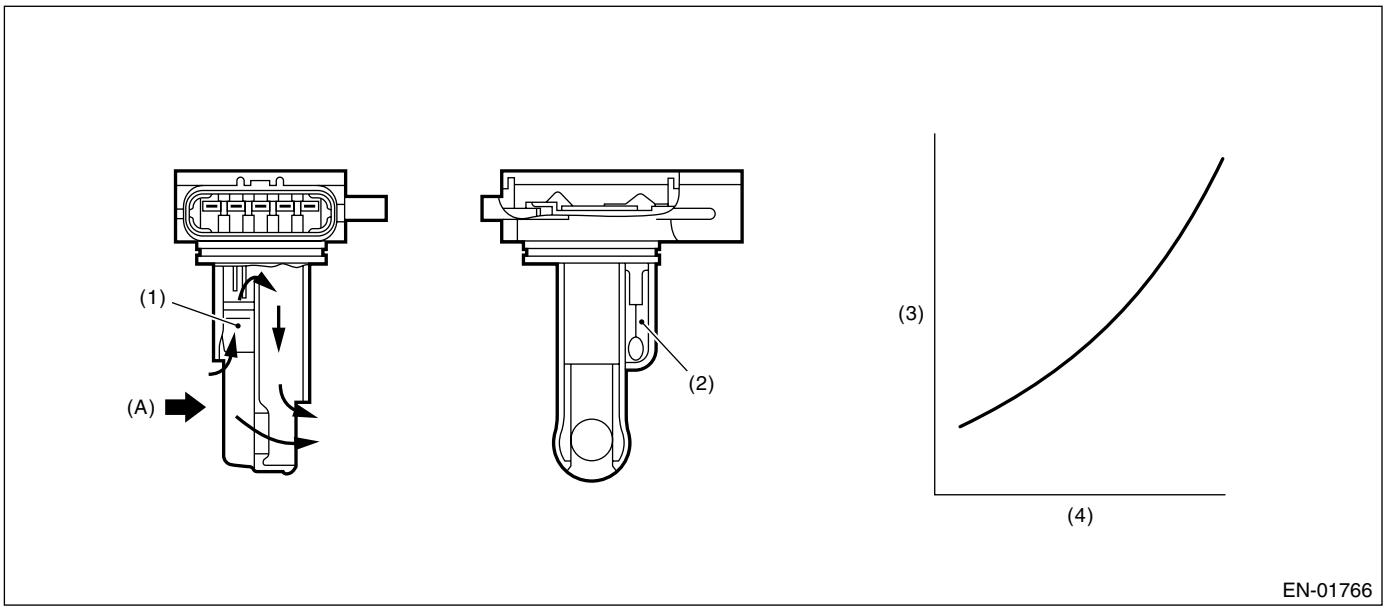
MEMO:

O: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.25 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – At normal: learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value
  – At trouble: learned ignition timing value = –3°CA (retard 3°CA)
  knock F/B timing value = 0°CA
  – Whole learning is not allowed.
  – Partial learning is not allowed.
• ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)

9. ECM OPERATING AT DTC SETTING

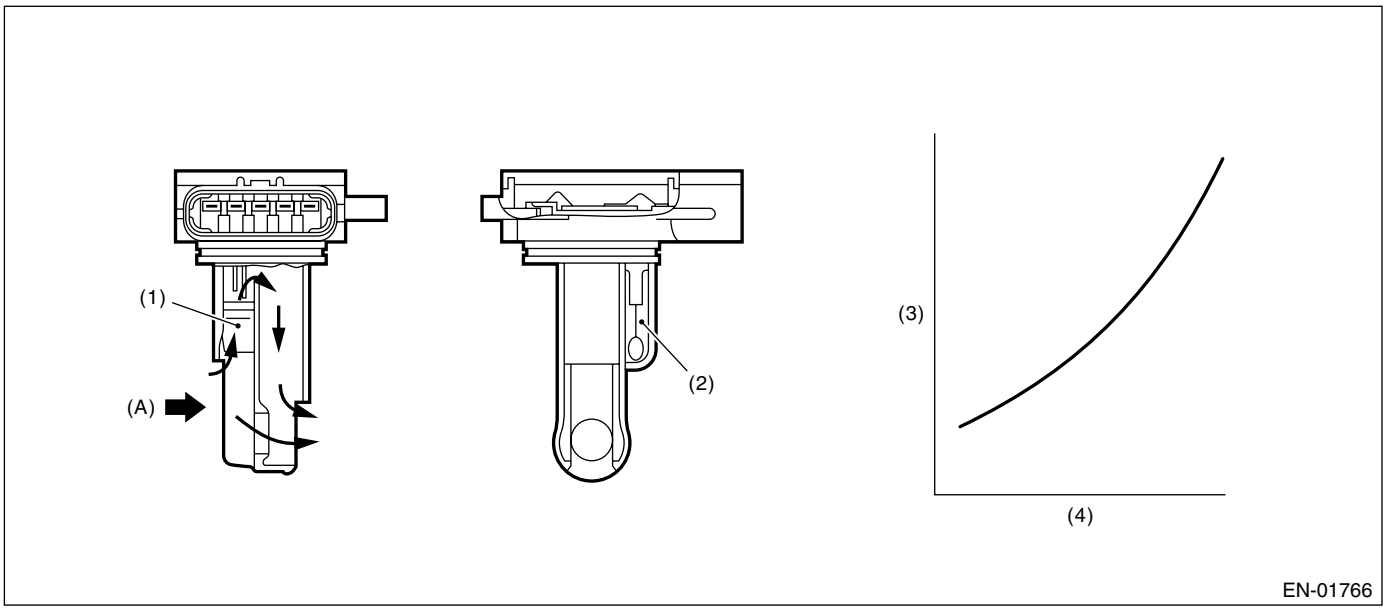
Memorize the freeze frame data. (For test mode $02)

P: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – At normal: learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value
  – At trouble: learned ignition timing value = –3°CA (retard 3°CA)
  knock F/B timing value = 0°CA
  – Whole learning is not allowed.
  – Partial learning is not allowed.
• ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)

9. ECM OPERATING AT DTC SETTING

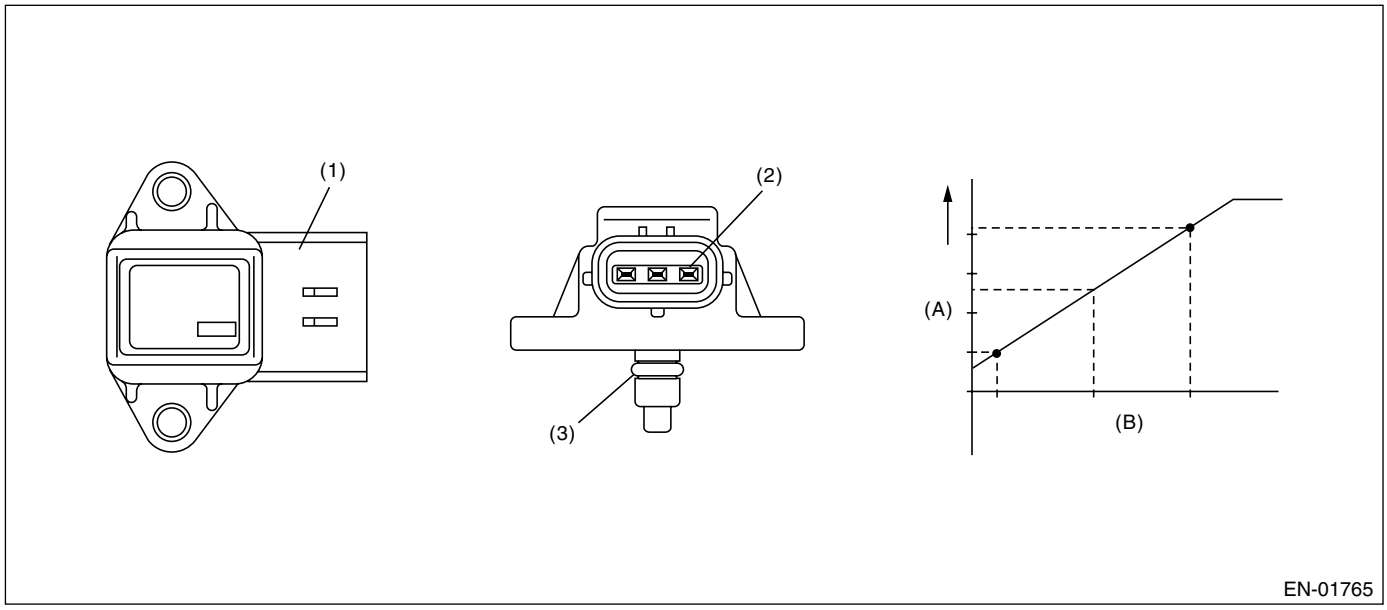
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Perform fuel cut when intake manifold sensor is NG. (When amount of fuel injection is large)

9. ECM OPERATING AT DTC SETTING

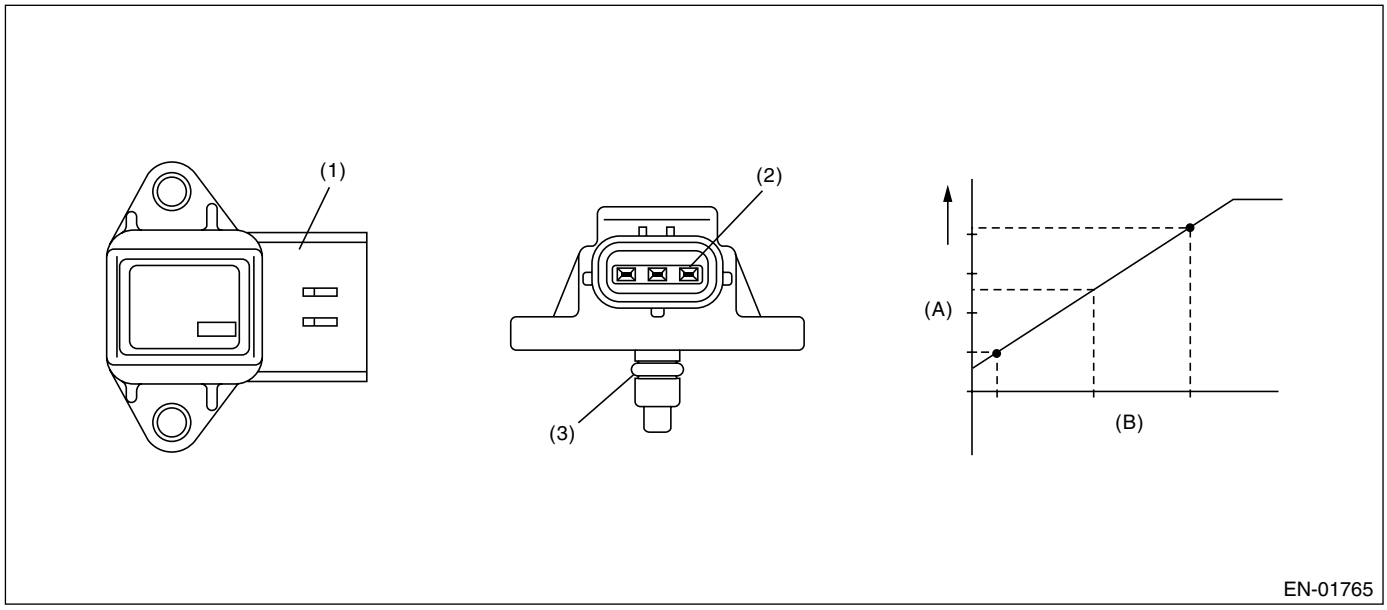
Memorize the freeze frame data. (For test mode $02)

R: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Perform fuel cut when intake manifold sensor is NG. (When amount of fuel injection is large)

9. ECM OPERATING AT DTC SETTING

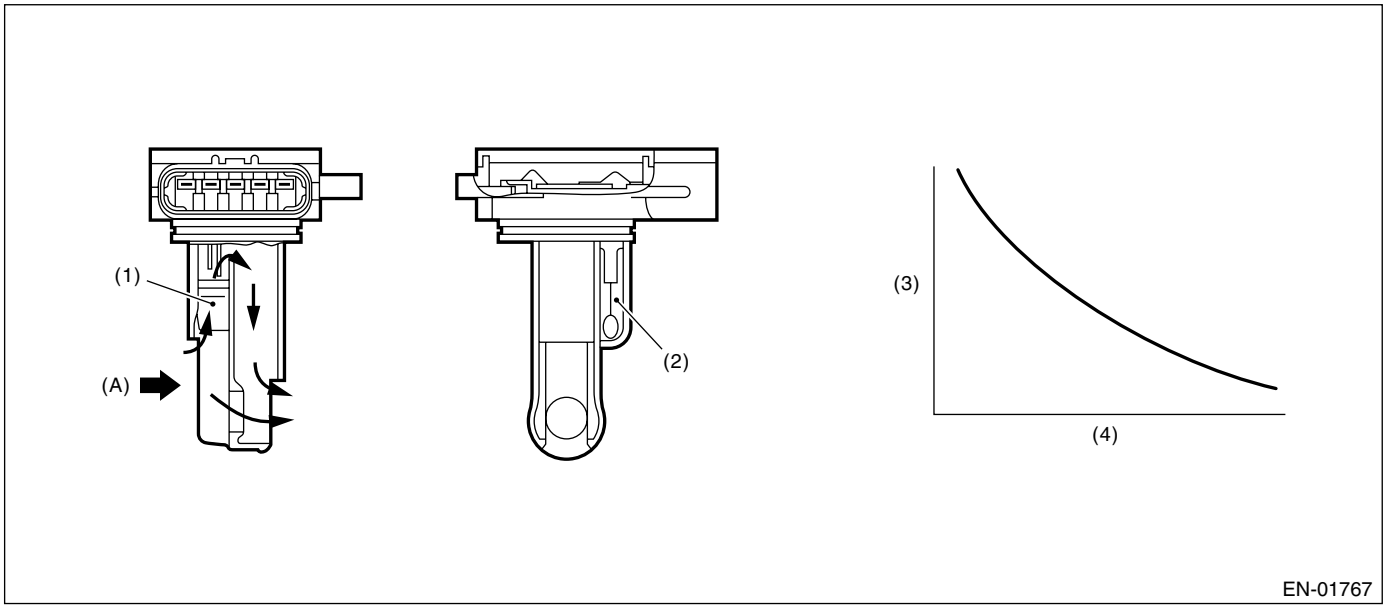
Memorize the freeze frame data. (For test mode $02)

S: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Coolant temperature	> 95°C (203°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 60 km/h (37 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (0.9°F) around 25°.)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

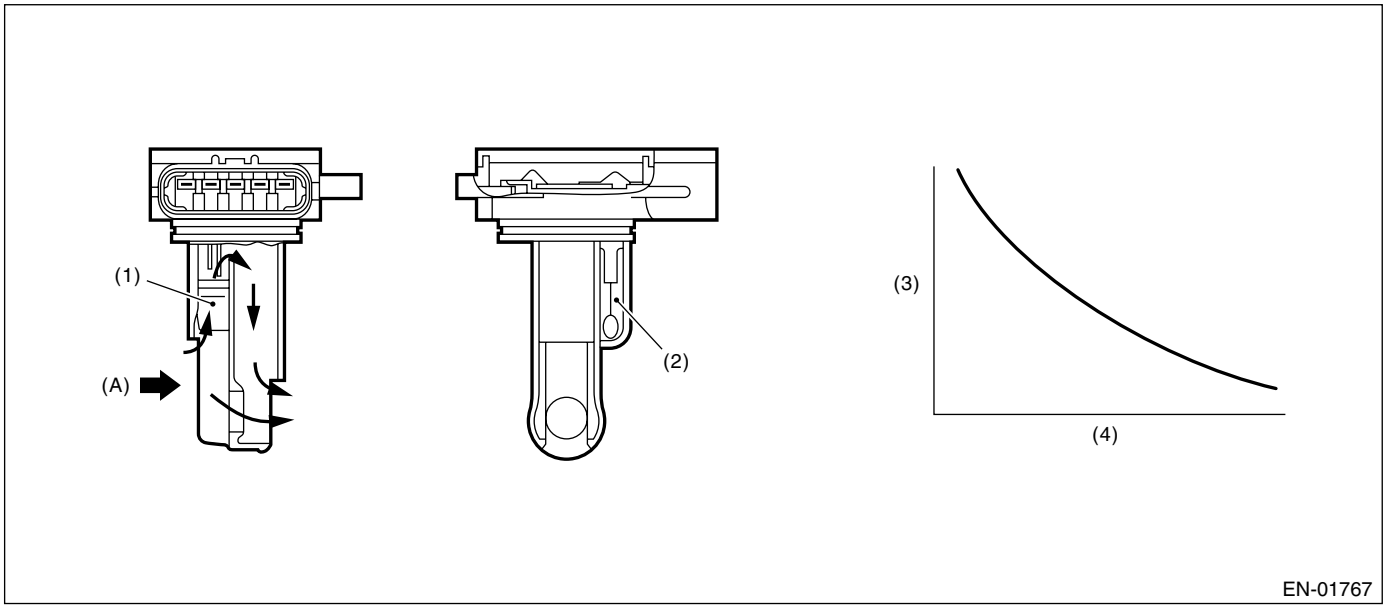
Memorize the freeze frame data. (For test mode $02)

T: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

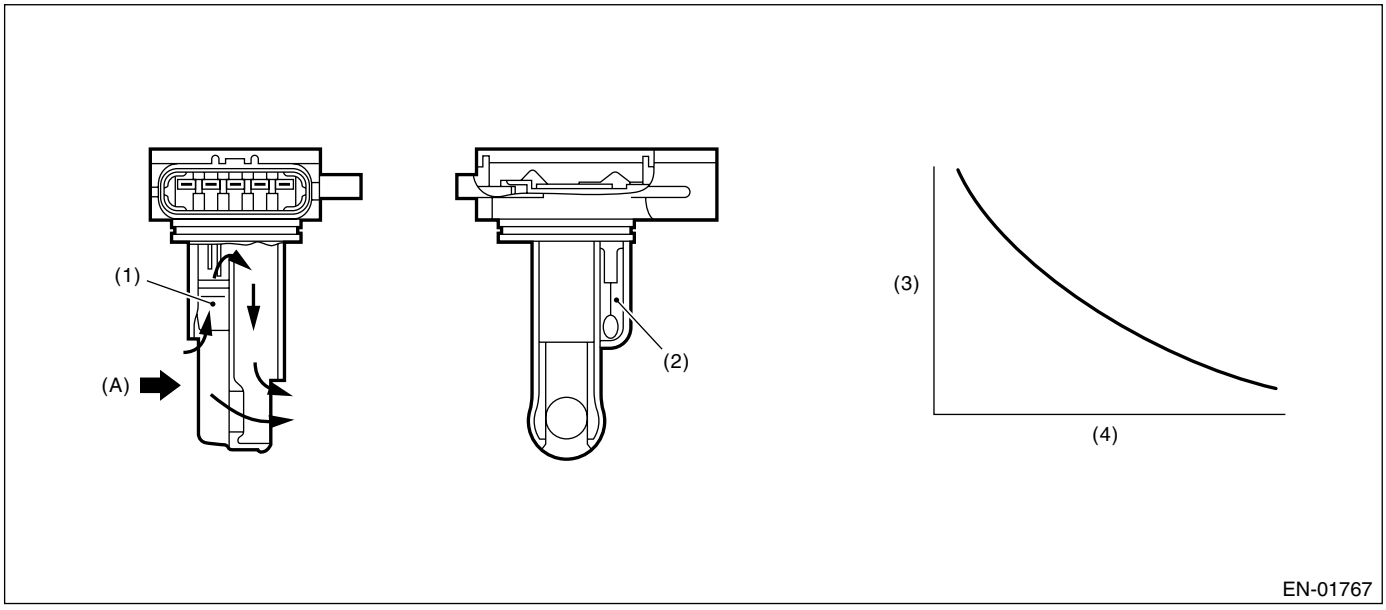
Memorize the freeze frame data. (For test mode $02)

U: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

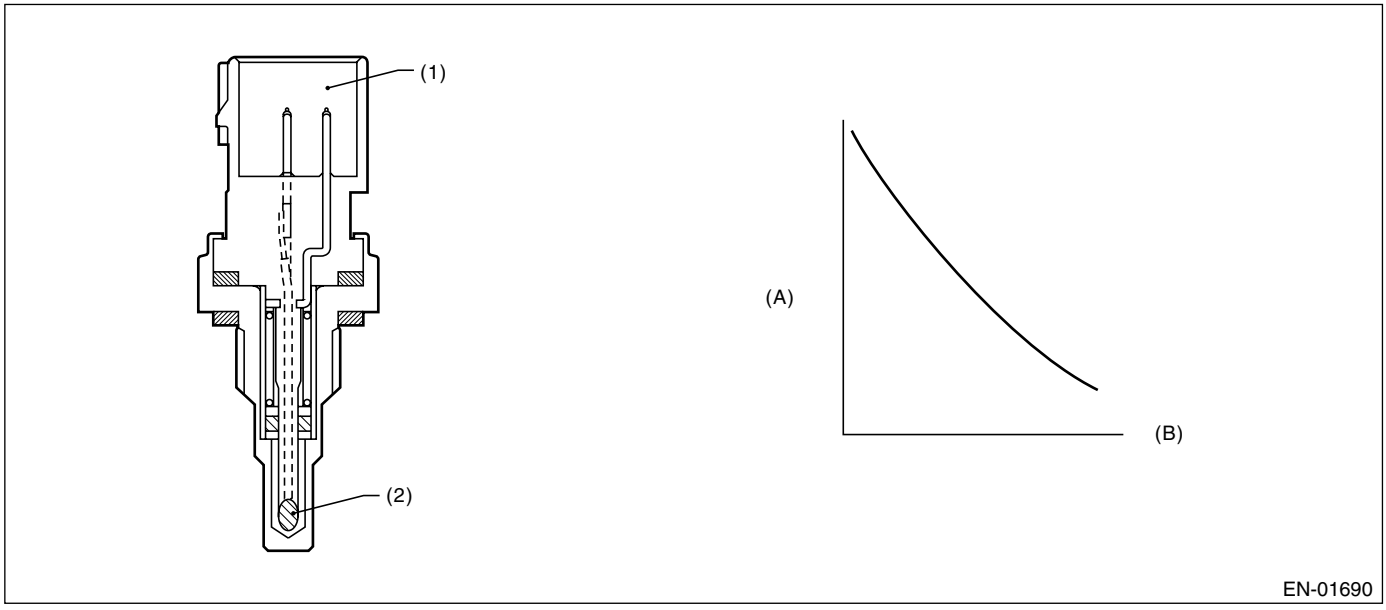
Memorize the freeze frame data. (For test mode $02)

V: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

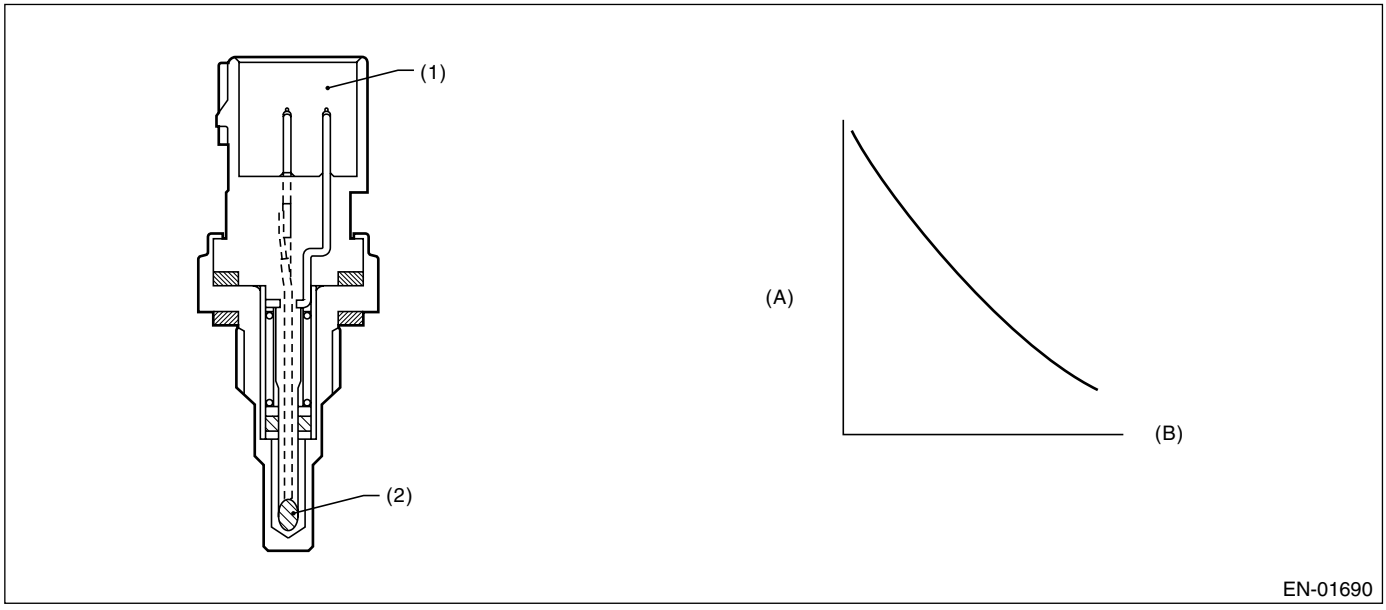
Memorize the freeze frame data. (For test mode $02)

W: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

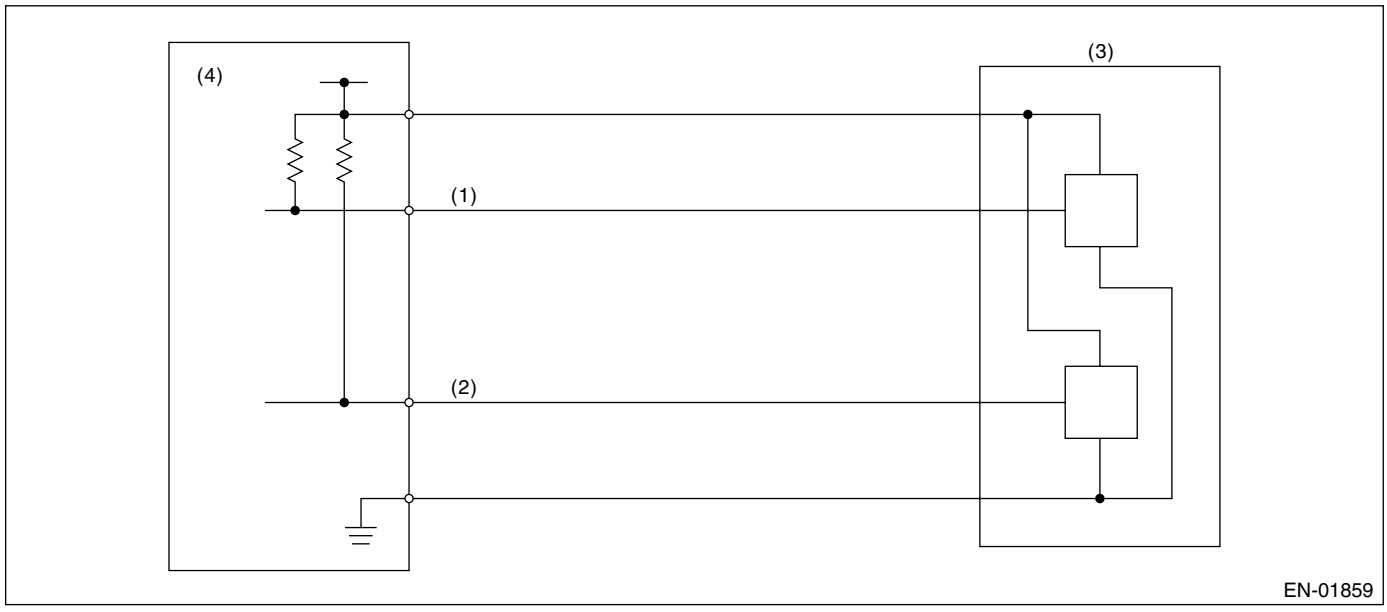
Memorize the freeze frame data. (For test mode $02)

X: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.309 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

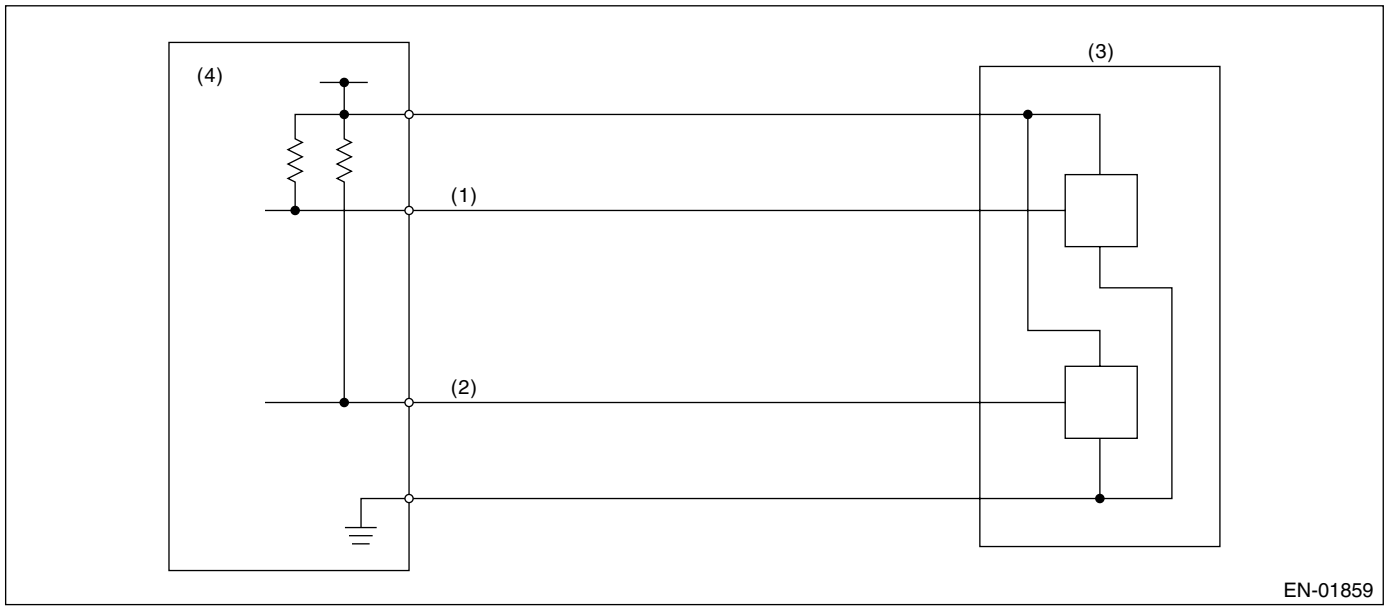
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

Y: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.646 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

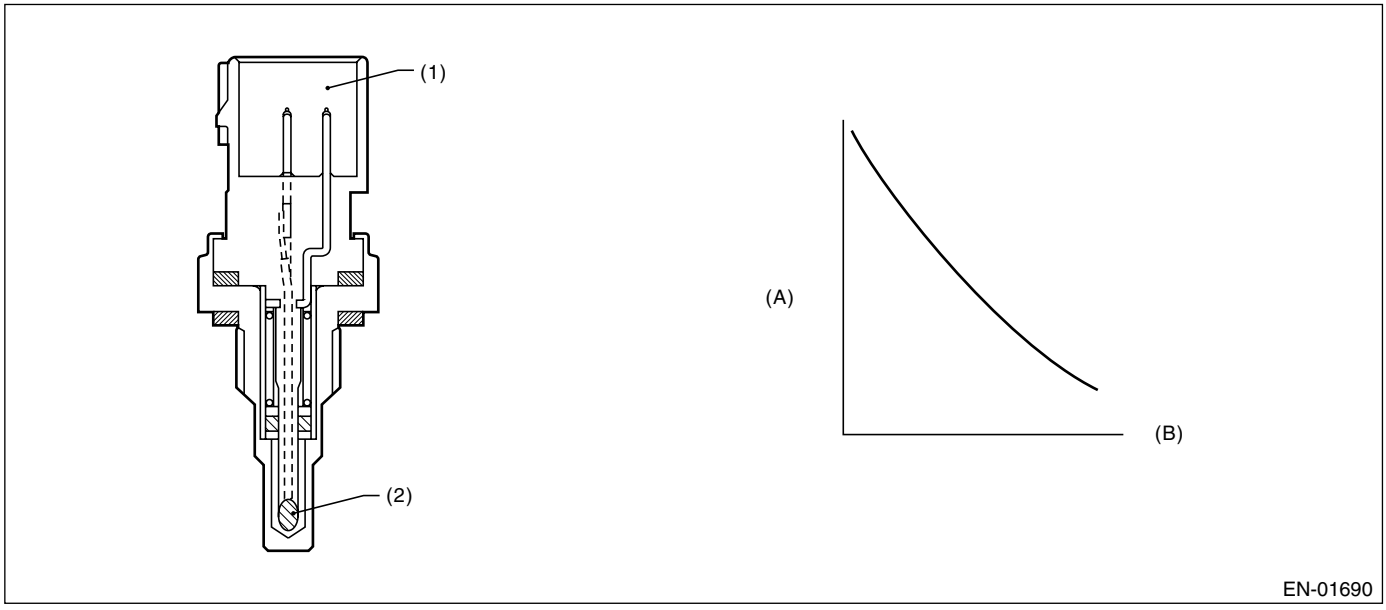
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

Z: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting
a) Timer stop at fuel cut mode.
b) During the driving conditions except a) above, timer count up by
64 milliseconds + TWCNT milliseconds at every 64 milliseconds.
Where,TWCNT is determined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
–20 (–4)	0 ms	37.16 ms	74.272 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
–10 (14)	0 ms	27.39 ms	54.782 ms	82.173 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.646 ms	35.292 ms	52.938 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45.63 ms	67.556 ms	80.711 ms	93.867 ms

Judgment value of timer after engine starting
$t = 455 - 27 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

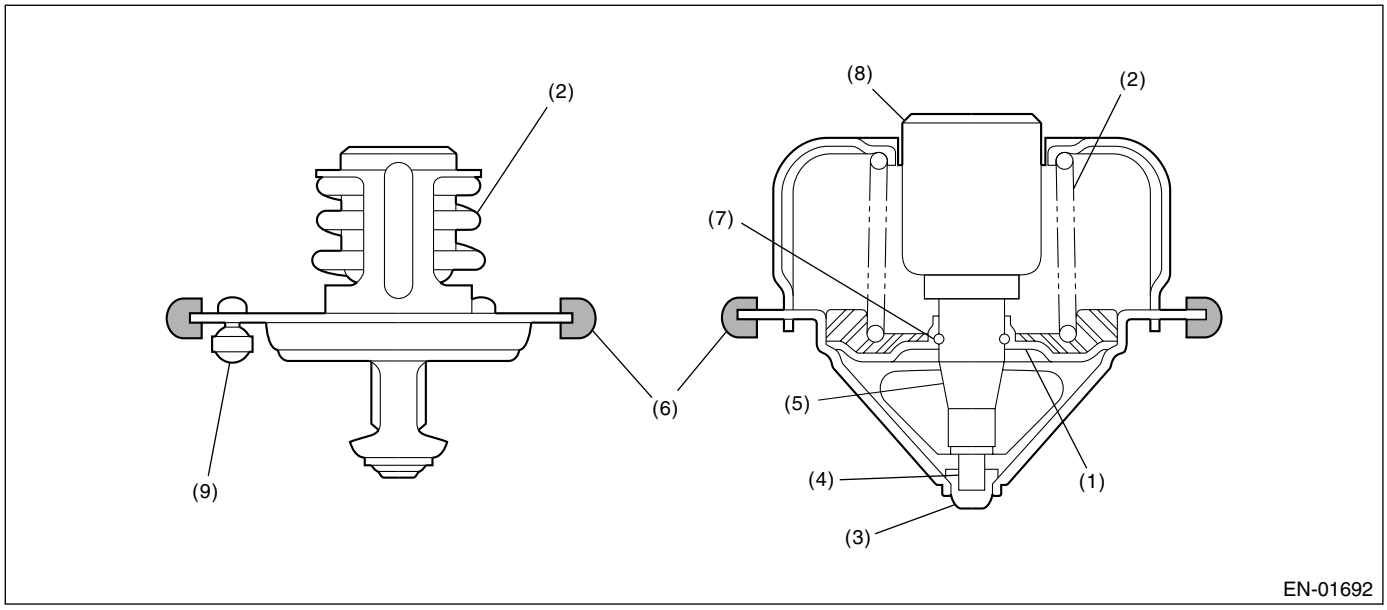
Memorize the freeze frame data. (For test mode $02)

AA:DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 70°C (158°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	< 70°C (158°F)
(Estimated – measured) coolant temperature	> 30°C (86°F)
Vehicle speed	≥ 30 km/h (19 MPH)

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 70°C (158°F)
(Estimated – measured) coolant temperature	≤ 30°C (86°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AB:DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis before engine starting with the ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine starting – manifold absolute pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION n

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

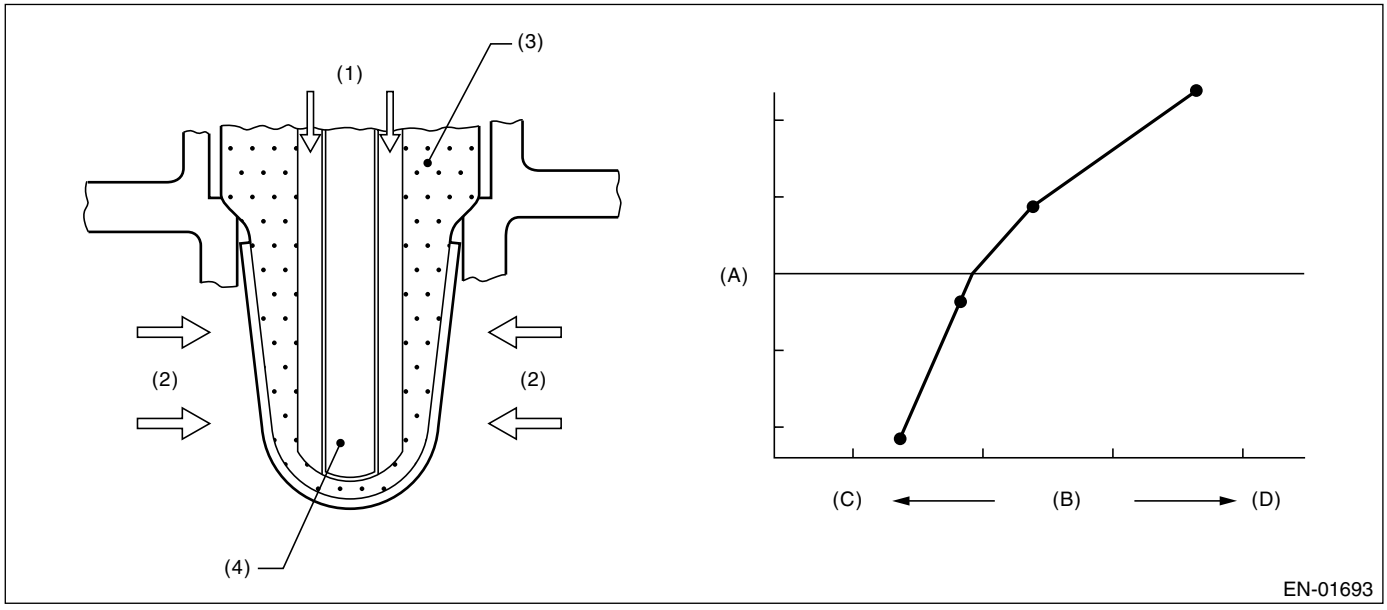
MEMO:

AC:DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< –0.005 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

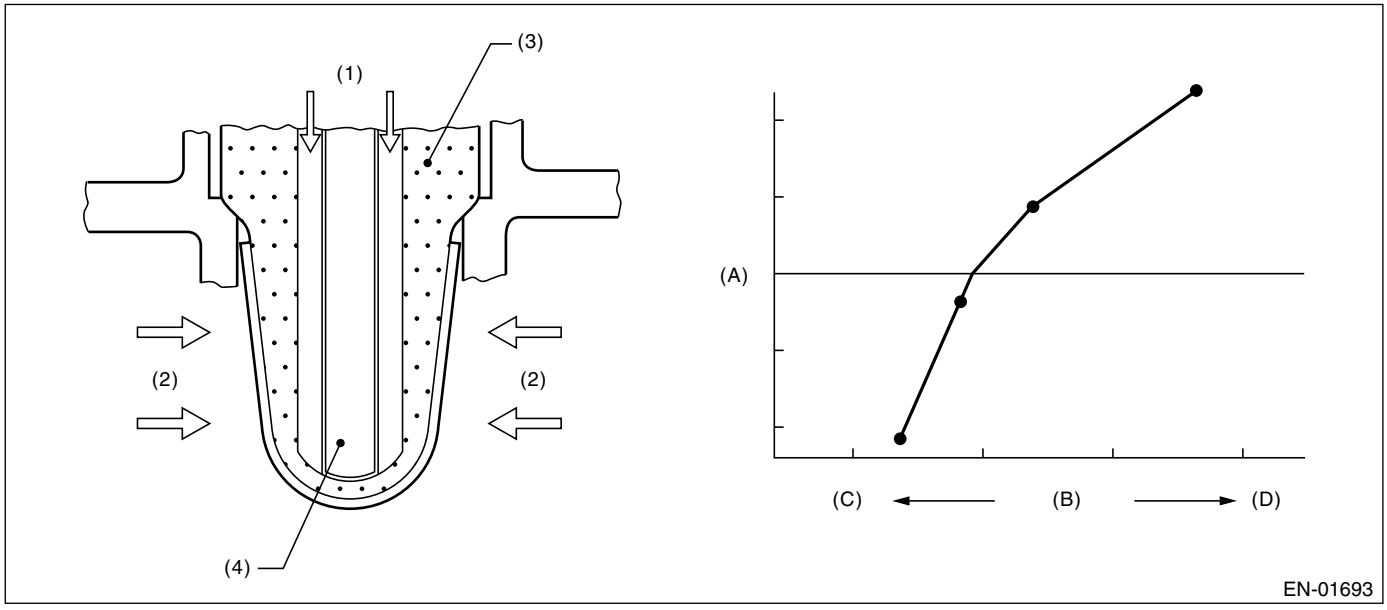
Memorize the freeze frame data. (For test mode $02)

AD:DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.005 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

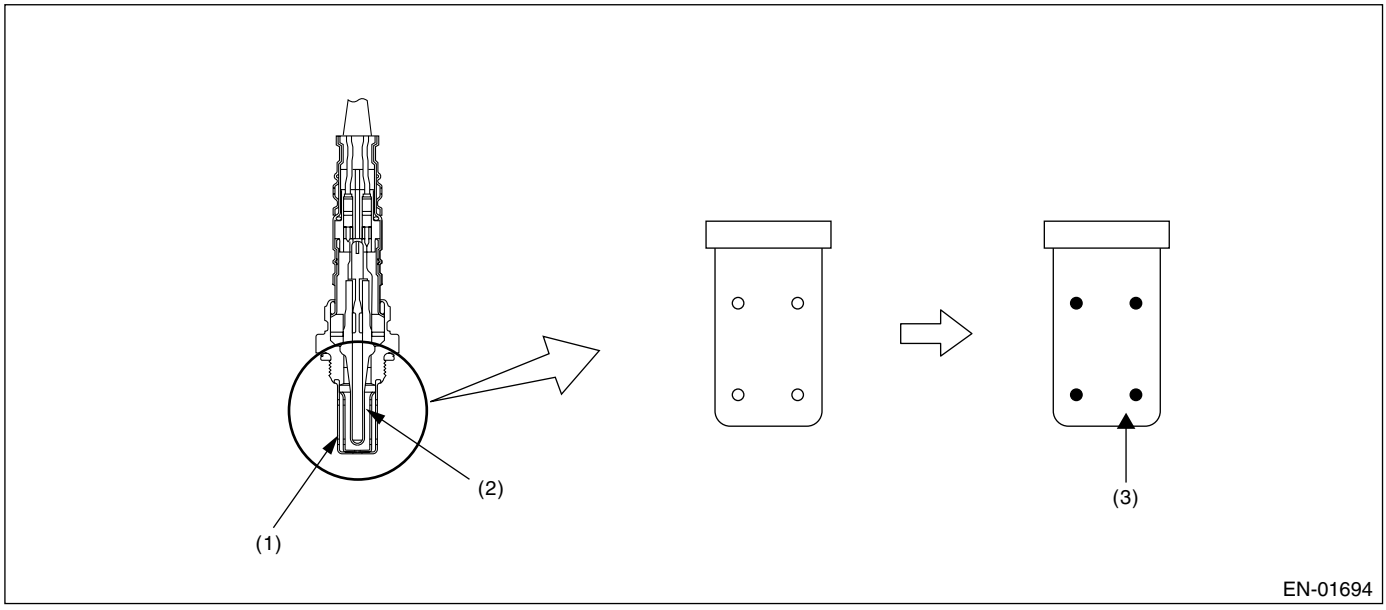
9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AE:DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

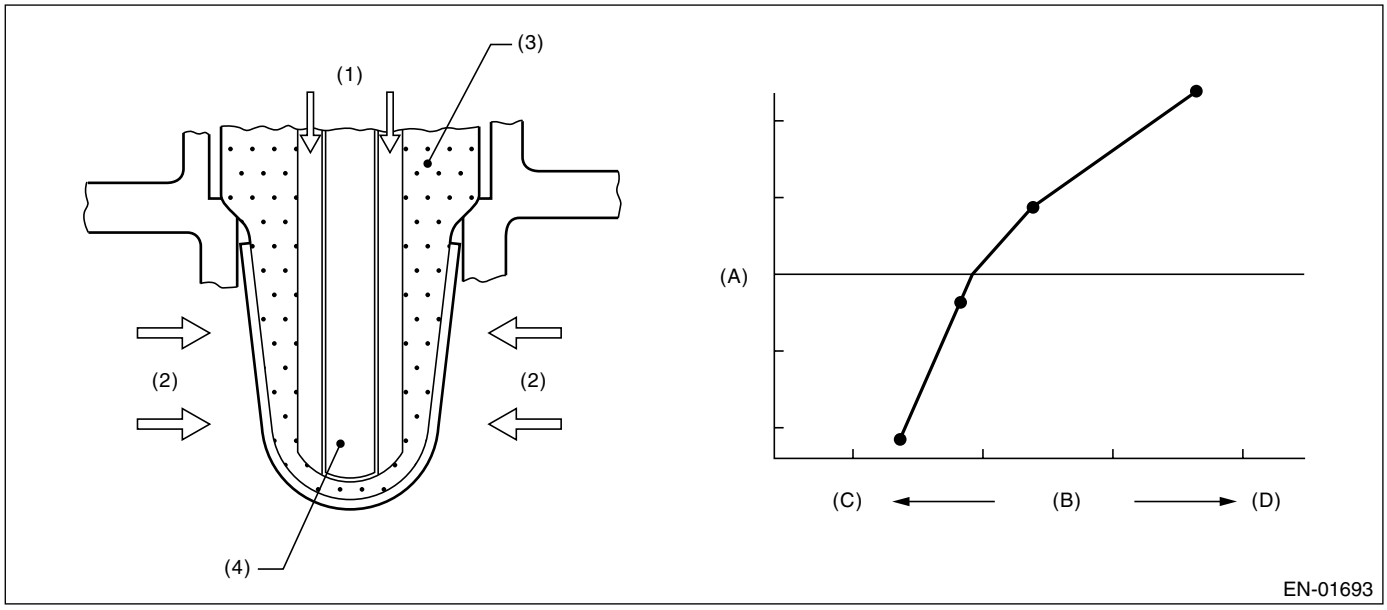
1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover
(2) Zirconia
(3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Engine speed	1000 ←→ 3200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 40 g (0.35 ←→ 1.41 oz)/s
Engine load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.
After integrate 350 seconds, calculate the diagnosis value.
Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up for a total of 210 seconds d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (n) = (lmd (n) – lmd (n–1)) – (lmd (n–1) – lmd (n–2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.12

Time Needed for Diagnosis: 350 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- A/F sub learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

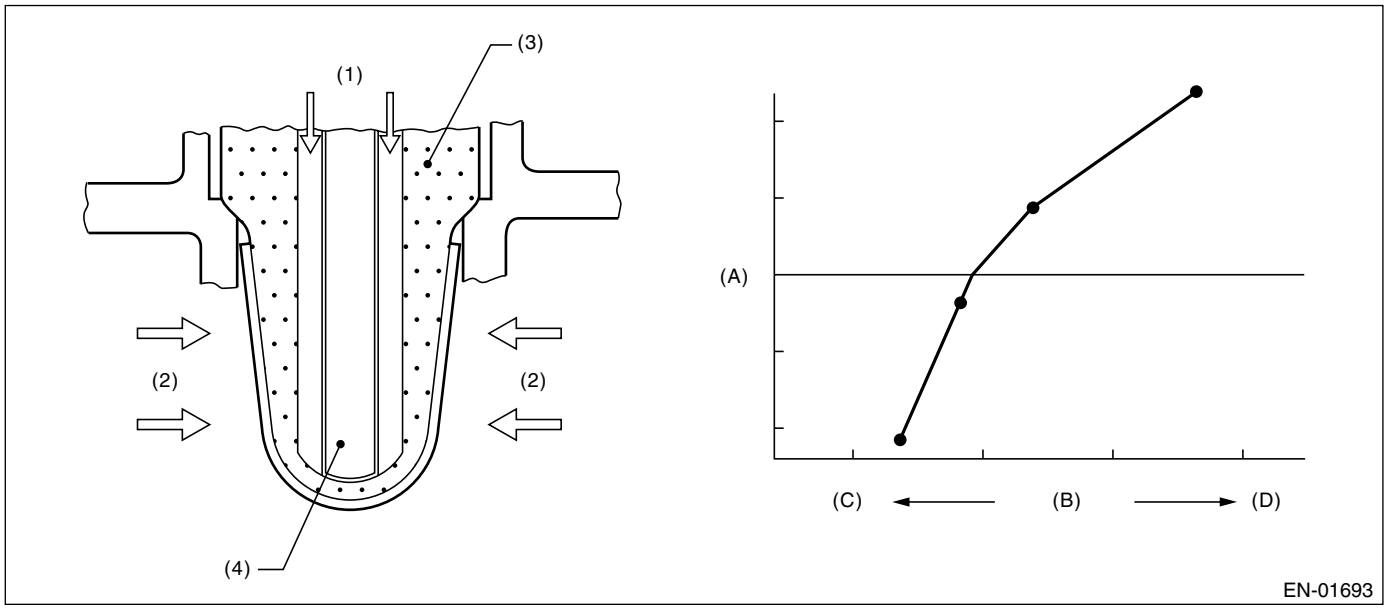
MEMO:

AF:DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.
Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 24 seconds
Variable amount of Front O_2 (A/F) sensor heater control duty every 128 milliseconds	≥ 28000%
Front lambda sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

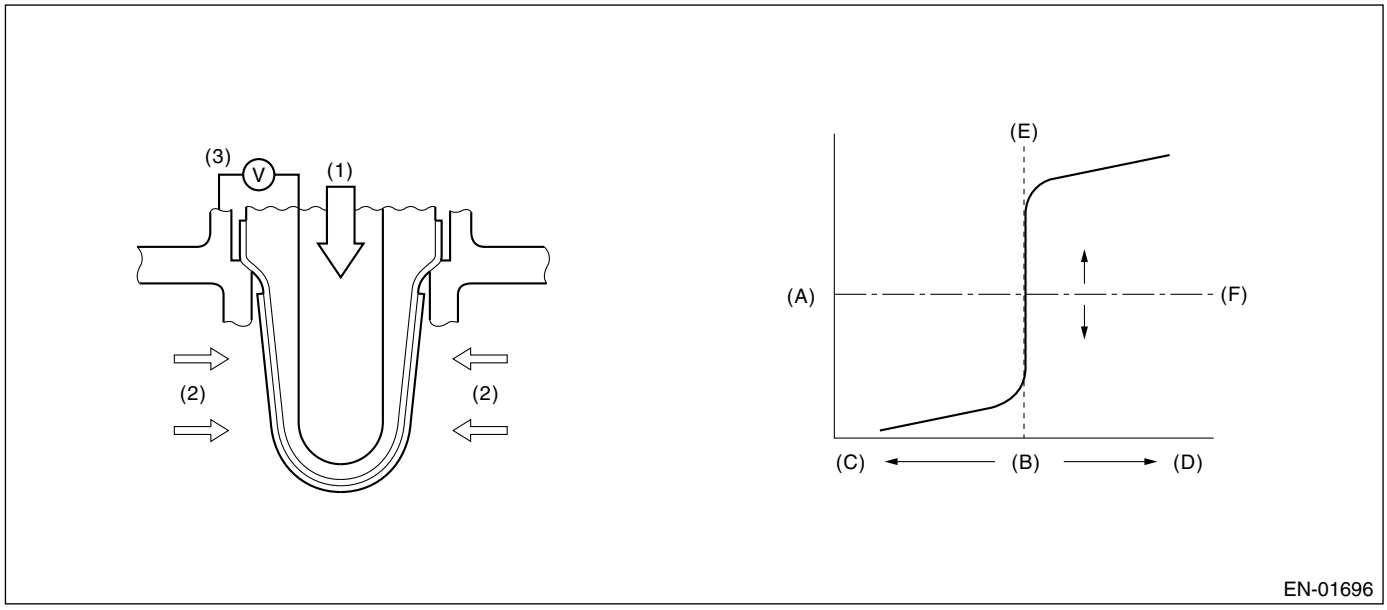
Memorize the freeze frame data. (For test mode $02)

AG:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal from oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 10 g/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
6 seconds or more fuel shut-off in decel. time	Experience

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 550 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of oxygen sensor voltage	Incomplete
Max. output voltage	≥ 550 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

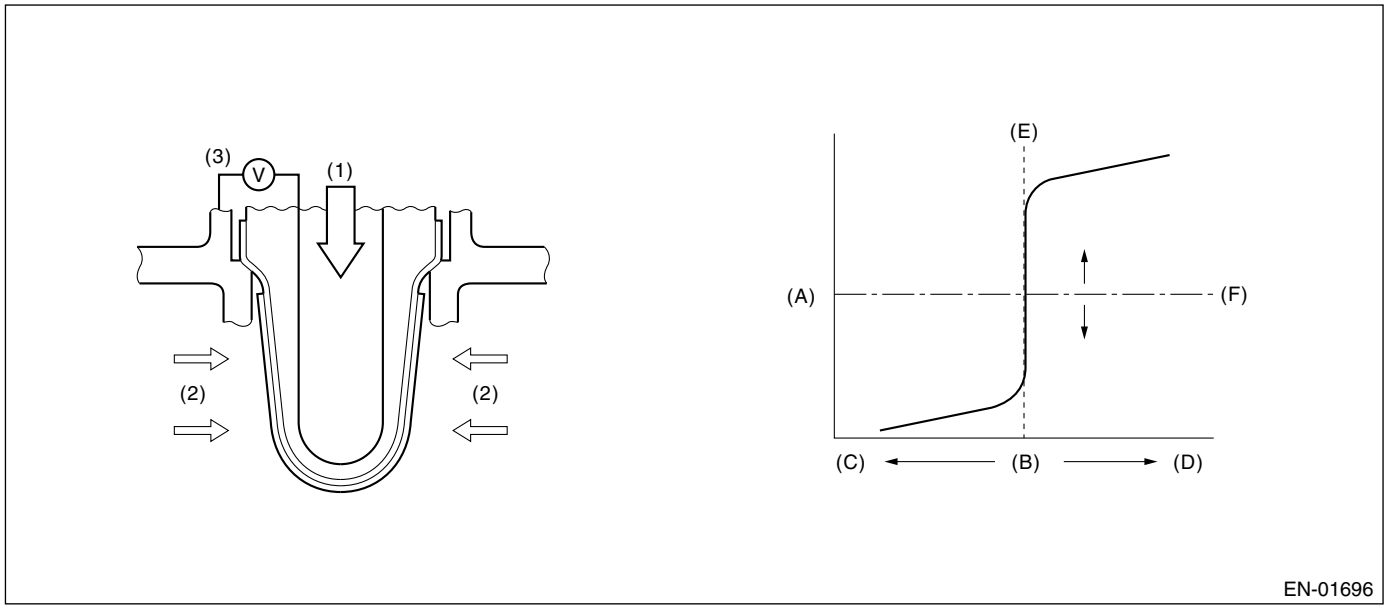
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and malfunction standard value. (For test mode $06)

AH:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 10 g/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
6 seconds or more fuel shut-off in decel. time	Experience

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and malfunction fiducial value. (For test mode $06)

AI: DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

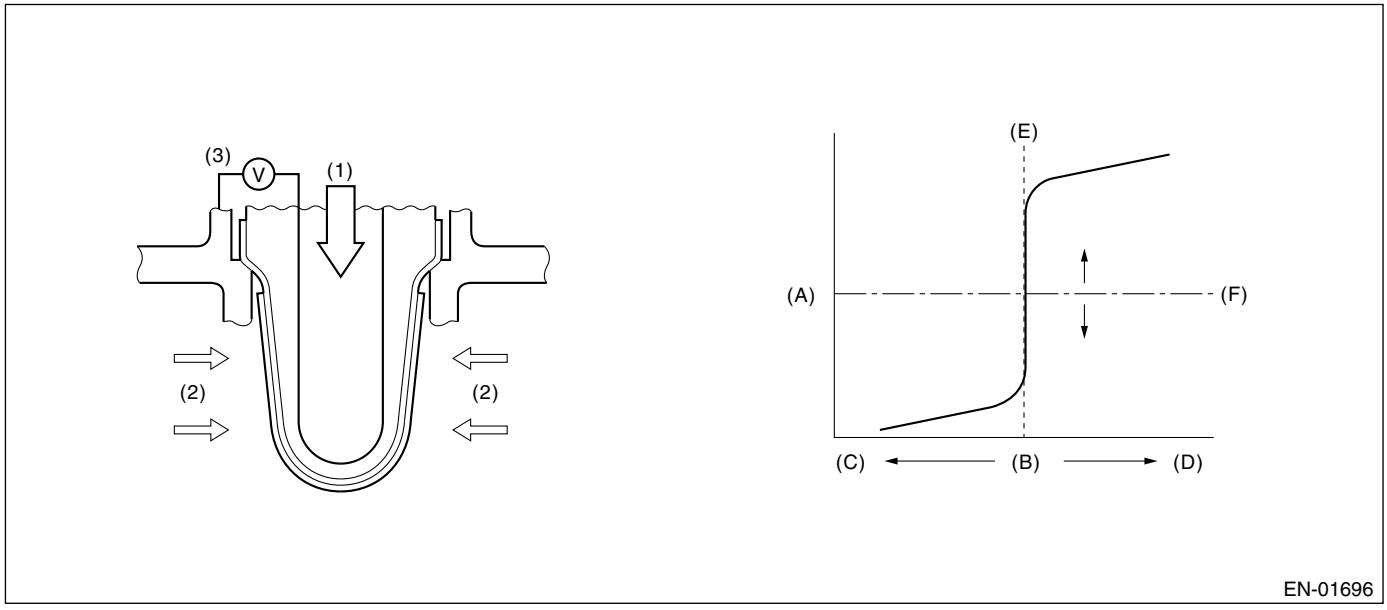
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.
Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.
[Rich → Lean diagnosis response]
(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O2 sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.
(2) When O2 sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.
[Lean → Rich diagnosis response]
(1) The response time of output change of O2 sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.
(2) It is referred to as NG when O2 sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

• Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

- Rich → Lean response diagnosis

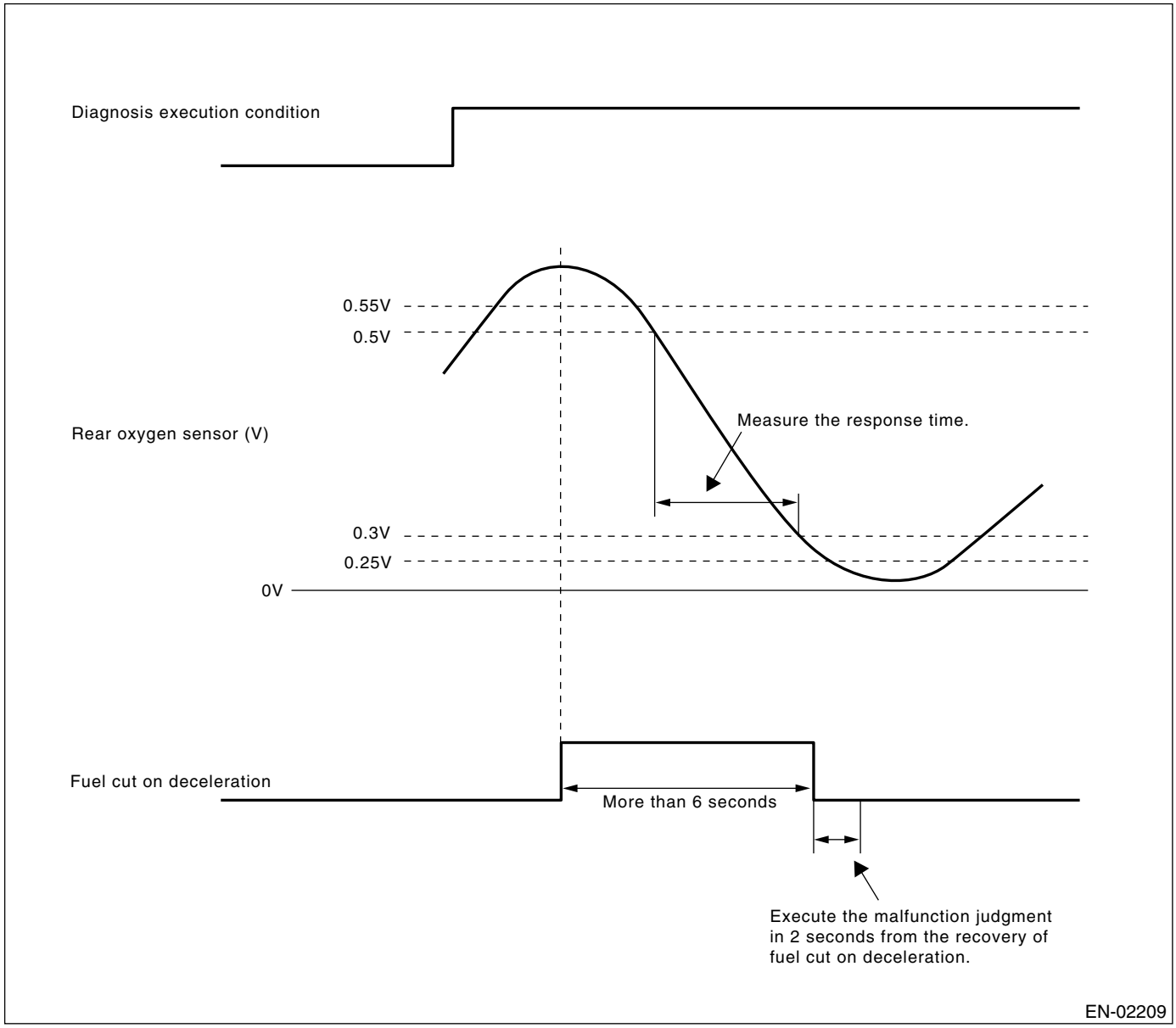
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
6 seconds or more fuel shut-off indecel. time	Experienced
After fuel cut	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.
(2) Judge NG when the O2 sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6s or more), and although carried out the fuel shut-off in deceleration cut return, when O2 sensor voltage is large (more than 0.55V).

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O_2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.698 milliseconds
Longest time to change to 550 mV	> 2 seconds

Time Needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O2 sensor voltage.
(2) A normal judging is not carried out.

• Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (500 mV02 output), when voltage decreases from 550 mV to 250 mV to lean (300 mV).	≤ 0.698 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

10.ENABLE CONDITION

- Lean → Rich response diagnosis

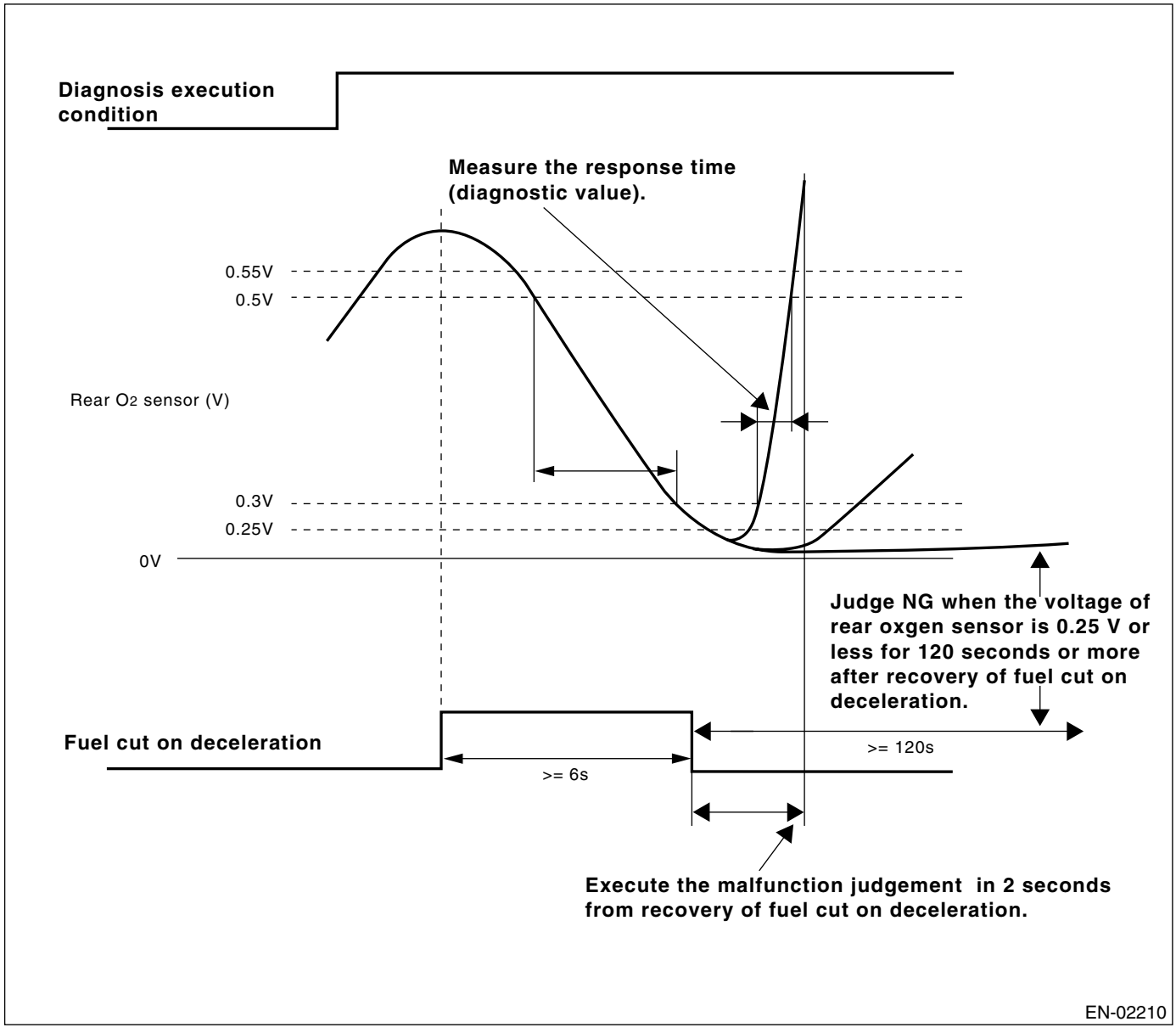
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deterioration diagnosis for oxygen sensor response	Not completed

11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

12.DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal

(2) Judge NG when the O2 sensor voltage after recovery of fuel shut-off in deceleration is small.

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV.	> 2 seconds
Longest time to change to 250 mV	> 120 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O2 sensor voltage.

Response Time (diagnosis value) ≤ Threshold value → Normal

(2) A normal judging is not carried out.

• Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (300 mV02 output), when voltage decreases from 550 mV to 250 mV to lean (500 mV).	≤ 0.698 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

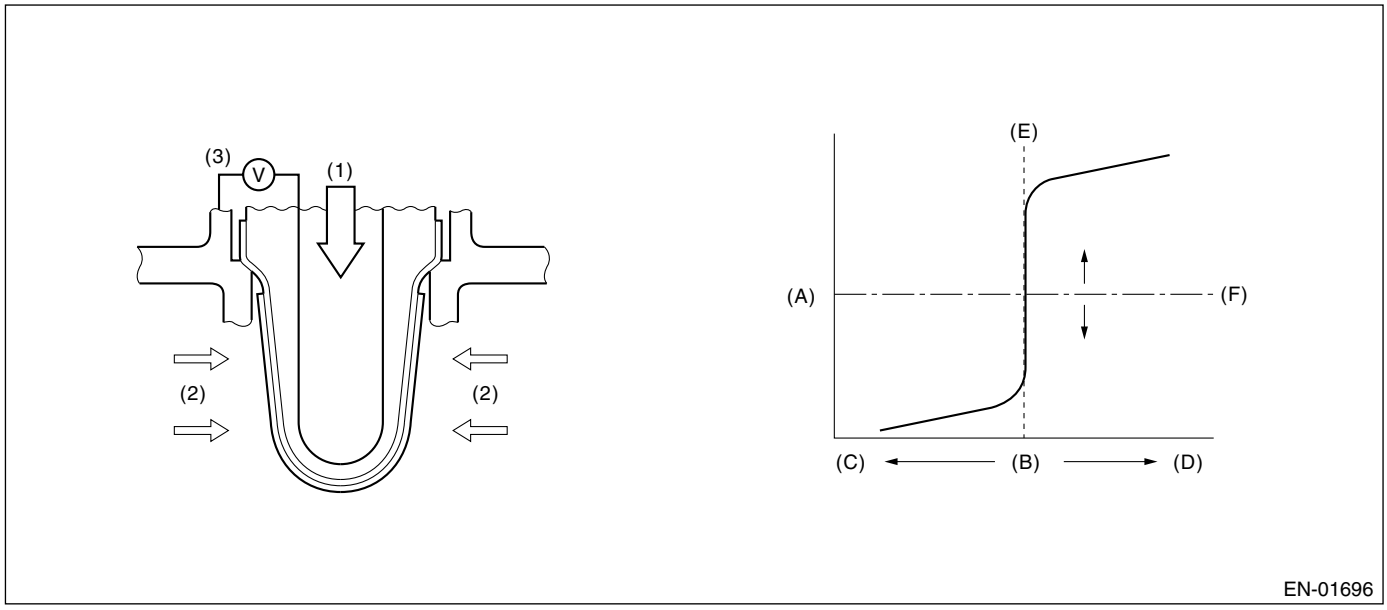
MEMO:

AJ:DTC P0143 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal from oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation (Both banks)
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 30 g (1.06 oz)/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value (Both banks)
Battery voltage	> 10.9 V
6 seconds or more fuel shut-off in decel.	Experience

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 400 mV

Time Needed for Diagnosis: 320 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 400 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

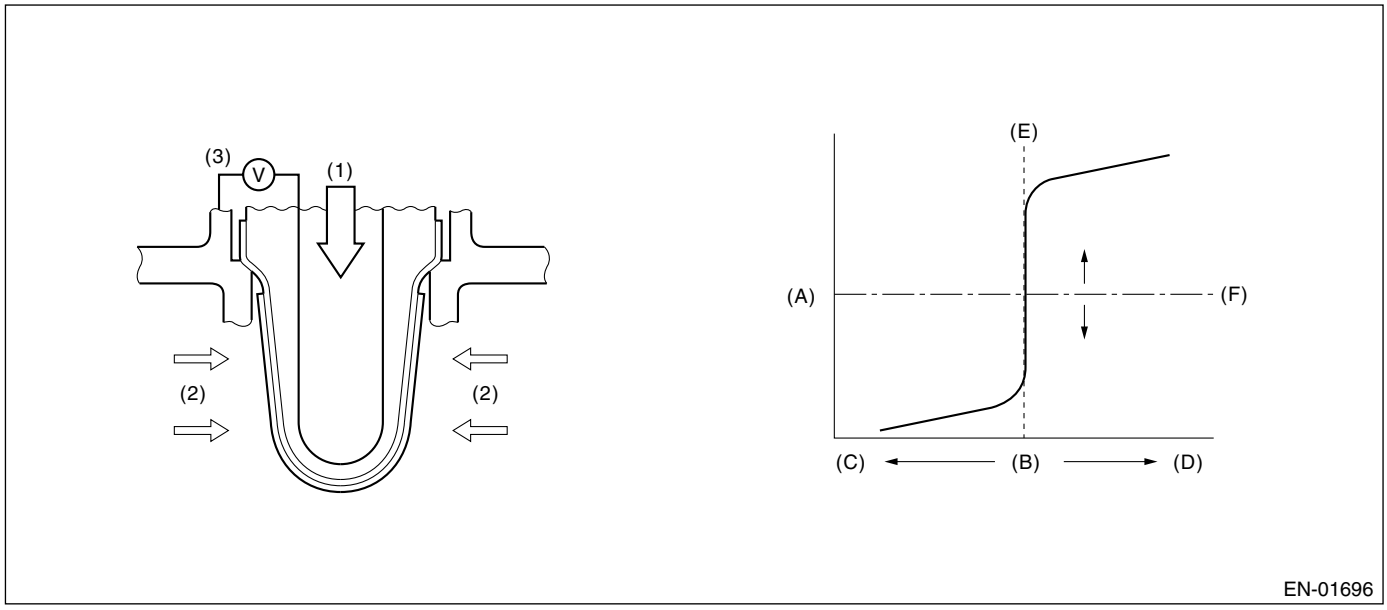
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AK:DTC P0144 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation (Both banks)
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 30 g (1.06 oz)/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value (Both banks)
Battery voltage	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 320 seconds
6 seconds or more fuel shut-off in decel. from engine speed of 1700 rpm or more	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 150 mV

Time Needed for Diagnosis: 320 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 150 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AL:DTC P0151 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0131. <Ref. to GD(H4SO U5)-62, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AM:DTC P0152 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0132. <Ref. to GD(H4SO U5)-64, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AN:DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0133. <Ref. to GD(H4SO U5)-66, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AO:DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

NOTE:
For the detection standard, refer to P0134. <Ref. to GD(H4SO U5)-70, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AP:DTC P0157 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —

NOTE:
For the detection standard, refer to P0137. <Ref. to GD(H4SO U5)-72, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AQ:DTC P0158 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) —

NOTE:
For the detection standard, refer to P0138. <Ref. to GD(H4SO U5)-74, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0159 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —

NOTE:
For the detection standard, refer to P0139. <Ref. to GD(H4SO U5)-76, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

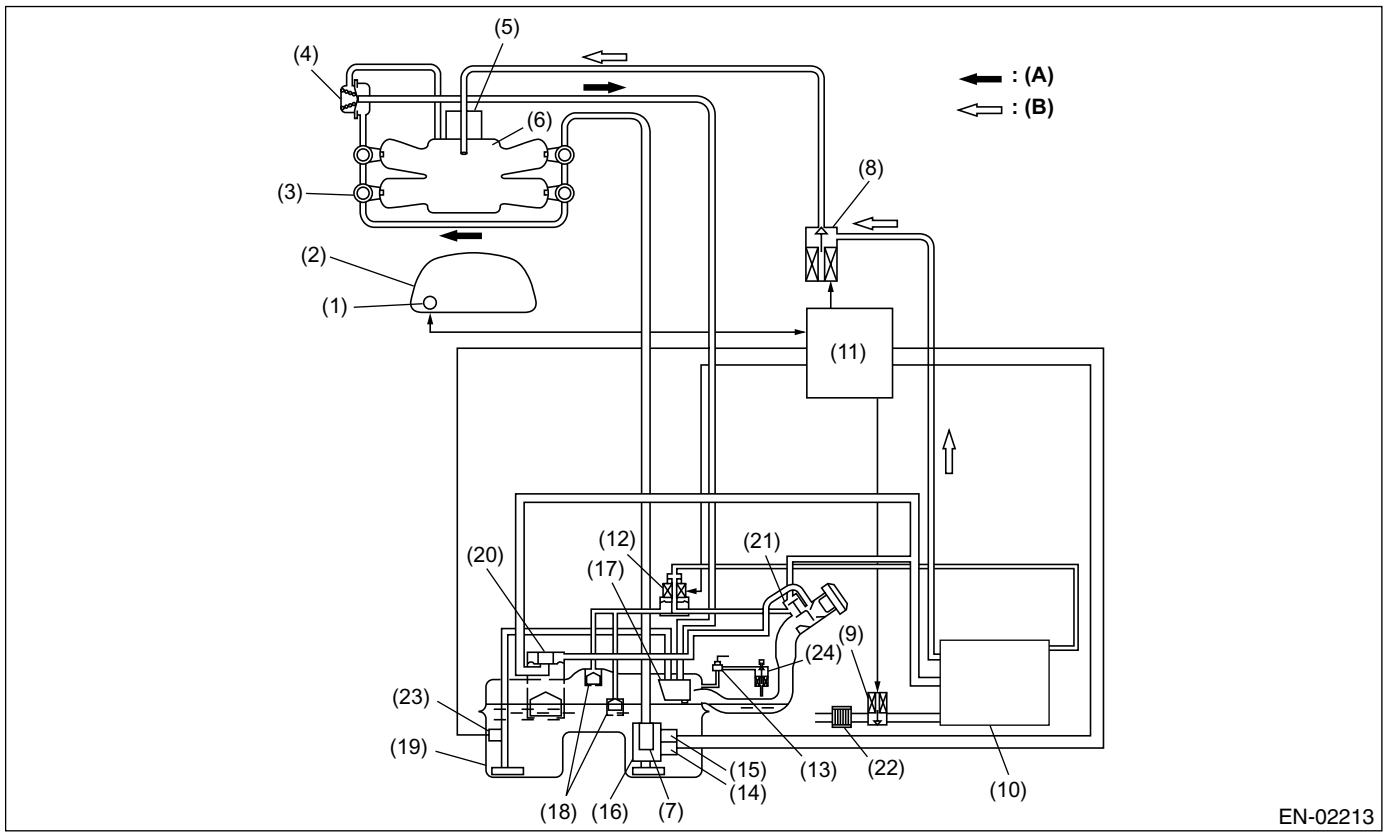
MEMO:

AS:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Fuel meter
(2) Combination meter
(3) Fuel injector
(4) Pressure regulator
(5) Throttle body
(6) Intake manifold
(7) Fuel filter
(8) Purge control solenoid valve
(9) Drain valve
(10) Canister
(11) Engine control module (ECM)
(12) Pressure control solenoid valve
(13) Fuel tank pressure sensor
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel tank
(20) Vent valve
(21) Shut-off valve
(22) Drain filter
(23) Fuel sub level sensor
(24) Tank pressure switching solenoid valve
(A) Fuel line
(B) Evaporation fuel line

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

• Lean side

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Intake air amount	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	< 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/ rev)	NA	0,218 (0.008)	0.216 (0.008)	0.199 (0.007)	0.203 (0.007)	0.206 (0.007)	0.196 (0.007)	0.195 (0.007)	0.21 (0.007)	0.217 (0.008)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idling after warm-up or a constant speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ fsobdL1
where,	See Map 4
sglmd = measured lambda	
tglmda = target lambda	fsobdL1 = lean side threshold value of fsobd
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air [g(oz)/s]	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

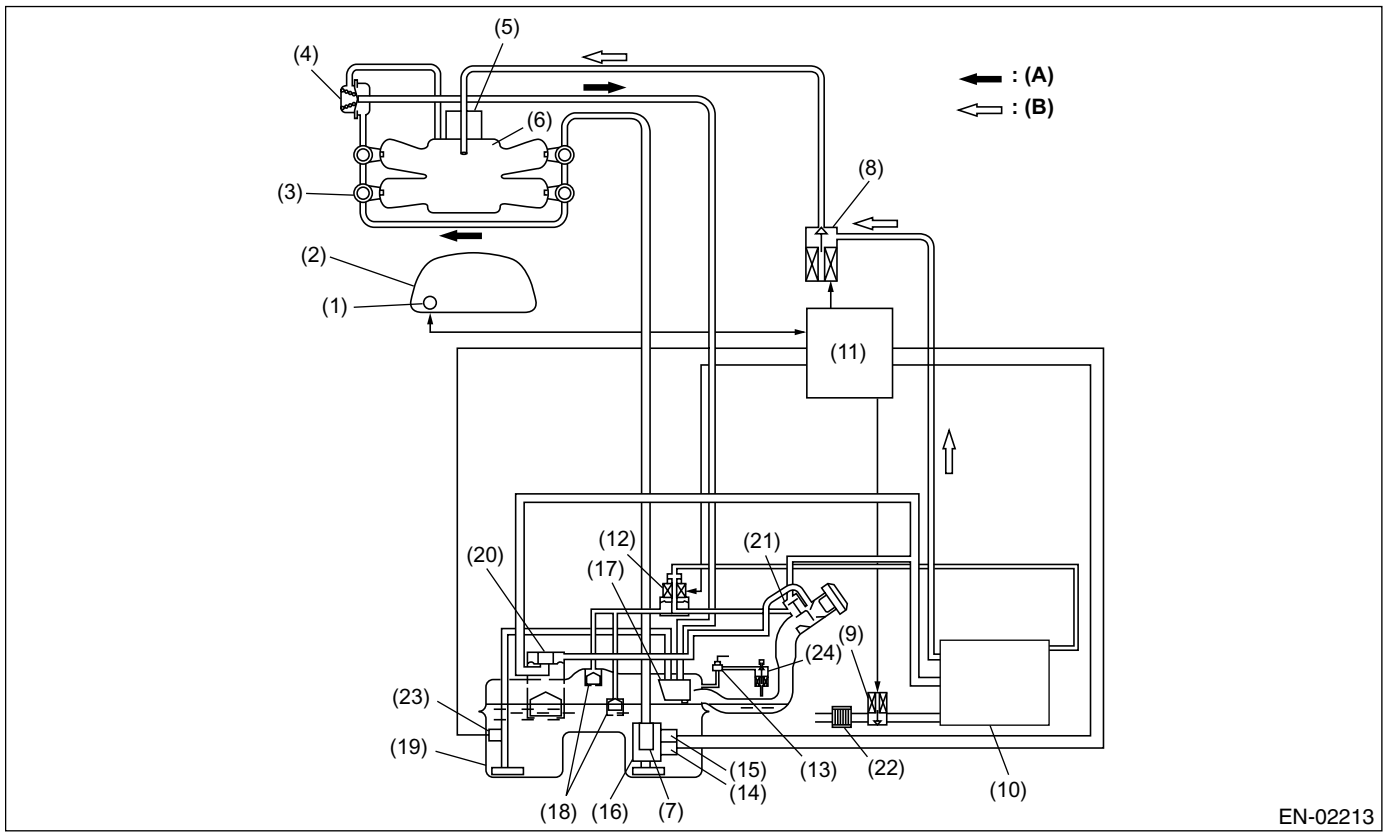
MEMO:

AT:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Fuel meter
(2) Combination meter
(3) Fuel injector
(4) Pressure regulator
(5) Throttle body
(6) Intake manifold
(7) Fuel filter
(8) Purge control solenoid valve
(9) Drain valve
(10) Canister
(11) Engine control module (ECM)
(12) Pressure control solenoid valve
(13) Fuel tank pressure sensor
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel tank
(20) Vent valve
(21) Shut-off valve
(22) Drain filter
(23) Fuel sub level sensor
(24) Tank pressure switching solenoid valve
(A) Fuel line
(B) Evaporation line

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Intake air amount	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	< 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/ rev)	NA	0,218 (0.008)	0.216 (0.008)	0.199 (0.007)	0.203 (0.007)	0.206 (0.007)	0.196 (0.007)	0.195 (0.007)	0.21 (0.007)	0.217 (0.008)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idling after warm-up or a constant speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≤ fsobdR1
where,	See Map 4
sglmd = measured lambda	fsobdR1 = rich side threshold value of fsobd
tglmda = target lambda	
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria for System E

Amount of air [g(oz)/s]	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	11.7 (0.413)	19.2 (0.677)
fsobdR1 (%)	–40	–40	–33.2	–26.5	–26.5	–26.5	–26.5

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ –20%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AU:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

NOTE:
For the detection standard, refer to P0171. <Ref. to GD(H4SO U5)-88, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0175 — SYSTEM TOO RICH (BANK 2) —

NOTE:
For the detection standard, refer to P0172. <Ref. to GD(H4SO U5)-92, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0181 — FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE —

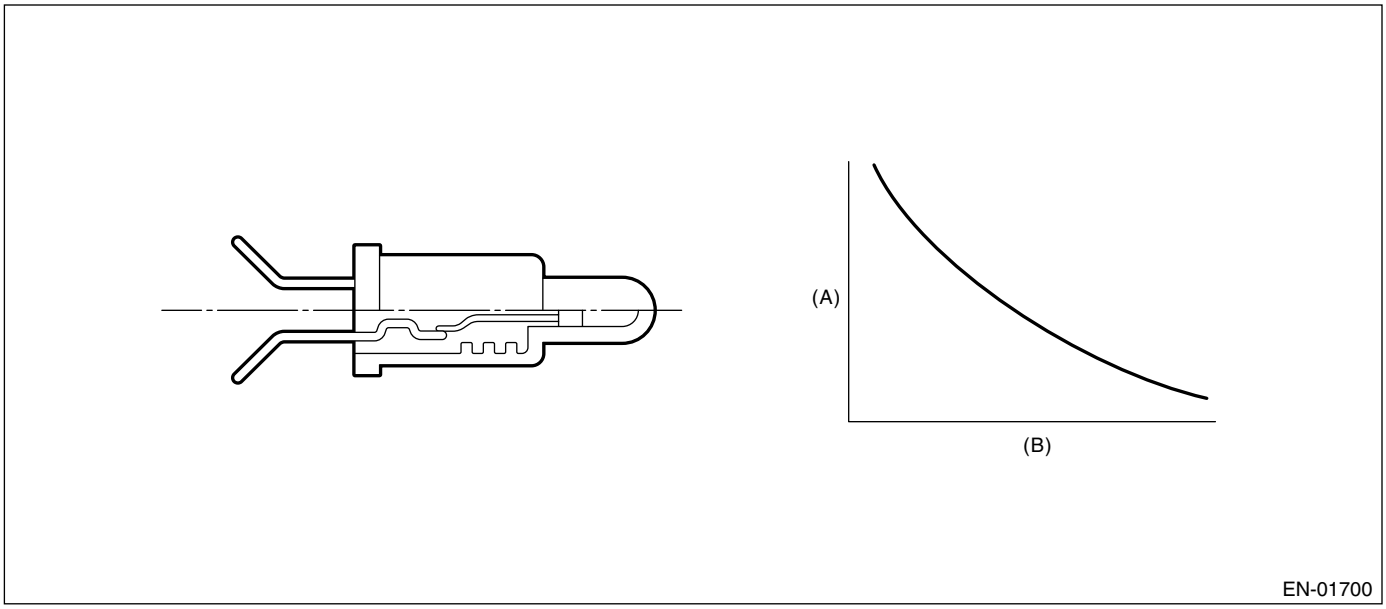
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – engine coolant temperature	≥ 10°C (18°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – engine coolant temperature	< 10°C (18°F)
Battery voltage	> 10.9 V

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	< 3°C (5.4°F)

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

None

12.ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

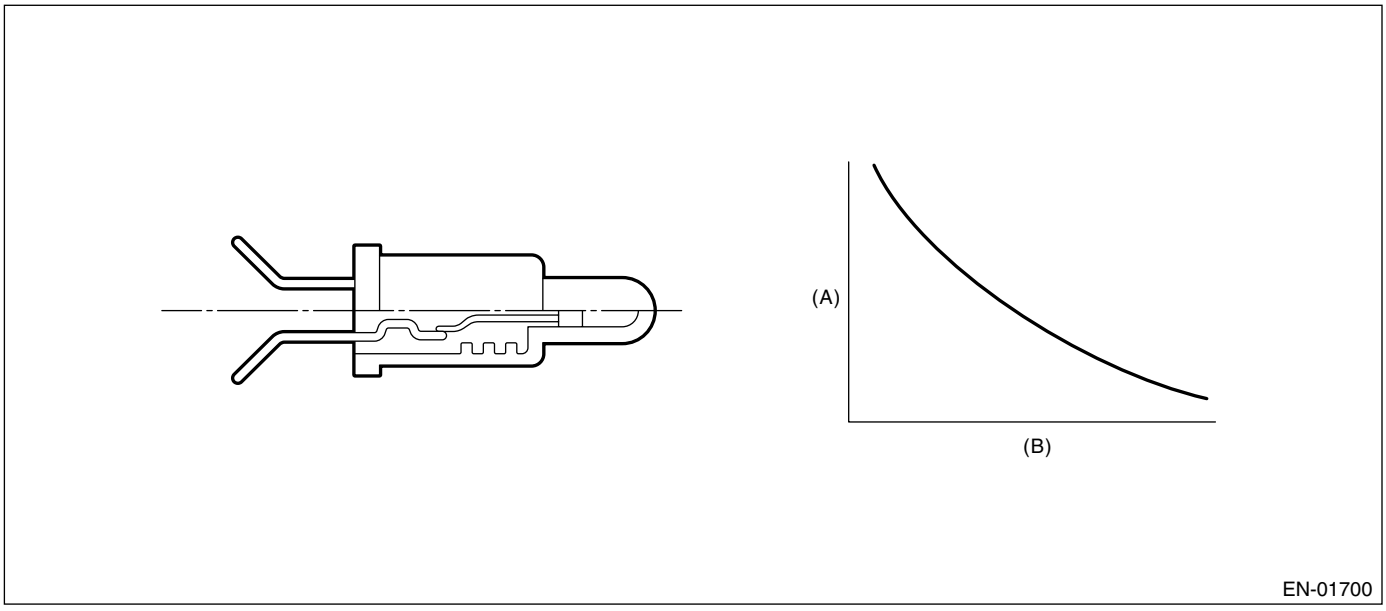
MEMO:

AX:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

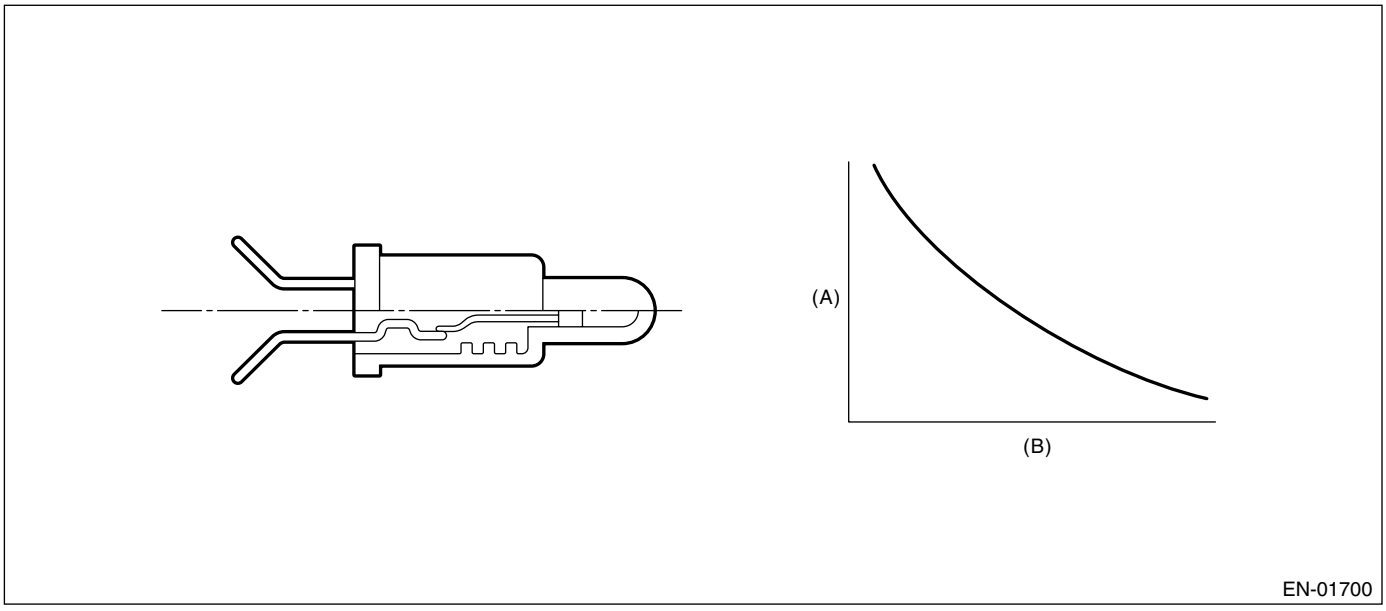
Memorize the freeze frame data. (For test mode $02)

AY:DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

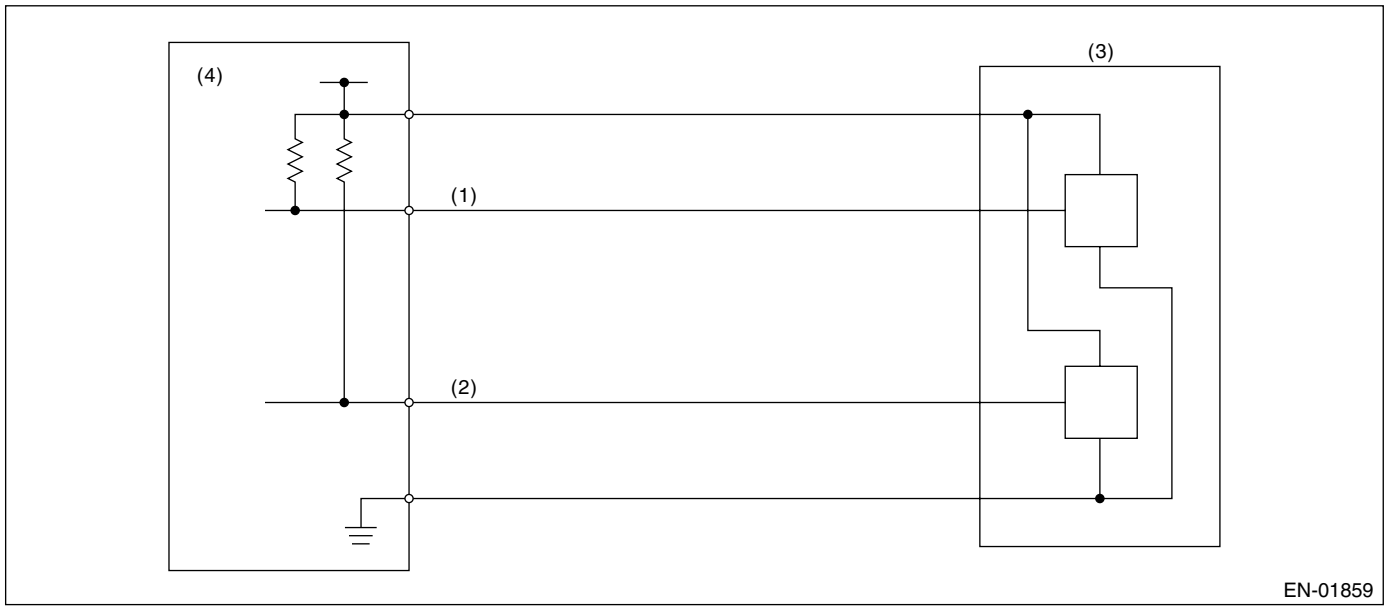
Memorize the freeze frame data. (For test mode $02)

AZ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.749 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

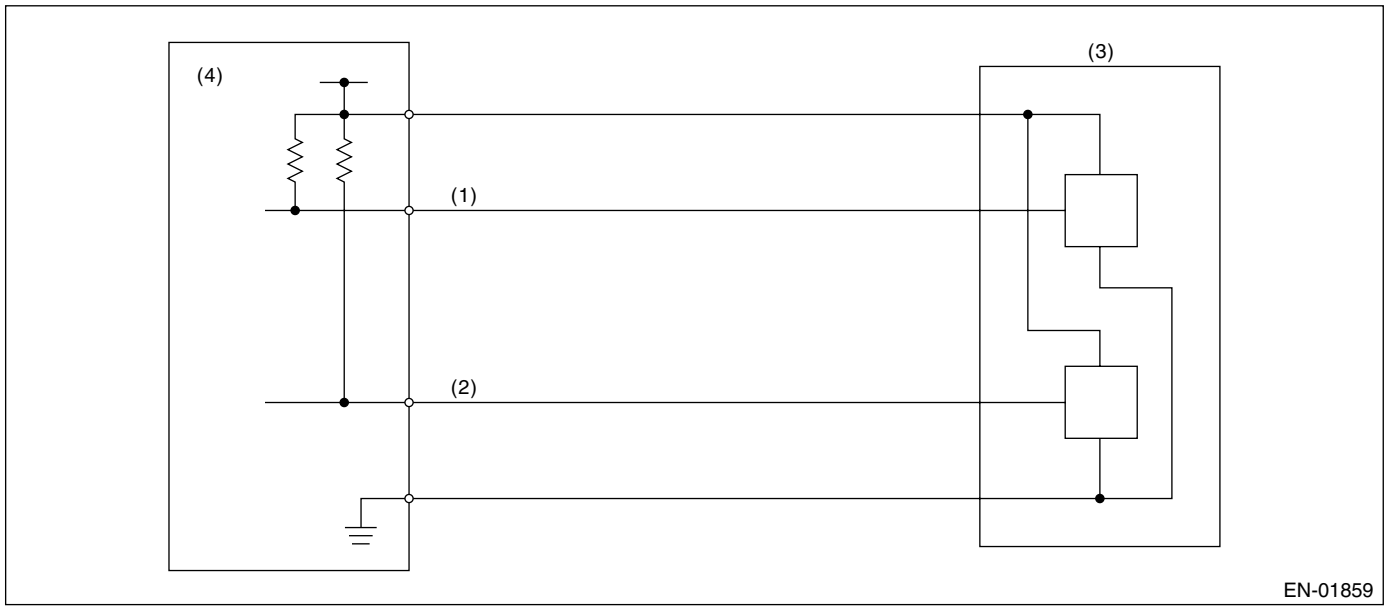
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BA:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.747 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BB:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire
- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	More than 1 second
Intake manifold pressure change during 0.5 engine rev.	< 11.3 kPa (85 mmHg, 3.35 inHg)
Engine speed change	< 700 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 8°
Fuel shut-off function	Not operating
Atomospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
AT torque control	Not in operation
Air condition	No switching ON ←→ OFF
Radiator fan	No switching ON ←→ OFF
Power steering switch	No switching ON ←→ OFF
Starter	ON, or OFF, or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	462.5 — –6500 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V
Conclusion of fuel parameter	Not supervolatile

Map3
MT (Vehicle Speed < 64.4 km/h (40 MPH))

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	25.6 (194.8, 7.67)	23.2 (174.1, 6.85)	22.2 (166.8, 6.57)	22.8 (171, 6.73)	21.9 (164.3, 6.47)	23.5 (175.9, 6.92)	26.9 (201.6, 7.94)	29.4 (220.5, 8.68)	30.9 (232.1, 9.14)	32.5 (243.5, 9.59)	37.3 (280.1, 11.03)	42.6 (319.8, 12.59)	45.1 (338, 13.31)

MT (Vehicle Speed ≥ 64.4 km/h (40 MPH))

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	36.8 (276, 10.87)	33.3 (250, 9.84)	33.3 (250, 9.84)	35.2 (264, 10.39)	34.4 (258, 10.16)	37.1 (278, 10.94)	37.3 (280, 11.02)	37.2 (279, 10.98)	37.5 (281, 11.06)	37.4 (280.5, 11.04)	37.4 (280.1, 11.03)	42.6 (319.8, 12.59)	45.1 (338, 13.31)

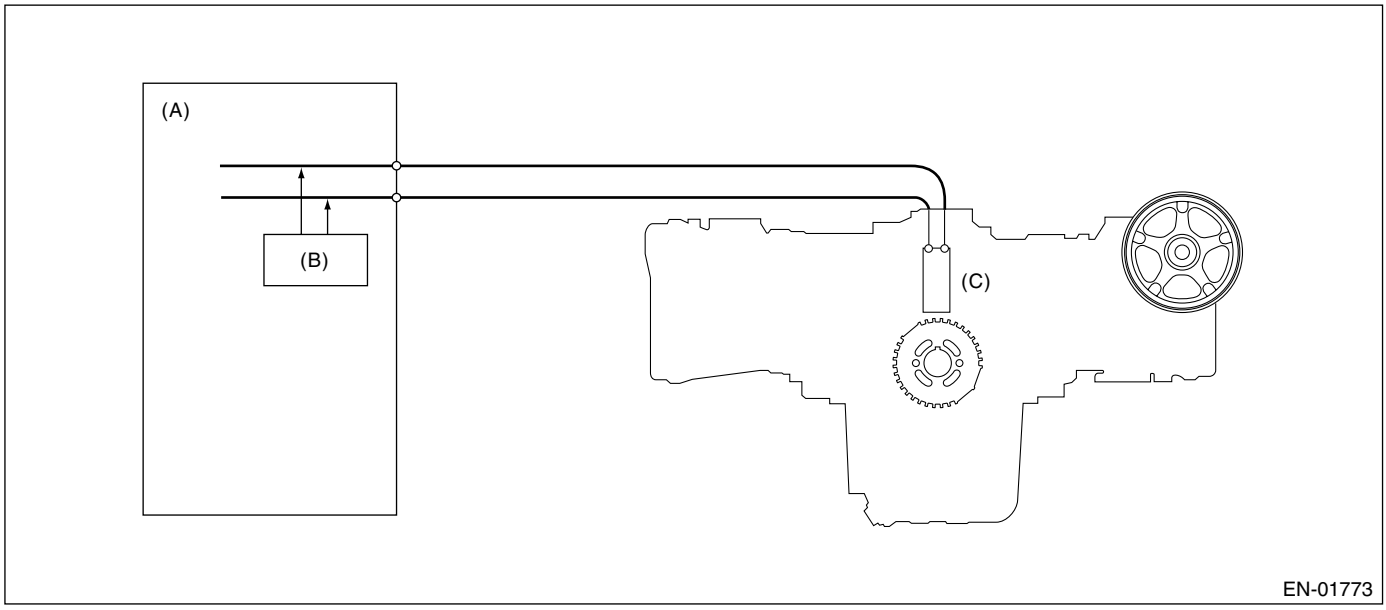
AT

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	27.6 (207, 8.15)	24.0 (180, 7.09)	23.1 (173, 6.81)	23.9 (179, 7.05)	22.8 (171, 6.73)	24.1 (181, 7.13)	27.3 (204.6, 8.06)	29.8 (223.5, 8.78)	32.7 (245.1, 9.65)	34.2 (256.5, 10.10)	39.2 (294.1, 11.58)	44.6 (334.8, 13.18)	46.7 (350, 13.78)

3. GENERAL DRIVING CYCLE

- Detecting misfire between idling and high revolution.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



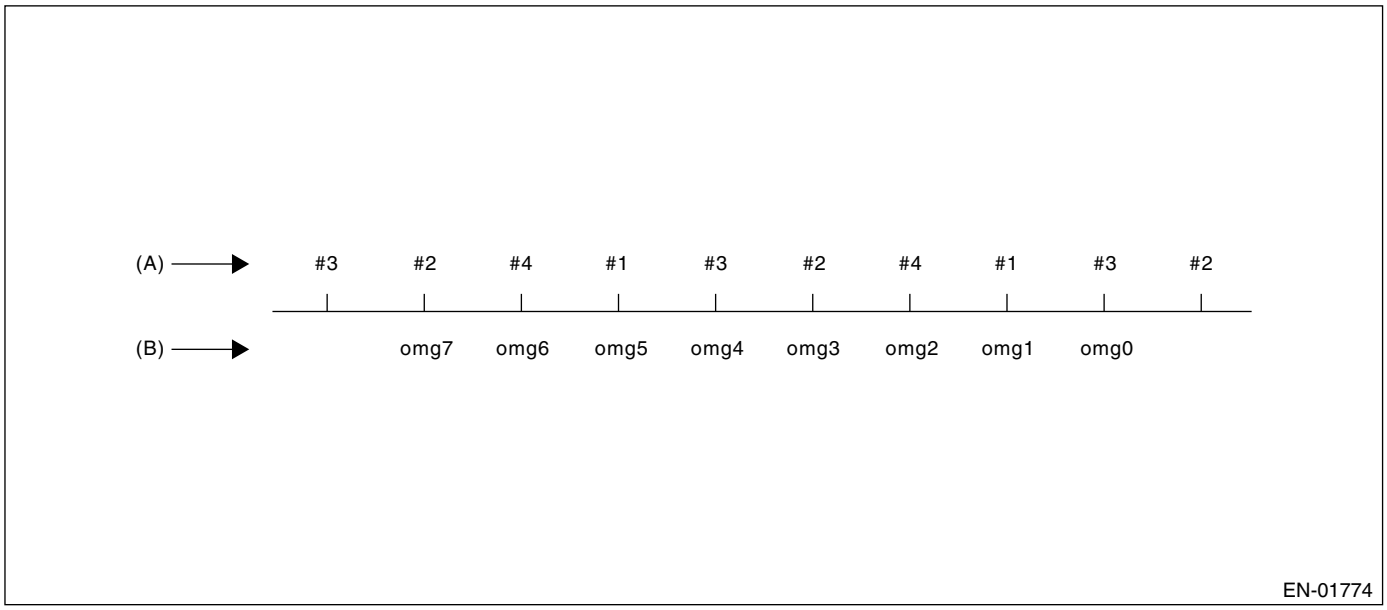
(A) Engine control module (ECM) (B) Diagnosis circuit (C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed) → Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
- 360° Interval Difference Method
- 720° Interval Difference Method

→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
- Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



(A) Ignition order (B) Crankshaft position speed

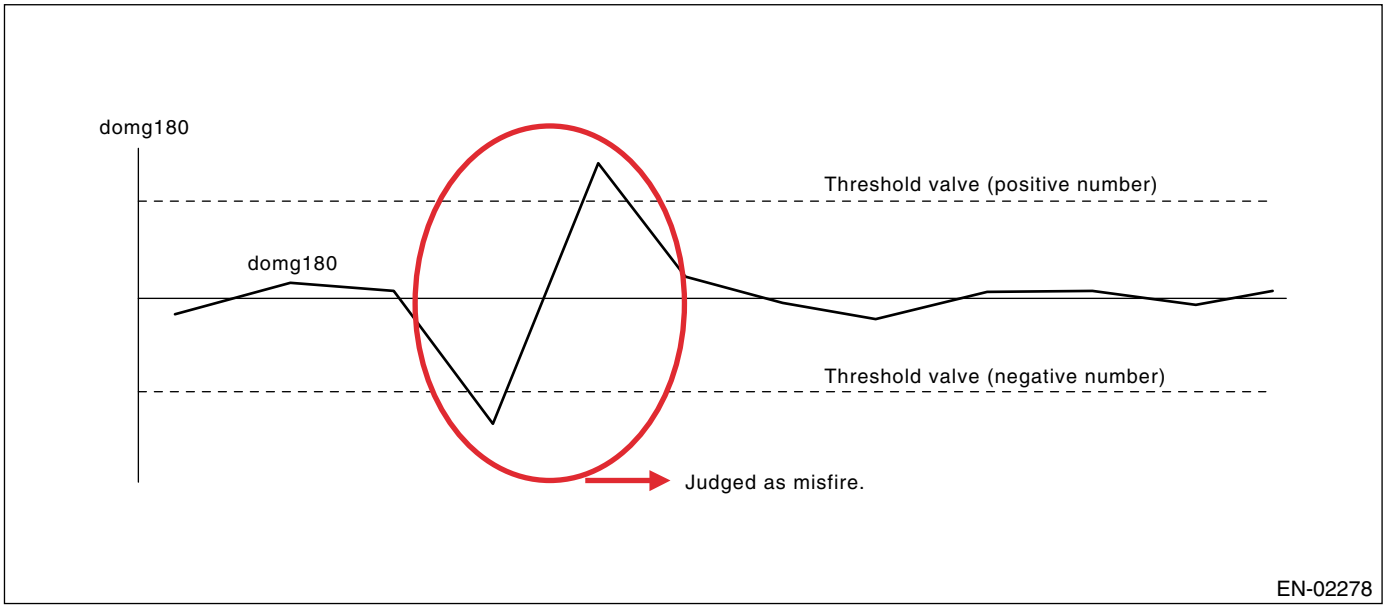
• 180° Interval Difference Method

Diagnosis value domg 180 = (omg –1 omg 0) – (omg 5 – omg 1)/4

Judge misfire occurs in the following cases.

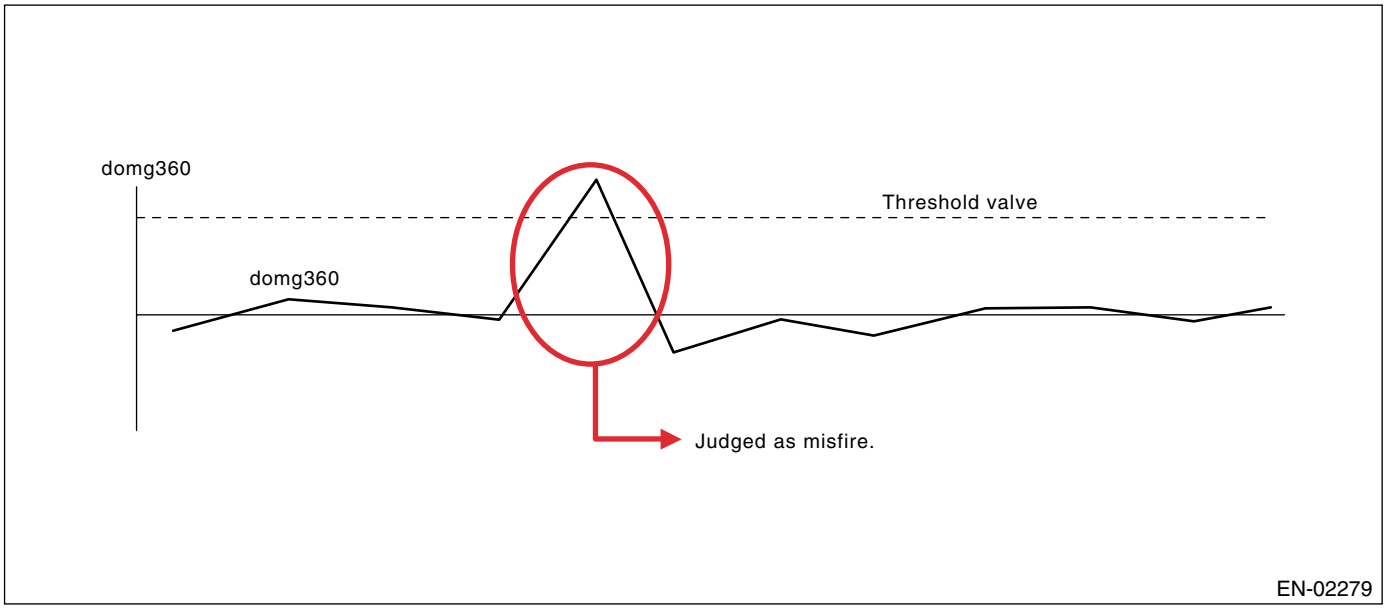
- domg 180 > judgment value of positive side
- domg 180 ≤ judgment value of negative side

(judgment value before 180°CA)



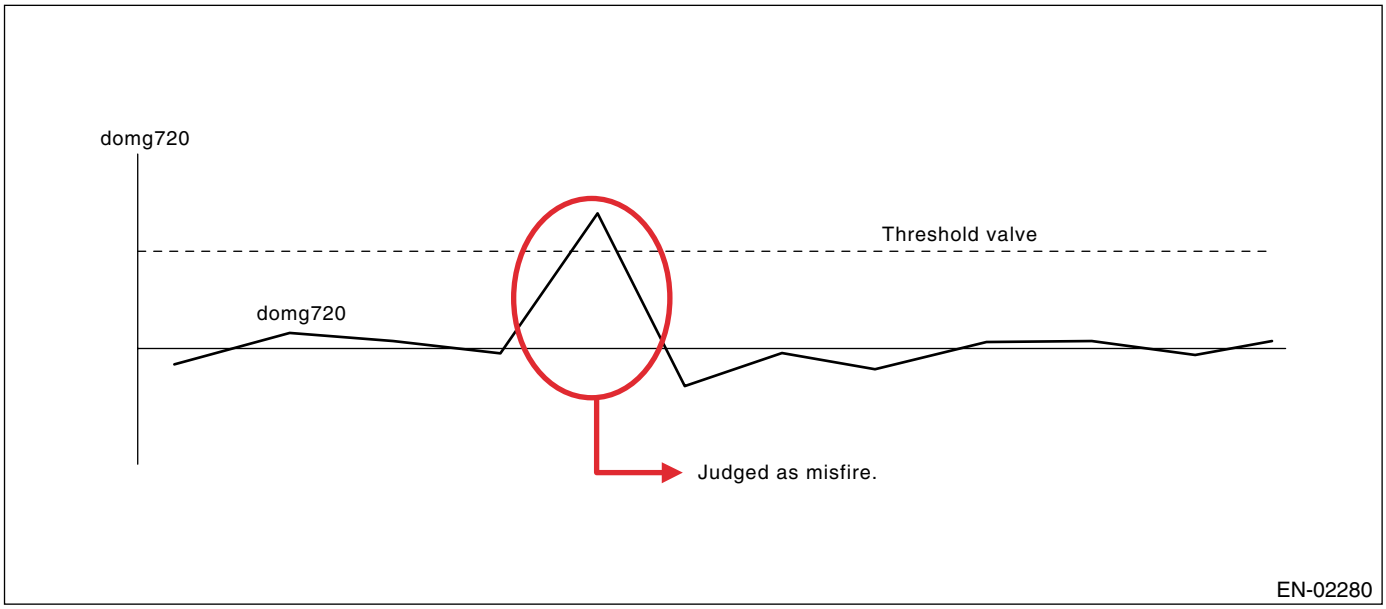
• 360° Interval Difference Method

Diagnosis value	domg 360 = (omg 1 – omg 0) – (omg 3 – omg 2)		
Misfire judgment	domg 360 > judgment value	→	Misfire occurs



• 720° Interval Difference Method

Diagnosis value	domg 720 = (omg 1 – omg 0) – (omg 5 – omg 4)		
Misfire judgment	domg 720 > judgment value	→	Misfire occurs



• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Catalyst damage misfire (Misfire occurrence level damaging catalyst)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

Percentage		Intake air (g (oz) /rev.)							
		0.16 (0.0006)	0.28 (0.010)	0.4 (0.014)	0.52 (0.018)	0.64 (0.023)	0.76 (0.027)	0.92 (0.032)	1.1 (0.039)
Engine speed (rpm)	700	22.5	22.5	22.5	22.5	22.5	12.5	12.5	12.5
	1000	22.5	22.5	22.5	12.5	12.5	12.5	8.3	8.3
	1500	22.5	22.5	12.5	12.5	8.3	8.3	8.3	8.3
	2000	12.5	12.5	8.3	8.3	8.3	6.3	8.3	8.3
	2500	8.3	8.3	8.3	6.3	5	5	5	5
	3000	8.3	8.3	6.3	5	5	–	–	–
	3500	6.3	6.3	5	–	–	–	–	–
	4000	6.3	6.3	5	–	–	–	–	–
	4500	6.3	6.3	5	–	–	–	–	–
	5000	6.3	6.3	5	–	–	–	–	–
	5500	6.3	6.3	5	–	–	–	–	–
	6000	6.3	6.3	5	–	–	–	–	–
	6200	6.3	6.3	5	–	–	–	–	–

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These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.
Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BC:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BE:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

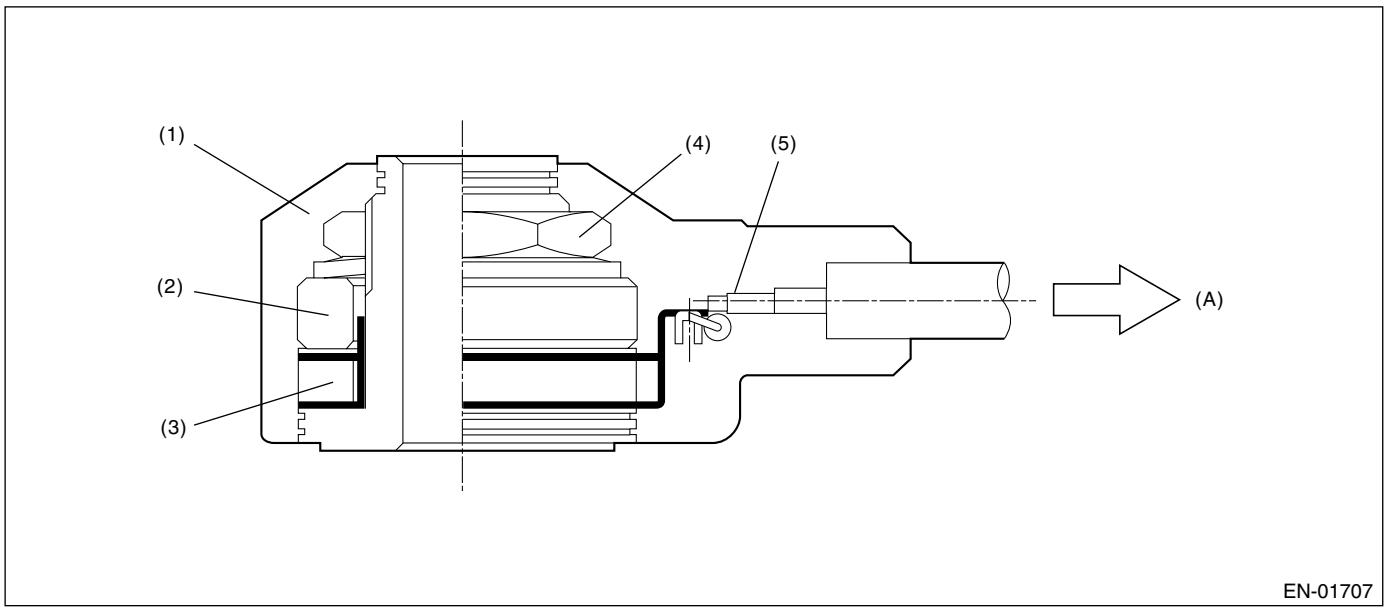
NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BF:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.25 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.25 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Knock compensation:
- At normal: Learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value.
- At trouble: Learned ignition timing = –3°CA (Retard 3°CA)

Knock F/B timing value = 0°CA
Whole learning is not allowed.
Partial learning is not allowed.

9. ECM OPERATING AT DTC SETTING

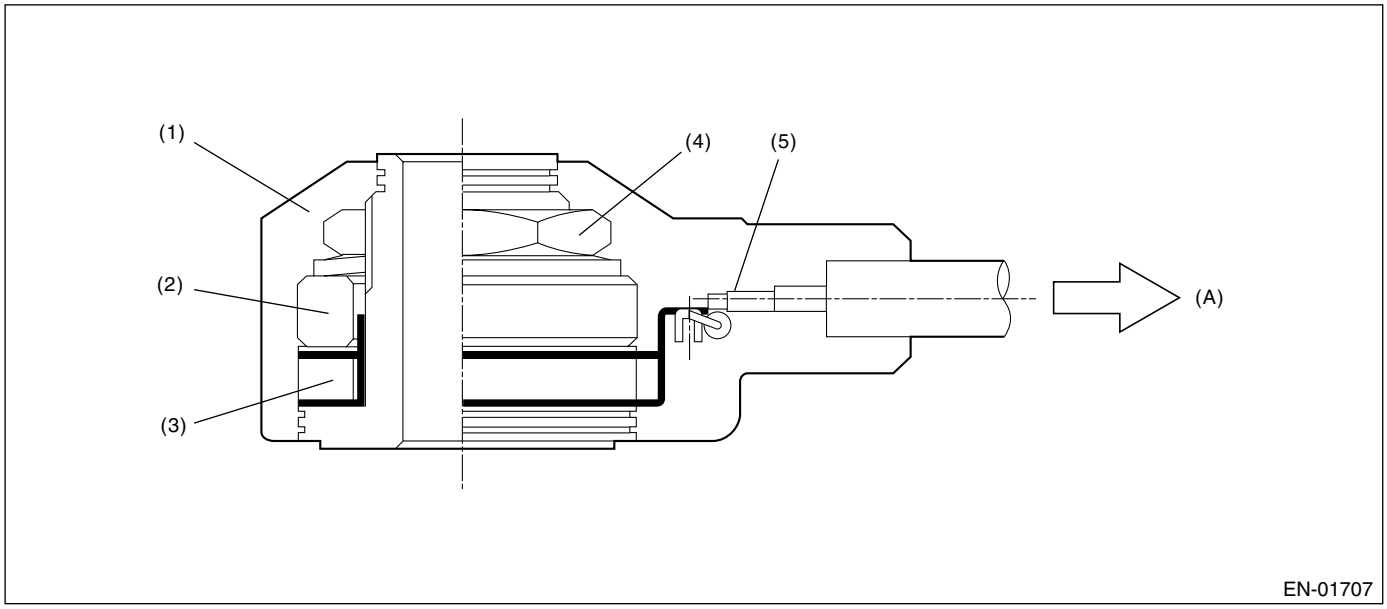
Memorize the freeze frame data. (For test mode $02)

BG:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.7 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.7 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Knock compensation:
- At normal: Learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value.
- At trouble: Learned ignition timing = –3°CA (Retard 3°CA)

Knock F/B timing value = 0°CA
Whole learning is not allowed.
Partial learning is not allowed.

9. ECM OPERATING AT DTC SETTING

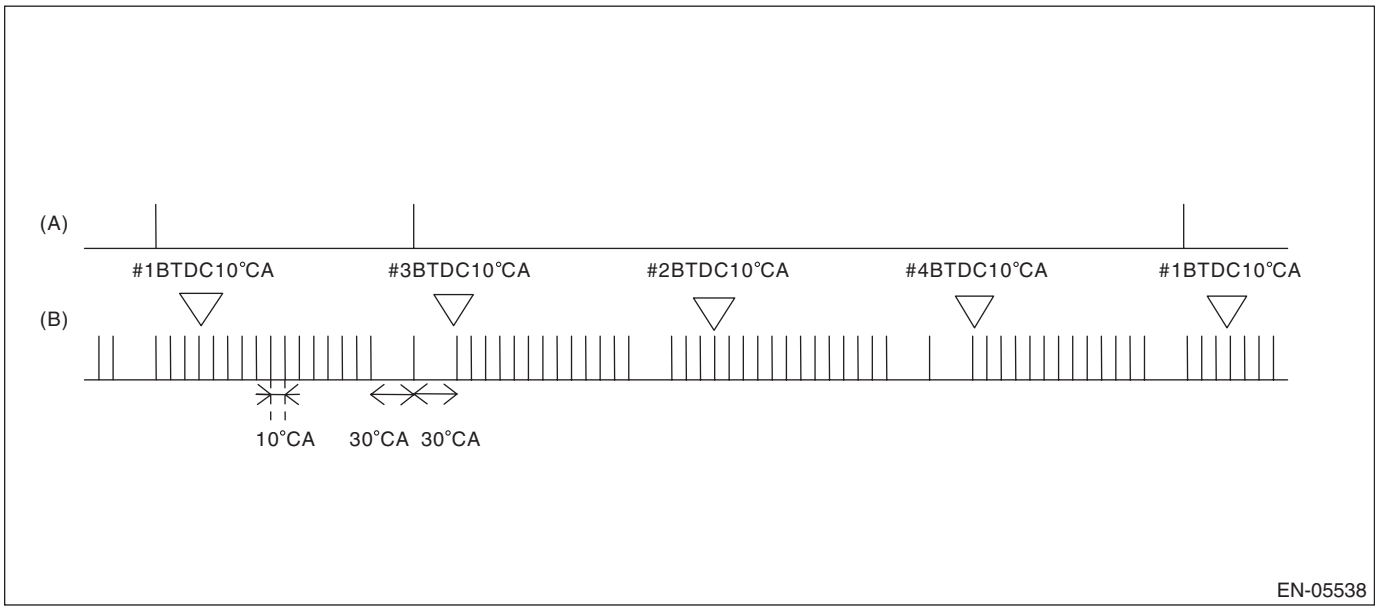
Memorize the freeze frame data. (For test mode $02)

BH:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

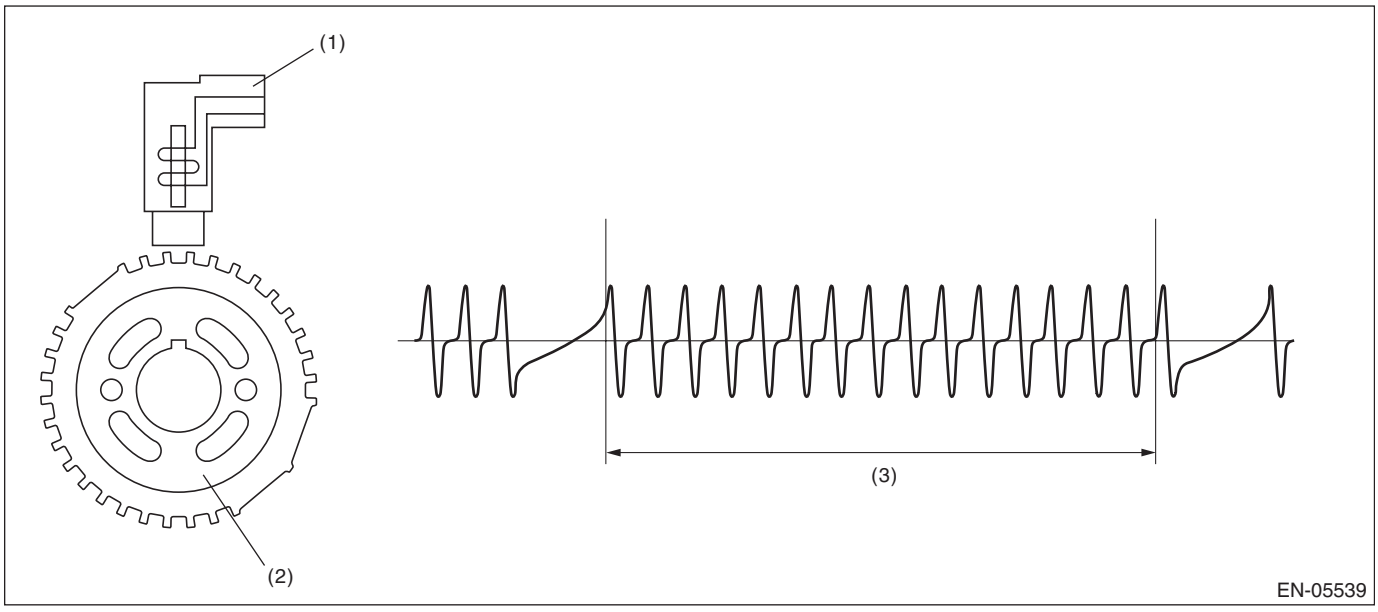
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (B) Crankshaft signal



(1) Crankshaft position sensor (2) Crankshaft sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

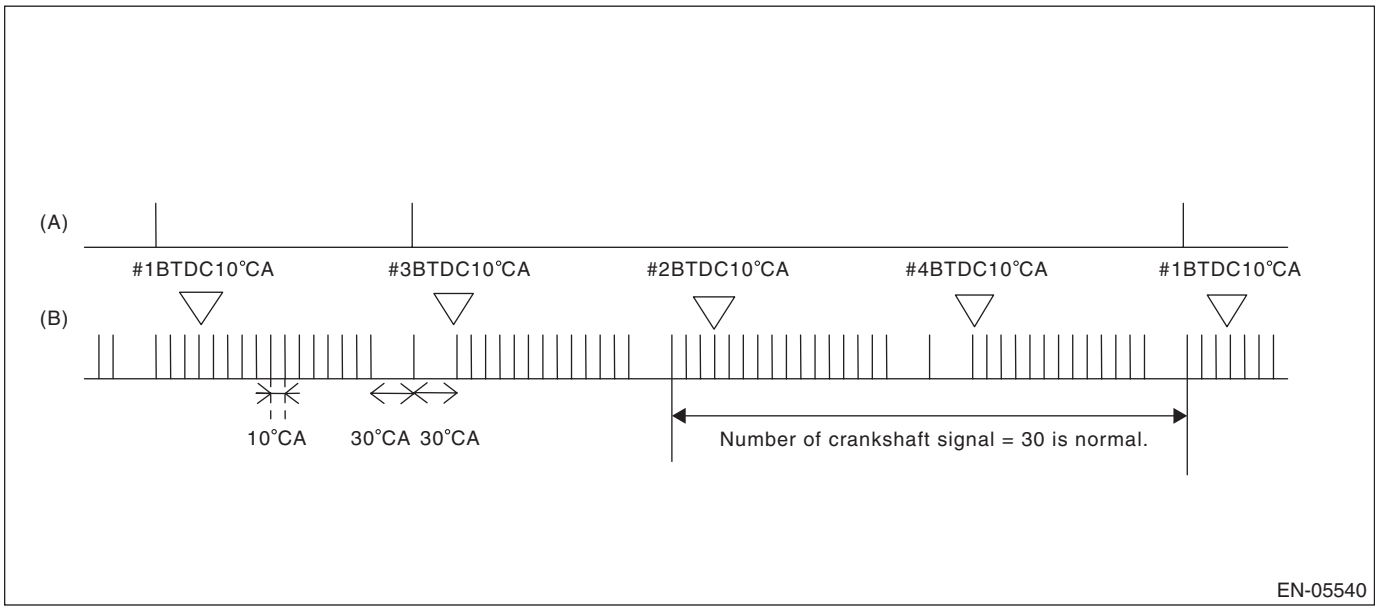
Memorize the freeze frame data. (For test mode $02)

BI: DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

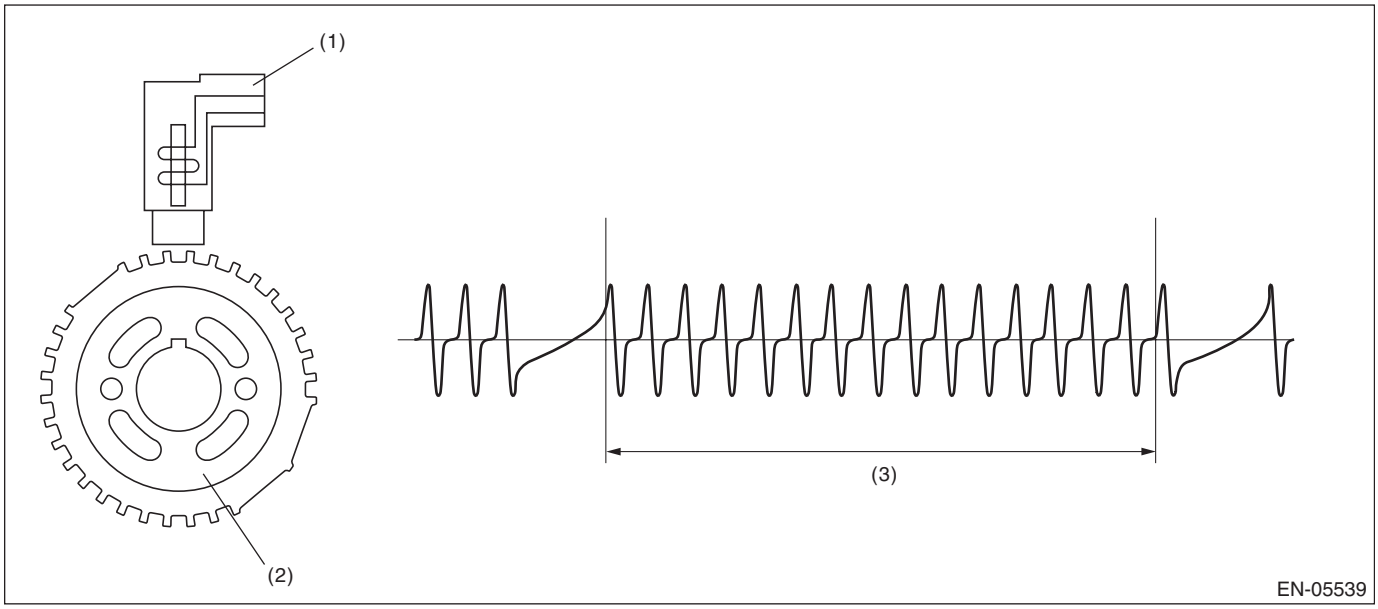
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (B) Crankshaft signal



(1) Crankshaft position sensor (2) Crankshaft sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 4000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 4000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

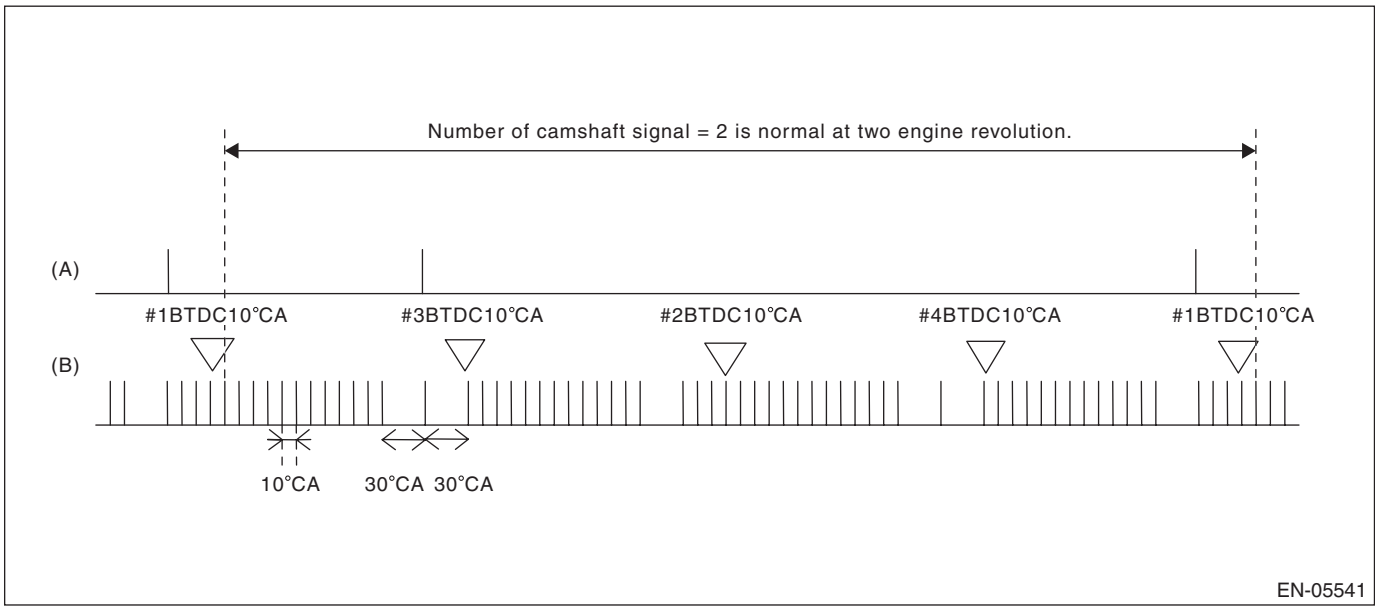
Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the engine speed continues 8 revolutions or more for the malfunction criteria below.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 8 V
Number of camshaft position sensor signal during 2 rev.	Except 2

Time Needed for Diagnosis: 8 rev.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 8 V
Number of camshaft position sensor signal during 2 rev.	Except 2

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

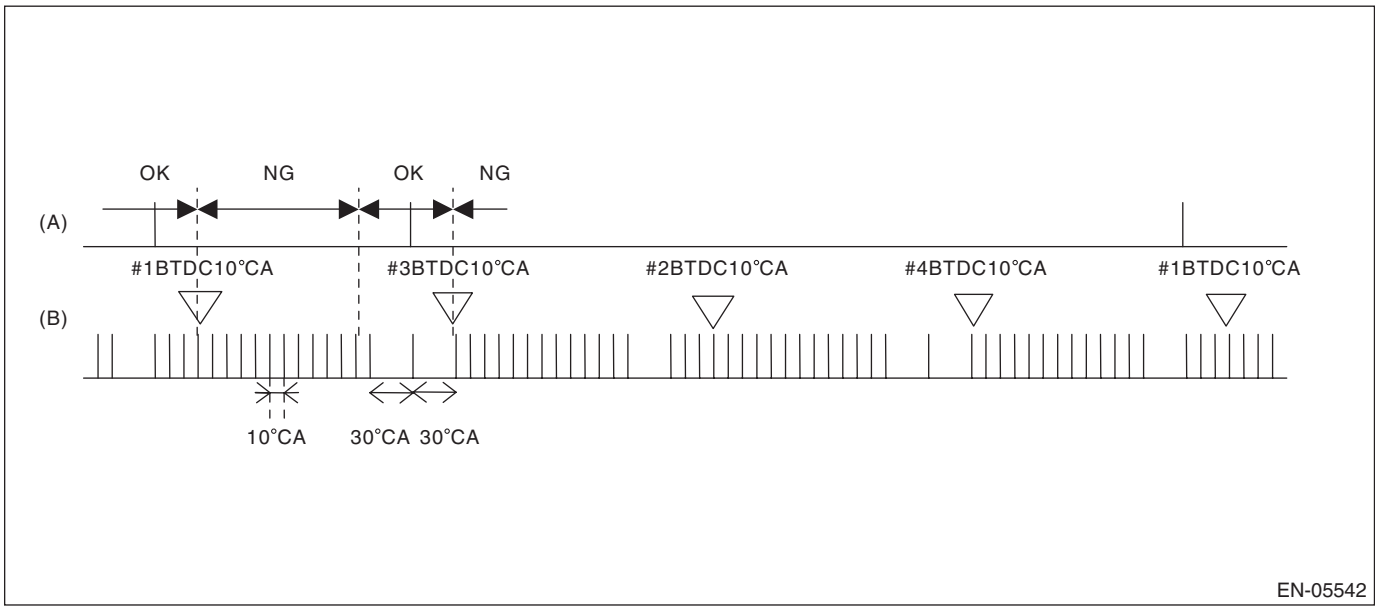
Memorize the freeze frame data. (For test mode $02)

BK:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

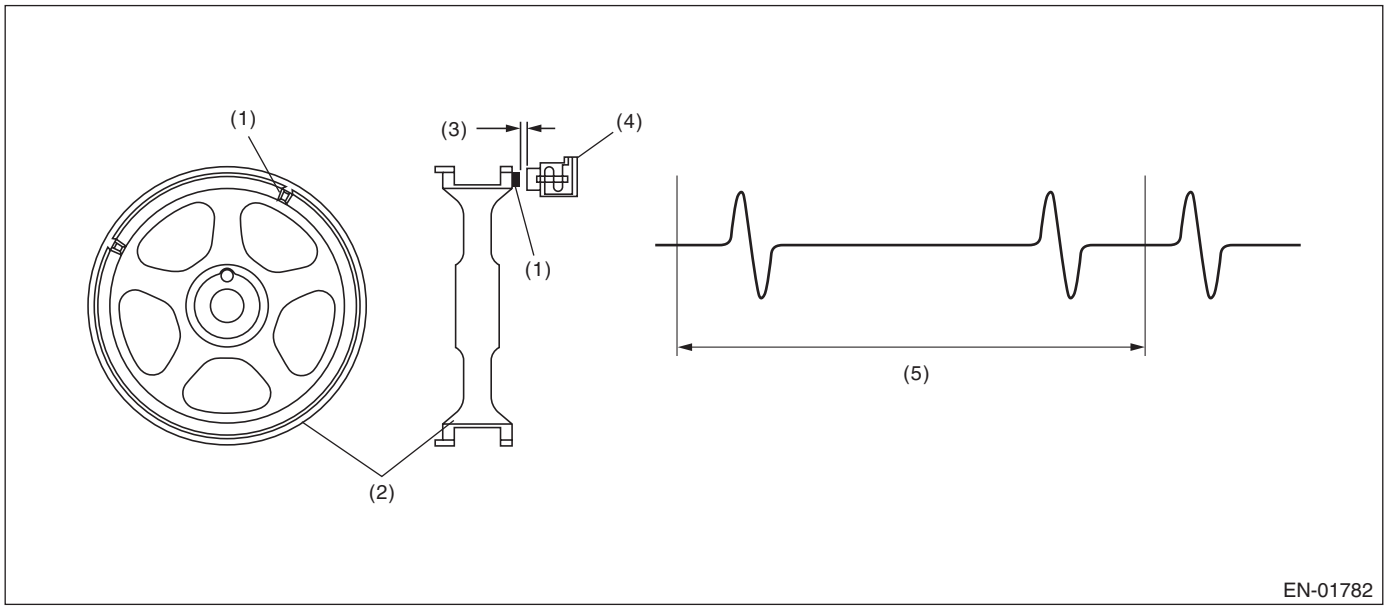
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of camshaft position sensor output property. Judge NG when the camshaft line signal input timing is shifted from the crankshaft signal because of timing belt tooth chip, etc.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Camshaft one revolution (Engine two revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Cylinder number distinction	Completed
Battery voltage	≥ 8 V
Engine speed	550 ←→ 1000 rpm
Engine operation	In idle
Misfire	Not detect

4. GENERAL DRIVING CYCLE

Perform the diagnosis at idling continuously.

5. DIAGNOSTIC METHOD

Judge NG when the engine speed continues 5 revolutions for the malfunction criteria below. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Position of camshaft position sensor signal	Not between BTDC 10°CA and BTDC 80°CA

Time Needed for Diagnosis: 5 revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

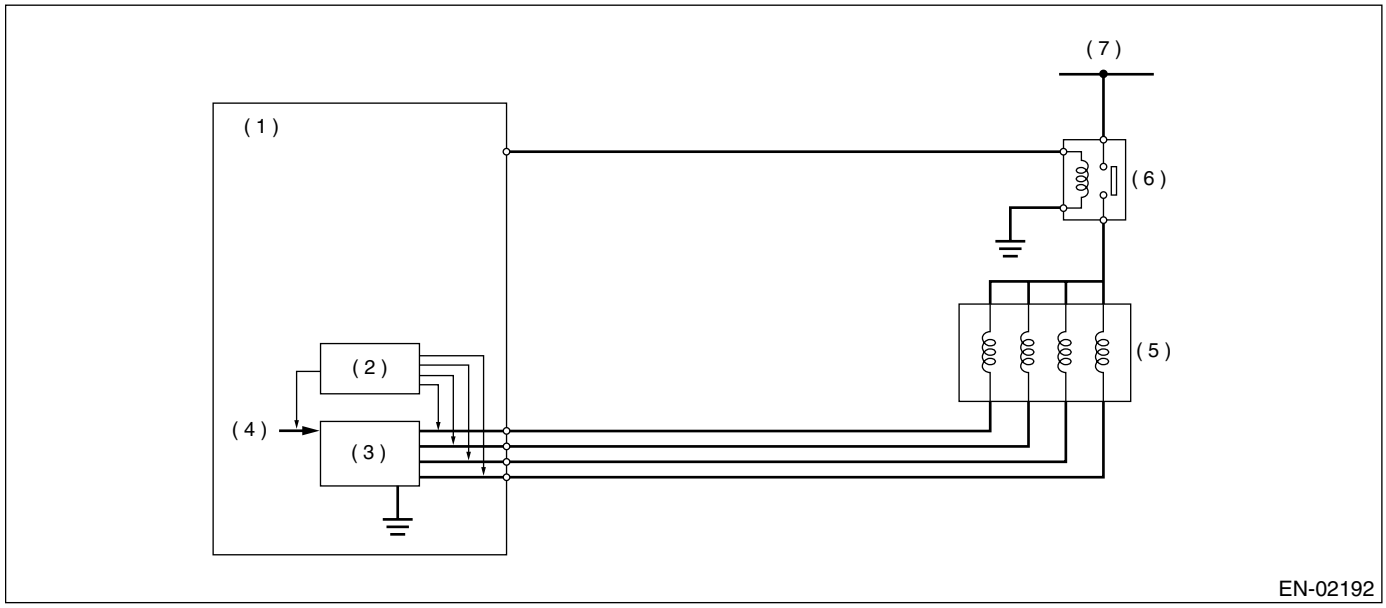
Memorize the freeze frame data. (For test mode $02)

BL:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of EGR system.
Intake manifold pressure (negative pressure) is stable because the throttle valve is fully closed during the fuel shut-off in deceleration. In this case, the intake manifold pressure changes when EGR valve is opened or closed. Judge EGR system is OK or NG according to intake manifold pressure change amount.

2. COMPONENT DESCRIPTION



(1) ECU
(2) Detecting circuit
(3) Switching circuit
(4) CPU
(5) EGR valve
(6) Main relay
(7) Battery voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	40 secs. or more
Engine coolant temperature	≥ 70°C (158°F)
Engine speed	1000 ←→ 3000 rpm
Intake manifold pressure (absolute pressure)	13.3 ←→ 38.7 kPa (100 ←→ 290 mmHg, 3.94 ←→ 11.42 inHg)
Estimated ambient temperature	≥ 5°C (41°F)
Throttle position	< 0.25°
Battery voltage	> 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Vehicle speed	≥ 48 km/h (30 MPH)
Fuel shut-off function	Operation
Neutral switch	OFF and 1 second after changing from "ON" to "OFF"
Load (air conditioner, power steering, lights, rear defroster, heater fun and radiator fan)	5 secs. or more no change
Amount of EGR actual step = condition of 0 step	Continuing for 2 seconds or more.

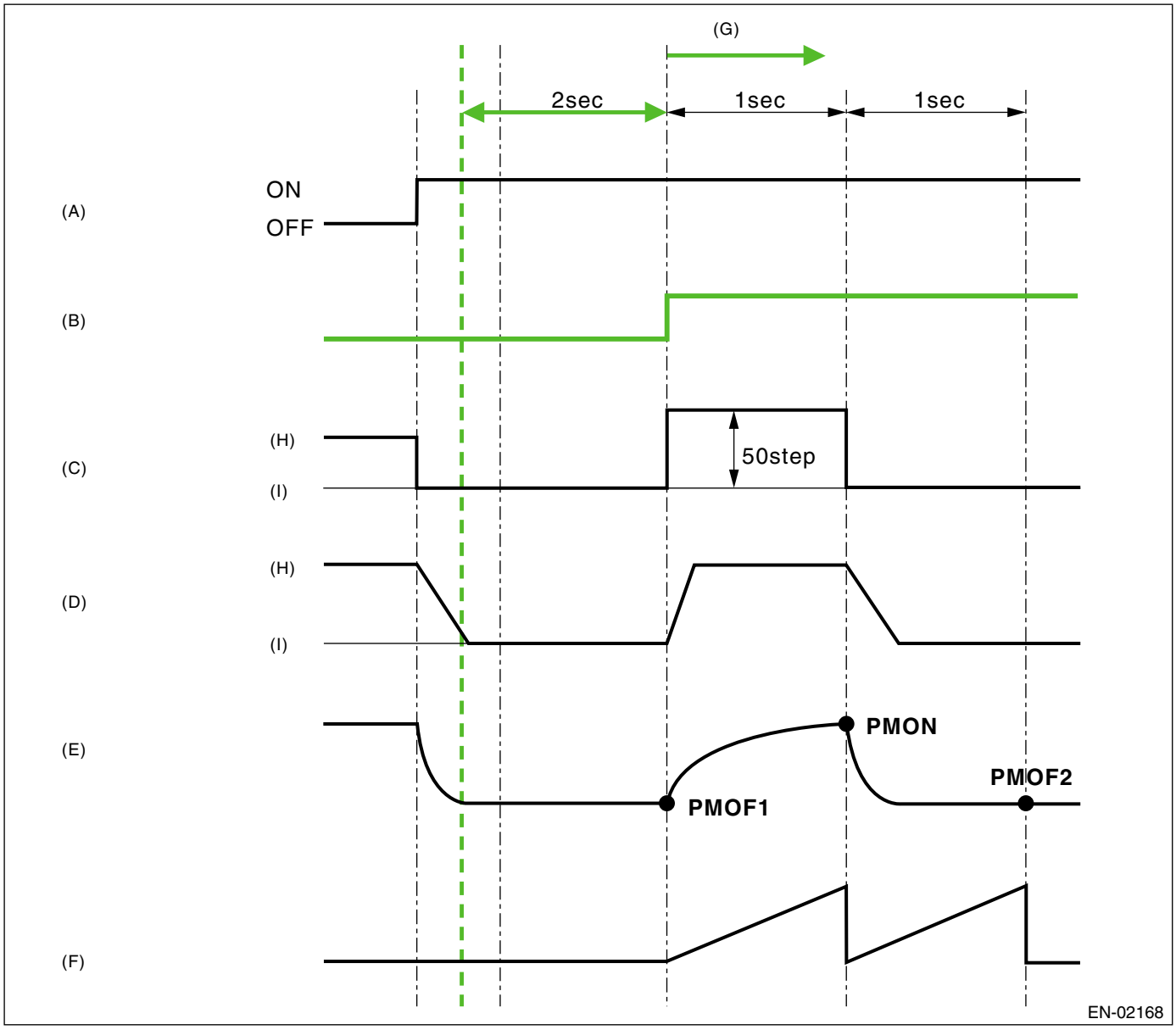
4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at the fuel shut-off in deceleration in vehicle speed more than 48 km/h (approx. 30 MPH). Pay attention to vehicle speed and engine speed. (The diagnosis is not completed if vehicle speed and engine speed are out of condition due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure in the following procedures when the enable conditions are completed, and then diagnosis by calculating the result.
(1) PMOF1 is equal to the intake manifold pressure at enable condition completed, and EGR target step is set to 50 steps (almost fully opened).
(2) PMON is equal to the intake manifold pressure in 1 second after EGR target step is set 50 steps (when enable conditions are completed), and EGR target step is set to 0 step.

(3) PMOF2 is equal to the intake manifold pressure in 1 second after EGR target step is set to 0 step (in 2 seconds after enable conditions are completed).
4) Calculate the judged value using the following formula.
Judged value = [PMON - (PMOF1 + PMOF2)/2]
Judged value < 18.63 mmHg, 2.48 kPa (18.63 mmHg, 0.733 inHg) → NG
Judged value ≥ 2.48 kPa (18.63 mmHg, 0.733 inHg) → OK
Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.



(A) Fuel shut-off in deceleration
(B) Diagnosis enable condition
(C) EGR target step
(D) EGR actual step
(E) Intake manifold pressure (At normal condition)
(F) Diagnosis mode timer
(G) Diagnosis starts.
(H) Open
(I) Close

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

A/F main learning: Not allowed
Knock learning: Not allowed
EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

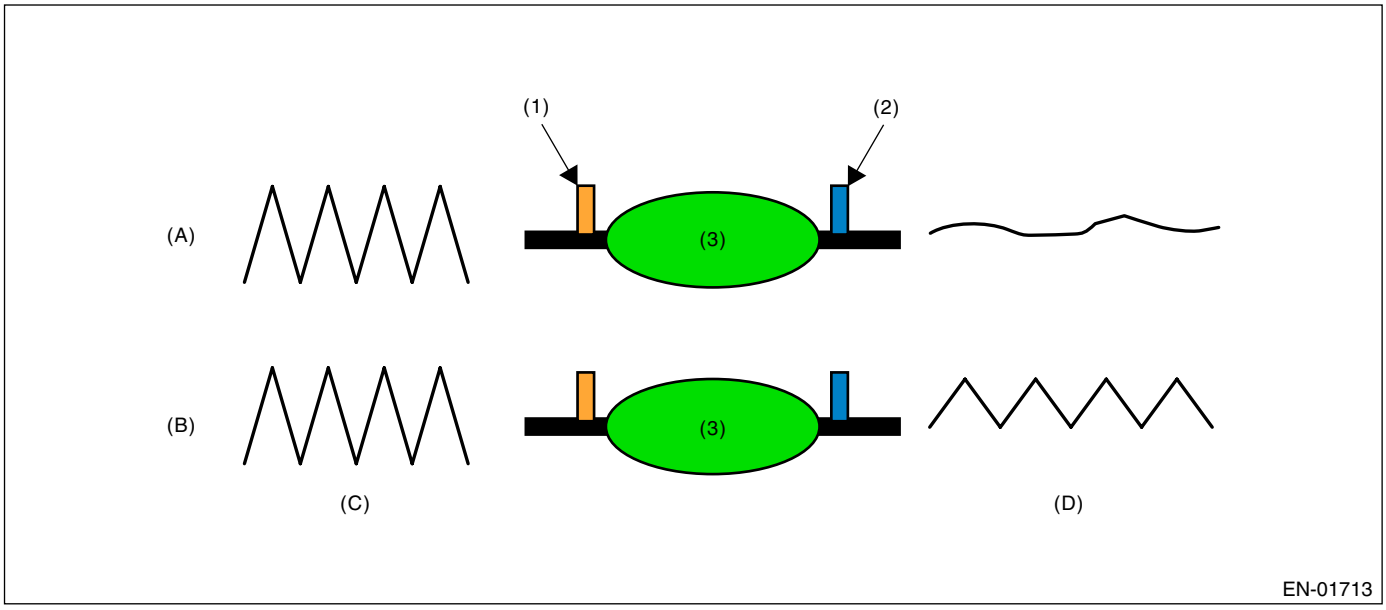
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

BM:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.
Though the front oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the front oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Front oxygen sensor
(3) Catalyst
(A) Normal
(B) Deterioration
(C) Front oxygen (A/F) sensor waveform
(D) Front oxygen sensor waveform

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Catalyst warm-up counter on Map 2	≥ 8000
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (43.5 MPH)
Amount of intake air	10 ←→ 40 g (0.35 ←→ 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 0.02 g/rev
Rear O_2 output change from below 660 mV to over	Experienced after fuel cut
After engine starting	≥ 210 seconds
Purge execution cumulative time	5 seconds or more

• Map 2

Add the following value every 512 milliseconds.

Amount of intake air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)	22.4 (0.790)	25.6 (0.903)	28.8 (1.016)	32 (1.129)	35.2 (1.242)
Integrated value for warm-up counter	–8	–8	20	32	52	82	113	143	173	204	234	264

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed 70 km/h (43 MPH).

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor (with right and left) and output fluctuation value of front oxygen sensor (with right and left).
Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value. (With right and left)
Diagnostic values on both sides are added and total is considered as a final diagnostic value.
Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Total value which was added from the diagnostic values on both sides.	> 11.6

Time Needed for Diagnosis: 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

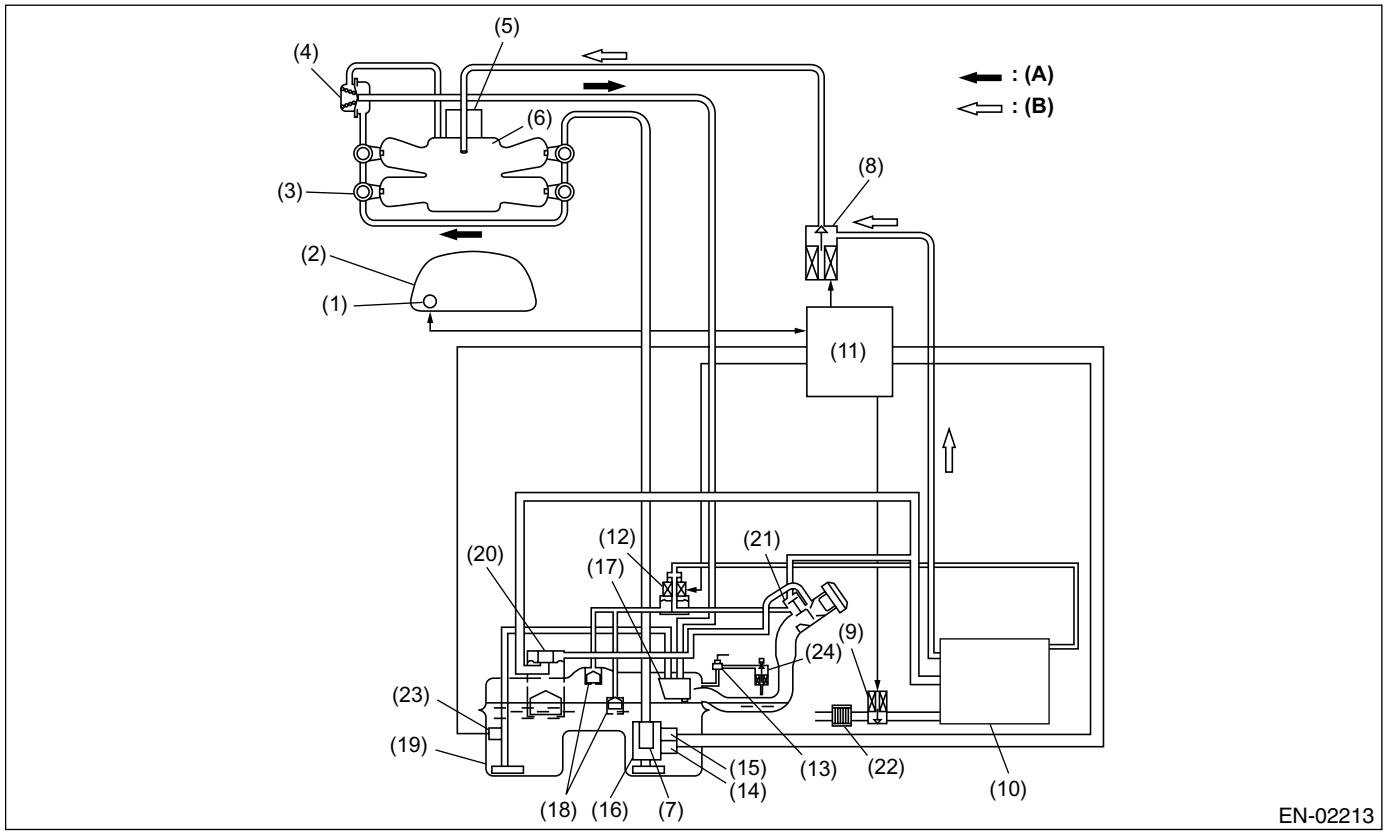
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

MEMO:

BN:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

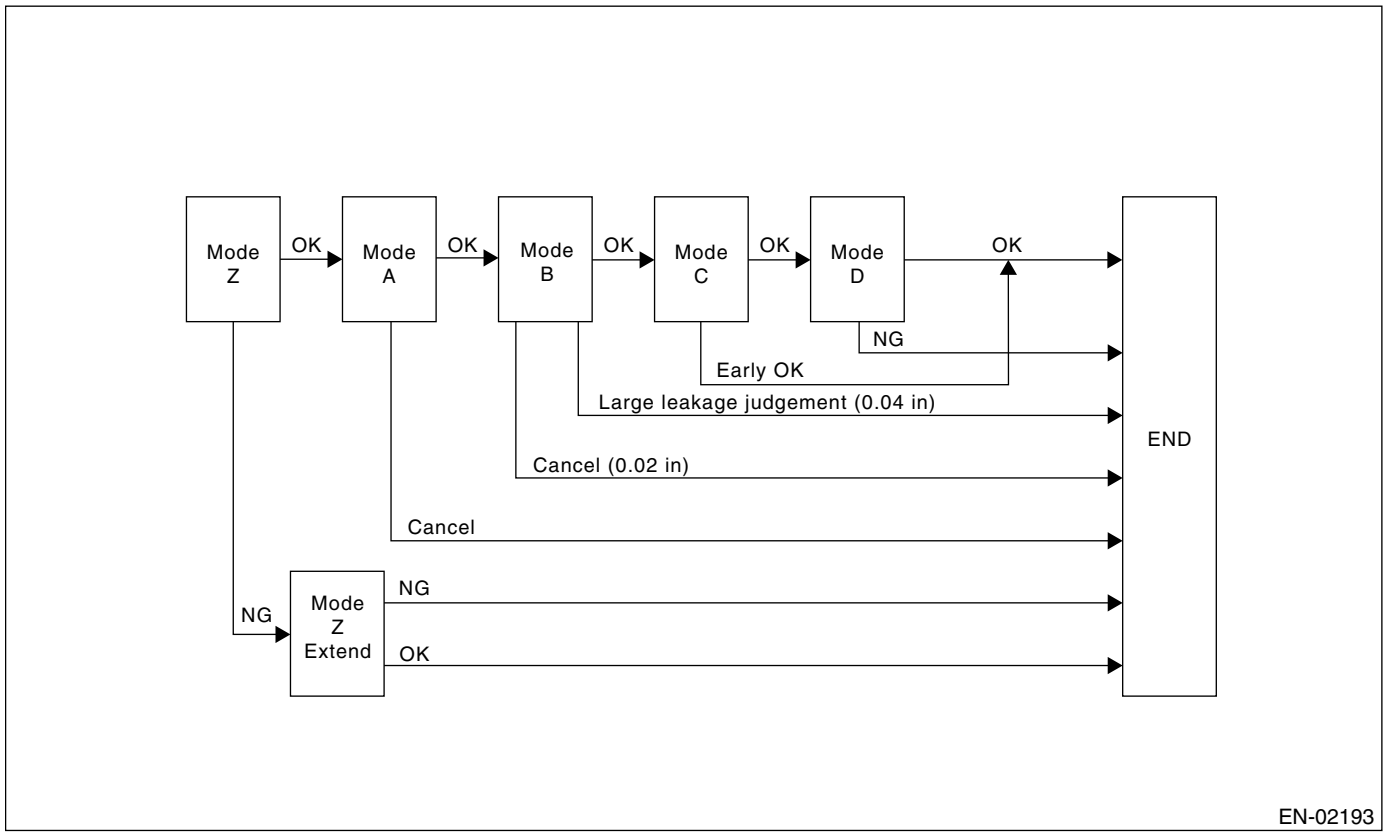
Perform the diagnosis of leakage of fuels system and valve functions.



(1) Fuel meter
(2) Combination meter
(3) Fuel injector
(4) Pressure regulator
(5) Throttle body
(6) Intake manifold
(7) Fuel filter
(8) Purge control solenoid valve
(9) Drain valve
(10) Canister
(11) Engine control module (ECM)
(12) Pressure control solenoid valve
(13) Fuel tank pressure sensor
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel tank
(20) Vent valve
(21) Shut-off valve
(22) Drain filter
(23) Fuel sub level sensor
(24) Tank pressure switching solenoid valve
(A) Fuel line
(B) Evaporation fuel line

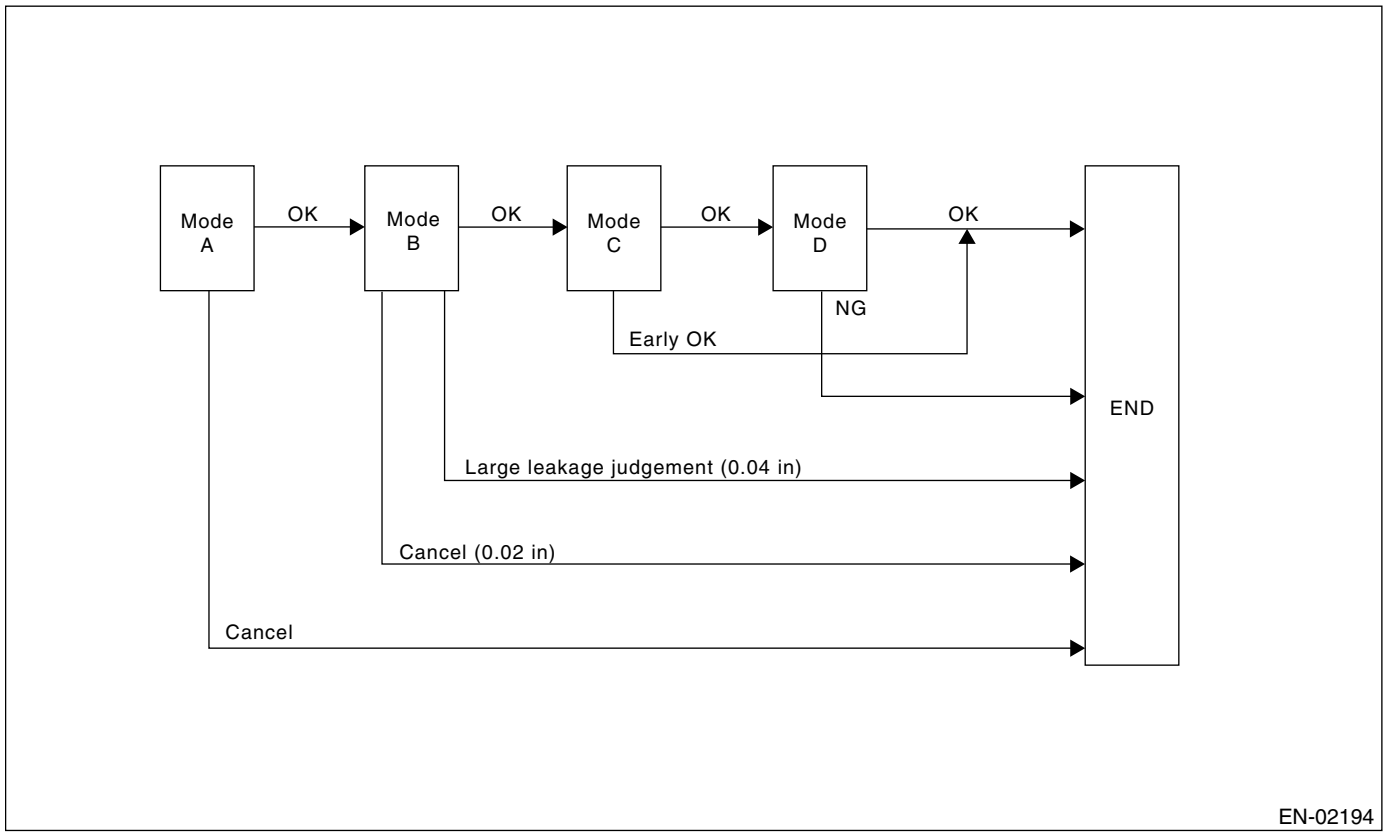
In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure with each solenoid valve switched to ON/OFF, and monitoring the pressure change using the fuel tank pressure sensor. 0.04-inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C and mode D, and 0.02-inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C and mode D.

• 0.04-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis)	Diagnosis starts when there is a chagne in fuel tank pressure amount. Purge control solenoid valve open trouble diagnosis begins.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	10 seconds

• 0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	28 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	5 — 14 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	1 — 36 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	24 seconds

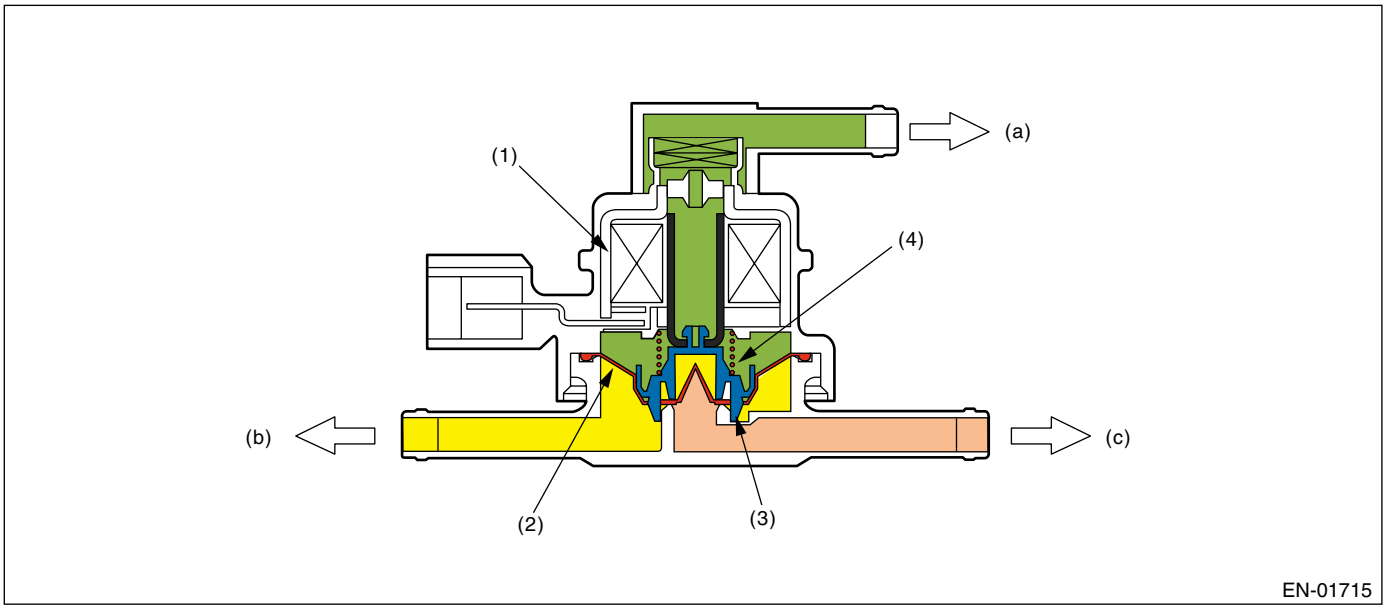
• Mode Table for Evaporative Emission Control System Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached.		None
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in)].	P0442
		EVAP. system is judged to have small leak [0.5 mm (0.02 in.)].	P0456

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

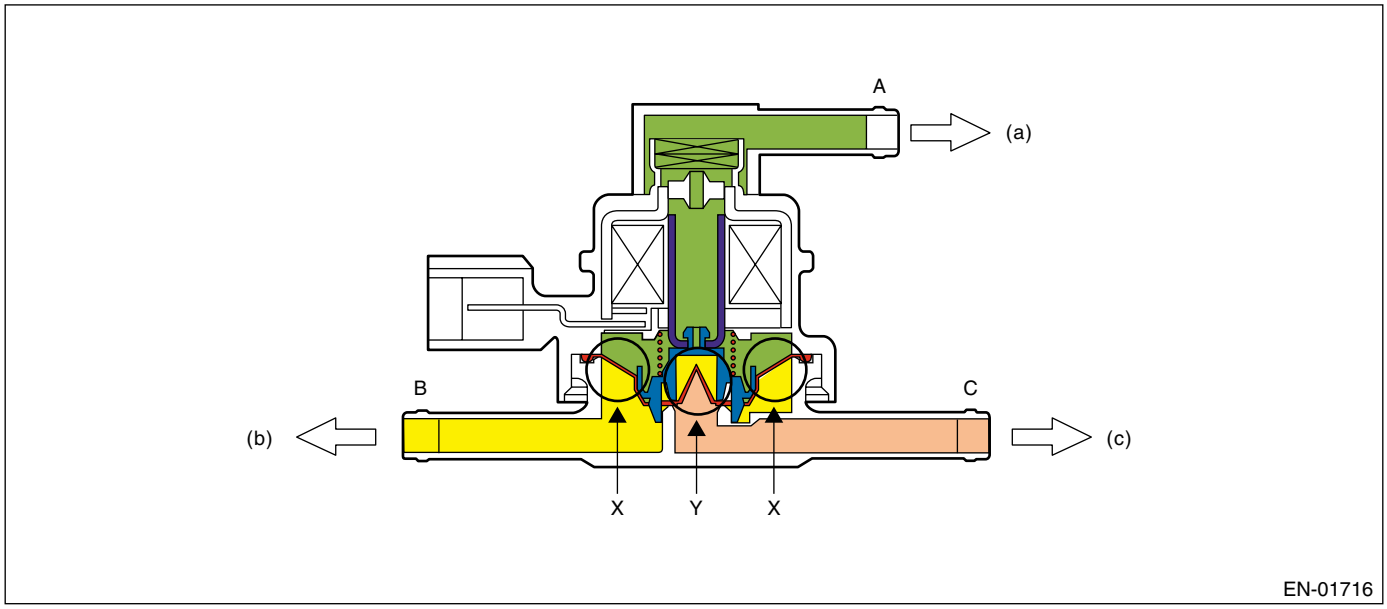
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

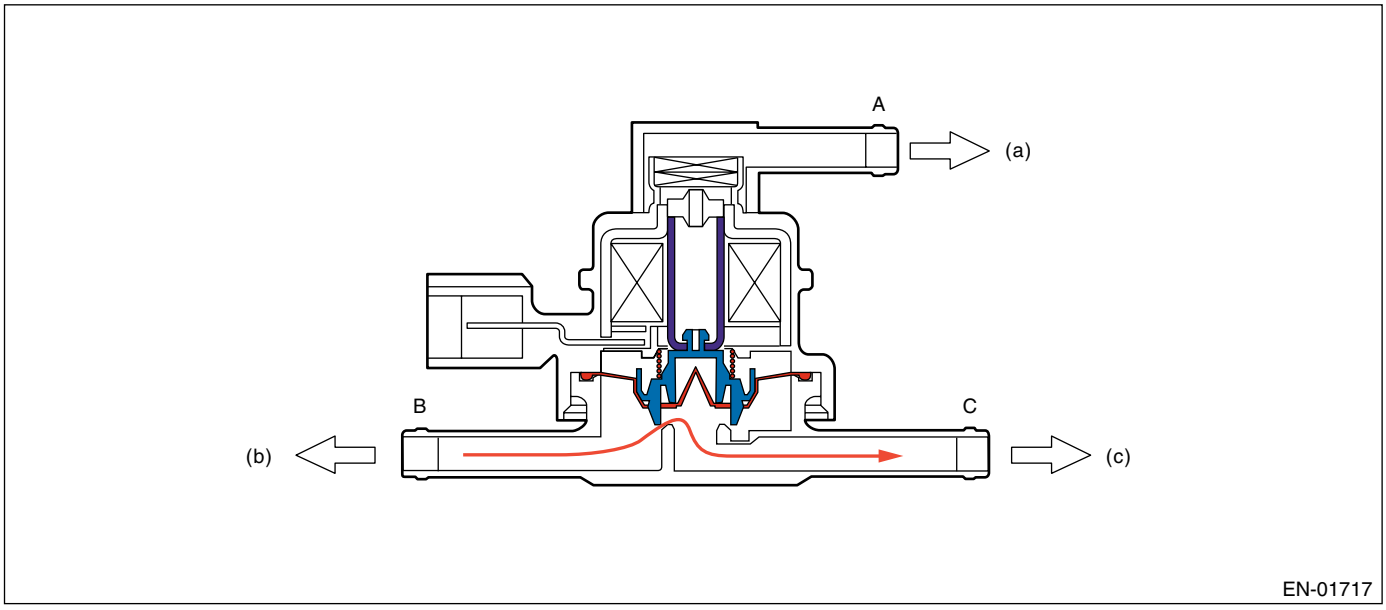
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Atmospheric pressure (b) Fuel tank (c) Canister

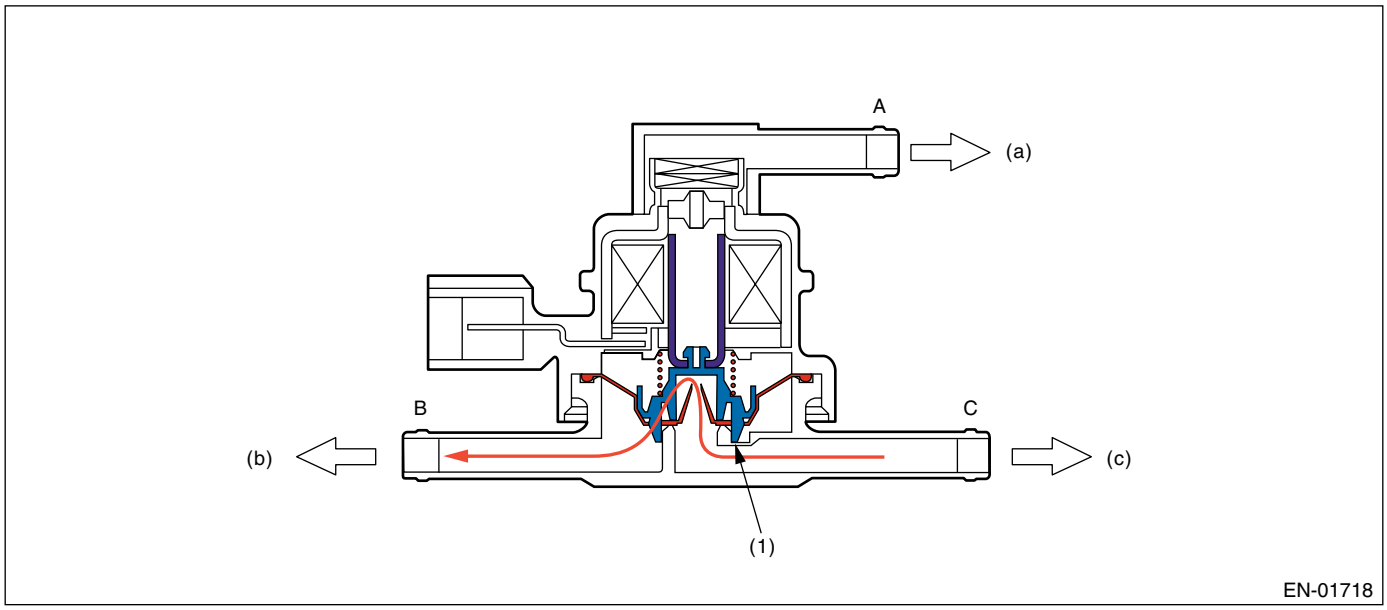
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



(a) Atmospheric pressure (b) Fuel tank (c) Canister

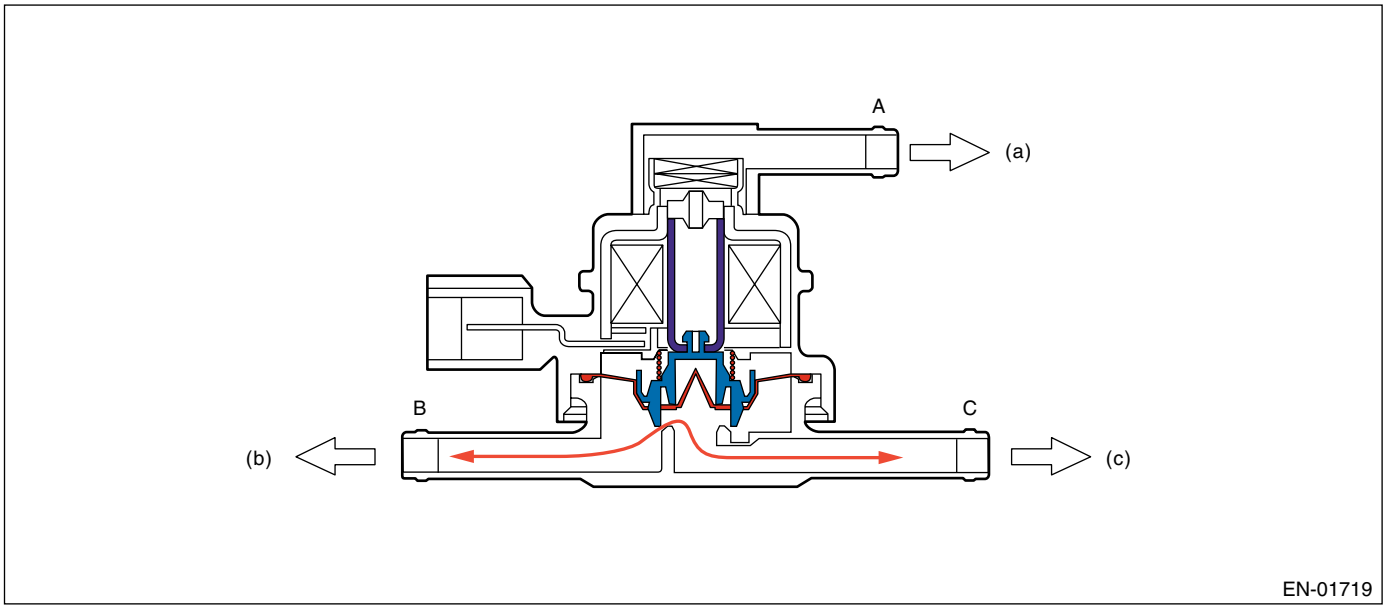
• When B < C (Solenoid OFF)



(1) Valve

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• When Solenoid is ON



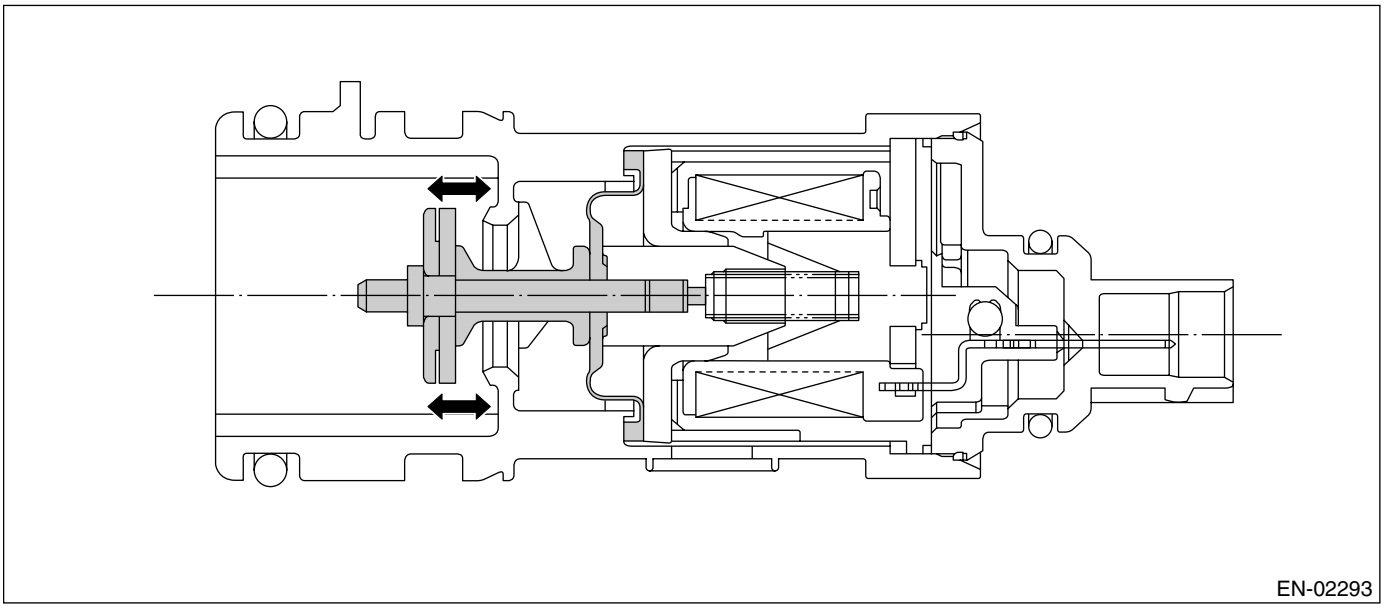
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

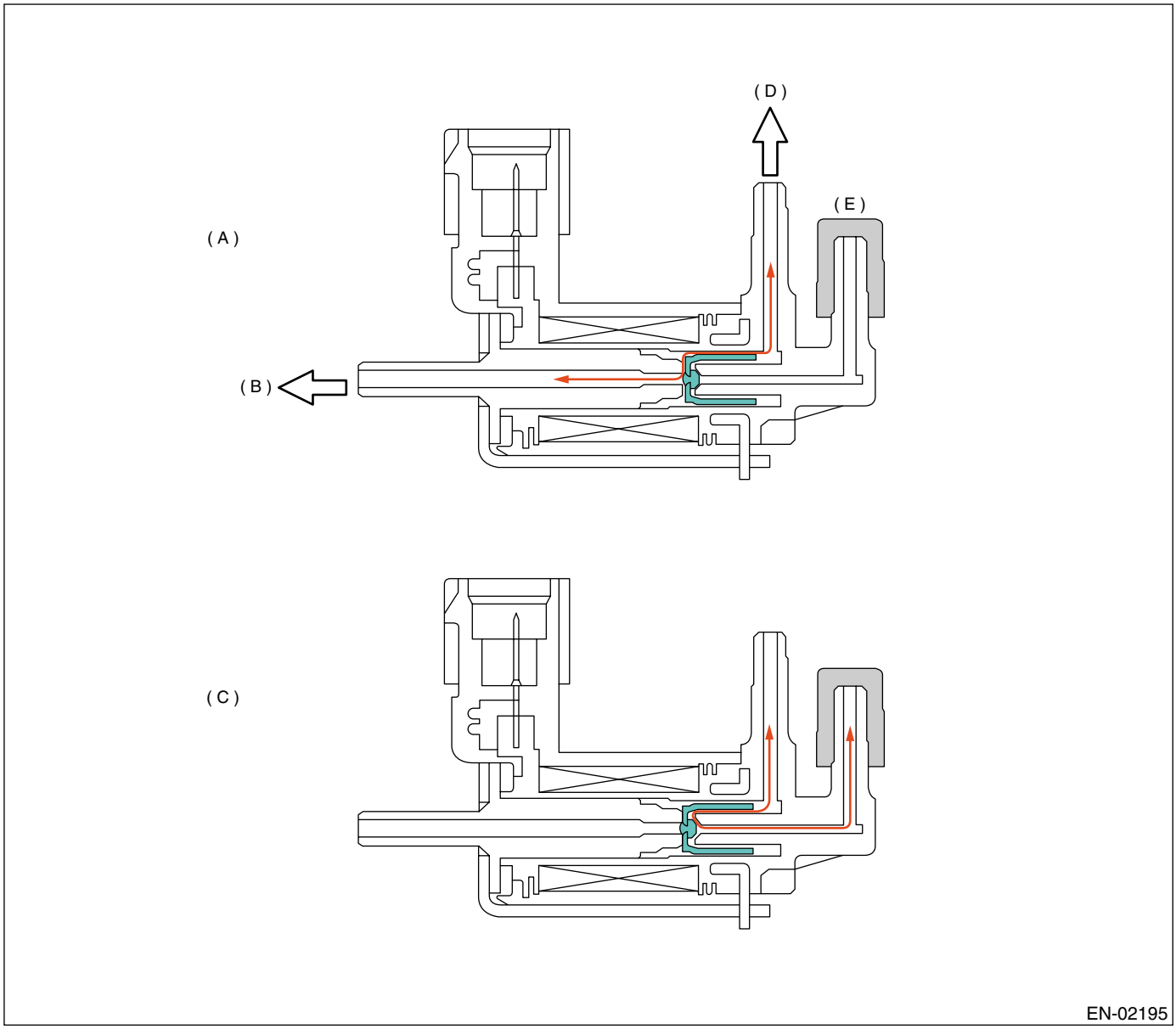
• CCV

CCV controls the ambient air to be introduced to the canister.



• Tank Pressure Switching Solenoid

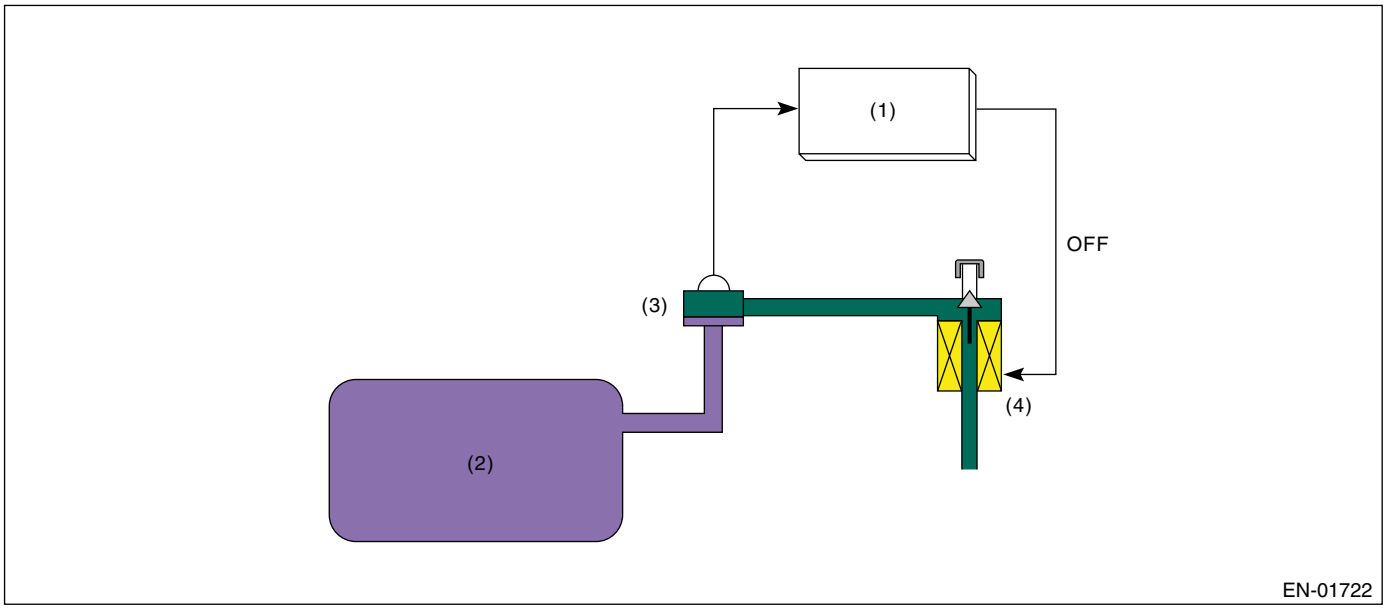
One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid is set to ON at diagnosis and the passage open to atmosphere can be closed.



(A) Released to atmosphere (Solenoid OFF)
(B) Ambient air
(C) During diagnostics (Solenoid ON)
(D) To pressure sensor
(E) Plug

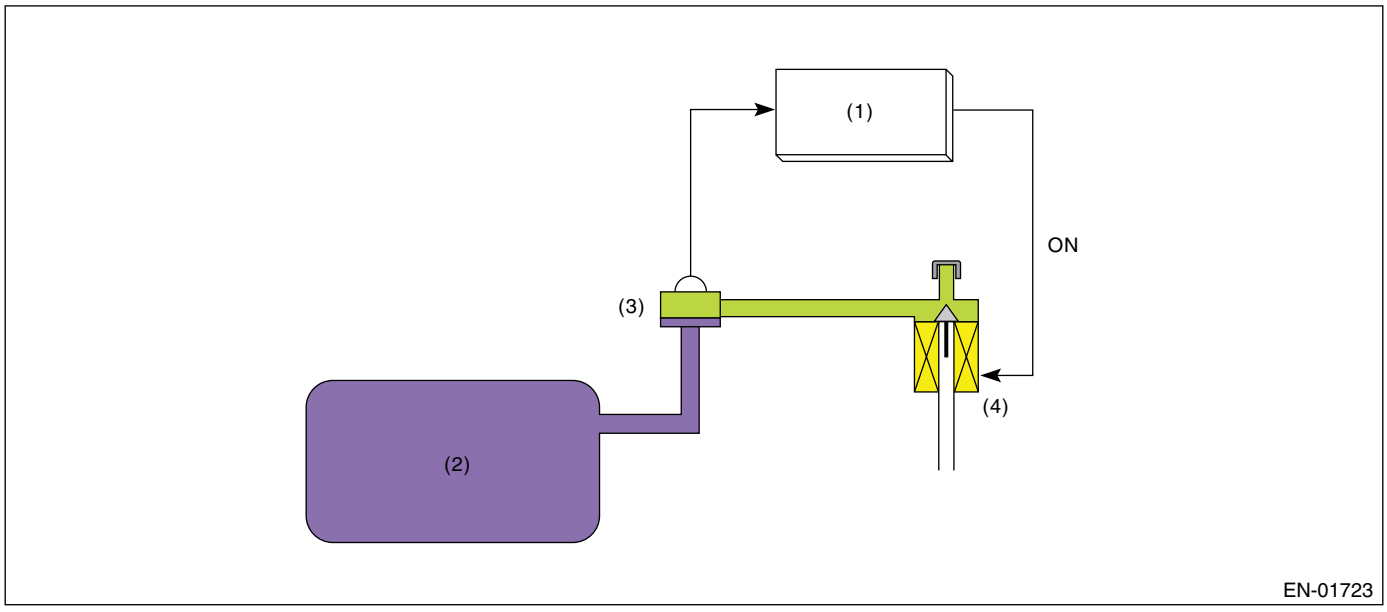
• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.
Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.08
Engine speed	1050 ←→ 6500 rpm
Fuel tank pressure	≤ –1.43 kPa (–10.7 mmHg, –0.42 inHg)
Intake manifold vacuum (relative pressure)	< –26.7 kPa (–200 mmHg, –7.87 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9 ←→ 48 ℓ (2.54 ←→ 12.68 US gal, 2.11 ←→ 10.56 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	–10 ←→ 45°C (14 ←→ 113°F)
Intake air temperature	≥ –10°C (14°F)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.04 inHg)
Min. pressure change per second – Max. pressure change per second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Fuel level change	< 3.0 ℓ (2.1 US qt, 1.8 Imp gal)/128 milliseconds
Air fuel ratio	> 0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	≥ 120 seconds
After engine starting	335 second or more
Fuel temperature	–10 ←→ 35°C (14 ←→ 95°F) < 2400 seconds
Or engine coolant temperature at engine start	< 40°C (104°F)
And time after engine start	< 2400 seconds
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.68 US gal, 2.11 ←→ 10.56 Imp gal)
(Ambient – fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below –3.01 kPa (–22.8 mmHg, –0.88 inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	< –8.0 kPa (–60 mmHg, –2.36 inHg)
Fuel tank pressure	–0.13 — 1.27 kPa (–1 — 9.5 mmHg, –0.04 — 0.37 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	≥ 1500 rpm
(During diagnosis)	
P1	–0.07 ←→ 0.13 kPa (–0.5 ←→ 1.0 mmHg, 0.020 ←→ 0.039 inHg)
Pressure change per second	< 0.13 kPa (0.96 mmHg, 0.04 inHg)
Fuel level change	2 ←→ 3 ℓ (2.1 ←→ 3.2 US qt, 1.8 ←→ 2.6 Imp qt)
Tank pressure	< 1.40 kPa (10.5 mmHg, 0.41 inHg)
Min. tank pressure change per second – Max. tank pressure change per second	< 0.23 kPa (1.7 mmHg, 0.067 inHg)
Change of atmospheric pressure during P1 calculation	–0.02 ←→ 0.13 kPa (–0.15 ←→ 0.95 mmHg, –0.006 ←→ 0.037 inHg)
Change of atmospheric pressure during P2 calculation	–0.17 ←→ 0.17 kPa (–1.3 ←→ 1.3 mmHg, –0.051 ←→ 0.051 inHg)

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

• Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
• Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

• Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and judged OK or NG.
• If not judged OK or NG, repeat the diagnosis.
• Pay attention to the fuel temperature and fuel level.

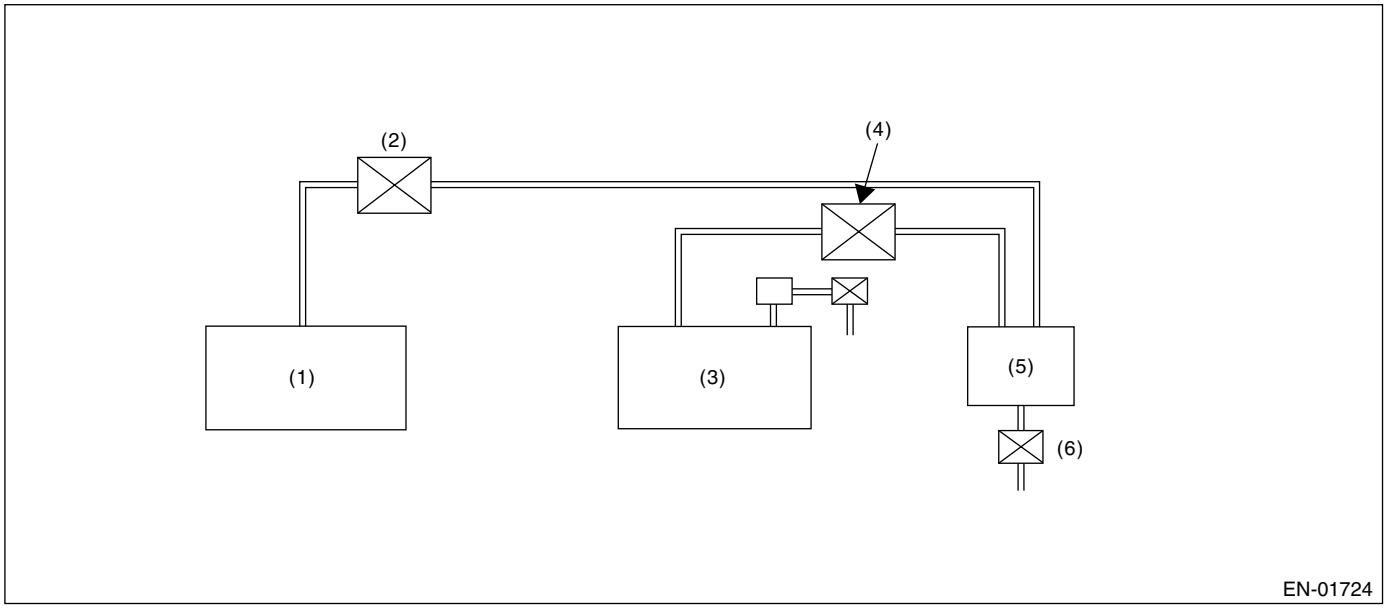
5. DIAGNOSTIC METHOD

• MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

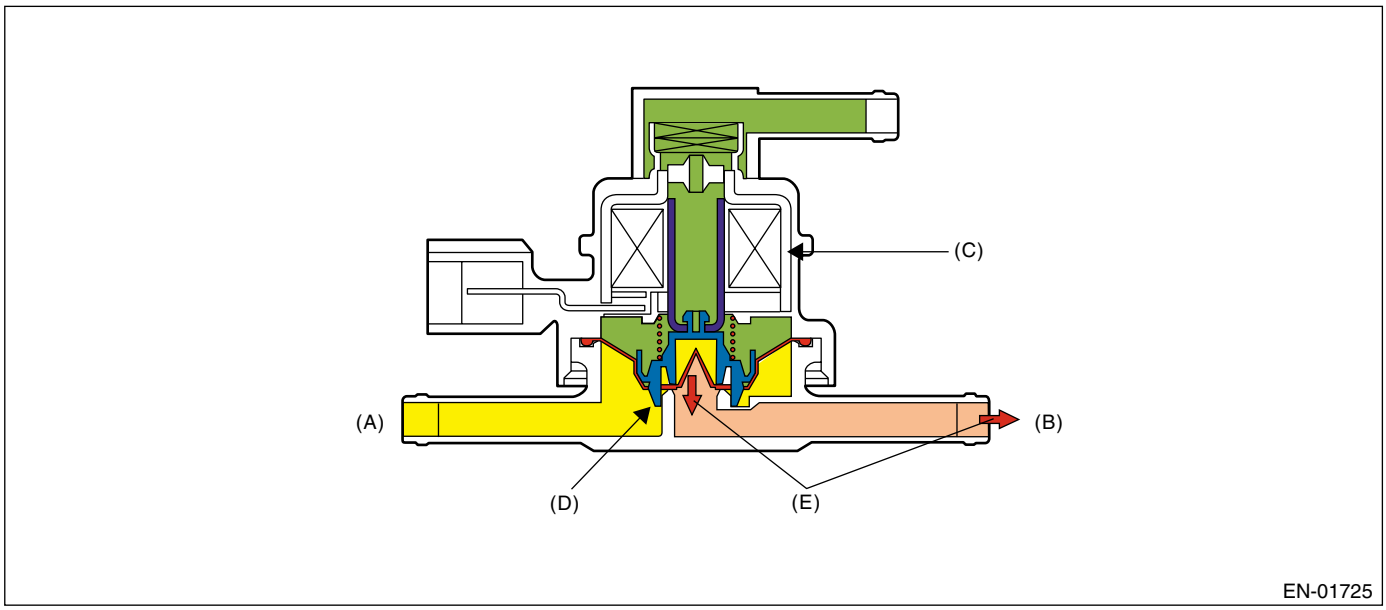
DTC P0457

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CPC has to operate normally. Therefore, mode Z is used to diagnose the CPC open fixation.
If the CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.



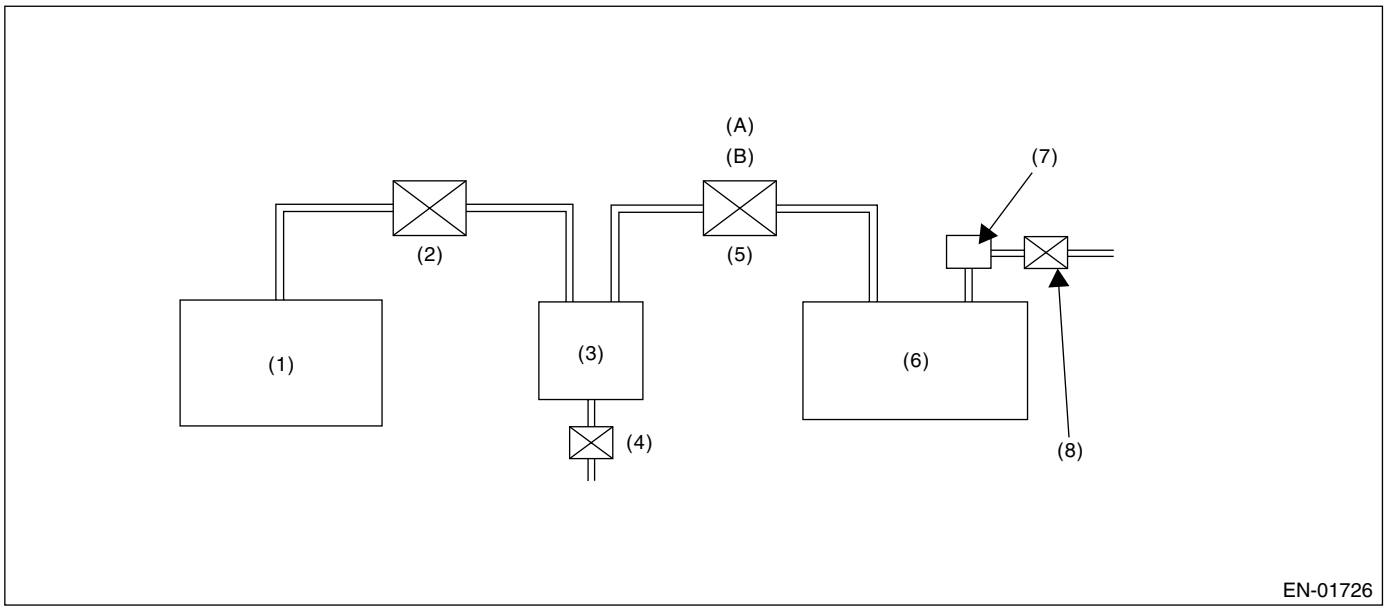
(1) Engine
(2) Purge control solenoid valve open
(3) Fuel tank
(4) Pressure control solenoid valve close
(5) Canister
(6) CCV stuck close



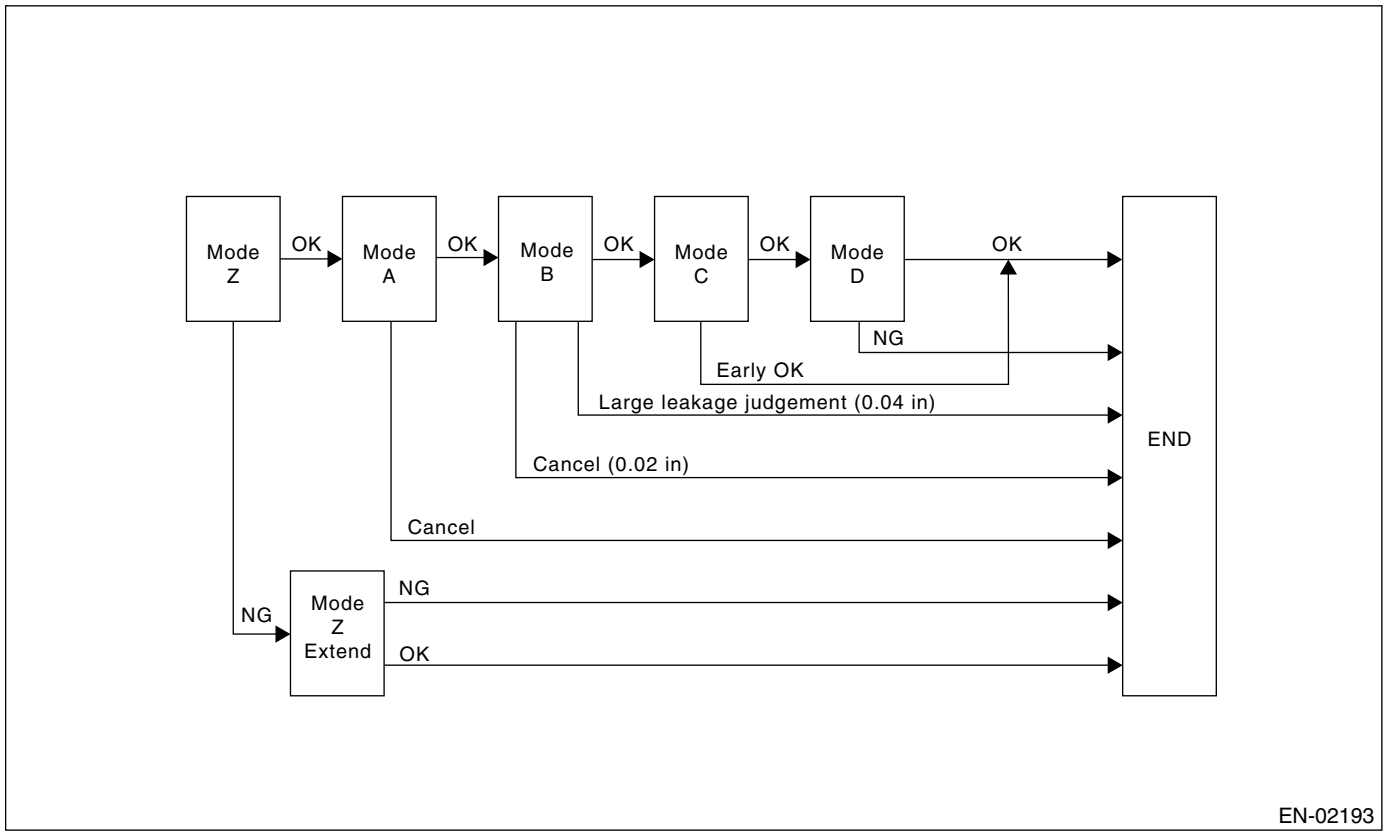
(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

• Diagnostic method

CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Tank pressure switching solenoid valve



• Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

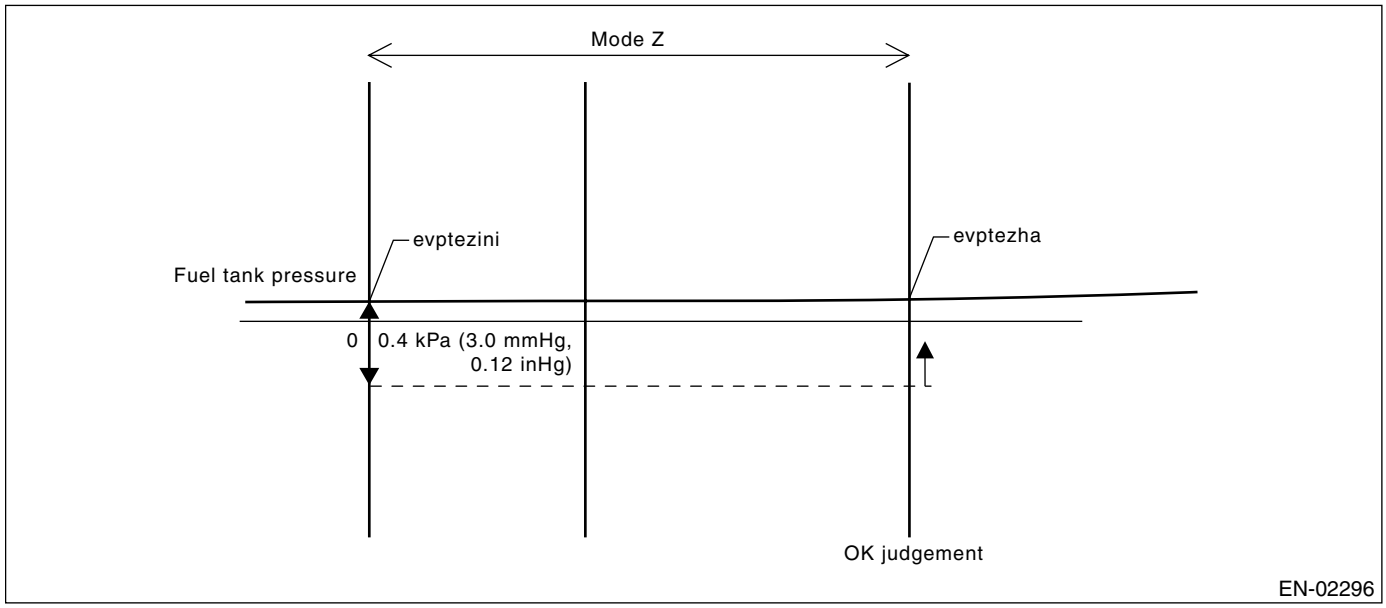
Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) — (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

• Normal Operation



• evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
Judge normal when calculation is completed.

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
TIme for no fuel rolling of 2 ℓ or more	≥ 40 seconds	

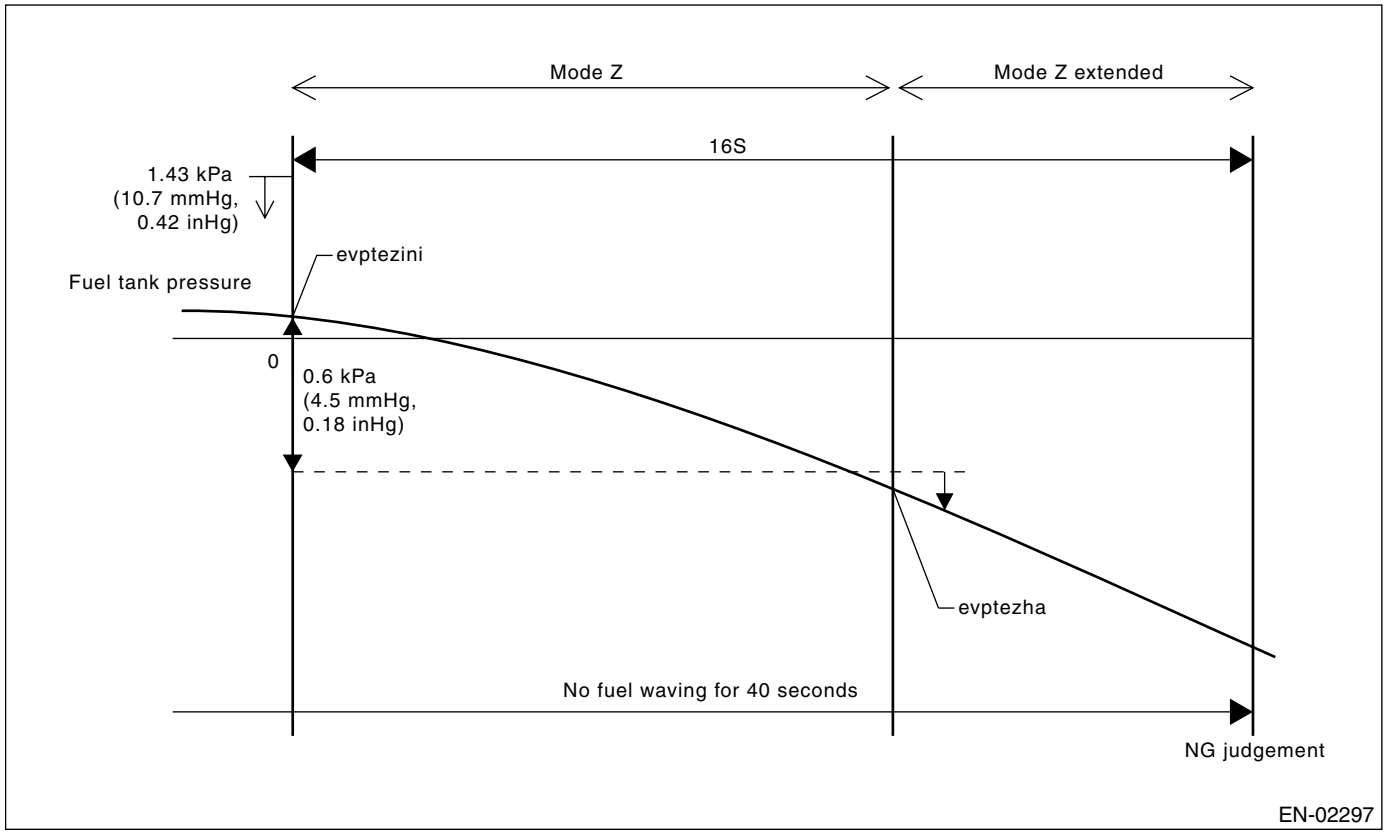
Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Purge Control Solenoid Valve Open Fixation



• evptezini ≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)
• No fuel rolling of above 2 ℓ (0.79 US gal, 0.67 Imp gal) for more than 40 seconds.

Judge normal when these calculations are completed.

• Leak Diagnosis

DTC P0442
DTC P0456
DTC P0457

• Diagnostic method

• The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
• The diagnosis is divided into the following five phases.

Mode A: (Estimation of evaporation gas yield)

The amount of change of tank pressure (P1) in Mode A is calculated. After calculating P1, change to Mode B.

Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.
Approx. 0 → −1.4 kPa (0 → −10.5 mmHg, 0 → −0.41 inHg) (0.04-in diagnosis)
Approx. 0 → −3.05 kPa (0 → −22.9 mmHg, 0 → −0.9 inHg) (0.02-in diagnosis)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.
Judge NG when the malfunction criteria below is completed.
Finish the Evap. diagnosis when judging large leak (10 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (14 seconds) in 0.02-inch diagnosis.

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Or time for Mode B (Min. value of tank pressure during Mode B) − (Tank pressure when Mode B started)	 ≥ 10 seconds < −0.3 kPa (−2 mmHg, −0.08 inHg)	P0457

Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D when the tank pressure returns to the start level of P2 calculation.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Tank pressure when P2 calculation started	Time for immediate OK judgment
0.04-inch diagnosis	−1.3 kPa (−9.75 mmHg, −0.38 inHg)	15 seconds
0.02-inch diagnosis	−3 kPa (−22.5 mmHg, −0.89 inHg)	36 seconds

Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode Z. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform following small leak diagnosis.

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 10 seconds on Mode D P1: Change of tank pressure within 10 seconds on Mode A	> Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

***1.5:** Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

• Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.32 kPa (2.4 mmHg, 0.094 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.35 kPa (2.6 mmHg, 0.102 inHg)	0.35 kPa (2.65 mmHg, 0.104 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.35 kPa (2.6 mmHg, 0.102 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.37 kPa (2.8 mmHg, 0.110 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.40 kPa (3.0 mmHg, 0.118 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.40 kPa (3.0 mmHg, 0.118 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.48 kPa (3.6 mmHg, 0.142 inHg)	0.49 kPa (3.7 mmHg, 0.146 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.43 kPa (3.25 mmHg, 0.128 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.49 kPa (3.65 mmHg, 0.144 inHg)	0.50 kPa (3.75 mmHg, 0.148 inHg)	0.51 kPa (3.85 mmHg, 0.152 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.48 kPa (3.6 mmHg, 0.142 inHg)	0.51 kPa (3.8 mmHg, 0.150 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.53 kPa (4.0 mmHg, 0.157 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 22 seconds on Mode D P1: Change of tank pressure within 22 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

• Map 8 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.32 kPa (2.39 mmHg, 0.094 inHg)	0.32 kPa (2.39 mmHg, 0.094 inHg)	0.37 kPa (2.77 mmHg, 0.109 inHg)	0.73 kPa (5.49 mmHg, 0.216 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.35 kPa (2.63 mmHg, 0.104 inHg)	0.36 kPa (2.68 mmHg, 0.106 inHg)	0.41 kPa (3.04 mmHg, 0.120 inHg)	0.79 kPa (5.92 mmHg, 0.233 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.96 mmHg, 0.117 inHg)	0.39 kPa (2.96 mmHg, 0.117 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.85 kPa (6.34 mmHg, 0.250 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.48 kPa (3.58 mmHg, 0.141 inHg)	0.89 kPa (6.7 mmHg, 0.264 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.51 kPa (3.86 mmHg, 0.152 inHg)	0.93 kPa (7 mmHg, 0.276 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

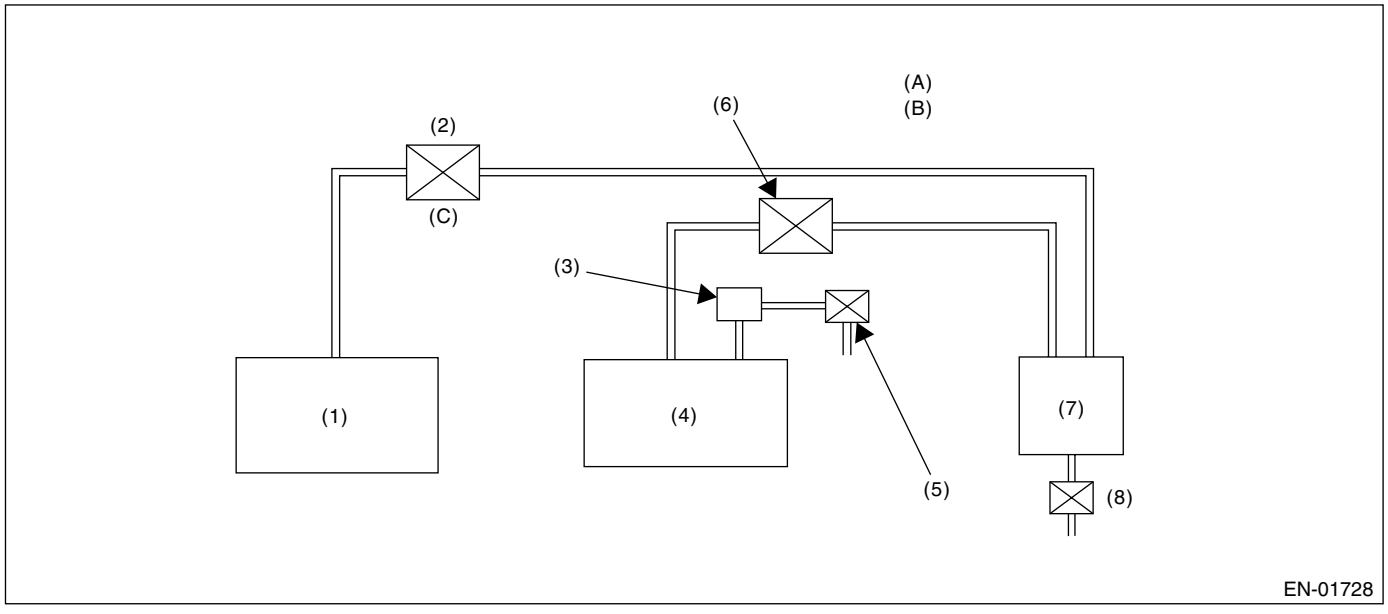
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	< Valve on map 9.	P0456

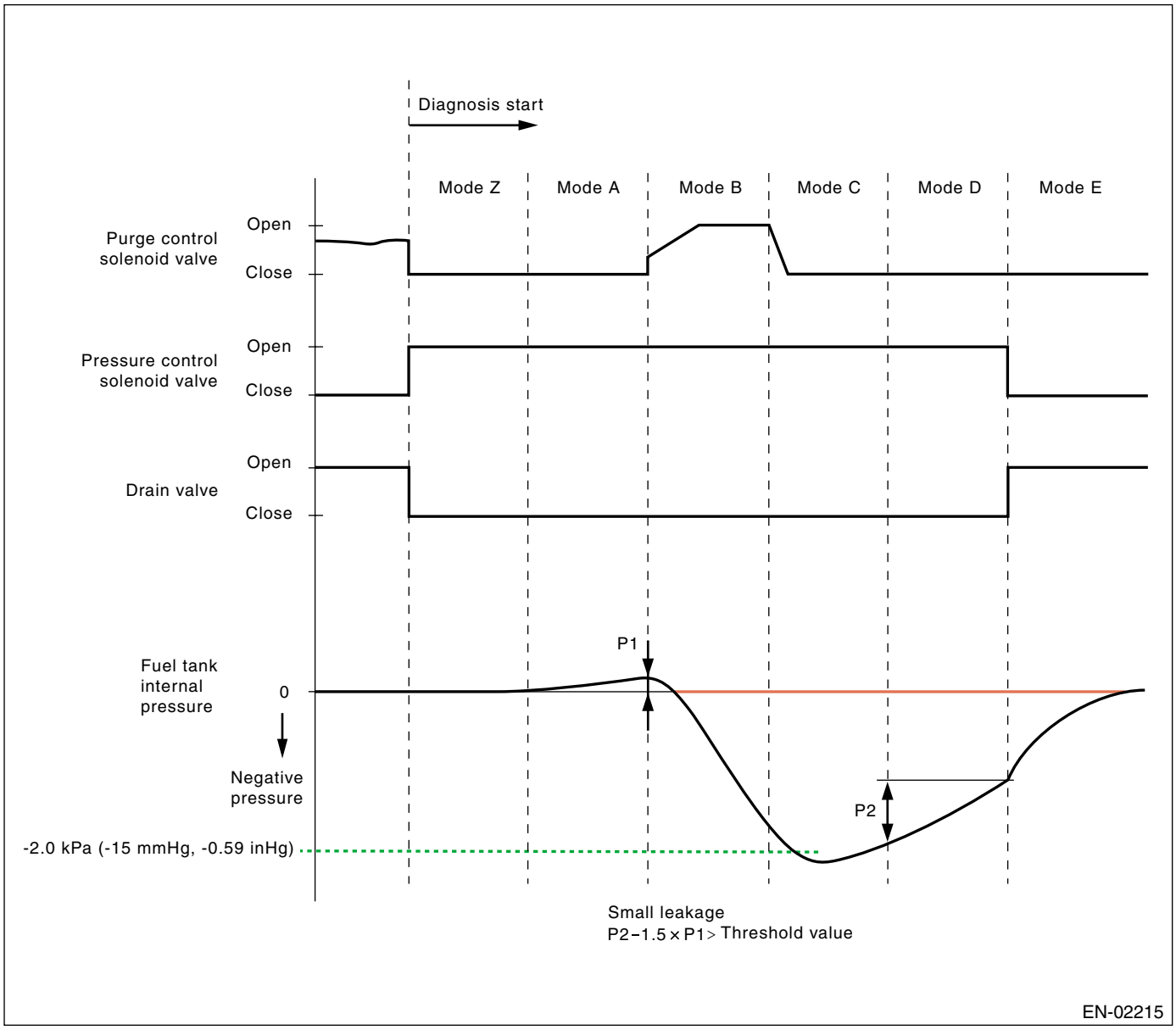
• Map 9.

Fuel temperature & Fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.26 kPa (1.97 mmHg, 0.078 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.33 kPa (2.45 mmHg, 0.096 inHg)	0.37 kPa (2.81 mmHg, 0.111 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.39 kPa (2.92 mmHg, 0.115 inHg)	0.43 kPa (3.26 mmHg, 0.128 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.40 kPa (3.02 mmHg, 0.119 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)	0.37 kPa (2.78 mmHg, 0.109 inHg)

If not judged OK or NG, repeat the diagnosis until judged OK or NG.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve



• Time Needed for Diagnosis:

0.04-inch:	30 — 100 seconds
0.02-inch:	30 — 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

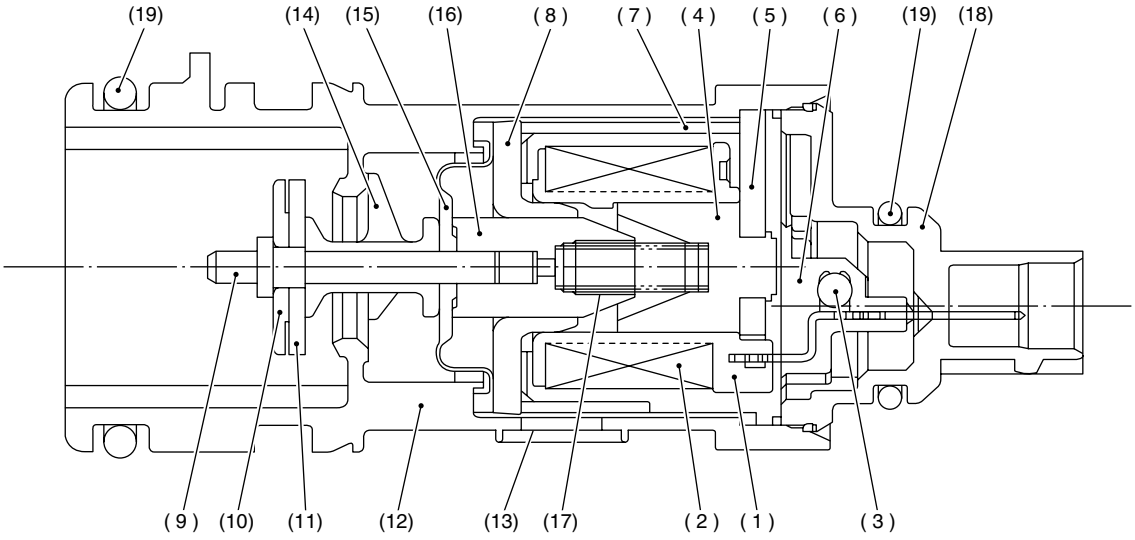
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BO:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Moving core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

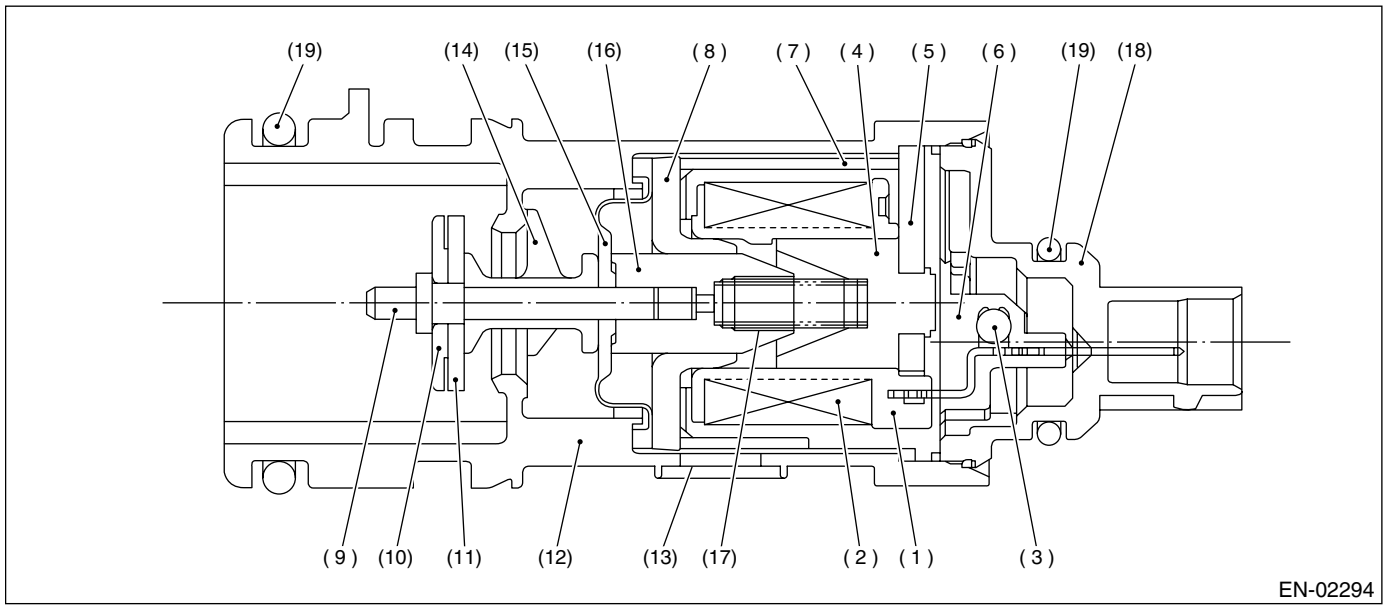
Memorize the freeze frame data. (For test mode $02)

BP:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Moving core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

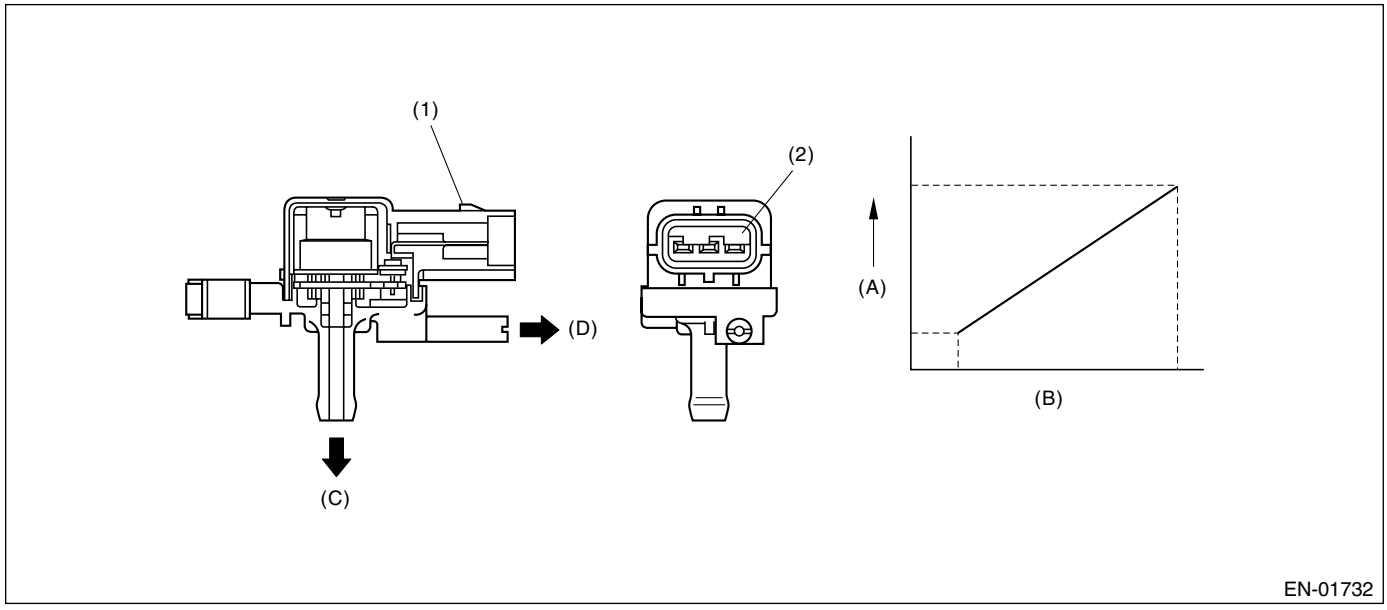
Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	≥ 9.6 ℓ (10.1 US gal, 8.4 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (12.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.
If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.
Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 2 ℓ .
Time Needed for Diagnosis: 1 minute × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

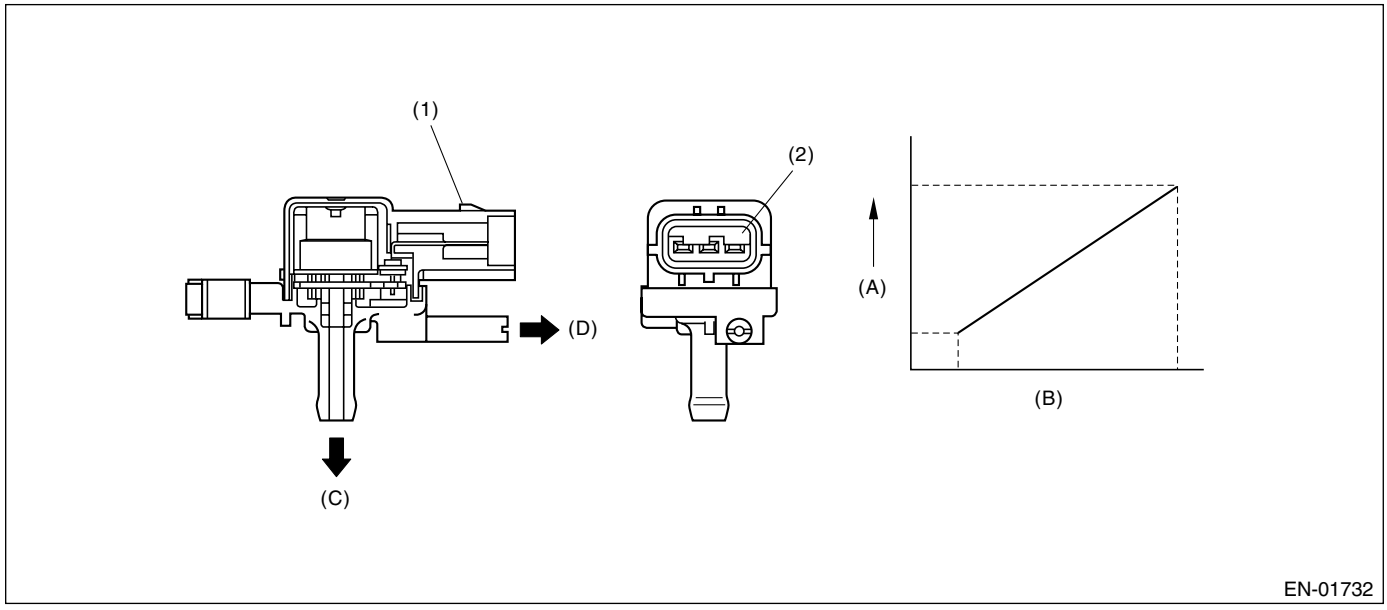
Memorize the freeze frame data. (For test mode $02)

BR:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.44 kPa (–55.86 mmHg, –2.20 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.44 kPa (–55.86 mmHg, –2.20 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

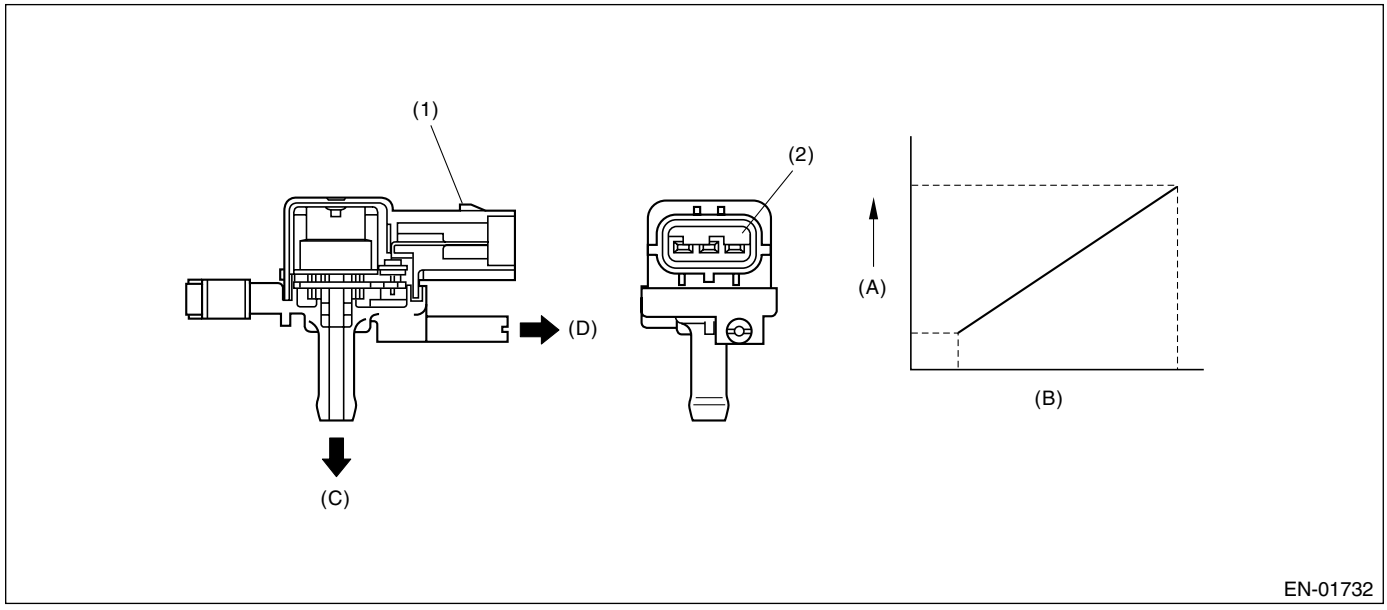
Memorize the freeze frame data. (For test mode $02)

BS:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.86 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.86 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BT:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BU:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

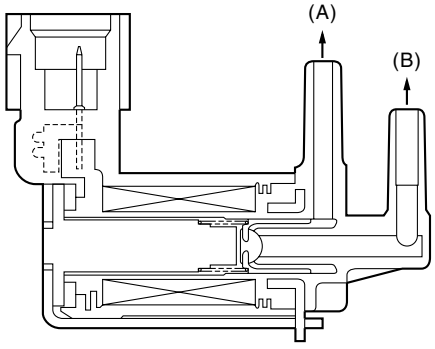
MEMO:

BV:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

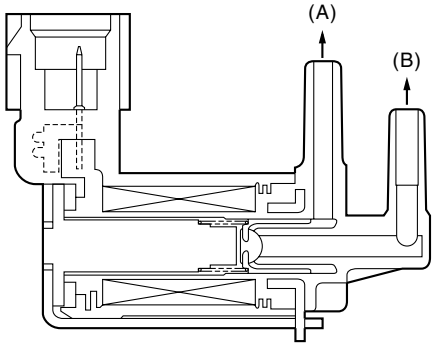
Memorize the freeze frame data. (For test mode $02)

BW:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

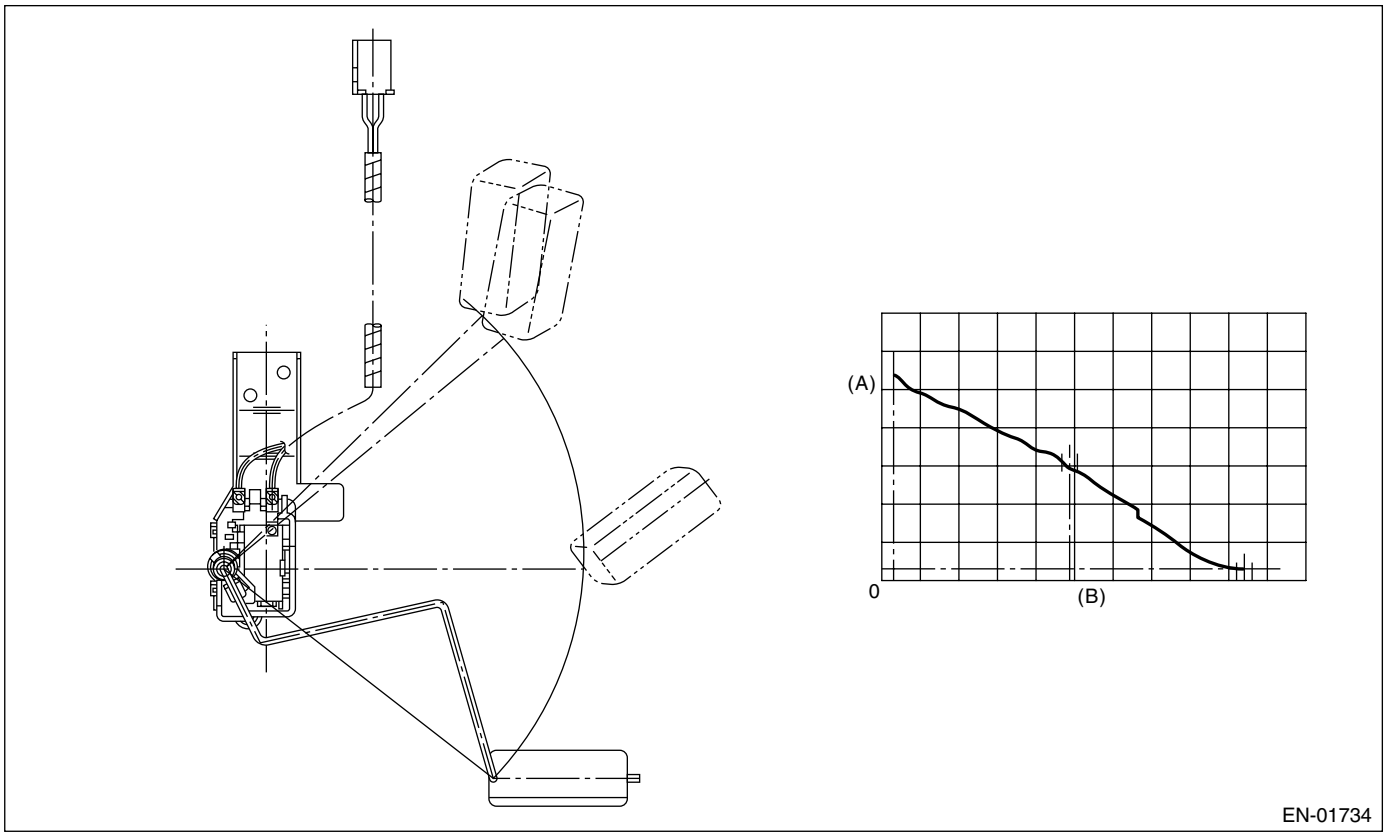
Memorize the freeze frame data. (For test mode $02)

BX:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



(A) Fuel level
(B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine start	More than 0.5 seconds

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine start	More than 0.5 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

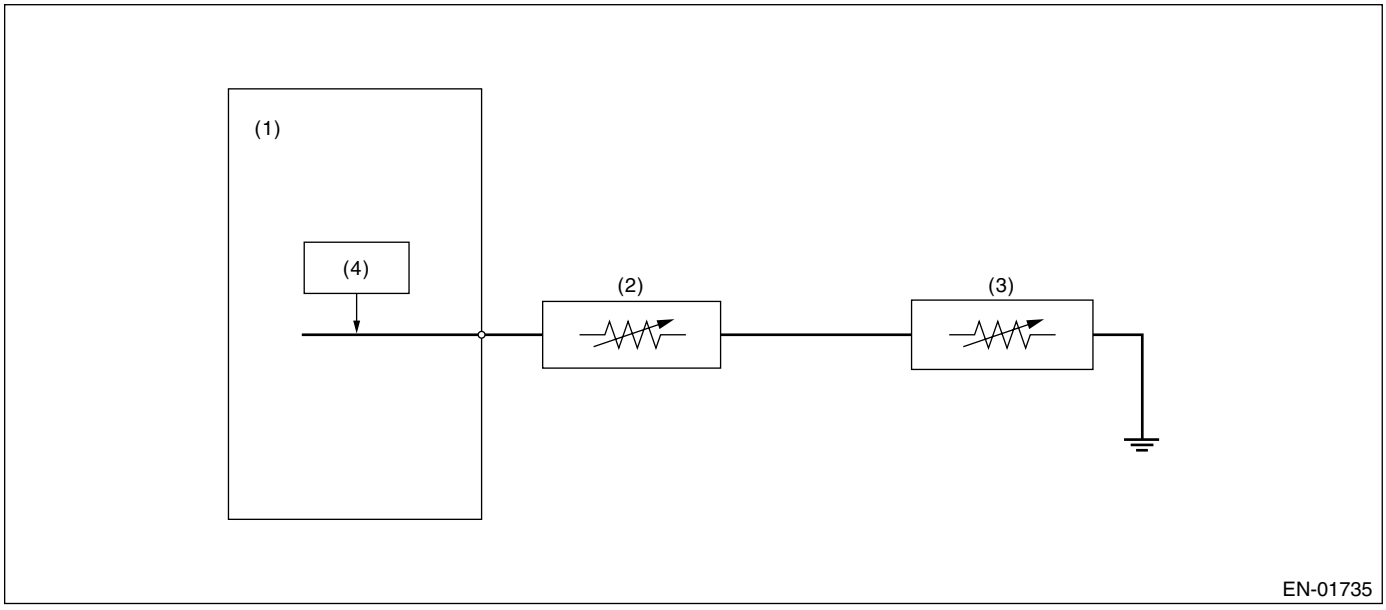
Memorize the freeze frame data. (For test mode $02)

BY:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.015 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.015 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

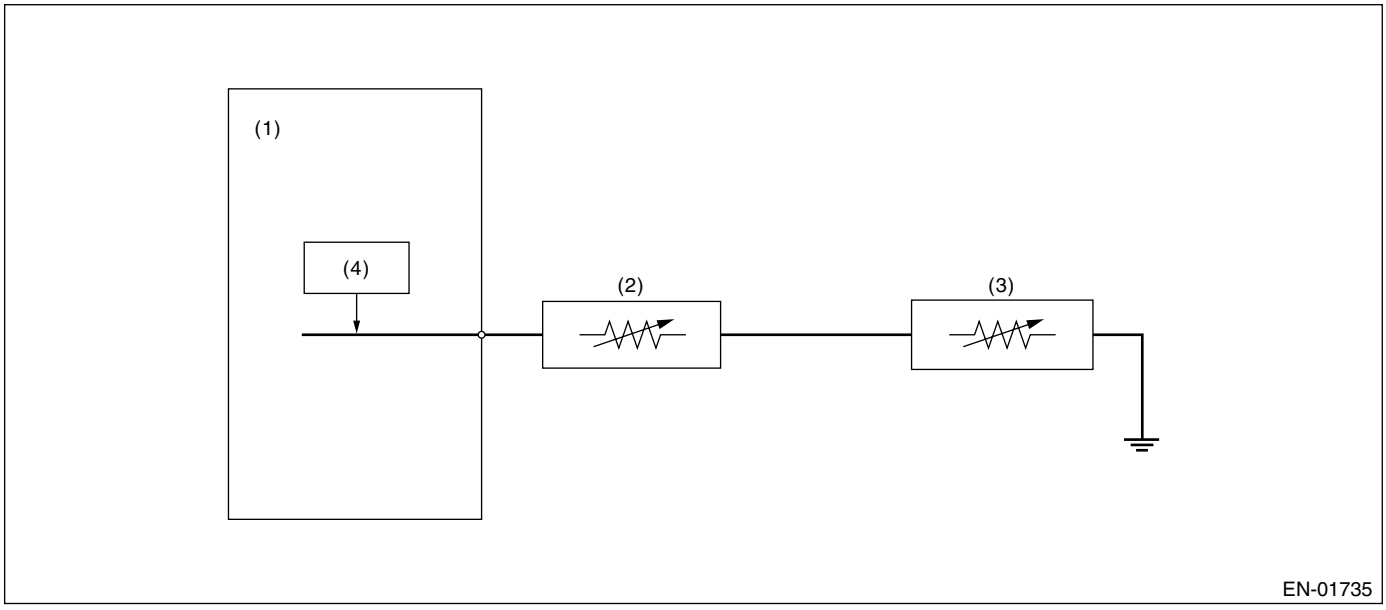
Memorize the freeze frame data. (For test mode $02)

BZ:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.926 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.926 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.
Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

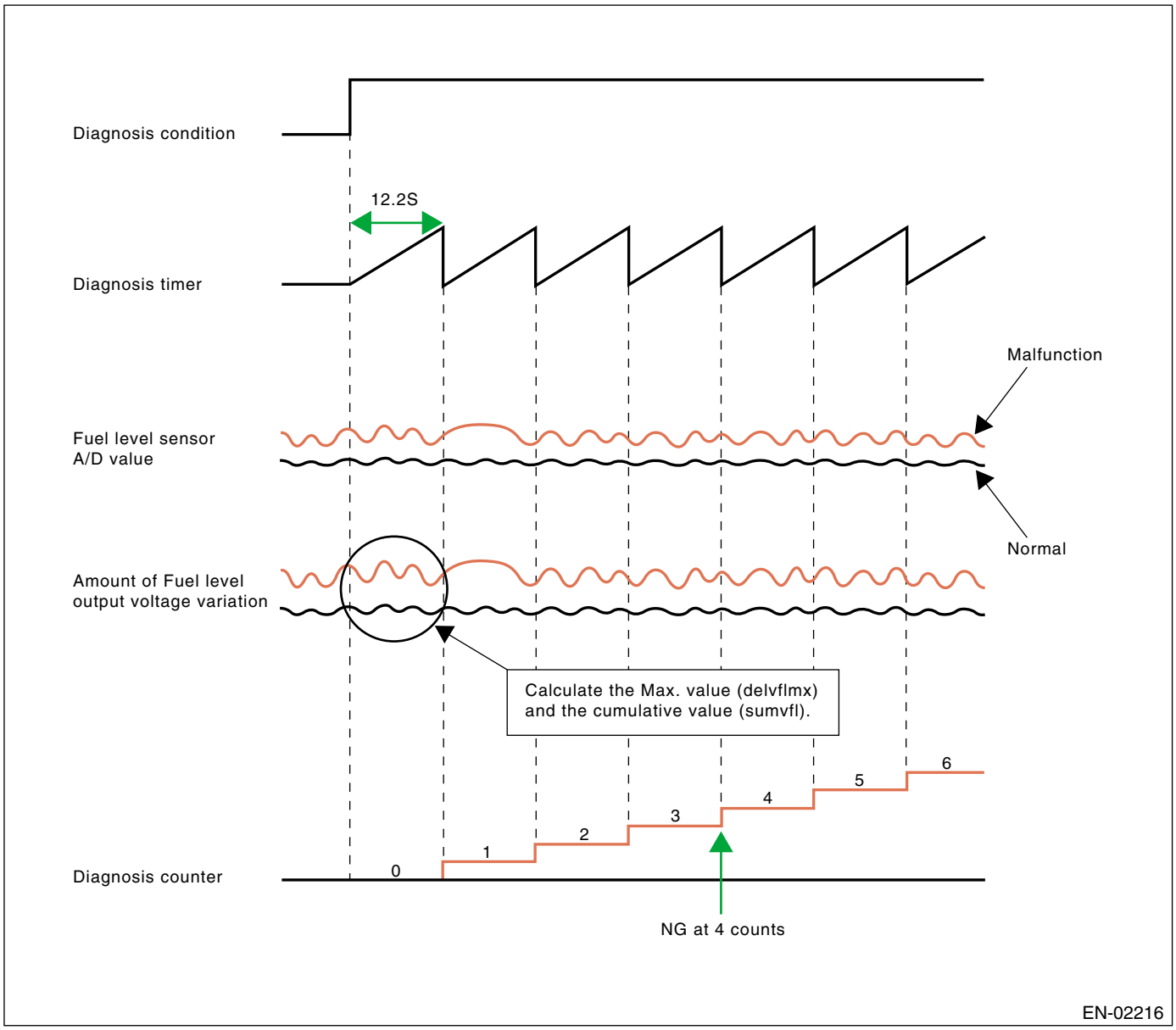
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ←→ 48 ℓ (10.1 ←→ 50.7 US gal, 8.4 ←→ 42.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.24 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 4 counts.



• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.2 ←→ 0.26 V or SUMFL ≥ 16 V where, DELFLMAX is Max. deviation of sensor output during 12.2 seconds. SUMFL is integrated value of sensor output deviation during 12.2 seconds.	≥ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

Max – Min of tank pressure during 12.2 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 12.2 seconds	≥ 0.465 V

Time Needed for Diagnosis: 12.2 seconds × 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 ←→ 0.26 V
SUMFL Where, DELFLMAX is Max. deviation of sensor output during 12.2 seconds. SUMFL is integrated value of sensor output deviation during 12.2 seconds.	< 16 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB:DTC P0483 — COOLING FAN RATIONALITY CHECK —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	562.5 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1.2 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 100°C (212°F)
Radiator fan signal changes	OFF to ON
Engine coolant temperature	Not reducing

Time Needed for Diagnosis: 5 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan signal changes	OFF to ON
Engine coolant temperature	Reducing

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION (USED WITH ABNORMAL JUDGEMENT)

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,400 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: ON both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CD:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION (USED WITH ABNORMAL JUDGEMENT)

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 240
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,400 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: ON both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda (left and right)	0.81 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5.1 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< –100 rpm
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ –100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CF:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda (left and right)	0.81 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5.1 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0512 — STARTER REQUEST CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains to be on.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detect
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detect
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1000 rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ –5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P0565 — CRUISE CONTROL ON SIGNAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the cruise control set signal is continued to be ON for a certain period of time at the vehicle speed less than 20 km/h (12 MPH).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≤ 20 km/h (12.4 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis at vehicle speed 20 km/h (12.4 MPH) or less.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Canceling signal	No signal

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CJ:DTC P0600 — CAN COMMUNICATION CIRCUIT—

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.
It judges as NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

2. COMPONENT DISCRIPTION

CAN connects between ECU and TCU with high speed.

(Common Specification)
CAN PROTCOL 2.0B (active)
Frame format: 11 bit ID Frame (Standard frame)
(High Speed CAN)
ISO 11898 compliance
Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery Voltages	> = 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• JUDGMENT OF MALFUNCTION

It judges as NG if any of the following conditions are judged as NG. It judges as OK if all of the following conditions are judged as OK within 1s, and the NG memory is cleared.

• Judgement Value

Malfunction Criteria	Threshold Value
Buss off flag or warning flag	Set
ID cannot be received from TCU	= 500 m/s

Time needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.
When “Clear Memory” was performed.

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed.

8. FAIL-SAFE

None

9. ECM OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode $02)

CK:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.
At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality	
Write 5AA5A55A, and read out. (All area of RAM)	Cannot be read out 5AA5A55A.
Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality.	
Write 5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5.
Or write A55A, and read out. (All area of RAM)	Cannot be read out A55A.

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge NG when the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality	
Write 5AA5A55A, and read out. (All area of RAM)	Cannot be read out 5AA5A55A.
Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality.	
Write 5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5.
Or write A55A, and read out. (All area of RAM)	Cannot be read out A55A.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

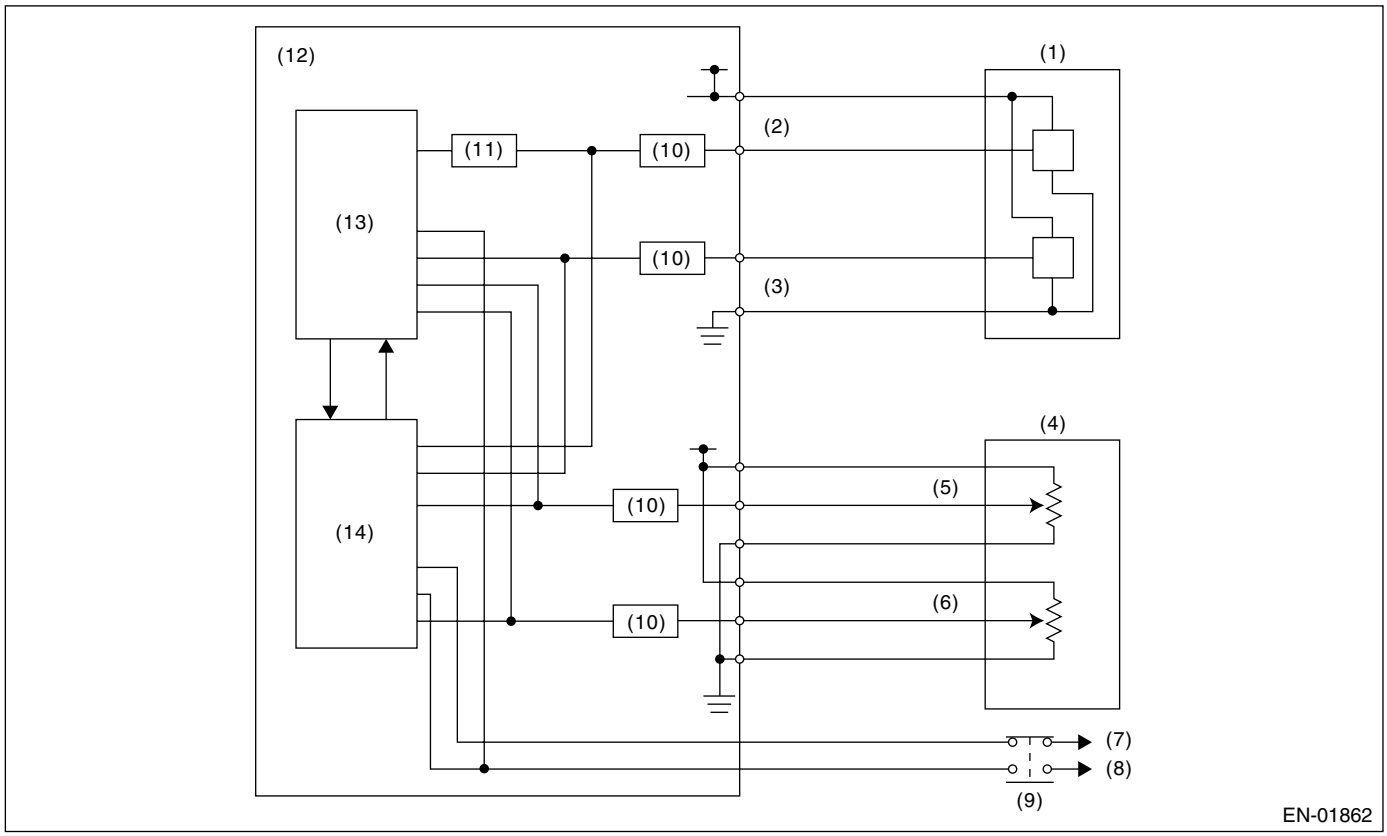
MEMO:

CM:DTC P0607 — CONTROL MODULE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor
(2) Throttle position sensor 1
(3) Throttle position sensor 2
(4) Accelerator pedal position sensor
(5) Accelerator pedal position sensor 1
(6) Accelerator pedal position sensor 2
(7) Battery
(8) Stop light
(9) Brake switch
(10) I/F circuit
(12) Engine control module (ECM)
(13) Sub CPU
(14) Main CPU

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Ignition switch	ON
None	—
None	—
Throttle opening angle	
Brake SW (with cruise control)	ON
None	—
Cruise control	OFF

4. GENERAL DRIVING CYCLE

(1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously on idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.12 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.07 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within × 4±0.6 V
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched
(8) Throttle opening angle directing value	Within the opening angle +3.4° which calculated from accelerator opening angle coefficient.

Time Needed for Diagnosis:
(1) 250 milliseconds
(2) 250 milliseconds
(3) 200 milliseconds
(4) 200 milliseconds
(5) 24 milliseconds
(6) 250 milliseconds
(7) 200 milliseconds
(8) 250 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

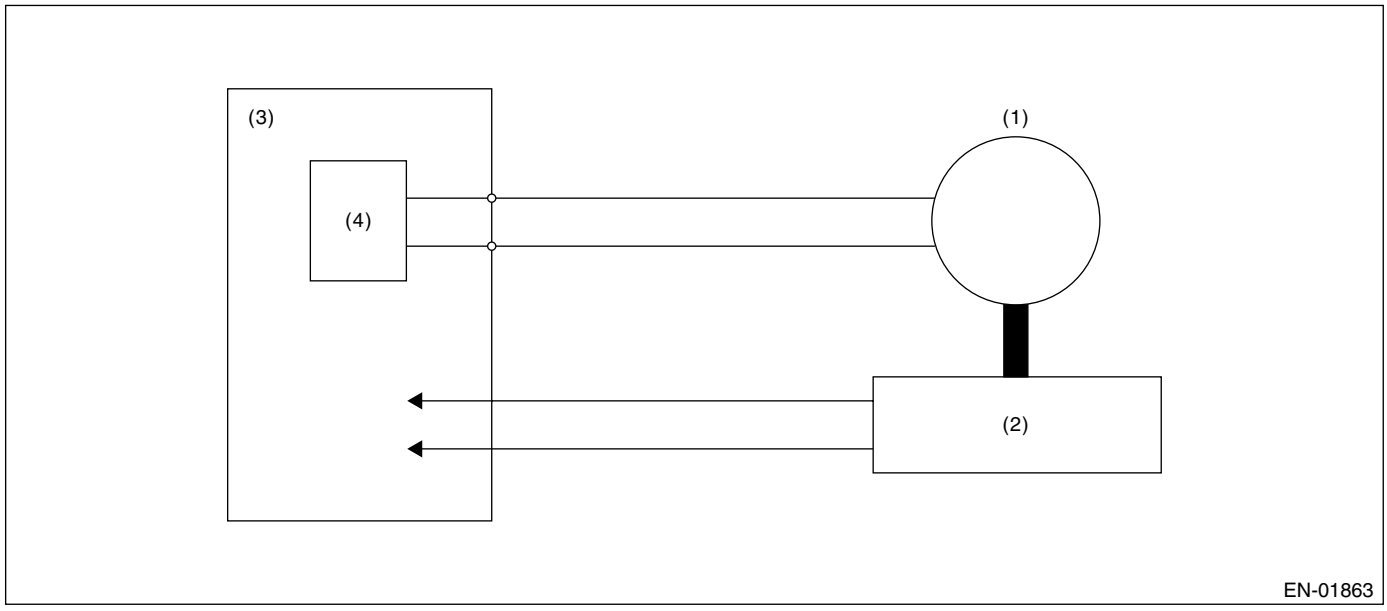
MEMO:

CN:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric control throttle is operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

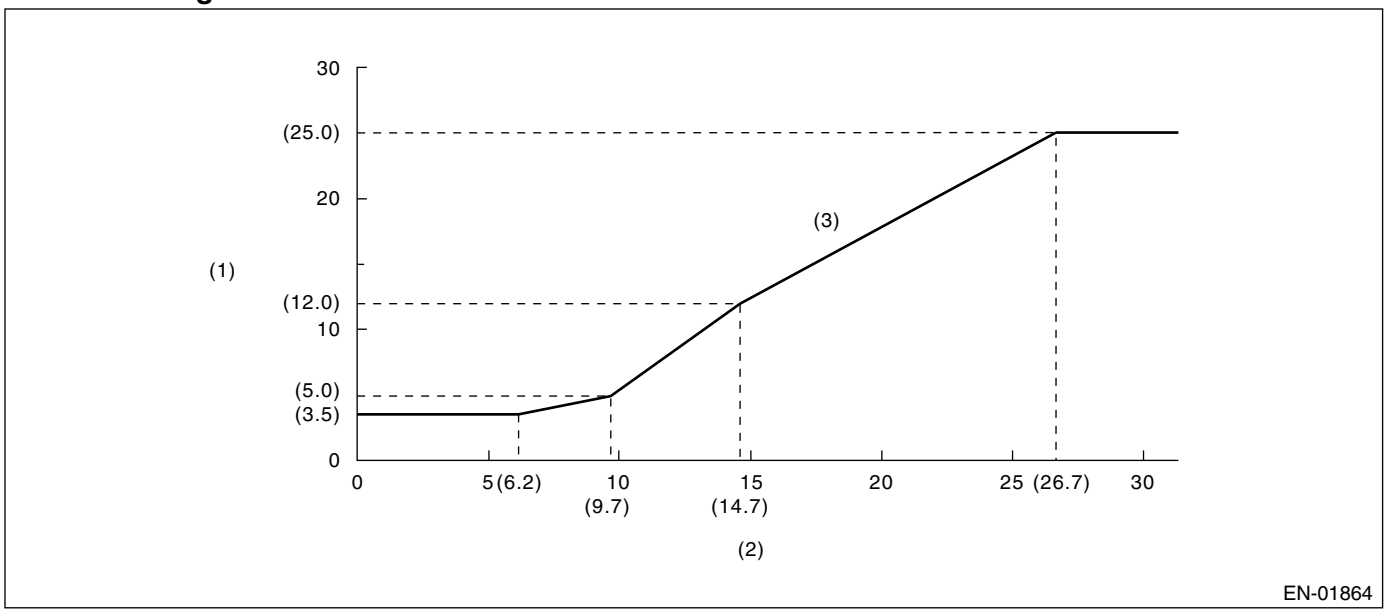
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

Time Needed for Diagnosis:

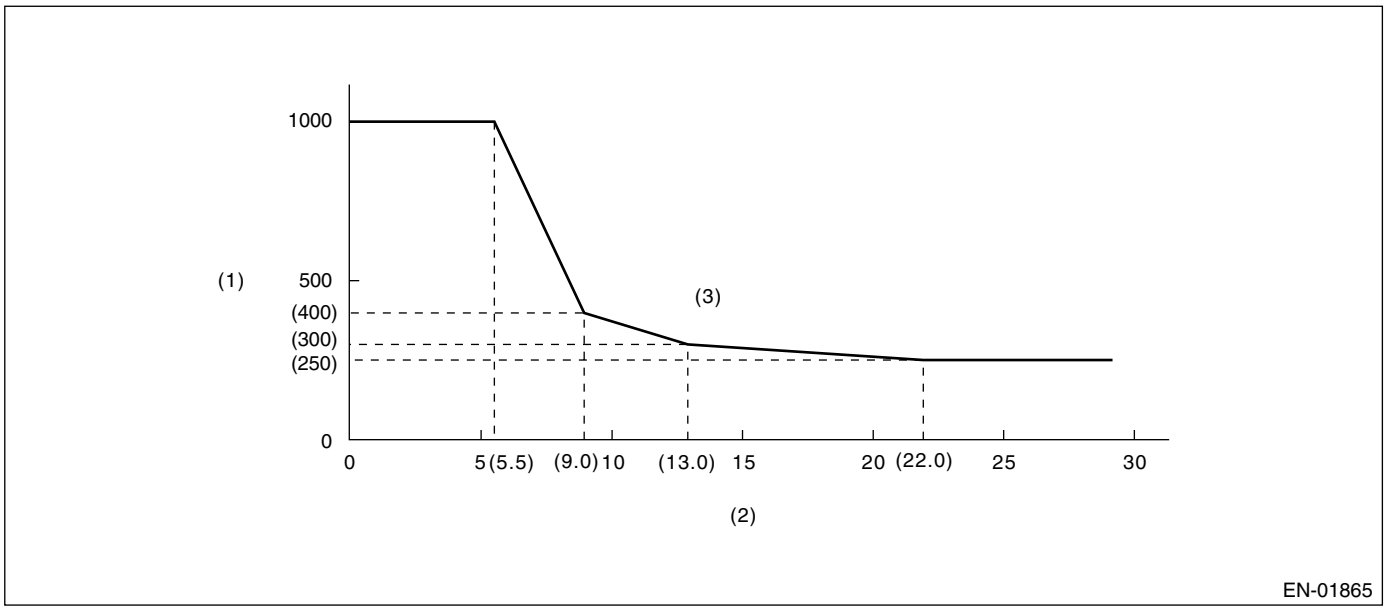
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
Output duty to drive circuit: 2000 milliseconds

Details of Judgment



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgment (Always 1000 milliseconds when the actual opening angle ≤ target opening angle)



(1) Judgment time (milliseconds)
(2) Throttle position sensor 1 opening angle
(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stopped)

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

MEMO:

CO:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the AT brake switch circuit becomes battery short, ground short or open circuit.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed change	30 to 0 km/h (18.6 to 0 MPH) 0 to 30 km/h (0 to 18.6 MPH)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
ON signal	No signal
OFF signal	No signal

Time Needed for Diagnosis: 15 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the “D” range switch becomes ground short or open circuit.

2. COMPONENT DESCRIPTION

Inhibitor switch ensures the safety at engine start. This switch is installed to the right side of transmission case, and operated by selector lever. When the selector lever is in the “P” or “N” range, the engine will start because the electric circuit in inhibitor switch is closed and the starter circuit is connected. When the selector lever is in the “R”, “D”, “3”, “2” or “1” range, the electric circuit in inhibitor switch is open; therefore, the engine cannot be cranked. In the “R” range, the back-up light will illuminate because the back-up light circuit in the switch is connected. In addition to the functions above, the inhibitor switch has the circuit which detects the selected range position at the present and transmits the range signal to the TCM.

3. ENABLE CONDITION

Secondary Parameters		Enable Conditions
(1)	Shift	“N” to “3”
	Vehicle speed	≥ 60 km/h (37 MPH)
(2)	Engine speed	> 500 rpm
	Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria		Threshold Value
(1)	“D” signal continuously	Not detected
(2)	Simultaneous signal	≥ 2

Time Needed for Diagnosis:

- 63.75 seconds (1)
- 10 seconds (2)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CS:DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

- Judge NG when ATF temperature sensor becomes open circuit, battery short or ground short.
- Judge NG when ATF temperature sensor is faulty.

2. COMPONENT DESCRIPTION

ATF temperature sensor is installed to the hydraulic control valve body of transmission as a unit with transmission harness. This sensor detects ATF temperature and outputs it as electric resistance signal.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V
Output at ≥ 80 km/h (50 MPH) after 5 minutes from reaching more than 4.8 V	≥ 4.7 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control ATF temperature at a constant temperature 80°C (176°F)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CT:DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the turbine speed signal is not transmitted for some reasons.

2. COMPONENT DESCRIPTION

Torque converter turbine speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the turbine speed of torque converter by the peripheral speed of high clutch drum connected to input shaft. And then it transmits the sine wave signal (32 pulses per rev.) to TCM. TCM calculates the ratio of the input shaft speed to vehicle speed, and then makes a judgment whether to shift or not.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 1500 rpm
Vehicle speed	≥ 40 km/h (25 MPH)
Range switch	“D”, “3”, “2” or “1”

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below were continued for 2 seconds.
(1) Except “P”, “N”, “R” ranges and inhibitor switch is normal.
(2) Engine speed is more than 3000 rpm.
(3) Vehicle speed is 30 km/h (19 MPH) and vehicle speed sensor is normal.
(4) Turbine speed is more than 600 rpm.

Judgment Value

Malfunction Criteria	Threshold Value
Output from turbine shaft speed	< 600 rpm

Time Needed for Diagnosis: Immediately
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CU:DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when an abnormal large signal is input to the front vehicle speed sensor, or no signal is input to the rear vehicle speed sensor.

2. COMPONENT DESCRIPTION

This vehicle speed sensor (output shaft speed sensor) is installed to the outside of transmission case.
This sensor detects the front wheel speed, and transmits the sine wave signal (32 pulses per rev.) to TCM.
TCM converts the signal to pulse signal, and transmits to both of the ECM and the combination meter.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 20 km/h (12 MPH)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis with more than 20 km/h (12 MPH) vehicle speed.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Number of vehicle speed sensor signal each 1 second	≥ 4698 or no signal

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Use the normal vehicle speed sensor signal when either of them is normal.
- Use the vehicle speed calculated from the current gear position and turbine speed when both front and rear wheels are troubled.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CV:DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is not input in the status of running the engine.

2. COMPONENT DESCRIPTION

Engine speed sensor is installed to the outside of engine body and crank part. This sensor detects the crank speed, and transmits the sine wave signal (2 pulses per rev.) to TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Output from mass air flow sensor	≥ 1.0 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≤ 400 rpm

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CW:DTC P0731 — GEAR 1 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(1st gear ratio) where, GR = (vehicle speed sensor 1 output)/ (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CX:DTC P0732 — GEAR 2 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(2nd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CY:DTC P0733 — GEAR 3 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(3rd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CZ:DTC P0734 — GEAR 4 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(4th gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DA:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is different from the turbine speed for some reasons at AT lock-up.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
In 4th gear position, duty ratio for duty solenoid valve	≥ 90%

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed ≥ (output shaft speed × 4th gear ratio × 9/8)	

Time Needed for Diagnosis: 10.2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Not allowed to lock up.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DB:DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the lock-up duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Lock-up duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows the lock-up clutch to be connected or released smoothly by controlling the lock-up control valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DC:DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the line pressure duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Line pressure duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows controlling the pressure modifier valve and accumulator control valve A, and allows the line pressure to be adjusted to the pressure appropriate for driving condition.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 1 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 1 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 2 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 2 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DF:DTC P0771 — SHIFT SOLENOID "E" PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the low clutch timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Low clutch timing solenoid Low clutch timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the low clutch timing valve B and reverse inhibitor valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at "ON" signal from ECM	Low level
Vc at "OFF" signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DG:DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This solenoid decreases the change gear shock by adjusting the 2-4 brake pressure during 2-4 brake operation.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DH:DTC P0785 — SHIFT/TIMING SOLENOID —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the 2-4 brake timing valve B and decreases the change gear shock.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DI: DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “ON” & any other switches = “OFF” on AT	OFF

Time Needed for Diagnosis: 6.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DJ:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change.
Judge OK and clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DK:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “OFF” & any other switches = “ON” on AT	ON

Time Needed for Diagnosis: 6.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DL:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change.
Judge OK and clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DM:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect malfunction of communication of AT diagnosis.
Judge NG when communication format is disagreement.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform diagnosis after starting.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (60 seconds). Judge OK and clear NG when receiving normal data.

Judgment Value

Malfunction Criteria	Threshold Value
AT malfunction data reception control	Not receive normal data

Time Needed for Diagnosis: 60 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DN:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.
Judge NG when the AT diagnosis input line signal remains Low.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

4. GENERAL DRIVING CYCLE

Perform diagnosis after starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	Low

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DO:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.
Judge NG when the AT diagnosis input line signal remains High.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

4. GENERAL DRIVING CYCLE

Perform diagnosis after starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	High

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

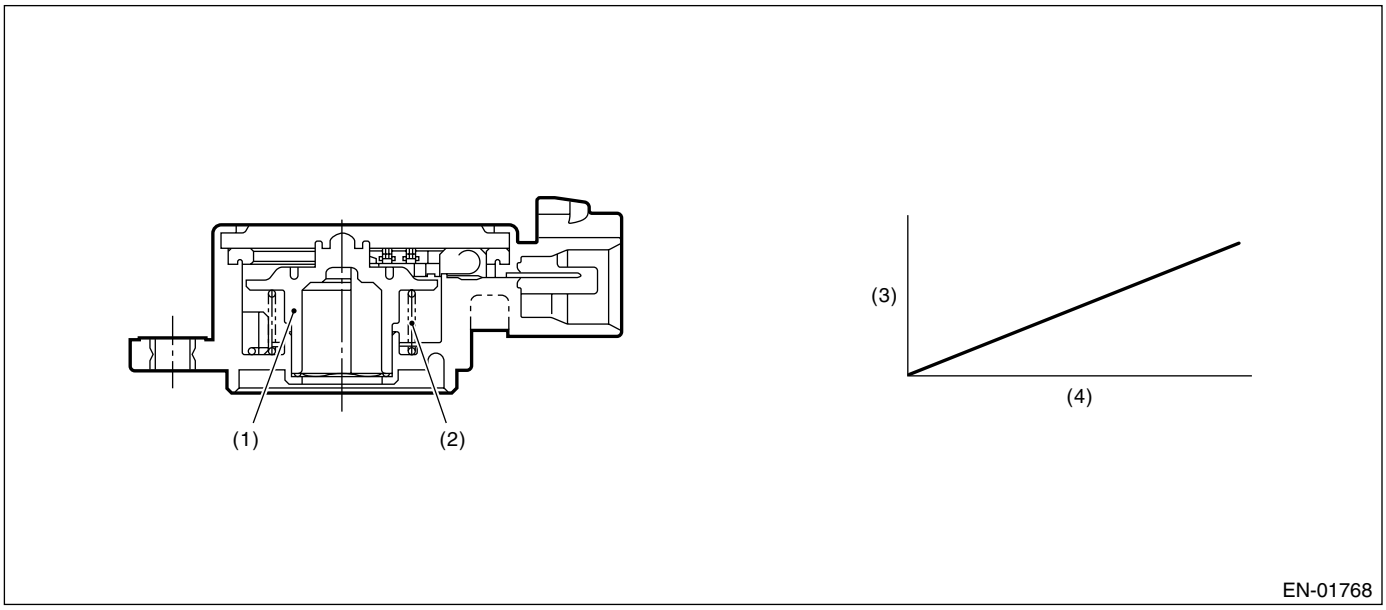
MEMO:

DP:DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.182 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

Basic advance angle
- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle
- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

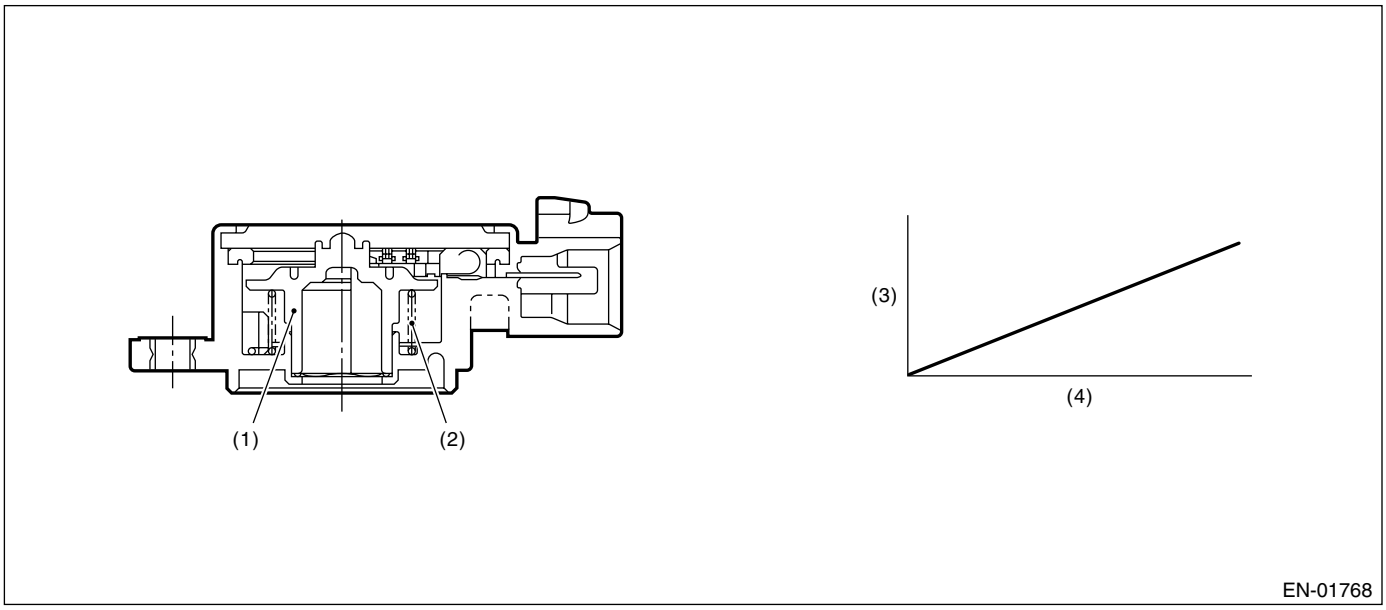
Memorize the freeze frame data. (For test mode $02)

DQ:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

Basic advance angle
- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle
- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DR:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 52.5°
Tumble generated valve “close” signal output	2.5 seconds or more

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 52.5°
Tumble generated valve “close” signal output	2.5 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DS:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature value estimated	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 52.5°
Tumble generated valve “open” signal output	2.2 seconds or more

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 52.5°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

Basic advance angle
- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle
- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

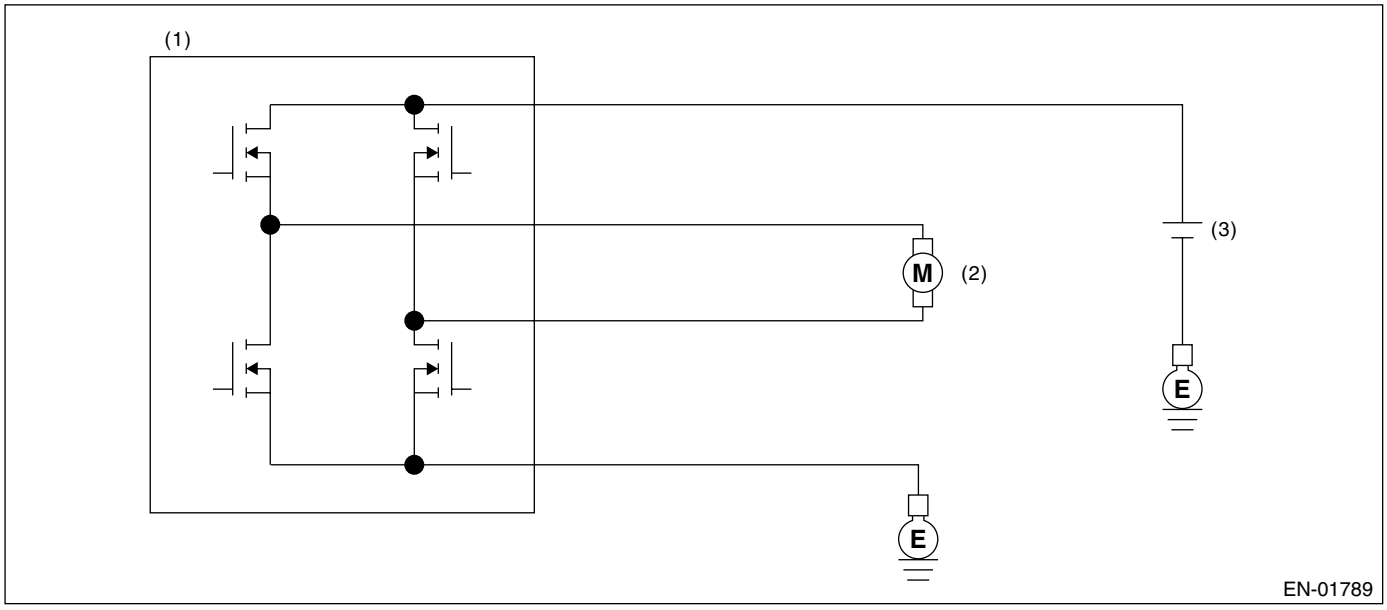
MEMO:

DT:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Output signal from ECM	Before changing from ON to OFF
Output ON signal from ECM	20 milli-seconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent continuously during 3.5 seconds. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
(Open NG)	
Diagnosis input — Open	High
Diagnosis input — Short	High

Time Needed for Diagnosis: 3.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.
Basic advance angle

- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle

- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

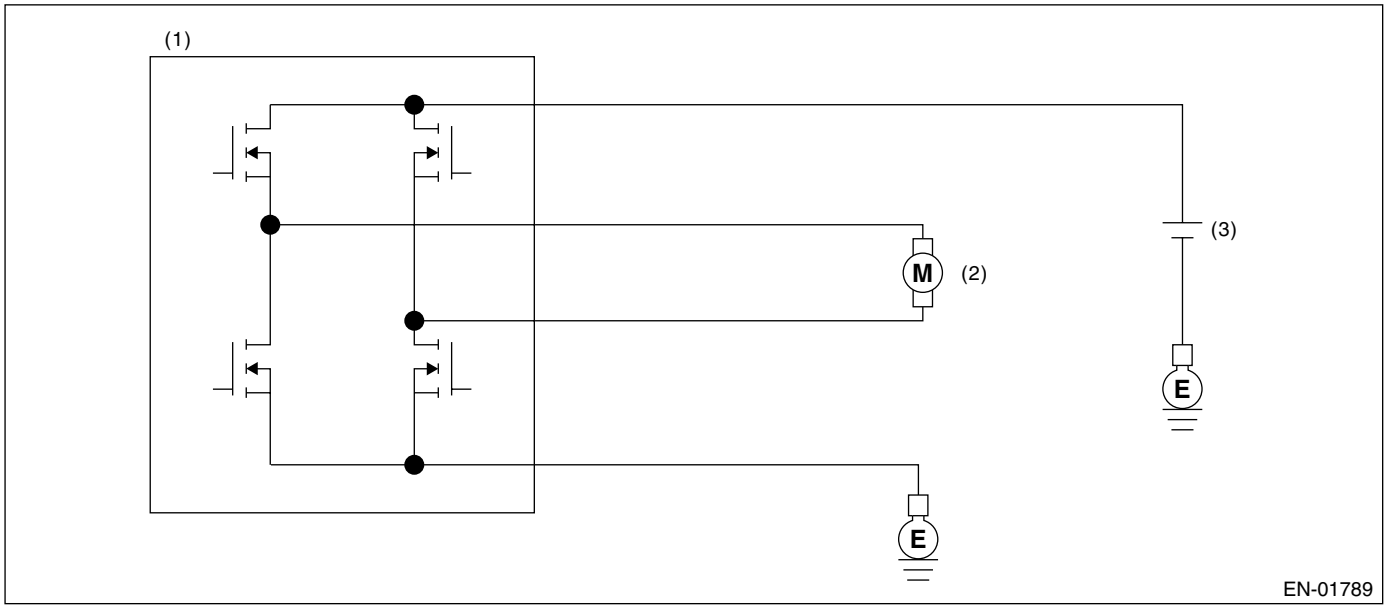
Memorize the freeze frame data. (For test mode $02)

DU:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Output signal from ECM	Before changing from ON to OFF
Output ON signal from ECM	20 milli-seconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent continuously during 3.5 seconds. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis input — Open	Low
Diagnosis input — Short	High

Time Needed for Diagnosis: 3.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.
Basic advance angle
- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle
- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DV:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DW:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.941 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.941 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

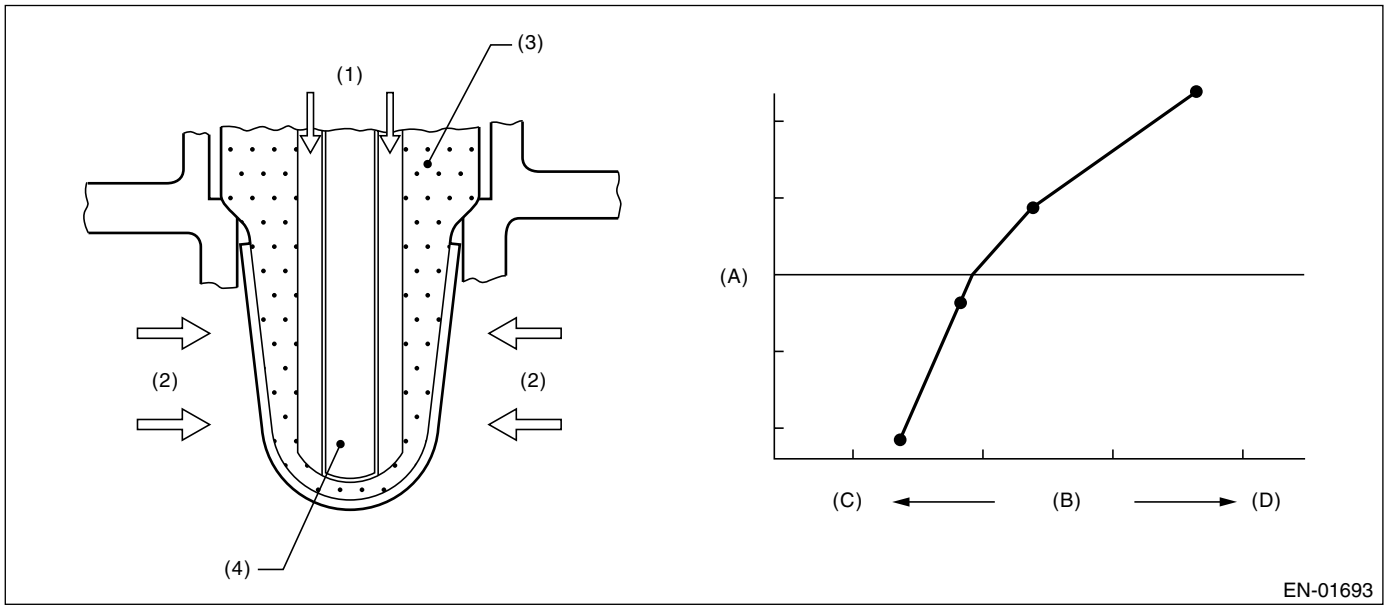
Memorize the freeze frame data. (For test mode $02)

DX:DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

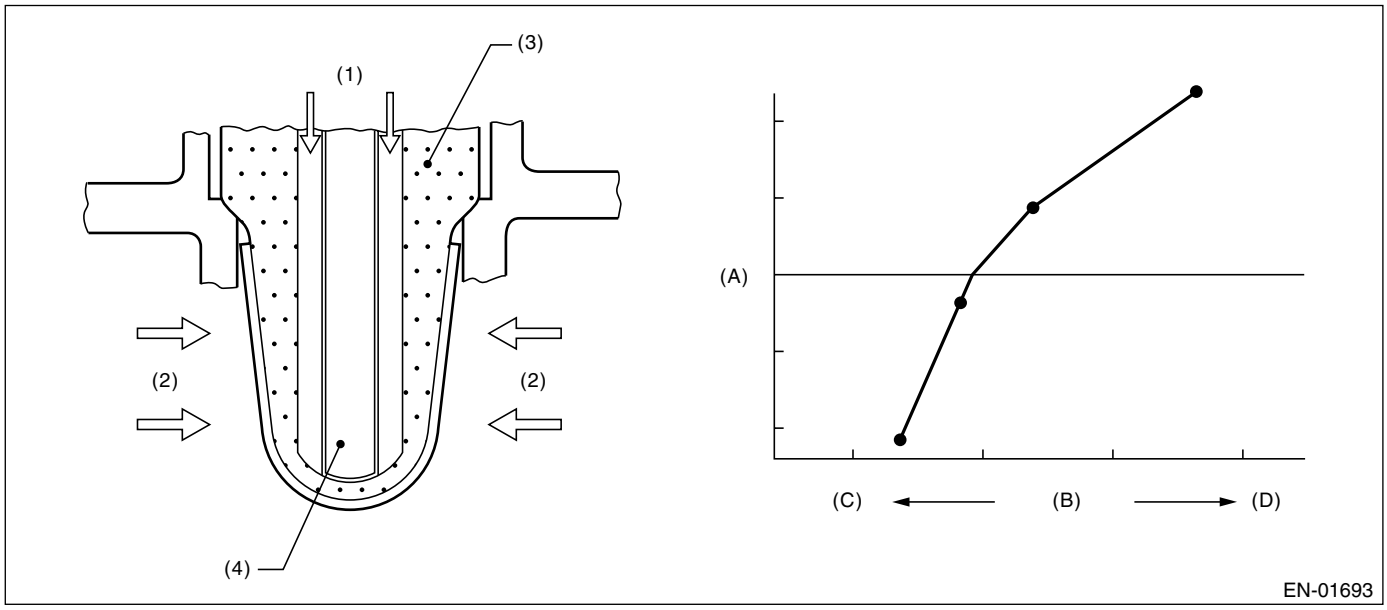
MEMO:

DY:DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O_2 sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DZ:DTC P1154 — O_2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1) —

NOTE:
For the detection standard, refer to P1152.<Ref. to GD(H4SO U5)-248, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EA:DTC P1155 — O_2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)—

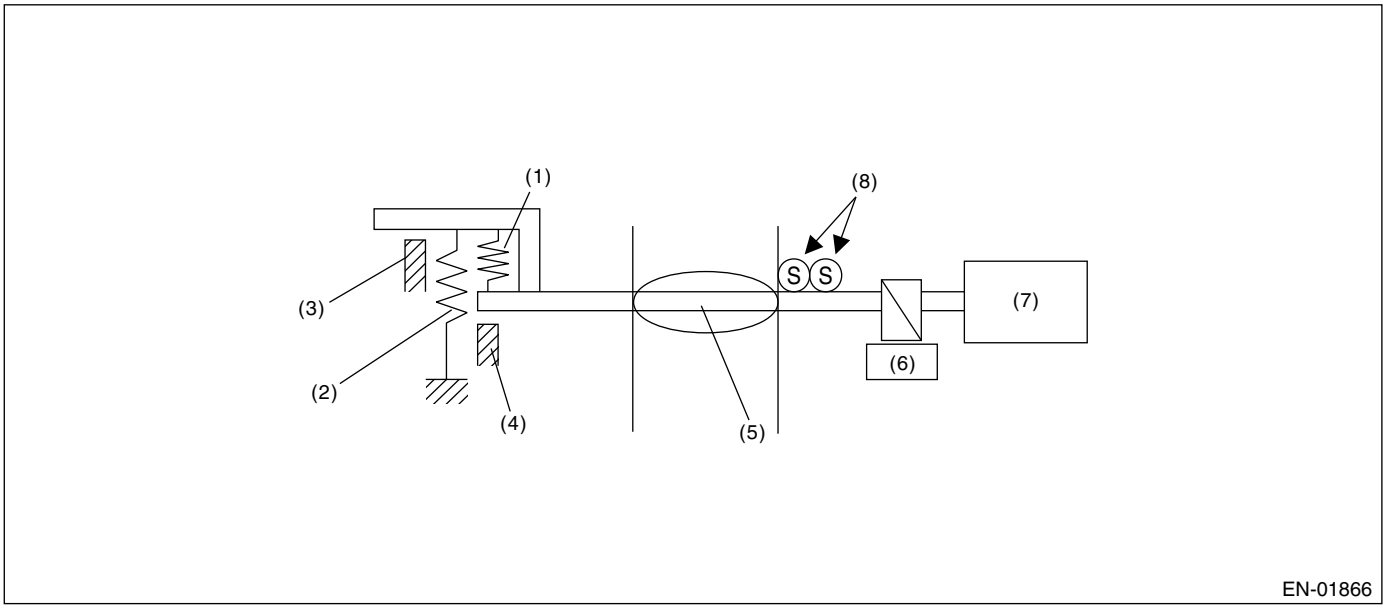
NOTE:
For the detection standard, refer to P1153.<Ref. to GD(H4SO U5)-252, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EB:DTC P1160 — RETURN SPRING FAILURE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2°

Time Needed for Diagnosis: 600 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Fix the throttle opening to 6°.

9. ECM OPERATION AT DTC SETTING

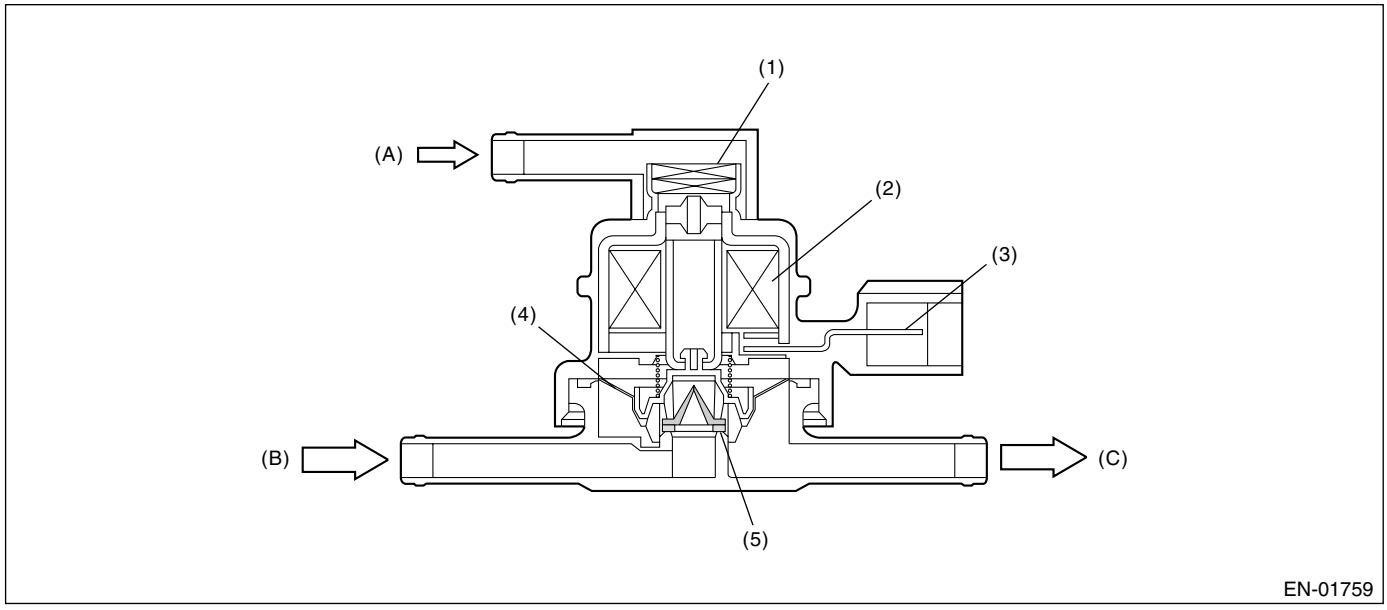
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

EC:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

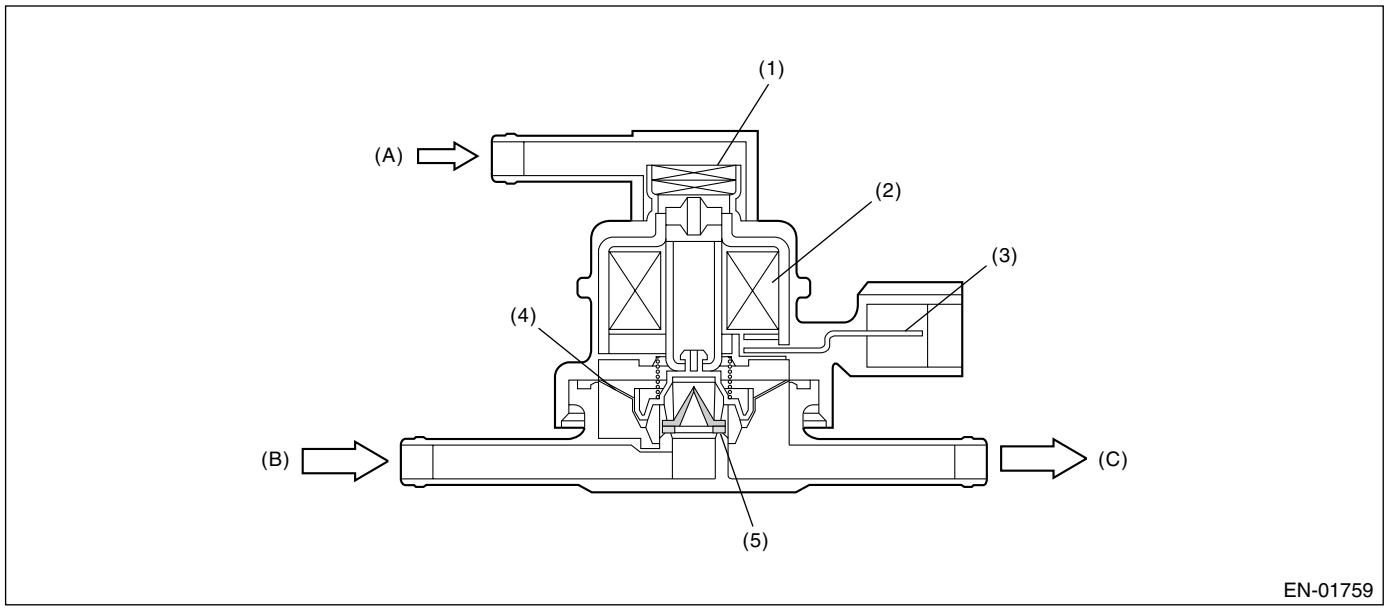
Memorize the freeze frame data. (For test mode $02)

ED:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

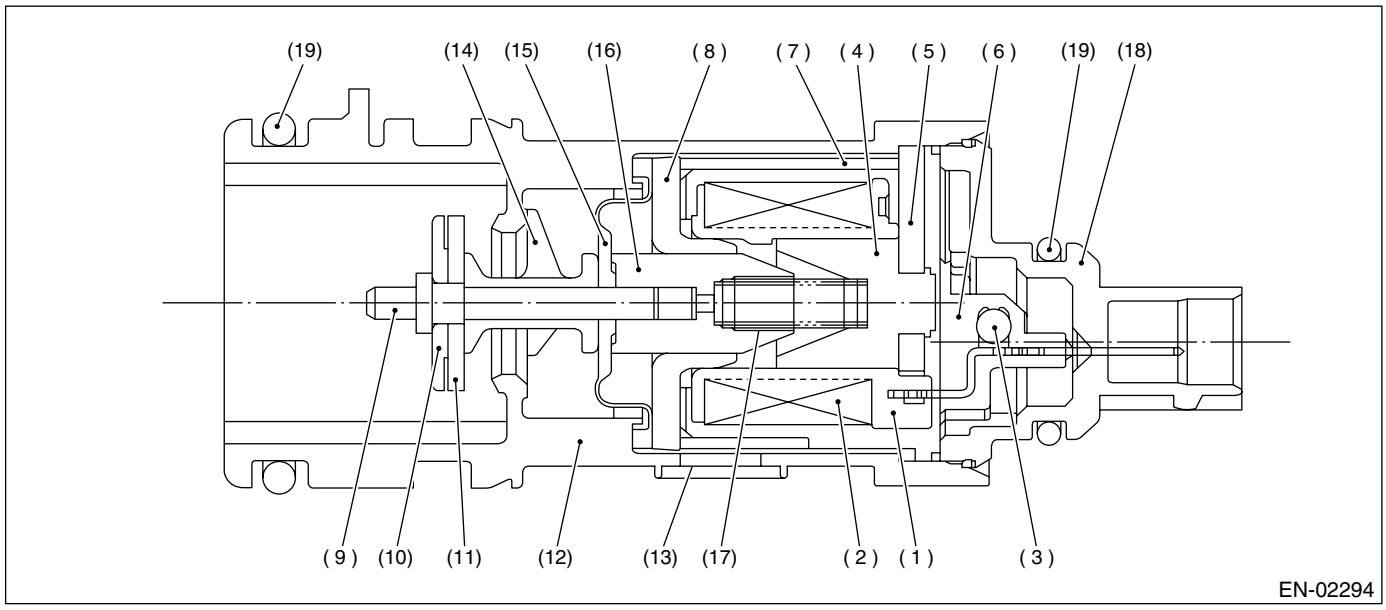
Memorize the freeze frame data. (For test mode $02)

EE:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.
Judge NG when the fuel tank pressure is small.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Drain valve	Open
Battery voltage	≥10.9 V
Atmospheric pressure	≥75.0 kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter ON → OFF	−0.7←→1.5 kPa (−5 ←→11 mmHg, −0.20 ←→ 0.43 inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	–4.0 kPa (–30 mmHg, –1.18 inHg

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	–4.0 kPa (–30 mmHg, –1.18 inHg)
Cumulative time when the malfunction criteria below are completed	≥ 30 seconds
Duty ratio of purge control solenoid valve	Except 0
Fuel temperature	–10 ←→ 45°C (14 ←→ 113°F)
Relative ratio of intake manifold	–26.7 kPa (–200 mmHg, –7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

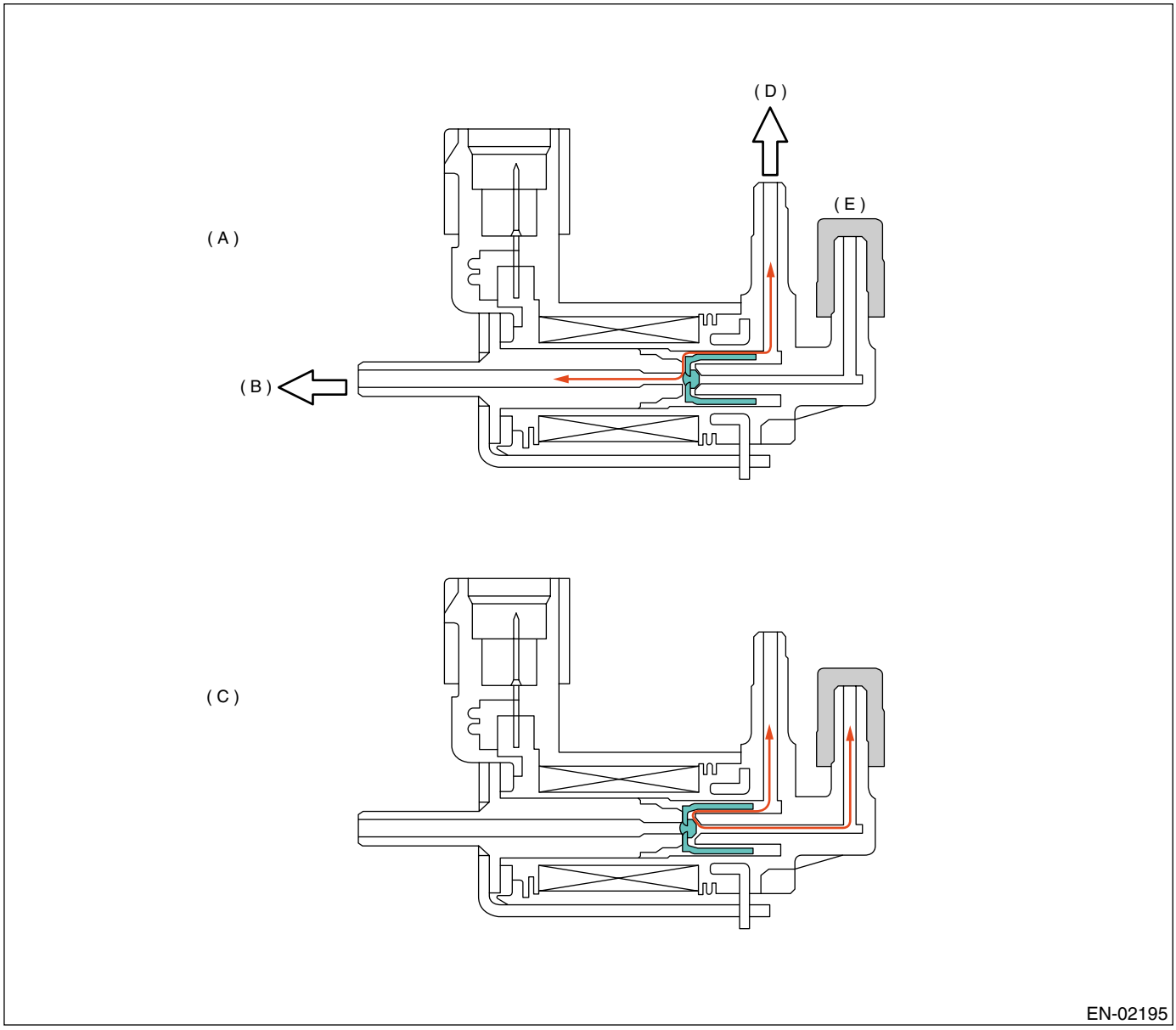
Memorize the freeze frame data. (For test mode $02)

EF:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Vent control (solenoid OFF)
(B) Atmosphere
(C) During diagnostics (Solenoid ON)
(D) To pressure sensor
(E) Plug

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low
Ignition switch	ON

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

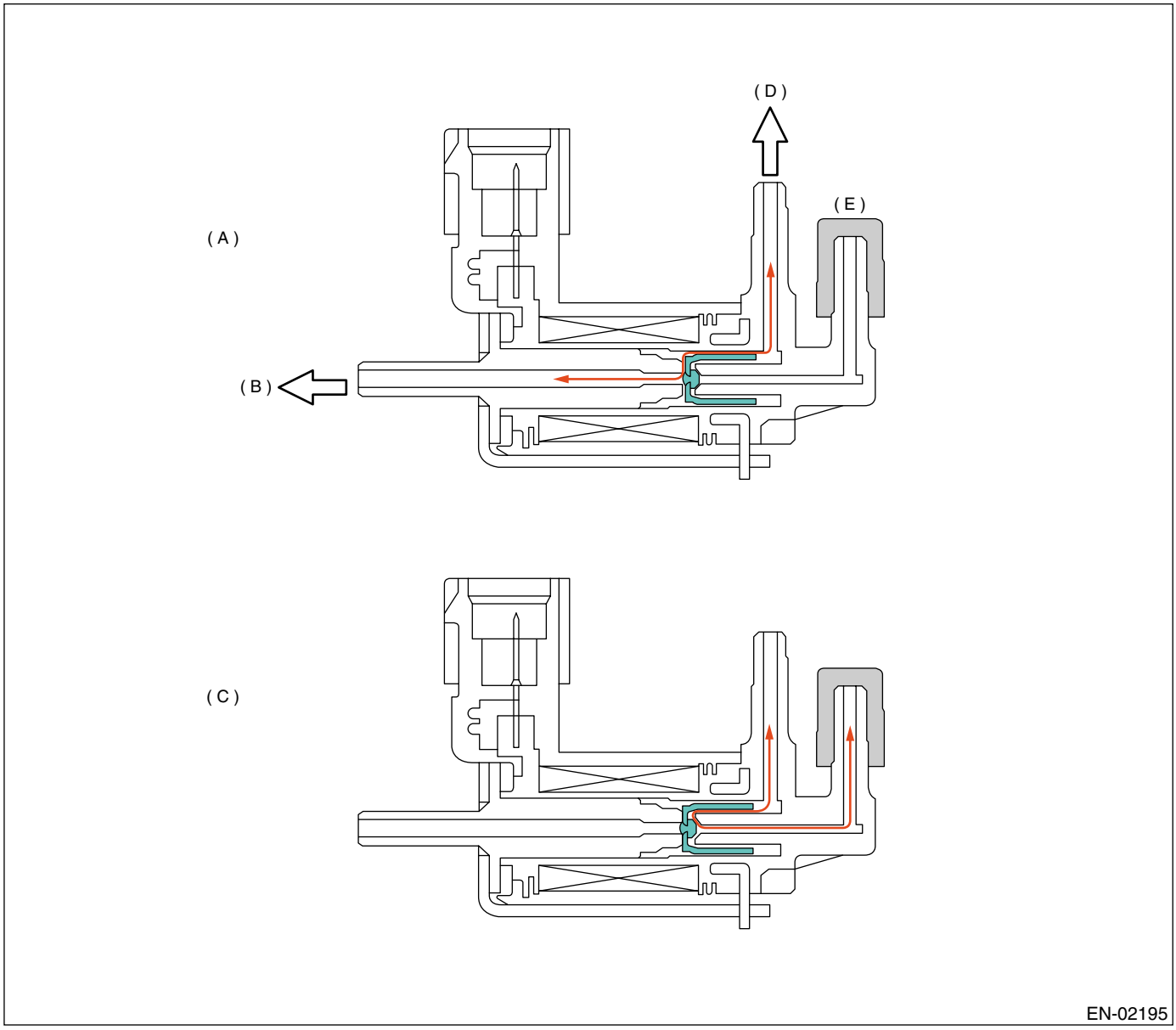
Memorize the freeze frame data. (For test mode $02)

EG:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Vent control (solenoid OFF)
(B) Atmosphere
(C) During diagnostics (Solenoid ON)
(D) To pressure sensor
(E) Plug

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High
Ignition switch	ON

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

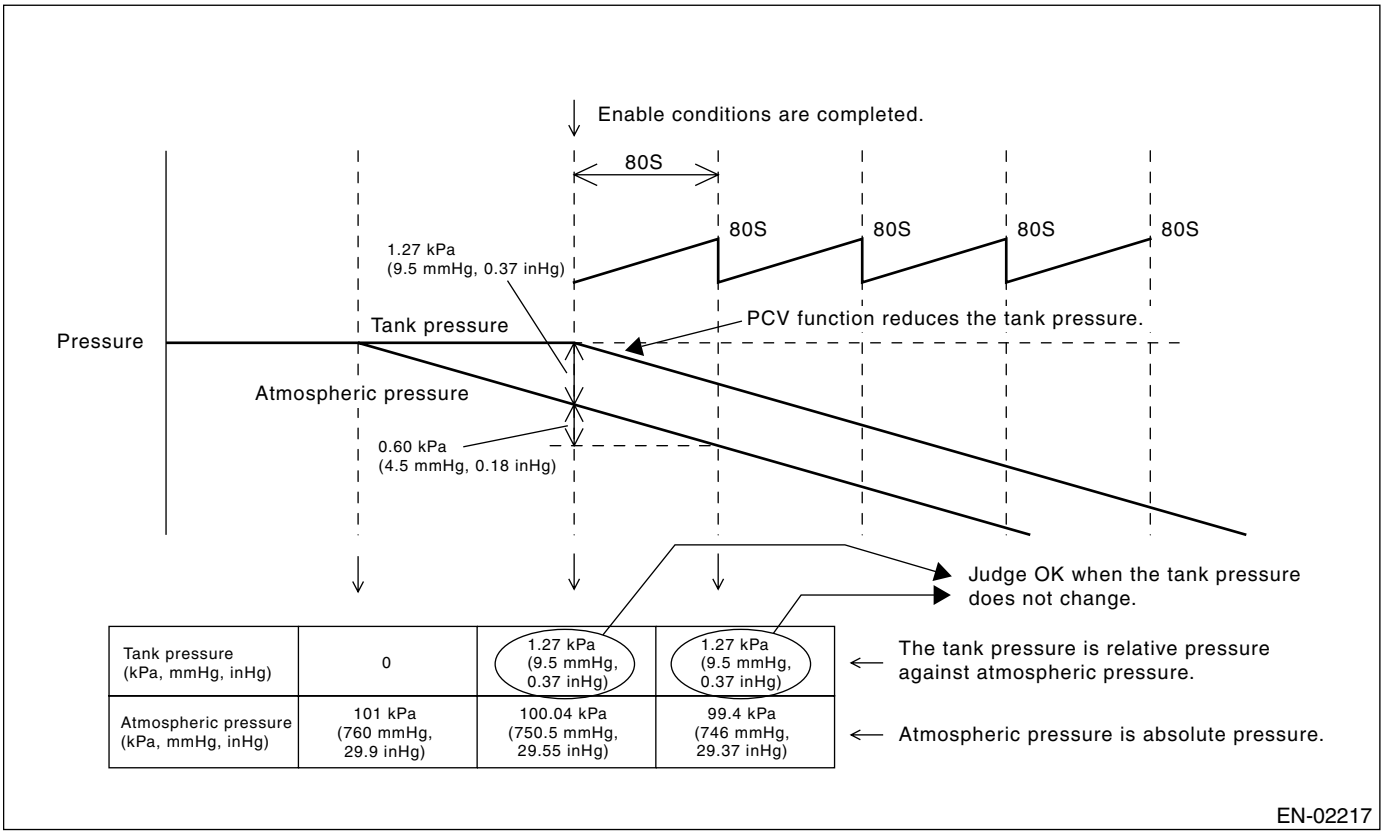
EH:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

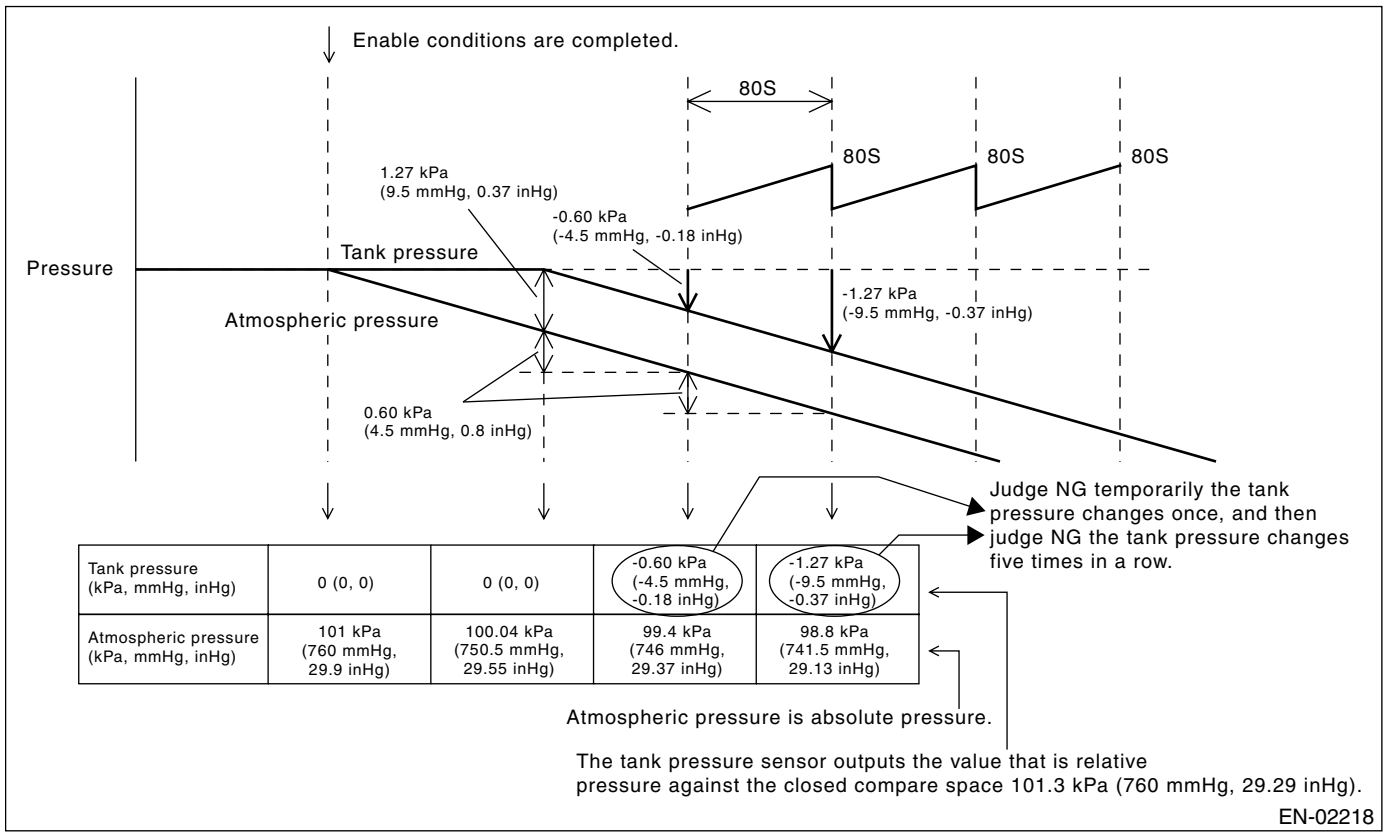
• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.60 kPa (4.5 mmHg, 0.177 inHg)) at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.177 inHg) or more per 80 seconds.



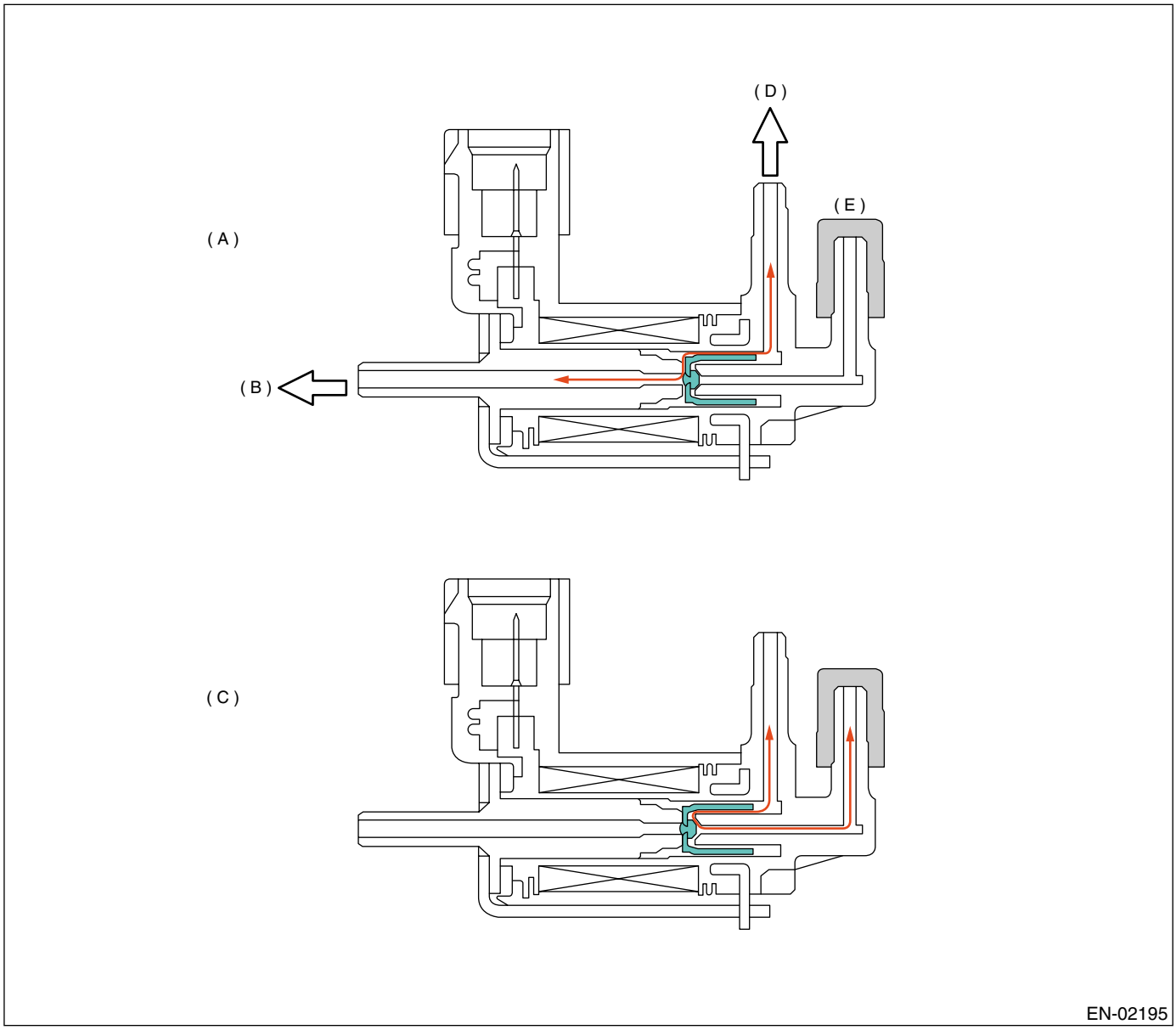
• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 3 times in a row.



Tank pressure (kPa, mmHg, inHg)	0 (0, 0)	0 (0, 0)	-0.60 kPa (-4.5 mmHg, -0.18 inHg)	-1.27 kPa (-9.5 mmHg, -0.37 inHg)
Atmospheric pressure (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100.04 kPa (750.5 mmHg, 29.55 inHg)	99.4 kPa (746 mmHg, 29.37 inHg)	98.8 kPa (741.5 mmHg, 29.13 inHg)

2. COMPONENT DESCRIPTION



(A) Atmospheric air is released (Solenoid OFF)
(B) Ambient air
(C) During diagnosis (Solenoid ON)
(D) To pressure sensor
(E) Plug

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.68 US gal, 2.11 ←→ 10.56 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	< 0.1 kPa (1 mmHg, 0.04 inHg) or > 1.27 kPa (9.5 mmHg, 0.37 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 3 times.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	< 3 ℓ (3.2 US qt, 2.6 Imp qt)

Time Needed for Diagnosis: 80 seconds × 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.60 kPa (4.5 mmHg, 0.18 inHg)
Fuel tank pressure change in 80 seconds	< 0.60 kPa (4.5 mmHg, 0.18 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

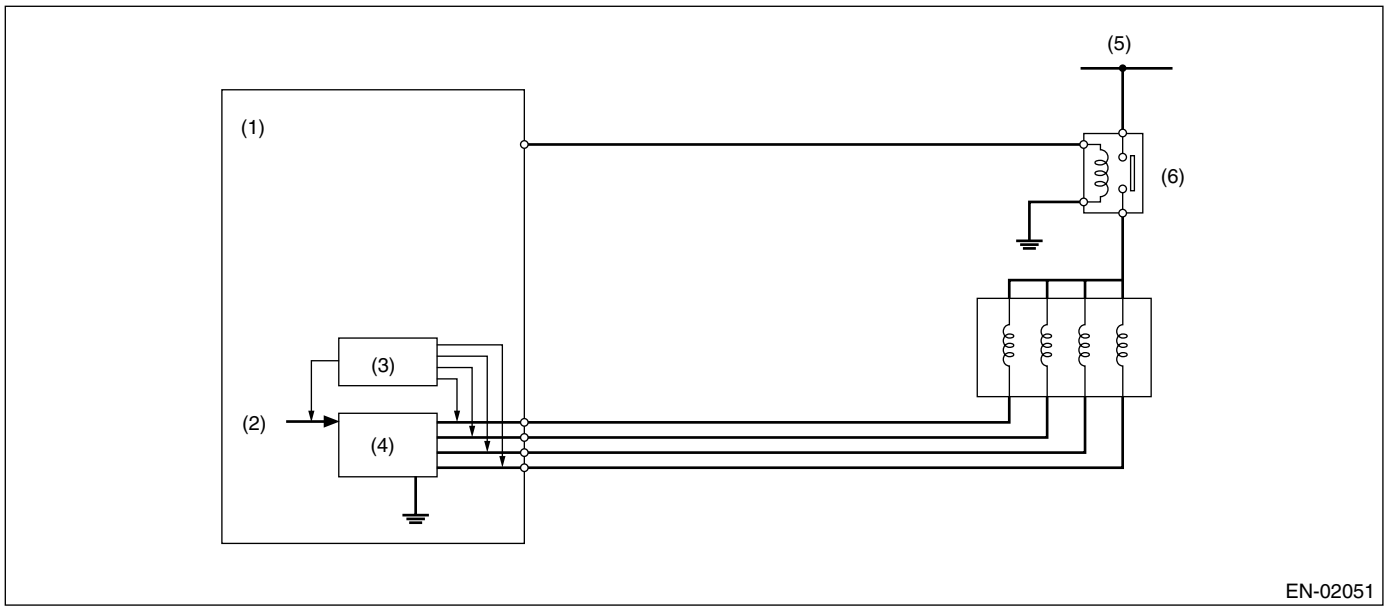
Memorize the freeze frame data. (For test mode $02)

EI: DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Critera	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

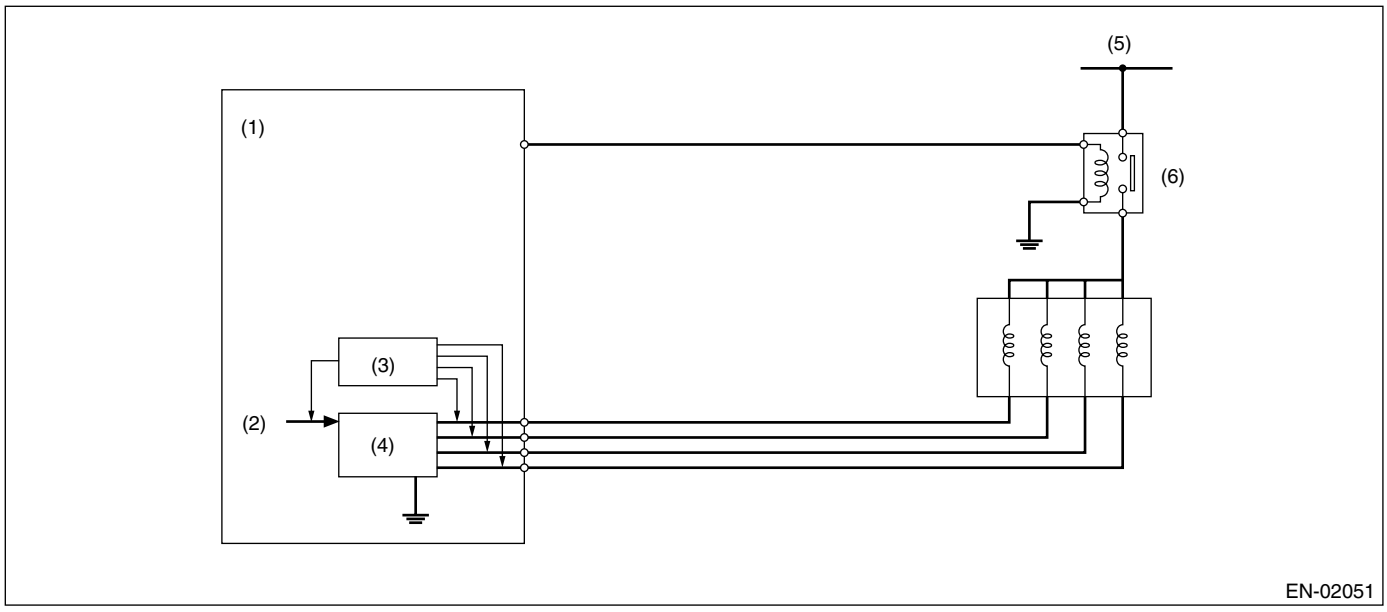
Memorize the freeze frame data. (For test mode $02)

EJ: DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

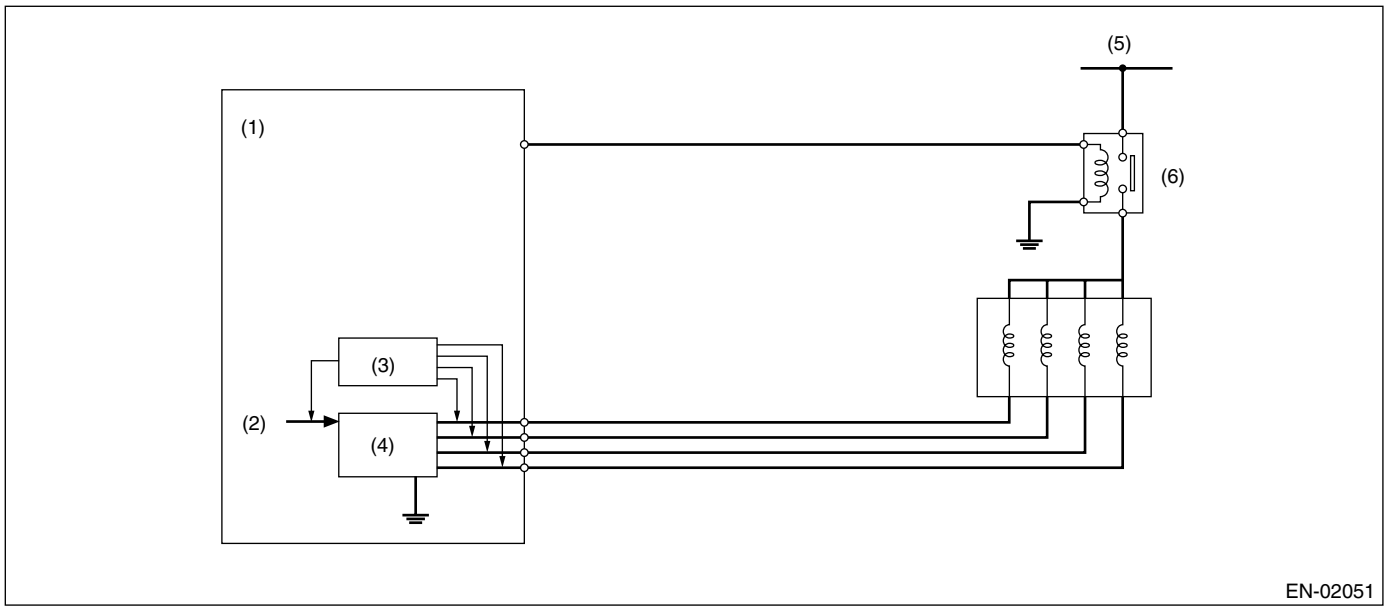
Memorize the freeze frame data. (For test mode $02)

EK:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

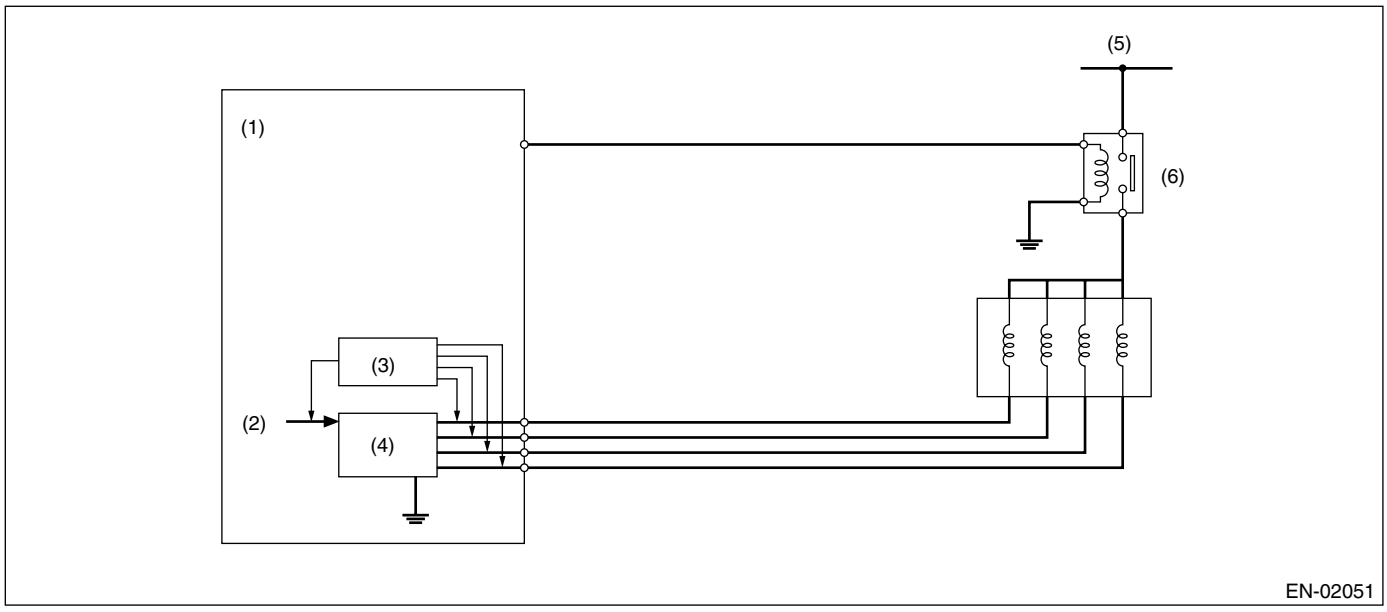
Memorize the freeze frame data. (For test mode $02)

EL:DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

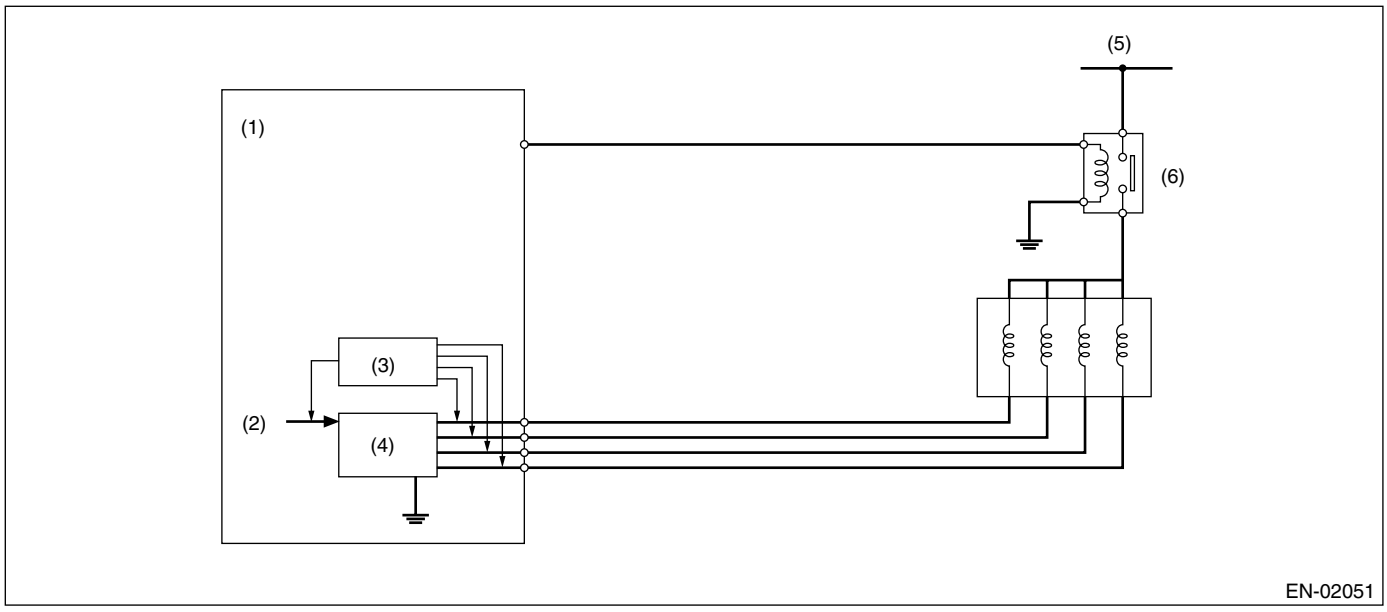
Memorize the freeze frame data. (For test mode $02)

EM:DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

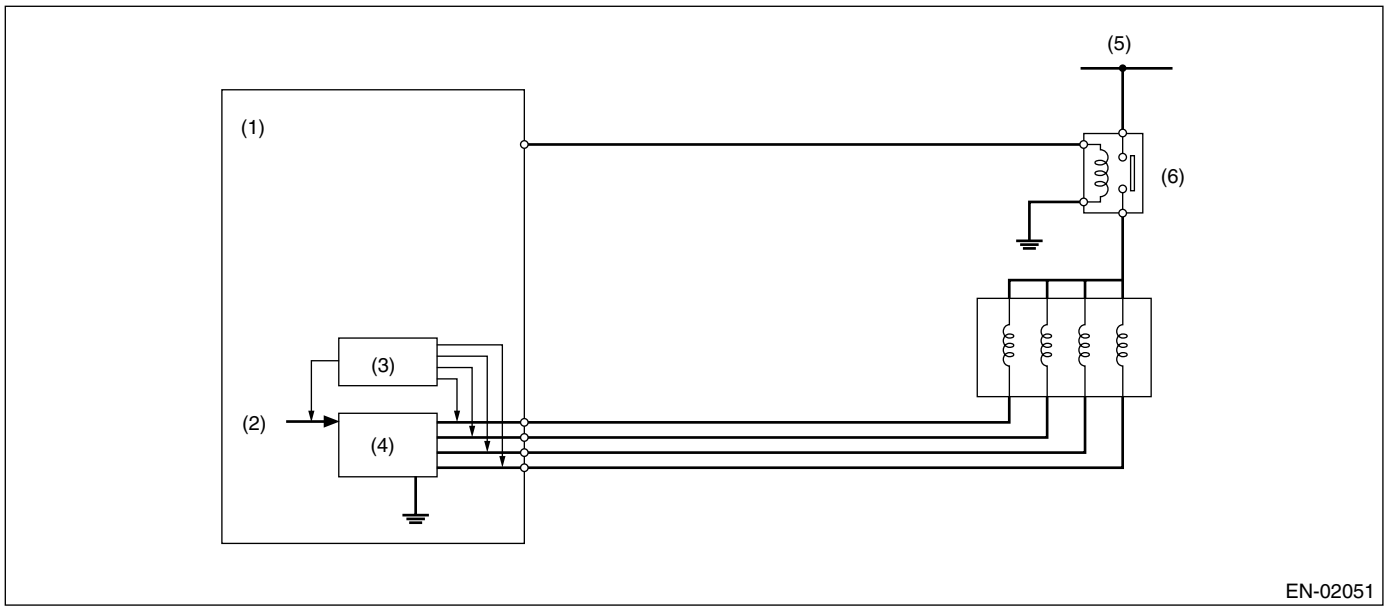
Memorize the freeze frame data. (For test mode $02)

EN:DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

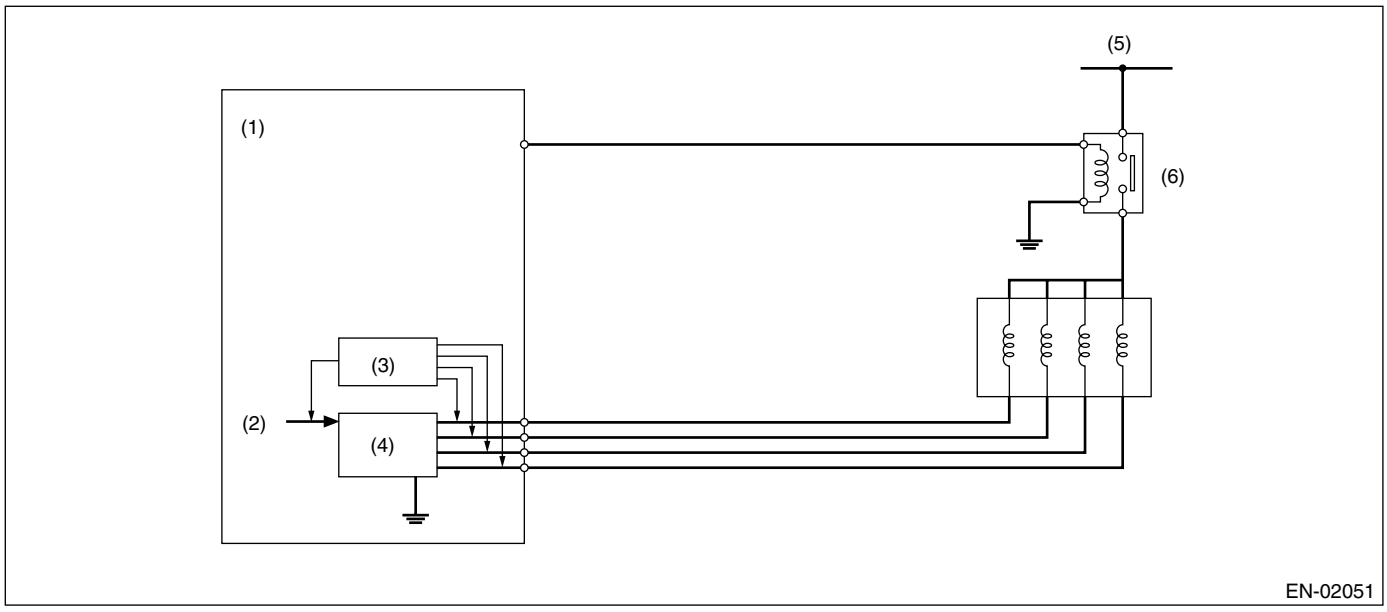
Memorize the freeze frame data. (For test mode $02)

EO:DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

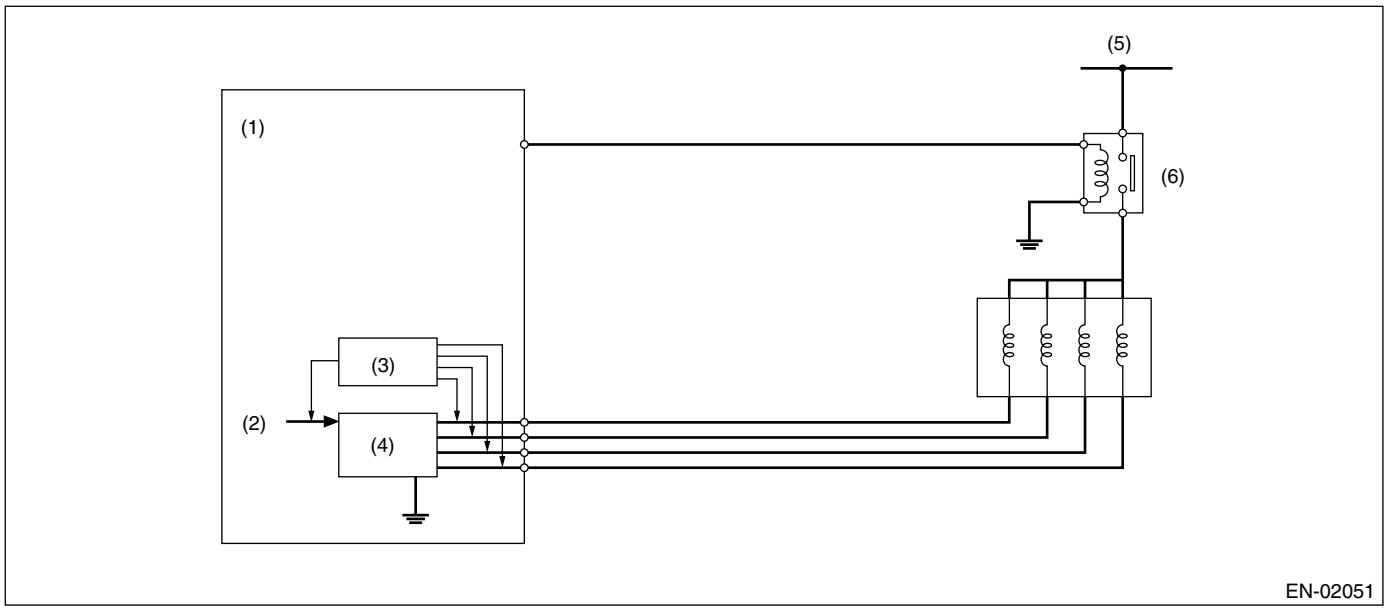
Memorize the freeze frame data. (For test mode $02)

EP:DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)
(2) CPU
(3) Detecting circuit
(4) Switching circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EQ:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after the engine speed of less than 500 rpm continues 0.8 seconds or more	≥ 500 rpm

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ER:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	Low
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ES:DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the voltage from throttle sensor is out of specified value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 or ≥ 4.6 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Make the throttle angle to 3/8, and the line pressure and 2-4B pressure to maximum.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

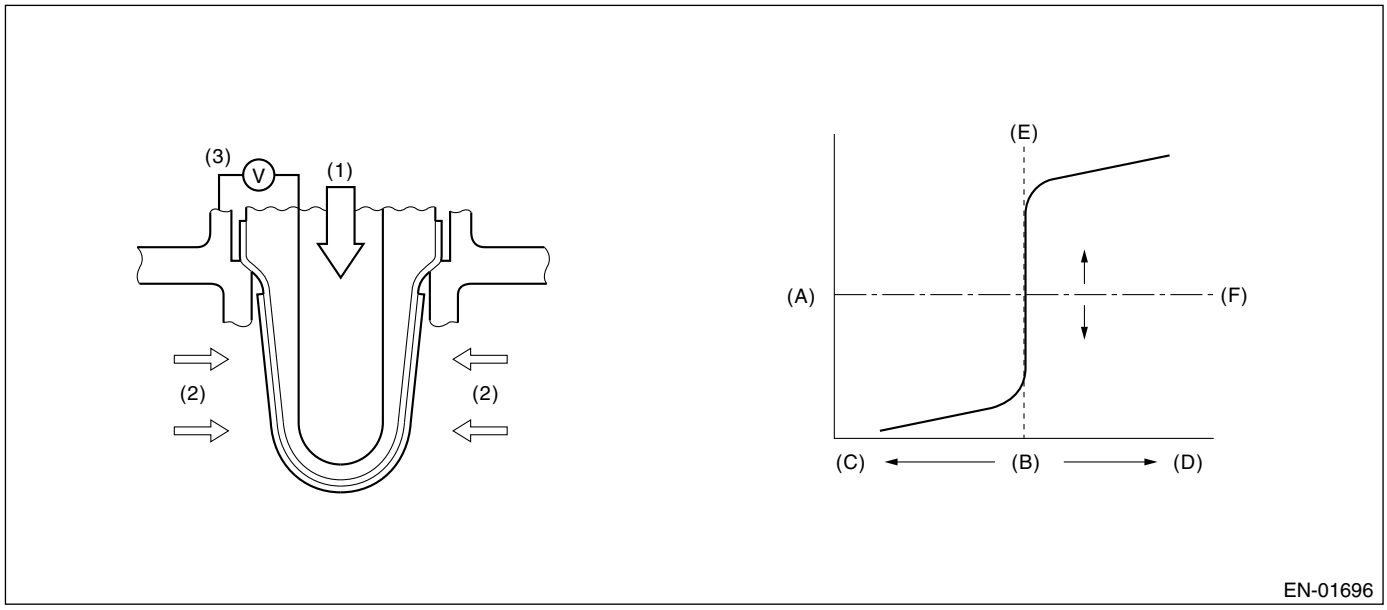
MEMO:

ET:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Judge NG when the sub feedback learning value sticks to lean sides during sub feedback learningcontrol.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all condition below	1 second or more
Main feedback	In operation
Sub feedback	In operation
Engine coolant temperature	≥ 70°C (158°F)
Amount of intake air	≥ 8 ←→ 25 g (0.28 ←→ 0.88 oz)/sec
Amount of intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.03
Total time of operating canister purge after engine starting	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 to 100 km/h (31 to 62 MPH).

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK when it becomes less than 5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Sub feedbacl learning value	≤ –0.015 V

Time Needed for Diagnosis: 5 seconds ×1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

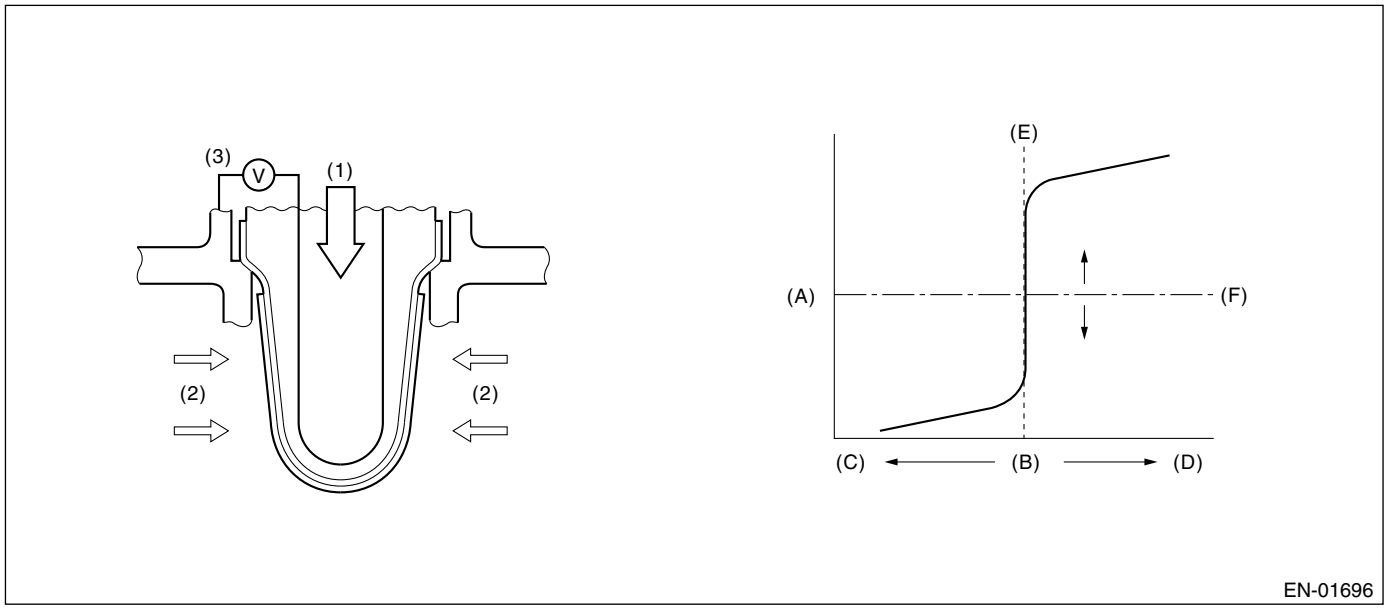
Memorize the freeze frame data. (For test mode $02)

EU:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Judge NG when the sub feedback learning value sticks to rich sides during sub feedback learning control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all condition below	1 second or more
Main feedback	In operation
Sub feedback	In operation
Engine coolant temperature	≥ 70°C (158°F)
Amount of intake air	≥ 15 g (0.53 oz)/sec
Amount of intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.03
Total time of operating canister purge after engine starting	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed 50 to 100 km/h (31 to 62 MPH).

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK when it becomes less than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	> 0.015 V

Time Needed for Diagnosis: 5 seconds ×1 time
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EV:DTC P2098 — Post Catalyst Fuel Trim System Too Lean Bank 2 —

NOTE:
For the detection standard, refer to P2096. <Ref. to GD(H4SO U5)-292, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EW:DTC P2099 — Post Catalyst Fuel Trim System Too Rich Bank 2 —

NOTE:
For the detection standard, refer to P2097. <Ref. to GD(H4SO U5)-294, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

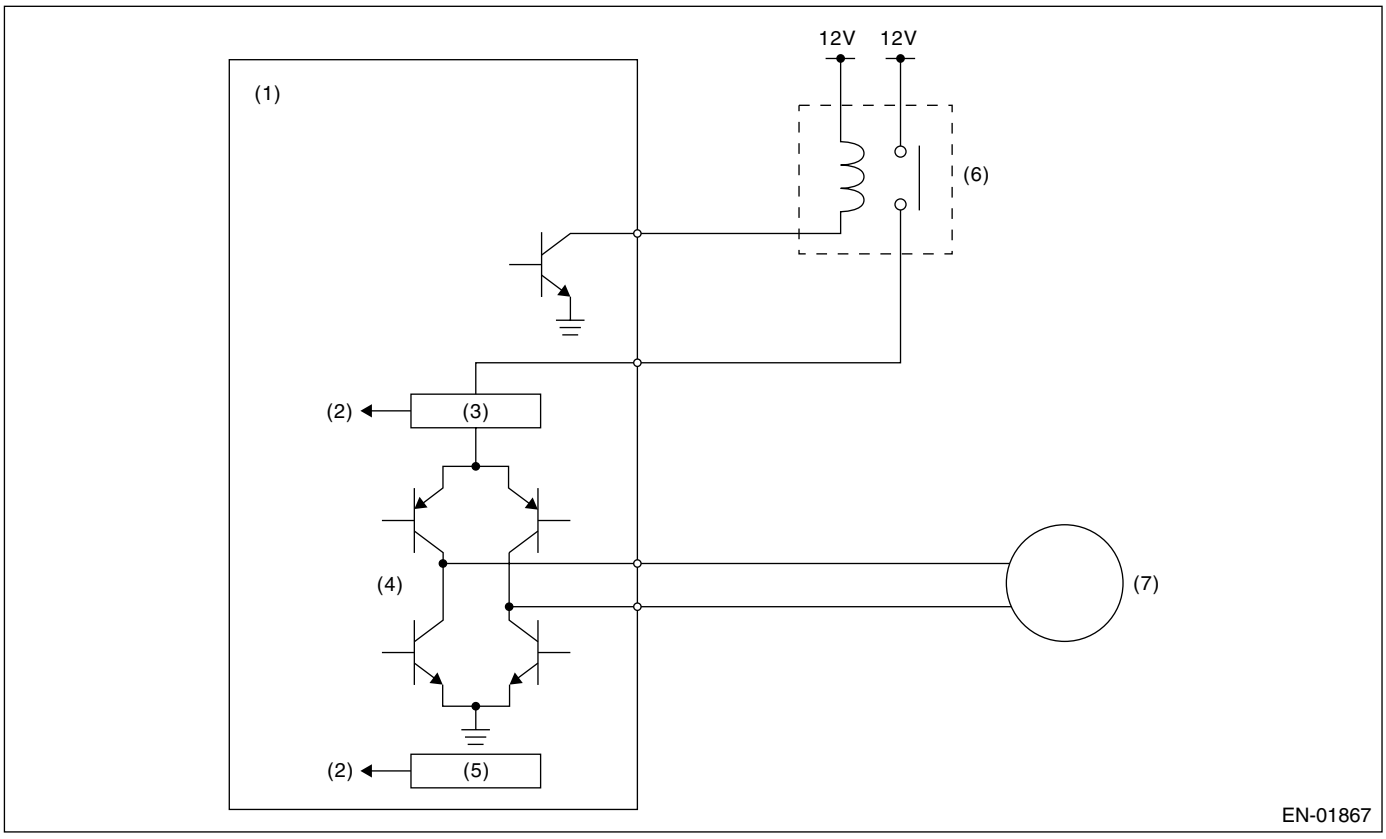
MEMO:

EX:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control unit (ECM)
(2) Detection circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic control throttle relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2000 milliseconds (OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

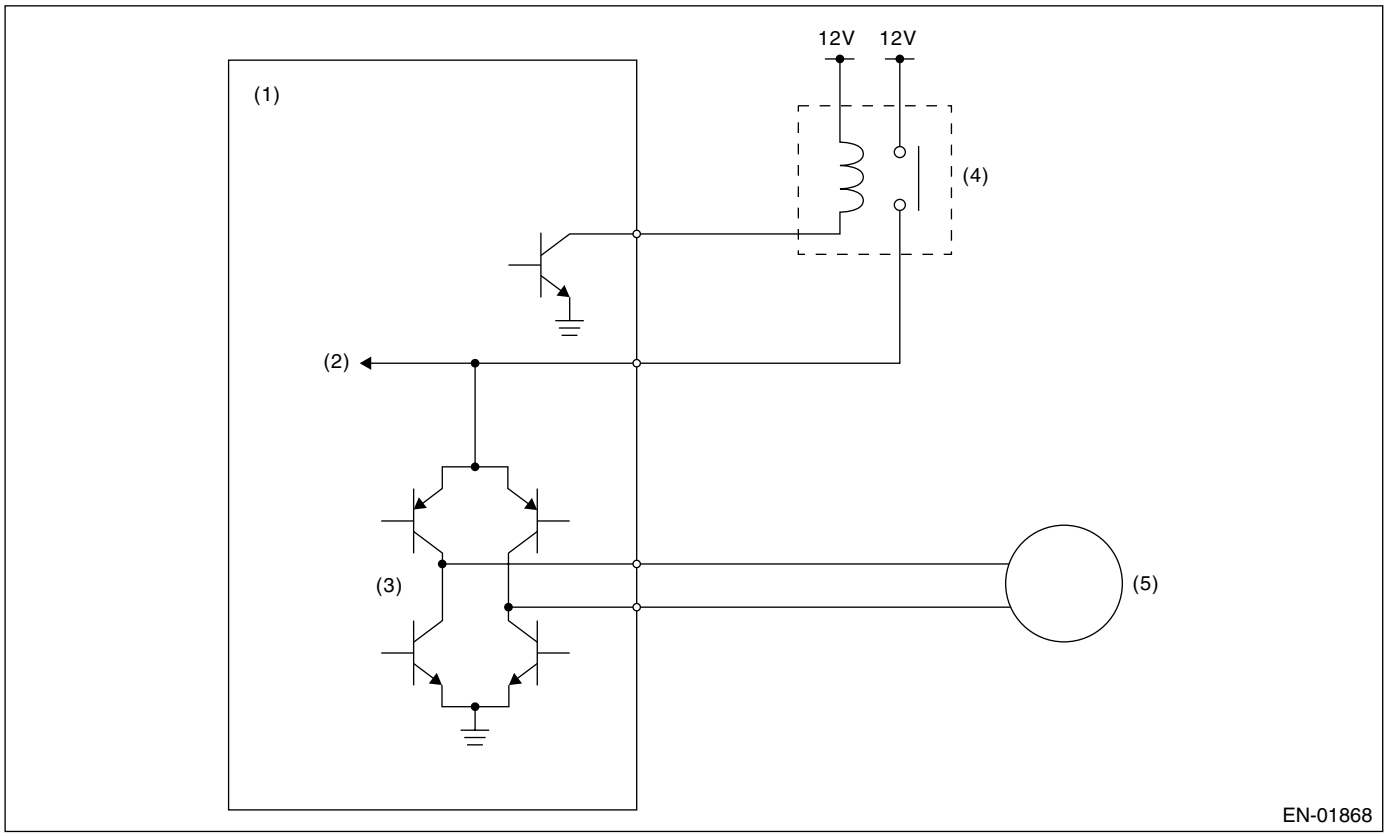
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

EY:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic control throttle relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are cmpleted.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

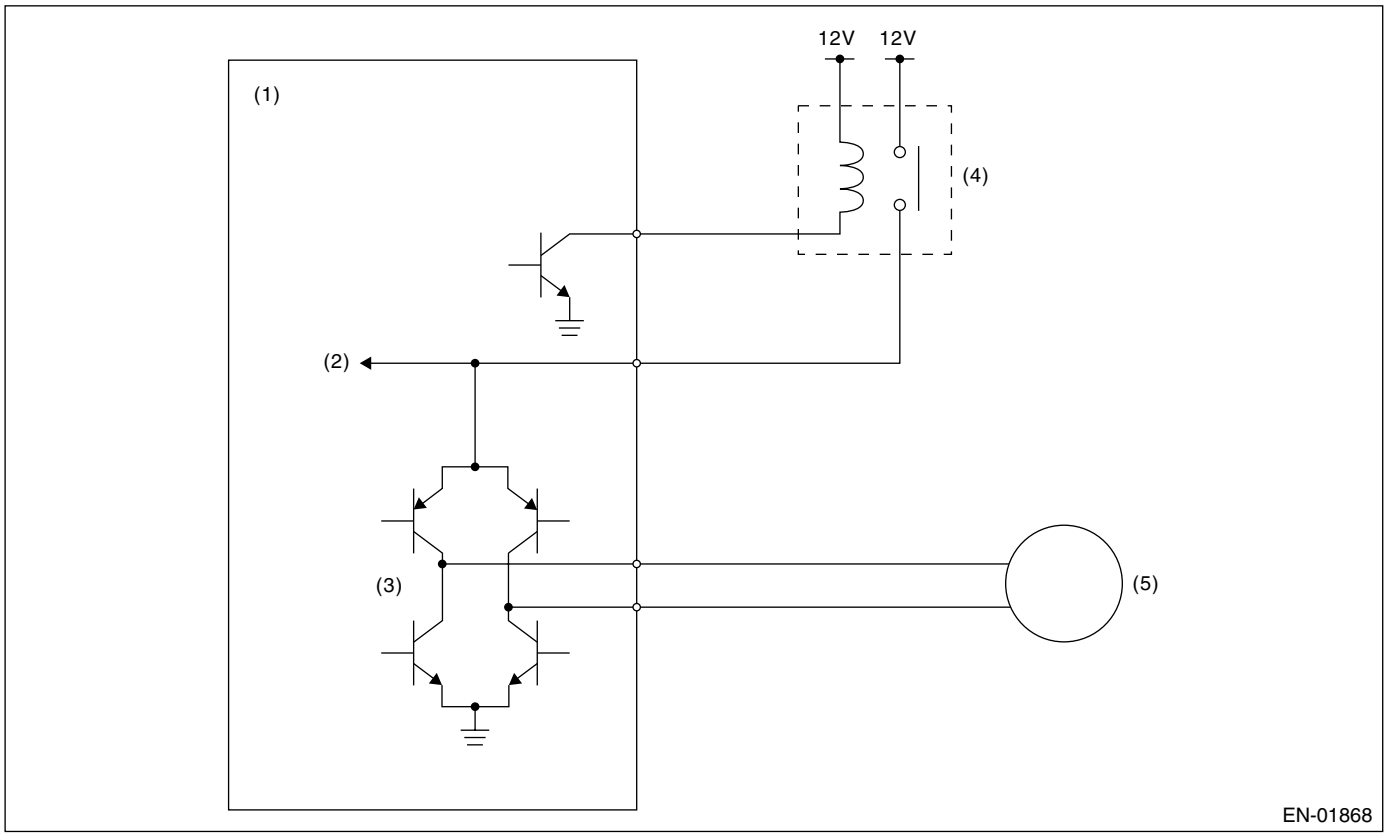
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

EZ:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic control throttle relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

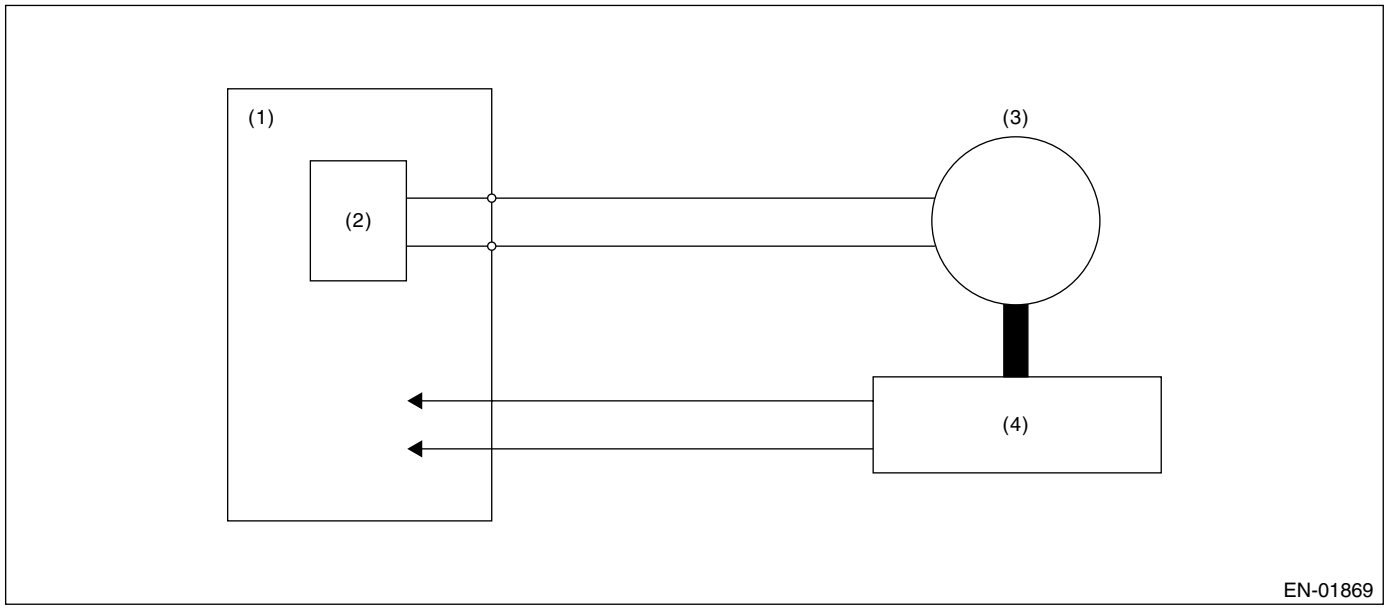
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FA:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor voltage at all close point learning	0.41 — 0.79 V
Time for all close point learning completion	Within 80 milliseconds

Time Needed for Diagnosis: None
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

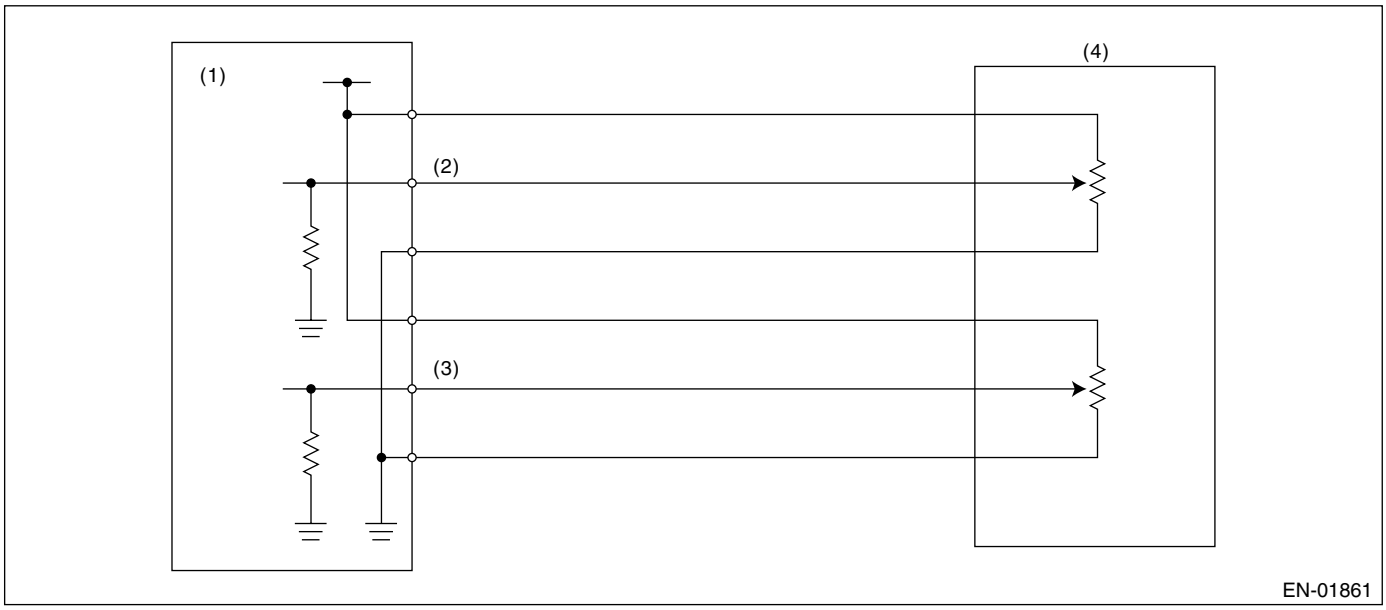
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FB:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

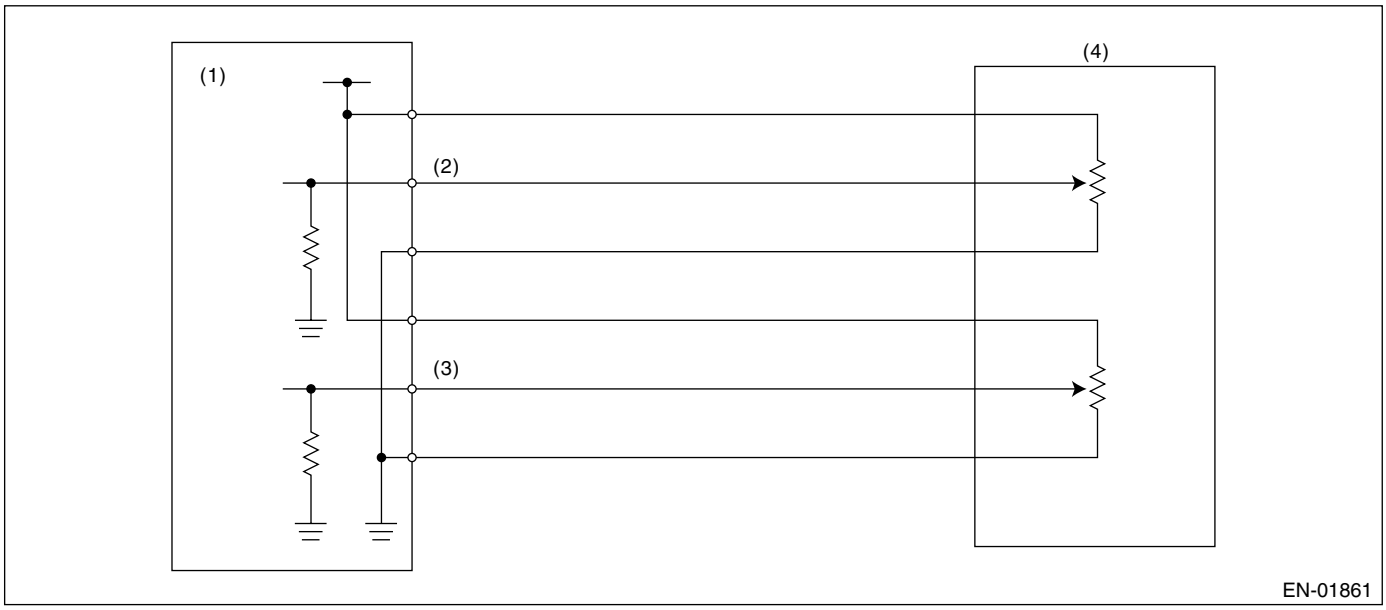
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FC:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.856 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

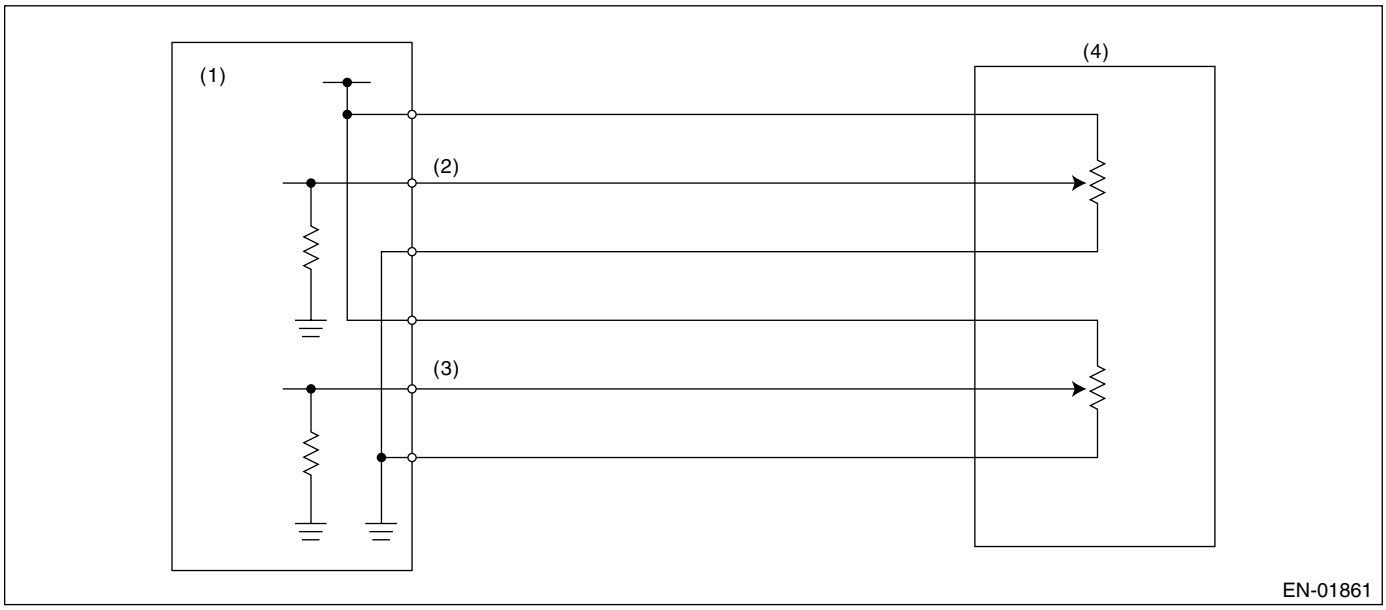
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FD:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

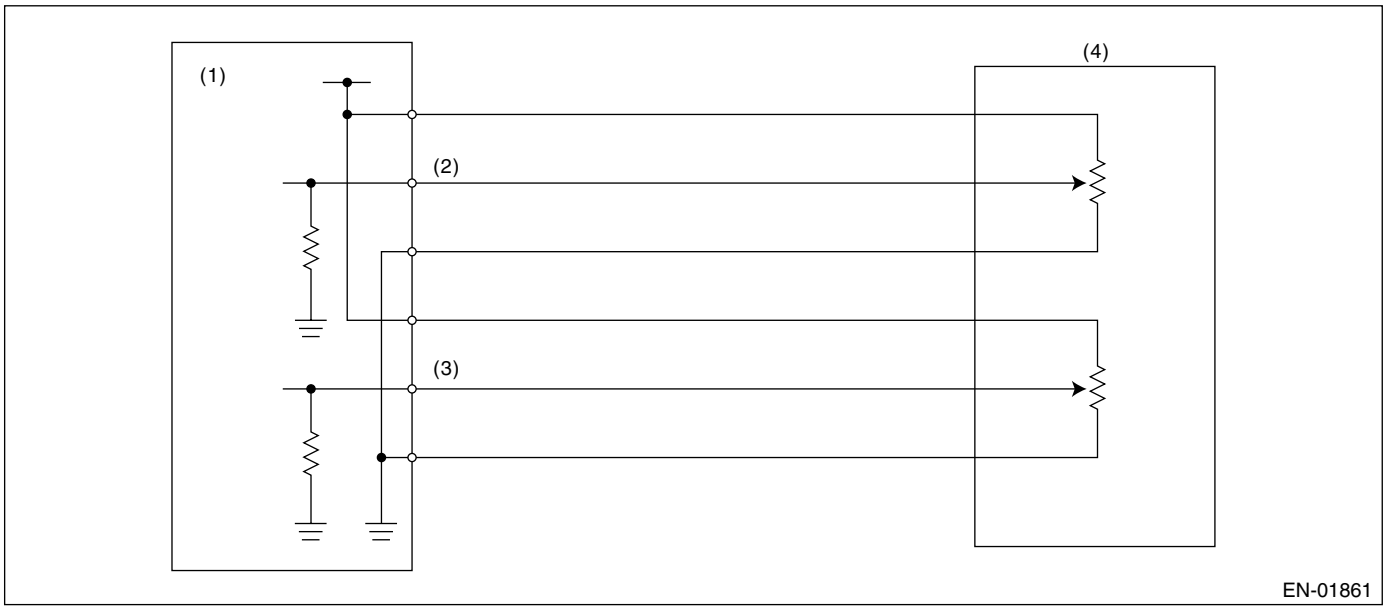
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FE:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

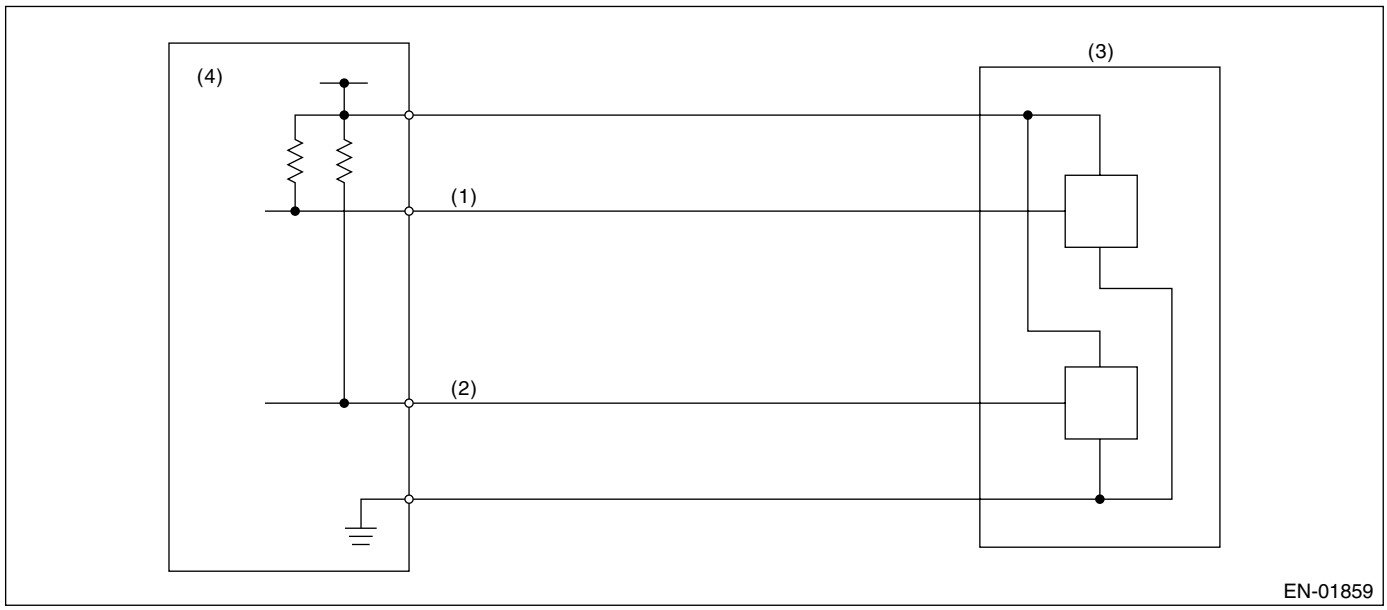
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FF: DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal.
(2) Throttle position sensor 2 signal.
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

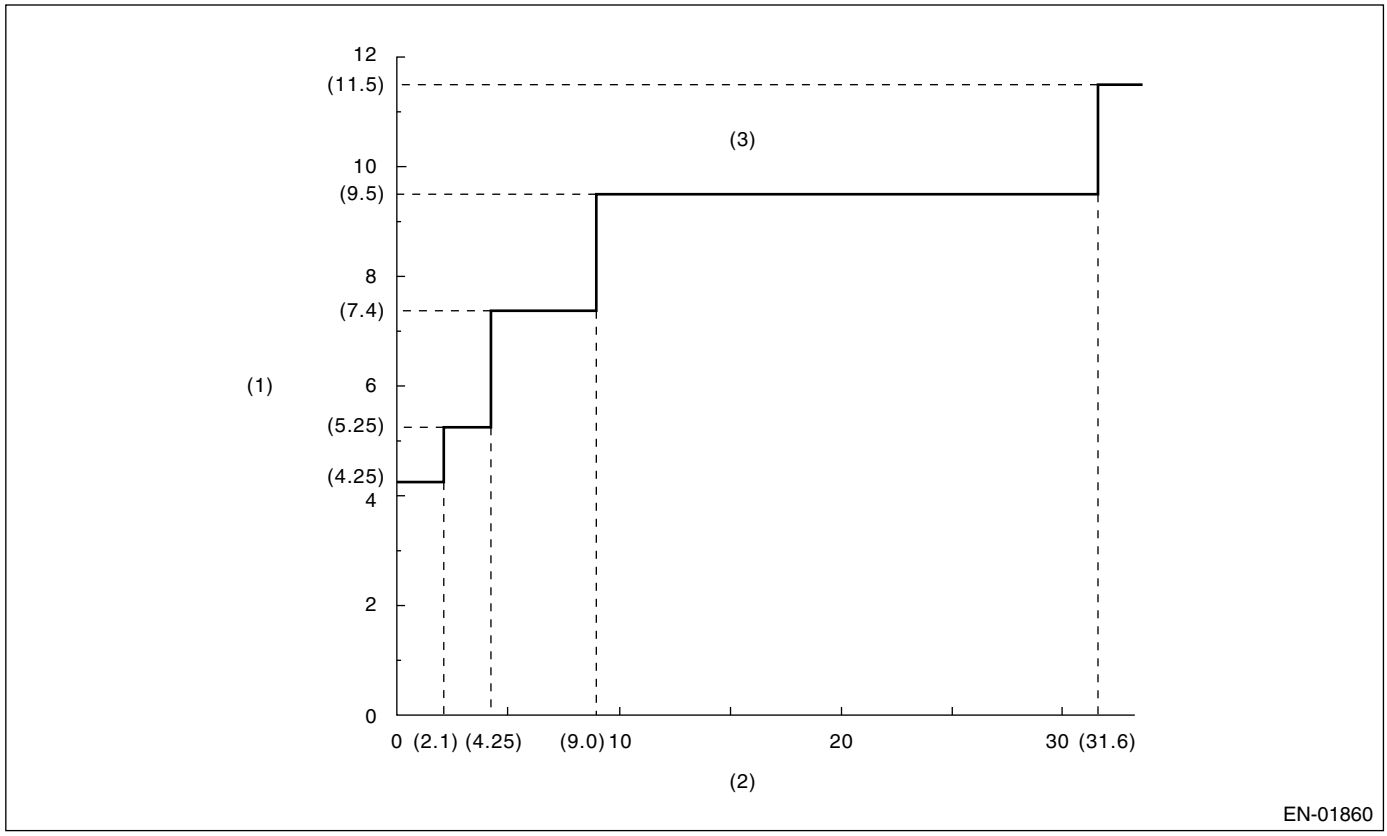
5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25 °

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 milliseconds(NG judgment) 24 milliseconds(OK judgment)
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

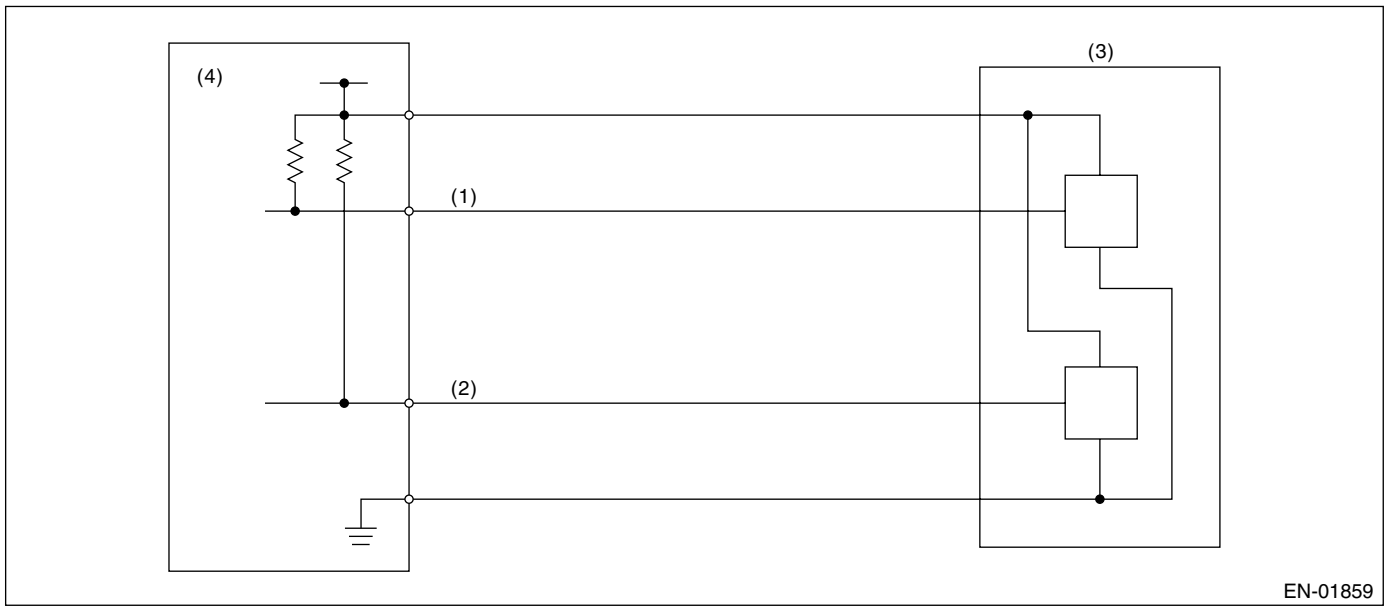
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

FG:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

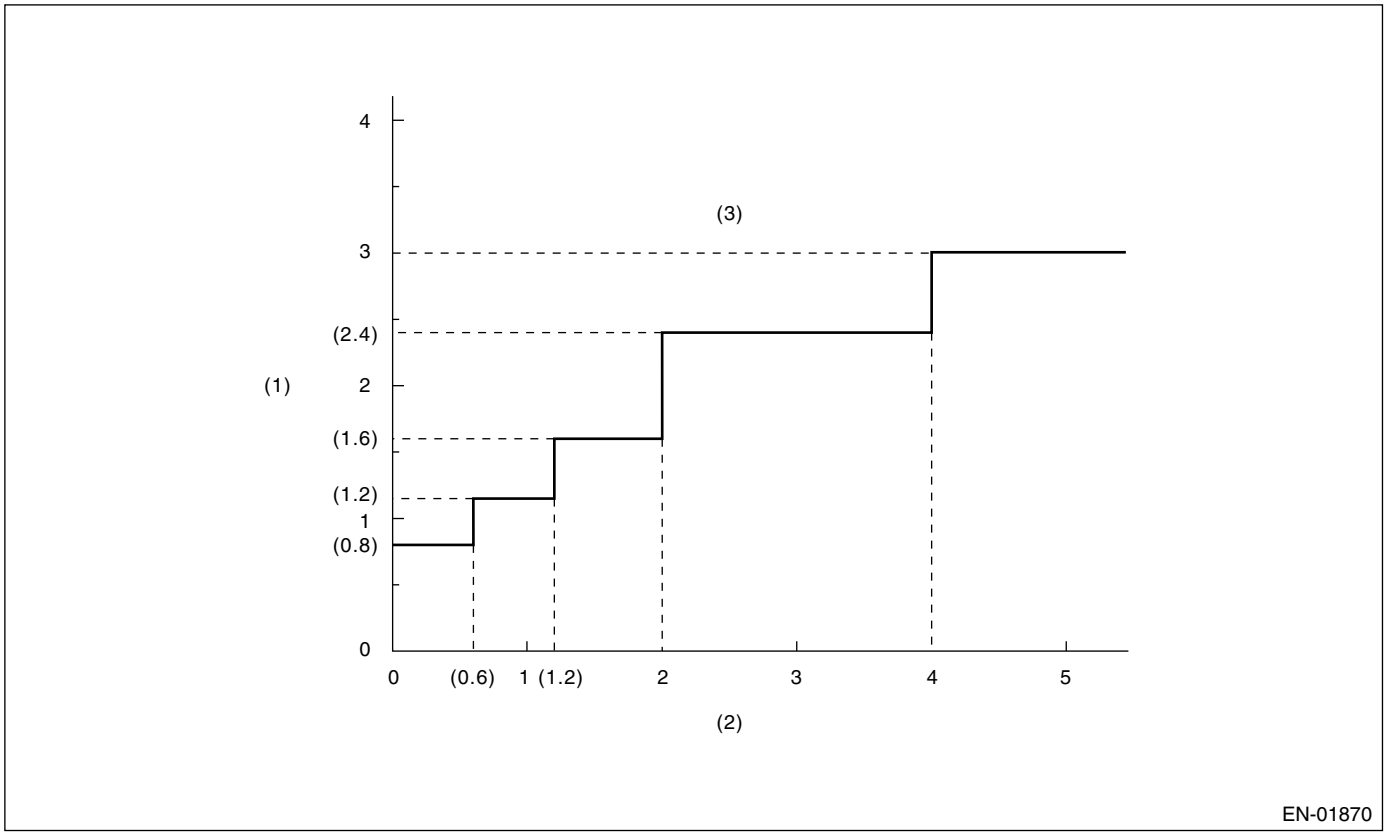
5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 0.8°

Details of Judgment Value



(1) Sensor output difference (°)
(2) Accelerator pedal position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

MEMO:

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC)

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1. General Description

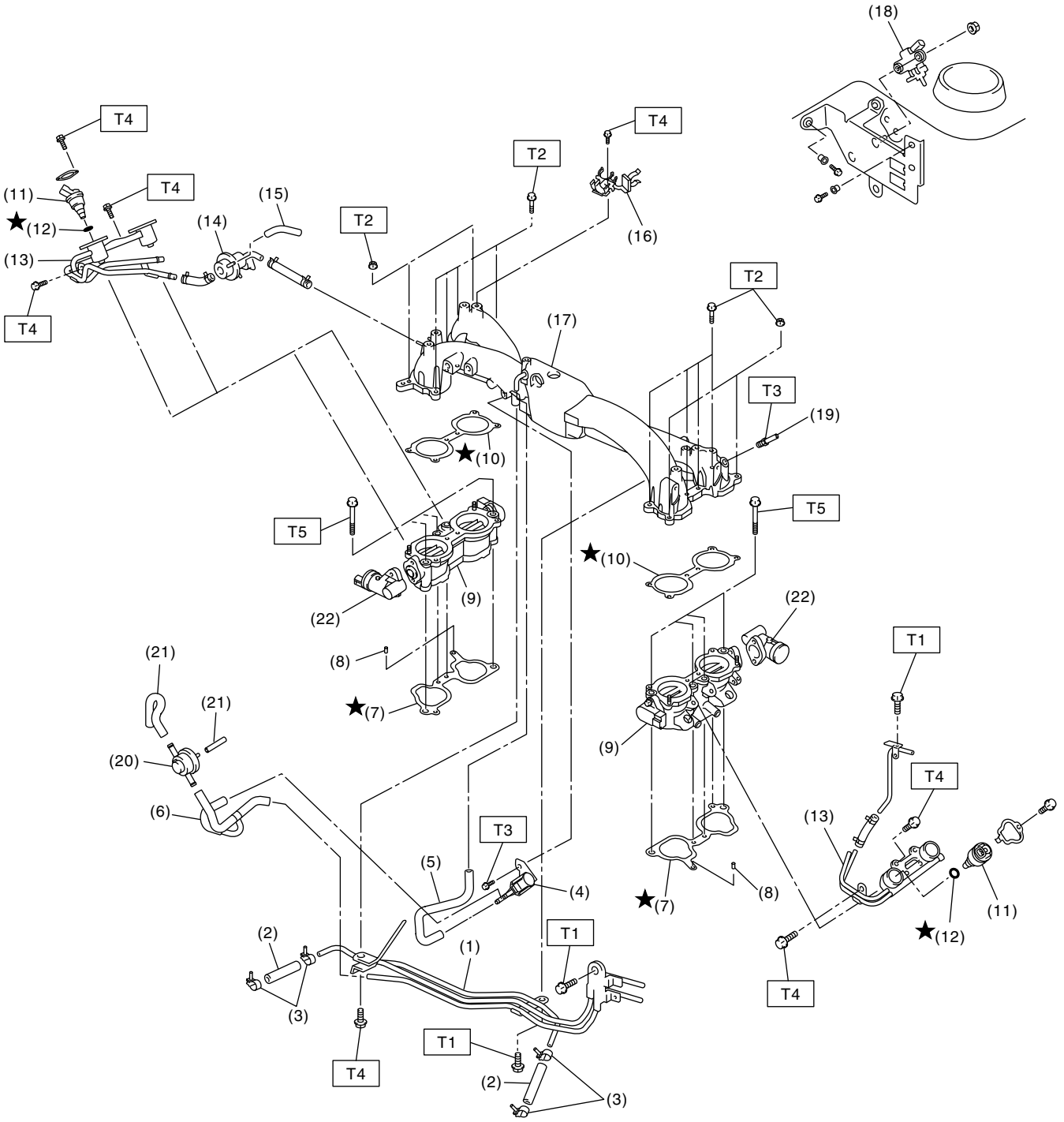
A: SPECIFICATIONS

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

MEMO:

B: COMPONENT

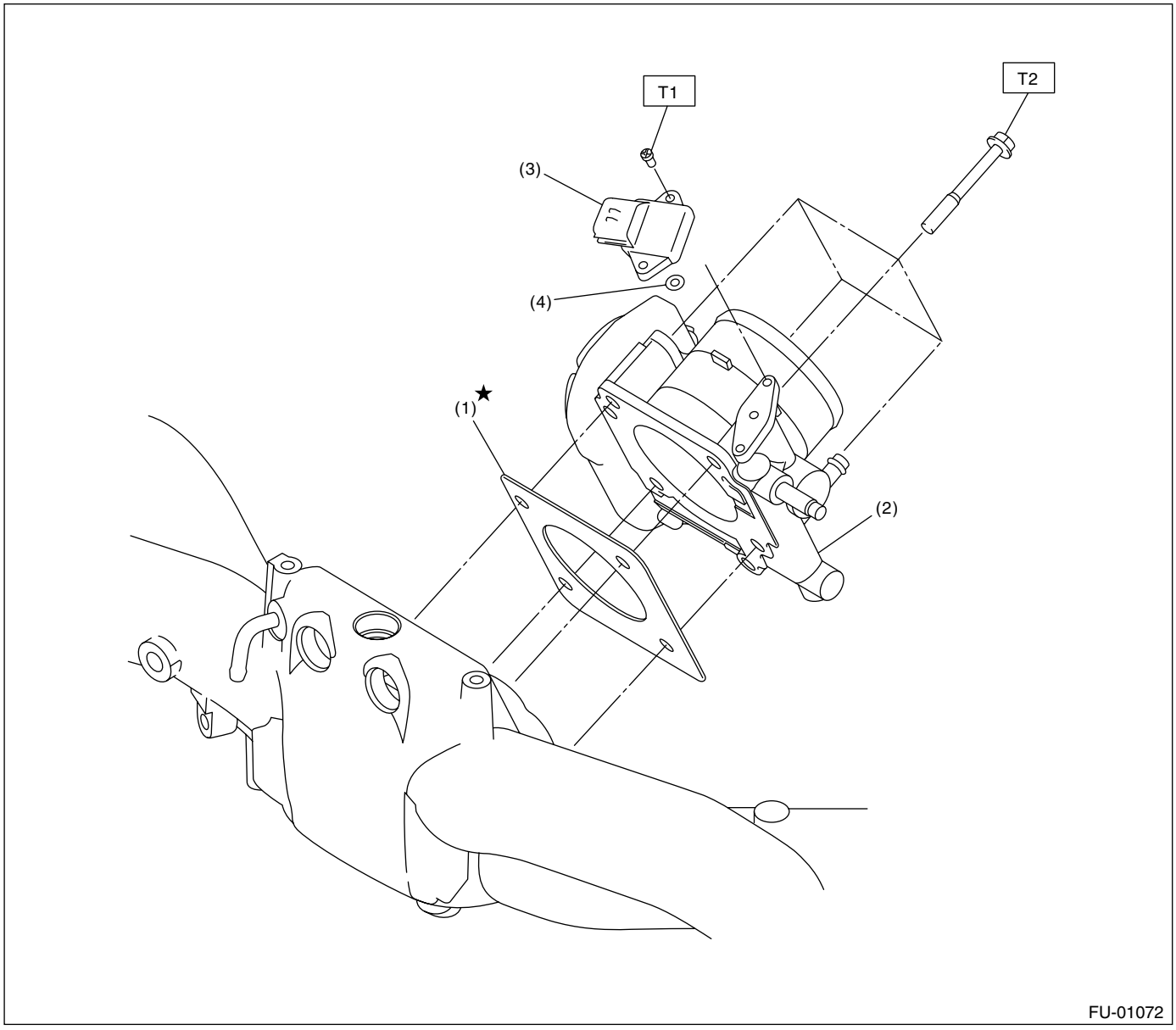
1. INTAKE MANIFOLD



(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Tumble generator valve gasket
(11) Fuel injector
(12) O-ring
(13) Fuel injector pipe
(14) Pressure regulator
(15) Pressure regulator hose
(16) Blow-by hose stay
(17) Intake manifold
(18) Wastegate control solenoid valve ASSY
(19) Nipple
(20) Purge valve
(21) Purge hose
(22) Tumble generator valve actuator

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T3: 8.25 (0.84, 6.1)
T5: 17 (1.73, 12.5)
T6: 19 (1.94, 13.7)
T7: 25 (2.5, 18.1)

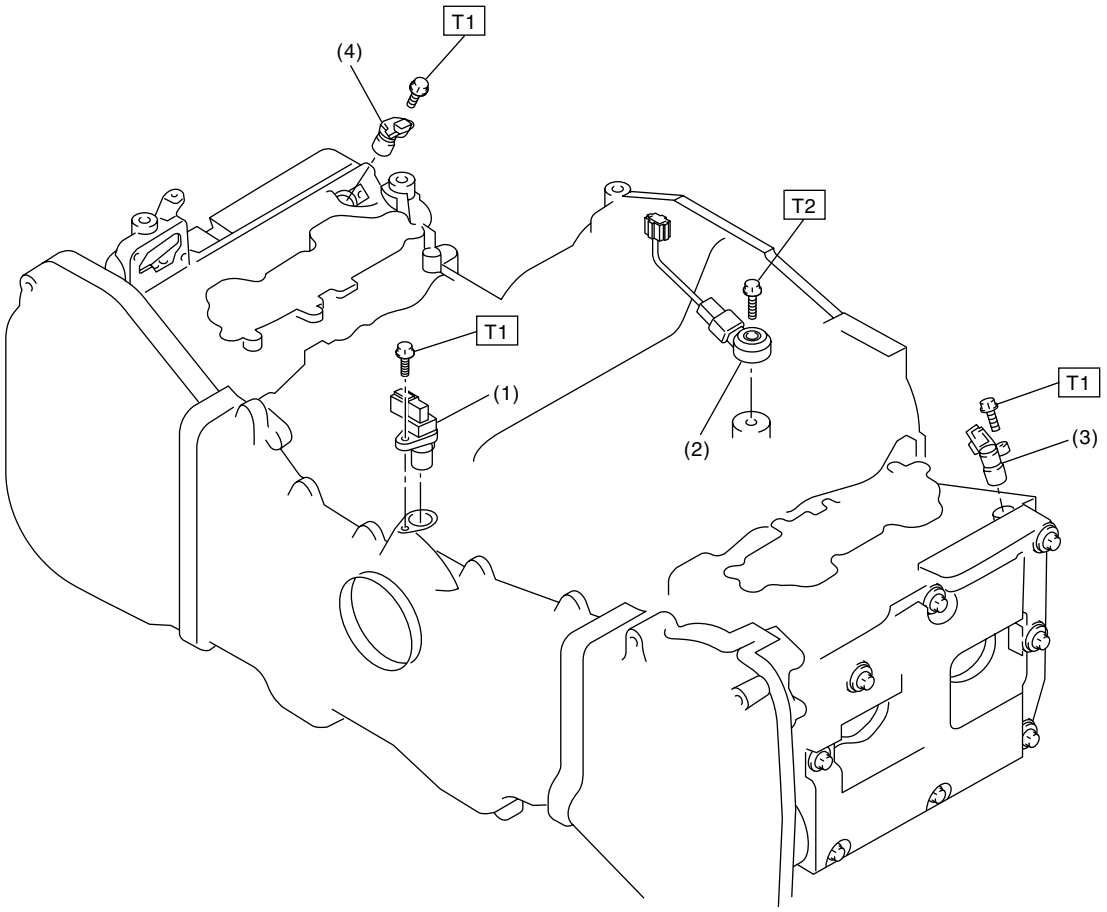
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle body
(3) Manifold absolute pressure sensor
(4) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 8 (0.8, 5.8)

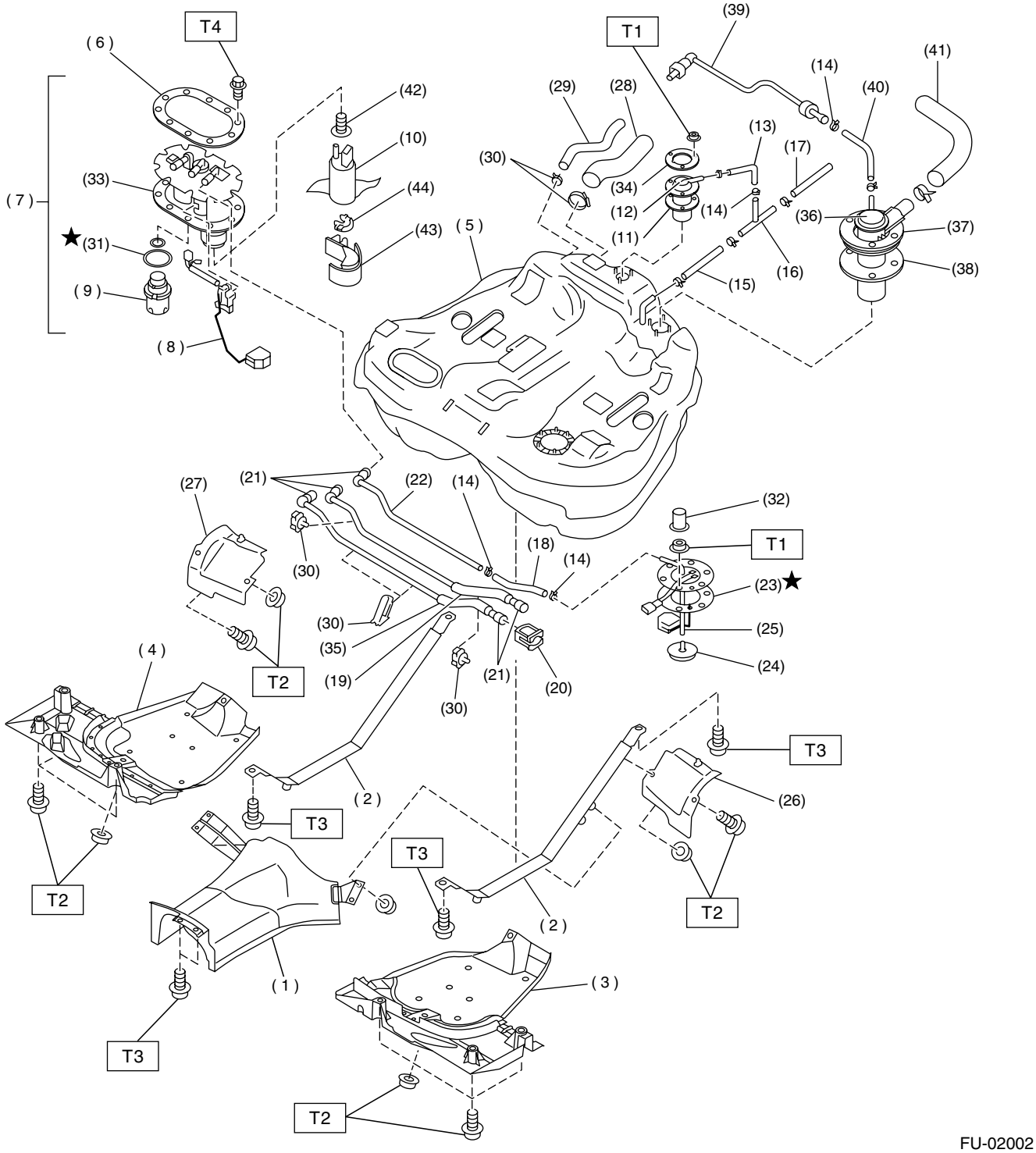
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor LH
(4) Camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

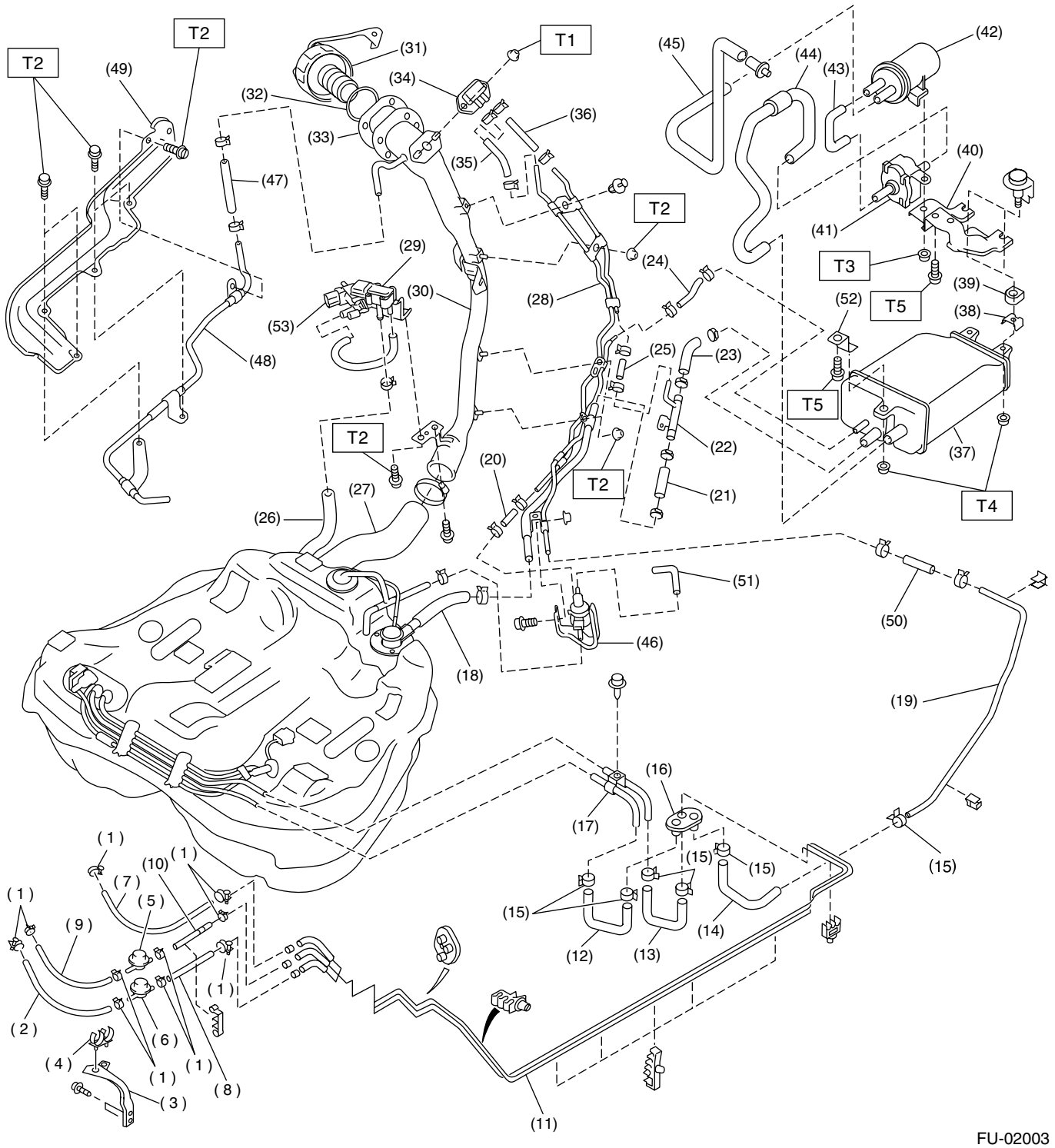


FU-02002

(1) Heat sealed cover
(2) Fuel tank band
(3) Protector LH (Front)
(4) Protector RH (Front)
(5) Fuel tank
(6) Fuel pump plate
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel filter
(10) Fuel pump
(11) Fuel cut valve gasket
(12) Fuel cut valve
(13) Evaporation hose A
(14) Clip
(15) Evaporation hose C
(16) Joint pipe
(17) Evaporation hose B
(18) Jet pump hose
(19) Fuel return tube
(20) Retainer
(21) Quick connector
(22) Jet pump tube
(23) Fuel sub level sensor gasket
(24) Jet pump filter
(25) Fuel sub level sensor
(26) Protector LH (Rear)
(27) Protector RH (Rear)
(28) Fuel filler hose
(29) Fuel tank pressure sensor hose
(30) Clamp
(31) Gasket
(32) Cap
(33) Gasket
(34) Fuel cut valve plate
(35) Fuel delivery tube
(36) Vent valve
(37) Vent valve plate
(38) Vent valve gasket
(39) Evaporation tube
(40) Evaporation hose D
(41) Air vent hose
(42) Seal
(43) Fuel pump holder
(44) Grommet

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)
T4: 5.9 (0.6, 4.3)

5. Fuel Line


T1
T2
T3
T4
T5
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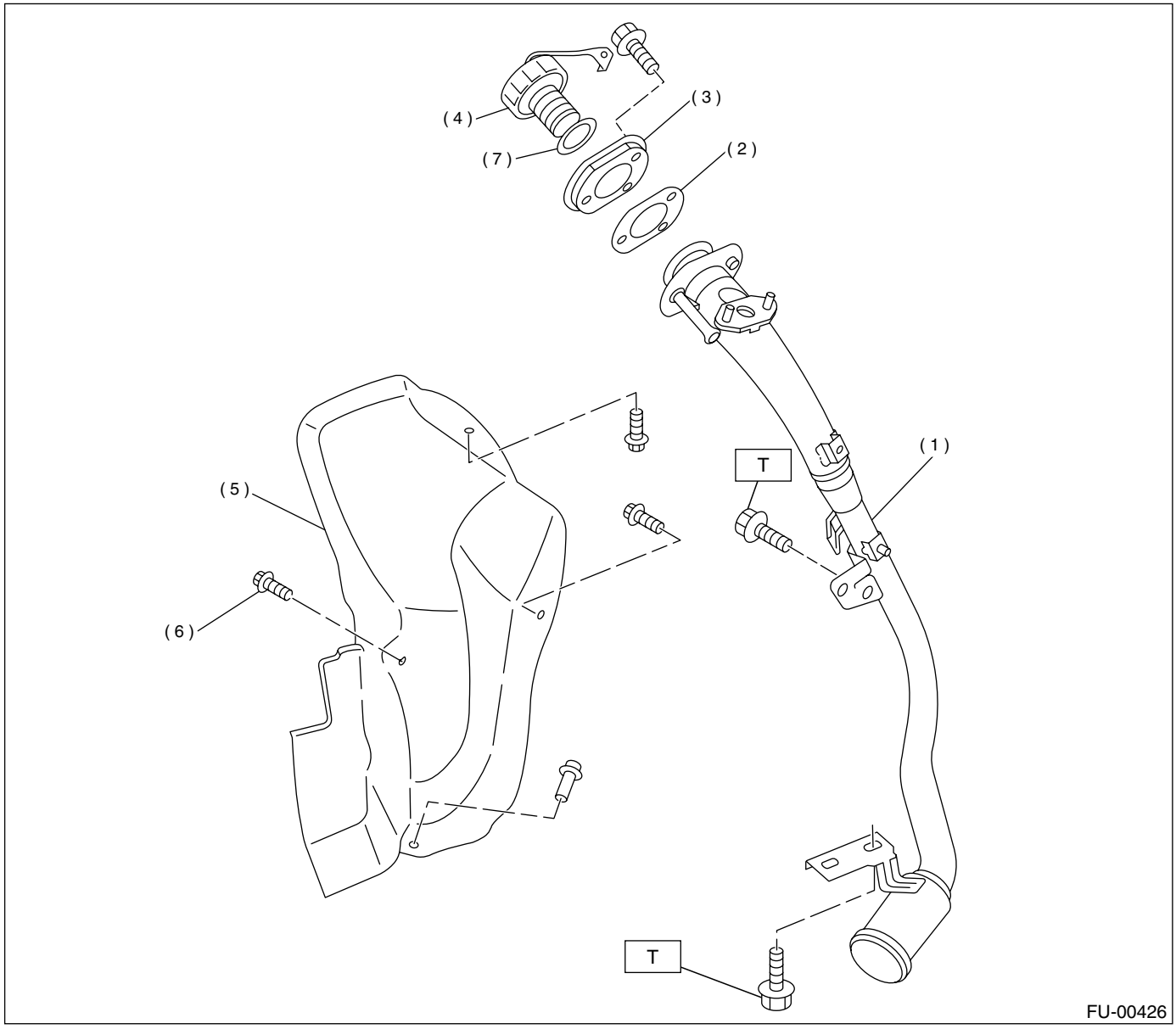
FU-02003

(1) Clamp
(2) Fuel delivery hose A
(3) Bracket
(4) Clamp
(5) Fuel damper (return)
(6) Fuel damper (delivery)
(7) Evaporation hose F
(8) Fuel delivery hose B
(9) Fuel return hose A
(10) Fuel return hose B
(11) Fuel pipe ASSY
(12) Fuel delivery hose C
(13) Fuel return hose C
(14) Evaporation hose G
(15) Clamp
(16) Grommet
(17) Fuel pipe ASSY
(18) Air vent hose A
(19) Evaporation pipe A
(20) Evaporation hose H
(21) Air vent hose B
(22) Air vent pipe
(23) Evaporation hose I
(24) Evaporation hose J
(25) Evaporation hose K
(26) Fuel tank pressure sensor hose
(27) Fuel filler hose
(28) Evaporation pipe B
(29) Fuel tank pressure sensor
(30) Fuel filler pipe
(31) Fuel filler cap
(32) Ring B
(33) Packing
(34) Shut valve
(35) Evaporation hose L
(36) Evaporation hose M
(37) Canister
(38) Canister lower bracket
(39) Cushion rubber
(40) Canister upper bracket
(41) Drain valve
(42) Drain filter
(43) Drain filter hose A
(44) Drain valve hose
(45) Drain filter hose B
(46) Pressure control solenoid valve
(47) Evaporation hose N
(48) Evaporation pipe C
(49) Pipe protector
(50) Evaporation hose O
(51) Pressure control solenoid valve hose
(52) Canister bracket (front)
(53) Fuel tank sensor control valve

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.5 (0.46, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 23 (2.3, 16.6)
T5: 33 (3.4, 25)

6. Fuel Filler Pipe



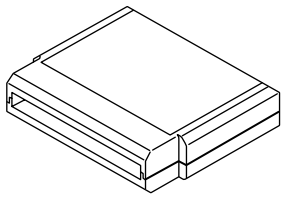
(1) Fuel filler pipe ASSY
(2) Filler pipe packing
(3) Filler ring
(4) Filler cap
(5) Filler pipe protector
(6) Clip
(7) Ring B

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.75, 5.4)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

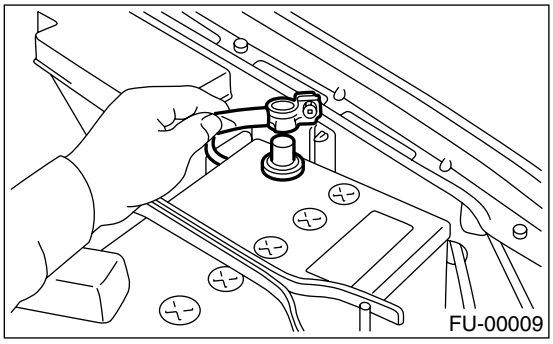
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230 (New adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

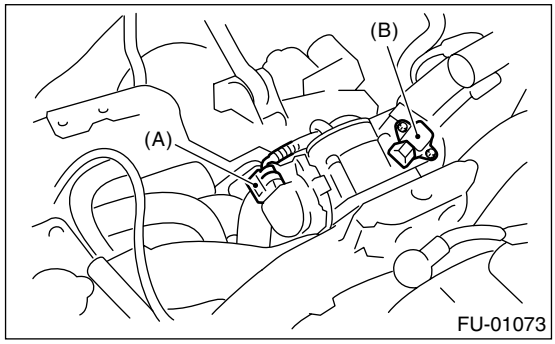
2. Throttle Body

A: REMOVAL

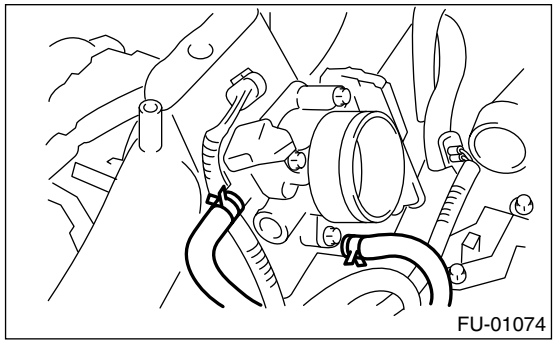
1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



4) Disconnect the engine coolant hoses from the throttle body.



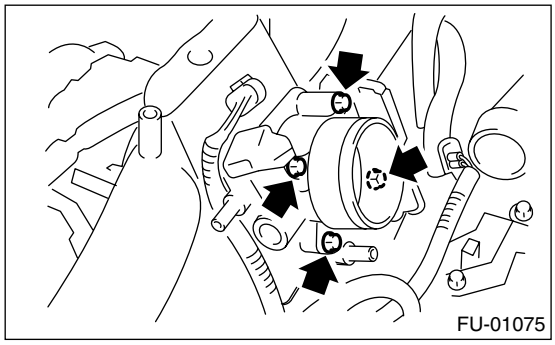
5) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

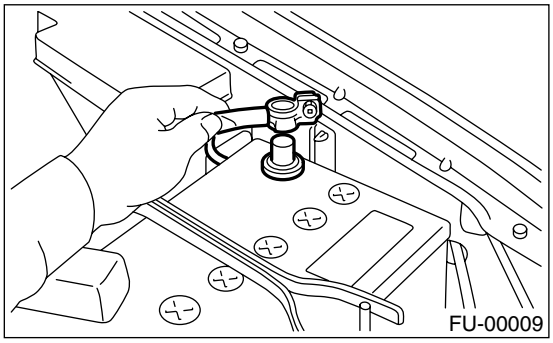
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



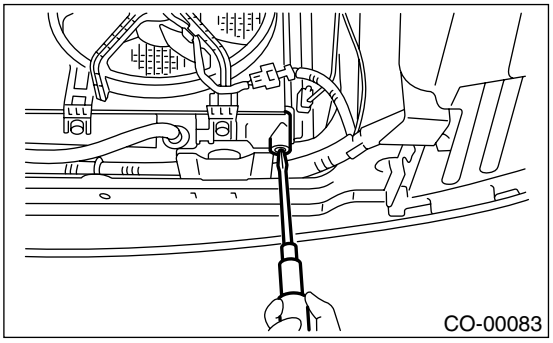
3. Intake Manifold

A: REMOVAL

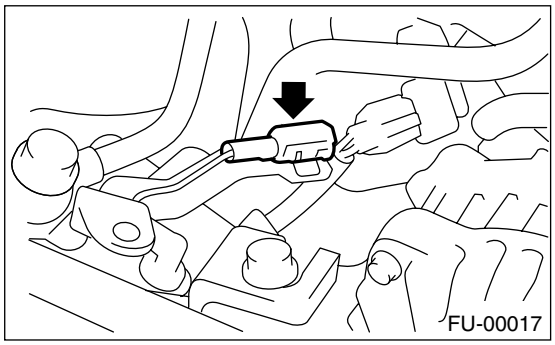
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Lift up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).

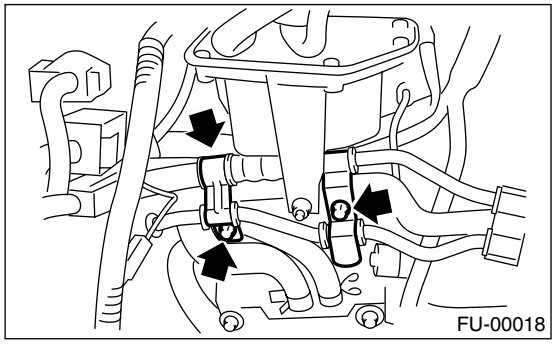


7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
8) Remove the air cleaner element.
9) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-29, REMOVAL, Coolant Filler Tank.>
11) Remove the power steering pump.
(1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

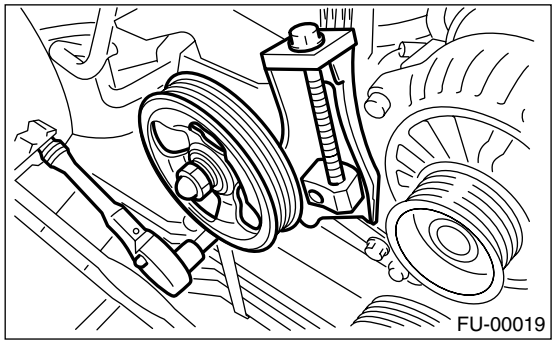


(3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

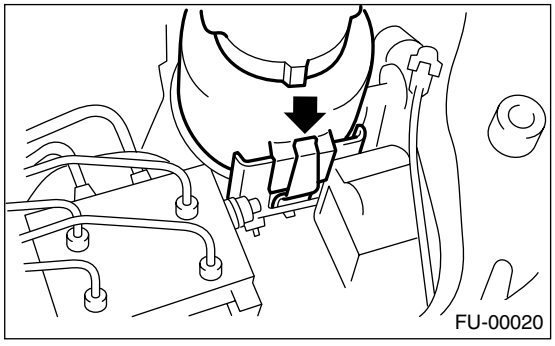
NOTE:
Do not disconnect the power steering hose.



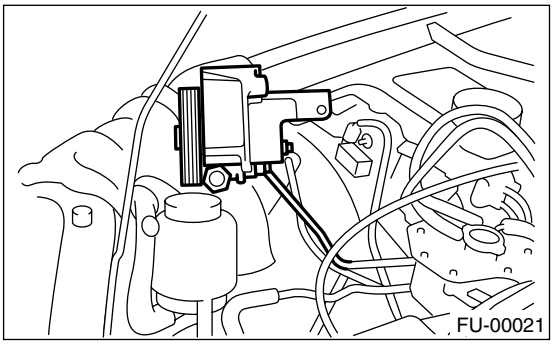
(4) Remove the bolts which secure the power steering pump bracket.



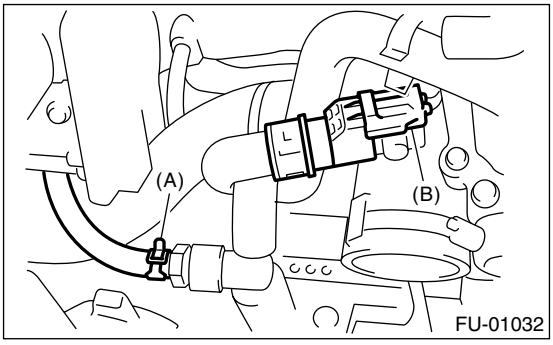
(5) Remove the power steering tank from the bracket by pulling it upward.



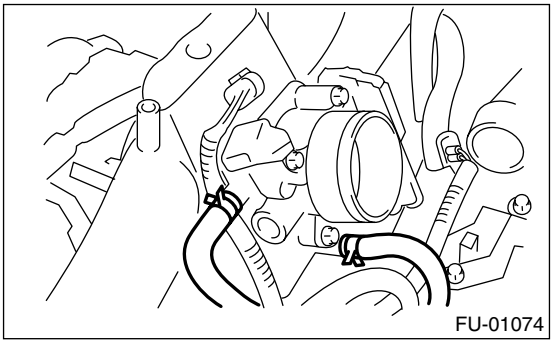
(6) Place the power steering pump on the right side wheel apron.



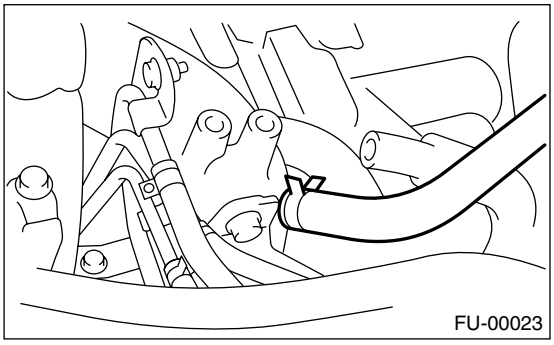
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



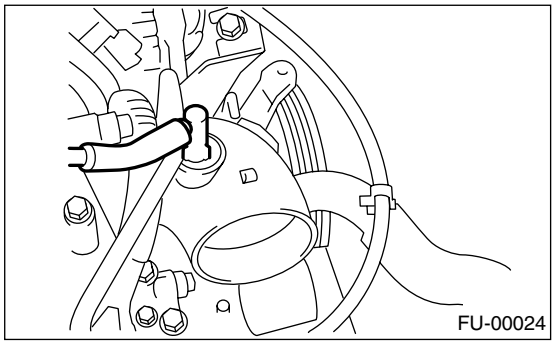
13) Disconnect the engine coolant hoses from the throttle body.



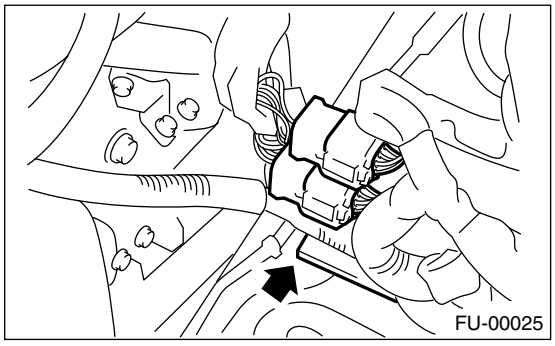
14) Disconnect the brake booster hose.

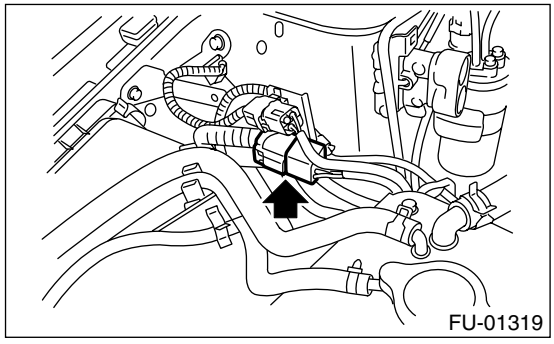


15) Disconnect the pressure hose from the intake duct.

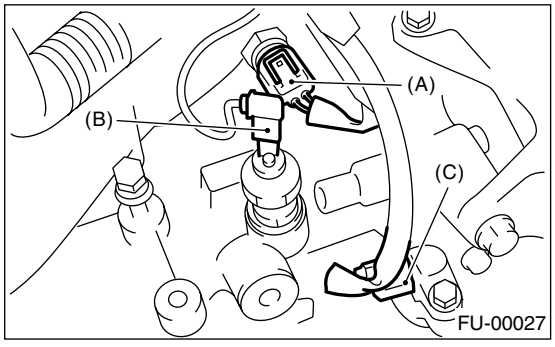


16) Disconnect the engine harness connectors from the bulkhead harness connectors.

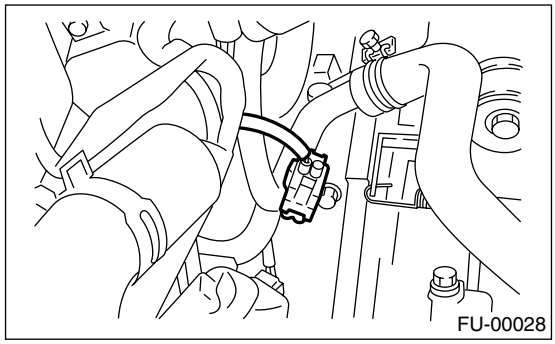




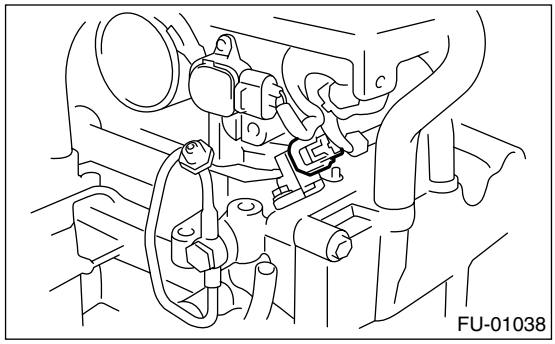
17) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



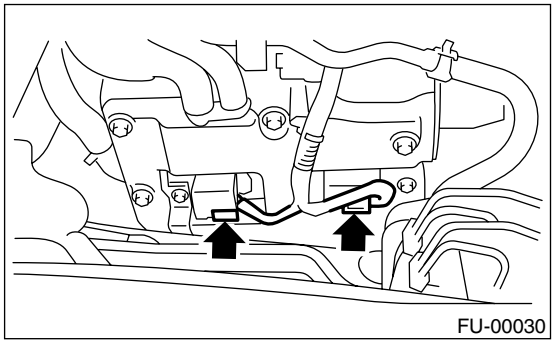
18) Disconnect the knock sensor connector.



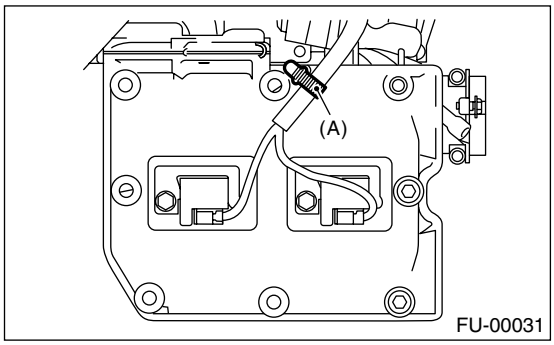
19) Disconnect the connector from the camshaft position sensor.



20) Disconnect the connector from the ignition coil.

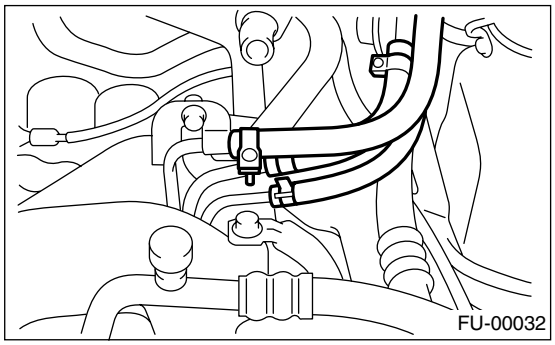


21) Disconnect the engine harness fixed by clip (A) from the bracket.

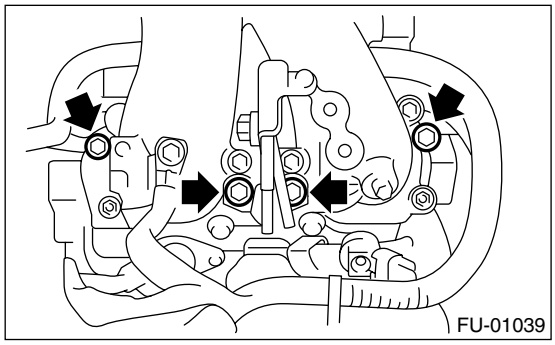


22) Disconnect the fuel delivery hose, return hose and evaporation hose.

CAUTION:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



23) Remove the bolts which secure the intake manifold to the cylinder heads.



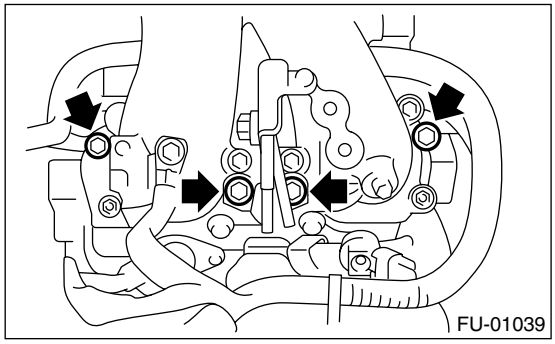
24) Remove the intake manifold.

B: INSTALLATION

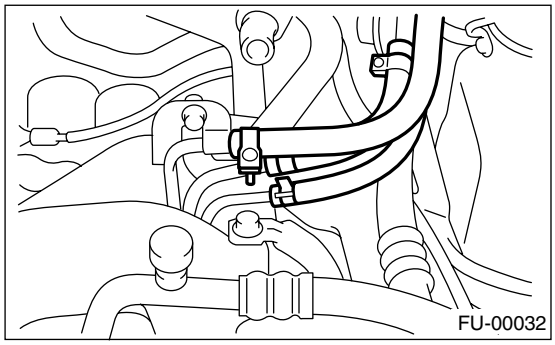
1) Install the intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

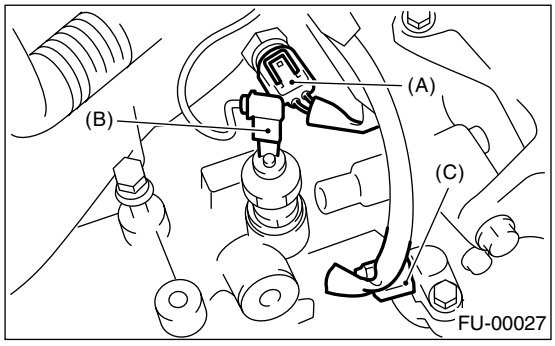
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



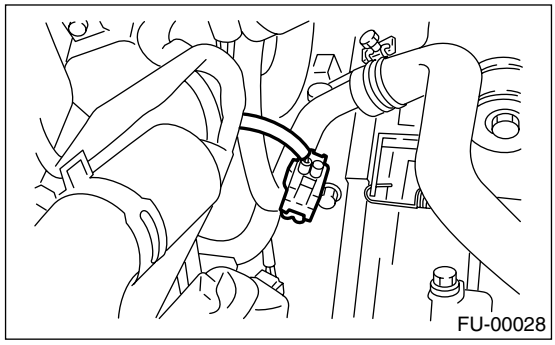
2) Connect the fuel delivery hose, return hose and evaporation hose.



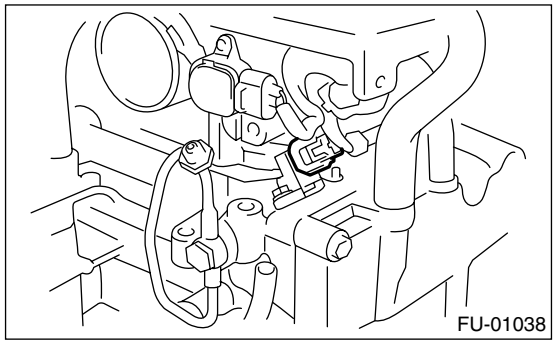
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



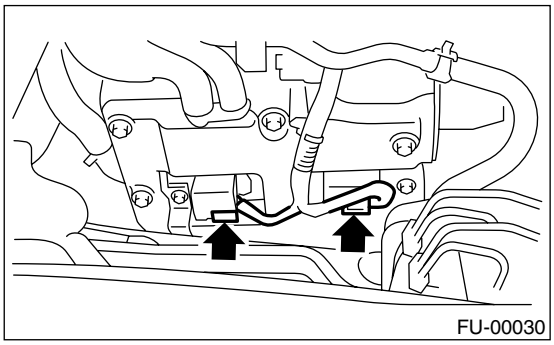
4) Connect the connector to the knock sensor.



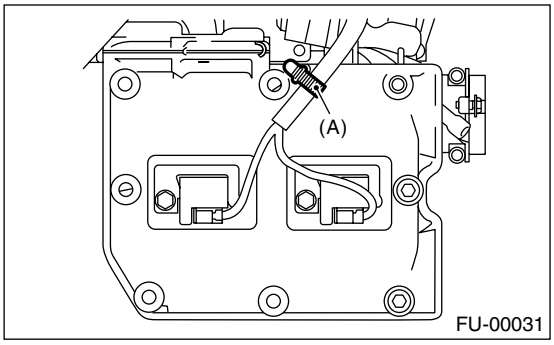
5) Connect the connector to the camshaft position sensor.



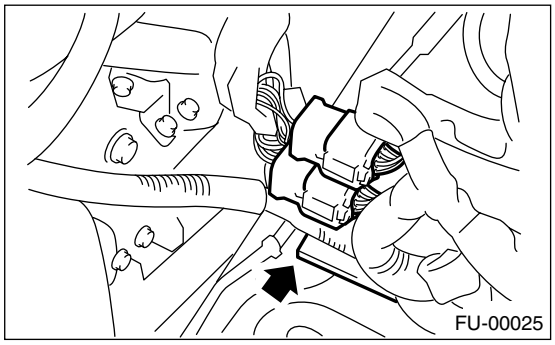
6) Connect the connector to the ignition coil.

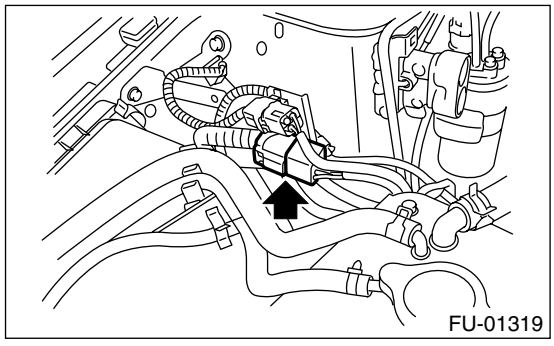


7) Connect the engine harness with clip (A) to the bracket.

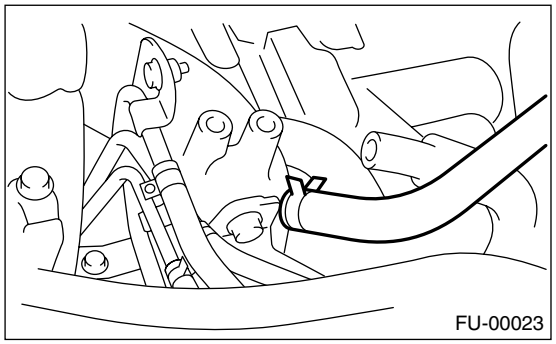


8) Connect the engine harness connector to the bulkhead harness connectors.

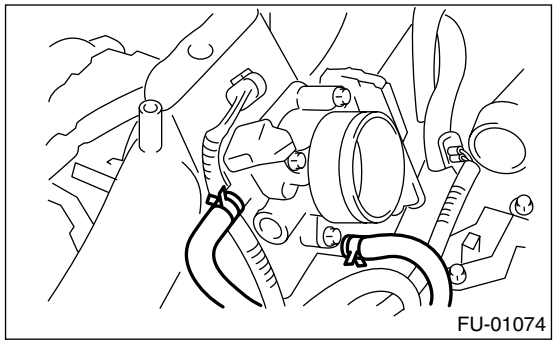




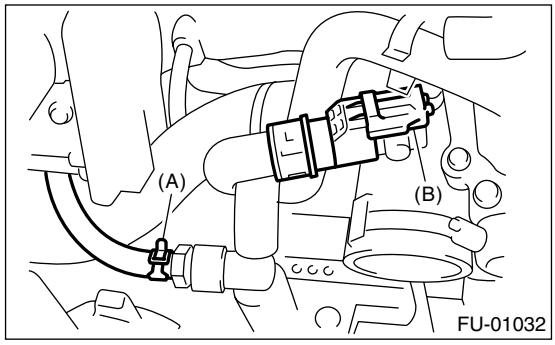
9) Connect the brake booster vacuum hose.



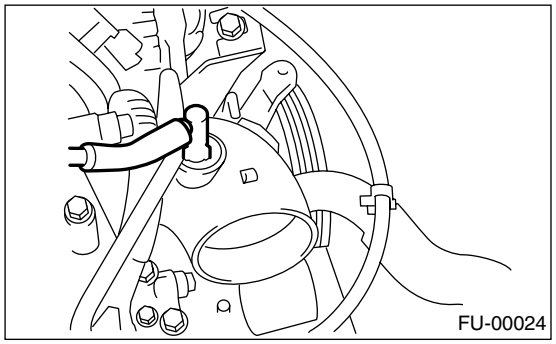
10) Connect the engine coolant hoses to the throttle body.



11) Connect the emission hose (A) and connector (B) to the PCV hose assembly.

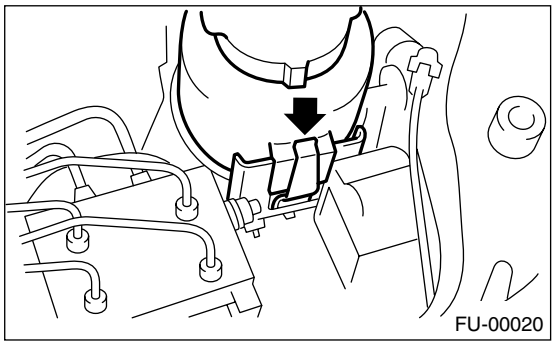


12) Connect the pressure hose to the intake duct.

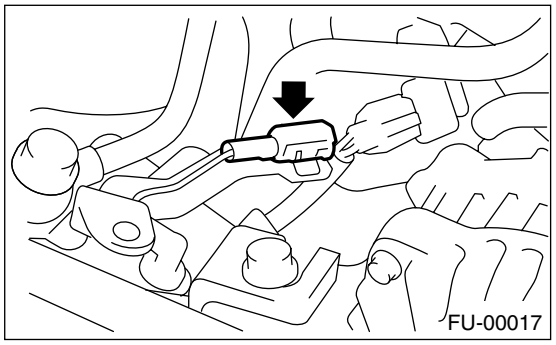


13) Install the power steering pump.

(1) Install the power steering tank on the bracket.

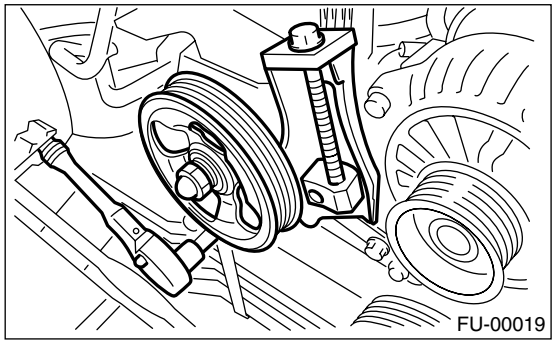


(2) Connect the connector to the power steering pump switch.

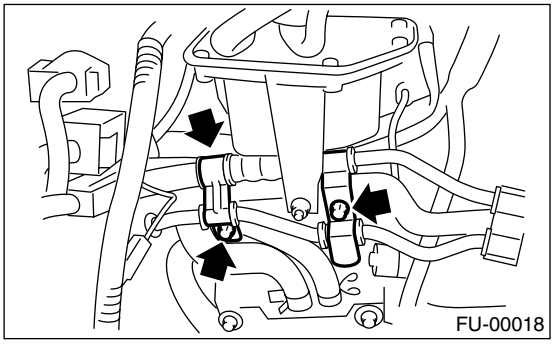


(3) Install the power steering pump, and tighten the bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

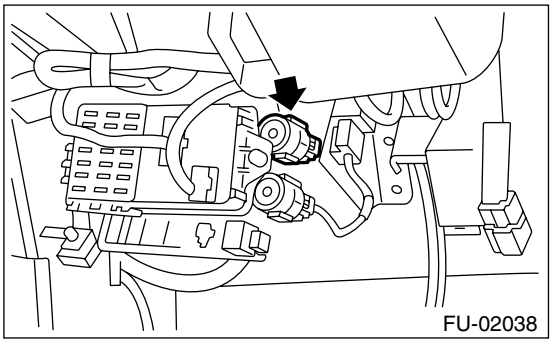


(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>

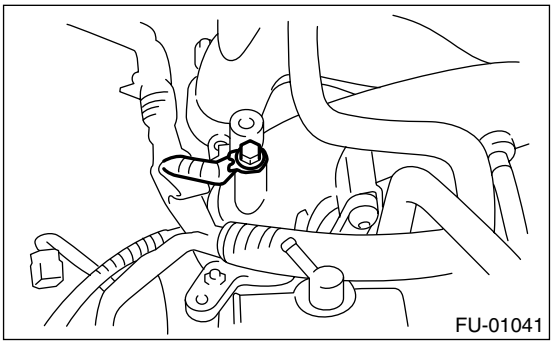
14) Install the coolant filler tank. <Ref. to CO(H4DOTC)-29, INSTALLATION, Coolant Filler Tank.>
15) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
16) Install the air cleaner element.
17) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-7, INSTALLATION, Air Cleaner.>
18) Connect the connector to the fuel pump relay.

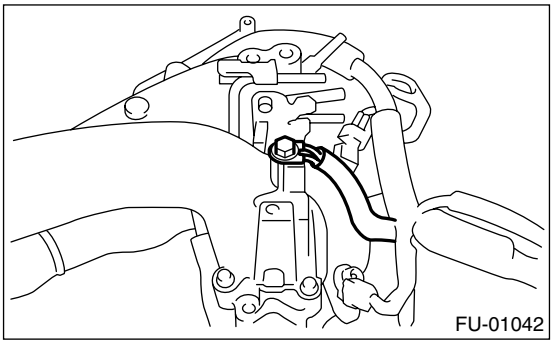

FU-02038

19) Connect the battery ground cable to battery.
20) Lift up the vehicle.
21) Install the under cover.
22) Fill the engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

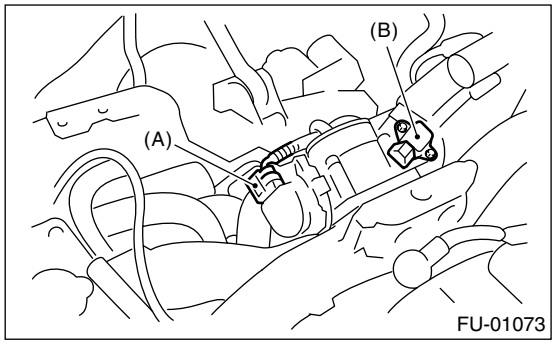
C: DISASSEMBLY

1) Remove the engine ground terminal from the intake manifold.


FU-01041

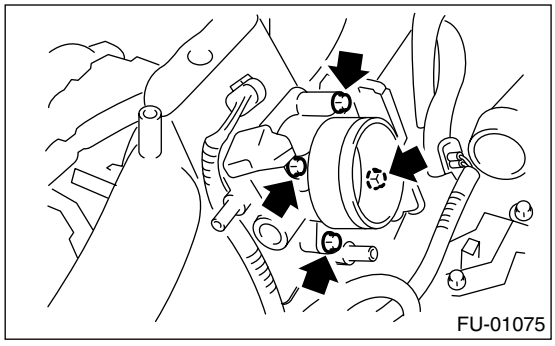

FU-01042

2) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).

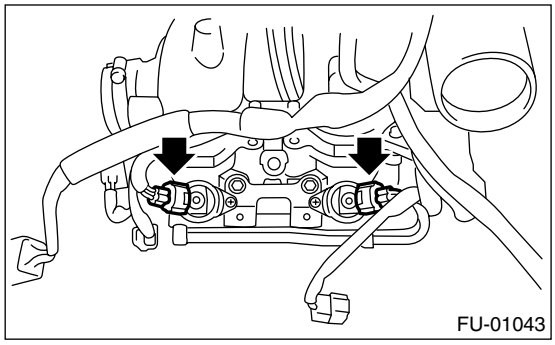


FU-01073

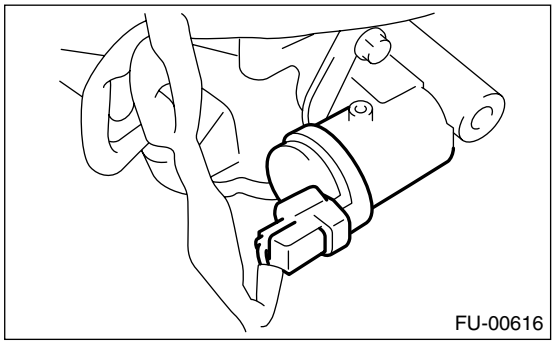
3) Remove the throttle body from the intake manifold.


FU-01075

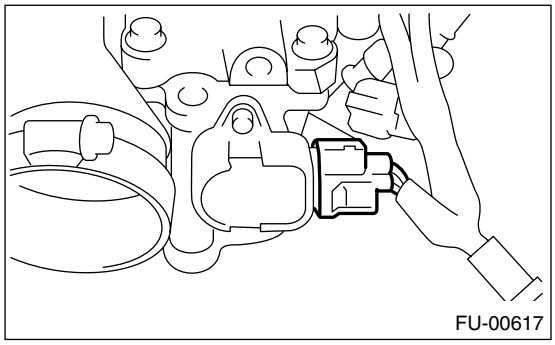
4) Disconnect the connector from the fuel injector.


FU-01043

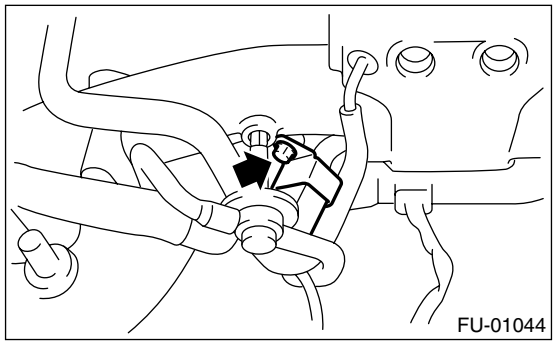
5) Disconnect the connector from the tumble generator valve actuator.


FU-00616

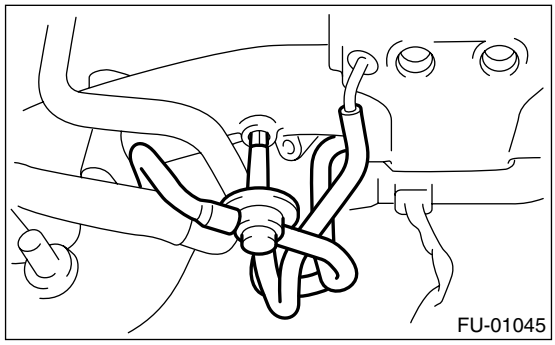
6) Disconnect the connector from the tumble generator valve sensor.


FU-00617

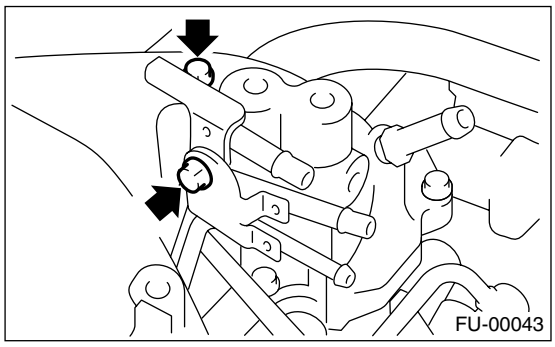
7) Disconnect the connector from the purge control solenoid valve.
8) Remove the purge control solenoid valve.


FU-01044

9) Disconnect the evaporation hose and purge valve from the intake manifold.

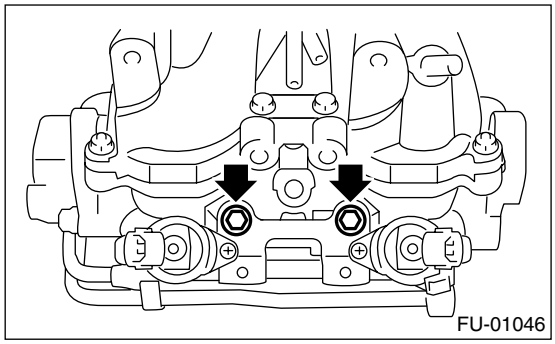

FU-01045

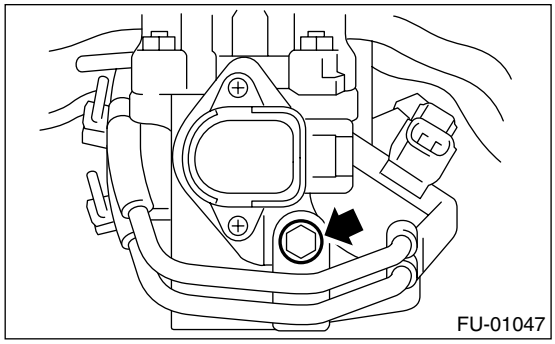
10) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.


FU-00043

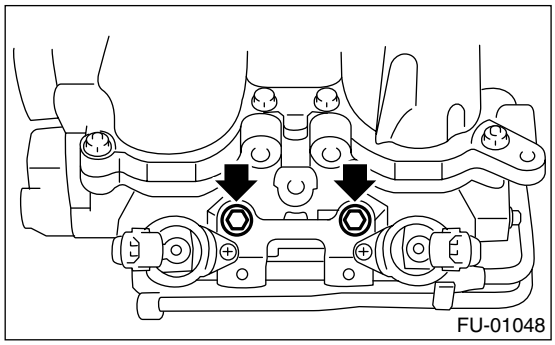
11) Remove the bolt which hold the fuel injector pipe onto intake manifold.

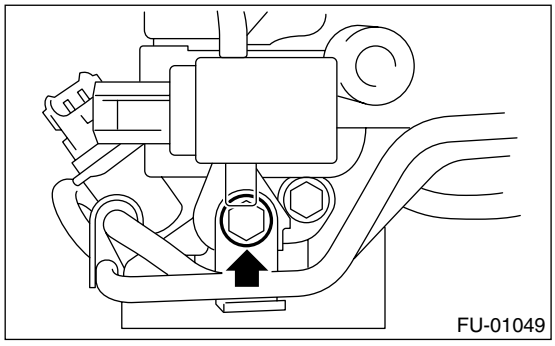
- LH SIDE


FU-01046

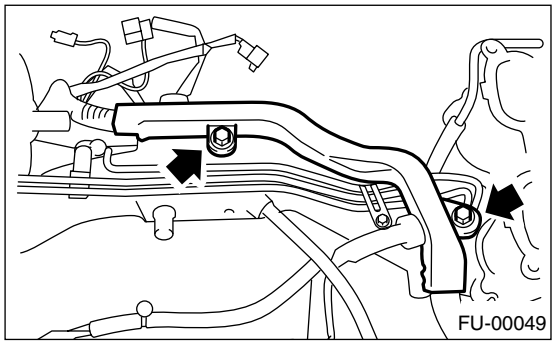

FU-01047

- RH SIDE

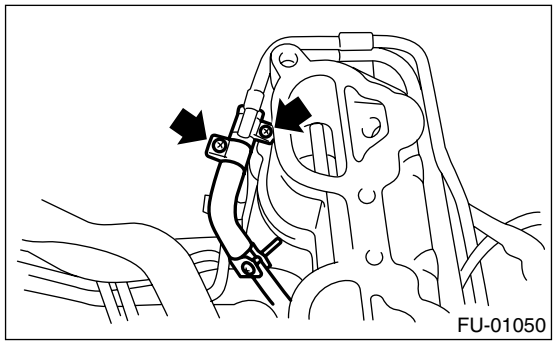

FU-01048


FU-01049

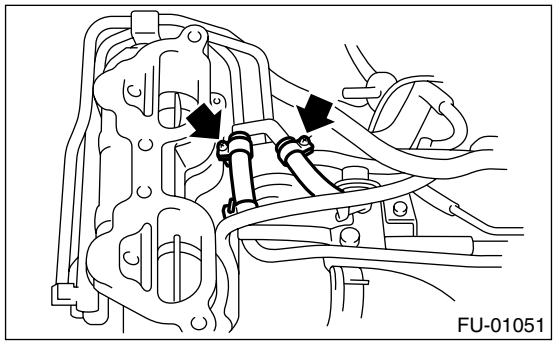
12) Remove the harness bracket which holds the engine harness onto intake manifold.



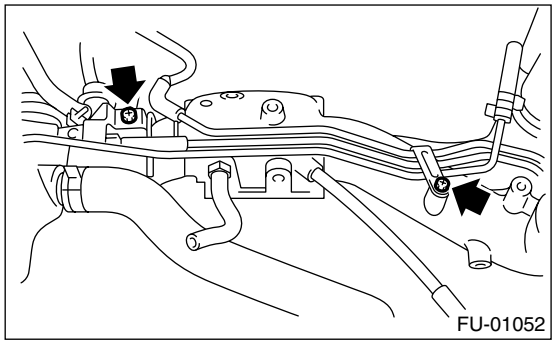
13) Remove the engine harness from the intake manifold.
14) Loosen the clamp which holds the front left side fuel hose to injector pipe, and then remove the pipe from clamp.



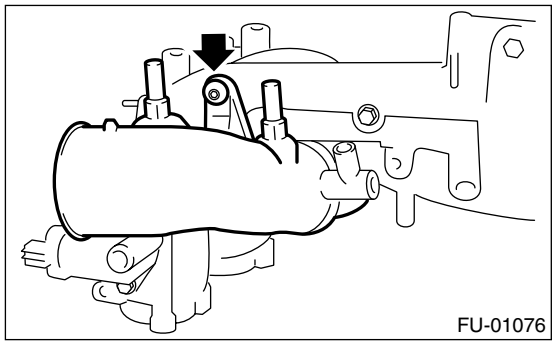
15) Loosen the clamp which holds the right side fuel hose to injector pipe, and then remove the pipe from clamp.



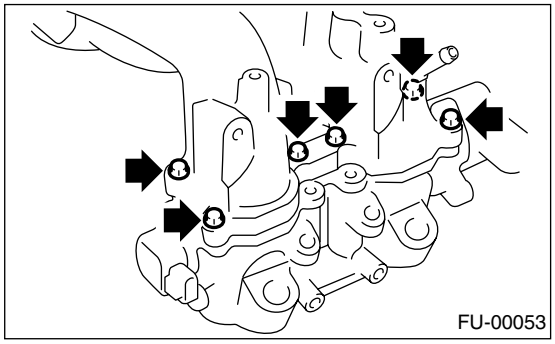
16) Remove the bolts which install the fuel pipe on intake manifold.



17) Remove the fuel pipe assembly and pressure regulator from the intake manifold.
18) Remove the intake duct from the intake manifold.



19) Remove the tumble generator valve assembly from the intake manifold.

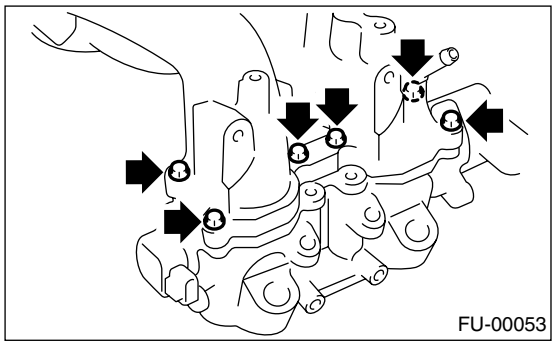


D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

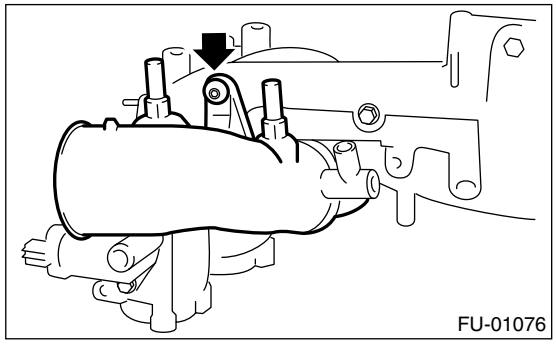
1) Install the tumble generator valve assembly to the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



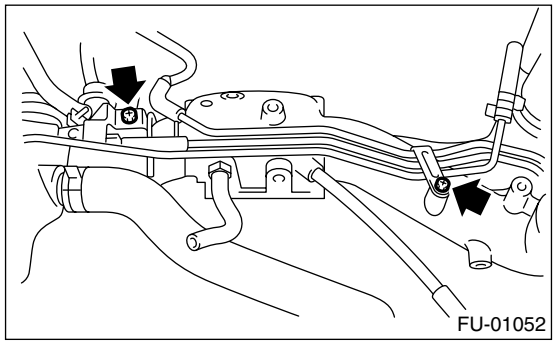
2) Install the air intake duct to the intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



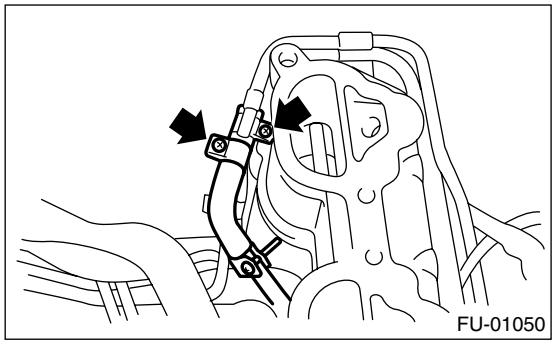
3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

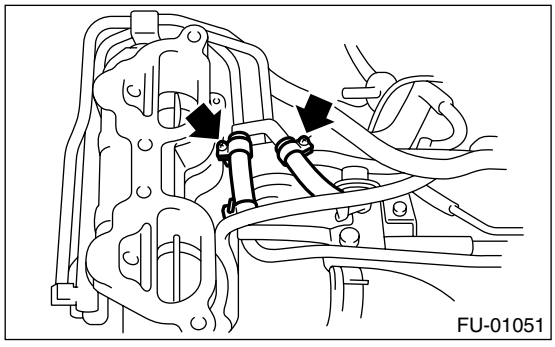


4) Install the fuel injector pipe LH.

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

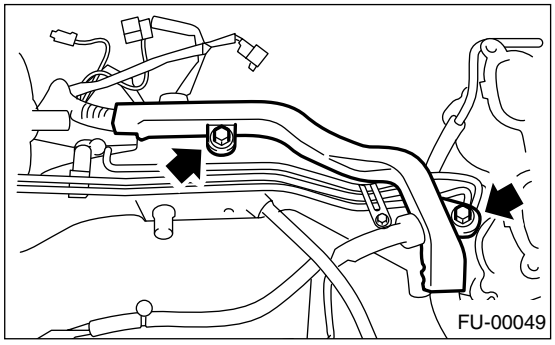


6) Install the fuel injector pipe RH.
7) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.



8) Install the engine harness to the intake manifold.
9) Install the harness bracket which holds the engine harness onto intake manifold.

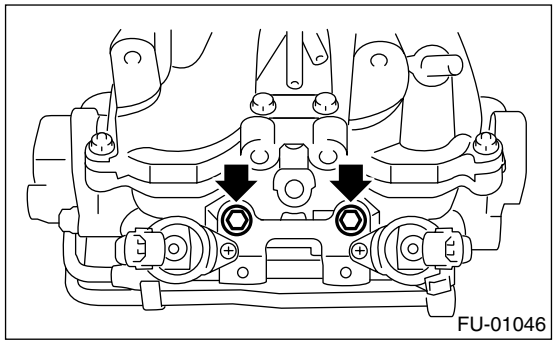
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

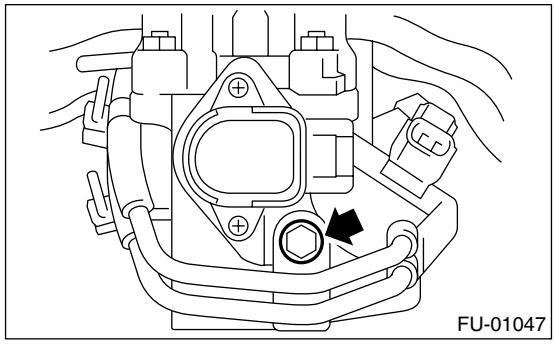


10) Tighten the bolts which install the fuel injector pipe onto intake manifold.

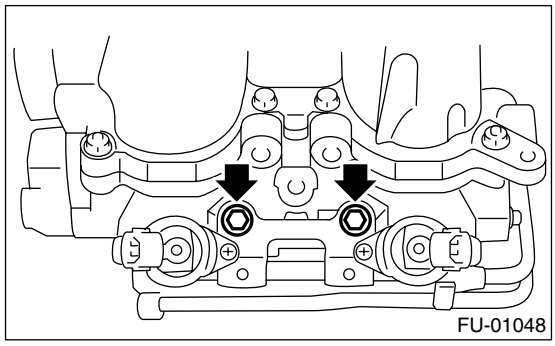
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

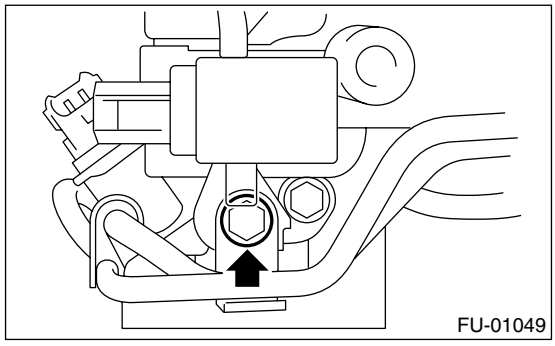
- LH SIDE





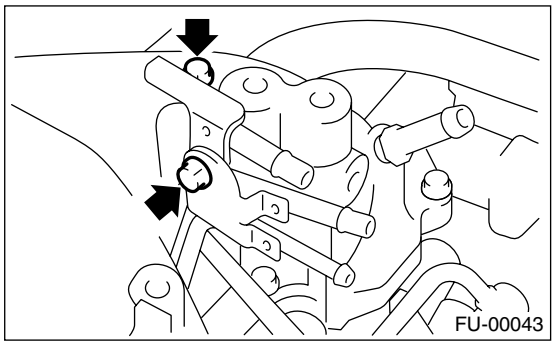
- RH SIDE





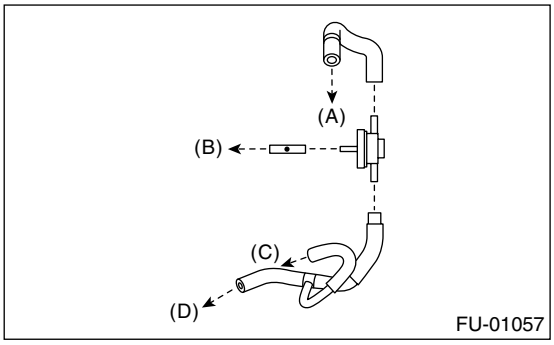
11) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



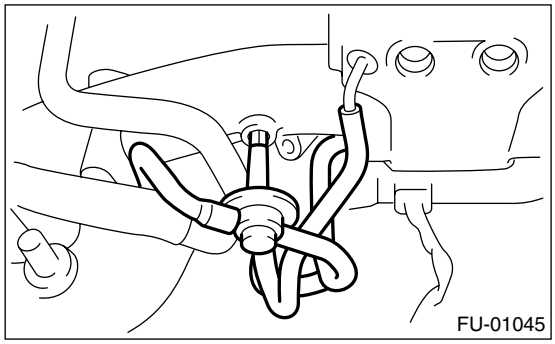
12) Connect the evaporation hoses to the purge valve.

NOTE:
Connect the evaporation hoses as shown in the figure.



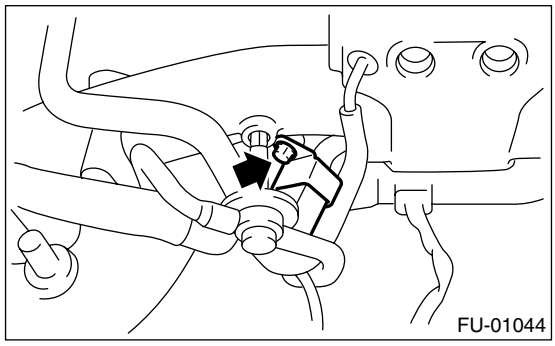
(A) To intake duct
(B) To intake manifold
(C) To purge control solenoid valve
(D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



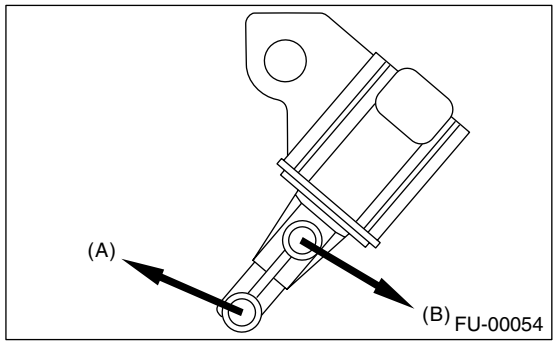
14) Install the purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



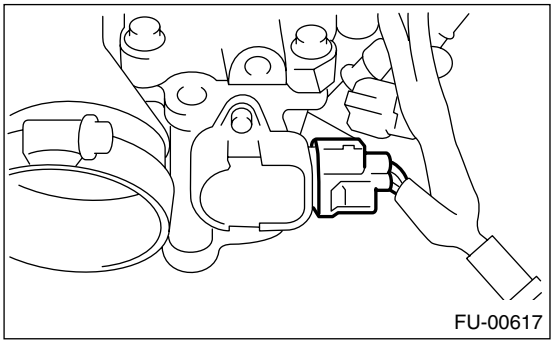
15) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hoses as shown in the figure.

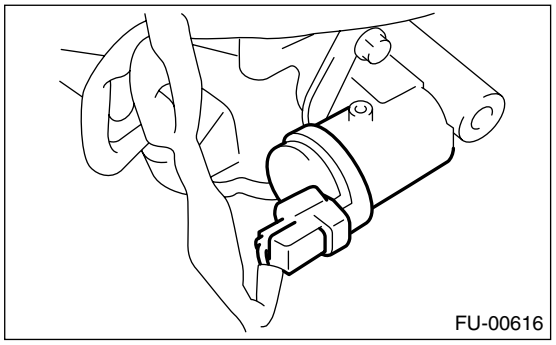


(A) To purge valve
(B) To intake manifold

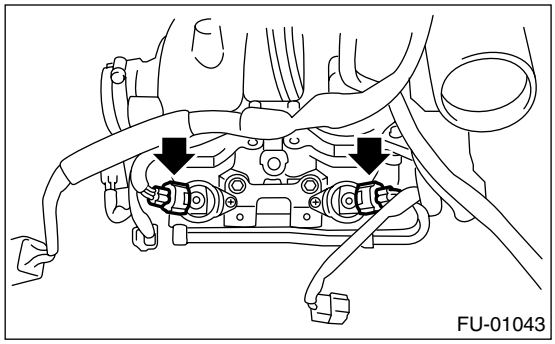
16) Connect the connector to the purge control solenoid valve.
17) Connect the connector to the tumble generator valve sensor.



18) Connect the connector to the tumble generator valve actuator.



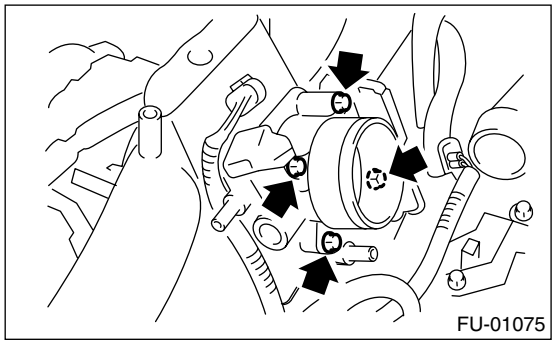
19) Connect the connector to the fuel injector.



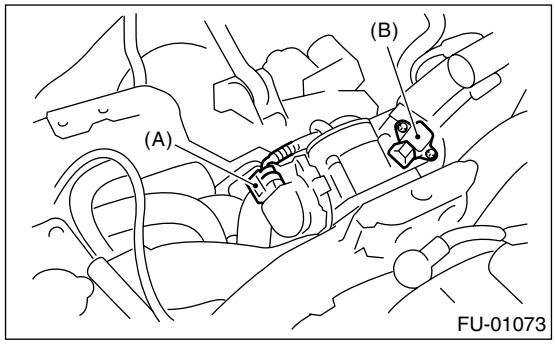
20) Install the throttle body to the intake manifold.

NOTE:
Replace the gasket with a new one.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

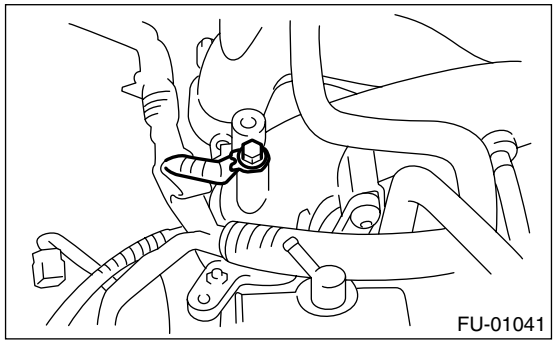


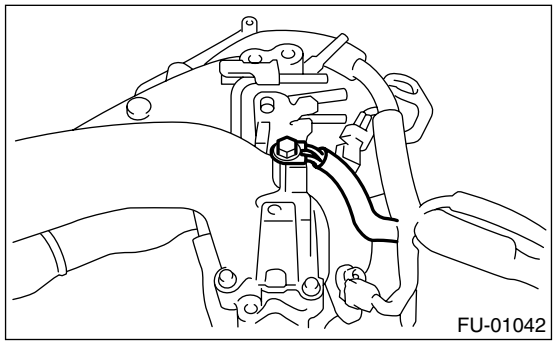
21) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).



22) Install the engine ground terminal to the intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)





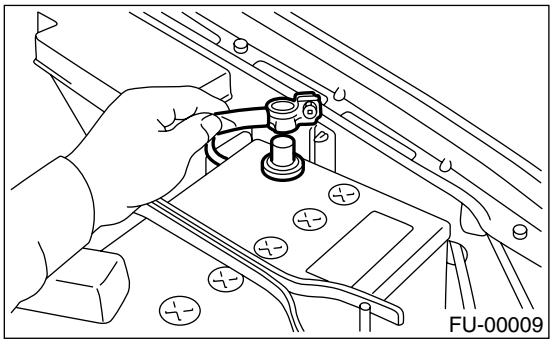
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened.

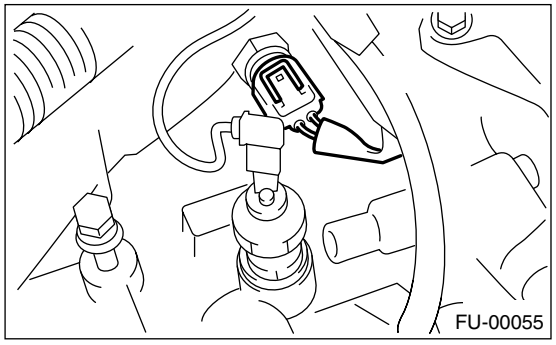
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the generator. <Ref. to SC(H4SO)-15, REMOVAL, Generator.>
3) Drain the engine coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connector from the engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

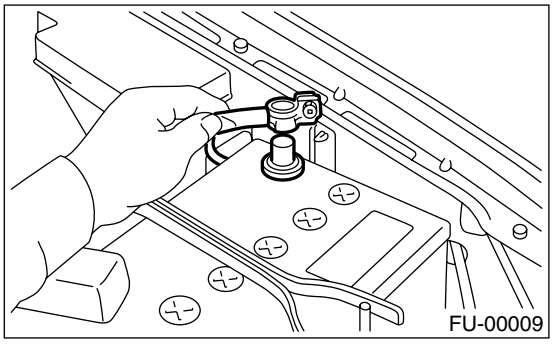
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

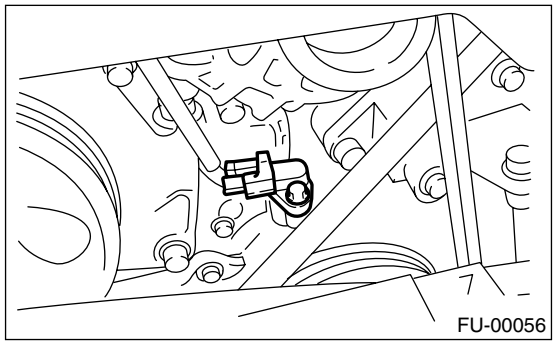
5. Crankshaft Position Sensor

A: REMOVAL

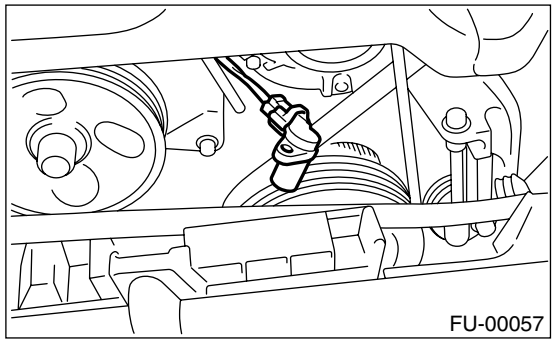
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



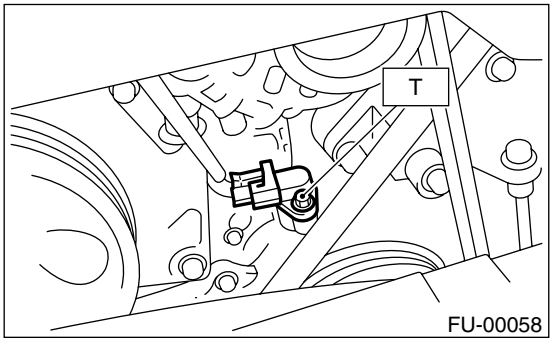
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

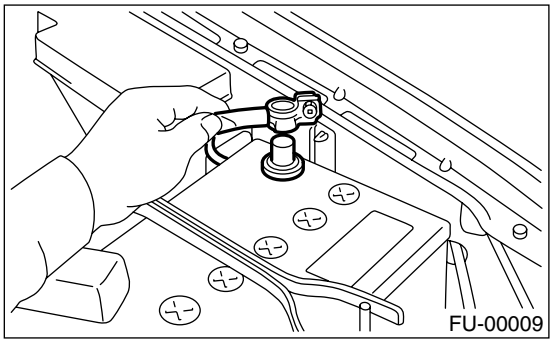
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



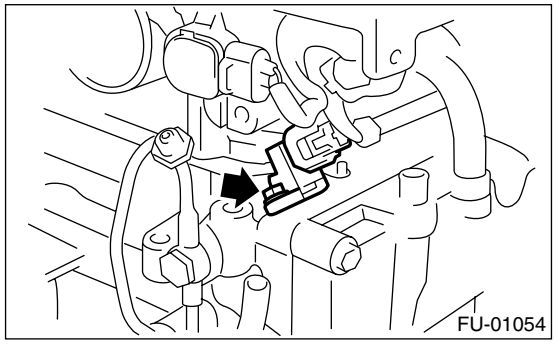
6. Camshaft Position Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the camshaft position sensor RH.
3) Remove the camshaft position sensor RH from the backside of cylinder head.

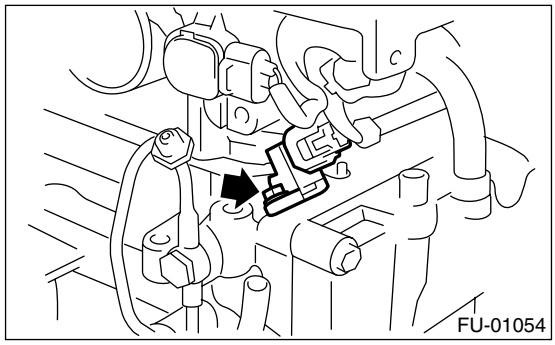


4) Remove the camshaft position sensor LH same as RH side.

B: INSTALLATION

Install in the reverse order of removal.

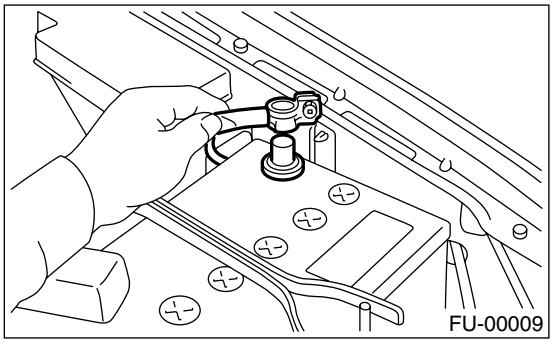
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



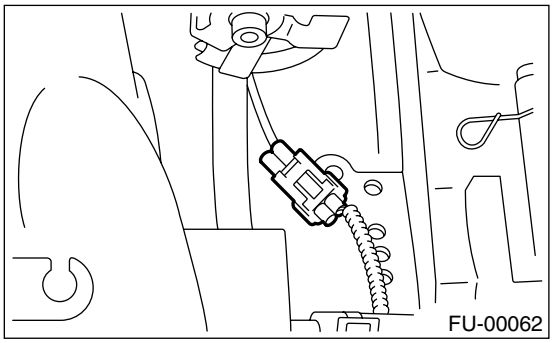
7. Knock Sensor

A: REMOVAL

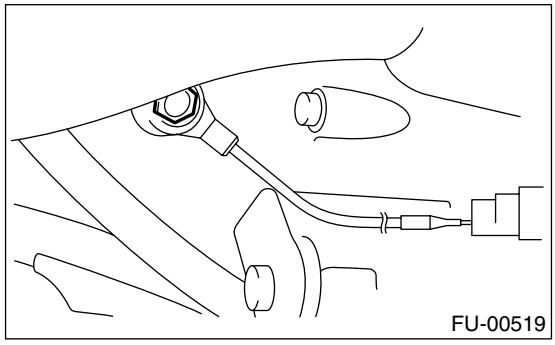
1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

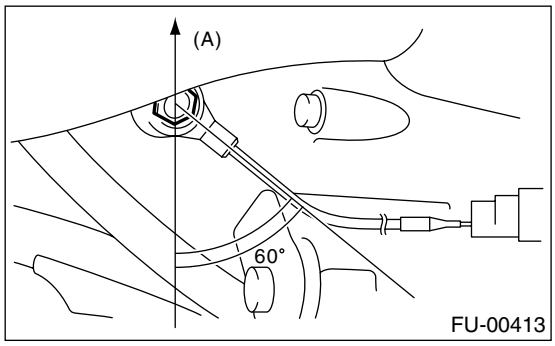


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

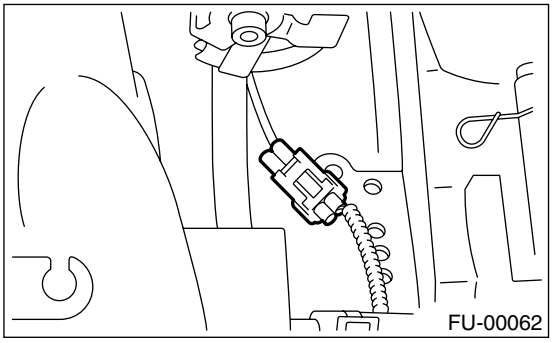
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
Extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.

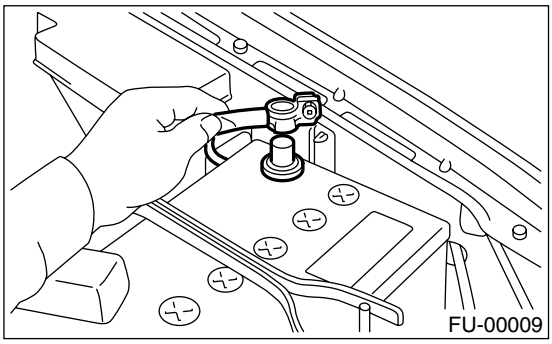


(A) Front side

2) Connect the knock sensor connector.



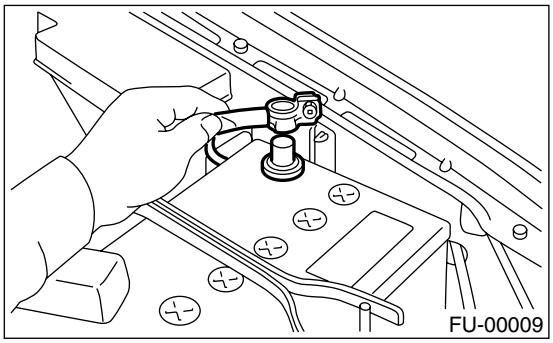
3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.



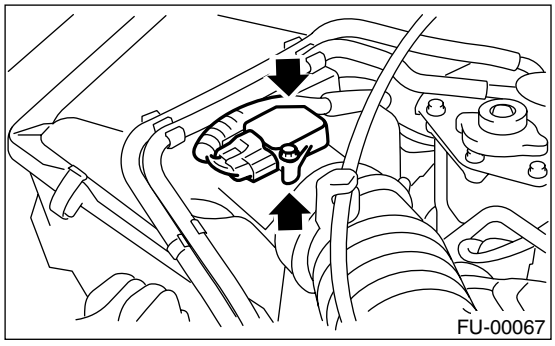
8. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

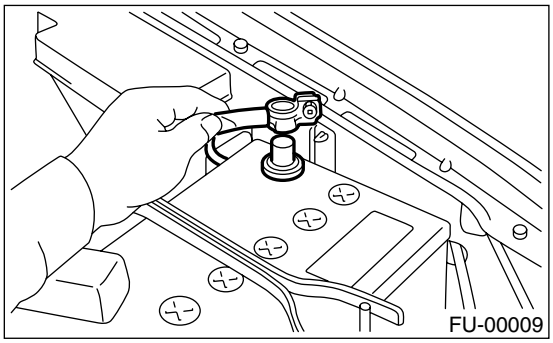
Install in the reverse order of removal.

Tightening torque:
1.7 N·m (0.17 kgf-m, 1.3 ft-lb)

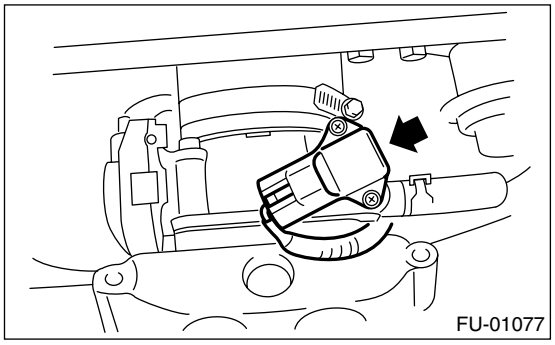
9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connectors from manifold absolute pressure sensor.



3) Remove the manifold absolute pressure sensor from the throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the O-rings for the manifold absolute pressure sensor with new ones.

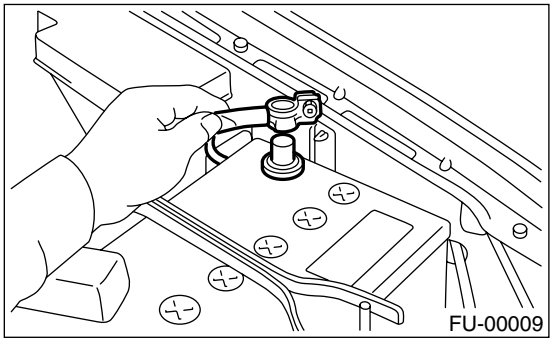
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

10.Fuel Injector

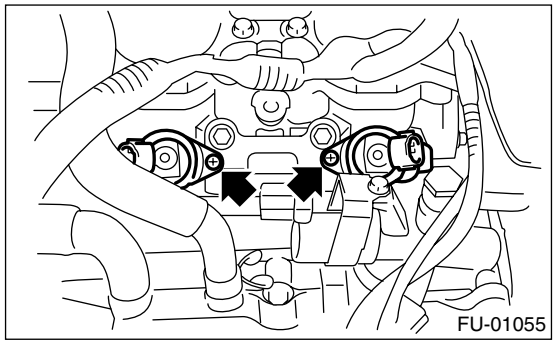
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

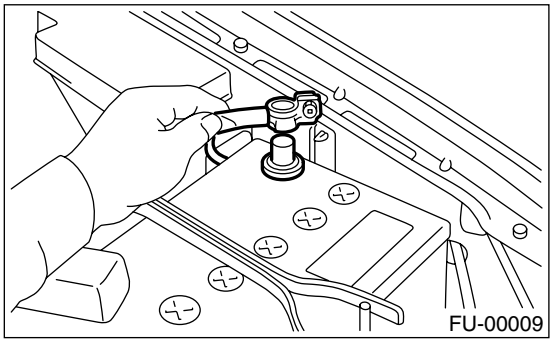


4) Disconnect the connector from the fuel injector.
5) Remove the screw and remove the fuel injector.

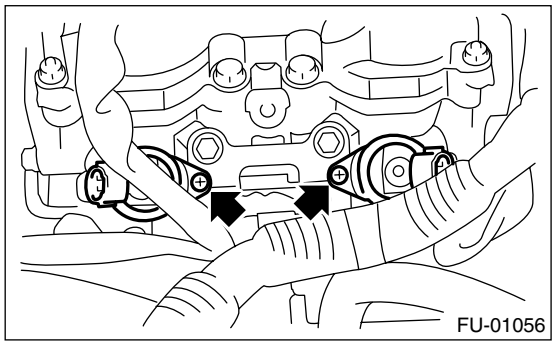


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the fuel injector.
6) Remove the screw and remove the fuel injector.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:
Replace the O-rings with new ones.

2. LH SIDE

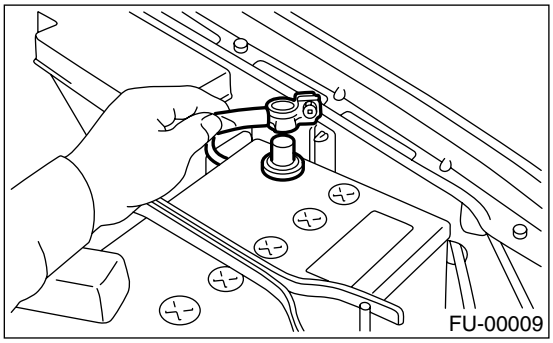
Install in the reverse order of removal.

NOTE:
Replace the O-rings with new ones.

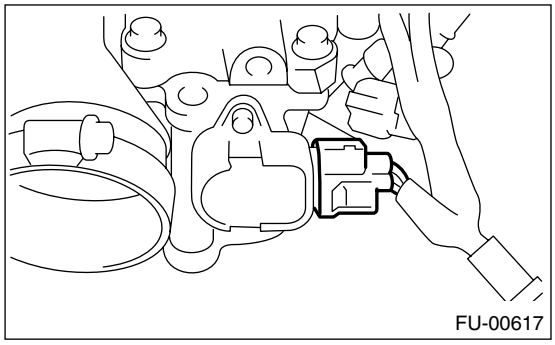
11.Tumble Generator Valve Assembly

A: REMOVAL

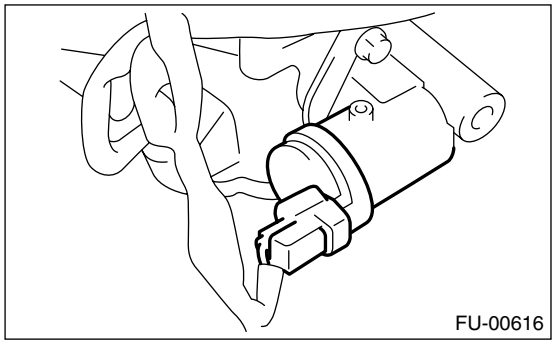
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



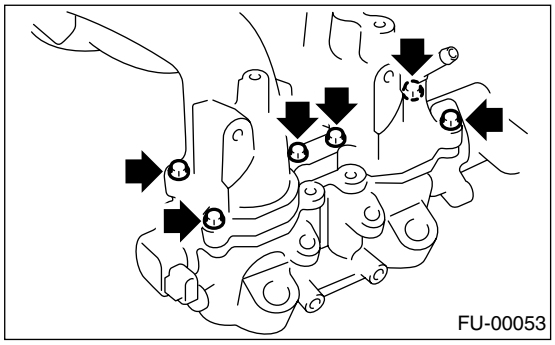
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the tumble generator valve sensor.



6) Disconnect the connector from the tumble generator valve actuator.



7) Remove the fuel injector. <Ref. to FU(H4DOTC)-33, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from the intake manifold.

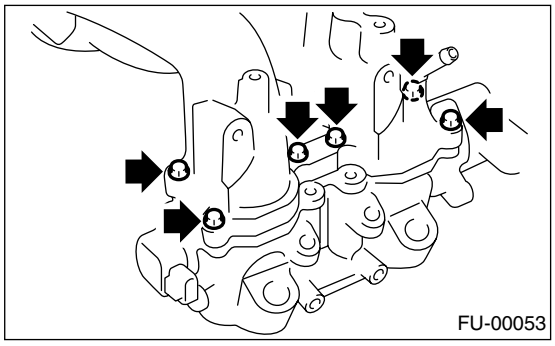


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)

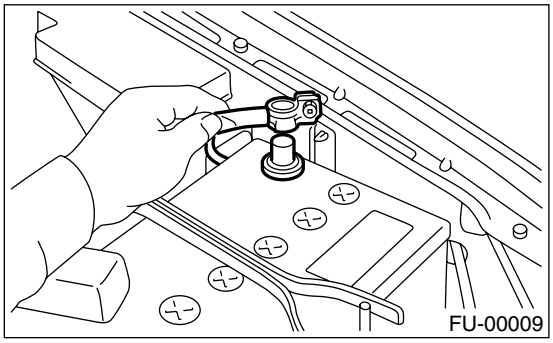


12.Tumble Generator Valve Actuator

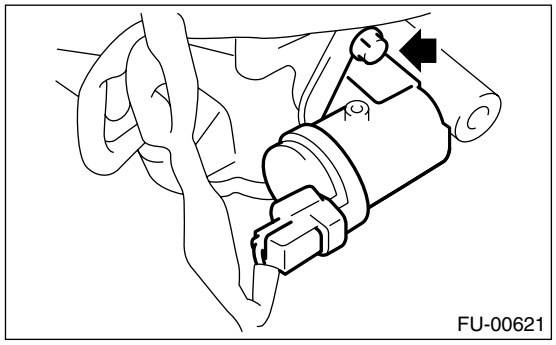
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

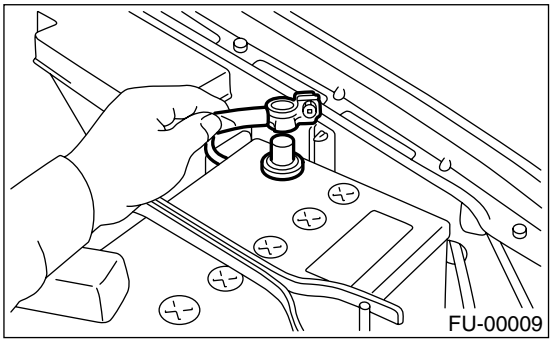


4) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve actuator RH.

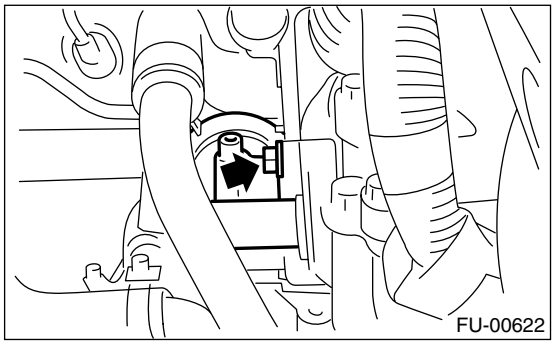


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from tumble generator valve actuator LH.
5) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

2. LH SIDE

Install in the reverse order of removal.

13.Tumble Generator Valve Position Sensor

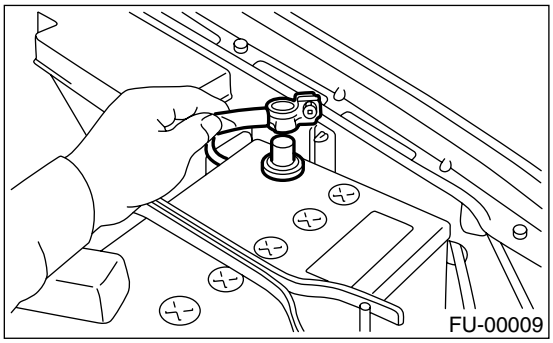
A: SPECIFICATIONS

Do not remove tumble generator valve position sensor from tumble generator valve assembly because the sensor cannot be adjusted when installing.
For removal and installation, refer to “Tumble Generator Valve Assembly”. <Ref. to FU(H4DOTC)-34, REMOVAL, Tumble Generator Valve Assembly.> and <Ref. to FU(H4DOTC)-34, INSTALLATION, Tumble Generator Valve Assembly.>

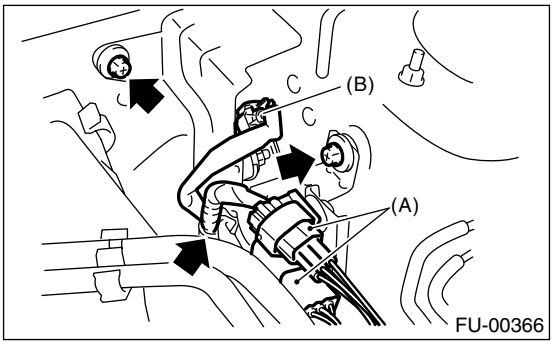
14.Wastegate Control Solenoid Valve

A: REMOVAL

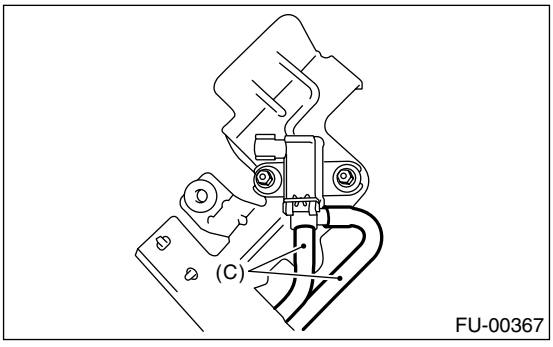
1) Disconnect the ground cable from battery.



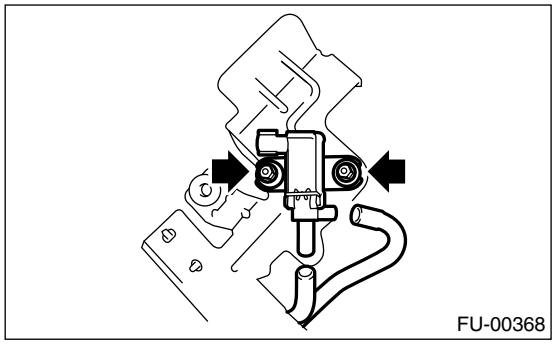
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



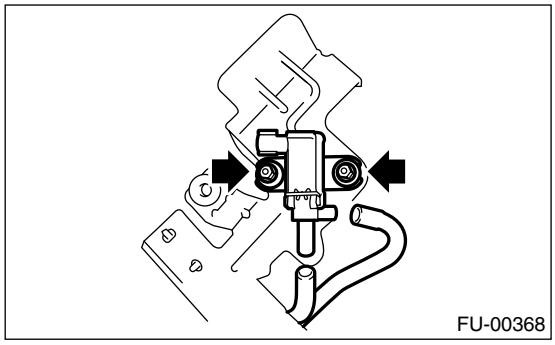
6) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

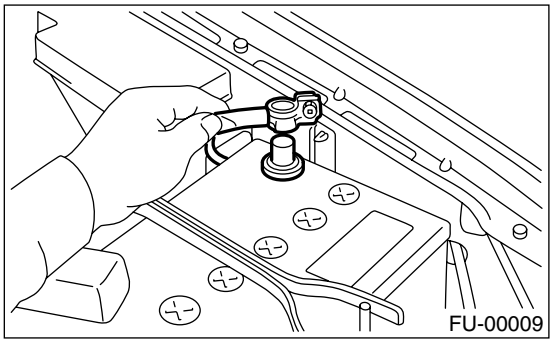
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



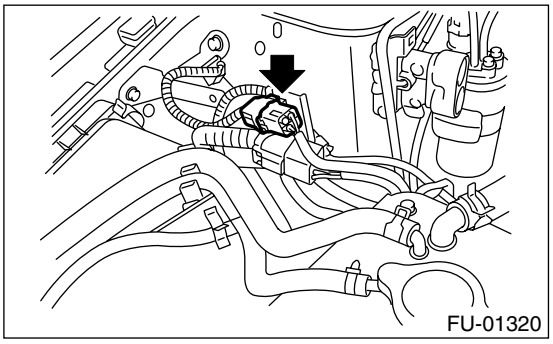
15.Front Oxygen (A/F) Sensor

A: REMOVAL

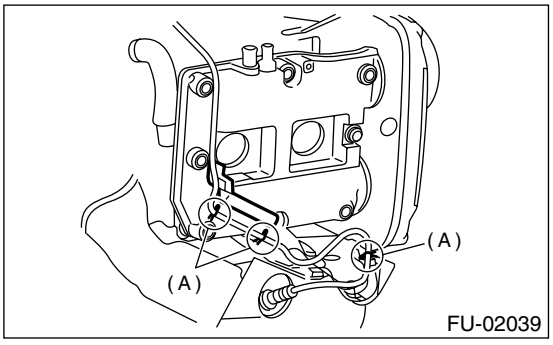
1) Disconnect the ground cable from battery.



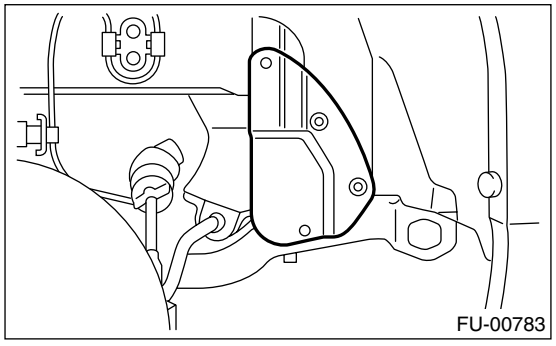
2) Disconnect the connector from the front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A).



4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.

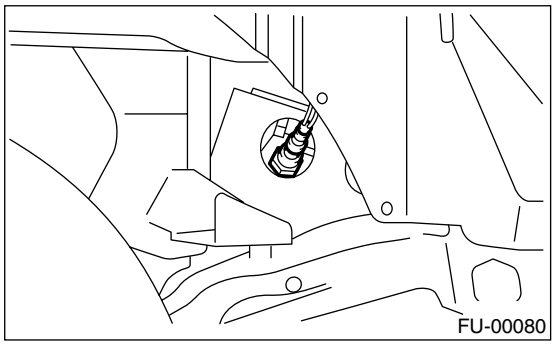


7) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

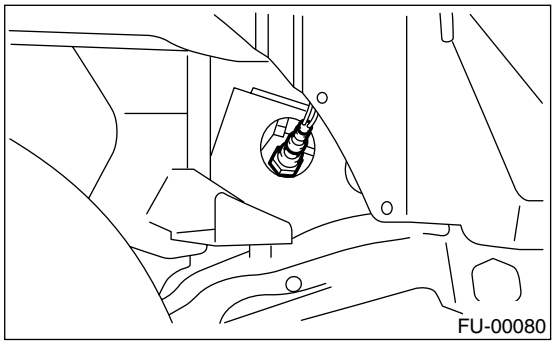
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

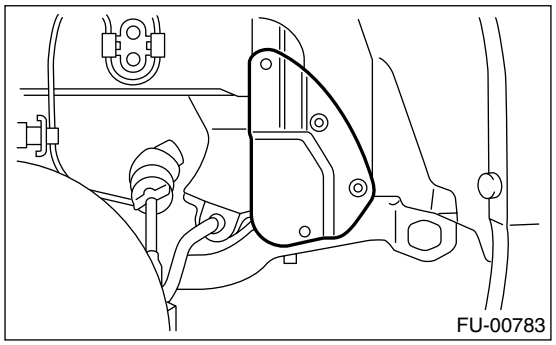
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

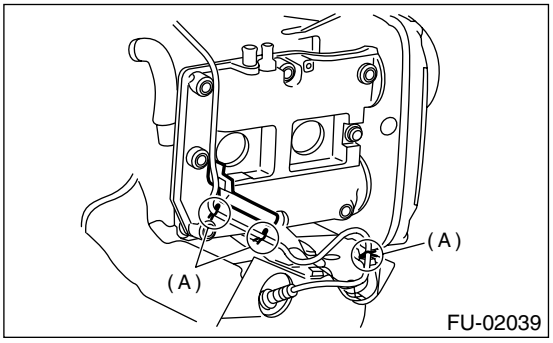
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



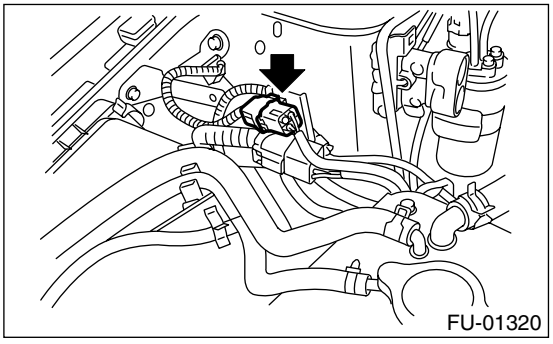
3) Install the service hole cover.



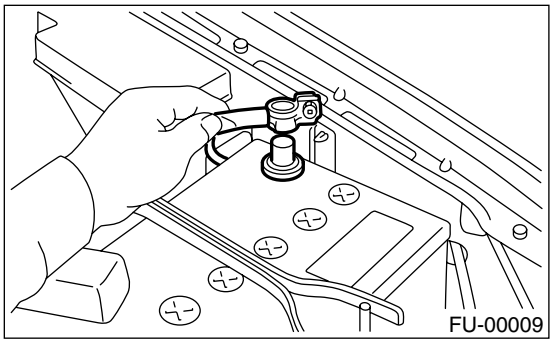
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness using clips (A).



7) Connect the connector of front oxygen (A/F) sensor.



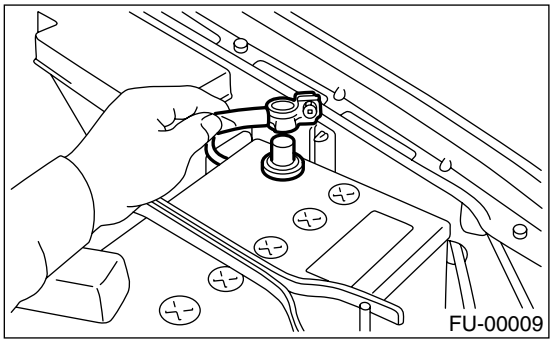
8) Connect the battery ground cable to battery.



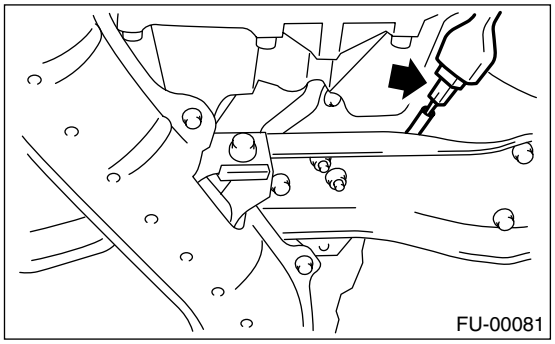
16.Rear Oxygen Sensor

A: REMOVAL

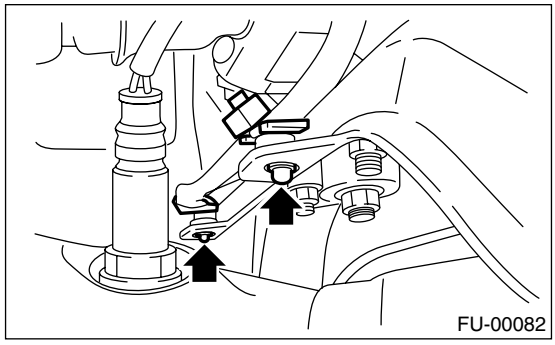
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.



4) Remove the clip by pulling out from the upper side of crossmember.

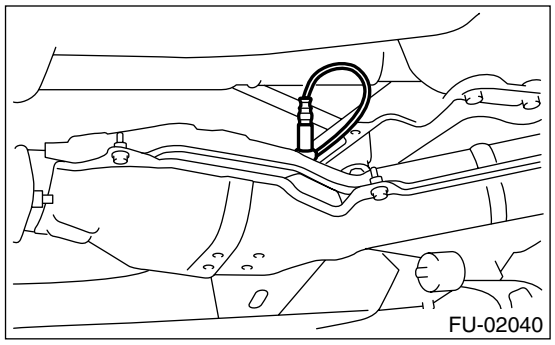


5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

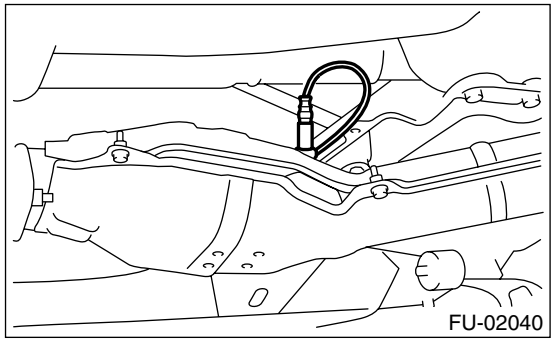
1) Before installing rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

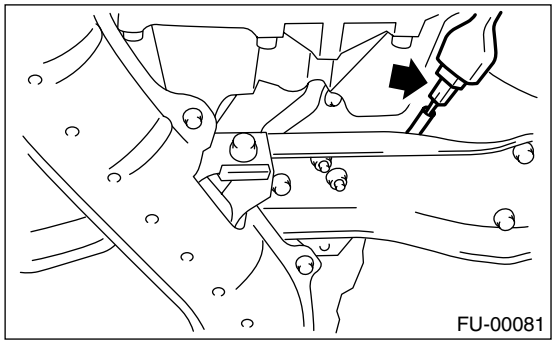
Anti-seize compound:
SS-30 by JET LUBE

2) Install the rear oxygen sensor.

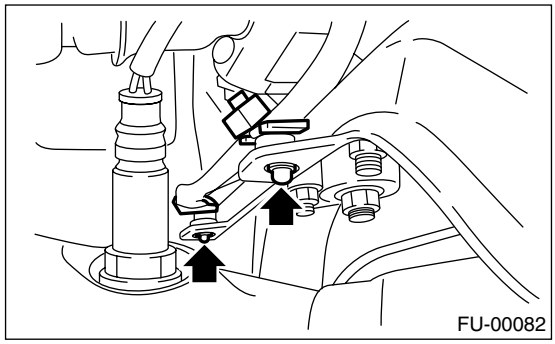
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



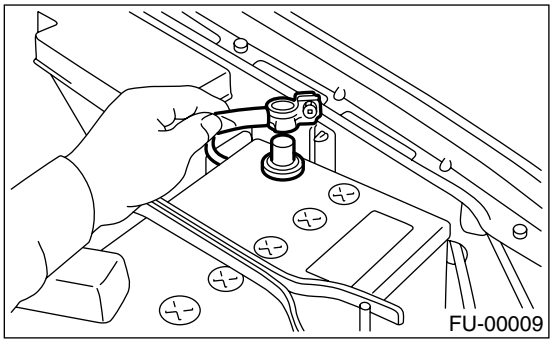
3) Connect the connector to the rear oxygen sensor.



4) Connect the clip to the crossmember.



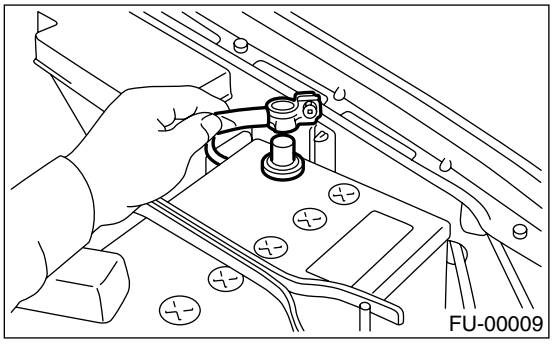
5) Lower the vehicle.
6) Connect the battery ground cable to battery.



17.Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

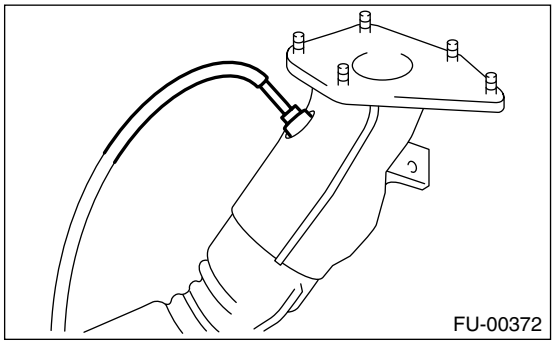


2) Remove the joint pipe. <Ref. to EX(H4DOTC)-13, REMOVAL, Joint Pipe.>
3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

4) Remove the exhaust temperature sensor.

CAUTION:
When removing the exhaust temperature sensor, wait until joint pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

1) Before installing exhaust temperature sensor, apply anti-seize compound only to the threaded portion of exhaust temperature sensor to make the next removal easier.

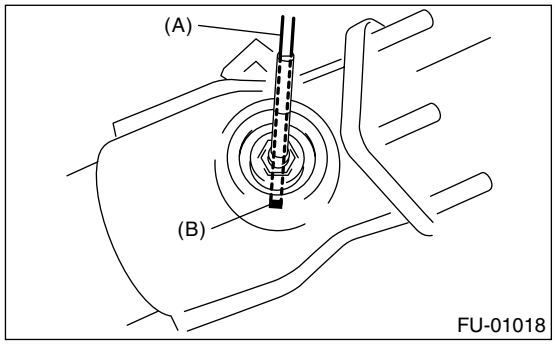
CAUTION:
Never apply anti-seize compound to protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 by JET LUBE

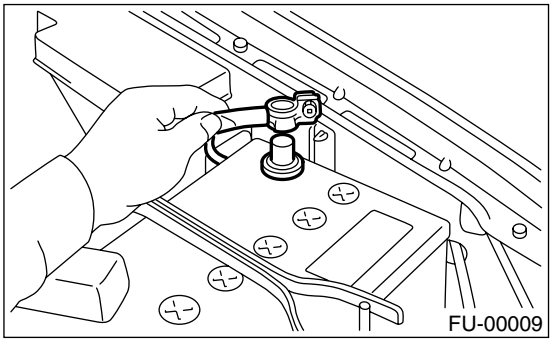
2) Install the exhaust temperature sensor.

NOTE:
Align the harness (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



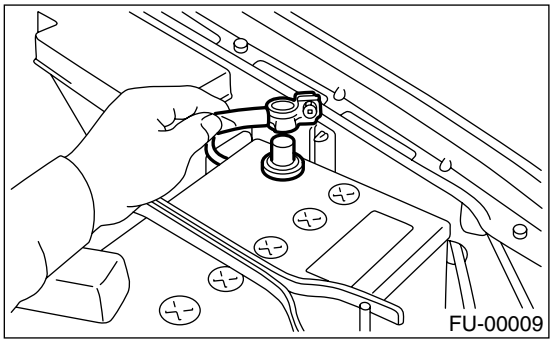
3) Install the joint pipe. <Ref. to EX(H4DOTC)-13, INSTALLATION, Joint Pipe.>
4) Connect the battery ground cable to battery.



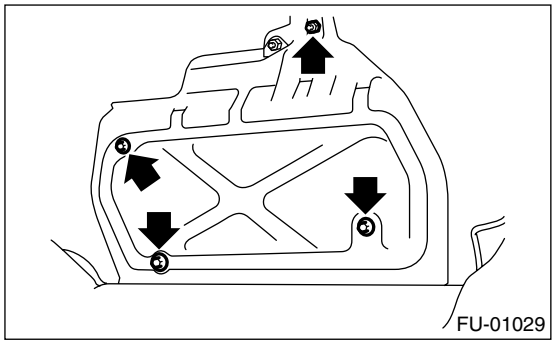
18.Engine Control Module (ECM)

A: REMOVAL

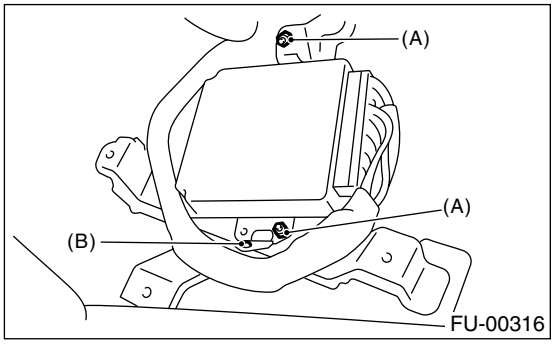
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of the passenger side.
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of the front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

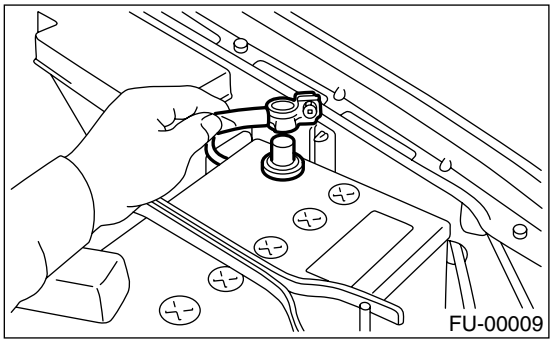
Install in the reverse order of removal.

NOTE:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

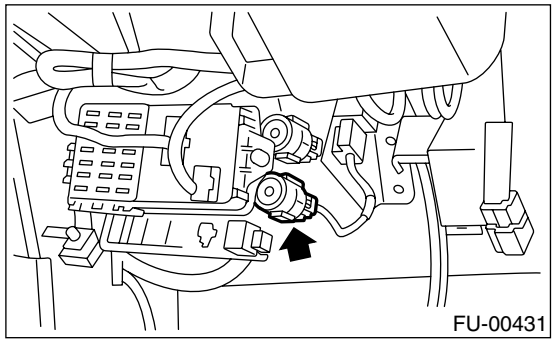
19.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the driver's side lower cover.
3) Disconnect the connectors from the main relay.
4) Remove the main relay from the bracket.



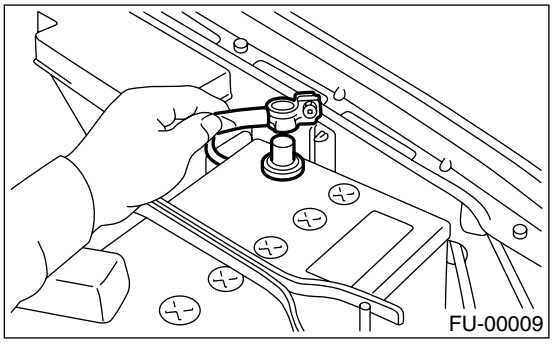
B: INSTALLATION

Install in the reverse order of removal.

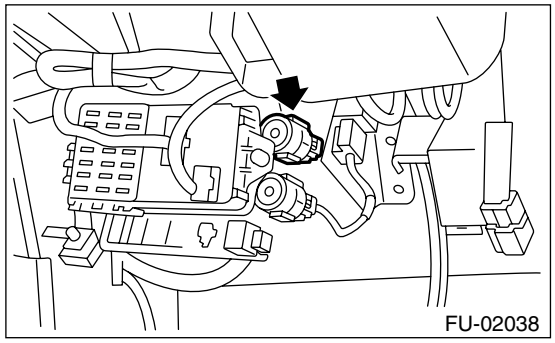
20.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the driver's side lower cover.
3) Disconnect the connector from the fuel pump relay.
4) Remove the fuel pump relay from the bracket.



5) Remove the fuel pump relay from the mounting bracket.

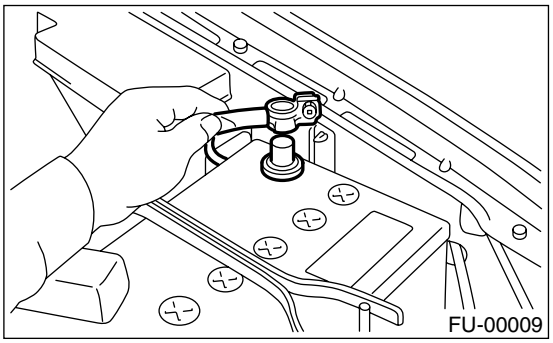
B: INSTALLATION

Install in the reverse order of removal.

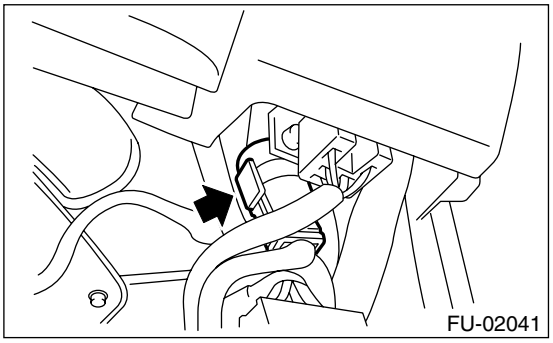
21.Electronic Contorl Throttle Relay

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connector form the passenger's side electronic control throttle relay.
3) Remove the electronic control throttle relay from the bracket.



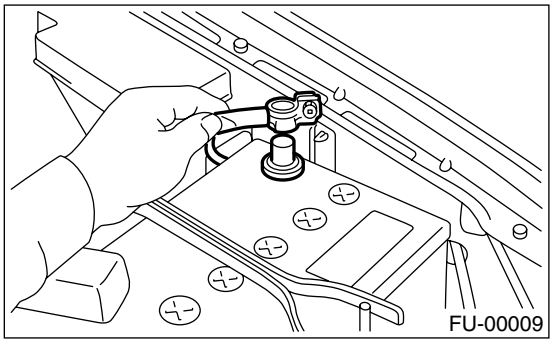
B: INSTALLATION

Install in the reverse order of removal.

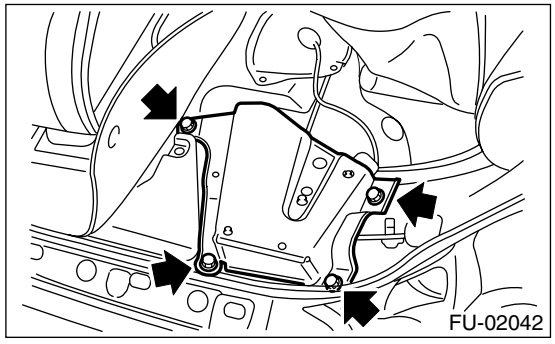
22.Fuel Pump Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the rear pillar trim. <Ref. to EI-69, REMOVAL, Rear Pillar Trim.>
3) Remove the fuel pump control unit bracket from the vehicle body.



4) Disconnect the connector from the fuel pump control unit.
5) Remove the fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

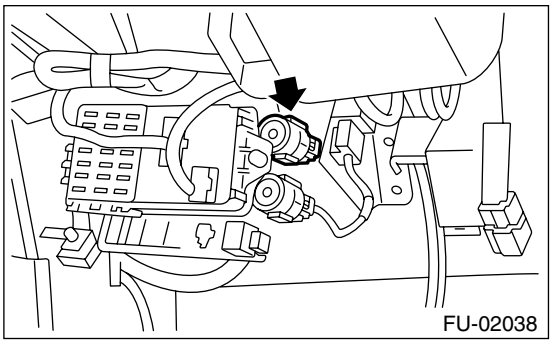
23.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect connector from fuel pump relay.

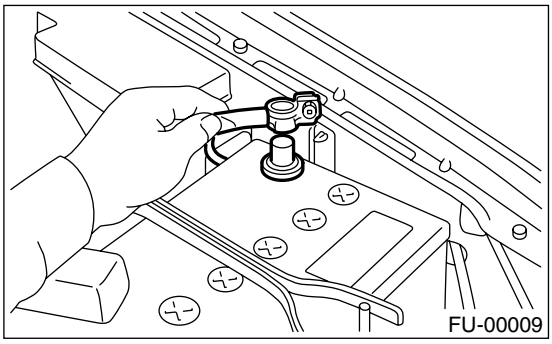


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn ignition switch to OFF.

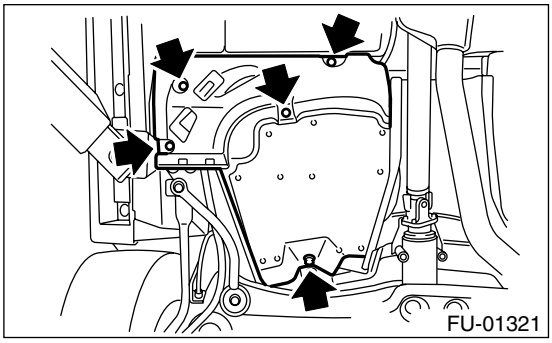
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

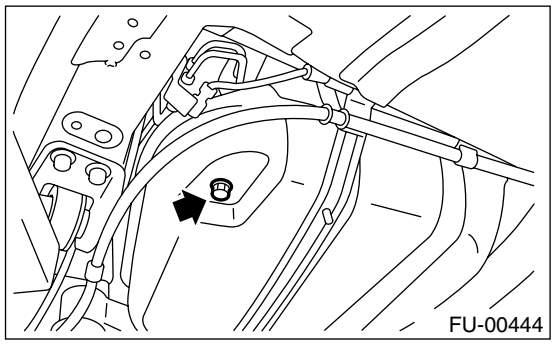
1) Set vehicle on the lift.
2) Disconnect battery ground cable.



3) Lift-up the vehicle.
4) Remove front right side fuel tank cover.



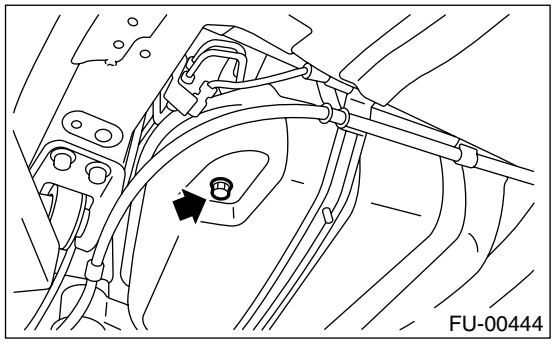
5) Drain fuel from fuel tank.
Set a container under the vehicle and remove drain plug from fuel tank.



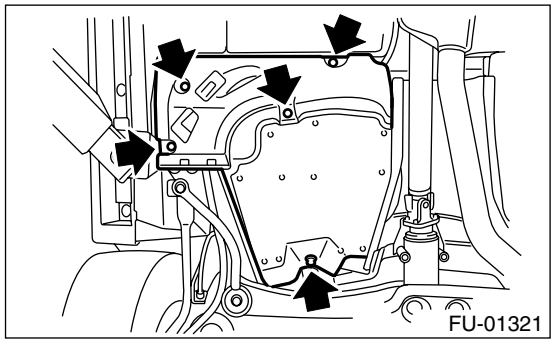
6) Tighten fuel drain plug and install front right side tank cover.

NOTE:
Replace gasket with new one.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

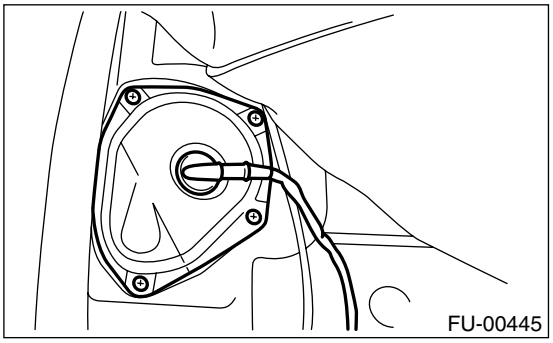


Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

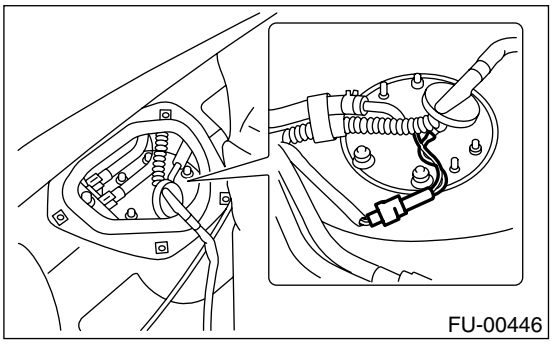


7) Lower the vehicle.

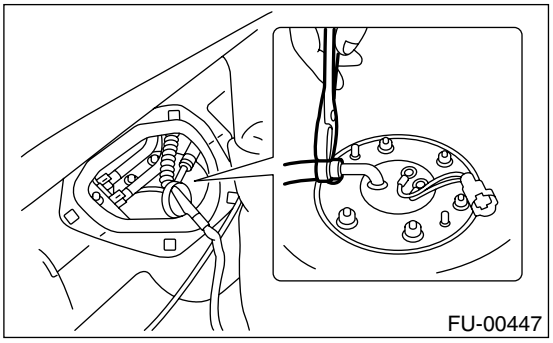
8) Remove sub service hole cover.



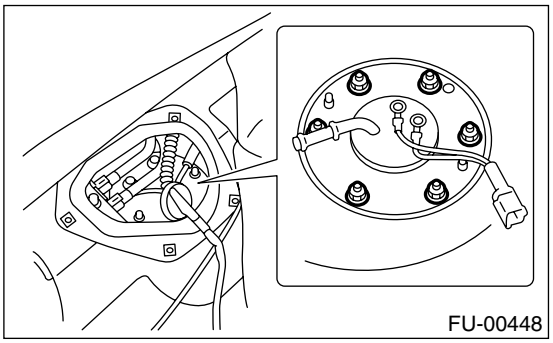
9) Disconnect connector from fuel sub level sensor.



10) Disconnect fuel jet pump hose.



11) Remove fuel sub level sensor.

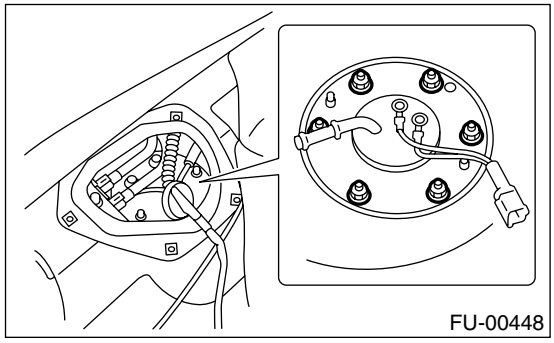


12) Drain fuel from fuel tank by using hand pump.

WARNING:
Do not use a motor pump when draining fuel.

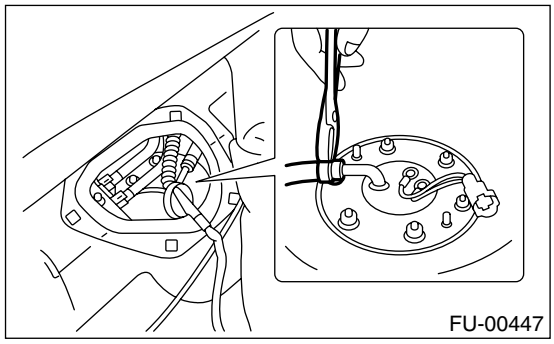
13) After draining fuel, reinstall fuel sub level sensor.

Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

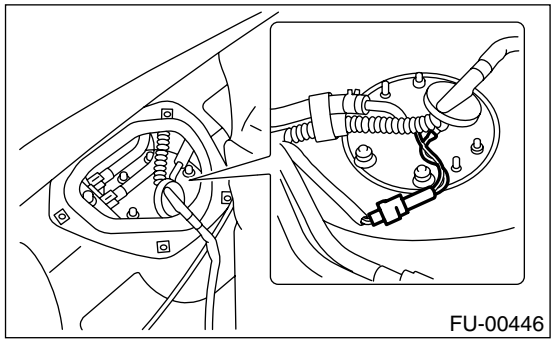


NOTE:
If you have not removed fuel tank yet, proceed with the procedure below for installation.

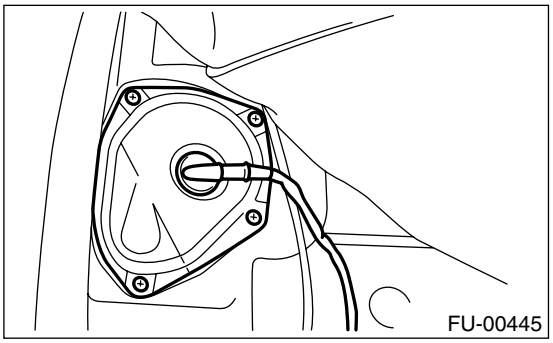
(1) Connect fuel jet pump hose.



(2) Connect connector from fuel sub level sensor.



(3) Install sub service hole cover.

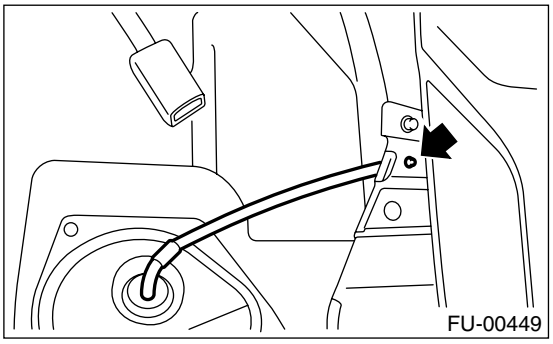


(4) Set rear seat and floor mat.

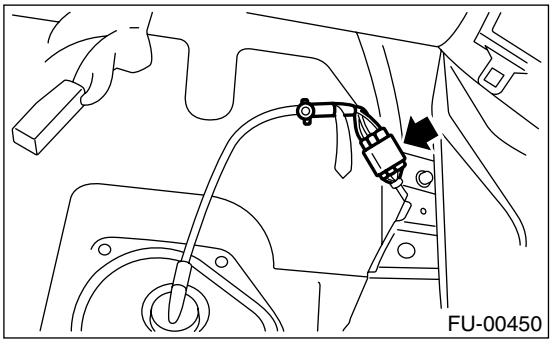
24.Fuel Tank

A: REMOVAL

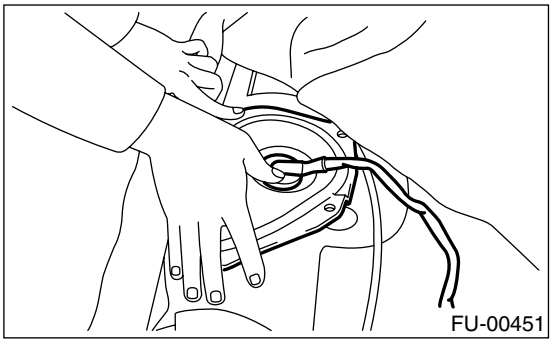
1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-48, DRAINING FUEL, OPERATION, Fuel.>
4) Remove holder clip which secures fuel tank cord on bracket.



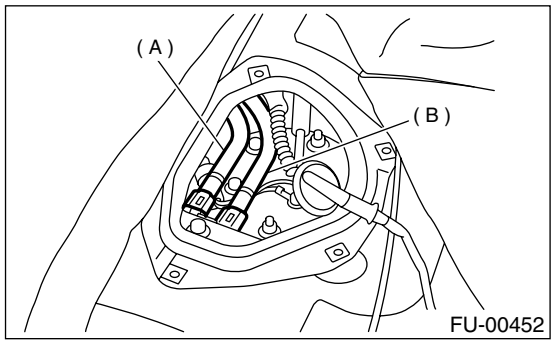
5) Disconnect connector of fuel tank cord to rear harness.



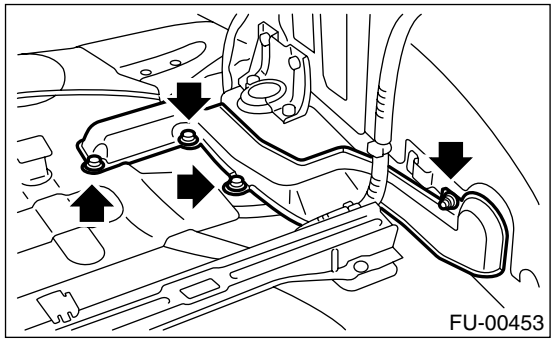
6) Push grommet which holds fuel tank cord on service hole cover into body side.



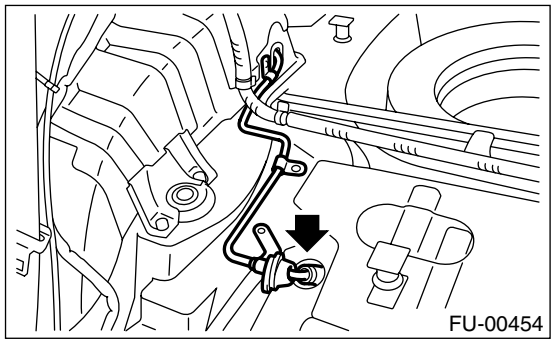
7) Separate quick connector of fuel delivery (A) and return hose (B).<Ref. to FU(H4DOTC)-75, REMOVAL, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



8) Remove parking brake cable.
   (1) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
   (2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-6, REMOVAL, Parking Brake Cable.>
9) Remove rear pillar trim.
<Ref. to EI-69, REMOVAL, Rear Pillar Trim.>
10) Remove pipe protector.

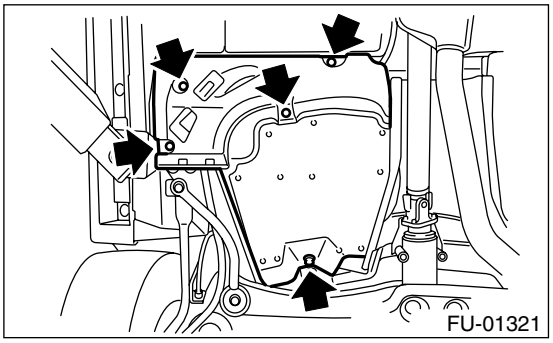


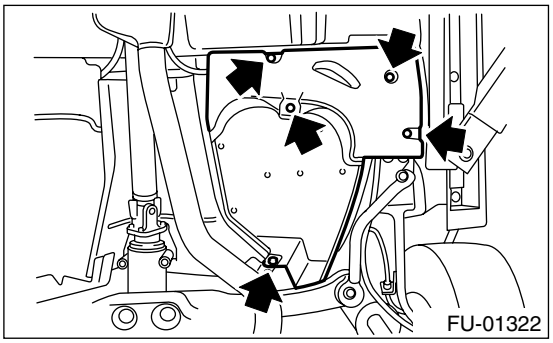
11) Separate quick connector of evaporation pipe. <Ref. to FU(H4DOTC)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



12) Remove wheel nuts from rear wheels.
13) Lift-up the vehicle.
14) Remove rear wheel.

15) Remove front side fuel tank cover.


FU-01321

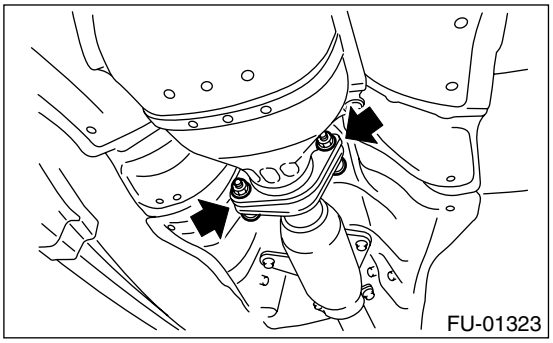

FU-01322

16) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

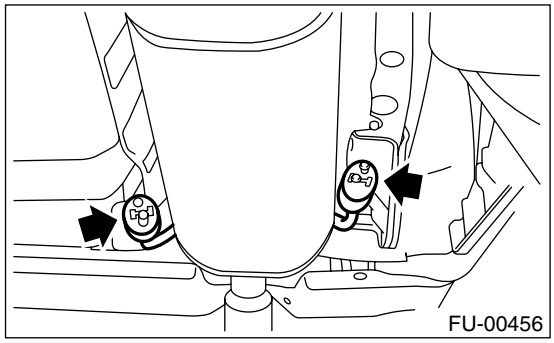
SUBARU CRC (Part No. 004301003)

(1) Separate rear exhaust pipe from center exhaust pipe.

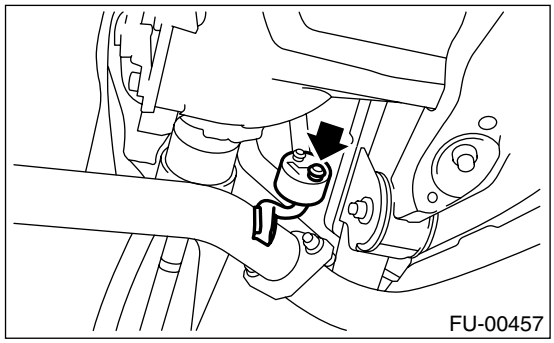

FU-01323

(2) Remove left and right rubber cushions.

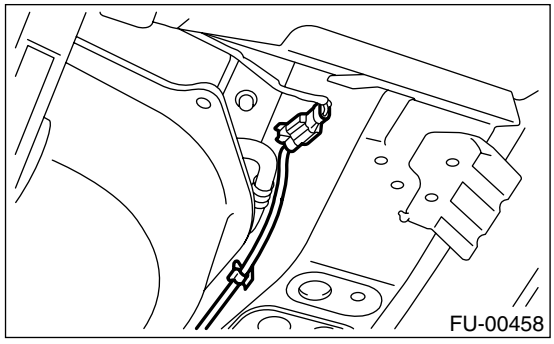
CAUTION:
Be careful not to pull down muffler.


FU-00456

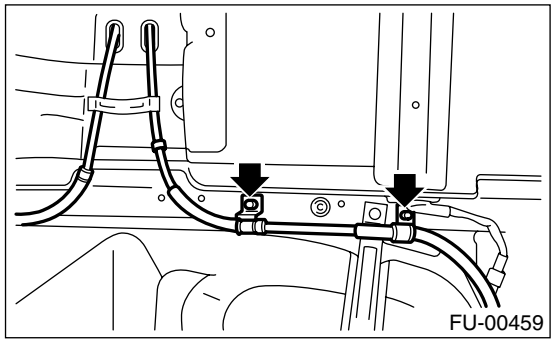
(3) Remove front rubber cushion and detach muffler assembly.


FU-00457

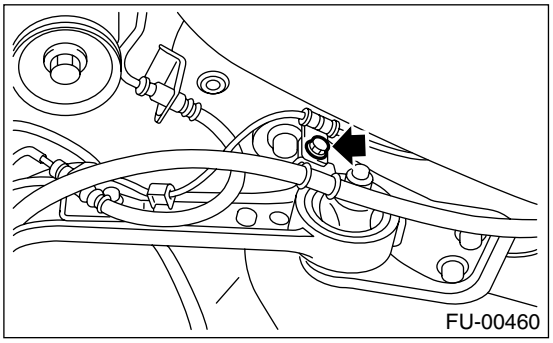
17) Remove propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
18) Disconnect connector from ABS sensor.


FU-00458

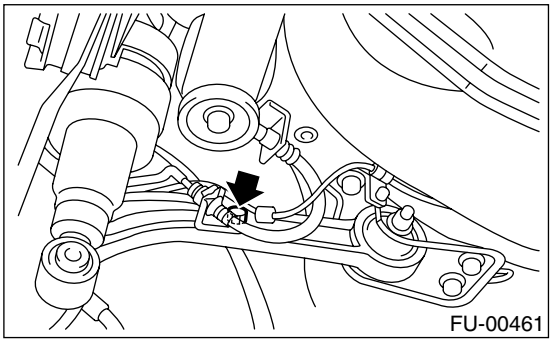
19) Remove bolts which hold parking brake cable holding bracket.
20) Remove parking brake cable from cabin by forcibly pulling it backward.


FU-00459

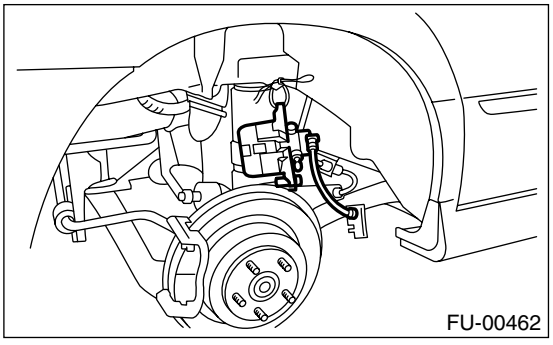
21) Remove bolts which hold parking brake cable holding bracket.



22) Remove bolts which hold rear brake hoses holding bracket.



23) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.

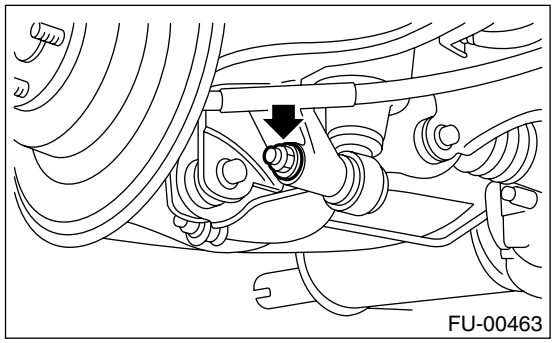


24) Remove rear suspension assembly.

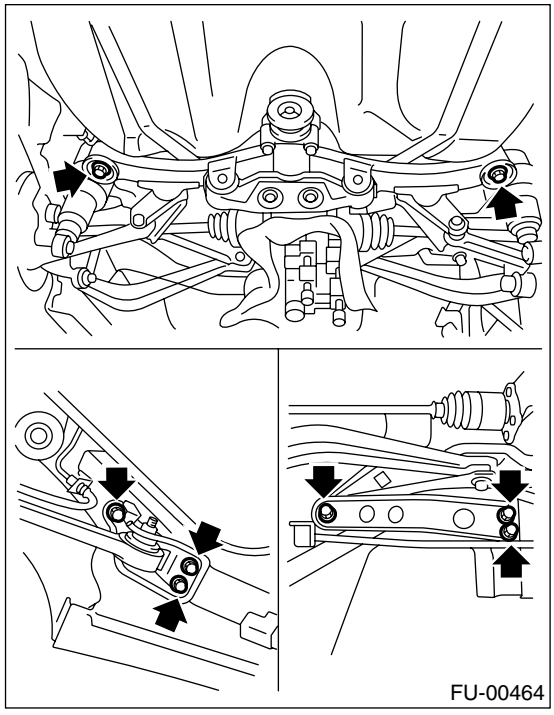
WARNING:
A helper is required to perform this work.

(1) Support rear differential with transmission jack.

(2) Remove bolt which holds rear shock absorber to rear suspension arm.

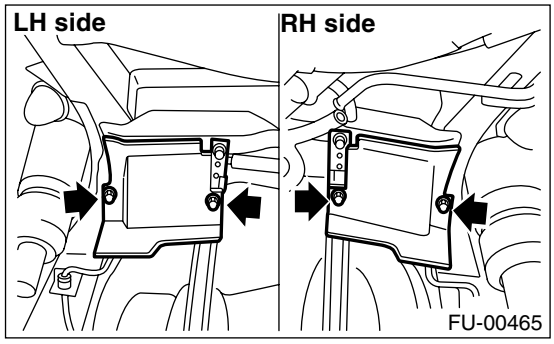


(3) Remove bolts which secure rear suspension assembly to body.

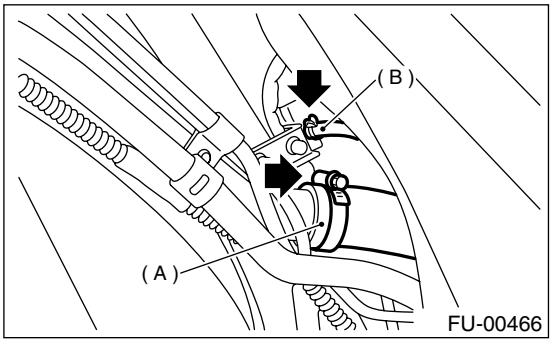


(4) Remove rear suspension assembly.

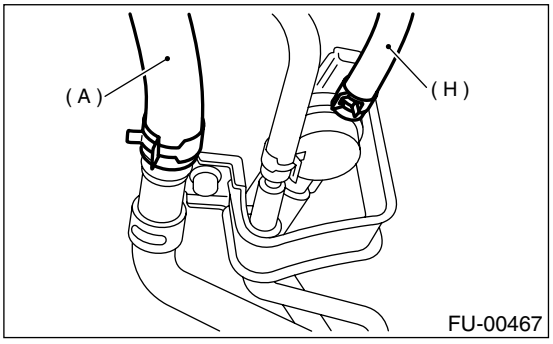
25) Remove rear side fuel tank cover.



26) Disconnect fuel filler hose (A) and fuel tank pressure sensor hose (B).

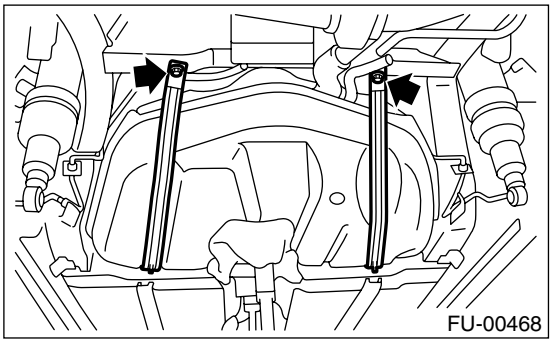


27) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (H) from pressure control solenoid valve.



28) Support fuel tank with transmission jack, remove bolts from bands and dismount fuel tank from the vehicle.

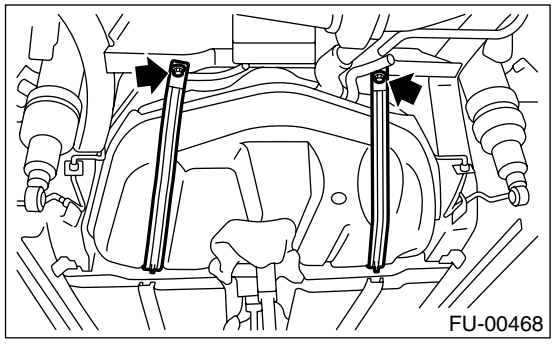
WARNING:
A helper is required to perform this work.



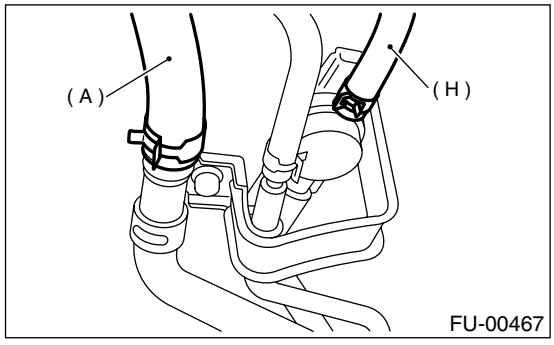
B: Installation

1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

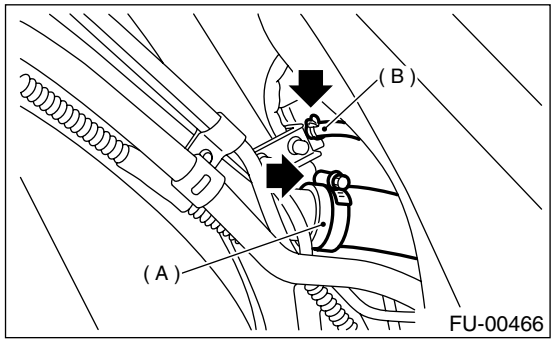
WARNING:
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (H) to pressure control solenoid valve.

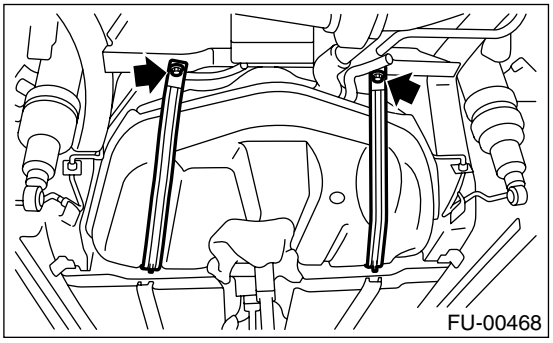


4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



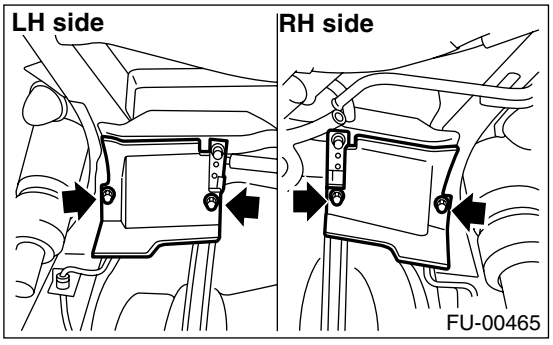
5) Tighten band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



6) Install rear side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

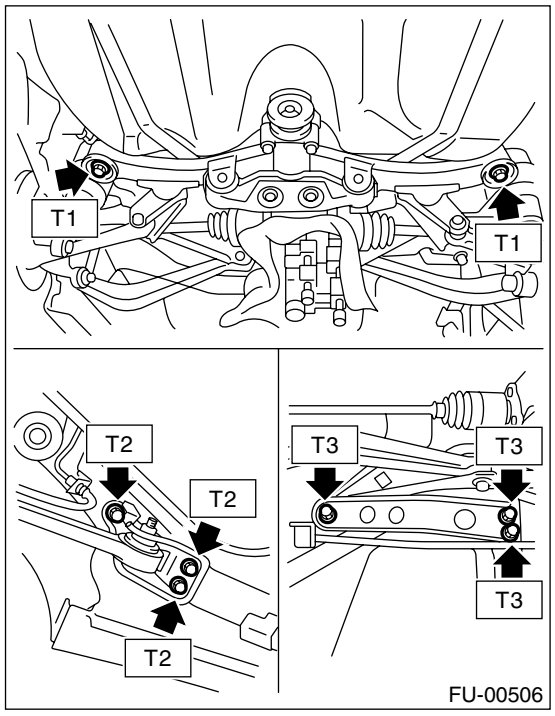


7) Install rear suspension assembly.

WARNING:
A helper is required to perform this work.

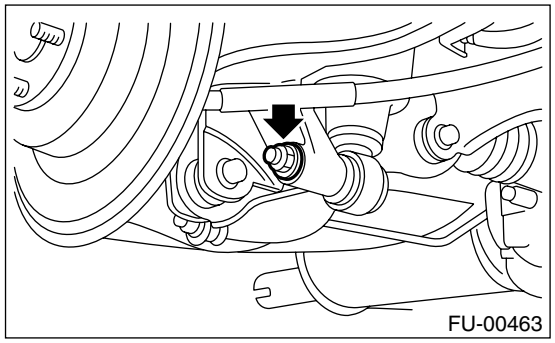
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

Tightening torque:
T1: 172 N·m (17.5 kgf-m, 127 ft-lb)
T2: 108 N·m (11.0 kgf-m, 80 ft-lb)
T3: 66 N·m (6.7 kgf-m, 48 ft-lb)

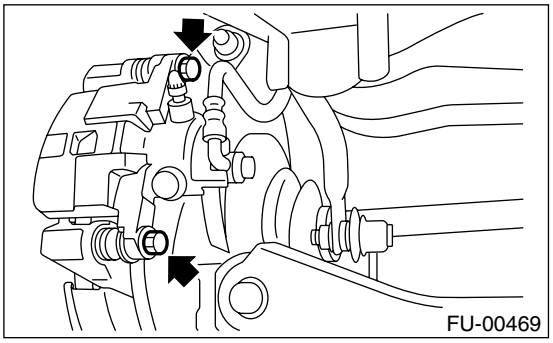


(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)

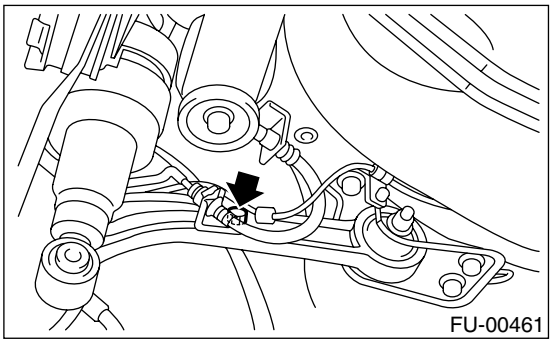


8) Install rear brake caliper. <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



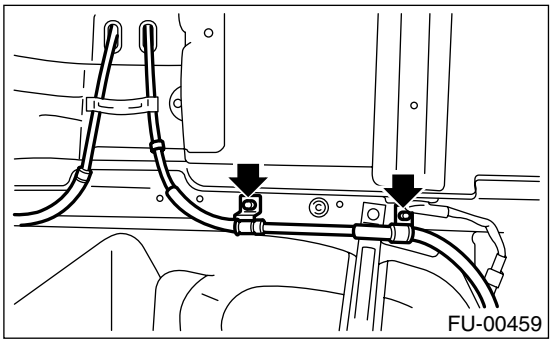
9) Tighten bolts which hold rear brake hoses holding bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

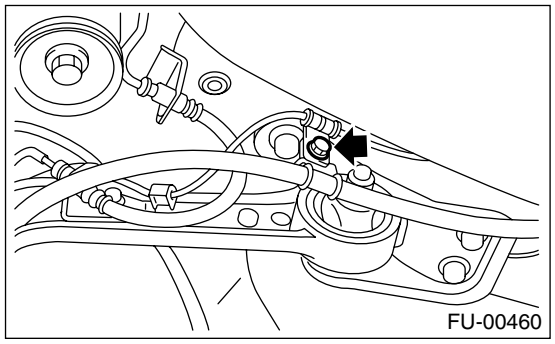


10) Install parking brake cable to cabin by forcibly pushing it forward.
11) Tighten bolts which hold parking brake cable holding bracket.

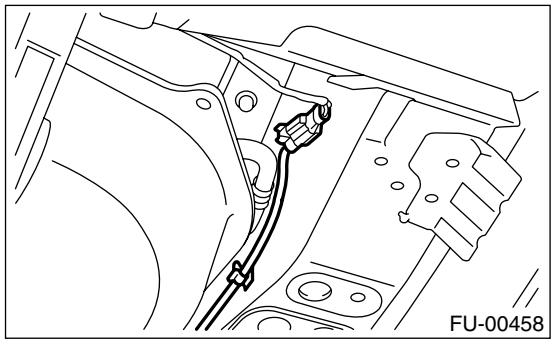
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect connector to ABS sensor.

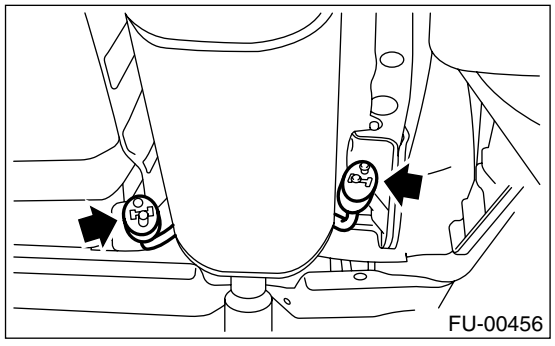


13) Install propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
14) Install rear exhaust pipe and muffler.

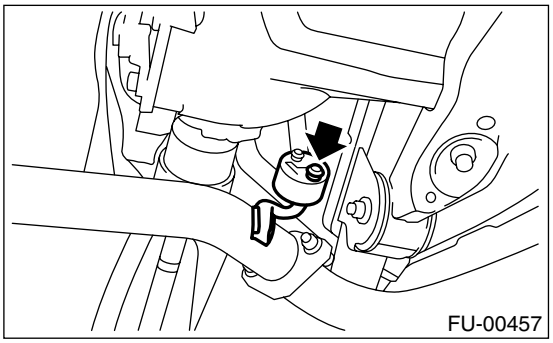
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

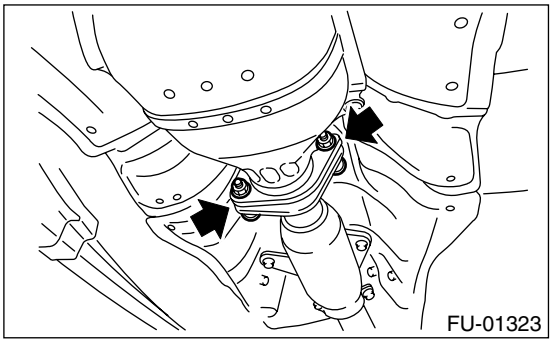


(2) Install front rubber cushion and attach muffler assembly.



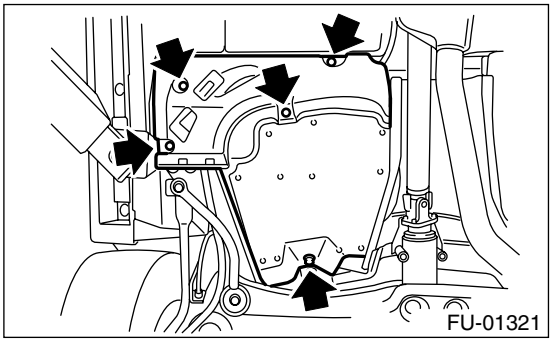
(3) Install rear exhaust pipe to center exhaust pipe.

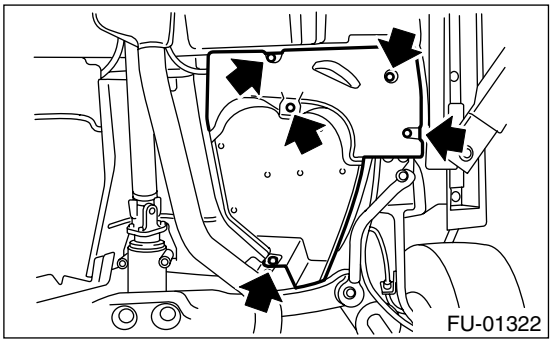
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



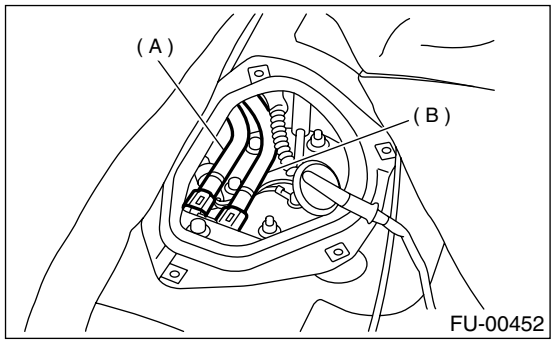
15) Install front side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



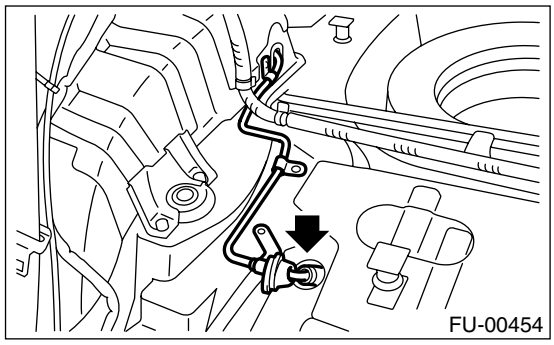


16) Install rear wheel.
17) Lower the vehicle.
18) Tighten wheel nuts to rear wheel.
19) Install parking brake cable. <Ref. to PB-5, INSTALLATION, Parking Brake Lever.>
20) Install console box. <Ref. to EI-45, INSTALLATION, Console Box.>
21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H4DOTC)-76, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

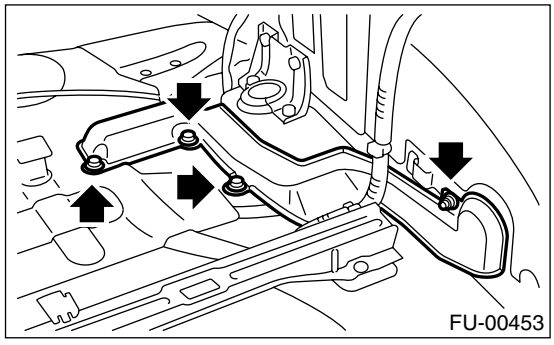


(A) Delivery hose
(B) Return hose

22) Connect evaporation pipe and hold it with quick connector. <Ref. to FU(H4DOTC)-76, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

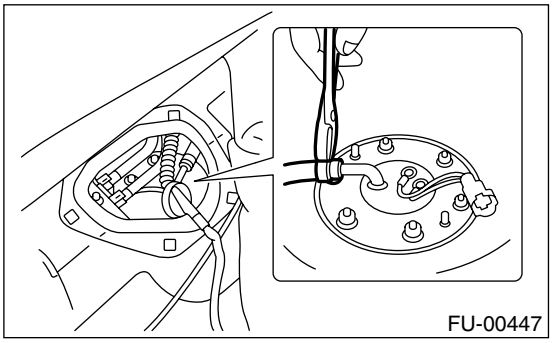


23) Install pipe protector.

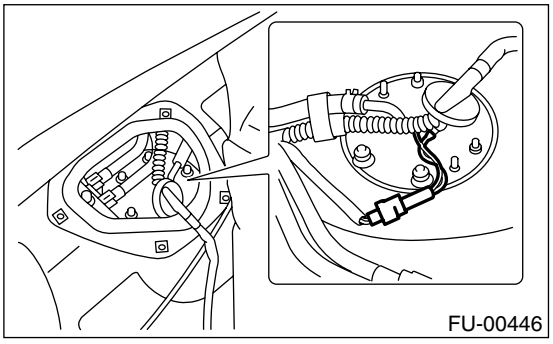


24) Install rear pillar trim. <Ref. to EI-69, REMOVAL, Rear Pillar Trim.>

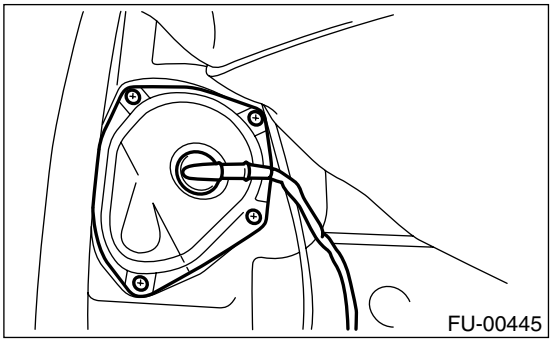
25) Connect fuel jet pump hose.



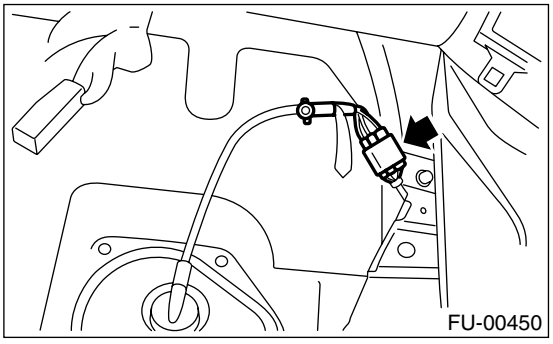
26) Connect connector to fuel sub level sensor.



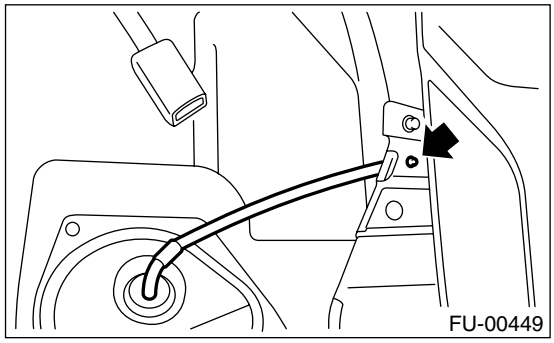
27) Install sub service hole cover.



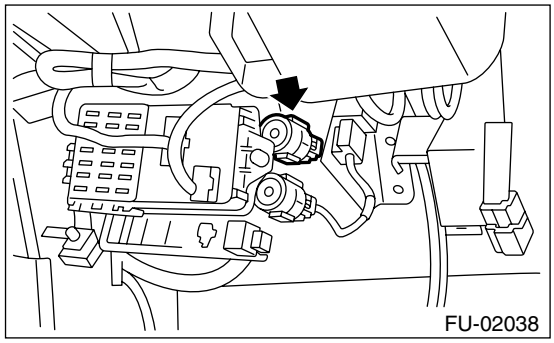
28) Connect connectors to fuel tank cord and plug service hole with grommet.



29) Install holder clip which secures fuel tank cord on bracket.



30) Set rear seat and floor mat.
31) Connect connector to fuel pump relay.



32) Adjust parking brake lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>
33) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

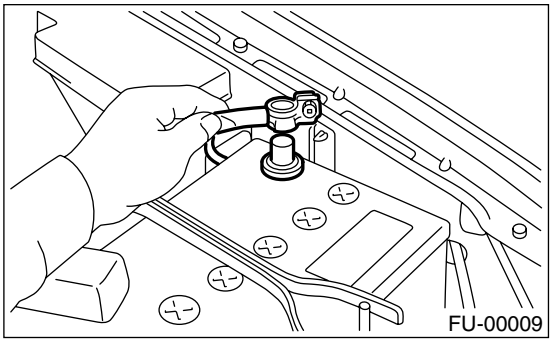
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

25.Fuel Filler Pipe

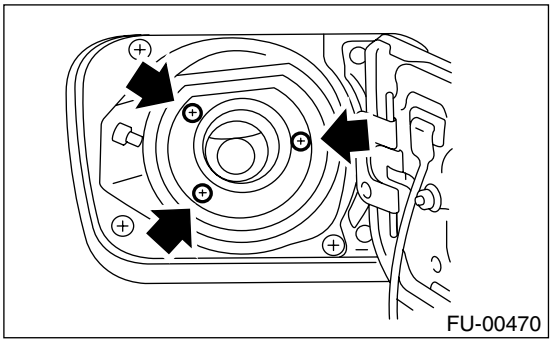
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

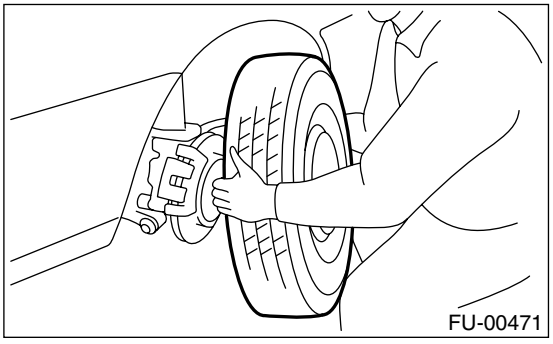
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



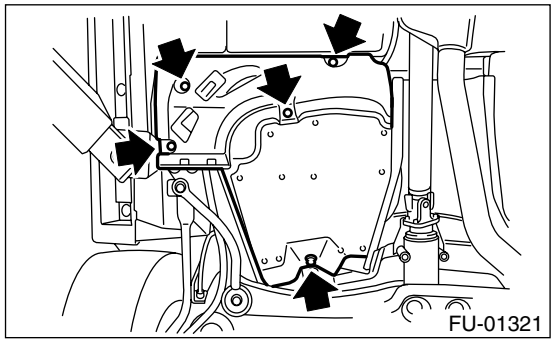
3) Open fuel filler flap lid and remove filler cap.
4) Remove screws holding packing in place.



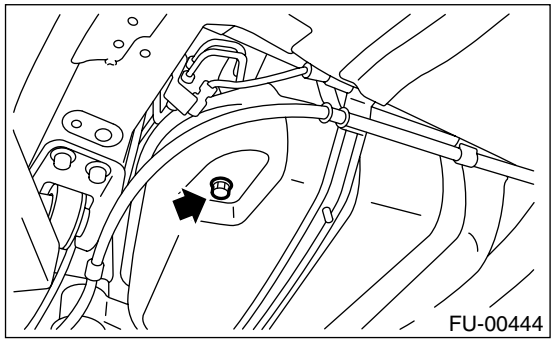
5) Lift-up the vehicle.
6) Remove rear wheel nuts.
7) Remove rear wheel.



8) Remove front right side fuel tank cover.



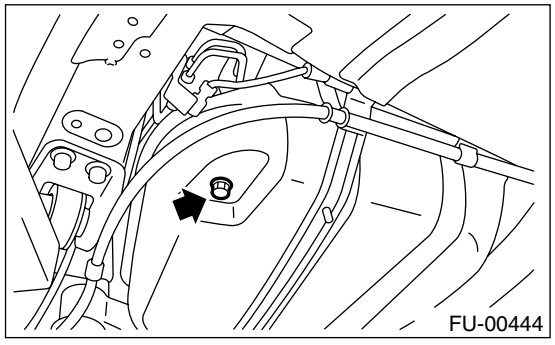
9) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



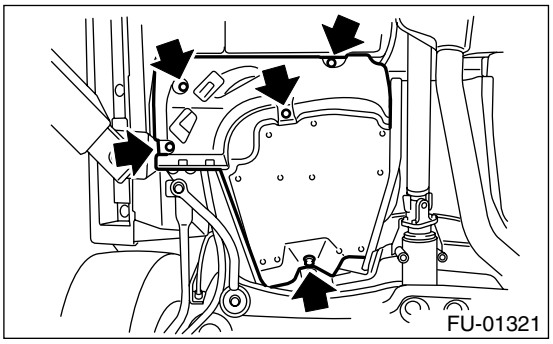
10) Tighten fuel drain plug and then install front right side tank cover.

NOTE:
Replace gasket with new one.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)



Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

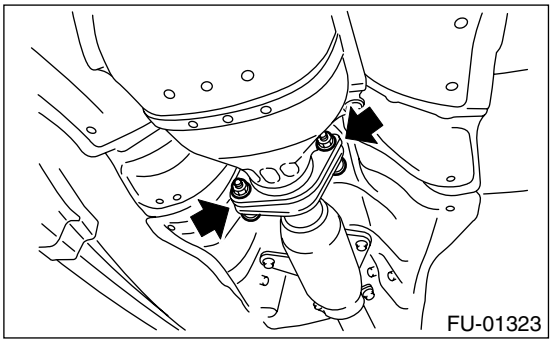

FU-01321

11) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

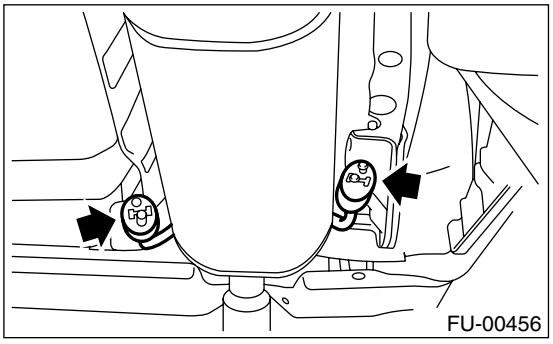
SUBARU CRC (Part No. 004301003)

(1) Separate rear exhaust pipe from center exhaust pipe.

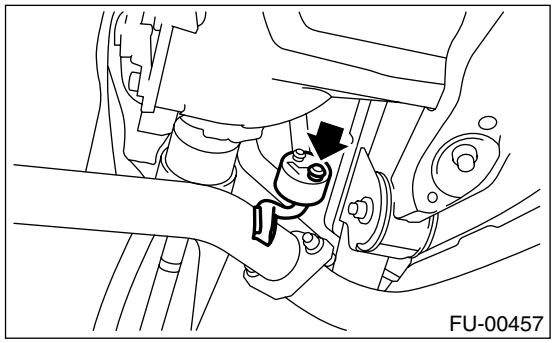

FU-01323

(2) Remove left and right rubber cushions.

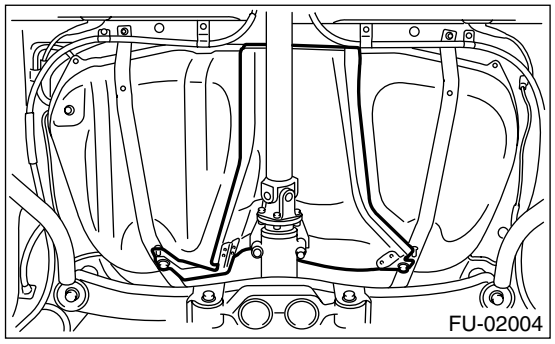
CAUTION:
Be careful not to pull down muffler.


FU-00456

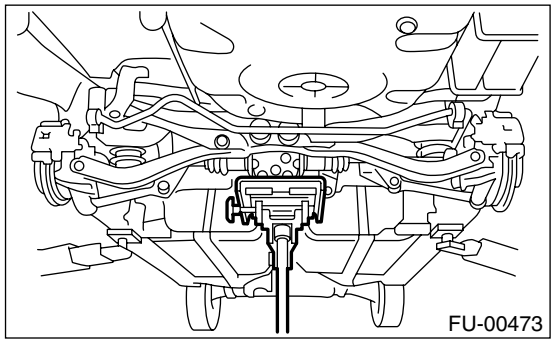
(3) Remove front rubber cushion and detach muffler assembly.


FU-00457

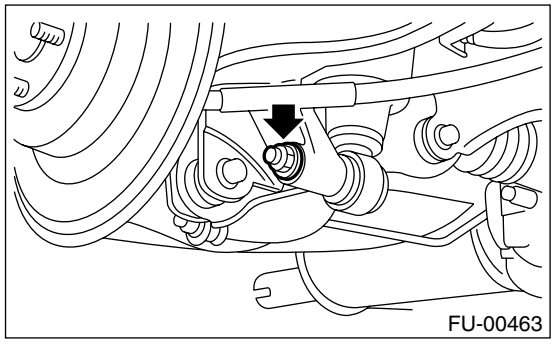
12) Remove heat sealed cover.


FU-02004

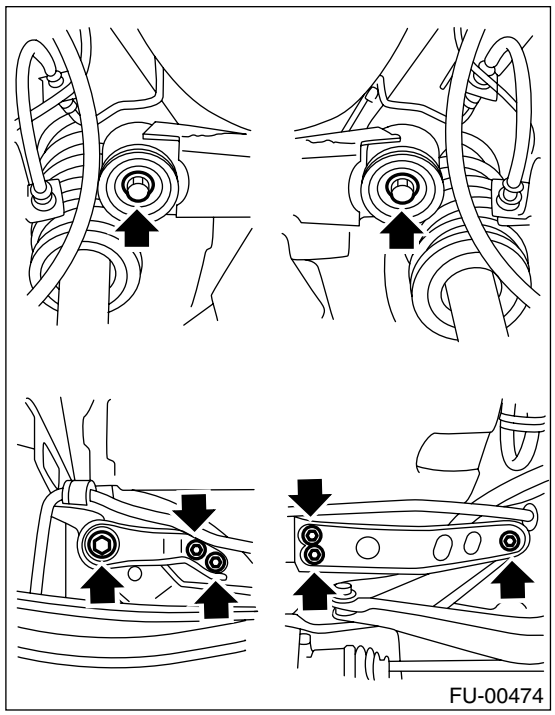
13) Place transmission jack under sub frame.


FU-00473

14) Remove bolt which holds rear shock absorber to rear suspension arm.


FU-00463

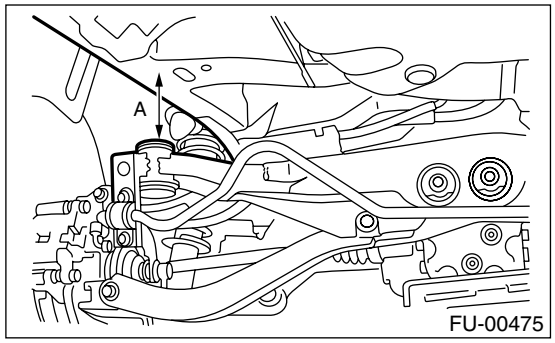
15) Remove bolts which hold rear sub frame on body.



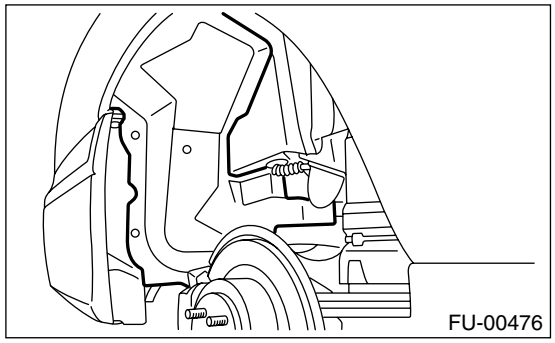
16) Lower the rear sub frame.

CAUTION:
Be sure to lower sub frame slowly.

A = 150 mm (5.91 in)

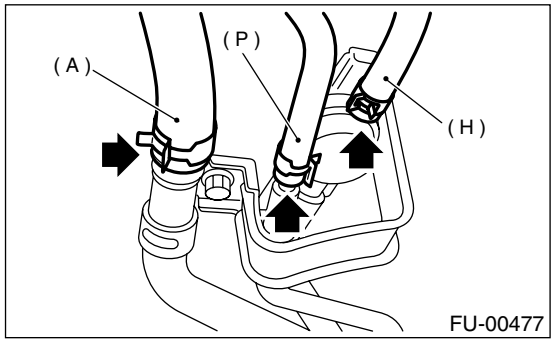


17) Remove fuel filler pipe protector.

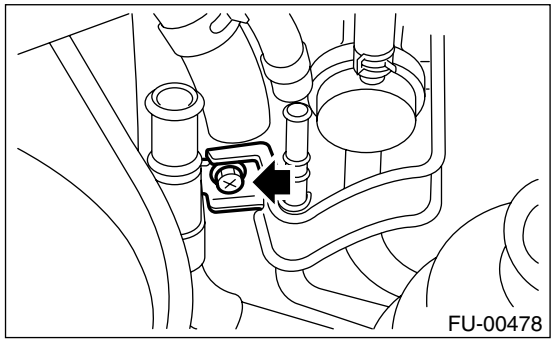


18) Disconnect air vent hose (A) and evaporation hose (P) from evaporation pipe assembly.

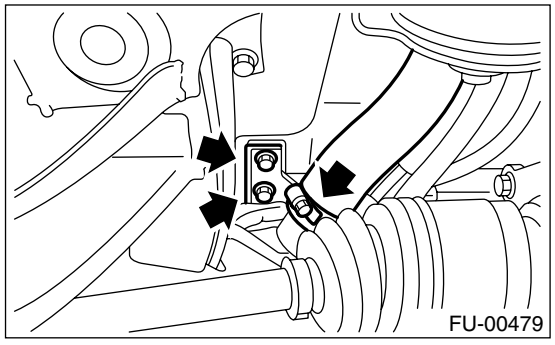
19) Disconnect evaporation hose (H) from pressure control solenoid valve.



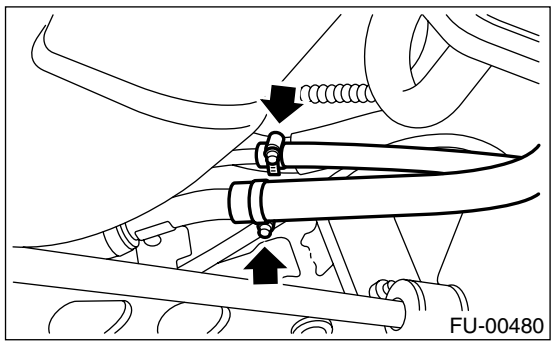
20) Remove bolt which holds evaporation pipe assembly on body.



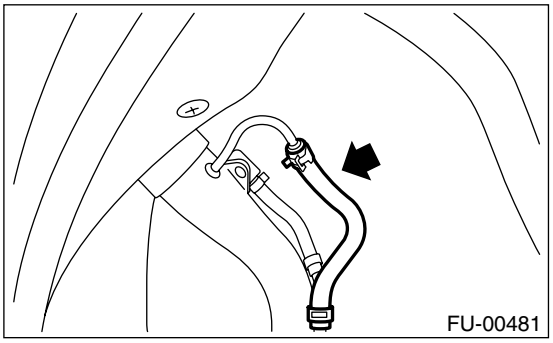
21) Disconnect fuel filler hose.
22) Remove bolt which holds fuel pressure sensor on fuel filler pipe and remove bolt which holds fuel filler pipe on body.



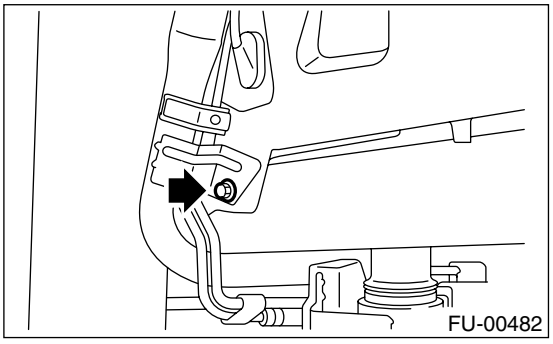
23) Disconnect canister hose from evaporation pipe assembly.



24) Disconnect evaporation hose (O) from fuel filler pipe.



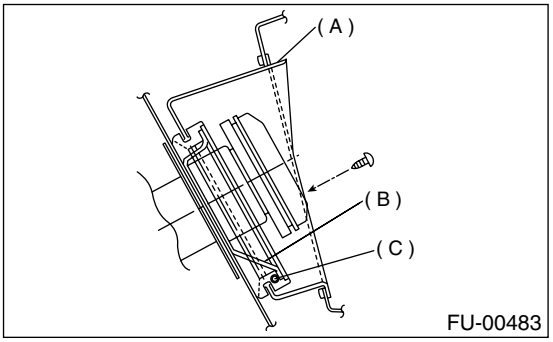
25) Remove bolt which holds fuel filler pipe to body.



26) Remove fuel filler pipe from under side of the vehicle.

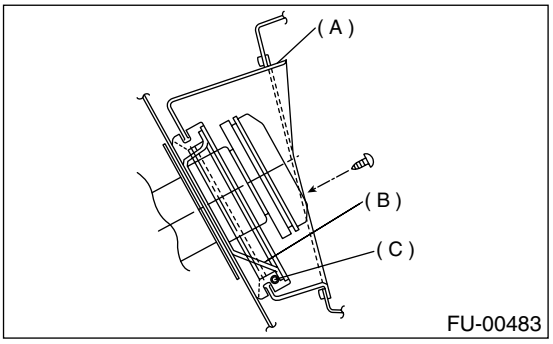
B: Installation

1) Hold fuel filler flap open.
2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



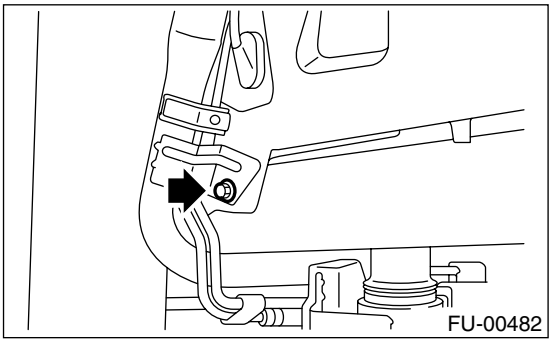
3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.

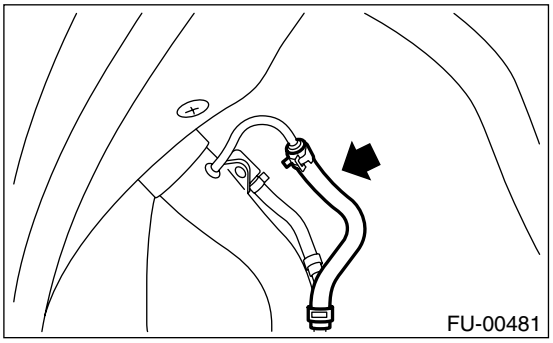


4) Tighten bolt which holds fuel filler pipe on body.

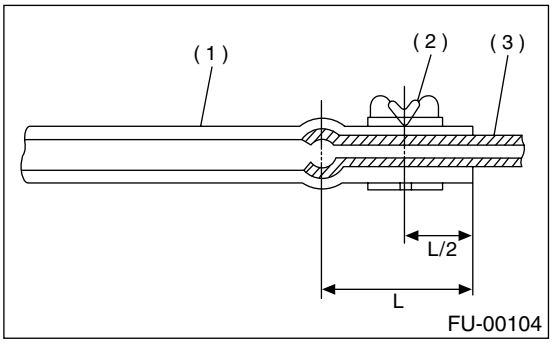
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



5) Insert evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold clip.

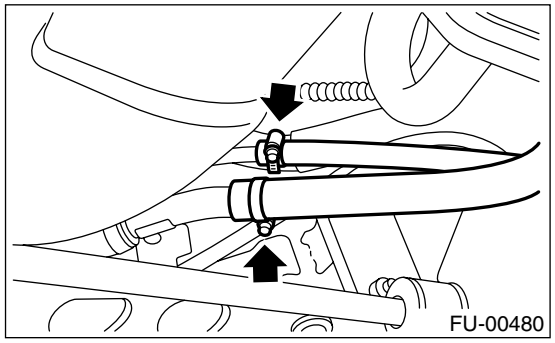


L = 27.5±2.5 mm (1.083±0.098 in)

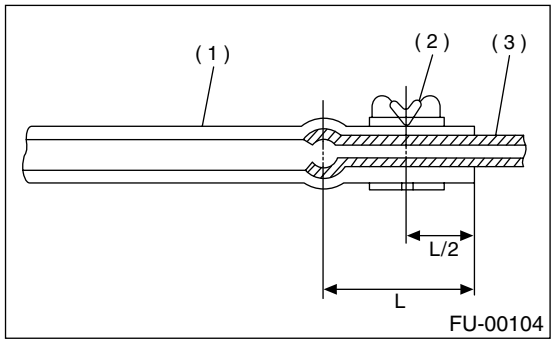


(1) Hose
(2) Clip
(3) Pipe

6) Insert canister hoses approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and tighten clamp.



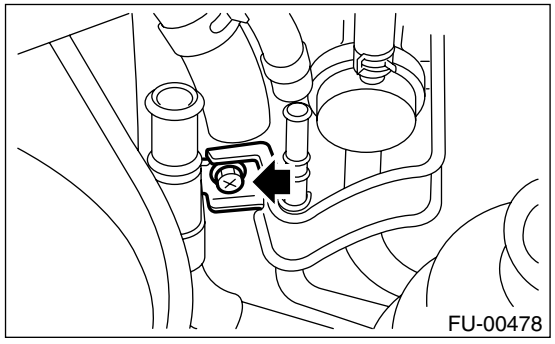
L = 27.5±2.5 mm (1.083±0.098 in)



(1) Hose
(2) Clip
(3) Pipe

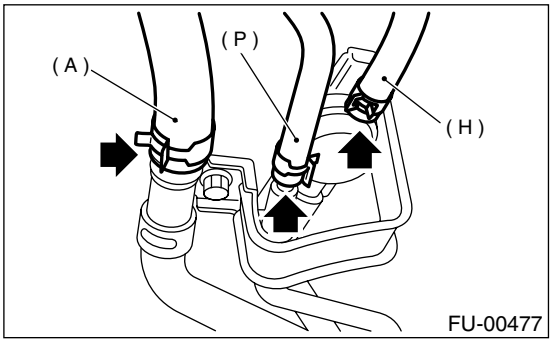
7) Tighten bolt which holds evaporation pipe assembly on body.

Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

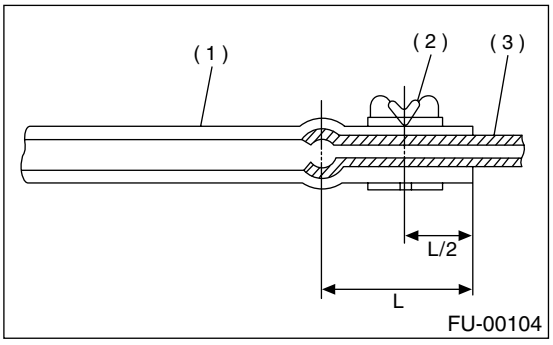


8) Insert air vent hose (A), evaporation hose (P) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and hold clip.

9) Insert evaporation hose (H) to pressure control solenoid valve and hold clip.



L = 27.5±2.5 mm (1.083±0.098 in)

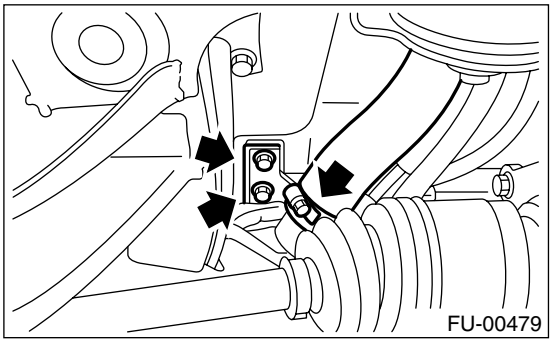


(1) Hose
(2) Clip
(3) Pipe

10) Tighten bolt which holds fuel filler pipe on body and tighten bolt which holds fuel pressure sensor on fuel filler pipe.

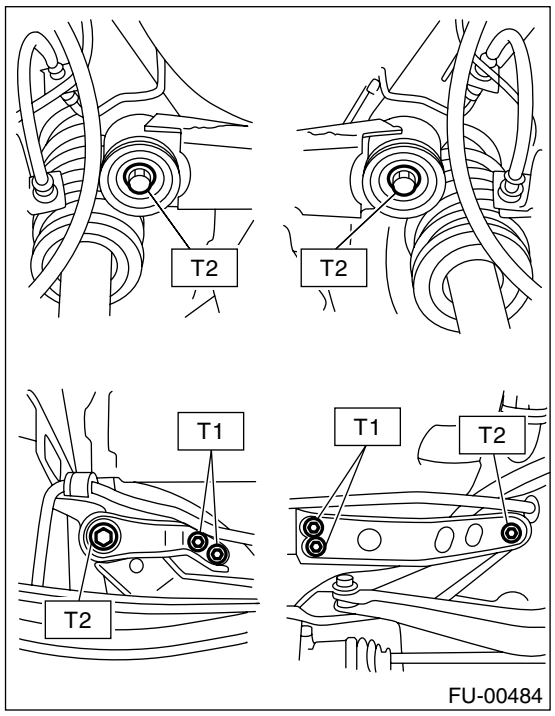
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

11) Insert fuel filler hose approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten clamp.



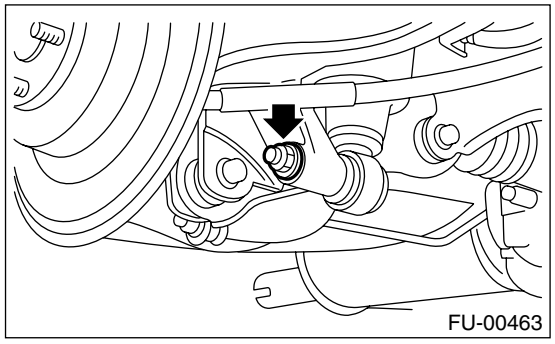
12) Jack-up the rear sub frame and tighten bolts which hold rear sub frame on body.

Tightening torque:
T1: 66 N·m (6.7 kgf-m, 48.5 ft-lb)
T2: 172 N·m (17.5 kgf-m, 127 ft-lb)

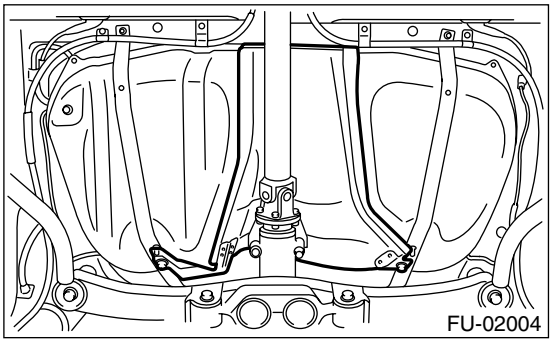


13) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-17, INSTALLATION, Rear Shock Absorber.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)



14) Install heat shield cover.

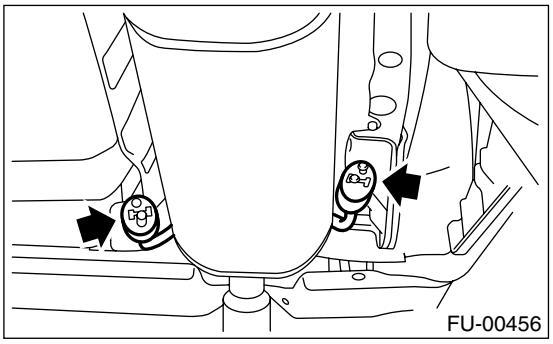


15) Install rear exhaust pipe and muffler.

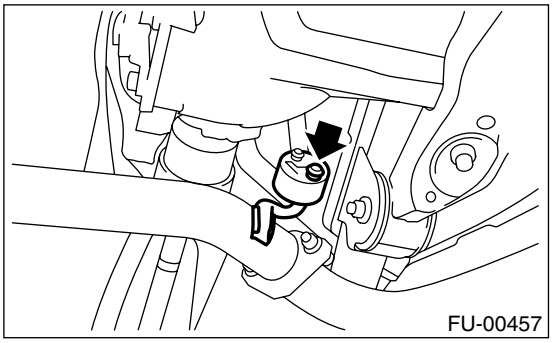
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

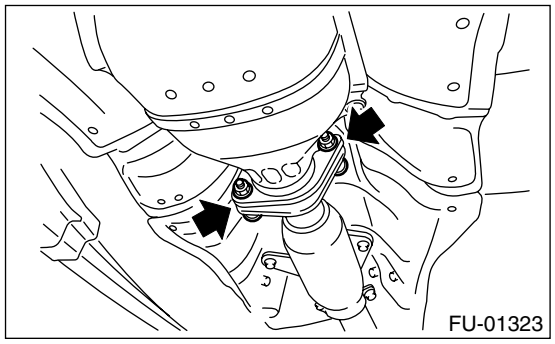


(2) Install front rubber cushion and attach muffler assembly.

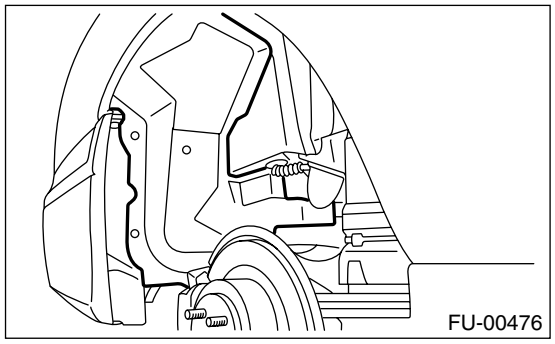


(3) Install rear exhaust pipe to center exhaust pipe.

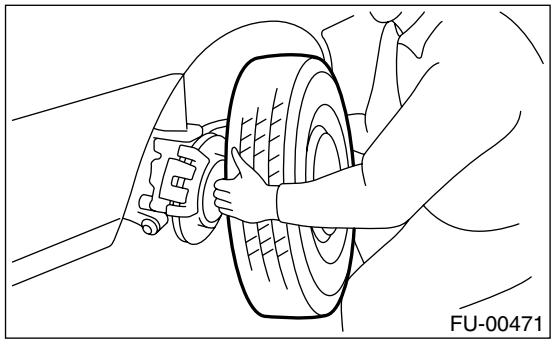
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



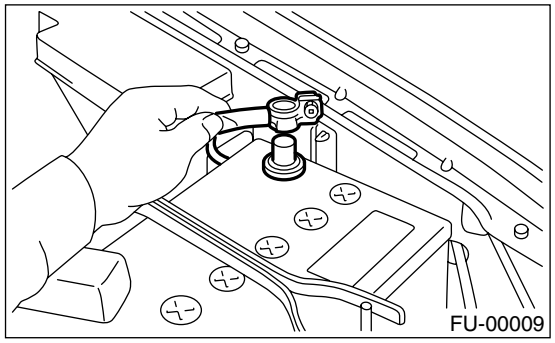
16) Install fuel filler pipe protector.



17) Install rear right wheel.



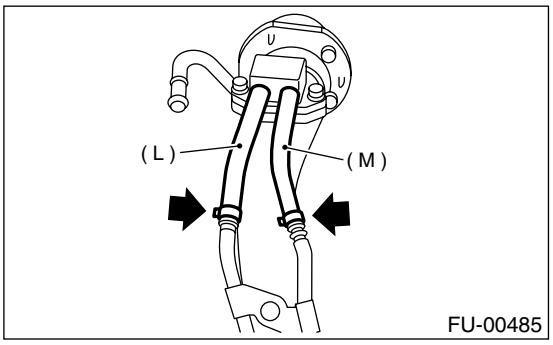
18) Lower the vehicle.
19) Tighten wheel nuts.
20) Connect battery ground cable.



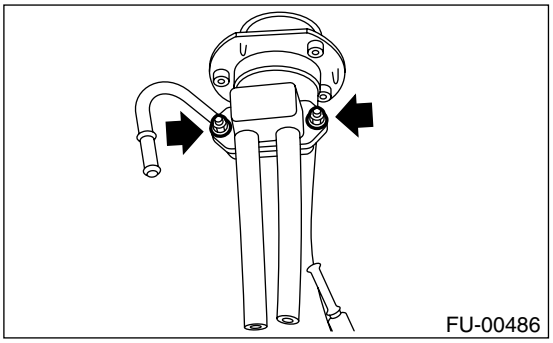
21) Remove fuel filler pipe to under side of the vehicle.

C: DISASSEMBLY

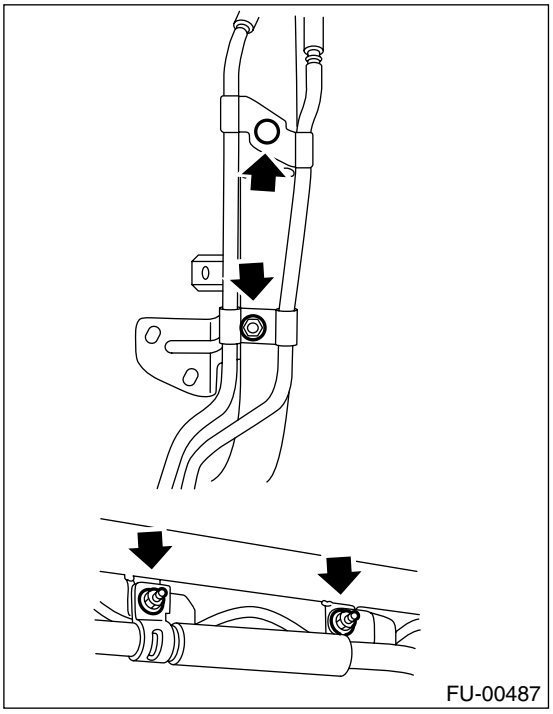
1) Disconnect evaporation hose (L) and (M) from evaporation pipe assembly.



2) Remove shut valve from fuel filler pipe.



3) Remove nut which holds evaporation pipe assembly on fuel filler pipe.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

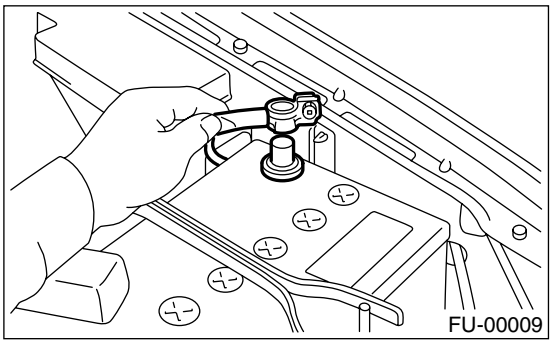
26.Fuel Pump

A: REMOVAL

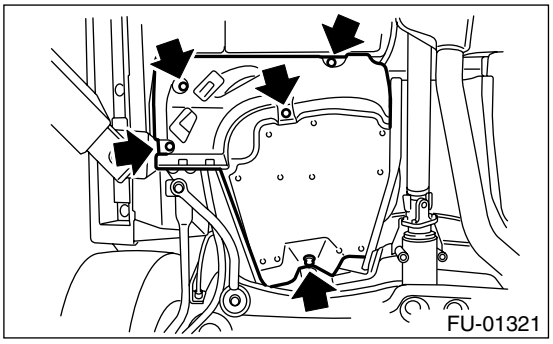
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

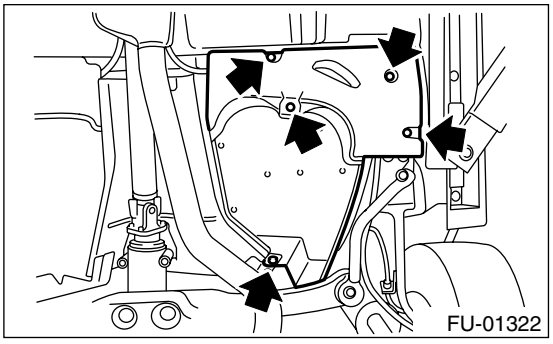
NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel filler flap lid and remove fuel filler cap.
3) Disconnect battery ground cable.

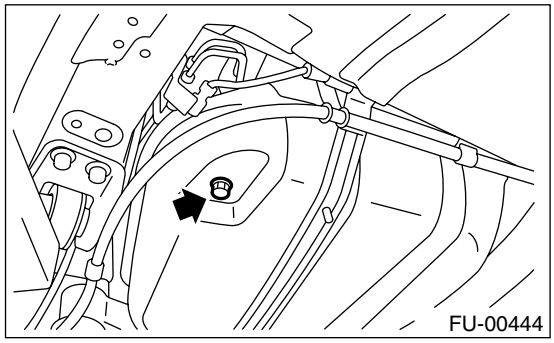


4) Lift-up the vehicle.
5) Remove front side fuel tank cover.





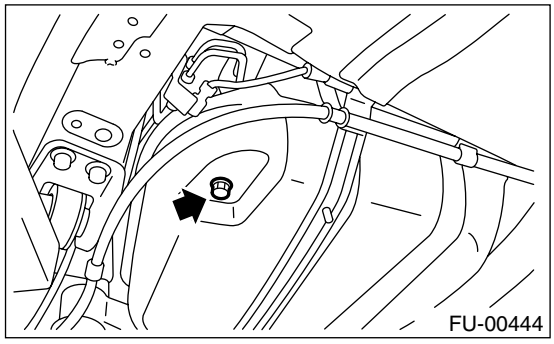
6) Drain fuel from fuel tank. Set a container under the vehicle and remove drain plug from fuel tank.



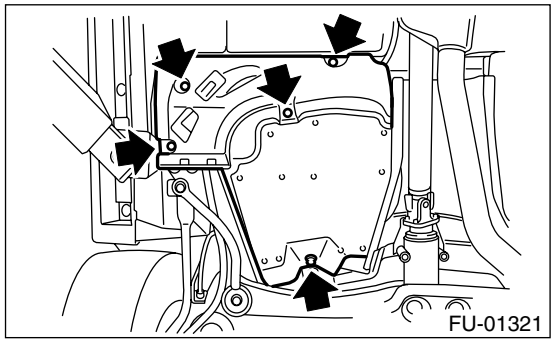
7) Tighten fuel drain plug and install front right side fuel tank cover.

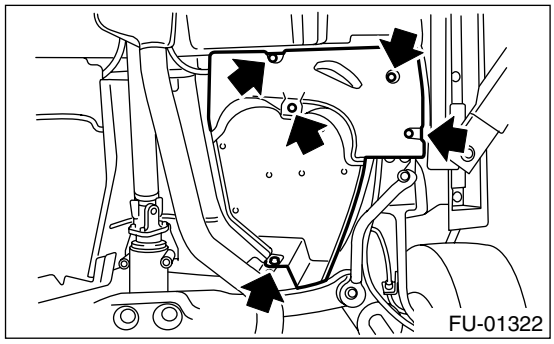
NOTE:
Replace gasket with new one.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

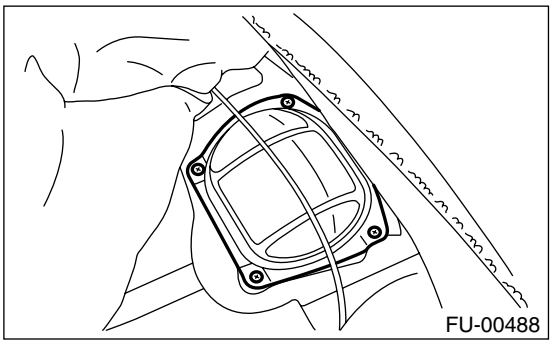


Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

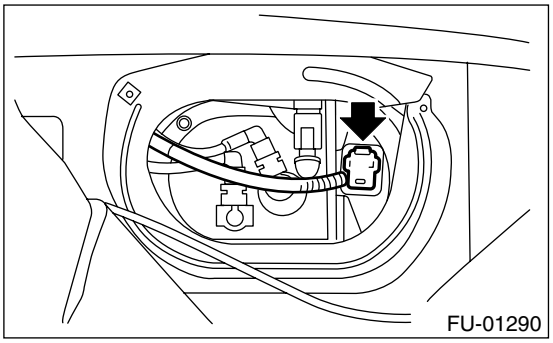




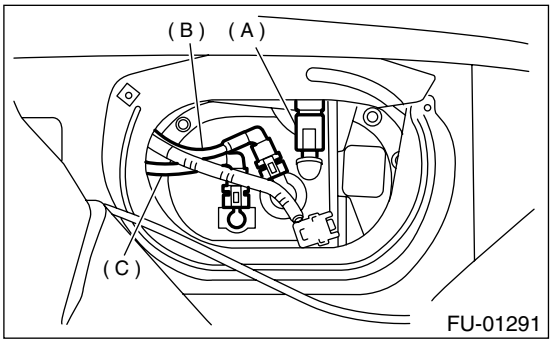
8) Raise rear seat and turn floor mat up.
9) Remove access hole lid.



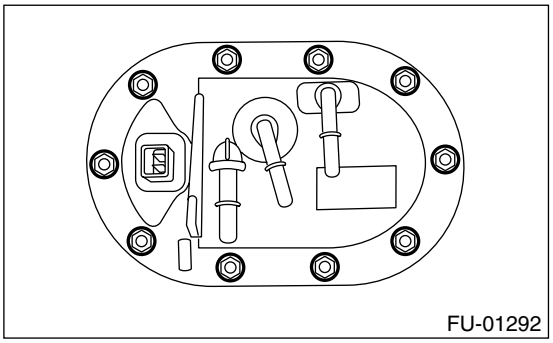
10) Disconnect connector from fuel pump.



11) Move clips and then disconnect jet pump hose (C).
12) Disconnect quick connector and then disconnect fuel delivery hose (A) and return hose (B). <Ref. to FU(H4DOTC)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



13) Remove nuts which install fuel pump assembly onto fuel tank.

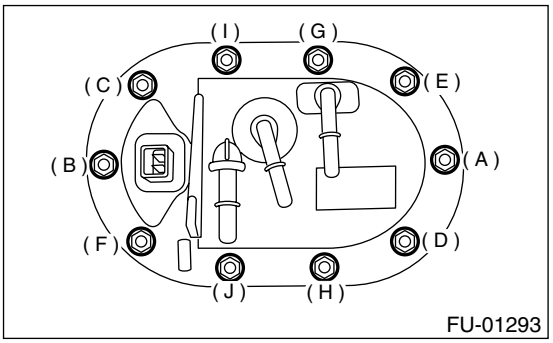


14) Take off fuel pump assembly from fuel tank.

B: INSTALLATION

Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

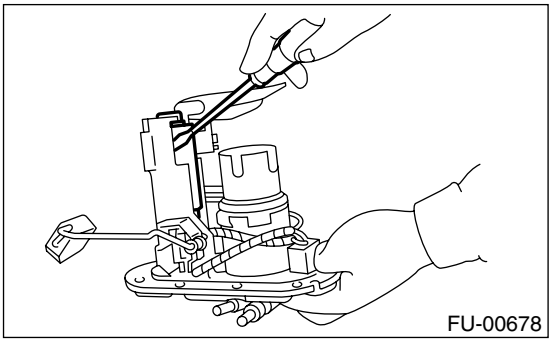
Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)



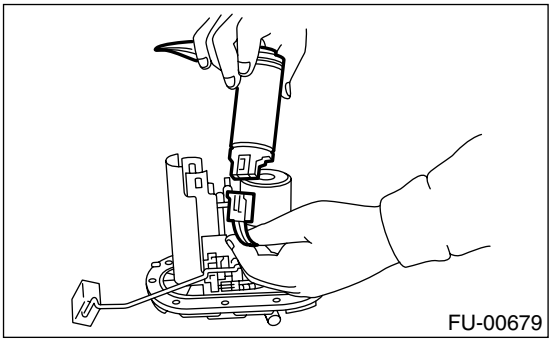
C: Disassembly

1) Remove fuel pump and pump holder.

NOTE:
When disassembling pump holder, be careful as it is installed with two pawls.



2) Disconnect connector from fuel pump.



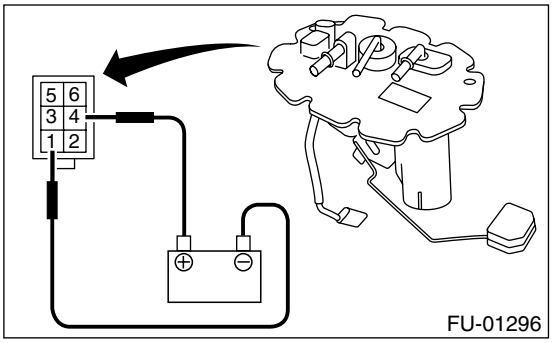
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

Connect lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

WARNING:
• Wipe off the fuel completely.
• Keep battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on the battery side.
• Do not run fuel pump for a long time under non-load condition.



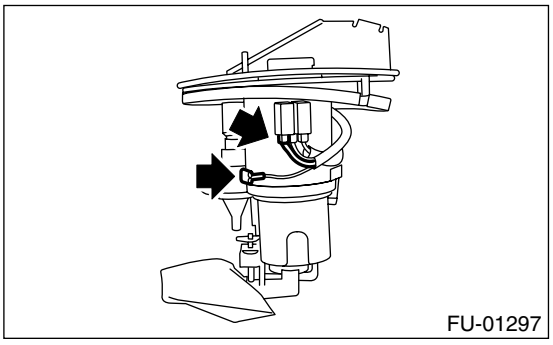
27.Fuel Level Sensor

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

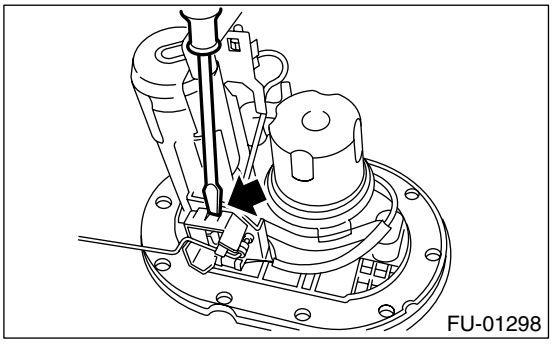
NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.


FU-01297

3) Pushing the pawls with a screwdriver, remove fuel level sensor by pulling it downwards.

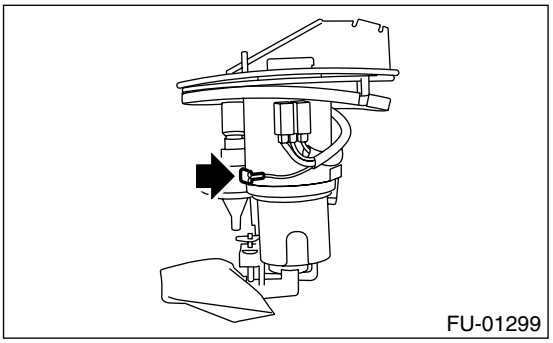
NOTE:
If the retainer pawls are broken during removal, the fuel level sensor must be replaced with a new one.


FU-01298

B: Installation

Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**

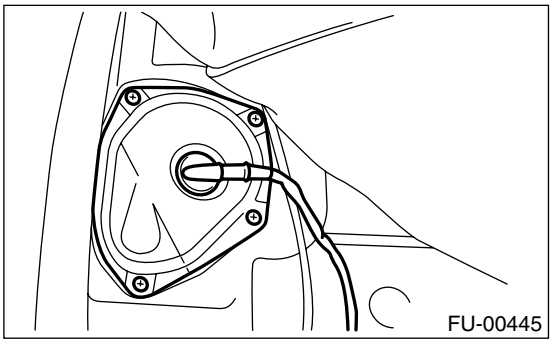

FU-01299

28.Fuel Sub Level Sensor

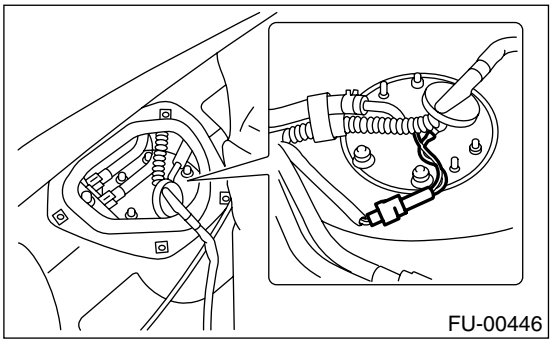
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

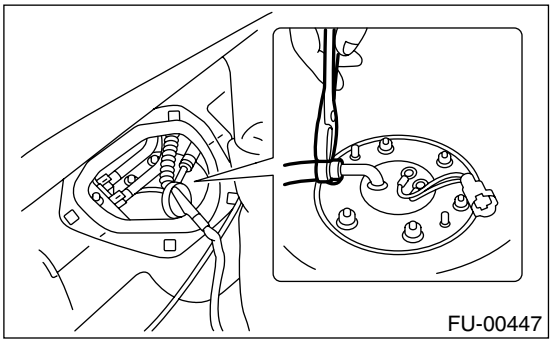
1) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-48, DRAINING FUEL, OPERATION, Fuel.>
2) Raise rear seat and turn floor mat up.
3) Remove service hole cover.



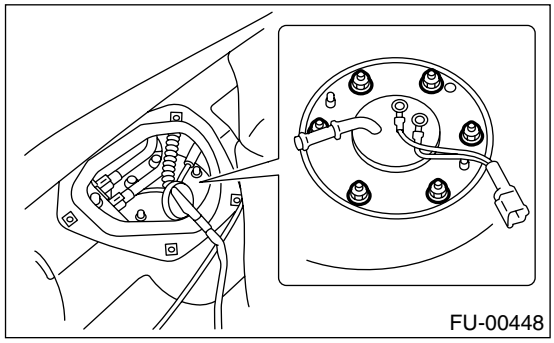
4) Disconnect connector from fuel sub level sensor.



5) Disconnect fuel jet pump hose.



6) Remove bolts which install fuel sub level sensor on fuel tank.

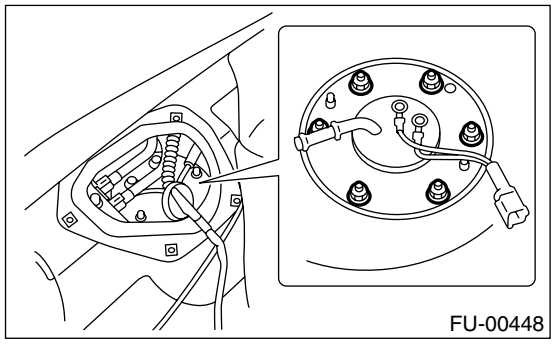


7) Remove fuel sub level sensor.

B: Installation

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



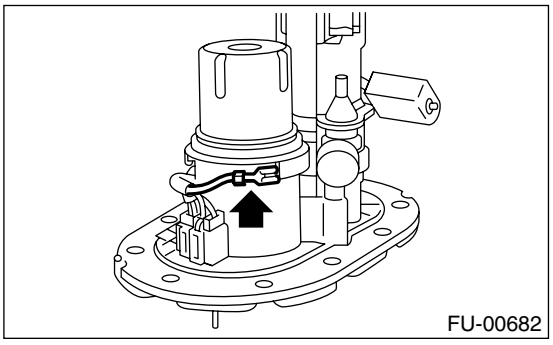
29.Fuel Filter

A: REMOVAL

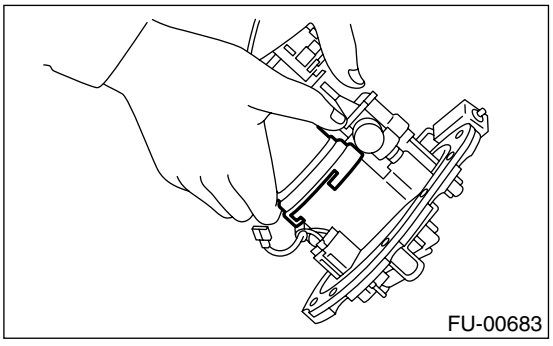
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel filter is built in fuel pump assembly.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Pump.>
3) Disconnect the ground cable from filter holder.



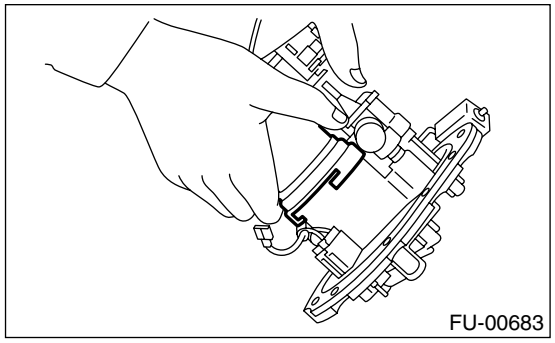
4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.



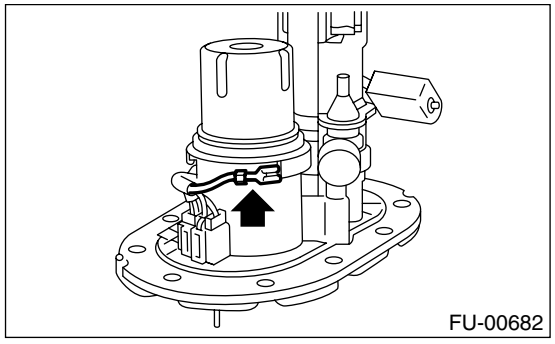
B: Installation

NOTE:
- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

1) Set the O-ring on the filter holder, and then install by turning to the right.



2) Connect the ground cable to filter holder.



3) Install the fuel pump assembly. <Ref. to FU(H4DOTC)-68, INSTALLATION, Fuel Pump.>

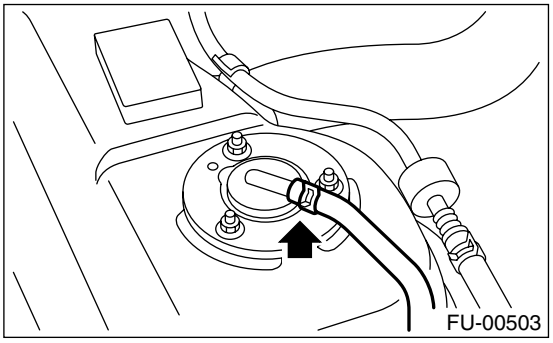
C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.

30.Fuel Cut Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
2) Move clip and disconnect evaporation hose from fuel cut valve.

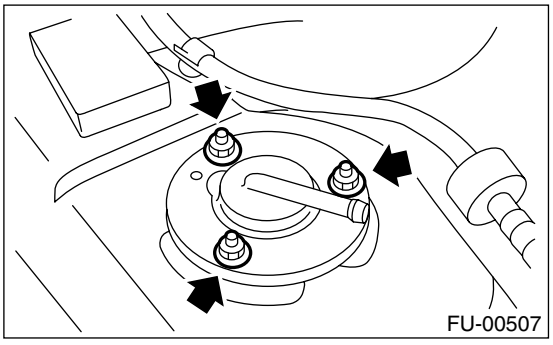


3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

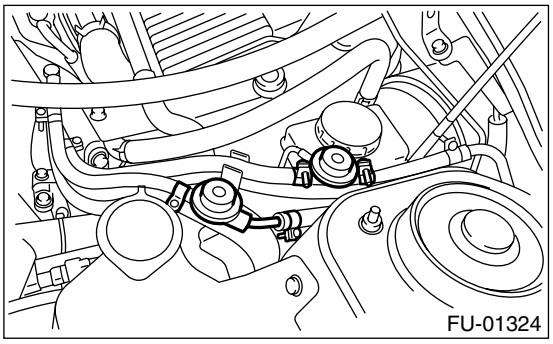
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



31.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from the fuel delivery line and return line.



B: INSTALLATION

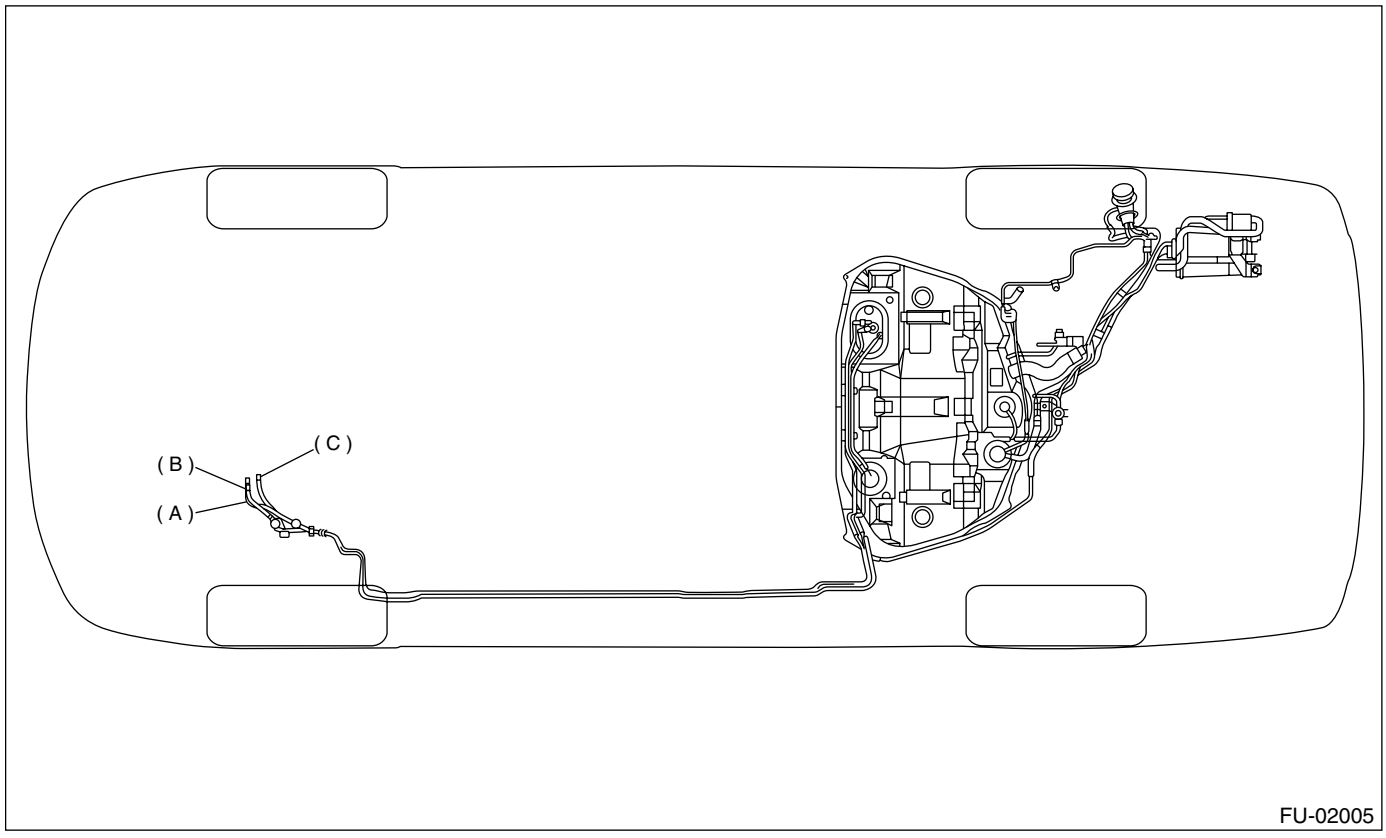
Install in the reverse order of removal.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

32. Fuel Delivery, Return and Evaporation Lines

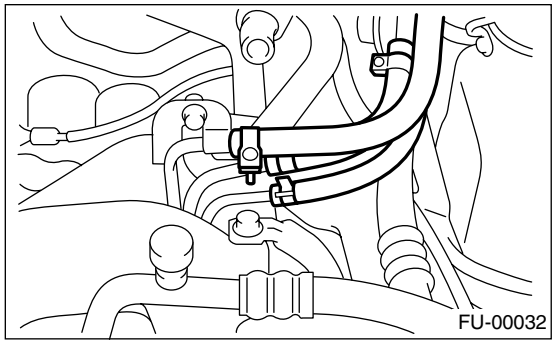
A: REMOVAL

1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open fuel filler flap lid and remove fuel filler cap.
4) Remove fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
5) Remove fuel filler pipe. <Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Filler Pipe.>
6) Remove floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
7) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



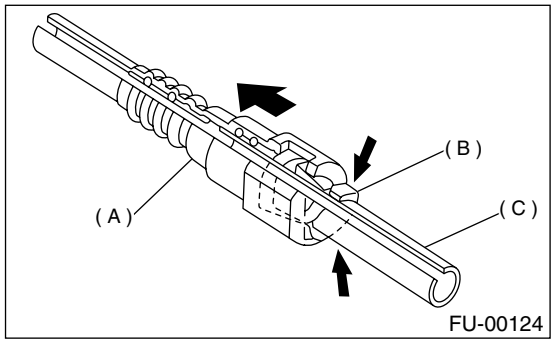
(A) Fuel delivery line
(B) Fuel return line
(C) Evaporation line

8) In engine room, detach fuel delivery hoses, return hoses and evaporation hose.



9) Separate quick connector on fuel delivery and return line.
(1) Clean pipe and connector, if they are covered with dust.
(2) Hold connector (A) and push retainer (B) down.
(3) Pull out connector (A) from retainer (B).

CAUTION:
Replace retainer with new ones.

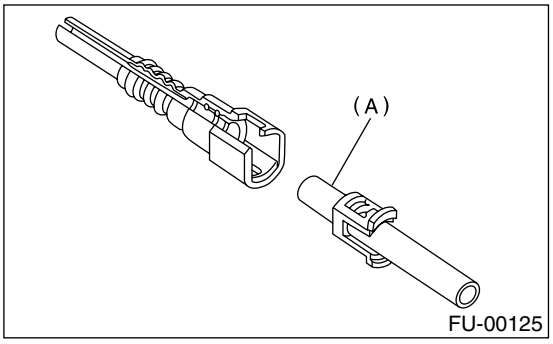


(A) Connector
(B) Retainer
(C) Pipe

B: Installation

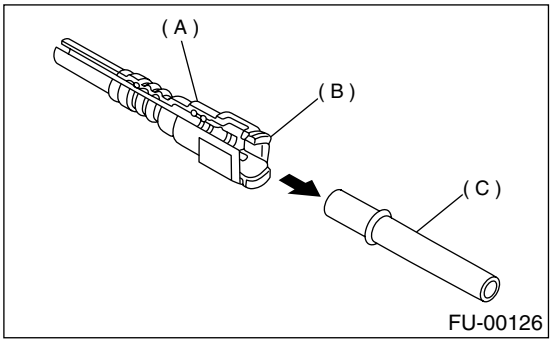
1) Connect quick connector on fuel delivery and return line.

CAUTION:
• Always use a new retainer.
• Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface (A) of pipe.



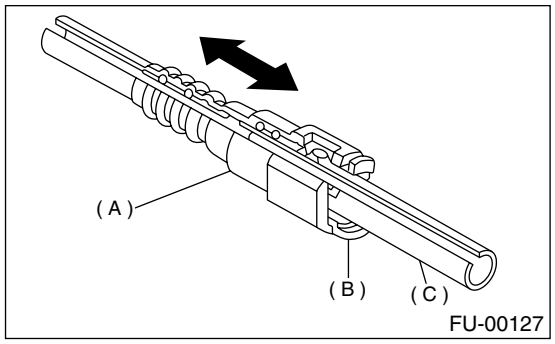
(1) Set new retainer (B) to connector (A).
(2) Push pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.
• Be sure to inspect hoses and their connections for any leakage of fuel.

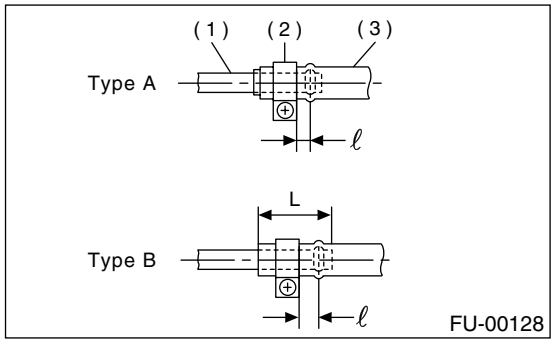


(A) Connector
(B) Retainer
(C) Pipe

2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When insertion length is specified.
Type B: When insertion length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

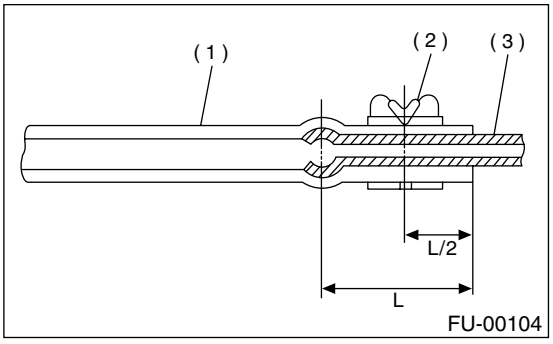


(1) Pipe
(2) Clamp
(3) Hose

3) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

33.Fuel System Trouble in General

A: Inspection

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel level indicator		
1)	Defective operation of fuel level sensor.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation.
(1) Top off the fuel tank or drain the fuel completely.
(2) Drain water condensation from the fuel filter.
• Refilling the fuel tank.
Refill the fuel tank while there is still some fuel left in the tank.
• Protecting the fuel system against freezing and water condensation.
(1) Cold areas
In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the fuel tank. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under damaged areas below.
(2) Damaged areas
If water accumulated in the fuel filter, drain water from both the fuel filter and fuel tank or use an anti-freeze solution (water removing agent) in the fuel tank.
• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H4DOTC)

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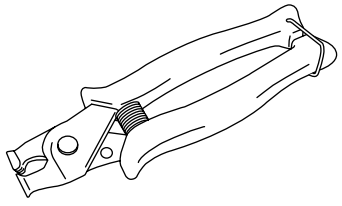
1. General Description

A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the negative terminal from battery.

B: PREPARATION TOOL

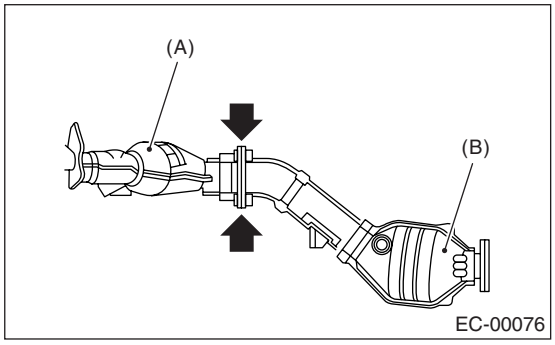
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing PCV hose. • This tool is a general tool that is made by CAILLAU in France. (Code: 54.0.000.205) Tool number is fixed as special tool in order to obtain it as easily as SUBARU genuine parts.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

NOTE:
- Replace the gaskets with new ones.
- Install in the reverse order of removal.

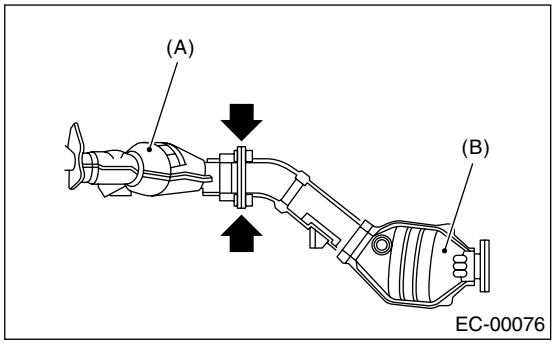
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

NOTE:
- Replace the gaskets with new ones.
- Install in the reverse order of removal.

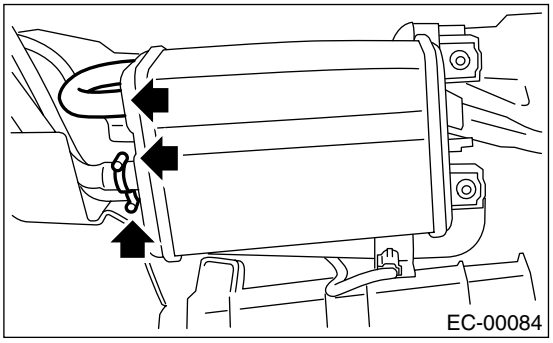
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

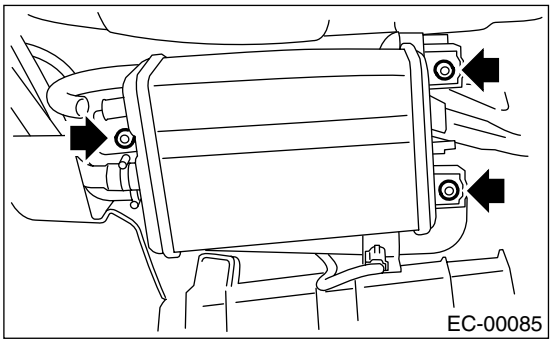
4. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen two clamps which hold two canister hoses, and disconnect evaporation three hoses from canister.



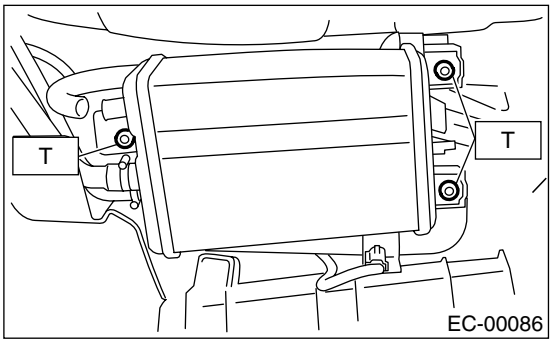
3) Remove canister from body.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



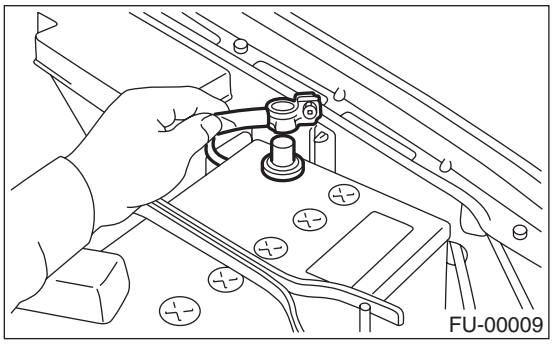
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

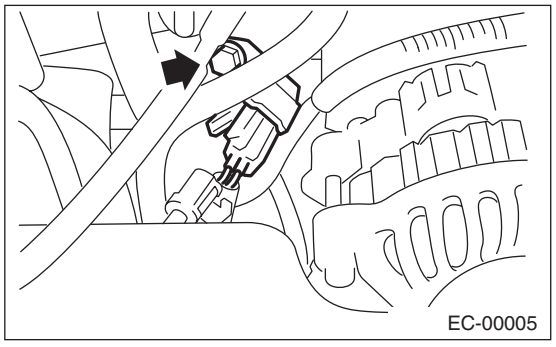
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect ground cable from battery.



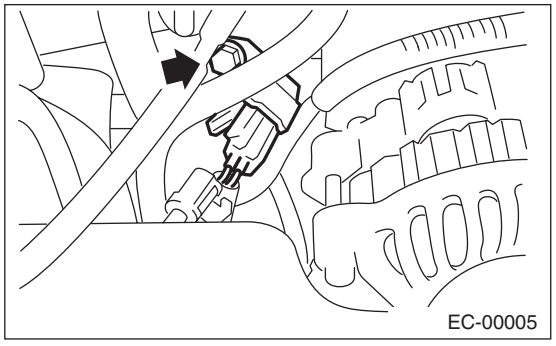
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



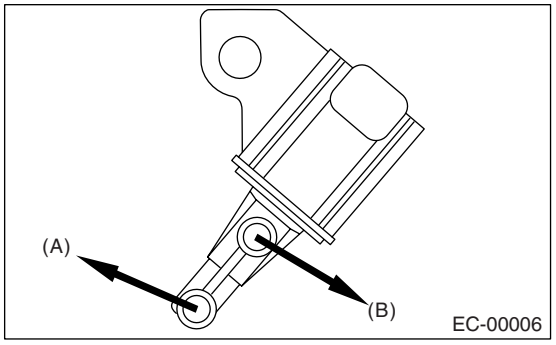
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To purge value
(B) To intake manifold

C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-70, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For work procedures, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-70, INSTALLATION, Fuel Level Sensor.>

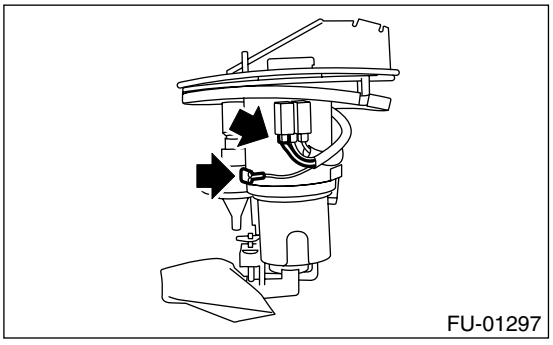
7. Fuel Temperature Sensor

A: REMOVAL

WARNING:
During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.

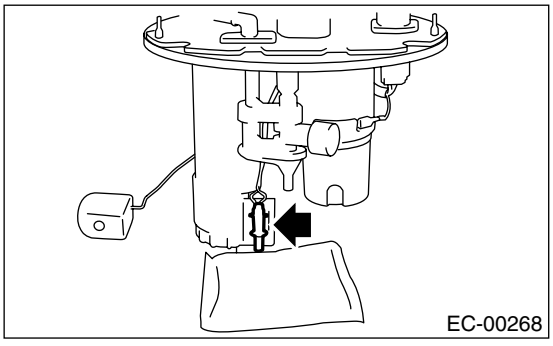
NOTE:
Fuel temperature sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.



3) Remove fuel temperature sensor.

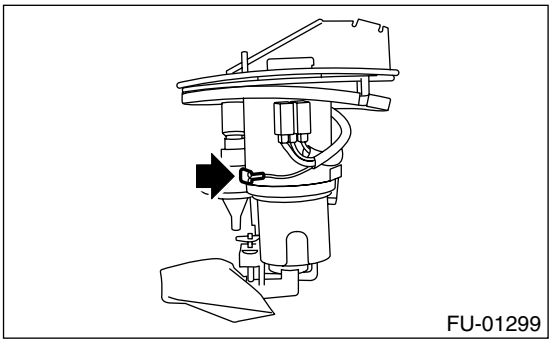
NOTE:
When replacing fuel temperature sensor, also replace fuel level sensor. <Ref. to FU(H4DOTC)-70, REMOVAL, Fuel Level Sensor.>



B: Installation

1) Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**



8. Sub Fuel Level Sensor

A: REMOVAL

For work procedures, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-71, REMOVAL, Fuel Sub Level Sensor.>

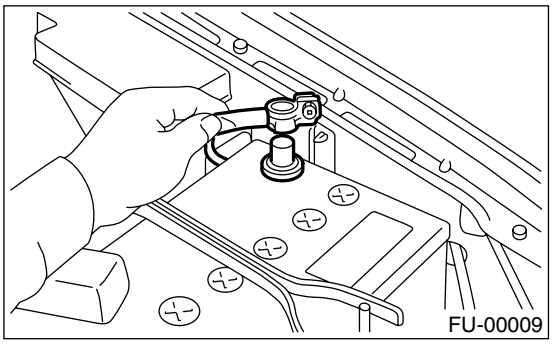
B: INSTALLATION

For work procedures, refer to “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-71, INSTALLATION, Fuel Sub Level Sensor.>

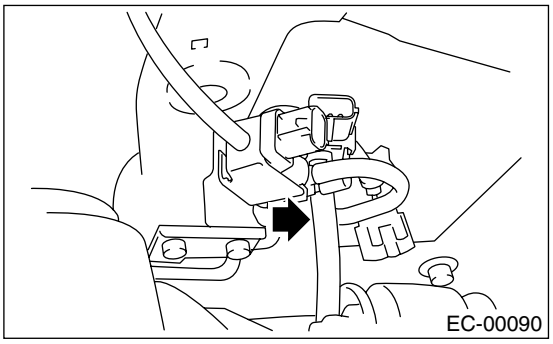
9. Fuel Tank Pressure Sensor

A: REMOVAL

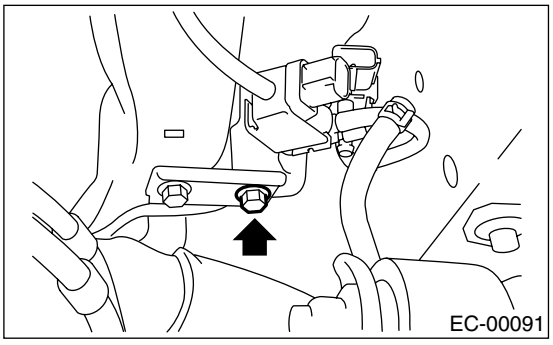
1) Set the vehicle on the lift.
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect ground cable from battery.



4) Lift-up the vehicle.
5) Disconnect connector from fuel tank pressure sensor and fuel tank sensor control valve.
6) Disconnect pressure hose from fuel tank pressure sensor.

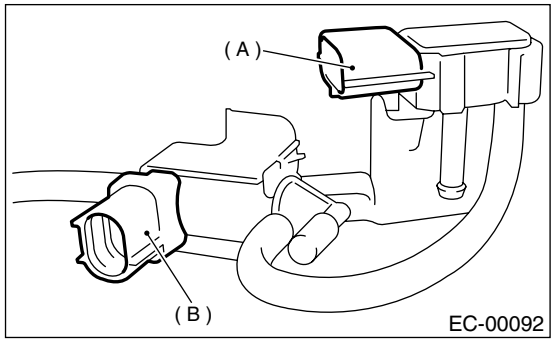


7) Remove fuel tank pressure sensor and fuel tank sensor control valve with bracket.



8) Remove fuel tank sensor control valve from bracket.

NOTE:
Fuel tank pressure sensor cannot be removed because it is integral with bracket.

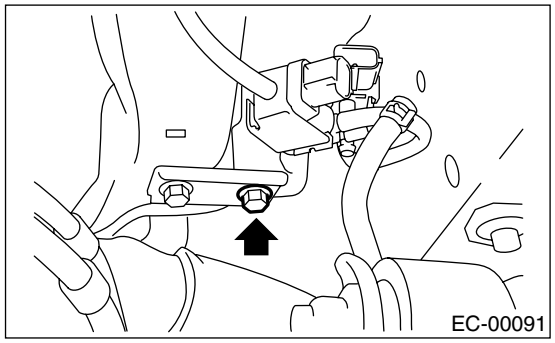


(A) Fuel tank pressure sensor
(B) Fuel tank sensor control valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



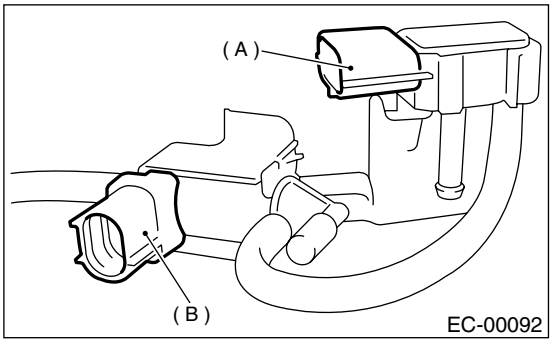
C: INSPECTION

Make sure that hoses are not cracked or loose.

10.Fuel Tank Sensor Control Valve

A: REMOVAL

1) Remove fuel tank pressure sensor. <Ref. to EC(H4DOTC)-10, REMOVAL, Fuel Tank Pressure Sensor.>
2) Remove fuel tank sensor control valve from bracket.



(1) Fuel tank pressure sensor
(2) Fuel tank sensor control valve

B: INSTALLATION

Install in the reverse order of removal.

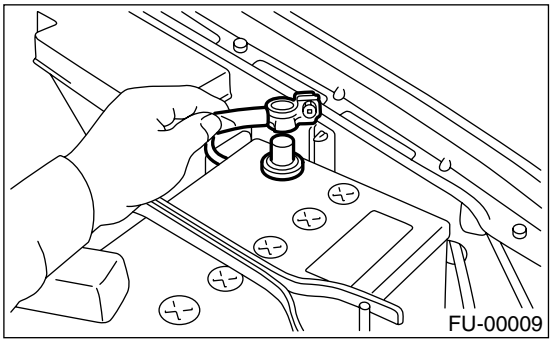
C: INSPECTION

Make sure that hoses are not cracked or loose.

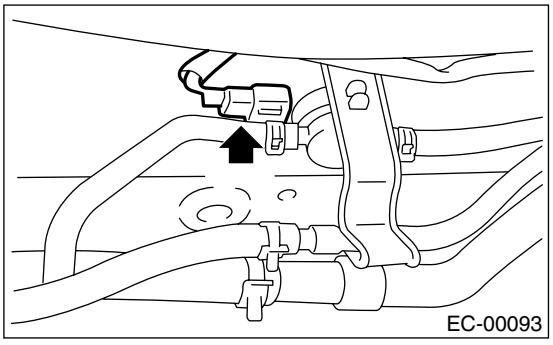
11.Pressure Control Solenoid Valve

A: REMOVAl

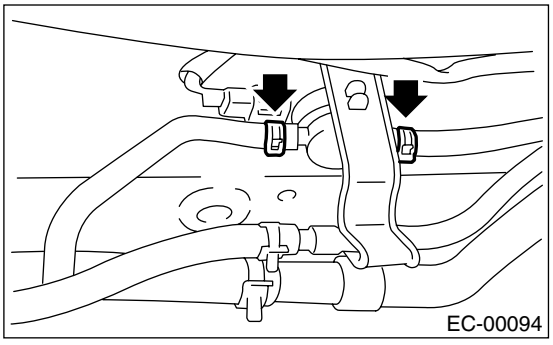
1) Set the vehicle on the lift.
2) Disconnect ground cable from batetry.



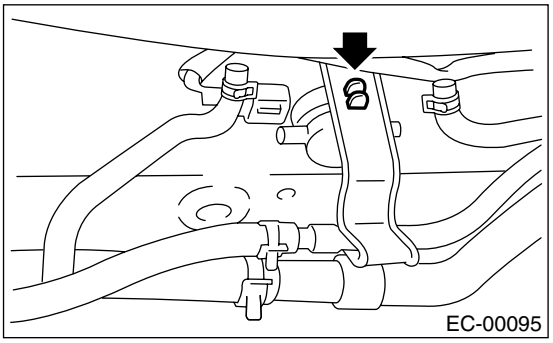
3) Lift-up the vehicle.
4) Disconnect connector from pressure control solenoid valve.



5) Disconnect two evaporation hoses from pressure control solenoid valve.



6) Remove pressure control solenoid valve from bracket.



B: INSTALLTION

Install in the reverse order of removal.

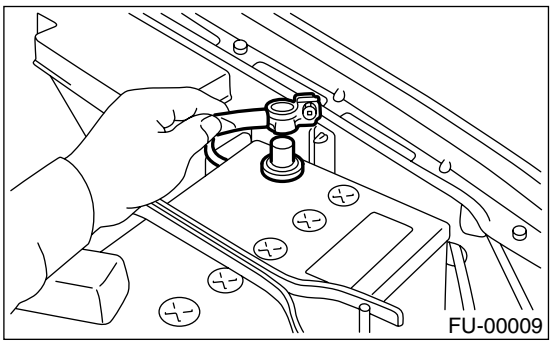
C: INSPECTION

Make sure that hoses are not cracked or loose.

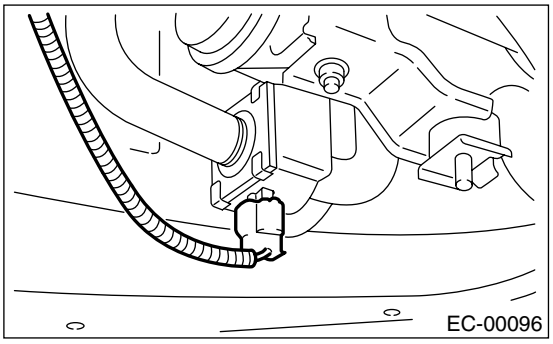
12.Drain Filter

A: REMOVAL

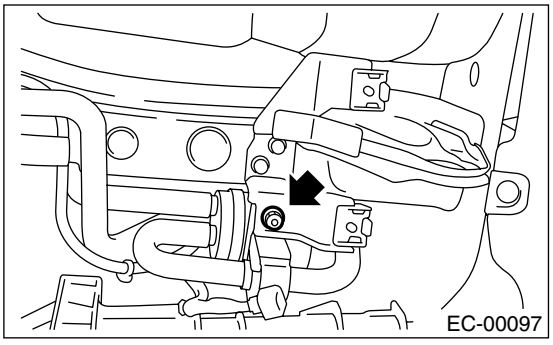
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



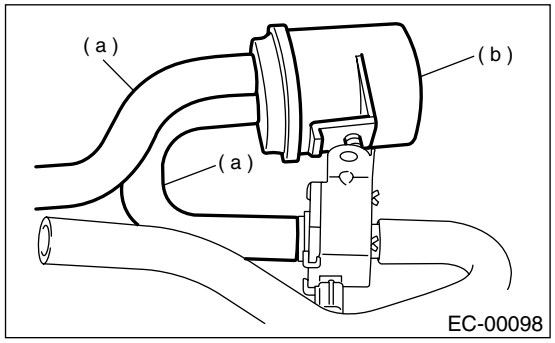
3) Lift-up the vehicle.
4) Remove canister. <Ref. to EC(H4DOTC)-5, REMOVAL, Canister.>
5) Disconnect connector from drain valve.



6) Remove nut which installs drain filter and drain valve brackets on body, and remove them as a unit.



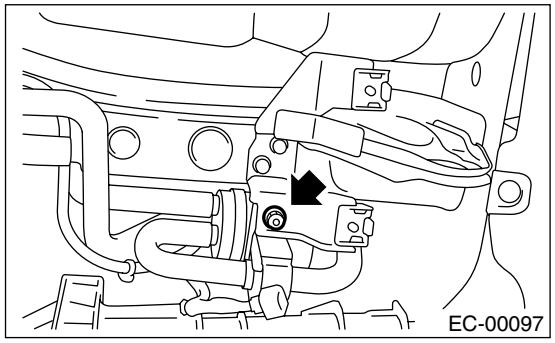
7) Disconnect evaporation hoses, (a) and remove drain filter (b).



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



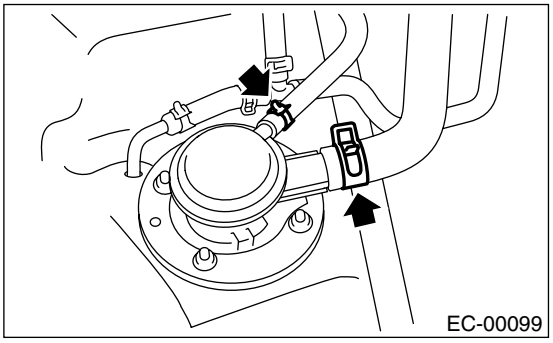
C: INSPECTION

1) Make sure that all hoses are installed correctly.
2) Make sure that hoses are not cracked or loose.

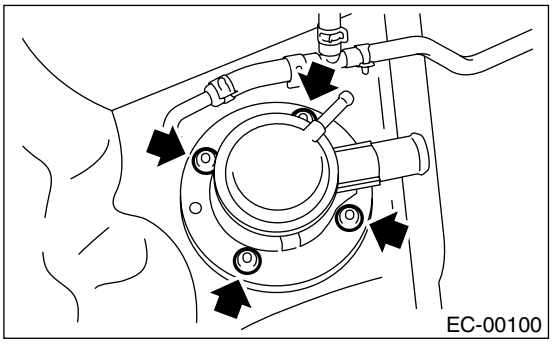
13.Vent Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
2) Move clips, and disconnect hoses from vent valve.



3) Remove nuts which install vent valve on fuel tank.

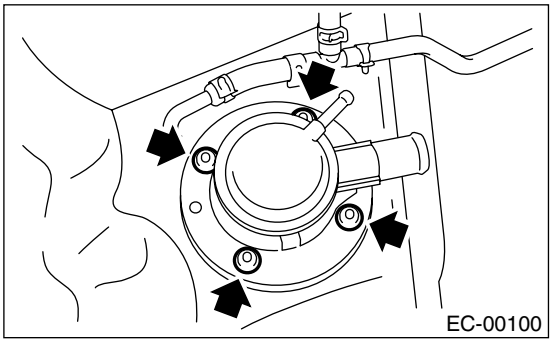


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace rubber seat with a new one.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



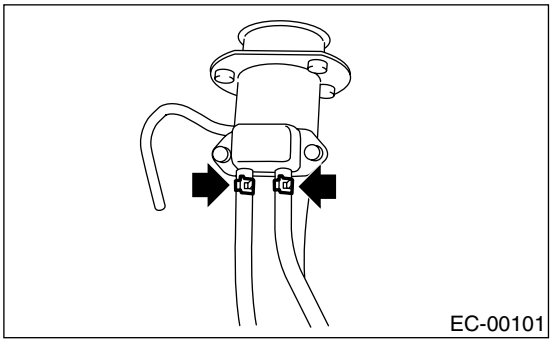
C: INSPECTION

Make sure that hoses are not cracked or loose.

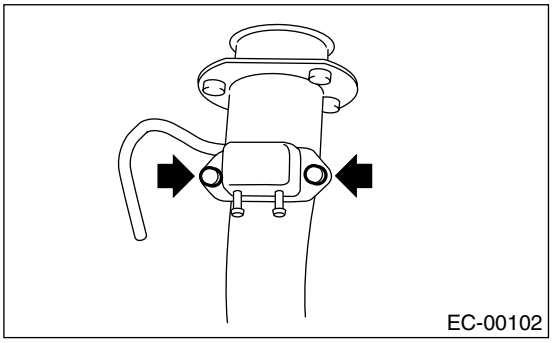
14.Shut Valve

A: REMOVAL

1) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-48, DRAINING FUEL, OPERATION, Fuel.>
2) Remove fuel filler pipe. <Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Filler Pipe.>
3) Disconnect evaporation hoses from shut valve.



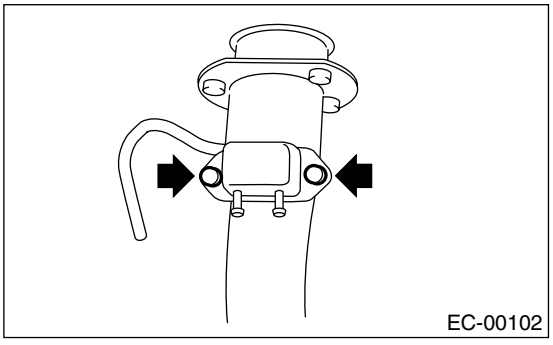
4) Remove shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



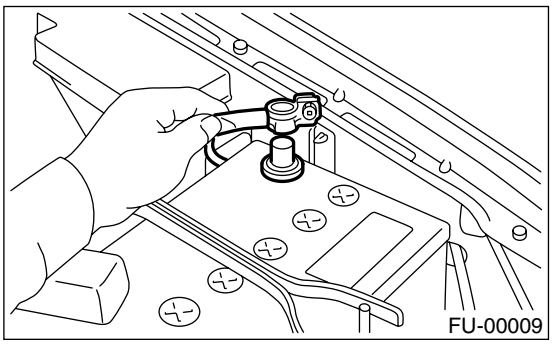
C: INSPECTION

Make sure that hoses are not cracked or loose.

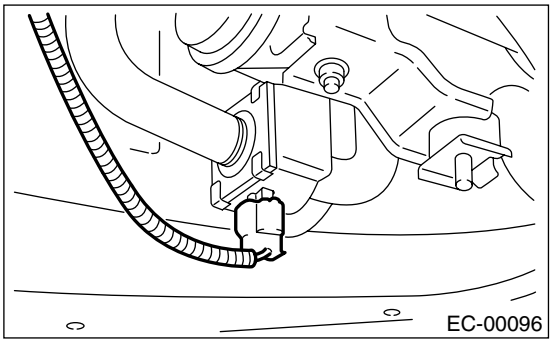
15.Drain Valve

A: REMOVAL

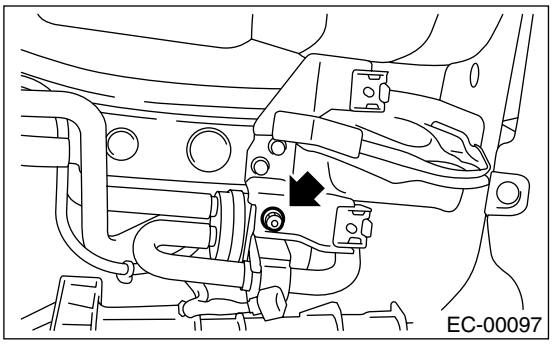
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



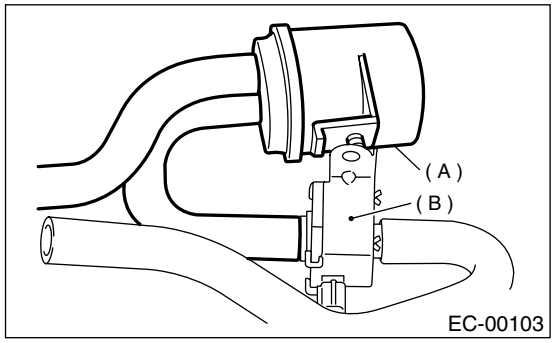
3) Lift-up the vehicle.
4) Remove canister. <Ref. to EC(H4DOTC)-5, REMOVAL, Canister.>
5) Disconnect connector from drain valve.



6) Remove bolt which installs drain filter and drain valve brackets on body.



7) Disconnect evaporation hose and remove drain valve.

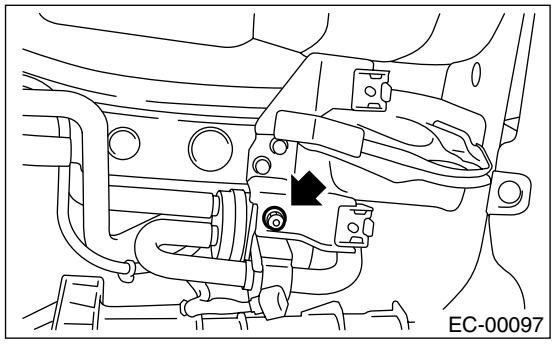


(1) Drain filter
(2) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

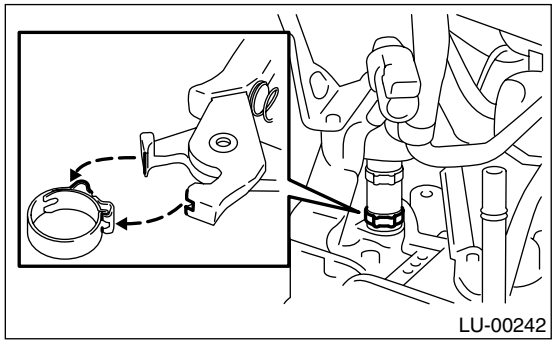
1) Make sure that all hoses are installed correctly.
2) Make sure that hoses are not cracked or loose.

16.PCV Hose Assembly

A: REMOVAL

CAUTION:
Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

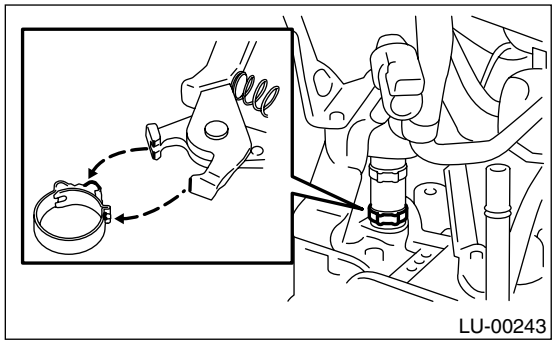
1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
2) Unlock with a dent of special tool clipped by a protrusion of clamp.
3) Remove the PCV hose assembly.
ST 18353AA000 CLUMP PLIER



B: INSTALLATION

NOTE:
Replace the clamp with a new one.

1) Install the PCV hose assembly and lock it with a protrusion of clamp clipped by special tool.
ST 18353AA000 CLUMP PLIER



2) Install the intake manifold.
<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

MEMO:

INTAKE (INDUCTION)

IN(H4DOTC)

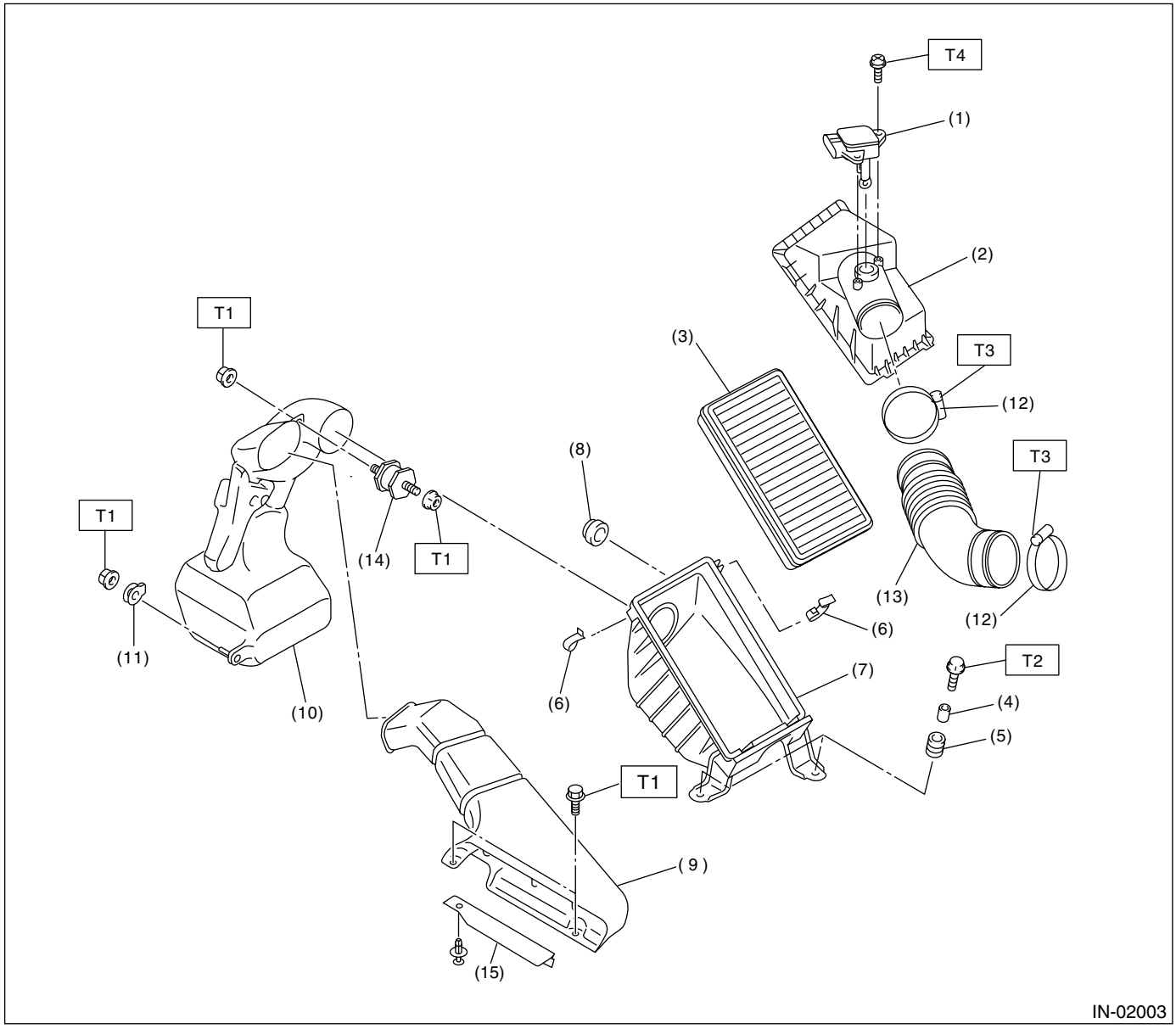
Page

1. General Description 2
2. Air Cleaner 7
3. Air Intake Duct 8
4. Intake Duct 9
5. Intercooler 10
6. Turbocharger 12
7. Air Bypass Valve 14
8. Resonator Chamber 15

1. General Description

A: COMPONENT

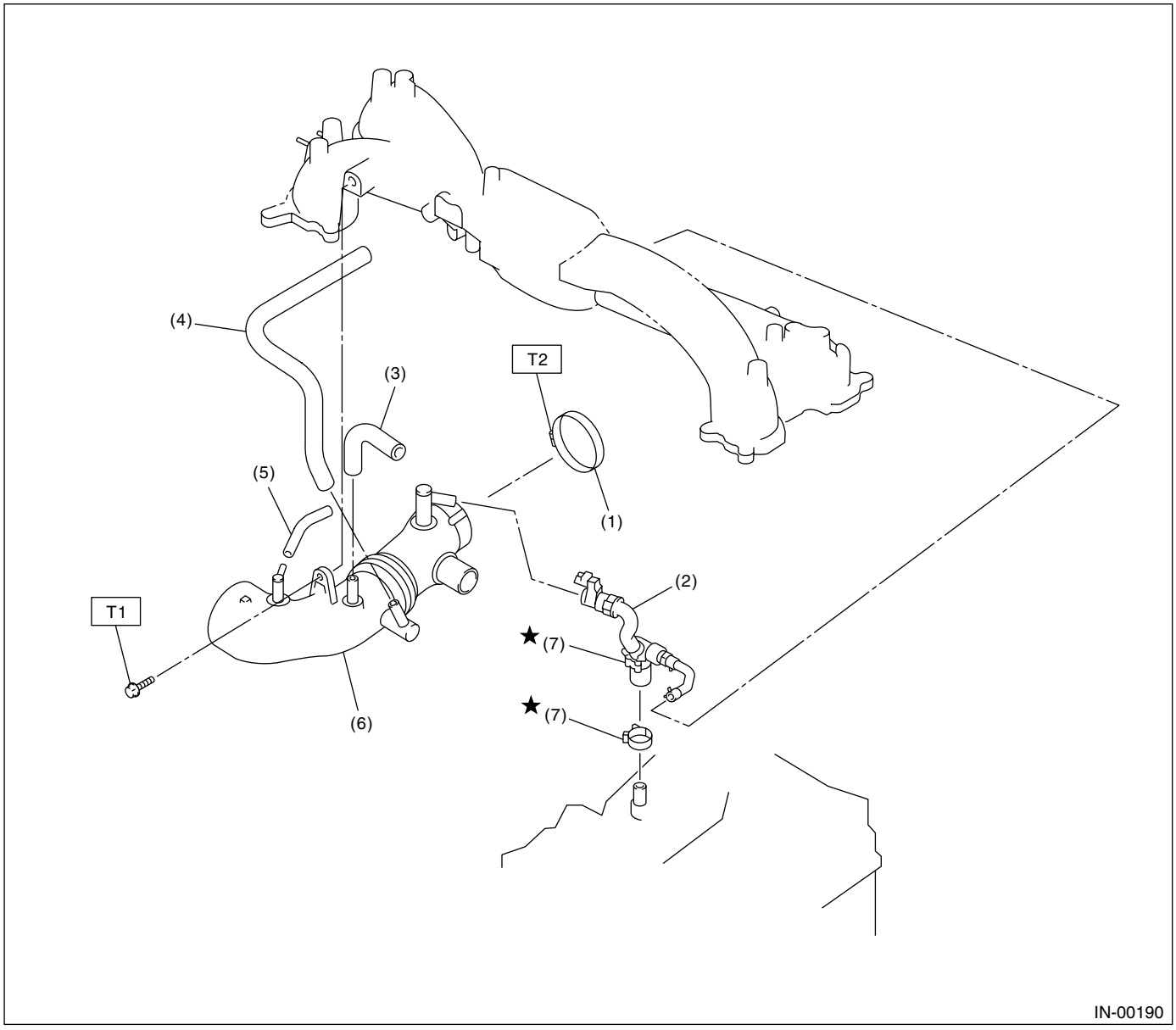
1. AIR CLEANER



(1) Mass air flow and intake air temperature sensor
(2) Air cleaner upper cover
(3) Air cleaner element
(4) Spacer
(5) Cushion
(6) Clip
(7) Air cleaner lower case
(8) Cushion
(9) Air intake duct
(10) Resonator chamber ASSY
(11) Cushion
(12) Clamp
(13) Air intake boot
(14) Cushion
(15) Plate

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24.6)
T3: 2.5 (0.25, 1.8)
T4: 1.0 (0.10, 1)

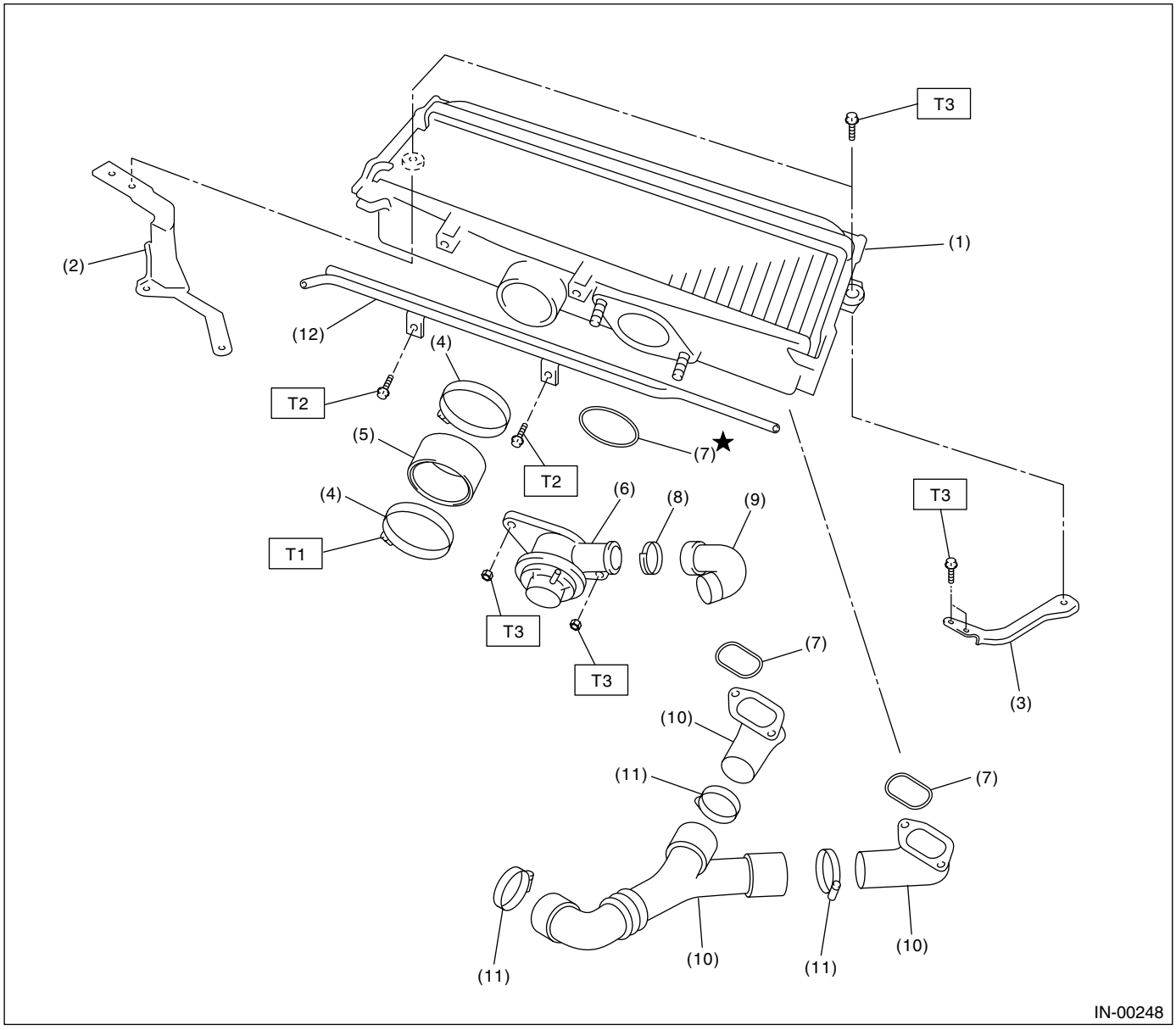
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air bypass hose A
(4) Air bypass hose B
(5) Air bypass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 3 (0.3, 2.2)

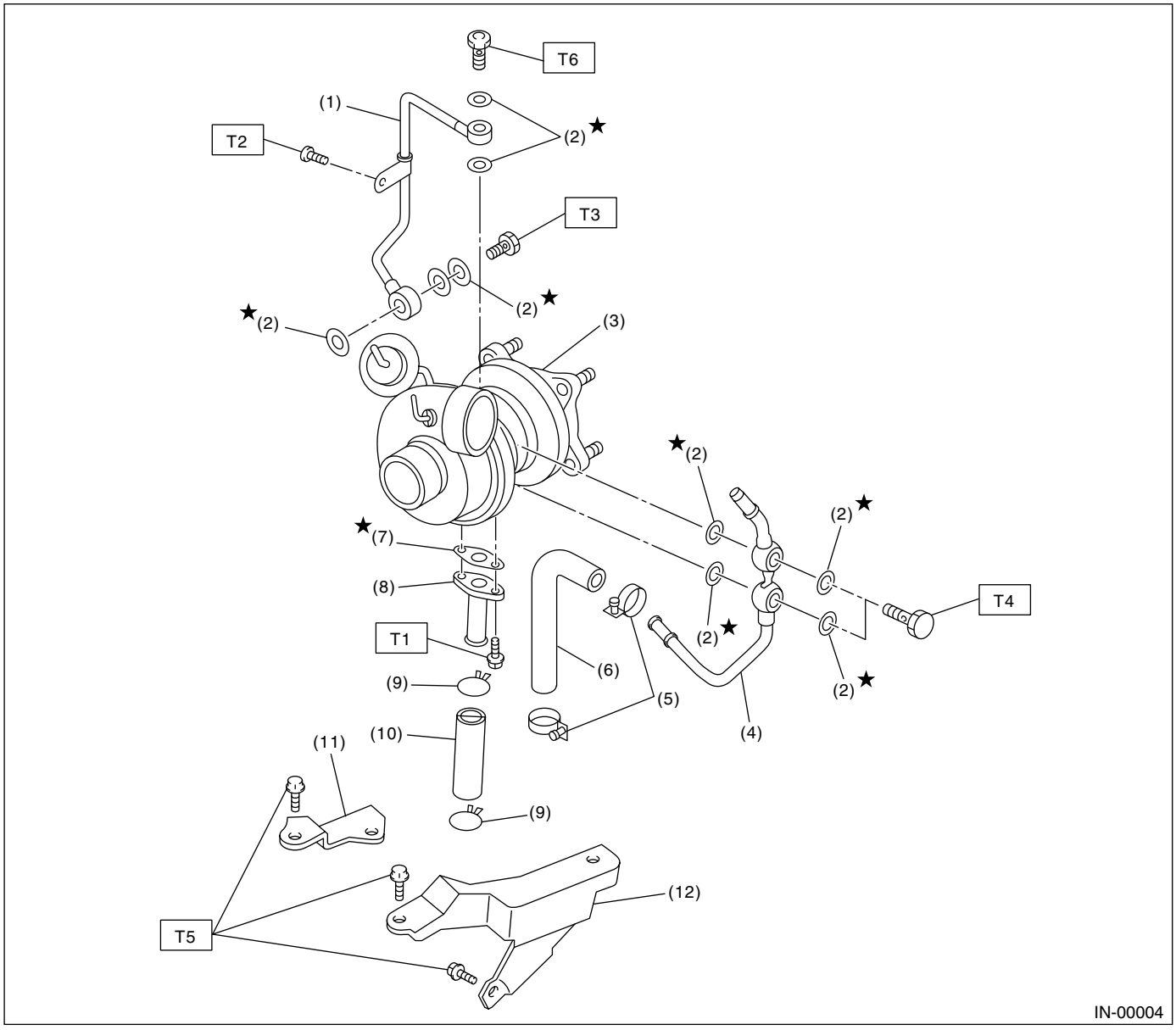
3. INTERCOOLER



(1) Intercooler
(2) Intercooler bracket RH
(3) Intercooler bracket LH
(4) Clamp
(5) Air intake duct
(6) Air bypass valve
(7) O-ring
(8) Clamp
(9) Air bypass hose A
(10) Intercooler duct
(11) Clamp
(12) PCV pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 6.1 (0.62, 4.2)
T3: 16 (1.6, 11.6)

4. TURBOCHARGER



(1) Oil inlet pipe
(2) Metal gasket
(3) Turbocharger
(4) Water pipe
(5) Clamp
(6) Engine coolant hose
(7) Gasket
(8) Oil outlet pipe
(9) Clip
(10) Oil outlet hose
(11) Turbocharger bracket RH
(12) Turbocharger bracket LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 29 (3.0, 21.7)
T4: 33 (3.4, 24.6)
T5: 33 (3.4, 24.6)
T6: 16 (1.6, 11.6)

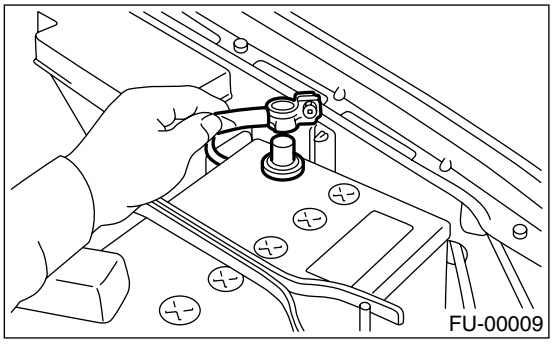
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

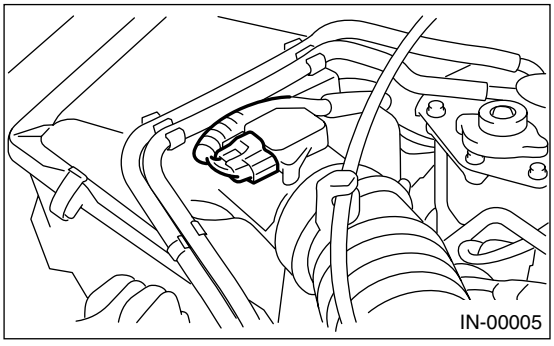
2. Air Cleaner

A: REMOVAL

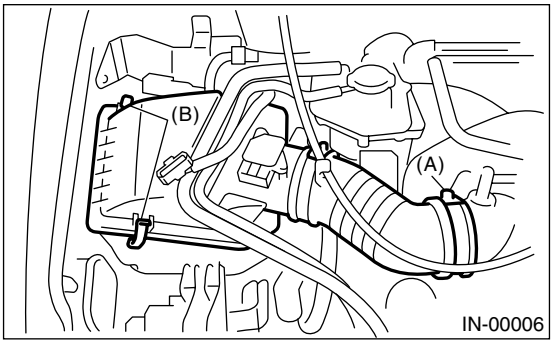
1) Disconnect the ground cable from battery.



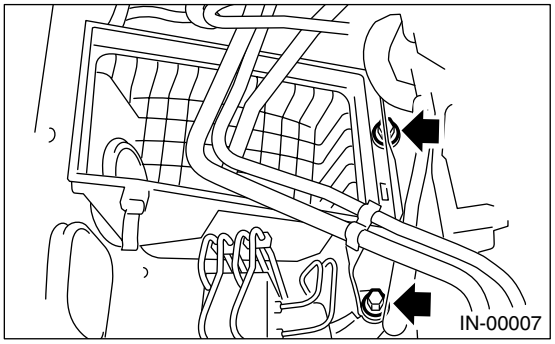
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects the air intake boot and intake duct.
4) Remove the clip (B) from air cleaner upper cover.



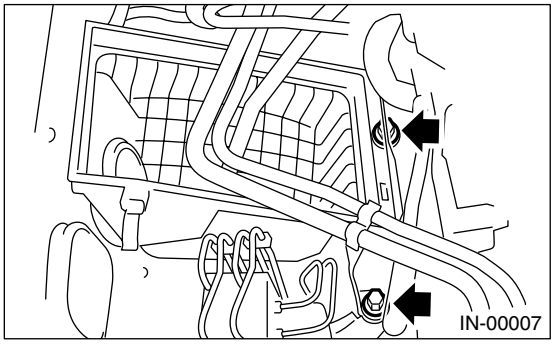
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



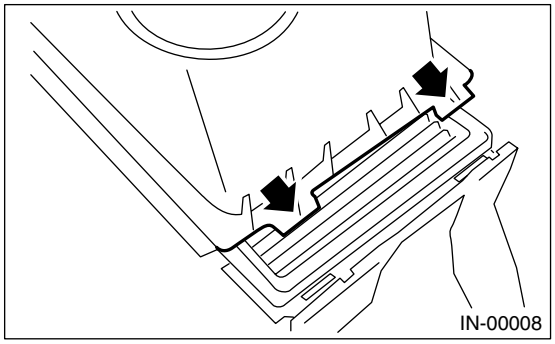
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:
Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



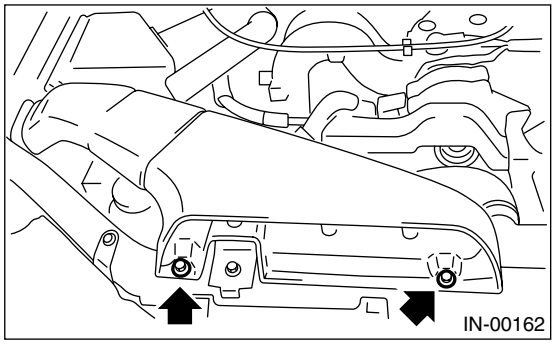
C: INSPECTION

Replace it if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

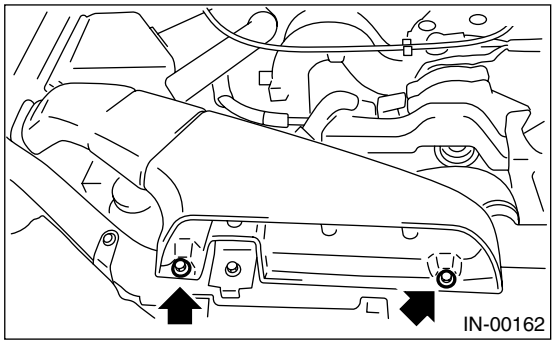
Remove the bolts which install the air intake duct on front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



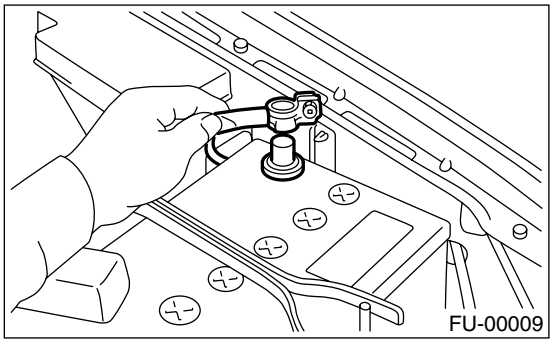
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in air intake duct.

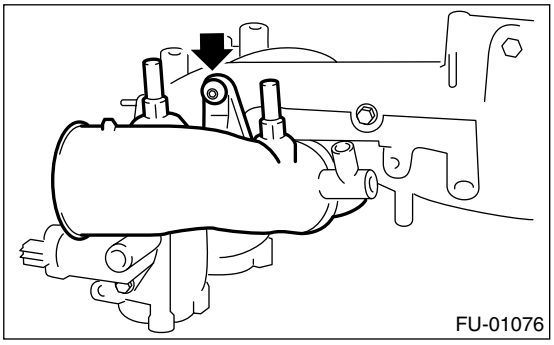
4. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from battery.



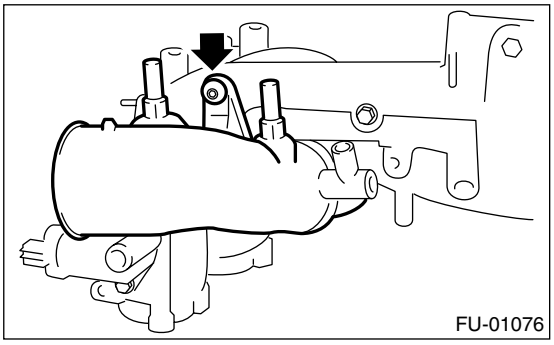
2) Remove the intake manifold.
<Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
3) Remove the sensor, engine harness and fuel pipe attached to intake manifold.
<Ref. to FU(H4DOTC)-20, DISASSEMBLY, Intake Manifold.>
4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

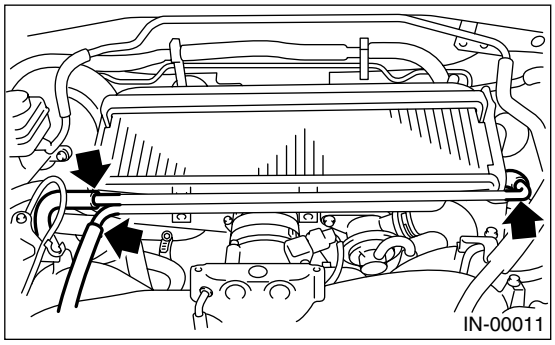
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



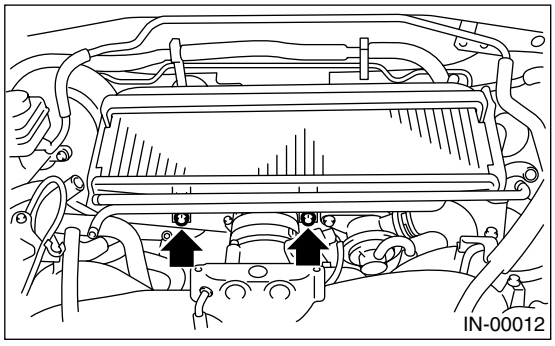
5. Intercooler

A: REMOVAL

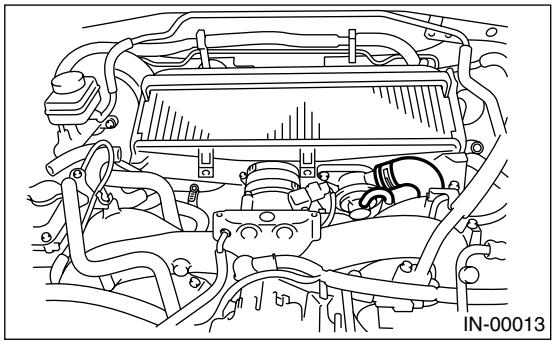
1) Disconnect PCV hose from PCV pipe.



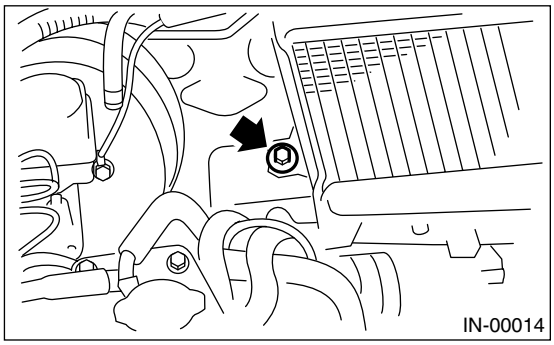
2) Remove PCV pipe from intercooler.

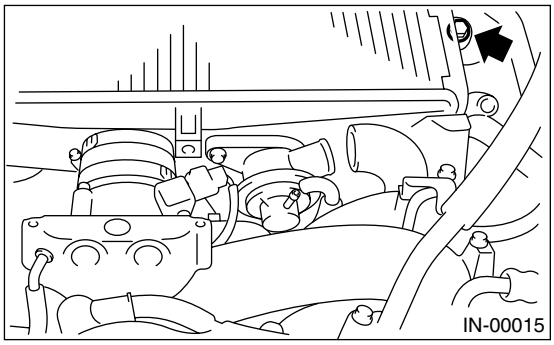


3) Disconnect hose from air bypass valve.

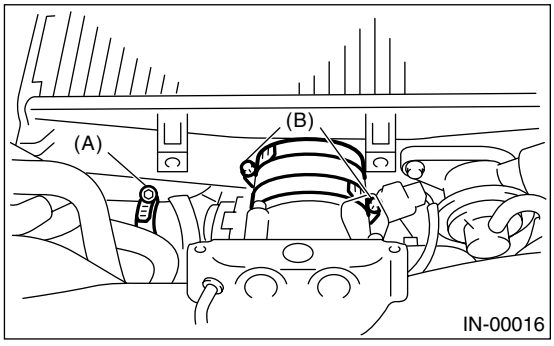


4) Remove bolt which secure intercooler to bracket.





5) Loosen clamp (A) which connects turbocharger and intercooler duct.
6) Loosen clamp (B) which connects throttle body and intercooler.

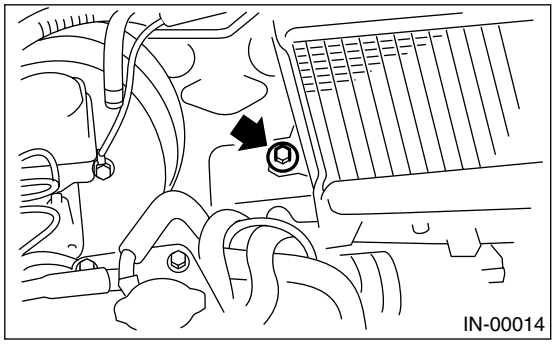


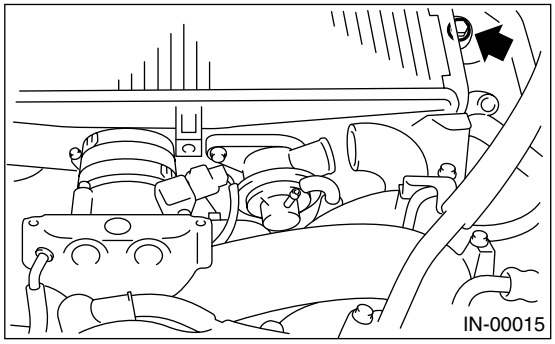
7) Disconnect intercooler duct from turbocharger.
8) Remove intercooler from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

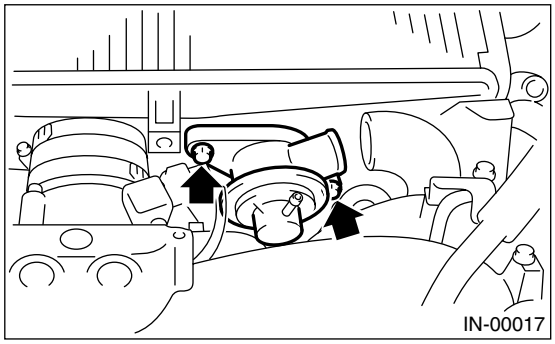
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)


IN-00014

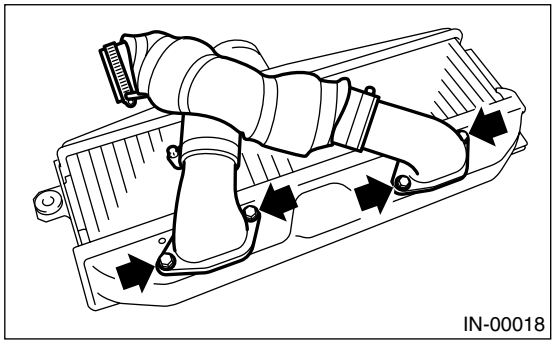

IN-00015

C: DISASSEMBLY

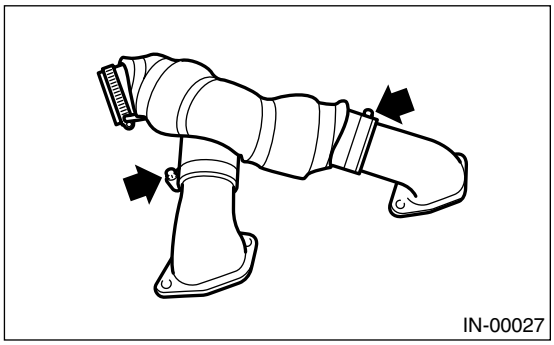
1) Remove air bypass valve from intercooler.


IN-00017

2) Remove intercooler duct from intercooler.


IN-00018

3) Separate duct.

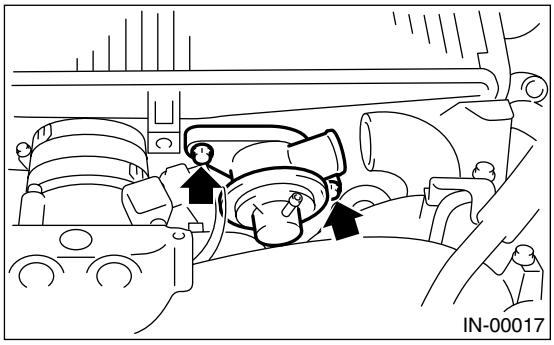

IN-00027

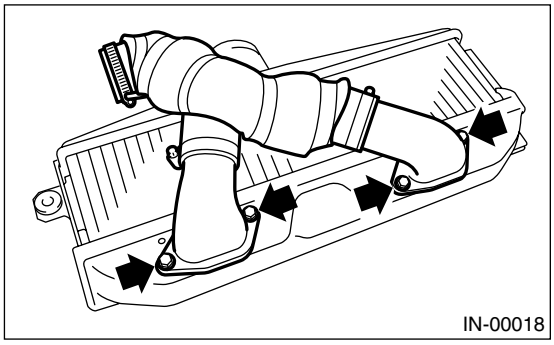
D: ASSEMBLY

To assemble, reverse order of disassembly.

NOTE:
Be careful pinching of O-ring.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

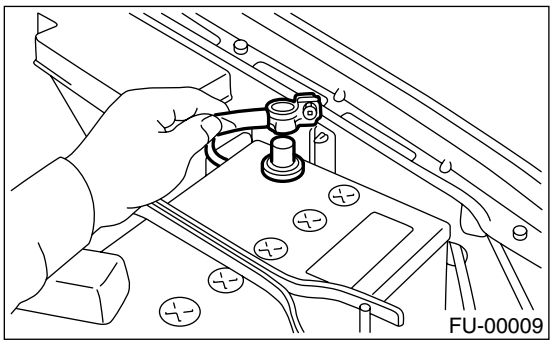

IN-00017


IN-00018

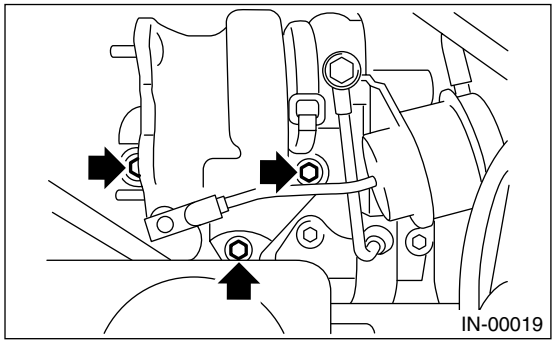
6. Turbocharger

A: REMOVAL

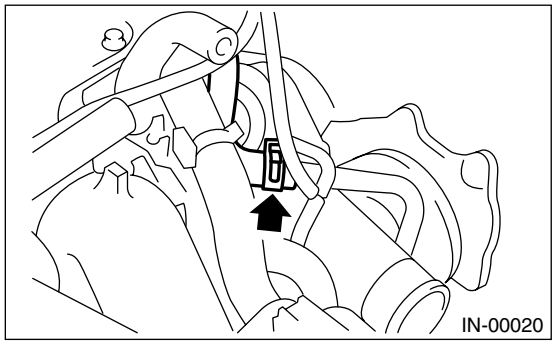
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



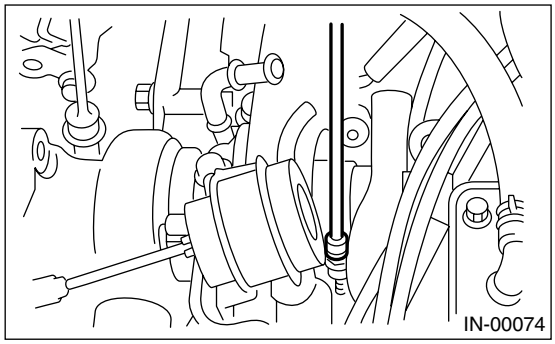
3) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



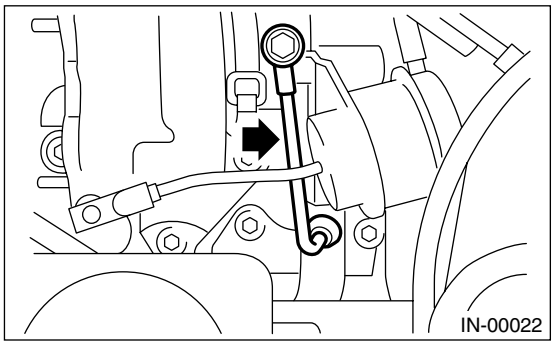
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



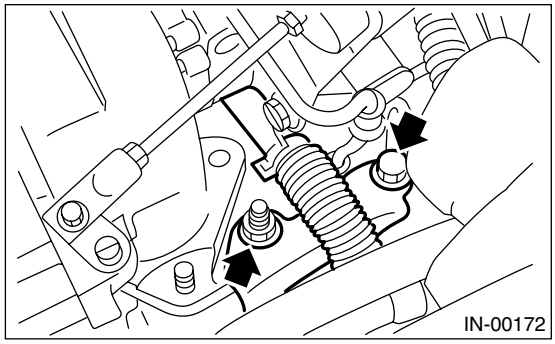
7) Loosen the clamp which secures the turbocharger to intake duct.



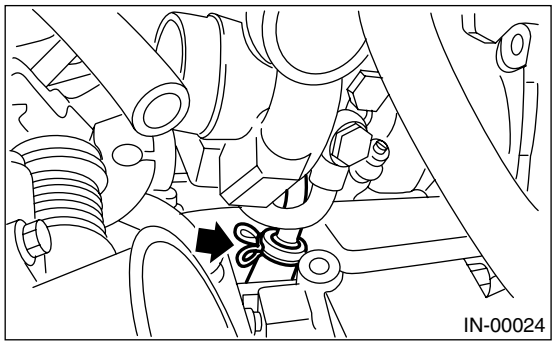
8) Remove the bolt which secures the bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Disconnect the engine coolant hose.
11) Remove the turbocharger bracket.



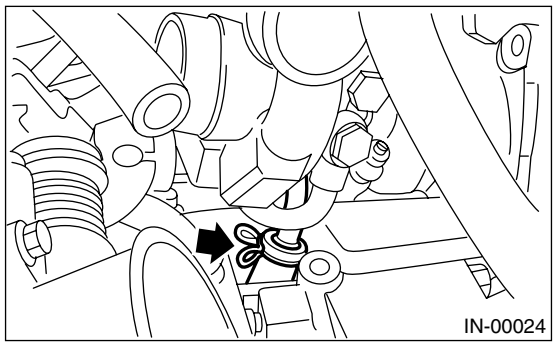
12) Disconnect the oil outlet hose from pipe.



13) Take out the turbocharger from engine compartment.

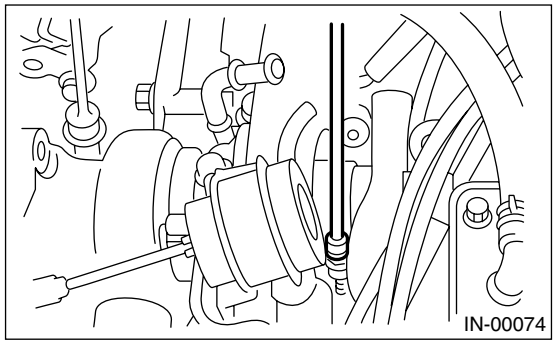
B: INSTALLATION

1) Connect the oil outlet hose to outlet pipe.



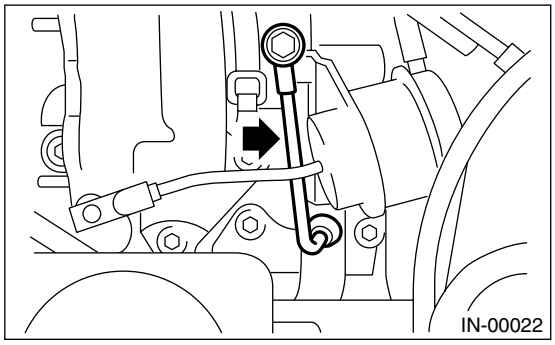
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil pipe to turbocharger.

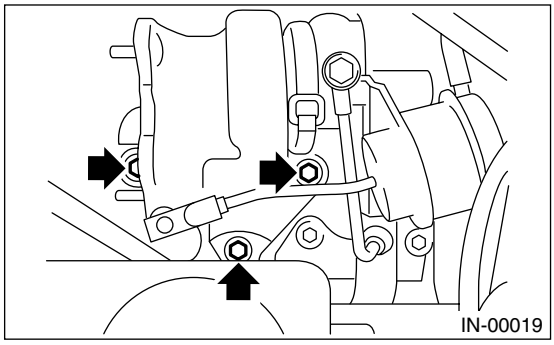
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



4) Install the joint pipe to turbocharger.

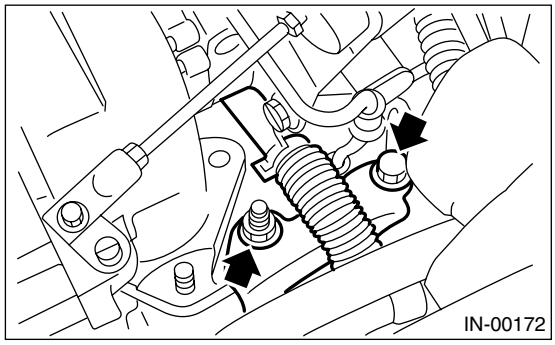
NOTE:
Replace the gasket with a new one.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

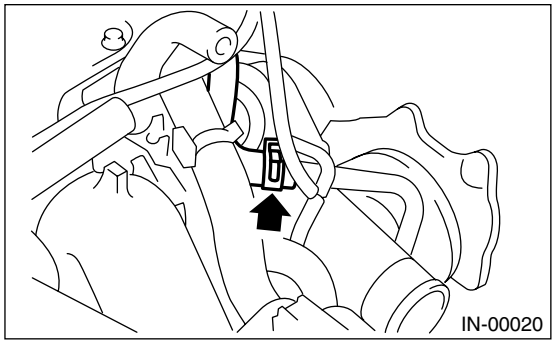


5) Connect the engine coolant hose.
6) Install the turbocharger bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



7) Connect the engine coolant hose which is connected to coolant filler tank.

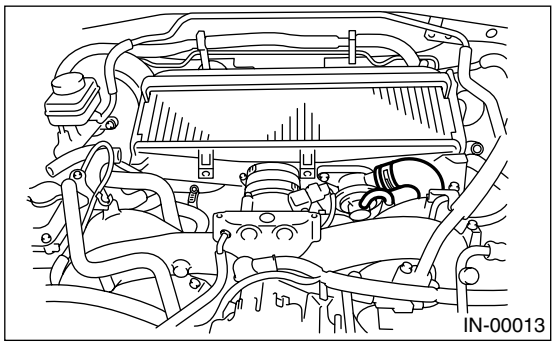


8) Lift-up the vehicle.
9) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>

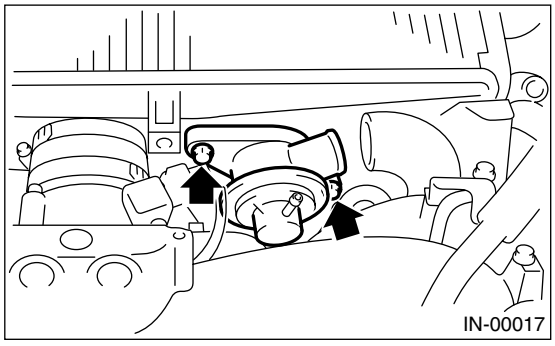
7. Air Bypass Valve

A: REMOVAL

1) Disconnect air bypass hose from air bypass valve.



2) Remove air bypass valve from intercooler.

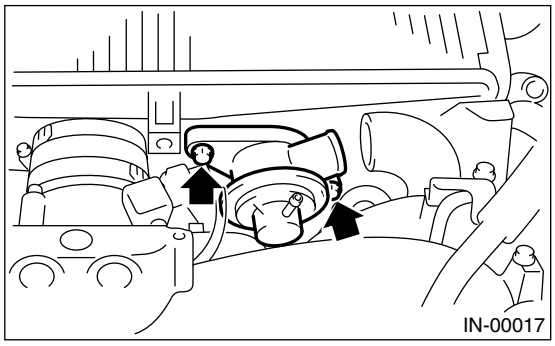


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Be careful pinching of O-ring.

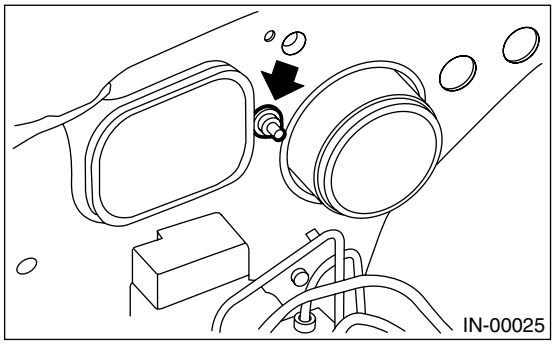
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



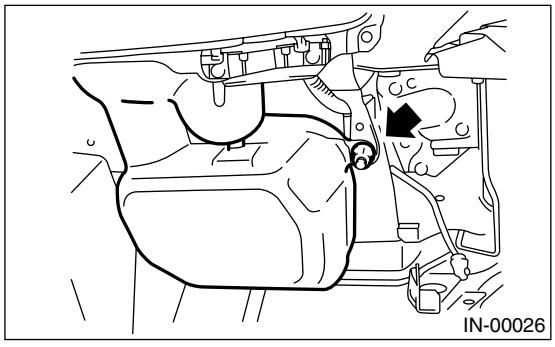
8. Resonator Chamber

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
3) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
4) Remove the resonator chamber mounting bolt on right side of engine compartment.



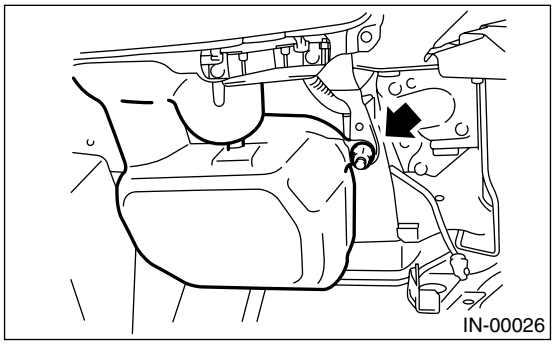
5) Remove the front right tire, and lift up the vehicle.
6) Remove the front mudguard RH.
7) Remove the resonator chamber from the inside front fender.

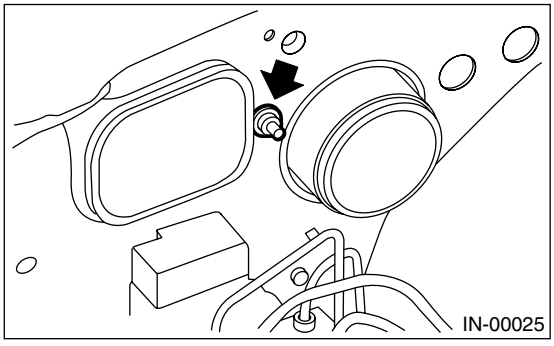


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in resonator chamber.

MEMO:

MECHANICAL

ME(H4DOTC)

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1. General Description

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke mm (in)			99.5 × 79.0 (3.917 × 3.110)	
	Piston displacement cm^3 (cu in)			2,457 (150)	
	Compression ratio			8.2	
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	Max. retard	ATDC 5°	
			Min. advance	BTDC 15°	
		Closing	Max. retard	ABDC 65°	
			Min. advance	ABDC 45°	
	Exhaust valve timing	Opening		BBDC 55°	
		Closing		ATDC 5°	
	Valve clearance	Intake mm (in)		$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)	
		Exhaust mm (in)		0.35±0.05 (0.0138±0.0020)	
	Idling speed [At neutral position on MT, “P” or “N” position on AT] rpm		No load	M/T: 700±100 A/T: 700±100	
			A/C ON	A/C refrigerant pressure low	M/T: 725±100 A/T: 750±100
				A/C refrigerant pressure high	M/T: 800±100 A/T: 825±100
	Firing order			1 → 3 → 2 → 4	
	Ignition timing BTDC/rpm			MT:13°±10° AT:17°±10°	

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.00079 in)
	Thrust clearance		STD	0.068 — 0.116 mm (0.0027 — 0.0046 in)
			Limit	0.14 mm (0.0055 in)
	Cam lobe height	Intake	STD	46.55 — 46.65 mm (1.833 — 1.837 in)
			Limit	46.45 mm (1.829 in)
		Exhaust	STD	46.75 — 46.85 mm (1.841 — 1.844 in)
			Limit	46.65 mm (1.837 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.65 mm (4.120 in)
Valve spring	Free length			47.32 mm (1.863 in)
	Squareness			2.5°, 2.1 mm (0.083 in)
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.50 mm (1.043 in)

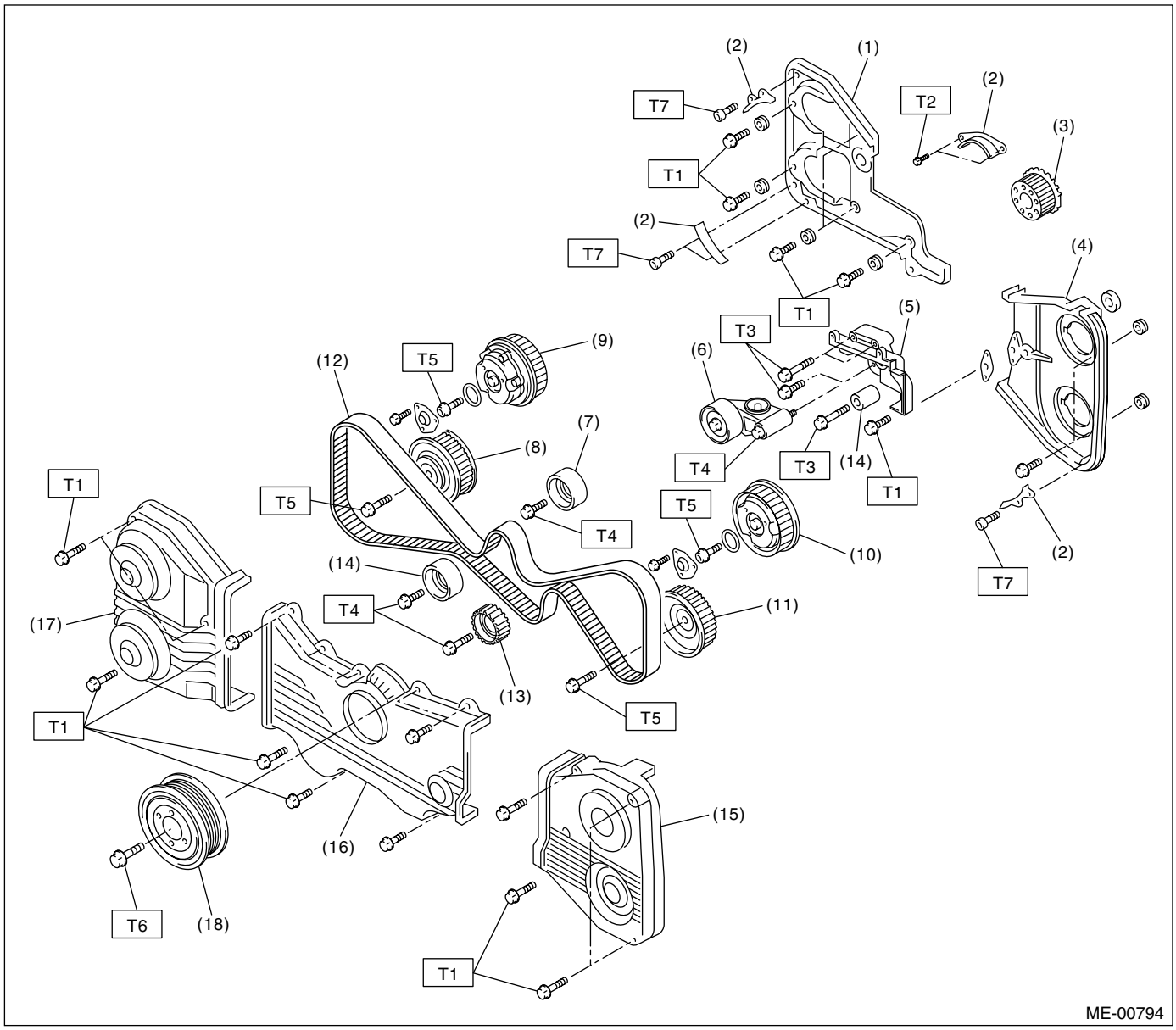
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			201.0 mm (7.91 in)
	Cylinder bore	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	–0.010 — 0.010 mm (–0.0004 — 0.0004 in)
			Limit	0.030 mm (0.0012 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9278 in)
		0.50 mm (0.0197 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.017 — 0.045 mm (0.0007 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.00012 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.00012 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

Crankshaft main bearing	Crankshaft main bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

1. TIMING BELT

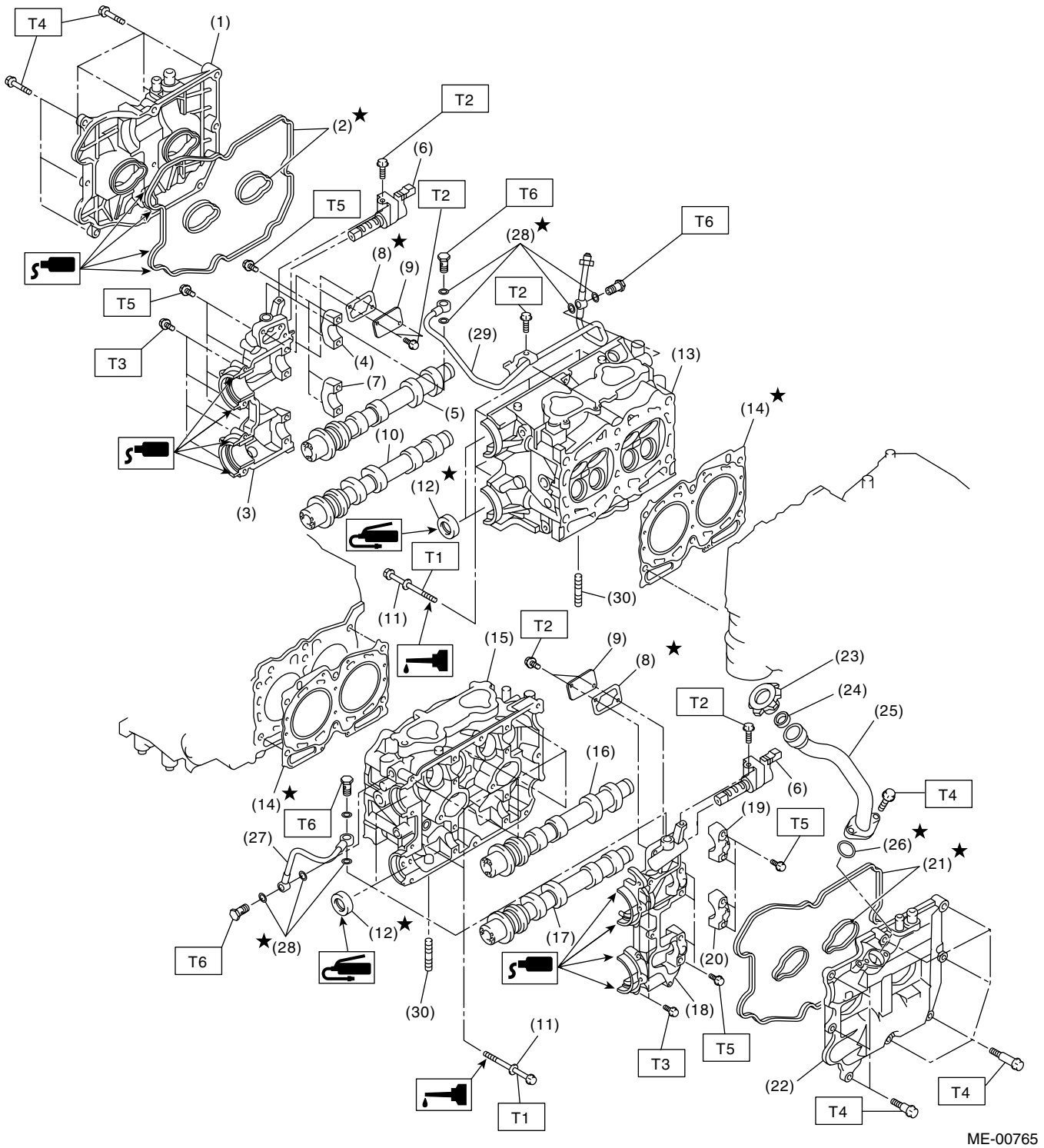


(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust camshaft sprocket (RH)
(9) Intake camshaft sprocket (RH)
(10) Intake camshaft sprocket (LH)
(11) Exhaust camshaft sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)

T1: ***5 (0.5, 3.6)***
T2: ***10 (1.0, 7)***
T3: ***25 (2.5, 18.1)***
T4: ***39 (4.0, 28.9)***
T5: ***<Ref. to ME(H4DOTC)-58, INSTALLATION, CRANKSHAFT SPROCKET.>***
T6: ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
T7: 6.4 (0.65, 4.7)

2. CYLINDER HEAD AND CAMSHAFT

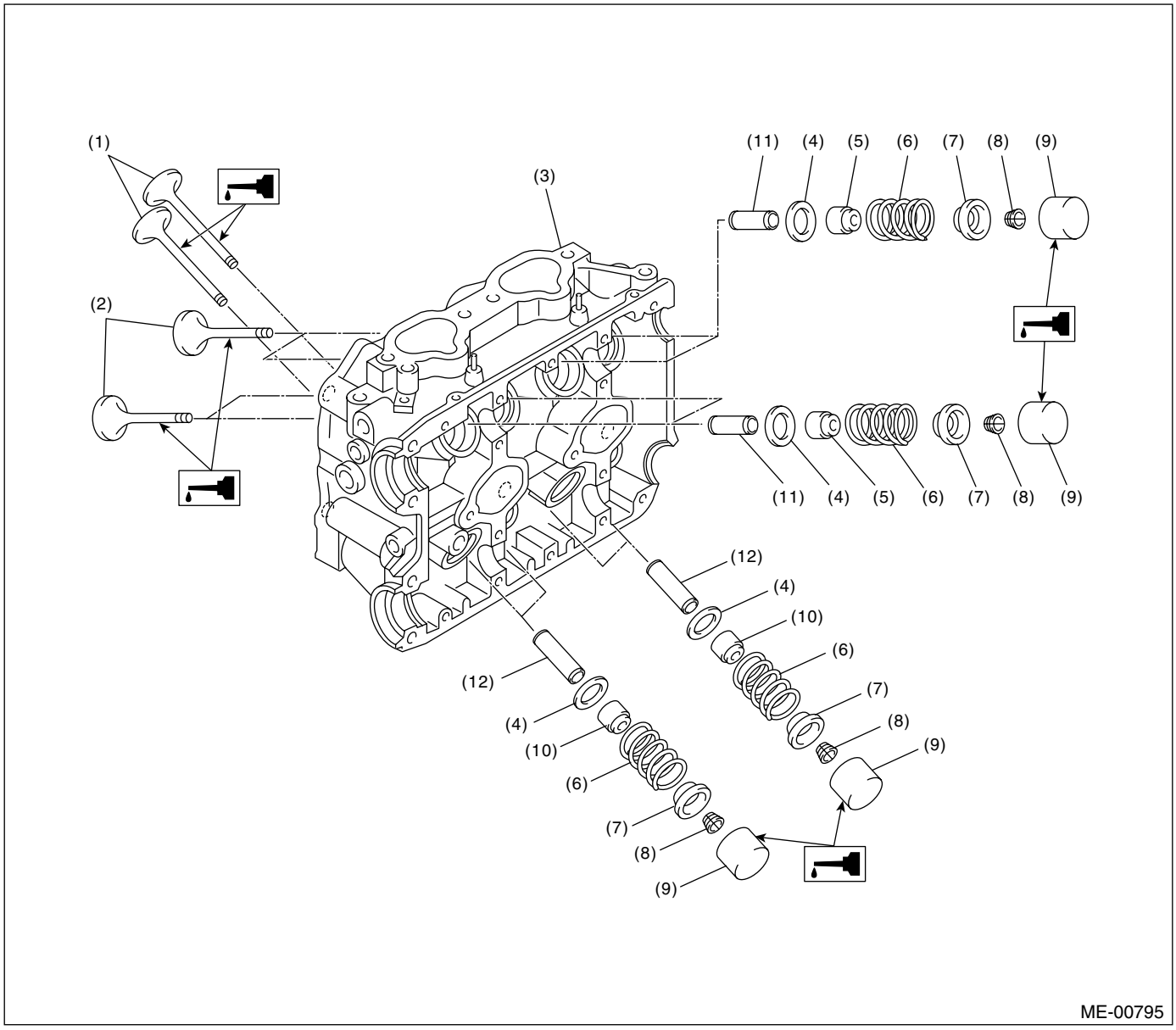


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (RH)
(5) Intake camshaft (RH)
(6) Variable valve timing solenoid valve
(7) Exhaust camshaft cap (Center RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head (RH)
(14) Cylinder head gasket
(15) Cylinder head (LH)
(16) Intake camshaft (LH)
(17) Exhaust camshaft (LH)
(18) Camshaft cap (Front LH)
(19) Intake camshaft cap (Rear LH)
(20) Exhaust camshaft cap (Rear LH)
(21) Rocker cover gasket (LH)
(22) Rocker cover (LH)
(23) Oil filler cap
(24) Gasket
(25) Oil filler duct
(26) O-ring
(27) Oil pipe (LH)
(28) Gasket
(29) Oil pipe (RH)
(30) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***<Ref. to ME(H4DOTC)-65, INSTALLATION, CYLINDER HEAD ASSEMBLY.>***
T2:	***8 (0.8, 5.9)***
T3:	***10 (1.0, 7)***
T4:	***6.4 (0.65, 4.7)***
T5:	***20 (2.0, 14.5)***
T6:	29 (3.0, 21.4)

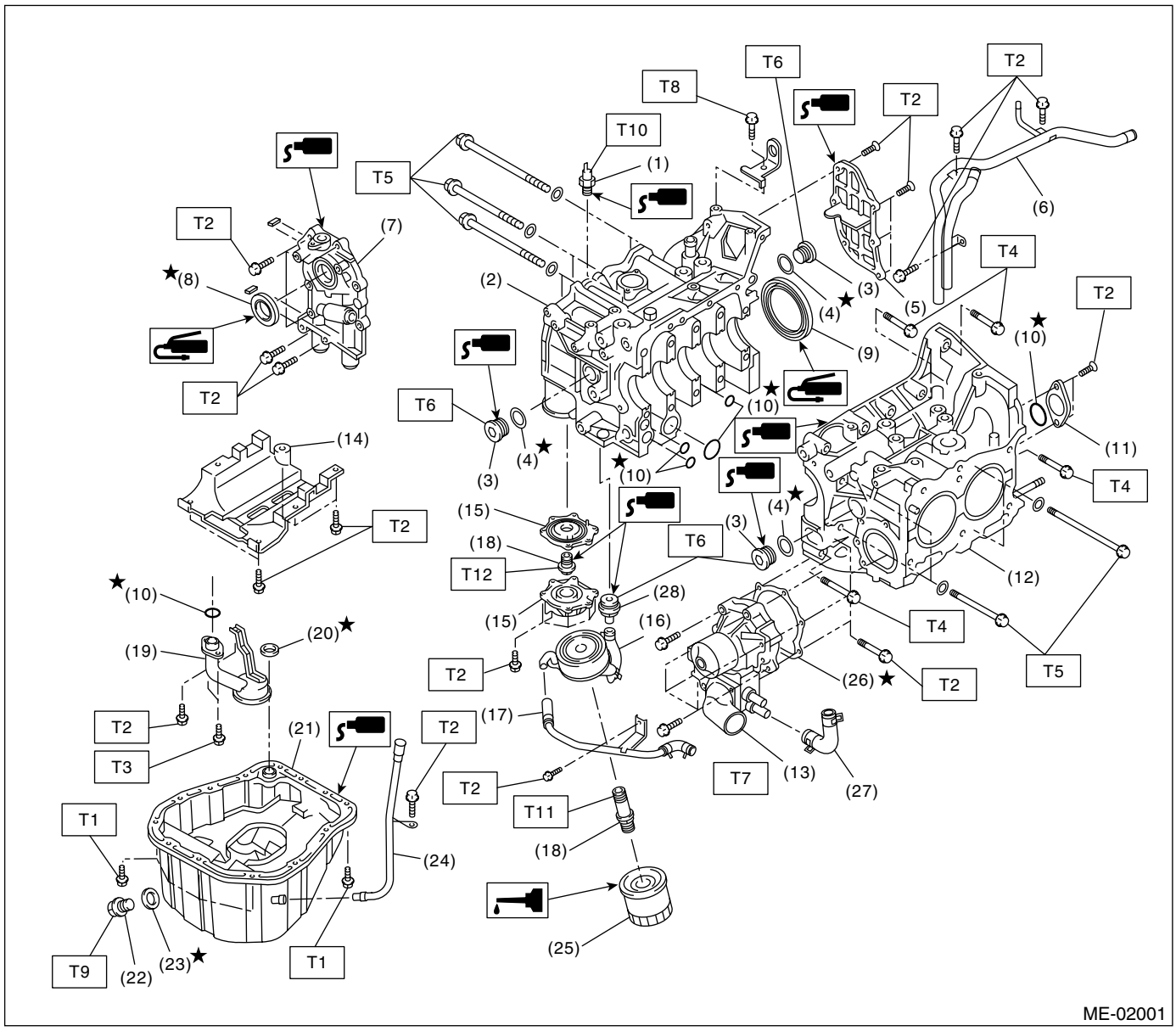
3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

MEMO:

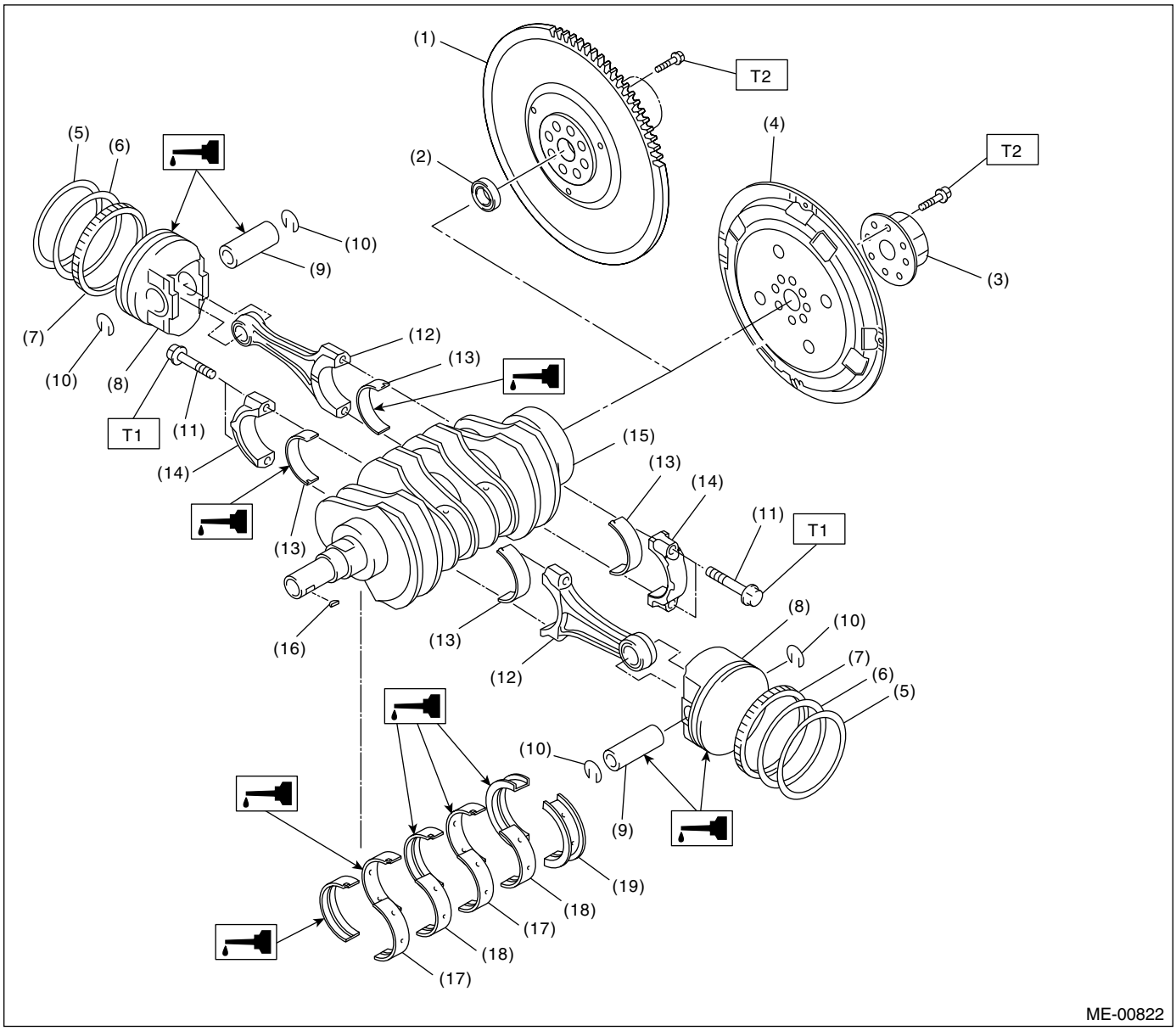
4. CYLINDER BLOCK



(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Adapter
(16) Oil cooler
(17) Water by-pass pipe
(18) Connector
(19) Oil strainer
(20) Gasket
(21) Oil pan
(22) Drain plug
(23) Metal gasket
(24) Oil level gauge guide
(25) Oil filter
(26) Gasket
(27) Water pump hose
(28) Plug

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*5 (0.5, 3.6)*
T2:	*6.4 (0.65, 4.7)*
T3:	*10 (1.0, 7.2)*
T4:	*25 (2.5, 18.1)*
T5:	*<Ref. to ME(H4DOTC)-76, INSTALLATION, CYLINDER BLOCK.>*
T6:	*70 (7.1, 50.6)*
T7:	*First 12 (1.2, 8.7) Second 12 (1.2, 8.7)*
T8:	*16 (1.6, 11.6)*
T9:	*44 (4.5, 33)*
T10:	*25 (2.5, 18.1)*
T11:	*54 (5.5, 40)*
T12:	*45 (4.6, 33)*

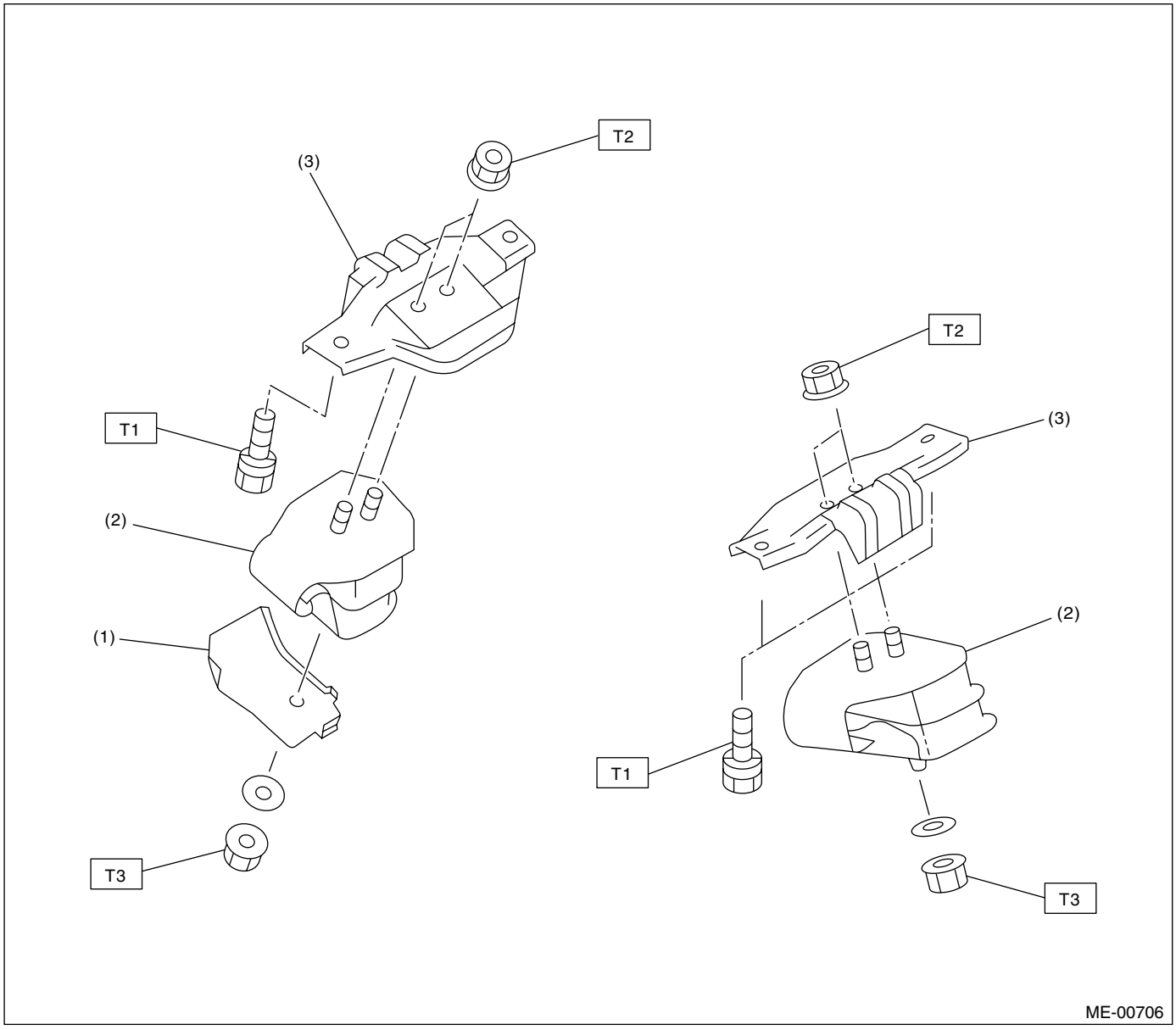
5. CRANKSHAFT AND PISTON



(1) Flywheel (MT model)
(2) Ball bearing (MT model)
(3) Reinforcement (AT model)
(4) Drive plate (AT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Circlip
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 52 (5.3, 38.4)
T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



(1) Heat shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 30.9)
T3: 85 (8.7, 62.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

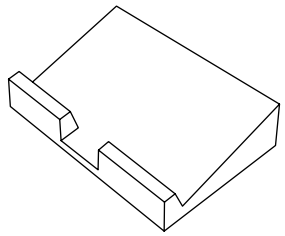
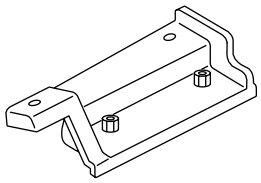
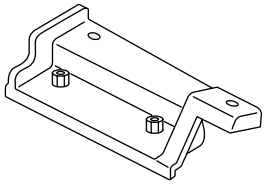
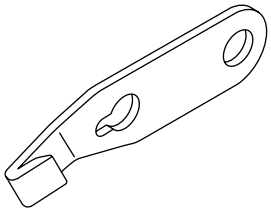
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

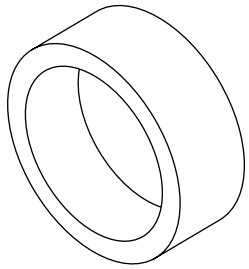
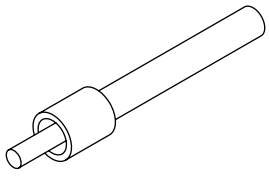
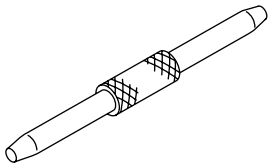
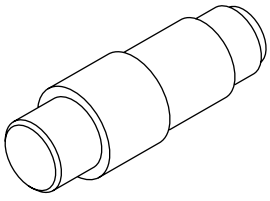
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder for 2.5 L engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

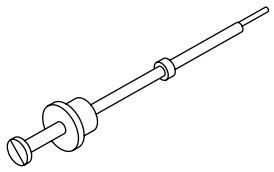
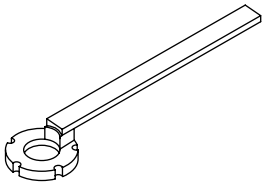
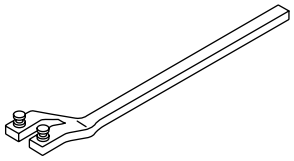
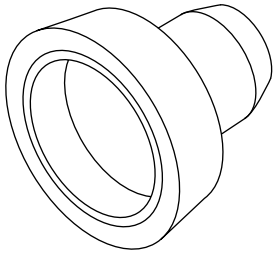
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket.
 ST-499977500	499977500	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

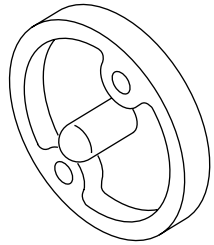
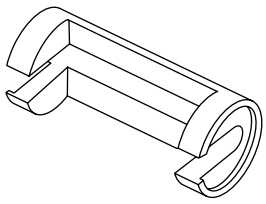
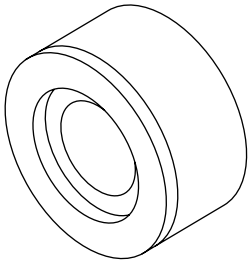
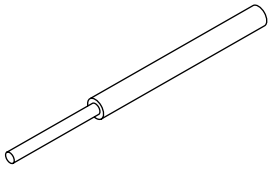
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

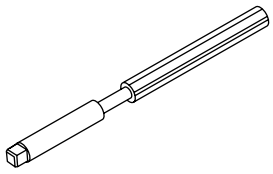
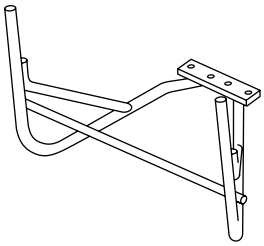
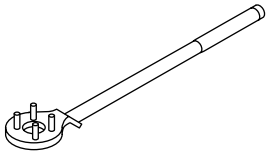
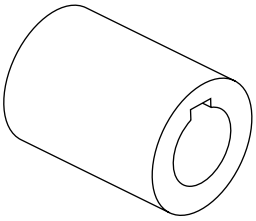
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

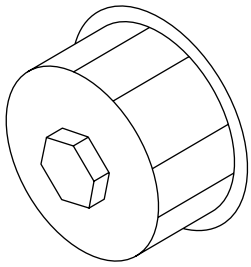
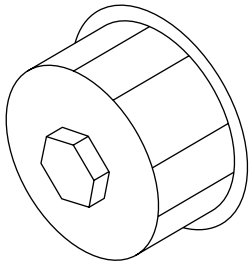
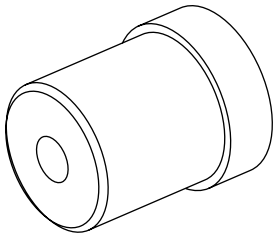
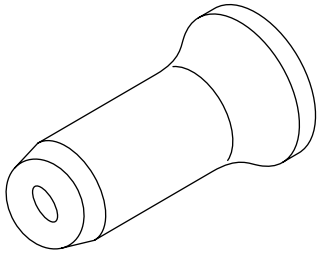
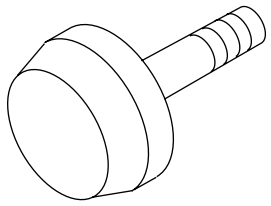
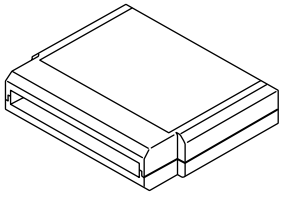
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter : 68 mm (2.68 in))
 ST18332AA000	18332AA010	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter : 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL GUIDE (499587600).
 ST24082AA230	24082AA230 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

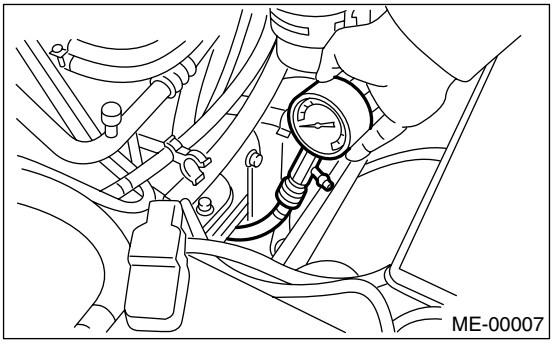
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H4DOTC)-5, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Limit
882 kPa (9.0 kgf/cm^2, 128 psi)
Difference between cylinders
Less than 49 kPa (0.5 kgf/cm^2, 7 psi)

3. Idle Speed

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, and then read the engine idle speed.
12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:
700±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:
- ***A/C refrigerant pressure is low***
  MT: 725±100 rpm
  AT: 750±100 rpm
- ***A/C refrigerant pressure is high***
  MT: 800±100 rpm
  AT: 825±100 rpm

NOTE:
As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)-439, General Diagnostic Table.>

4. Ignition Timing

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:
MT model:
13°±10°
AT model:
17°±10°

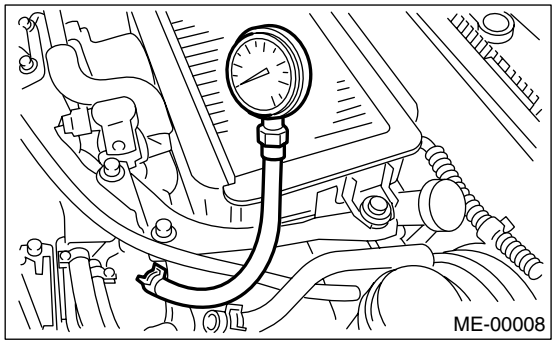
If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



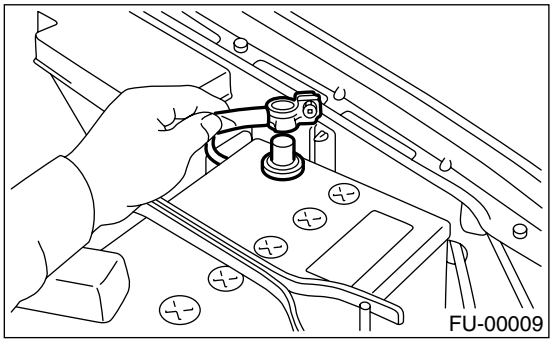
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 inHg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

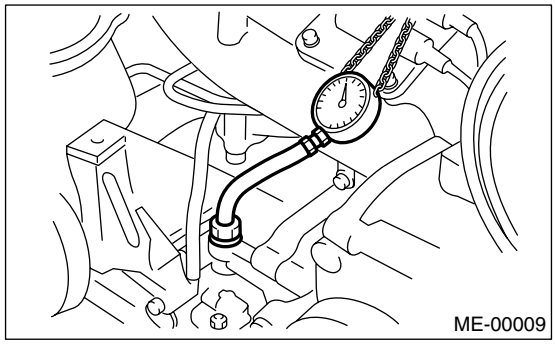
6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4DOTC)-18, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the battery ground cable to battery.



4) Start the engine, and then measure the oil pressure.



Oil pressure:
98 kPa (1.0 kgf/cm^2, 14 psi) or more at 800 rpm
294 kPa (3.0 kgf/cm^2, 43 psi) or more at 5,000 rpm

• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-22, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4DOTC)-18, Oil Pressure Switch.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-18, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

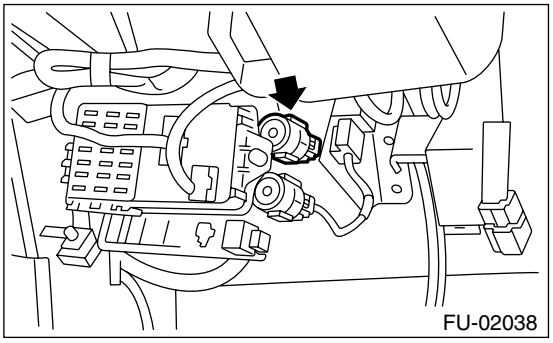
7. Fuel Pressure

A: INSPECTION

CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

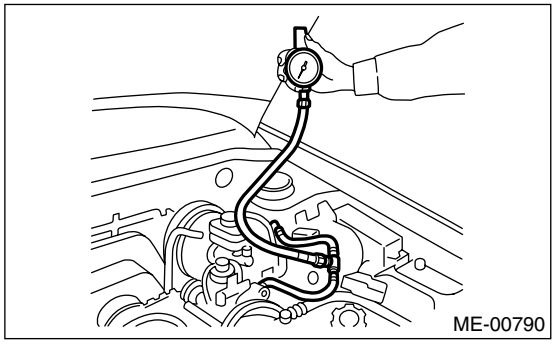
NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses, and then connect the fuel pressure gauge.
4) Connect the connector of fuel pump relay.



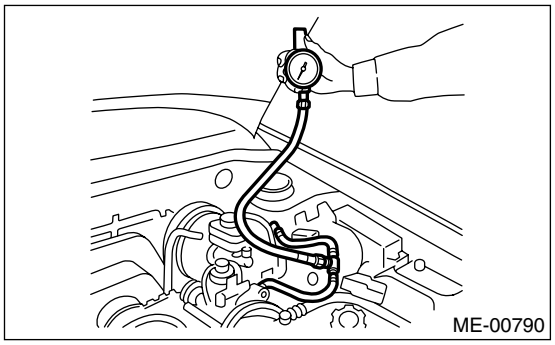
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



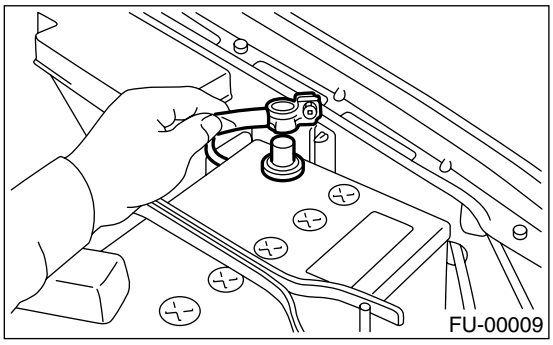
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

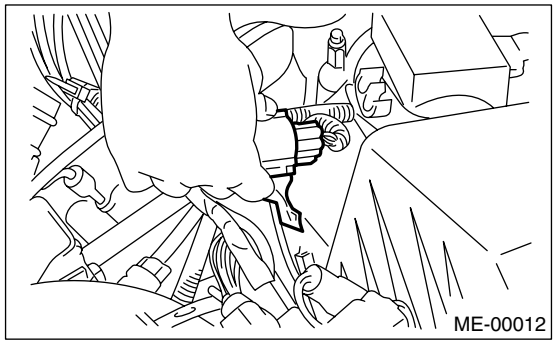
A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

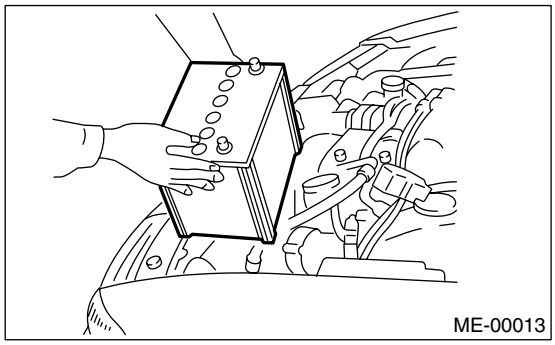
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



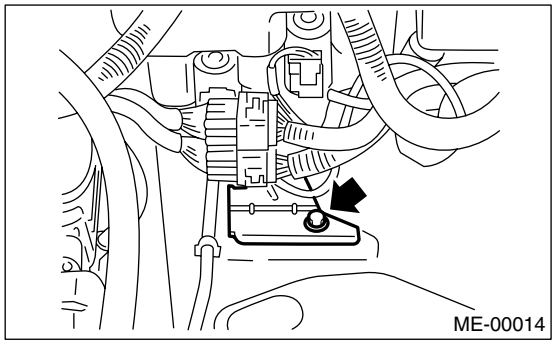
3) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
4) Remove the bolts which secure the timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
8) Lower the vehicle.
9) When inspecting the #1 and #3 cylinders:
   (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



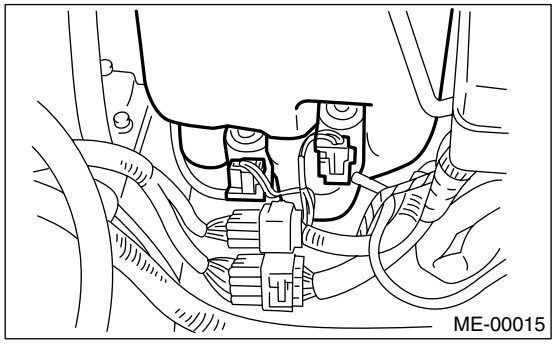
   (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
   (3) Disconnect the ignition coil connector.
   (4) Remove the ignition coil.
   (5) Place a suitable container under the vehicle.
   (6) Disconnect the PCV hose from rocker cover (RH).
   (7) Remove the bolts, and then remove the rocker cover (RH).
10) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.



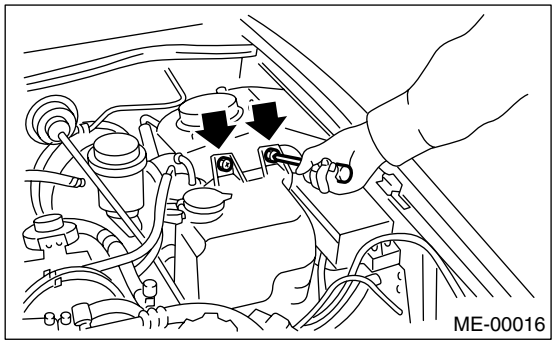
   (2) Remove the bolt which secures the engine harness bracket onto body.



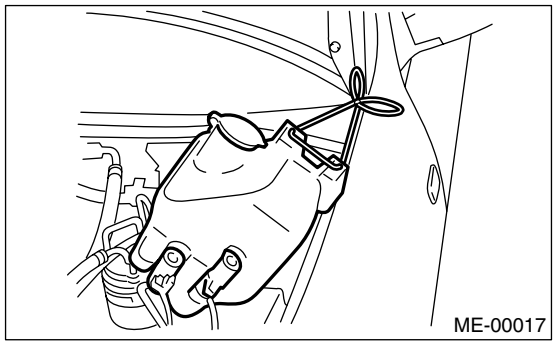
   (3) Disconnect the washer motor connectors.



   (4) Remove the washer tank mounting bolts.



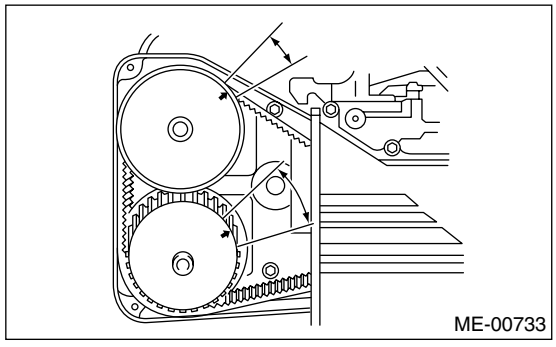
(5) Move the washer tank upward.



(6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

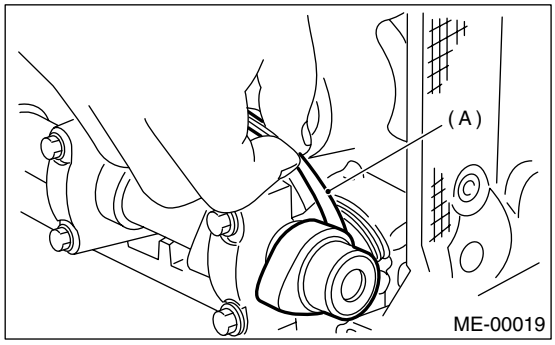


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake:
$0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.024}$ in)
Exhaust:
0.35±0.05 mm (0.0138±0.0020 in)

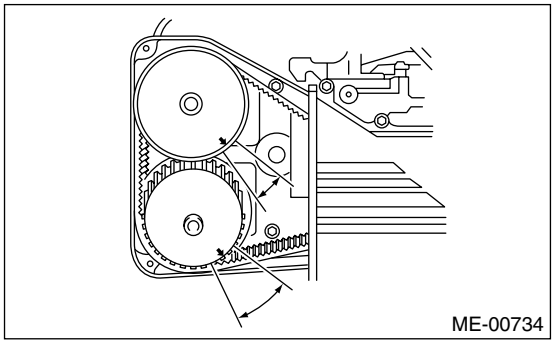
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



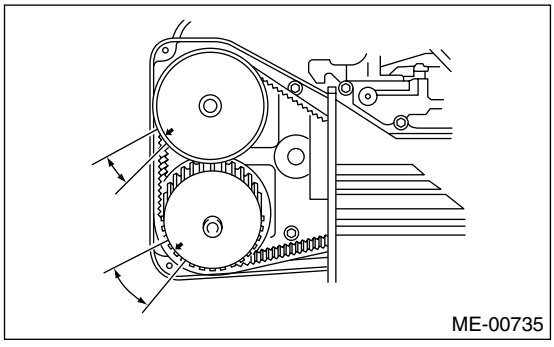
13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-32, ADJUSTMENT.>

14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

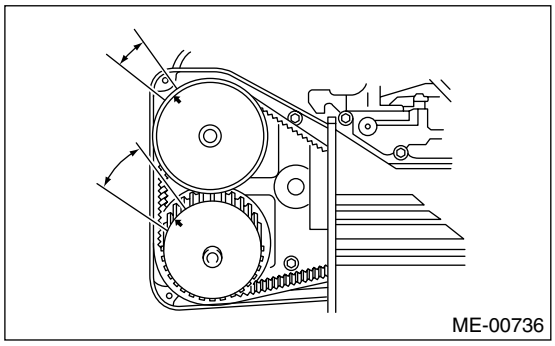
(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

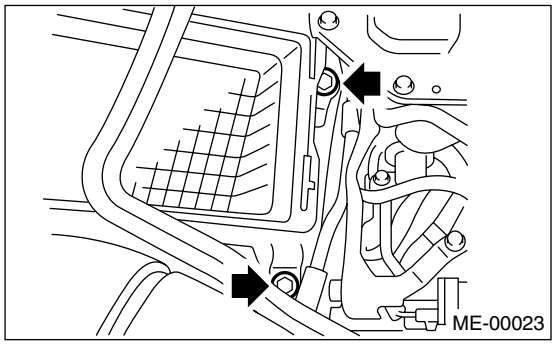


(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.


ME-00736

15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

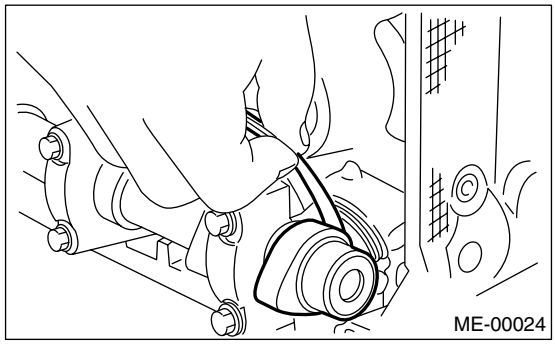

ME-00023

B: ADJUSTMENT

CAUTION:
Adjustment of the valve clearance should be performed while engine is cold.

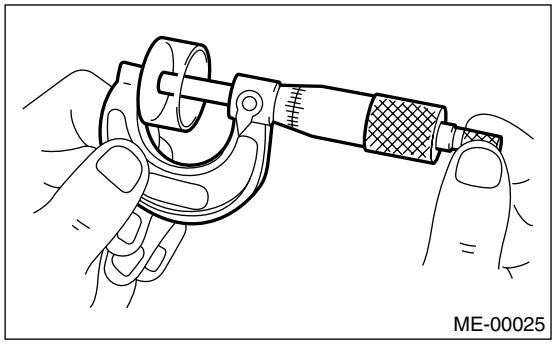
1) Measure all valve clearances. <Ref. to ME(H4DOTC)-30, INSPECTION.>

NOTE:
Record each valve clearance after it has been measured.


ME-00024

2) Remove the camshaft. <Ref. to ME(H4DOTC)-59, REMOVAL.>
3) Remove the valve lifter.

4) Measure the thickness of valve lifter with a micrometer.


ME-00025

5) Select a valve lifter of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Unit: mm
Intake valve: S = (V + T) – 0.20 Exhaust valve: S = (V + T) – 0.35
S: Required thickness of valve lifter V: Measured valve clearance T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)

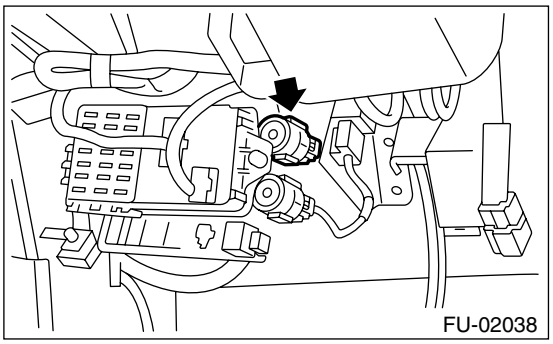
Part No.	Thickness mm (in)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

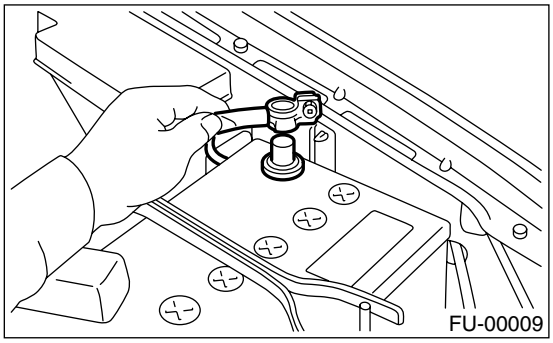
9. Engine Assembly

A: REMOVAL

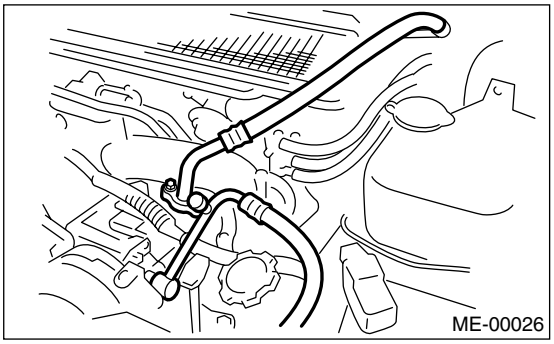
1) Set the vehicle on a lift.
2) Open the front hood fully, and then support with the hood stay.
3) Collect the refrigerant from A/C system.<Ref. to AC-20, Refrigerant Recovery Procedure.>
4) Release the fuel pressure.
   (1) Disconnect the fuel pump relay connector.



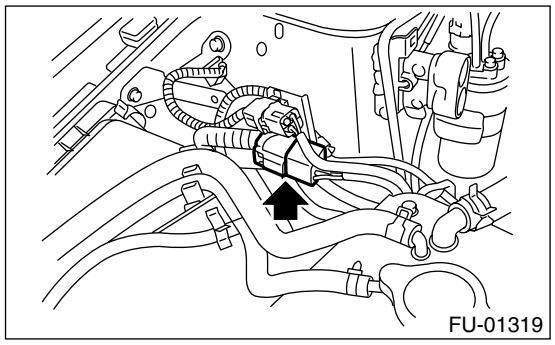
   (2) Start the engine, and run until stalls.
   (3) After the engine stalls, crank it for 5 seconds more.
   (4) Turn the ignition switch to OFF.
5) Remove the filler cap.
6) Disconnect the ground cable from battery.



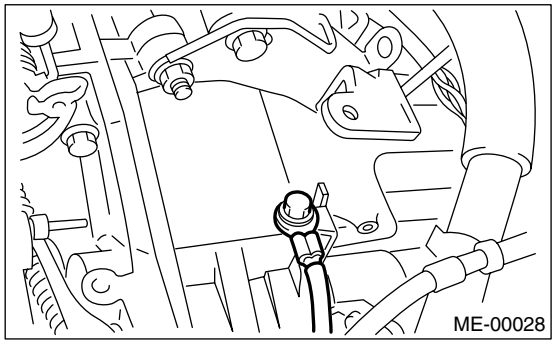
7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-29, REMOVAL, Coolant Filler Tank.>
9) Disconnect the A/C pressure hoses from A/C compressor.



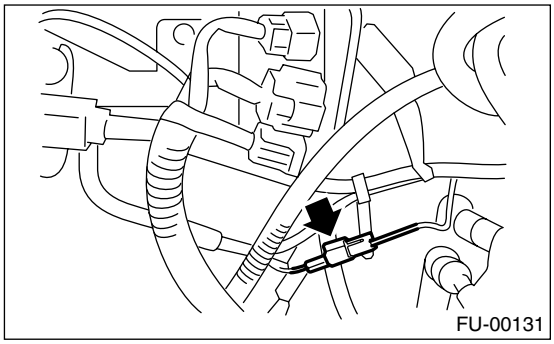
10) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
   (1) Engine harness connector

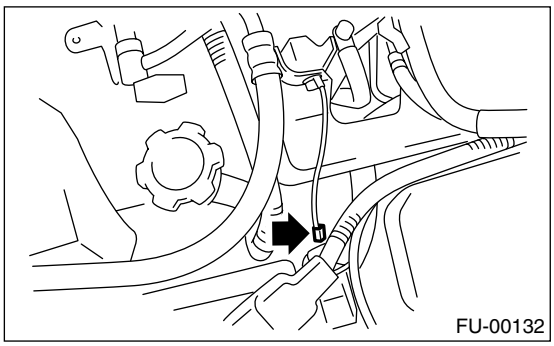


   (2) Engine ground terminal

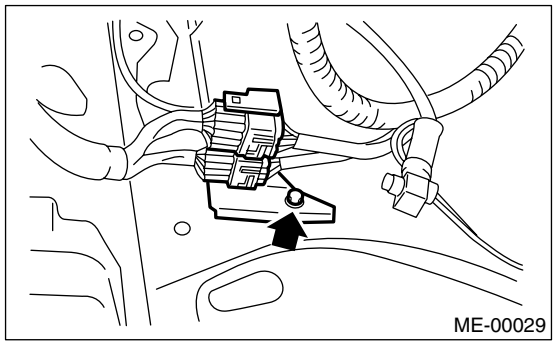


   (3) Disconnect engine ground cables on the left and right sides.

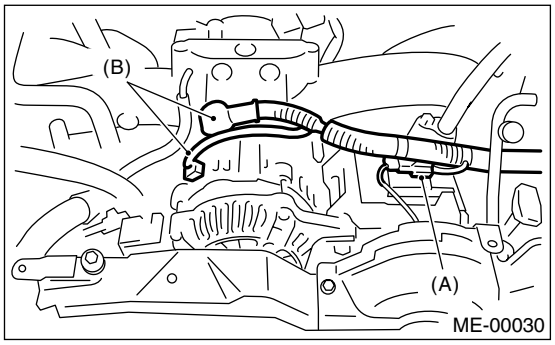




(4) Engine harness connector

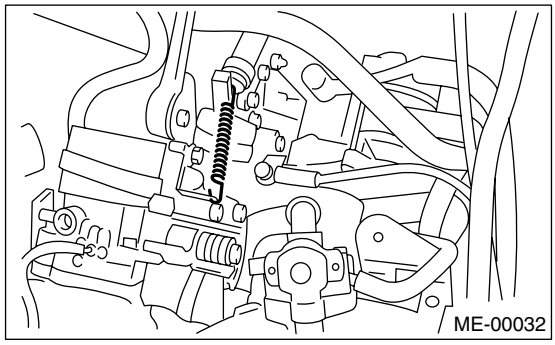


(5) Generator connector, terminal and A/C compressor connectors

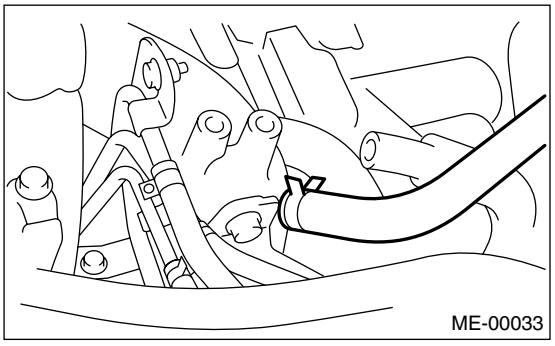


(A) A/C compressor connector
(B) Generator connector and terminal

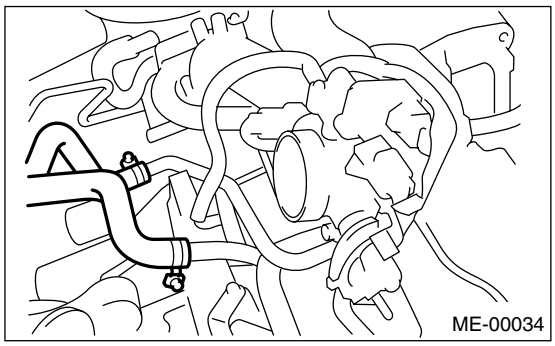
(6) Clutch release spring (MT model)



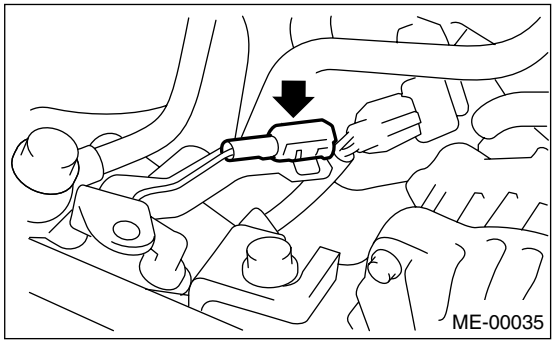
12) Disconnect the following hoses.
(1) Brake booster vacuum hose



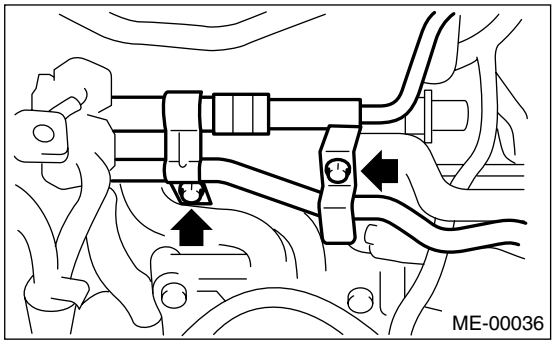
(2) Heater inlet outlet hose



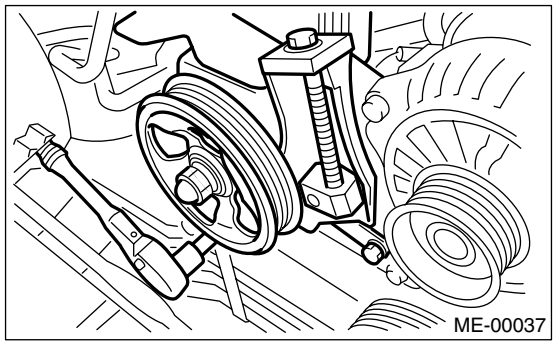
13) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4DOTC)-45, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.



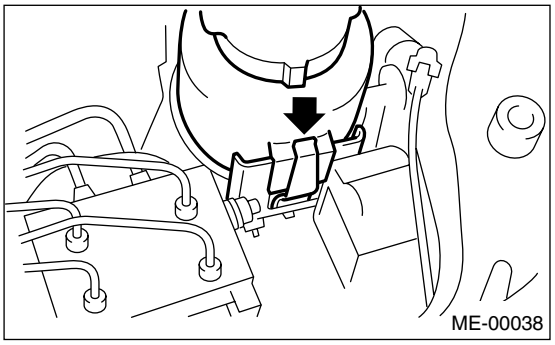
(3) Remove the pipe with bracket from intake manifold.



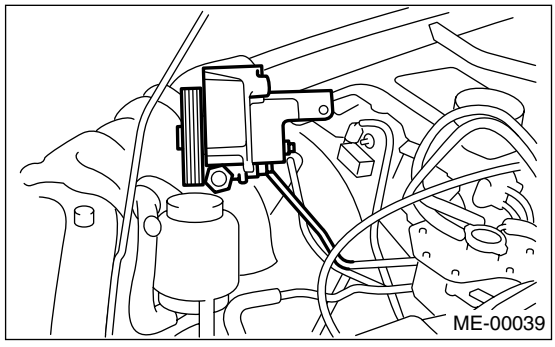
(4) Remove the power steering pump from engine.



(5) Remove the power steering tank from bracket by pulling it upward.

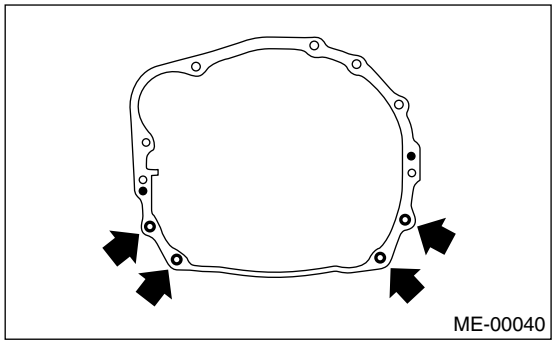


(6) Place the power steering pump on right side wheel apron.

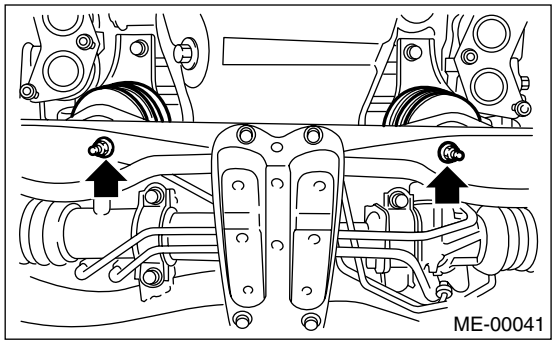


14) Lift-up the vehicle.
15) Remove ATF cooler pipe from frame. (AT model)
16) Remove the center exhaust pipe.<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>

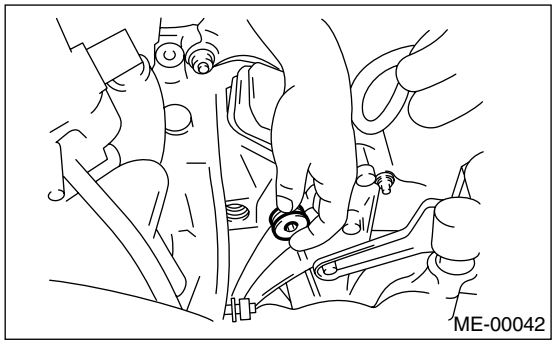
17) Remove the nuts which hold the lower side of transmission to engine.



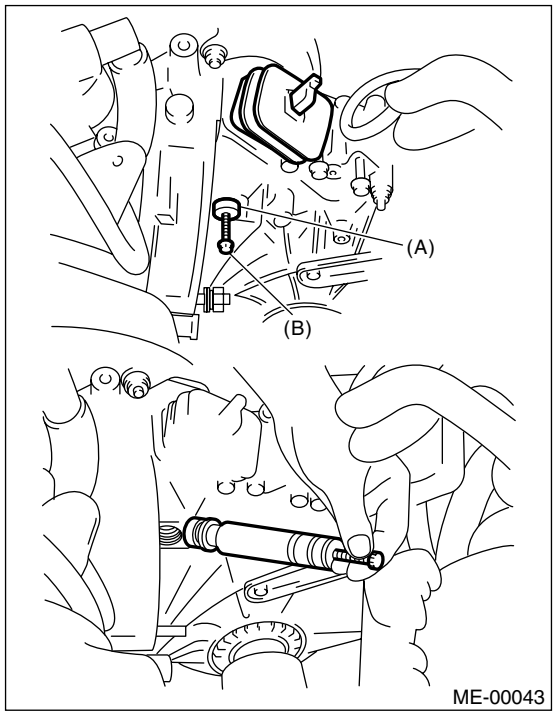
18) Remove the nuts which install the front cushion rubber onto front crossmember.



19) Lower the vehicle.
20) Separate the clutch release fork from release bearing. (MT model)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.

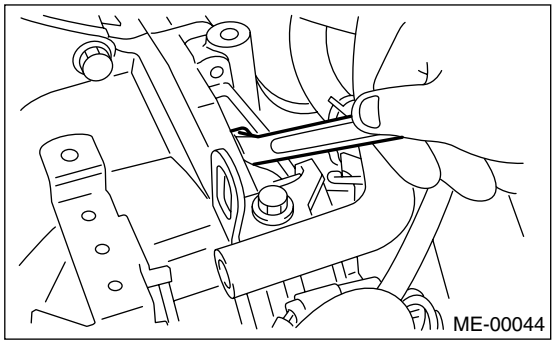


(A) Shaft
(B) Bolt

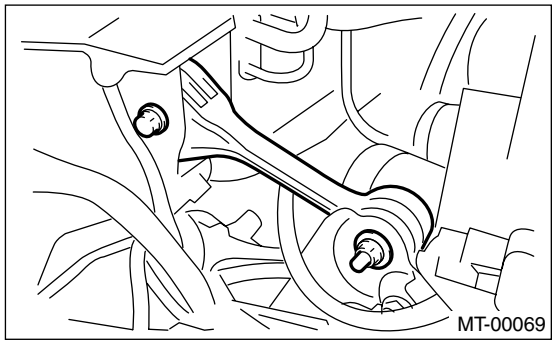
(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

21) Separate torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove service hole plug.
(3) Remove bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the engine using socket wrench.

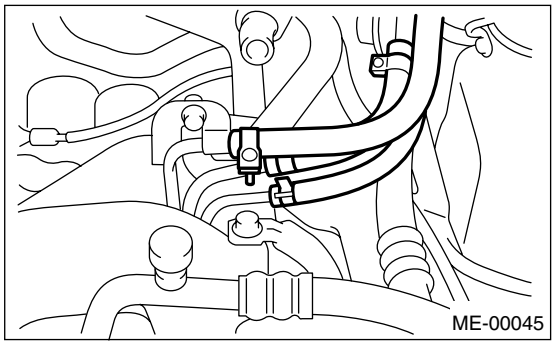


22) Remove the pitching stopper.

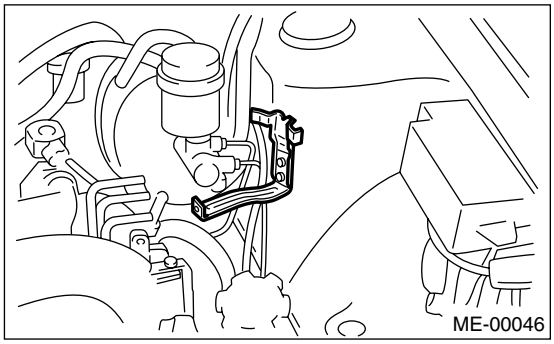


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

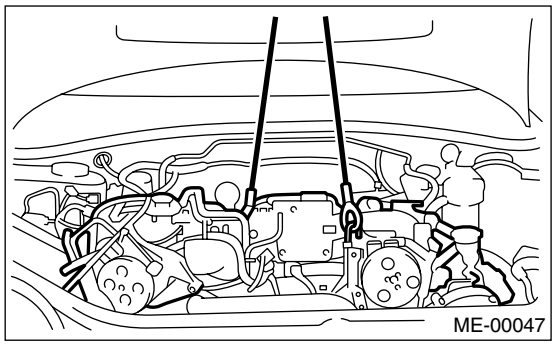
NOTE:
• Catch fuel from the hose into container.
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



24) Remove fuel filter and bracket.

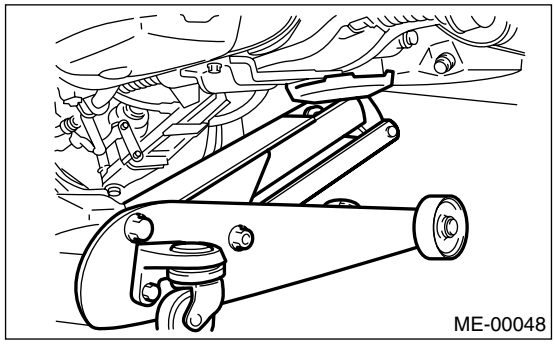


25) Support the engine with a lifting device and wire ropes.



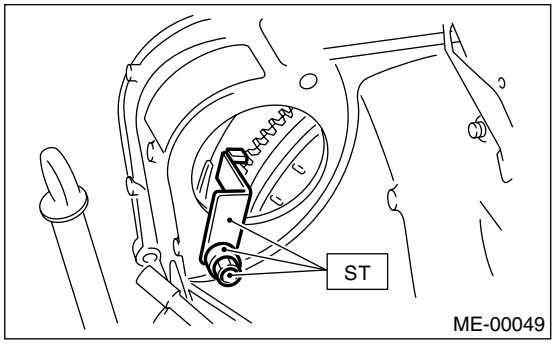
26) Support the transmission with a garage jack.

NOTE:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.

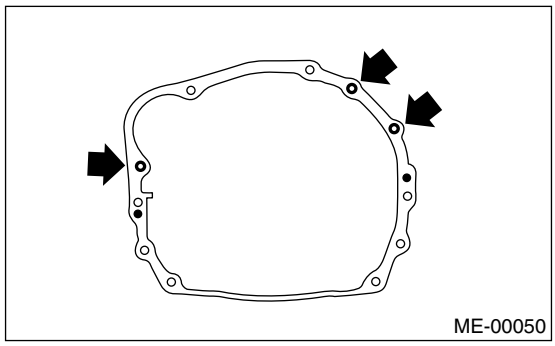


27) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
(2) Install special tool to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold the right upper side of transmission to engine.



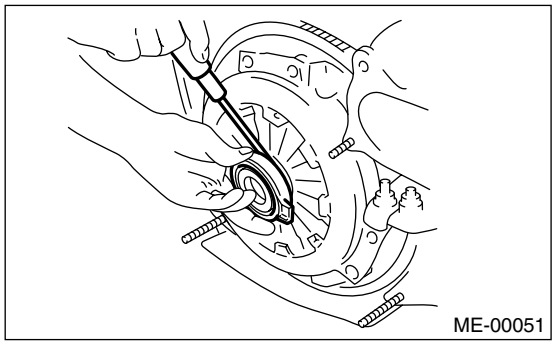
28) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

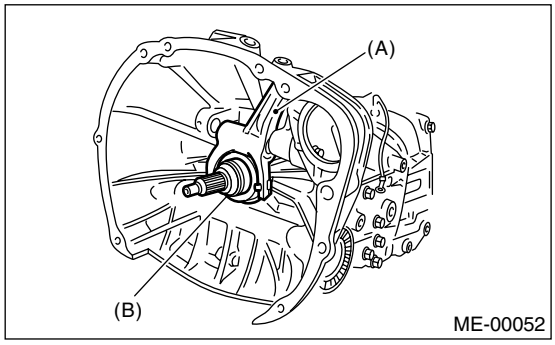
29) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission.
(1) Remove the release bearing from clutch cover with flat type screw driver.



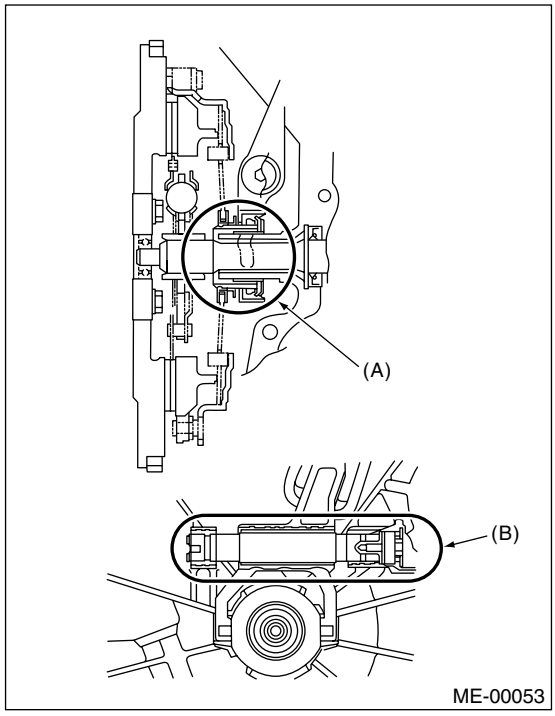
(2) Install the release bearing on transmission.
(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

(4) Apply grease to the specified points.
- Spline FX2200

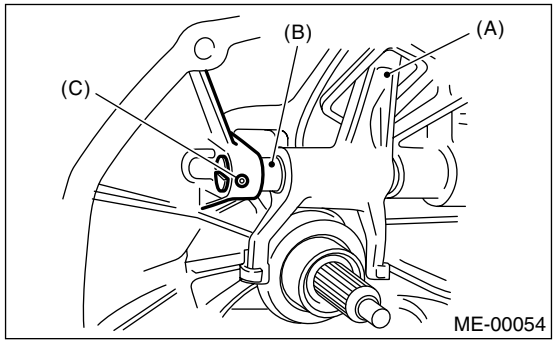
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

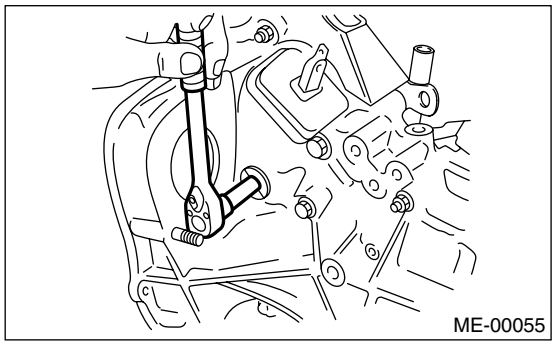
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

(6) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

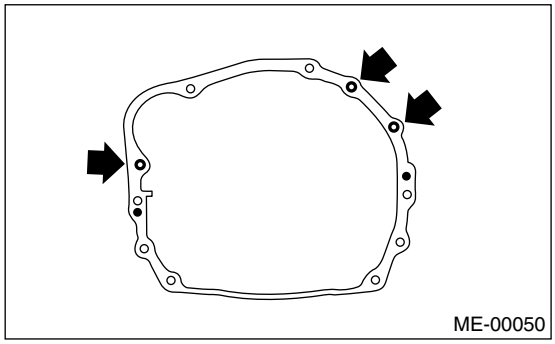
3) Install the engine onto transmission.
(1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

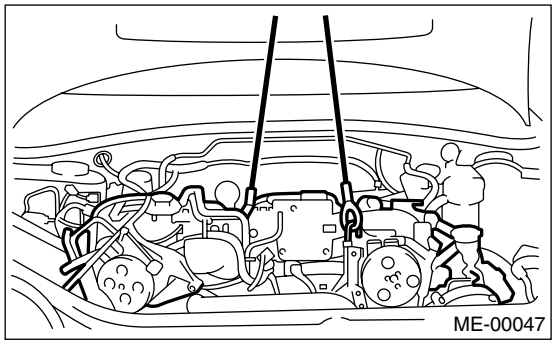
(2) Apply a small amount of grease to the splines of mainshaft. (MT model)

4) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

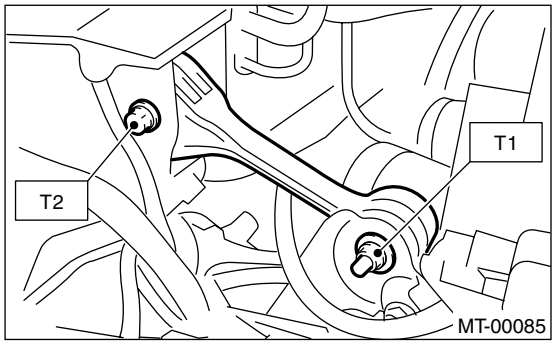


5) Remove the lifting device and wire ropes.
6) Remove the garage jack.



7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove special tool from torque converter clutch case. (AT model)

NOTE:
Be careful not to drop the special tool into the torque converter clutch case when installing it.

ST 498277200 STOPPER SET

9) Install starter. <Ref. to SC(H4SO)-7, Starter.>

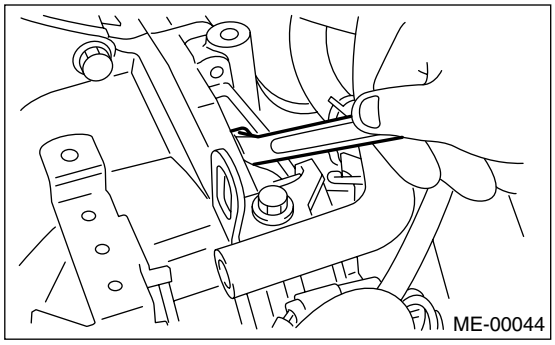
10) Install torque converter clutch to drive plate. (AT model)

(1) Tighten bolts which hold torque converter clutch to drive plate.

(2) Tighten other bolts while rotating the engine by using socket wrench.

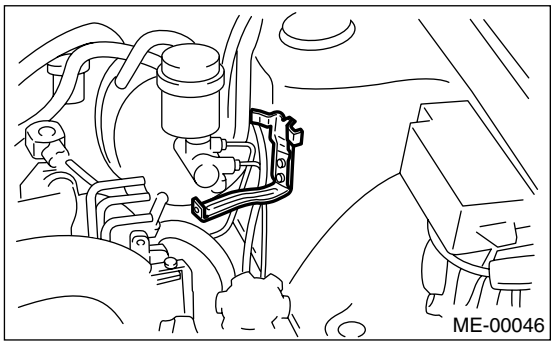
CAUTION:
Be careful not to drop bolts into torque converter clutch housing.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



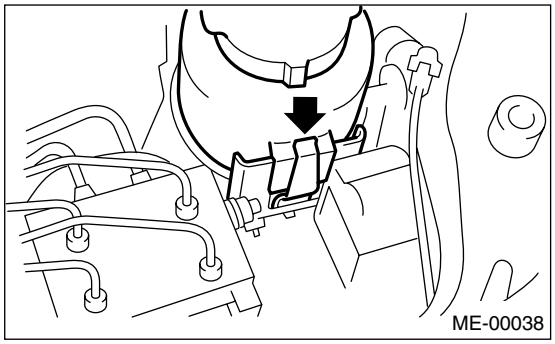
(3) Clog plug onto service hole.

11) Install fuel filter and bracket.



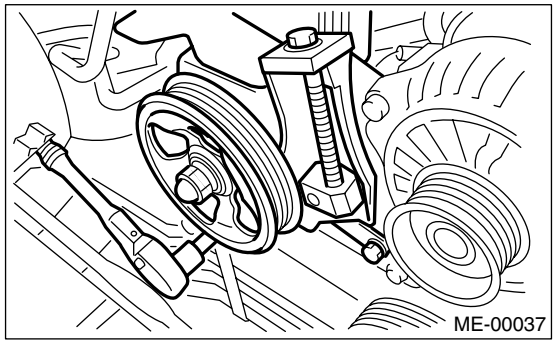
12) Install the power steering pump on bracket.

(1) Install the power steering tank on bracket.

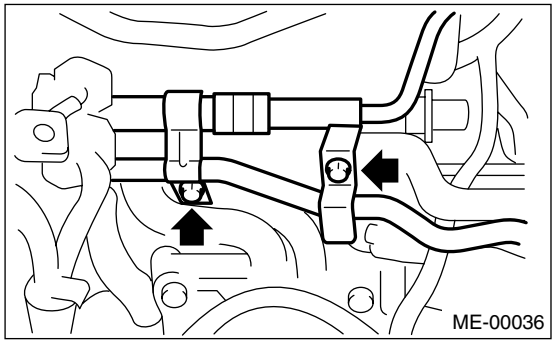


(2) Install the power steering pump.

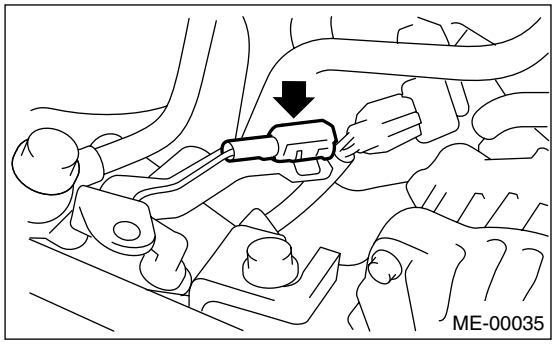
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)


ME-00037

(3) Install the power steering pipe bracket on intake manifold RH.


ME-00036

(4) Connect the power steering switch connector.

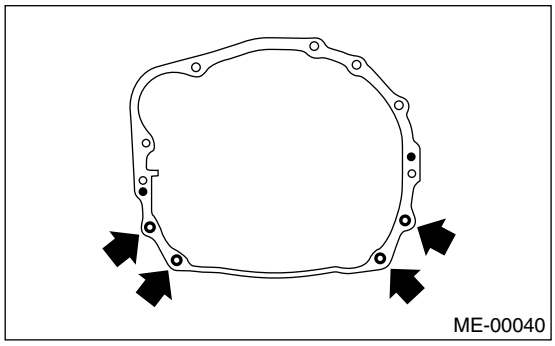

ME-00035

(5) Install the front side V-belt, and adjust it. <Ref. to ME(H4DOTC)-45, REAR SIDE BELT, INSTALLATION, V-belt.>

13) Lift-up the vehicle.

14) Tighten the nuts which hold the lower side of transmission to engine.

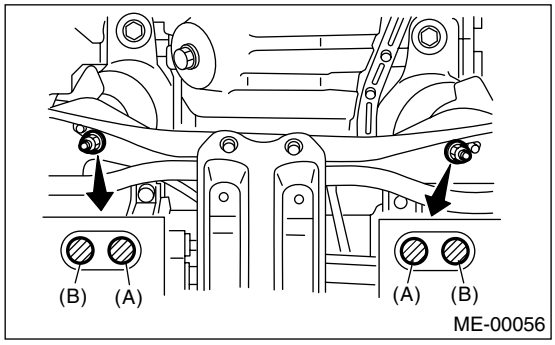
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)


ME-00040

15) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



ME-00056

16) Install ATF cooler pipe to frame. (AT model)

17) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>

18) Lower the vehicle.

19) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose

20) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors

21) Connect the following cables:
(1) Accelerator cable
(2) Clutch release spring

22) After connecting each cable, adjust them.

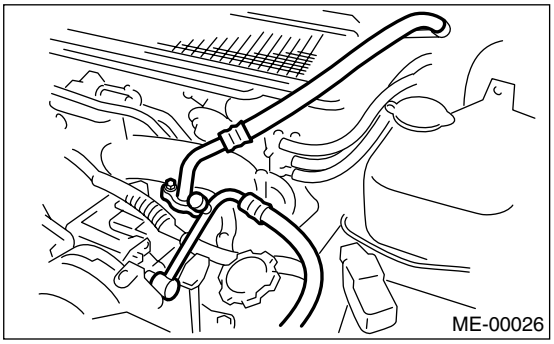
23) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.

24) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



25) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
26) Install the coolant filler tank. <Ref. to CO(H4DOTC)-29, INSTALLATION, Coolant Filler Tank.>
27) Install the window washer tank.
28) Install the battery in the vehicle, and then connect the cables.
29) Fill coolant.
<Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
30) Charge the A/C system with refrigerant.
<Ref. to AC-21, Refrigerant Charging Procedure.>
31) Remove the front hood stay, and close the front hood.
32) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4DOTC)-34, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

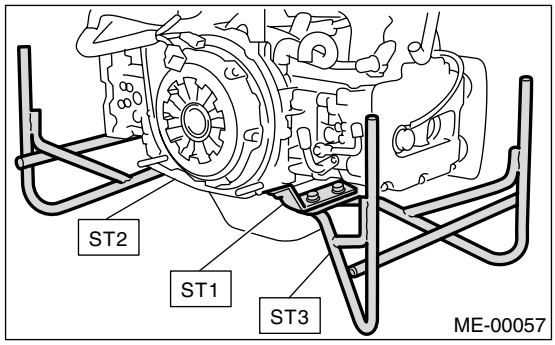
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	4998170 00	ENGINE STAND



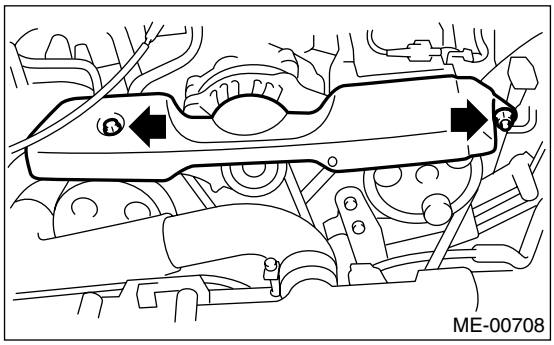
2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

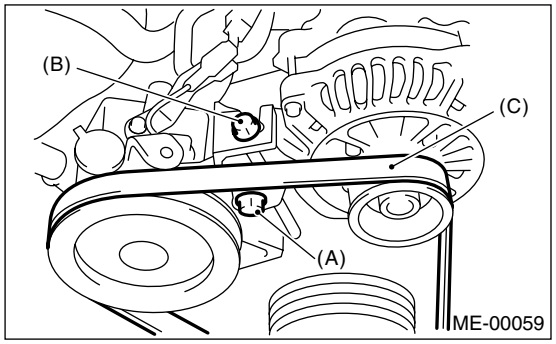
A: REMOVAL

1. FRONT SIDE BELT

1) Remove the V-belt cover.

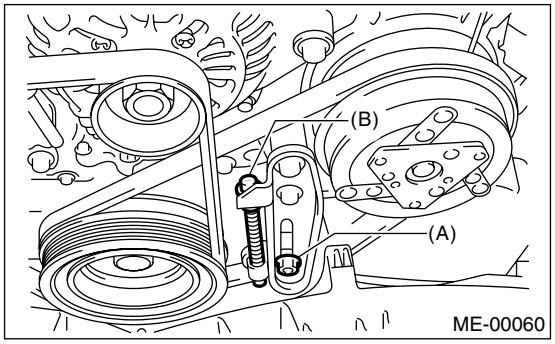


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

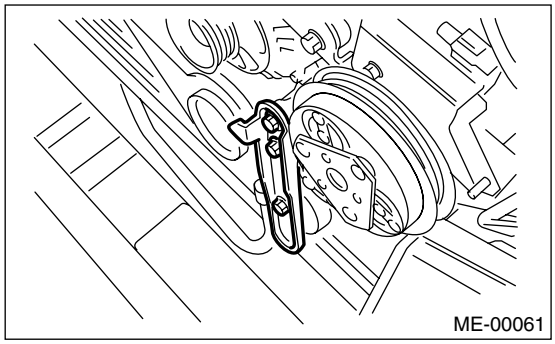


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



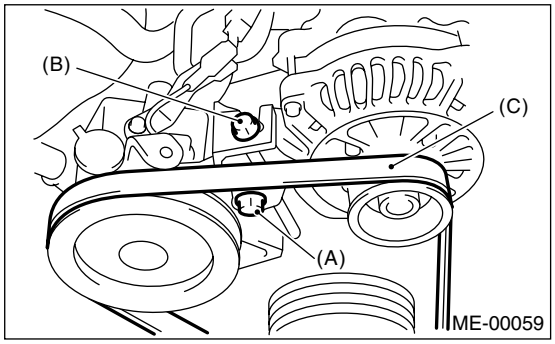
B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:
Wipe off any oil or water on the belt and pulley.

1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(H4DOTC)-46, INSPECTION.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)

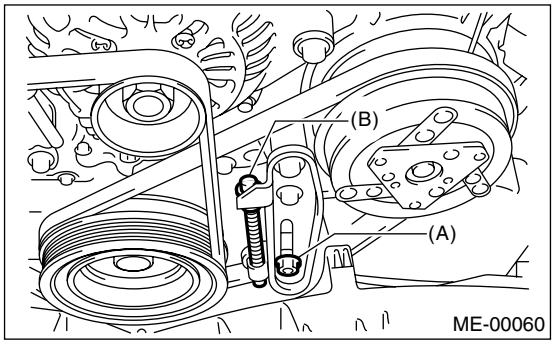


2. REAR SIDE BELT

1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-46, INSPECTION.>

2) Tighten the lock nut (A).

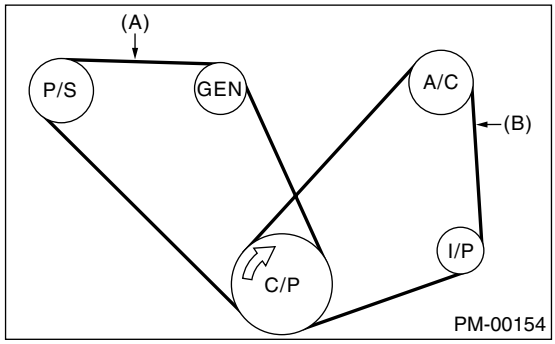
Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

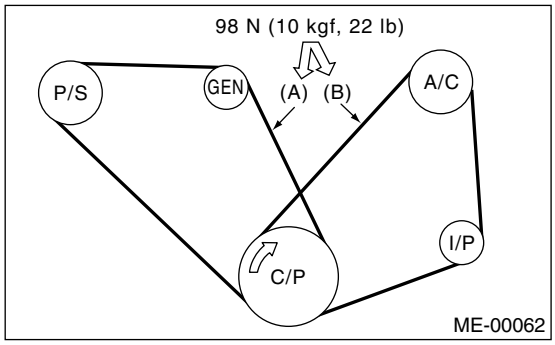
1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension (With using belt tension gauge)
(A)
replaced: 618 — 755 N (63 — 77 kgf, 139 — 170 lb)
reused: 490 — 640 N (50 — 65 kgf, 110 — 144 lb)
(B)*
replaced: 740 — 880 N (75 — 90 kgf, 166 — 198 lb)
reused: 350 — 450 N (36 — 46 kgf, 78 — 101 lb)
****: with air conditioner***



(A) Front side belt
(B) Rear side belt
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)
****: with air conditioner***



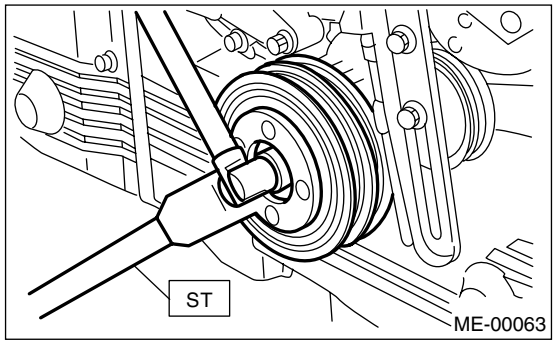
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH



3) Remove the crankshaft pulley.

B: INSTALLATION

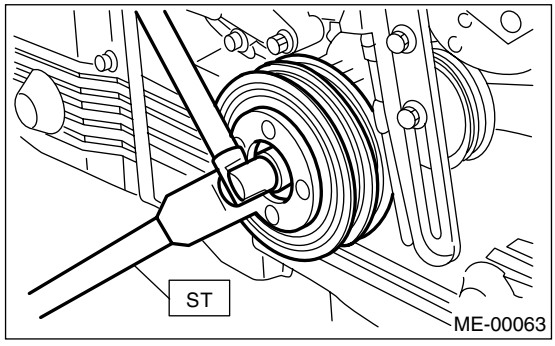
1) Install the crankshaft pulley.
2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
180 N·m (18.3 kgf-m, 132.7 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 65 degrees, conduct the following procedures.

CAUTION:
If the tightening angle of crankshaft pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

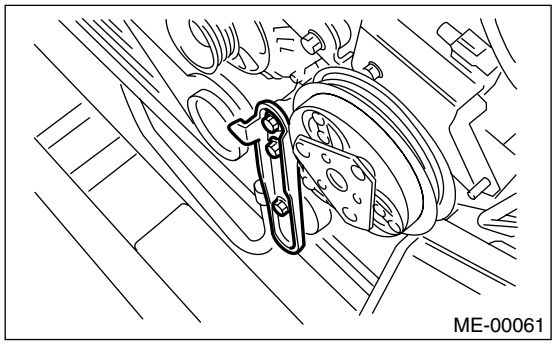
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

(2) Clean the crankshaft thread using an air gun.
(3) Apply engine oil to the crankshaft pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

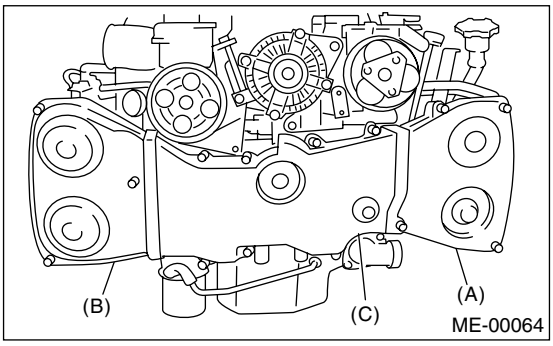
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4DOTC)-46, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



B: INSTALLATION

1) Install the front timing belt cover (C).

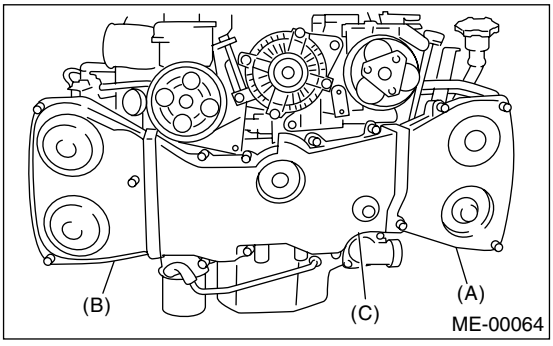
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the timing belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
5) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

C: INSPECTION

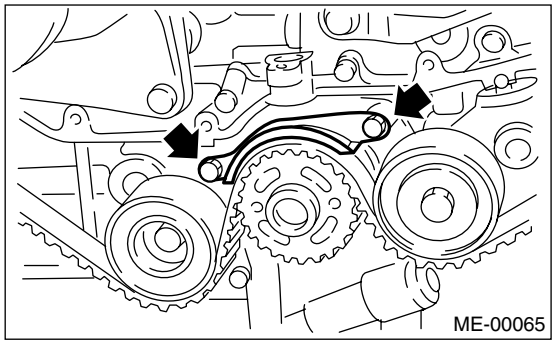
Make sure the cover is not damaged.

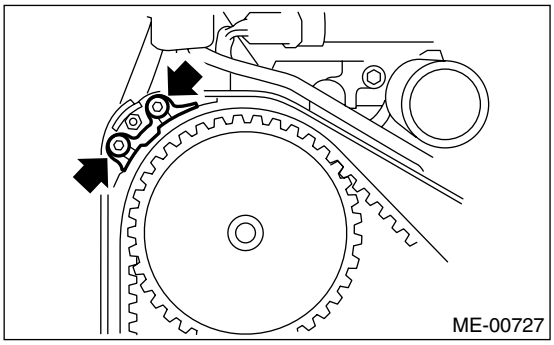
15.Timing Belt Assembly

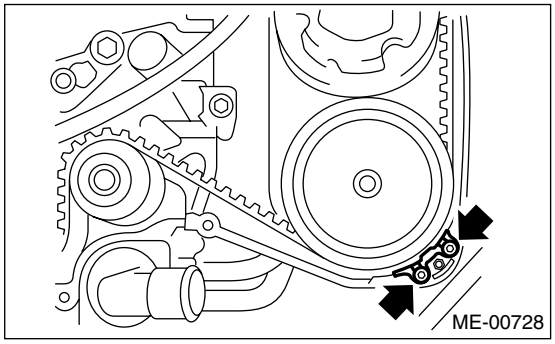
A: REMOVAL

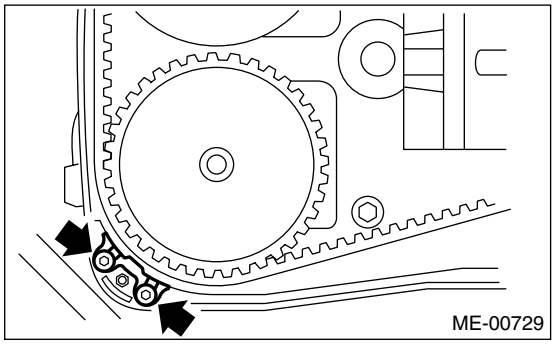
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guides. (MT model)



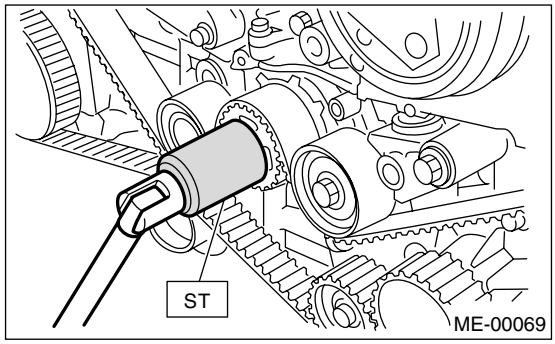




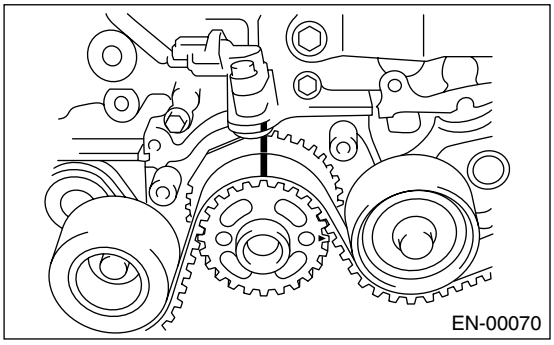


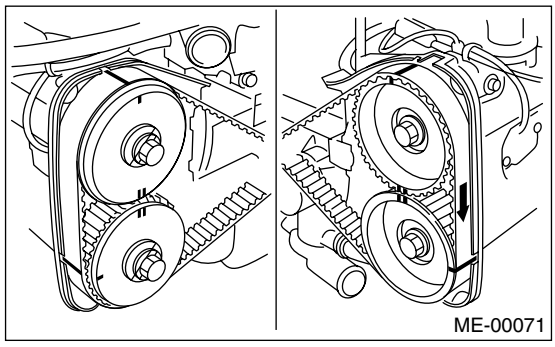
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
   (1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

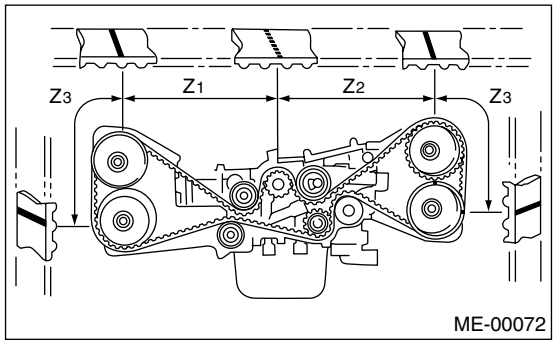


(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.

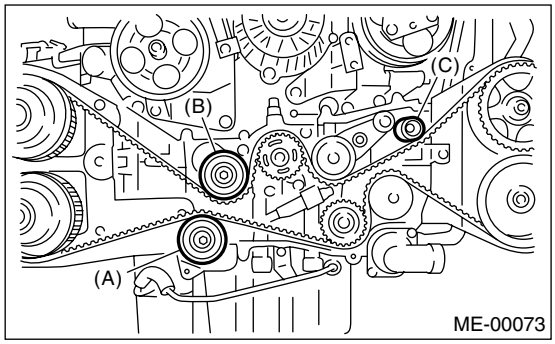




Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



6) Remove the belt idler (A).

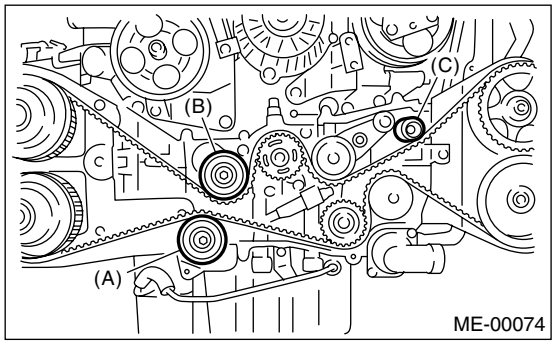


7) Remove the timing belt.

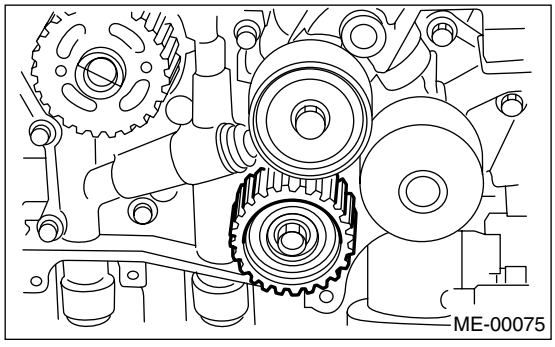
CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

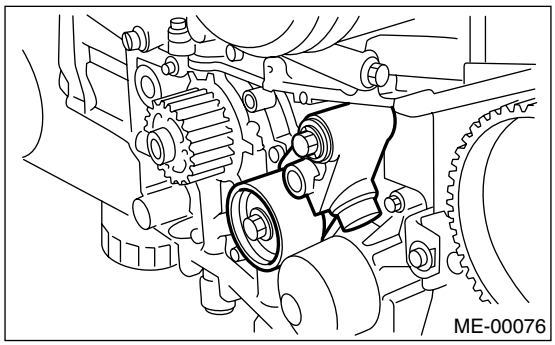
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



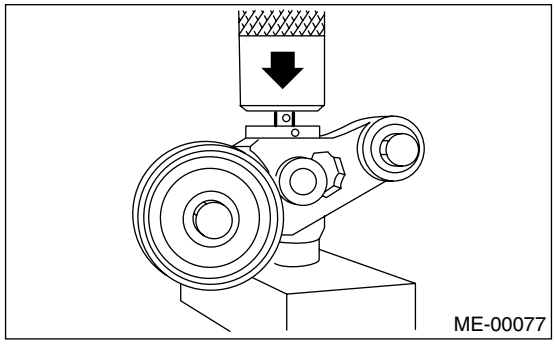
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

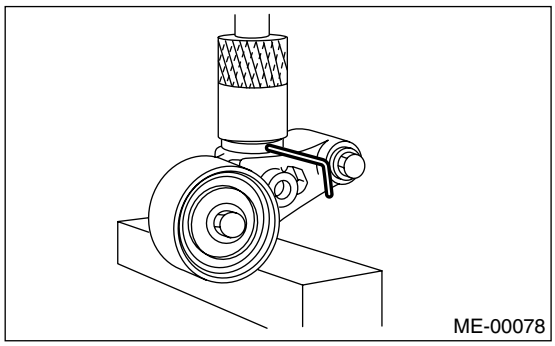
1) Preparation for installation of automatic belt tension adjuster assembly:

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf , 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

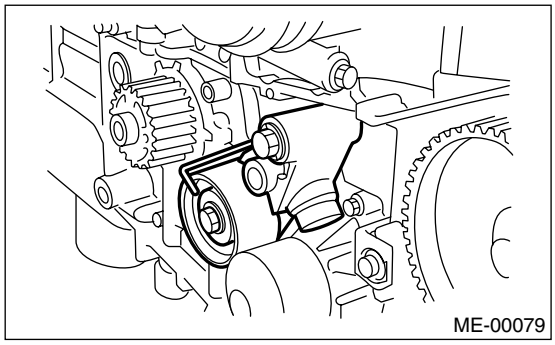


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



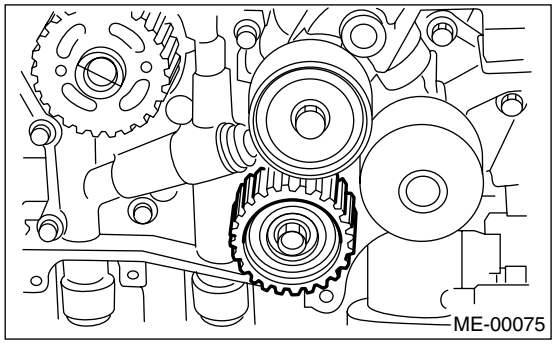
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



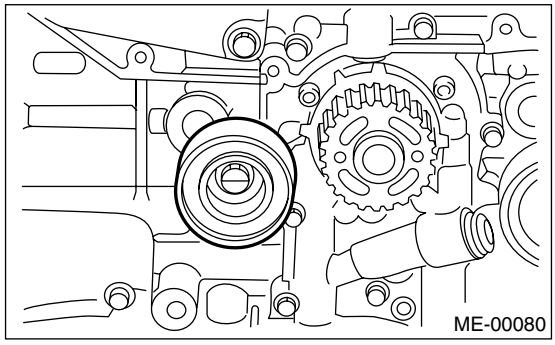
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



4) Install the belt idler.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

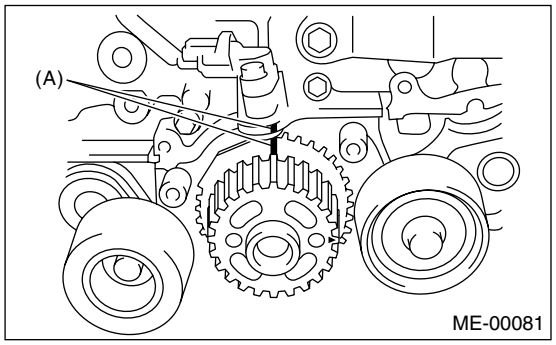


2. TIMING BELT

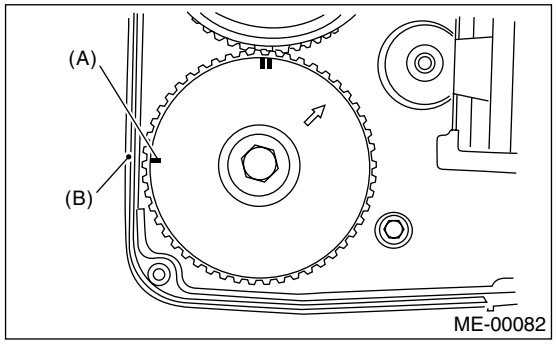
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-56, AUTOMATIC BELT TENSION ADJUSTER, INSPECTION, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

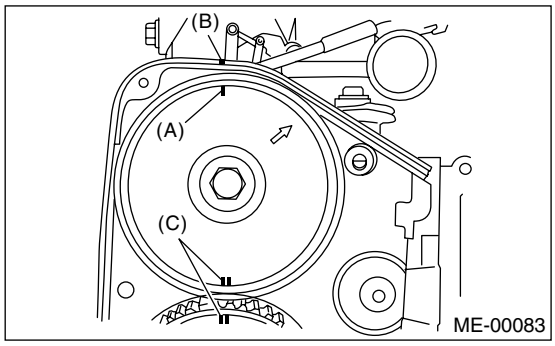
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



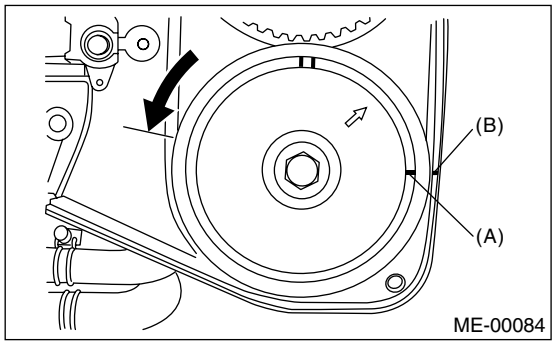
(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on timing belt cover.



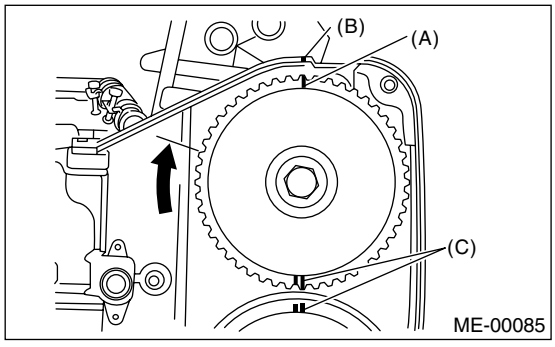
(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on timing belt cover.
(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).

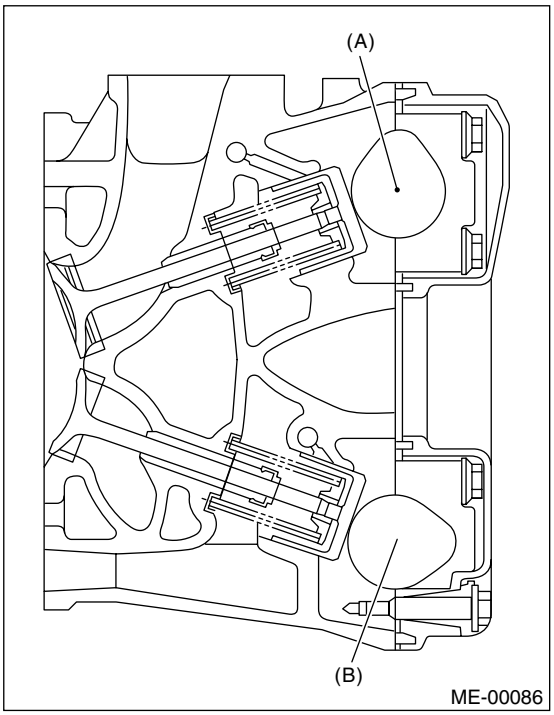


(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).
Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



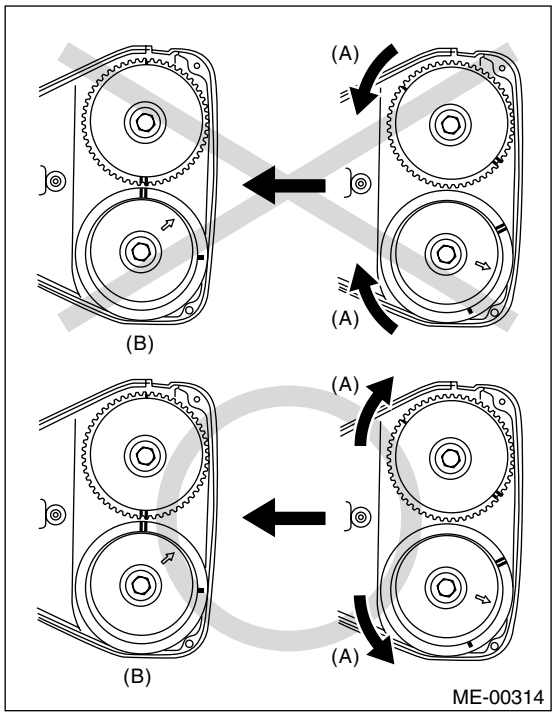
(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
• Camshafts (LH) must be rotated from the "zero-lift" position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
• Do not allow the camshafts to rotate in the direction shown in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.

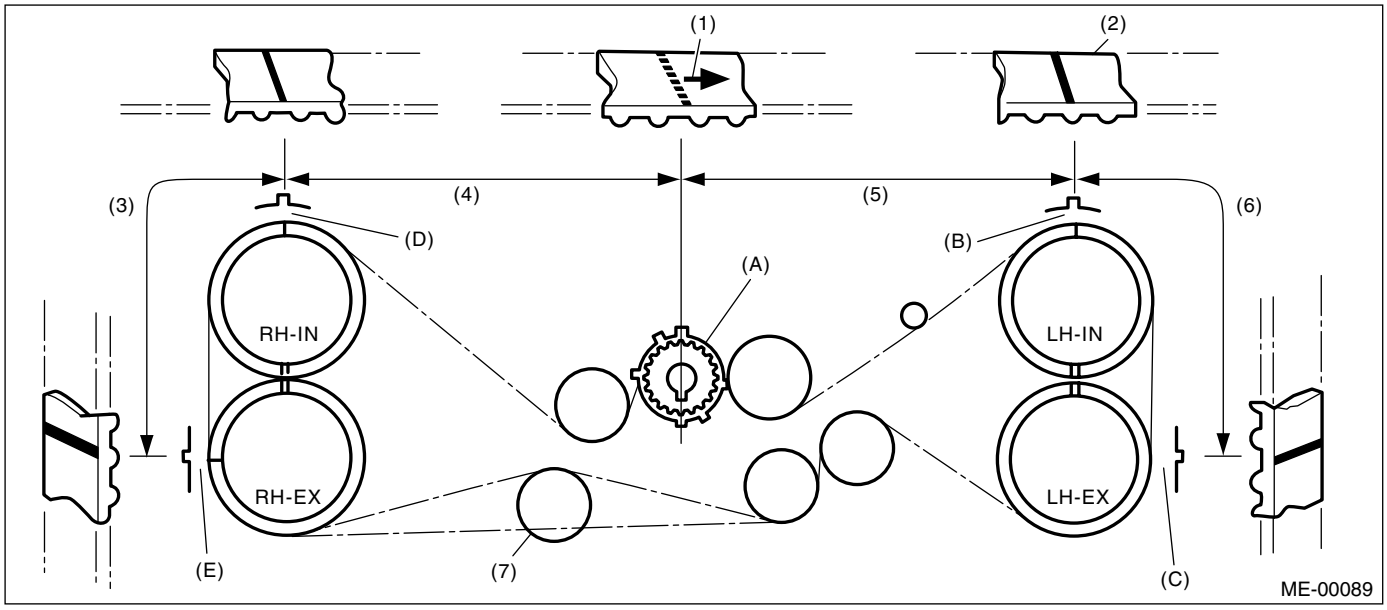


(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt:
Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
• Disengagement of more than three timing belt teeth may result in interference between the valve and piston.

- **Ensure the belt's rotating direction is correct.**

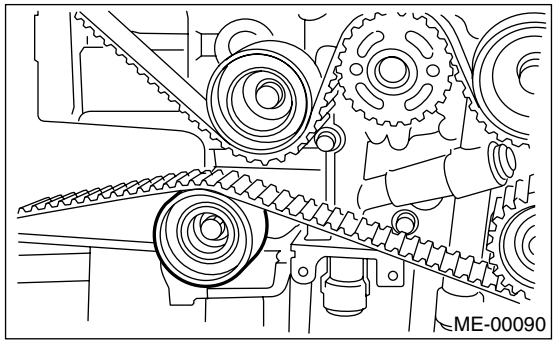


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

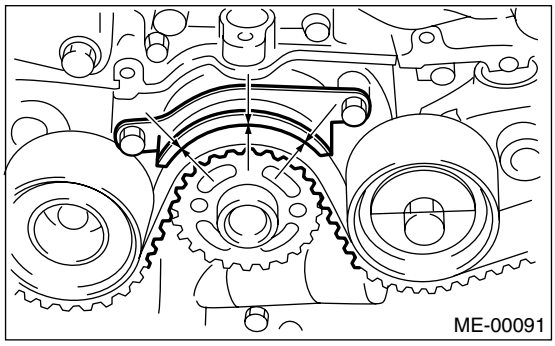
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

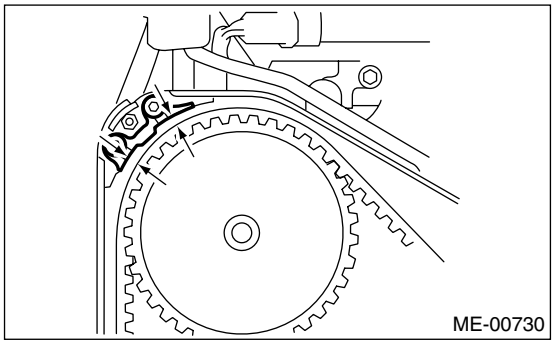
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

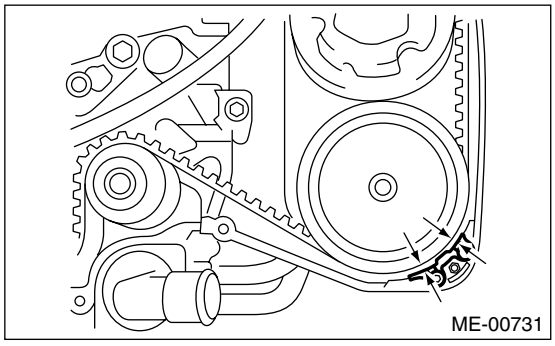


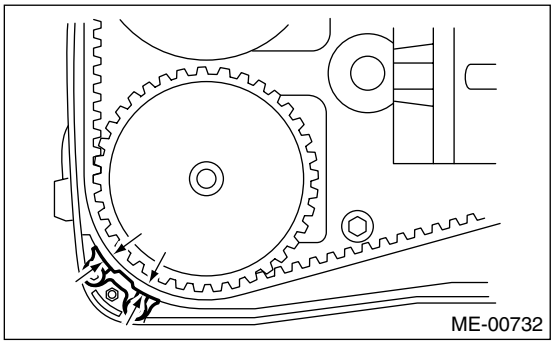
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.
6) Install the timing belt guide. (MT model)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



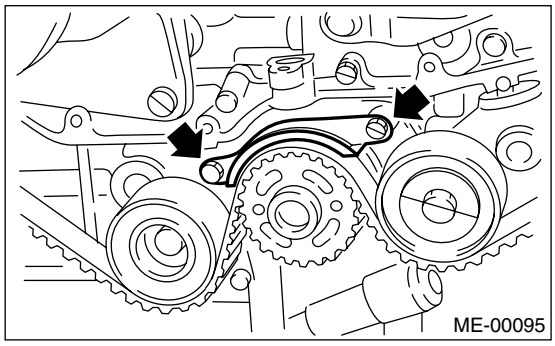




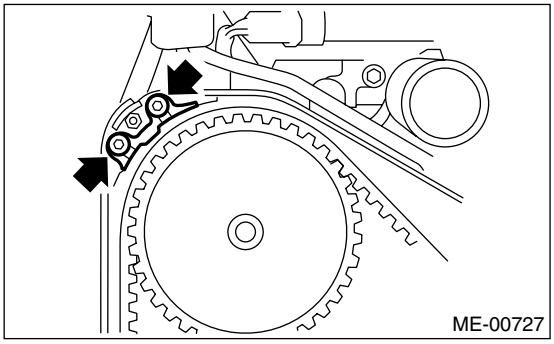


(3) Tighten the bolts.

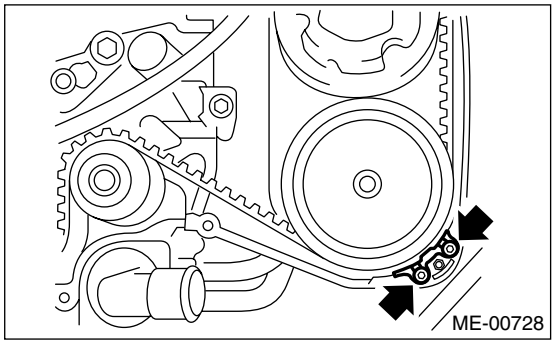
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



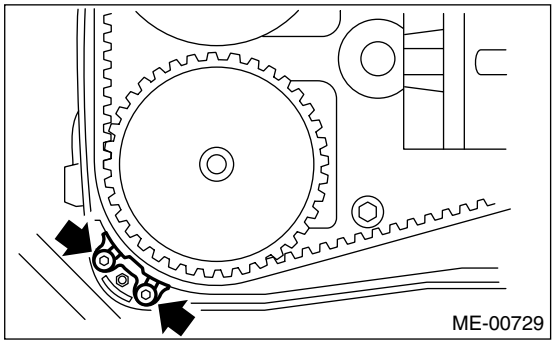
Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



7) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
8) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
9) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

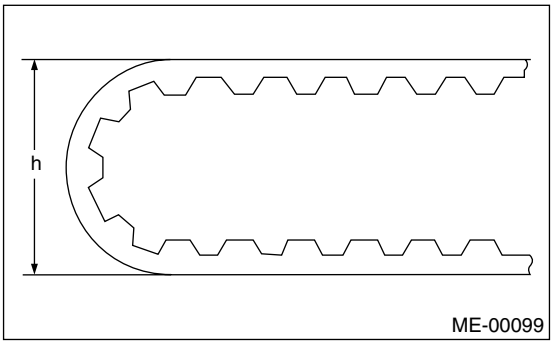
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

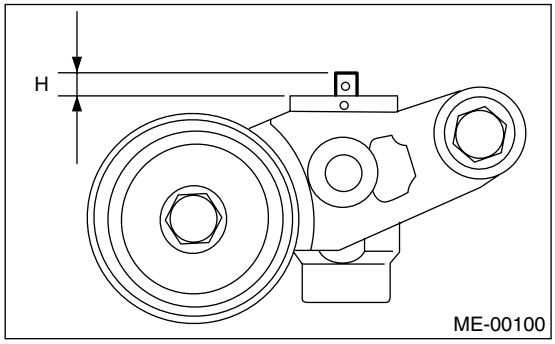
NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf , 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

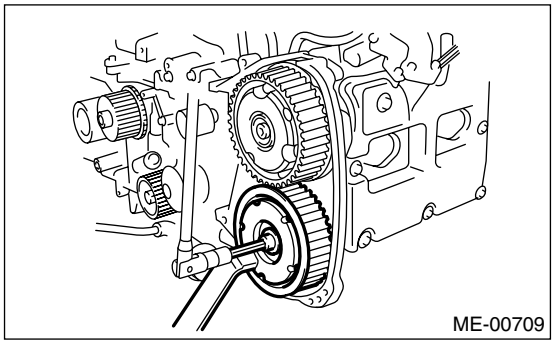
1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

16.Camshaft Sprocket

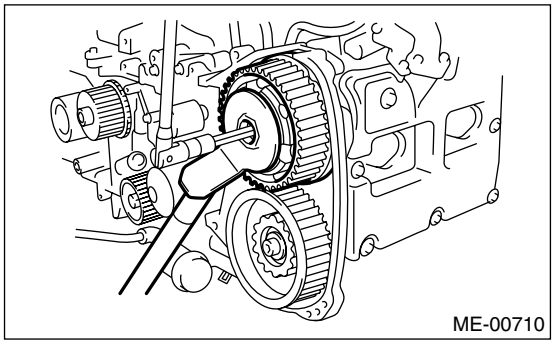
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprockets. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



ST 499977500 CAMSHAFT SPROCKET WRENCH



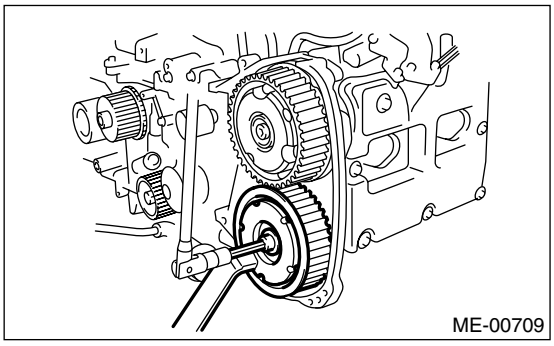
B: INSTALLATION

1) Install the camshaft sprocket. To lock the camshaft, use ST.

NOTE:
Do not confuse camshaft sprockets (RH) and (LH) during installation.

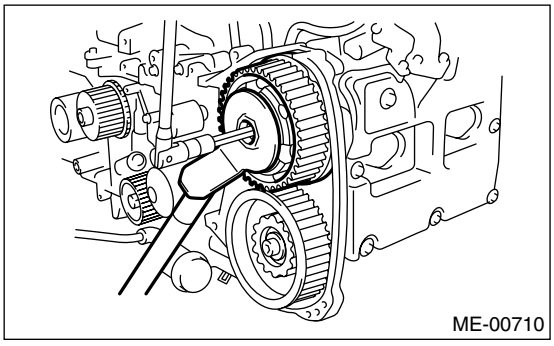
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)



ST 499977500 CAMSHAFT SPROCKET WRENCH

Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb), and then tighen 45° furthermore



2) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
4) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
5) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

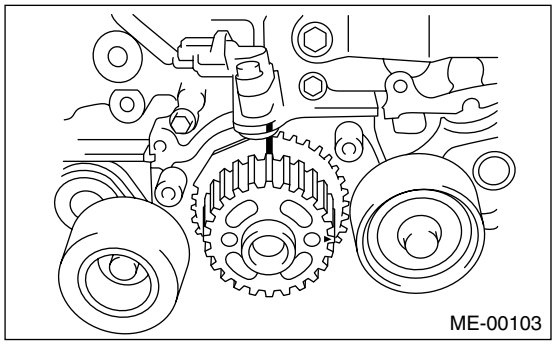
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

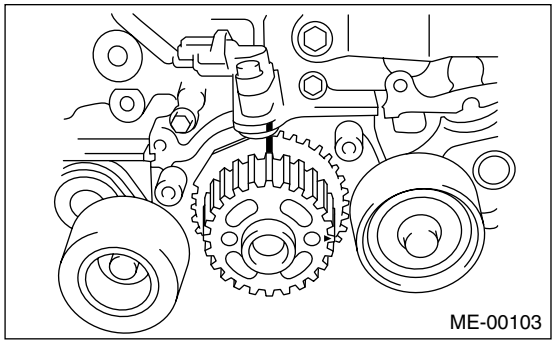
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Sprocket.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
6) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

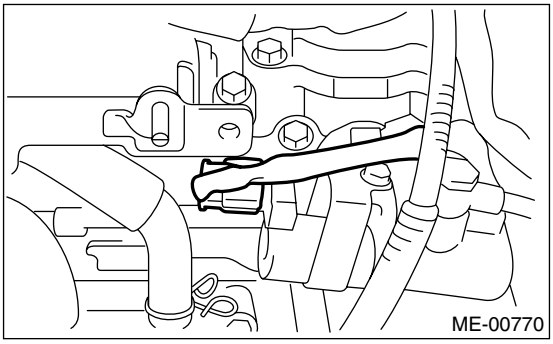
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

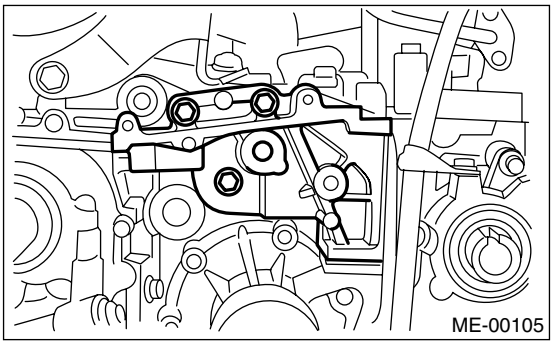
18.Camshaft

A: REMOVAL

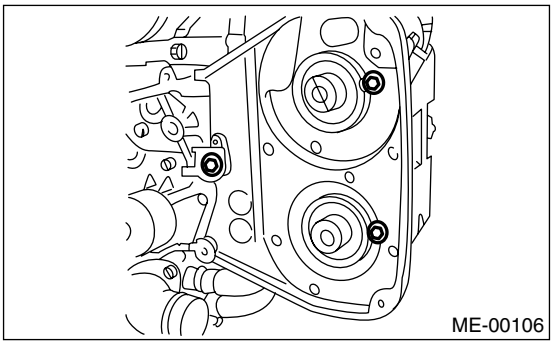
1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
6) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Sprocket.>
7) Disconnect the variable valve timing solenoid valve assembly connector.


ME-00770

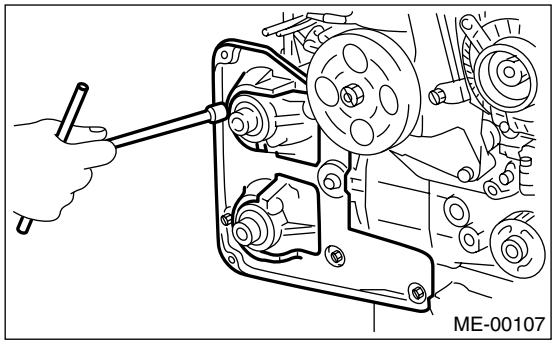
8) Remove the tensioner bracket.


ME-00105

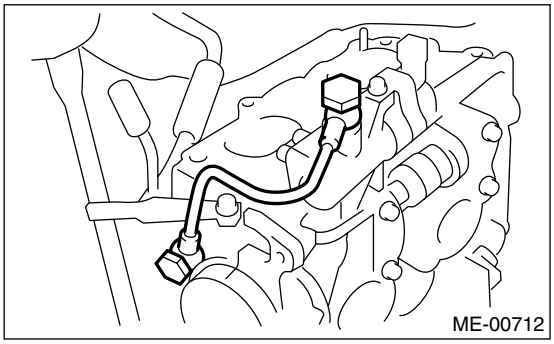
9) Remove the timing belt cover No. 2 (LH).


ME-00106

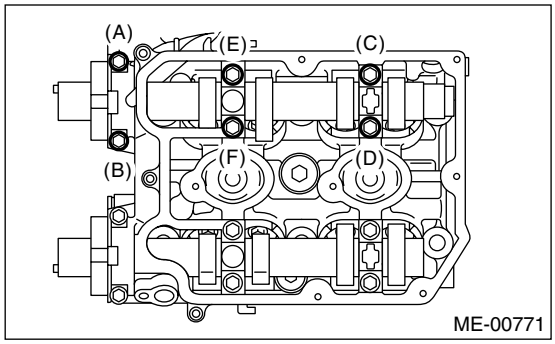
10) Remove the timing belt cover No.2 (RH).


ME-00107

11) Remove the spark plug cord.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.


ME-00712

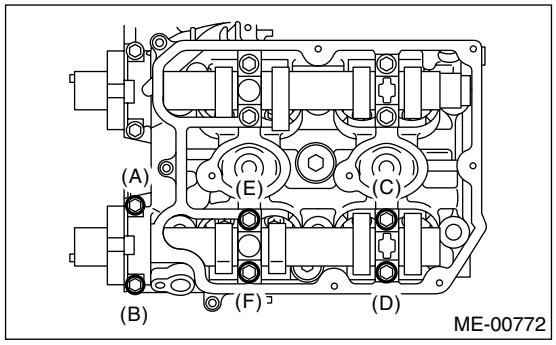
15) Loosen the variable valve timing solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00771

16) Remove the variable valve timing solenoid valve assembly, intake camshaft cap, and camshaft.

17) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the exhaust camshaft cap and camshaft.

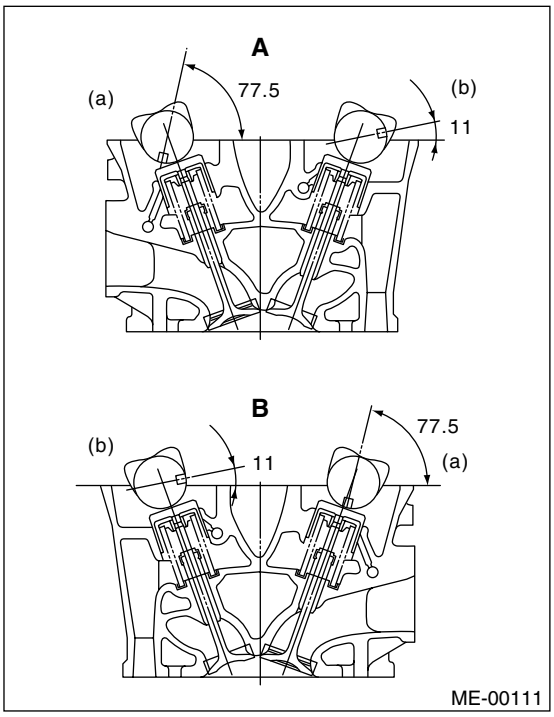
NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

19) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation: Apply engine oil to cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft (RH) need not be rotated when set at position shown in the figure. Intake camshaft (LH): Rotate 80° clockwise. Exhaust camshaft (LH): Rotate 45° counterclockwise.

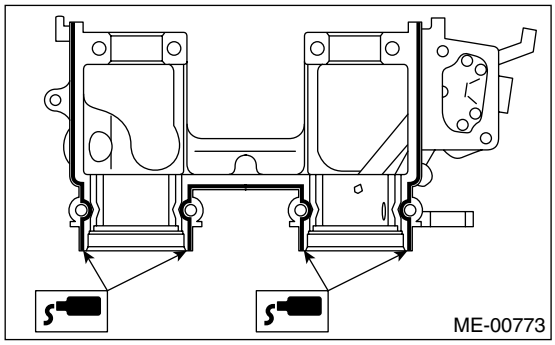


A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap and variable valve timing solenoid valve assembly installation:
(1) Apply fluid packing sparingly to cap mating surface.

NOTE:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward the oil seal, resulting in oil leaks.

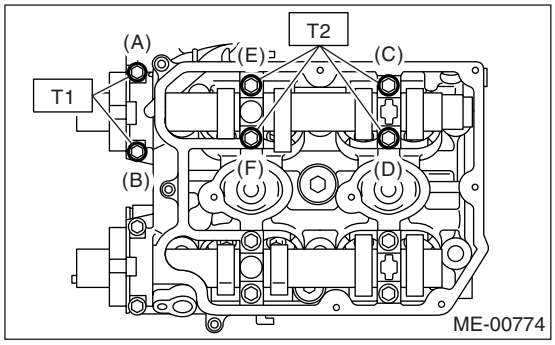
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).

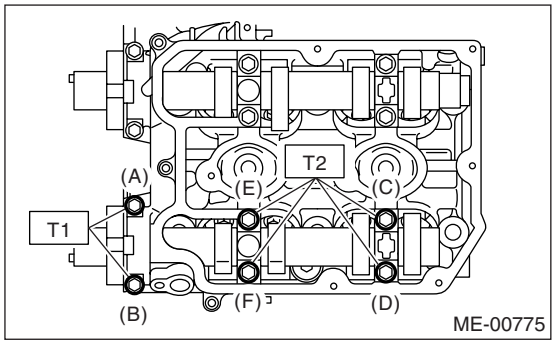
(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) Similarly, tighten cap on the exhaust side. After tightening cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

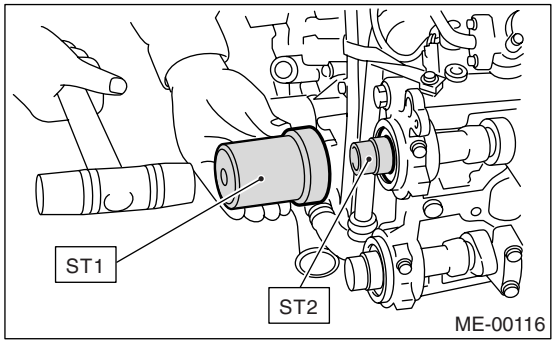
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



3) Camshaft oil seal installation: Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

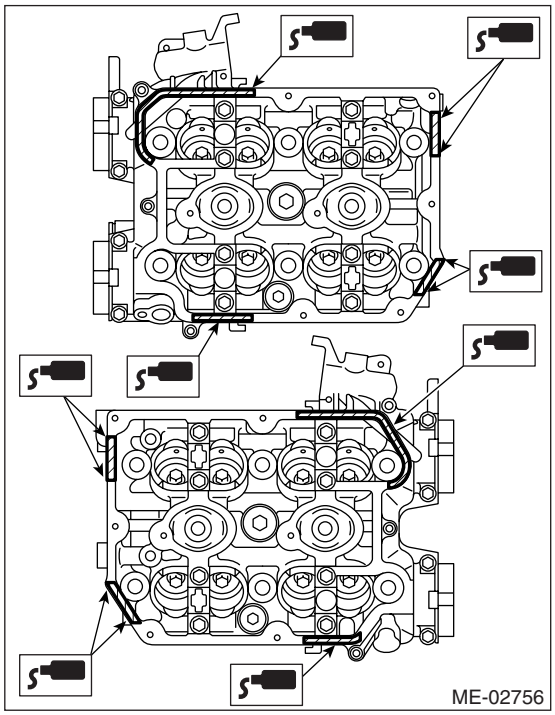
NOTE:
Use a new oil seal.

ST1	499587600	OIL SEAL GUIDE
ST2	499597200	OIL SEAL GUIDE



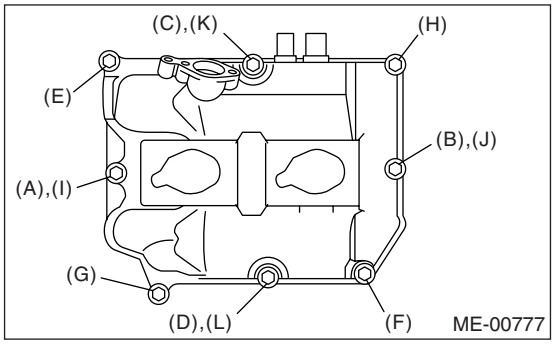
4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the specified point of cylinder head.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



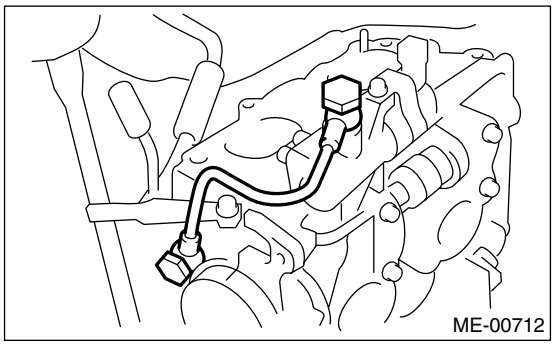
(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.
(4) Tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

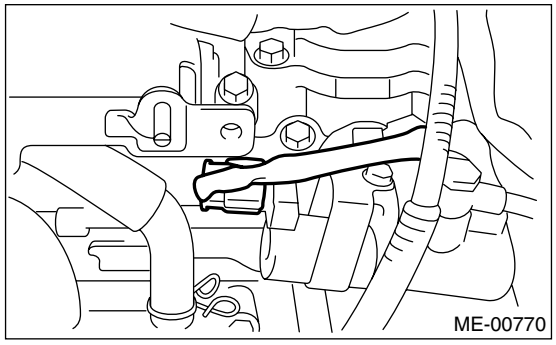


5) Install the oil pipe.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)

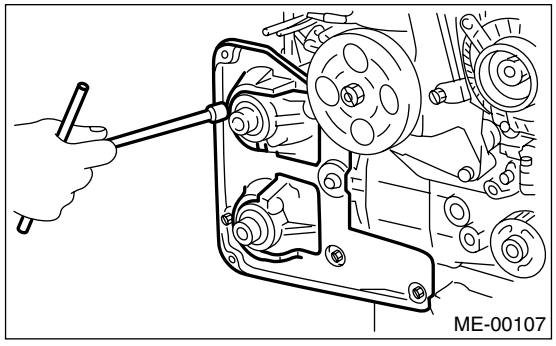


6) Connect the variable valve timing solenoid valve connector.



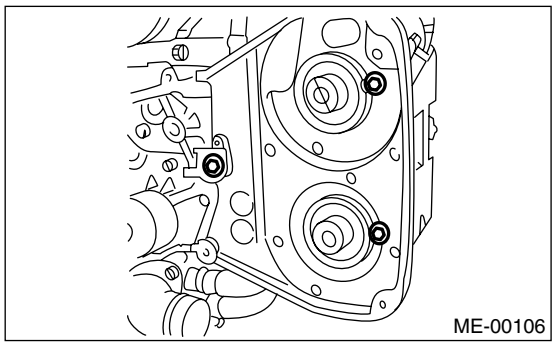
7) Install the spark plug cord.
8) Similarly, install the parts on right-hand side.
9) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



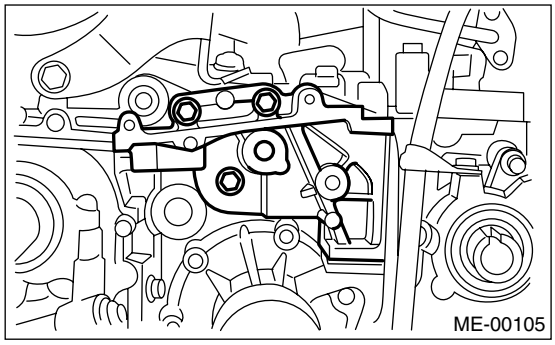
10) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



11) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

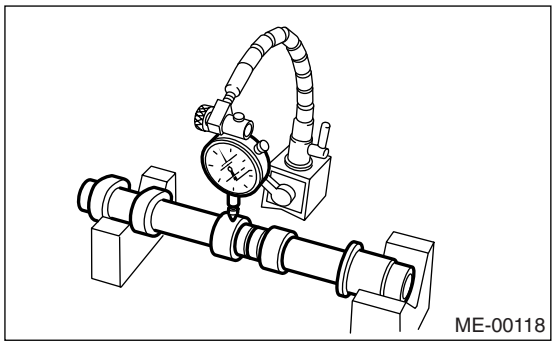


12) Install the crankshaft sprocket. ***<Ref. to ME(H4DOTC)-58, INSTALLATION, CRANKSHAFT SPROCKET.>***
13) Install the camshaft sprockets. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>
14) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>
15) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
16) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
17) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.00079 in)

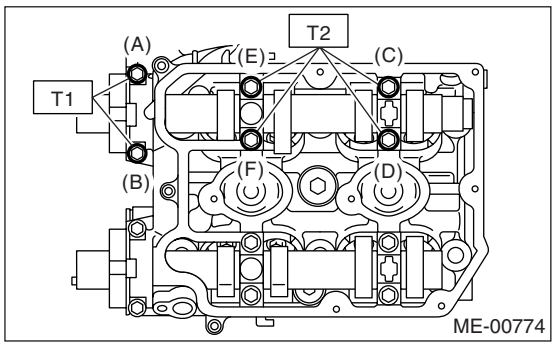


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.
Do not turn the camshaft.

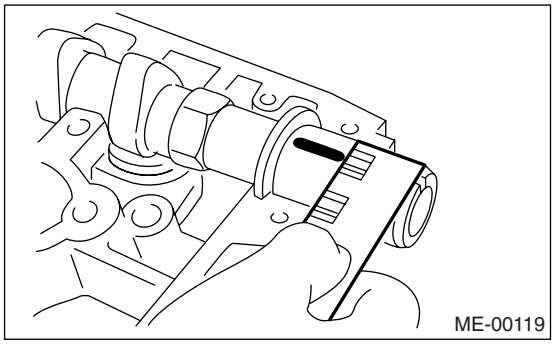
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(5) Remove the bearing caps.
(6) Measure the widest point of plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



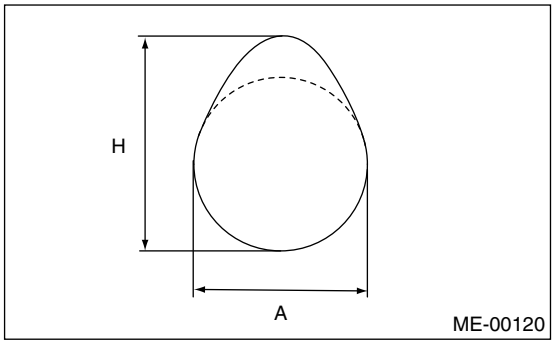
(7) Completely remove the plastigauge.
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H, replace if the limit has been exceeded.

Cam height: H

Standard:
Intake:
46.55 — 46.65 mm (1.833 — 1.837 in)
Exhaust:
46.75 — 46.85 mm (1.841 — 1.844 in)

Limit:
Intake:
46.45 mm (1.829 in)
Exhaust:
46.65 mm (1.837 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



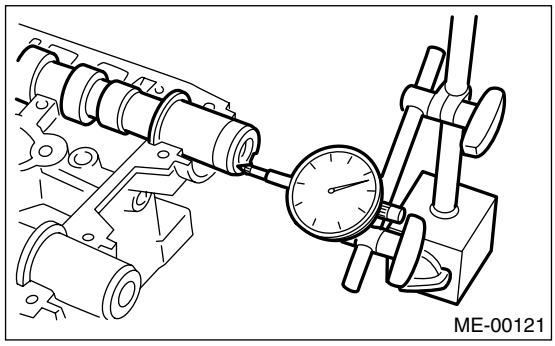
6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:

0.068 — 0.116 mm (0.0027 — 0.0046 in)

Limit:

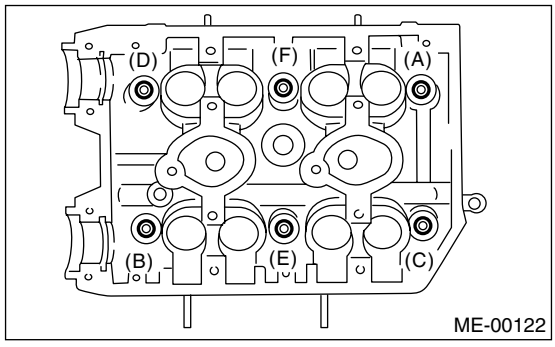
0.14 mm (0.0055 in)


ME-00121

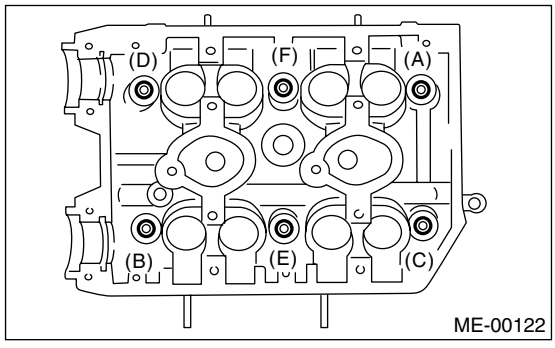
19.Cylinder Head Assembly

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold.<Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(H4DOTC)-59, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

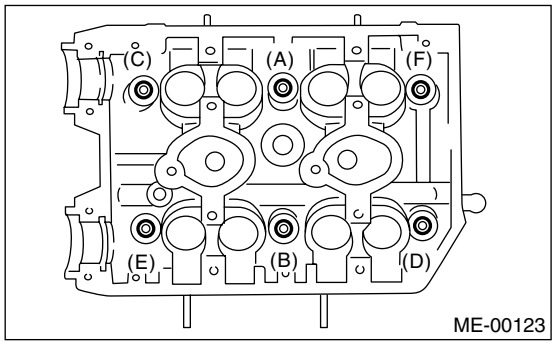
NOTE:
- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
   (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
   (6) Tighten all bolts 80 to 90° in alphabetical sequence.
   (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

NOTE:
Do not tighten the bolts by more than 45°.

   (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:
Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



3) Install the camshaft. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>
6) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>
7) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>

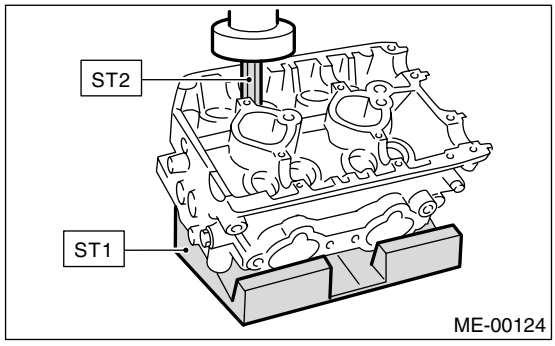
8) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
9) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
10) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>

C: DISASSEMBLY

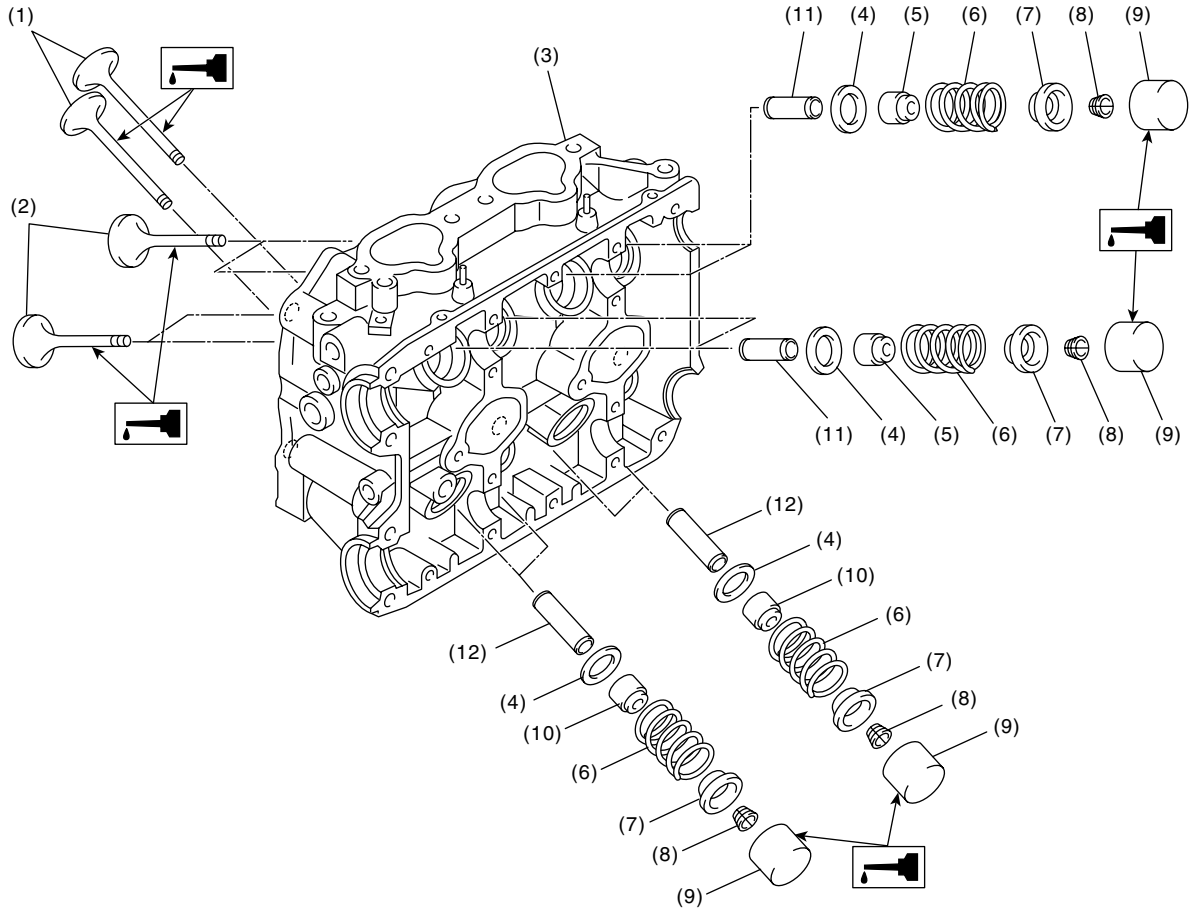
1) Remove the valve lifters.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
• Keep the removed parts in order for re-installing in their original positions.
• Mark each valve to prevent confusion.
• Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



D: ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

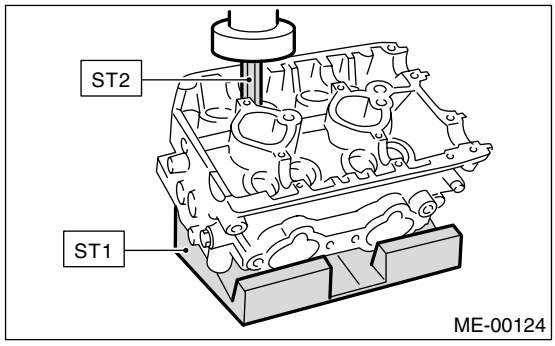
1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 4982676 00 CYLINDER HEAD TABLE
ST2 499718 000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring, and then fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

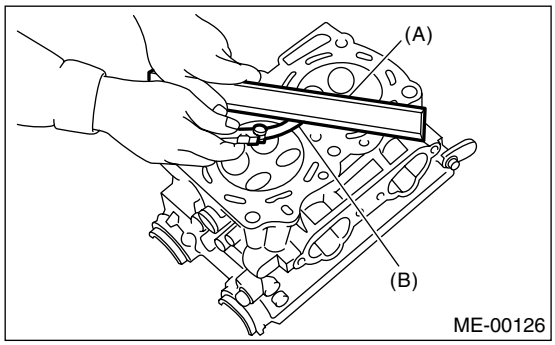
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

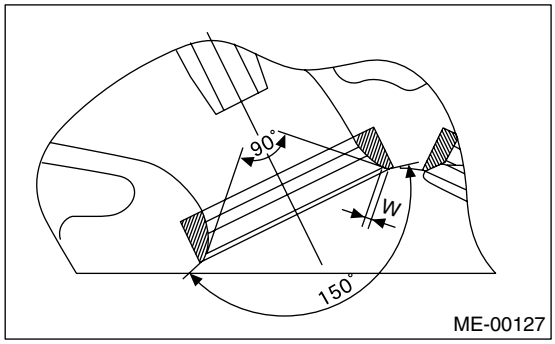
NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake
Standard 1.0 mm (0.039 in)
Limit 1.7 mm (0.067 in)
Exhaust
Standard 1.5 mm (0.059 in)
Limit 2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit
0.15 mm (0.0059 in)

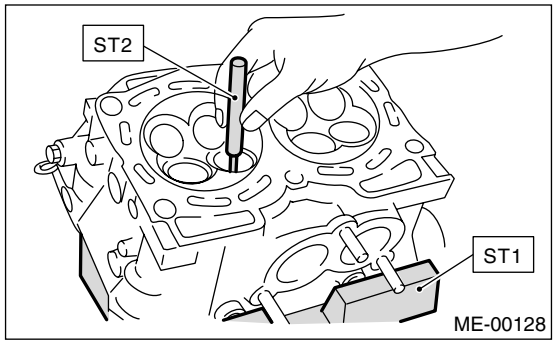
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

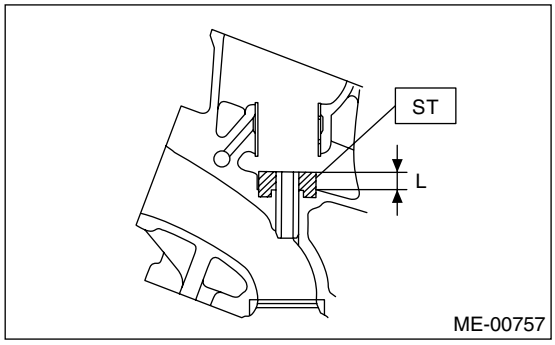
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



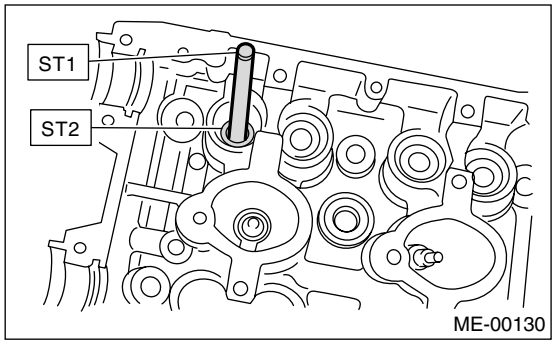
(3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

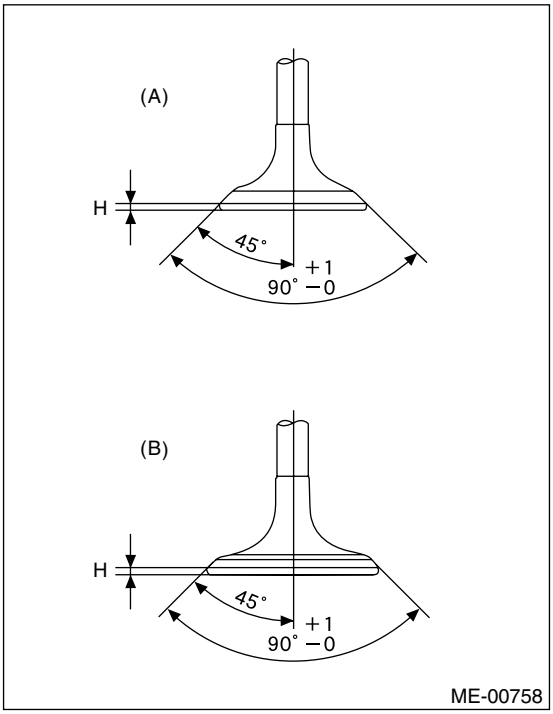
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:
Intake (A)
Standard 1.2 mm (0.047 in)
Limit 0.8 mm (0.031 in)
Exhaust (B)
Standard 1.5 mm (0.059 in)
Limit 0.8 mm (0.031 in)

Valve overall length:
Intake (A)
104.4 mm (4.110 in)
Exhaust (B)
104.65 mm (4.120 in)

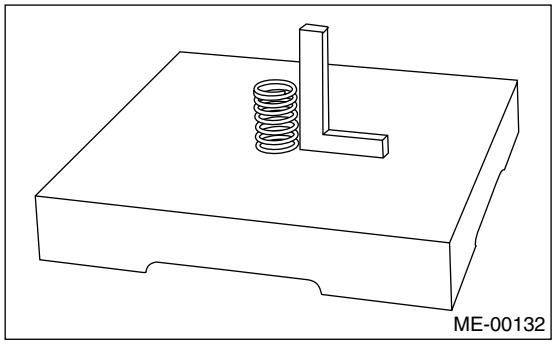


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb) /36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) /26.45 mm (1.041 in)
Squareness		2.5°, 2.1 mm (0.083 in)



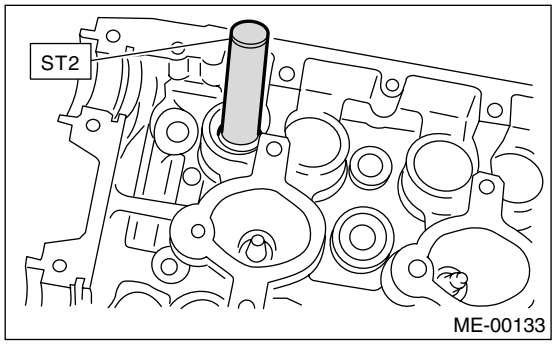
6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.
1) Place the cylinder head on ST1.
2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.
ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:
• Apply engine oil to oil seal before press-fit.
• Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:
Intake [Black] Exhaust [Brown]

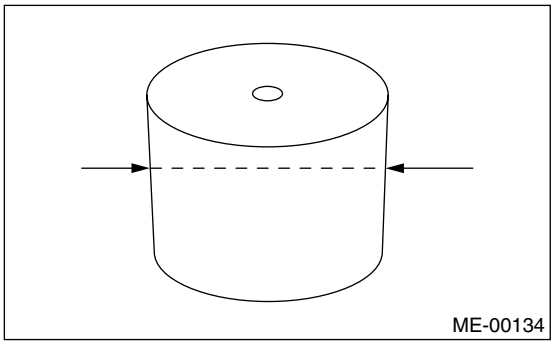
Color of spring part:
Intake [White] Exhaust [White]



7. VALVE LIFTER

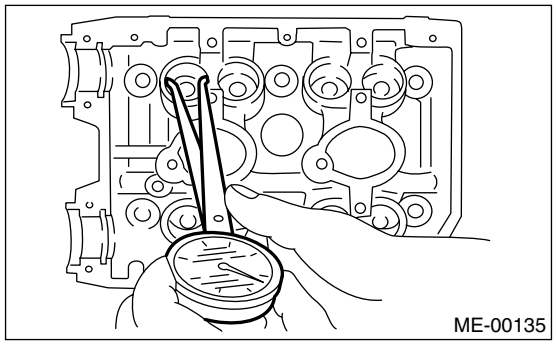
1) Visually check the valve lifter.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:
0.100 mm (0.0039 in)

F: DISPOSAL

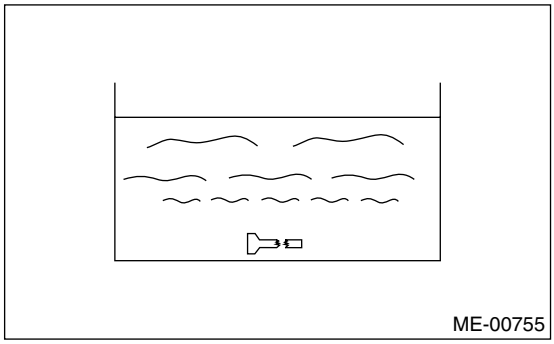
CAUTION:
• Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
• Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.
(1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
(2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).
(3) Immerse the damaged valve in the receptacle.

CAUTION:
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

(4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.
(5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:
Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.

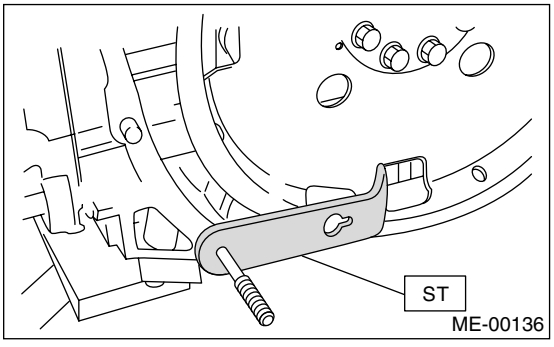


20.Cylinder Block

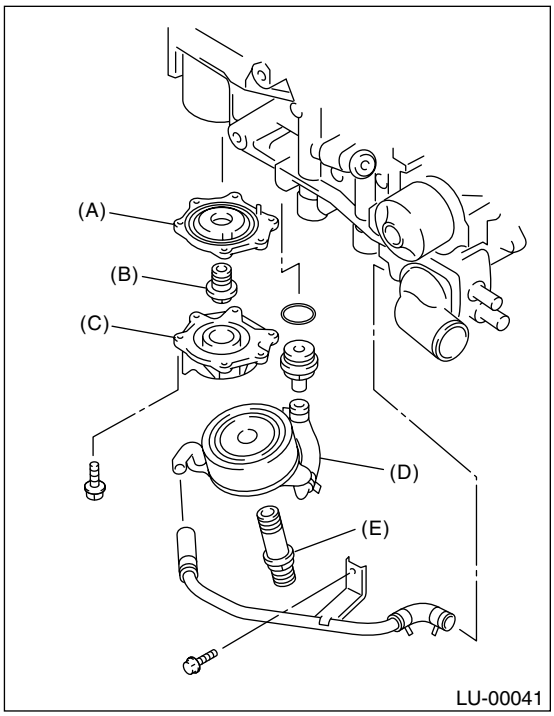
A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>
4) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Head Assembly.>
10) Remove the clutch disc and cover.<Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT model) <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
12) Remove drive plate. (AT model)
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



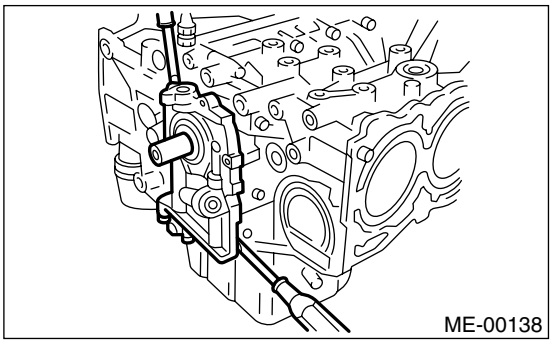
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter.
ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))
16) Remove the oil cooler.

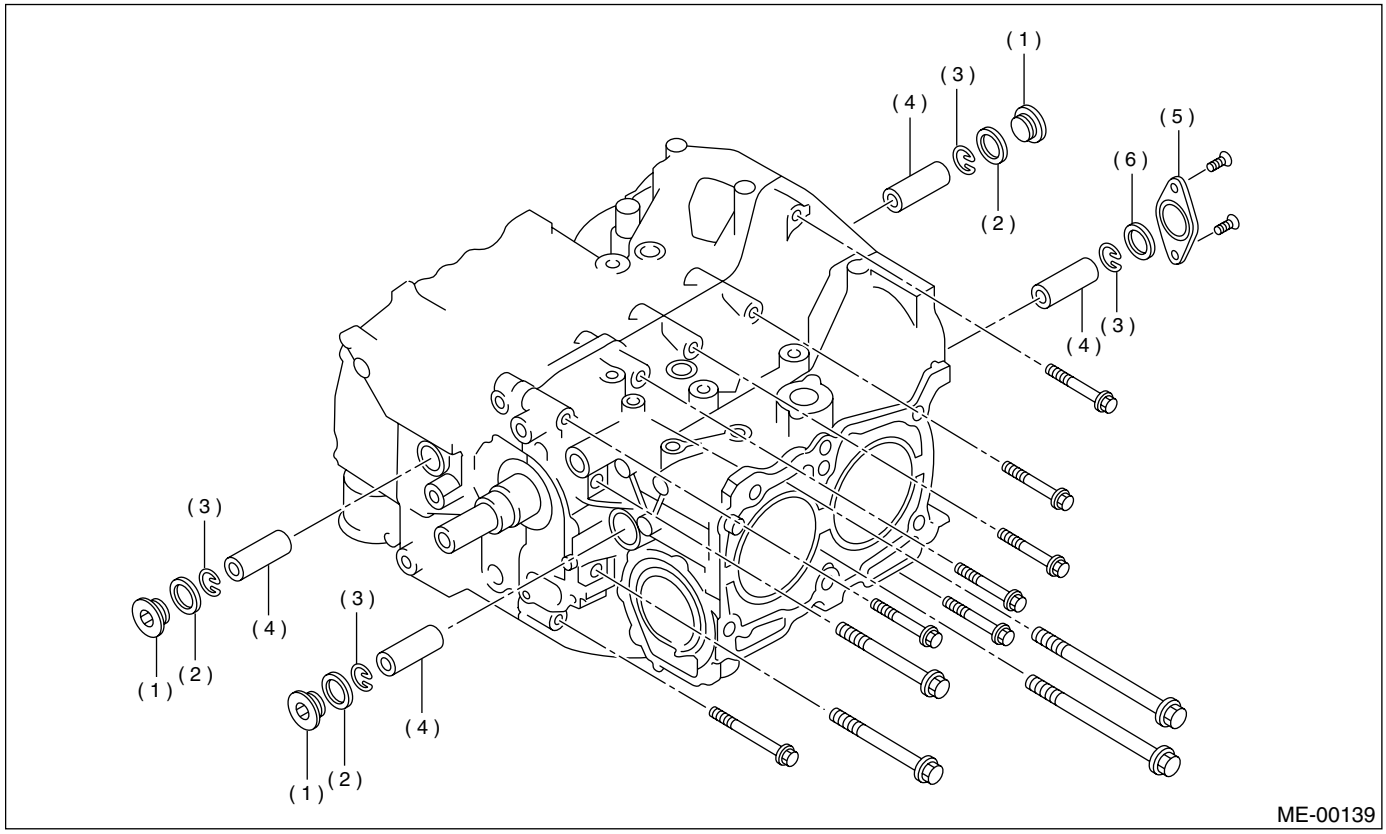


(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

17) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.
Do not use a screwdriver or similar tool in place of oil pan cutter.
18) Remove the oil strainer stay.
19) Remove the oil strainer.
20) Remove the baffle plate.
21) Remove the water pipes.
22) Remove the water pump.
23) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.

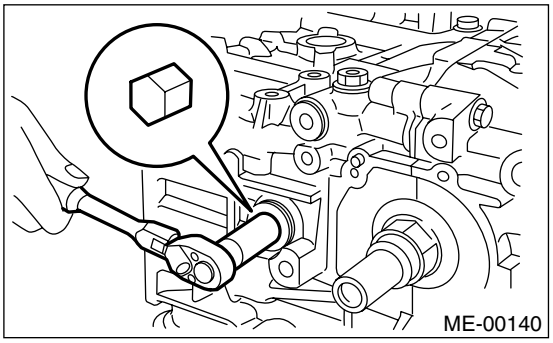

ME-00138



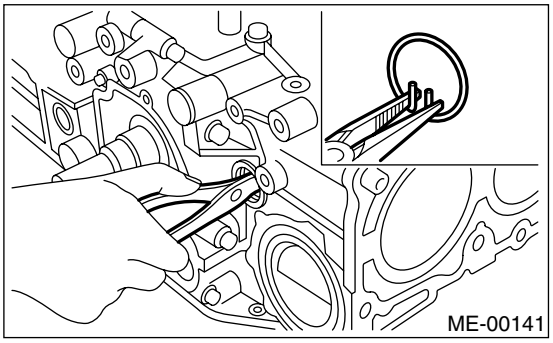
ME-00139

(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

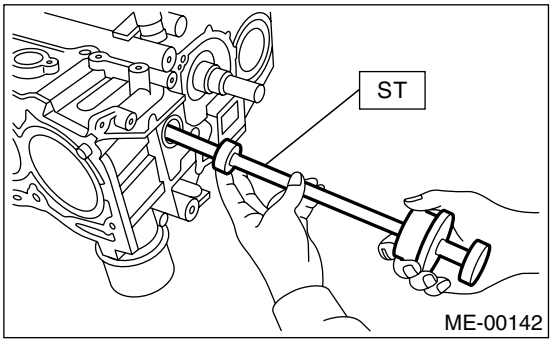


25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



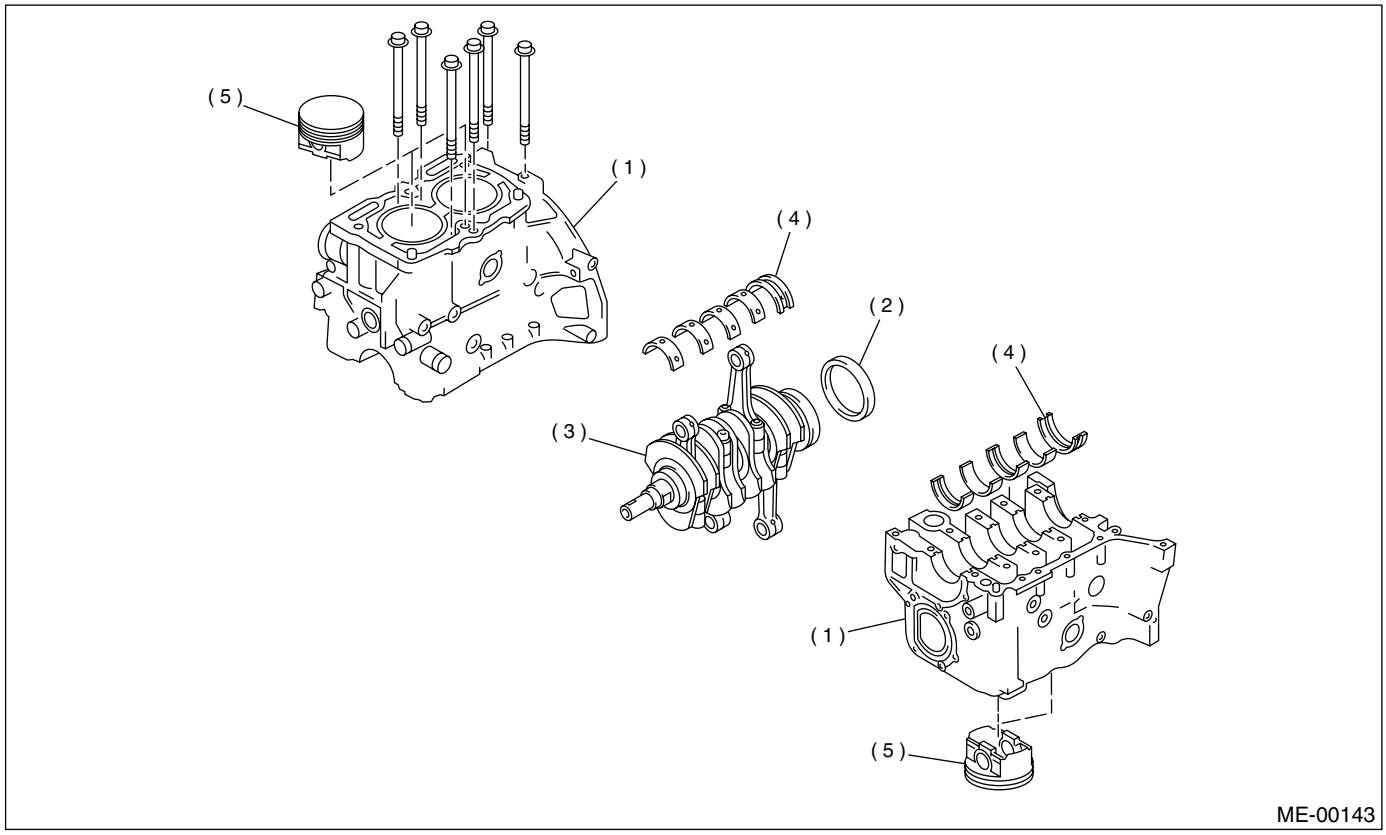
26) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.
28) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.
29) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.
30) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
31) Separate the cylinder blocks (LH) and (RH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

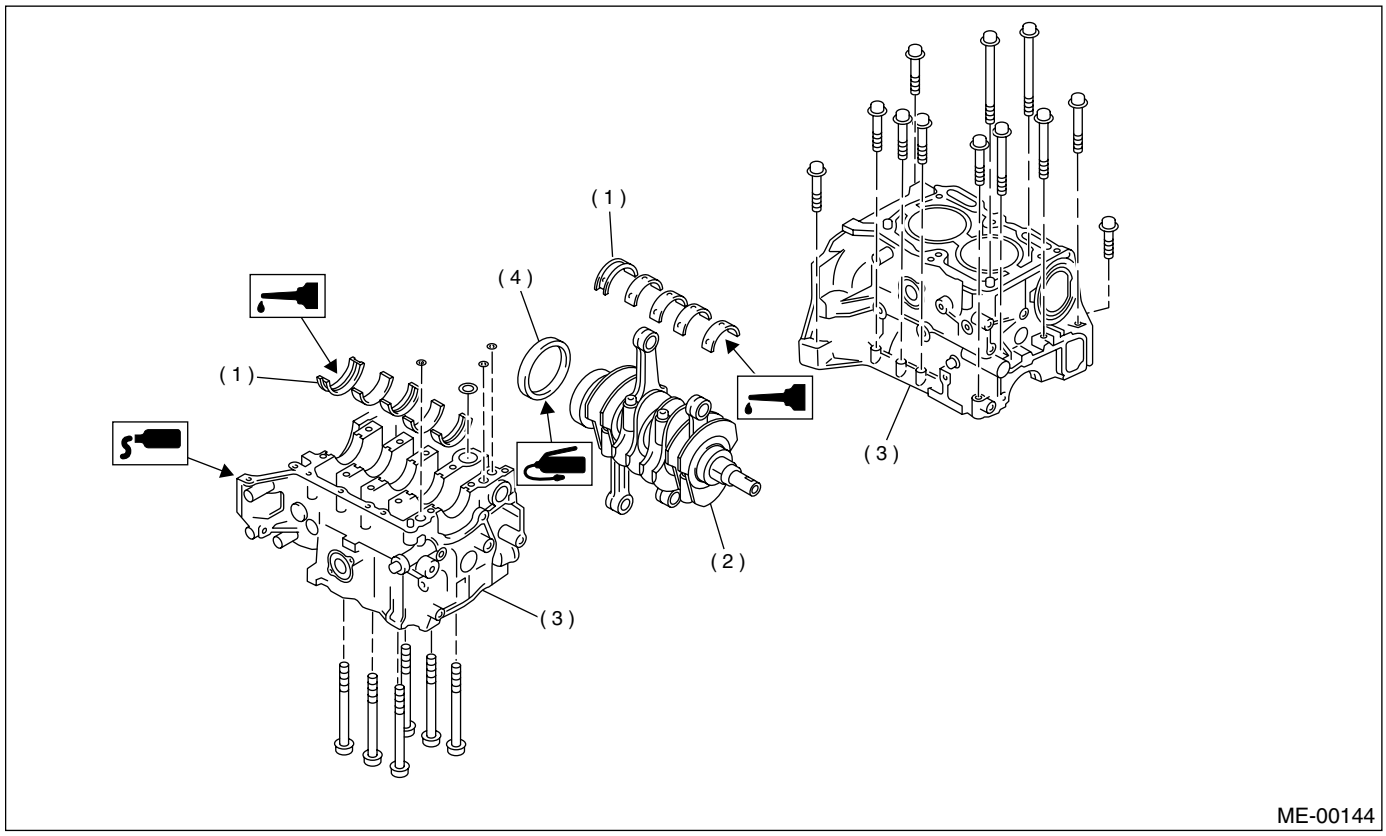
32) Remove the rear oil seal.
33) Remove the crankshaft together with connecting rod.
34) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

35) Draw out each piston from cylinder block using a wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION

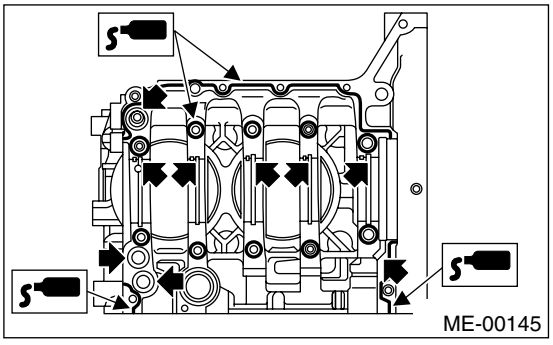


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on #2 and #4 cylinder block.
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

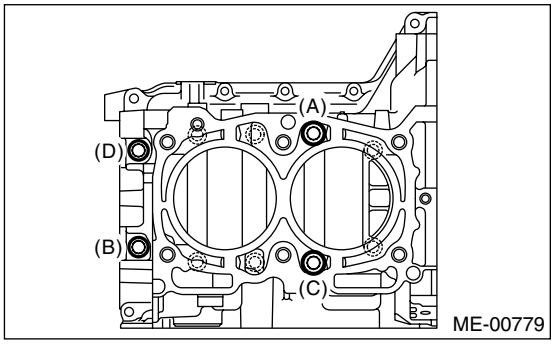
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



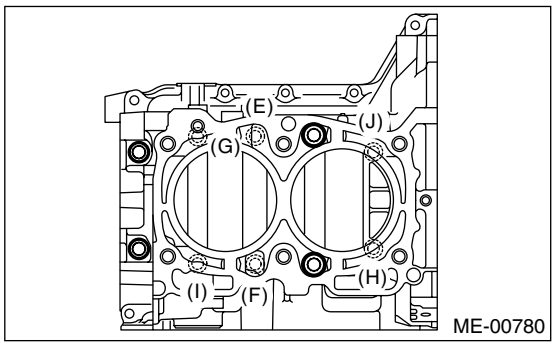
4) Apply engine oil to washers and thread of bolts.
5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



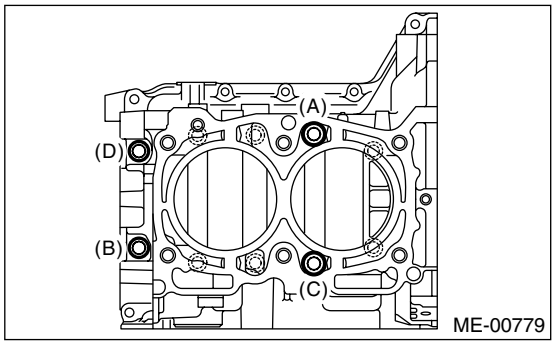
6) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



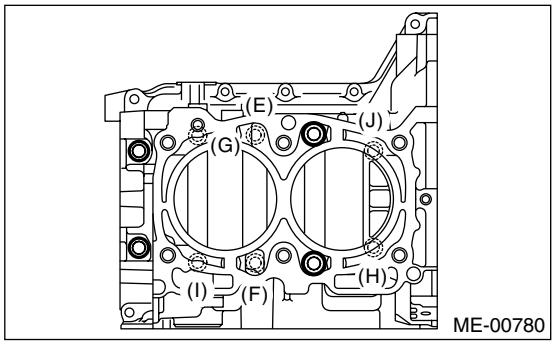
7) Further tighten the LH side bolts (A — D) in alphabetical sequence.

Tightening torque:
(A), (C): 20 N·m (2.0 kgf-m, 14.8 ft-lb)
(B), (D): 15 N·m (1.5 kgf-m, 10.8 ft-lb)

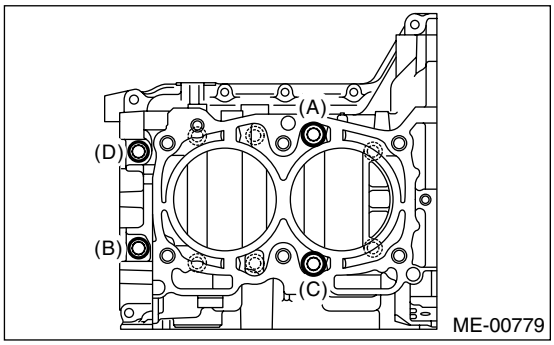


8) Further tighten the RH side bolts (E — J) in alphabetical sequence.

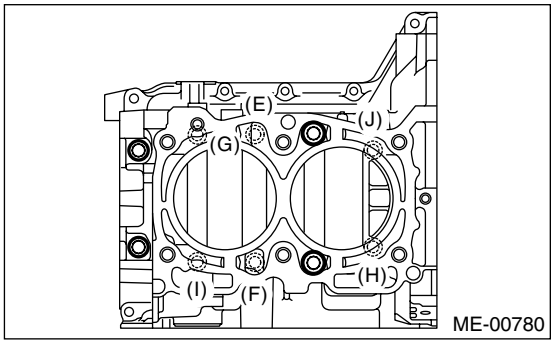
Tightening torque:
(E), (F), (G), (I): 20 N·m (2.0 kgf-m, 14.8 ft-lb)
(H), (J): 18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Further tighten the LH side bolts (A — D) by 90° in alphabetical sequence.

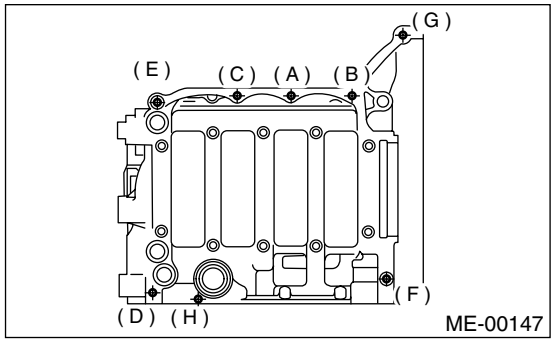


10) Further tighten the RH side bolts (E — J) by 90° in alphabetical sequence.



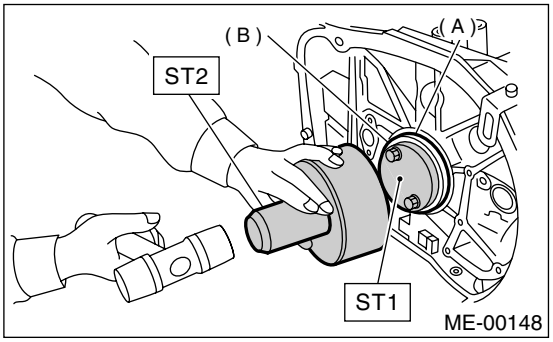
11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



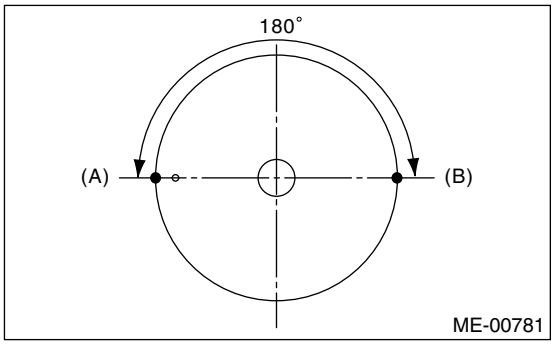
12) Install the rear oil seal using ST1 and ST2.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

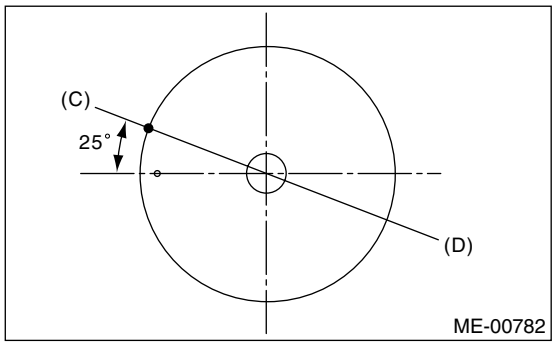


(A) Rear oil seal
(B) Flywheel attaching bolt

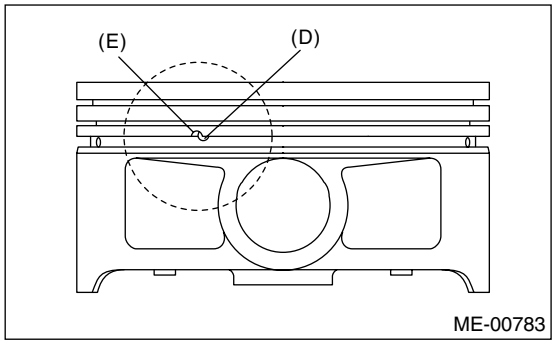
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



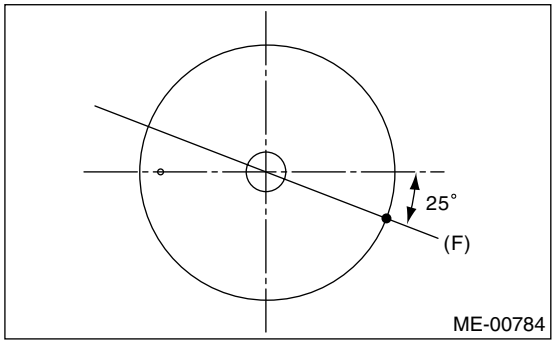
15) Position the upper rail gap at (C) in the figure.



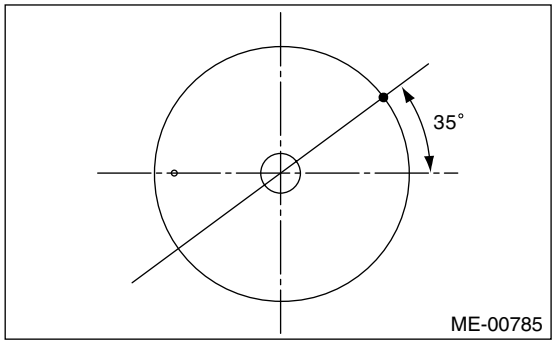
16) Align upper rail spin stopper (D) with piston side surface hole (E).



17) Position the expander gap at (F) in the figure.



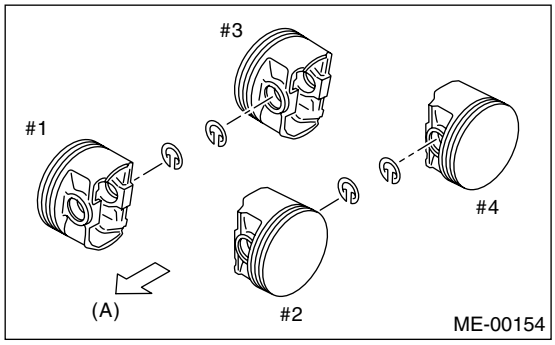
18) Position the lower rail gap at (G) in the figure.

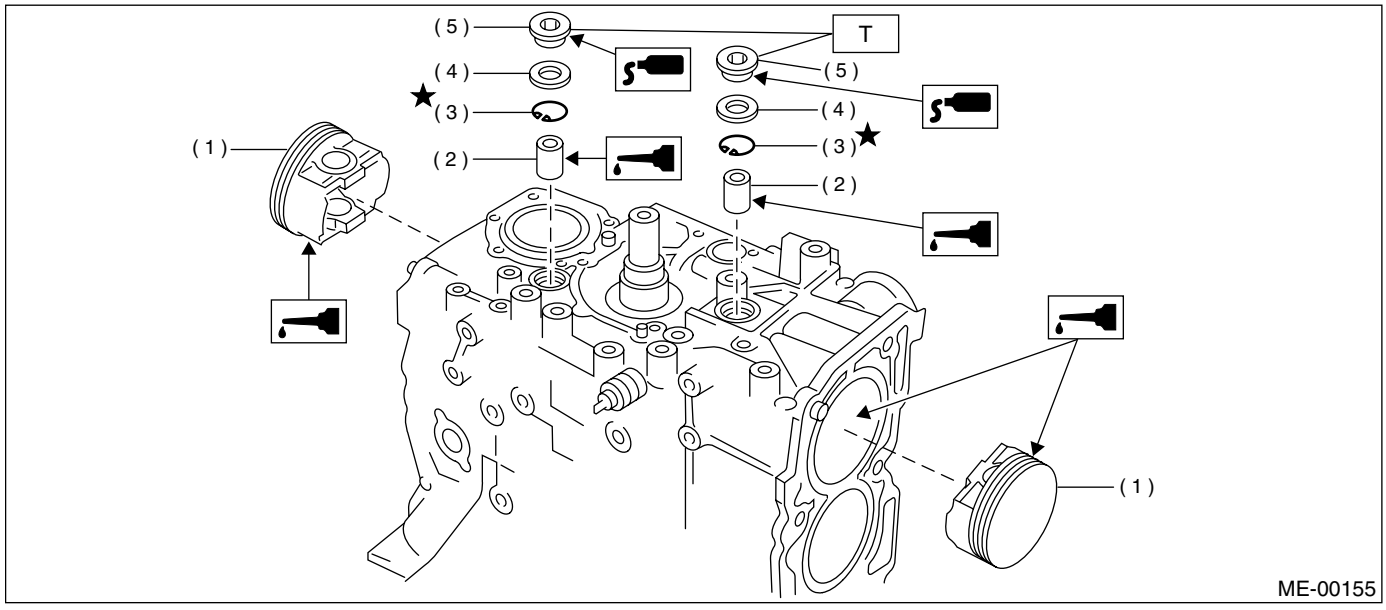


NOTE:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

19) Install the circlip.
Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

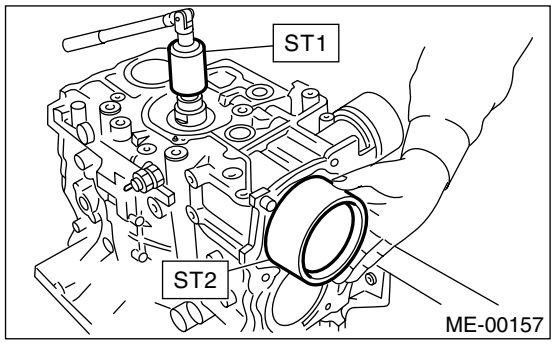
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.4)

20) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

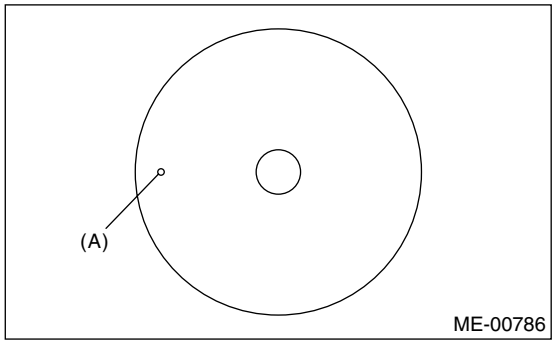
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



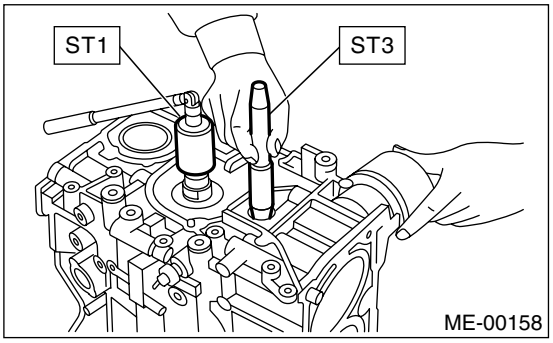
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

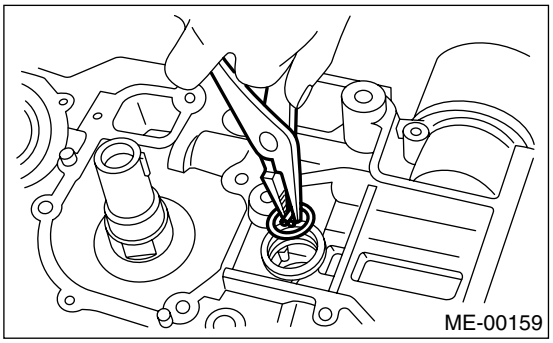
21) Installing piston pin:
(1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



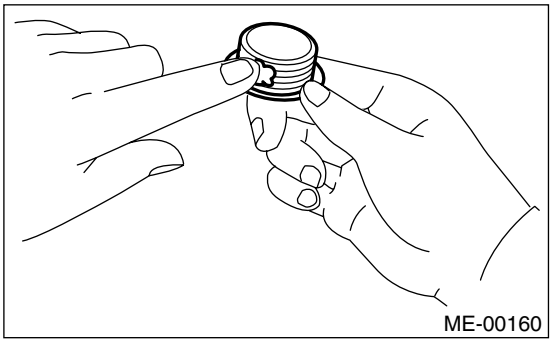
(2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
(3) Using the ST, install the circlip.

NOTE:
Use new circlips.



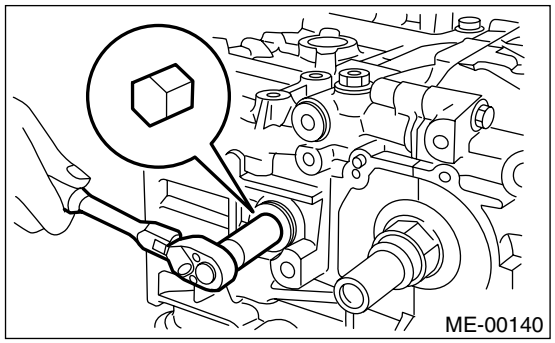
(4) Apply fluid packing around the service hole plug.

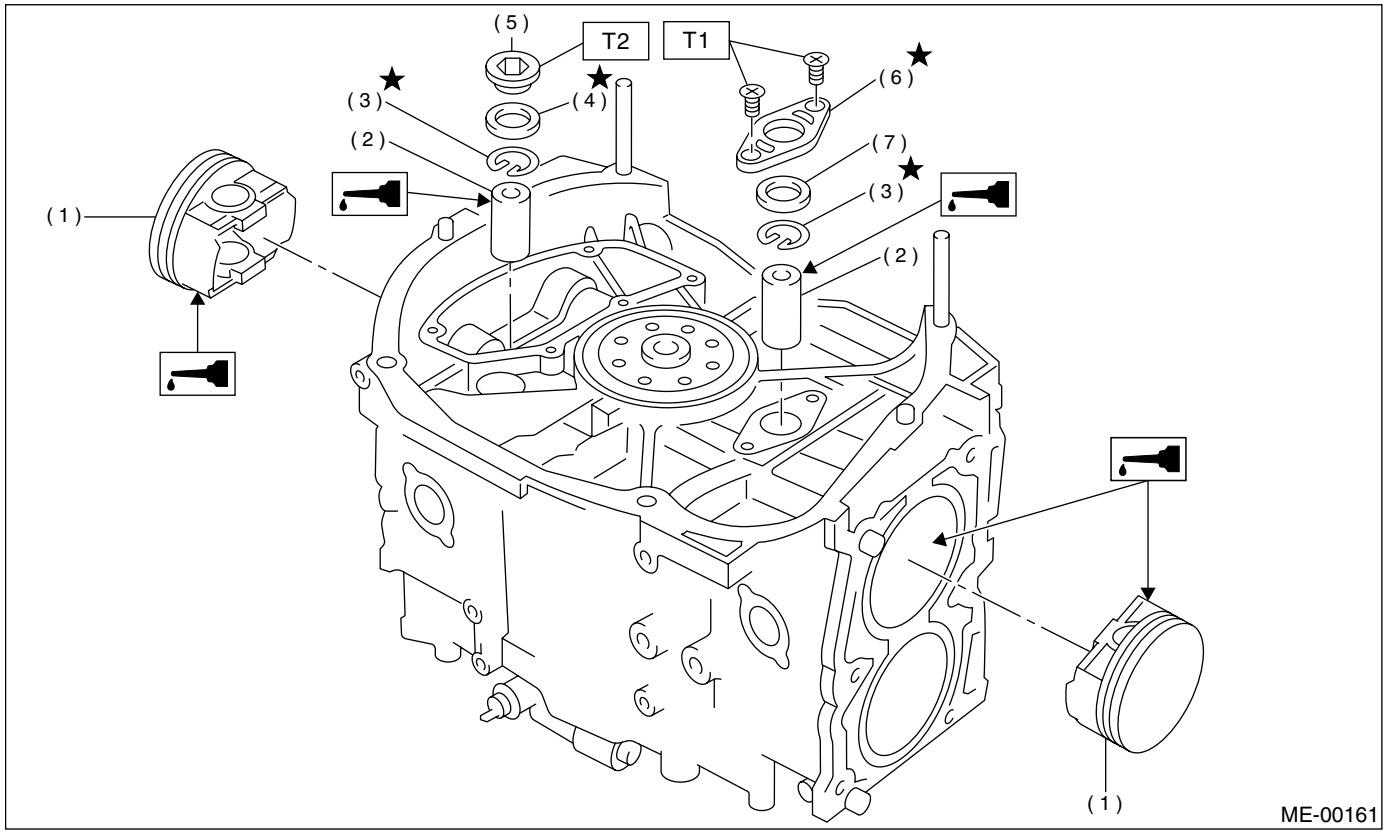
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.4)

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.
23) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring

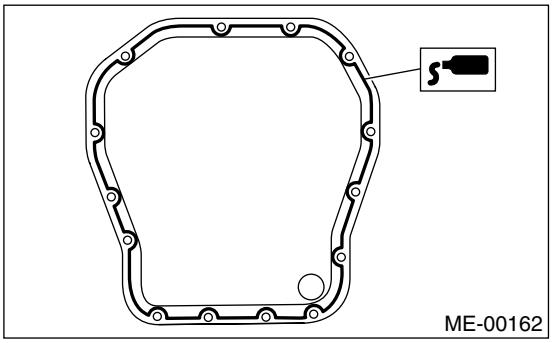
Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

25) Install the oil strainer stay.

26) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:
Part No. 004403012
THREE BOND 1207C or equivalent

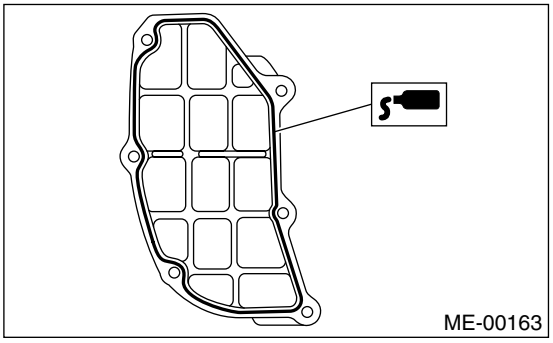
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



27) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

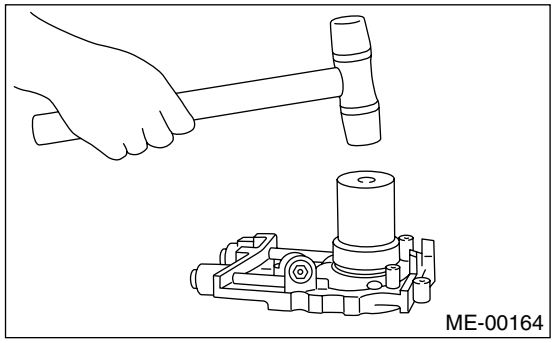
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



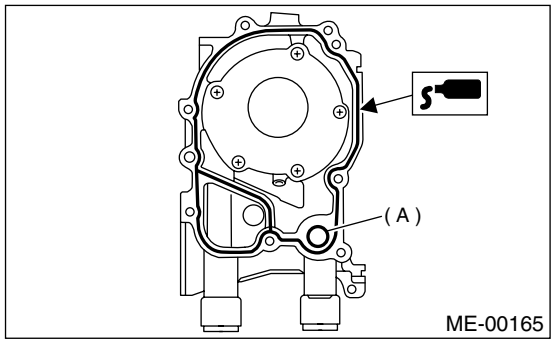
28) Install the flywheel. <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>
29) Install the clutch disc and cover. <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
30) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER



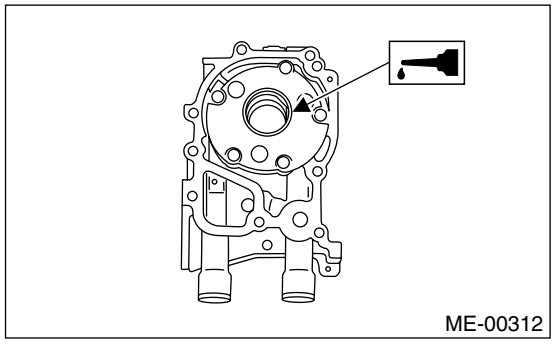
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

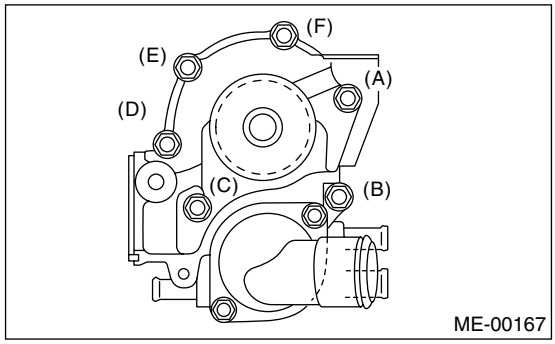
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

31) Install the water pump and gasket.

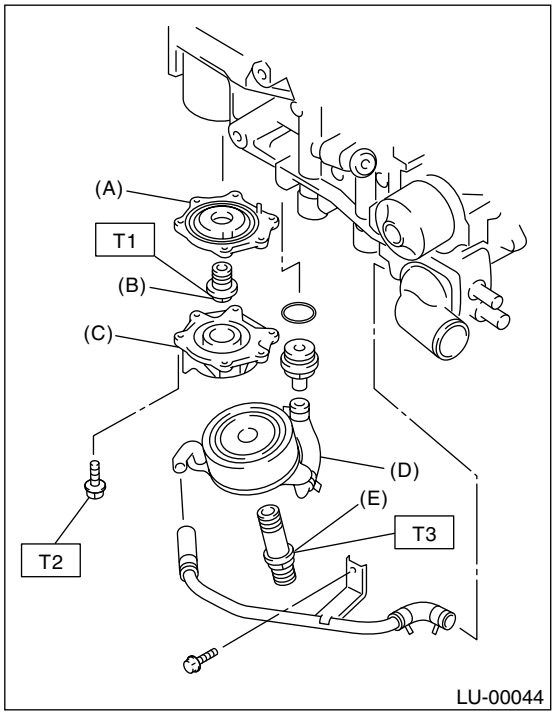
Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



32) Install the water by-pass pipe for heater.
33) Install the oil cooler.

Tightening torque:
T1: 45 N·m (4.6 kgf-m, 33 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 54 N·m (5.3 kgf-m, 39 ft-lb)



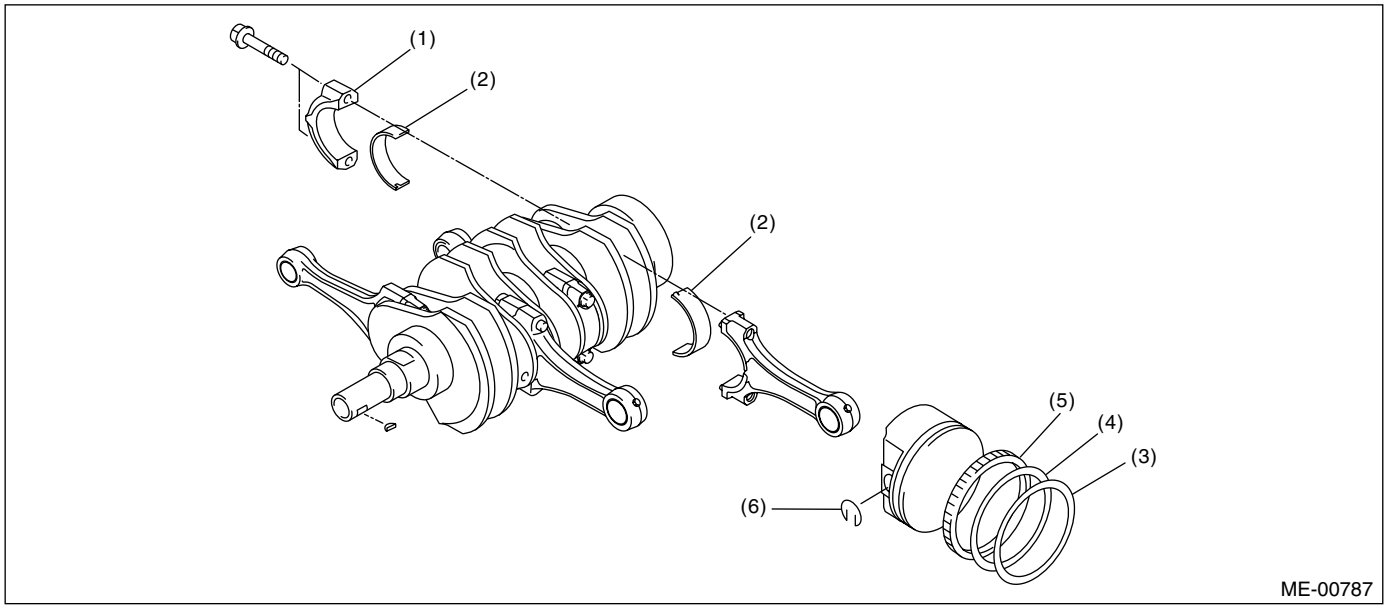
(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

34) Install the oil filter using ST.
ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm)
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm)
35) Install the water by-pass pipe between oil cooler and water pump.
36) Install the water pipe.

NOTE:
Always use a new O-ring.

37) Install the cylinder head assembly. ***<Ref. to ME(H4DOTC)-65, INSTALLATION, CYLINDER HEAD ASSEMBLY.>***
38) Install the oil level gauge guide and tighten the attaching bolt (LH side).
39) Install the rocker cover.
40) Install the crankshaft sprocket. ***<Ref. to ME(H4DOTC)-58, INSTALLATION, CRANKSHAFT SPROCKET.>***
41) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>
42) Install the timing belt assembly. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>
43) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
44) Install the crankshaft pulley. ***<Ref. to ME(H4DOTC)-47, INSTALLATION, CRANKSHAFT PULLEY.>***
45) Install the generator and A/C compressor brackets on cylinder head.
46) Install the V-belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>
47) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

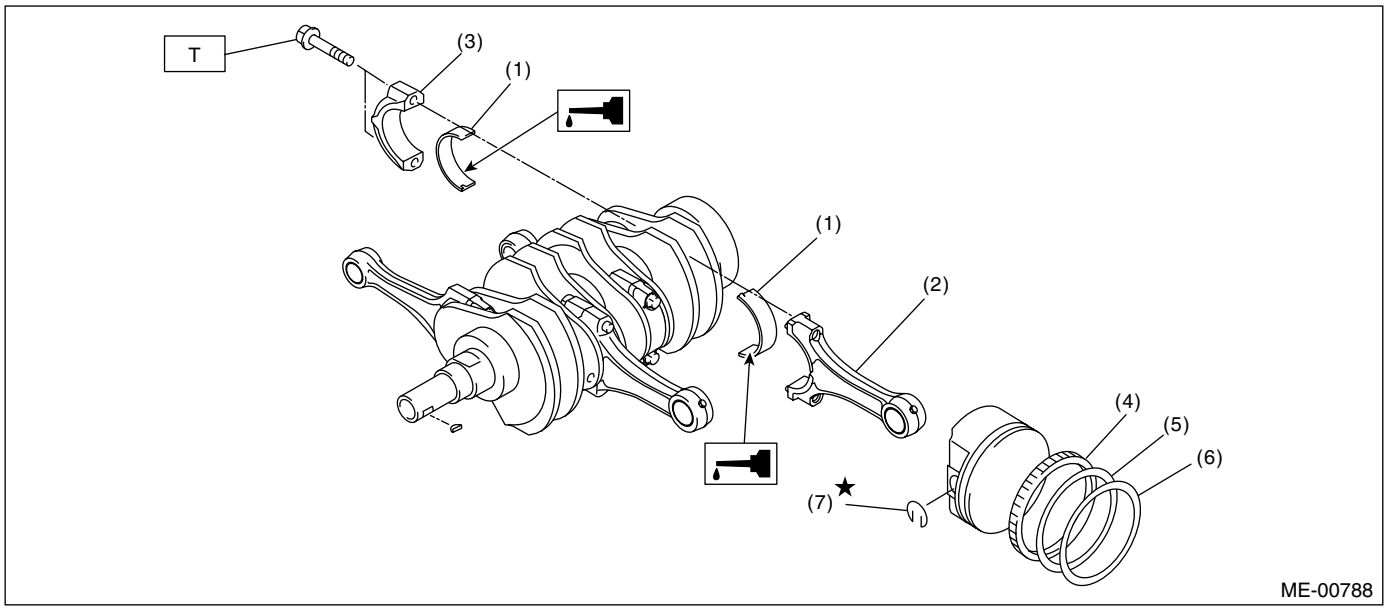
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip

Tightening torque: N·m (kgf-m, ft-lb)
T: 52 (5.3, 38.4)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

NOTE:
Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

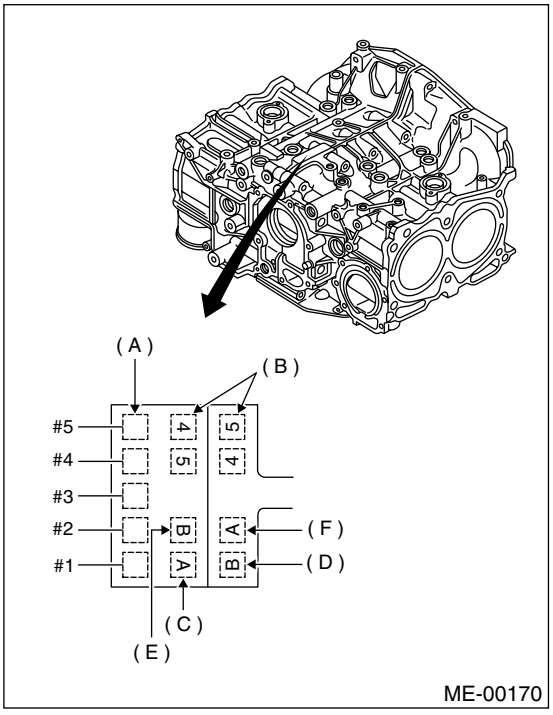
2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

NOTE:
Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



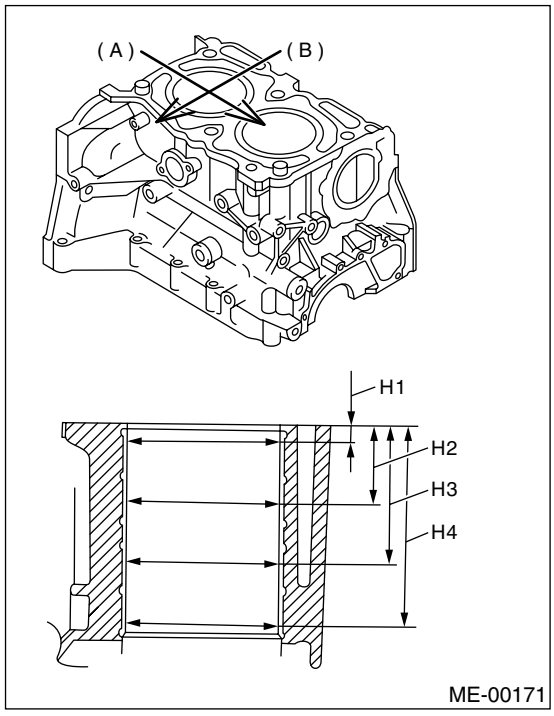
(A) Main journal size mark
(B) Cylinder block (RH)-(LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



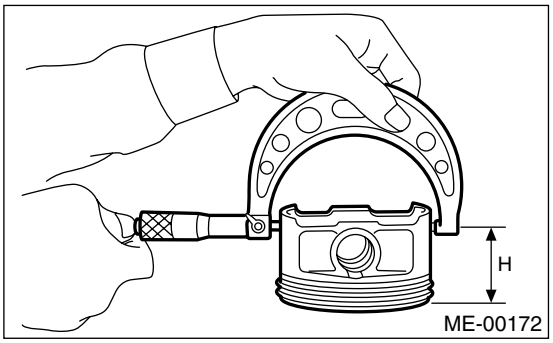
(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.2 mm (1.50 in)

Piston outer diameter:
Standard
A: 99.505 — 99.515 mm
(3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm
(3.9171 — 3.9175 in)
0.25 mm (0.0098 in) oversize
99.745 — 99.765 mm
(3.9270 — 3.9278 in)
0.50 mm (0.0197 in) oversize
99.995 — 100.015 mm
(3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)
Limit
0.030 mm (0.0012 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

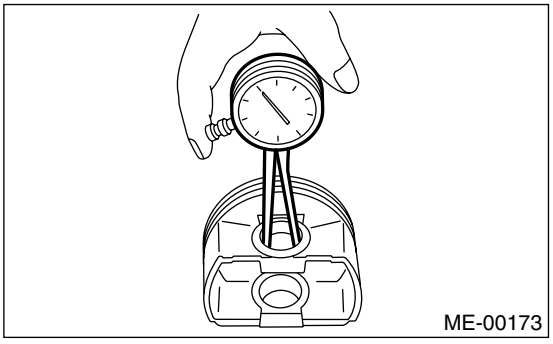
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

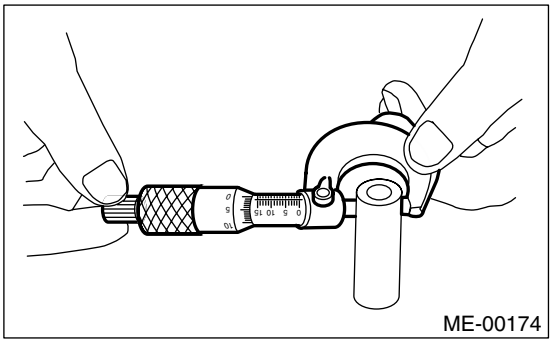
3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-86, CYLINDER AND PISTON.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

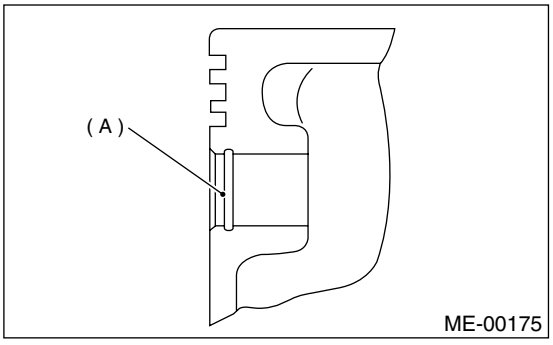
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



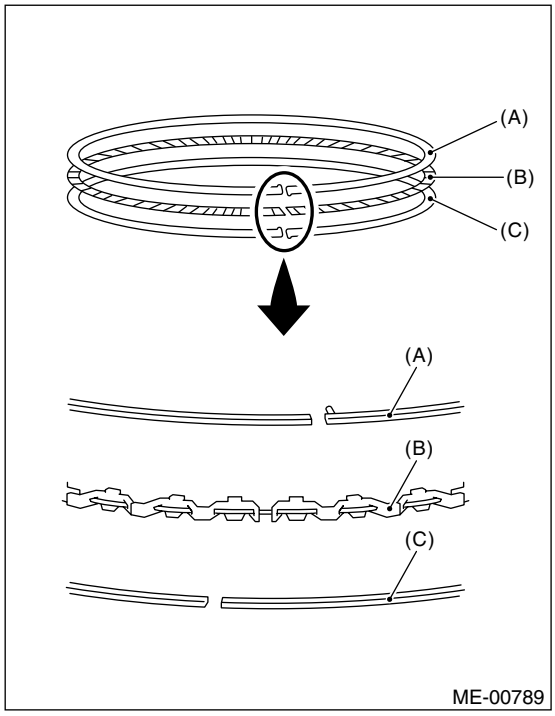
ME-00175

5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



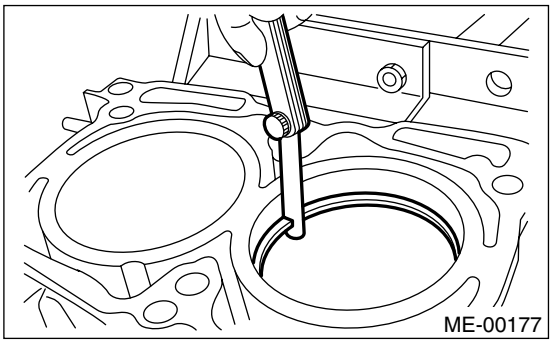
ME-00789

(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

Unit: mm (in)

		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

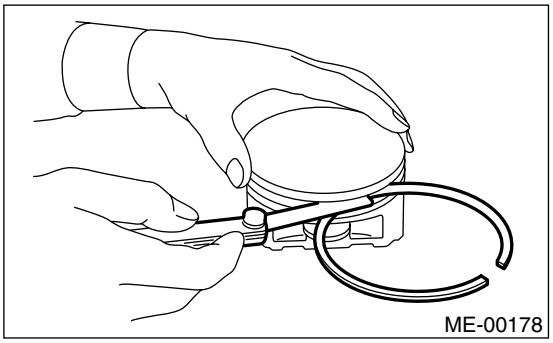

ME-00177

3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)

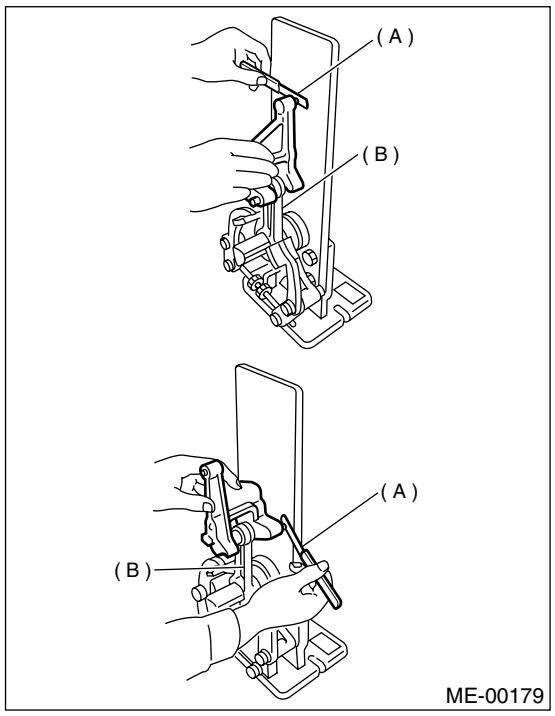
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

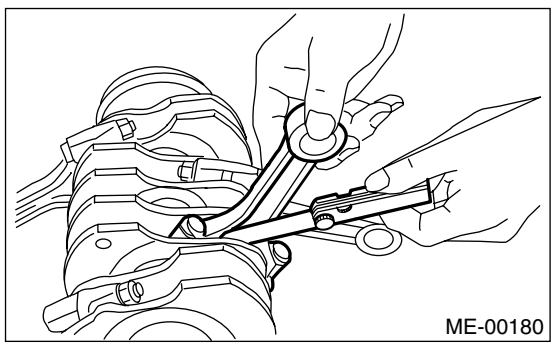


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.40 mm (0.016 in)


ME-00180

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

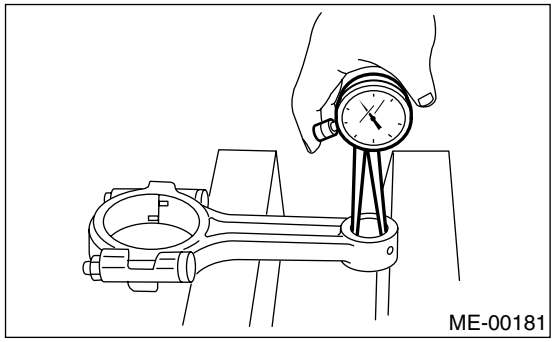
Connecting rod oil clearance:
Standard
0.017 — 0.045 mm (0.0007 — 0.0018 in)
Limit
0.050 mm (0.0020 in)

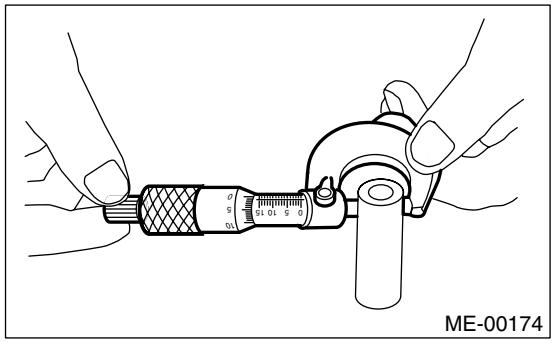
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

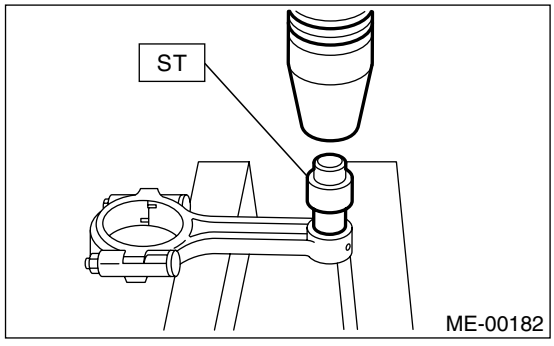
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows:
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

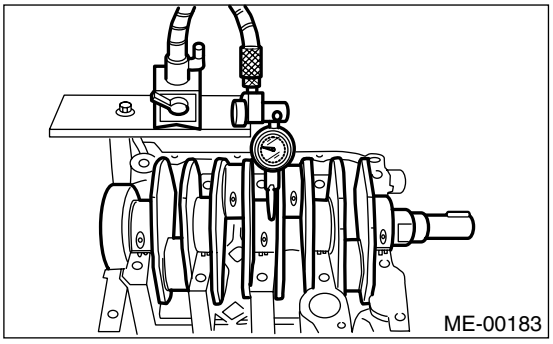
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

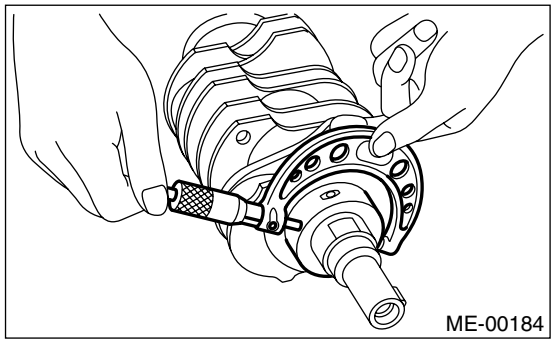
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.005 mm (0.0002 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)



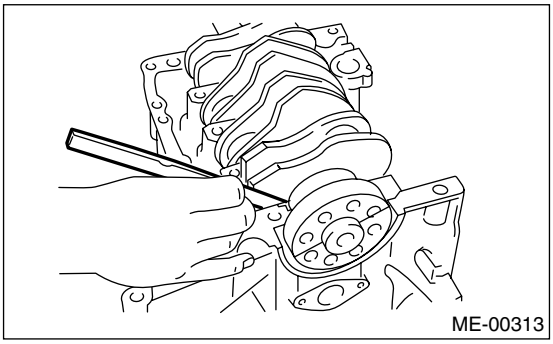
Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3, #5	#2, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft side clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Unit: mm (in)		
Crankshaft oil clearance		
#1	STD	0.003 — 0.030 (0.00012 — 0.0012)
	Limit	0.040 (0.0016)
#2	STD	0.012 — 0.033 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#3	STD	0.003 — 0.033 (0.00012 — 0.0012)
	Limit	0.040 (0.0016)
#4	STD	0.012 — 0.033 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#5	STD	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

21.Intake and Exhaust Valve

A: SPECIFICATIONS

For operations related to intake and exhaust valve, refer to “19. Cylinder Head.” <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Head Assembly.> and <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Head Assembly.>

22.Piston

A: SPECIFICATIONS

For operations related to piston, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-72, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-72, REMOVAL, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATIONS

For operations related to connecting rod, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-72, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-72, REMOVAL, Cylinder Block.>

24.Crankshaft

A: SPECIFICATIONS

For operations related to crankshaft, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-96, SPECIFICATIONS, Crankshaft.> and <Ref. to ME(H4DOTC)-72, REMOVAL, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refers to the possibility of reason for the trouble in order ("Very often" to "Rarely")

A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. Afterburning in exhaust system	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Accelerator cable out of adjustment	B

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-47, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-39, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC)

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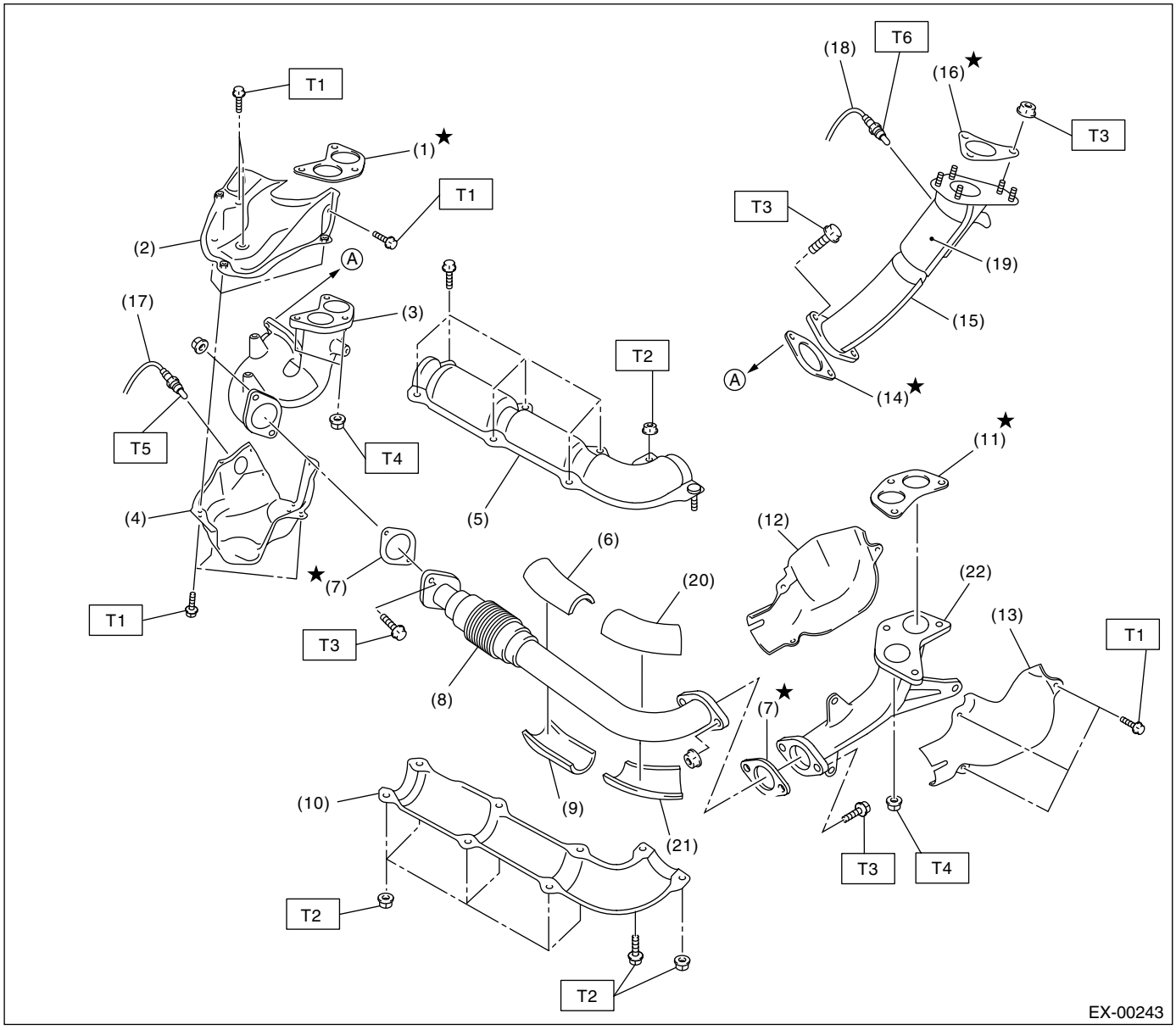
1. General Description

A: COMPONENT

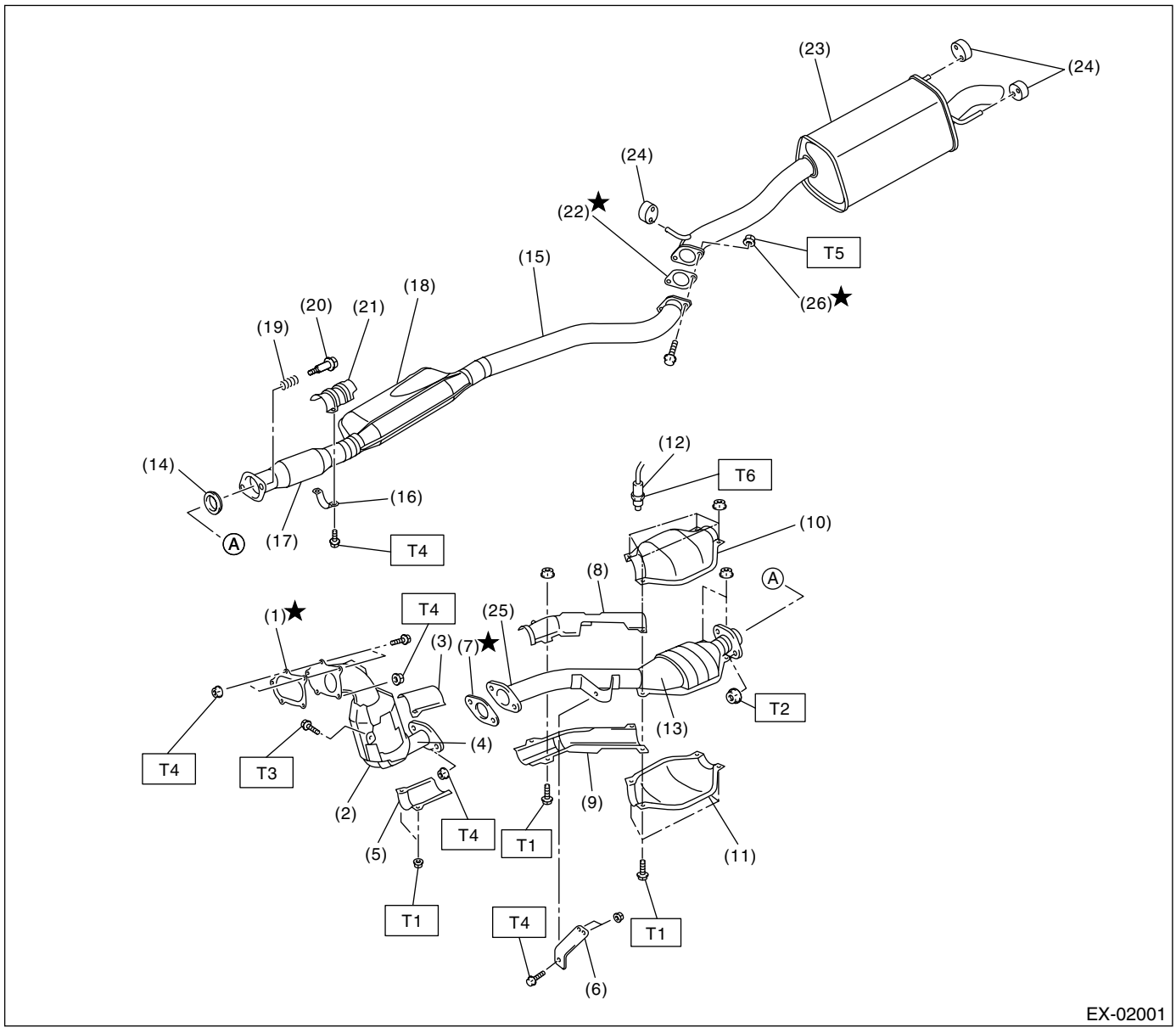
1. FRONT EXHAUST PIPE



(1) Gasket
(2) Exhaust manifold upper cover (RH)
(3) Exhaust manifold (RH)
(4) Exhaust manifold lower cover (RH)
(5) Front exhaust pipe upper cover
(6) Front exhaust pipe upper insulator (RH)
(7) Gasket
(8) Front exhaust pipe
(9) Front exhaust pipe lower insulator (RH)
(10) Front exhaust pipe lower cover
(11) Gasket
(12) Exhaust manifold upper cover (LH)
(13) Exhaust manifold lower cover (LH)
(14) Gasket
(15) Turbocharger joint pipe
(16) Gasket
(17) Front oxygen (A/F) sensor
(18) Exhaust temperature sensor
(19) Precatalytic converter
(20) Front exhaust pipe upper insulator (LH)
(21) Front exhaust pipe lower insulator (LH)
(22) Exhaust manifold (LH)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 7.5 (0.8, 5.5)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)
T5: <Ref. to FU(H4DOTC)-38, INSTALLATION, FRONT OXYGEN (A/F) SENSOR.>
T6: <Ref. to FU(H4DOTC)-42, INSTALLATION, EXHAUST TEMPERATURE SENSOR.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



(1) Gasket
(2) Front catalytic converter
(3) Center pipe upper cover (Front)
(4) Center exhaust pipe (Front)
(5) Center pipe lower cover (Front)
(6) Bracket
(7) Gasket
(8) Center pipe upper cover (Rear)
(9) Center pipe lower cover (Rear)
(10) Rear catalytic converter upper cover
(11) Rear catalytic converter lower cover
(12) Rear oxygen sensor
(13) Rear catalytic converter
(14) Gasket
(15) Rear exhaust pipe
(16) Clamp
(17) Chamber (Front)
(18) Chamber (Rear)
(19) Spring
(20) Bolt
(21) Rear exhaust pipe upper cover (Front)
(22) Gasket
(23) Muffler
(24) Cushion rubber
(25) Center exhaust pipe (Rear)
(26) Self-locking nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC)-40, INSTALLATION, REAR OXYGEN SENSOR.>

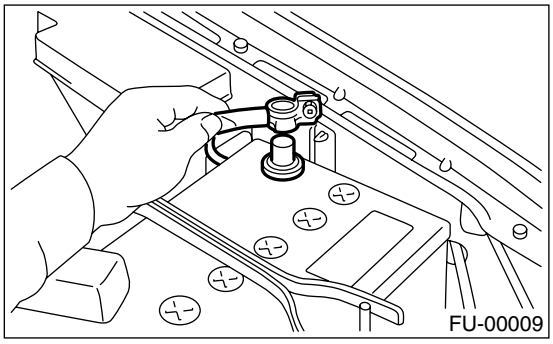
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

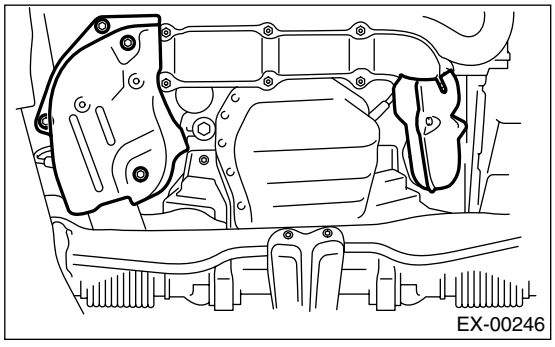
2. Front Exhaust Pipe

A: REMOVAL

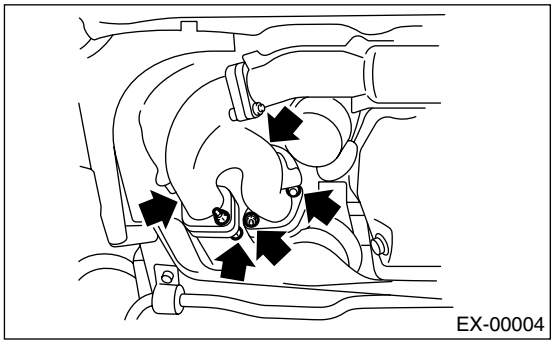
1) Disconnect the ground cable from battery.

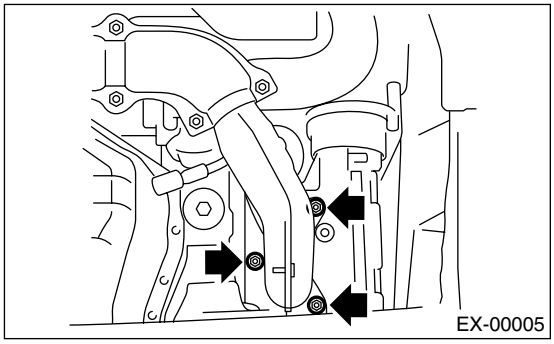


2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the lower exhaust manifold cover (RH).
5) Remove the lower and upper exhaust manifold covers (LH).

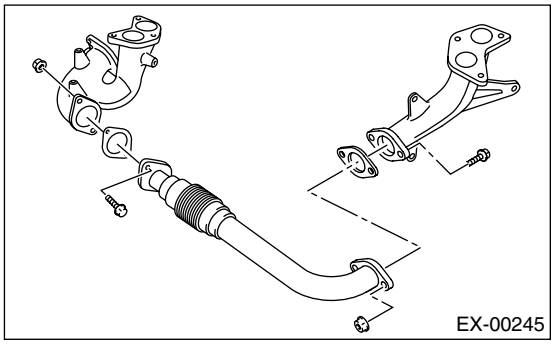


6) Remove the nuts and bolts which hold the front exhaust pipe assembly to turbocharger joint pipe.
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.





8) Remove the front exhaust pipe assembly.
9) Remove the covers from exhaust manifold and front exhaust pipe.
10) Separate the front exhaust pipe from exhaust manifolds.

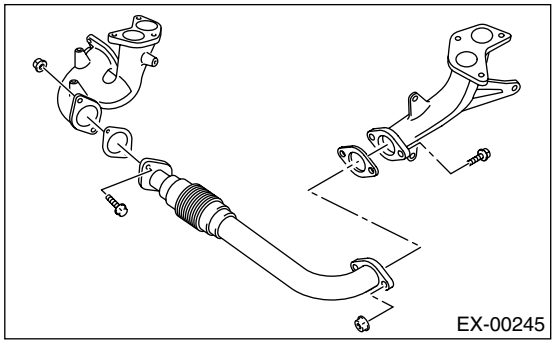


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe covers.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3) Install the upper exhaust manifold cover (RH).

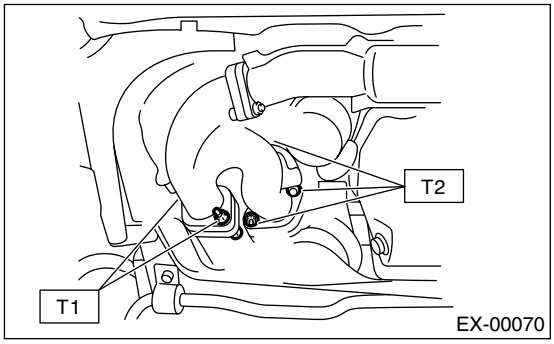
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

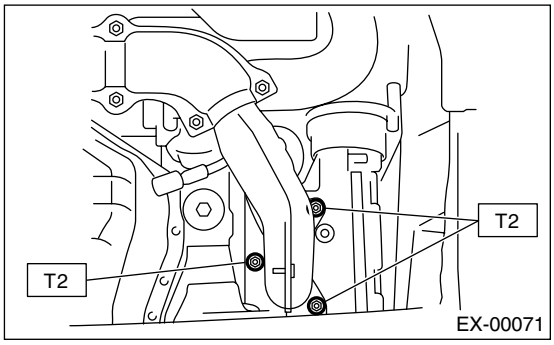
4) Install the front exhaust pipe assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect the exhaust manifold (RH) to turbocharger joint pipe.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)
T2: 40 N·m (4.0 kgf-m, 28.9 ft-lb)



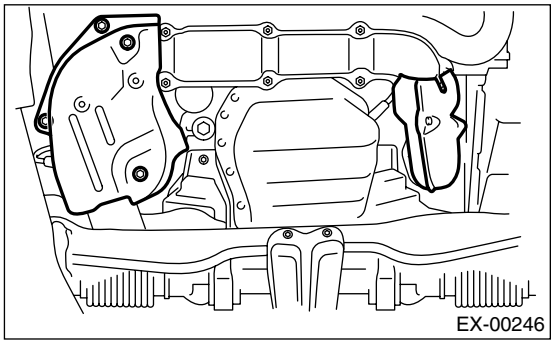


6) Install the upper and lower exhaust manifold covers (LH).

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

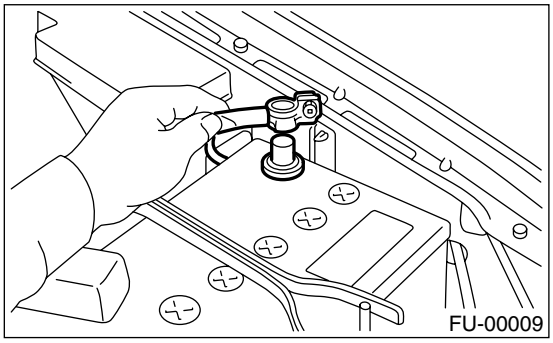
7) Install the lower exhaust manifold cover (RH).

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



8) Install the front oxygen (A/F) sensor. ***<Ref. to FU(H4DOTC)-38, INSTALLATION, FRONT OXYGEN (A/F) SENSOR.>***
9) Install the under cover.

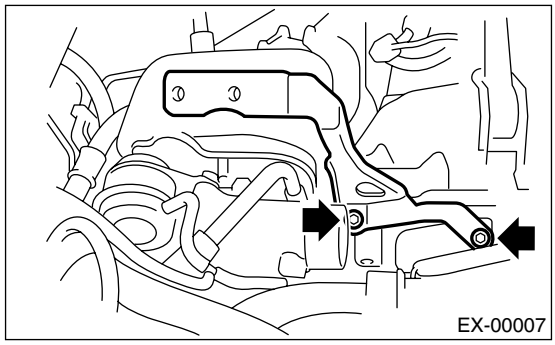
10) Connect the battery ground cable to battery.



3. Center Exhaust Pipe

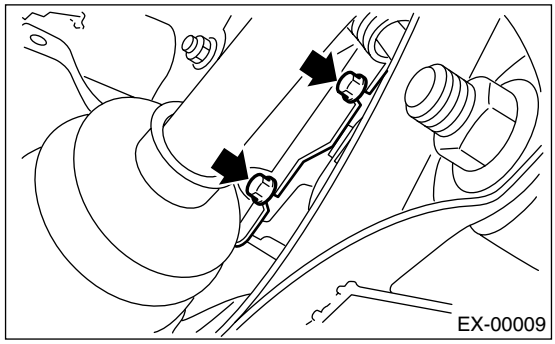
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Remove the intercooler bracket.

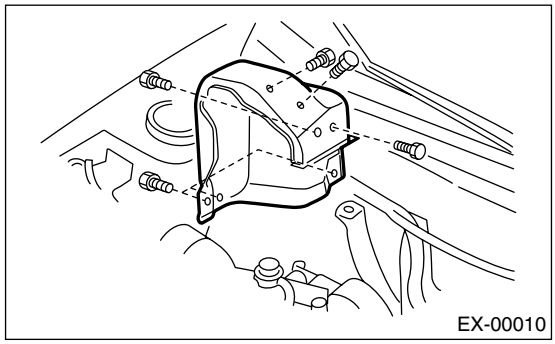


5) Lift-up the vehicle.
6) Remove the under cover.
7) Remove the bolts which install the lower side of turbocharger upper cover.

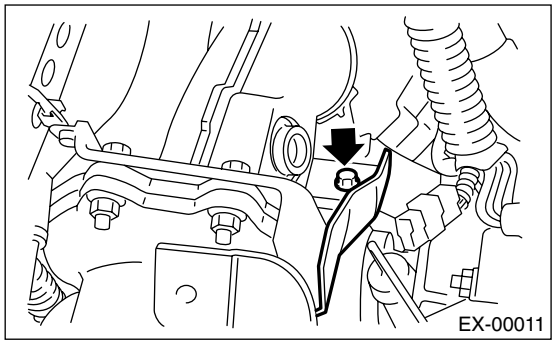
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.



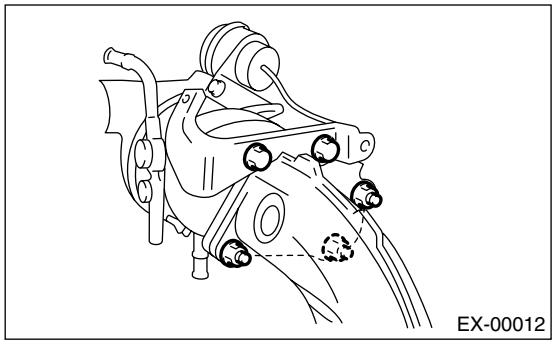
8) Lower the vehicle.
9) Remove the turbocharger upper cover.



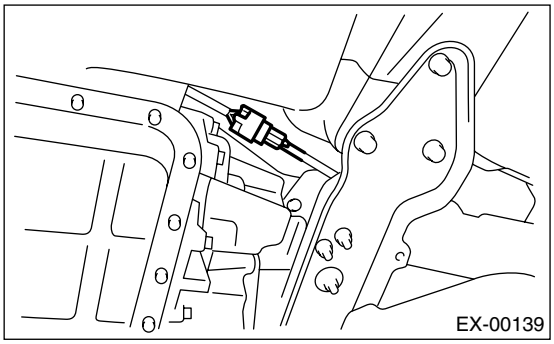
10) Remove the bolts which install the lower upper side of turbocharger upper cover, and remove it.



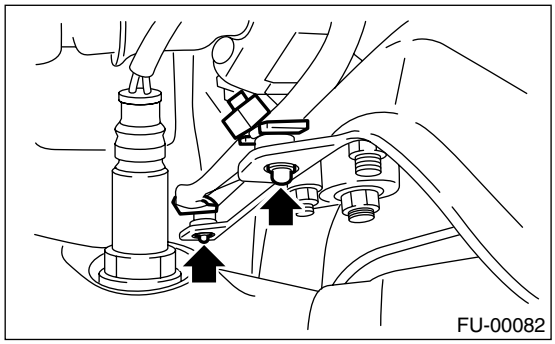
11) Separate the center exhaust pipe from turbocharger.



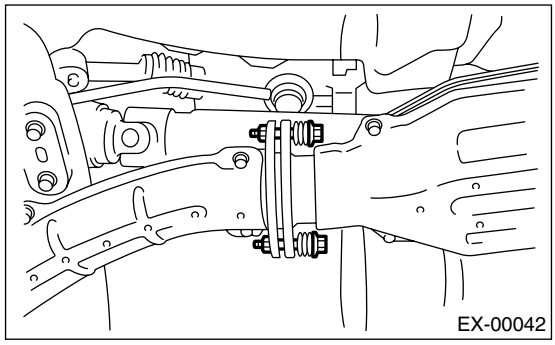
12) Lift-up the vehicle.
13) Disconnect the connector from rear oxygen sensor.



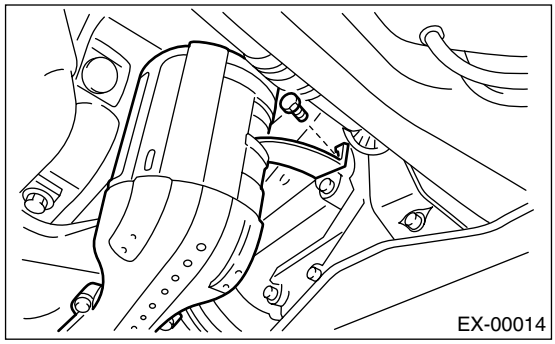
14) Vertically draw out the clip from crossmember.



15) Separate the center exhaust pipe from rear exhaust pipe.

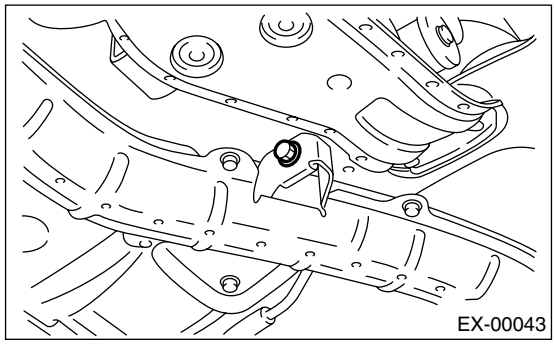


16) Remove the bolt which holds the center exhaust pipe bracket to transmission.

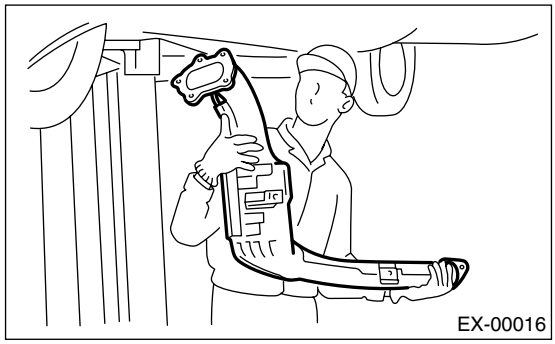


17) Remove the intercooler bracket.
18) Remove the bolt which holds the center exhaust pipe to hanger bracket.

CAUTION:
Be careful not to pull down the center exhaust pipe.



19) Remove the center exhaust pipe.

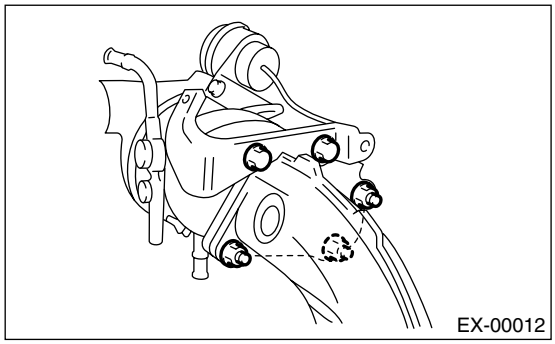


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

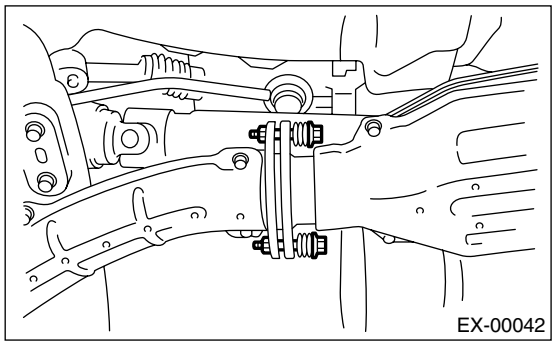
1) Install the center exhaust pipe and temporarily tighten the bolt which holds the center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds the center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

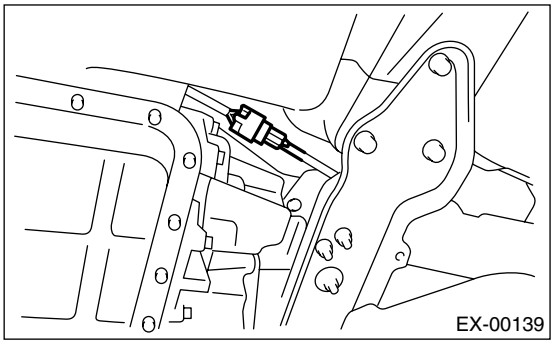


4) Install the center exhaust pipe to rear exhaust pipe.

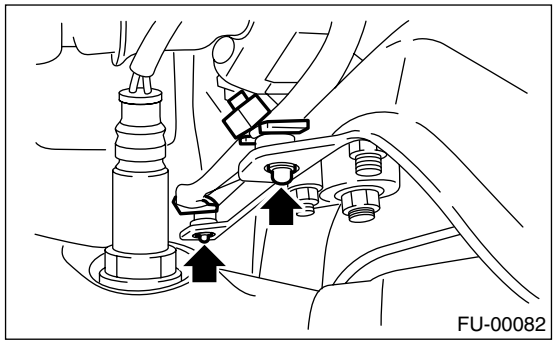
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the connector to rear oxygen sensor.

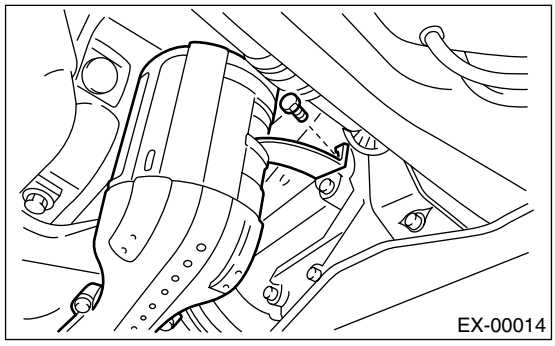


6) Secure the clip on crossmember.



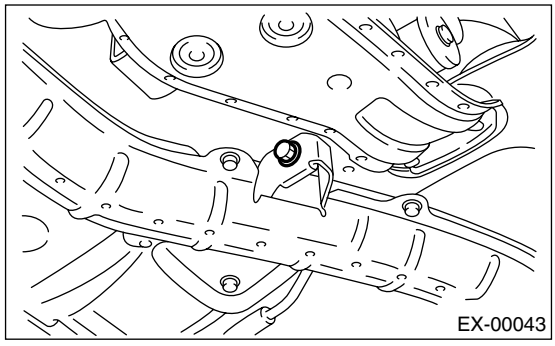
7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

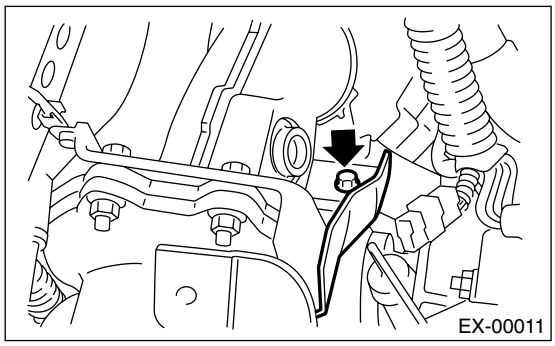
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



9) Lower the vehicle.

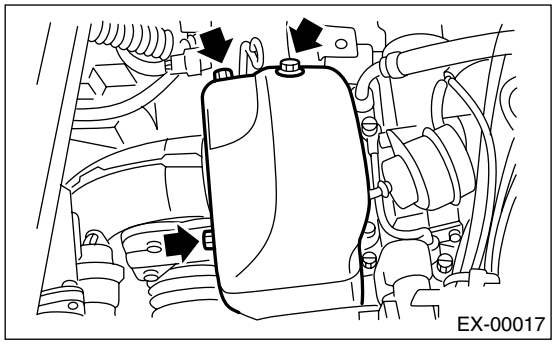
10) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



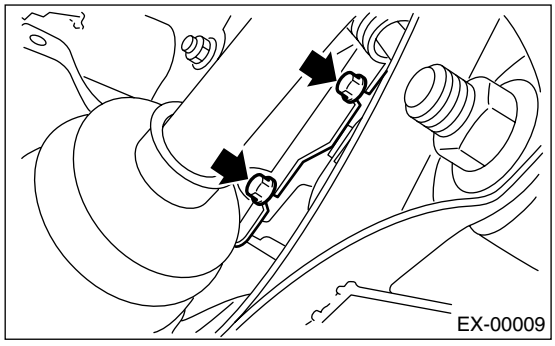
11) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



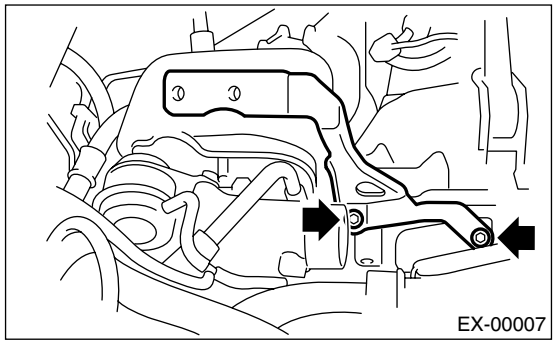
12) Lift-up the vehicle.
13) Tighten the bolts which install the under side of turbocharger upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



14) Install the under cover.
15) Lower the vehicle.

16) Install the intercooler bracket.

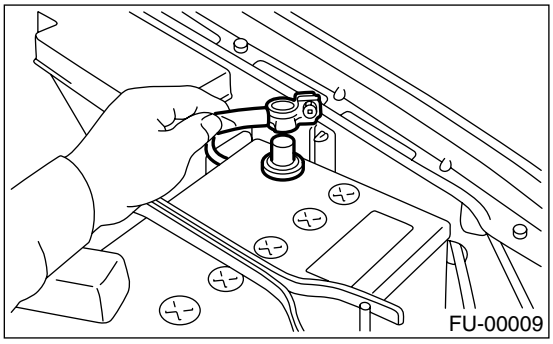


17) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

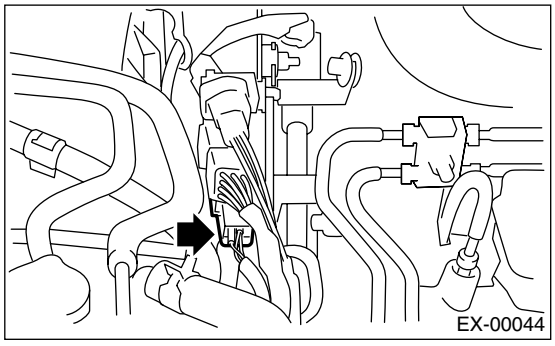
4. Joint Pipe

A: REMOVAL

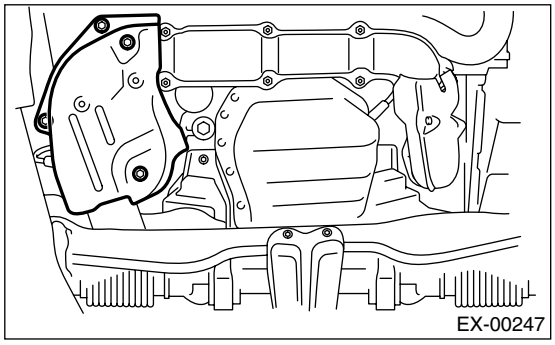
1) Disconnect the ground cable from battery.



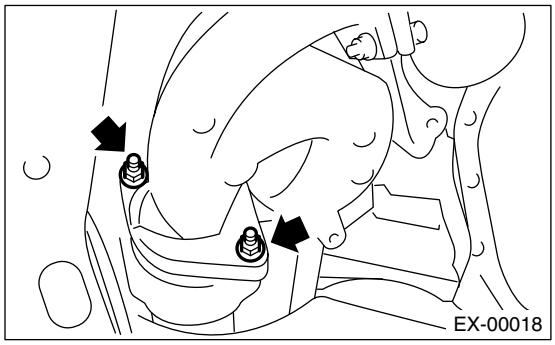
2) Disconnect the exhaust temperature sensor connector.



3) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the lower exhaust manifold cover (RH).



6) Remove the nuts which hold the front exhaust manifold to joint pipe.

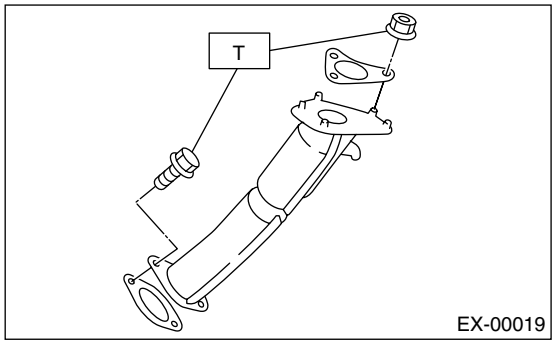


7) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
8) Remove the turbocharger. <Ref. to IN(H4DOTC)-12, REMOVAL, Turbocharger.>
9) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)

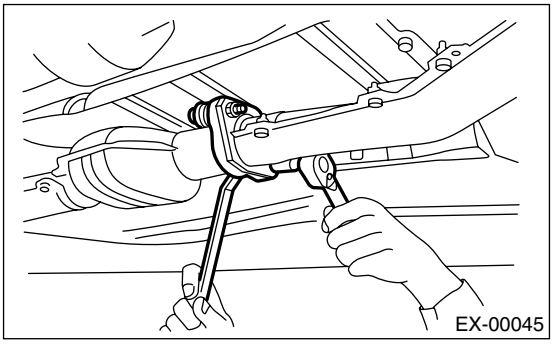


5. Rear Exhaust Pipe

A: REMOVAL

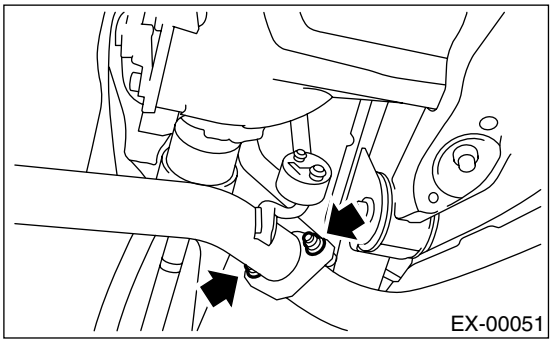
1) Lift-up the vehicle.
2) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



3) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.



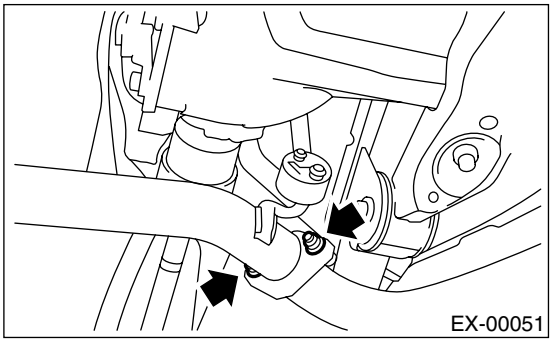
4) Remove the rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

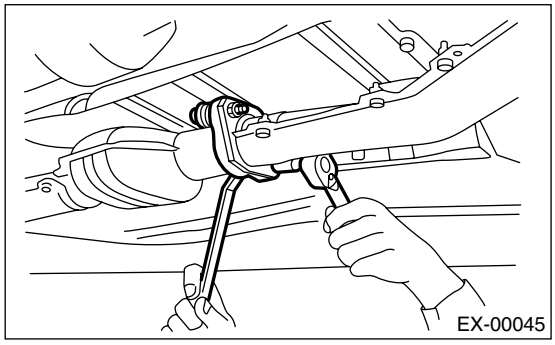
1) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Lower the vehicle.

C: INSPECTION

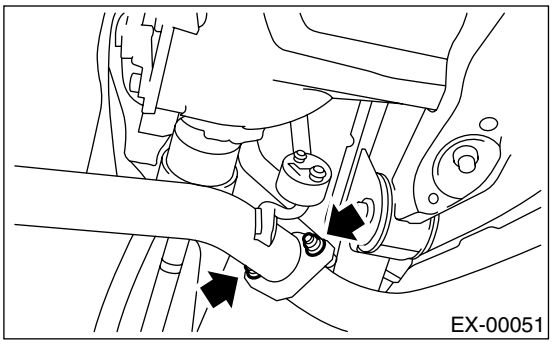
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

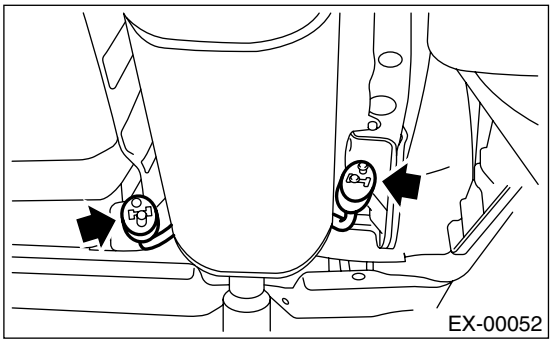


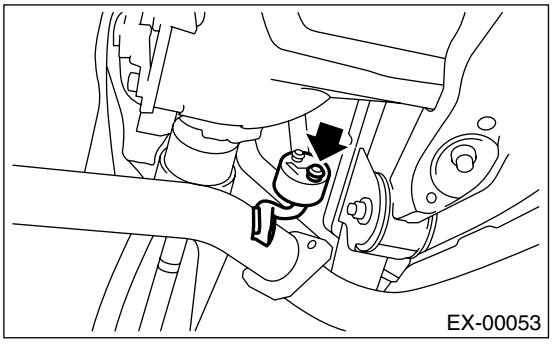
2) Remove the rubber cushions, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to the mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)



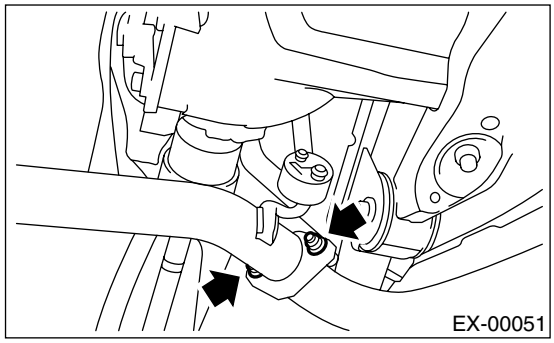


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket and self-locking nut with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

MUFFLER

MEMO:

COOLING

CO(H4DOTC)

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8.	Radiator Main Fan and Fan Motor	24
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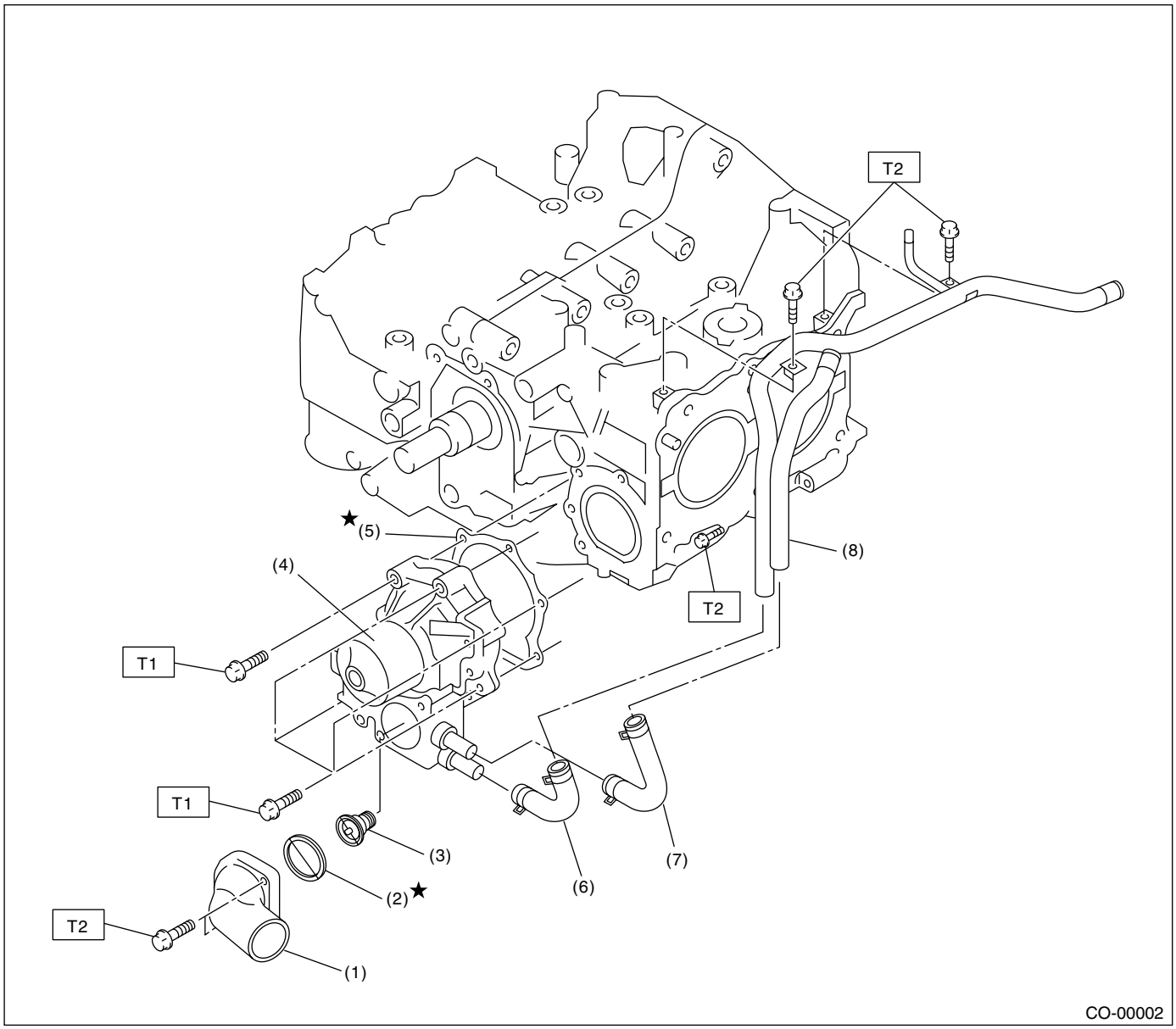
1. General Description

A: SPECIFICATIONS

Model			DOHC TURBO
Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			AT: Approx. 7.6 (8.03, 6.69) MT: Approx. 7.7 (8.14, 6.78)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
	Clearance between impeller and case	Standard	0.5 — 1.5 mm (0.020 — 0.059 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more/91°C (196°F)
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor	Main fan	120 W
		Sub fan	120 W
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions	Width × Height × Thickness	AT: 691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in) MT: 691.5 × 340 × 27 mm (27.22 × 13.39 × 1.06 in)
	Pressure range in which cap valve is open	Coolant filler tank side	Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)
		Radiator side	Above only: 137±14.7 kPa (1.40±0.15 kg/cm^2, 20±2.1 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

B: COMPONENT

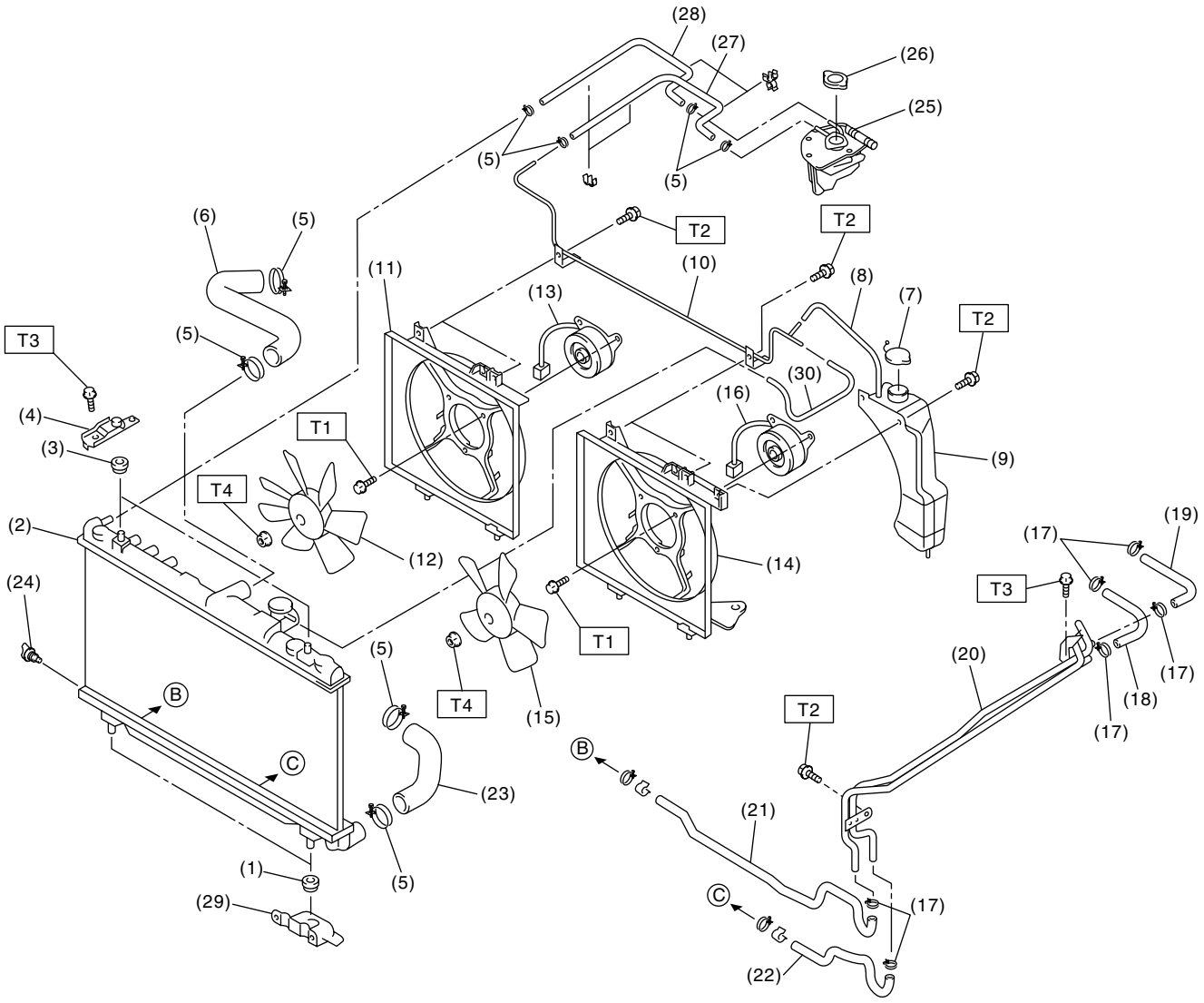
1. WATER PUMP



(1) Thermostat cover
(2) Gasket
(3) Thermostat
(4) Water pump ASSY
(5) Gasket
(6) Heater by-pass hose
(7) Coolant filler tank by-pass hose
(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 12 (1.2, 8.7)

2. RADIATOR AND RADIATOR FAN



CO-00242

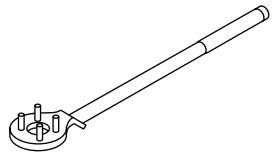
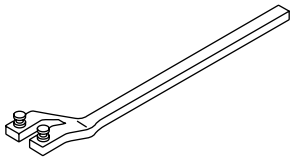
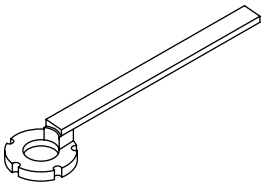
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Overflow hose A
(9) Engine coolant reservoir tank
(10) Overflow pipe
(11) Radiator sub fan shroud
(12) Radiator sub fan
(13) Radiator sub fan motor
(14) Radiator main fan shroud
(15) Radiator main fan, fan motor ASSY
(16) Radiator main fan motor
(17) ATF hose clamp (AT model)
(18) ATF inlet hose A (AT model)
(19) ATF outlet hose A (AT model)
(20) ATF pipe (AT model)
(21) ATF inlet hose B (AT model)
(22) ATF outlet hose B (AT model)
(23) Radiator outlet hose
(24) Radiator drain plug
(25) Engine coolant filler tank
(26) Radiator cap (engine coolant filler tank cap)
(27) Engine overflow hose
(28) Engine air breather hose
(29) Radiator lower bracket
(30) Overflow hose B

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*4.4 (0.45, 3.3)*
T2:	*7.5 (0.76, 5.5)*
T3:	*18 (1.8, 13.0)*
T4:	*3.4 (0.35, 2.5)*

C: CAUTION

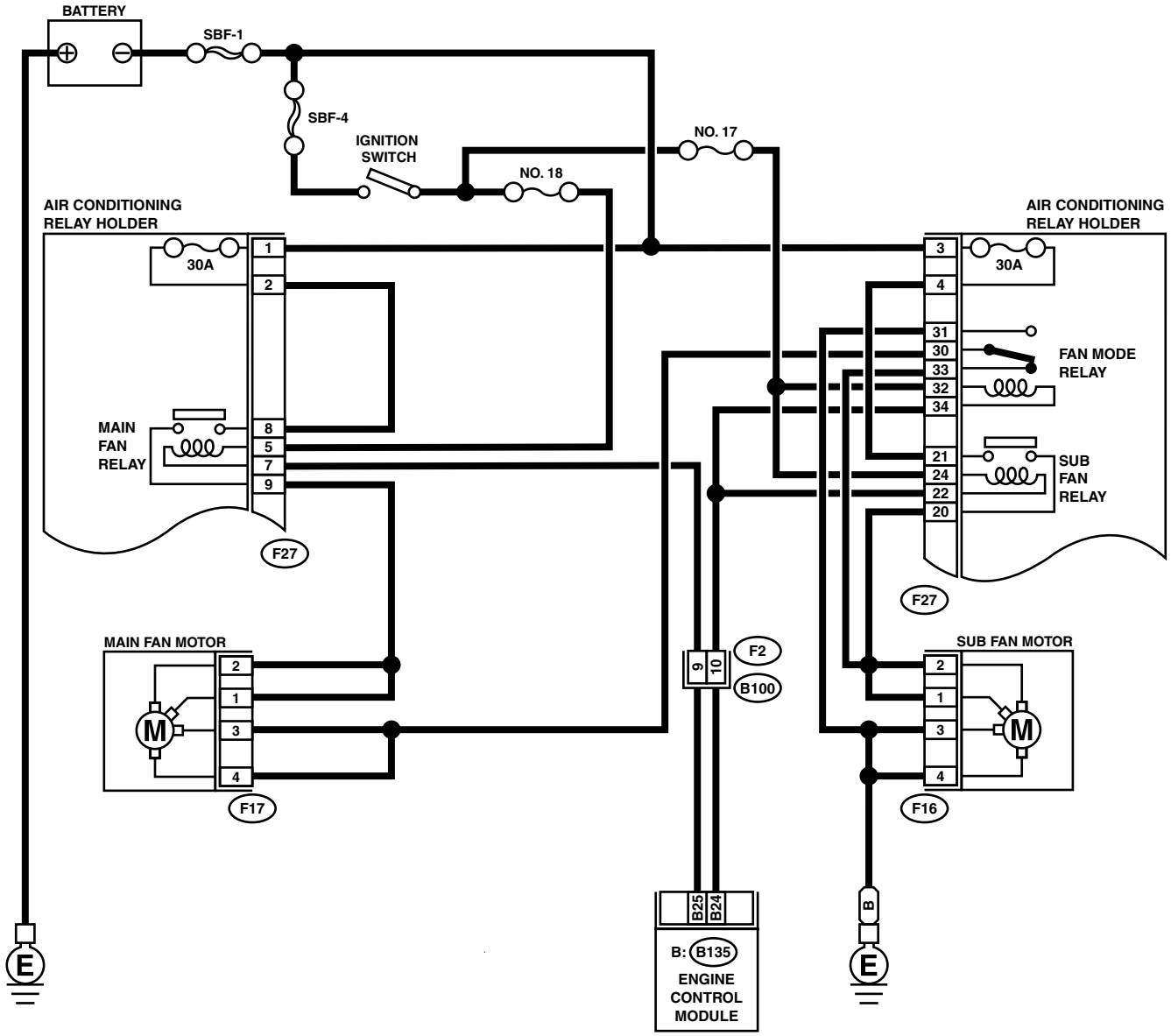
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

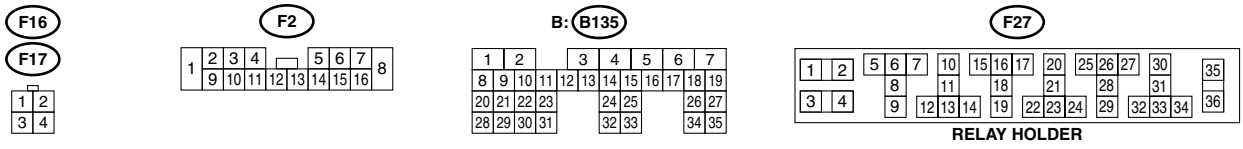
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499977500	499977500	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprockets.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprockets.

2. Radiator Fan System

A: SCHEMATIC





CO-00296

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main and sub fan do not rotate under the above conditions.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan. NOTE: •With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. •Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fan rotate at low speed?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan. NOTE: •With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. •Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fan rotate at high speed?	Radiator main fan system is okay.	Go to step **32.**
3	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay from A/C relay holder. 3) Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Go to step **7.**
5	**CHECK FUSE.** 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS OF 30 A FUSE TERMINAL AND MAIN FAN RELAY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between 20 A fuse terminal and main fan relay terminal. ***Terminal*** ***No. 2 — No. 8:***	Is the measured value less than 1 Ω?	Repair the power supply line.	Repair the open harness.
7	**CHECK FUSE.** 1) Turn the ignition switch to OFF 2) Remove the fuse No. 18. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
8	**CHECK N\AIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 8 — No. 9:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Replace the main fan relay.
9	**CHECK MAIN FAN RELAY.** 1) Connect the battery to main fan relay terminals No. 5 and No. 7. 2) Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 8 — No. 9:***	Is the measured value less than 1 Ω?	Go to step **10.**	Replace the main fan relay.
10	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from main fan motor. 2) Measure the resistance between main fan relay terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 1 — (F27) No. 9:*** ***(F17) No. 2 — (F27) No. 9:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair the open harness between main fan relay terminal and main fan motor connector.
11	**CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND FAN MODE RELAY CONNECTOR.** 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between main fan motor connector and fan mode relay connector. ***Connector & terminal*** ***(F17) No. 3 — (F27) No. 30:*** ***(F17) No. 4 — (F27) No. 30:***	Is the measured value less than 1 Ω?	Go to step **12.**	Repair the open harness between main fan motor connector and fan mode relay connector.
12	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step **13.**
13	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1 and No. 2, and ground (-) terminal to terminal No. 3 and No. 4 of main fan motor.	Does the main fan rotate?	Go to step **14.**	Replace the main fan motor.
14	**CHECK FAN MODE RELAY.** Measure the resistance of fan mode relay. ***Terminal*** ***No. 30 — No. 33***	Is the measured value less than 1 Ω?	Go to step **15.**	Replace the fan mode relay.

	Step	Check	Yes	No
15	**CHECK RESISTANCE BETWEEN FAN MODE RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from sub fan motor. 2) Measure the resistance between fan mode relay terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 33:*** ***(F16) No. 2 — (F27) No. 33:***	Is the measured value less than 1 Ω?	Go to step **16.**	Repair the open harness between fan mode relay terminal and sub fan motor connector.
16	**CHECK SUB FAN MOTOR AND GROUND CIRCUIT.** Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 3 — Chassis ground:*** ***(F16) No. 4 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **17.**	Repair the open harness between sub fan motor connector and chassis ground.
17	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step **18.**
18	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1 and No. 2, and ground (-) terminal to terminal No. 3 and No. 4 of sub fan motor.	Does the sub fan rotate?	Go to step **19.**	Replace the sub fan motor.
19	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between main fan relay terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 25 — (F25) No. 7:***	Is the measured value less than 1 Ω?	Go to step **20.**	Repair the open harness between main fan relay terminal and ECM.
20	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service.
21	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 21 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **22.**	Go to step **23.**
22	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 24 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **26.**	Go to step **25.**
23	**CHECK FUSE.** 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **24.**

	Step	Check	Yes	No
24	**CHECK HARNESS BETWEEN 30 A FUSE TERMINAL AND SUB FAN RELAY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between 30 A fuse terminal and sub fan relay terminal. ***Terminal*** ***No. 4 — No. 21:***	Is the measured value less than 1 Ω?	Repair the power supply line.	Repair the open harness.
25	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
26	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the resistance of sub fan relay. ***Terminal*** ***No. 20 — No. 21:***	Is the measured value more than 1 MΩ?	Go to step **27.**	Replace the sub fan relay.
27	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 22 and No. 24 of sub fan relay. 2) Measure the resistance of sub fan relay. ***Terminal*** ***No. 20 — No. 21:***	Is the measured value less than 1 Ω?	Go to step **28.**	Replace the sub fan relay.
28	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from sub fan motor. 2) Measure the resistance between sub fan relay terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 20:*** ***(F16) No. 2 — (F27) No. 20:***	Is the measured value less than 1 Ω?	Go to step **30.**	Repair the open harness between sub fan relay terminal and sub fan motor connector.
29	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between sub fan relay terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 24 — (F27) No. 22:***	Is the measured value less than 1 Ω?	Go to step **30.**	Repair the open harness between sub fan relay terminal and ECM.
30	**CHECK HARNESS BETWEEN FAN MODE RELAY AND ECM.** Measure the resistance between fan mode relay terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 24 — (F27) No. 34:***	Is the measured value less than 1 Ω?	Go to step **31.**	Repair the open harness between fan mode relay terminal and ECM.
31	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact with your SOA (distributor) service.
32	**CHECK OPERATION OF RADIATOR FAN.**	Does the radiator main fan rotate when the radiator main and sub fan do not rotate at high speed at step 2?	Go to step **21.**	Go to step **33.**

	Step	Check	Yes	No
33	**CHECK GROUND CIRCUIT OF FAN MODE RELAY.** 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between fan mode relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 31 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **34.**	Repair the open harness between fan mode relay and chassis ground.
34	**CHECK POWER SUPPLY TO FAN MODE RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fan mode relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 32 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **35.**	Repair the power supply line.
35	**CHECK FAN MODE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the fan mode relay. 3) Measure the resistance of fan mode relay. ***Terminal*** ***(F27) No. 30 — (F27) No. 31:***	Is the measured value more than 1 MΩ?	Go to step **36.**	Replace the fan mode relay.
36	**CHECK FAN MODE RELAY.** 1) Connect the battery to terminals No. 32 and No. 34 of fan mode relay. 2) Measure the resistance of fan mode relay. ***Terminal*** ***(F27) No. 30 — (F27) No. 31:***	Is the measured value less than 1 Ω?	Go to step **29.**	Replace the fan mode relay.

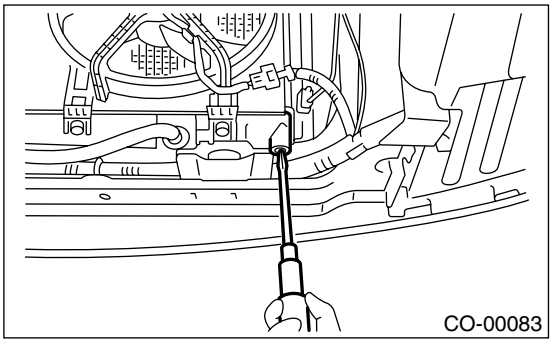
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain cock to drain engine coolant into container.

NOTE:
Remove the coolant filler tank cap so that engine coolant will drain faster.



4) Install the drain cock.

2. FILLING OF ENGINE COOLANT

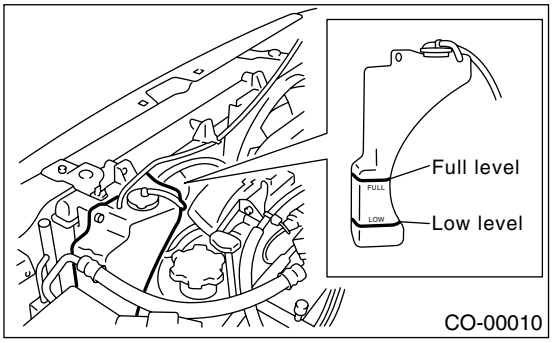
1) Fill engine coolant into the coolant filler tank up to filler neck position.

Coolant capacity (fill up to "FULL" level):
AT model
Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)
MT model
Approx. 7.7 ℓ (8.14 US qt, 6.78 Imp qt)

CAUTION:
Do not mix up the coolant filler tank side cap with radiator side cap.

NOTE:
• Do not remove the radiator side cap when filling engine coolant.
• The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

2) Fill engine coolant into the reservoir tank up to Full level.

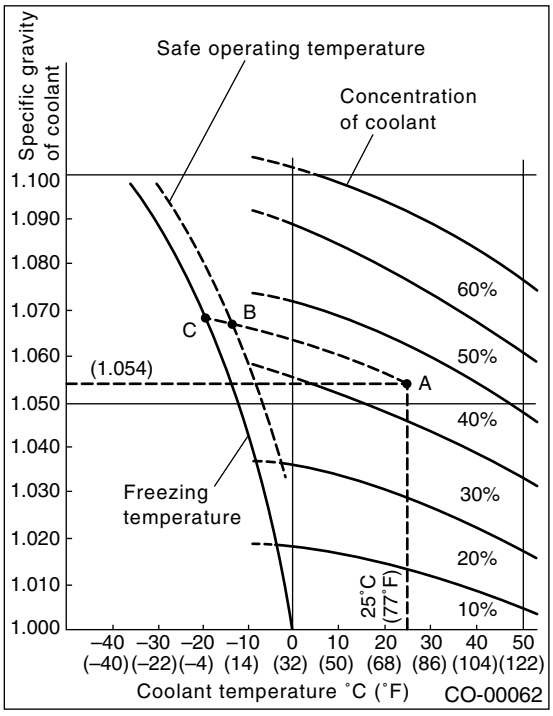


3) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.
4) If the engine coolant level drops in coolant filler tank, add engine coolant to filler neck position.
5) If the engine coolant level drops from Full level of reservoir tank, add engine coolant to Full level.
6) Attach the coolant filler tank cap and reservoir tank cap properly.

B: INSPECTION

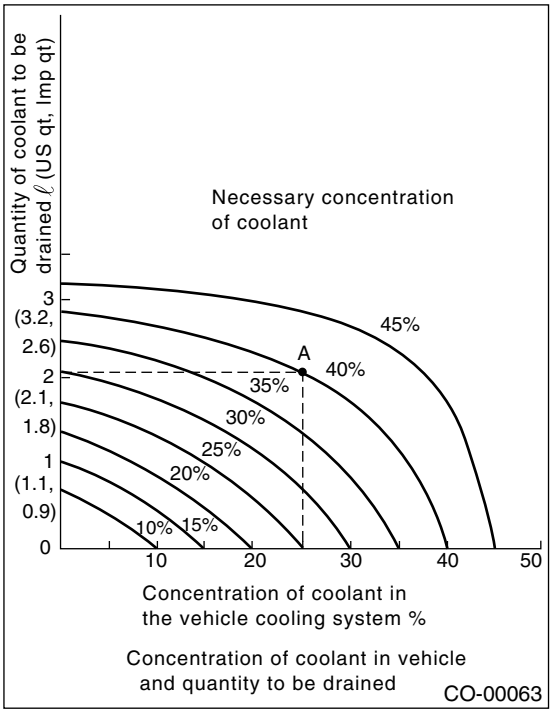
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 45% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

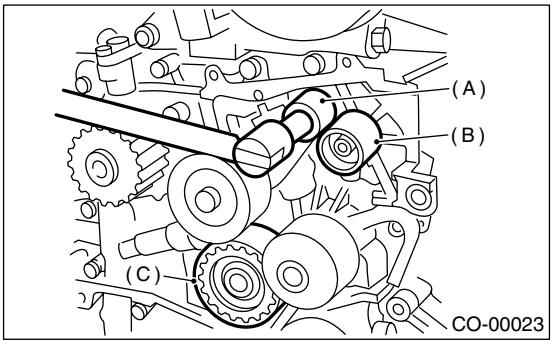
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



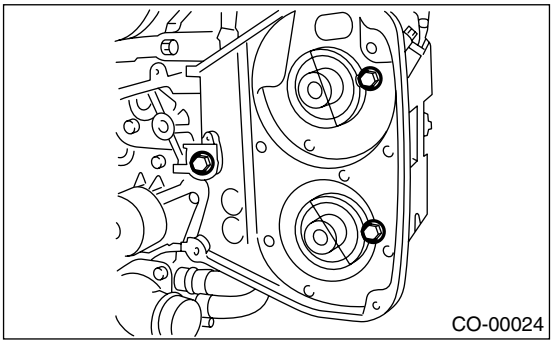
4. Water Pump

A: REMOVAL

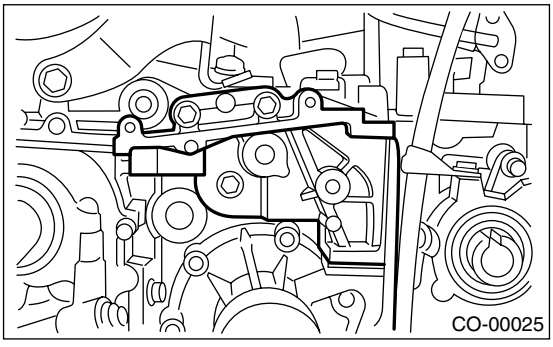
1) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
3) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt Assembly.>
4) Remove the automatic belt tension adjuster (A).
5) Remove the belt idler (B).
6) Remove the belt idler No. 2 (C).



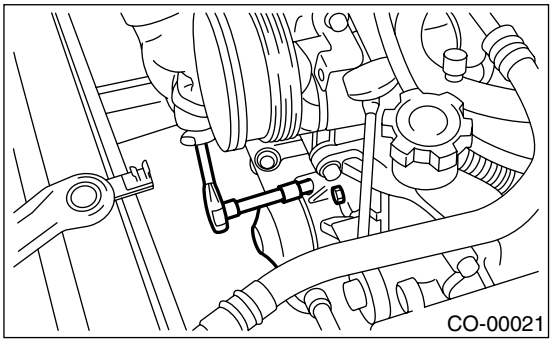
7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-29, REMOVAL, Camshaft Position Sensor.>
8) Remove the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
9) Remove the belt cover No. 2 (LH).



10) Remove the tensioner bracket.



11) Disconnect the hose from water pump.
12) Remove the water pump.

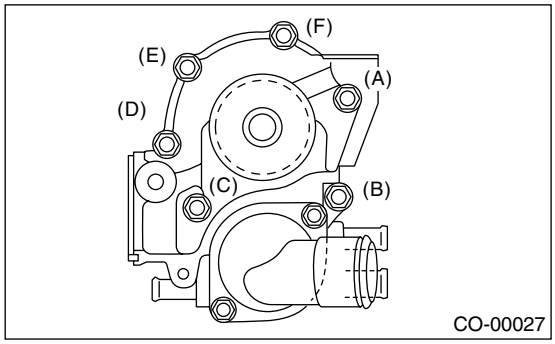


B: INSTALLATION

1) Install the water pump onto cylinder block (LH).

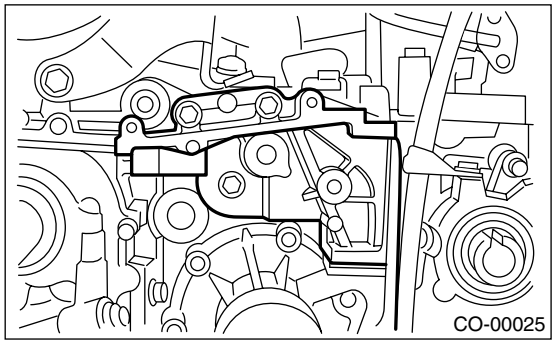
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



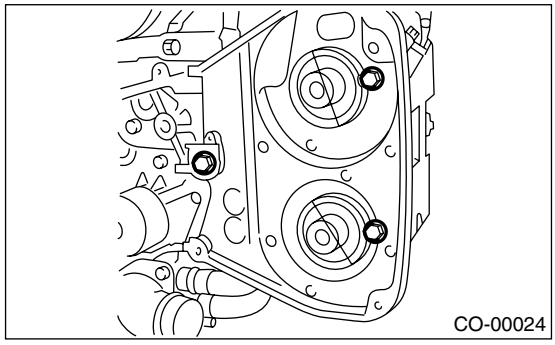
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



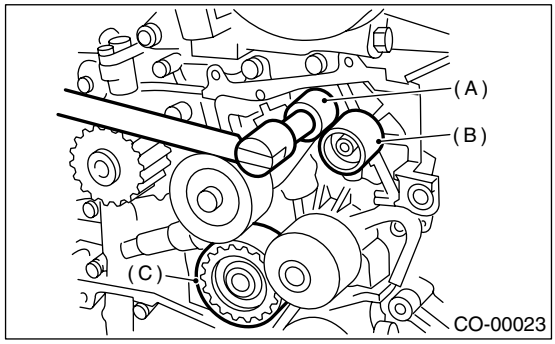
4) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>
6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-29, INSTALLATION, Camshaft Position Sensor.>
7) Install the belt idler No. 2 (C).
8) Install the belt idler (B).
9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. <Ref. to ME(H4DOTC)-51, INSTALLATION, Timing Belt Assembly.>

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

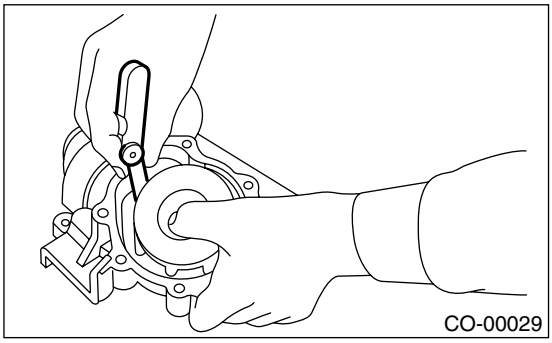


10) Install the timing belt. <Ref. to ME(H4DOTC)-52, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
11) Install the V-belts. <Ref. to ME(H4DOTC)-45, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>

C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Check the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 1.5 mm (0.020 — 0.059 in)

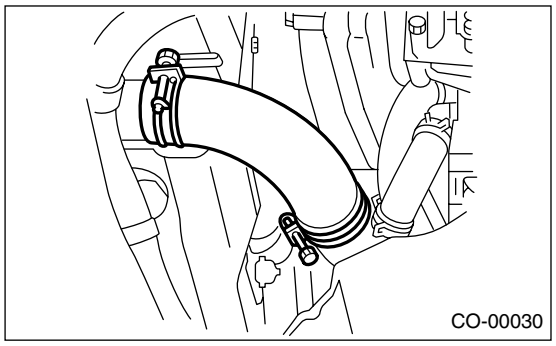


4) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

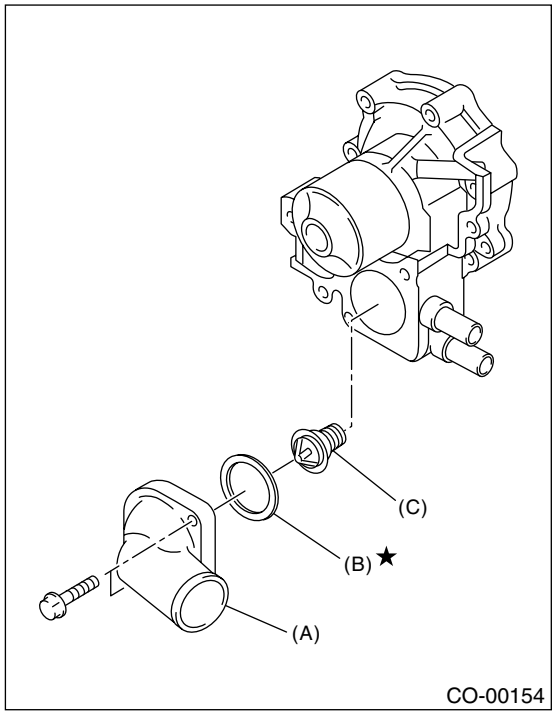
5. Thermostat

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the radiator outlet hose.



6) Remove the thermostat cover and gasket, and then pull out the thermostat.



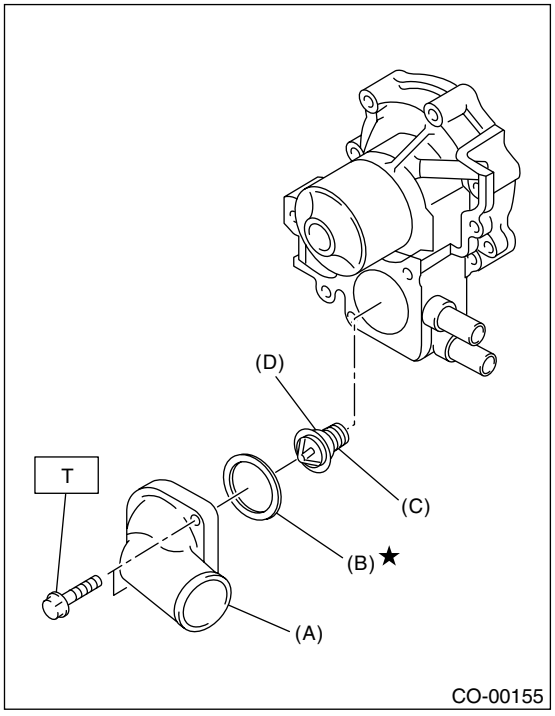
(A) Thermostat cover
(B) Gasket
(C) Thermostat

B: INSTALLATION

1) Install the thermostat in water pump, and then install the thermostat cover together with a gasket.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin (A) facing to front side.

Tightening torque:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



(A) Thermostat cover
(B) Gasket
(C) Thermostat
(D) Jiggle pin

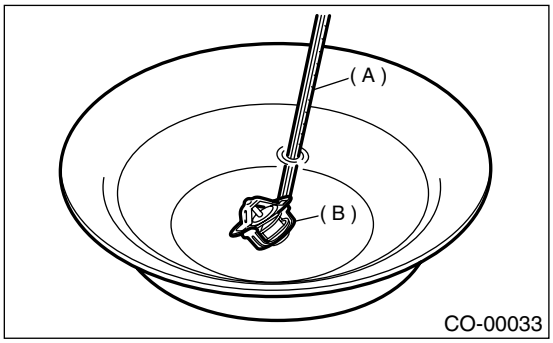
2) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
76 — 80 °C (169 — 176°F)

Fully opens:
91°C (196°F)



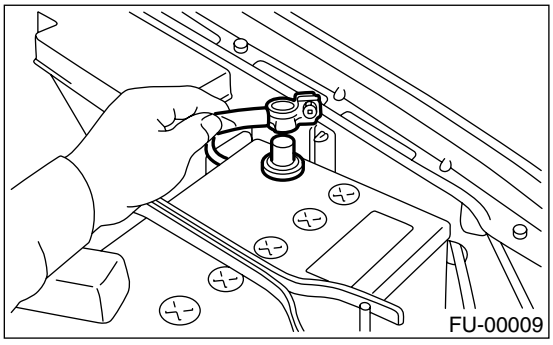
(A) Thermometer
(B) Thermostat

6. Radiator

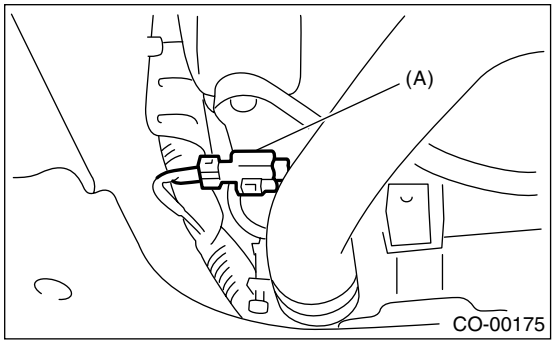
A: REMOVAL

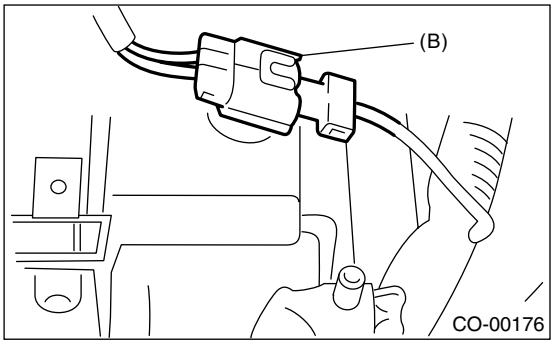
WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.

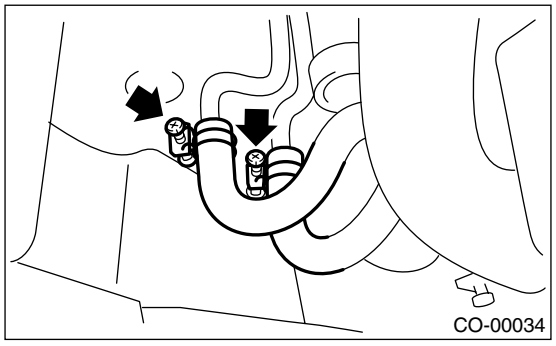


3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).

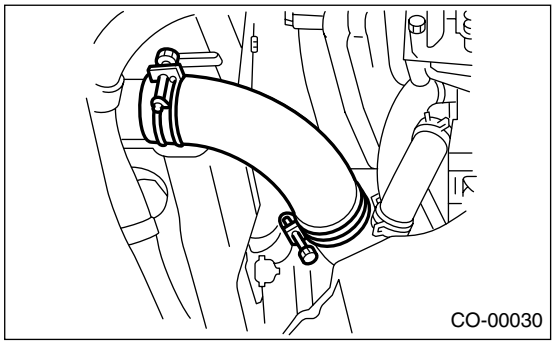




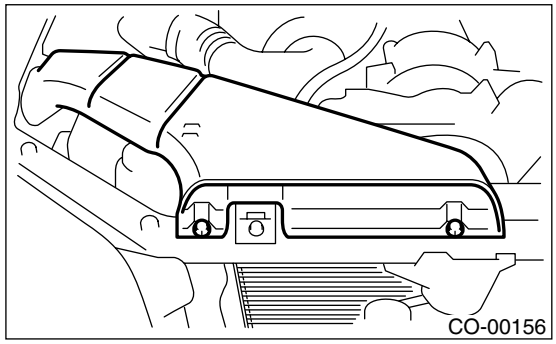
7) Disconnect the ATF cooler hose from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



8) Disconnect the radiator outlet hose from thermostat cover.

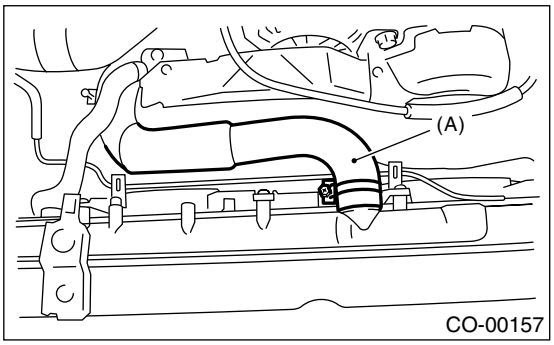


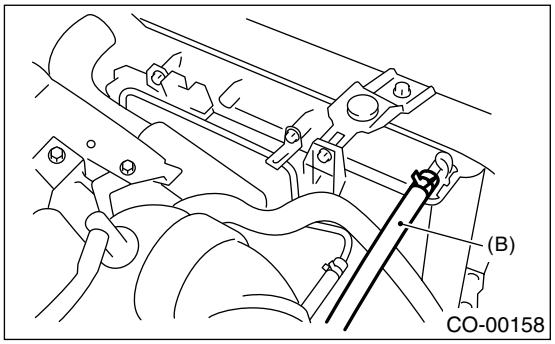
9) Lower the vehicle.
10) Remove the air intake duct.



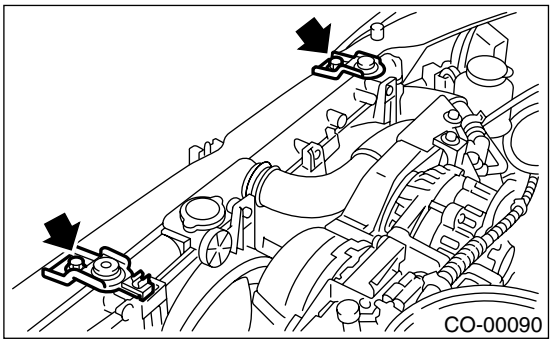
11) Remove the V-belt covers.
12) Disconnect the overflow hose.
13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-28, REMOVAL, Reservoir Tank.>

14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.





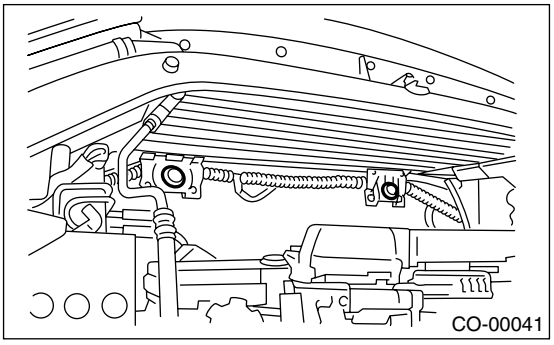
15) Remove the radiator upper brackets.



16) Lift-up the radiator, and then remove it from vehicle.

B: INSTALLATION

1) Attach the radiator mounting cushions to the holes on vehicle.

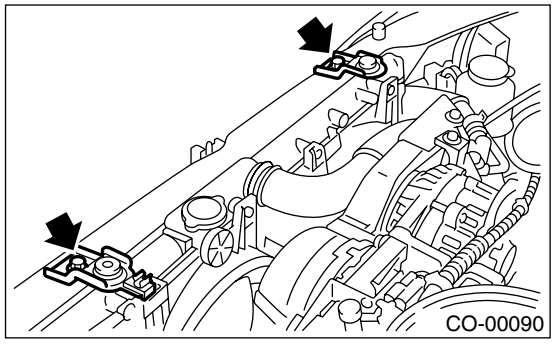


2) Install the radiator to vehicle.

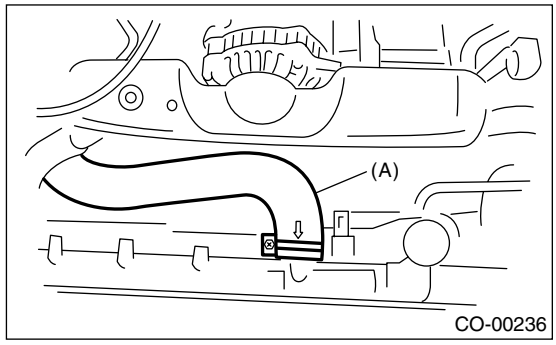
NOTE:
Fit the pins on lower side of radiator into the cushions on body side.

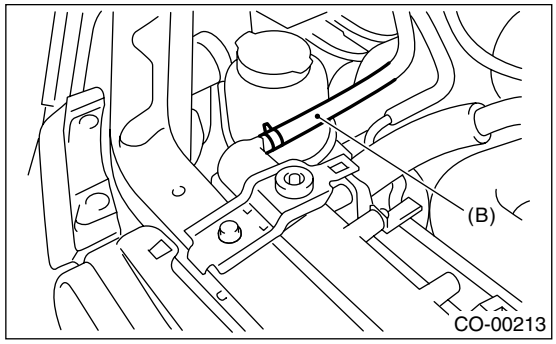
3) Install the radiator brackets, and then tighten the bolts.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



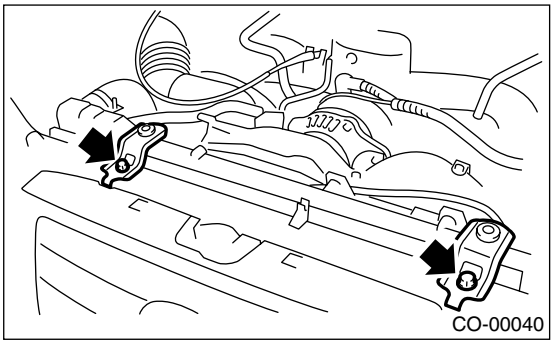
4) Connect the radiator inlet hose (A) and water tank hose (B).



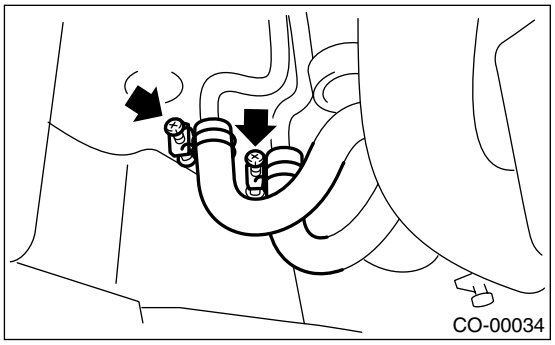


5) Install the reservoir tank. <Ref. to CO(H4DOTC)-28, INSTALLATION, Reservoir Tank.>
6) Connect the overflow hose.

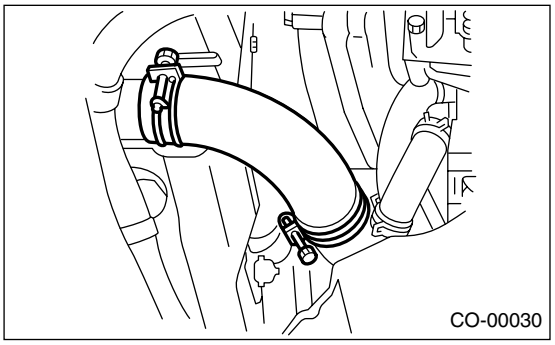
7) Install the V-belt cover.



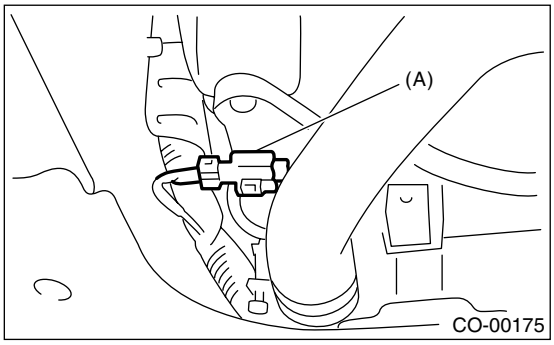
8) Install the air intake duct.
<Ref. to IN(H4DOTC)-8, INSTALLATION, Air Intake Duct.>
9) Lift-up the vehicle.
10) Connect the ATF cooler hoses. (AT model).

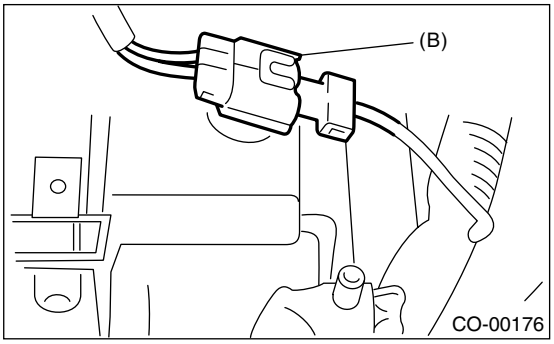


11) Connect the radiator outlet hose.

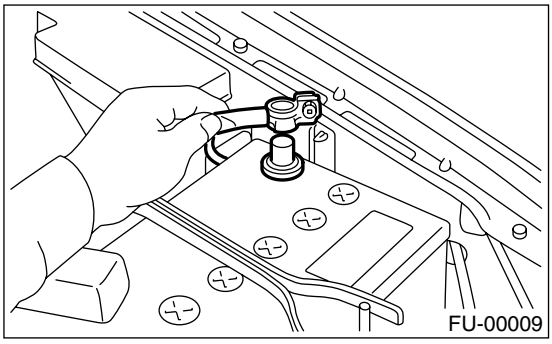


12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).





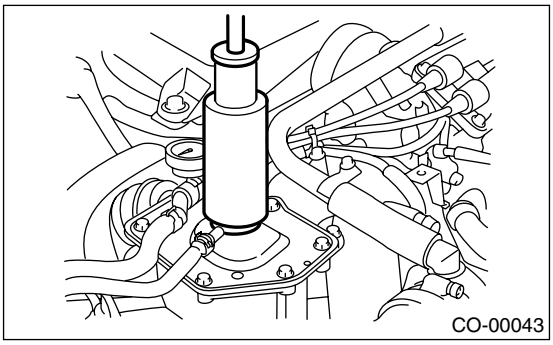
13) Install the under cover.
14) Lower the vehicle.
15) Connect the battery ground cable to battery.



16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Check the ATF level. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove the coolant filler tank cap, top off coolant filler tank, and then attach the tester to coolant filler tank in place of cap.



2) Apply a pressure of 122 kPa (1.2 kg/cm^2, 18 psi) to the radiator to check if:

(1) Engine coolant leaks at/around radiator.

(2) Engine coolant leaks at/around hoses or connections.

CAUTION:

• Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.

• Engine should be turned off.

• Wipe engine coolant from check points in advance.

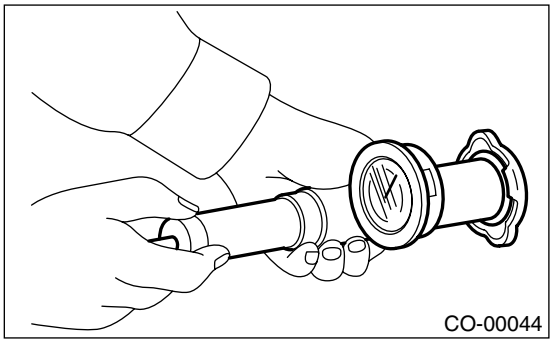
• Be careful to prevent engine coolant from spurting out when removing the tester.

• Be careful also not to deform the filler neck of coolant filler tank when installing or removing tester.

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

Coolant filler tank side
Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

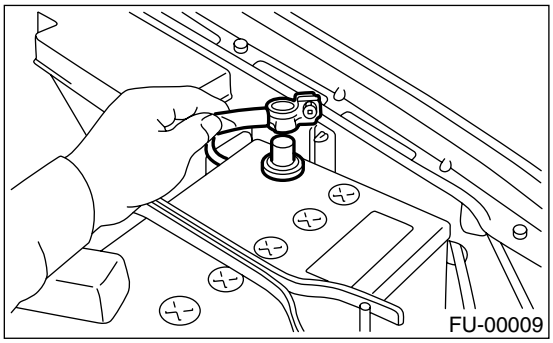
Radiator side
Standard pressure:
122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)
Service limit pressure:
112 kPa (1.14 kg/cm^2, 16 psi)

CAUTION:
• Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.
• Do not mix up the coolant filler tank side cap with radiator side cap.

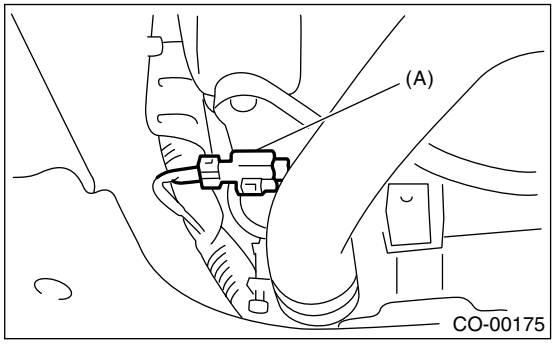
8. Radiator Main Fan and Fan Motor

A: REMOVAL

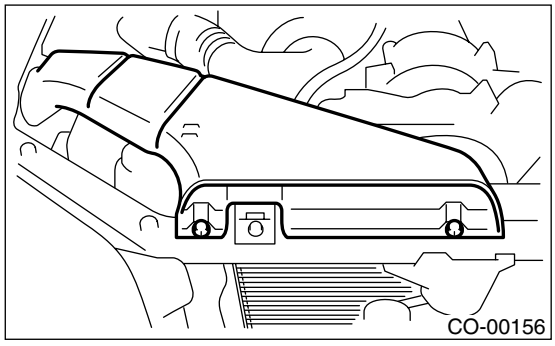
1) Disconnect the ground cable from battery.



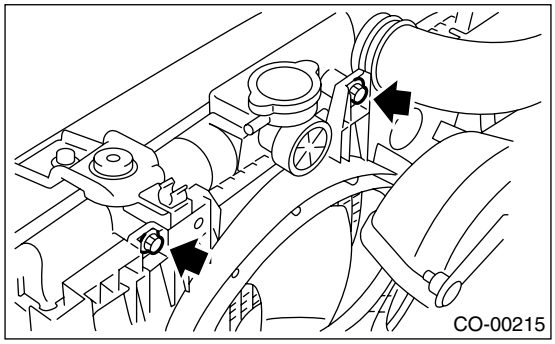
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the connector of main fan motor.



5) Lower the vehicle.
6) Remove the air intake duct.



7) Disconnect the overflow hose.
8) Remove the overflow pipe.
9) Remove the reservoir tank. <Ref. to CO(H4DOTC)-28, REMOVAL, Reservoir Tank.>
10) Remove the radiator main fan motor assembly.

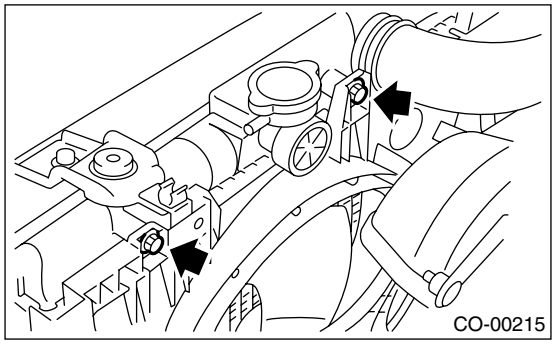


B: INSTALLATION

Install in the reverse order of removal.

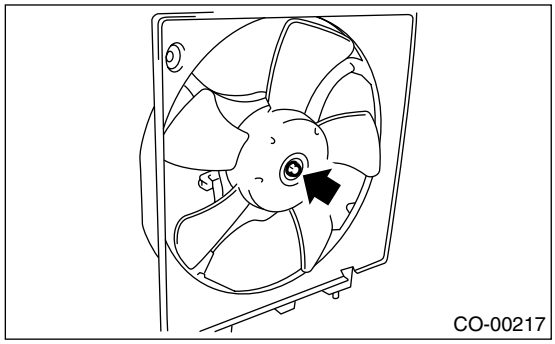
NOTE:
When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

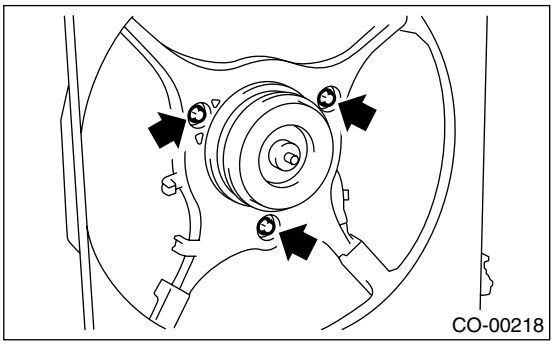


C: DISASSEMBLY

1) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



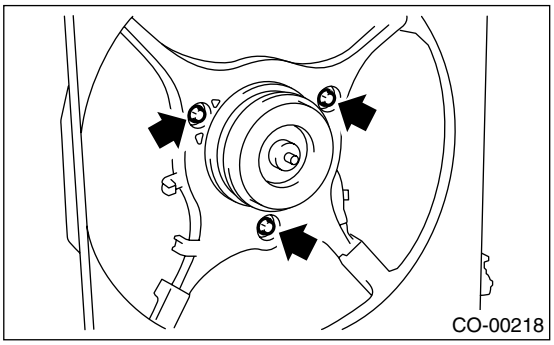
2) Remove the bolts which install the fan motor onto shroud.



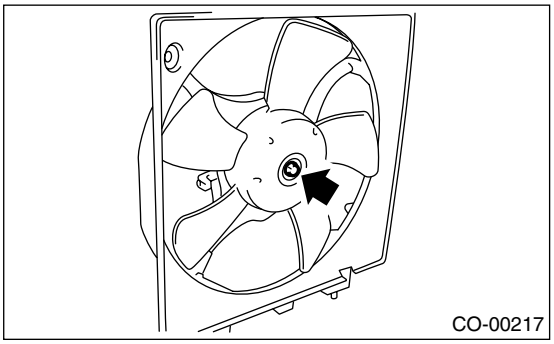
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



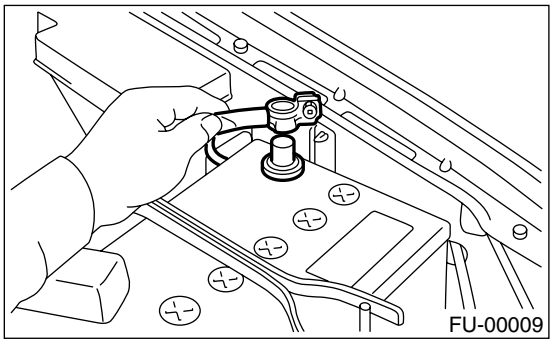
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



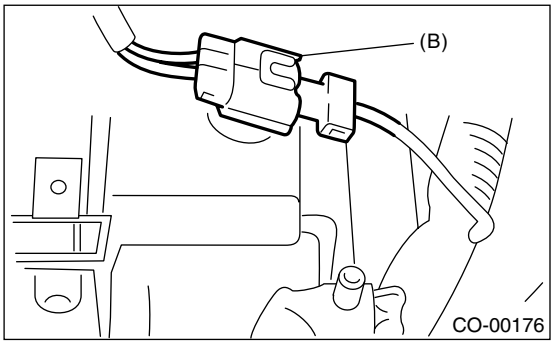
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

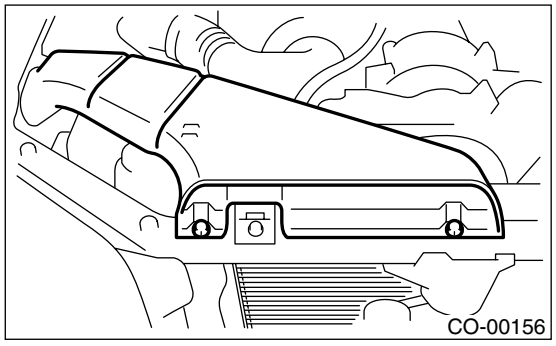
1) Disconnect the ground cable from battery.



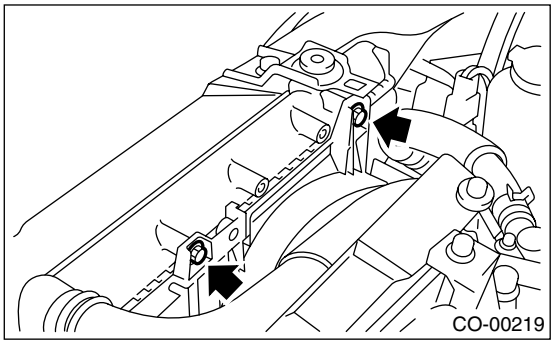
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the connector of sub fan motor (B).



5) Lower the vehicle.
6) Remove the air intake duct.



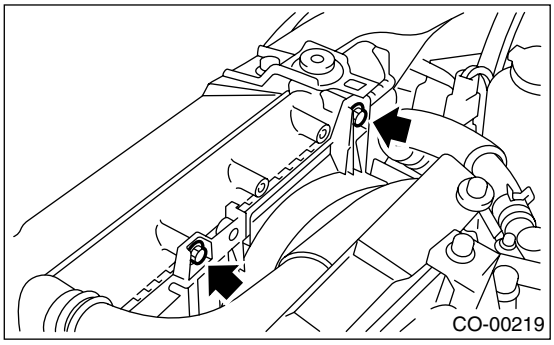
7) Remove the bolts which hold the sub fan shroud to radiator.
8) Remove the overflow pipe.
9) Remove the radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

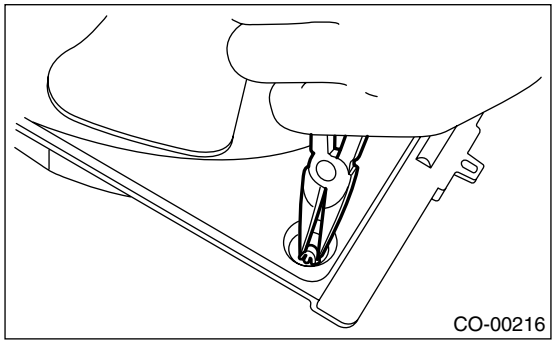
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

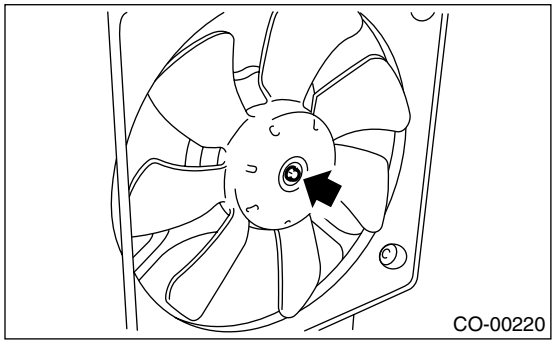


C: DISASSEMBLY

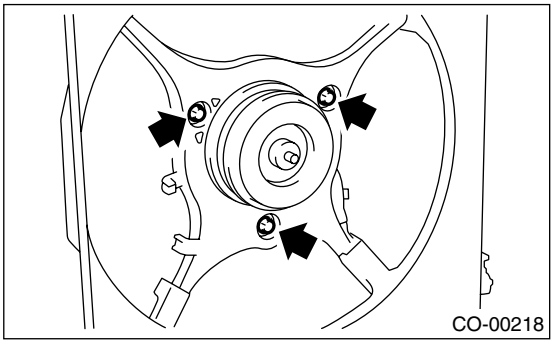
1) Remove the clip which holds the motor harness onto shroud.



2) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



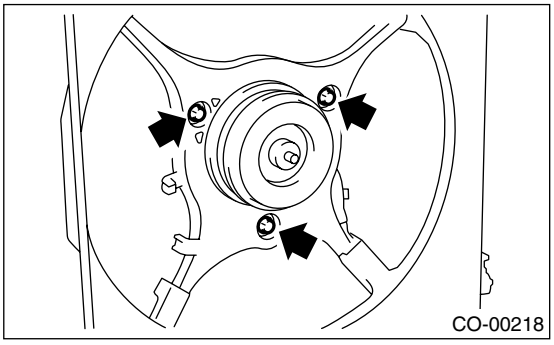
3) Remove the bolts which install the fan motor onto shroud.



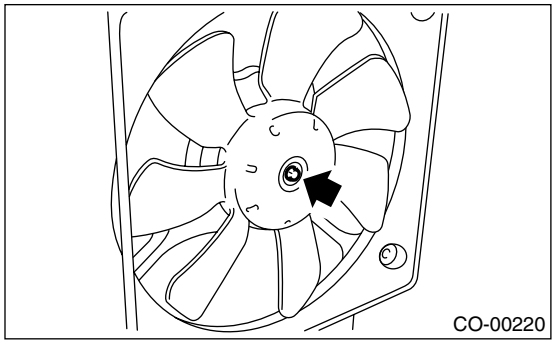
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



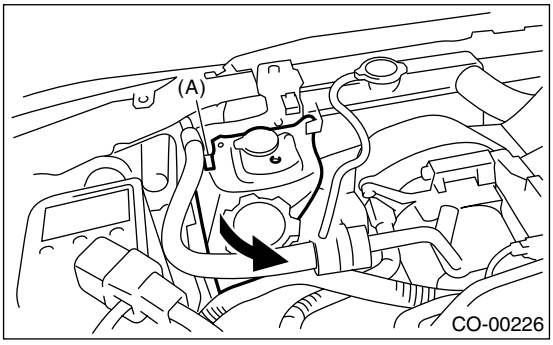
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



10.Reservoir Tank

A: REMOVAL

1) Disconnect the overflow hose from the radiator filler neck position.
2) Pull out the reservoir tank to direction of arrow while pushing the pawl (A).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(H4DOTC)-3, COMPONENT, General Description.>

C: INSPECTION

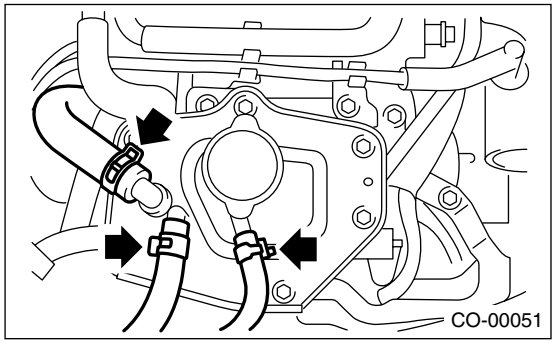
Make sure the engine coolant level is between full and low.

11.Coolant Filler Tank

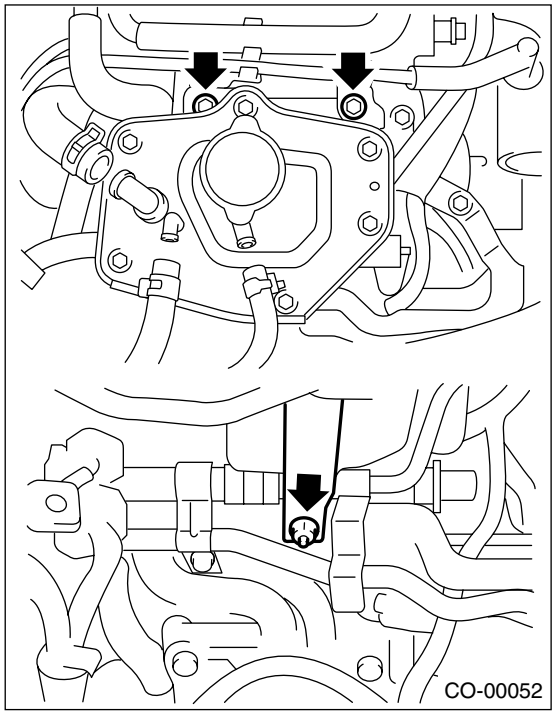
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
3) Remove the air cleaner element.
4) Disconnect the engine coolant hoses from coolant filler tank.



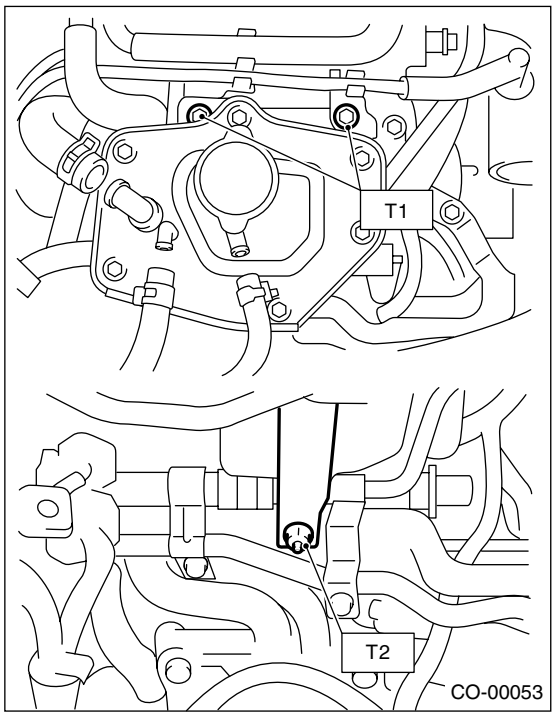
5) Remove the bolts and nut which install the coolant filler tank.
6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
7) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)



2) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4DOTC)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DOTC)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Defective thermostat	Replace.
	p. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

LUBRICATION

LU(H4DOTC)

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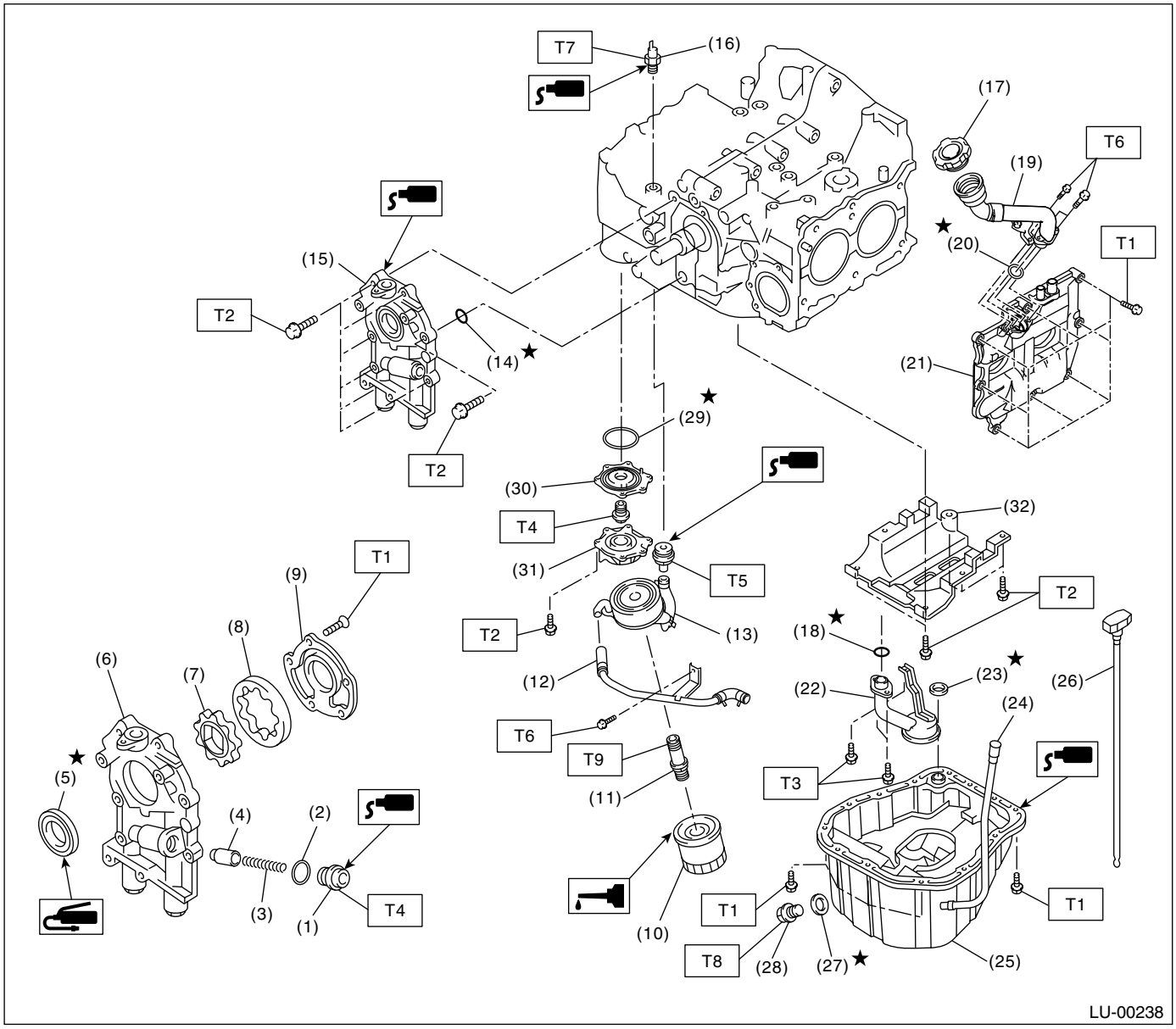
3. Engine Oil 8
4. Oil Pump 10
5. Oil Pan and Strainer 14
6. Oil Pressure Switch 18
7. Engine Oil Cooler 19
8. Engine Oil Filter 21
9. Engine Lubrication System Trouble in General 22

1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		9
		Outer rotor		10
	Outer rotor diameter × thickness			78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotor		STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
			LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case		STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
			LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case		STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
			LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
			Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
		5,000 rpm	Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
			Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.
	Relief valve operation pressure			588 kPa (6.0 kg/cm^2, 85 psi)
Oil filter	Type			Full-flow filter type
	Filtration area			800 cm^2 (124 sq in)
	By-pass valve opening pressure			160 kPa (1.63 kg/cm^2, 23.2 psi)
	Outer diameter × width			68 × 65 mm (2.68 × 2.56 in)
	Oil filter to engine thread size			M 20 × 1.5
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure			14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure			More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)				4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector
(12) Water by-pass pipe
(13) Oil cooler
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler cap
(18) O-ring
(19) Oil filler duct
(20) O-ring
(21) Rocker cover
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Adapter (1)
(31) Adapter (2)
(32) Baffle plate

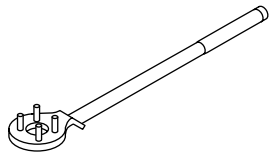
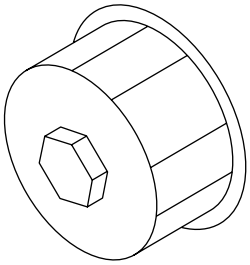
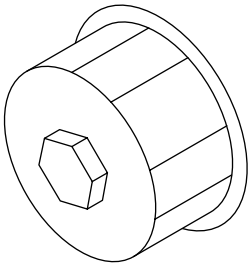
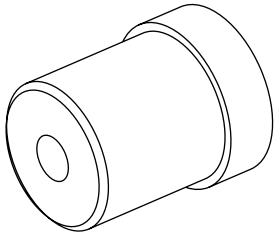
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.0)
T4: 45 (4.6, 33.2)
T5: 70 (7.1, 51.6)
T6: 6.4 (0.65, 4.7)
T7: 25 (2.5, 18.1)
T8: 44 (4.5, 32.5)
T9: 54 (5.5, 40)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

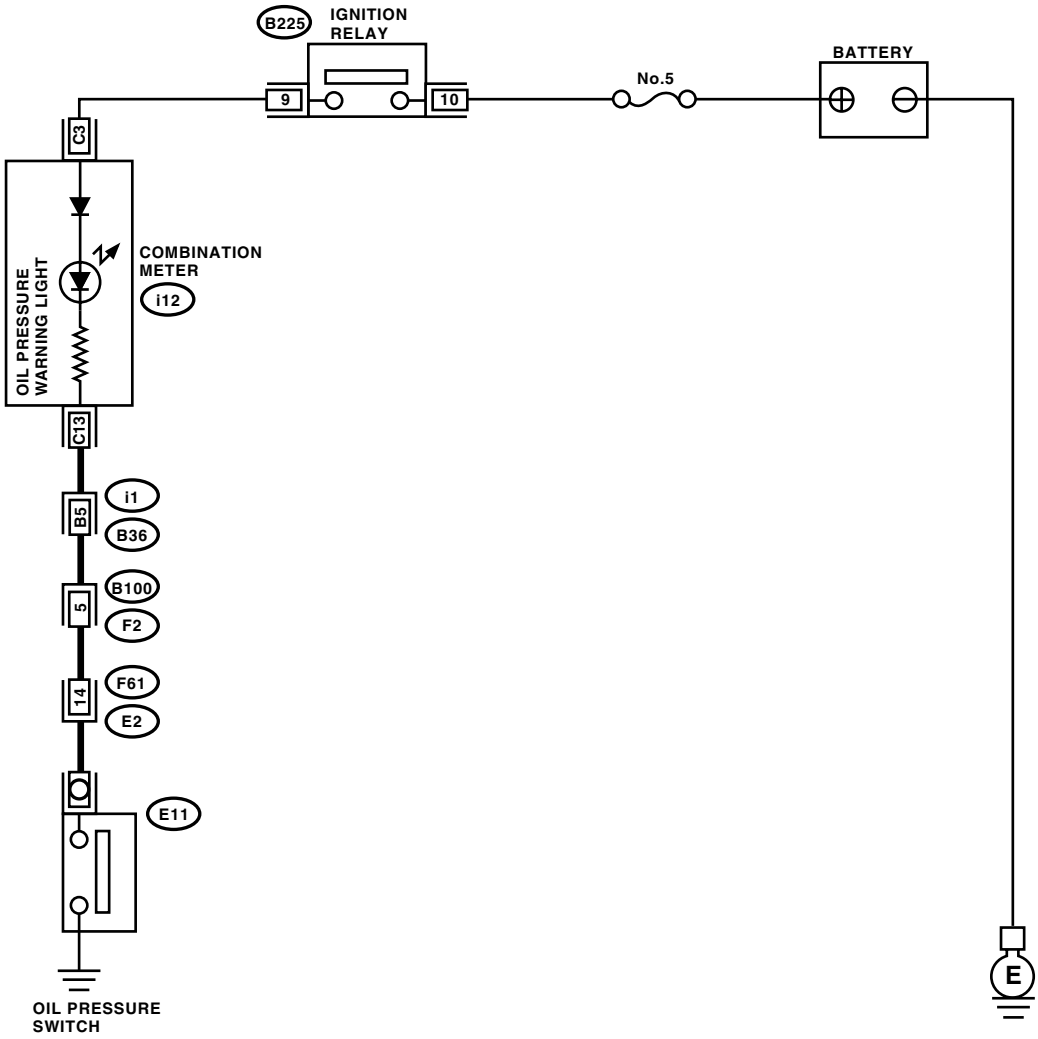
D: PREPARATION TOOL

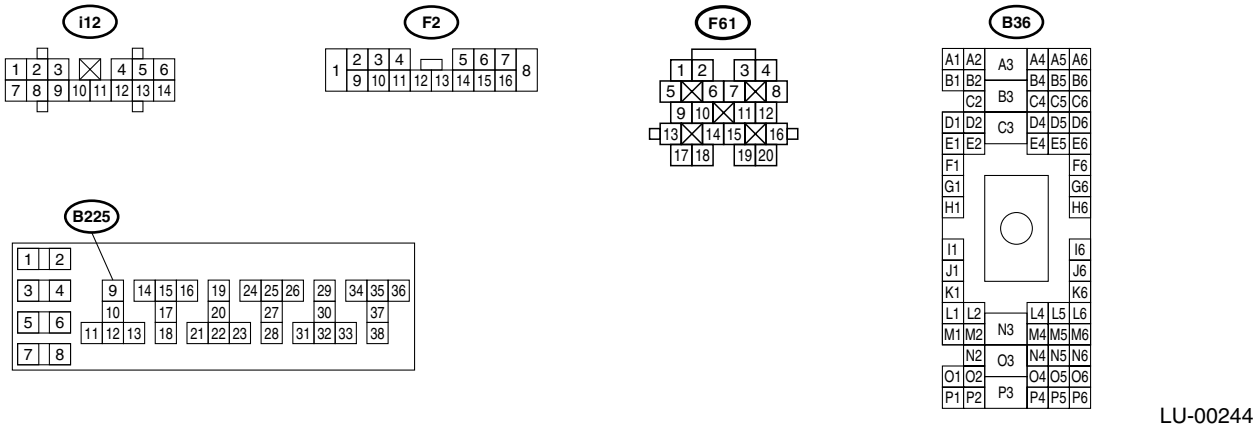
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	49 9977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal to oil pump.

2. Oil Pressure System

A: SCHEMATIC





LU-00244

B: INSPECTION

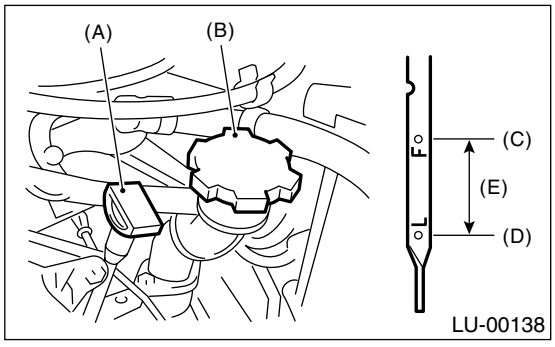
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check other warning lights.	Does the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***No. C3 — No. C13:***	Is the measured value less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter.

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of engine oil.

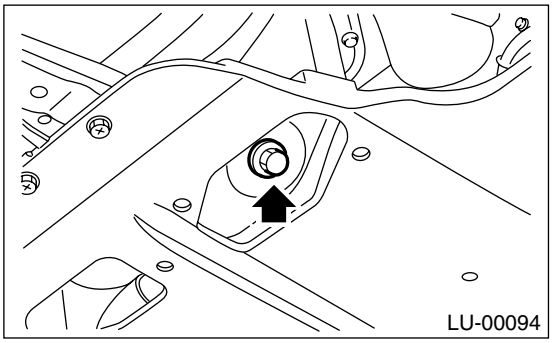
NOTE:
To prevent overfilling the engine oil, do not add oil above “F” line when the engine is cold.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

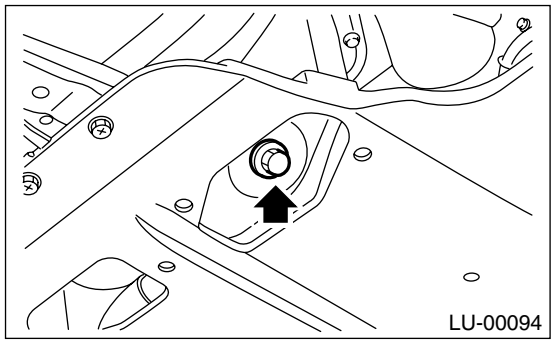
B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of engine oil.
2) Drain the engine oil by loosening the engine oil drain plug.



3) Replace the drain plug gasket.
4) Tighten the engine oil drain plug after draining engine oil.

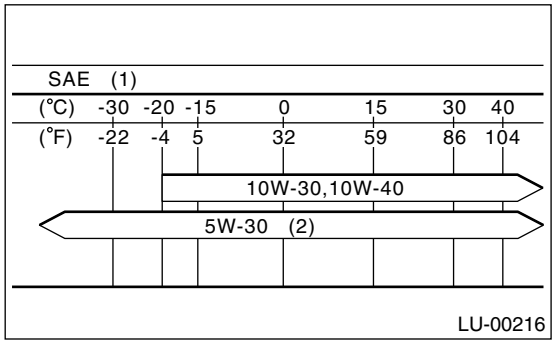
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



5) Install the service hole cover.
6) Fill engine oil through the filler pipe up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level. Use the engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark)
API classification SL with the words “ENERGY CONSERVING” (if you cannot obtain the oil with SL grade, you may use SJ grade “ENERGY CONSERVING” oil)

Engine oil capacity:
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)



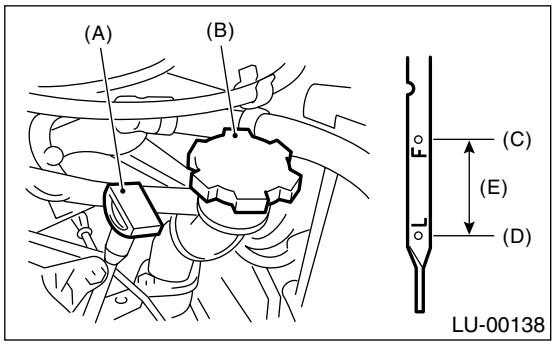
(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

7) Close the engine oil filler cap.
8) Start the engine and warm it up for a time.
9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

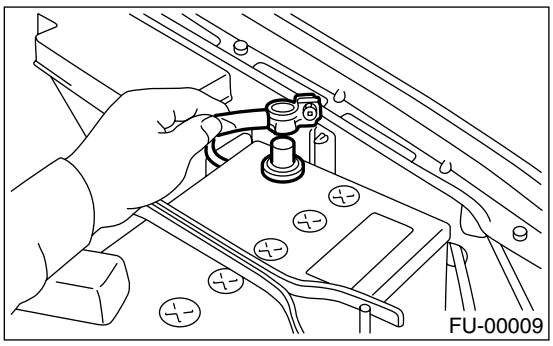


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

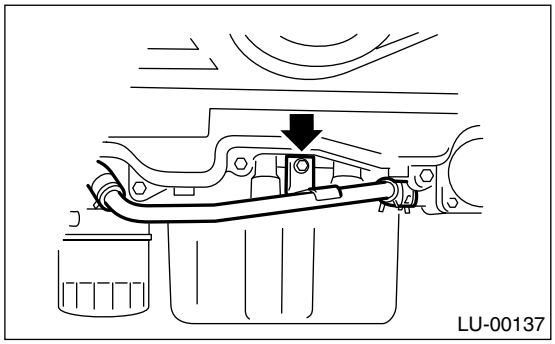
4. Oil Pump

A: REMOVAL

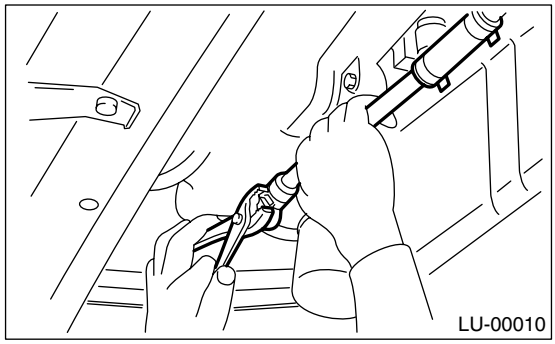
1) Disconnect ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the bolts which install the water pipe of oil cooler to oil pump.

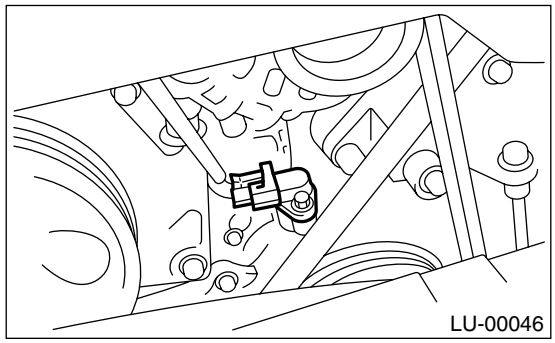


5) Remove the water pipe and hoses between oil cooler and water pump.

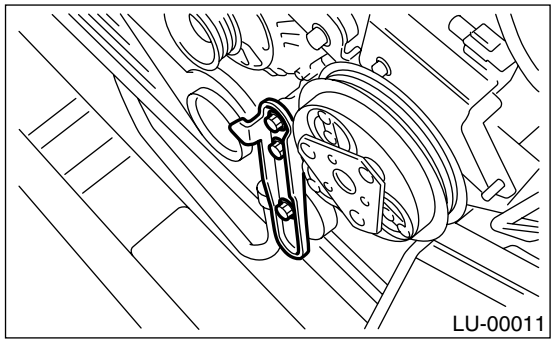


6) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>

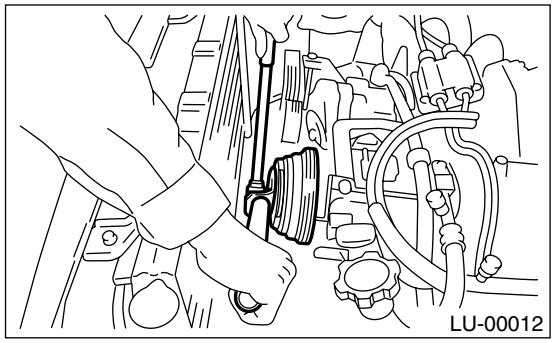
7) Remove the crankshaft position sensor.



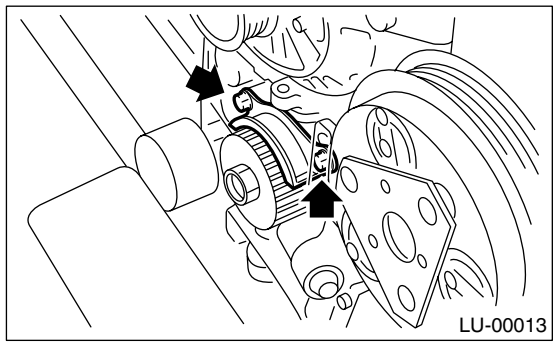
8) Remove the V-belts. <Ref. to ME(H4DOTC)-45, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.



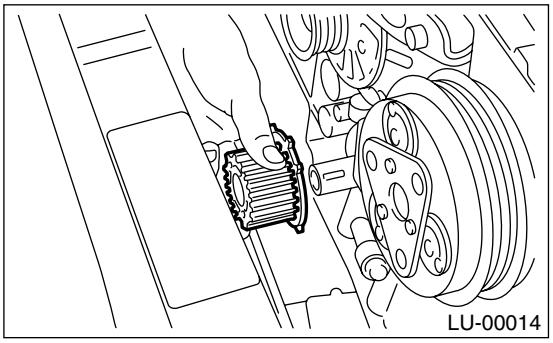
10) Remove the crankshaft pulley by using ST. <Ref. to ME(H4DOTC)-47, REMOVAL, Crankshaft Pulley.>



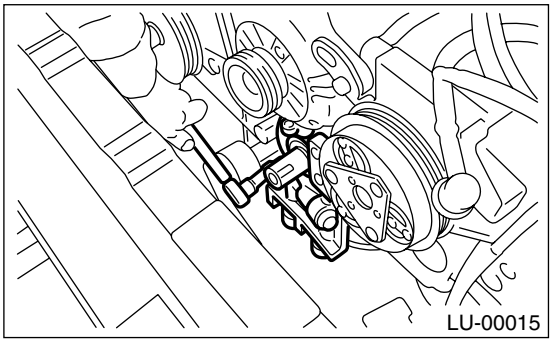
11) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
12) Remove the timing belt guide. (MT model)



13) Remove the crankshaft sprocket.

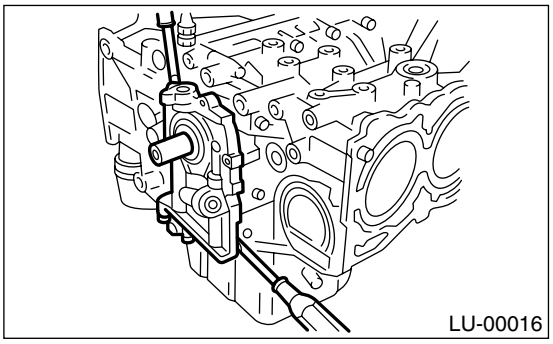


14) Remove the bolts which install the oil pump onto cylinder block.



15) Remove the oil pump using the flat tip screwdriver.

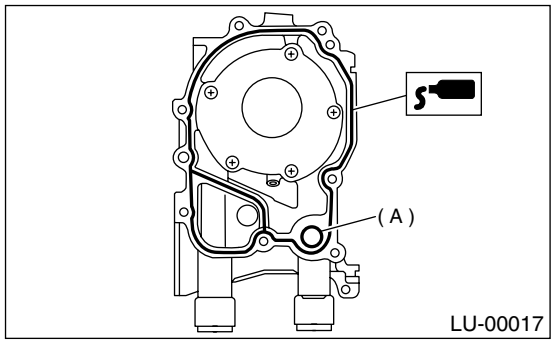
CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



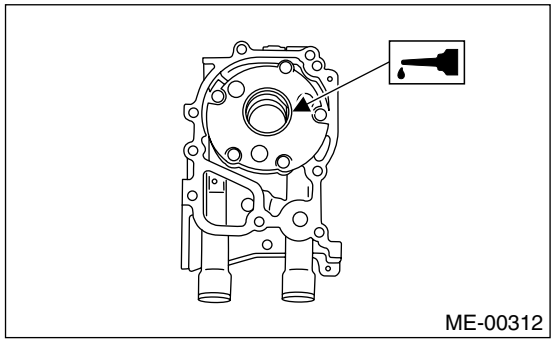
B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply fluid packing to the matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.

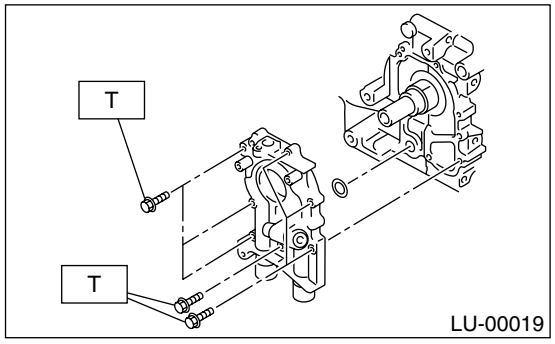


4) Be careful not to scratch the oil seal when installing the oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

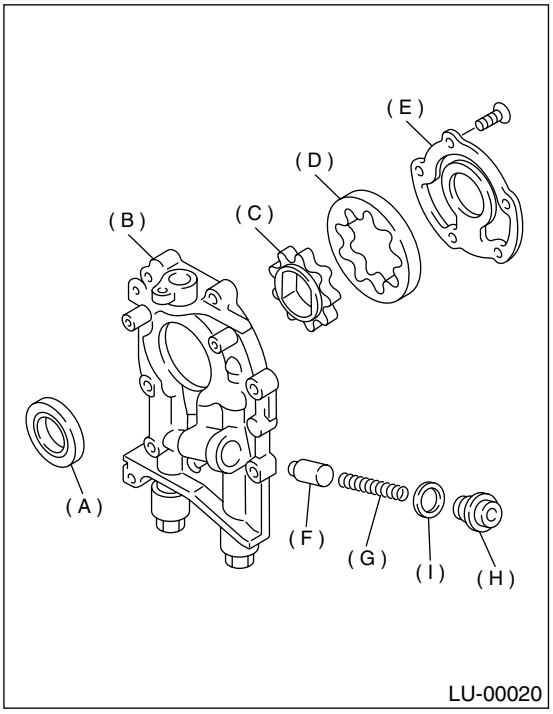
Tightening torque:
6.4 N·m (0.65 kgf -m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

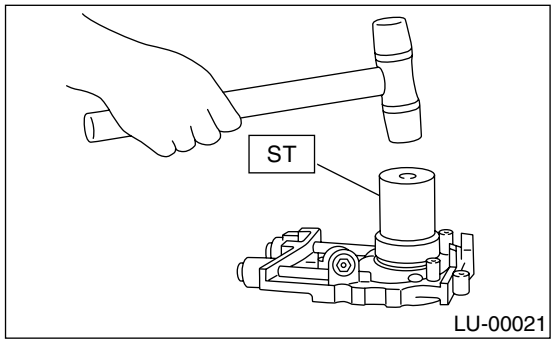


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

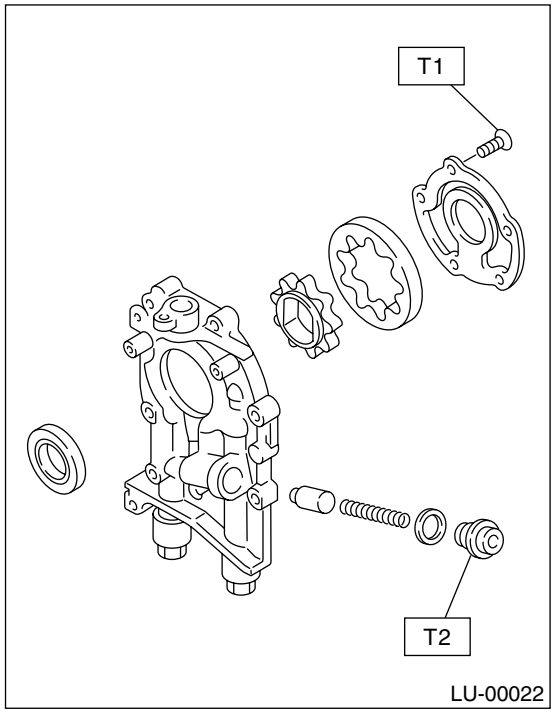


2) Apply a coat of engine oil to the inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve, relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

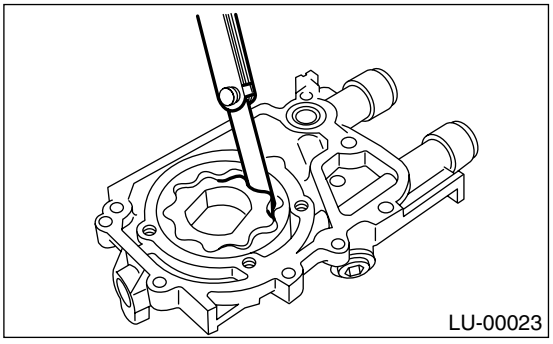


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

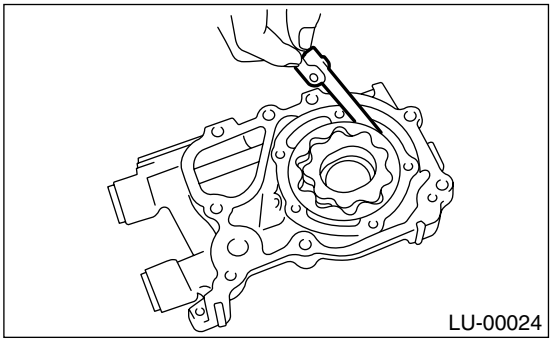
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

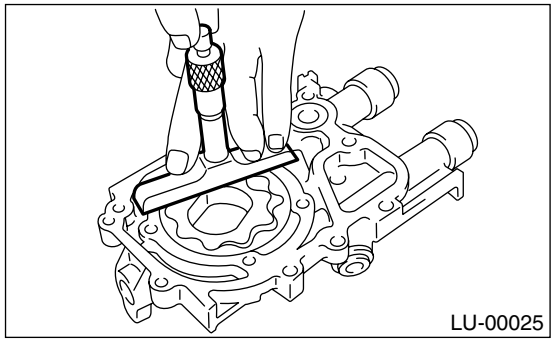
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.1 N (9.49 kgf, 20.88 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

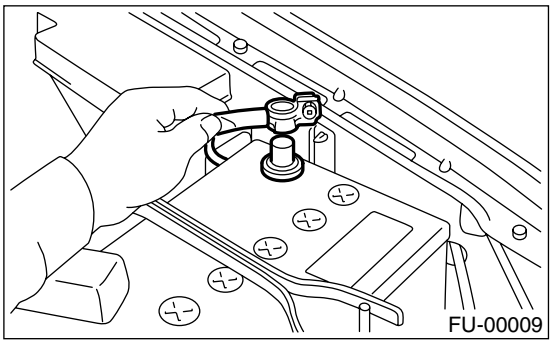
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

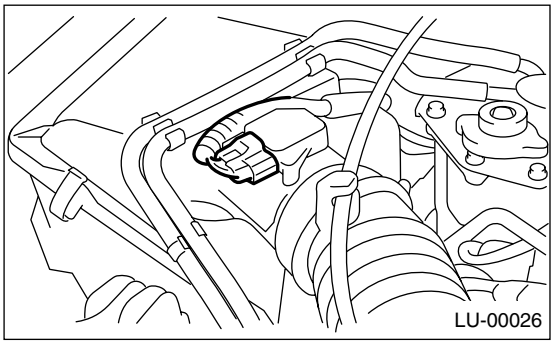
5. Oil Pan and Strainer

A: REMOVAL

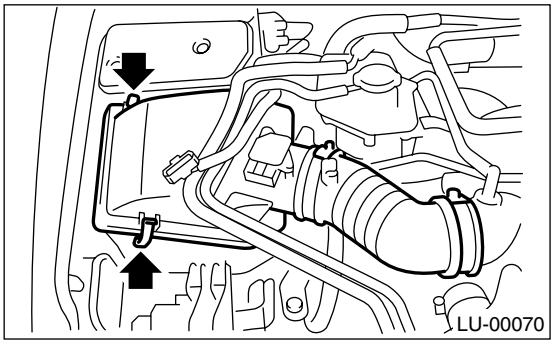
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from mass air flow sensor.

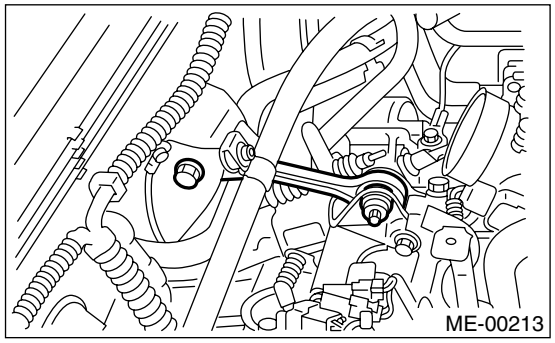


5) Remove the air intake boot and air cleaner upper cover.

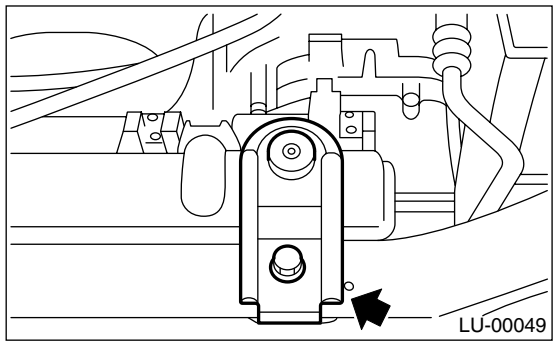


6) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

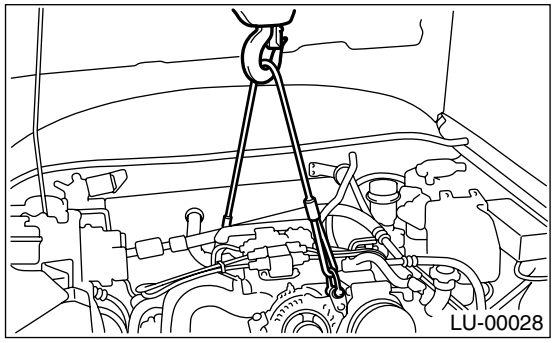
7) Remove the pitching stopper.



8) Remove the radiator upper brackets.



9) Support the engine with a lifting device and wire ropes.

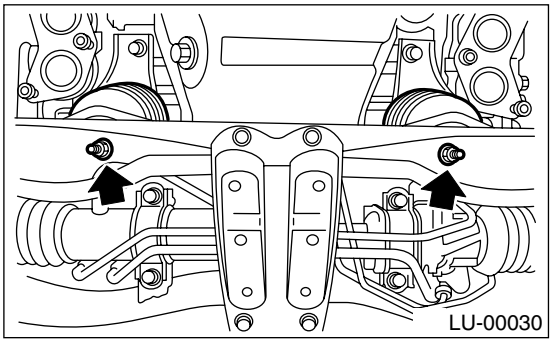


10) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, rise up the wire rope together.

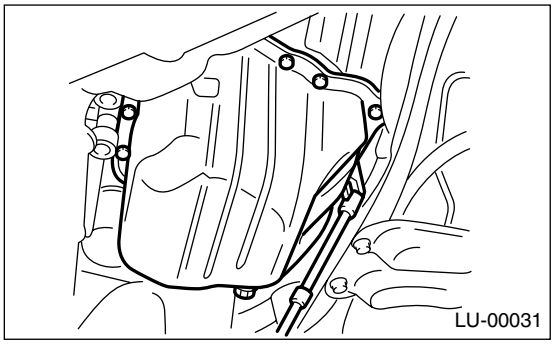
11) Remove the under cover.
12) Drain the engine oil.

13) Remove the nuts which install the front cushion rubber onto front crossmember.

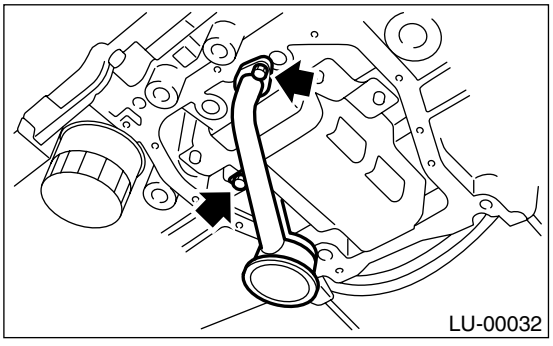


14) Remove the bolts which install the oil pan on cylinder block while raising up engine.
15) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

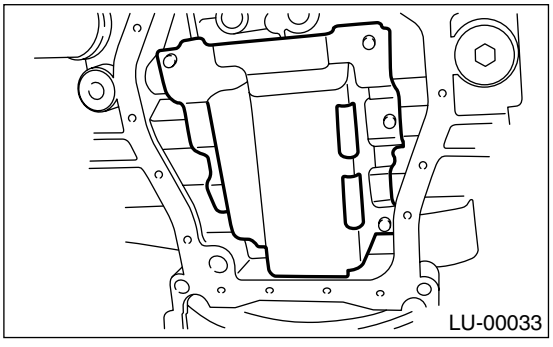
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



16) Remove the oil strainer.



17) Remove the baffle plate.

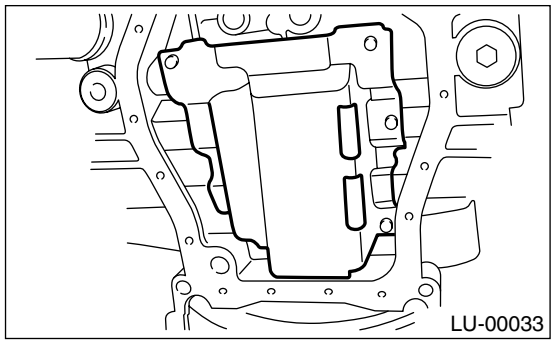


B: INSTALLATION

CAUTION:
Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

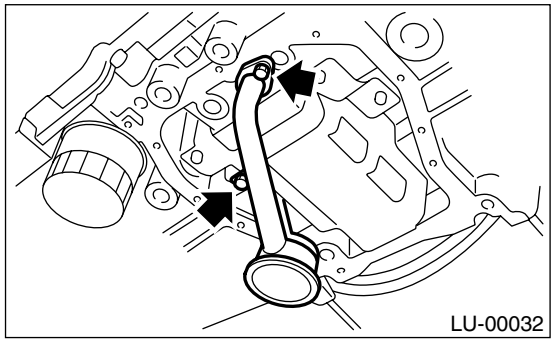
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install the oil strainer onto baffle plate.

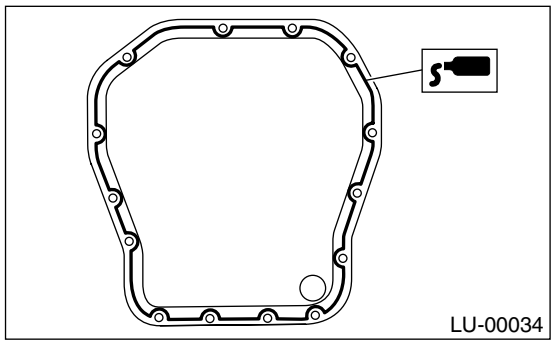
NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



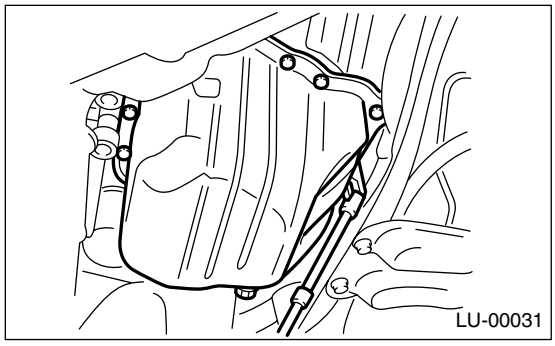
3) Apply fluid packing to the mating surfaces, and then install the oil pan.

Fluid packing:
THREE BOND 1207C (Part No. 004403012) or equivalent



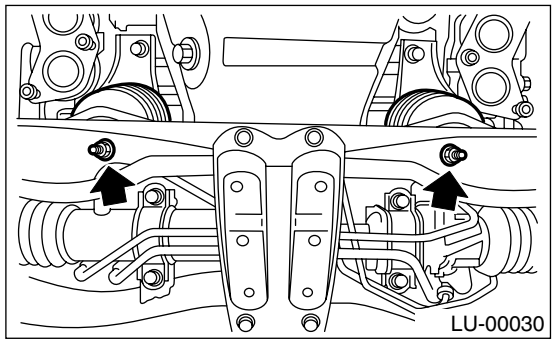
4) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Lower the engine onto front crossmember.
6) Tighten the nuts which install the front cushion rubber onto front crossmember.

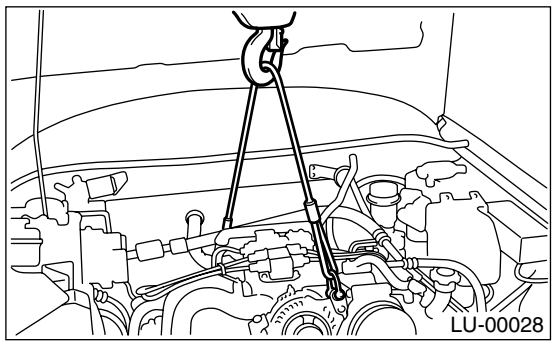
Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)



7) Install the under cover.
8) Lower the vehicle.

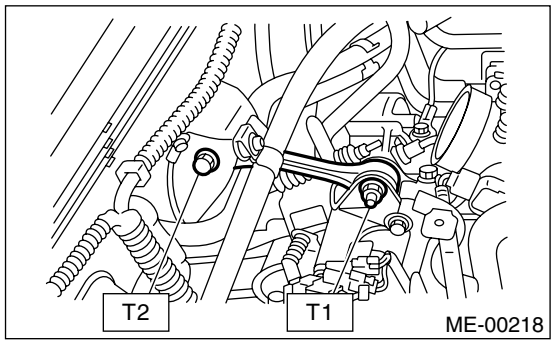
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

9) Remove the lifting device and steel cables.

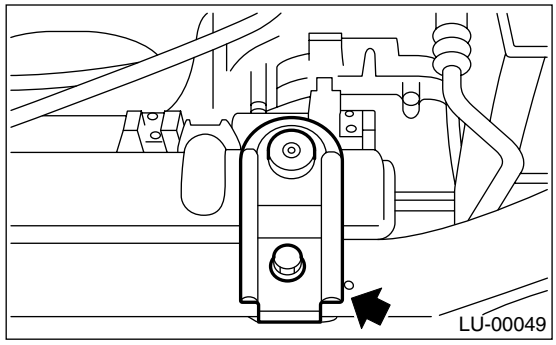


10) Install the pitching stopper.

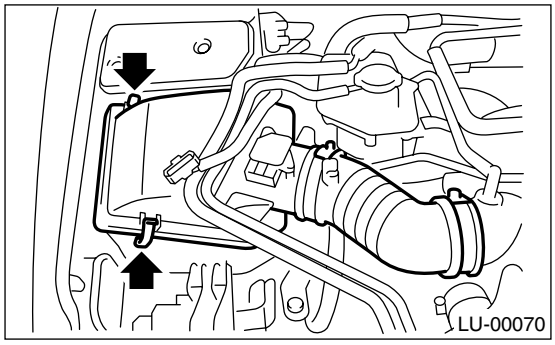
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



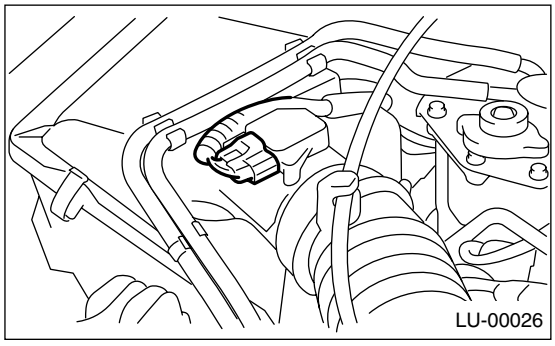
11) Install the radiator upper brackets.



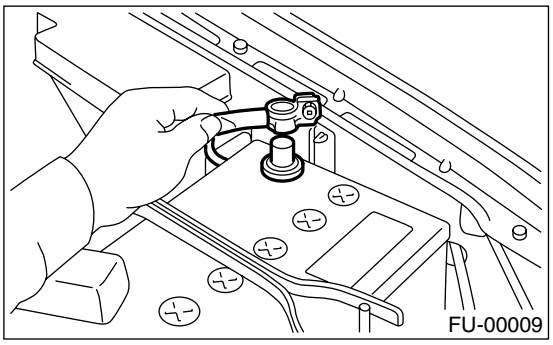
12) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
13) Install the air intake boot and air cleaner upper cover.



14) Connect the connector to mass air flow sensor.



15) Install the front wheels.
16) Connect the battery ground cable to battery.



17) Fill engine oil. <Ref. to LU(H4DOTC)-8, INSPECTION, Engine Oil.>

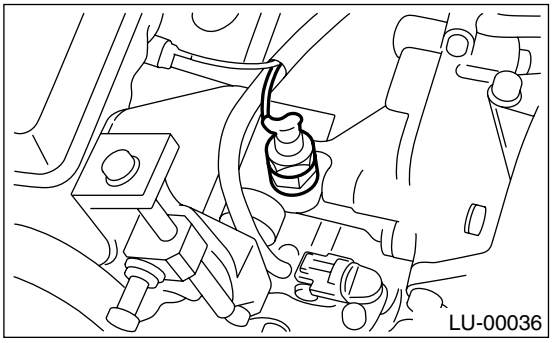
C: INSPECTION

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

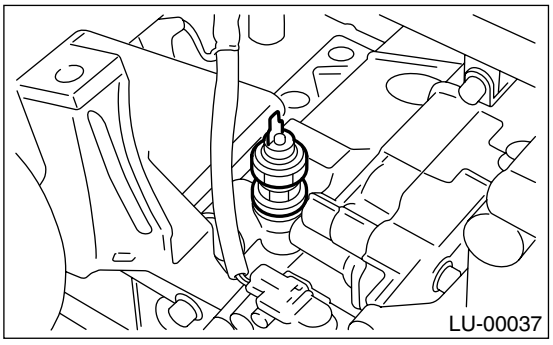
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. <Ref. to SC(H4SO)-15, REMOVAL, Generator.>
2) Disconnect the terminal from oil pressure switch.



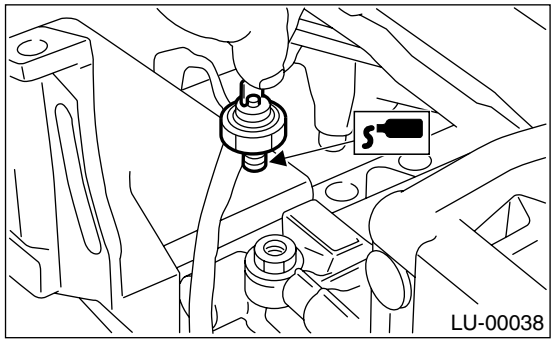
3) Remove the oil pressure switch.



B: INSTALLATION

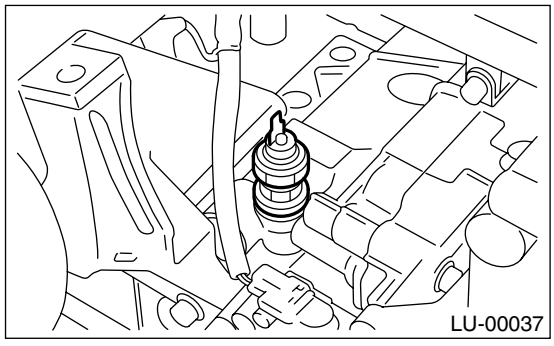
1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:
THREE BOND 1324 (Part No. 004403042) or equivalent

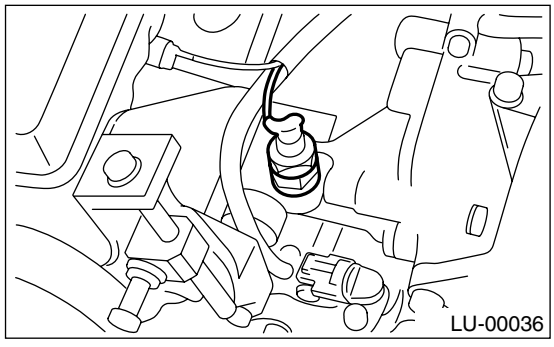


2) Install the oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



4) Install the generator on bracket. <Ref. to SC(H4SO)-15, INSTALLATION, Generator.>

C: INSPECTION

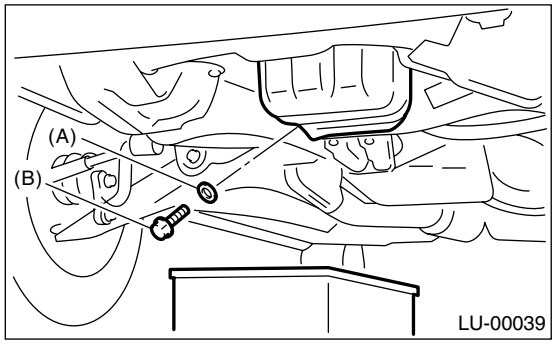
Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Cooler

A: REMOVAL

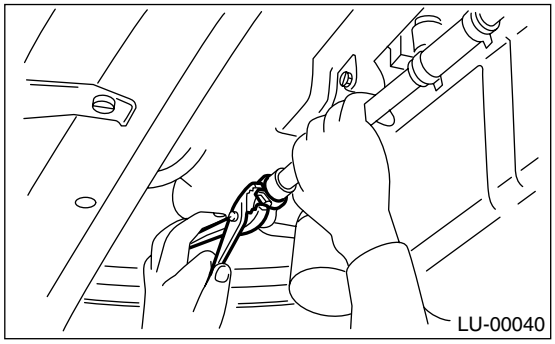
NOTE:
Engine oil cooler is equipped with turbo model only.

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine oil. Set a container under the vehicle, and remove the drain plug from oil pan.

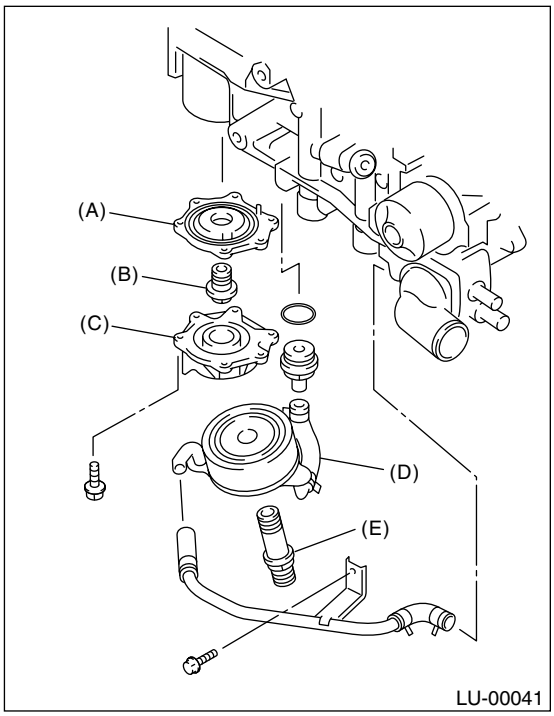


(A) Gasket
(B) Drain plug

4) Drain the engine coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU(H4DOTC)-21, REMOVAL, Engine Oil Filter.>
7) Remove the connector and remove oil cooler.
8) Remove the adapters (1) and (2).

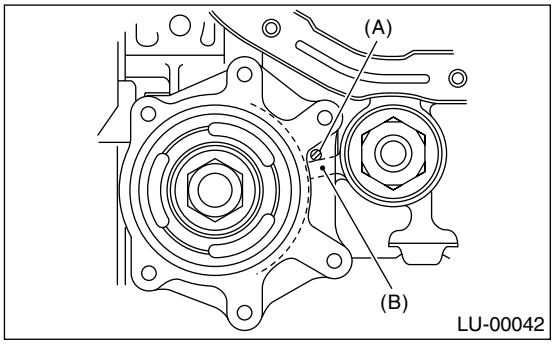


(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

B: INSTALLATION

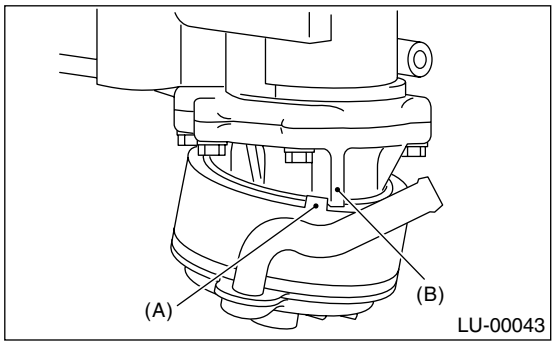
NOTE:
Engine oil cooler is equipped with turbo model only.

1) Install in the reverse order of removal.
2) Contact the knock pin (A) of adapter (1) to cylinder block rib (B) to install adapter (1).



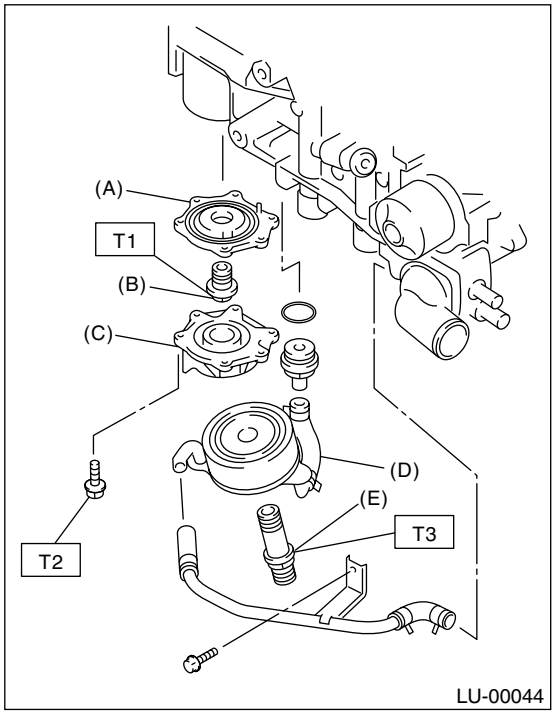
3) Install the adapter (2).

4) Contact the engine oil cooler stopper (A) to adapter (2) rib to install engine oil cooler.



Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 5.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 33 ft-lb)
T3: 54 N·m (5.5 kgf-m, 40 ft-lb)

NOTE:
Always use a new O-ring.



C: INSPECTION

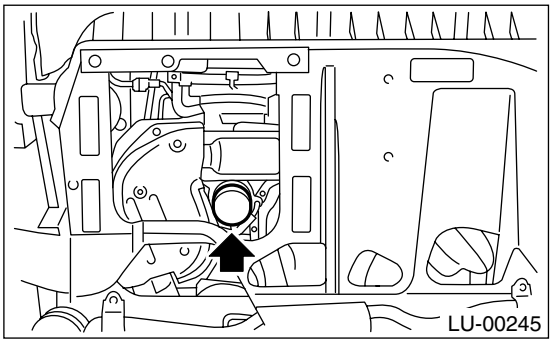
1) Check that the coolant passages are not clogged using air blow method.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

8. Engine Oil Filter

A: REMOVAL

1) Remove the service hole cover.
2) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



B: INSTALLATION

CAUTION:
Oil filter with 80 mm (3.15 in) outer diameter cannot be used for a TURBO model.

1) Clean oil filer mounting surface of oil cooler.
2) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
3) Be careful not to damage seal rubber when oil filter is turned by hand and installed.

• Oil filter with 68 mm (2.68 in) outer diameter is further tightened (about 1 rotation) after seal rubber contacts an oil cooler.
• Oil filter with 65 mm (2.56 in) outer diameter is further tightened (about 2/3 to 3/4 rotation) after seal rubber contacts an oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

C: INSPECTION

1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

NOTE:
The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

2) Check the engine oil level. <Ref. to LU(H4DOTC)-8, INSPECTION, Engine Oil.>

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Poor contact of switch contact points		Replace.
	2) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1. — 2).

SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for TURBO model are the same as those for SOHC U5 model.
<Ref. to SP(H4SO U5)-2, General Description.>

IGNITION

IG(H4DOTC)

Page

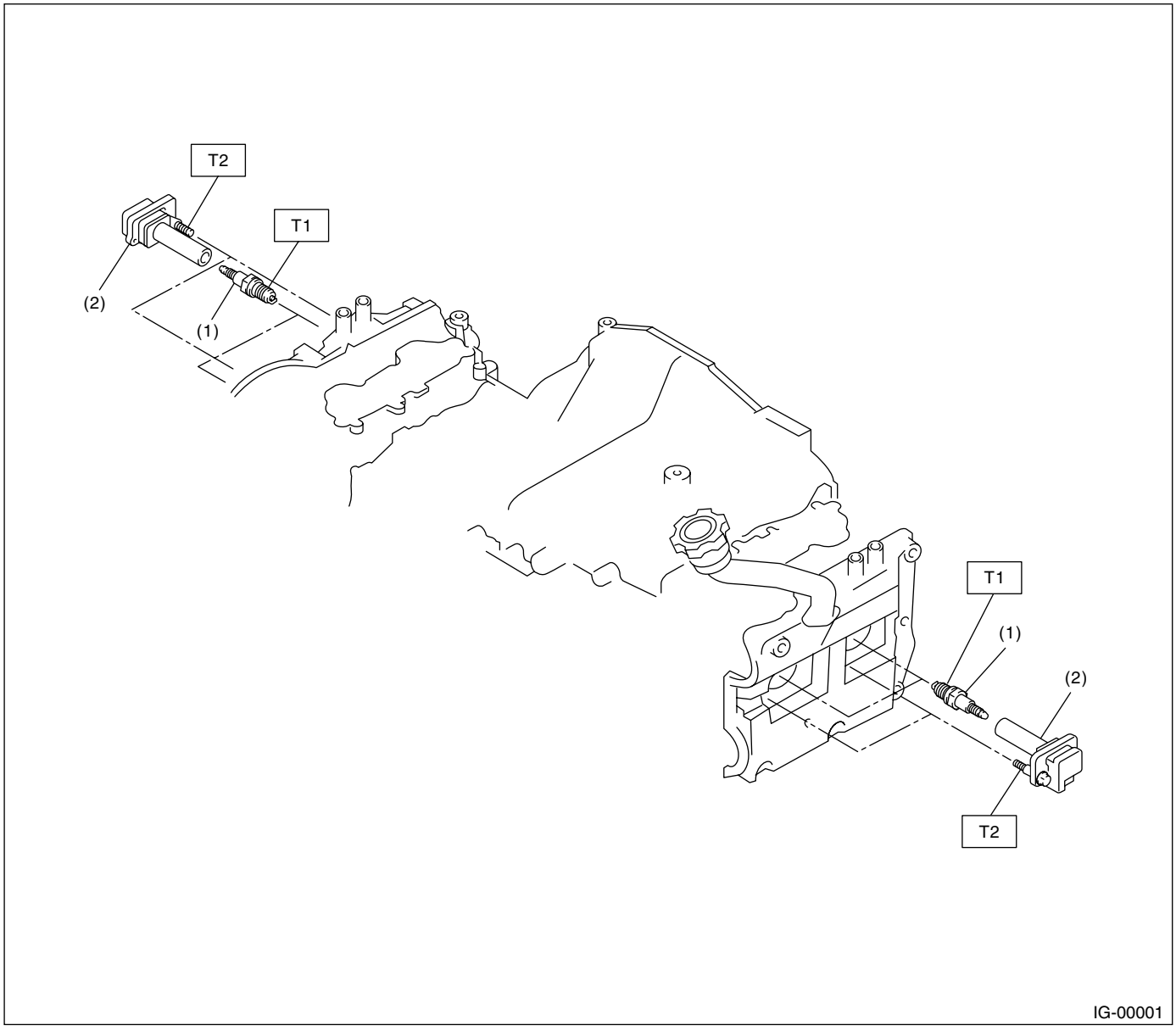
1. General Description 2
2. Spark Plug.....5
3. Ignition Coil & Ignitor ASSY 8

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil & ignitor assembly	Model	FK0186
	Ignition type	Direct ignition
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK: ILFR6B
	Thread diameter, pitch, length mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Platinum, Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil & ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

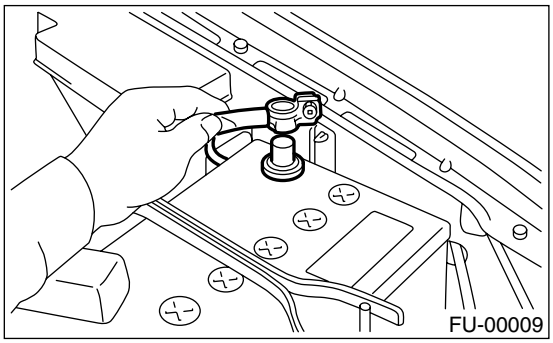
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

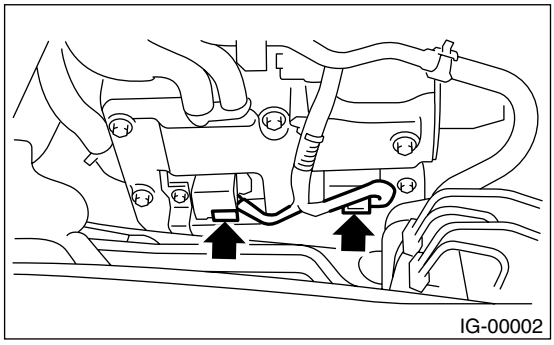
Spark plug:
NGK: ILFR6B

1. RH SIDE

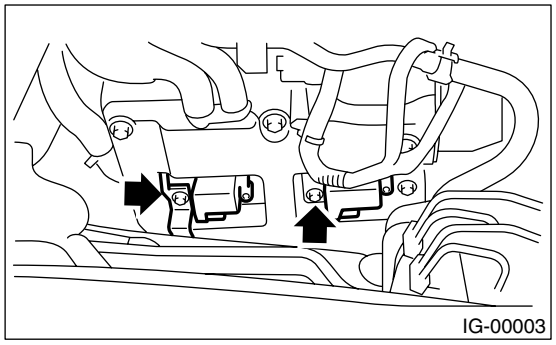
1) Disconnect the ground cable from battery.



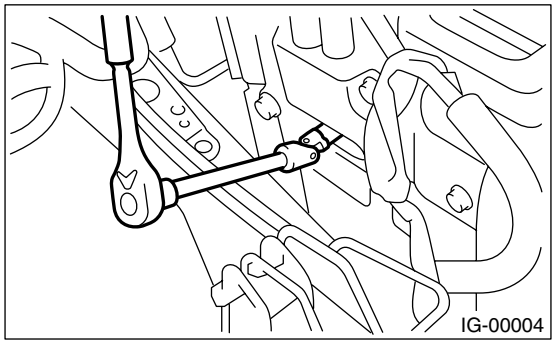
2) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

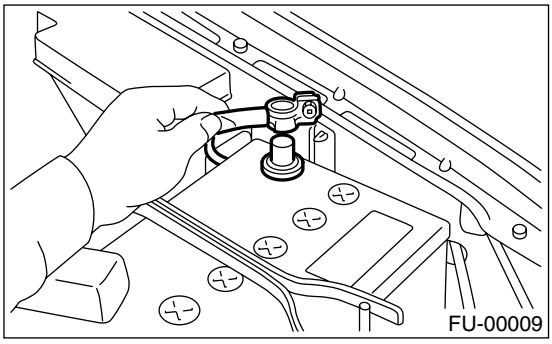


5) Remove the spark plugs with the spark plug sockets.

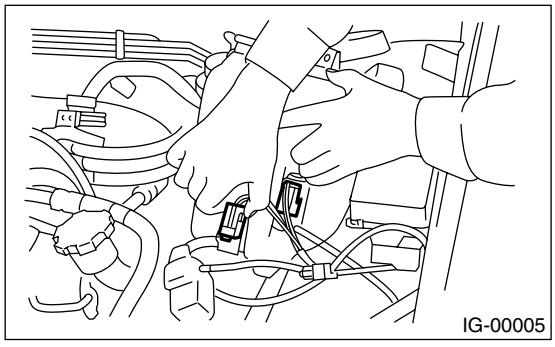


2. LH SIDE

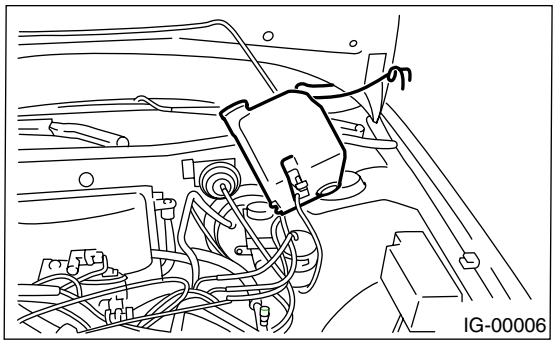
1) Disconnect the battery cables, and then remove the battery and battery carrier.



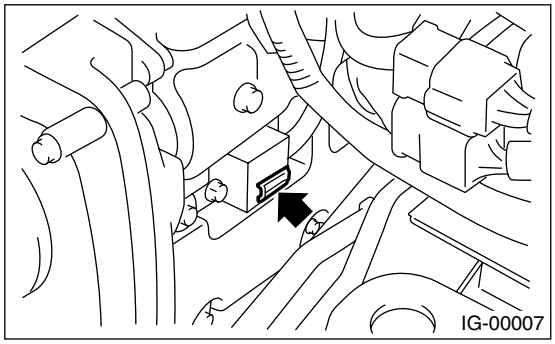
2) Disconnect the washer motor connector.



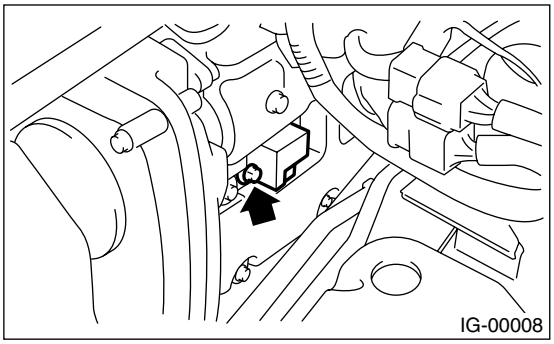
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



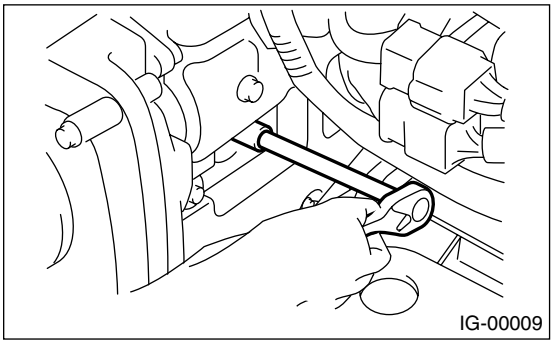
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

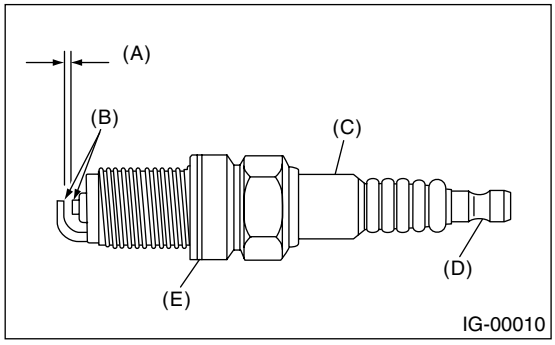
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

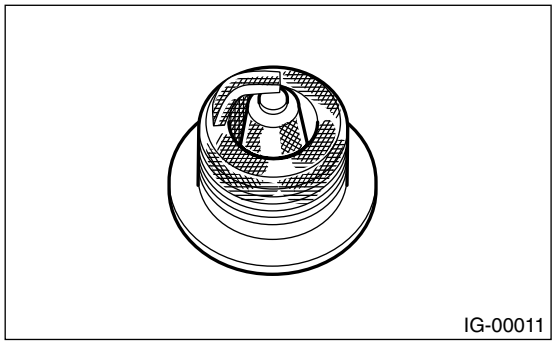
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

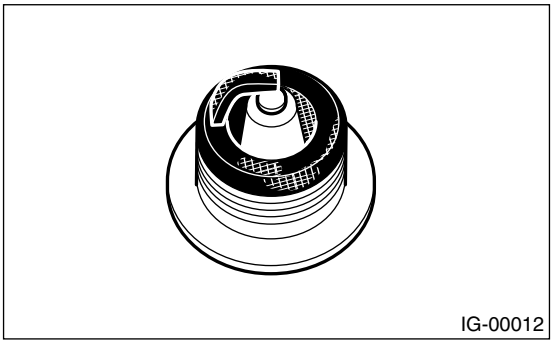


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

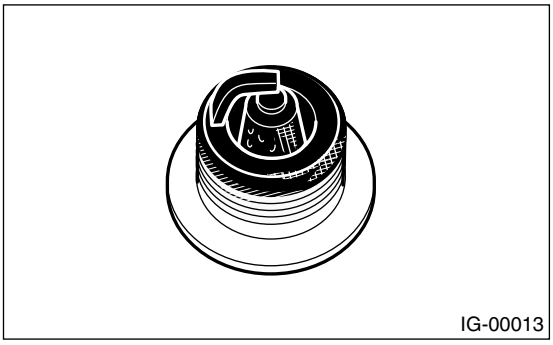
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



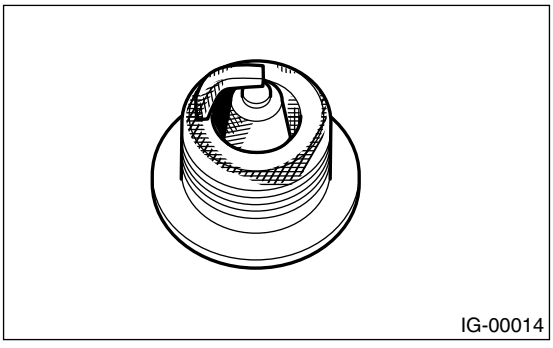
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00012

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00013

4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

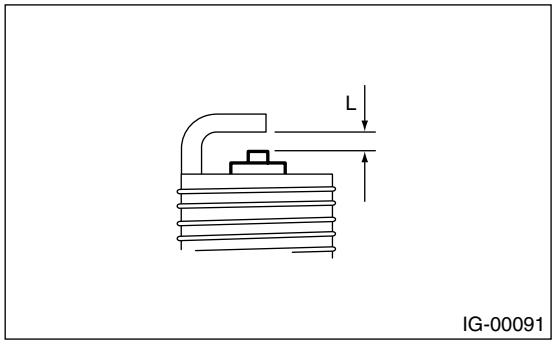

IG-00014

D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the plugs.
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use spark plug cleaners, because the spark plugs are applied with iridium tips.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-00091

3. Ignition Coil & Ignitor ASSY

A: REMOVAL

Direct ignition type has been adopted. Refer to the “Spark Plug Removal” for removal procedure. <Ref. to IG(H4DOTC)-5, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

For inspection, refer to the following. <Ref. to EN(H4DOTC)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for Turbo model are included in SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(H4DOTC)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)-61, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does the malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(H4DOTC)-439, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read the DTC on Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Repair the related parts. NOTE: If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)-50, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(H4DOTC)-47, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4DOTC)-39, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-84, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
VIN			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	° C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON/❑ OFF	Rear defogger	❑ ON/❑ OFF
Blower	❑ ON/❑ OFF	Radio	❑ ON/❑ OFF
A/C compressor	❑ ON/❑ OFF	CD/Cassette	❑ ON/❑ OFF
Cooling fan	❑ ON/❑ OFF	Car phone	❑ ON/❑ OFF
Front wiper	❑ ON/❑ OFF	CB	❑ ON/❑ OFF
Rear wiper	❑ ON/❑ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge: • Had run out of gas before: ❑ Yes/❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

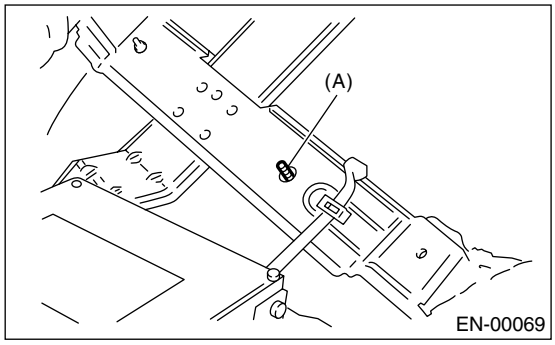
CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.
3) Do not disconnect the battery cables while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.
4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.
6) Before removing the ECM from located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

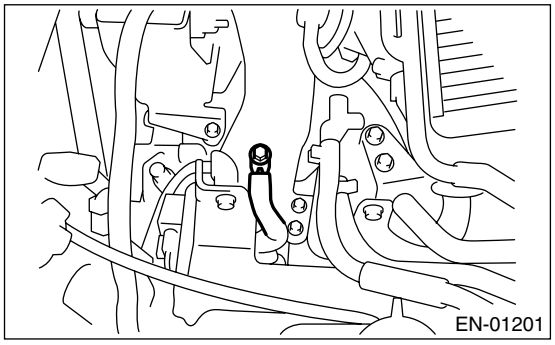
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.
11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far as possible from ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.

13) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
14) On model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

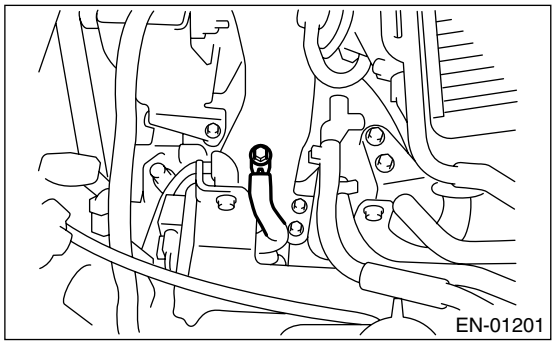
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of complex electronic control. Malfunction indicator light in combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from usual diagnostics procedure. When troubleshooting model with OBD-II, connect the Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, de-

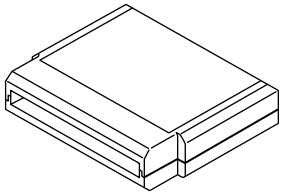
pending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

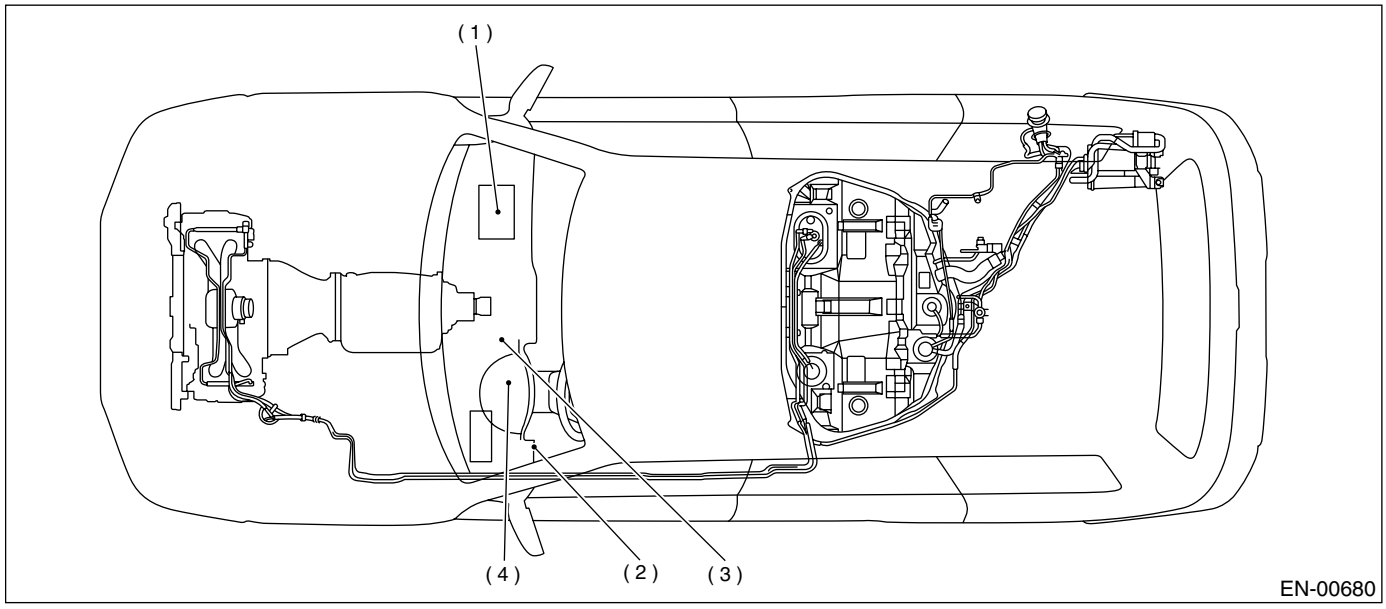
MEMO:

4. Electrical Components Location

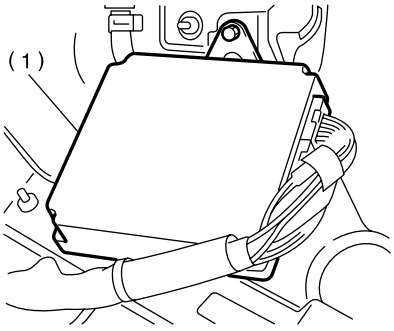
A: LOCATION

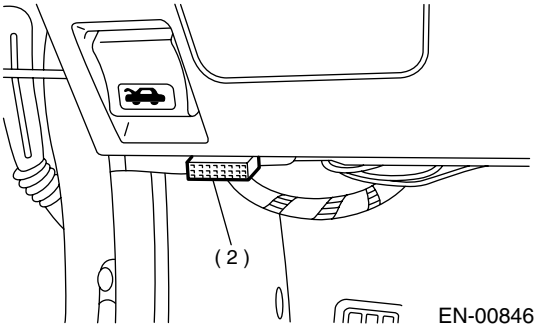
1. ENGINE

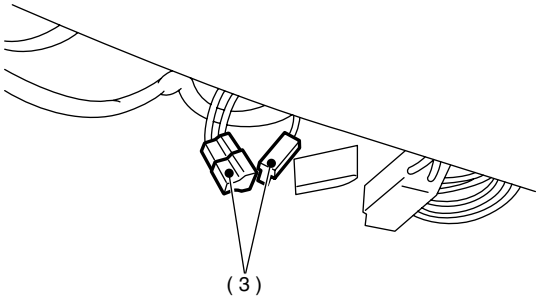
• Module

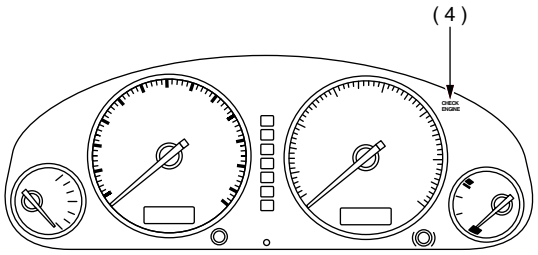


(1) Engine control module (ECM)
(2) Data link connector
(3) Test mode connector
(4) Malfunction indicator light

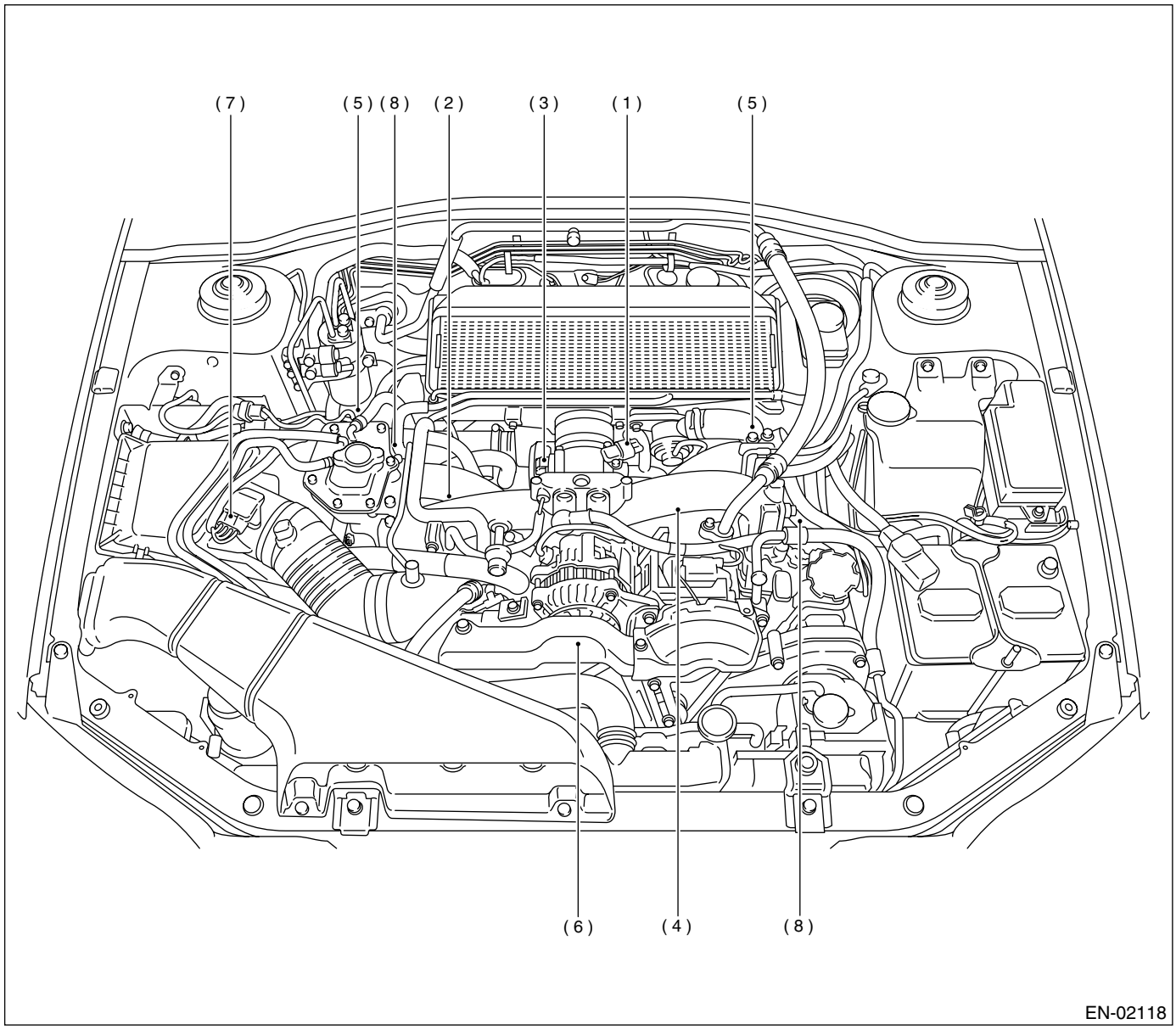




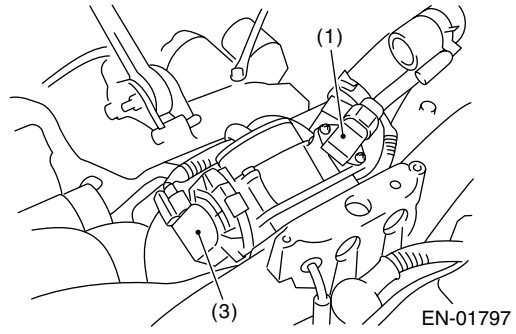




• Sensor



(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electric throttle
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor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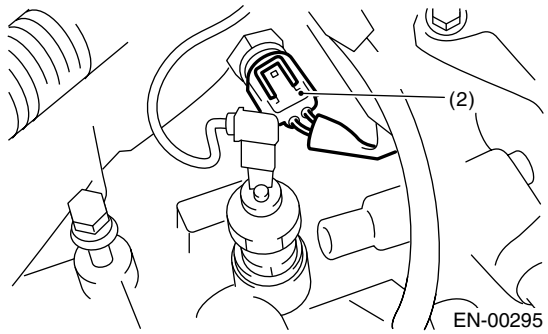
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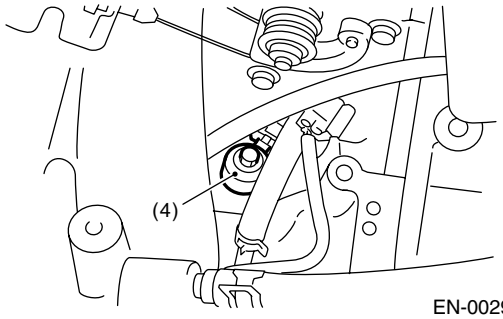
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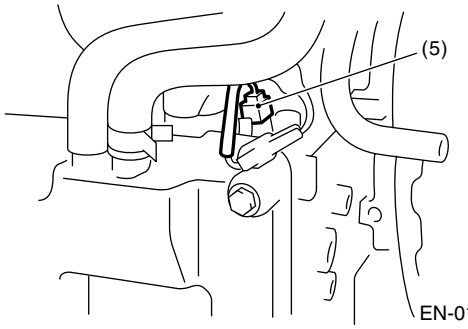
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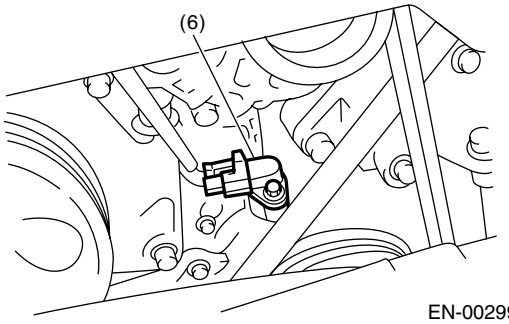
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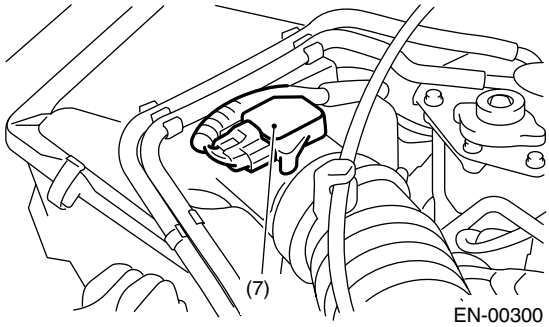
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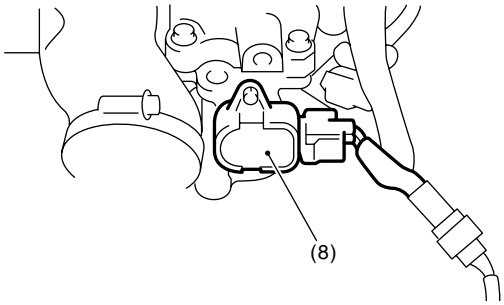
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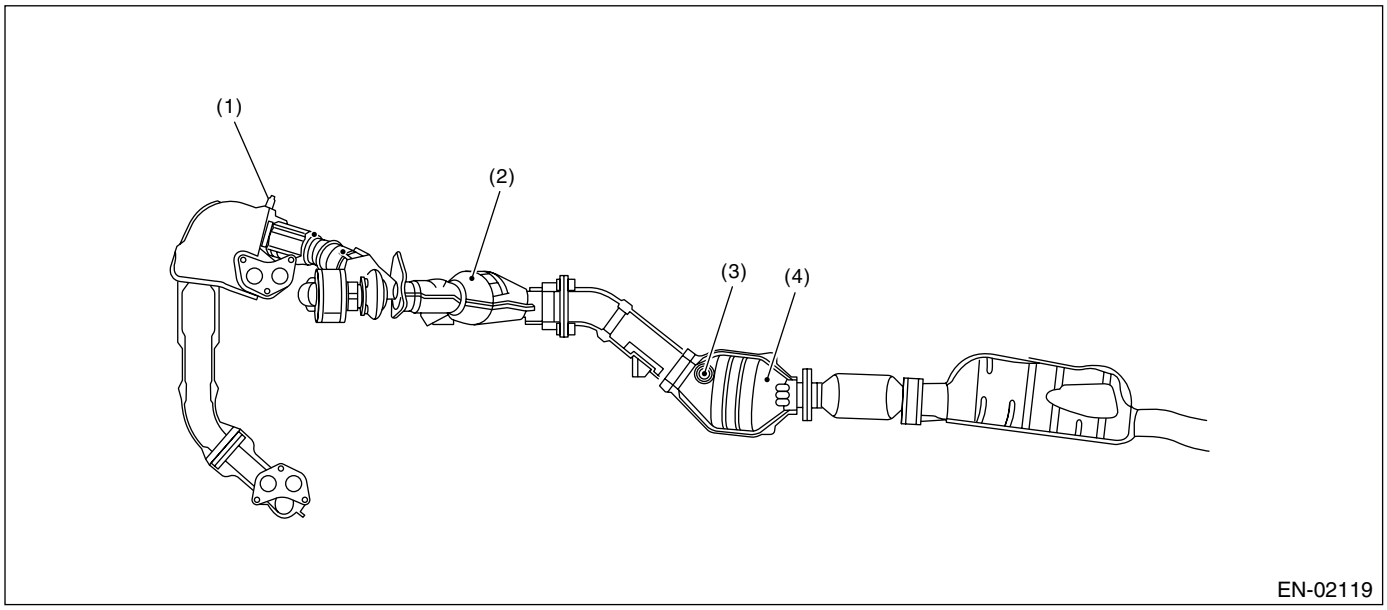
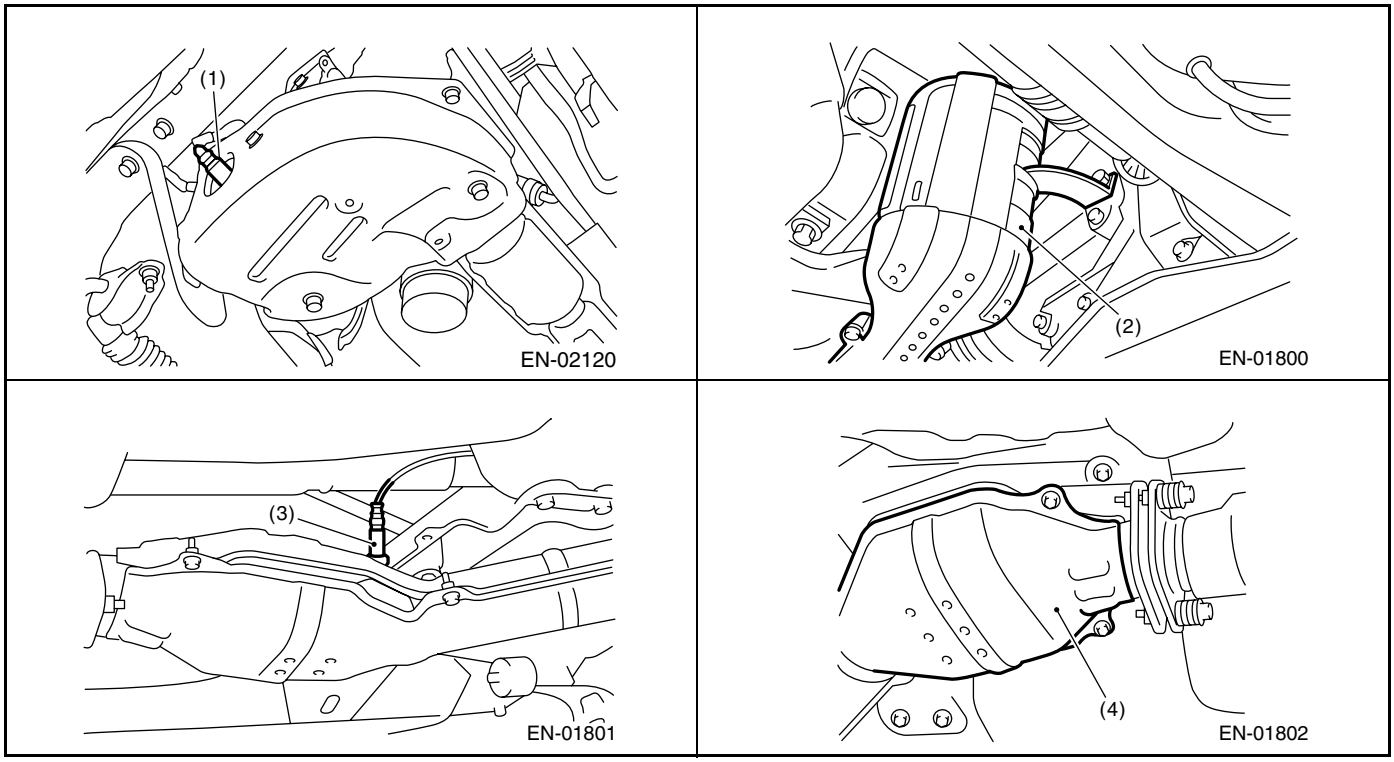
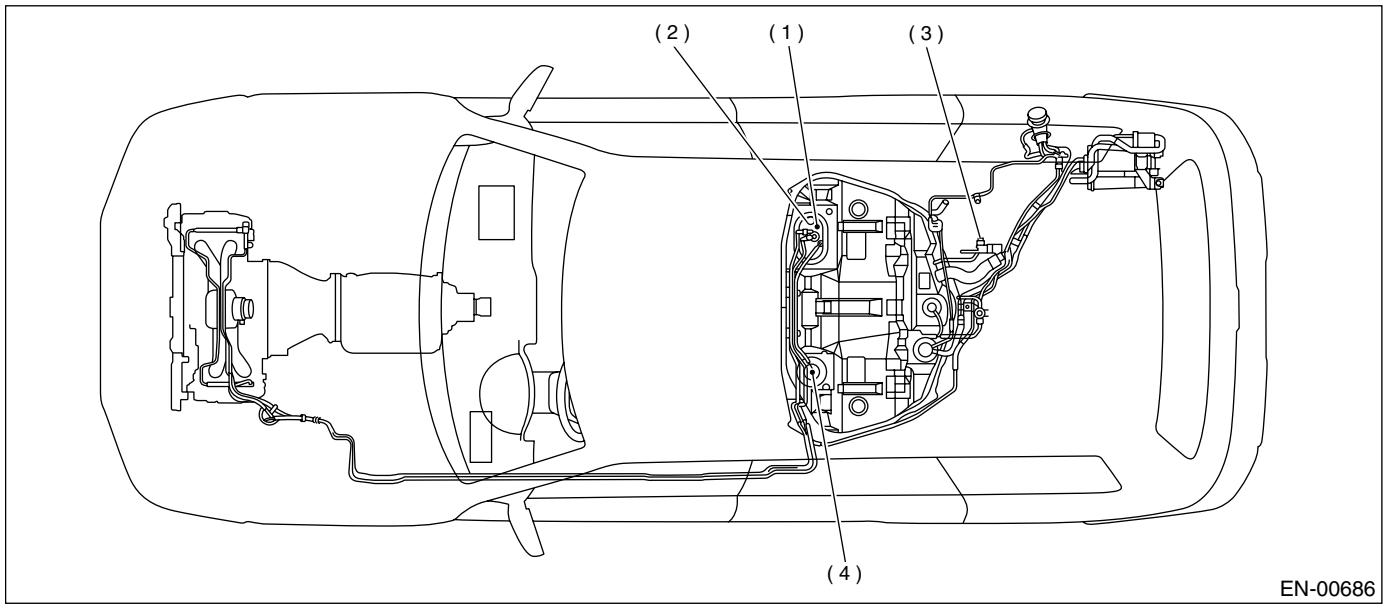
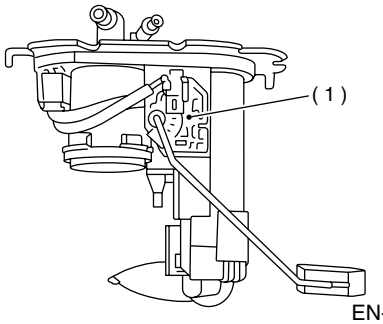


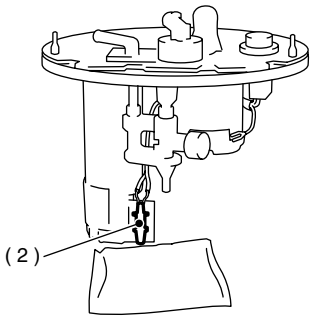
(1) Front oxygen (A/F) sensor
(2) Front catalytic converter
(3) Rear oxygen sensor
(4) Rear catalytic converter

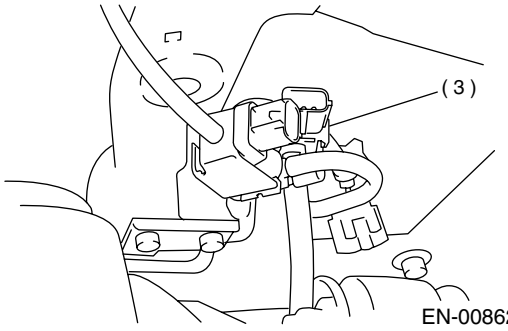


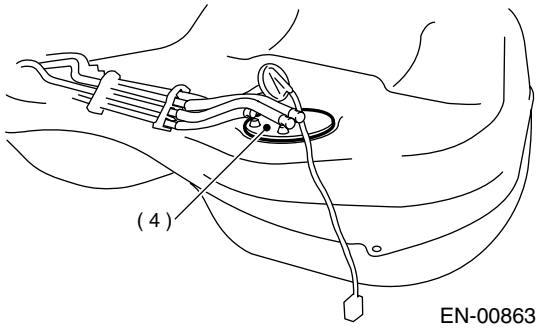


(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor

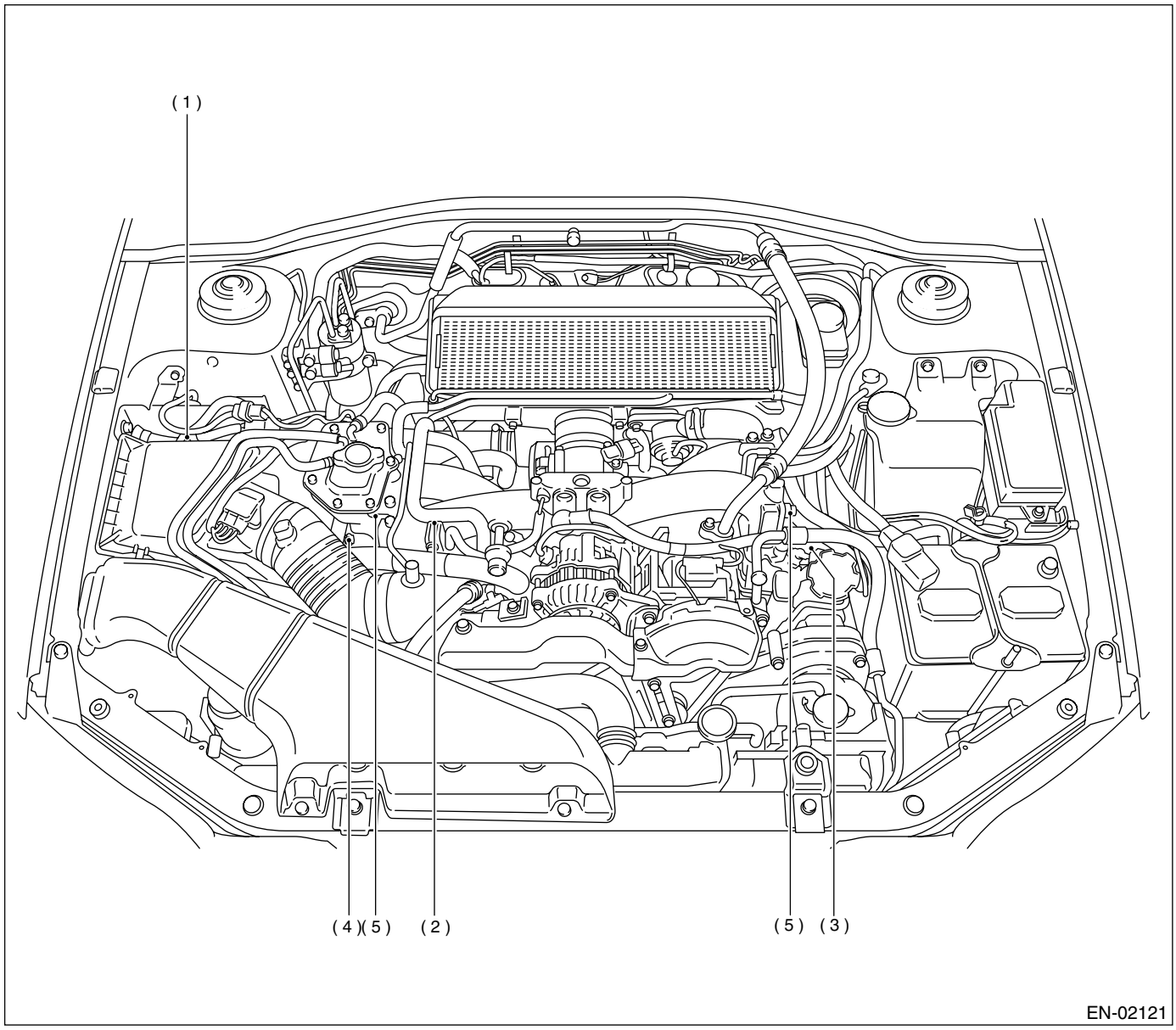




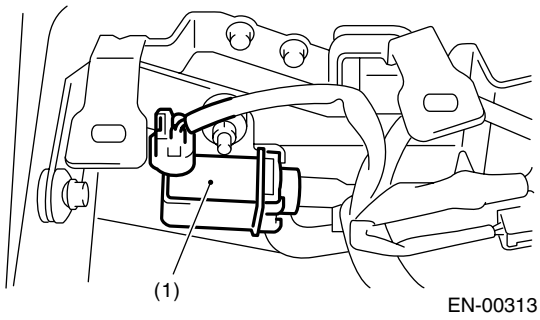




• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts



(1) Wastegate control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil
(4) Tumble generator valve actuator
(5) Oil flow control solenoid valve



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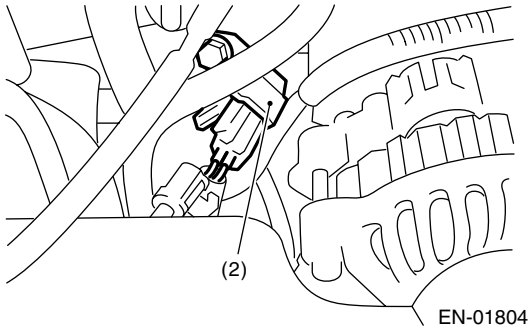

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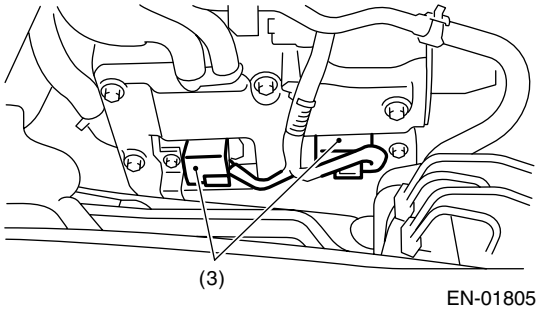

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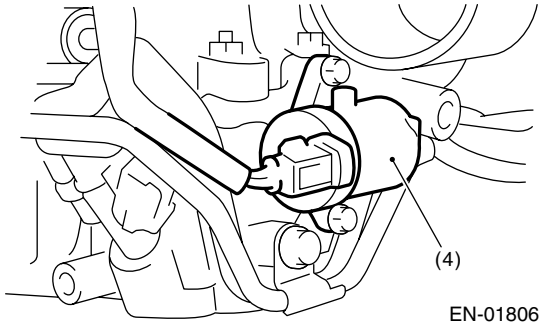

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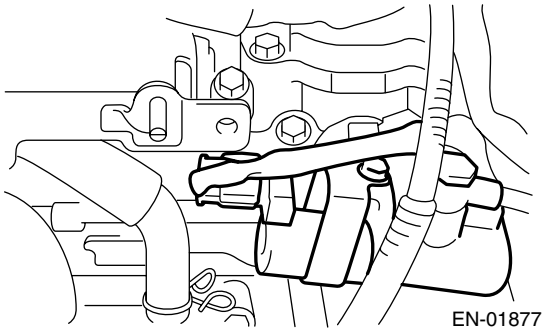
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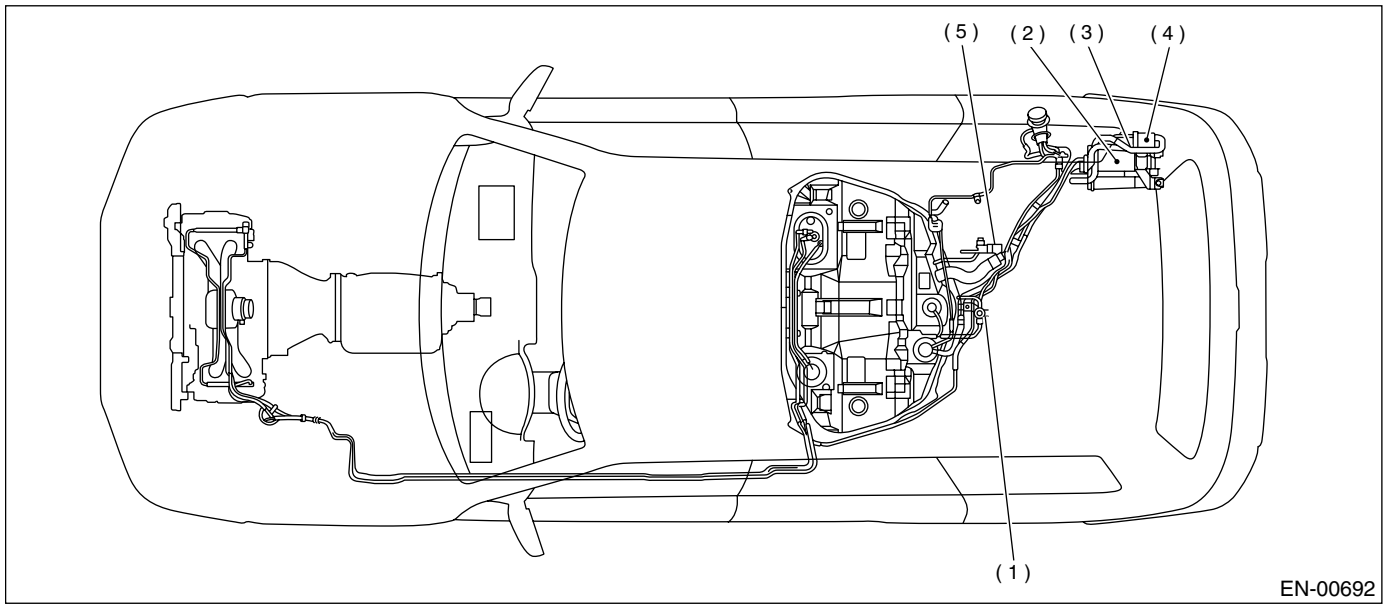
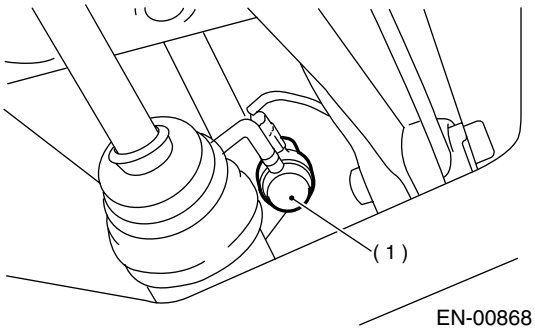
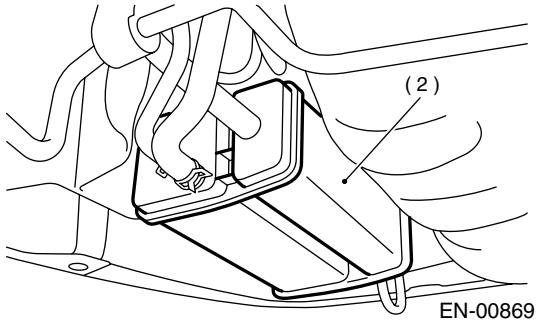
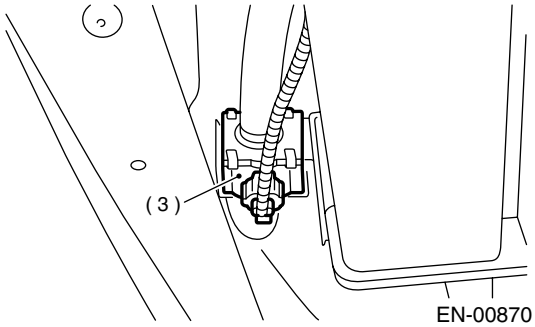
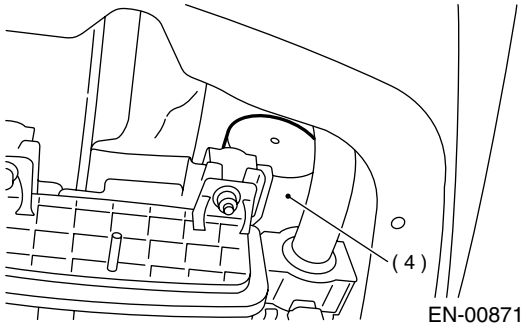


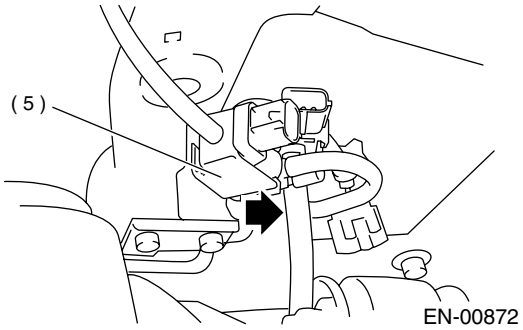
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter
(5) Fuel tank sensor control valve







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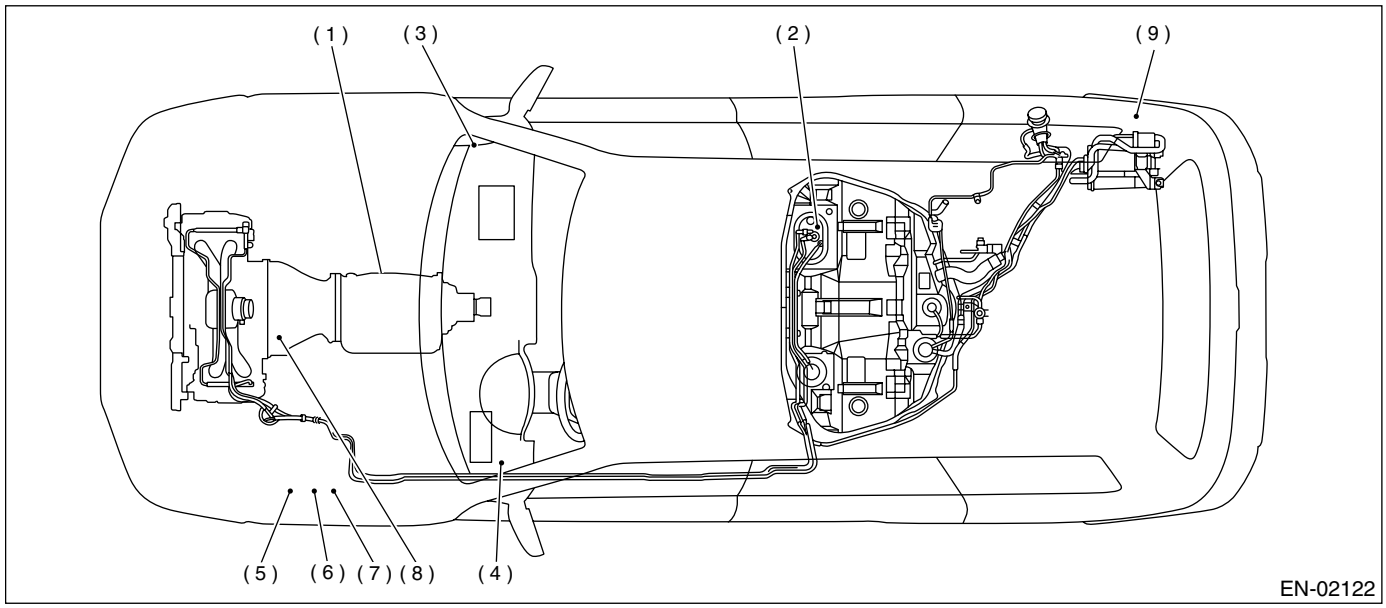
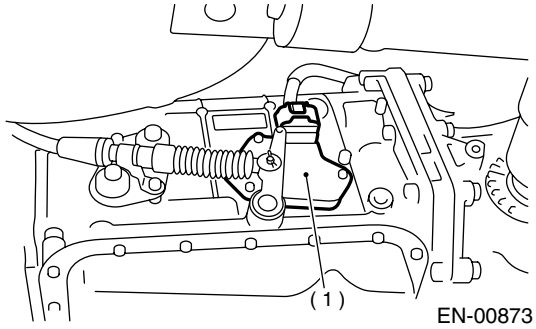
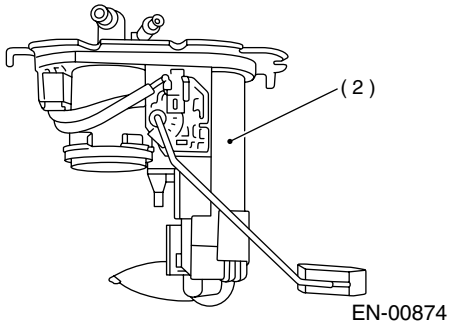
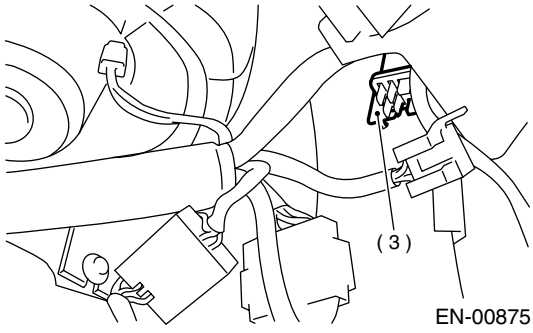
EN-00872

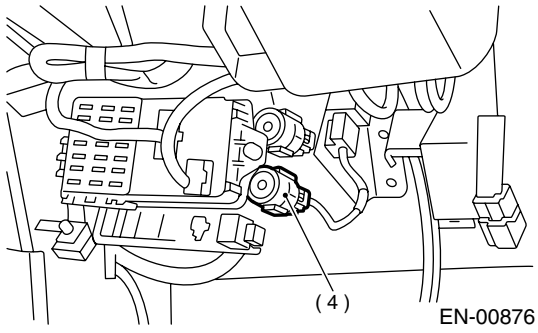


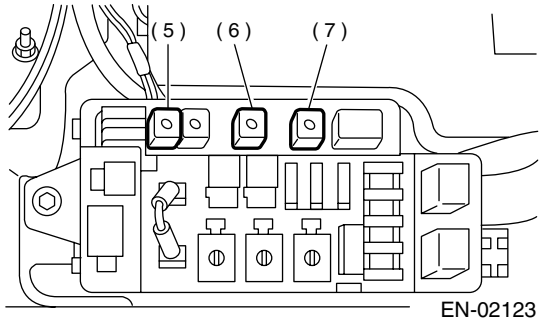
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Radiator fan mode relay
(8) Starter
(9) Fuel pump control unit



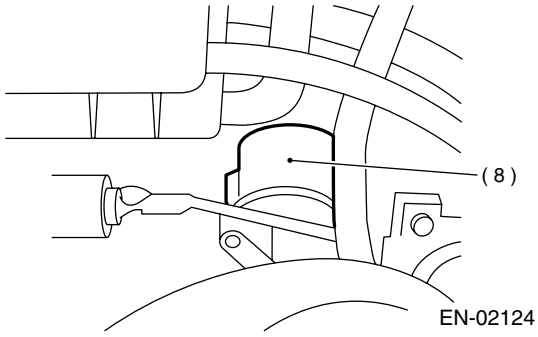




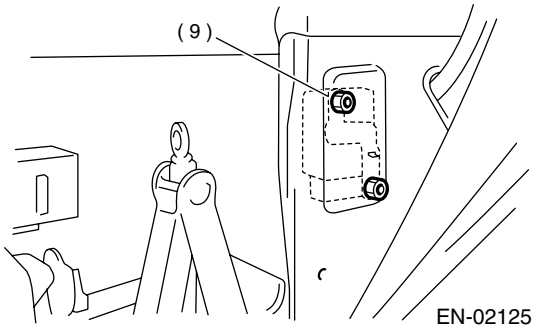




EN-02123



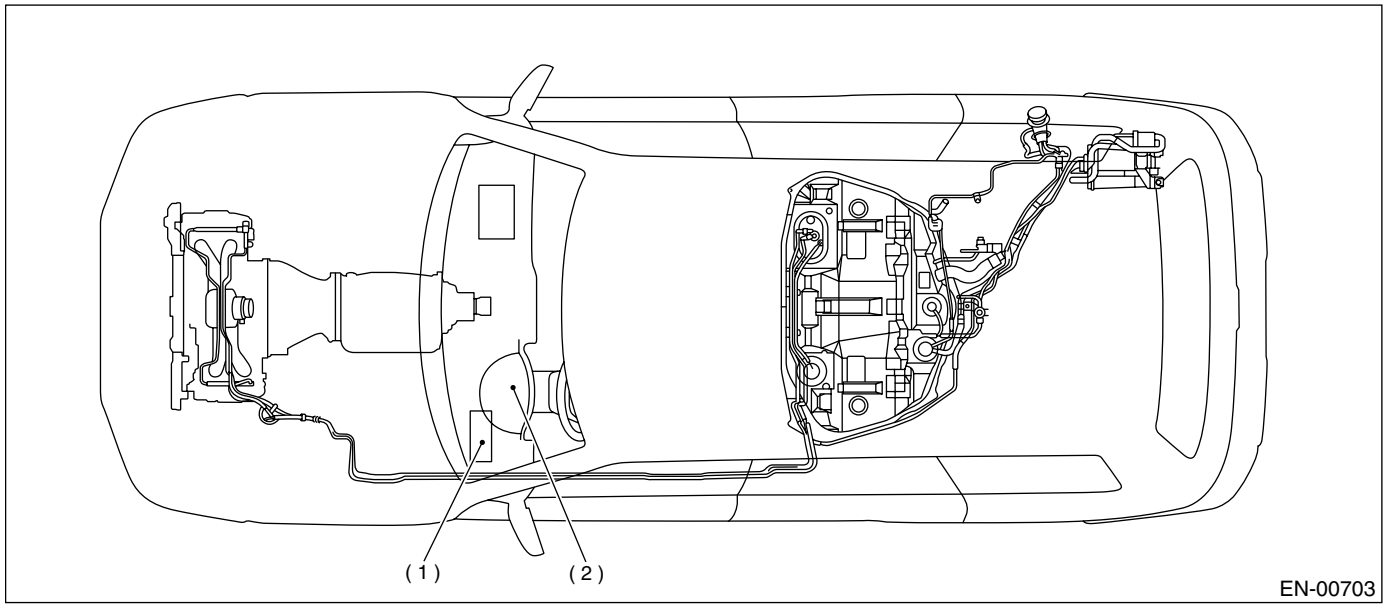
EN-02124



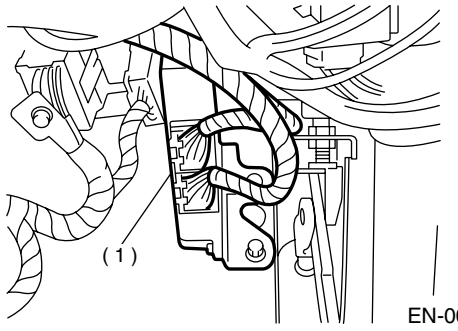
EN-02125

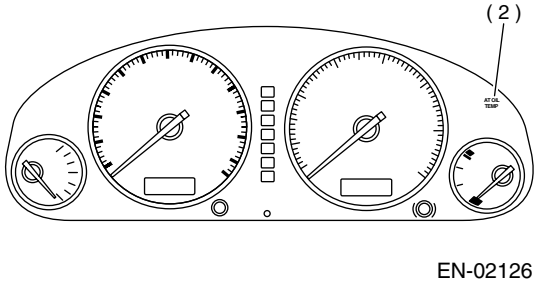
2. TRANSMISSION

• MODULE

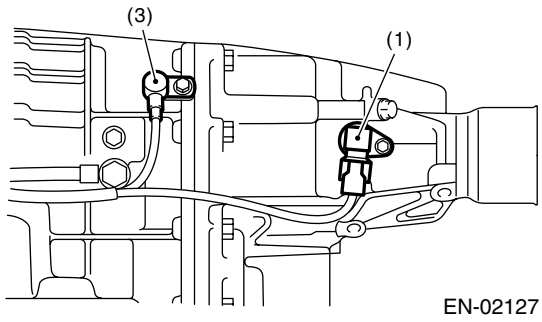


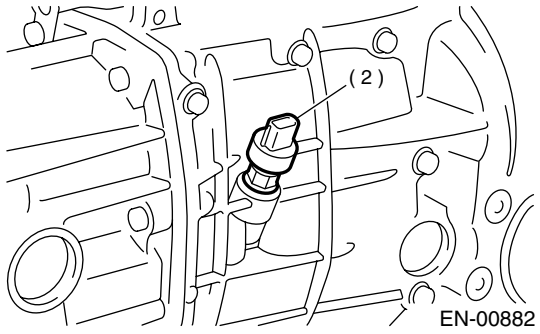
(1) Transmission Control Module (TCM) (for AT vehicles)
(2) AT diagnostic indicator light (for AT vehicles)

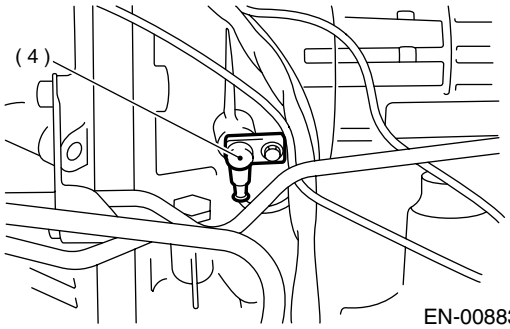


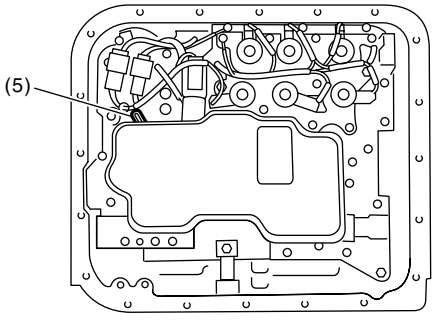


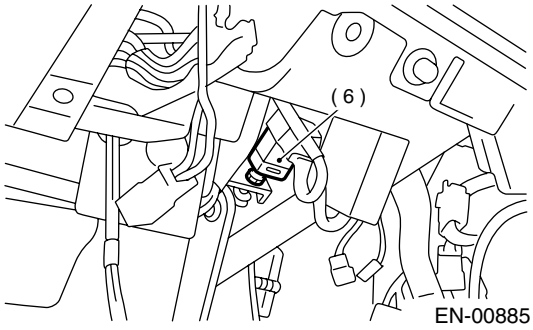
• SENSOR





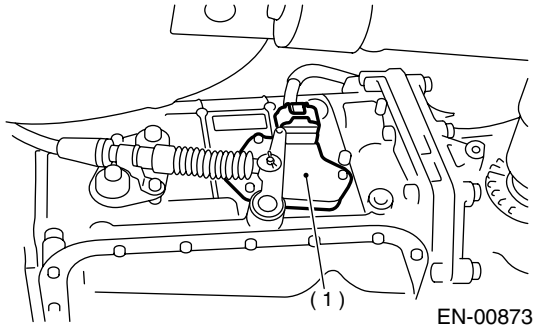




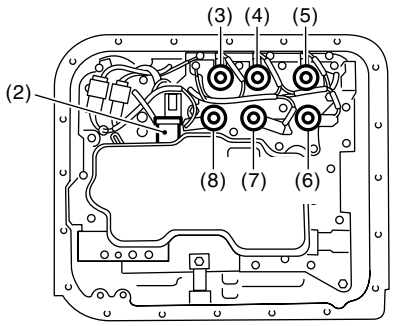


(1) Rear vehicle speed sensor (for AT vehicles)
(2) Front vehicle speed sensor (for MT vehicles)
(3) Front vehicle speed sensor (for AT vehicles)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (for AT vehicles)
(6) Brake light switch

• SOLENOID VALVE AND SWITCH (AT MODEL)



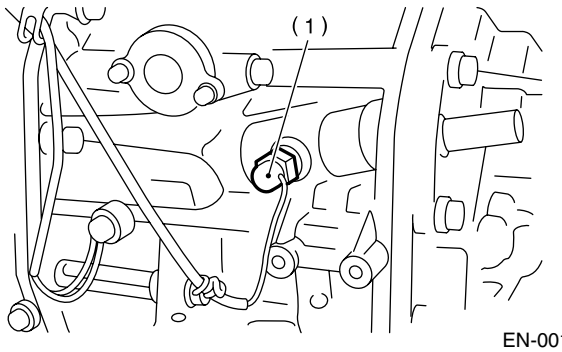
EN-00873



EN-02129

(1) Inhibitor switch
(2) Line pressure linear solenoid
(3) High clutch duty solenoid
(4) 2-4 brake duty solenoid
(5) Low clutch duty solenoid valve
(6) Transfer duty solenoid
(7) Low & reverse duty solenoid
(8) Lock-up duty solenoid

• SOLENOID VALVE AND SWITCH (MT MODEL)

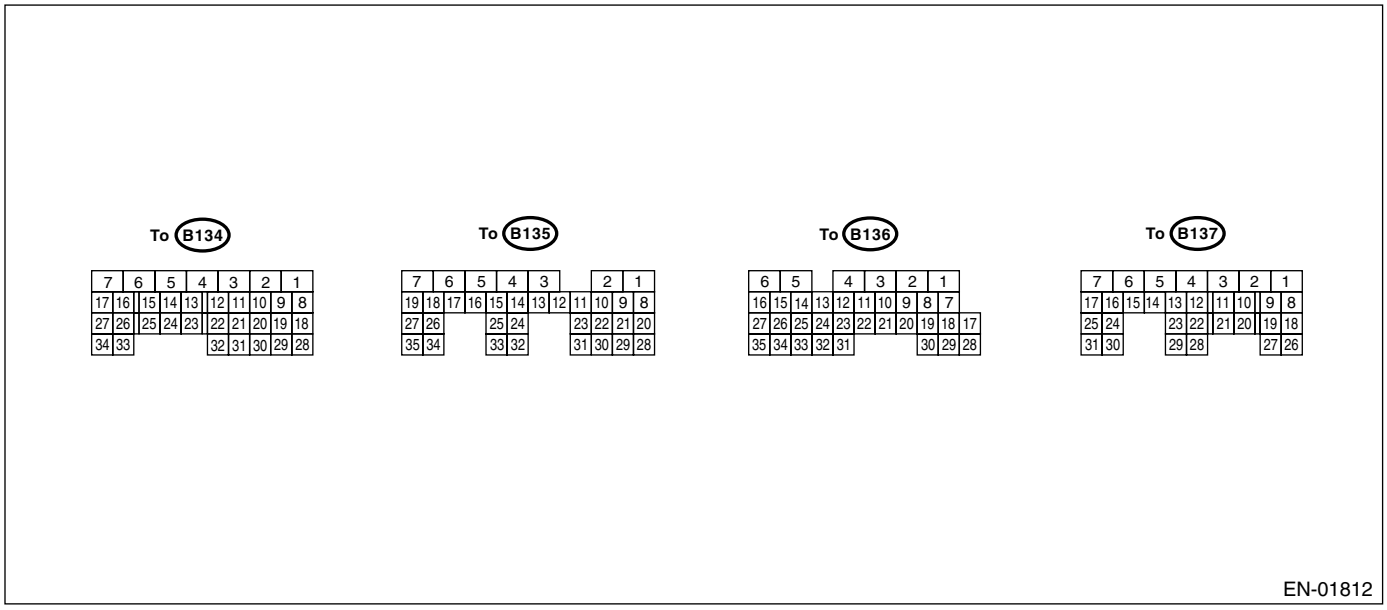


EN-00192

(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Rear oxygen sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	GND (sensor)	B136	35	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	3	0 — 1.0	—	Sensor output waveform
	Signal 2	B134	2	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor heater signal		B135	2	0 — 1.0	—	Sensor output waveform
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B136	35	0	0	After warm-up the engine.
Vehicle speed signal		B135	27	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Mass air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	GND	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Tumble generator valve position sensor RH	Signal	B136	27	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve position sensor LH	Signal	B136	26	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Tumble generator valve RH (open)		B134	9	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Tumble generator valve RH (close)		B134	8	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Tumble generator valve LH (open)		B134	11	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Tumble generator valve LH (close)		B134	10	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Wastegate control solenoid valve		B134	32	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Starter switch		B137	8	0	0	Cranking: 8 — 14
A/C switch		B137	16	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B137	15	10 — 13	13 — 14	—
Neutral position switch		B137	9	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Test mode connector		B137	14	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Back-up power supply		B135	19	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B135	5	10 — 13	13 — 14	—
		B135	6	10 — 13	13 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	13 — 14	Waveform
	#2	B135	17	0	13 — 14	Waveform
	#3	B135	16	0	13 — 14	Waveform
	#4	B135	15	0	13 — 14	Waveform
Fuel injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B135	26	0 or 5	0 or 5	Sensor output waveform
	Signal 2	B137	28	10 — 13	13 — 14	—
A/C relay control		B133	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 1 control		B135	25	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 2 control		B135	24	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Model with A/C only
Malfunction indicator lamp		B134	17	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B134	23	—	0 — 13, or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	Sensor output waveform
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B136	16	5	5	
	GND (sensor)	B136	35	0	0	
Fuel tank pressure sensor	Signal	B136	21	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and reinstalled.
	GND (sensor)	B136	35	0	0	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Pressure control solenoid valve		B134	12	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Drain valve		B134	13	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel tank sensor control valve		B134	24	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel level sensor		B136	20	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B136	12	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Blow-by leak diagnosis signal		B137	24	0	0	When disconnection (malfunction): 5
Small light switch		B137	12	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B137	11	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B137	10	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B134	25	0	0	—
SSM/GST communication line		B137	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (injectors)		B137	7	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control systems)		B137	1	0	0	—
		B137	2	0	0	—
GND (front oxygen (A/F) sensor heater 1)		B134	7	0	0	—
GND (front oxygen (A/F) sensor heater 2)		B134	6	0	0	—
Camshaft position sensor (LH)		B135	8	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Camshaft position sensor (RH)		B135	9	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Electric throttle	Main	B136	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine warm-up)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B136	29	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine warm-up)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B136	16	5	5	—
	GND (sensor)	B137	3	0	0	—
Electric throttle motor (+)		B137	5	Duty waveform	Duty waveform	Driving frequeney: 500Hz
Electric throttle motor (–)		B137	4	Duty waveform	Duty waveform	Driving frequeney: 500Hz
Electric throttle motor power supply		B137	6	10 — 13	13 — 14	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Electric throttle motor relay		B135	35	ON: 010 OFF: — 13	ON: 0 OFF: 13 — 14	When ignition switch is ON: ON
Oil flow control solenoid valve (LH)	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Oil flow control solenoid valve (RH)	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Accelerator position sensor	Main	B136	17	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Power supply	B136	15	5	5	—
	GND (sensor)	B136	34	0	0	—
	Sub	B136	28	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
Cruise control set light		B134	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Main light		B134	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Clutch switch		B134	1	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 13 — 14	—
SET/COAST switch		B136	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Brake switch 1		B136	9	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2		B136	8	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
RESUME/ACCEL switch		B136	10	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Main switch		B136	7	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
CAN communication	Signal (+)	B137	18	Pulse signal		—
	Signal (–)	B137	26	Pulse signal		—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.2 — 2.9 (%): Idling
	4.7 — 12.8 (%): 2,500 rpm racing

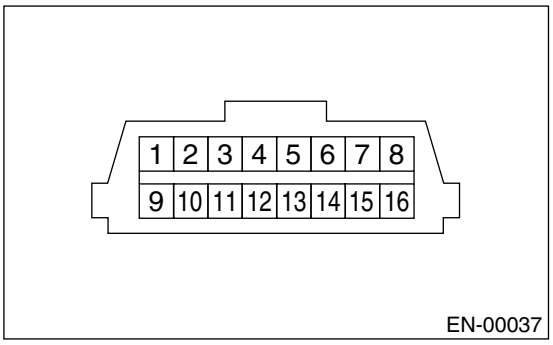
Measuring condition:
- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

7. Data Link Connector

A: NOTE

This connector is used both for the OBD-II general scan tools and Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



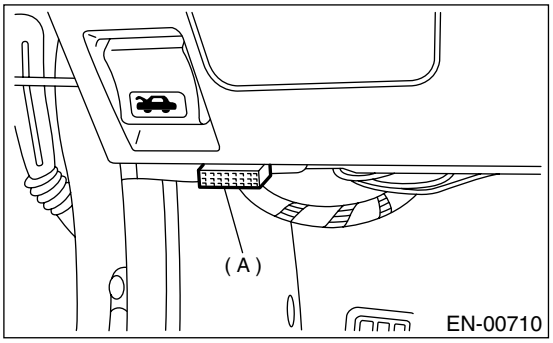
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor/OBD-II general scan tool signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Line end check signal 2	16	Blank

8. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to data link connector (A) located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up DTC and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request on-board monitoring test results for non-continuously monitored systems
(6) MODE $07: Request on-board monitoring test results for continuously monitored systems
(7) MODE $09: Request vehicle information
Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F sensor current	— and mA

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
15	O_2 sensor output voltage and O_2 sensor short term fuel trim	V and %

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)-38, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit
$01	$01	Catalyst system efficiency below threshold
$03	$01	Evaporative emission control system large leak
	$02	Evaporative emission control system small leak
	$03	Evaporative emission control system very small leak
$05	$01	O_2 sensor circuit slow response (Bank 1 Sensor 1)
$06	$01	O_2 sensor circuit (Bank 1 Sensor 2)
	$02	
$07	$01	O_2 sensor circuit slow response (Bank 1 Sensor 2)
$0C	$01	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
$0F	$01	Drain valve range/performance
	$02	

7. MODE $07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE $09

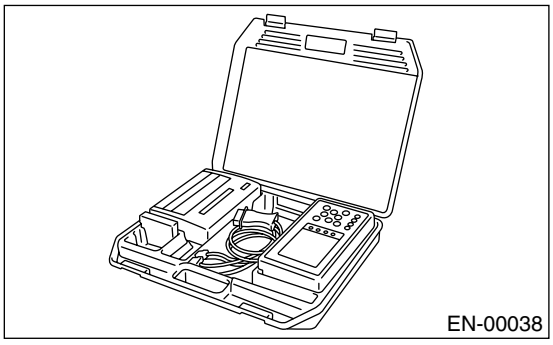
Refer to data of vehicle specification (VIN, calibration ID, etc.).

9. Subaru Select Monitor

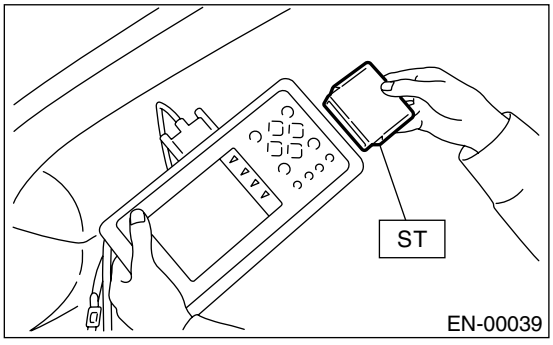
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>

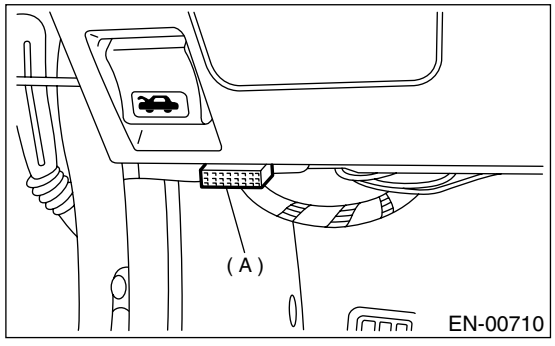


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

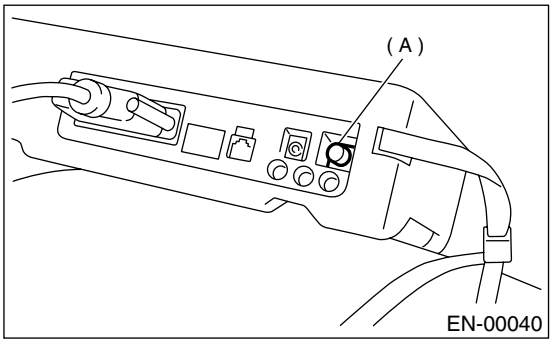
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)-38, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)-38, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Injection pulse width	Fuel Injection #1 Pulse	ms
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	ohm
Front oxygen (A/F) sensor lambda value	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor correction	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Accelerator position	Accel.Opening Angle	%
VVT advanced timing (R)	VVTAdv.Amount R	deg
VVT advanced timing (L)	VVTAdv.Amount L	deg
OCV duty ratio (R)	OCV Duty R	%
OCV duty ratio (L)	OCV Duty L	%
OCV duty current (R)	OCV Current R	mA
OCV duty current (L)	OCV Current L	mA
Throttle motor duty	Throttle Motor Duty	%
Throttle power supply voltage	Throttle Motor Voltage	V
Sub-throttle sensor voltage	Sub-Throttle Sensor	V
Main-throttle sensor voltage	Main-Throttle Sensor	V
Sub-accelerator sensor voltage	Sub-Accelerator Sensor	V
Main-accelerator sensor voltage	Main-Accelerator Sensor	V
Memorized cruise speed	Memorized Cruise Speed	km/h
Roughness Monitor for #1 cylinder	Roughness Monitor #1	—

Contents	Display	Unit of measure
Roughness Monitor for #2 cylinder	Roughness Monitor #2	—
Roughness Monitor for #3 cylinder	Roughness Monitor #3	—
Roughness Monitor for #4 cylinder	Roughness Monitor #4	—
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Fuel temperature signal	Fuel Temp.	°C or °F
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF
Fuel pressure control signal	PCV Solenoid Valve	ON or OFF
Drain valve signal	Vent. Solenoid Valve	ON or OFF
Tank sensor control solenoid valve signal	Tank Sensor Cntl Valve	ON or OFF
ETC Motor Relay	ETC Motor Relay	ON or OFF
Clutch SW	Clutch Switch	ON or OFF
Stop light SW	Stop Light Switch	ON or OFF
SET/COAST SW	SET/COAST Switch	ON or OFF
RESUME/ACCEL SW	RESUME/ACCEL Switch	ON or OFF
Brake SW	Brake Switch	ON or OFF
Main SW	Main Switch	ON or OFF
Ignition switch signal	Ignition Switch	ON or OFF
Test mode signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until desired data is shown.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor #11	Oxygen Sensor #11	—
Oxygen sensor #12	Oxygen Sensor #12	—
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	CARB-OBD2
A/F sensor output signal	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—
A/F lambda signal #11	A/F sensor #11	—
A/F sensor current #11	A/F sensor #11	mA

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	Closed loop or Open loop
Air fuel ratio control system for bank 2	Fuel system for Bank2	Open loop
O_2 sensor output voltage	Oxygen Sensor #12	V
Short term fuel trim by O_2 sensor	Short term fuel trim #12	%
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Test mode signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Tumble generator valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	Close or Open	When TGV moves and valve opens.
Fuel pressure control solenoid	PCV Solenoid Valve	ON or OFF	When fuel pressure control solenoid valve is in function.
Drain valve signal	Vent. Solenoid Valve	ON or OFF	When drain valve is in function.
Fuel tank sensor control solenoid valve signal	Fuel Tank Sensor Ctrl Valve	ON or OFF	When tank sensor control solenoid valve is in function.
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF	When connected.
Handle SW	Handle SW	RHD/LHD	When the vehicle is LHD model.
ETC motor relay	ETC Motor Relay	ON or OFF	When electric throttle is in function.
Clutch SW	Clutch SW	ON or OFF	When clutch switch is turned ON.
Stop SW	Stop Light Switch	ON or OFF	When stop light switch is turned ON.
SET/CST SW	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned ON.
RES/ACC SW	RESUME/ACCEL Switch	ON or OFF	When RESUME/ACCEL switch is turned ON.
Brake SW	Brake Switch	ON or OFF	When brake switch is turned ON.
Main SW	Main Switch	ON or OFF	When main switch is turned ON.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

10.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure that a DTC is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE $03).

11.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H4DOTC)-44, Drive Cycle.>

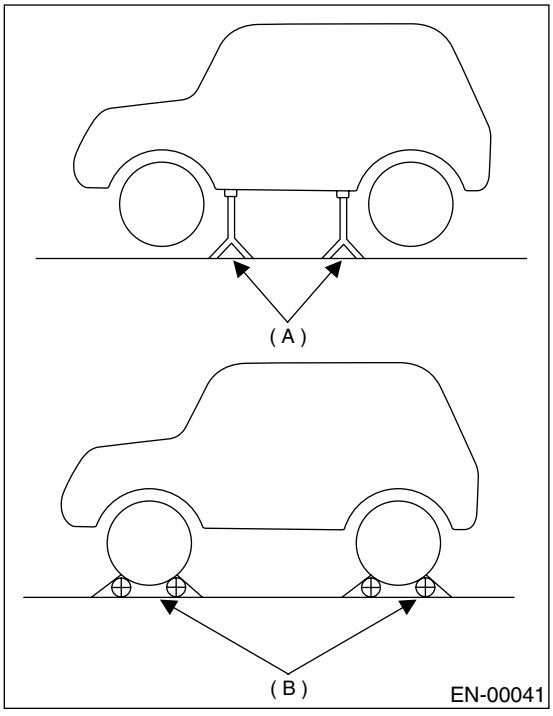
DTC	Item	Condition
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	—
P0021	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	—
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	—
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	—
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor "A" Circuit Low Input	—
P0183	Fuel Temperature Sensor "A" Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input	—
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor "A" Circuit	—
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	—
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	—
P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—

DTC	Item	Condition
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	—
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	—
P1091	Tumble Generated Valve System 1 (Valve Close)	—
P1093	Tumble Generated Valve System 2 (Valve Close)	—
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P1110	Atmospheric Pressure sensor circuit malfunction (Low input)	—
P1111	Atmospheric Pressure sensor circuit malfunction (High input)	—
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1446	Fuel Tank Sensor Control Valve Circuit Low	—
P1447	Fuel Tank Sensor Control Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A” / “B” Voltage Rationality	—
P2138	Throttle/Pedal Position Sensor/Switch “D” / “E” Voltage Rationality	—

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

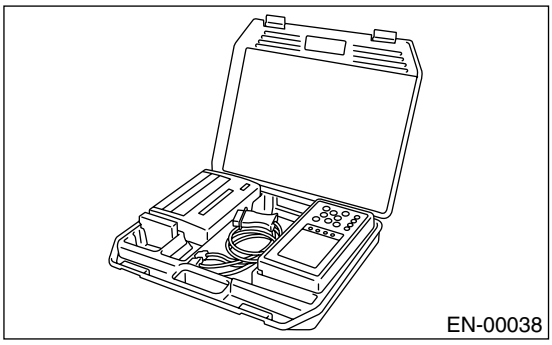
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



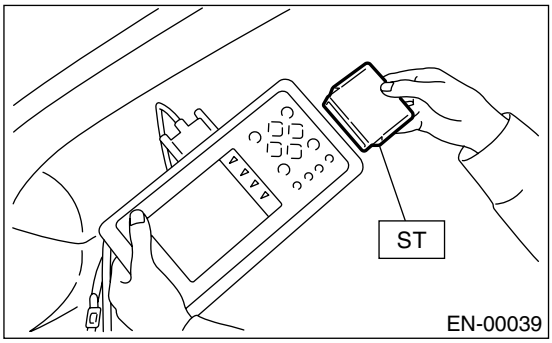
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

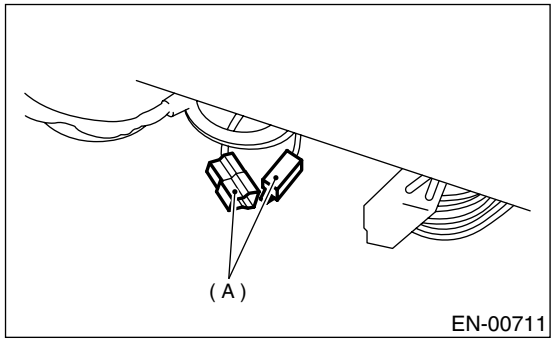
1) Warm up the engine.
2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>



3) Connect the diagnosis cable to Subaru Select Monitor.
4) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>

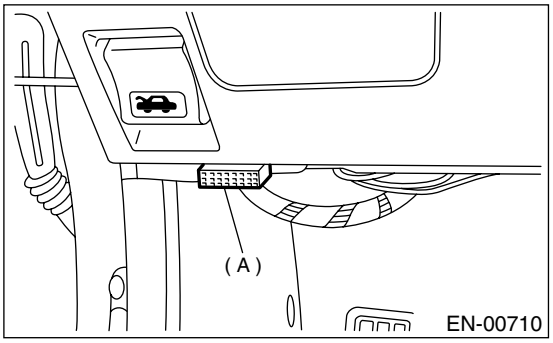


5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



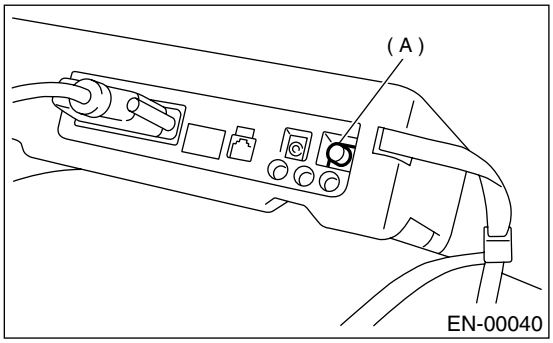
(A) Test mode connector

6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

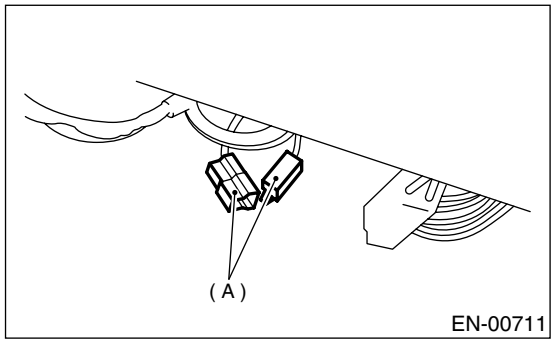
8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
10) Press the [YES] key after the information of engine type is displayed.
11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
12) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.
13) Perform subsequent procedures as instructed on the display screen.

• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

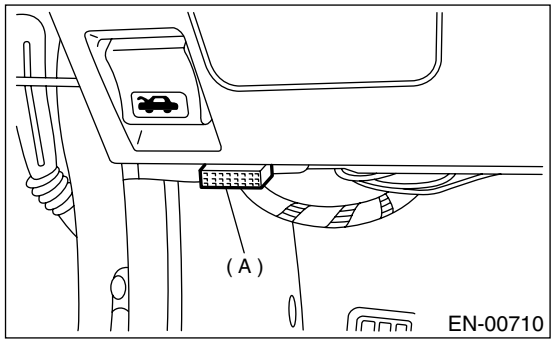
3. OBD-II GENERAL SCAN TOOL

1) Warm up the engine.
2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



3) Connect the OBD-II general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



4) Start the engine.

NOTE:
• Ensure the selector lever is placed in the "P" position before starting. (AT vehicles)
• Depress clutch pedal when starting the engine. (MT vehicles)

5) Using the selector lever or shift lever, turn the "P" position switch and the "N" position switch to ON.
6) Depress the brake pedal to turn the brake switch ON. (AT vehicles)

7) Keep engine speed in the 2,500 to 3,000 rpm range for 40 seconds.
8) Place the selector lever or shift lever in the “D” position (AT vehicles) or “1st” gear (MT vehicles) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD model, release the parking brake.
• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

9) Using the OBD-II general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
2) Separate the test mode connector.

NOTE:
• Except for the engine coolant temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

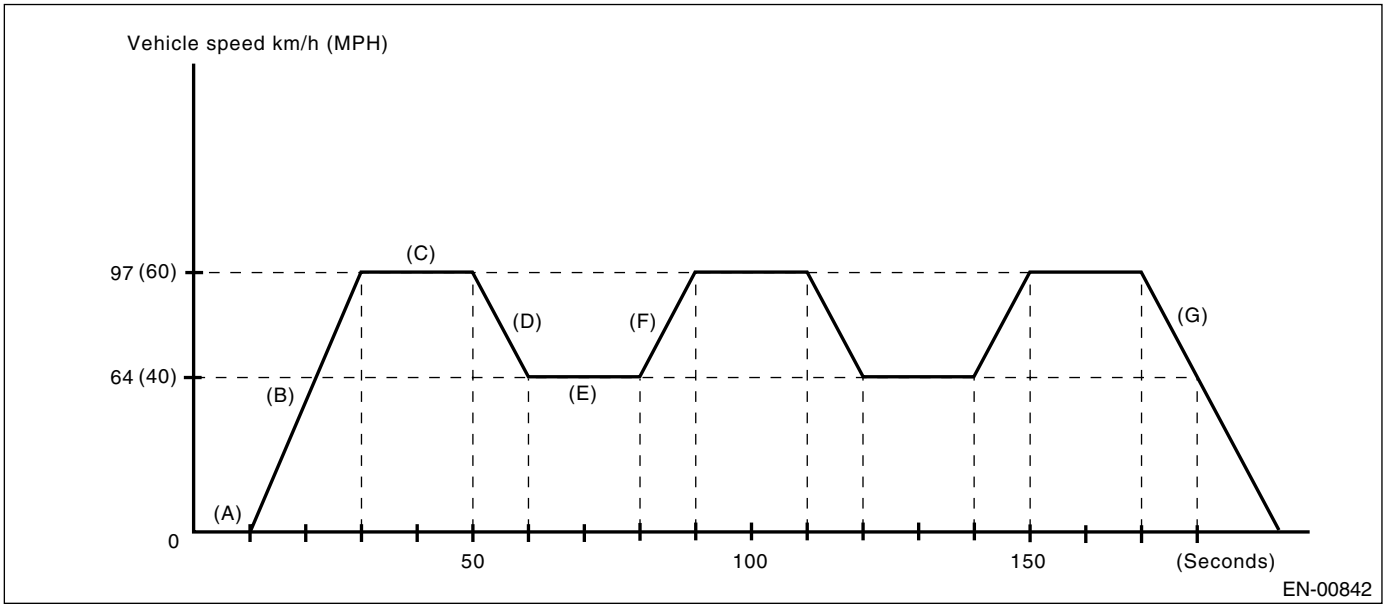
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature is less than 20°C (68°F) at engine start.
*P0128	Coolant Thermostat	Engine coolant temperature is less than 55°C (131°F) at engine start.
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0181	Fuel Temperature Sensor A Performance Problem	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	—
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	—
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0461	Fuel Level Sensor Circuit Range/Performance	—
P0545	Exhaust Gas Temperature Sensor Circuit Low-BANK1	—
P0546	Exhaust Gas Temperature Sensor Circuit High-BANK1	—
P0692	Cooling Fan 1 Control Circuit High	—
P1312	Exhaust Gas Temperature Sensor Malfunction	Engine coolant temperature is less than 30°C (86°F) when engine start.
P1443	Vent Control Solenoid Valve Function Problem	—
*P1448	Fuel Tank Sensor Control Valve Range/Performance	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	—
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	—

3. IDLE FOR 10 MINUTES

NOTE:
Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor Range/Performance Problem	Engine coolant temperature is less than 30°C (86°F) at engine start.
P0171	System too Lean (Bank 1)	—
P0172	System too Rich (Bank 1)	—
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 10 seconds or more.

(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.

(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.

(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).

(E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.

(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.

(G) Stop vehicle with throttle fully closed.

DTC	Item	Condition
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
*P0101	Mass or Volume Air Flow Circuit Range/performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0244	Turbo/Supercharger Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/Supercharger Wastegate Solenoid “A” High	—
*P0301	Cylinder 1 Misfire Detected	In some cases, diagnosis may complete at once.
*P0302	Cylinder 2 Misfire Detected	In some cases, diagnosis may complete at once.
*P0303	Cylinder 3 Misfire Detected	In some cases, diagnosis may complete at once.
*P0304	Cylinder 4 Misfire Detected	In some cases, diagnosis may complete at once.
P1090	Tumble Generated Valve System 1 (Valve Open)	—
P1092	Tumble Generated Valve System 2 (Valve Open)	—
P1301	Misfire Detected (High Temperature Exhaust Gas)	—
P1544	Exhaust Gas Temperature Too High	—

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

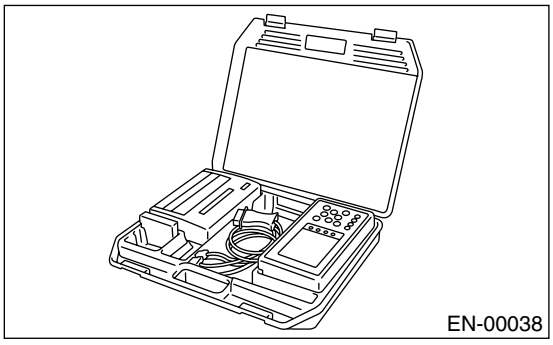
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

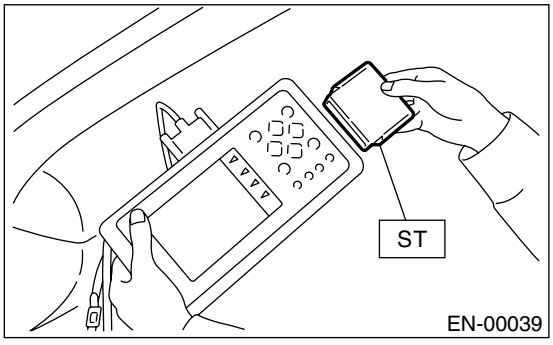
14.Compulsory Valve Operation Check Mode

A: OPERATION

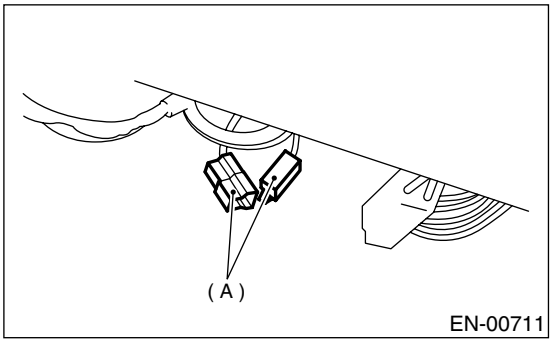
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>



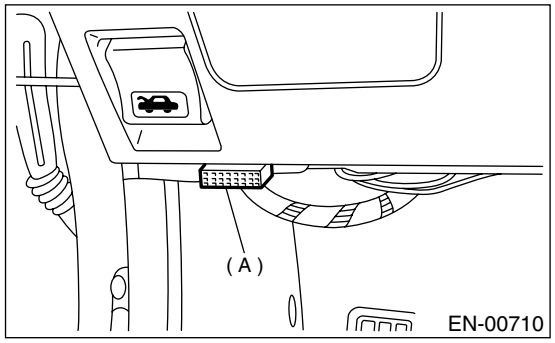
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).

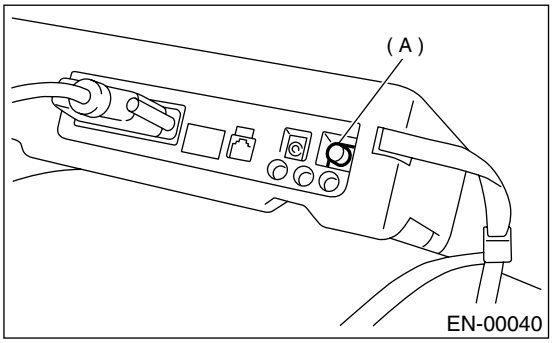


5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



CAUTION:
Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type is displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent. Control Solenoid Valve
Compulsory fuel tank sensor control valve operation check	Fuel Tank Sensor Control Valve

NOTE:
• The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Turbocharger Wastegate Solenoid

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

15.Malfunction Indicator Light

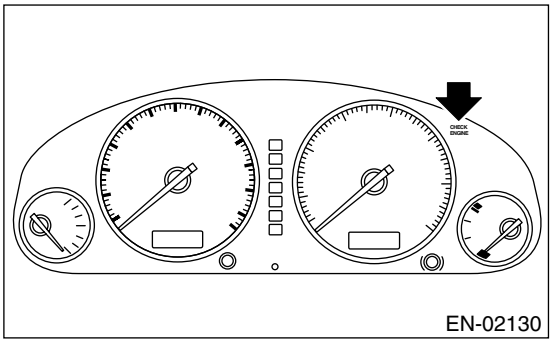
A: PROCEDURE

1. Activation of check malfunction indicator light. <Ref. to EN(H4DOTC)-51, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)-52, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)-54, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC)-56, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC)-58, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

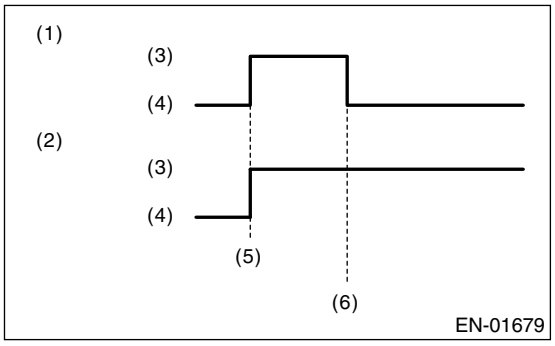
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)-52, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>

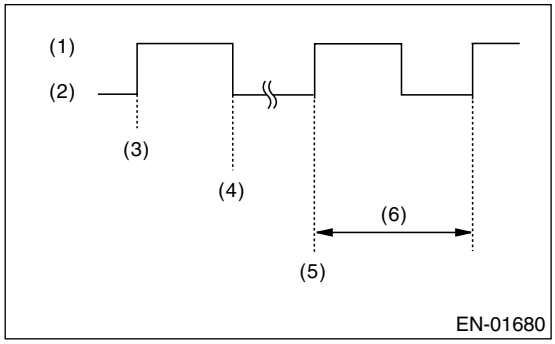


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



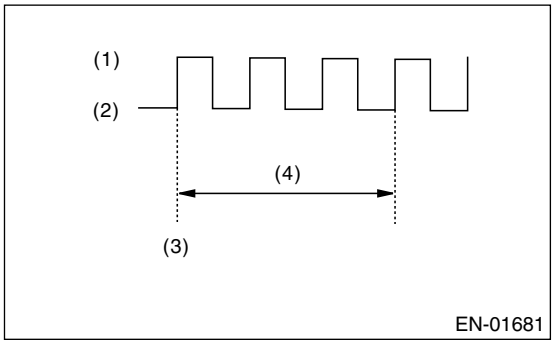
(1) No trouble
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

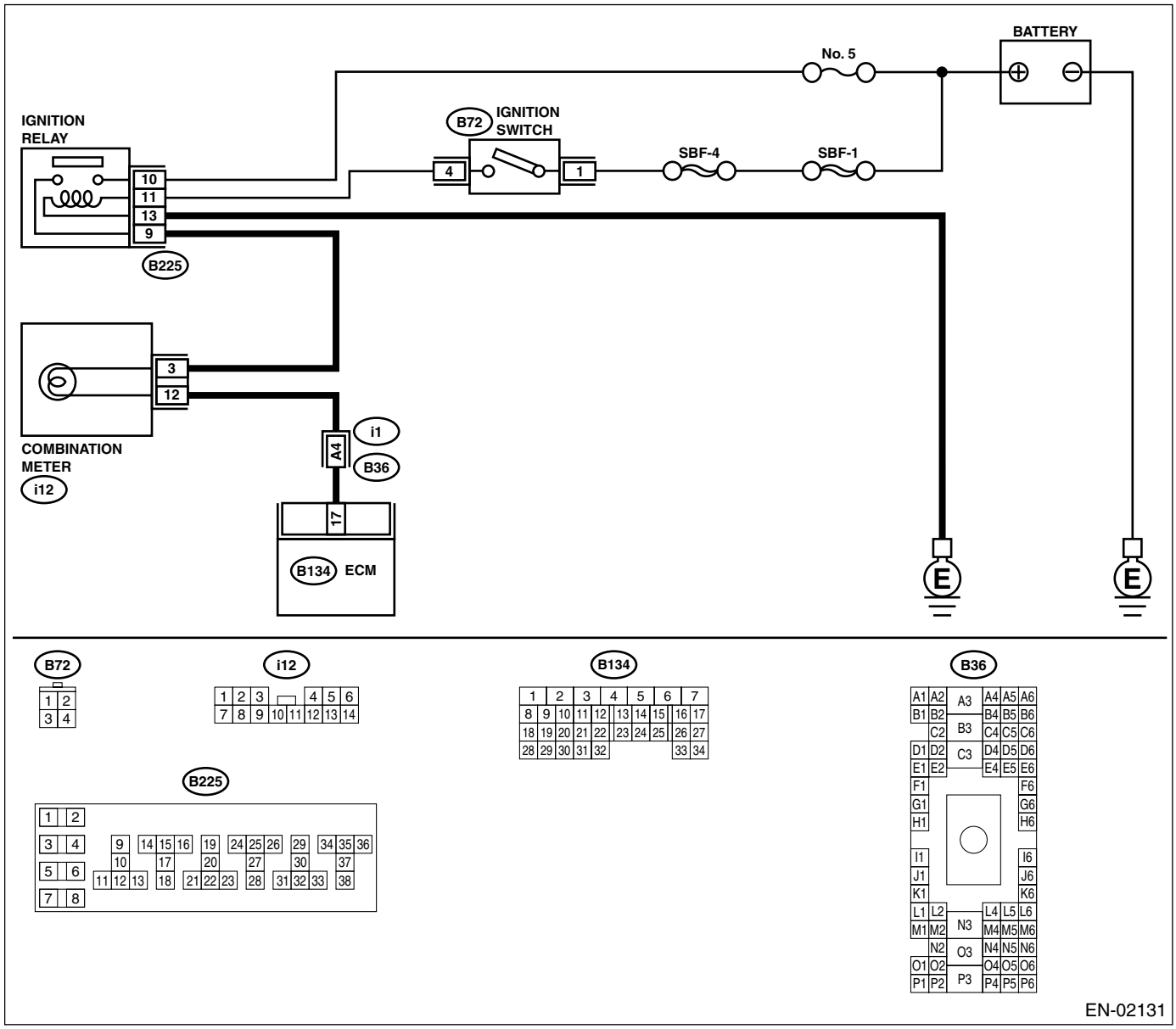
4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

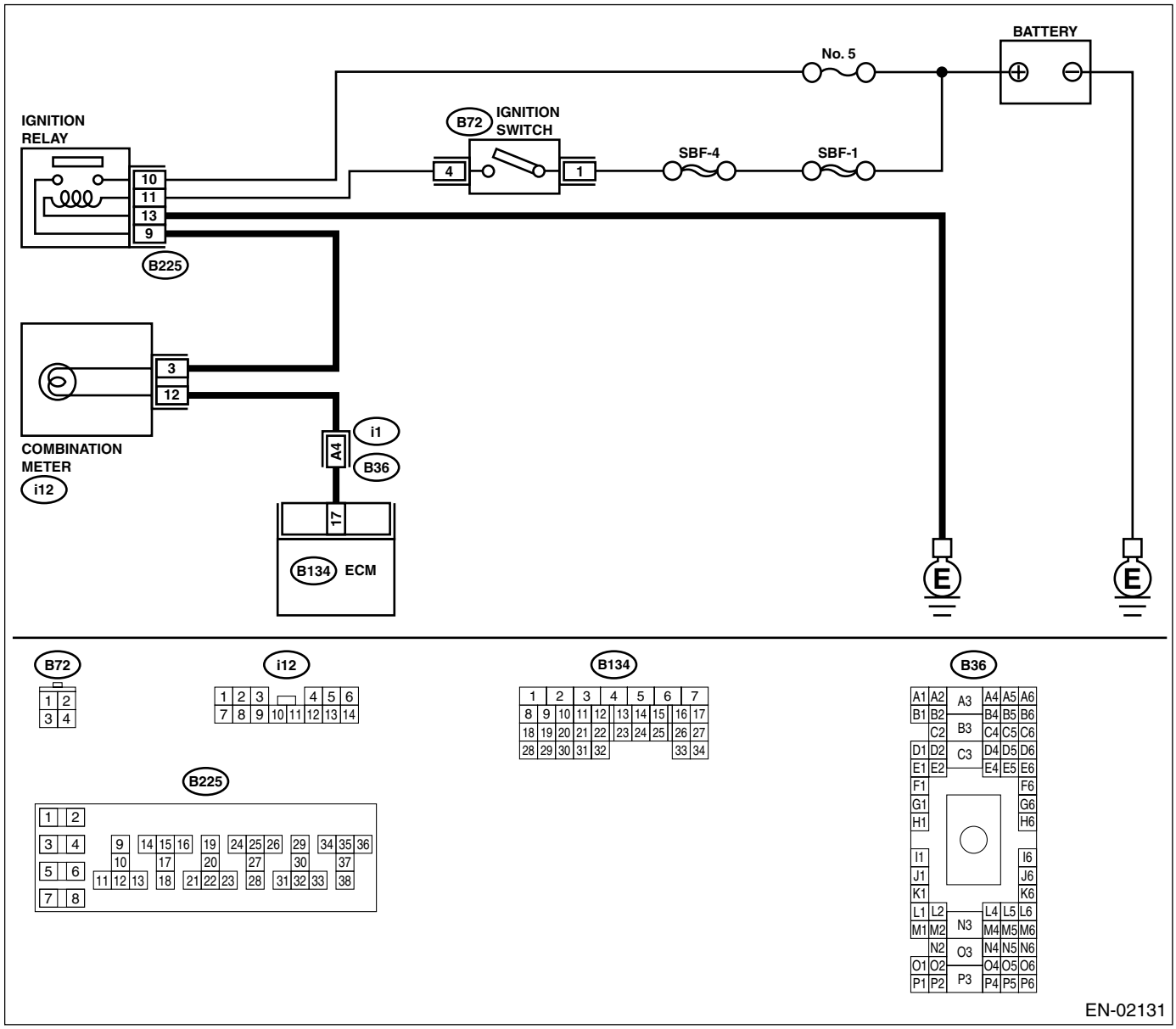
- **DIAGNOSIS:**
  - The malfunction indicator light circuit is shorted.
- **TROUBLE SYMPTOM:**
  - When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-13, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (i12) No. 12:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-13, Combination Meter Assembly.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 5) • Open or short circuit in harness between fuse (No. 5) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

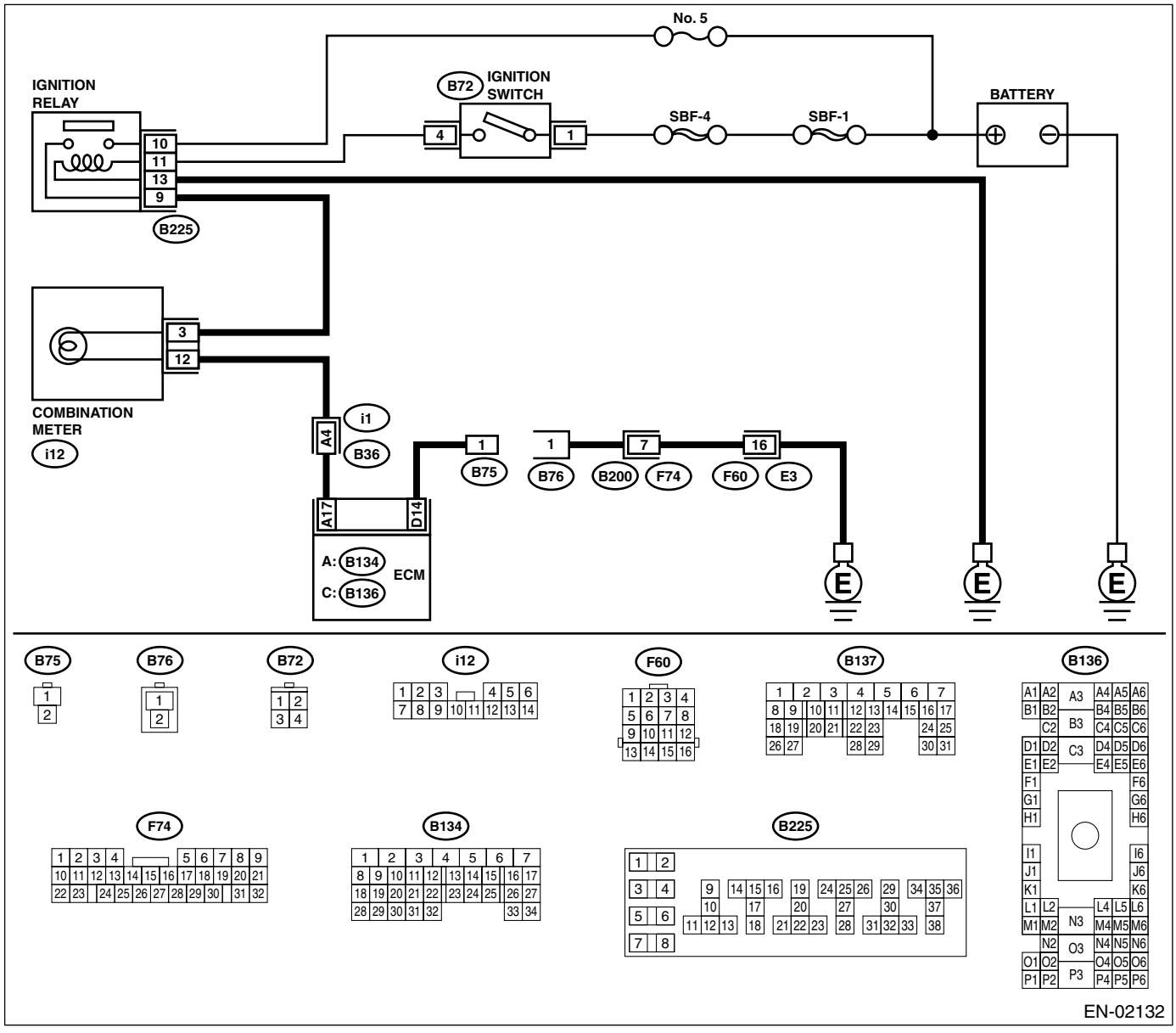
- **DIAGNOSIS:**
  - The malfunction indicator light circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ.

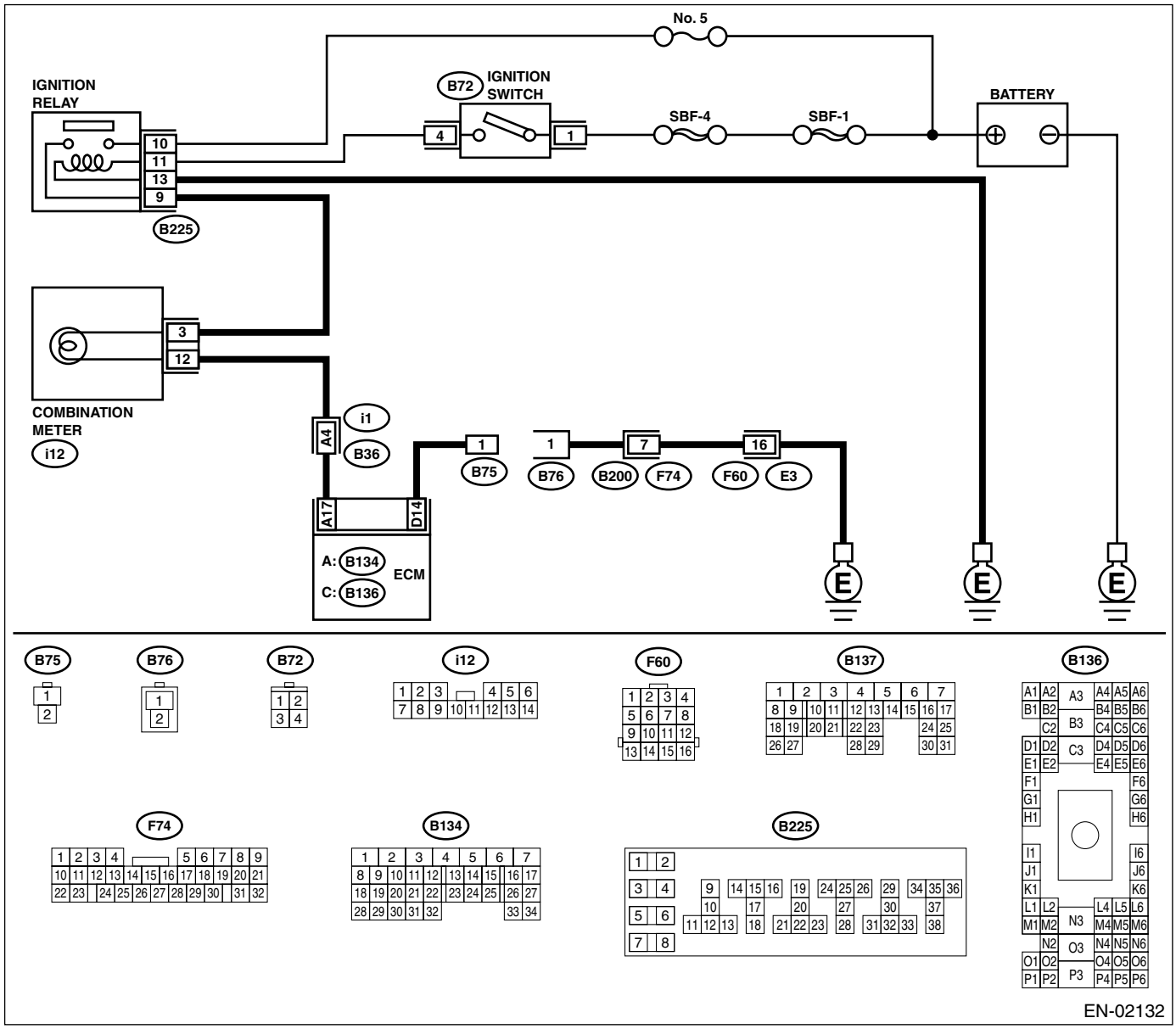
- **DIAGNOSIS:**
  - The malfunction indicator light circuit is open or shorted.
  - Test mode connector circuit is open.
- **TROUBLE SYMPTOM:**
  - During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light come on?	Go to step **2.**	Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)-52, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 14 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connector. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 14 — Chassis ground:***	Is the measured value less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

MEMO:

16.Diagnostics for Engine Starting Failure

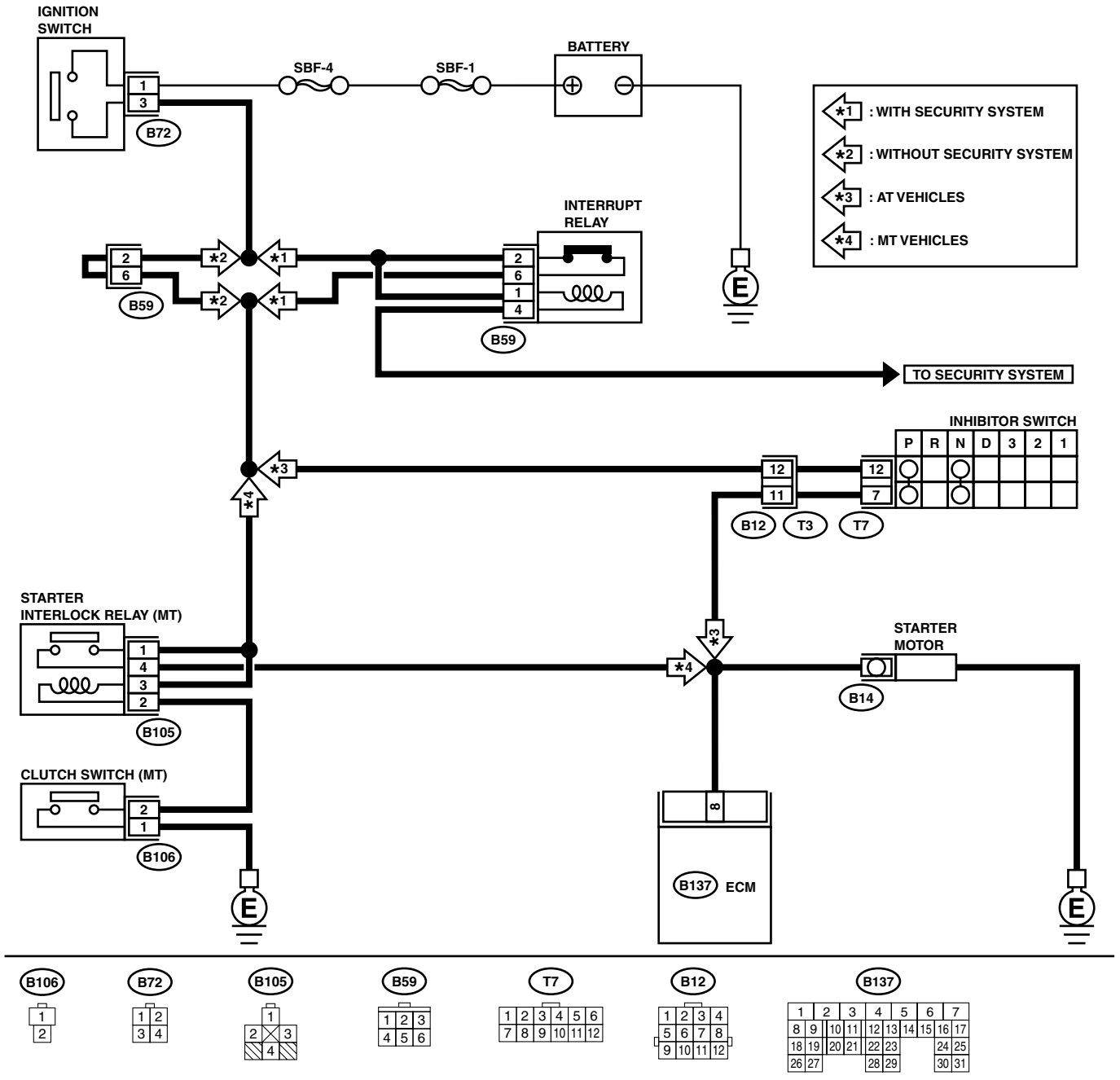
A: PROCEDURE

1. Check the fuel level.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)-66, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)-72, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is the DTC displayed? <Ref. to EN(H4DOTC)-38, OPERATION, Read Diagnostic Trouble Code (DTC).>	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: Depress the clutch pedal.	Is the measured value more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the measured value less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair the open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Check the following, repair if necessary. • Fuse is blown out. • Open circuit in harness between ignition switch and battery.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to START. ***Terminals*** ***No. 1 — No. 3:***	Is the measured value less than 5 Ω?	Go to step **7.**	Replace the ignition switch.
7	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **8.**	Go to step **10.**

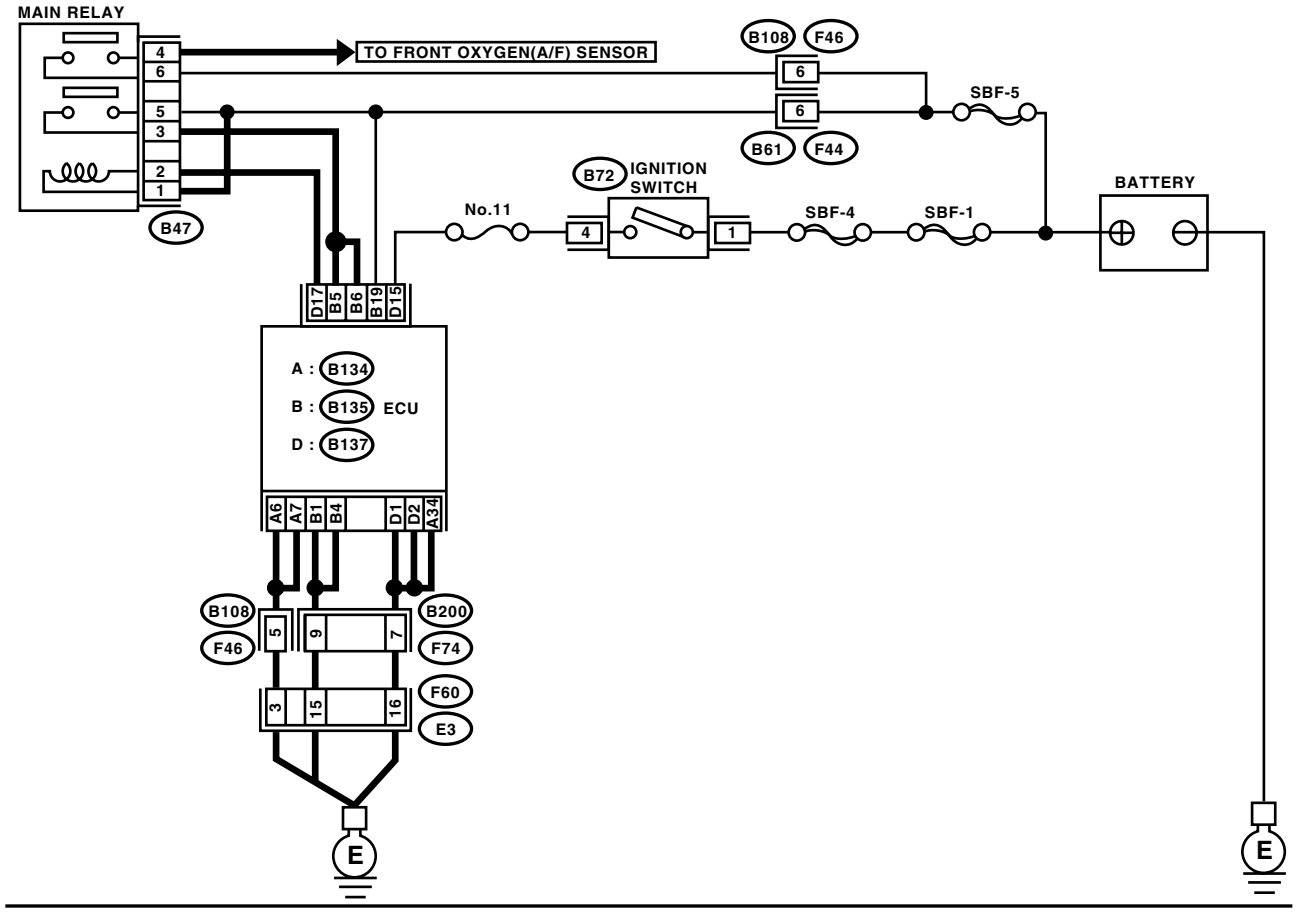
	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **9.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-24, Security System.>
9	**CHECK INHIBITOR SWITCH.** 1) Place the selector lever in the "P" or "N" position. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the measured value less than 1 Ω?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-52, REMOVAL, Inhibitor Switch.>
10	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START. ***Connector & terminal*** ***(B105) No. 1 (+) — Chassis ground (–):*** ***(B105) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **11.**	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-24, Security System.>
11	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals No. 2 and No. 3. 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 1 — No. 4:***	Is the measured value less than 1 Ω?	Go to step **12.**	Replace the starter interlock relay.
12	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **13.**	Repair open circuit of ground cable.
13	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **14.**	Replace the clutch switch. <Ref. to CL-32, Clutch Switch.>
14	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B105) No. 2 — Chassis ground:***	Is the measured value less than 1 Ω?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

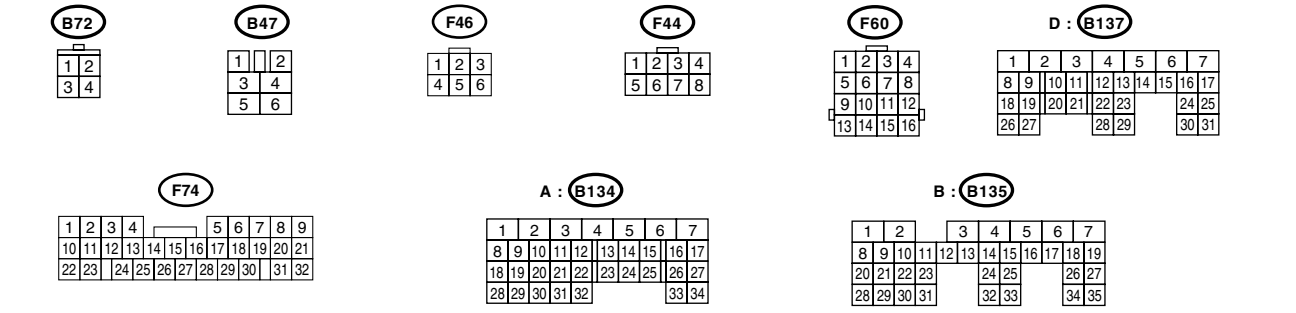
MEMO:

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





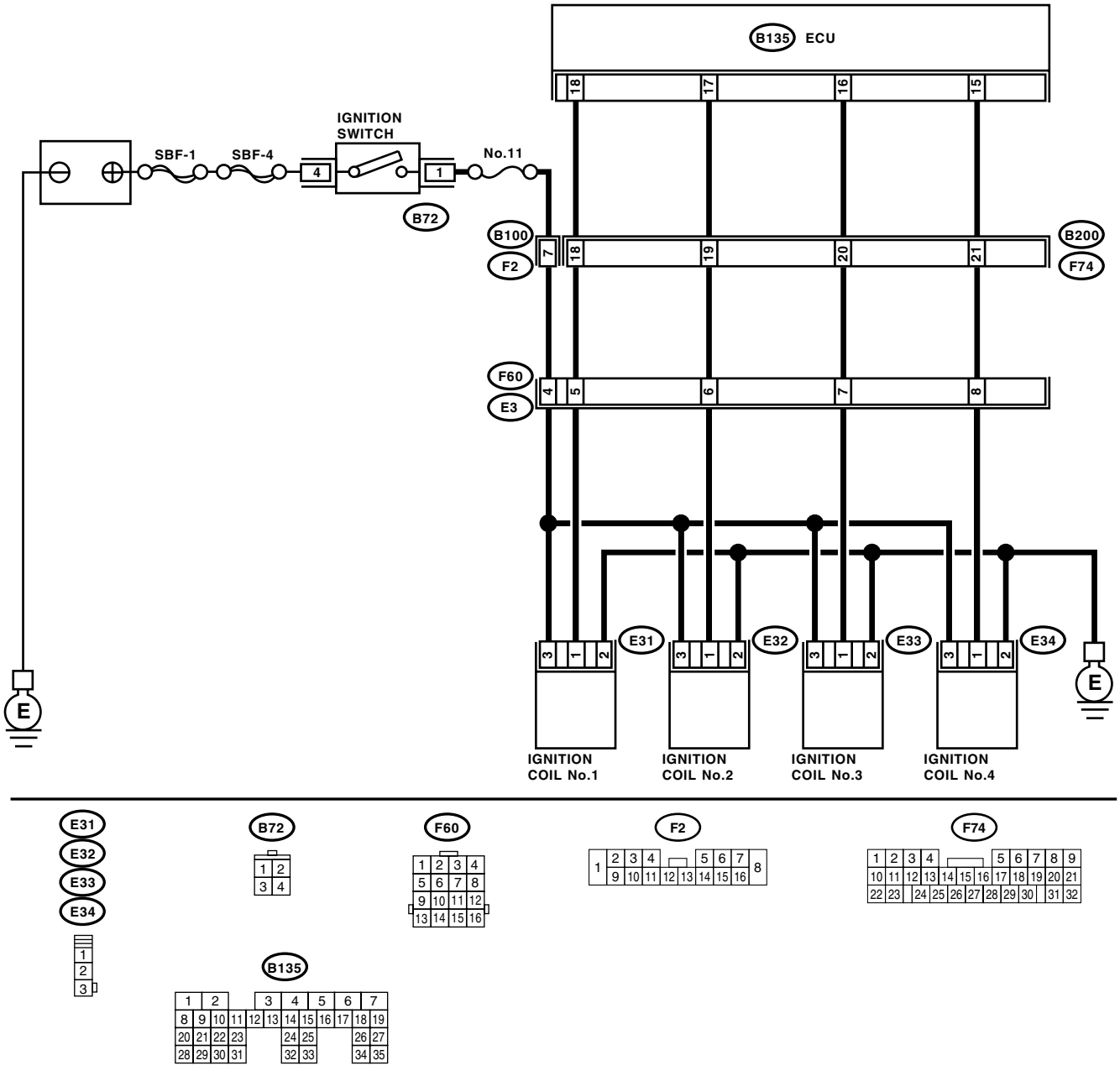
EN-02134

	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the measured value less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 34 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):*** ***(B137) No. 15 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair the open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (–):*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Repair the open or ground short circuit in harness of power supply circuit.
5	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 6 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Check the ignition control system. <Ref. to EN(H4DOTC)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02135

	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DOTC)-6, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-6, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-48, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(H4DOTC)-72, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 18 — (E31) No. 1:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector

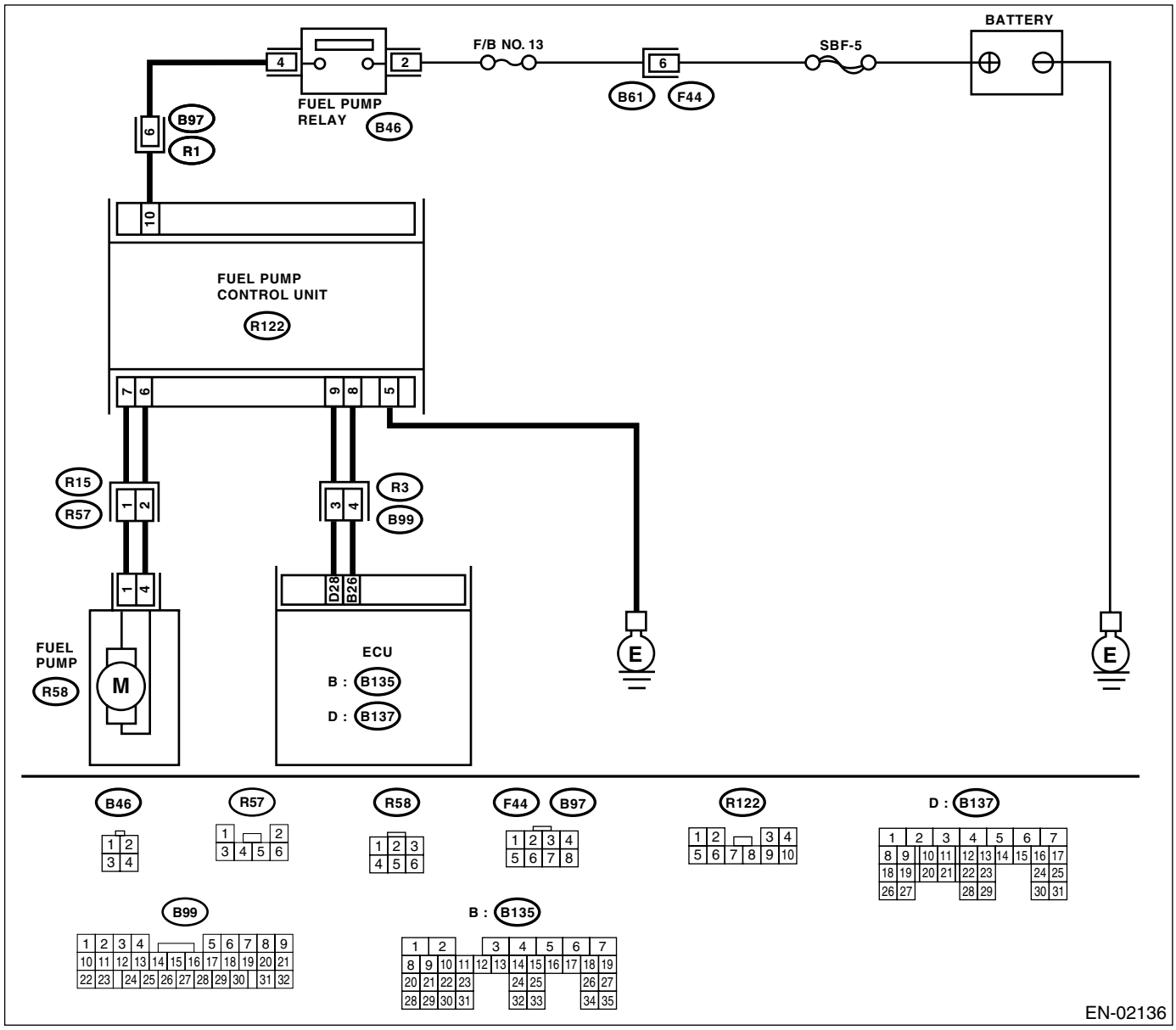
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 18 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

MEMO:

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

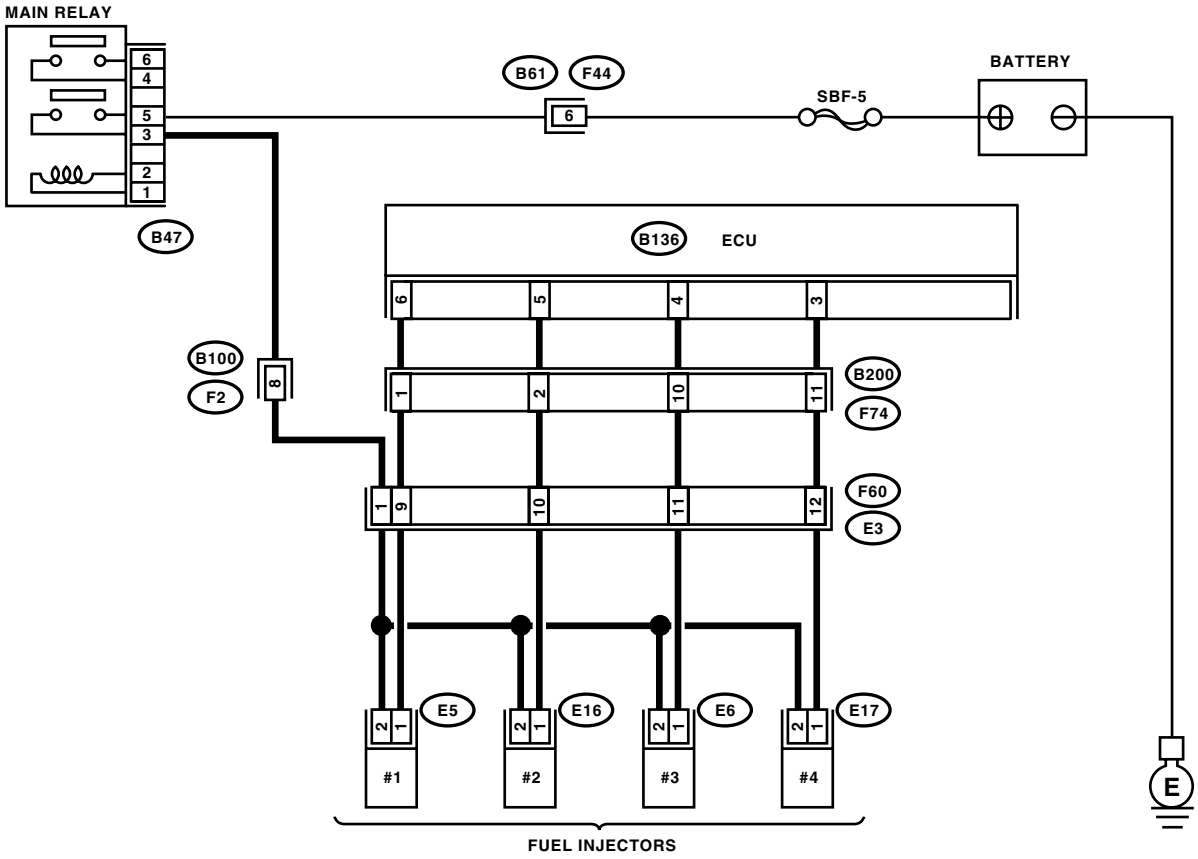


	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce “operating” sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)-38, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02137

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit “operating” sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-29, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — (E5) No. 1:*** ***(B136) No. 5 — (E16) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** ***(B136) No. 3 — (E6) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:***	Is the measured value less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4DOTC)-439, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(H4DOTC)-84, DTC P0011 — “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)-85, DTC P0021 — “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-86, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-88, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-92, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)-94, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)-98, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to EN(H4DOTC)-100, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)-102, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC)-104, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC)-108, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)-110, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)-112, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(H4DOTC)-114, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4DOTC)-116, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4DOTC)-118, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOTC)-122, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4DOTC)-124, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4DOTC)-128, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(H4DOTC)-132, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4DOTC)-136, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4DOTC)-138, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)-139, DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-140, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-142, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-144, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-146, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)-148, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)-152, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)-156, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(H4DOTC)-158, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(H4DOTC)-159, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)-162, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H4DOTC)-164, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H4DOTC)-166, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to EN(H4DOTC)-170, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to EN(H4DOTC)-174, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)-178, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(H4DOTC)-182, DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC)-184, DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC)-186, DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H4DOTC)-189, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H4DOTC)-189, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H4DOTC)-189, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H4DOTC)-190, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)-196, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)-198, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC)-200, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)-202, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)-204, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H4DOTC)-206, DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)-208, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to EN(H4DOTC)-210, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4DOTC)-214, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4DOTC)-218, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(H4DOTC)-220, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4DOTC)-222, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4DOTC)-226, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to EN(H4DOTC)-230, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to EN(H4DOTC)-234, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)-238, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC)-240, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)-242, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4DOTC)-244, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4DOTC)-248, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)-252, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4DOTC)-254, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4DOTC)-258, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to EN(H4DOTC)-260, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)-262, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(H4DOTC)-266, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)-270, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4DOTC)-274, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low-BANK 1	<Ref. to EN(H4DOTC)-278, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High-BANK 1	<Ref. to EN(H4DOTC)-280, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Improper CAN Communication	<Ref. to EN(H4DOTC)-284, DTC P0600 — CAN COMMUNICATION CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)-286, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4DOTC)-289, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC)-290, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4DOTC)-293, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC)-294, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4DOTC)-298, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Request AT MIL ON	<Ref. to EN(H4DOTC)-301, DTC P0700 — AT MIL LIGHT UP REQUEST —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC)-302, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)-304, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC)-306, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)-310, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(H4DOTC)-312, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(H4DOTC)-316, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(H4DOTC)-318, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(H4DOTC)-322, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(H4DOTC)-324, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(H4DOTC)-325, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(H4DOTC)-326, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(H4DOTC)-327, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)-328, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)-330, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)-332, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)-334, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4DOTC)-336, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4DOTC)-337, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)-338, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)-340, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)-343, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to EN(H4DOTC)-344, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust Gas Temperature Sensor Function	<Ref. to EN(H4DOTC)-346, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)-348, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4DOTC)-352, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4DOTC)-354, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to EN(H4DOTC)-356, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to EN(H4DOTC)-360, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to EN(H4DOTC)-362, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4DOTC)-364, DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)-366, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(H4DOTC)-370, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)-372, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(H4DOTC)-376, DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(H4DOTC)-378, DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(H4DOTC)-380, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to EN(H4DOTC)-382, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)-384, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4DOTC)-390, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC)-396, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4DOTC)-404, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4DOTC)-408, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to EN(H4DOTC)-411, DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H4DOTC)-412, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to EN(H4DOTC)-416, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to EN(H4DOTC)-420, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(H4DOTC)-424, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGHT INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to EN(H4DOTC)-428, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to EN(H4DOTC)-434, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

MEMO:

18.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 — "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Inspect the advance angle and OCV duty output using Subaru Select Monitor and OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the advance angle more than approx. 0°C and the OCV duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • OCV (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

B: DTC P0021 — "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

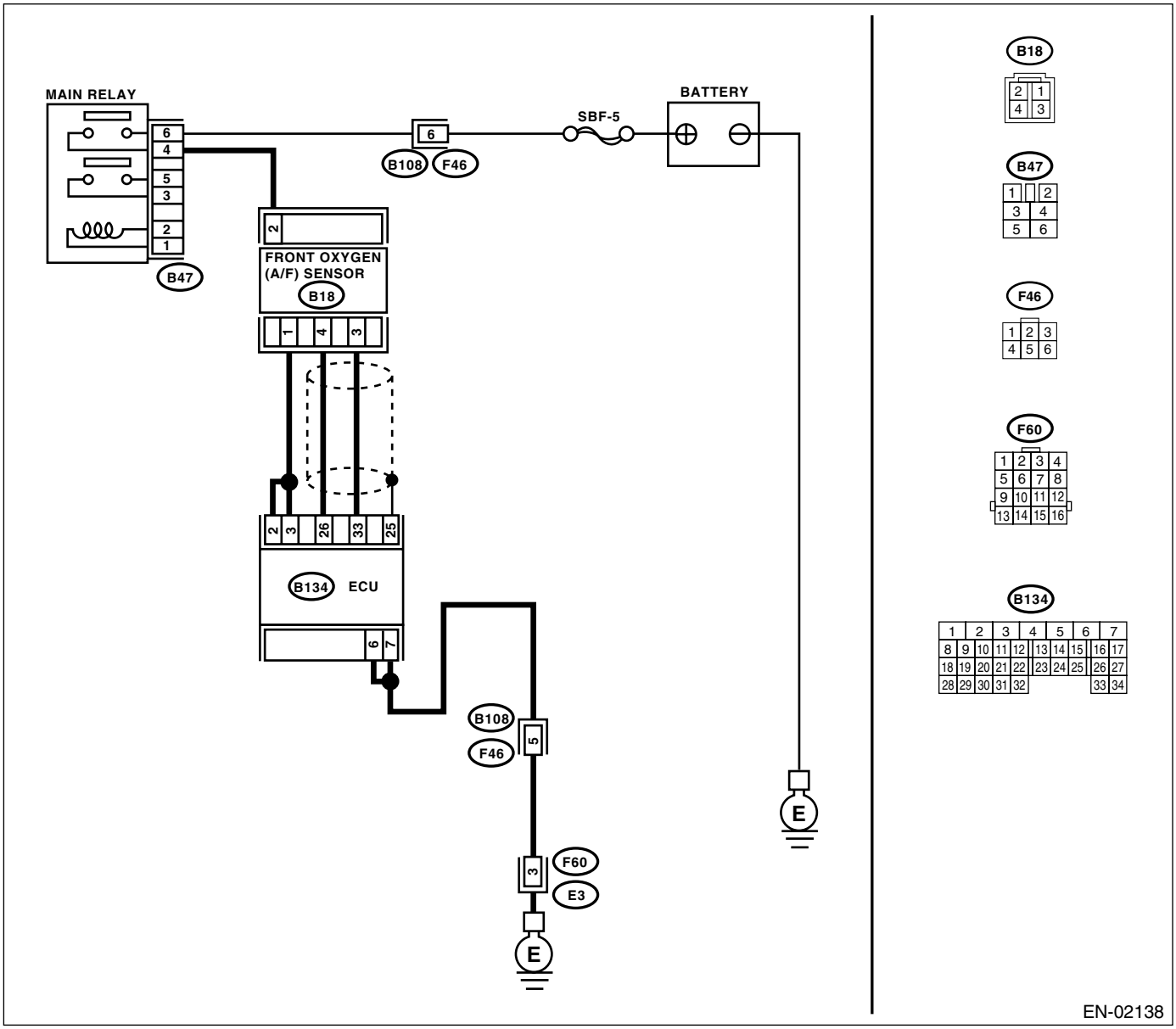
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Inspect the advance angle and OCV duty output using Subaru Select Monitor and OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the advance angle more than approx. 0°C and the OCV duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • OCV (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

C: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-14, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



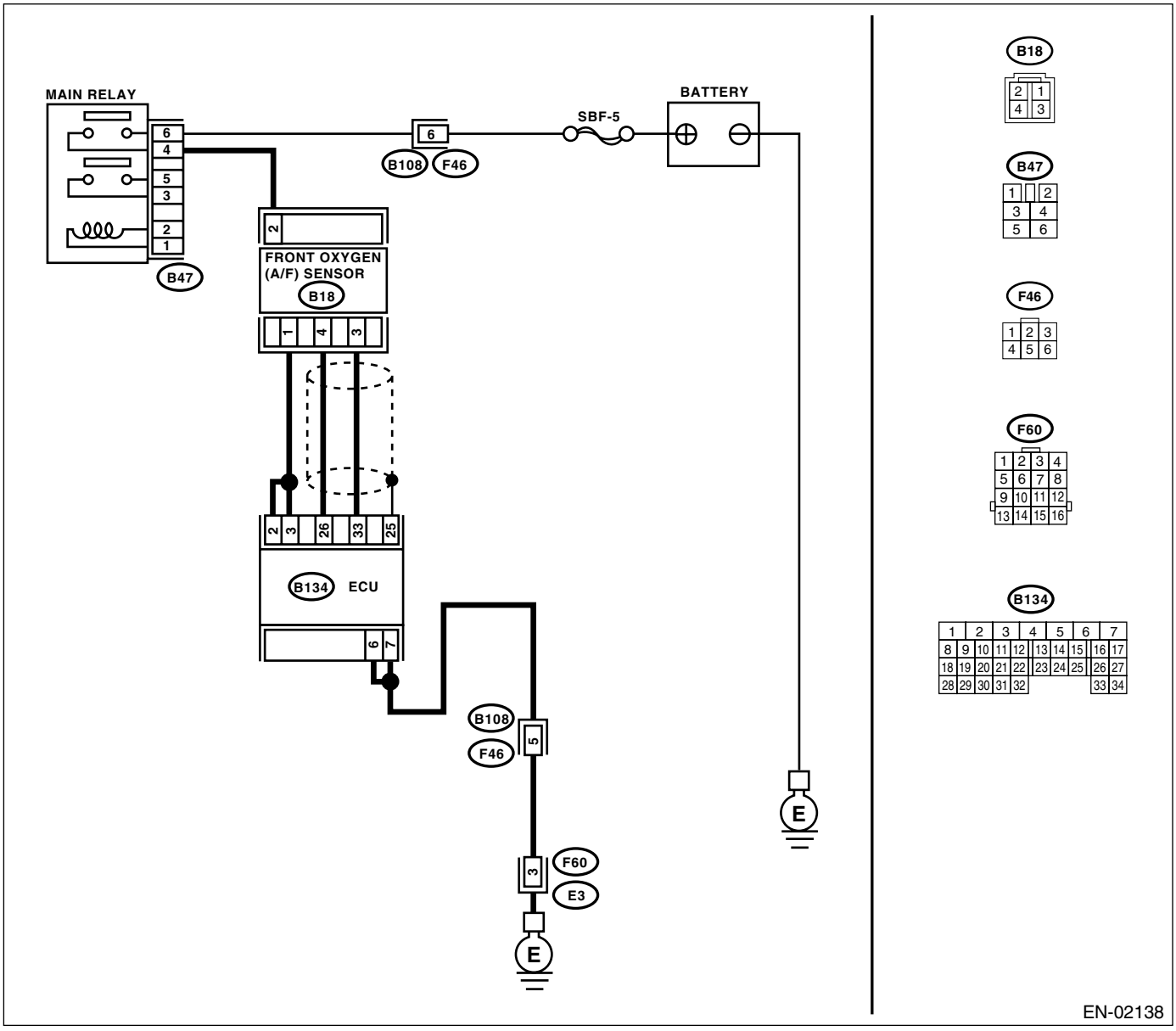
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 2 — (B18) No. 1:*** ***(B134) No. 3 — (B18) No. 1:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 2:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the measured value less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>

D: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-16, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
2	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

Step		Check	Yes	No
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the measured value less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>

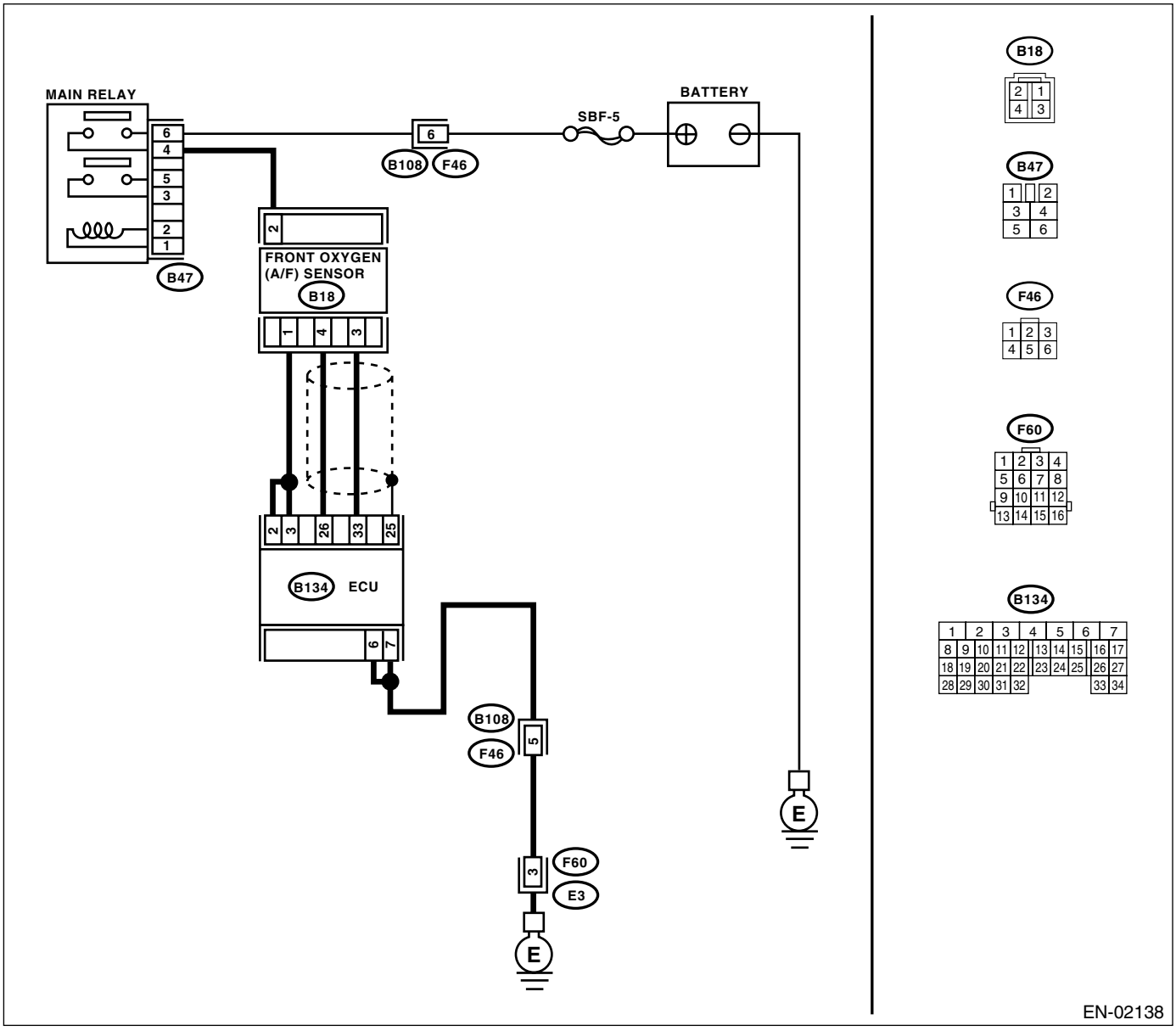
MEMO:

E: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-18, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



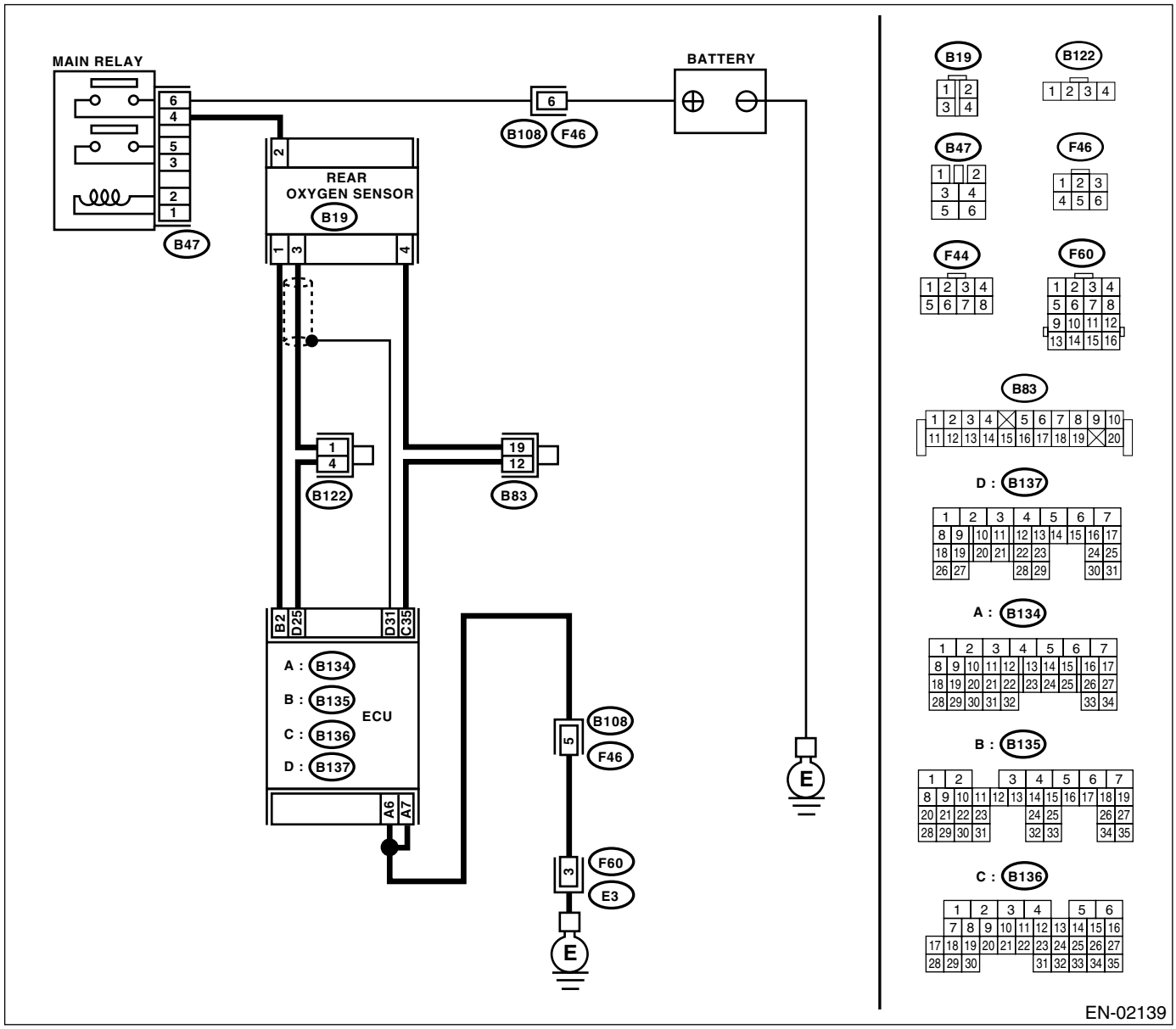
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

F: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-20, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

Step		Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 30 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>

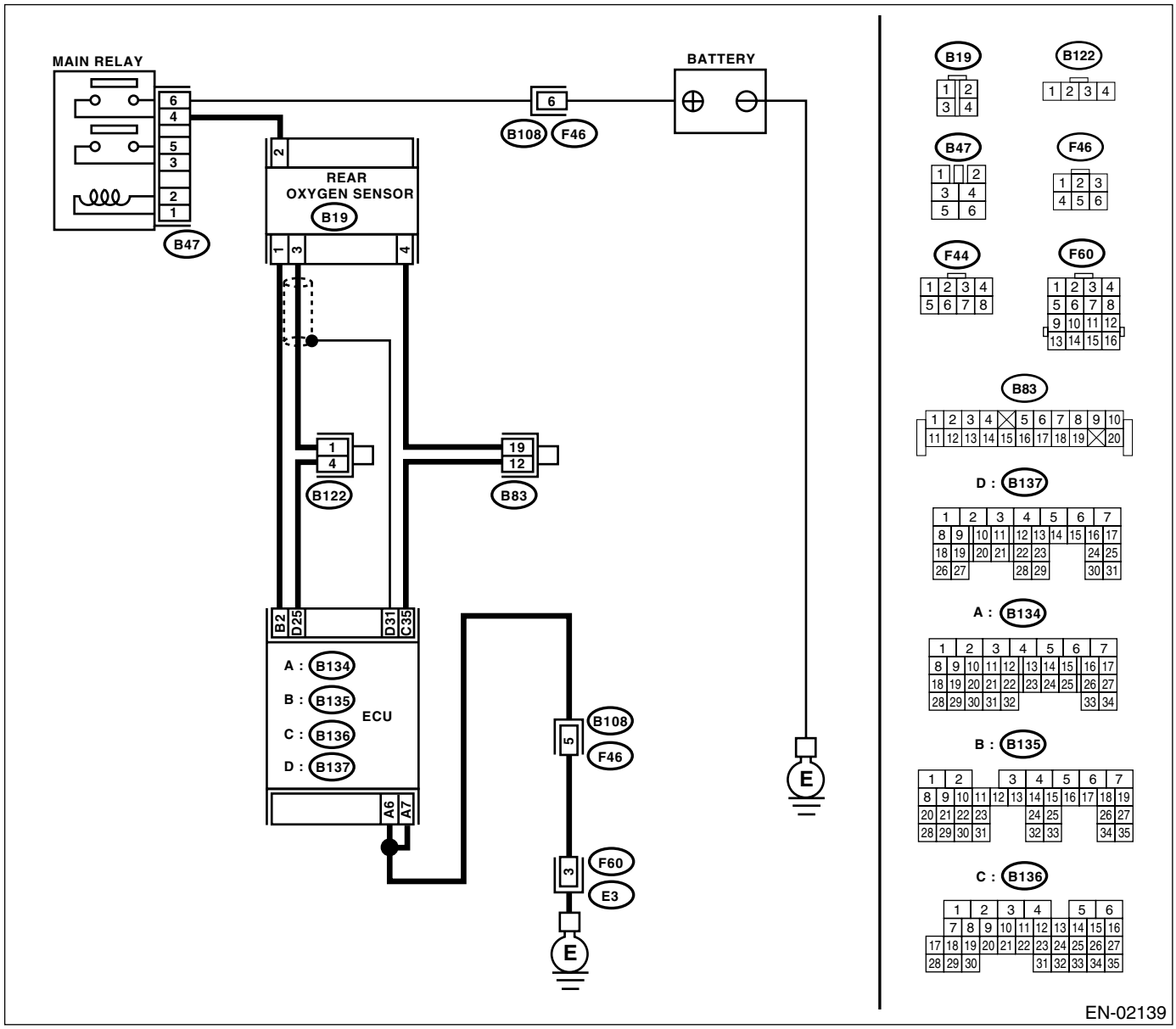
MEMO:

G: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-22, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



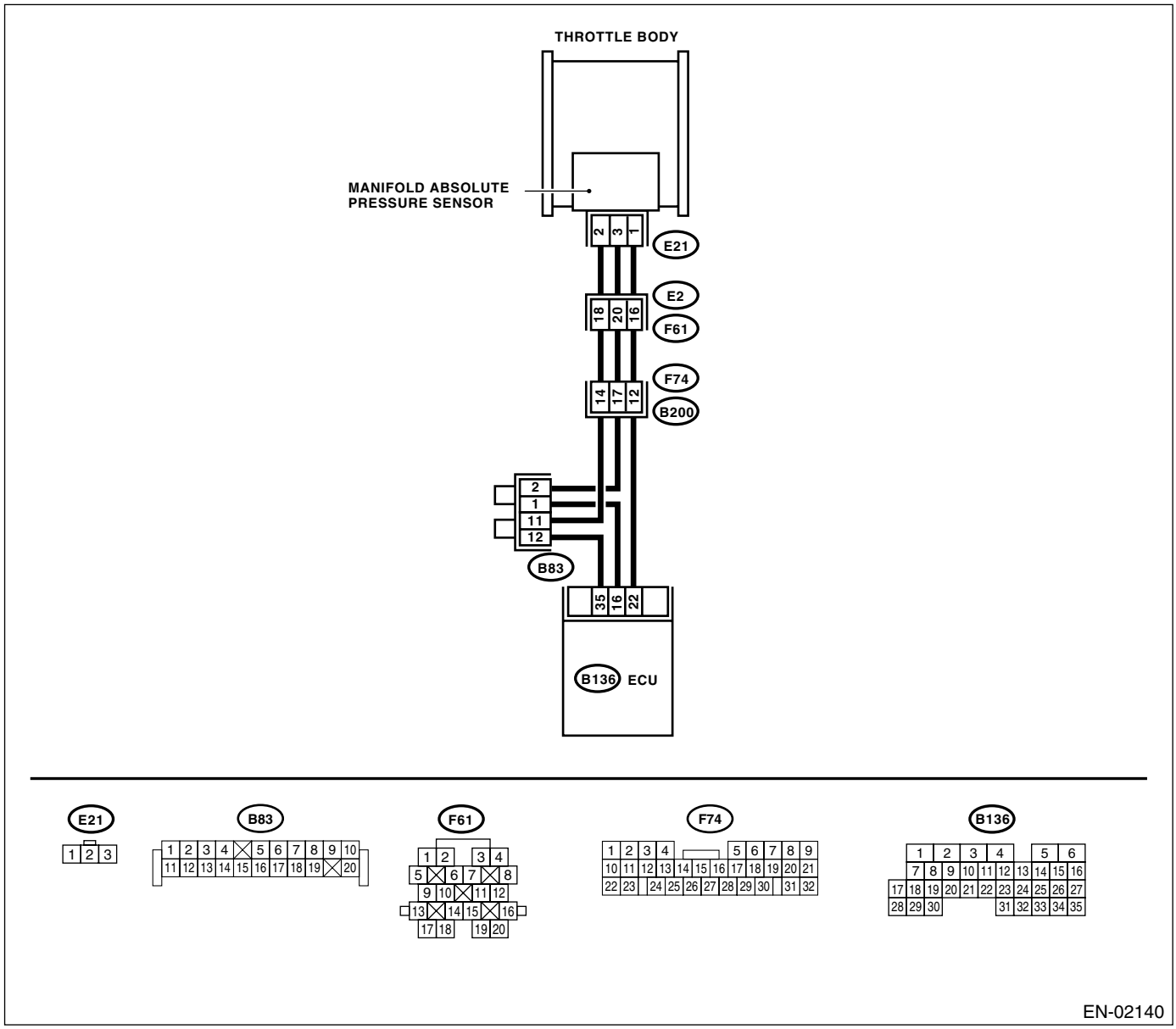
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END

H: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-24, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02140

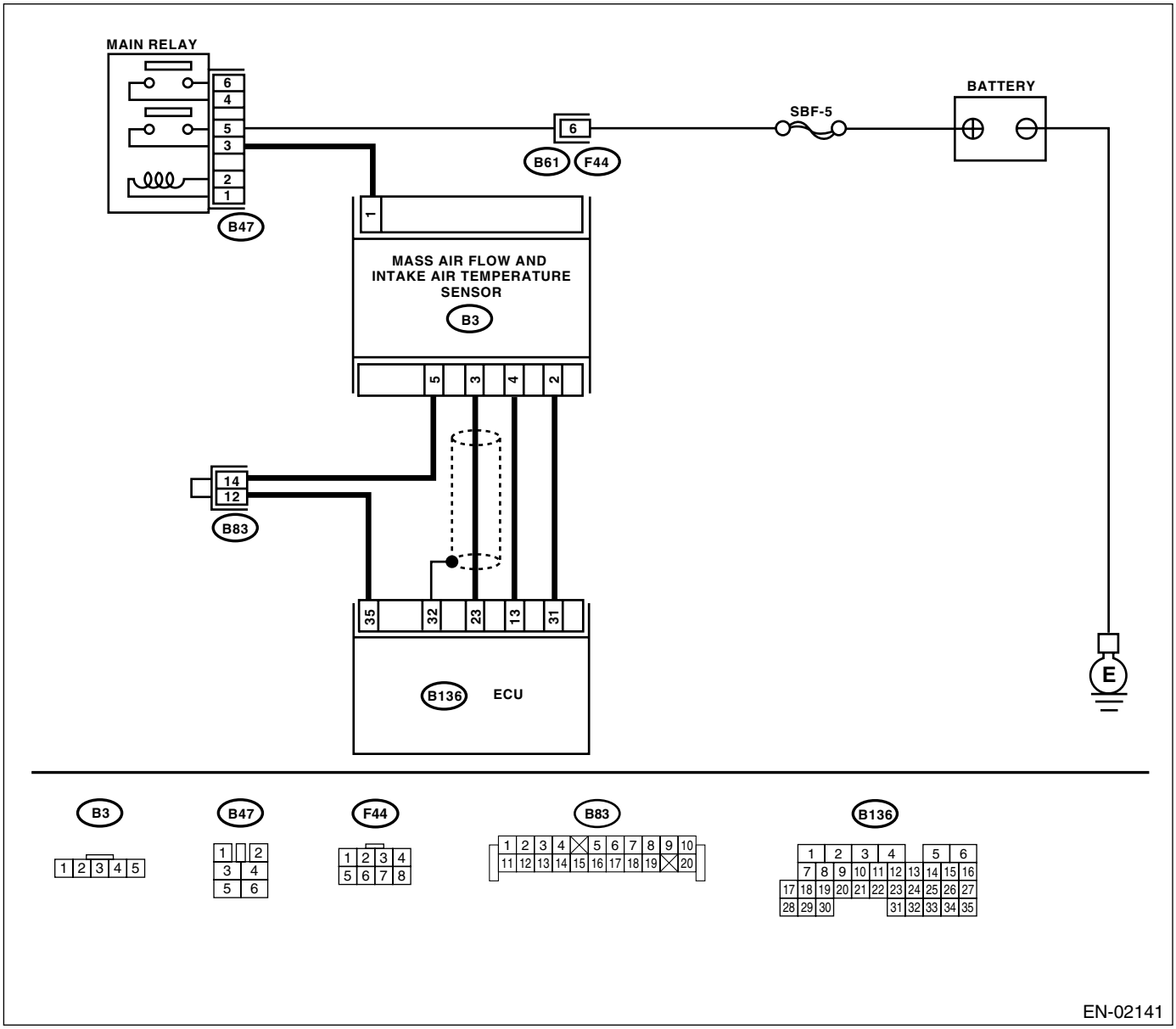
	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2.**	Check the throttle position sensor circuit. <Ref. to EN(H4DOTC)-428, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE RATIONALITY —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.**	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step **4.**	Tighten the manifold absolute pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

I: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-26, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



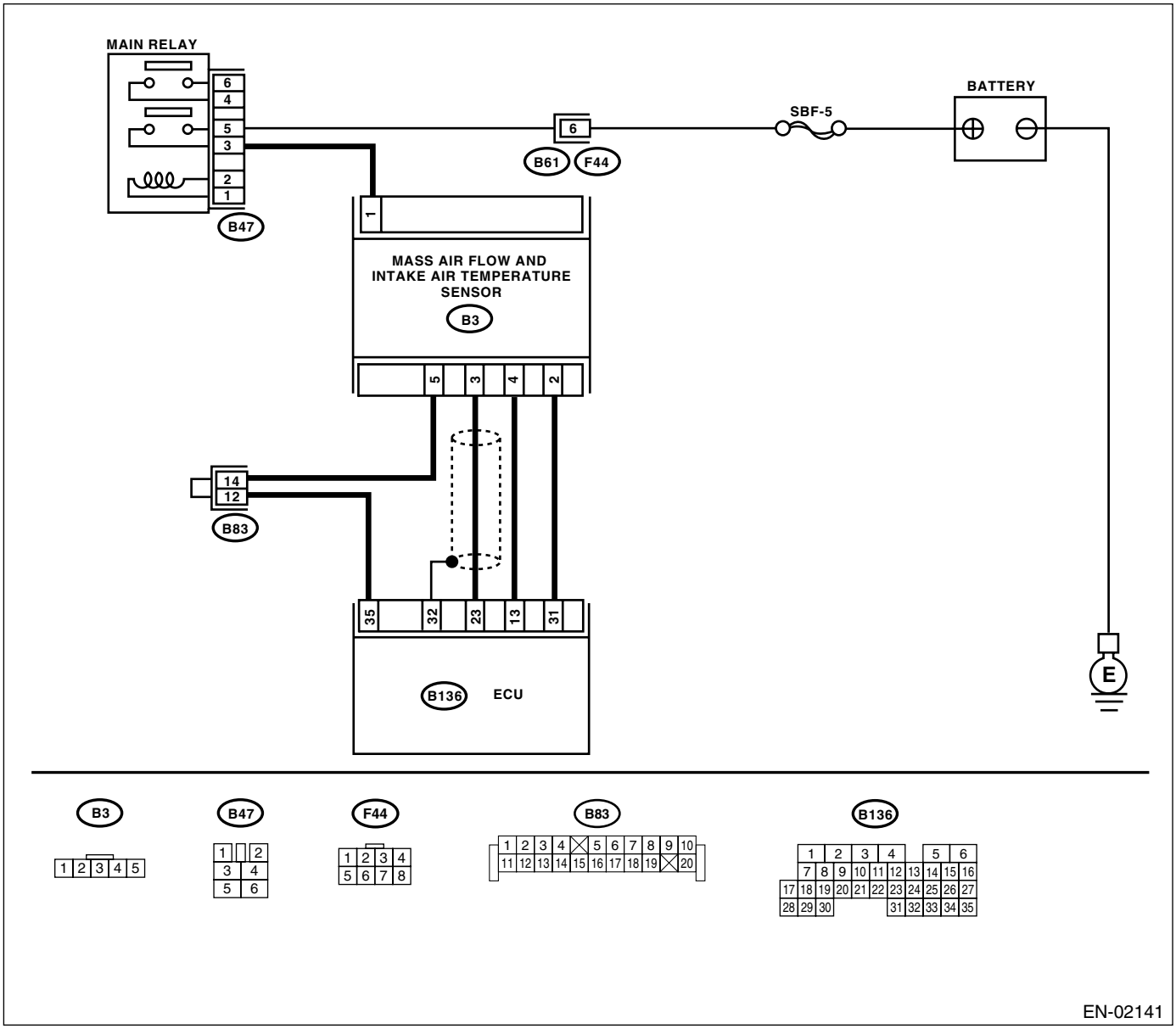
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

J: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-30, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.2 to 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (B3) No. 5:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

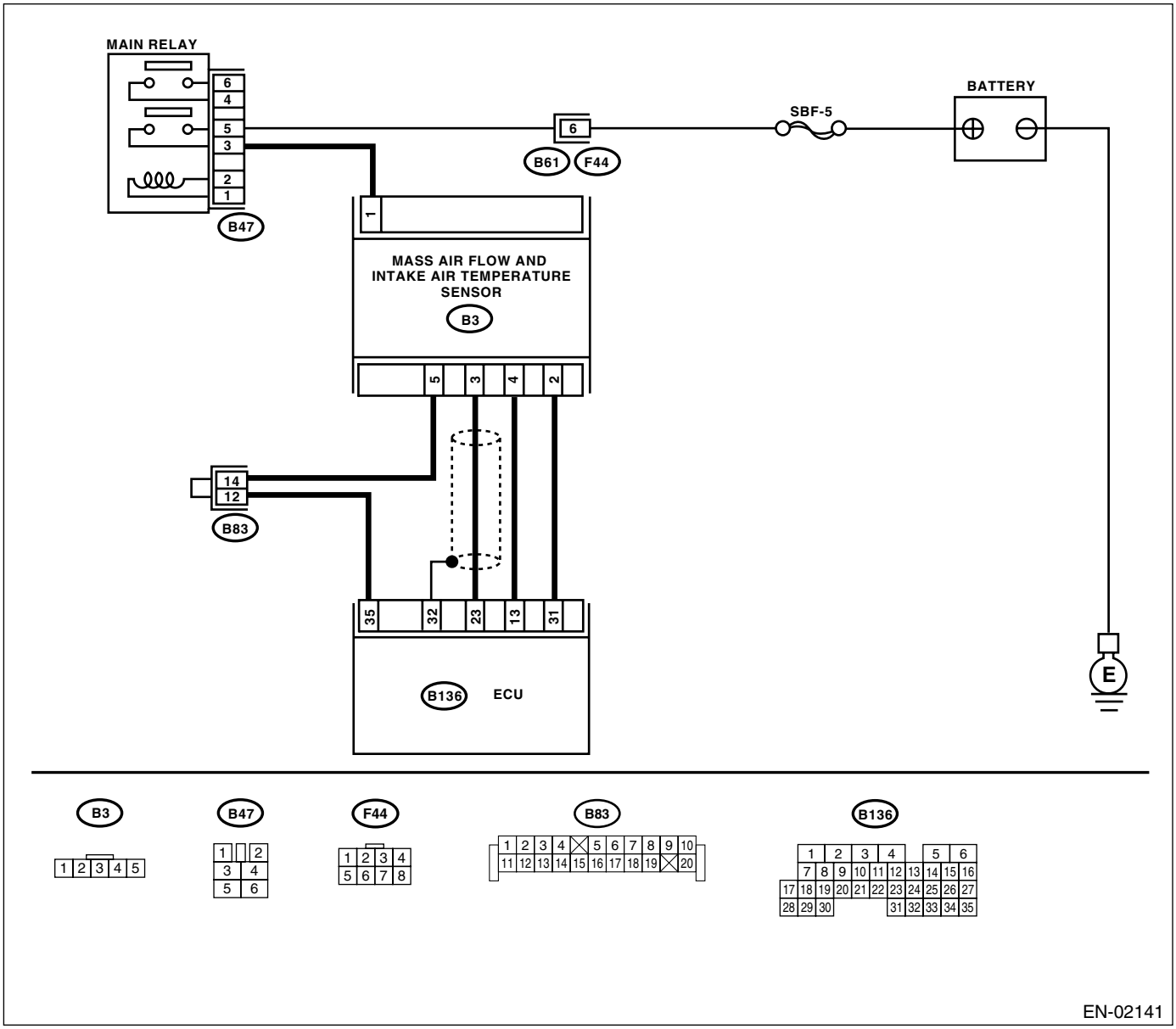
MEMO:

K: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-32, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02141

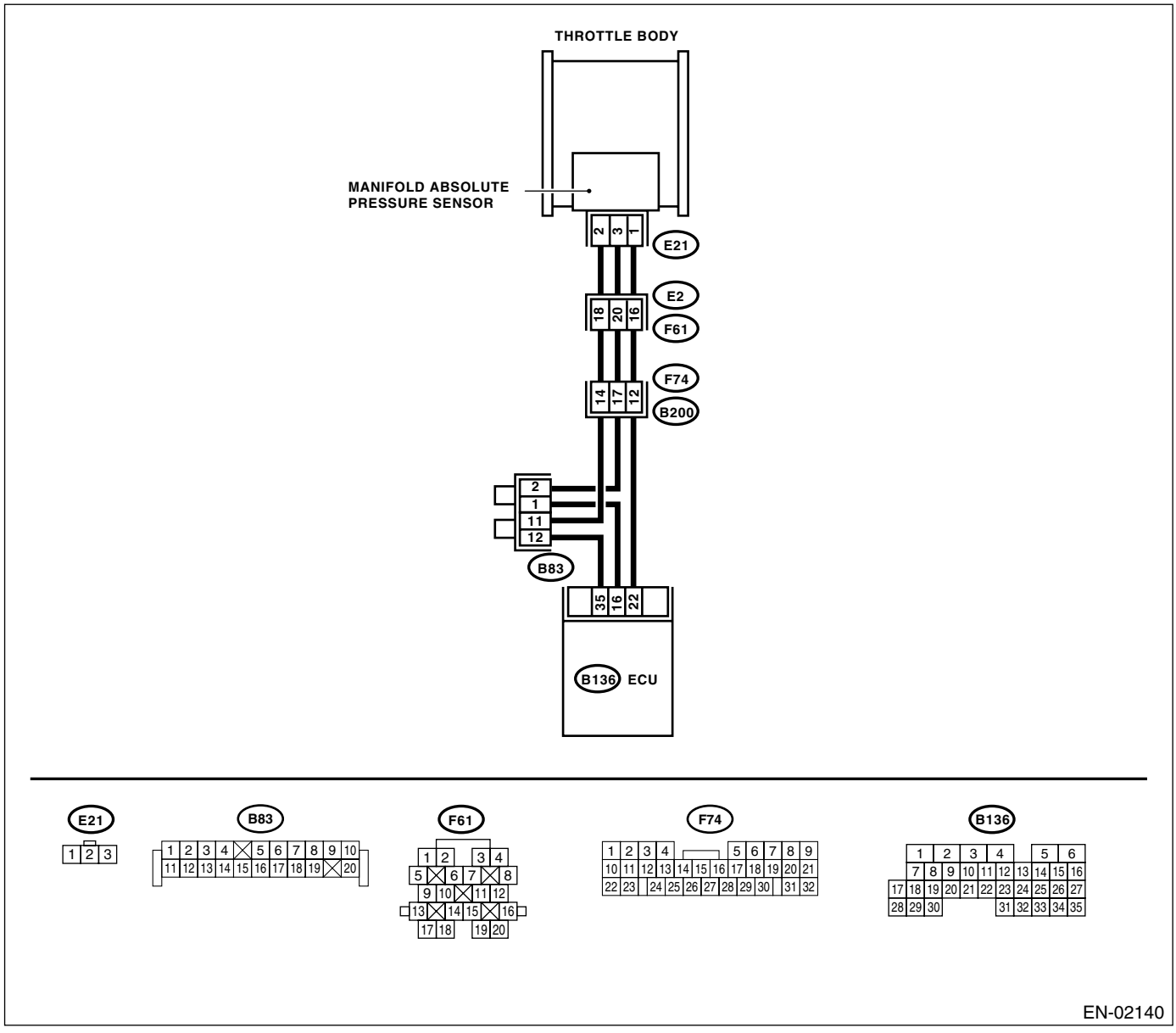
	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.2 to 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Repair the battery short of harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the measured value less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow sensor connector and ECM connector.

L: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-34, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



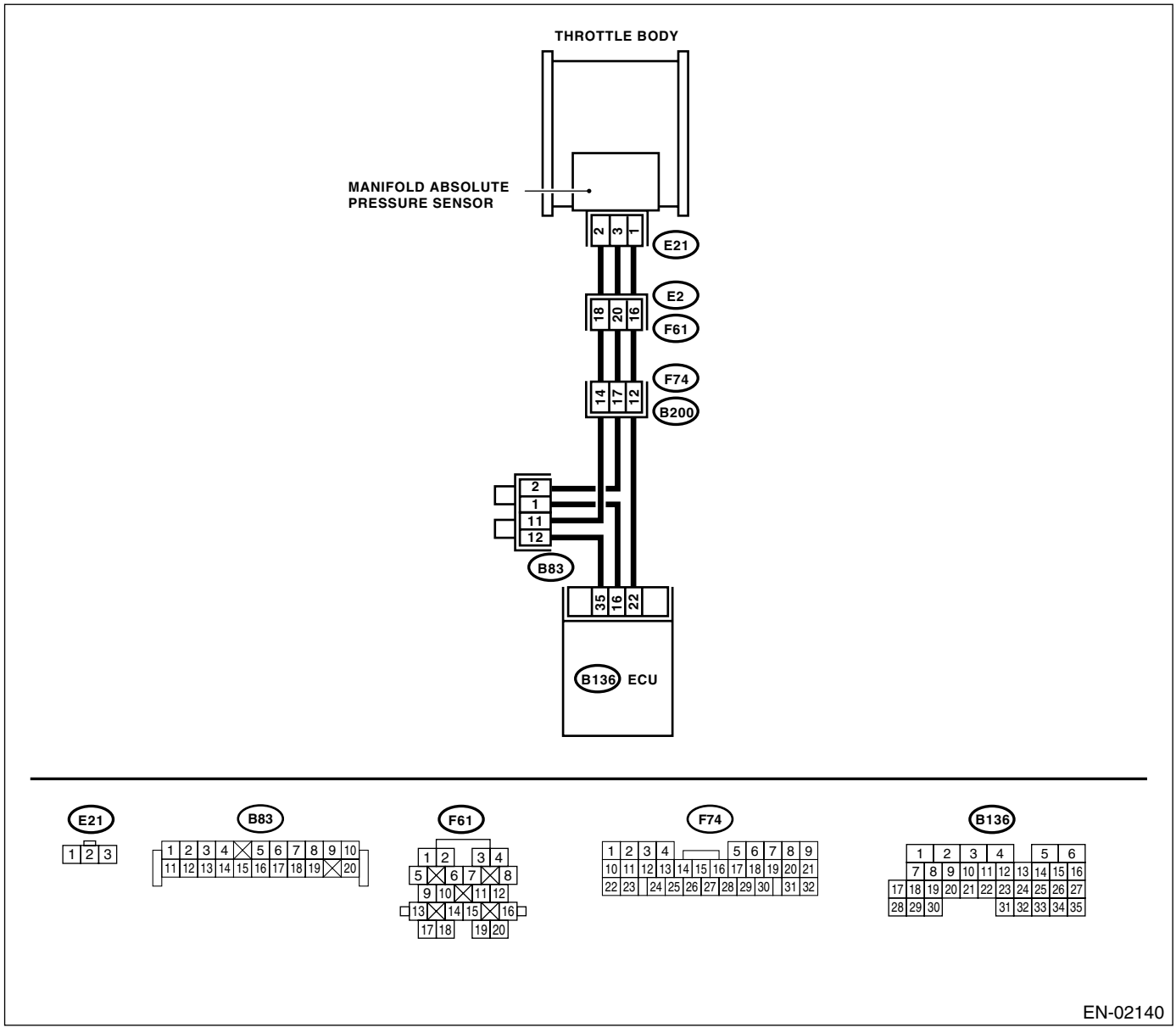
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the measured value less than 0.7 V?	Go to step **4.**	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

M: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-36, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



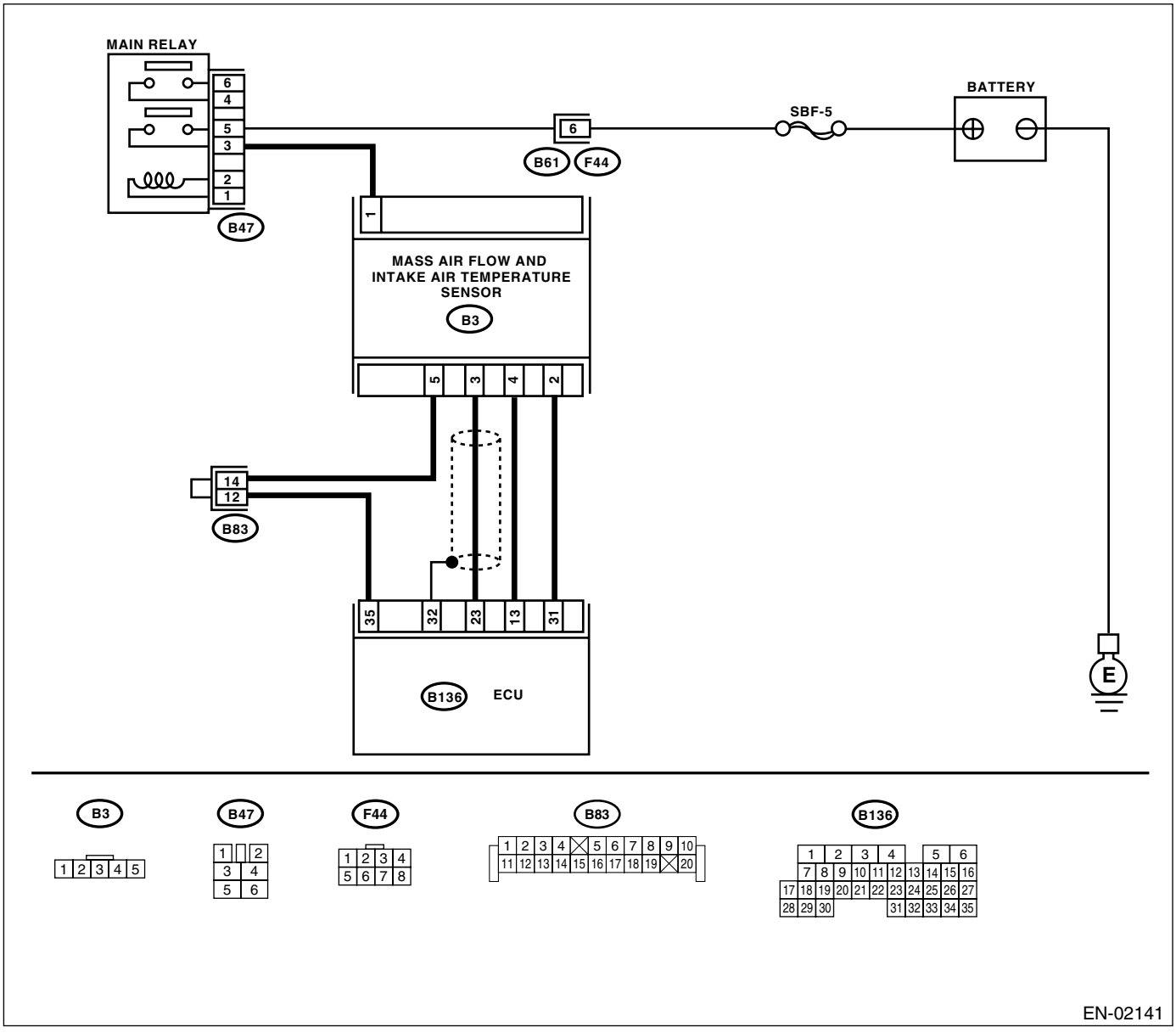
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (E21) No. 1:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-38, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



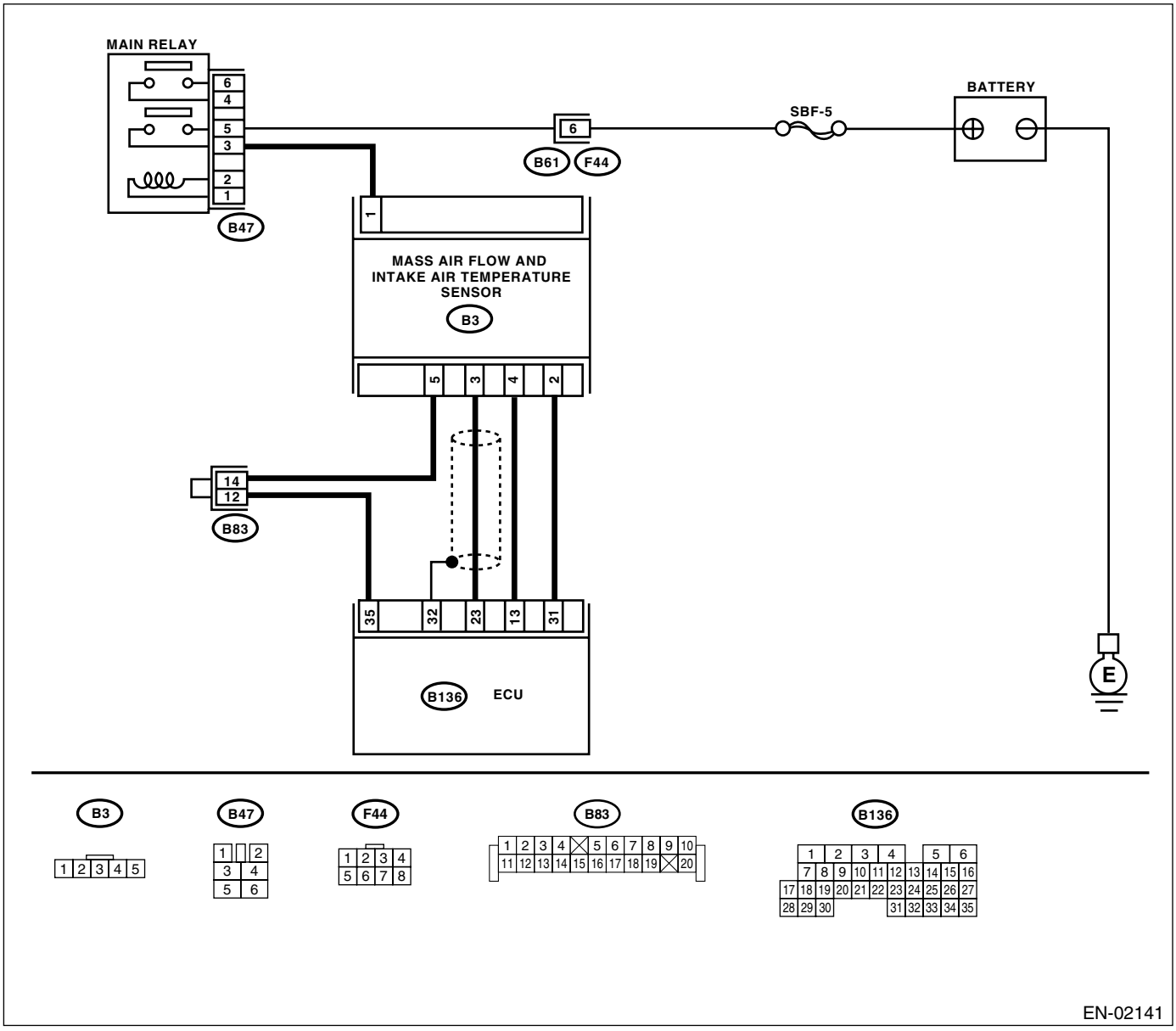
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm it up completely. 2) Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 75°C (167°F) to 95°C (203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>

O: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



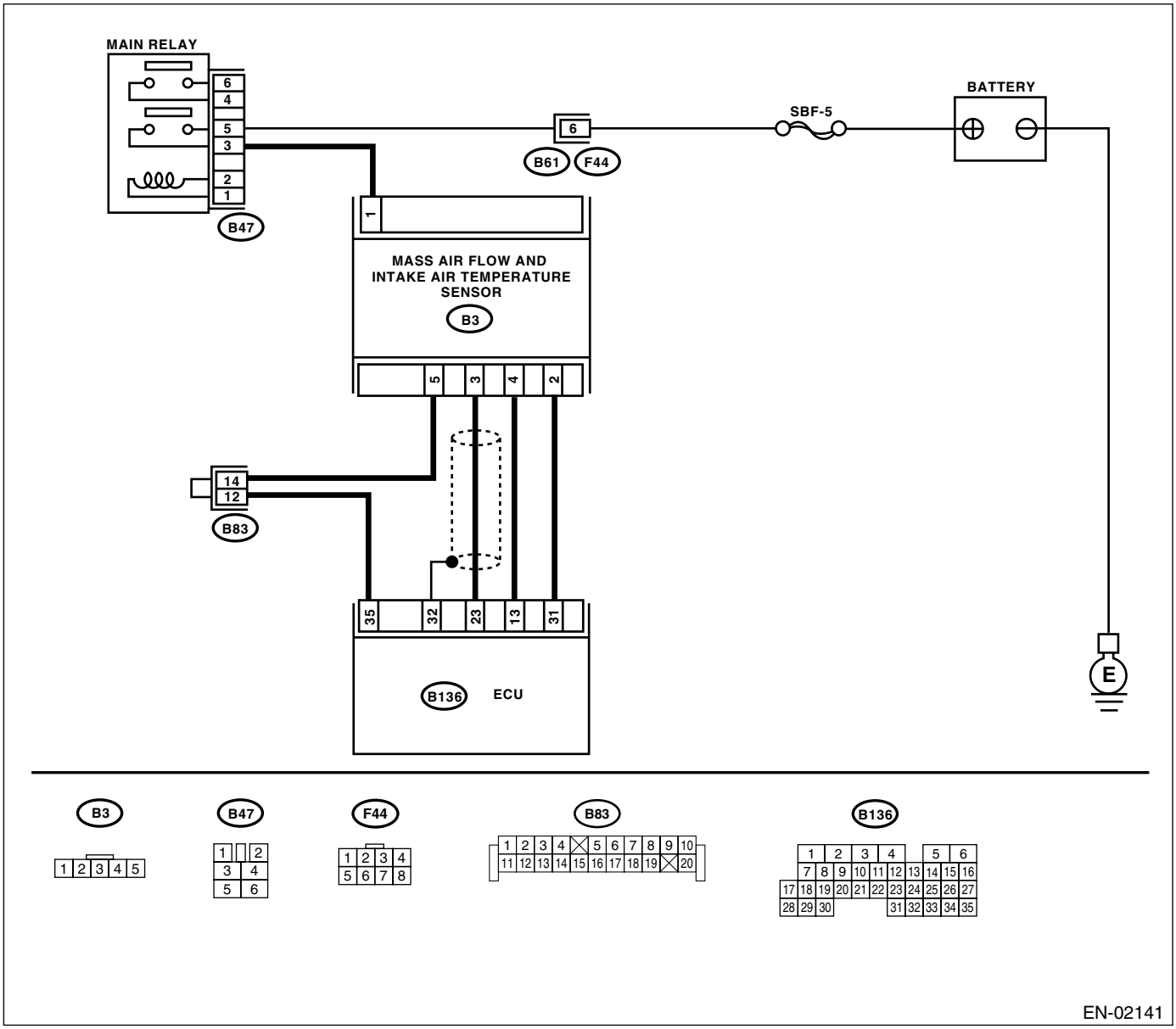
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 55°C (131°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −36°C (−33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

P: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-42, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −36°C (−33°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the measured value less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

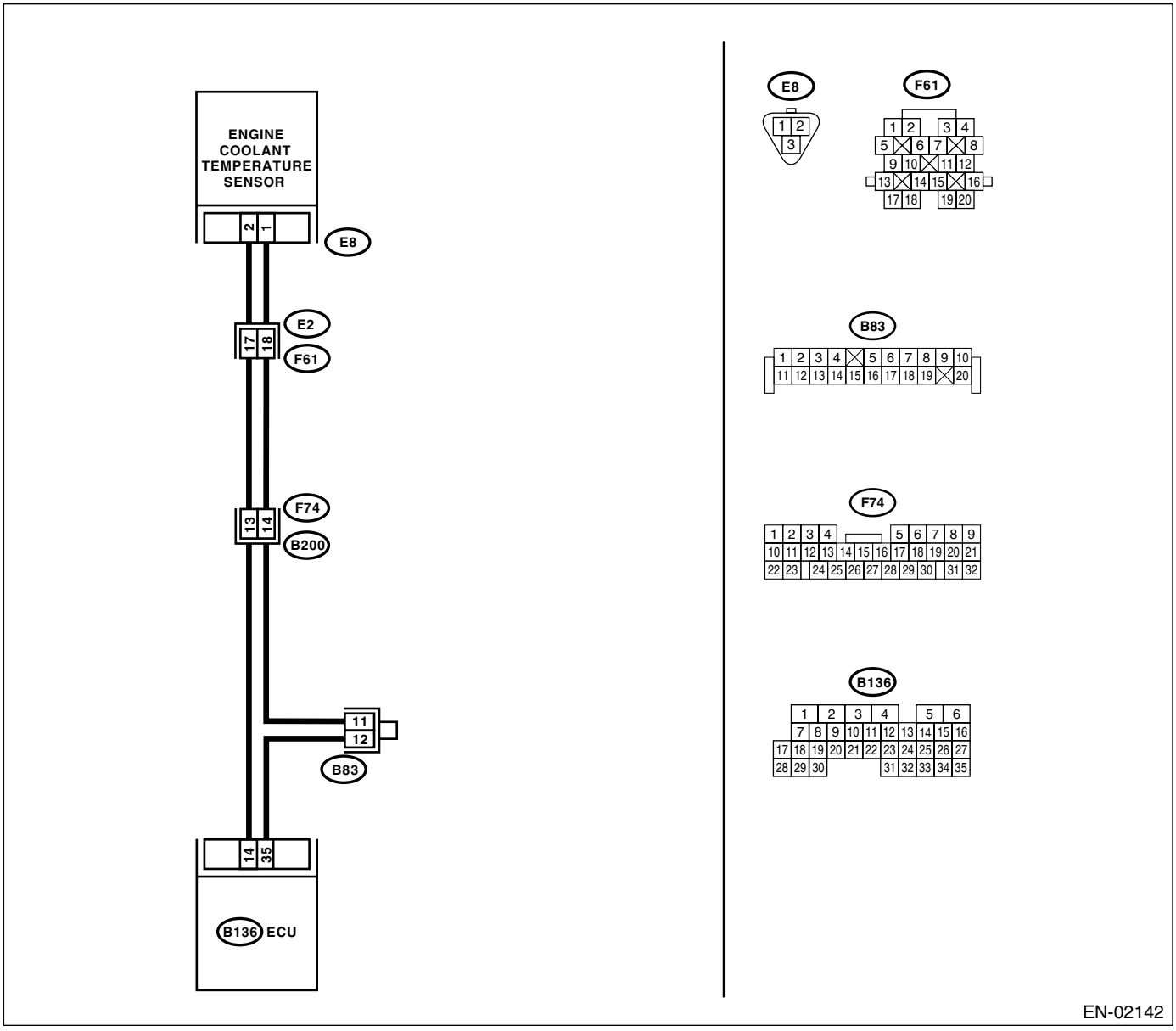
MEMO:

Q: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



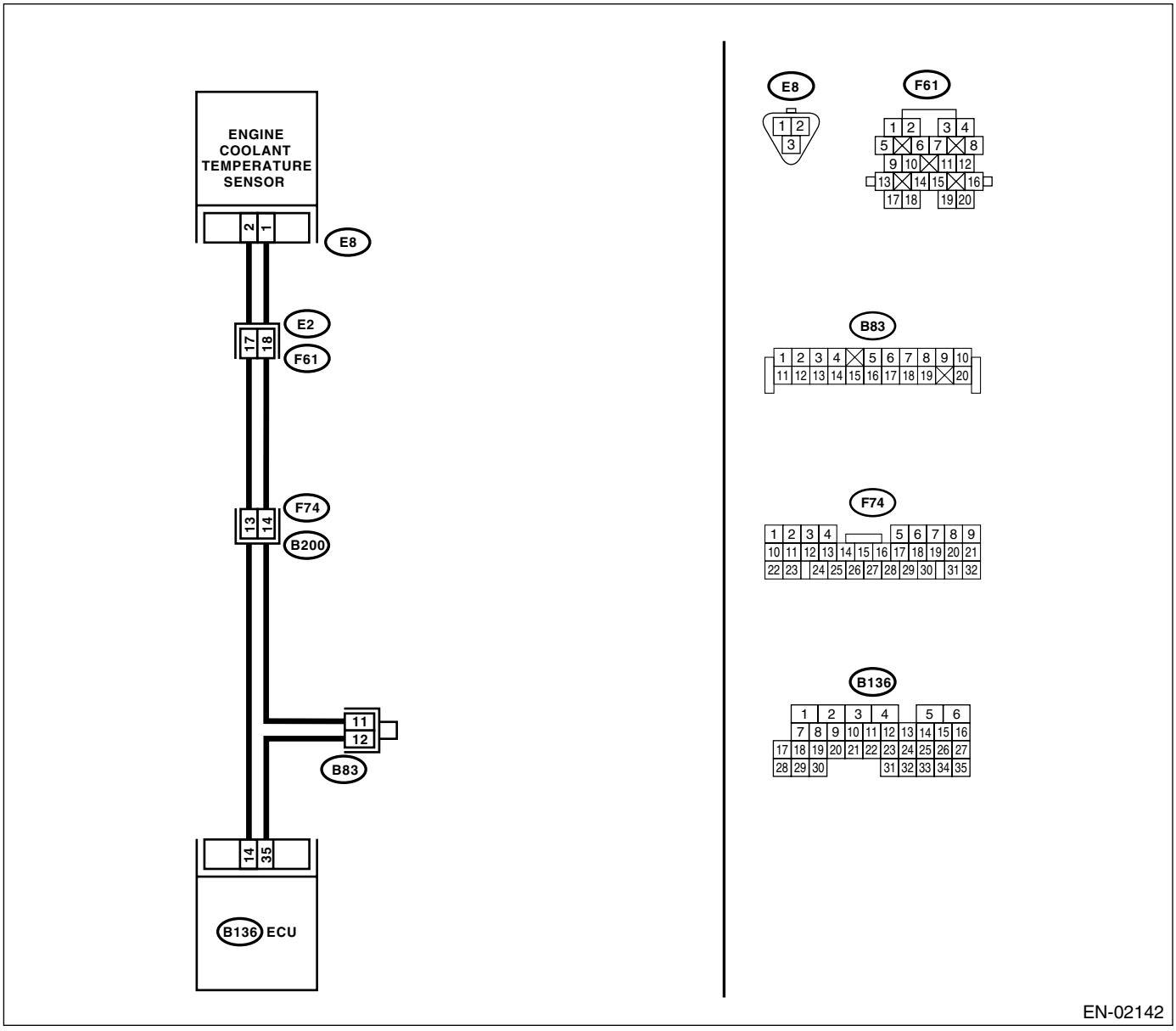
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

R: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the measured value more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

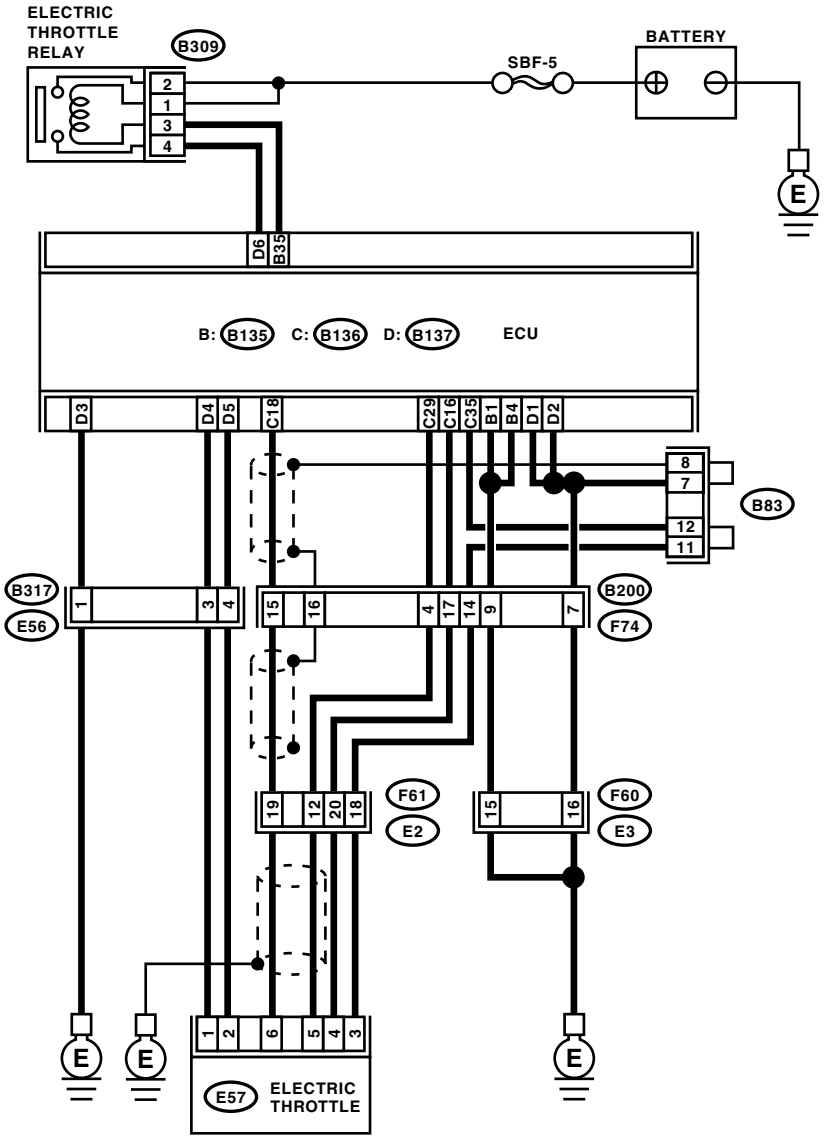
	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the measured value less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

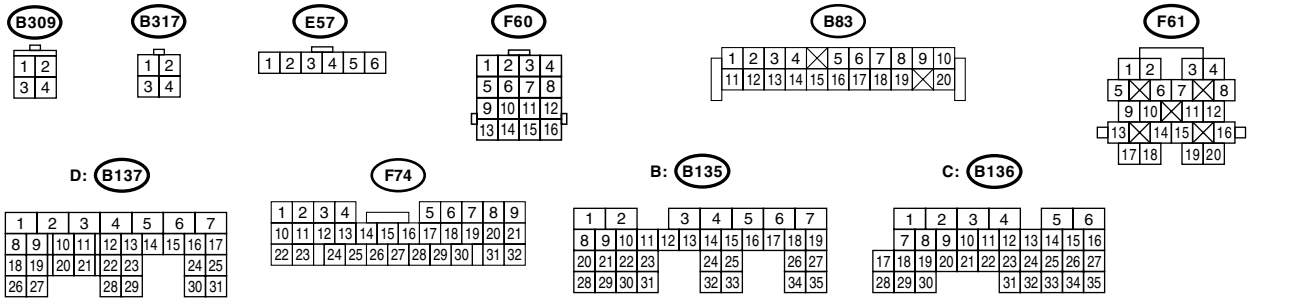
MEMO:

S: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-48, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

- **WIRING DIAGRAM:**





EN-02143

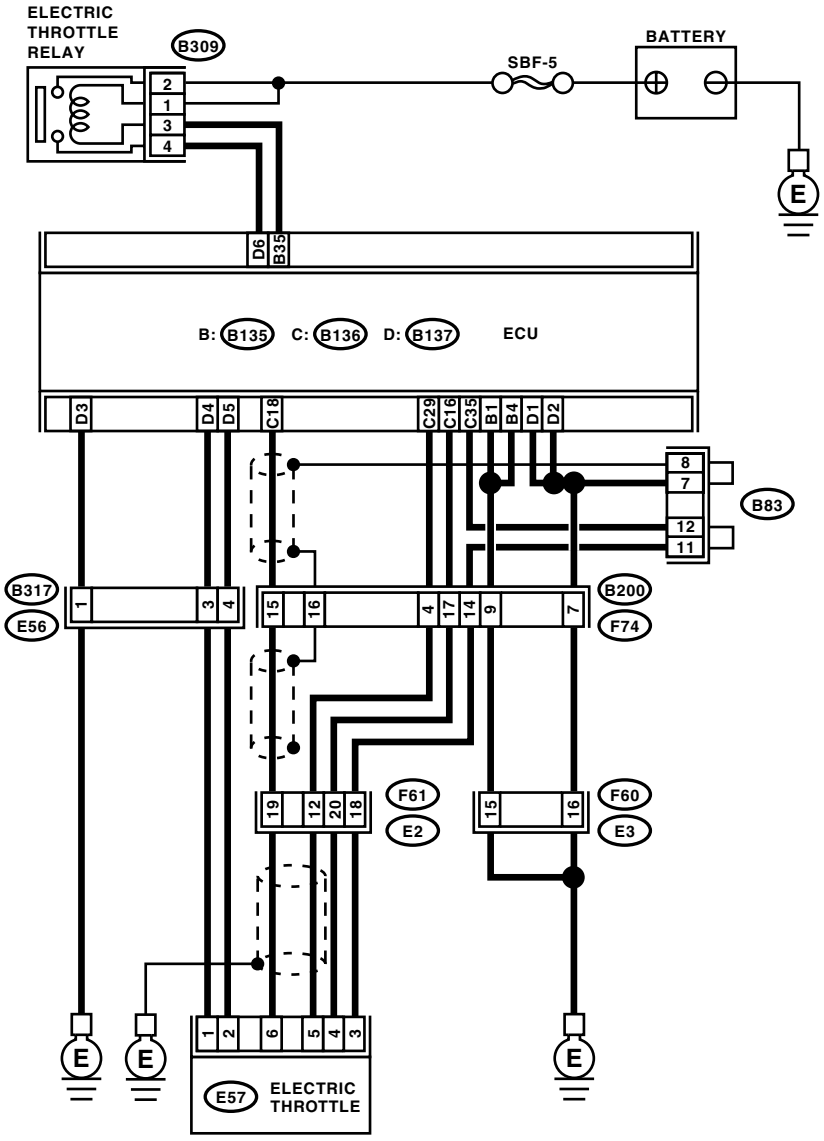
	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (-):*** 3) Shake the ECM harness and connector, engine harness connectors and electric throttle.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the chassis short of harness.
5	**CHECK POWER SURPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
6	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the measured value more than 10 Ω?	Repair the poor contact in electric throttle connector. If problem persists, replace the accelerator position sensor.	Repair the poor the contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

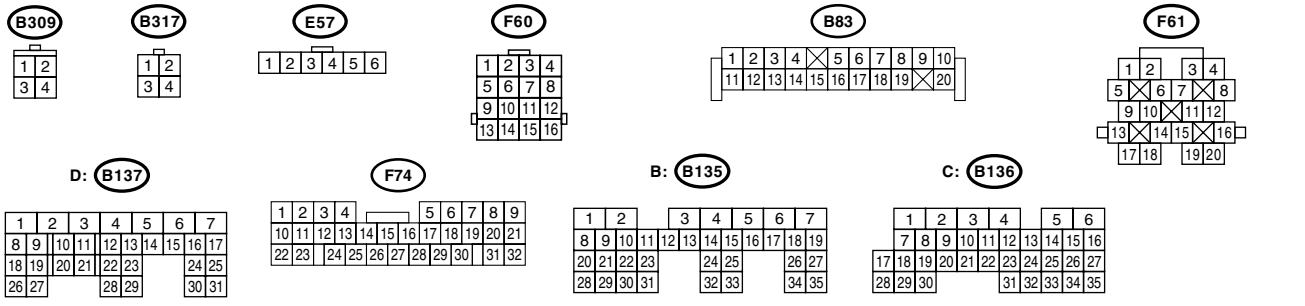
MEMO:

T: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-50, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

- **WIRING DIAGRAM:**





EN-02143

	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value less than 4.63 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 35 — (E57) No. 3:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** 3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value more than 10 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and electric throttle connector.
6	**CHECK POWER SUPPLY TO SENSOR.** 1) Measure the voltage between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value less than 10 V?	Go to step **7.**	Repair the short of harness between ECM connector and electric throttle connector.

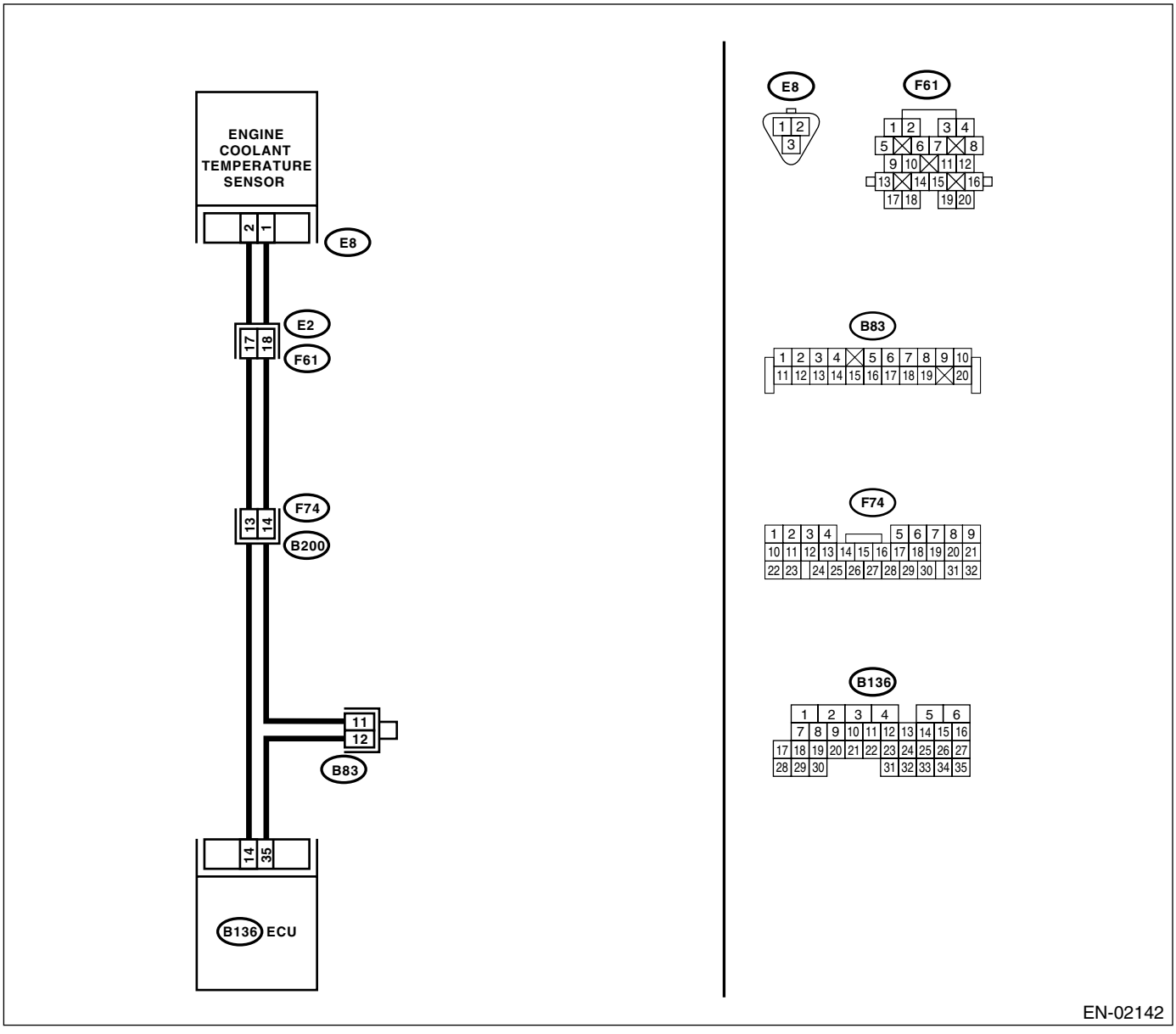
	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:***	Is the measured value more than 1 MΩ?	Repair the poor contact in harness. Replace the electric throttle.	Repair the short of harness of power supply to sensor.

U: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-52, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine will not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items. •Thermostat open stuck •Coolant level •Coolant freeze •Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4DOTC)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

V: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-56, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Codes (DTC)”. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to antifreeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref. to CO(H4DOTC)-13, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4DOTC)-24, Radiator Main Fan and Fan Motor.> and<Ref. to CO(H4DOTC)-26, Radiator Sub Fan and Fan Motor.>.	Replace the thermostat. <Ref. to CO(H4DOTC)-17, Thermostat.>

W: DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-58, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

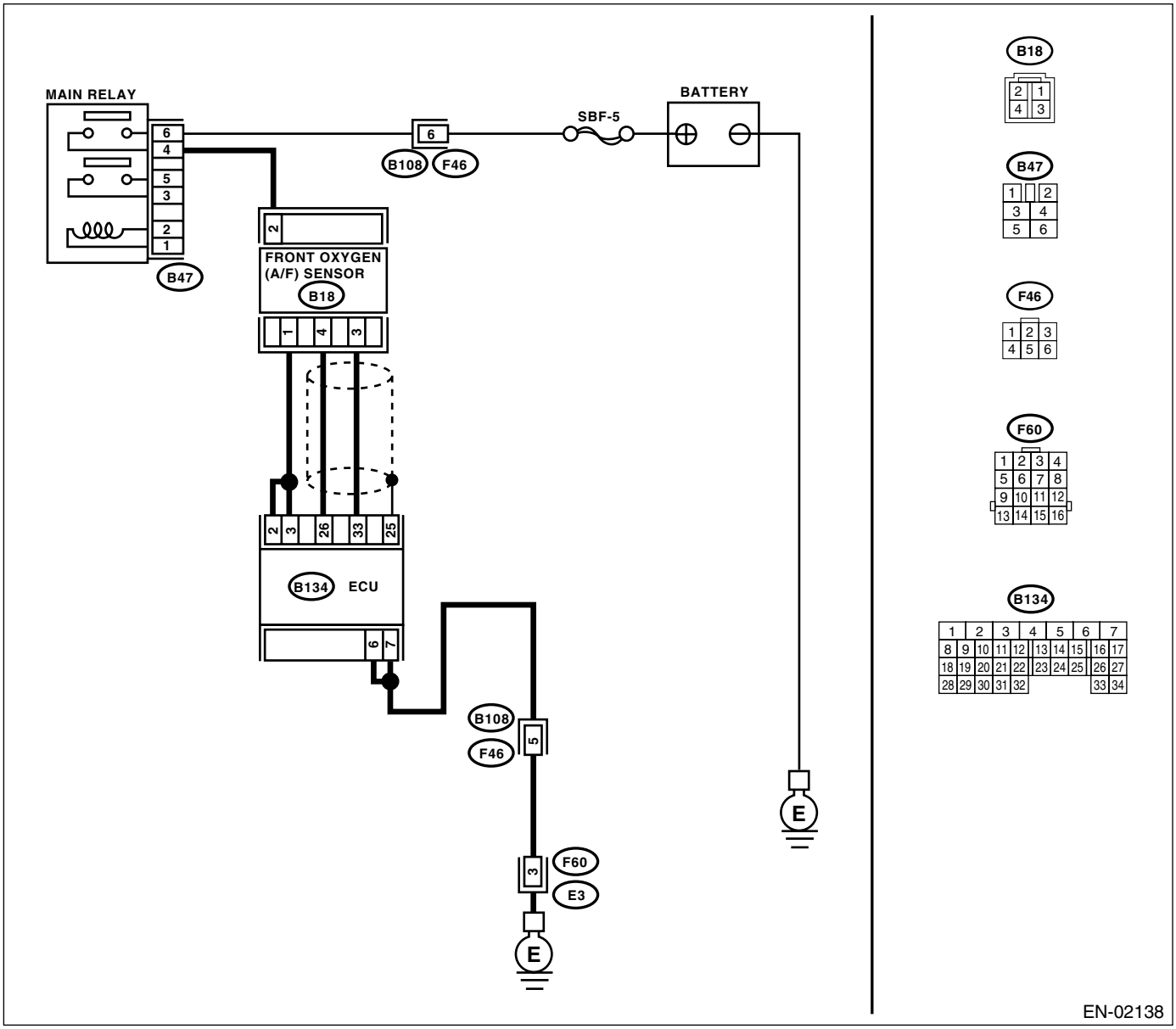
Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	NOTE: It is not necessary to inspect DTC P0129.

X: DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-60, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



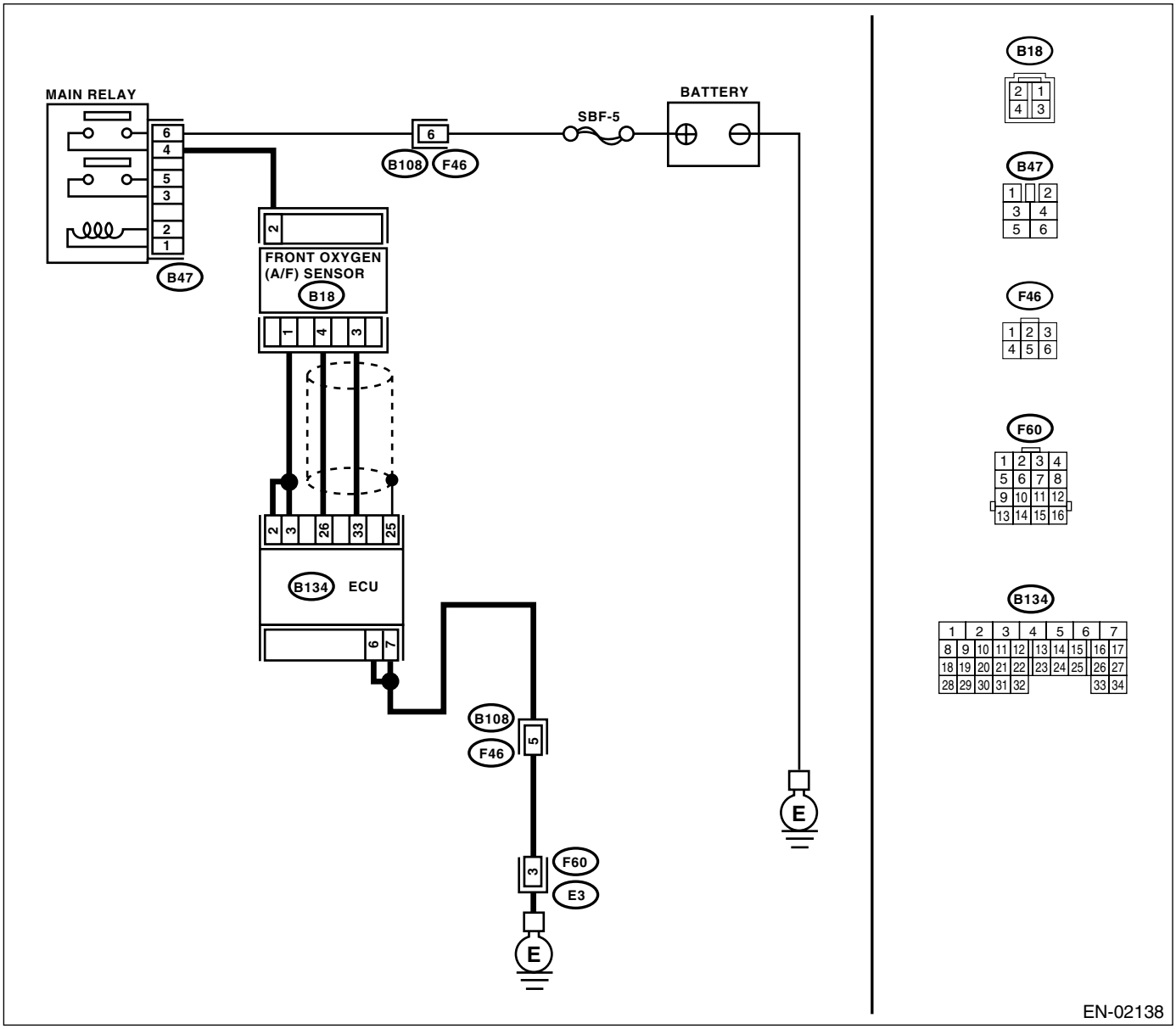
Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

Y: DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-62, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



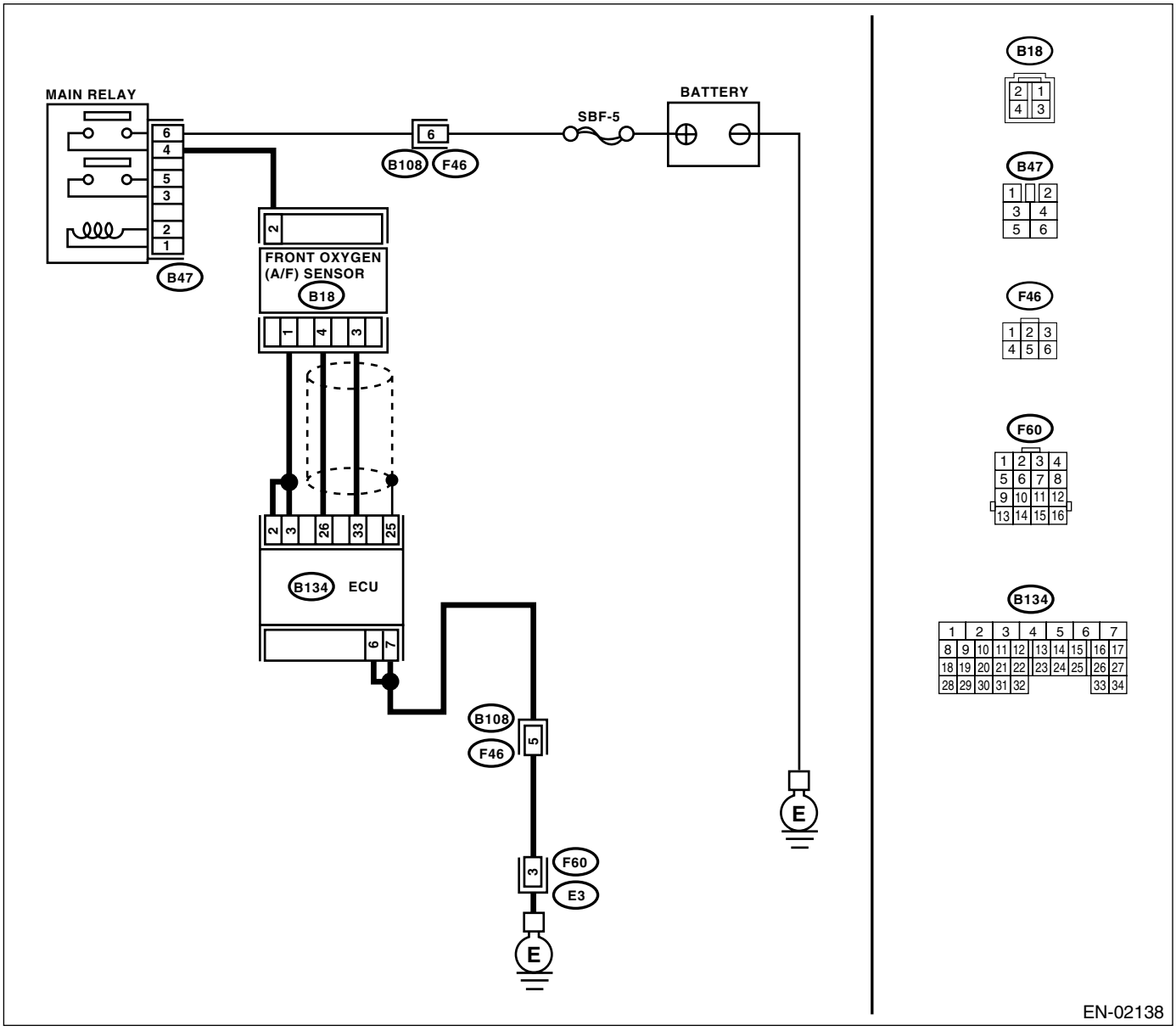
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

Z: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-64, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



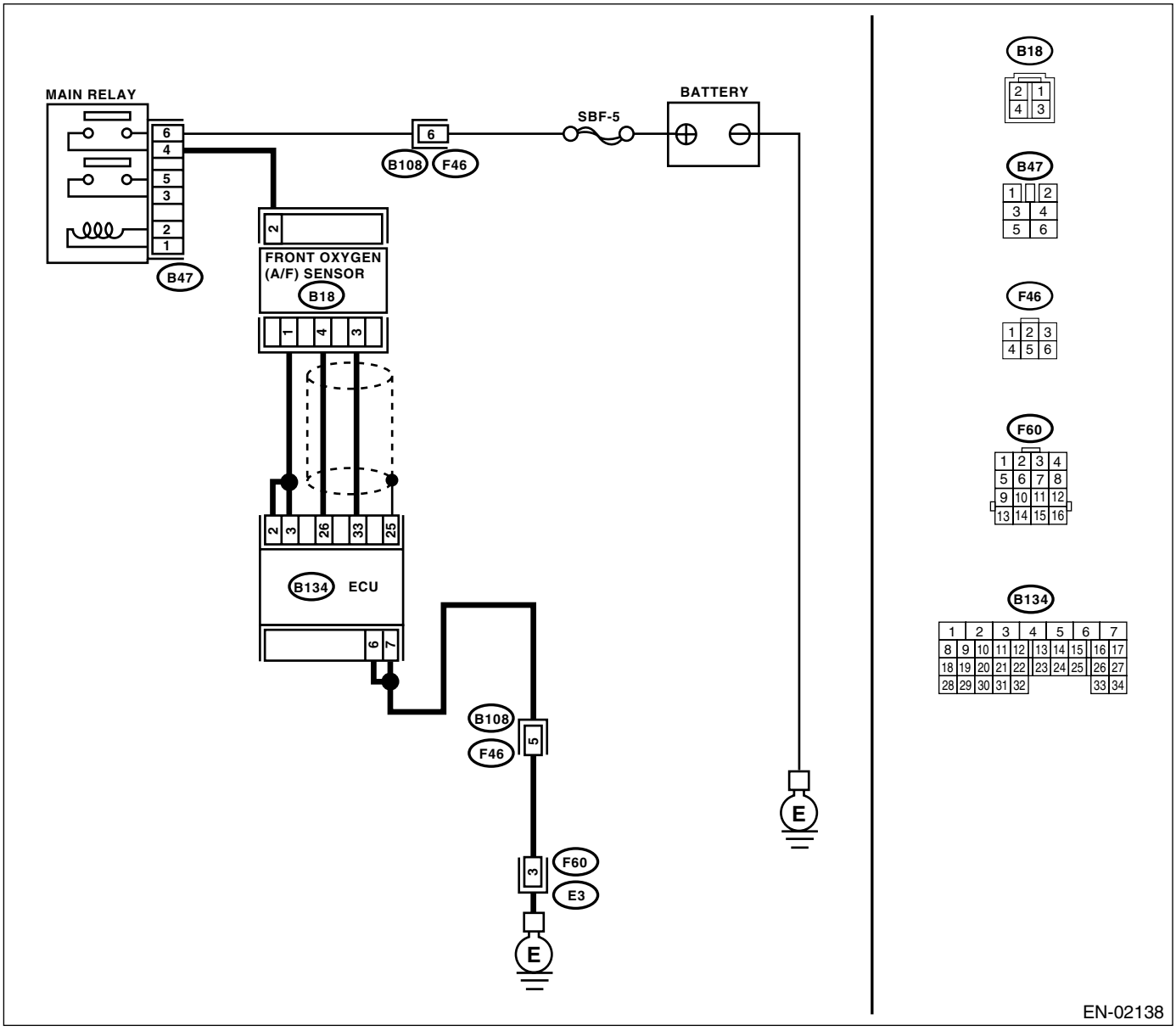
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •Loose installation of front portion of exhaust pipe onto cylinder heads •Loose connection between front exhaust pipe and front catalytic converter •Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>

AA: DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-68, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



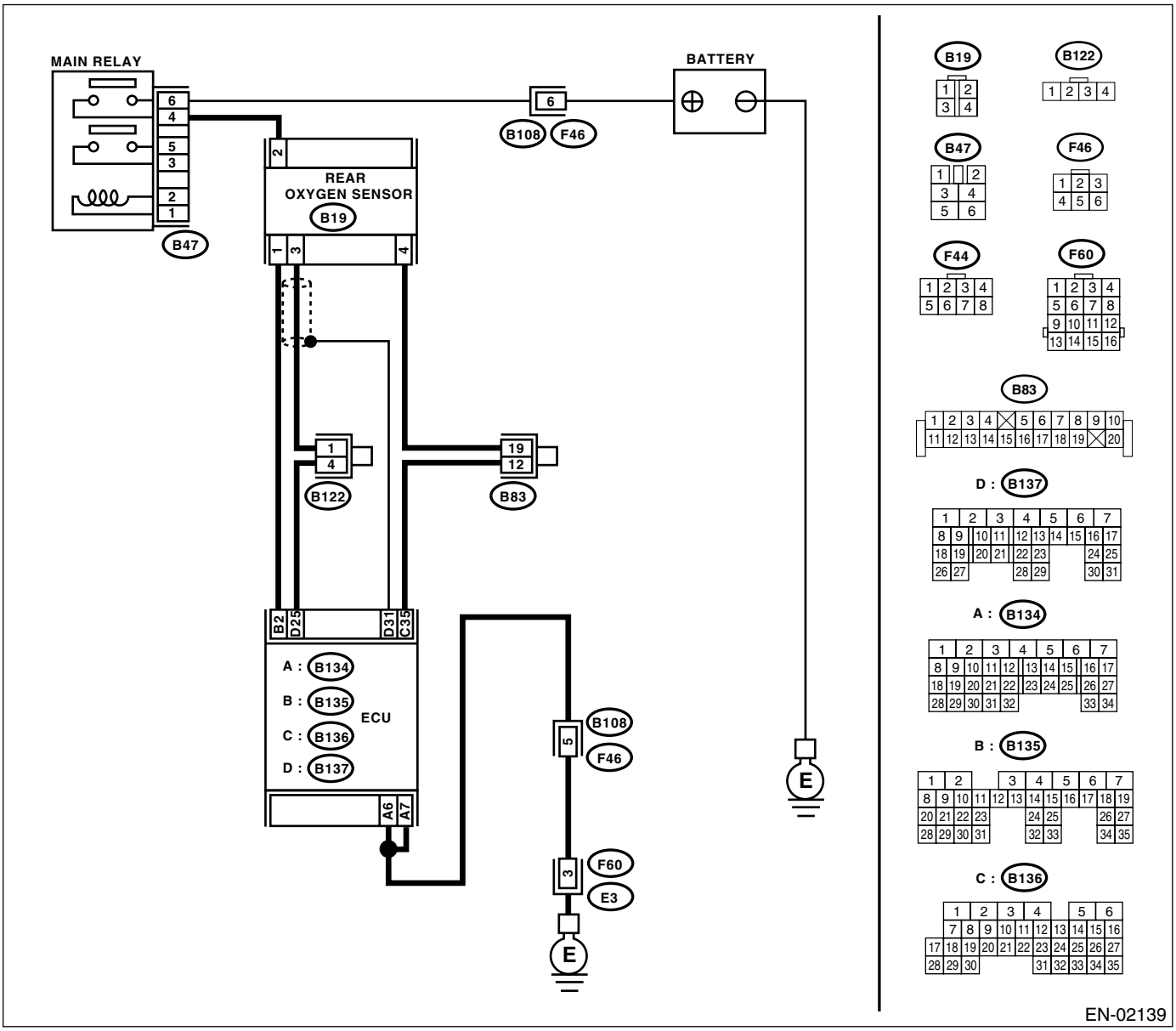
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the measured value less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.

AB:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-70, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the measured value within 0.2 to 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (B19) No. 3:***	Is the measured value more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (–):***	Is the measured value more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>

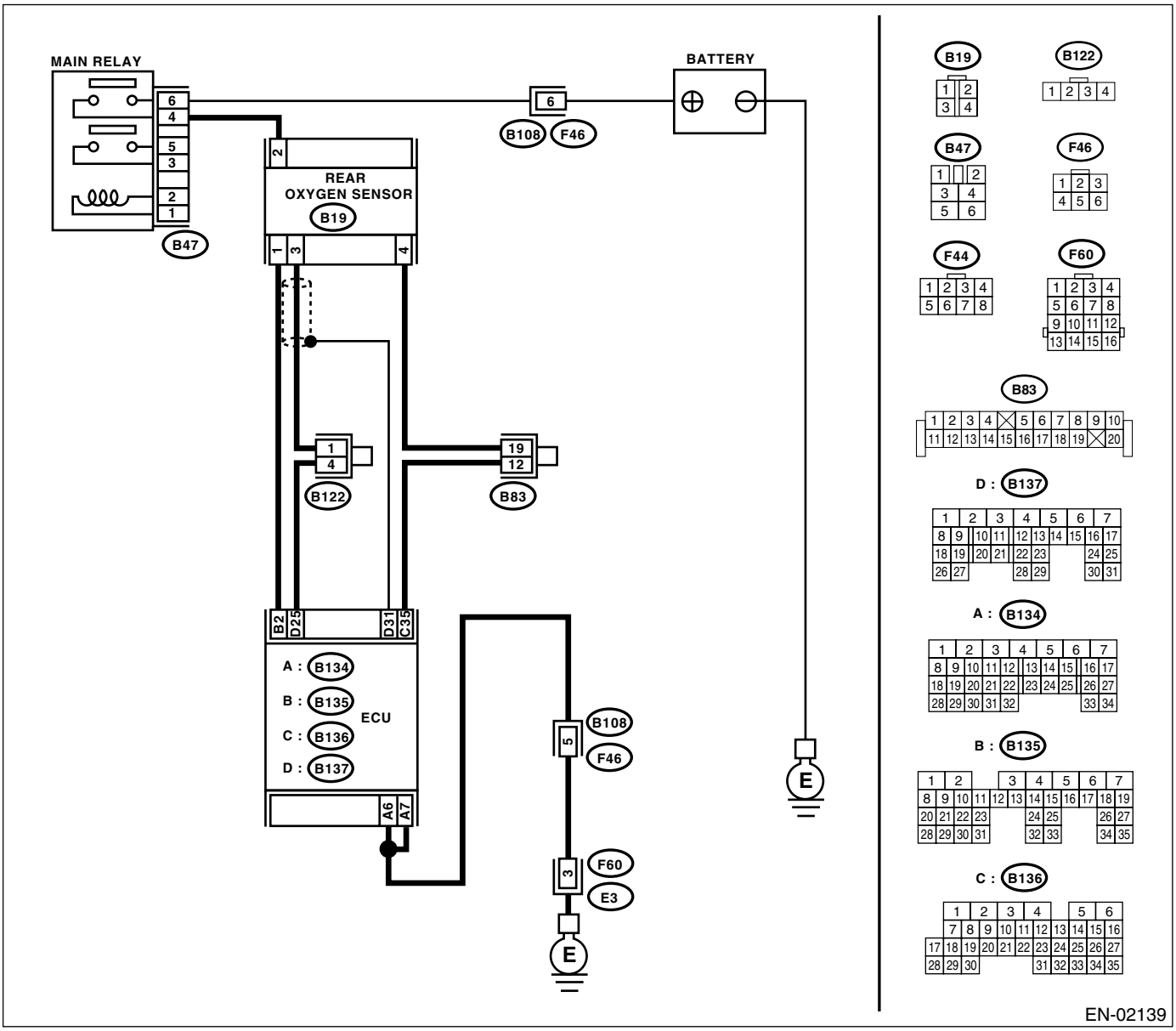
MEMO:

AC:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-72, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the measured value within 0.2 to 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (B19) No. 3:***	Is the measured value more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (–):***	Is the measured value more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>

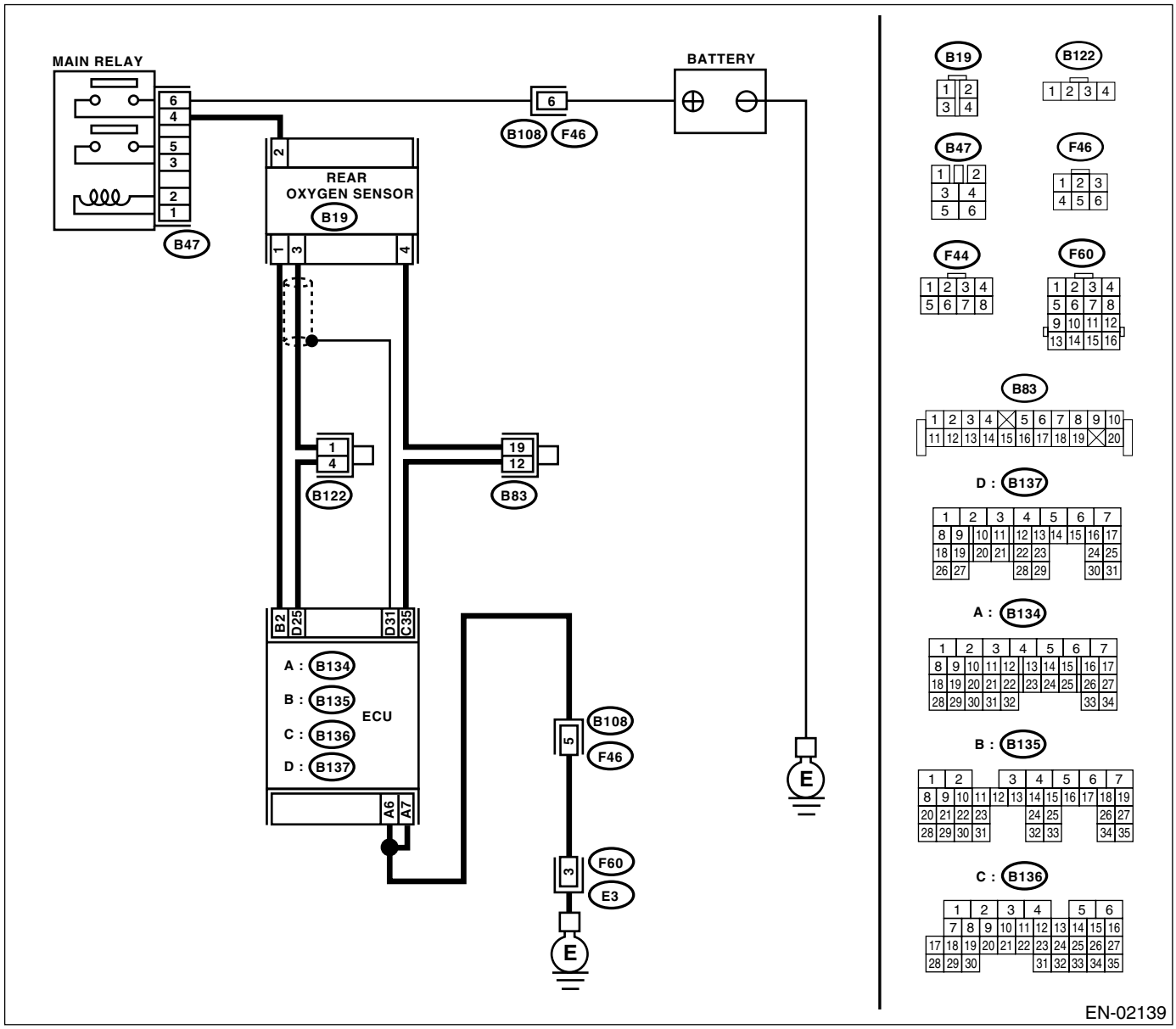
MEMO:

AD:DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-74, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>

AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)-159, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-78, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4DOTC)-82, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (within 2.9 to 3.2 kg/cm^2, within 41 to 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (within 2.1 to 2.4 kg/cm^2, within 30 to 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

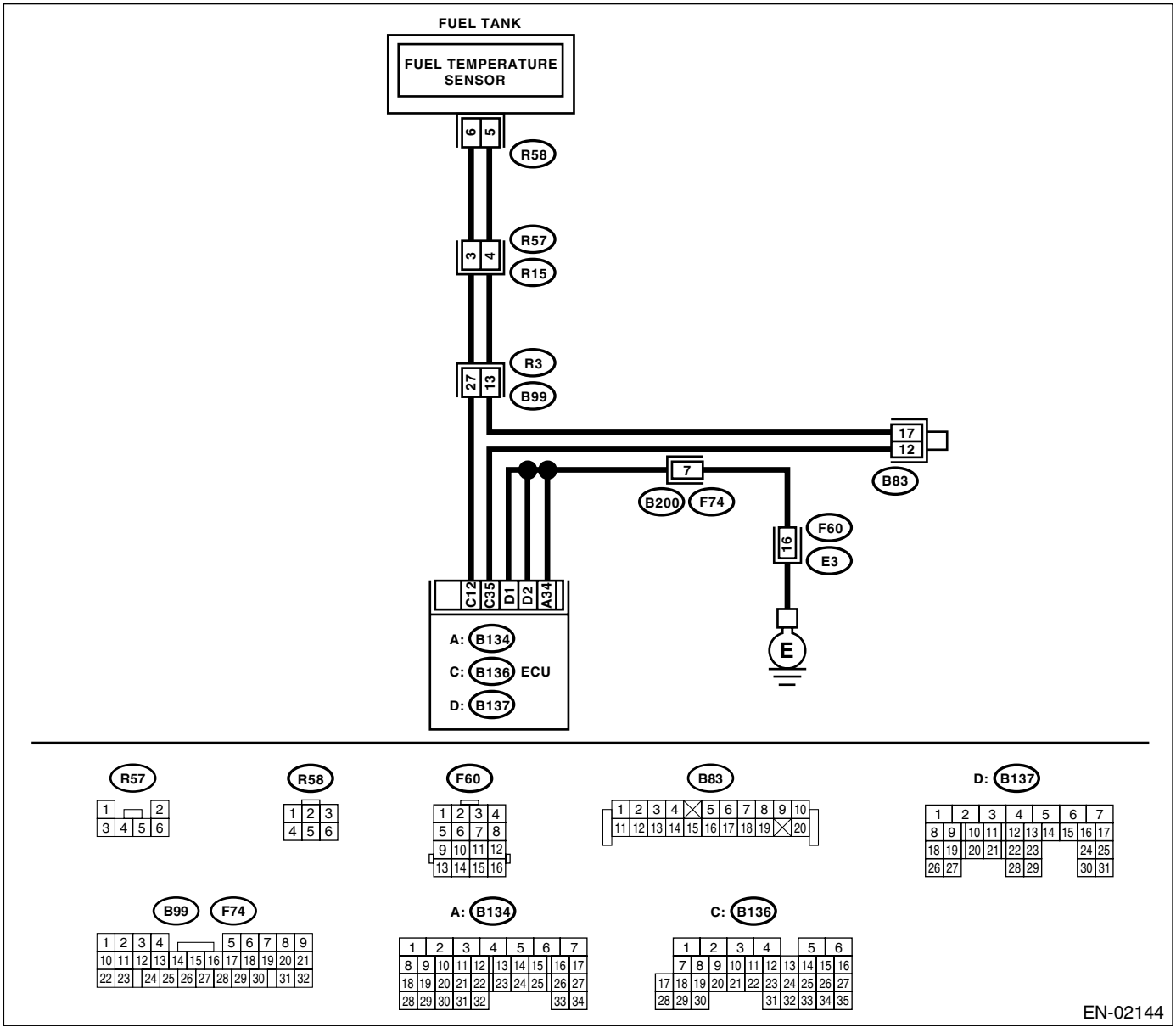
	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value within –10°C to 50°C (within 14°F to 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

AG:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



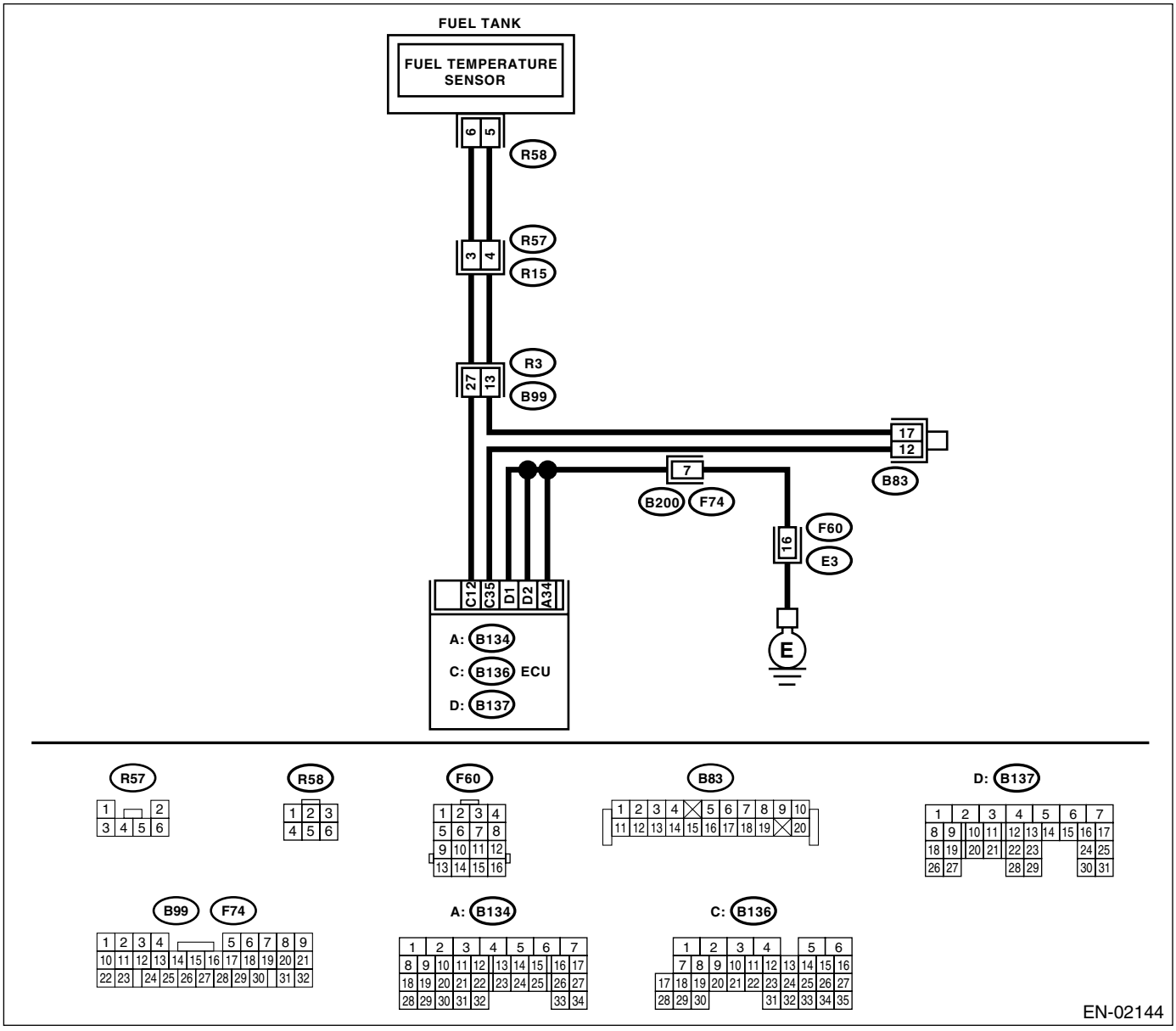
Step		Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-8, Fuel Temperature Sensor.>

AH:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-88, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



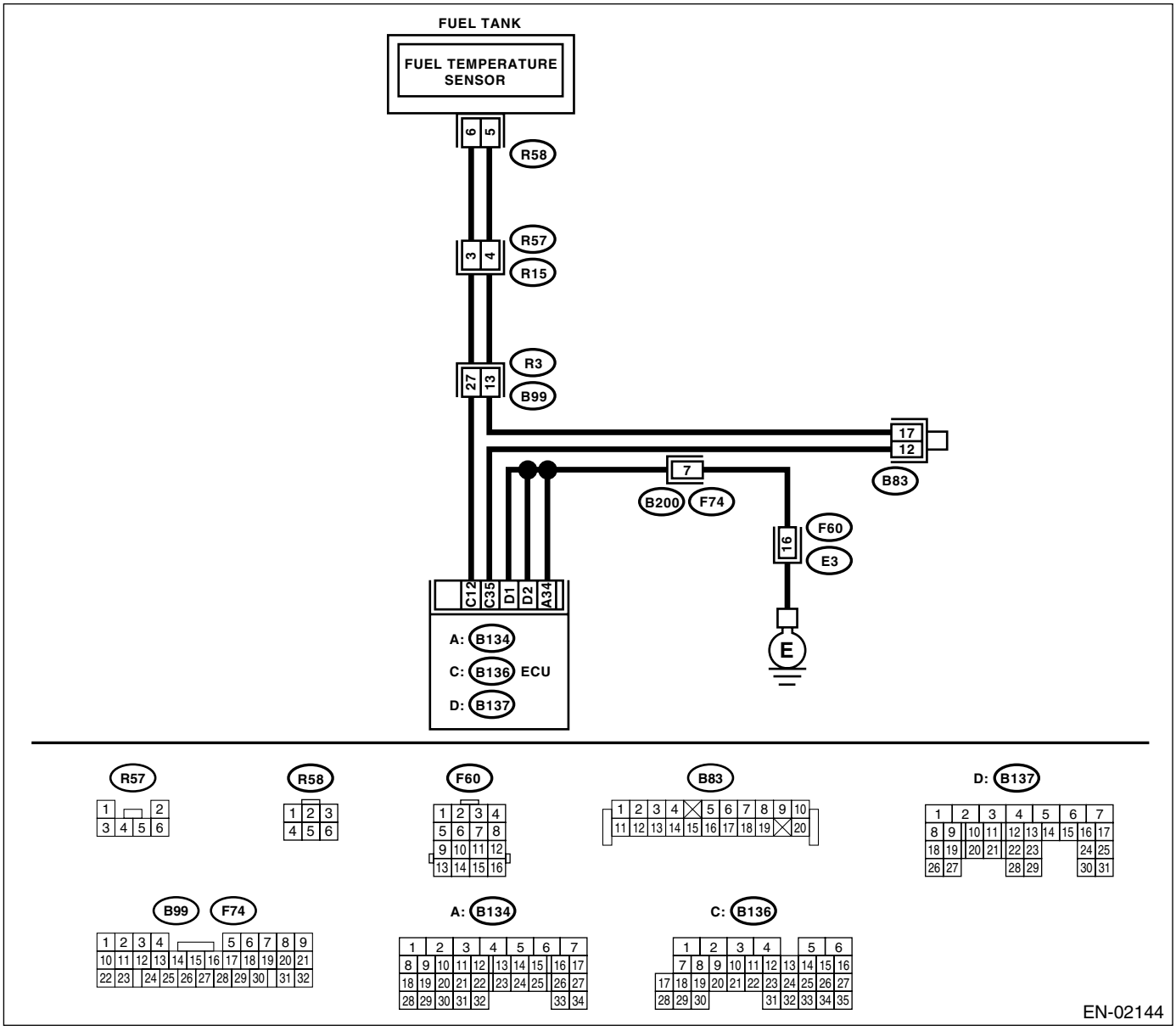
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 150°C (302°F)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-8, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

AI: DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-90, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

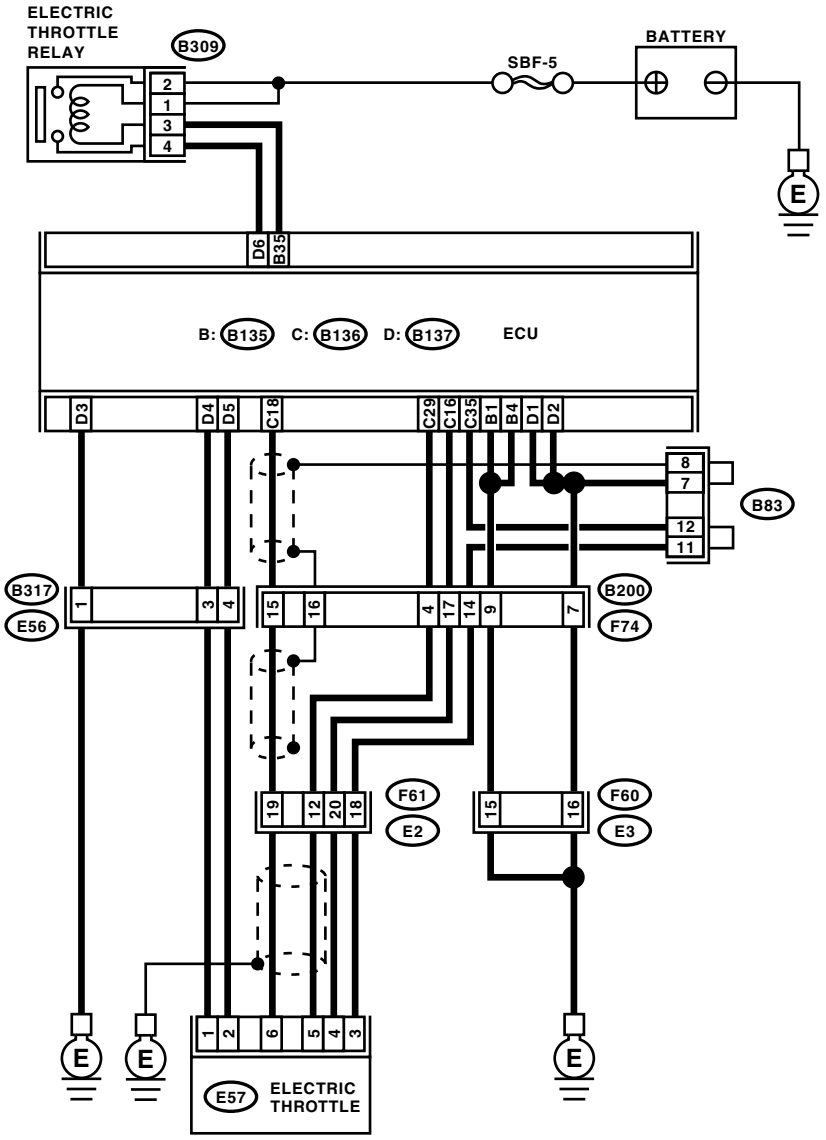
Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 5 — (B136) No. 35:***	Is the measured value less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-8, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

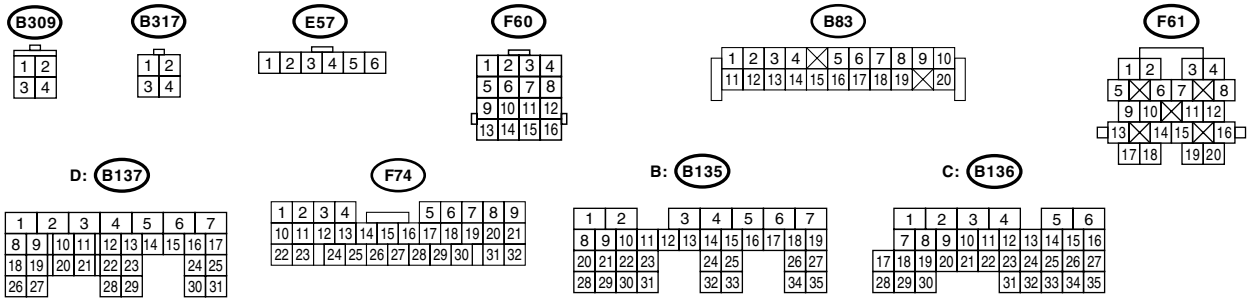
MEMO:

AJ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-92, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

- **WIRING DIAGRAM:**





EN-02143

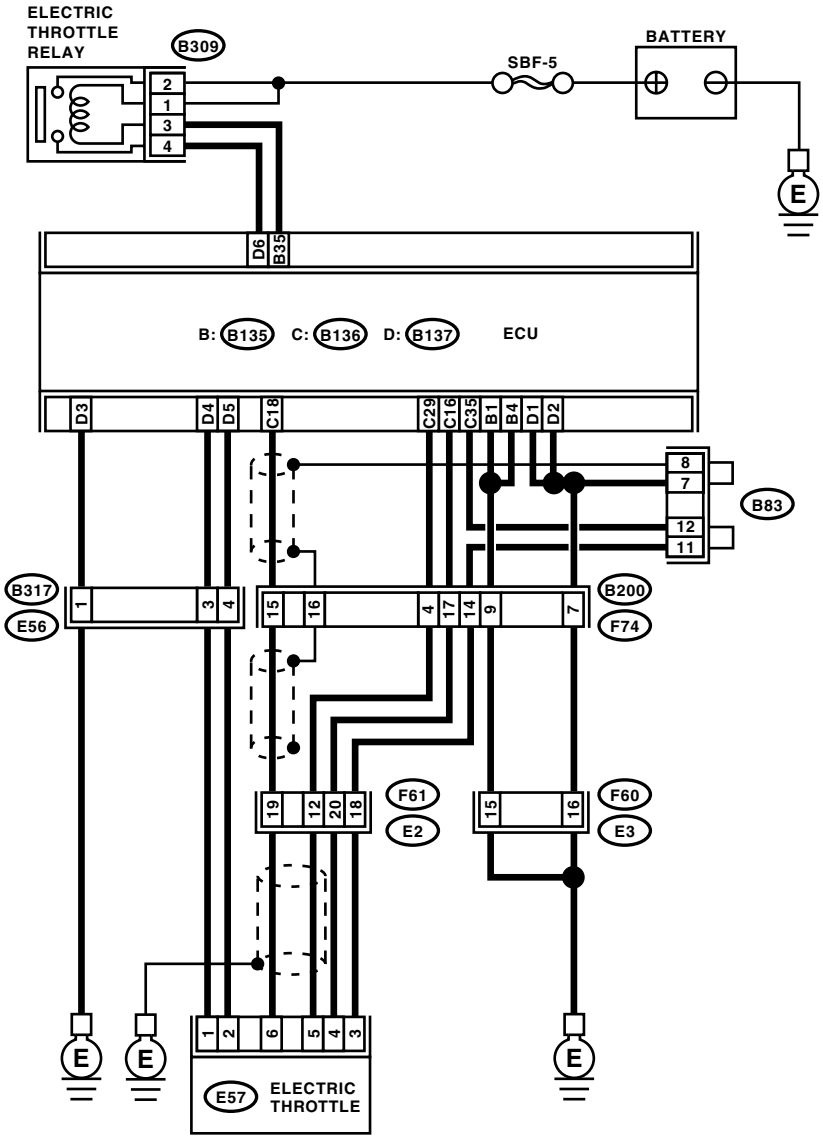
	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electric throttle connector harness while monitoring value of voltage meter.	Is the measured value more than 0.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in the connectors between the ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between the ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Check the resistance between the ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the chassis short of harness.
5	**CHECK POWER SURPLY TO SENSOR.** 1) Connect the ECM connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (-):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
6	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 — Engine ground:***	Is the measured value more than 10 Ω?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

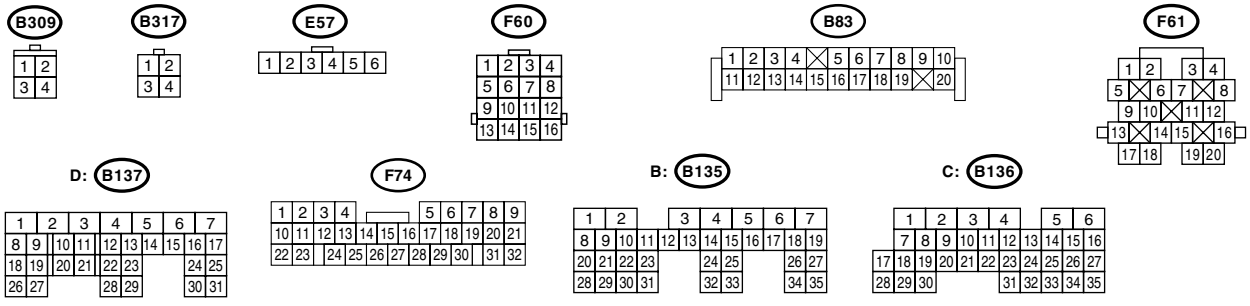
MEMO:

AK:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-94, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

- **WIRING DIAGRAM:**





EN-02143

	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electric throttle connector harness while monitoring value of voltage meter.	Is the measured value less than 4.73 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 29 — (E57) No. 5:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value more than 10 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and electric throttle connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value less than 10 V?	Go to step **7.**	Repair the short of harness between ECM connector and electric throttle connector.

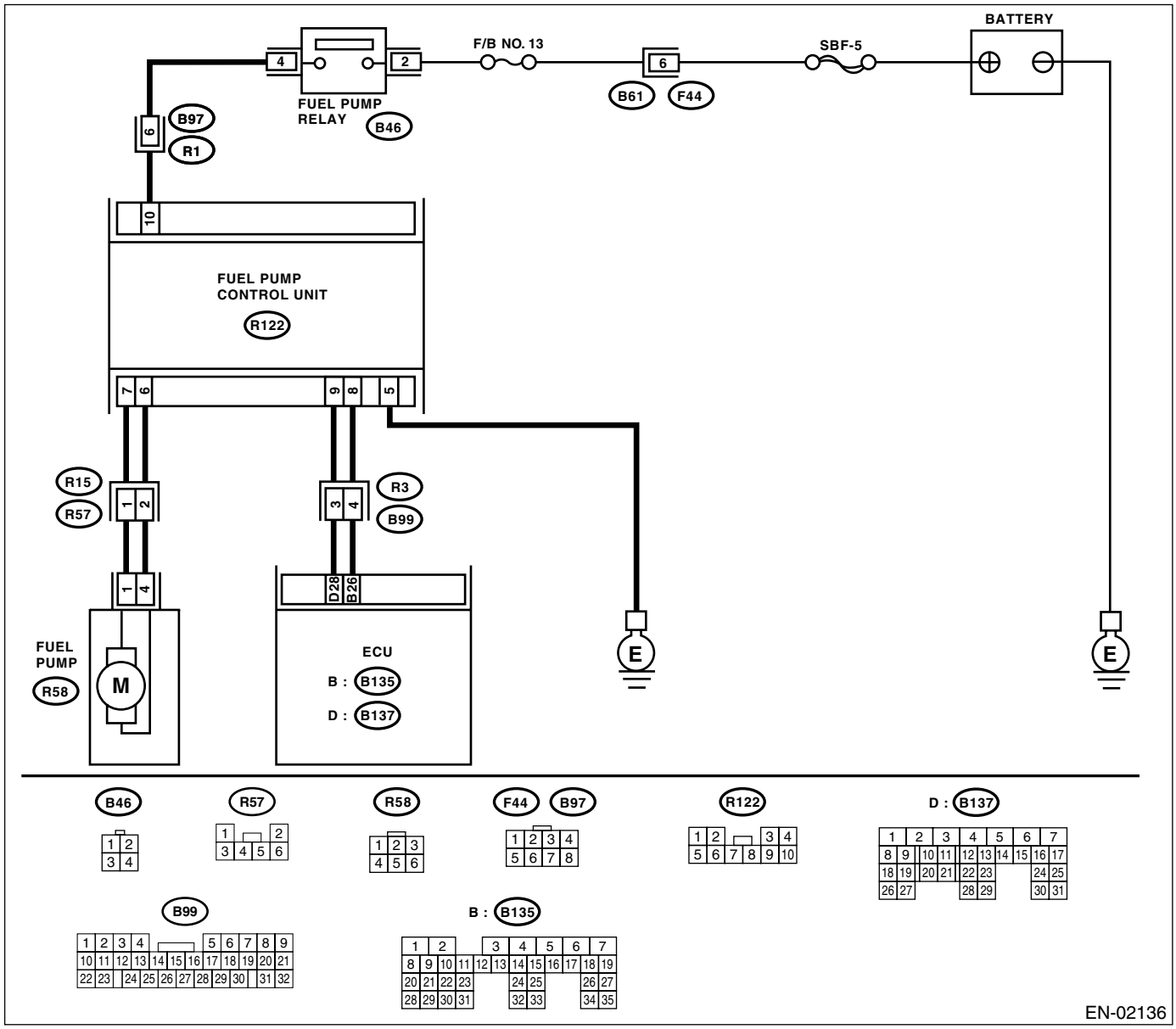
Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between connectors. ***Connector & terminal*** ***(B136) No. 29 — (B136) No. 16:***	Is the measured value more than 1 MΩ?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Short circuit of sensor power supply may be the cause.

AL:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-96, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit • Poor contact in fuel pump control unit connector • Poor contact in fuel pump relay connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and chassis ground • Poor contact in fuel pump control unit connector
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 1:*** ***(R122) No. 6 — (R58) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B137) No. 28:*** ***(R122) No. 8 — (B135) No. 26:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and ECM • Poor contact in fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step **8.**
8	**CHECK EXPERIENCE OF OUT OF GAS.**	Have the vehicle been out of gas before?	Complete the diagnosis. NOTE: DTC may be recorded due to the idle running of fuel pump at out of gas.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-47, FUEL PUMP CONTROL UNIT, .>

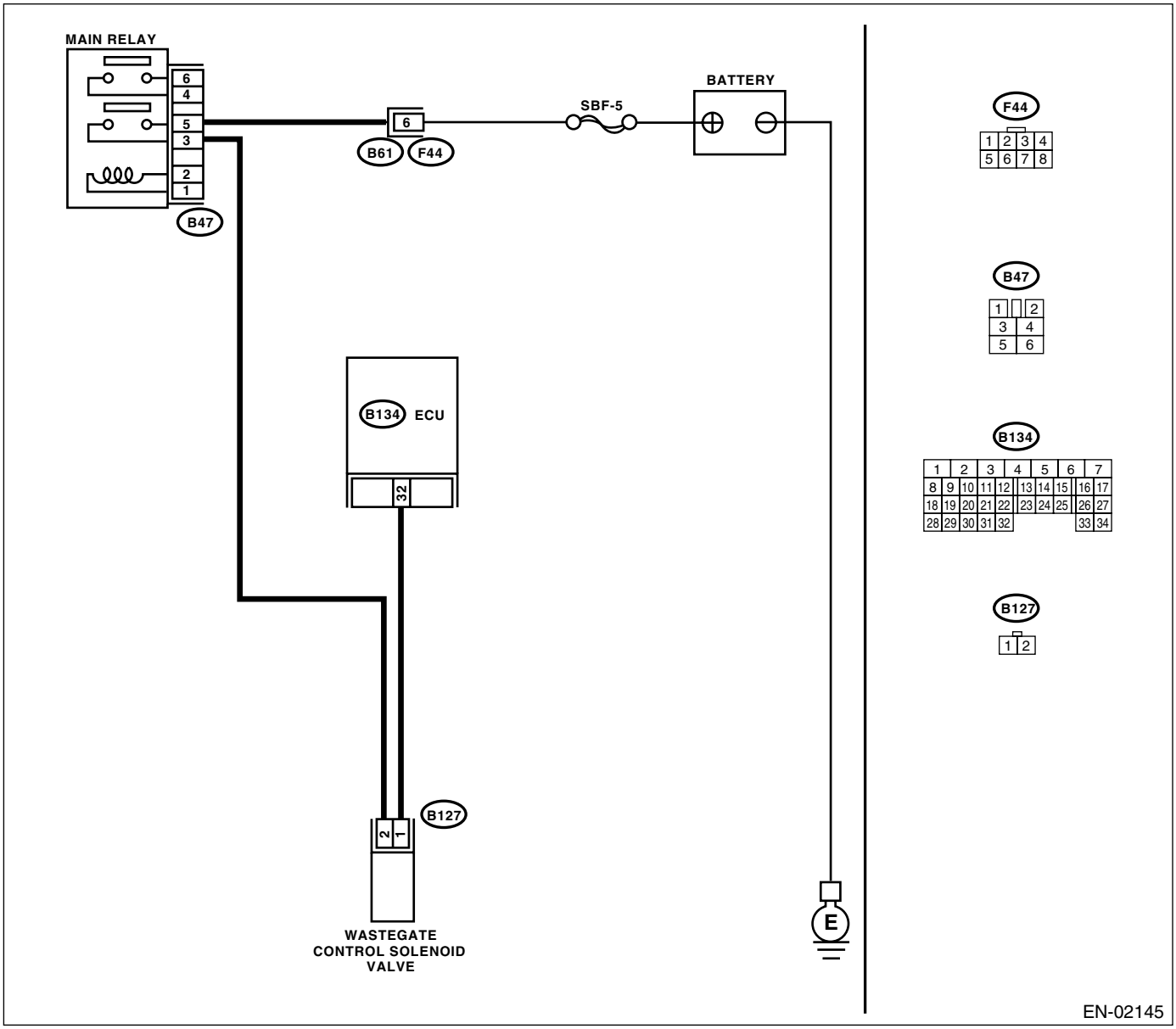
MEMO:

AM:DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-98, DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



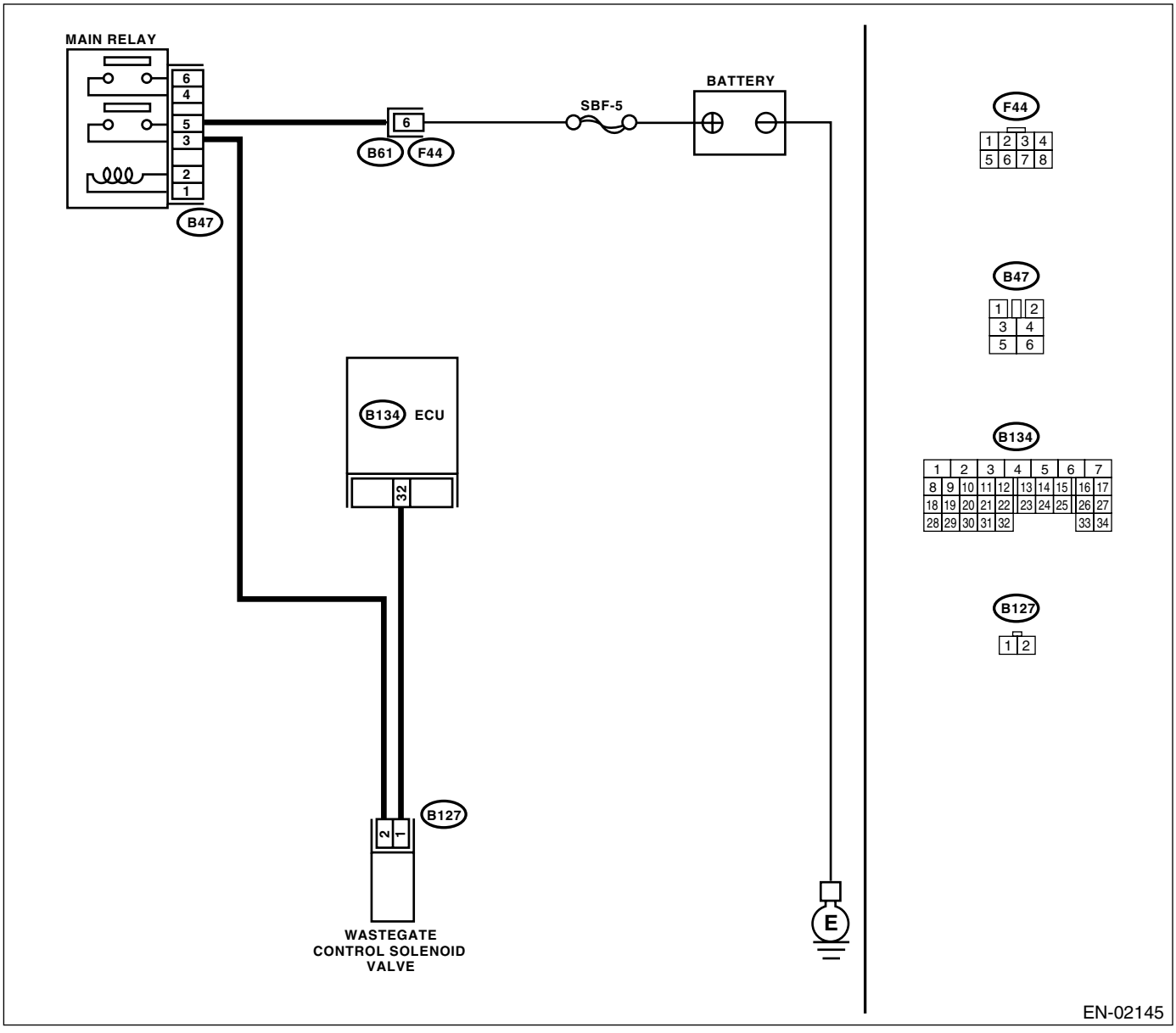
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-37, Wastegate Control Solenoid Valve.>

AN:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-100, DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



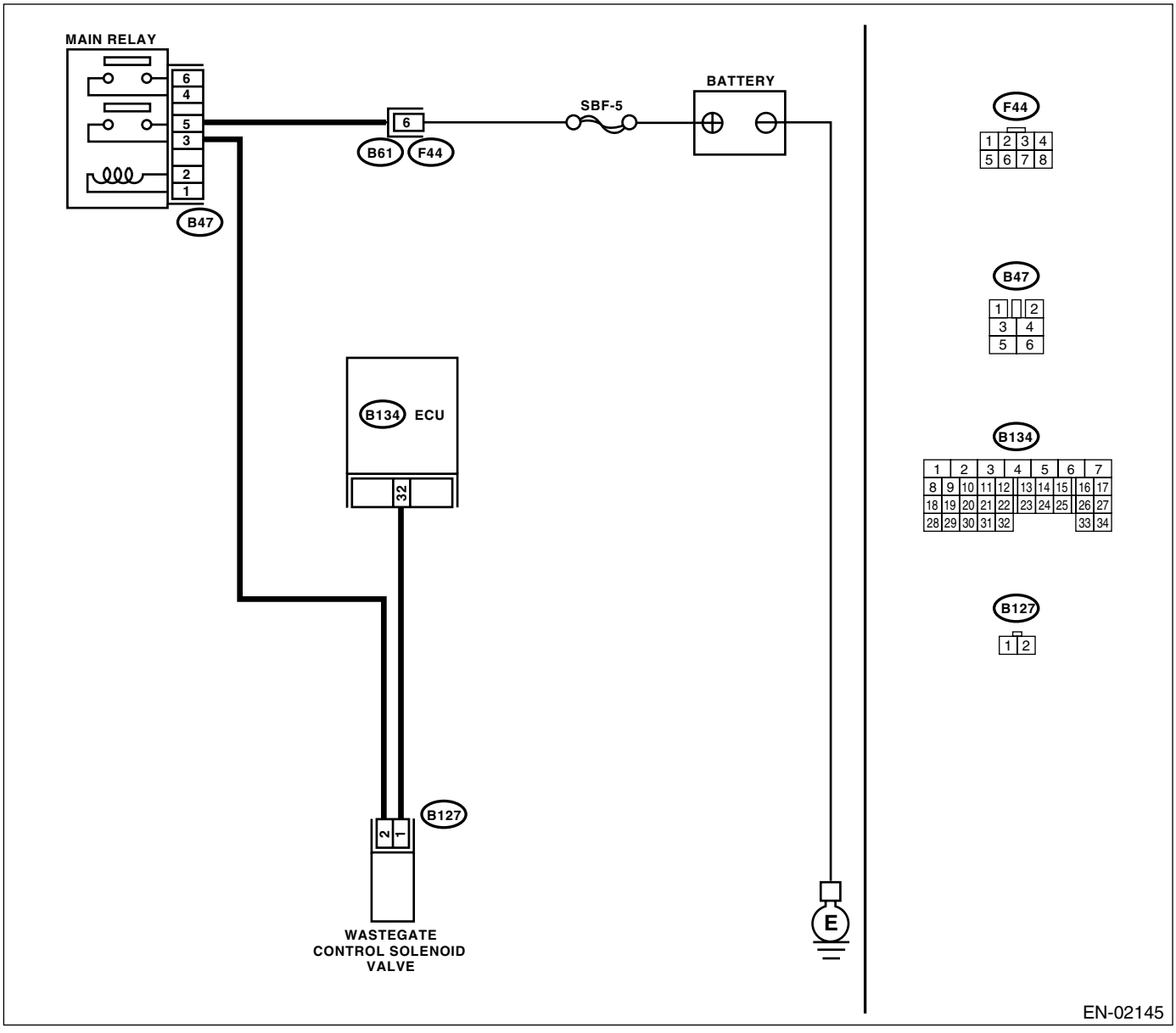
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 32 — (B127) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 30 to 40 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-37, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair the poor contact in wastegate control solenoid valve connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AO:DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-102, DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the wastegate control solenoid valve <Ref. to FU(H4DOTC)-37, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

MEMO:

AP:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-190, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AQ:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-190, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

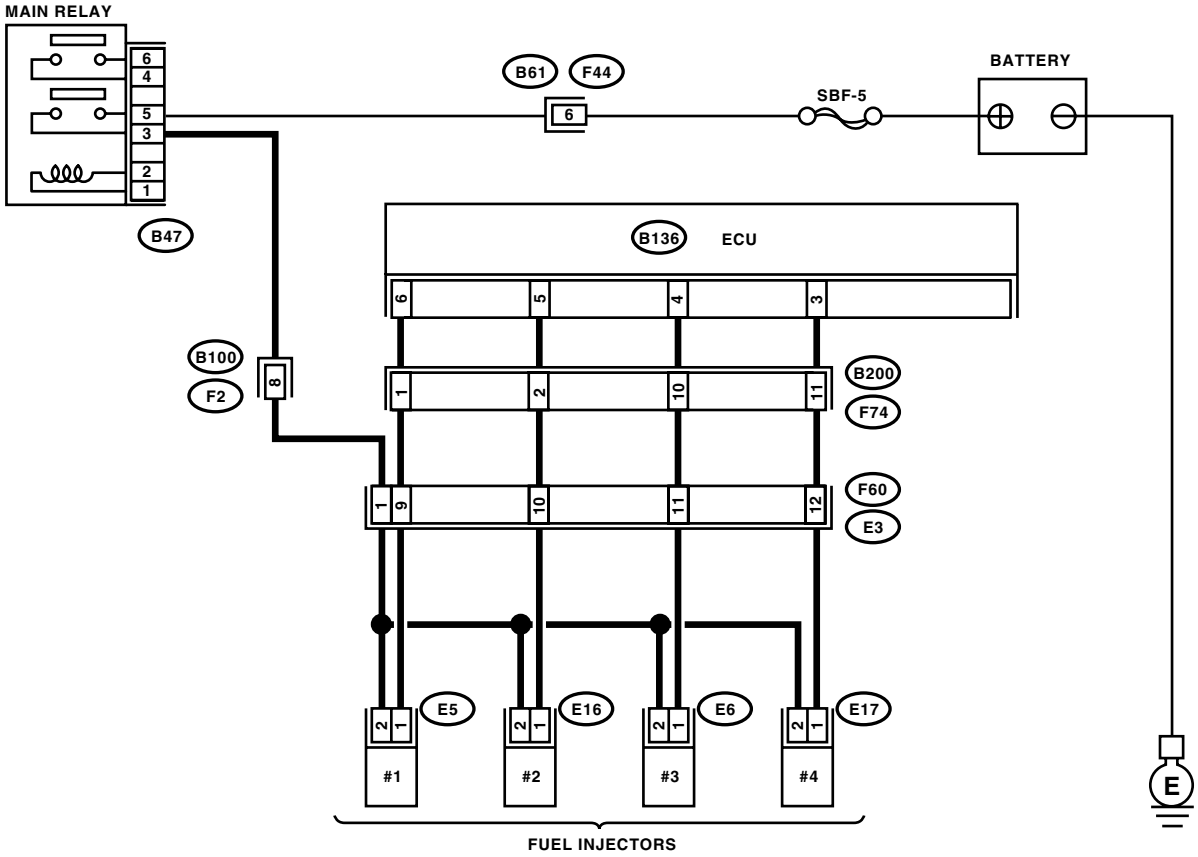
NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-190, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

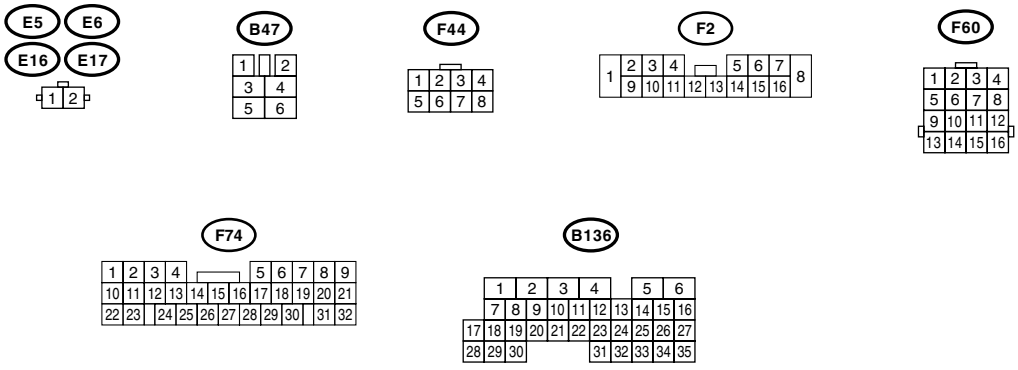
AS:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Immediately at fault recognition (A misfire which could damage catalyst occurs.)
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-104, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02137

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (–):*** ***#2 (B136) No. 5 (+) — Chassis ground (–):*** ***#3 (B136) No. 4 (+) — Chassis ground (–):*** ***#4 (B136) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connector from ECM. 4) Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 — (E5) No. 1:*** ***#2 (B136) No. 5 — (E16) No. 1:*** ***#3 (B136) No. 4 — (E6) No. 1:*** ***#4 (B136) No. 3 — (E17) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the poor contact in all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (–):*** ***#2 (B136) No. 5 (+) — Chassis ground (–):*** ***#3 (B136) No. 4 (+) — Chassis ground (–):*** ***#4 (B136) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H4DOTC)-33, Fuel Injector.> and ECM <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(H4DOTC)-58, Crankshaft Sprocket.>	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-49, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish the fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel; Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Is the malfunction indicator light coming on or blinking?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire diagnosed when the engine is running?	Finish the diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair the air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK CYLINDER.**	Is there a fault in that cylinder?	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression pressure	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)-158, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

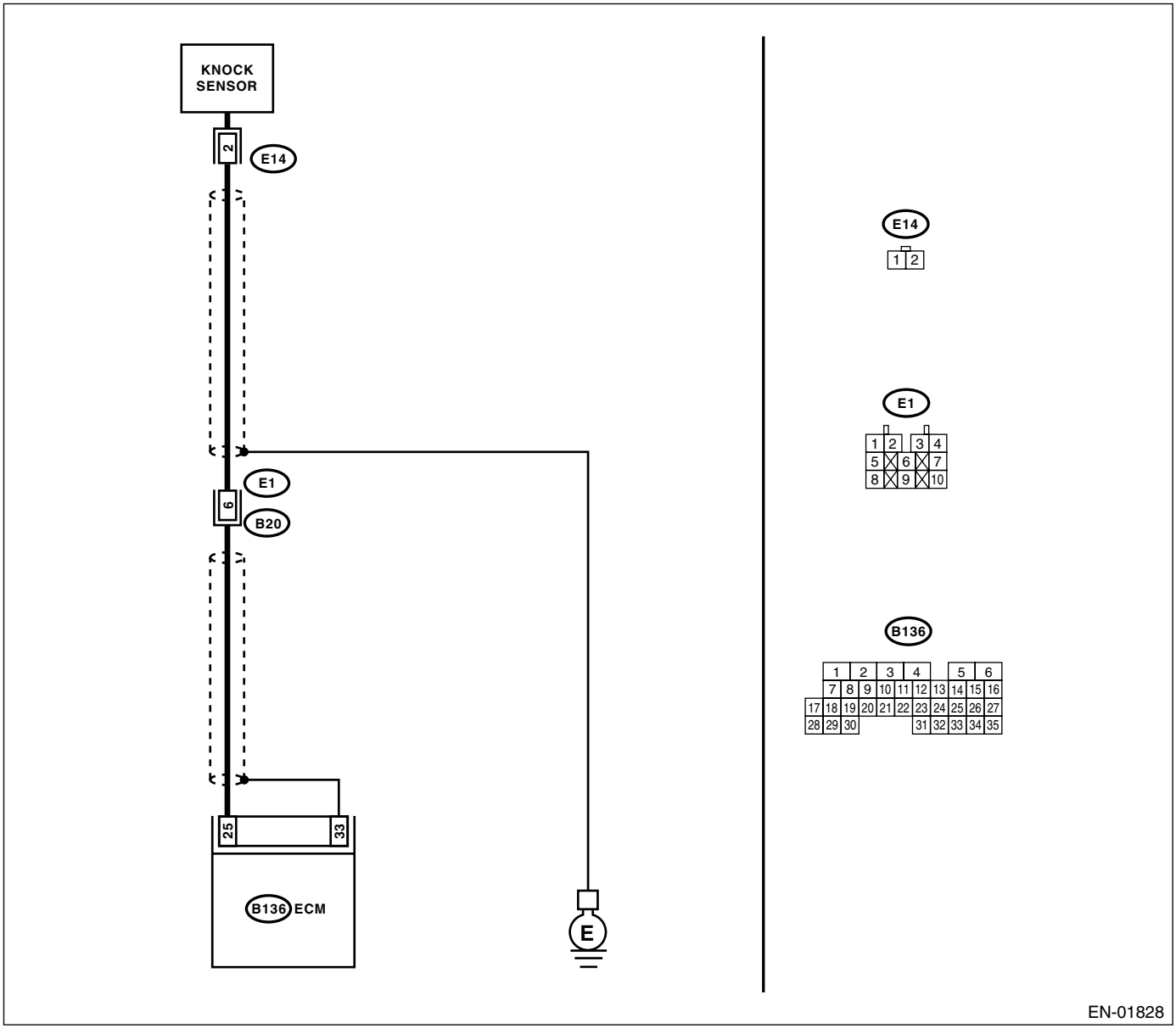
MEMO:

AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-112, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



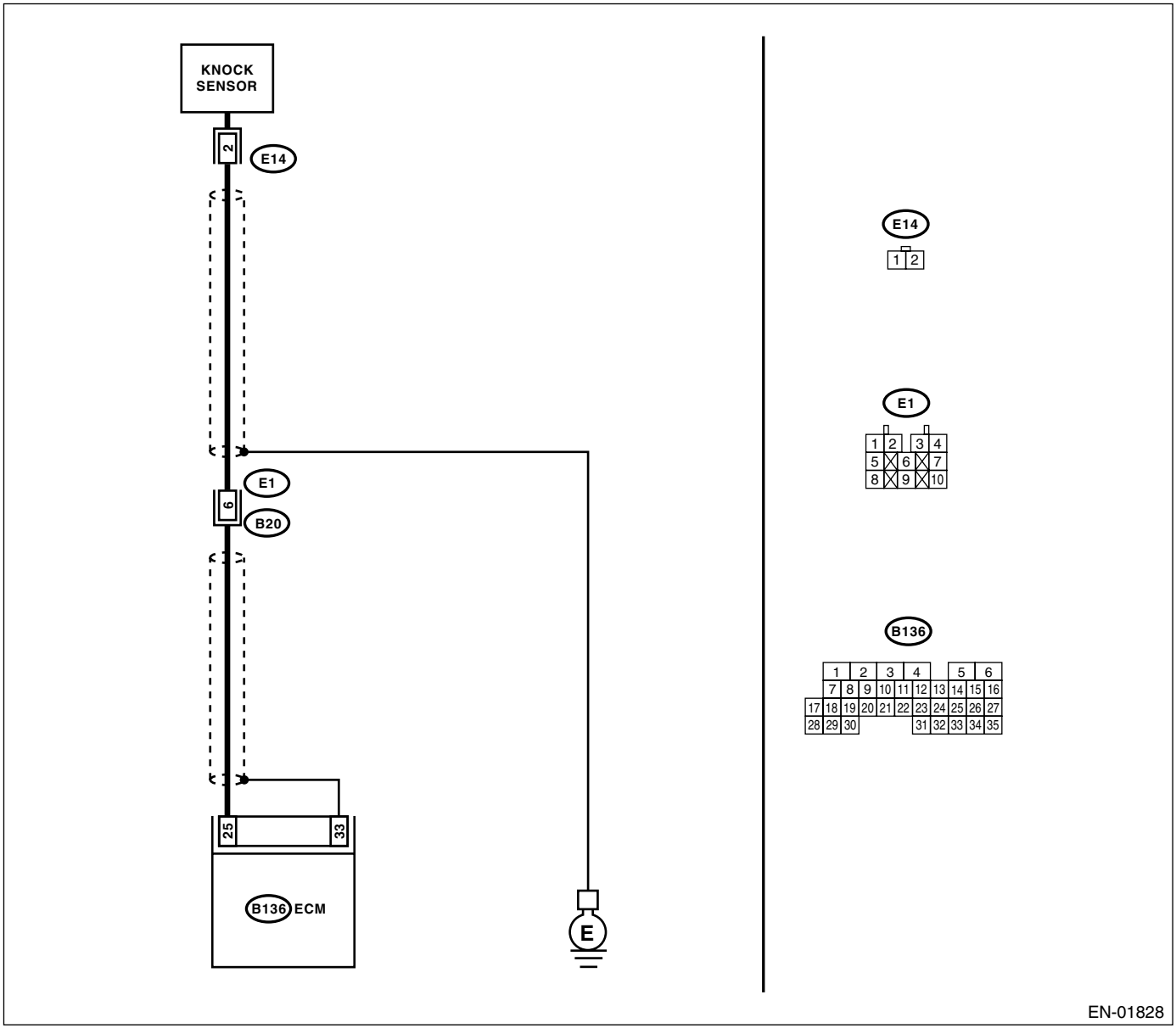
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the measured value more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the measured value more than 700 kΩ?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-114, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



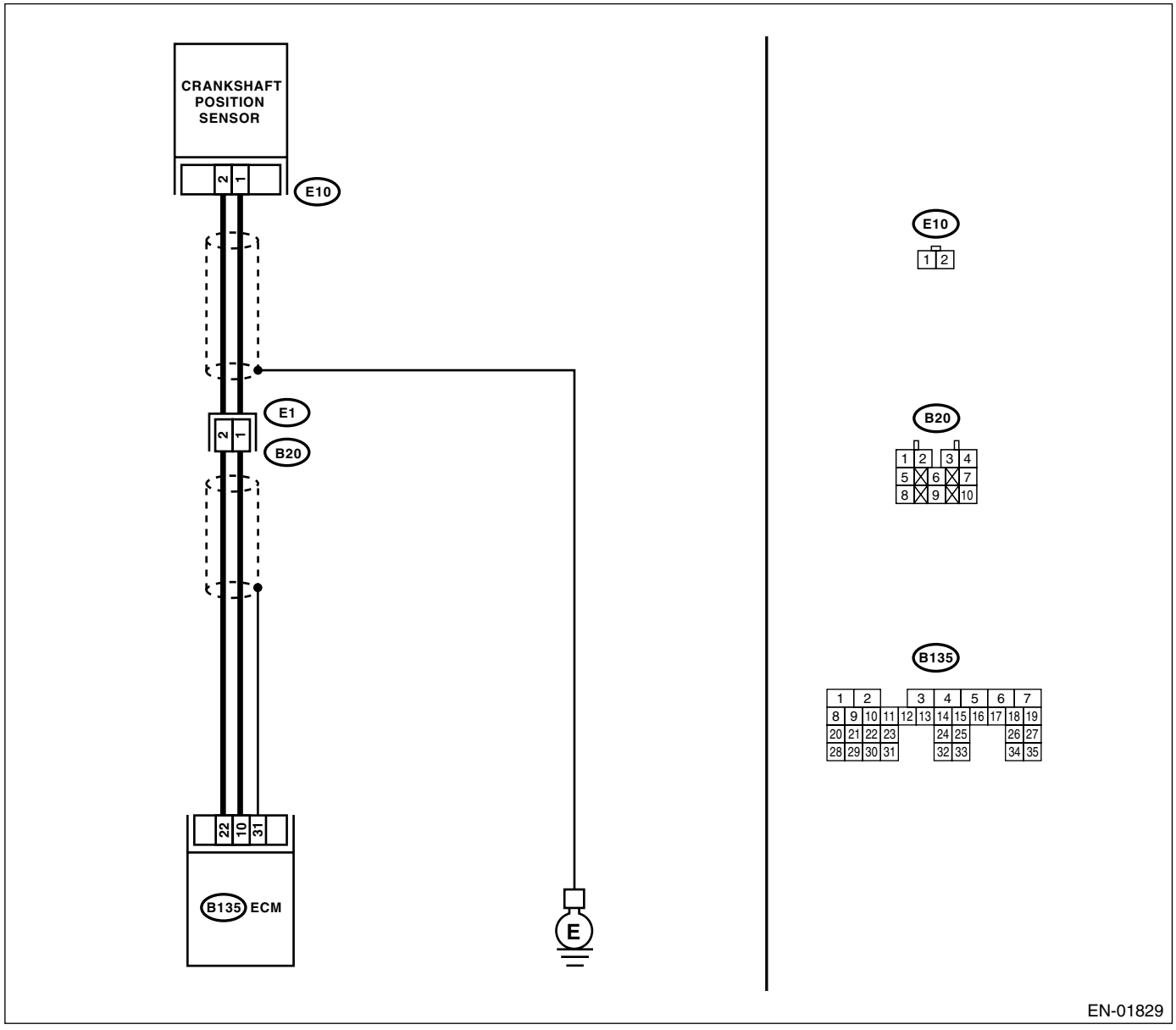
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the measured value less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the measured value less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AV:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



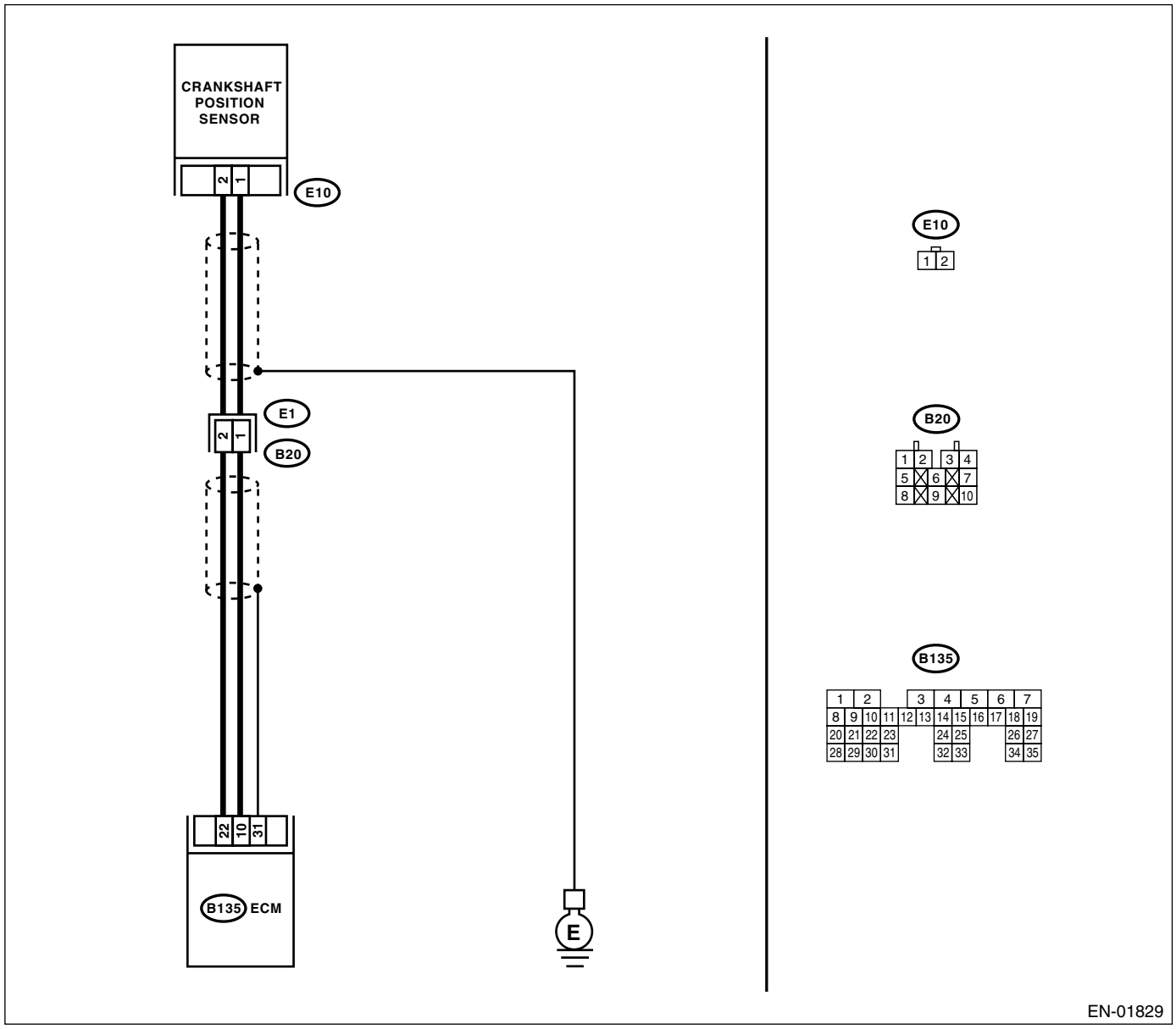
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the measured value more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 1 to 4 kΩ?	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

AW:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-118, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



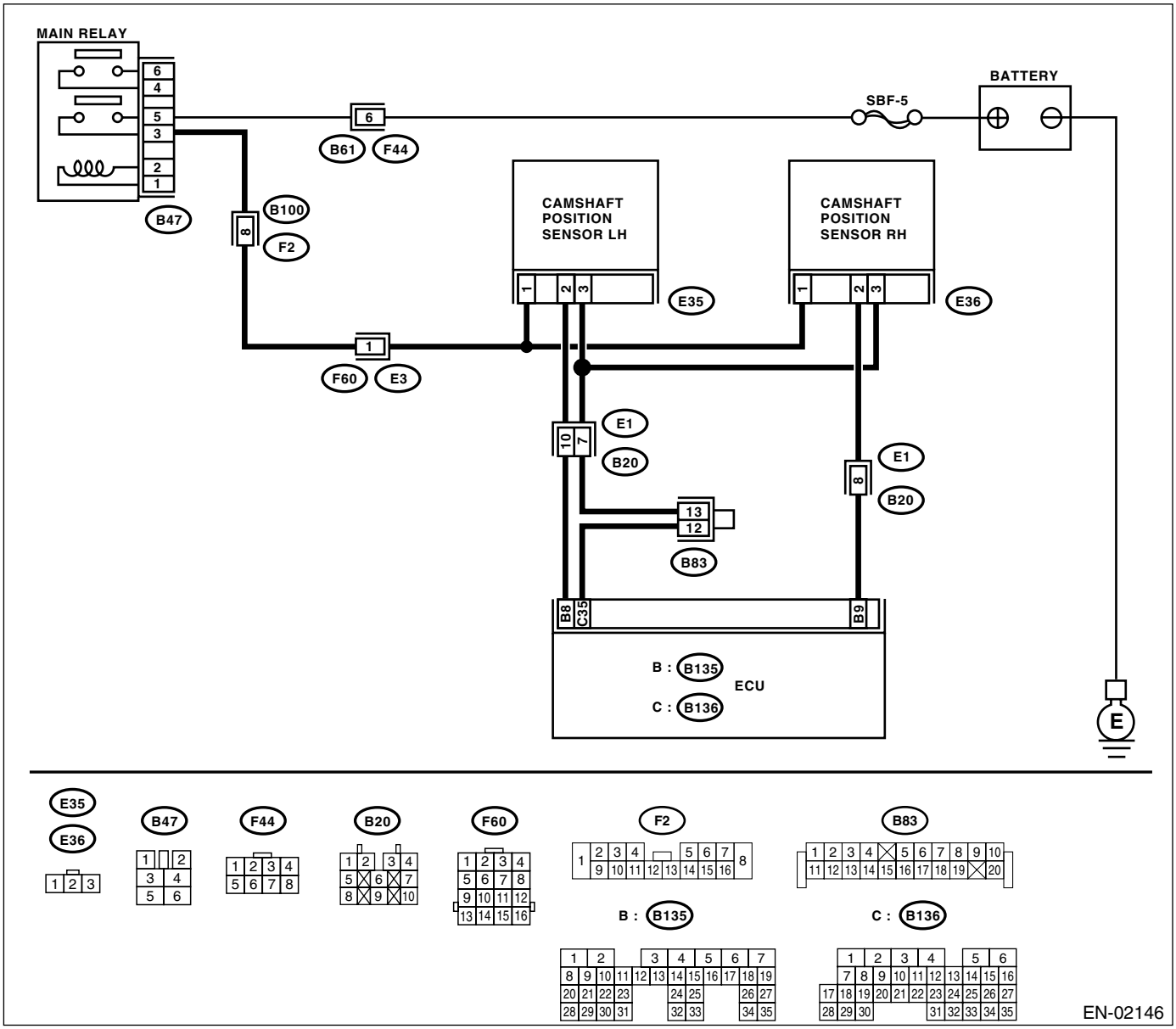
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are the crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-49, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

AX:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-120, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



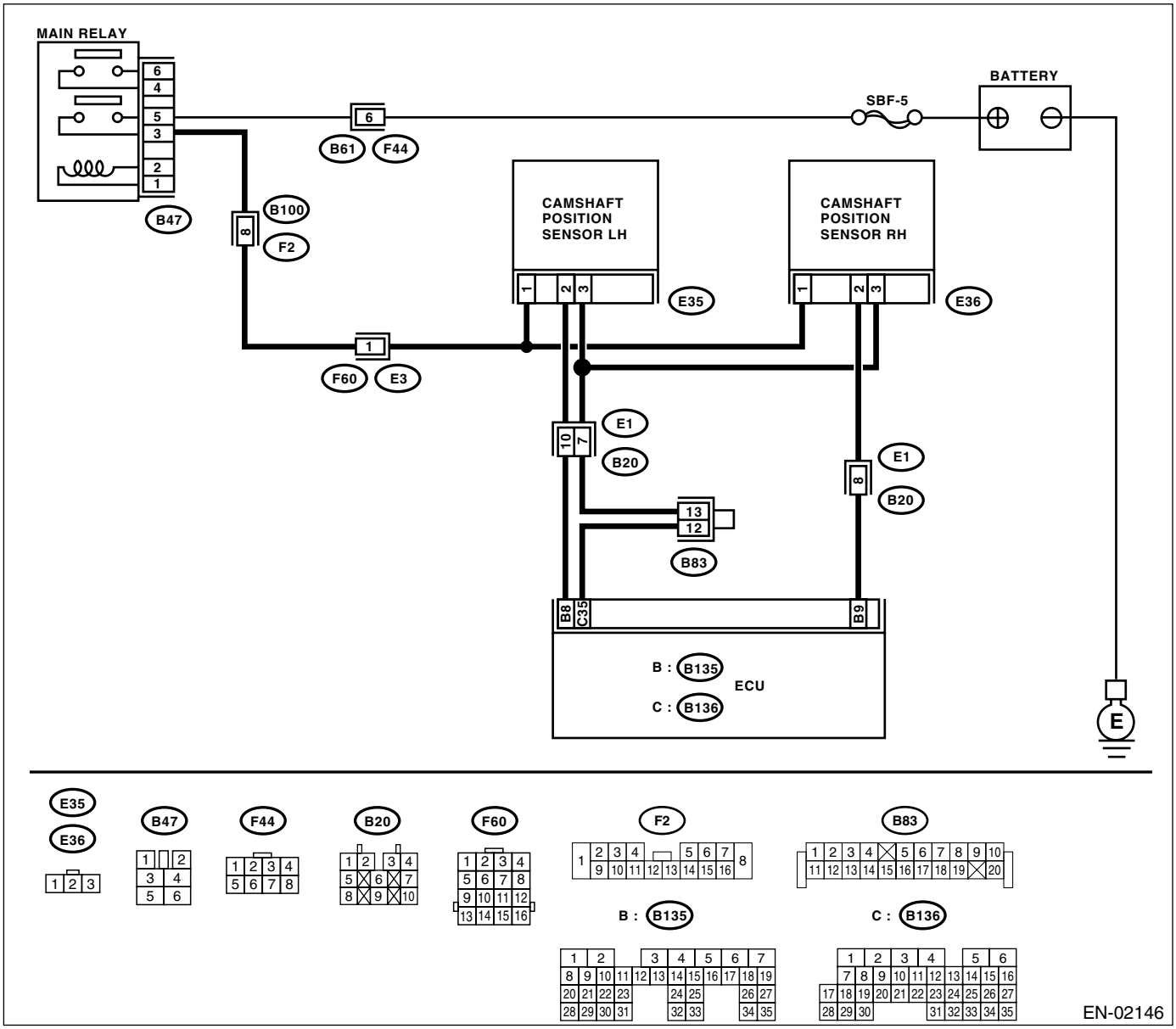
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the ground short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E36) No. 2 — (E135) No. 9:*** ***(E36) No. 3 — (E136) No. 35:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:*** ***(E36) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the camshaft position sensor wave form. <Ref. to EN(H4DOTC)-23, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

AY:DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-122, DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



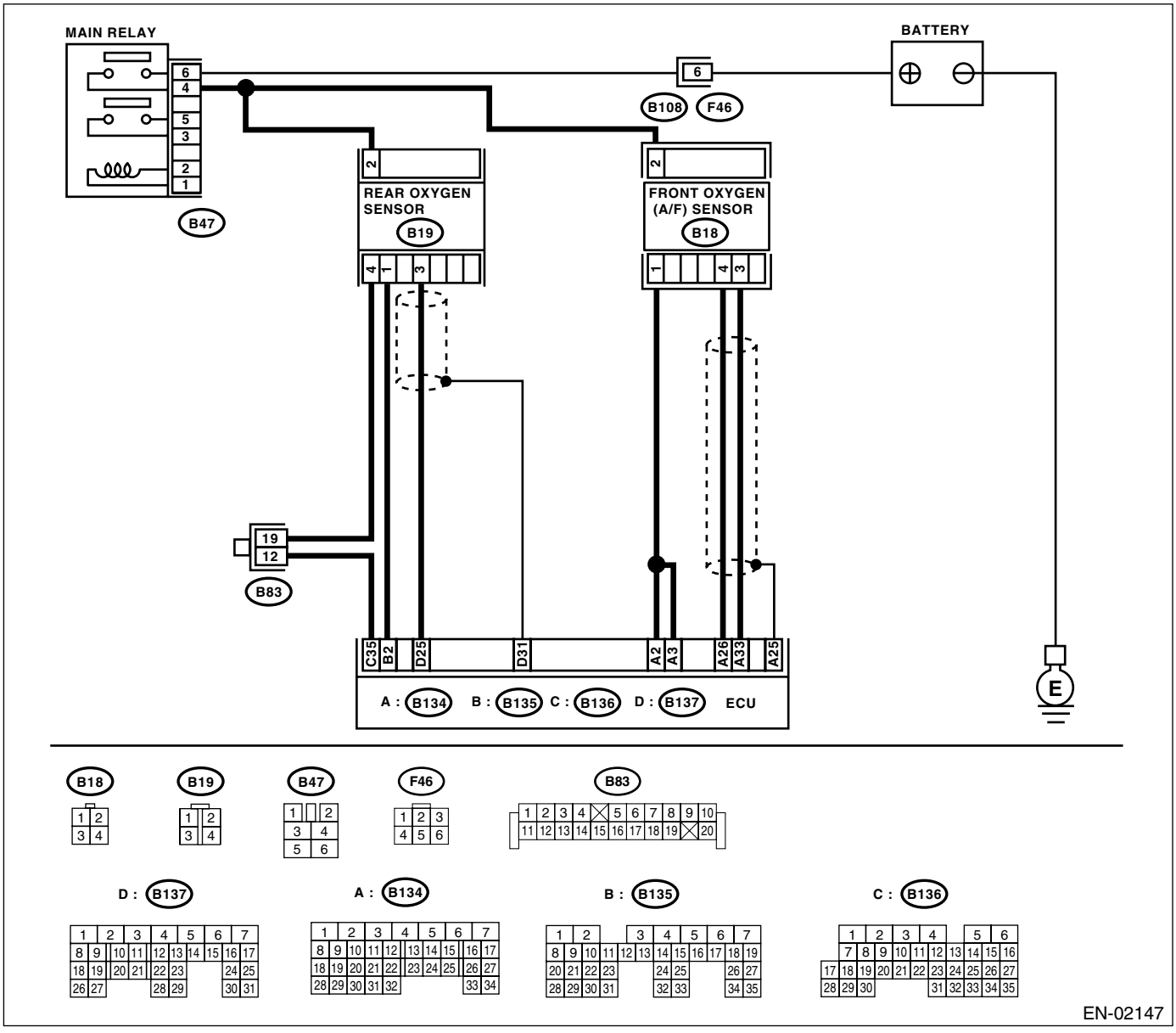
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E35) No. 2 — (B135) No. 8:*** ***(E35) No. 3 — (B136) No. 35:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:*** ***(E35) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the camshaft position sensor wave form. <Ref. to EN(H4DOTC)-23, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

AZ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-124, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



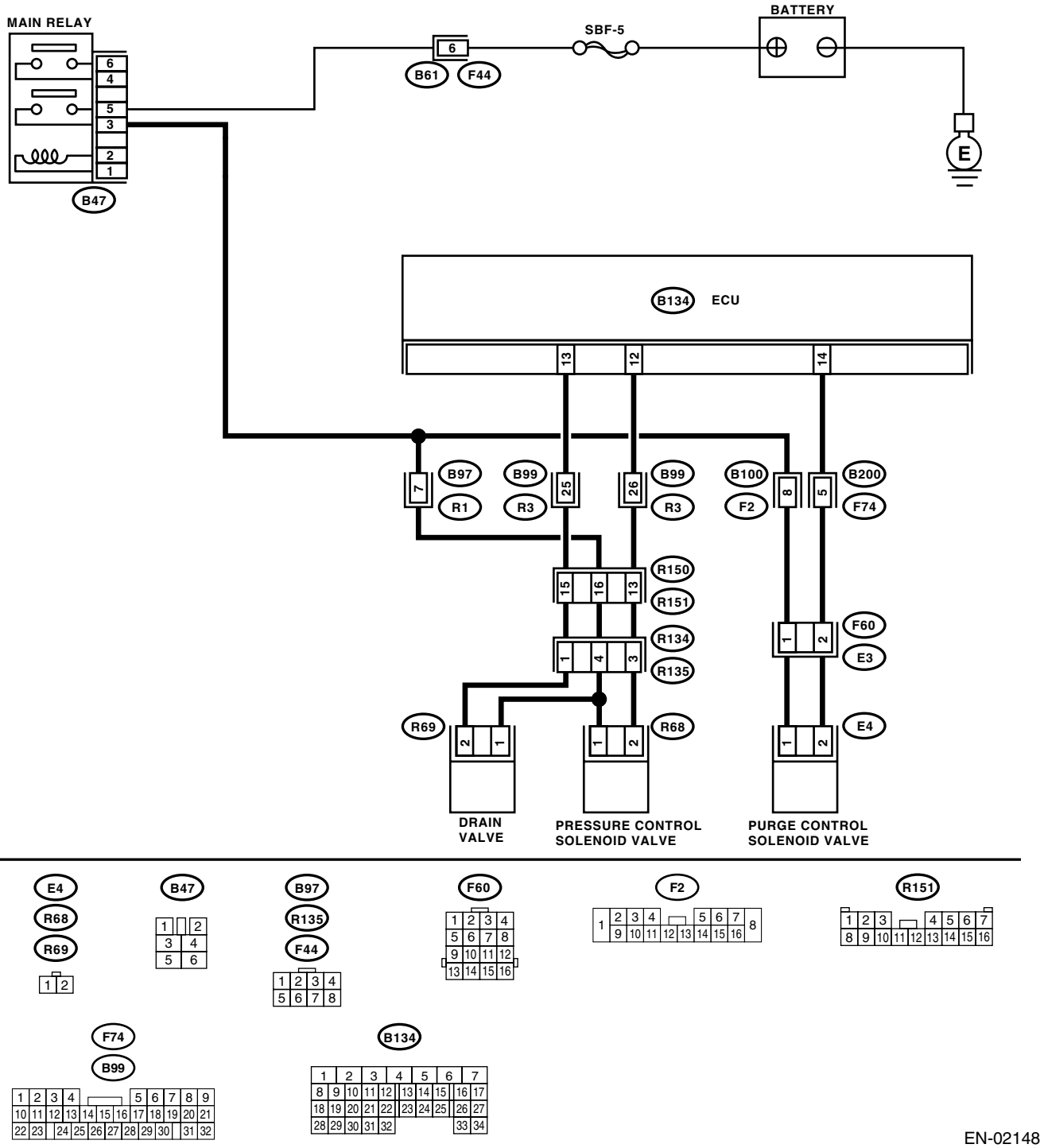
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate the rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front CatalyticConverter.> and rear catalytic converter <Ref. to EC(H4DOTC)-4, Rear Catalytic Converter.>	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front CatalyticConverter.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BA:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Fuel odor
  - There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-59, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-16, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge ControlSolenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>

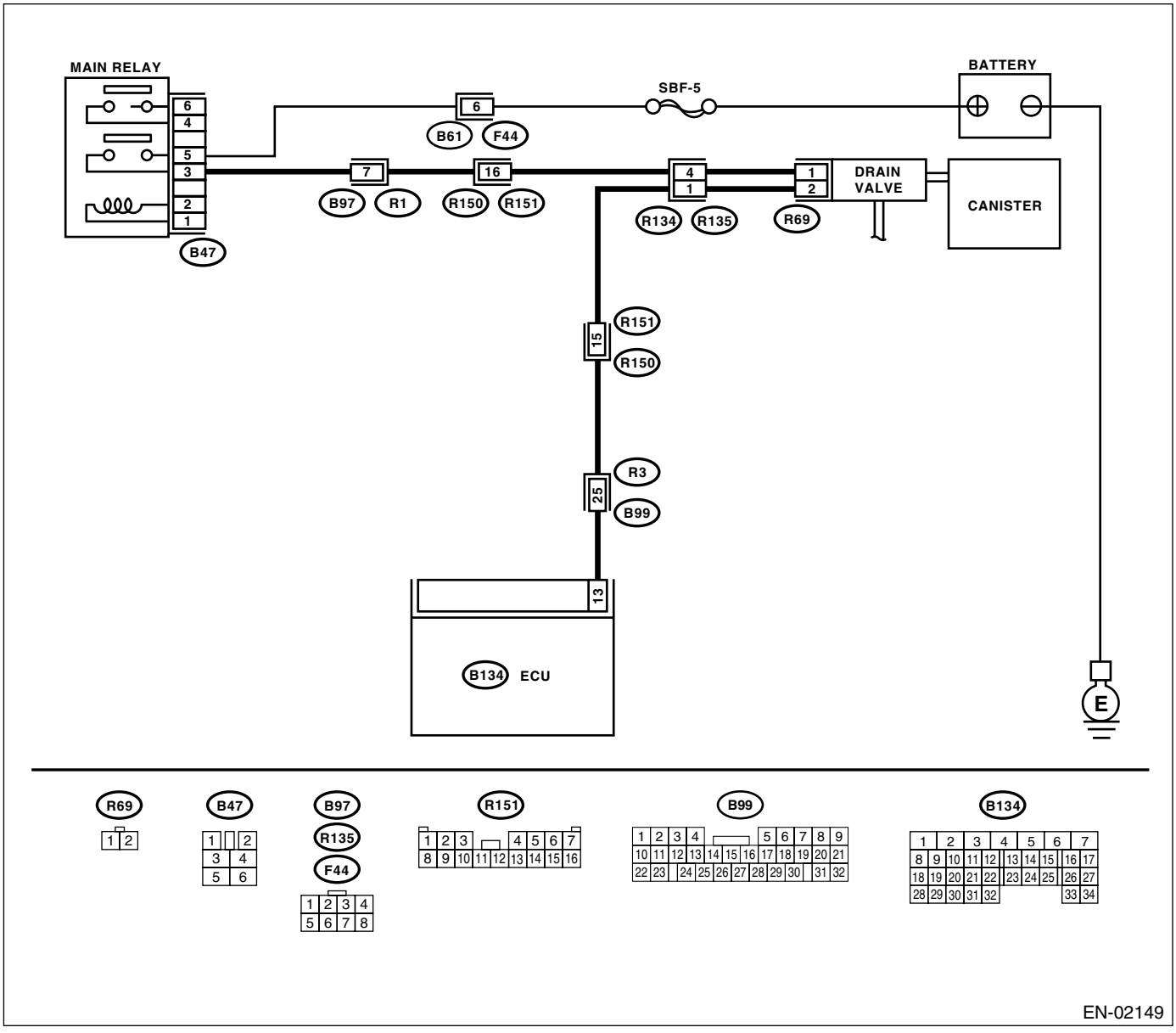
	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-75, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BB:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-152, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B134) No. 13 — (R69) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-16, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R69) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

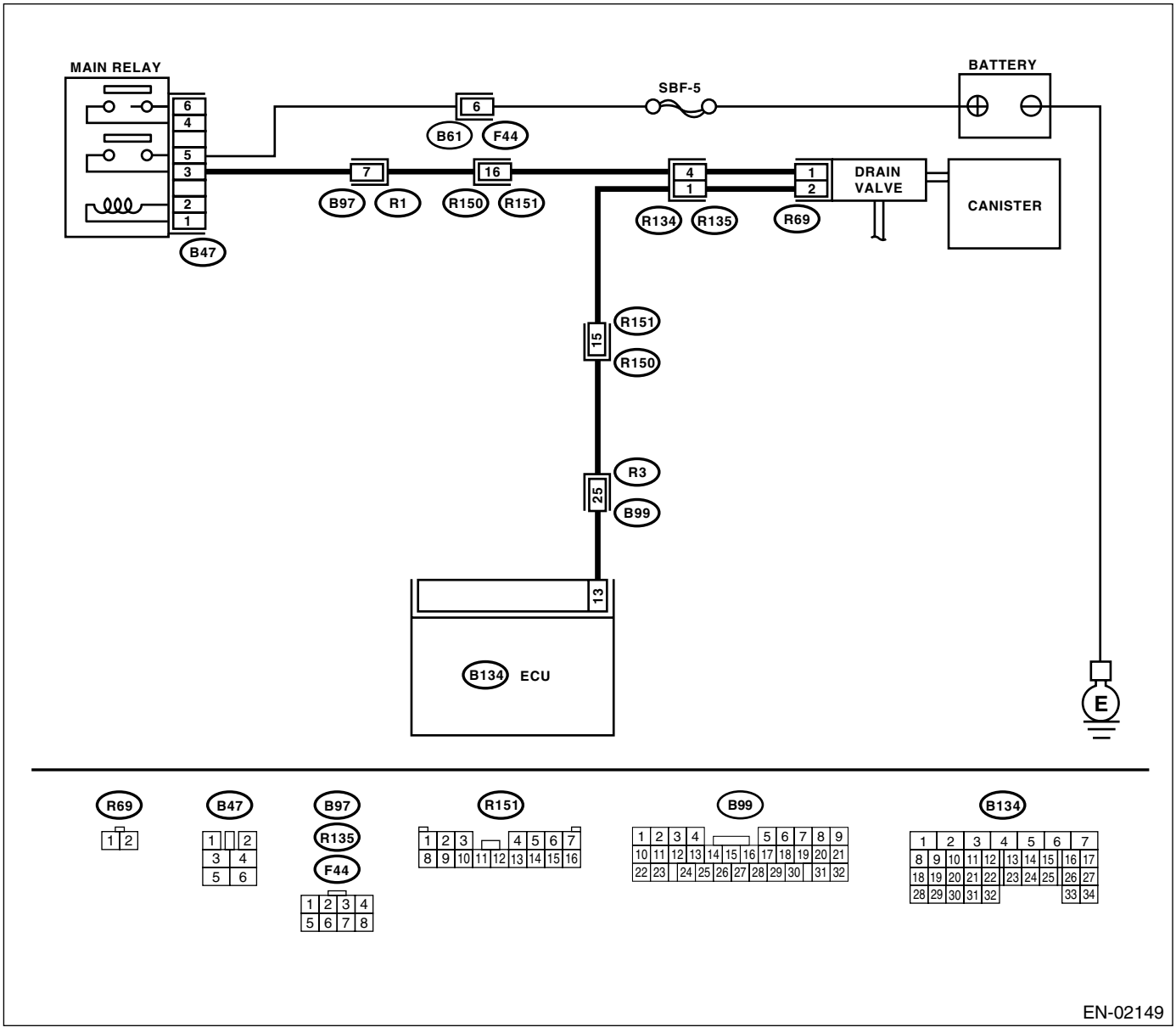
MEMO:

BC:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-154, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



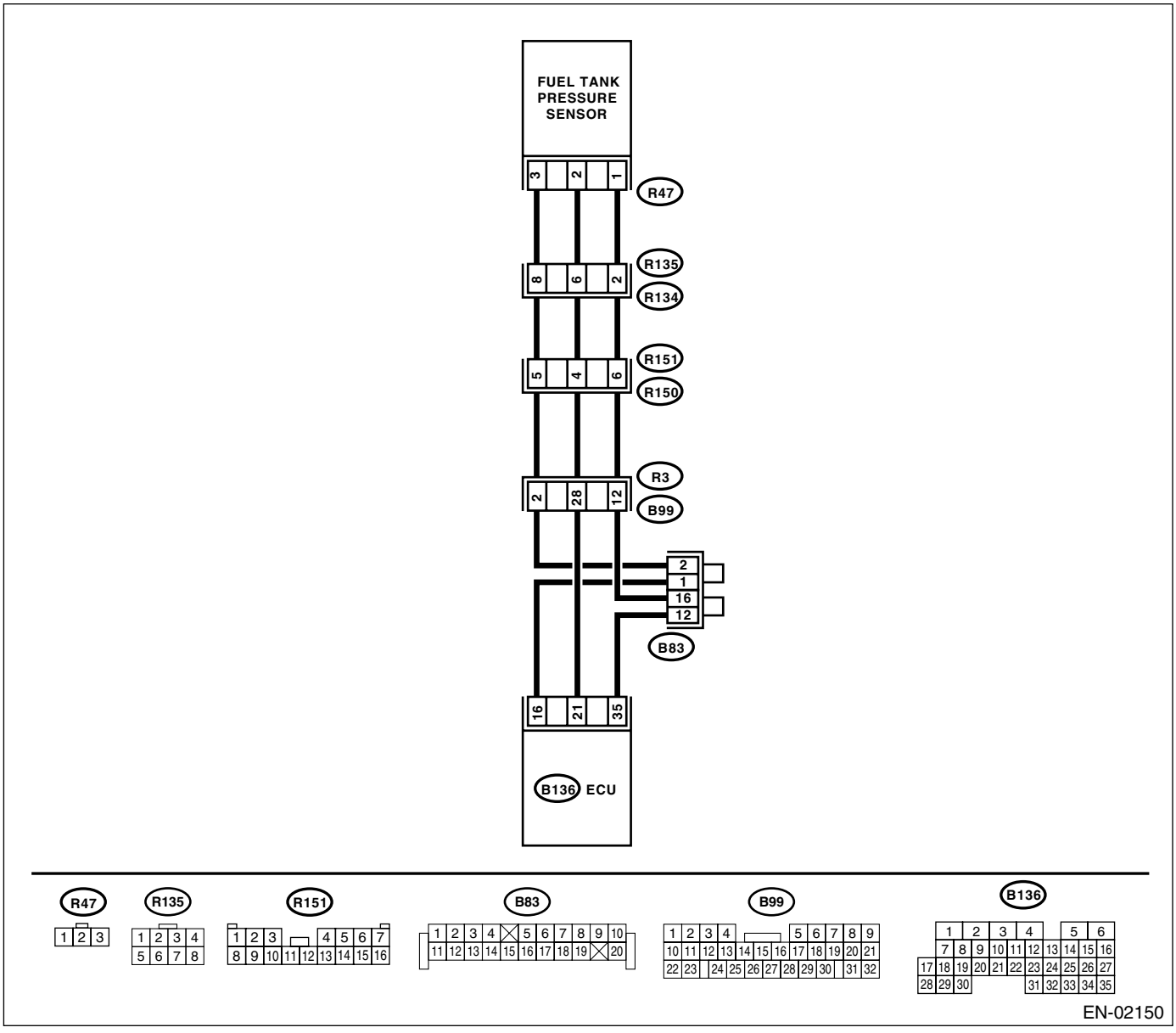
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Does the resistance change within 0 to 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the drain valve <Ref. to EC(H4DOTC)-16, Drain Valve.> and ECM <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

BD:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-156, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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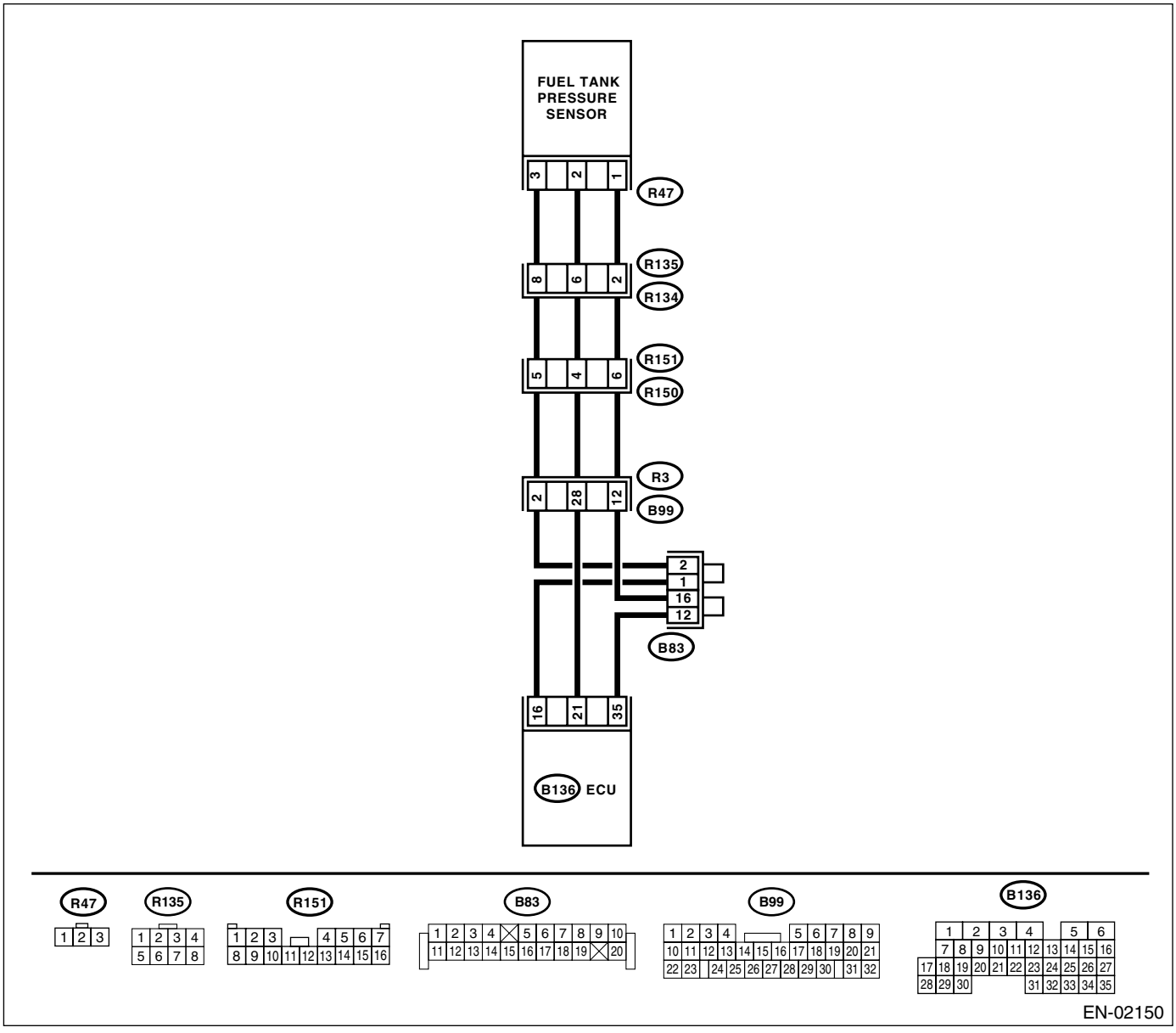
	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank •Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-10, Fuel Tank Pressure Sensor.>

BE:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-158, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured valve less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R150) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 35 — (R150) No. 6:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R151) No. 5 — (R47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R151) No. 6 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair short circuit to ground in fuel tank cord.
12	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-10, Fuel Tank Pressure Sensor.>

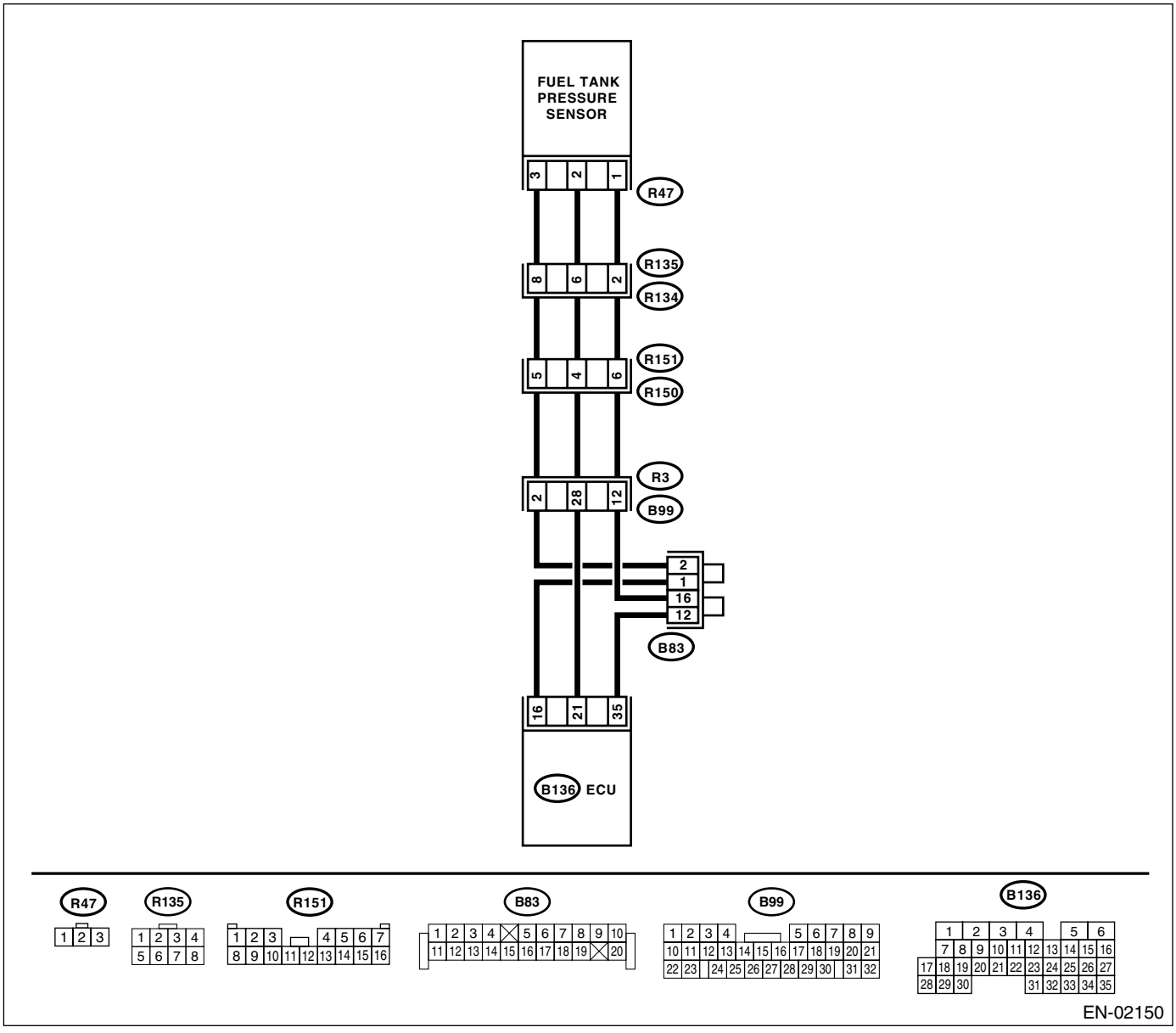
MEMO:

BF:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-160, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)	Go to step **11.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the measured value exceed –2.8 kPa (–21.0 mmHg, –0.827 inHg) by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R150) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 21 — (R150) No. 4:*** ***(B136) No. 35 — (R150) No. 6:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R151) No. 4 — (R47) No. 2:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R151) No. 6 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-10, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-10, Fuel Tank Pressure Sensor.>

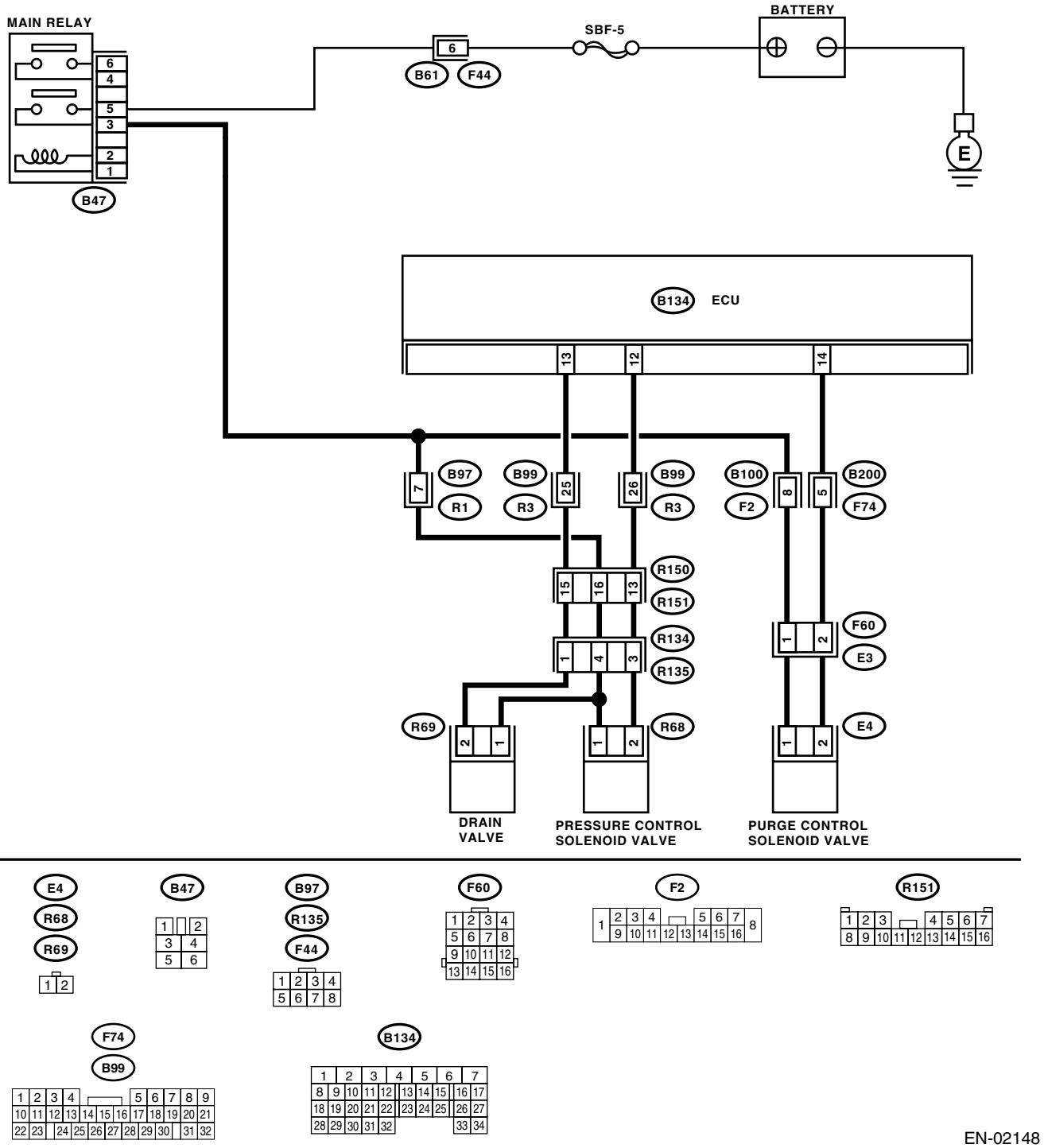
MEMO:

BG:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Fuel odor
  - There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-59, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-16, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge ControlSolenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge Control-Solenoid Valve.>

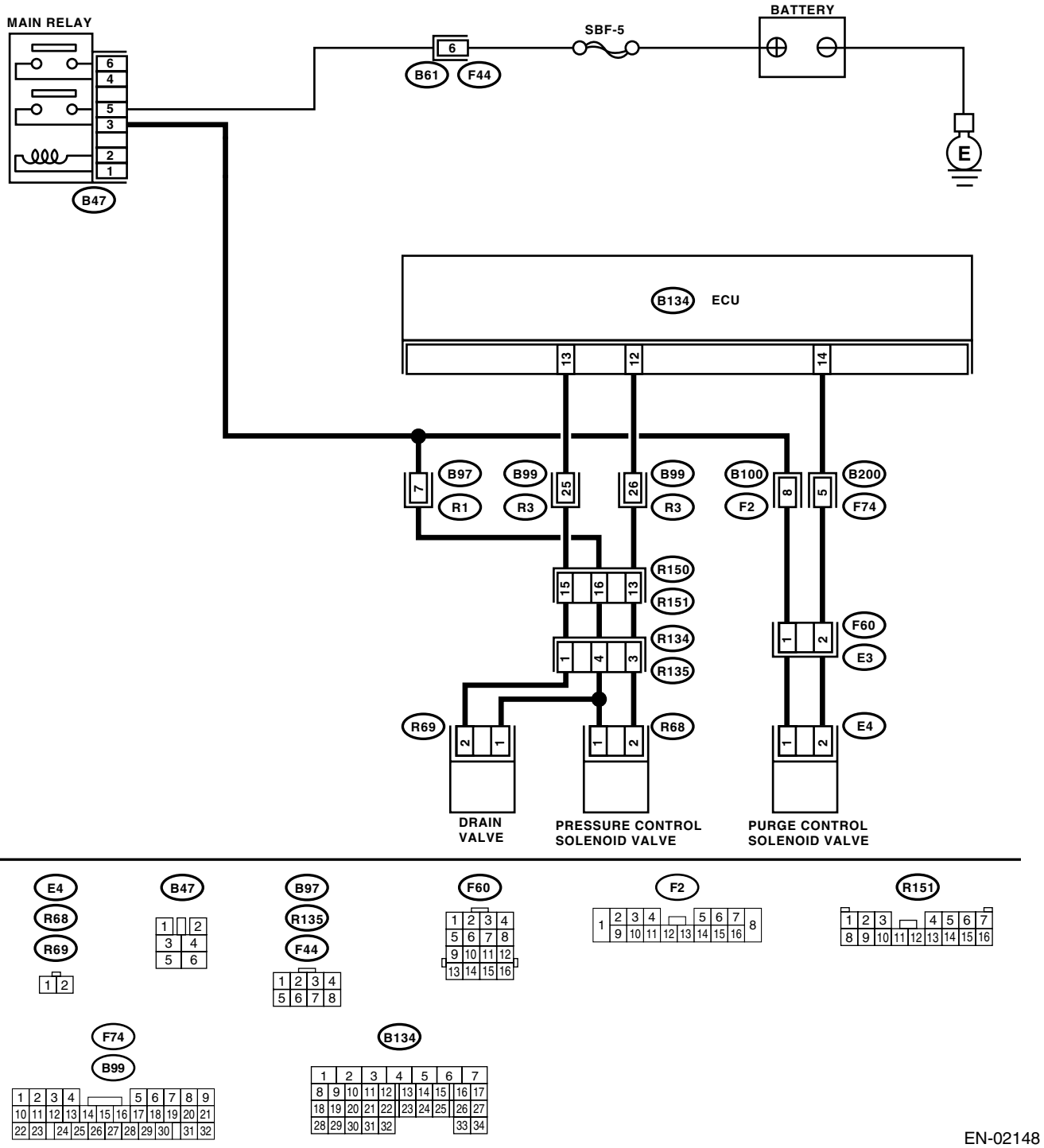
	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-75, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BH:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Fuel odor
  - Fuel filler cap is loose or not installed.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02148

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-59, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-16, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge ControlSolenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge Control-Solenoid Valve.>
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-5, Canister.>	Go to step **9.**

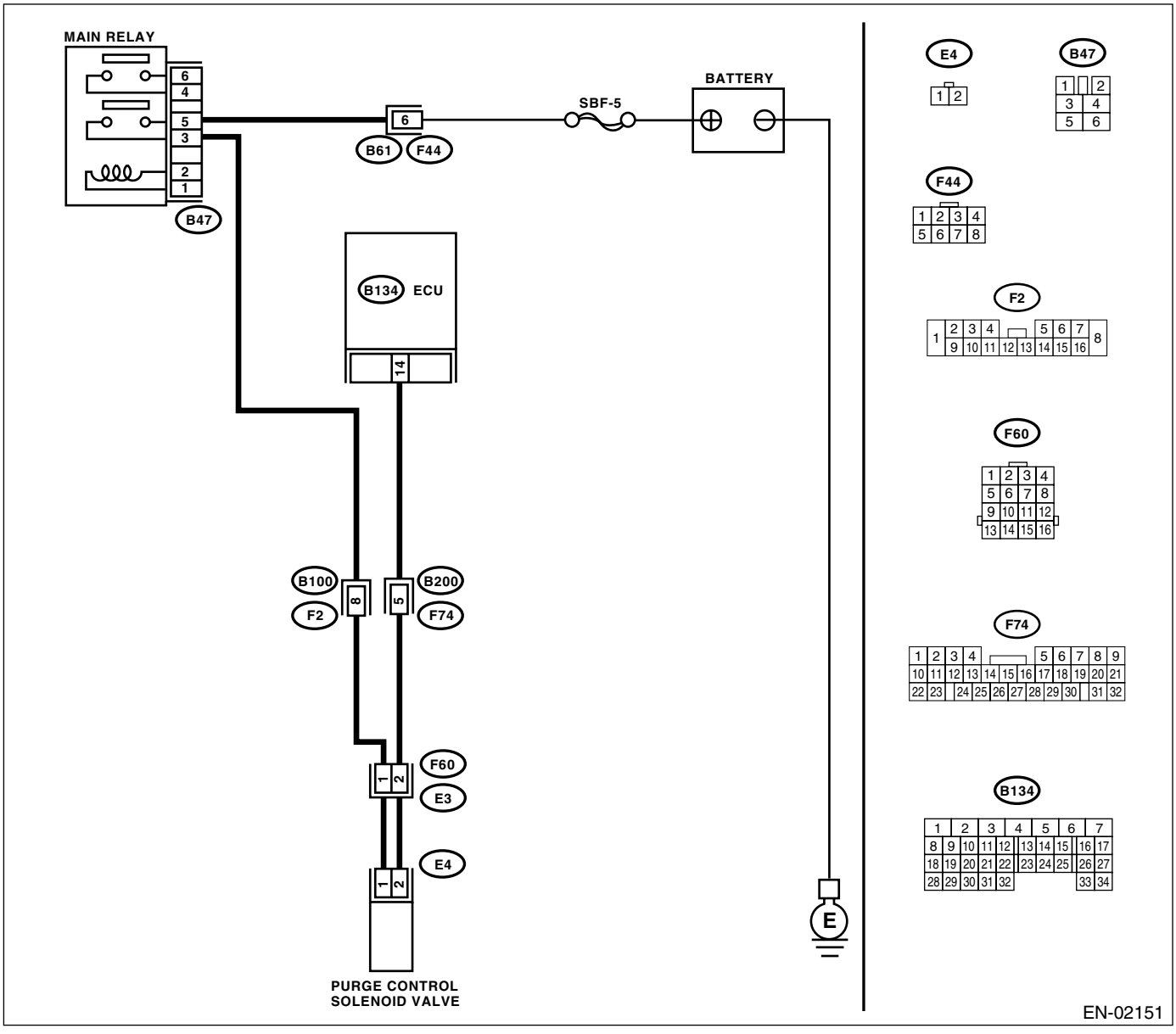
Step		Check	Yes	No
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BI: DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-164, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



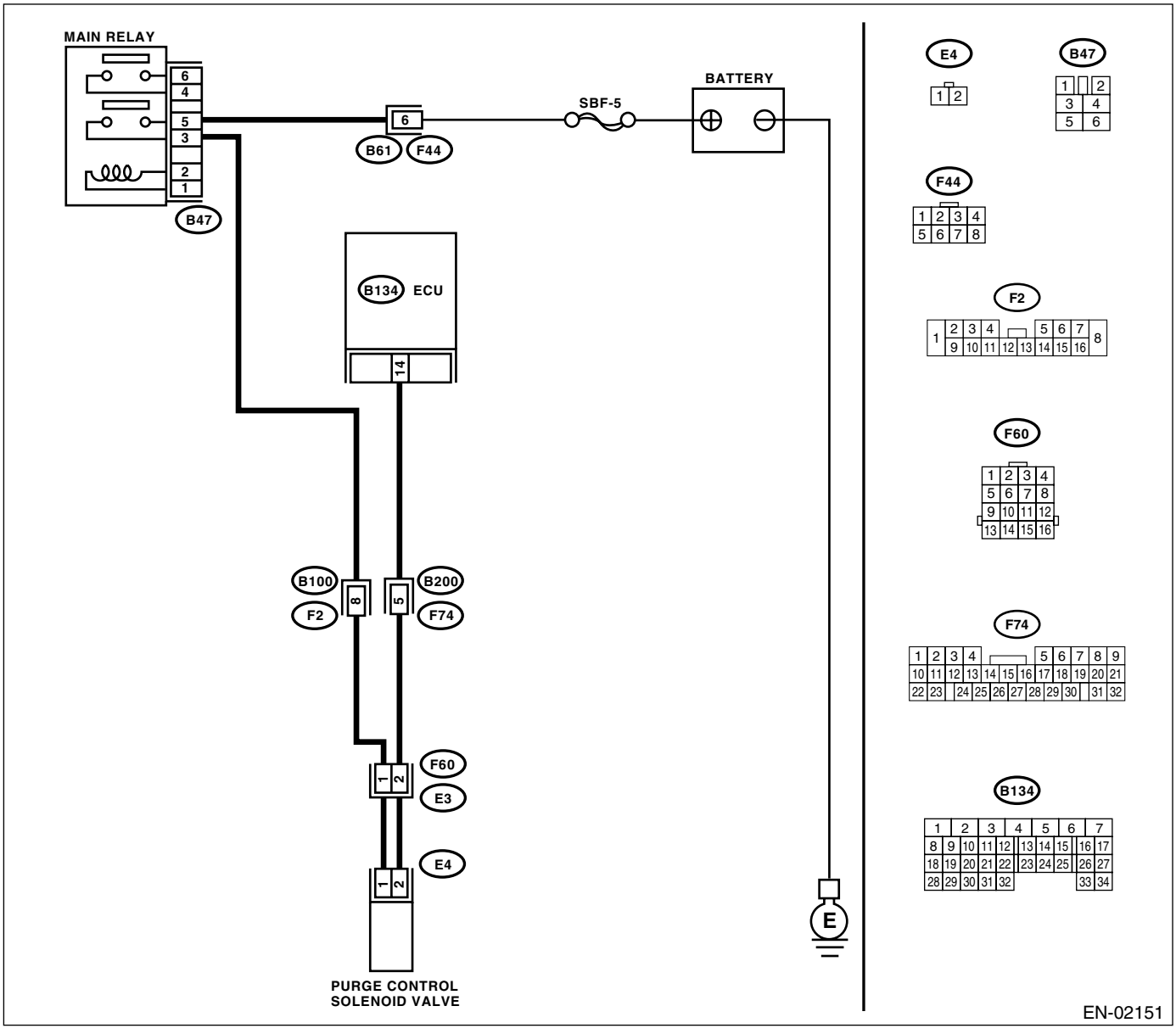
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-6, Purge ControlSolenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair the open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair the poor contact in purge control solenoid valve connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BJ:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



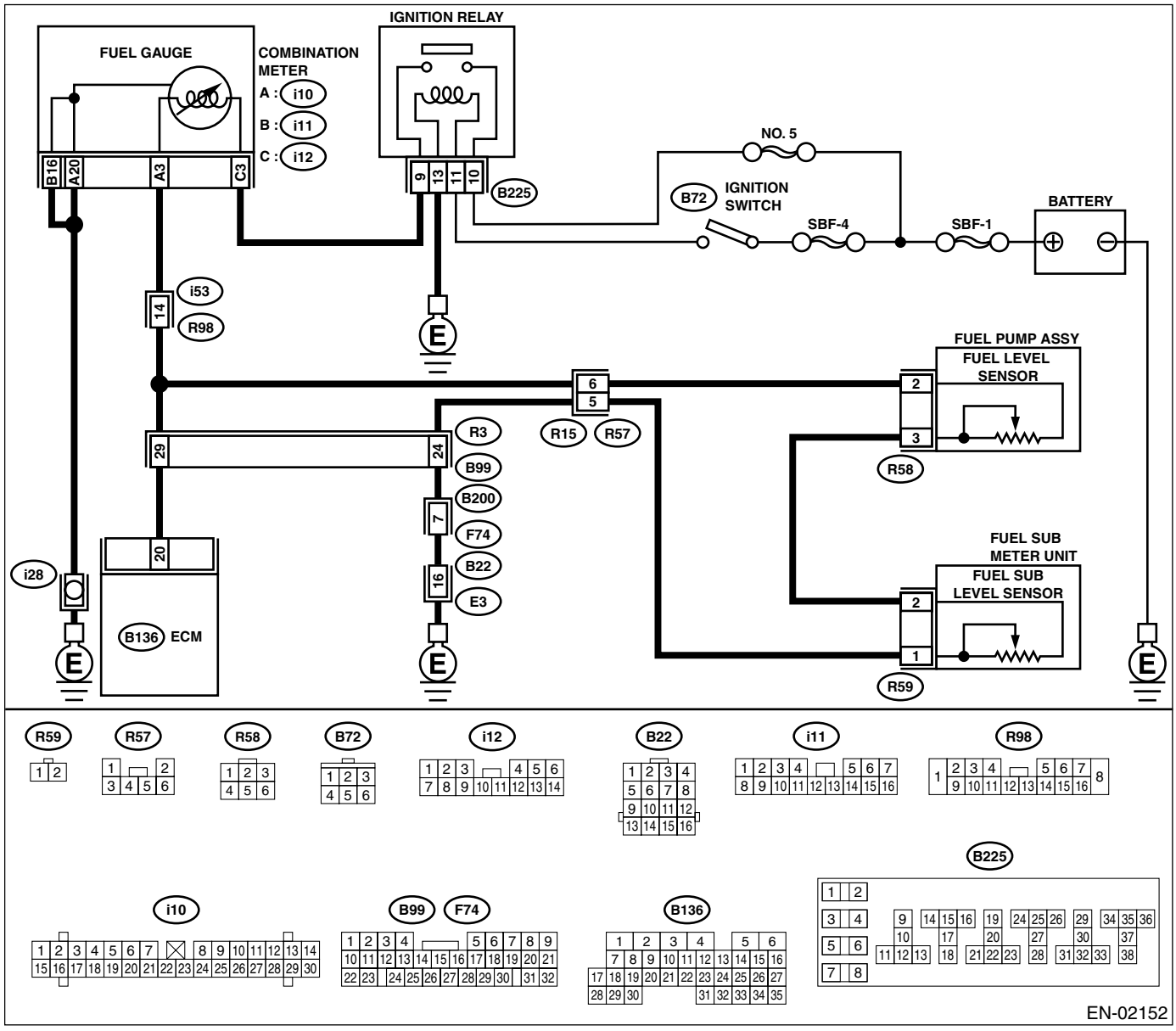
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value within 0 to 13 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H4DOTC)-6, Purge ControlSolenoid Valve.> and ECM <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

BK:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-168, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



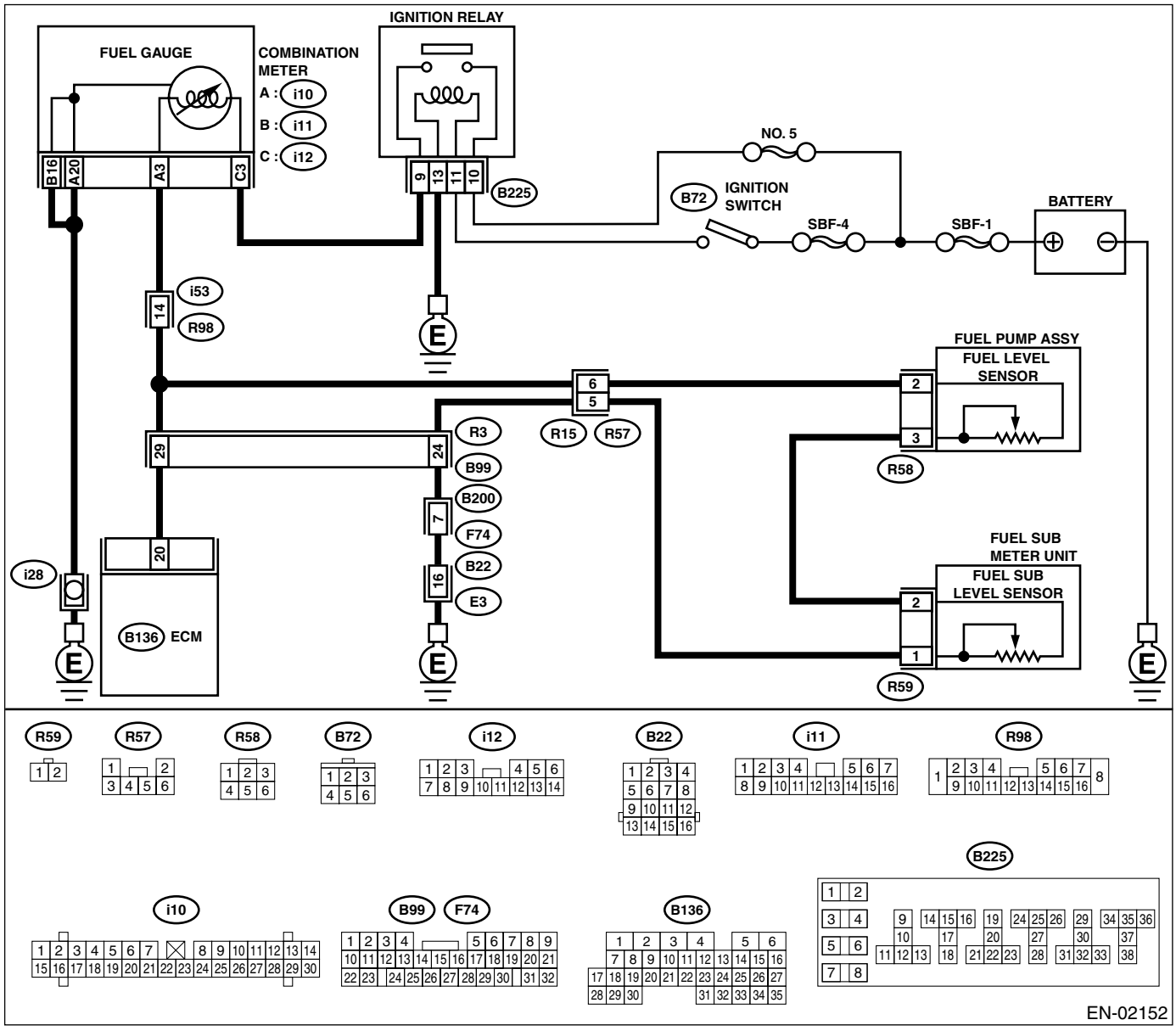
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-70, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H4DOTC)-71, Fuel Sub Level Sensor.>

BL:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-170, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (–):***	Is the measured value less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the voltage change, while shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i10), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and combination meter connector.

Step		Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 20 — (i10) No. 3:***	Is the measured value less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair the ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-67, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 2 — No. 3:***	Is the measured value within 0.5 to 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-71, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 0.5 to 2.5 Ω?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

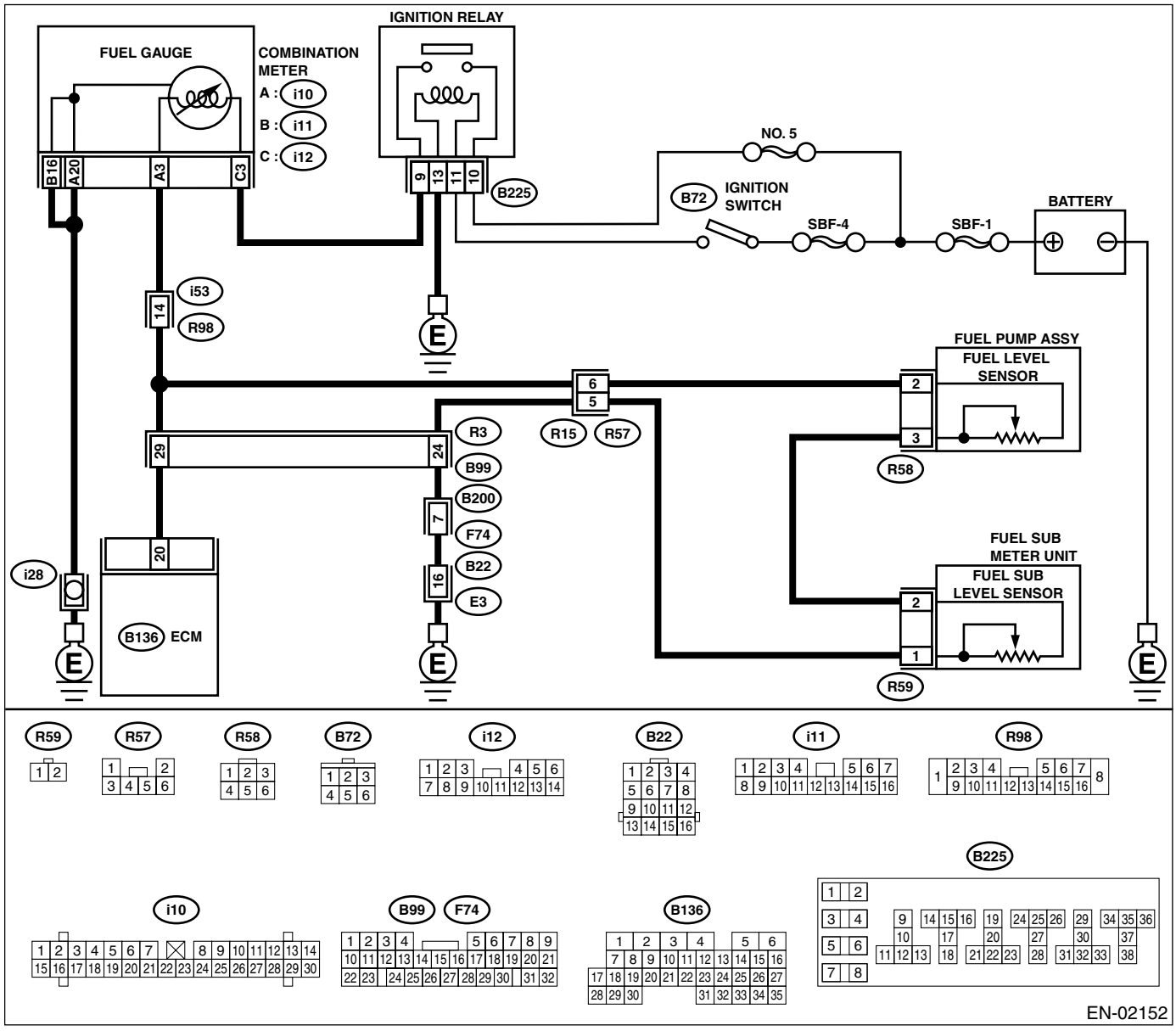
MEMO:

BM:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-172, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **3.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **4.**	Repair the battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B136) No. 20 — (R15) No. 6:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 5 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **6.**	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R58) No. 2:***	Is the measured value less than 10 Ω?	Go to step **7.**	Repair the open circuit between coupling connector and fuel level sensor.

Step		Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the measured value less than 10 Ω?	Go to step **8.**	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 5 — (R59) No. 1:***	Is the measured value less than 10 Ω?	Go to step **9.**	Repair the open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-67, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the measured value more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-70, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-71, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-71, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-13, Combination Meter Assembly.>

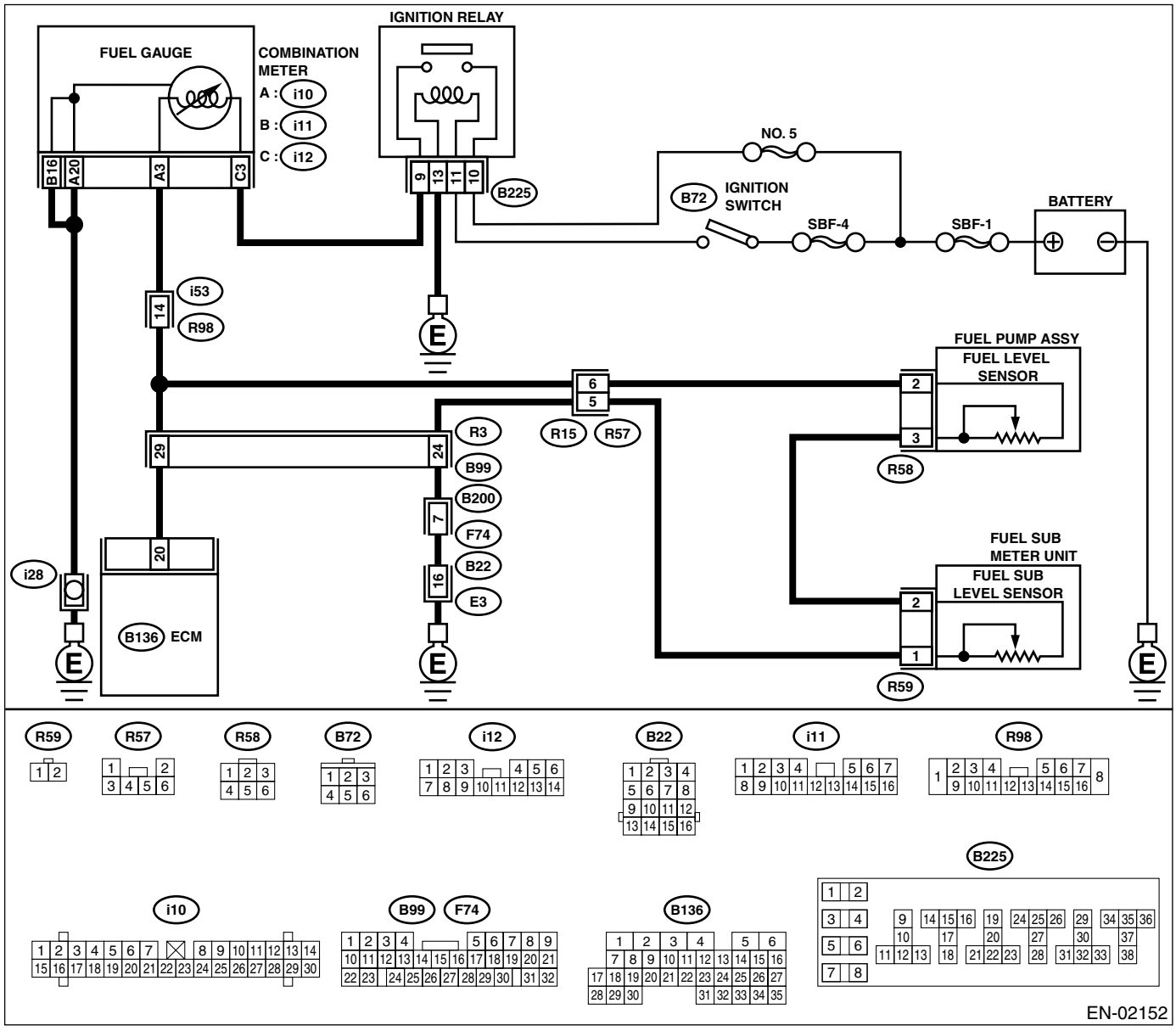
MEMO:

BN:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-174, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-67, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 2:***	Does the resistance change smoothly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-70, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-71, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-71, Fuel Sub Level Sensor.>

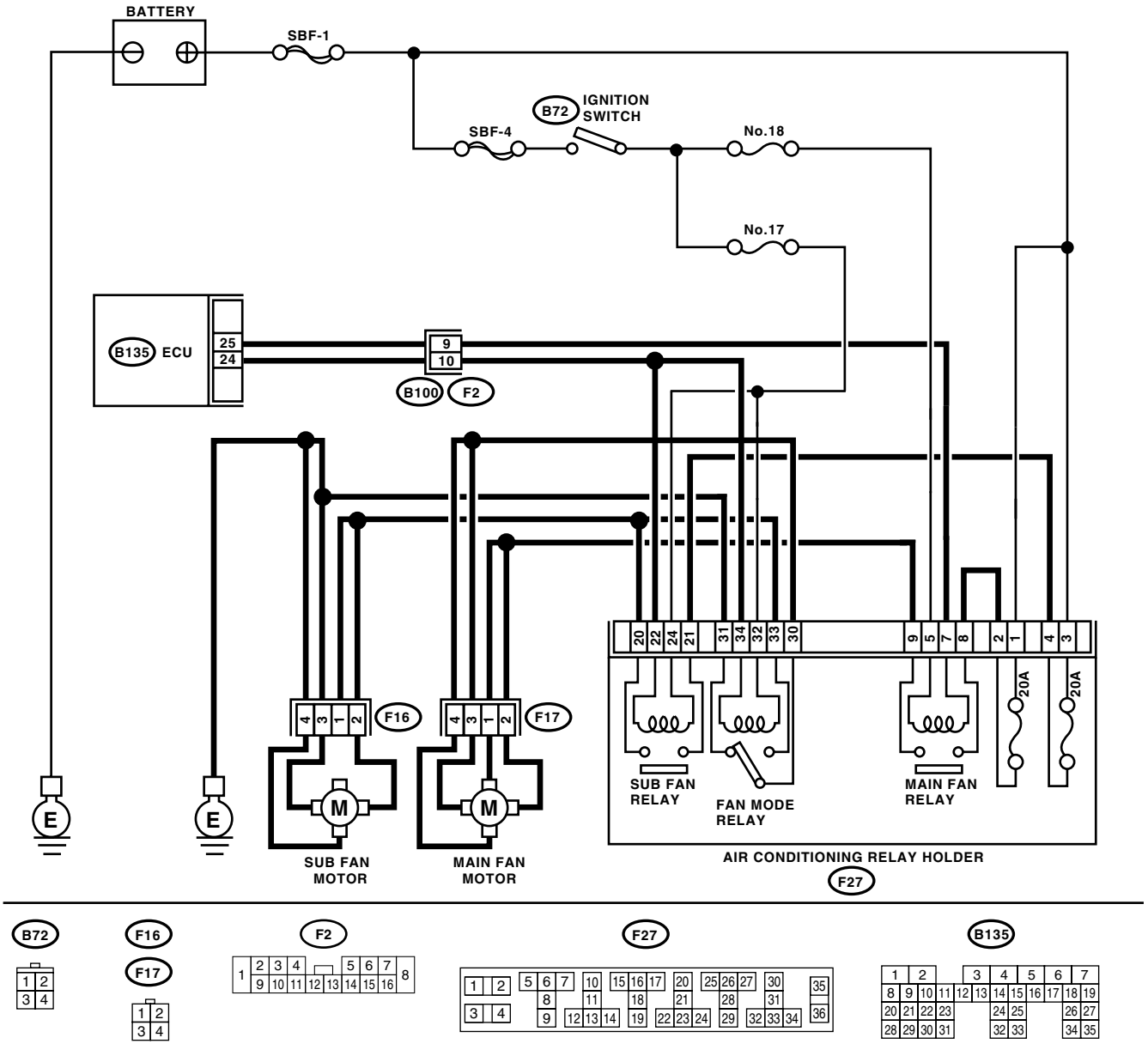
BO:DTC P0483 — COOLING FAN RATIONALITY CHECK —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**



EN-02153

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4DOTC)-24, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOTC)-26, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat.

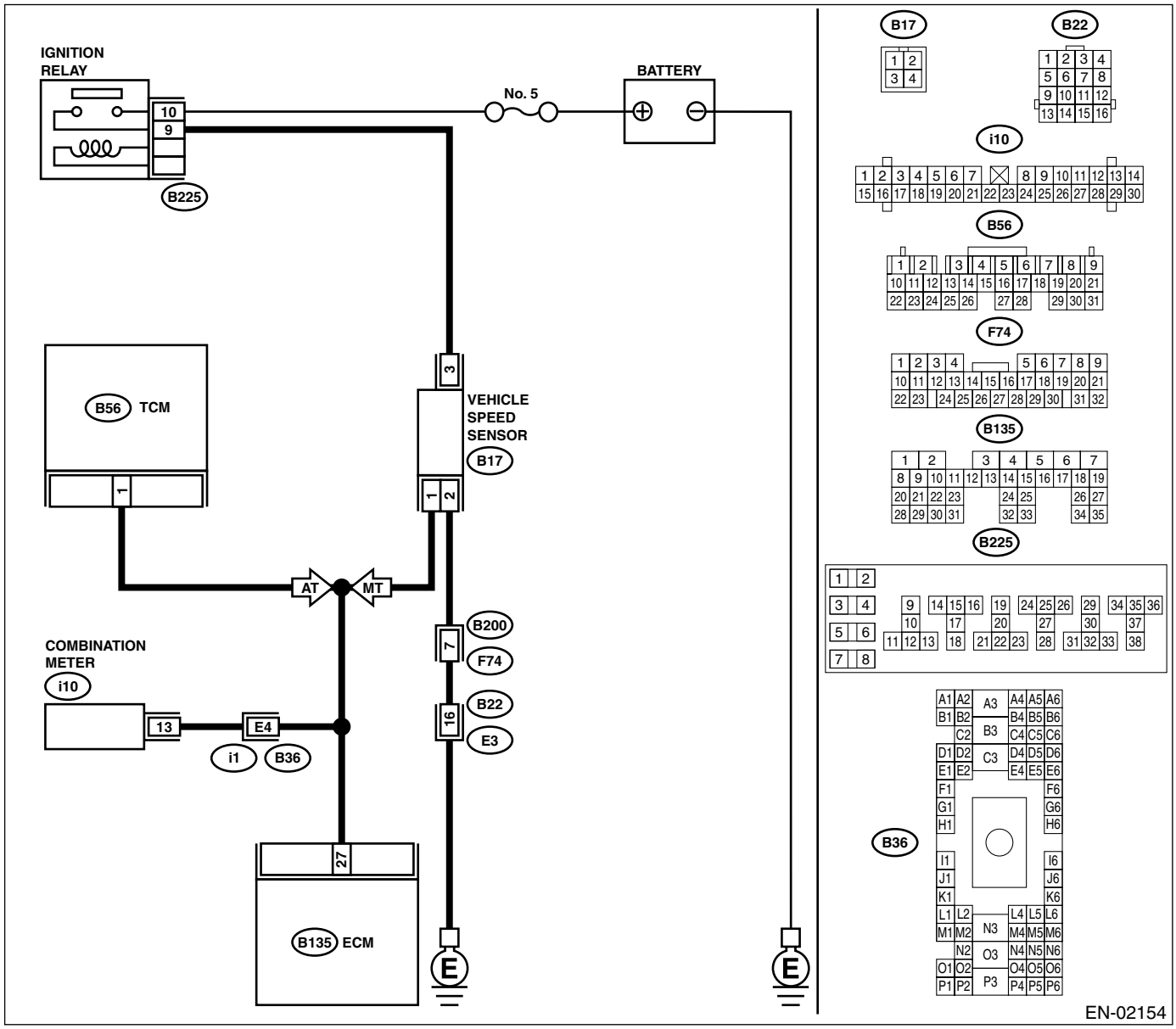
MEMO:

BP:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-178, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



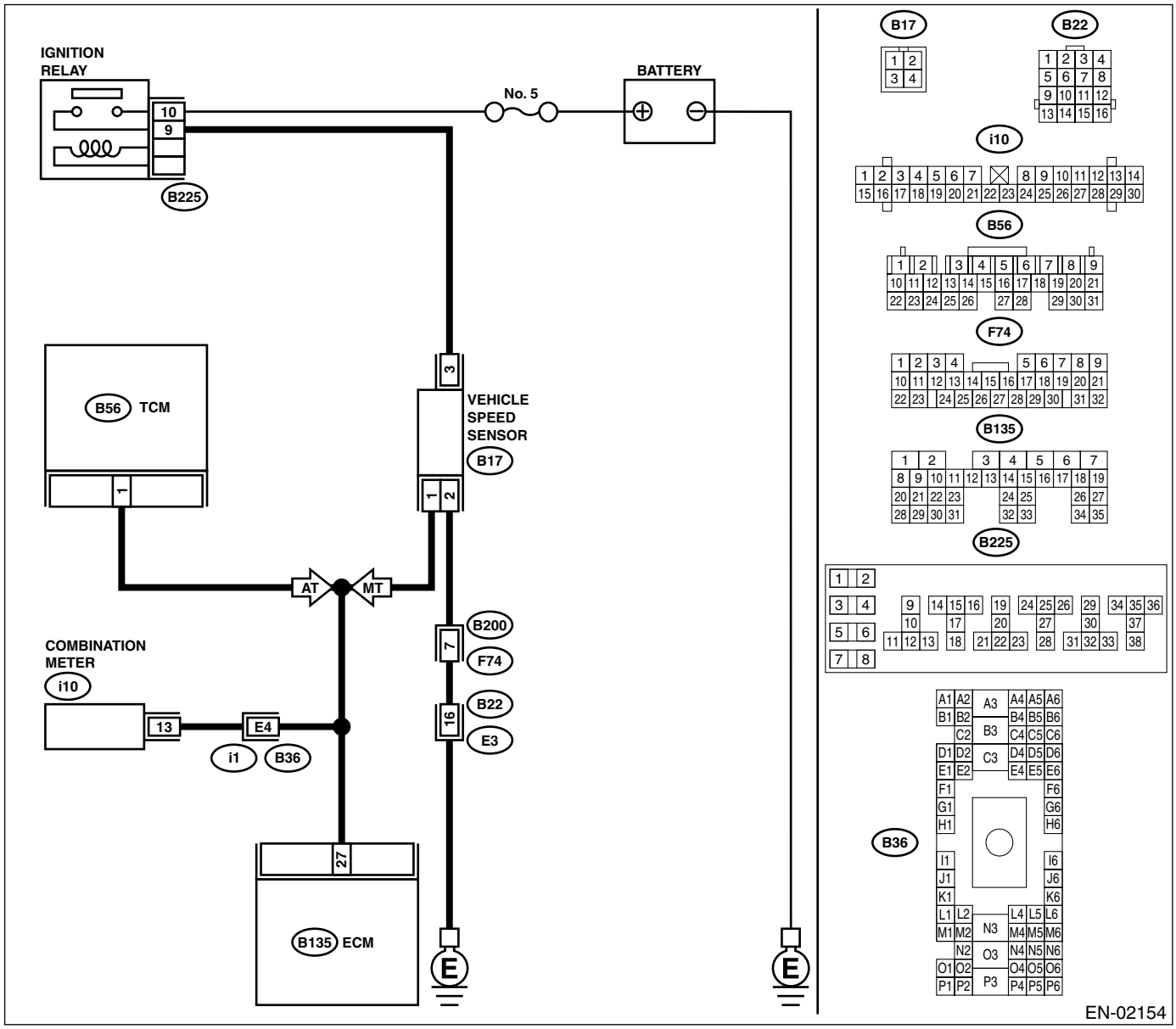
	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission AT?	Go to step **2.**	Go to step **4.**
2	**Check the harness between ECM and TCM connector.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between vehicle speed sensor and ECM connector.
3	**CHECK FOR POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Contact your SOA service center.
4	**CHECK HARENESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between vehicle speed sensor and ECM connector.
5	**CHECK POOR CONTACT.** Check poor contact in the vehicle speed sensor connector.	Is there poor contact in the vehicle speed sensor connector?	Repair poor contact in the vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-41, Vehicle Speed Sensor.>

BQ:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



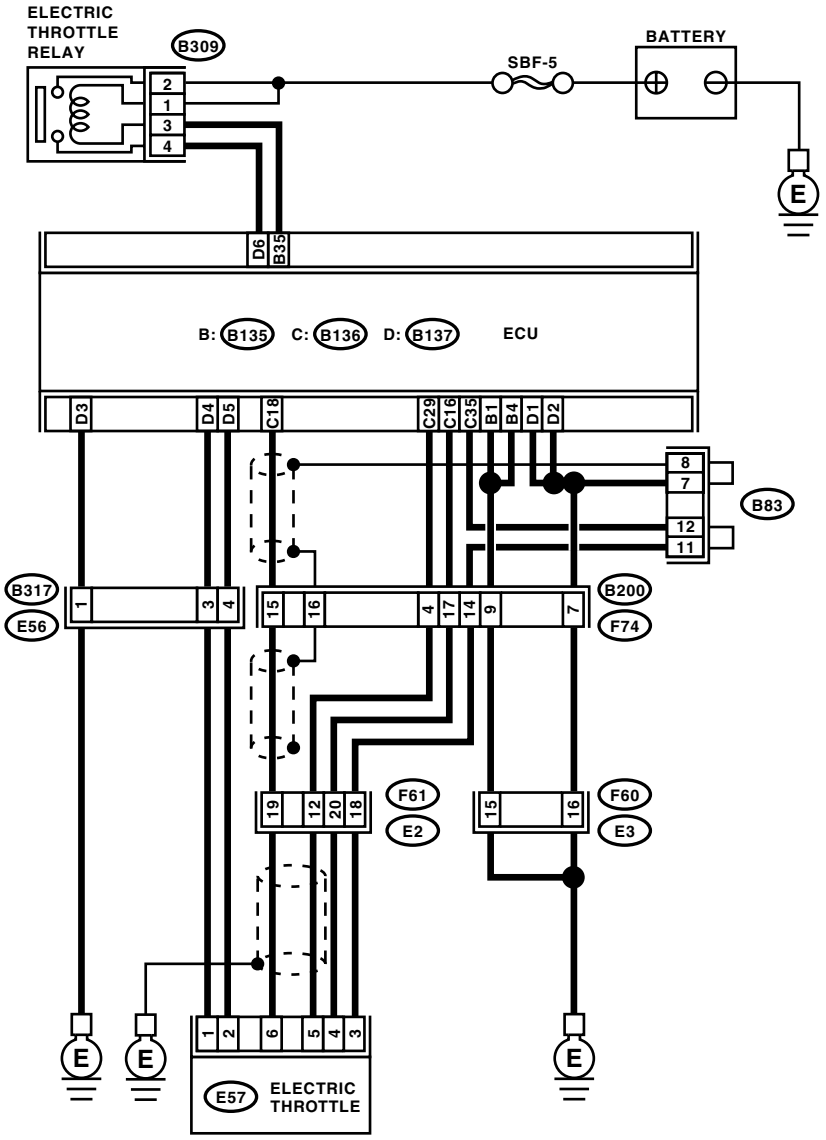
	Step	Check	Yes	No
1	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **2.**	Check the speedometer. <Ref. to IDI-15, Speedometer.>
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B135) No. 27 — (i10) No. 13:***	Is the measured value less than 10 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

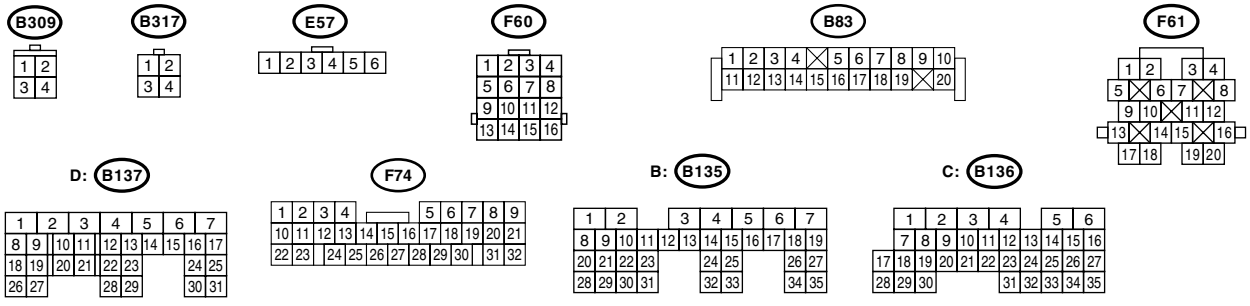
BR:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02143

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check air cleaner element.	Is there excessive clogging on air cleaner element.	Replace the air cleaner element. <Ref. to IN(H4DOTC)-7, Air Cleaner.>	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2101.

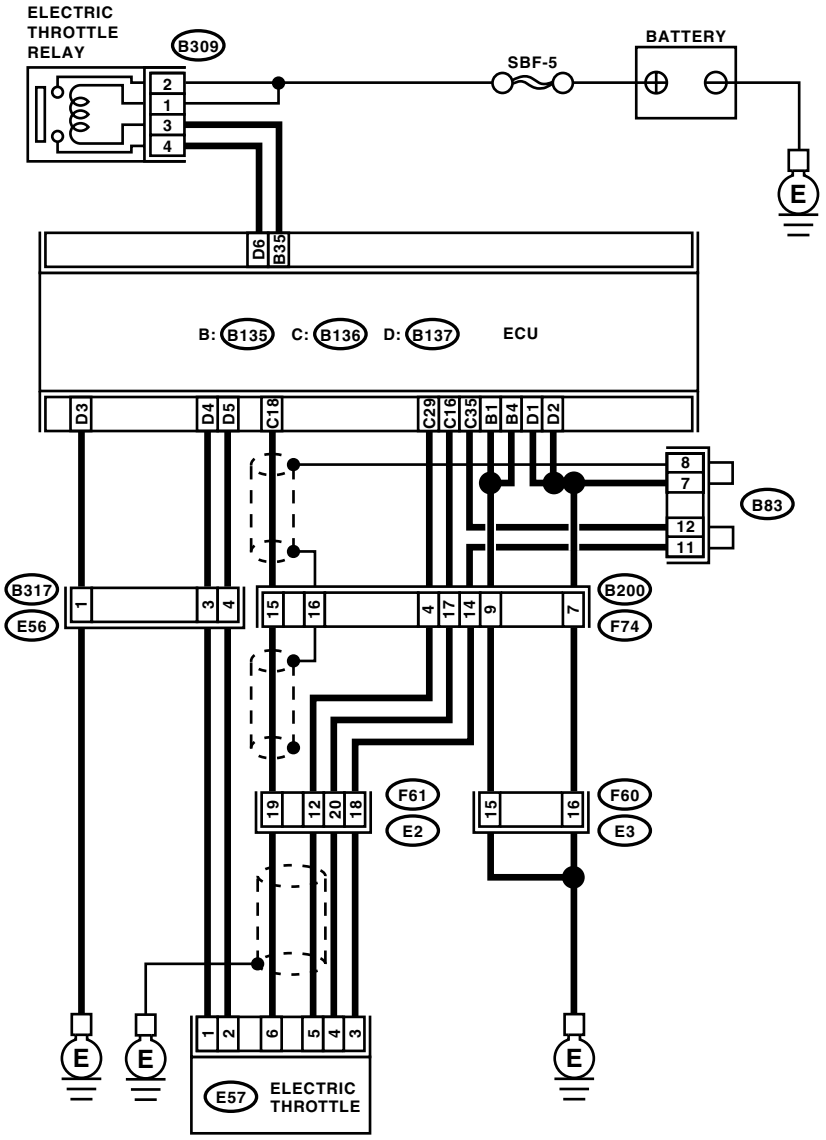
MEMO:

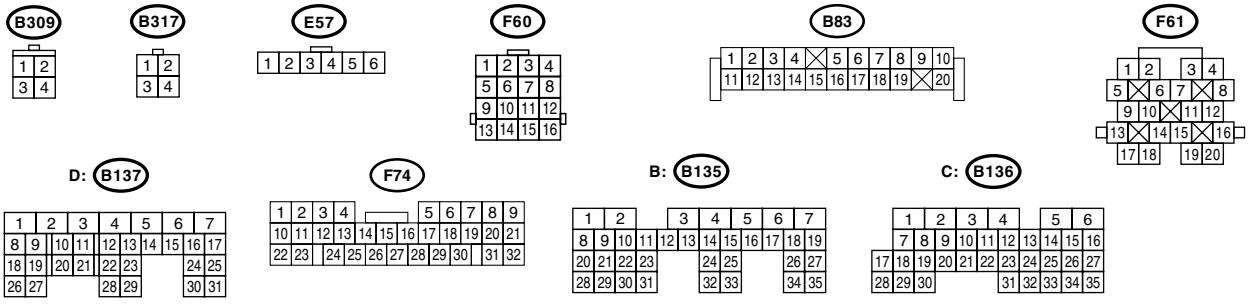
BS:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02143

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. •Loose installation of intake manifold and throttle body •Cracks of intake manifold gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2102.

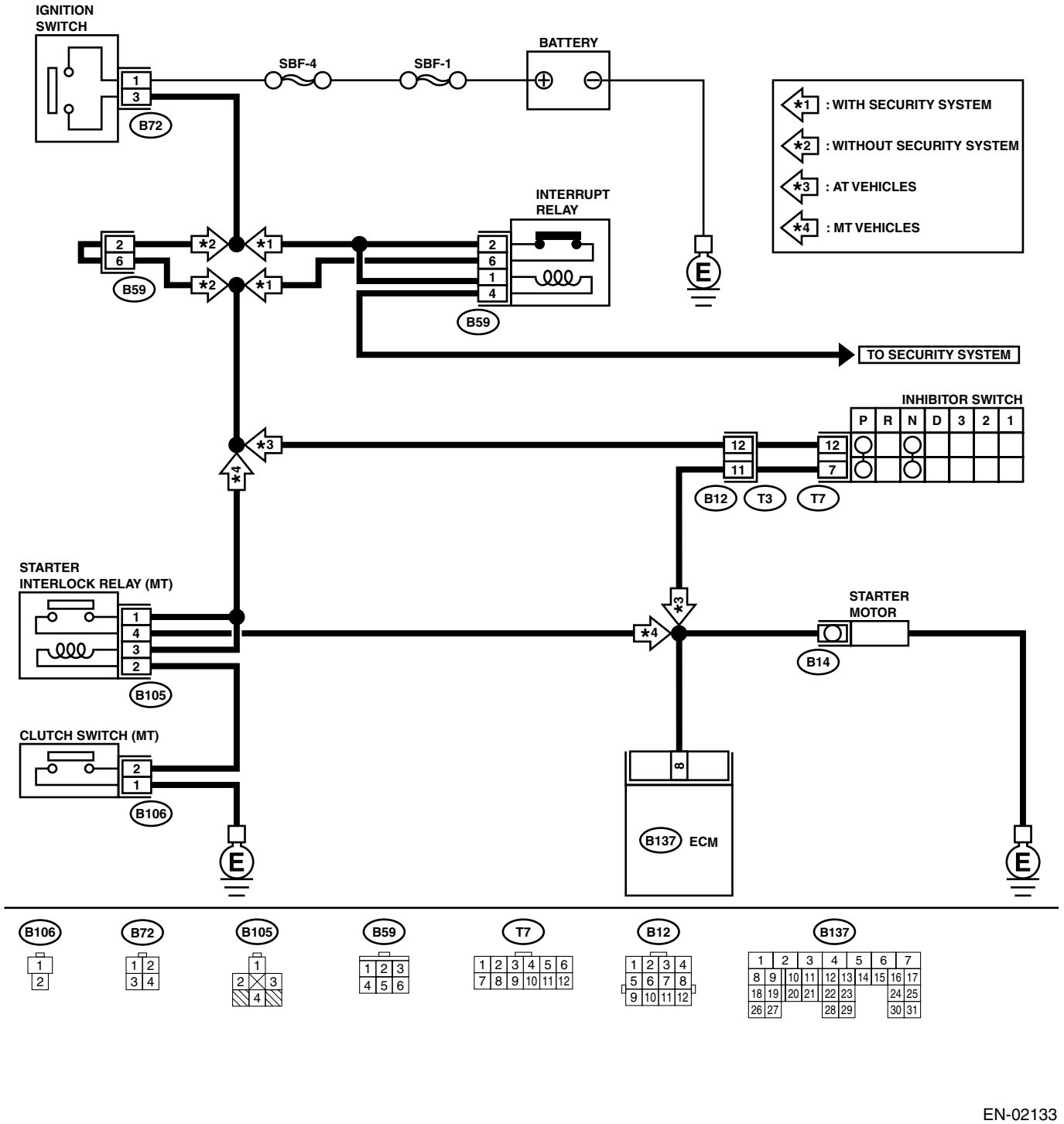
MEMO:

BT:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-186, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02133

Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when ignition switch is turned to ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(H4DOTC)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

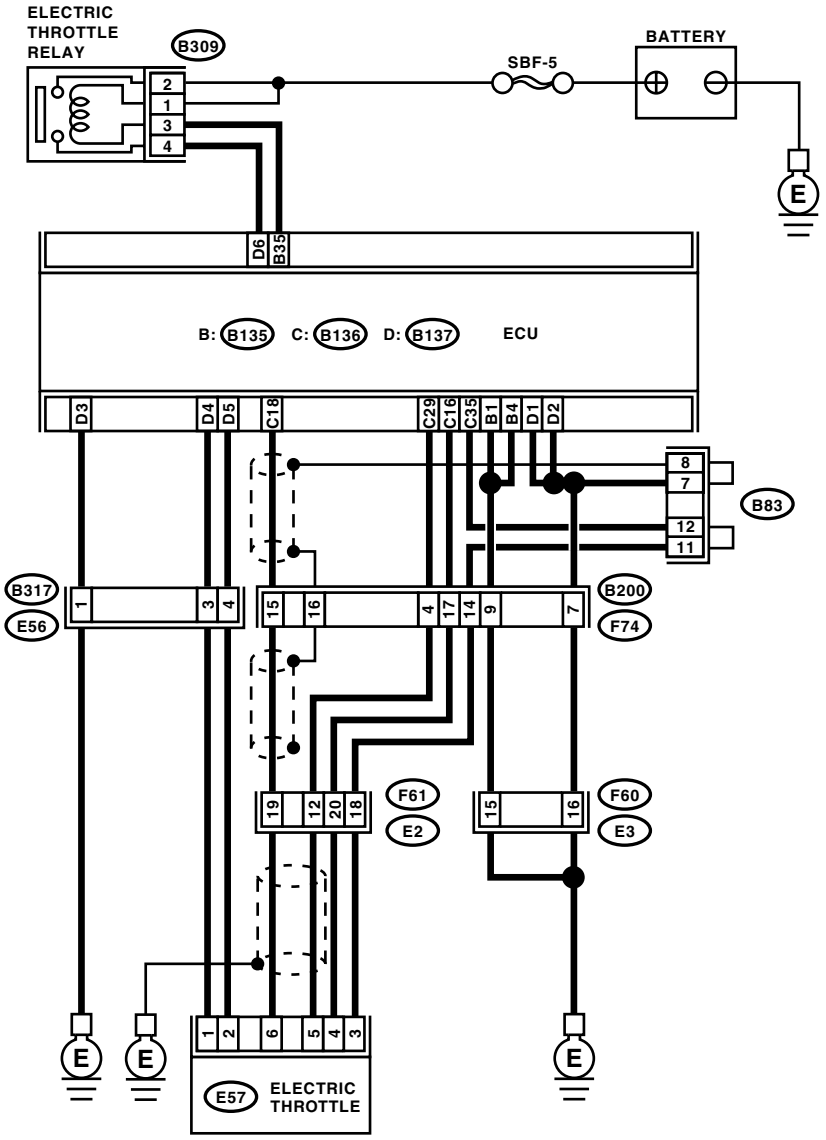
MEMO:

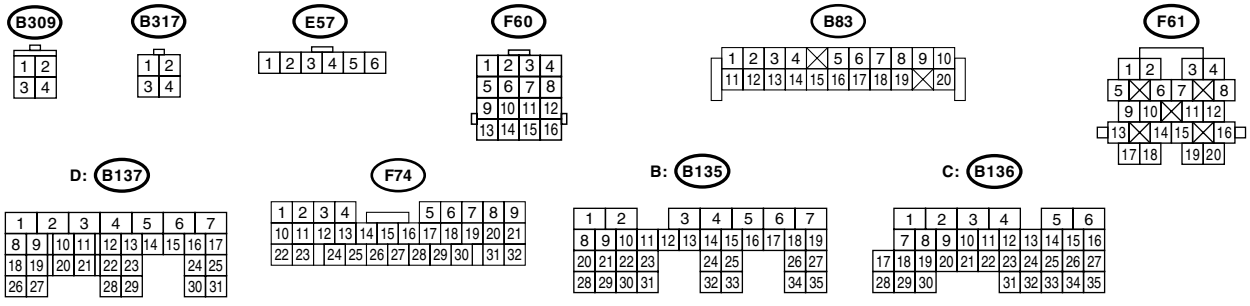
BU:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-187, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.
  - Fuel is cut according to fail-safe function.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02143

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. •Loose installation of intake manifold and throttle body •Cracks of intake manifold gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2102.

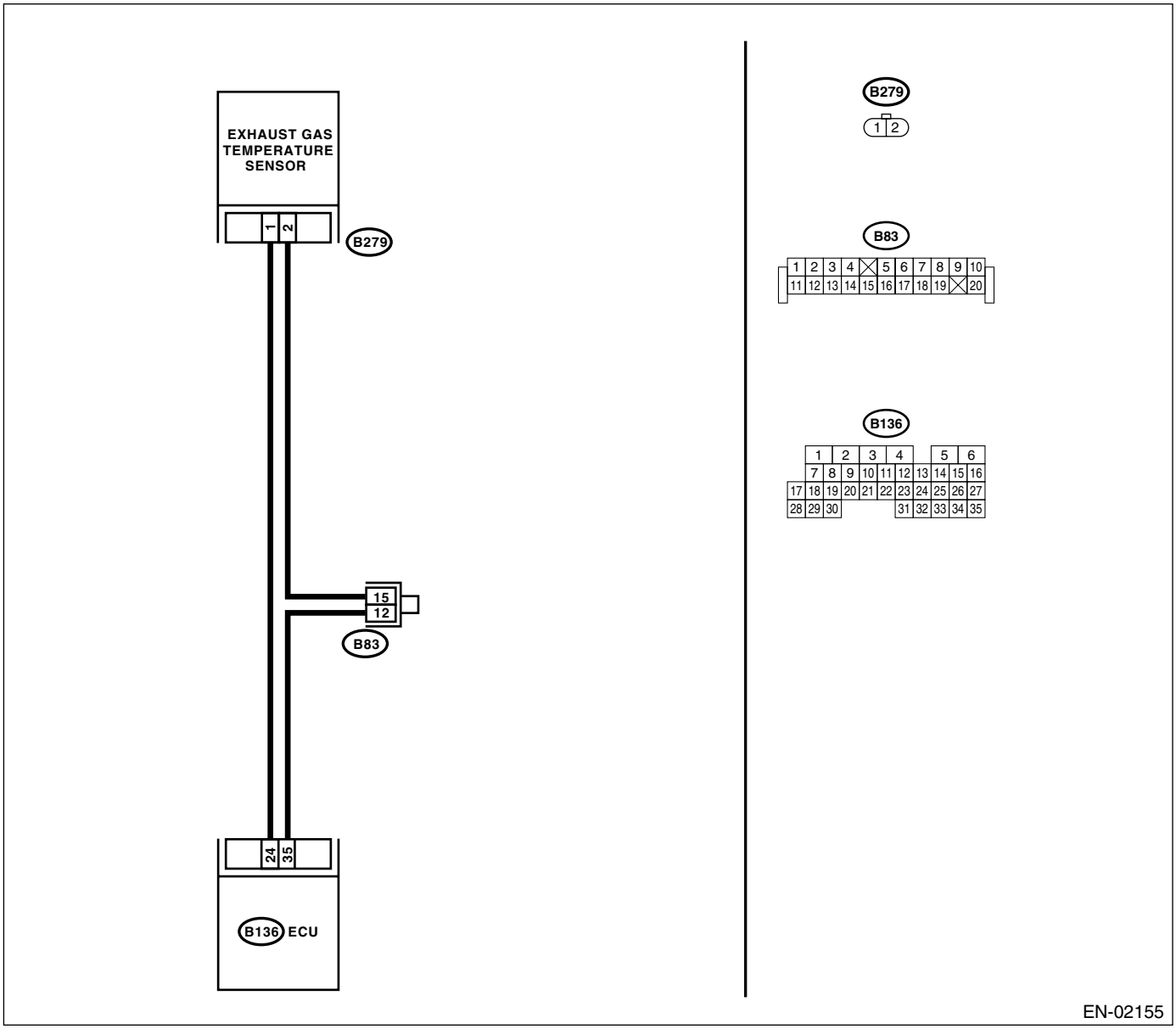
MEMO:

BV:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-188, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



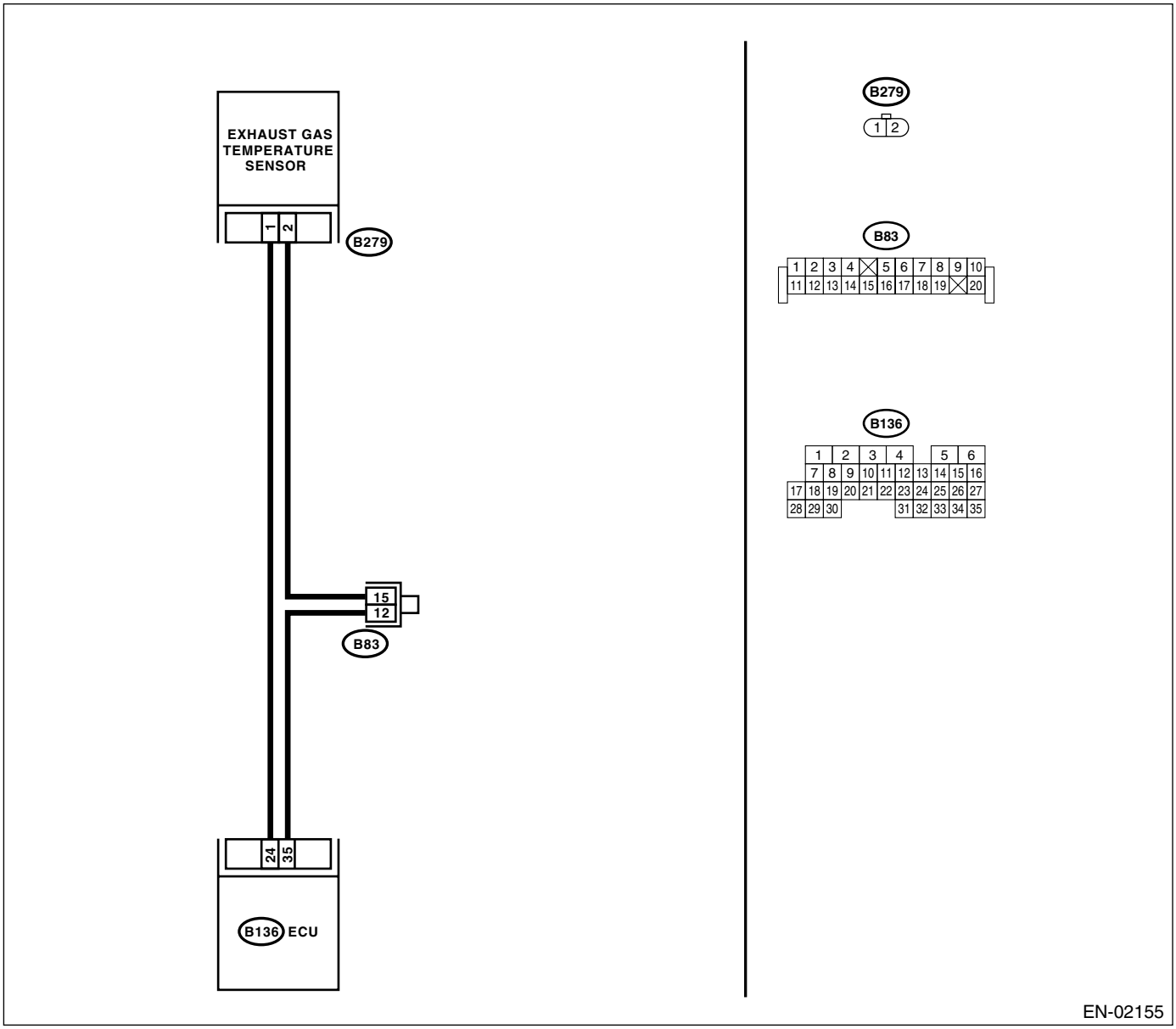
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 1200°C (2192°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust gas temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 372°C (702°F)?	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-42, Exhaust Temperature Sensor.>	Repair the ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

BW:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 372°C (702°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust gas temperature sensor. 3) Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-42, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

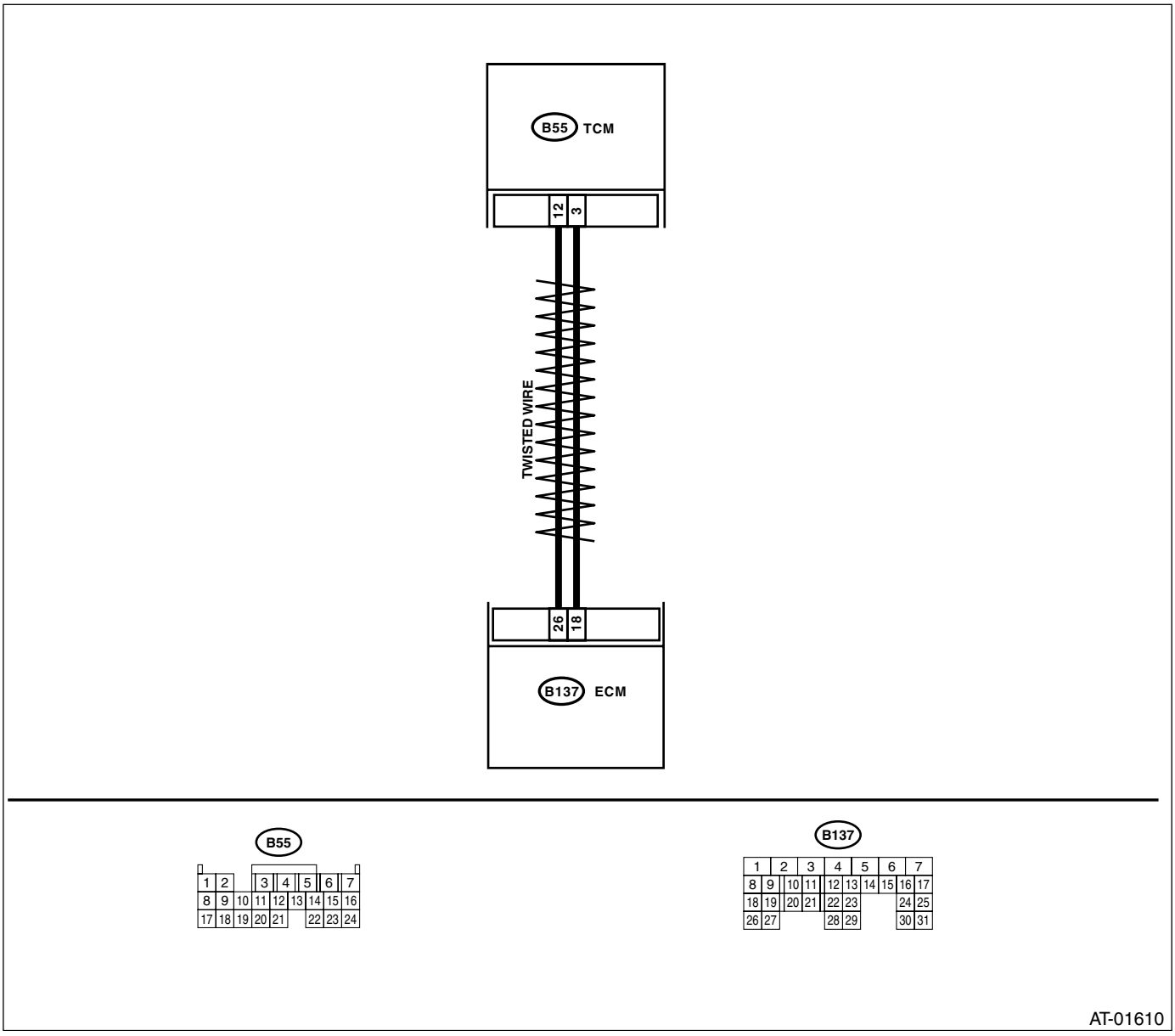
MEMO:

BX:DTC P0600 — CAN COMMUNICATION CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



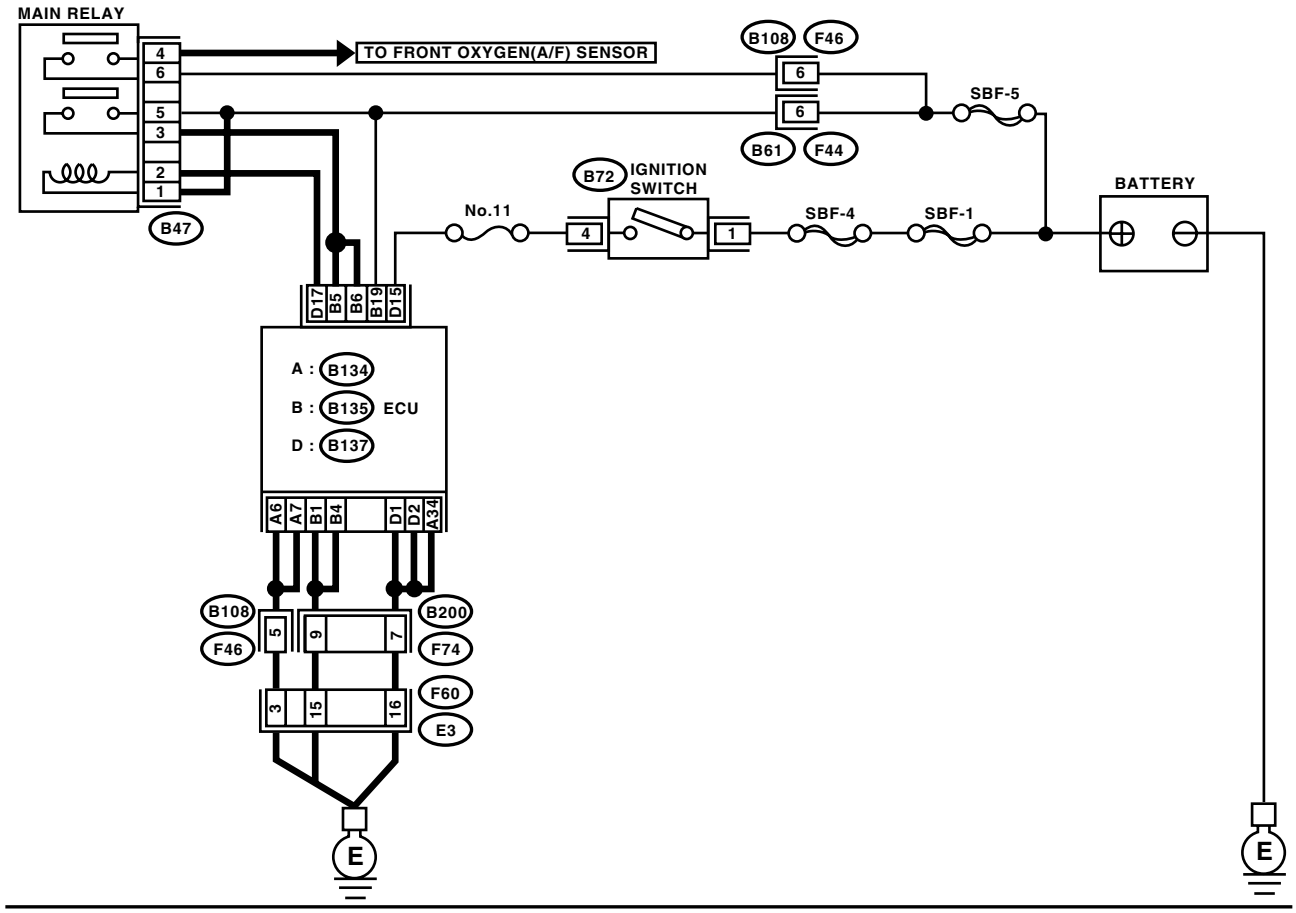
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Disconnect connector from TCM. 4) Measure the resistance between ECM and TCM. ***Connector & terminal*** ***(B137) No. 18 — (B55) No. 3:*** ***(B137) No. 26 — (B55) No. 12:***	Is measured value less than 1 Ω?	Go to step **2.**	Repair harness and connector.
2	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure resistance between ECM connector and chassis. ***Connector & terminal*** ***(B137) No. 18 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:***	Is measured value more than 1 MΩ?	Go to step **3.**	Repair harness and connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM.** Check resistance in ECM. ***Connector & terminal*** ***(B137) No. 18 — (B137) No. 26:***	Is measured value more than 1 MΩ?	Go to step **4.**	Repair harness and connector.
4	**CHECK AT SYSTEM STATE.** Perform diagnosis of AT using Subaru Select Monitor. Check DTC P1718 display.	Is there displayed DTC P1718?	Check AT system.	Replace ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

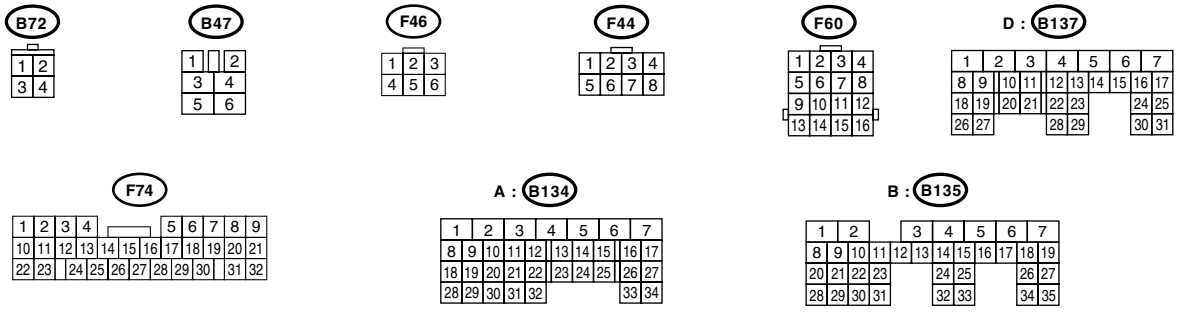
BY:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02134

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	A temporary poor contact.

MEMO:

BZ:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —

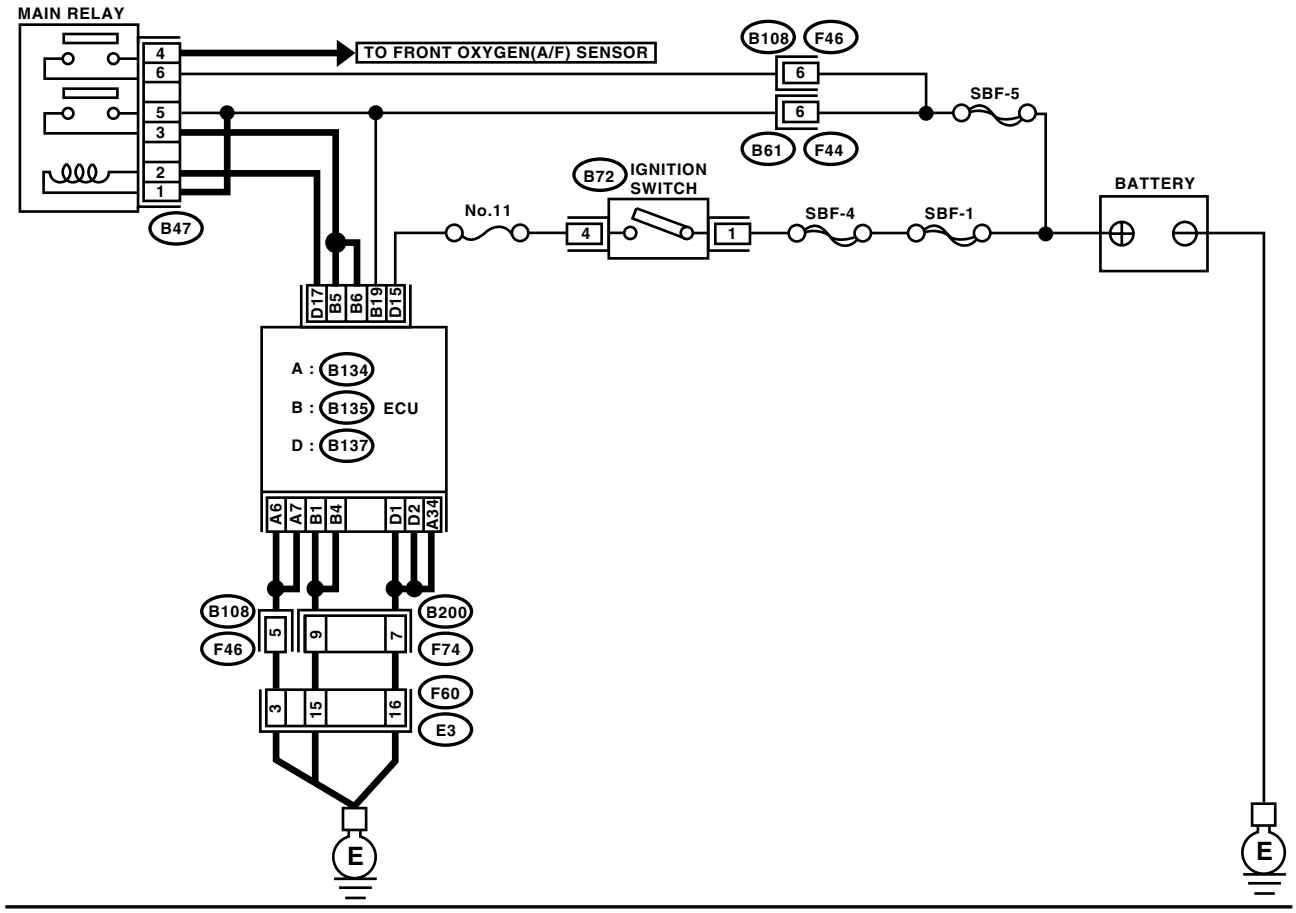
NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)-290, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

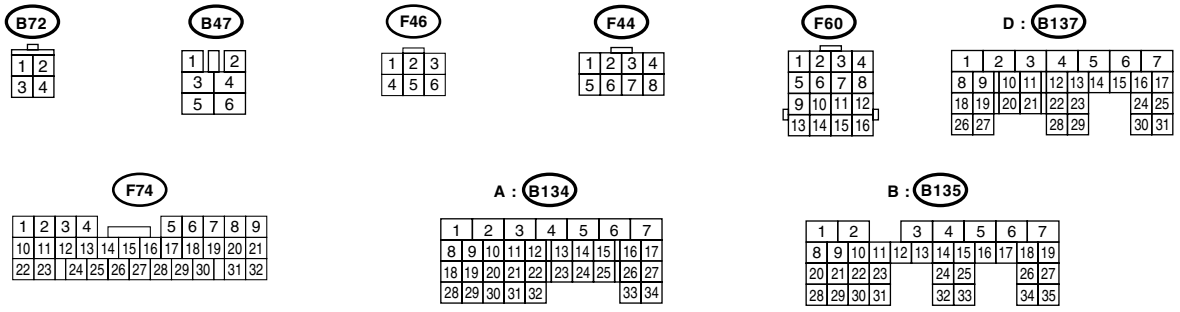
CA:DTC P0607 — CONTROL MODULE PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4DOTC)-196, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02134

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the measured value within 10 to 13 V?	Go to step **2.**	Repair the open circuit or ground short of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM** 1) Start the engine. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the measured value within 13 to 15 V?	Go to step **3.**	Repair the open circuit or ground short of power supply circuit.
3	**CHECK GROUND HARNESS OF ECM** Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Repair poor contact of ECM connector. If poor contact occur, replace the ECM.	Retighten the engine ground terminal.

CB:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

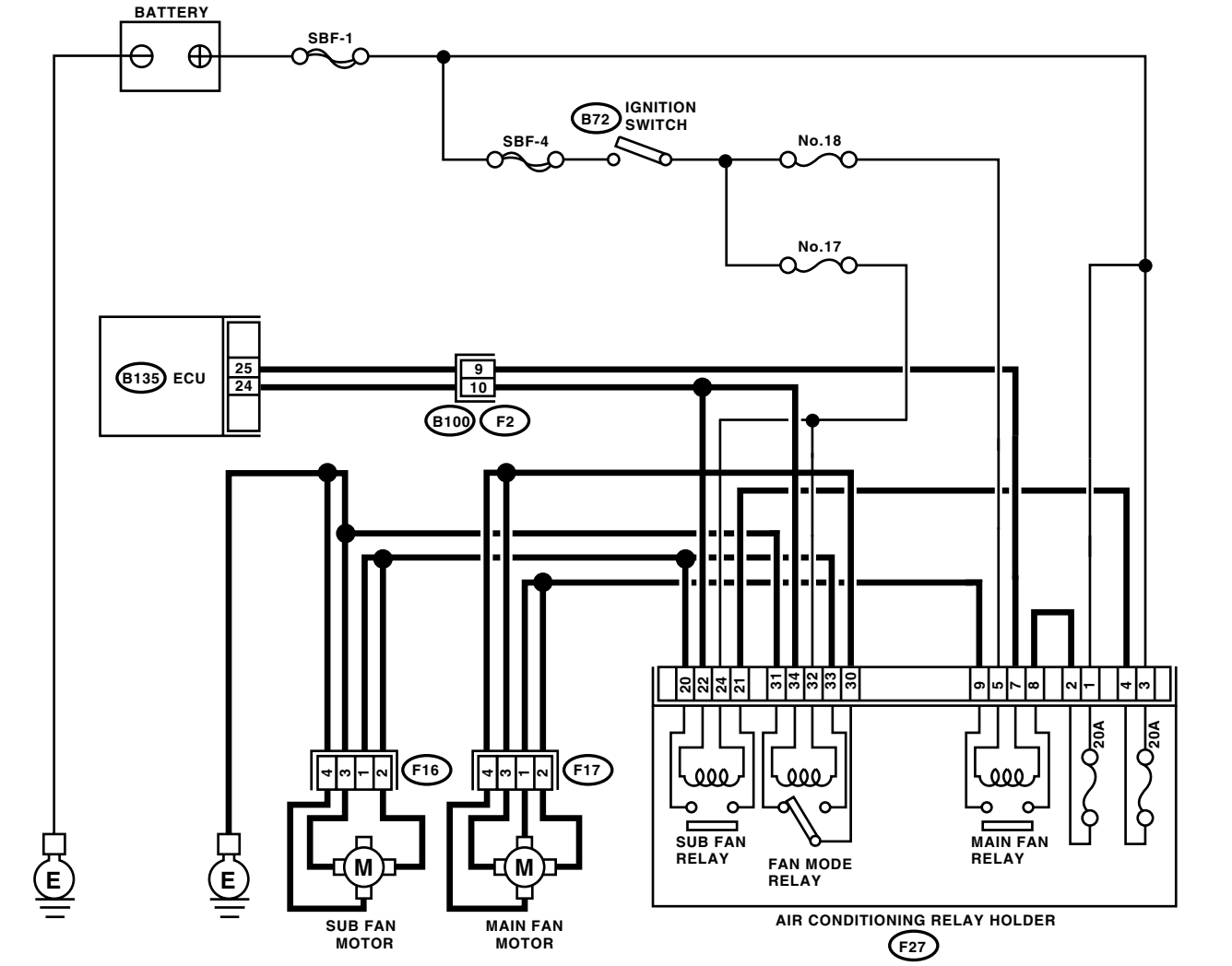
NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)-396, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

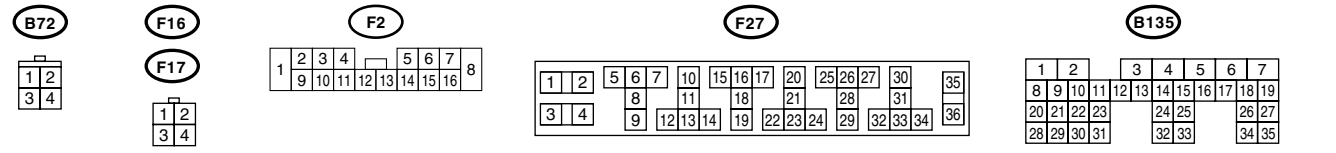
CC:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02153

Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Does the voltage change within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the main fan relay 1 and main fan relay 2 from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 5 — No. 7:***	Is the measured value within 87 to 107 Ω?	Go to step **5.**	Replace the main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***(B135) No. 25 — (F27) No. 7:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair poor contact in ECM or fan relay connector.	Contact your SOA Service Center.

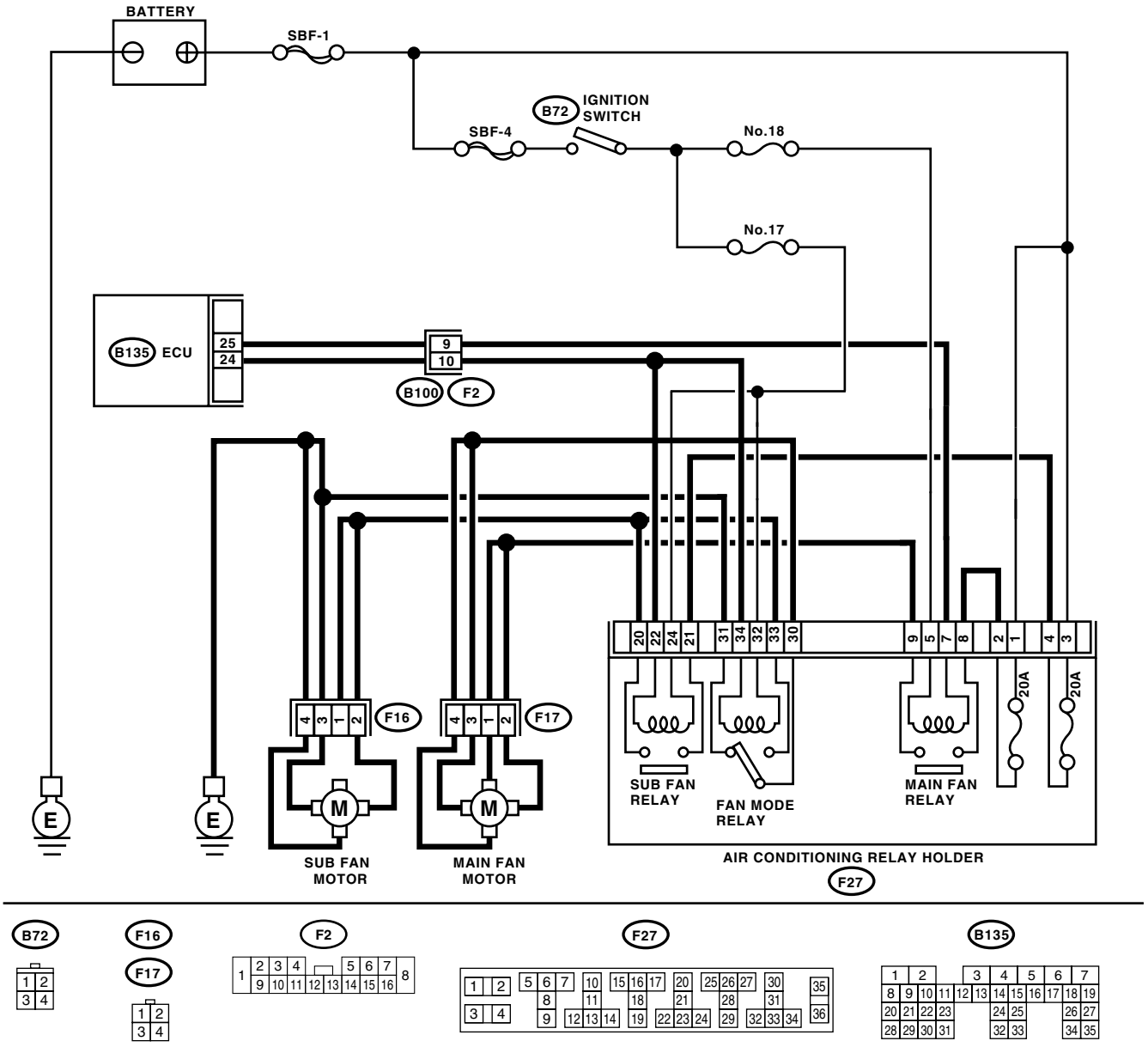
MEMO:

CD:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-204, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02153

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Does the voltage change within 0 to 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay, sub fan relay and fan mode relay. 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 8 — No. 9:***	Is the measured value less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the measured value less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

CE:DTC P0700 — AT MIL LIGHT UP REQUEST —

- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-205, DTC P0700 — AT MIL LIGHT UP REQUEST — , Diagnostic Trouble Code (DTC) Detecting Criteria.>

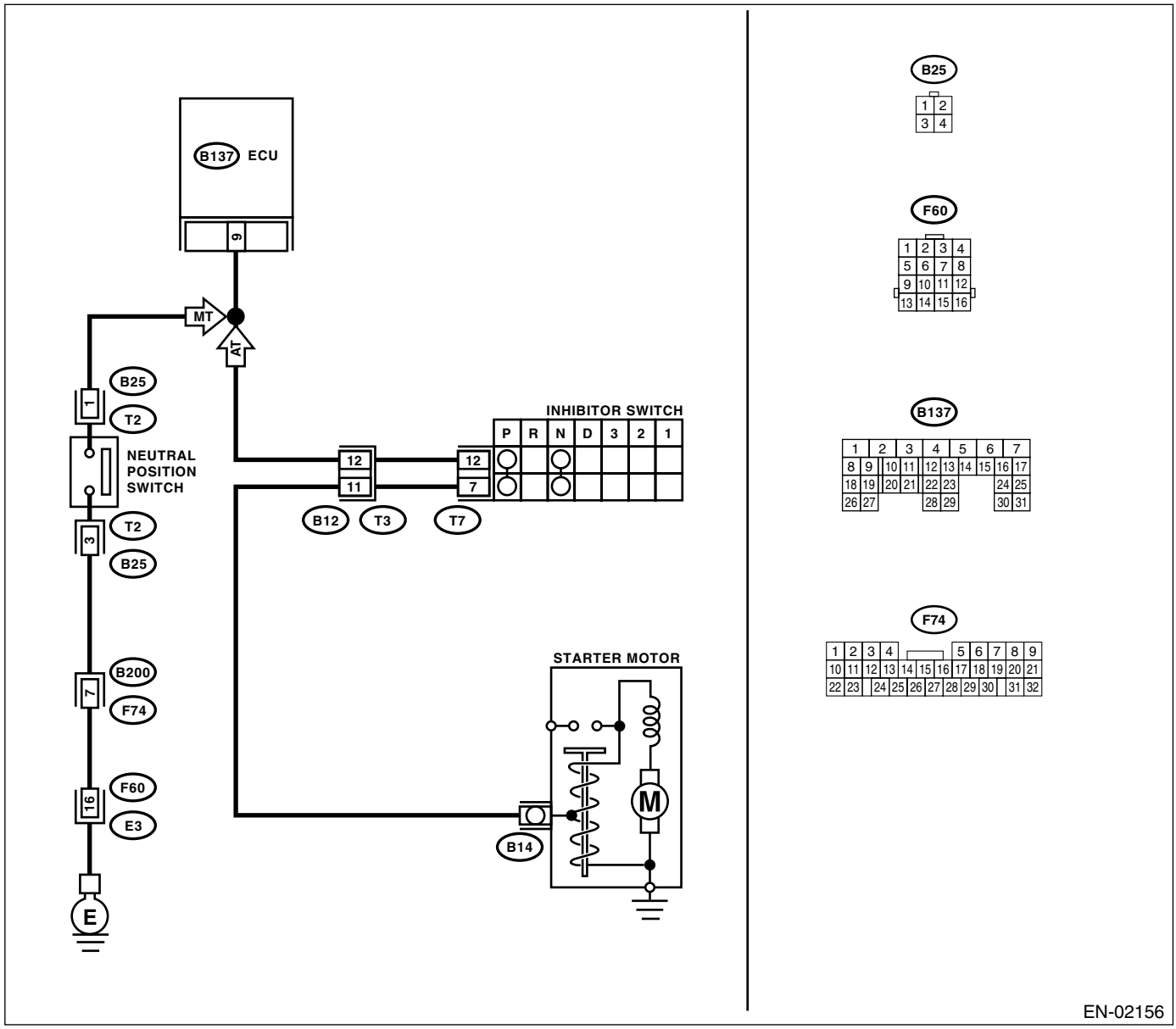
NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(H4DOTC)-2, PROCEDURE, Basic Diagnostic Procedure.>

CF:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



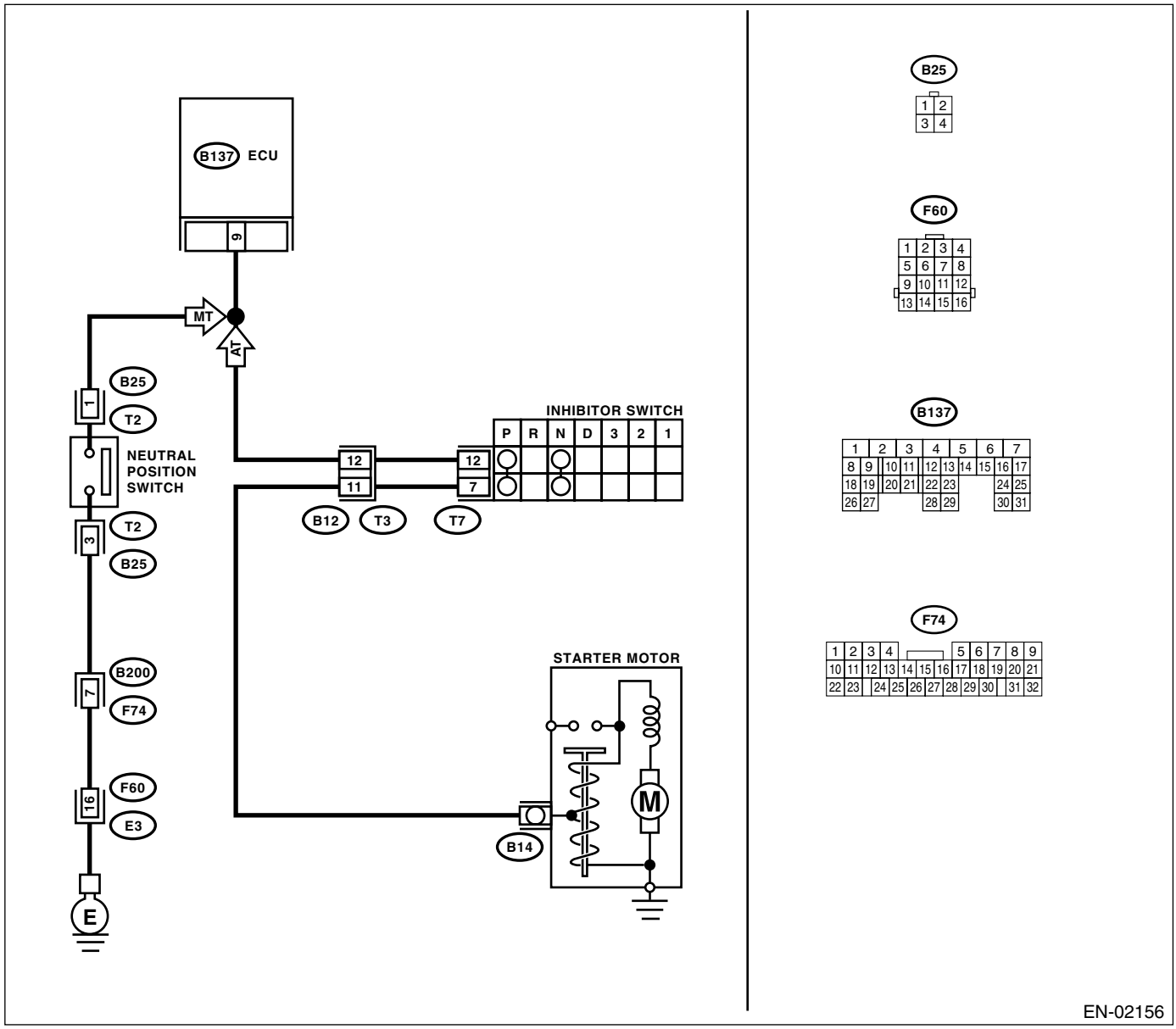
	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Is DTC P0705 indicated?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the select lever except for "N" and "P" positions. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Replace the inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CG:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



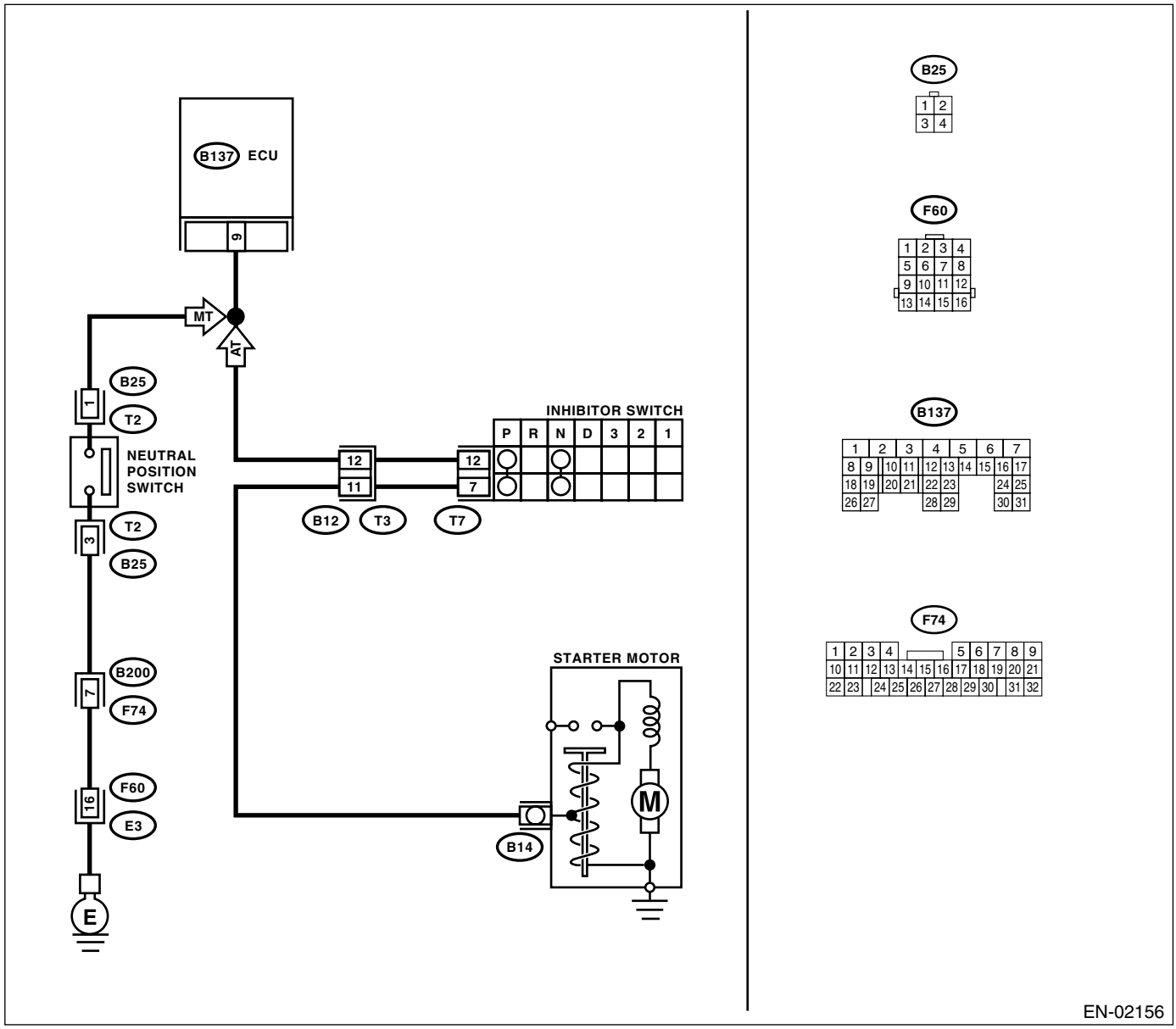
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 3:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the measured value less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B137) No. 9 — (B25) No. 1:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center.

CH:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Is DTC P0705 indicated?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B137) No. 9 — (T7) No. 12:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

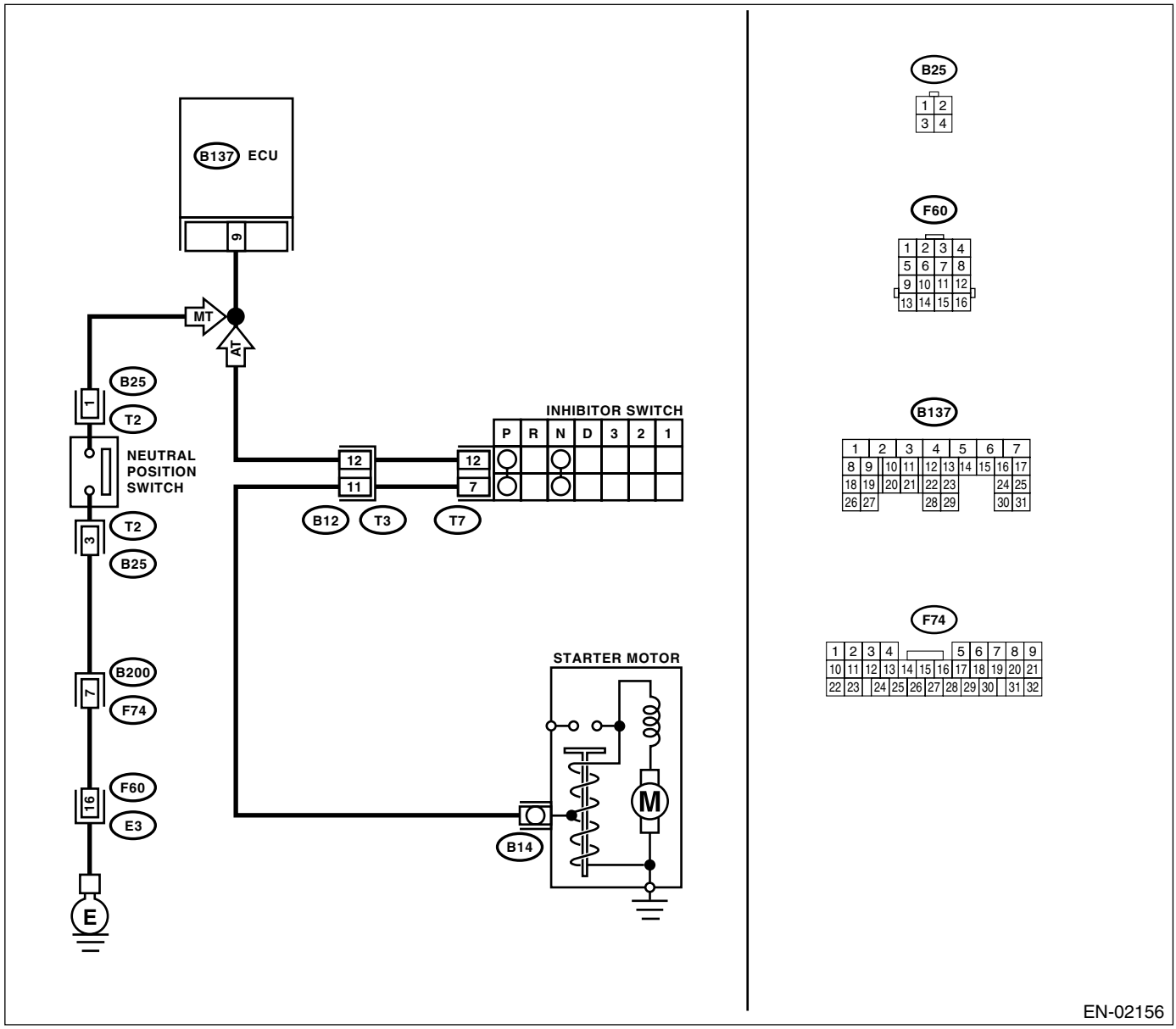
MEMO:

CI: DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



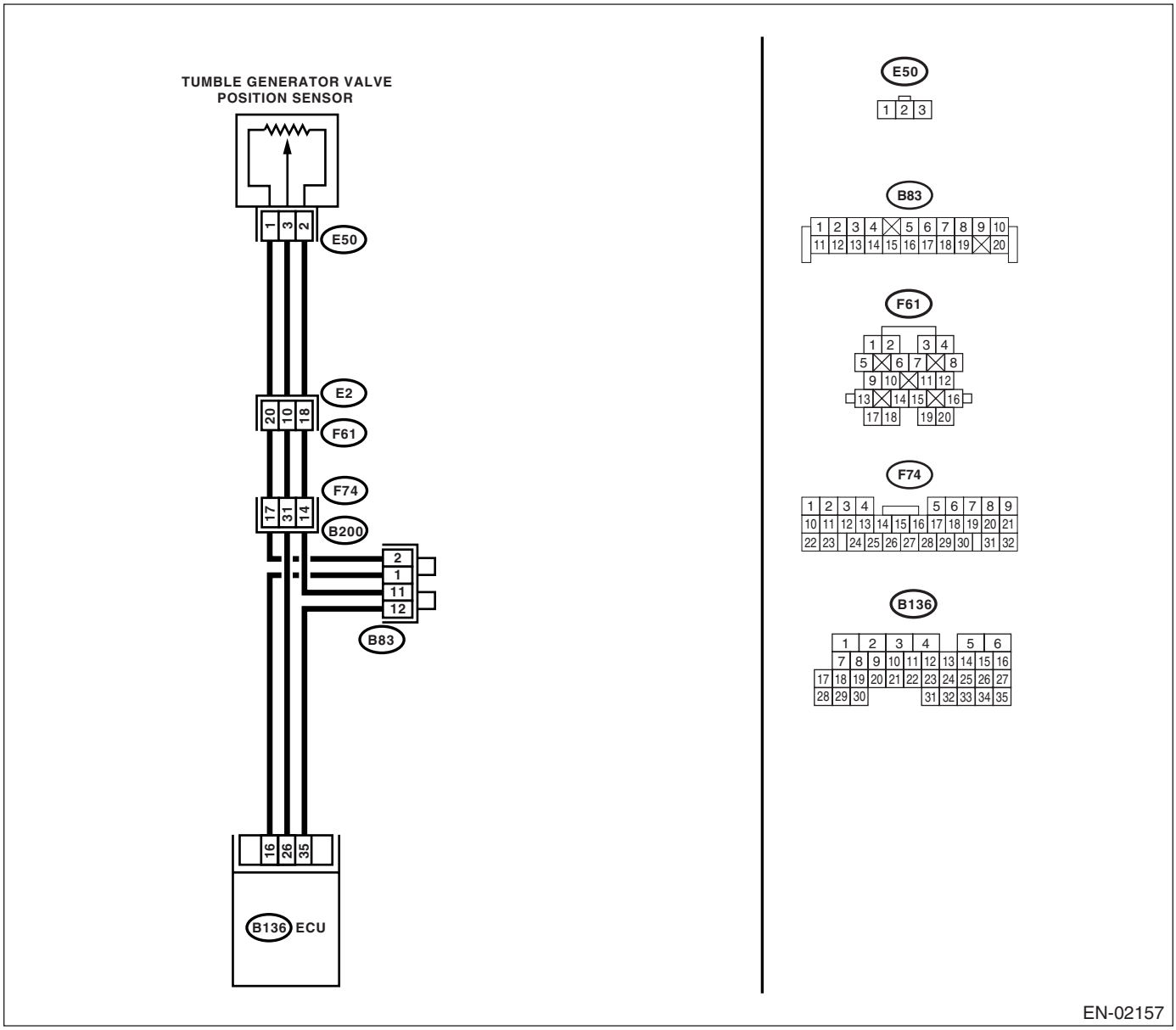
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Set the shift lever to except neutral position. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Set the shift lever to neutral position. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact your SOA Service Center.
4	**CHECK INPUT SIGNAL FOR ECM.** 1) Disconnect ECM connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and transmission connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B137) No. 9 — (B25) No. 1:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and transmission harness • Poor contact in transmission harness connector • Poor contact in ECM connector
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **7.**	Repair the open circuit in harness of neutral position switch ground line.
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Set the shift lever to except neutral position. 2) Measure the resistance between transmission harness connector receptacle's terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Replace the neutral position switch.
8	**CHECK POOR CONTACT.** Check poor contact in the transmission harness connector.	Is there poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center.

CJ: DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-210, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

Step		Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 26 — (E50) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Position Sensor.>

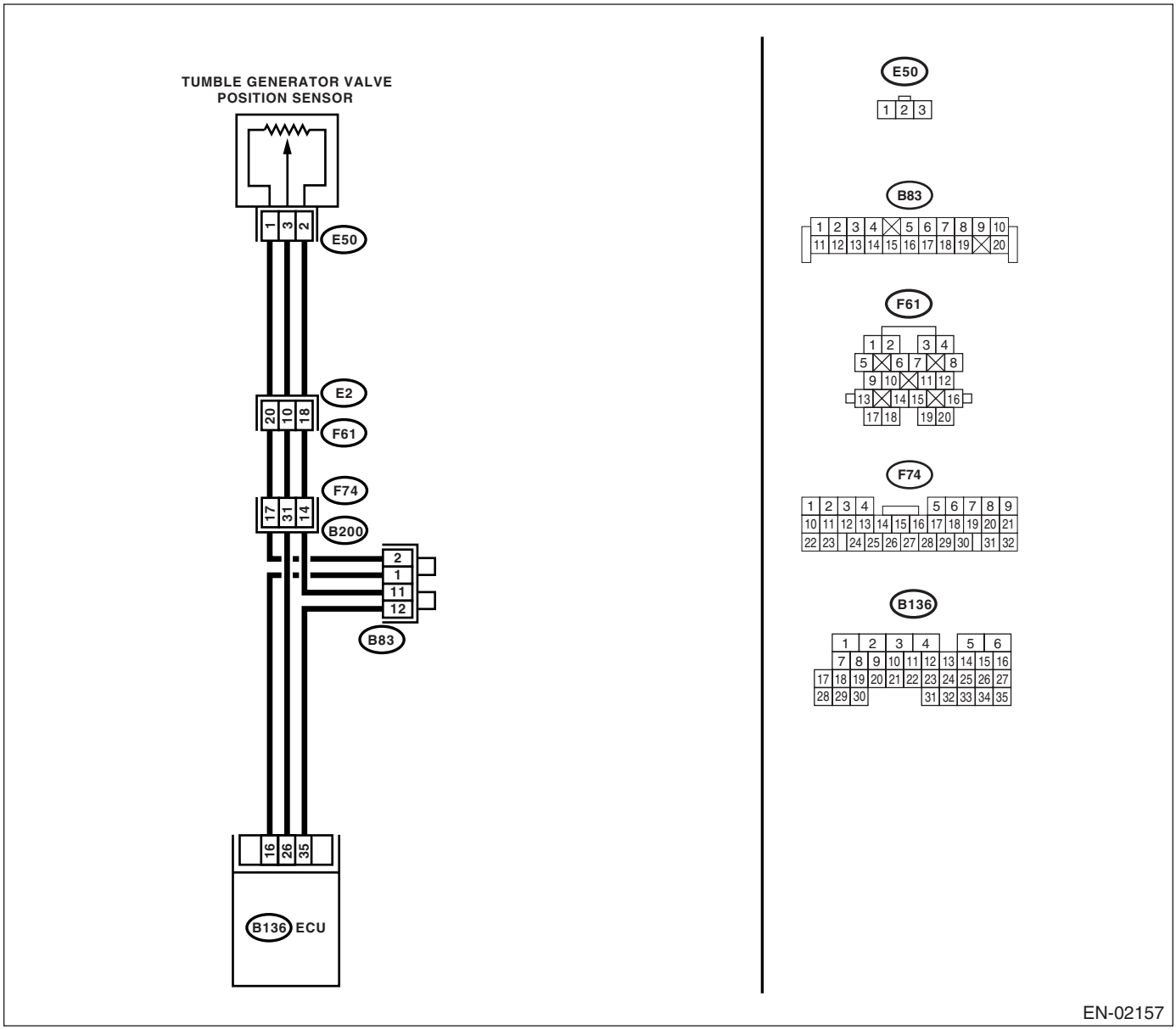
MEMO:

CK:DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-212, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



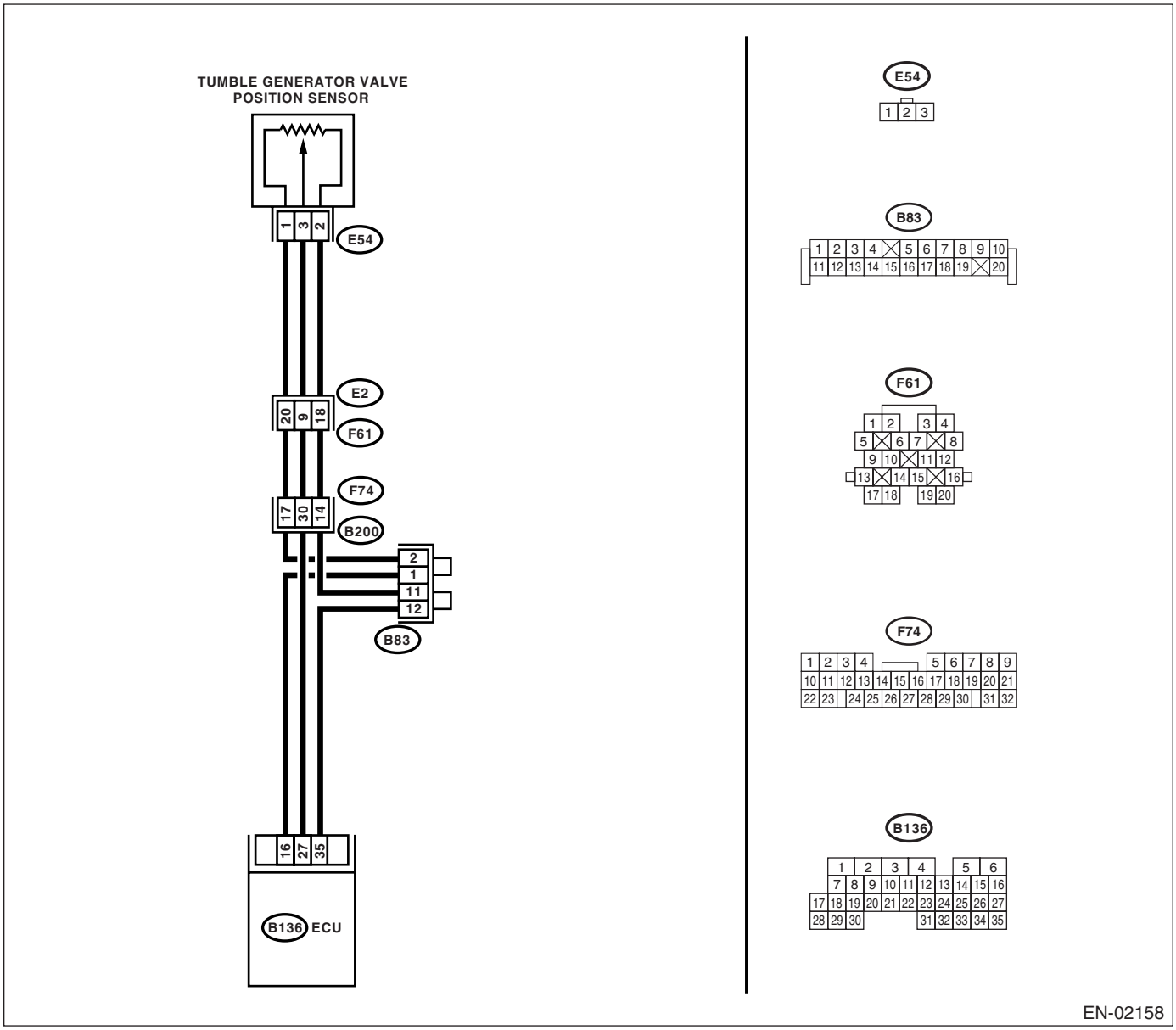
Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Position Sensor.>

CL: DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-214, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the measured value less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 27 — (E54) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Position Sensor.>

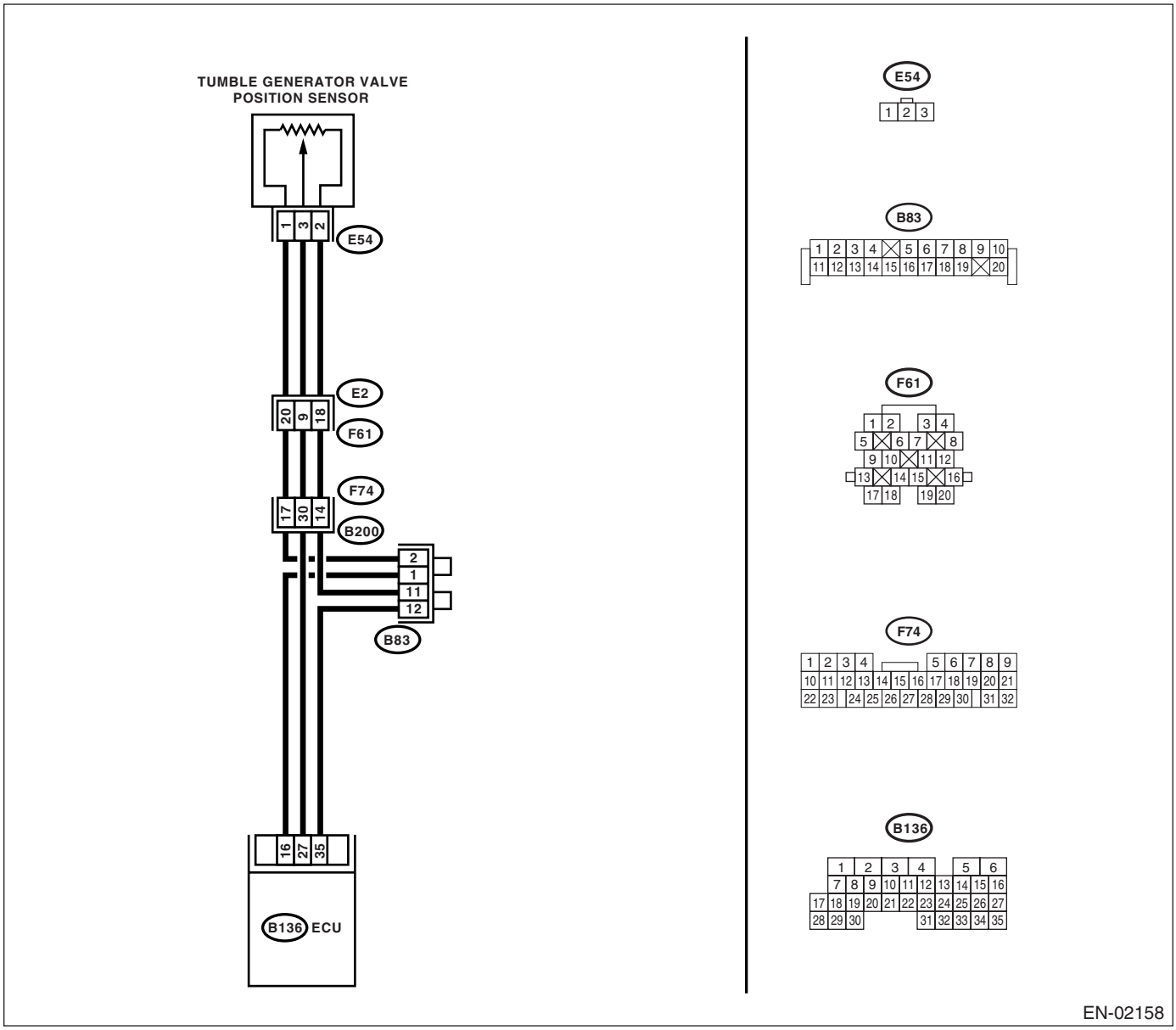
MEMO:

CM:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-216, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Position Sensor.>

CN:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CO:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CP:DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CQ:DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-221, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

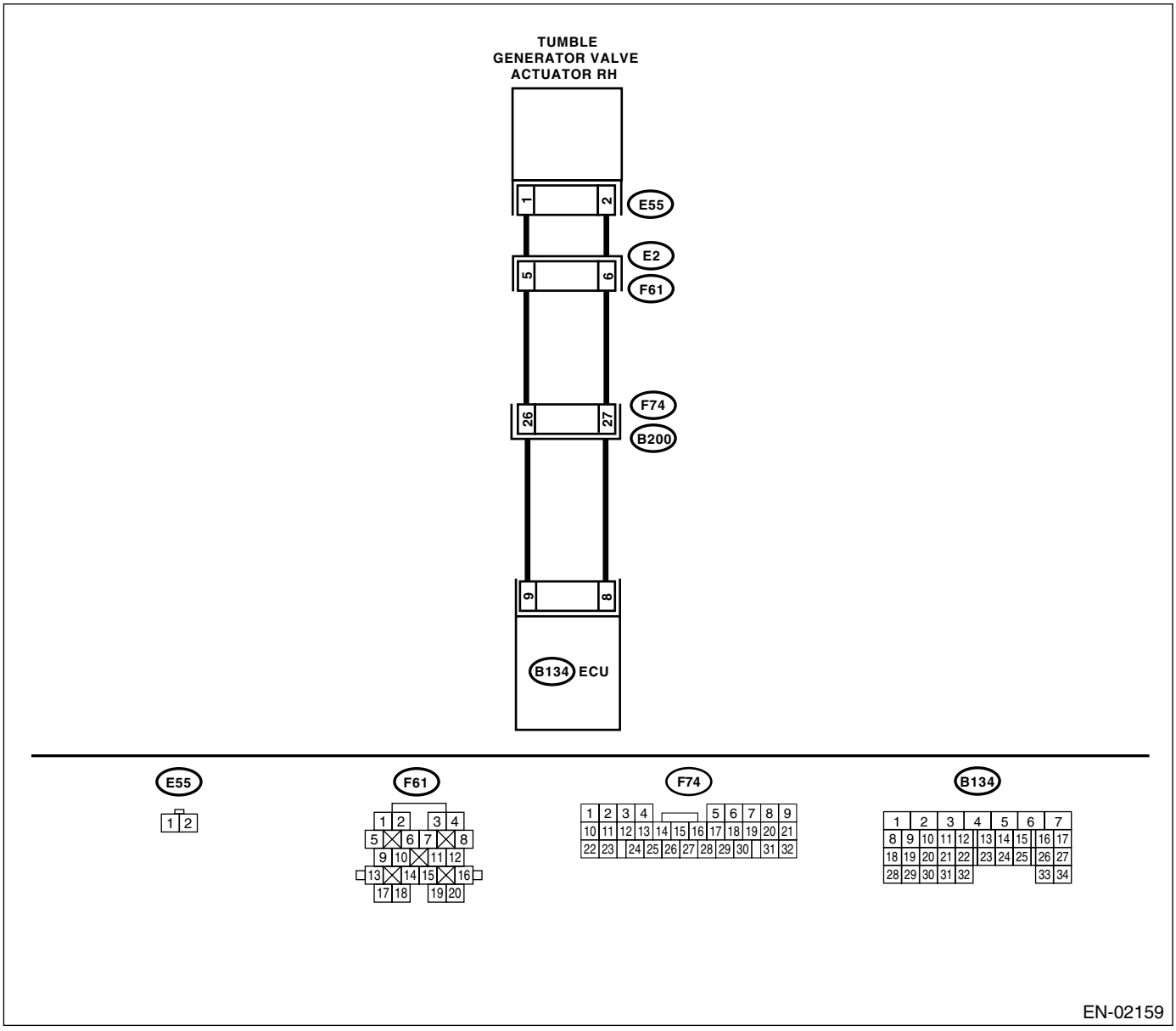
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-34, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CR:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



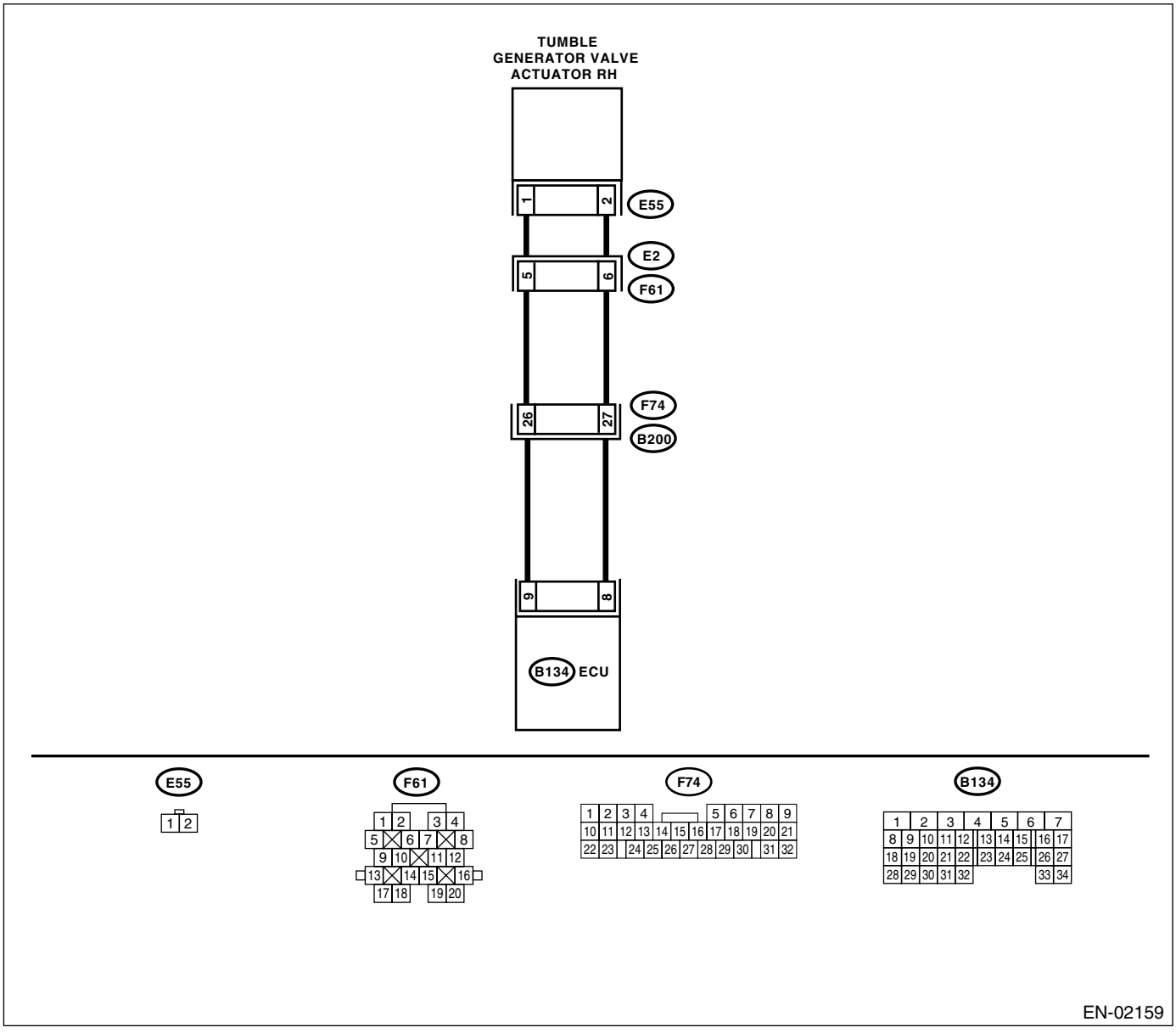
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B134) No. 9:*** ***(E55) No. 2 — (B134) No. 8:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Actuator.>

CS:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-224, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



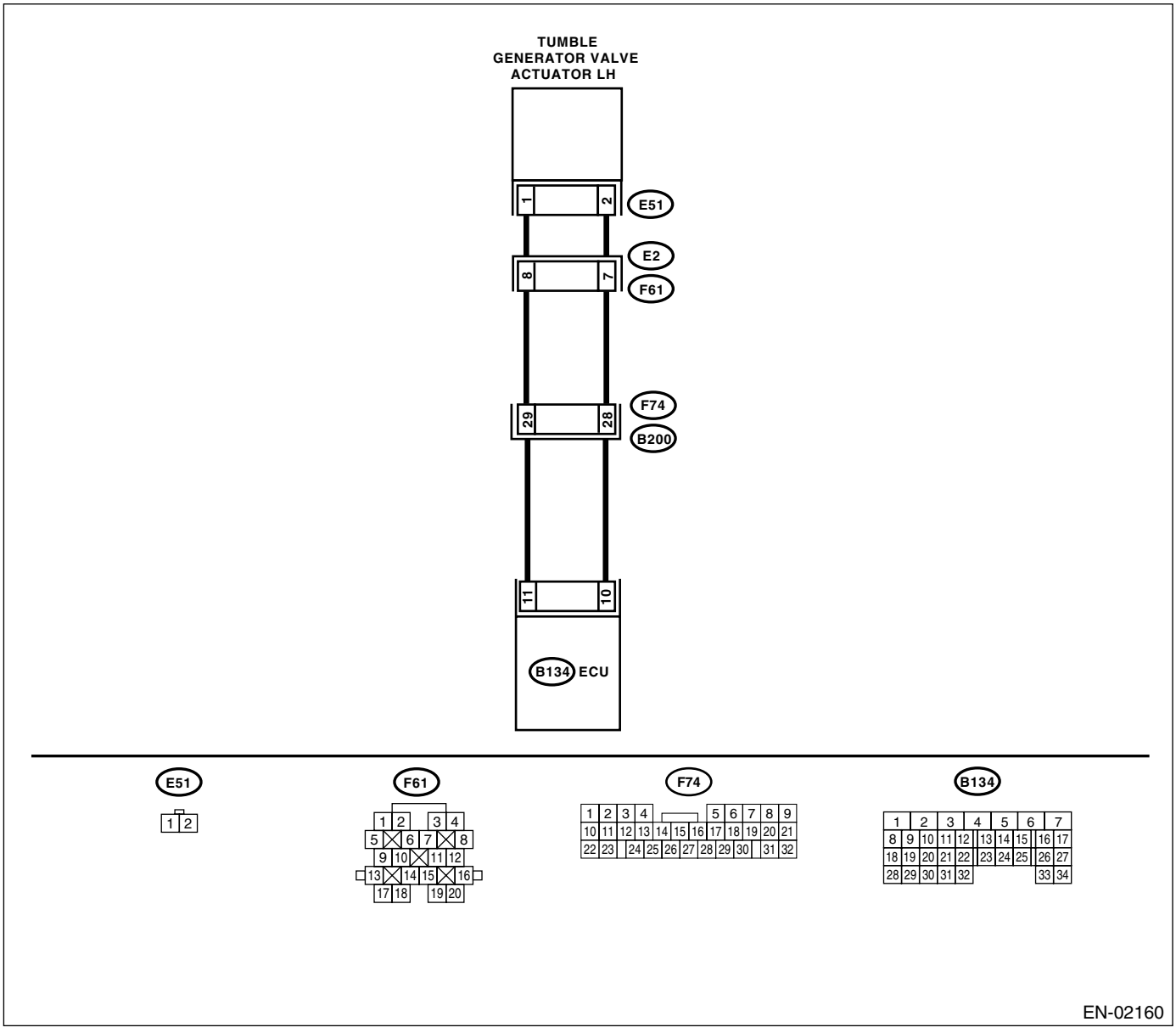
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (–):*** ***(E55) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CT:DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-226, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



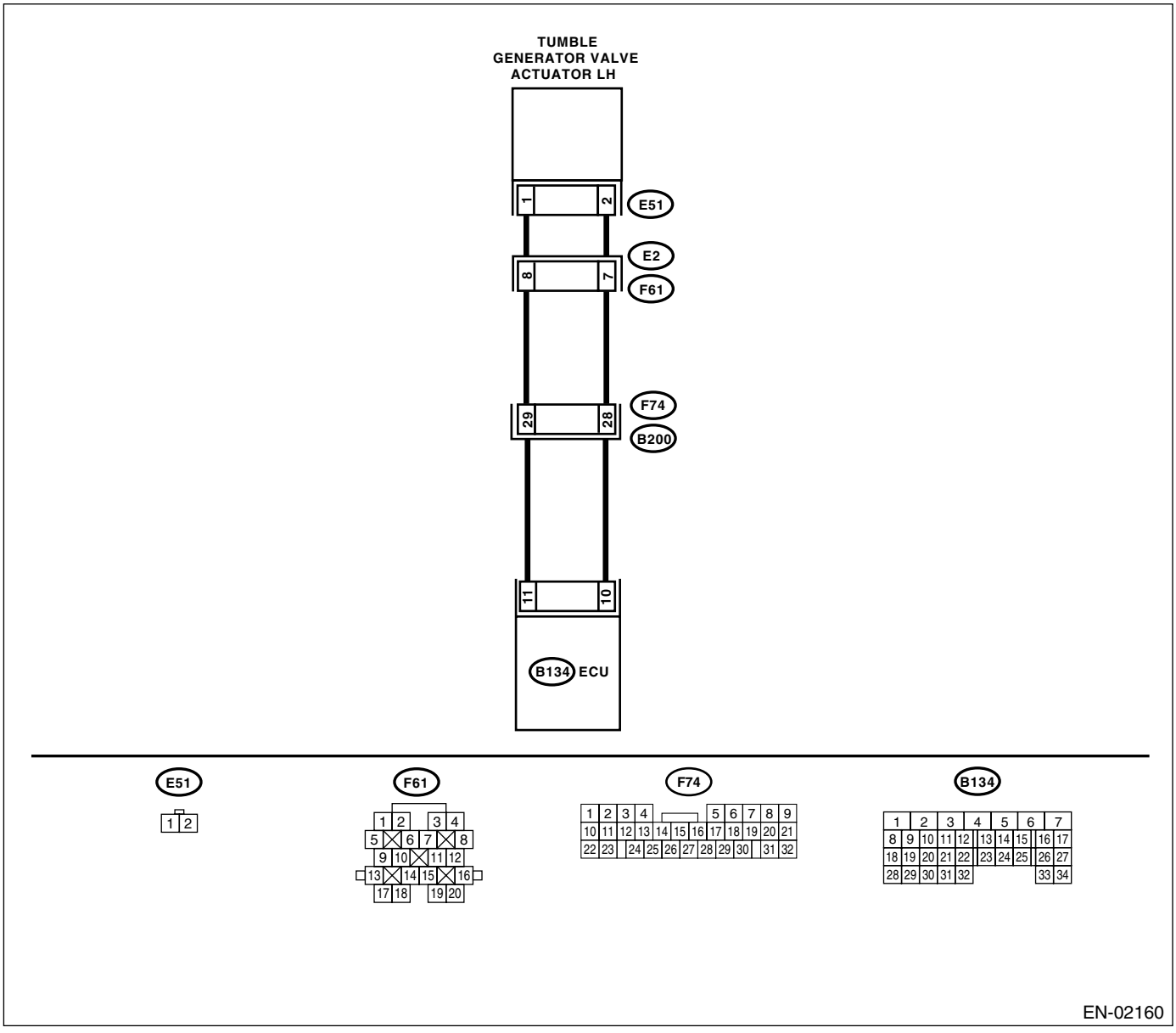
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B134) No. 11:*** ***(E51) No. 2 — (B134) No. 10:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Actuator.>

CU:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (–):*** ***(E51) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-35, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CV:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-230, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CW:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-231, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

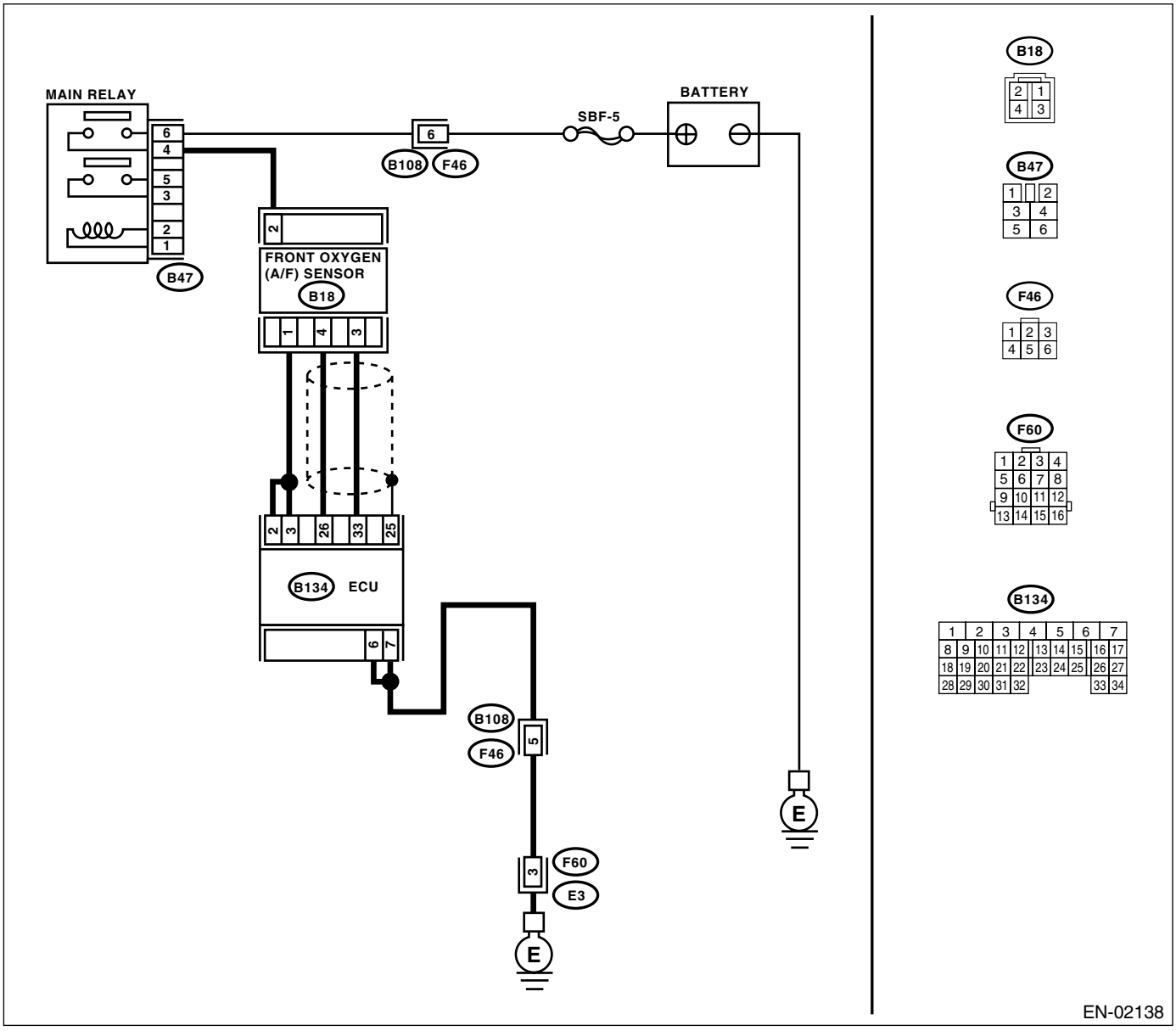
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CX: DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-232, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



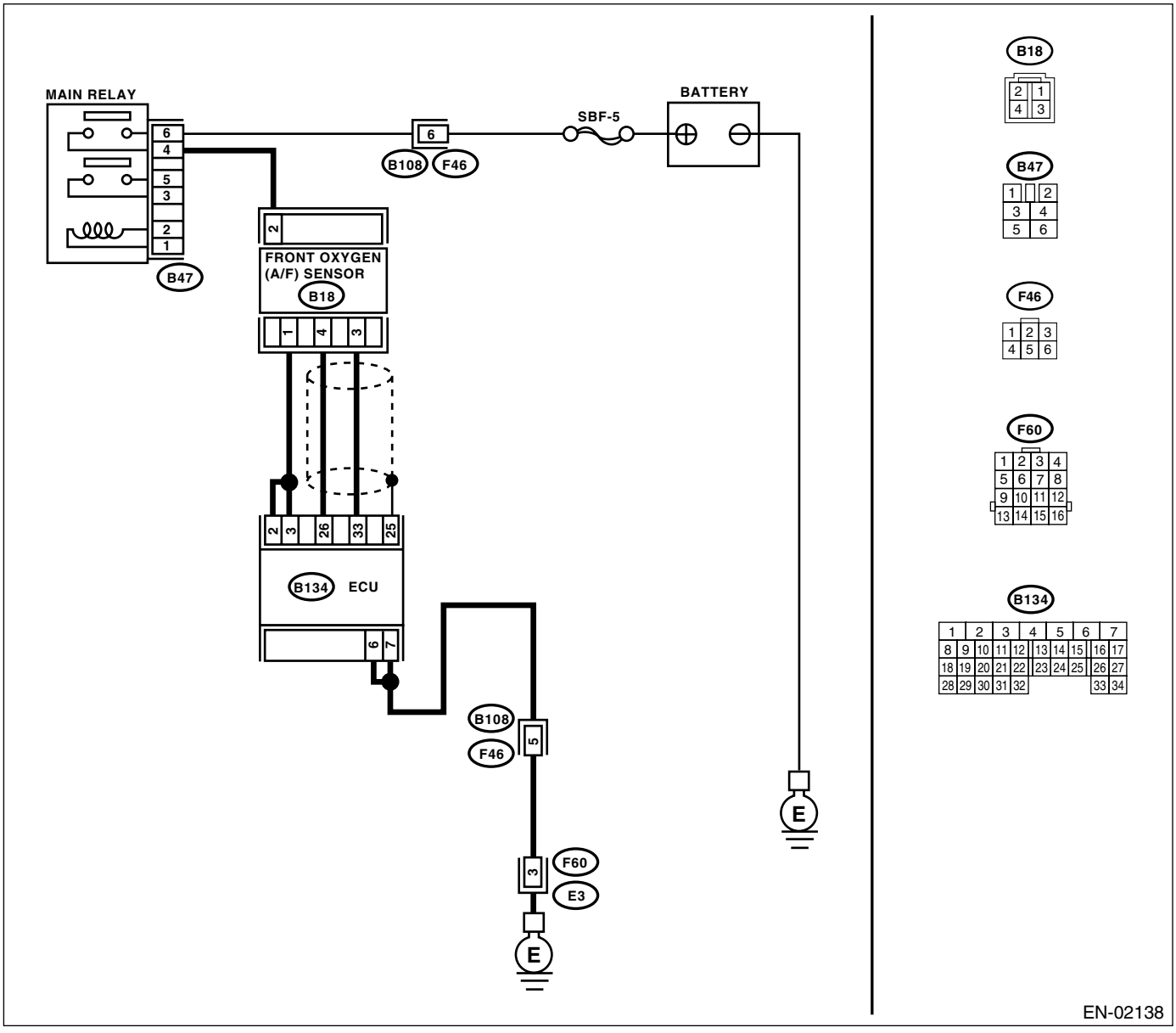
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 33 — (B18) No. 3:*** ***(B134) No. 26 — (B18) No. 4:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>

CY: DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-236, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

MEMO:

CZ:DTC P1160 — RETURN SPRING FAILURE —

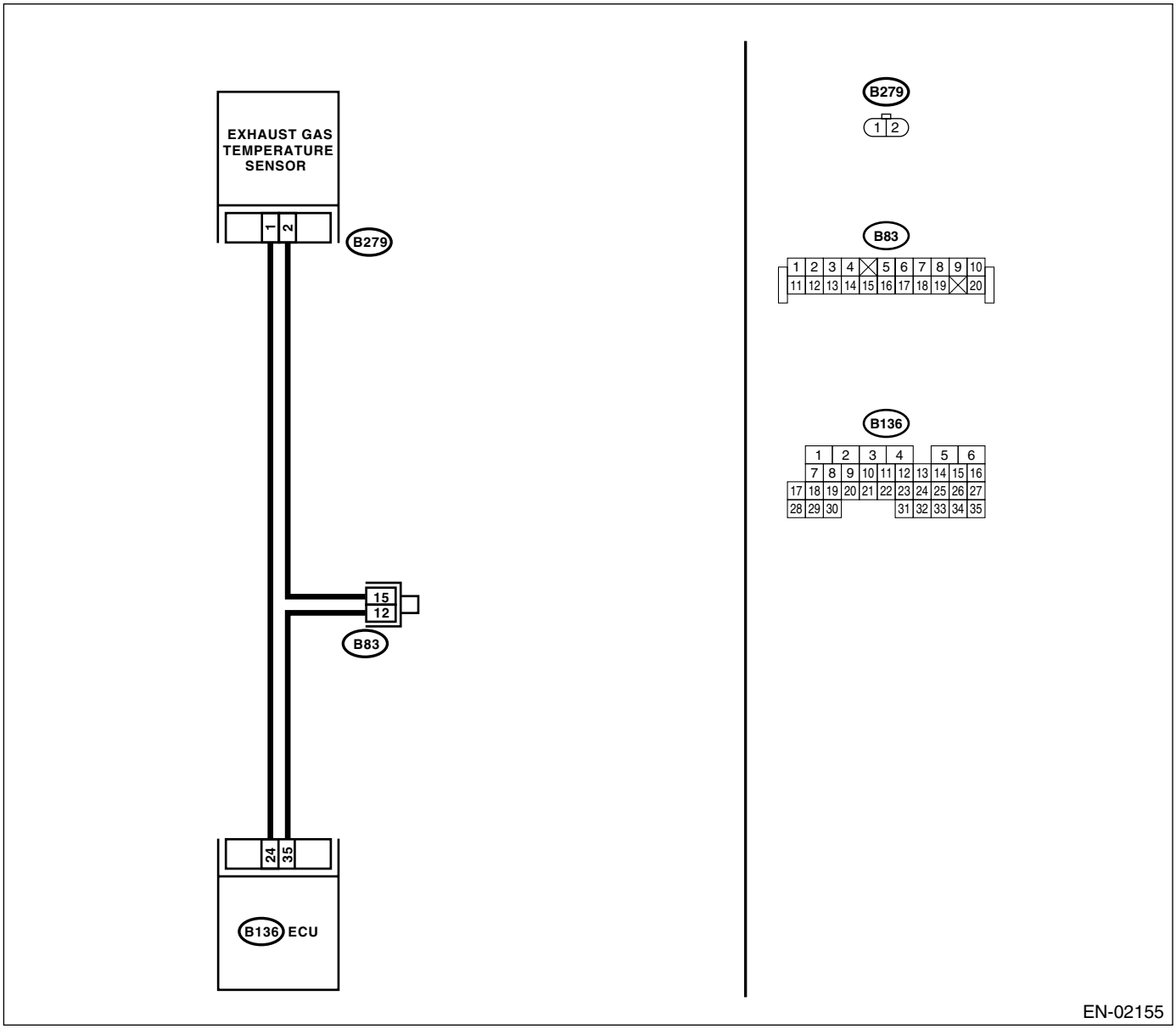
NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)-396, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DA:DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-242, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



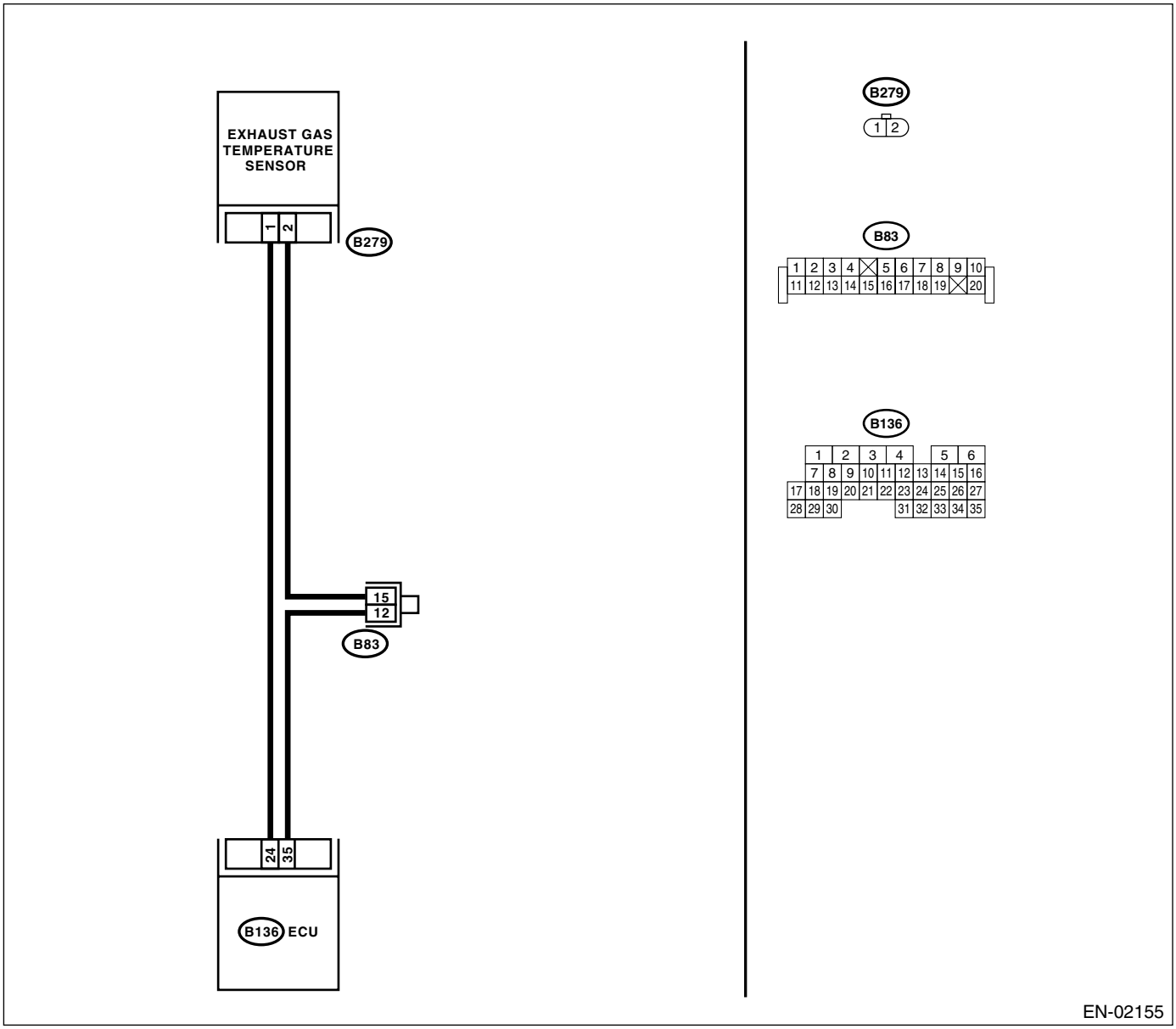
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC.** Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace the failure, then replace precatalytic converter.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DB:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-244, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



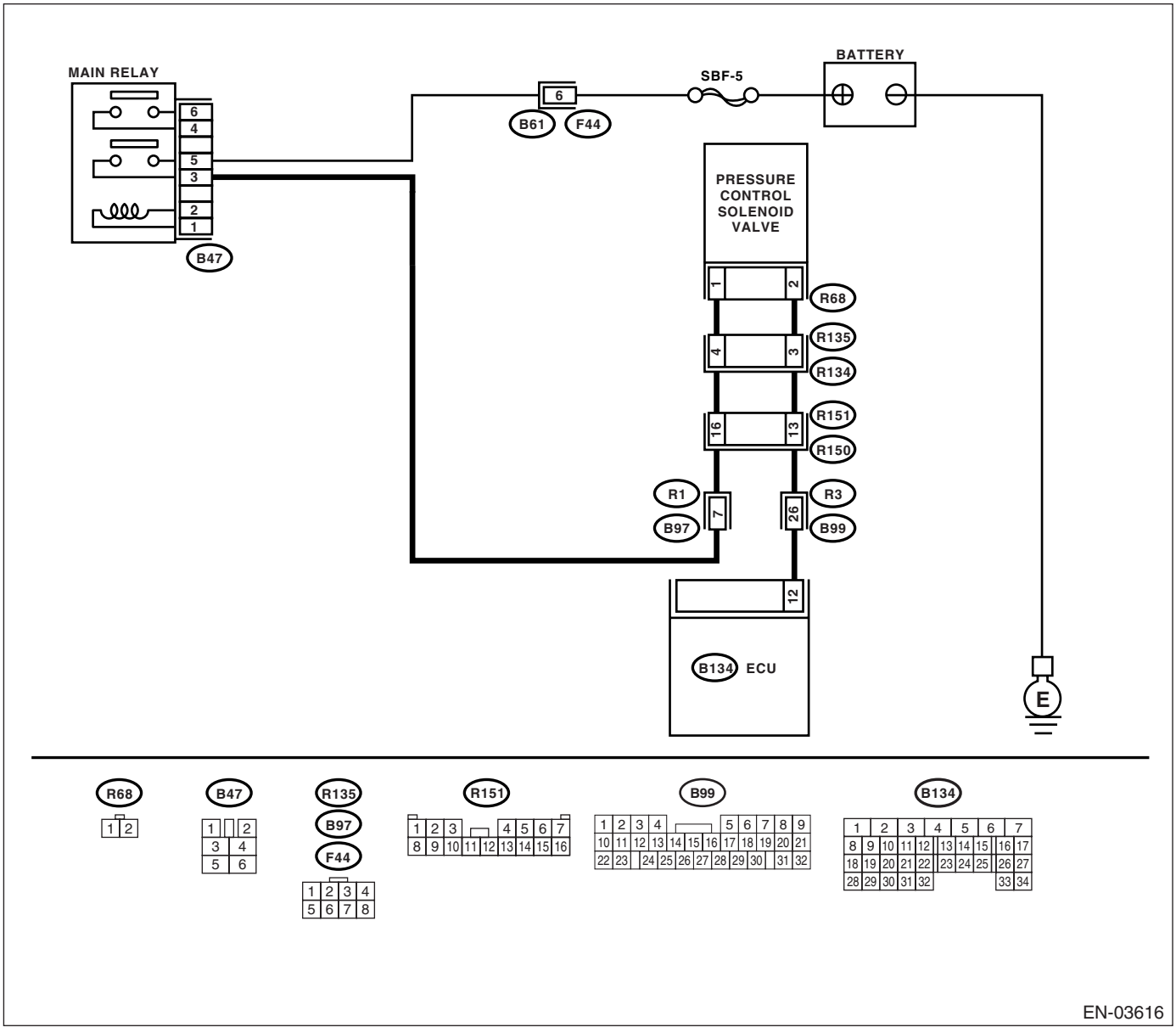
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-42, Exhaust Temperature Sensor.>

DC:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-246, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 12 — (R68) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

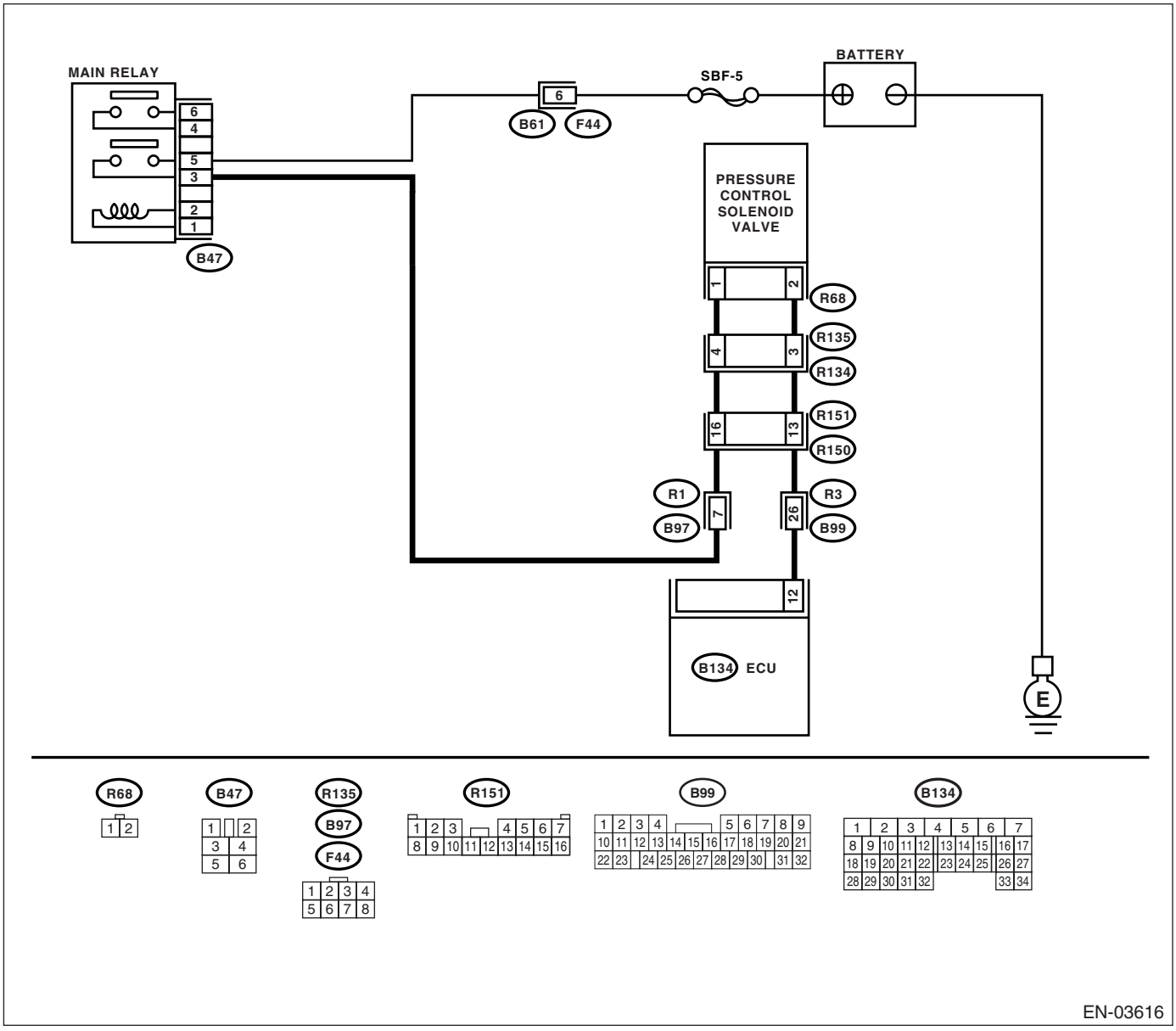
MEMO:

DD:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-248, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



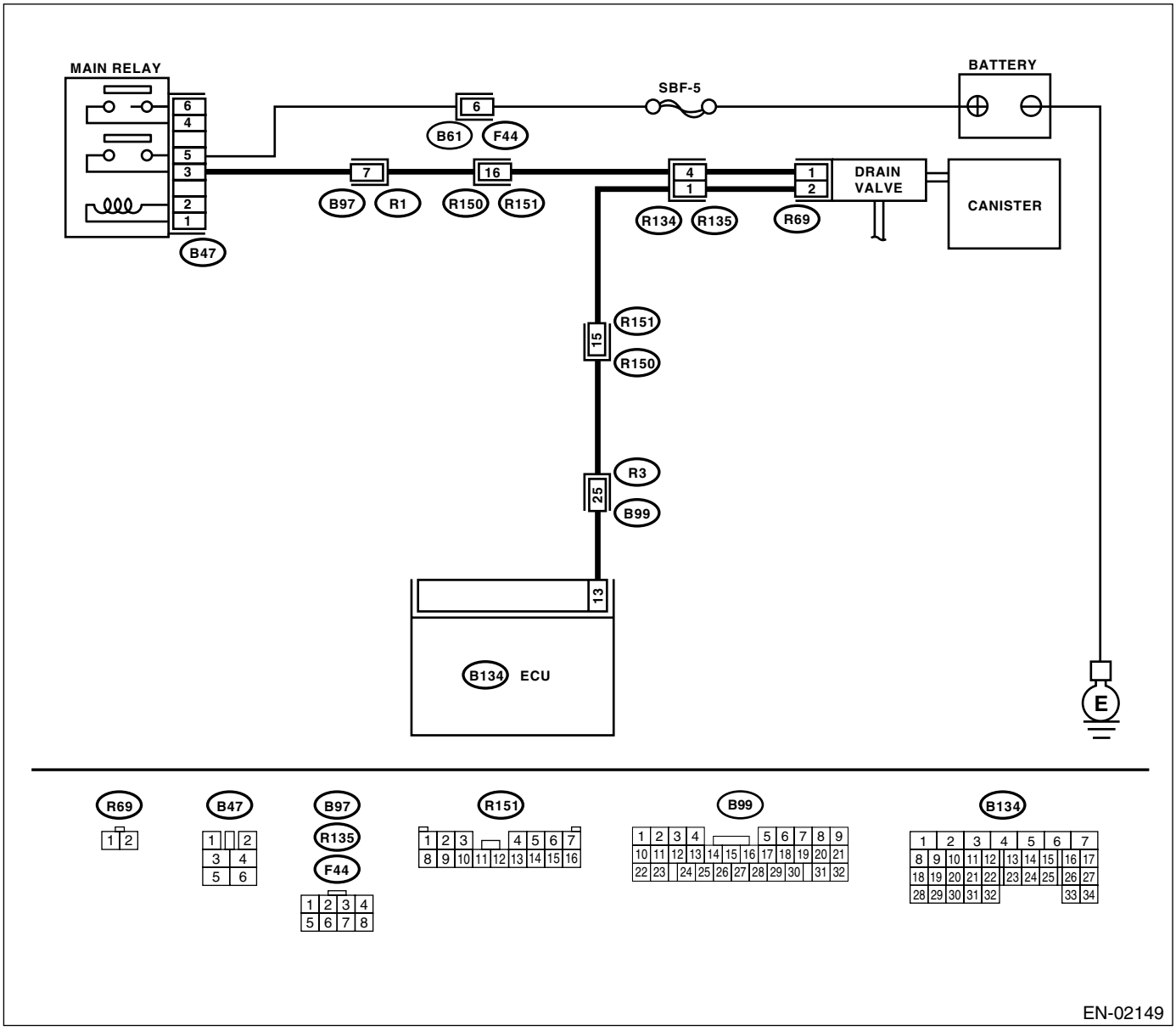
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Does the voltage value change within 0 to 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the pressure control solenoid valve <Ref. to EC(H4DOTC)-12, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

DE:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-250, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



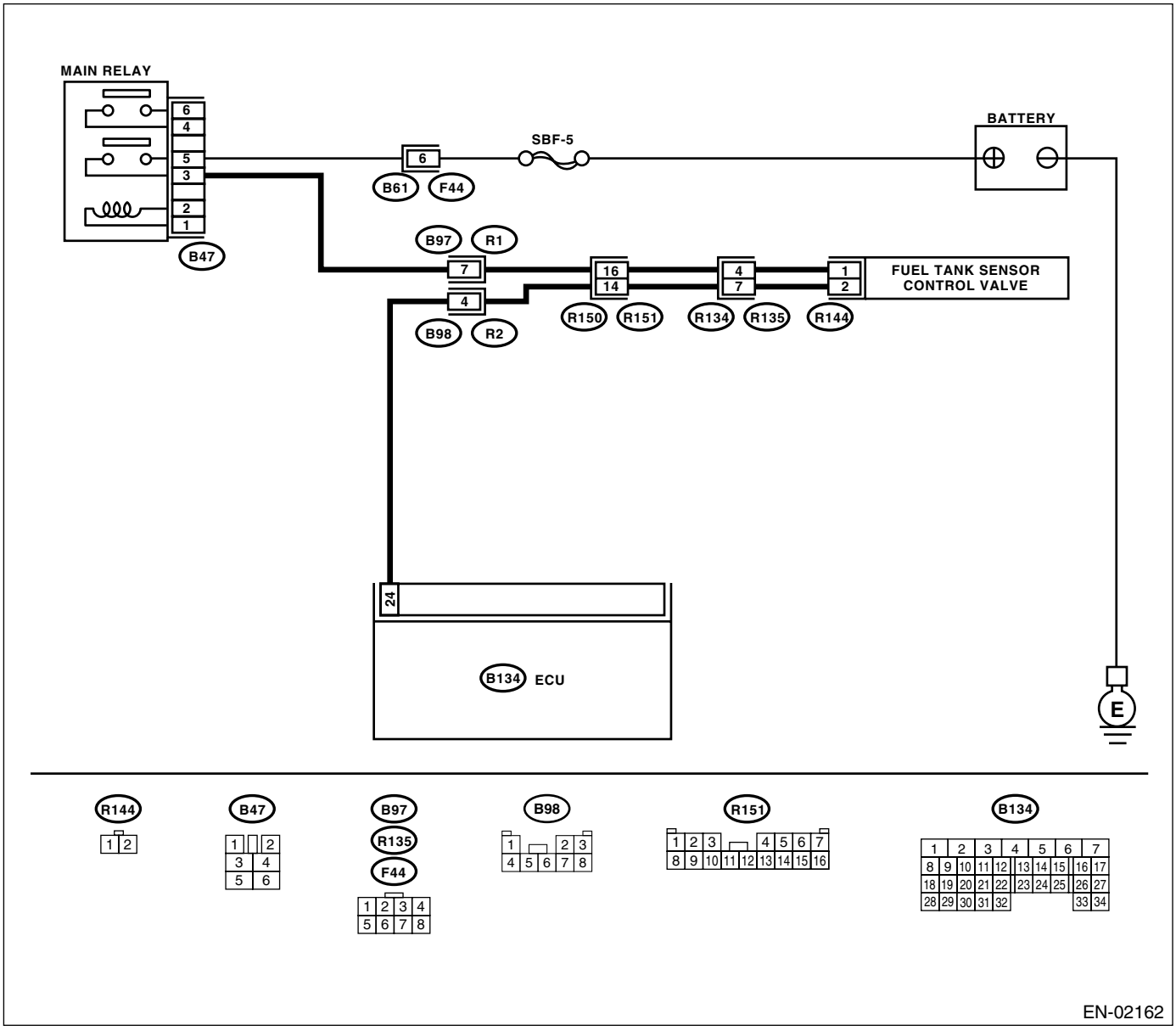
	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the following items. •Clogging of vent hoses between canister and drain valve •Clogging of vent hose between drain valve and air filter •Clogging of drain filter	Is there a fault in vent line?	Repair or replace faulty parts.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-48, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(H4DOTC)-16, Drain Valve.>

DF:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-252, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.)j NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from fuel tank sensor control valve and ECM. 3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B134) No. 24 — (R144) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connector
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace the fuel tank sensor control valve. <Ref. to EC(H4DOTC)-16, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

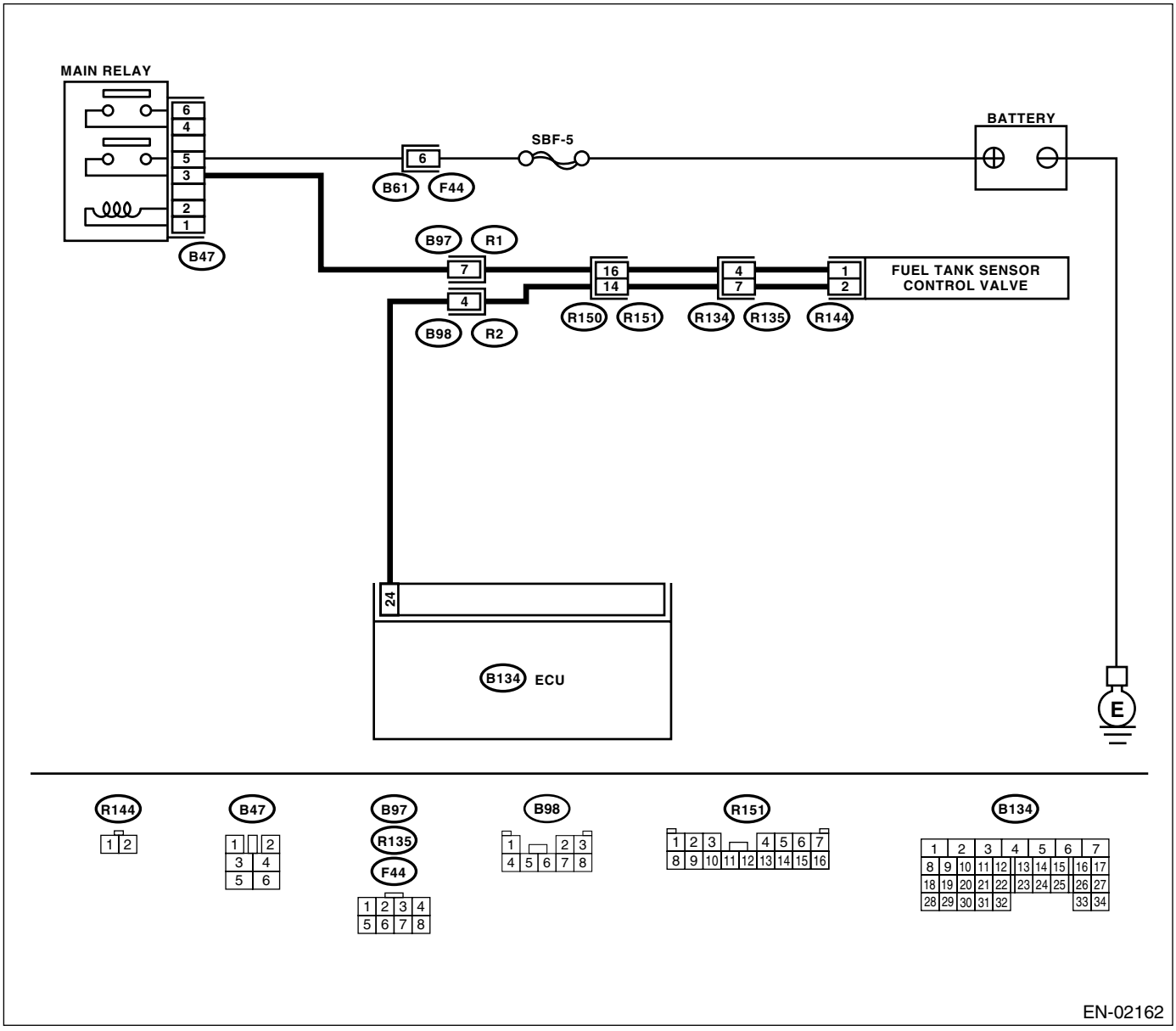
MEMO:

DG:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-254, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



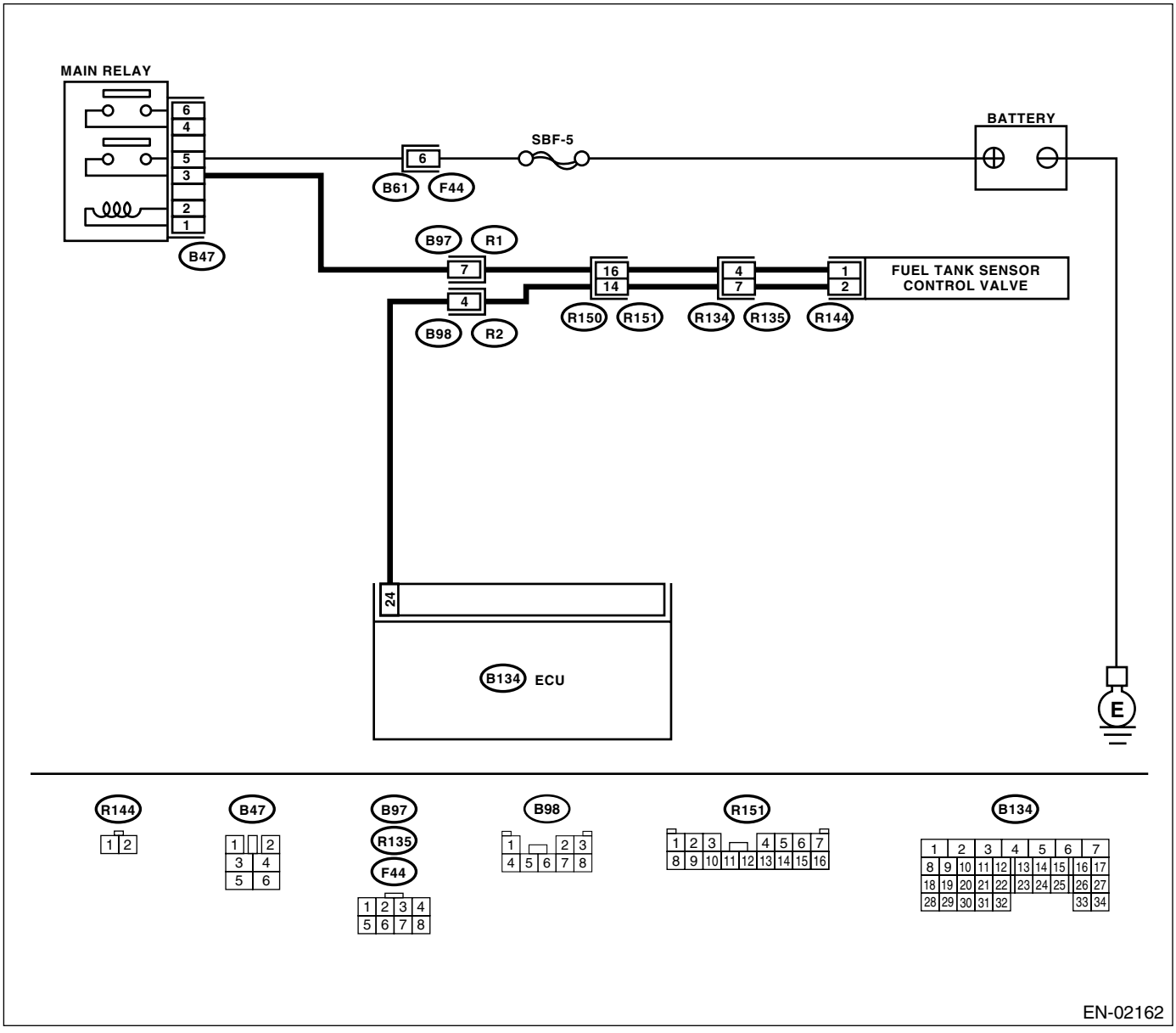
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace the fuel tank sensor control valve <Ref. to EC(H4DOTC)-11, Fuel Tank Sensor Control Valve.> and the ECM <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>.	Go to step **5.**
5	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>

DH:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



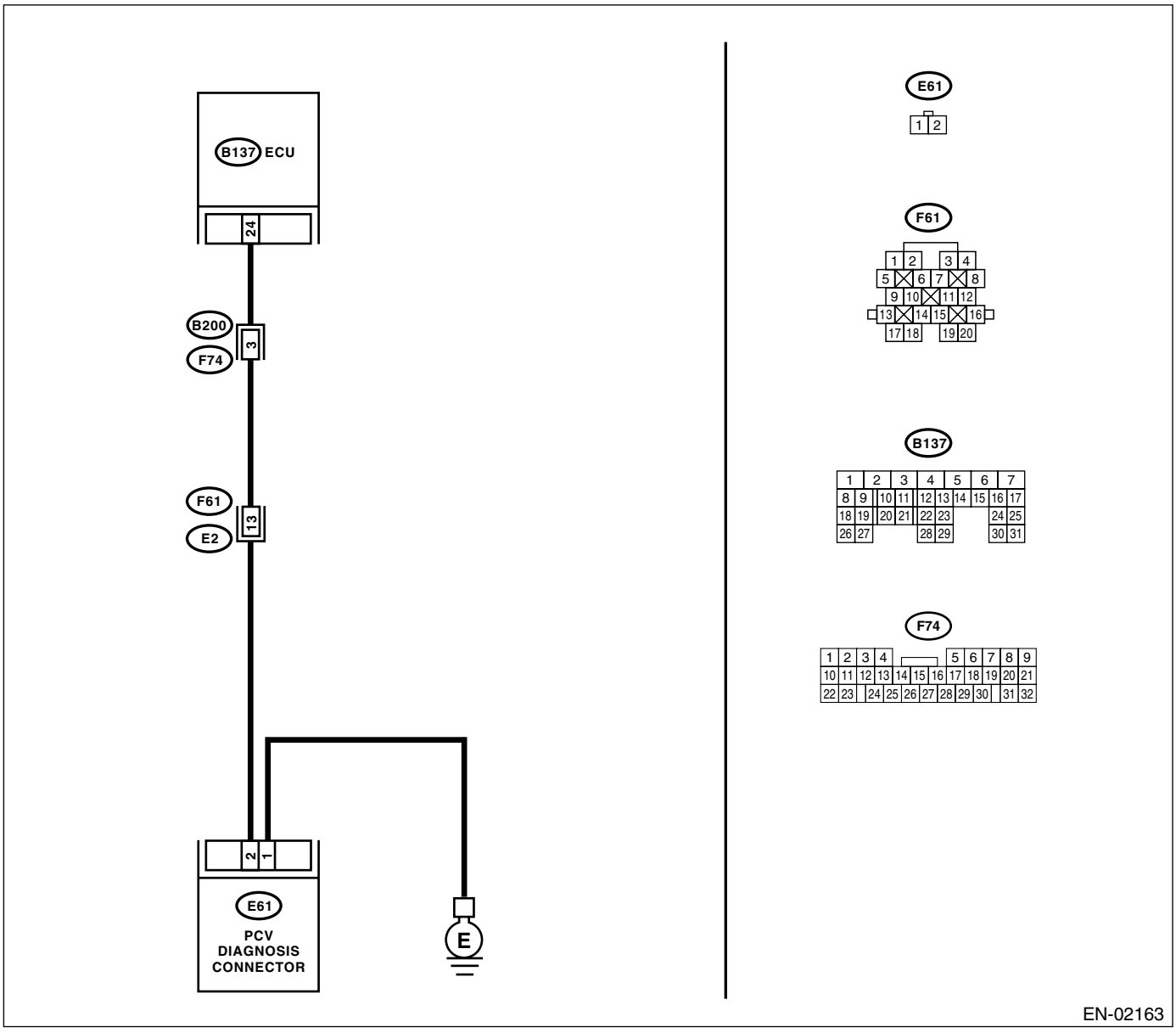
	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using the "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK EVAPORATIVE EMISSION LINE.** NOTE: Check the following items. •Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank. •Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank.	Is there any trouble in evaporative emission line?	Repair the hoses and pipes.	Replace the fuel tank pressure sensor.

DI: DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-260, DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



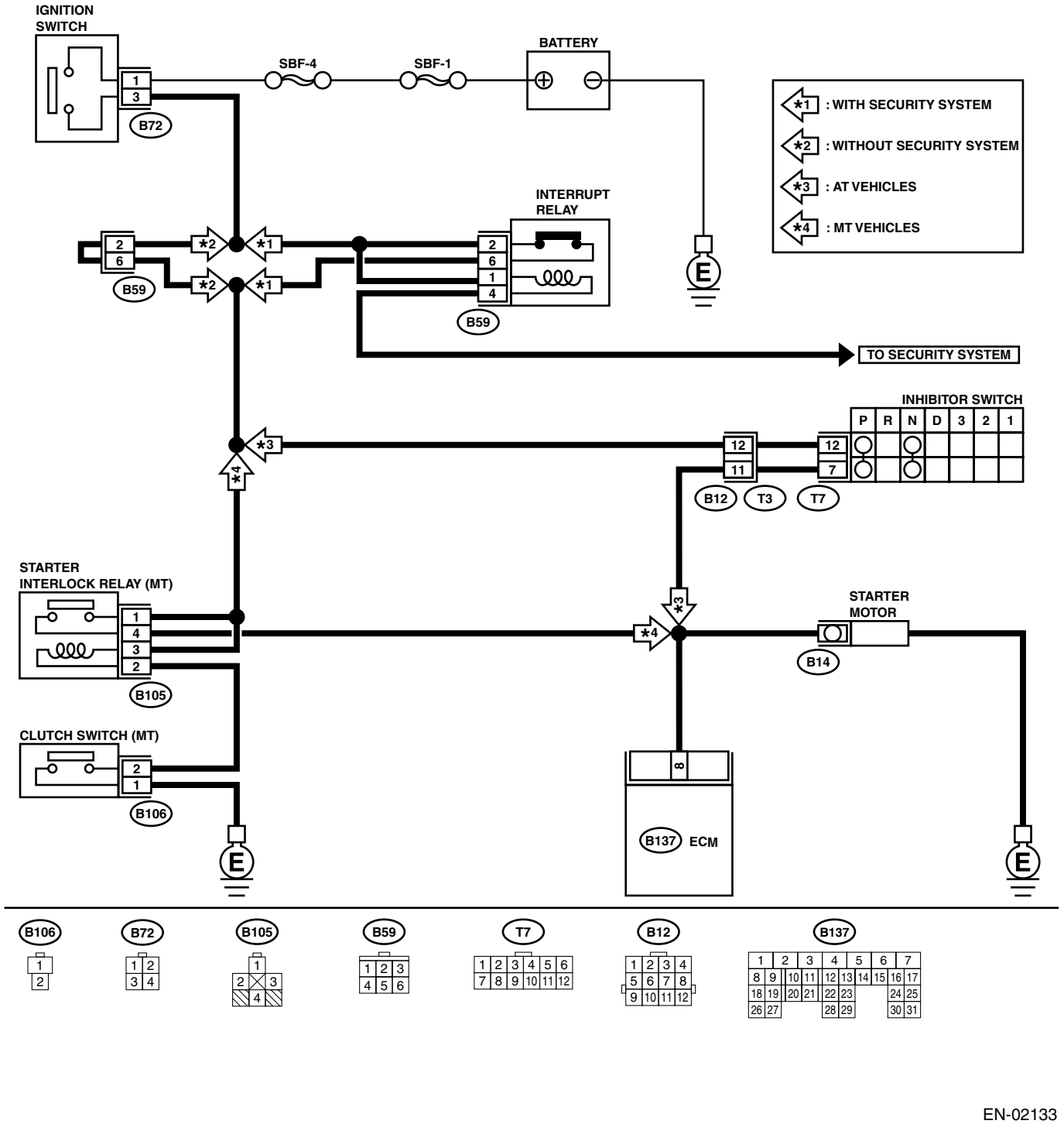
	Step	Check	Yes	No
1	**CHECK BLOW-BY HOSE.** Check the blow-by hose.	Is there disconnection or crack in blow-by hose?	Replace or repair blow-by hose.	Go to step **2.**
2	**INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. ***Connector & terminal*** ***(B137) No. 24 — (E61) No. 2:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between PCV diagnosis connector and ECM.
3	**INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between PCV diagnosis connector and chassis ground. ***Connector & terminal*** ***(B137) No. 24 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM.
4	**INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.** Measure the resistance between PCV diagnosis connector and engine ground. ***Connector & terminal*** ***(B61) No. 1 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair PCV diagnosis connector ground circuit.
5	**INSPECT PCV DIAGNOSIS CONNECTOR.** Measure the resistance between PCV diagnosis connector and terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Repair poor contact in ECM and PCV diagnosis connector.	Replace PCV diagnosis connector.

DJ:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-262, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-02133

Step		Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(H4DOTC)-62, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

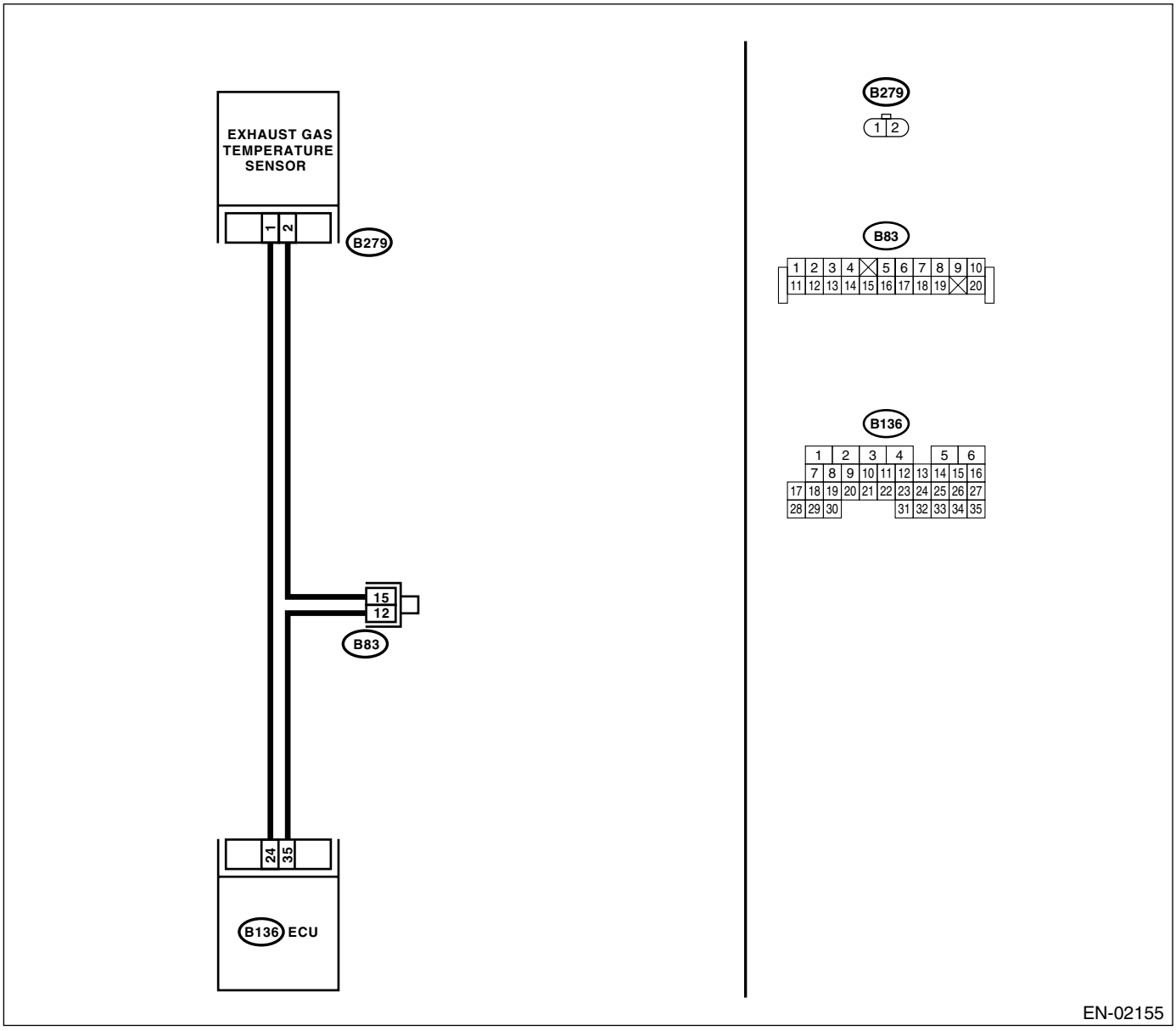
MEMO:

DK:DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-263, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



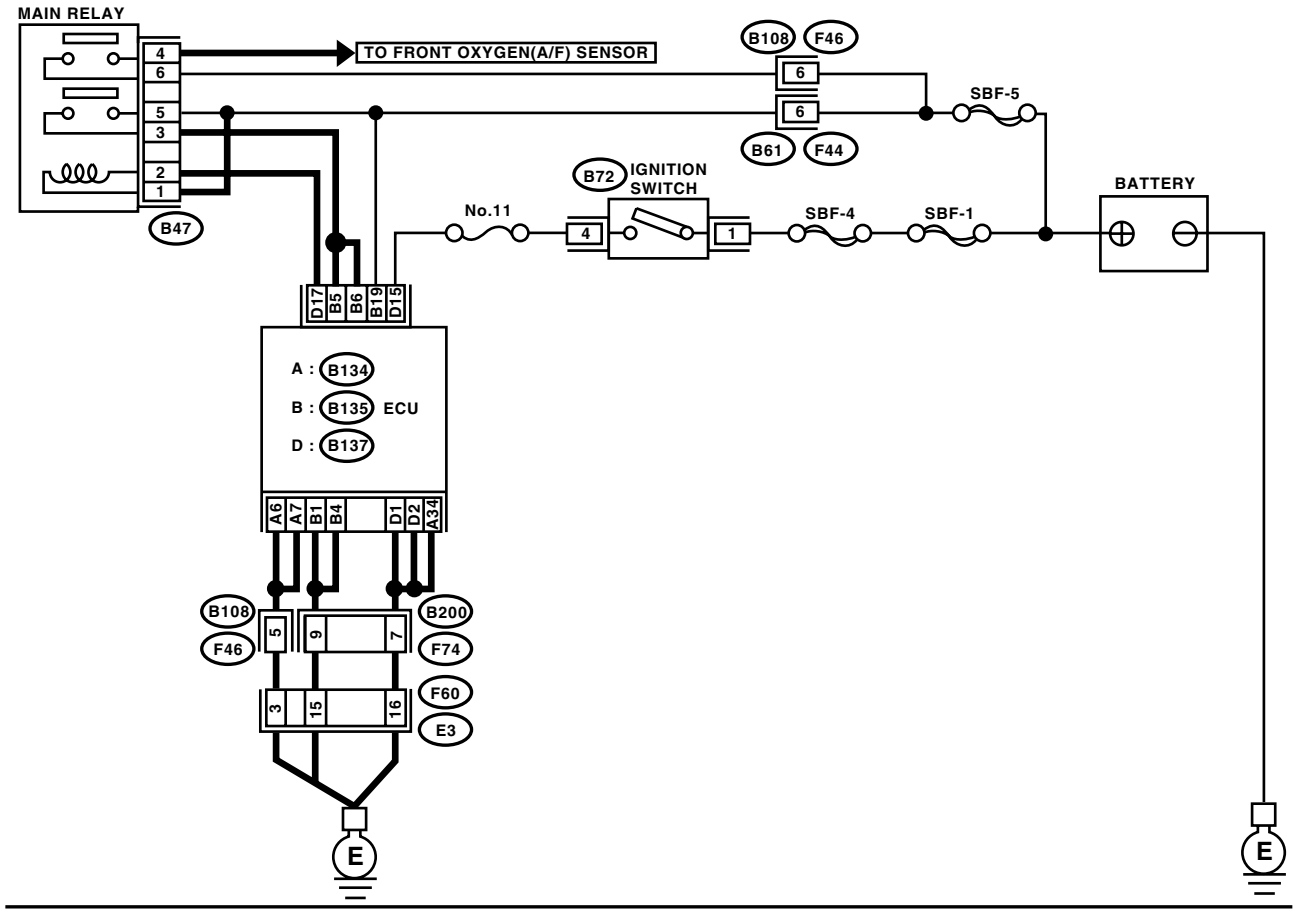
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of exhaust manifold •Cracks or hole of exhaust manifold •Loose installation of front oxygen (A/F) sensor	Is there a fault in exhaust system?	Repair or replace the failure, then replace precatalytic converter.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

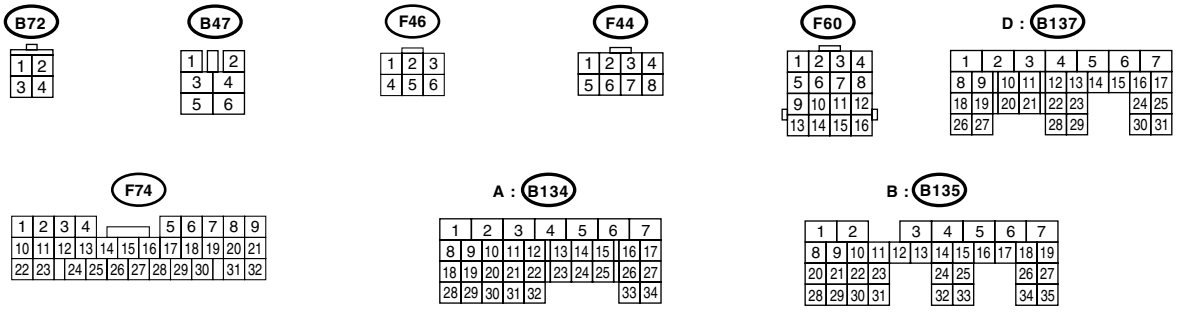
DL:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-264, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02134

Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair the ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

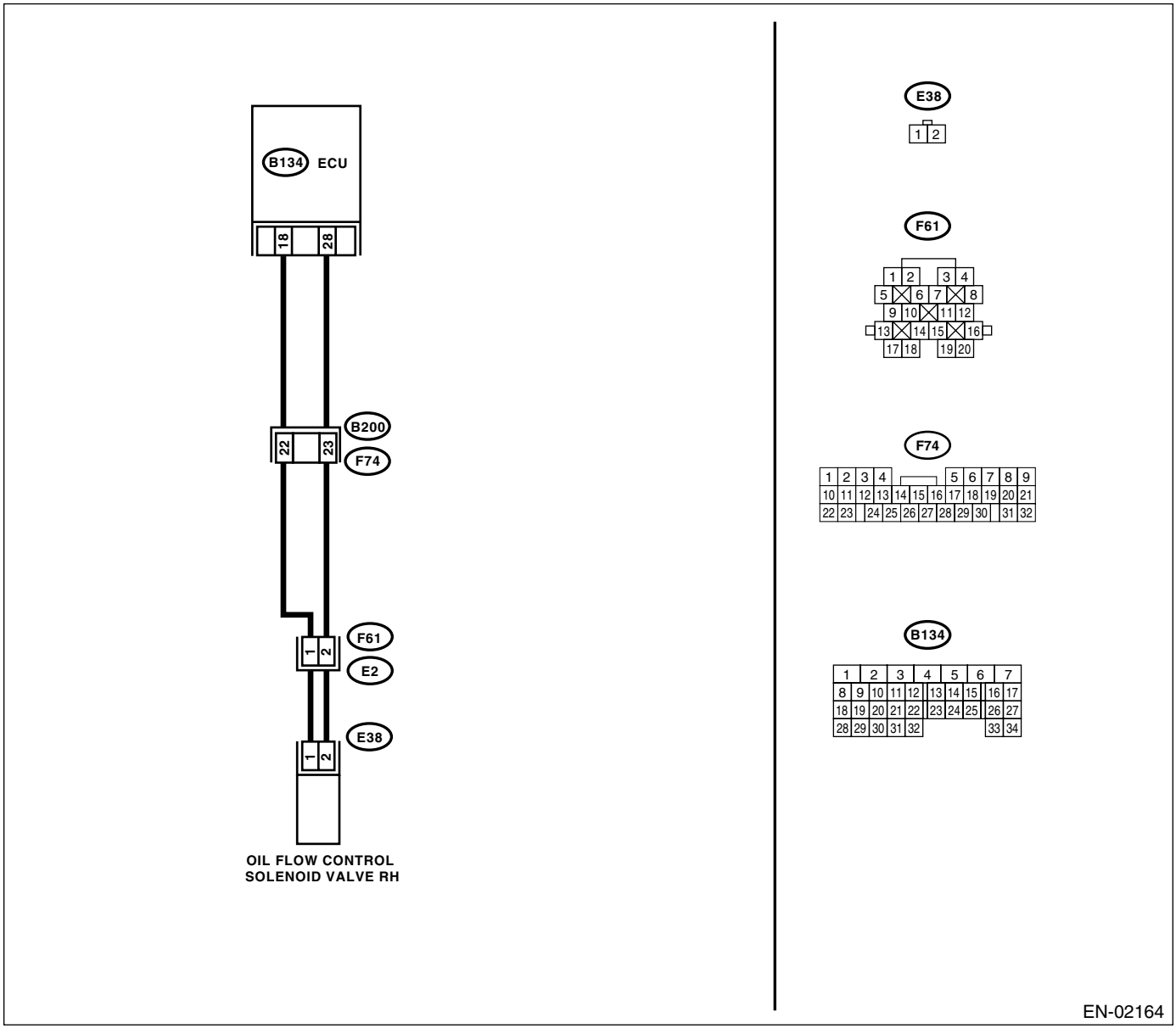
MEMO:

DM:DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-265, DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



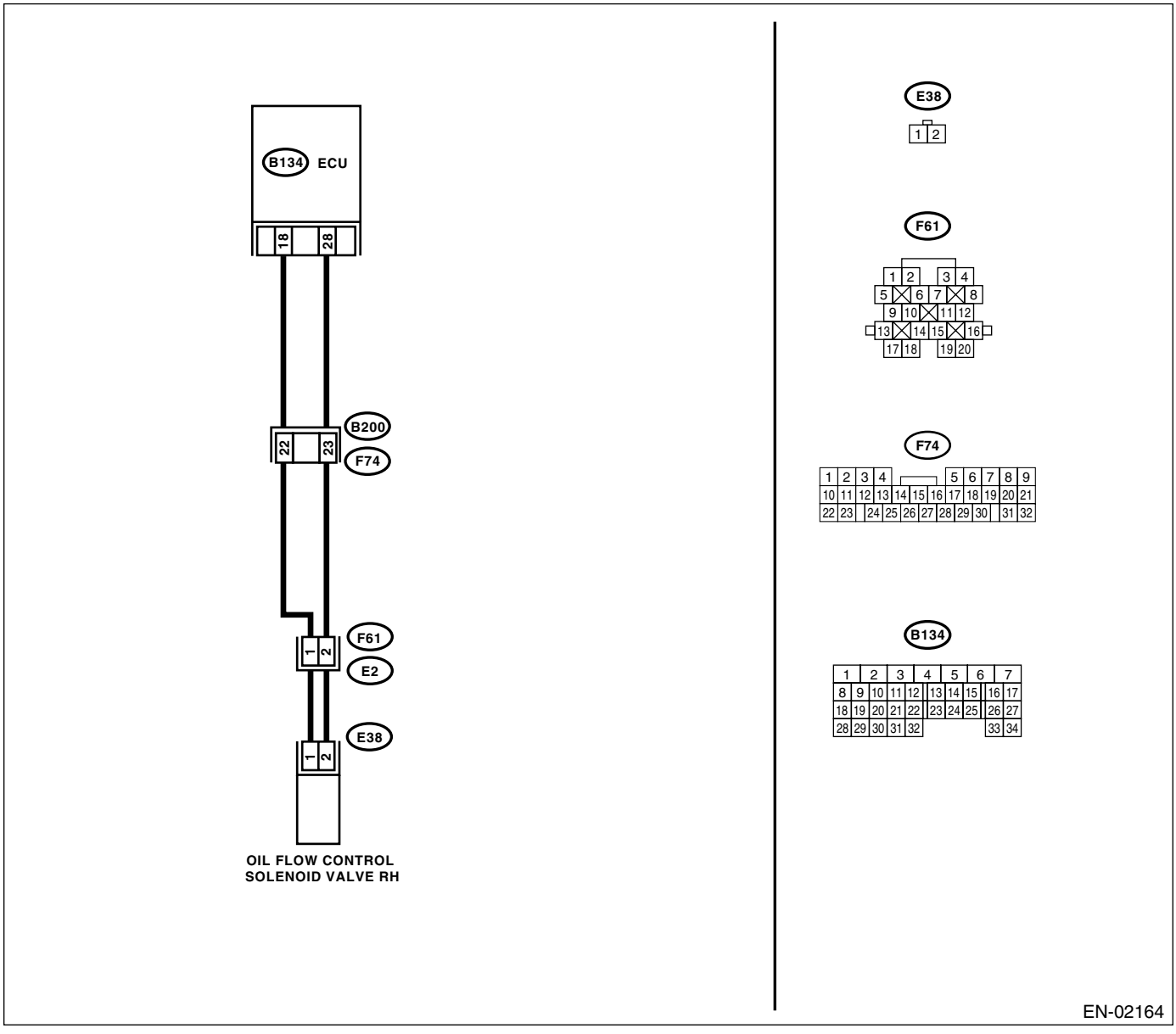
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 6 to 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-59, Camshaft.>

DN:DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-268, DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



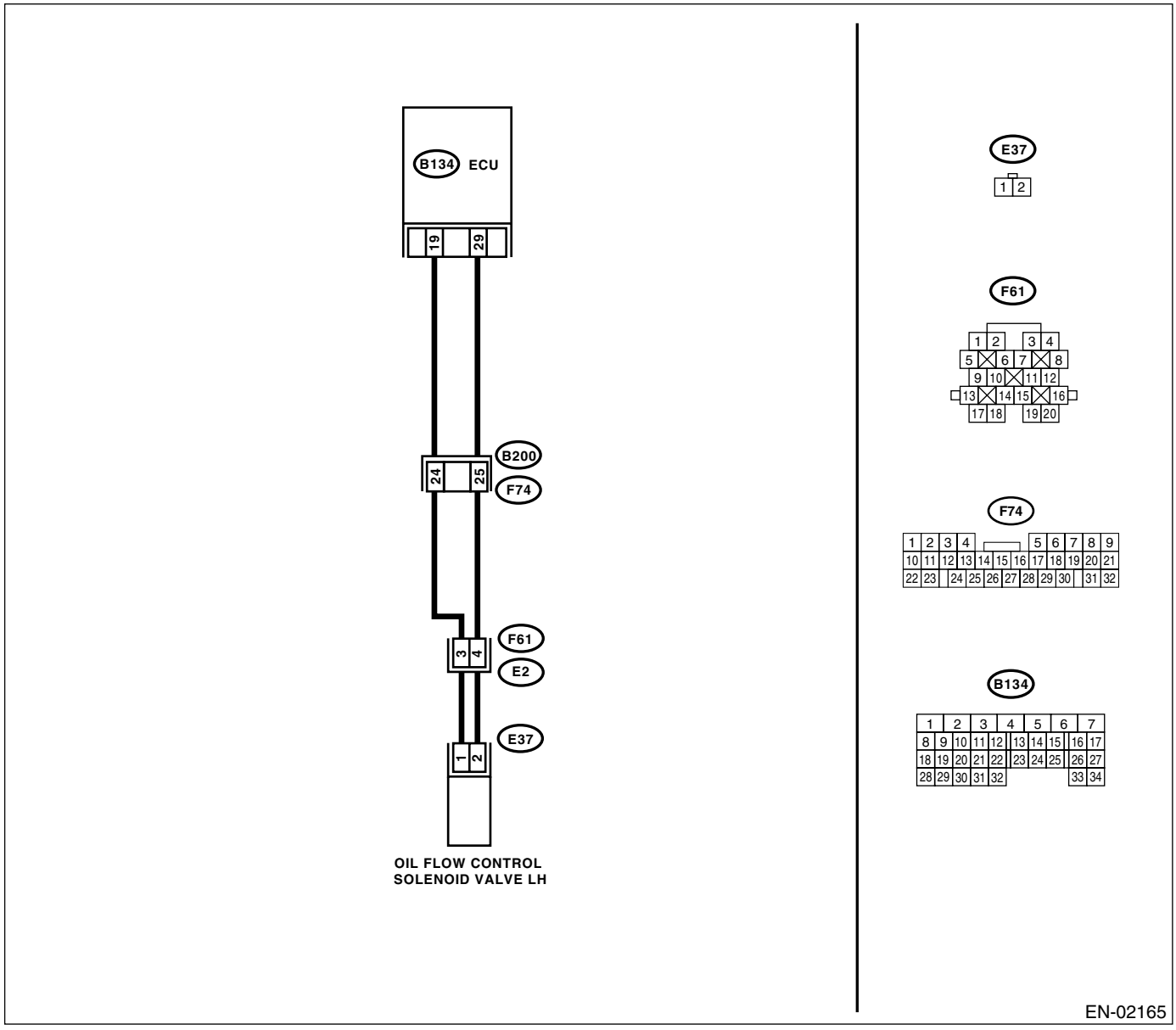
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 6 to 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-59, Camshaft.>

DO:DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-270, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



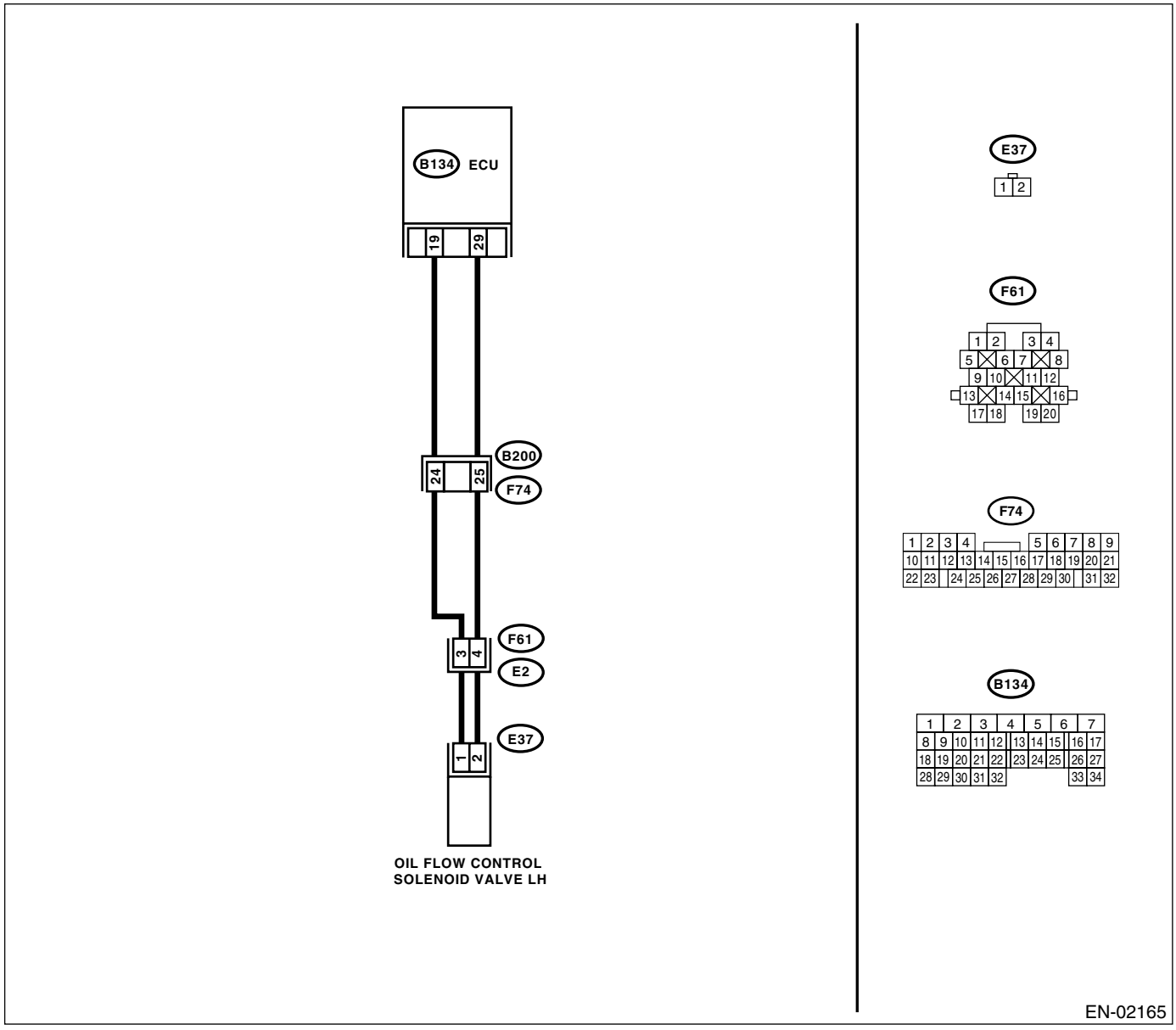
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 6 to 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-59, Camshaft.>

DP:DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-272, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



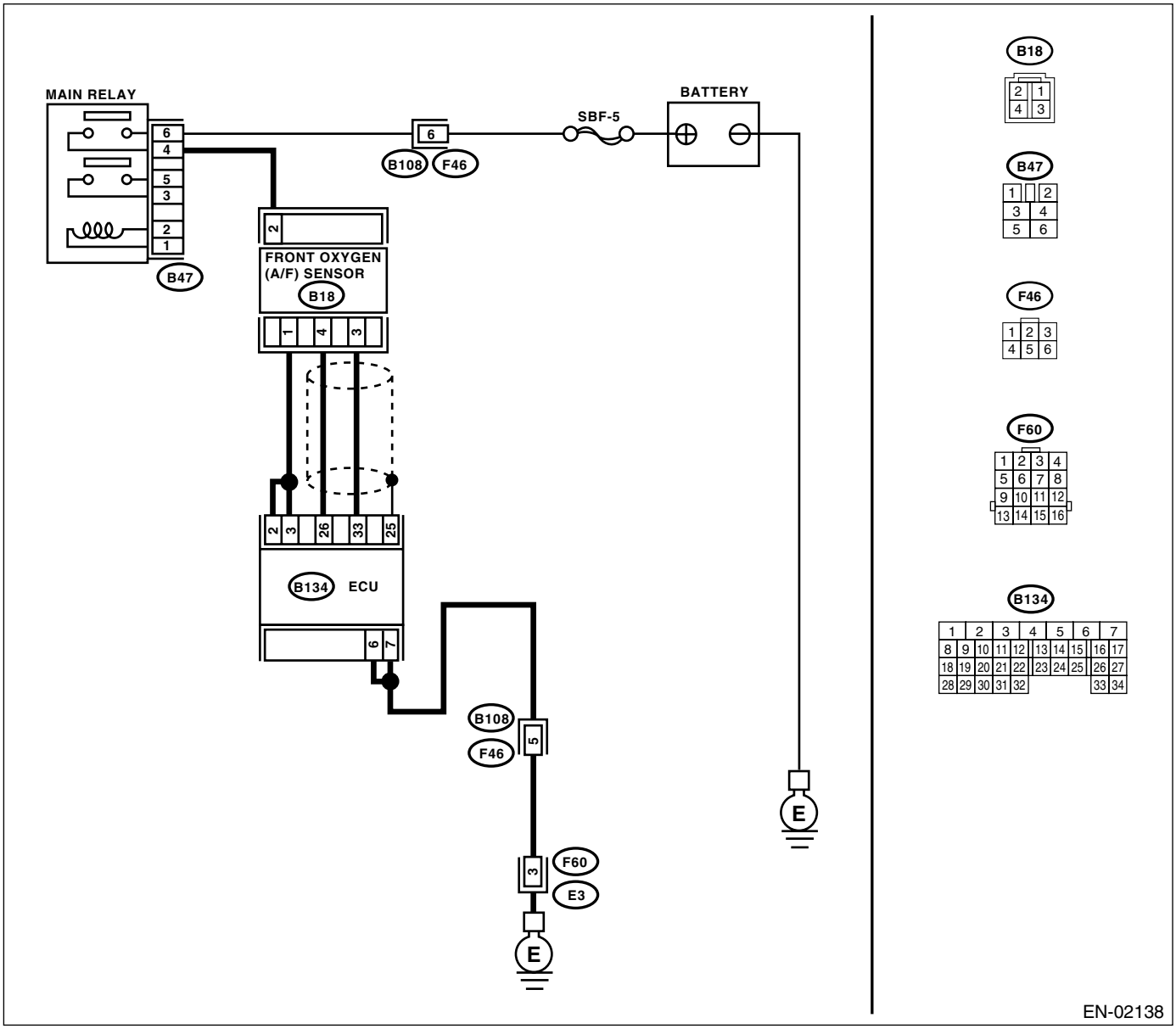
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 6 to 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-59, Camshaft.>

DQ:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.85 to 1.15 (in idling)?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the LED of (Rear O2 Rich Signal) blink?	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Go to step **5.**
5	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (within 2.9 to 3.2 kg/cm^2, within 41 to 46 psi)?	Go to step **7.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line
7	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (within 2.1 to 2.4 kg/cm^2, within 30 to 34 psi)?	Go to step **8.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 60°C (140°F)?	Go to step **9.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
9	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) Idling: 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg)	Go to step **10.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
10	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value within – 10°C to 50°C (within 14°F to 122°F)?	Go to step **11.**	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

	Step	Check	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **13.**	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.
13	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the measured value less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.

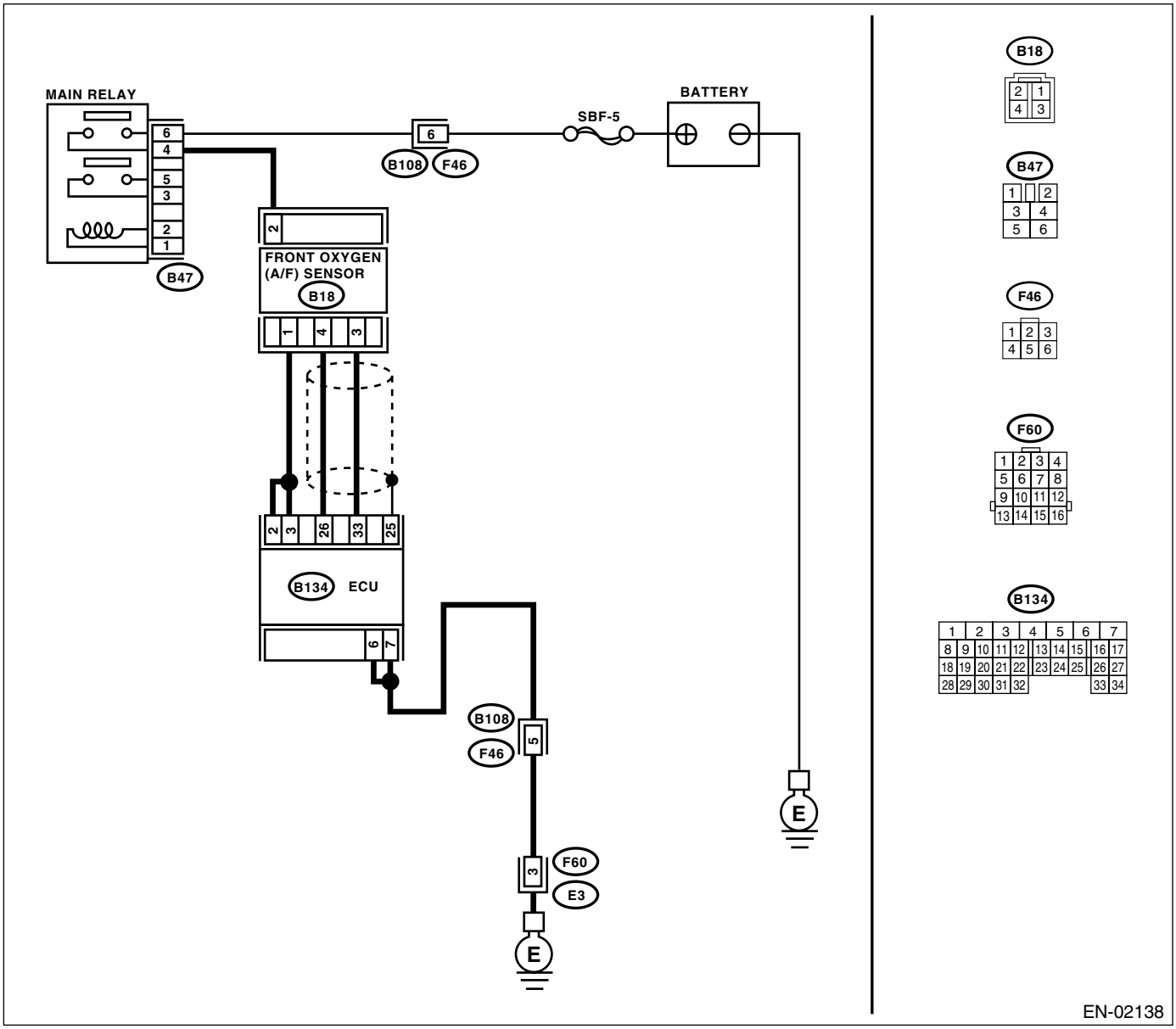
MEMO:

DR:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-276, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-76, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.85 to 1.15 (in idling)?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the LED of (Rear O2 Rich Signal) blink?	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(H4DOTC)-40, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Go to step **5.**
5	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (within 2.9 to 3.2 kg/cm^2, within 41 to 46 psi)?	Go to step **7.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line
7	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (within 2.1 to 2.4 kg/cm^2, within 30 to 34 psi)?	Go to step **8.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 60°C (140°F)?	Go to step **9.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
9	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) Idling: 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg)	Go to step **10.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
10	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value within – 10°C to 50°C (within 14°F to 122°F)?	Go to step **11.**	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

	Step	Check	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **13.**	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.
13	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the measured value less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-38, Front Oxygen (A/F) Sensor.>	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.

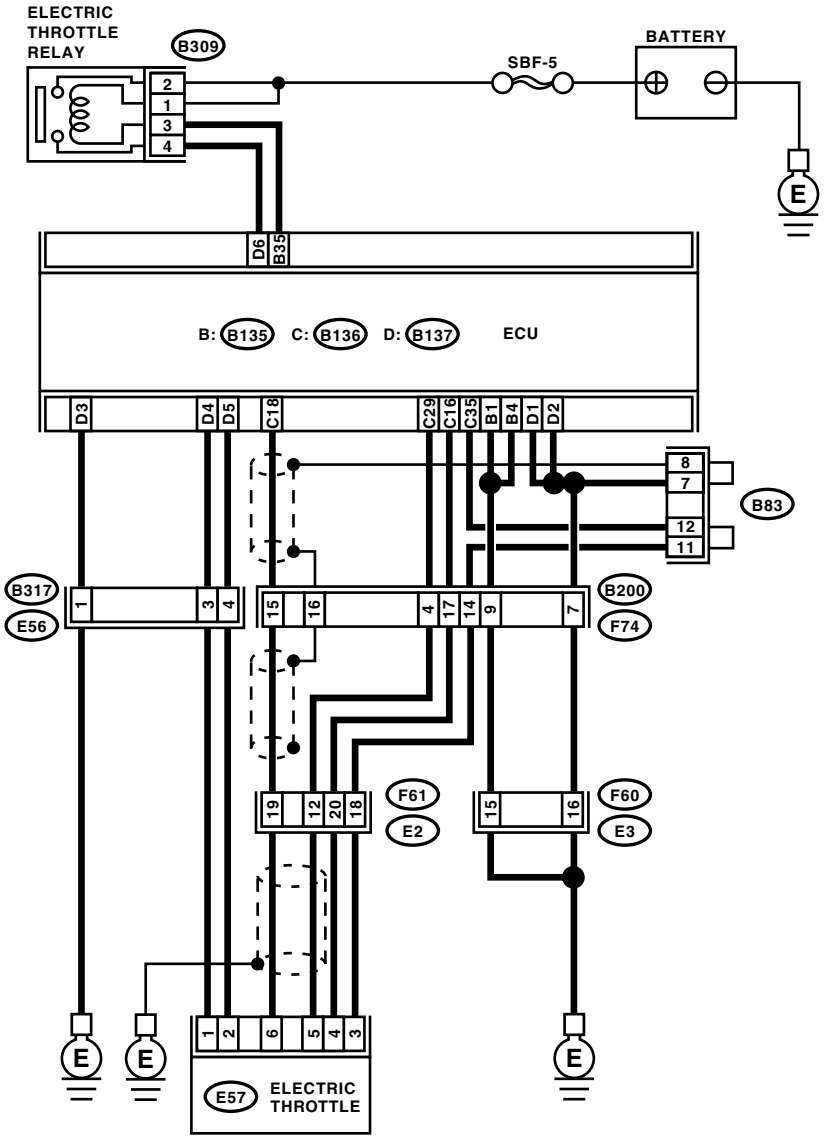
MEMO:

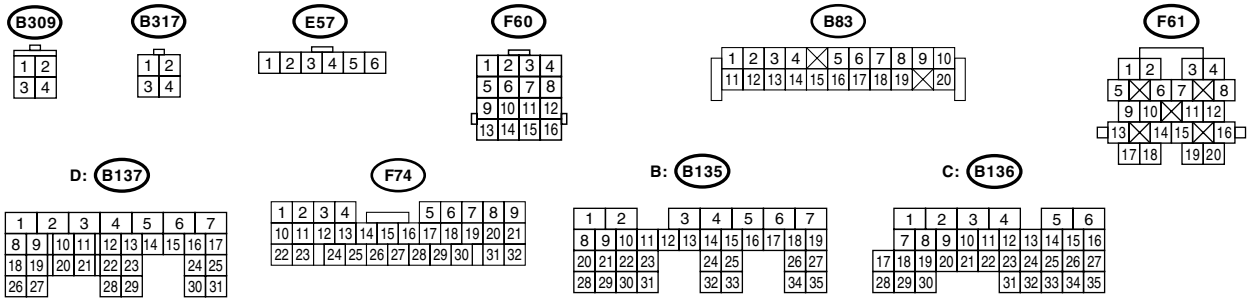
DS:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-200, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(H4DOTC)-240, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4DOTC)-278, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Connect the battery to electric throttle relay terminal No. 1 and No. 3. 4) Measure the resistance between electric throttle relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the measured value less than 1 Ω?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK POWER SUPPLY TO ELECTRIC THROTTLE RELAY.** Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (–):*** ***(B309) No. 2 (+) — Engine ground (–):***	Is the measured value more than 5 V?	Go to step **3.**	Repair the open power supply circuit or ground short.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (–):***	Is the measured value less than 5 V?	Go to step **4.**	Repair short of the power supply circuit between ECM and electric throttle.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness between ECM and electric throttle relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and electric throttle relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B309) No. 3:*** ***(B137) No. 6 — (B309) No. 4:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and electric throttle relay.
6	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):*** 4) Shake the ECM harness and connector, engine harness connectors (B136, F61), electric throttle connector harness while monitoring value of voltage meter.	Is the measured value more than 0.4 V?	Go to step **7.**	Go to step **9.**

Step		Check	Yes	No
7	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 4) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value more than 0.8 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POOR CONTACT.** Check poor contact between ECM connector and electric throttle connector.	Is there poor contact between ECM connector and electric throttle connector?	Repair the poor contact.	Go to step **13.**
9	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair the open harness connector.
10	**CHECK THE HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Repair the ground short of harness.
11	**CHECK POWER SUPPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value within 4.5 to 5.5 V?	Go to step **12.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
12	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 5 — Engine ground:***	Is the measured value more than 10 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
13	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal, using the Subaru Select Monitor. 4) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value 4.63 V?	Go to step **14.**	Go to step **16.**

	Step	Check	Yes	No
14	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Read the data of sub throttle sensor signal, using the Subaru Select Monitor. 2) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value 4.73 V?	Go to step **15.**	Go to step **16.**
15	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle?	Is there poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **21.**
16	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 5:***	Is the measured value less than 1 Ω?	Go to step **17.**	Repair the open harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **18.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
18	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** 3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value less than 10 V?	Go to step **19.**	Repair the battery short of harness between ECM connector and electric throttle connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 5 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value less than 10 V?	Go to step **20.**	Repair the short of harness between ECM connector and electric throttle connector.
20	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the voltage between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the measured value more than 1 MΩ?	Go to step **21.**	Repair the short of sensor power supply.

	Step	Check	Yes	No
21	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors except electric throttle replay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signals, using Subaru Select Monitor.	Is the measured value within 0.81 to 0.87 V?	Go to step **22.**	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.
22	**CHECK OUTPUT VOLTAGE OF SENSOR.** Read the data of sub throttle sensor signals, using Subaru Select Monitor.	Is the measured value within 1.64 to 1.70 V?	Go to step **23.**	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	Is the measured value less than 1 Ω?	Go to step **24.**	Repair the open harness connector.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Connect the connectors to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (–):*** ***(E57) No. 1 (+) — Engine ground (–):***	Is the measured value less than 5 V?	Go to step **25.**	Repair the short of harness to power supply circuit between ECM and electric throttle.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **26.**	Repair the short of harness.
26	**CHECK ELECTRIC THROTTLE MOTOR HARNESS.** Measure the resistance between electric throttle connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the measured value more than 1 MΩ?	Go to step **27.**	Repair the short of harness.
27	**CHECK ELECTRIC THROTTLE GROUND CIRCUIT.** Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B137) No. 3 — Engine ground:***	Is the measured value less than 10 Ω?	Go to step **28.**	Repair the open circuit harness.
28	**CHECK ELECTRIC THROTTLE.** Measure the resistance between electric throttle terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 5 Ω?	Go to step **29.**	Replace the electric throttle.

	Step	Check	Yes	No
29	**CHECK ELECTRIC THROTTLE.** Open and close the throttle valve to its full width with finger.	Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Replace the electric throttle.

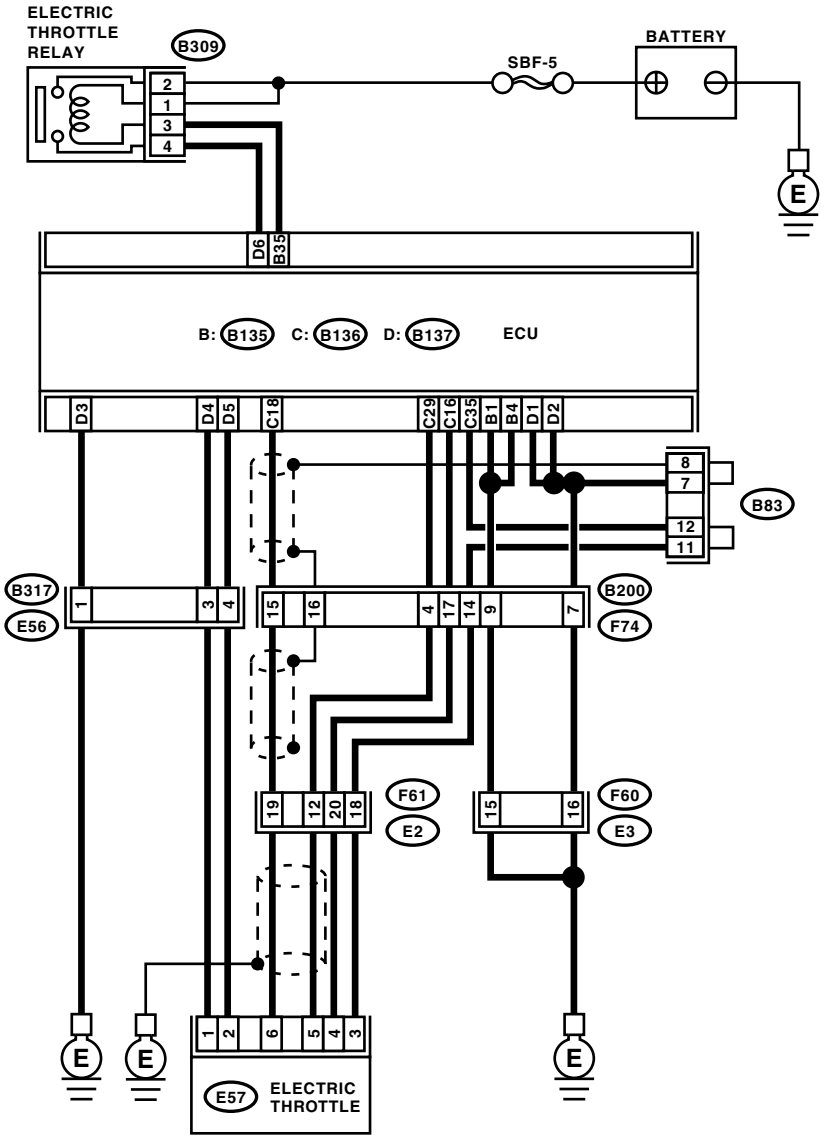
MEMO:

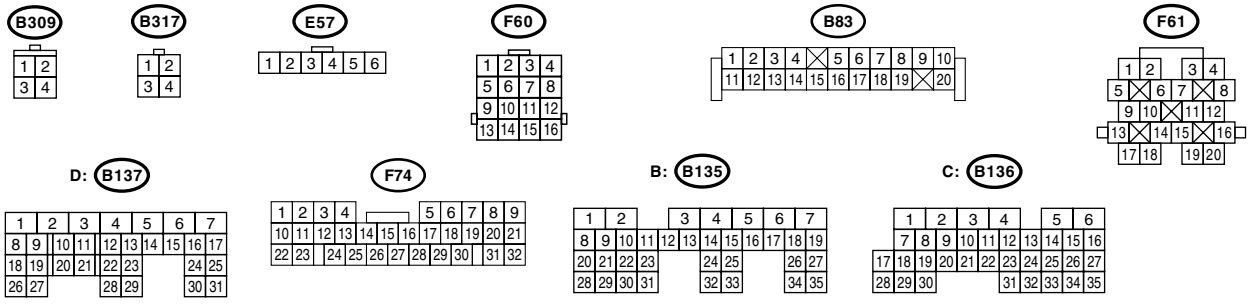
DT:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-280, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Connect the battery to electric throttle relay terminal No. 1 and No. 3. 4) Measure the resistance between electric throttle terminals. ***Connector & terminal*** ***(B309) No. 2 — (B309) No. 4:***	Is the measured value less than 1 Ω?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK POWER TO ELECTRIC THROTTLE RELAY** Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (–):*** ***(B309) No. 2 (+) — Engine ground (–):***	Is the measured value more than 5 V?	Go to step **3.**	Repair the open power supply circuit or ground short.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (–):***	Is the measured value less than 5 V?	Go to step **4.**	Repair the short of power supply circuit between ECM and electric throttle.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness between ECM and electric throttle relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** Measure the resistance between ECM connector and electric throttle relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B309) No. 3:*** ***(B137) No. 6 — (B309) No. 4:***	Is the measured value less than 1 Ω?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the open harness between ECM and electric throttle relay.

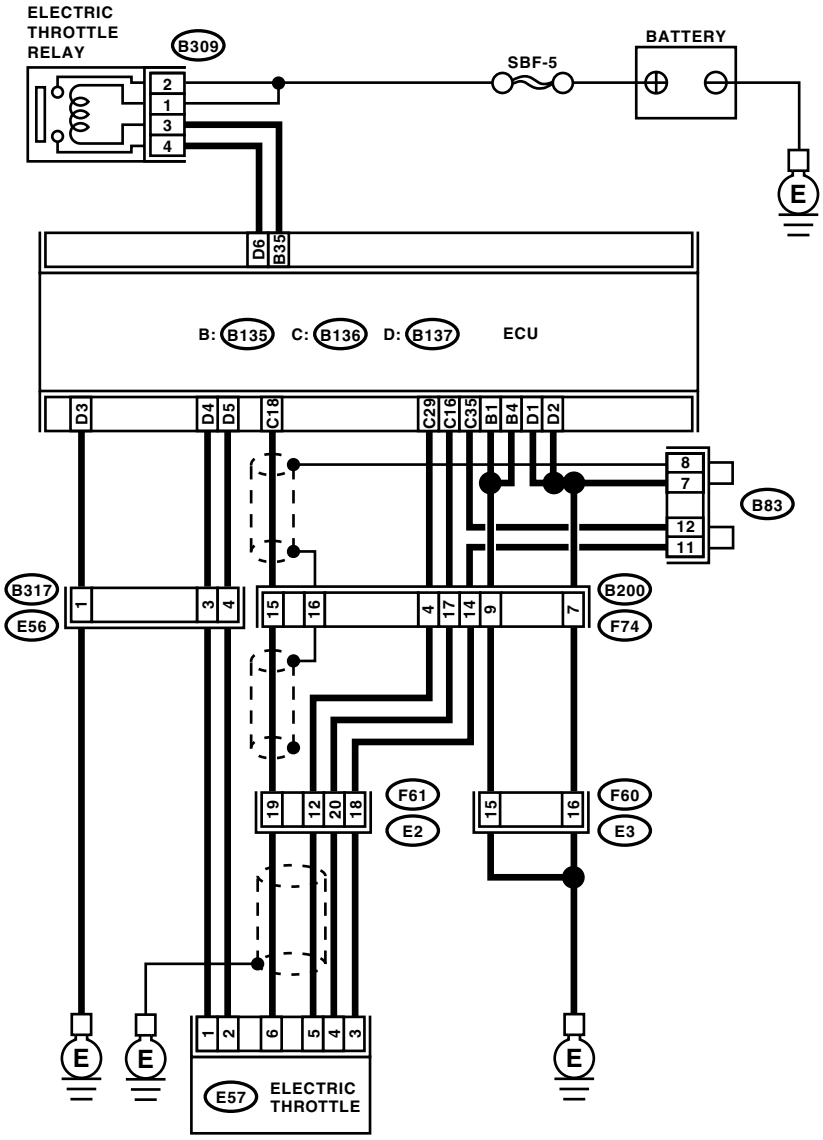
MEMO:

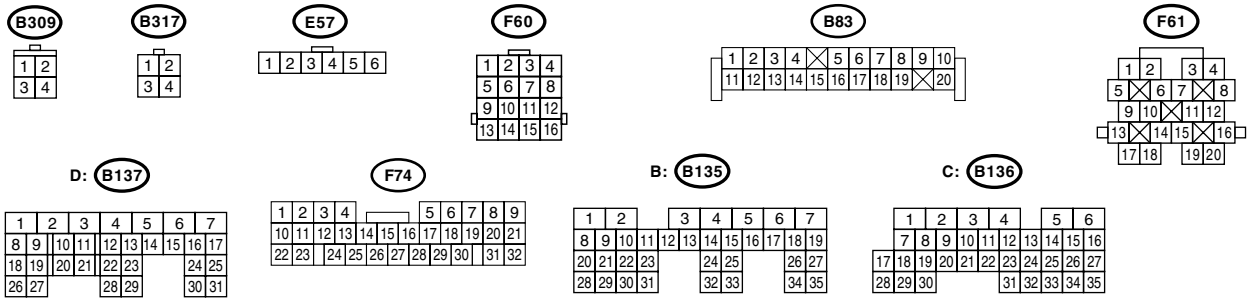
DU:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-282, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Measure the resistance between electric throttle relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the measured value more than 1 MΩ?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK SHORT OF ELECTRIC THROTTLE RELAY POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 4 (+) — Engine ground (–):***	Is the measured value more than 5 V?	Go to step **3.**	Repair the short of power supply to harness between ECM and electric throttle relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B135) No. 35 — Engine ground:***	Is the measured value more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the ground short of harness between ECM and electric throttle relay.

DV:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

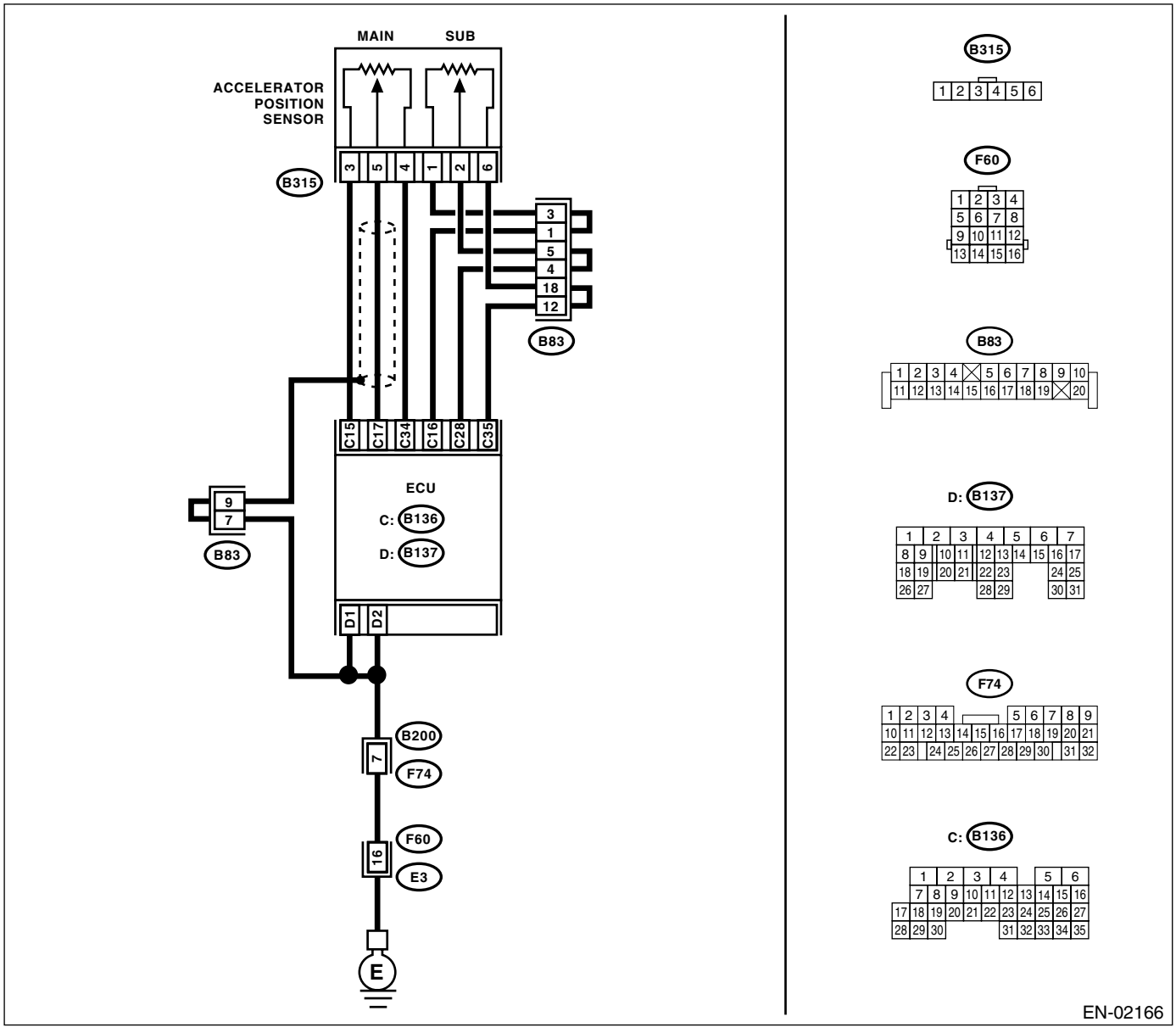
NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)-396, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DW:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-286, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 (+) — (B136) No. 34 (–):*** 3) Shake the ECM harness and connector, accelerator position sensor.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the open harness connector.
5	**CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the measured value within 1.2 to 4.8 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when accelerator pedal is released. ***Terminals*** ***No. 5 — No. 4:***	Is the measured value within 0.2 to 1.0 kΩ?	Go to step **8.**	Replace the accelerator position sensor.

Step		Check	Yes	No
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when acceleration pedal is being depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the measured value within 0.5 to 2.5 kΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Replace the accelerator position sensor.

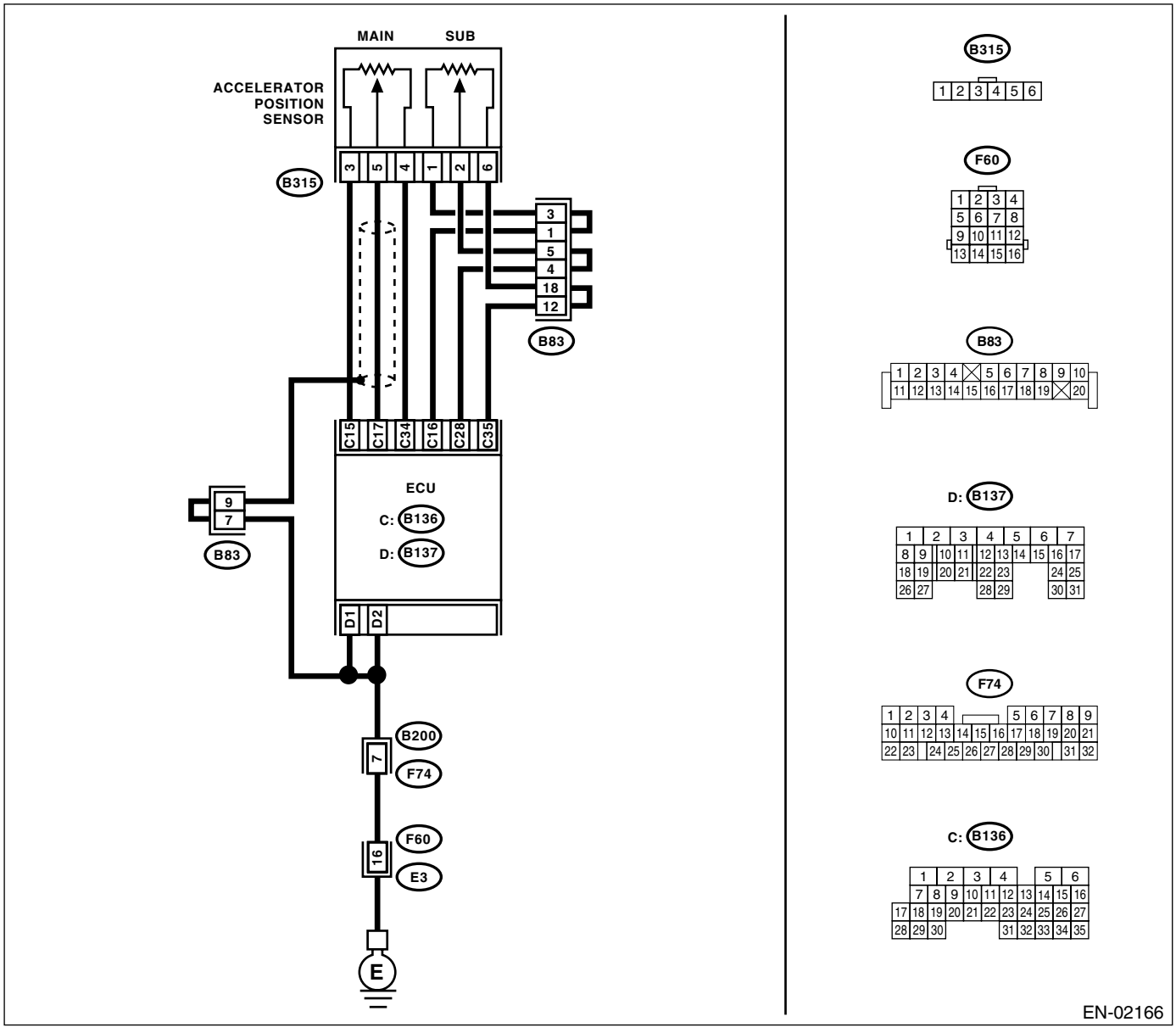
MEMO:

DX:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-288, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator position sensor signals, using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.	Is the measured value less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value more than 6 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and accelerator position sensor.
6	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value less than 4.8 V?	Go to step **7.**	Repair the short of harness between ECM connector and accelerator position sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the measured value 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.

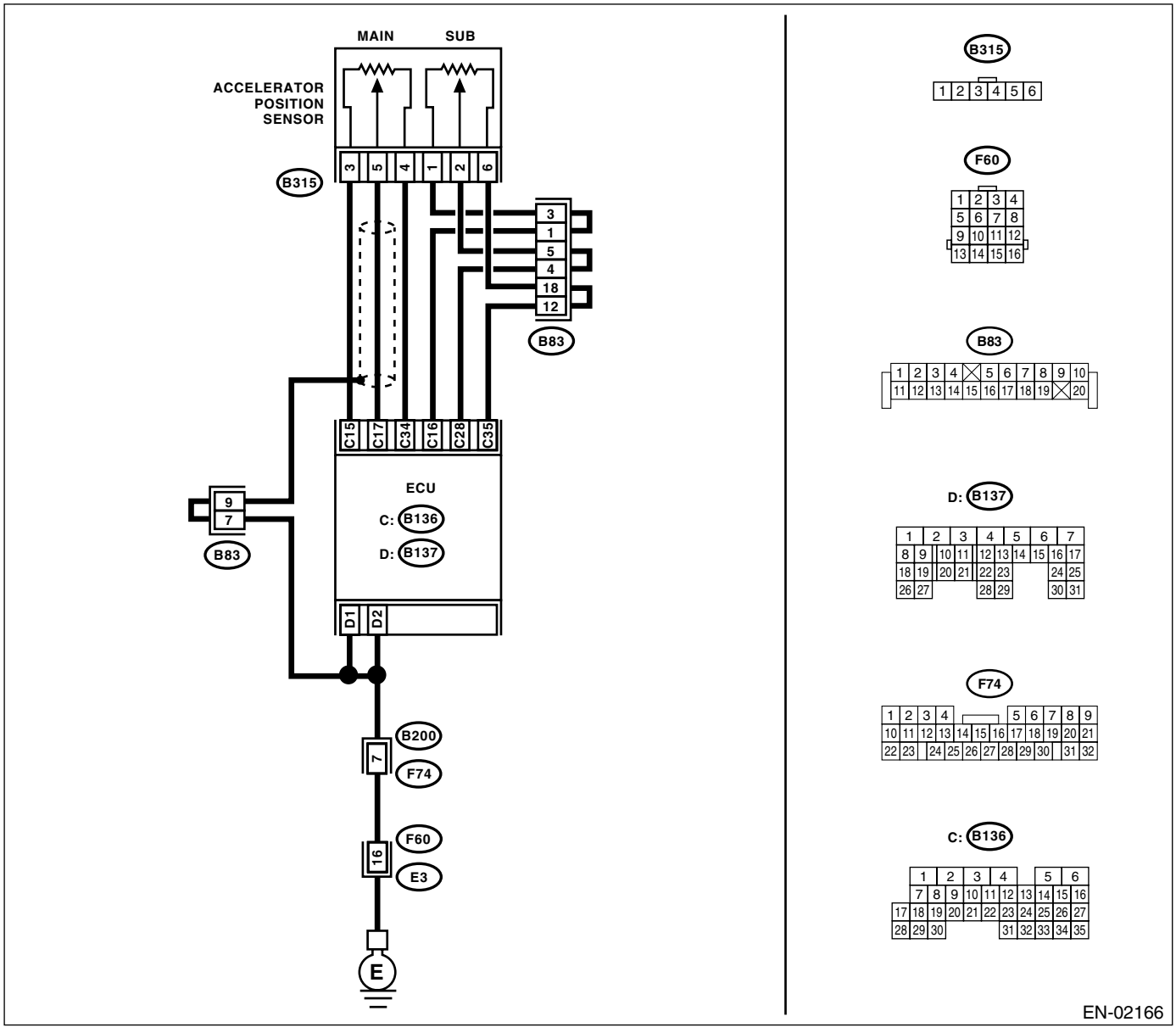
MEMO:

DY:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-290, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 28 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, accelerator position sensor.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value within 4.5 to 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the measured value within 0.75 to 3.15 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when accelerator pedal is released. ***Terminals*** ***No. 2 — No. 6:***	Is the measured value within 0.15 to 0.63 kΩ?	Go to step **8.**	Replace the accelerator position sensor.

Step		Check	Yes	No
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when acceleration pedal is being depressed. ***Terminals*** ***No. 2 — No. 6:***	Is the measured value within 0.28 to 1.68 kΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Replace the accelerator position sensor.

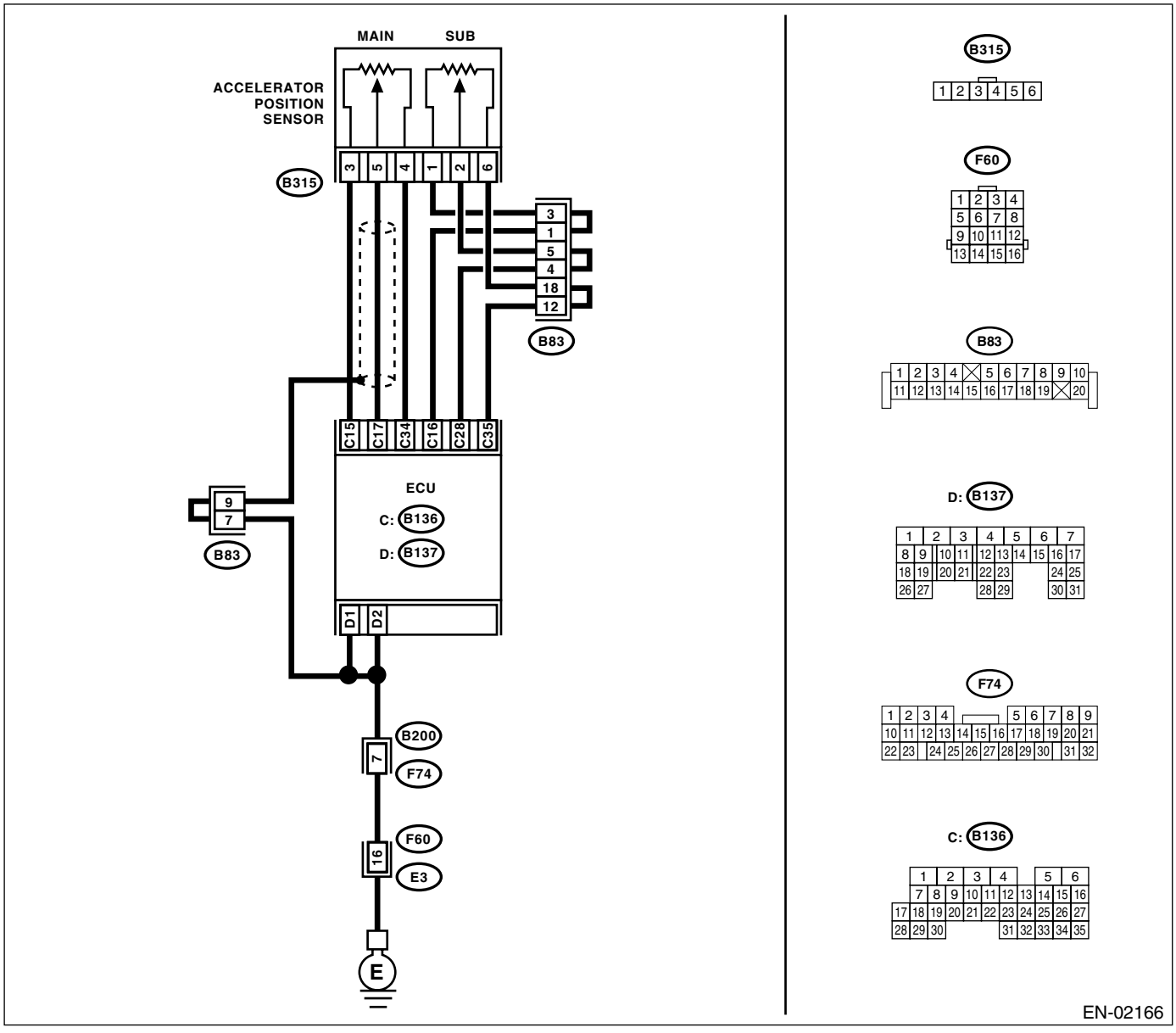
MEMO:

DZ:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGHT INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-292, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator position sensor signals, using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.	Is the measured value less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 35 — (B315) No. 6:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 6 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value less than 6 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and accelerator position sensor connector.
6	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value less than 4.8 V?	Go to step **7.**	Repair the short of harness between ECM connector and accelerator position sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the measured value 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.

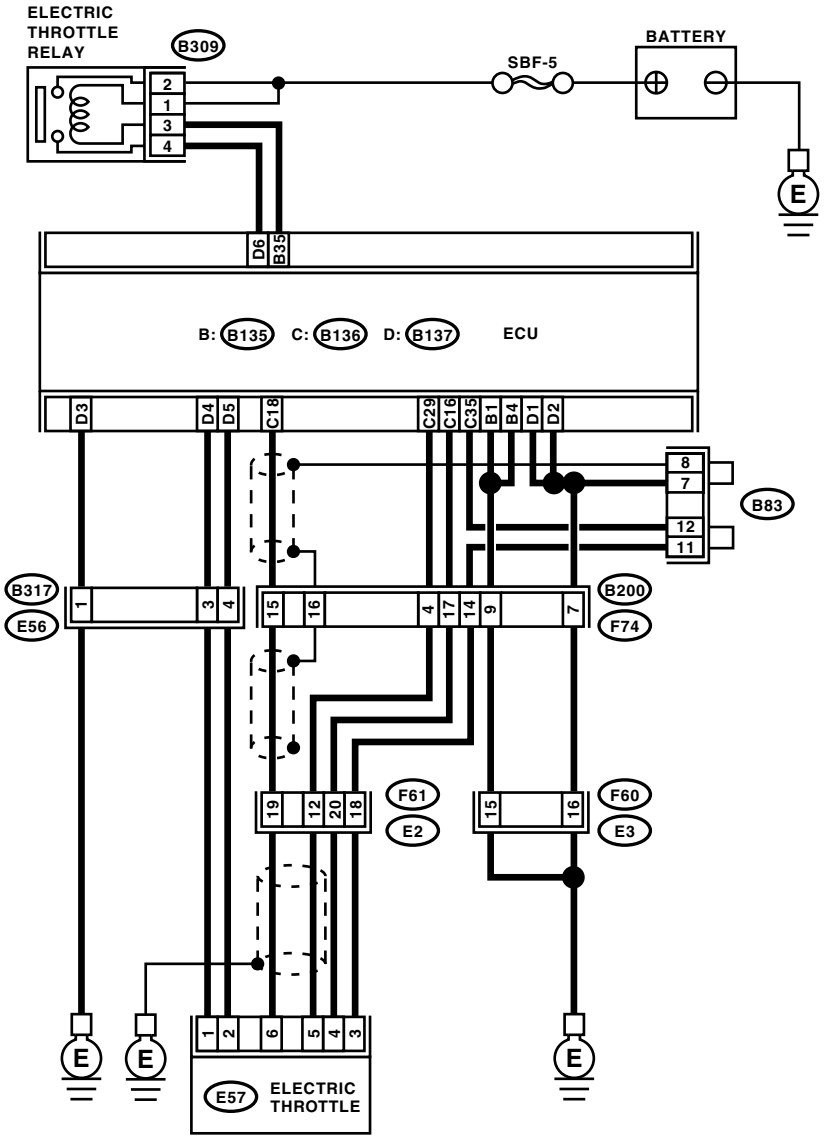
MEMO:

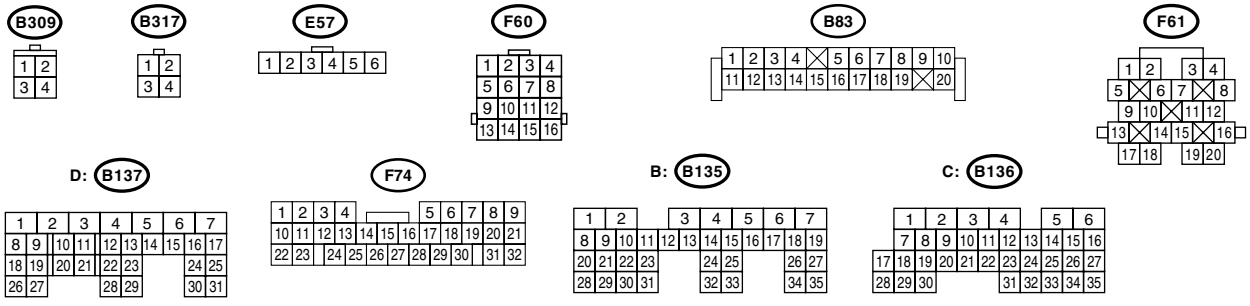
EA:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-294, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





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	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **4.**
2	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 2) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value more than 0.8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **14.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 4:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair the open harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair the ground short of harness.
6	**CHECK POWER SUPPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value within 4.5 to 5.5 V?	Go to step **7.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.

	Step	Check	Yes	No
7	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 5 — Engine ground:***	Is the measured value more than 10 Ω?	Go to step **8.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-43, Engine Control Module (ECM).>
8	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signals, using Subaru Select Monitors. 4) Shake the ECM harness and connector, engine harness connector, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value less than 4.63 V?	Go to step **9.**	Go to step **11.**
9	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Read the data of sub throttle sensor signals, using Subaru Select Monitors. 2) Shake the ECM harness and connector, engine harness connector, electric throttle connector harness while monitoring value of voltage meter.	Is the measured value less than 4.73 V?	Go to step **10.**	Go to step **11.**
10	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 5:***	Is the measured value less than 1 Ω?	Go to step **12.**	Repair the open harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.

	Step	Check	Yes	No
13	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value less than 10 V?	Go to step **14.**	Repair the battery short of harness between ECM connector and electric throttle connector.
14	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 5 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the measured value less than 10 V?	Go to step **15.**	Repair the short of harness between ECM connector and electric throttle connector.
15	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the electric throttle connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):*** ***(B136) No. 29 (+) — (B136) No. 35 (–):***	Is the measured value more than 1 MΩ?	Go to step **16.**	Repair the short of power supply sensor.
16	**CHECK ELECTRIC THROTTLE HARNESS.** 1) Disconnect the connector from ECM. 2) Disconnect the connector from electric throttle. 3) Measure the resistance between electric throttle connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 5:***	Is the measured value more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness.

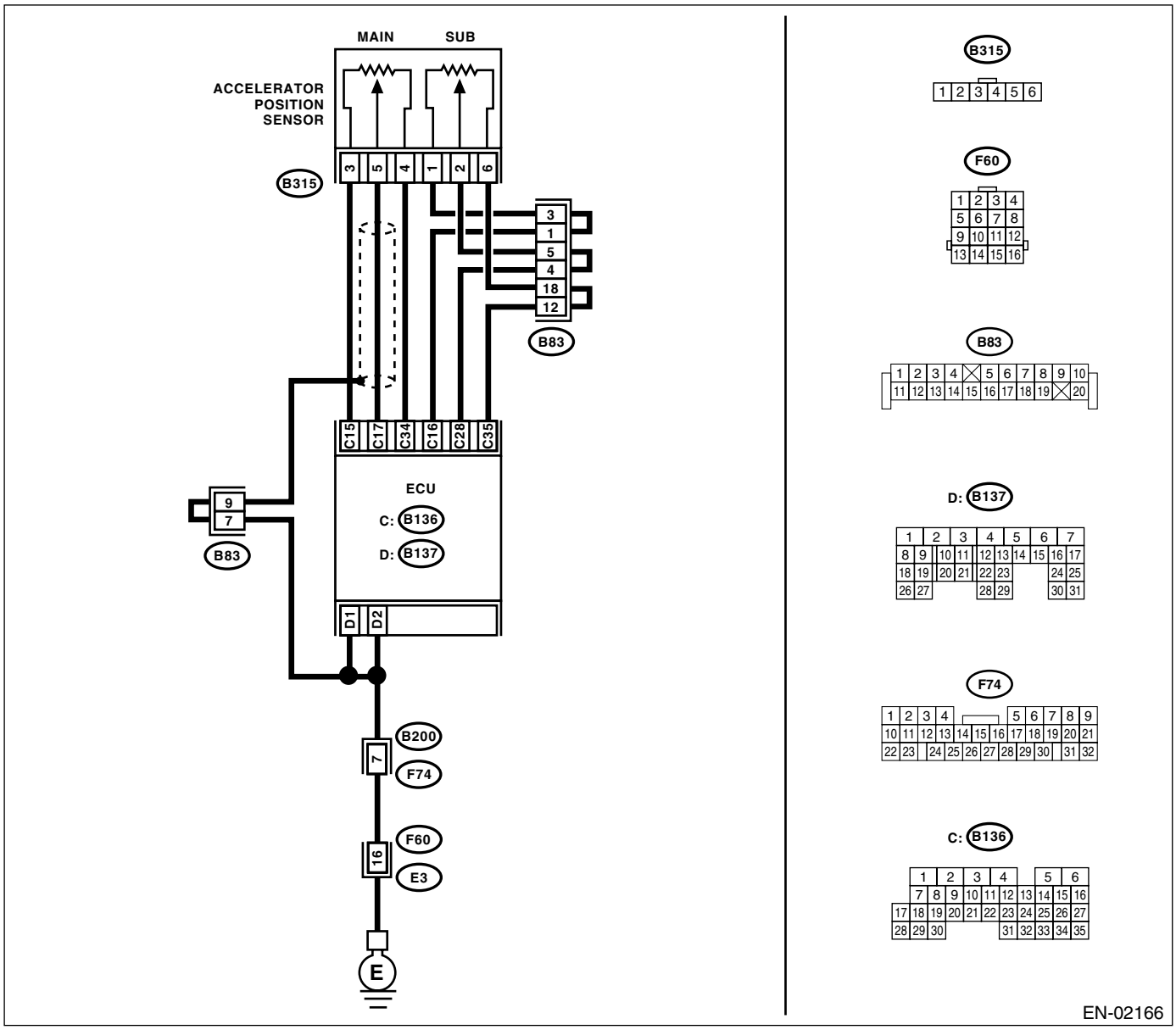
MEMO:

EB:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
  - GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-296, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-39, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 (+) — (B136) No. 34 (–):*** ***(B136) No. 28 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, accelerator position sensor connector and harness.	Is the measured value more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **9.**
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the measured value within 1.2 to 4.8 kΩ?	Go to step **7.**	Replace the accelerator position sensor.

Step		Check	Yes	No
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the measured value within 0.75 to 3.15 kΩ?	Go to step **8.**	Replace the accelerator position sensor.
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is released. ***Terminals*** ***No. 5 — No. 4:***	Is the measured value within 0.2 to 0.8 kΩ?	Go to step **9.**	Replace the accelerator position sensor.
9	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is released. ***Connector & terminal*** ***No. 2 — No. 6:***	Is the measured value within 0.15 to 0.63 kΩ?	Go to step **10.**	Replace the accelerator position sensor.
10	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is being depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the measured value within 0.5 to 2.5 kΩ?	Go to step **11.**	Replace the accelerator position sensor.
11	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is being depressed. ***Terminals*** ***No. 2 — No. 6: (Sub)***	Is the measured value within 0.28 to 1.68 kΩ?	Go to step **12.**	Replace the accelerator position sensor.
12	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main accelerator position sensor signals and sub accelerator position sensor signals, using Subaru Select Monitor. 5) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.	Is the measured value less than 4.8 V?	Go to step **13.**	Go to step **14.**
13	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **19.**

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:*** ***(B136) No. 35 — (B315) No. 6:***	Is the measured value less than 1 Ω?	Go to step **15.**	Repair the open harness connector.
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:*** ***(B315) No. 6 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **16.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value less than 6 V?	Go to step **17.**	Repair the battery short of harness between ECM connector and accelerator position sensor.
17	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (–):*** ***(B315) No. 2 (+) — Engine ground (–):*** 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the measured value less than 4.8 V?	Go to step **18.**	Repair the short of harness between ECM connector and accelerator position sensor connector.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the measured value less than 4.8 V?	Go to step **19.**	Repair the poor contact in accelerator position sensor connector. If problem persists, replace the accelerator position sensor.

	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between terminals of accelerator position sensor connector. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the measured value less than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness between accelerator position sensor connector and accelerator position sensor connector.

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-97, Engine Troublein General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electric throttle 2) Manifold absolute pressure sensor 3) Mass air flow and intake temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Electric throttle 2) Manifold absolute pressure sensor 3) Mass air flow and intake temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Electric throttle 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Electric throttle 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surge	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After-burning in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.

GENERAL DESCRIPTION

GD(H4DOTC)

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1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H4DOTC)-10, DTC P0011 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-13, DTC P0021 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-14, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-16, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-18, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-20, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-22, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to GD(H4DOTC)-24, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-26, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4DOTC)-30, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4DOTC)-32, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4DOTC)-34, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4DOTC)-36, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4DOTC)-38, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-40, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4DOTC)-42, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-44, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4DOTC)-46, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H4DOTC)-48, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H4DOTC)-50, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-52, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-56, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-58, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-60, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-62, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-64, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-68, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-70, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-72, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-74, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(H4DOTC)-78, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(H4DOTC)-82, DTC P0172 — SYSTEM TOO RICH (BANK 1) — , Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-85, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H4DOTC)-88, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H4DOTC)-90, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to GD(H4DOTC)-92, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to GD(H4DOTC)-94, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-96, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to GD(H4DOTC)-98, DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to GD(H4DOTC)-100, DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to GD(H4DOTC)-102, DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(H4DOTC)-104, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 misfire detected	<Ref. to GD(H4DOTC)-110, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(H4DOTC)-110, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(H4DOTC)-110, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-112, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-114, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4DOTC)-116, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-118, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-120, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to GD(H4DOTC)-122, DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-124, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4DOTC)-152, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4DOTC)-154, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4DOTC)-156, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-158, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4DOTC)-160, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to GD(H4DOTC)-162, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/ off)	<Ref. to GD(H4DOTC)-162, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4DOTC)-164, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-166, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/ Performance	<Ref. to GD(H4DOTC)-168, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-170, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4DOTC)-172, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-174, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4DOTC)-177, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-178, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to GD(H4DOTC)-180, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-182, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4DOTC)-184, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-186, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4DOTC)-187, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0545	Exhaust Gas Temperature Sensor Circuit Low — Bank 1 —	<Ref. to GD(H4DOTC)-188, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0546	Exhaust Gas Temperature Sensor Circuit High — Bank 1 —	<Ref. to GD(H4DOTC)-190, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	CAN Communication Circuit	<Ref. to GD(H4DOTC)-192, DTC P0600 — CAN COMMUNICATION CIRCUIT—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-193, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4DOTC)-194, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-196, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-200, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-203, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-204, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	AT MIL Light up Request	<Ref. to GD(H4DOTC)-205, DTC P0700 — AT MIL LIGHT UP REQUEST — , Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (AT model)	<Ref. to GD(H4DOTC)-206, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT model)	<Ref. to GD(H4DOTC)-207, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (AT model)	<Ref. to GD(H4DOTC)-208, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT model)	<Ref. to GD(H4DOTC)-209, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to GD(H4DOTC)-210, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to GD(H4DOTC)-212, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to GD(H4DOTC)-214, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to GD(H4DOTC)-216, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to GD(H4DOTC)-218, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to GD(H4DOTC)-219, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to GD(H4DOTC)-220, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to GD(H4DOTC)-221, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to GD(H4DOTC)-222, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to GD(H4DOTC)-224, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to GD(H4DOTC)-226, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to GD(H4DOTC)-228, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4DOTC)-230, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4DOTC)-231, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-232, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-236, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-240, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1301	Misfire Defected (High Temperature Exhaust Gas)	<Ref. to GD(H4DOTC)-242, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to GD(H4DOTC)-244, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-246, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-248, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4DOTC)-250, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4DOTC)-252, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4DOTC)-254, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(H4DOTC)-256, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(H4DOTC)-260, DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-262, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1544	Exhaust Gas Temperature Tool High	<Ref. to GD(H4DOTC)-263, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-264, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(H4DOTC)-265, DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(H4DOTC)-268, DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(H4DOTC)-270, DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to GD(H4DOTC)-272, DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4DOTC)-274, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4DOTC)-276, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4DOTC)-278, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4DOTC)-280, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DOTC)-282, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to GD(H4DOTC)-284, DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to GD(H4DOTC)-286, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to GD(H4DOTC)-288, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to GD(H4DOTC)-290, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to GD(H4DOTC)-292, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to GD(H4DOTC)-294, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to GD(H4DOTC)-296, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

MEMO:

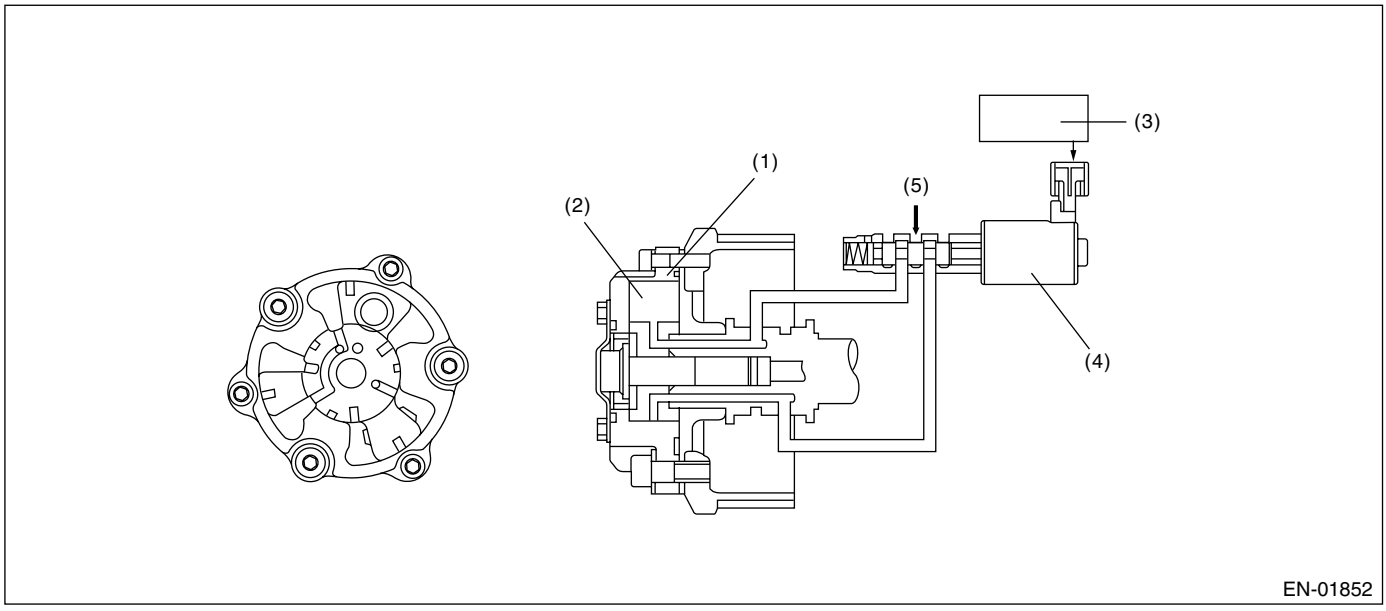
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0011 — "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.
1) Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.
2) Judge NG when the most retarded learning value is outside of the normal range.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control valve
(5) Oil pressure

3. ENABLE CONDITION (For abnormality judgment only)

Secondary Parameters	Enable Conditions
Abnormality judgement (1)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Coolant temperature	≥ 60°C (140 °F)
Abnormality judgement (2)	
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Coolant temperature	≥ 60°C (140 °F)

4. GENERAL DRIVING CYCLE

1) Always perform the diagnosis after idling when the engine speed is more than 1500 rpm.
2) Always perform the diagnosis after warming up the engine when the engine speed is more than 500 rpm.

5. DIAGNOSTIC METHOD

1) Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large.
2) Judge NG when the most retarded learning value is outside of the normal range.

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 20 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
(1) Judgemet value |AVCS target position – AVCS actual position|	≥ 7.5°
(2) Judgemet value AVCS control Most timing retard learning value	During most timing retard learning < –29.5°CA or > 29.5°CA

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
(1) Judgemet value AVCS control Amount of AVCS target timing advance AVCS target position – AVCS actual position	 During feedback 5 — 30°CA < 10°
(2) Judgemet value Most timing retard learning value	 –29.5 — 29.5°CA

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

B: DTC P0021 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —

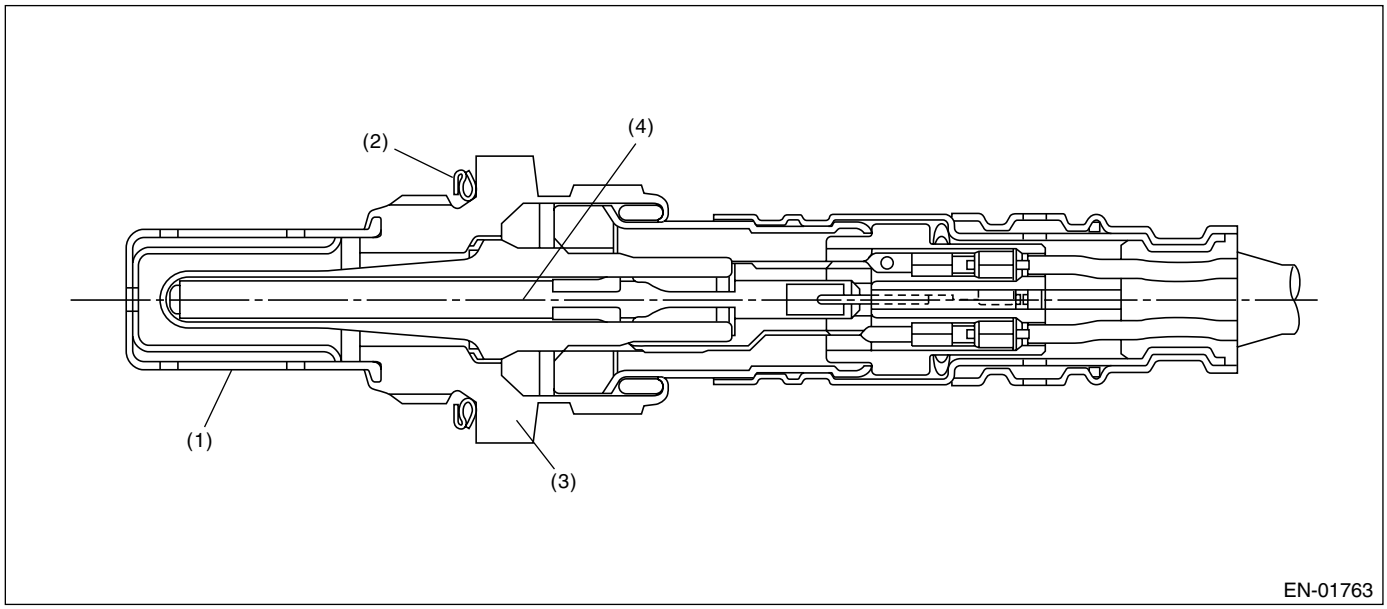
NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 — “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —.>

C: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	60 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more
Front oxygen (A/F) sensor heater control duty ≥ 70%	Experienced

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

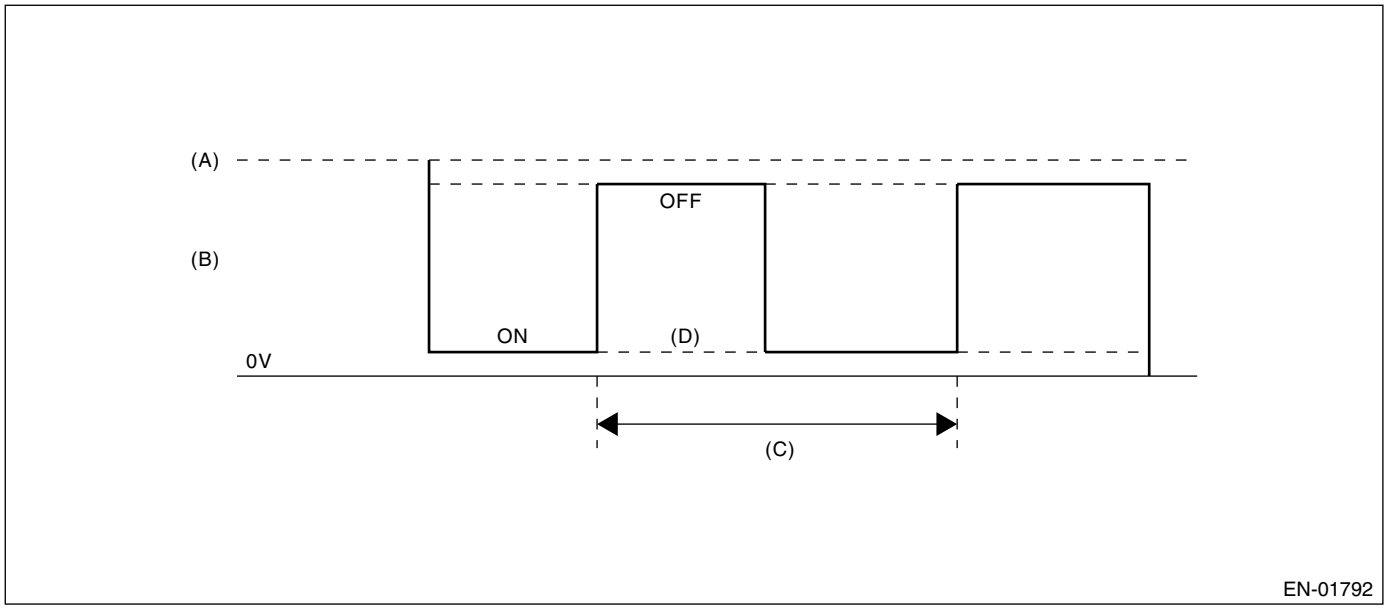
Memorize the freeze frame data. (For test mode $02)

D: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) Low abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	Low < 87.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

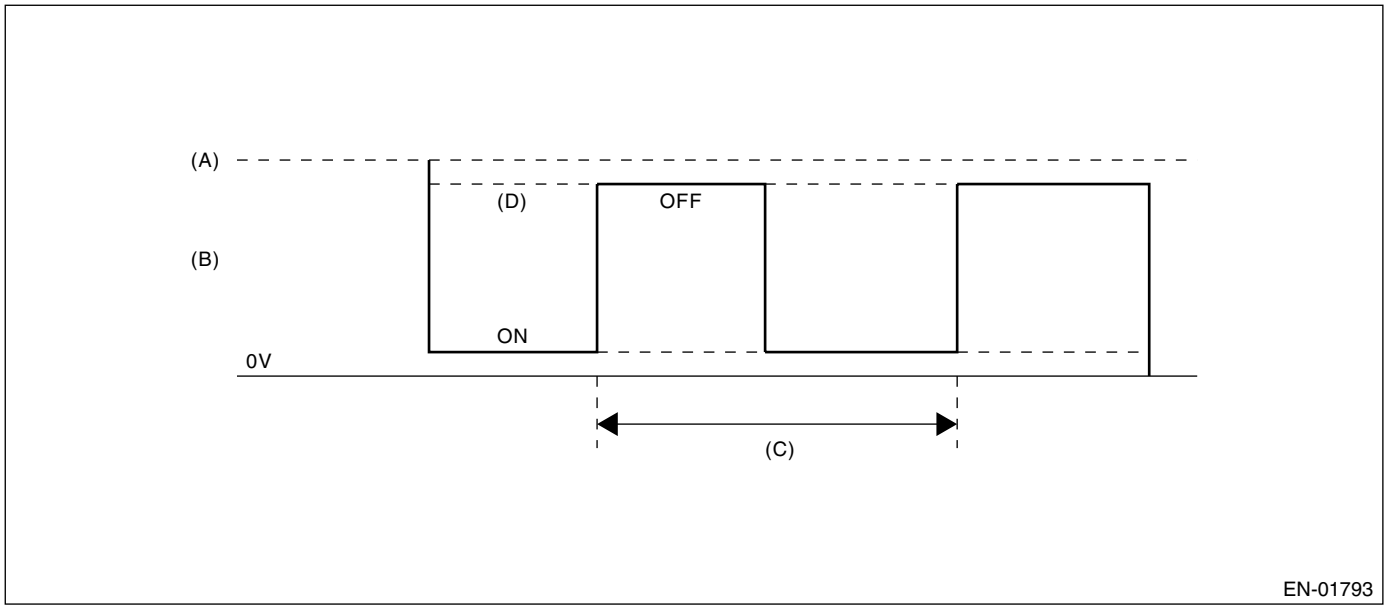
Memorize the freeze frame data. (For test mode $02)

E: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

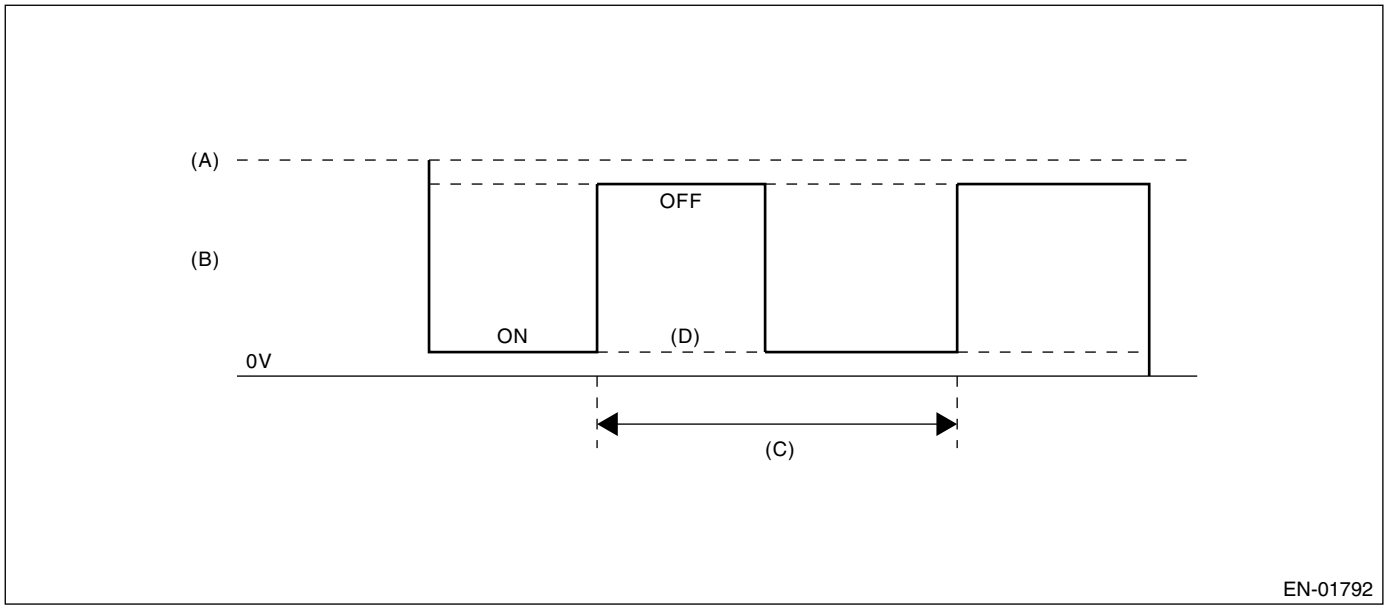
Memorize the freeze frame data. (For test mode $02)

F: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater.
Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 millisecond (10 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

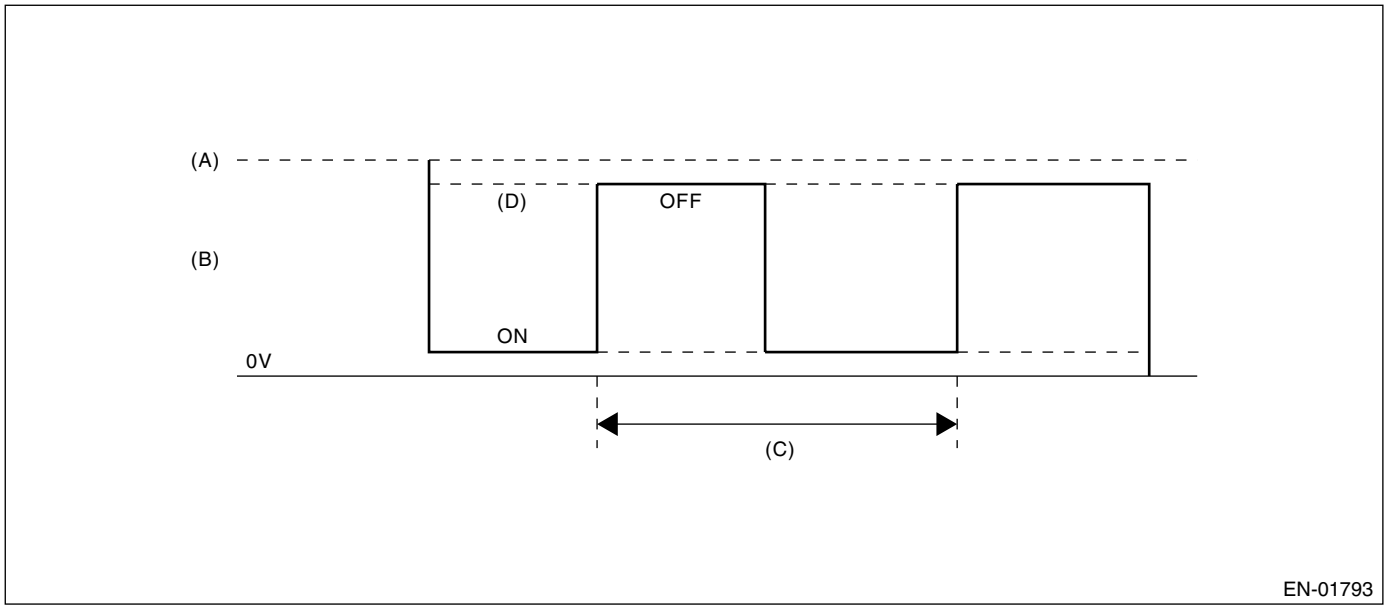
Memorize the freeze frame data. (For test mode $02)

G: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.
Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycle)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 milliseconds (10 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

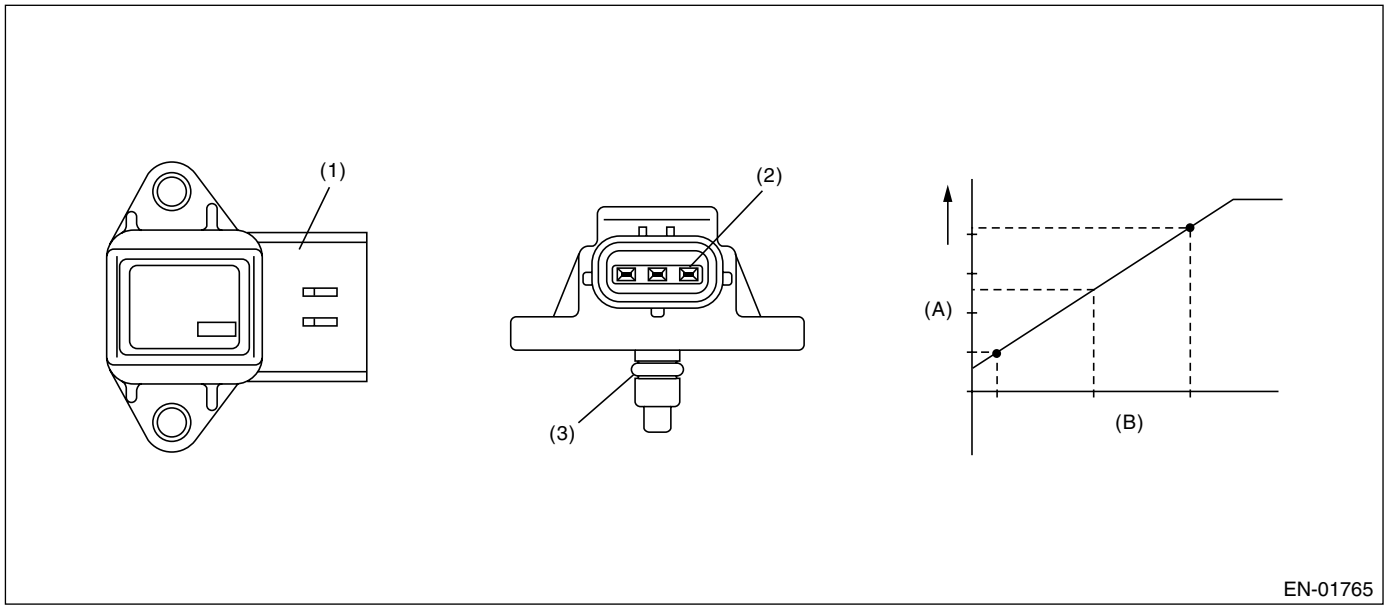
Memorize the freeze frame data. (For test mode $02)

H: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	< 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

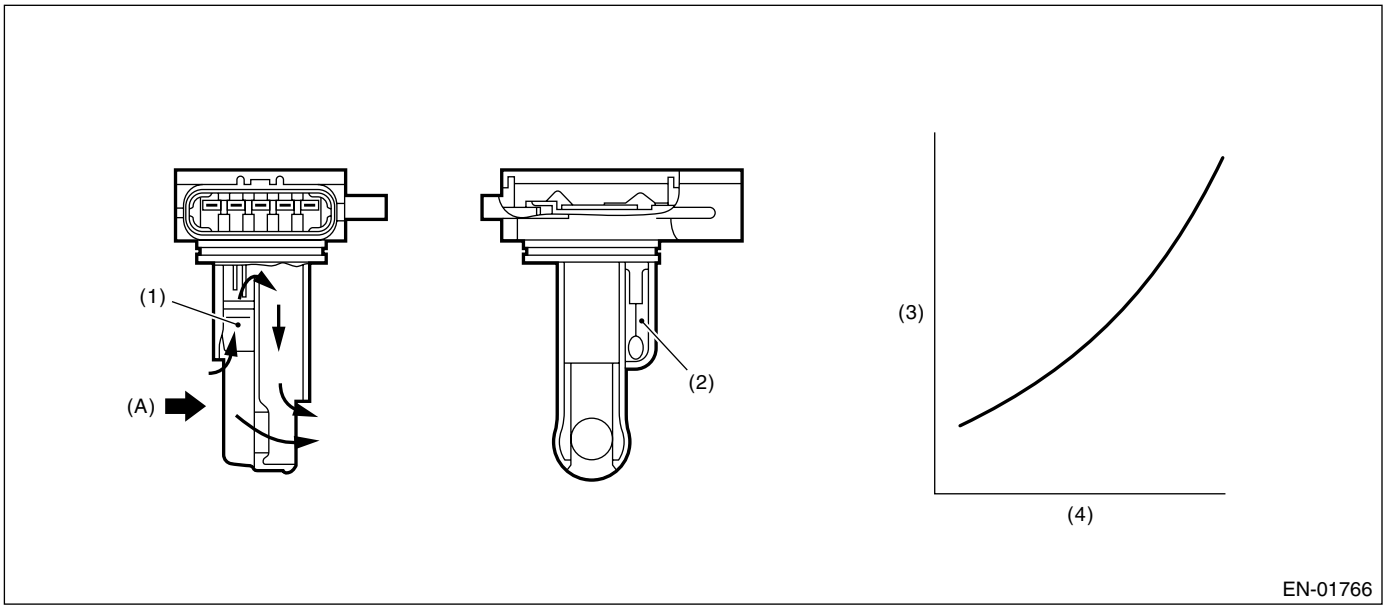
Memorize the freeze frame data. (For test mode $02)

I: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more then the time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.5 V
Engine speed	≥ 2500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	≥ 2.5 V
Engine speed	550 ←→ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.5 V
Engine speed	≥ 2500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 2.5 V
Engine speed	550 ←→ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
  - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  - At normal: knock compensation = 0°CA is fixed.
  - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  - Not allowed to update the whole learning compensation factor.
  - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

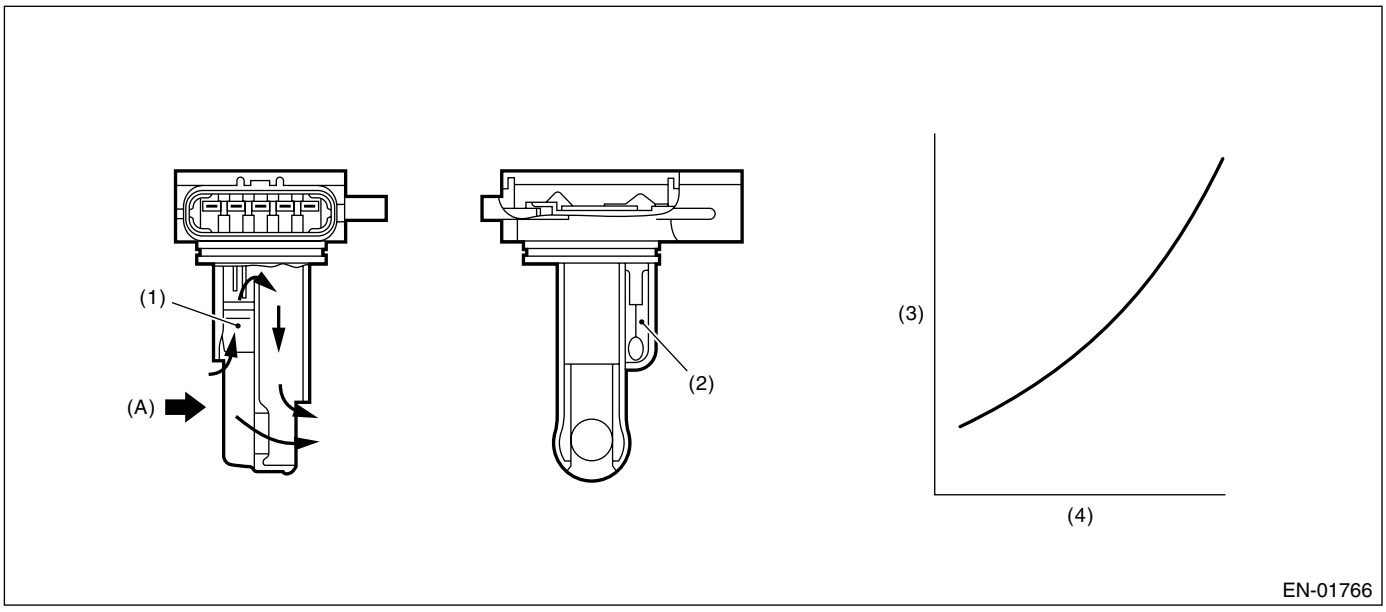
MEMO:

J: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  – At normal: knock compensation = 0°CA is fixed.
  – At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  – Not allowed to update the whole learning compensation factor.
  – Not allowed to calculate the partial learning zone compensation value.
• ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
• Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

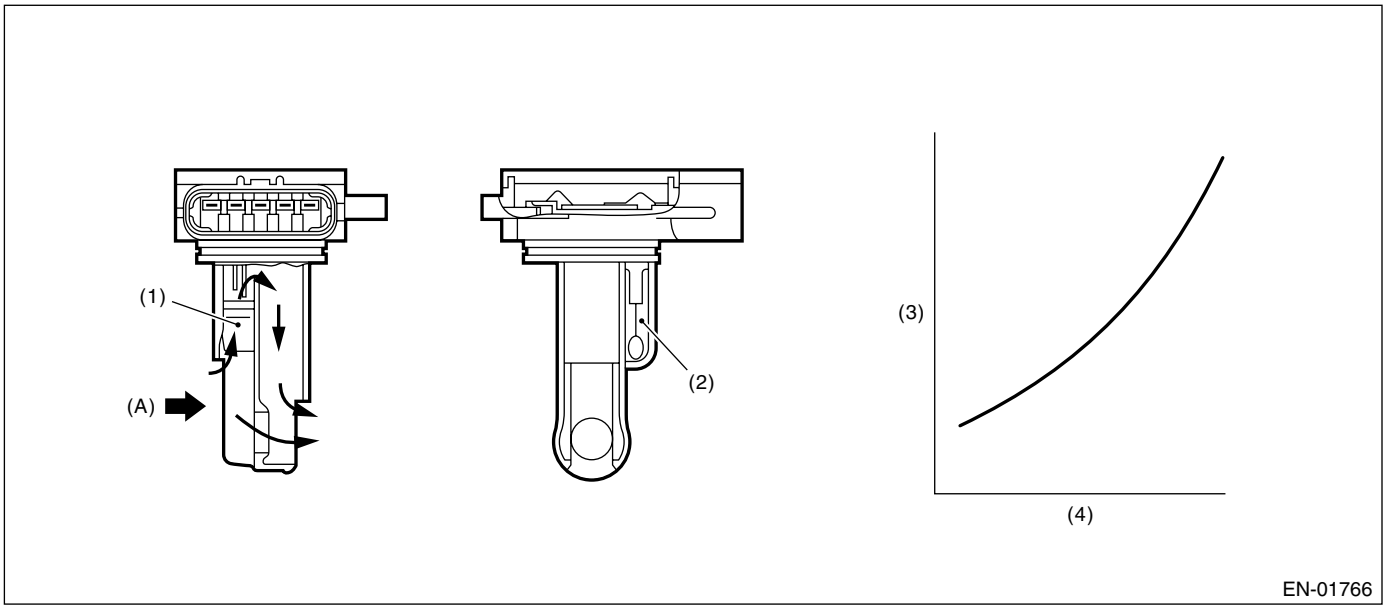
Memorize the freeze frame data. (For test mode $02)

K: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg (lb)/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  – At normal: knock compensation = 0°CA is fixed.
  – At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  – Not allowed to update the whole learning compensation factor.
  – Not allowed to calculate the partial learning zone compensation value.
• ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
• Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

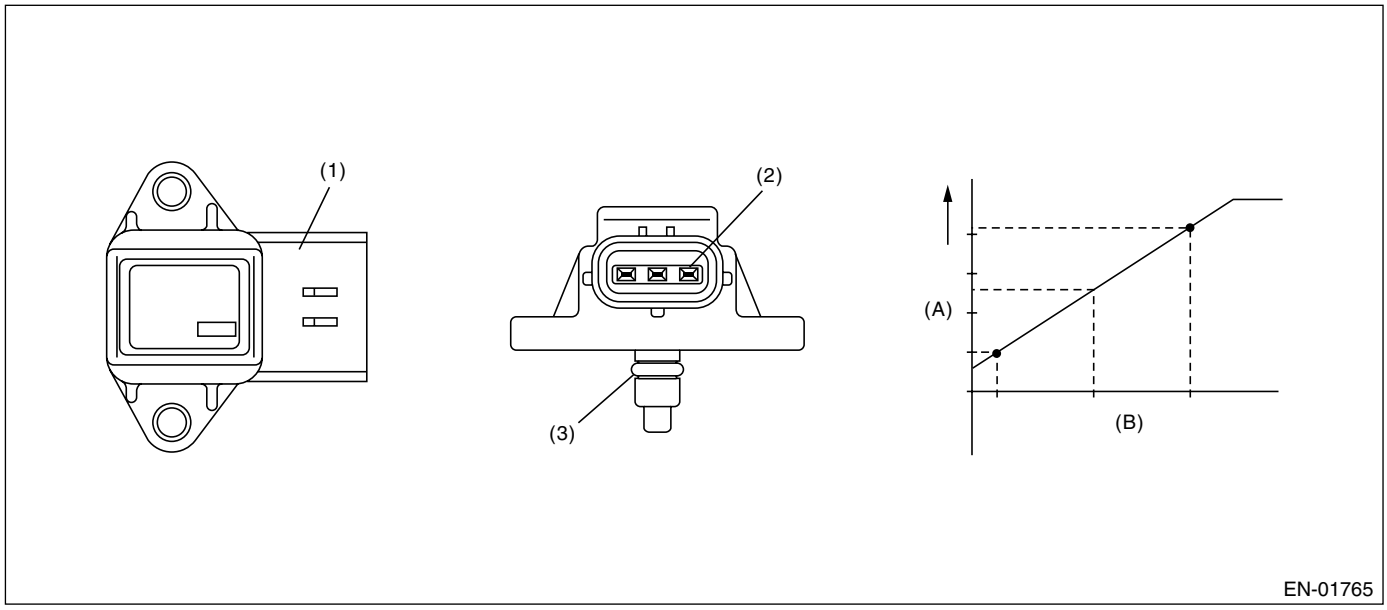
Memorize the freeze frame data. (For test mode $02)

L: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

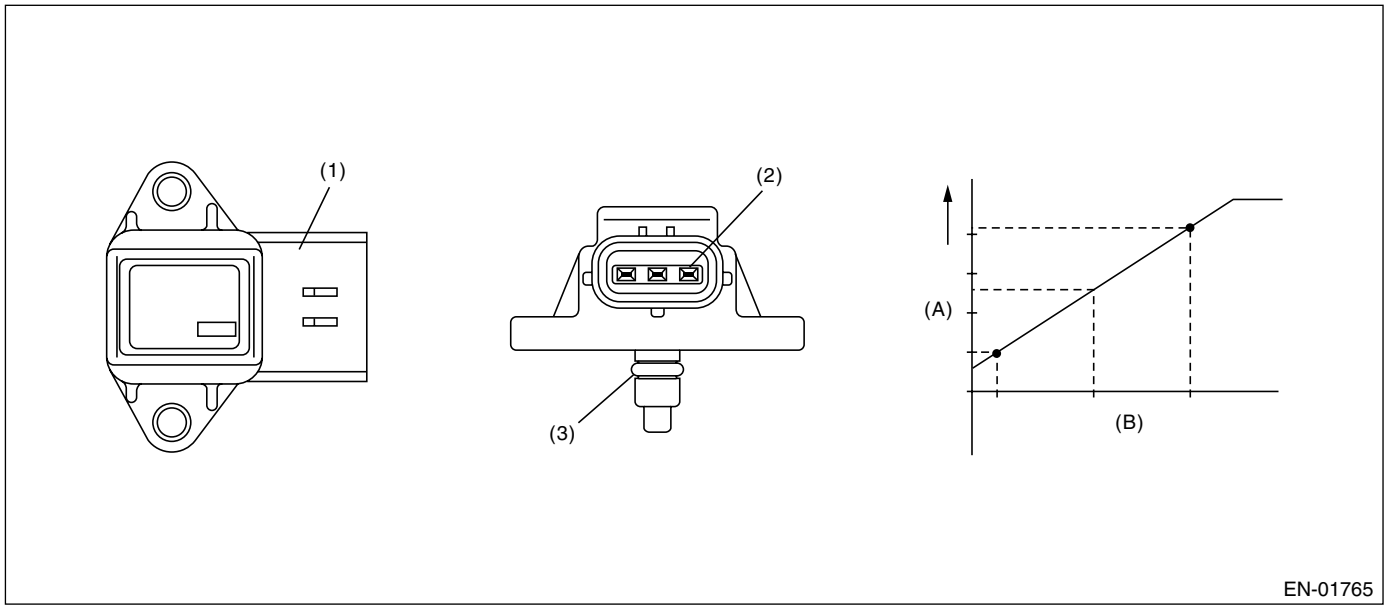
Memorize the freeze frame data. (For test mode $02)

M: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.93 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

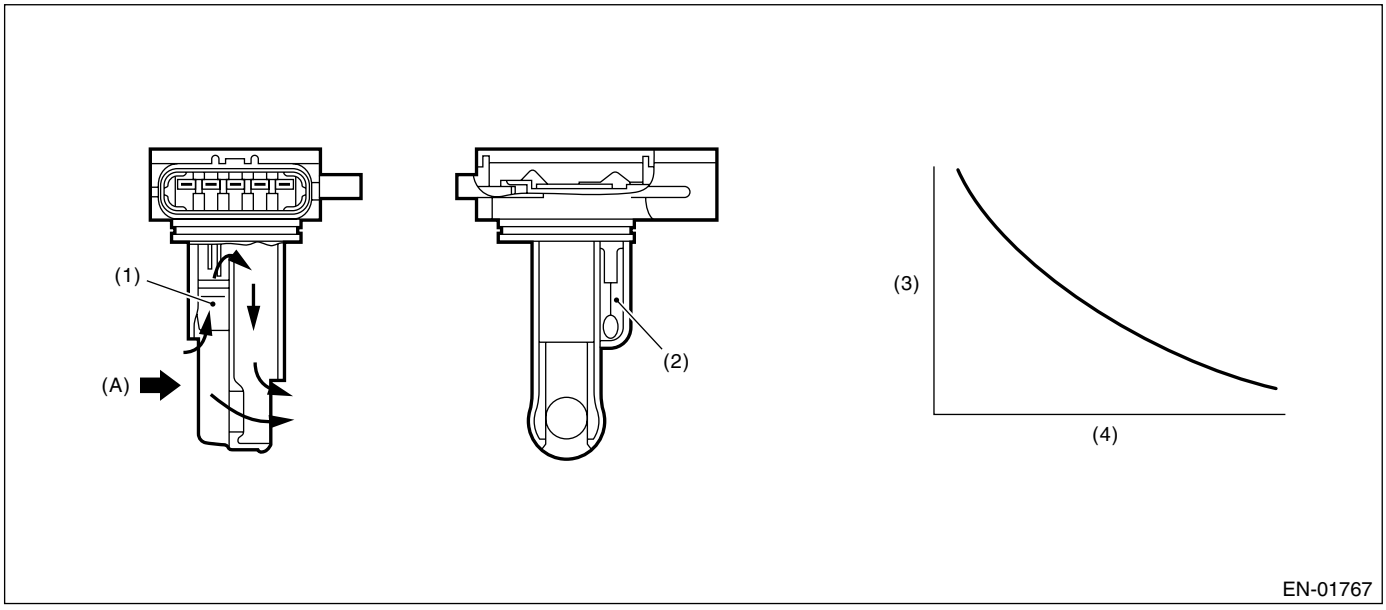
Memorize the freeze frame data. (For test mode $02)

N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.)
Exhaust temperature above 500°C (932°F)	60 seconds or more

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

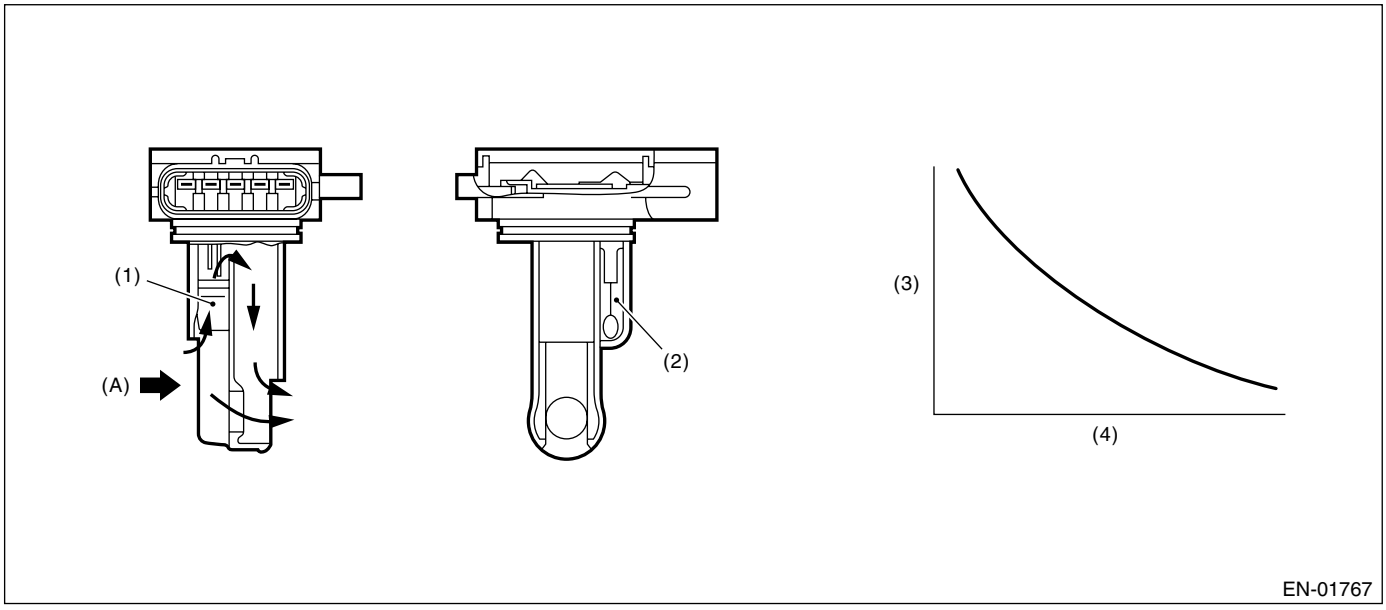
Memorize the freeze frame data. (For test mode $02)

O: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

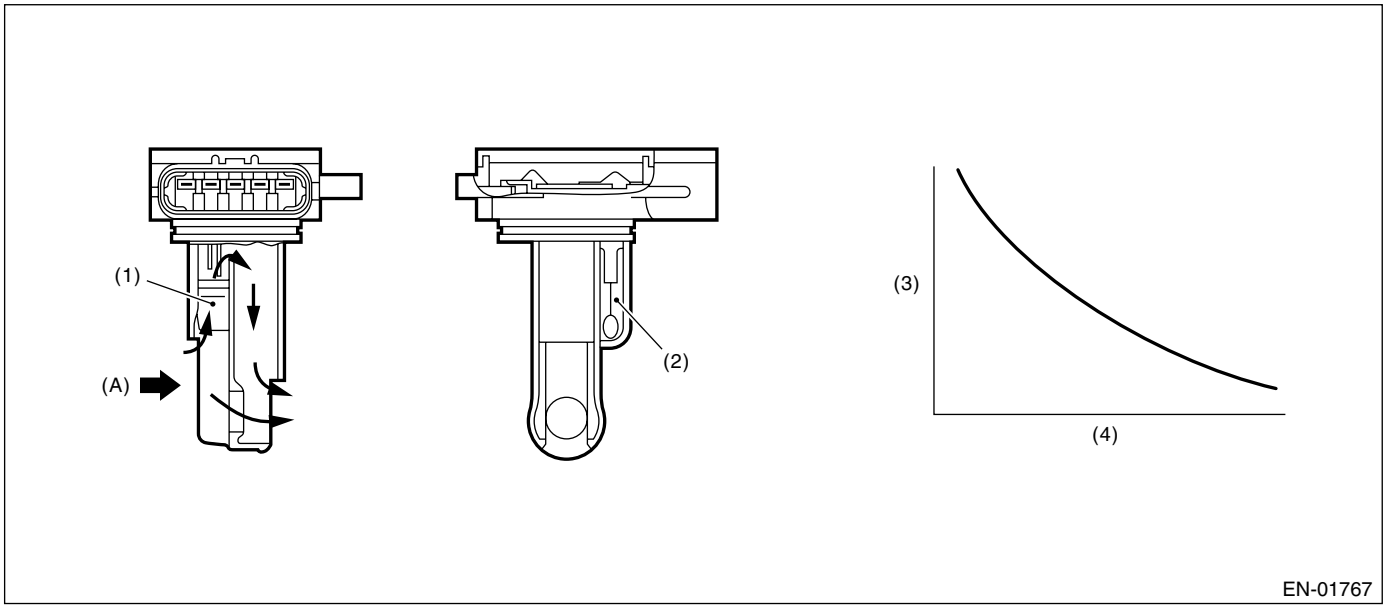
Memorize the freeze frame data. (For test mode $02)

P: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

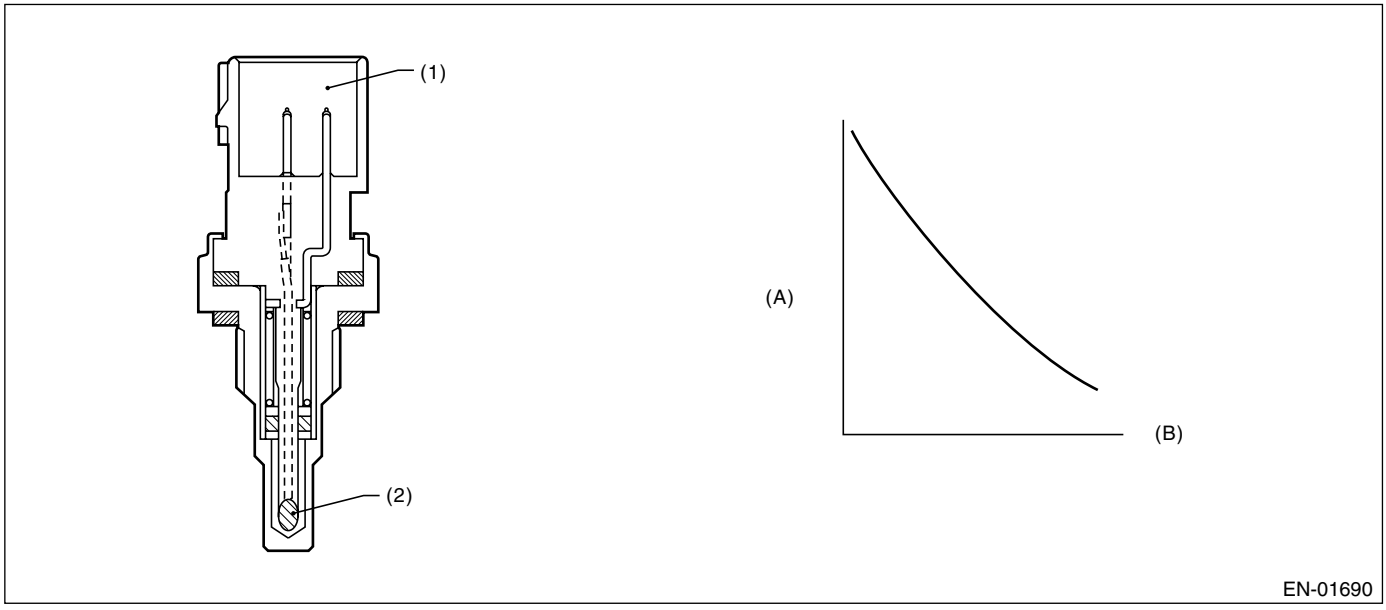
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

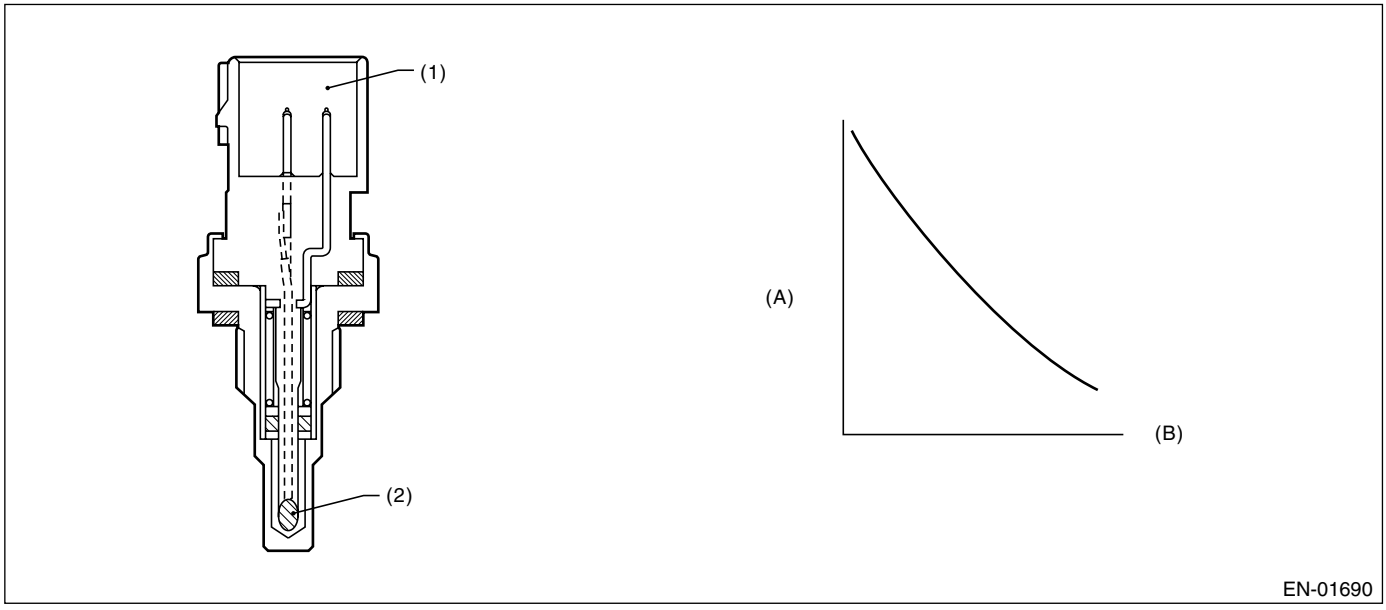
Memorize the freeze frame data. (For test mode $02)

R: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

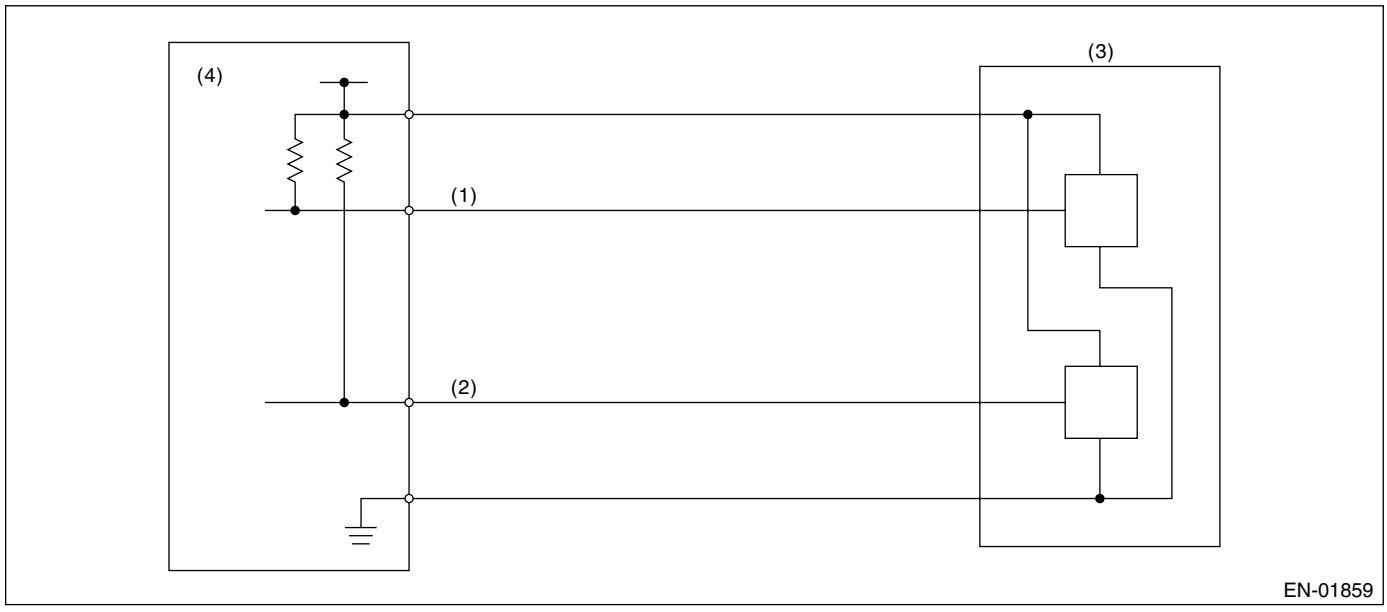
Memorize the freeze frame data. (For test mode $02)

S: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.309 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

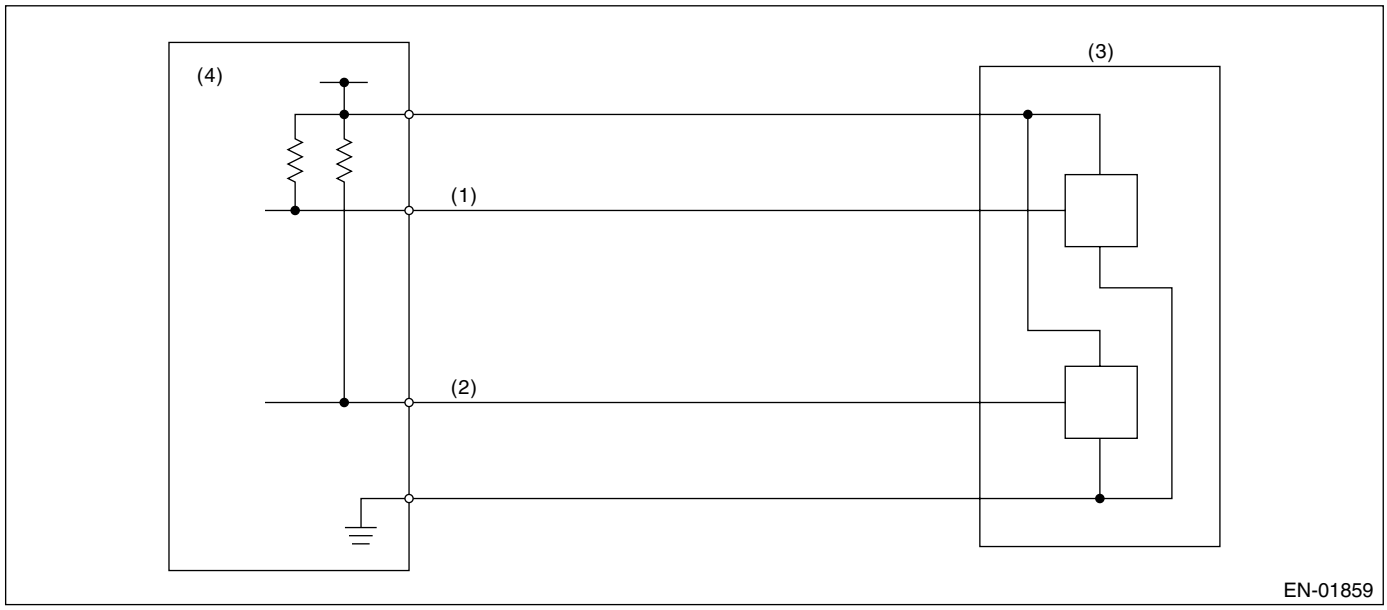
Memorize the freeze frame data. (For test mode $02)

T: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.646 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

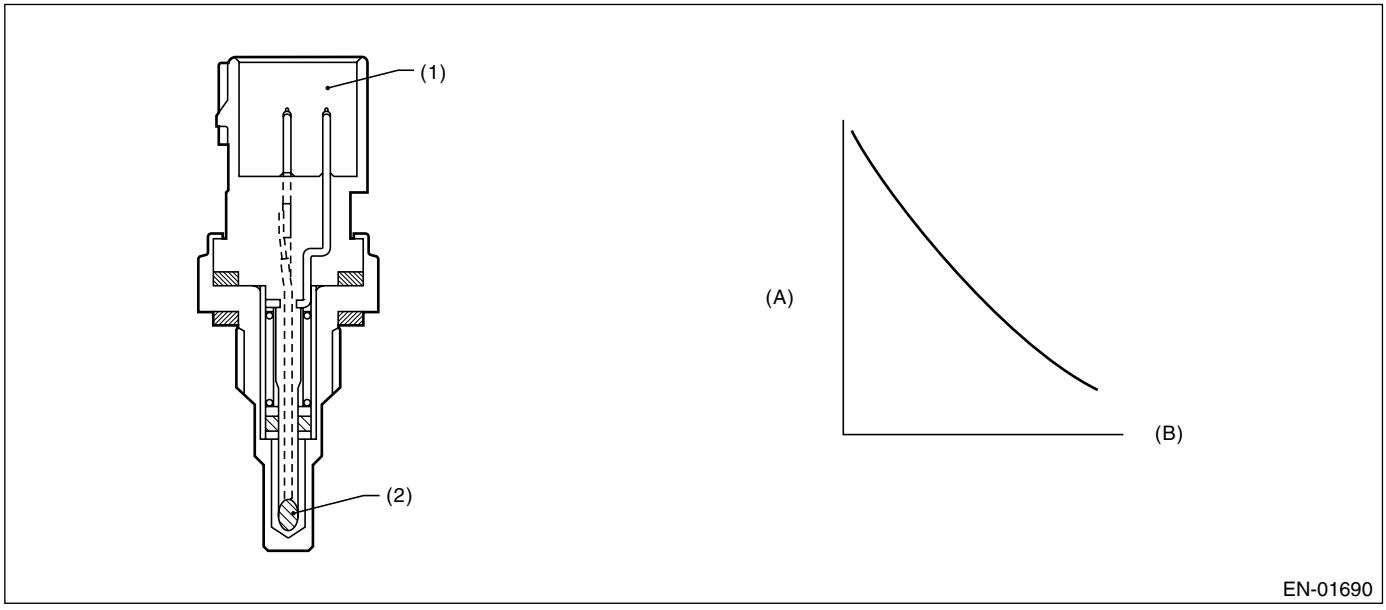
Memorize the freeze frame data. (For test mode $02)

U: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting
a) Timer stop at fuel cut mode.
b) During the driving conditions except a) above, timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.
Where,TWCNT is determined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
–20 (–4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
–10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting
$t = 451.1 - 25.9 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

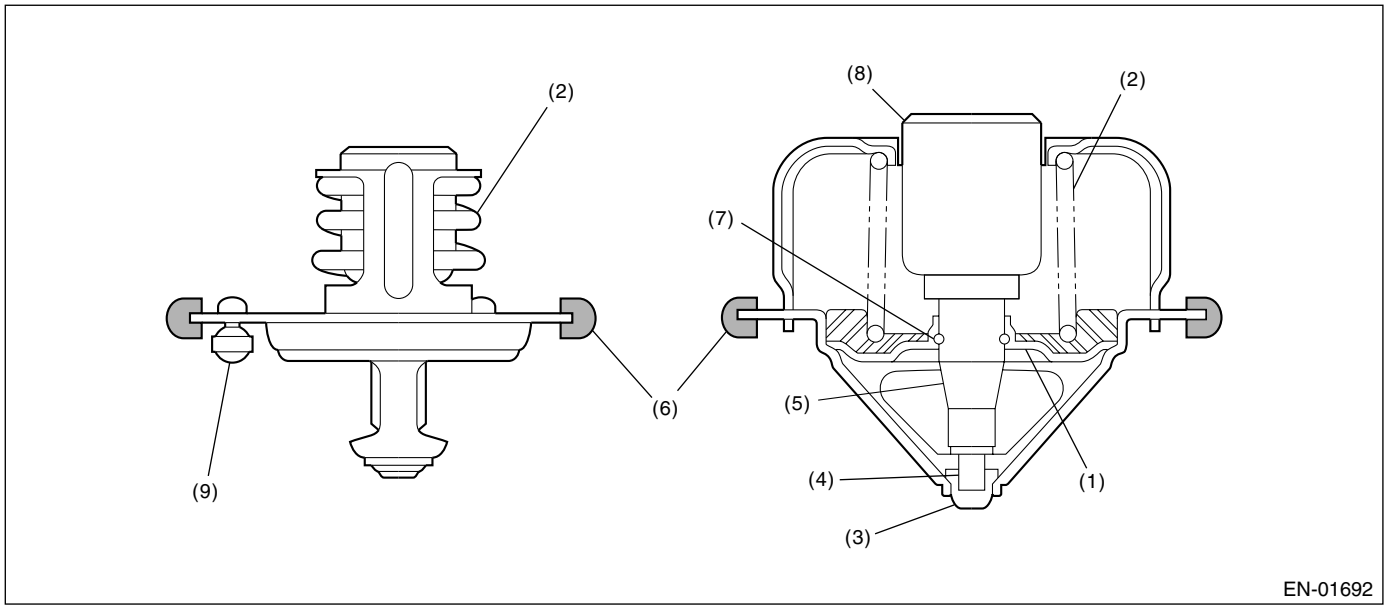
MEMO:

V: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ –7°C (19.4°F)
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 75°C (167°F)
Engine coolant temperature	< 75°C (167°F)
(Estimated – measured) coolant temperature	> 30°C (86°F)

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ –7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 75°C (167°F)
(Estimated – measured) coolant temperature	≤ 30°C (86°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

W: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine starting with the ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine starting – manifold absolute pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

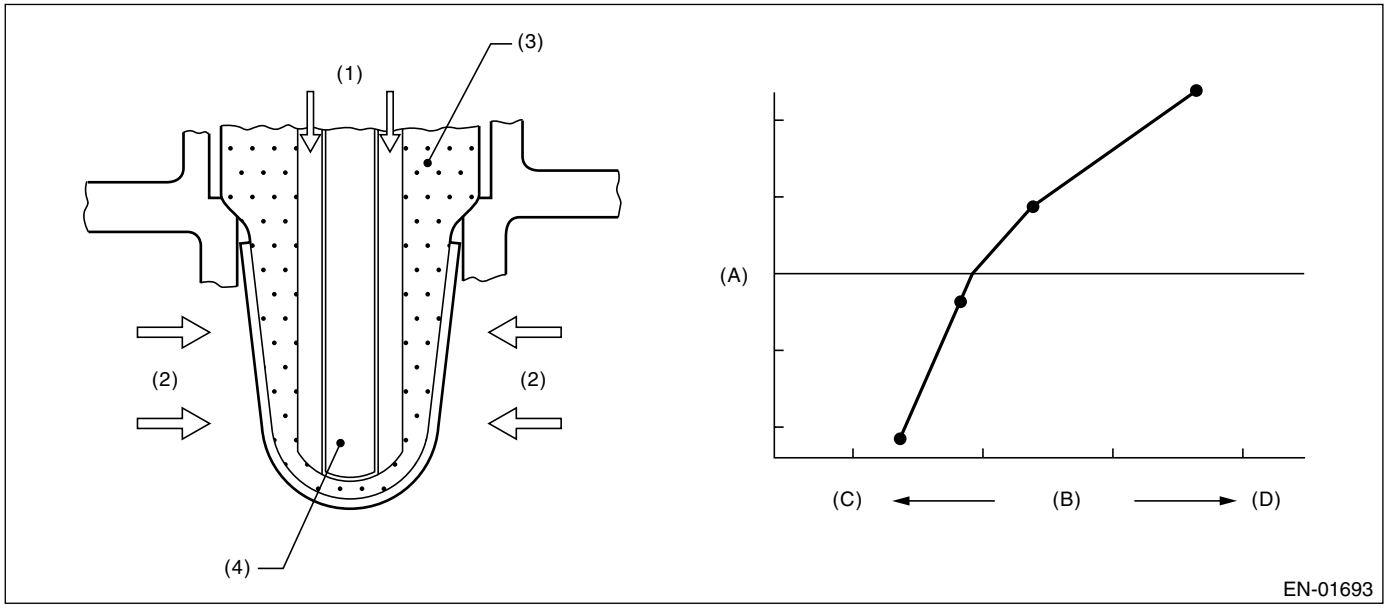
MEMO:

X: DTC P0131 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< –0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

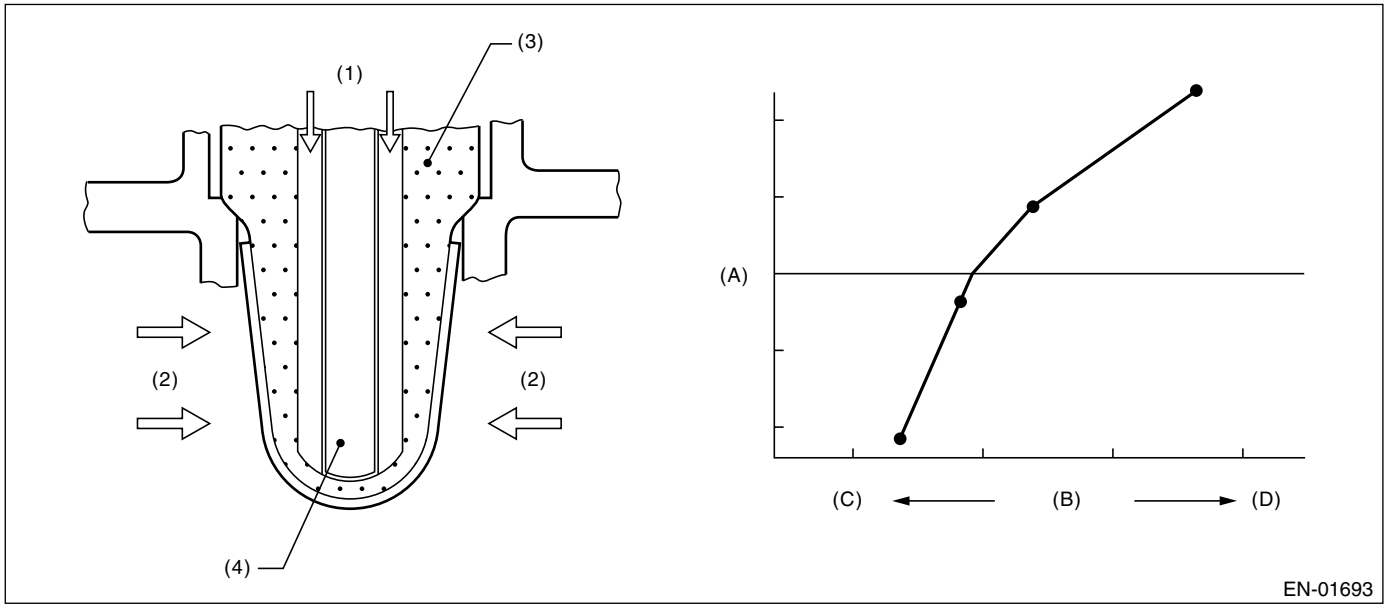
Memorize the freeze frame data. (For test mode $02)

Y: DTC P0132 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

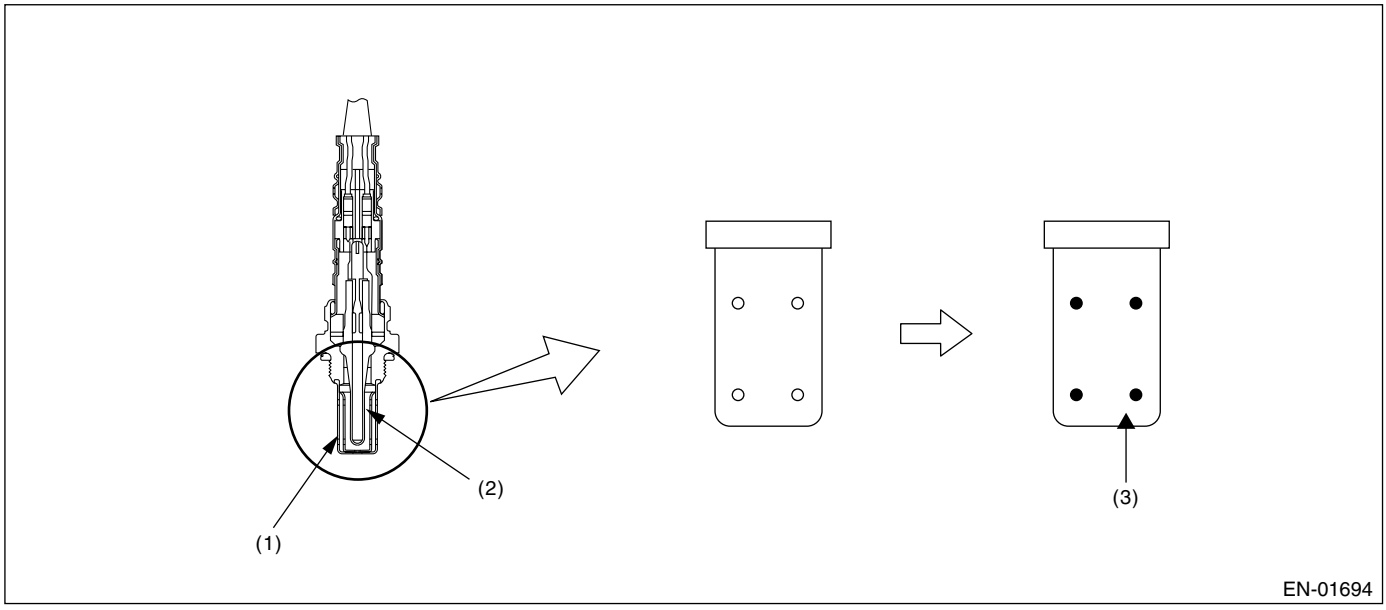
9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

Z: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

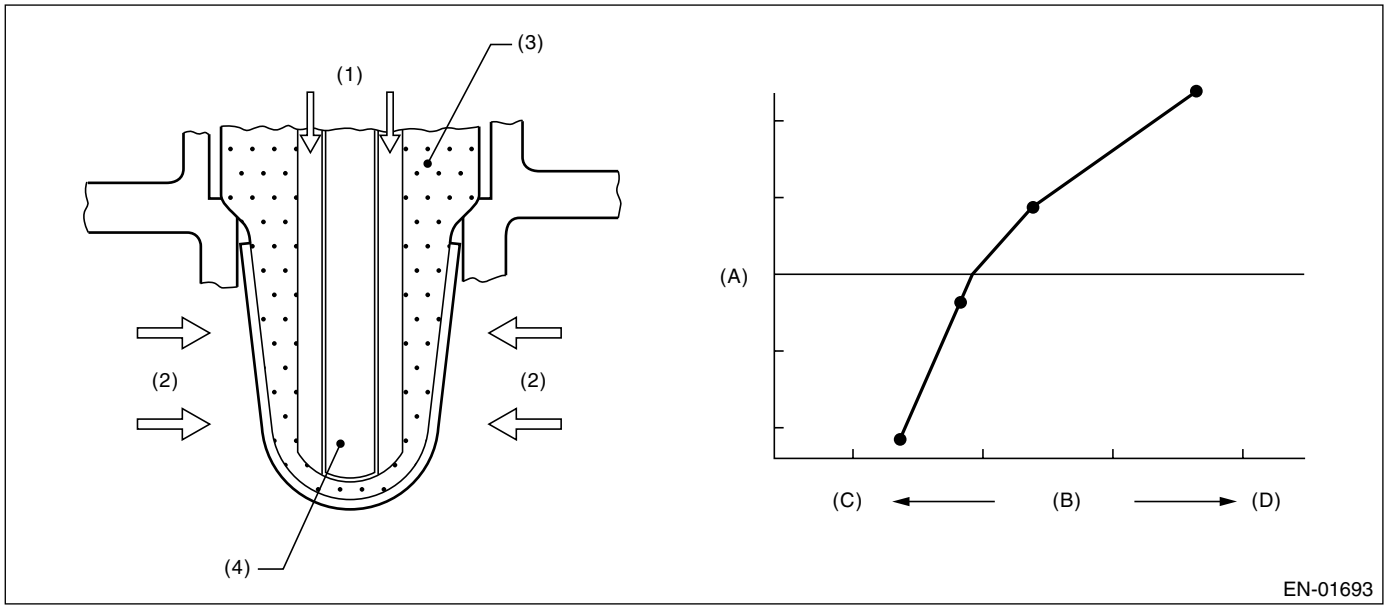
1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
After starting engine	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1000 ←→ 3200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 31 g (0.35 ←→ 1.09 oz)/s
Engine load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
All conditions for EVAP canister purge	to be in enable
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.
After integrate 1640 times (210 seconds), calculate the diagnosis value.
Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up for a total of 210 seconds d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (n) = (lmd (n) – lmd (n–1)) – (lmd (n–1) – lmd (n–2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.367

Time Needed for Diagnosis: 210 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

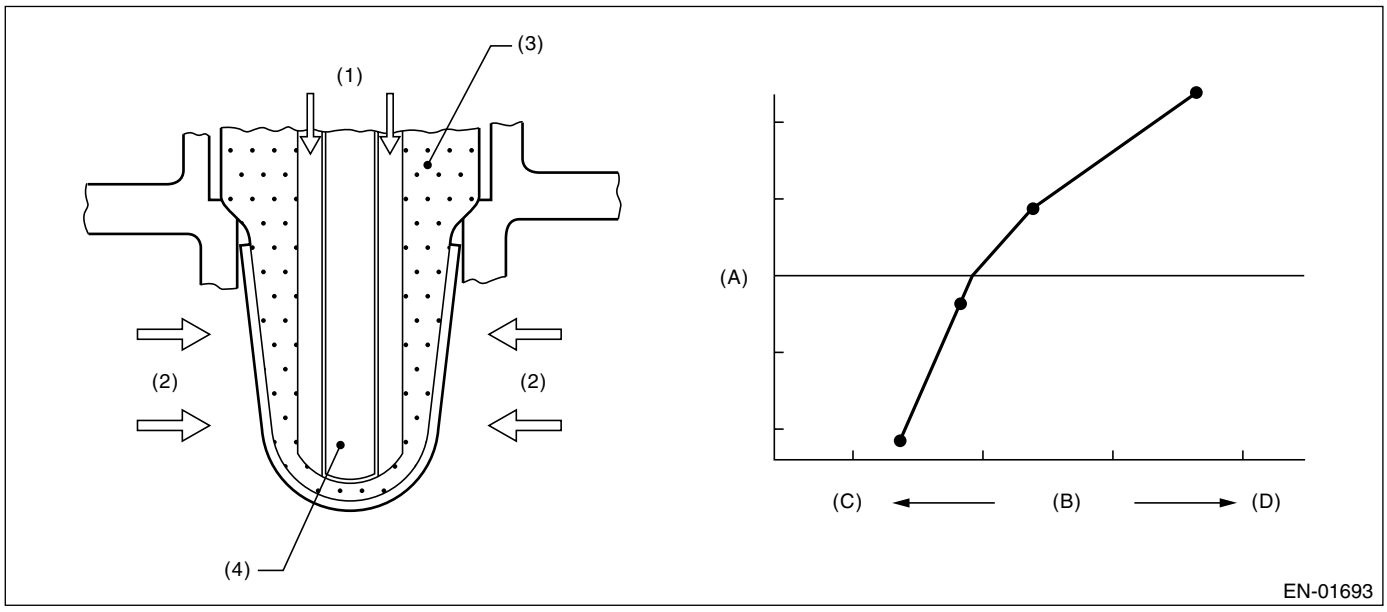
MEMO:

AA:DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.
Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Cumulative amount of Front O_2 (A/F) sensor heater control duty every 128 milliseconds	≥ 28000%
Front lambda sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

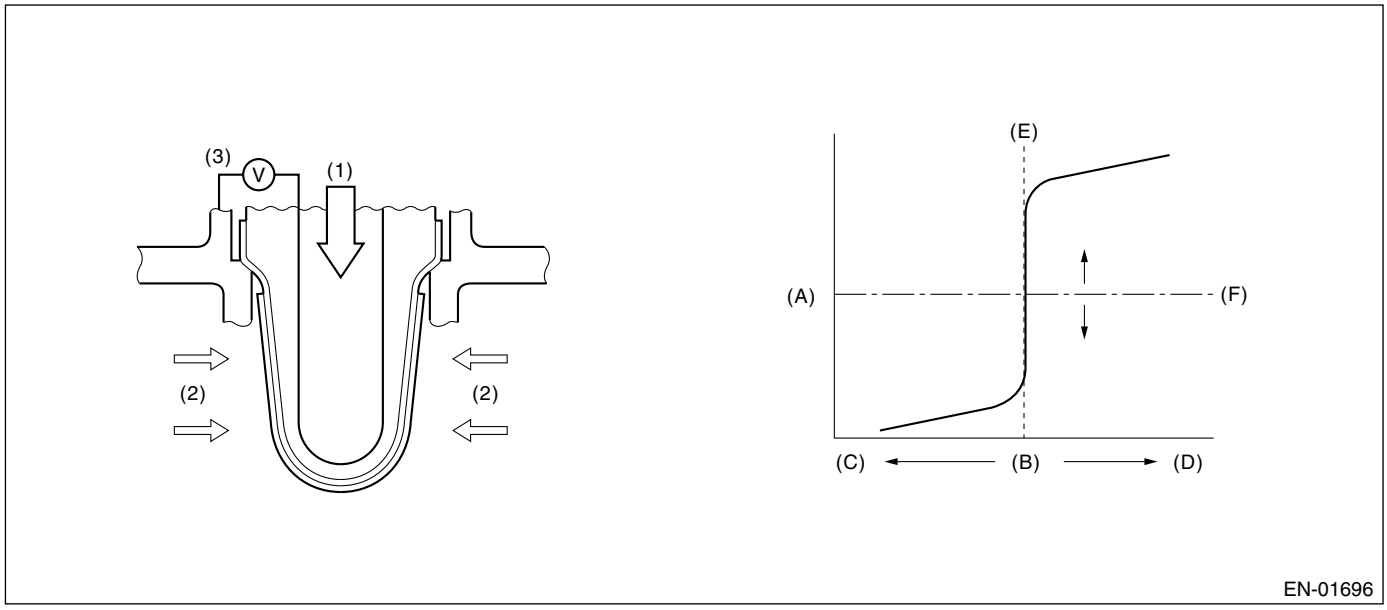
Memorize the freeze frame data. (For test mode $02)

AB:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor	≥ 0.54 V
Amount of intake air	≥ 10 g (0.35 oz)/s
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming up the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 490 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 490 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

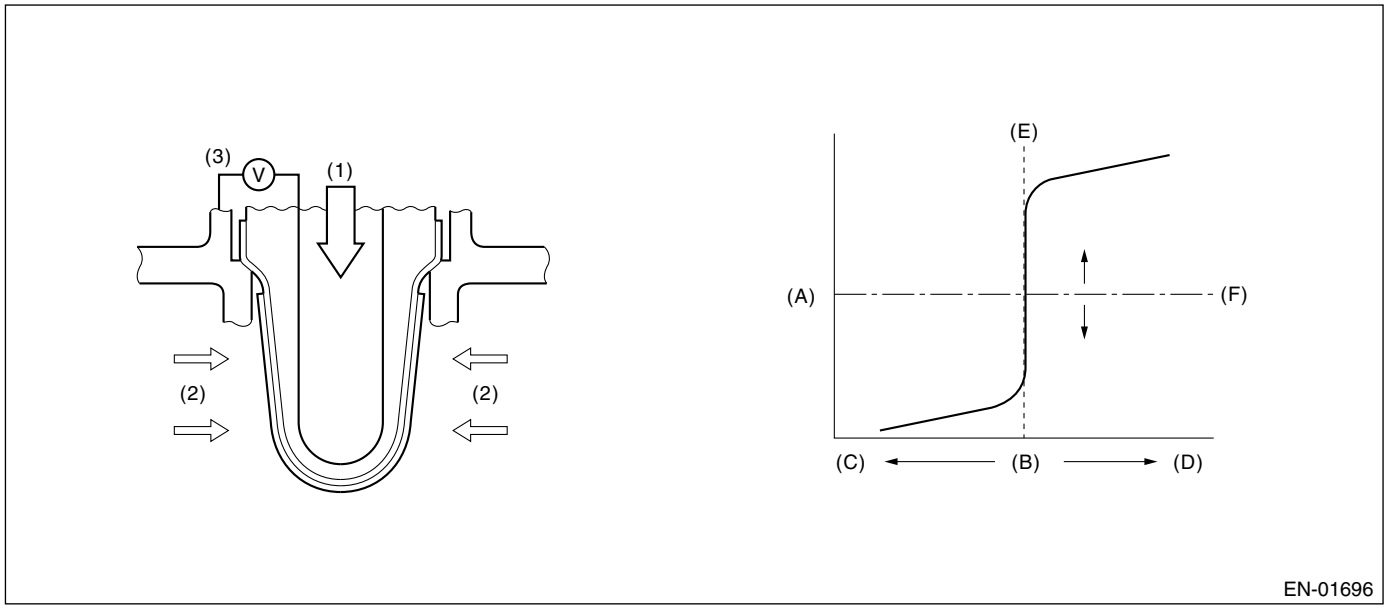
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AC:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor	≥ 0.54 V
Amount of intake air	≥ 10 g (0.35 oz)/s
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming up the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AD:DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

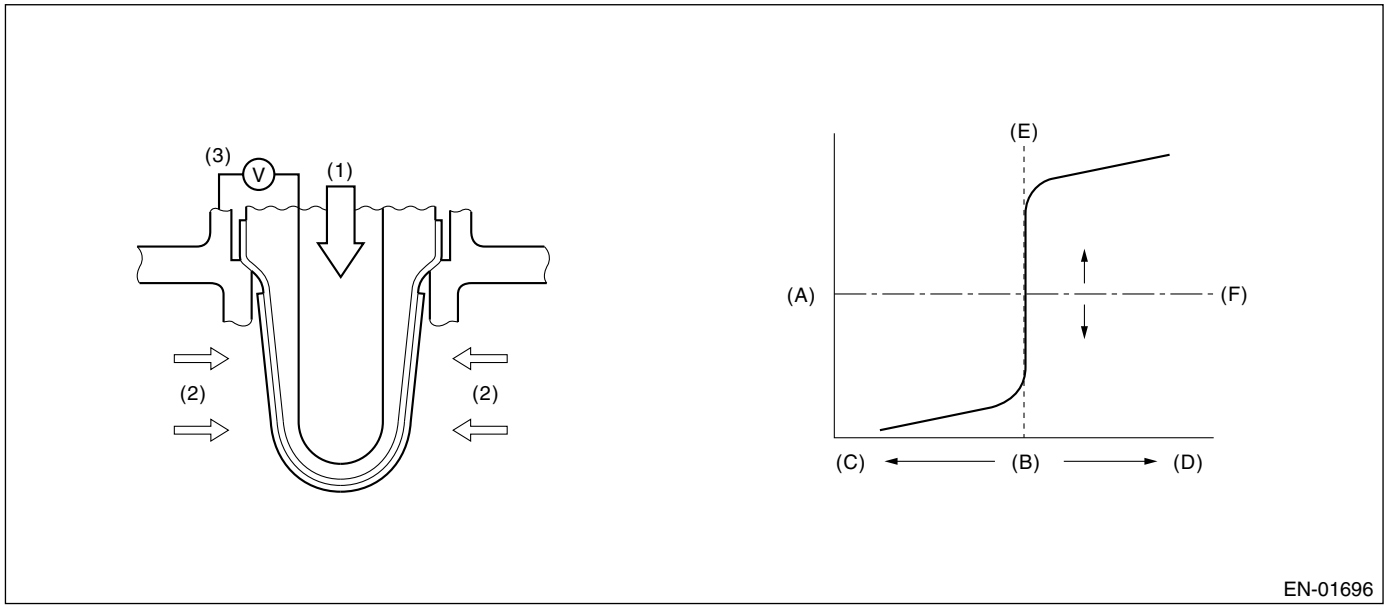
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

• Diagnostic Method

Measure the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

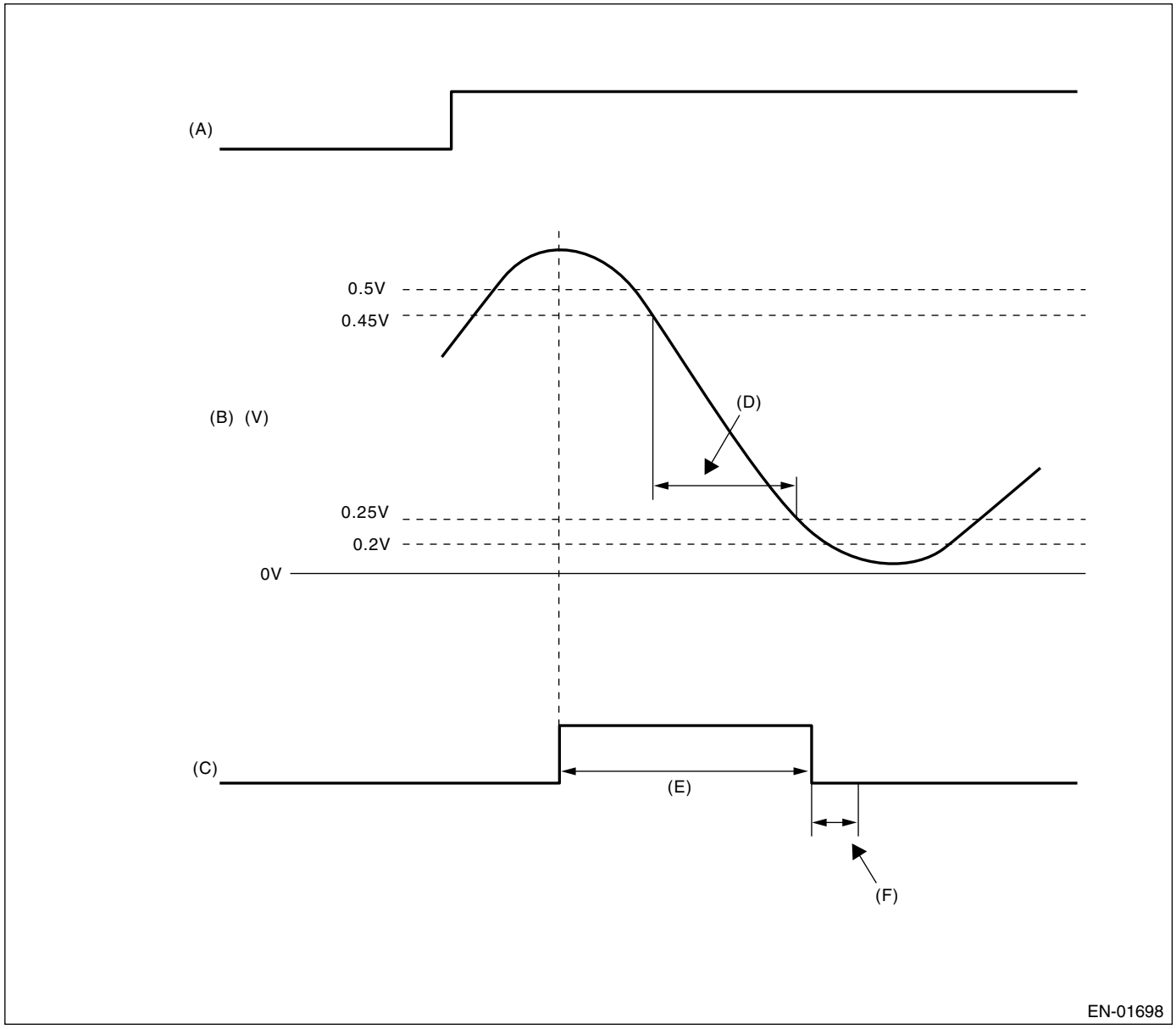
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
5 seconds or more fuel shut-off in deceleration	Experienced
After fuel shutting-off in deceleration	2 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration in order to calculated the diagnostic value.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.2 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.45 V to 0.25 V.



(A) State of diagnosis execution
(B) Rear oxygen senosr
(C) Fuel cut during deceleration
(D) Measure response time
(E) More than 2 seconds
(F) Perform malfunction determination 2 seconds after carriage return from deceleration fuel cut.

• Abnormality Judgment

Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal
Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 5 seconds or more. Judge OK when the malfunction criteria below are not completed regardless of the fuel shut-off in deceleration.

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (450 mV O_2 output) to lean (250 mV) if voltage reduces from 500 mV to 200 mV.	≥ 327 milliseconds

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

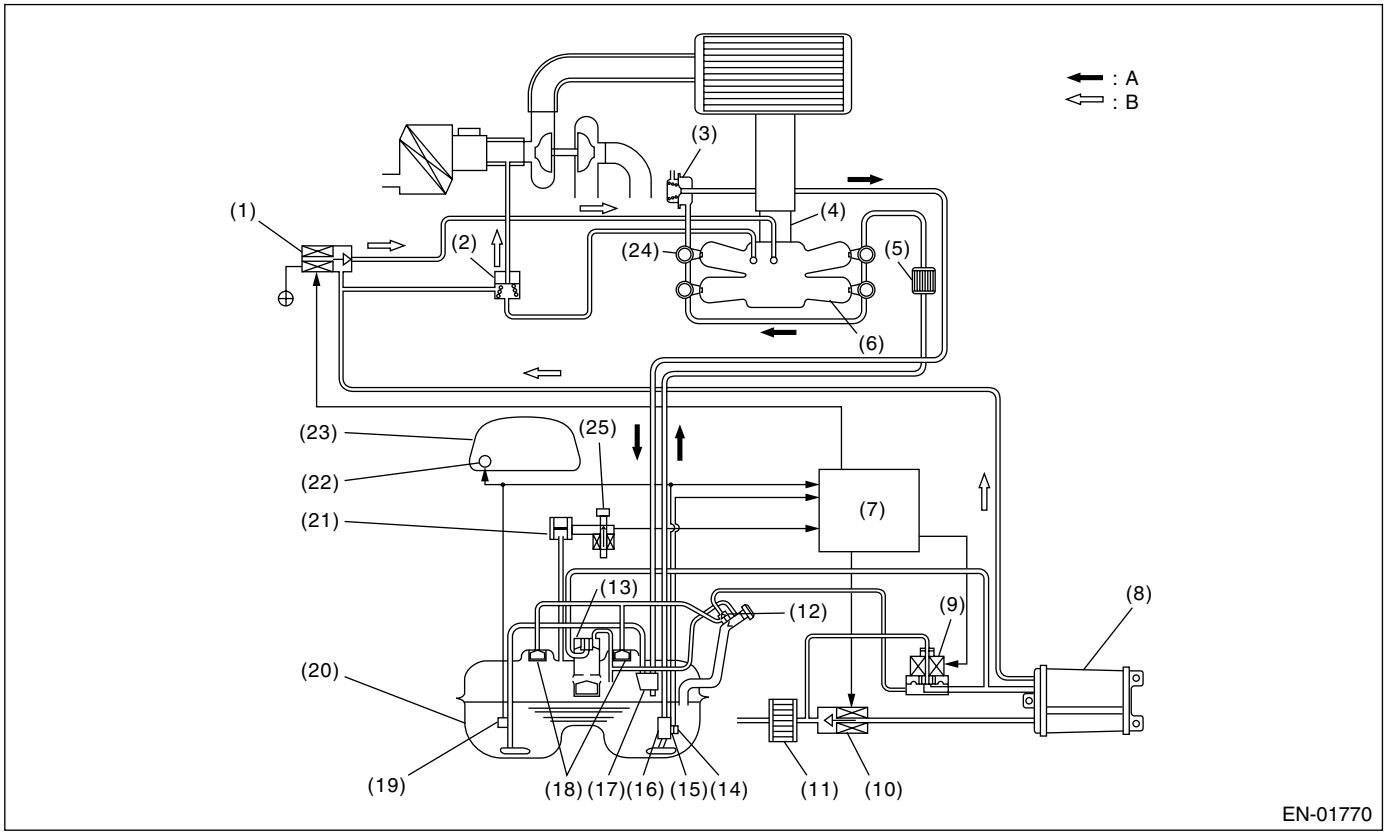
MEMO:

AE:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 75 °C (167°F)
Engine load	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g (oz)/rev)	NA	0.236 (0.008)	0.232 (0.008)	0.226 (0.008)	0.231 (0.008)	0.252 (0.009)	0.262 (0.009)	0.243 (0.009)	0.243 (0.009)	0.267 (0.009)	0.270 (0.010)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ fsobdL1
where,	See Map 4
sglmd = measured lambda	
tglmda = target lambda	fsobdL1 = lean side threshold value of fsobd
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0 (0)	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction
- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

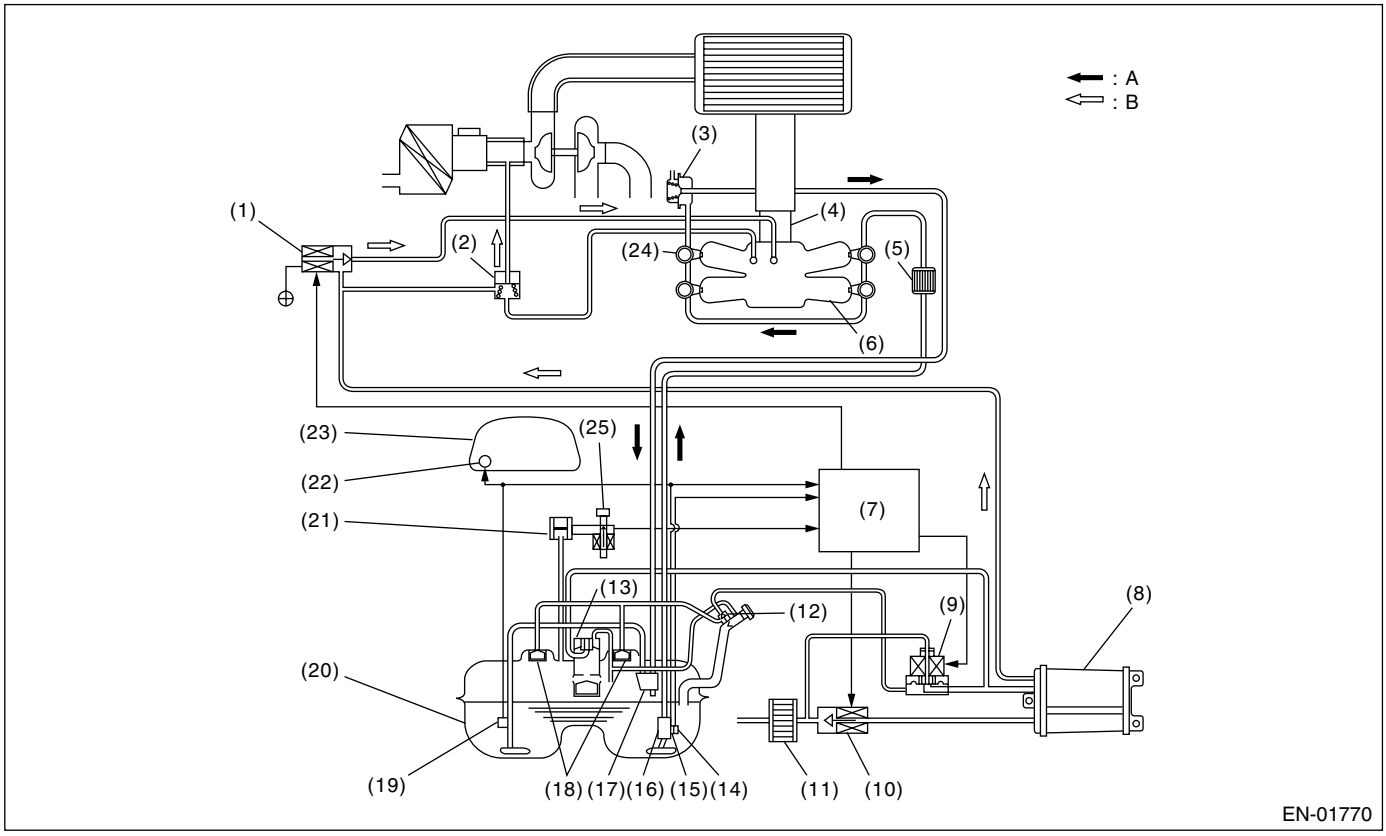
MEMO:

AF:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥75°C (167°F)
Engine load	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g (oz)/ rev)	NA	0.236 (0.008)	0.232 (0.008)	0.226 (0.008)	0.231 (0.008)	0.252 (0.009)	0.262 (0.009)	0.243 (0.009)	0.243 (0.009)	0.267 (0.009)	0.270 (0.010)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≤ fsobdR1
where,	See Map 4
sglmd = measured lambda	fsobdR1 = rich side threshold value of fsobd
tglmda = target lambda	
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0 (0)	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	
fsobdR1 (%)	–40	–40	–36.9	–32.0	–27.0	–27.0	

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ –20%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction
- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AG:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

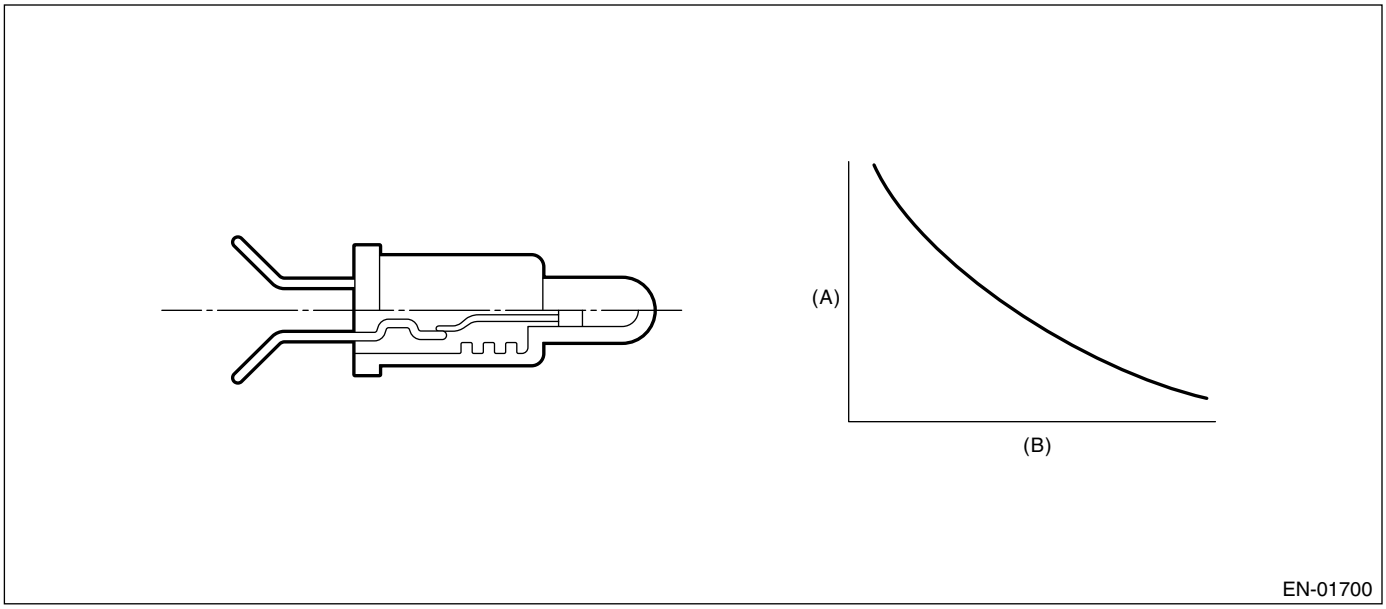
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After starting engine	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (50°F)
Fuel temperature – engine coolant temperature	≥ 10°C (50°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After starting engine	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (50°F)
Fuel temperature – engine coolant temperature	< 10°C (50°F)
Battery voltage	> 10.9 V

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting engine	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.5 lb)
Fuel temperature difference between Max. and Min.	< 3°C (37.4°F)

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.5 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (37.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

None

12.ECM OPERATING AT DTC SETTING

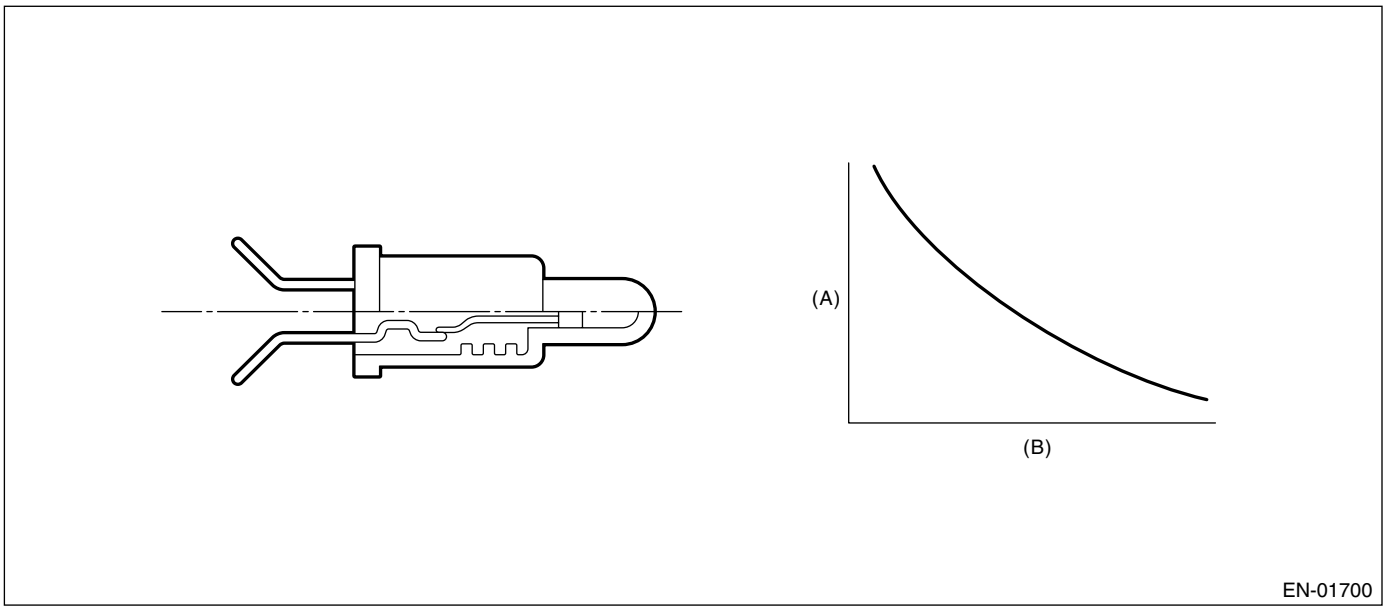
Memorize the freeze frame data. (For test mode $02)

AH:DTC P0182 — FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.1646 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.1646 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

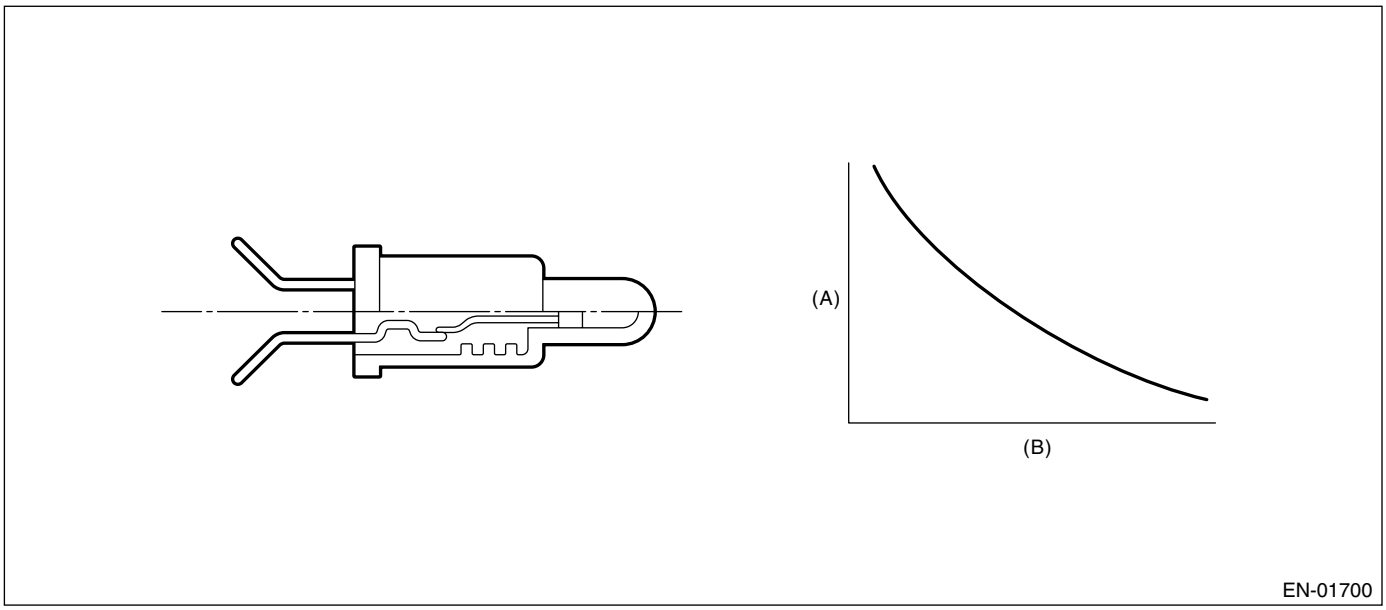
Memorize the freeze frame data. (For test mode $02)

AI: DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

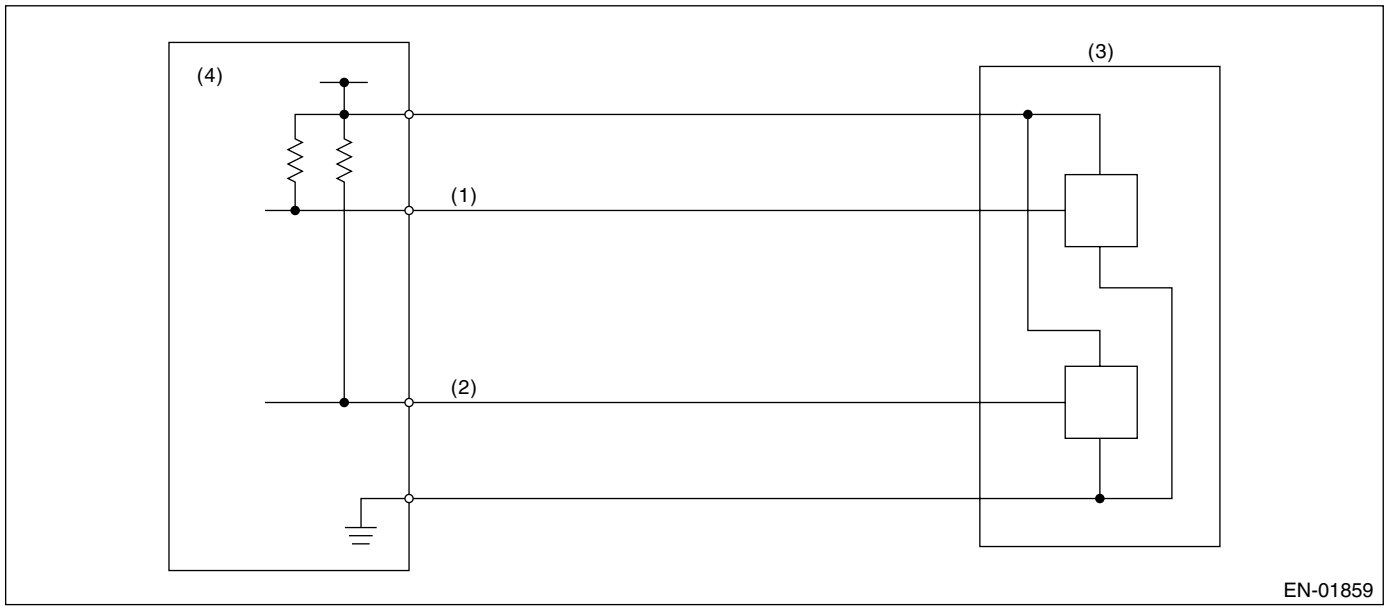
Memorize the freeze frame data. (For test mode $02)

AJ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.749 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

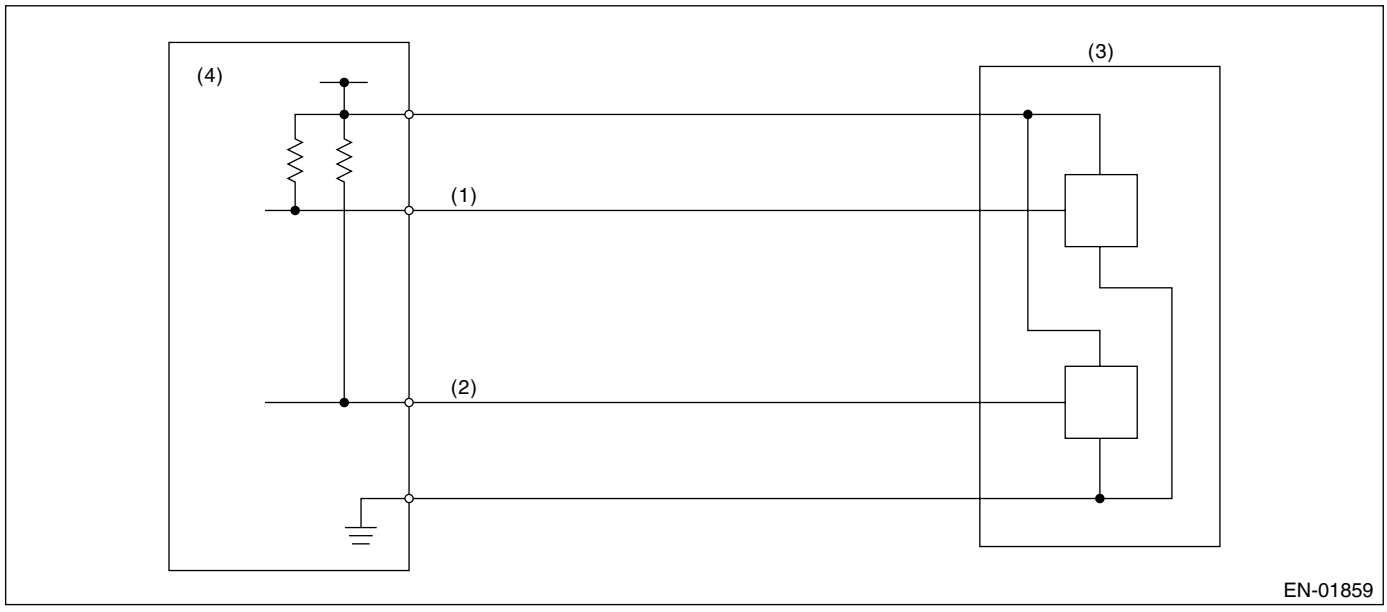
Memorize the freeze frame data. (For test mode $02)

AK:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.747 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

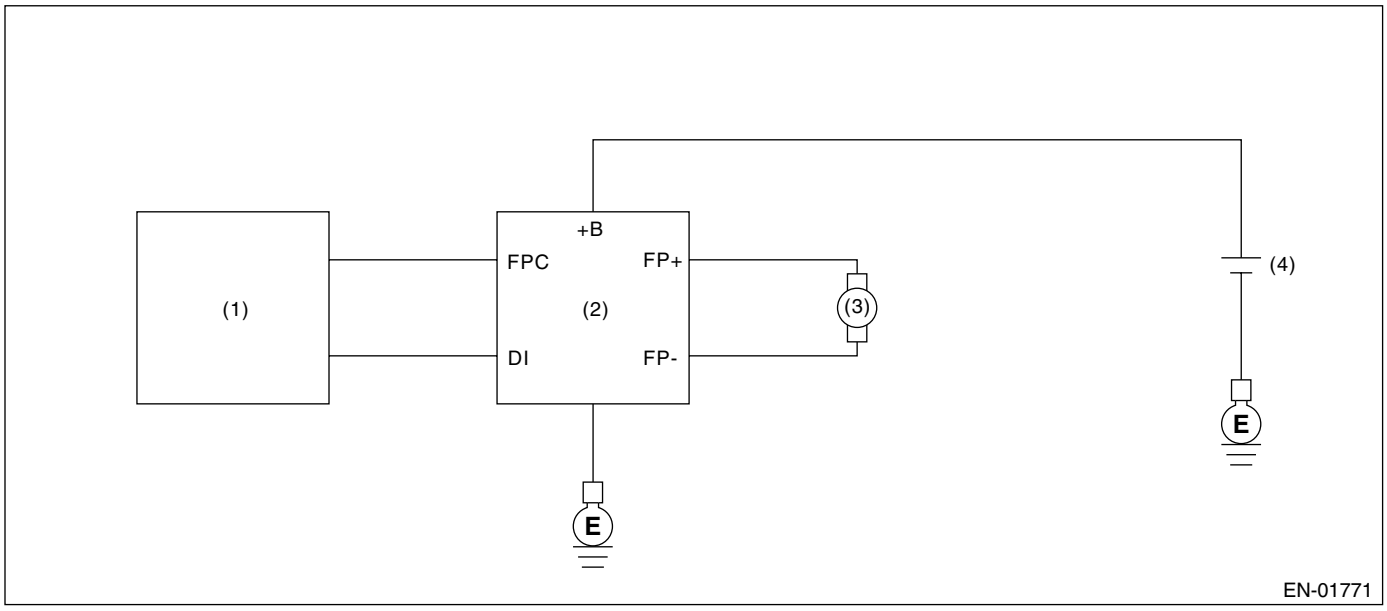
Memorize the freeze frame data. (For test mode $02)

AL:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After starting engine	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After starting engine	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATING AT DTC SETTING

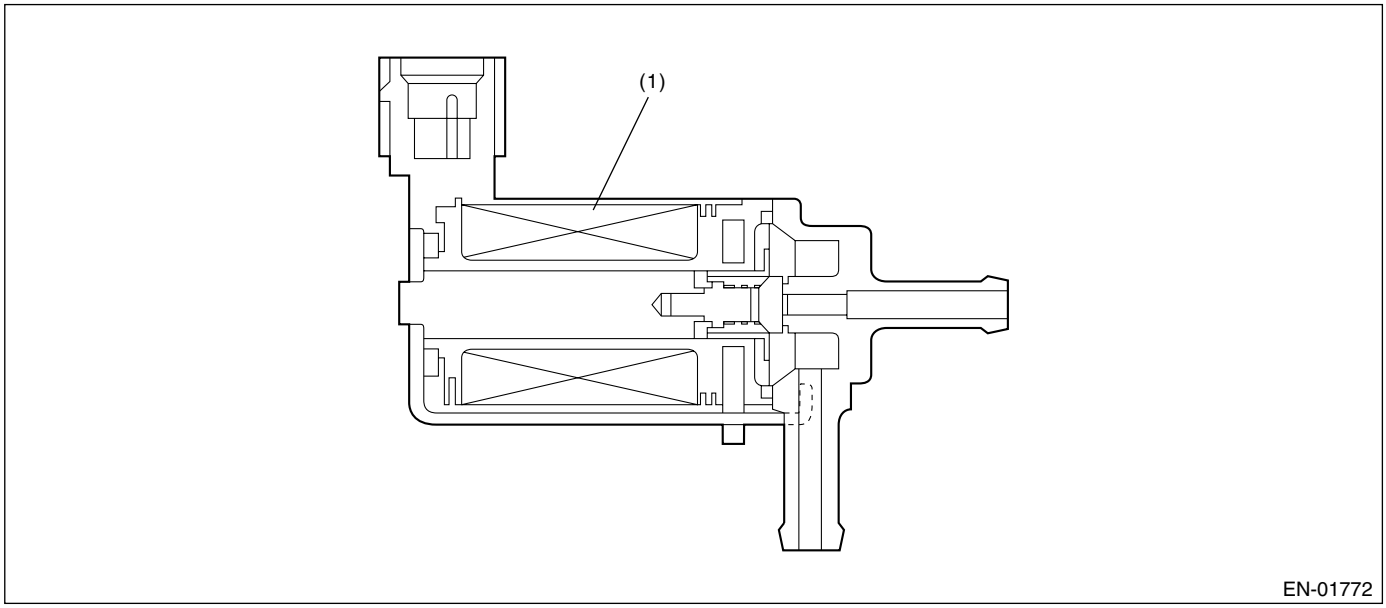
Memorize the freeze frame data. (For test mode $02)

AM:DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

• Map 10

Pa (kPa (mmHg, inHg))	56.7 (440,17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.3 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
Abnormal threshold (kPa (mmHg, inHg))	152.6 (1145, 45.08)	165.4 (1241, 48.8)	177.2 (1329, 52.3)	189.0 (1418, 55.8)	200.7 (1506, 59.3)	212.5 (1594, 62.8)
Normal threshold (kPa (mmHg, inHg))	130.2 (977, 38.5)	143.0 (1073, 42.2)	154.8 (1161, 45.7)	166.6 (1250, 49.2)	178.4 (1338, 52.7)	190.1 (1426, 56.1)

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	< Map 10

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

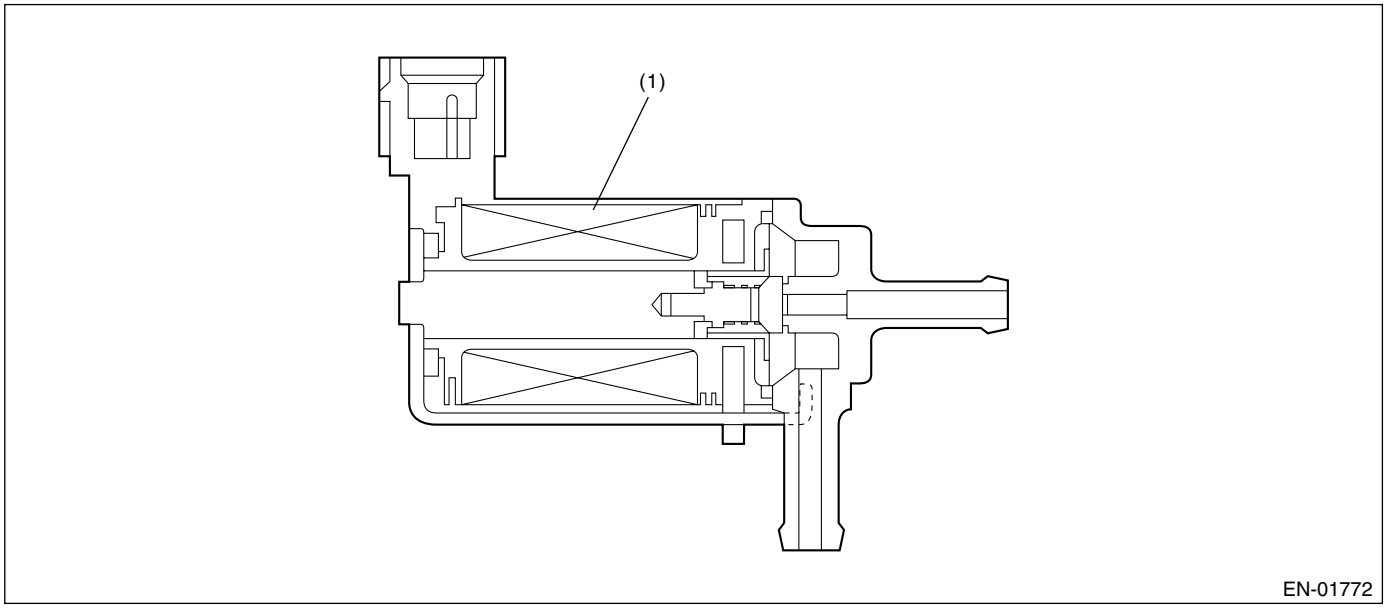
Memorize the freeze frame data. (For test mode $02)

AN:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After starting engine	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage Duty ratio for turbocharged pressure control	Low < 75%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

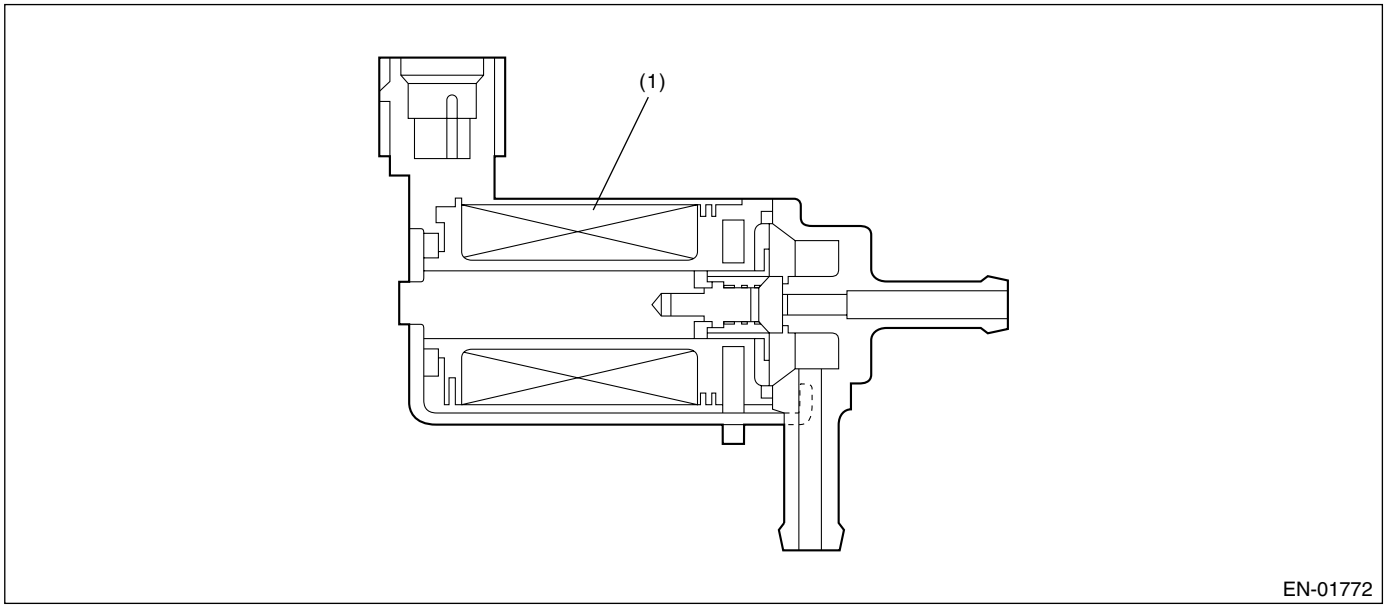
Memorize the freeze frame data. (For test mode $02)

AO:DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After starting engine	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage Duty ratio for turbocharged pressure control	High > 25%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AP:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire
- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters approval continuation time	1 second or more
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg) (MT) < 14.7 kPa (110 mmHg, 4.33 inHg) (AT)
Engine speed change	< 500 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 10°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Air condition	No switching ON ←→ OFF
Radiator fan	No switching ON ←→ OFF
Power steering switch	No switching ON ←→ OFF
Starter	ON, or OFF, or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	500 — 6700 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V
Engine coolant temperature	≤ 111°C (232°F)
Intake air temperature	≤ 101°C (214°F)
Heavy quality fuel judgement	Does not execute.
VDC and AT control	Is not controlling.

Map3

- MT

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, 13.9)	51.1 (383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.5)	38.5 (288.9, 11.4)	40.4 (302.9, 11.9)	41.1 (308.6, 12.1)	40.8 (306, 12.0)	44.8 (335.8, 13.2)	47.3 (354.5, 14.0)	49.1 (368.2, 14.5)	50.9 (381.9, 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

- AT

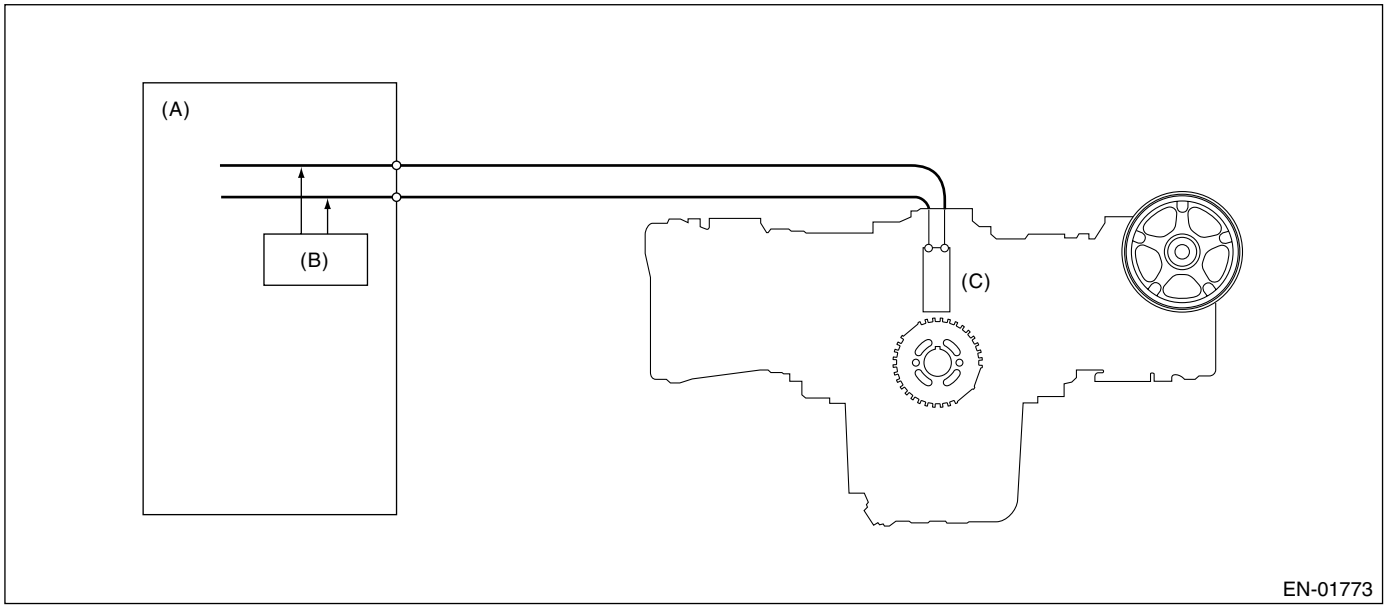
Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.8 (186, 7.32)	23.6 (177, 6.97)	25.5 (191, 7.52)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5, 8.72)	31.3 (235, 9.25)	32.7 (245.5, 9.67)	33.3 (250, 9.84)	38.2 (286.5, 11.3)	33.6 (252.3, 9.93)	49.5 (371.5, 14.62)	51.5 (386, 15.20)

3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



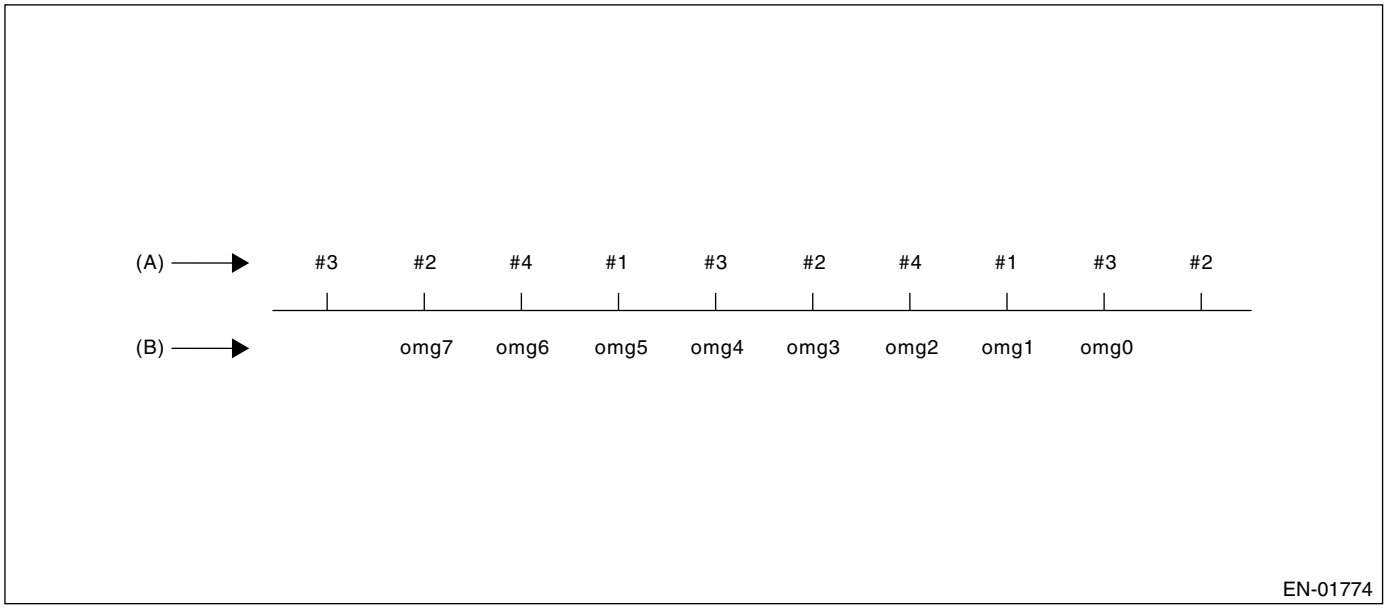
(A) Engine control module (ECM) (B) Diagnosis circuit (C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed) → Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
- 360° Interval Difference Method
- 720° Interval Difference Method

→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
- Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



(A) Ignition order

(B) Crankshaft position speed

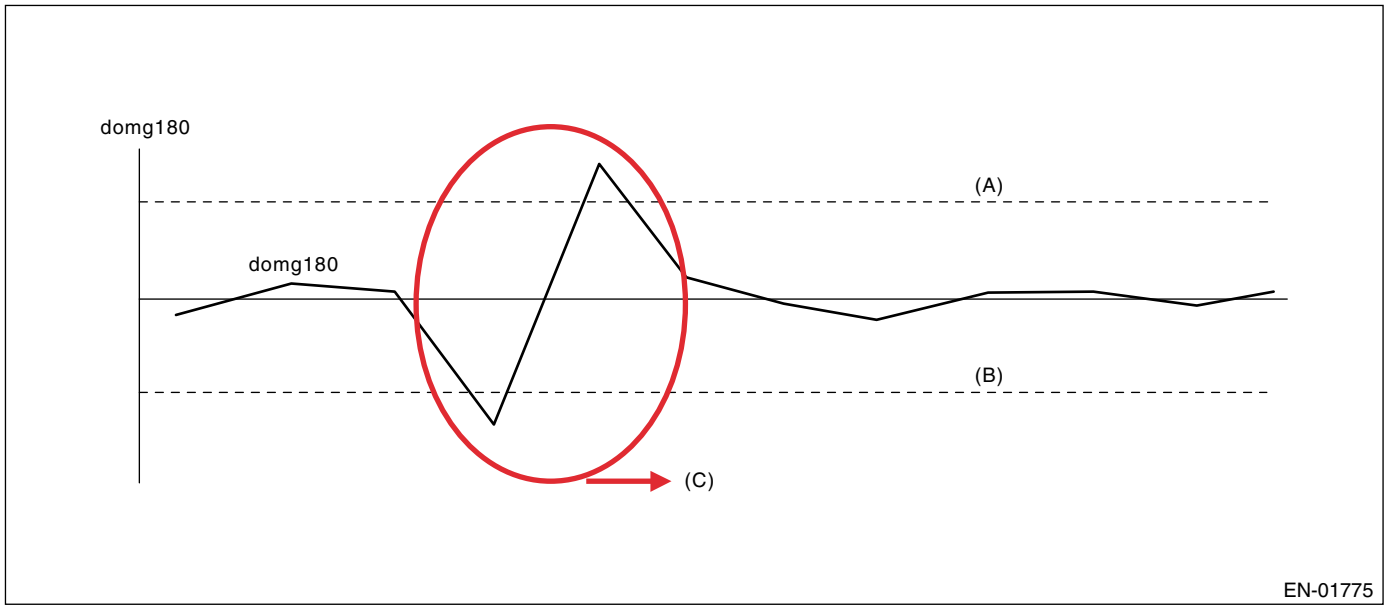
• 180° Interval Difference Method

Diagnosis value domg 180 = (omg –1 omg 0) – (omg 7 – omg 1)/6

Judge misfire occurs in the following cases.

- domg 180 > judgment value of positive side
- domg 180 ≤ judgment value of negative side

(judgment value before 180°CA)



(A) Threshold value (positive judged value)

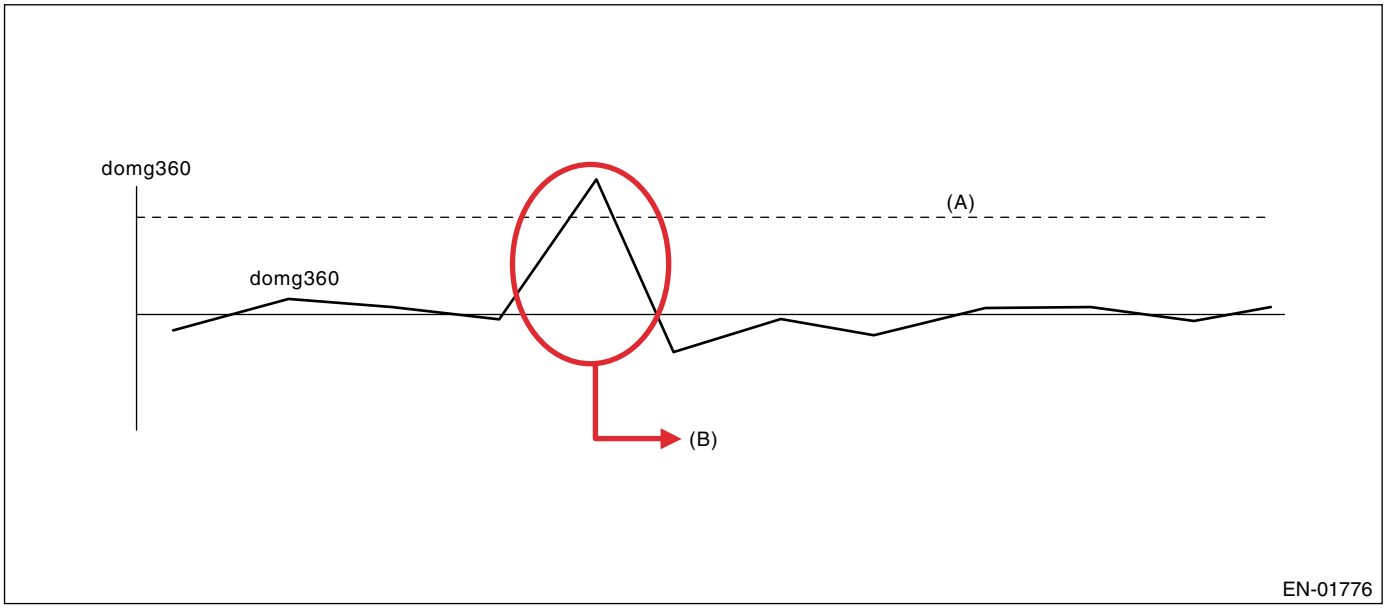
(B) Threshold value (negative judged value)

(C) Judged as misfire

• 360° Interval Difference Method

Diagnosis value domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)

Misfire judgment domg 360 > judgment value → Misfire occurs

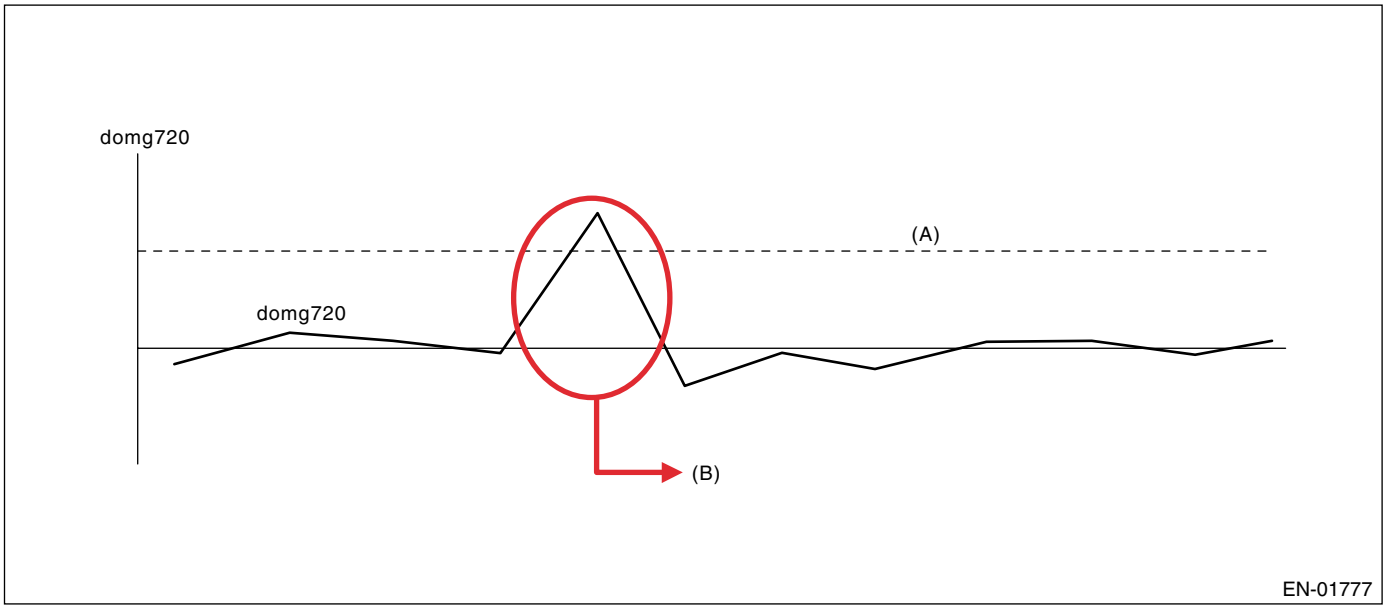


(A) Threshold value

(B) Judged as misfire

• 720° Interval Difference Method

Diagnosis value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)		
Misfire judgment	domg 720 > judgment value	→	Misfire occurs



(A) Threshold value (B) Judged as misfire

• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Catalyst damage misfire (Misfire occurrence level damaging catalyst)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

percentage		Intake air (g (oz)/gev.)									
		0.2 (0.007)	0.4 (0.014)	0.6 (0.021)	0.8 (0.028)	1.0 (0.035)	1.2 (0.042)	1.4 (0.049)	1.6 (0.056)	1.8 (0.063)	2.0 (0.071)
Engine speed (rpm)	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	—	—	—
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	18.0	—	—
	2000	32.0	22.5	22.5	18.3	14.5	10.8	10.0	9.0	8.0	5.0
	2500	29.0	21.8	14.3	11.3	9.8	9.0	8.5	8.0	7.5	5.0
	3000	27.0	21.8	14.5	9.8	9.0	9.0	8.0	7.5	7.0	5.0
	3500	24.5	18.5	10.8	6.8	5.8	5.5	5.0	5.0	5.0	5.0
	4000	—	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	—	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	—
	5000	—	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	—
	5500	—	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	—
	6000	—	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	—
	6500	—	12.5	7.5	5.0	5.0	5.0	5.0	5.0	—	—
	6700	—	12.3	7.3	5.0	5.0	5.0	5.0	5.0	—	—

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.
Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AQ:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —.>

AR:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —.>

AS:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —.>

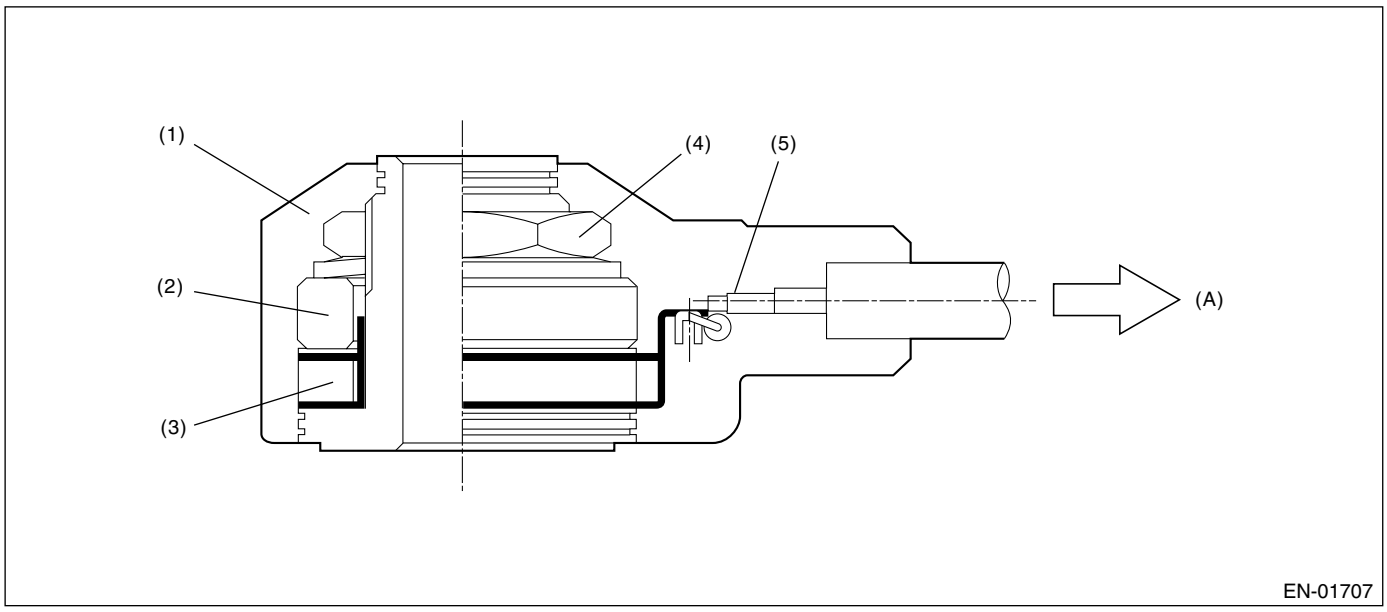
MEMO:

AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = –5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATING AT DTC SETTING

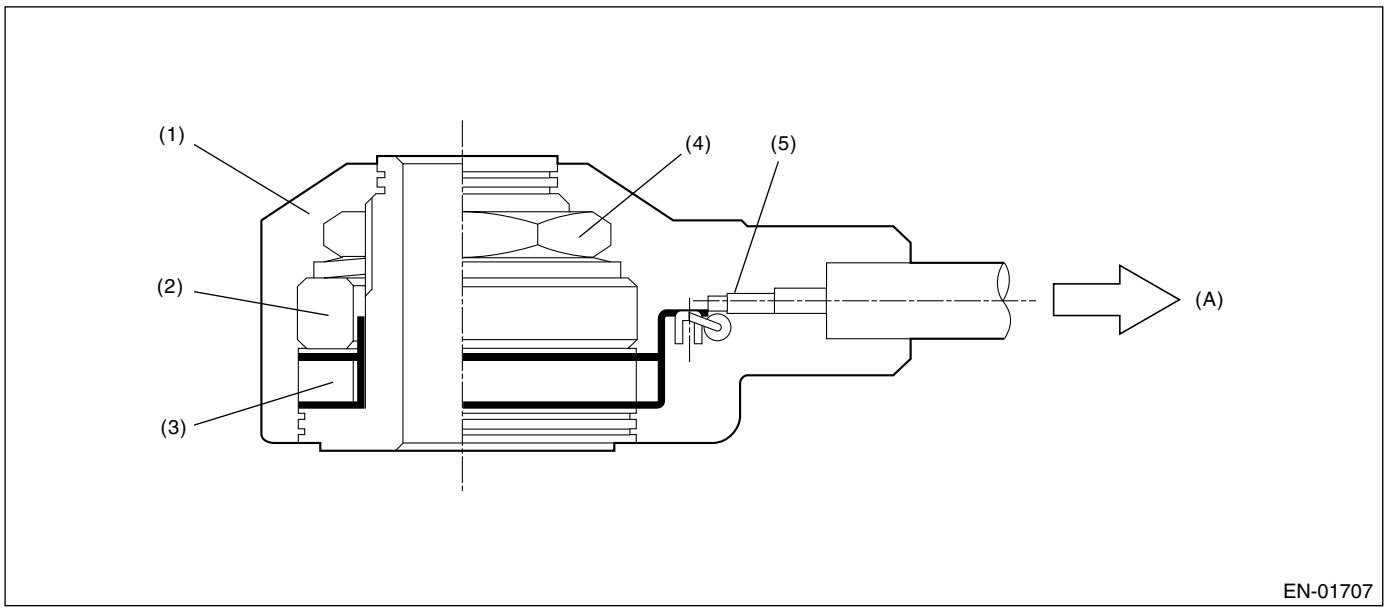
Memorize the freeze frame data. (For test mode $02)

AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = –5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATING AT DTC SETTING

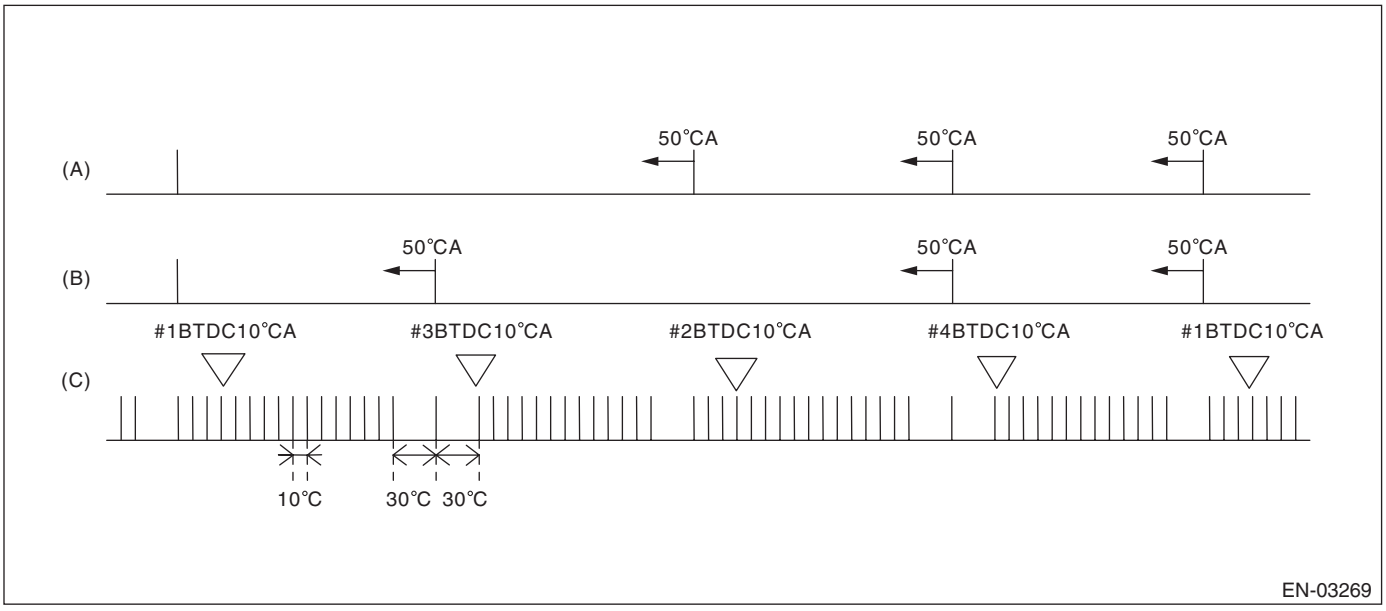
Memorize the freeze frame data. (For test mode $02)

AV:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

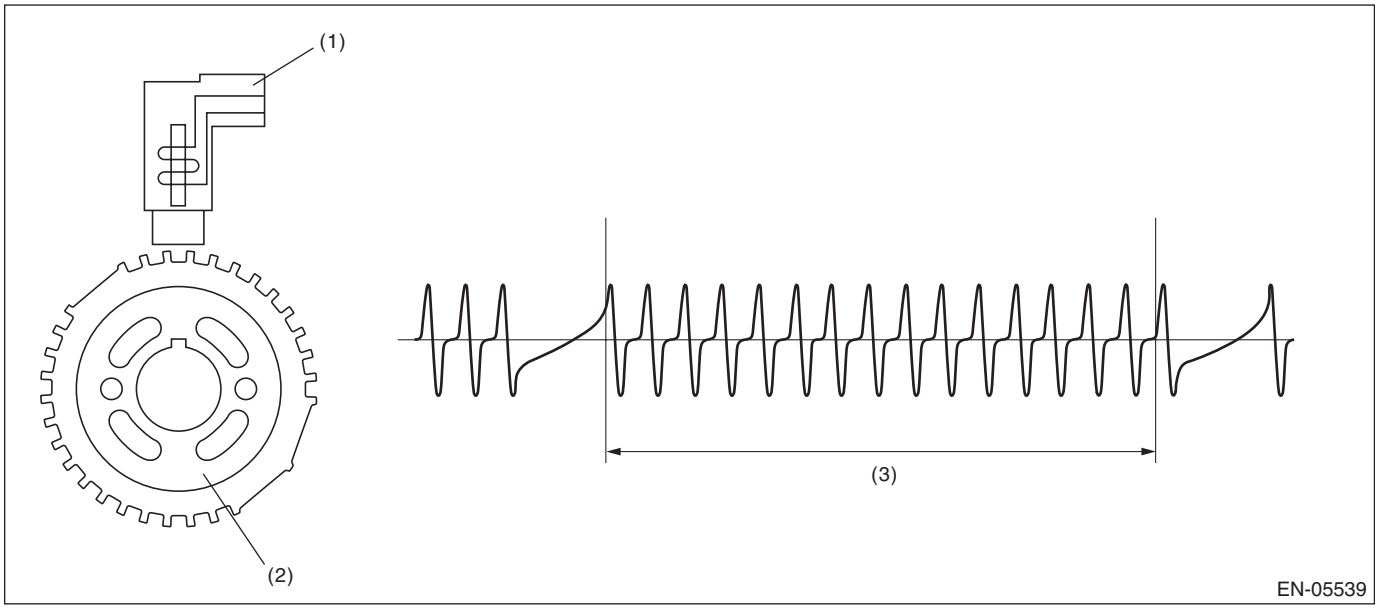
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

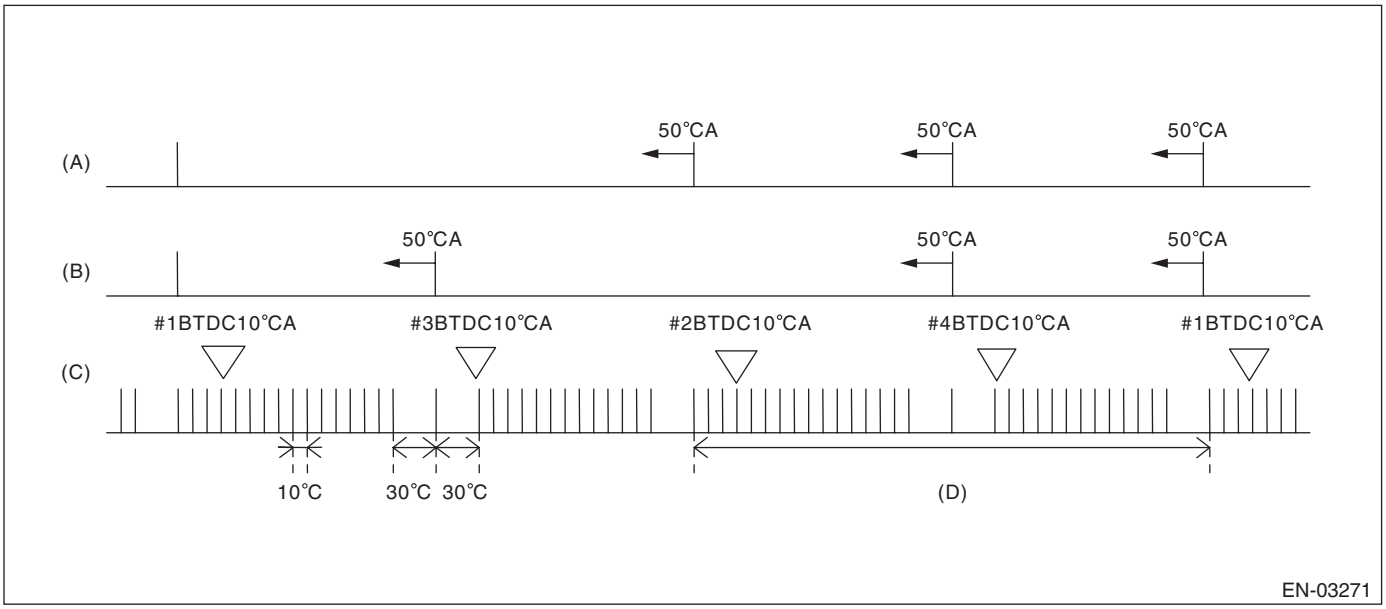
Memorize the freeze frame data. (For test mode $02)

AW:DTC P0336 — CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/ PERFORMANCE —

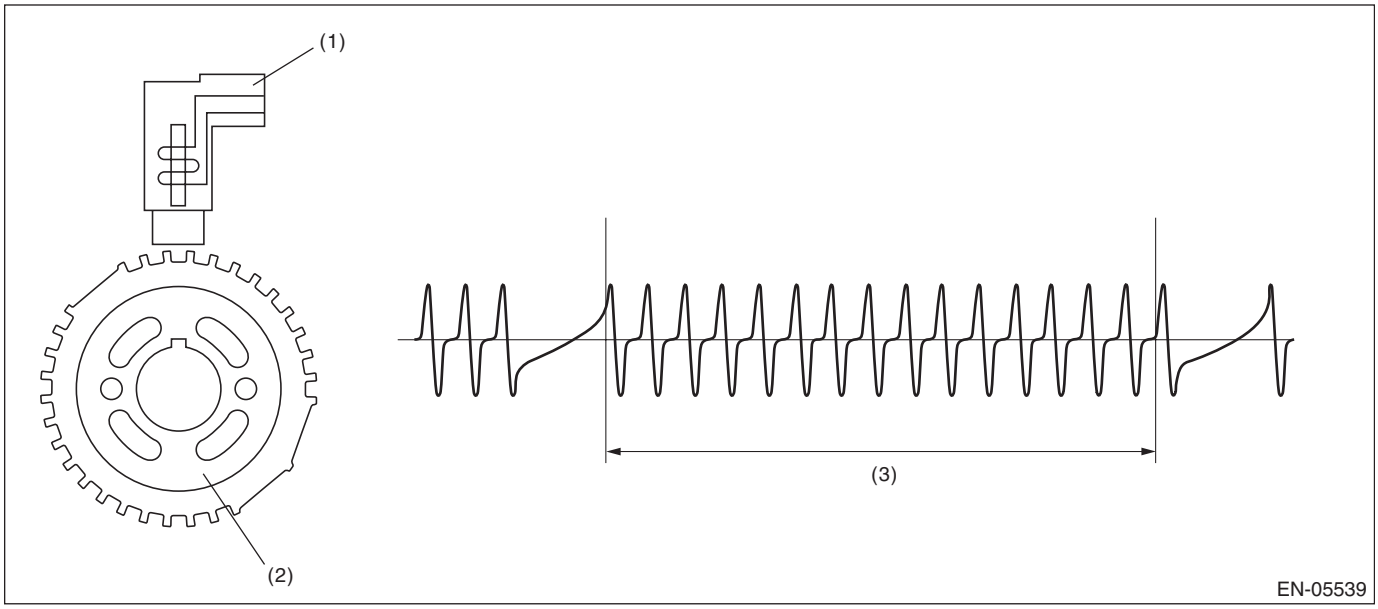
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal
(D) Number of crankshaft signal = 30 is normal.



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

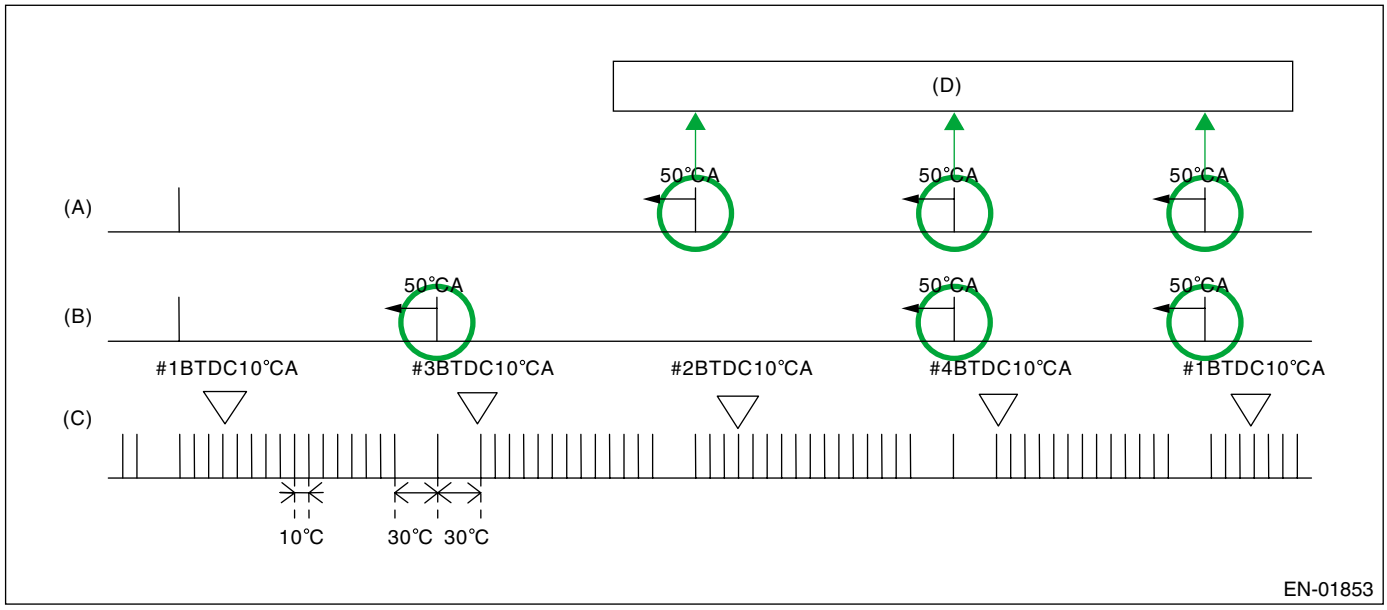
Memorize the freeze frame data. (For test mode $02)

AX:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal RH
(B) Camshaft signal LH
(C) Crankshaft signal
(D) Number of camshaft position signals = Recieve camshaft position signal 3 times per tow engine revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V
Engine speed	≥ 600 rpm

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.
Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signal during 2 rev.	Except 3
Engine speed	≥ 600 rpm

Time Needed for Diagnosis: 100 rev.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Exists

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AY:DTC P0345 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2) —

NOTE:
For diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-120, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —.>

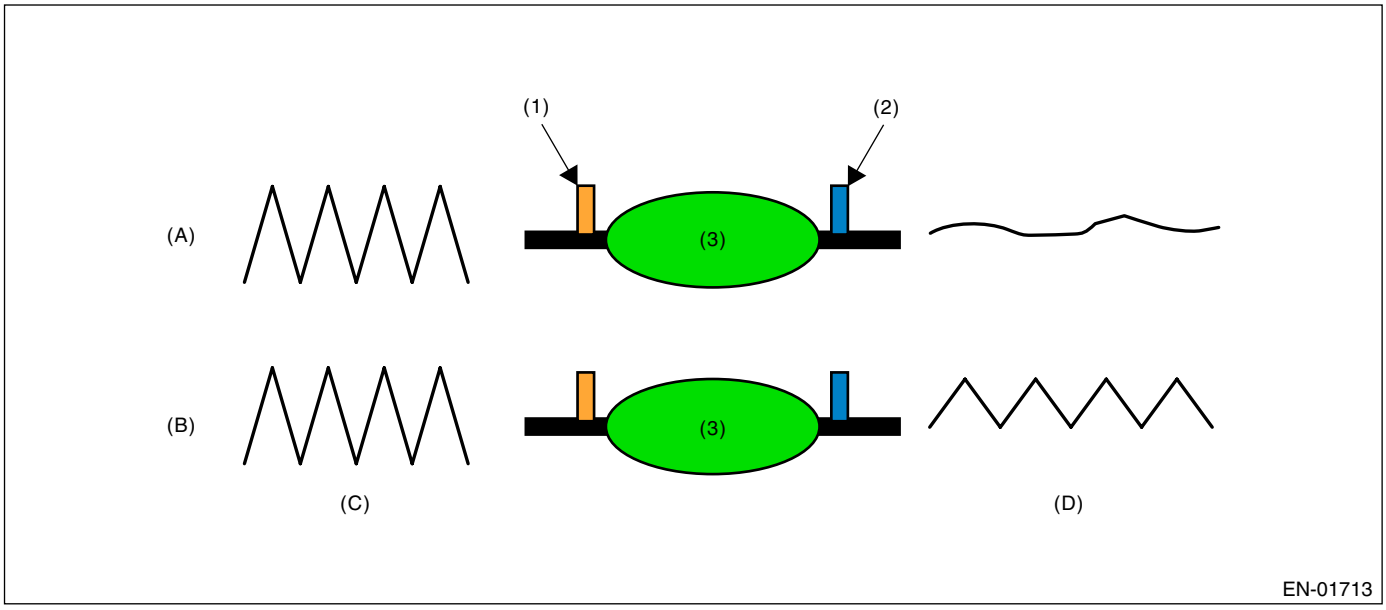
MEMO:

AZ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.
Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalyst

(A) Normal
(B) Deterioration

(C) Front oxygen (A/F) sensor waveform
(D) Rear oxygen (A/F) sensor waveform

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1.2 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 65°C (149°F)
Catalyst warm-up counter on Map 2	≥ 8000
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	In operation
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1000 milliseconds or more
Vehicle speed	≥ 85 km/h (53 MPH)
Amount of intake air	12 — 40 g (0.35 ←→ 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 0.03 g (0.001 oz)/rev
Rear O_2 output change from below 600 mV to over	Experienced after fuel cut
After starting engine	≥ 200 seconds
Engine speed	1600 — 3500 rpm

• Map 2

Add the following value every 512 milliseconds.

• Catalyst warm-up counter ≤ 9000

Amount of intake air (g (oz)/s)	0 (0)	5 (0.18)	7.5 (0.265)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	30 (1.06)	35 (1.23)	40 (1.41)	45 (1.59)	50 (1.76)
Integrated value for warm-up counter	−18	−5	3	11	25	40	57	72	87	100	100	100

• Catalyst warm-up counter > 8000

Amount of intake air (g (oz)/s)	0 (0)	5 (0.18)	7.5 (0.265)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	30 (1.06)	35 (1.23)	40 (1.41)	45 (1.59)	50 (1.76)
Integrated value for warm-up counter	−8	−4	−1	3	6	8	9	11	13	14	14	14

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed of 75 km/h (46.6 MPH) or more after warming up the engine.

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.
Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.
Regard the A/F response properties and diagnosis value as parameters for judgment value.
Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds	≥ 7.0

Time Needed for Diagnosis: 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

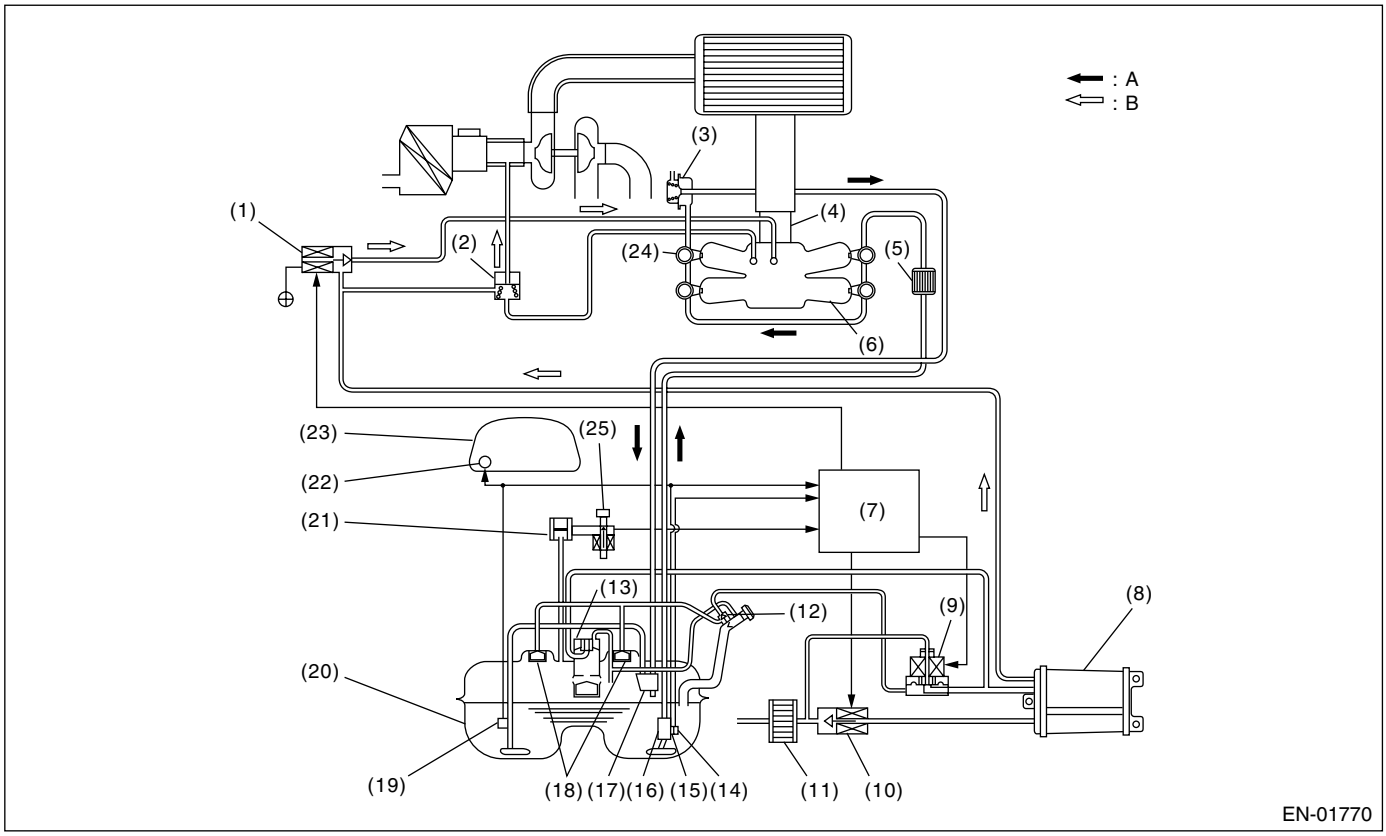
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

MEMO:

BA:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

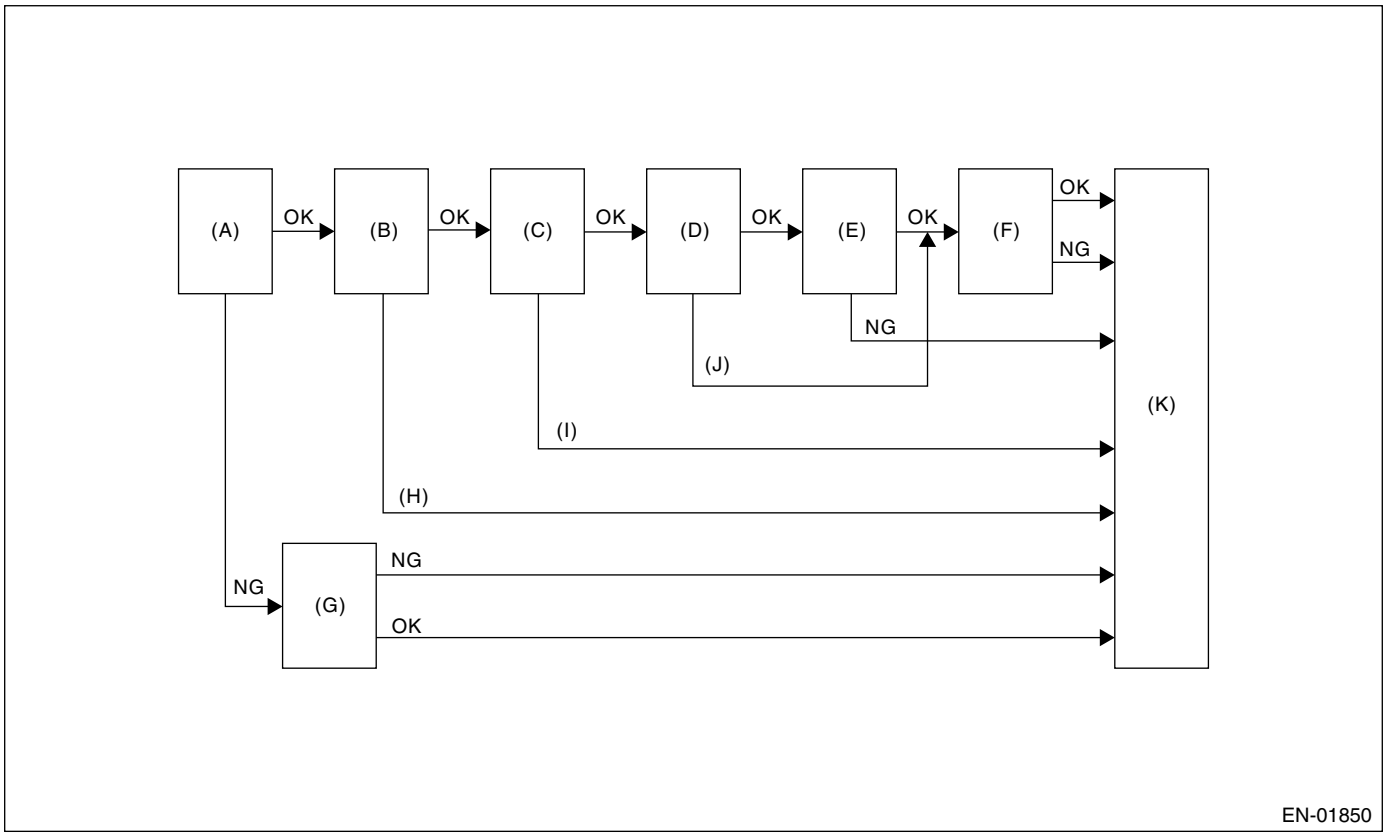
Perform the diagnosis of leakage of fuels system and valve functions.



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure, and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

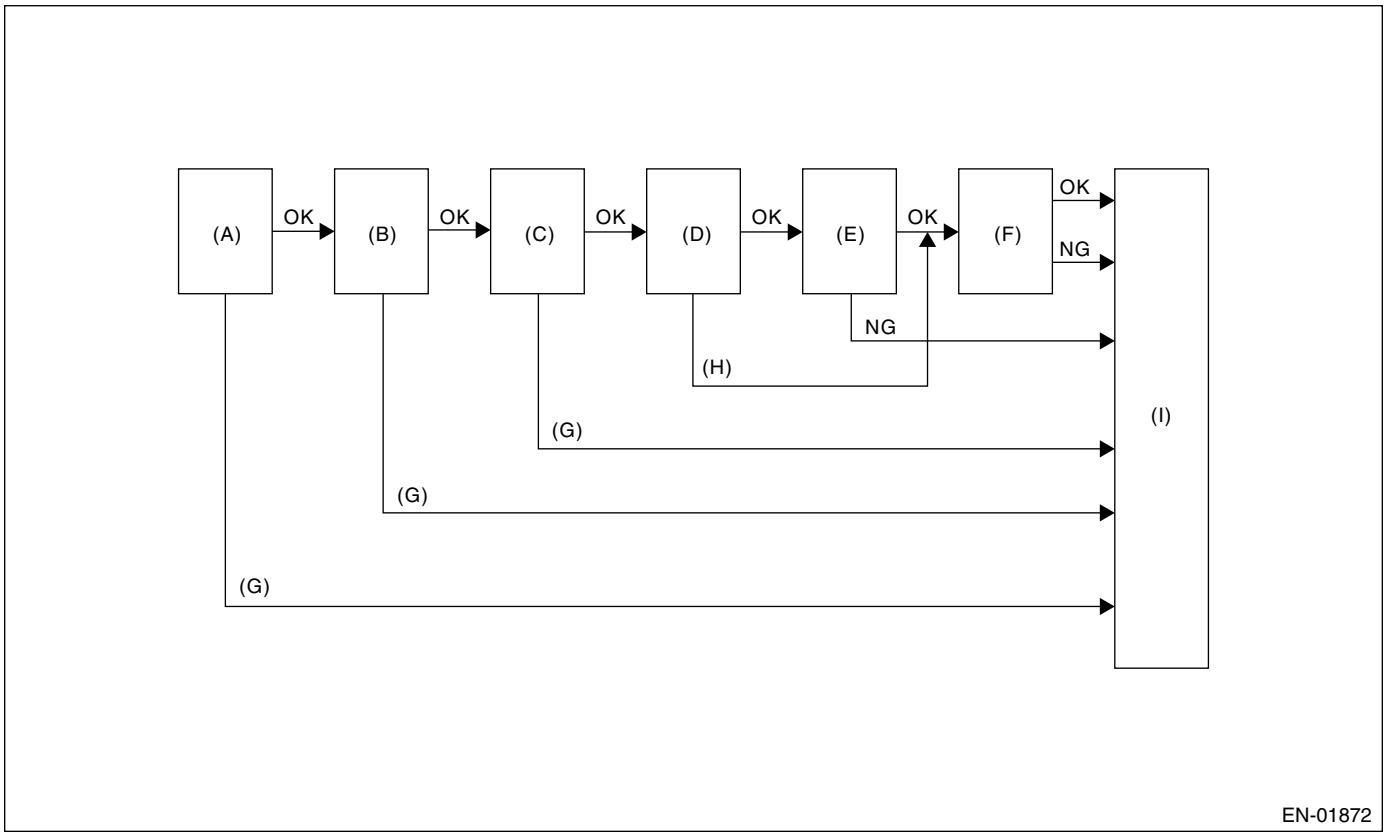
• 0.04-inch Diagnosis



(A) Mode Z
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Mode Z Extend
(H) Cancel
(I) Large leakage diagnosis
(J) Quick OK judgement
(K) END

Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis, CCV abnormal close diagnosis)	Perform CPC open stick fast and CCV close stick fast diagnosis according to tank pressure change amount after the diagnosis has started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	16 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	4 — 35 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	4 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	12 — 16 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leak diagnosis has finished.	4 seconds

• 0.02-inch Diagnosis



(A) Mode Y
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Cancel
(H) Quick OK judgement
(I) END

Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	29 seconds
Mode B (Negative pressure sealed)	Intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 20 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	20 — 25 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leak diagnosis has finished.	4 seconds

• Mode Table for Evaporative Emission Control System Diagnosis

• 0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CCV is judged to be stuck closed.	P1443
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached	EVAP system is judged to have no large leak.	None
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in)].	P0442
Mode E	Return to atmosphere	CCV property	P1443

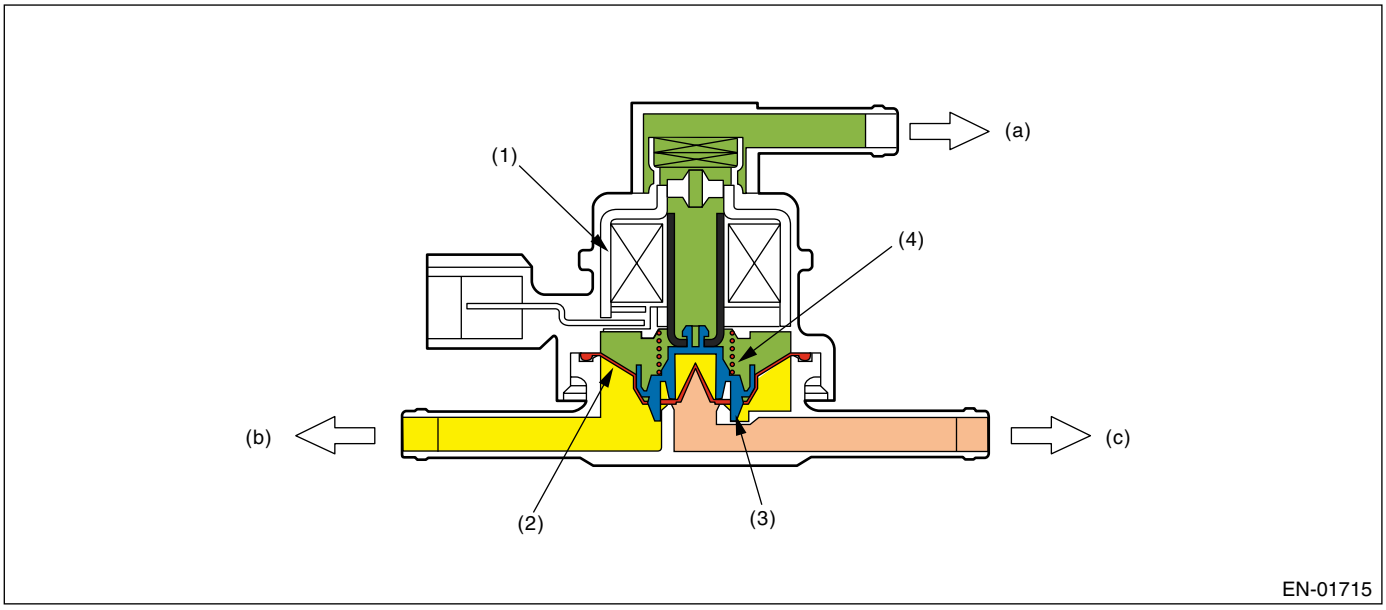
• 0.02-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere		
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.		
Mode B	Negative pressure is formed due to intake manifold negative pressure		
Mode C	Target pressure is reached		
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property judgment	P1443

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

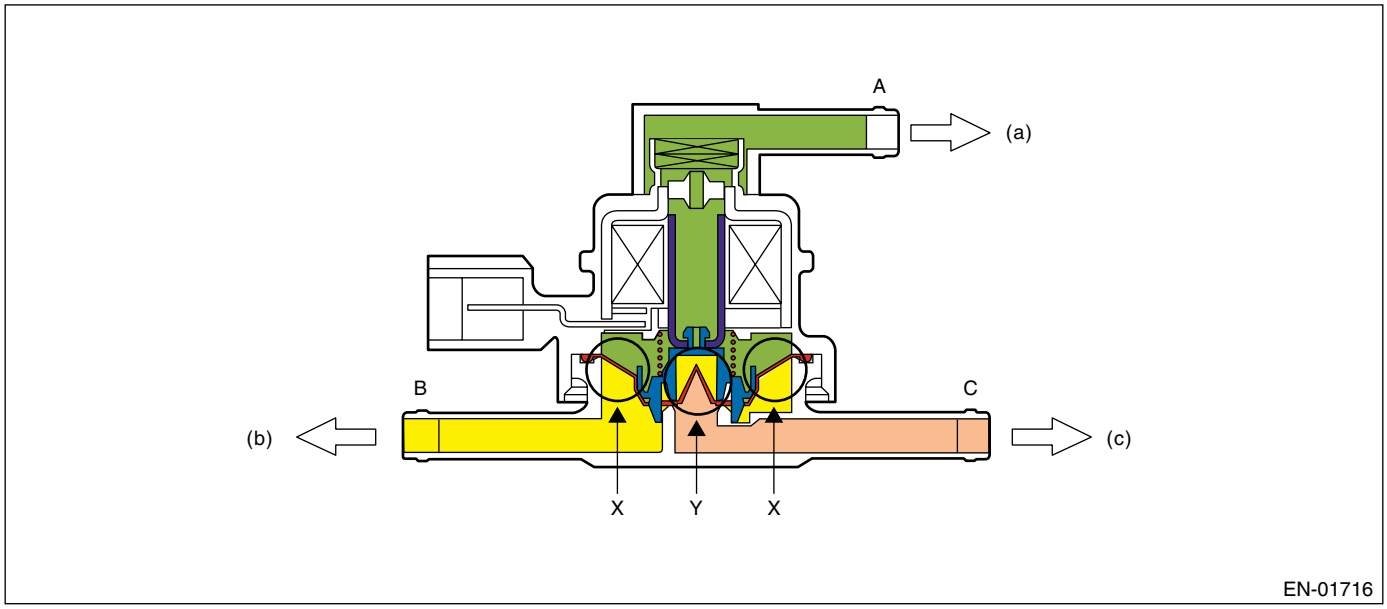
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
Also the valve can be forcibly opened by setting the solenoid to ON.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

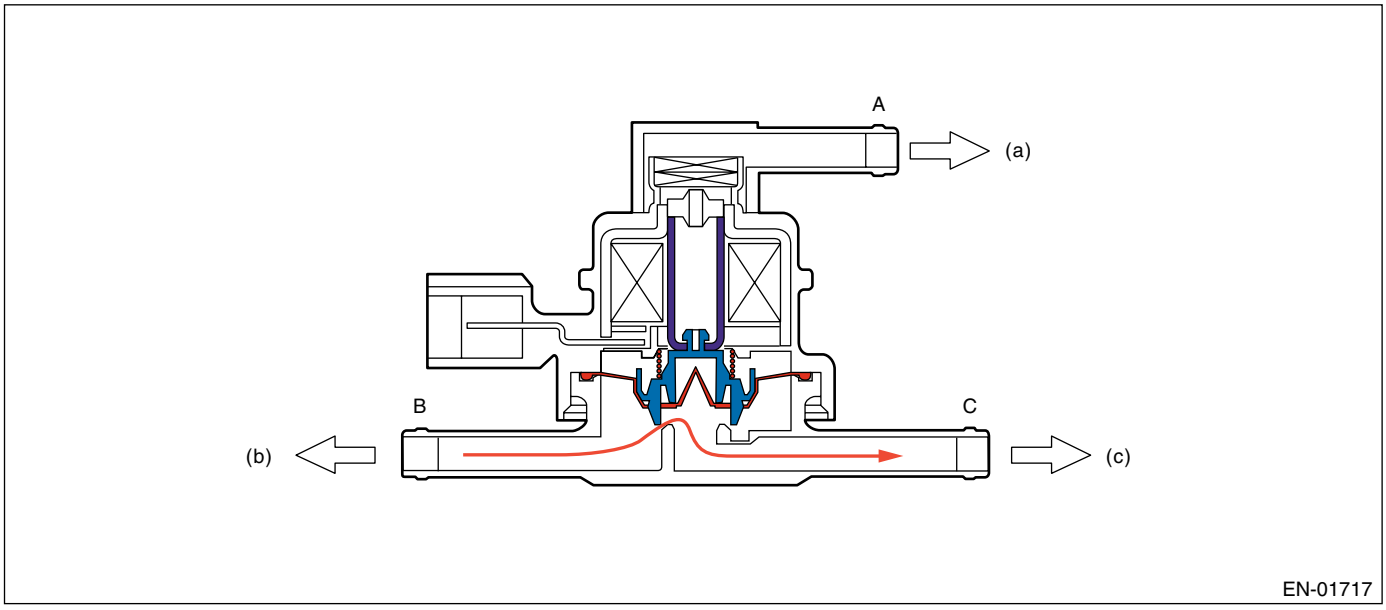
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Atmospheric pressure (b) Fuel tank (c) Canister

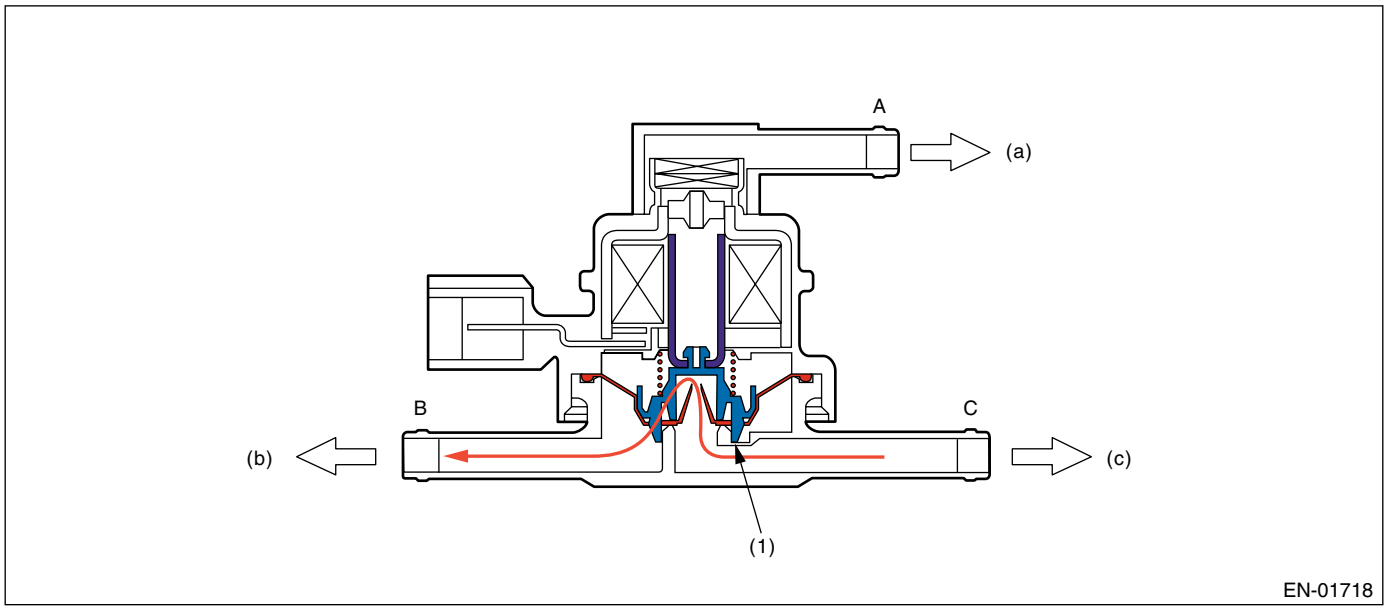
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



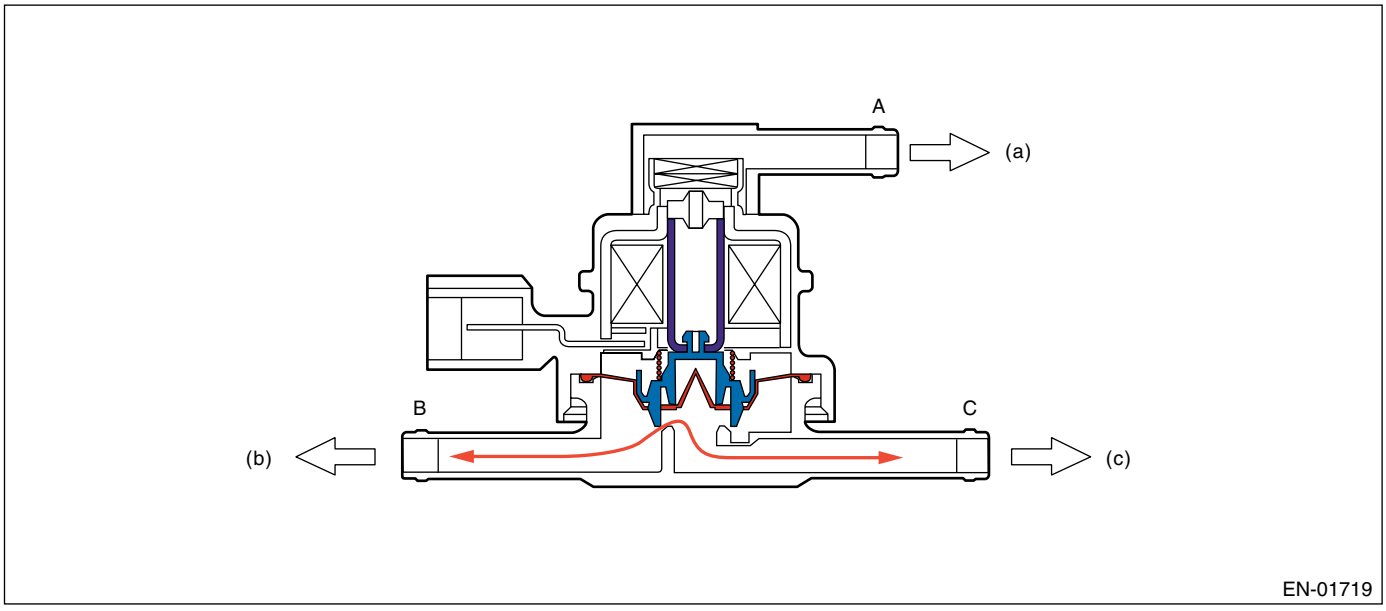
(a) Atmospheric pressure (b) Fuel tank (c) Canister

• When B < C (Solenoid OFF)



(1) Valve
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

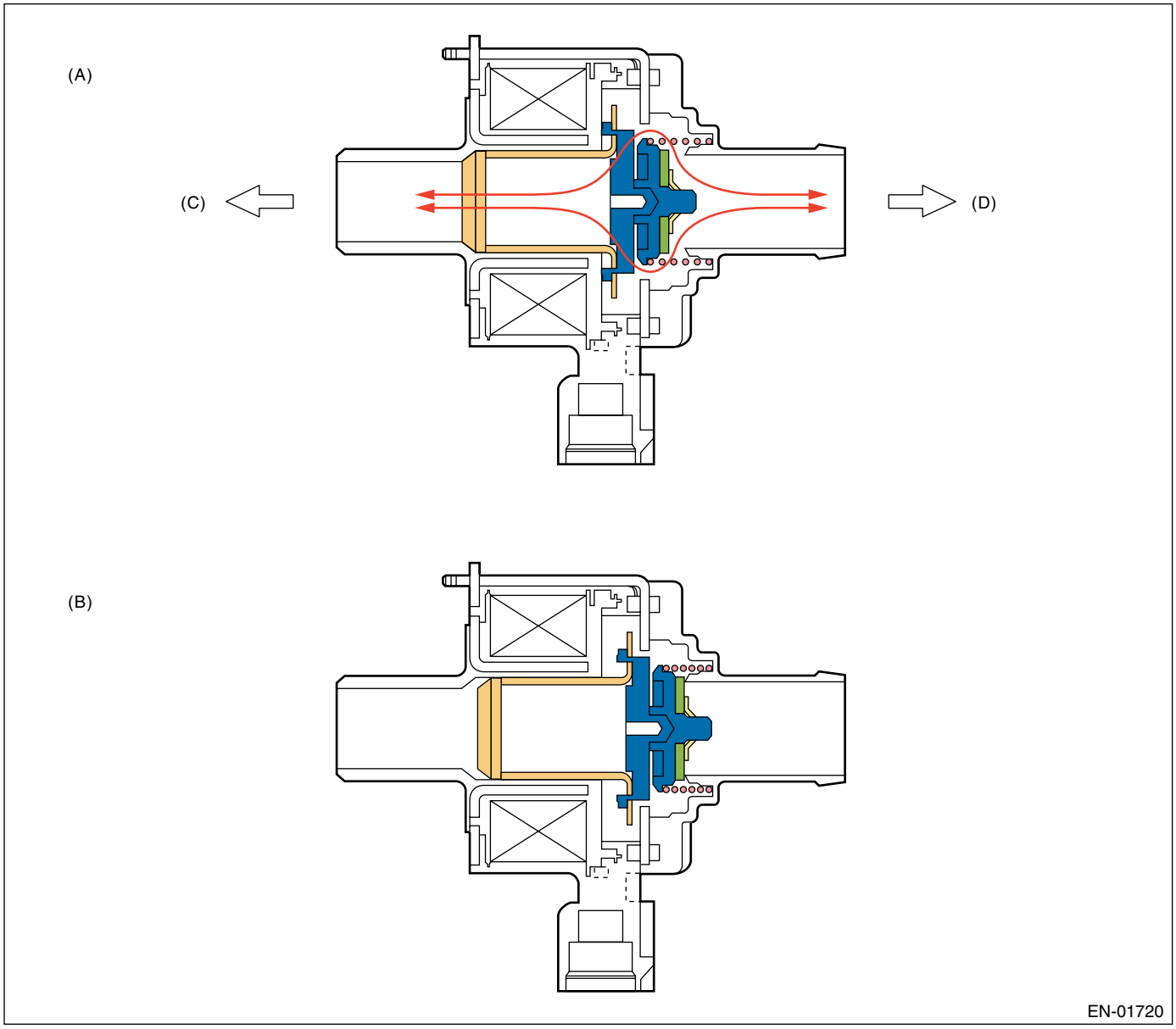
• When Solenoid is ON



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

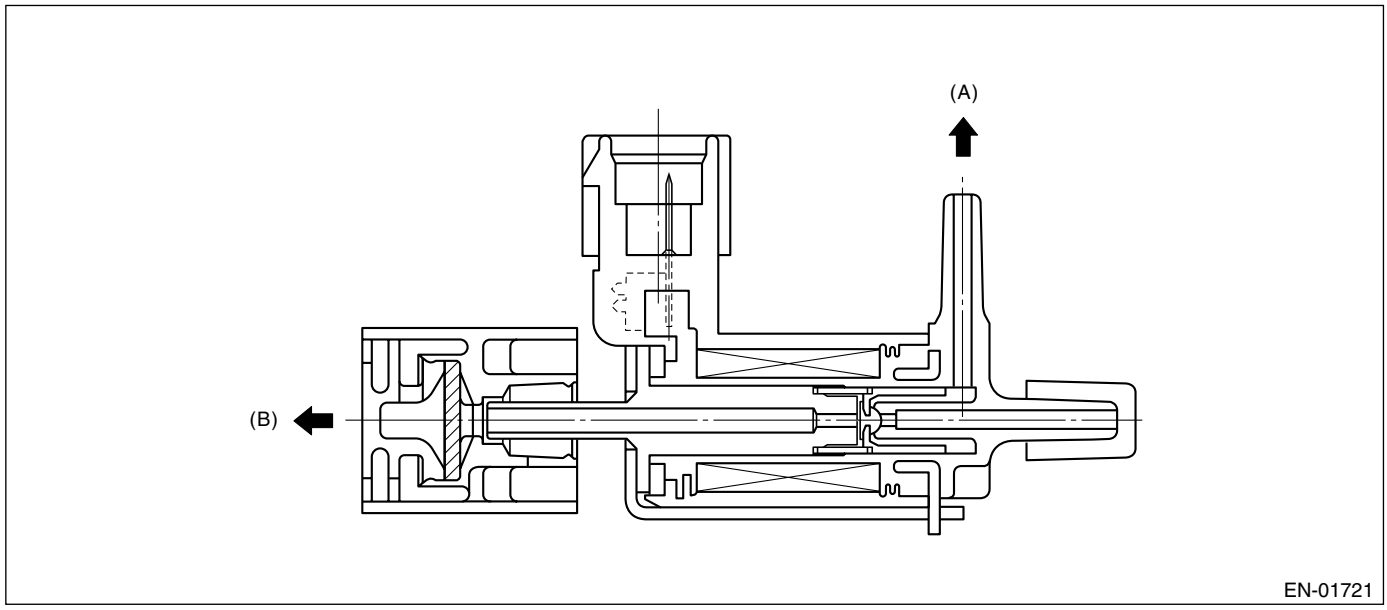
• CCV

CCV controls the ambient air to be introduced to the canister.



(A) Open (Solenoid OFF)
(B) Close (Solenoid ON)
(C) Filter
(D) Canister

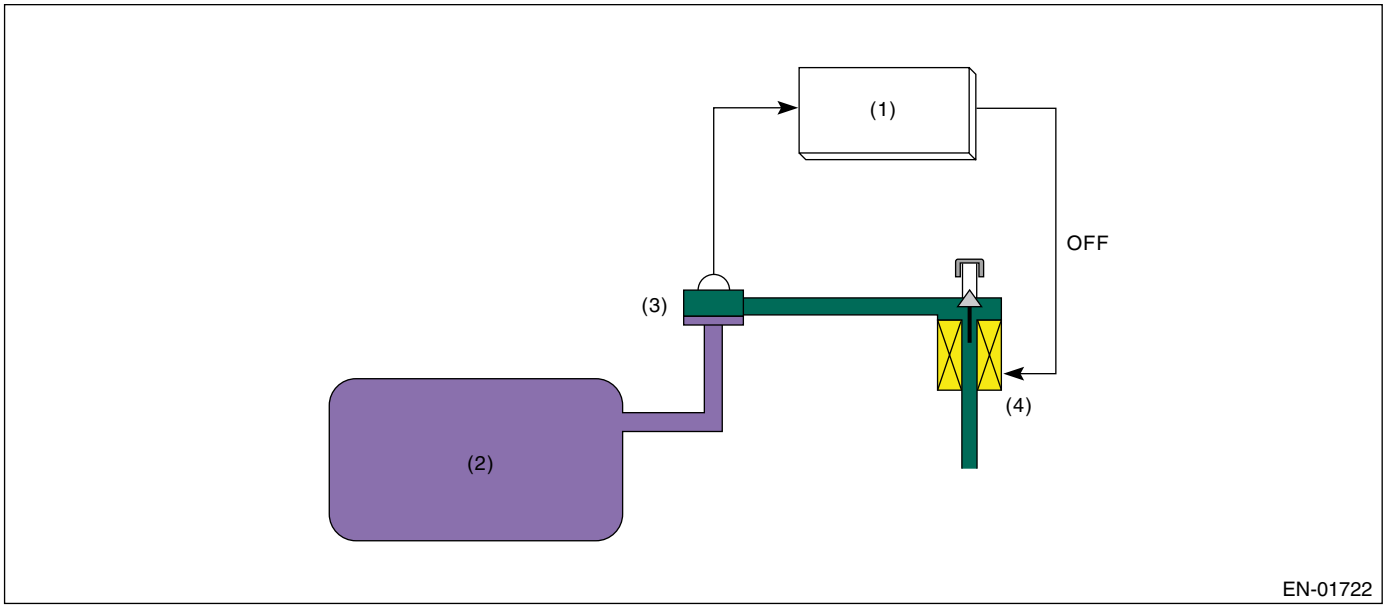
• Tank Pressure Switching Solenoid



(A) Fuel tank pressure sensor (B) Atmosphere

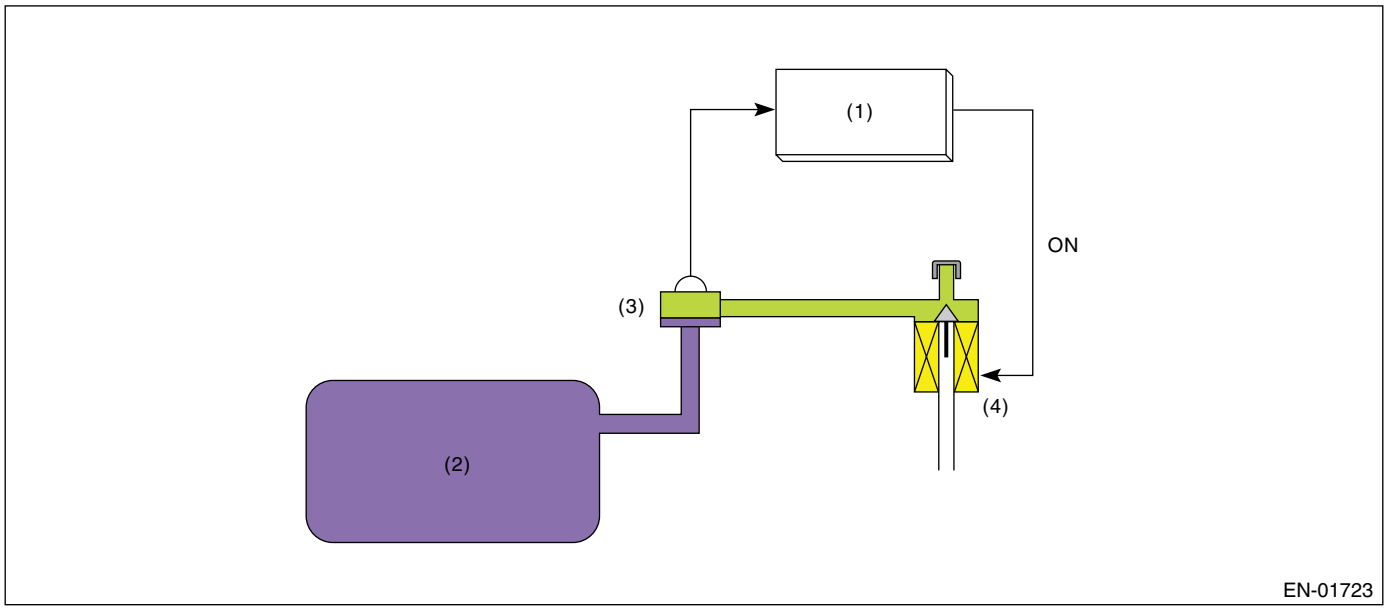
• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.
Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After starting engine	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1050 ←→ 6500 rpm
Fuel tank pressure	–1.3 — 0.91 kPa (–10 — 6.8 mmHg, –0.39 — 0.27 inHg)
Intake manifold vacuum (relative pressure)	< –13.3 kPa (–100 mmHg, –3.92 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.7 US gal, 2.11 ←→ 10.6 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	–10 ←→ 45°C (14 ←→ 113°F)
Intake air temperature	≥ –10°C (14°F)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.037 inHg)
Min. pressure change per second – Max. pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Fuel level change	< 3.0 ℓ (3.2 US gal, 2.6 Imp gal)/128 milliseconds
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	> 120 seconds
Total time of canister purge operation	120 second or more
After starting engine	335 second or more
Fuel temperature	−10 ←→ 35°C (14 ←→ 95°F)
Or engine coolant temperature at engine start	< 45°C (113°F)
And time after engine start	< 2400 seconds
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.7 US gal, 2.11 ←→ 10.6 Imp gal)
Ambient temperature	≥ −10°C (14°F)
(Ambient − fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below −3.01 kPa (−22.8 mmHg, −0.88 inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	< −13.3 kPa (−100 mmHg, −3.92 inHg)
Fuel tank pressure	−0.7 — 0.9 kPa (−5 — 7 mmHg, −0.20 — 0.28 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	1500 ←→ 3000 rpm
(During diagnosis)	
P1	−0.13 ←→ 0.13 kPa (−1 ←→ 1 mmHg, −0.04 ←→ 0.04 inHg)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.037 inHg)
Fuel level change	2 ←→ 3 ℓ (2.1 ←→ 3.2 US gal, 1.8 ←→ 2.6 Imp gal)
Tank pressure	< 1.03 kPa (7.72 mmHg, 0.037 inHg)
Min. tank pressure change per second − Max. tank pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Change of atmospheric pressure during P1 calculation	−0.04 ←→ 0.17 kPa (−0.3 ←→ 1.3 mmHg, −0.01 ←→ 0.05 inHg)
Change of atmospheric pressure during P2 calculation	−0.09 ←→ 0.17 kPa (−0.7 ←→ 1.3 mmHg, −0.028 ←→ 0.051 inHg)

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

• Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
• Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

• Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
• If not judged OK or NG, repeat the diagnosis until judged OK or NG.
• Pay attention to the fuel temperature and fuel level.

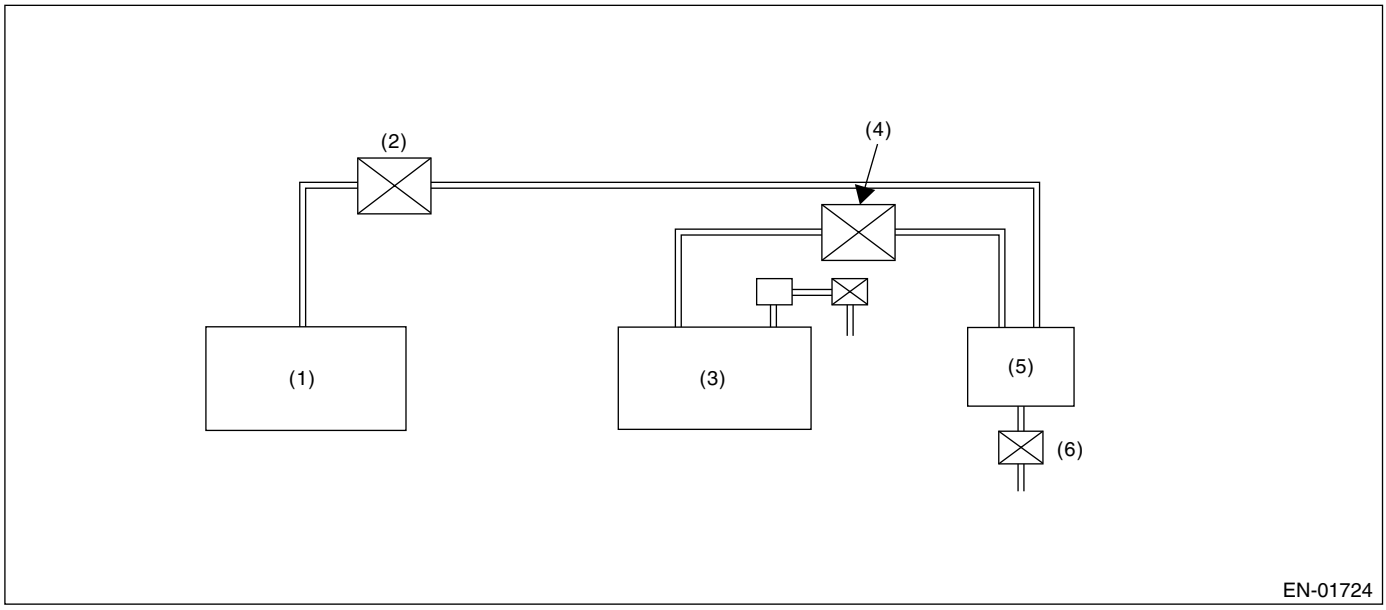
5. DIAGNOSTIC METHOD

• MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

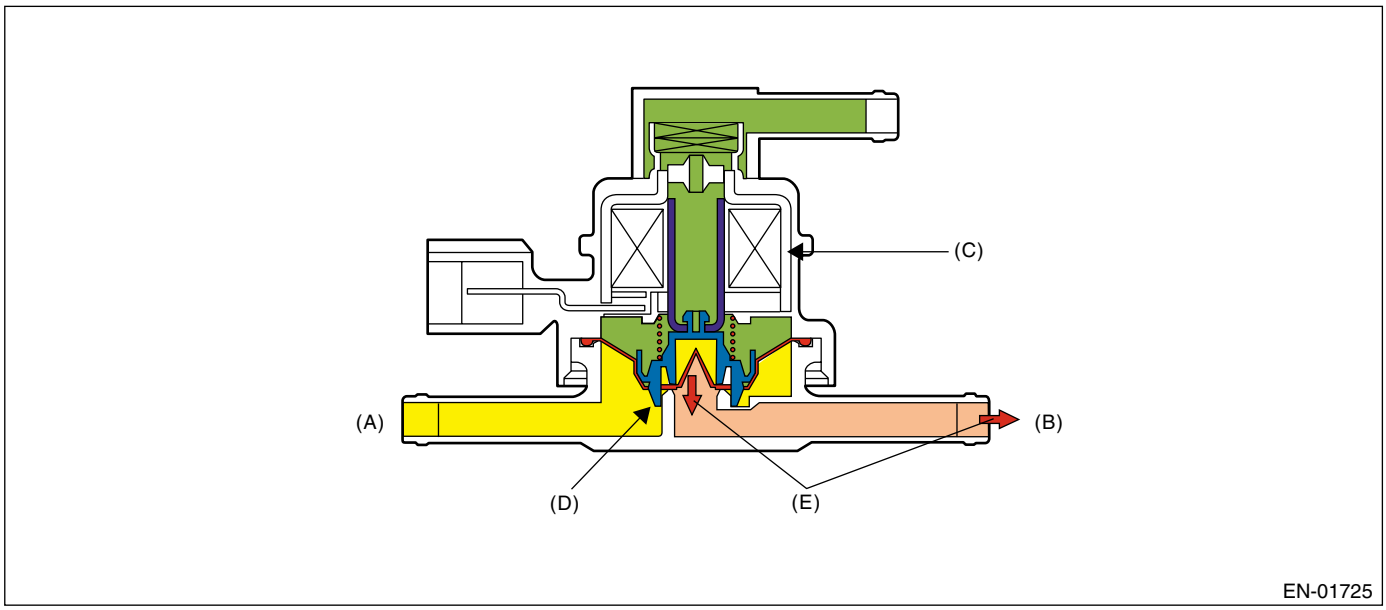
DTC P0457
DTC P1443

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.
If the CCV closed fixation trouble or CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.
If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. When this status occurs the valve cannot be opened for the pressure control solenoid valve structure if the negative pressure is larger than electromagnetic force when pressure control solenoid valve solenoid is set to ON in order to open the valve.



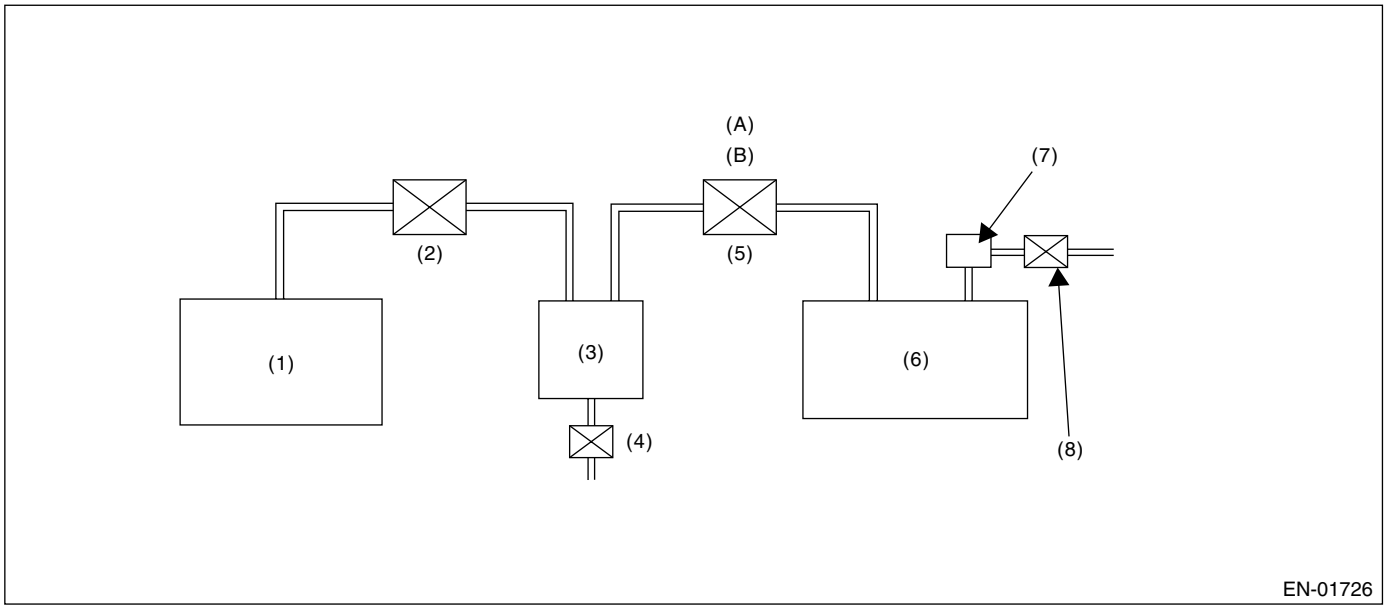
(1) Engine
(2) Purge control solenoid valve open
(3) Fuel tank
(4) Pressure control solenoid valve close
(5) Canister
(6) CCV stuck close



(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

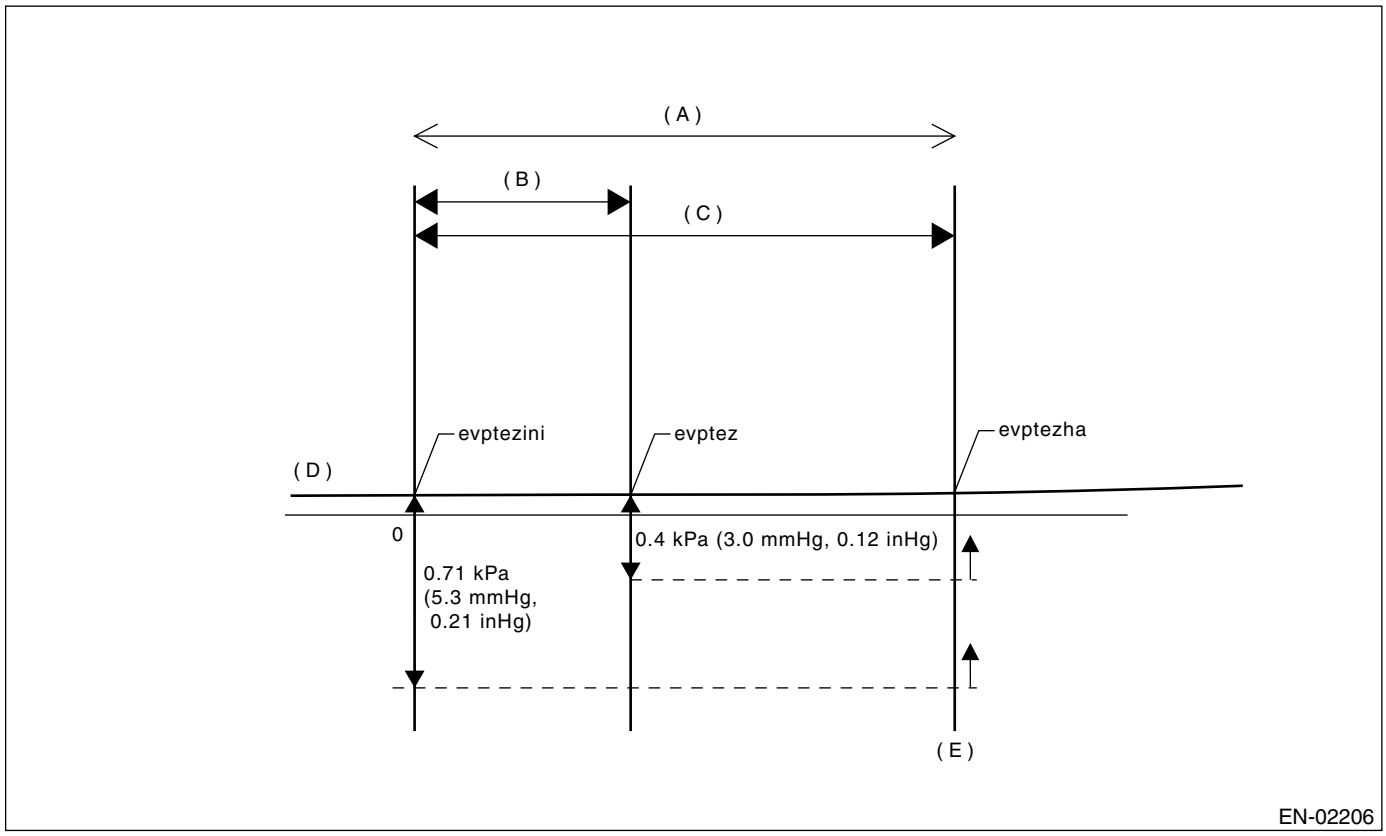
• Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Tank pressure switching solenoid valve
(A) Normal condition: mechanical control
(B) Under the diagnosis: electronic control

• Normal Operation

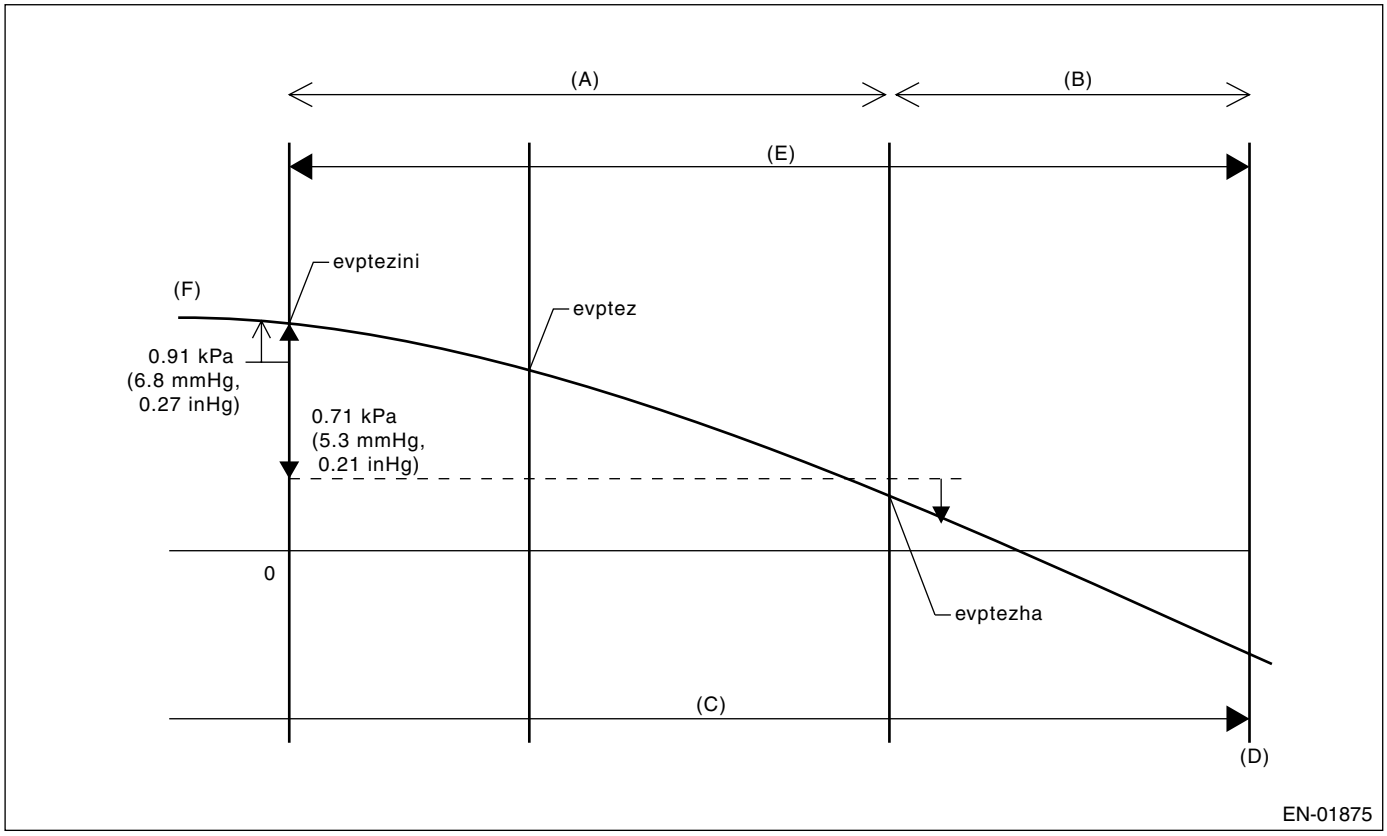


(A) Mode Z
(B) 1 second
(C) 3 seconds
(D) Fuel tank pressure
(E) OK judgement

- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini – evptezha ≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)

Judge normal when these calculations are completed.

• Drain Valve close fixation



(A) Mode Z
(B) Mode Z extened
(C) Fuel does not waver more than 3 seconds.
(D) Judgement
(E) 16S
(F) Fuel tank pressure

- evptezini – evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
- evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)

Judge normal when these calculations are completed.

• Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation in Mode Z.

Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

• Judgment Value

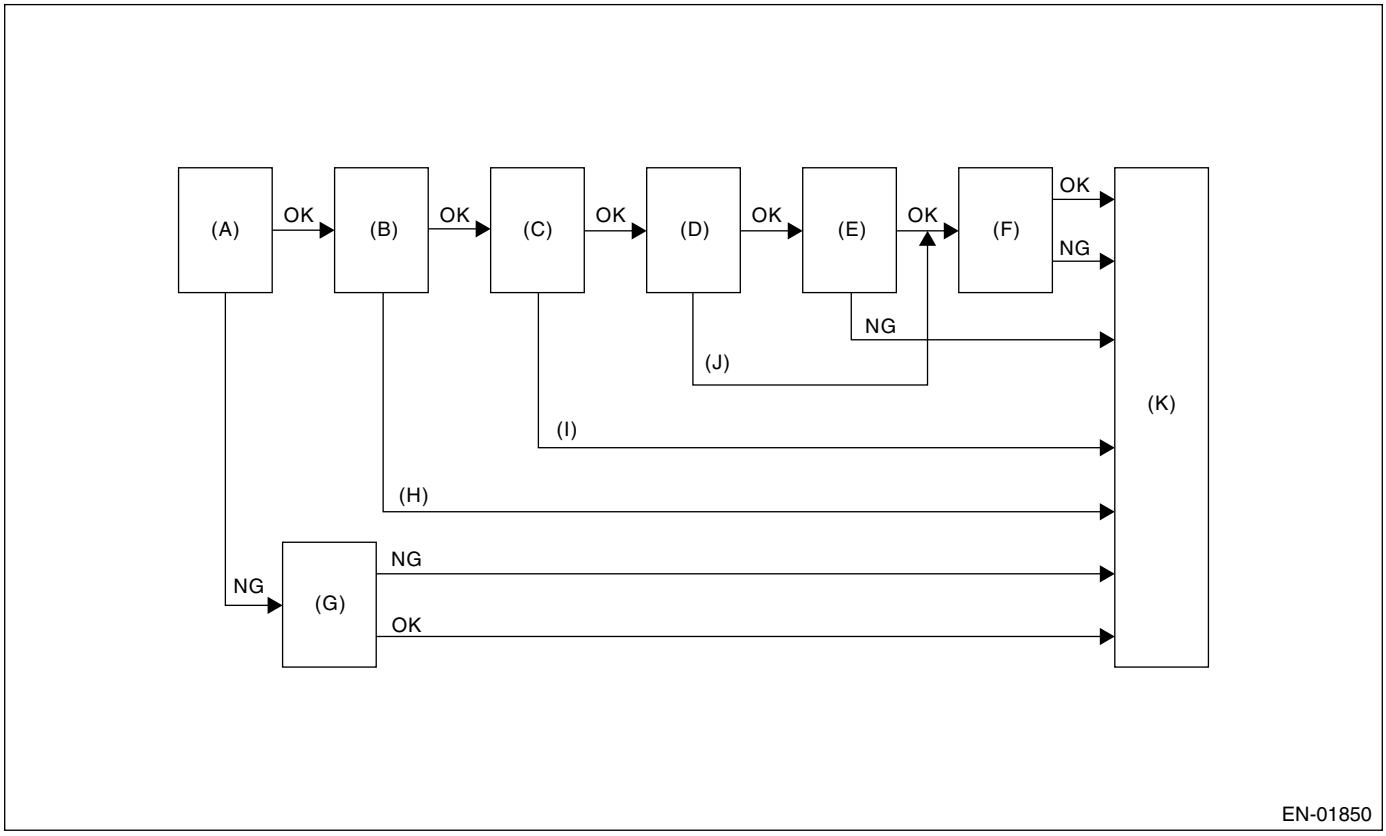
Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 3 seconds after Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.7 kPa (5.3 mmHg, 0.21 inHg)	P0457

Abnormality Judgment
If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when Mode Z started	> 0.91 kPa (6.8 mmHg, 0.27 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.7 kPa (5.3 mmHg, 0.21 inHg)	

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
Finish the Evap. diagnosis when making NG judgment for drain valve close fixation.
Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.



(A) Mode Z
(B) Mode A
(C) Mode B
(D) Mode C
(E) Mode D
(F) Mode E
(G) Mode Z Extend
(H) Cancel
(I) Large leakage diagnosis
(J) Quick OK judgement
(K) END

• Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.
Normality Judgment
Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.
Both diagnostic method and judgment value are the same as PCV normality judgment.

• Leak Diagnosis

DTC P0442
DTC P0456
DTC P0457

• Diagnostic method

• The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
• The diagnosis is divided into the following five phases.

Mode A: (Estimation of evaporation gas yield)

The tank pressure variation amount in Mode A is calculated as P1. The tank pressure variation amount in Mode A is calculated as P1. After calculating P1, change to Mode B.

Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.
Approx. 0 → −1.4 kPa (0 → −10.5 mmHg, 0 → −0.41 inHg) (0.04-in diagnosis)
Approx. 0 → −3.05 kPa (0 → −22.9 mmHg, 0 → −0.9 inHg) (0.02-in diagnosis)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.
Judge NG when the malfunction criteria below is completed.
Finish the Evap. diagnosis when judging large leak (10 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis)		P0457
Time for Mode B	10 seconds	
(Tank pressure during Mode B) − (Tank pressure when Mode B started)	< −0.5 kPa (−4 mmHg, −0.16 inHg)	

Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D when the tank pressure returns to the start level of P2 calculation.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Tank pressure when P2 calculation started	Time for immediate OK judgment
0.04-inch diagnosis	−1.3 kPa (−9.75 mmHg, −0.38 inHg)	15 seconds
0.02-inch diagnosis	−3 kPa (−22.5 mmHg, −0.89 inHg)	20 seconds

Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

***1.5:** Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

• Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.31 kPa (2.34 mmHg, 0.092 inHg)	0.31 kPa (2.34 mmHg, 0.092 inHg)	0.33 kPa (2.49 mmHg, 0.098 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.37 kPa (2.80 mmHg, 0.110 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.35 kPa (2.65 mmHg, 0.104 inHg)	0.38 kPa (2.84 mmHg, 0.112 inHg)	0.41 kPa (3.08 mmHg, 0.121 inHg)	0.44 kPa (3.28 mmHg, 0.129 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.94 mmHg, 0.116 inHg)	0.39 kPa (2.94 mmHg, 0.116 inHg)	0.42 kPa (3.18 mmHg, 0.125 inHg)	0.47 kPa (3.52 mmHg, 0.139 inHg)	0.50 kPa (3.76 mmHg, 0.148 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.45 kPa (3.35 mmHg, 0.132 inHg)	0.45 kPa (3.35 mmHg, 0.132 inHg)	0.47 kPa (3.49 mmHg, 0.137 inHg)	0.50 kPa (3.74 mmHg, 0.147 inHg)	0.52 kPa (3.88 mmHg, 0.153 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.50 kPa (3.76 mmHg, 0.148 inHg)	0.50 kPa (3.76 mmHg, 0.148 inHg)	0.51 kPa (3.80 mmHg, 0.150 inHg)	0.53 kPa (3.95 mmHg, 0.156 inHg)	0.53 kPa (3.99 mmHg, 0.157 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 22 seconds on Mode D P1: Change of tank pressure within 22 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

• Map 8 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.34 kPa (2.57 mmHg, 0.101 inHg)	0.37 kPa (2.80 mmHg, 0.110 inHg)	0.44 kPa (3.30 mmHg, 0.130 inHg)	0.73 kPa (5.49 mmHg, 0.216 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.38 kPa (2.83 mmHg, 0.111 inHg)	0.42 kPa (3.12 mmHg, 0.123 inHg)	0.49 kPa (3.70 mmHg, 0.146 inHg)	0.79 kPa (5.92 mmHg, 0.233 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.41 kPa (3.09 mmHg, 0.122 inHg)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.55 kPa (4.10 mmHg, 0.161 inHg)	0.85 kPa (6.34 mmHg, 0.250 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.46 kPa (3.46 mmHg, 0.136 inHg)	0.49 kPa (3.66 mmHg, 0.144 inHg)	0.56 kPa (4.18 mmHg, 0.165 inHg)	0.89 kPa (6.70 mmHg, 0.264 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.51 kPa (3.83 mmHg, 0.151 inHg)	0.52 kPa (3.89 mmHg, 0.153 inHg)	0.57 kPa (4.25 mmHg, 0.167 inHg)	0.93 kPa (7.00 mmHg, 0.276 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

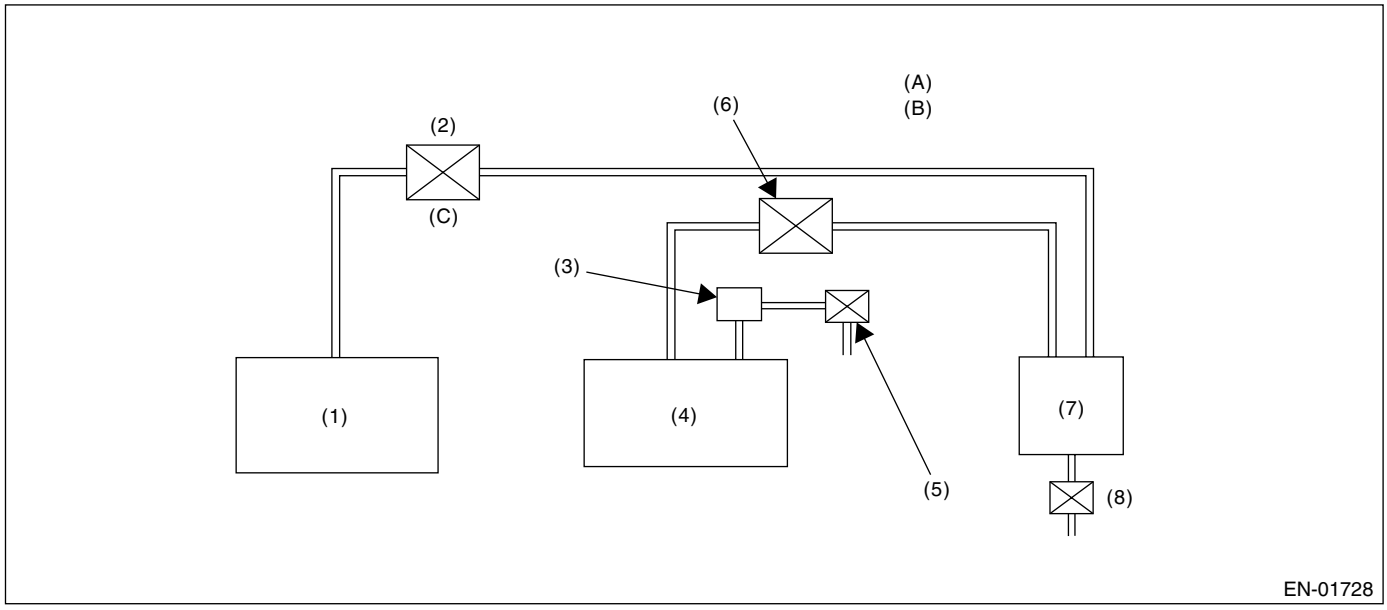
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	> Valve on map 9.	P0456

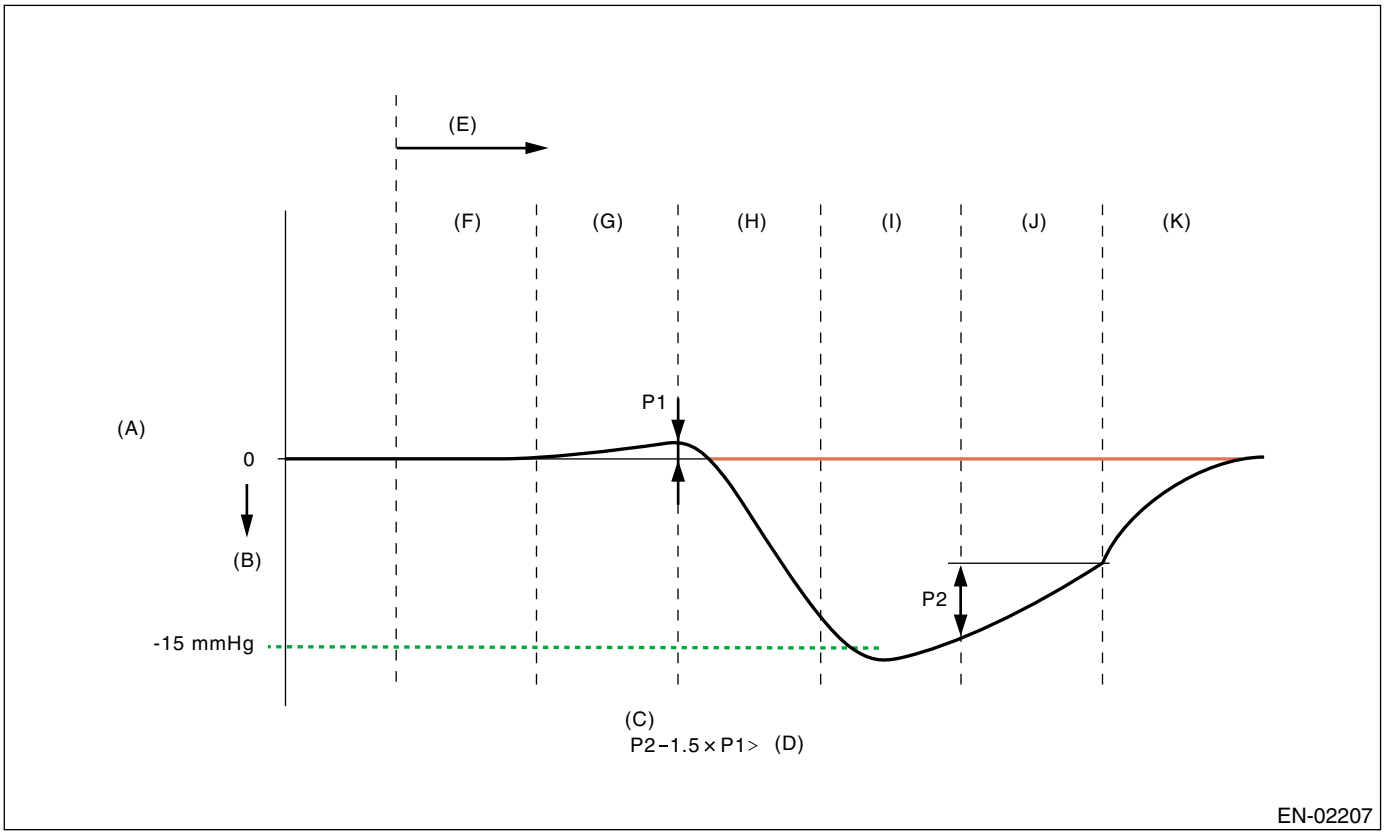
• Map 9.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.21 kPa (1.59 mmHg, 0.063 inHg	0.26 kPa (1.97 mmHg, 0.078 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.28 kPa (2.09 mmHg, 0.082 inHg	0.33 kPa (2.45 mmHg, 0.096 inHg)	0.37 kPa (2.81 mmHg, 0.111 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.39 kPa (2.92 mmHg, 0.115 inHg)	0.43 kPa (3.26 mmHg, 0.128 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.40 kPa (3.02 mmHg, 0.119 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)	0.37 kPa (2.78 mmHg, 0.109 inHg)

If not judged OK or NG, repeat the diagnosis until judged OK or NG.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve
(A) Normal condition: mehcanical control
(B) Under the diagnosis electronic control
(C) Duty control



(A) Fuel tank pressure
(B) Negative pressure
(C) Small leakage
(D) Threshold value
(E) Diagnosis start
(F) Mode Z
(G) Mode A
(H) Mode B
(I) Mode C
(J) Mode D
(K) Mode E

• CCV Property Diagnosis [P1443]

Mode E:
The tank pressure must become again as high as the atmospheric air pressure, after the evaporation diagnosis (normal judgment on Mode C or after Mode D). If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.
Judge NG when the criteria below are completed.

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later	< 0.36 kPa (2.72 mmHg, 0.11 inHg)	P1443

• Time Needed for Diagnosis:

0.04-inch: 30 — 100 seconds
0.02-inch: 30 — 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

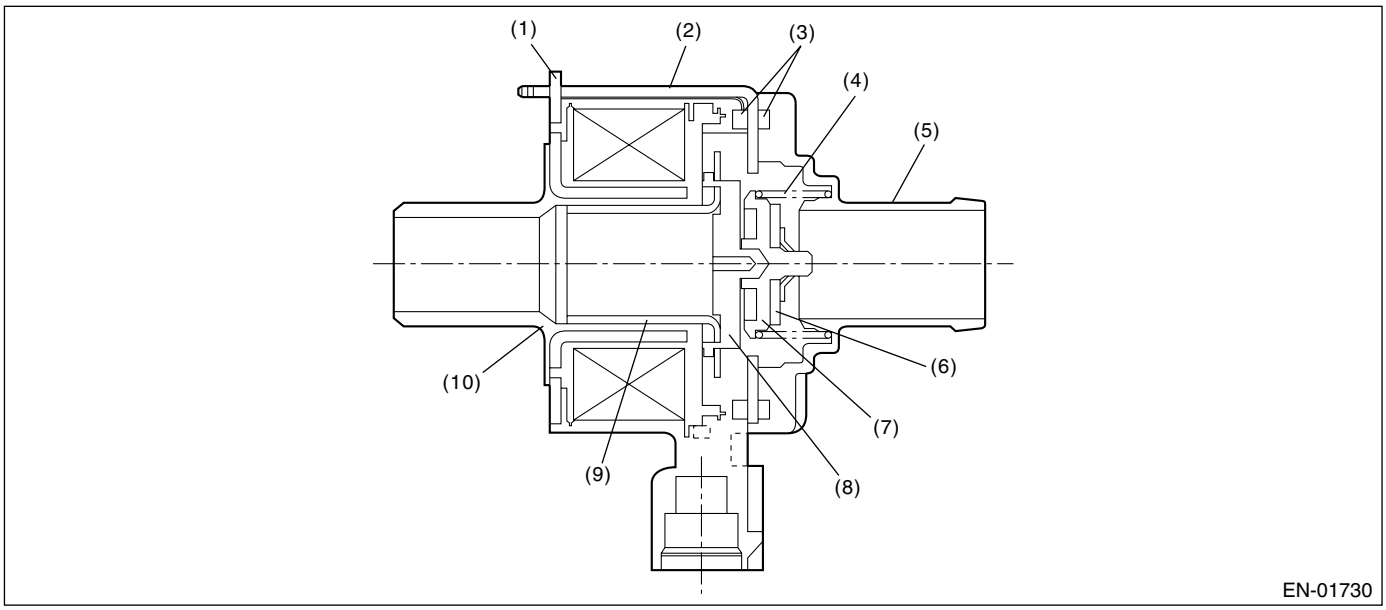
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BB:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

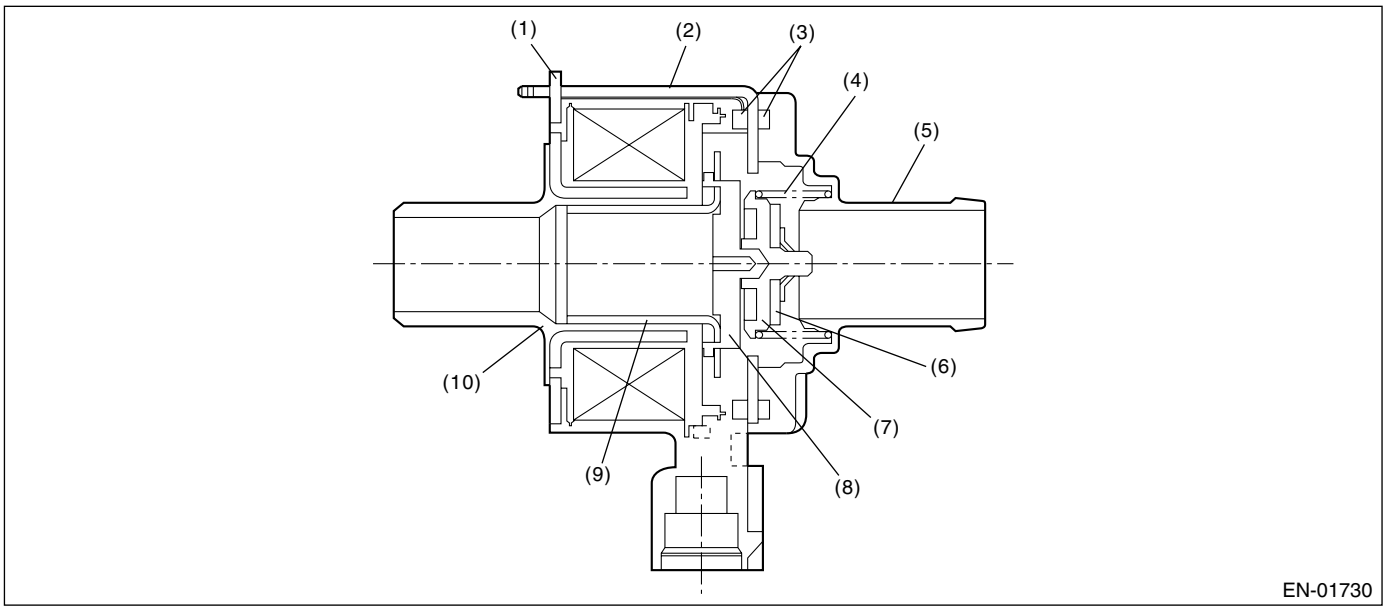
Memorize the freeze frame data. (For test mode $02)

BC:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

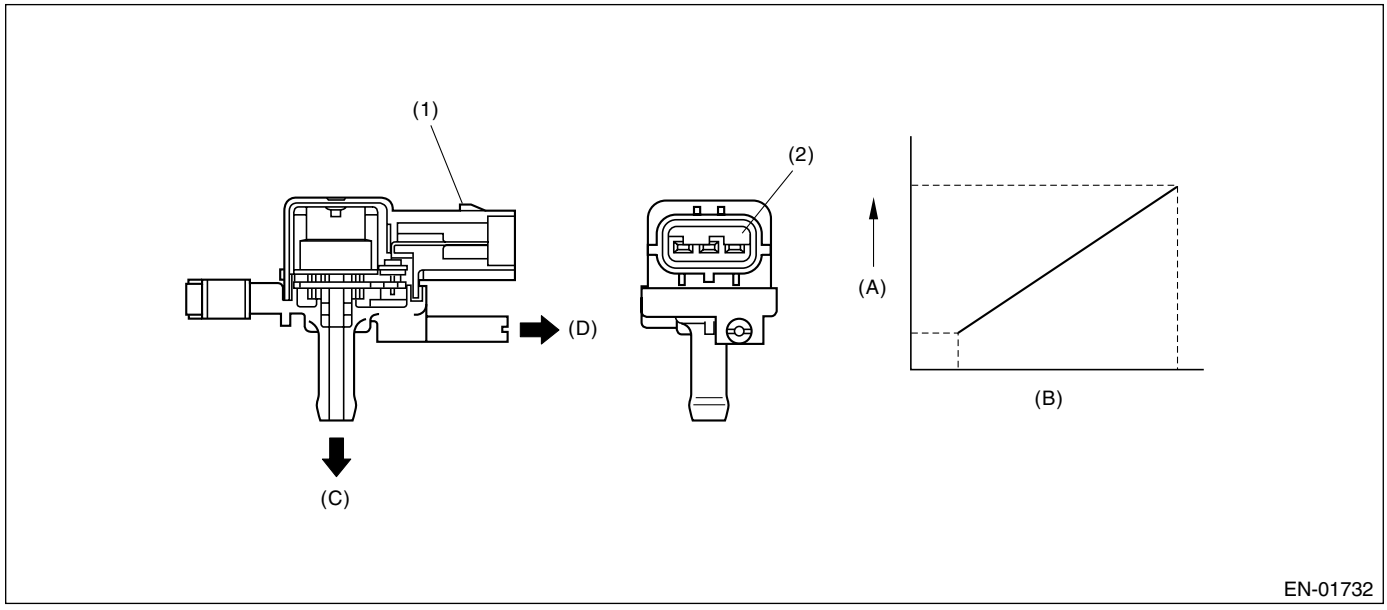
Memorize the freeze frame data. (For test mode $02)

BD:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting engine	60 second or more
Fuel level	≥ 18 ℓ (4.76 US gal, 3.96 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine speed	< 6500 rpm
Purge control solenoid valve ON/OFF	Experienced

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 5 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 5 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.
If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.
Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 5 ℓ .
Time Needed for Diagnosis: 1 minute × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

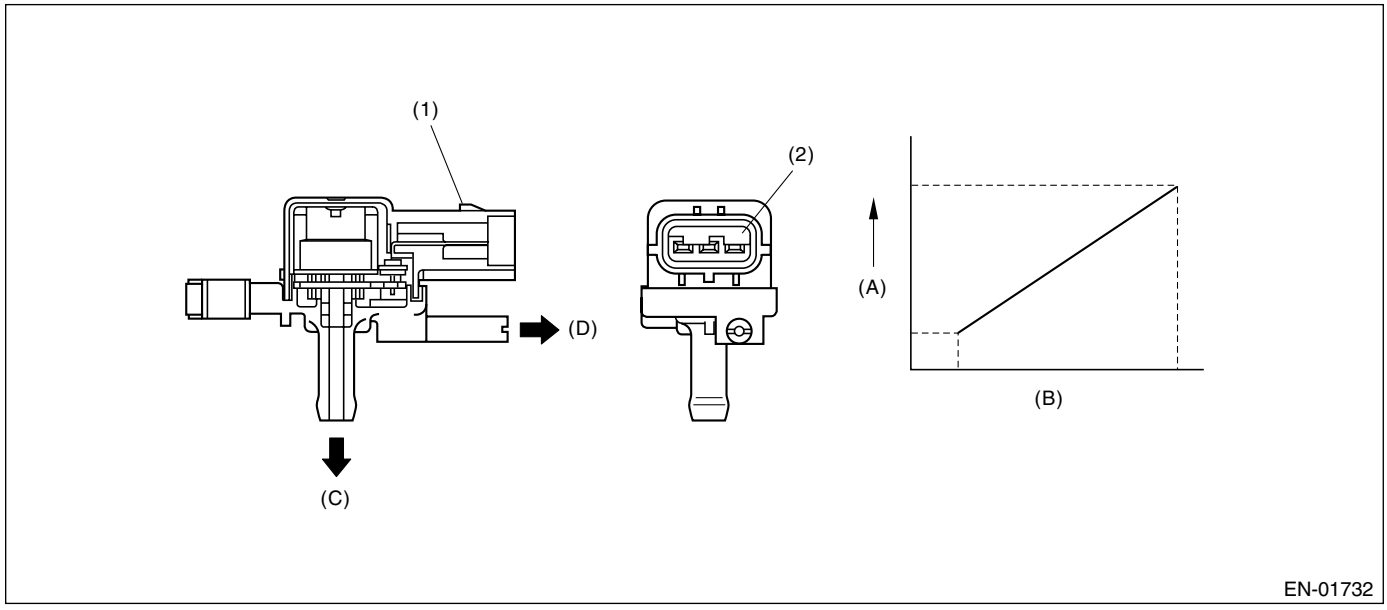
Memorize the freeze frame data. (For test mode $02)

BE:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.33 kPa (–55 mmHg, –2.17 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.33 kPa (–55 mmHg, –2.17 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

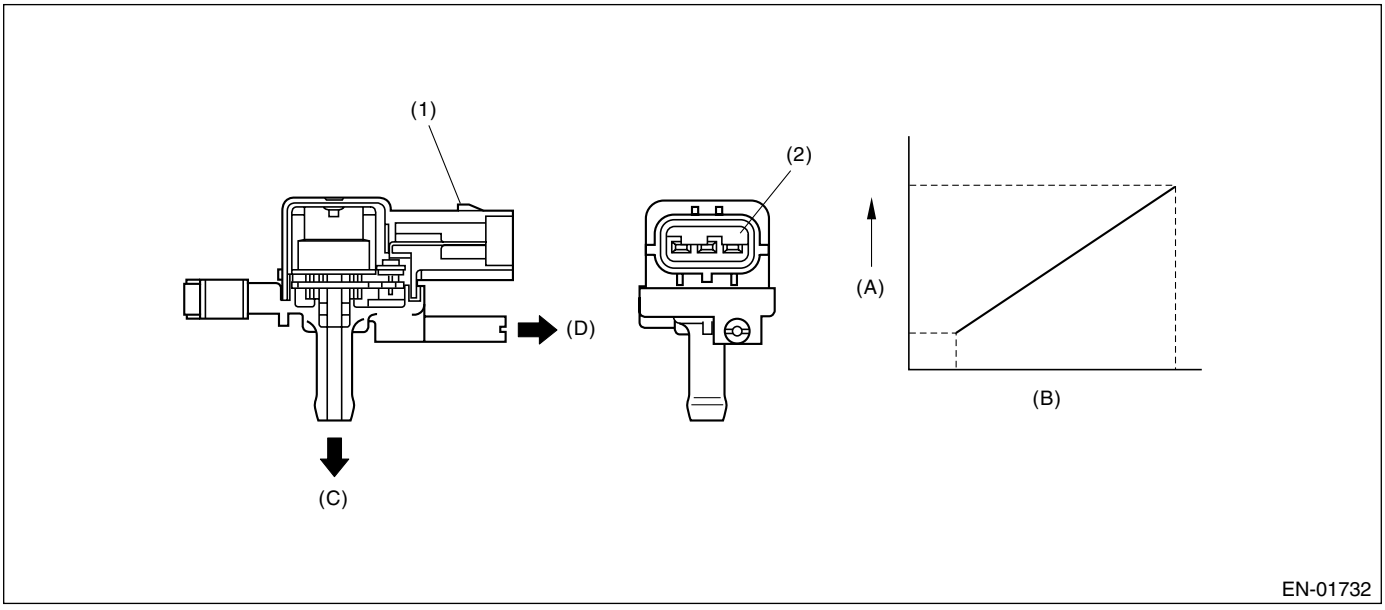
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all conditions are completed.	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.33 kPa (55 mmHg, 2.17 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.33 kPa (55 mmHg, 2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BG:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

BH:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

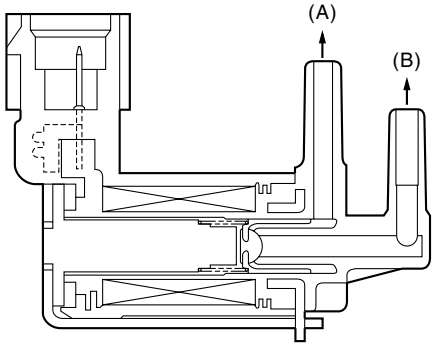
MEMO:

BI: DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

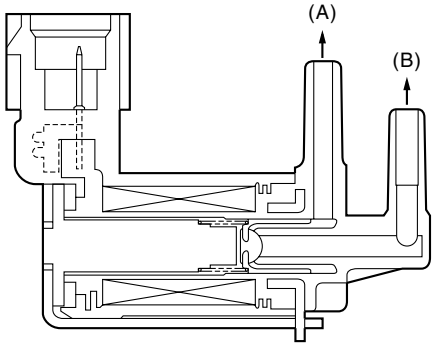
Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

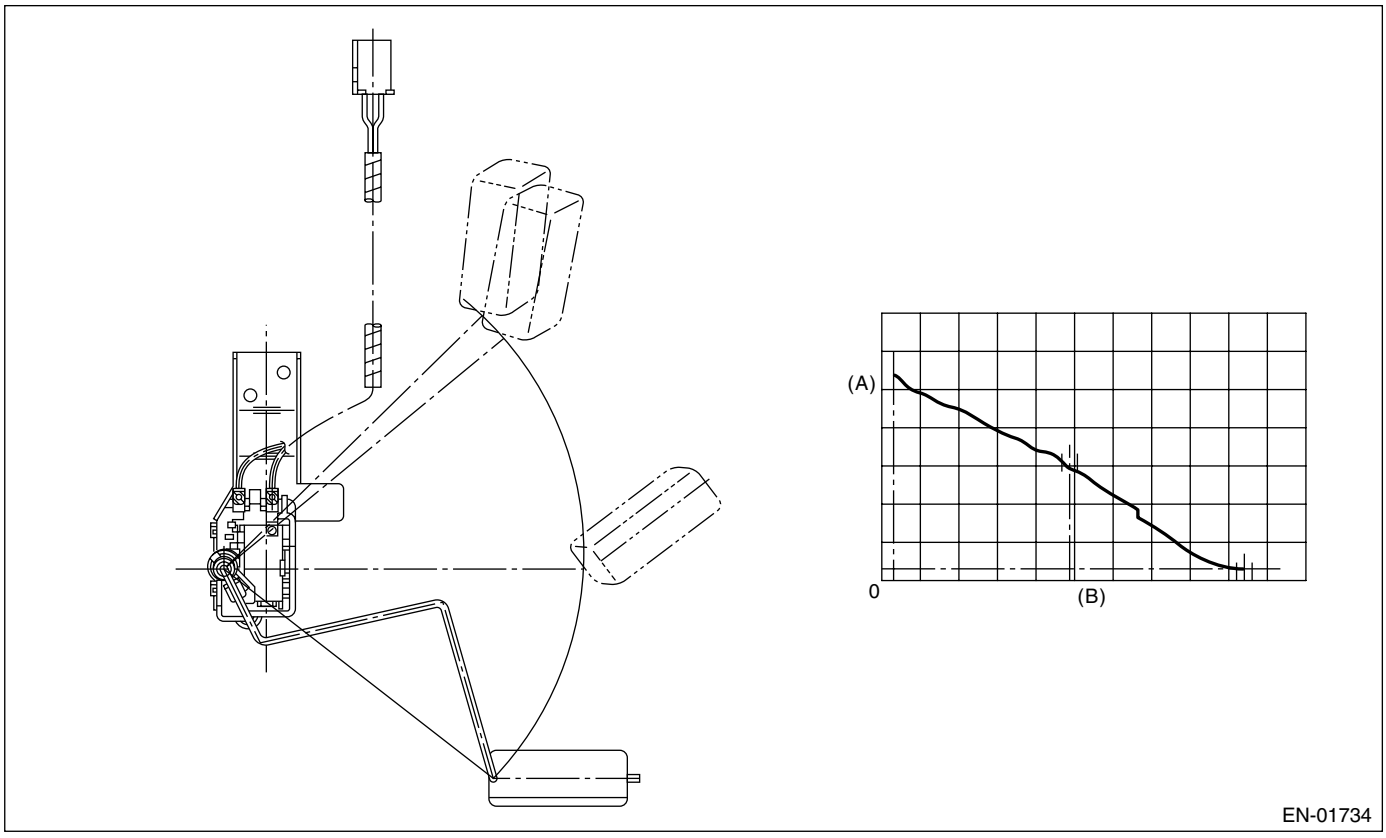
Memorize the freeze frame data. (For test mode $02)

BK:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



(A) Fuel level (L)
(B) Resistance (Ω)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After starting engine	More than 10 seconds

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After starting engine	More than 10 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

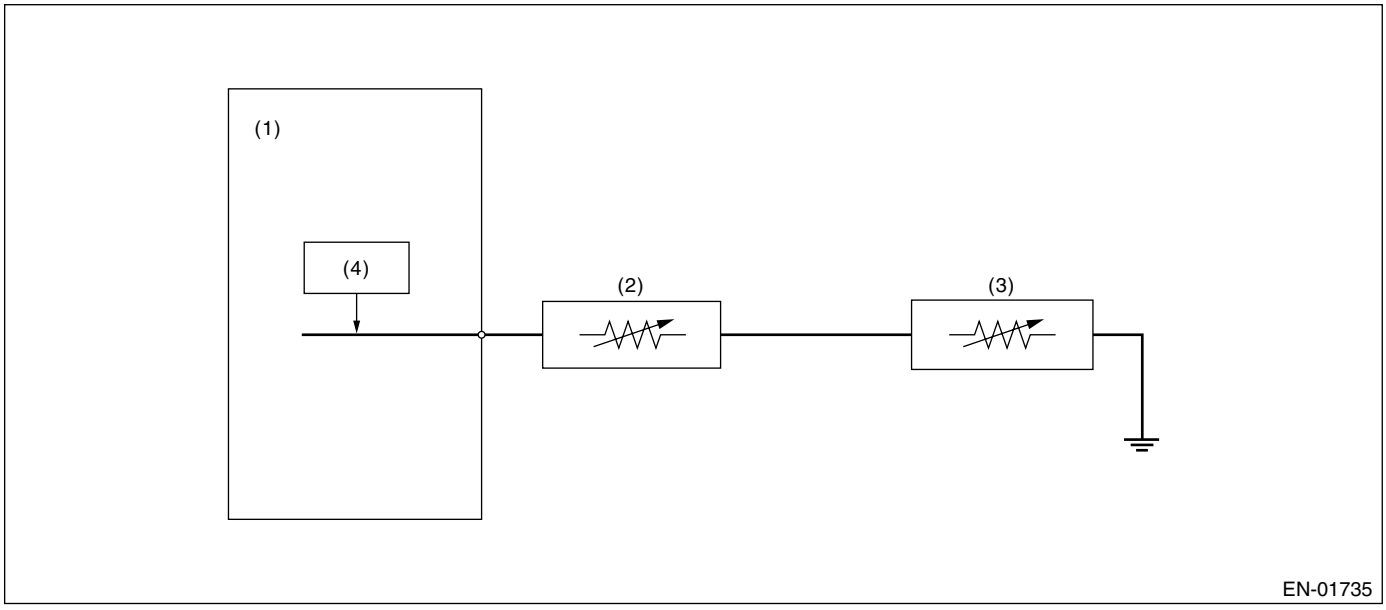
Memorize the freeze frame data. (For test mode $02)

BL:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	< 0.02 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	≥ 0.02 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

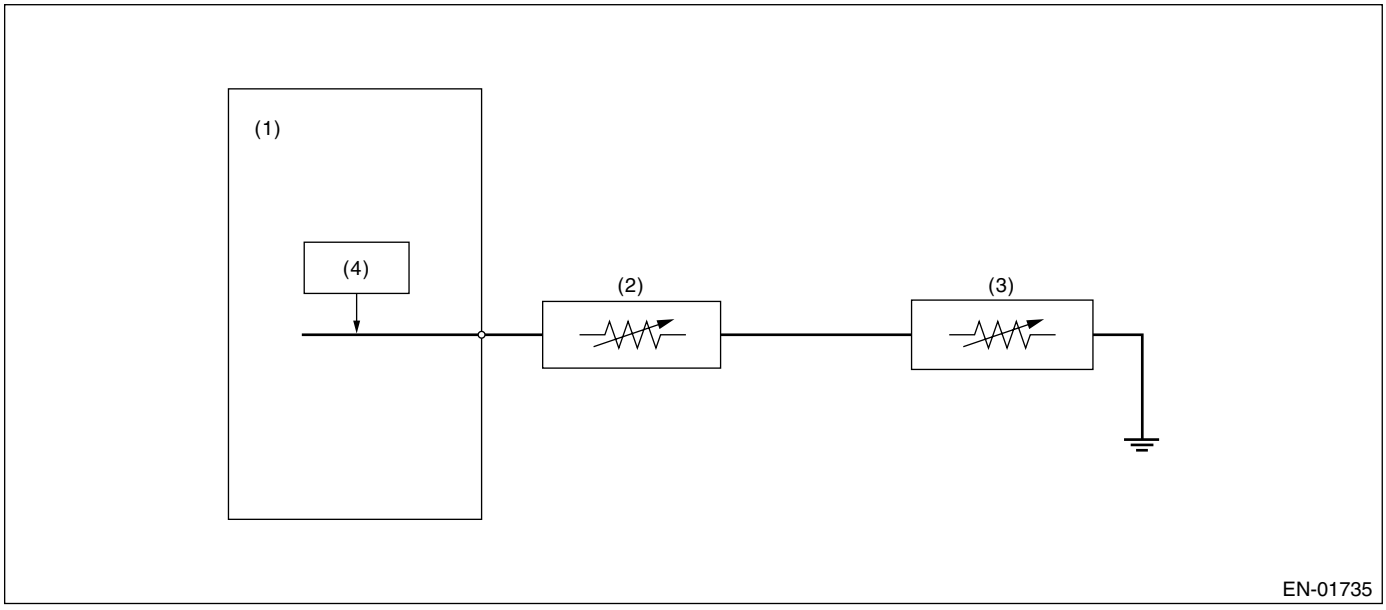
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	≥ 4.95 V

Time Needed for Diagnosis: 10 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	3 seconds or more
Output voltage	< 4.95 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BN:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.
Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

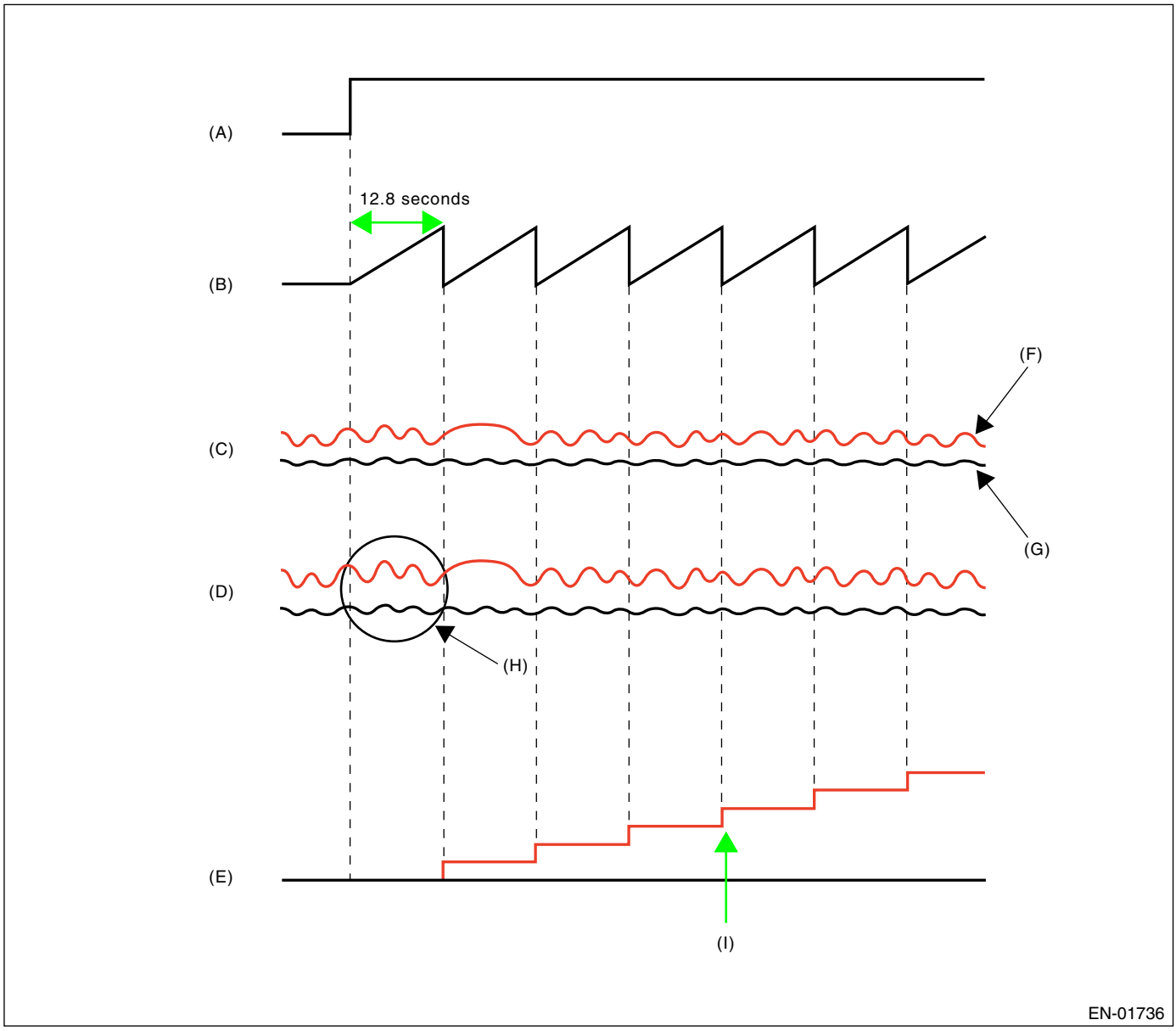
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After starting engine	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 ←→ 51 ℓ (2.4 ←→ 13.4 US gal, 1.98 ←→ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.8 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



(A) Diagnosis condition
(B) Diagnosis time
(C) Fuel level sensor at idle
(D) Amount of fuel level output voltage variation
(E) Diagnosis counter
(F) Malfunction
(G) Normal
(H) Calculate the Max. value (delvfmx) and the cumulative value (sumvfl)
(I) NG at 4 counts

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.2 V or SUMFL ≥ 19.2 V where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds. SUMFL is integrated value of sensor output deviation during 12.8 seconds.	≥ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 12.8 seconds.

Max – Min of tank pressure during 12.8 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 12.8 seconds	≥ 0.27 V

Time Needed for Diagnosis: 12.8 seconds × 4 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 V
SUMFL Where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds. SUMFL is integrated value of sensor output deviation during 12.8 seconds.	< 15 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BO:DTC P0483 — COOLING FAN RATIONALITY CHECK —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	500 — 900 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 98°C (208°F)
Radiator fan	OFF → ON
Engine coolant temperature	not reduce

Time Needed for Diagnosis: 5 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan	OFF → ON
Engine coolant temperature	reduce

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BP:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at engine speed of 4000 rpm or less.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (300 km/h (186 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at engine speed of 4000 rpm or less.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 300
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BR:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After starting engine	10 seconds or more
Feedback in ISC	In operation
Measured lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling, 10 seconds after starting and warming up.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< –100 rpm
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ –100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BS:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After starting engine	10 seconds or more
Feedback in ISC	In operation
Lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling, 10 seconds after starting and warming up.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BT:DTC P0512 — STARTER REQUEST CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains to be on.
Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BU:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1000 rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ –5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

8. ECM OPERATION AT DTC SETTING

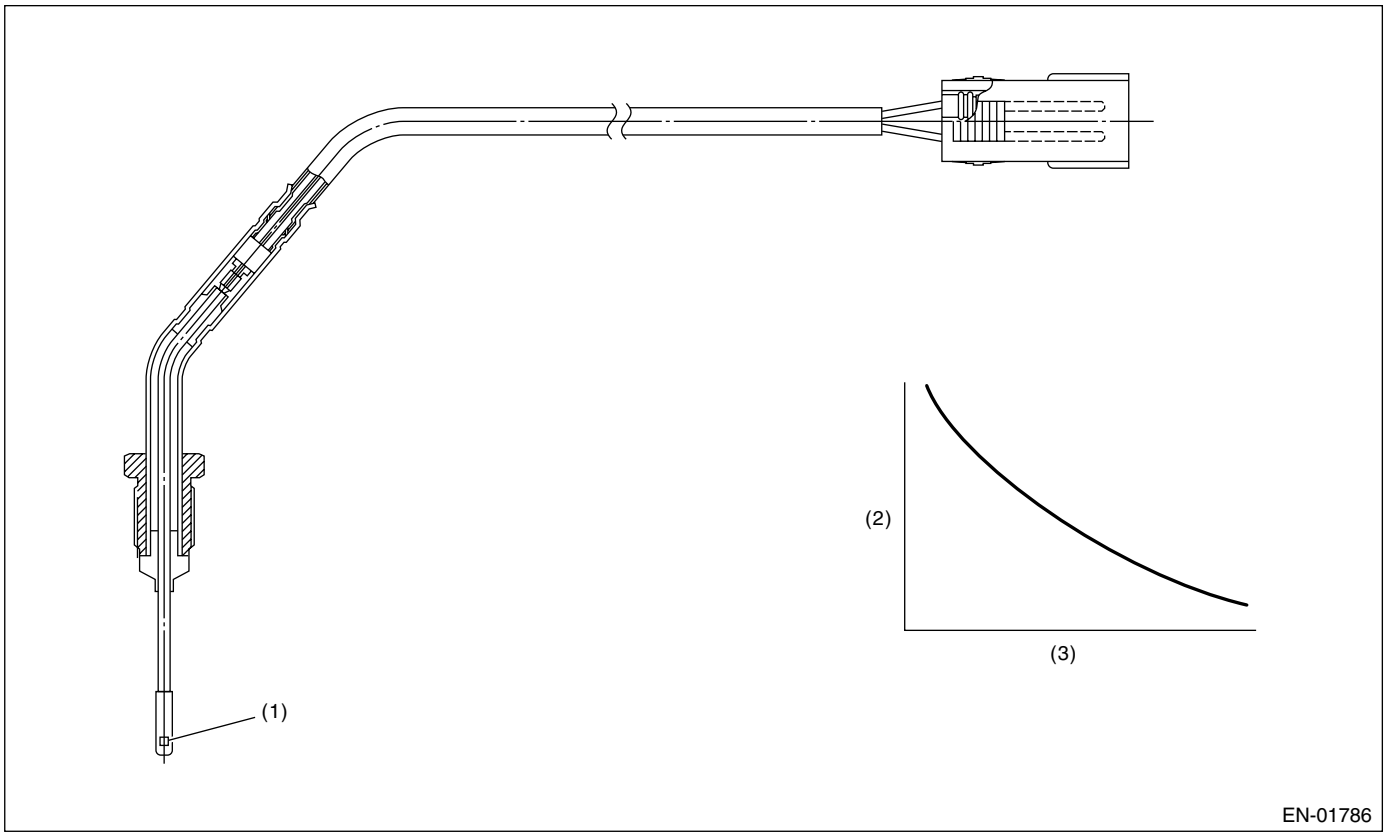
Memorize the freeze frame data. (For test mode $02)

BV:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Thermistor (2) Resistance value (kΩ) (3) Exhaust temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 0.15 V
Amount of intake air	< 100 g (3.53 oz)/s

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	≥ 0.15 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

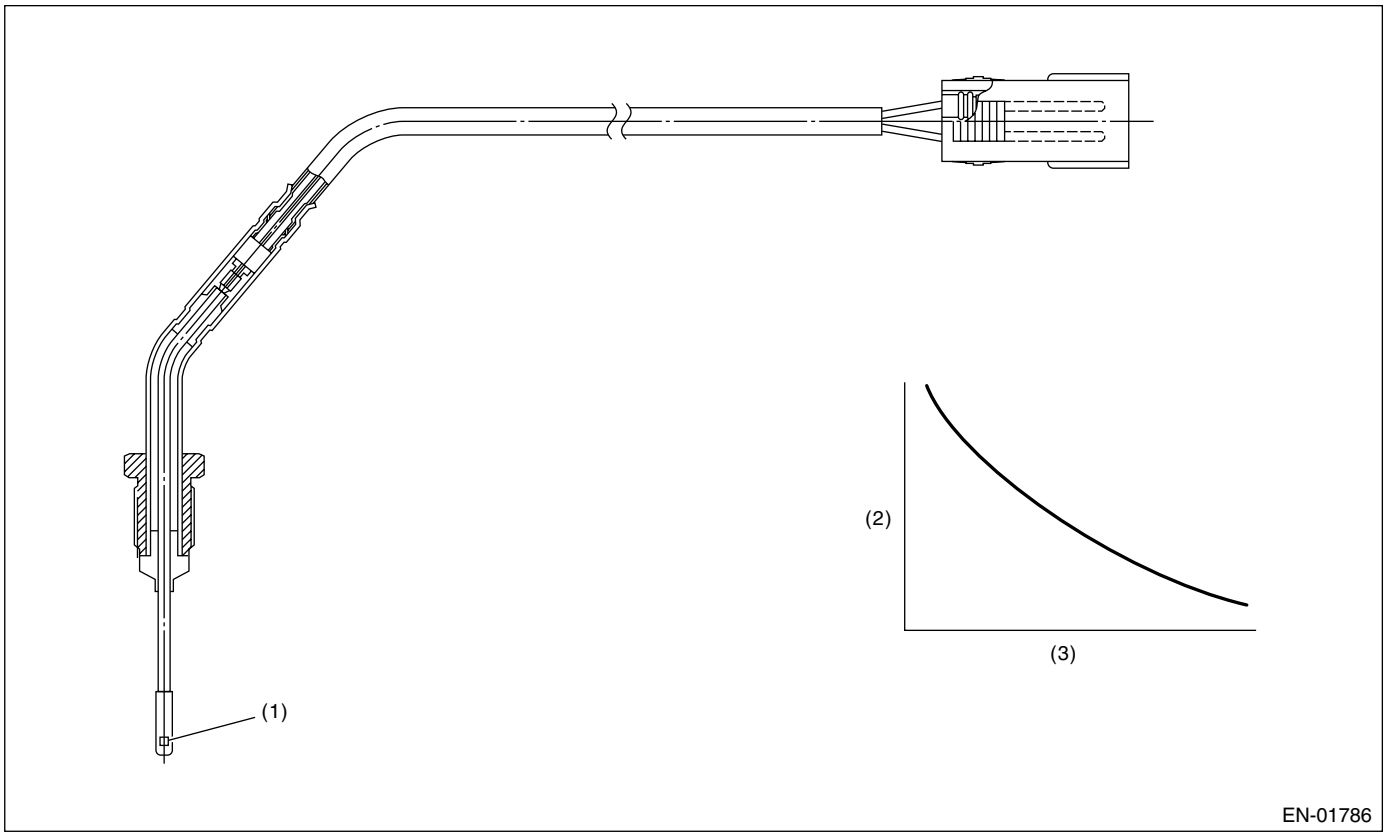
Memorize the freeze frame data. (For test mode $02)

BW:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Thermistor (2) Resistance value (kΩ) (3) Exhaust temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than the time needed for diagnosis (30 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	240 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 65 km/h (40.4 MPH)
Engine speed	≥ 1800 rpm
Engine load (gn)	≥ 0.6 g (0.021 oz)/rev
Fuel cut event	Not in operation
After the recovery from fuel cut event	30 seconds or more
Sensor output voltage	≥ 4.72 V

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 4.72 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BX:DTC P0600 — CAN COMMUNICATION CIRCUIT—

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.
It judges as NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

2. COMPONENT DISCRIPTION

CAN connects between ECU and TCU with high speed.

(Common Specification)
CAN PROTCOL 2.0B (active)
Frame format: 11 bit ID Frame (Standard frame)
(High Speed CAN)
ISO 11898 compliance
Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery Voltages	≥ 10.9 V
Starter switch	ON
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• JUDGMENT OF MALFUNCTION

It judges as NG if any of the following conditions are judged as NG. It judges as OK if all of the following conditions are judged as OK within 1s, and the NG memory is cleared.

• Judgement Value

Malfunction Criteria	Threshold Value
Buss off flag or warning flag	Set
ID cannot be received from TCU	= 500 m/s

Time needed for Diagnosis: 1 time
Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.
When “Clear Memory” was performed.

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed.

8. FAIL-SAFE

The angle operation of accelerator position sensor demand target throttle opening calculation

9. ECM OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode $02)

BY:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Write zero to all area of RAM. After the zero initialization, judge NG when the result of addition of all values in area of RAM is not zero.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF → ON

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below is completed, and judge OK when it is not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Result of RAM data addition, after zero initialization	Except zero

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BZ:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

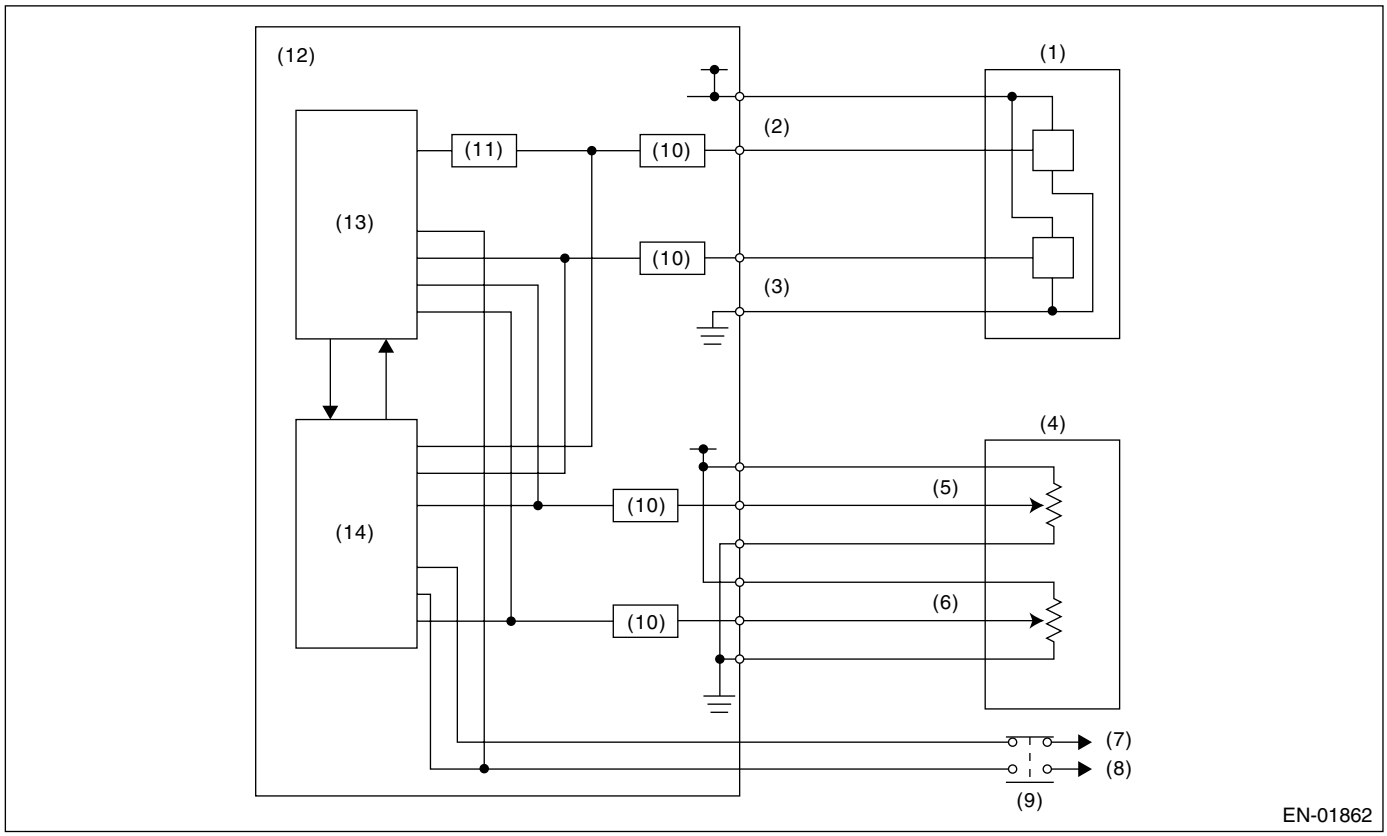
MEMO:

CA:DTC P0607 — CONTROL MODULE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor
(2) Throttle position sensor 1
(3) Throttle position sensor 2
(4) Accelerator pedal position sensor
(5) Accelerator pedal position sensor 1
(6) Accelerator pedal position sensor 2
(7) Battery
(8) Stop light
(9) Brake switch
(10) I/F circuit
(11) Amplifier circuit
(12) Engine control module (ECM)
(13) Sub CPU
(14) Main CPU

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake SW (with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

4. GENERAL DRIVING CYCLE

(1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously on idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.12 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.07 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within × 4±0.6 V
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched
(8) Throttle opening angle directing value	Within the opening angle +3.4° which calculated from accelerator opening angle coefficient.

Time Needed for Diagnosis:
(1) 250 milliseconds
(2) 250 milliseconds
(3) 200 milliseconds
(4) 200 milliseconds
(5) 24 milliseconds
(6) 250 milliseconds
(7) 200 milliseconds
(8) 250 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

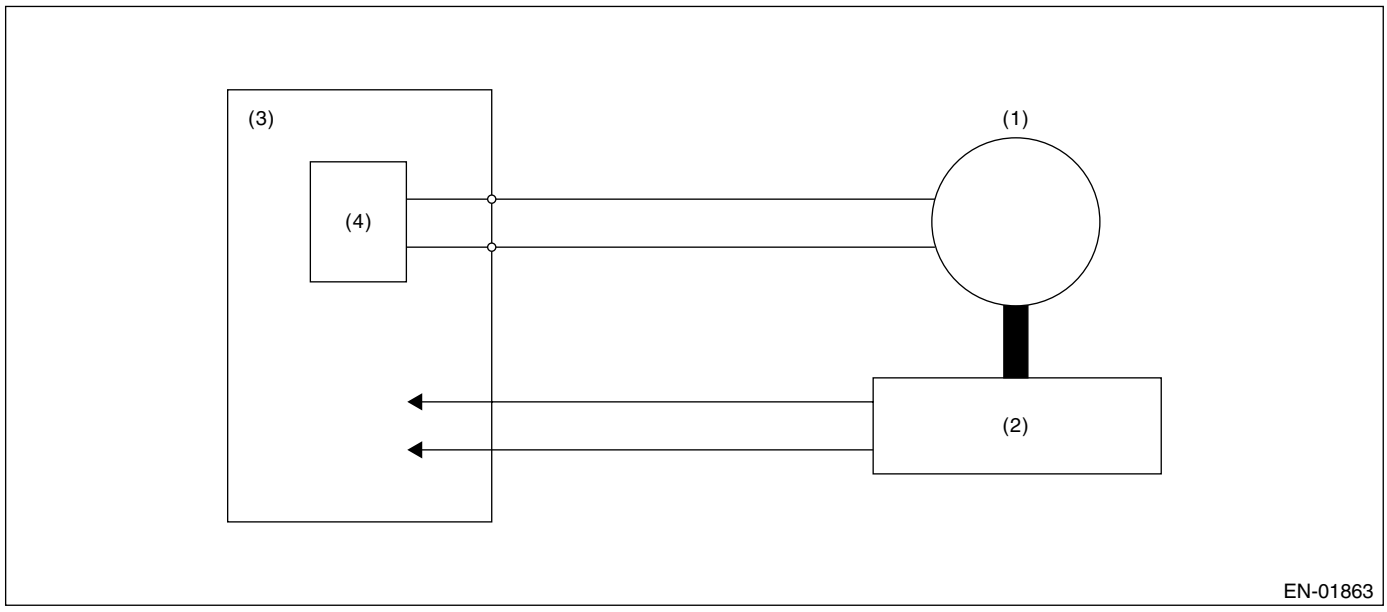
MEMO:

CB:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric control throttle is operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

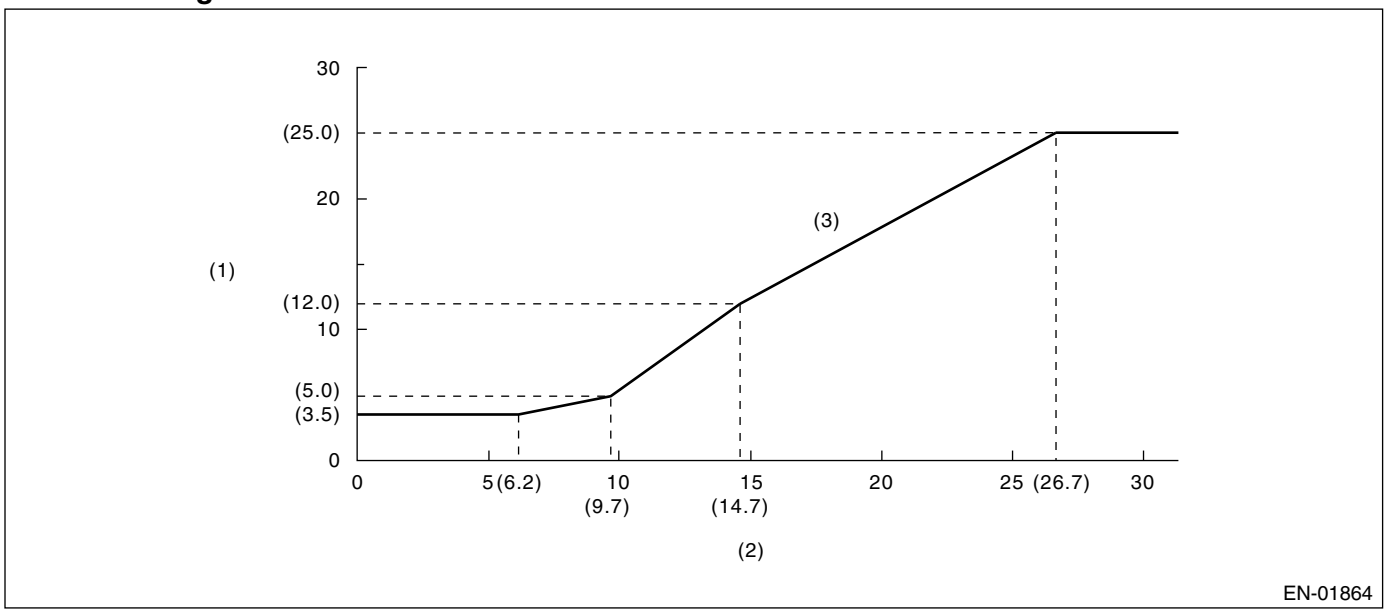
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

Time Needed for Diagnosis:

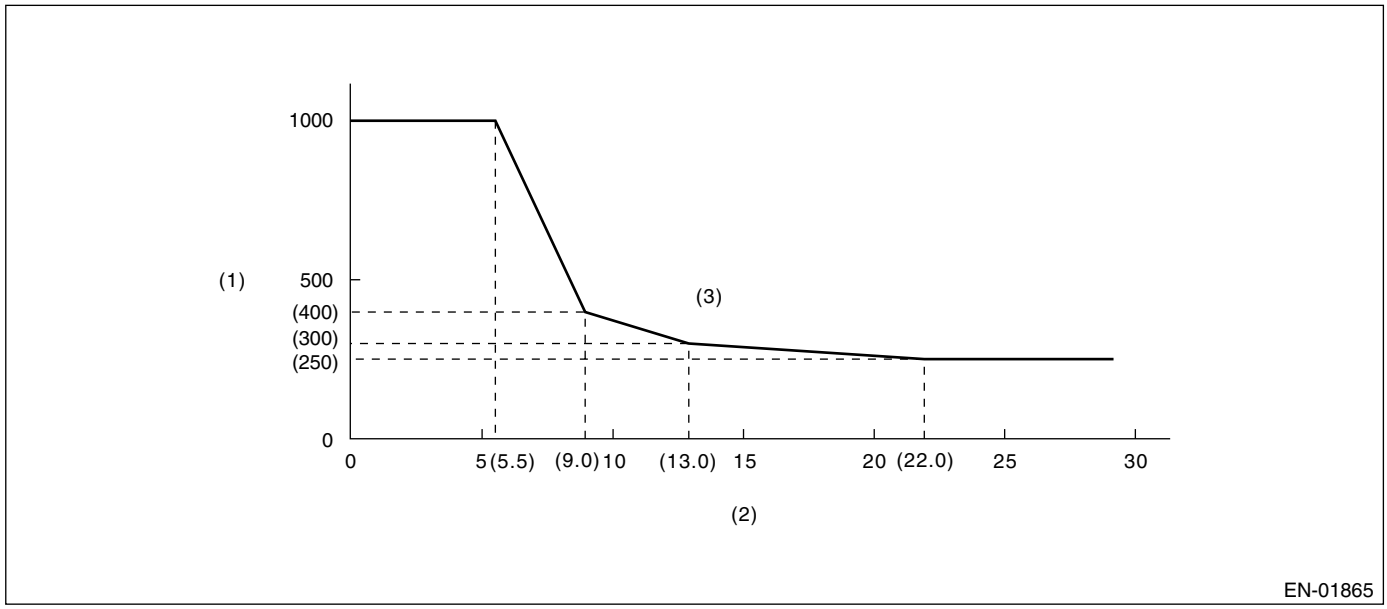
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
Output duty to drive circuit: 2000 milliseconds

Details of Judgment



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgment (Always 1000 milliseconds when the actual opening angle ≤ target opening angle)



(1) Judgment time (milliseconds)
(2) Throttle position sensor 1 opening angle
(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stopped)

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CD:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Valueg

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE:DTC P0700 — AT MIL LIGHT UP REQUEST —

1. OUTLINE OF DIAGNOSIS

AT C/U performs CAN communication. It judges as NG if malfunction is detected.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Batery Voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform diagnosis continously.

4. DIAGNOSTIC METHOD

It judges as NG if the following condition malfunctions more than the predetermined time (0.5s). It judges as OK if the following condition does not malfunction, and the NG memory is cleared.

Judgement Value

Malfunction Criteria	Threshold Value
MIL light up request from TCU	set

Time needed for diagnosis: 500 m/seconds
Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

5. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 consecutive times.
- When “Clear Memory” was performed.

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When “Clear Memory” was performed.

7. FAIL-SAFE

None

8. ECU OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode $02)

CF:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT model) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “ON” & any other switches = “OFF” on AT	OFF

Time Needed for Diagnosis: 6.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT model) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT model) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “OFF” & any other switches = “ON” on AT	ON

Time Needed for Diagnosis: 6.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT model) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

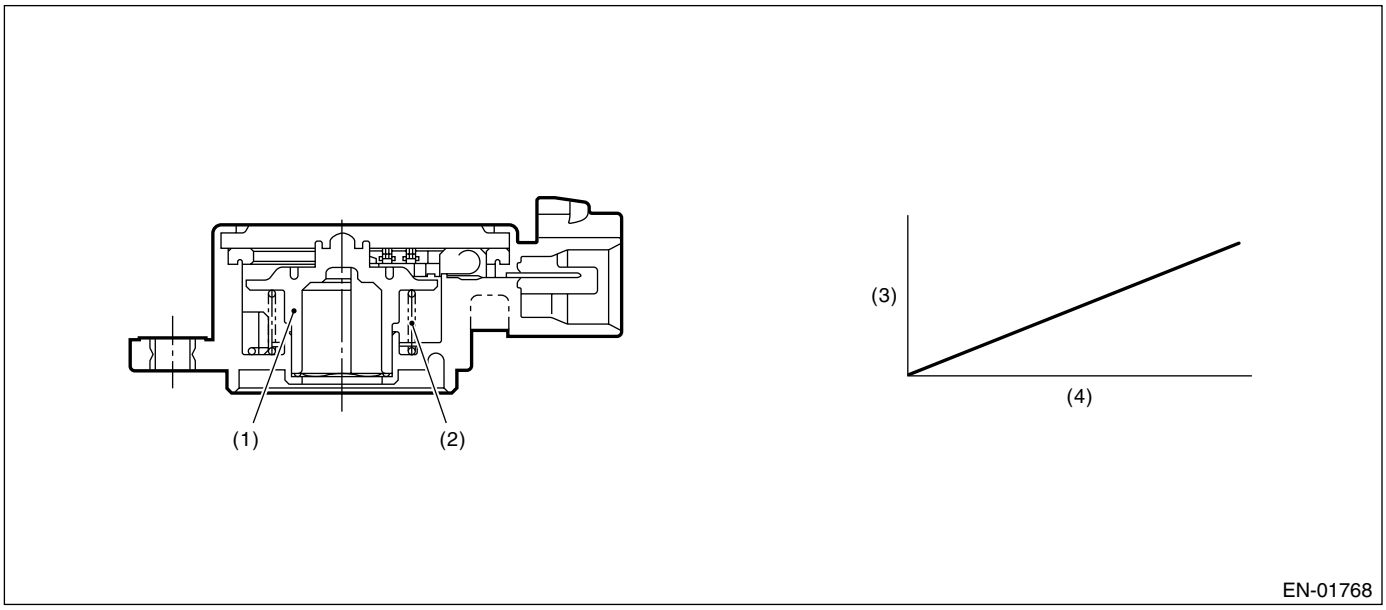
Memorize the freeze frame data. (For test mode $02)

CJ:DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

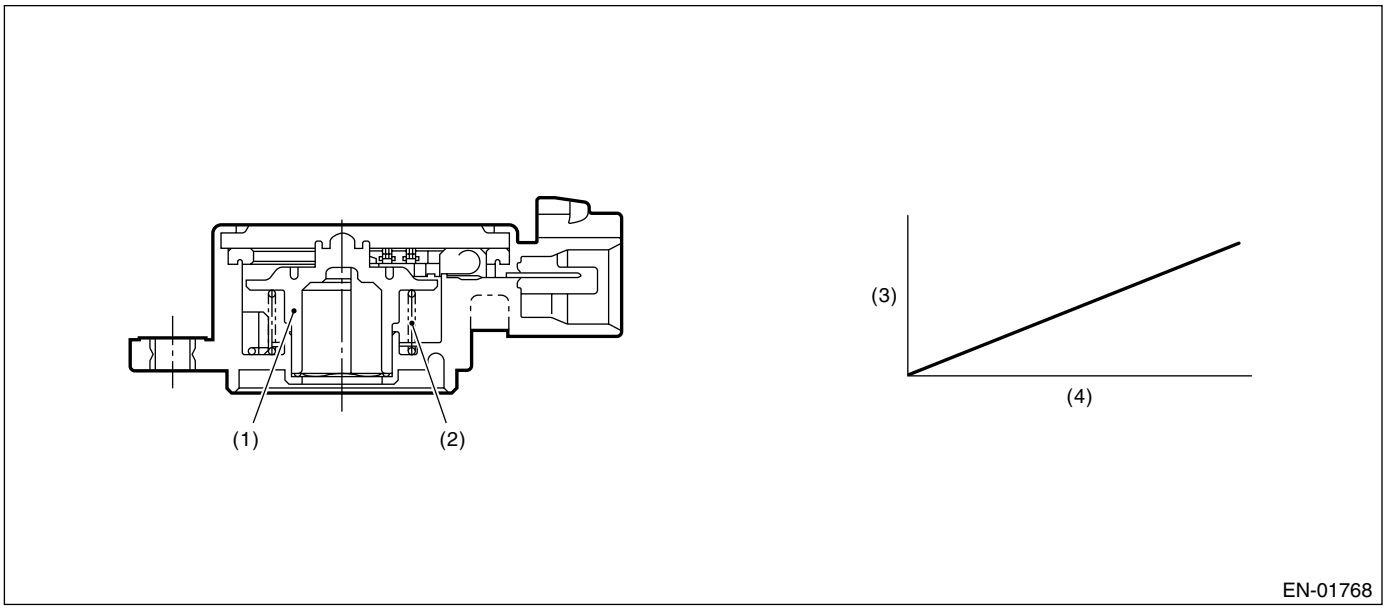
Memorize the freeze frame data. (For test mode $02)

CK:DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

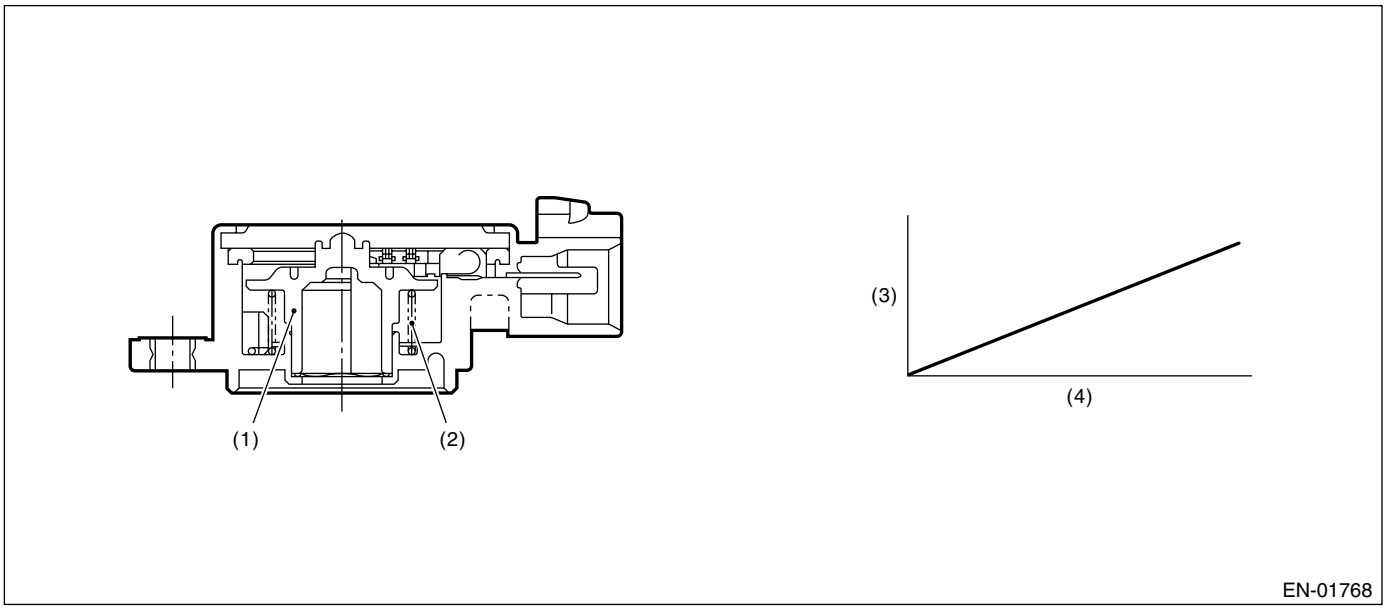
Memorize the freeze frame data. (For test mode $02)

CL:DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

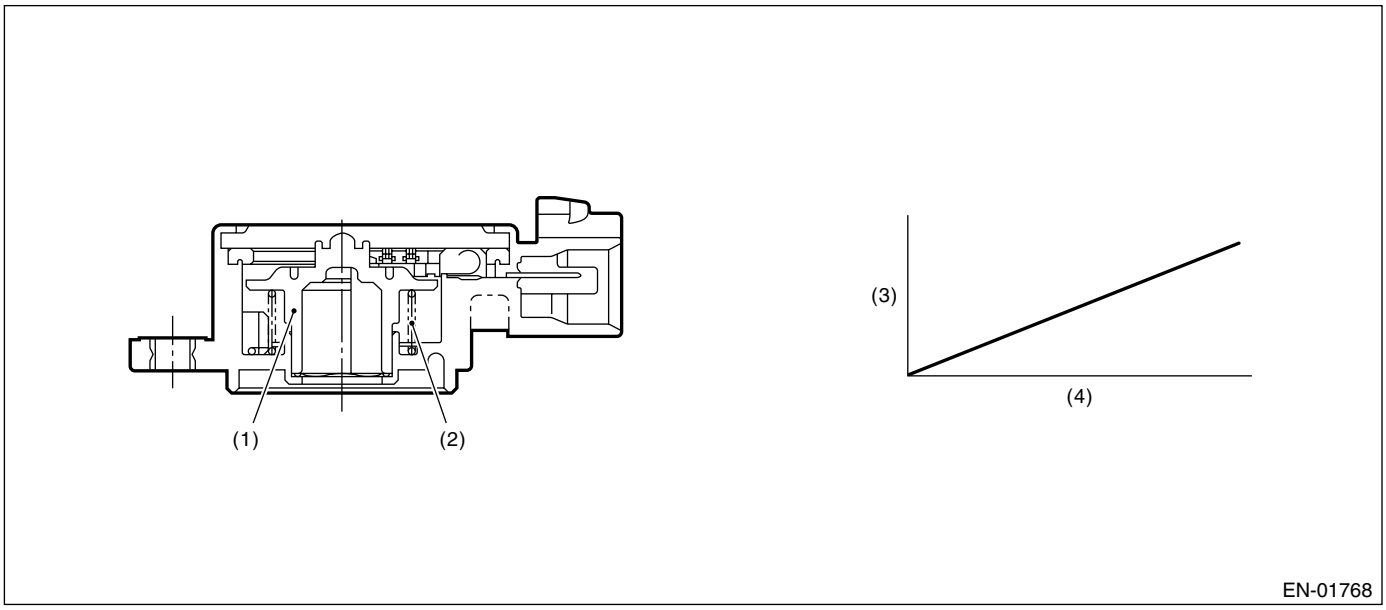
Memorize the freeze frame data. (For test mode $02)

CM:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CN:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve close driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CO:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP:DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

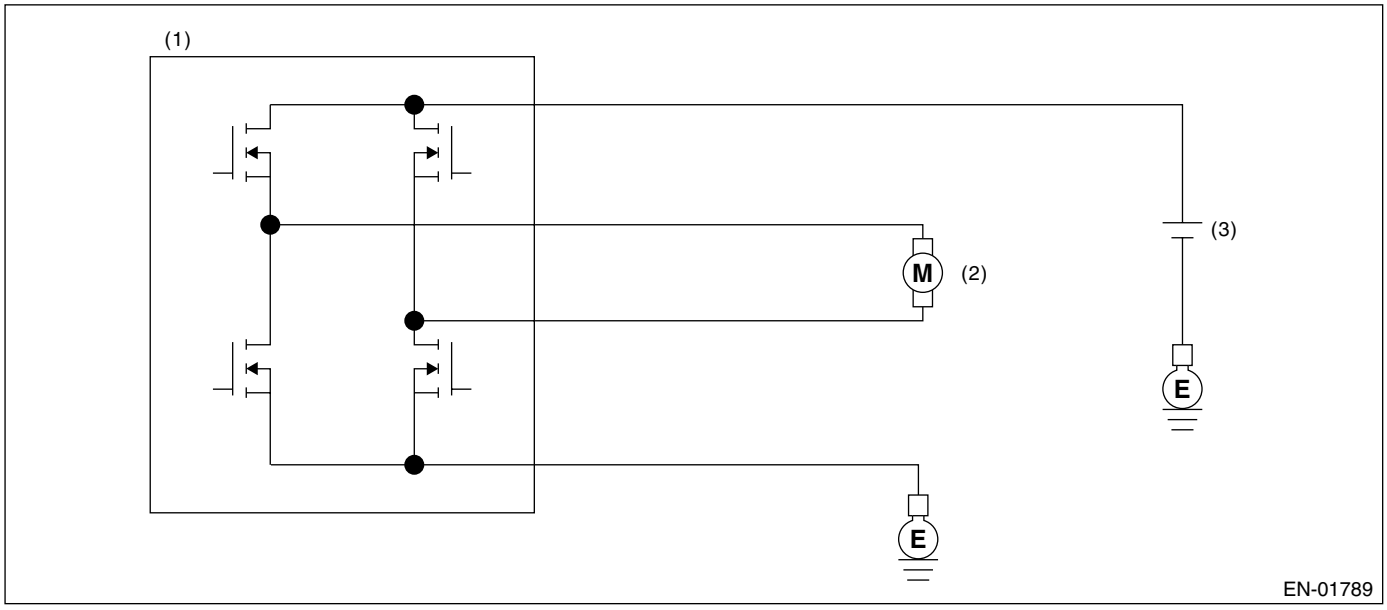
Memorize the freeze frame data. (For test mode $02)

CR:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 10 seconds in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

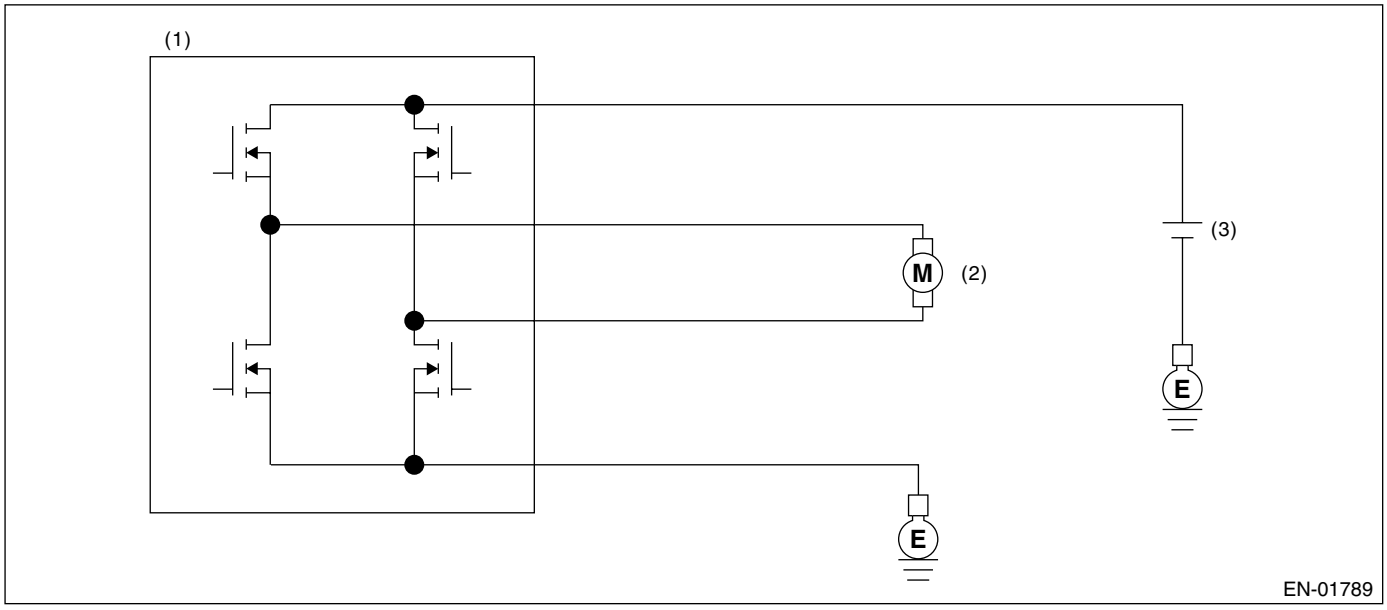
Memorize the freeze frame data. (For test mode $02)

CS:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 10 seconds in a row. Judge OK and clear the NG when the OK signal is sent.
Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

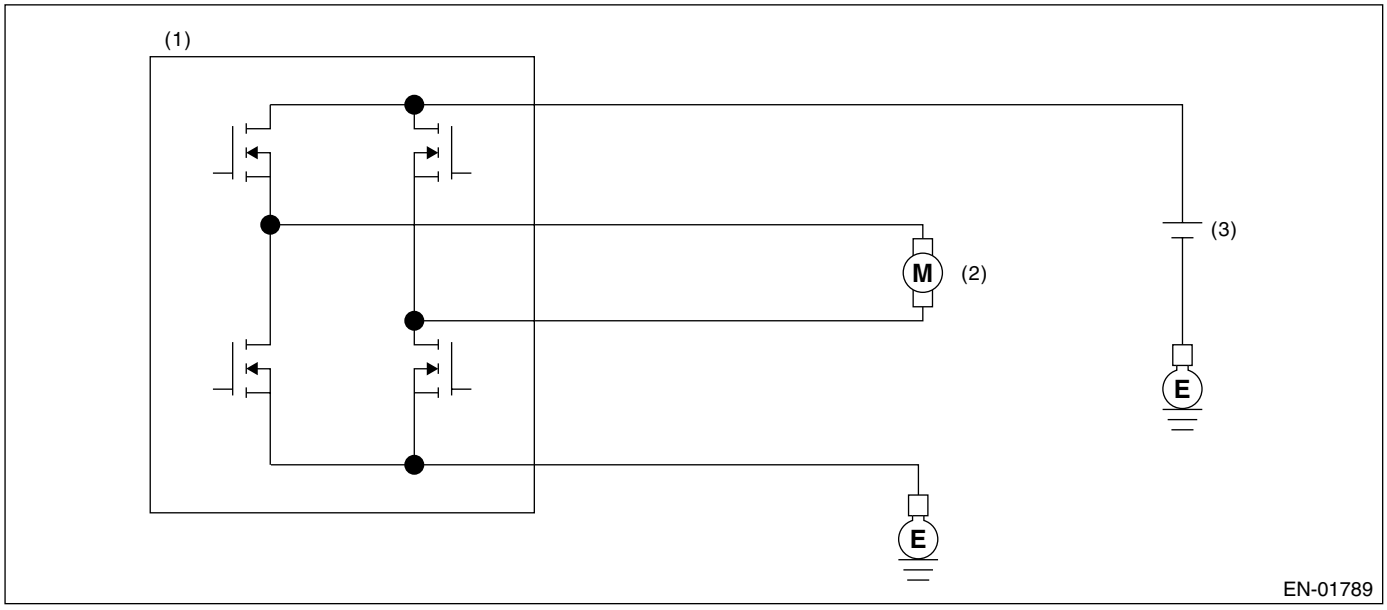
Memorize the freeze frame data. (For test mode $02)

CT:DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 10 seconds in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

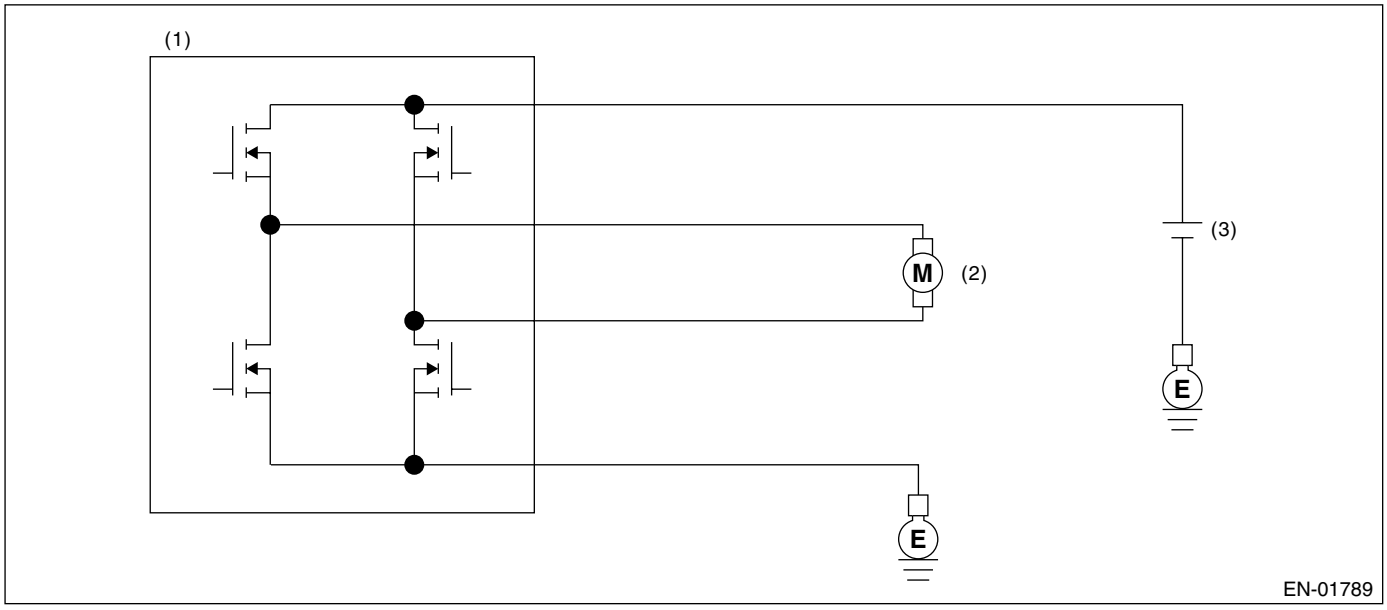
Memorize the freeze frame data. (For test mode $02)

CU:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generated valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 10 seconds in a row.
Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CV:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CW:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

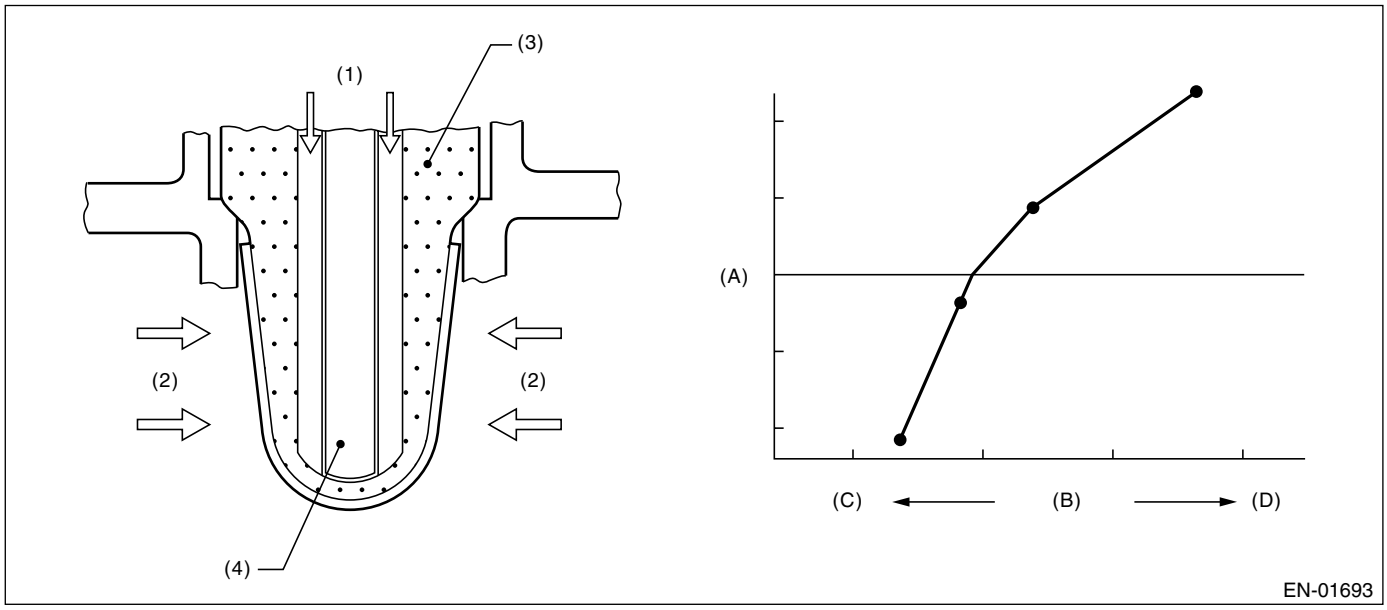
Memorize the freeze frame data. (For test mode $02)

CX:DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	In operation
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or	
rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
rear oxygen sensor sub feedback compensation coefficient	On Max.
After starting engine	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.01 g (0.0003 oz)/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

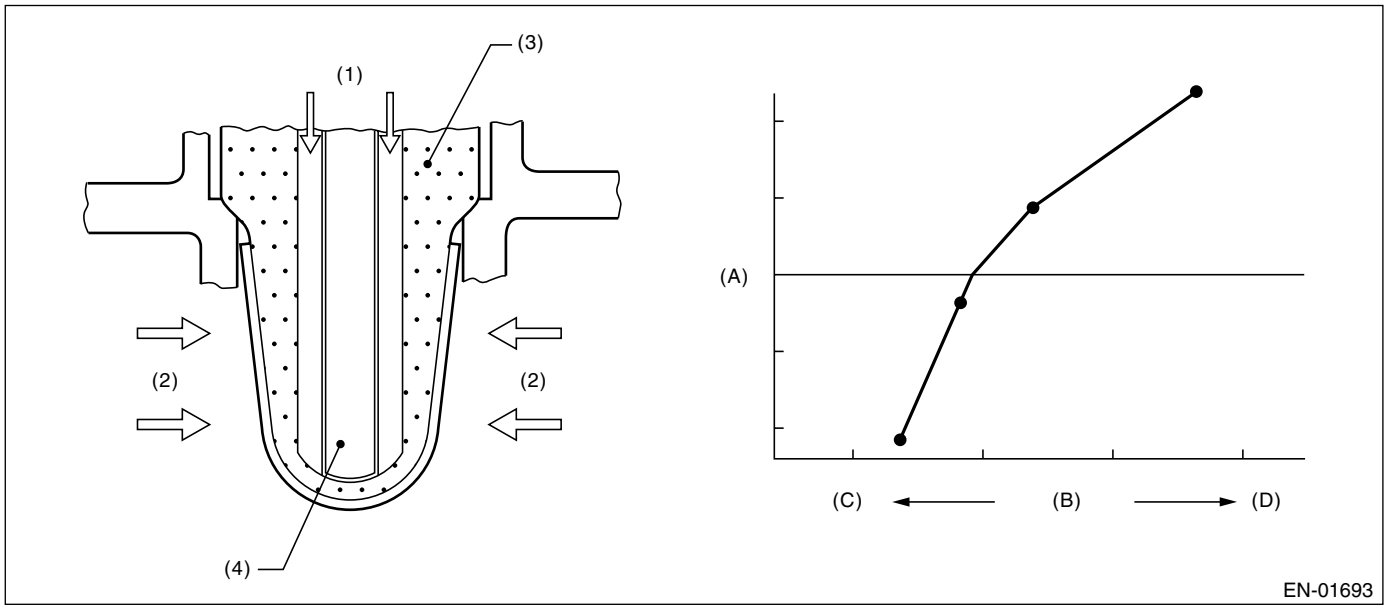
MEMO:

CY:DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	In operation
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or	
rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.01 g (0.0003 oz)/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O_2 sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

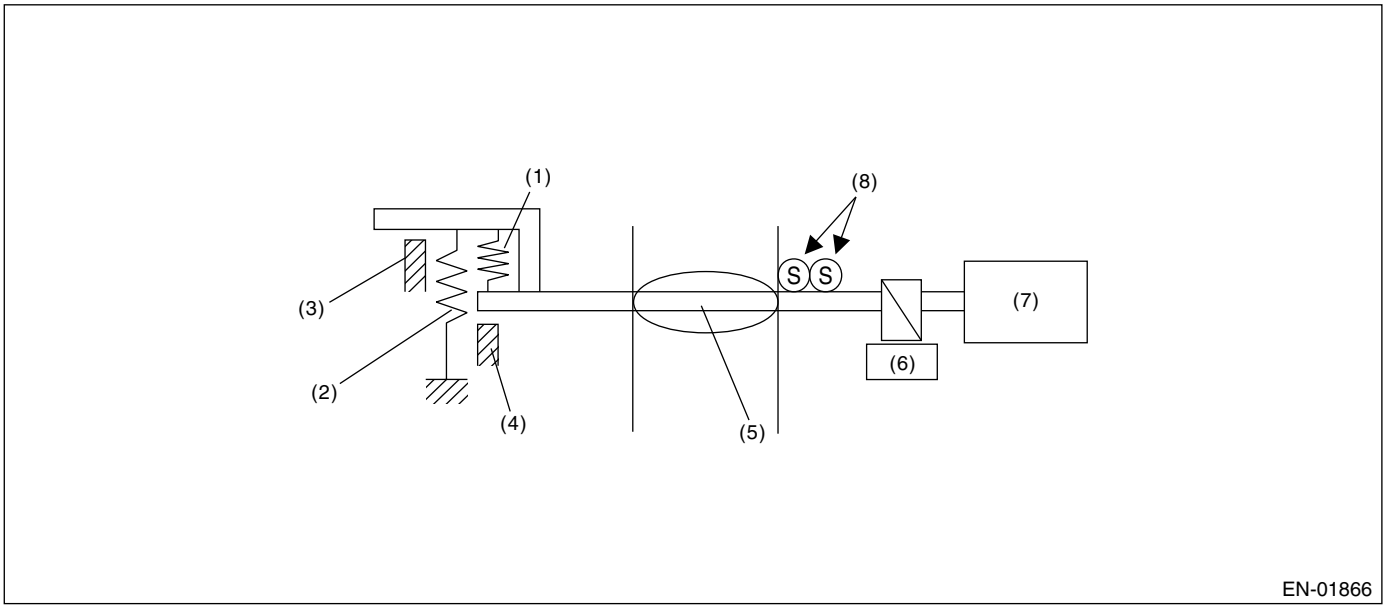
MEMO:

CZ:DTC P1160 — RETURN SPRING FAILURE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2°

Time Needed for Diagnosis: 600 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Fix the throttle opening to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DA:DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Exhaust temperature method)
Judge NG when the exhaust temperature is high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters approval continuation time	1 second or more
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg) (MT) < 14.7 kPa (110 mmHg, 4.33 inHg) (AT)
Engine speed change	< 500 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 10°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Air conditioner	No switching ON ←→ OFF
Radiator fan	No switching ON ←→ OFF
Power steering switch	No switching ON ←→ OFF
Starter	ON, OFF, or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	500 — 6700 rpm
Intake manifold pressure	> Map3 or more
Battery voltage	≥ 8 V
Engine coolant temperature	≥ 111°C (232°F)
Intake air temperature	≥ 101°C (214°F)
Heavy quality fuel judgement	Does not execute.
VDC and AT control	Is not torque controlling.

Map3

- MT

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, 13.9)	51.1 (383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.5)	38.5 (288.9, 11.4)	40.4 (302.9, 11.9)	41.1 (308.6, 12.1)	40.8 (306, 12.0)	44.8 (335.8, 13.2)	47.3 (354.5, 14.0)	49.1 (368.2, 14.5)	50.9 (381.9, 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

- AT

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.8 (186, 7.32)	23.6 (177, 6.97)	25.5 (191, 7.52)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5, 8.72)	31.3 (235, 9.25)	32.7 (245.5, 9.67)	33.3 (250, 9.84)	38.2 (286.5, 11.3)	33.6 (252.3, 9.93)	49.5 (371.5, 14.62)	51.5 (386, 15.20)

3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below continue 200 engine revs. (400 ignitions) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	> 1050°C (1922°F)

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DB:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of exhaust temperature sensor output property.
Judge NG when the exhaust temperature remains high or low whereas it seemed to vary from the viewpoint of driving condition.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting engine	240 seconds or more
Engine coolant temperature at engine start	≤ 40°C (104°F)
Engine coolant temperature	≥ 75°C (167°F)
Intake air temperature at engine start	≥ 0°C (32°F)
Estimate ambient temperature	≥ 0°C (32°F)
Engine speed	≥ 2400 rpm
Engine load	≥ 0.85 g (0.030 oz)/rev
Lambda value	0.75 ←→ 1.25

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at more than 2400 rpm of engine speed in 240 seconds and more after starting the engine in cool condition.
Pay attention to the coolant temperature at engine starting.

4. DIAGNOSTIC METHOD

Judge NG when one of the malfunction criteria below is completed, and judge OK and clear the NG when all of the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Min. exhaust temperature from engine starting	≥ 700°C (1292°F)
Max. exhaust temperature from engine starting	< 500°C (932°F)

Time Needed for Diagnosis: 0 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

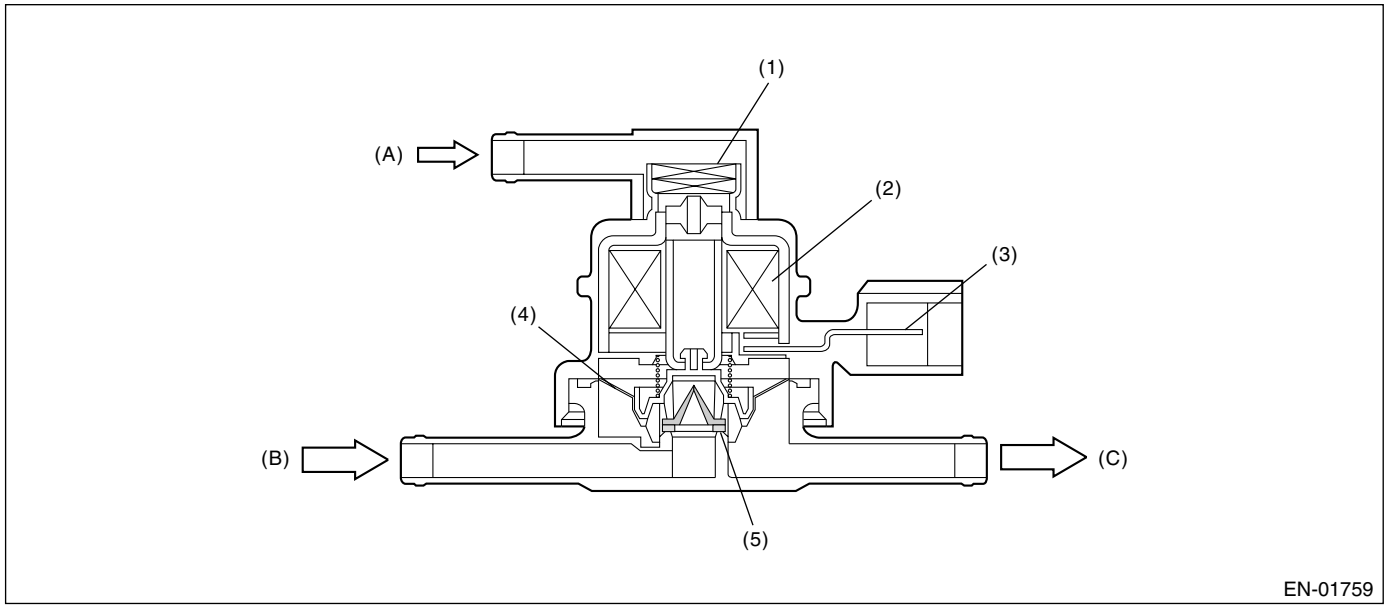
MEMO:

DC:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

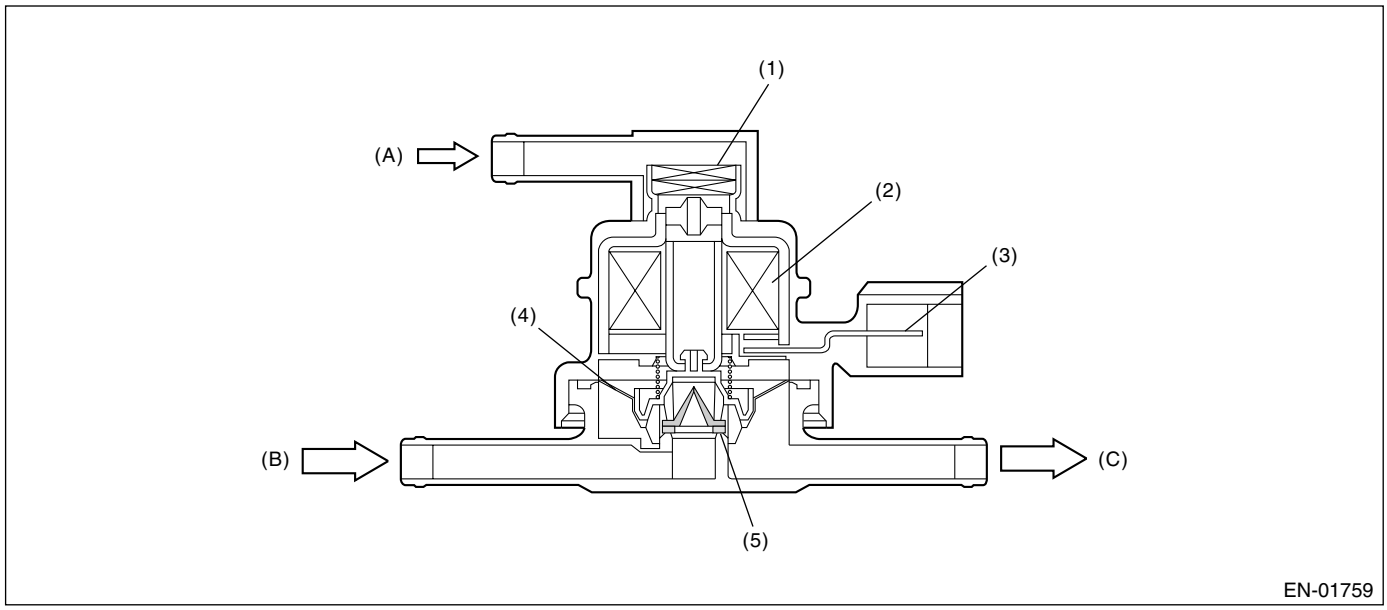
Memorize the freeze frame data. (For test mode $02)

DD:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting engine	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-128, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —.>

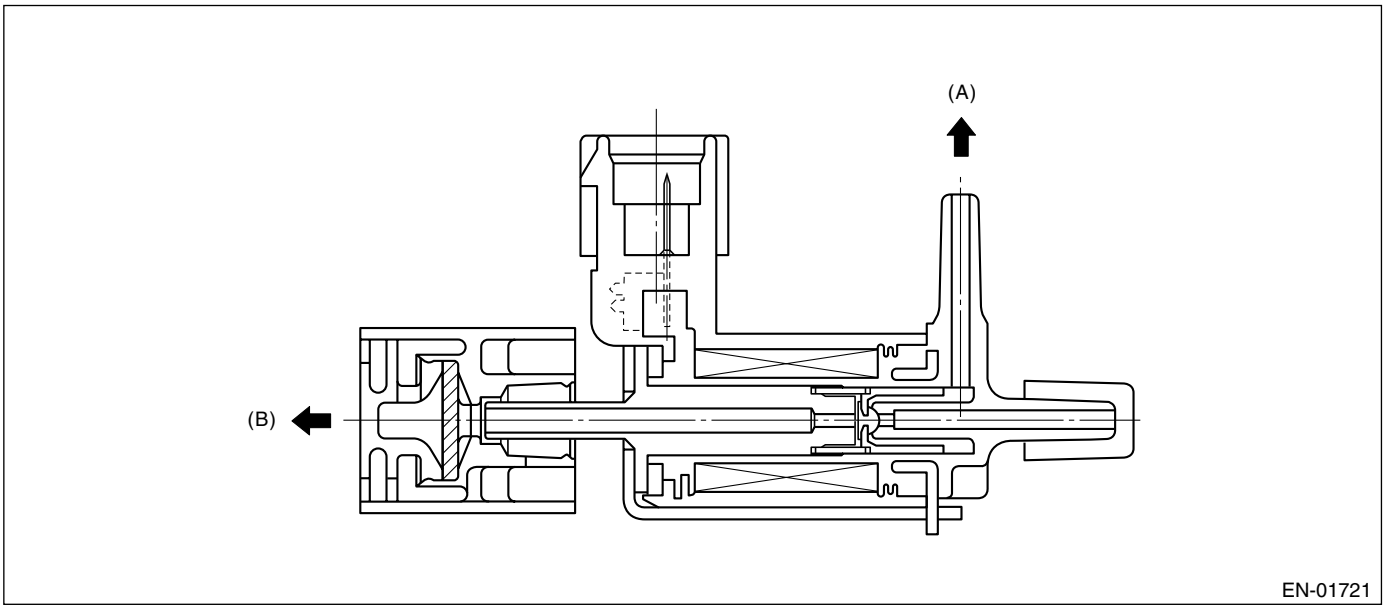
MEMO:

DF:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sent OFF signals	Low
Ignition switch	ON

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sent OFF signals	High
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

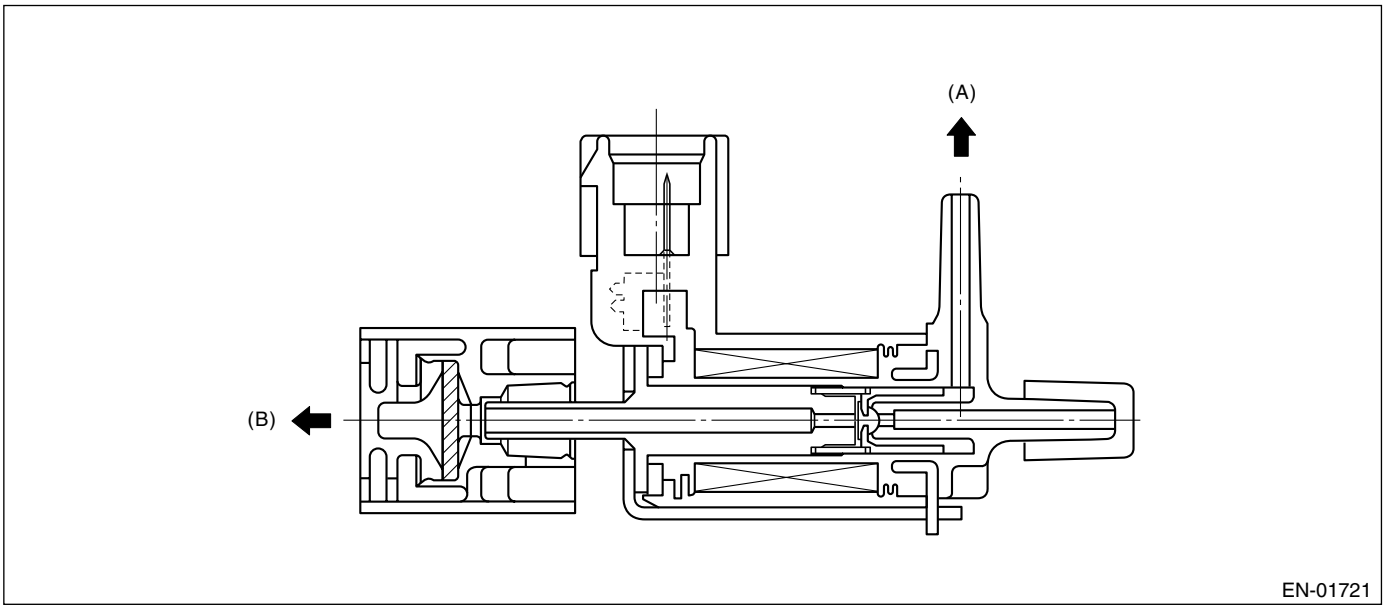
Memorize the freeze frame data. (For test mode $02)

DG:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sent ON signals	High
Ignition switch	ON

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After starting engine	1 second or more
Terminal output voltage when ECM sent OFF signals	Low
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

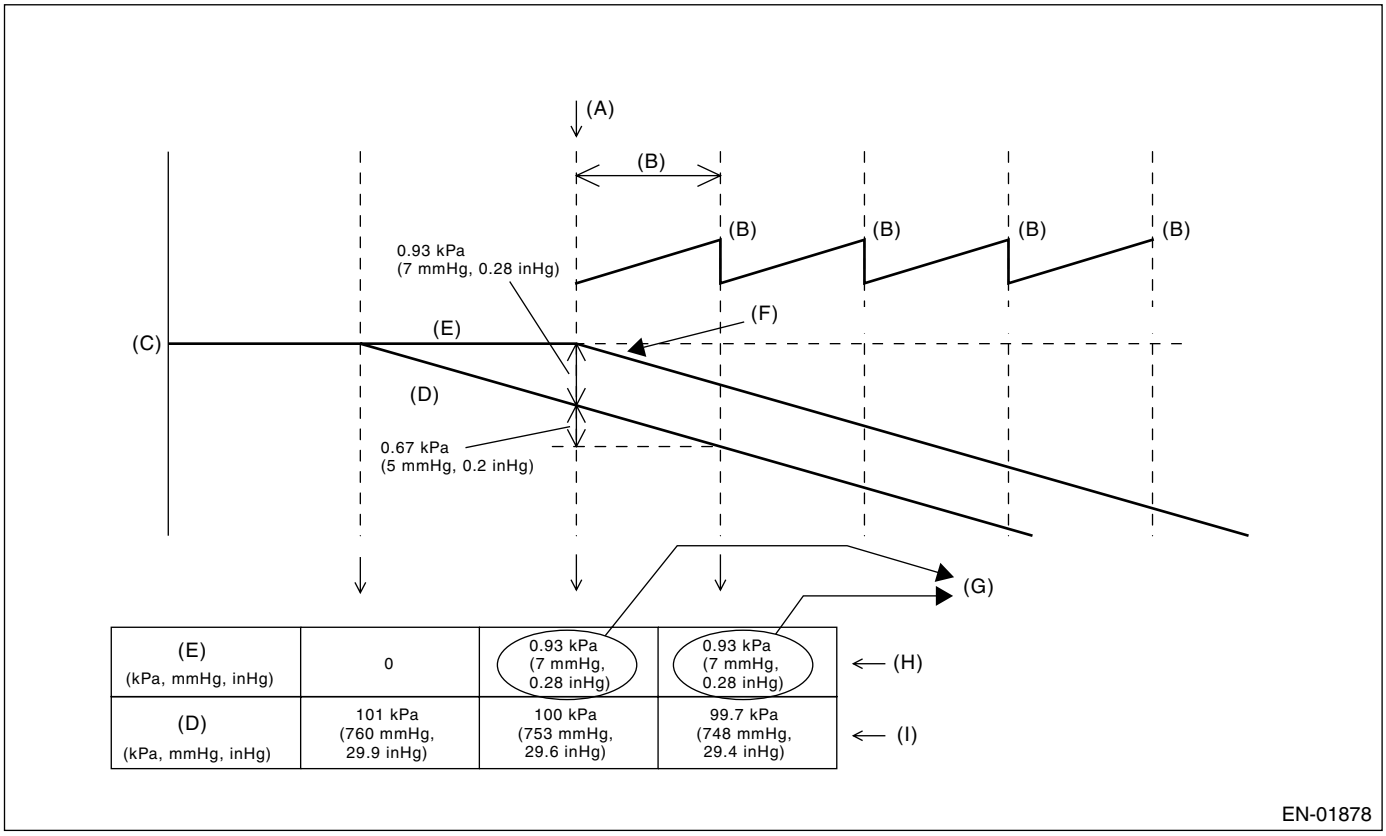
DH:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

• Normality Judgment

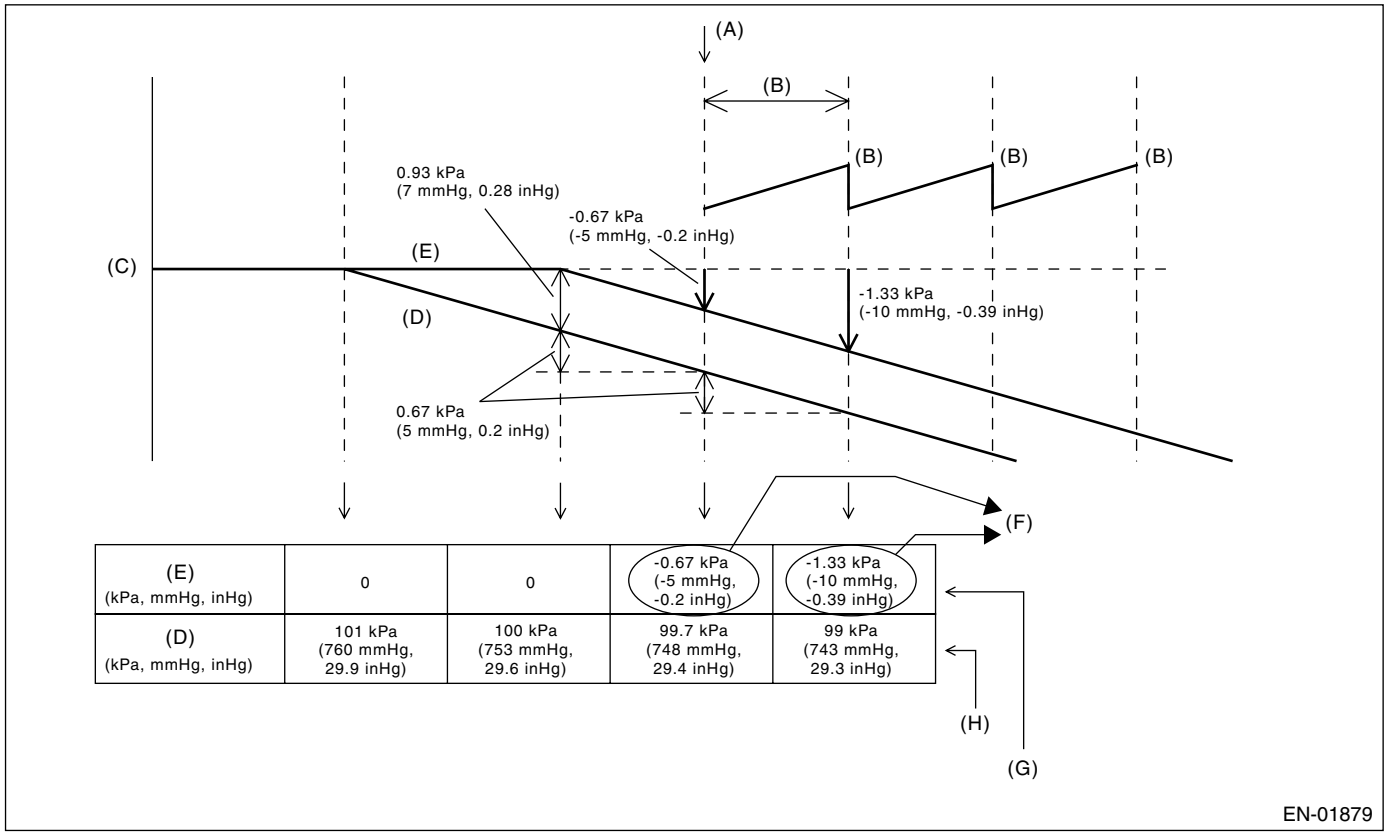
Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.



(A) Enable conditions are completed.
(B) 80S
(C) Pressure
(D) Atmospheric pressure
(E) Tank pressure
(F) PCV function reduces the tank pressure
(G) Judge OK when the tank pressure does not change.
(H) The tank pressure is relative pressure against atmospheric pressure
(I) Change of atmospheric pressure

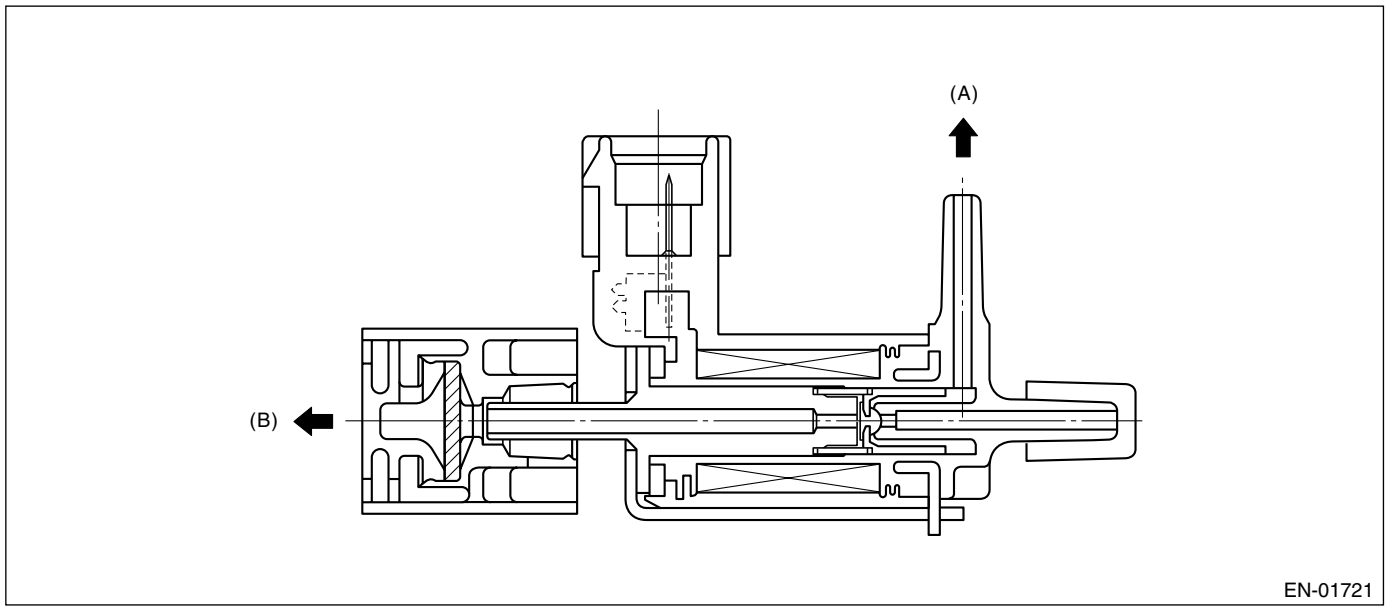
• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



(A) Enable conditions are completed.
(B) 80S
(C) Pressure
(D) Atmospheric pressure
(E) Tank pressure
(F) Judge NG temporarily the tank pressure changes once, and then judge NG the tank pressure changes five consecutive times
(G) The tank pressure is relative pressure against atmospheric pressure. Ordinary, part of pressure comparison is atmospheric pressure. 101 kPa (760 mmHg, 29.9 inHg).
(H) Atmospheric pressure is absolute pressure.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor (B) Ambient air

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.3 US gal, 1.98 ←→ 11.2 Imp gal)
Evaporation system diagnosis	Not in operation
After starting engine	80 seconds or more
Fuel tank pressure	< –0.67 kPa (–5 mmHg, –0.2 inHg) or > –0.93 kPa (7 mmHg, 0.28 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	< 3 ℓ (3.2 US gal, 2.6 Imp gal)

Time Needed for Diagnosis: 80 seconds × 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	< 0.67 kPa (4.5 mmHg, 0.2 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

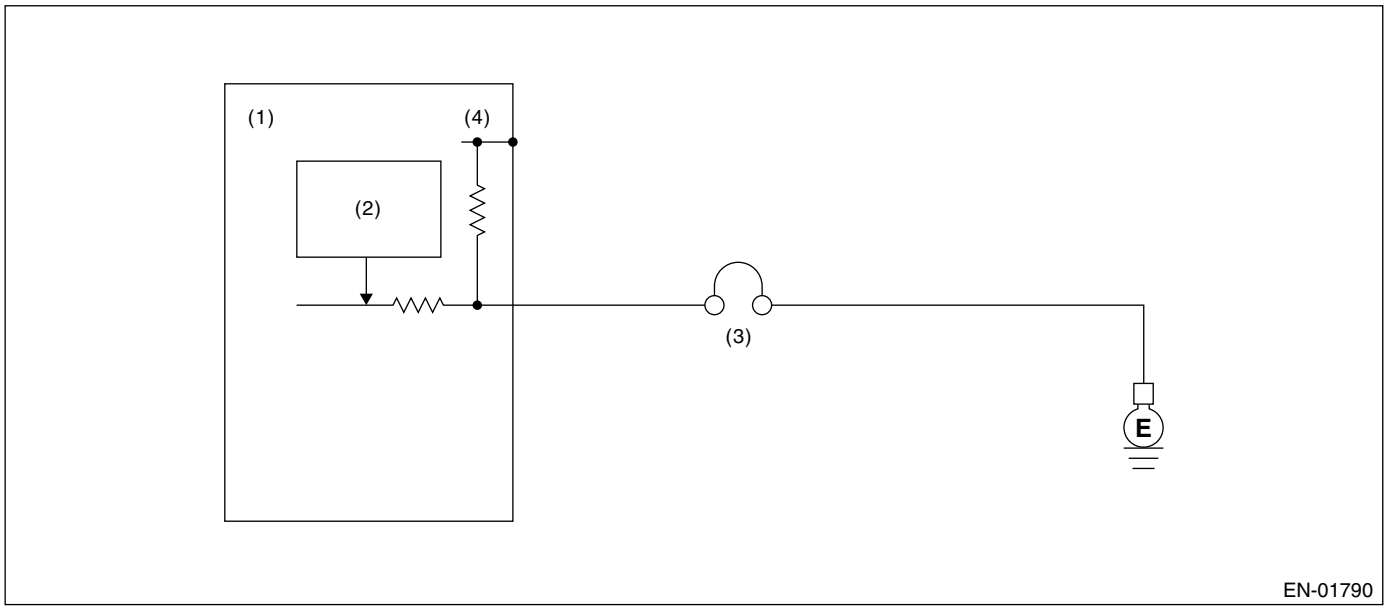
Memorize the freeze frame data. (For test mode $02)

DI: DTC P1491 — POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) PCV diagnosis connector
(4) 5 V

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSIS METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DJ:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
It took more than 0.8 seconds at engine starting, and then it turned after engine starting.	
Starter ON signal	Not detected
Engine speed after the engine speed of 500 rpm or less has continued for 0.8 seconds or more	≥ 500 rpm
Battery voltage	> 8 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosis
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DK:DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of high exhaust gas temperature.
Judge NG when the exhaust gas becomes too high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel cut event	Not in operation
After fuel cut	≥ 1 milliseconds
Exhaust temperature	≥ 1050°C (1922°F)

Time Needed for Diagnosis: 8.2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	< 550°C (1022°F)

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DL:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	< Battery voltage × 0.7
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	≥ Battery voltage × 0.7
Battery voltage	≥ 10.9 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DM:DTC P2088 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	≥ 99.61%
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	≥ 0.14%
| Target current value of OCV – Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

DN:DTC P2089 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	< 0.39%
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
| Target current value of OCV – Control current value of OCV |	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DO:DTC P2092 — OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	≥ 99.61%
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	≥ 0.14%
| Target current value of OCV – Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DP:DTC P2093 — OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	< 0.39%
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
| Target current value of OCV – Control current value of OCV |	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

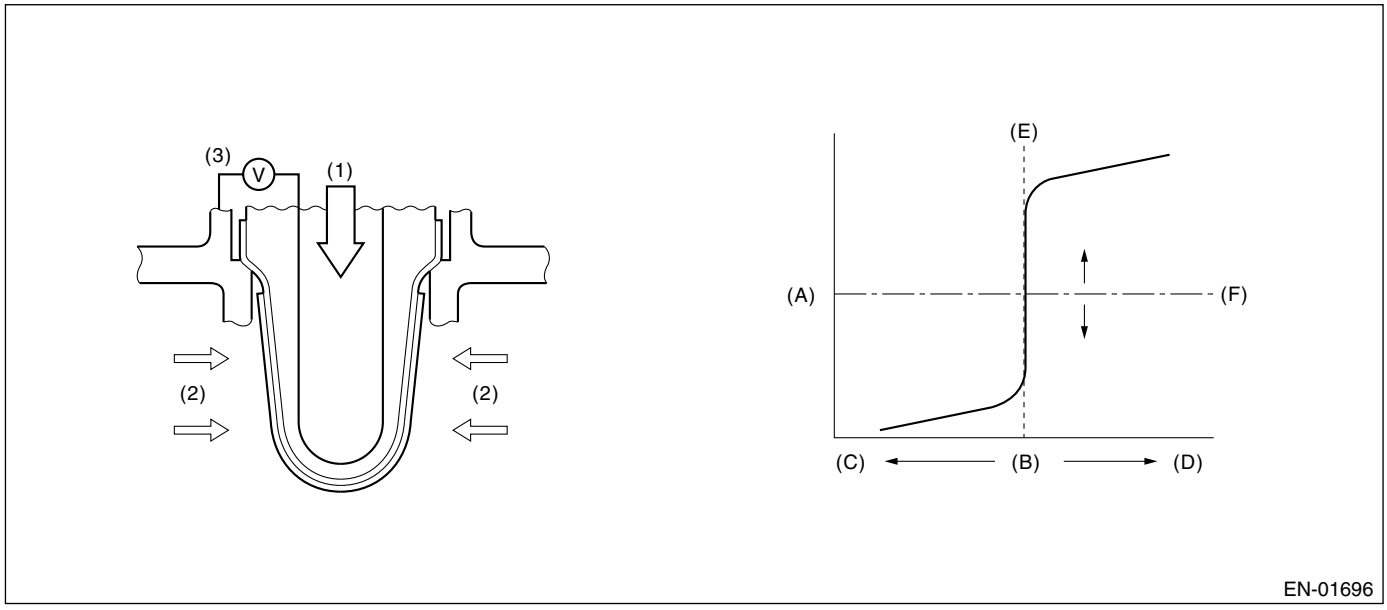
Memorize the freeze frame data. (For test mode $02)

DQ:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to lean sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 15 g (0.53 oz)/sec
Sub feedback	Sticks to the limit value (lean side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

• Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 – rsl) rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	< –2500 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

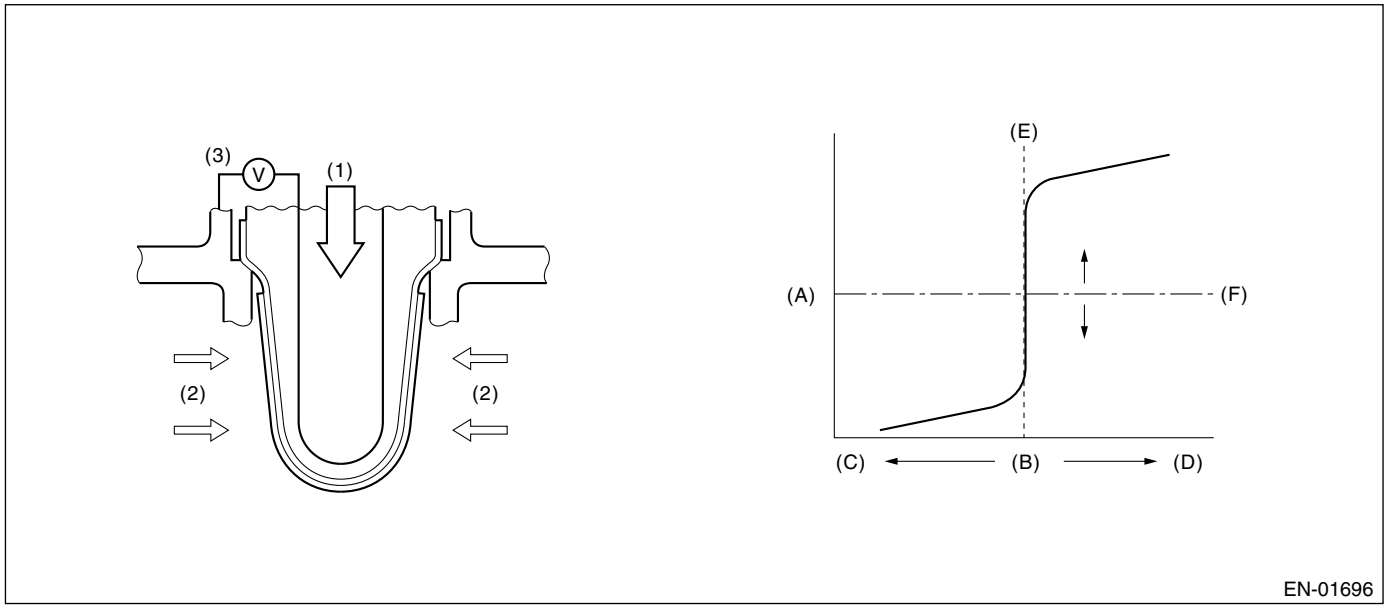
Memorize the freeze frame data. (For test mode $02)

DR:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to rich sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 15 g (0.53 oz)/sec
Sub feedback	Sticks to the limit value (rich side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

• Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 – rsl) rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> 1500 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

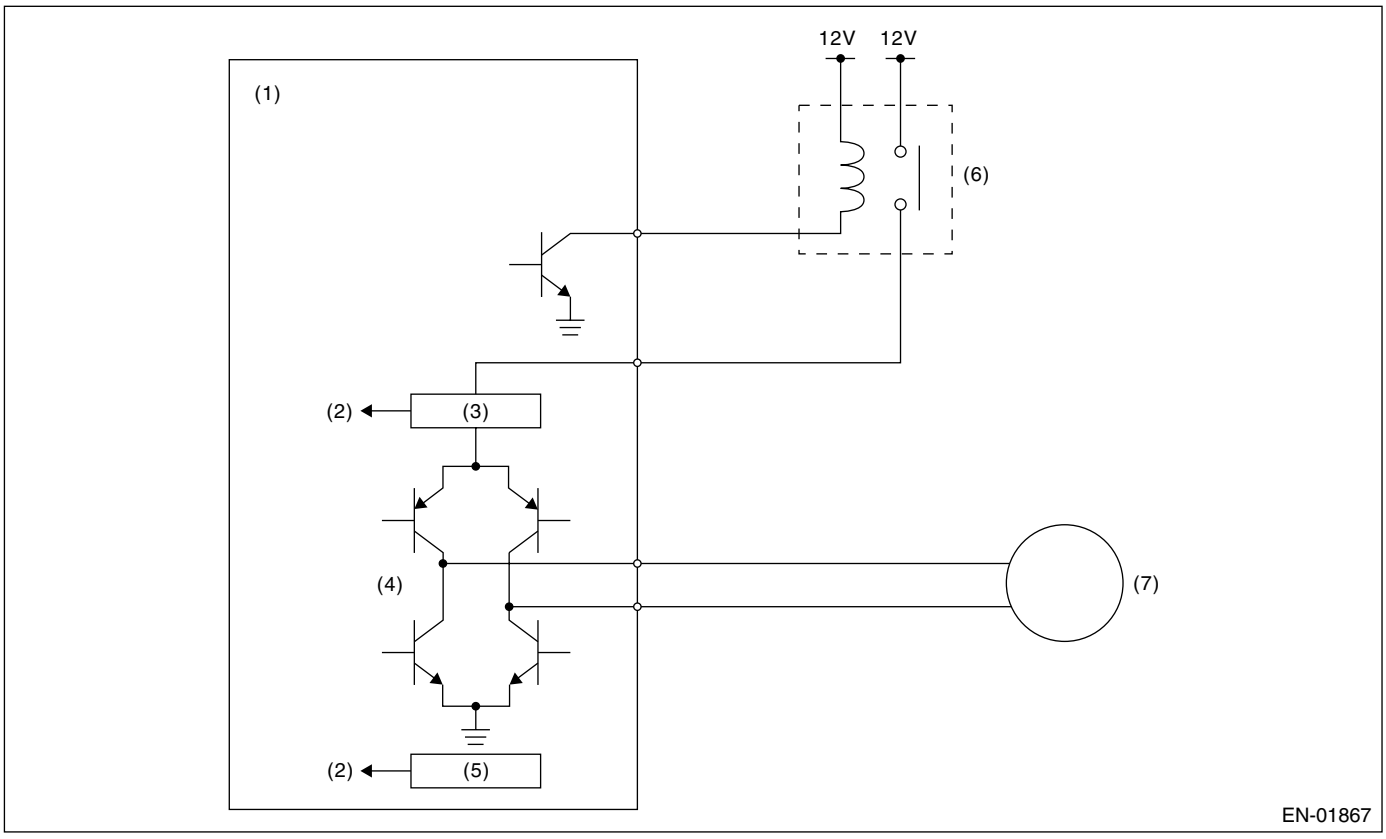
Memorize the freeze frame data. (For test mode $02)

DS:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control unit (ECM)
(2) Detection circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic control throttle relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2000 milliseconds (OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

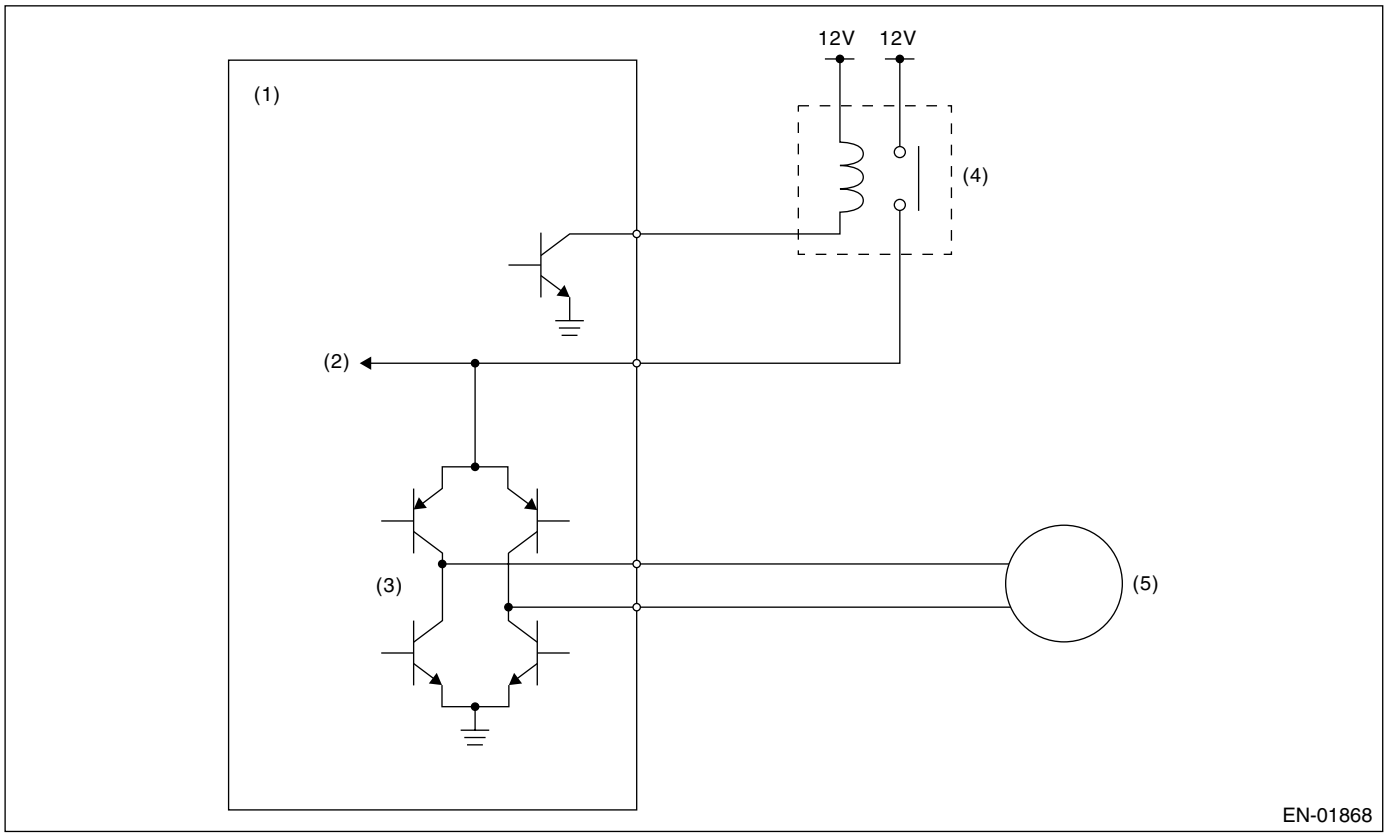
Memorize the freeze frame data. (For test mode $02)

DT:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic control throttle relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis:
- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

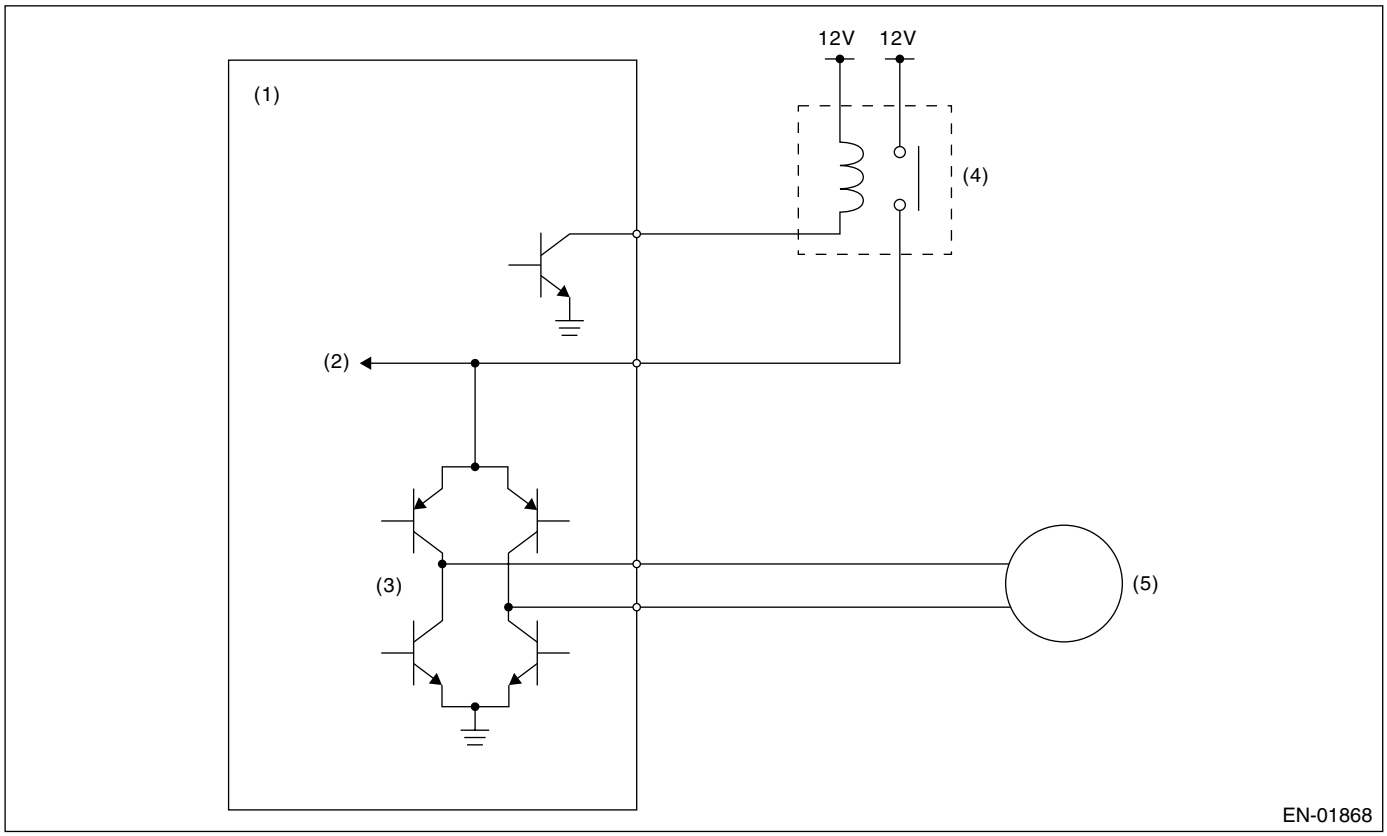
Memorize the freeze frame data. (For test mode $02)

DU:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Judge NG when the power for electronic throttle control system is not supplied even when ECM sets the electric throttle control relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

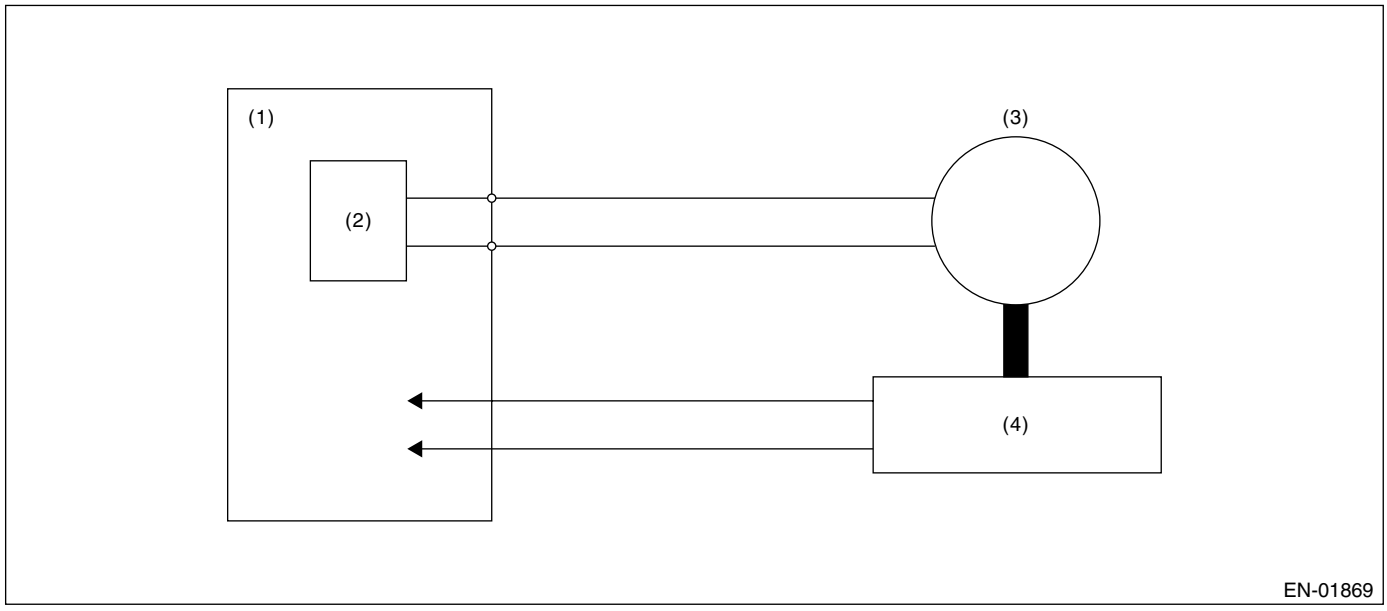
Memorize the freeze frame data. (For test mode $02)

DV:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor voltage at all close point learning	0.41 — 0.79 V
Time for all close point learning completion	Within 80 milliseconds

Time Needed for Diagnosis: None
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

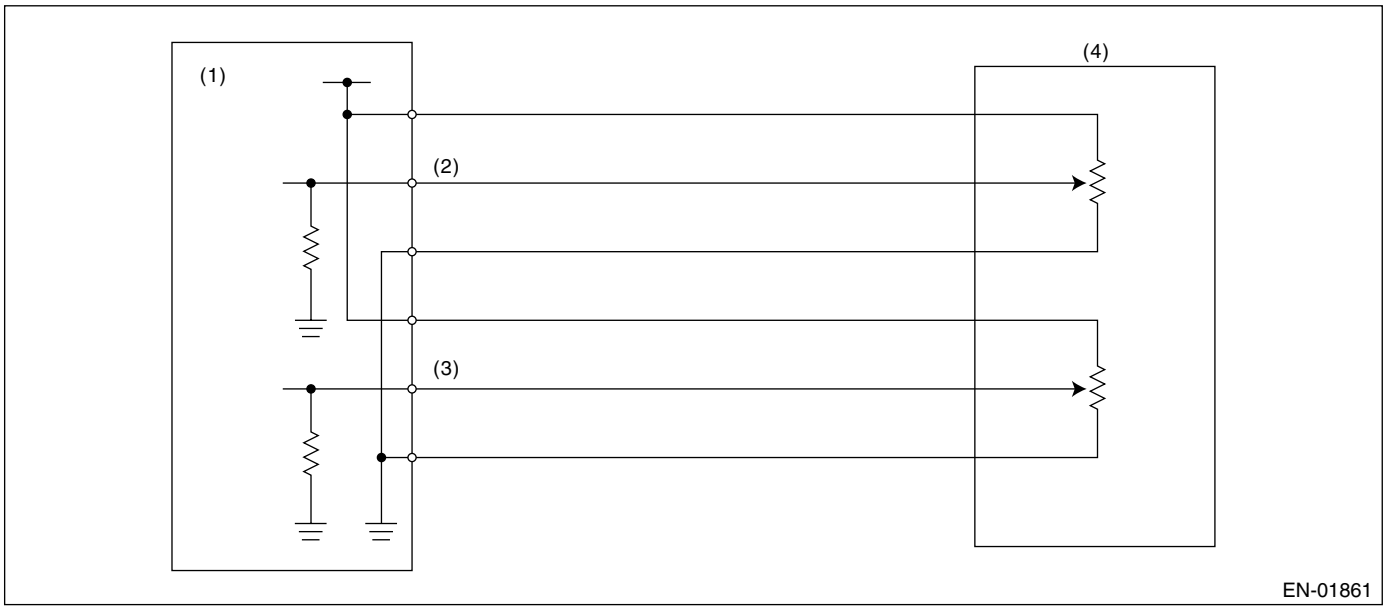
Memorize the freeze frame data. (For test mode $02)

DW:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

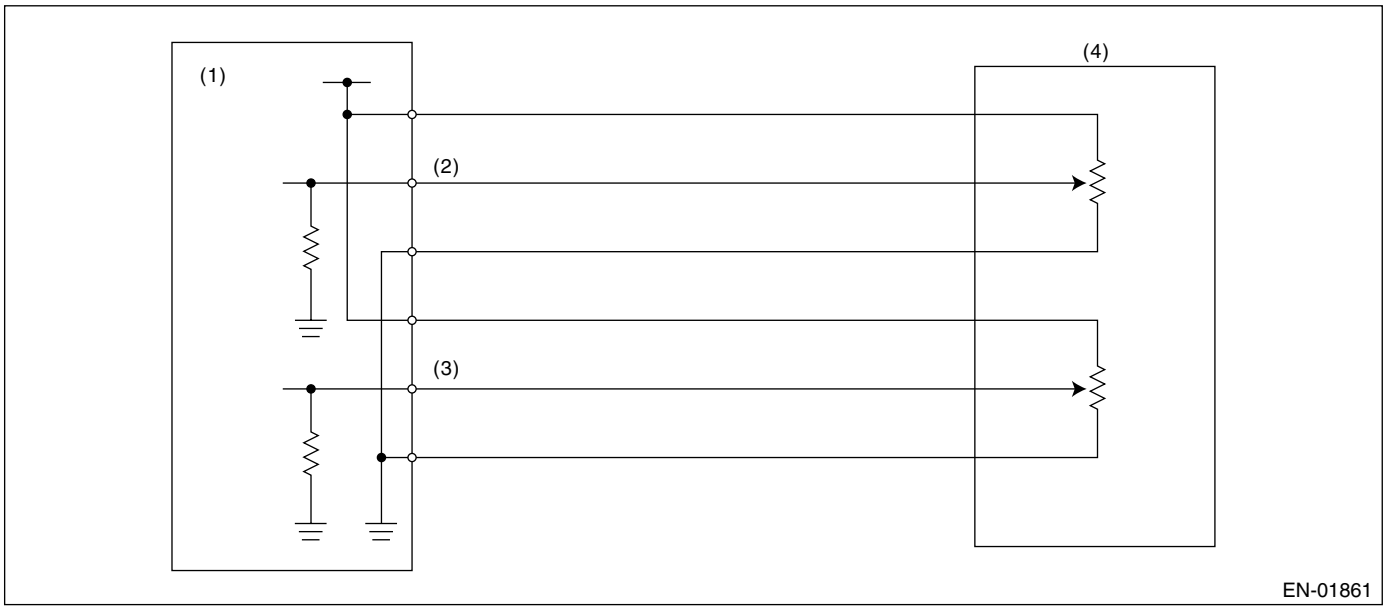
Memorize the freeze frame data. (For test mode $02)

DX:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.856 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

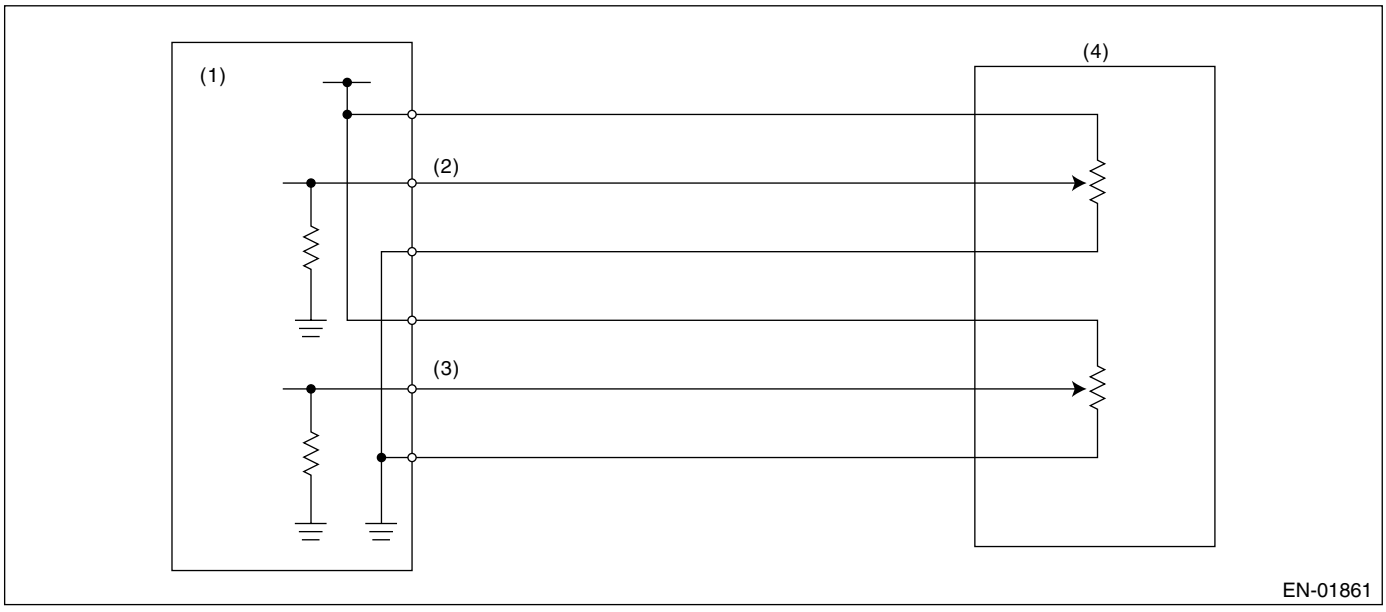
Memorize the freeze frame data. (For test mode $02)

DY:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

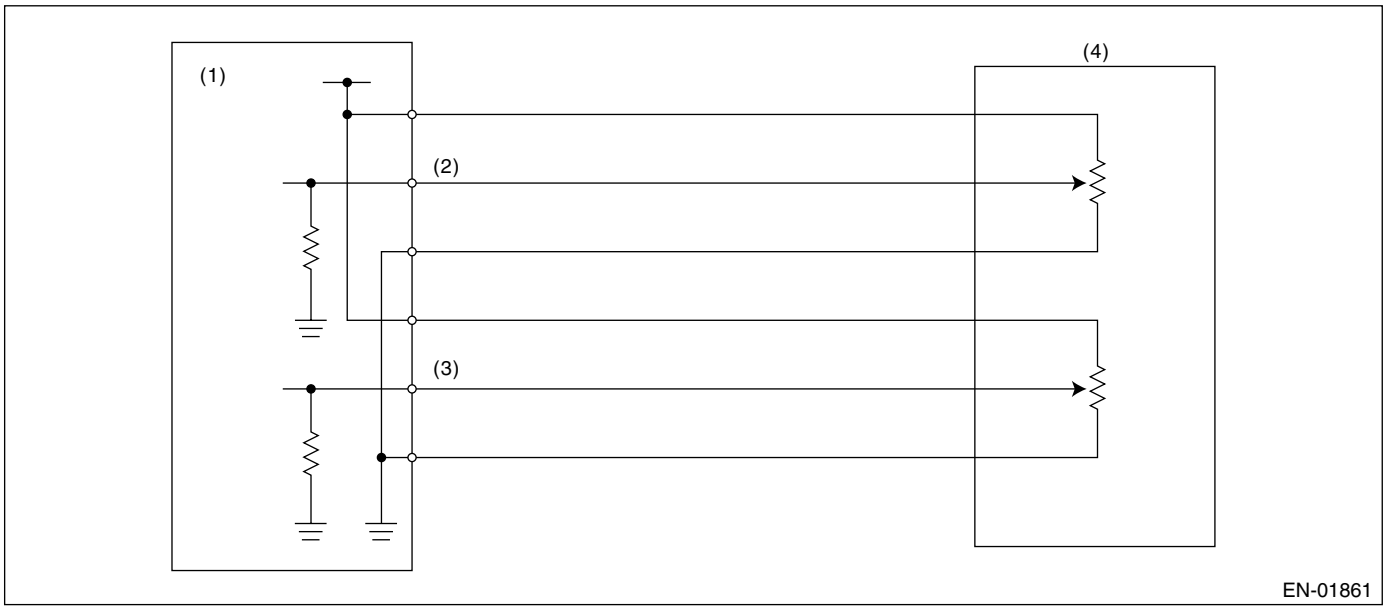
Memorize the freeze frame data. (For test mode $02)

DZ:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

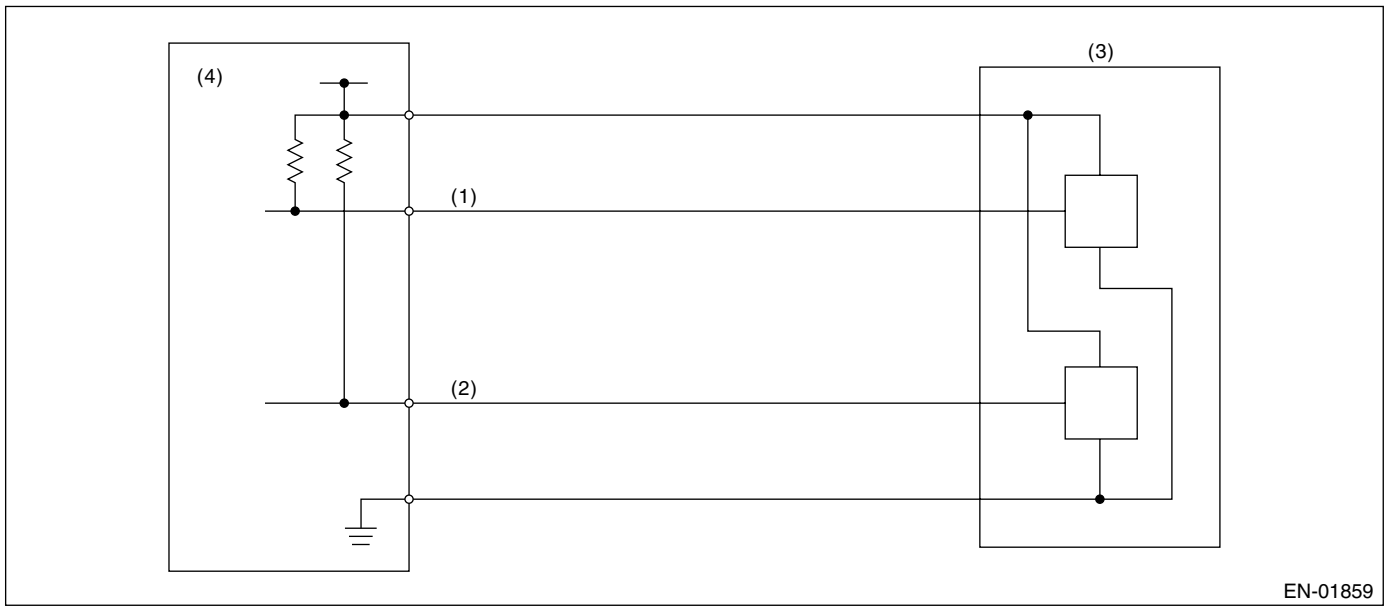
Memorize the freeze frame data. (For test mode $02)

EA:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal.
(2) Throttle position sensor 2 signal.
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

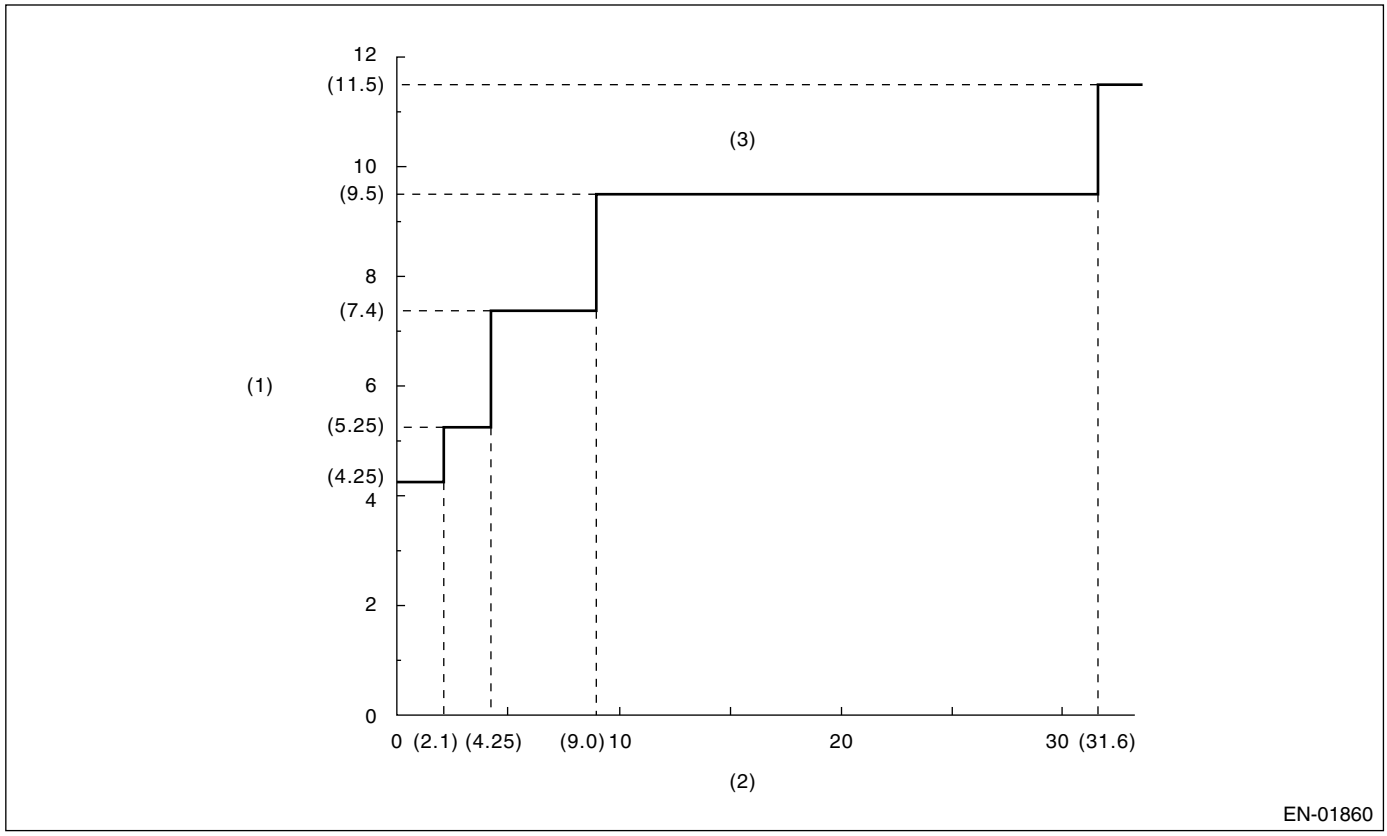
5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

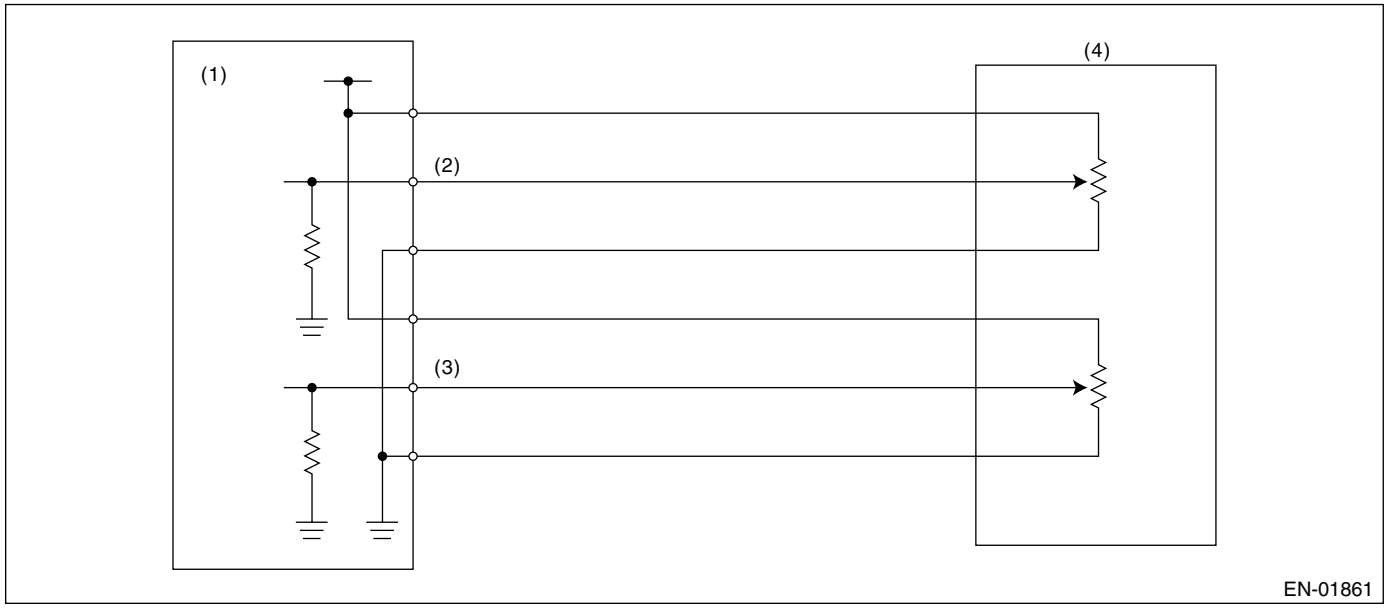
Memorize the freeze frame data. (For test mode $02)

EB:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

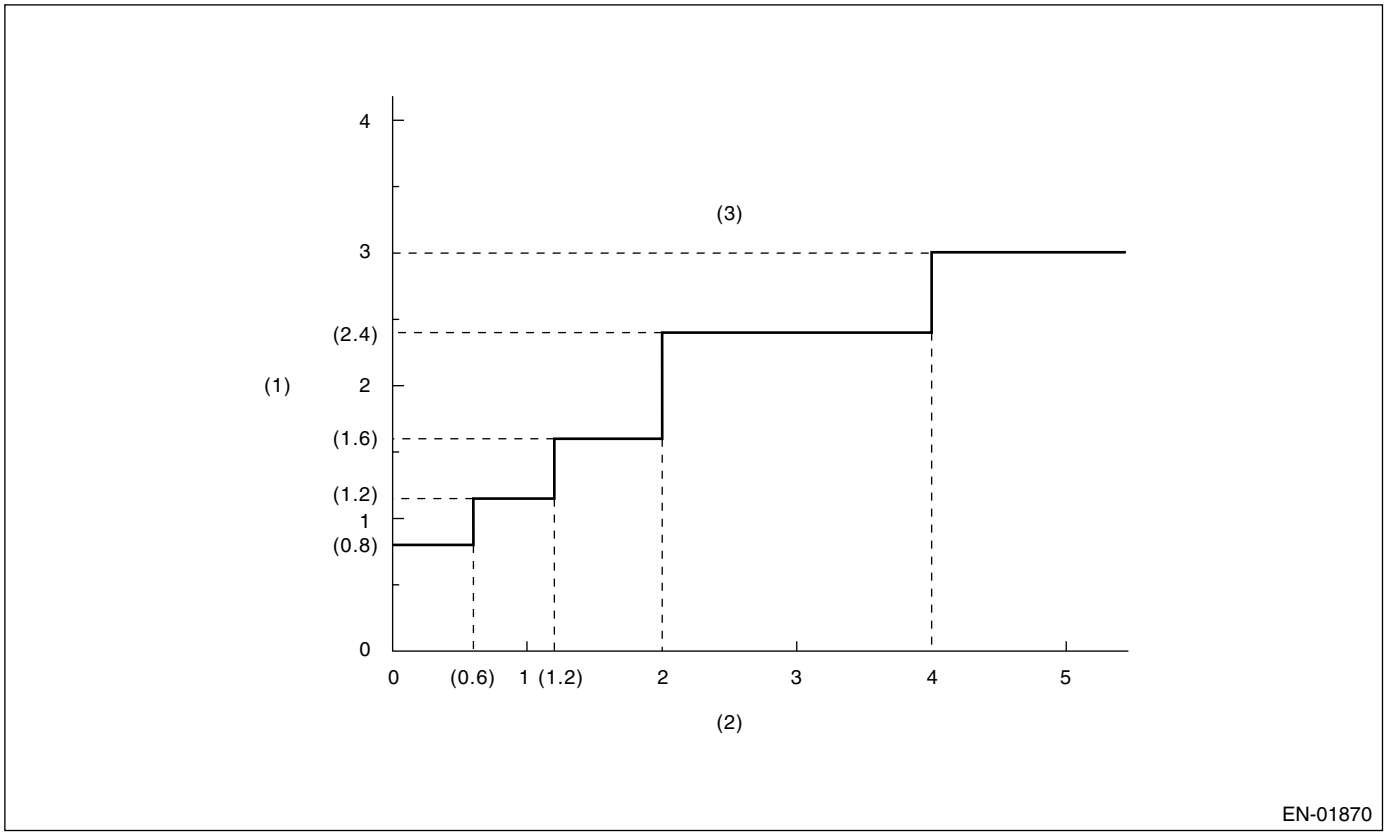
5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 0.8°

Details of Judgment Value



(1) Sensor output difference (°)
(2) Accelerator pedal position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

FUEL INJECTION (FUEL SYSTEMS)

FU(H6DO)

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1. General Description

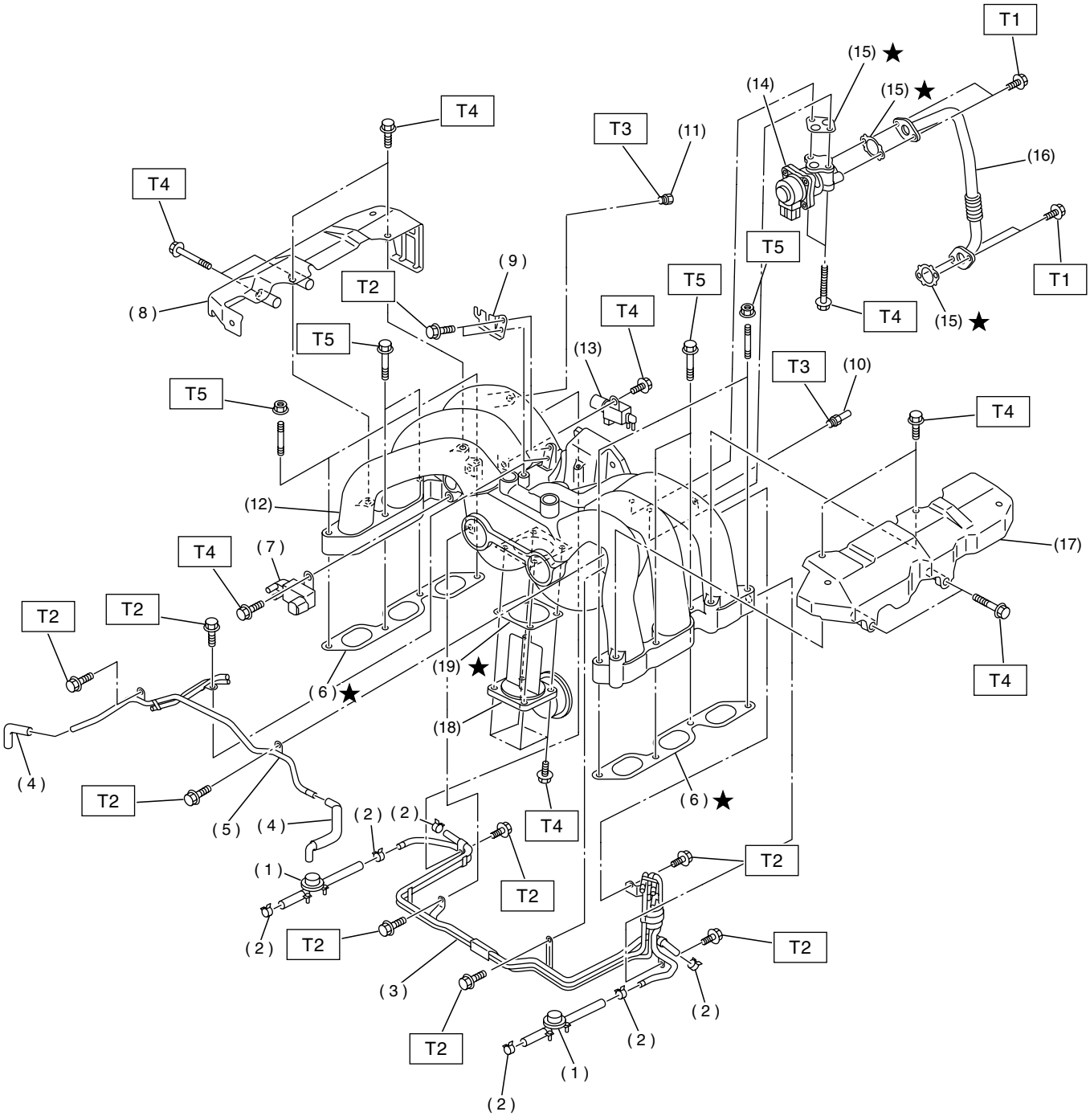
A: SPECIFICATIONS

Model		
Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm^2, 53.6 — 98 psi)
	Discharge flow	More than 85 ℓ (22.5 US gal, 18.7 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

MEMO:

B: COMPONENT

1. INTAKE MANIFOLD

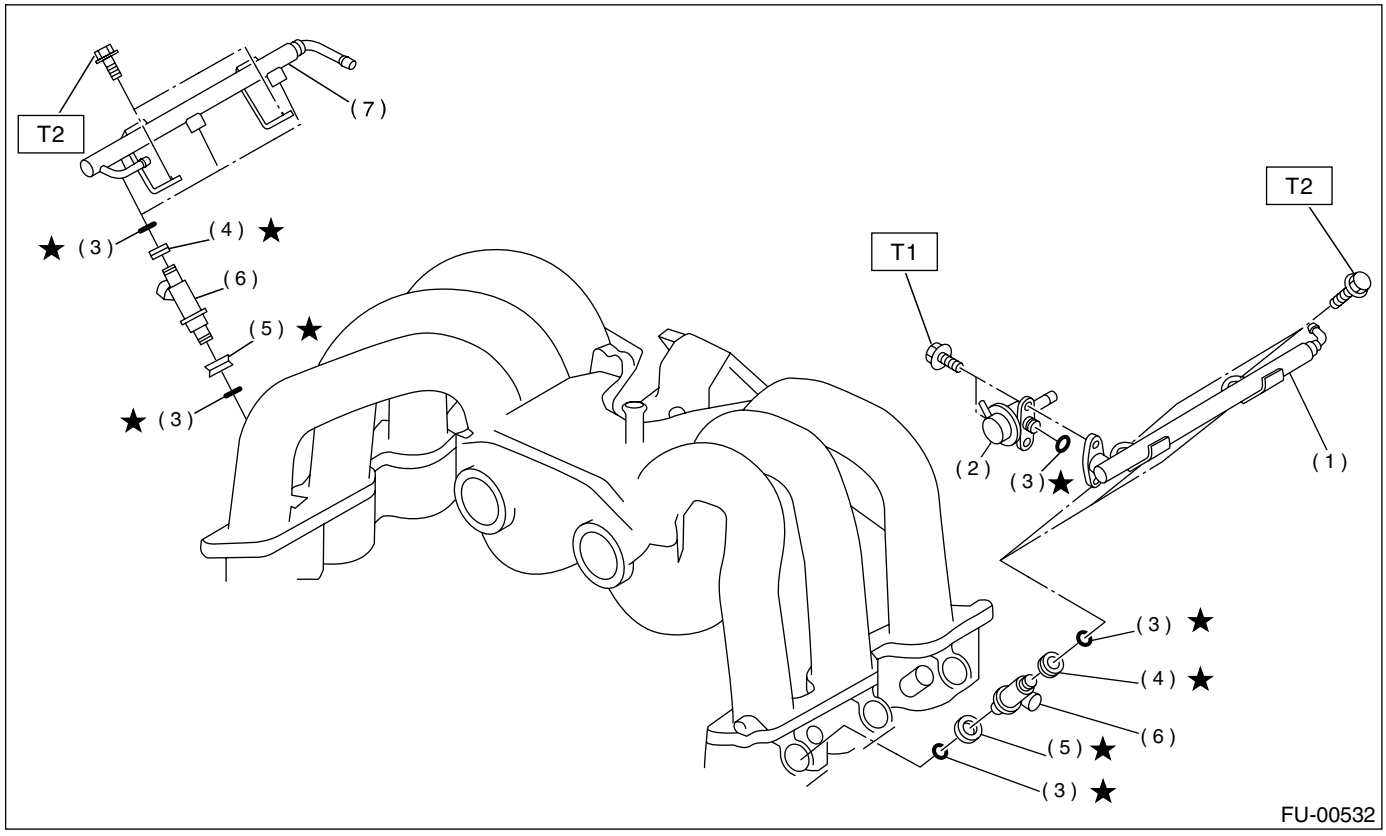


FU-02030

(1) Fuel damper valve
(2) Clamp
(3) Fuel pipe ASSY
(4) Air assist hose
(5) Air assist and purge pipe ASSY
(6) Gasket
(7) Purge control solenoid valve
(8) Fuel pipe protector RH
(9) Accelerator cable bracket
(10) Nipple
(11) Plug
(12) Intake manifold
(13) Induction valve control solenoid
(14) EGR valve
(15) Gasket
(16) EGR pipe
(17) Fuel pipe protector LH
(18) Induction valve
(19) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 5.0 (0.51, 3.7)
T3: 17 (1.7, 12)
T4: 19 (1.9, 14)
T5: 25 (2.5, 18)

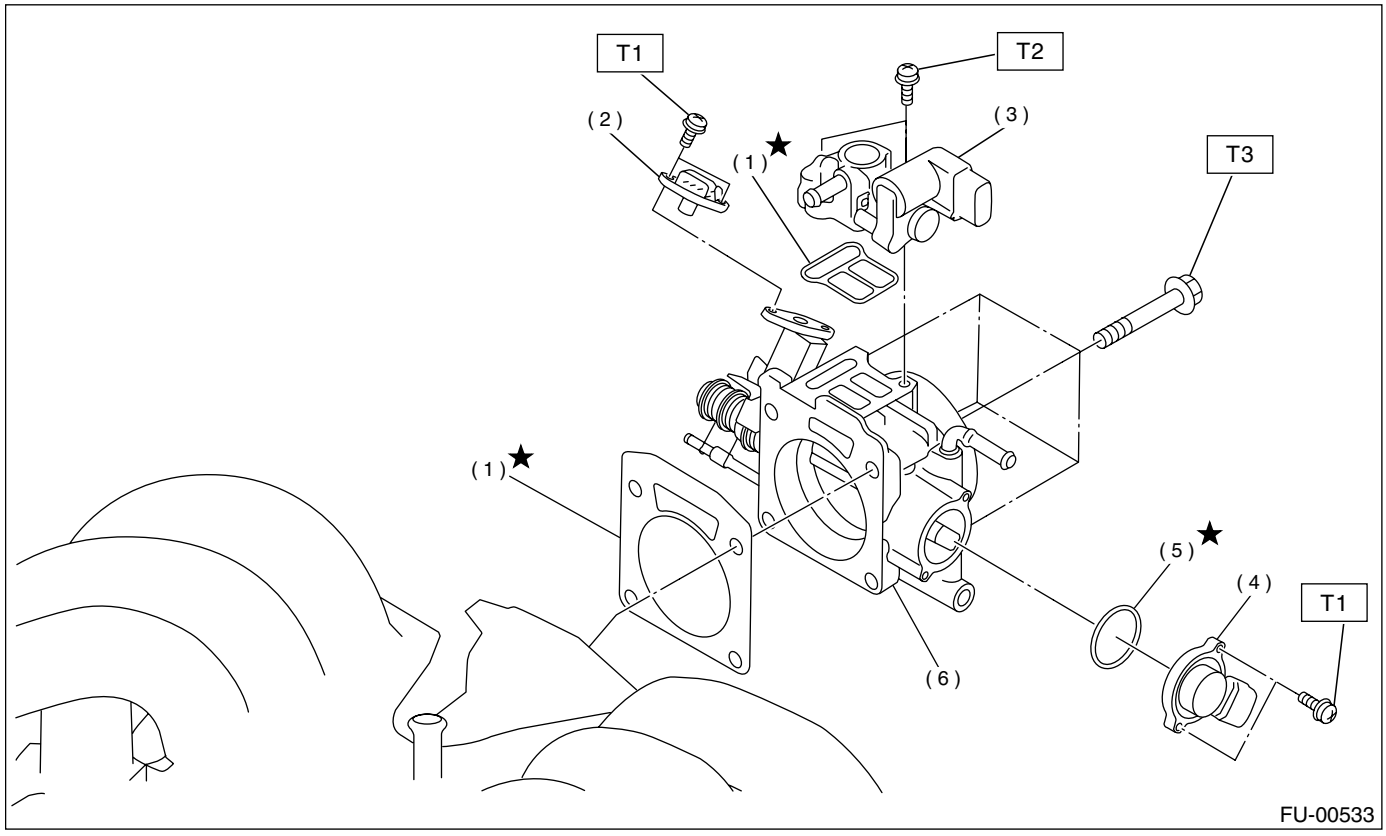
2. FUEL INJECTOR



(1) Fuel injector pipe LH
(2) Pressure regulator
(3) O-ring
(4) Injection rubber
(5) Insulator
(6) Fuel injector
(7) Fuel injector pipe RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 19 (1.9, 14)

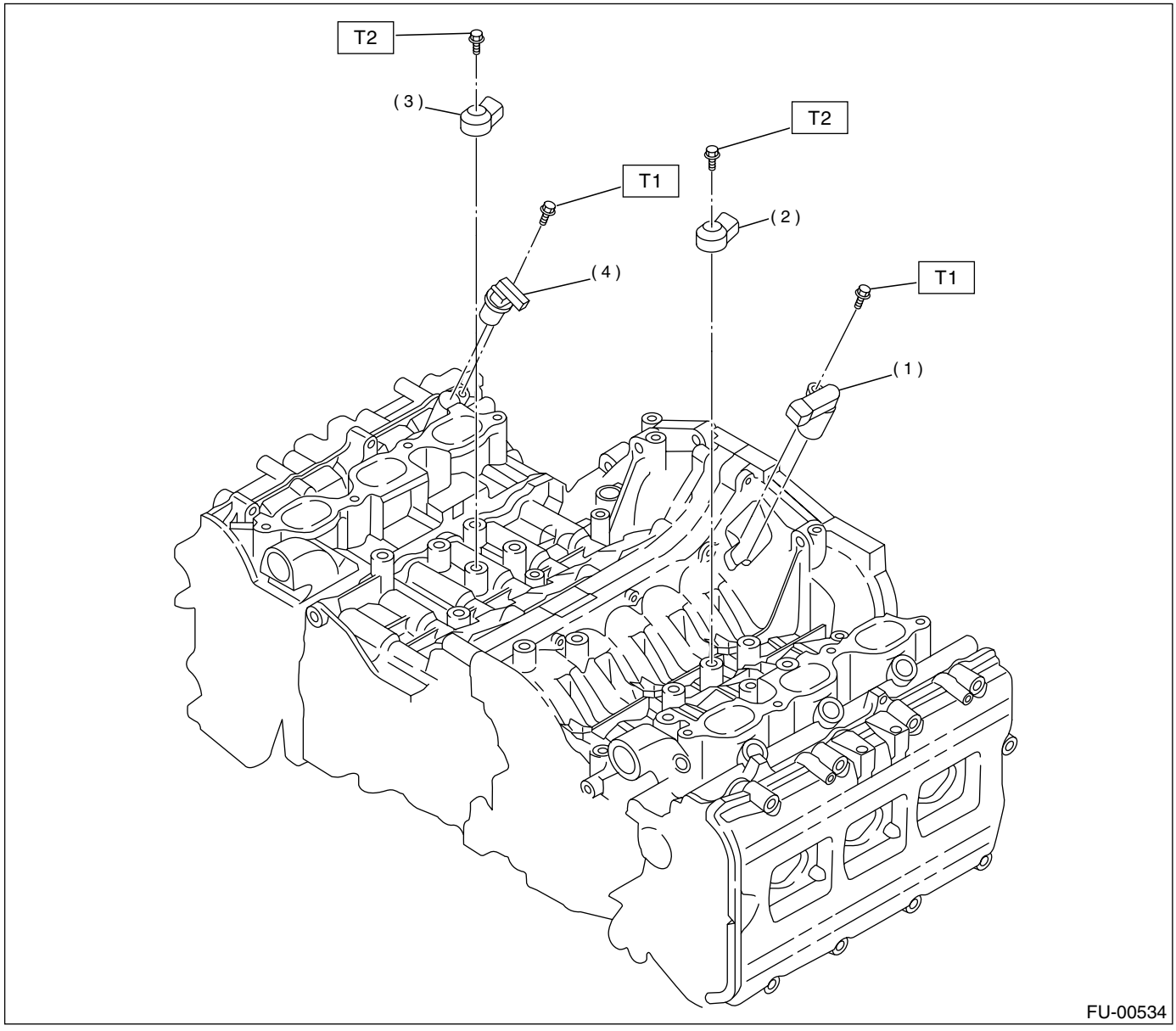
3. AIR INTAKE SYSTEM



(1) Gasket
(2) Intake manifold pressure sensor
(3) Idle air control solenoid valve
(4) Throttle position sensor
(5) O-ring
(6) Throttle body

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 2.8 (0.29, 2.1)
T3: 22 (2.2, 15.9)

4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS

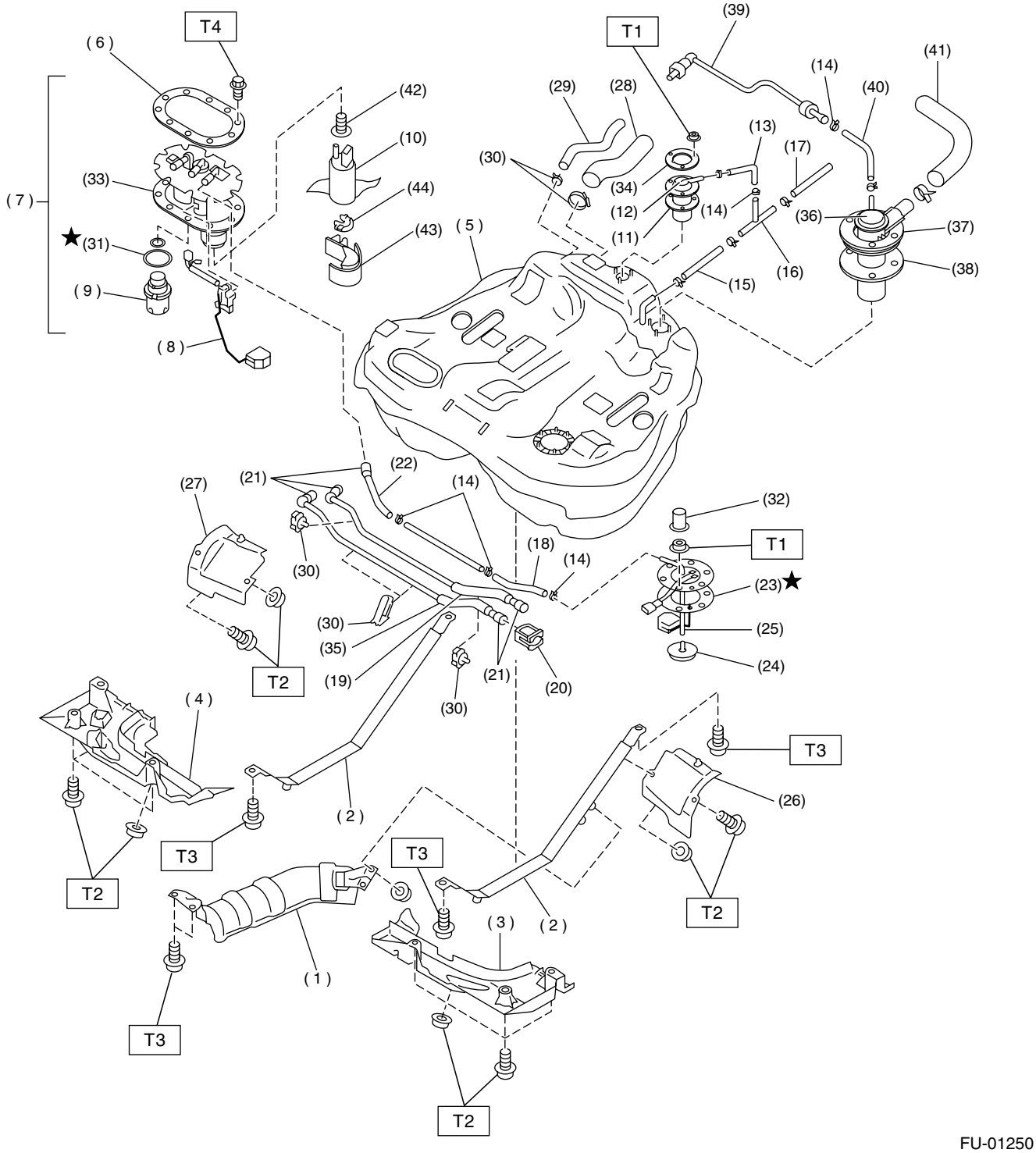


(1) Crankshaft position sensor
(2) Knock sensor LH
(3) Knock sensor RH
(4) Camshaft position sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 25 (2.5, 18)

MEMO:

5. FUEL TANK

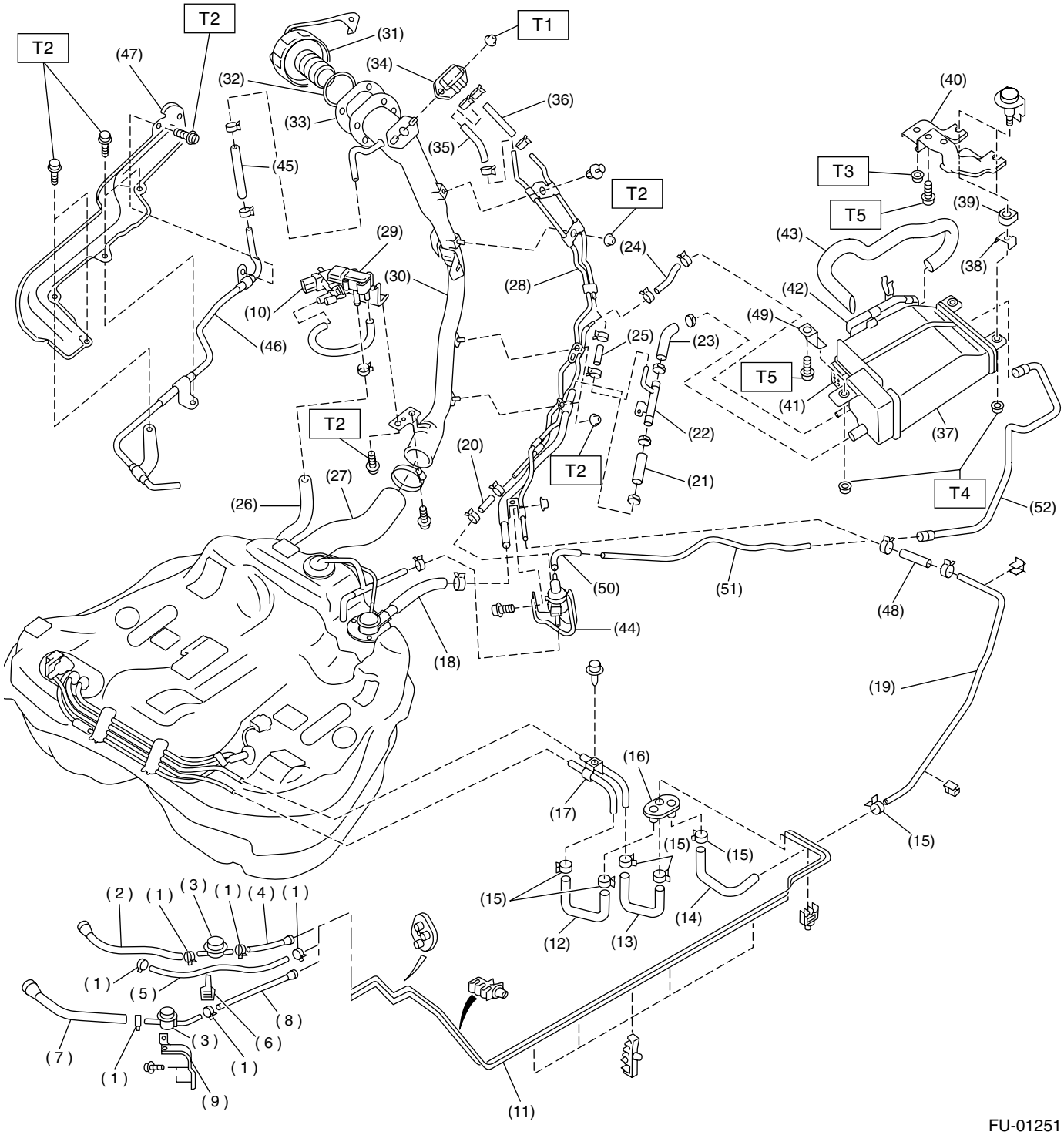


FU-01250

(1) Heat sealed cover
(2) Fuel tank band
(3) Protector LH (Front)
(4) Protector RH (Front)
(5) Fuel tank
(6) Fuel pump plate
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel filter
(10) Fuel pump
(11) Fuel cut valve gasket
(12) Fuel cut valve
(13) Evaporation hose A
(14) Clip
(15) Evaporation hose C
(16) Joint pipe
(17) Evaporation hose B
(18) Jet pump hose A
(19) Fuel return tube
(20) Retainer
(21) Quick connector
(22) Jet pump tube B
(23) Fuel sub level sensor gasket
(24) Jet pump filter
(25) Fuel sub level sensor
(26) Protector LH (Rear)
(27) Protector RH (Rear)
(28) Fuel filler hose
(29) Fuel tank pressure sensor hose
(30) Clamp
(31) Gasket
(32) Cap
(33) Gasket
(34) Fuel cut valve plate
(35) Fuel delivery tube
(36) Vent valve
(37) Vent valve plate
(38) Vent valve gasket
(39) Evaporation tube
(40) Evaporation hose D
(41) Air vent hose
(42) Seal
(43) Fuel pump holder
(44) Rubber lower

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)
T4: 5.9 (0.6, 4.3)

6. FUEL LINE


T1
T2
T3
T4
T5
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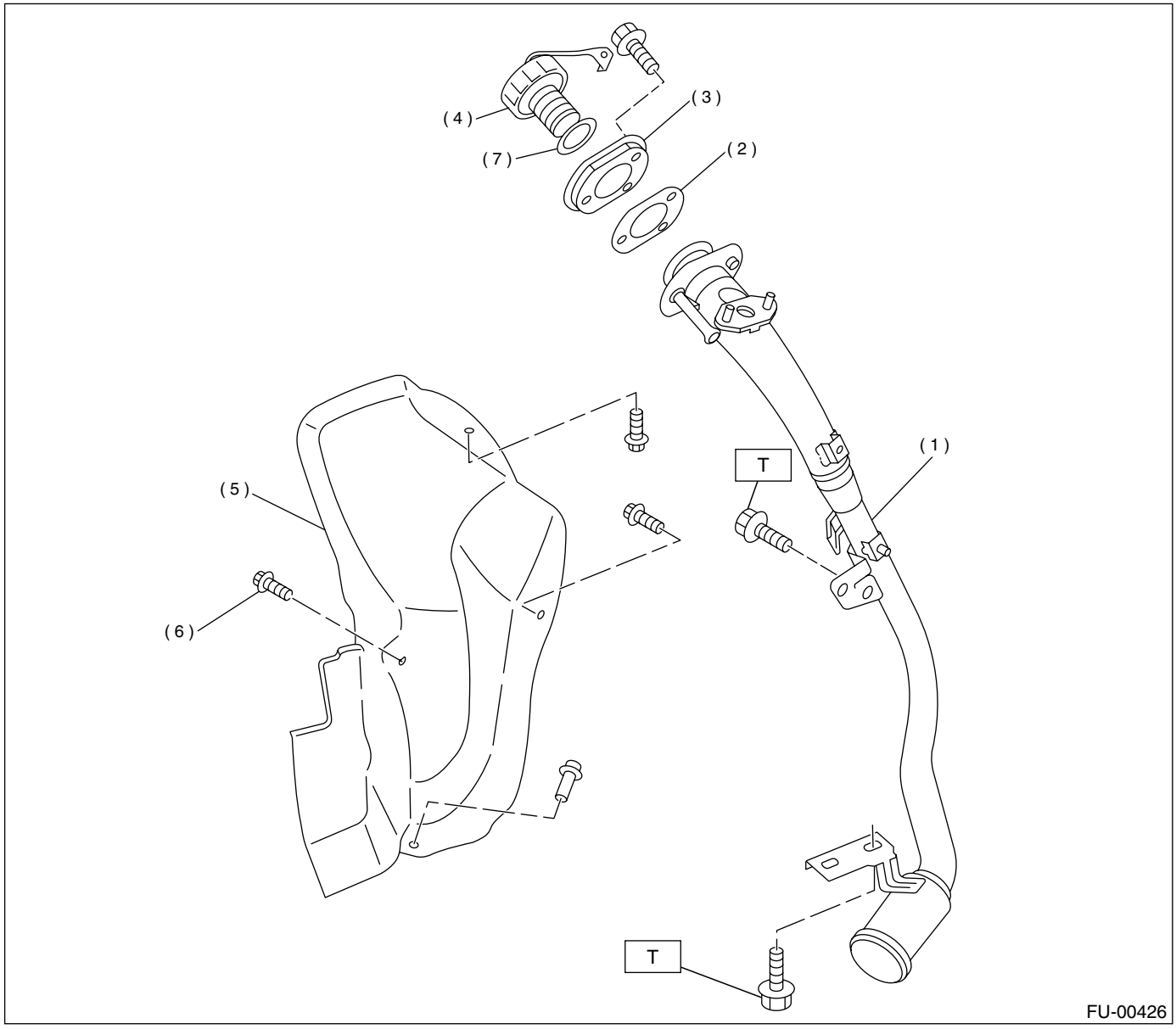
FU-01251

(1) Clamp
(2) Fuel return hose A
(3) Fuel damper valve
(4) Fuel return hose B
(5) Evaporation hose A
(6) Clip
(7) Fuel delivery hose A
(8) Fuel delivery hose B
(9) Fuel damper valve bracket
(10) Fuel tank sensor control valve
(11) Fuel pipe ASSY
(12) Fuel delivery hose C
(13) Fuel return hose C
(14) Evaporation hose B
(15) Clamp
(16) Grommet
(17) Fuel pipe ASSY
(18) Air vent hose A
(19) Evaporation pipe A
(20) Evaporation hose C
(21) Air vent hose B
(22) Air vent pipe
(23) Air vent hose C
(24) Evaporation hose D
(25) Evaporation hose E
(26) Fuel tank pressure sensor hose
(27) Fuel filler hose
(28) Evaporation pipe B
(29) Fuel tank pressure sensor
(30) Fuel filler pipe
(31) Fuel filler cap
(32) Ring
(33) Packing
(34) Shut valve
(35) Evaporation hose F
(36) Evaporation hose G
(37) Canister
(38) Canister lower bracket
(39) Cushion rubber
(40) Canister upper bracket
(41) Drain valve
(42) Drain filter
(43) Drain hose
(44) Pressure control solenoid valve
(45) Evaporation hose H
(46) Evaporation pipe C
(47) Pipe protector
(48) Evaporation hose I
(49) Canister front bracket
(50) PCV hose
(51) PCV pipe
(52) PCV tube

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.5 (0.46, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 23 (2.3, 16.6)
T5: 33 (3.4, 25)

7. FUEL FILLER PIPE



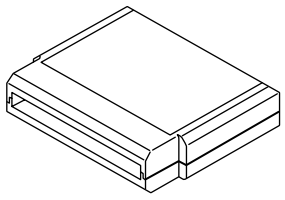
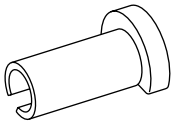
(1) Fuel filler pipe ASSY
(2) Filler pipe packing
(3) Filler ring
(4) Filler cap
(5) Filler pipe protector
(6) Clip
(7) Ring

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.75, 5.4)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

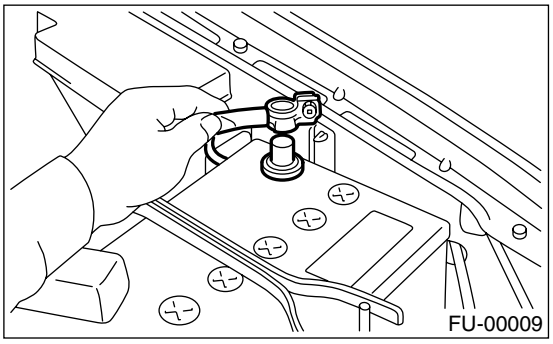
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for disconnecting quick connector.

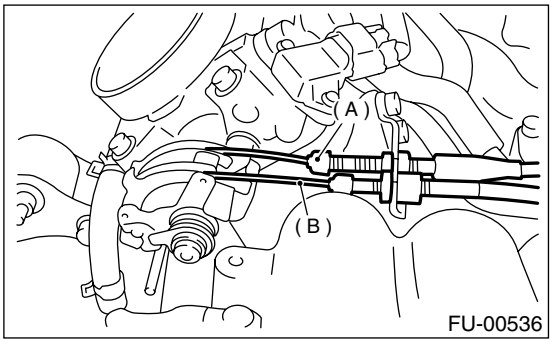
2. Throttle Body

A: REMOVAL

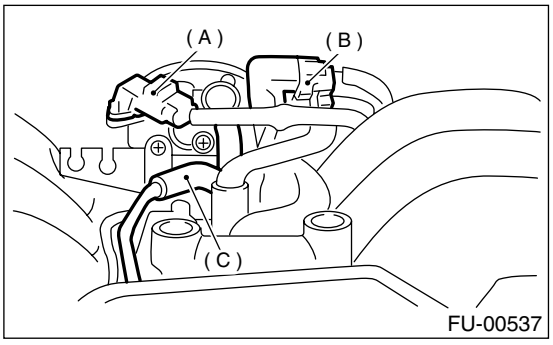
1) Disconnect ground cable from battery.



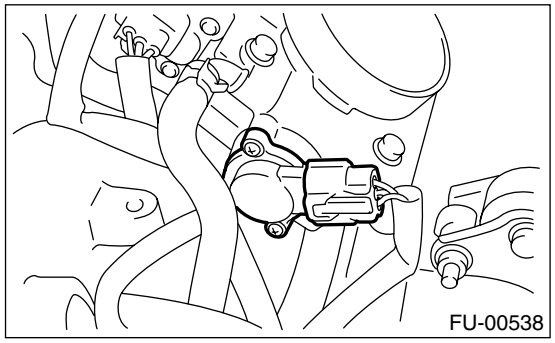
2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
3) Disconnect accelerator cable (A).
4) Disconnect cruise control cable (B). (With cruise control model)



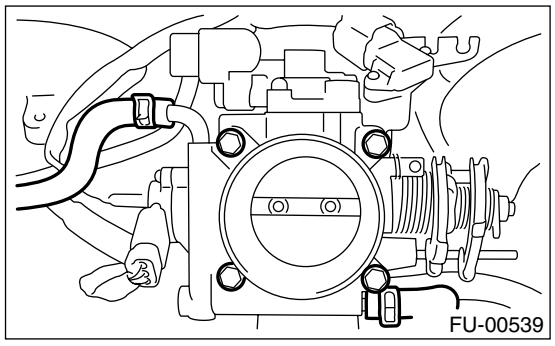
5) Disconnect connectors from intake manifold pressure sensor (A) and idle air control solenoid valve (B).
6) Disconnect air by-pass hose (C) from idle air control solenoid valve.



7) Disconnect throttle position sensor connector.



8) Disconnect engine coolant hoses from throttle body.
9) Remove bolts which secure throttle body to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

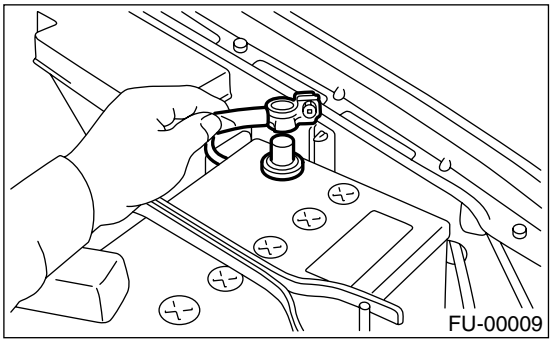
NOTE:
When removing throttle body, replace gasket with new one.

Tightening torque:
Throttle body;
22 N·m (2.2 kgf-m, 15.9 ft-lb)

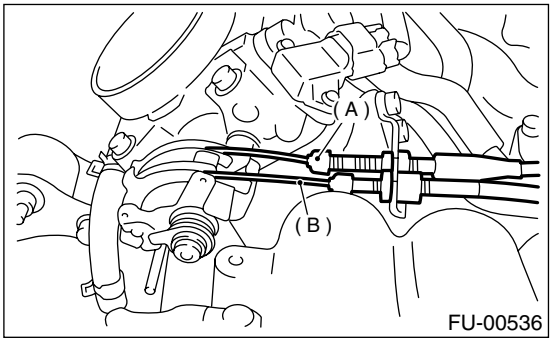
3. Intake Manifold

A: REMOVAL

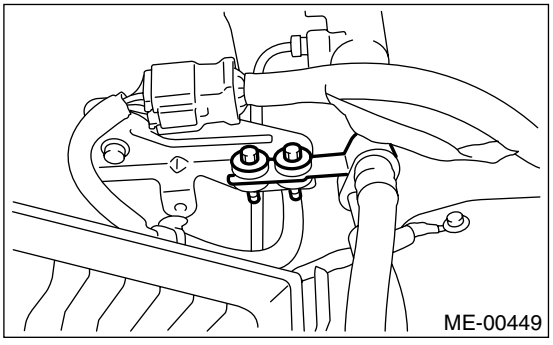
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect ground cable from battery.



4) Remove air intake duct, air cleaner assembly and air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> or <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
5) Disconnect accelerator cable (A).
6) Disconnect cruise control cable (B). (With cruise control model)

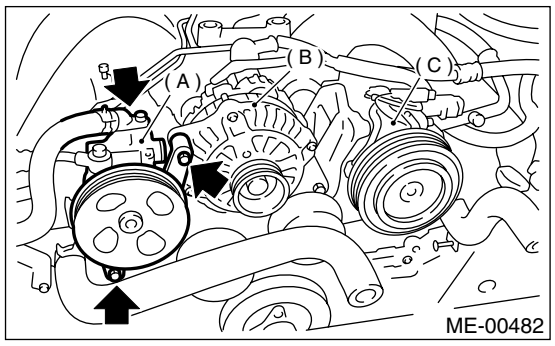


7) Remove power steering pump and tank from brackets.
(1) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
(2) Remove power steering oil pipe with bracket.



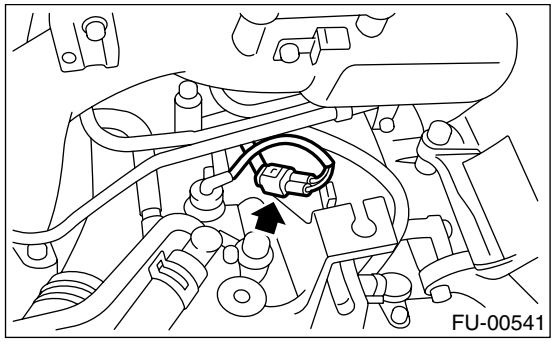
(3) Remove bolts which install power steering pump bracket.

NOTE:
Do not disconnect power steering hose.

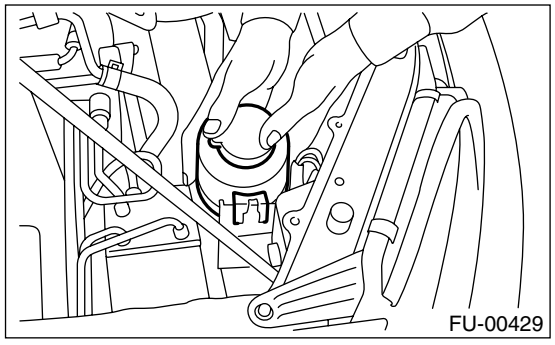


(A) Power steering pump
(B) Generator
(C) A/C compressor

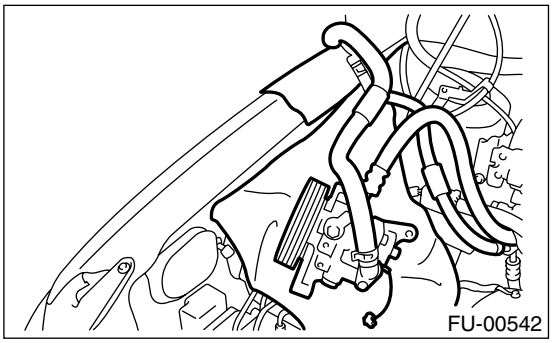
(4) Disconnect connector from power steering pump switch.



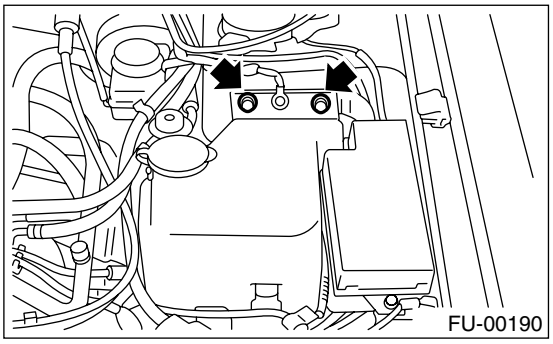
(5) Remove power steering tank from the bracket by pulling it upward.



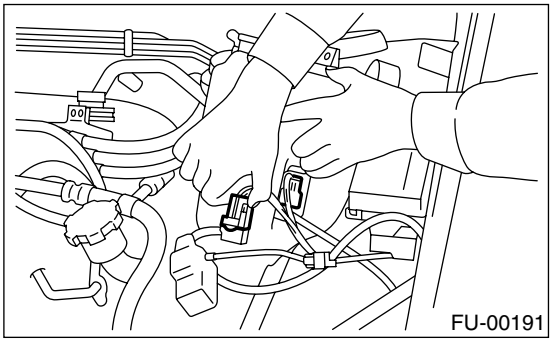
(6) Place power steering pump on the right side wheel apron.



8) Remove two bolts which install washer tank on body.

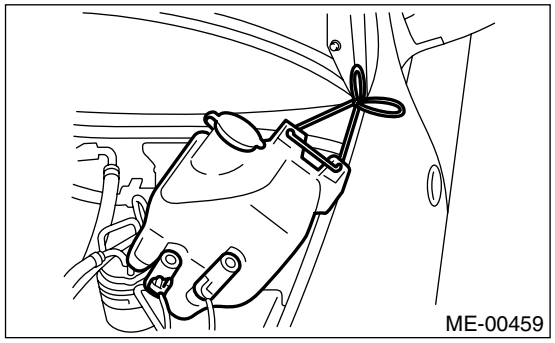


9) Disconnect connector from front window washer motor.
10) Disconnect connector from rear gate glass washer motor.

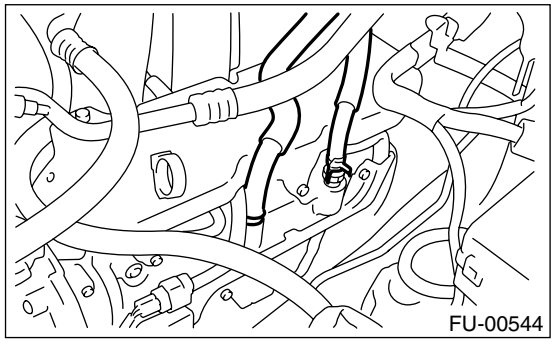


11) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

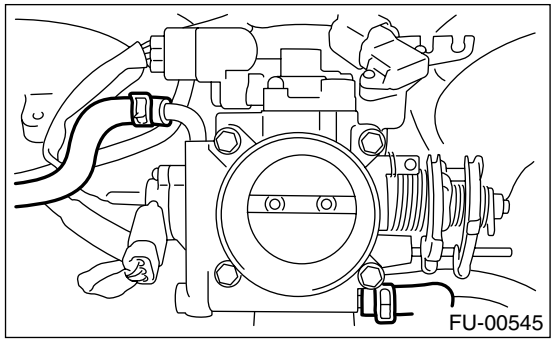
12) Move washer tank upward.



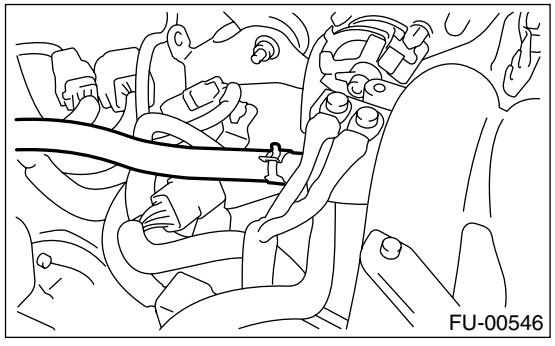
13) Disconnect PCV hoses from cylinder head cover.



14) Disconnect engine coolant hose from throttle body.

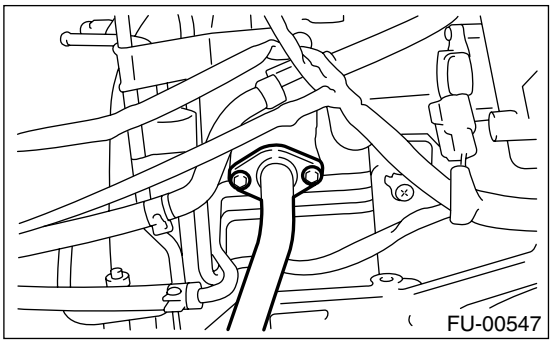


15) Disconnect brake booster hose.

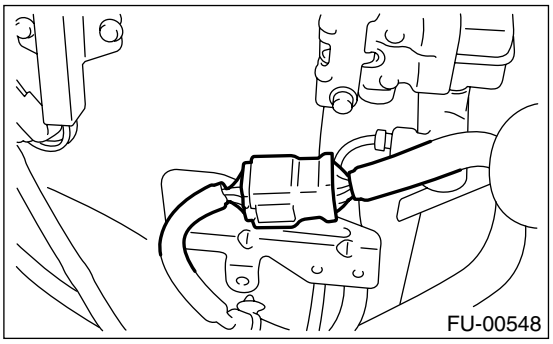


16) Remove EGR pipe from EGR valve.

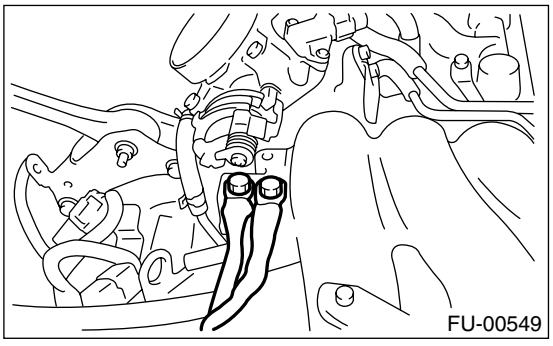
NOTE:
Be careful not to drop gaskets.



17) Disconnect engine harness connectors from bulkhead harness connectors.



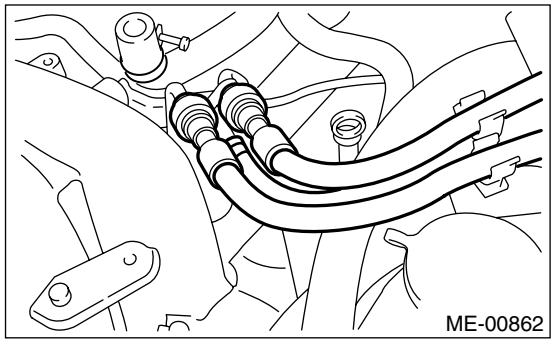
18) Disconnect engine ground terminal from intake manifold.



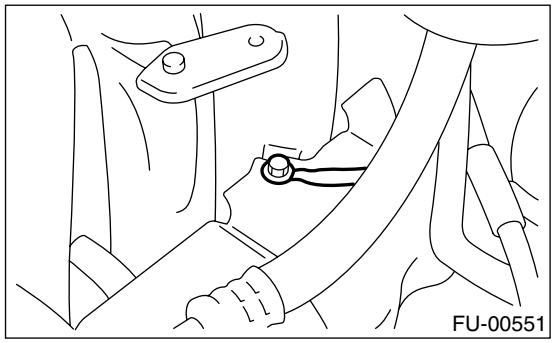
19) Using ST, disconnect fuel delivery hose, return hose and evaporation hose. <Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

ST 42099AE000 CONNECTOR REMOVER

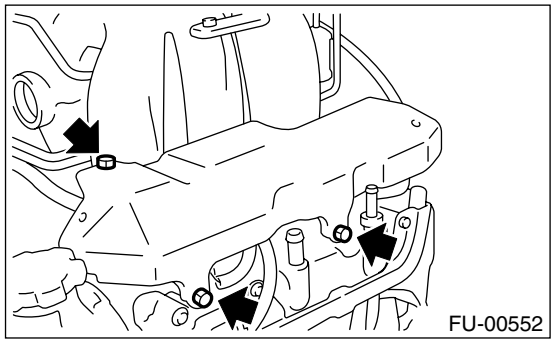
WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



20) Remove ground cable from fuel pipe protector LH.

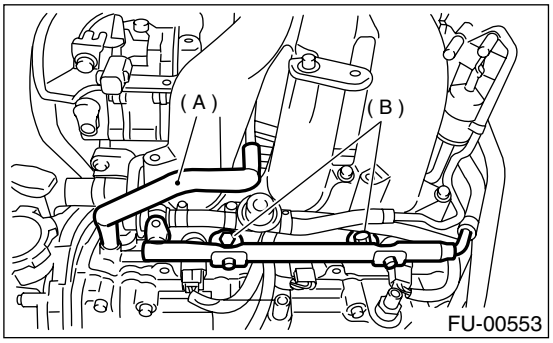


21) Remove fuel pipe protector LH.

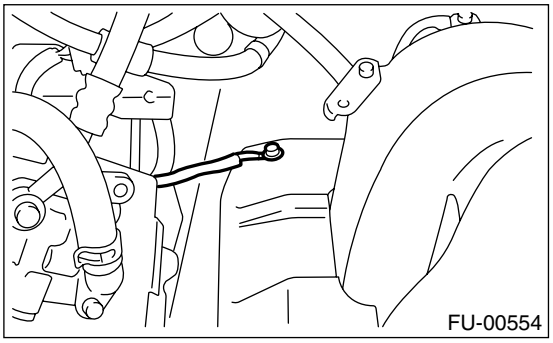


22) Disconnect air assist hose (A).

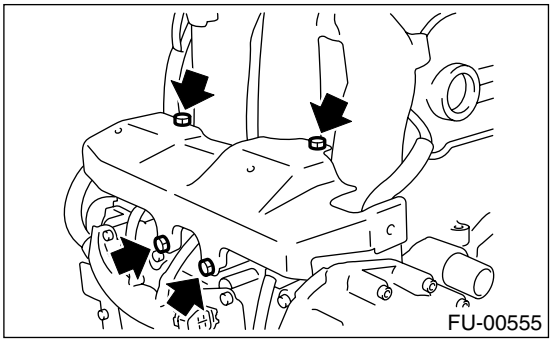
23) Remove the bolt (B), which holds fuel injector pipe LH onto cylinder head.



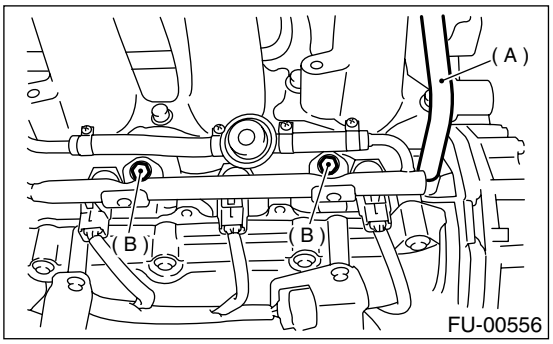
24) Remove ground cable from fuel pipe protector RH.



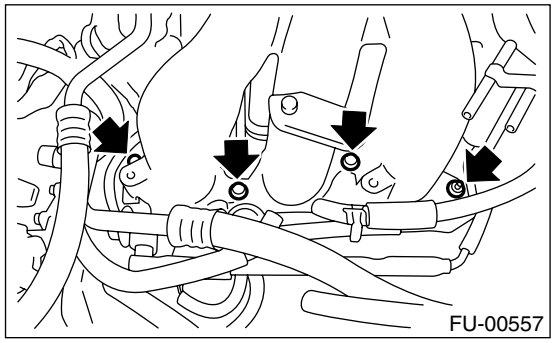
25) Remove fuel pipe protector RH.

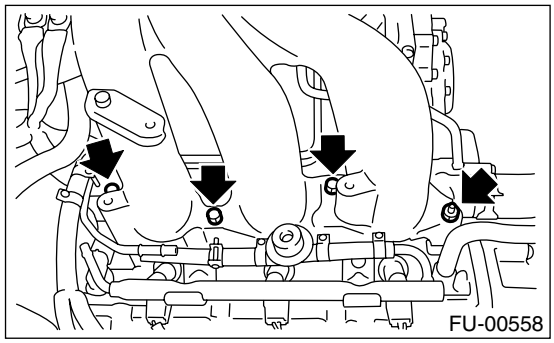


26) Disconnect air assist hose (A).
Remove the bolt (B), which holds fuel injector pipe RH onto cylinder head.



27) Remove bolts which holds intake manifold onto cylinder heads.





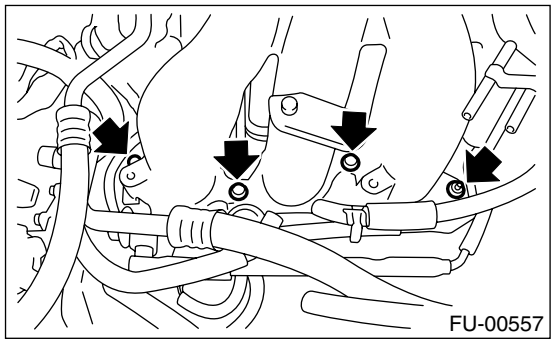
28) Remove intake manifold.

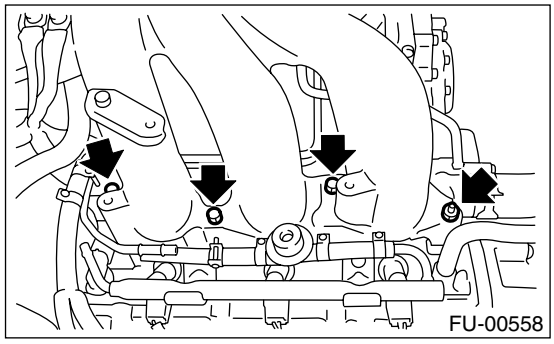
B: INSTALLATION

1) Install intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

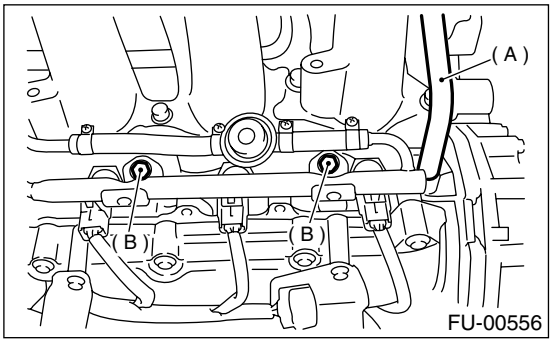




2) Install the bolt (B), which holds fuel injector pipe RH onto cylinder head.

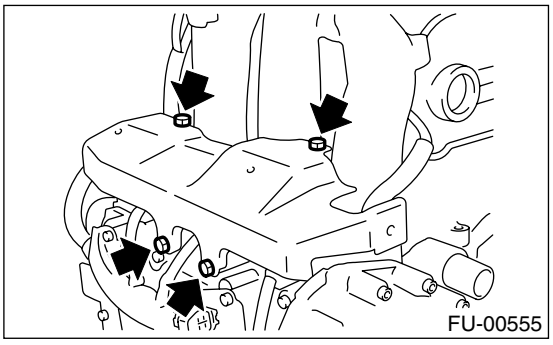
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

3) Connect air assist hose (A).

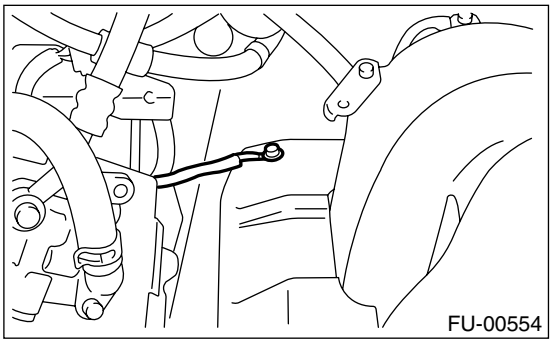


4) Install fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



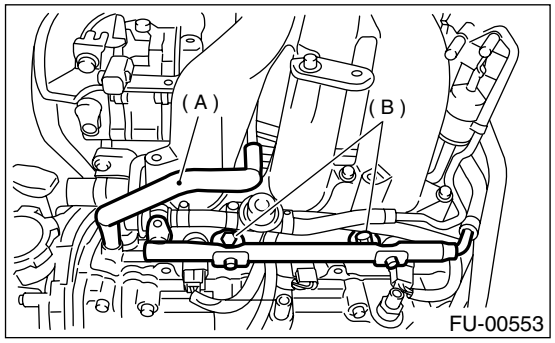
5) Install ground cable to fuel pipe protector RH.



6) Install the bolt (B) which holds fuel injector pipe RH onto cylinder head.

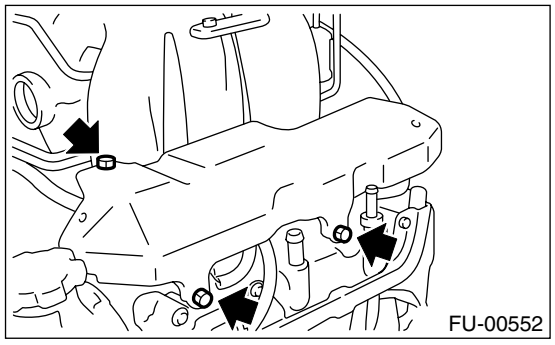
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

7) Connect air assist hose (A).

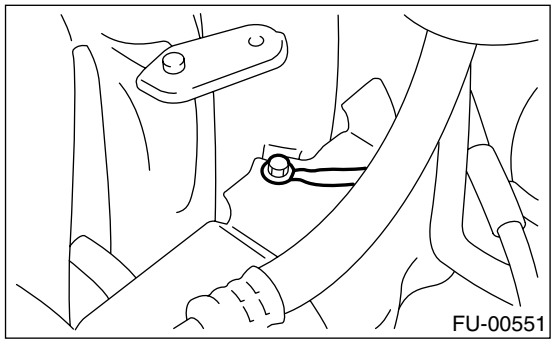


8) Install fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



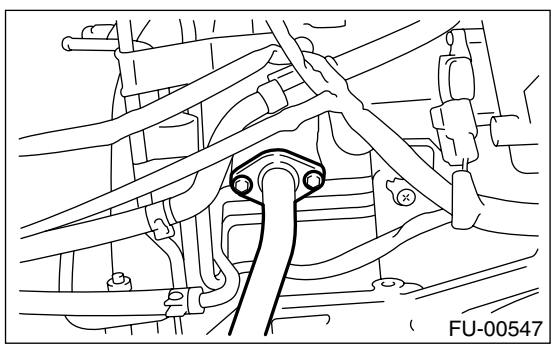
9) Install ground cable to fuel pipe protector LH.



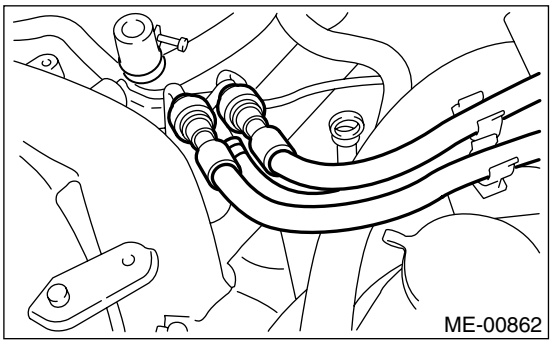
10) Install EGR pipe to EGR valve.

NOTE:
Always use new gasket.

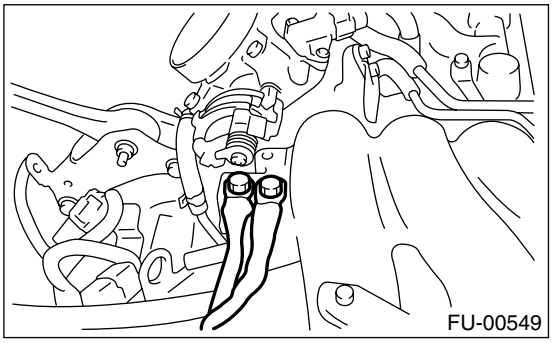
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



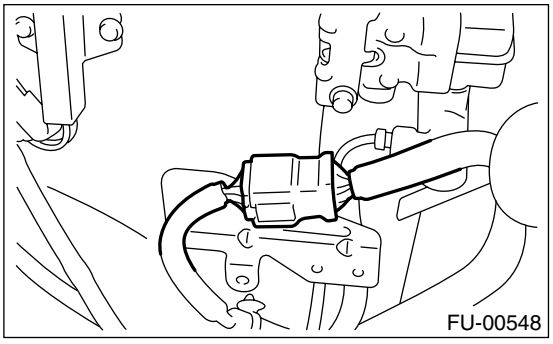
11) Connect fuel delivery hose, return hose and evaporation hose. <Ref. to FU(H6DO)-76, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



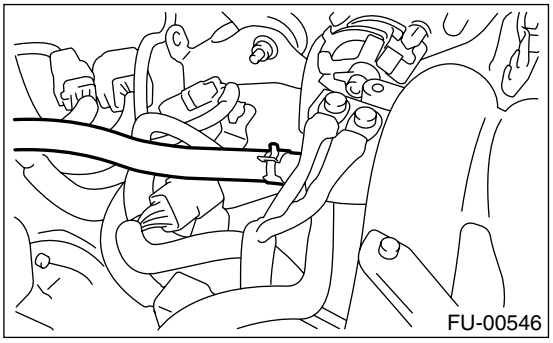
12) Connect engine ground cable to intake manifold.



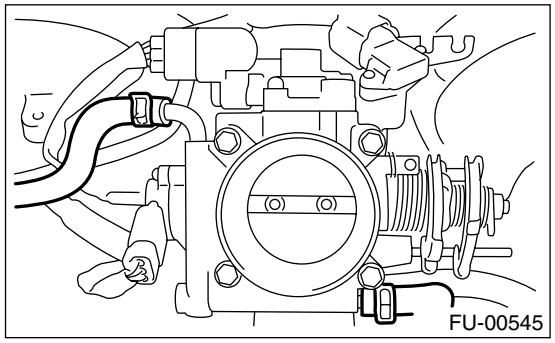
13) Connect engine harness connectors to bulkhead connectors.



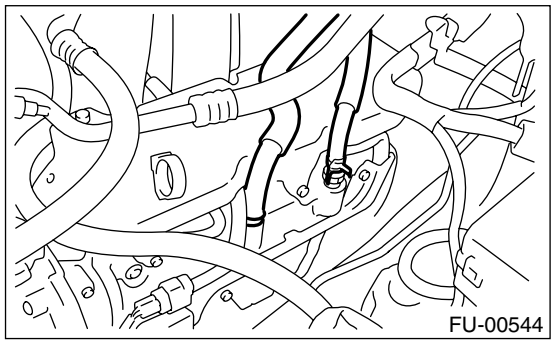
14) Connect brake booster hose.



15) Connect engine coolant hose to throttle body.

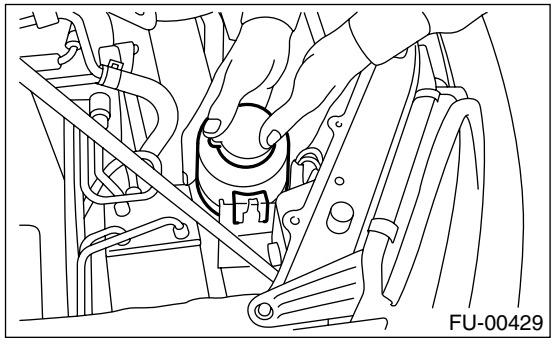


16) Connect PCV hose to cylinder head cover.

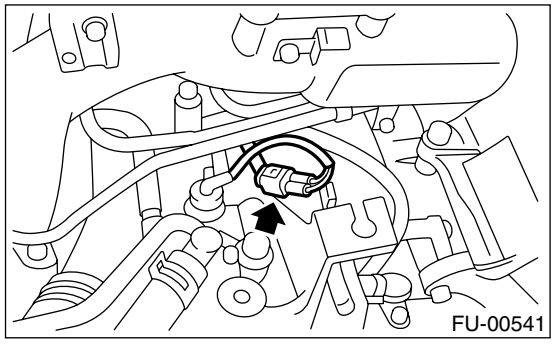


17) Install power steering pump and tank on brackets.

(1) Install power steering tank on bracket.

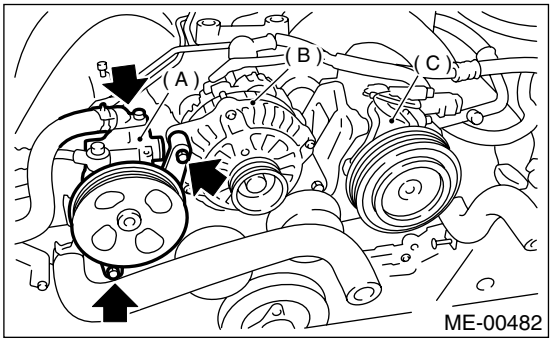


(2) Connect connector to power steering pump switch.



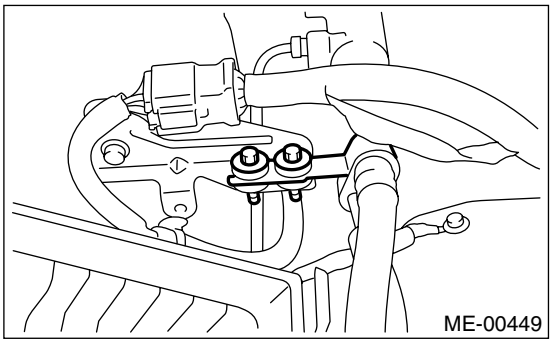
(3) Tighten bolts which install power steering pump on bracket.

Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



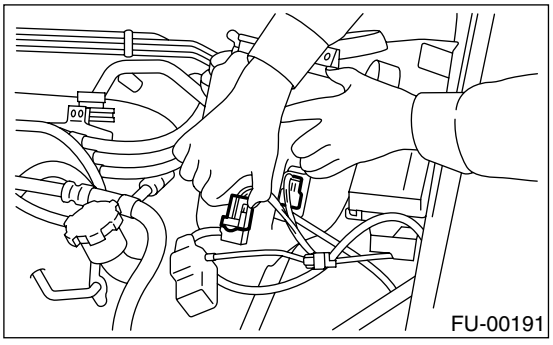
(A) Power steering pump
(B) Generator
(C) A/C compressor

(4) Install power steering pipes with bracket.

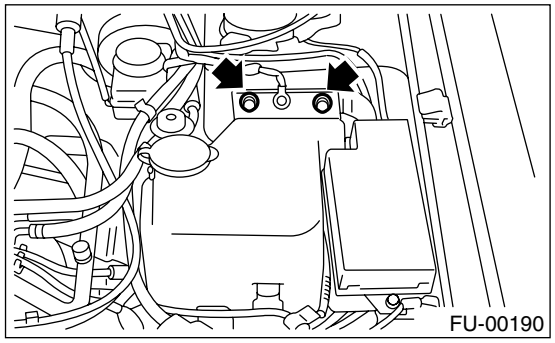


(5) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>

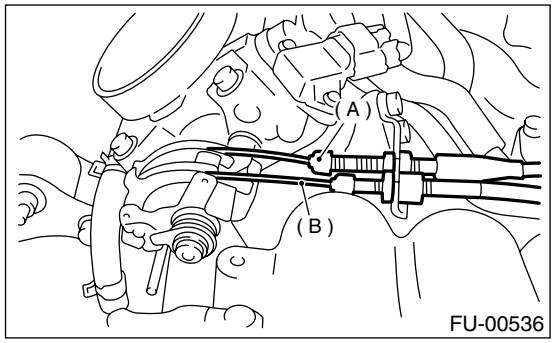
18) Connect rear window washer hose to washer motor.
19) Connect front window washer motor connector.
20) Connect rear window washer motor connector.



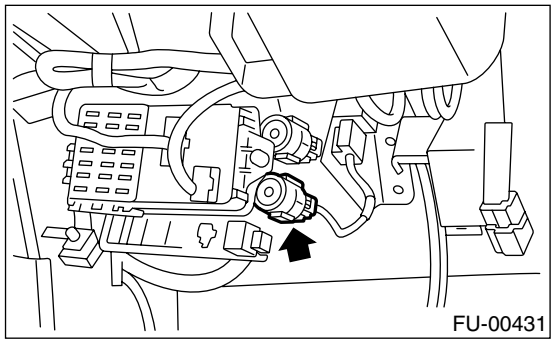
21) Install washer tank on body.



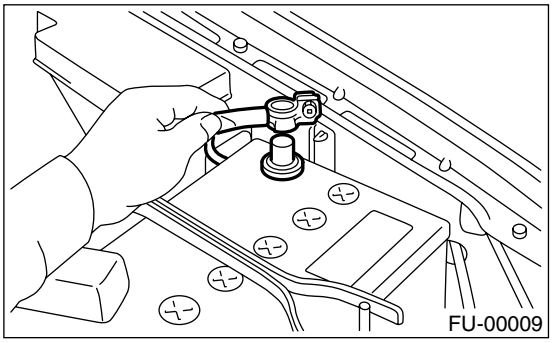
22) Connect accelerator cable (A).
23) Connect cruise control cable (B). (With cruise control models)



24) Install air intake duct, air cleaner and air intake chamber. <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
25) Connect connector to fuel pump relay.

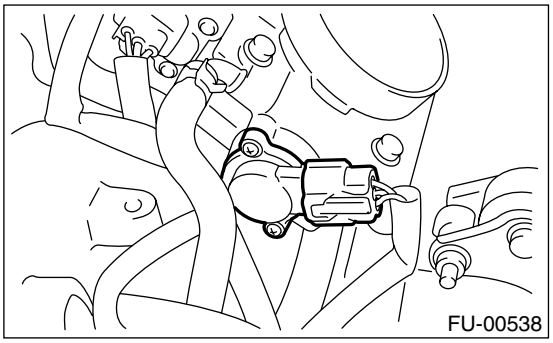


26) Connect battery ground cable.

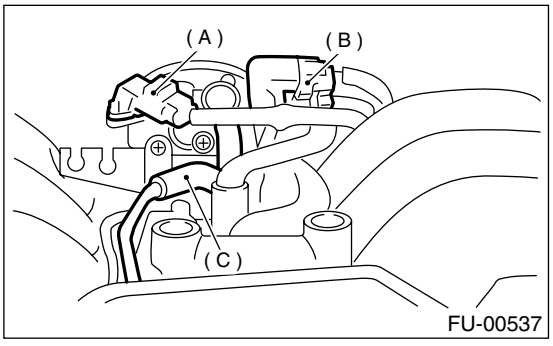


C: DISASSEMBLY

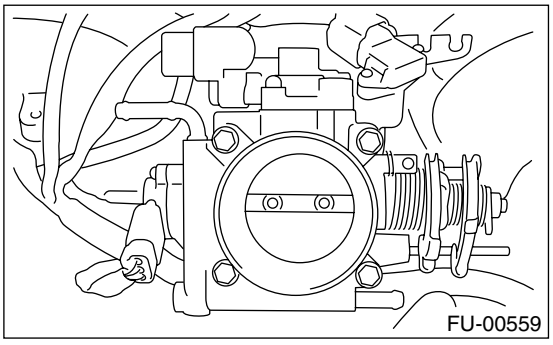
1) Disconnect connectors from throttle position sensor.



2) Disconnect connectors from intake manifold pressure sensor (A) and idle air control solenoid valve (B).
3) Disconnect air by-pass hose (C) from idle air control solenoid valve.

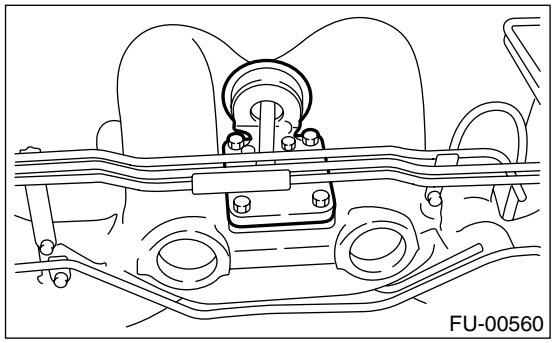


4) Remove throttle body.

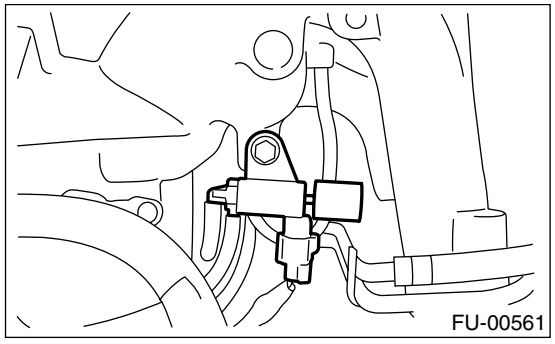


NOTE:
When removing throttle body, use a new gasket.

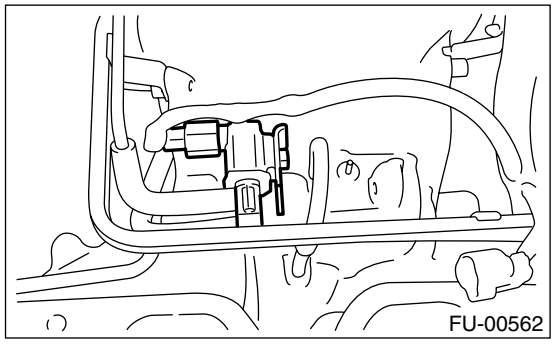
5) Disconnect hose which connects induction valve to induction valve control solenoid, then remove.



6) Disconnect connector from induction valve control solenoid.
7) Remove induction valve control solenoid.

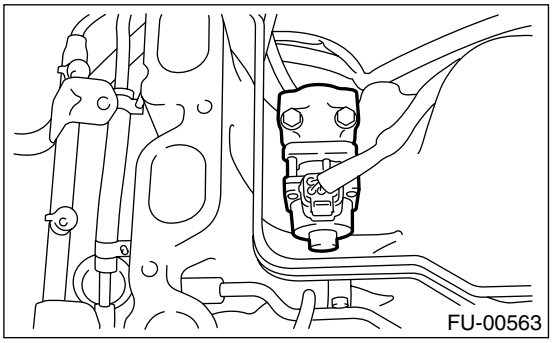


8) Disconnect connector from purge control solenoid valve.
9) Disconnect two hoses between purge control solenoid valve and purge pipe of intake manifold.
10) Remove purge control solenoid valve.

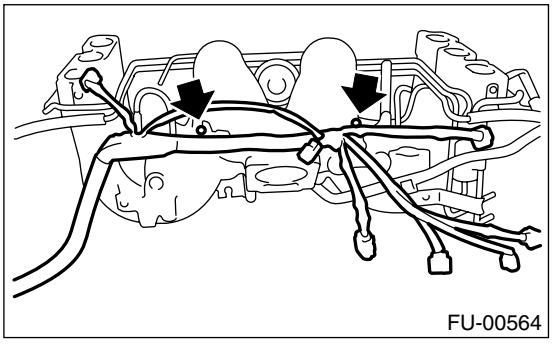


11) Disconnect connector from EGR valve.

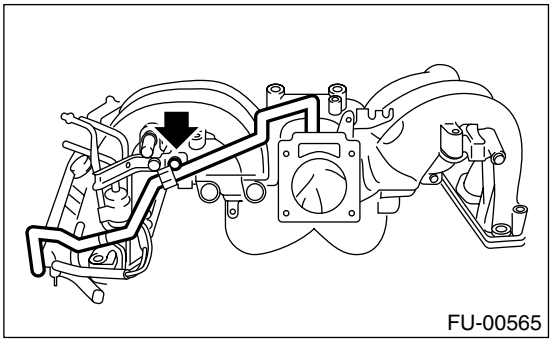
12) Remove EGR valve.



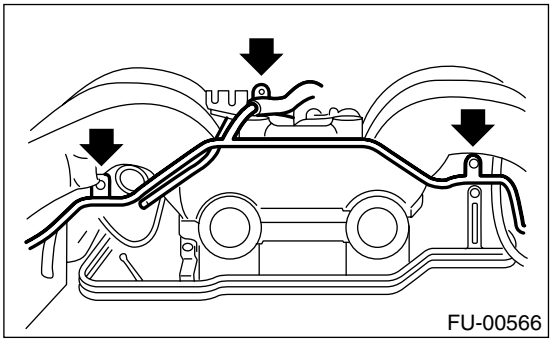
13) Remove engine harness assembly from intake manifold.



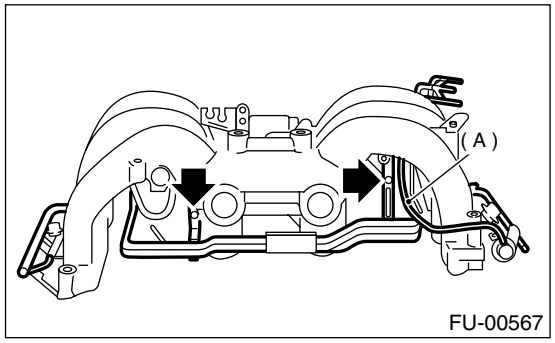
14) Remove PCV pipe from intake manifold.



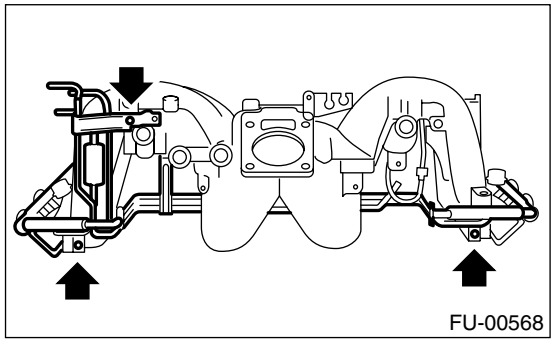
15) Remove air assist and purge pipe assembly.



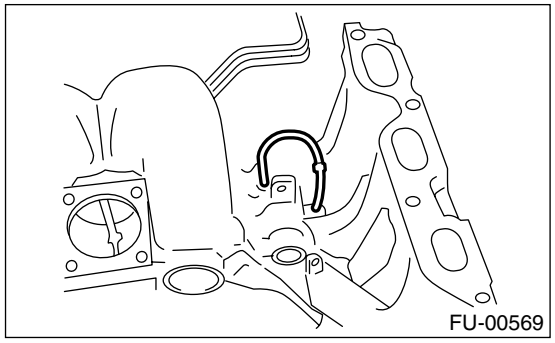
16) Disconnect pressure regulator vacuum hose (A) from intake manifold.



17) Remove fuel pipe and injector pipe assembly.

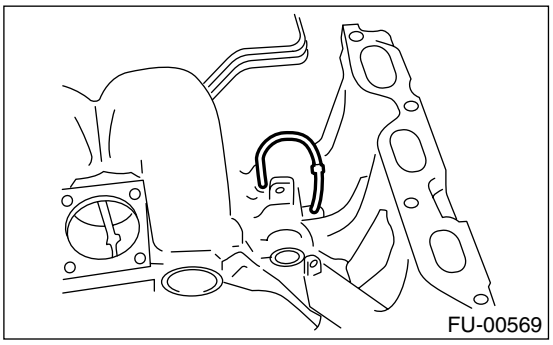


18) Remove induction valve vacuum hose from intake manifold.



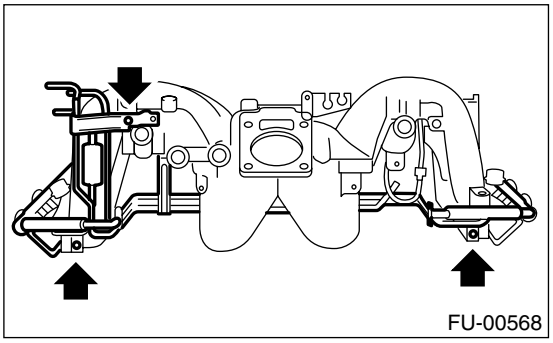
D: ASSEMBLY

1) Intake induction valve vacuum hose to intake manifold.

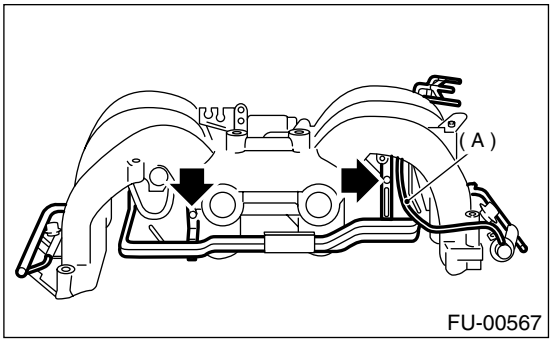


2) Install fuel pipe and injector pipe assembly.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

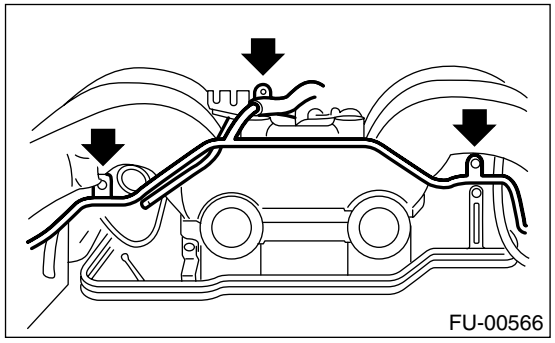


3) Connect pressure regulator vacuum hose (A) to intake manifold.



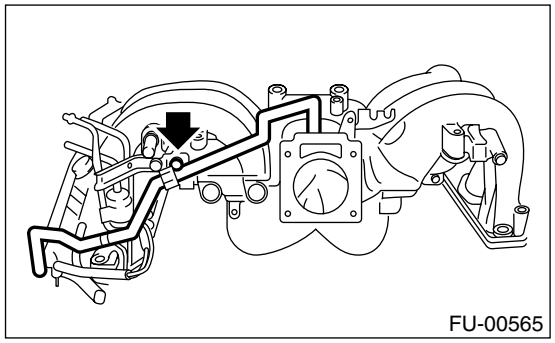
4) Install air assist and purge pipe assembly.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



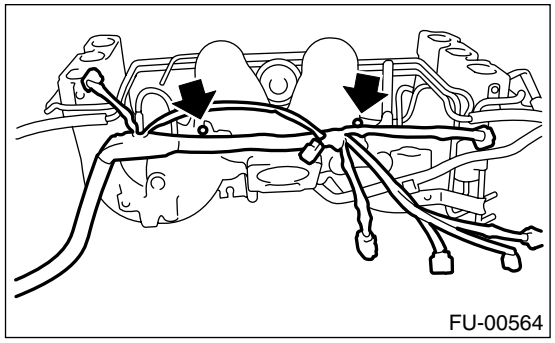
5) Install PCV pipe to intake manifold.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



6) Install engine harness assembly to intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

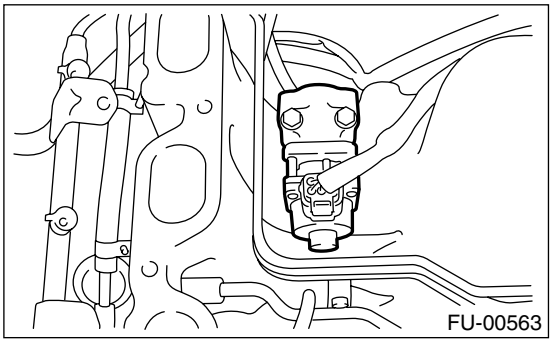


7) Install EGR valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

NOTE:
When removing EGR valve, use a new gasket.

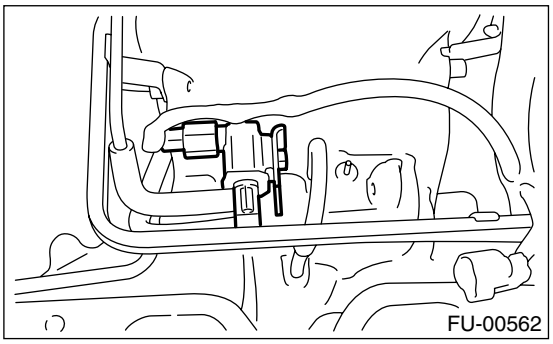
8) Connect connector to EGR valve.



9) Install purge control solenoid valve.

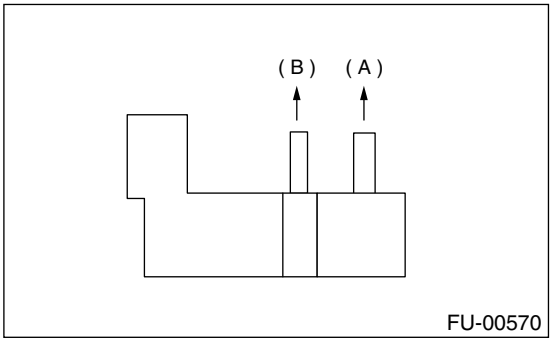
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

10) Connect connector to purge control solenoid valve.



11) Connect hoses to purge control solenoid valve.

CAUTION:
Carefully connect the evaporation hoses.

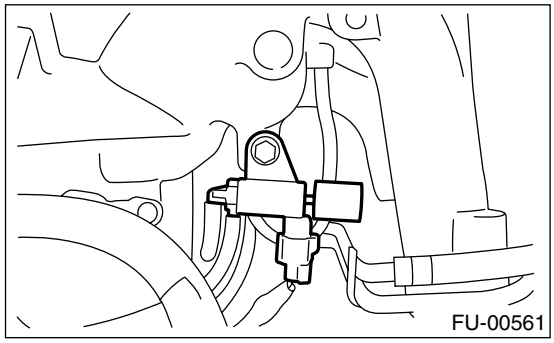


(A) To purge pipe
(B) To fuel pipe

12) Install induction valve control solenoid.

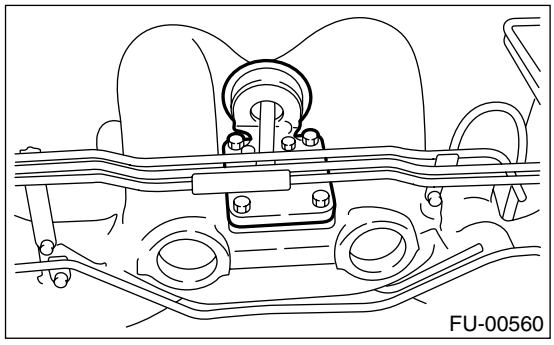
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

13) Connect connector to induction valve control solenoid.



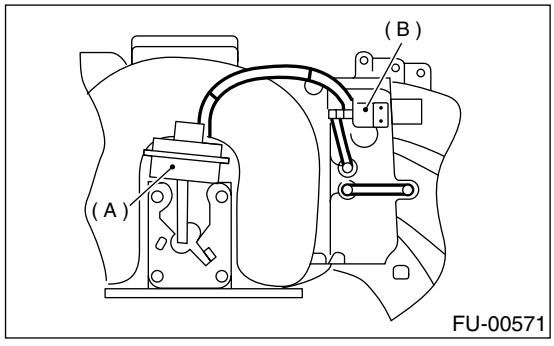
14) Install induction valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



15) Connect hoses to induction valve control solenoid.

CAUTION:
Carefully connect the vacuum hoses.

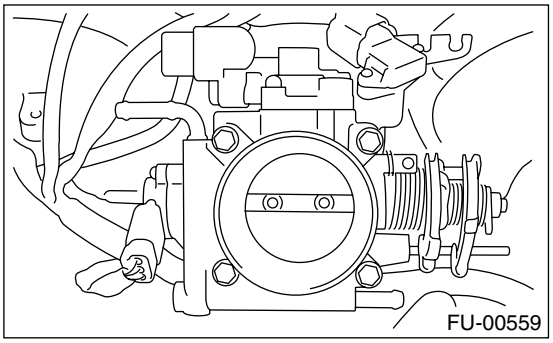


(A) Induction valve
(B) Induction valve control solenoid

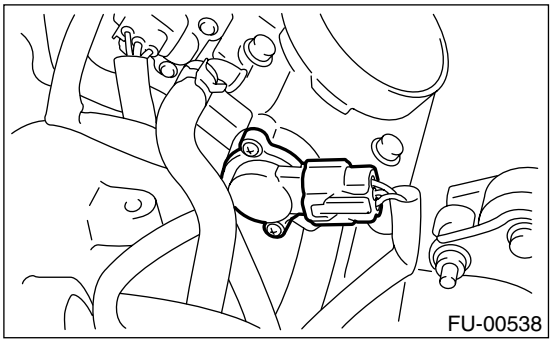
16) Install throttle body to intake manifold.

NOTE:
When removing throttle body, replace gasket with new one.

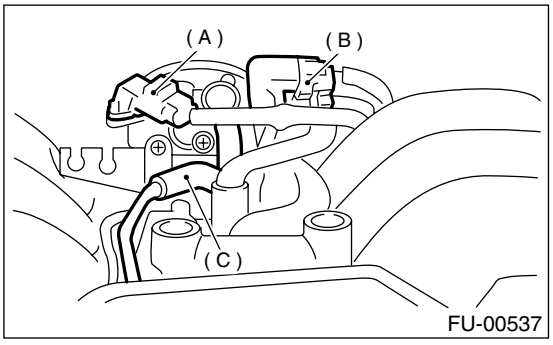
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



17) Connect connectors to throttle position sensor.



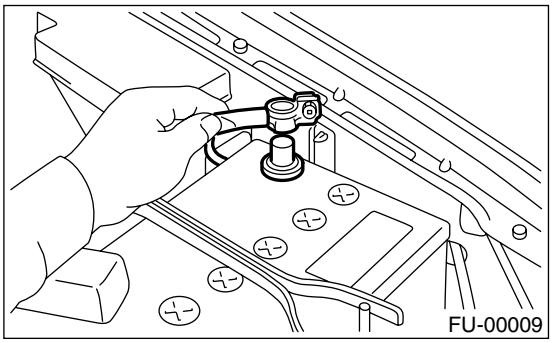
18) Connect connectors to intake manifold pressure sensor (A) and idle air control solenoid valve (B).
19) Connect air by-pass hose (C) to idle air control solenoid valve.



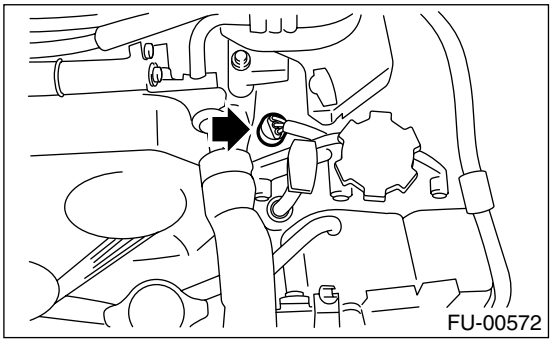
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



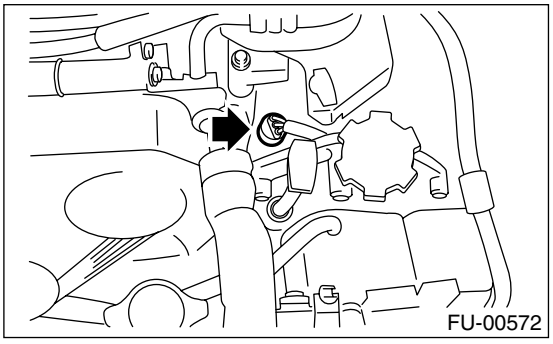
2) Disconnect connector from engine coolant temperature sensor.
3) Remove engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

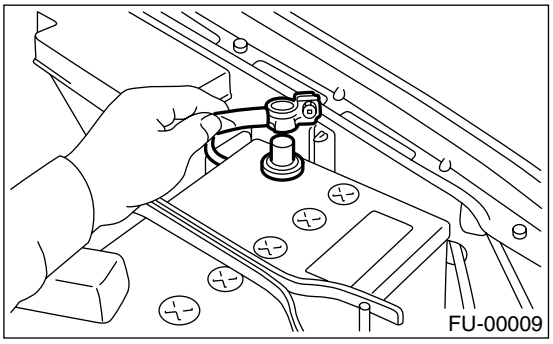
Tightening torque:
16 N·m (0.16 kgf-m, 1.2 ft-lb)



5. Crankshaft Position Sensor

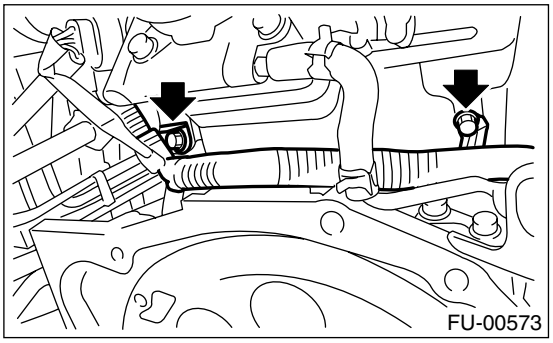
A: REMOVAL

1) Disconnect ground cable from battery.

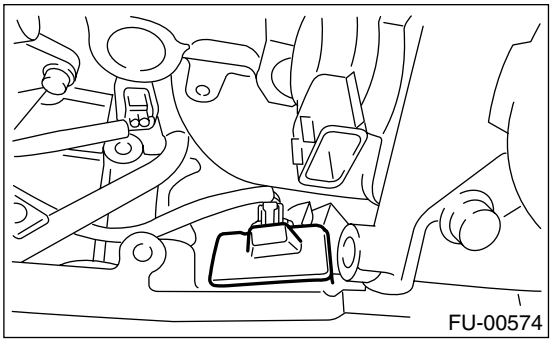


2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Remove engine harness bracket from intake manifold.

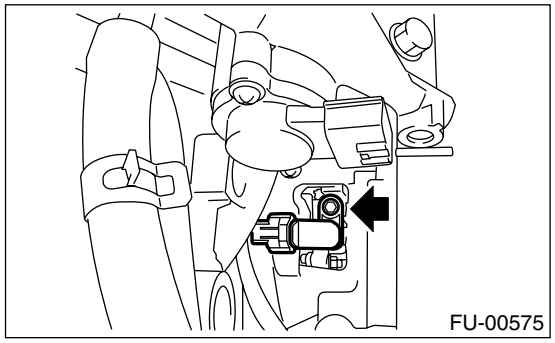


4) Remove service hole cover.



5) Remove bolt which install crankshaft position sensor to cylinder block.

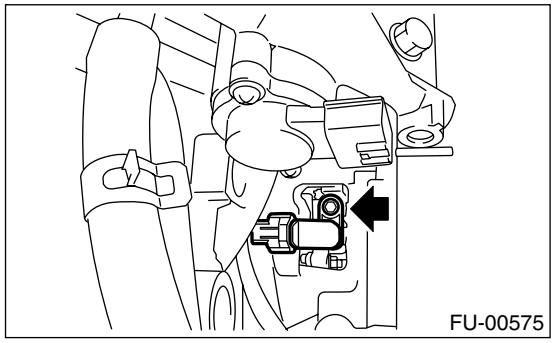
6) Remove crankshaft position sensor, and disconnect connector from it.



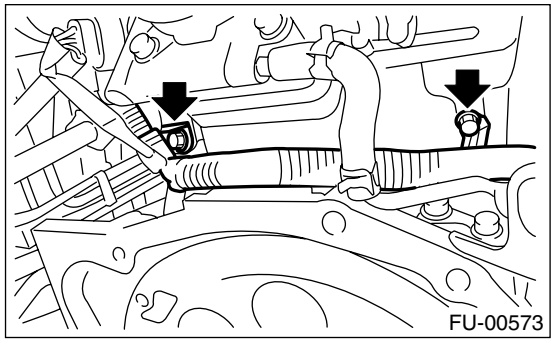
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



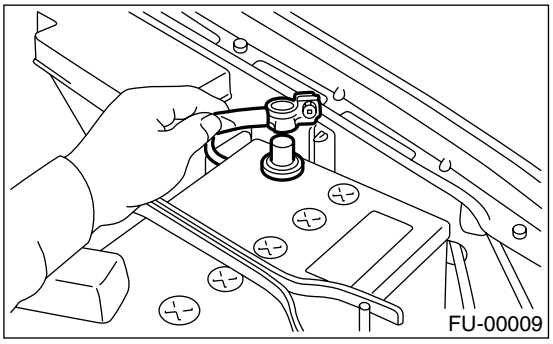
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



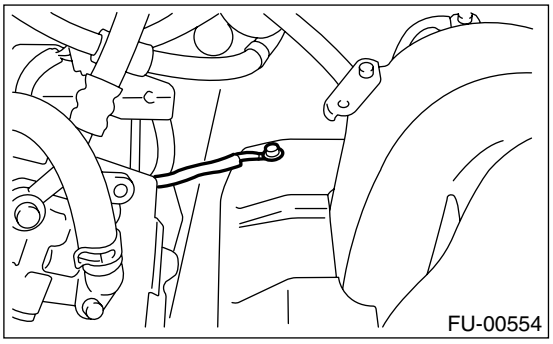
6. Camshaft Position Sensor

A: REMOVAL

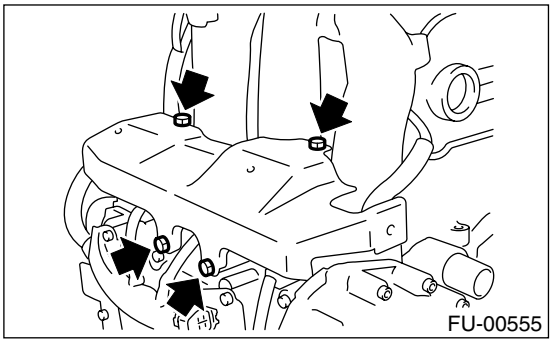
1) Disconnect ground cable from battery.



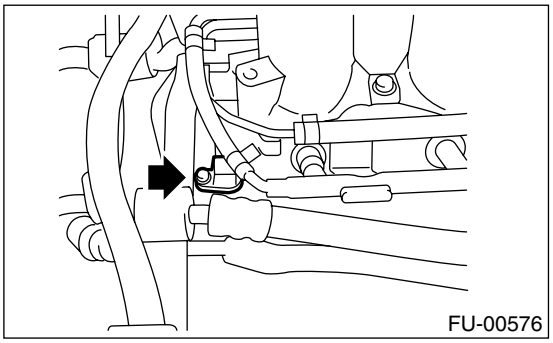
2) Remove ground cable from fuel pipe protector RH.



3) Remove fuel pipe protector RH.



4) Disconnect connector from camshaft position sensor.
5) Remove camshaft position sensor.



B: INSTALLATION

Install in the reverse order of removal.

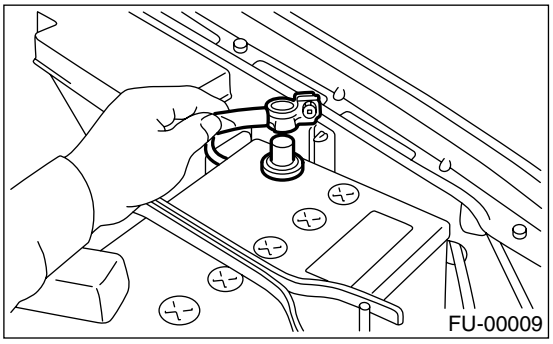
Tightening torque:

- ***Camshaft position sensor; 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)***
- ***Fuel pipe protector RH; 19 N·m (1.9 kgf-m, 14 ft-lb)***

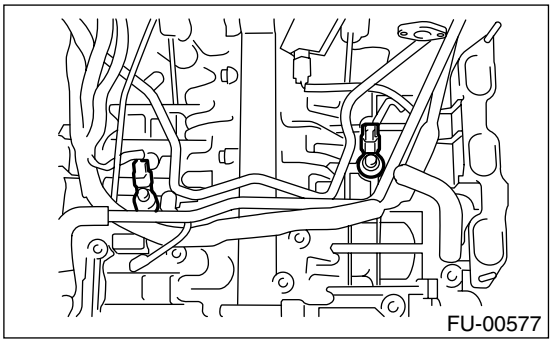
7. Knock Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
3) Disconnect knock sensor connector.
4) Remove knock sensor from cylinder block.

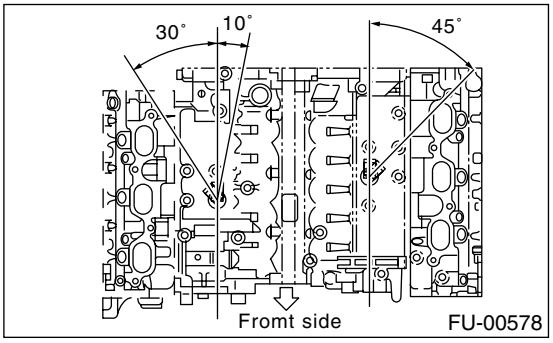


B: INSTALLATION

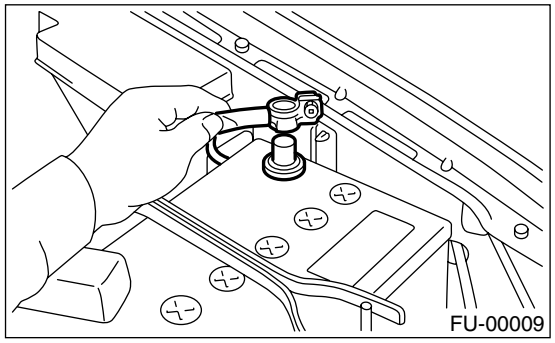
1) Install knock sensor to cylinder block.

Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

NOTE:
For the knock sensor's installation angle, refer to the figure below.



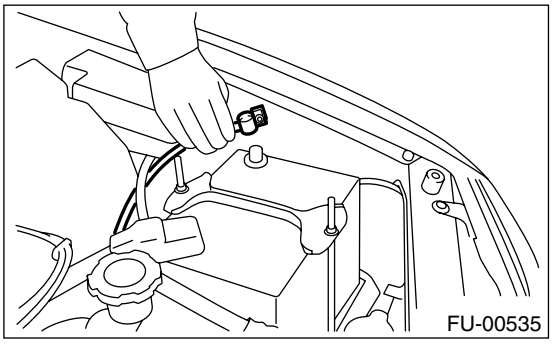
2) Connect knock sensor connector.
3) Install intake manifold. <Ref. to FU(H6DO)-20, INSTALLATION, Intake Manifold.>
4) Connect battery ground cable.



8. Throttle Position Sensor

A: REMOVAL

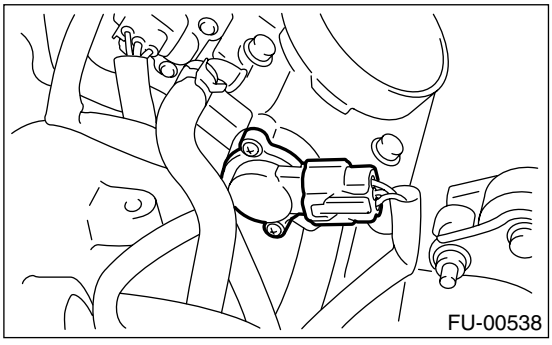
1) Disconnect ground cable from battery.



Remove air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

2) Disconnect connector from throttle position sensor.

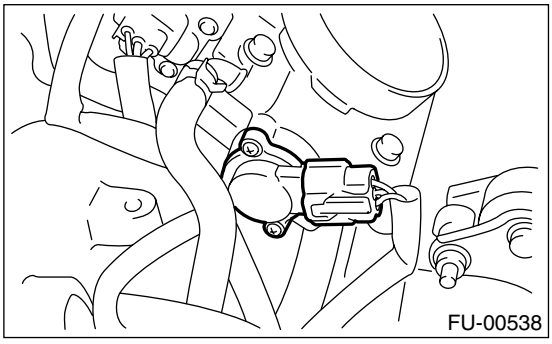
3) Remove throttle position sensor holding screws, and remove throttle position sensor.



B: INSTALLATION

Install in the reverse order of removal.

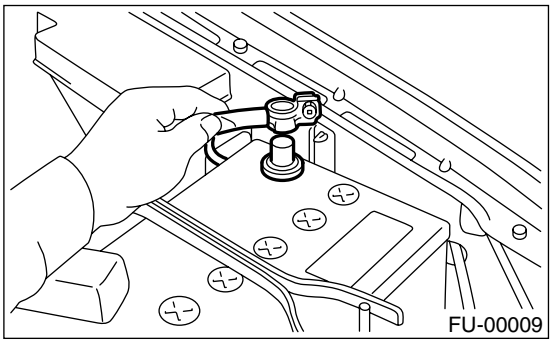
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



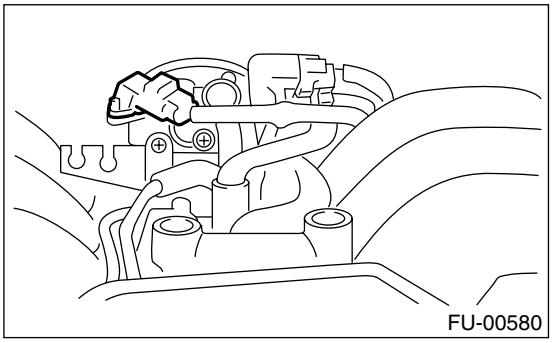
9. Intake Manifold Pressure Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connector from intake manifold pressure sensor.
3) Remove intake manifold pressure sensor from throttle body.

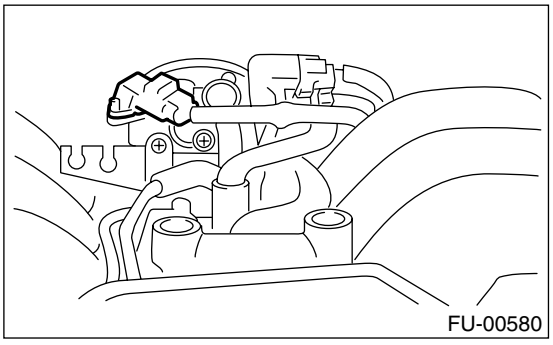


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
When removing intake manifold pressure sensor, replace O-ring with new one.

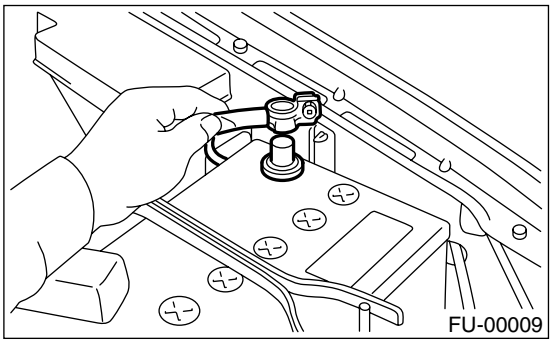
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



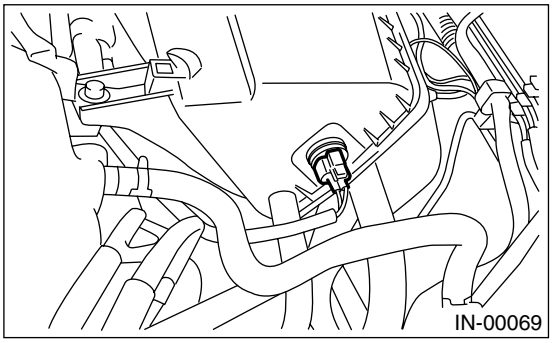
10.Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connector from intake air temperature sensor.
3) Remove intake air temperature sensor from air intake chamber.



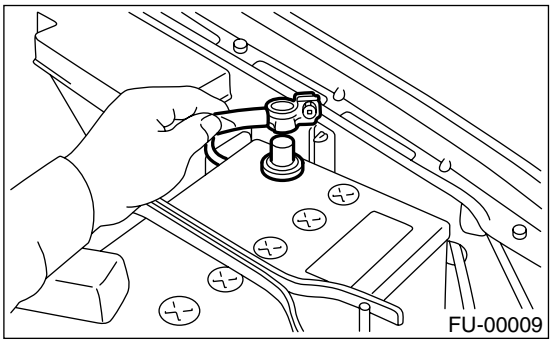
B: INSTALLATION

Install in the reverse order of removal.

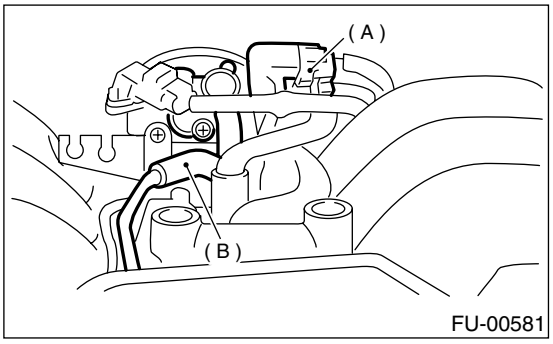
11.Idle Air Control Solenoid Valve

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connector (A) from idle air control solenoid valve.
3) Disconnect air by-pass hose (B) from idle air control solenoid valve.
4) Remove idle air control solenoid valve from throttle body.



B: INSTALLATION

Install in the reverse order of removal.

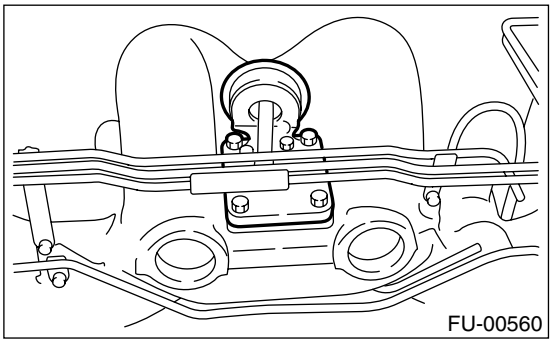
NOTE:
When removing idle air control solenoid valve, replace gasket with new one.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

12.Induction Valve

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
3) Remove induction valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

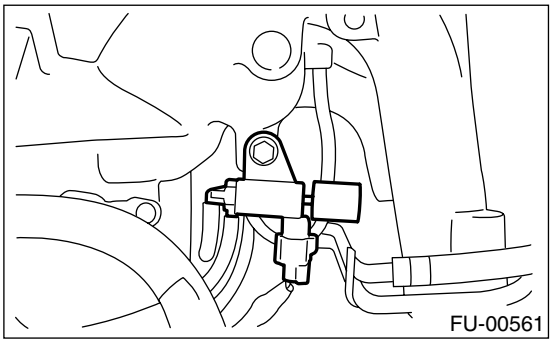
NOTE:
When removing induction valve, replace gasket with new one.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

13.Induction Valve Control Solenoid

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove intake manifold.
<Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
3) Disconnect hose which connectors induction valve to induction valve control solenoid.
4) Disconnect connector from induction valve control solenoid.
5) Remove induction valve control solenoid from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
When removing induction valve control solenoid, replace gasket with new one.

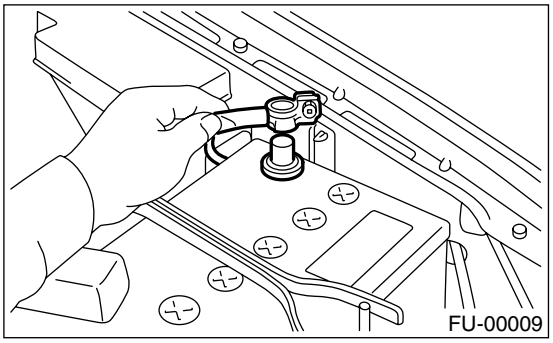
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

14.Fuel Injector

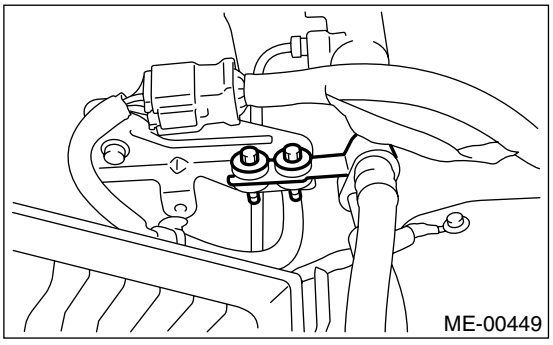
A: REMOVAL

1. RH SIDE

1) Release fuel pressure.
<Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect ground cable from battery.

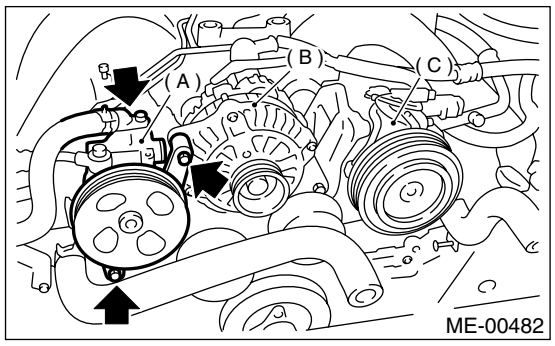


4) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
5) Remove power steering pump and tank from brackets.
(1) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
(2) Remove power steering oil pipe with bracket.



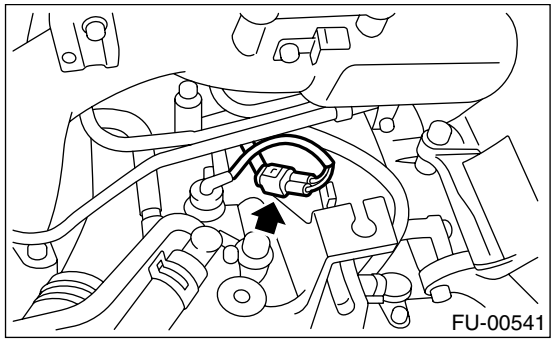
(3) Remove bolts which install power steering pump bracket.

CAUTION:
Do not disconnect power steering hose.

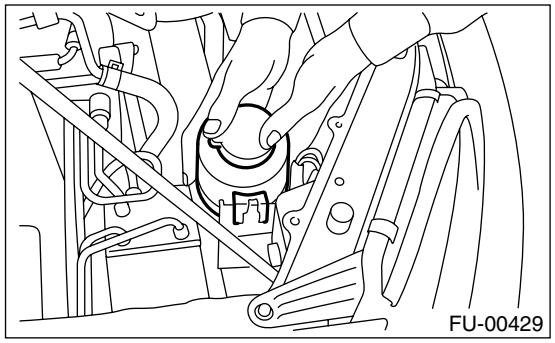


(A) Power steering pump
(B) Generator
(C) A/C compressor

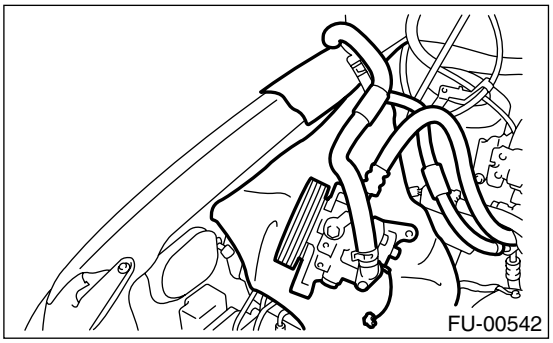
(4) Disconnect power steering pump switch connector.



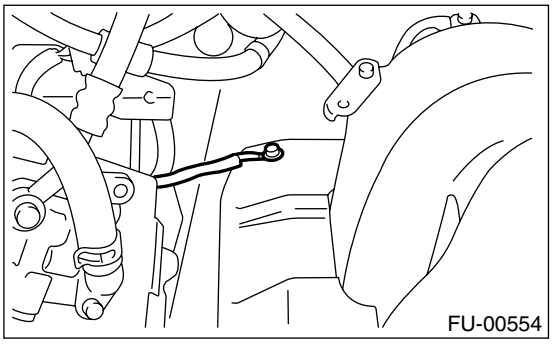
(5) Remove power steering tank from the bracket by pulling it upward.



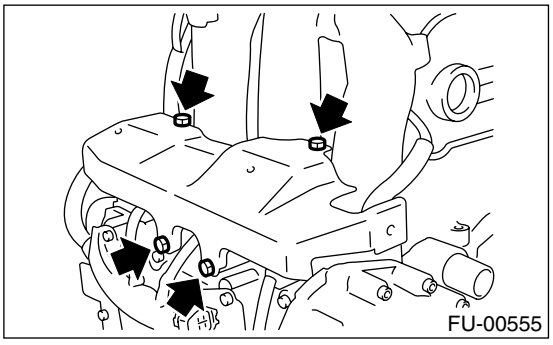
(6) Place power steering pump on the right side wheel apron.



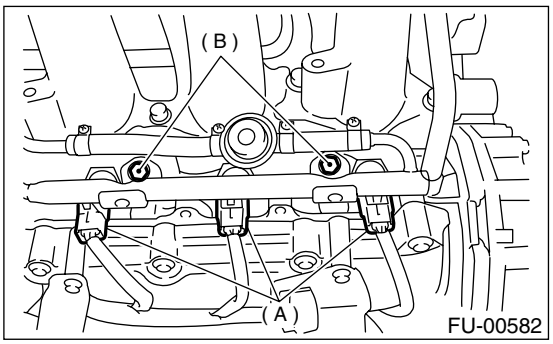
6) Remove ground cable from fuel pipe protector RH.



7) Remove fuel pipe protector RH.



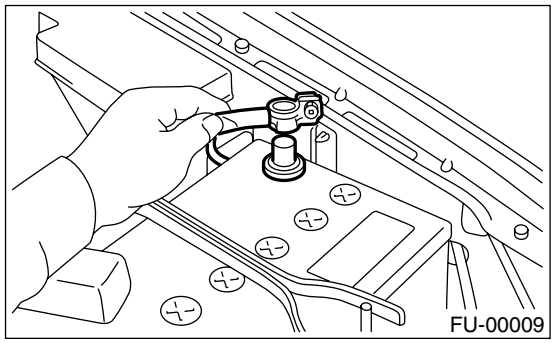
8) Disconnect connector (A) from fuel injector.
9) Remove bolt (B) which holds injector pipe onto cylinder head.



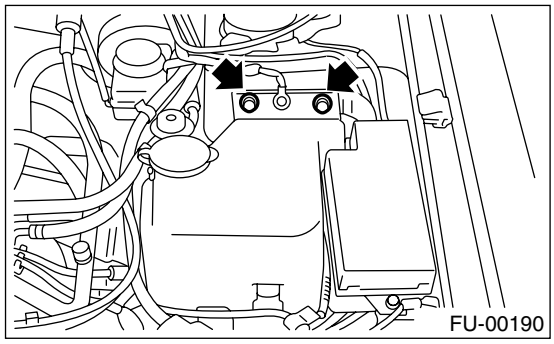
10) Remove fuel injector while lifting up fuel injector pipe.

2. LH SIDE

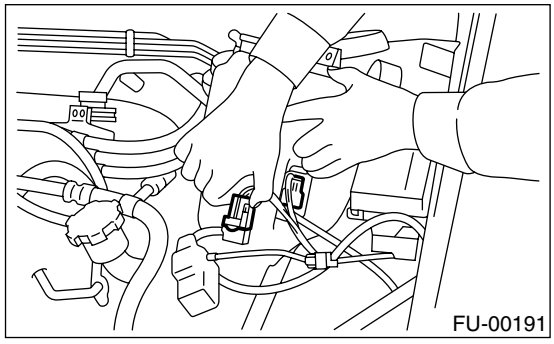
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELESING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect ground cable from battery.



4) Remove two bolts which install washer tank on body.

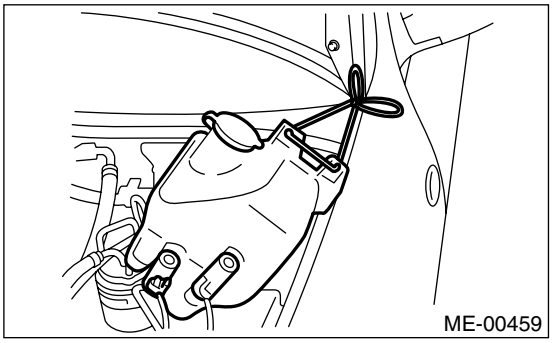


5) Disconnect connector from front window washer motor.
6) Disconnect connector from rear gate glass washer motor.

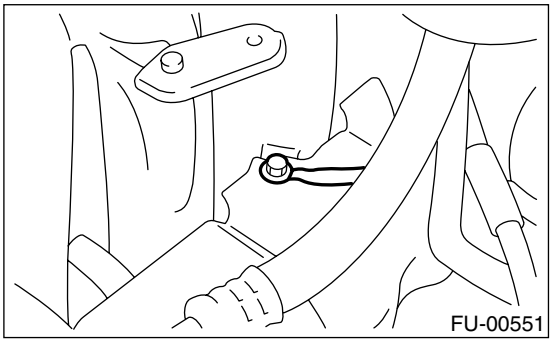


7) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

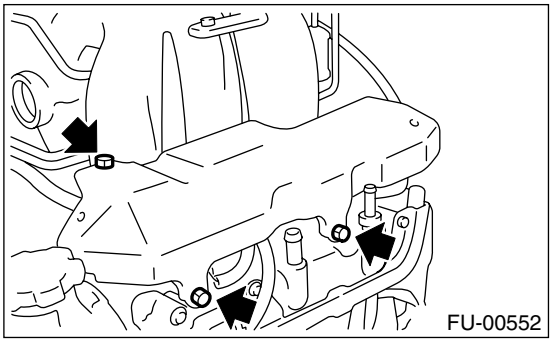
8) Move washer tank upward.



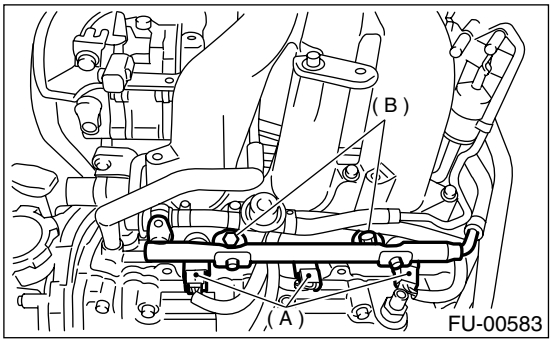
9) Remove ground cable from fuel pipe protector LH.



10) Remove fuel pipe protector LH.



11) Disconnect connector (A) from fuel injector.
12) Remove bolt (B) which holds injector pipe onto cylinder head.



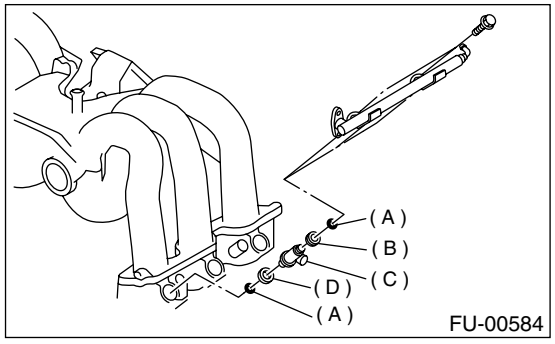
13) Remove fuel injector while lifting up fuel injector pipe.

B: INSTALLATION

1. RH SIDE

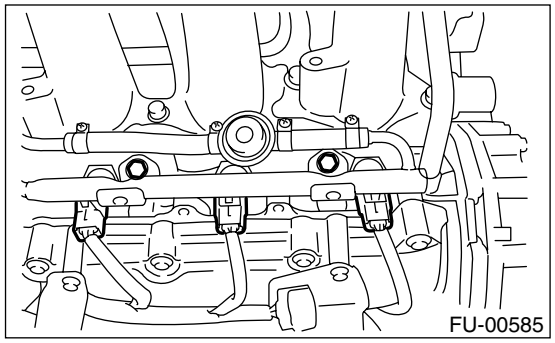
Install in the reverse order of removal.

NOTE:
Replace O-rings and insulators with new ones.

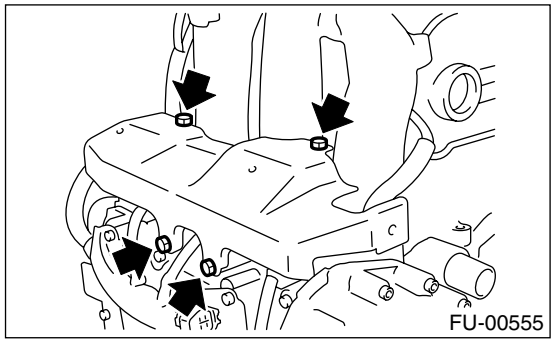


(A) O-ring
(B) Injection rubber
(C) Fuel injector
(D) Insulator

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



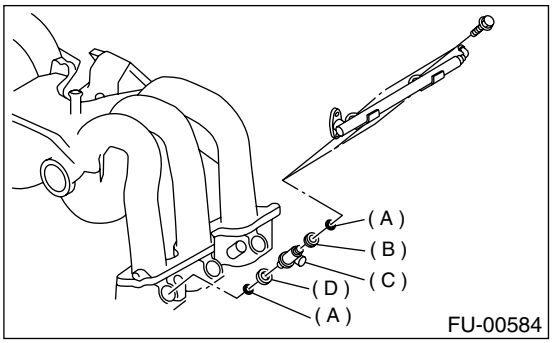
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



2. LH SIDE

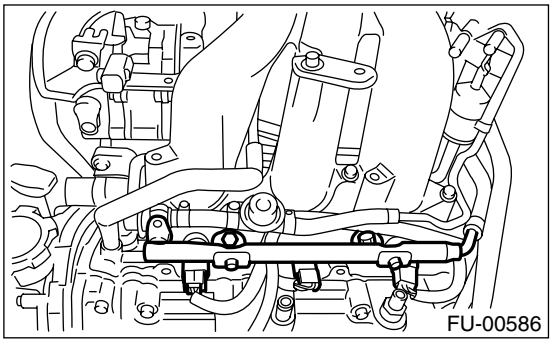
Install in the reverse order of removal.

NOTE:
Replace O-rings and insulators with new ones.

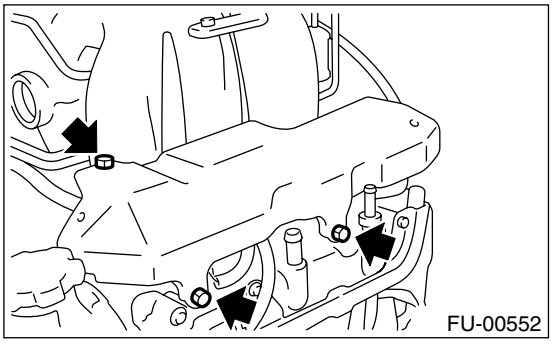


(A) O-ring
(B) Injection rubber
(C) Fuel injector
(D) Insulator

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



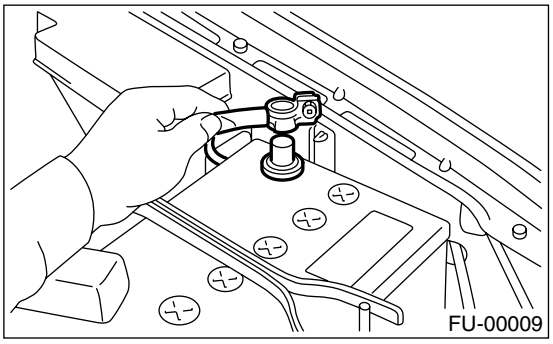
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



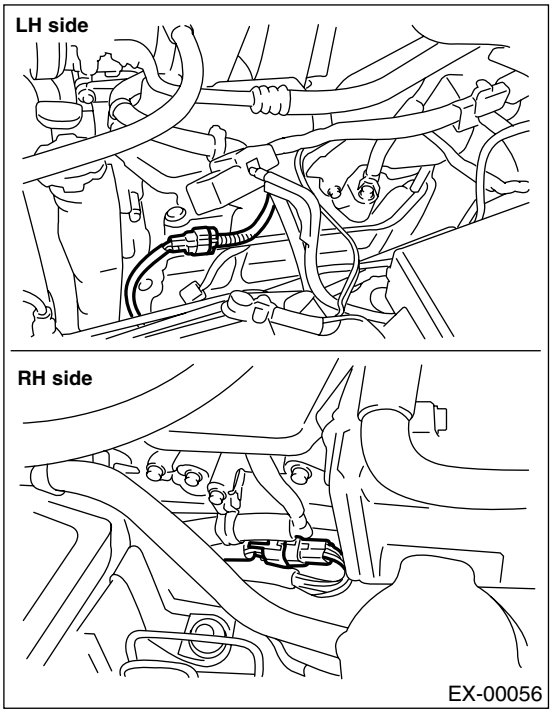
15.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect ground cable from battery.

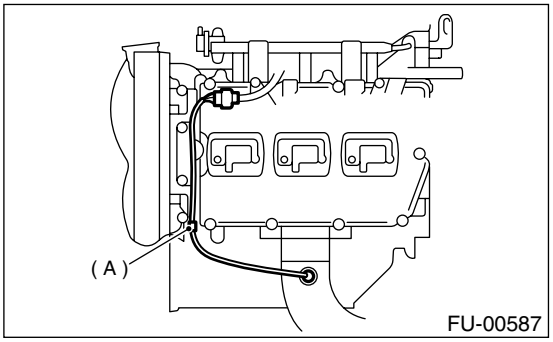


2) Disconnect connector from front oxygen (A/F) sensor.

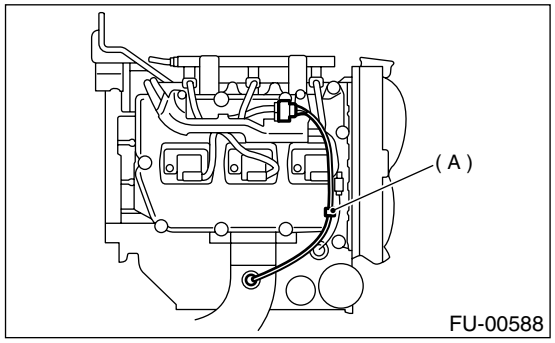


3) Lift-up the vehicle.
4) Remove undercover.
5) Separate harness from clip (A).

• LH side



• RH side

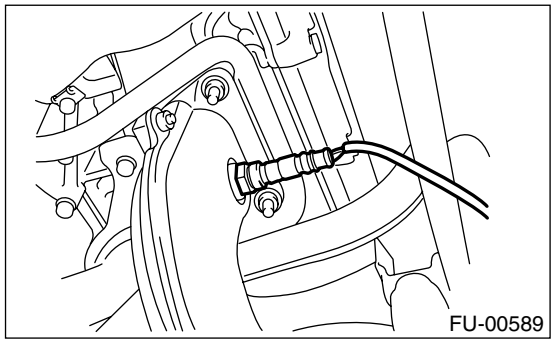


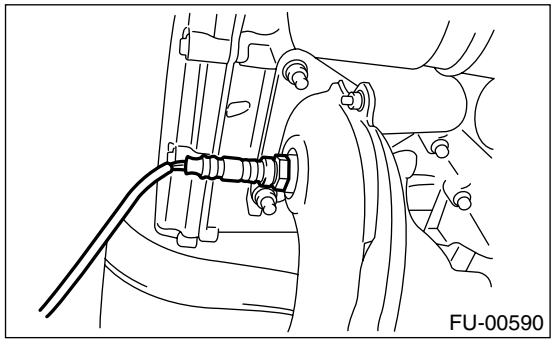
6) Apply SUBARU CRC or its equivalent to threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

7) Remove front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.





B: INSTALLATION

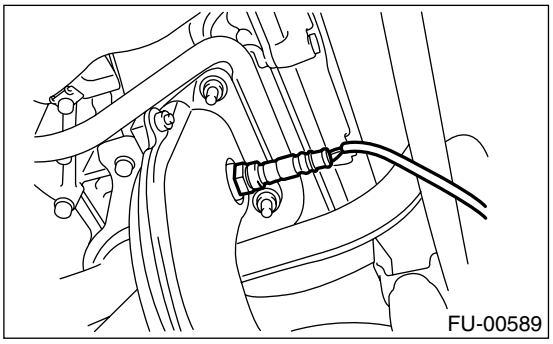
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to threaded portion of front oxygen (A/F) sensor to make the next removal easier.

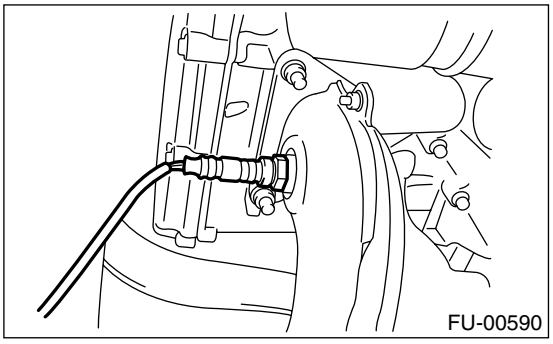
Anti-seize compound:
SS-30 by JET LUBE

CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

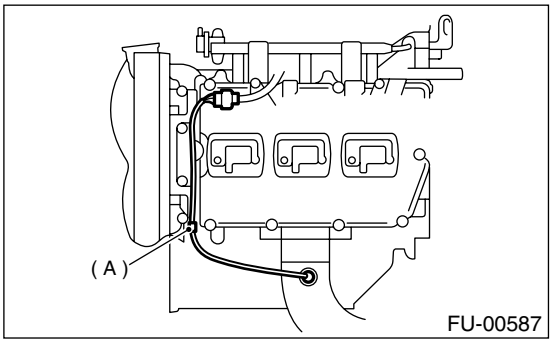
2) Install front oxygen (A/F) sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)


FU-00589

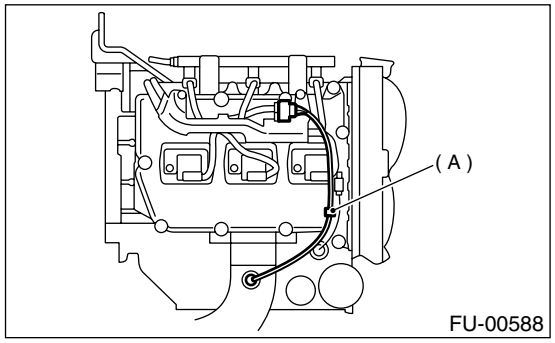

FU-00590

3) Secure harness to clip (A).
• LH side



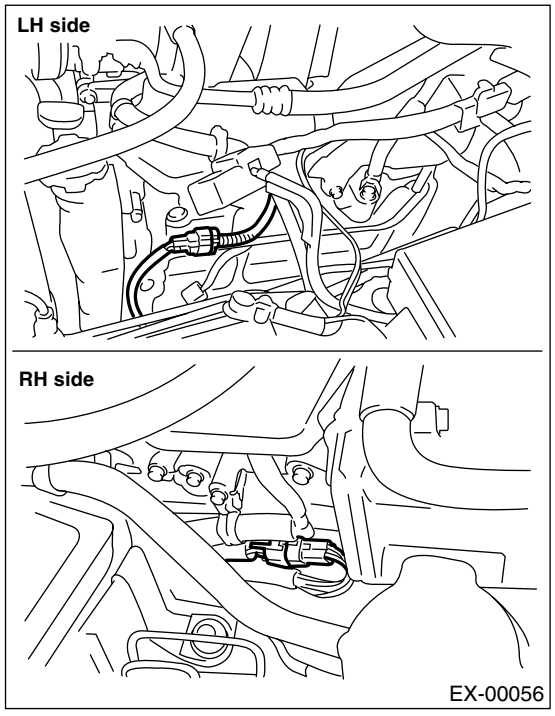
FU-00587

• RH side



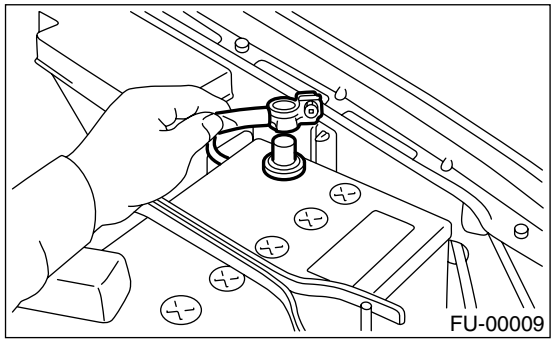
FU-00588

4) Install undercover.
5) Lower the vehicle.
6) Connect connector of front oxygen (A/F) sensor.



EX-00056

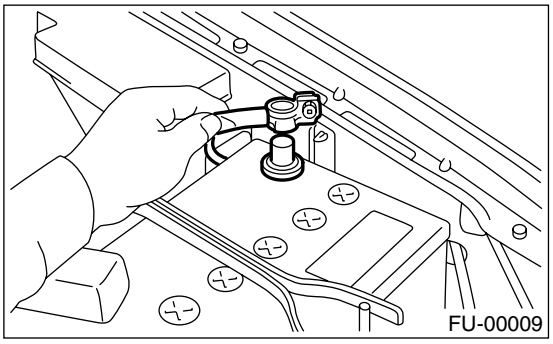
7) Connect battery ground cable.


FU-00009

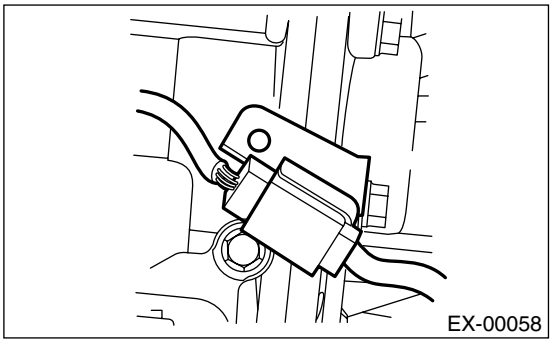
16.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect ground cable from battery.



2) Disconnect connector from rear oxygen sensor.

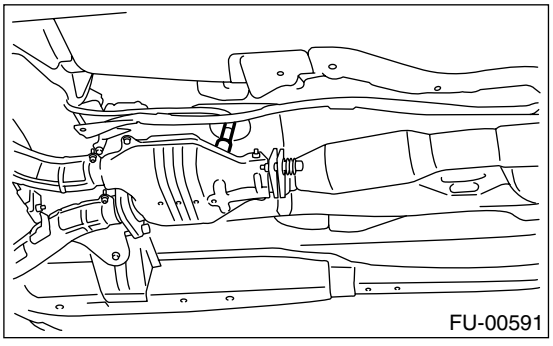


3) Lift-up the vehicle.
4) Apply SUBARU CRC or its equivalent to threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove rear oxygen sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

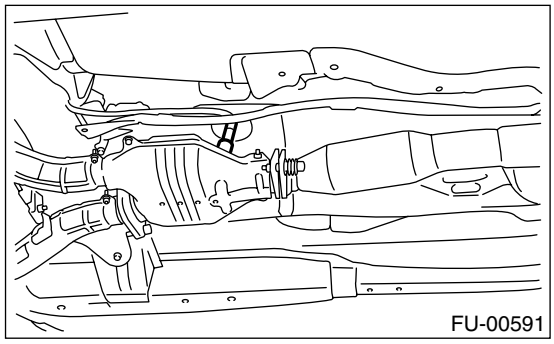
1) Before installing rear oxygen sensor, apply anti-seize compound only to threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

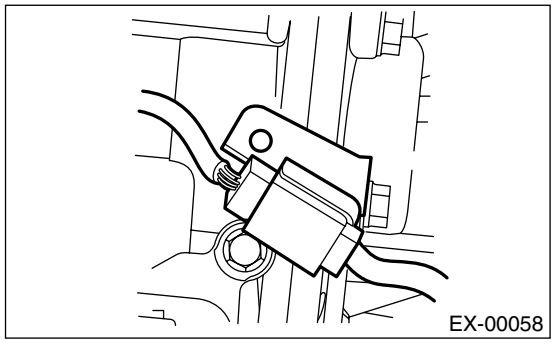
Anti-seize compound:
SS-30 by JET LUBE

2) Install rear oxygen sensor.

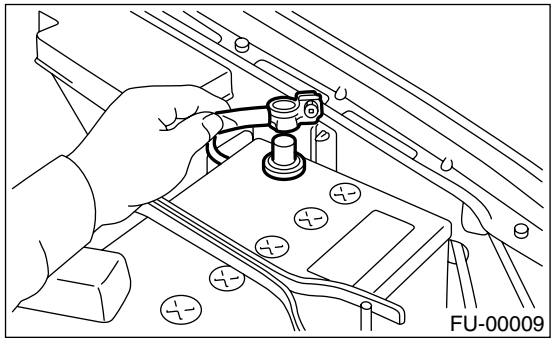
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Connect connector to rear oxygen sensor.



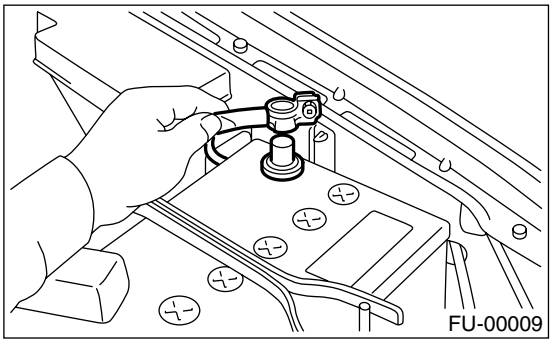
4) Lower the vehicle.
5) Connect battery ground cable.



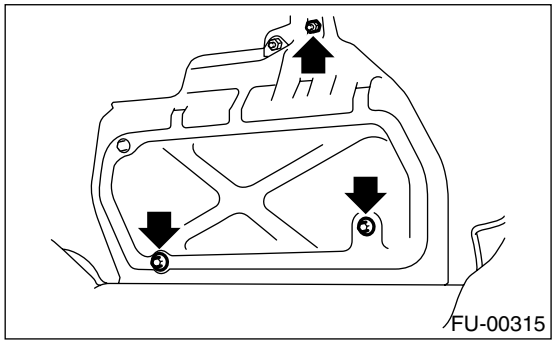
17.Engine Control Module

A: REMOVAL

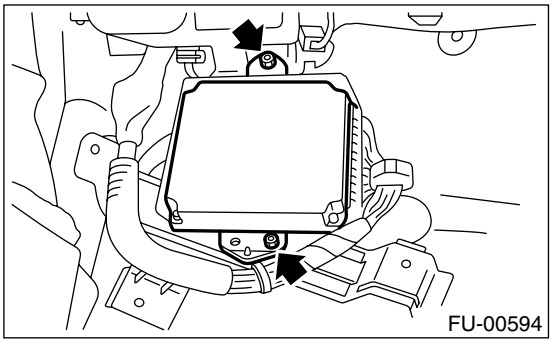
1) Disconnect ground cable from battery.



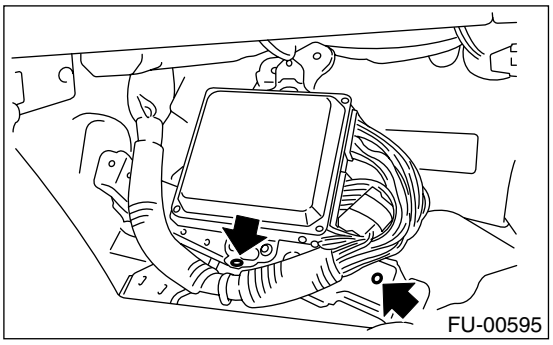
2) Remove lower inner trim of passenger side.
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Detach floor mat of front passenger seat.
4) Remove protect cover.



5) Remove nuts which hold ECM to bracket.



6) Remove clip from bracket.



7) Disconnect ECM connectors and take out ECM.

B: INSTALLATION

Install in the reverse order of removal.

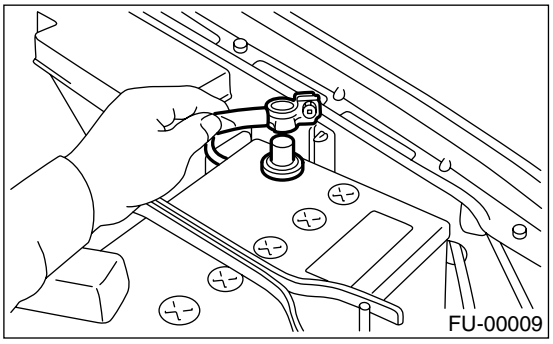
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

Tightening torque:
5 N·m (0.51 kgf-m, 3.7 ft-lb)

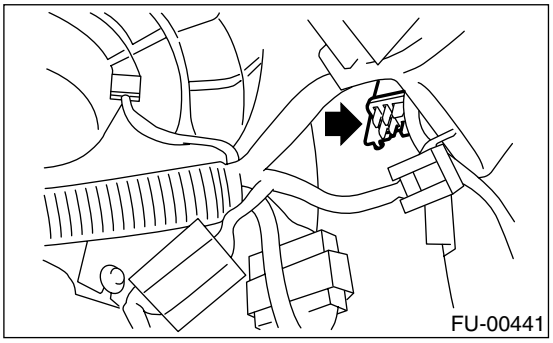
18.Main Relay

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove lower inner trim of passenger side. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Disconnect connectors from main relay.
4) Remove bolt which holds main relay bracket on body.



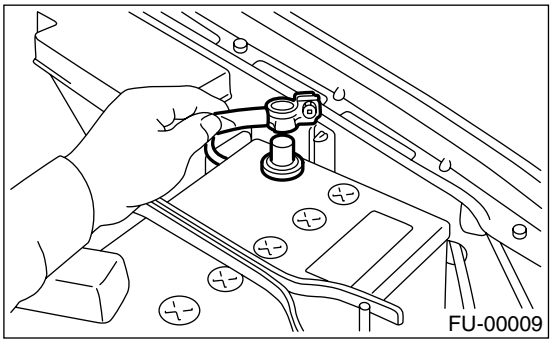
B: INSTALLATION

Install in the reverse order of removal.

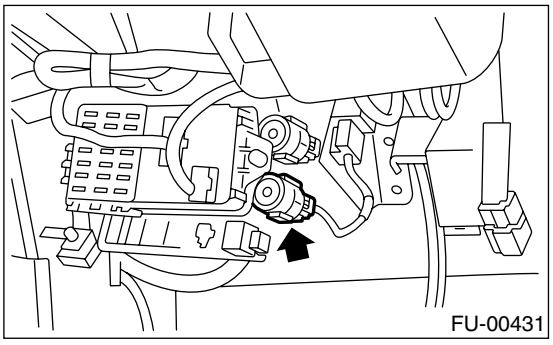
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove lower cover. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
3) Disconnect connector from fuel pump relay.



4) Remove fuel pump relay from mounting bracket.

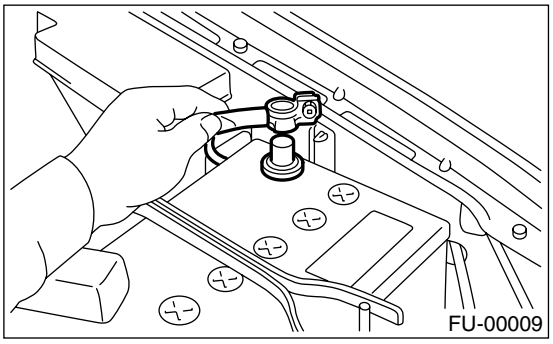
B: INSTALLATION

Install in the reverse order of removal.

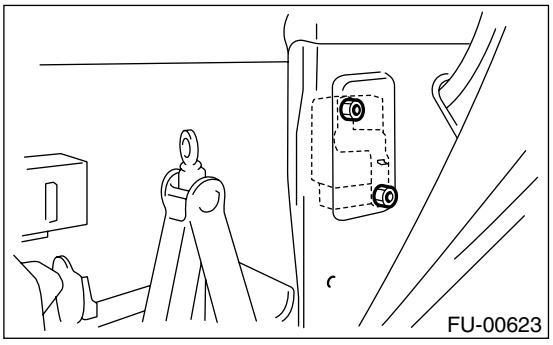
20.Fuel Pump Controller

A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
3) Disconnect connector from fuel pump control unit.



4) Remove connector of fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

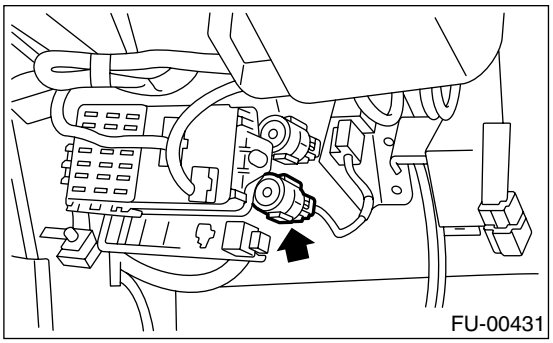
21.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect connector from fuel pump relay.

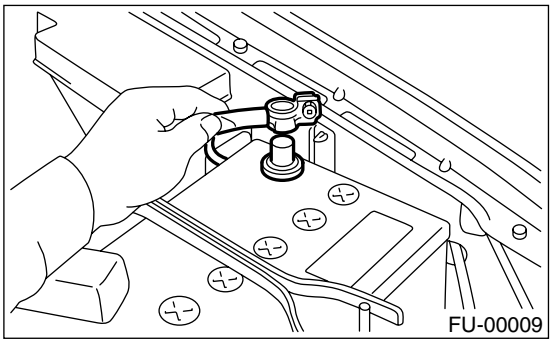


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn ignition switch to OFF.

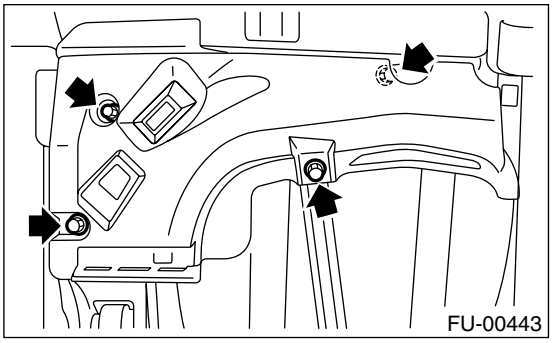
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

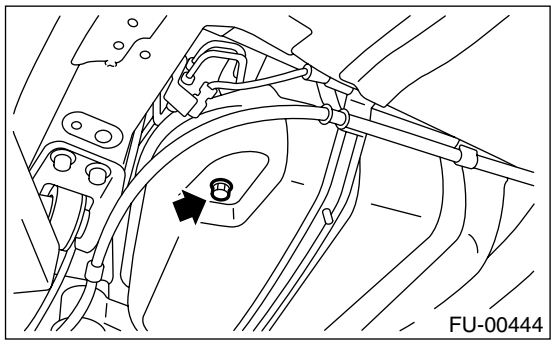
1) Set vehicle on the lift.
2) Disconnect ground cable from battery.



3) Lift-up the vehicle.
4) Remove front right side fuel tank cover.

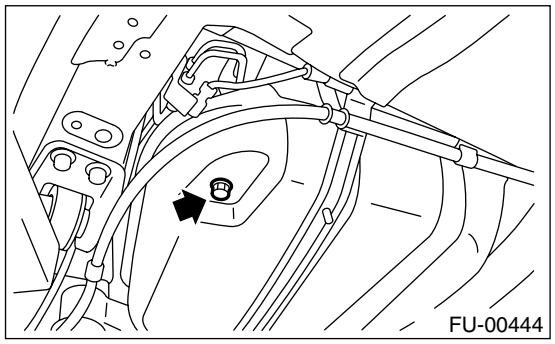


5) Drain fuel from fuel tank.
Set a container under the vehicle and remove drain plug from fuel tank.

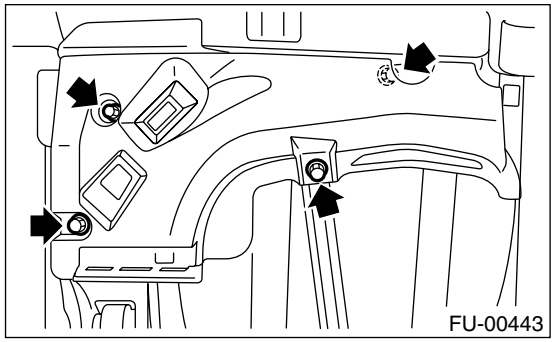


6) Tighten fuel drain plug and install front right side tank cover.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

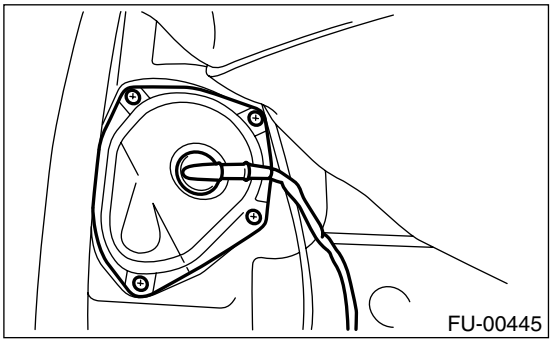


Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

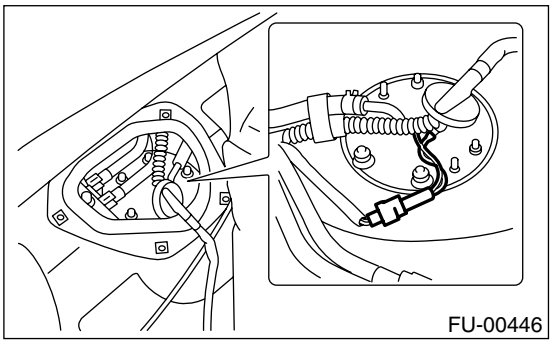


7) Lower the vehicle.

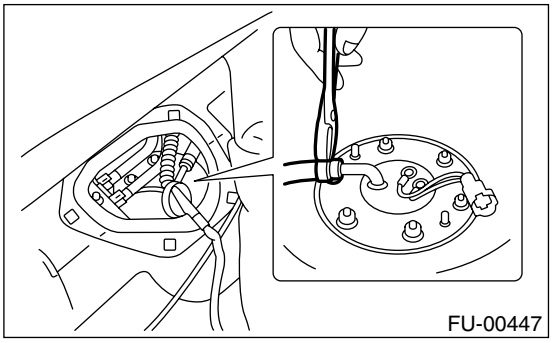
8) Remove sub service hole cover.



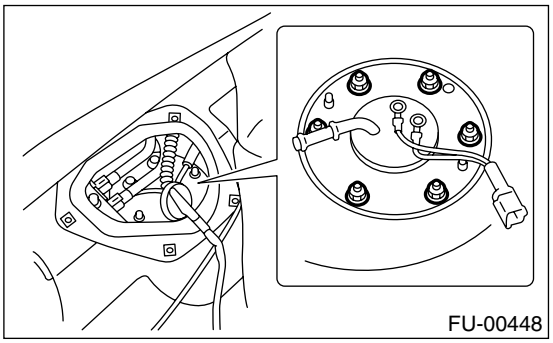
9) Disconnect connector from fuel sub level sensor.



10) Disconnect fuel jet pump hose.



11) Remove fuel sub level sensor.

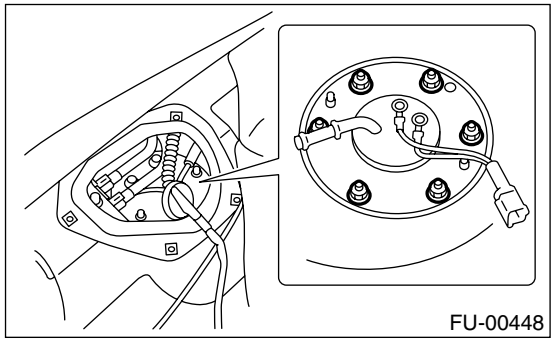


12) Drain fuel from fuel tank by using hand pump.

WARNING:
Do not use a motor pump when draining fuel.

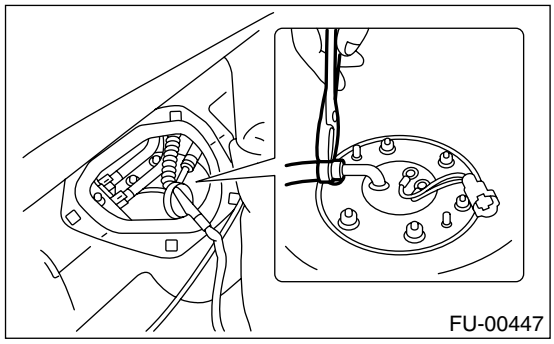
13) After draining fuel, reinstall fuel sub level sensor.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

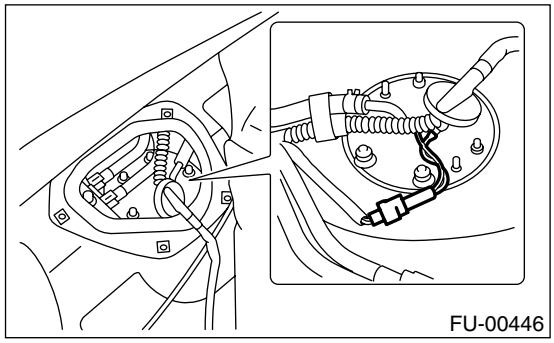


NOTE:
If you have not removed fuel tank yet, proceed with the procedure below for installation.

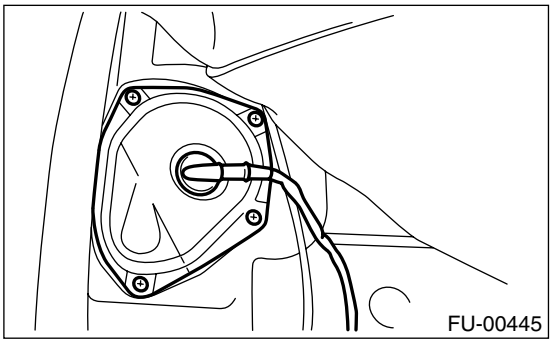
(1) Connect fuel jet pump hose.



(2) Connect connector from fuel sub level sensor.



(3) Install sub service hole cover.

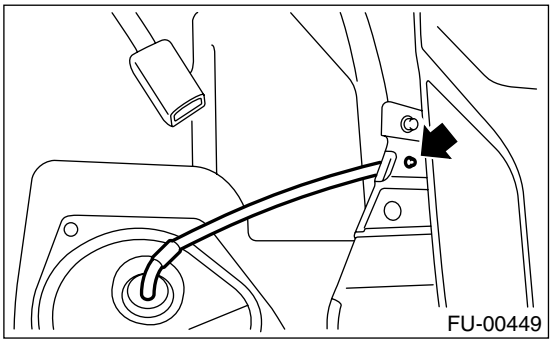


(4) Set rear seat and floor mat.

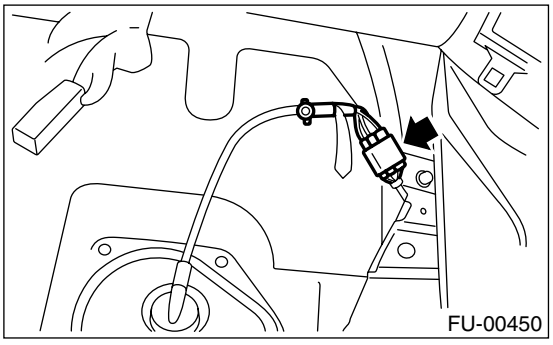
22.Fuel Tank

A: REMOVAL

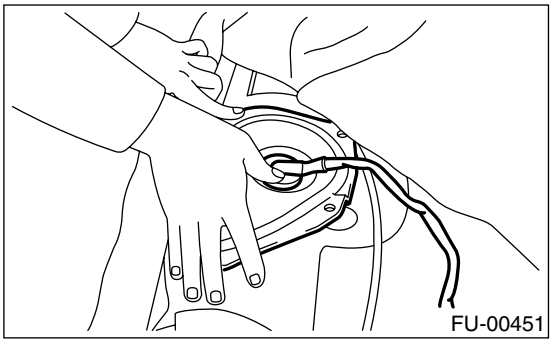
1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from fuel tank. <Ref. to FU(H6DO)-50, DRAINING FUEL, OPERATION, Fuel.>
4) Remove holder clip which secures fuel tank cord on bracket.



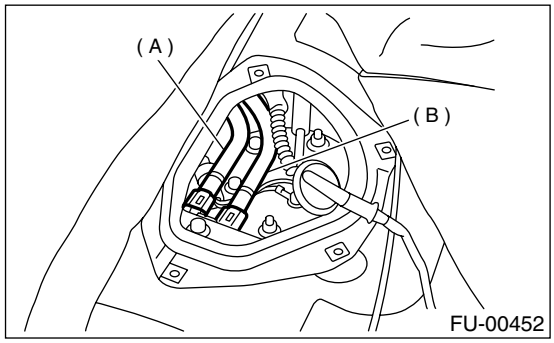
5) Disconnect connector of fuel tank cord to rear harness.



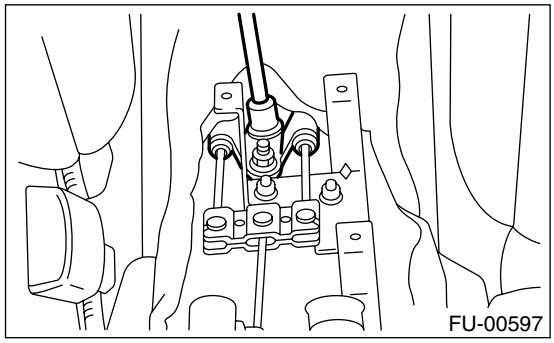
6) Push grommet which holds fuel tank cord on service hole cover into body side.



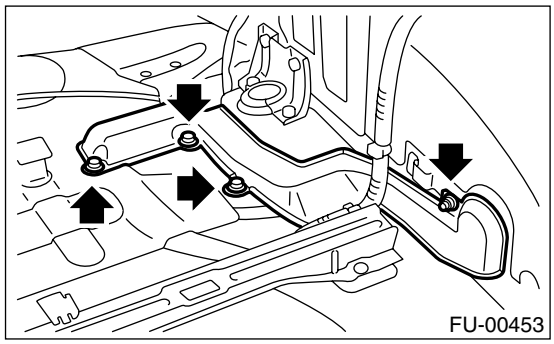
7) Using ST, separate quick connector of fuel delivery (A) and return hose (B).<Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
ST 42099AE000 CONNECTOR REMOVER



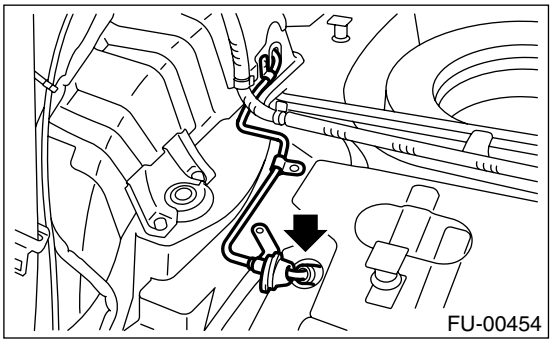
8) Remove parking brake cable.
(1) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
(2) Remove parking brake bracket and disconnect parking brake cable from equalizer. <Ref. to PB-6, REMOVAL, Parking Brake Cable.>



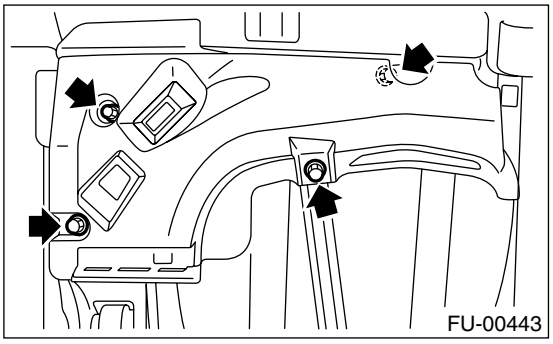
9) Remove trunk trim. (Sedan model)
<Ref. to EI-59, REMOVAL, Trunk Trim.>
10) Remove rear quarter lower trim.
<Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
11) Remove pipe protector.



12) Using ST, separate quick connector of evaporation pipe (A). <Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
ST 42099AE000 CONNECTOR REMOVER



13) Remove wheel nuts from rear wheels.
14) Lift-up the vehicle.
15) Remove rear wheel.
16) Remove front side fuel tank cover.

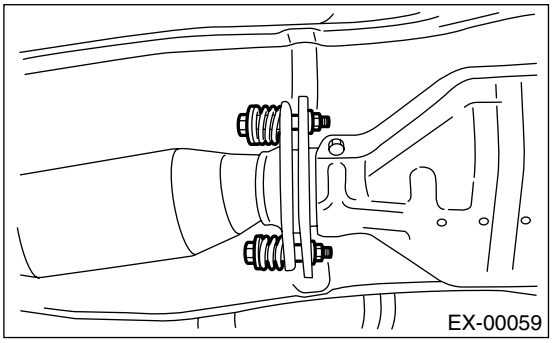


17) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

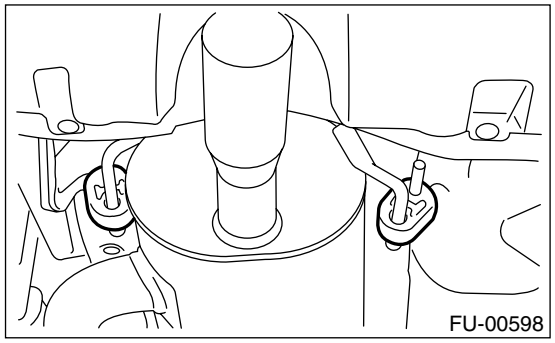
SUBARU CRC (Part No. 004301003)

(1) Separate rear exhaust pipe from center exhaust pipe.

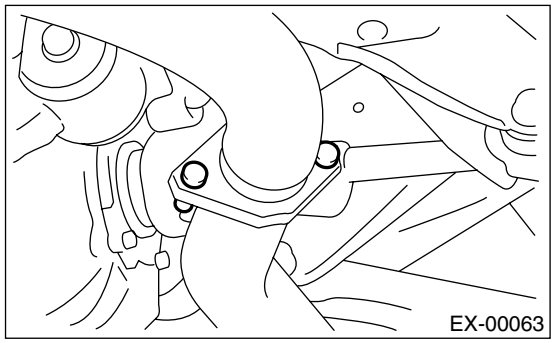


(2) Remove left and right rubber cushions.

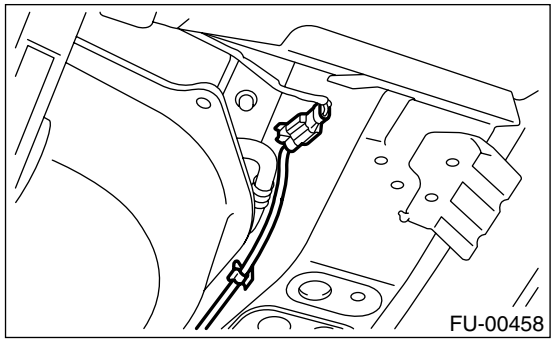
CAUTION:
Be careful not to pull down muffler.



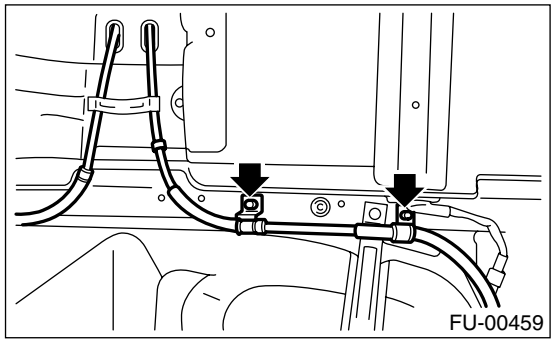
(3) Remove front rubber cushion and detach muffler assembly.



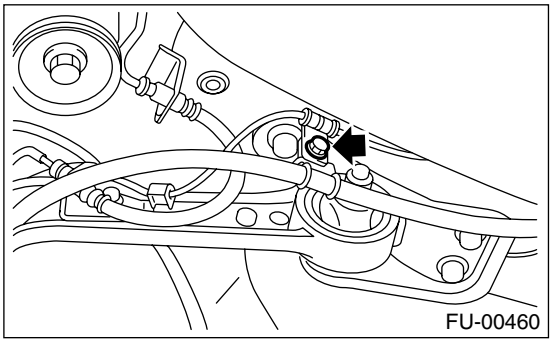
18) Remove propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
19) Disconnect connector from ABS sensor.



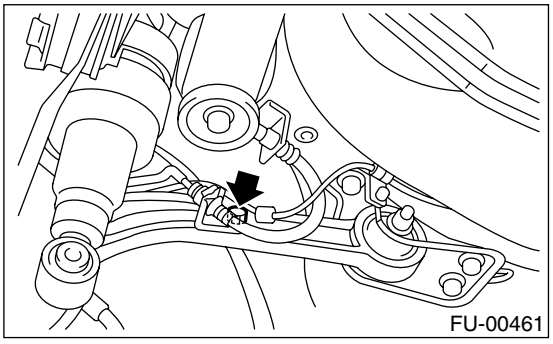
20) Remove bolts which hold parking brake cable holding bracket.
21) Remove parking brake cable from cabin by forcibly pulling it backward.



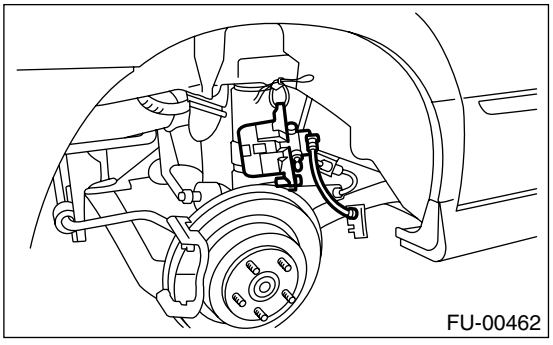
22) Remove bolts which hold parking brake cable holding bracket.



23) Remove bolts which hold rear brake hoses holding bracket.



24) Remove rear brake caliper, then tie it up to the body side of the vehicle as shown in figure.

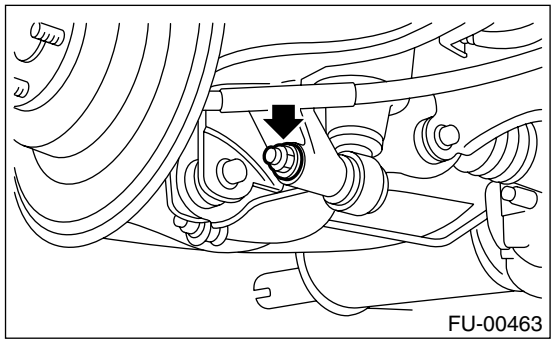


25) Remove rear suspension assembly.

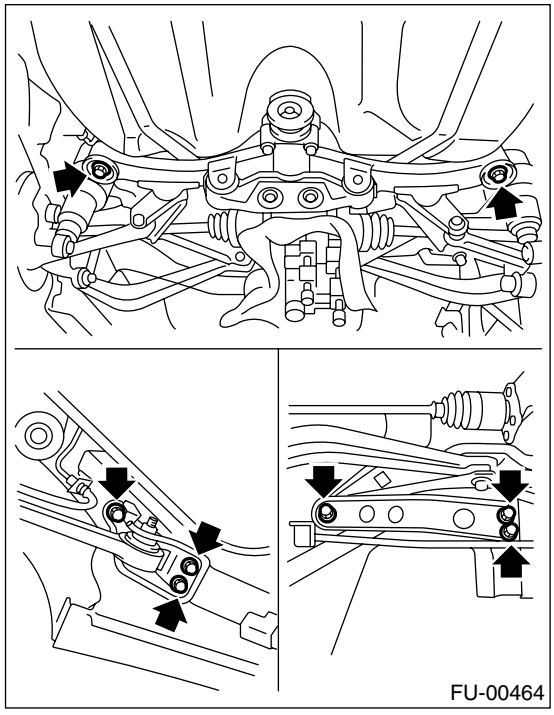
WARNING:
A helper is required to perform this work.

(1) Support rear differential with transmission jack.

(2) Remove bolt which holds rear shock absorber to rear suspension arm.

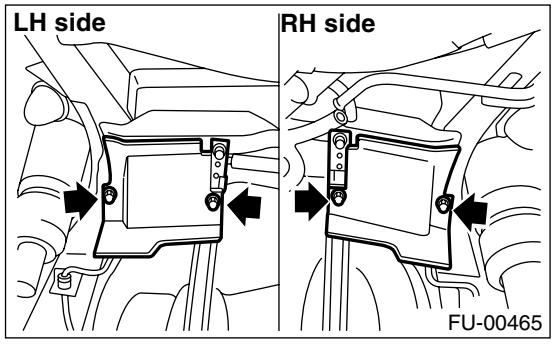


(3) Remove bolts which secure rear suspension assembly to body.

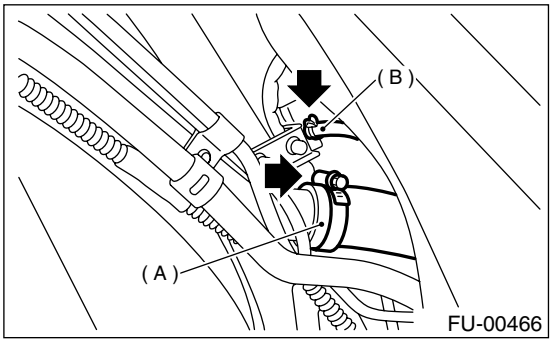


(4) Remove rear suspension assembly.

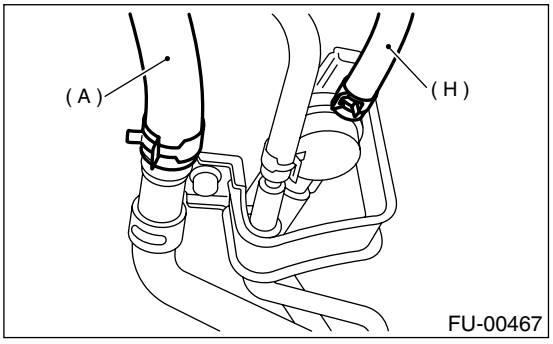
26) Remove rear side fuel tank cover.



27) Disconnect fuel filler hose (A) and fuel tank pressure sensor (B) hose.

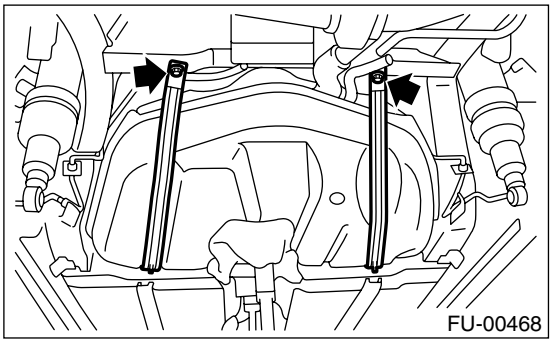


28) Disconnect air vent hose (A) from evaporation pipe assembly and disconnect evaporation hose (I) from pressure control solenoid valve.



29) Support fuel tank with transmission jack, remove bolts from bands and dismount fuel tank from the vehicle.

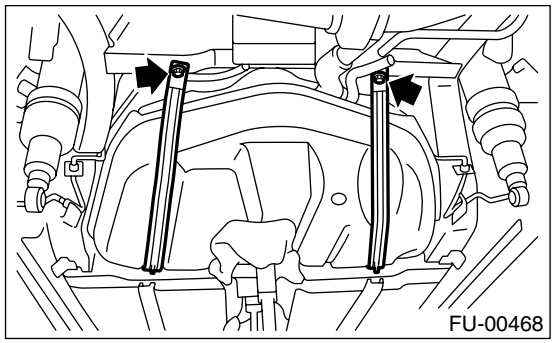
WARNING:
A helper is required to perform this work.



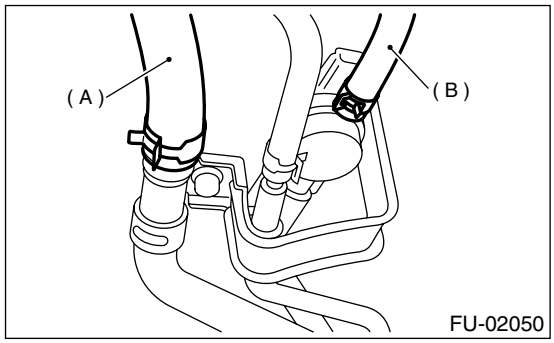
B: INSTALLATION

1) Support fuel tank with transmission jack and push fuel tank harness into access hole with grommet.
2) Set fuel tank and temporarily tighten bolts of fuel tank bands.

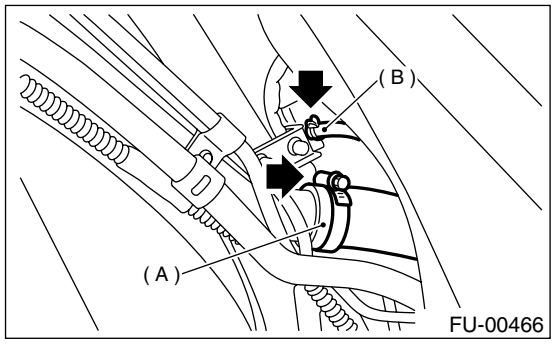
WARNING:
A helper is required to perform this work.



3) Connect air vent hose (A) to evaporation pipe assembly and connect evaporation hose (B) to pressure control solenoid valve.

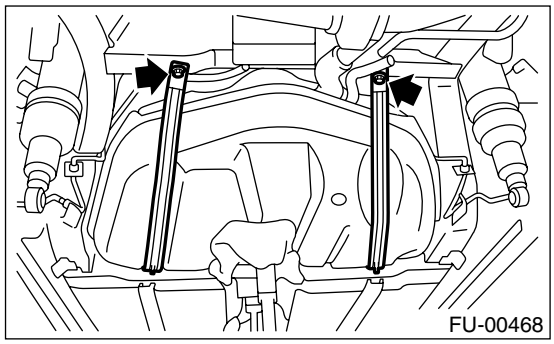


4) Connect fuel filler hose (A) and fuel tank pressure sensor hose (B).



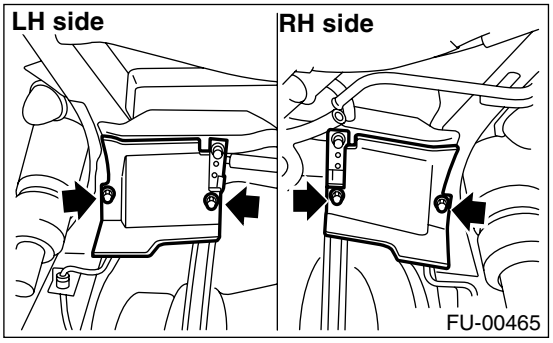
5) Tighten band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



6) Install rear side fuel tank cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

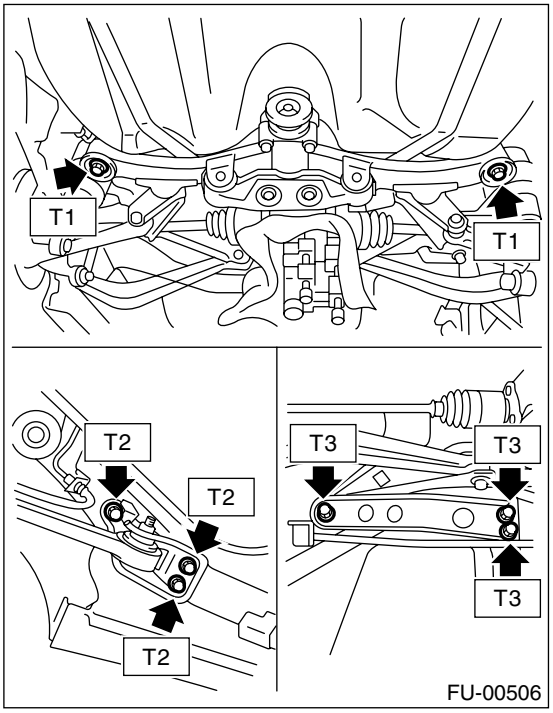


7) Install rear suspension assembly.

WARNING:
A helper is required to perform this work.

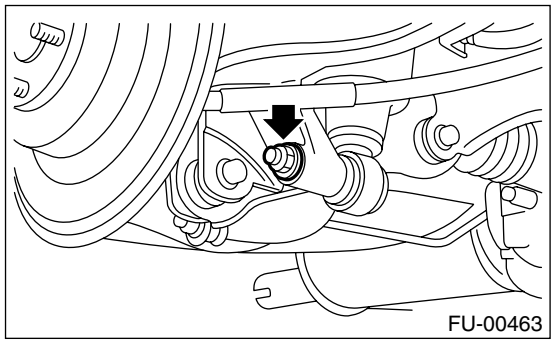
(1) Support rear suspension assembly and then tighten bolts which secure rear suspension assembly.

Tightening torque:
T1: 172 N·m (17.5 kgf-m, 127 ft-lb)
T2: 108 N·m (11.0 kgf-m, 80 ft-lb)
T3: 66 N·m (6.7 kgf-m, 48 ft-lb)

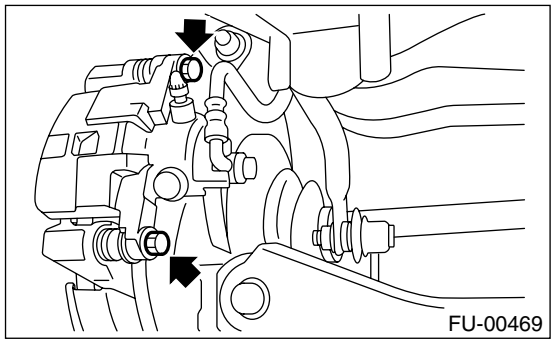


(2) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-14, INSTALLATION, Link Upper.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)

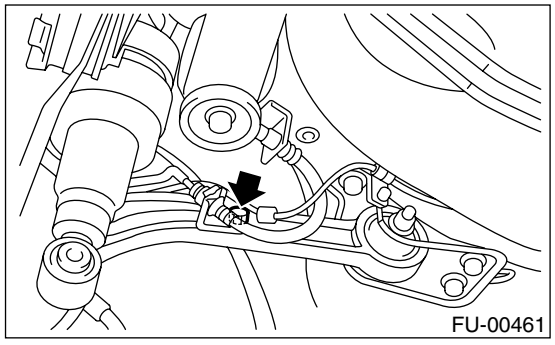


8) Install rear brake caliper. <Ref. to BR-22, INSTALLATION, Rear Disc Brake Assembly.>



9) Tighten bolts which hold rear brake hoses holding bracket.

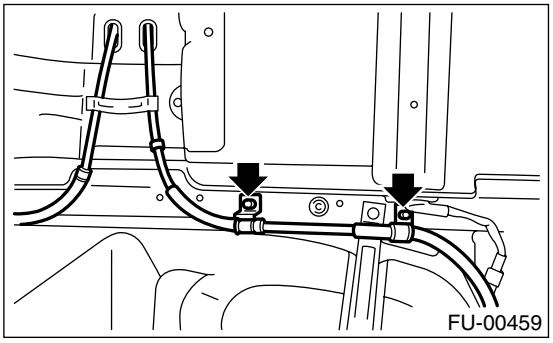
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



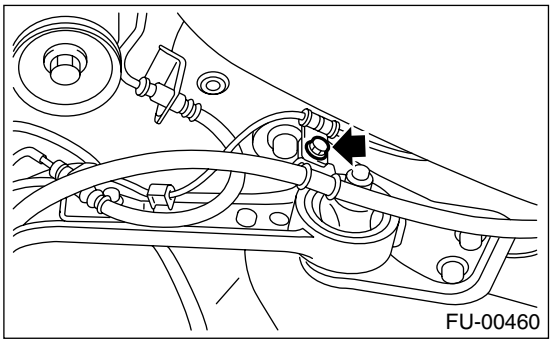
10) Install parking brake cable to cabin by forcibly pushing it forward.

11) Tighten bolts which hold parking brake cable holding bracket.

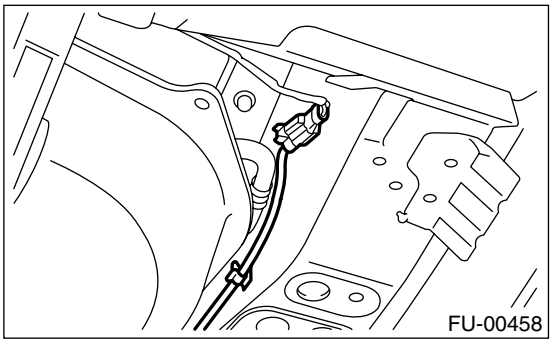
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)



12) Connect connector to ABS sensor.

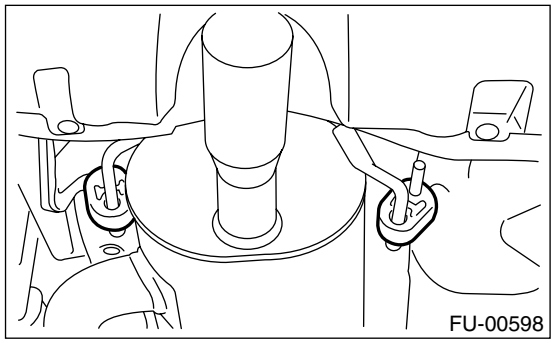


13) Install propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>,
14) Install rear exhaust pipe and muffler.

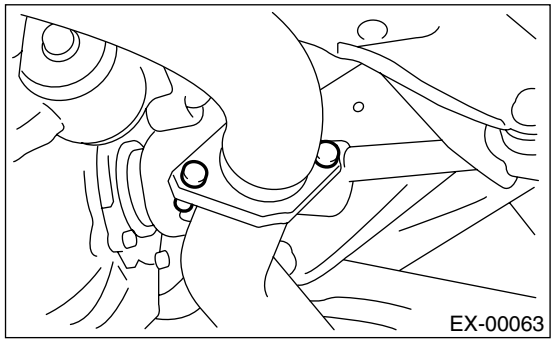
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

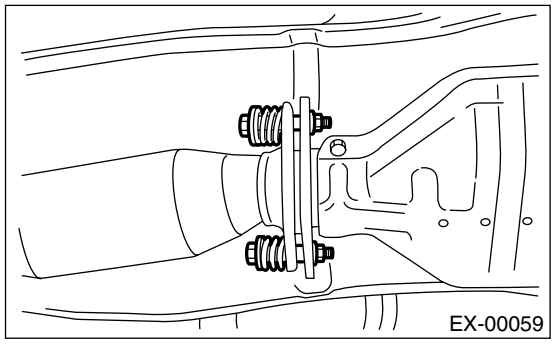


(2) Install front rubber cushion and attach muffler assembly.



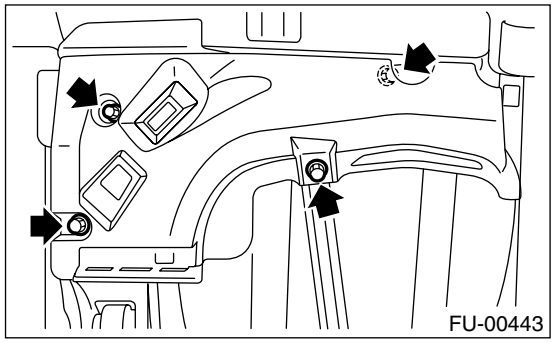
(3) Install rear exhaust pipe to front exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

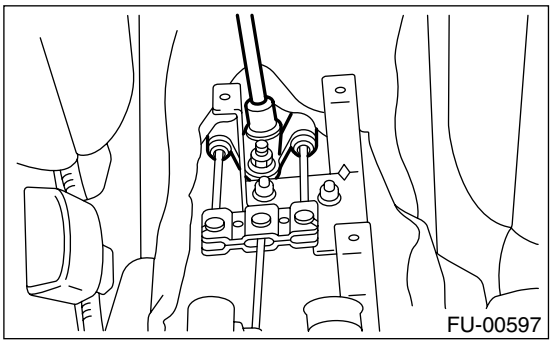


15) Install front side fuel tank cover.

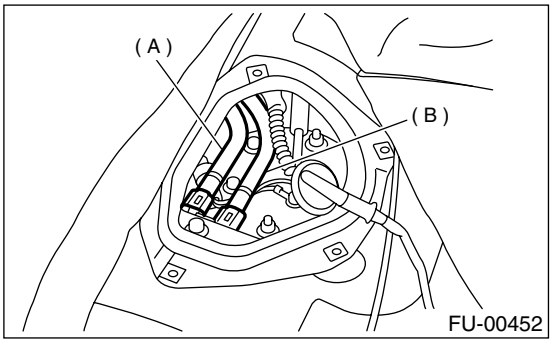
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



16) Install rear wheel.
17) Lower the vehicle.
18) Tighten wheel nuts.
19) Install parking brake cable. <Ref. to PB-6, INSTALLATION, Parking Brake Cable.>

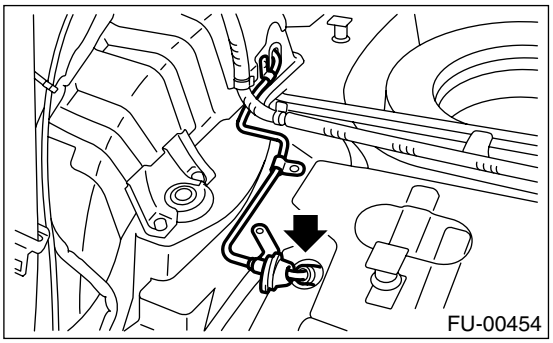


20) Install console box. <Ref. to EI-45, INSTALLATION, Console Box.>
21) Connect fuel hoses and hold them with quick connector. <Ref. to FU(H6DO)-76, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

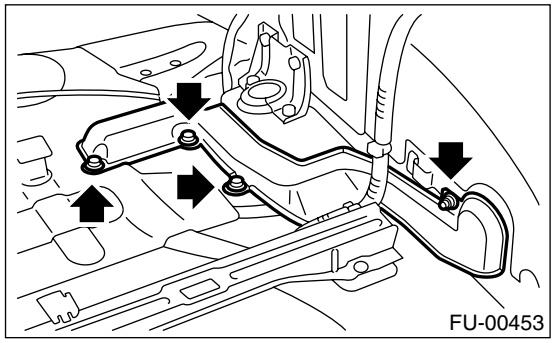


(A) Delivery hose
(B) Return hose

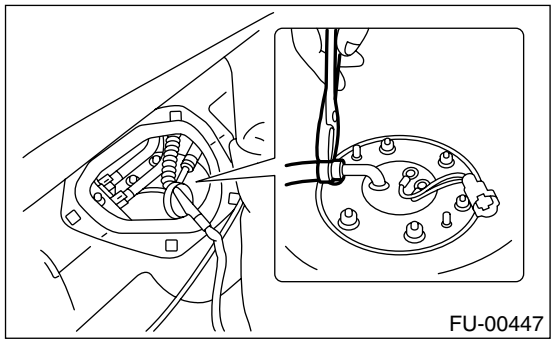
22) Connect evaporation pipe and hold it with quick connector. <Ref. to FU(H6DO)-76, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



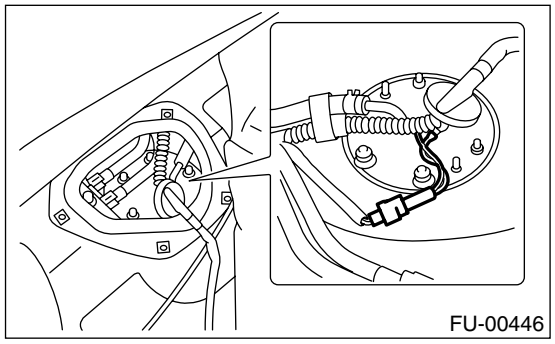
23) Install pipe protector.



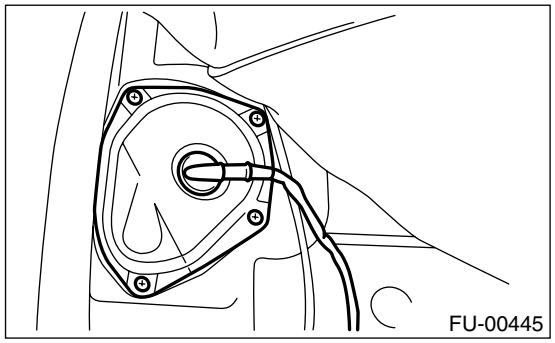
24) Install trunk trim. (Sedan model) <Ref. to EI-59, INSTALLATION, Trunk Trim.>
25) Install rear quarter lower trim. (Wagon model) <Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
26) Connect fuel jet pump hose.



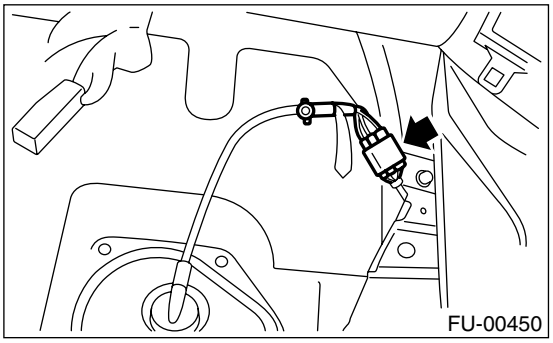
27) Connect connector to fuel sub level sensor.



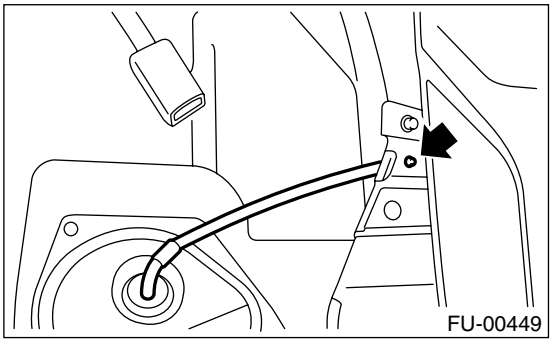
28) Install sub service hole cover.



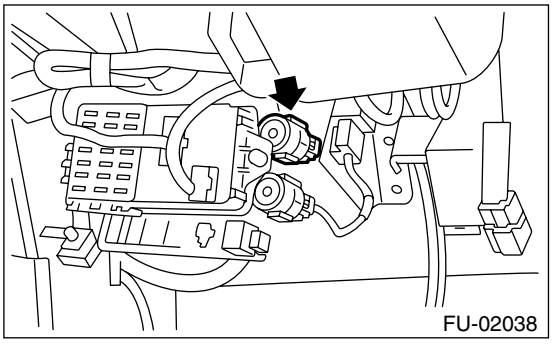
29) Connect connectors to fuel tank cord and plug service hole with grommet.



30) Install holder clip which secures fuel tank cord on bracket.



31) Set rear seat and floor mat.
32) Connect connector to fuel pump relay.



33) Adjust parking brake lever stroke. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>
34) Check wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

23.Fuel Filler Pipe

A: REMOVAL

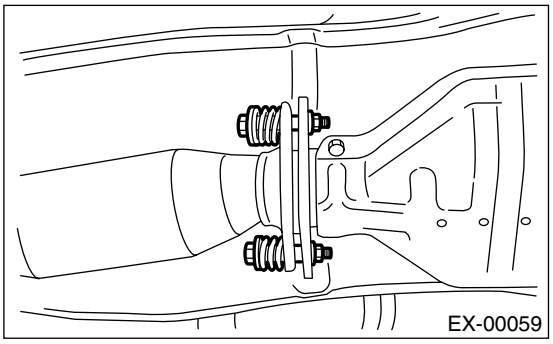
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Drain fuel from fuel tank. <Ref. to FU(H6DO)-50, DRAINING FUEL, OPERATION, Fuel.>
2) Remove rear exhaust pipe and muffler.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

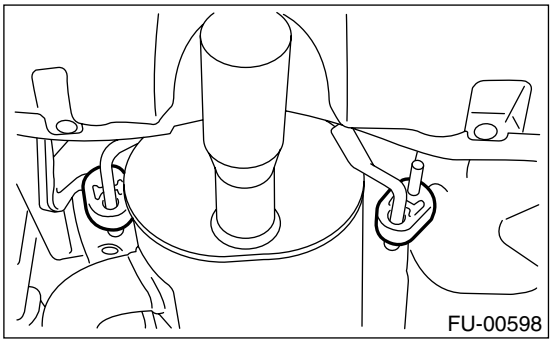
SUBARU CRC (Part No. 004301003)

(1) Separate rear exhaust pipe from front exhaust pipe.

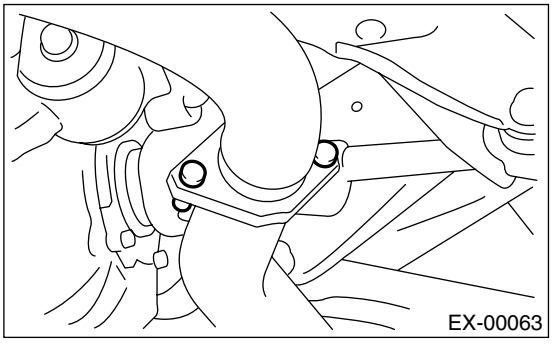


(2) Remove left and right rubber cushions.

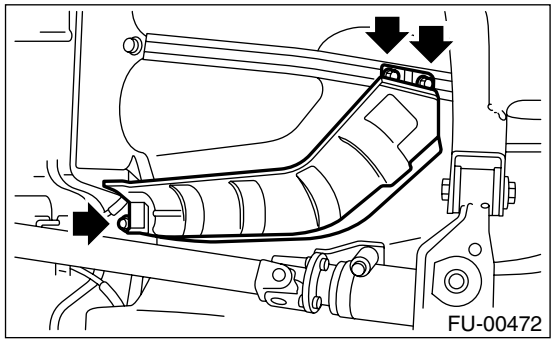
CAUTION:
Be careful not to pull down muffler.



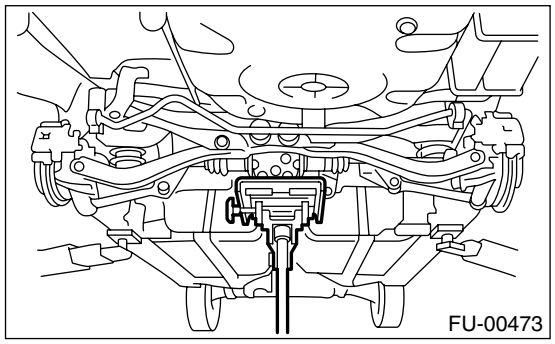
(3) Remove front rubber cushion and detach muffler assembly.



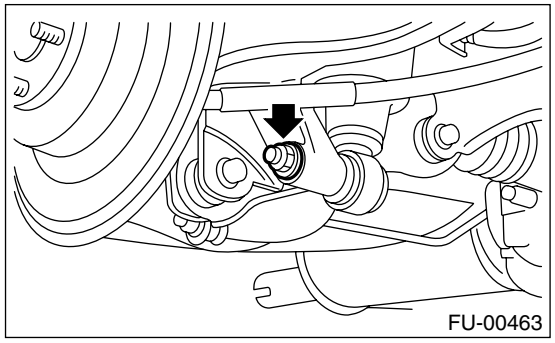
3) Remove heat sealed cover.



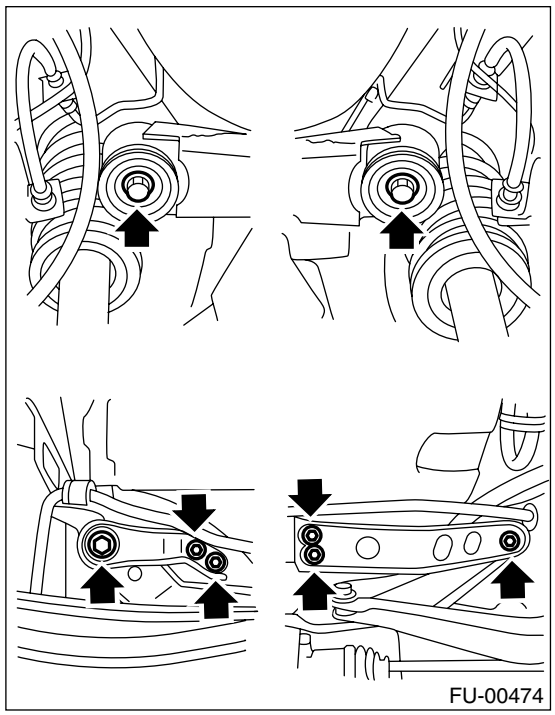
4) Place transmission jack under sub frame.



5) Remove bolt which holds rear shock absorber to rear suspension arm.



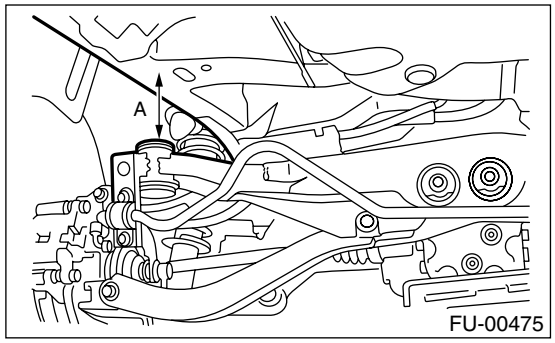
6) Remove bolts which hold rear sub frame on body.



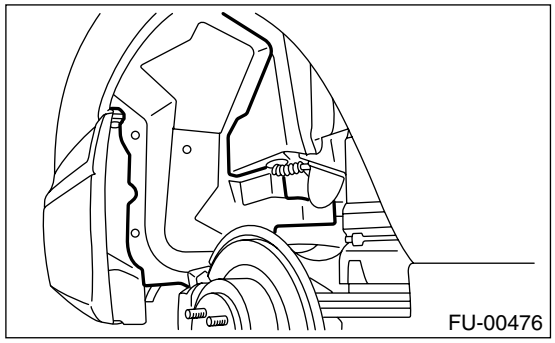
7) Lower the rear sub frame.

CAUTION:
Be sure to lower sub frame slowly.

A = 150 mm (5.91 in)

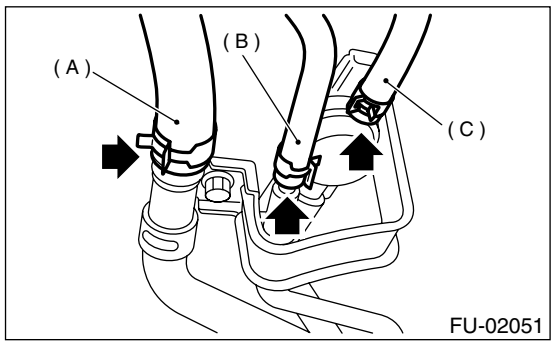


8) Remove fuel filler pipe protector.

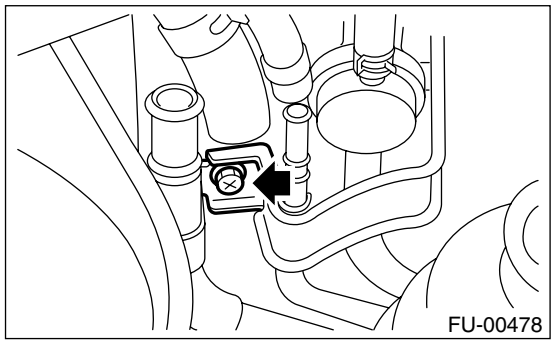


9) Disconnect air vent hose (A) and evaporation hose (B) from evaporation pipe assembly.

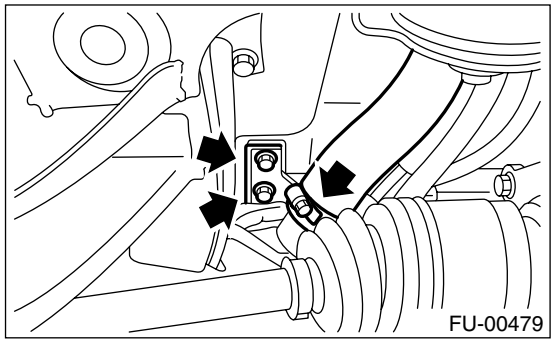
10) Disconnect evaporation hose (C) from pressure control solenoid valve.



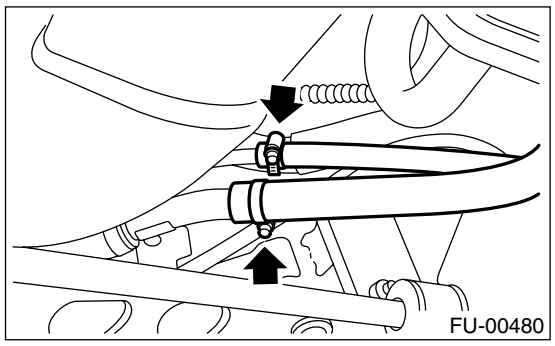
11) Remove bolt which holds evaporation pipe assembly on body.



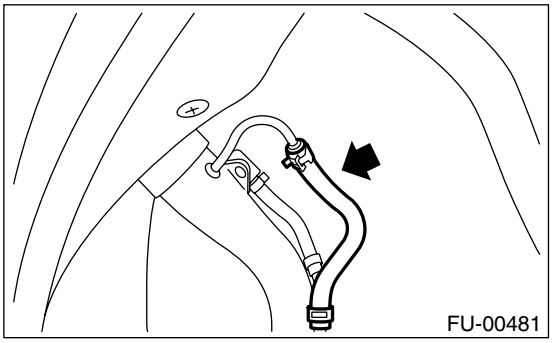
12) Disconnect fuel filler hose.
13) Remove bolt which holds fuel pressure sensor on fuel filler pipe and remove bolt which holds fuel filler pipe on body.



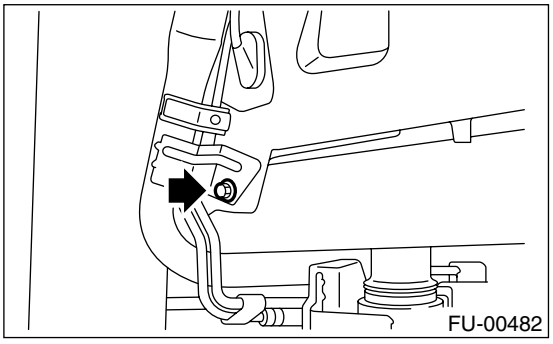
14) Disconnect canister hose from evaporation pipe assembly.



15) Disconnect evaporation hose (O) from fuel filler pipe.



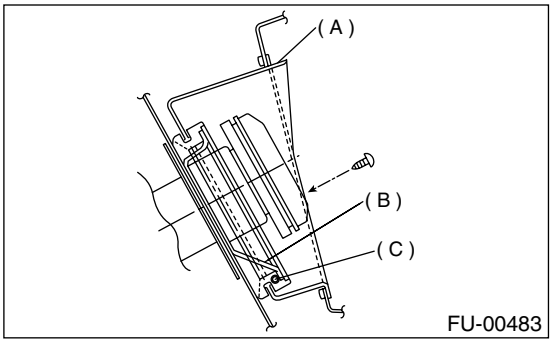
16) Remove bolt which holds fuel filler pipe to body.



17) Remove fuel filler pipe to under side of the vehicle.

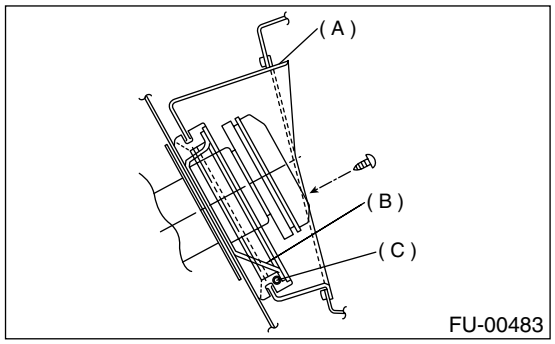
B: INSTALLATION

1) Hold fuel filler flap open.
2) Set fuel saucer (A) with rubber packing (C) and insert fuel filler pipe into hole from the inner side of apron.



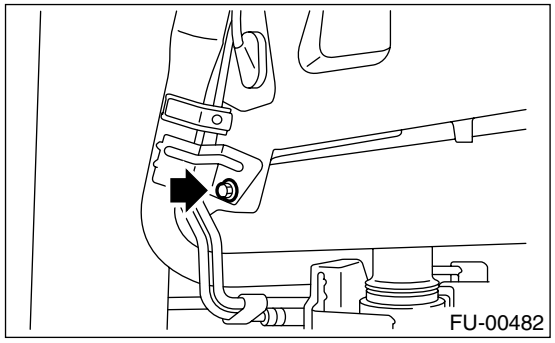
3) Align holes in fuel filler pipe neck and set cup (B), and tighten screws.

NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.

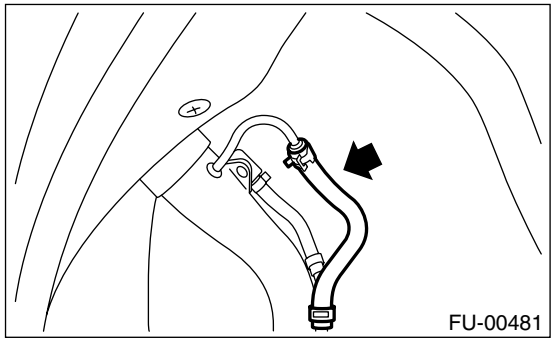


4) Tighten bolt which holds fuel filler pipe on body.

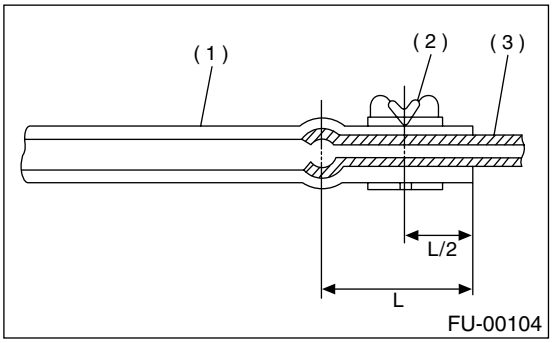
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



5) Insert evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold clip.

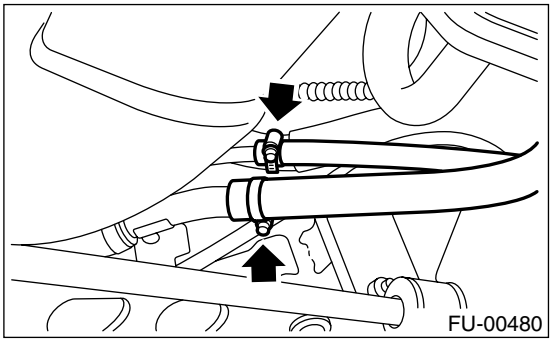


L = 27.5±2.5 mm (1.083±0.098 in)

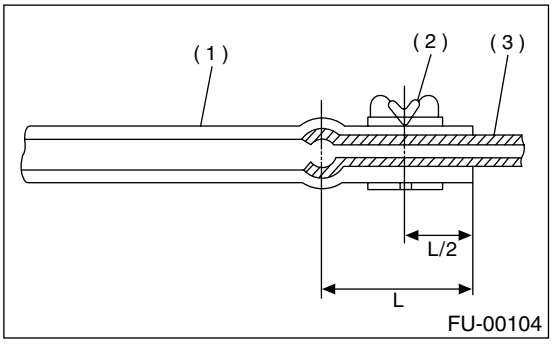


(1) Hose
(2) Clip
(3) Pipe

6) Insert canister hoses approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and tighten clamp.



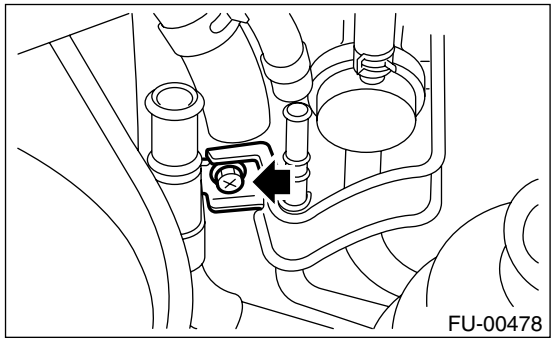
L = 27.5±2.5 mm (1.083±0.098 in)



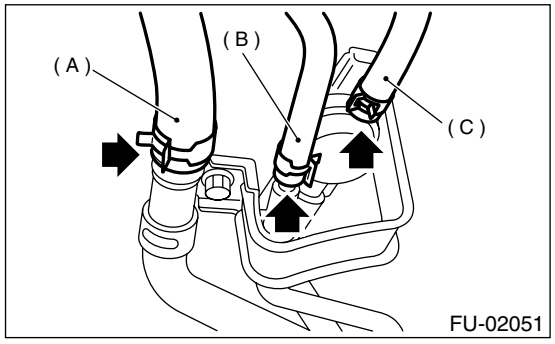
(1) Hose
(2) Clip
(3) Pipe

7) Tighten bolt which holds evaporation pipe assembly on body.

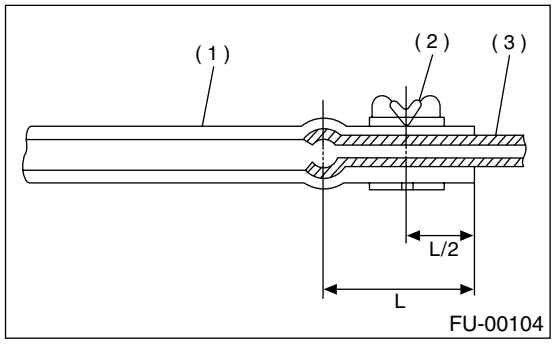
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



8) Insert air vent hose (A), evaporation hose (B) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe assembly and hold clip.
9) Insert evaporation hose (C) to pressure control solenoid valve and hold clip.



L = 27.5±2.5 mm (1.083±0.098 in)

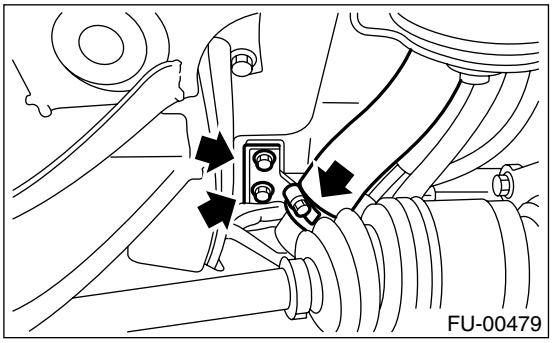


(1) Hose
(2) Clip
(3) Pipe

10) Tighten bolt which holds fuel filler pipe on body and tighten bolt which holds fuel pressure sensor on fuel filler pipe.

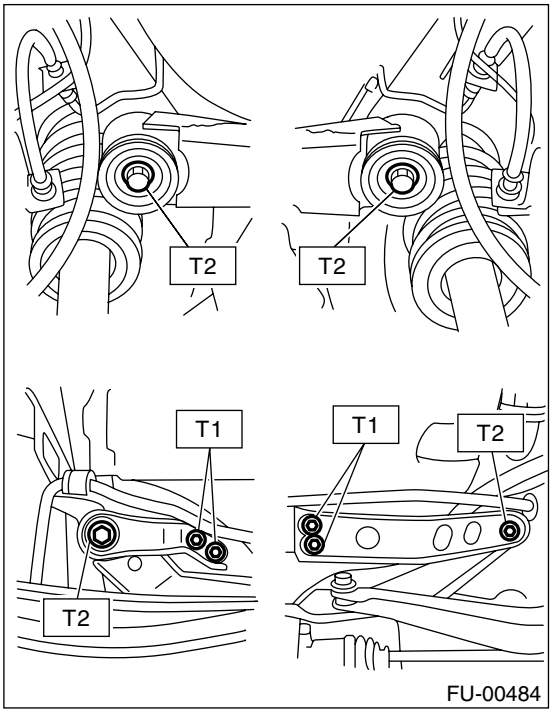
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)

11) Insert fuel filler hose approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten clamp.



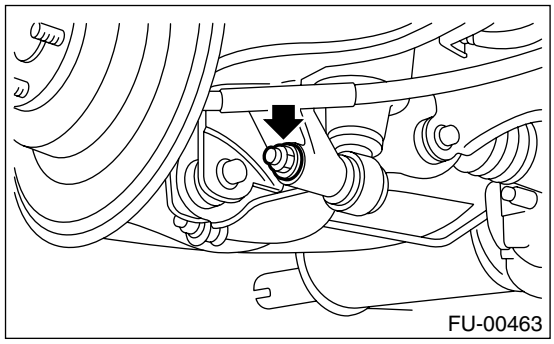
12) Jack-up the rear sub frame and tighten bolts which hold rear sub frame on body.

Tightening torque:
T1: 66 N·m (6.7 kgf-m, 48.5 ft-lb)
T2: 172 N·m (17.5 kgf-m, 127 ft-lb)

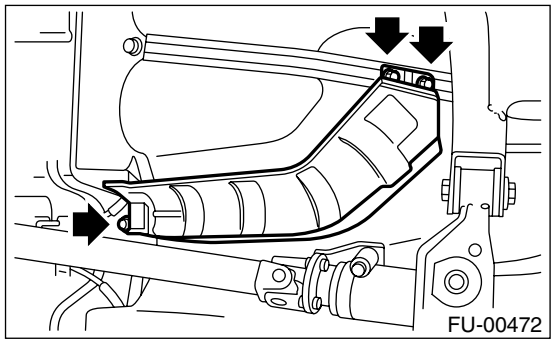


13) Tighten bolt which holds rear shock absorber to rear suspension arm. <Ref. to RS-17, INSTALLATION, Rear Shock Absorber.>

Tightening torque:
157 N·m (16 kgf-m, 116 ft-lb)



14) Install heat shield cover.

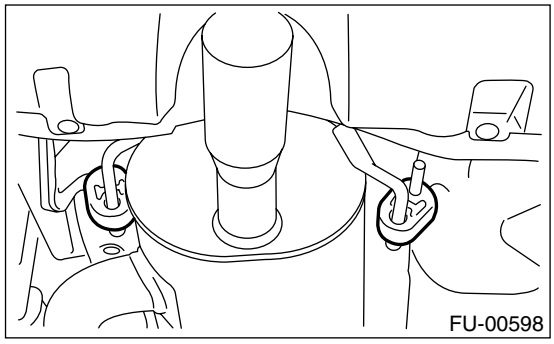


15) Install rear exhaust pipe and muffler.

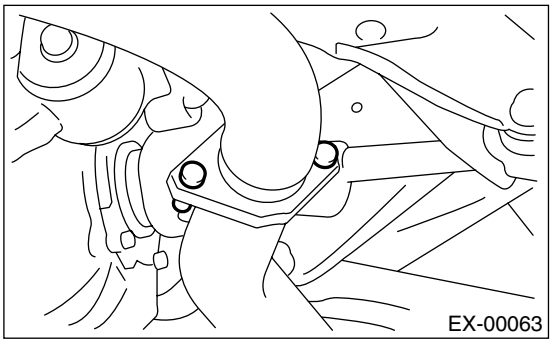
NOTE:
To facilitate the procedure, apply a coat of SUBARU CRC to matching area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

(1) Install left and right rubber cushions.

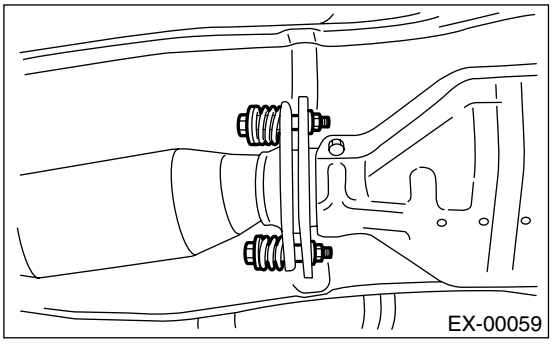


(2) Install front rubber cushion and attach muffler assembly.

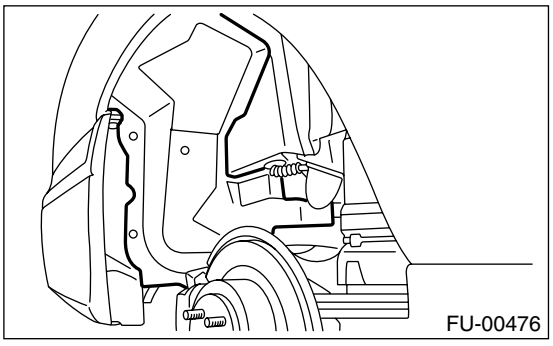


(3) Install rear exhaust pipe to front exhaust pipe.

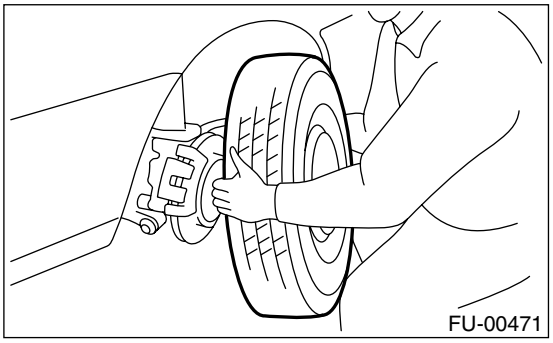
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



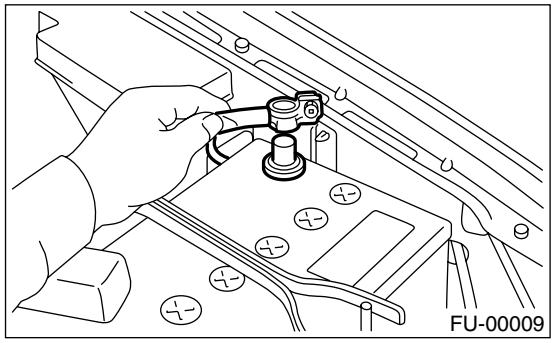
16) Install fuel filler pipe protector.



17) Install rear right wheel.

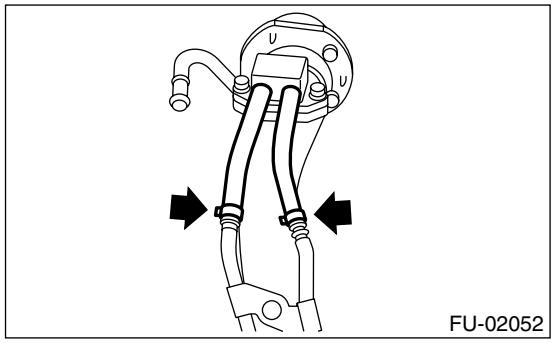


18) Lower the vehicle.
19) Tighten wheel nuts.
20) Connect battery ground cable.

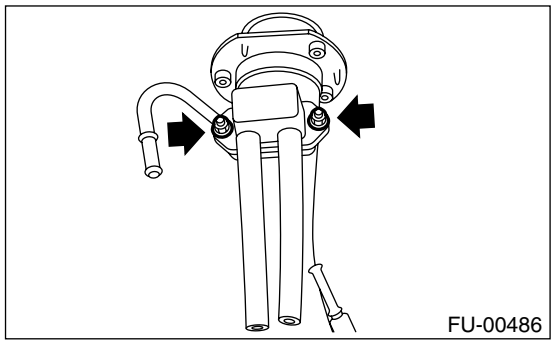


C: DISASSEMBLY

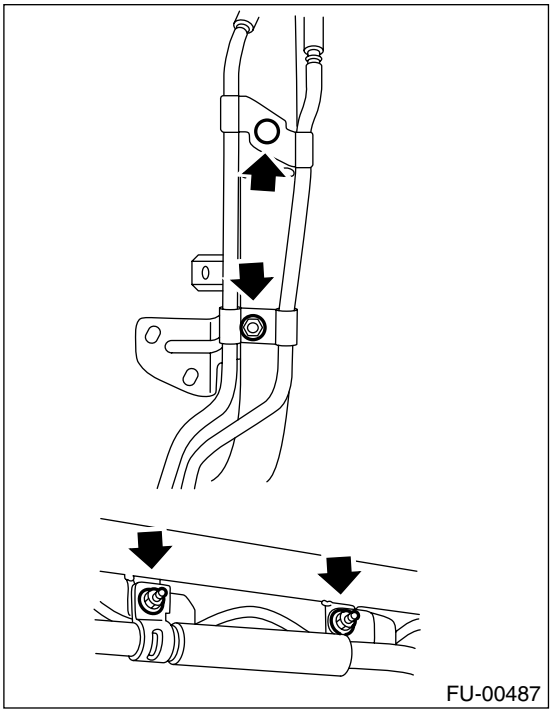
1) Disconnect evaporation hose from evaporation pipe assembly.



2) Remove shut valve from fuel filler pipe.



3) Remove nut which holds evaporation pipe assembly on fuel filler pipe.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

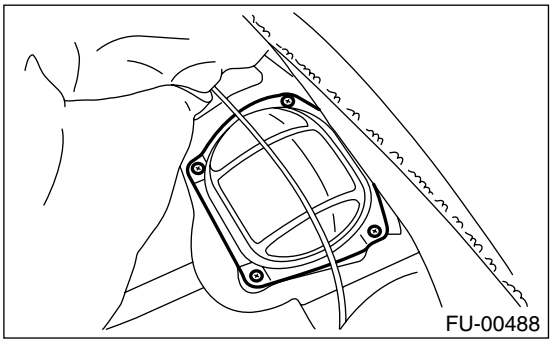
24.Fuel Pump

A: REMOVAL

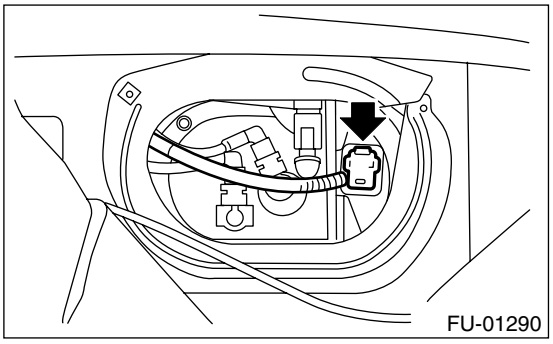
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

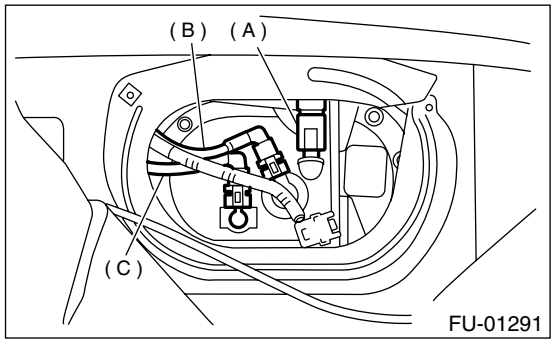
1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Drain fuel from fuel tank. <Ref. to FU(H6DO)-50, DRAINING FUEL, OPERATION, Fuel.>
3) Raise rear seat and turn floor mat up.
4) Remove access hole lid.


FU-00488

5) Disconnect connector from fuel pump.

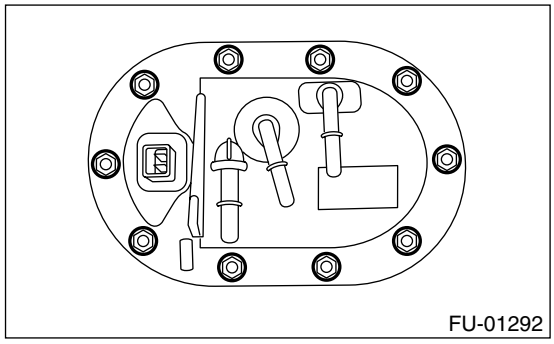

FU-01290

6) Using ST, disconnect quick connector and then disconnect fuel delivery hose (A), return hose (B) and jet pump hose. <Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
ST 42099AE000 CONNECTOR REMOVER



FU-01291

7) Remove nuts which install fuel pump assembly onto fuel tank.

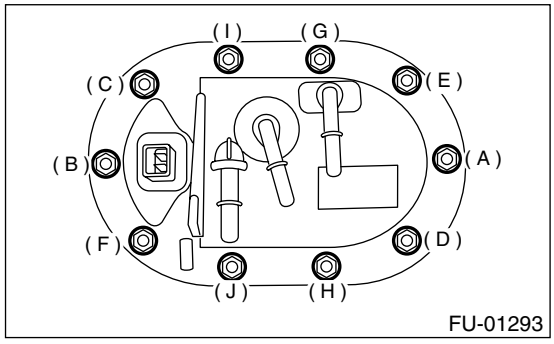

FU-01292

8) Take off fuel pump assembly from fuel tank.

B: INSTALLATION

Install in the reverse order of removal. Do the following:
(1) Always use new gaskets.
(2) Ensure sealing portion is free from fuel or foreign particles before installation.
(3) Tighten nuts in alphabetical sequence shown in figure to specified torque.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

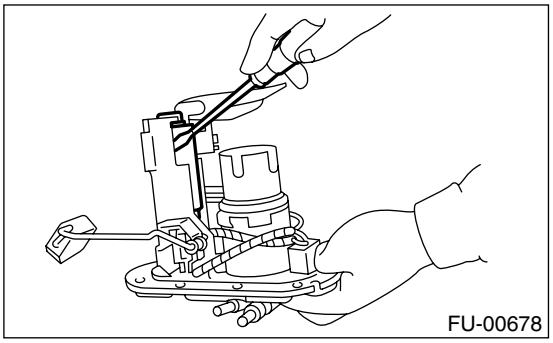


FU-01293

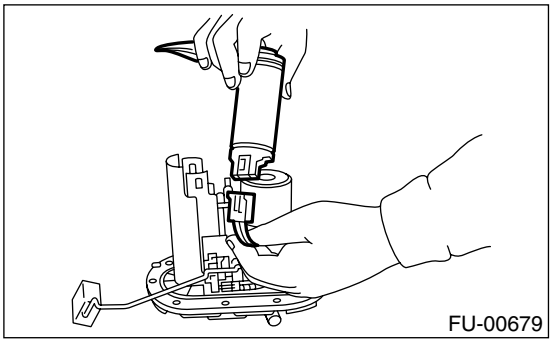
C: DISASSEMBLY

1) Remove fuel pump and pump holder.

NOTE:
When disassembling pump holder, be careful as it is installed with two pawls.



2) Disconnect connector from fuel pump.



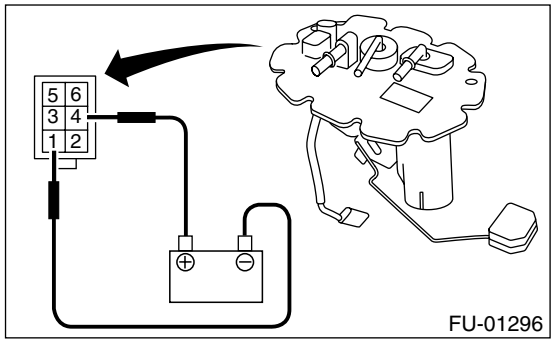
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

Connect lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operates.

WARNING:
- **Wipe off the fuel completely.**
- **Keep battery as far apart from fuel pump as possible.**
- **Be sure to turn the battery supply ON and OFF on the battery side.**
- **Do not run fuel pump for a long time under no-load condition.**



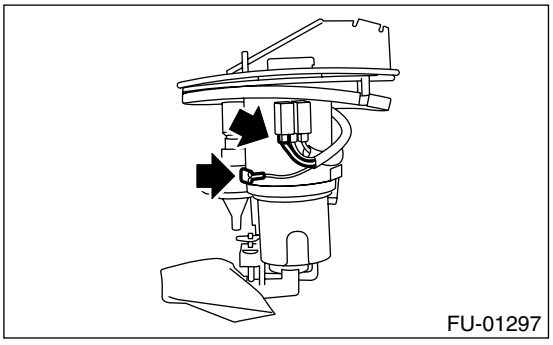
25.Fuel Level Sensor

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

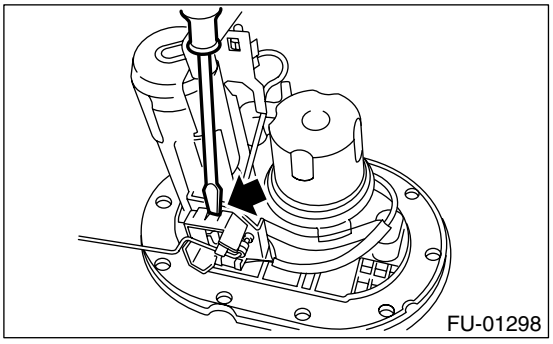
NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H6DO)-68, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.


FU-01297

3) Pushing the pawls with a screwdriver, remove fuel meter unit by pulling it downwards.

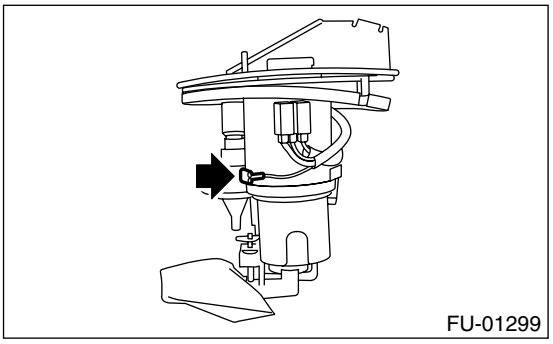
NOTE:
If the retainer pawls are broken during removal, the fuel level sensor must be replaced with a new one.


FU-01298

B: INSTALLATION

Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**

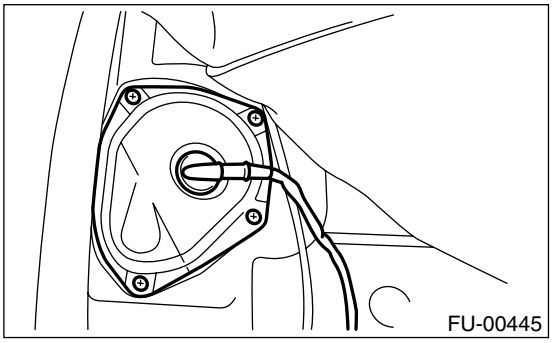

FU-01299

26.Fuel Sub Level Sensor

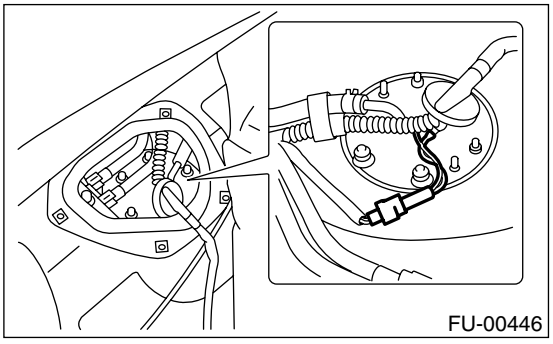
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.**

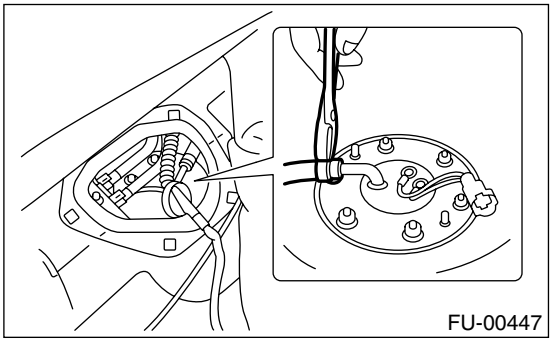
1) Drain fuel from fuel tank. <Ref. to FU(H6DO)-50, DRAINING FUEL, OPERATION, Fuel.>
2) Raise rear seat and turn floor mat up. (Wagon model)
3) Remove rear seat. (Sedan model)
4) Remove service hole cover.



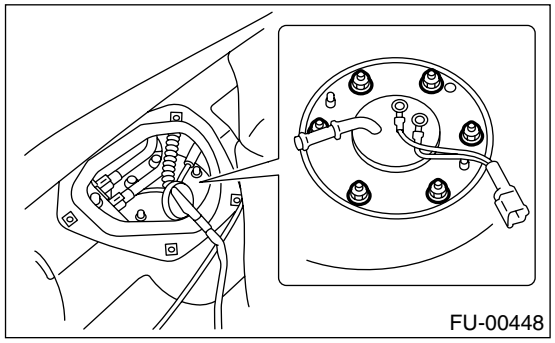
5) Disconnect connector from fuel sub level sensor.



6) Disconnect fuel jet pump hose.



7) Remove bolts which install fuel sub level sensor on fuel tank.

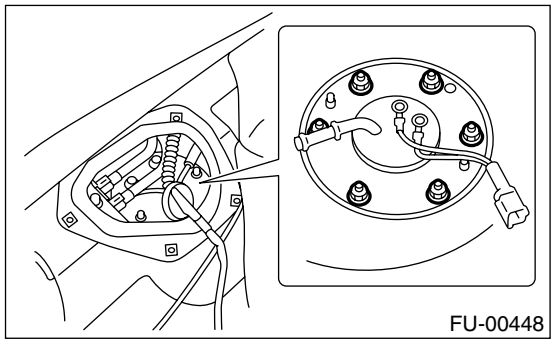


8) Remove fuel sub level sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



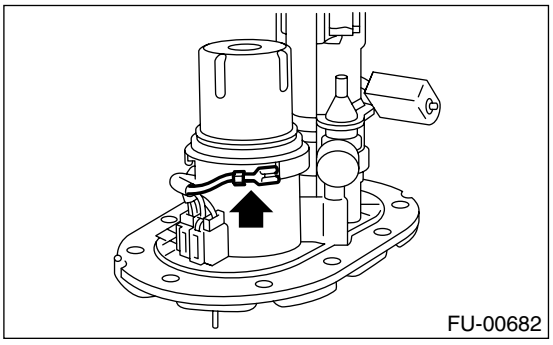
27.Fuel Filter

A: REMOVAL

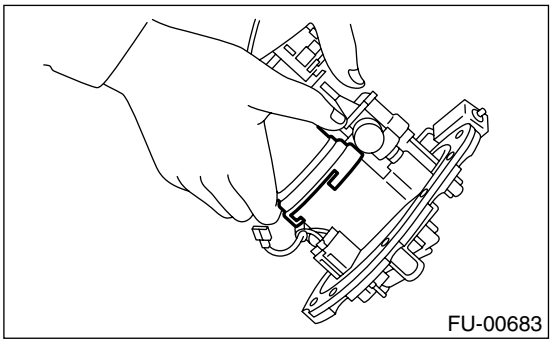
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel filter is built in fuel pump assembly.

1) Release the fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel pump assembly. <Ref. to FU(H6DO)-68, REMOVAL, Fuel Pump.>
3) Disconnect the ground cable from filter holder.


FU-00682

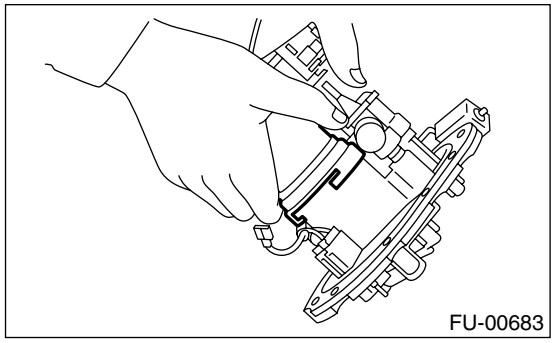
4) Remove the filter holder by turning it to the left from the body pawls, and then take out the filter.


FU-00683

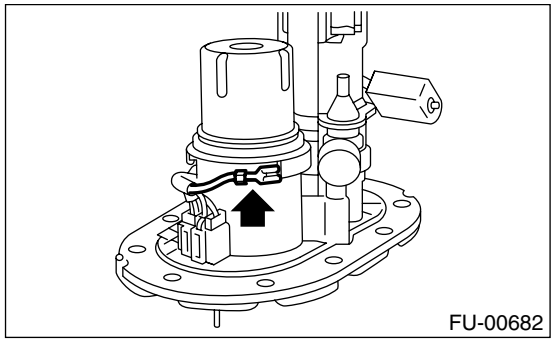
B: INSTALLATION

NOTE:
- If the fuel hoses are damaged at the connecting portion, replace it with a new one.
- If the clamps are badly damaged, replace with new ones.
- Replace the o-ring with new ones.

1) Set the O-ring on the filter holder, and then install by turning to the right.


FU-00683

2) Connect the ground cable to filter holder.


FU-00682

3) Install the fuel pump assembly. <Ref. to FU(H6DO)-68, INSTALLATION, Fuel Pump.>

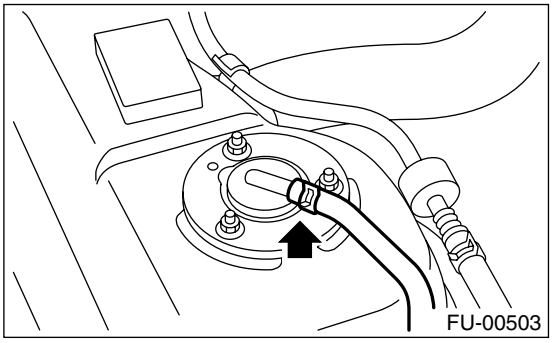
C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.

28.Fuel Cut Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
2) Move clip and disconnect evaporation hose from fuel cut valve.

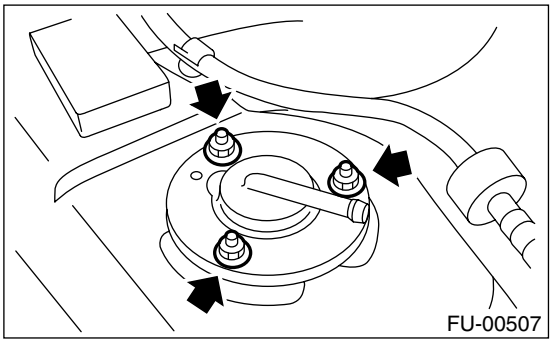


3) Remove bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

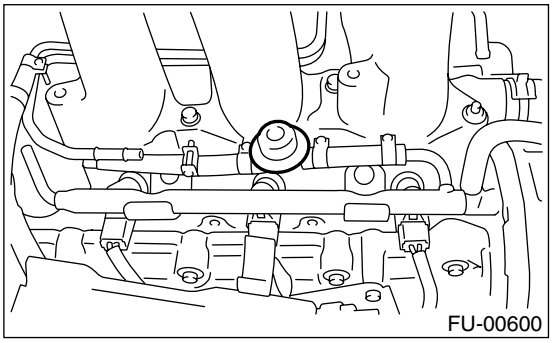


29.Fuel Damper Valve

A: REMOVAL

1) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove fuel damper valve from fuel delivery and return lines.

CAUTION:
Right and left portion of fuel damper valve are not identical. Do not confuse them when installing.
Right and left portion of fuel damper valve are colored differently on their upper side. The RH portion is colored olive, and the LH portion is colored yellow.



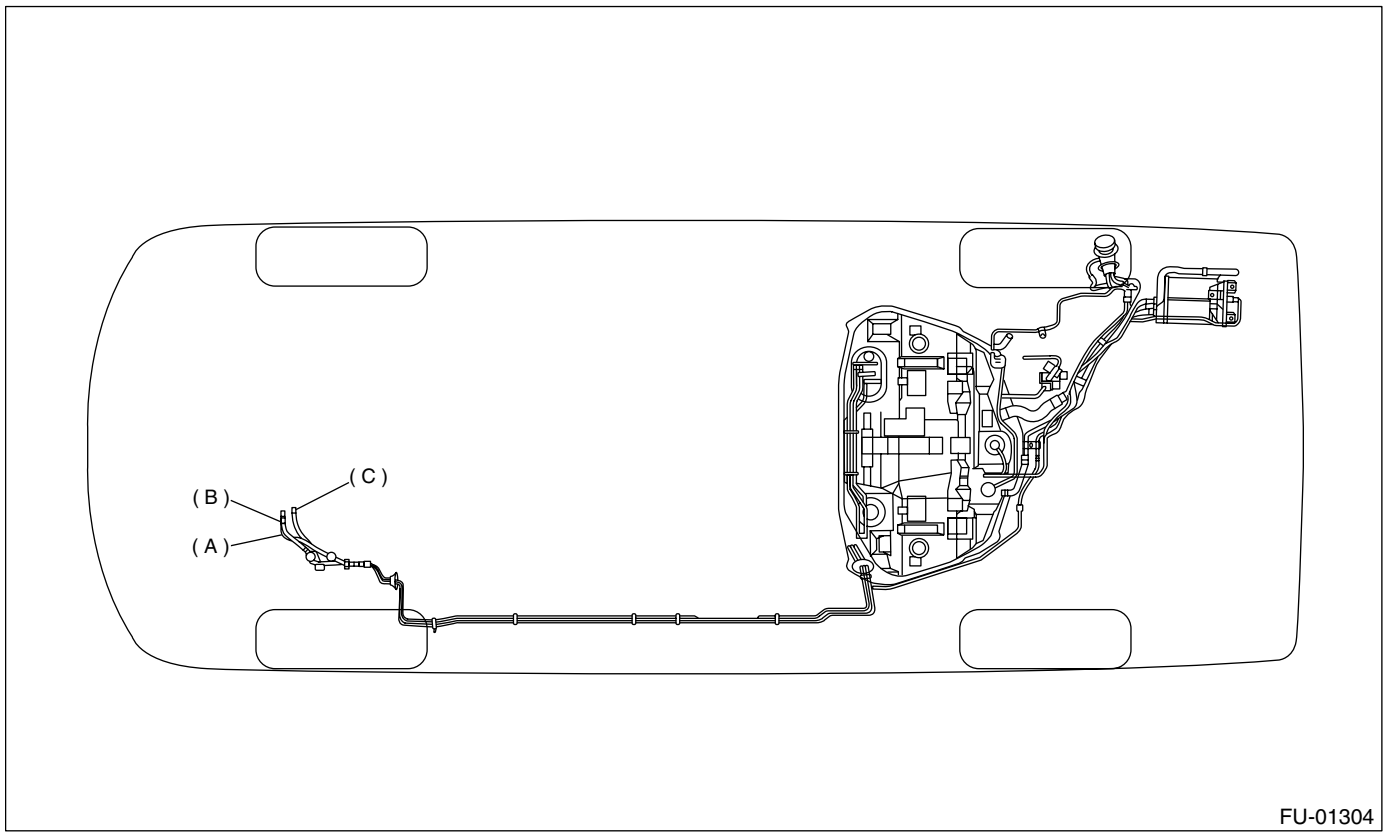
B: INSTALLATION

Install in the reverse order of removal.

30.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

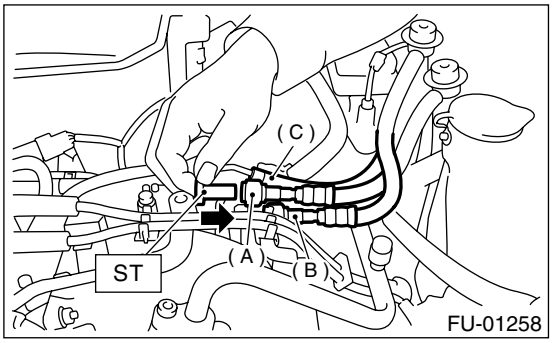
1) Set vehicle on the lift.
2) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open fuel filler flap lid and remove fuel filler cap.
4) Remove fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
5) Remove fuel filler pipe. <Ref. to FU(H6DO)-61, REMOVAL, Fuel Filler Pipe.>
6) Remove floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
7) Remove fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



(A) Fuel delivery line
(B) Fuel return line
(C) Fuel evaporation line

8) In engine compartment, detach fuel delivery hoses, return hoses and evaporation hose.
(1) Separate quick connector of fuel delivery line and return line by pushing an ST in the direction of the arrow.
(2) Remove clips, and then separate evaporation hose from pipe.

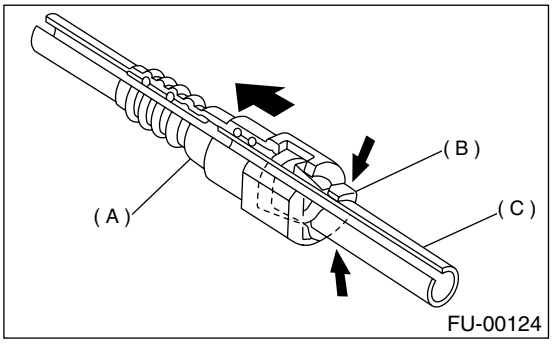
ST 42099AE000 CONNECTOR REMOVER



(A) Fuel delivery hose
(B) Fuel return hose
(C) Fuel evaporation hose

9) Separate quick connector on fuel delivery and return line.
(1) Clean pipe and connector, if they are covered with dust.
(2) Hold connector (A) and push retainer (B) down.
(3) Pull out connector (A) from retainer (B).

CAUTION:
Replace retainer with new ones.

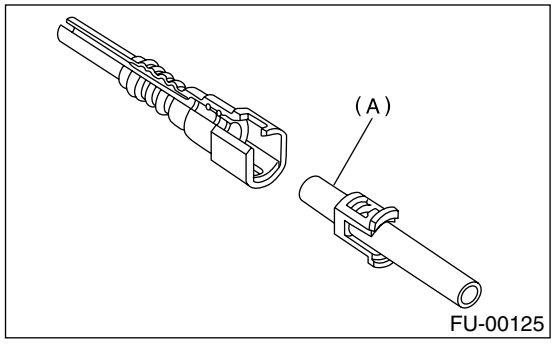


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

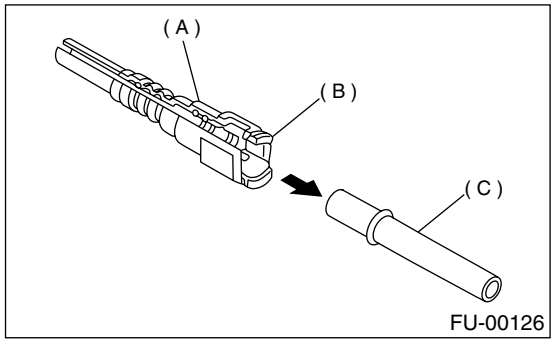
1) Connect quick connector on fuel delivery and return line.

CAUTION:
- **Always use a new retainer.**
- **Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface (A) of pipe (B).**



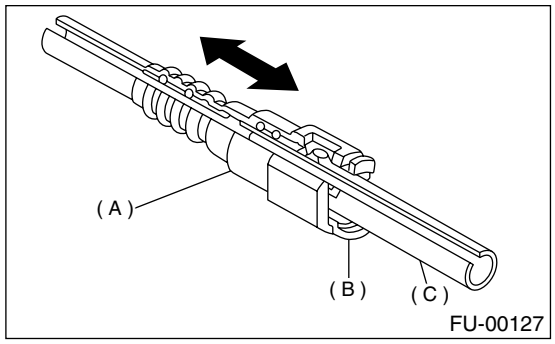
(1) Set new retainer (B) to connector (A).
(2) Push pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.
• Be sure to inspect hoses and their connections for any leakage of fuel.

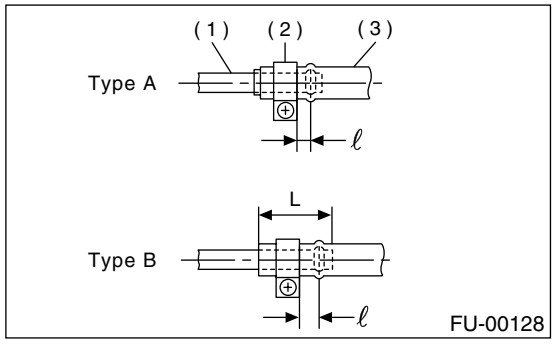


(A) Connector
(B) Retainer
(C) Pipe

2) Connect fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When fitting length is specified.
Type B: When fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

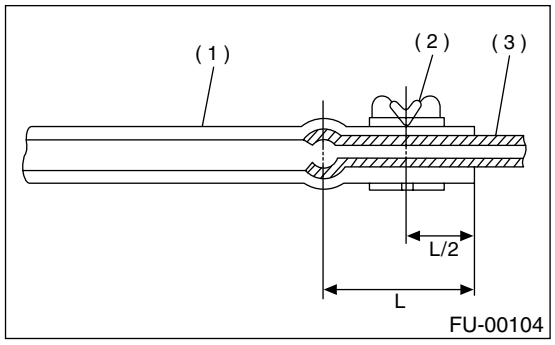


(1) Pipe
(2) Clamp
(3) Hose

3) Connect evaporation hose to pipe by approx. 15 mm (0.59 in) from hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

31.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel gauge.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation:

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain water condensation from the fuel filter.

• Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

• Protecting the fuel system against freezing and water condensation.

(1) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the fuel tank. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under damaged areas below.

(2) Affected areas

If water accumulated in the fuel filter, drain water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC(H6DO)

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10.	Fuel Tank Pressure Sensor	15
11.	Fuel Tank Sensor Control Valve	16
12.	Pressure Control Solenoid Valve	17
13.	Drain Filter	18
14.	Vent Valve	19
15.	Shut Valve	20
16.	Drain Valve	21

1. General Description

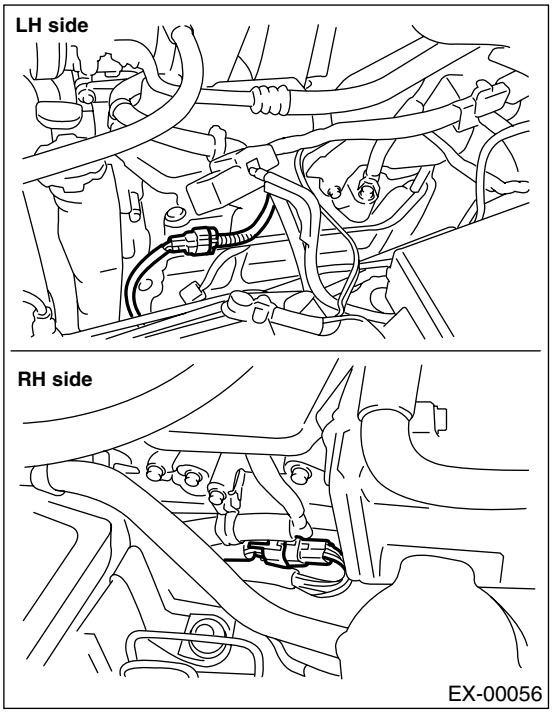
A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

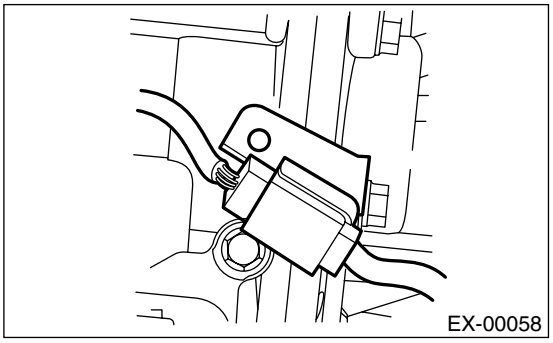
2. Front Catalytic Converter

A: REMOVAL

1) Set the vehicle on the lift.
2) Remove battery.
3) Remove air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
4) Disconnect front oxygen (A/F) sensor connectors.

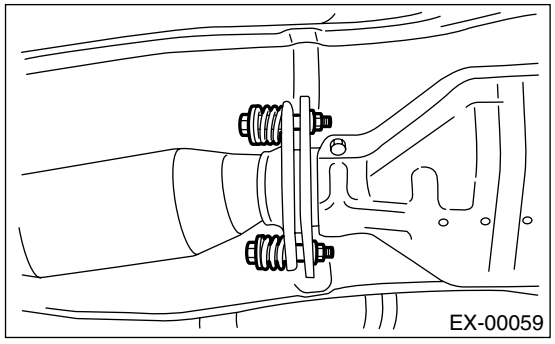


5) Lift-up the vehicle.
6) Remove under cover.
7) Remove front oxygen (A/F) sensor harness from the clips attached to both right and left cylinder head covers.
8) Disconnect harness connector from rear oxygen sensor connector.

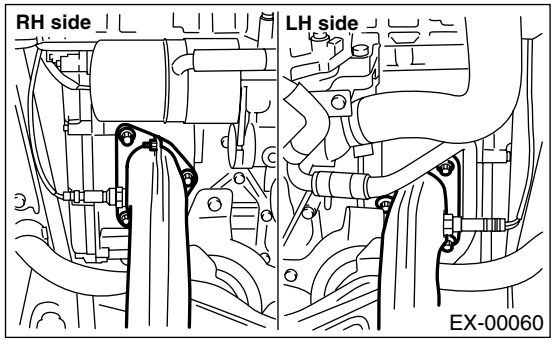


9) Separate front exhaust pipe and rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

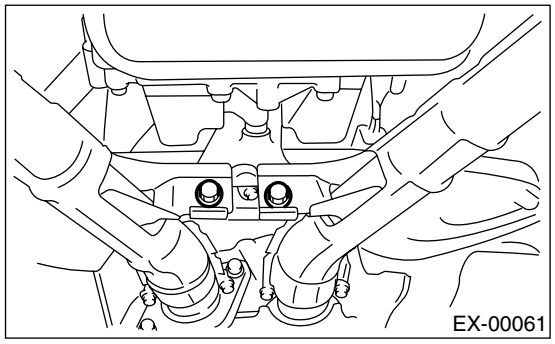


10) Remove nuts which hold front exhaust pipe onto cylinder heads.

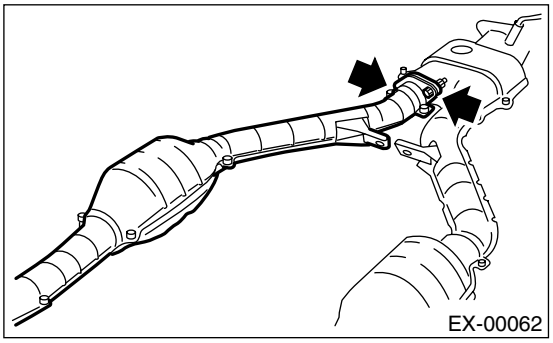


11) Remove front exhaust pipe from hanger bracket.

CAUTION:
Be careful not to pull down front exhaust pipe.



12) Separate front catalytic converter (RH) from front exhaust pipe.

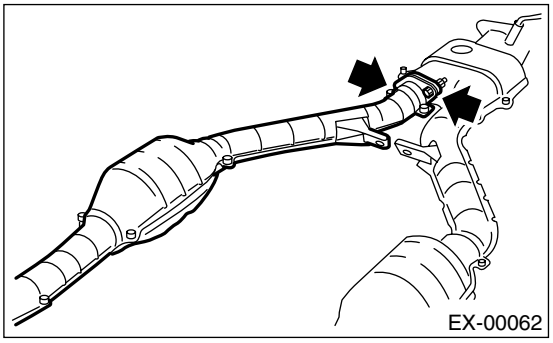


B: INSTALLATION

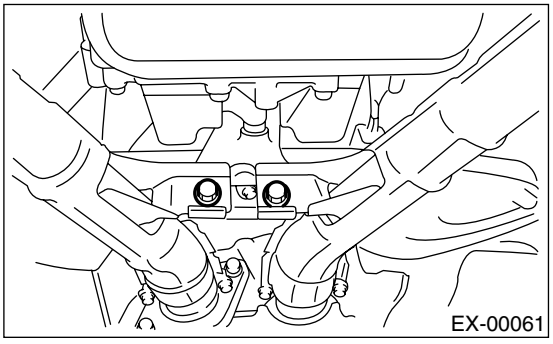
NOTE:
Replace gaskets with new ones.

1) Install front catalytic converter (RH) to front exhaust pipe.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

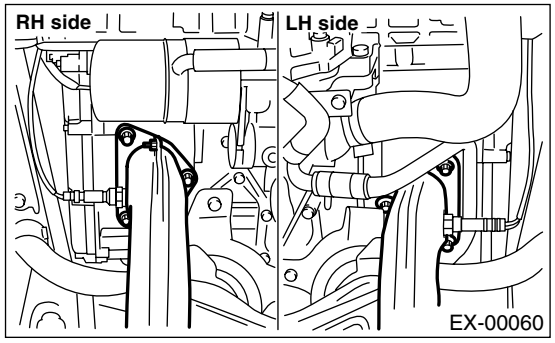


2) Install front exhaust pipe assembly to the vehicle. And temporarily tighten bolt which installs front exhaust pipe to hanger bracket.



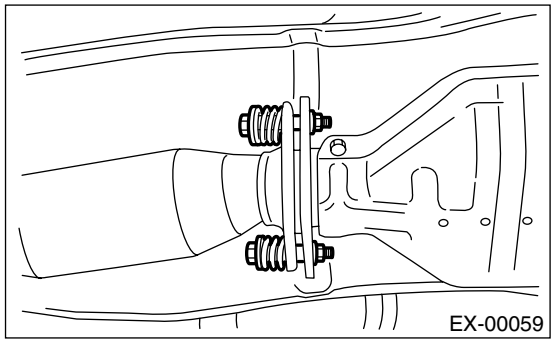
3) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



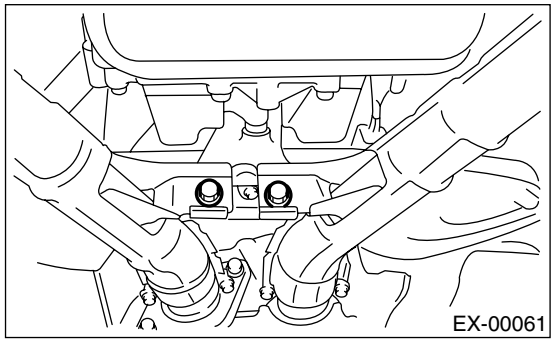
4) Tighten bolts which secure front exhaust pipe assembly to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

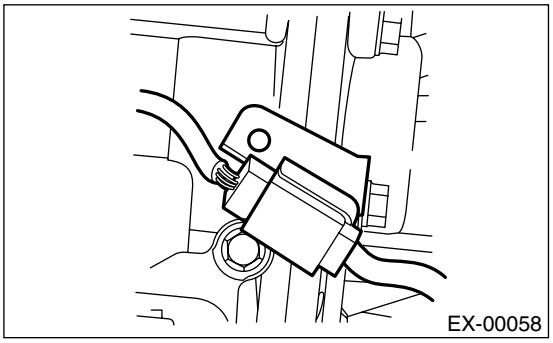


5) Tighten bolt which holds front exhaust pipes to hanger bracket.

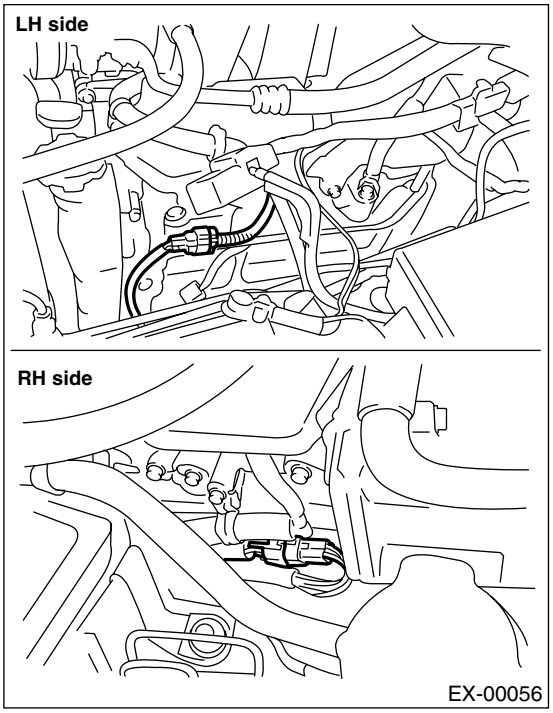
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



6) Connect connector to rear oxygen sensor connector.



7) Install front oxygen (A/F) sensor harness to the clips attached to the cylinder head covers.
8) Install under cover.
9) Lower the vehicle.
10) Connect front oxygen (A/F) sensor connector.



11) Install air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
12) Install battery.

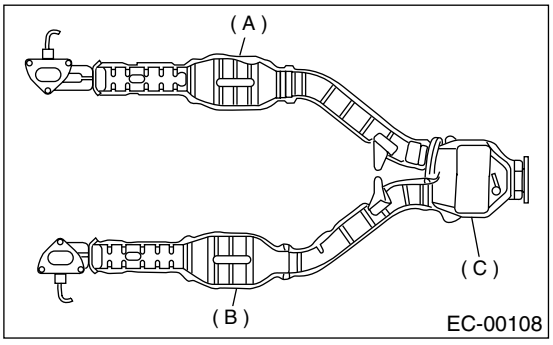
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

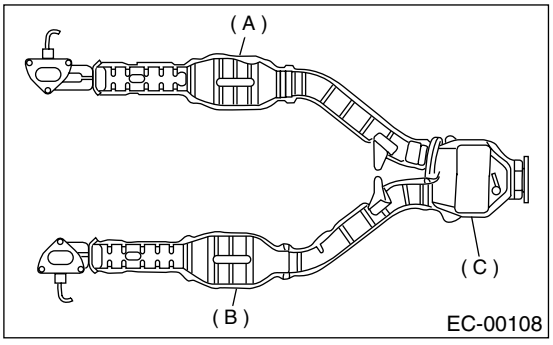
The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(H6DO)-3, REMOVAL, Front Catalytic Converter.>



(A) Front catalytic converter RH
(B) Front catalytic converter LH
(C) Rear catalytic converter

B: INSTALLATION

The front and rear catalytic converter are integrated into one unit. Therefore, the removal and installation procedures are the same as the ones described under front catalytic converter. <Ref. to EC(H6DO)-4, INSTALLATION, Front Catalytic Converter.>



(A) Front catalytic converter RH
(B) Front catalytic converter LH
(C) Rear catalytic converter

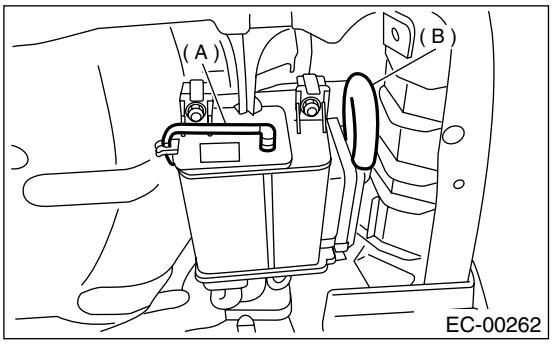
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

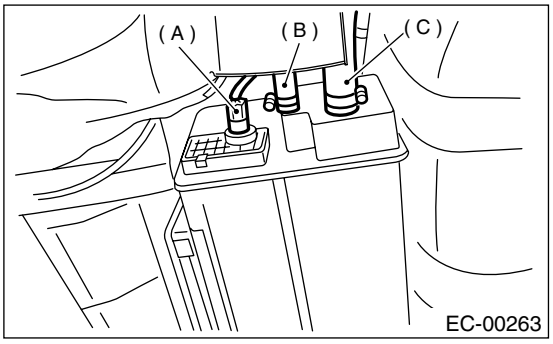
4. Canister

A: REMOVAL

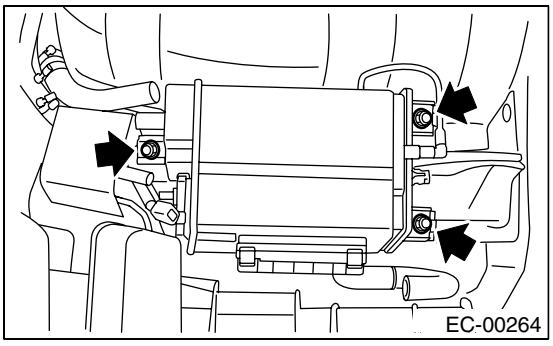
1) Lift-up the vehicle.
2) Disconnect connector (A) from drain valve.
3) Disconnect evaporation hoses (B) and (C) from canister.



4) Disconnect quick connector (A) from canister.
5) Disconnect evaporation hoses (B) and (C) from canister.



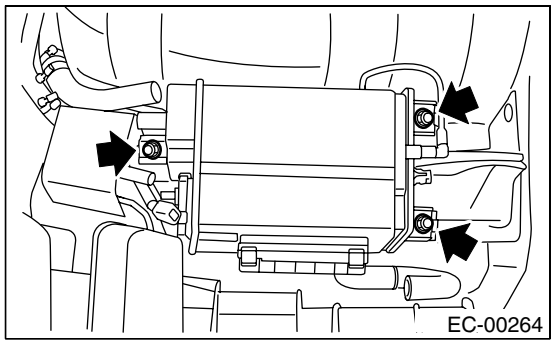
6) Remove the canister from body.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



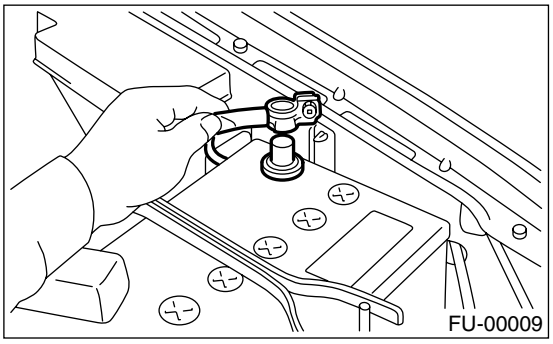
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

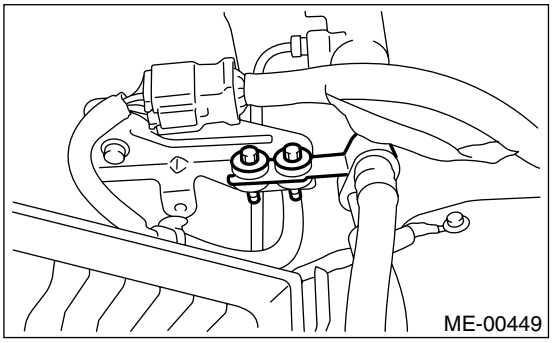
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect ground cable from battery.

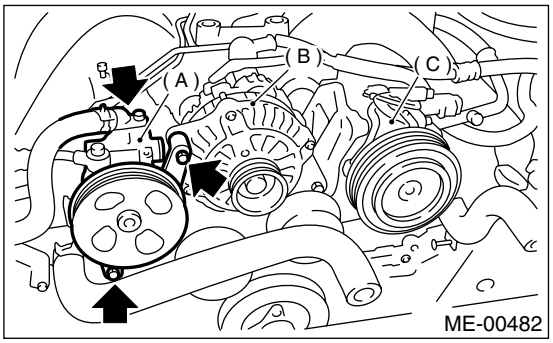


2) Remove power steering pump from bracket.
   (1) Remove air intake duct and air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
   (2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
   (3) Remove power steering oil pipe with bracket.



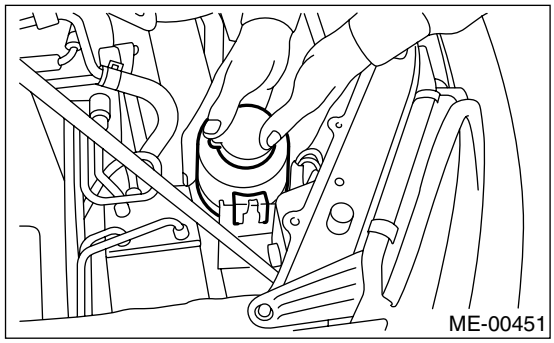
   (4) Remove bolts which install power steering pump bracket.

CAUTION:
Do not separate hose and pipe from the pump main unit.

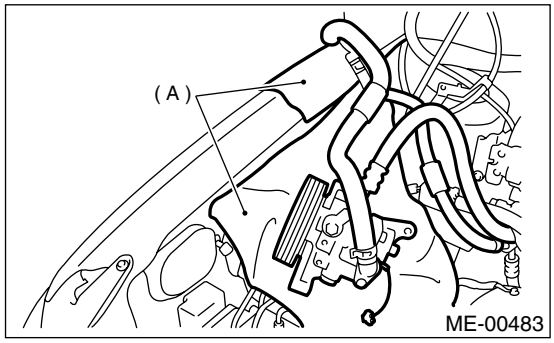


(A) Power steering pump
(B) Generator
(C) A/C compressor

(5) Remove power steering tank from the bracket by pulling it upward.

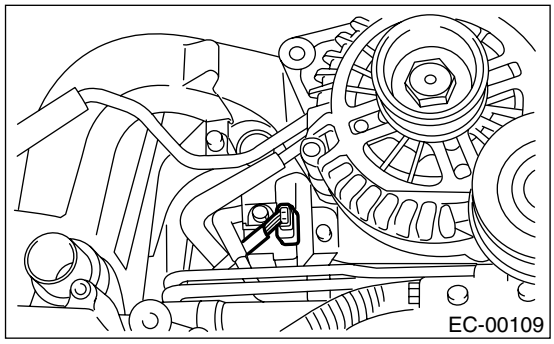


(6) Place power steering pump on the right side wheel apron.

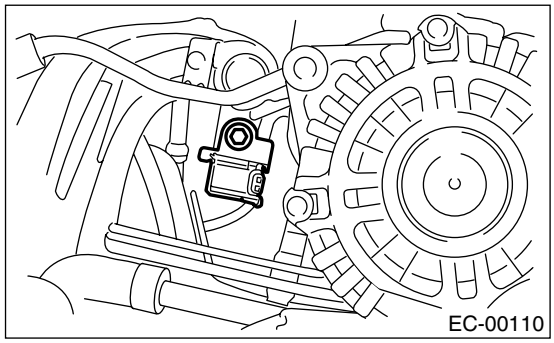


(A) Cloth

3) Disconnect connector and hoses from purge control solenoid valve.



4) Remove bolt which installs purge control solenoid valve onto intake manifold.

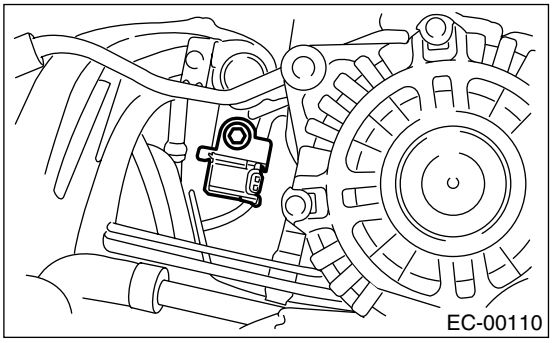


5) Take out purge control solenoid valve through the bottom of the intake manifold.

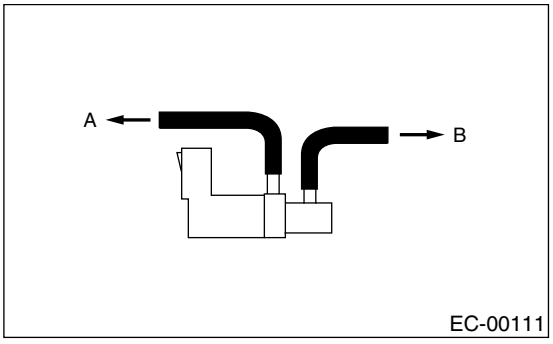
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



CAUTION:
Carefully connect the evaporation hoses.



A: To fuel pipe
B: To intake manifold

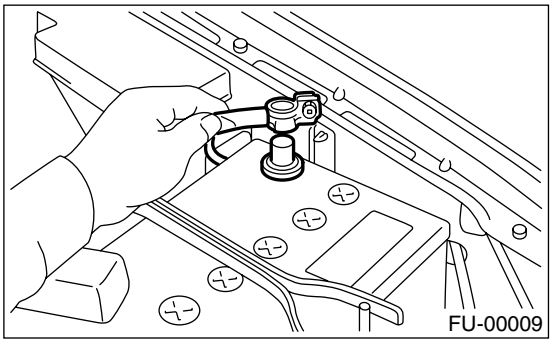
C: INSPECTION

Make sure hoses are not cracked or loose.

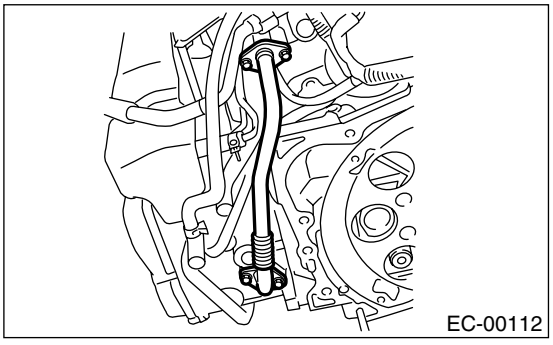
6. EGR Valve

A: REMOVAL

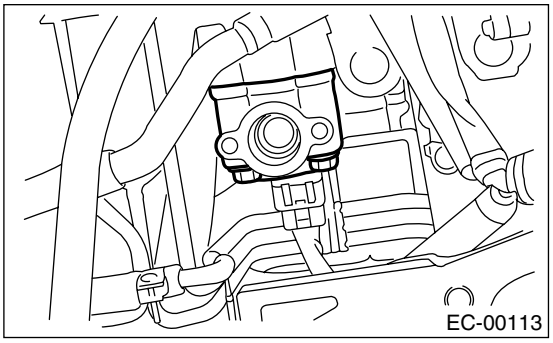
1) Disconnect ground cable from battery.



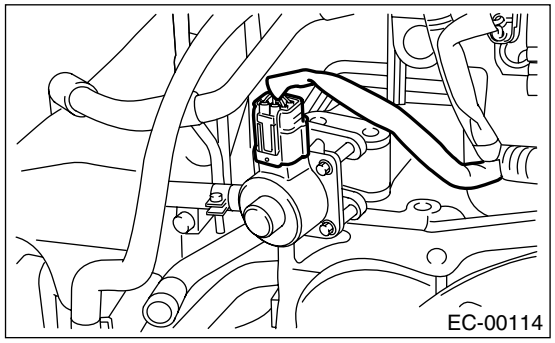
2) Remove air intake chamber. <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
3) Remove starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
4) Remove EGR pipe from EGR valve and cylinder head.



5) Remove EGR valve from intake manifold.



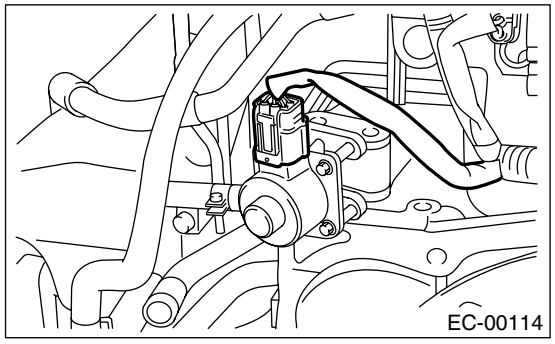
6) Disconnect connector from EGR valve.



B: INSTALLATION

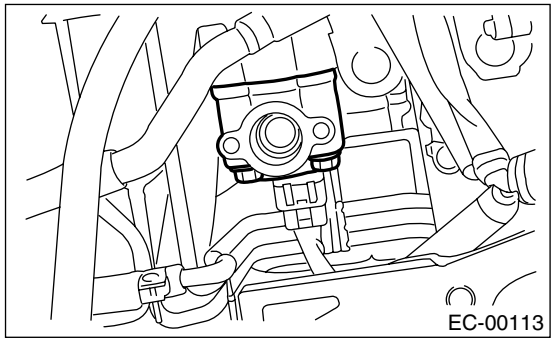
NOTE:
Replace old gaskets with new one.

1) Connect connector EGR valve.



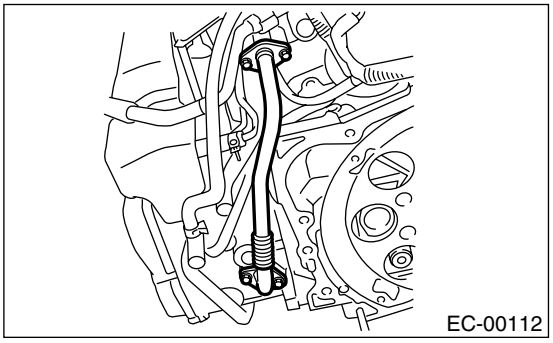
2) Install EGR valve to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



3) Install EGR pipe to EGR valve and cylinder head.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Install starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>
5) Install air intake chamber. <Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
6) Connect battery ground cable.

C: INSPECTION

Check the EGR pipe, etc., for blockages or cracks.

7. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-70, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For work procedures, refer to “FU(H6DO)” section. <Ref. to FU(H6DO)-70, INSTALLATION, Fuel Level Sensor.>

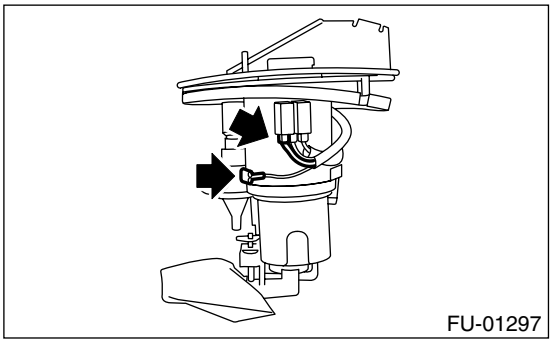
8. Fuel Temperature Sensor

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

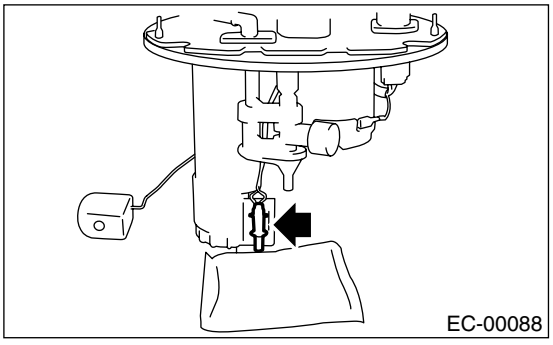
NOTE:
Fuel temperature sensor is built in fuel pump assembly.

1) Remove fuel pump assembly. <Ref. to FU(H6DO)-68, REMOVAL, Fuel Pump.>
2) Disconnect connector from fuel pump bracket.



3) Remove fuel temperature sensor.

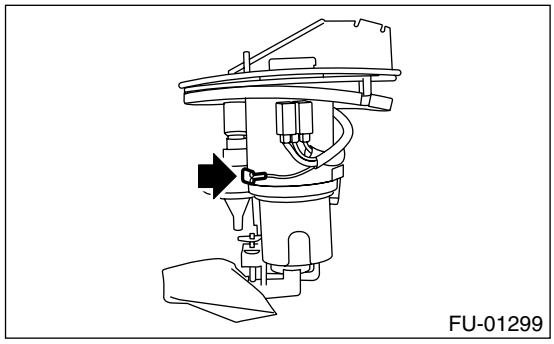
NOTE:
When replacing fuel temperature sensor, also replace fuel level sensor. <Ref. to FU(H6DO)-70, REMOVAL, Fuel Level Sensor.>



B: INSTALLATION

1) Install in the reverse order of removal.

WARNING:
- **Ground cable must be connected.**
- **Spark may occur and ignite if fuel is nearby.**



9. Sub Fuel Level Sensor

A: REMOVAL

For work procedures, refer to “FU(H6)” section. <Ref. to FU(H6DO)-71, REMOVAL, Fuel Sub Level Sensor.>

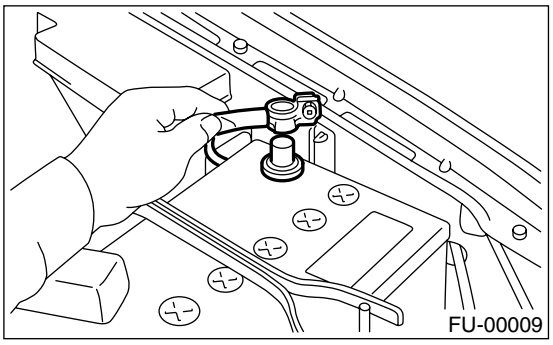
B: INSTALLATION

For work procedures, refer to “FU(H6)” section. <Ref. to FU(H6DO)-71, INSTALLATION, Fuel Sub Level Sensor.>

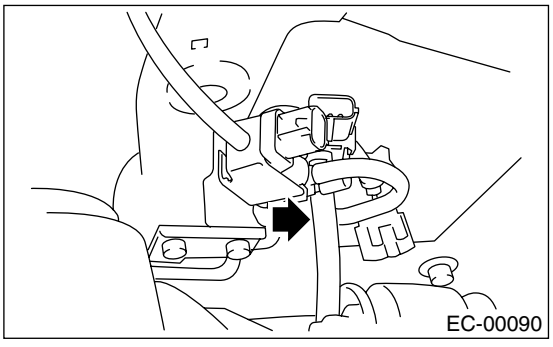
10.Fuel Tank Pressure Sensor

A: REMOVAL

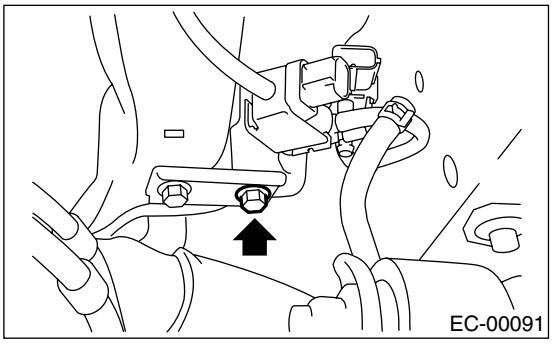
1) Set the vehicle on the lift.
2) Open fuel flap lid, and remove fuel filler cap.
3) Disconnect battery ground cable.



4) Lift-up the vehicle.
5) Disconnect connector from fuel tank pressure sensor and atmospheric pressure solenoid valve.
6) Disconnect pressure hose from fuel tank pressure sensor.

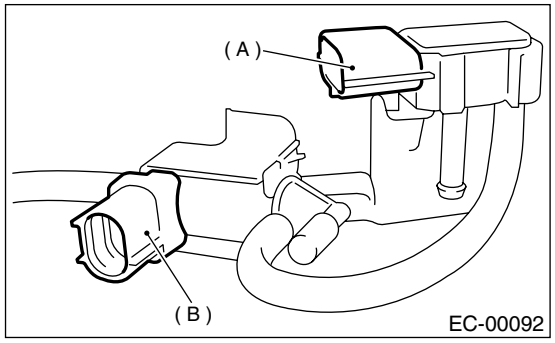


7) Remove fuel tank pressure sensor and atmospheric pressure solenoid valve with bracket.



8) Remove atmospheric pressure solenoid valve from bracket.

NOTE:
Fuel tank pressure sensor cannot be removed because it is integral with bracket.

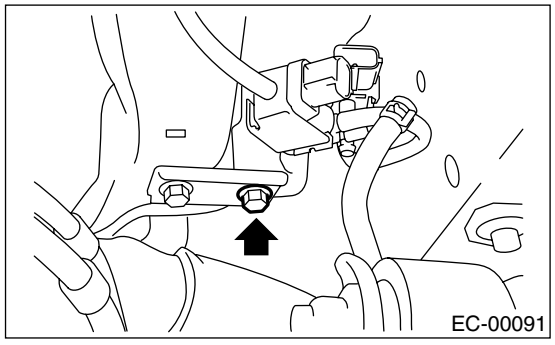


(A) Fuel tank pressure sensor
(B) Atmospheric pressure solenoid valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



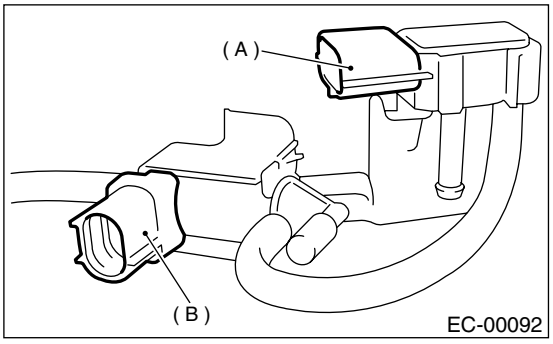
C: INSPECTION

Make sure that hoses are not cracked or loose.

11.Fuel Tank Sensor Control Valve

A: REMOVAL

1) Remove fuel tank pressure sensor. <Ref. to EC(H6DO)-15, REMOVAL, Fuel Tank Pressure Sensor.>
2) Remove fuel tank sensor control valve from bracket.



(1) Fuel tank pressure sensor
(2) Fuel tank sensor control valve

B: INSTALLATION

Install in the reverse order of removal.

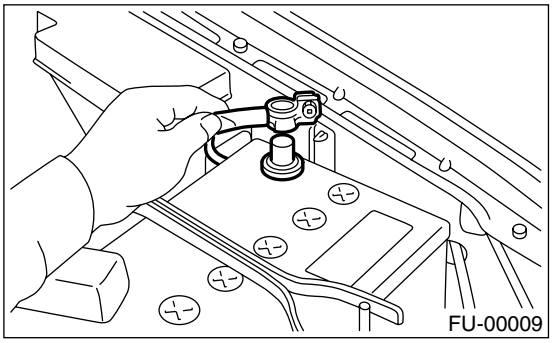
C: INSPECTION

Make sure that hoses are not cracked or loose.

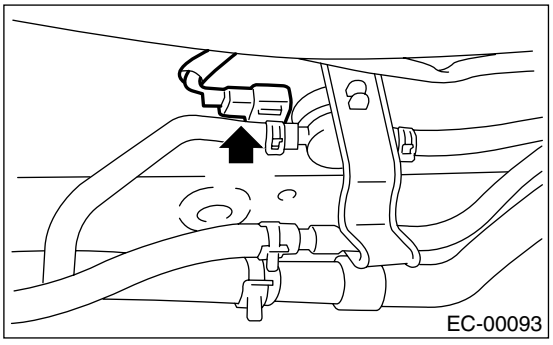
12.Pressure Control Solenoid Valve

A: REMOVAL

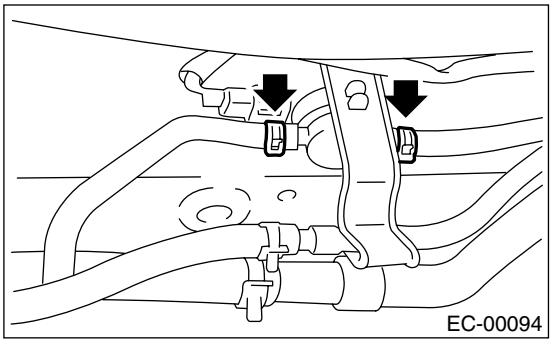
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



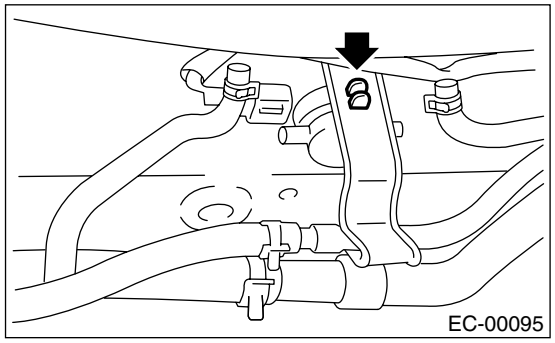
3) Lift-up the vehicle.
4) Disconnect connector from pressure control solenoid valve.



5) Disconnect two evaporation hoses from pressure control solenoid valve.



6) Remove pressure control solenoid valve from bracket.



B: INSTALLTION

Install in the reverse order of removal.

C: INSPECTION

Make sure that hoses are not cracked or loose.

13.Drain Filter

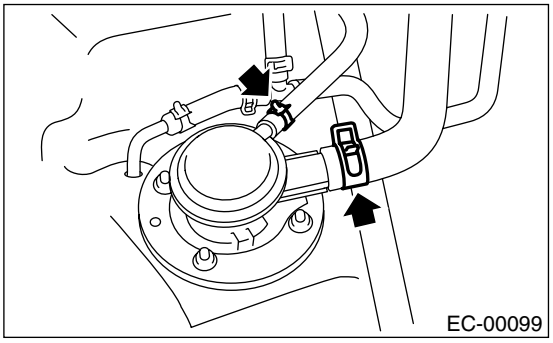
A: SPECIFICATIONS

Drain filter is built-in canister and cannot be disassembled.

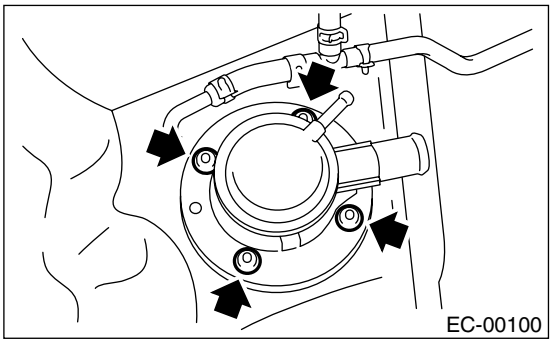
14.Vent Valve

A: REMOVAL

1) Remove fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
2) Move clips, and disconnect hoses from vent valve.



3) Remove nuts which install vent valve on fuel tank.

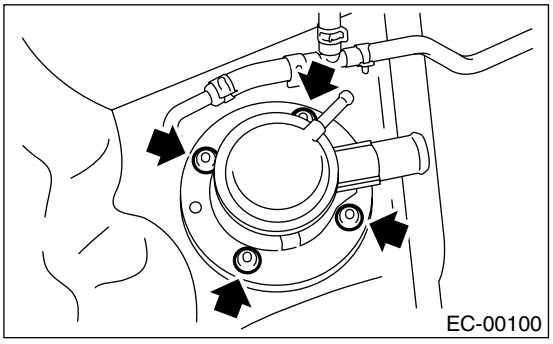


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace rubber seat with a new one.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



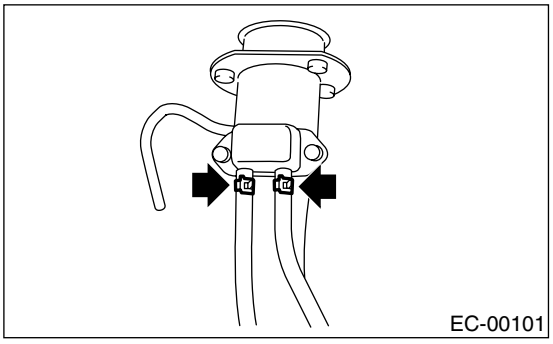
C: INSPECTION

Make sure that hoses are not cracked or loose.

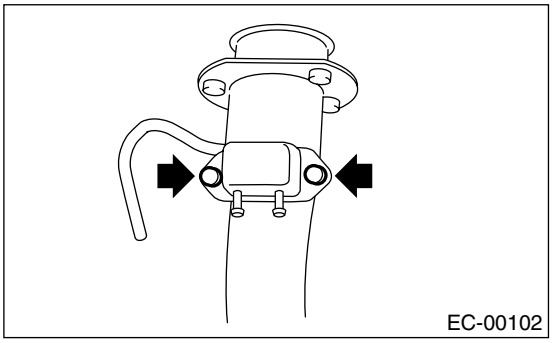
15.Shut Valve

A: REMOVAL

1) Drain fuel from fuel tank. <Ref. to FU(H6DO)-53, REMOVAL, Fuel Tank.>
2) Remove fuel filler pipe. <Ref. to FU(H6DO)-61, REMOVAL, Fuel Filler Pipe.>
3) Disconnect evaporation hoses from shut valve.



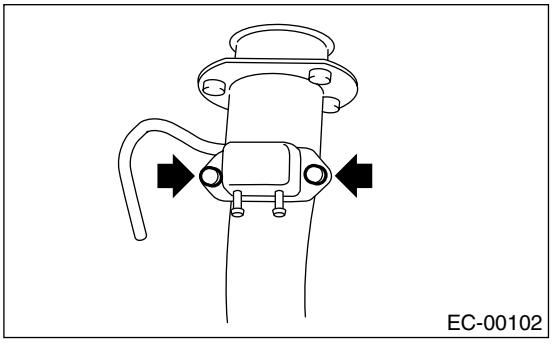
4) Remove shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



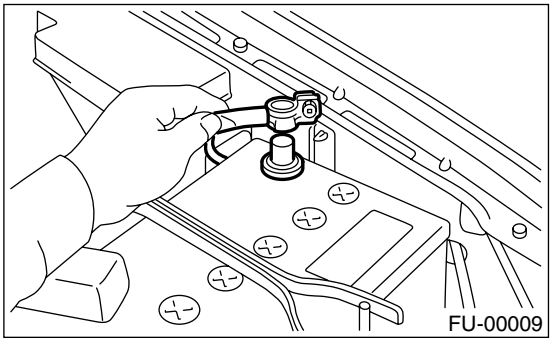
C: INSPECTION

Make sure that hoses are not cracked or loose.

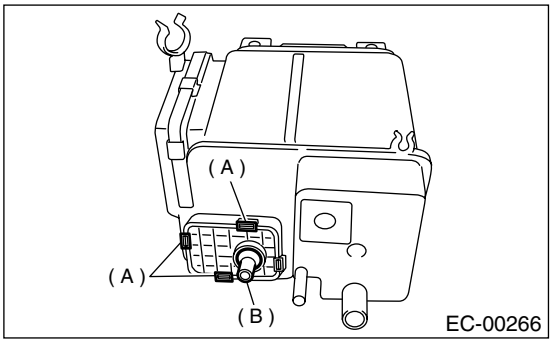
16.Drain Valve

A: REMOVAL

1) Set the vehicle on the lift.
2) Disconnect ground cable from battery.



3) Lift-up the vehicle.
4) Remove canister. <Ref. to EC(H4SO)-5, REMOVAL, Canister.>
5) Remove clip (A), and then remove drain valve (B) from canister.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Make sure that all hoses are installed correctly.
2) Make sure that hoses are not cracked or loose.

MEMO:

INTAKE (INDUCTION)

IN(H6DO)

Page

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2. Air Cleaner 5
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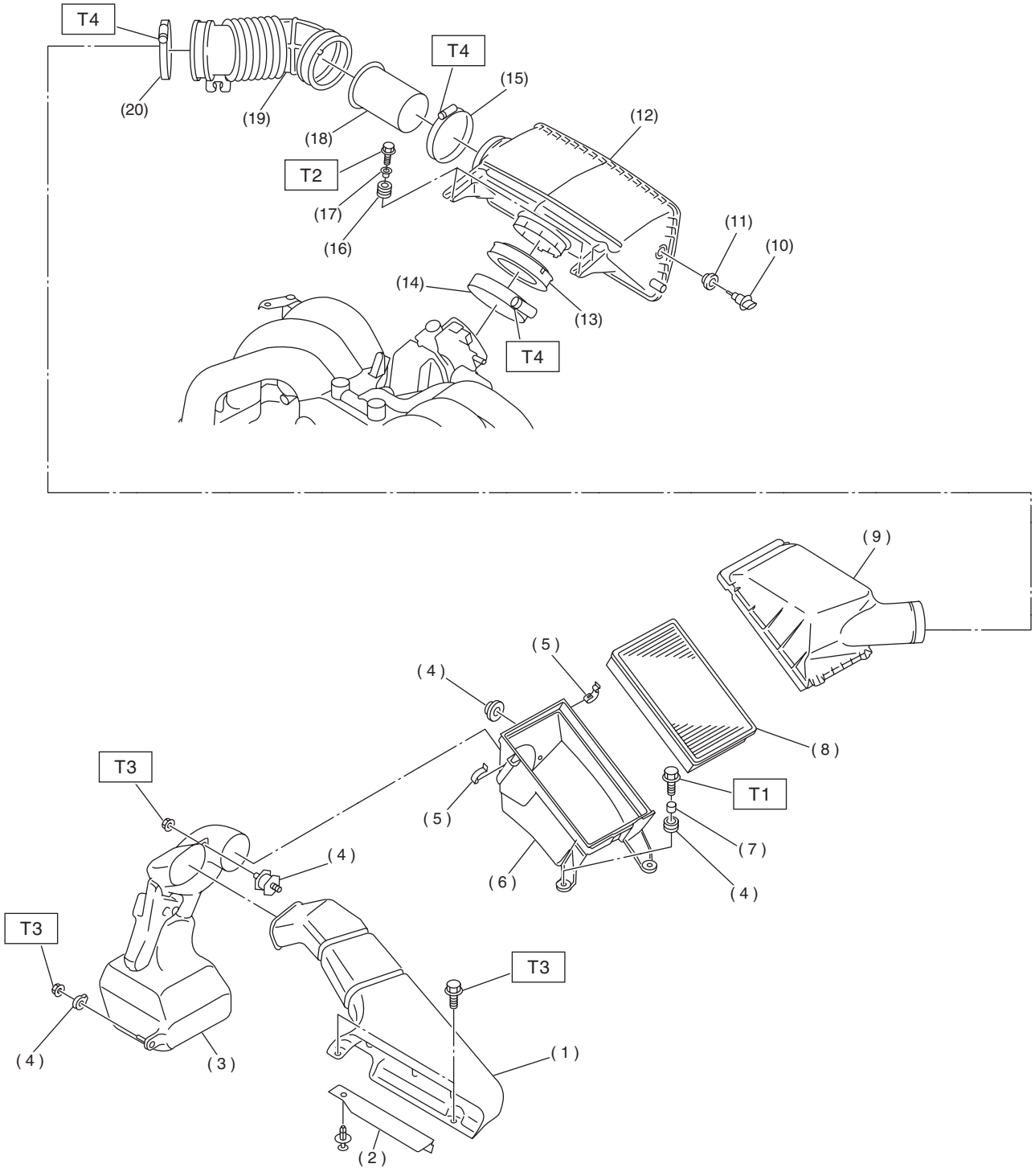
4. Air Intake Duct 7
5. Resonator Chamber 8

1. General Description

A: COMPONENT



IN-00064

(1) Air intake duct
(2) Plate
(3) Resonator chamber
(4) Cushion
(5) Clip
(6) Air cleaner lower case
(7) Spacer
(8) Air cleaner element
(9) Air cleaner upper cover
(10) Intake air temperature sensor
(11) Grommet
(12) Air intake chamber
(13) Grommet
(14) Clamp
(15) Clamp
(16) Cushion
(17) Spacer
(18) Intake duct
(19) Air intake boot
(20) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24.6)
T2: 6.4 (0.65, 4.7)
T3: 7.5 (0.76, 5.5)
T4: 3 (0.3, 2.2)

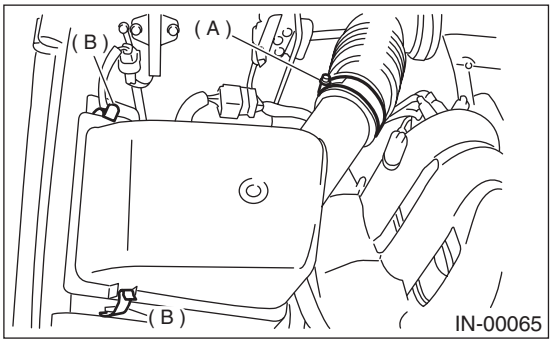
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensor or units, be sure to disconnect ground cable from battery.

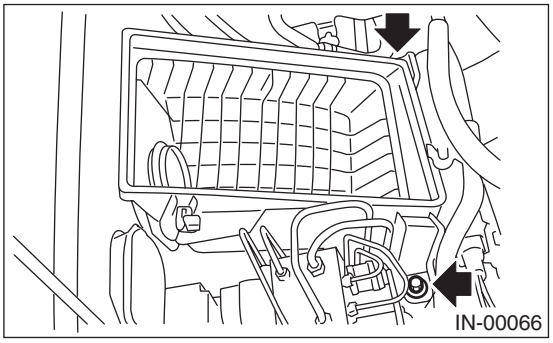
2. Air Cleaner

A: REMOVAL

1) Loosen clamp (A), and separate air cleaner upper cover from air intake boot.
2) Remove the clip (B) above the air cleaner upper cover.



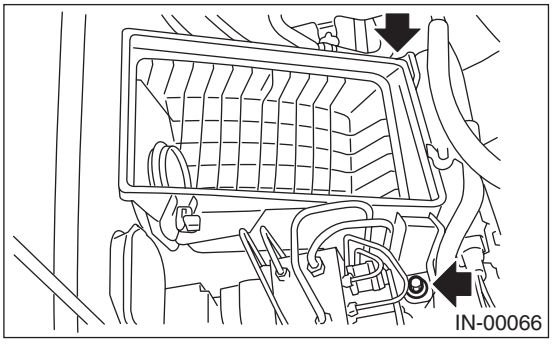
3) Remove air cleaner element.
4) Remove air cleaner lower case.



B: INSTALLATION

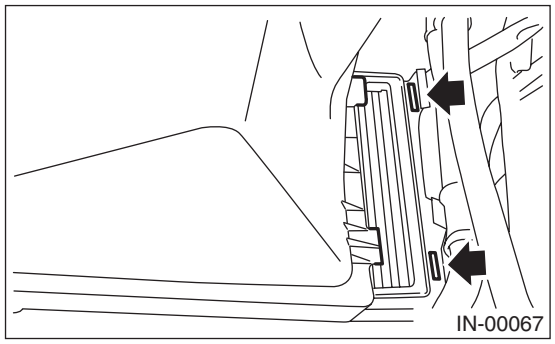
1) Install the air cleaner lower case.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)

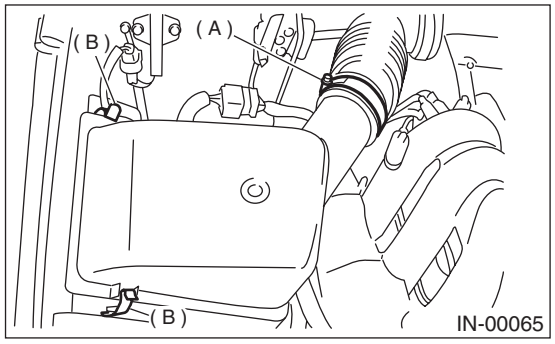


2) Set the air cleaner element.
3) Install the air cleaner upper cover.

NOTE:
Before installing air cleaner upper cover, align holes with protruding portions of air cleaner lower case, then secure upper cover to lower case.



4) Install the clip (B) above the air cleaner upper cover.
5) Tighten clamp (A), and connect air intake boot and air cleaner upper cover.



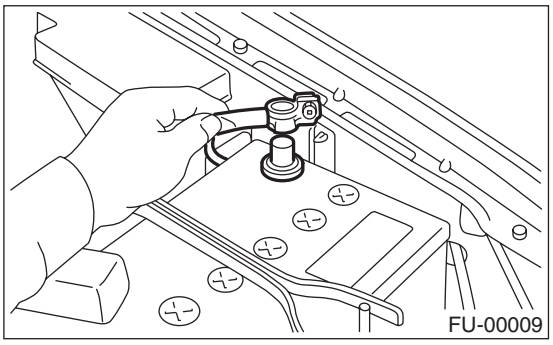
C: INSPECTION

Replace if excessively damaged or dirty.

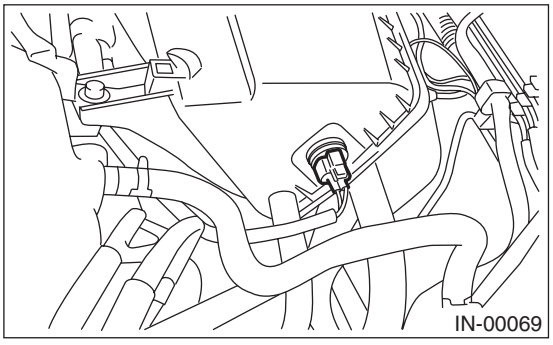
3. Air Intake Chamber

A: REMOVAL

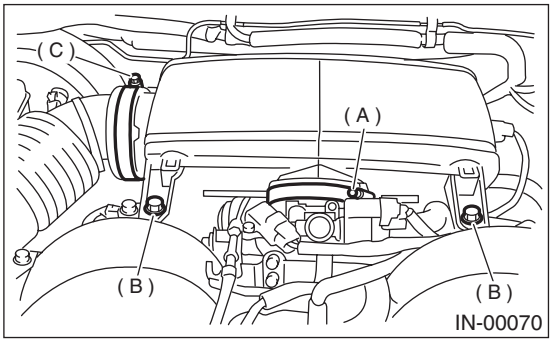
1) Disconnect ground cable from battery.



2) Disconnect connector from intake air temperature sensor.



3) Loosen clamp (A) which connects air intake chamber to throttle body.
4) Remove bolts (B) which install air intake chamber to intake manifold.
5) Loosen clamp (C) which connects air intake chamber to air intake boot.



6) Disconnect hoses from air intake chamber.
7) Remove air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

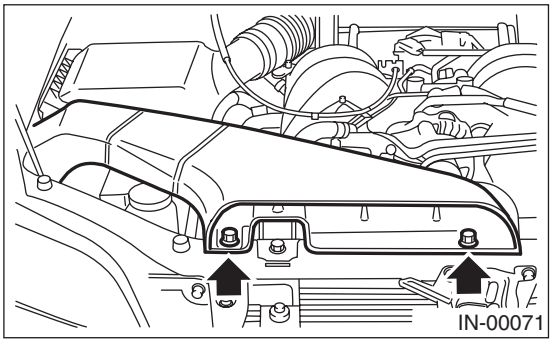
C: INSPECTION

Inspect for cracks and loose connections.

4. Air Intake Duct

A: REMOVAL

Remove bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

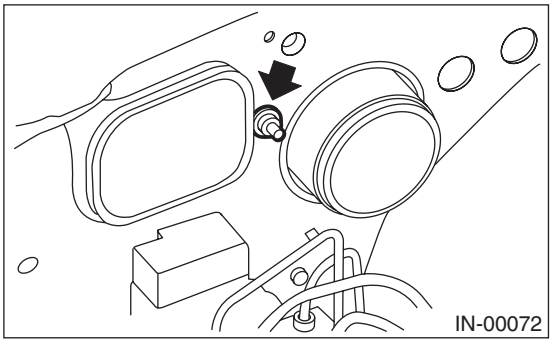
C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the air intake duct.

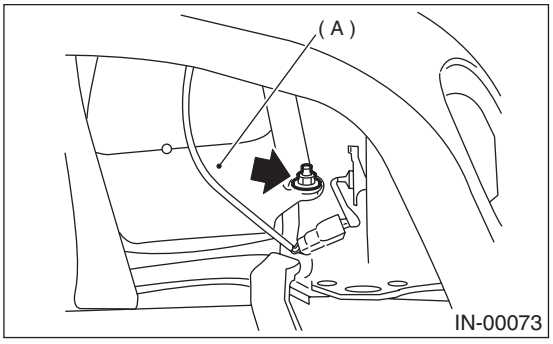
5. Resonator Chamber

A: REMOVAL

1) Set vehicle on a lift.
2) Remove air intake duct. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
3) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
4) Remove the resonator chamber mounting bolt on the right of engine compartment.



5) Remove the front right tire, and lift the vehicle.
6) Remove front mudguard RH.
7) Remove the resonator chamber (A) from the inside front fender.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the resonator chamber.

MECHANICAL

ME(H6DO)

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1. General Description

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
	Valve arrangement			Chain driven, double over-head camshaft, 4-valve/cylinder
	Bore x Stroke		mm (in)	89.2 x 80 (3.512 x 3.150)
	Displacement		cm^3 (cu in)	3,000 (183)
	Compression ratio			10.7
	Compression pressure (350 rpm and fully open throttle)		kPa (kg/cm^2, psi)	1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening		5° BTDC
		Closing		55° ABDC
	Exhaust valve timing	Opening		52° BBDC
		Closing		0° ATDC
	Valve clearance	Intake	mm (in)	$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)
		Exhaust	mm (in)	0.25±0.05 (0.0098±0.0020)
	Idle speed [At “P” or “N” position]		rpm	600±50 (No load) 700±50 (A/C switch ON)
	Firing order			1 → 6 → 3 → 2 → 5 → 4
	Ignition timing		BTDC/rpm	10°±8°/600

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

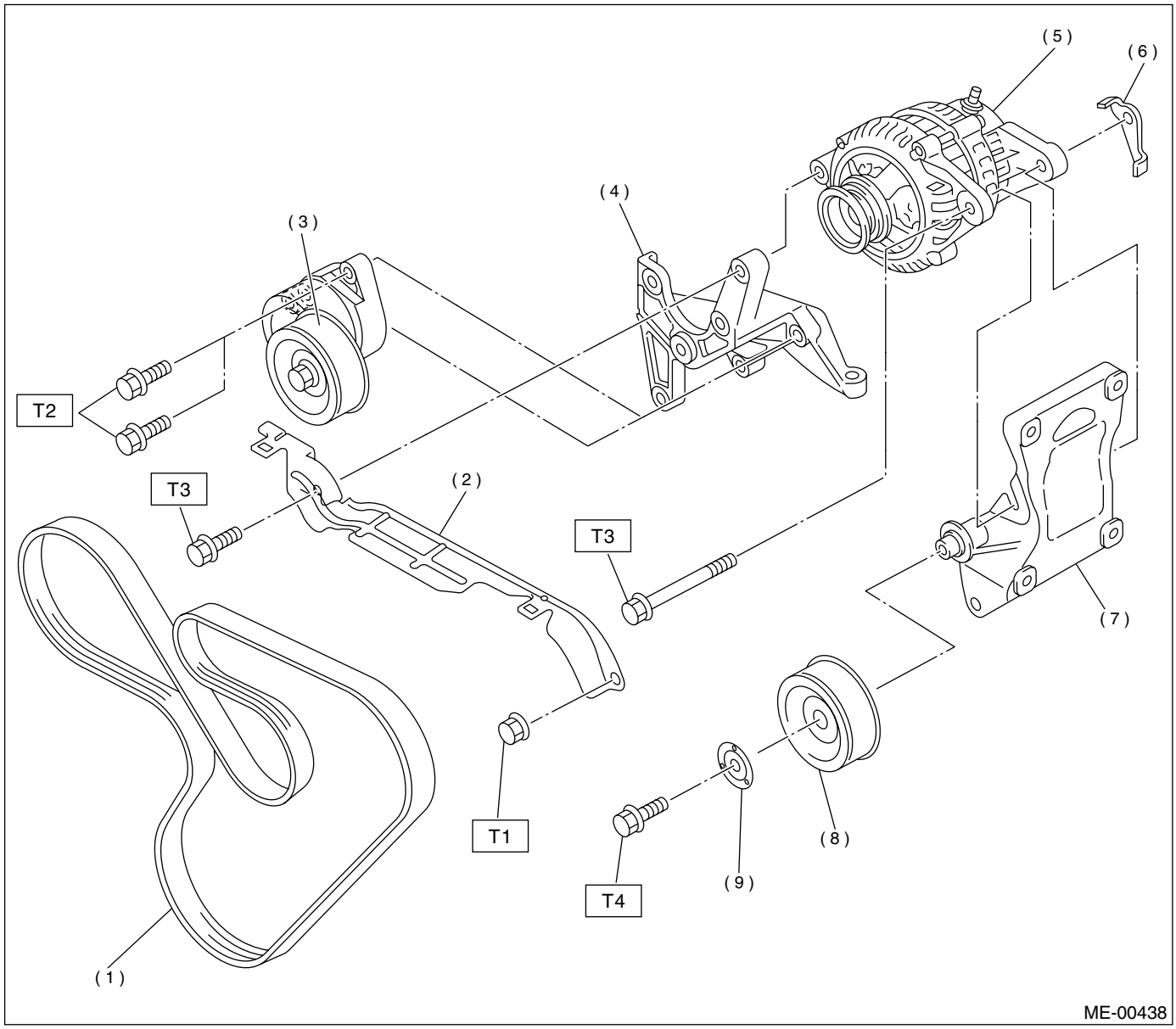
Camshaft	Bend limit			0.020 mm (0.0008 in)
	Thrust clearance	Intake	STD	0.075 — 0.135 mm (0.0030 — 0.0053 in)
		Exhaust	STD	0.048 — 0.108 mm (0.0019 — 0.0043 in)
	Cam lobe height	Intake	STD	45.75 — 45.85 mm (1.8012 — 1.8051 in)
		Exhaust	STD	45.25 — 45.35 mm (1.7815 — 1.7854 in)
	Camshaft journal O.D.	Front		37.946 — 37.963 mm (1.4939 — 1.4946 in)
		Center & Rear		27.946 — 27.963 mm (1.1002 — 1.1009 in)
	Camshaft journal hole I.D.	Front		38.000 — 38.018 mm (1.4961 — 1.4968 in)
		Center & Rear		28.000 — 28.018 mm (1.1024 — 1.1031 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
Cylinder head	Warping limit (Mating with cylinder block)			0.02 mm (0.0008 in)
	Inner diameter of valve lifter hole			34.006 — 34.016 mm (1.3388 — 1.3392 in)
	Standard height			124 mm (4.88 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			5.500 — 5.512 mm (0.2165 — 0.2170 in)
	Protrusion above head		Intake	12.3 — 12.7 mm (0.484 — 0.500 in)

Valve	Head edge thickness		Intake	STD	1.0 mm (0.039 in)
				Limit	0.8 mm (0.031 in)
			Exhaust	STD	1.2 mm (0.047 in)
				Limit	1.0 mm (0.039 in)
	Stem diameter			Intake	5.455 — 5.470 mm (0.2148 — 0.2154 in)
				Exhaust	5.445 — 5.460 mm (0.2144 — 0.2150 in)
	Stem oil clearance		STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
				Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
	Overall length			Intake	103.5 mm (4.07 in)
				Exhaust	103.2 mm (4.06 in)
	Outer diameter of valve lifter				33.959 — 33.975 mm (1.3370 — 1.3376 in)
Valve spring	Free length				46.79 mm (1.8421 in)
	Squareness				2.5°, 2.0 mm (0.079 in)
Cylinder block	Standard height				202 mm (7.951 in)
	Warping limit (Mating with cylinder head)				0.02 mm (0.0008 in)
	Cylinder bore		STD	A	89.205 — 89.215 mm (3.5120 — 3.5124 in)
				B	89.195 — 89.205 mm (3.5116 — 3.5120 in)
	Taper				0.03 mm (0.0012 in)
	Out-of-roundness				0.01 mm (0.0004 in)
	Piston clearance			STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
	Enlarging (boring) limit				0.5 mm (0.020 in)
Piston	Outer diameter		STD	A	89.185 — 89.195 mm (3.5112 — 3.5116 in)
				B	89.175 — 89.185 mm (3.5108 — 3.5112 in)
			0.25 mm (0.0098 in) OS		89.425 — 89.435 mm (3.5207 — 3.5211 in)
			0.50 mm (0.0197 in) OS		89.675 — 89.685 mm (3.5305 — 3.5309 in)
	Standard inner diameter of piston pin hole				22.000 — 22.006 mm (0.8661 — 0.8664 in)
Piston pin	Outer diameter				21.994 — 22.000 mm (0.8659 — 0.8661 in)
	Standard clearance between piston pin and hole in piston				0.004 — 0.008 mm (0.0002 — 0.0003 in)
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD		0.20 — 0.35 mm (0.0079 — 0.0138 in)
		Second ring	STD		0.35 — 0.50 mm (0.0138 — 0.0197 in)
		Oil ring	STD		0.20 — 0.60 mm (0.0079 — 0.0236 in)
	Clearance between piston ring and piston ring groove	Top ring	STD		0.040 — 0.080 mm (0.0016 — 0.0031 in)
		Second ring	STD		0.030 — 0.070 mm (0.0012 — 0.0028 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit		0.10 mm (0.0039 in)
	Side clearance		STD		0.070 — 0.330 mm (0.0028 — 0.0130 in)
Connecting rod bearing	Oil clearance		STD		0.022 — 0.052 mm (0.0009 — 0.0020 in)
	Thickness at center portion		STD		1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US		1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US		1.520 — 1.523 mm (0.0598 — 0.0600 in)
			0.25 mm (0.0098 in) US		1.620 — 1.623 mm (0.0638 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD		0 — 0.022 mm (0 — 0.0009 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3, #5, #7	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
		#2, #4, #6	STD	63.992 — 64.008 mm (2.5194 — 2.5200 in)
			0.03 mm (0.0012 in) US	63.962 — 63.978 mm (2.5182 — 2.5188 in)
			0.05 mm (0.0020 in) US	63.942 — 63.958 mm (2.5174 — 2.5180 in)
			0.25 mm (0.0098 in) US	63.742 — 63.758 mm (2.5095 — 2.5102 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
	Oil clearance		STD	0.015 — 0.030 mm (0.0006 — 0.0012 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3, #5, #7	STD	1.992 — 2.005 mm (0.0784 — 0.0789 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	1.996 — 2.000 mm (0.0786 — 0.0787 in)
			0.03 mm (0.0012 in) US	2.019 — 2.020 mm (0.0795 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

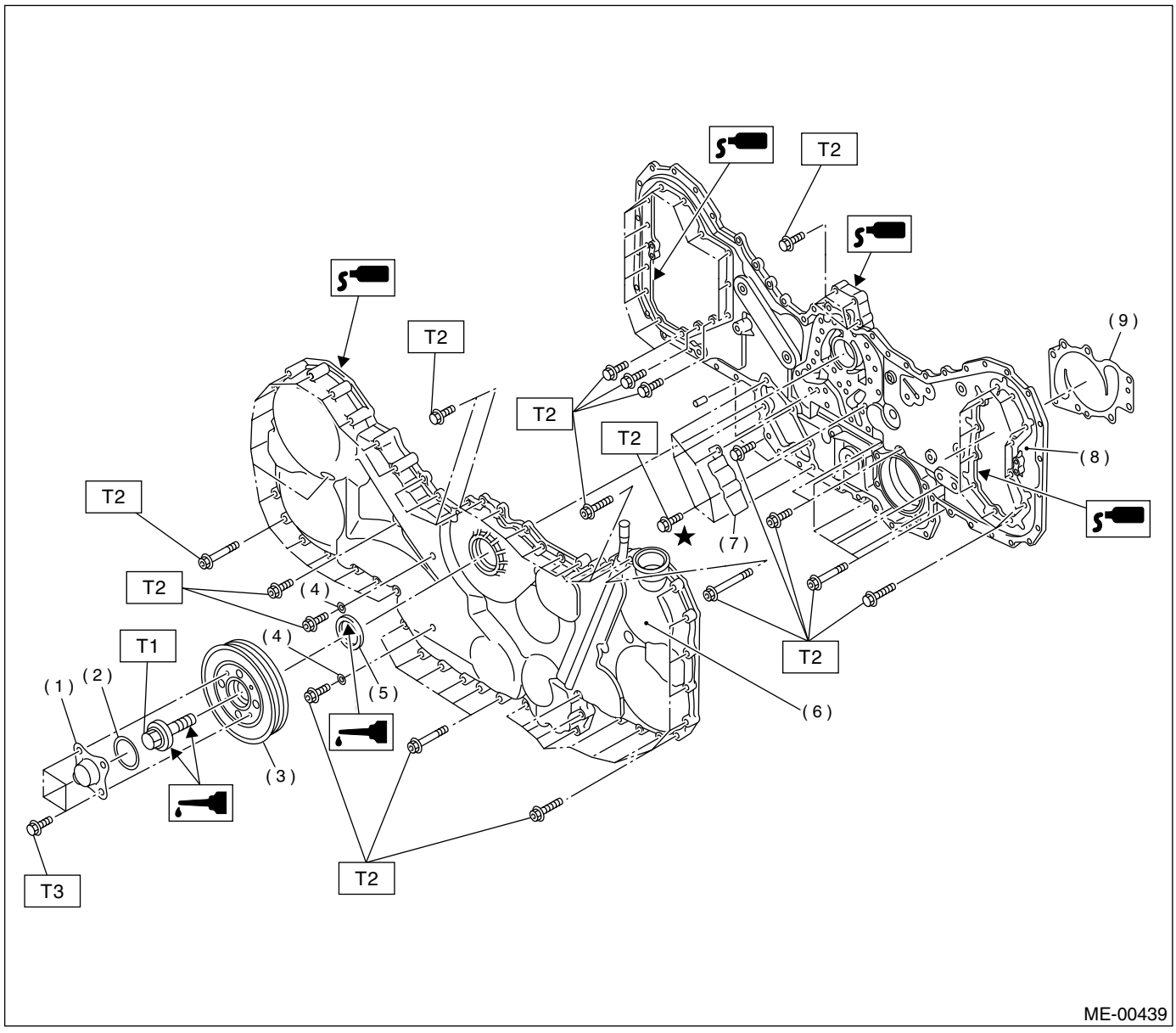
1. V-BELT



(1) V-belt
(2) Belt cover
(3) Belt tensioner
(4) Power steering pump bracket
(5) Generator
(6) Generator plate
(7) A/C compressor stay
(8) Idler pulley
(9) Idler pulley cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 20 (2.0, 14)
T3: 25 (2.5, 18)
T4: 33 (3.4, 25)

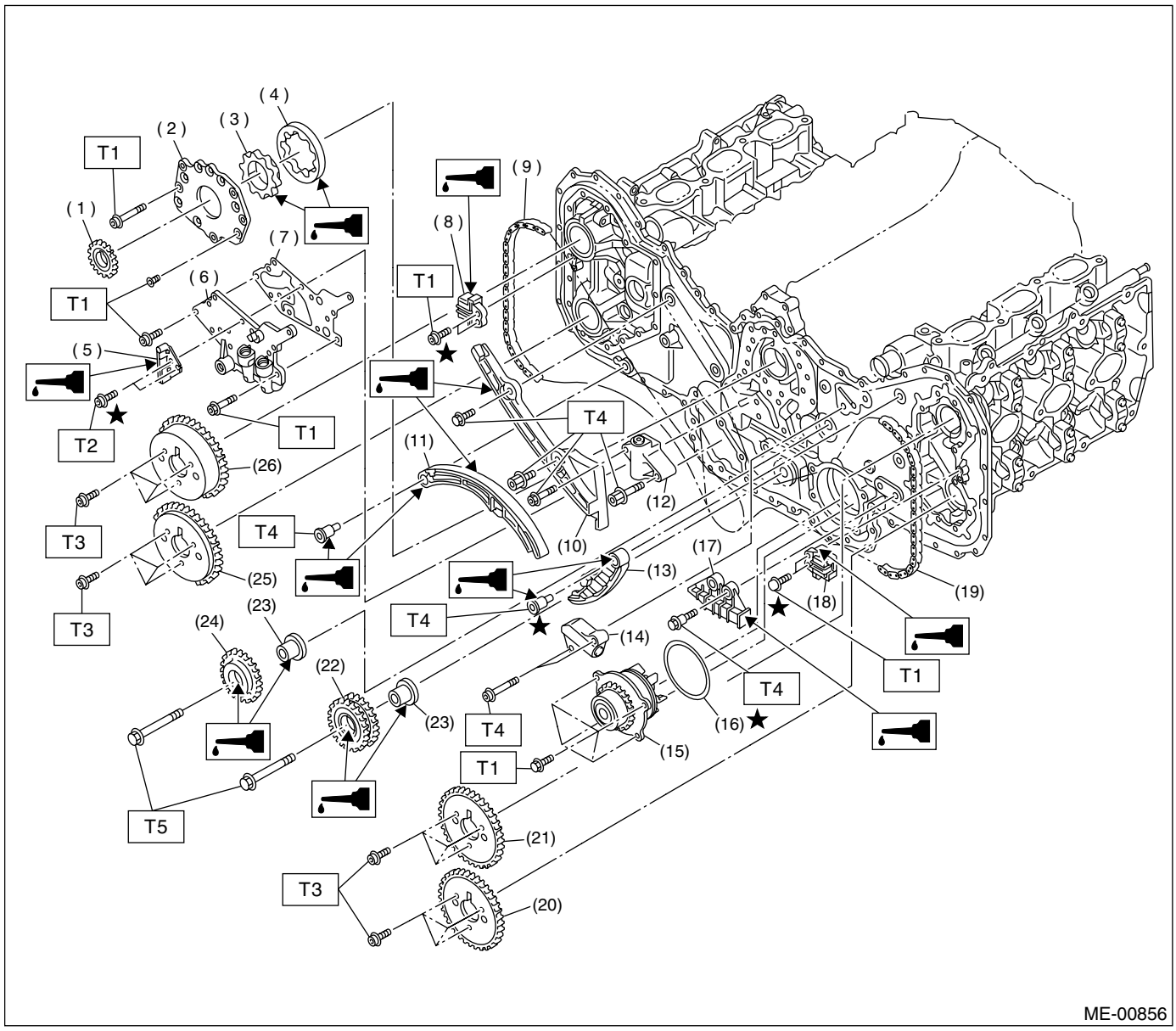
2. TIMING CHAIN COVER



(1) Crank pulley cover
(2) O-ring
(3) Crank pulley
(4) Sealing washer
(5) Oil seal
(6) Front chain cover
(7) Baffle
(8) Rear chain cover
(9) Water pump gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: <Ref. to ME(H6DO)-38, Crankshaft Pulley.>
T2: <Ref. to ME(H6DO)-39, Front Chain Cover.>
T3: 6.4 (0.65, 4.7)

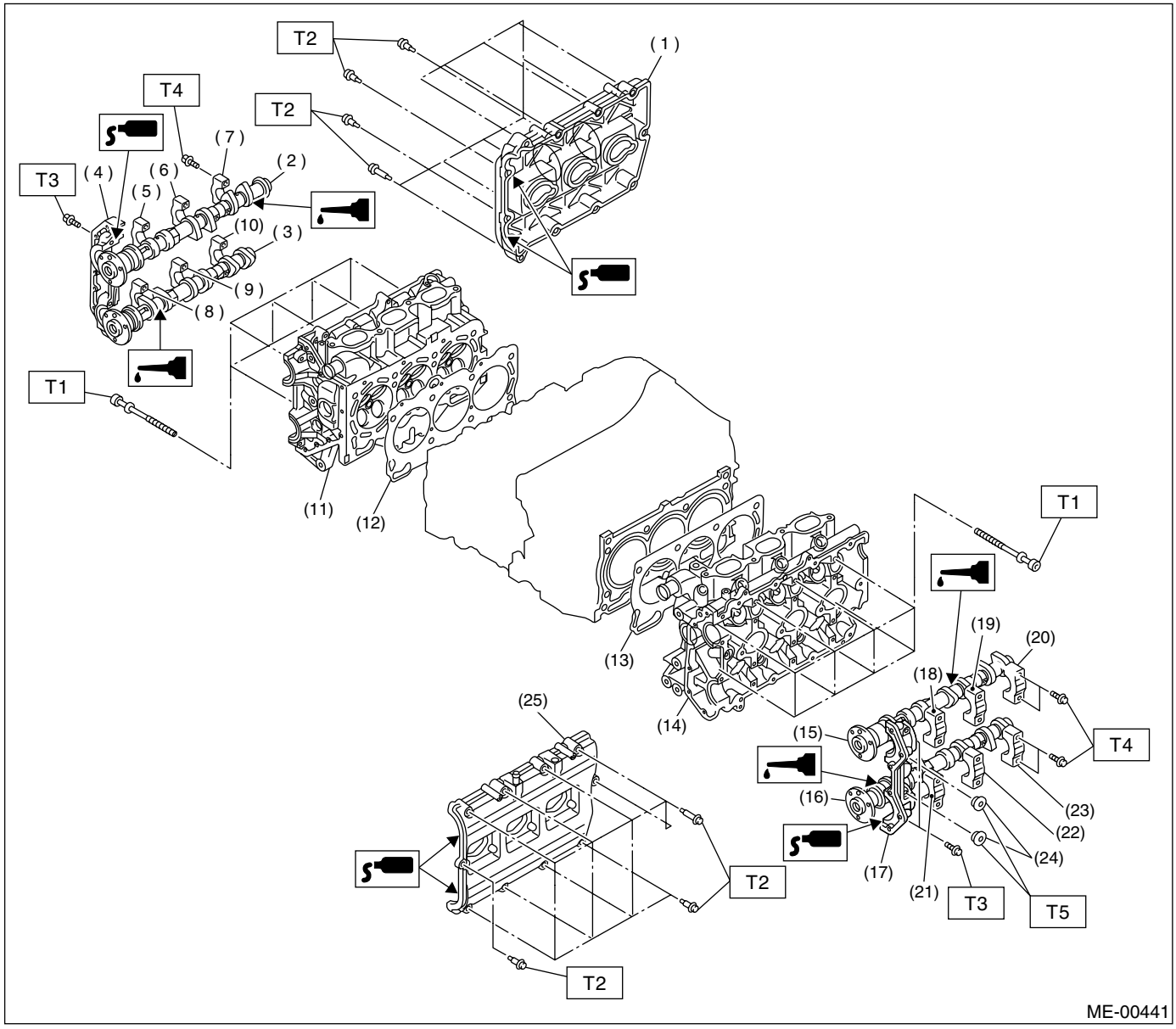
3. TIMING CHAIN



(1) Crank sprocket
(2) Oil pump cover
(3) Inner rotor
(4) Outer rotor
(5) Chain guide (Center)
(6) Relief valve case
(7) Relief valve case gasket
(8) Chain guide (Right-hand between cams)
(9) Timing chain (RH)
(10) Chain guide (RH)
(11) Chain tensioner lever (RH)
(12) Chain tensioner (RH)
(13) Chain tensioner lever (LH)
(14) Chain tensioner (LH)
(15) Water pump
(16) O-ring
(17) Chain guide (LH)
(18) Chain guide (Left-hand between cams)
(19) Timing chain (LH)
(20) Exhaust cam sprocket (LH)
(21) Intake cam sprocket (LH)
(22) Idler sprocket (Lower)
(23) Idler sprocket color
(24) Idler sprocket (Upper)
(25) Exhaust cam sprocket (RH)
(26) Intake cam sprocket (RH)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.64, 4.7)
T2: 7.8 (0.80, 5.8)
T3: 13 (1.3, 9.4)
T4: 16 (1.6, 11.6)
T5: 69 (7.0, 50.6)

4. CYLINDER HEAD AND CAMSHAFT

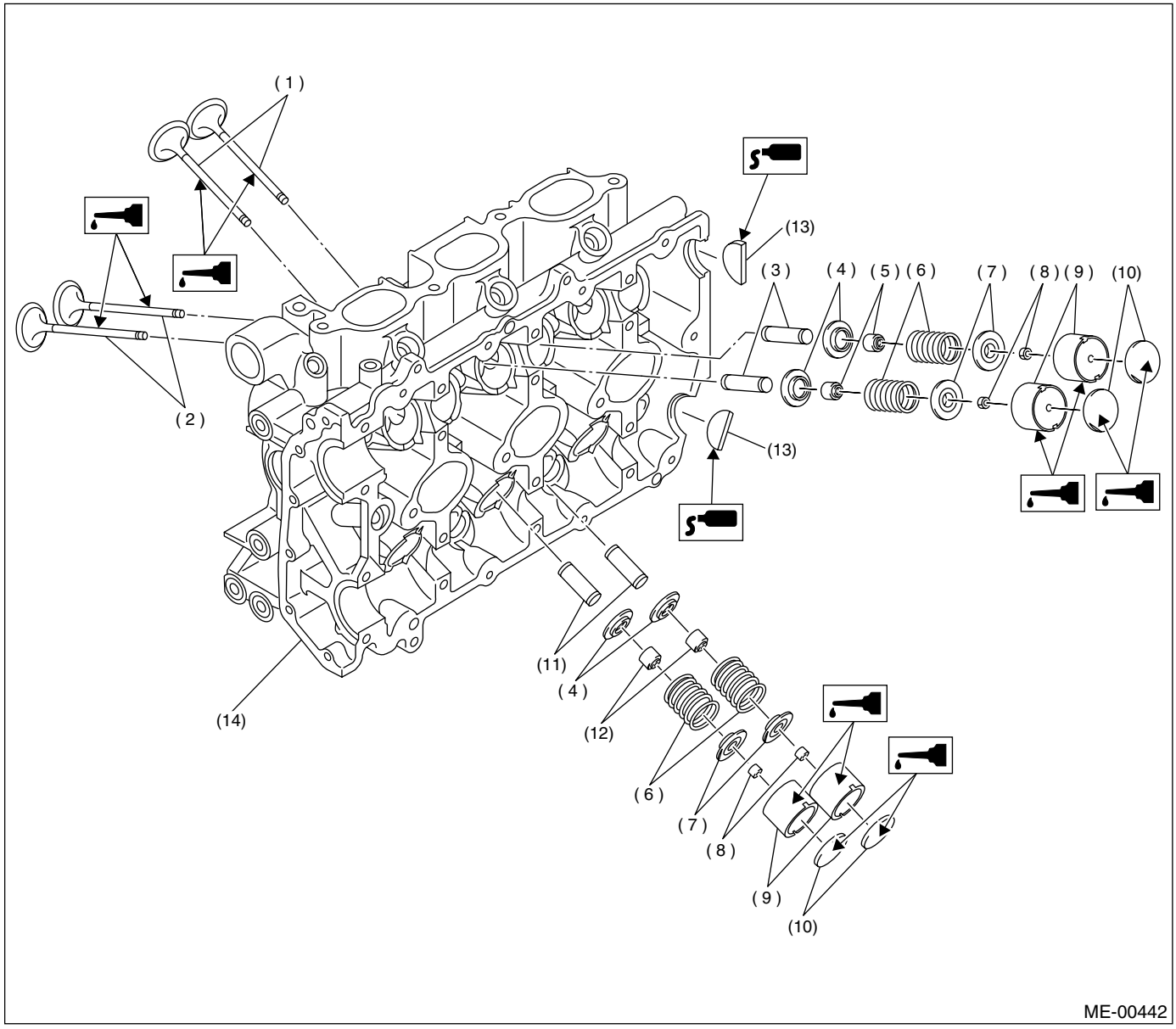


(1) Rocker cover (RH)
(2) Intake camshaft (RH)
(3) Exhaust camshaft (RH)
(4) Front camshaft cap (RH)
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Exhaust camshaft cap (Front RH)
(9) Exhaust camshaft cap (Center RH)
(10) Exhaust camshaft cap (Rear RH)
(11) Cylinder head (RH)
(12) Cylinder head gasket (RH)
(13) Cylinder head gasket (LH)
(14) Cylinder head (LH)
(15) Intake camshaft (LH)
(16) Exhaust camshaft (LH)
(17) Front camshaft cap (LH)
(18) Intake camshaft cap (Front LH)
(19) Intake camshaft cap (Center LH)
(20) Intake camshaft cap (Rear LH)
(21) Exhaust camshaft cap (Front LH)
(22) Exhaust camshaft cap (Center LH)
(23) Exhaust camshaft cap (Rear LH)
(24) Plug
(25) Rocker cover (LH)

Tightening torque: N·m (kgf-m, ft-lb)

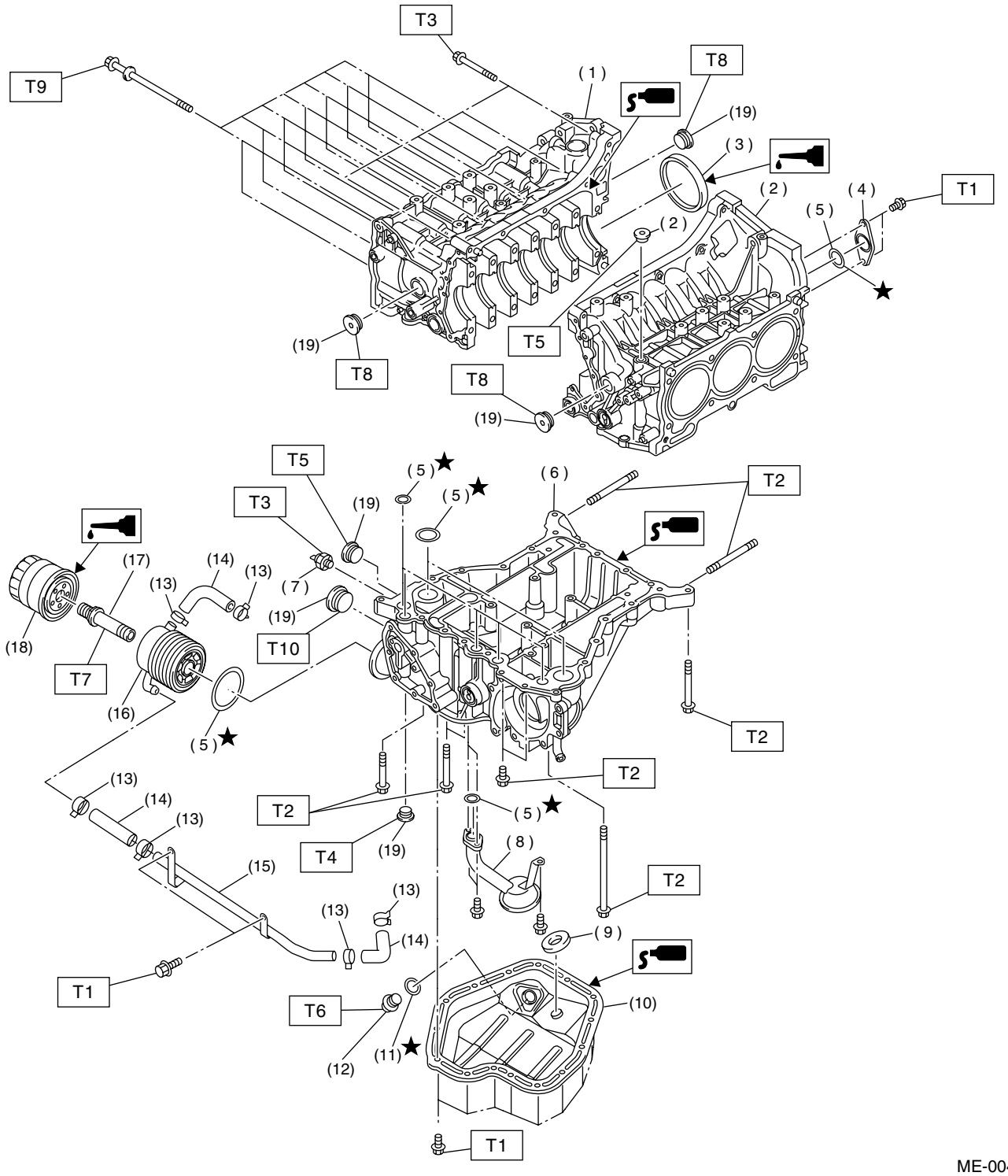
T1: <Ref. to ME(H6DO)-54, Cylinder Head Assembly.>
T2: <Ref. to ME(H6DO)-50, Camshaft.>
T3: <Ref. to ME(H6DO)-50, Camshaft.>
T4: <Ref. to ME(H6DO)-50, Camshaft.>
T5: 59 (6.0, 43)

5. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Intake valve guide
(4) Valve spring seat
(5) Intake valve stem seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Shim
(11) Exhaust valve guide
(12) Exhaust valve stem seal
(13) Cylinder head plug
(14) Cylinder head

6. CYLINDER BLOCK

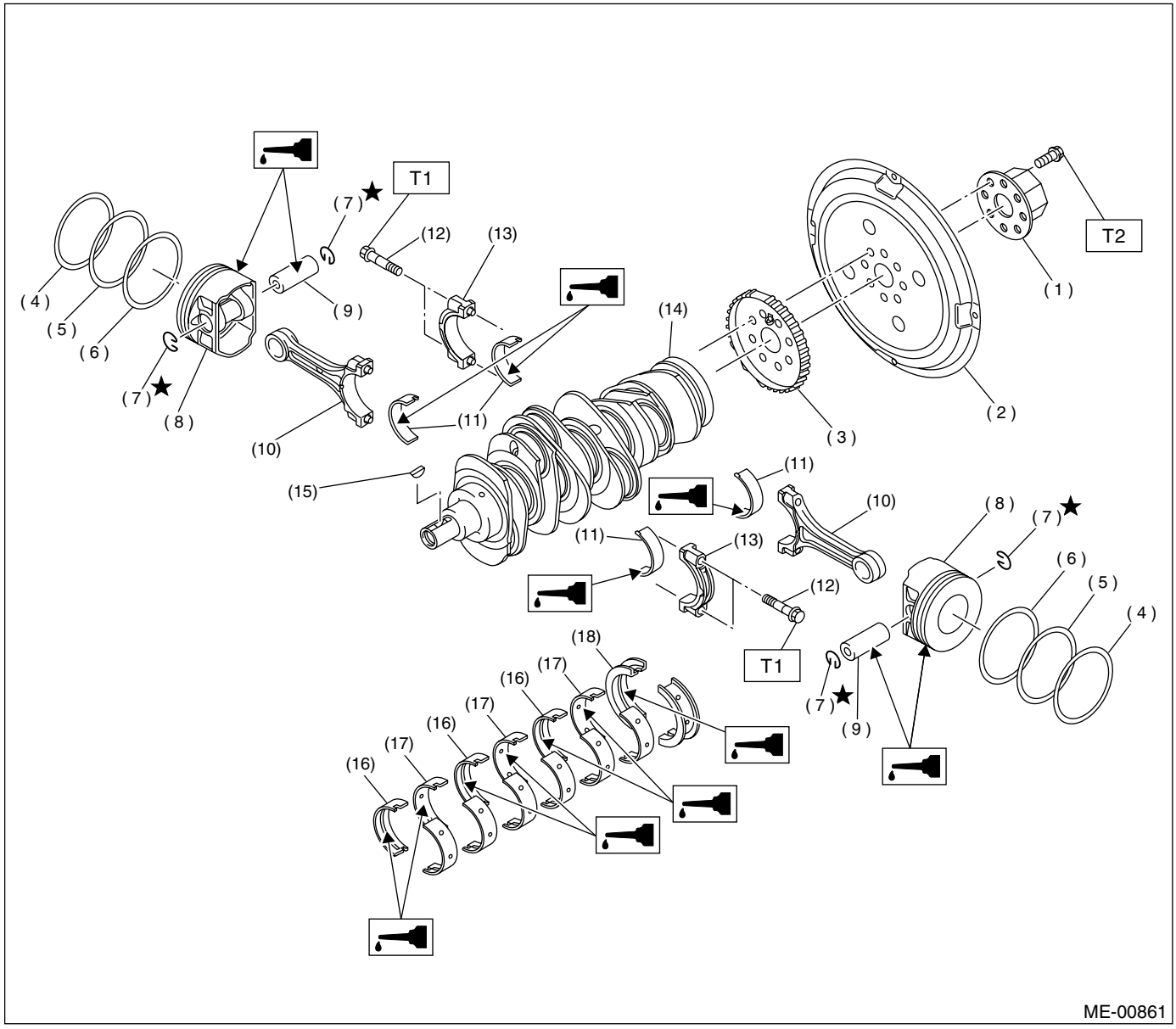


ME-00443

(1) Cylinder block (RH)
(2) Cylinder block (LH)
(3) Rear oil seal
(4) Service hole cover
(5) O-ring
(6) Oil pan upper
(7) Oil pressure switch
(8) Oil strainer
(9) Magnet
(10) Oil pan
(11) Metal gasket
(12) Drain plug
(13) Clamp
(14) Hose
(15) Oil cooler pipe
(16) Oil cooler
(17) Connector
(18) Oil filter
(19) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 18 (1.8, 13.0)
T3: 25 (2.5, 18)
T4: 34 (3.5, 25)
T5: 37 (3.8, 27)
T6: 44 (4.5, 33)
T7: 54 (5.5, 40)
T8: 69 (7.0, 51)
T9: <Ref. to ME(H6DO)-60, Cylinder Block.>
T10: 90 (9.2, 67)

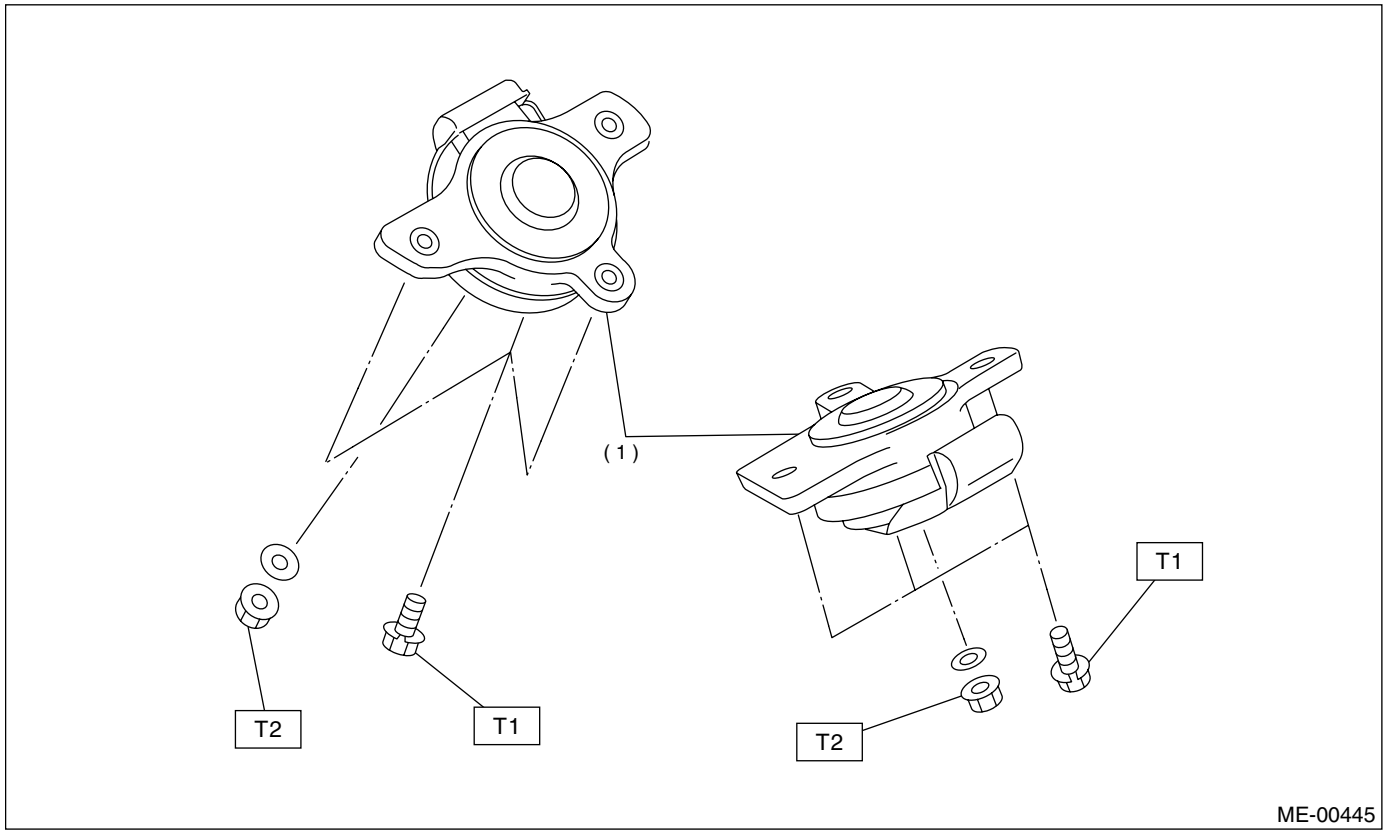
7. CRANKSHAFT AND PISTON



(1) Reinforcement
(2) Drive plate
(3) Crankshaft sensor plate
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Circlip
(8) Piston
(9) Piston pin
(10) Connecting rod
(11) Connecting rod bearing
(12) Connecting rod bolt
(13) Connecting rod cap
(14) Crankshaft
(15) Woodruff key
(16) Crankshaft bearing #1, #3, #5
(17) Crankshaft bearing #2, #4, #6
(18) Crankshaft bearing #7

Tightening torque: N·m (kgf-m, ft-lb)
T1: 53 (5.4, 39)
T2: 81 (8.3, 60)

8. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 34 (3.5, 25.3)
T2: 74 (7.5, 54)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

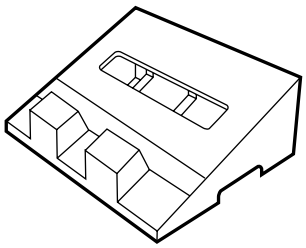
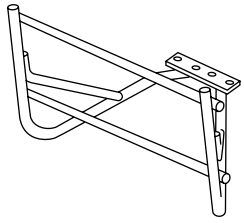
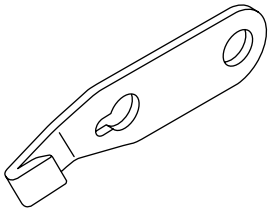
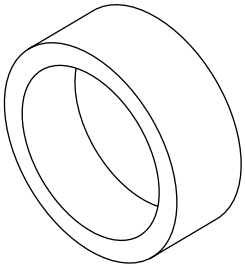
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA000	18250AA000	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST18232AA000	18232AA000	ENGINE STAND	Used for engine disassembly and assembly.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 ST18254AA000	18254AA000	PISTON GUIDE	Used for installing piston in cylinder.

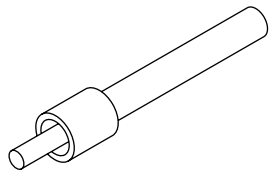
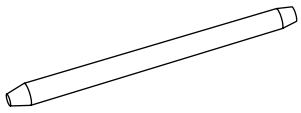
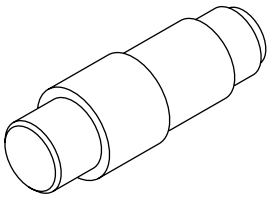
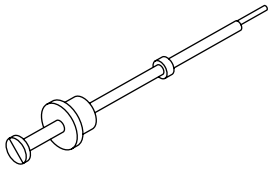
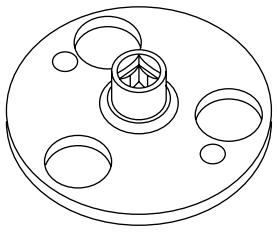
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499585500	499585500	VALVE STEM SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide stem seals.
 ST18253AA000	18253AA000	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097500	499097500	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST18231AA000	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

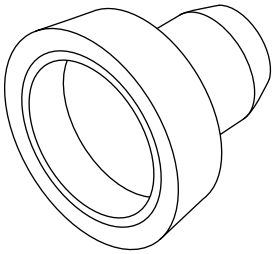
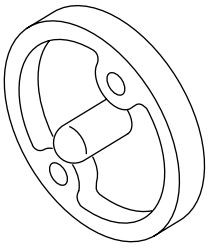
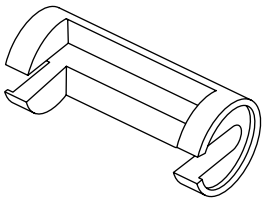
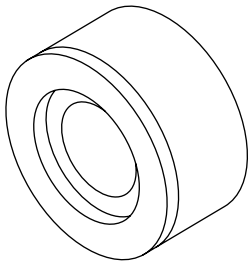
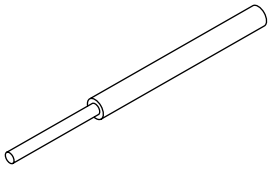
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA000	18251AA000	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 ST-499765700	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.

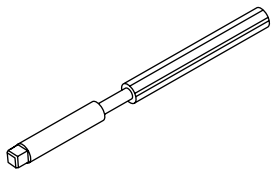
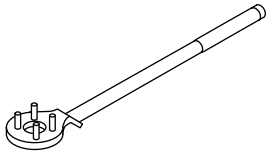
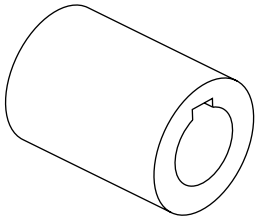
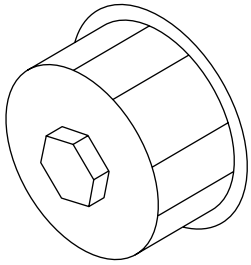
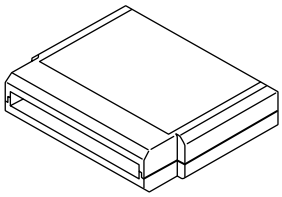
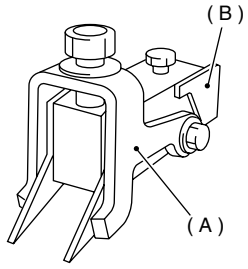
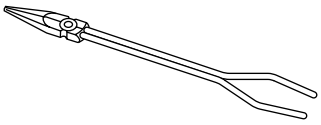
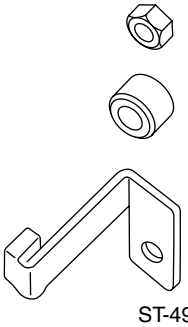
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA020	22771AA020	SELECT MONITOR KIT	Troubleshooting for electrical systems.
 ST18329AA000	18329AA000	SHIM REPLACER ASSY	Used for correct valve clearance.
	A: 18330AA010	LIFTER	If 498187200 SHIM REPLACER ASSY (H4) tool is available, it is commonly used for H6 by partially replacing the following parts: • LIFTER (H4) → LIFTER (H6) A: 18330AA010 • SLIDER (H4) → SLIDER (H6) B: 18351AA000
	B: 18351AA000	SLIDER	
 ST18233AA000	18233AA000	PISTON PIN CIRCLIP PLIERS	Used for removing piston pin circlip.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- Camshaft
- Cylinder Head

2. Compression

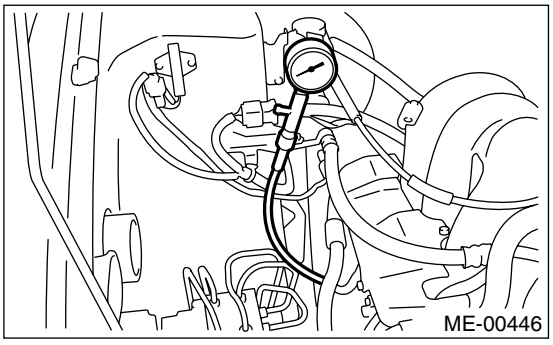
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
5) Check the starter motor for satisfactory performance and operation.
6) Hold the compression gauge tight against the spark plug hole.

CAUTION:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

7) Fully open throttle valve.
8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



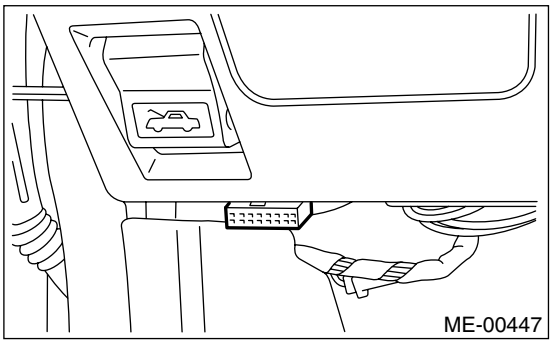
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,275 — 1,471 kPa (13.0 — 15.0 kg/cm^2, 185 — 213 psi)
Limit;
1,128 kPa (11.5 kg/cm^2, 164 psi)

3. Idle Speed

A: INSPECTION

1) Before checking idle speed, check the following:
   (1) Ensure that air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn ignition switch to OFF.
4) When using SUBARU SELECT MONITOR <Ref. to ME(H6DO)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect SUBARU SELECT MONITOR to the data link connector.



   (3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
   (4) Select {2. Each System Check} in Main Menu.
   (5) Select {Engine Control System} in Selection Menu.
   (6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
   (7) Select {1.12 Data Display} in Data Display Menu.
   (8) Start the engine, and read engine idle speed.

NOTE:
• When using the OBD-II general scan tool, carefully read its operation manual.

5) Check idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed (No load and gears in N or P position):
600±50 rpm

6) Check idle speed when loaded. (Turn air conditioning switch to "ON" and operate compressor for at least one minute before measurement.)

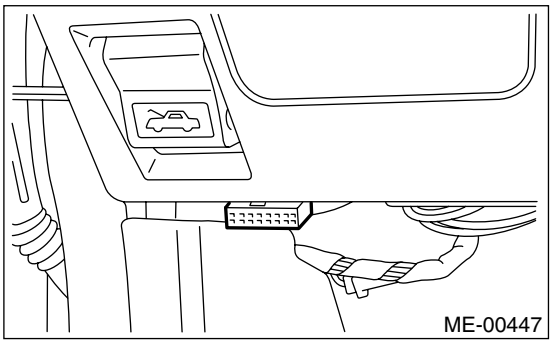
Idle speed [A/C "ON", no load and gears in N or P position]:
700±50 rpm

CAUTION:
Idle speed cannot be adjusted manually because it is controlled automatically. If idle speed is out of specifications, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1) Before checking ignition timing, check the following:
   (1) Ensure that air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure that malfunction indicator light (CHECK ENGINE light) does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn ignition switch to OFF.
4) When using SUBARU SELECT MONITOR <Ref. to ME(H6DO)-14, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect SUBARU SELECT MONITOR to the data link connector.



   (3) Turn ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
   (4) Select {2. Each System Check} in Main Menu.
   (5) Select {Engine Control System} in Selection Menu.
   (6) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
   (7) Select {1.12 Data Display} in Data Display Menu.
   (8) Start engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
10°±3°/600±50

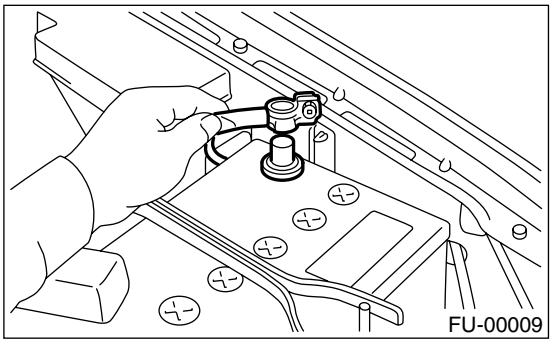
If the timing is not correct, check the ignition control system.
Refer to EN(H6) Engine Control System. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>

5. Valve Clearance

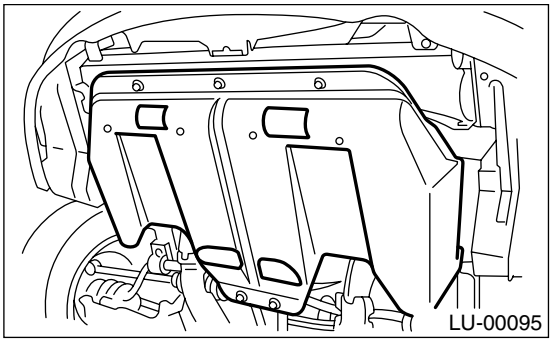
A: INSPECTION

CAUTION:
Inspection and adjustment of valve clearance should be performed while engine is cold.

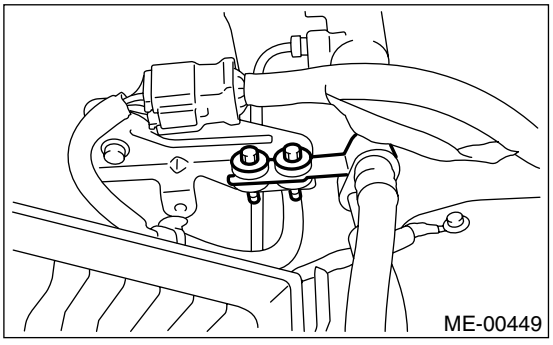
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.



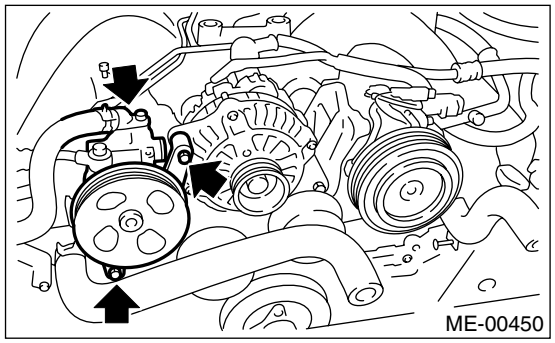
3) Lift up the vehicle.
4) Remove under cover.



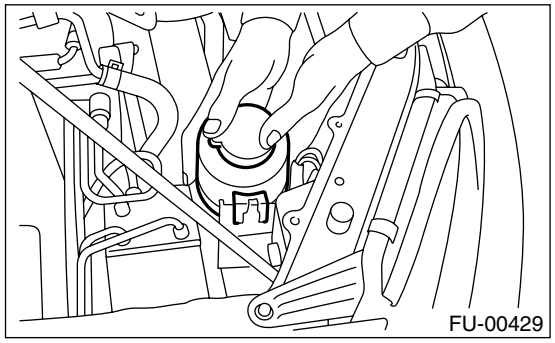
5) Lower the vehicle.
6) Place suitable container under the vehicle.
7) When inspecting RH side cylinder.
   (1) Remove air intake duct and air cleaner case. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
   (2) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
   (3) Remove power steering hose from bracket.



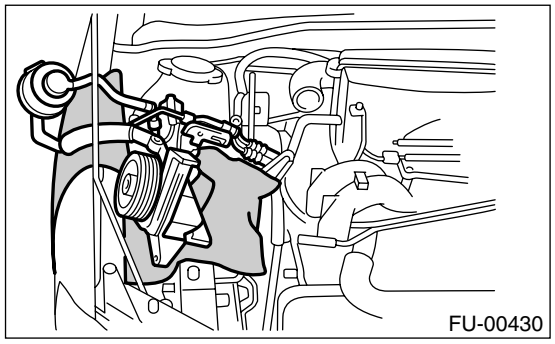
(4) Remove bolts which install power steering pump bracket.



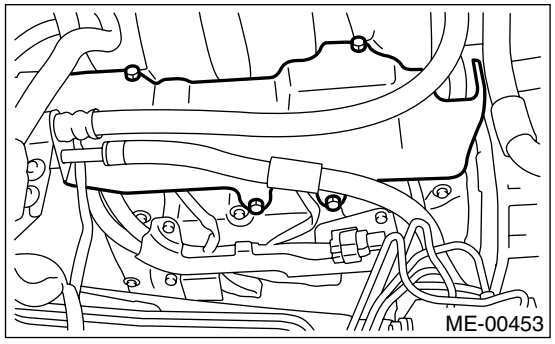
(5) Remove power steering tank from the bracket by pulling it upward.



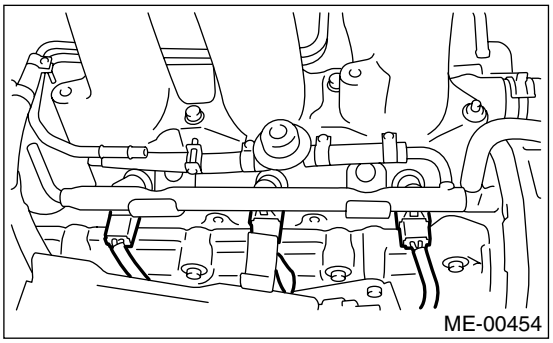
(6) Place power steering pump on the right side wheel apron.



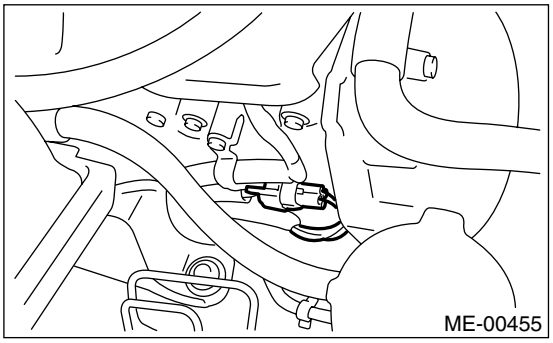
(7) Remove fuel pipe protector RH.



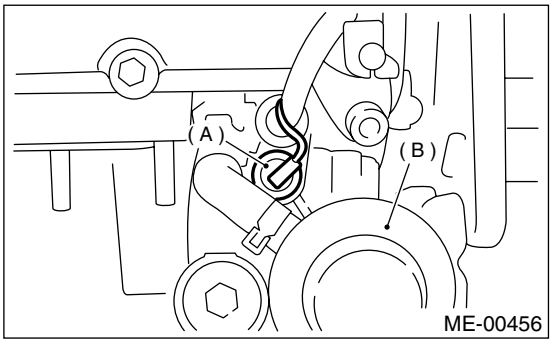
(8) Disconnect fuel injector connectors.



(9) Disconnect front oxygen (A/F) sensor connector.



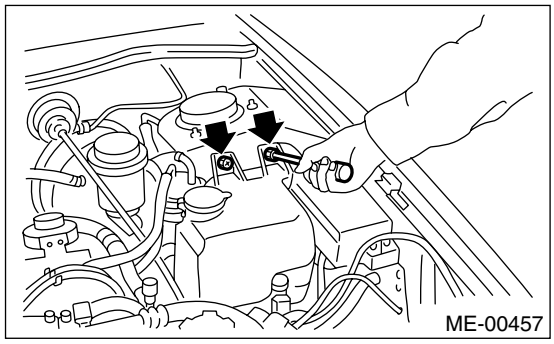
(10) Disconnect oil pressure switch connector.



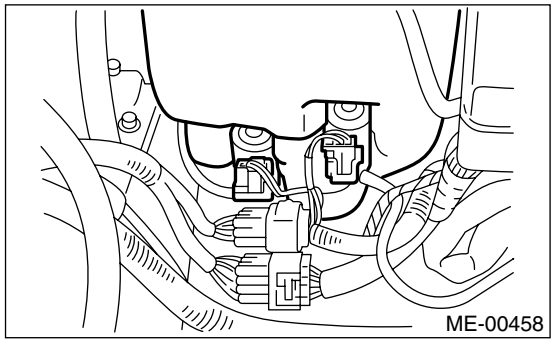
(A) Oil pressure switch
(B) Oil filter

(11)Remove ignition coils. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>
(12)Remove rocker cover RH. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>

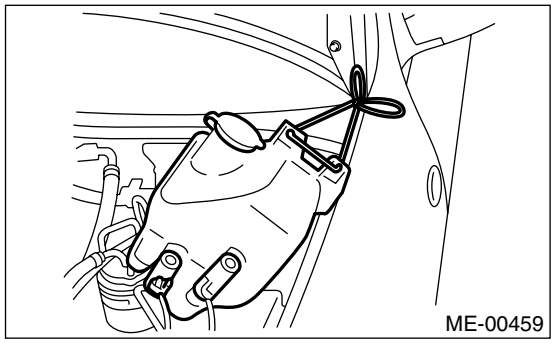
8) When inspecting LH side cylinder.
(1) Set the vehicle on the lift.
(2) Remove battery.
(3) Remove washer tank mounting bolts.



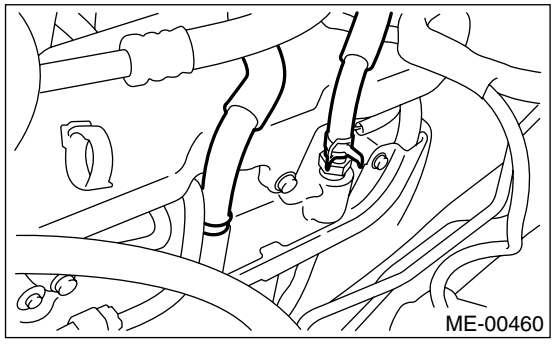
(4) Disconnect washer motor connectors.



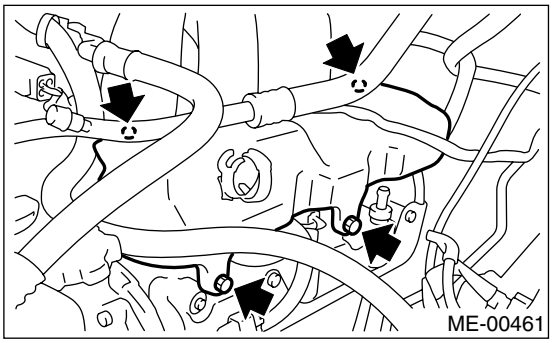
(5) Move washer tank upward.



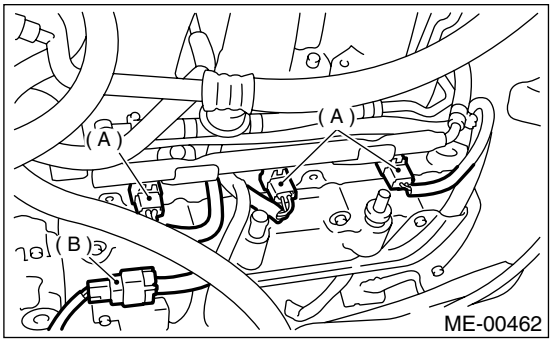
(6) Disconnect PCV hose and blow-by hose from rocker cover LH.



(7) Remove fuel pipe protector LH.

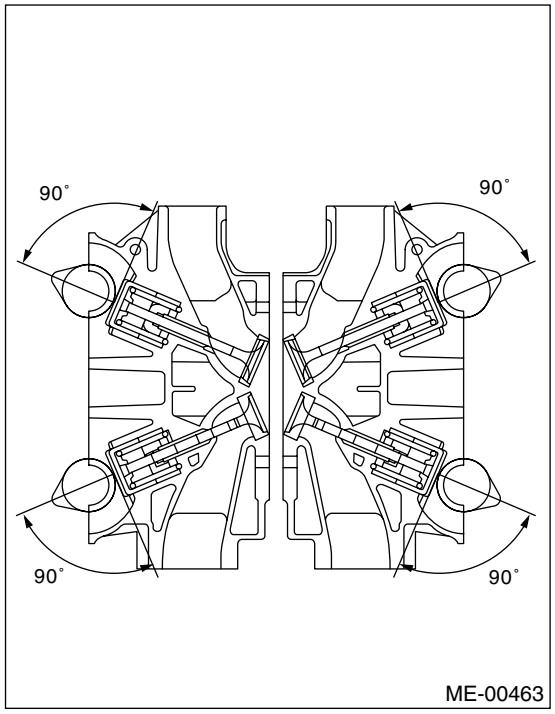


(8) Disconnect fuel injector connectors. (A)
(9) Disconnect front oxygen (A/F) sensor connector. (B)



(10)Remove ignition coils. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil and Ignitor Assembly.>
(11)Remove rocker cover LH. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>

9) Turn the crankshaft clockwise using the ST. Move the camshaft position so that the adjusting cam is perpendicular to the shim as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET

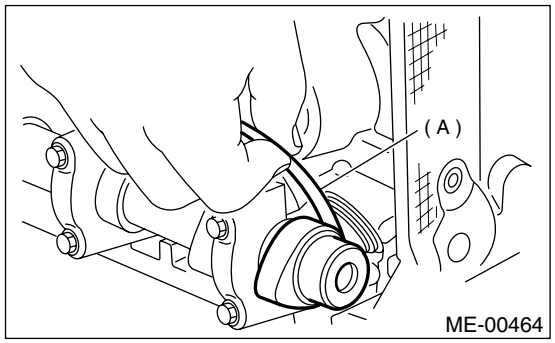


10) Measure intake valve and exhaust valve clearances by using thickness gauge (A).

CAUTION:
Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.

Valve clearance:
Intake: $0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.0024}$ in)
Exhaust: 0.25±0.05 mm (0.0098±0.0020 in)

NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



11) If necessary, adjust the valve clearance. <Ref. to ME(H6DO)-25, ADJUSTMENT, Valve Clearance.>

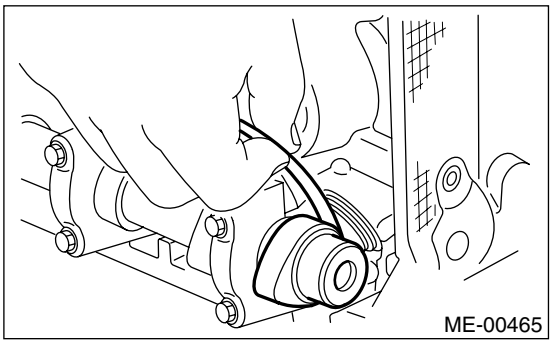
12) Further turn crankshaft pulley clockwise. Using the same procedure described previously, then measure valve clearances again.
13) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

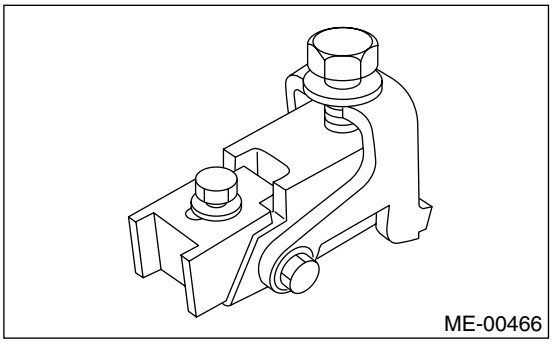
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(H6DO)-22, INSPECTION, Valve Clearance.>

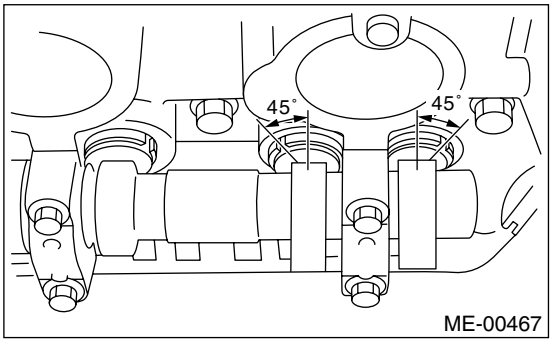
NOTE:
Record each valve clearance after it has been measured.



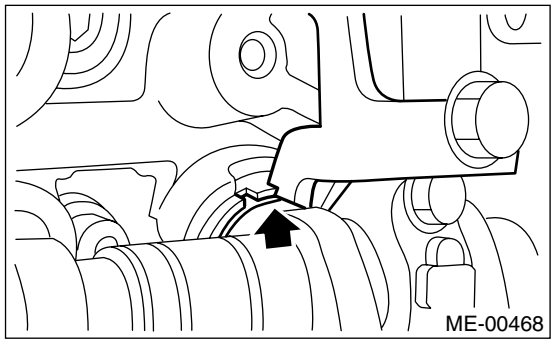
2) Remove shim from valve lifter.
(1) Prepare the ST.
ST 18329AA000 SHIM REPLACER
<Ref. to ME(H6DO)-14, PREPARATION TOOL, General Description.>



(2) Rotate the notch of the valve lifter outward by 45°.

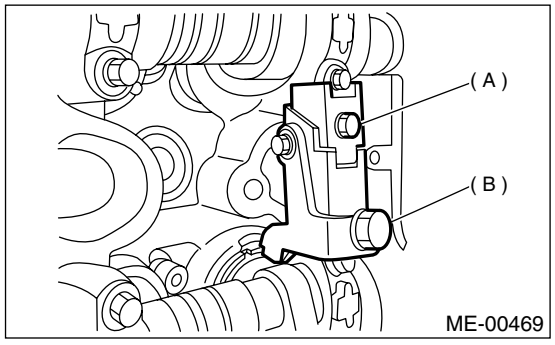


(3) Adjust SHIM REPLACER notch to valve lifter and set it.

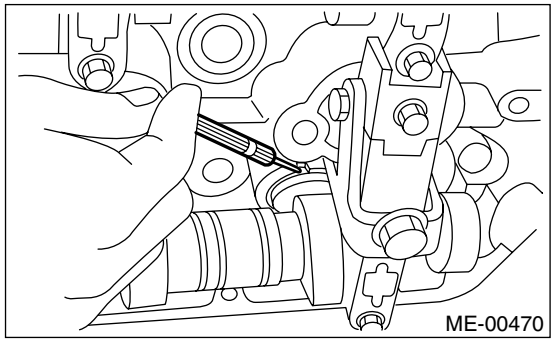


NOTE:
When setting, be careful SHIM REPLACER edge does not touch shim.

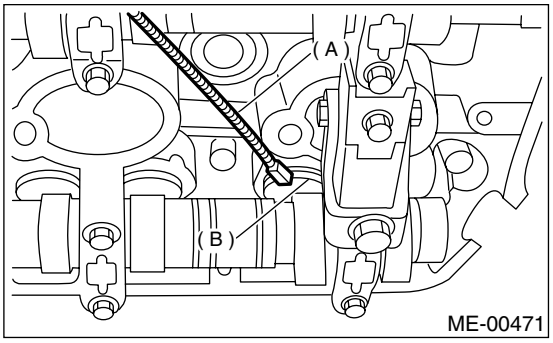
(4) Tighten bolt (A) and install it to the cylinder head.
(5) Tighten bolt (B) and insert the valve lifter.



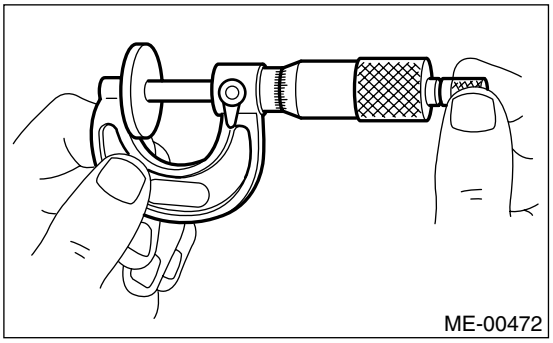
(6) Insert tweezers into the notch of the valve lifter, and take the shim out.



NOTE:
By using a magnet (A), the shim (B) can be taken out without dropping it.



3) Measure thickness of shim with micrometer.



4) Select a shim of suitable thickness using measured valve clearance and shim thickness, by referring to the following table.
5) Set suitable shim selected in step 4) to valve lifter.

Unit: mm
Intake valve: S = (V + T) − 0.20 Exhaust valve: S = (V + T) − 0.25
S: Shim thickness to be used V: Measured valve clearance T: Shim thickness required

Part No.	Thickness mm (in)
13218 AK010	2.00 (0.0787)
13218 AK020	2.02 (0.0795)
13218 AK030	2.04 (0.0803)
13218 AK040	2.06 (0.0811)
13218 AK050	2.08 (0.0819)
13218 AK060	2.10 (0.0827)
13218 AK070	2.12 (0.0835)
13218 AK080	2.14 (0.0843)
13218 AK090	2.16 (0.0850)
13218 AK100	2.18 (0.0858)
13218 AK110	2.20 (0.0866)
13218 AE710	2.22 (0.0874)
13218 AE720	2.23 (0.0878)
13218 AE730	2.24 (0.0882)
13218 AE740	2.25 (0.0886)
13218 AE750	2.26 (0.0890)
13218 AE760	2.27 (0.0894)
13218 AE770	2.28 (0.0898)
13218 AE780	2.29 (0.0902)
13218 AE790	2.30 (0.0906)
13218 AE800	2.31 (0.0909)
13218 AE810	2.32 (0.0913)
13218 AE820	2.33 (0.0917)
13218 AE830	2.34 (0.0921)
13218 AE840	2.35 (0.0925)
13218 AE850	2.36 (0.0929)
13218 AE860	2.37 (0.0933)
13218 AE870	2.38 (0.0937)
13218 AE880	2.39 (0.0941)
13218 AE890	2.40 (0.0945)
13218 AE900	2.41 (0.0949)
13218 AE910	2.42 (0.0953)
13218 AE920	2.43 (0.0957)
13218 AE930	2.44 (0.0961)
13218 AE940	2.45 (0.0965)
13218 AE950	2.46 (0.0969)
13218 AE960	2.47 (0.0972)
13218 AE970	2.48 (0.0976)
13218 AE980	2.49 (0.0980)
13218 AE990	2.50 (0.0984)
13218 AF000	2.51 (0.0988)
13218 AF010	2.52 (0.0992)
13218 AF020	2.53 (0.0996)
13218 AF030	2.54 (0.1000)
13218 AF040	2.55 (0.1004)
13218 AF050	2.56 (0.1008)
13218 AF060	2.57 (0.1012)
13218 AF070	2.58 (0.1016)
13218 AF090	2.60 (0.1024)
13218 AF100	2.61 (0.1028)
13218 AF110	2.62 (0.1031)
13218 AF120	2.63 (0.1035)
13218 AF130	2.64 (0.1039)
13218 AF140	2.65 (0.1043)
13218 AF150	2.66 (0.1047)
13218 AF160	2.67 (0.1051)
13218 AF170	2.68 (0.1055)
13218 AF180	2.69 (0.1059)
13218 AF190	2.70 (0.1063)
13218 AF200	2.71 (0.1067)
13218 AF210	2.72 (0.1071)
13218 AF220	2.73 (0.1075)
13218 AF230	2.74 (0.1079)
13218 AF240	2.75 (0.1083)
13218 AF250	2.76 (0.1087)
13218 AF260	2.77 (0.1091)

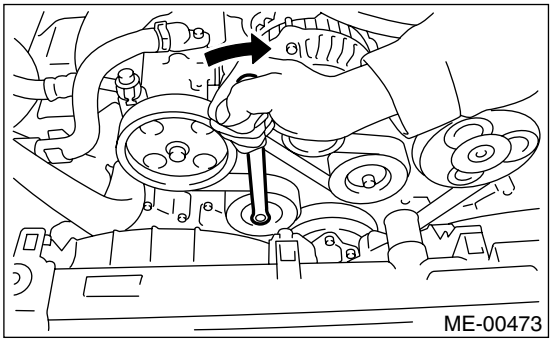
Part No.	Thickness mm (in)
13218 AF270	2.78 (0.1094)
13218 AF280	2.79 (0.1098)
13218 AF290	2.80 (0.1102)
13218 AF300	2.81 (0.1106)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

6. V-belt

A: REMOVAL

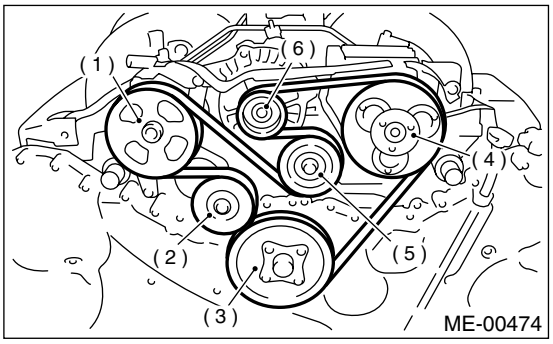
1) Fit the tool to the belt tensioner mounting bolt.
2) Turn the tool clockwise, and loosen the V-belt to remove.



3) Remove the V-belt cover.

B: INSTALLATION

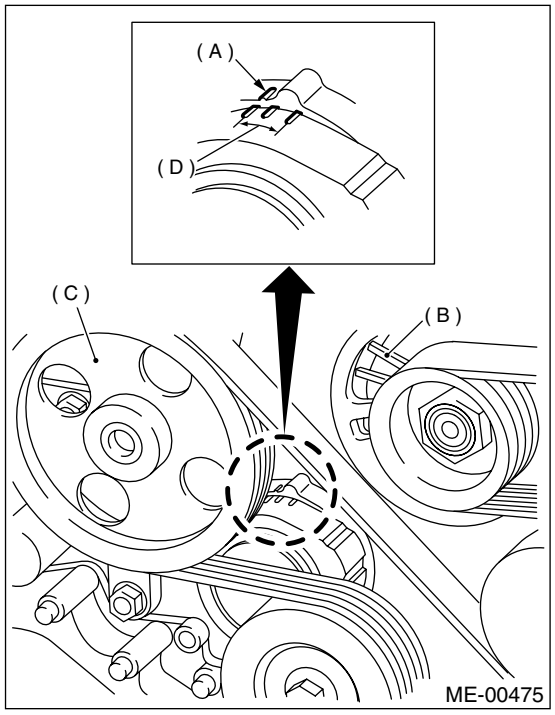
1) Install in the reverse order of removal.



(1) Power steering oil pump
(2) Belt tension adjuster
(3) Crankshaft pulley
(4) A/C compressor
(5) Belt idler
(6) Generator

C: INSPECTION

1) Replace belts, if cracks, fraying or wear is found.
2) Check that the V-belt automatic tensioner indicator (A) is within the range (D).

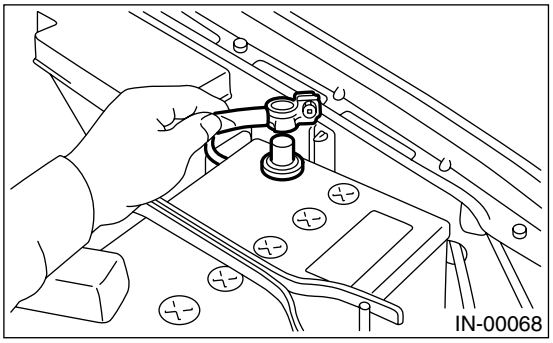


(A) Indicator
(B) Generator
(C) Power steering oil pump
(D) Service limit

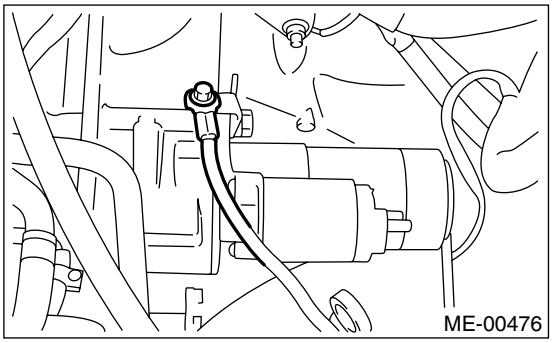
7. Engine Assembly

A: REMOVAL

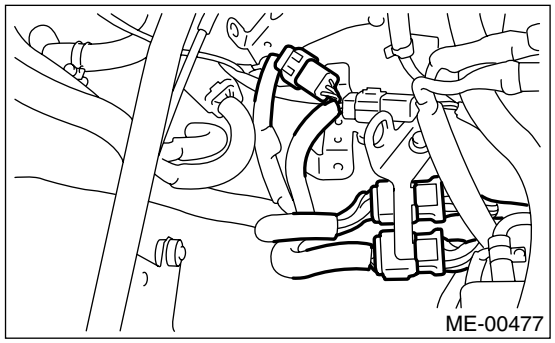
1) Set the vehicle on lift arms.
2) Open front hood fully and support with stay.
3) Raise rear seat, and turn floor mat up.
4) Release fuel pressure. <Ref. to FU(H6DO)-50, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
5) Remove filler cap.
6) Disconnect battery ground cable.



7) Remove air intake duct, air cleaner case and air intake chamber.
<Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>, <Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
8) Lift up the vehicle.
9) Remove under cover.
10) Remove radiator from vehicle. <Ref. to CO(H6DO)-23, REMOVAL, Radiator.>
11) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
12) Disconnect A/C pressure hoses from A/C compressor. <Ref. to AC-38, REMOVAL, Flexible Hose.>
13) Disconnect the following connectors and cables.
(1) Engine ground terminal



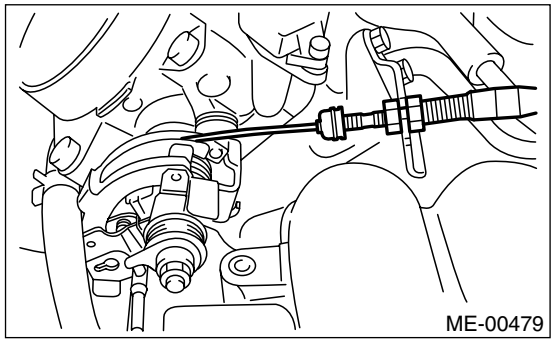
(2) Engine harness connectors



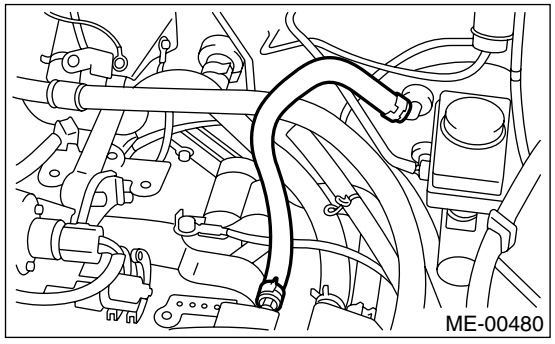
(3) Generator connector, terminal and A/C compressor connector

(A) Generator connector and terminal
(B) A/C compressor connector

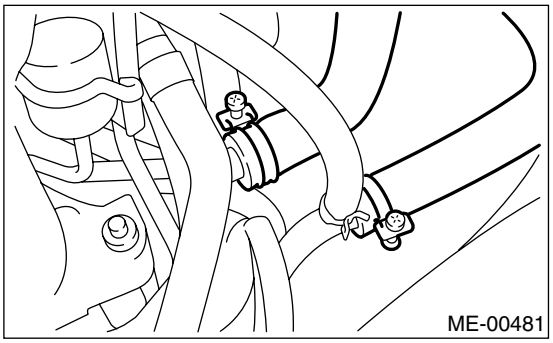
(4) Accelerator cable



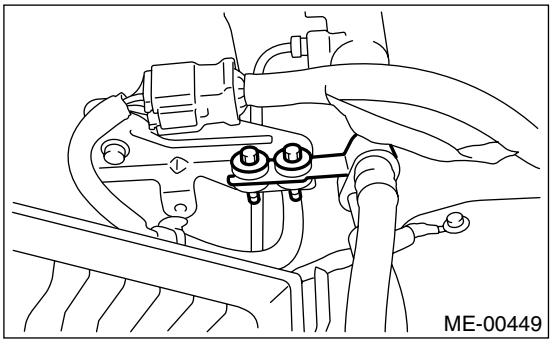
14) Disconnect the following hoses.
(1) Brake booster vacuum hose



(2) Heater inlet outlet hose

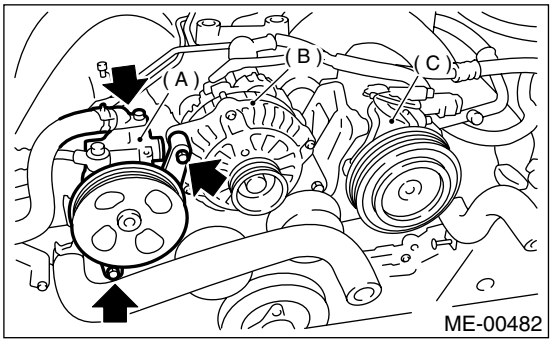


15) Remove power steering pump from bracket.
(1) Remove pipe with bracket.



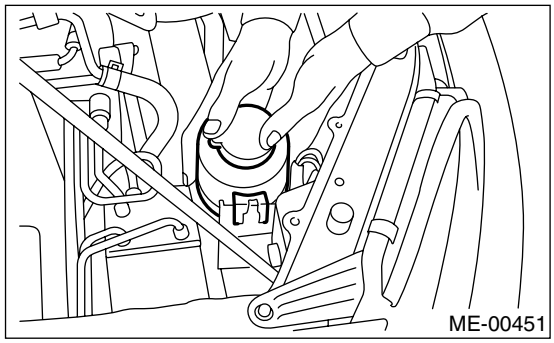
(2) Remove bolts which install power steering pump bracket.

CAUTION:
Do not separate the hose and the pipe from the pump body.

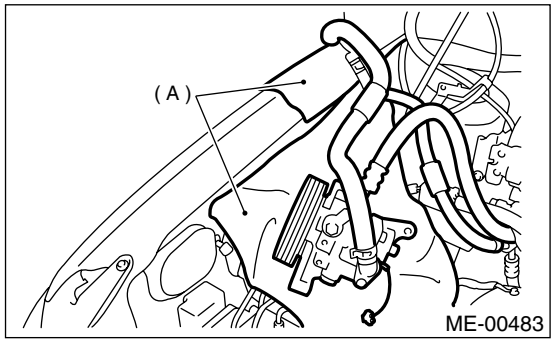


(A) Power steering pump
(B) Generator
(C) A/C compressor

(3) Remove power steering tank from the bracket by pulling it upward.

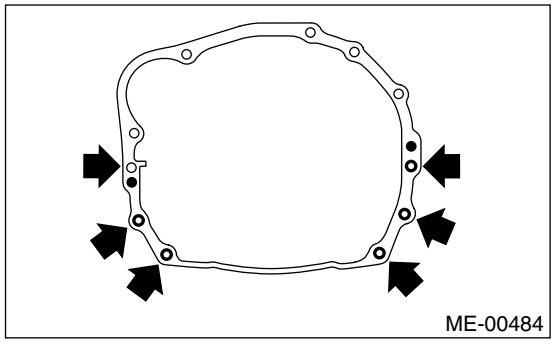


(4) Place power steering pump on the right side wheel apron.

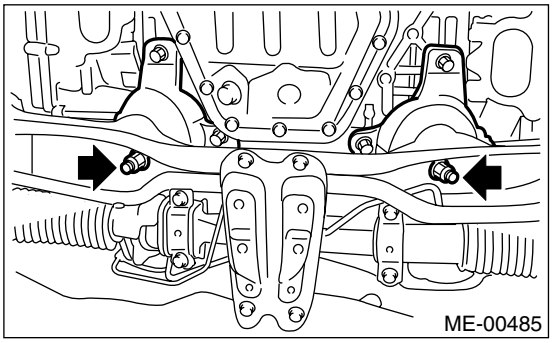


(A) Cloth

16) Remove front exhaust pipe.
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
17) Remove nuts which hold lower side of transmission to engine.

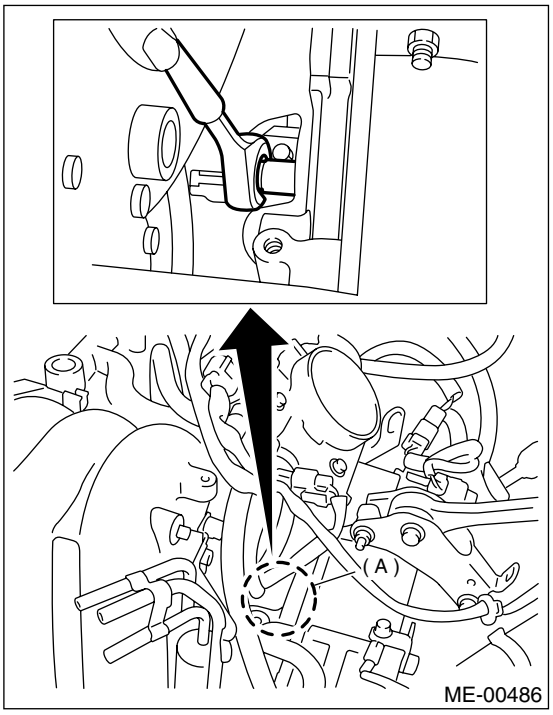


18) Remove nuts which install front cushion rubber onto front crossmember.

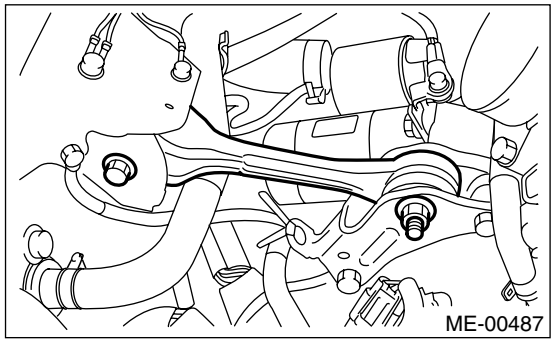


19) Separate torque converter clutch from drive plate.
(1) Lower the vehicle.
(2) Remove service hole plug (A).
(3) Remove bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the engine using ST.

ST 499977100 CRANK PULLEY WRENCH

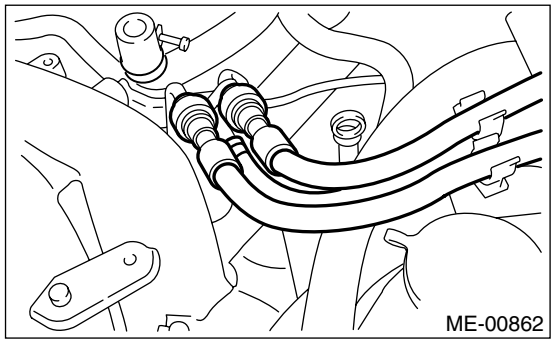


20) Remove pitching stopper.

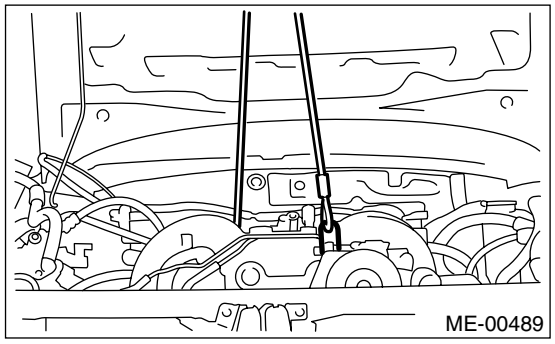


21) Disconnect fuel delivery hose, return hose and evaporation hose.
<Ref. to FU(H6DO)-75, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

CAUTION:
• Disconnect hose with its end wrapped with cloth to prevent fuel from splashing.
• Catch fuel from hose into container.

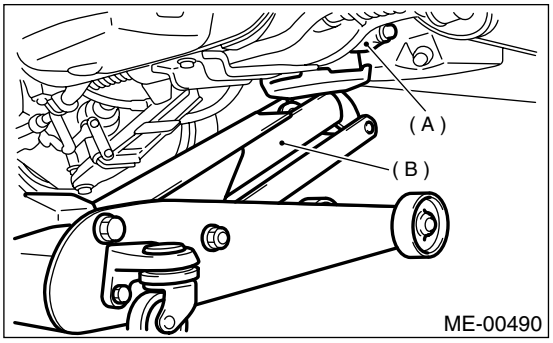


22) Support engine with a lifting device and wire ropes.



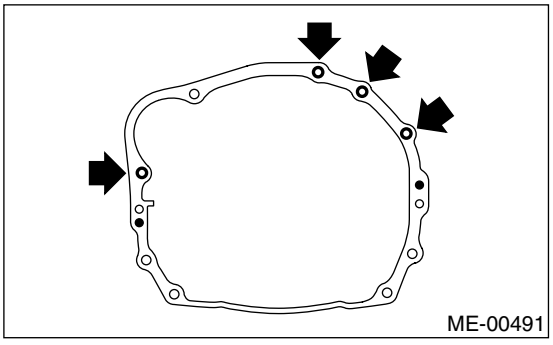
23) Support transmission with a garage jack.

CAUTION:
Before moving engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.

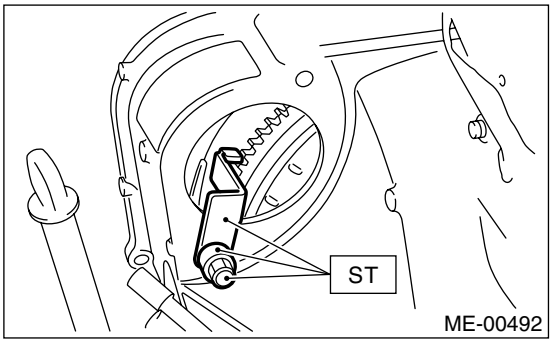


(A) Transmission
(B) Garage jack

24) Separation of engine and transmission.
(1) Remove starter. <Ref. to SC(H6DO)-6, REMOVAL, Starter.>
(2) Remove bolts which hold upper side of transmission to engine.

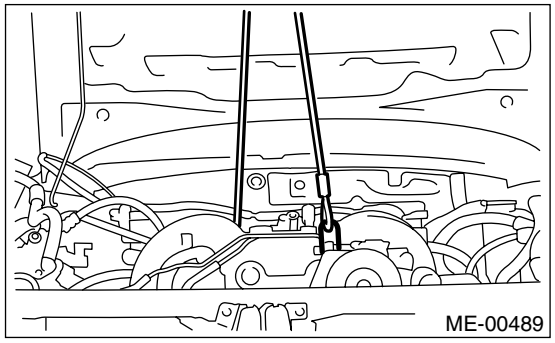


25) Install ST to torque converter clutch case.
ST 498277200 STOPPER SET



26) Remove engine from vehicle.
(1) Slightly raise engine.
(2) Raise transmission with garage jack.
(3) Move engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move engine away from engine compartment.

CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



27) Remove front cushion rubbers.

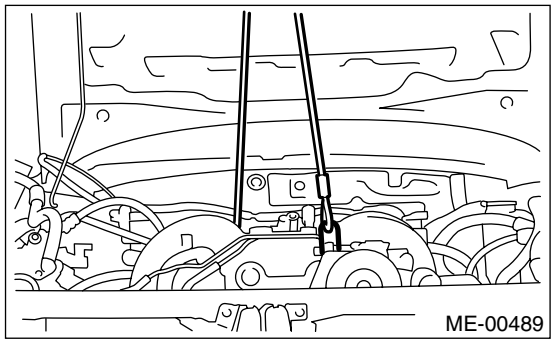
B: INSTALLATION

1) Install front cushion rubbers.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

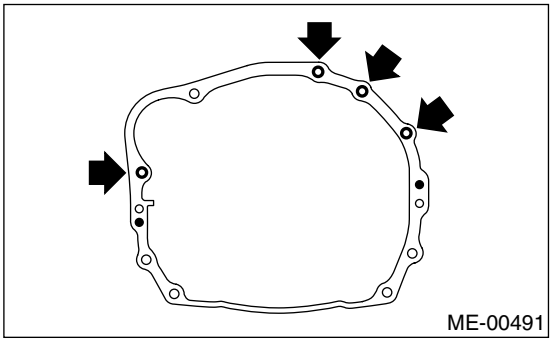
2) Position engine in engine compartment and align it with transmission.

CAUTION:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

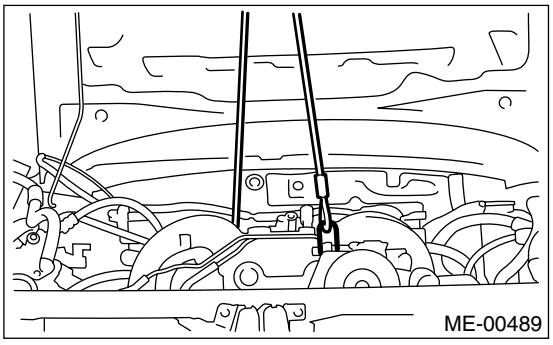


3) Tighten bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

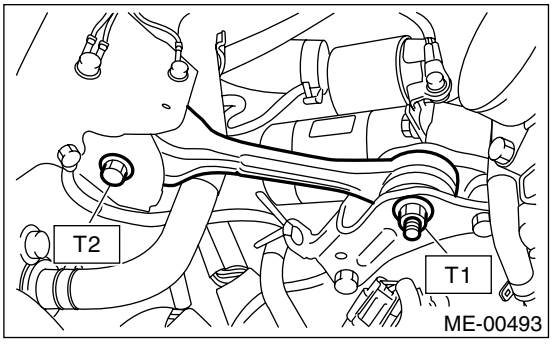


4) Remove lifting device and wire ropes.



5) Remove garage jack.
6) Install pitching stopper.

Tightening torque:
T1: 49 N·m (5.0 kgf-m, 36.2 ft-lb)
T2: 57 N·m (5.8 kgf-m, 42 ft-lb)



7) Remove ST from torque converter clutch case.

NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

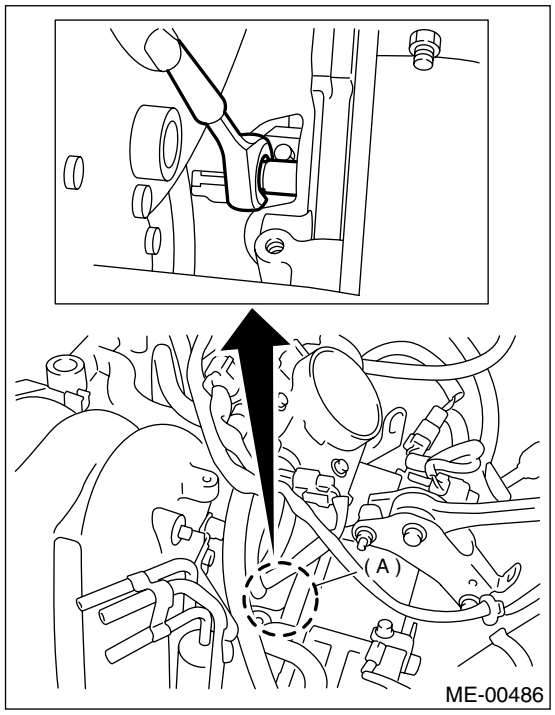
8) Install starter. <Ref. to SC(H6DO)-6, INSTALLATION, Starter.>

9) Install torque converter clutch onto drive plate.
(1) Tighten bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

CAUTION:
Be careful not to drop bolts into torque converter clutch housing.

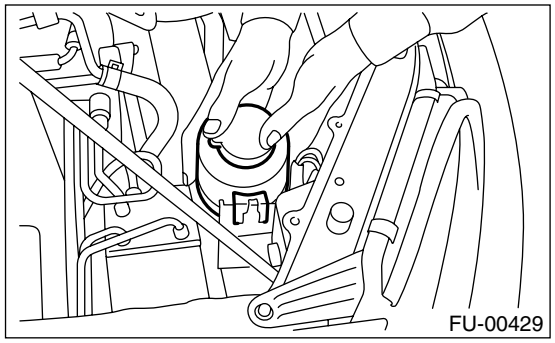
ST 499977100 CRANK PULLEY WRENCH

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



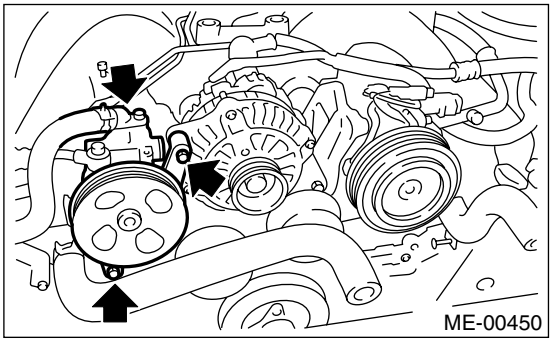
(3) Clog plug (A) onto service hole.

10) Install power steering pump on bracket.
(1) Install power steering tank on bracket.

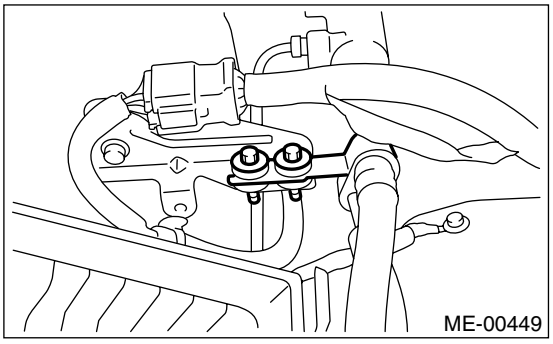


(2) Install power steering pump on bracket, and tighten bolts.

Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)

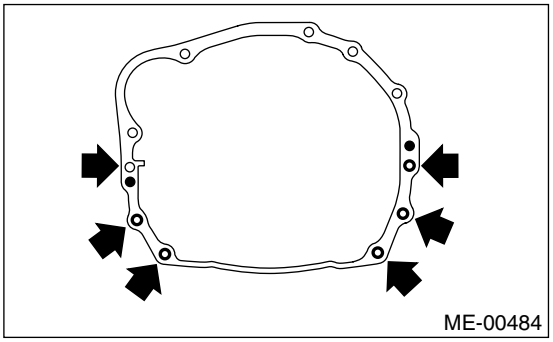


(3) Tighten bolt which installs power steering pipe bracket.



11) Tighten nuts which hold lower side of transmission to engine.

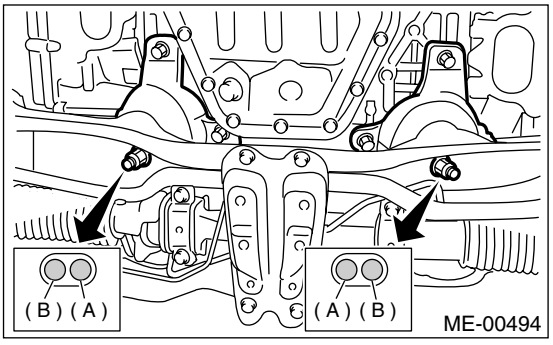
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



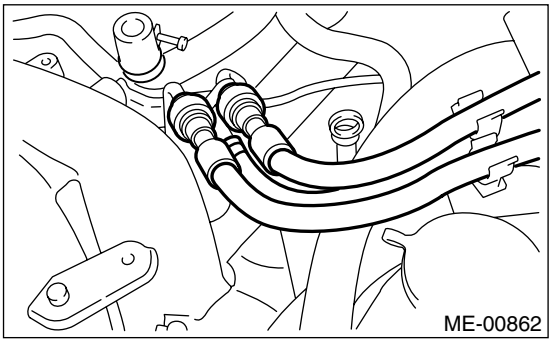
12) Tighten nuts which install front cushion rubber onto crossmember.

Tightening torque:
74 N·m (7.5 kgf-m, 54 ft-lb)

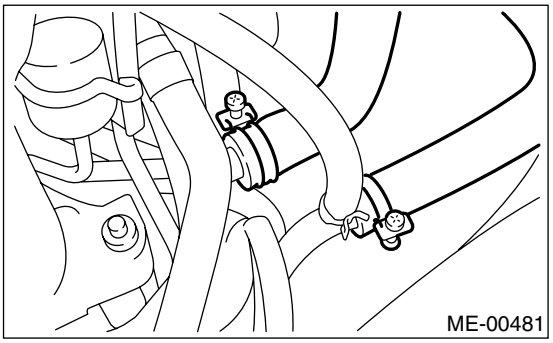
CAUTION:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



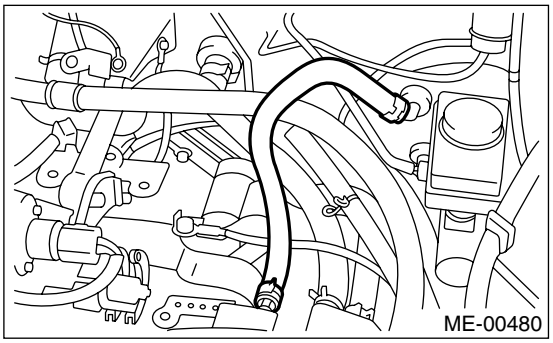
13) Install front exhaust pipe.
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>
14) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose.
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>



(2) Heater inlet and outlet hoses

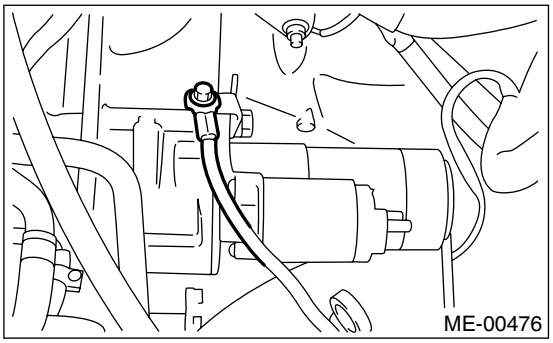


(3) Brake booster vacuum hose

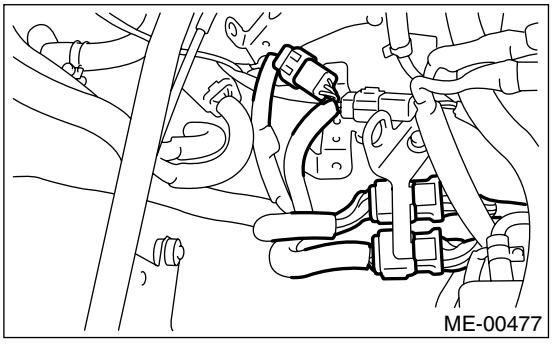


15) Connect the following connectors.
(1) Engine ground terminals

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

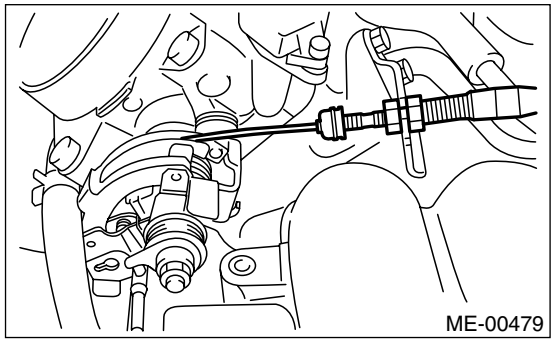


(2) Engine harness connectors



(3) Alternator connector and terminal (A)
(4) A/C compressor connectors (B)

16) Connect the following cables.
(1) Accelerator cable



CAUTION:
After connecting each cable, adjust them.

17) Install A/C pressure hoses.
<Ref. to AC-38, INSTALLATION, Flexible Hose.>
18) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
19) Install radiator to vehicle. <Ref. to CO(H6DO)-24, INSTALLATION, Radiator.>
20) Install air intake duct, cleaner case and air intake chamber.
<Ref. to IN(H6DO)-2, General Description.>
21) Install under cover.
22) Install battery in the vehicle, and connect cables.
23) Fill coolant.
<Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
24) Check ATF level and correct if necessary.
<Ref. to 4AT-31, Automatic Transmission Fluid.>
25) Charge A/C system with refrigerant.
<Ref. to AC-21, Refrigerant Charging Procedure.>
26) Remove front hood stay, and close front hood.
27) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

8. Engine Mounting

A: REMOVAL

1) Remove engine assembly. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>
2) Remove engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

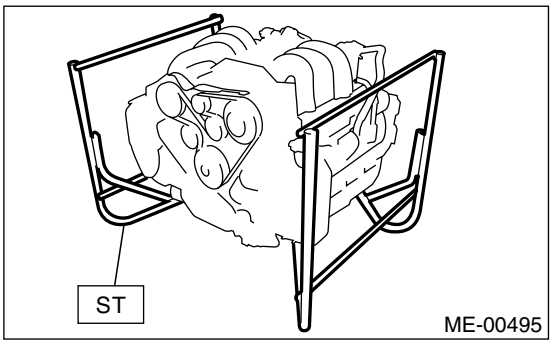
C: INSPECTION

Make sure there are no cracks or other damage.

9. Preparation for Overhaul

A: REMOVAL

1) Remove engine from body. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>
2) Drain engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
3) After removing engine from body, install ST onto engine.
ST 18232AA000 ENGINE STAND

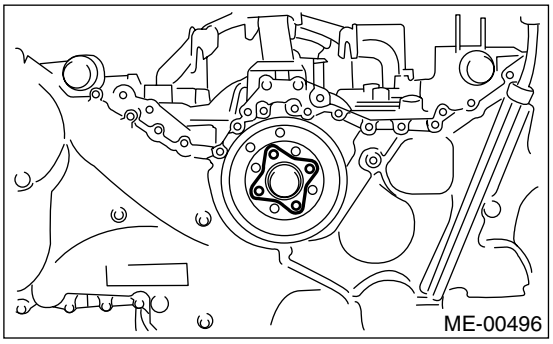


4) Remove sensors, pipes, and hoses installed on engine before starting overhaul.
(1) Remove intake manifold. <Ref. to FU(H6DO)-17, REMOVAL, Intake Manifold.>
(2) Remove generator. <Ref. to SC(H6DO)-14, REMOVAL, Generator.>
(3) Remove A/C compressor. <Ref. to AC-32, REMOVAL, Compressor.>
(4) Remove EGR pipe. <Ref. to EC(H6DO)-10, REMOVAL, EGR Valve.>
(5) Remove water pipe and hoses.
(6) Remove engine harness.
(7) Remove spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
(8) Remove camshaft position sensor. <Ref. to FU(H6DO)-31, REMOVAL, Camshaft Position Sensor.>
(9) Remove crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>
(10)Remove knock sensor. <Ref. to FU(H6DO)-32, REMOVAL, Knock Sensor.>
(11)Remove engine coolant temperature sensor. <Ref. to FU(H6DO)-29, REMOVAL, Engine Coolant Temperature Sensor.>
(12)Remove oil pressure switch. <Ref. to LU(H6DO)-17, REMOVAL, Oil Pressure Switch.>
(13)Remove oil filter. <Ref. to LU(H6DO)-18, REMOVAL, Engine Oil Filter.>
(14)Remove oil cooler. <Ref. to LU(H6DO)-19, REMOVAL, Oil Cooler.>

10.Crankshaft Pulley

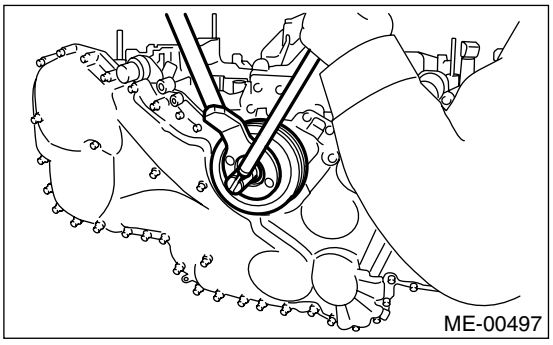
A: REMOVAL

1) Remove crankshaft pulley cover.



2) Remove crankshaft pulley bolt. To lock crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH



3) Remove crankshaft pulley.

B: INSTALLATION

1) Install crankshaft pulley.

2) Install crankshaft pulley bolt. To lock crankshaft, use ST.

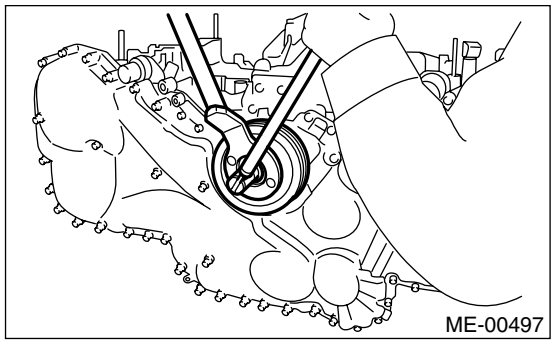
ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

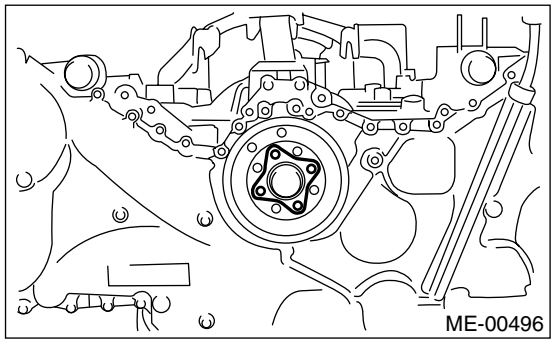
(3) Tighten the crankshaft pulley bolts.

Tightening torque:
178 N·m (18.1 kgf-m, 131 ft-lb)



3) Install the crankshaft pulley cover.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



C: INSPECTION

1) Check crankshaft pulley cover for oil leaks and bleeding.

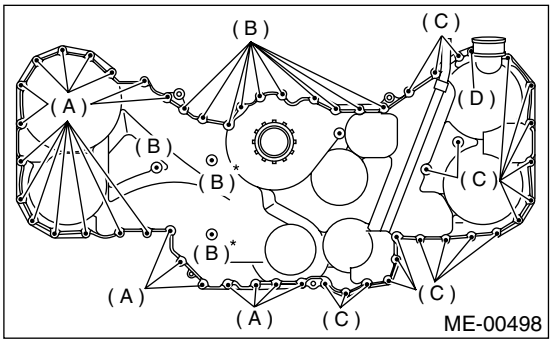
2) Check crankshaft pulley for looseness.

11.Front Chain Cover

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover.

NOTE:
There are four different types of chain cover mounting bolts. Sort them into separate containers to avoid confusion at installation.



Bolt dimension:

(A) 6 × 45
(B) 6 × 16
(C) 6 × 30
(D) 6 × 50

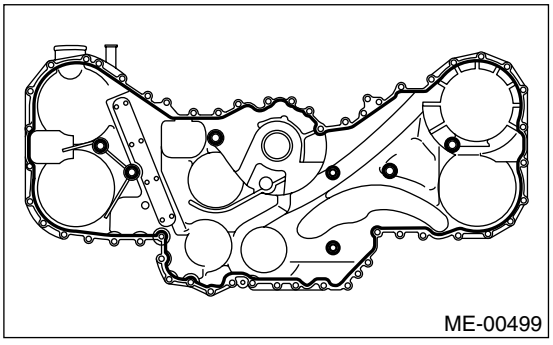
*: Sealing washer

B: INSTALLATION

1) Remove old fluid gasket on the matching surface, and degrease it.
2) Apply fluid gasket to the mating surface of front chain cover.

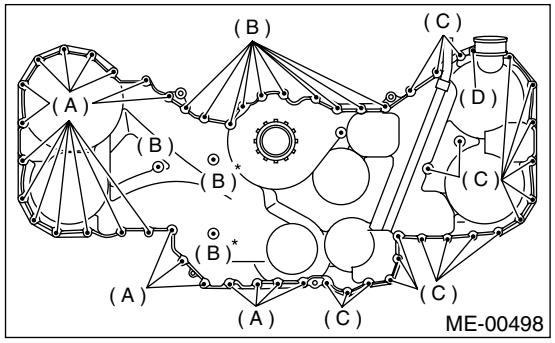
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
2.5±0.5 mm (0.098±0.020 in)



3) Install front chain cover. Temporarily tighten the bolts.

CAUTION:
Do not confuse the mounting positions of the bolts.



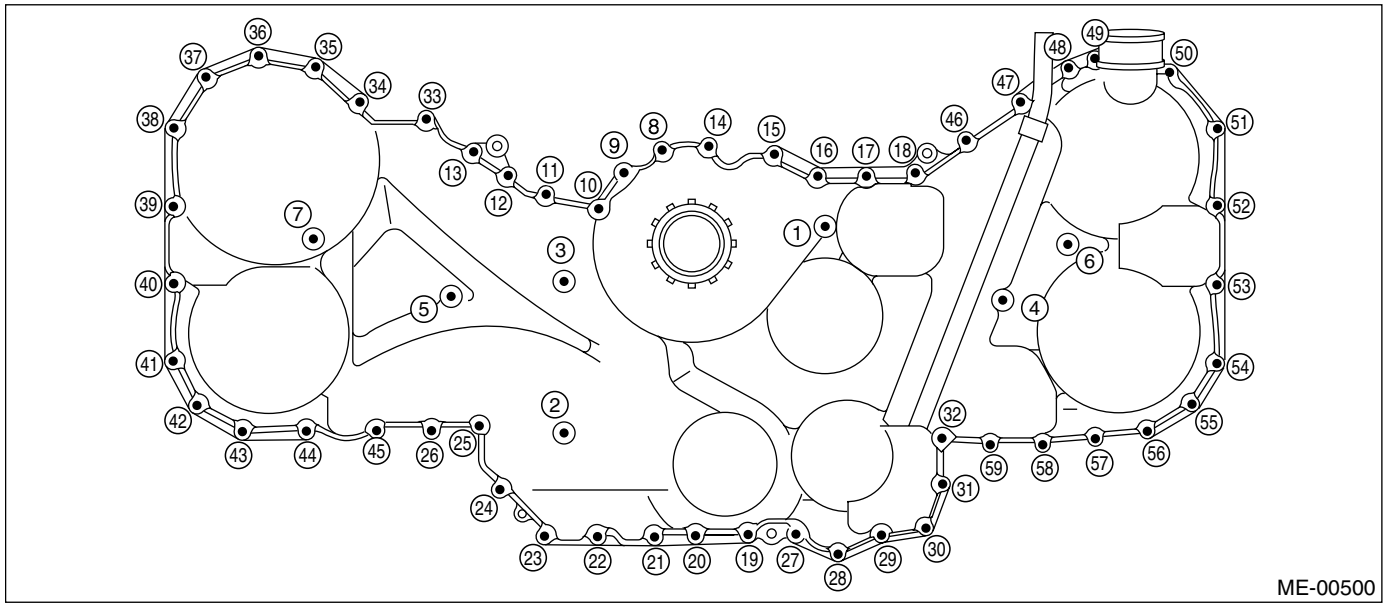
Bolt dimension:

(A) 6 × 45
(B) 6 × 16
(C) 6 × 30
(D) 6 × 50

*: Sealing washer

4) Tighten the bolts in the numerical sequence shown in figure.

Tightening torque:
6.6 N·m (0.67 kgf-m, 4.8 ft-lb)



5) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

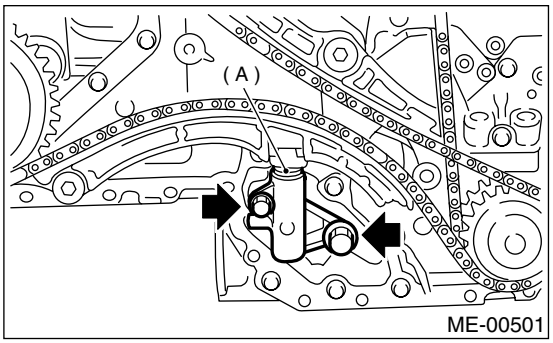
Check the cover surface for flaws and dents.
Check the cover mating surface and the mounting point of crankshaft pulley for oil leaks.

12.Timing Chain Assembly

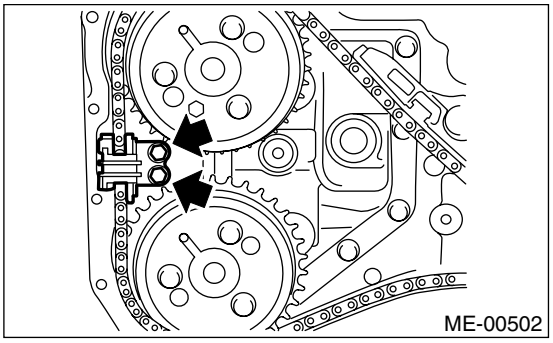
A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove chain tensioner (RH).

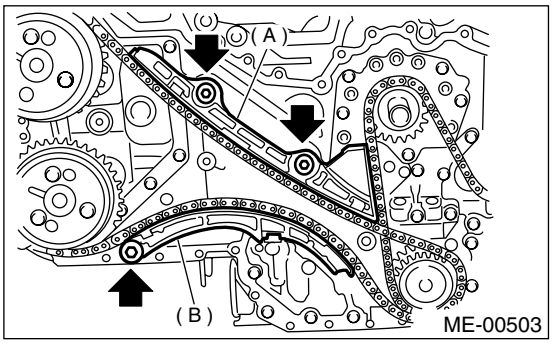
NOTE:
Make sure plunger (A) does not come out.



4) Remove chain guide. (Right-hand between cams)



5) Remove chain guide (RH).
6) Remove chain tensioner lever (RH).

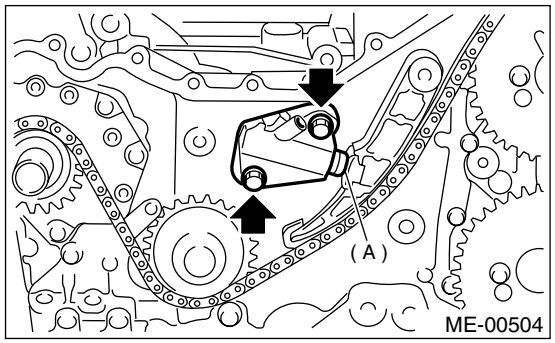


(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

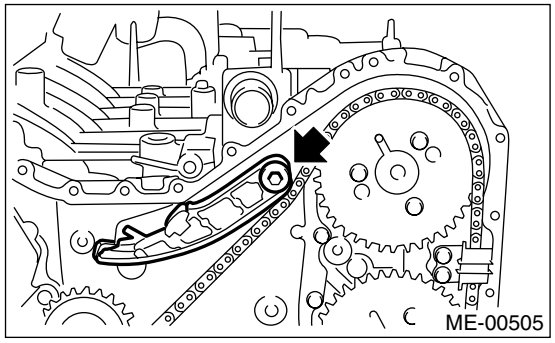
7) Remove timing chain (RH).

8) Remove chain tensioner (LH).

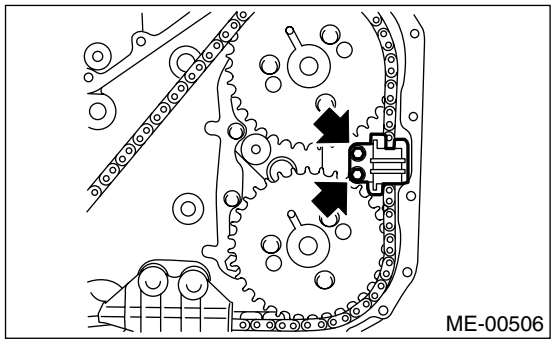
NOTE:
Make sure plunger (A) does not come out.



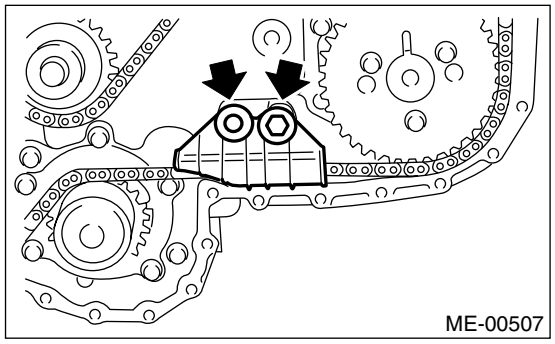
9) Remove chain tensioner lever (LH).



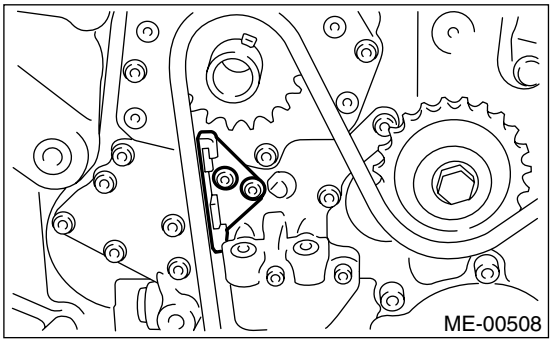
Remove chain guide. (Left-hand between cams)



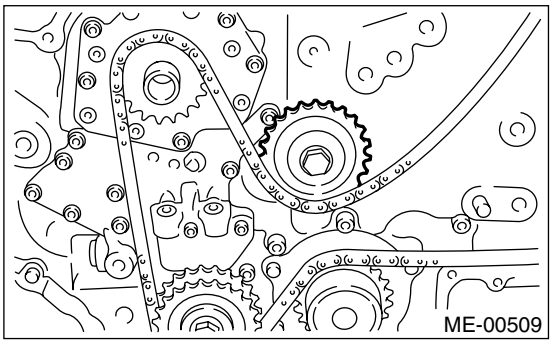
10) Remove chain guide (LH).



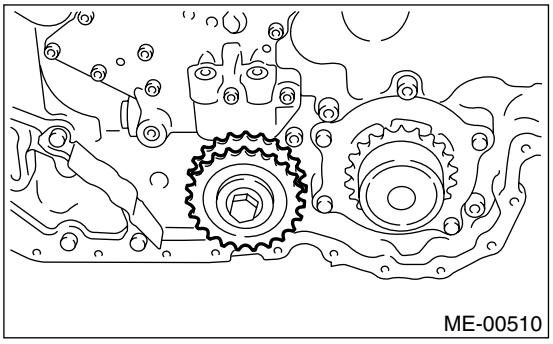
11) Remove chain guide. (Center)



12) Remove idler sprocket. (Upper)



13) Remove timing chain (LH).
14) Remove idler sprocket. (Lower)

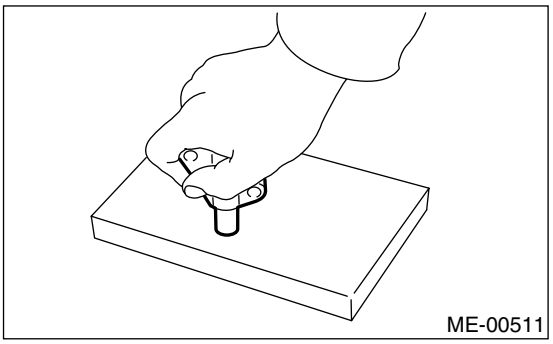


B: INSTALLATION

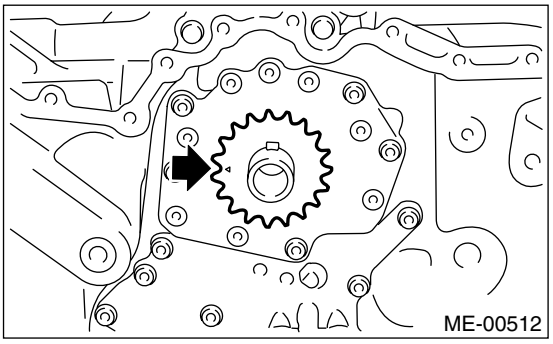
CAUTION:
• During installation, be careful to prevent foreign objects from attaching to or mixing with assembled components.
• Apply engine oil to chain guide, chain tensioner lever, and idler sprocket during installation.

1) Preparation for installation of chain tensioner.
   (1) Put the screw, spring, pin and tension rod into the tensioner body.
   (2) While pressing tensioner onto rubber mat, twist it left and right to shorten tension rod. Then set a thin pin into the holes between tension rod and tensioner body to hold it.

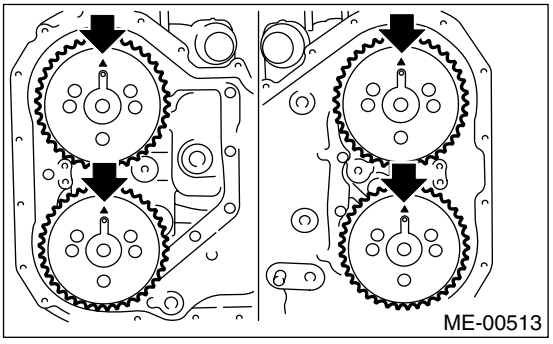
NOTE:
Carry out the work on rubber mat or other nonslip material.



2) Using ST, align “top mark” on crankshaft sprocket at 9 o'clock position as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET

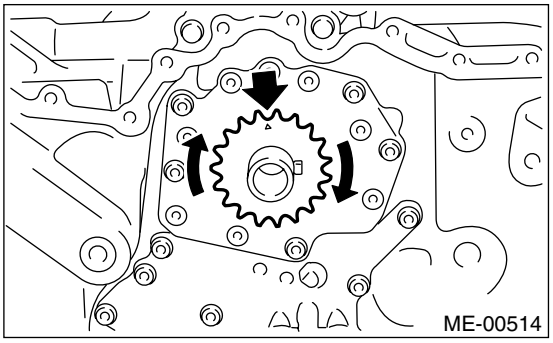


3) Using ST, align four key grooves on camshaft sprocket at 12 o'clock position as shown in the figure.
ST 18231AA000 CAMSHAFT SPROCKET WRENCH



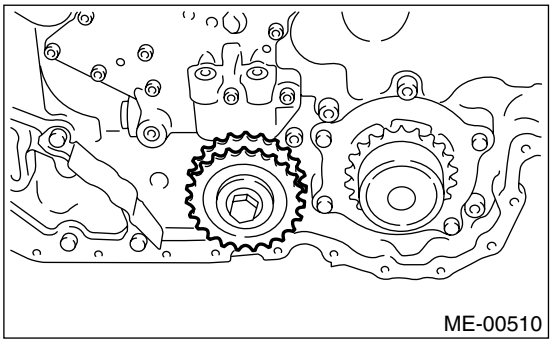
4) Rotate crankshaft sprocket clockwise to align “top mark” at 12 o'clock position as shown in the figure. (Piston # 1 is at TDC.)

CAUTION:
Do not rotate crankshaft and camshaft sprockets until timing chain is completely routed.

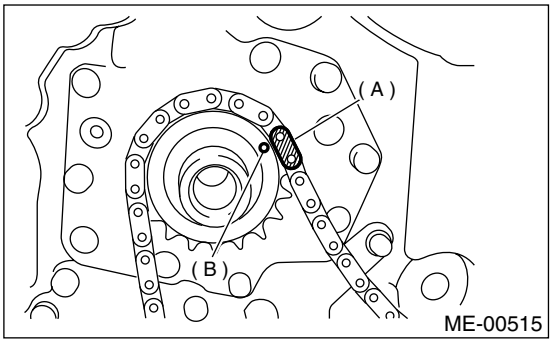


5) Install the idler sprocket. (Lower)

Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



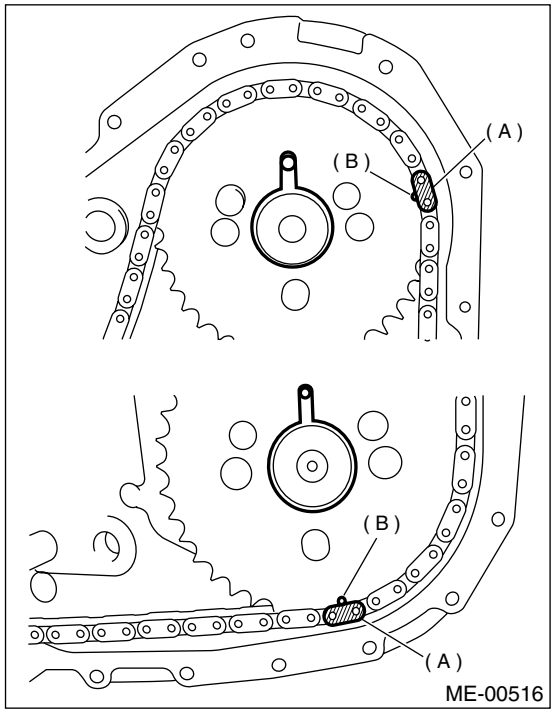
6) Install timing chain LH.
(1) Align the timing mark (B) on crankshaft sprocket with the matching mark (A) on timing chain LH.



(A) Gold
(B) Mark

(2) Route timing chain LH on idler sprocket (Lower), water pump, exhaust cam sprocket, and intake cam sprocket in order.

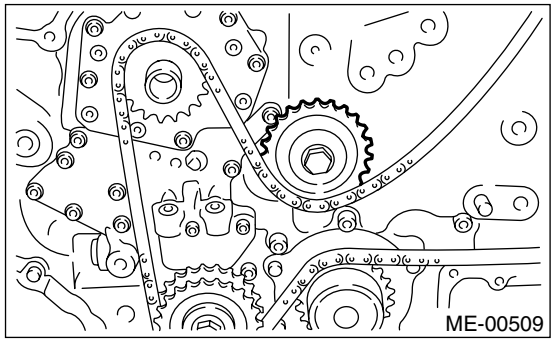
CAUTION:
Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.



(A) Dark blue
(B) Mark

(3) Install chain idler. (Upper)

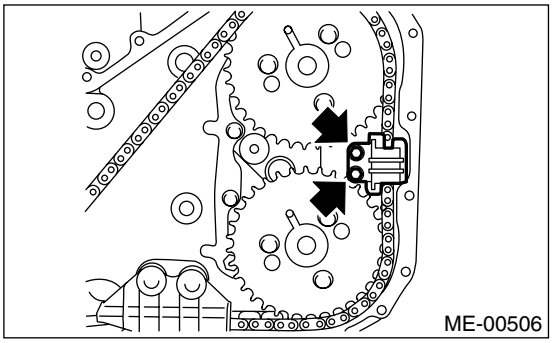
Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



(4) Install chain guide. (Left-hand between cams)

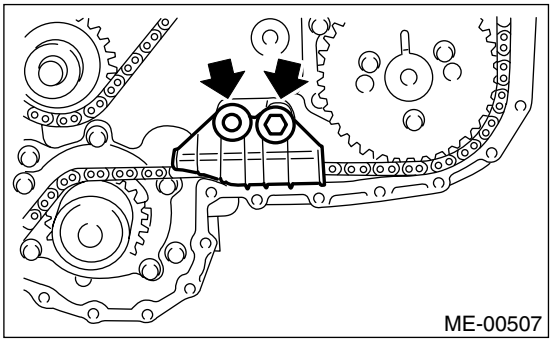
Tightening torque:
6.3N·m (0.64 kgf-m, 4.6 ft-lb)

NOTE:
Replace mounting bolt with a new one.



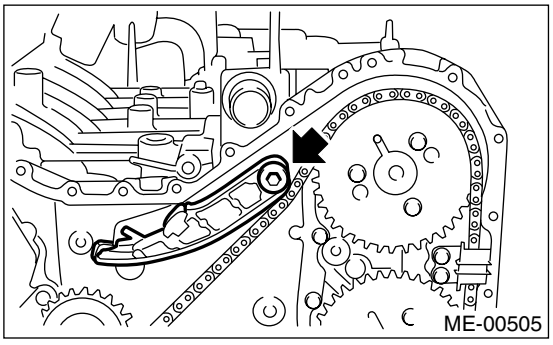
(5) Install chain guide (LH).

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



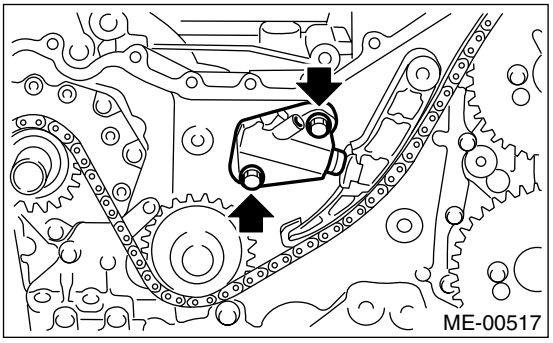
(6) Install chain tensioner lever LH.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

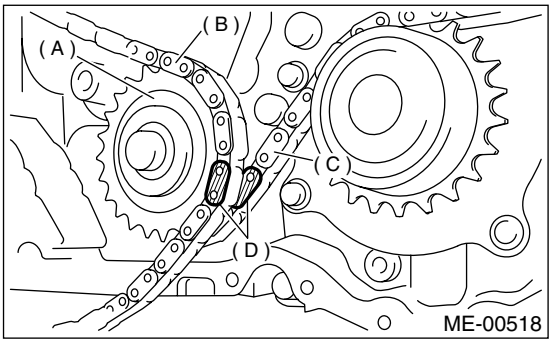


(7) Install chain tensioner LH.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



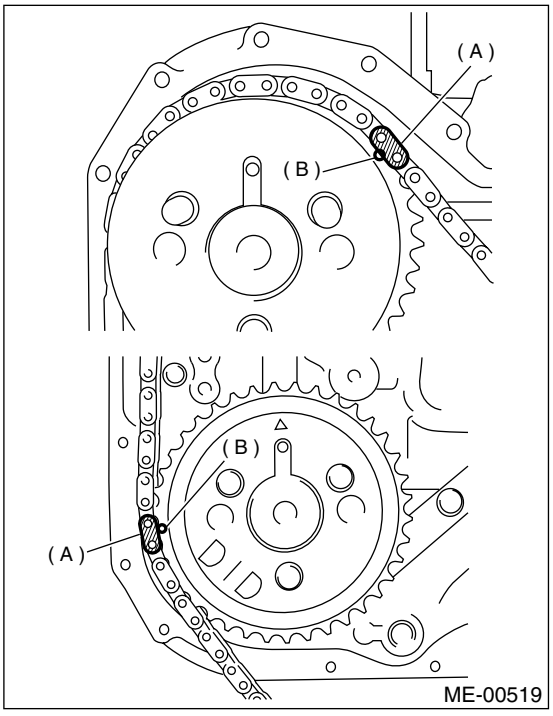
7) Install timing chain RH.
(1) On idler sprocket (Lower) , align matching marks on timing chains LH and RH.



(A) Lower idler sprocket
(B) Timing chain RH
(C) Timing chain LH
(D) Dark gray

(2) Route timing chain RH on intake cam sprocket and then exhaust cam sprocket.

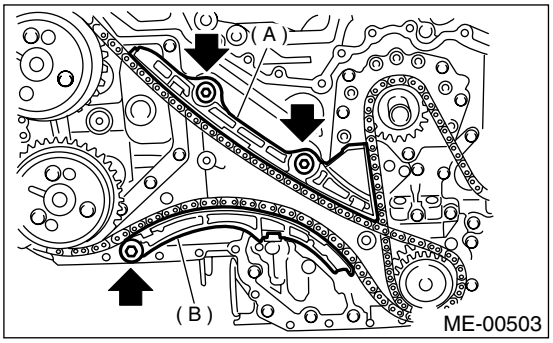
CAUTION:
Make sure that matching marks on the timing chain (A) and camshaft sprocket (B) are aligned the same way as the one on crankshaft sprocket.



(A) Gold
(B) Mark

(3) Install chain guide (RH).
(4) Install chain tensioner lever (RH).

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

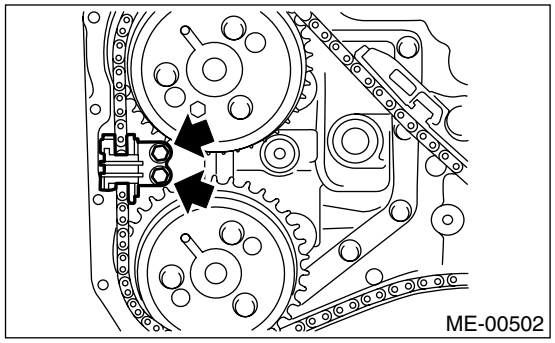


(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

(5) Install timing chain guide RH No. 1.

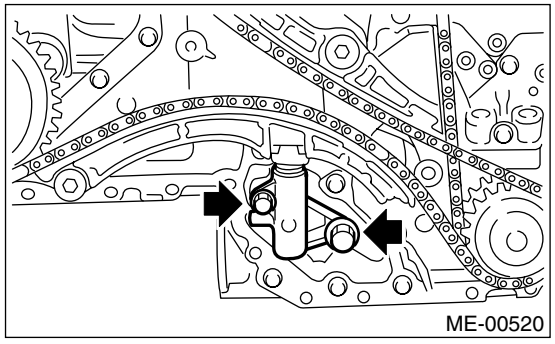
Tightening torque:
6.3 N·m (0.64 kgf-m, 4.6 ft-lb)

NOTE:
Replace mounting bolt with a new one.



(6) Install the chain tensioner (RH).

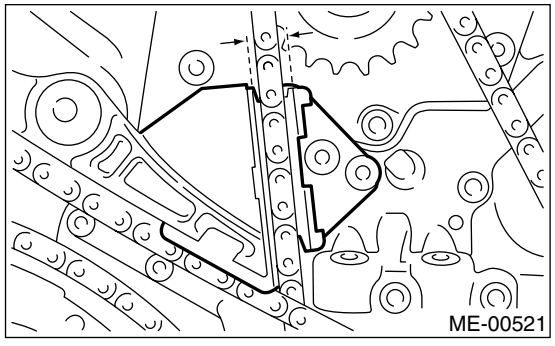
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



(7) Adjust the clearance between chain guide (RH) and chain guide (Center) to the range between 8.4 mm (0.331 in) to 8.6 mm (0.339 in). And install chain guide (Center).

Tightening torque:
7.8 N·m (0.8 kgf-m, 5.8 ft-lb)

NOTE:
Replace mounting bolt with a new one.



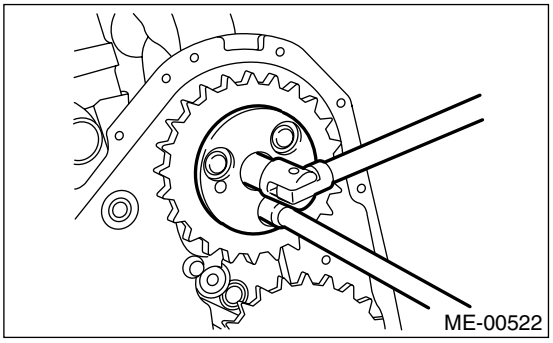
(8) After checking the matching marks on each sprocket and corresponding timing chain are aligned, pull stopper pin out of chain tensioner.

13.Camshaft Sprocket

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH

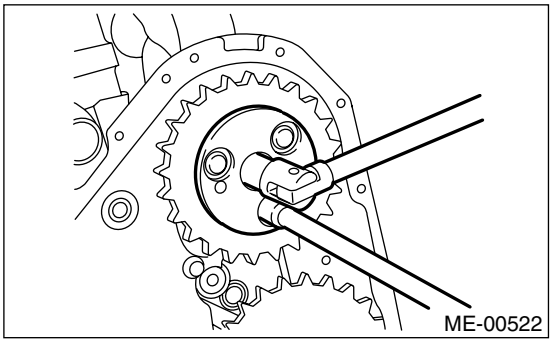


B: INSTALLATION

1) Install camshaft sprocket. To lock camshaft, use ST.

ST 18231AA000 CAMSHAFT SPROCKET WRENCH

Tightening torque:
13 N·m (1.0 kgf-m, 7.2 ft-lb)



2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
3) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
4) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

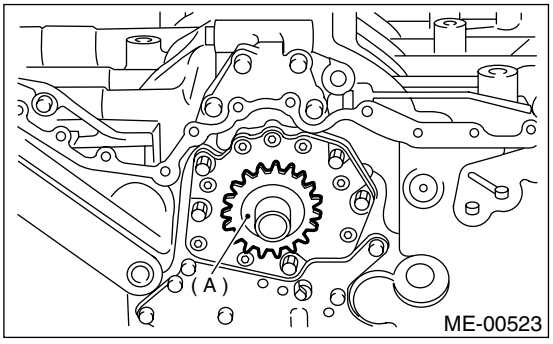
C: INSPECTION

1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.

14.Crankshaft Sprocket

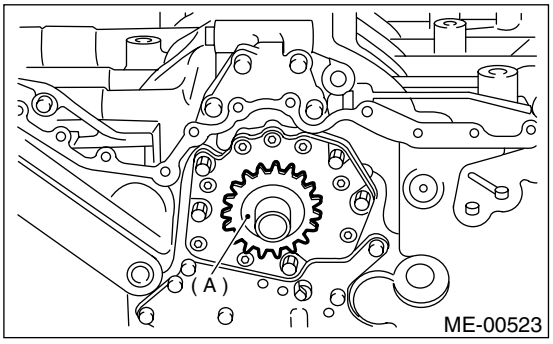
A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprocket. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket (A).



B: INSTALLATION

1) Install crankshaft sprocket (A).



2) Install camshaft sprocket. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
3) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
4) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
5) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

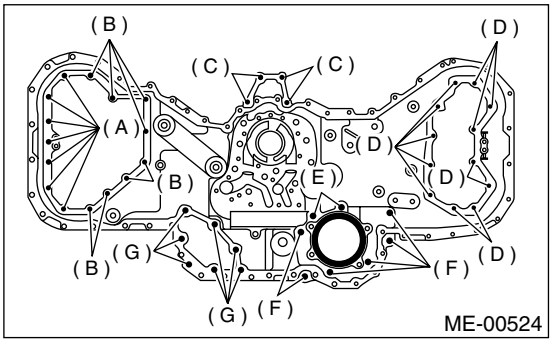
1) Check sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.

15.Rear Chain Cover

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprocket. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket.
6) Remove oil pump. <Ref. to LU(H6DO)-12, REMOVAL, Oil Pump.>
7) Remove oil pump relief valve. <Ref. to LU(H6DO)-14, REMOVAL, Oil Pump Relief Valve.>
8) Remove water pump. <Ref. to CO(H6DO)-20, REMOVAL, Water Pump.>
9) Remove rear chain cover.

NOTE:
There are seven different types of mounting bolts. Sort them into separate containers to avoid confusion at installation.



Bolt dimension:

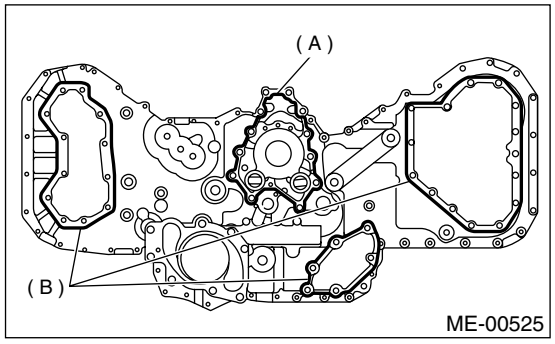
(A) 6 × 14
(B) 6 × 18 (Silver)
(C) 6 × 30
(D) 6 × 18
(E) 6 × 40
(F) 6 × 30
(G) 6 × 22

B: INSTALLATION

1) Remove old fluid gasket on the matching surface, and degrease it.
2) Apply fluid gasket to the mating surface of rear chain cover.

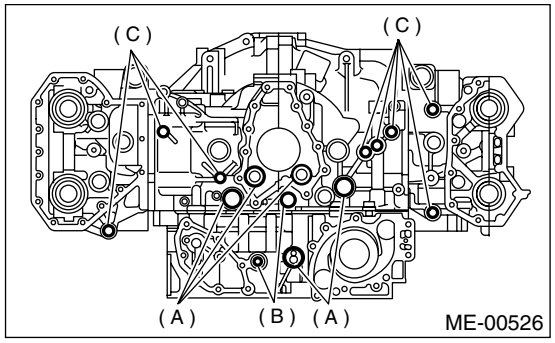
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
(A) 1.0±0.5 mm (0.039±0.020 in)
(B) 3.0±1.0 mm (0.118±0.039 in)



3) Install O-ring.

NOTE:
Do not reuse the O-ring.

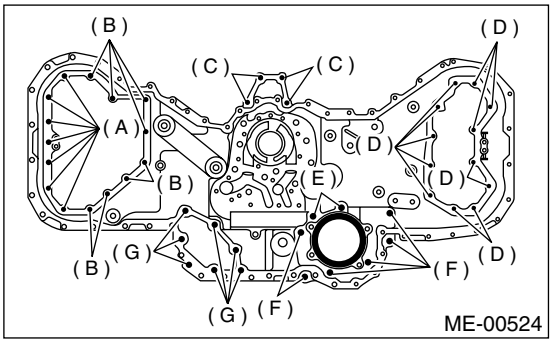


(A) O-ring (Large)
(B) O-ring (Medium)
(C) O-ring (Small)

4) Temporarily tighten rear chain cover.

CAUTION:
Do not confuse the mounting positions of the bolts.

NOTE:
Replace mounting bolts (G) with new ones.



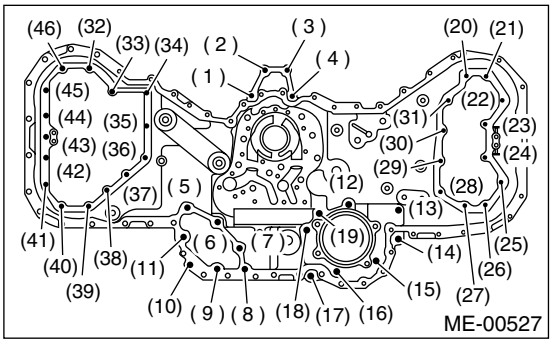
Bolt dimension:

(A) 6 × 14
(B) 6 × 18 (Silver)
(C) 6 × 30
(D) 6 × 18
(E) 8 × 40
(F) 8 × 30
(G) 6 × 22

5) Tighten the bolts in the numerical sequence shown in figure.

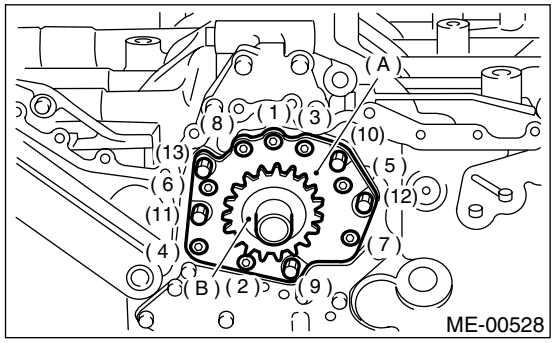
Tightening torque:

(1) to (11)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(12) to (19)	20 N·m (2.0 kgf-m, 14 ft-lb)
(20) to (31)	9 N·m (0.9 kgf-m, 6.5 ft-lb)
(32) to (39)	12 N·m (1.2 kgf-m, 8.7 ft-lb)
(40) to (46)	9 N·m (0.9 kgf-m, 6.5 ft-lb)



6) Install water pump. <Ref. to CO(H6DO)-20, REMOVAL, Water Pump.>
7) Install oil pump relief valve. <Ref. to LU(H6DO)-14, INSTALLATION, Oil Pump Relief Valve.>
8) Install oil pump. <Ref. to LU(H6DO)-12, INSTALLATION, Oil Pump.>

9) Install crankshaft sprocket.

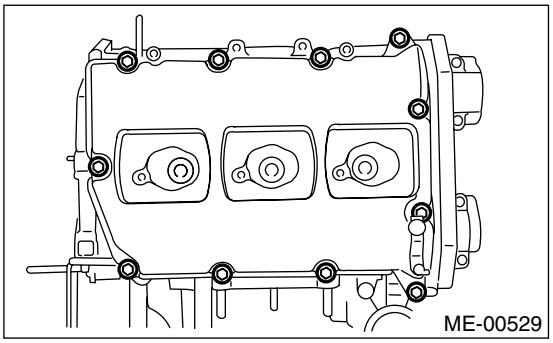


10) Install camshaft sprocket. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
11) Install timing chain. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
12) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
13) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

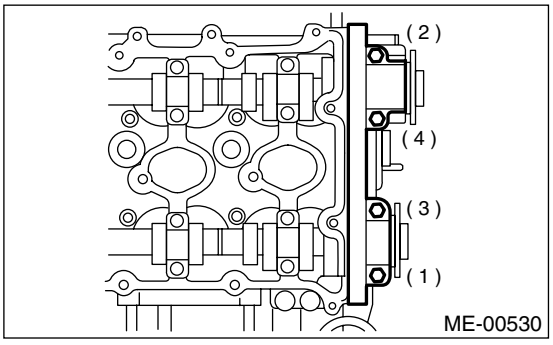
16.Camshaft

A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
7) Remove rocker cover (RH).

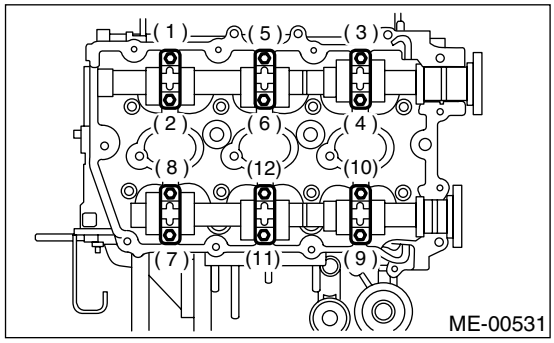


8) Loosen front camshaft cap bolts equally, a little at a time in numerical sequence shown in the figure (RH).



9) Remove camshaft cap and intake camshaft (RH).

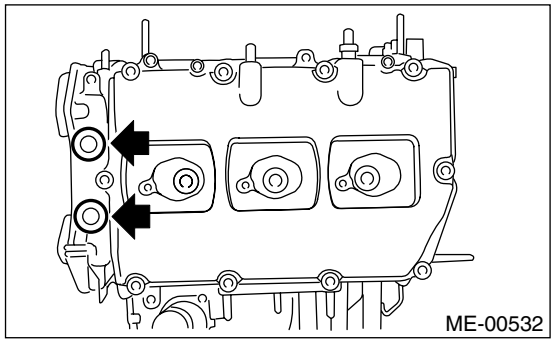
10) Loosen camshaft cap bolts equally, a little at a time in the numerical sequence shown in the figure.



11) Remove camshaft cap and exhaust camshaft (RH).

CAUTION:
Arrange camshaft caps in order so that they can be installed in their original position.

12) Remove plug (LH).

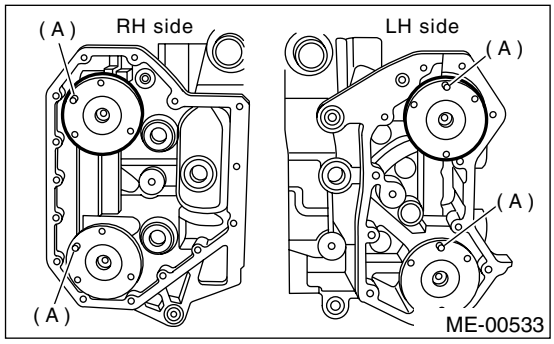


13) Similarly, remove left-hand camshafts and related parts.

B: INSTALLATION

1) Apply a coat of engine oil to camshaft journals and install camshaft.

CAUTION:
When installing camshaft, adjust camshaft front flange knock pin (A) position as follows:
LH side: 12 o'clock
RH side: 10 o'clock

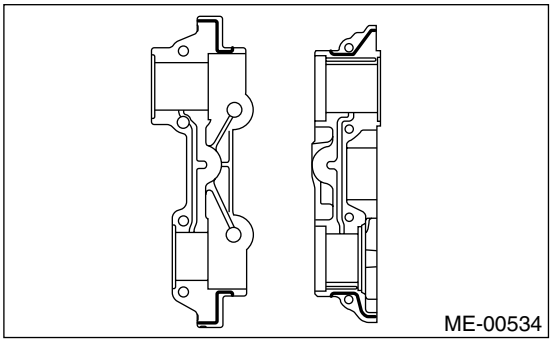


2) Install camshaft cap.
(1) Apply fluid packing sparingly to back of front camshaft cap shown in the figure.

CAUTION:
Do not apply fluid gasket excessively. Failure to do so may cause excess fluid gasket to come out and flow toward camshaft journal, resulting burning stuck of engine.

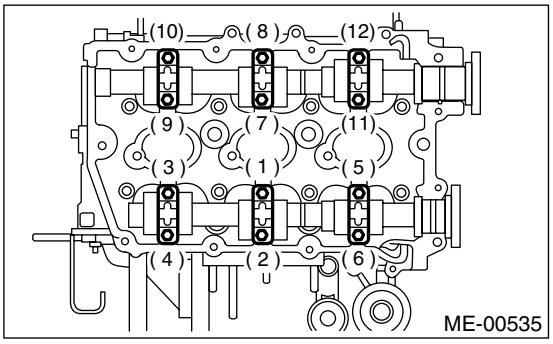
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
2.0±0.5 mm (0.079±0.020 in)


ME-00534

(2) Apply engine oil to cap bearing surface and install cap on camshaft.
(3) Tighten the camshaft cap bolts in the numerical sequence shown in the figure.

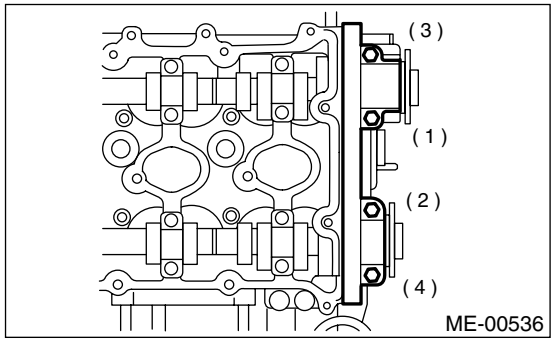
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



ME-00535

(4) Tighten the front camshaft cap bolts in the numerical sequence shown in the figure.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

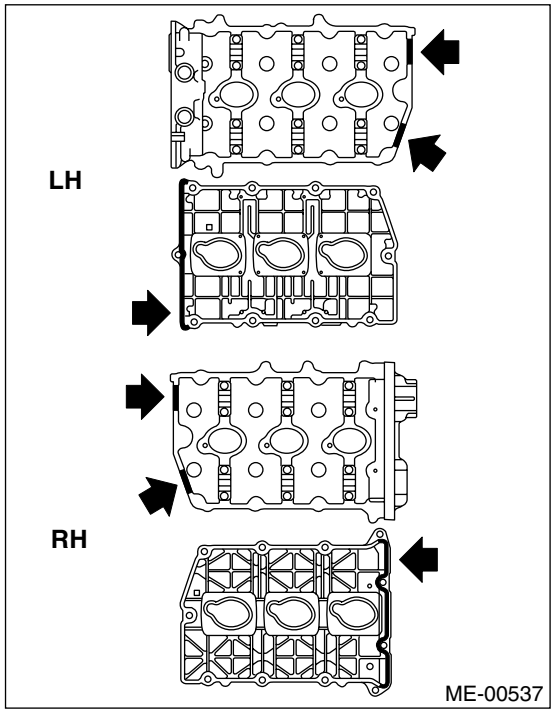


ME-00536

3) Install rocker cover.
(1) Apply fluid gasket sparingly to matching surface of cylinder heads and rocker covers shown in the figure.

CAUTION:
Do not apply fluid gasket excessively. Doing so may cause excess fluid gasket to come out and flow toward camshaft journal, resulting burning stuck of engine.

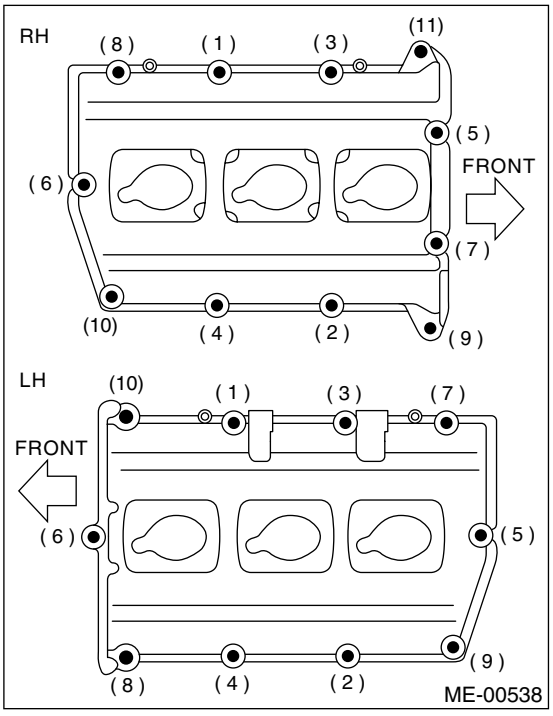
Fluid gasket:
THREE BOND 1280B



ME-00537

(2) Tighten the rocker cover bolts in the numerical order shown in the figure.

Tightening torque:
6.4 N·m (0.64 kgf-m, 4.6 ft-lb)



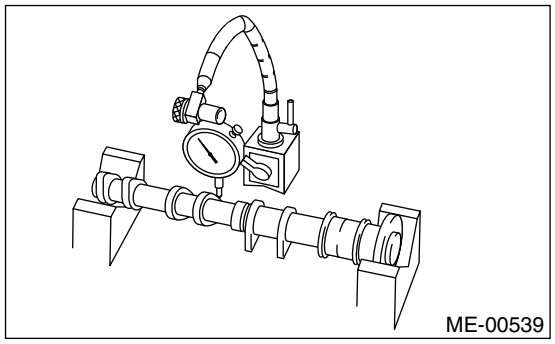
4) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
5) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
6) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
7) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
8) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
9) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.0008 in)



2) Check journal for damage and wear. Replace if faulty.
3) Measure outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	27.946 — 27.963 mm (1.1002 — 1.1009 in)

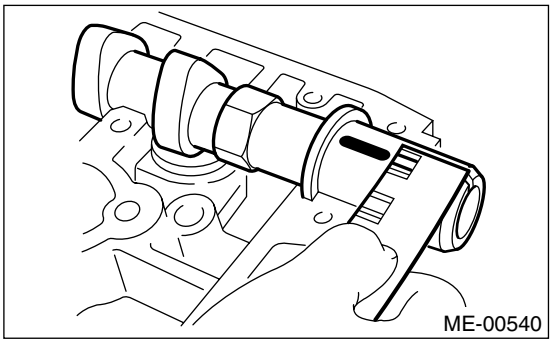
4) Measurement of the camshaft journal oil clearance
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on the cylinder head.
(3) Place plastigauge across each of the camshaft journals.
(4) Install the bearing caps.

CAUTION:
Do not turn the camshaft.

(5) Remove the bearing caps.

(6) Measure the widest point of the plastigauge on each journal.
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard oil clearance:
0.037 — 0.072 mm (0.0015 — 0.0028 in)



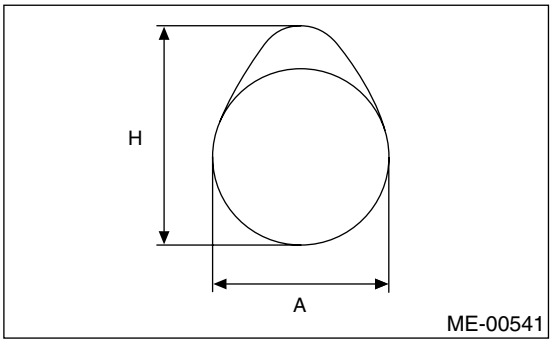
(7) Completely remove the plastigauge.

5) Check cam face condition; remove minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

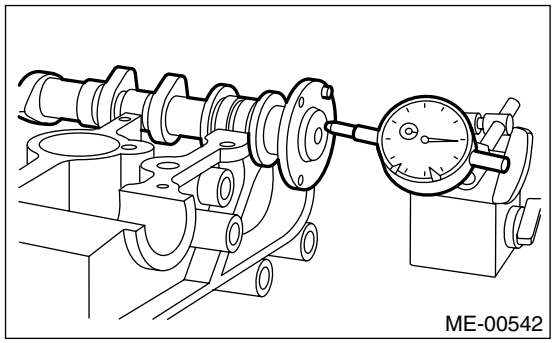
Standard:
Intake:
45.75 — 45.85 mm (1.8012 — 1.8051 in)
Exhaust:
45.25 — 45.35 mm (1.7815 — 1.7854 in)

Cam base circle diameter A:
36.0 mm (1.4173 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace caps and cylinder head as a set. If necessary replace camshaft.

Standard:
Intake:
0.075 — 0.135 mm (0.0030 — 0.0053 in)
Exhaust:
0.048 — 0.108 mm (0.0019 — 0.0043 in)

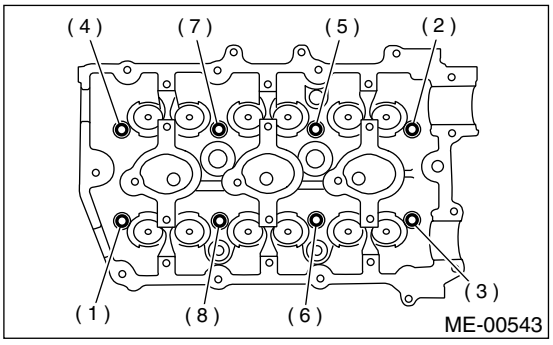


17.Cylinder Head Assembly

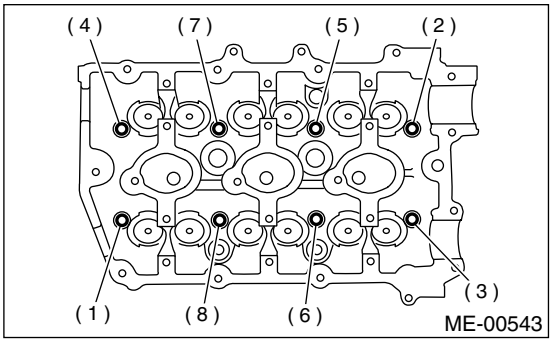
A: REMOVAL

1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
7) Remove camshafts. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>
8) Remove cylinder head bolts in numerical sequence shown in figure.

CAUTION:
Leave bolts (2) and (4) engaged by three or four threads to prevent cylinder head from falling.



9) Tap cylinder head with a plastic hammer to separate it from cylinder block.
10) Remove bolts (2) and (4) to remove cylinder head.



11) Remove cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

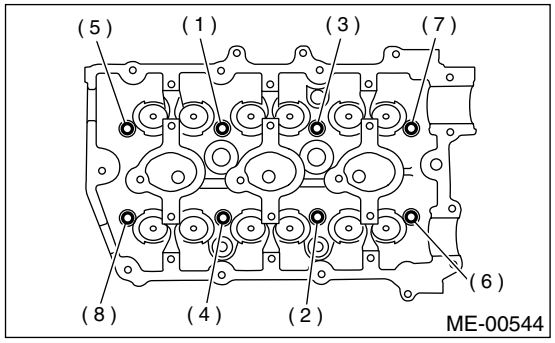
12) Similarly, remove right side cylinder head.

B: INSTALLATION

1) Install cylinder head and gaskets on cylinder block.

CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder block and oil pump.**

2) Tighten cylinder head bolts.
(1) Coat the washers and threaded parts of the cylinder head bolts with engine oil.
(2) Install the cylinder head on the cylinder block and tighten the bolts in the numerical order shown in the figure to a tightening torque of 20 N·m (2.0 kgf-m, 14 ft-lb).
(3) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 50 N·m (5.1 kgf-m, 37 ft-lb).
(4) Loosen all the bolts in 2 stages, 180° at a time, in the reverse order of tightening.
(5) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf-m, 18 ft-lb).
(6) Tighten the bolts in the numerical order shown in the figure to a tightening torque of 25 N·m (2.5 kgf-m, 18 ft-lb).
(7) Tighten all the bolts 90° in the numerical order shown in the figure.
(8) Tighten the (1) to (4) bolts 90° again in the numerical order shown in the figure.
(9) Tighten the (5) to (8) bolts 45° again in the numerical order shown in the figure.



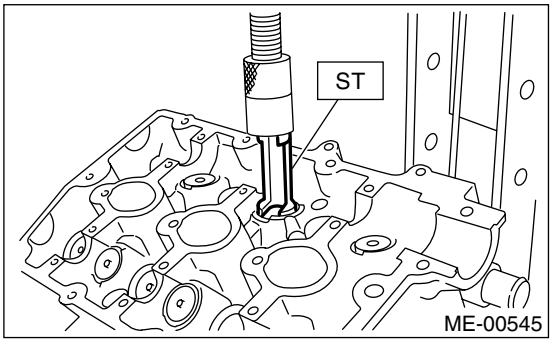
3) Install camshafts. <Ref. to ME(H6DO)-50, INSTALLATION, Camshaft.>
4) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
5) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
6) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
7) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
8) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>

9) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: DISASSEMBLY

1) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
2) Remove valve shims and valve lifters.
3) Set ST on valve spring retainer. Compress valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:
• For correct re-installation, keep removed parts in order in their original positions.
• Mark each valve to prevent confusion.
• Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve stem seals.



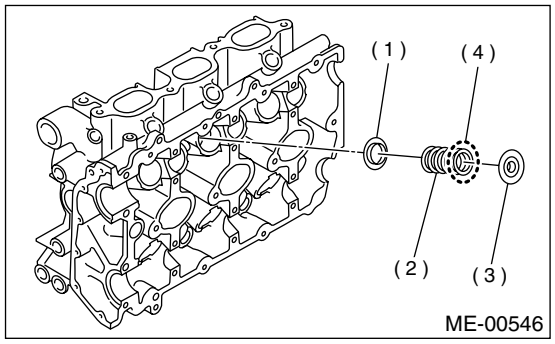
D: ASSEMBLY

1) Installation of valve spring and valve
(1) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
(2) Coat stem of each valve with engine oil and insert valve into valve guide.

CAUTION:
When inserting valve into valve guide, use special care not to damage the stem seal lip.

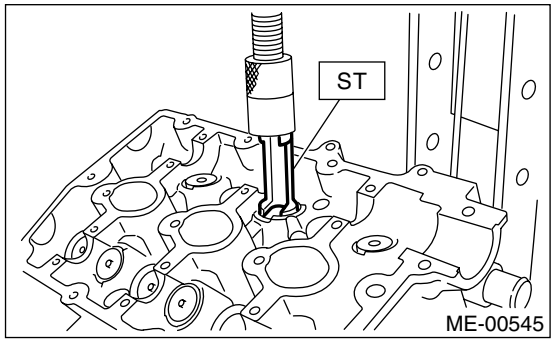
(3) Install valve spring and retainer.

CAUTION:
• Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.
• Install valve spring with the painted surface facing the retainer side.



(1) Seat
(2) Valve spring
(3) Retainer
(4) Painted face

(4) Set ST on valve spring.
ST 499718000 VALVE SPRING REMOVER



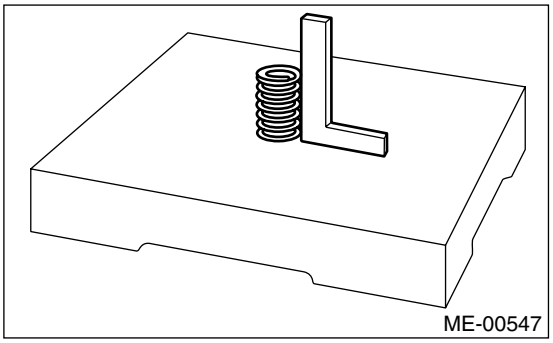
(5) Compress valve spring and fit valve spring retainer key.
(6) After installing, tap valve spring retainers lightly with wooden hammer for better seating.
2) Apply oil to the surface of the valve lifter and valve shim.
3) Install valve lifter and valve shim.

E: INSPECTION

1. VALVE SPRING

1) Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.
2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	46.79 mm (1.8421 in)
Squareness	2.5°, 2.0 mm (0.079 in)

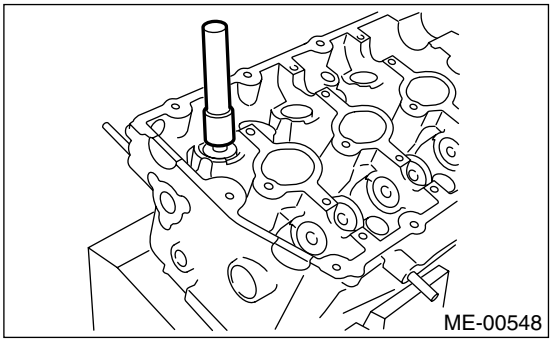


2. INTAKE AND EXHAUST VALVE STEM SEAL

Replace oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove oil seal from valve.
1) Place cylinder head on ST1.
2) Press-fit oil seal to the specified dimension indicated in the figure using ST2.

CAUTION:
• Apply engine oil to stem seal before press-fitting.
• When press-fitting stem seal, do not use hammer or strike in.

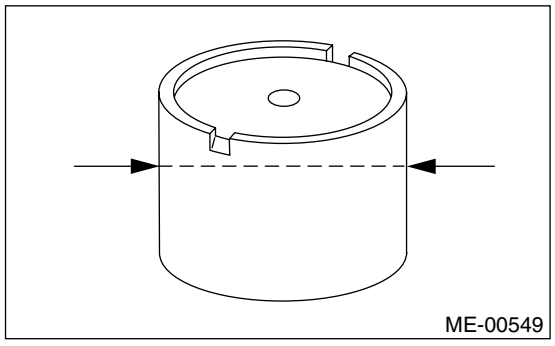
ST1 18250AA000 CYLINDER HEAD TABLE
ST2 499585500 VALVE OIL SEAL GUIDE



3. VALVE LIFTER

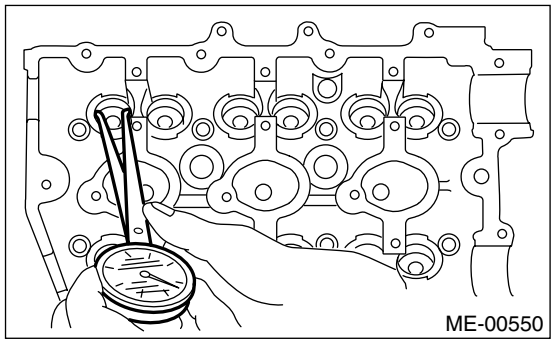
1) Check valve lifter visually.
2) Measure outer diameter of valve lifter.

Outer diameter:
33.959 — 33.975 mm (1.3370 — 1.3376 in)



3) Measure inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.006 — 34.016 mm (1.3388 — 1.3392 in)



CAUTION:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

F: ADJUSTMENT

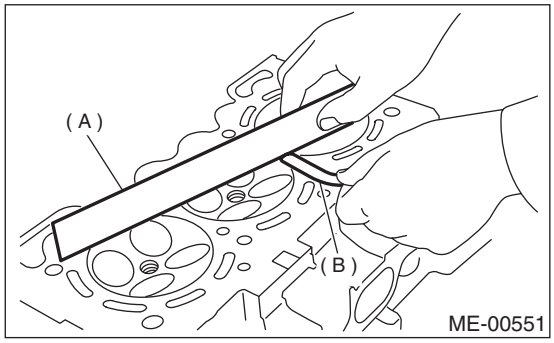
1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place cylinder head on ST.
ST 18250AA000 CYLINDER HEAD TABLE
3) Inspect the cylinder head surface that mates with cylinder block for warping by using a straight edge (A) and thickness gauge (B). If the warping exceeds the limit, replace the cylinder head.

Warping limit value:
0.02 mm (0.0008 in)

Standard height of cylinder head:
124 mm (4.88 in)

CAUTION:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



(A) Straight edge
(B) Thickness gauge

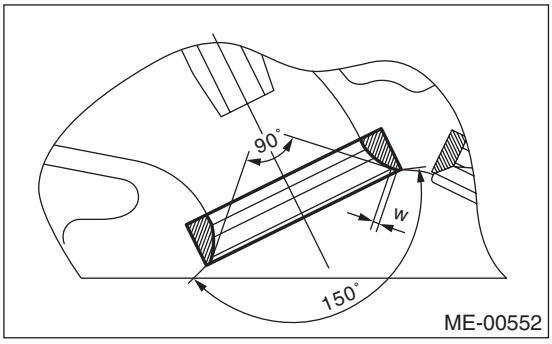
2. VALVE SEAT

Inspect intake and exhaust valve seats, and correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W

Intake
Standard
1.0 mm (0.039 in)
Limit
1.7 mm (0.067 in)

Exhaust
Standard
1.5 mm (0.059 in)
Limit
2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

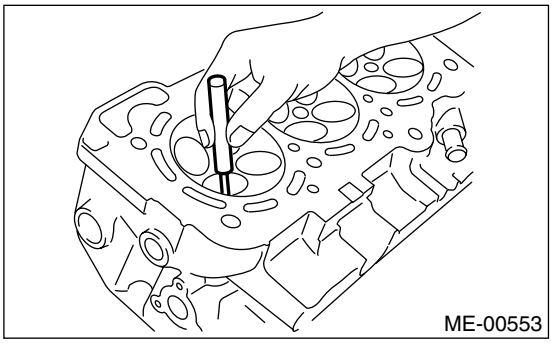
2) If the clearance between valve guide and stem exceeds the limit, replace valve guide or valve itself whichever shows greater amount of wear. See following procedure for valve guide replacement.

Valve guide inner diameter:
5.500 — 5.512 mm (0.2165 — 0.2170 in)

Valve stem outer diameter:
Intake
5.455 — 5.470 mm (0.2148 — 0.2154 in)
Exhaust
5.445 — 5.460 mm (0.2144 — 0.2150 in)

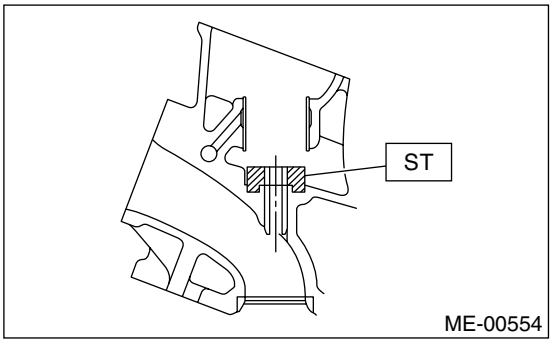
(1) Place cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert ST2 into valve guide and press it down to remove valve guide.

ST1 18250AA000 CYLINDER HEAD TABLE
ST2 499765700 VALVE GUIDE REMOVER



(3) Turn cylinder head upside down and place ST as shown in the figure.

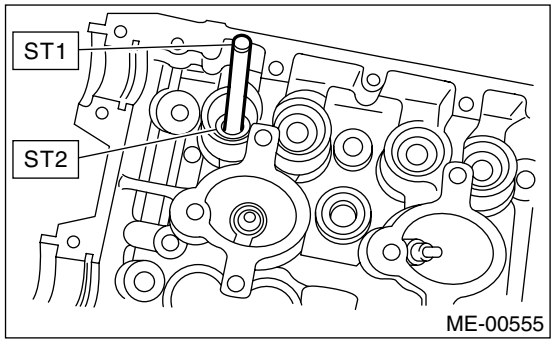
ST 18251AA000 VALVE GUIDE ADJUSTER



(4) Before installing new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put new valve guide in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499765700 VALVE GUIDE REMOVER
ST2 18251AA000 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
12.3 — 12.7 mm (0.484 — 0.500 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean valve guide to remove chips.

ST 499765900 VALVE GUIDE REAMER

CAUTION:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

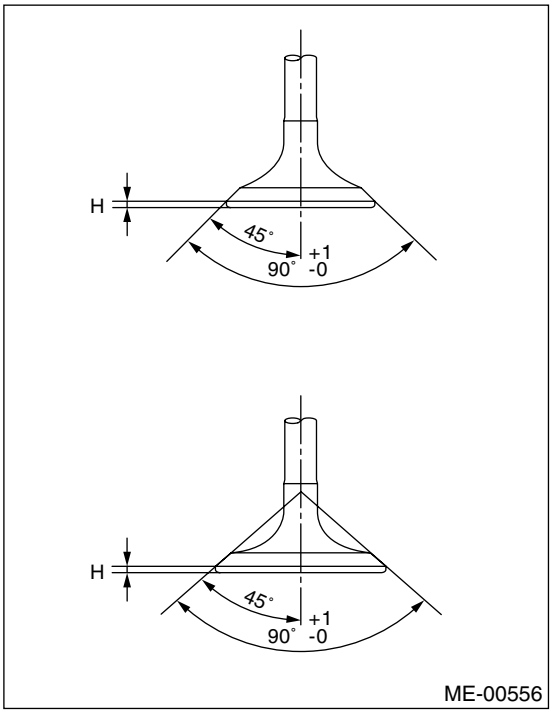
1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:

Intake
Standard
1.0 mm (0.039 in)
Limit
0.8 mm (0.031 in)

Exhaust
Standard
1.2 mm (0.047 in)
Limit
1.0 mm (0.039 in)

Valve overall length:
Intake
103.5 mm (4.075 in)
Exhaust
103.2 mm (4.063 in)

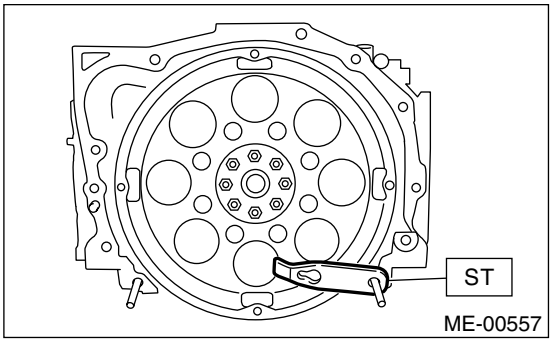


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

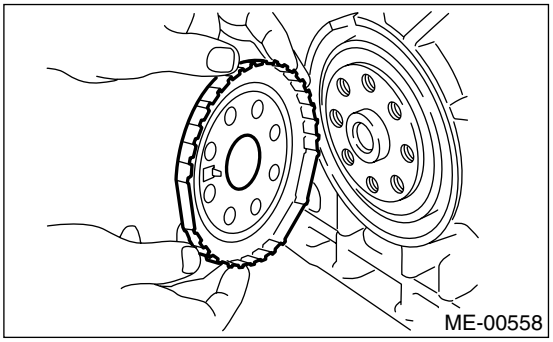
18.Cylinder Block

A: REMOVAL

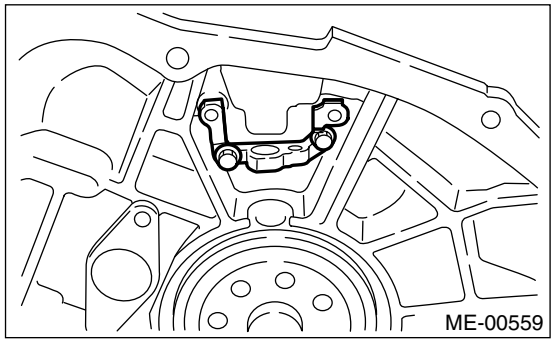
1) Remove crankshaft pulley. <Ref. to ME(H6DO)-38, REMOVAL, Crankshaft Pulley.>
2) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
3) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
4) Remove camshaft sprockets. <Ref. to ME(H6DO)-46, REMOVAL, Camshaft Sprocket.>
5) Remove crankshaft sprocket. <Ref. to ME(H6DO)-47, REMOVAL, Crankshaft Sprocket.>
6) Remove rear chain cover. <Ref. to ME(H6DO)-48, REMOVAL, Rear Chain Cover.>
7) Remove camshafts. <Ref. to ME(H6DO)-50, REMOVAL, Camshaft.>
8) Remove cylinder head assembly. <Ref. to ME(H6DO)-54, REMOVAL, Cylinder Head Assembly.>
9) Remove drive plate.
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



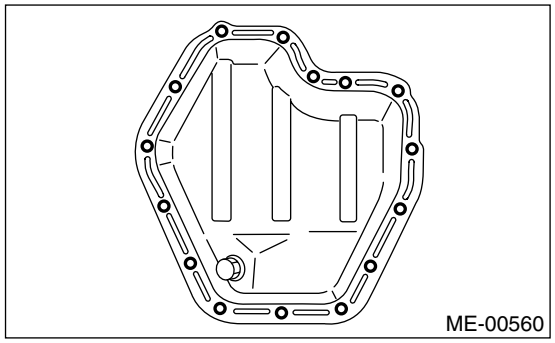
10) Remove crankshaft position sensor plate.



11) Remove crankshaft position sensor bracket.



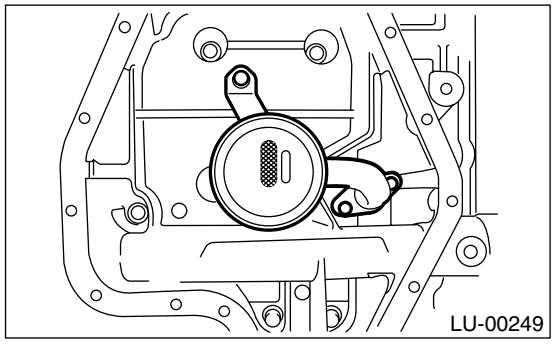
12) Rotate engine until oil pan comes to the top.
13) Remove bolts which secure lower oil pan to upper oil pan.



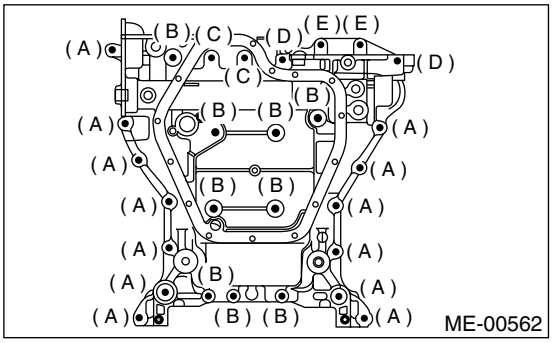
14) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove oil pan.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

15) Remove oil strainer.



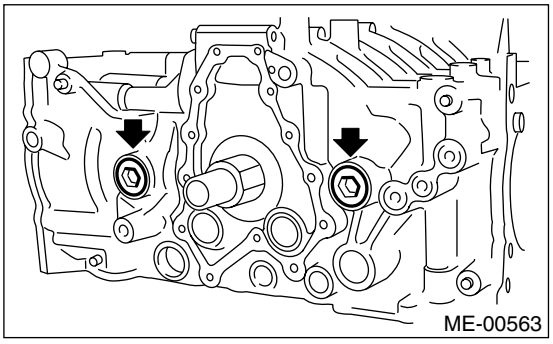
16) Remove bolts which secure upper oil pan to cylinder block.



Bolt dimension:

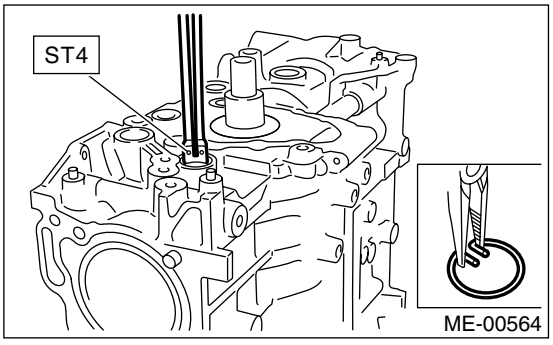
(A) 8 × 40
(B) 8 × 65
(C) 8 × 85
(D) 8 × 130
(E) 8 × 24

17) Remove service hole cover and service hole plugs using hexagon wrench.



18) Rotate crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove piston circlip through service hole of #1 and #2 cylinders by using ST.

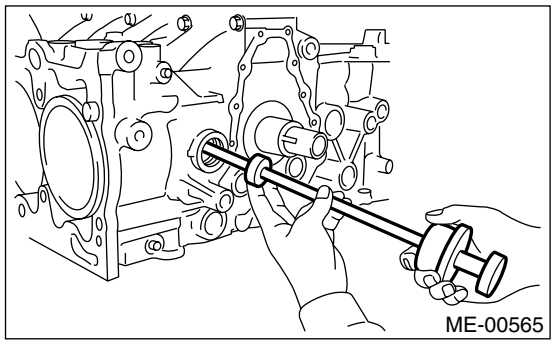
ST 18233AA000 PISTON PIN CIRCLIP PLIER



19) Draw out piston pin from #1 and #2 pistons by using ST.

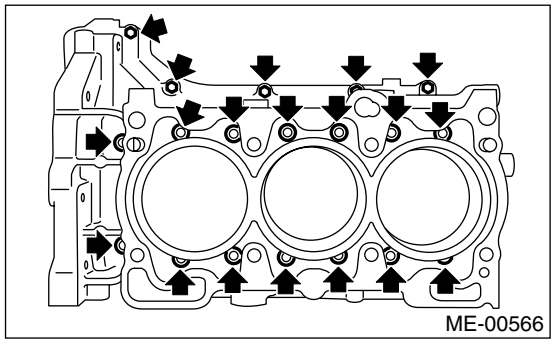
ST 499097500 PISTON PIN REMOVER

CAUTION:
Be careful not to confuse original combination of piston, piston pin and cylinder.



20) Similarly remove piston pins from #3, #4, #5 and #6 pistons.

21) Remove bolts which connect cylinder block.



22) Separate left-hand and right-hand cylinder blocks.

CAUTION:
When separating cylinder block, do not allow the connecting rod to fall and damage the cylinder block.

23) Remove rear oil seal.

24) Remove crankshaft together with connecting rod.

25) Remove crankshaft bearings from cylinder block using hammer handle.

CAUTION:
Do not confuse combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

26) Draw out each piston from cylinder block using wooden bar or hammer handle.

CAUTION:
Do not confuse combination of piston, piston pin and cylinder.

B: INSTALLATION

1) Install ST to cylinder block, then install crankshaft bearing.
ST 18232AA000 ENGINE STAND

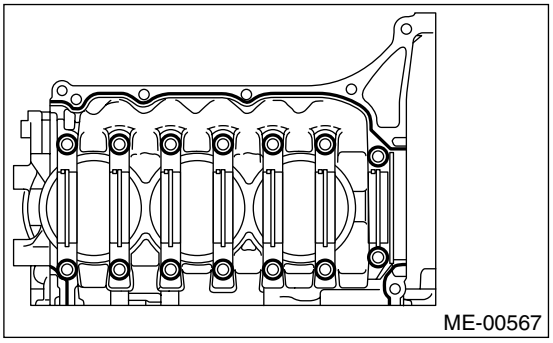
CAUTION:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

2) Position crankshaft and connecting rod on the #2, #4 and #6 cylinder.
3) Apply fluid gasket to the mating surface of #1, #3 and #5 cylinder block.

Fluid gasket:
THREE BOND 1215B or equivalent

CAUTION:
Do not allow fluid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.

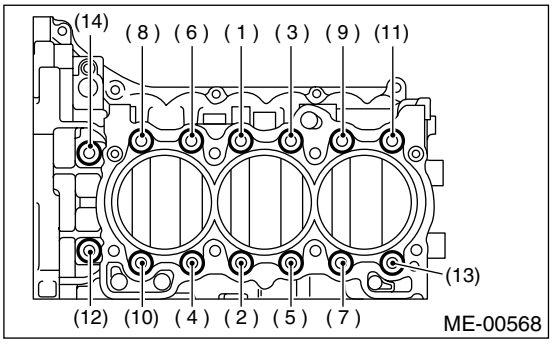
Fluid gasket application diameter:
1.0±0.2 mm (0.039±0.008 in)


ME-00567

4) Apply engine oil to washers and threads of cylinder block connecting bolts. Tighten the bolts following the steps below.
(1) Tighten all the bolts in the numerical order shown in the figure.

Tightening torque:

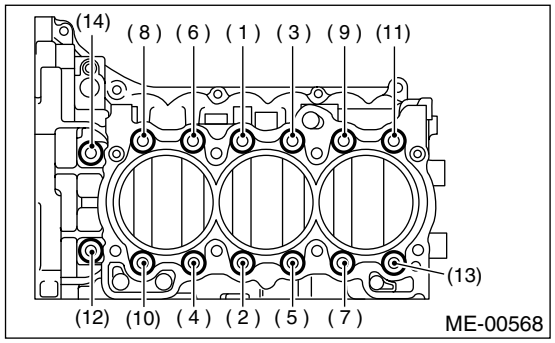
(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)



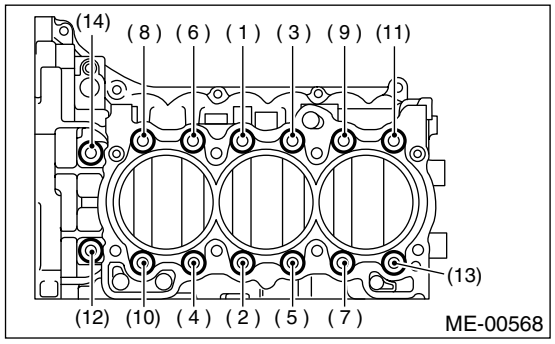
(2) Tighten all the bolts again in the order shown in the figure.

Tightening torque:

(1) to (11)	25 N·m (2.5 kgf-m, 18 ft-lb)
(12)	20 N·m (2.0 kgf-m, 14 ft-lb)
(13)	25 N·m (2.5 kgf-m, 18 ft-lb)
(14)	20 N·m (2.0 kgf-m, 14 ft-lb)

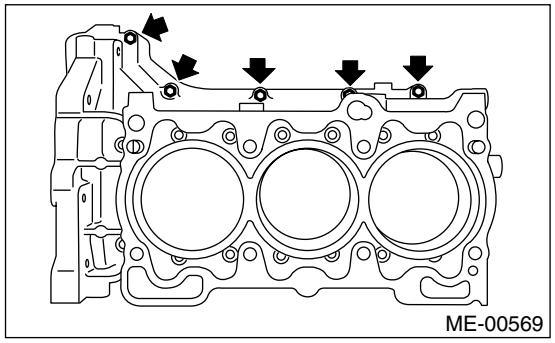


5) Tighten all the bolts by 90° in the order shown in the figure.



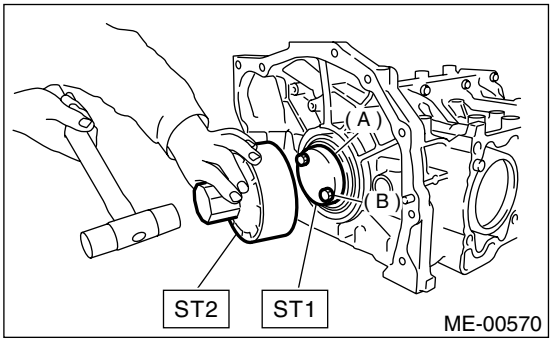
6) Install upper bolts on cylinder block.

Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)


ME-00569

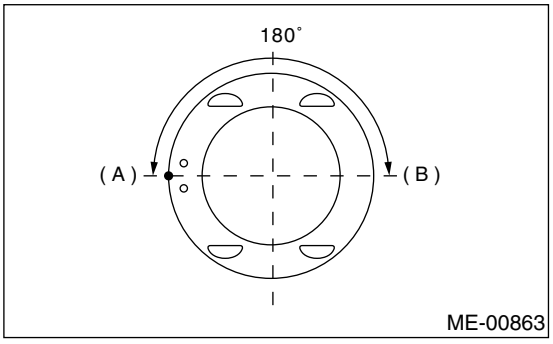
7) Install rear oil seal using ST1 and ST2.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE
ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

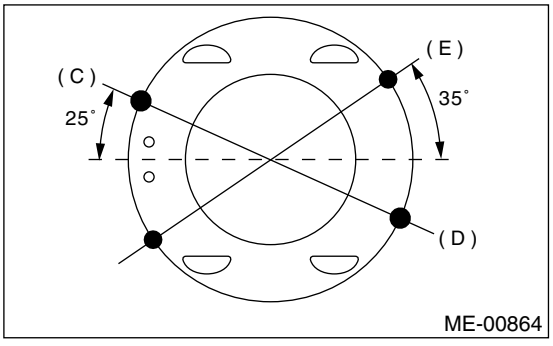


(A) Rear oil seal
(B) Drive plate attaching bolt

8) Positioning of piston ring.
(1) Position the top ring gap at (A) in the figure.
(2) Position the second ring gap at (B) in the figure.



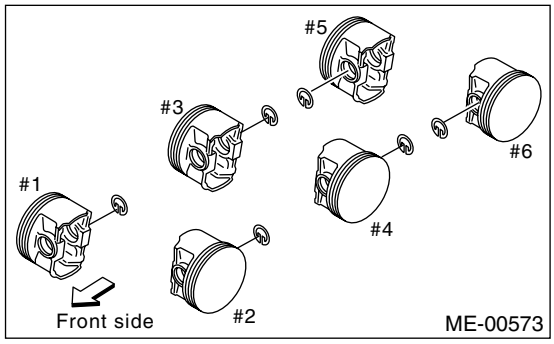
(3) Position the upper rail gap at (C) in the figure.
(4) Position the expander gap at (D) in the figure.
(5) Position the lower rail gap at (E) in the figure.



CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

(6) Install circlip.
Install circlips in piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.

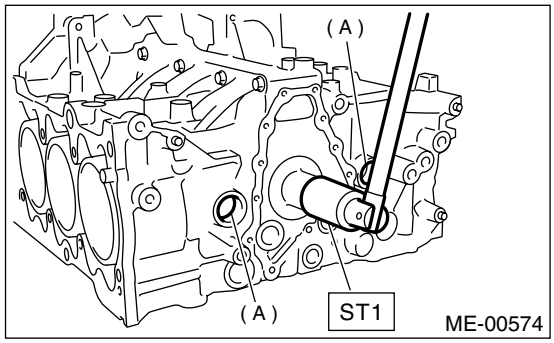


9) Installing piston.

CAUTION:
Install piston and piston pin to the same cylinder they were installed before overhaul.

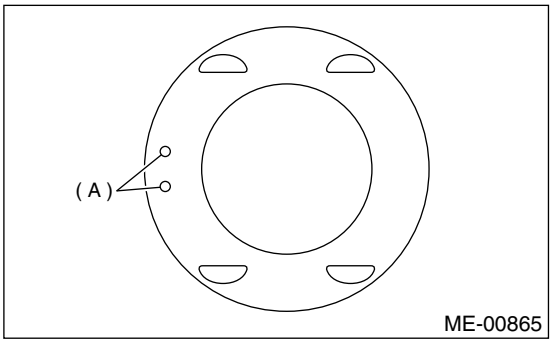
(1) Using ST1, rotate crankshaft until each small end of connecting rods #3 and #4 is aligned over service hole (A).

ST1 18252AA000 CRANKSHAFT SOCKET



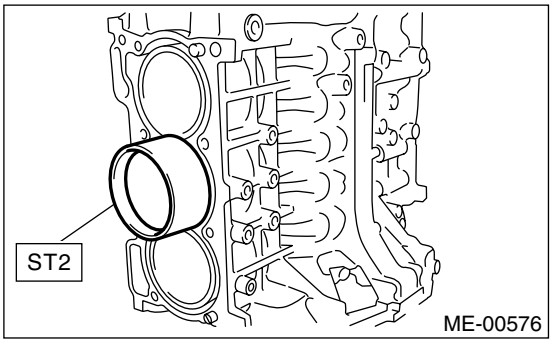
(2) Apply a coat of engine oil to piston and cylinders.

(3) Install pistons with their front marks (A) facing the front of engine.



(4) Insert pistons in their cylinders using ST2.

ST2 18254AA000 PISTON GUIDE

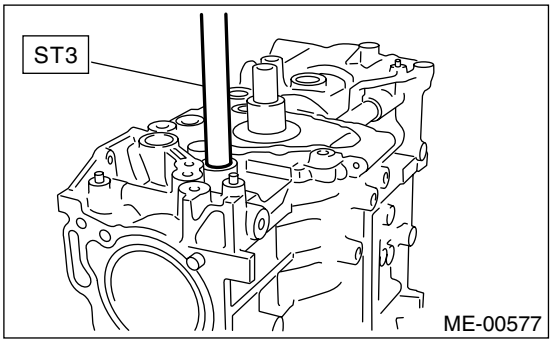


10) Installing piston pin.

(1) Apply a coat of engine oil to ST3.

ST3 18253AA000 PISTON PIN GUIDE

(2) Insert ST3 into service hole to align piston pin hole with connecting rod small end.

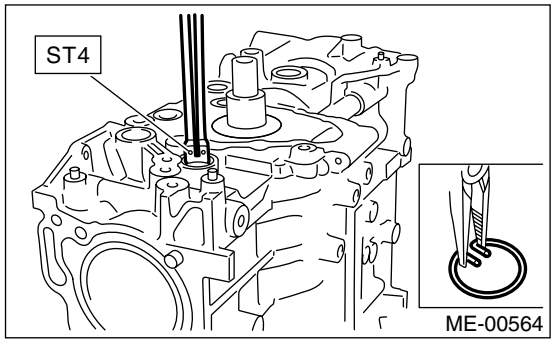


(3) Apply a coat of engine oil to piston pin and insert piston pin into piston and connecting rod small end through service hole.

(4) Using ST4, install circlip.

ST4 18233AA000 PISTON PIN CIRCLIP PLIER

NOTE:
Use a new circlip.



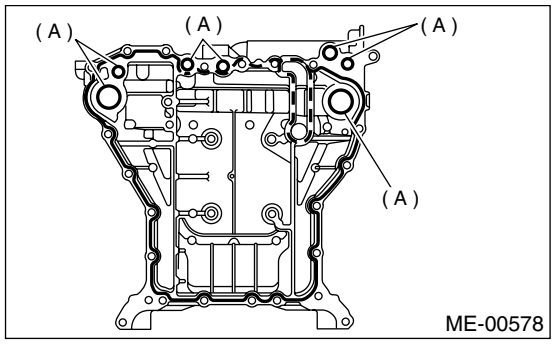
11) Repeat the same steps for pistons #1 and #2, #5 and #6.

12) Install service hole plug and cover.

13) Apply fluid gasket to mating surface of upper oil pan.

14) Install O-ring.

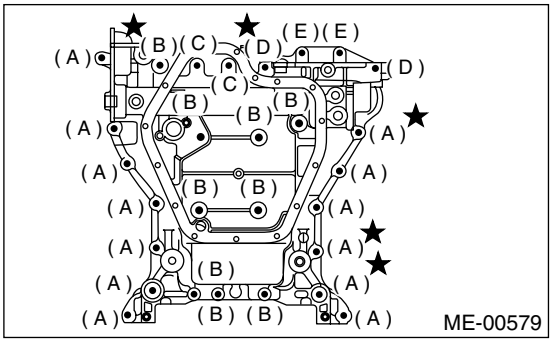
Fluid gasket:
THREE BOND 1280B



(A) O-ring

15) Temporarily tighten the upper oil pan.

CAUTION:
Do not confuse the mounting positions of the bolts.

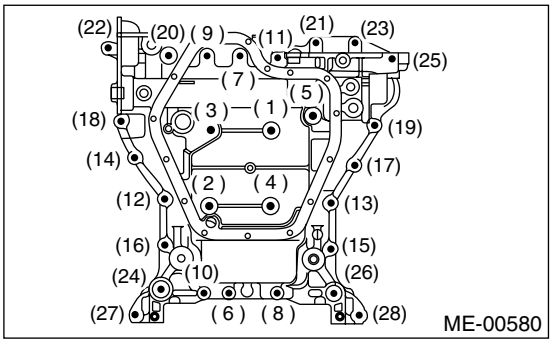


Bolt dimension:

(A) 8 × 40
(B) 8 × 65
(C) 8 × 85
(D) 8 × 130
(E) 8 × 20

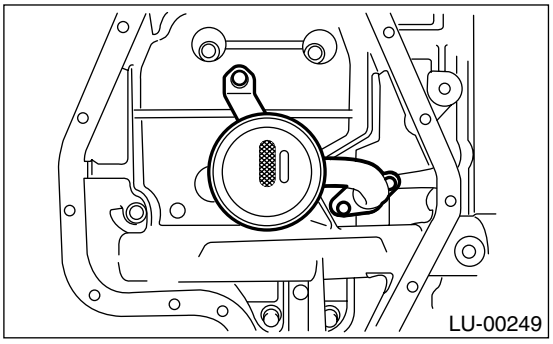
16) Tighten the upper oil pan mounting bolts in the numerical sequence shown in the figure.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



17) Install oil strainer.

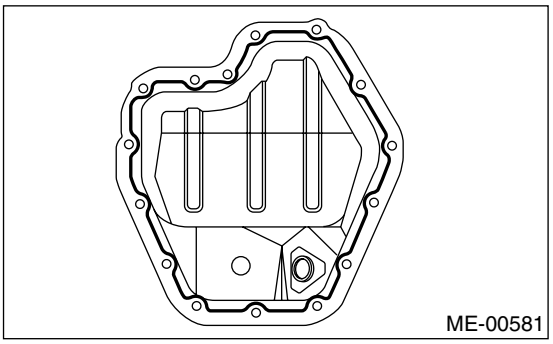
NOTE:
Use a new O-ring.



18) Apply fluid gasket to mating surface of lower oil pan.

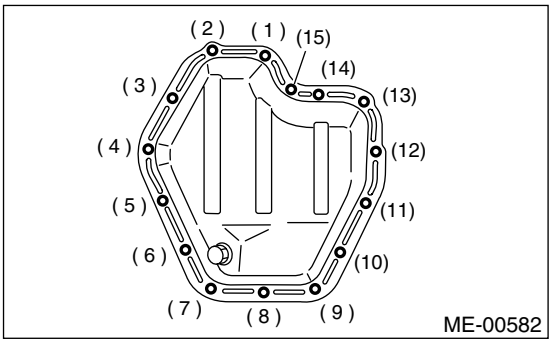
Fluid gasket:
THREE BOND 1280B

Fluid gasket application diameter:
5.0±1.0 mm (0.097±0.039 in)



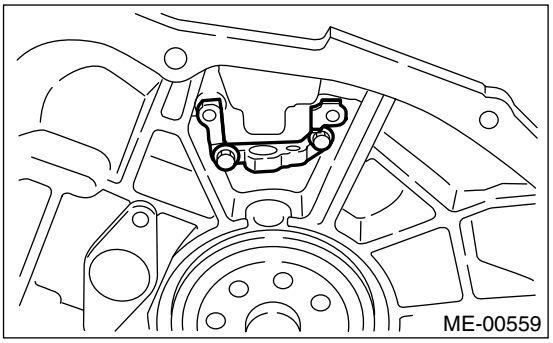
19) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

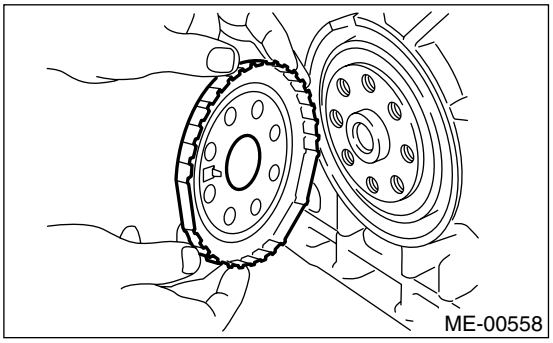


20) Install crankshaft position sensor bracket.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

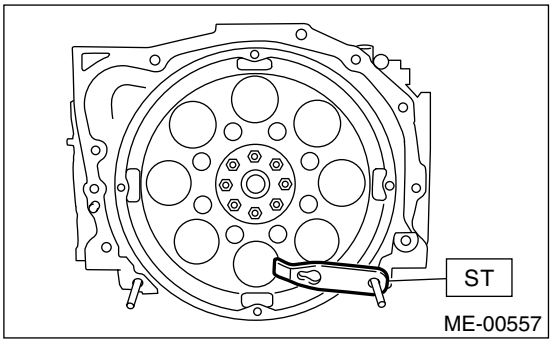


21) Install crankshaft position sensor plate.



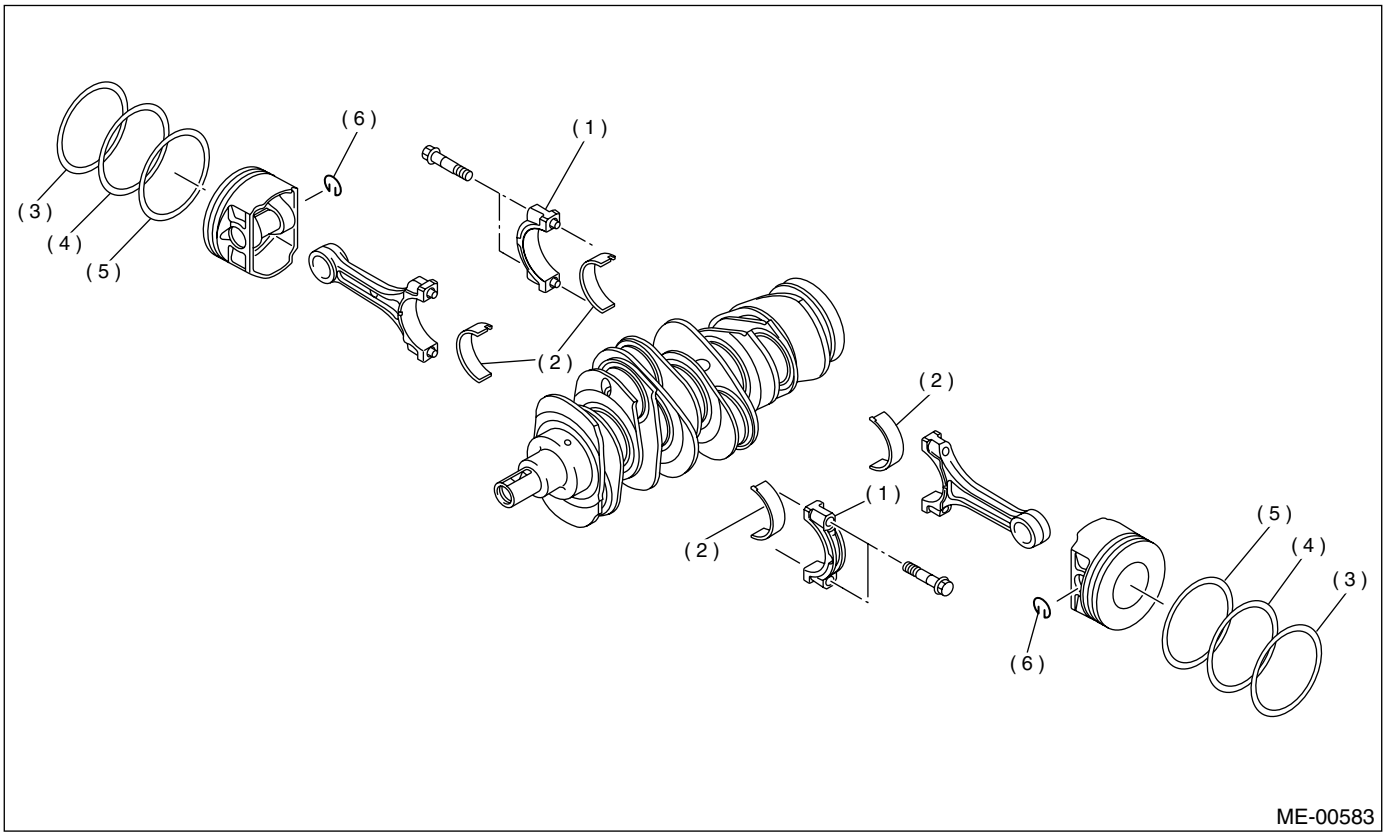
22) Install drive plate.
Using ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
81 N·m (8.3 kgf-m, 60 ft-lb)



23) Install cylinder head assembly. <Ref. to ME(H6DO)-54, INSTALLATION, Cylinder Head Assembly.>
24) Install camshafts. <Ref. to ME(H6DO)-50, INSTALLATION, Camshaft.>
25) Install rear chain cover. <Ref. to ME(H6DO)-48, INSTALLATION, Rear Chain Cover.>
26) Install crankshaft sprocket. <Ref. to ME(H6DO)-47, INSTALLATION, Crankshaft Sprocket.>
27) Install camshaft sprockets. <Ref. to ME(H6DO)-46, INSTALLATION, Camshaft Sprocket.>
28) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
29) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
30) Install crankshaft pulley. <Ref. to ME(H6DO)-38, INSTALLATION, Crankshaft Pulley.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove connecting rod cap.
2) Remove connecting rod bearing.

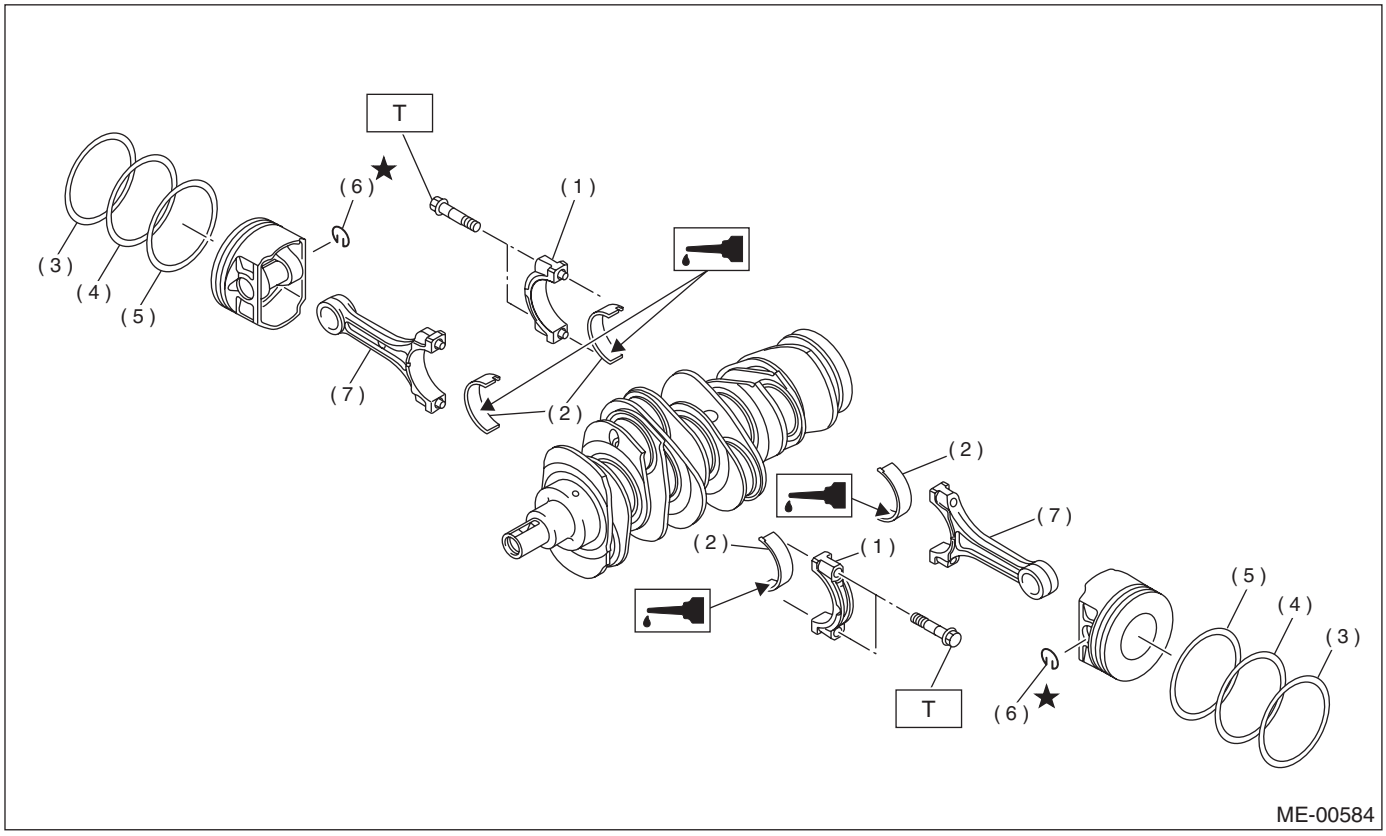
CAUTION:
Arrange removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove piston rings using the piston ring expander.
4) Remove the oil ring by hand.

CAUTION:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove circlip.

D: ASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip
(7) Connecting rod

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39)

1) Install connecting rod bearings on connecting rods and connecting rod caps.

CAUTION:
Apply oil to the surfaces of the connecting rod bearings.

2) Install connecting rod on crankshaft.

CAUTION:
Position each connecting rod with the side marked facing forward.

3) Install connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

4) Installation of piston rings and oil ring

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge. If the warping exceeds the limit, replace the cylinder block.

Warping limit:
0.02 mm (0.0008 in)

Standard height of cylinder block:
202 mm (7.95 in)

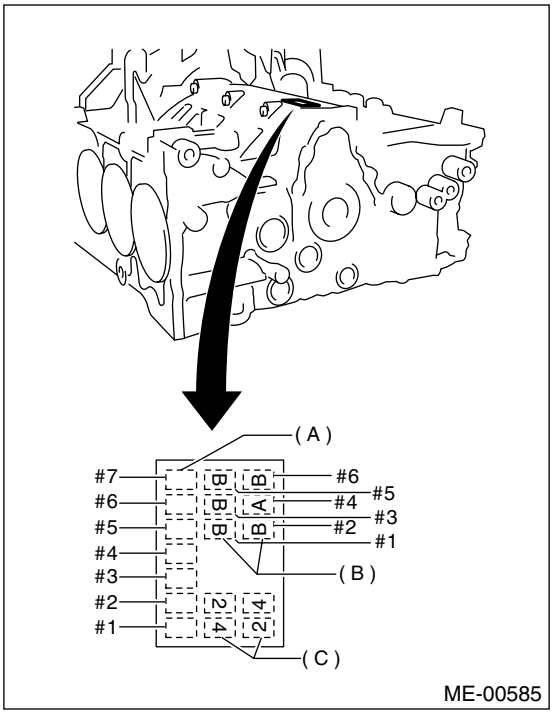
2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block's front upper surface.

CAUTION:
Measurement should be performed at a temperature 20°C (68°F).

NOTE:
Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 89.205 — 89.215 mm (3.5120 — 3.5124 in)
B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)



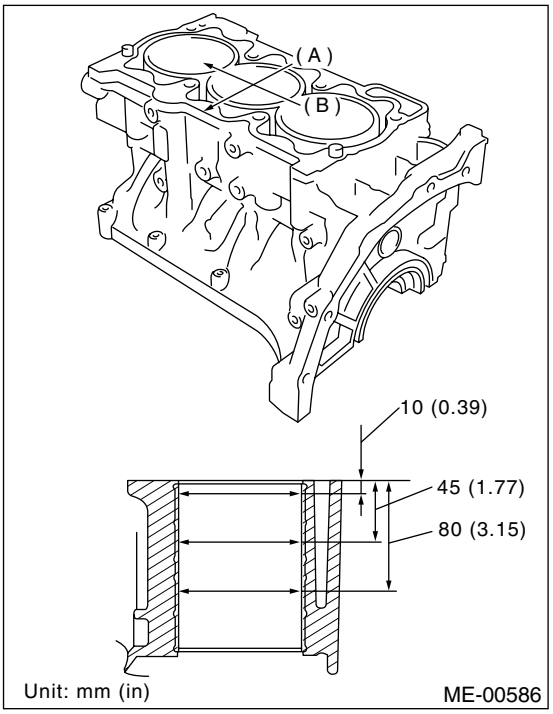
(A) Main journal size mark
(B) Cylinder bore size mark
(C) Cylinder block RH-LH combination mark

2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

CAUTION:
Measurement should be performed at a temperature 20°C (68°F).

Taper:
Limit
0.030 mm (0.0012 in)

Out-of-roundness:
Limit
0.01 mm (0.0004 in)



(A) Thrust direction
(B) Piston pin direction

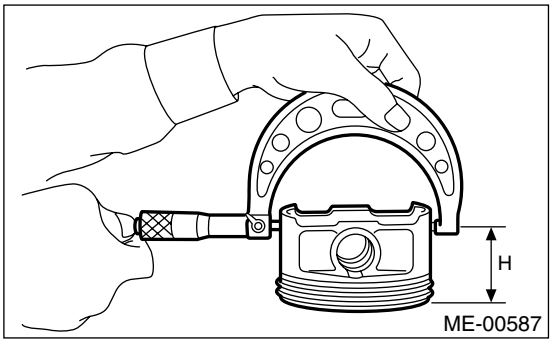
3) When piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

CAUTION:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
39.0 mm (1.535 in)

Piston outer diameter:
Standard
A: 89.185 — 89.195 mm
(3.5112 — 3.5116 in)
B: 89.175 — 89.185 mm
(3.5108 — 3.5112 in)
0.25 mm (0.0098 in) oversize
89.425 — 89.435 mm
(3.5207 — 3.5211 in)
0.50 mm (0.0197 in) oversize
89.675 — 89.685 mm
(3.5305 — 3.5309 in)



5) Calculate the clearance between cylinder and piston.

CAUTION:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)

6) Boring and honing
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

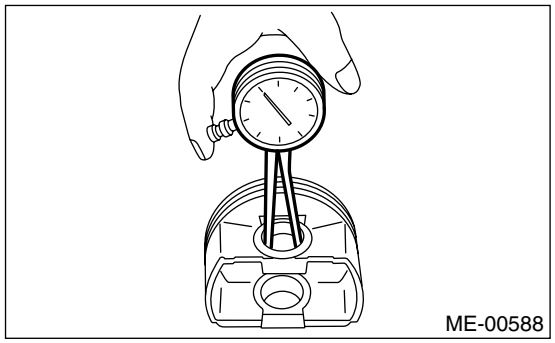
CAUTION:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

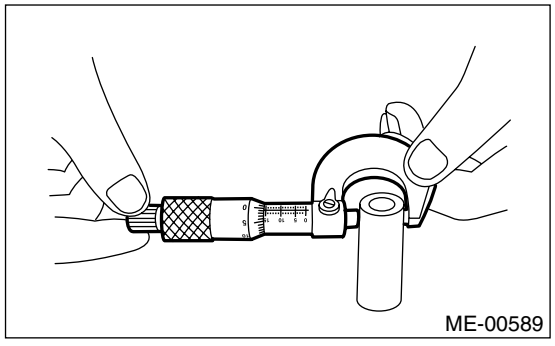
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

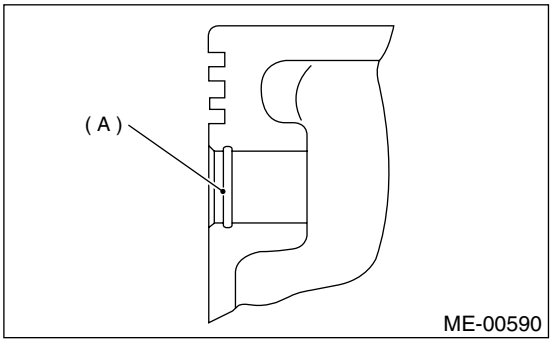
1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H6DO)-68, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)





4) Check circlip installation groove on the piston for burr. If necessary, remove burr (A) from the groove so that piston pin can lightly move.

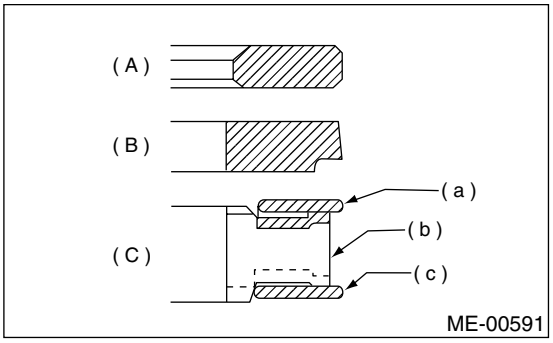


5) Check piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

CAUTION:
• Marks are shown on the end of the top and second rings. When installing the rings to the piston, face this mark upward.
• The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful to assemble correctly.

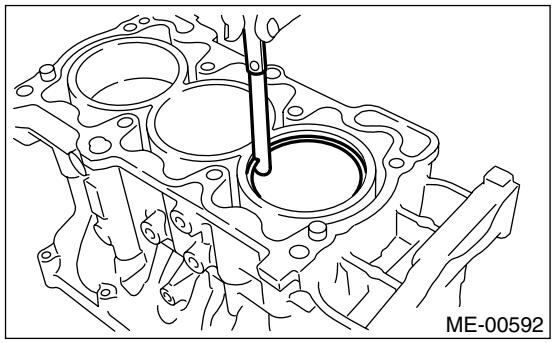


(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Expander
(c) Lower rail

2) Squarely place piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

Unit: mm (in)

		Standard
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)
	Oil ring rail	0.20 — 0.60 (0.0079 — 0.0236)

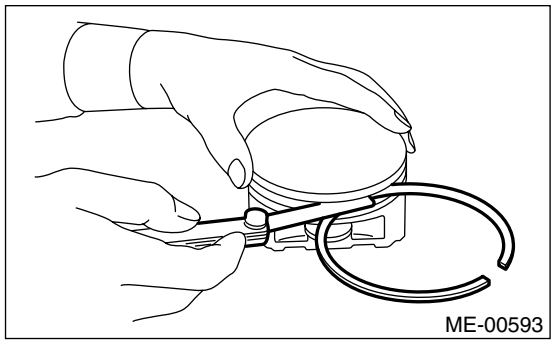


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

CAUTION:
Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)

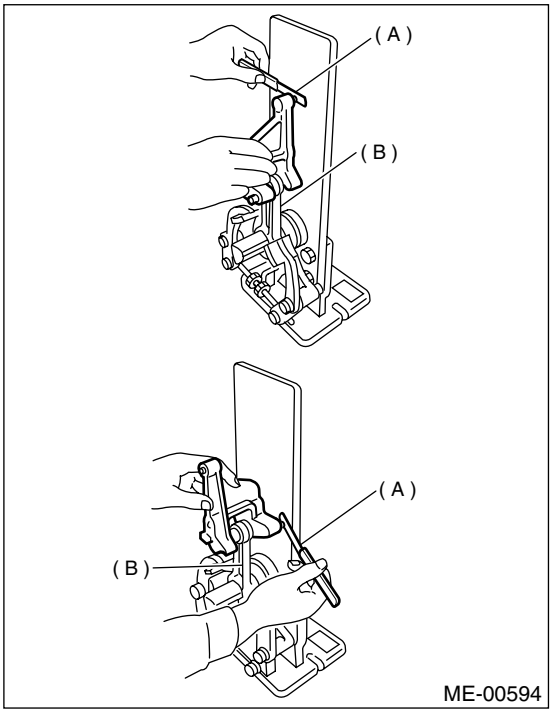
		Standard
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)
Clearance between oil ring and oil ring groove		0.065 — 0.155 (0.0026 — 0.0061)



5. CONNECTING ROD

1) Replace connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

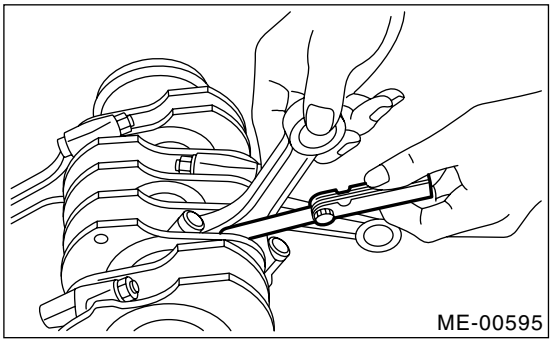
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)



4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

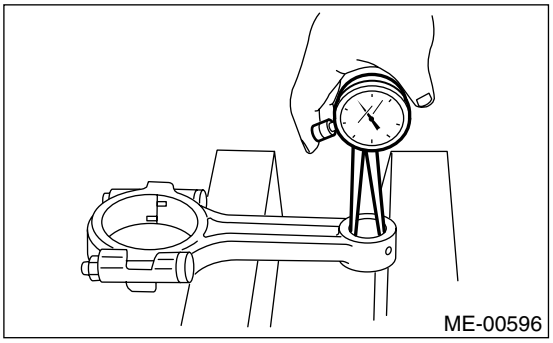
Connecting rod oil clearance:
Standard
0.022 — 0.052 mm (0.0009 — 0.0020 in)

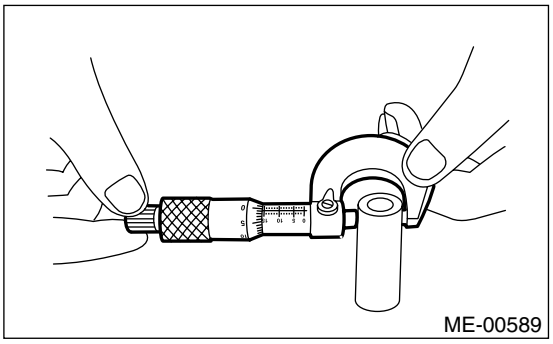
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

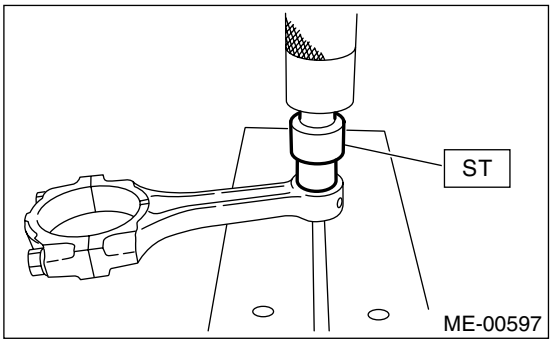
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)


ME-00596


ME-00589

7) Replacement procedure is as follows.
(1) Remove bushing from connecting rod with ST and press.
(2) Press bushing with ST after applying oil on the periphery of bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00597

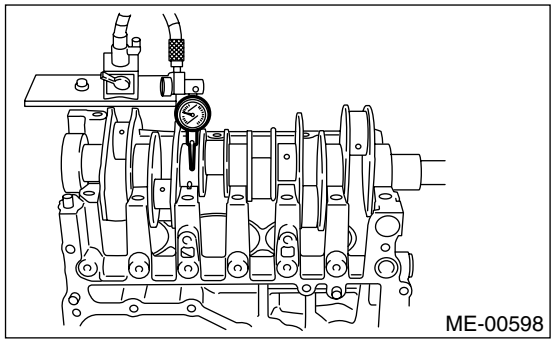
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

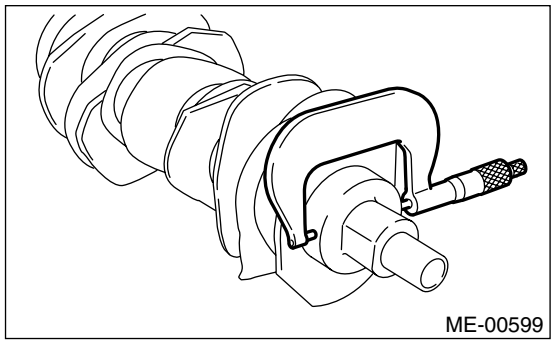
CAUTION:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position crankshaft on these bearings and measure crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00598

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace bearing with a suitable (undersize) one, and replace or recondition crankshaft as necessary. When grinding crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.020 mm (0.0008 in) or less
Grinding limit
0.250 mm (0.0098 in)


ME-00599

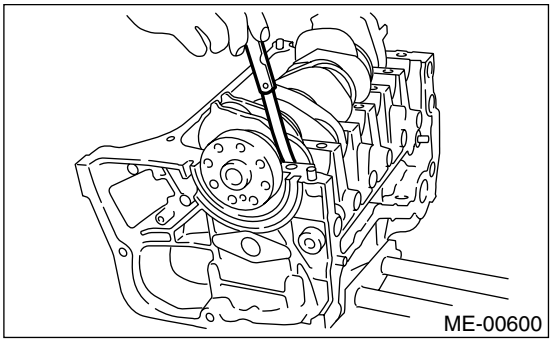
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3, #5, #7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)		51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.992 — 2.005 (0.0784 — 0.0789)	1.996 — 2.000 (0.0786 — 0.0787)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)		51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.020 (0.0795 — 0.0795)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)		51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	63.742 — 63.758 (2.5095 — 2.5102)		51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

O.D. ... Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)


ME-00600

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance	
Standard	0.010 — 0.030 (0.0004 — 0.0012)

19.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refer to the possibility of reason for the trouble in order ("Very often" to "Rarely")
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seat	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
3) Initial combustion occur.	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Chain	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Improper adjustment of accelerator cable	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seat	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
	• Cooling system	• Overheating	C
		• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	A
4. Surging	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seat	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Improper adjustment of accelerator cable	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After fire in exhaust system	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seat	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	C
8. Knocking	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filter cap	B
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Dirty air cleaner element	A
	• Chain	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seat	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	B
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Improper adjustment of accelerator cable	B

20.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing chain noise	—	• Loose timing chain • Chain contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H6DO)-58, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX(H6DO)

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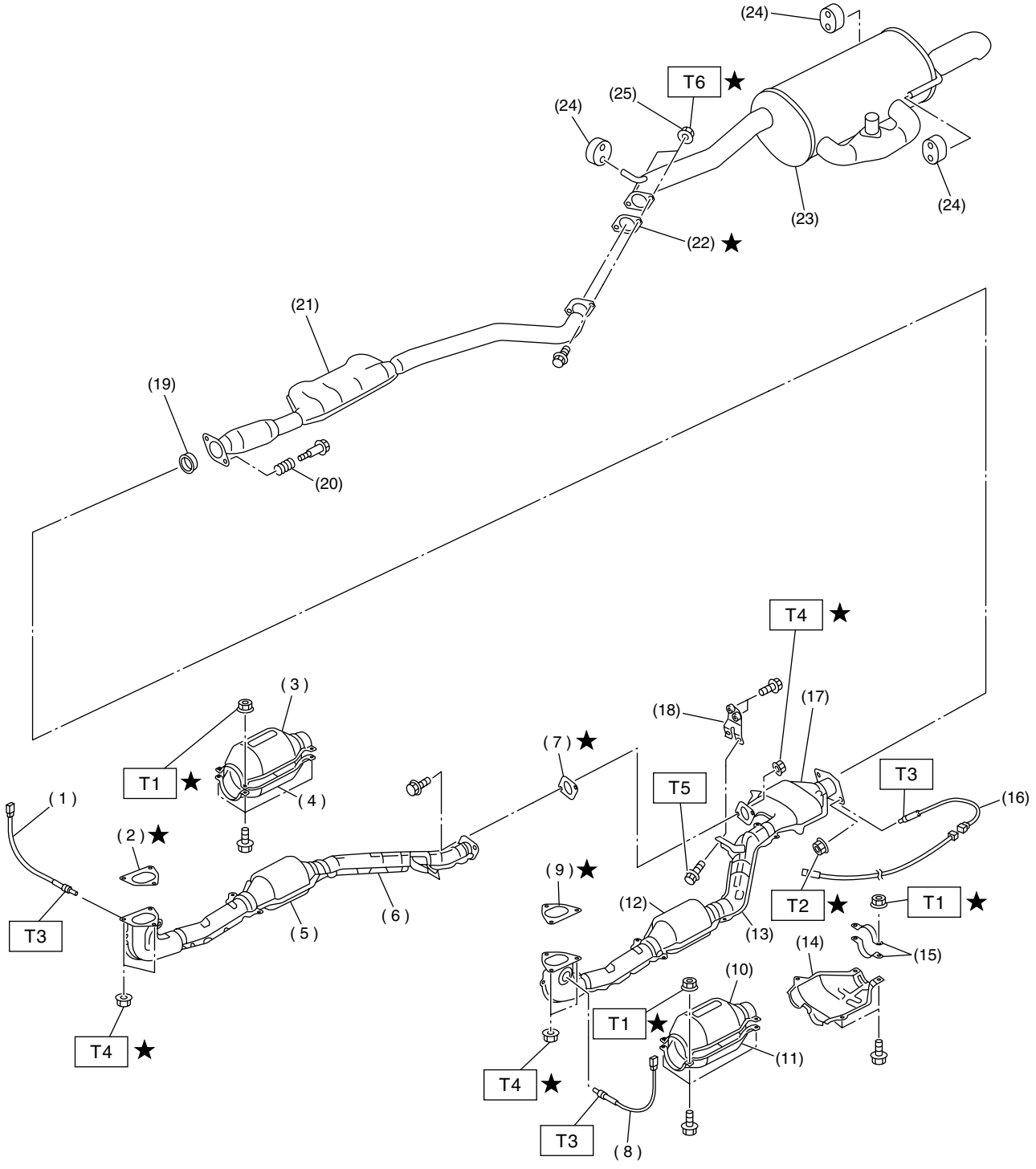
2. Front Exhaust Pipe....5
3. Rear Exhaust Pipe 8
4. Muffler 9

1. General Description

A: COMPONENT



EX-00055

(1) Front oxygen (A/F) sensor (RH)
(2) Gasket (RH)
(3) Upper front catalytic converter cover (RH)
(4) Lower front catalytic converter cover (RH)
(5) Front catalytic converter (RH)
(6) Front exhaust pipe (RH)
(7) Gasket (RH)
(8) Front oxygen (A/F) sensor (LH)
(9) Gasket (LH)
(10) Upper front catalytic converter cover (LH)
(11) Lower front catalytic converter cover (LH)
(12) Front catalytic converter (LH)
(13) Front exhaust pipe (LH)
(14) Lower rear catalytic converter cover
(15) Clamp
(16) Rear oxygen sensor
(17) Rear catalytic converter
(18) Bracket
(19) Gasket
(20) Spring
(21) Rear exhaust pipe
(22) Gasket
(23) Muffler
(24) Cushion rubber
(25) Self-locking nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 21 (2.1, 15)
T4: 30 (3.1, 22.4)
T5: 35 (3.6, 26.0)
T6: 48 (4.9, 35.4)

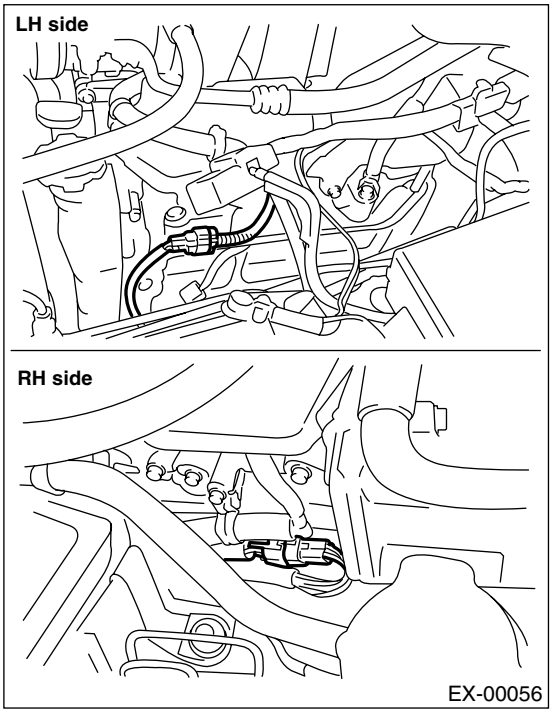
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

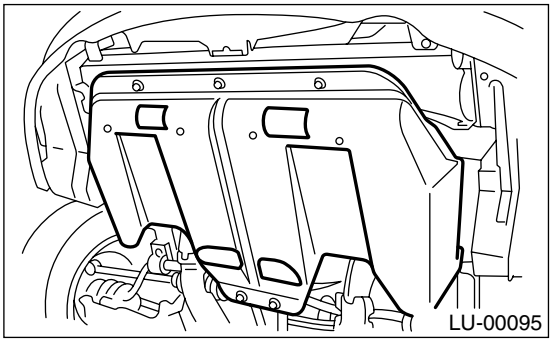
2. Front Exhaust Pipe

A: REMOVAL

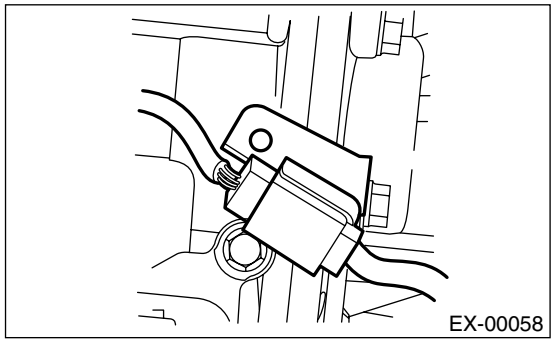
1) Remove battery.
2) Remove air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.> and <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
3) Disconnect front oxygen (A/F) sensor connector.



4) Lift-up the vehicle.
5) Remove under cover.

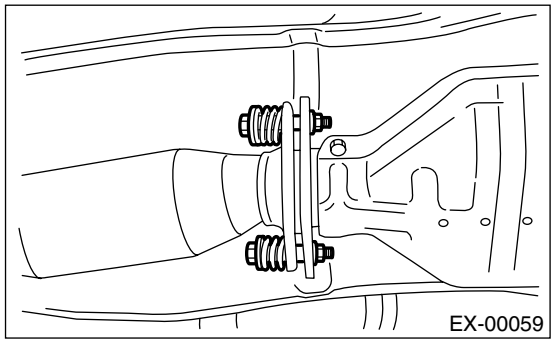


6) Disconnect rear oxygen sensor connector.



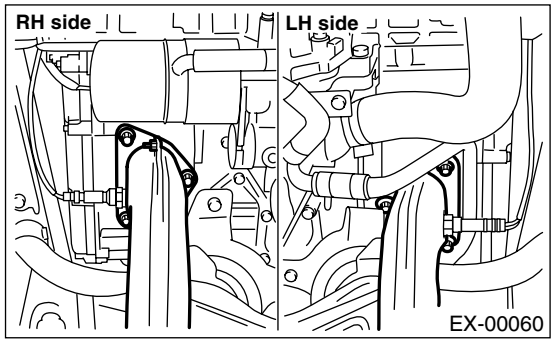
7) Separate front exhaust pipe assembly from rear exhaust pipe.

WARNING:
Be careful, exhaust pipe is hot.

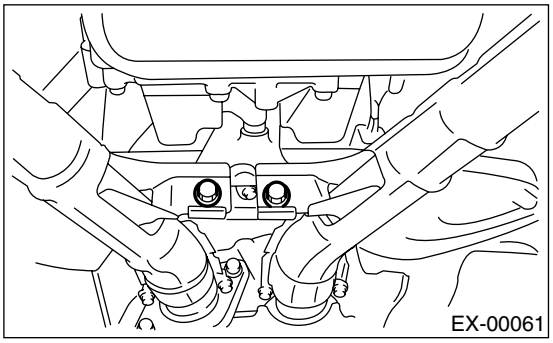


8) Remove nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to pull down front exhaust pipe assembly.



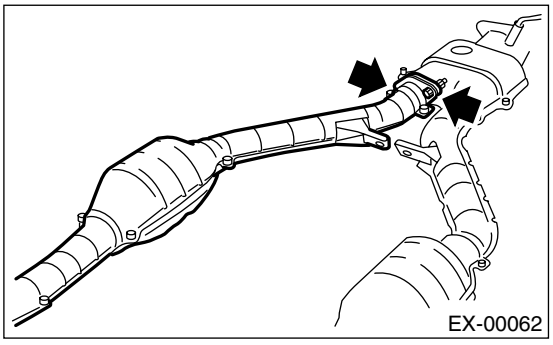
9) Remove bolt which secures front exhaust pipe assembly to hanger bracket.



10) Remove front exhaust pipe from the vehicle.

CAUTION:
• Be careful not to let front exhaust pipe assembly fall off when removing as it is quite heavy.
• After removing front exhaust assembly, do not apply excessive pulling force on rear exhaust pipe.

11) Separate front exhaust pipe (RH) from front exhaust pipe assembly.

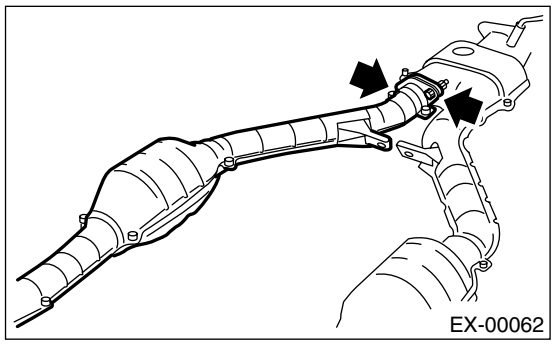


B: INSTALLATION

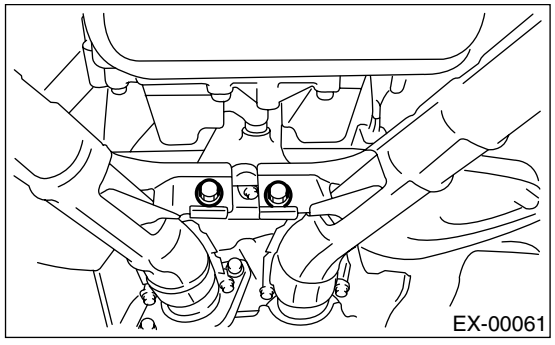
1) Install front exhaust pipe (RH) to front exhaust pipe assembly.

NOTE:
Replace gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

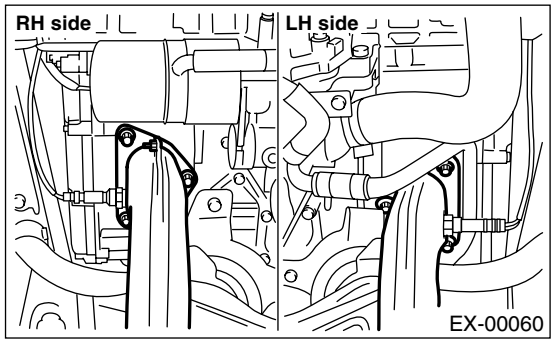


2) Install front exhaust pipe assembly to the vehicle.
3) Temporarily tighten bolt which installs front exhaust pipe assembly to hanger bracket.



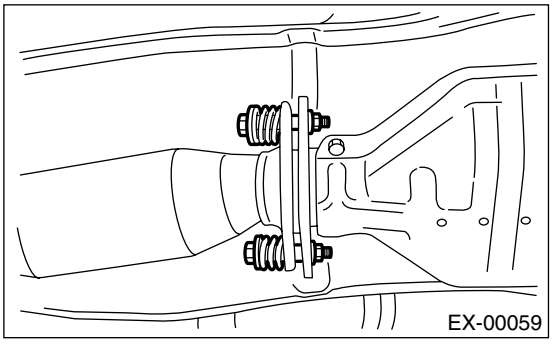
4) Tighten nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



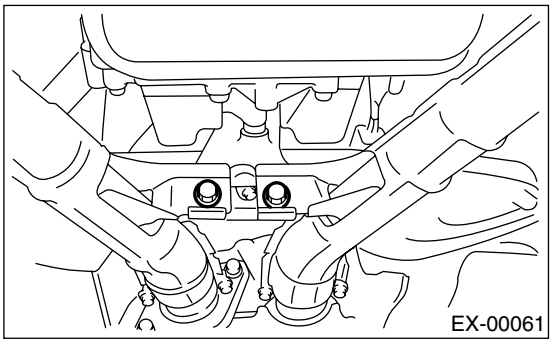
5) Install under cover.
6) Tighten bolts which install front exhaust pipe to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

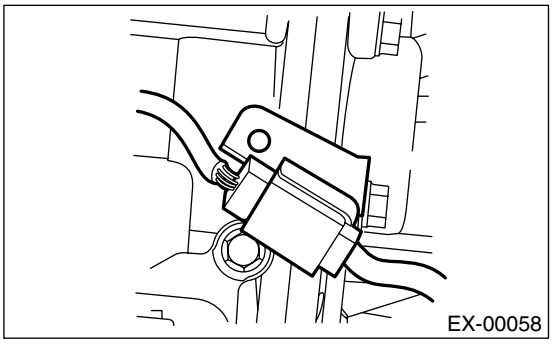


7) Tighten bolt which holds front exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

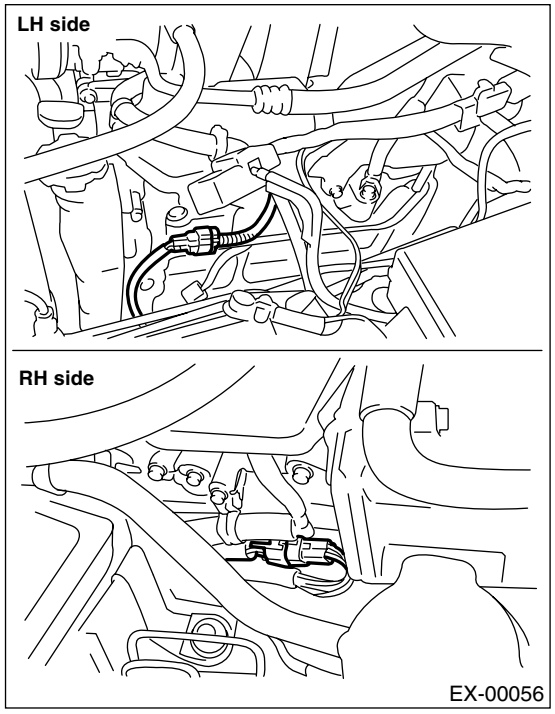


8) Connect rear oxygen sensor connector.



9) Install under cover.
10) Lower the vehicle.

11) Connect front oxygen (A/F) sensor connectors.



12) Install air cleaner case and air intake duct. <Ref. to IN(H6DO)-5, INSTALLATION, Air Cleaner.> and <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Duct.>
13) Install battery.

C: INSPECTION

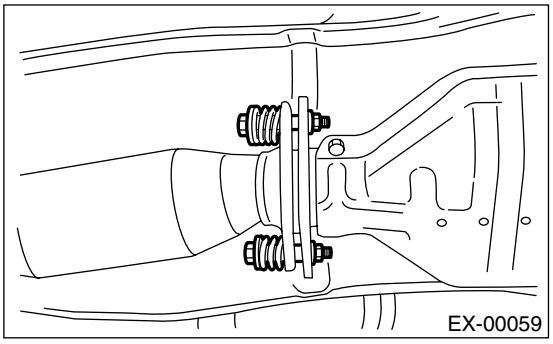
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Exhaust Pipe

A: REMOVAL

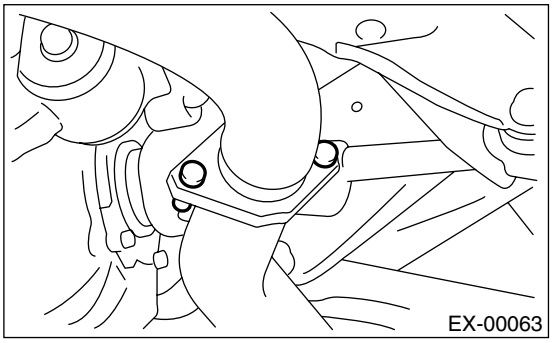
1) Separate rear exhaust pipe from front exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.



2) Separate rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down rear exhaust pipe.



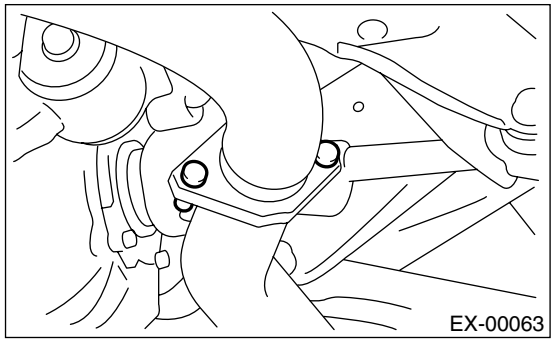
3) Remove rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace gaskets and self-lock nut with new ones.

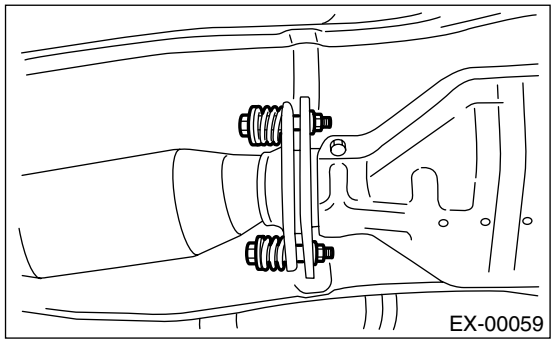
1) Install rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



2) Install rear exhaust pipe to front exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

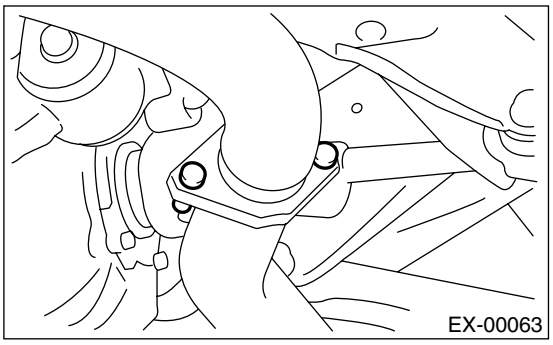
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

4. Muffler

A: REMOVAL

1) Separate muffler from rear exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

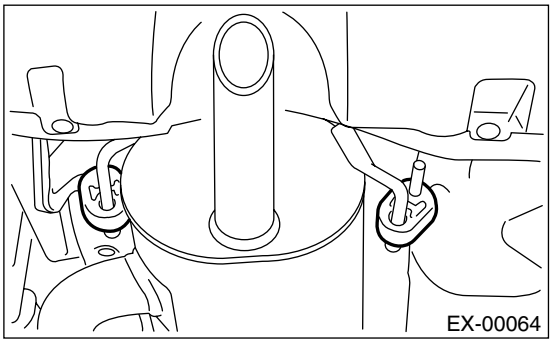


2) Remove left and right rubber cushions.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushions in advance.

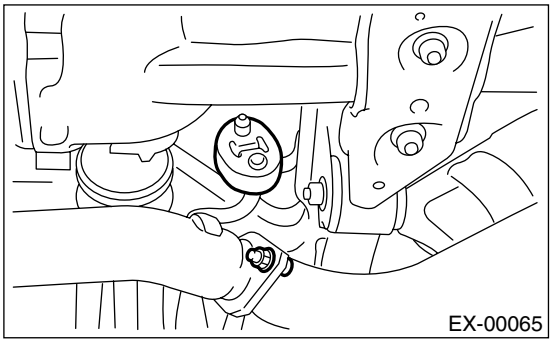
SUBARU CRC (Part No. 004301003)



3) Remove front rubber cushion, and detach muffler assembly.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to mating area of rubber cushion in advance.

SUBARU CRC (Part No. 004301003)

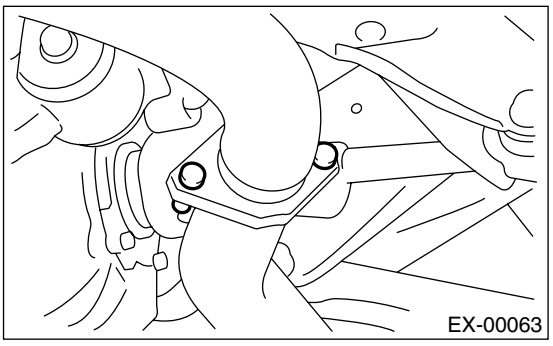


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace gasket and self-lock nut with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

MUFFLER

MEMO:

COOLING

CO(H6DO)

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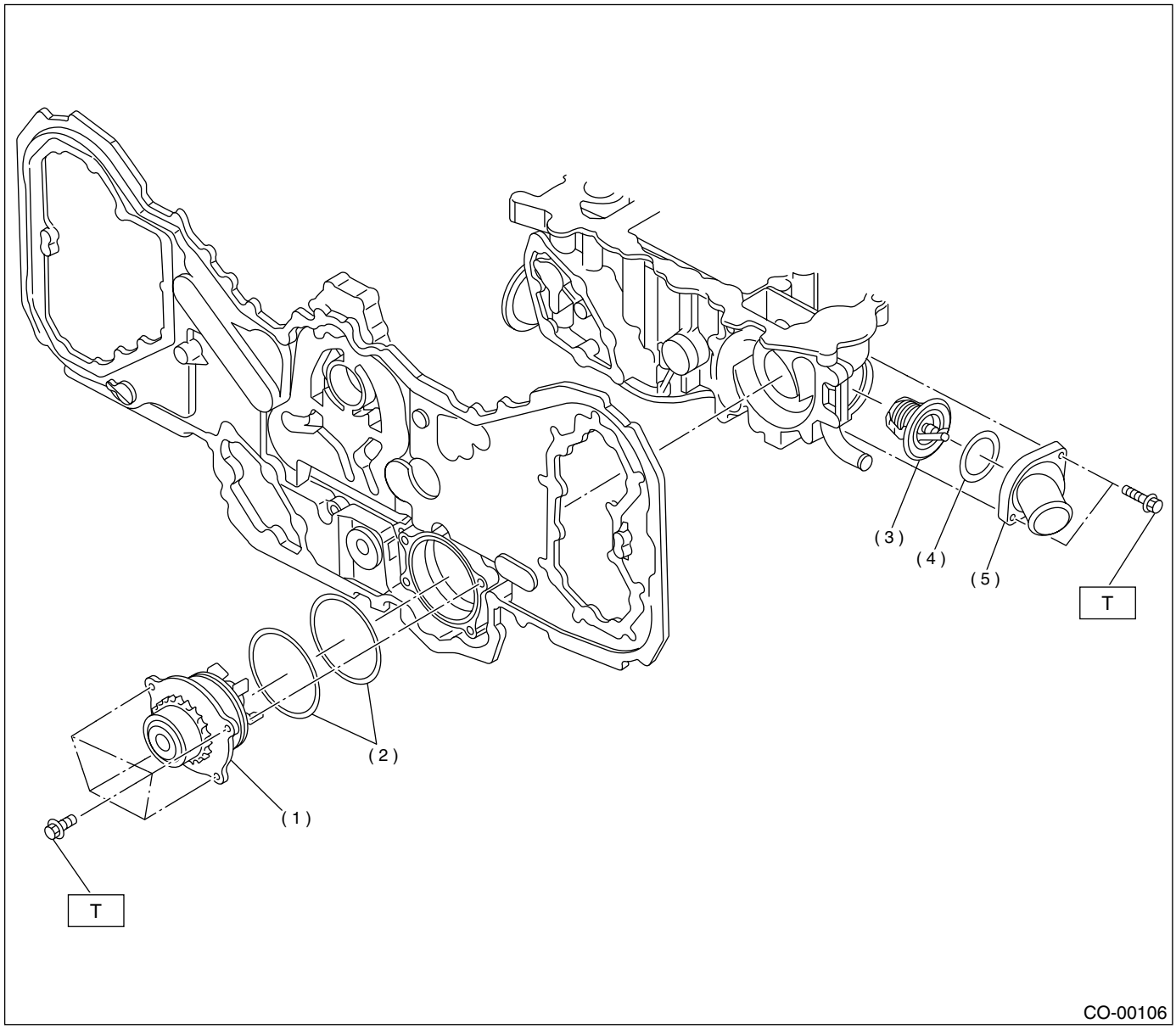
1. General Description

A: SPECIFICATIONS

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			Approx. 7.9 (8.4, 7.0)
Water pump	Type		Centrifugal impeller type
	Discharge performance	Discharge	320 L (84.5 US gal, 70.4 Imp gal)/min.
		Pump speed—total engine coolant head	5,500 rpm — 18 mAq (59 ft Aq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter		73.2 mm (2.882 in)
	Number of impeller vanes		6
	Tooth number of pump sprocket		22 t
Thermostat	Type		Wax pellet type
	Start to open		76 — 80°C (169 — 176°F)
	Fully open		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor		120 W (main fan) 120 W (sub fan)
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions		699 × 349 × 27 mm (27.52 × 13.74 × 1.06 in)
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: –1.0 to –4.9 kPa (–0.01 to –0.05 kg/cm^2, –0.1 to –0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 L (0.5 US qt, 0.4 Imp qt)

B: COMPONENT

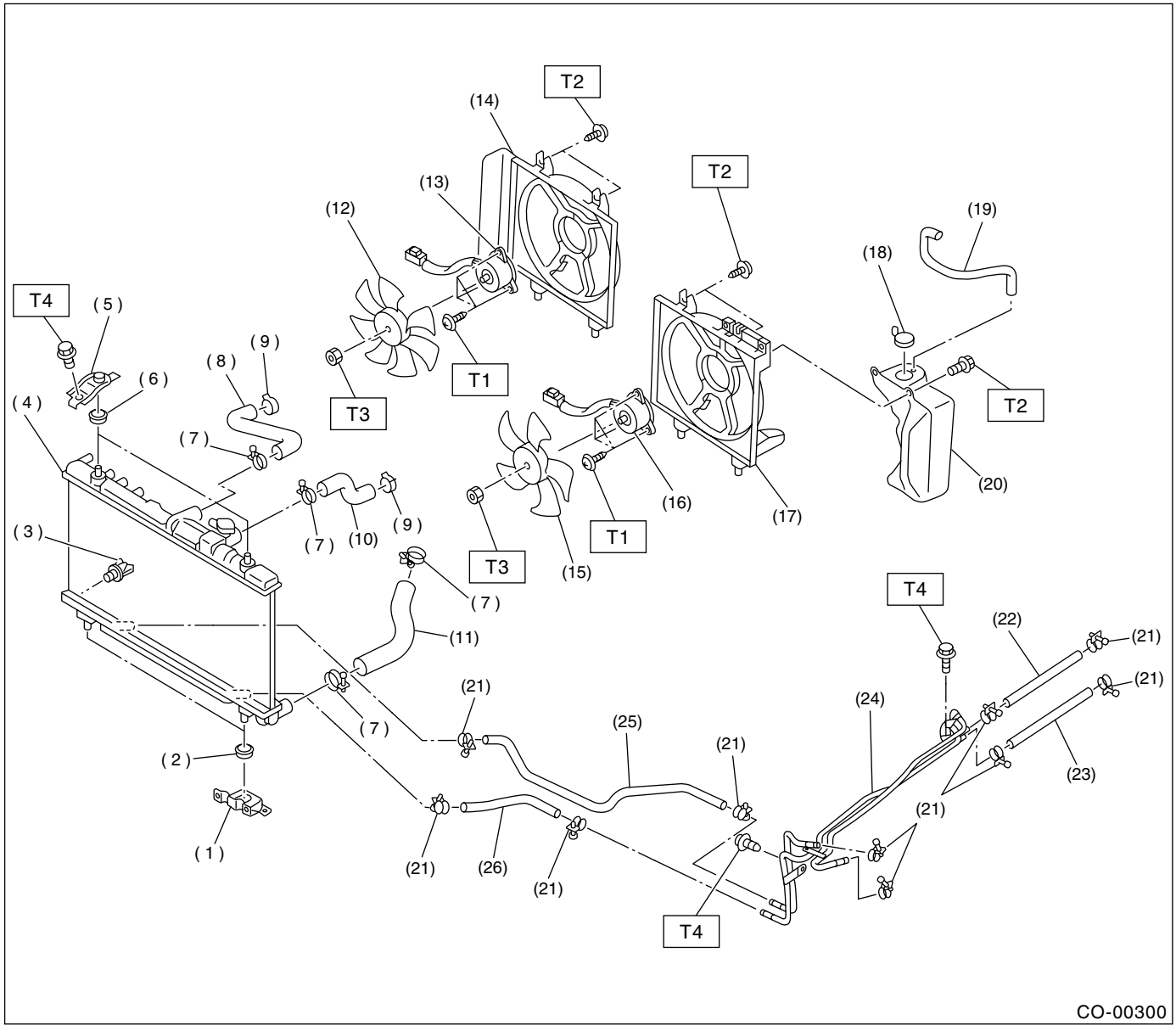
1. WATER PUMP



(1) Water pump ASSY
(2) O-ring
(3) Thermostat
(4) Gasket
(5) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 6.4 (0.65, 4.7)

2. RADIATOR AND RADIATOR FAN



(1) Radiator lower bracket
(2) Radiator lower cushion
(3) Drain cock
(4) Radiator
(5) Radiator upper bracket
(6) Radiator upper cushion
(7) Clamp
(8) Radiator inlet hose A
(9) Clamp
(10) Radiator inlet hose B
(11) Radiator outlet hose
(12) Radiator sub fan
(13) Radiator sub fan motor
(14) Sub fan shroud
(15) Radiator main fan
(16) Radiator main fan motor
(17) Main fan shroud
(18) Engine coolant reservoir tank cap
(19) Over flow hose
(20) Engine coolant reservoir tank
(21) ATF hose clamp
(22) ATF inlet hose A
(23) ATF outlet hose A
(24) ATF pipe
(25) ATF inlet hose B
(26) ATF outlet hose B

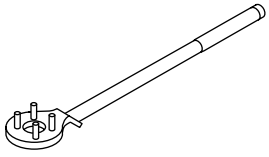
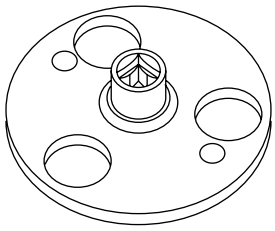
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 7.5 (0.76, 5.5)
T4: 12 (1.2, 8.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

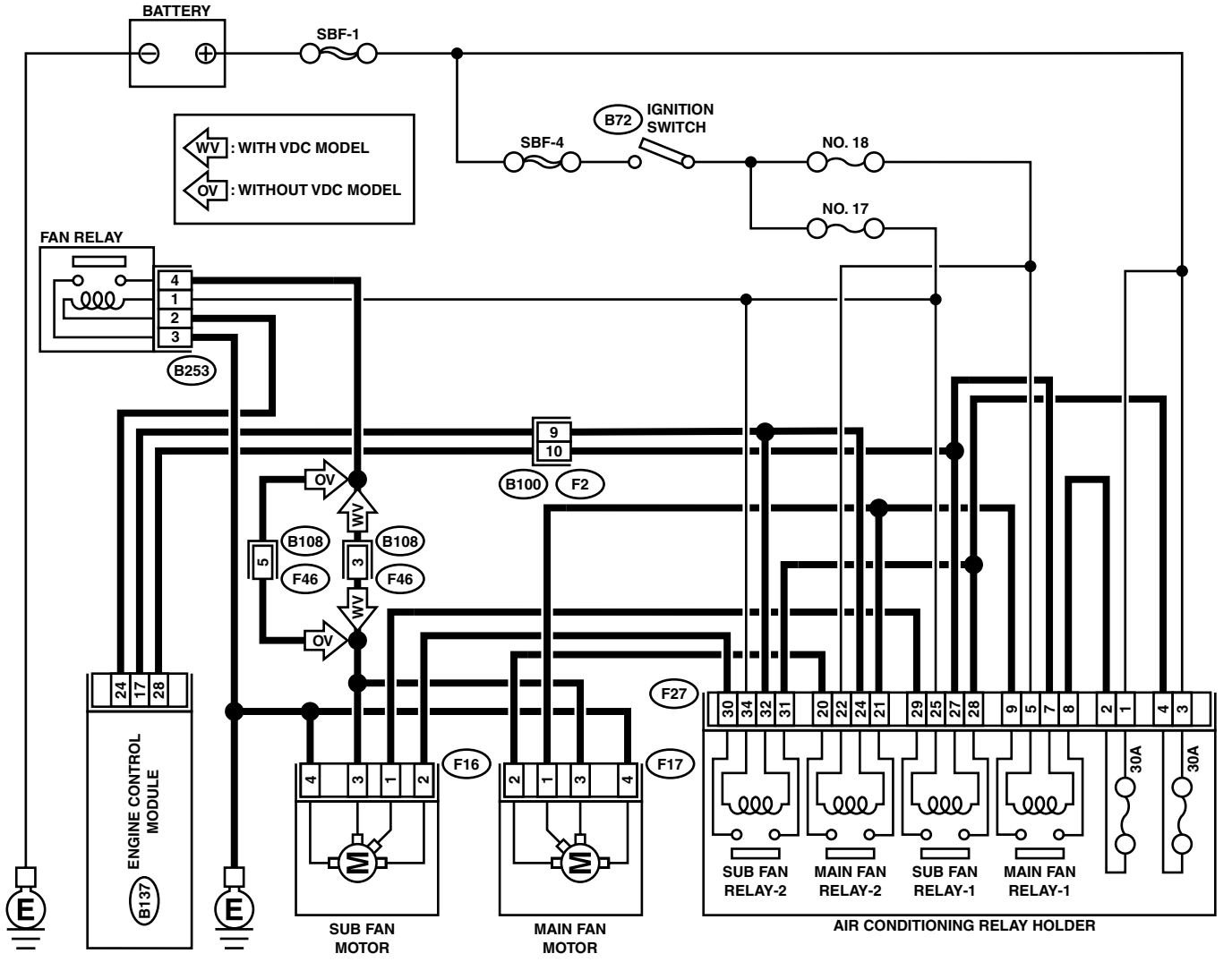
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA000	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

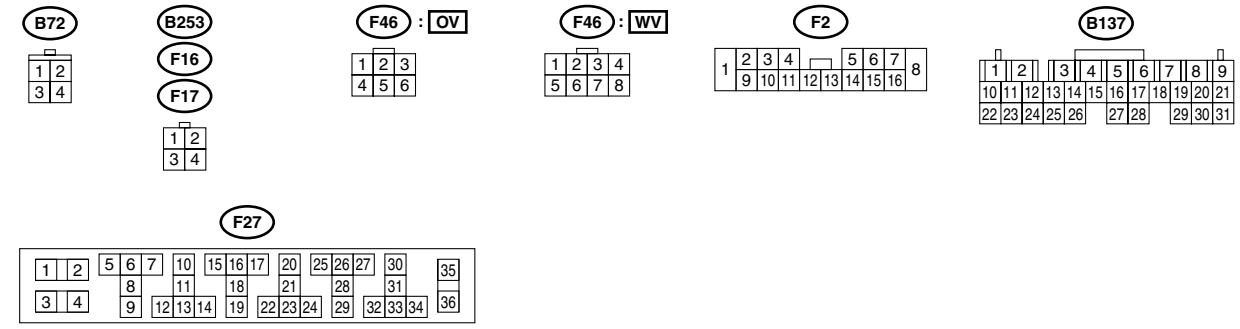
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

2. Radiator Main Fan System

A: SCHEMATIC





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B: INSPECTION

TROUBLE SYMPTOM:

- Radiator main fan does not rotate in low speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to OFF.
- Radiator main fan does not rotate in middle speed under the following conditions:
  (1) Coolant temperature 94°C (201°F) or less.
  (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator main fan does not rotate in high speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to ON and A/C temperature at the lowest position.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less.	When A/C compressor is operating, does the radiator main fan rotate in middle speed?	Go to step **2.**	Go to step **4.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F).	When A/C compressor is operating, does the radiator main fan rotate in low speed?	Go to step **3.**	Go to step **15.**
3	**CHECK OPERATION OF RADIATOR FAN.** Turn the A/C switch to ON, set temperature at the lowest position.	When A/C compressor is operating, does the radiator main fan rotate in high speed?	Radiator main fan system is okay.	Go to step **28.**
4	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Go to step **8.**
5	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 4 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **6.**	Repair open circuit in harness between main fan motor connector and chassis ground.
6	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step **7.**
7	**CHECK MAIN FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 2 and negative (–) terminal to terminal No. 4 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **10.**	Go to step **9.**
9	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay 2 and ignition switch.
10	**CHECK MAIN FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 2. 3) Measure resistance of main fan relay 2. ***Terminal*** ***No. 20 — No. 21:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace main fan relay 2.
11	**CHECK MAIN FAN RELAY 2.** 1) Connect battery to terminals No. 19 and No. 20 of main fan relay 2. 2) Measure resistance of main fan relay 2. ***Terminal*** ***No. 20 — No. 21:***	Is the measured value less than 1 Ω?	Go to step **12.**	Replace main fan relay 2.
12	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure resistance of harness between main fan motor connector and main fan relay 2 terminal. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 20:***	Is the measured value less than 1 Ω?	Go to step **13.**	Repair open circuit in harness between main fan motor connector and main fan relay 2 terminal.
13	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 2 connector and ECM connector. ***Connector & terminal*** ***(F27) No. 24 — (B137) No. 17:***	Is the measured value less than 1 Ω?	Go to step **14.**	Repair open circuit in harness between main fan relay 2 and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
15	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Measure voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **16.**	Go to step **18.**

Step		Check	Yes	No
16	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step **17.**
17	**CHECK MAIN FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 1, and negative (–) terminal to terminal No. 4 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
18	**CHECK POWER SUPPLY TO MAIN FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 1 from A/C relay holder. 3) Measure voltage between main fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **19.**	Go to step **20.**
19	**CHECK POWER SUPPLY TO MAIN FAN RELAY 1.** 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **23.**	Go to step **22.**
20	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step **21.**
21	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair open circuit in harness between 30 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
22	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown out?	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay 1 and ignition switch.
23	**CHECK MAIN FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove main fan relay 1. 3) Measure resistance of main fan relay 1. ***Terminal*** ***No. 8 — No. 9:***	Is the measured value more than 1 MΩ?	Go to step **24.**	Replace main fan relay 1.
24	**CHECK MAIN FAN RELAY.** 1) Connect battery to terminals No. 5 and No. 6 of main fan relay 1. 2) Measure resistance of main fan relay 1. ***Terminal*** ***No. 8 — No. 9:***	Is the measured value less than 1 Ω?	Go to step **25.**	Replace main fan relay 1.
25	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure resistance of harness between main fan motor connector and main fan relay 1 terminal. ***Connector & terminal*** ***(F17) No. 1 — (F27) No. 9:***	Is the measured value less than 1 Ω?	Go to step **26.**	Replace open circuit in harness between main fan motor connector and main fan relay 1 terminal.

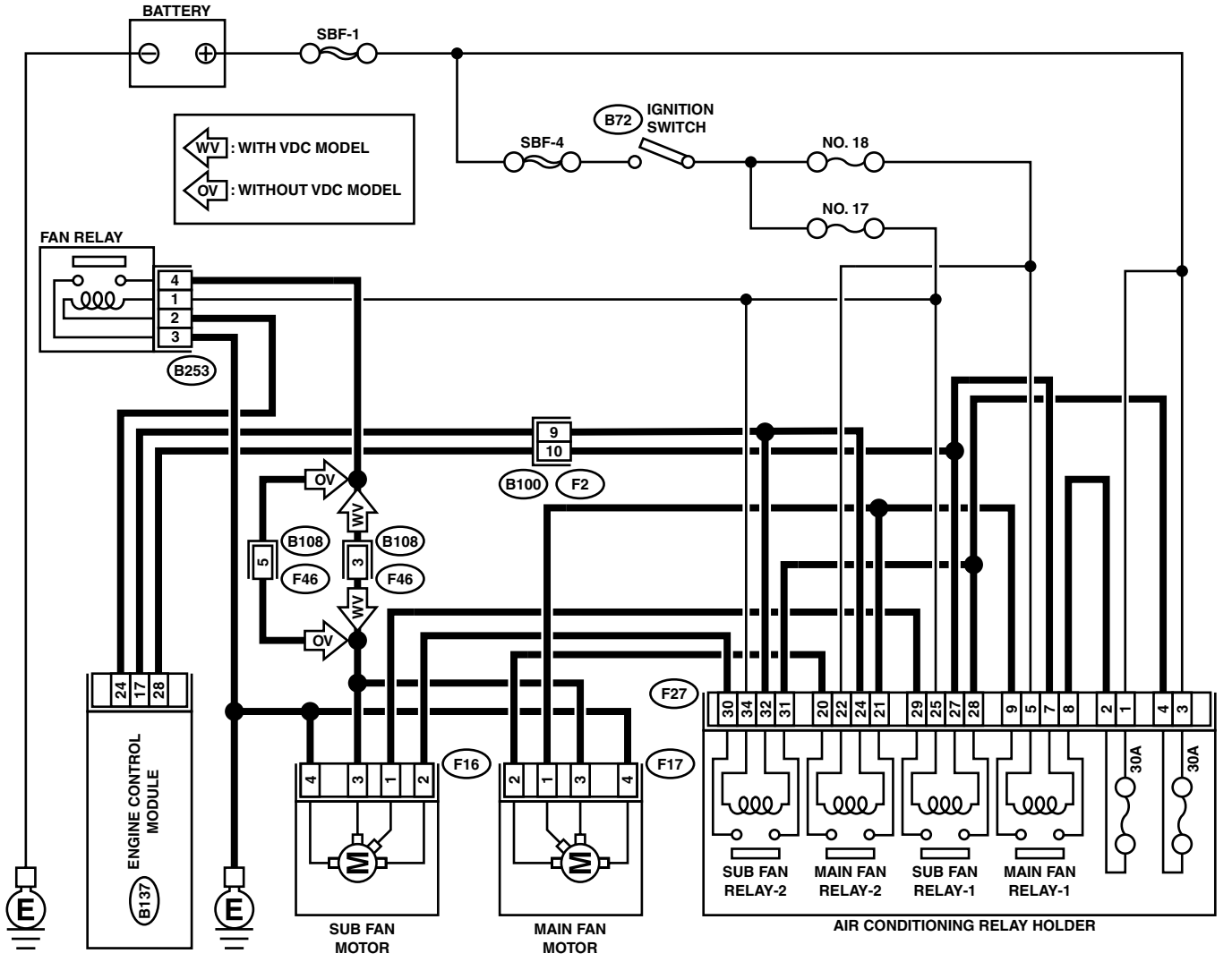
	Step	Check	Yes	No
26	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 1 connector and ECM connector. ***Connector & terminal*** ***(F27) No. 7 — (B137) No. 28:***	Is the measured value less than 1 Ω?	Go to step **27.**	Repair open circuit in harness between main fan relay 1 and ECM.
27	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
28	**CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Measure resistance of harness between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 3 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **29.**	Go to step **30.**
29	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
30	**CHECK HARNESS BETWEEN MAIN FAN AND FAN RELAY.** 1) Disconnect fan relay connector. 2) Measure resistance of between main fan motor connector and fan relay connector. ***Connector & terminal*** ***(F17) No. 3 — (B253) No. 4:***	Is the measured value less than 1 Ω?	Go to step **31.**	Repair open circuit between main fan motor connector and fan relay connector.
31	**CHECK POWER SUPPLY TO FAN RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. ***Connector & terminal*** ***(B253) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **33.**	Go to step **32.**
32	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
33	**CHECK FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:***	Is the measured value more than 1 MΩ?	Go to step **34.**	Replace fan relay.
34	**CHECK FAN RELAY.** 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:***	Is the measured value less than 1 Ω?	Go to step **35.**	Replace fan relay.

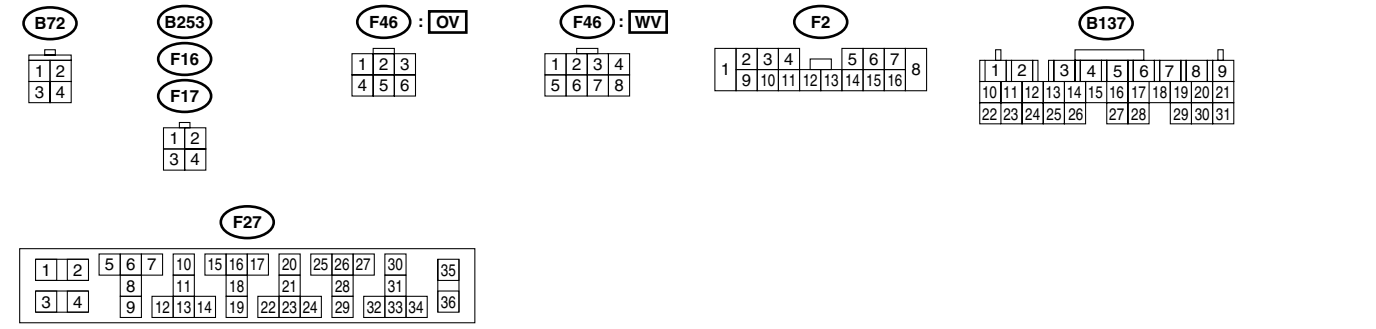
	Step	Check	Yes	No
35	**CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND.** Measure resistance of harness between fan relay connector and chassis ground. ***Connector & terminal*** ***(B253) No. 3 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **36.**	Repair open circuit in harness between fan relay connector and chassis ground.
36	**CHECK HARNESS BETWEEN FAN RELAY AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay and ECM connector. ***Connector & terminal*** ***(B253) No. 2 — (B137) No. 24:***	Is the measured value less than 1 Ω?	Go to step **37.**	Repair open circuit in harness between fan relay connector and ECM.
37	**CHECK POOR CONTACT.** Check poor contact in connector between fan relay and ECM.	Is there poor contact in connector between fan relay and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

NOTE:
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

3. Radiator Sub Fan System

A: SCHEMATIC





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B: INSPECTION

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate in low speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to OFF.
- Radiator sub fan does not rotate in middle speed under the following conditions:
  (1) Coolant temperature 94°C (201°F) or less.
  (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator sub fan does not rotate in high speed under the following conditions:
  (1) Coolant temperature 95°C (203°F) or more.
  (2) A/C switch set to ON and A/C temperature at the lowest position.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less.	When A/C compressor is operating, does the radiator sub fan rotate in middle speed?	Go to step **2.**	Go to step **4.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F).	When A/C compressor is operating, does the radiator sub fan rotate in low speed?	Go to step **3.**	Go to step **18.**
3	**CHECK OPERATION OF RADIATOR FAN.** 1) Turn the A/C switch to ON, set temperature at the lowest position.	When A/C compressor is operating, does the radiator sub fan rotate in high speed?	Radiator sub fan system is okay.	Go to step **31.**
4	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Go to step **8.**
5	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 4 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **6.**	Repair open circuit in harness between sub fan motor connector and chassis ground.
6	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step **7.**
7	**CHECK SUB FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 2 and negative (–) terminal to terminal No. 4 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

Step		Check	Yes	No
8	**CHECK POWER SUPPLY TO SUB FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2 from A/C relay holder. 3) Measure voltage between sub fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 31 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **9.**	Go to step **10.**
9	**CHECK POWER SUPPLY TO SUB FAN RELAY 2.** 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **13.**	Go to step **12.**
10	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step **11.**
11	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between sub fan relay 2 and ignition switch.
13	**CHECK SUB FAN RELAY 2.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2. 3) Measure resistance of sub fan relay 2. ***Terminal*** ***No. 30 — No. 31:***	Is the measured value more than 1 MΩ?	Go to step **14.**	Replace sub fan relay 2.
14	**CHECK SUB FAN RELAY 2.** 1) Connect battery to terminals No. 27 and No. 28 of sub fan relay 2. 2) Measure resistance of sub fan relay 2. ***Terminal*** ***No. 30 — No. 31:***	Is the measured value less than 1 Ω?	Go to step **15.**	Replace sub fan relay 2.
15	**CHECK HARNESS BETWEEN SUB FAN RELAY 2 TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure resistance of harness between sub fan motor connector and sub fan relay 2 terminal. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 30:***	Is the measured value less than 1 Ω?	Go to step **16.**	Repair open circuit in harness between sub fan motor connector and sub fan relay 2 terminal.
16	**CHECK HARNESS BETWEEN SUB FAN RELAY 2 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 2 connector and ECM connector. ***Connector & terminal*** ***(F27) No. 32 — (B137) No. 17:***	Is the measured value less than 1 Ω?	Go to step **17.**	Repair open circuit in harness between sub fan relay 2 and ECM.

	Step	Check	Yes	No
17	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
18	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat engine during repair.** 1) Turn ignition switch to OFF. 2) Turn A/C switch to OFF. 3) Disconnect sub fan motor connector. 4) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 5) Measure voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **19.**	Go to step **21.**
19	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step **20.**
20	**CHECK SUB FAN MOTOR.** Connect battery positive (+) terminal to terminal No. 1, and negative (–) terminal to terminal No. 4 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
21	**CHECK POWER SUPPLY TO SUB FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1 from A/C relay holder. 3) Measure voltage between sub fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 28 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **22.**	Go to step **23.**
22	**CHECK POWER SUPPLY TO SUB FAN RELAY 1.** 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **26.**	Go to step **25.**
23	**CHECK 30 A FUSE.** 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step **24.**
24	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3(+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay 1 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
25	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between sub fan relay 1 and ignition switch.

Step		Check	Yes	No
26	**CHECK SUB FAN RELAY 1.** 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1. 3) Measure resistance of sub fan relay 1. ***Terminal*** ***No. 28 — No. 29:***	Is the measured value more than 1 MΩ?	Go to step **27.**	Replace sub fan relay 1.
27	**CHECK SUB FAN RELAY.** 1) Connect battery to terminals No. 21 and No. 22 of sub fan relay 1. 2) Measure resistance of sub fan relay 1. ***Terminal*** ***No. 28 — No. 29:***	Is the measured value less than 1 Ω?	Go to step **28.**	Replace sub fan relay 1.
28	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure resistance of harness between sub fan motor connector and sub fan relay 1 terminal. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 29:***	Is the measured value less than 1 Ω?	Go to step **29.**	Replace open circuit in harness between sub fan motor connector and sub fan relay 1 terminal.
29	**CHECK HARNESS BETWEEN SUB FAN RELAY 1 AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 1 connector and ECM connector. ***Connector & terminal*** ***(F27) No. 27 — (B137) No. 28:***	Is the measured value less than 1 Ω?	Go to step **30.**	Repair open circuit in harness between sub fan relay and ECM.
30	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
31	**CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect sub fan motor connector. 3) Measure resistance of harness between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 3 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **32.**	Go to step **33.**
32	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
33	**CHECK HARNESS BETWEEN SUB FAN AND FAN RELAY.** 1) Disconnect fan relay connector. 2) Measure resistance between sub fan motor connector and fan relay connector. ***Connector & terminal*** ***(F16) No. 3 — (B253) No. 4:***	Is the measured value less than 1 Ω?	Go to step **34.**	Repair open circuit between sub fan motor connector and fan relay connector.
34	**CHECK POWER SUPPLY TO FAN RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. ***Connector & terminal*** ***(B253) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **36.**	Go to step **35.**

	Step	Check	Yes	No
35	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between fan relay and ignition switch.
36	**CHECK FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:***	Is the measured value more than 1 MΩ?	Go to step **37.**	Replace fan relay.
37	**CHECK FAN RELAY.** 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. ***Terminal*** ***No. 4 — No. 3:***	Is the measured value less than 1 Ω?	Go to step **38.**	Replace fan relay.
38	**CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND.** Measure resistance of harness between fan relay connector and chassis ground. ***Connector & terminal*** ***(B253) No. 3 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **39.**	Repair open circuit in harness between fan relay connector and chassis ground.
39	**CHECK HARNESS BETWEEN FAN RELAY AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay connector and ECM connector. ***Connector & terminal*** ***(B253) No. 2 — (B137) No. 24:***	Is the measured value less than 1 Ω?	Go to step **40.**	Repair open circuit in harness between fan relay connector and ECM.
40	**CHECK POOR CONTACT.** Check poor contact in connector between fan relay and ECM.	Is there poor contact in connector between fan relay and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

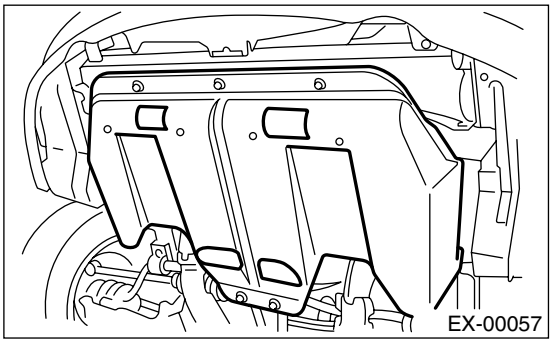
NOTE:
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

4. Engine Coolant

A: REPLACEMENT

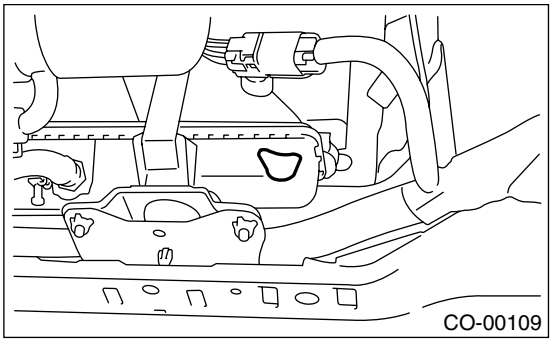
1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove under cover.



3) Remove drain cock to drain engine coolant into container.

NOTE:
Remove radiator cap so that engine coolant will drain faster.



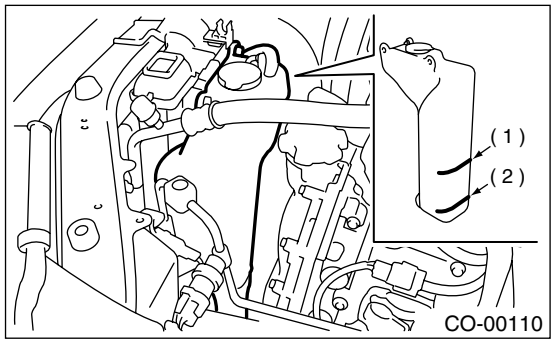
2. FILLING OF ENGINE COOLANT

1) Fill engine coolant into radiator up to filler neck position.

Coolant amount for refill:
Approx. 7.9 ℓ (8.4 US qt, 7.0 Imp qt)

CAUTION:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

2) Fill engine coolant into reservoir tank up to upper level.



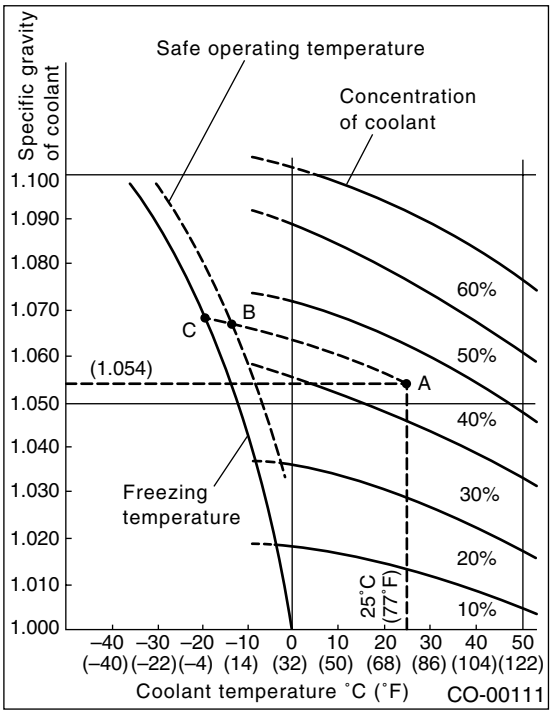
(1) Full level
(2) Low level

3) Attach radiator cap and reservoir tank cap properly.
4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
7) Attach radiator cap and reservoir tank cap properly.

B: INSPECTION

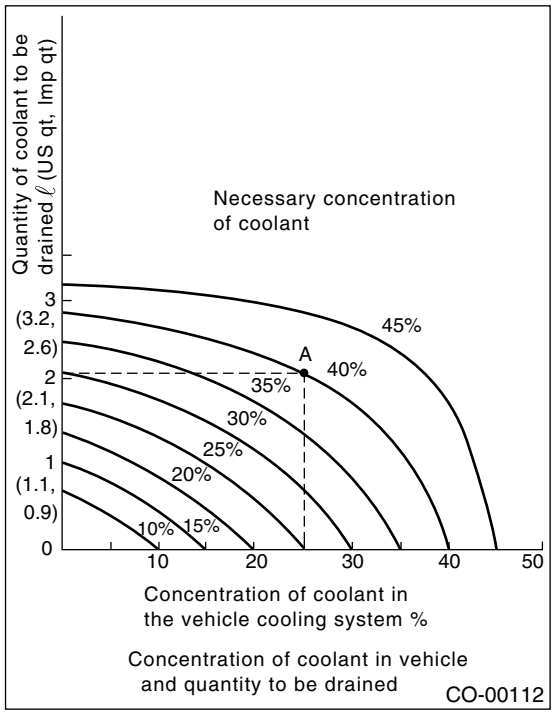
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is –14°C (7°F) (point B), and the freezing temperature is –20°C (–4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased form 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.

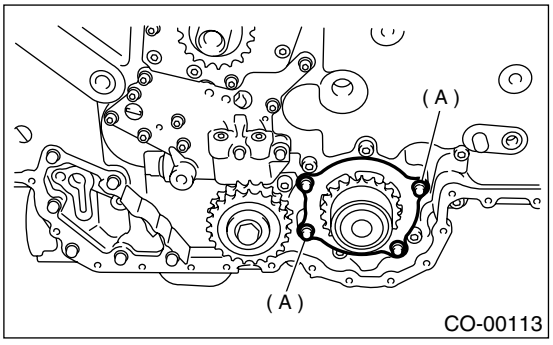


5. Water Pump

A: REMOVAL

1) Remove radiator. <Ref. to CO(H6DO)-23, REMOVAL, Radiator.>
2) Drain engine oil.
<Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
3) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
4) Remove front chain cover.
<Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
5) Remove timing chain.
<Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
6) Remove water pump.

NOTE:
When water pump cannot be easily removed, install M8 bolt in opposing bolt holes (“A” in figure). Alternately tightening each bolt should be enough to gradually free water pump from rear chain cover.



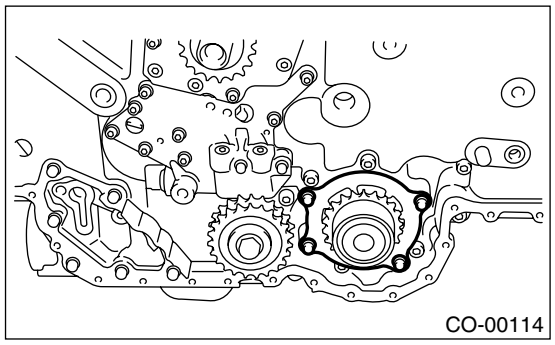
B: INSTALLATION

1) Install water pump onto rear chain cover.

NOTE:
Apply engine coolant to O-ring.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
- Replace O-rings with a new one.
- Applying engine coolant to O-ring makes water pump installation easier.



2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
3) Install front chain cover.
<Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
4) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
5) Install radiator. <Ref. to CO(H6DO)-24, INSTALLATION, Radiator.>
6) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Fill engine oil.
<Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

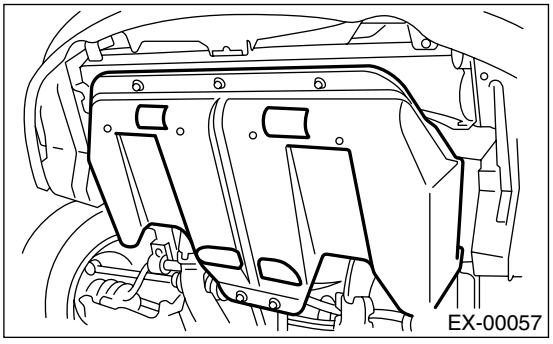
C: INSPECTION

1) Check water pump bearing for smooth rotation.
2) Check water pump sprocket for abnormalities.

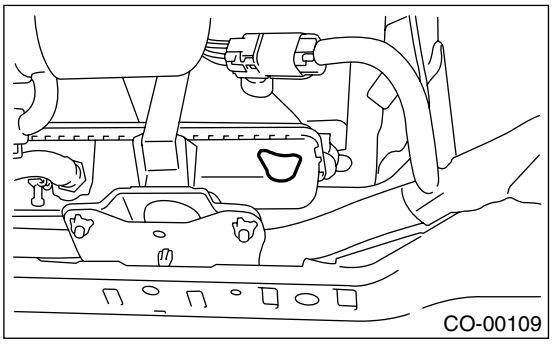
6. Thermostat

A: REMOVAL

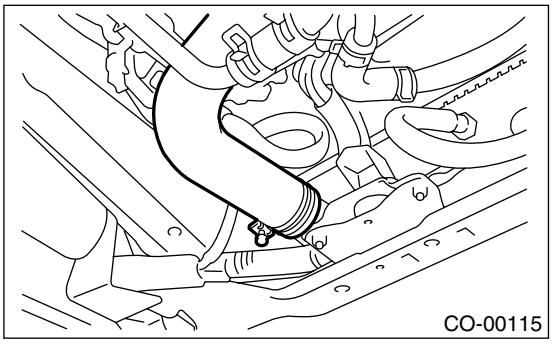
1) Lift-up the vehicle.
2) Remove under cover.



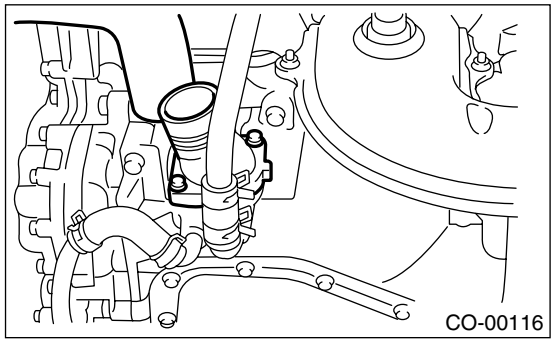
3) Drain engine coolant completely. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



4) Disconnect radiator outlet hose from thermostat cover.



5) Remove thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

1) Install the thermostat to oil pan upper, and install the thermostat cover together with a gasket.

NOTE:
When reinstalling the thermostat, use a new gasket.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

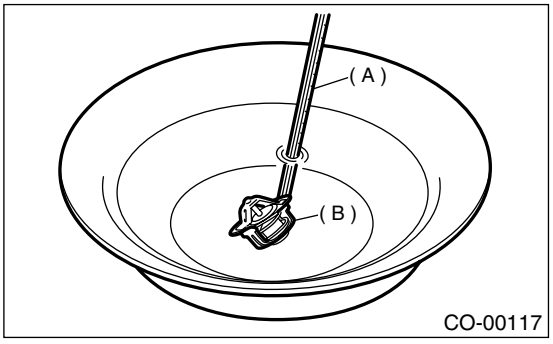
2) Connect radiator outlet hose to thermostat cover.
3) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
76.0 — 80.0°C (169 — 176°F)

Fully opens:
91°C (196°F)

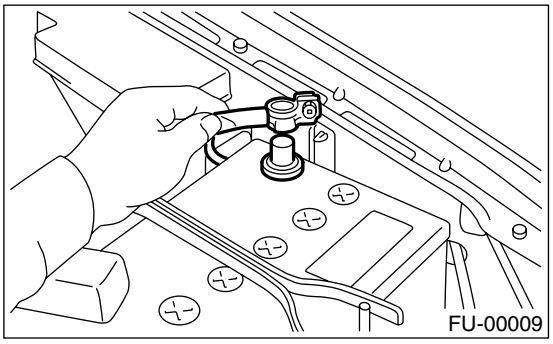


(A) Thermometer
(B) Thermostat

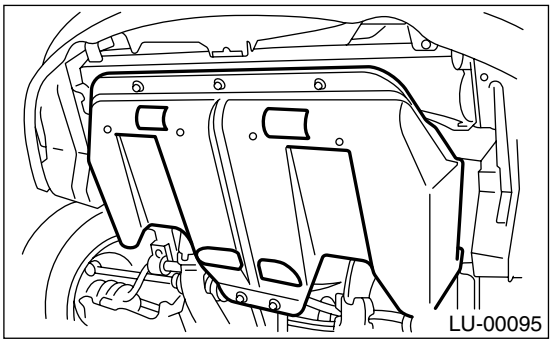
7. Radiator

A: REMOVAL

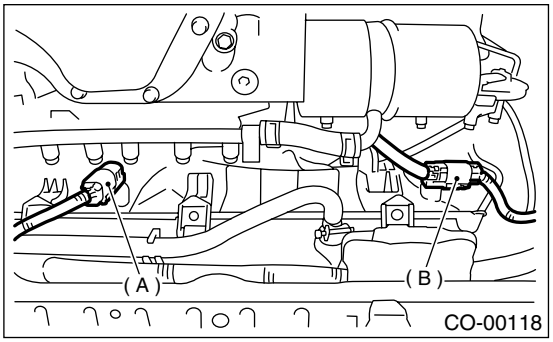
1) Disconnect battery ground cable.



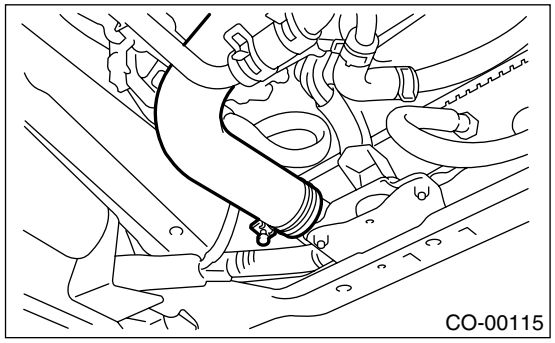
2) Lift-up the vehicle.
3) Remove under cover.



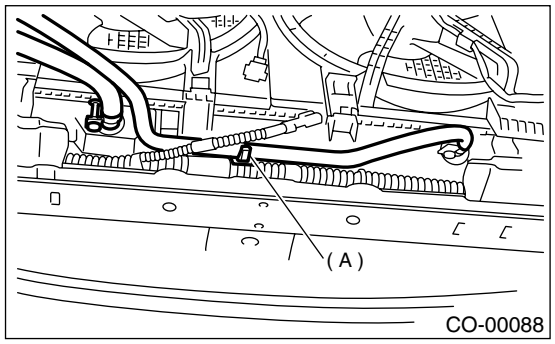
4) Drain engine coolant completely. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect connectors of radiator main fan motor (A) and sub fan motor (B).



6) Disconnect radiator outlet hose from radiator.

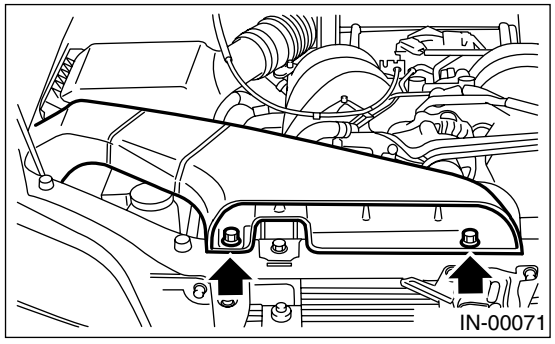


7) Disconnect ATF cooler hoses from radiator.

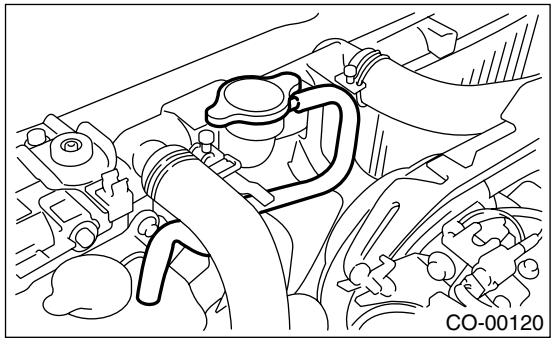


(A) Clip

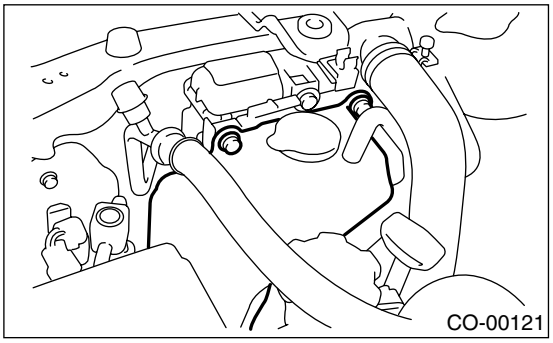
8) Lower the vehicle.
9) Remove air intake duct.



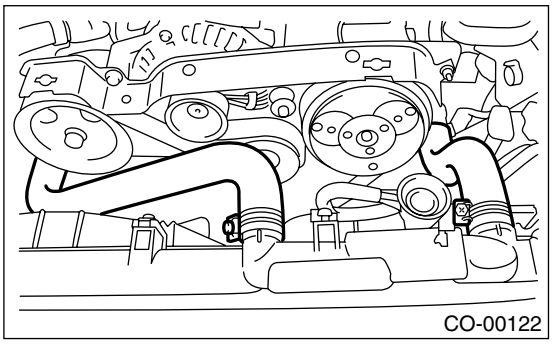
10) Disconnect over flow hose.



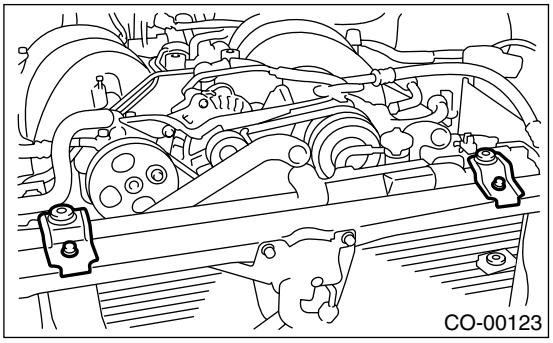
11) Remove reservoir tank.



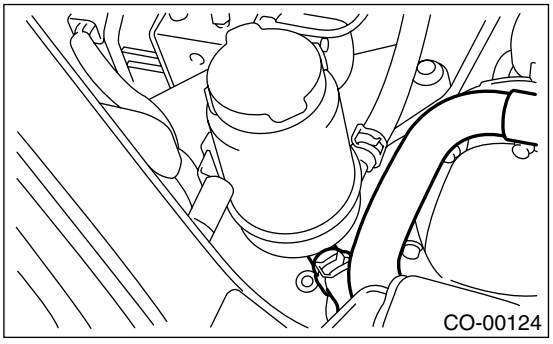
12) Disconnect radiator inlet hoses from radiator.



13) Remove radiator upper brackets.

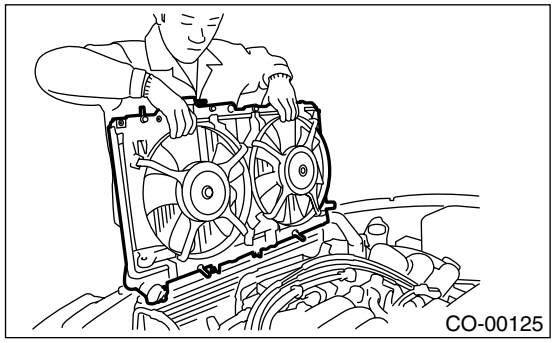


14) Detach power steering hose from the clip on the radiator.



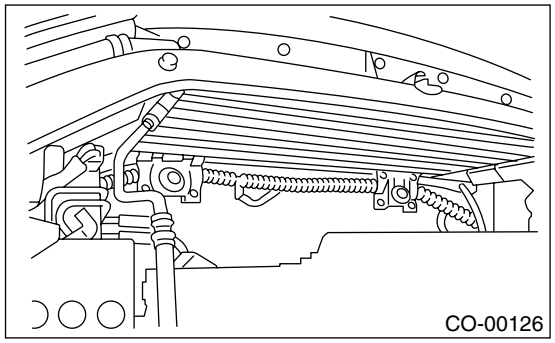
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.



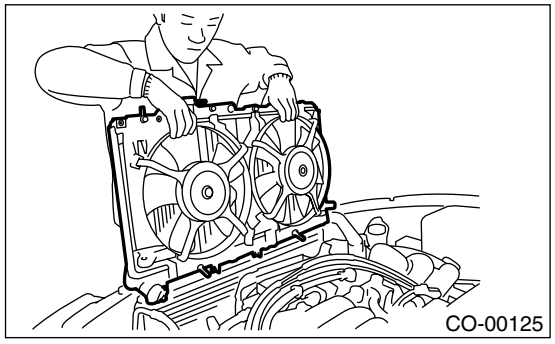
B: INSTALLATION

1) Attach radiator mounting cushions to holes on the vehicle.



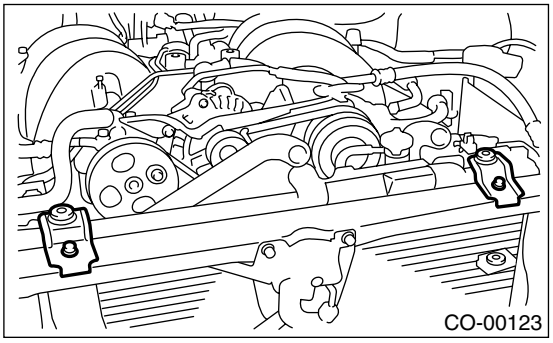
2) Install radiator while fitting radiator pins to cushions.

NOTE:
Fit pins on lower side of radiator into cushions on body side.

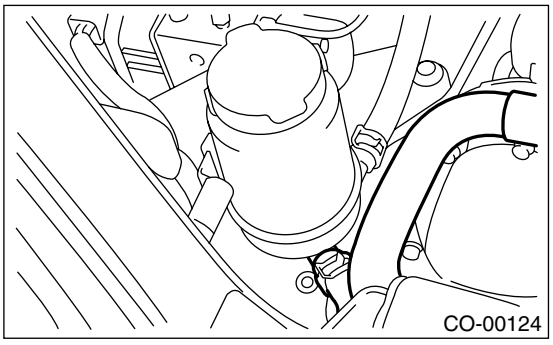


3) Install radiator brackets and tighten bolts.

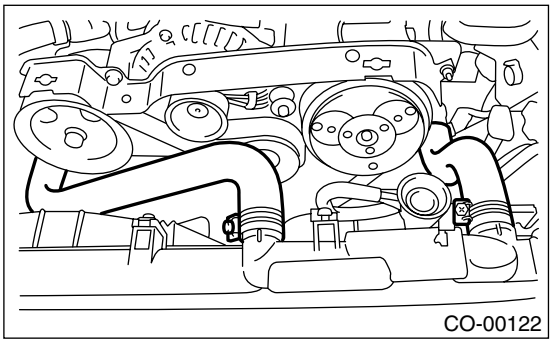
Tightening torque:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



4) Attach power steering hose to the radiator.

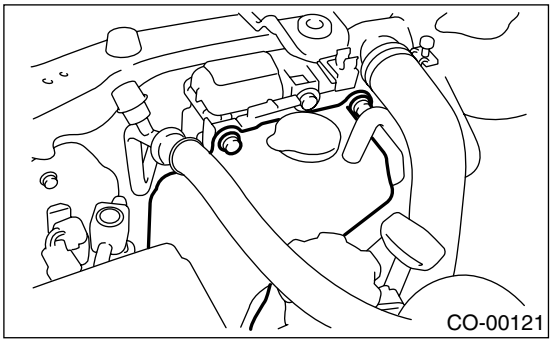


5) Connect radiator inlet hoses.

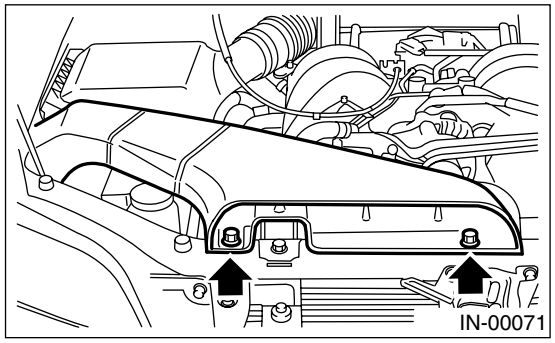


6) Install reservoir tank.

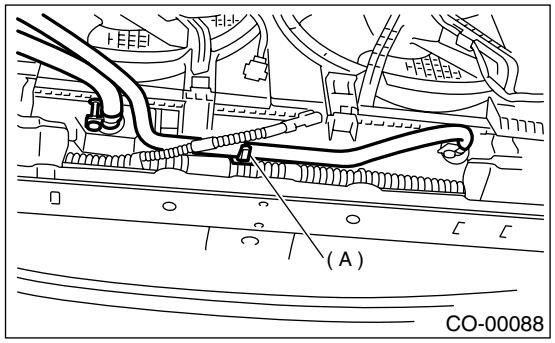
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



7) Install air intake duct.

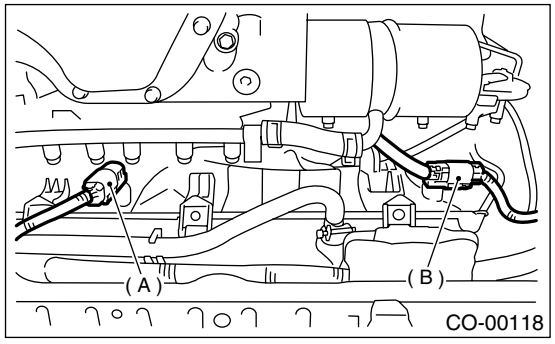


8) Lift-up the vehicle.
9) Connect ATF cooler hoses.

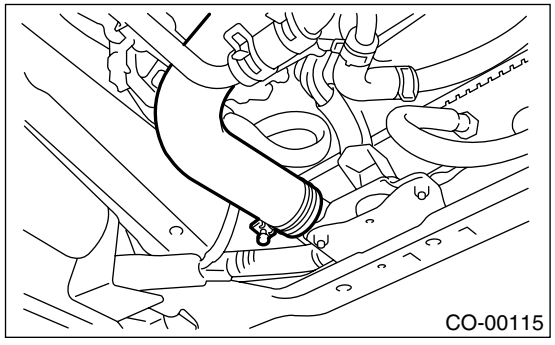


(A) Clip

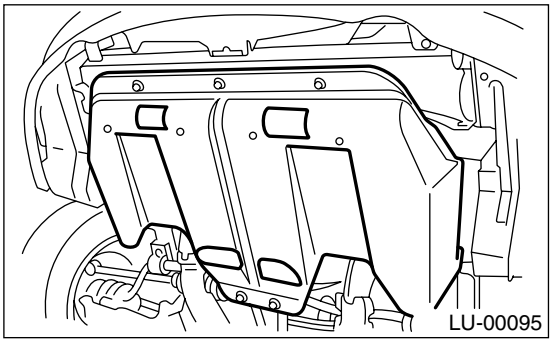
10) Connect connectors to radiator main fan motor (A) and sub fan motor (B).



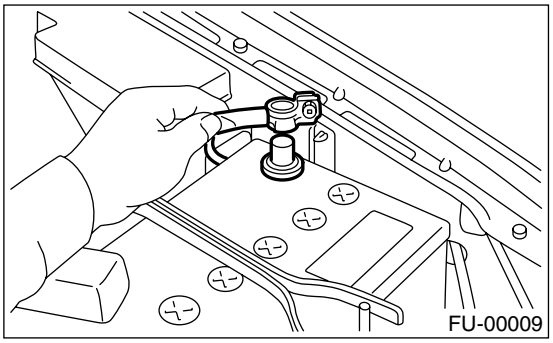
11) Connect radiator outlet hose.



12) Install under cover.



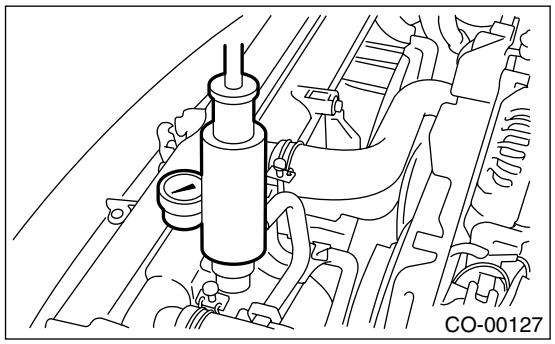
13) Lower the vehicle.
14) Connect battery ground cable.



15) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Check ATF level. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



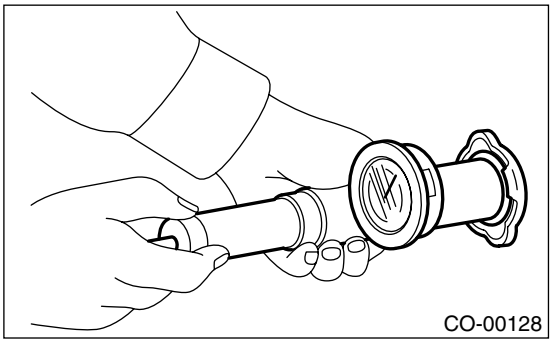
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

CAUTION:
- **Engine should be off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful also not to deform filler neck of radiator when installing or removing tester.**

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

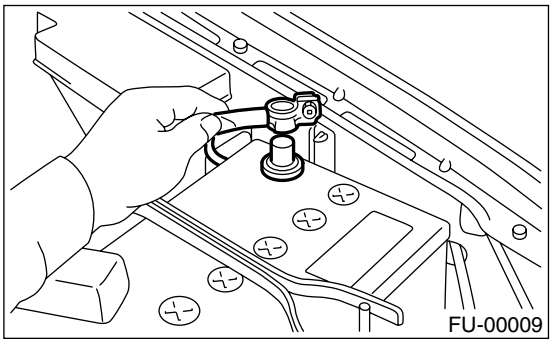
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

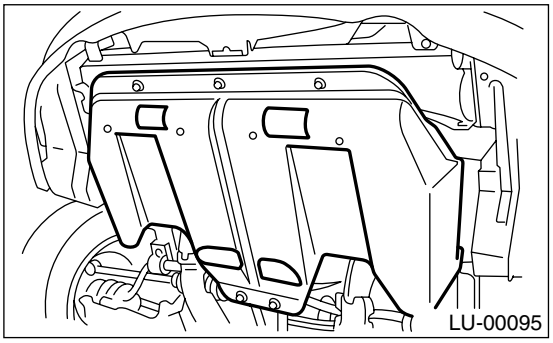
9. Radiator Main Fan and Fan Motor

A: REMOVAL

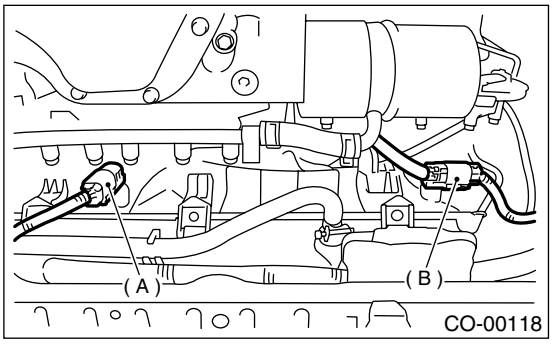
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.

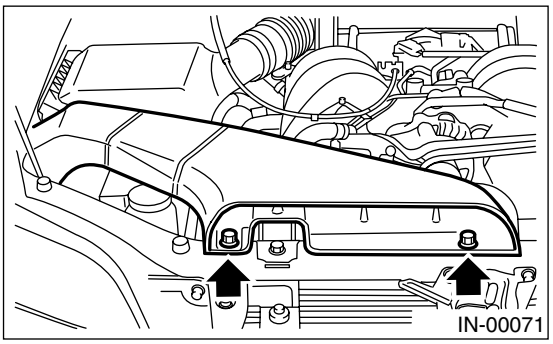


4) Drain engine coolant completely.
<Ref. to CO(H6DO)-18, Engine Coolant.>
5) Disconnect connectors of main and sub fan motor.

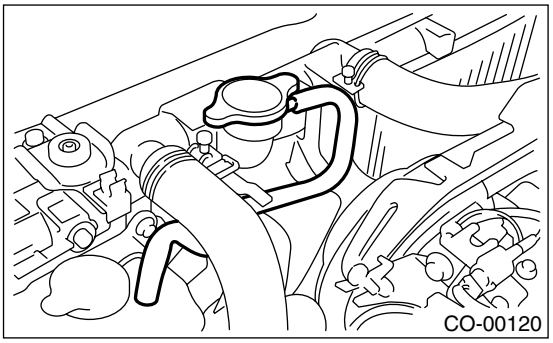


(A) Main fan motor connector
(B) Sub fan motor connector

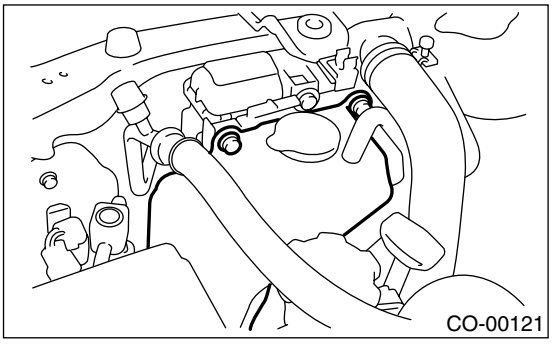
6) Lower the vehicle.
7) Remove air intake duct.



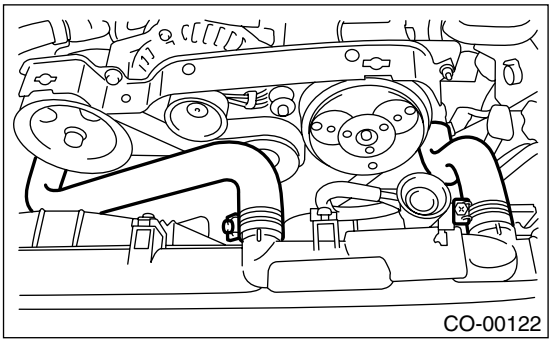
8) Disconnect over flow hose.



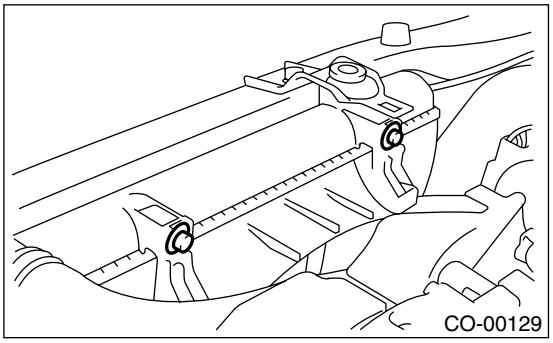
9) Remove reservoir tank.



10) Disconnect radiator inlet hoses from radiator.

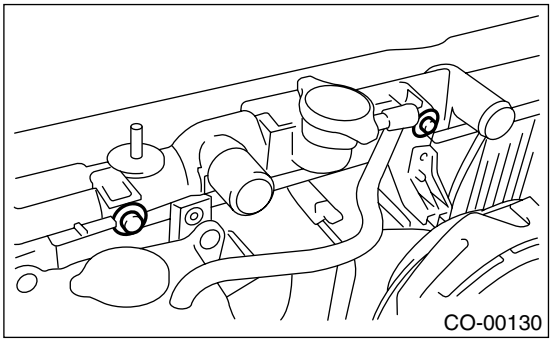


11) Remove radiator sub fan motor assembly.



12) Remove radiator main fan motor assembly.

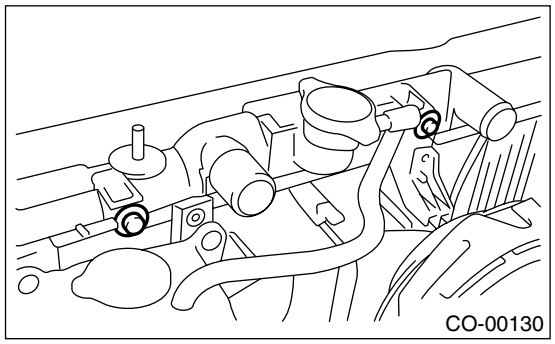
NOTE:
When removing main fan assembly by lifting it upward, main fan shroud will cause interference with coolant suction area. In order to avoid this, shift the main fan assembly over to sub fan side before removing it.



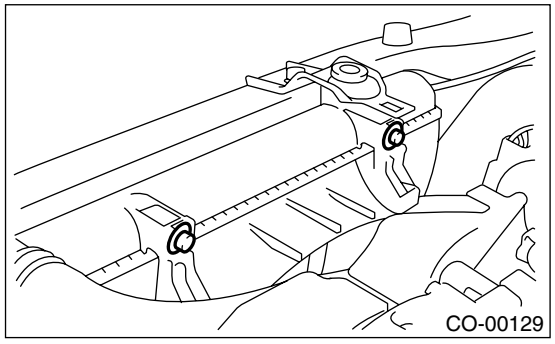
B: INSTALLATION

Install in the reverse order of removal.

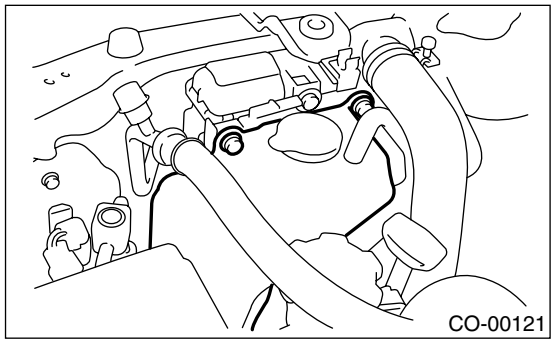
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

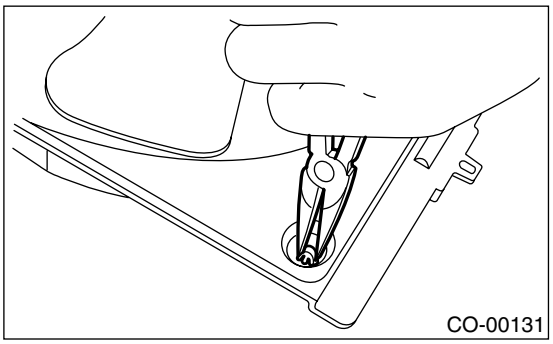


Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

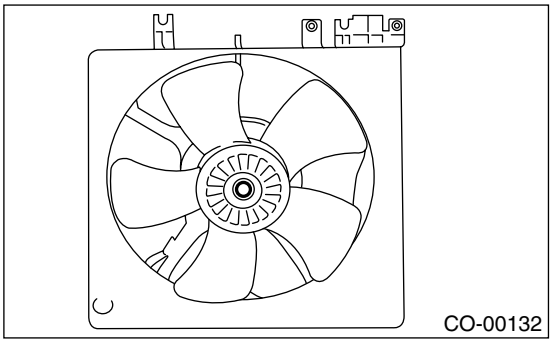


C: DISASSEMBLY

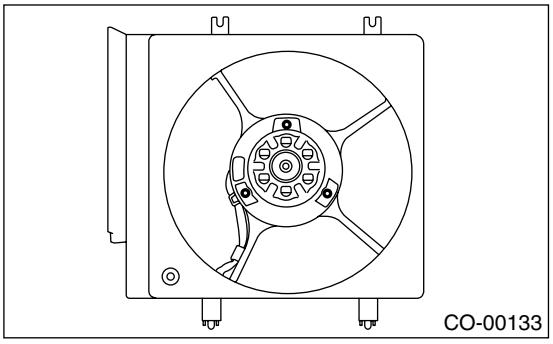
1) Remove clip which holds motor connector onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



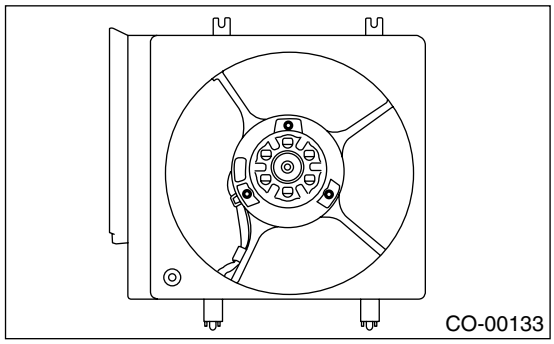
3) Remove screws which install fan motor onto shroud.



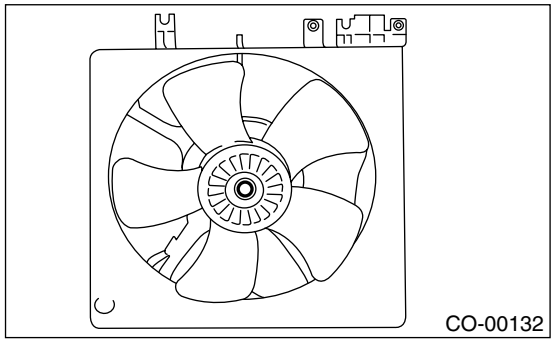
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

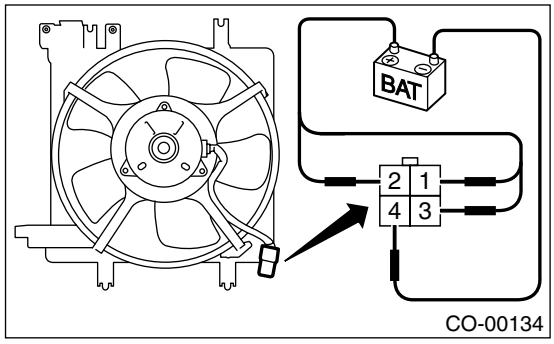


Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



E: INSPECTION

1) Connect battery as shown in the figure.



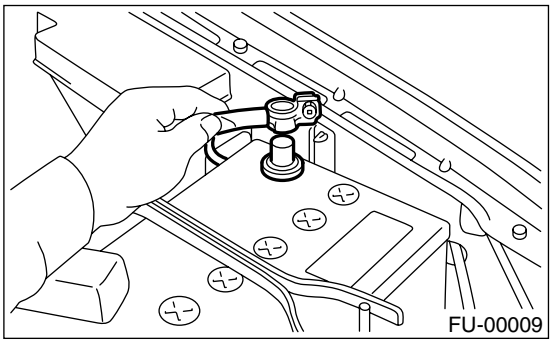
Terminal
No. 1 (+) — No. 4 (–): Low speed
No. 2 (+) — No. 4 (–): Middle speed
No. 3 (+) — No. 4 (–): High speed

2) Make sure the main fan motor operates properly. Replace it if it doesn't.

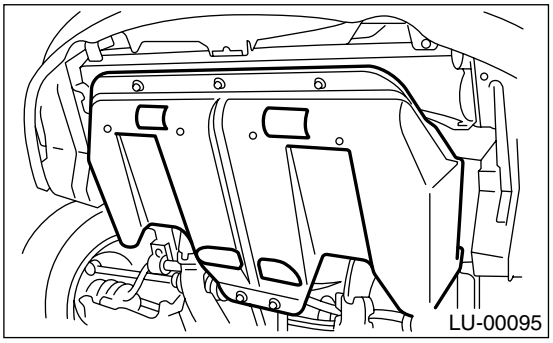
10.Radiator Sub Fan and Fan Motor

A: REMOVAL

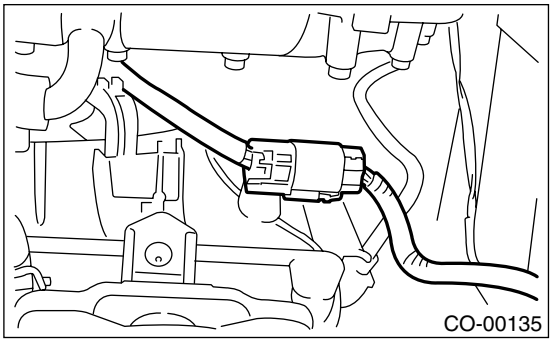
1) Disconnect battery ground cable.



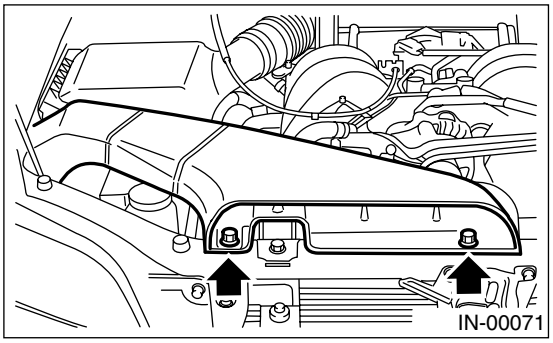
2) Lift-up the vehicle.
3) Remove under cover.



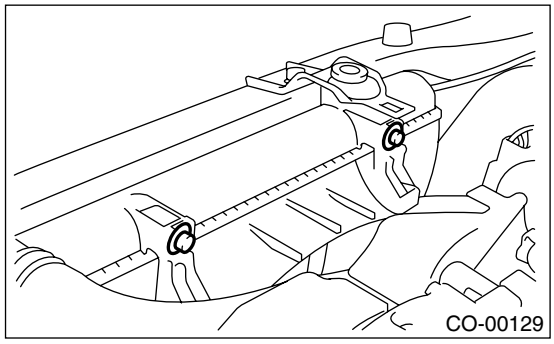
4) Disconnect connector of sub fan motor.



5) Lower the vehicle.
6) Remove air intake duct.



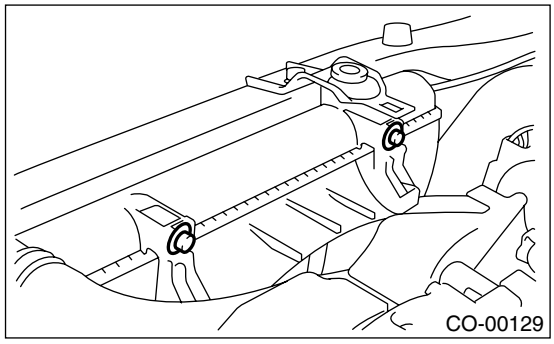
7) Remove bolts which hold sub fan shroud to radiator.
8) Remove radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

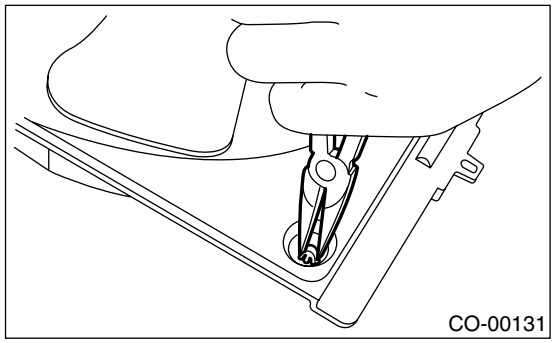
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

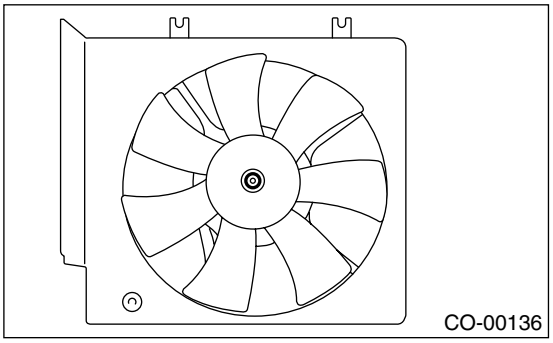


C: DISASSEMBLY

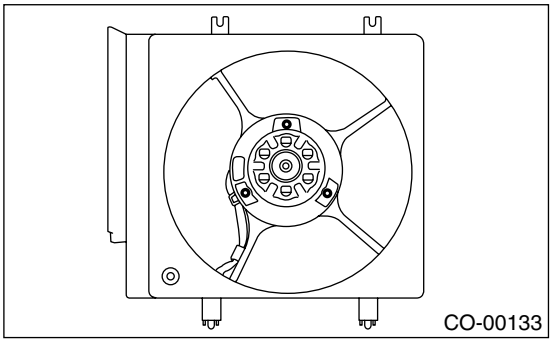
1) Remove clip which holds motor harness onto shroud.



2) Remove nut which holds fan itself onto fan motor and shroud assembly.



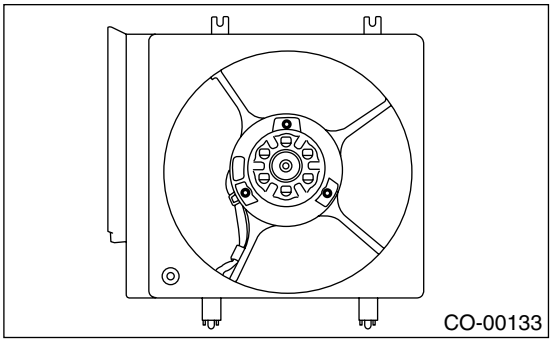
3) Remove screws which install fan motor onto shroud.



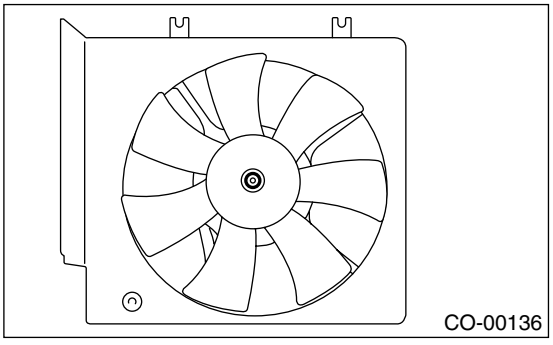
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

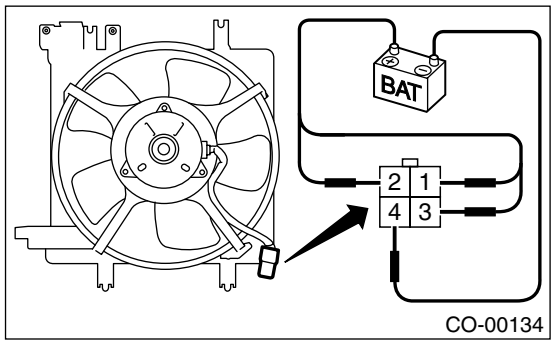


Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



E: INSPECTION

1) Connect battery as shown in the figure.



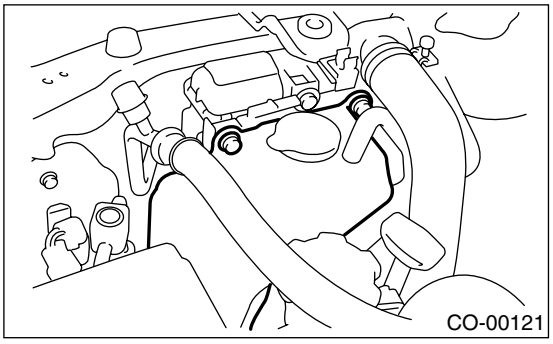
Terminal
No. 1 (+) — No. 4 (–): Low speed
No. 2 (+) — No. 4 (–): Middle speed
No. 3 (+) — No. 4 (–): High speed

2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.

11.Reservoir Tank

A: REMOVAL

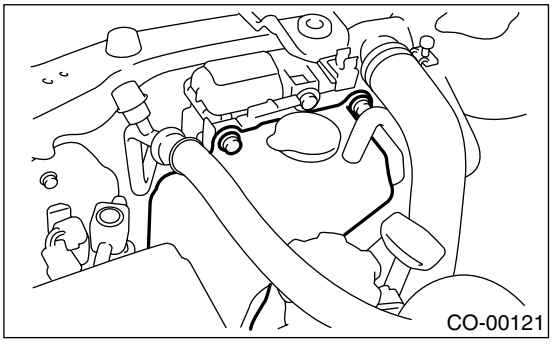
1) Disconnect over flow hose from radiator filler neck position.
2) Remove bolts which install reservoir tank onto radiator main fan shroud.
3) Remove reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble		Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Malfunction of thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean or repair, or replace.
	g. Improper engine oil in engine coolant	Replace engine coolant.
	h. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	i. Excessive back pressure in exhaust system	Clean or replace.
	j. Insufficient clearance between piston and cylinder	Adjust or replace.
	k. Slipping clutch	Repair or replace.
	l. Dragging brake	Adjust.
	m. Improper transmission oil	Replace.
	n. Defective thermostat	Replace.
	o. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective timing chain	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H6DO)

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8.	Engine Oil Filter	18
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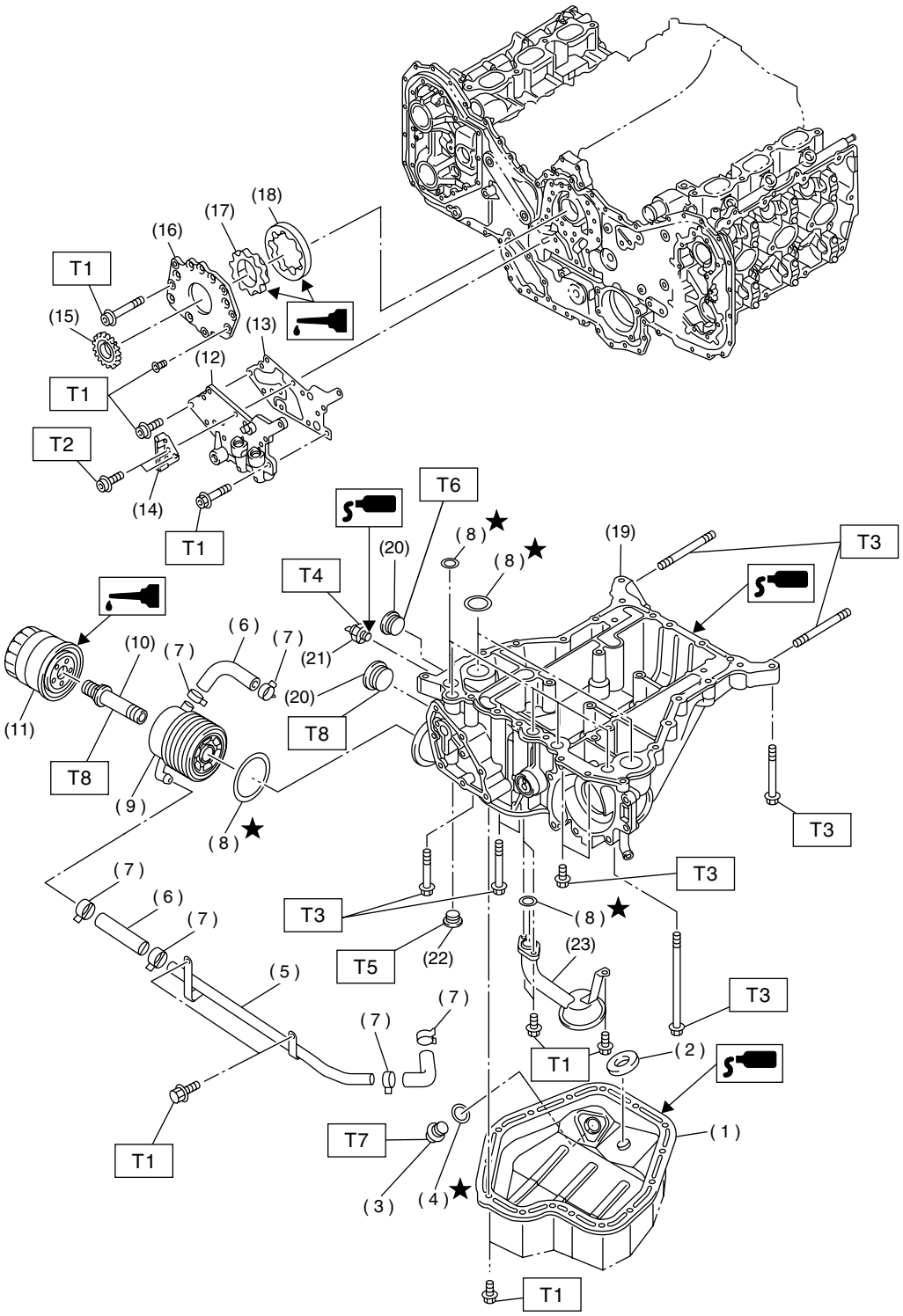
1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		9
		Outer rotor		10
	Outer rotor diameter × thickness			78 × 11 mm (3.07 × 0.43 in)
	Tip clearance between inner and outer rotor		Standard	0.04 — 0.14 mm (0.0016 — 0.0055 in)
	Side clearance between inner rotor and pump case		Standard	0.02 — 0.07 mm (0.0008 — 0.0028 in)
	Case clearance between outer rotor and pump case		Standard	0.10 — 0.18 mm (0.0039 — 0.0071 in)
Oil filter	Type			Full-flow filter type
	Filtration area			1,300 cm^2 (201.5 sq in)
	By-pass valve opening pressure			160 kPa (1.63 kg/cm^2, 23 psi)
	Outer diameter × width			80 × 75 mm (3.15 × 2.95 in)
	Oil filter to engine thread size			M 20 × 1.5
Relief valve peration pressure				588 kPa (6 kg/cm^2, 85 psi)
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure			15 kPa (0.153 kg/cm^2, 2.18 psi)
	Proof pressure			More than 980 kPa (9.993 kg/cm^2, 142 psi)
Oil capacity	Total capacity			6.6 L (7.0 US qt, 5.8 Imp qt)
	Engine oil amount for refill			5.3 L (5.6 US qt, 4.6 Imp qt)

MEMO:

B: COMPONENT



LU-00109

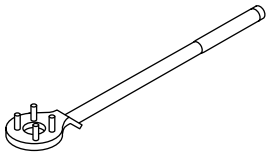
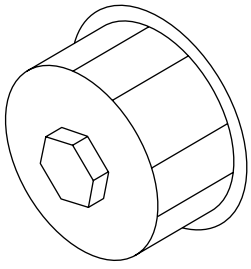
(1) Oil pan lower
(2) Magnet
(3) Drain plug
(4) Gasket
(5) Oil cooler pipe
(6) Hose
(7) Clamp
(8) O-ring
(9) Oil cooler
(10) Connector
(11) Oil filter
(12) Relief valve case
(13) Relief valve case gasket
(14) Chain guide (center)
(15) Crank sprocket
(16) Oil pump cover
(17) Inner rotor
(18) Outer rotor
(19) Oil pan upper
(20) Plug
(21) Oil pressure switch
(22) Plug
(23) Oil strainer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 7.8 (0.80, 5.8)
T3: 18 (1.8, 13)
T4: 25 (2.5, 18)
T5: 34 (3.5, 25)
T6: 37 (3.8, 27)
T7: 44 (4.5, 33)
T8: 54 (5.5, 40)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

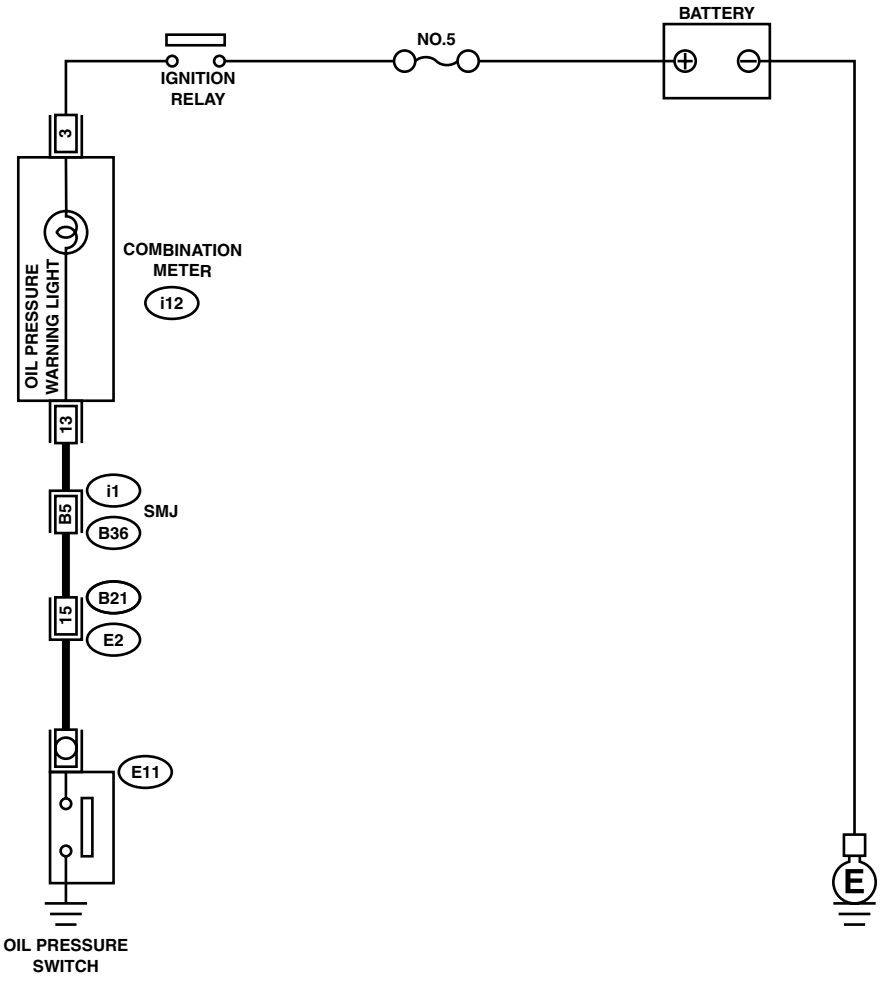
D: PREPARATION TOOL

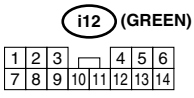
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

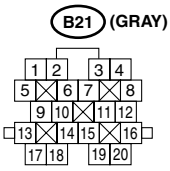
MEMO:

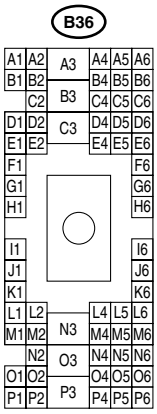
2. Oil Pressure System

A: SCHEMATIC









LU-00110

B: INSPECTION

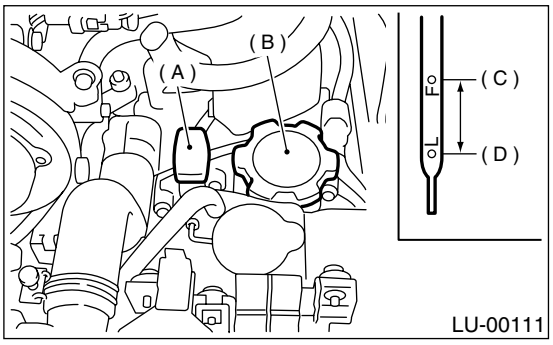
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn ignition switch to ON. (engine OFF) 2) Check other warning lights.	Do the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn ignition switch to OFF. 2) Disconnect connector from the oil pressure switch. 3) Turn ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 — Chassis ground:***	Is the measured value more than 10 V?	Replace oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of the combination meter. ***Terminals*** ***No. 13 — No. 3:***	Is the measured value less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

3. Engine Oil

A: INSPECTION

1) Park vehicle on a level surface.
2) Remove oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
6) To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.

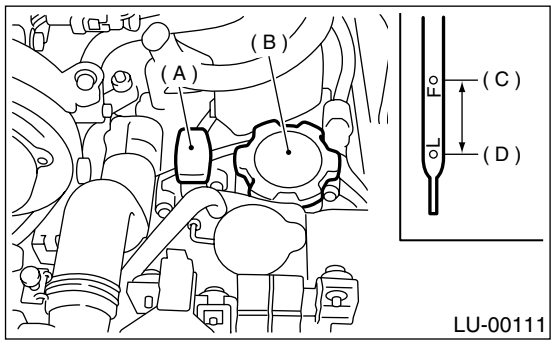
NOTE:
Just after driving or during warm-up, engine oil level may rise above the “F” mark.



(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level

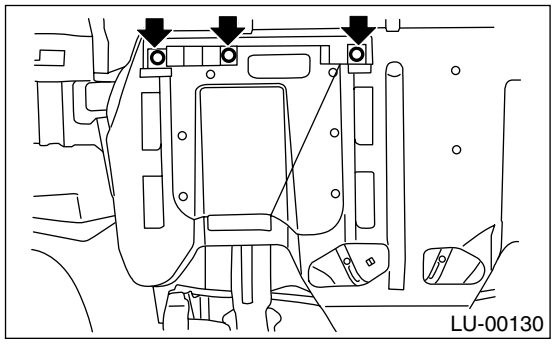
B: REPLACEMENT

1) Open engine oil filler cap for quick draining of the engine oil.

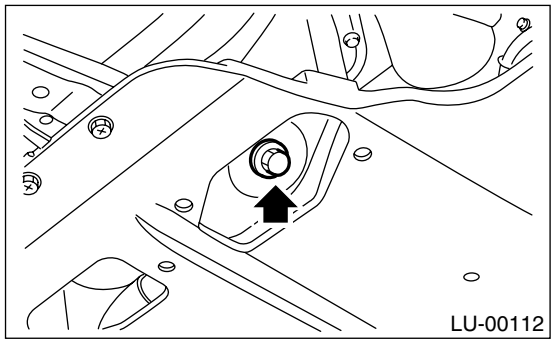


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level

2) Remove access lid.

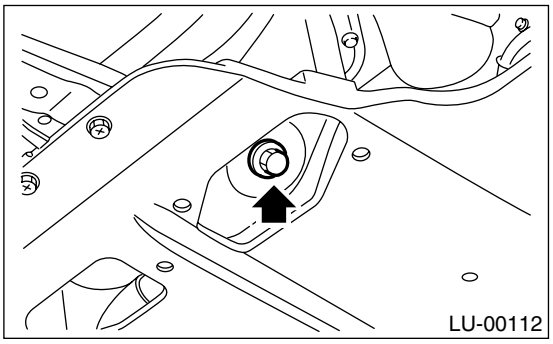


3) Drain engine oil by removing engine oil drain plug.



4) Replace drain plug gasket.
5) Tighten engine oil drain plug after draining engine oil.

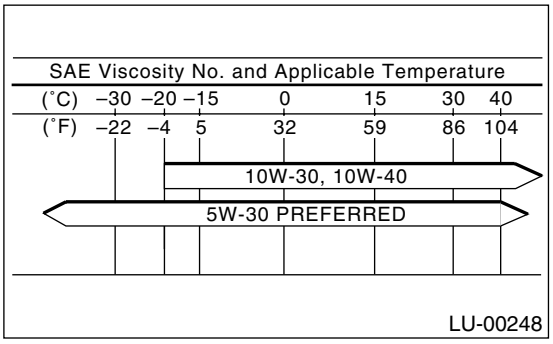
Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



6) Fill engine oil through filler pipe up to upper point on level gauge. Make sure that vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
• ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark)
• API certification SL with the words "ENERGY CONSERVING" (if you cannot obtain the oil with SL grade, you may use SJ grade "ENERGY CONSERVING" oil)
• ACEA specification A1, A2 or A3

Engine oil amount for preparation (with replacing engine oil):
Approx. 5.3 L (5.6 US qt, 4.6 Imp qt)

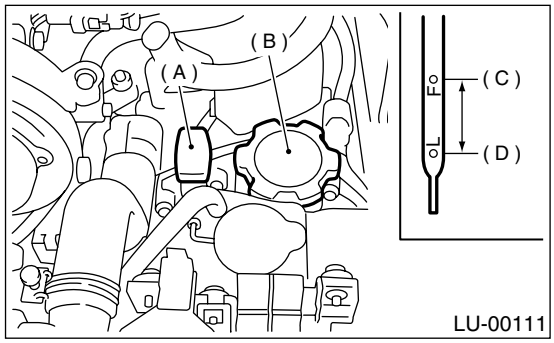


The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the ILSAC or API classification and SAE viscosity No. designated by SUBARU.

NOTE:
If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: ILSAC classification : GF-3 or API classification: SL
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

7) Close engine oil filler cap.
8) Start engine and warm it up for a time.
9) After engine stops, recheck the oil level. If necessary, add engine oil up to upper level on level gauge.

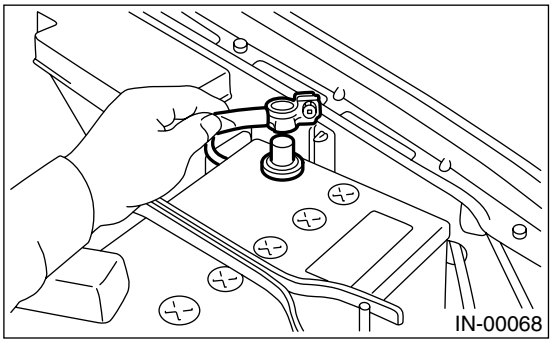


(A) Oil level gauge
(B) Engine oil filler cap

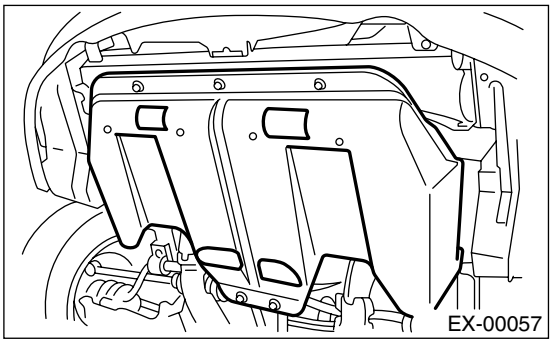
4. Oil Pump

A: REMOVAL

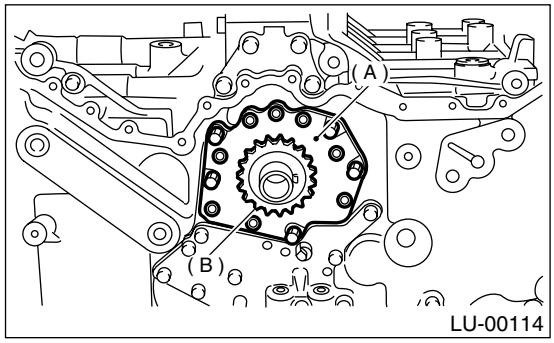
1) Disconnect ground cable from battery.



2) Lift-up the vehicle.
3) Remove under cover.



4) Drain coolant. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Drain engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
6) Lower the vehicle.
7) Remove radiator. <Ref. to CO(H6DO)-23, REMOVAL, Radiator.>
8) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
9) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
10) Remove timing chain. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
11) Remove oil pump cover and crankshaft sprocket.

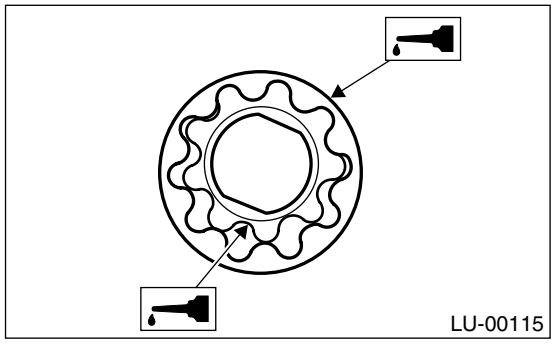


(A) Oil pump cover
(B) Crankshaft sprocket

12) Remove inner rotor and outer rotor.

B: INSTALLATION

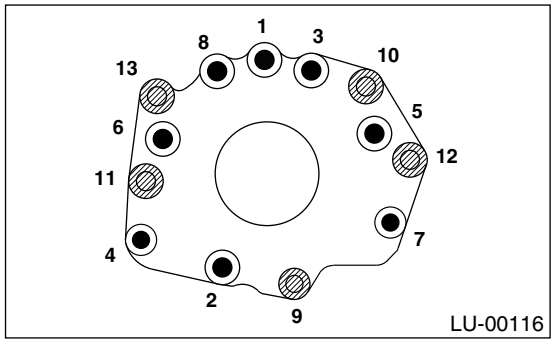
1) Apply engine oil to the entire surface area of both inner and outer rotor.



2) Install the inner rotor by fitting it into the groove on the crankshaft, and then assemble the outer rotor.
3) Install oil pump cover.
4) Tighten the bolts in the numerical sequence shown in the figure.

CAUTION:
Make sure that bolt mounting position is correct.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



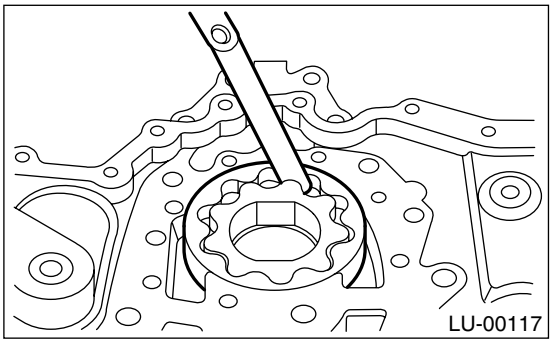
5) Install crank sprocket.
6) Install timing chain. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
7) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
8) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
9) Install radiator. <Ref. to CO(H6DO)-24, INSTALLATION, Radiator.>
10) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
11) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

C: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. Replace rotors as a set, if the clearance exceeds the standard value, or the rotors are damaged, dented, partially worn etc.

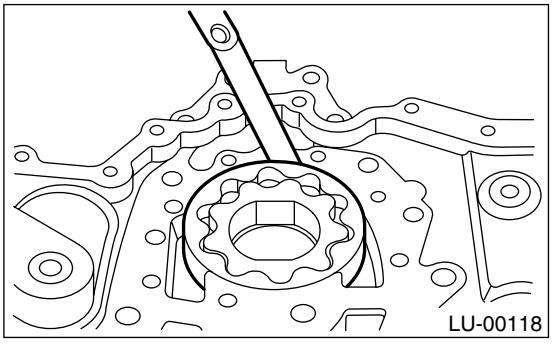
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and the rear chain cover rotor housing. Replace the rotor, if the clearance exceeds the standard value, or the rotor is damaged, dented, partially worn etc.

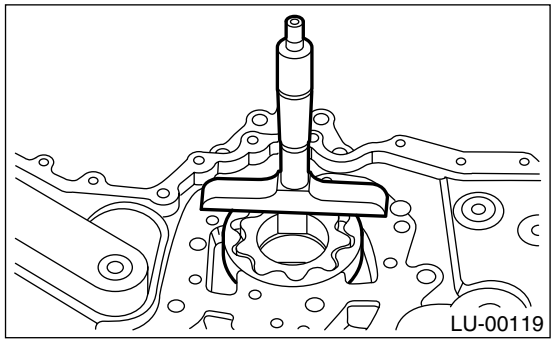
Case clearance:
Standard
0.10 — 0.18 mm (0.0039 — 0.0071 in)



3. SIDE CLEARANCE

Measure clearance between oil pump inner rotor and rear chain cover. Replace rotors as a set, if the clearance exceeds the standard value, or the rotors are damaged, dented, partially worn etc.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)



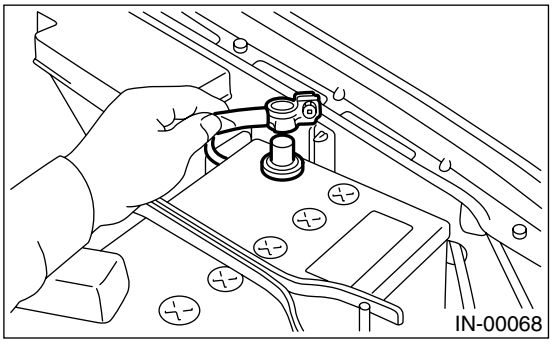
4. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, cracks and other faults.

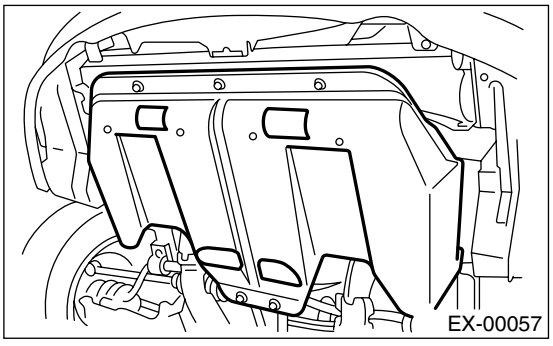
5. Oil Pump Relief Valve

A: REMOVAL

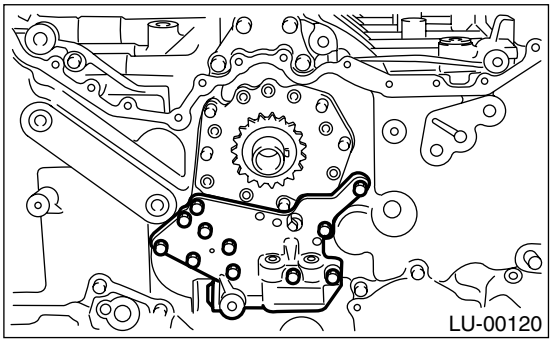
1) Disconnect ground cable from battery.



2) Lift-up the vehicle.
3) Remove under cover.



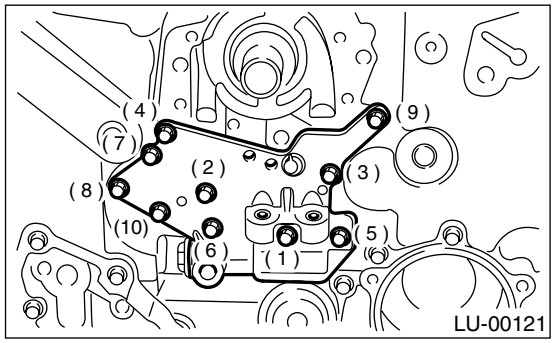
4) Drain coolant. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Drain engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
6) Lower the vehicle.
7) Remove radiator. <Ref. to CO(H6DO)-23, REMOVAL, Radiator.>
8) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
9) Remove front chain cover. <Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
10) Remove timing chain assembly. <Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
11) Remove oil pump relief valve.



B: INSTALLATION

1) Install oil pump relief valve case and gasket
2) Tighten the bolts in the numerical sequence shown in the figure.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



Bolt installation position	Bolt dimension
(1) and (5)	6 x 26
(2), (3), (4) and (9)	6 x 35
(6), (7), (8) and (10)	6 x 16

3) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
4) Install front chain cover. <Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
5) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
6) Install radiator.<Ref. to CO(H6DO)-24, INSTALLATION, Radiator.>
7) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
8) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

C: INSPECTION

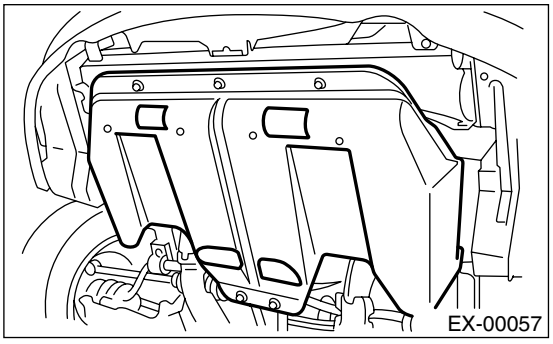
- Check the oil pump relief valve case for worn shaft hole, clogged oil passage, cracks and other faults.
- Make sure that there are no foreign materials on the gasket filter.

6. Oil Pan and Strainer

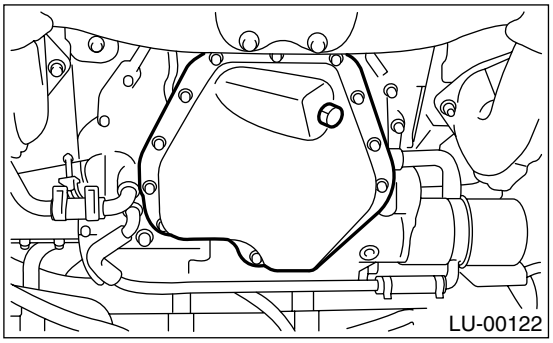
A: REMOVAL

NOTE:
Oil pan upper cannot be removed from the normal vehicle position. The engine must be separated from the vehicle prior to removal. <Ref. to ME(H6DO)-29, REMOVAL, Engine Assembly.>

1) Set the vehicle on lift arms.
2) Lift-up the vehicle.
3) Remove under cover.



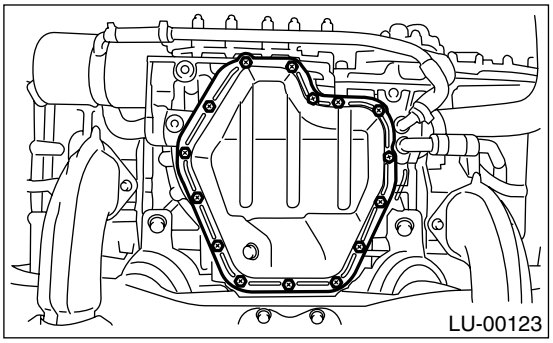
4) Drain engine oil.
Set container under the vehicle, and remove drain plug from oil pan.



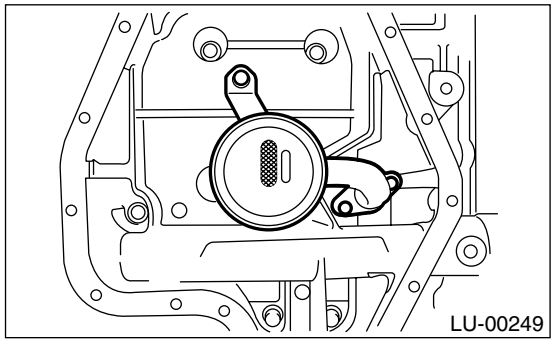
5) Insert oil pan cutter blade between upper and lower oil pans.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

6) Remove lower oil pan.



7) Remove oil strainer.



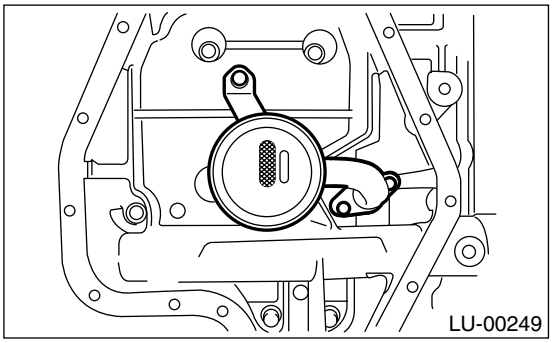
B: INSTALLATION

CAUTION:
Before installing oil pan, clean liquid gasket from lower oil pan and upper oil pan.

1) Install oil strainer onto upper oil pan.

CAUTION:
Replace O-ring with a new one.

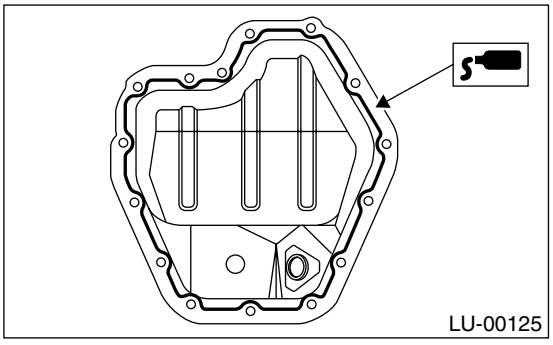
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Apply liquid gasket to mating surfaces and install oil pan.

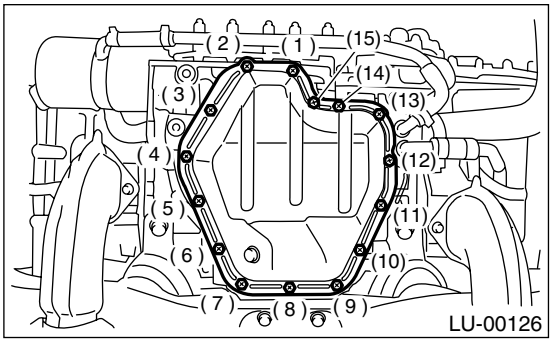
Liquid gasket:
THREE BOND 1280B or 1217G

Liquid gasket application diameter:
5.0±1.0 mm (0.197±0.039 in)

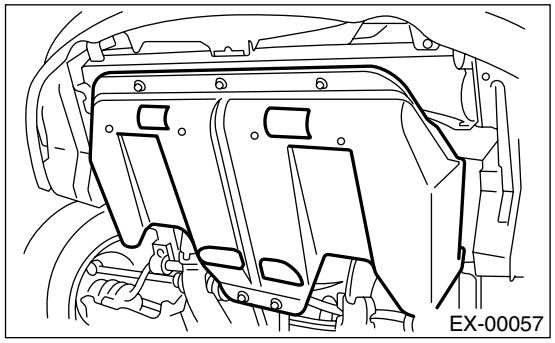


3) Tighten the lower oil pan mounting bolts in the numerical sequence shown in the figure.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Install under cover.



5) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

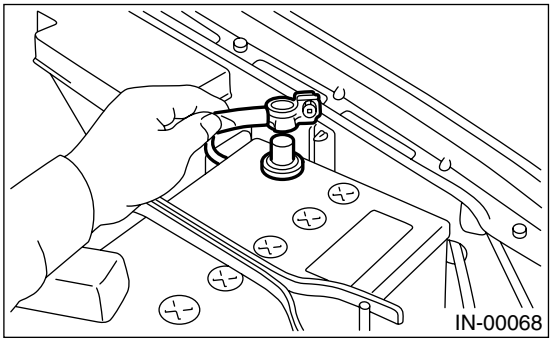
C: INSPECTION

By visual check make sure oil pan, oil strainer and oil strainer stay are not damaged.

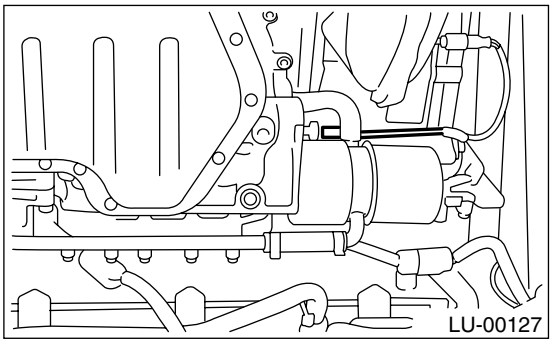
7. Oil Pressure Switch

A: REMOVAL

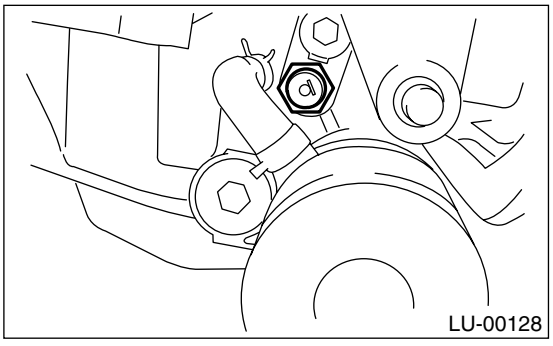
1) Set vehicle on the lift.
2) Disconnect ground cable from battery.



3) Drain engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
4) Lift-up the vehicle.
5) Remove under cover.
6) Disconnect terminal from oil pressure switch.



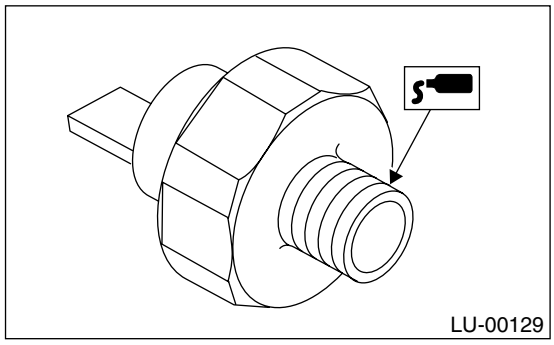
7) Remove oil pressure switch.



B: INSTALLATION

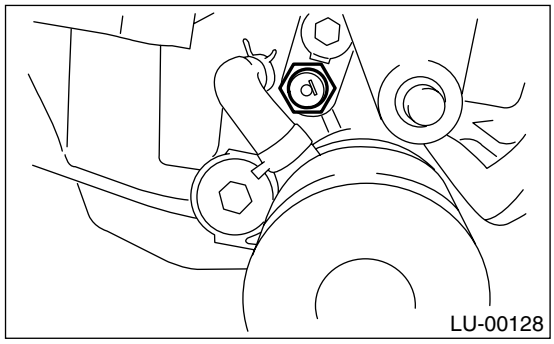
1) Apply liquid gasket to oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 or equivalent

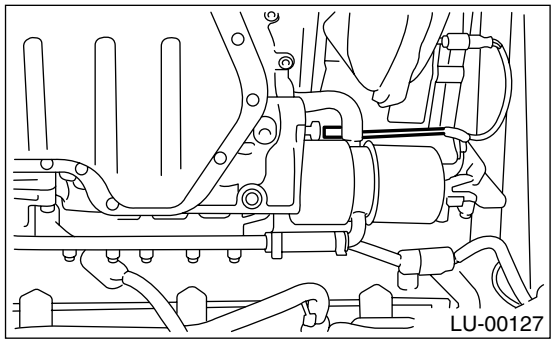


2) Install oil pressure switch.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect terminal of oil pressure switch.



4) Install under cover.
5) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

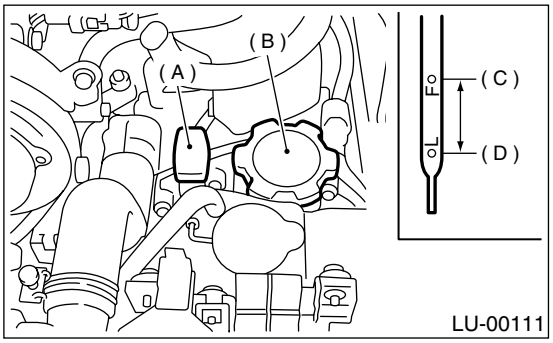
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

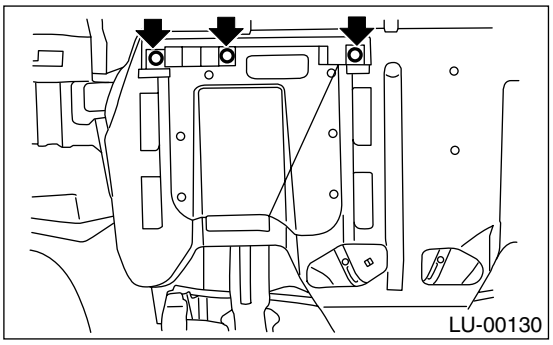
8. Engine Oil Filter

A: REMOVAL

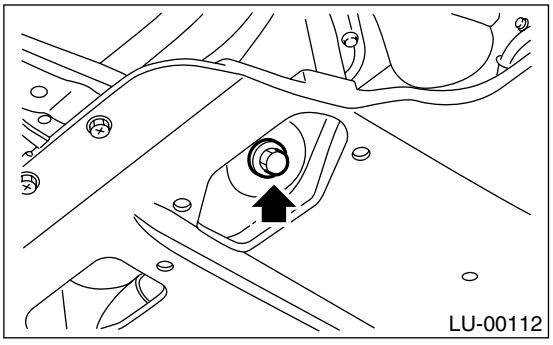
1) Open engine oil filler cap for quick draining of the engine oil.



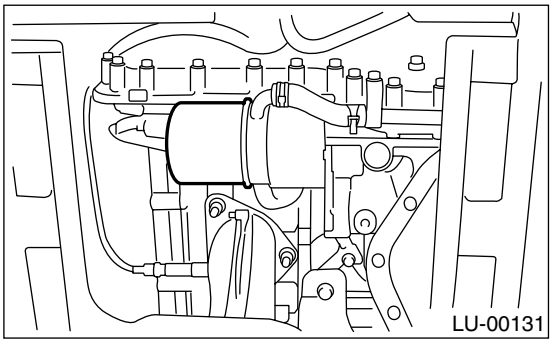
2) Remove access lid.



3) Drain engine oil by removing engine oil drain plug.



4) Remove oil filter with ST.
ST 498547000 OIL FILTER WRENCH



B: INSTALLATION

1) Get a new oil filter and thinly apply engine oil to the rubber seal.
2) Install oil filter by turning it by hand, being careful not to damage rubber seal.
3) Tighten more (approximately 3/4 turn) after the rubber seal contacts the oil cooler. Do not tighten excessively, or oil may leak.
4) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

C: INSPECTION

1) After installing oil filter, run engine and make sure that no oil is leaking around rubber seal.

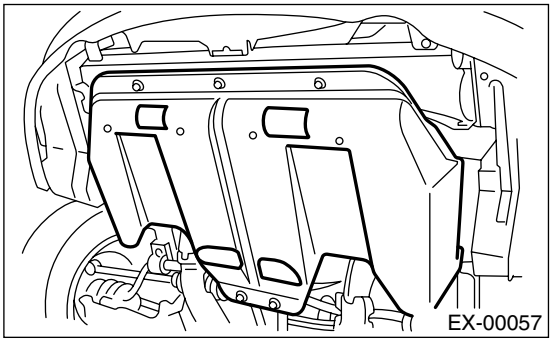
NOTE:
The filter element and filter case are unified; therefore, interior cleaning is not necessary.

2) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

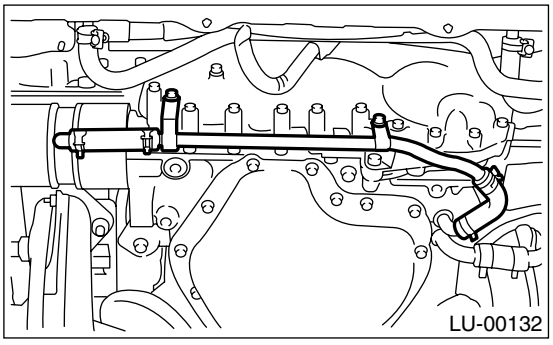
9. Oil Cooler

A: REMOVAL

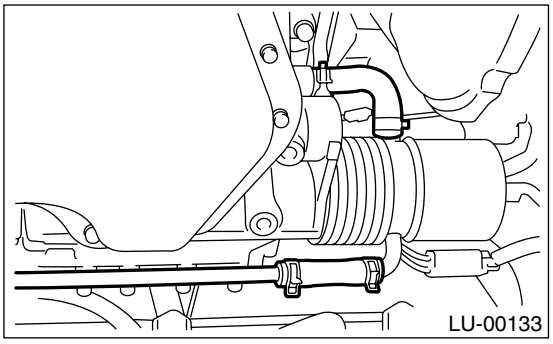
1) Lift-up the vehicle.
2) Remove under cover.



3) Drain engine coolant completely. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Drain engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
5) Remove bolts which installs water pipe to engine.

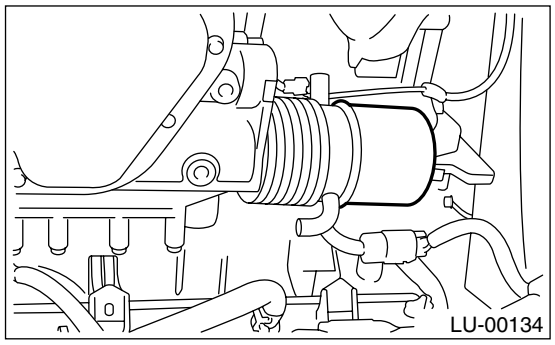


6) Disconnect water hoses from oil cooler.

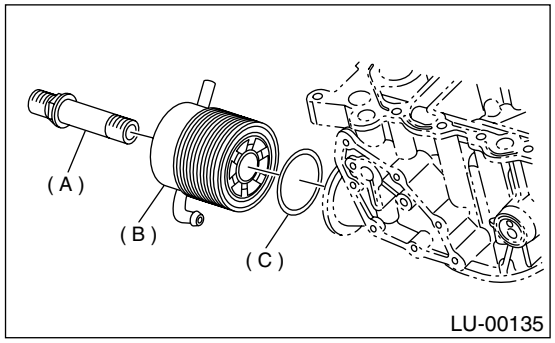


7) Remove oil filter using ST. <Ref. to LU(H6DO)-18, REMOVAL, Engine Oil Filter.>
ST 498547000 OIL FILTER WRENCH

NOTE:
Set container under the vehicle.



8) Remove connector and remove oil cooler.



(A) Connector
(B) Oil cooler
(C) O-ring

B: INSPECTION

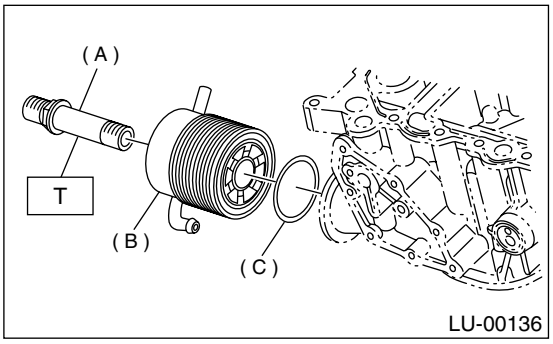
1) Check that coolant passages are not clogged using air blow method.
2) Check upper oil pan and the installation surface of oil filter O-ring for damage.

C: INSTALLATION

1) Install oil cooler on upper oil pan with connector pipe.

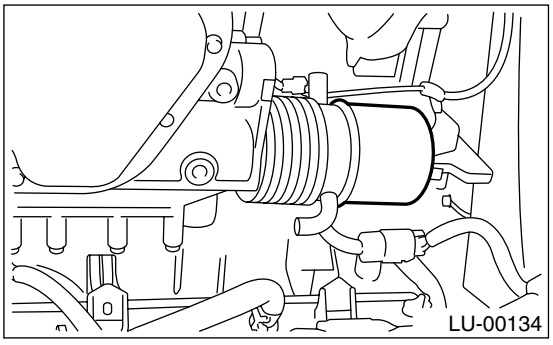
Tightening torque:
T: 54 N·m (5.5 kgf-m, 39.8 ft-lb)

NOTE:
Always use a new O-ring.

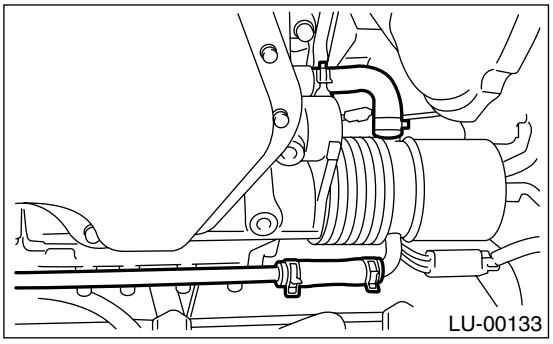


(A) Connector
(B) Oil cooler
(C) O-ring

2) Install oil filter using ST. <Ref. to LU(H6DO)-18, INSTALLATION, Engine Oil Filter.>
ST 498547000 OIL FILTER WRENCH

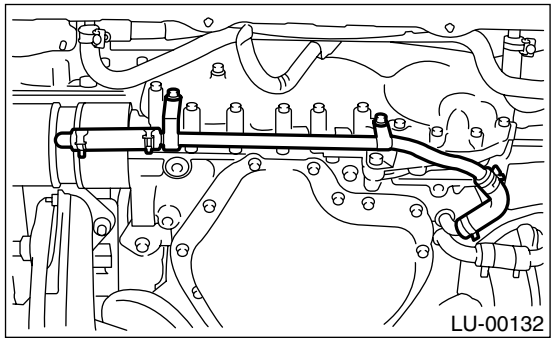


3) Install water hose.



4) Install water pipe to engine.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



5) Fill engine oil. <Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
6) Fill engine coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Check the engine oil level. <Ref. to LU(H6DO)-10, INSPECTION, Engine Oil.>

10.Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains ON.	1) Oil pressure switch failure	Cracked diaphragm or pressure leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Oil pump rotor does not rotate.	Replace.
2. Warning light does not go on.	1) Broken line related to bulb		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.—2).

MEMO:

SPEED CONTROL SYSTEMS

SP(H6DO)

Page

1. General Description 2
2. Accelerator Pedal 4
3. Accelerator Control Cable 7

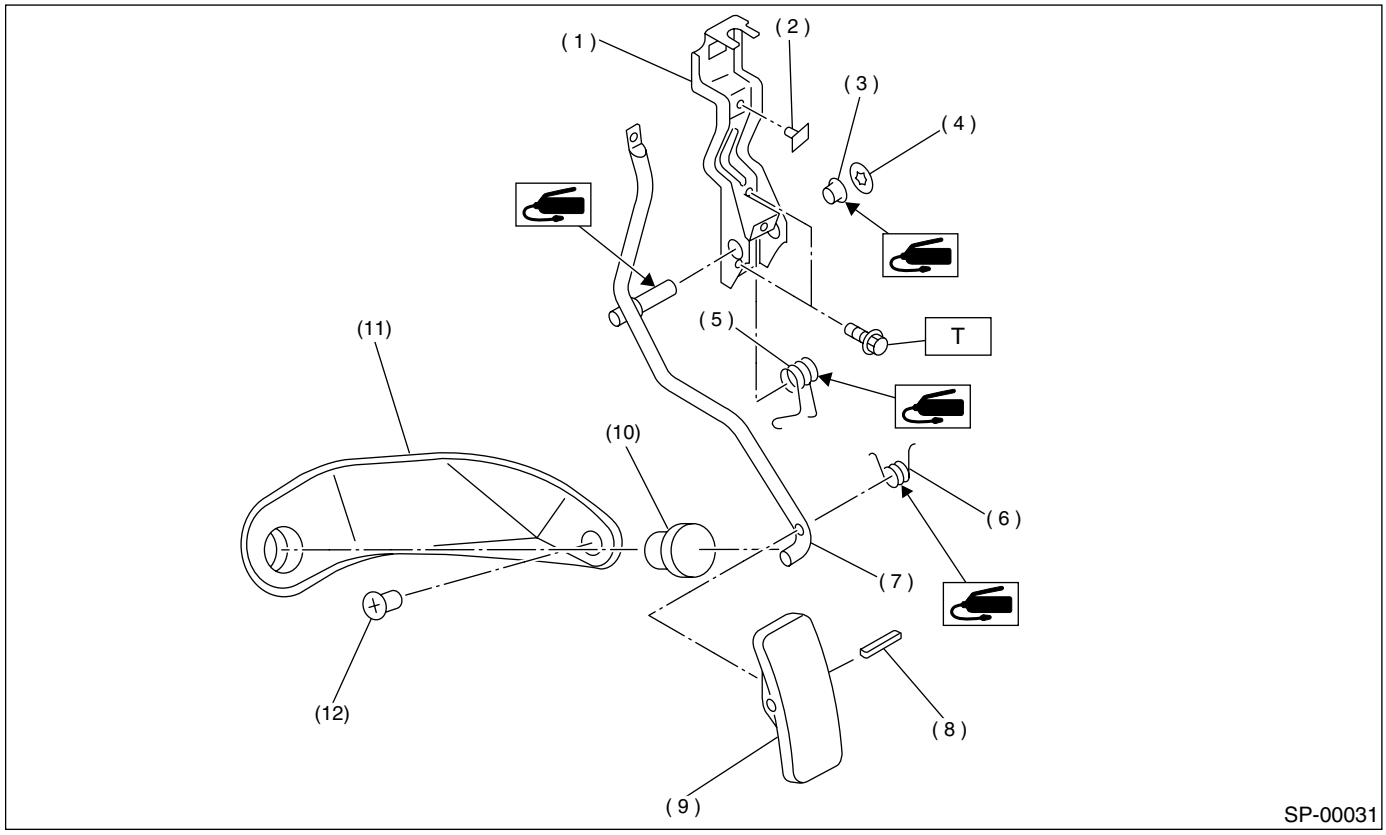
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	50 — 55 mm (1.97 — 2.17 in)

B: COMPONENT

1. LHD MODEL



(1)	Accelerator bracket	(7)	Accelerator pedal lever
(2)	Stopper	(8)	Spring pin
(3)	Bushing	(9)	Accelerator pedal
(4)	Clip	(10)	Accelerator stopper
(5)	Accelerator spring	(11)	Accelerator plate
(6)	Accelerator pedal spring	(12)	Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

C: CAUTION

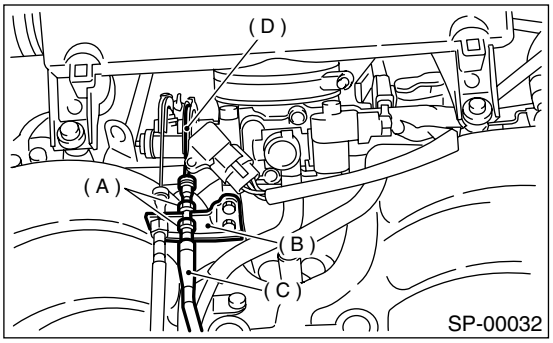
• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

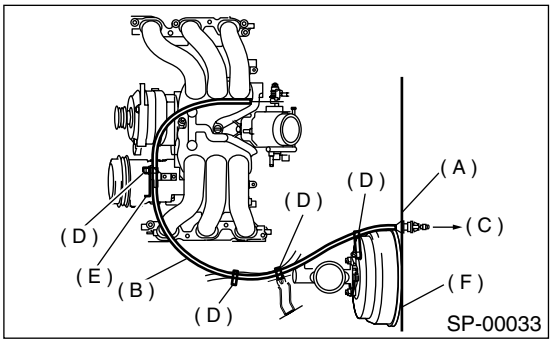
1) Disconnect ground cable from battery.
2) Remove lock nut from accelerator cable bracket.
3) Remove accelerator cable from bracket.
4) Remove accelerator cable end from throttle cam.

CAUTION:
Be careful not to kink accelerator cable.



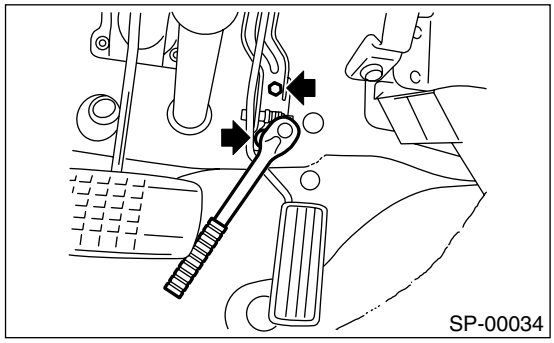
(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

5) Remove clip inside engine compartment.



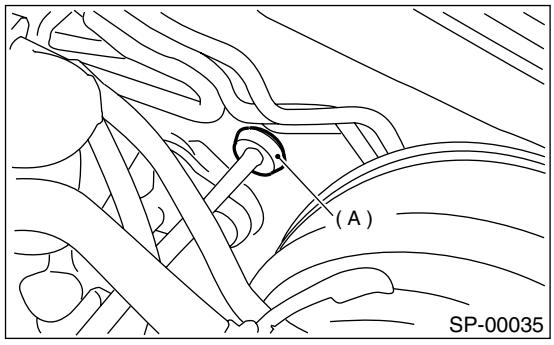
(A) Toe board
(B) Accelerator cable
(C) To accelerator pedal
(D) Clip
(E) Bracket
(F) Brake booster

6) Remove instrument panel lower cover from instrument panel, and connector.
7) Remove brake and clutch pedal bracket. (MT model) <Ref. to BR-39, REMOVAL, Brake Pedal.>
8) Remove accelerator pedal connecting bolt from accelerator pedal bracket.



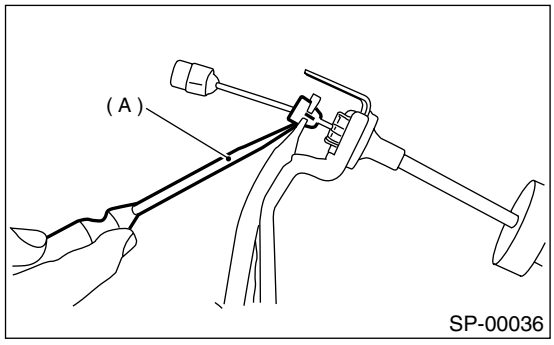
9) Disconnect grommet (A) from toe board.

NOTE:
From engine room side, push grommet (A) into hole.



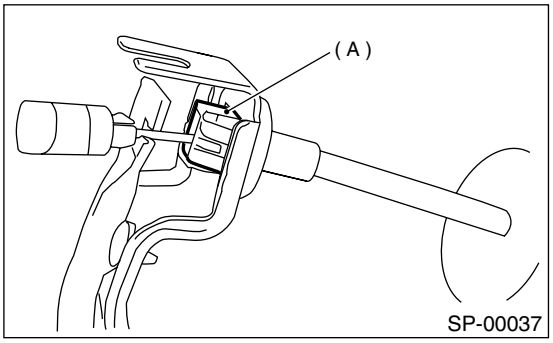
(A) Grommet

10) Pull out the cable from the toe board hole.
11) Disconnect accelerator cable bushing from accelerator pedal lever.



(A) Flat-bladed screwdriver

12) Disconnect accelerator cable stopper (A) from bracket.



13) Remove accelerator cable from bracket.

B: INSTALLATION

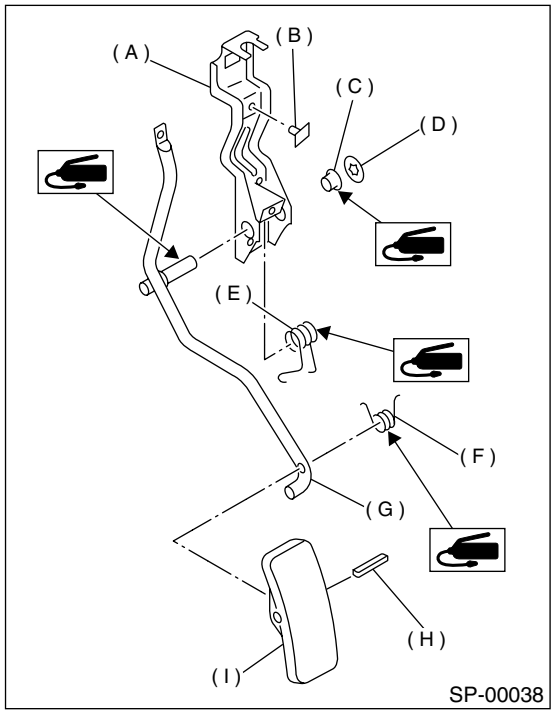
1) Install in the reverse order of removal.
2) After installing pedal, adjust accelerator cable. <Ref. to SP(H6DO)-6, ADJUSTMENT, Accelerator Pedal.>

CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.

Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

C: DISASSEMBLY

1) Remove the clip, and then remove the accelerator pedal from the bracket.
2) Pull out the spring pin, and then remove the accelerator pedal from the accelerator pedal lever.



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Clean areas as shown in the above figure and apply grease.

Grease:
Part No. 003602010
SUNLIGHT No. 2

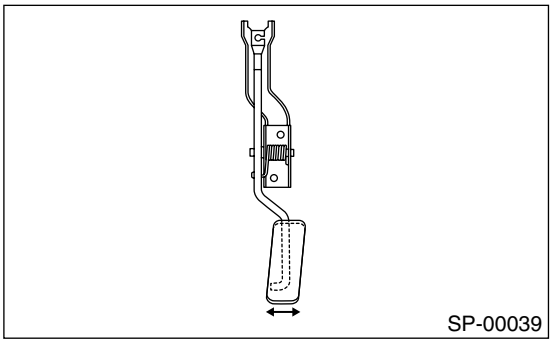
E: INSPECTION

1. ACCELERATOR PEDAL

Lightly move pedal pad in the lateral direction to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace bushing and clip with new ones.

Deflection of accelerator pedal:
Service limit
±2.0 mm (±0.079 in) or less

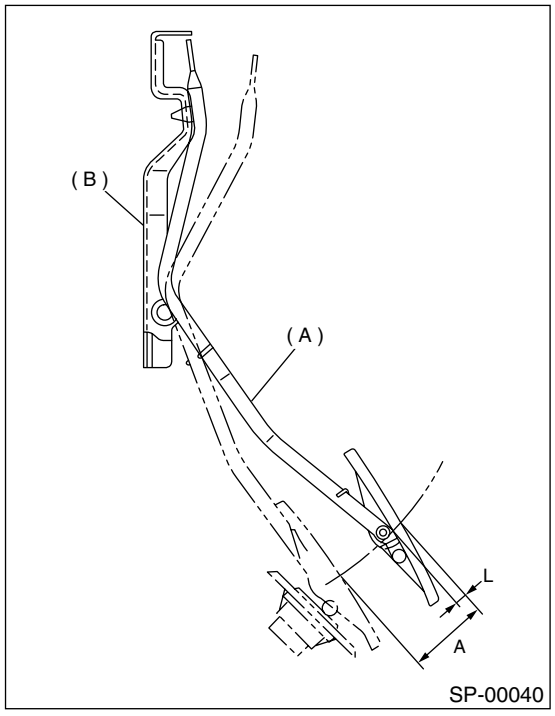


F: ADJUSTMENT

1) Check pedal stroke and free play by operating accelerator pedal by hand.
If it is not within specified value, adjust it by turning nut connecting accelerator cable to throttle body.

Free play at pedal pad: L
0 — 4 mm (0 — 0.16 in)

Stroke at pedal pad: A
50 — 55 mm (1.97 — 2.17 in)



(A) Accelerator pedal
(B) Accelerator pedal bracket

Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

3. Accelerator Control Cable

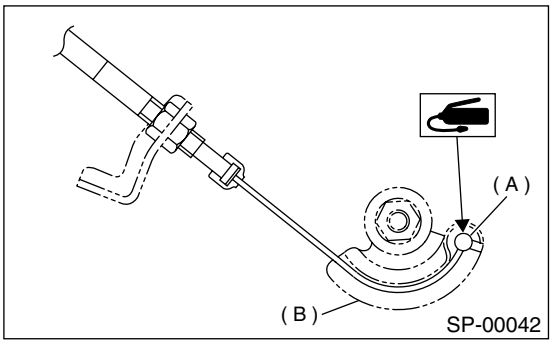
A: REMOVAL

1) Remove accelerator pedal. <Ref. to SP(H6DO)-4, REMOVAL, Accelerator Pedal.>
2) Separate accelerator cable and accelerator pedal.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to the point (engine side accelerator cable end) in the figure below.

Grease:
Part No. 004404002
Slicolube G-30M



(A) Grease application area (Accelerator cable end)
(B) Throttle cam

CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.
• Do not apply grease to areas except for the specified point.

3) Adjustment after pedal installation <Ref. to SP(H6DO)-5, INSTALLATION, Accelerator Pedal.>

C: INSPECTION

1) Make sure the inner cable is not twisted or frayed.
2) Make sure the outer cable is not cracked.

MEMO:

IGNITION

IG(H6DO)

Page

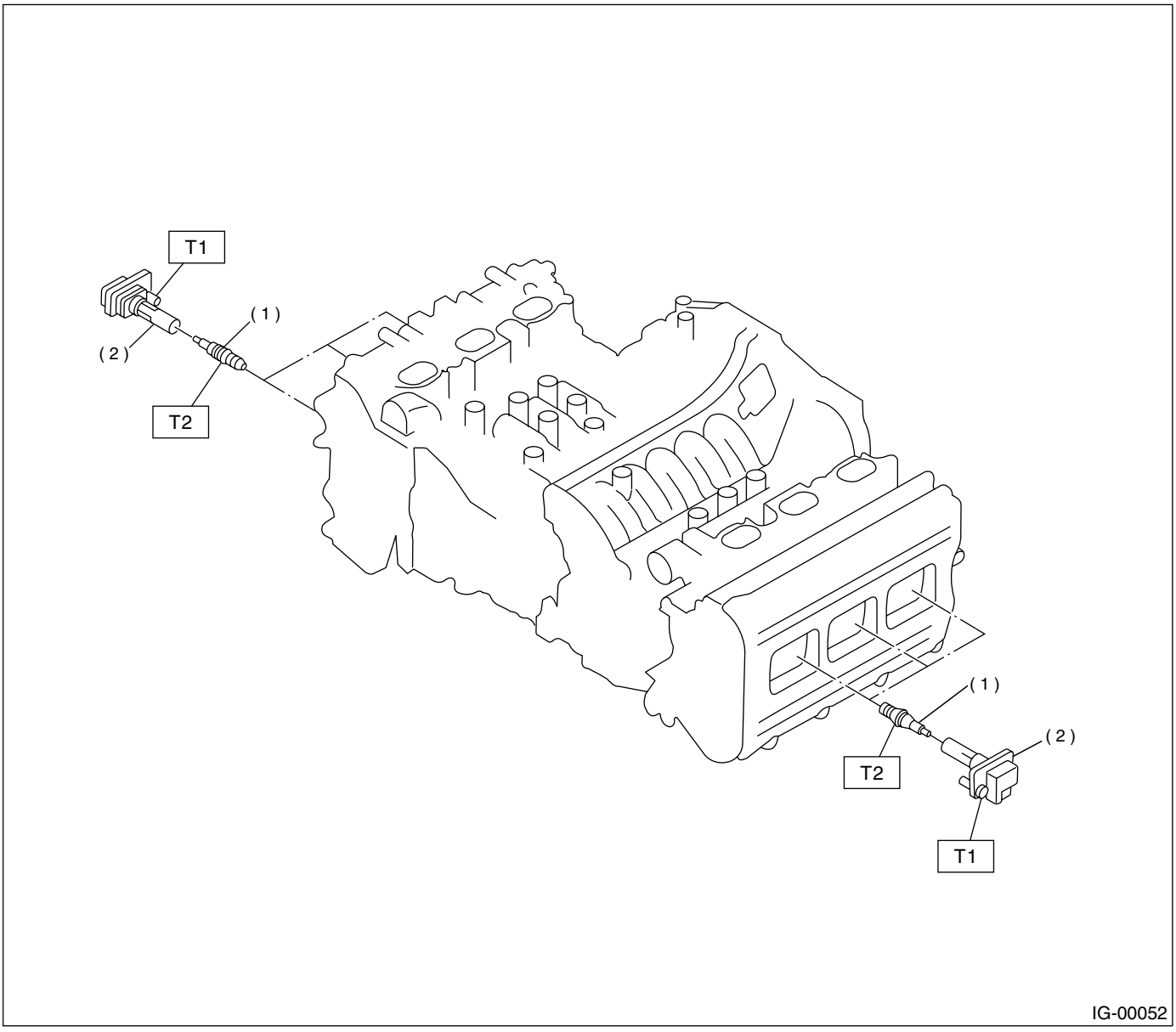
1. General Description 2
2. Spark Plug.....4
3. Ignition Coil and Ignitor Assembly.....7

1. General Description

A: SPECIFICATIONS

Item			Designation
Ignition coil and ignitor assembly	Model		FK0140
	Manufacturer		DIAMOND
Spark plug	Type and manufacturer		NGK : PLFR6A-11
	Thread size	mm	14, P = 1.25
	Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)

B: COMPONENT



(1) Spark plug
(2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 12)
T2: 21 (2.1, 15)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Spark Plug

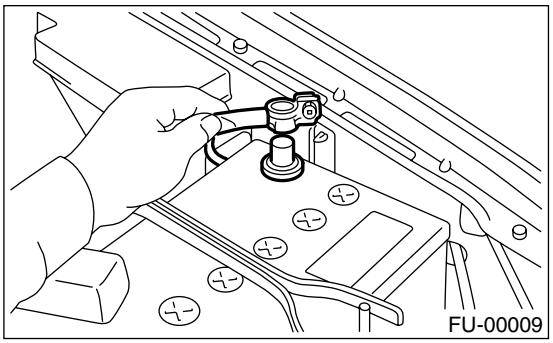
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

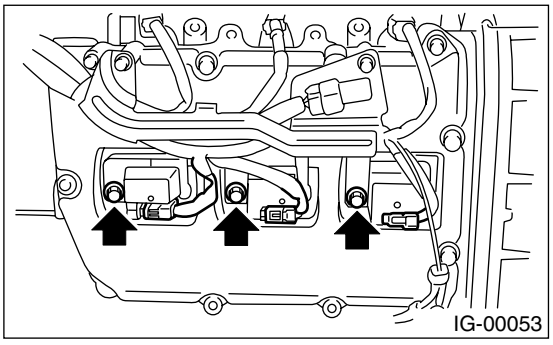
Spark plug:
NGK: PLFR6A-11

1. RH SIDE

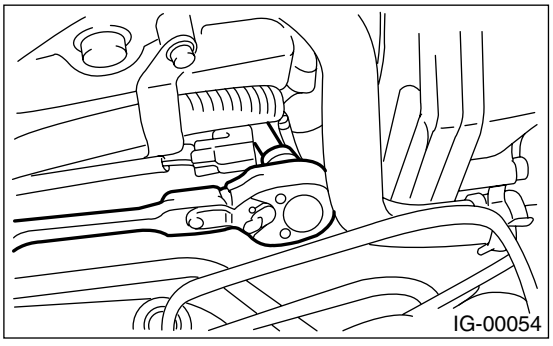
1) Disconnect battery ground cable.



2) Remove air cleaner lower case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner.>
3) Disconnect connector from ignition coil.
4) Remove ignition coil.

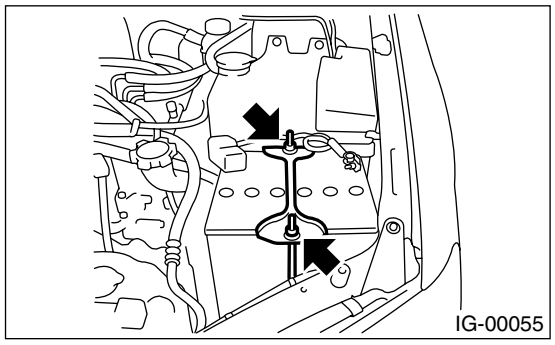


5) Remove spark plugs with the spark plug socket.

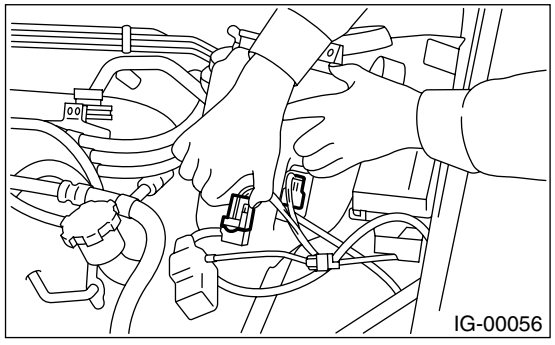


2. LH SIDE

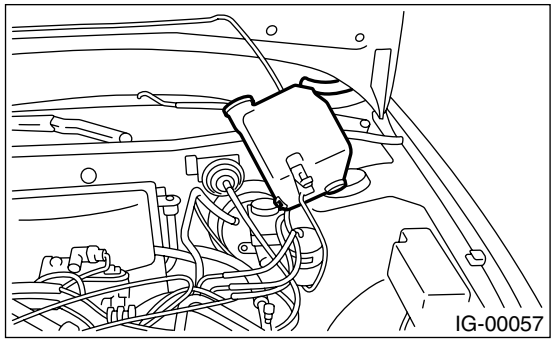
1) Disconnect battery cables and then remove battery and battery carrier.



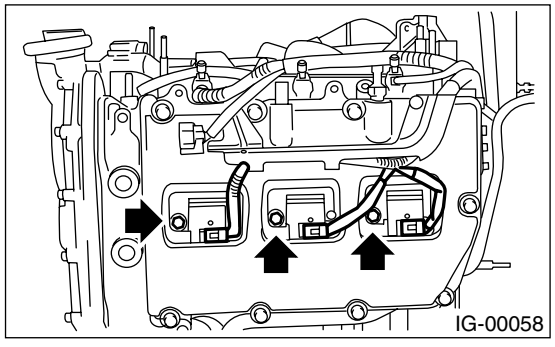
2) Disconnect washer motor connector.



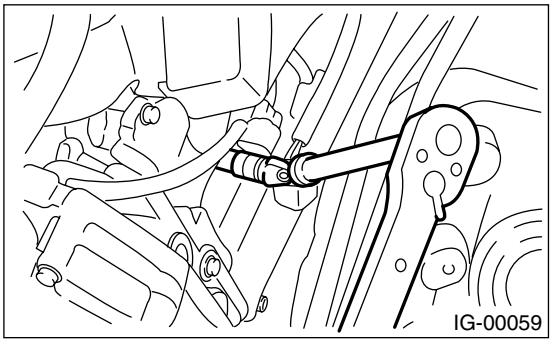
3) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



4) Disconnect connector from ignition coil.
5) Remove ignition coil.



6) Remove spark plug with the spark plugs socket.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 12 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

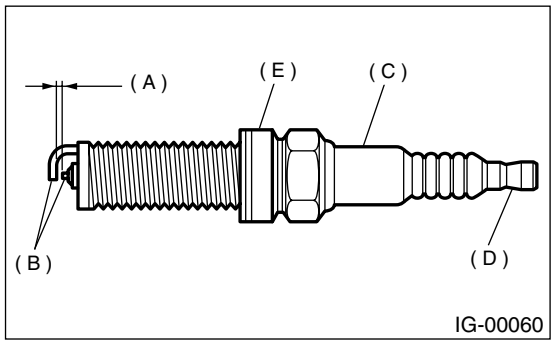
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15 ft-lb)

CAUTION:
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 12 ft-lb)

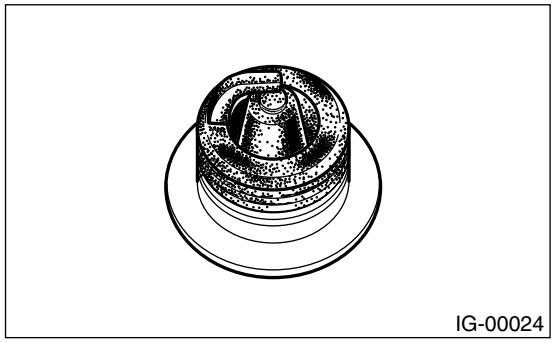
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

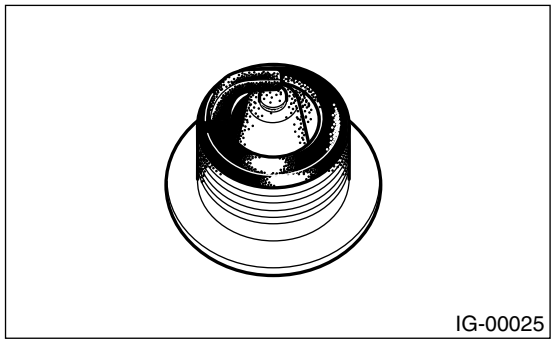


(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

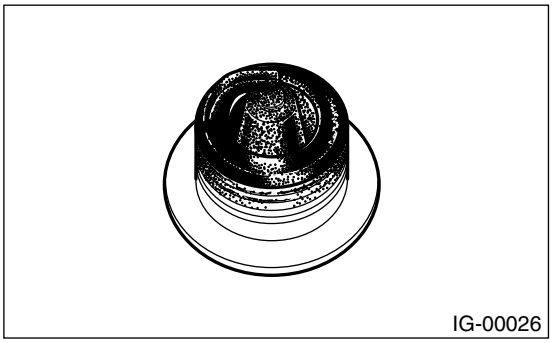
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



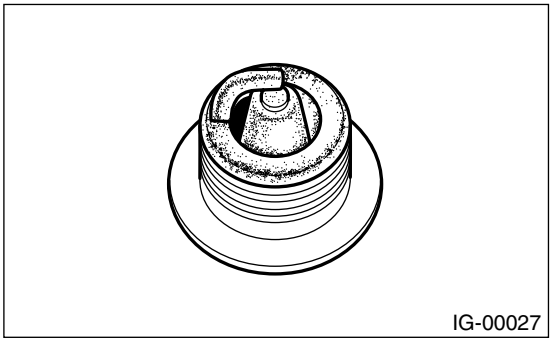
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.



3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00026

4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.


IG-00027

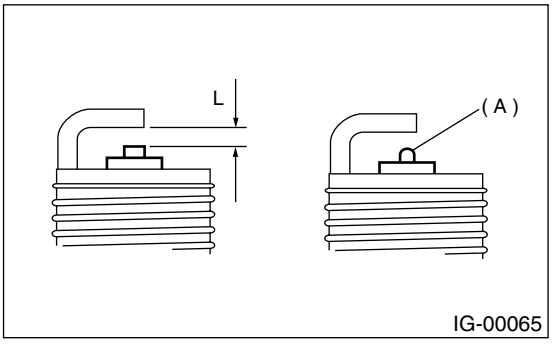
D: CLEANING

CAUTION:
Do not use plug cleaner because spark plugs are platinum-tipped.

E: ADJUSTMENT

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)



IG-00065

NOTE:
Replace with new spark plug if this area (A) is worn to “ball” shape.

3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type is adopted.
For the order of removal, refer to the removal of spark plugs.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)

C: INSPECTION

Because ignition coil is a direct ignition type, the resistance cannot be measured in a single unit. For inspection procedure of ignition system, refer to the following. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

MEMO:

STARTING/CHARGING SYSTEMS

SC(H6DO)

Page

1. General Description 2
2. Starter 6
3. Generator 14
4. Battery 20

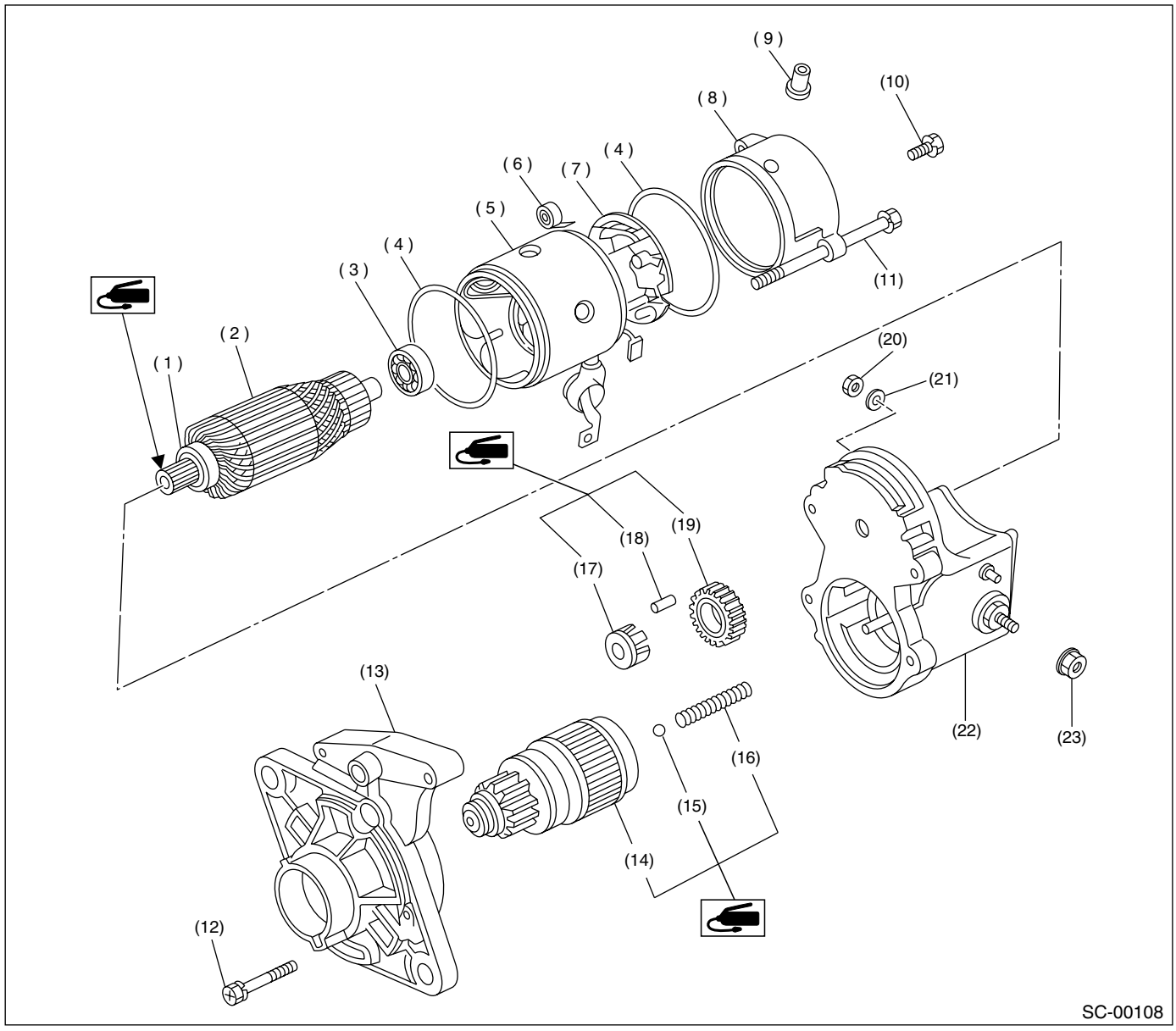
1. General Description

A: SPECIFICATIONS

Item			Designation
Starter	Type		Reduction type
	Model		228000-7141
	Manufacturer		DENSO CORPORATION
	Voltage and output		12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)
	Number of pinion teeth		9
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,900 rpm or more
	Load characteristics	Voltage	8 V
		Current	370 A or less
		Torque	13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
		Rotating speed	880 rpm or more
	Lock characteristics	Voltage	5 V
		Current	1,050 A or less
		Torque	27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type
	Model		A003EB1870
	Manufacturer		MITSUBISHI ELECTRIC
	Voltage and output		12 V — 100 A
	Polarity on ground side		Negative
	Rotating direction		Clockwise (when observed from pulley side.)
	Armature connection		3-phase Y-type
	Output current		1,500 rpm — 43 A or more 2,500 rpm — 76 A or more 5,000 rpm — 100 A or more
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]
Battery	Reserve capacity	amps min.	110
	Cold cranking	amp.	490

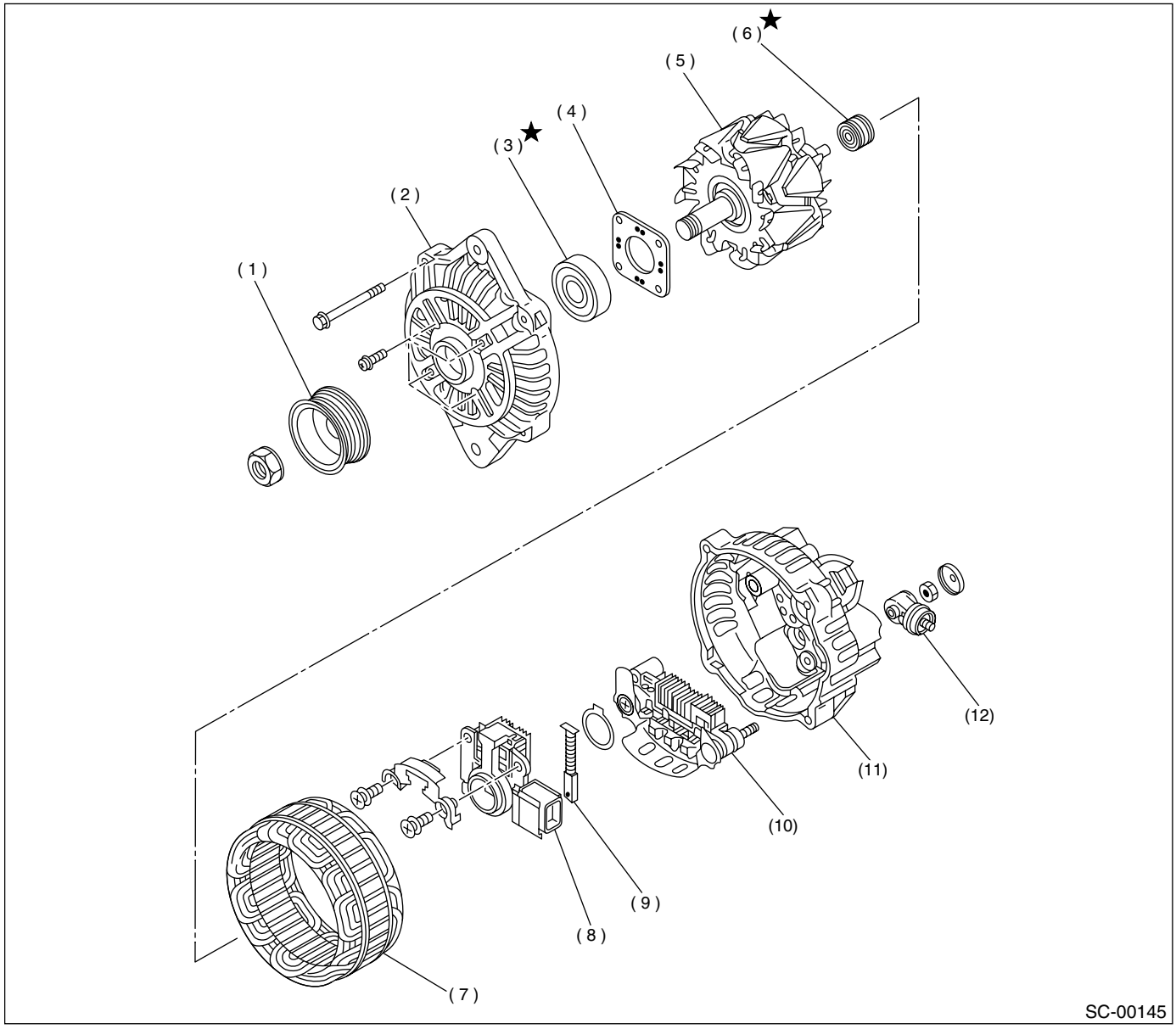
B: COMPONENT

1. STARTER



(1)	Front ball bearing	(9)	Cover	(17)	Retainer
(2)	Armature	(10)	Screw	(18)	Roller
(3)	Rear ball bearing	(11)	Through-bolt	(19)	Idle gear
(4)	O-ring	(12)	Screw & washer	(20)	Nut
(5)	Yoke	(13)	Starter housing	(21)	Spring washer
(6)	Brush spring	(14)	Overrunning clutch	(22)	Magnetic switch
(7)	Brush holder	(15)	Steel ball	(23)	Nut
(8)	End frame	(16)	Spring		

2. GENERATOR



(1) Pulley
(2) Front cover
(3) Ball bearing
(4) Bearing retainer
(5) Rotor
(6) Bearing
(7) Stator coil
(8) IC regulator with brush
(9) Brush
(10) Rectifier
(11) Rear cover
(12) Terminal

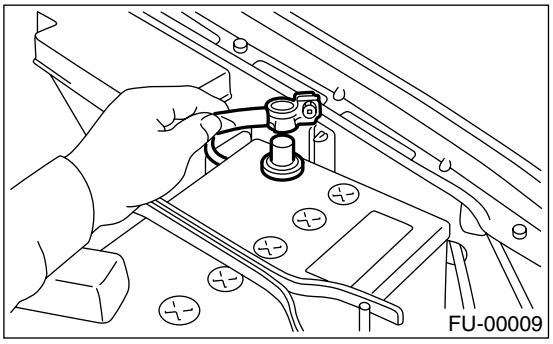
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

2. Starter

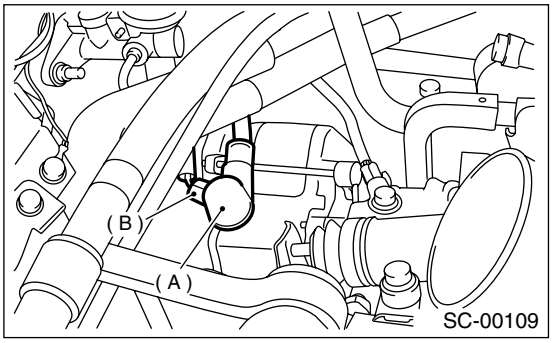
A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove air intake chamber.
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>

3) Disconnect connector and terminal from starter.



(A) Terminal
(B) Connector

4) Remove starter from transmission.

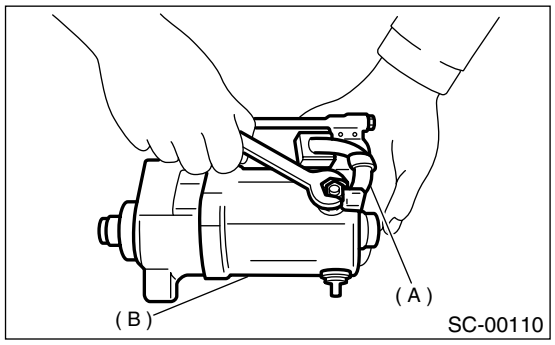
B: INSTALLATION

Install in the reverse order of removal.

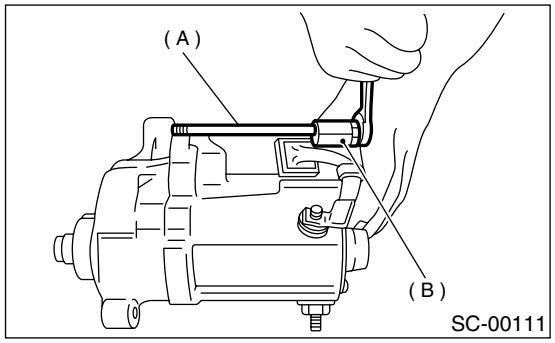
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

C: DISASSEMBLY

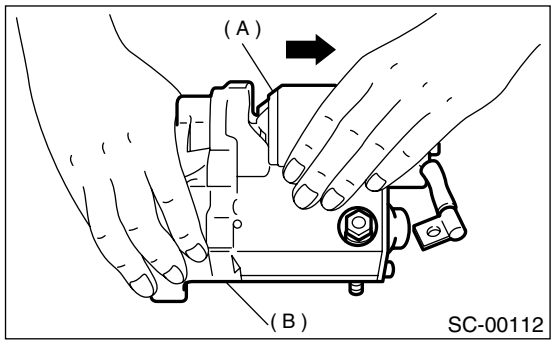
1) Disconnect lead wire (A) from magnetic switch (B).



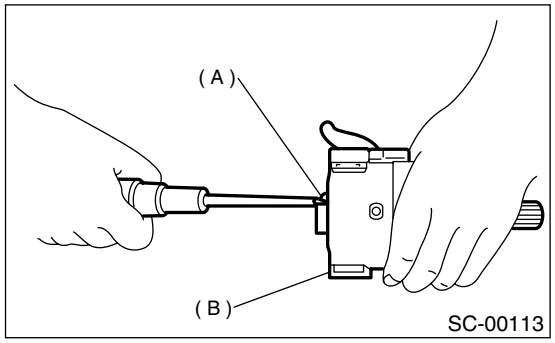
2) Remove through-bolts (A) from end frame (B).



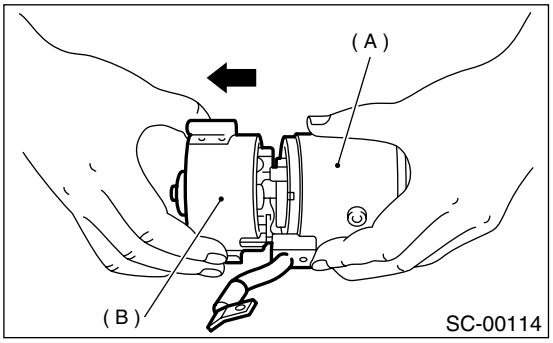
3) Remove yoke (A) from magnetic switch (B).



4) Remove screws (A) securing brush holder to end frame (B).

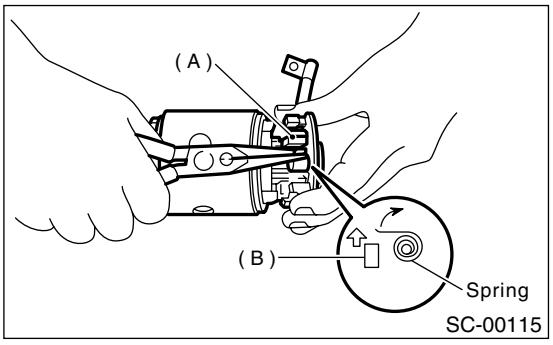


5) Separate yoke (A) from end frame (B).

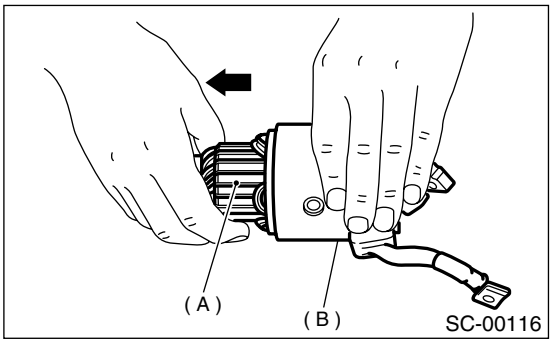


6) Remove brush (A) by lifting up positive (+) side brush spring (B) using long-nose pliers.

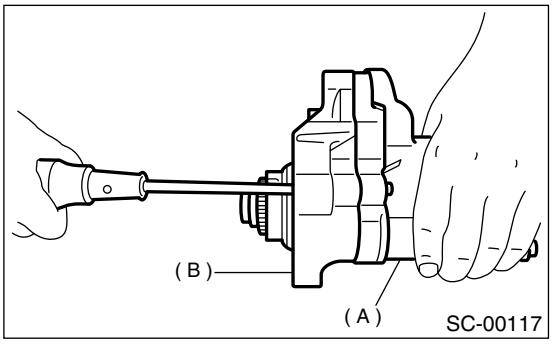
CAUTION:
Be careful not to damage brush and commutator.



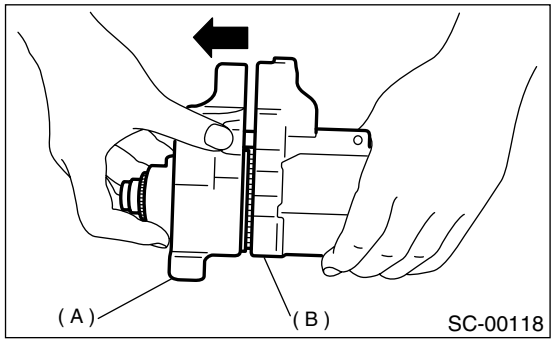
7) Remove armature (A) from yoke (B).



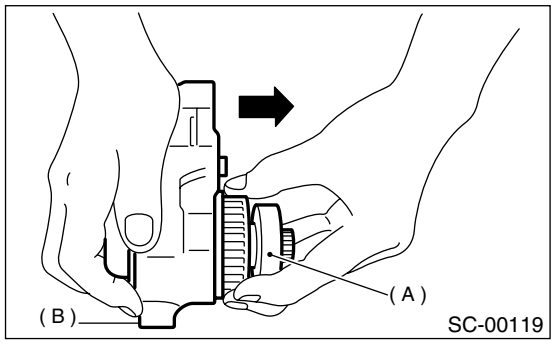
8) Remove screws securing magnetic switch (A) to housing (B).



9) Remove housing (A) from magnetic switch (B).

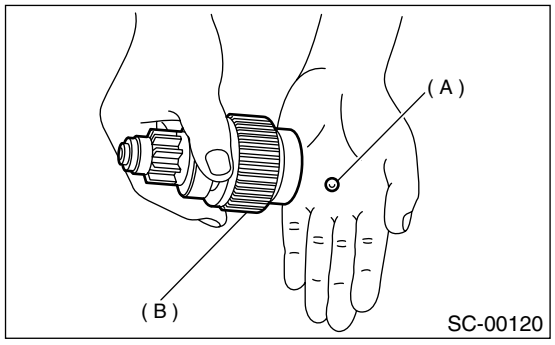


10) Remove clutch (A) from housing (B).

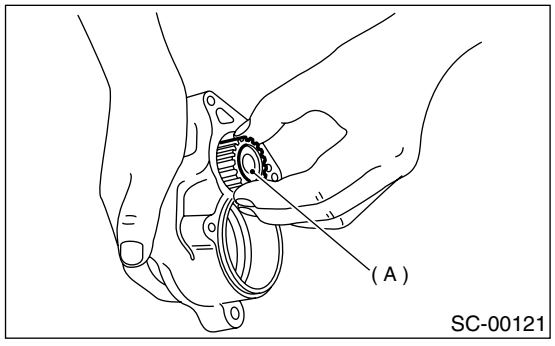


11) Take out steel ball (A) from clutch (B).

CAUTION:
Be careful not to lose steel ball.

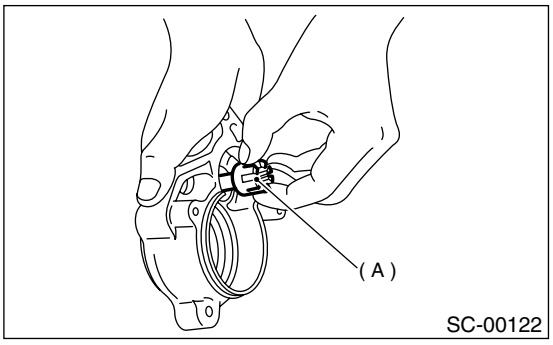


12) Remove idle gear (A) from housing.

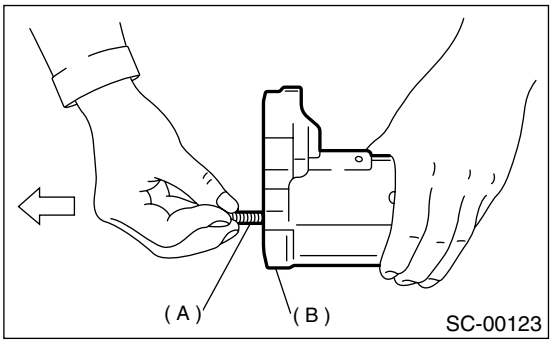


13) Remove retainer and roller (A) from housing.

CAUTION:
Be careful not to drop retainer and roller.



14) Remove coil spring (A) from magnetic switch (B).



D: ASSEMBLY

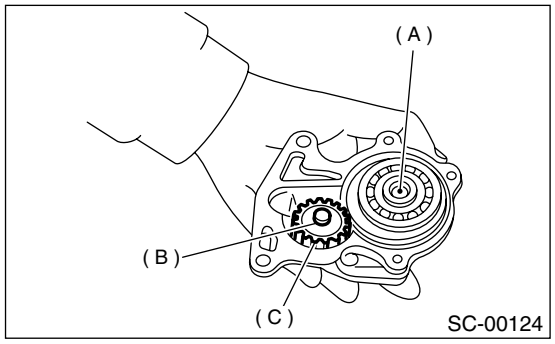
Assemble in the reverse order of disassembly. Observe the following:

1) Before assembling, apply grease to the points shown in “COMPONENT PARTS”. <Ref. to SC(H6DO)-3, COMPONENT, General Description.>

2) Assembling magnetic switch, clutch, and housing

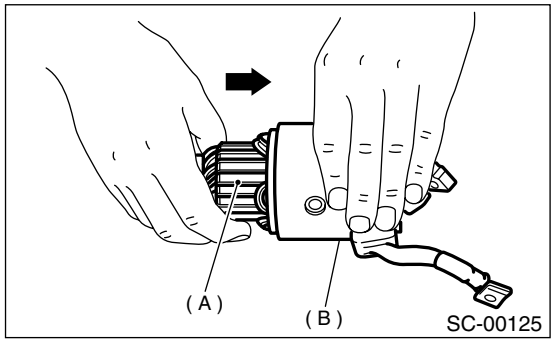
To assemble, first install clutch to magnetic switch, then install idle gear, and finally install clutch.

CAUTION:
- **Do not forget to install steel ball and coil spring to clutch.**
- **Attach bearing to idle gear beforehand.**

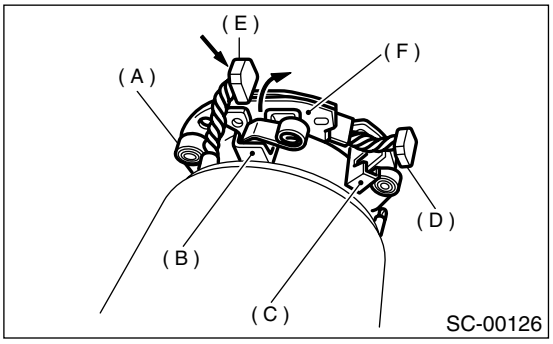


(A) Steel ball
(B) Retainer
(C) Idle gear

3) Installing armature (A) to yoke (B)

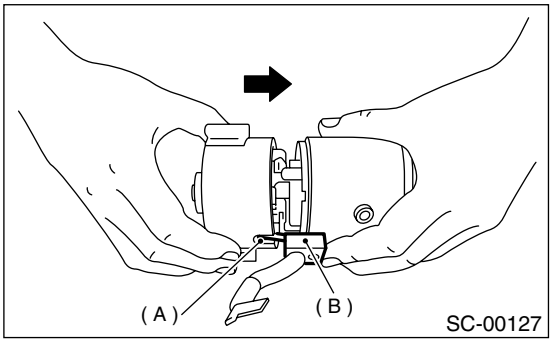


4) Installing brushes
Assemble brush holder to yoke as shown, then assemble two yoke-side brushes to brush holder.

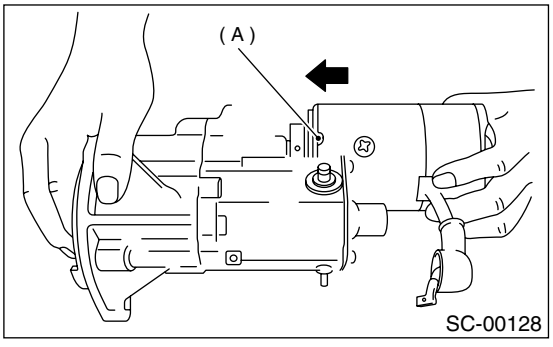


(A) Brush spring
(B) Brush holder hole (+)
(C) Brush holder hole (–)
(D) Brush (–)
(E) Brush (+)
(F) Insulator

5) Installing end frame
When assembling end frame to yoke, align notched portion (A) of end frame with lead wire grommet (B).



6) Installing yoke
When installing yoke to magnetic switch, align notch (A) of yoke with groove of magnetic switch.

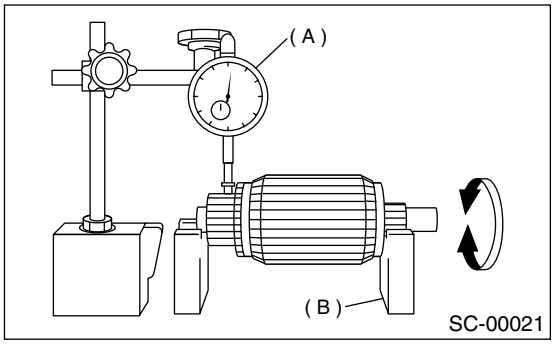


E: INSPECTION

1. ARMATURE

1) Check commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test
Check the commutator run-out and replace if it exceeds the limit.

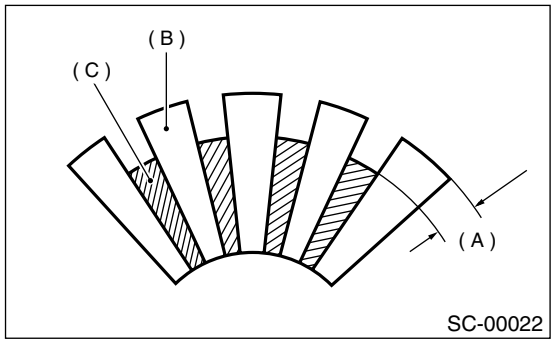
Commutator run-out:
Standard
0.02 mm (0.0008 in), or less
Service limit
Less than 0.05 mm (0.0020 in)



(A) Dial gauge
(B) V-block

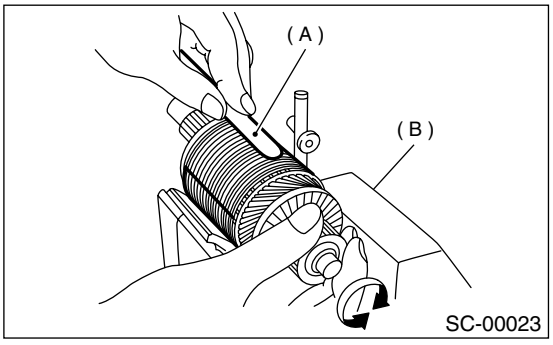
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.6 mm (0.024 in)
Limit
0.2 mm (0.008 in)



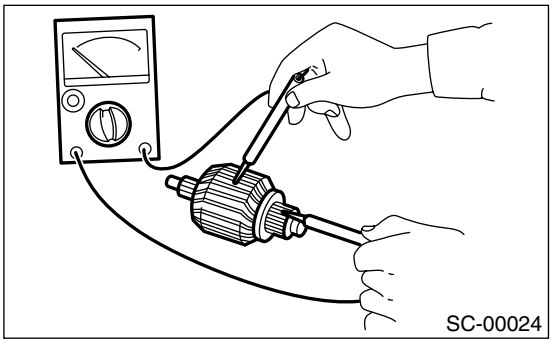
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Check armature for short-circuit by placing it on growler tester. Hold a iron sheet against armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Growler tester

5) Armature ground test
Using circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is a continuity, armature is grounded.
Replace armature if it is grounded.



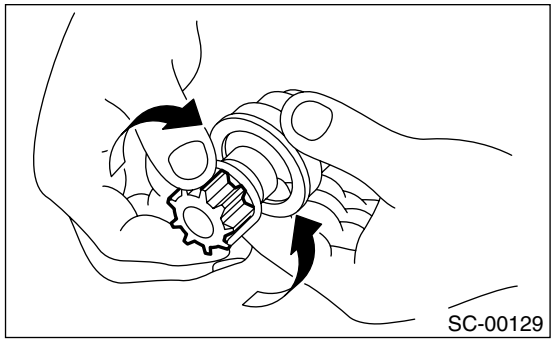
2. YOKE

Make sure pole is set in position.

3. OVERRUNNING CLUTCH

Inspect teeth of pinion for wear and damage. Replace if it is damaged. Rotate pinion in correct direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

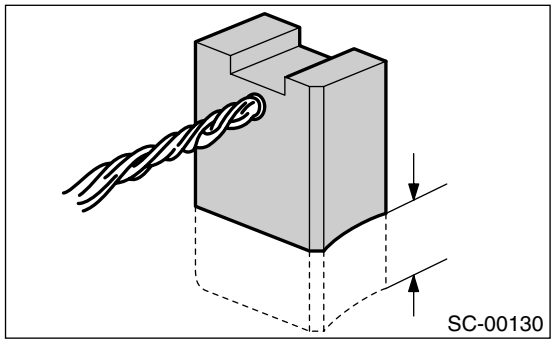
CAUTION:
Do not clean overrunning clutch with oil to prevent grease from flowing out.



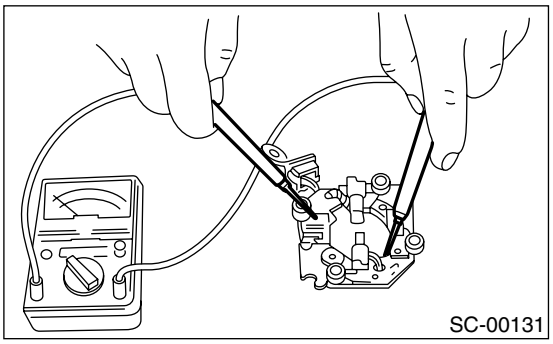
4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length and replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard
15 mm (0.59 in)
Service limit
10 mm (0.39 in)



2) Brush movement
Be sure brush moves smoothly inside brush holder.
3) Insulation resistance of brush holder
Be sure there is no continuity between brush holder and its plate.

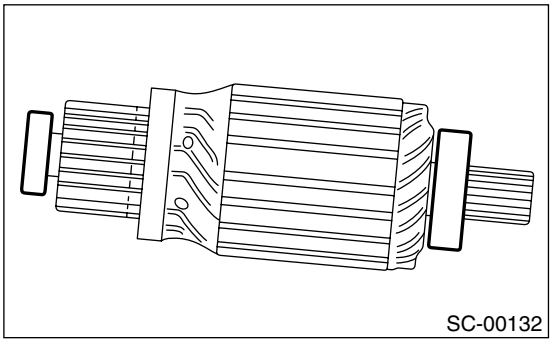

SC-00131

4) Brush spring force
Measure brush spring force with a spring scale. If it is less than the service limit, replace brush spring.

Brush spring force:
Standard
18.6 N (1.9 kgf, 4.2 lb) (when new)
Service limit
6.9 N (0.7 kgf, 1.5 lb)

5. BEARING

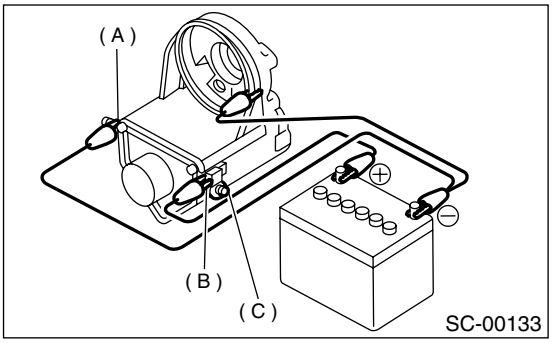
1) Rotate bearing by hand; no binding should exist.
2) Rotate bearing rapidly; no abnormal noise should be heard.


SC-00132

6. MAGNETIC SWITCH

CAUTION:
• The following magnetic switch tests should be performed with specified voltage applied.
• Each test should be conducted within 3 to 5 seconds. Power to be furnished should be one-half the rated voltage.

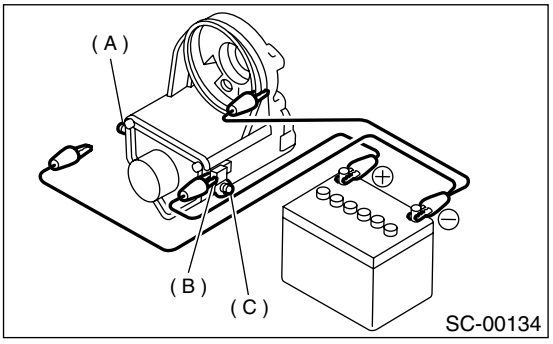
1) Pull-in test
Connect two battery negative leads onto magnetic switch body and terminal C respectively. Then connect battery positive lead onto terminal 50. Pinion should extend when lead connections are made.



SC-00133

(A) Terminal C
(B) Terminal 50
(C) Terminal M

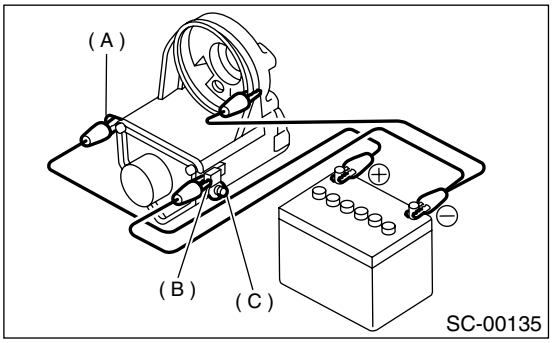
2) Holding-in test
Disconnect lead from terminal C with pinion extended. Pinion should be held in the extended position.



SC-00134

(A) Terminal C
(B) Terminal 50
(C) Terminal M

3) Return test
Connect two battery negative leads onto terminal 50 and onto switch body respectively. Then connect battery positive lead onto terminal C. Next, disconnect lead from terminal 50. Pinion should return immediately.

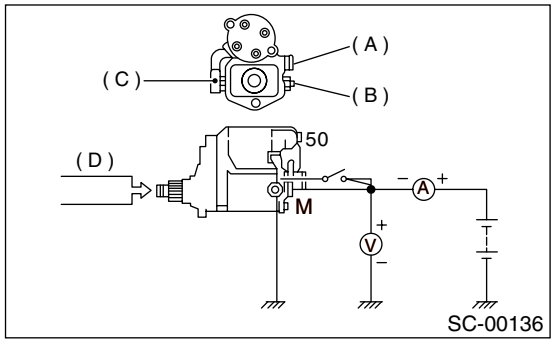


(A) Terminal C
(B) Terminal 50
(C) Terminal M

7. PERFORMANCE TEST

The starter is required to produce a large torque and high rotating speed, but these starter characteristics vary with the capacity of the battery. It is therefore important to use a battery with the specified capacity whenever testing the starter.
The starter should be checked for the following three items:
• No-load test
Measure the maximum rotating speed and current under a no-load state.
• Load test
Measure the magnitude of current needed to generate the specified torque and rotating speed.
• Stall test
Measure the torque and current when the armature is locked.
1) No-load test
Under no-load state, measure its rotating speed and current, using the specified battery. Measured values must meet the following standards:

No-load test (Standard):
Voltage/Current
11 V/90 A, or more
Rotating speed
228000-7141
2,900 rpm, or more



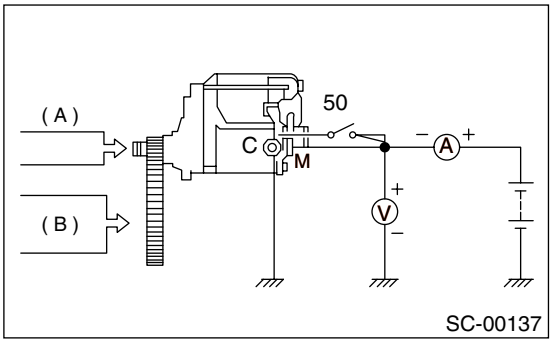
(A) Terminal 50
(B) Terminal M
(C) Terminal C
(D) Tachometer

2) Load test (For reference)
Perform this test to check maximum output of starter. Use test bench which is able to apply load (brake) to starter. Measure torque value and rotating speed under the specified voltage and current conditions while controlling braking force applied to starter.

CAUTION:
Change engagement position of overrunning clutch and make sure it is not slipping.

Load test (Standard):

228000-7141
Voltage/Load
8 V/13.7 N·m (1.4 kgf-m, 10.1 ft-lb)
Current/Speed
370 A, or less/880 rpm, or more

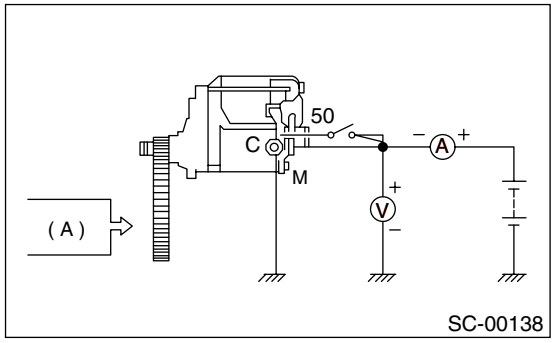


(A) Tachometer
(B) Torque gauge

3) Stall test
Using the same test equipment used for load test, apply brake to lock starter armature. Then measure voltage, current, and torque values.
Measured values must meet the following standard.

Stall test (Standard):

228000-7141
Voltage/Current
5 V/1,050 A, or less
Torque
27.5 N·m (2.8 kgf-m, 20.3 ft-lb) or more.



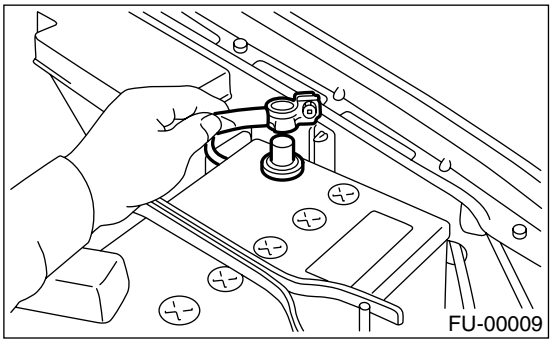
(A) Torque gauge

NOTE:
Low rotating speed or excessive current during no-load test may be attributable to high rotating resistance of starter due to improper assembling.
Small current and no torque during stall test may be attributable to excessive contact resistance between brush and commutator; whereas, normal current and insufficient torque may be attributable to shorted commutator or poor insulation.
Starter can be considered normal if it passes no-load and stall tests; therefore, load test may be omitted.

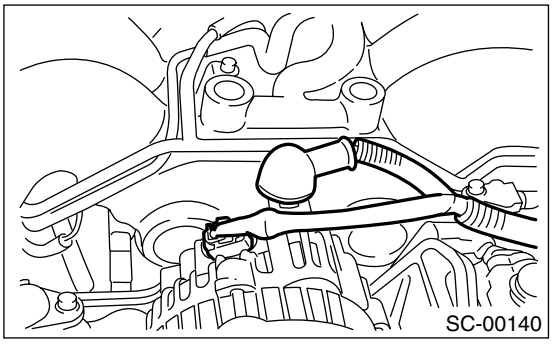
3. Generator

A: REMOVAL

1) Disconnect ground cable from battery.

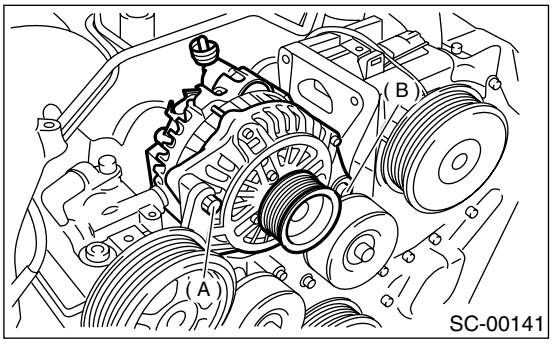


2) Disconnect connector and terminal from generator.



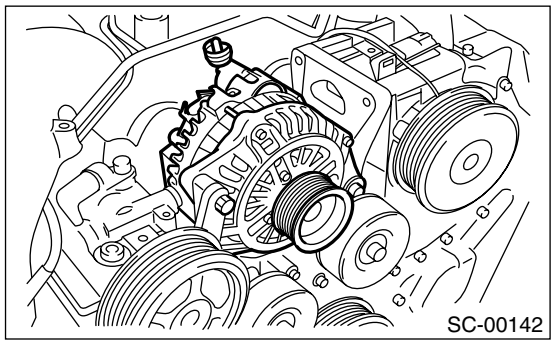
3) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>

4) Remove bolt (A), and loosen bolt (B). Then, remove generator from bracket.



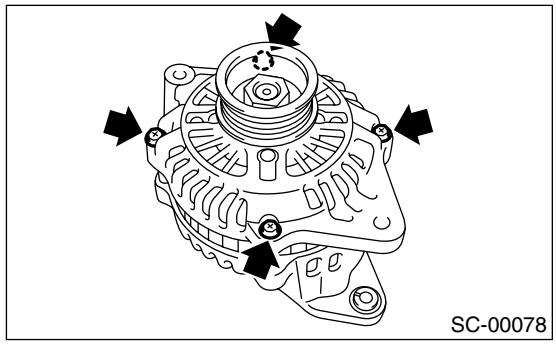
B: INSTALLATION

Install in the reverse order of removal.

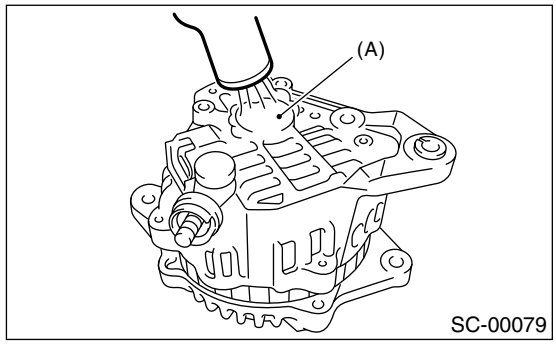


C: DISASSEMBLY

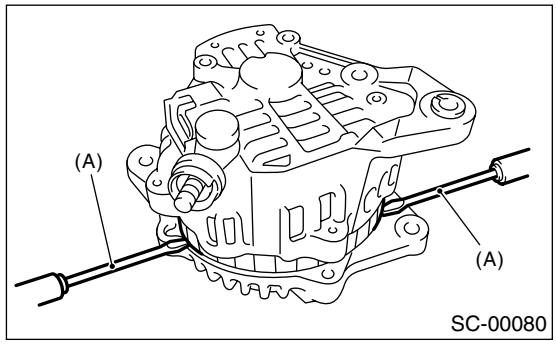
1) Remove the four through-bolts.



2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

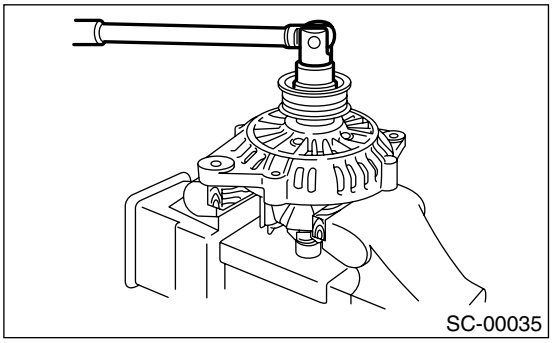


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

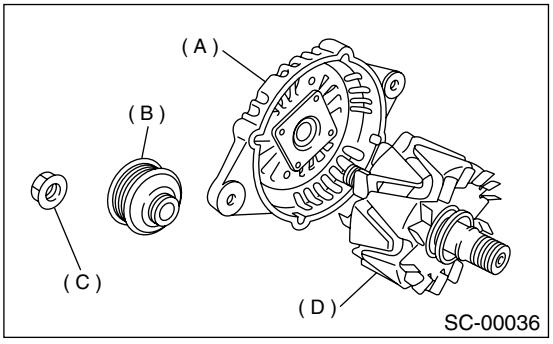


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.

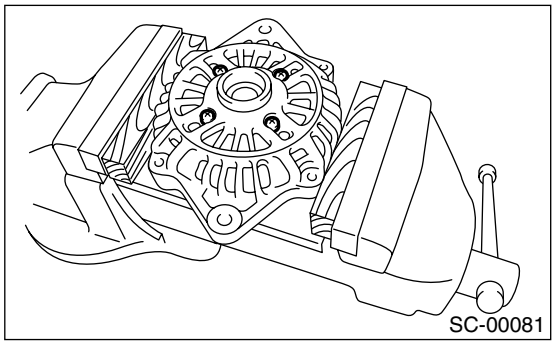


CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.

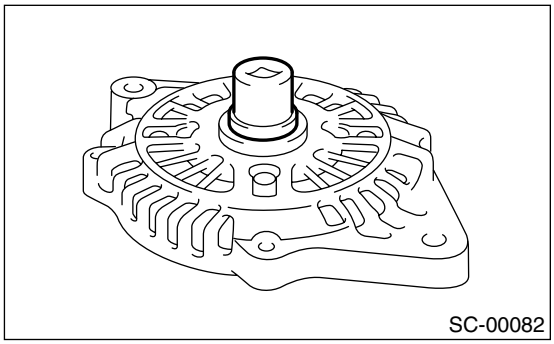


(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Remove the ball bearing as follows.
(1) Remove the bolt, and then remove the bearing retainer.

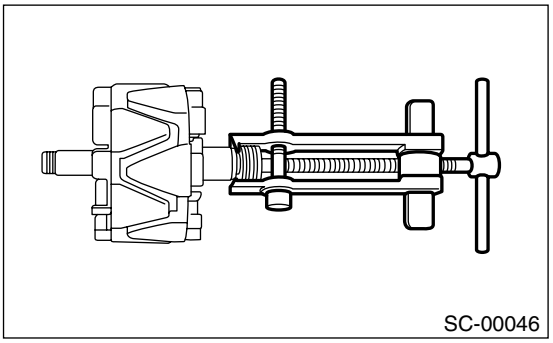


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



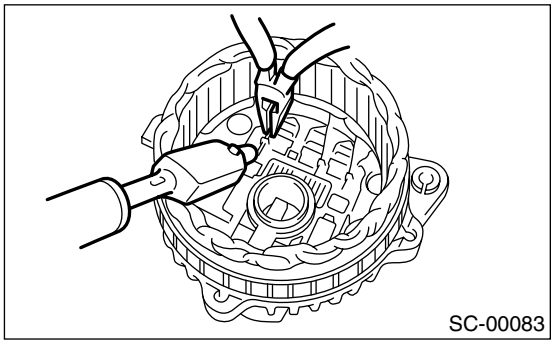
(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.

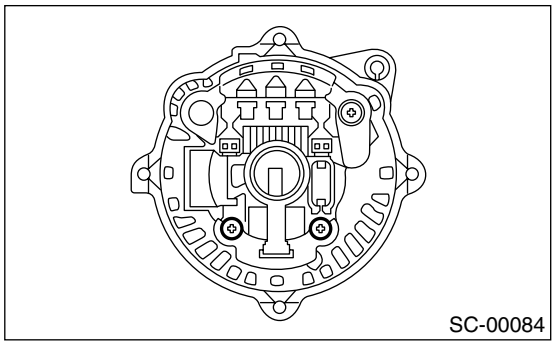


7) Unsolder connection between rectifier and stator coil to remove the stator coil.

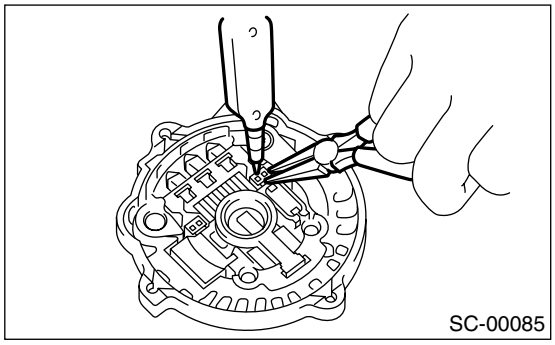
CAUTION:
Do not allow the 180 — 270 W solding bit to contact the terminals for more than 5 seconds at a time because the rectifier cannot withstand heat very well.



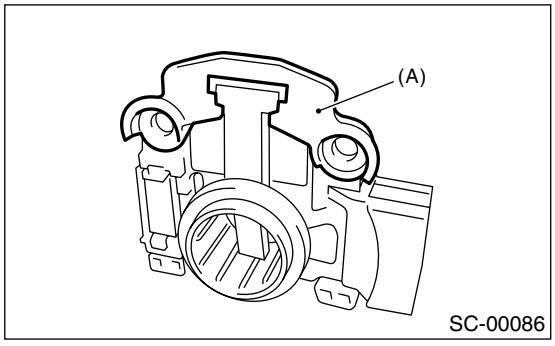
8) Remove the IC regulator as follows.
(1) Remove the screws which secure IC regulator to rear cover.


SC-00084

(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.


SC-00085

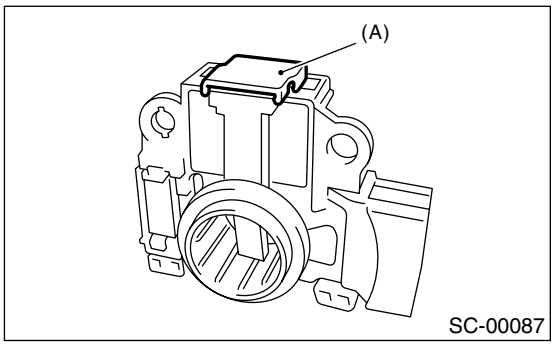
9) Remove the brush as follows.
(1) Remove cover A.



SC-00086

(A) Cover A

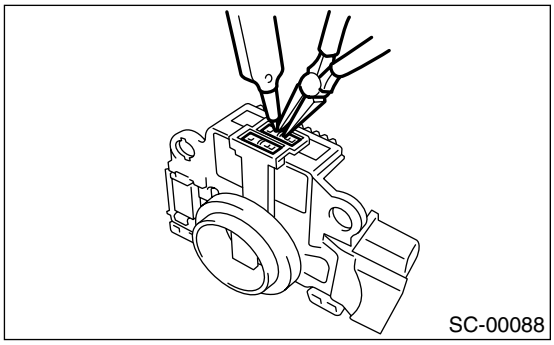
(2) Remove the cover B.



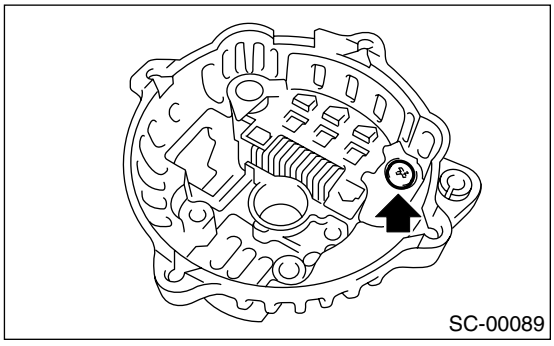
SC-00087

(A) Cover B

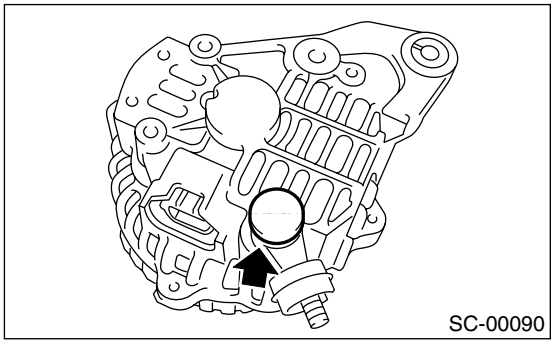
(3) Separate the brush from connection to remove.


SC-00088

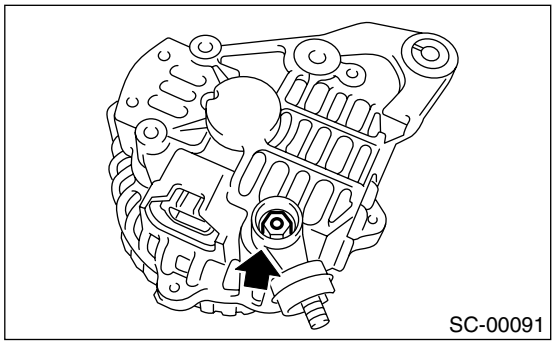
10) Remove the rectifier as follows.
(1) Remove the bolts which secure the rectifier.


SC-00089

(2) Remove the cover of terminal B.


SC-00090

(3) Remove the nut of terminal B, and then remove the rectifier.


SC-00091

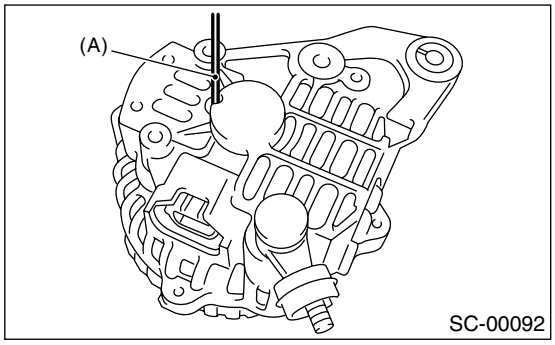
D: ASSEMBLY

To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



SC-00092

(A) Wire

2) Install the ball bearing.

(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.

(2) Press the ball bearing into the specified position using a press.

(3) Install the bearing retainer.

3) Press the bearing (rear side) into the rotor shaft using a press to install.

4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

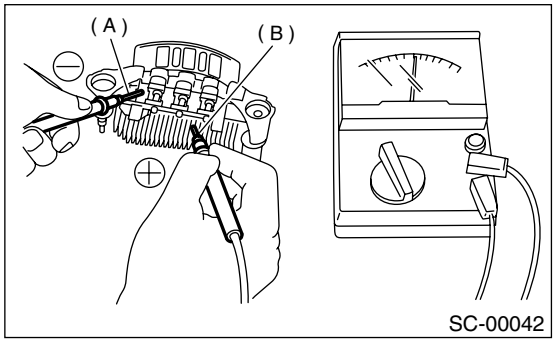
E: INSPECTION

1. DIODE

CAUTION:
Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode

Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.

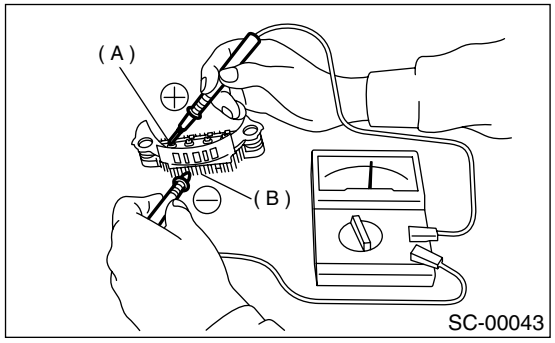


SC-00042

(A) Diode lead
(B) Heat sink (Positive side)

2) Checking negative diode

Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



SC-00043

(A) Diode lead
(B) Heat sink (Negative side)

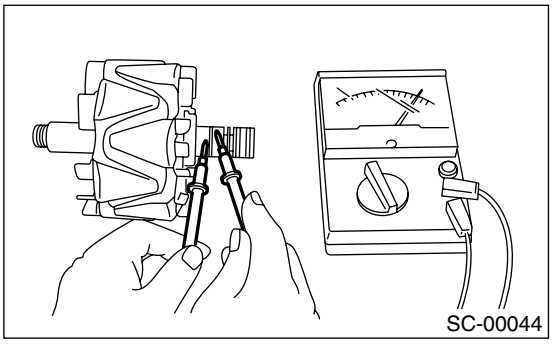
2. ROTOR

1) Slip ring surface
Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Slip ring outer diameter
Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

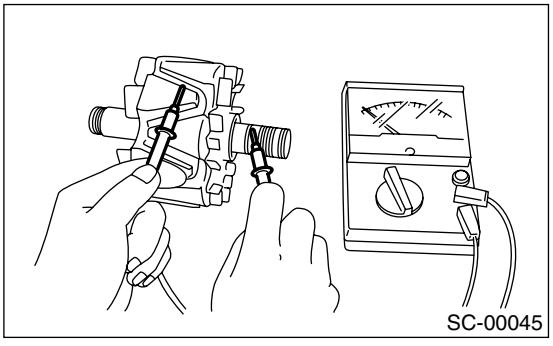
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test
Check the resistance between slip rings using circuit tester.
If the resistance is not within specification, replace the rotor assembly.

Specified resistance:
Approx. 2.0 — 2.4 Ω



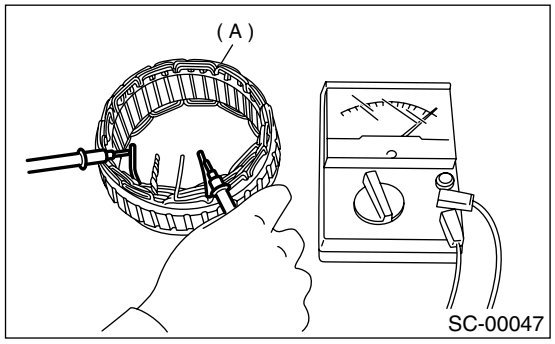
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)
Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

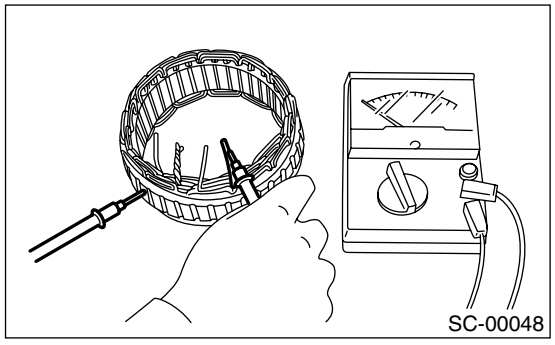
3. STATOR

1) Continuity test
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

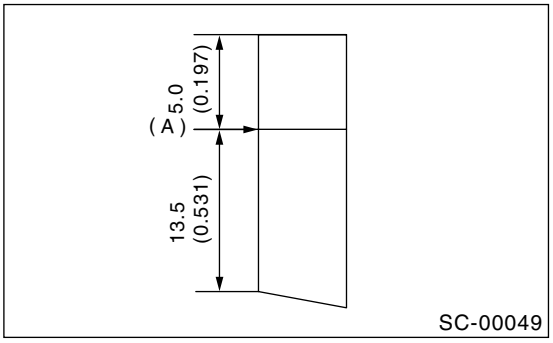
2) Insulation test
Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



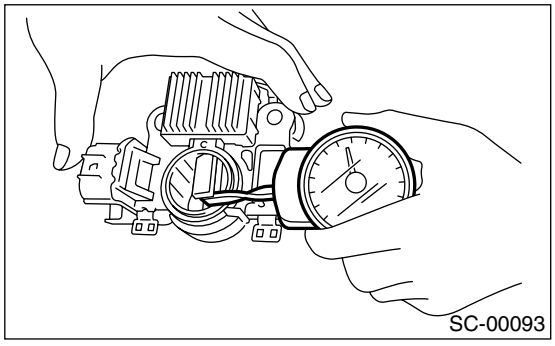
4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

Brush length:
Standard
18.5 mm (0.728 in)
Service limit
5.0 mm (0.197 in)



2) Checking brush spring for proper pressure
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



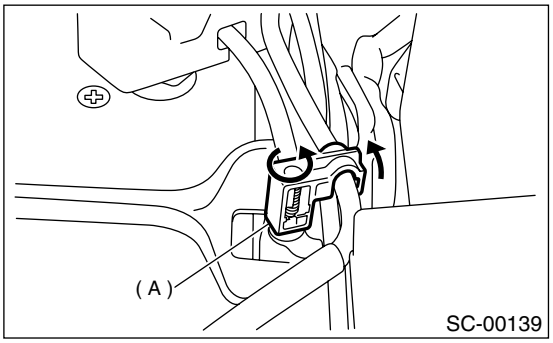
5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

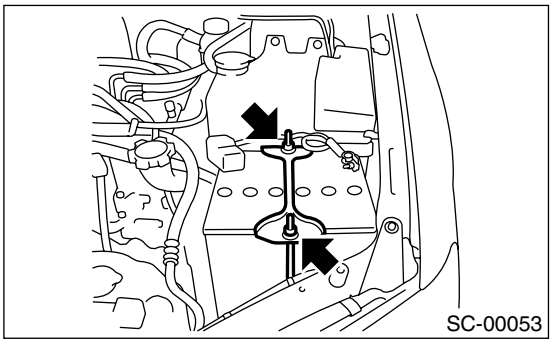
4. Battery

A: REMOVAL

1) Remove battery cable holder (A) from battery rod.



2) Disconnect the positive (+) cable after disconnecting the negative (–) cable of battery.
3) Remove flange nuts from battery rods and take off battery holder.



4) Remove battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:
• Clean battery cable terminals and apply grease to prevent corrosion.
• Connect the positive (+) cable of battery and then the negative (–) cable of the battery.

C: INSPECTION

WARNING:
• Electrolyte has toxicity; be careful handling the fluid.
• Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.
• Batteries produce explosive gases. Keep sparks, flame, cigarettes away.
• Ventilate when charging or using in enclosed space.
• For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
• Do not let battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
• To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on the battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

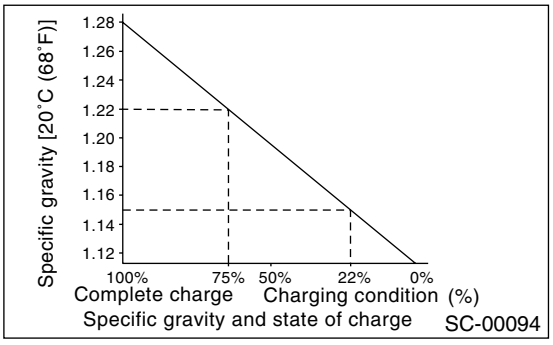
2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

S_{20} = St + 0.0007 × (t – 20)
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St : Measured specific gravity
t : Measured temperature (°C)
Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in the battery will disclose the state of charge of the battery. The relation between the specific gravity and the state of charge is as shown in figure.

D: MEASUREMENT

WARNING:
Do not bring an open flame close to the battery at this time.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
• Be careful since battery electrolyte overflows while charging the battery.
• Observe instructions when handling battery charger.
• Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)
*: Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
Never use more than 10 amperes when charging the battery because that will shorten battery life.

MEMO:

ENGINE (DIAGNOSTICS)

EN(H6DO)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H6DO)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H6DO)-75, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).**	Does CHECK ENGINE malfunction indicator lamp illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(H6DO)-382, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read DTC on the Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(H6DO)-61, Engine Malfunction Indicator Lamp (MIL).>
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6DO)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: Carry out the basic check, only when DTC about automatic transmission is shown on display. <Ref. to EN(H6DO)-50, Read Diagnostic Trouble Code.> 2) Repair the trouble cause. 3) Perform the clear memory mode. <Ref. to EN(H6DO)-58, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to EN(H6DO)-51, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". NOTE: <Ref. to EN(H6DO)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When trouble code about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to 4AT-31, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-32, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-31, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-32, Differential Gear Oil.>
5) Stall test <Ref. to 4AT-34, Stall Test.>
6) Line pressure test <Ref. to 4AT-36, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to 4AT-38, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to 4AT-35, Time Lag Test.>
9) Road test <Ref. to 4AT-33, Road Test.>
10) Shift characteristics <Ref. to 4AT-38, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine no.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin no.			miles
Weather	❏ Fine ❏ Cloudy ❏ Rainy ❏ Snowy ❏ Various/Others:		
Outdoor temperature	°F (°C)		
	❏ Hot ❏ Warm ❏ Cool ❏ Cold		
Place	❏ Highway ❏ Suburbs ❏ Inner city ❏ Uphill ❏ Downhill ❏ Rough road ❏ Others:		
Engine temperature	❏ Cold ❏ Warming-up ❏ After warming-up ❏ Any temperature ❏ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❏ Not affected ❏ At starting ❏ While idling ❏ At racing ❏ While accelerating ❏ While cruising ❏ While decelerating ❏ While turning (RH/LH)		
Headlight	❏ ON/❏ OFF	Rear defogger	❏ ON/❏ OFF
Blower	❏ ON/❏ OFF	Radio	❏ ON/❏ OFF
A/C compressor	❏ ON/❏ OFF	CD/Cassette	❏ ON/❏ OFF
Cooling fan	❏ ON/❏ OFF	Car phone	❏ ON/❏ OFF
Front wiper	❏ ON/❏ OFF	CB	❏ ON/❏ OFF
Rear wiper	❏ ON/❏ OFF		

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ VDC warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes/❑ No • Indicator position of fuel gauge: • Lack of gasoline has been occured: ❑ Yes/❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes/❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes/❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes/❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes/❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes/❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes/❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:
• All Airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage Airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

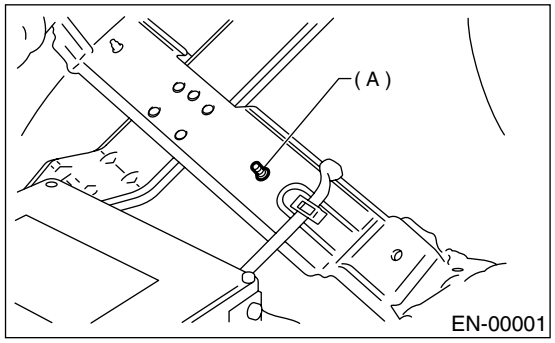
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing ECM from the located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

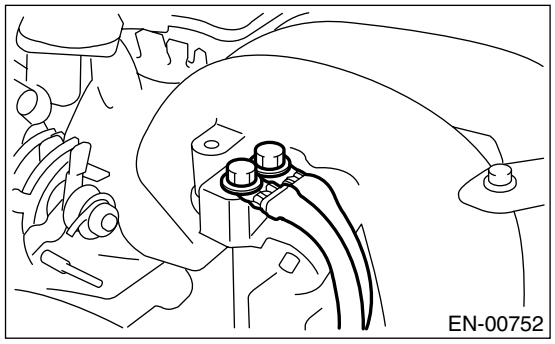
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.

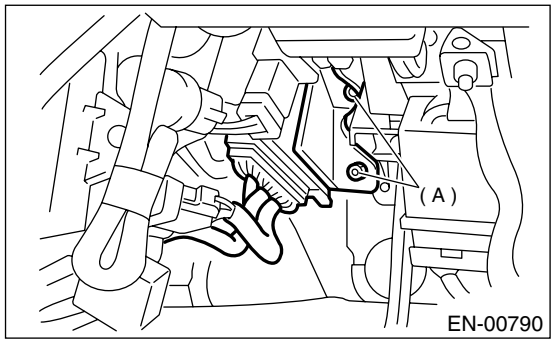


(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT vehicles, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
17) On ABS vehicle, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

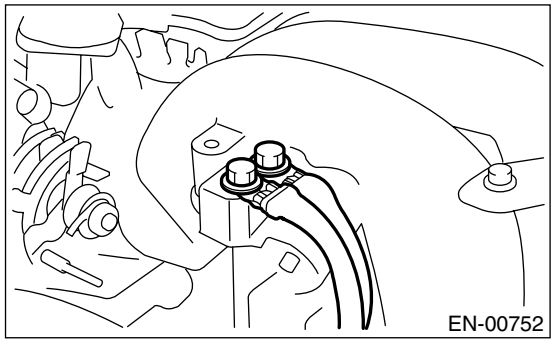
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, MIL illuminates. At the same time of the MIL illumination or blinking, a diagnostic trouble code (DTC) and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, MIL is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting OBD-II vehicles, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

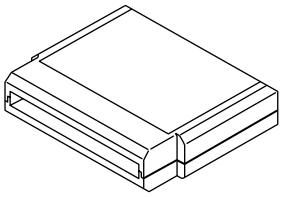
2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

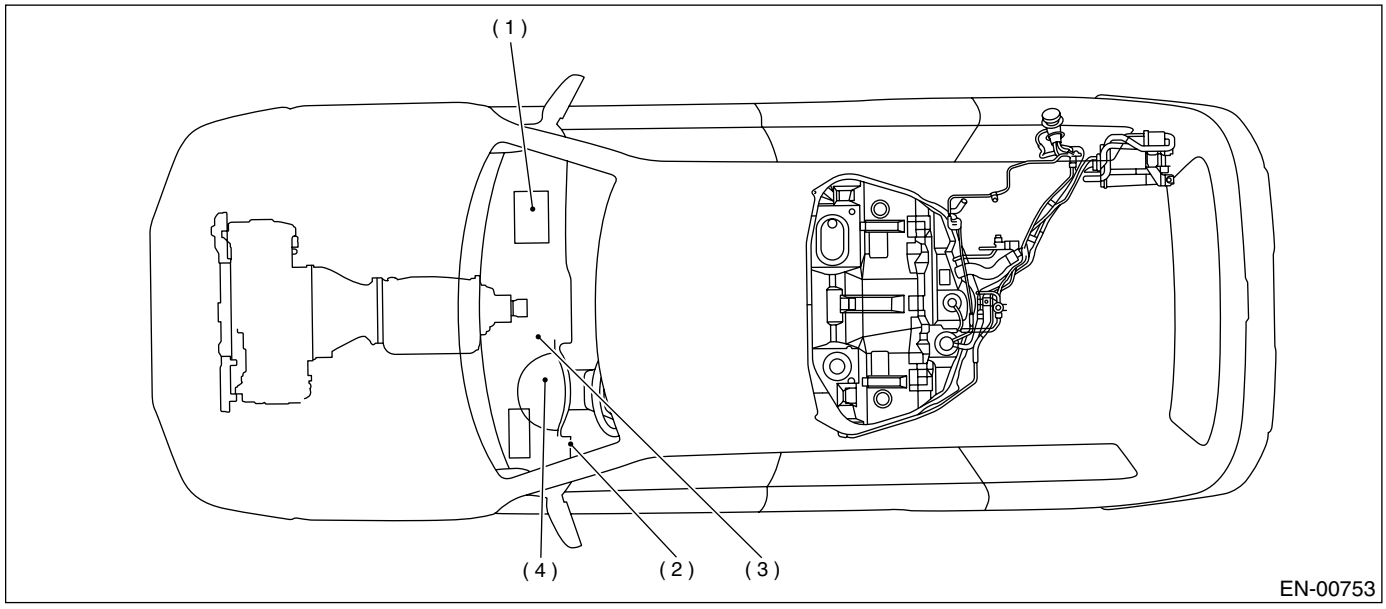
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

4. Electrical Components Location

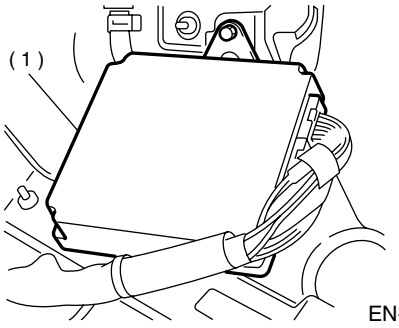
A: LOCATION

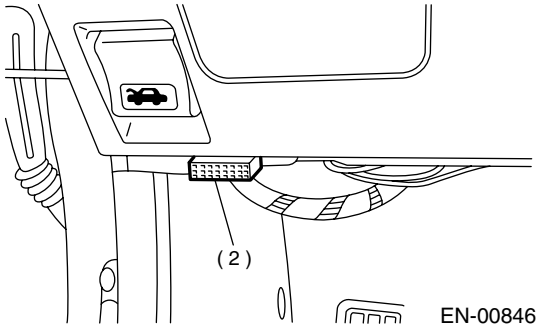
1. ENGINE

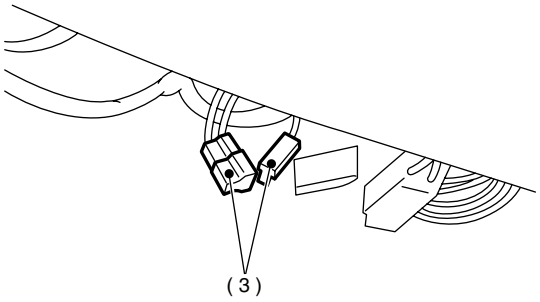
• MODULE

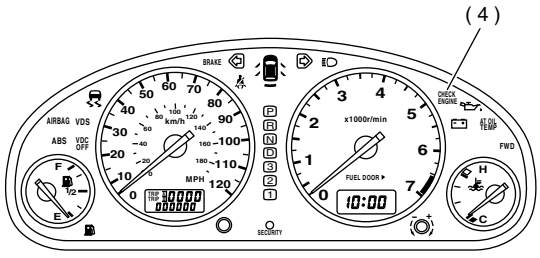


(1) Engine control module (ECM)
(2) Data link connector (for Subaru Select Monitor and OBD-II general scan tool)
(3) Test mode connector
(4) CHECK ENGINE malfunction indicator lamp (MIL)



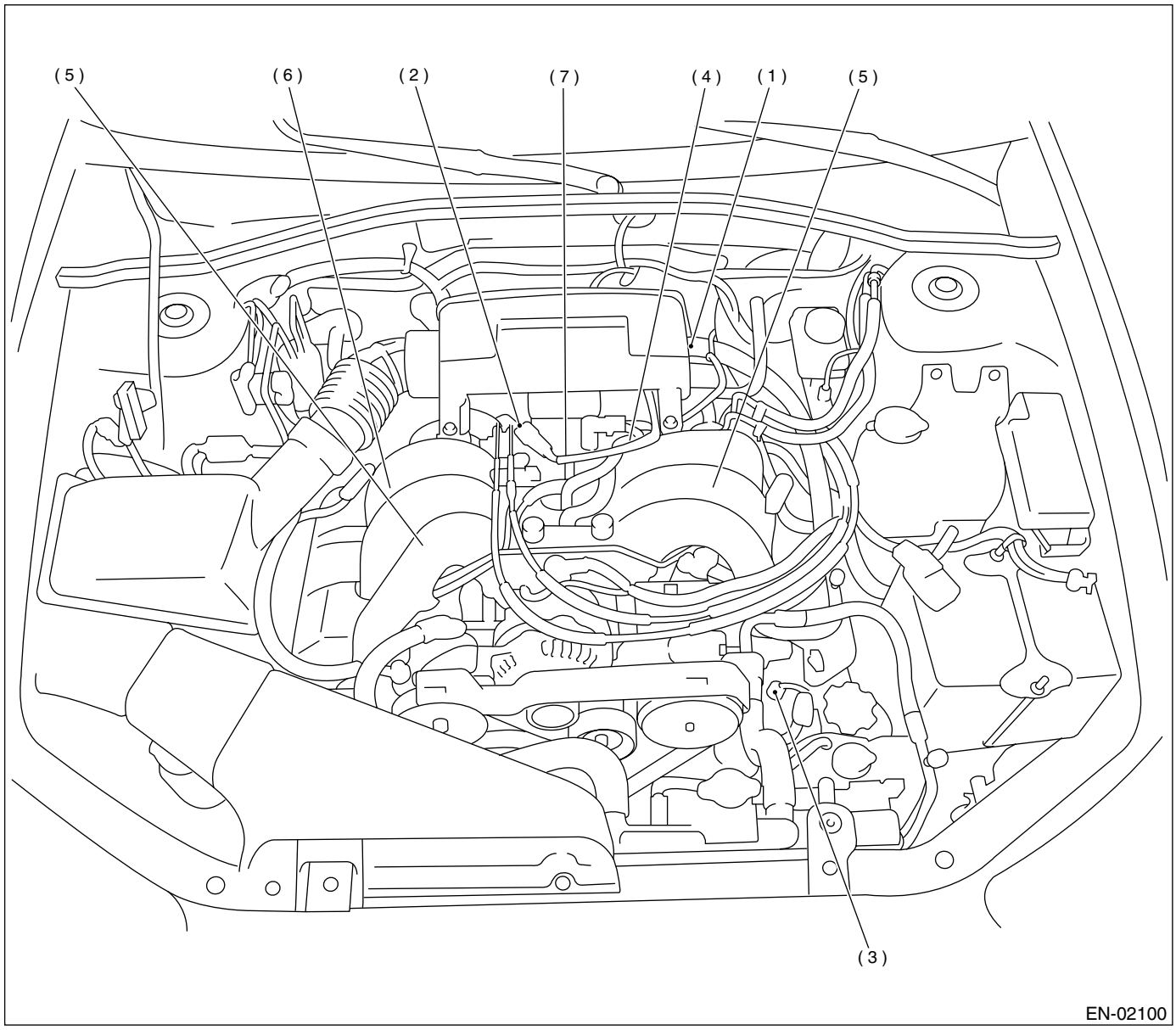




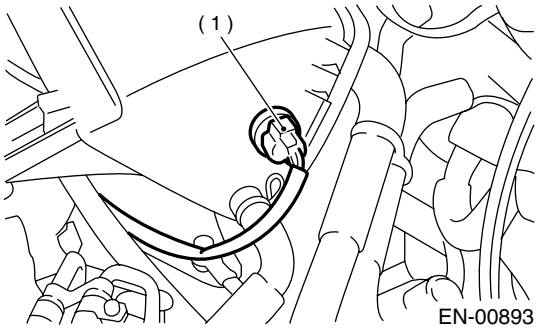


MEMO:

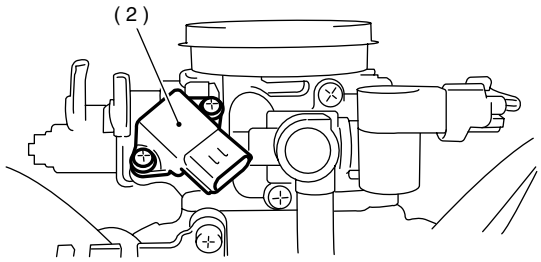
• SENSOR



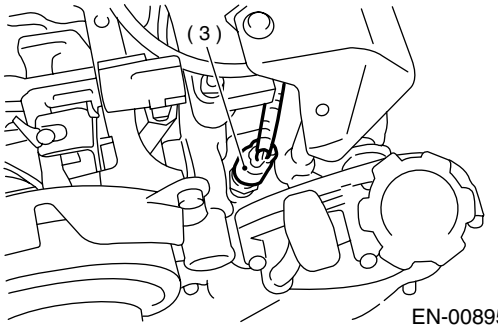
(1) Intake air temperature sensor
(2) Intake manifold pressure sensor
(3) Engine coolant temperature sensor
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor



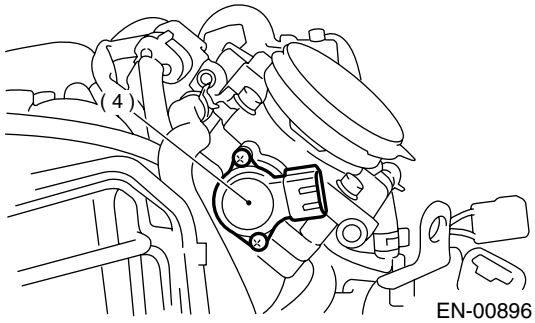
EN-00893



EN-00894



EN-00895



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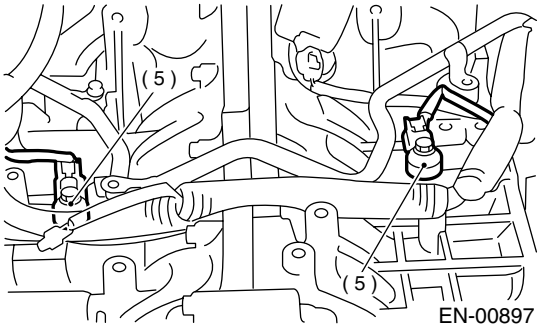

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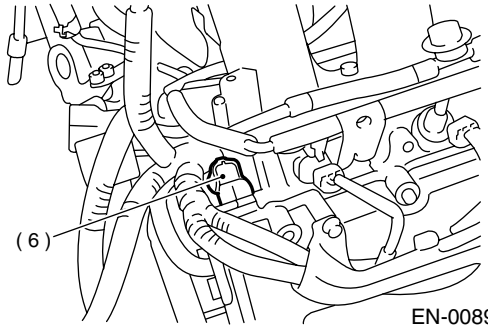
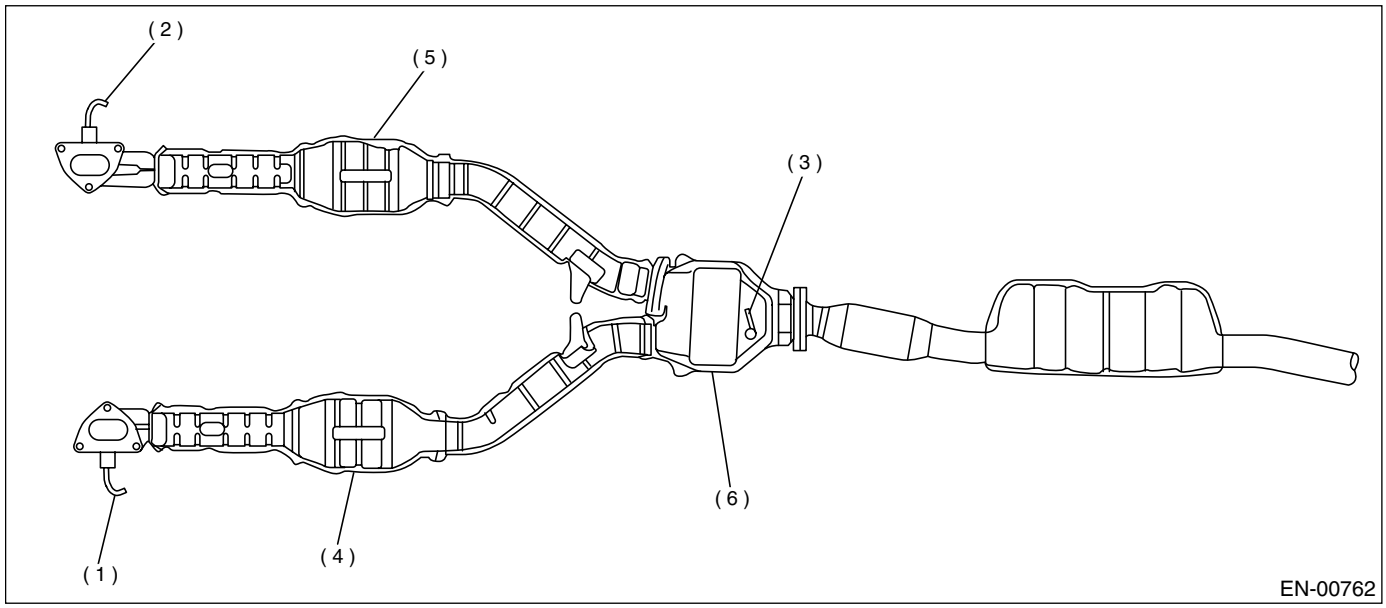
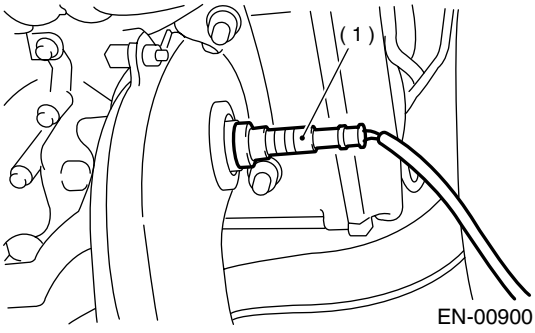


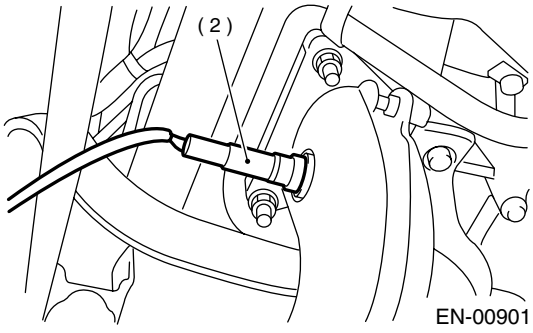
EN-00898

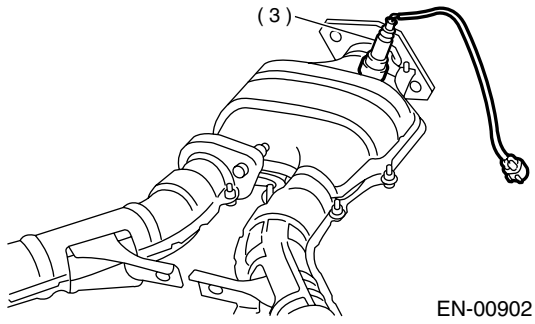
EN-00899

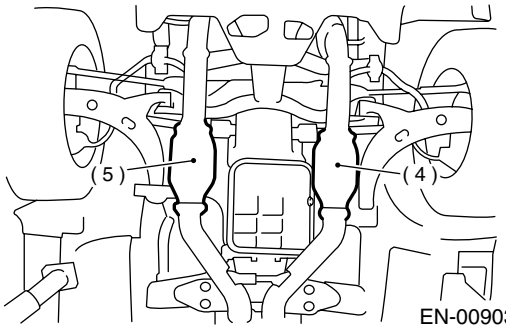


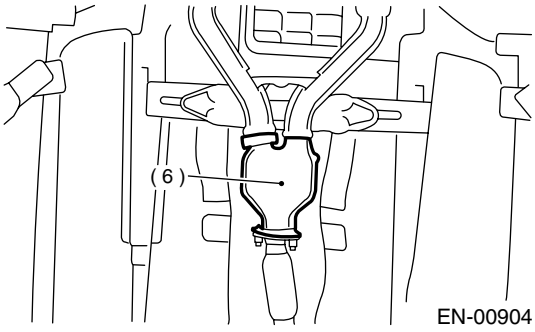
(1) Front oxygen (A/F) sensor (LH)
(2) Front oxygen (A/F) sensor (RH)
(3) Rear oxygen sensor
(4) Front catalytic converter (LH)
(5) Front catalytic converter (RH)
(6) Rear catalytic converter

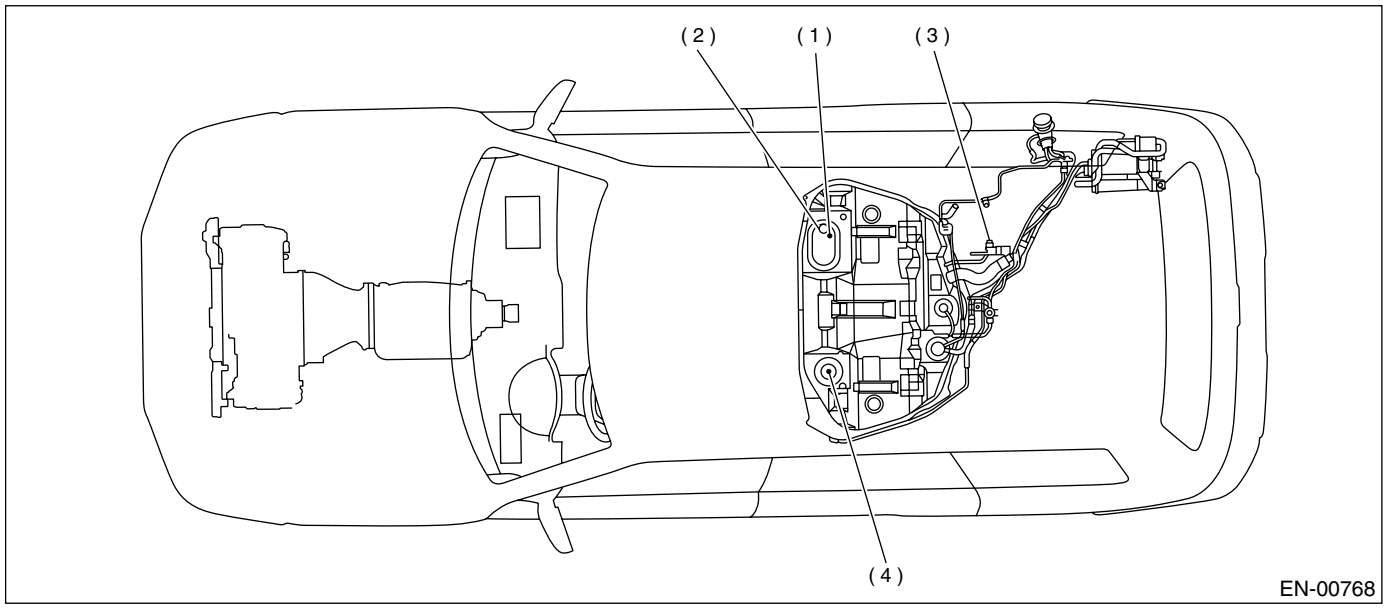




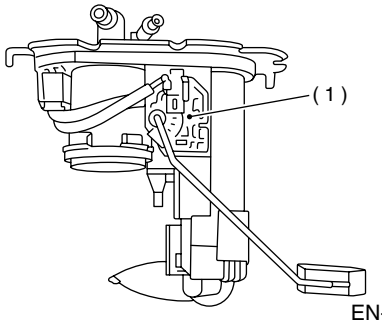


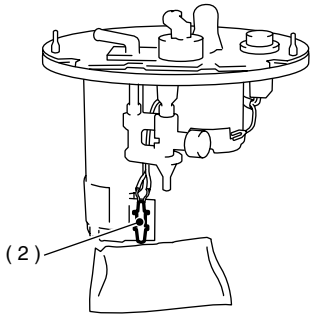


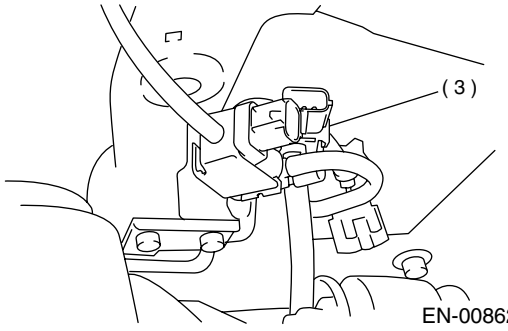


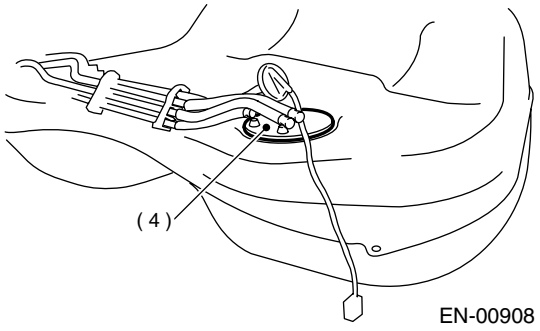


(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor

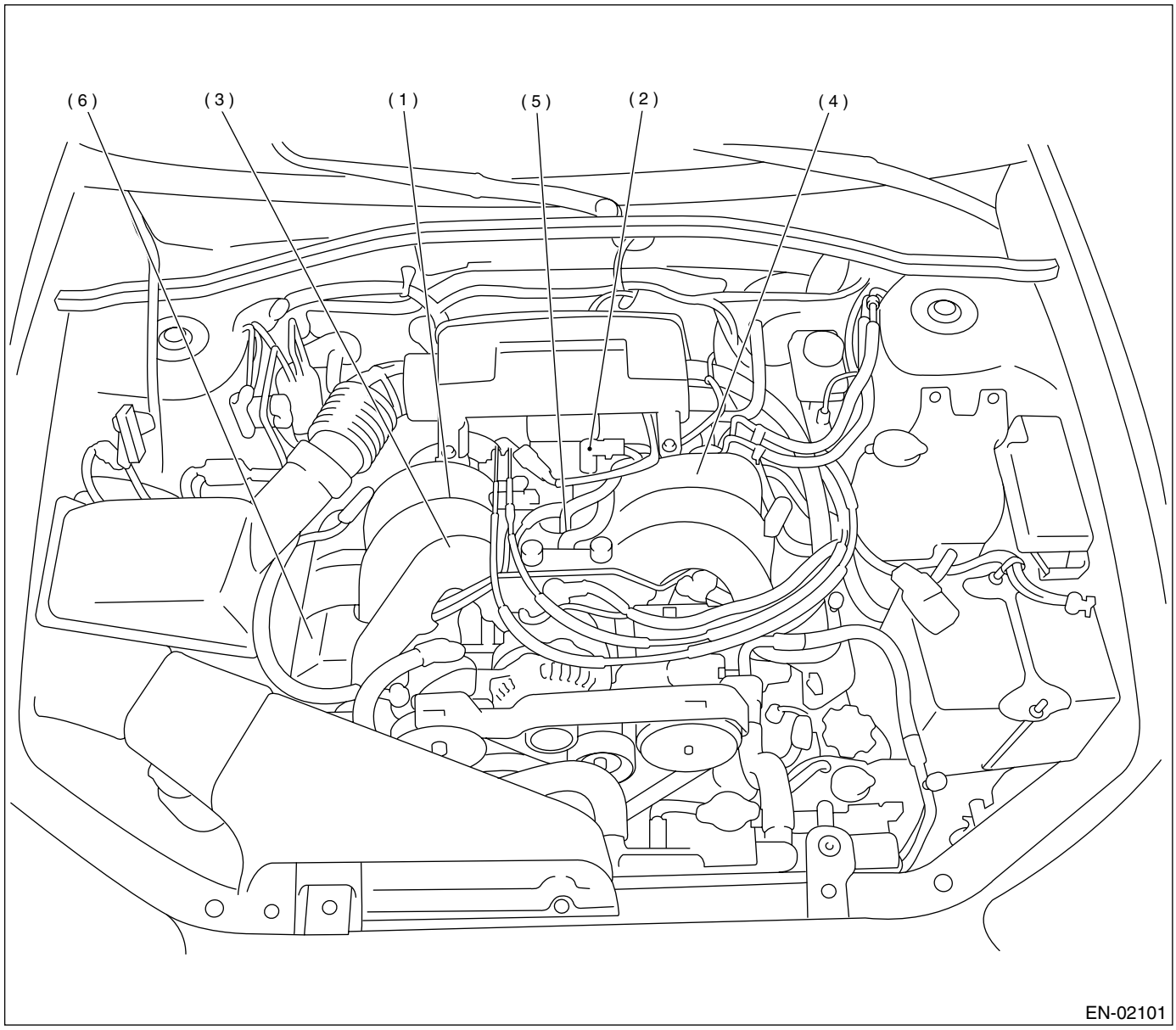




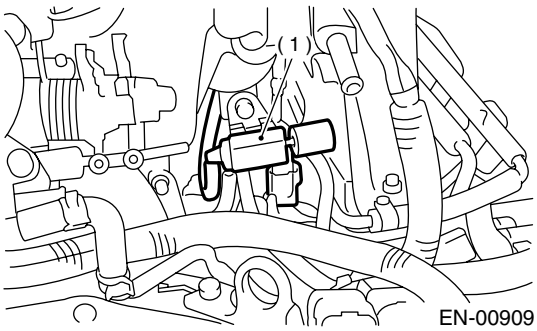


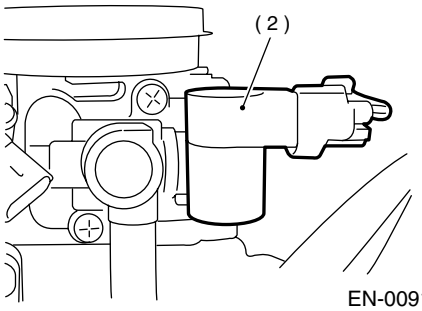


• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



(1) Induction control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) EGR solenoid valve
(5) Induction control valve
(6) Ignition coil & ignitor ASSY


(1)
EN-00909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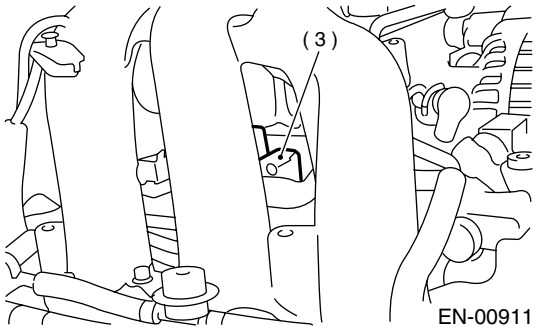
EN-00910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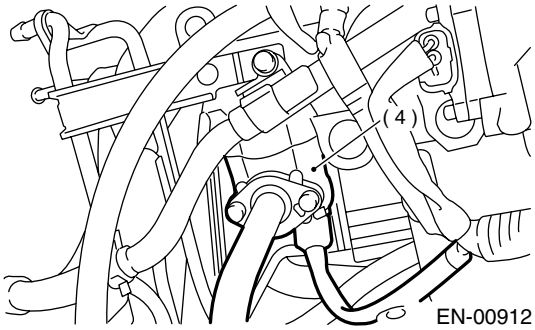
EN-00911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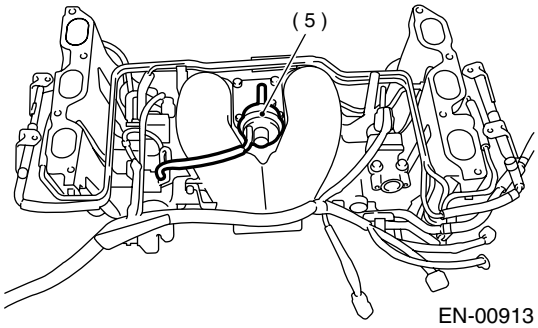
EN-00912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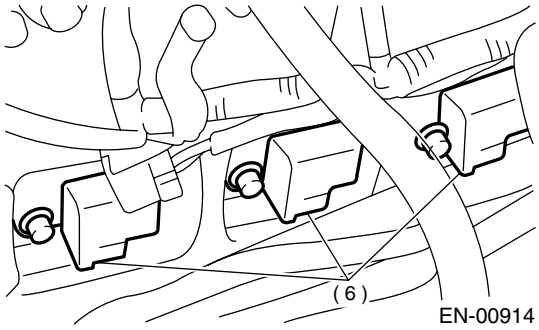
EN-00913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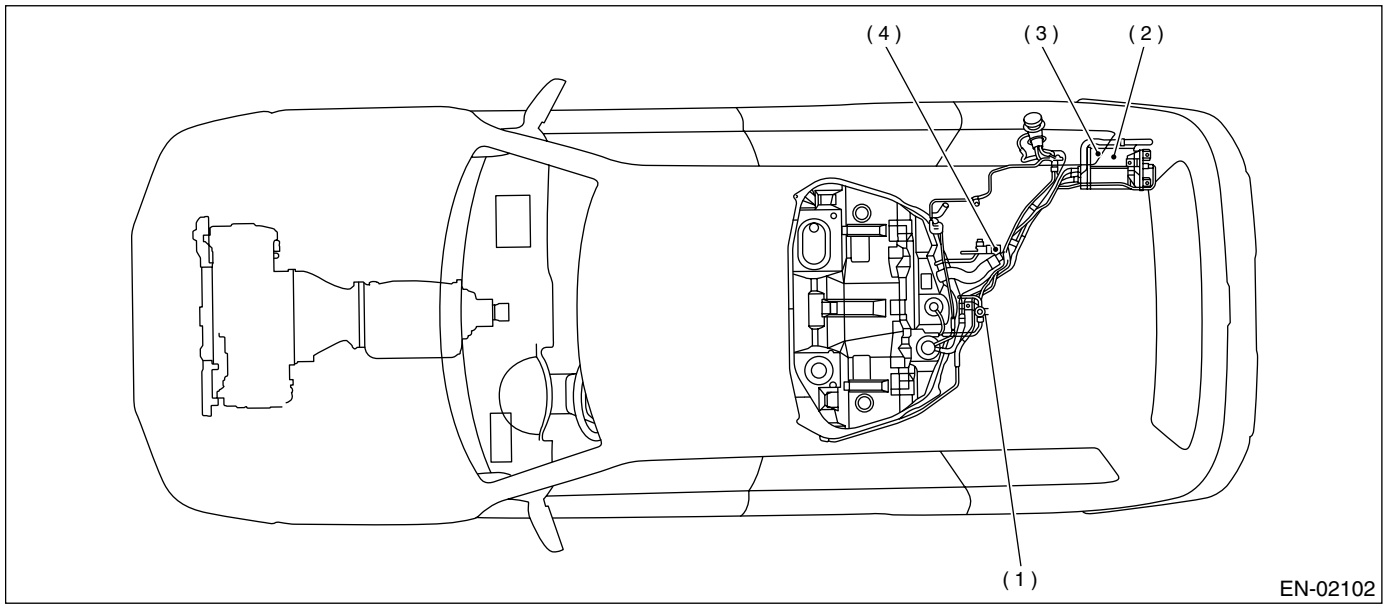
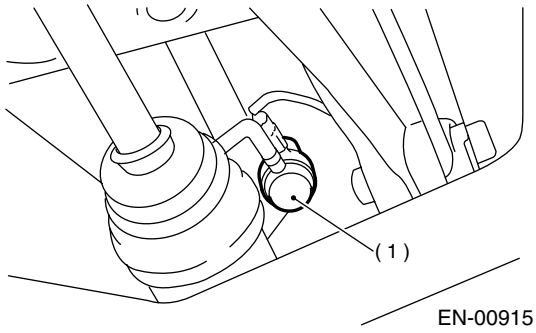
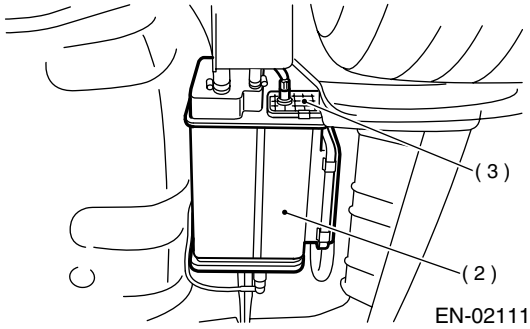
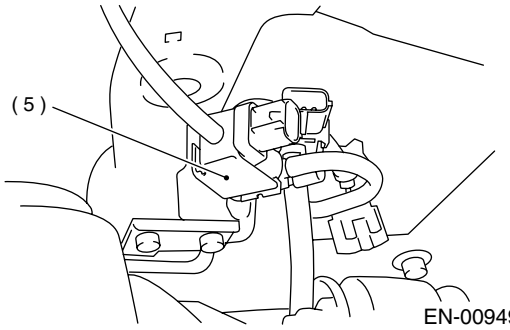
EN-00914



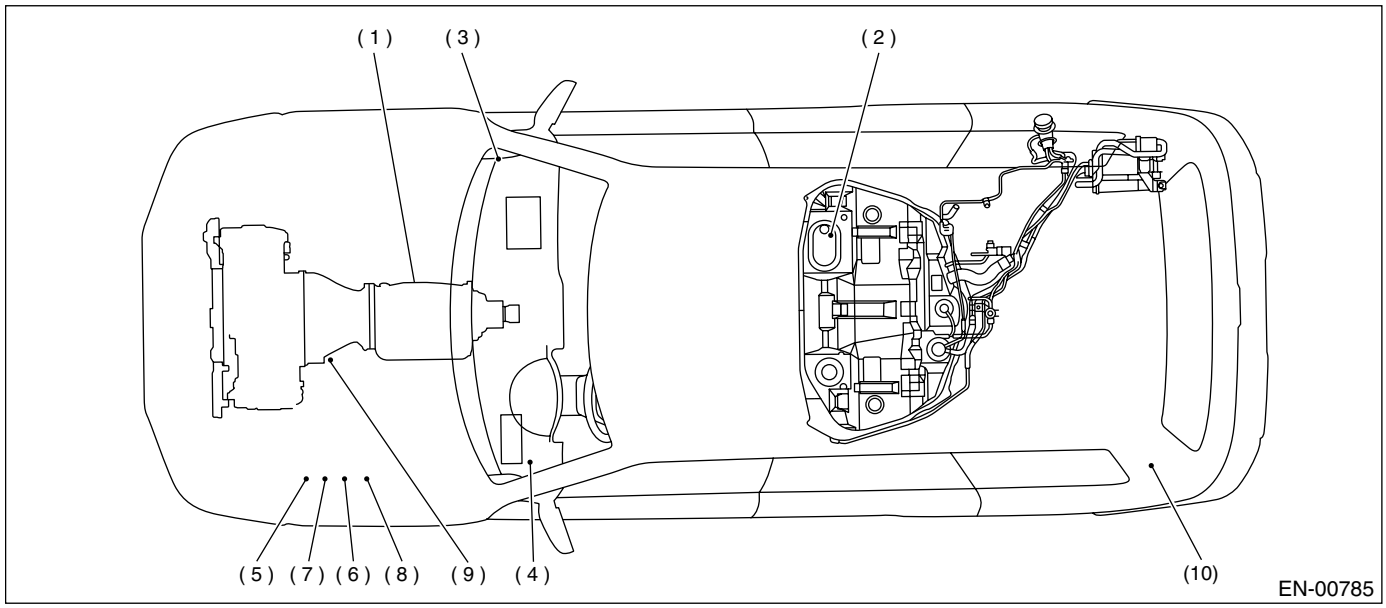
(1) Pressure control solenoid valve
(2) Canister (with drain filter)
(3) Drain valve (integrated with canister)
(4) Fuel tank sensor control valve



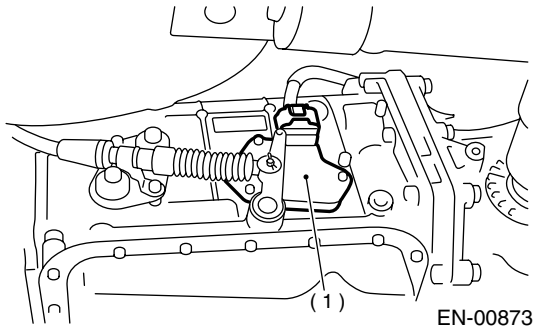




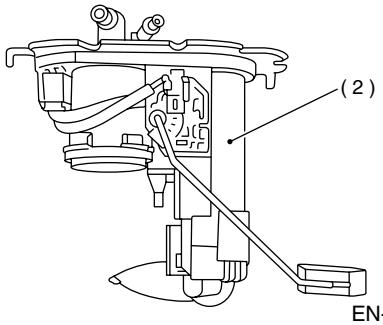
MEMO:



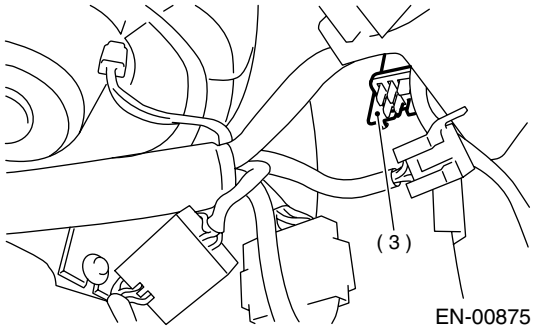
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay-1
(6) Radiator sub fan relay-1
(7) Radiator main fan relay-2
(8) Radiator sub fan relay-2
(9) Starter
(10) Fuel pump controller



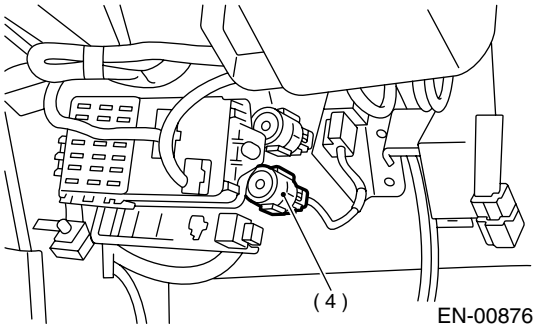
EN-00873



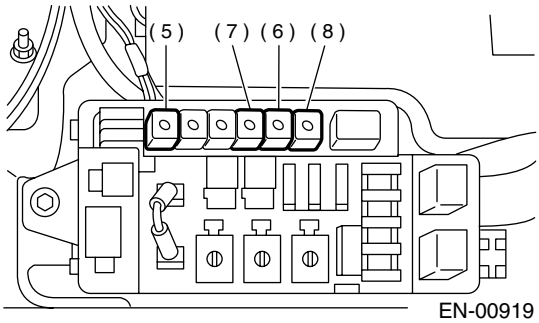
EN-00874



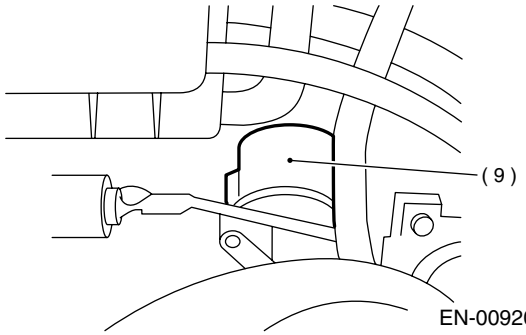
EN-00875



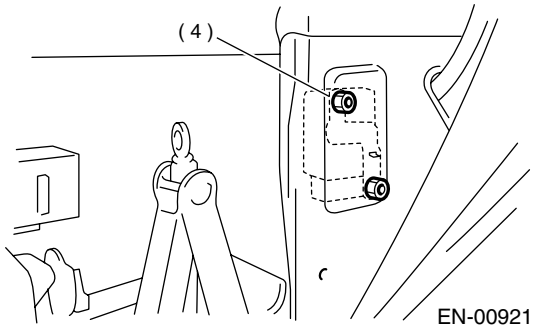
EN-00876



EN-00919



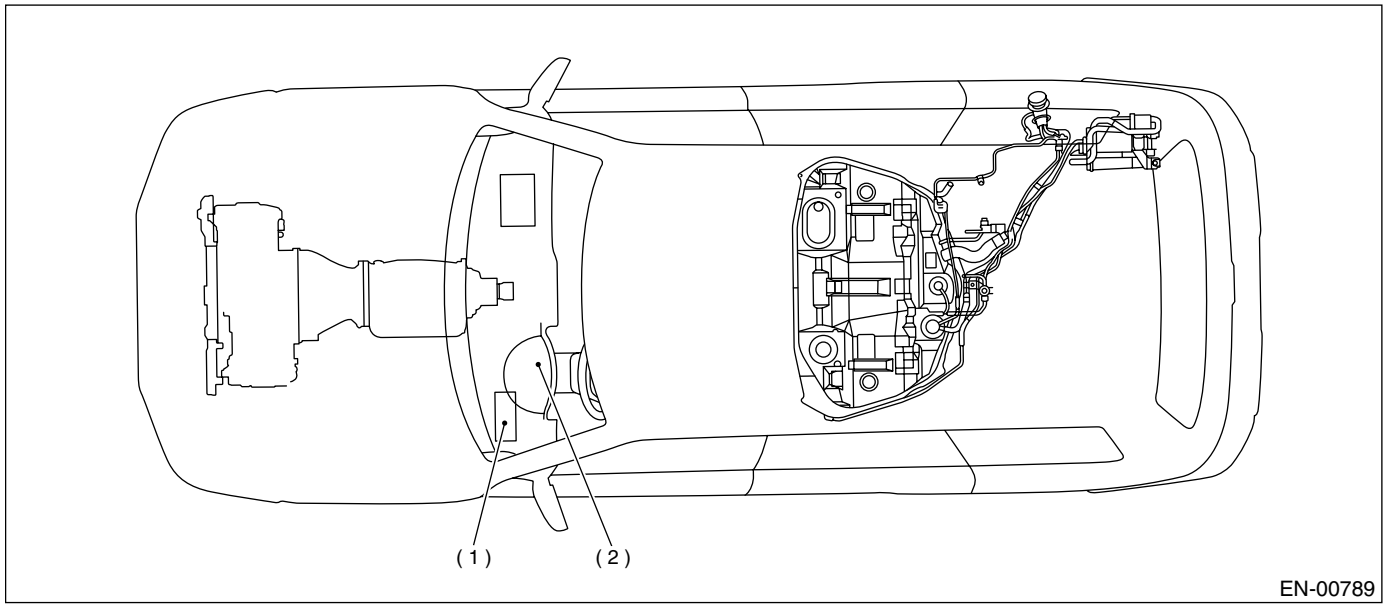
EN-00920



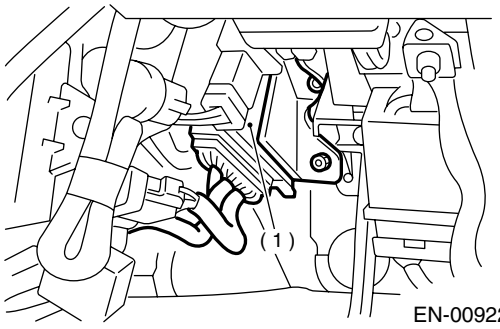
EN-00921

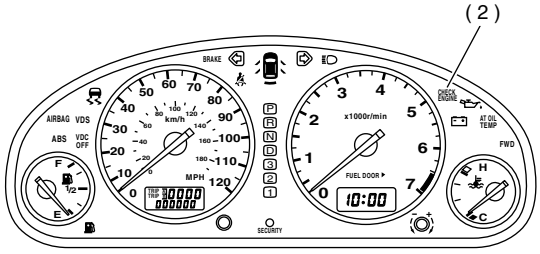
2. TRANSMISSION

• MODULE

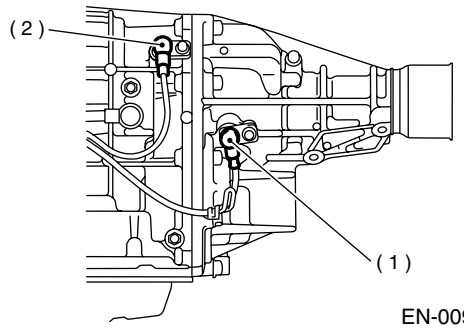


(1) Transmission Control Module (TCM)
(2) AT diagnostic indicator light

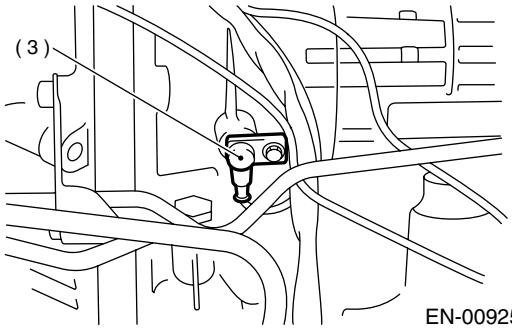




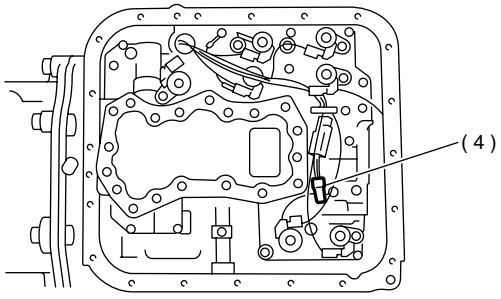
• SENSOR



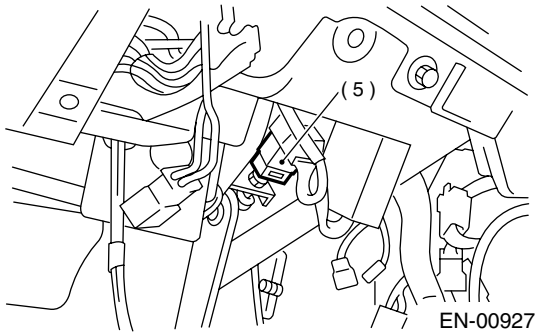
EN-00924



EN-00925



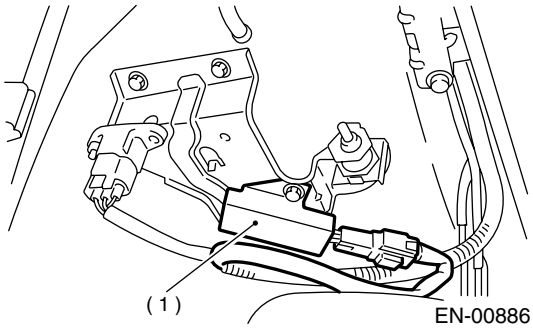
EN-00926

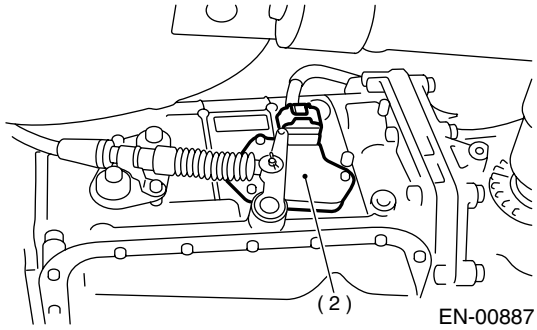


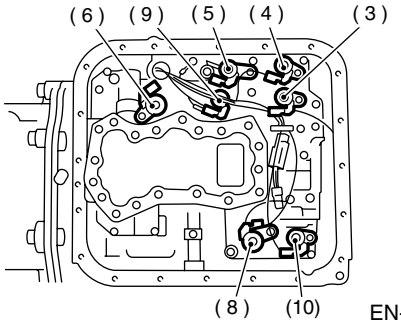
EN-00927

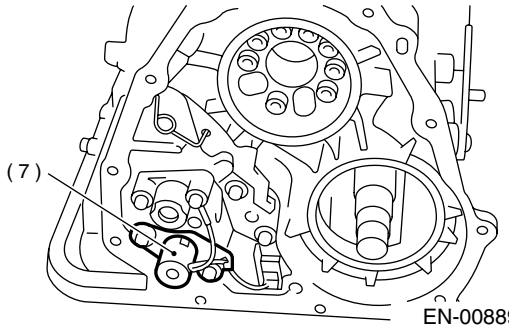
(1) Rear vehicle speed sensor
(2) Front vehicle speed sensor
(3) Torque converter turbine speed sensor
(4) ATF temperature sensor
(5) Brake light switch

• SOLENOID VALVE AND SWITCH







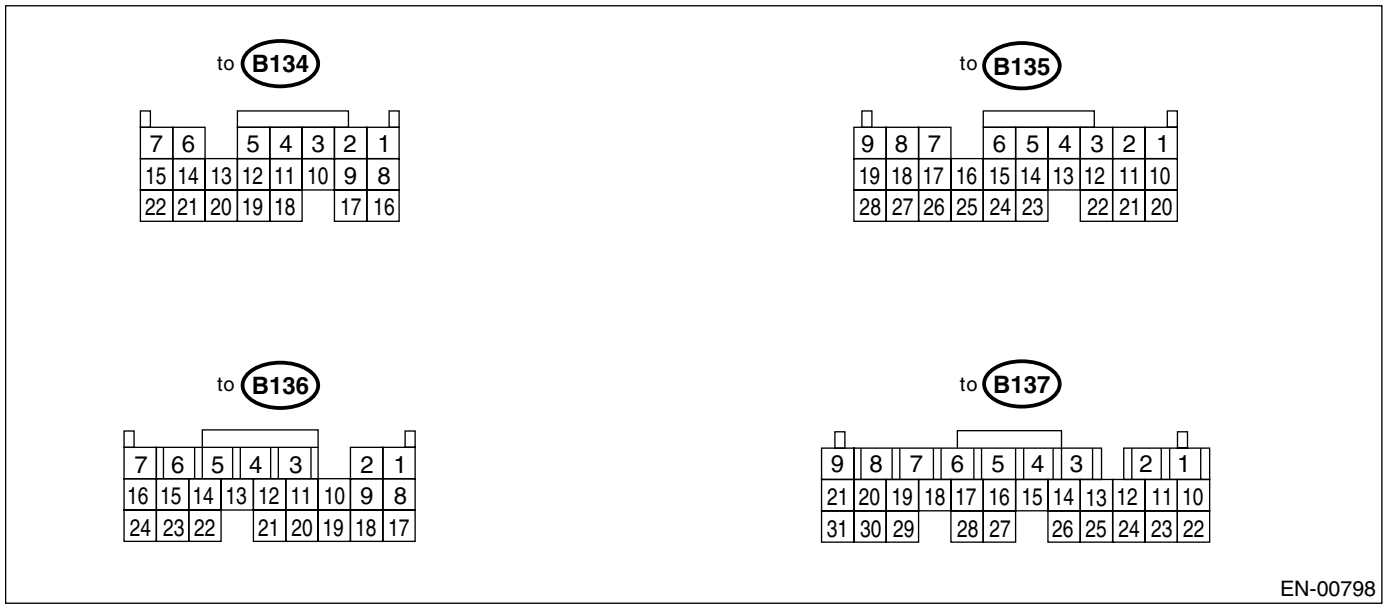


(1) Dropping resistor
(2) Inhibitor switch
(3) Shift solenoid valve 1
(4) Shift solenoid valve 2
(5) Line pressure duty solenoid
(6) Lock-up duty solenoid
(7) Transfer duty solenoid
(8) 2-4 brake duty solenoid
(9) Low clutch timing solenoid valve
(10) 2-4 brake timing solenoid valve

MEMO:

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content			Connector No.	Terminal No.	Signal (V)		Note
					Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)		B135	2	0	—	Sensor output waveform <Ref. to EN(H6DO)-30, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>
	Signal (–)		B135	11	0	0	—
	Shield		B135	21	0	0	—
Camshaft position sensor	Signal (+)		B135	1	0	—	Sensor output waveform <Ref. to EN(H6DO)-30, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>
	Signal (–)		B135	10	0	0	—
Throttle position sensor	Signal		B135	7	Fully closed: 0.3 — 0.8 Fully open: 4.2 — 4.7	0.3 — 0.8	—
	Power supply		B135	9	5	5	—
	GND (sensor)		B135	19	0	0	—
Rear oxygen sensor	Signal		B135	17	0 — 0.5	0 — 0.9	—
	Shield		B135	26	0	0	—
Front oxygen (A/F) sensor heater	Signal	LH1	B137	7	—	—	—
		LH2	B137	6	—	—	—
		RH1	B137	5	—	—	—
		RH2	B137	4	—	—	—
Rear oxygen sensor heater signal			B136	13	—	—	—
Vehicle speed signal			B134	1	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content			Connector No.	Terminal No.	Signal (V)		Note
					Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Engine coolant temperature sensor	Signal		B135	18	—	—	After warm-up the engine.
	GND (sensor)		B134	7	0	0	After warm-up the engine.
				15			
Generator signal			B137	12	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 10 — 13	Waveform
Starter switch			B134	16	0	0	Cranking: 9 — 12
A/C switch			B134	2	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch			B134	5	10 — 13	13 — 14	—
Neutral position switch			B134	8	ON: 0 OFF: 5		Switch is ON when shift is in “N” or “P” position.
Test mode connector			B134	14	5	5	When connected: 0
Knock sensor	Signal	1	B135	4	2.5	2.5	—
		2		13	2.5	2.5	—
	Shield		B135	22	0	0	—
Back-up power supply			B137	10	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply			B137	2	10 — 13	13 — 14	—
				3	10 — 13	13 — 14	—
Sensor power supply			B135	9	5	5	—
Line end check 1			B134	10	0	0	—
Ignition control	#1		B136	24	0	—	Waveform
	#2		B136	23	0	—	Waveform
	#3		B136	22	0	—	Waveform
	#4		B136	21	0	—	Waveform
	#5		B136	20	0	—	Waveform
	#6		B136	19	0	—	Waveform
Fuel injector	#1		B137	1	10 — 13	1 — 14	Waveform
	#2		B136	6	10 — 13	1 — 14	Waveform
	#3		B136	5	10 — 13	1 — 14	Waveform
	#4		B136	4	10 — 13	1 — 14	Waveform
	#5		B136	3	10 — 13	1 — 14	Waveform
	#6		B136	1	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal		B136	10	10 — 13	—	Waveform
Fuel pump controller		Signal	B135	12	—	—	—
			B136	15	—	—	—
A/C relay control			B137	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control			B137	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control			B137	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	With A/C vehicles only
Radiator fan relay 3 control			B137	24	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Self-shutoff control			B134	6	10 — 13	13 — 14	—
Malfunction indicator lamp			B137	15	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output			B136	9	—	0 — 13	Waveform

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

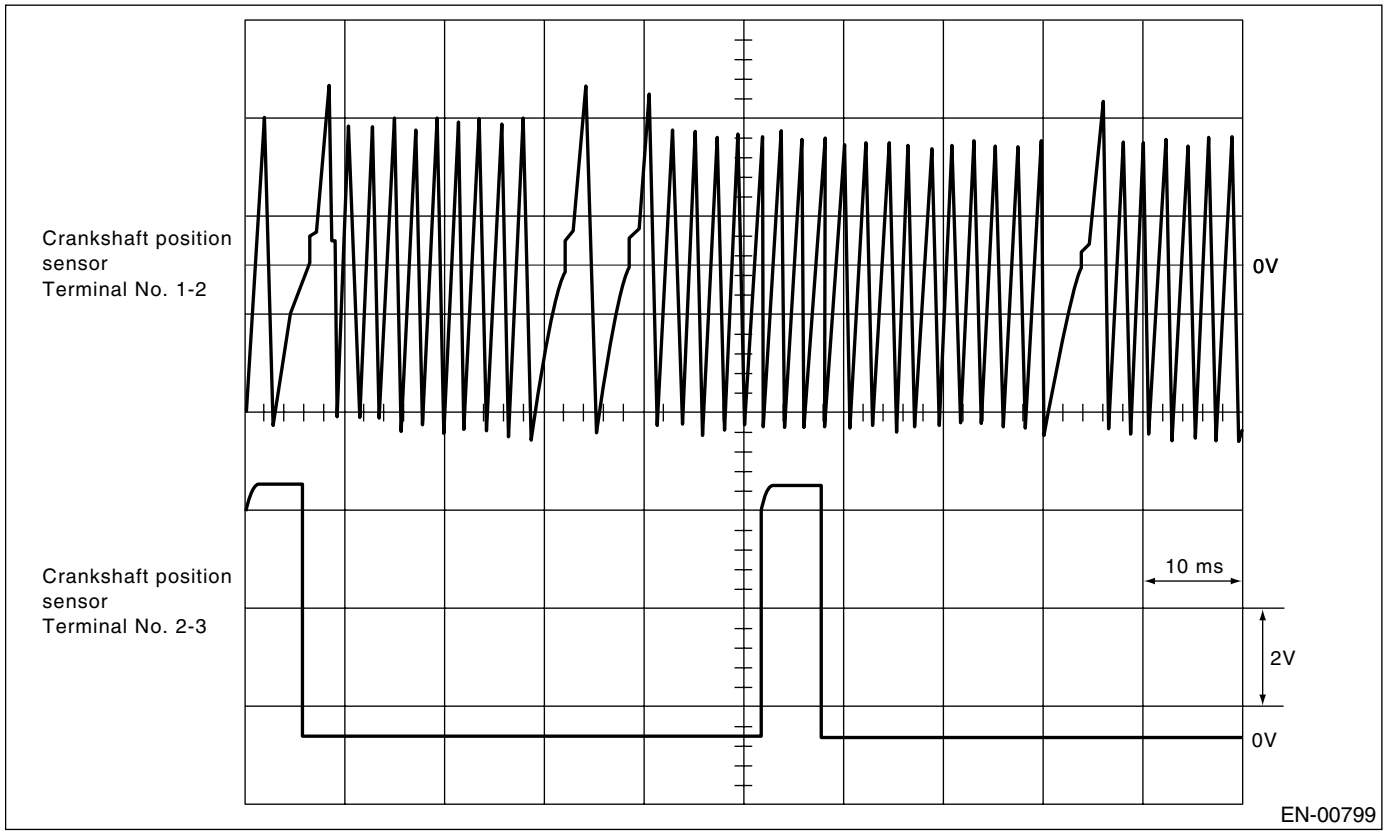
Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Torque control 1 signal		B134	19	5	5	—
Torque control 2 signal		B134	18	5	5	—
Torque control cut signal		B136	14	8	8	—
EGR solenoid valve (A–)		B137	26	10 — 13	13 — 14	—
EGR solenoid valve (B–)		B137	25	10 — 13	13 — 14	—
EGR solenoid valve (A+)		B137	14	10 — 13	13 — 14	—
EGR solenoid valve (B+)		B137	13	10 — 13	13 — 14	—
Induction control solenoid valve		B137	23	0	ON: 0 OFF: 13 — 14	—
Purge control solenoid valve		B137	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel temperature sensor		B135	6	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
Fuel tank pressure sensor	Signal	B135	15	2.3 — 2.7	2.3 — 2.7	The value obtained after the fuel filler cap was removed once and recapped.
	GND (sensor)	B134	15	0	0	—
Pressure control solenoid valve		B137	22	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Fuel tank sensor control valve		B136	7	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Drain valve		B137	11	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
A/C compressor switch		B134	13	—	—	—
A/C pressure switch		B135	23	OFF: 5	ON: 1, or less OFF: 5	—
AT diagnosis input signal		B135	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
AT load signal		B135	28	4.3 — 4.4	0.9 — 1.4	—
Small light switch		B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal RH (+)		B137	29	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal RH (–)		B137	19	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor signal LH (+)		B137	30	3.7 — 3.9	3.7 — 3.9	—
Front oxygen (A/F) sensor signal LH (–)		B137	20	2.6 — 4.4	3.4 — 3.6	—
Front oxygen (A/F) sensor shield		B137	18	0	0	—
Pressure sensor		B135	8	3.0 — 4.2	1.0 — 2.6	—
Intake air temperature sensor		B135	27	—	—	—
Power steering switch		B135	24	ON: 0 OFF: 5	ON: 0 OFF: 5	—
SSM/GST communication line		B134	21	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)		B134	15	0	0	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (injectors)		B136	8	0	0	—
GND (ignition system)		B136	18	0	0	—
GND (power supply)		B134	22	0	0	—
		B136	17	0	0	—
GND (control systems)		B134	7	0	0	—
			15	0	0	—
GND (oxygen sensor heater LH)	1	B137	21	0	0	—
	2	B137	31			
GND (oxygen sensor heater RH)	1	B137	9	0	0	—
	2	B137	8			

B: MEASUREMENT

Measure input/output signal voltage.

1. WAVEFORM



6. Engine Condition Data

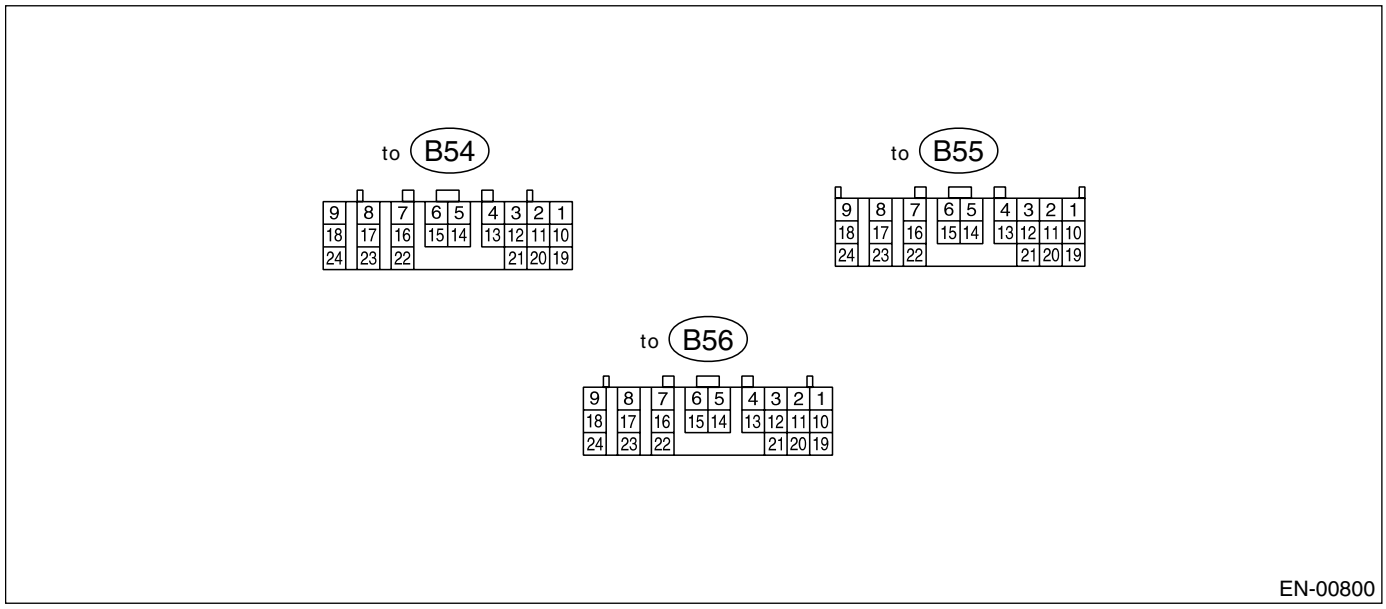
A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 4.0 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned OFF.
- All accessory switches are turned OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 16	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 16	—
		B54	24			
Inhibitor switch	“P” range switch	B55	1	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range (except “N” range)	More than 8	
	“N” range switch	B55	14	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range (except “P” range)	More than 8	
	“R” range switch	B55	3	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	More than 8	
	“D” range switch	B55	4	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	More than 8	
	“3” range switch	B55	5	Select lever in “3” range	Less than 1	—
				Select lever in any other than “3” range	More than 8	
	“2” range switch	B55	6	Select lever in “2” range	Less than 1	—
				Select lever in any other than “2” range	More than 8	
	“1” range switch	B55	7	Select lever in “1” range	Less than 1	—
				Select lever in any other than “1” range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
VDC communication signal +	B56	9	Ignition ON	(+) — (–) Plus signal	—
VDC communication signal –	B56	18		(+) — (–) Plus signal	—
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	0.3 — 0.7	—
			Throttle fully open.	4.3 — 4.9	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.5 — 0.8	275 — 375
Rear vehicle speed sensor	B55	24	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	18	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range) 4	
Torque converter turbine speed sensor	B55	8	Engine idling after warm-up. (D range)	0	450 — 650
			Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal	B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1← →More than 4	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set (SET lamp ON)	Less than 1	—
			When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B55	10	Ignition switch ON	8	—
Intake manifold pressure signal	B54	10	Engine idling after warm-up.	1.2 — 1.8	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	

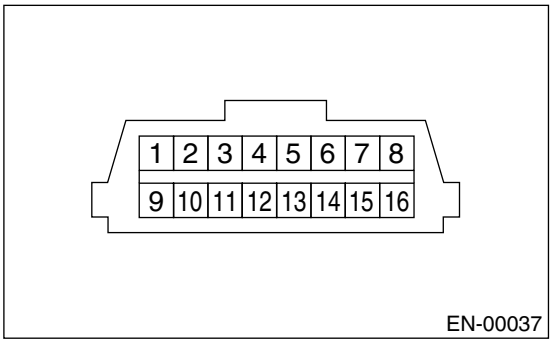
Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Dropping resistor	B54	8	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	6	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 4.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line 1	B54	19	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	20			
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

8. Data Link Connector

A: NOTE

1) This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.
2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



(A) Data link connector

Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	K line of ISO 9141 CARB
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	—	14	Blank
7	Blank	15	Blank
8	—	16	Blank

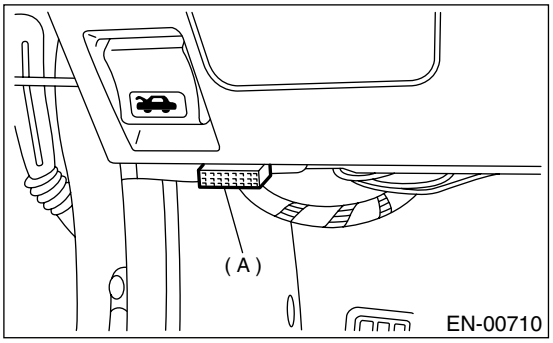
*: Circuit only for Subaru Select Monitor

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to the data link connector (A) located in the lower portion of the instrument panel (on the driver's side).



(A) Data link connector

3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information
Read out data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and MIL status	ON/OFF and number
03	Fuel system control status	%
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate from pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 1	V and %
28	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
1C	On-board diagnosis system	—

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim (Bank 1)	%
07	Long term fuel trim (Bank 1)	%
08	Short term fuel trim (Bank 2)	%
09	Long term fuel trim (Bank 2)	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H6DO)-50, Read Diagnostic Trouble Code.>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

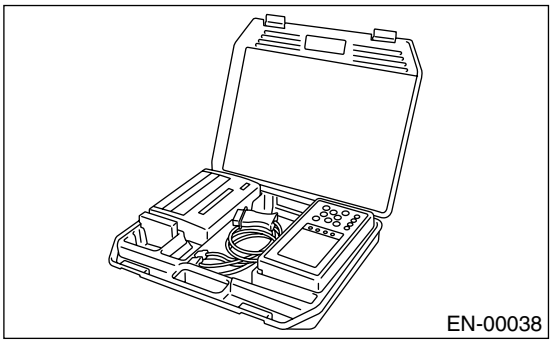
NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

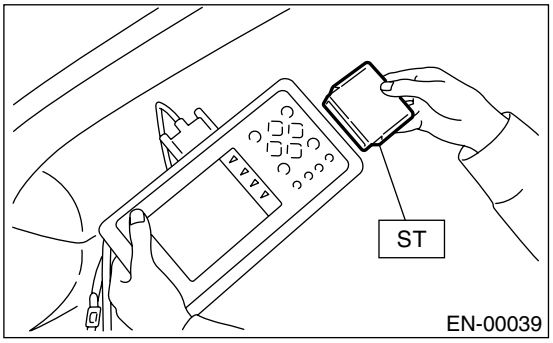
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

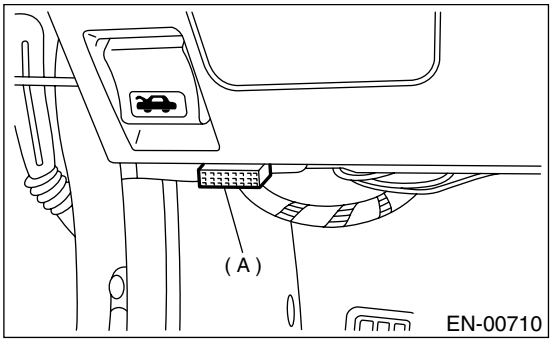
1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).

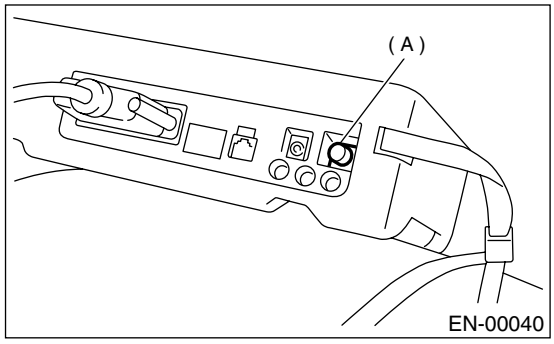


(A) Data link connector

(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using Subaru Select Monitor, call up diagnostic trouble code(s) and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H6DO)-50, Read Diagnostic Trouble Code.>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to EN(H6DO)-50, Read Diagnostic Trouble Code.>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width 1	Fuel Injection #1 Pulse	ms
Injection pulse width 2	Fuel Injection #2 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal 1	A/F Sensor #1	—
Front oxygen (A/F) sensor output signal 2	A/F Sensor #2	—
Front oxygen (A/F) sensor resistance 1	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor resistance 2	A/F Sensor #2 Resistance	Ω
Rear oxygen sensor output signal	Rear O2 Sensor	V
Short term fuel trim 1	A/F Correction #1	%
Short term fuel trim 2	A/F Correction #2	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psig
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psig
EGR control signal	No. of EGR Steps	STEP
Front oxygen (A/F) sensor 1 current	A/F Sensor #1 Current	mA
Front oxygen (A/F) sensor 2 current	A/F Sensor #2 Current	mA
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim 1	A/F Learning #1	%
Long term whole fuel trim 2	A/F Learning #2	%
Long term whole fuel trim 3	A/F Learning #3	%
Front oxygen (A/F) sensor heater current 1	A/F Heater Current 1	A
Front oxygen (A/F) sensor heater current 2	A/F Heater Current 2	A
Rear oxygen sensor heater voltage	Rear O2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psig
Fuel temperature signal	Fuel Temp.	°C or °F
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Ignition switch signal	Ignition Switch	ON or OFF

Contents	Display	Unit of measure
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioner switch signal	A/C Switch	ON or OFF
Radiator fan relay signal 1	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator fan relay signal 2	Radiator Fan Relay #2	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Control Permission Signal	ON or OFF
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF
Drain valve	Vent. Solenoid Valve	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF
Air conditioner compressor signal	A/C Compressor Signal	ON or OFF
Radiator fan relay signal 3	Radiator Fan Relay #3	ON or OFF
Induction control solenoid signal	Variable Intake Air Sol.	ON or OFF
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF

NOTE:
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For select monitor display details, refer to the following.

Engine Load
Display: 0 — 100%

The engine load is displayed. The ECM calculates the engine load via the engine speed and signals from the pressure sensor. The engine load increases when the engine speed and absolute pressure of the intake manifold increase.

Coolant Temp.
Display: –40 to 215°C (–40 to 419°F)

The coolant temperature transmitted from the engine coolant temperature sensor is displayed.

A/F Correction #1, #2 and #3
Display: –100 to 99%

Using the signal from the front oxygen (A/F) sensor, the correction value of the fuel supply amount regulated by the ECM is indicated. When the A/F is lean and when displayed value becomes 0 % or more, ECM increases the fuel. When the A/F is rich and when displayed value becomes 0 % or less, ECM decreases the fuel.

A/F Learning #1, #2 and #3
Display: –100 to 99.2%

The ECM calculates the long-term fuel trim value from the short-term fuel trim value. The long-term fuel trim value means the correction value of long-term fuel supply amount. If the displayed value is less than 0 %, the fuel system is in rich status and the ECM restricts the fuel supply (by shortening the injector pulse). If the displayed value is more than 0 %, the fuel system is in lean status and the ECM increases the fuel supply (by extending the injector pulse).

Mani Absolute Pressure
Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)

The pressure in the intake manifold is displayed. The ECM detects the pressure in the intake tube via the signal from the pressure sensor. The ECM calculates the air mass required for the engine.

Engine Speed
Display: 0 — 16,383 rpm
The engine speed transmitted from the crankshaft position sensor is detected.

Vehicle Speed
Display: 0 — 255 km/h (0 — 158 MPH)
The vehicle speed transmitted from the vehicle speed sensor is displayed.

Ignition Timing
Display: –64 to 63.5 deg.
The advanced ignition timing value is displayed. The ECM calculates the advanced ignition timing value using engine coolant temperature, engine speed, and engine load.

Intake Air Temp.
Display: 40 — 215°C (104 — 419°F)
The intake air temperature is displayed. The ECM detects the intake air temperature via the signal from the intake air temperature sensor, and corrects the ignition timing and fuel supply amount.

Rear O2 Sensor
Display: 0 — 327.7 Volt
The ECM corrects air-fuel ratio by the signal sent from O2 sensor. Also, the signal is used for catalyst degradation diagnosis.

Battery Voltage
Display: 0 — 20.4 V
The battery voltage is displayed.

Throttle Sensor Voltage
Display: 0 — 5 V
The throttle angle is displayed in voltage. When the throttle is fully-closed, the displayed voltage value is approx. 0.5 V. When it is fully-open, the voltage is approx. 4 V or more.

Fuel Injection #1 and #2 Pulse
Display: 0 — 65.3 msec (0 — 214.2 ft/sec)
The injector valve opening time is displayed. The longer the injector valve opening time, the more the fuel is supplied. The higher the engine load, the longer the injector valve opening time becomes.

Knocking Correction
Display: –64 to 63.5 deg.
The ECM controls the ignition timing via the signal from the knock sensor.

Atmosphere Pressure
Display: 0 — 254.9 kPa (0 — 1,912.5 mmHg, 0 — 75.3 inHg)
The atmospheric pressure is displayed. The ECM detects the atmospheric pressure via the signal from the atmosphere sensor.

Mani. Relative Pressure
Display: –128 — 128 kPa (–952 — 952 mmHg, –37.5 — 37.5 inHg)
A value calculated by subtracting the absolute pressure in the intake tube from the atmospheric pressure is displayed. A larger load leads to a larger value.

Fuel Tank Pressure
Display: –3.2 — 3.2 kPa (–24 — 24 mmHg, –0.94 — 0.94 inHg)
The pressure in the fuel tank is displayed.

Fuel Temp.
Display: –40 to 215°C
The fuel temperature is displayed. The ECM detects the fuel temperature via the signal from the fuel temperature sensor. This signal is used for the evaporation diagnosis.

Front O2 Heater #1, #2 Current
Display: 0 — 25.5 A
The heater current of the A/F sensor is displayed. A larger current value leads to increased heat generation.

Fuel Level
Display: 0 — 5 V
The float inside the fuel tank is a variable resistor which varies the resistance based on fuel level. The ECM then averages this voltage and the signal voltage from the fuel tank in order to determine fuel level. The scan tool displays close to 0.7 volts for an empty tank, and close to 5 volts for a full tank.

CPC Valve Duty Ratio
Display: 0 — 100%
The purge control solenoid valve is regulated by the ECM. The displayed value of 0 % indicates that the purge amount is 0, and 100 % indicates that the purge amount becomes the maximum.

A/F sensor #1, #2
Display: 0 — 2
The air surplus ratio output from the front oxygen (A/F) sensor is displayed. Air overflow ratio = 1.0 is regarded as a stoichiometric A/F ratio. A value above 1.0 indicates A/F lean range, and below 1.0 indicates A/F rich range.

A/F Correction #3
Display:

The correction value of fuel supply amount regulated by the ECM via the signal from the rear oxygen sensor is displayed.

A/F Sensor #1, #2 Current
Display: –16 — 15.9 mA

A value of 0 mA is regarded as a stoichiometric A/F ratio. A negative value indicates A/F rich range, and positive value indicates A/F lean range.

A/F Sensor #1, #2 Resistance
Display: 0 — 255 Ω

The resistance value of the front oxygen (A/F) sensor is displayed. At idle after warm-up, the resistance value shows 27 to 32 ohm.

ISC Valve Duty Ratio
Display: 0 — 127.5%

The duty value of the idle air control solenoid valve is displayed. This value is regulated by the ECM. The displayed value of 0 % indicates that the air bypass circuit is closed, and 100 % indicates that it is fully-open.

No of EGR Steps
Display: 0 — 255 step

The number of the EGR valve steps is displayed. The EGR valve is driven by the stepping motor, and the number of steps is regulated by the ECM. A value of 0 steps indicates that the EGR ratio is 0 %.

Rear O2 Heater Voltage
Display: 0 — 5.1 V

The heater voltage value of the rear oxygen sensor is displayed. The heater current duty-controlled by driving range regulates heater temperature.

A/F Heater Current 1, 2
Display: 0 — 25.5 A

The heater voltage value of the front oxygen (A/F) sensor is displayed. To stabilize the output, the heater current is regulated to keep heater temperature to the specified value.

AT Vehicle ID Signal
Display: ON or OFF

AT and MT vehicles are identified. For AT vehicles, ON is displayed, and for MT ones, OFF is displayed.

Neutral Position Switch
Display: ON or OFF

When the shift lever stays in the neutral position, ON is displayed. When in other positions, OFF is displayed.

Idle Switch Signal
Display: ON or OFF

When the accelerator pedal is released fully, ON is displayed. When depressed fully, OFF is displayed.

P/S Switch
Display: ON or OFF

When the steering wheel is turned fully, ON is displayed. When returned, OFF is displayed. This signal is used for idle control or other controls.

A/C Switch
Display: ON or OFF

When the A/C switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Starter Switch
Display: ON or OFF

When the vehicle is cranking, ON is displayed. When not cranking, OFF is displayed.

Rear O2 Rich Signal
Display: ON or OFF

When the A/F ratio is rich, ON is displayed. When lean, OFF is displayed.

Knocking Signal
Display: ON or OFF

When knocking occurs and the ignition timing is retarded, ON is displayed. At any other time, OFF is displayed.

Crankshaft Position Sig.
Display: ON or OFF

When a crankshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

Camshaft Position Sig.
Display: ON or OFF

When a camshaft signal exists, ON is displayed. At any other time (at engine stall), OFF is displayed.

Rear Defogger SW
Display: ON or OFF

When the rear defogger switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Blower Fan SW
Display: ON or OFF

When the blower fan switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

Light Switch
Display: ON or OFF

When the light switch is turned ON, ON is displayed. When turned OFF, OFF is displayed. This signal is used for idle control or other controls.

A/C Lock Signal
Display: ON or OFF

Whether or not the A/C compressor is active is detected. When it is active, ON is displayed. When inactive, OFF is displayed.

A/C Mid Pressure Switch
Display: ON or OFF

The status of the A/C compressor is detected. When the A/C compressor voltage is high, ON is displayed. When low, OFF is displayed.

A/C Compressor Signal
Display: ON or OFF

When the A/C clutch is engaged, ON is displayed. When disengaged, OFF is displayed.

Radiator Fan Relay #1, #2, #3
Display: ON or OFF

When the radiator fan relay is ON (radiator operates), ON is displayed. When OFF (radiator stops), OFF is displayed.

Fuel Pump Relay
Display: ON or OFF

When the radiator fan relay is ON (fuel pump operates), ON is displayed. When OFF (fuel pump stops), OFF is displayed.

PCV Solenoid Valve
Display: ON or OFF

The status of the pressure control solenoid valve is displayed. When the pressure control solenoid valve is closed, OFF is displayed. When open, ON is displayed. During an evaporation leak diagnosis, the pressure control solenoid valve is only open when vacuum in the intake tube is taken into the fuel tank.

Vent Solenoid Valve
Display: ON or OFF

The status of the drain valve is displayed. When the drain valve is closed, ON is displayed. When open, OFF is displayed. Except during an evaporation leak diagnosis, the drain valve is always open.

Torque Control Signal #1, #2
Display: ON or OFF

When a torque down signal exists, ON is displayed. When it doesn't, OFF is displayed.

Torque Permission Signal
Display: ON or OFF

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

Variable Intake Air Sol.
Display: ON or OFF

The status of the induction control valve is displayed. When the valve is closed for the control to improve low- and mid-speed range, ON is displayed. When open, OFF is displayed.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diag Code:	—
Malfunction indicator lamp status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor (Bank 1, Bank 2, Rear)	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater (Bank 1, Bank 2, Rear)	O2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR steps	
Air fuel ratio control system for bank 1	Fuel System for Bank 1	C1 normal
Air fuel ratio control system for bank 2	Fuel System for Bank 2	C1 normal
Engine load data	Calculated load valve	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Oxygen sensor equipment	Oxygen Sensor #11	Supported
Oxygen sensor equipment	Oxygen Sensor #12	Supported
Oxygen sensor equipment	Oxygen Sensor #21	Supported
A/F sensor equipment	A/F Sensor #11	—
A/F sensor output signal	A/F Sensor #11	V
A/F sensor equipment	A/F Sensor #21	—
A/F sensor output signal	A/F Sensor #21	V

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Air fuel ratio control system for bank 2	Fuel System for Bank 2	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor bank 1	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor bank 1	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor bank 2	Short term fuel trim B2	%
Long term fuel trim by front oxygen (A/F) sensor bank 2	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED “ON” requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is functioning.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is functioning.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is functioning.
Knocking signal	Knocking Signal (#1 or #2)	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is functioning.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Pressure control solenoid valve	PCV Solenoid Valve	ON or OFF	When pressure control solenoid valve is functioning.
Drain valve	Vent. Solenoid Valve	ON or OFF	When drain valve is functioning.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Radiator sub fan relay 2 signal	Radiator Fan Relay 3	ON or OFF	When radiator sub fan relay is functioning.
Air conditioner mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When air conditioner mid pressure switch is entered.
Air conditioner lock switch signal	A/C Lock Signal	ON or OFF	When air conditioner lock switch is entered.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT.

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of transmission type.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Stop lamp switch signal	Stop Lamp Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	AT Diagnosis Lamp	ON or OFF

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For select monitor display details, refer to the following.

Front Wheel Speed
Display: 0 — 255 km/h (0 — 158 MPH)

The front wheel speed is displayed. This signal is used for the shift control, lock-up control, line pressure control, and transfer control.

ATF Temp.
Display: –40 to 215°C (–40 to 419°F)

The ATF temperature via the signal from the ATF temperature sensor is displayed.

Gear Position
Display:

The present gear position is displayed. The gear position is calculated from the engine speed and torque converter turbine speed.

Line Pressure Duty Ratio
Display: 0 — 123%

The duty value of the line pressure duty solenoid is displayed. The line pressure duty solenoid is regulated by the TCM, adjusting the line pressure to the optimum value depending on driving conditions.

Lock Up Duty Ratio
Display: 0 — 123%

The duty value of the lock-up duty solenoid is displayed. The lock-up duty solenoid is regulated by the TCM. Because the lock-up duty solenoid controls the lock-up control valve, the lock-up clutch engages and disengages smoothly.

Transfer Duty Ratio
Display: 0 — 123%

The duty value of the transfer duty solenoid is displayed. The transfer duty solenoid is regulated by the TCM, adjusting the transfer clutch oil pressure and controlling the driving force of the rear wheels.

Turbine Revolution Speed
Display: 0 — 8,160 rpm

The input shaft speed detected by the torque converter speed sensor is displayed. This signal is used to control the line pressure and 2 - 4 brake pressure control timing during shifting.

Throttle Sensor Power
Display: 0 — 256 V

The supply voltage to the throttle sensor is displayed. This signal is used for the throttle sensor output correction.

Brake Clutch Duty Ratio
Display: 0 — 123%

The duty value of the 2 - 4 brake duty solenoid. The 2 - 4 brake duty solenoid is regulated by the TCM, adjusting the 2 - 4 brake pressure during shifting and relieving from harsh shifting.

Rear Wheel Speed
Display: 0 — 255 km/h (0 — 158 MPH)

The rear wheel speed is displayed. This signal is used to control the transfer. If the front vehicle speed sensor is malfunctioning, this signal is used as a substitute.

Cruise Control Signal
Display: ON or OFF

When the cruise control switch is ON, ON is displayed. When OFF, OFF is displayed.

ABS Signal
Display: ON or OFF

When the ABS function is active, ON is displayed. When inactive, OFF is displayed.

Stop Light Signal
Display: ON or OFF

When the brake pedal is depressed, ON is displayed. When released, OFF is displayed.

1st, 2nd, 3rd, D, R, Range Signal
Display: ON or OFF

When the switch for each range is ON, ON is displayed.

2-4 Brake Timing Sol.
Display: ON or OFF

When the 2-4 brake timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The 2-4 brake timing solenoid is regulated by the TCM, controlling the release timing of the 2-4 brake.

Low Clutch Timing Sol.
Display: ON or OFF

When the low clutch timing solenoid is ON, ON is displayed. When OFF, OFF is displayed. The low clutch timing solenoid is regulated by the TCM, controlling the release timing of the low clutch.

Shift Solenoid #1, #2
Display: ON or OFF

When the solenoid valve is ON, ON is displayed. When OFF, OFF is displayed. By combining No. 1 and No. 2 solenoids, the shifting mechanism is controlled.

P Range
Display: ON or OFF

When the shift lever stays in P range, ON is displayed. When not in P range, OFF is displayed.

N Range
Display: ON or OFF

When the shift lever stays in N range, ON is displayed. When not in N range, OFF is displayed.

Torque Control Signal #1, #2
Display: ON or OFF

When the torque down signal exists, ON is displayed. When it does not exist, OFF is displayed.

Torque Permission Signal
Display: ON or OFF

The signal which notifies whether or not torque down is possible is displayed. This signal is transmitted from the ECU in response to a torque down signal from the TCU. When torque down is prohibited, ON is displayed. When permitted, OFF is displayed.

11.Read Diagnostic Trouble Code

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (MODE $03).

12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H6DO)-56, Drive Cycle.>

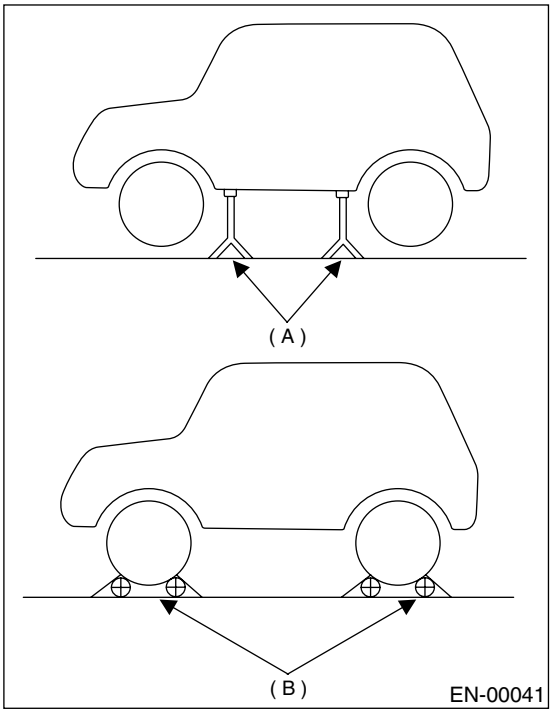
DTC No.	Item
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)
P0050	HO2S Heater control circuit (Bank 2 Sensor 1)
P0051	HO2S Heater control circuit low (Bank 2 Sensor 1)
P0052	HO2S Heater control circuit high (Bank 2 Sensor 1)
P0068	Manifold absolute pressure/barometric pressure circuit range/performance
P0107	Manifold absolute pressure/barometric pressure circuit low input
P0108	Manifold absolute pressure/barometric pressure circuit high input
P0112	Intake air temperature circuit low input
P0113	Intake air temperature circuit high input
P0117	Engine coolant temperature circuit low input
P0118	Engine coolant temperature circuit high input
P0122	Throttle/pedal position sensor/switch “A” circuit low input
P0123	Throttle/pedal position sensor/switch “A” circuit high input
P0129	Barometric pressure too low
P0130	O2 sensor circuit (Bank 1 Sensor 1)
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)
P0150	O2 sensor circuit (Bank 2 Sensor 1)
P0154	O2 sensor circuit no activity detected (Bank 2 Sensor 1)
P0182	Fuel temperature sensor “A” circuit low input
P0183	Fuel temperature sensor “A” circuit high input
P0230	Fuel pump primary circuit
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)
P0332	Knock sensor 2 circuit low input (Bank 2)
P0333	Knock sensor 2 circuit high input (Bank 2)
P0335	Crankshaft position sensor “A” circuit
P0336	Crankshaft position sensor “A” circuit range/performance
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single Sensor)
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single Sensor)
P0447	Evaporative emission control system vent control circuit open
P0448	Evaporative emission control system vent control circuit shorted
P0452	Evaporative emission control system pressure sensor low input
P0458	Evaporative emission control system purge control valve circuit low
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0502	Vehicle speed sensor circuit low input
P0503	Vehicle speed sensor intermittent/erratic/high
P0508	Idle control system circuit low
P0509	Idle control system circuit high

DTC No.	Item
P0512	Starter request circuit
P0519	Idle air control circuit system performace
P0565	Cruise control on signal
P0604	Internal control module random access memory (RAM) error
P0661	Intake manifold tuning valve control circuit low - bank 1
P0662	Intake manifold tuning valve control circuit high - bank 2
P0691	Cooling fan 1 control circuit low
P0692	Cooling fan 1 control circuit high
P0703	Torque converter/brake switch “B” circuit
P0705	Transmission range sensor circuit (PRNDL input)
P0710	Transmission fluid temperature sensor circuit
P0716	Input/turbine speed sensor circuit range/performance
P0720	Output speed sensor circuit
P0726	Engine speed input circuit range/performance
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch circuit performance or stuck off
P0743	Torque converter clutch circuit electrical
P0748	Pressure control solenoid “A” electrical
P0753	Shift solenoid “A” electrical
P0758	Shift solenoid “B” electrical
P0771	Shift solenoid “E” performance or stuck off
P0778	Pressure control solenoid “B” electrical
P0785	Shift/timing solenoid
P0851	Neutral switch input circuit low
P0852	Neutral switch input circuit high
P0864	TCM communication circuit range/performance
P0865	TCM communication circuit low
P0866	TCM communication circuit high
P1110	Atmospheric pressure sensor circuit malfunction (low input)
P1111	Atmospheric pressure sensor circuit malfunction (high input)
P1134	A/F sensor micro-computer problem
P1152	O2 sensor circuit range/performance (low) (Bank 1 Sensor 1)
P1153	O2 sensor circuit range/performance (high) (Bank 1 Sensor 2)
P1154	O2 sensor circuit range/performance (low) (Bank 2 Sensor 1)
P1155	O2 sensor circuit range/performance (high) (Bank 2 Sensor 1)
P1400	Fuel tank pressure control solenoid valve circuit low
P1420	Fuel tank pressure control solenoid valve circuit high
P1443	Vent control solenoid valve function problem
P1446	Fuel tank sensor control valve circuit low
P1447	Fuel tank sensor control valve circuit high
P1518	Starter switch circuit low input
P1560	Back-up voltage circuit malfunction
P1698	Engine torque control cut signal circuit malfunction (low input)
P1699	Engine torque control cut signal circuit malfunction (high input)
P1700	Throttle position sensor circuit malfunction for AT
P1711	Engine torque control signal #1 circuit malfunction
P1712	Engine torque control signal #2 circuit malfunction

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

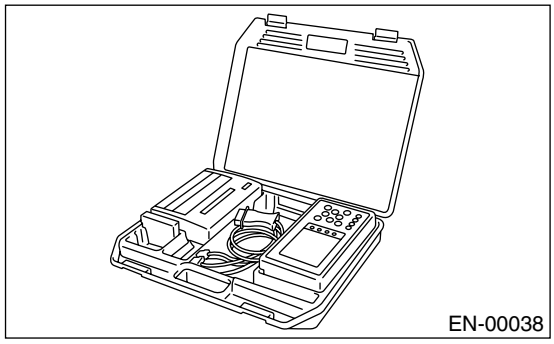


(A) Safety stand
(B) Free rollers

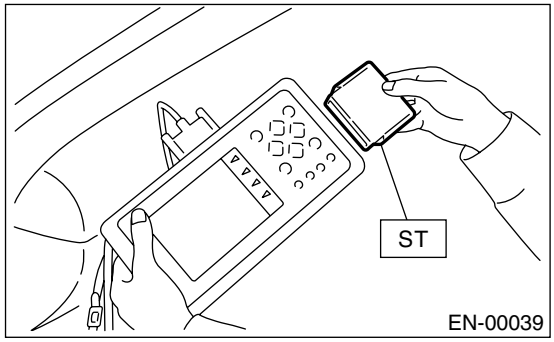
3) Warm up engine.

2. SUBARU SELECT MONITOR

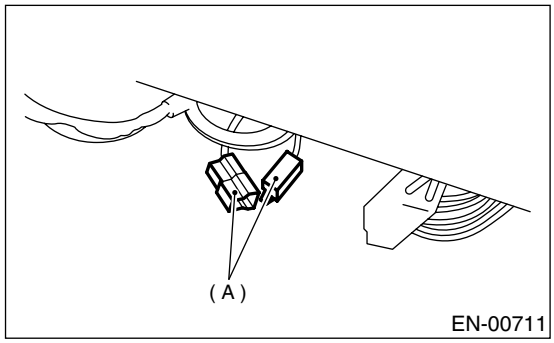
1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)-58, Clear Memory Mode.>
2) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



3) Connect diagnosis cable to Subaru Select Monitor.
4) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



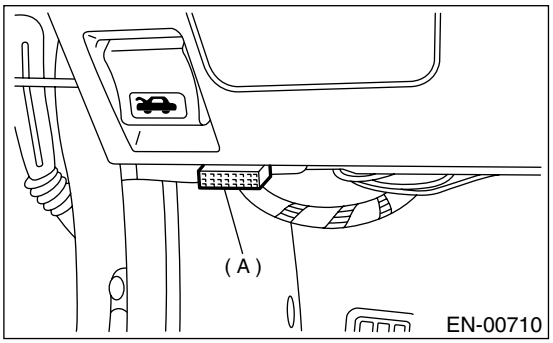
5) Connect test mode connector at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

6) Connect Subaru Select Monitor to data link connector.

(1) Connect Subaru Select Monitor to data link connector (A) located in the lower portion of the instrument panel (on the driver's side).

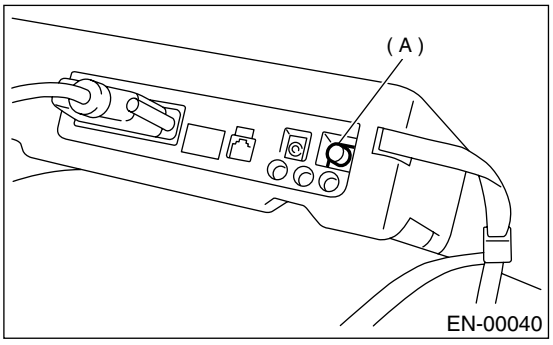


(A) Data link connector

(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

7) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



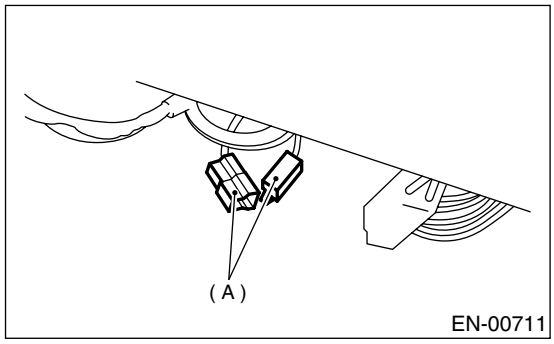
(A) Power switch

8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
10) Press the [YES] key after displayed the information of engine type.
11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
12) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
13) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

3. OBD-II GENERAL SCAN TOOL

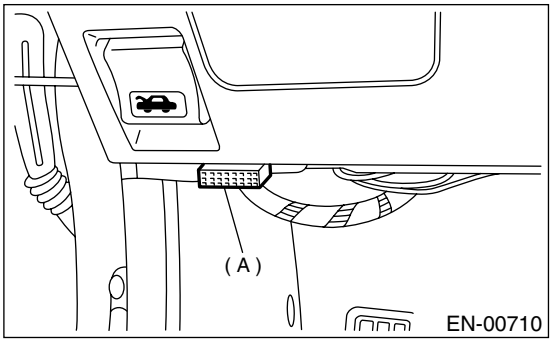
1) After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data: <Ref. to EN(H6DO)-58, Clear Memory Mode.>
2) Connect test mode connector at the lower side of the instrument panel (on the driver's side).



(A) Test mode connector

3) Connect the OBD-II general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



(A) Data link connector

4) Start the engine.

NOTE:
Ensure the selector lever is placed in the “P” position before starting.

5) Using the selector lever or shift lever, turn the “P” position switch and the “N” position switch to ON.
6) Depress the brake pedal to turn the brake switch ON.
7) Keep engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
8) Place the selector lever or shift lever in the “D” position and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

9) Using the OBD-II general scan tool, check for diagnostic trouble code(s) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are 3 drive patterns for trouble diagnosis. Driving in the specified pattern allows to diagnose the malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE.

1) Make sure that fuel remains approx. half amount [20 to 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
2) After performing diagnostics and cleaning the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)-58, Clear Memory Mode.>
3) Separate test mode connector.

NOTE:
- Except for water temperature specified items at starting, diagnosis is carried out after engine warm up.
- Carry out diagnosis which is marked * on DTC twice, Then, after finishing 1st diagnosis, stop engine and do the second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

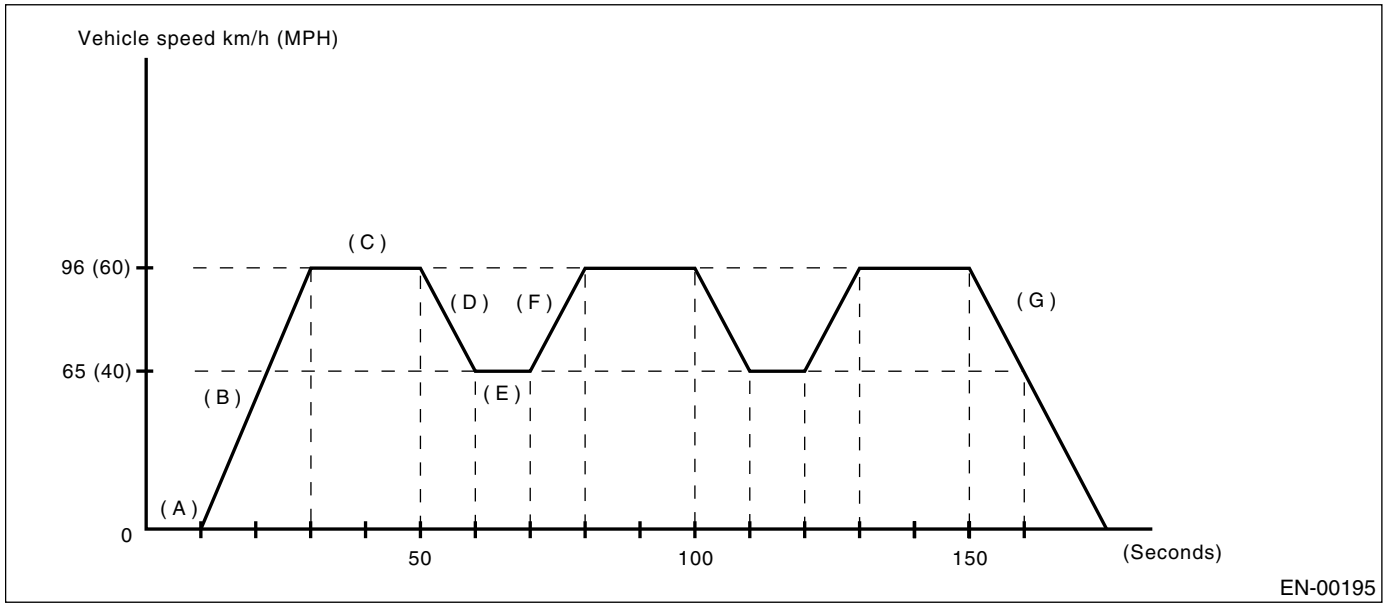
DTC No.	Item	Condition
*P0111	Intake air temperature circuit range/performance	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	Coolant temperature at start is less than 55°C (131°F).
*P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	—
*P0153	O2 sensor circuit slow response (Bank 2 Sensor 1)	—
*P0181	Fuel temperature sensor “A” circuit range/performance	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative emission control system leak detected (small leak)	—
*P0451	Evaporative emission control system pressure sensor range/performance	—
P0453	Evaporative emission control system pressure sensor high input	—
*P0456	Evaporative emission control system leak detected (very small leak)	—
*P0457	Evaporative emission control system leak detected (fuel cap loose/off)	—
*P0459	Evaporative emission control system purge control valve circuit high	—
*P0461	Fuel level sensor circuit range/performance	—
*P0464	Fuel level sensor circuit intermittent	—
P1448	Fuel Tank Sensor Control Valve Range/Performance	—

3. IDLE FOR 10 MINUTES

NOTE:
Before diagnosis, drive vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan rationality check	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 1 minute.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC No.	Item	Condition
*P0121	Throttle/pedal position sensor/switch “A” circuit range/performance	Coolant temperature at start is more than 80°C (176°F).
*P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	—
*P0171	System too lean (Bank 1)	—
*P0172	System too rich (Bank 1)	—
*P0174	System too lean (Bank 2)	—
*P0175	System too rich (Bank 2)	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P0305	Cylinder 5 misfire detected	—
*P0306	Cylinder 6 misfire detected	—
*P0400	Exhaust gas recirculation flow	—
*P2096	Post catalyst fuel trim system tool lean bank 1	—
*P2097	Post catalyst fuel trim system tool rich bank 1	—

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after displayed the information of engine type.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the `Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

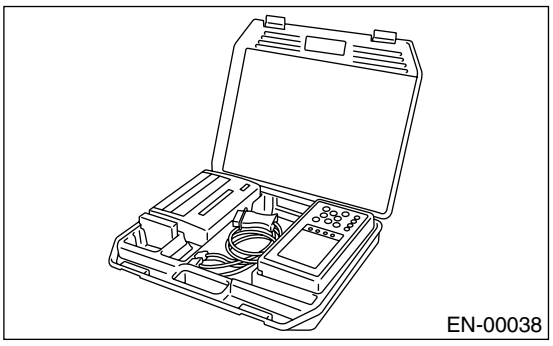
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

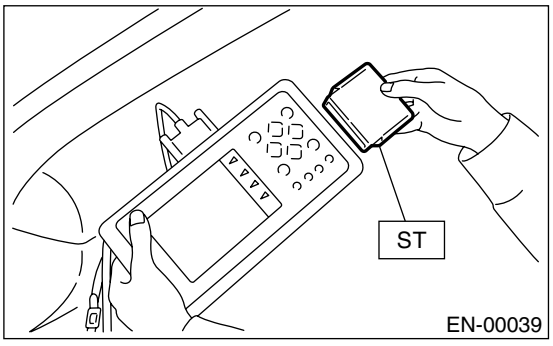
15.Compulsory Valve Operation Check Mode

A: OPERATION

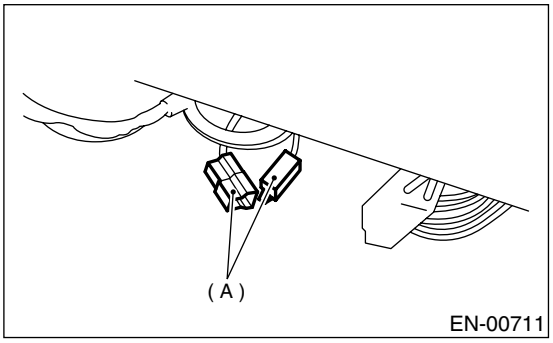
1) Prepare Subaru Select Monitor kit. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to EN(H6DO)-9, PREPARATION TOOL, General Description.>



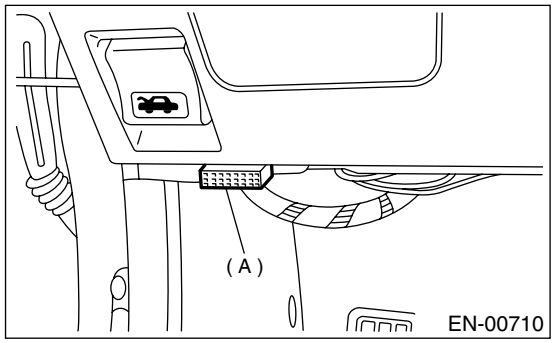
4) Connect test mode connector at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

5) Connect Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).

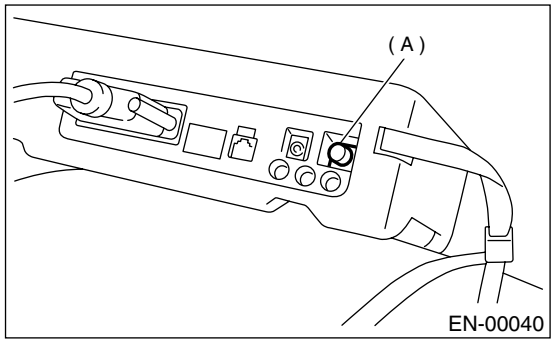


(A) Data link connector

(2) Connect diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after displayed the information of engine type.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.
• A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory air assist injector solenoid valve operation check	AAI Solenoid Valve
Compulsory fuel tank pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent Control Solenoid Valve

NOTE:
• The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Fuel Tank Sensor Control Valve
AAI Solenoid Valve

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Engine Malfunction Indicator Lamp (MIL)

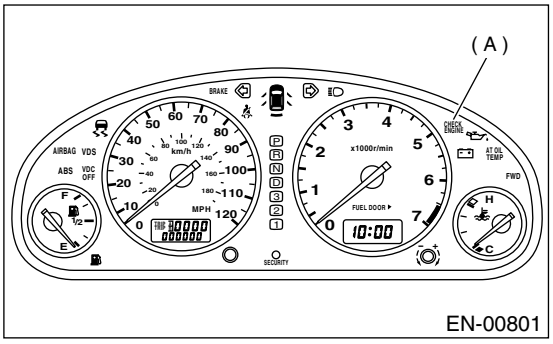
A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(H6DO)-62, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(H6DO)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(H6DO)-68, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(H6DO)-70, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(H6DO)-72, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

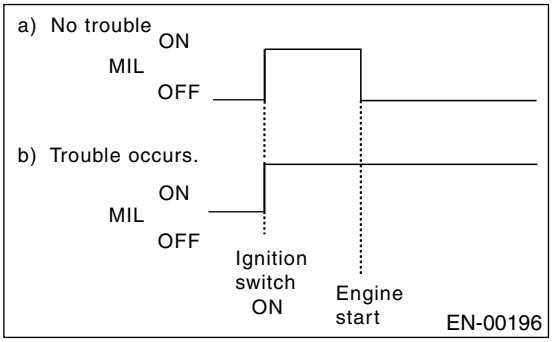
1) When ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(H6DO)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>

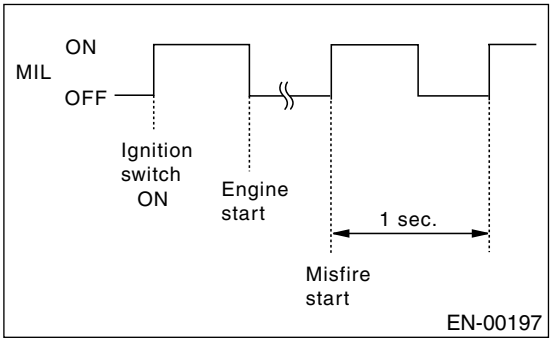


(A) Malfunction indicator lamp

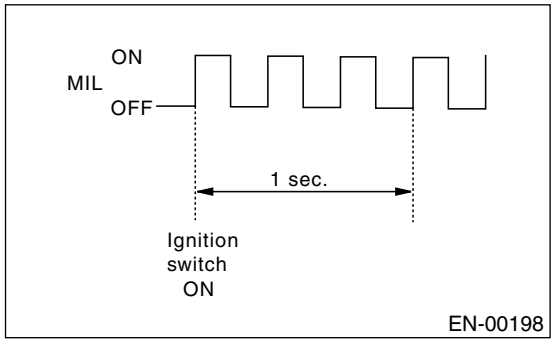
2) After starting the engine, the MIL goes out. If it does not, either the engine or the emission control system is malfunctioning.



3) If the diagnosis system senses a misfire which could damage the catalyzer, the MIL will blink at a cycle of 1 Hz.



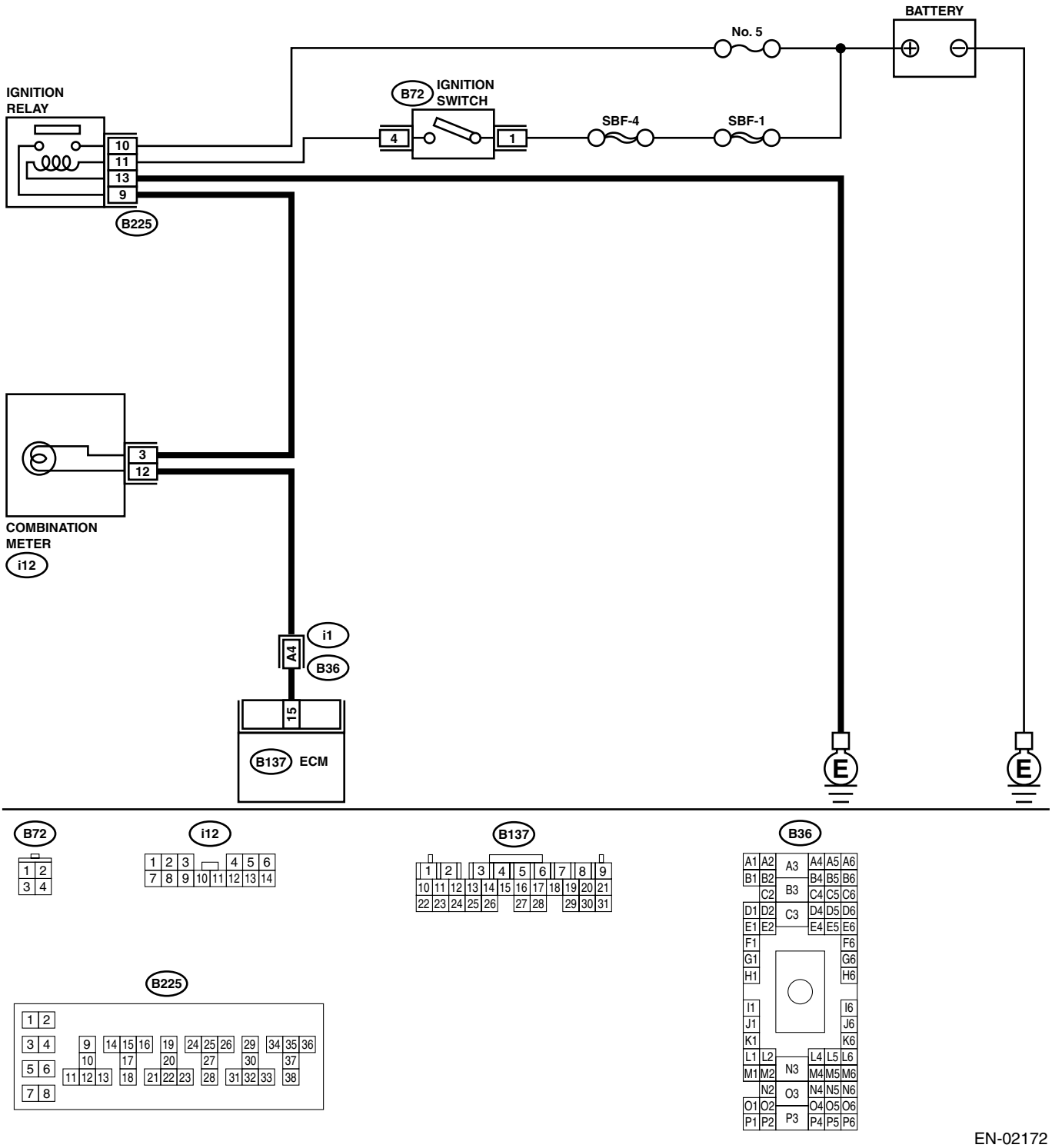
4) When ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



MEMO:

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- **TROUBLE SYMPTOM:**
  - When ignition switch is turned ON (engine OFF), MIL does not come on.
- **WIRING DIAGRAM:**



EN-02172

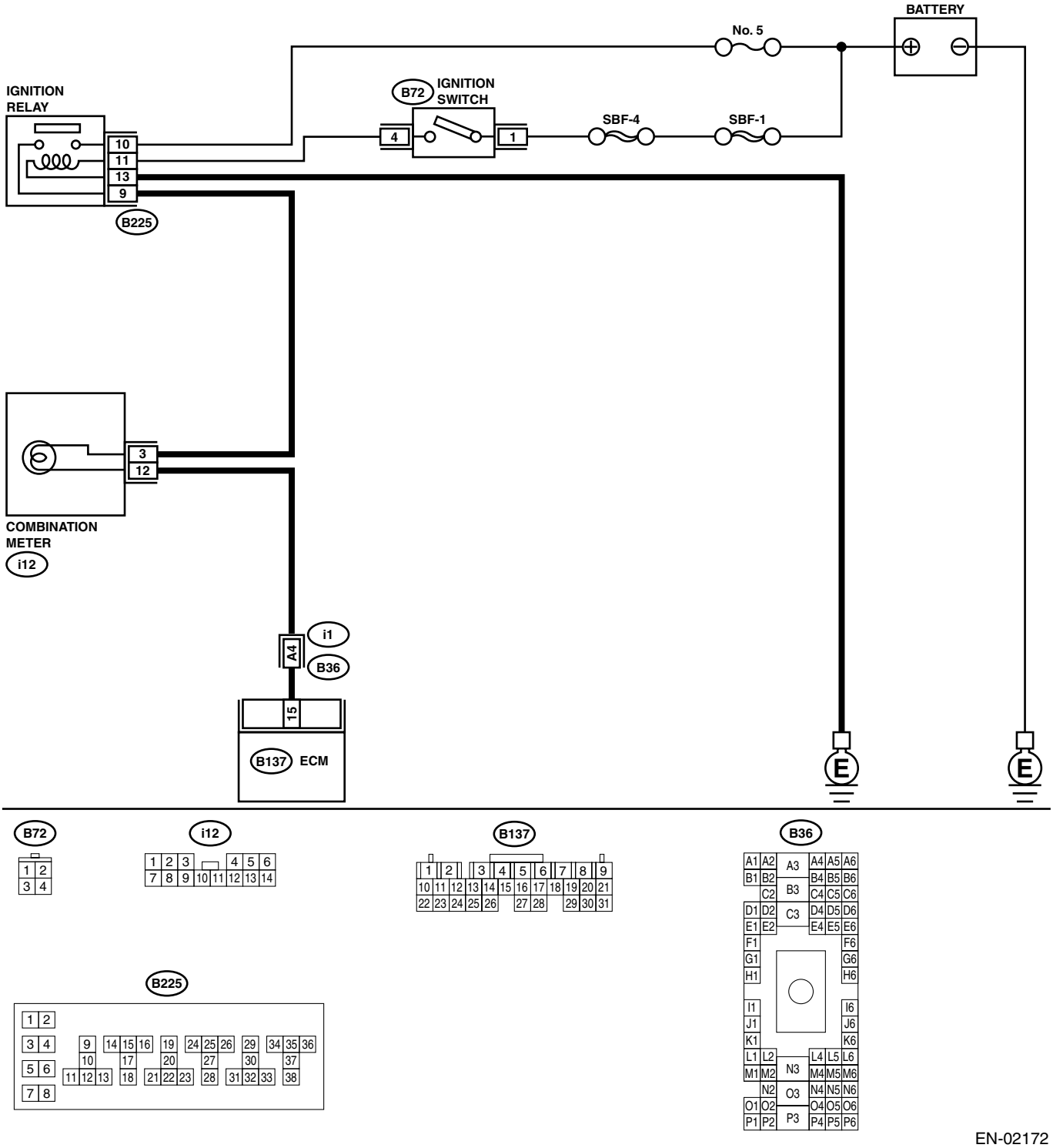
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the MIL come on when shaking or pulling ECM connector and harness?	Repair poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.**	Is ECM connector correctly connected?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove combination meter. <Ref. to IDI-13, Combination Meter Assembly.> 3) Disconnect connector from ECM and combination meter. 4) Measure resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B137) No. 15 — (i12) No. 12:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Check the following and repair if necessary. NOTE: • Broken down ignition relay. • Blown out fuse (No. 5). • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7	**CHECK LAMP BULB.** Remove engine malfunction indicator lamp bulb.	Is lamp bulb condition OK?	Repair combination meter connector.	Replace lamp bulb.

MEMO:

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.
- **TROUBLE SYMPTOM:**
  - Although MIL comes on when engine runs, trouble code is not shown on Subaru select monitor or OBD-II general scan tool display.
- **WIRING DIAGRAM:**

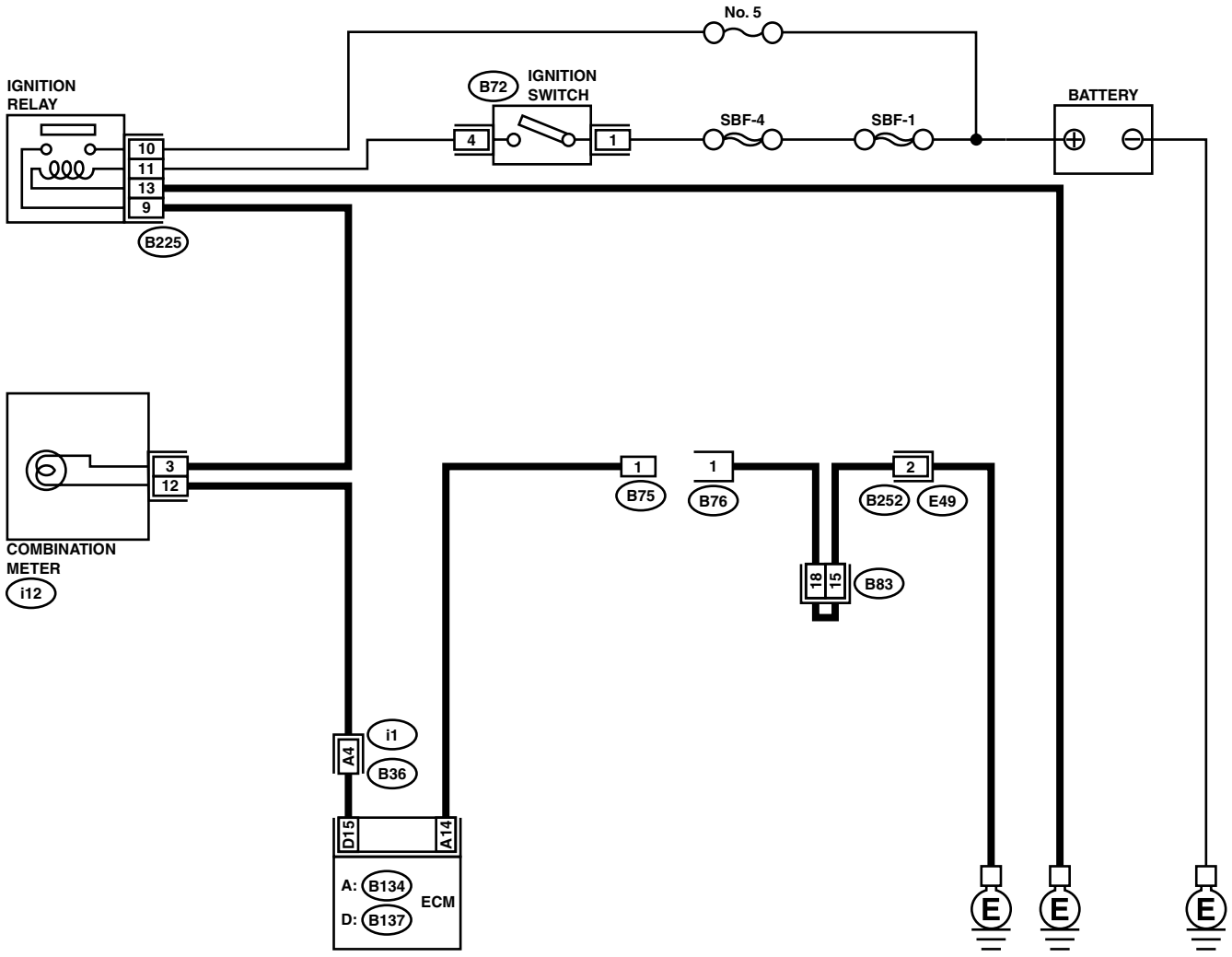


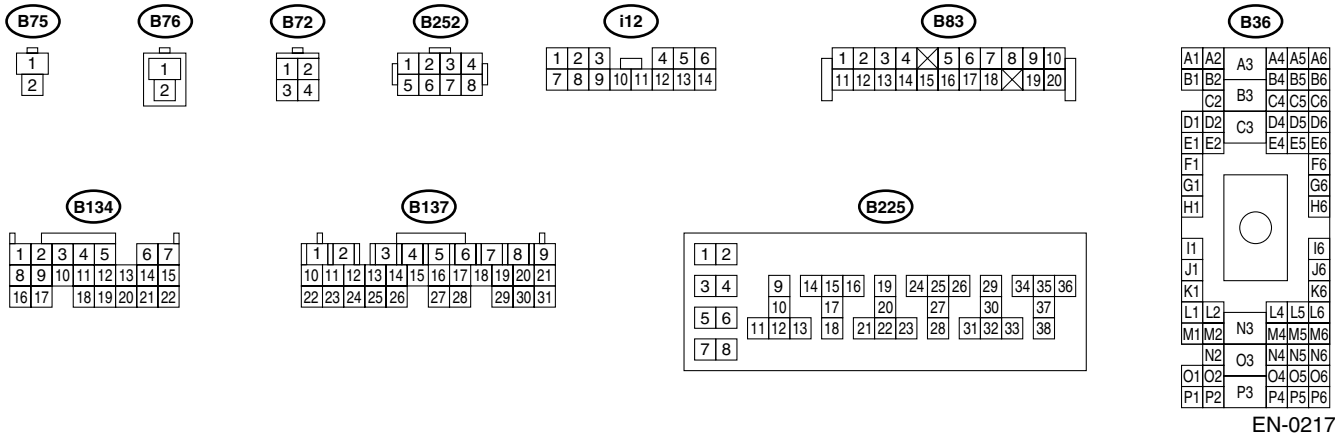
EN-02172

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair short circuit in harness between combination meter and ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
  - Test mode connector circuit is open.
- **TROUBLE SYMPTOM:**
  - When inspection mode, MIL does not blink at a cycle of 3 Hz.
- **WIRING DIAGRAM:**



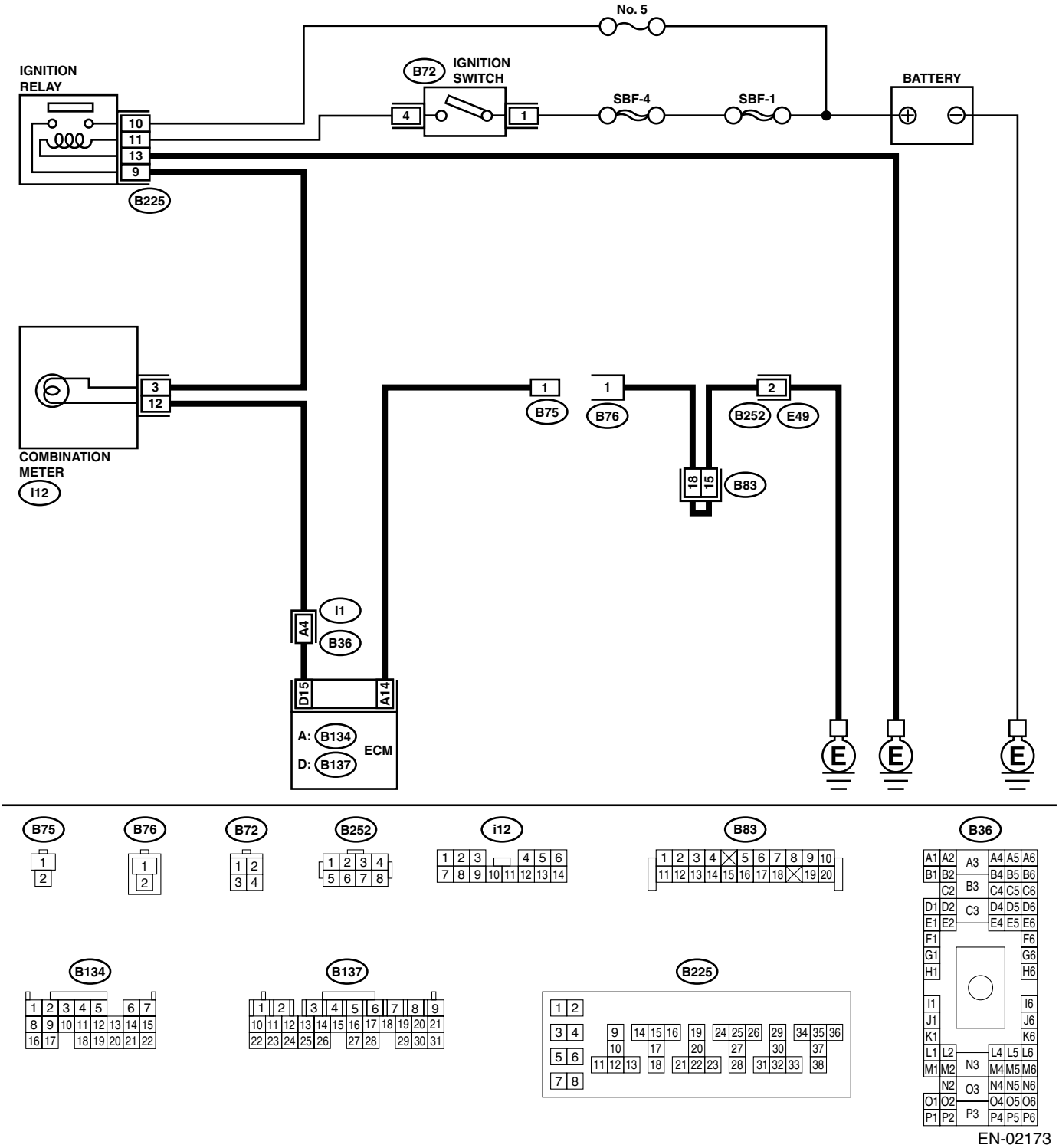


EN-02173

	Step	Check	Yes	No
1	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Turn ignition switch to OFF. 2) Disconnect test mode connector. 3) Turn ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step **2.**	Repair the MIL circuit. <Ref. to EN(H6DO)-64, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Turn ignition switch to ON.	Does the MIL come on?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect test mode connector. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

- **DIAGNOSIS:**
  - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
  - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



EN-02173

	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect test mode connector. 2) Turn ignition switch to ON.	Does MIL flash on and off?	Go to step **2.**	System is in good order. NOTE: MIL blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair short circuit in harness between ECM and test mode connector.

MEMO:

17.Diagnostics for Engine Starting Failure

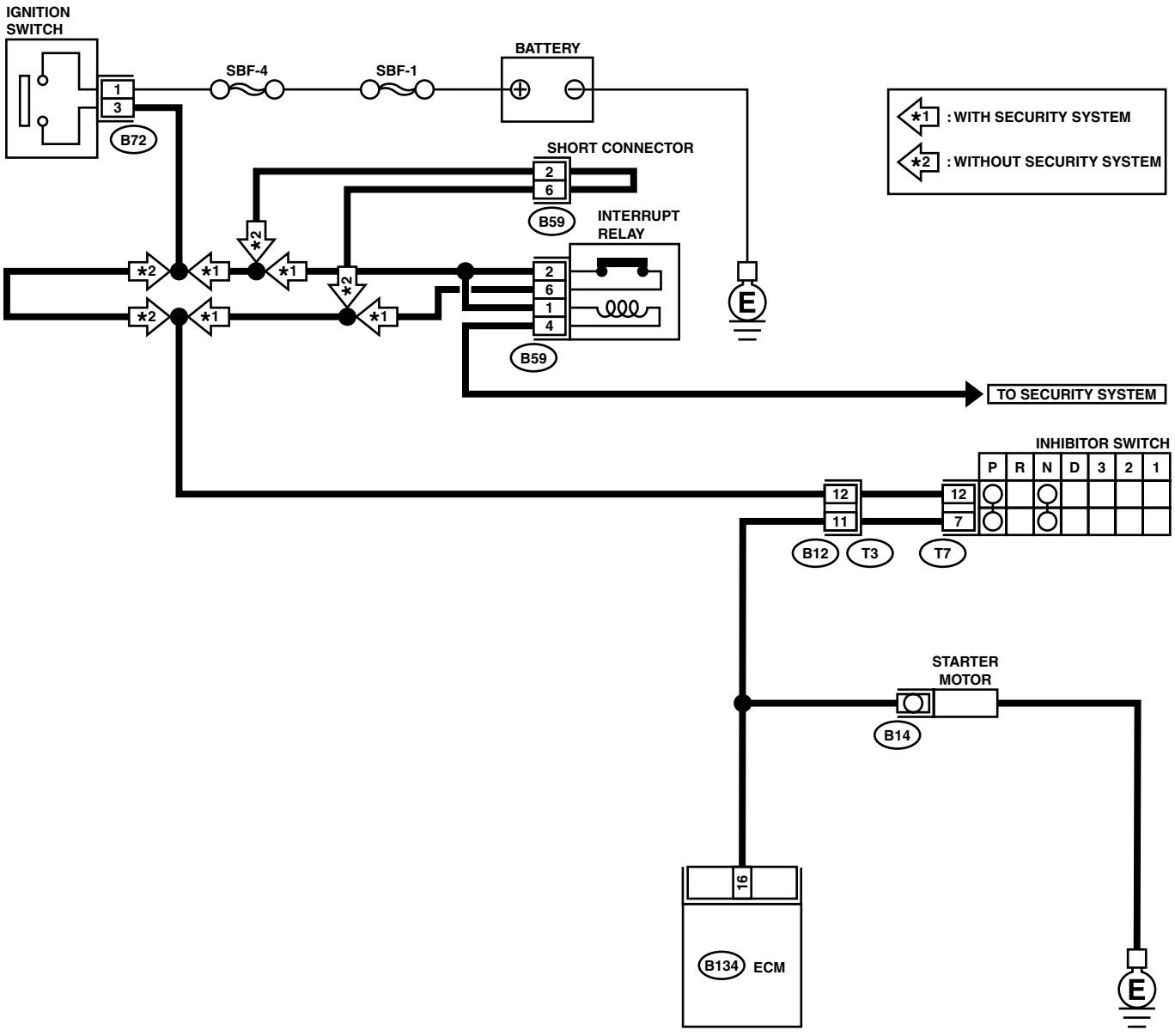
A: PROCEDURE

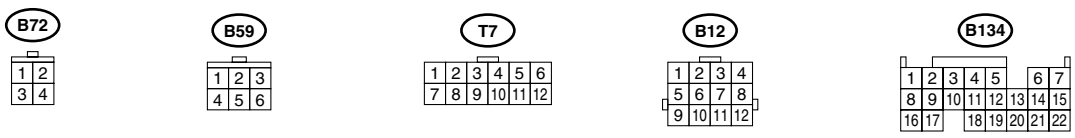
1. Inspection of starter motor circuit. <Ref. to EN(H6DO)-76, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)-80, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H6DO)-88, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H6DO)-90, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection using Subaru Select Monitor or OBD-II general scan tool <Ref. to EN(H6DO)-100, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or inspection using “General Diagnostics Table”. <Ref. to EN(H6DO)-382, General Diagnostic Table.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00804

	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Turn iginition switch to START.	Does starter motor operate?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.** Check diagnostic trouble code (DTC). <Ref. to EN(H6DO)-50, OPERATION, Read Diagnostic Trouble Code.>	Is diagnostic trouble code (DTC) displayed?	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Repair poor contact of ECM connector.
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from starter motor. 3) Turn ignition switch to START. 4) Measure power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: Place the selector lever in the "P" or "N" position.	Is the measured value more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of ground cable between ground cable terminal and engine ground.	Is the measured value less than 5 Ω?	Check starter motor. <Ref. to SC(H6DO)-6, Starter.>	Repair open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Ignition switch to OFF. 2) Disconnect connector from ignition switch. 3) Measure power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Check the following items and repair, if necessary. • Blown out fuse • Open circuit in harness between ignition switch and battery
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Connect connector to ignition switch. 2) Turn ignition switch to START. 3) Measure voltage between ignition switch and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Go to step **7.**
7	**CHECK POOR CONTACT.** Check ignition switch connector for poor contact.	Is there any poor contact in ignition switch connector?	Repair poor contact in ignition switch connector.	Replace ignition switch.
8	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn ignition switch to OFF. 2) Place the selector lever in the "P" or "N" position. 3) Separate transmission harness connector. 4) Measure resistance between transmission harness connector receptacle's terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the measured value less than 1 Ω?	Repair open circuit in harness between starter motor and ignition switch connector.	Go to step **9.**

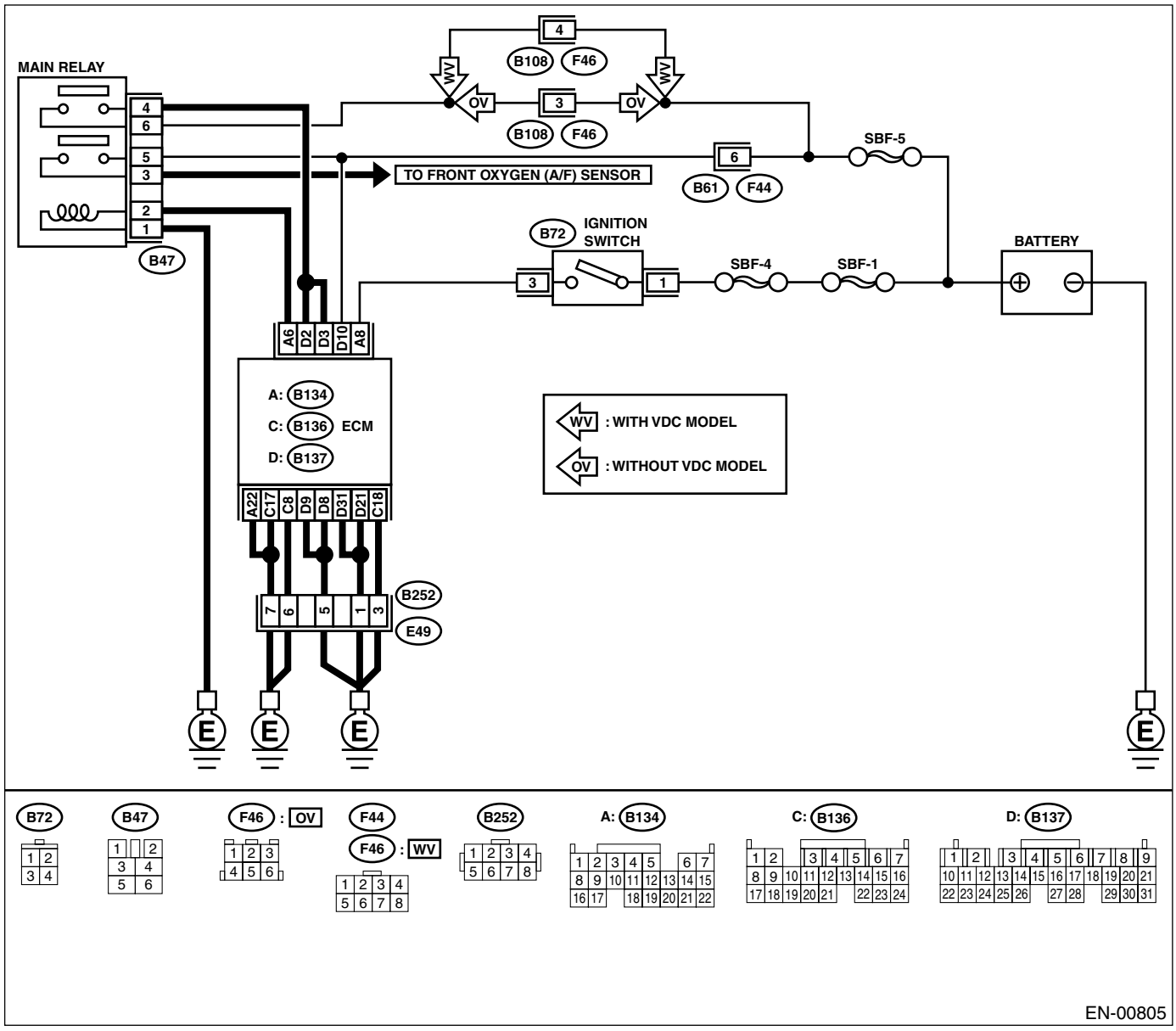
	Step	Check	Yes	No
9	**CHECK TRANSMISSION HARNESS.** 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness and inhibitor switch connector. ***Connector & terminal*** ***(T3) No. 11 — (T7) No. 7:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in harness between transmission harness and inhibitor switch connector.
10	**CHECK POOR CONTACT.** Check poor contact in inhibitor switch connector.	Is there poor contact in inhibitor switch connector?	Repair poor contact in inhibitor switch connector.	Replace inhibitor switch.

MEMO:

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove main relay. 3) Connect battery to main relay terminals No. 1 and No. 2. 4) Measure resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the measured value less than 10 Ω?	Go to step **2.**	Replace main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 22 — Chassis ground:*** ***(B136) No. 8 — Chassis ground:*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 31 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Replace ECM.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Repair open circuit in harness between ECM connector and main relay connector.

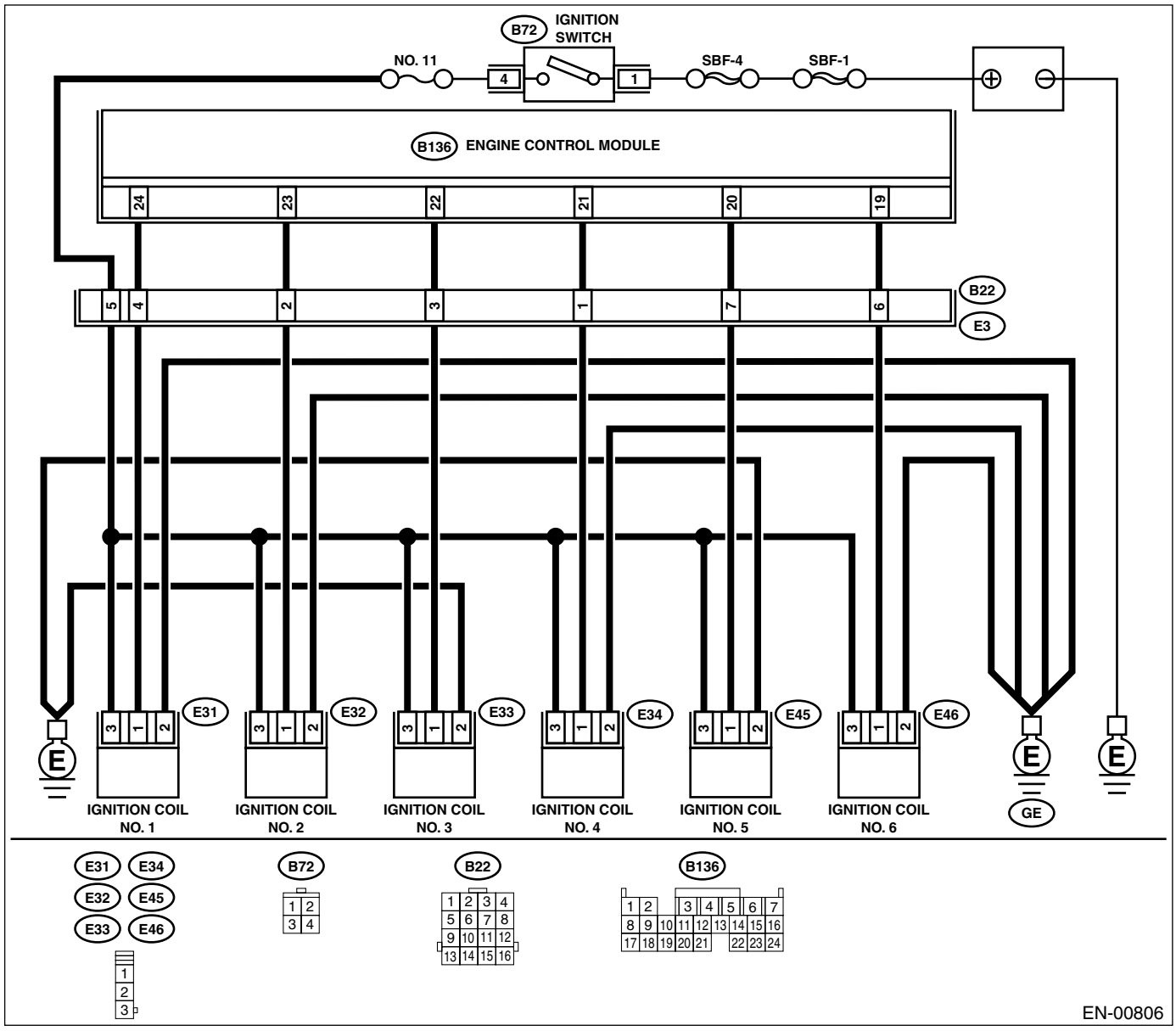
	Step	Check	Yes	No
8	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1) Turn ignition switch to OFF. 2) Measure resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.
10	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect main relay connector. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Check ignition control system. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

MEMO:

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-5, INSPECTION, Spark Plug.>	Is the spark plug OK?	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect spark plug to ignition coil. 2) Lower fuel pressure. 3) Contact spark plug thread portion with engine block. 4) While opening throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H6DO)-88, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ignition coil & ignitor assembly. 3) Turn ignition switch to ON. 4) Measure power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):*** ***(E45) No. 3 (+) — Engine ground (–):*** ***(E46) No. 3 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn ignition switch to OFF. 2) Measure resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:*** ***(E45) No. 2 — Engine ground:*** ***(E46) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Disconnect connector from ignition coil & ignitor assembly. 4) Measure resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B136) No. 24 — (E31) No. 1:*** ***(B136) No. 23 — (E32) No. 1:*** ***(B136) No. 22 — (E33) No. 1:*** ***(B136) No. 21 — (E34) No. 1:*** ***(B136) No. 20 — (E45) No. 1:*** ***(B136) No. 19 — (E46) No. 1:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector

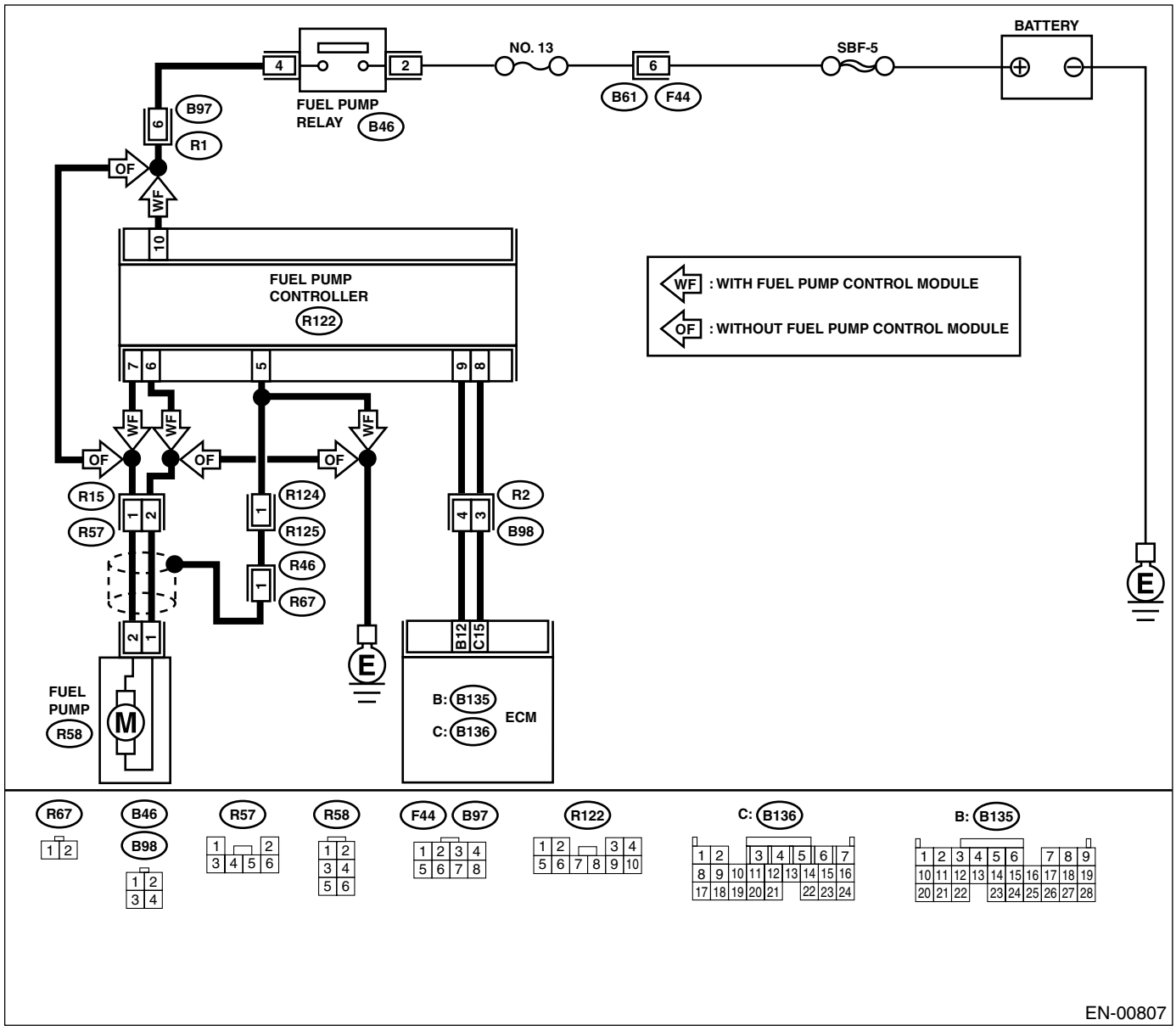
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B136) No. 24 — Engine ground:*** ***(B136) No. 23 — Engine ground:*** ***(B136) No. 22 — Engine ground:*** ***(B136) No. 21 — Engine ground:*** ***(B136) No. 20 — Engine ground:*** ***(B136) No. 19 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Connect connector to ignition coil & ignitor assembly. 2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 1 (+) — Engine ground (–):*** ***(E32) No. 1 (+) — Engine ground (–):*** ***(E33) No. 1 (+) — Engine ground (–):*** ***(E34) No. 1 (+) — Engine ground (–):*** ***(E45) No. 1 (+) — Engine ground (–):*** ***(E46) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Replace ignition coil & ignitor assembly. <Ref. to IG(H6DO)-7, Ignition Coil and Ignitor Assembly.>
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H6DO)-88, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

MEMO:

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

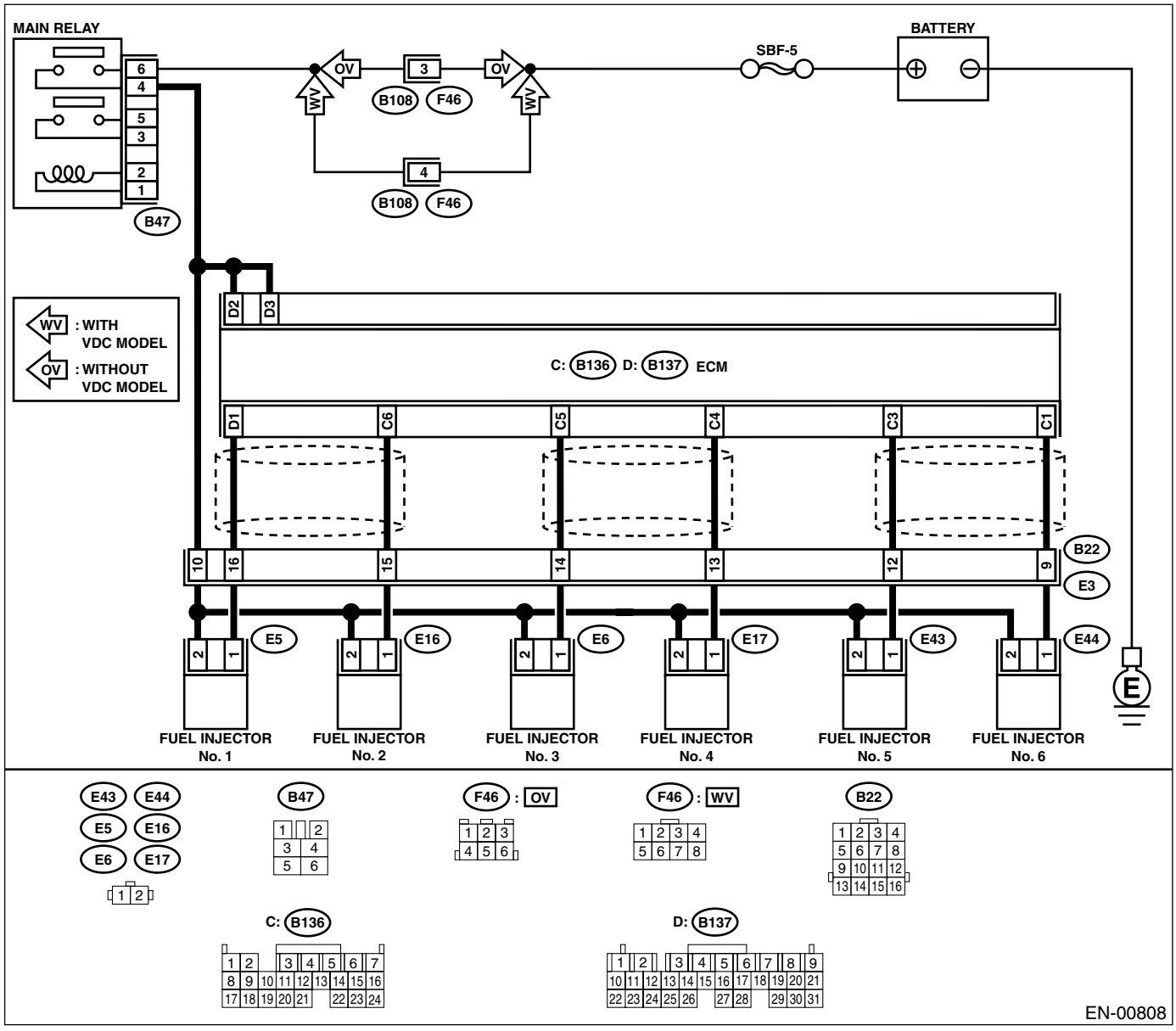
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(H6DO)-90, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Read the diagnostic Trouble Code (DTC) and check related DTC. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>**
- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit “operating” sound?	Check fuel pressure. <Ref. to FU(H6DO)-50, Fuel.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector. 3) Turn ignition switch to ON. 4) Measure power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E43) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect connector from ECM and fuel injector. 2) Measure resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 1 — (E5) No. 1:*** ***(B136) No. 6 — (E16) No. 1:*** ***(B136) No. 5 — (E6) No. 1:*** ***(B136) No. 4 — (E17) No. 1:*** ***(B136) No. 3 — (E43) No. 1:*** ***(B136) No. 1 — (E44) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B137) No. 1 — Chassis ground:*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:*** ***(B136) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:*** Is the measured value within the specified range?	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace faulty fuel injector.

Step		Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H6DO)-382, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0030	HO2S Heater control circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-100, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater control circuit low (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-102, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater control circuit high (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-106, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater control circuit low (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-108, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater control circuit high (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-112, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0050	HO2S Heater control circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-114, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	HO2S Heater control circuit low (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-116, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	HO2S Heater control circuit high (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-120, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold absolute pressure/barometric pressure circuit range/performance	<Ref. to EN(H6DO)-122, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold absolute pressure/barometric pressure circuit low input	<Ref. to EN(H6DO)-124, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold absolute pressure/barometric pressure circuit high input	<Ref. to EN(H6DO)-128, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake air temperature circuit range/performance	<Ref. to EN(H6DO)-132, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake air temperature circuit low input	<Ref. to EN(H6DO)-134, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake air temperature circuit high input	<Ref. to EN(H6DO)-136, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine coolant temperature circuit low input	<Ref. to EN(H6DO)-140, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine coolant temperature circuit high input	<Ref. to EN(H6DO)-142, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/pedal position sensor/switch “A” circuit range/performance	<Ref. to EN(H6DO)-146, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0122	Throttle/pedal position sensor/switch “A” circuit low input	<Ref. to EN(H6DO)-148, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/pedal position sensor/switch “A” circuit high input	<Ref. to EN(H6DO)-152, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient coolant temperature for closed loop fuel control	<Ref. to EN(H6DO)-154, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	<Ref. to EN(H6DO)-156, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Barometric pressure too low	<Ref. to EN(H6DO)-157, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O2 sensor circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-158, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 sensor circuit slow response (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-160, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 sensor circuit no activity detected (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-162, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 sensor circuit low voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-164, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 sensor circuit high voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-164, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 sensor circuit slow response (Bank 1 Sensor 2)	<Ref. to EN(H6DO)-168, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0150	O2 sensor circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-170, DTC P0150 — O2 SENSOR CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	O2 sensor circuit slow response (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-172, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0154	O2 sensor circuit no activity detected (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-174, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too lean (Bank 1)	<Ref. to EN(H6DO)-176, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too rich (Bank 1)	<Ref. to EN(H6DO)-176, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0174	System too lean (Bank 2)	<Ref. to EN(H6DO)-179, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	System too rich (Bank 2)	<Ref. to EN(H6DO)-179, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel temperature sensor “A” circuit range/performance	<Ref. to EN(H6DO)-182, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel temperature sensor “A” circuit low input	<Ref. to EN(H6DO)-184, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel temperature sensor “A” circuit high input	<Ref. to EN(H6DO)-186, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0230	Fuel pump primary circuit	<Ref. to EN(H6DO)-190, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H6DO)-193, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H6DO)-193, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H6DO)-193, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H6DO)-193, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 misfire detected	<Ref. to EN(H6DO)-193, DTC P0305 — CYLINDER 5 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0306	Cylinder 6 misfire detected	<Ref. to EN(H6DO)-194, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor 1 circuit low input (Bank 1 or Single sensor)	<Ref. to EN(H6DO)-202, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor 1 circuit high input (Bank 1 or Single sensor)	<Ref. to EN(H6DO)-204, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0332	Knock sensor 2 circuit low input (Bank 2)	<Ref. to EN(H6DO)-206, DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0333	Knock sensor 2 circuit high input (Bank 2)	<Ref. to EN(H6DO)-208, DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor “A” circuit	<Ref. to EN(H6DO)-210, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft position sensor “A” circuit range/performance	<Ref. to EN(H6DO)-212, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft position sensor “A” circuit (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)-214, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft position sensor “A” circuit range/performance (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)-216, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust gas recirculation flow	<Ref. to EN(H6DO)-218, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H6DO)-222, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative emission control system leak detected (small leak)	<Ref. to EN(H6DO)-224, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative emission control system vent control circuit open	<Ref. to EN(H6DO)-228, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative emission control system vent control circuit shorted	<Ref. to EN(H6DO)-232, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative emission control system pressure sensor range/performance	<Ref. to EN(H6DO)-234, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0452	Evaporative emission control system pressure sensor low input	<Ref. to EN(H6DO)-236, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative emission control system pressure sensor high input	<Ref. to EN(H6DO)-240, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative emission control system leak detected (very small leak)	<Ref. to EN(H6DO)-244, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative emission control system leak detected (fuel cap loose/off)	<Ref. to EN(H6DO)-248, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low	<Ref. to EN(H6DO)-252, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high	<Ref. to EN(H6DO)-256, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance	<Ref. to EN(H6DO)-258, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel level sensor circuit low input	<Ref. to EN(H6DO)-260, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel level sensor circuit high input	<Ref. to EN(H6DO)-264, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor circuit intermittent	<Ref. to EN(H6DO)-268, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan rationality check	<Ref. to EN(H6DO)-270, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle speed sensor circuit low input	<Ref. to EN(H6DO)-273, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle speed sensor intermittent/erratic/high	<Ref. to EN(H6DO)-274, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(H6DO)-278, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle control system RPM higher than expected	<Ref. to EN(H6DO)-280, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle control system circuit low	<Ref. to EN(H6DO)-282, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle control system circuit high	<Ref. to EN(H6DO)-284, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter request circuit	<Ref. to EN(H6DO)-286, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle air control circuit system performace	<Ref. to EN(H6DO)-290, DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMACE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise control on signal	<Ref. to EN(H6DO)-292, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0604	Internal control module random access memory (RAM) error	<Ref. to EN(H6DO)-294, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0661	Intake manifold tuning valve control circuit low -bank 1	<Ref. to EN(H6DO)-296, DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW - BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0662	Intake manifold tuning valve control circuit high -bank 2	<Ref. to EN(H6DO)-300, DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH - BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling fan 1 control circuit low	<Ref. to EN(H6DO)-302, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling fan 1 control circuit high	<Ref. to EN(H6DO)-306, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque converter/brake switch “B” circuit	<Ref. to EN(H6DO)-310, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit (PRNDL input)	<Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit	<Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Input/turbine speed sensor circuit range/performance	<Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor circuit	<Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine speed input circuit range/performance	<Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(H6DO)-312, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(H6DO)-312, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(H6DO)-312, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(H6DO)-312, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch circuit performance or stuck off	<Ref. to EN(H6DO)-314, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque converter clutch circuit electrical	<Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid “A” electrical	<Ref. to 4AT(H4SO)-102, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid “A” electrical	<Ref. to 4AT(H4SO)-86, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid “B” electrical	<Ref. to 4AT(H4SO)-90, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift solenoid “E” performance or stuck off	<Ref. to 4AT(H4SO)-94, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure control solenoid “B” electrical	<Ref. to 4AT(H4SO)-108, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/timing solenoid	<Ref. to 4AT(H4SO)-98, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral switch input circuit low	<Ref. to EN(H6DO)-316, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral switch input circuit high	<Ref. to EN(H6DO)-318, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P0864	TCM communication circuit range/performance	<Ref. to EN(H6DO)-322, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM communication circuit low	<Ref. to EN(H6DO)-324, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM communication circuit high	<Ref. to EN(H6DO)-326, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit malfunction (low input)	<Ref. to EN(H6DO)-328, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit malfunction (high input)	<Ref. to EN(H6DO)-329, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F sensor micro-computer problem	<Ref. to EN(H6DO)-330, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 sensor circuit range/performance (low) (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-332, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 sensor circuit range/performance (high) (Bank 1 Sensor 1)	<Ref. to EN(H6DO)-334, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1154	O2 sensor circuit range/performance (low) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-336, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1155	O2 sensor circuit range/performance (high) (Bank 2 Sensor 1)	<Ref. to EN(H6DO)-338, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel tank pressure control solenoid valve circuit low	<Ref. to EN(H6DO)-340, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel tank pressure control solenoid valve circuit high	<Ref. to EN(H6DO)-344, DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent control solenoid valve function problem	<Ref. to EN(H6DO)-346, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel tank sensor control valve circuit low	<Ref. to EN(H6DO)-348, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel tank sensor control valve circuit high	<Ref. to EN(H6DO)-352, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to EN(H6DO)-354, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(H6DO)-356, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(H6DO)-360, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine torque control cut signal circuit malfunction (low input)	<Ref. to EN(H6DO)-362, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine torque control cut signal circuit malfunction (high input)	<Ref. to EN(H6DO)-364, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC No.	Item	Index
P1700	Throttle position sensor circuit malfunction for AT	<Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal #1 circuit malfunction	<Ref. to EN(H6DO)-366, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine torque control signal #2 circuit malfunction	<Ref. to EN(H6DO)-368, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post catalyst fuel trim system tool lean bank 1	<Ref. to EN(H6DO)-370, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOOL LEAN BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post catalyst fuel trim system tool rich bank 1	<Ref. to EN(H6DO)-376, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOOL RICH BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

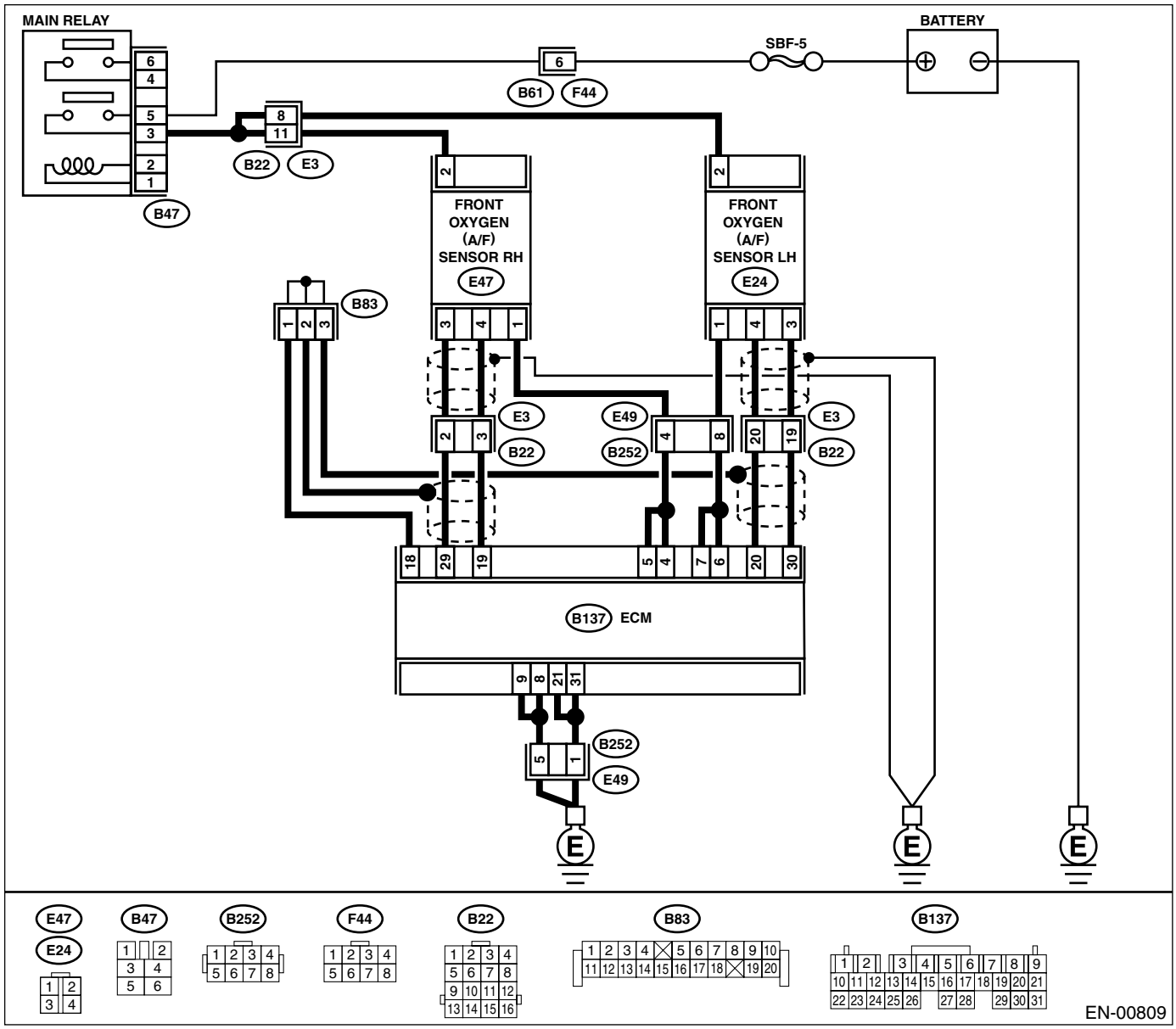
19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



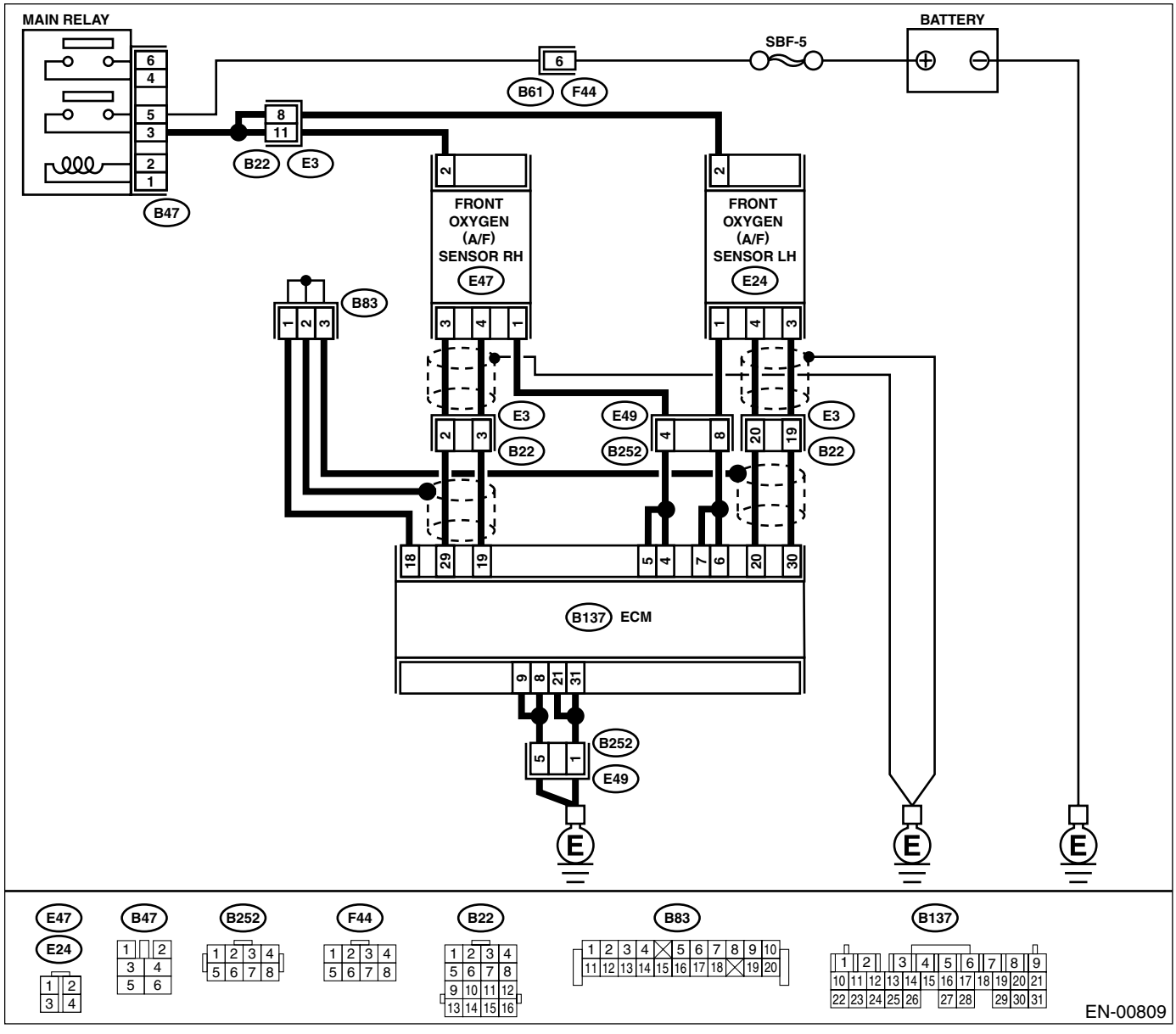
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 4 — (E47) No. 1:*** ***(B137) No. 5 — (E47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (E47) No. 4:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the measured value less than 5 Ω?	Go to step **5.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Go to step **7.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E47) No. 2 (+) — Engine ground (–):***	Is the measured value more than 1.0 V?	Go to step **8.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
8	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the measured value less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

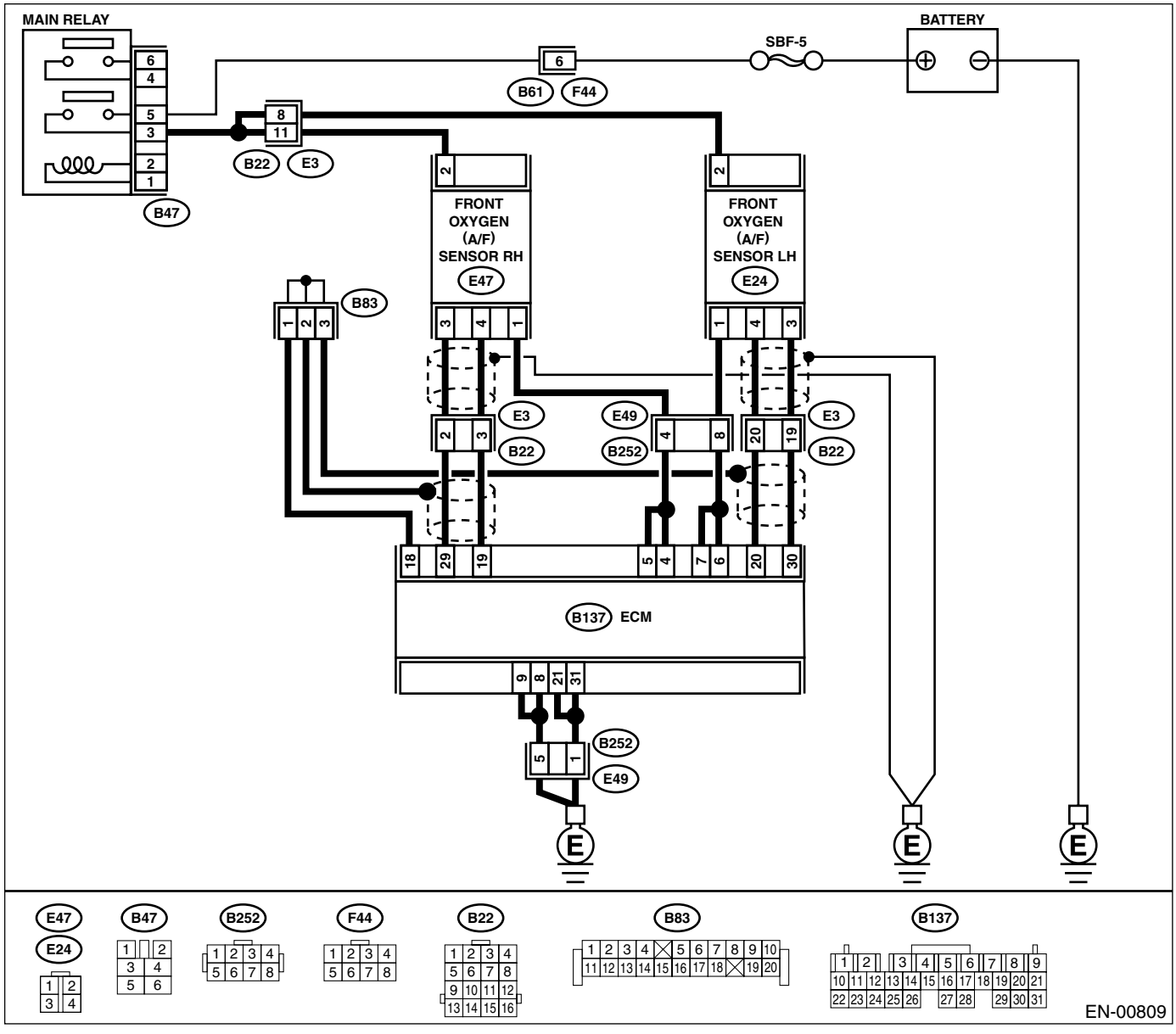
MEMO:

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



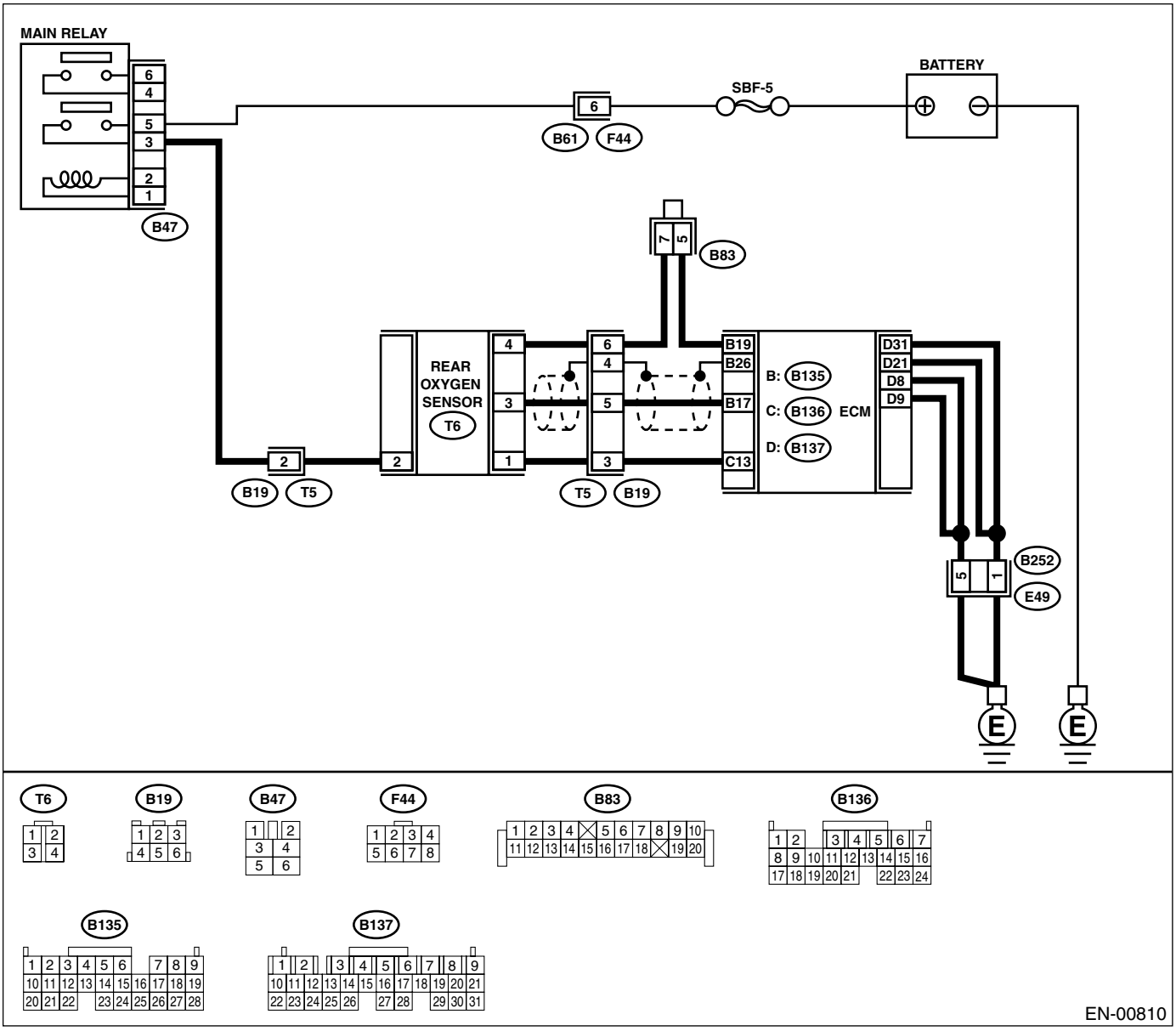
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.3 A?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 4 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 5 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn ignition switch to OFF. 2) Disconnect ECM connector. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 1.0 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

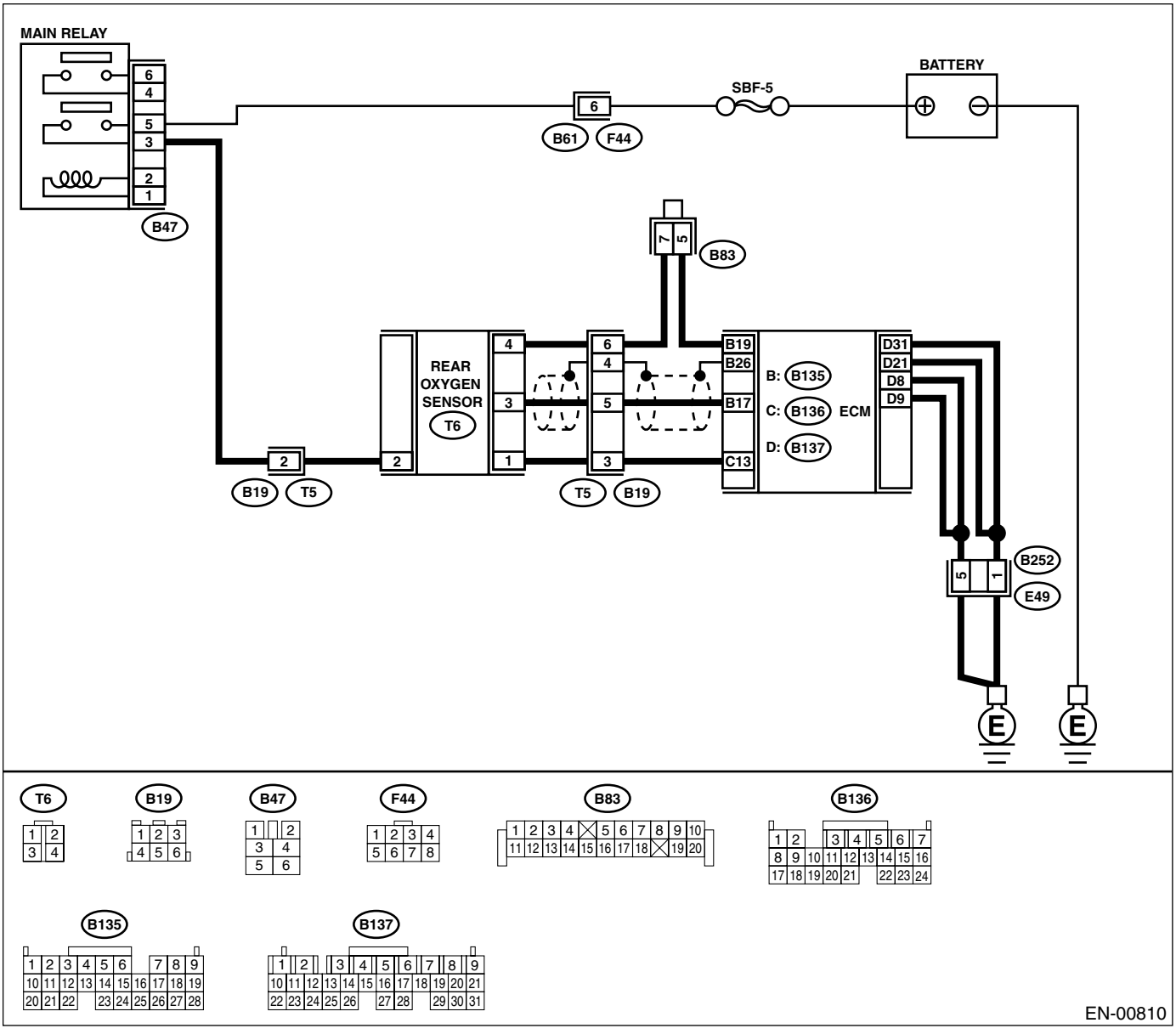
MEMO:

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



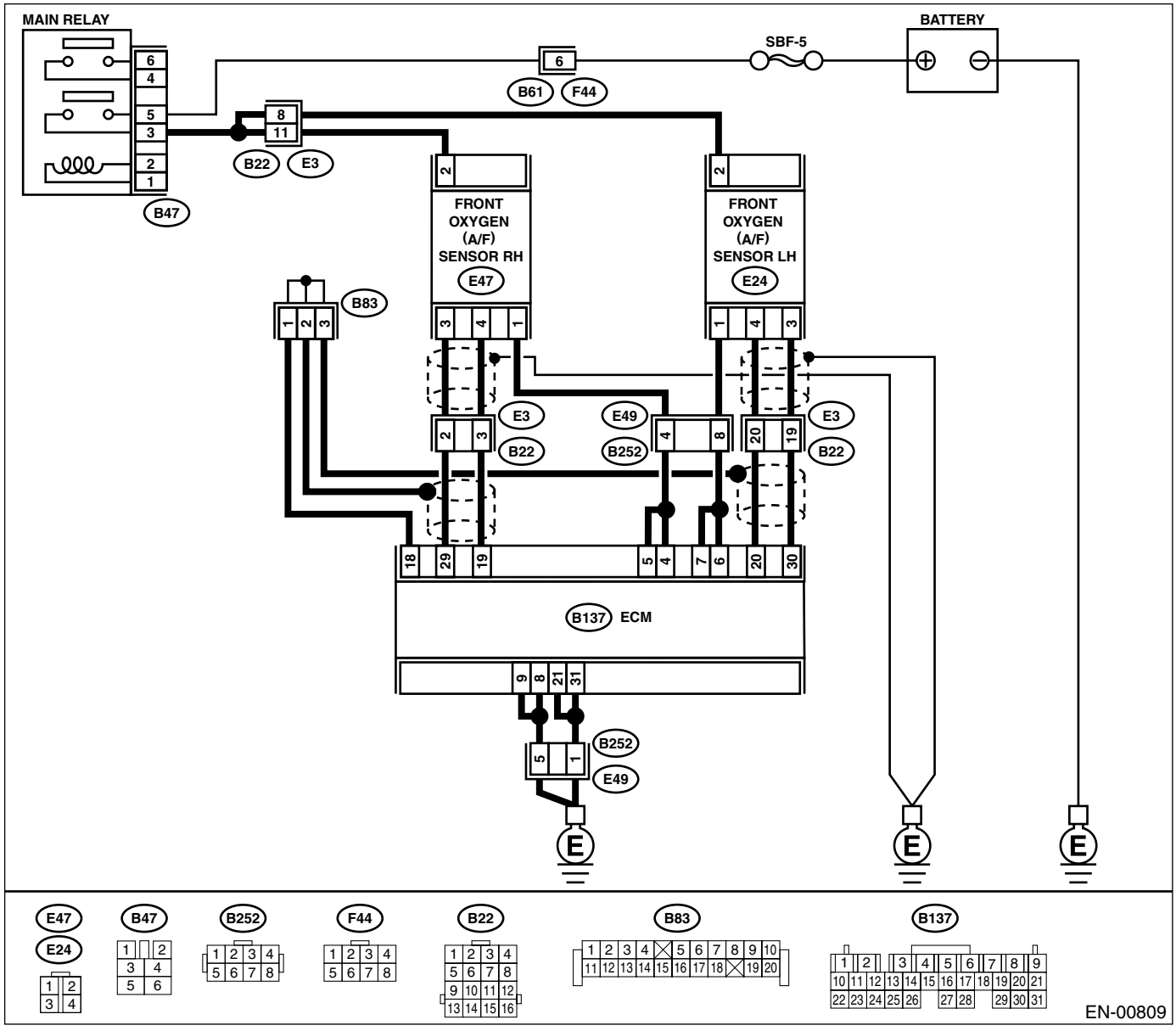
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn ignition switch to ON. 3) Read data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 7 A?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

F: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



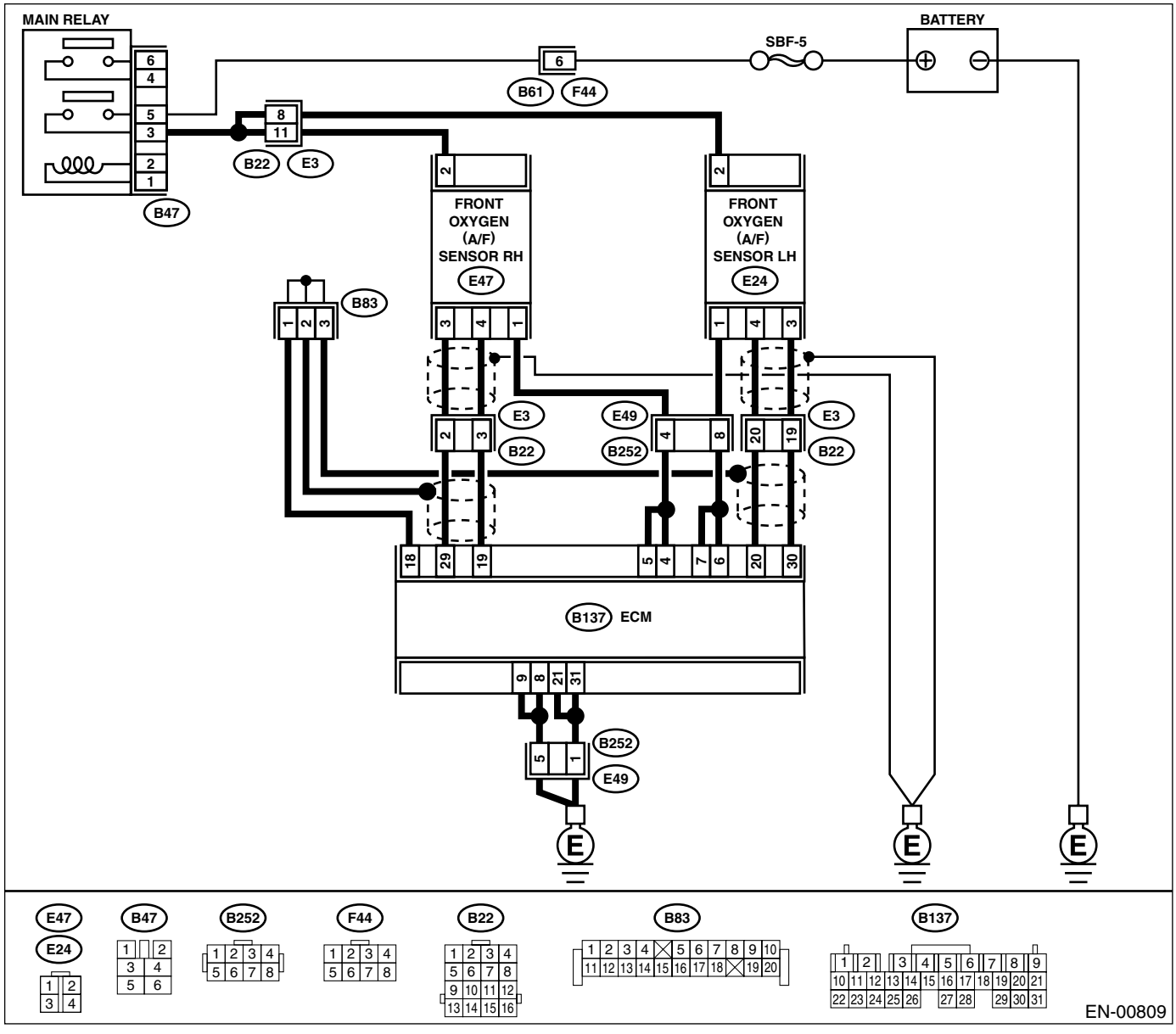
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connectors from ECM and front oxygen (A/F) sensor. 4) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 4 — (E24) No. 6:*** ***(B137) No. 5 — (E24) No. 7:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E24) No. 4:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the measured value less than 5 Ω?	Go to step **5.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

G: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:*** ***(B137) No. 21 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 9 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start engine 2) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1.0 V?	Go to step **7.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from front oxygen (A/F) sensor. 3) Turn ignition switch to ON. 4) Measure voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(E24) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **8.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
8	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the measured value less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

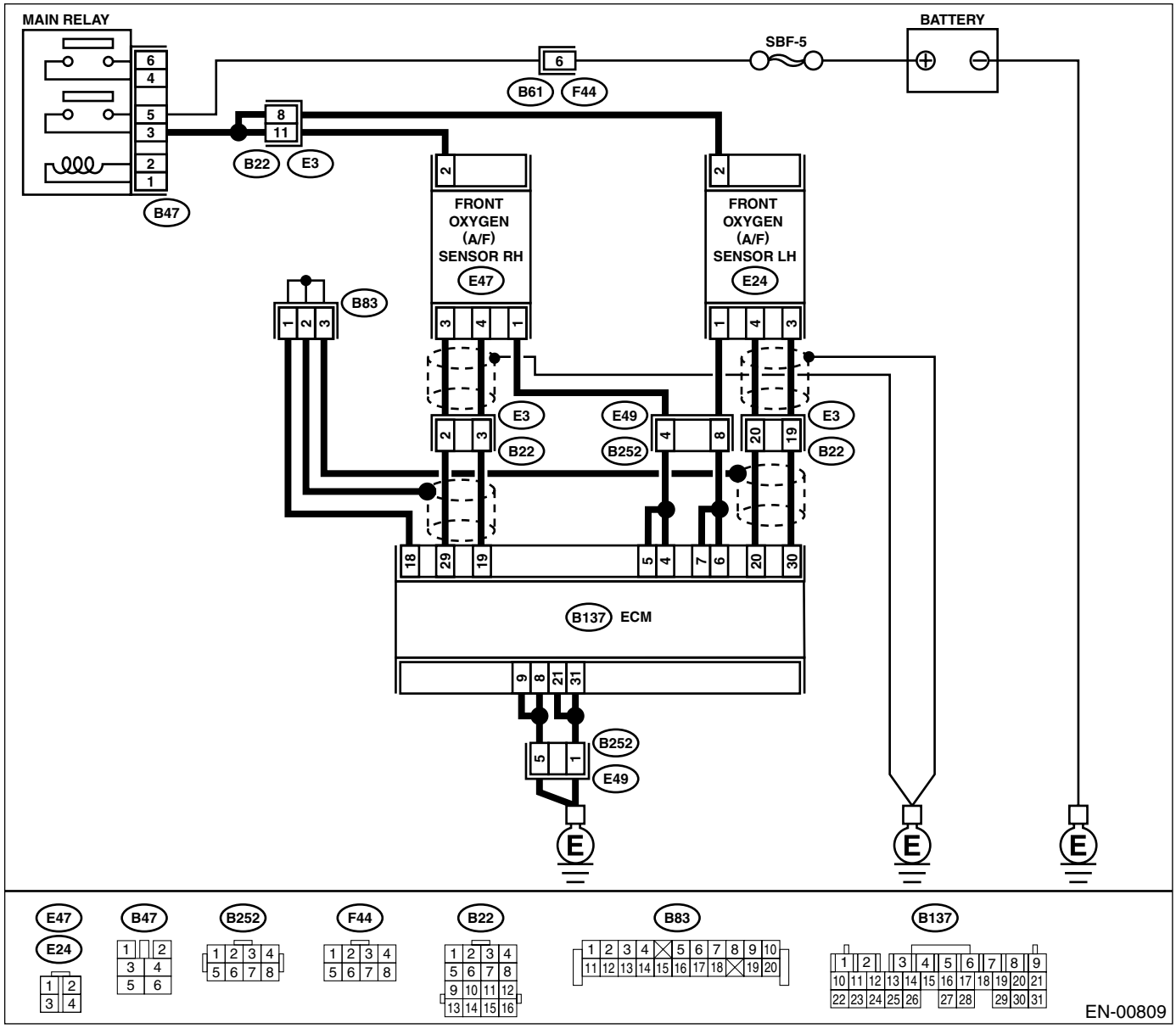
MEMO:

H: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



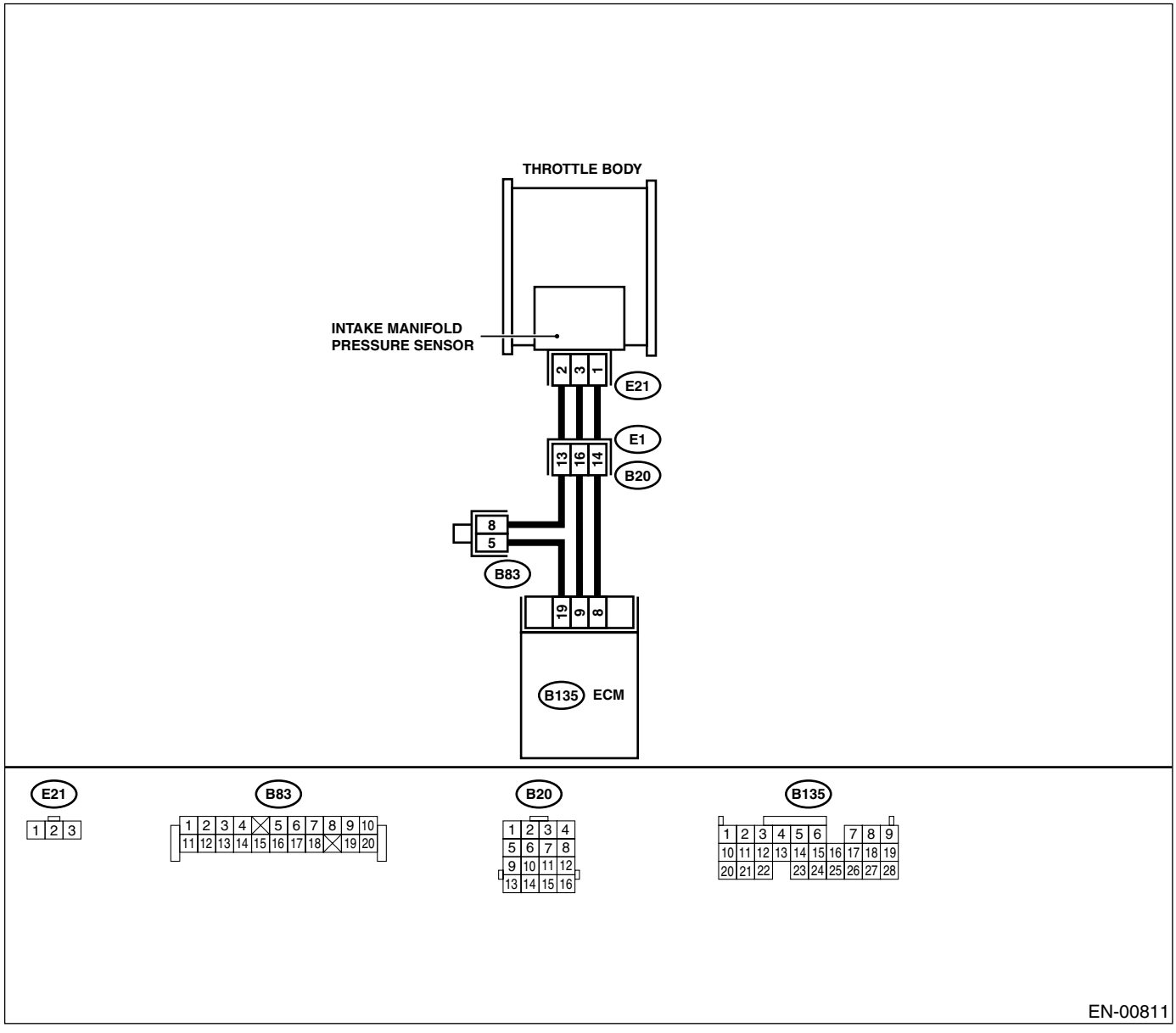
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn ignition switch to ON. 4) Read data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.3 A?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	END
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 7 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

I: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



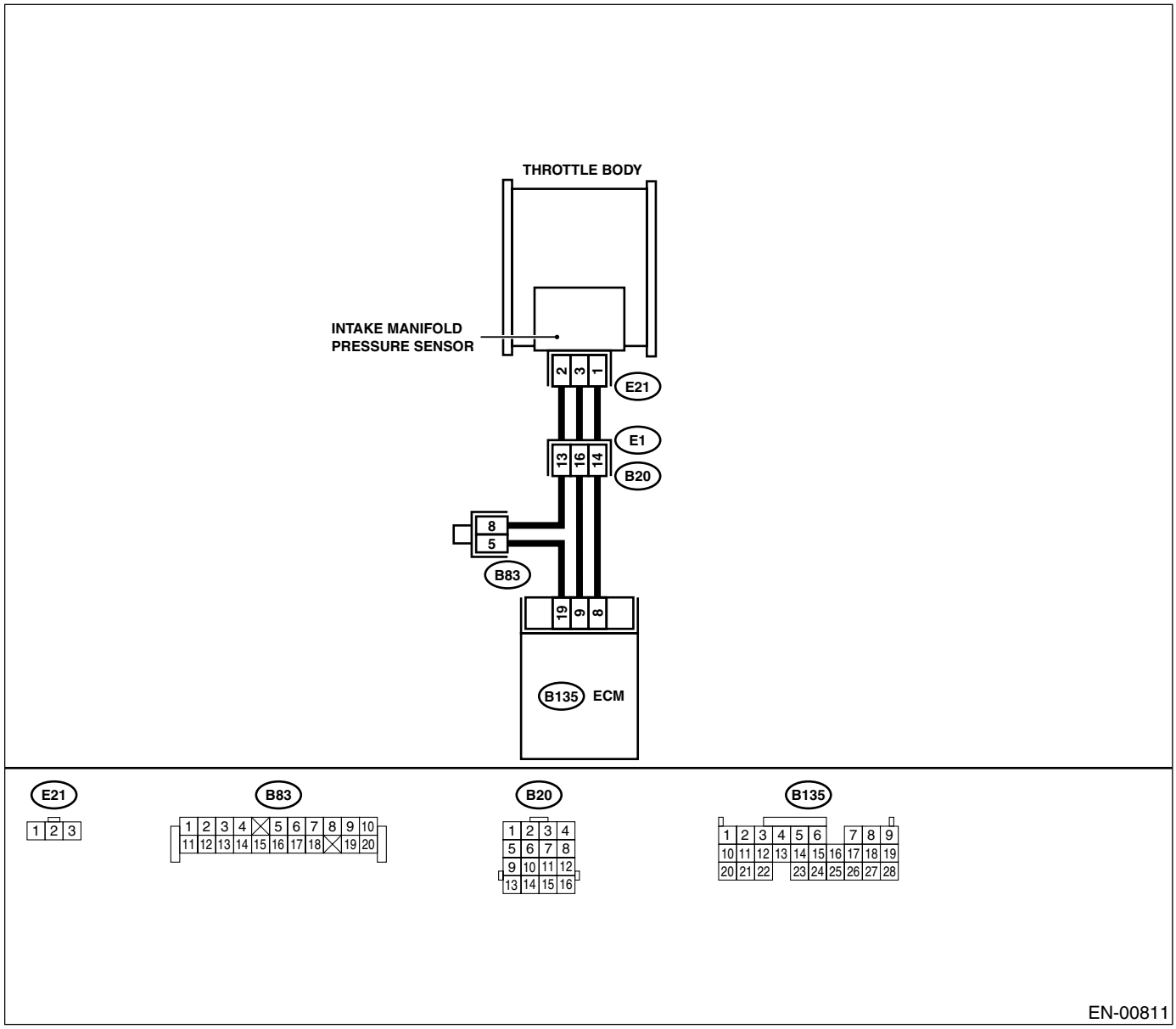
	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2.**	Check throttle position sensor circuit. <Ref. to EN(H6DO)-146, DTC P0121 — THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A" CIRCUIT RANGE/ PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF INTAKE MANIFOLD PRESSURE SENSOR.**	Is the intake manifold pressure sensor installation bolt tightened securely?	Go to step **4.**	Tighten intake manifold pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Go to step **5.**	Tighten throttle body installation bolt securely.
5	**CHECK CONDITION OF EGR VALVE.**	Is there any foreign object caught between EGR solenoid valve and intake manifold?	Completely remove foreign object, and install EGR solenoid valve securely to the intake manifold.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 1.7 kPa (13 mmHg, 0.51 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and pressure sensor connector.	Is there poor contact in ECM or pressure sensor connector?	Repair poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 0.7 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM.** Read data of intake manifold atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake manifold pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **8.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
9	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** Measure resistance of harness between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **10.**	Repair ground short circuit in harness between ECM and intake manifold pressure sensor connector.
10	**CHECK POOR CONTACT.** Check poor contact in intake manifold pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

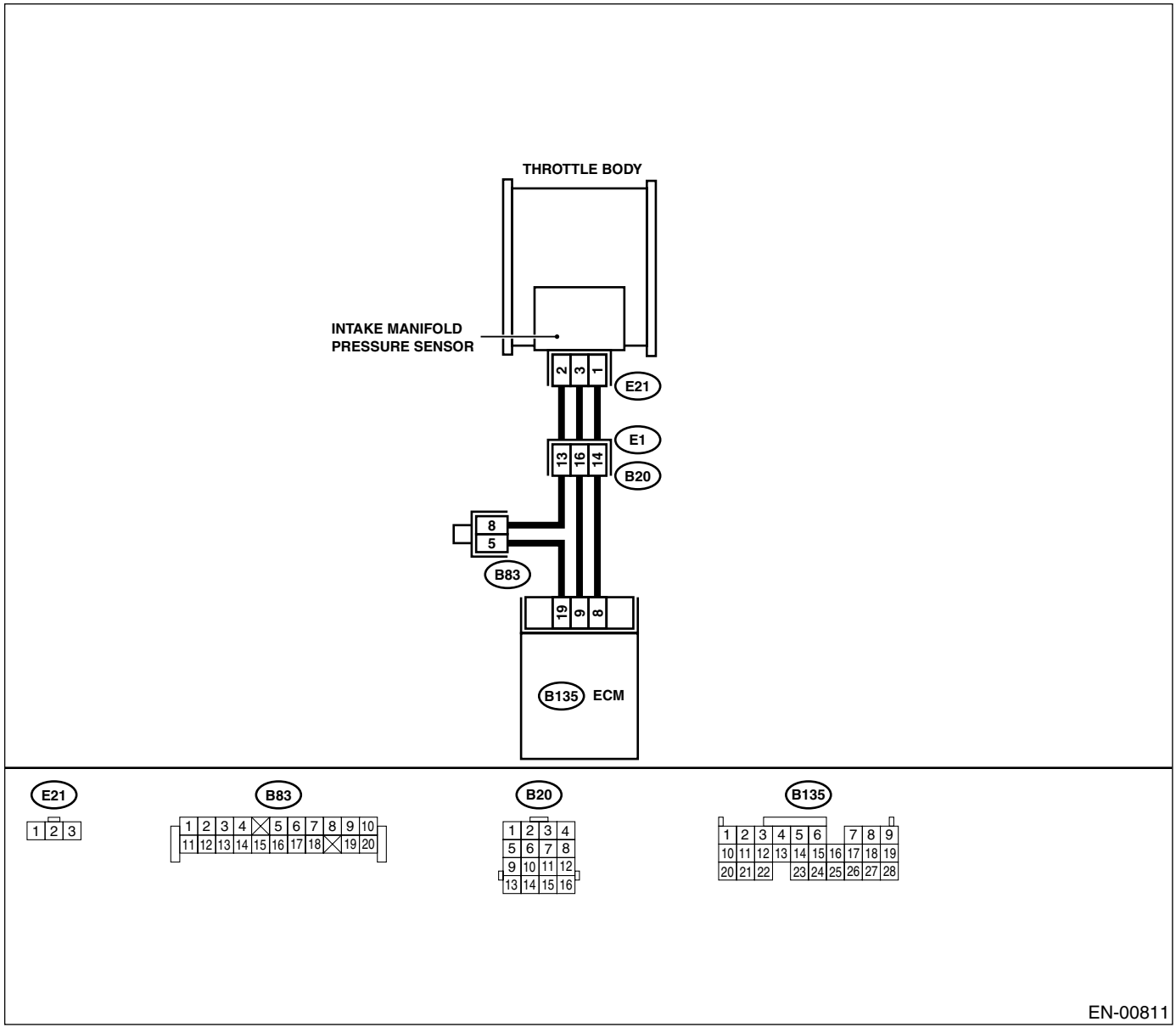
MEMO:

K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 130 kPa (975 mmHg, 38.39 inHg)?	Go to step **10.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 0.7 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM.** Read data of intake manifold atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake manifold pressure sensor. 3) Turn ignition switch to ON. 4) Measure voltage between intake manifold pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E21) No. 1:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR.** Measure resistance of harness between ECM and intake manifold pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and intake manifold pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in intake manifold pressure sensor connector.	Is there poor contact in intake manifold pressure sensor connector?	Repair poor contact in intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>
10	**CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect connector from pressure sensor. 3) Turn ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 130 kPa (975 mmHg, 38.39 inHg)?	Repair battery short circuit in harness between ECM and intake manifold pressure sensor connector.	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>

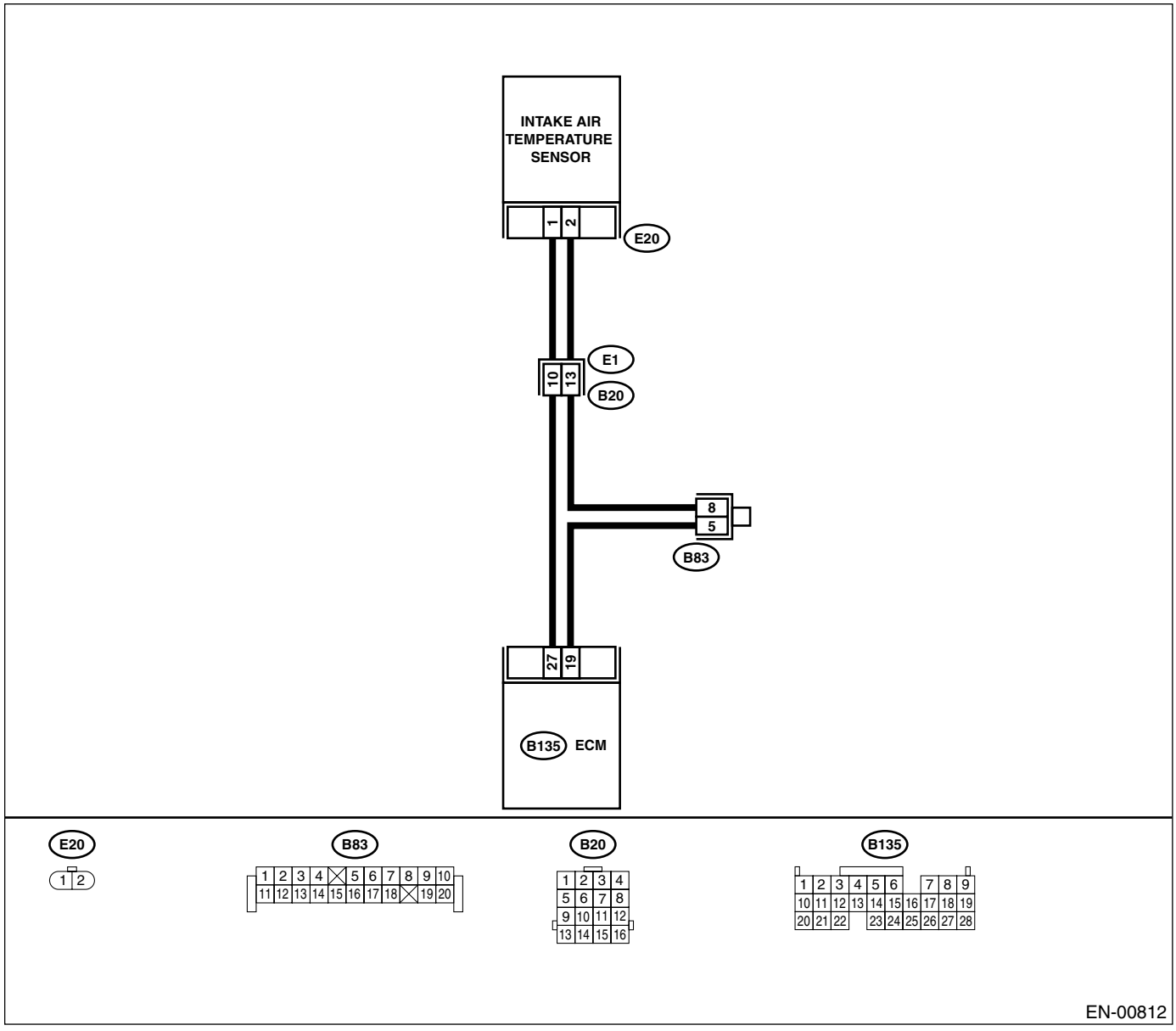
MEMO:

L: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



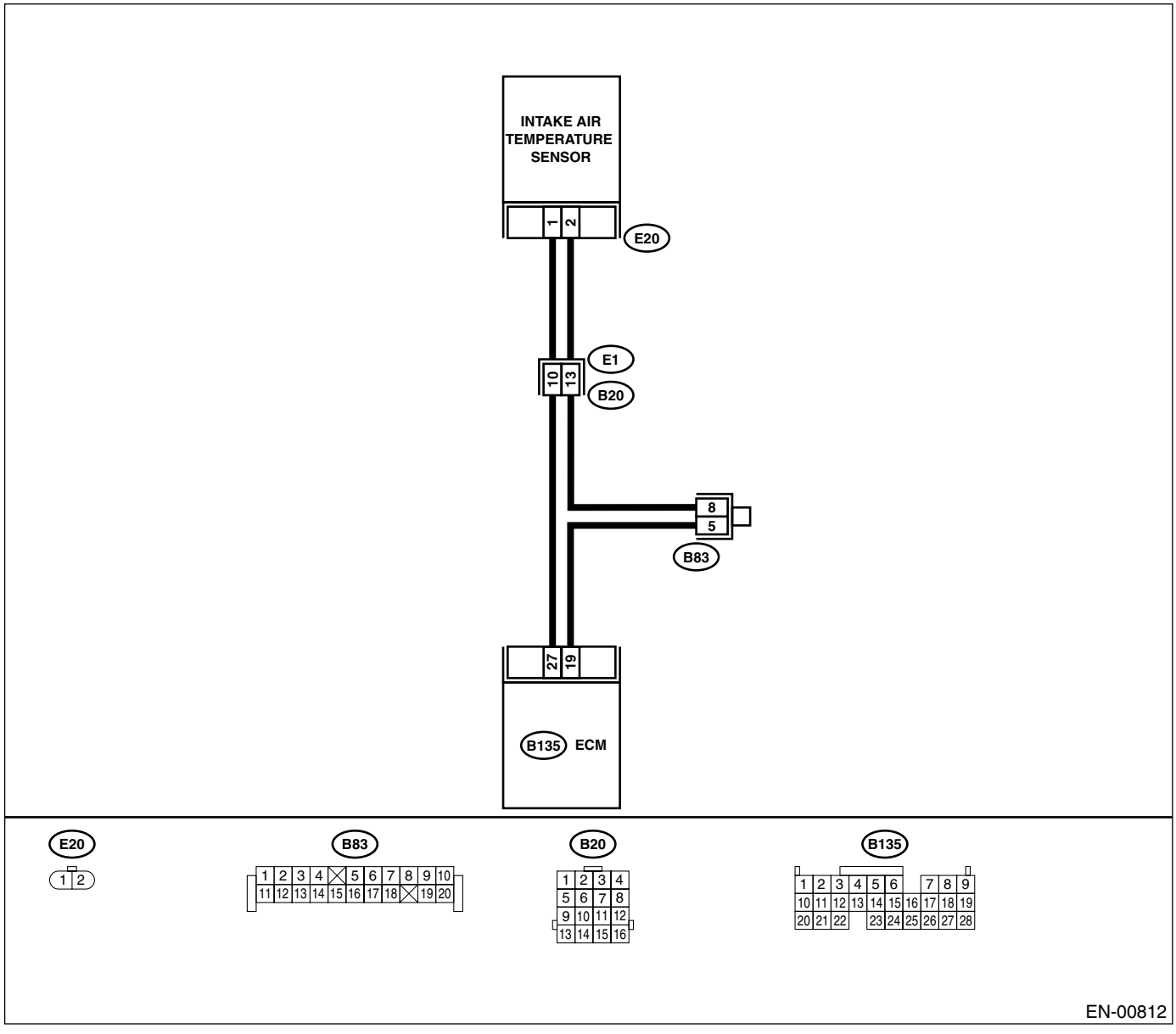
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

M: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



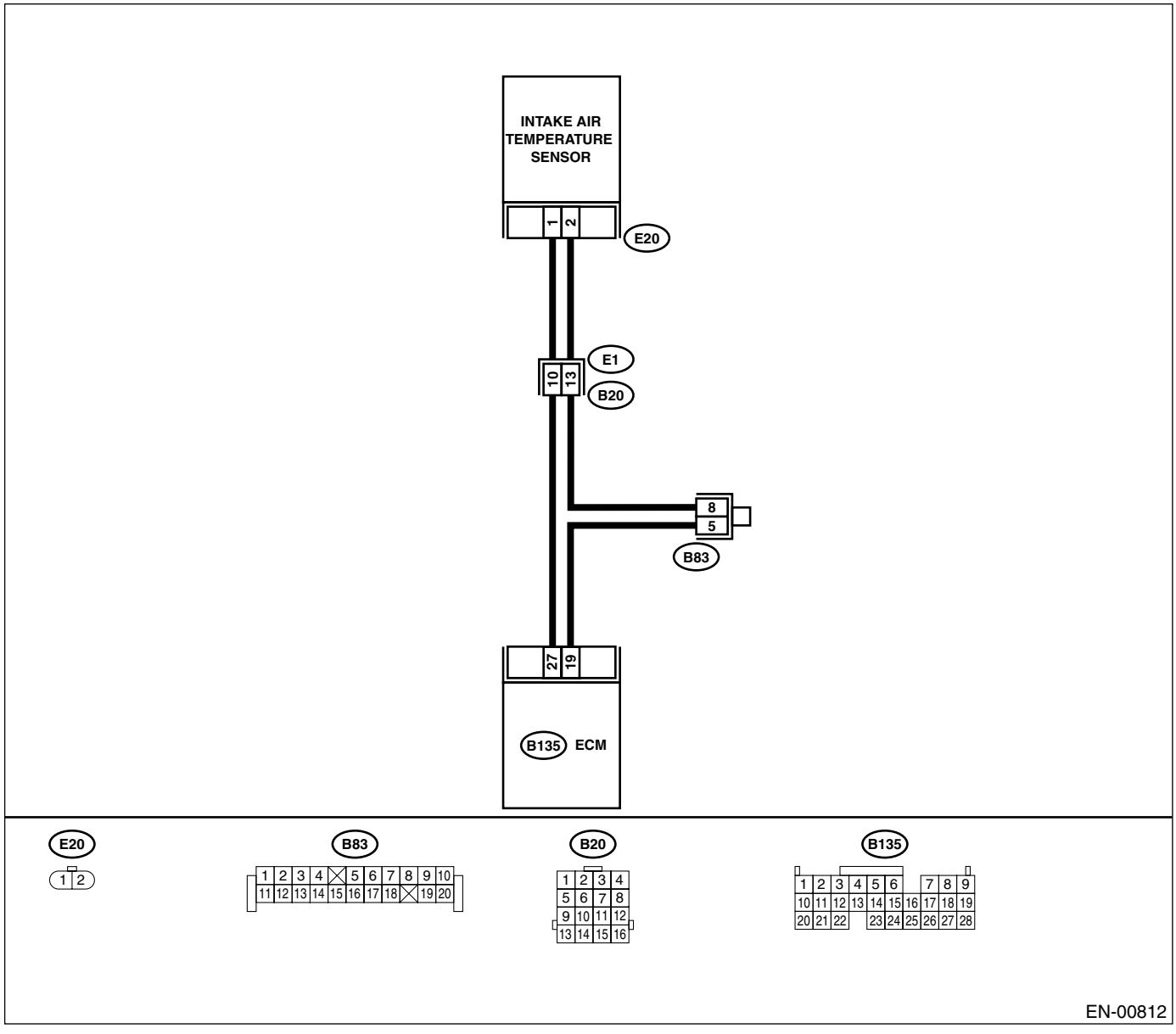
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Turn ignition switch to ON. 4) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than –40°C (–40°F)?	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

N: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to ON. 2) Start engine. 3) Read data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from intake air temperature sensor. 3) Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (–):***	Is the measured value more than 3 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Replace intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

MEMO:

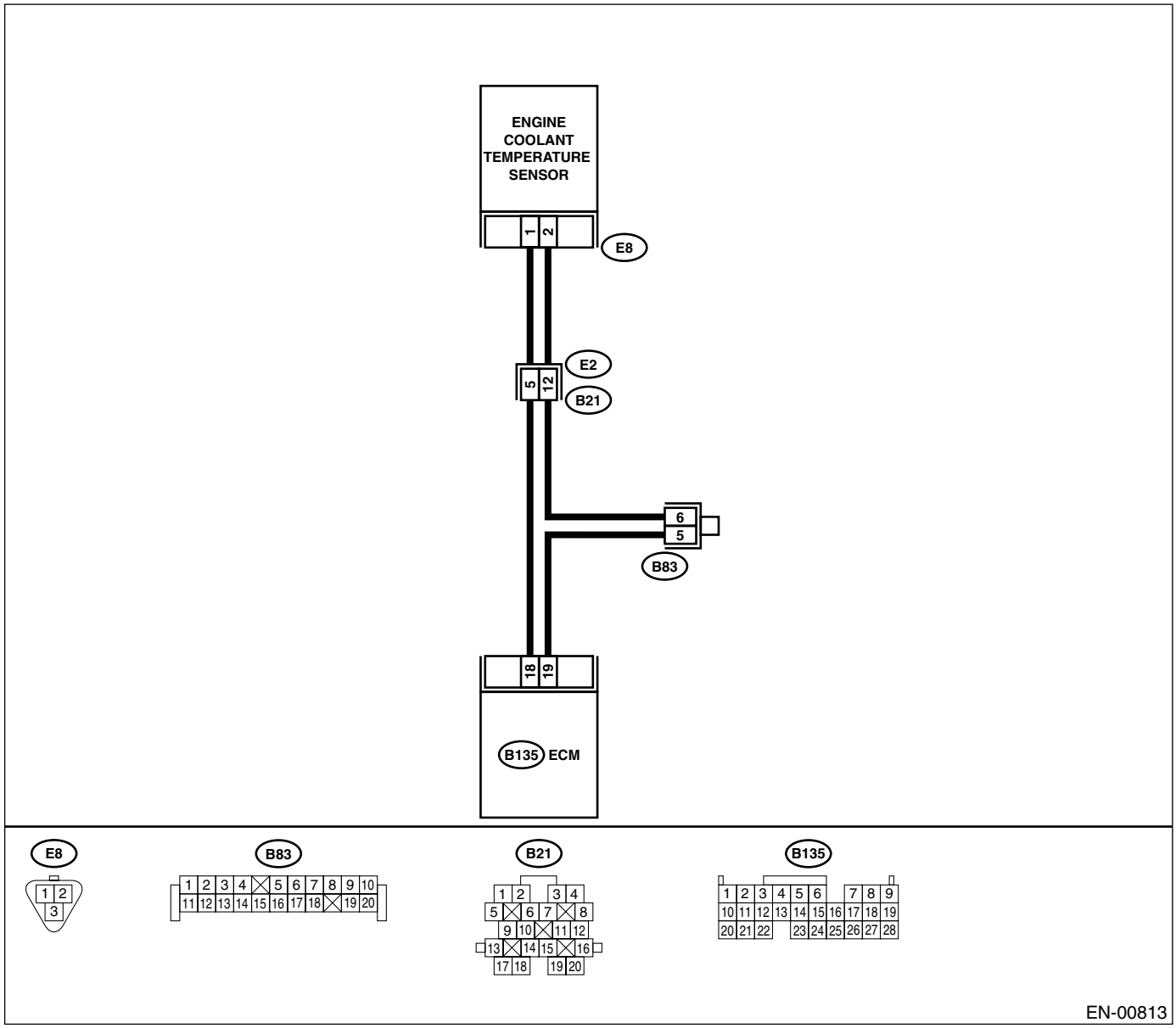
O: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



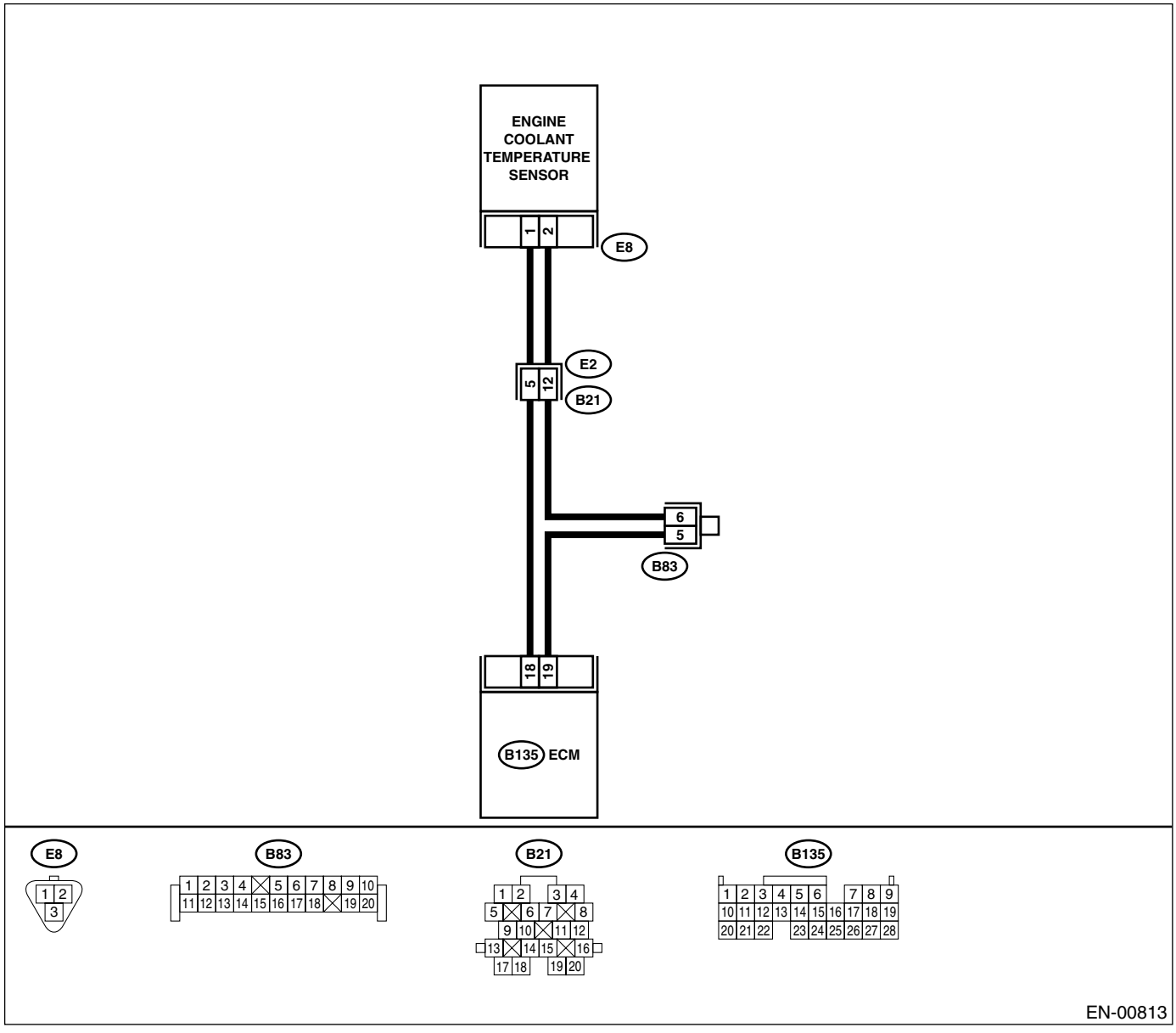
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Turn ignition switch to ON. 4) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

P: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor. 3) Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

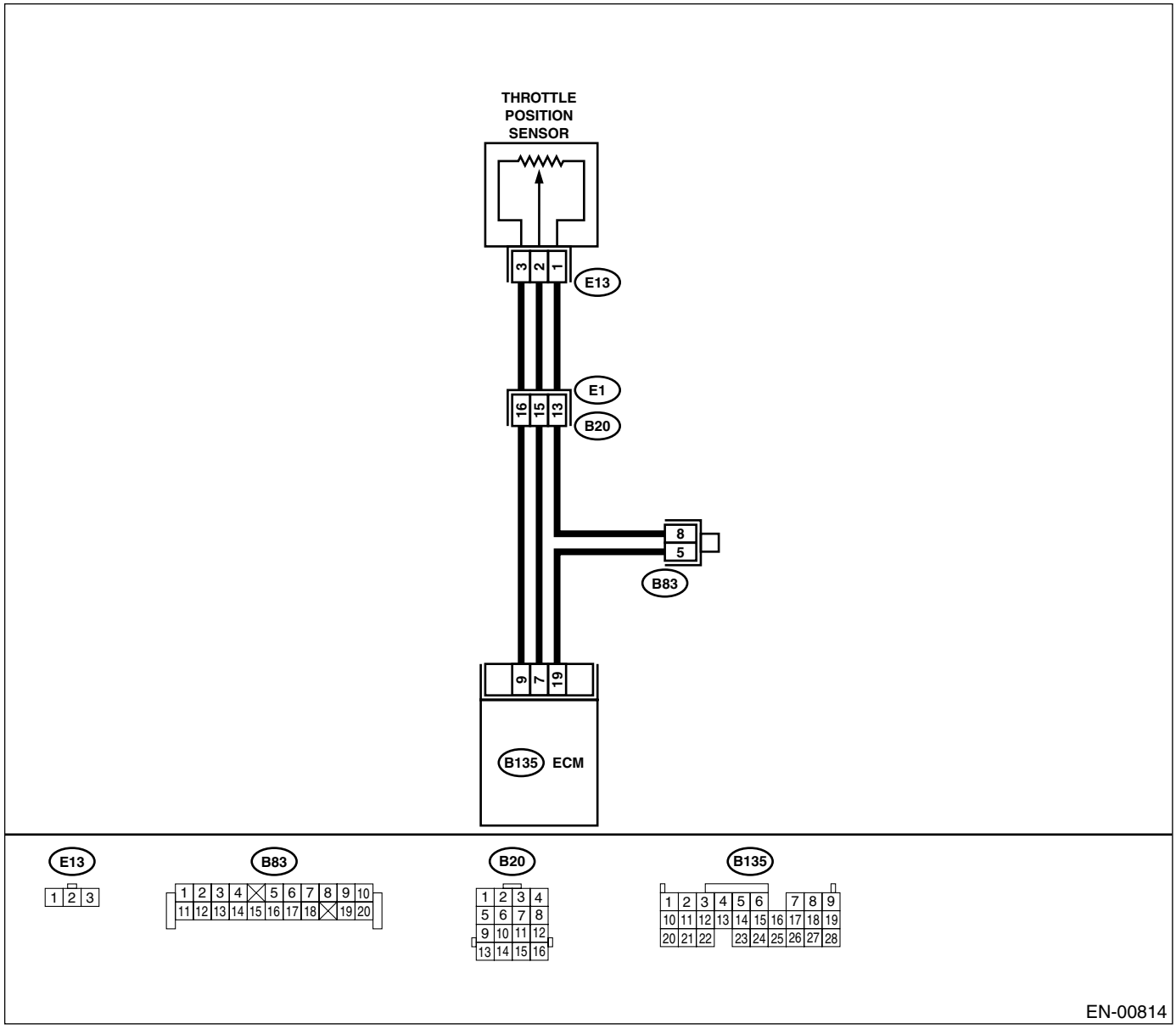
MEMO:

Q: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00814

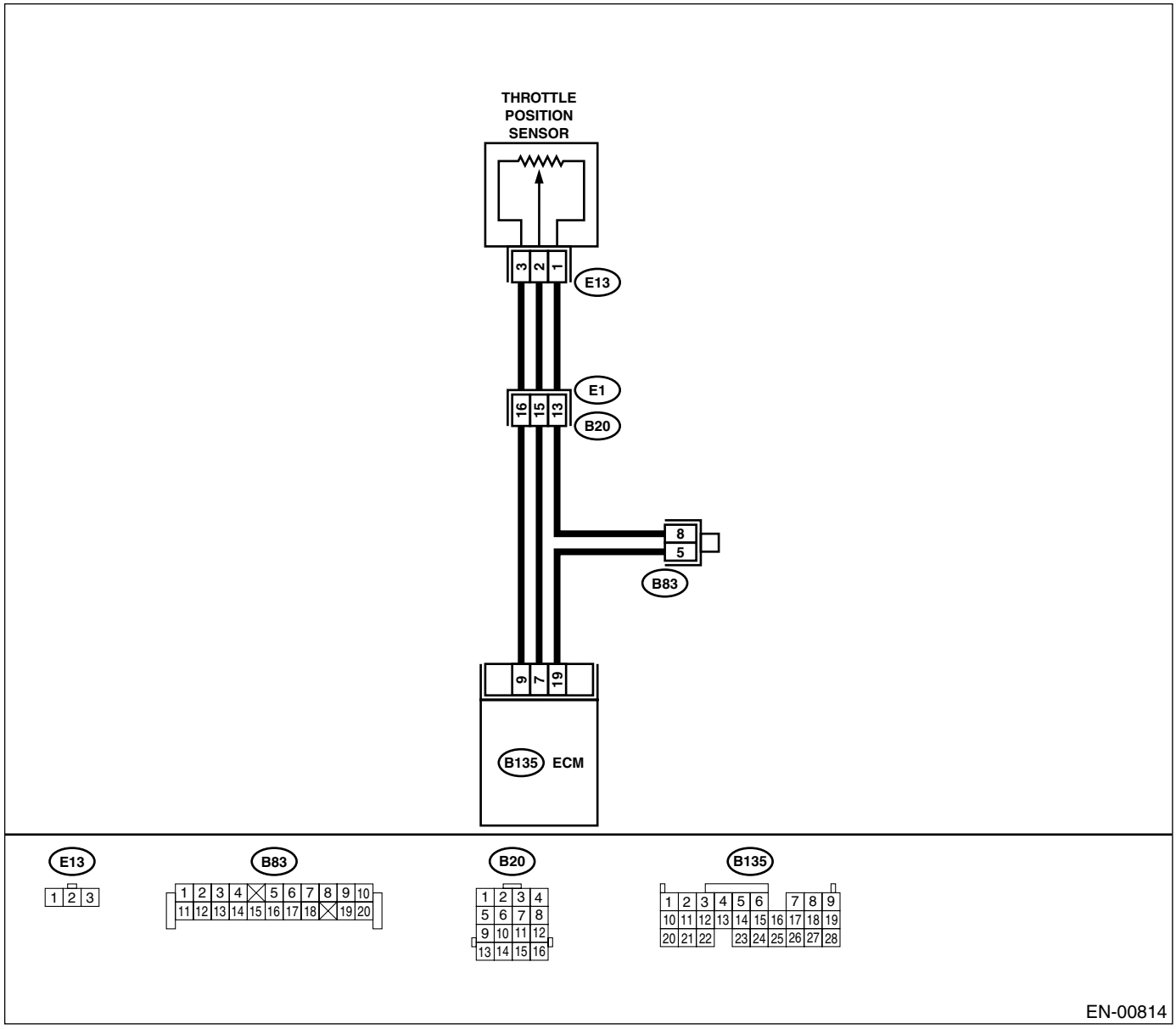
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

R: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 0.1 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure voltage between ECM connector and chassis ground.	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from throttle position sensor. 3) Turn ignition switch to ON. 4) Measure voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 (+) — Engine ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (E13) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between throttle position sensor and ECM connector.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

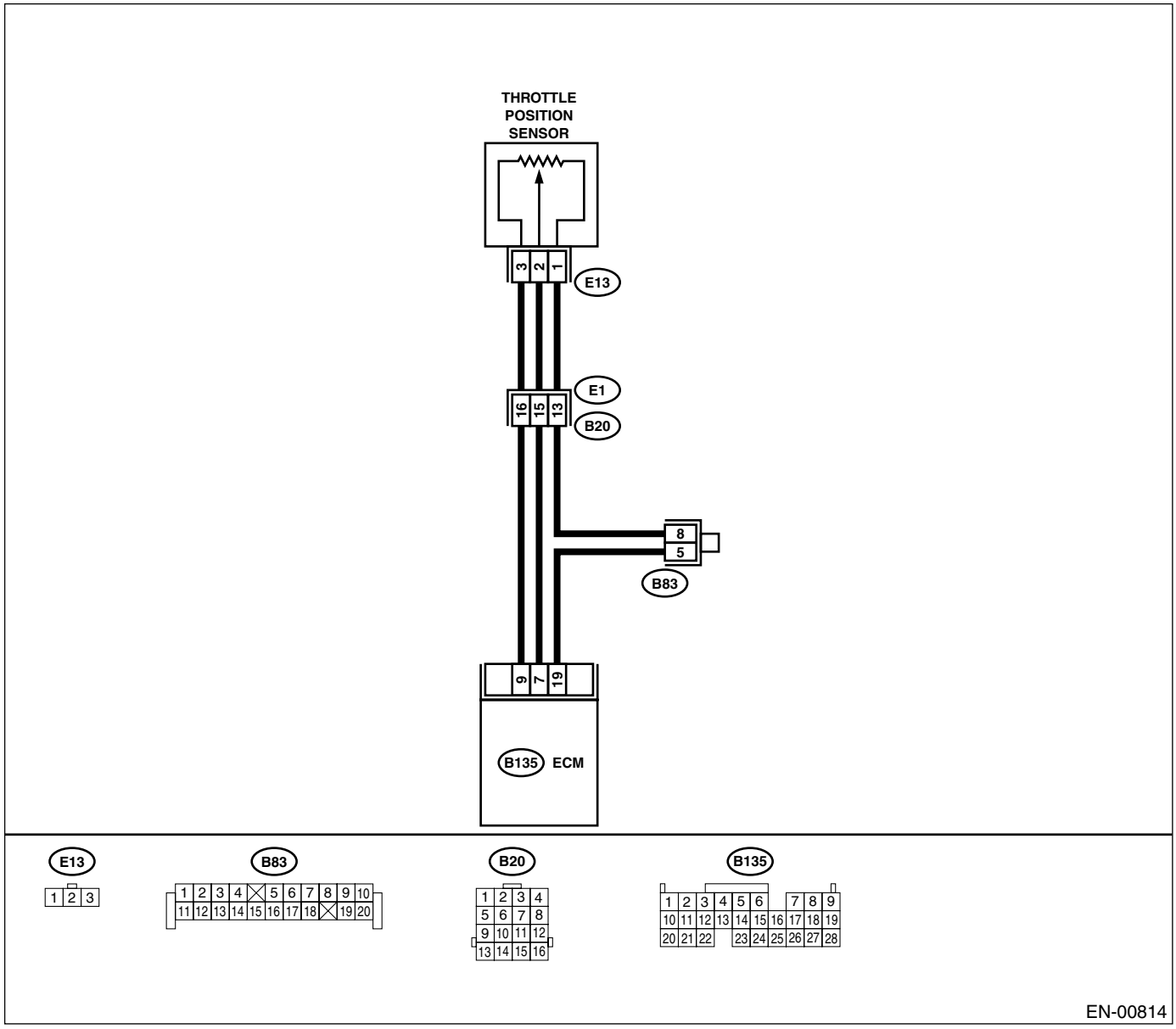
MEMO:

S: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



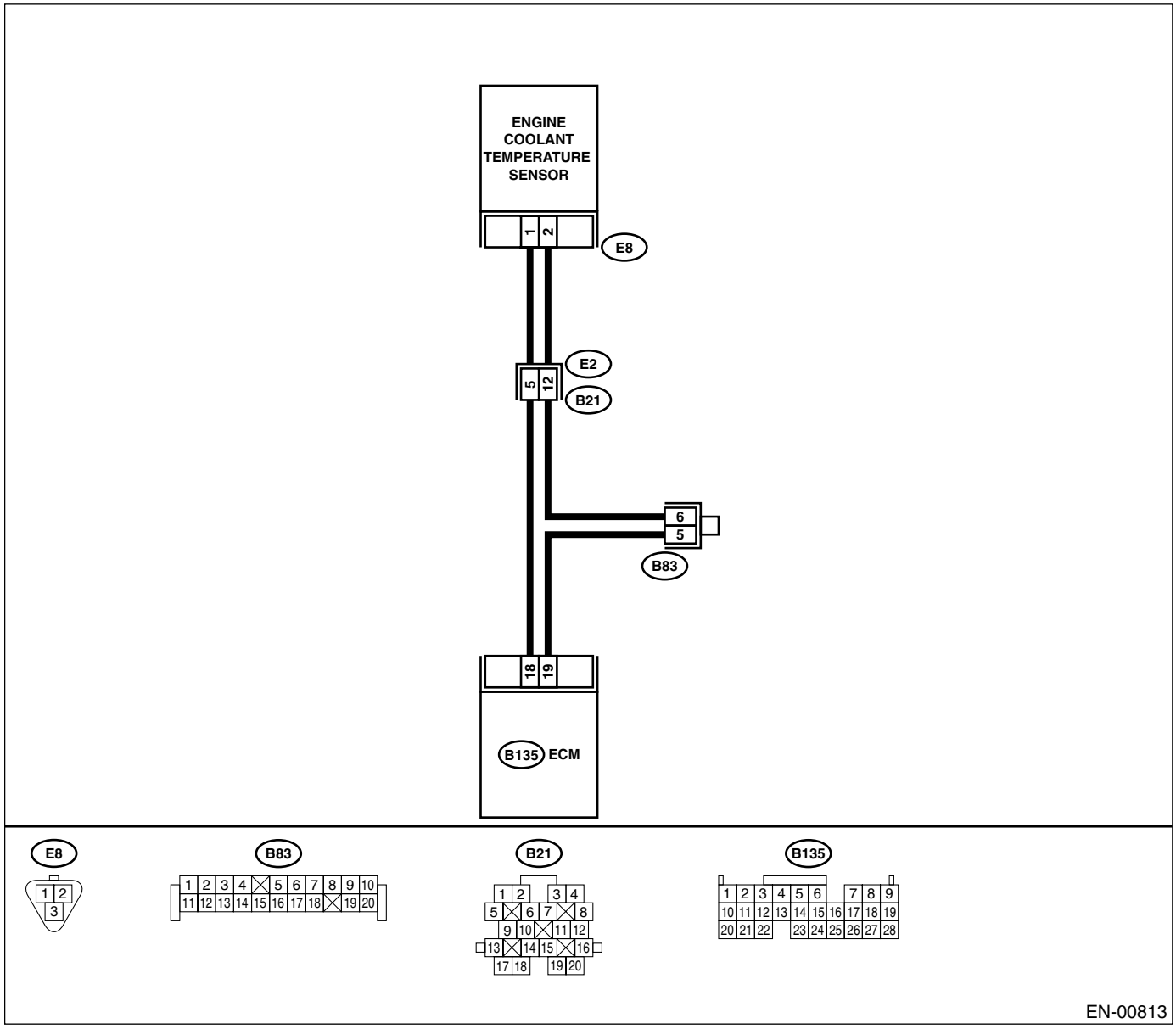
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 4.75 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from throttle position sensor. 3) Measure resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (–):***	Is the measured value more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Replace throttle position sensor. <Ref. to FU(H6DO)-33, Throttle Position Sensor.>

T: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine does not return to idle.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK TIRE SIZE.**	Is the tire size the same as designated tire and four-wheel tire?	Go to step **3.**	Replace tire.
3	**CHECK ENGINE COOLANT.** Check the following items. • Engine coolant volume • Engine coolant freezing • Contamination in engine coolant	Is the engine coolant normal?	Go to step **4.**	Refill or replace coolant. <Ref. to CO(H6DO)-19, INSPECTION, Engine Coolant.>
4	**CHECK THERMOSTAT.**	Does thermostat remain open?	Replace thermostat. <Ref. to CO(H6DO)-21, Thermostat.>	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>

U: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Thermostat remains open.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Has engine operated or has vehicle been driven with engine submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Go to step **3.**	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
3	**CHECK TIRE SIZE.**	Is the tire size the same as designated tire and four wheel tire?	Go to step **4.**	Replace tire.
4	**CHECK ENGINE COOLANT.** Check the following items: • Engine coolant for level • Engine coolant for icing • Engine coolant for dirt	Is condition of engine coolant OK?	Go to step **5.**	Replace engine coolant. <Ref. to CO(H6DO)-18, REPLACEMENT, Engine Coolant.>
5	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H6DO)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H6DO)-31, Radiator Sub Fan and Fan Motor.>	Replace thermostat. <Ref. to CO(H6DO)-21, Thermostat.>

V: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

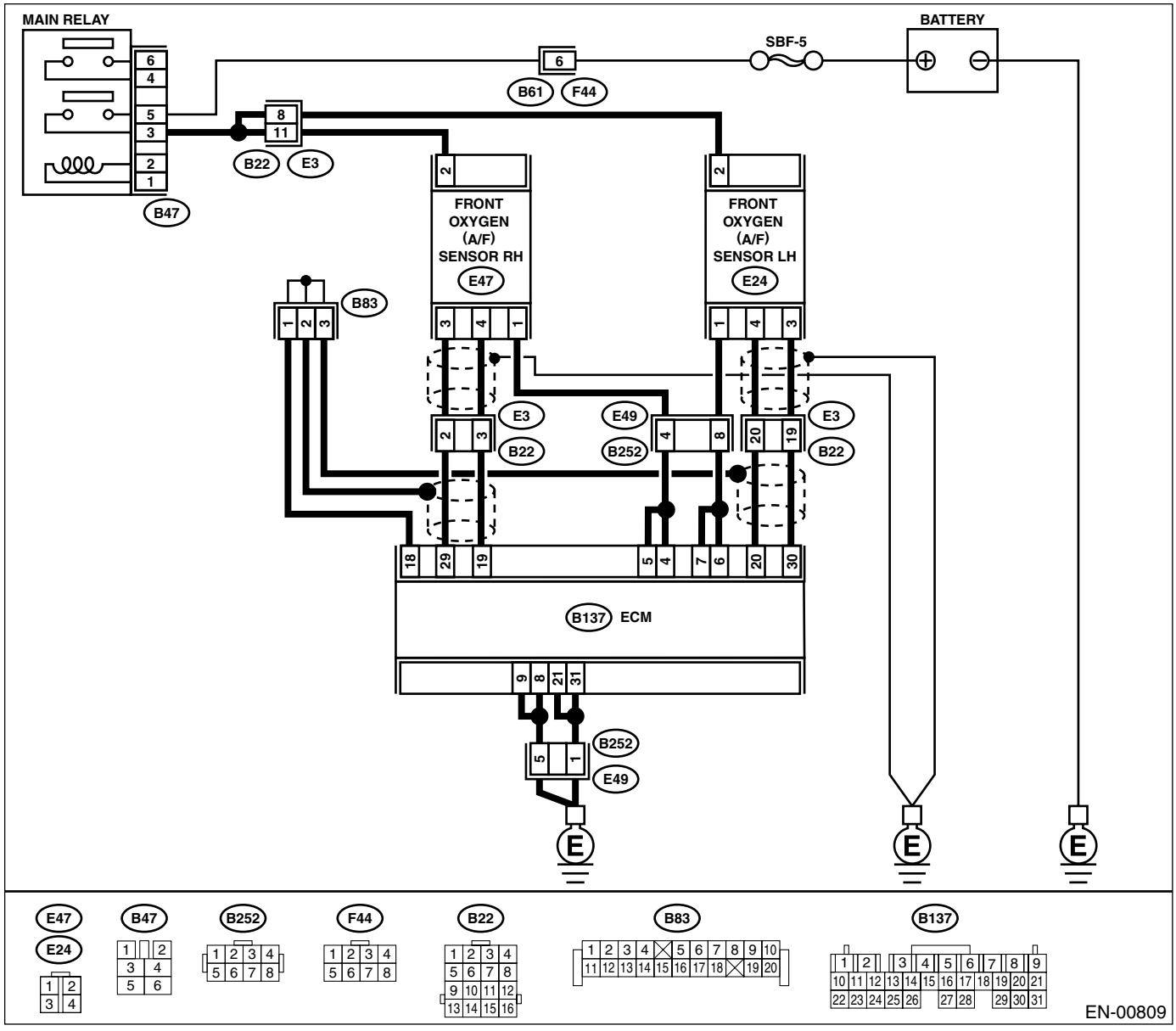
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

W: DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



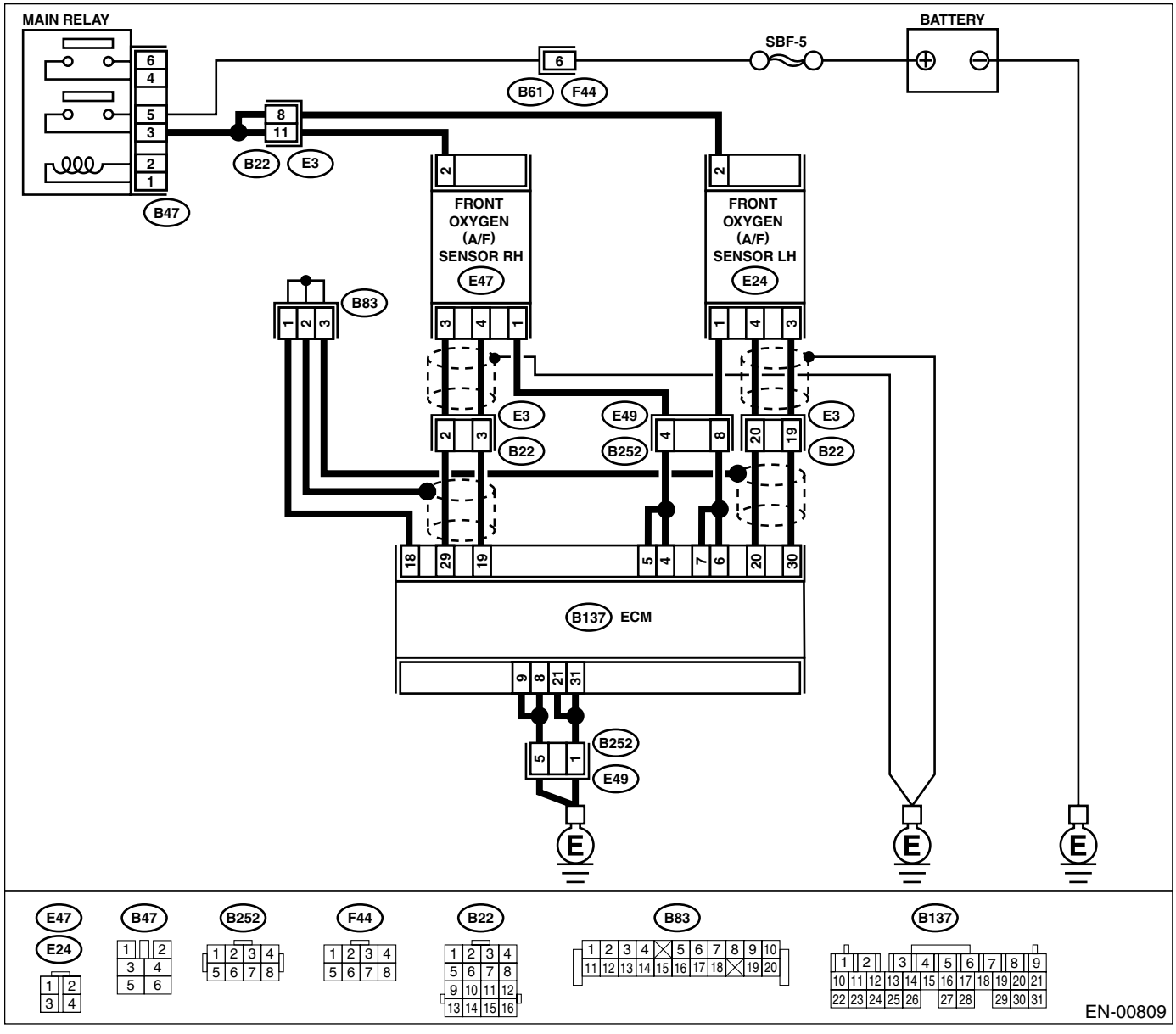
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **2.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **3.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **6.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.

X: DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



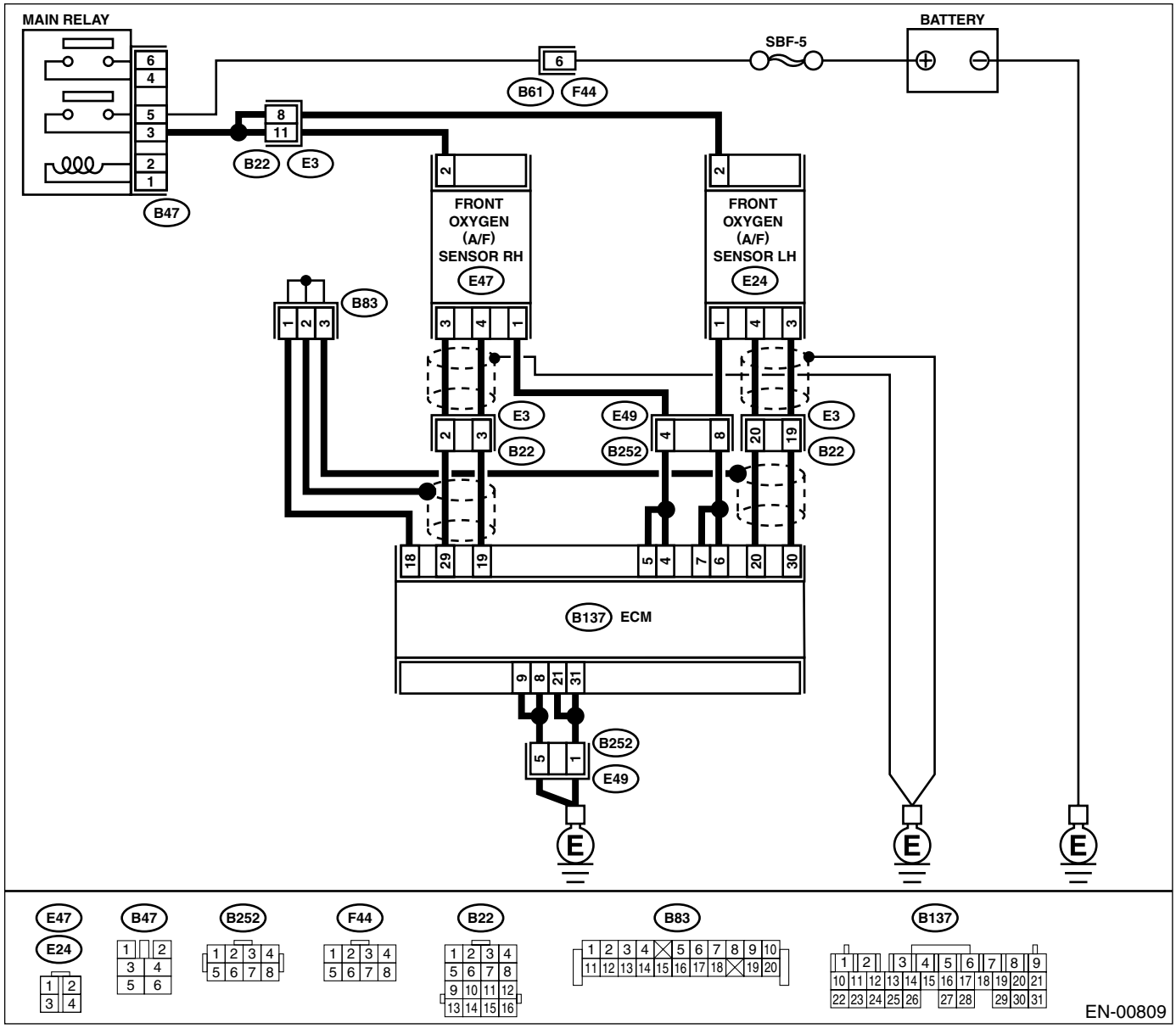
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter (RH side) • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

Y: DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (E47) No. 4:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

Z: DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

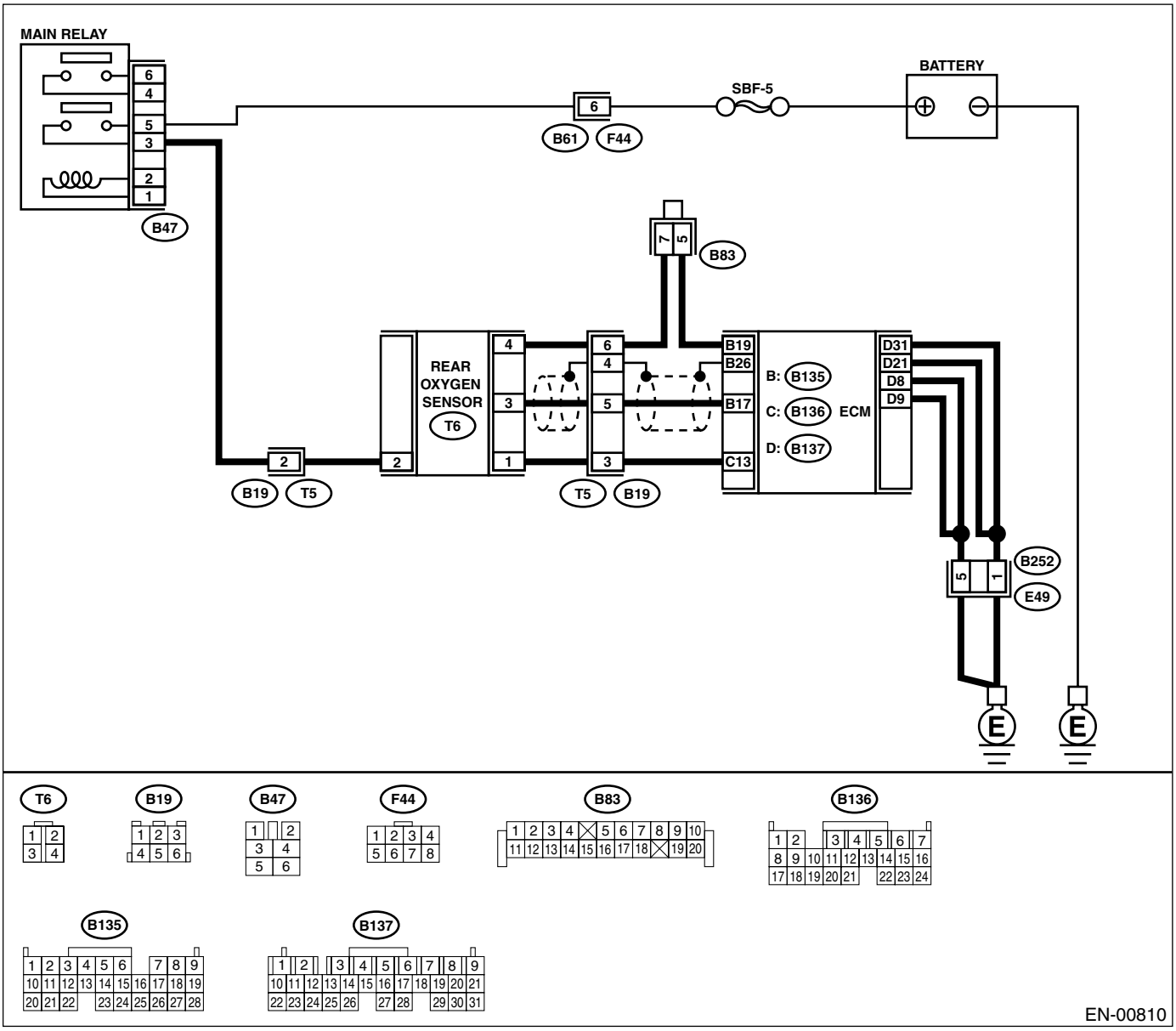
NOTE:
For diagnostic procedure, refer to DTC P0138.
<Ref. to EN(H6DO)-164, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AA:DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC is displayed?	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II General Scan Tool.	Is the measured value 0.49 V or more as maximum value and 0.25 V or less as minimum value?	Go to step **4.**	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and rear oxygen sensor. 3) Measure resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (T6) No. 4:***	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from rear oxygen sensor. 3) Turn ignition switch to ON. 4) Measure voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Engine ground (–):***	Is the measured value more than 0.2 V?	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

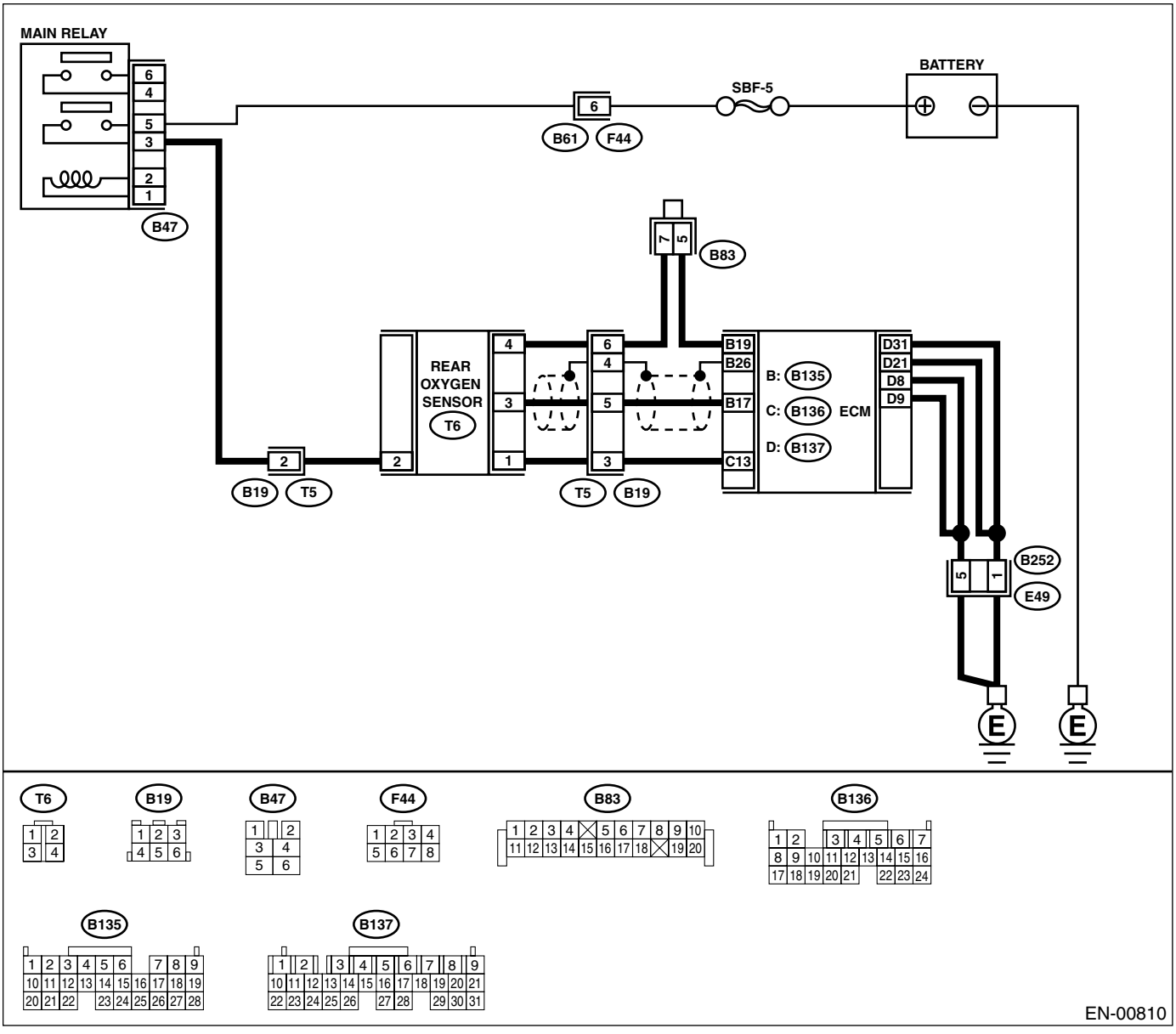
MEMO:

AB:DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



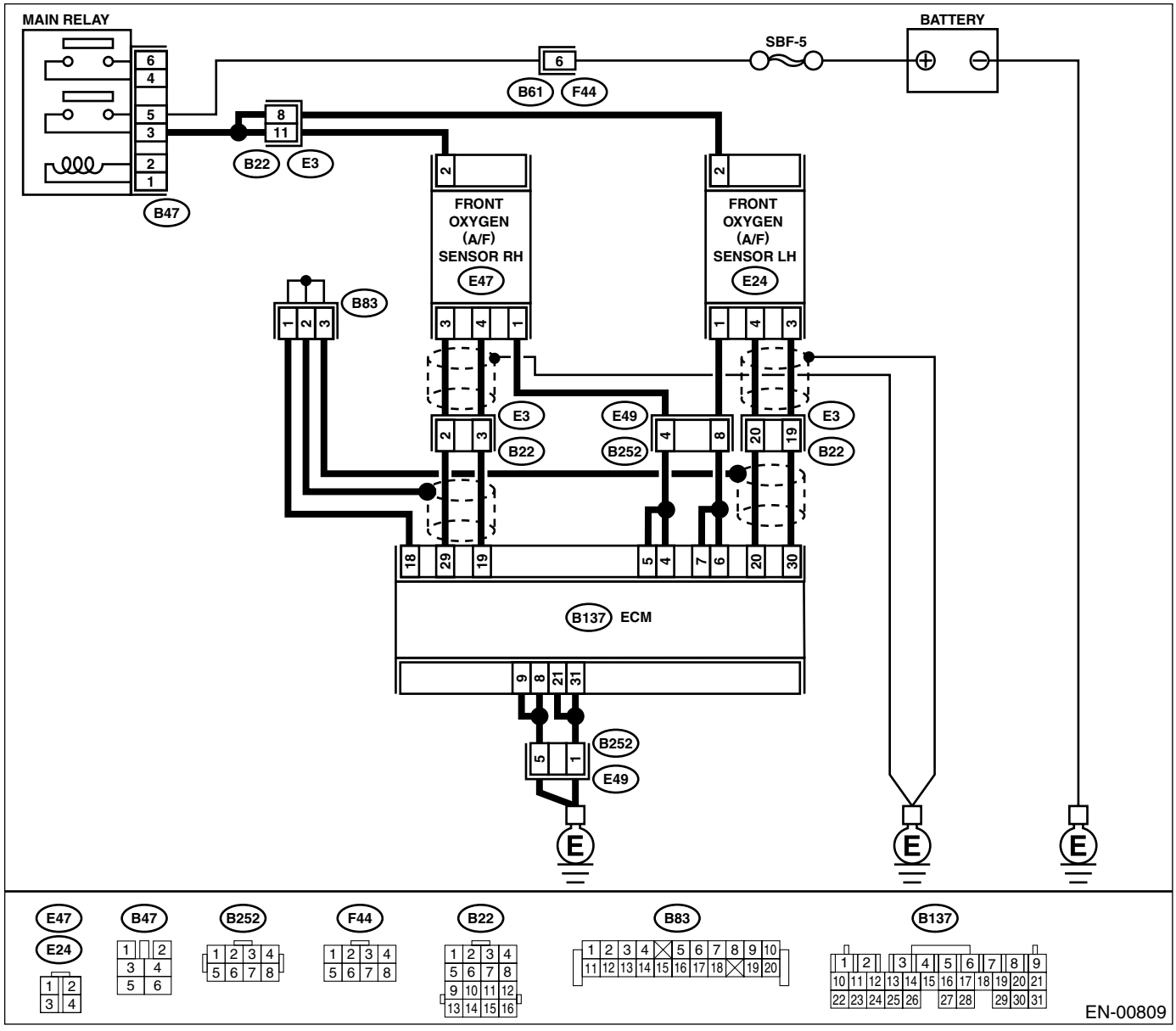
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace rear oxygen sensor. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>

AC:DTC P0150 — O2 SENSOR CIRCUIT (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



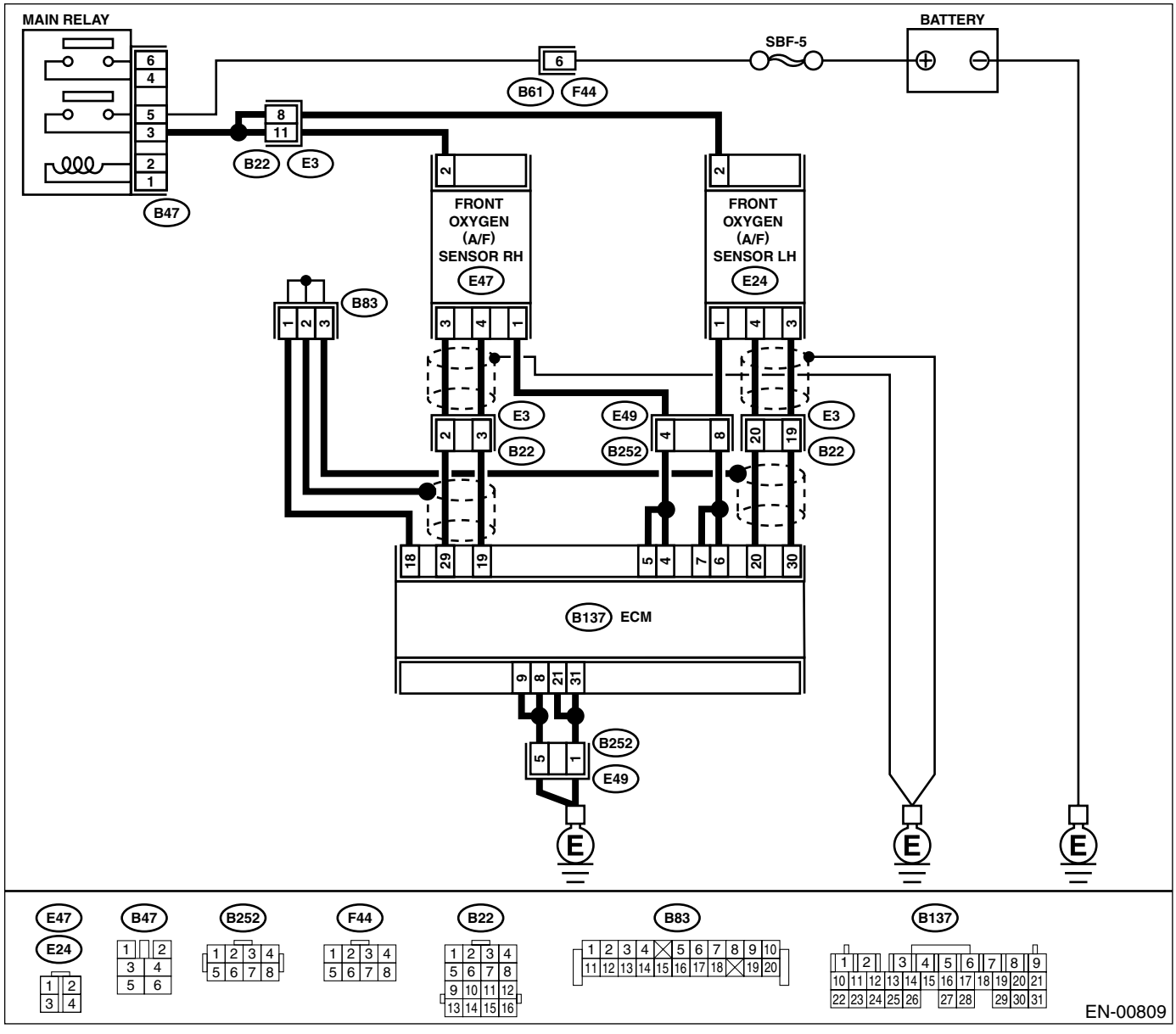
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 20 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **2.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 30 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **3.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **6.**	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.

AD:DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



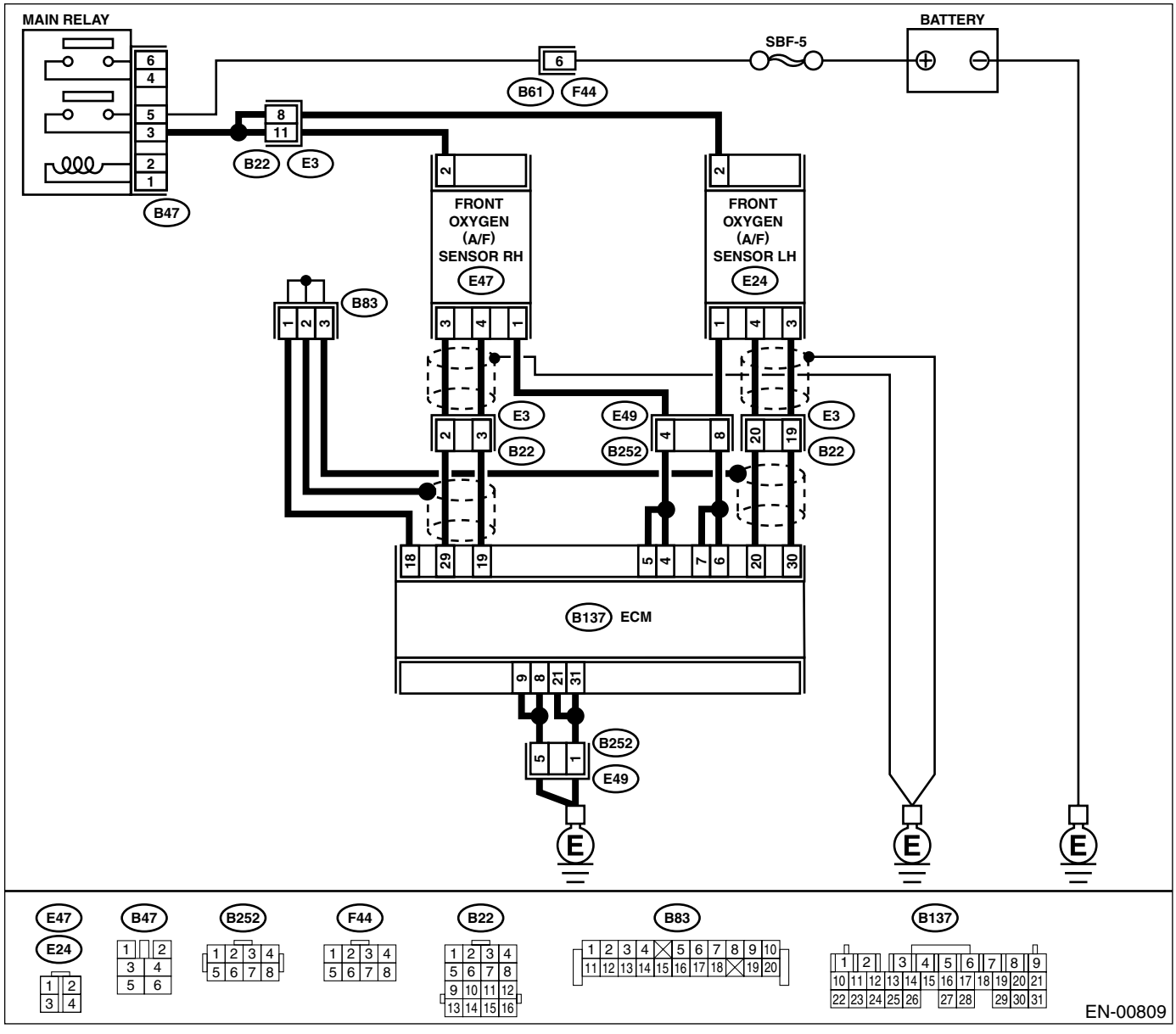
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0153.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter (RH side) • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

AE:DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E24) No. 4:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

AF:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H6DO)-176, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AG:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **3.**
3	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **4.**

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Lower fuel pressure. 1) Disconnect connector from fuel pump relay. 2) Start the engine and run it until it stalls. 3) After the engine stalls, crank it for five more seconds. 4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **5.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **6.**	Repair the following items. **Fuel pressure too high** • Faulty pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
6	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove right bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step **7.**
7	**CHECK FUEL INJECTOR.** Measure resistance between terminals of fuel injector. ***Terminals*** ***No. 1 — No. 2***	Is the measured value within 5 to 20 Ω?	Go to step **8.**	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>

	Step	Check	Yes	No
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 75°C (167°F)?	Go to step **9.**	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
9	**CHECK INTAKE MANIFOLD PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg)at ignition ON and 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) at idling?	Go to step **10.**	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>
10	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value within –10 to 50°C (14 to 122°F) when ambient temperature is subtracted from intake air temperature?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

AH:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

NOTE:
For the diagnostic procedure, refer to DTC P0175. <Ref. to EN(H6DO)-179, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0175 — SYSTEM TOO RICH (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **3.**
3	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **4.**

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Lower fuel pressure. 1) Disconnect connector from fuel pump relay. 2) Start the engine and run it until it stalls. 3) After the engine stalls, crank it for five more seconds. 4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **5.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **6.**	Repair the following items. **Fuel pressure too high** • Faulty pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
6	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove left bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector.	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step **7.**
7	**CHECK FUEL INJECTOR.** Measure resistance between terminals of fuel injector. ***Terminals*** ***No. 1 — No. 2***	Is the measured value within 5 to 20 Ω?	Go to step **8.**	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>

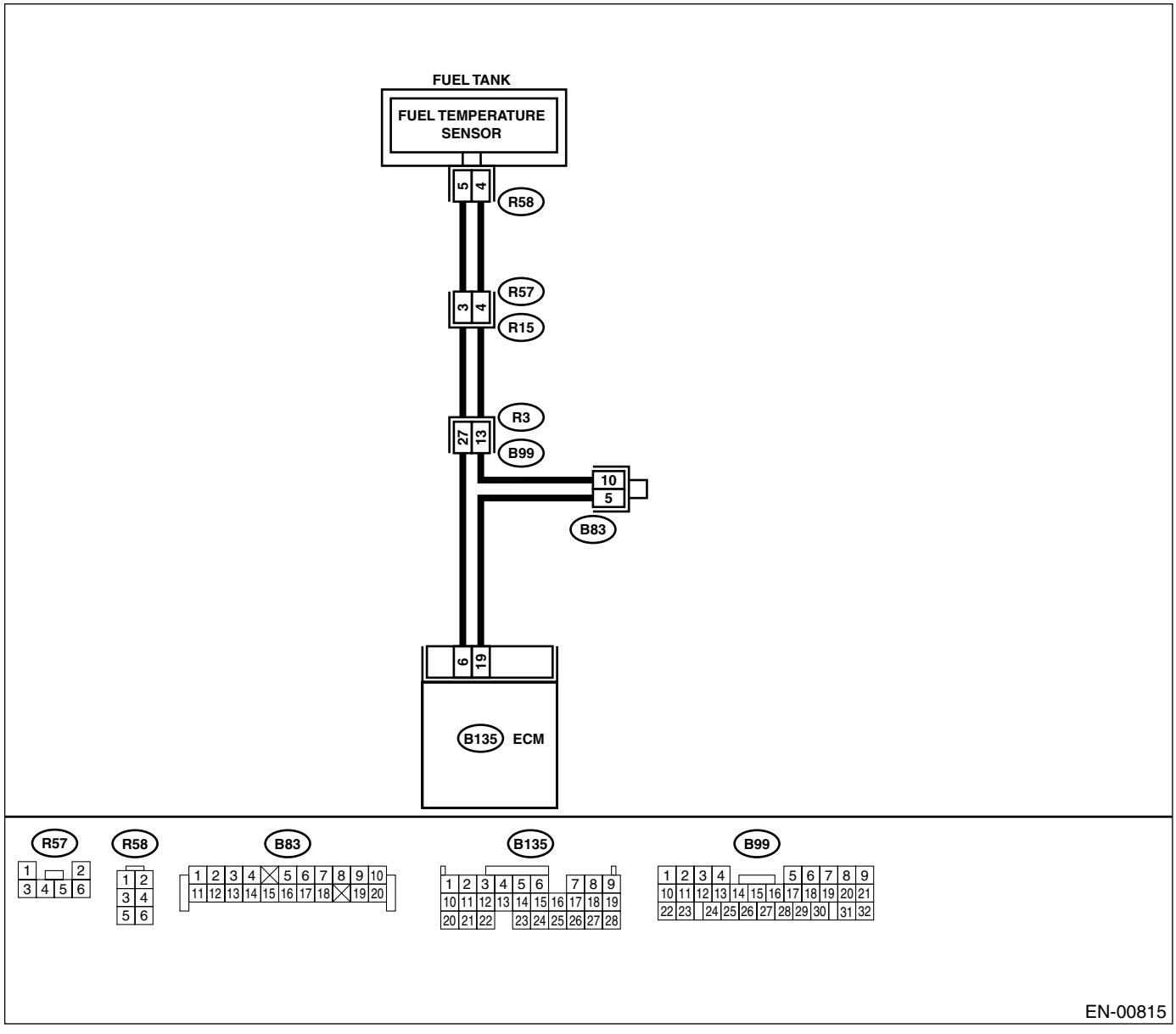
	Step	Check	Yes	No
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 75°C (167°F)?	Go to step **9.**	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
9	**CHECK INTAKE MANIFOLD PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg) at ignition ON and 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) at idling?	Go to step **10.**	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>
10	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value within −10 to 50°C (14 to 122°F) when ambient temperature is subtracted from intake air temperature?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

AJ:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



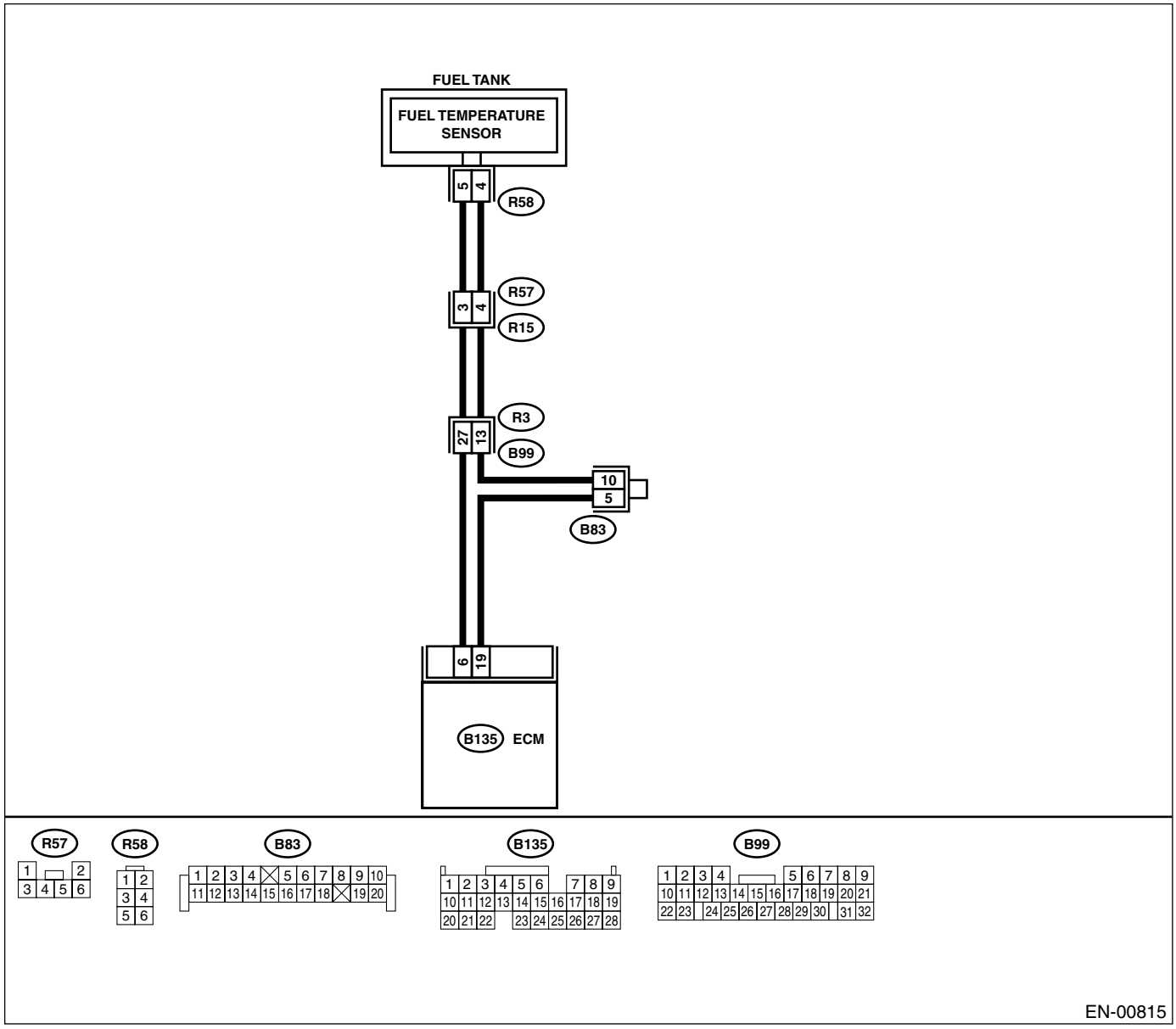
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace fuel temperature sensor. <Ref. to EC(H6DO)-13, Fuel Temperature Sensor.>

AK:DTC P0182 — FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



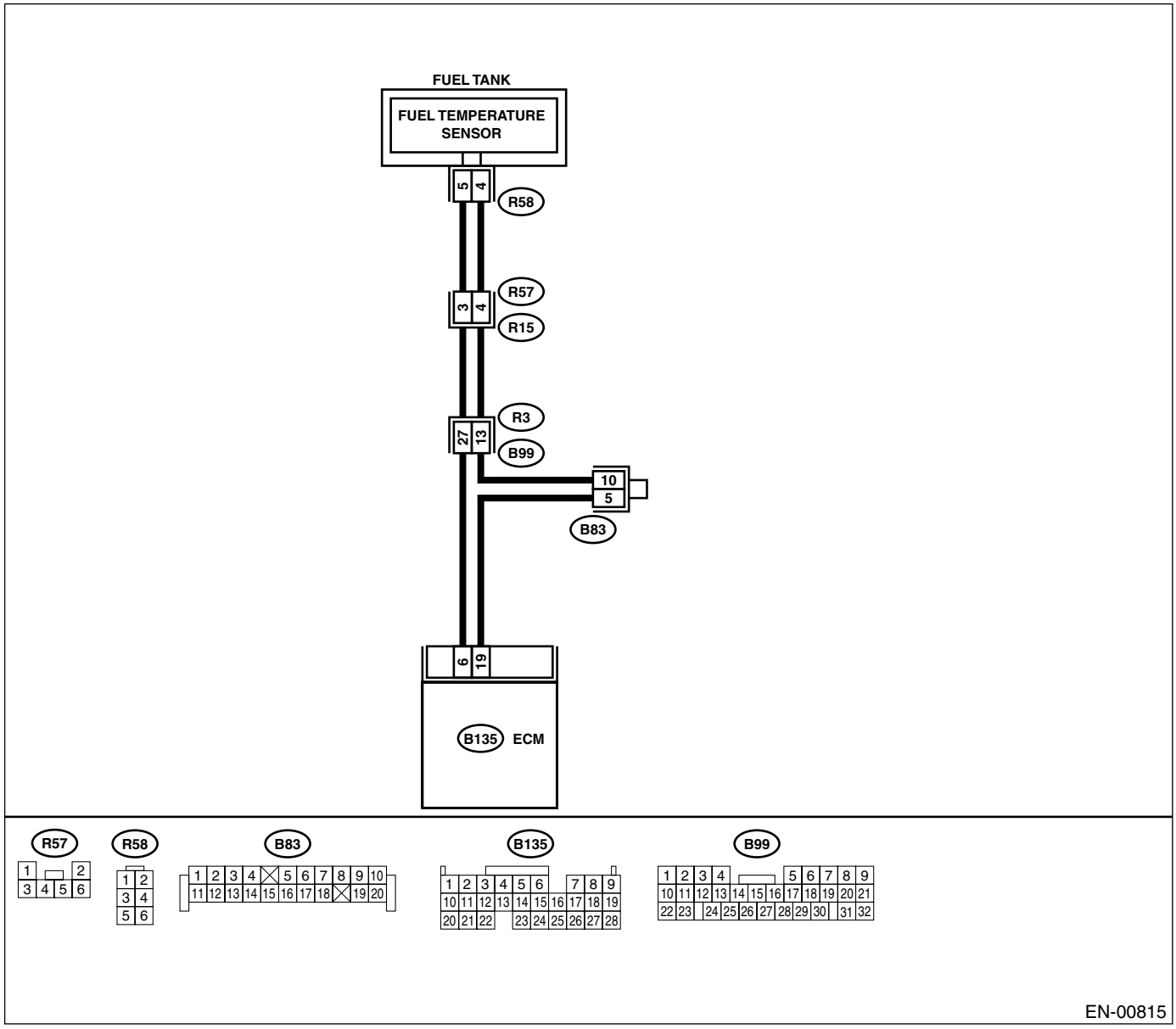
	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 120°C (248°F)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Turn ignition switch to ON. 5) Read data of fuel temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Replace fuel temperature sensor. <Ref. to EC(H6DO)-13, Fuel Temperature Sensor.>	Repair ground short circuit in harness between fuel pump and ECM connector.

AL:DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start engine. 2) Read data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove access hole lid. 3) Disconnect connector from fuel pump. 4) Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:***	Is the measured value less than 5 Ω?	Replace fuel temperature sensor. <Ref. to EC(H6DO)-13, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connectors • Poor contact in joint connector

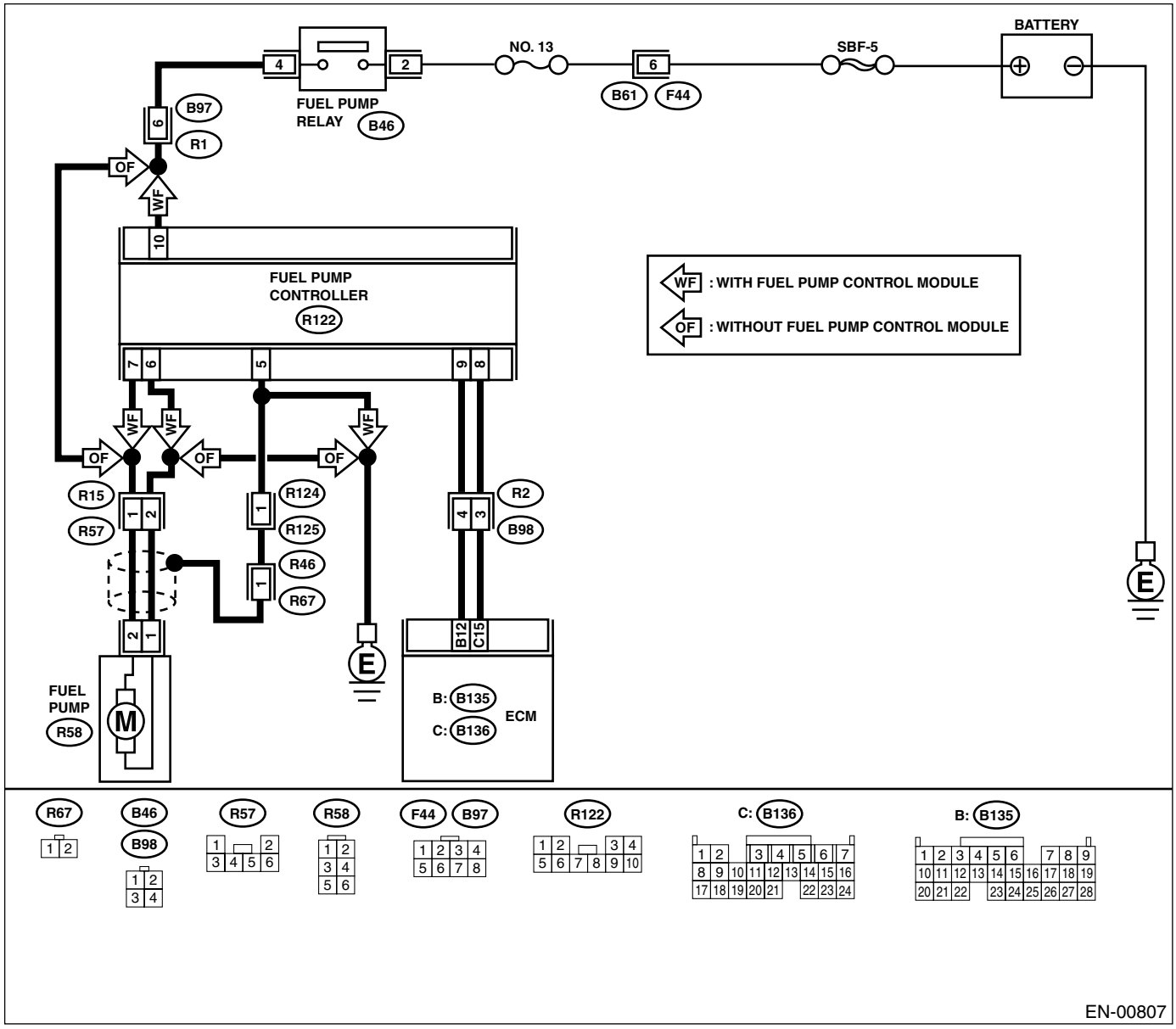
MEMO:

AM:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel pump controller. 3) Turn ignition switch to ON. 4) Measure voltage between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Repair power supply circuit. NOTE: In this case, repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump controller. • Poor contact in fuel pump controller connector. • Poor contact in fuel pump relay connector.
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and chassis ground. • Poor contact in fuel pump controller connector.
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.** 1) Disconnect connector from fuel pump. 2) Measure resistance of harness between fuel pump controller and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 2:*** ***(R122) No. 6 — (R58) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit between fuel pump controller and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.** Measure resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit between fuel pump controller and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fuel pump controller and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B135) No. 12:*** ***(R122) No. 8 — (B136) No. 15:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump controller and ECM. • Poor contact in fuel pump controller and ECM connector.
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR.** Measure resistance of harness between fuel pump controller and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair ground short circuit between fuel pump controller and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump controller connector.	Is there poor contact in ECM and fuel pump controller connector?	Repair poor contact in ECM and fuel pump controller.	Go to step **8.**
8	**CHECK FOR PREVIOUS LACK OF GASOLINE.**	Has lack of gasoline occurred previously?	Finish the diagnosis. DTC may be memorized by fuel pump turning freely when lack of gasoline has occurred.	Replace fuel pump controller. <Ref. to FU(H6DO)-49, Fuel Pump Controller.>

AN:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-194, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AO:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-194, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AP:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-194, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AQ:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-194, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0305 — CYLINDER 5 MISFIRE DETECTED —

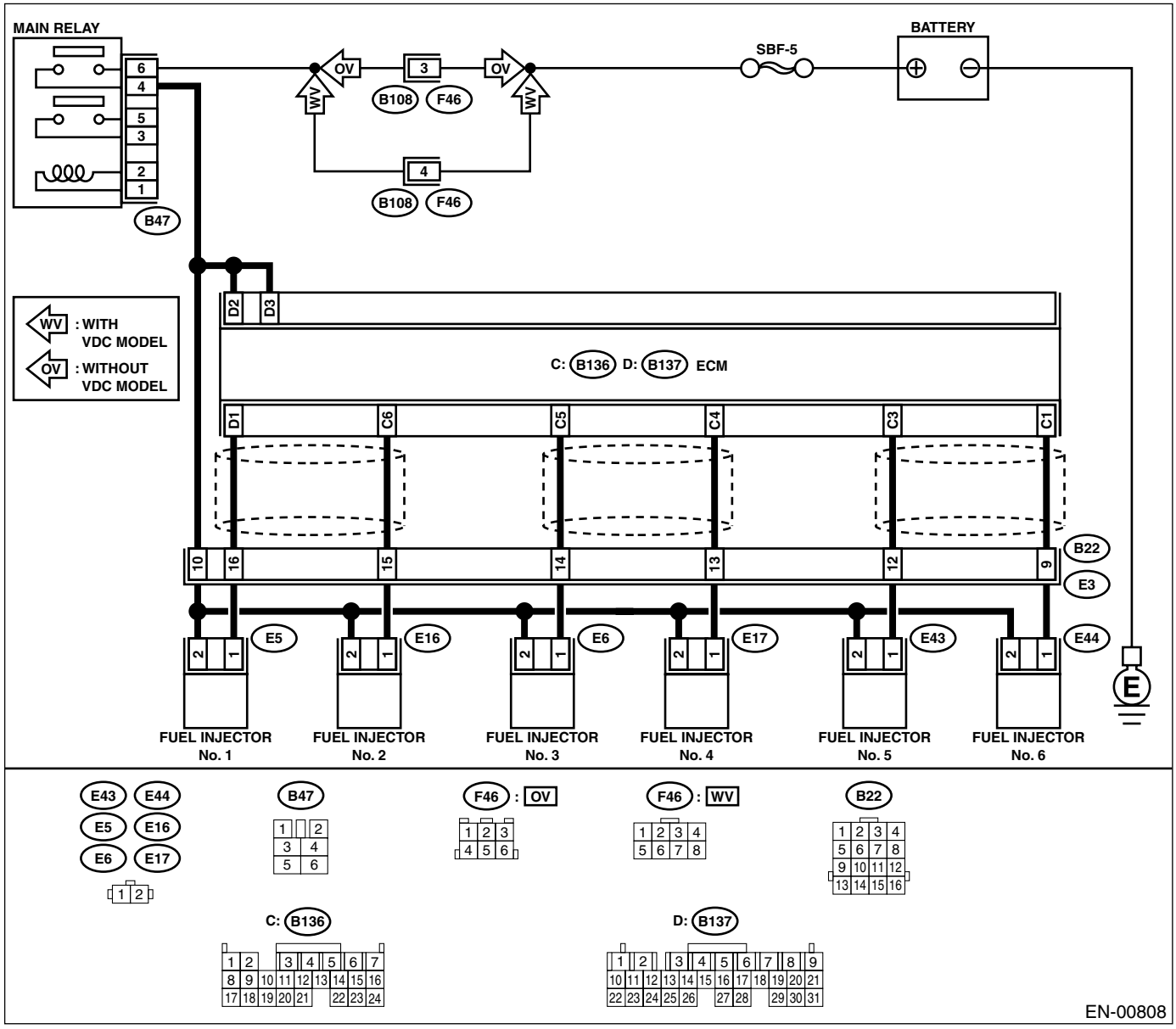
NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)-194, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0306 — CYLINDER 6 MISFIRE DETECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Detected simultaneously at fault occurrence (A misfire which could damage catalyst occurs.)
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303, P0304, P0305 and P0306.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 (+) — Chassis ground (–):*** ***#2 (B136) No. 6 (+) — Chassis ground (–):*** ***#3 (B136) No. 5 (+) — Chassis ground (–):*** ***#4 (B136) No. 4 (+) — Chassis ground (–):*** ***#5 (B136) No. 3 (+) — Chassis ground (–):*** ***#6 (B136) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinders. 3) Measure voltage between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:*** ***#5 (E43) No. 1 — Engine ground:*** ***#6 (E44) No. 1 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between fuel injector and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 — (E5) No. 1:*** ***#2 (B136) No. 6 — (E16) No. 1:*** ***#3 (B136) No. 5 — (E6) No. 1:*** ***#4 (B136) No. 4 — (E17) No. 1:*** ***#5 (B136) No. 3 — (E43) No. 1:*** ***#6 (B136) No. 1 — (E44) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector

	Step	Check	Yes	No
5	**CHECK FUEL INJECTOR.** Measure resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 5 to 20 Ω?	Go to step **6.**	Replace faulty fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>
6	**CHECK POWER SUPPLY LINE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel injector on faulty cylinder. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B137) No. 1 (+) — Chassis ground (–):*** ***#2 (B136) No. 6 (+) — Chassis ground (–):*** ***#3 (B136) No. 5 (+) — Chassis ground (–):*** ***#4 (B136) No. 4 (+) — Chassis ground (–):*** ***#5 (B136) No. 3 (+) — Chassis ground (–):*** ***#6 (B136) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace faulty fuel injector <Ref. to FU(H6DO)-39, Fuel Injector.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>.	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is camshaft position sensor or crankshaft position sensor loosely installed?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT PLATE.**	Is crankshaft plate rusted or does it have broken teeth?	Replace crankshaft plate.	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark. ST 18252AA000	Is timing chain dislocated from its proper position?	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication lower than the “Lower” level?	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**	Go to step **13.**
13	**CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).** 1) Clear memory using Subaru Select Monitor. <Ref. to EN(H6DO)-58, Clear Memory Mode.> 2) Start engine, and drive the vehicle more than 10 minutes.	Is the MIL coming on or blinking?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Did the cause of misfire become clear when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK MISFIRE SYMPTOM.** 1) Turn ignition switch to ON. 2) Read diagnostic trouble code (DTC) using the Subaru Select Monitor or OBD-II general scan tool. • Subaru Select Monitor <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.	Does the Subaru Select Monitor or OBD-II general scan tool indicate only one DTC?	Go to step **22.**	Go to step **17.**

Step		Check	Yes	No
17	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step **23.**	Go to step **18.**
18	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step **24.**	Go to step **19.**
19	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0305 and P0306?	Go to step **25.**	Go to step **20.**
20	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301, P0303 and P0305?	Go to step **26.**	Go to step **21.**
21	**CHECK DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302, P0304 and P0306?	Go to step **27.**	Go to step **28.**
22	**ONLY ONE CYLINDER**	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
23	**GROUP OF #1 AND #2 CYLINDERS**	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. Spark plugs Fuel injectors Ignition coil Compression ratio • If no abnormality is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
24	GROUP OF #3 AND #4 CYLINDERS	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. Spark plugs Fuel injectors Ignition coil • If no abnormality is discovered, check for "17. D: IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
25	GROUP OF #5 AND #6 CYLINDERS	Are there faults in #5 and #6 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items: Spark plugs, fuel injector, ignition coil and compression ratio • If no abnormality is discovered, check for "17. IGNITION CONTROL SYSTEM" of #5 and #6 cylinders side. <Ref. to EN(H6DO)-84, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
26	GROUP OF #1, #3 AND #5 CYLINDERS	Are there faults in #1, #3 and #5 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing chain	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
27	GROUP OF #2, #4 AND #6 CYLINDERS	Are there faults in #2, #4 and #6 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing chain	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>
28	CYLINDER AT RANDOM	Is the engine idle unstable?	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

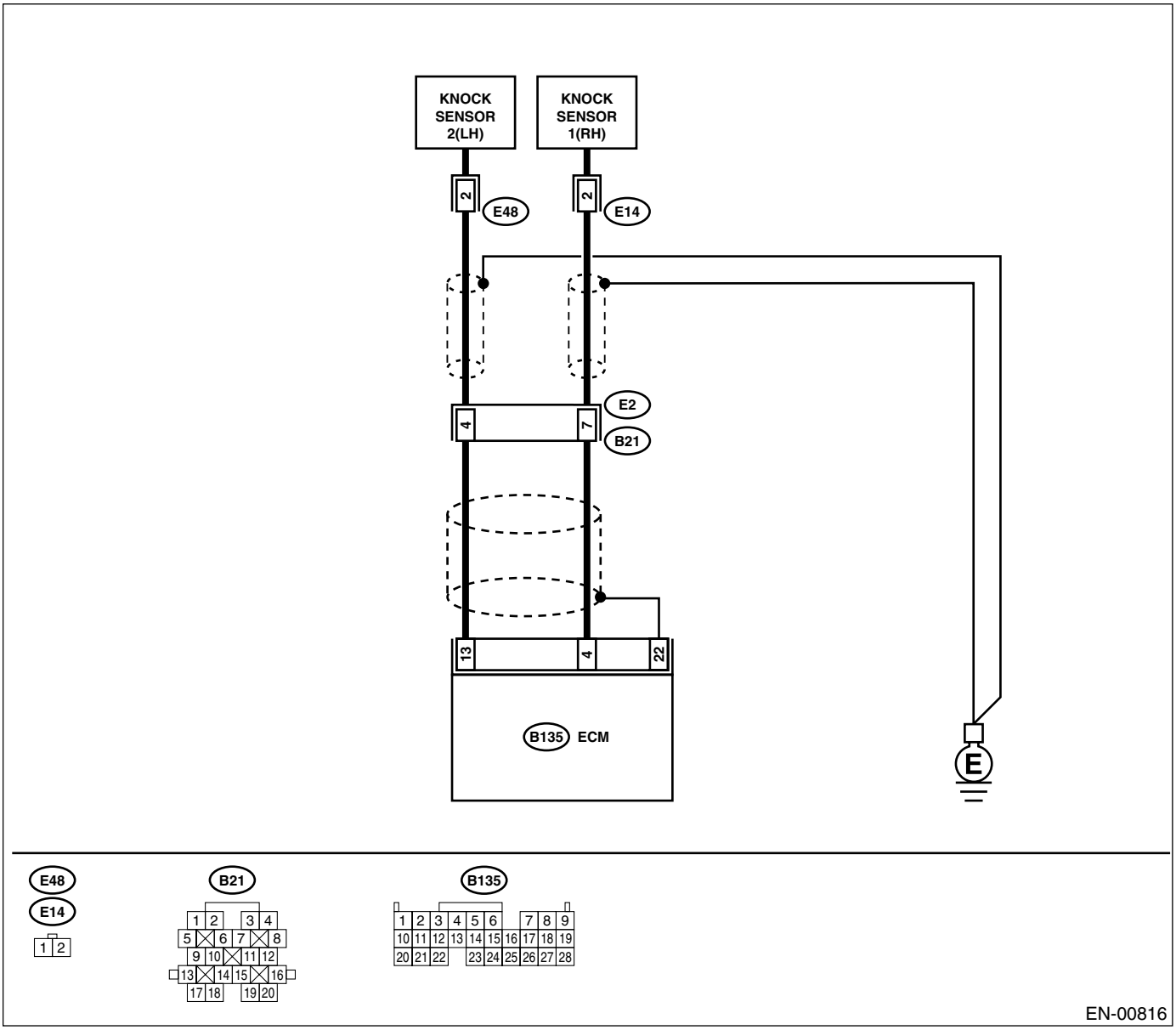
MEMO:

AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



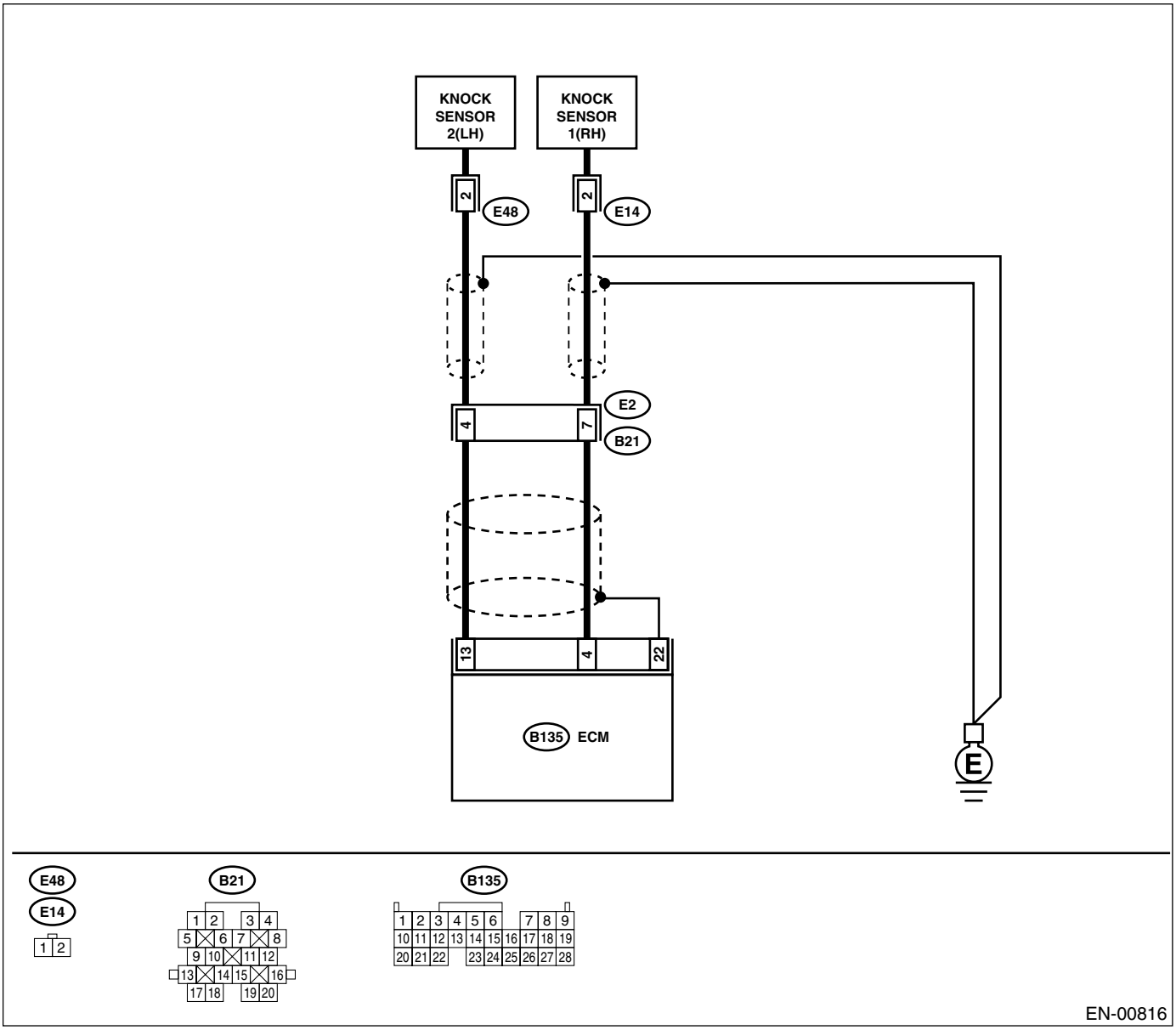
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 1 AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the measured value more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 1 (RH) and ECM connector • Poor contact in knock sensor 1 (RH) connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR 1 (RH).** 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the measured value more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 1 (RH) and ECM connector • Poor contact in knock sensor 1 (RH) connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR 1 (RH) INSTALLATION.**	Is the knock sensor 1 (RH) installation bolt tightened securely?	Replace knock sensor 1 (RH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Tighten knock sensor 1 (RH) installation bolt securely.

AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



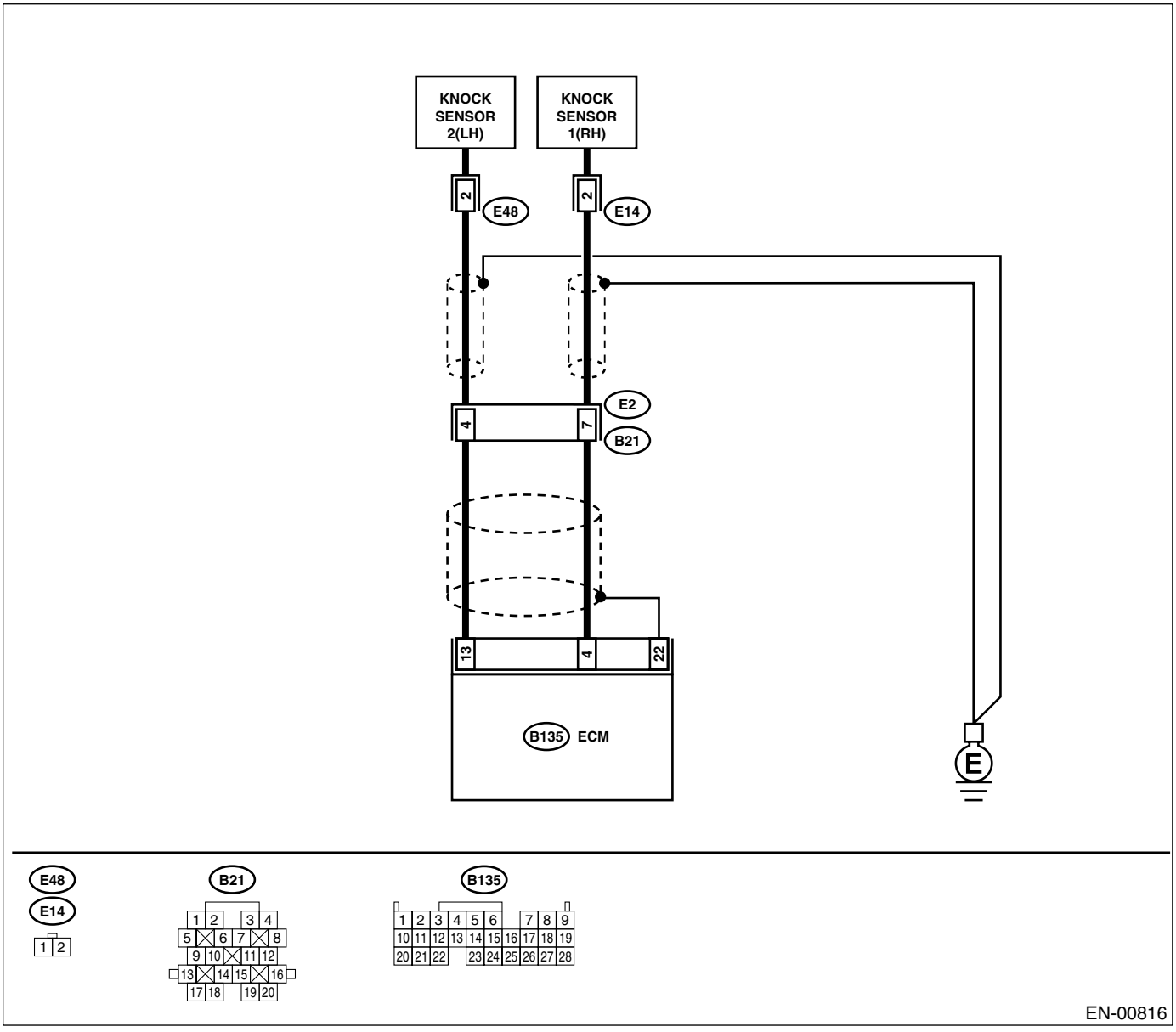
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 1 (RH) AND ECM CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the measured value less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR 1 (RH).** 1) Disconnect connector from knock sensor 1 (RH). 2) Measure resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the measured value less than 400 kΩ?	Replace knock sensor 1 (RH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 1 (RH) connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect connectors to ECM and knock sensor 1 (RH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 2 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor 1 (RH) connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AV:DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



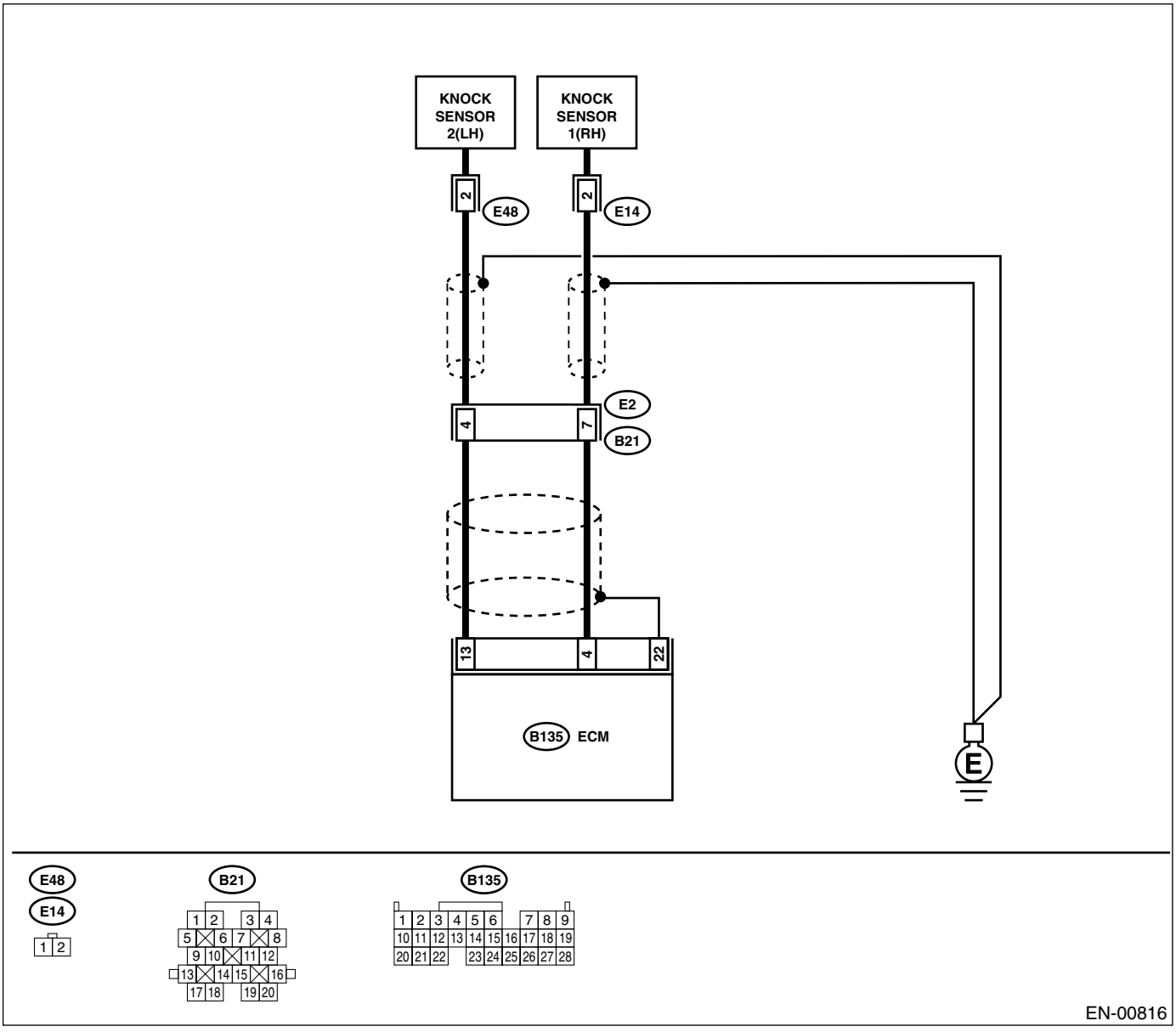
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 — Chassis ground:***	Is the measured value more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 2 (LH) and ECM connector • Poor contact in knock sensor 2 (LH) connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR 2 (LH).** 1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the measured value more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor 2 (LH) and ECM connector • Poor contact in knock sensor 2 (LH) connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR 2 (LH) INSTALLATION.**	Is the knock sensor 2 (LH) installation bolt tightened securely?	Replace knock sensor 2 (LH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Tighten knock sensor 2 (LH) installation bolt securely.

AW:DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



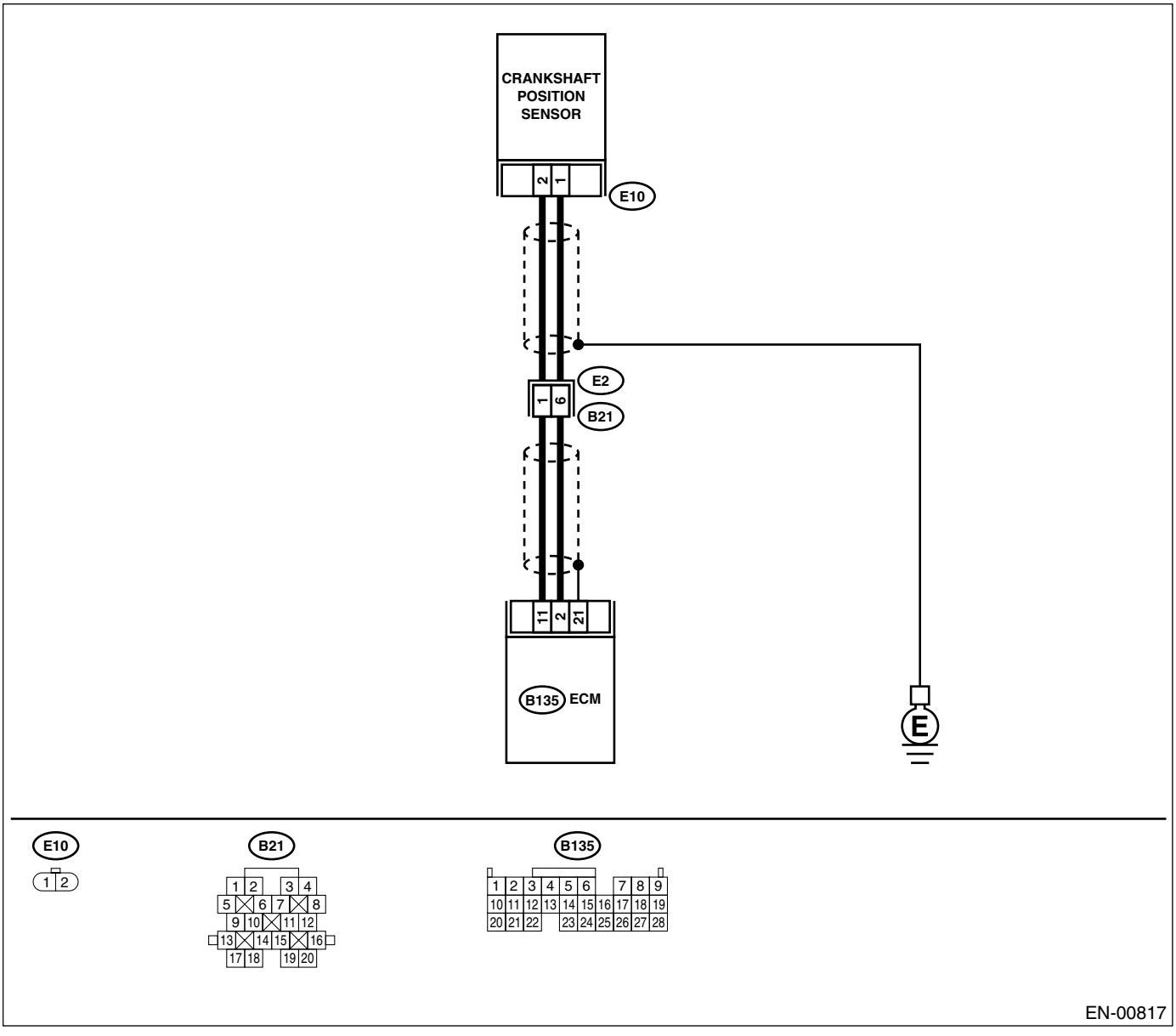
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR 2 (LH) AND ECM CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 — Chassis ground:***	Is the measured value less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR 2 (LH).** 1) Disconnect connector from knock sensor 2 (LH). 2) Measure resistance between knock sensor 2 (LH) connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the measured value less than 400 kΩ?	Replace knock sensor 2 (LH). <Ref. to FU(H6DO)-32, Knock Sensor.>	Repair ground short circuit in harness between knock sensor 2 (LH) connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect connectors to ECM and knock sensor 2 (LH). 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 2 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector 2 (LH) • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AX:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



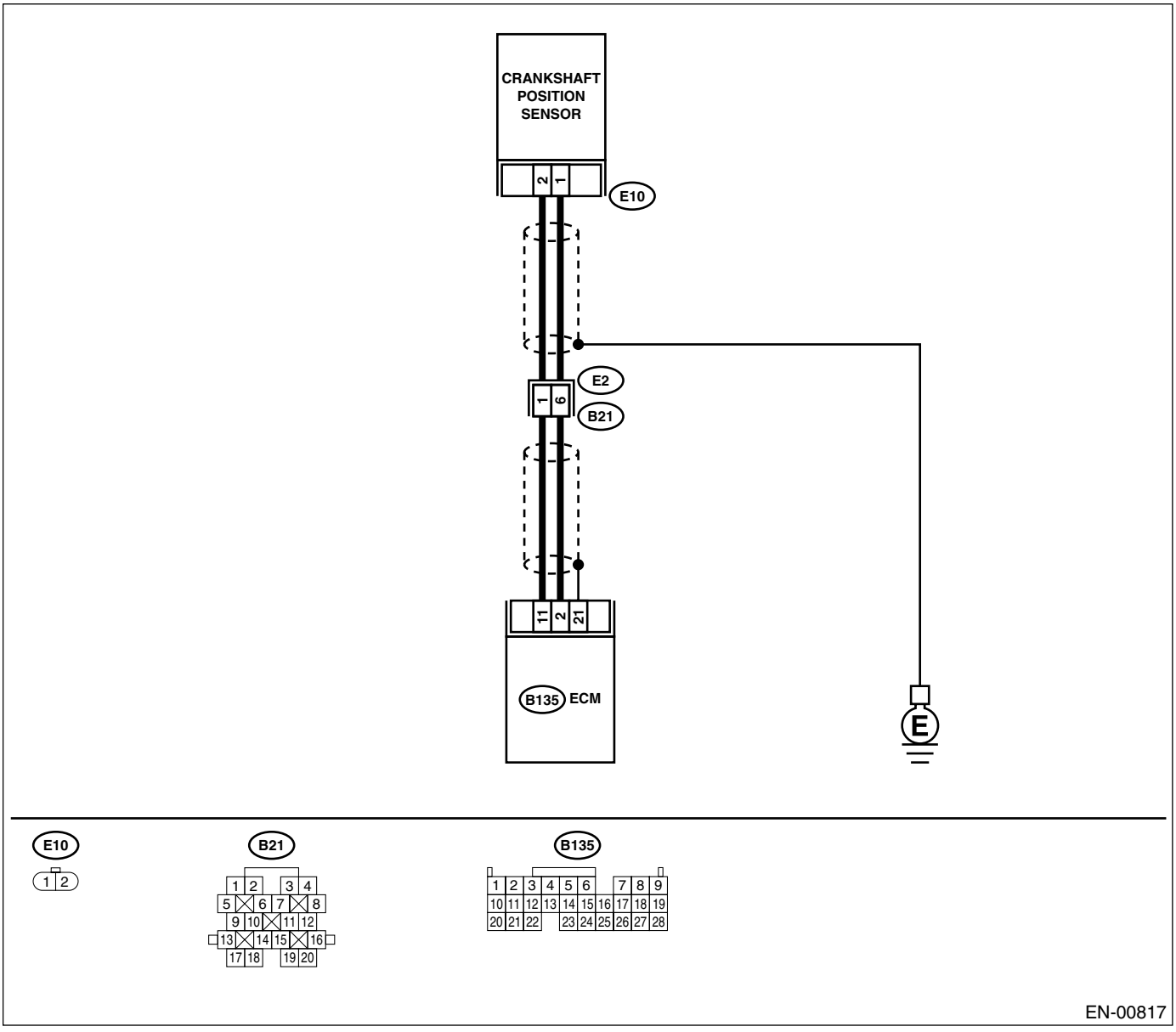
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between crankshaft position sensor and ECM. ***Connector & terminal*** ***(E10) No. 1 — (B135) No. 2:*** ***(E10) No. 2 — (B135) No. 11:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair open circuit between crankshaft position sensor and ECM.
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM.** Measure resistance between crankshaft position sensor and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:*** ***(E10) No. 2 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit between crankshaft position sensor and ECM.
3	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **4.**	Tighten crankshaft position sensor installation bolt securely.
4	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Turn ignition switch to OFF. 2) Remove crankshaft position sensor. 3) Measure resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 800 to 1300 kΩ?	Go to step **5.**	Replace crankshaft position sensor. <Ref. to FU(H6DO)-30, REMOVAL, Crankshaft Position Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

AY:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Tow consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



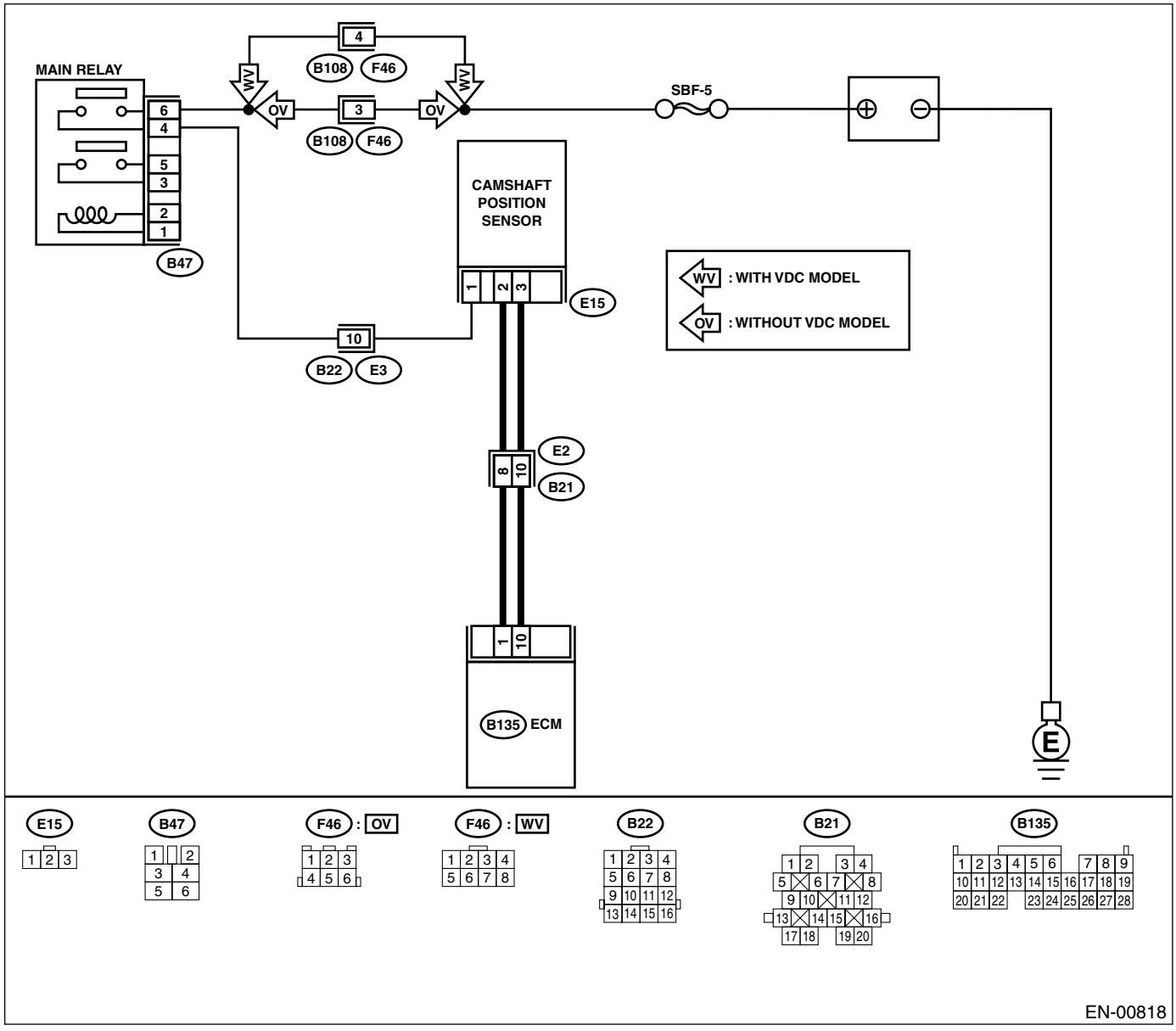
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0335 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT PLATE.**	Are crankshaft plate teeth cracked or damaged?	Replace crankshaft plate.	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is timing chain dislocated from its proper position?	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Replace crankshaft position sensor. <Ref. to FU(H6DO)-30, Crankshaft Position Sensor.>

AZ:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



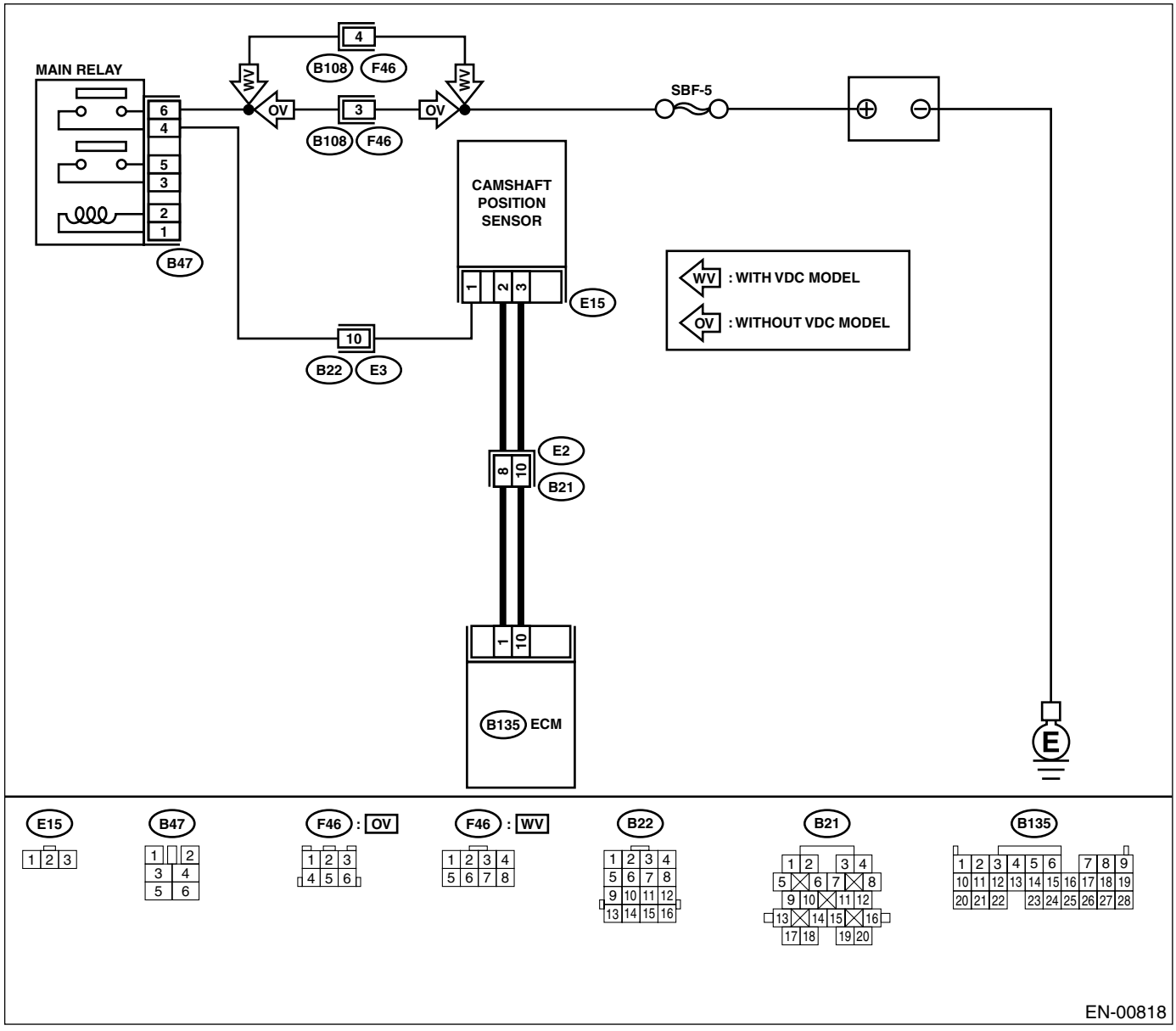
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from camshaft position sensor. 3) Measure voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E15) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10V?	Repair ground short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E15) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10V?	Go to step **3.**	Repair open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E15) No. 2 — (B135) No. 1:*** ***(E15) No. 3 — (B135) No. 10:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:*** ***(E15) No. 3 — Engine ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check camshaft position sensor wave form. <Ref. to EN(H6DO)-30, WAVEFORM, MEASUREMENT, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Go to step **7.**	Replace camshaft position sensor. <Ref. to FU(H6DO)-31, Camshaft Position Sensor.>
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

BA:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Tow consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



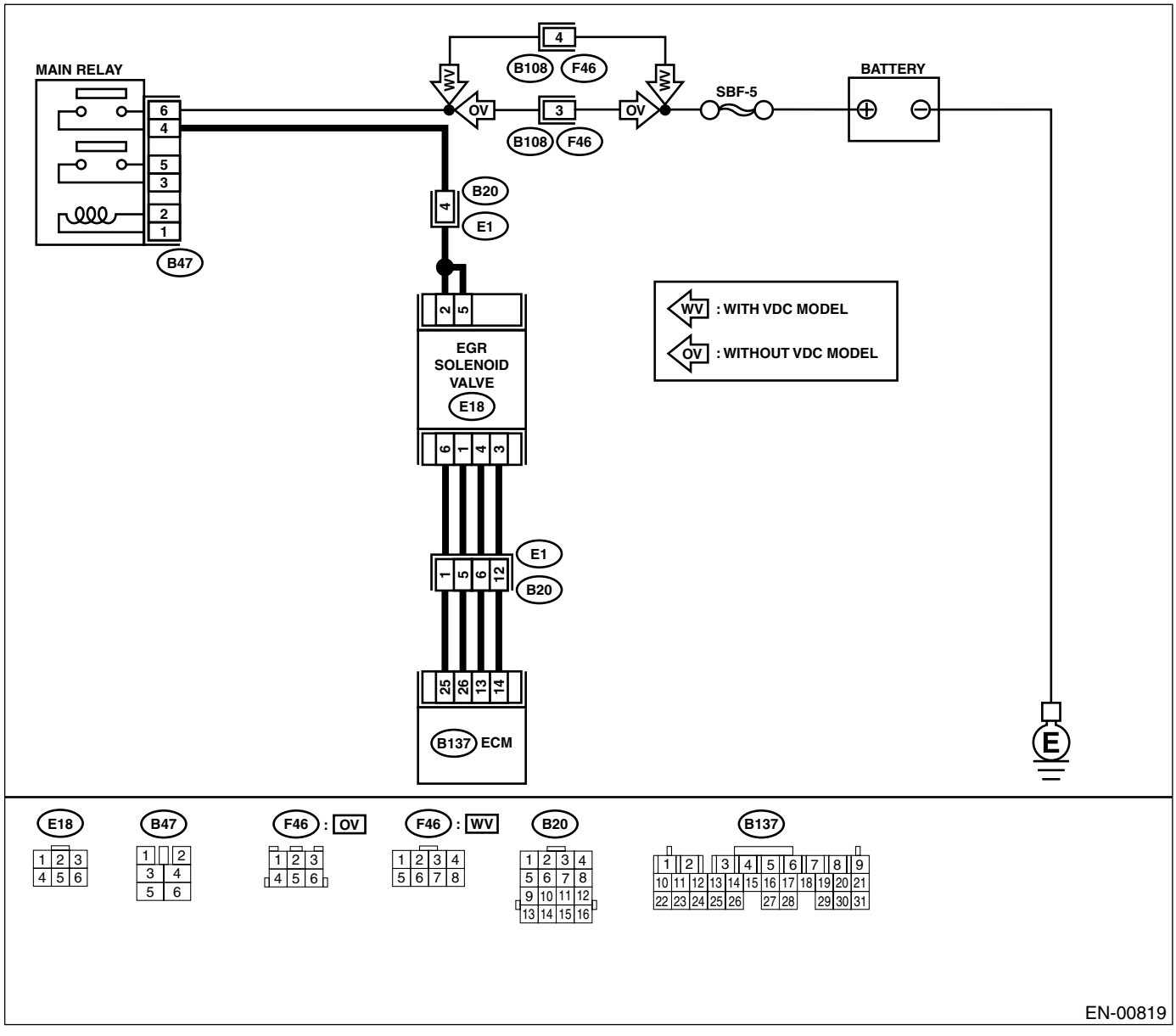
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0340 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten camshaft position sensor installation bolt securely.
3	**CHECK CAMSHAFT SPROCKET.** Remove front chain cover. <Ref. to ME(H6DO)-39, Front Chain Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace camshaft sprocket. <Ref. to ME(H6DO)-46, Camshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark. ST 18231AA000 CAMSHAFT SPROCKET WRENCH	Is timing chain dislocated from its proper position?	Repair installation condition of timing chain. <Ref. to ME(H6DO)-41, Timing Chain Assembly.>	Replace camshaft position sensor. <Ref. to FU(H6DO)-31, Camshaft Position Sensor.>

BB:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Poor driving performance on low engine speed
  - Erroneous idling
  - Poor driving performance.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start engine. 2) Rear the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 53.3 kPa (400 mmHg, 15.75 inHg)?	Check if EGR valve, intake manifold pressure sensor and throttle body are securely installed.	Go to step **3.**
3	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Disconnect connector from EGR solenoid valve. 2) Turn ignition switch to ON. 3) Measure voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:***	Is the measured value more than 10 V?	Go to step **4.**	Repair open circuit in harness between main relay and EGR solenoid valve connector.
4	**CHECK EGR SOLENOID VALVE.** Measure resistance between EGR solenoid valve terminals. NOTE: Make sure there are no foreign objects caught between EGR solenoid valve and valve seat. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:***	Is the measured value within 20 to 30 Ω?	Go to step **5.**	Replace EGR solenoid valve. <Ref. to EC(H6DO)-10, EGR Valve.>
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connectors to ECM and EGR solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 25 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:*** ***(B137) No. 13 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the measured value within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from EGR solenoid valve and ECM. 3) Measure resistance of harness between EGR solenoid valve and ECM connector. ***Connector & terminal*** ***(B137) No. 25 — (E18) No. 6:*** ***(B137) No. 26 — (E18) No. 1:*** ***(B137) No. 13 — (E18) No. 4:*** ***(B137) No. 14 — (E18) No. 3:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between ECM and EGR solenoid valve connector.
7	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between EGR solenoid valve and chassis ground. ***Connector & terminal*** ***(B137) No. 25 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:*** ***(B137) No. 13 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair short circuit in harness between main relay and EGR solenoid valve connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector.	Is there poor contact in ECM and EGR solenoid valve connector?	Repair poor contact in ECM and EGR solenoid valve connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.

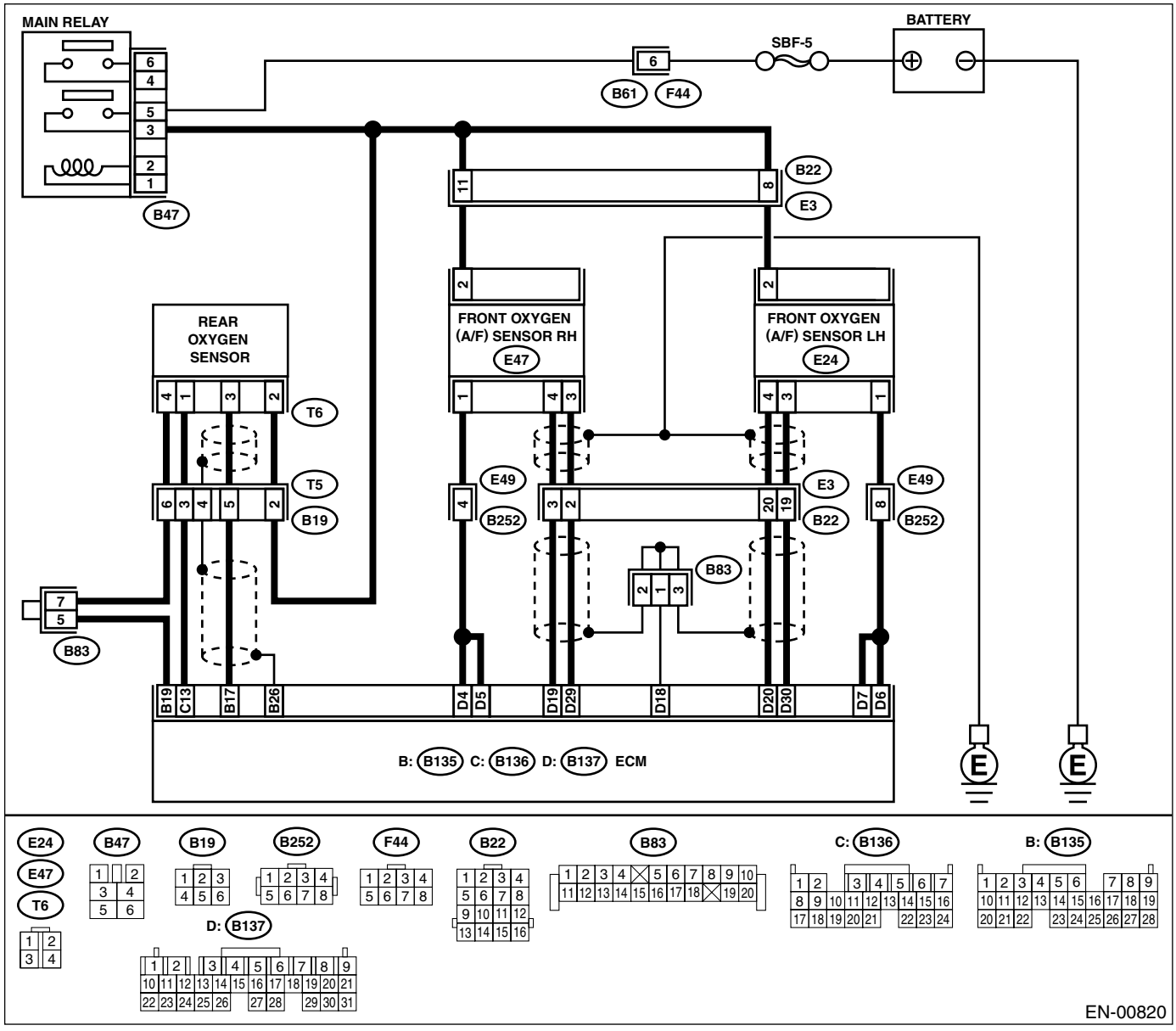
MEMO:

BC:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



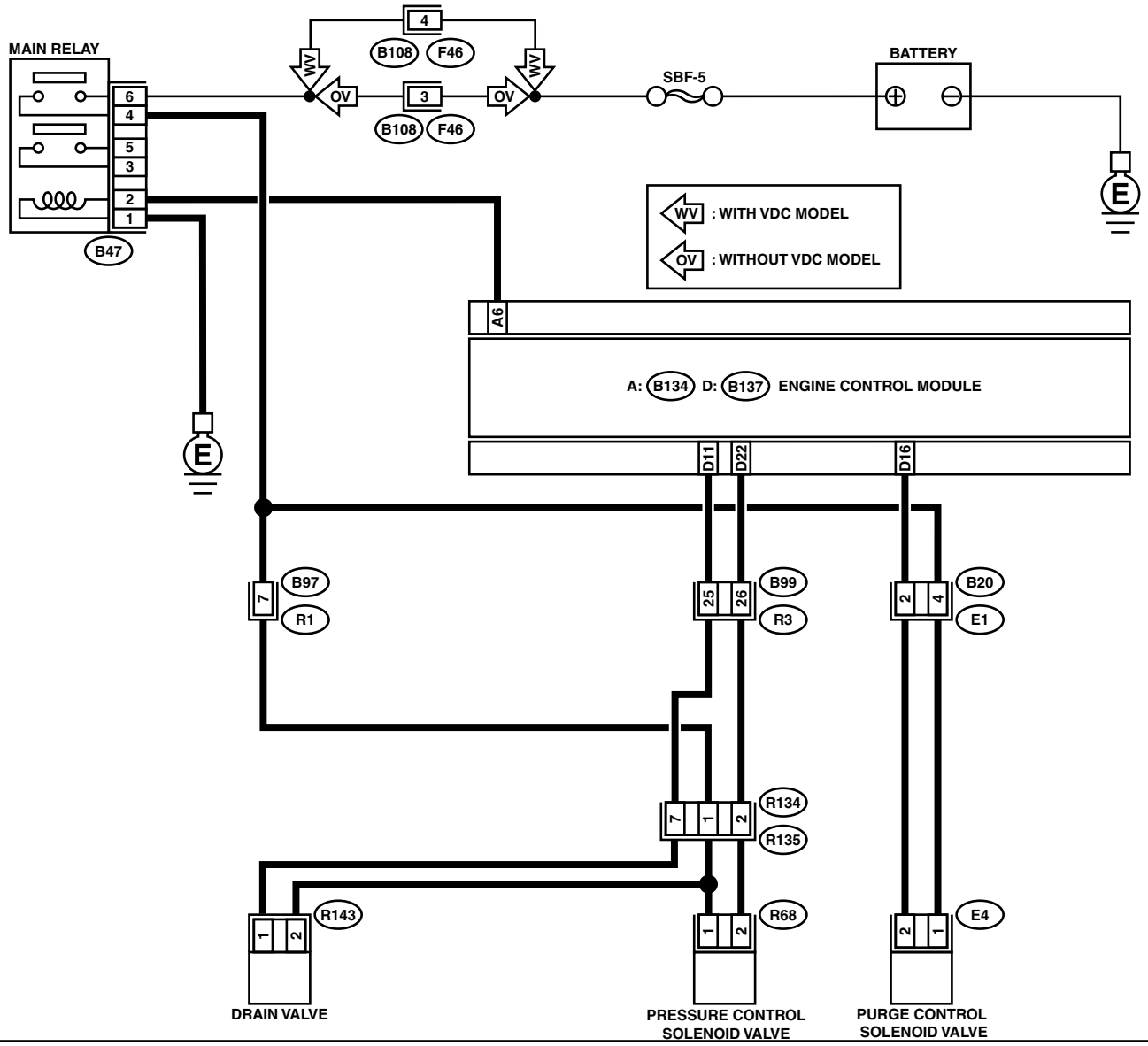
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace exhaust system.	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace front catalytic converter <Ref. to EC(H6DO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H6DO)-6, Rear Catalytic Converter.>.	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace front catalytic converter. <Ref. to EC(H6DO)-3, Front Catalytic Converter.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

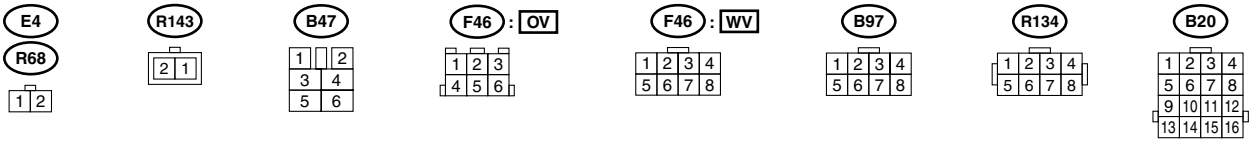
BD:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

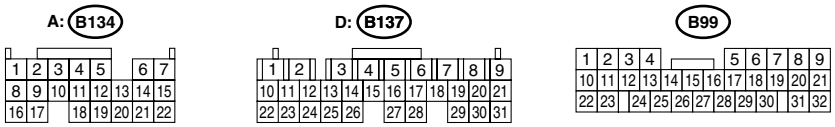
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**







EN-02103

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-61, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step **5.**	Replace drain valve. <Ref. to EC(H6DO)-21, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step **6.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step **7.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-17, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace evaporation line. <Ref. to FU(H6DO)-75, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**

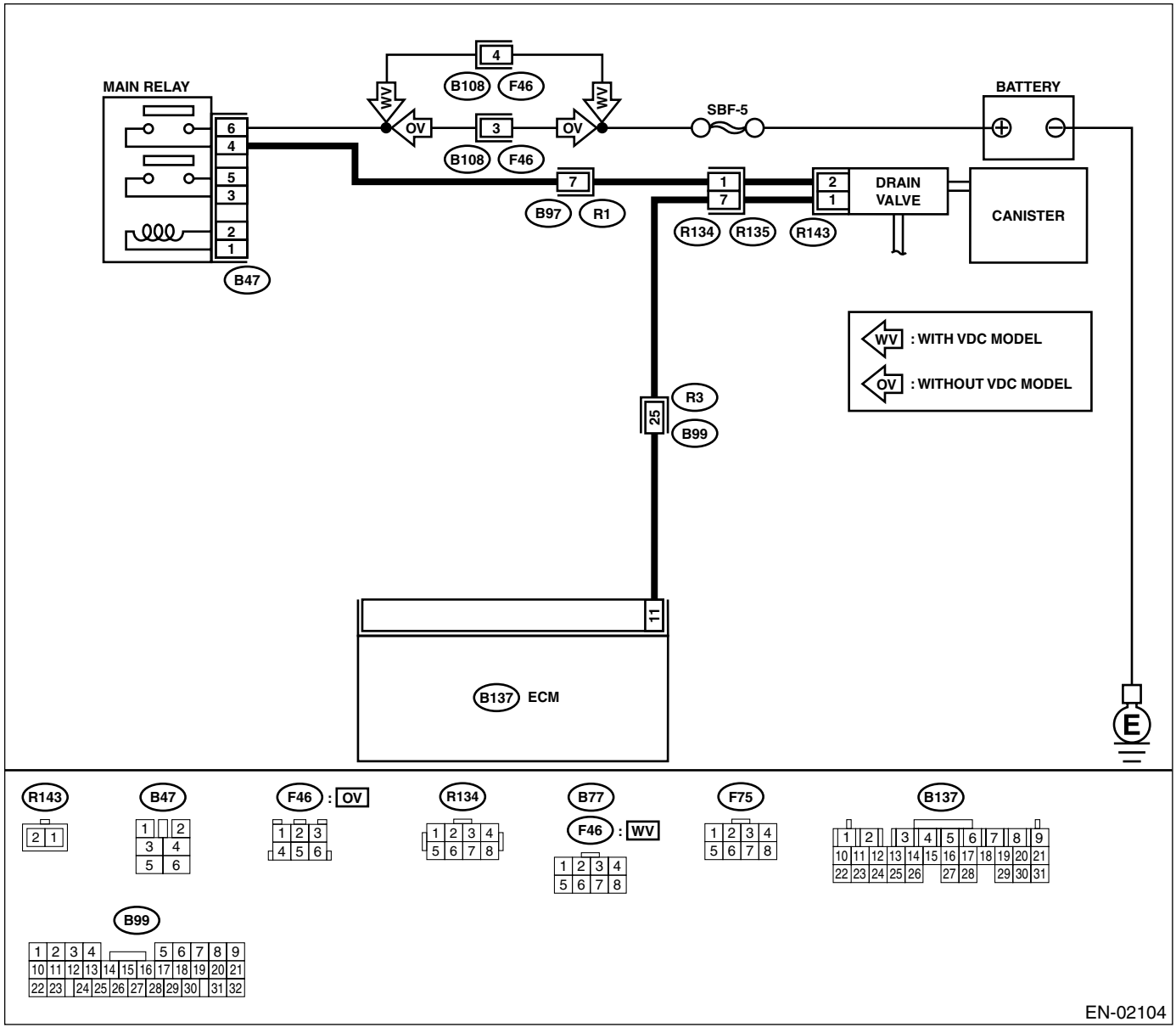
Step		Check	Yes	No
8	**CHECK CANISTER.**	Is canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace canister. <Ref. to EC(H6DO)-7, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BE:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connectors
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from drain valve and ECM. 3) Measure resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R143) No. 1 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and drain valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B137) No. 11 — (R143) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connectors
5	**CHECK DRAIN VALVE.** Measure resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace drain valve. <Ref. to EC(H6DO)-21, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R143) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

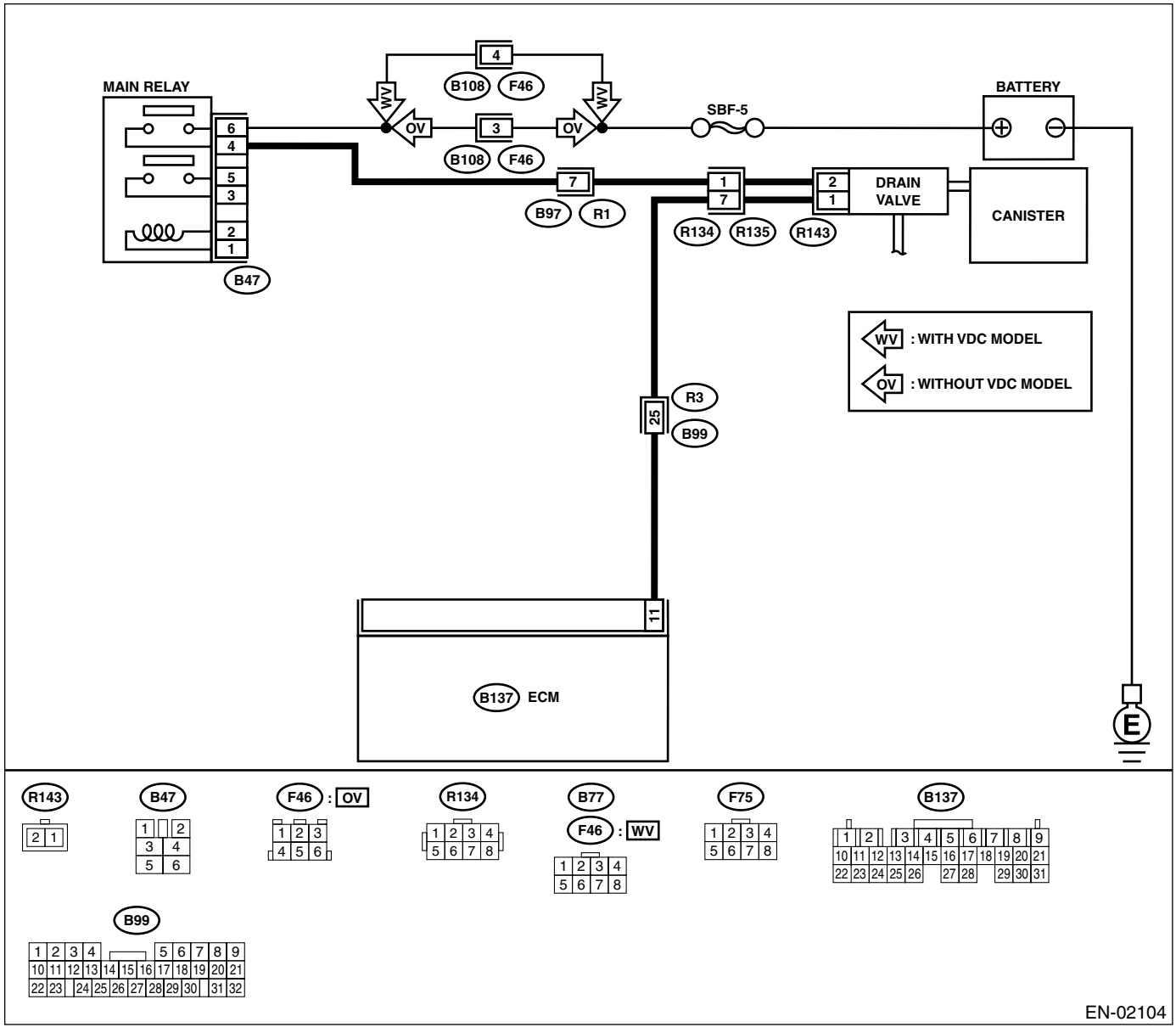
MEMO:

BF:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



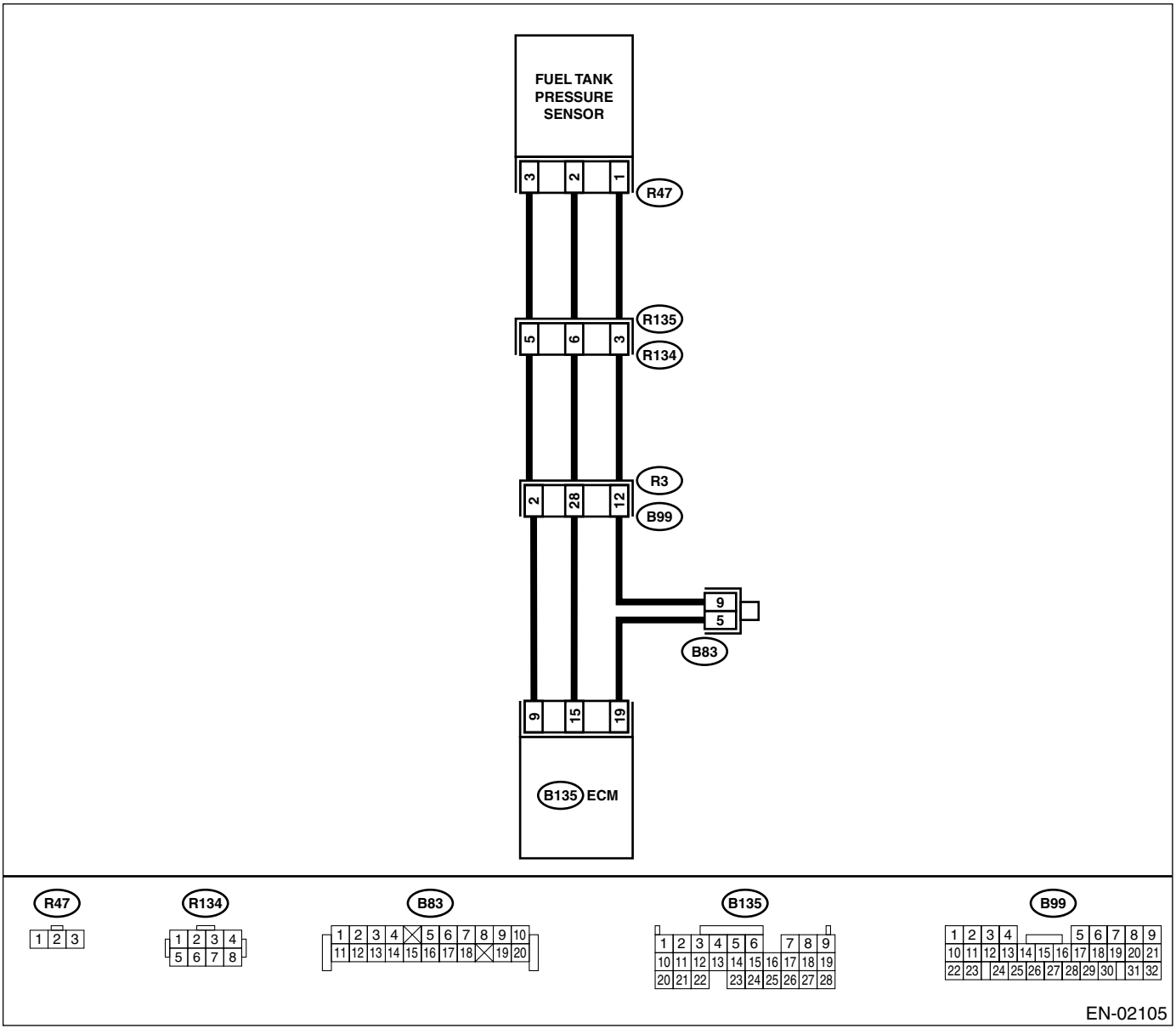
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from drain valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and drain valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace drain valve <Ref. to EC(H6DO)-21, Drain Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

BG:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



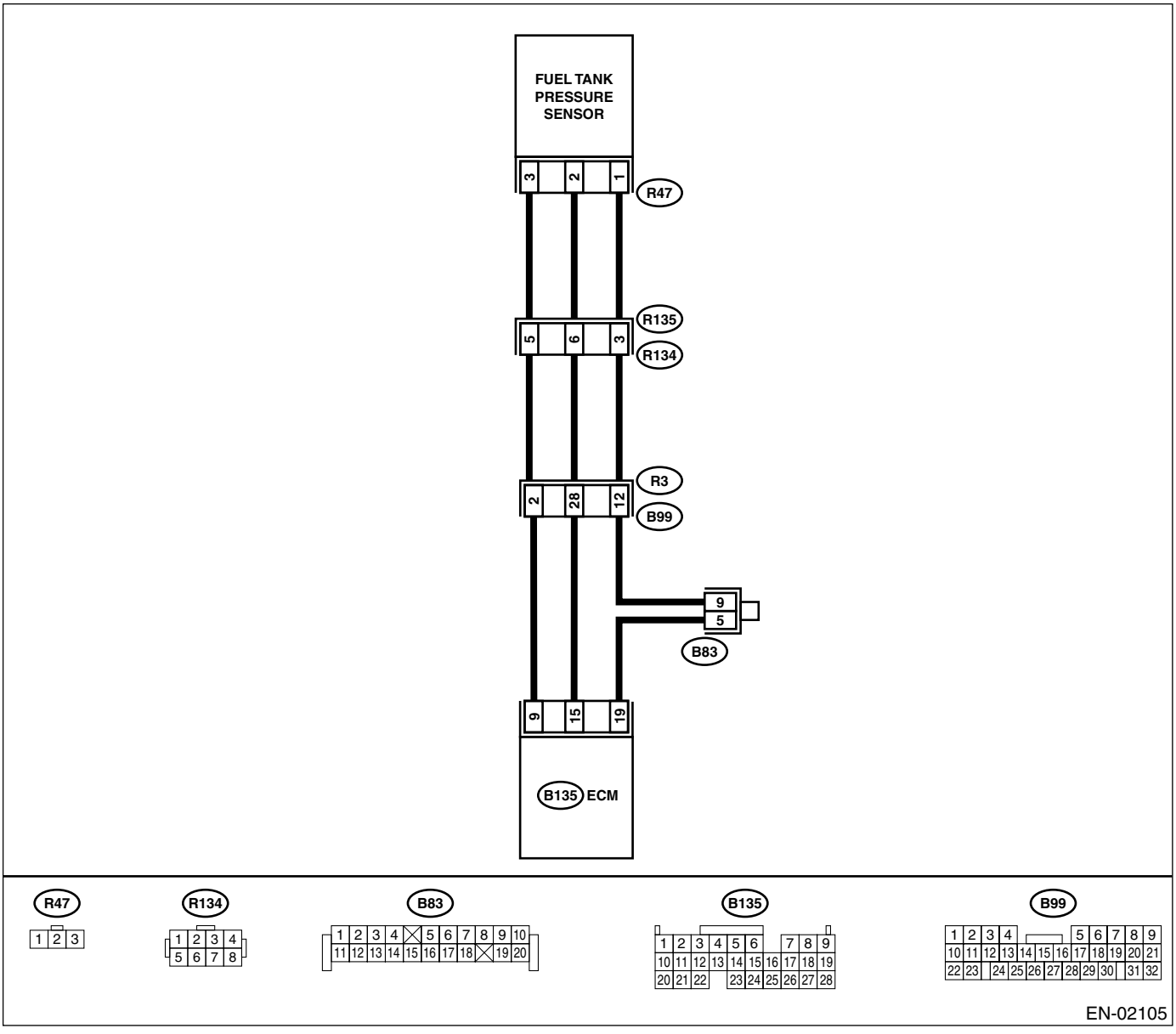
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace hoses and pipes.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-15, Fuel Tank Pressure Sensor.>

BH:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 19 — (R134) No. 3:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 5 — (R47) No. 3:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure resistance of harness between fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair ground short circuit in fuel tank cord.
12	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-15, Fuel Tank Pressure Sensor.>

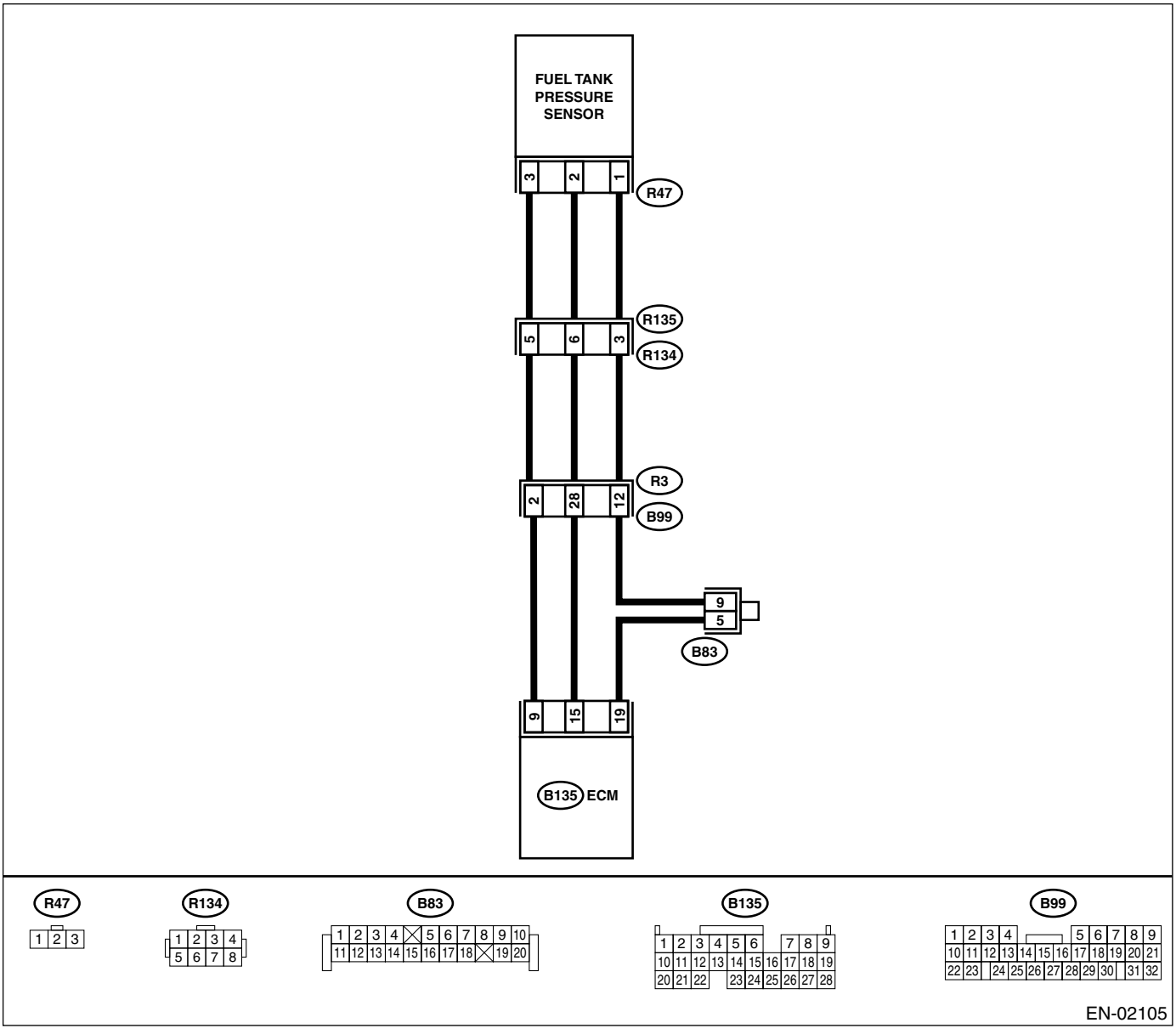
MEMO:

BI: DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove fuel filler cap. 3) Install fuel filler cap. 4) Turn ignition switch to ON. 5) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step **12.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove rear seat cushion (Sedan) or move rear seat cushion (Wagon). 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R134) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Step		Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 15 — (R134) No. 6:***	Is the measured value less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — (R135) No. 3:***	Is the measured value less than 1 Ω?	Go to step **9.**	Repair ground short circuit in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel tank pressure sensor. 2) Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 6 — (R47) No. 2:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure resistance of fuel tank cord. ***Connector & terminal*** ***(R135) No. 3 — (R47) No. 1:***	Is the measured value less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-15, Fuel Tank Pressure Sensor.>
12	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair battery short circuit in harness between ECM and fuel tank pressure sensor connector.	Replace fuel tank pressure sensor. <Ref. to EC(H6DO)-15, Fuel Tank Pressure Sensor.>

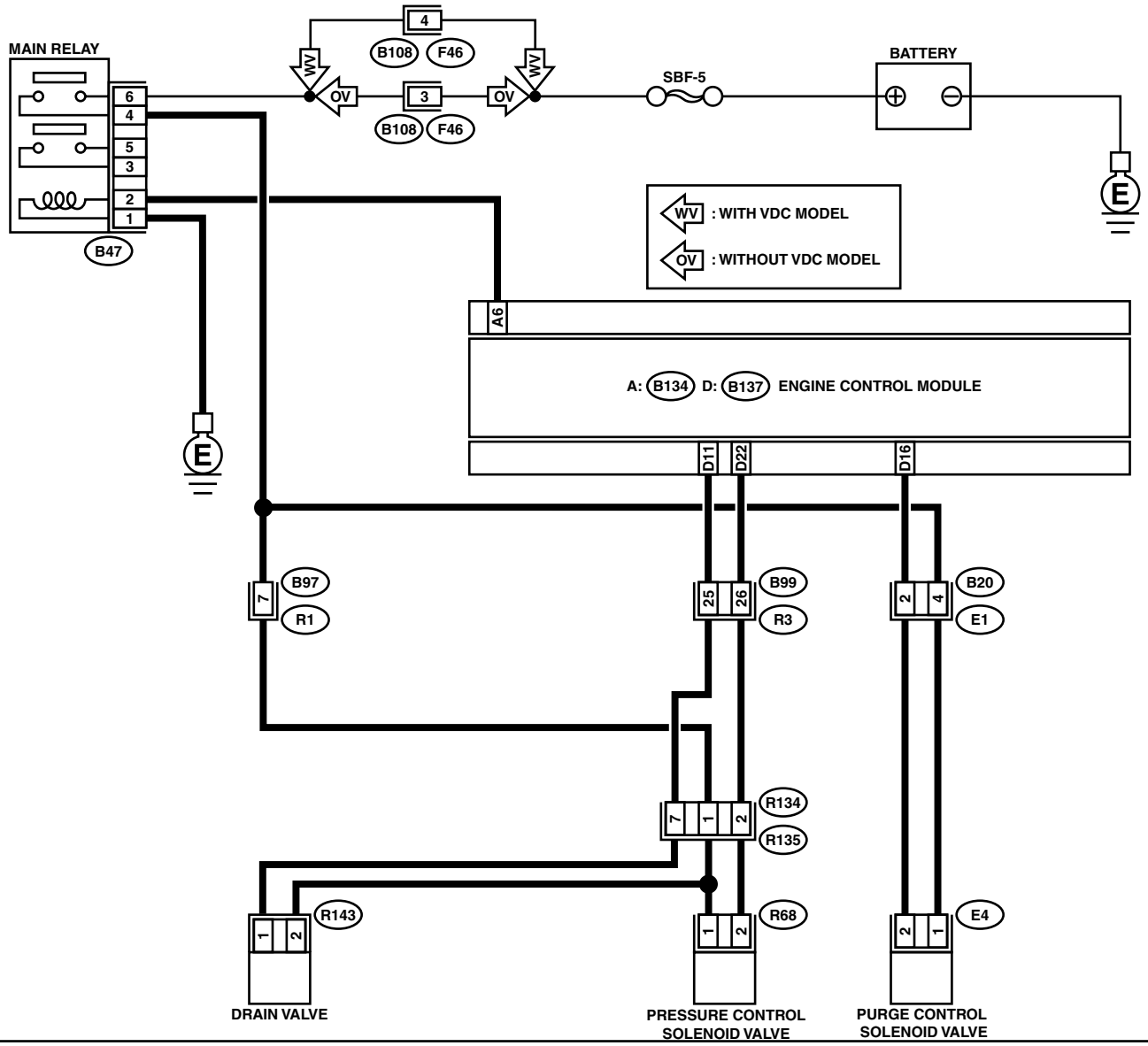
MEMO:

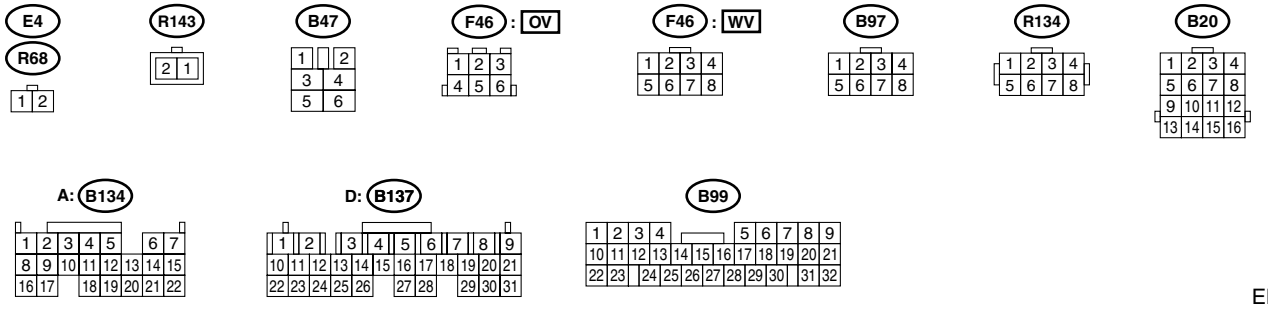
BJ:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02103

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-61, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step **5.**	Replace drain valve. <Ref. to EC(H6DO)-21, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step **6.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step **7.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-17, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace evaporation line. <Ref. to FU(H6DO)-75, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**

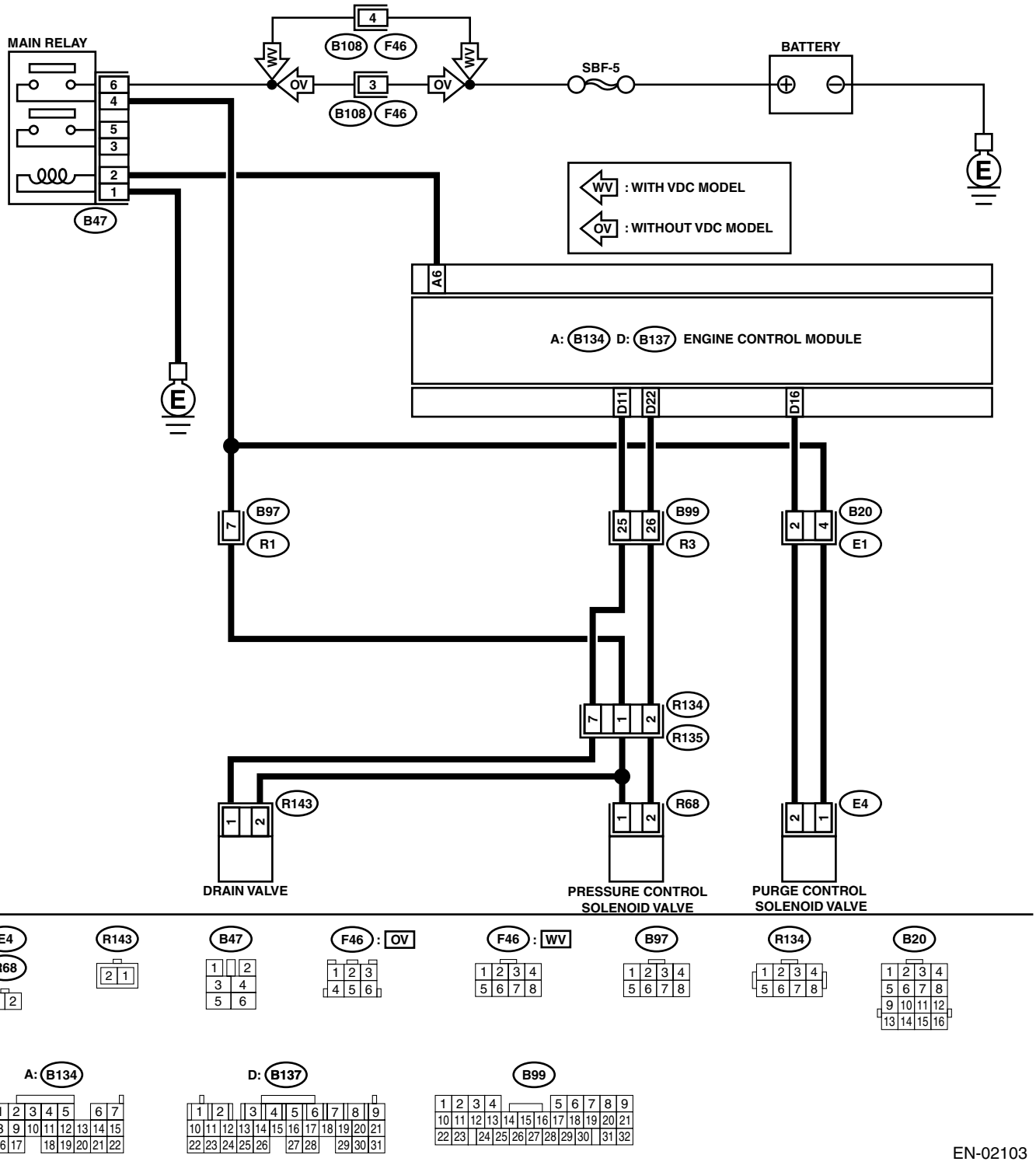
Step		Check	Yes	No
8	**CHECK CANISTER.**	Is canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace canister. <Ref. to EC(H6DO)-7, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BK:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Gasoline smell
  - Fuel filler cap loose or missing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC code is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace fuel filler cap and fuel filler pipe. <Ref. to FU(H6DO)-61, Fuel Filler Pipe.>	Go to step **4.**
4	**CHECK DRAIN VALVE.** 1) Connect test mode connector. 2) Turn ignition switch to ON. 3) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Go to step **5.**	Replace drain valve. <Ref. to EC(H6DO)-21, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does purge control solenoid valve produce operating sound?	Go to step **6.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does pressure control solenoid valve produce operating sound?	Go to step **7.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-17, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on fuel line?	Repair or replace fuel line. <Ref. to FU(H6DO)-75, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8.**

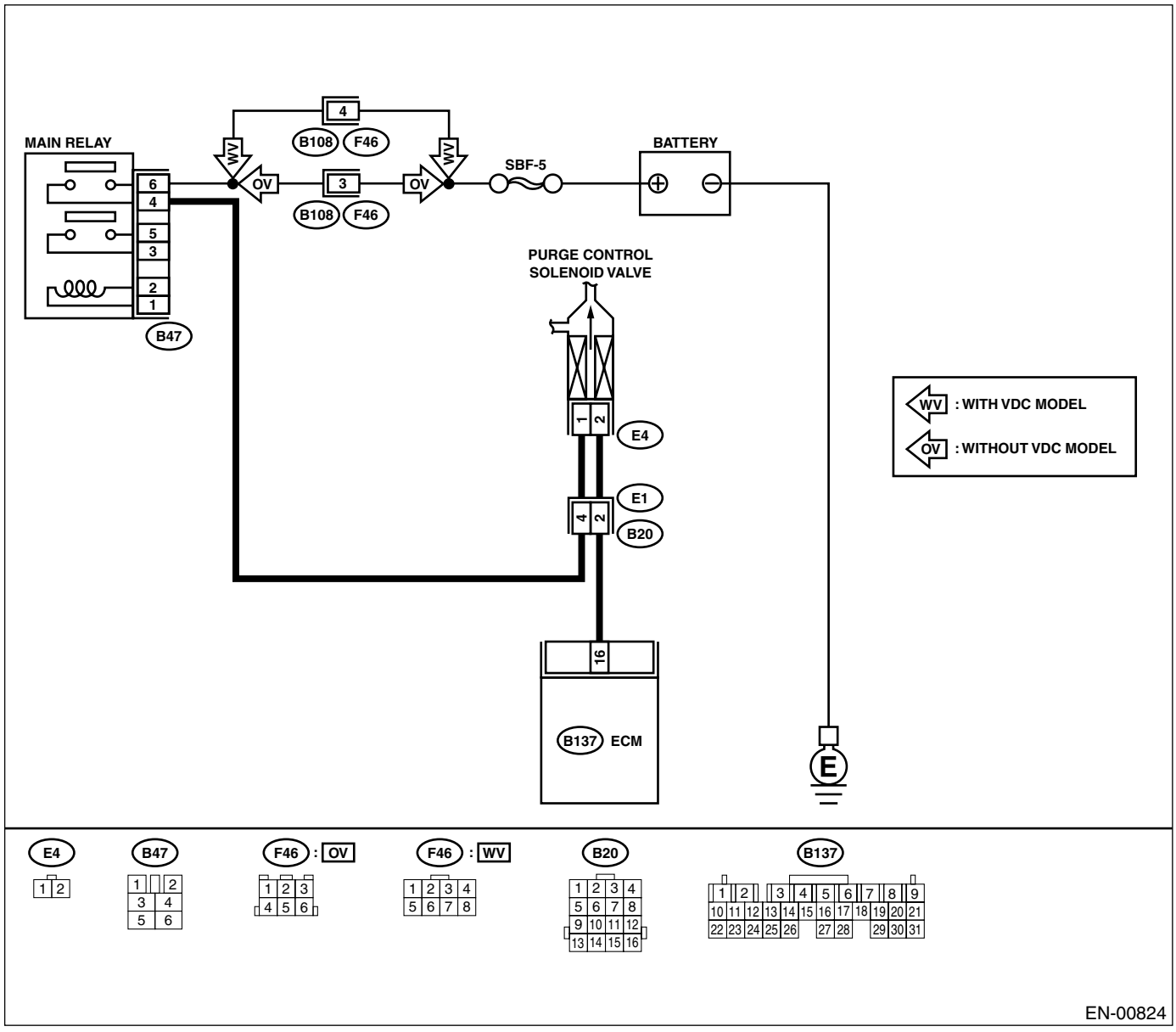
Step		Check	Yes	No
8	**CHECK CANISTER.**	Is canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace canister. <Ref. to EC(H6DO)-7, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.>	Is fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace fuel tank. <Ref. to FU(H6DO)-53, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace hoses or pipes.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BL:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00824

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from purge control solenoid valve and ECM. 3) Measure resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B137) No. 16 — (E4) No. 2:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove purge control solenoid valve. 2) Measure resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **5.**	Replace purge control solenoid valve. <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

Step		Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

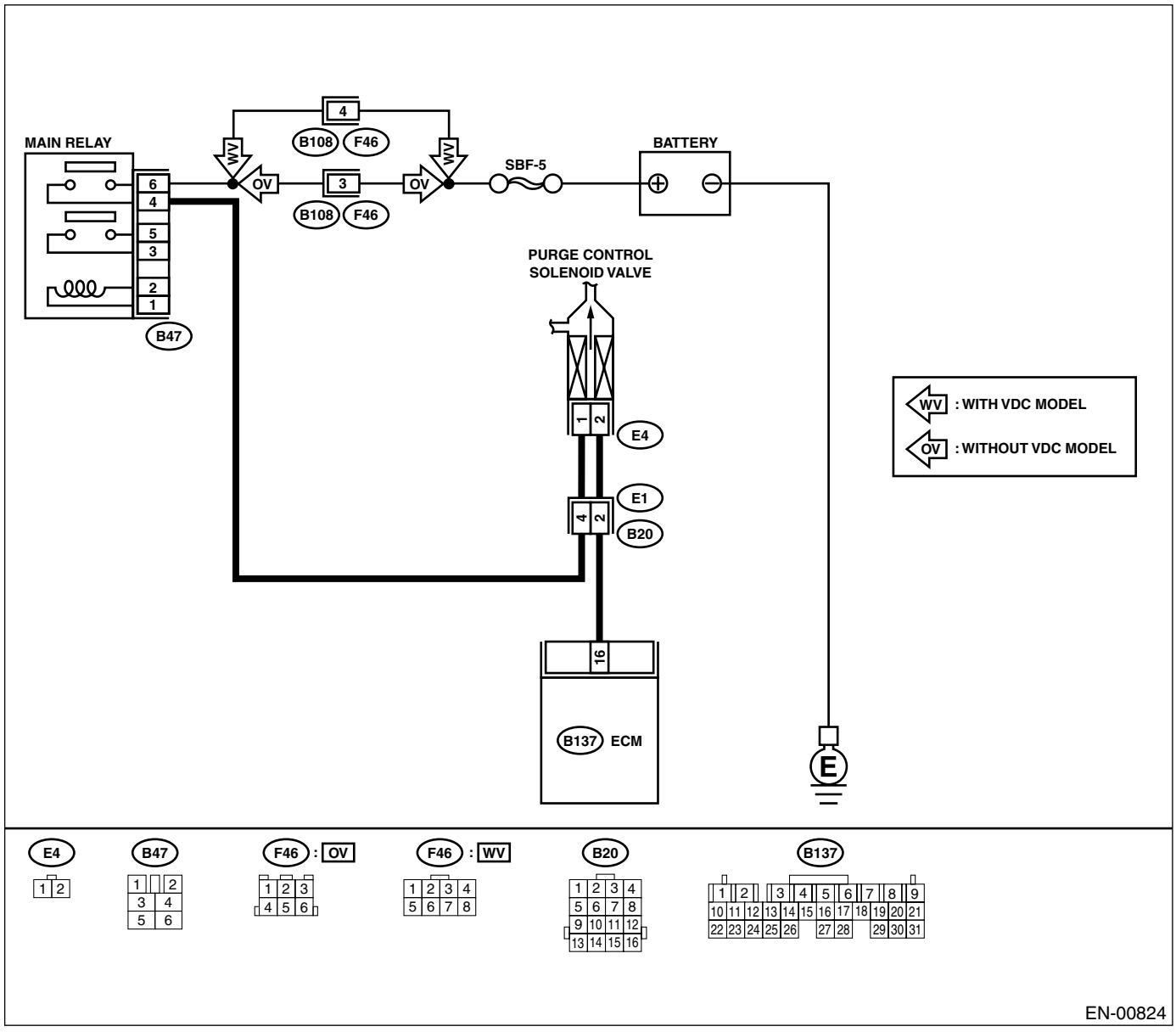
MEMO:

BM:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00824

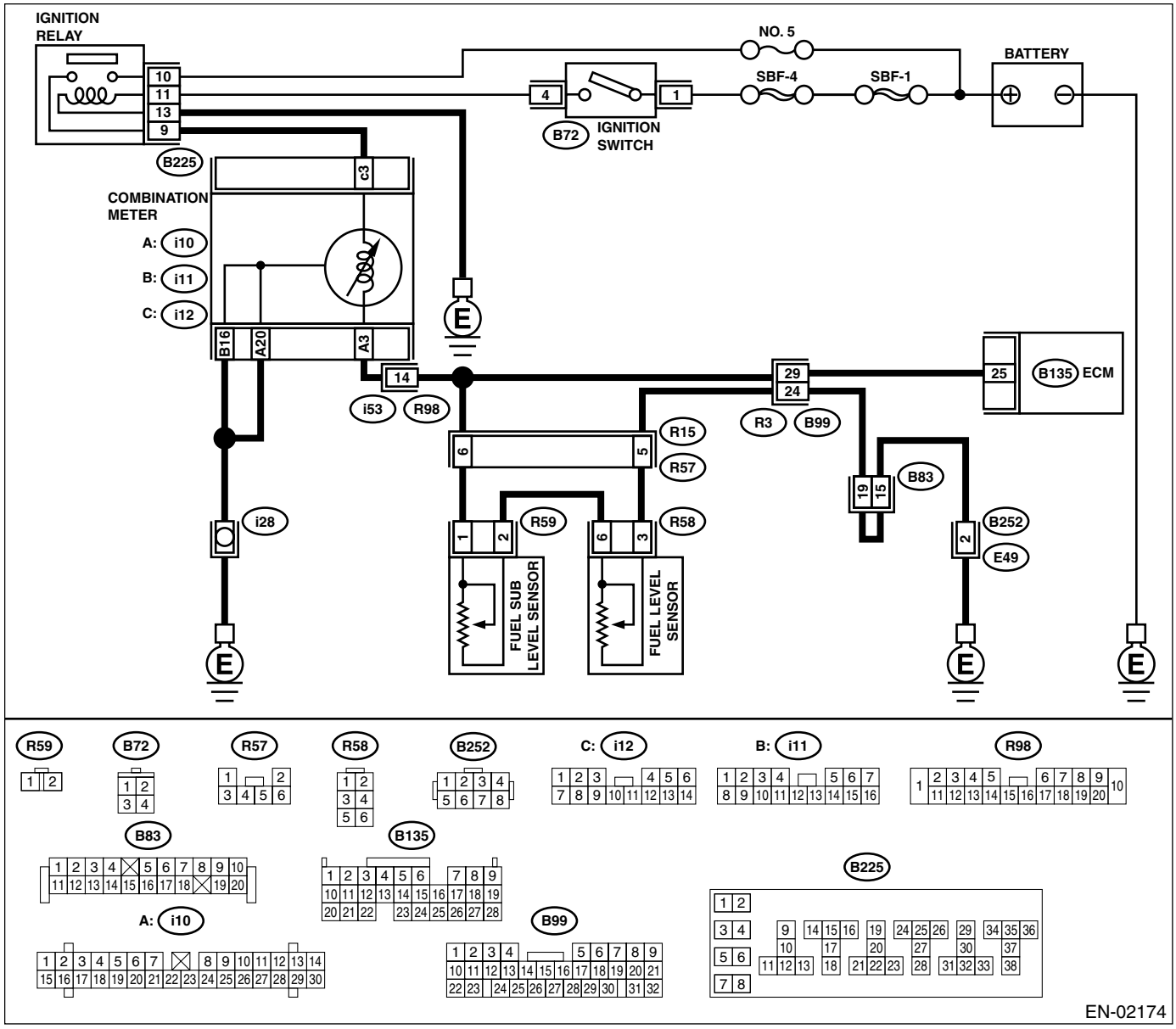
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from purge control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace purge control solenoid valve <Ref. to EC(H6DO)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

BN:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



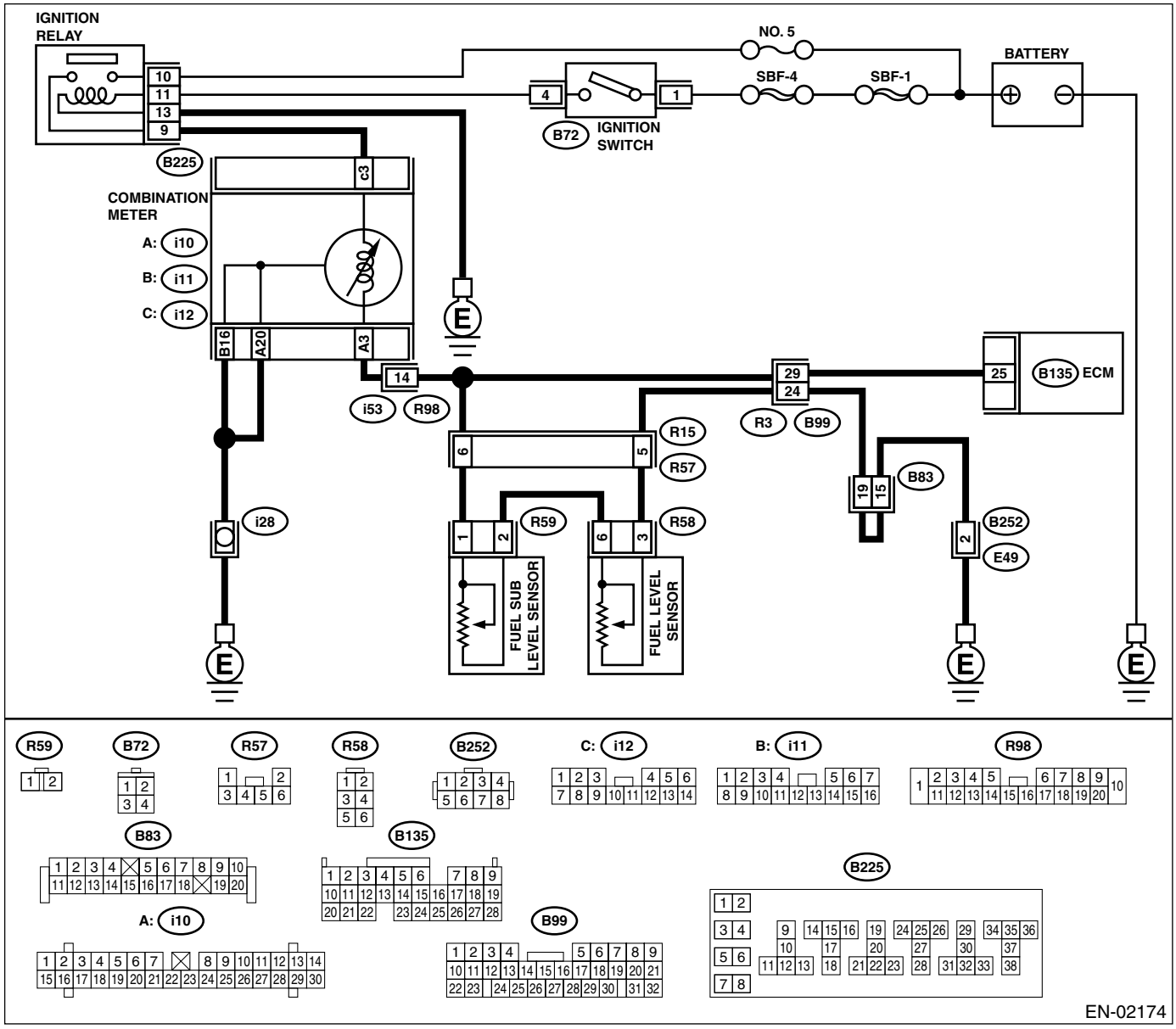
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace fuel level sensor <Ref. to FU(H6DO)-70, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H6DO)-71, Fuel Sub Level Sensor.>.

BO:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace combination meter. <Ref. to IDI-13, Combination Meter Assembly.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read data of fuel level sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the voltage change by shaking harness and connector of ECM?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 0.12 V?	Go to step **5.**	Go to step **7.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from connector (i10) and ECM connector. 3) Measure resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i10) No. 3:***	Is the measured value less than 10 Ω?	Repair or replace combination meter. <Ref. to IDI-13, Combination Meter Assembly.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel sub level sensor. 3) Measure resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel pump assembly. 2) Measure resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel pump assembly. <Ref. to FU(H6DO)-68, Fuel Pump.> 2) Measure resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value within 0.5 to 2.5 Ω?	Go to step **10.**	Replace fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel sub level sensor. <Ref. to FU(H6DO)-71, Fuel Sub Level Sensor.> 2) Measure resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 0.5 to 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace fuel sub level sensor.

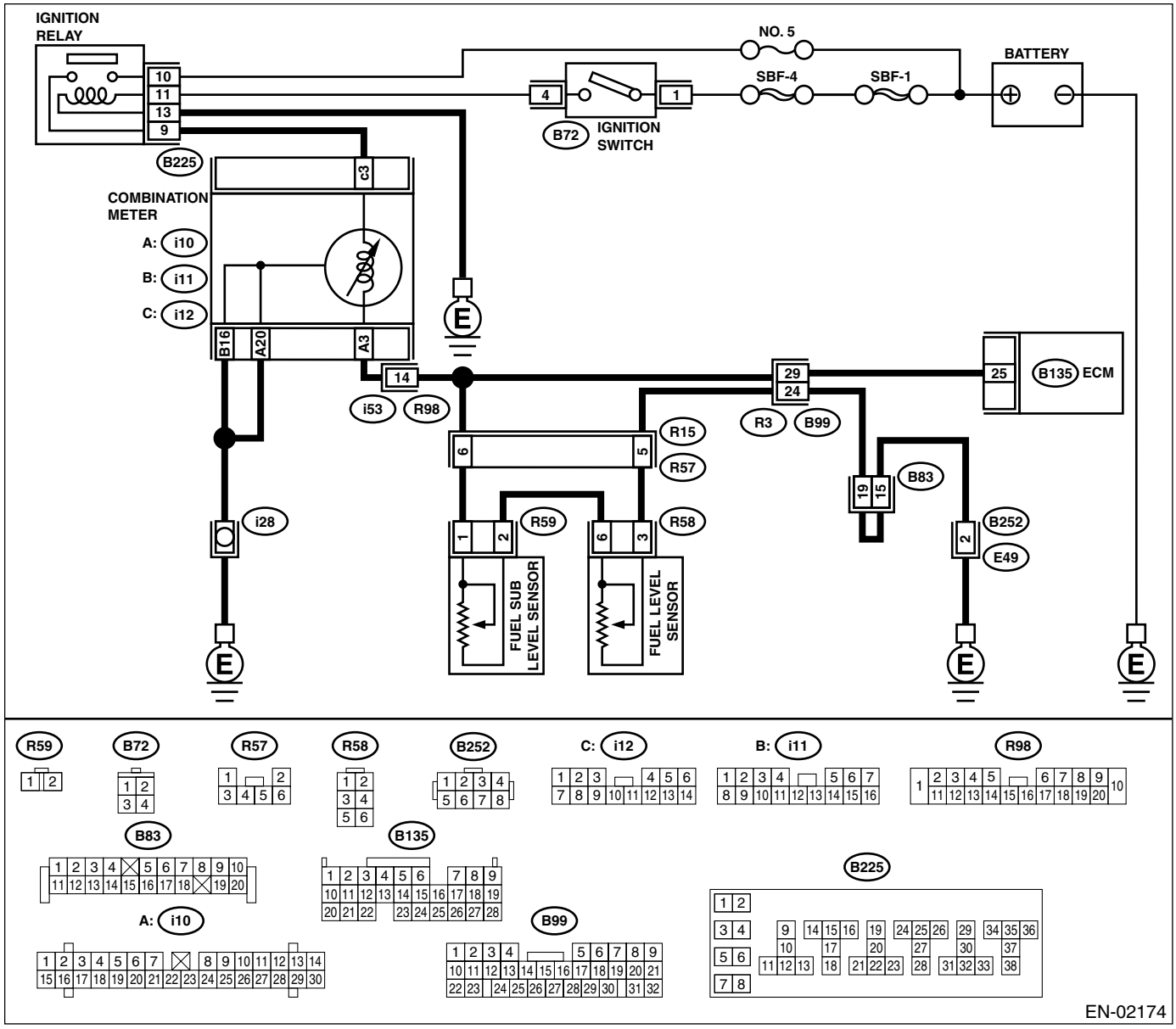
MEMO:

BP:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace combination meter. <Ref. to IDI-13, Combination Meter Assembly.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. (Engine OFF) 2) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **3.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn ignition switch to OFF. 2) Disconnect combination meter connector (i10) and ECM connector. 3) Turn ignition switch to ON. 4) Measure voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the measured value more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 6:***	Is the measured value less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 5 — Chassis ground:***	Is the measured value less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel level sensor. 2) Measure resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 5 — (R58) No. 3:***	Is the measured value less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect connector from fuel sub level sensor. 2) Measure resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 6 — (R59) No. 2:***	Is the measured value less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R59) No. 1:***	Is the measured value less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel pump assembly. <Ref. to FU(H6DO)-68, Fuel Pump.> 2) While moving fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value more than 54.5 Ω?	Replace fuel level sensor. <Ref. to FU(H6DO)-70, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel sub level sensor. <Ref. to FU(H6DO)-71, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value more than 41.5 Ω?	Replace fuel sub level sensor. <Ref. to FU(H6DO)-71, Fuel Sub Level Sensor.>	Replace combination meter. <Ref. to IDI-13, Combination Meter Assembly.>

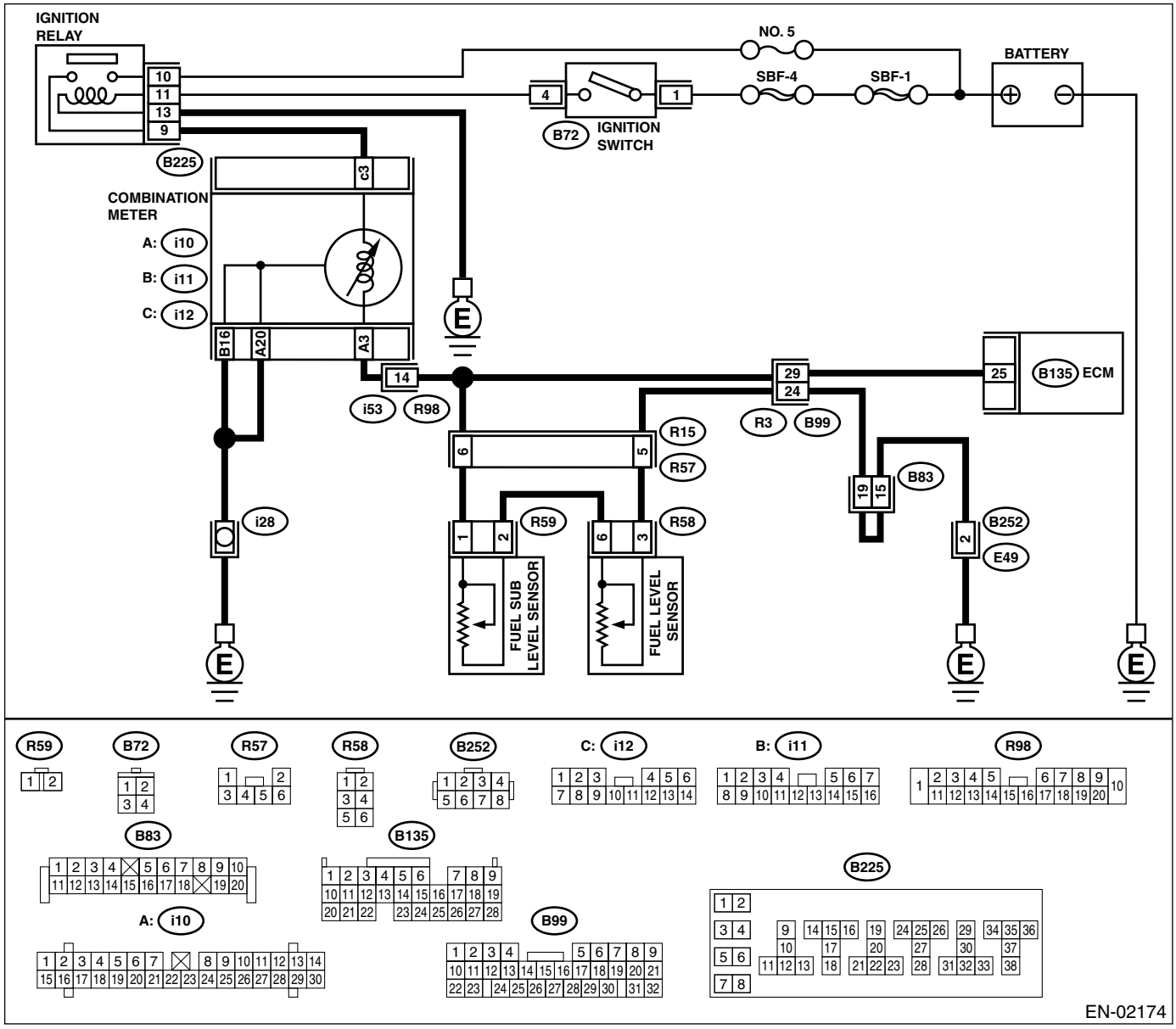
MEMO:

BQ:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT—

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove fuel pump assembly. <Ref. to FU(H6DO)-68, Fuel Pump.> 2) While moving fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 6:***	Does the resistance change smoothly?	Go to step **3.**	Replace fuel level sensor. <Ref. to FU(H6DO)-70, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** **Warning:** **During work procedures, if fuel tank is more than 3/4 full, be careful because fuel may spill.** 1) Remove fuel sub level sensor. <Ref. to FU(H6DO)-71, Fuel Sub Level Sensor.> 2) While moving fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace fuel sub level sensor. <Ref. to FU(H6DO)-71, Fuel Sub Level Sensor.>

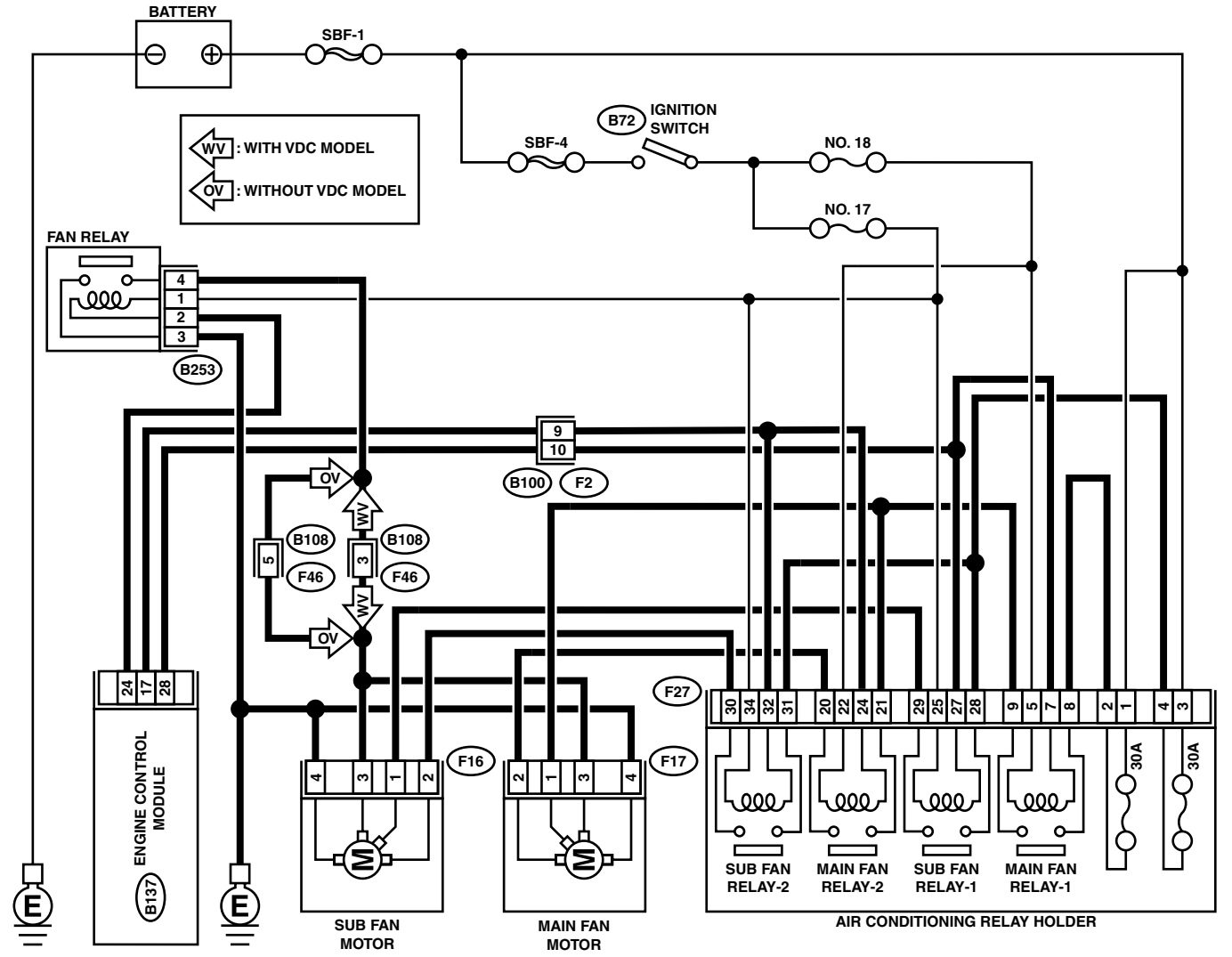
BR:DTC P0483 — COOLING FAN RATIONALITY CHECK —

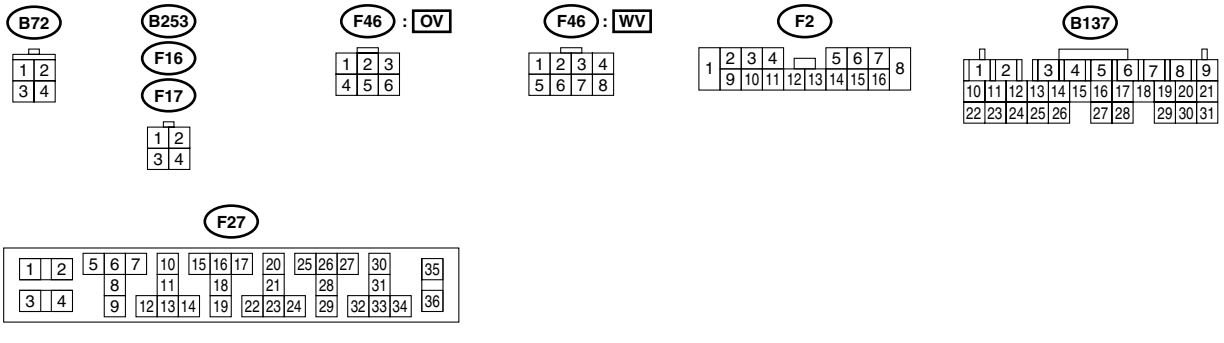
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

- **WIRING DIAGRAM:**





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Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H6DO)-7, INSPECTION, Radiator Main Fan System.> and <Ref. to CO(H6DO)-13, INSPECTION, Radiator Sub Fan System.>

BS:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H6DO)-274, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

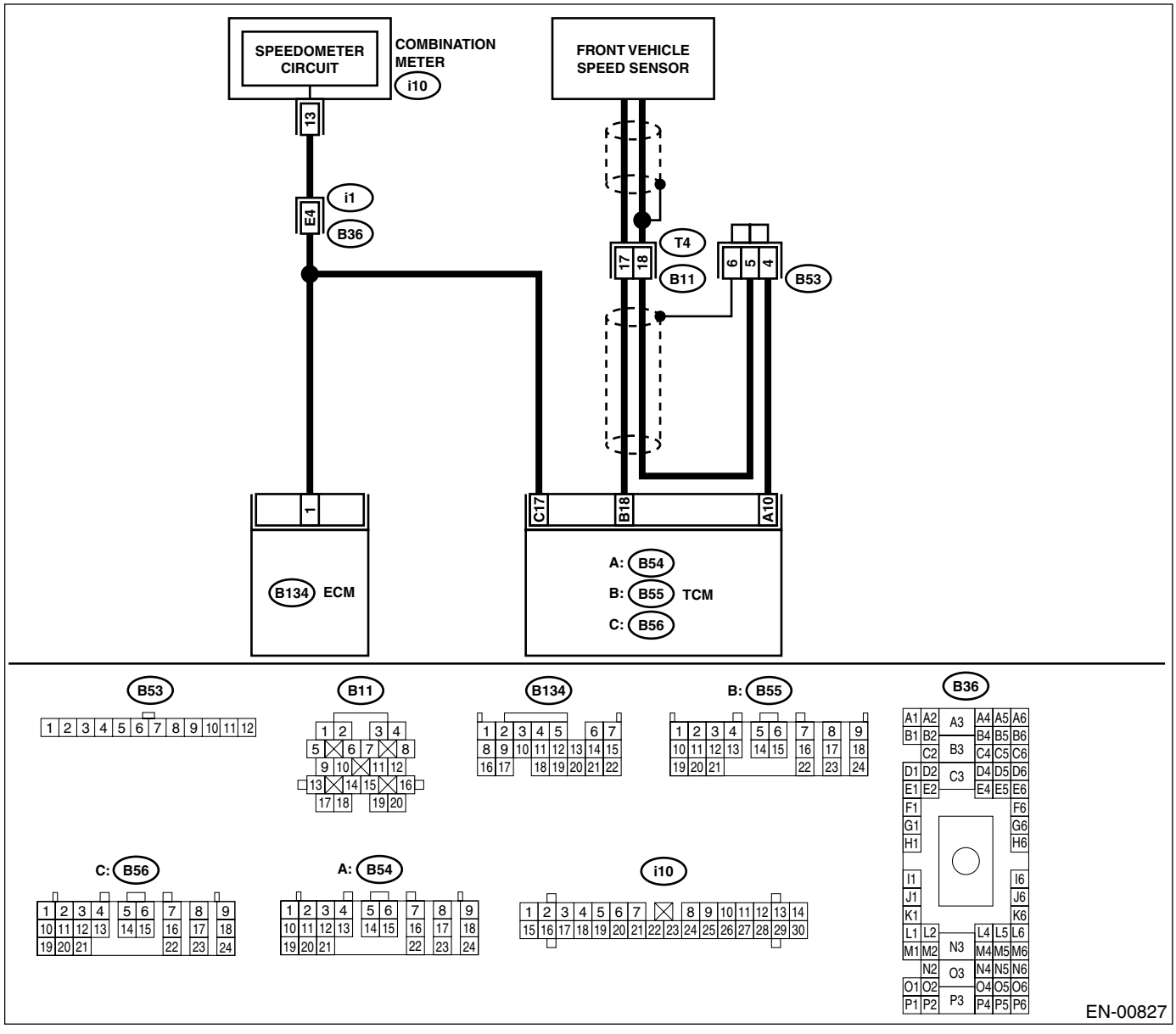
BT:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

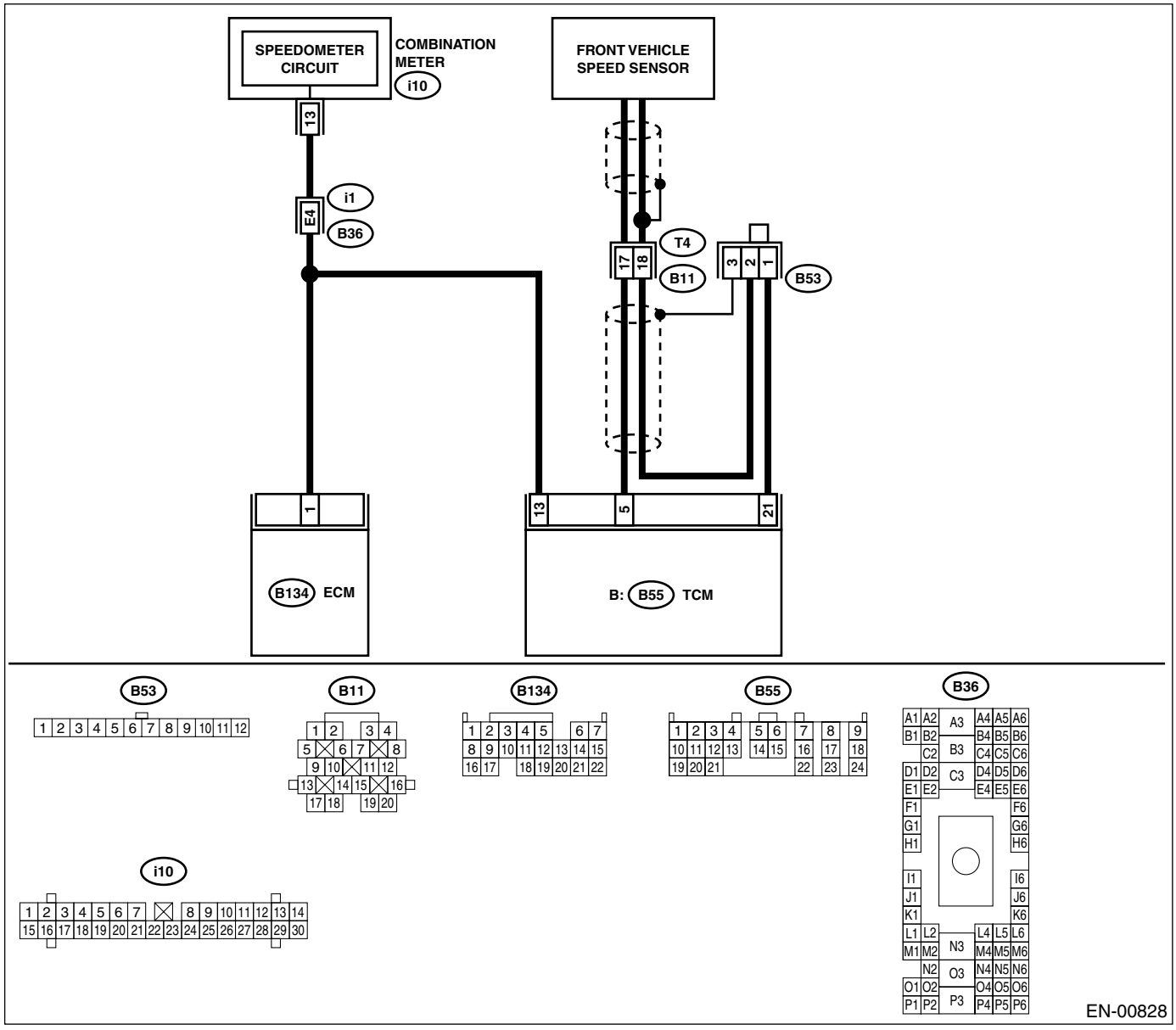
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

WITH VDC MODEL



WITHOUT VDC MODEL



Step		Check	Yes	No
1	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **3.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-15, Speedometer.>, <Ref. to 4AT-55, Front Vehicle Speed Sensor.>, <Ref. to 4AT-60, Rear Vehicle Speed Sensor.> and <Ref. to 4AT-61, Torque Converter Turbine Speed Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter. 3) Measure resistance between ECM and combination meter. ***Connector & terminal*** ***(B134) No. 1 — (i10) No. 13:***	Is the measured value less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

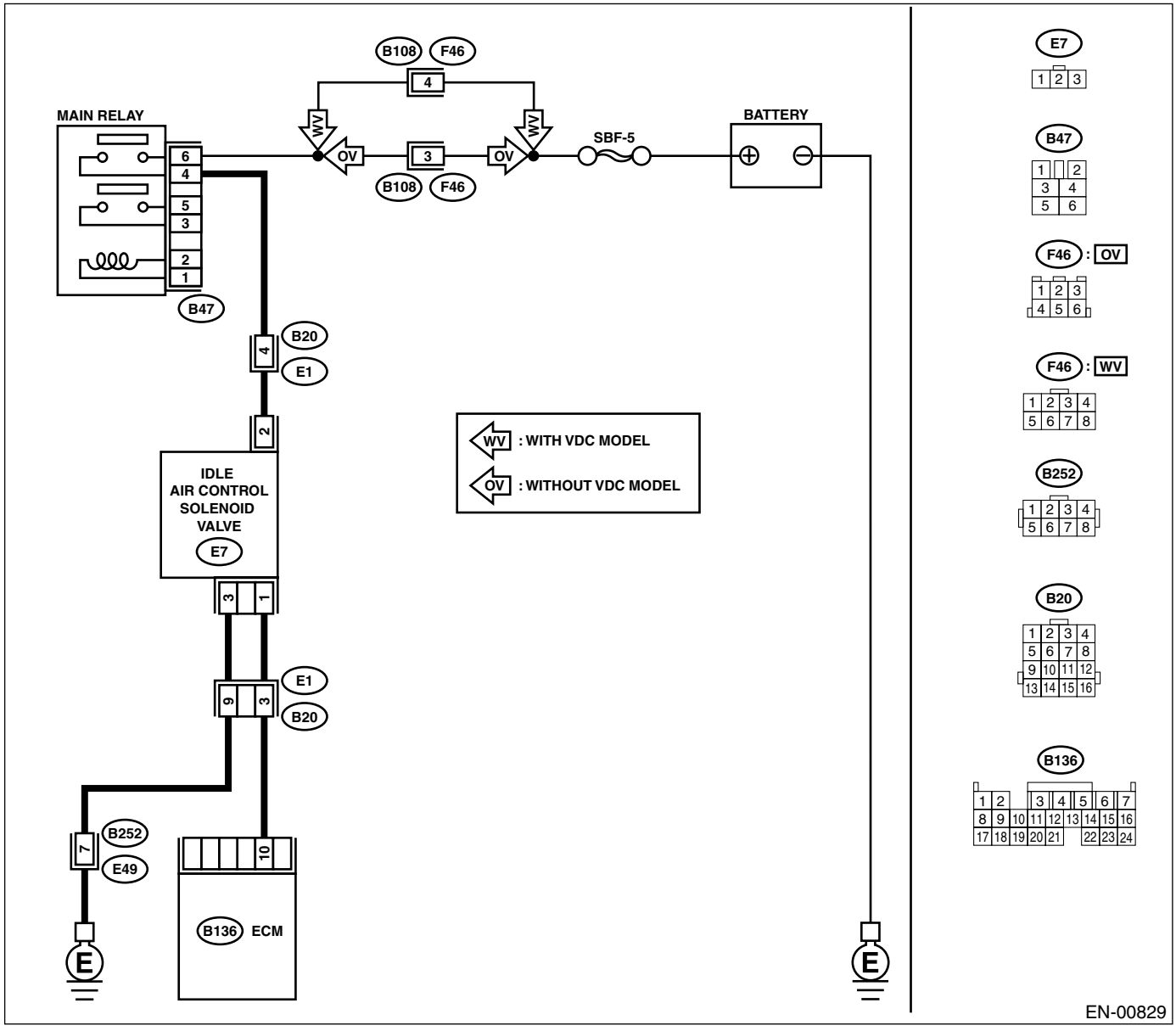
MEMO:

BU:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



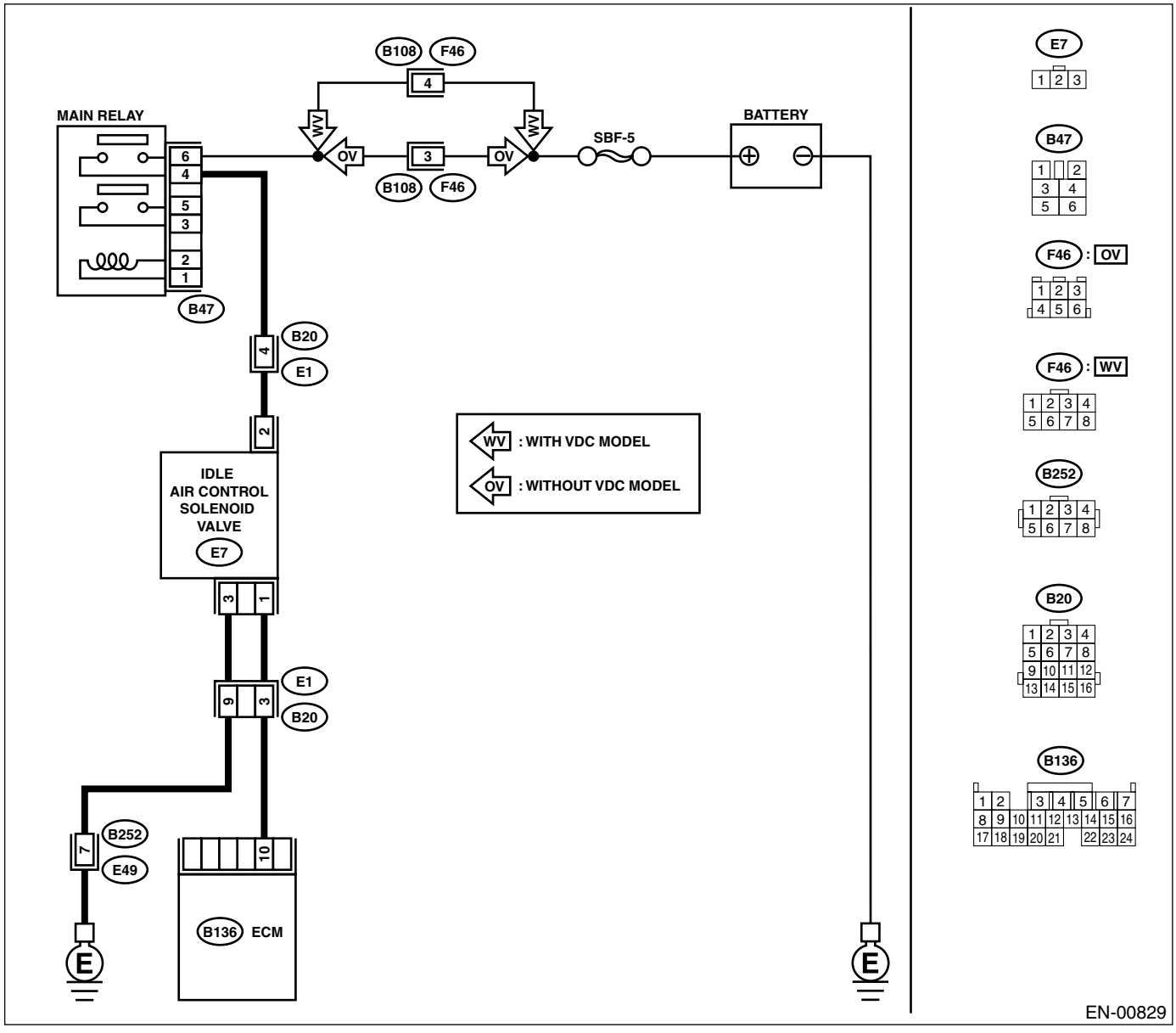
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> 3) Remove throttle body from intake manifold. <Ref. to FU(H6DO)-16, Throttle Body.> 4) Using an air gun, force air into idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior.	Does air flow out?	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>	Replace throttle body. <Ref. to FU(H6DO)-16, Throttle Body.>

BV:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine does not return to normal idle speed.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



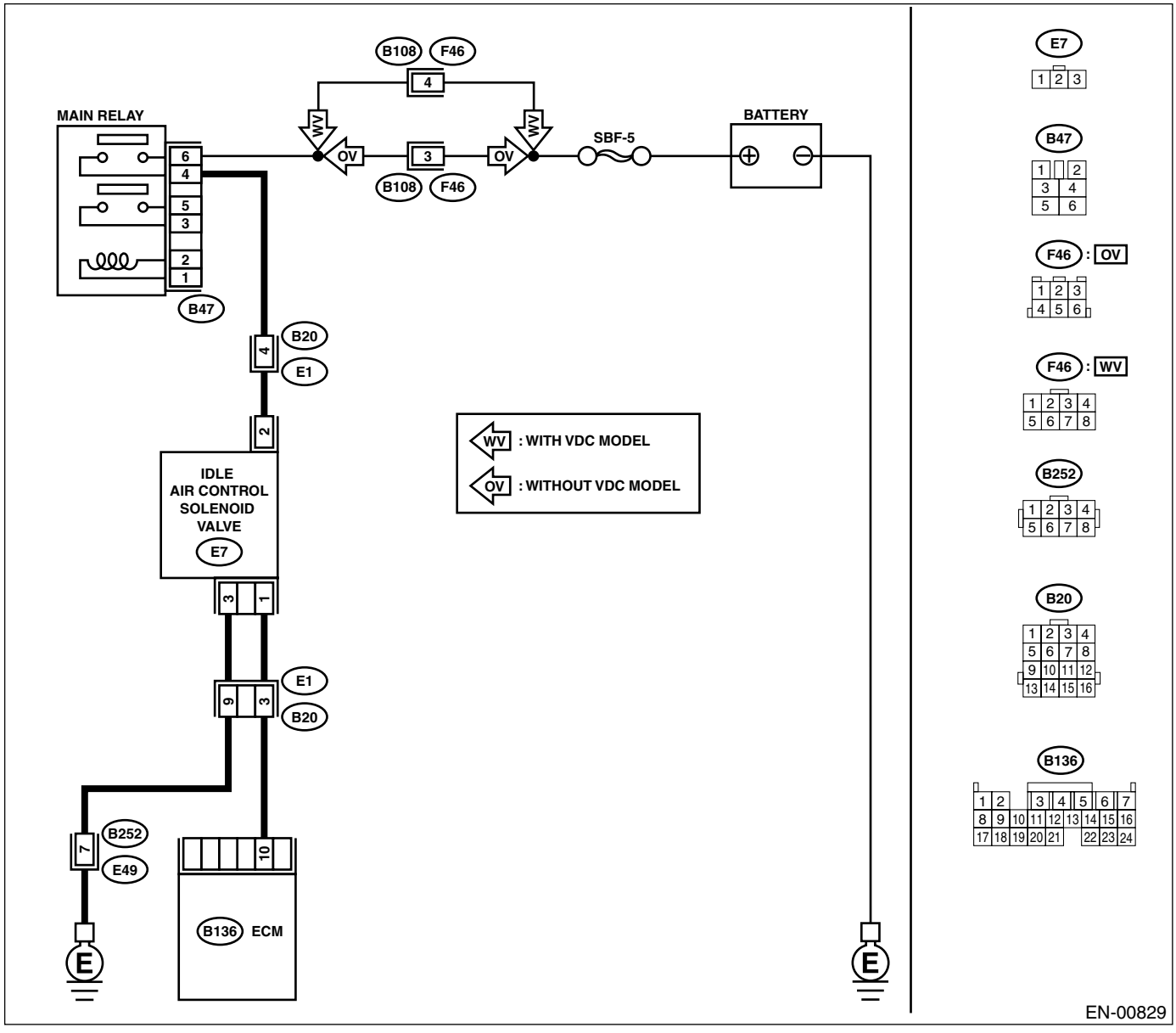
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H6DO)-7, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn ignition switch to OFF. 2) Remove idle air control solenoid valve from throttle body. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove foreign particles from by-pass air line.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

BW:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



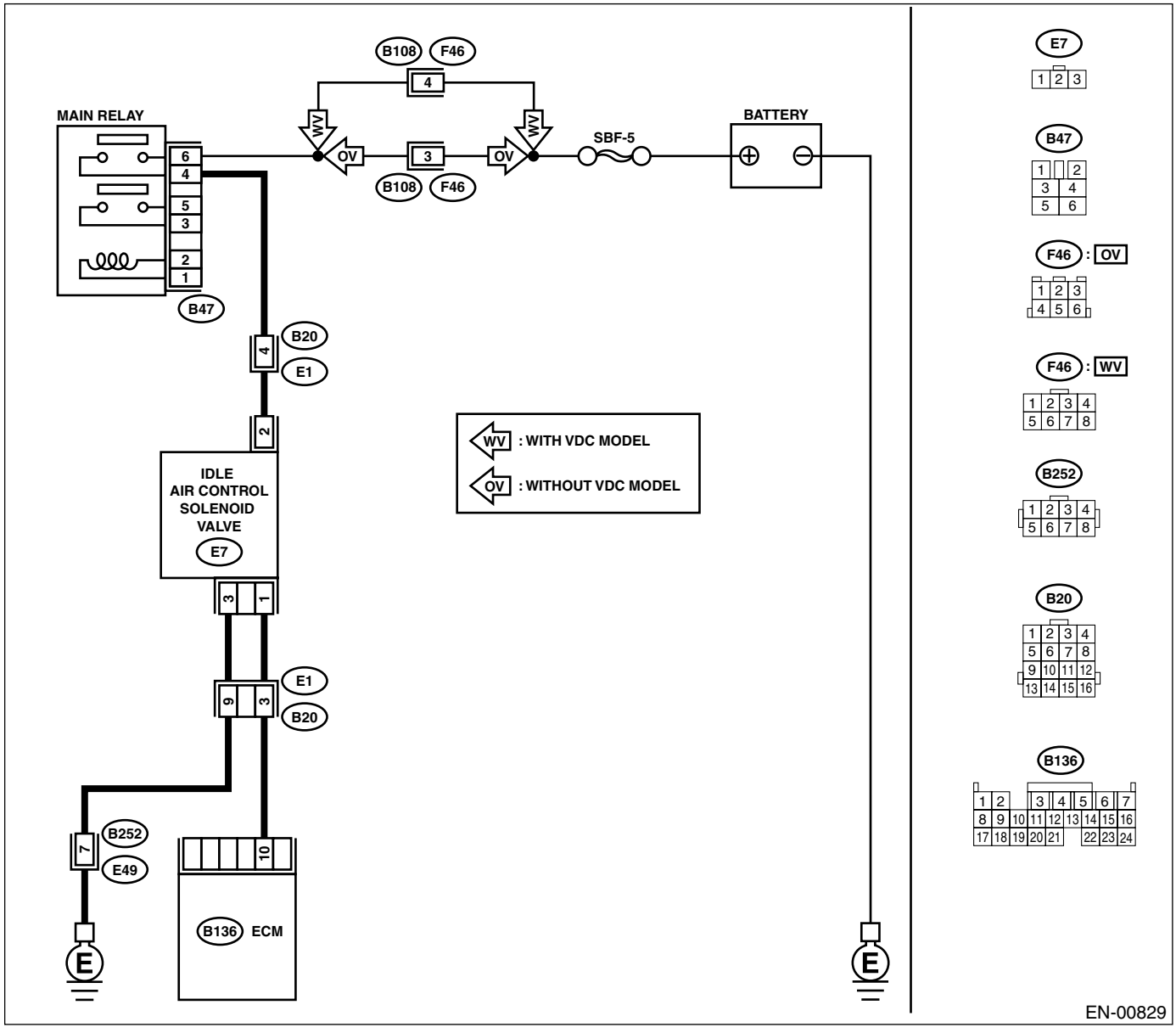
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 3 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between idle air control solenoid valve and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***(B136) No. 10 — (E7) No. 1:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.	Go to step **5.**
5	**CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.** Measure resistance of harness between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 3 — Engine ground:*** Is the measured value less than the specified value?	Is the measured value less than 5 Ω?	Go to step **6.**	Repair open circuit in harness between idle air control solenoid valve connector and engine ground terminal.
6	**CHECK POOR CONTACT.** Check poor contact in ECM and idle air control solenoid valve connectors.	Is there poor contact in ECM and idle air control solenoid valve connectors?	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

BX:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



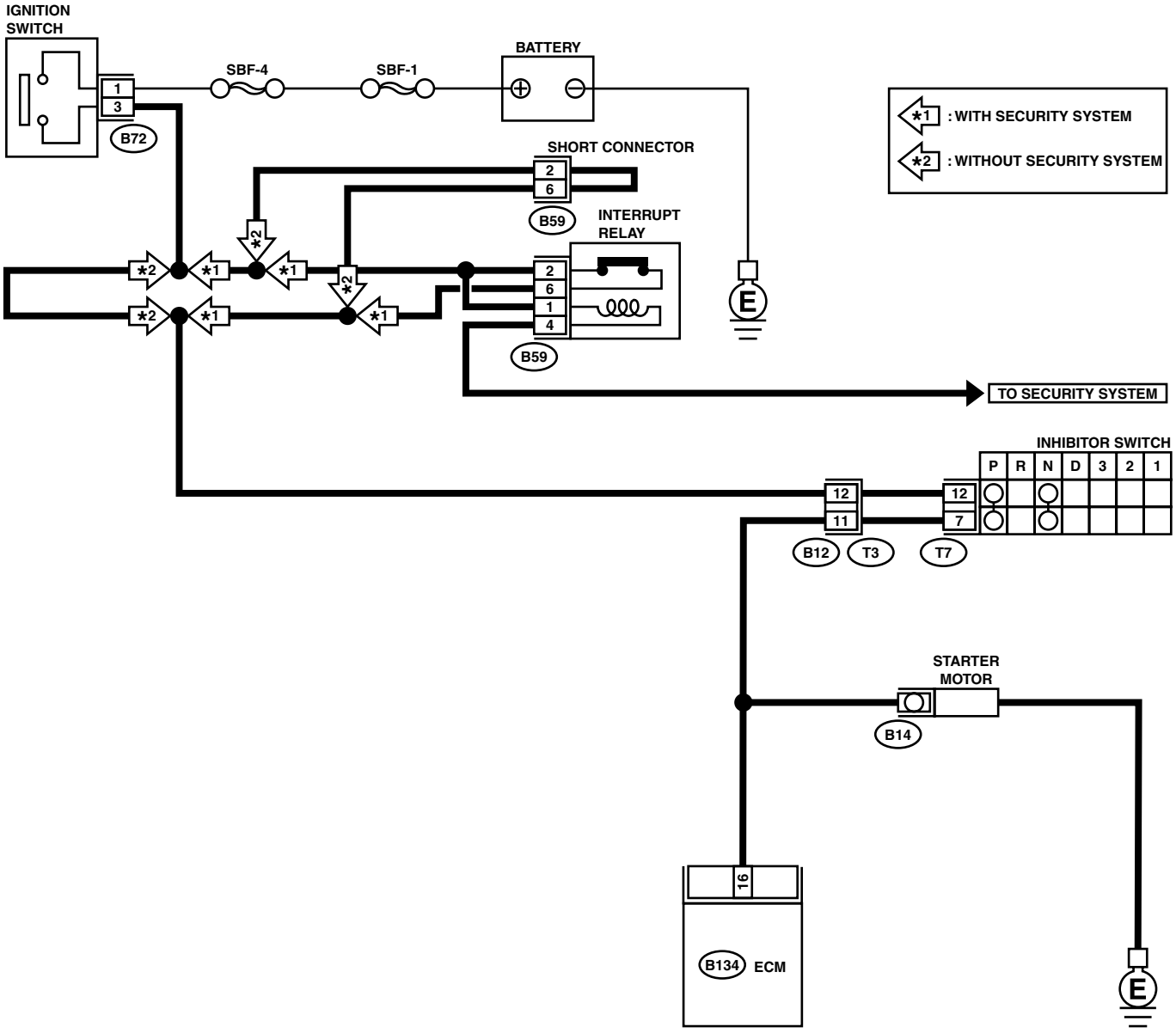
	Step	Check	Yes	No
1	**CHECK THROTTLE CABLE.**	Does throttle cable have play for adjustment?	Go to step **2.**	Adjust throttle cable. <Ref. to SP(H6DO)-7, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from idle air control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Replace idle air control solenoid valve <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>.
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Does the voltage change by shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

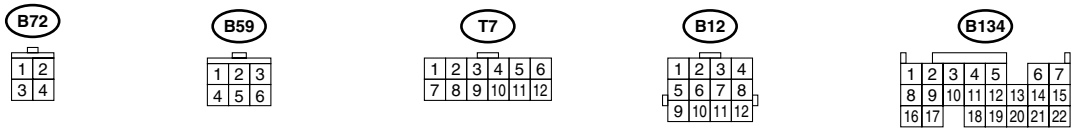
BY:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00804

Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in “P” or “N” position.	Does starter motor operate when ignition switch to “ON”?	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H6DO)-75, Diagnostics for Engine Starting Failure.>

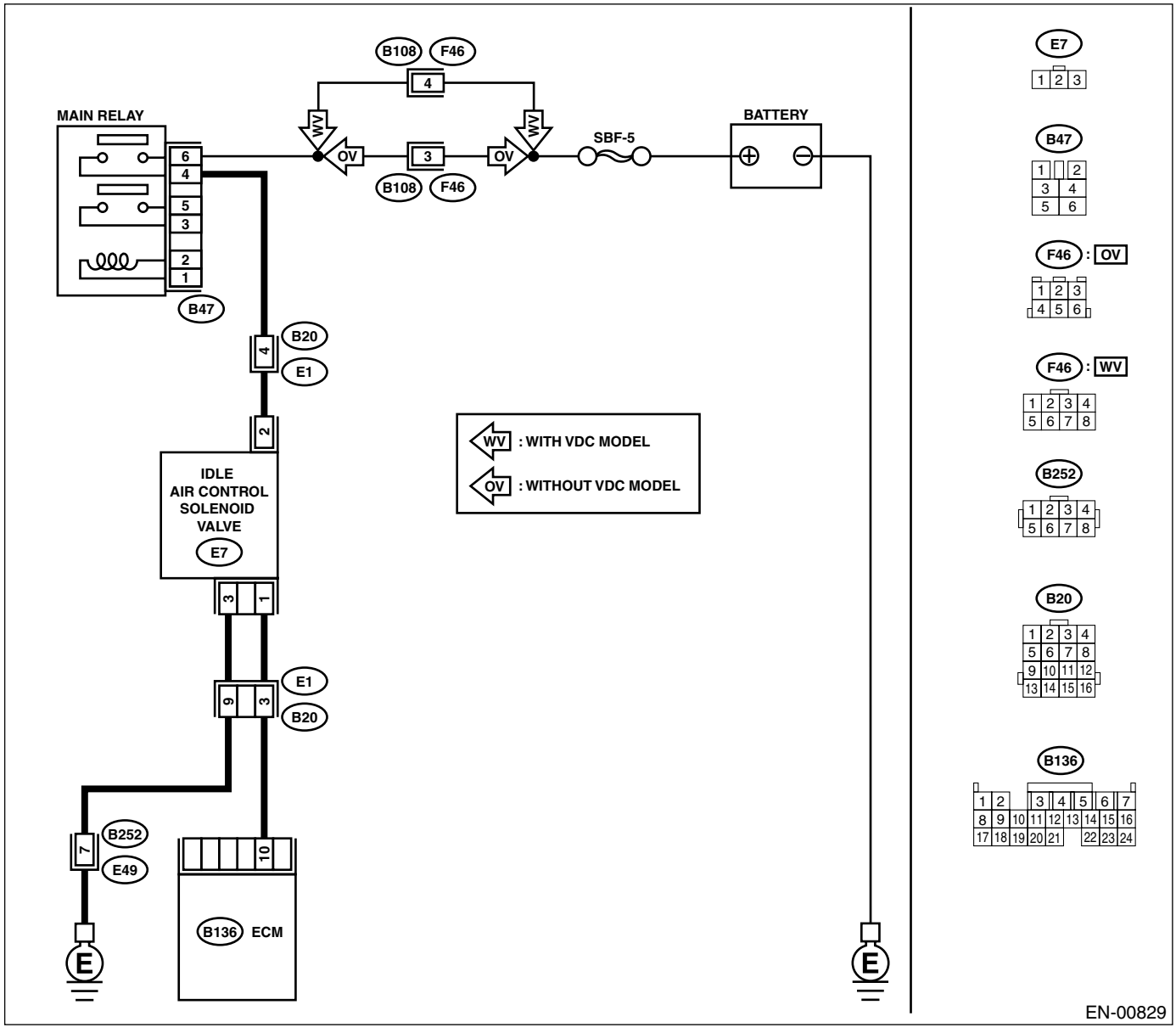
MEMO:

BZ:DTC P0519 — IDLE AIR CONTROL CIRCUIT SYSTEM PERFORMACE —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Engine does not return to normal idle speed.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



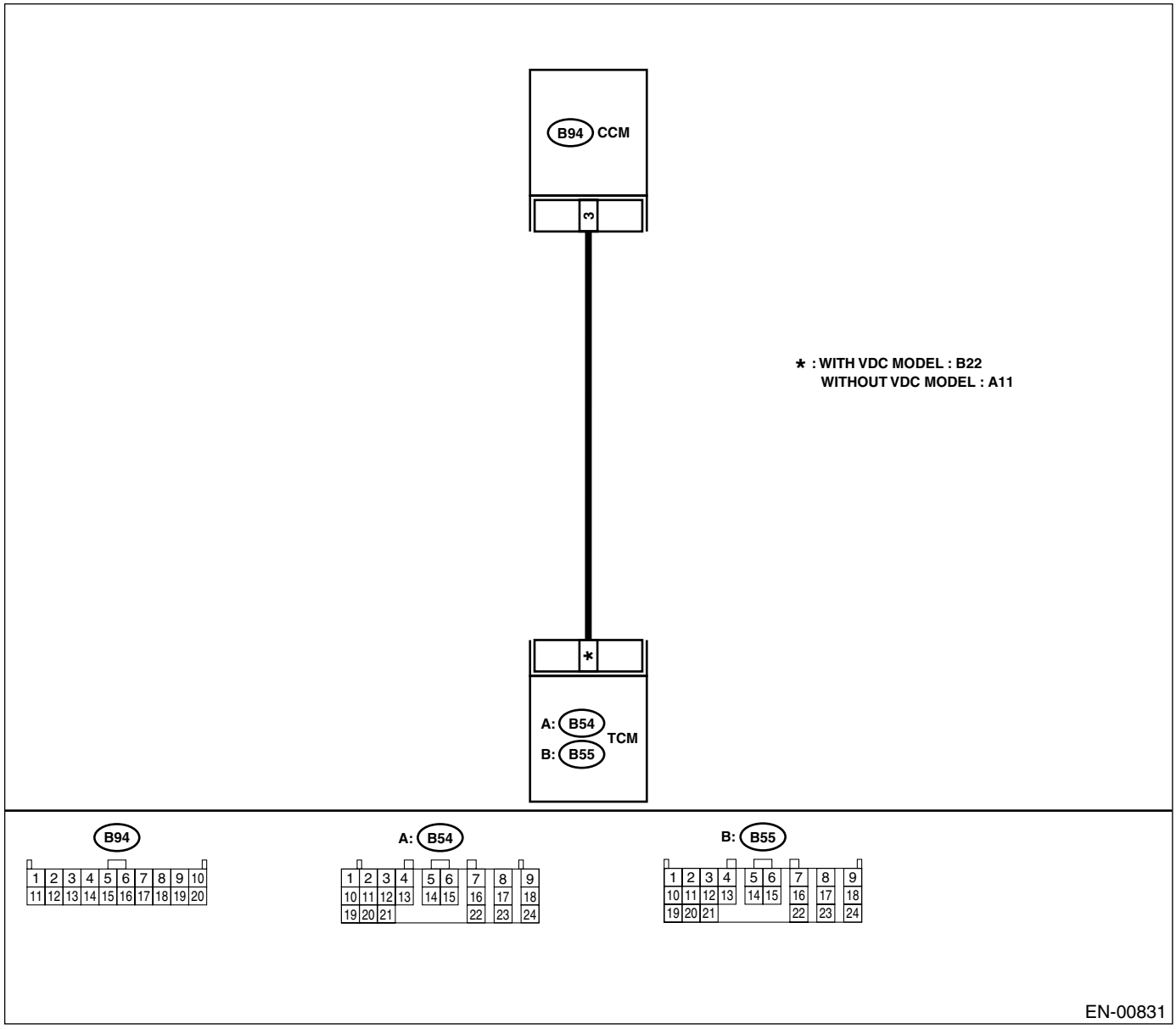
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1507.	Go to step **2.**
2	**CHECK THROTTLE CABLE.**	Does throttle cable have play for adjustment?	Go to step **3.**	Adjust throttle cable. <Ref. to SP(H6DO)-7, Accelerator Control Cable.>
3	**CHECK AIR INTAKE SYSTEM.** 1) Turn ignition switch to ON. 2) Start engine, and idle it. 3) Check the following items. • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair air suction and leaks.	Replace idle air control solenoid valve. <Ref. to FU(H6DO)-36, Idle Air Control Solenoid Valve.>

CA:DTC P0565 — CRUISE CONTROL ON SIGNAL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



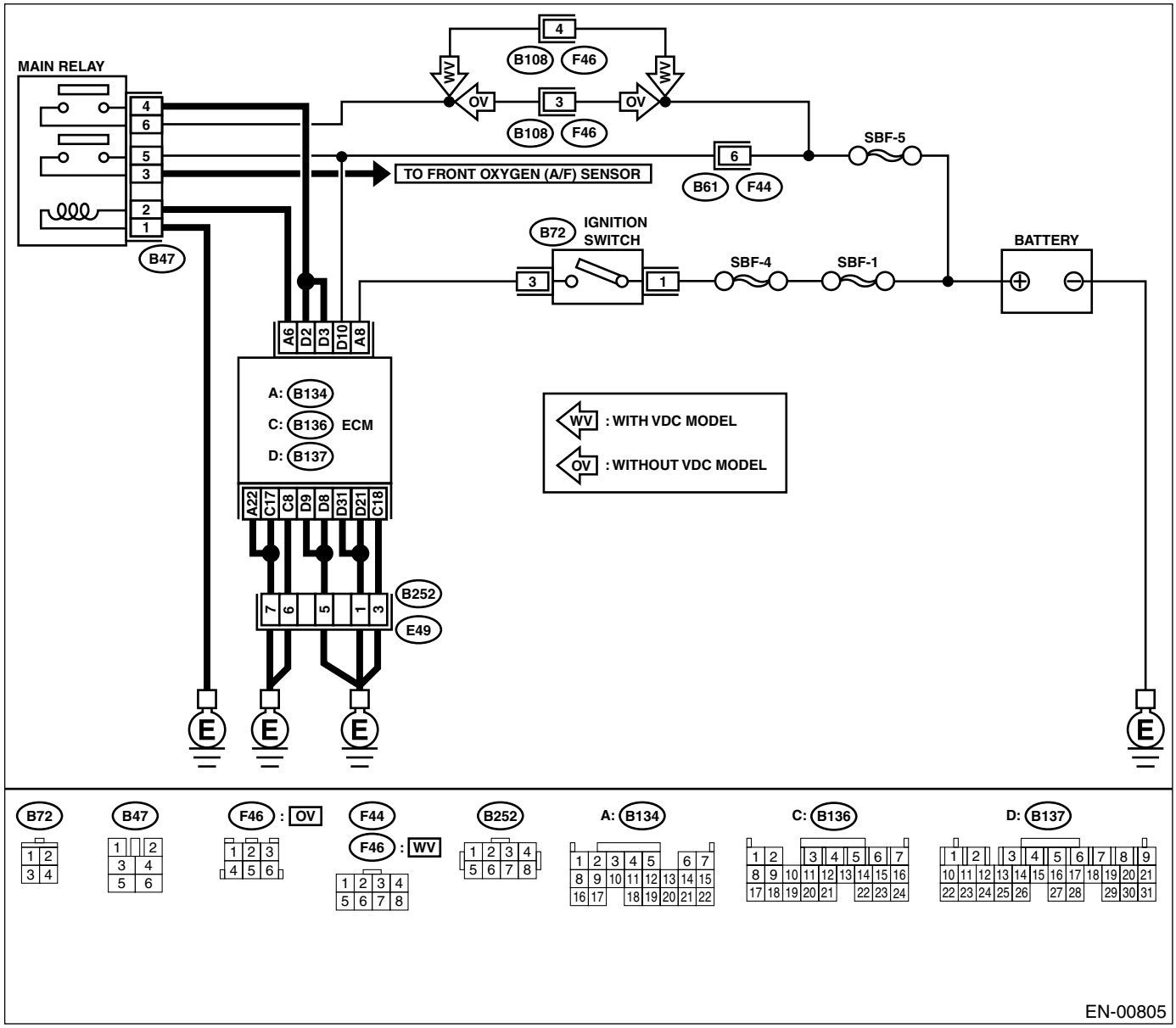
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from TCM and CCM. 3) Measure resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 22 — (B94) No. 3:*** ***WITHOUT VDC MODEL:*** ***(B54) No. 11 — (B94) No. 3:***	Is the measured value less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 22 — Chassis ground:*** ***WITHOUT VDC MODEL:*** ***(B54) No. 11 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair short circuit in harness between TCM and CCM connector.	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3) Start the engine. 4) Cruise control main switch to ON. 5) Move selector lever to “D” and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B54) No. 11 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-8, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CB:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



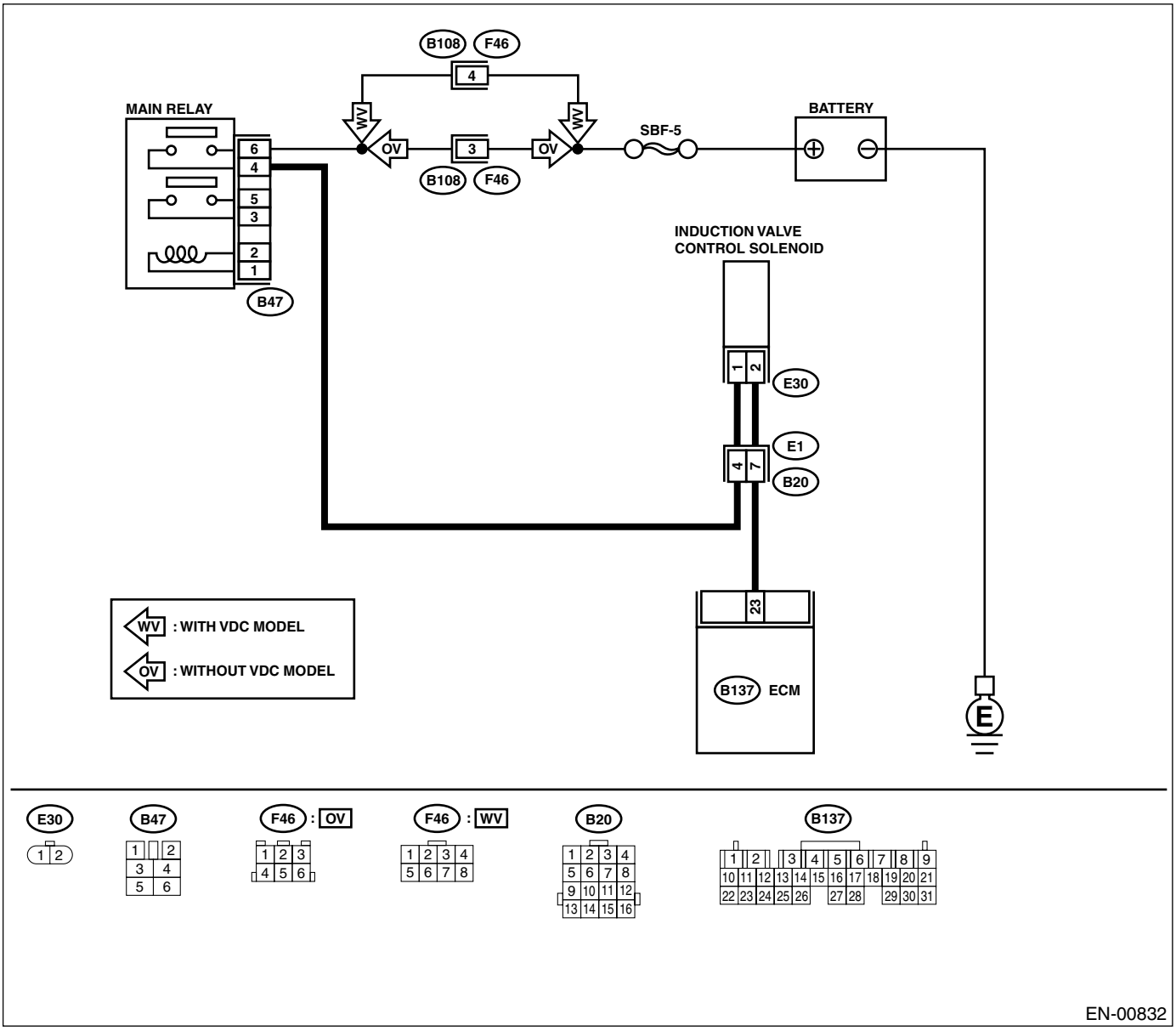
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	It is caused by a temporary poor contact.

CC:DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW - BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00832

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 23 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from induction control solenoid valve and ECM. 3) Measure resistance of harness between induction control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E30) No. 2 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and induction control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and induction control solenoid valve of harness connector. ***Connector & terminal*** ***(B137) No. 23 — (E30) No. 2:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and induction control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and induction control solenoid valve connector • Poor contact in coupling connector
4	**CHECK INDUCTION CONTROL SOLENOID VALVE.** 1) Remove induction control solenoid valve. 2) Measure resistance between induction control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 37 to 44 Ω?	Go to step **5.**	Replace induction control solenoid valve. <Ref. to FU(H6DO)-38, Induction Valve Control Solenoid.>
5	**CHECK POWER SUPPLY TO INDUCTION CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between induction control solenoid valve and engine ground. ***Connector & terminal*** ***(E30) No. 1 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and induction control solenoid valve connector.

Step		Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in induction control solenoid valve connector.	Is there poor contact in induction control solenoid valve connector?	Repair poor contact in induction control solenoid valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

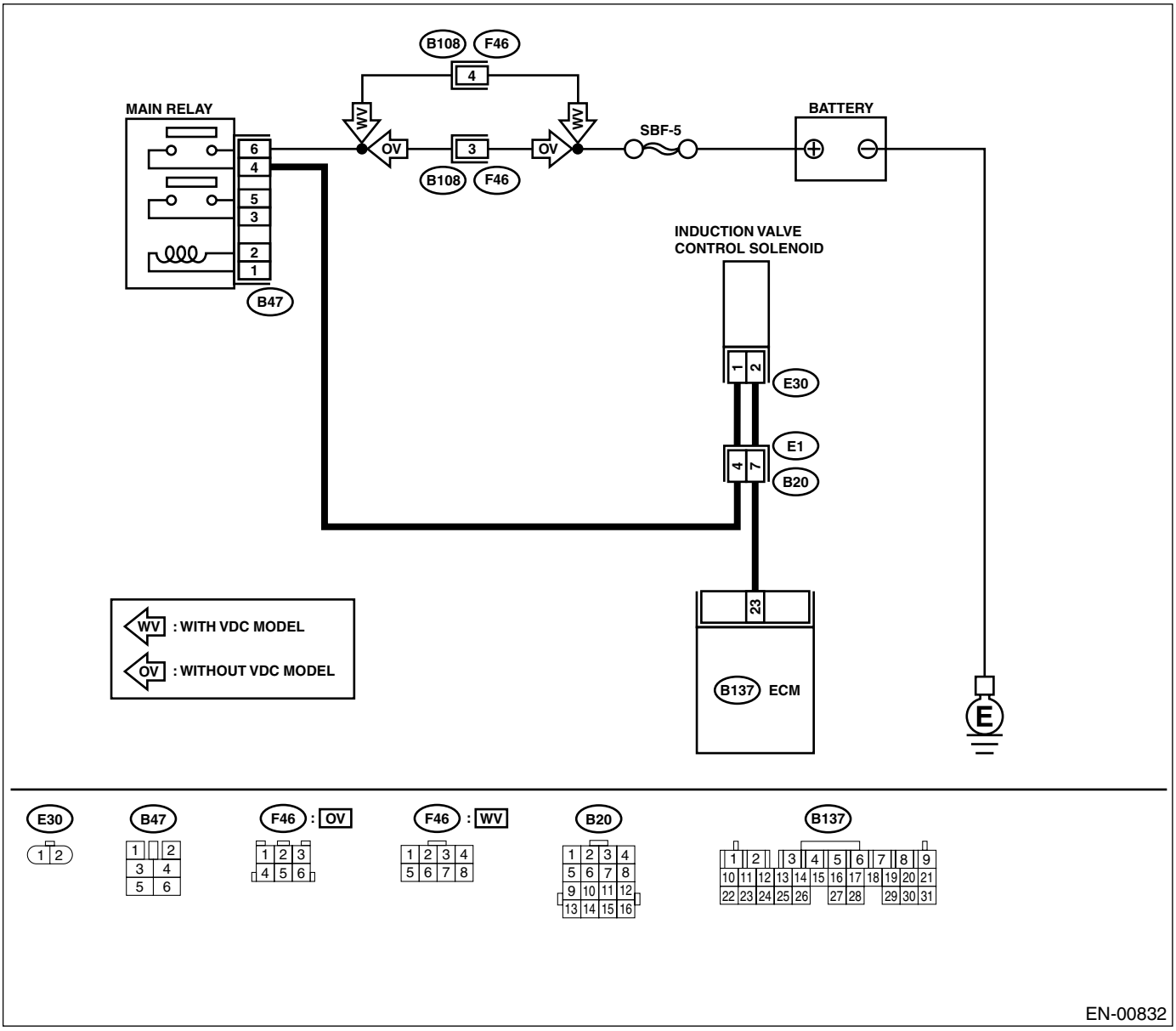
MEMO:

CD:DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH - BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-00832

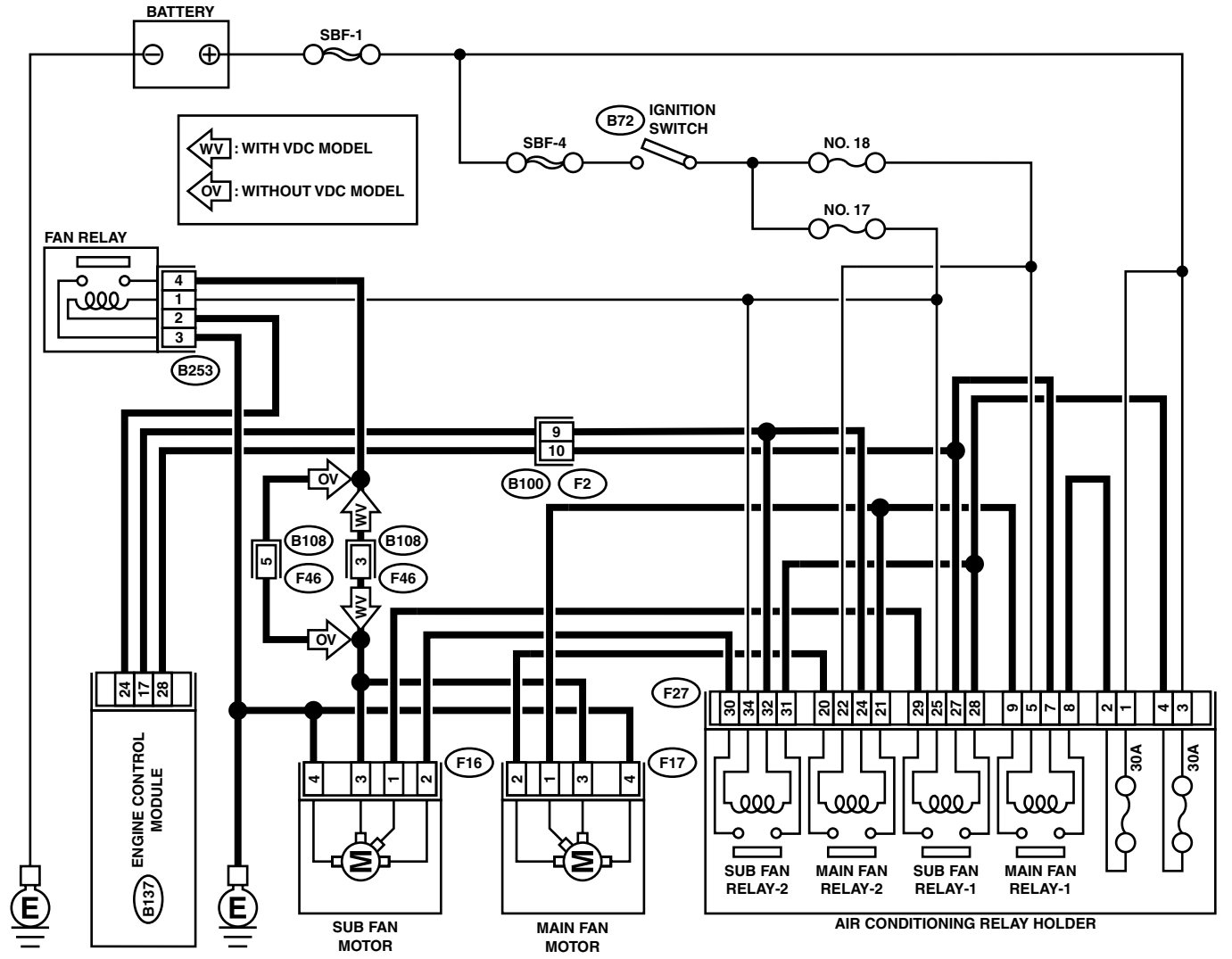
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 23 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
3	**CHECK HARNESS BETWEEN INDUCTION CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from induction control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and induction control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **4.**
4	**CHECK INDUCTION CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between induction control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace induction control solenoid valve <Ref. to FU(H6DO)-38, Induction Valve Control Solenoid.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

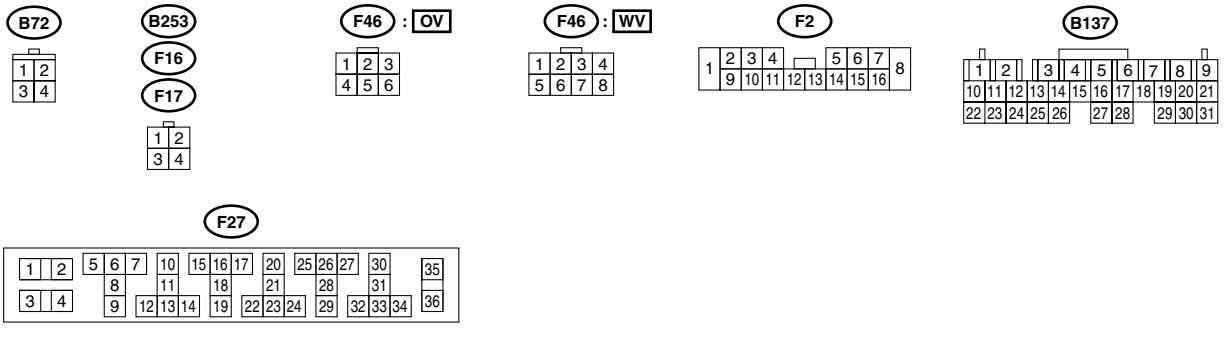
CE:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02175

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-38, Subaru Select Monitor.> ***Connector & terminal*** ***(B137) No. 28 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY 1 CONTROL CIRCUIT.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and remove main fan relays from A/C relay holder. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 28 — Chassis ground:*** ***(B137) No. 17 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay 1 control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (–):*** ***(F27) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAYS.** 1) Turn ignition switch to OFF. 2) Measure resistance between main fan relay terminals. ***Terminal*** ***(F27) No. 5 — No. 7:*** ***(F27) No. 22 — No. 24:***	Is the measured value within 87 to 107 Ω?	Go to step **5.**	Replace main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure resistance of harness between ECM and main fan relay connector. ***Connector & terminal*** ***(B137) No. 28 — (F27) No. 6:*** ***(B137) No. 17 — (F27) No. 24:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or main fan relay connector.	Is there poor contact in ECM or main fan relay connector?	Repair poor contact in ECM or main fan relay connector.	Contact with SOA service center.

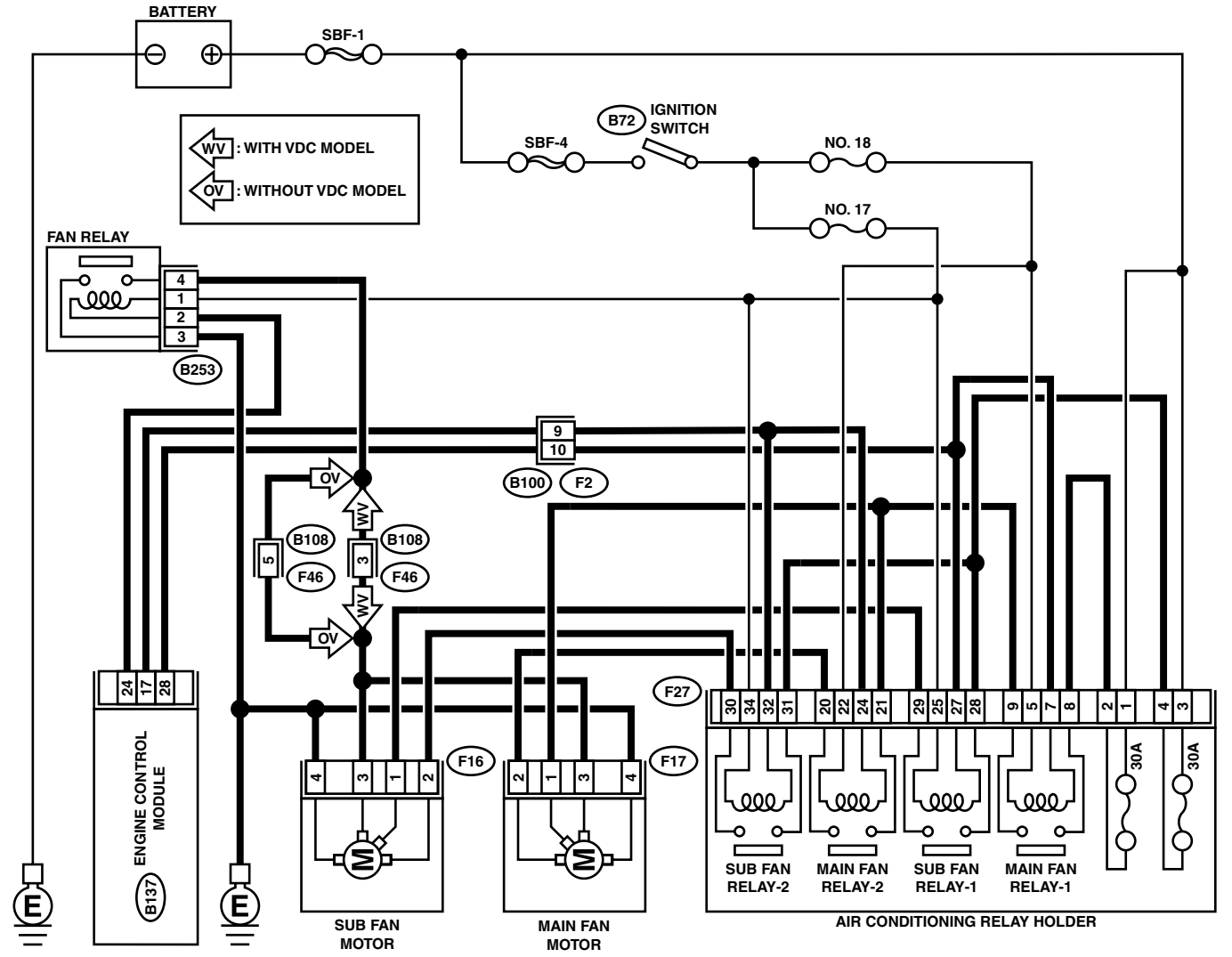
MEMO:

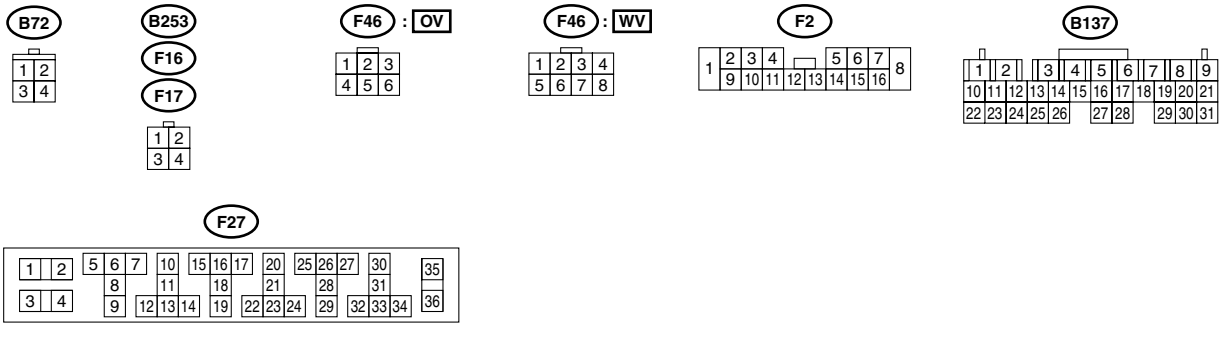
CF:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-02175

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector. 3) Turn ignition switch to ON. 4) While operating radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 28 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):***	Is the measured value within 0 to 10 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn ignition switch to OFF. 2) Remove main fan relay and sub fan relay. (with A/C models) 3) Disconnect test mode connector. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 28 (+) — Chassis ground (–):*** ***(B137) No. 17 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in radiator fan relay control circuit.	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn ignition switch to OFF. 2) Remove main fan relay. 3) Measure resistance between main fan relay terminals. ***Terminal*** ***(F66) No. 5 — No. 7:*** ***(F30) No. 22 — No. 24:***	Is the measured value less than 1 Ω?	Replace main fan relay.	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove sub fan relay. 2) Measure resistance between sub fan relay terminals. ***Terminal*** ***(F28) No. 25 — No. 27:*** ***(F29) No. 32 — No. 34:***	Is the measured value less than 1 Ω?	Replace sub fan relay.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

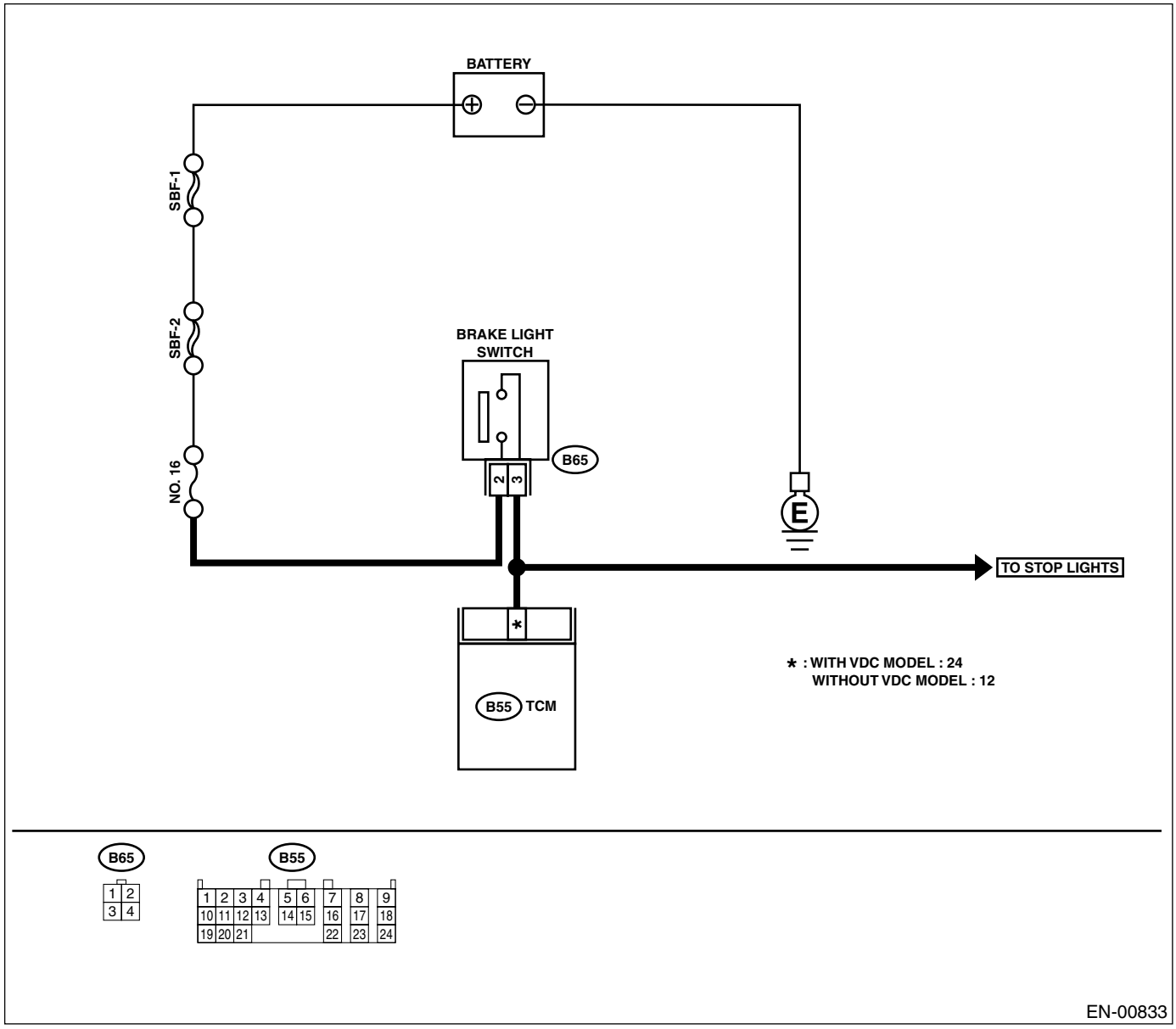
MEMO:

CG:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.**	Does brake light come on when depressing the brake pedal?	Go to step **2.**	Repair or replace brake light circuit.
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect connectors from TCM and brake light switch. 2) Measure resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 — (B65) No. 3:*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 — (B65) No. 3:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair or replace harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connectors to TCM and brake light switch. 2) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace brake light switch. <Ref. to LI-8, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B55) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace brake light switch. <Ref. to LI-8, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CH:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-312, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-312, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H6DO)-312, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front throttle position sensor circuit?	Repair or replace front vehicle speed sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace torque converter turbine speed sensor circuit.	Go to step **5.**

Step		Check	Yes	No
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace automatic transmission.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CL:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to 4AT(H4SO)-146, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace brake light switch circuit.	Go to step **8.**

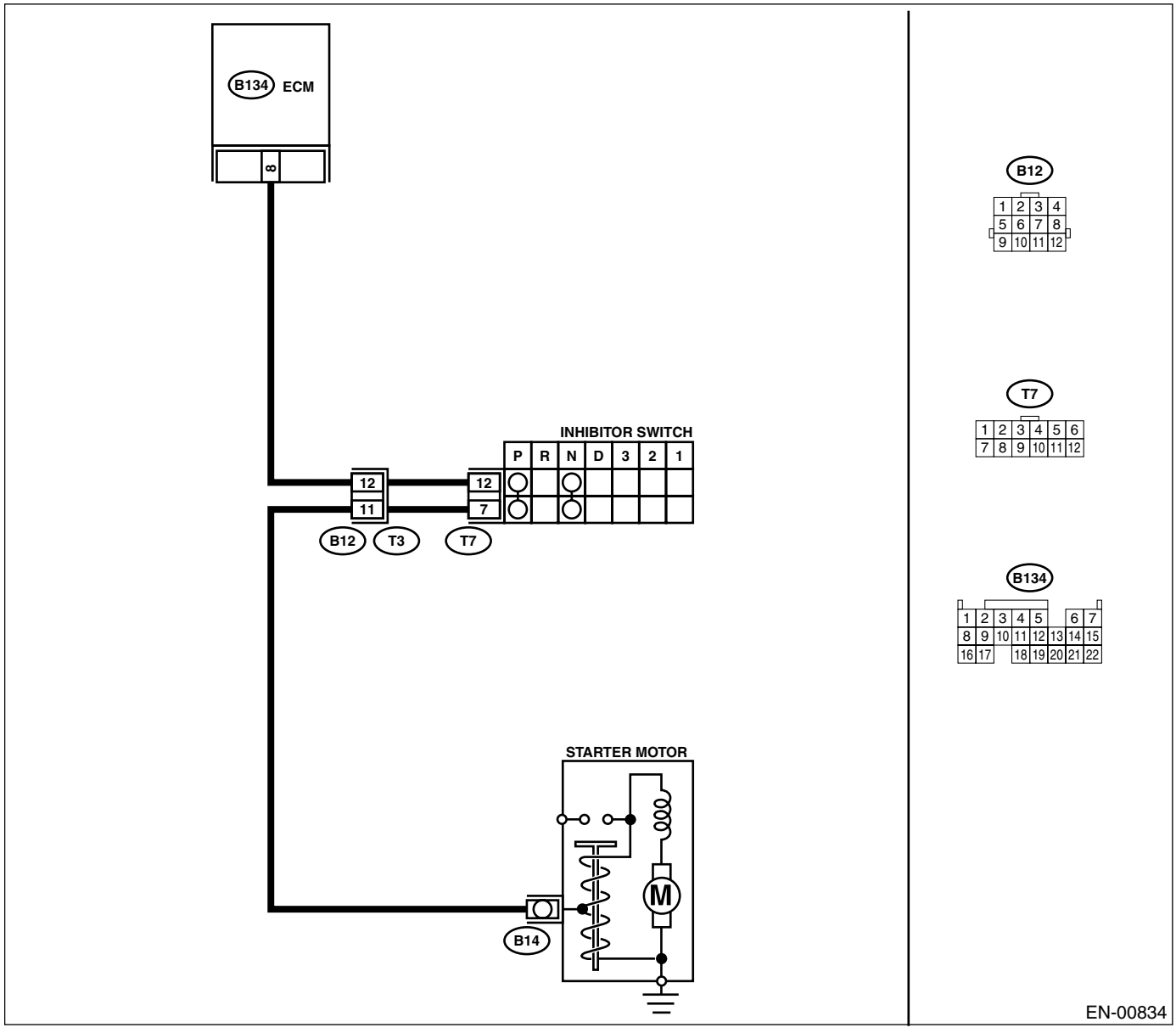
	Step	Check	Yes	No
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace automatic transmission.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CM:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



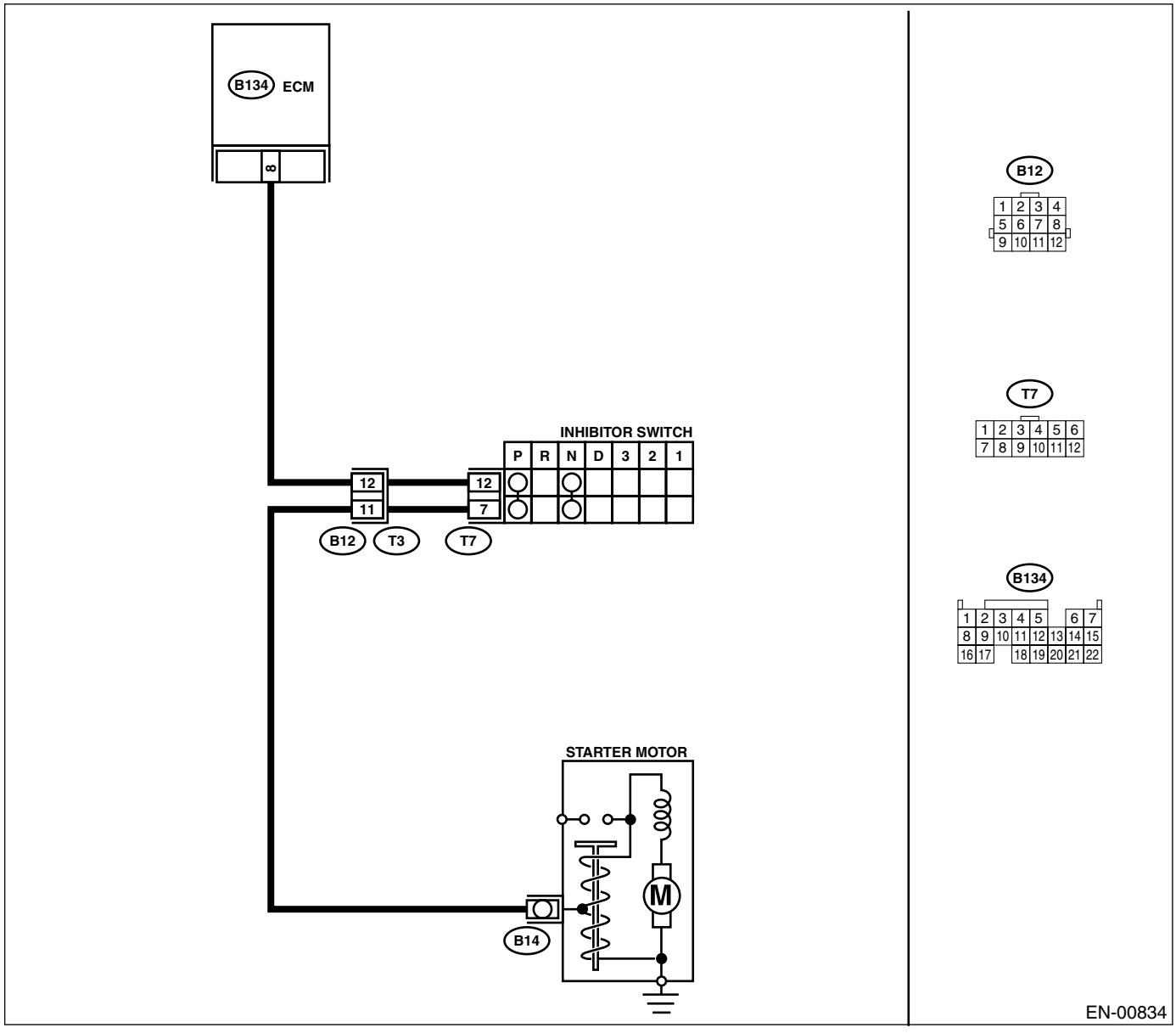
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the selector lever in position other than the "N" and "P" positions. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):***	Is the measured value within 4.5 to 5.5 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and transmission harness connector (T3). 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and transmission harness connector.	Go to step **4.**
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect connector from inhibitor switch. 2) Measure resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step **5.**
5	**CHECK INHIBITOR SWITCH.** Measure resistance between inhibitor switch connector terminals in selector lever except for "N" and "P" positions. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Replace inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-31, Select Cable.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CN:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):*** Is the measured value within the specified range?	Is the measured value within 4.5 to 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and inhibitor switch. 3) Measure resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B134) No. 8 — (T7) No. 12:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the measured value less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure resistance between inhibitor switch connector receptacle's terminals in selector lever “N” and “P” positions. ***Terminals*** ***No. 7 — No. 12:***	Is the measured value less than 1 Ω?	Go to step **9.**	Replace inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-31, Select Cable.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

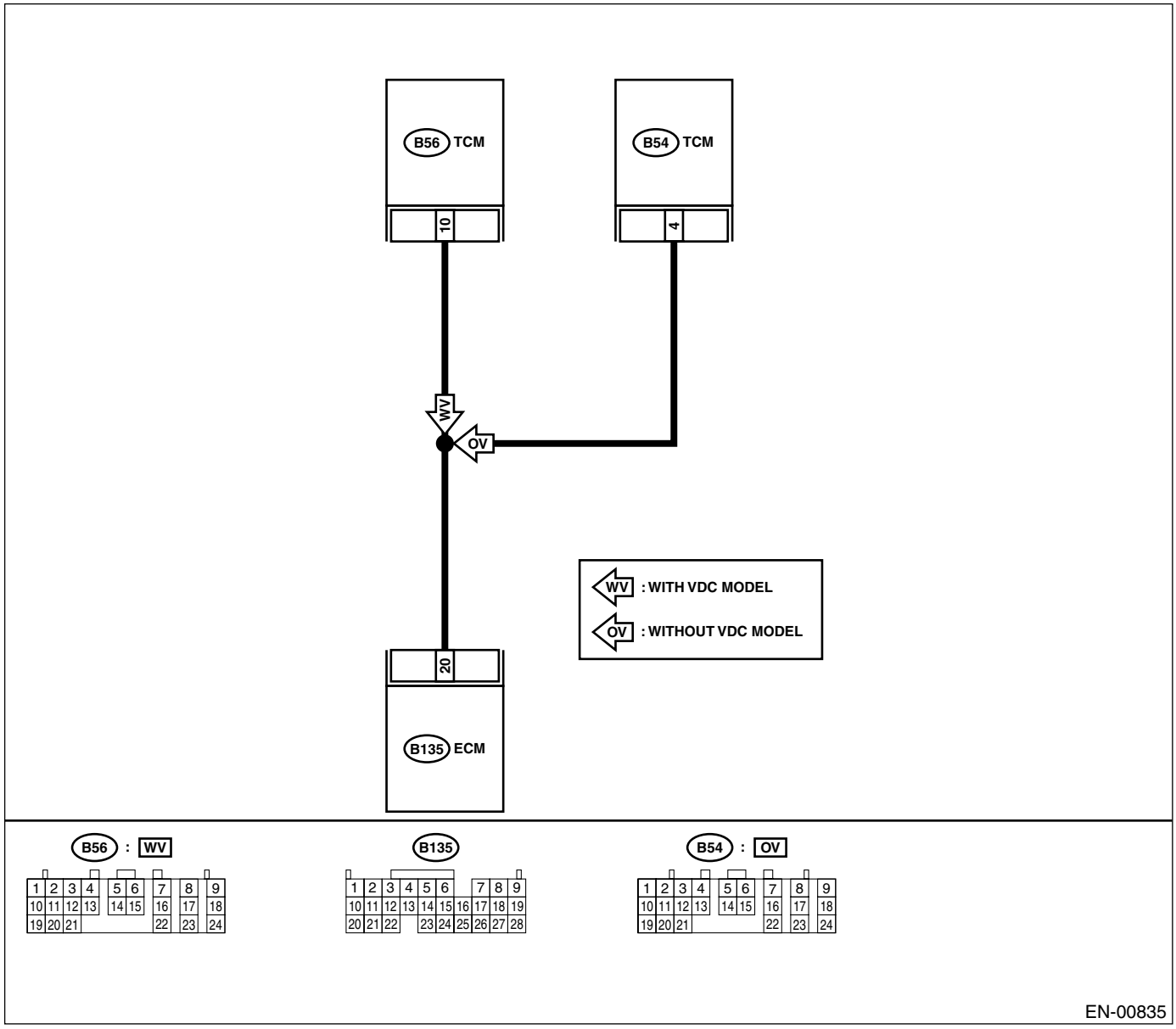
MEMO:

CO:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



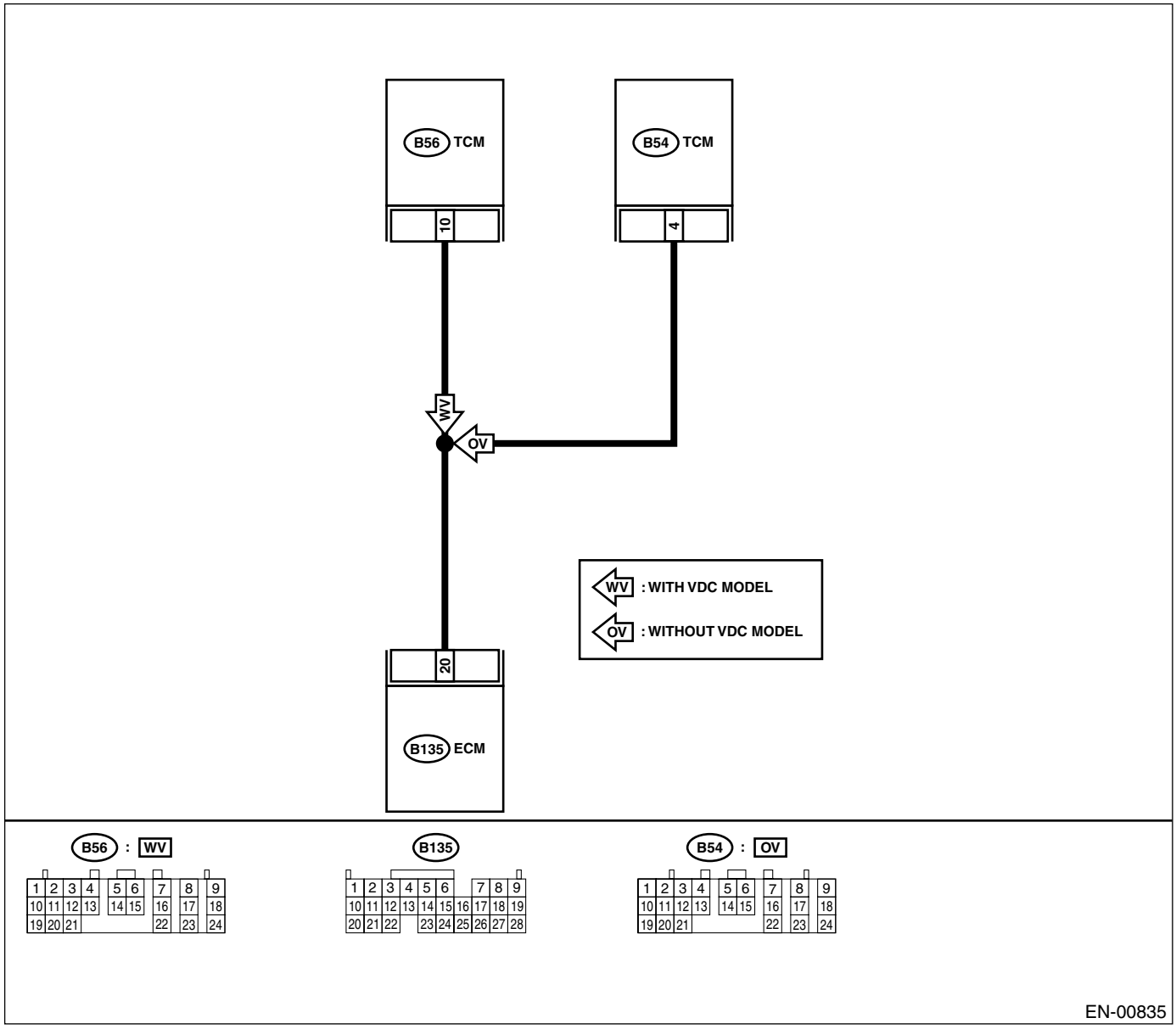
Step		Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is AT shift control functioning properly?	Go to step **2.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
2	**CHECK ACCESSORY.**	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CP:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



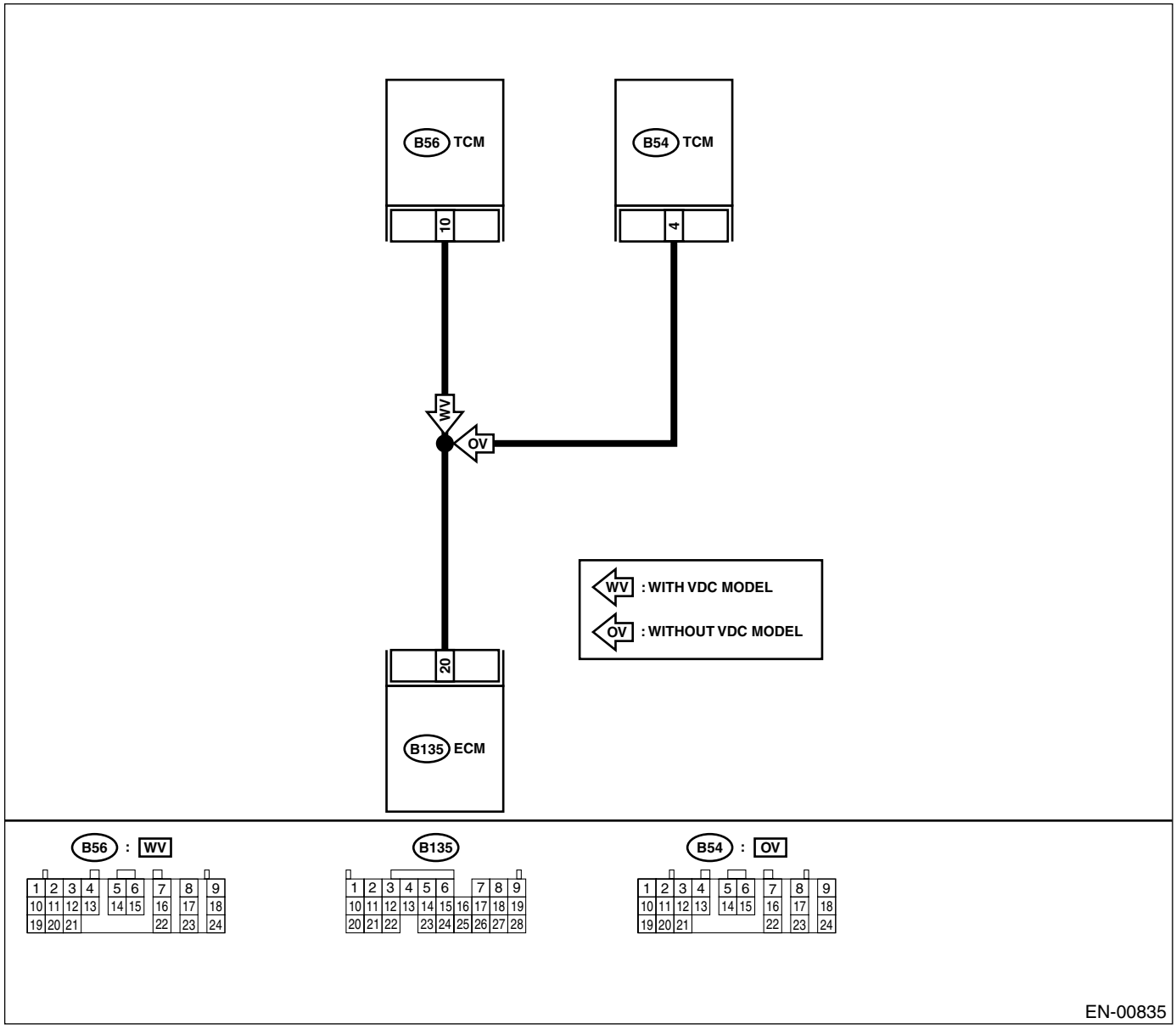
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 5 V?	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION.** Read trouble code for automatic transmission. <Ref. to 4AT(H4SO)-30, Read Diagnostic Trouble Code (DTC).>	Does trouble code appear for automatic transmission?	Inspect trouble code for automatic transmission.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

CQ:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the measured value within 1 V to 4 V?	Even if MIL lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact with SOA (distributor) service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***WITH VDC MODEL:*** ***(B56) No. 10 (+) — Chassis ground (–):*** ***WITHOUT VDC MODEL:*** ***(B54) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **6.**	Repair open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

CR:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1110.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

CS:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

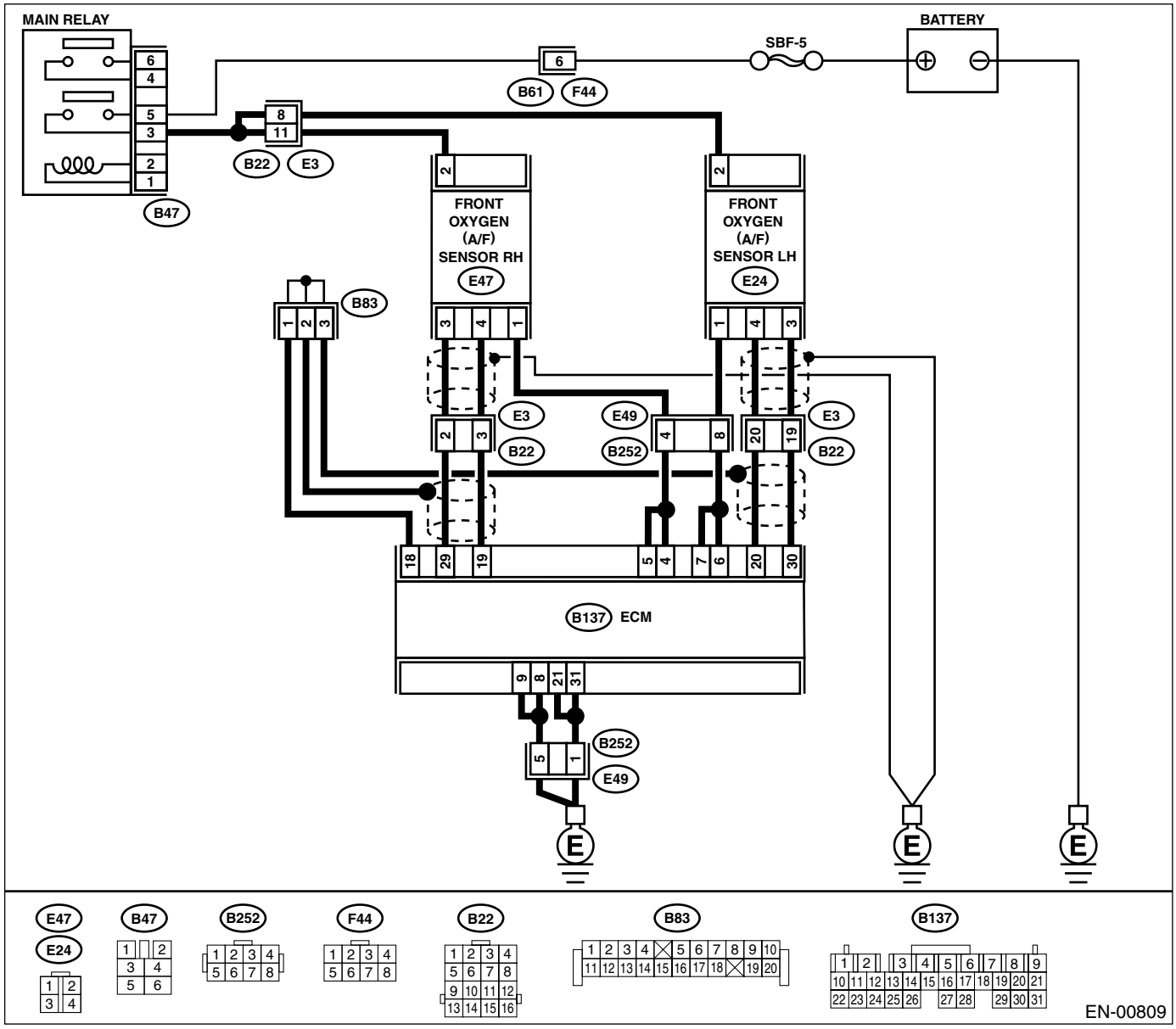
Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1111.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

CT:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1134.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

CU:DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —

NOTE:
For the diagnostic procedure, refer to DTC P1153. <Ref. to EN(H6DO)-334, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

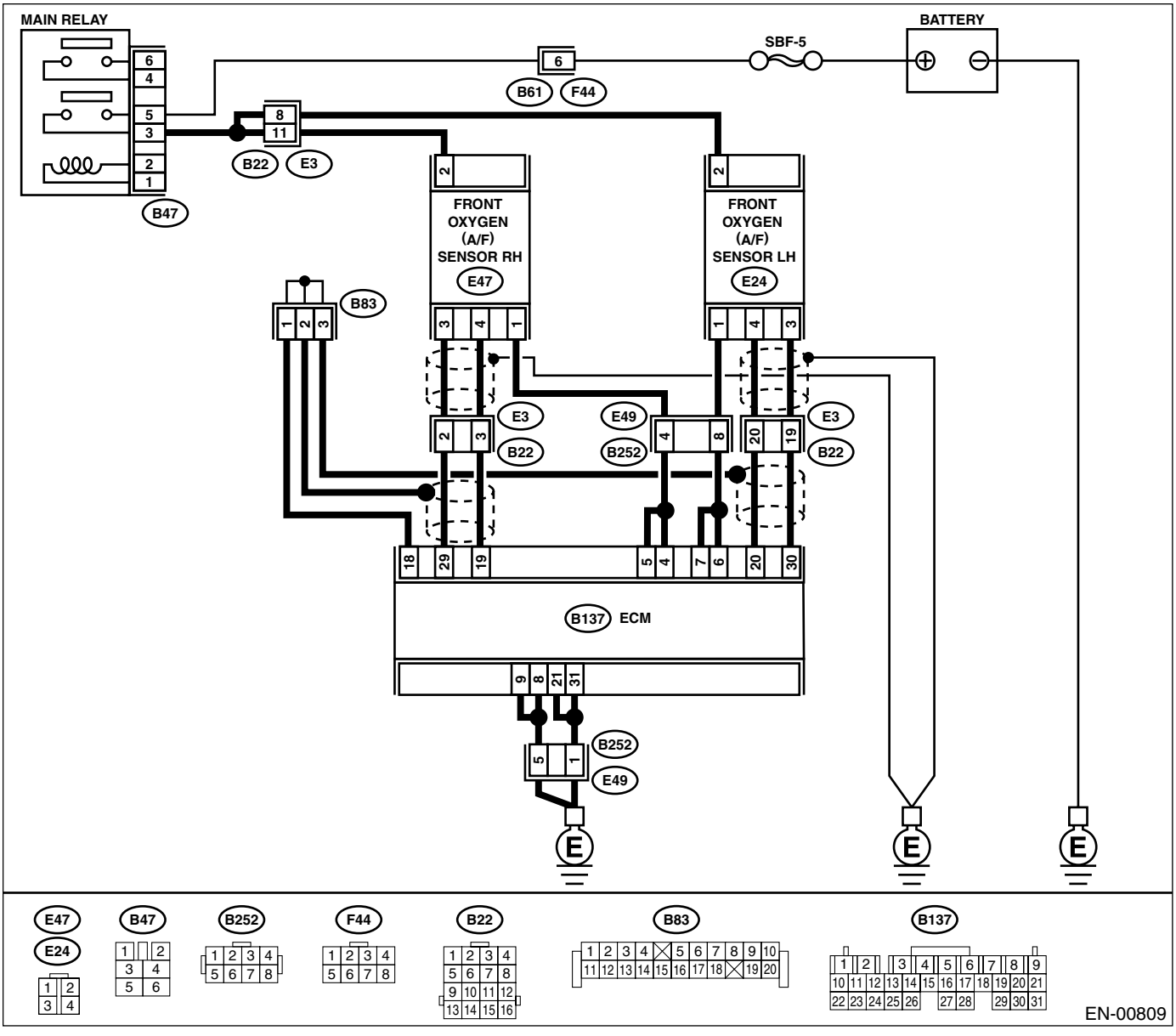
MEMO:

CV:DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal at idle using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.86 to 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

CW: DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —

NOTE:
For the diagnostic procedure, refer to DTC P1155. <Ref. to EN(H6DO)-338, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

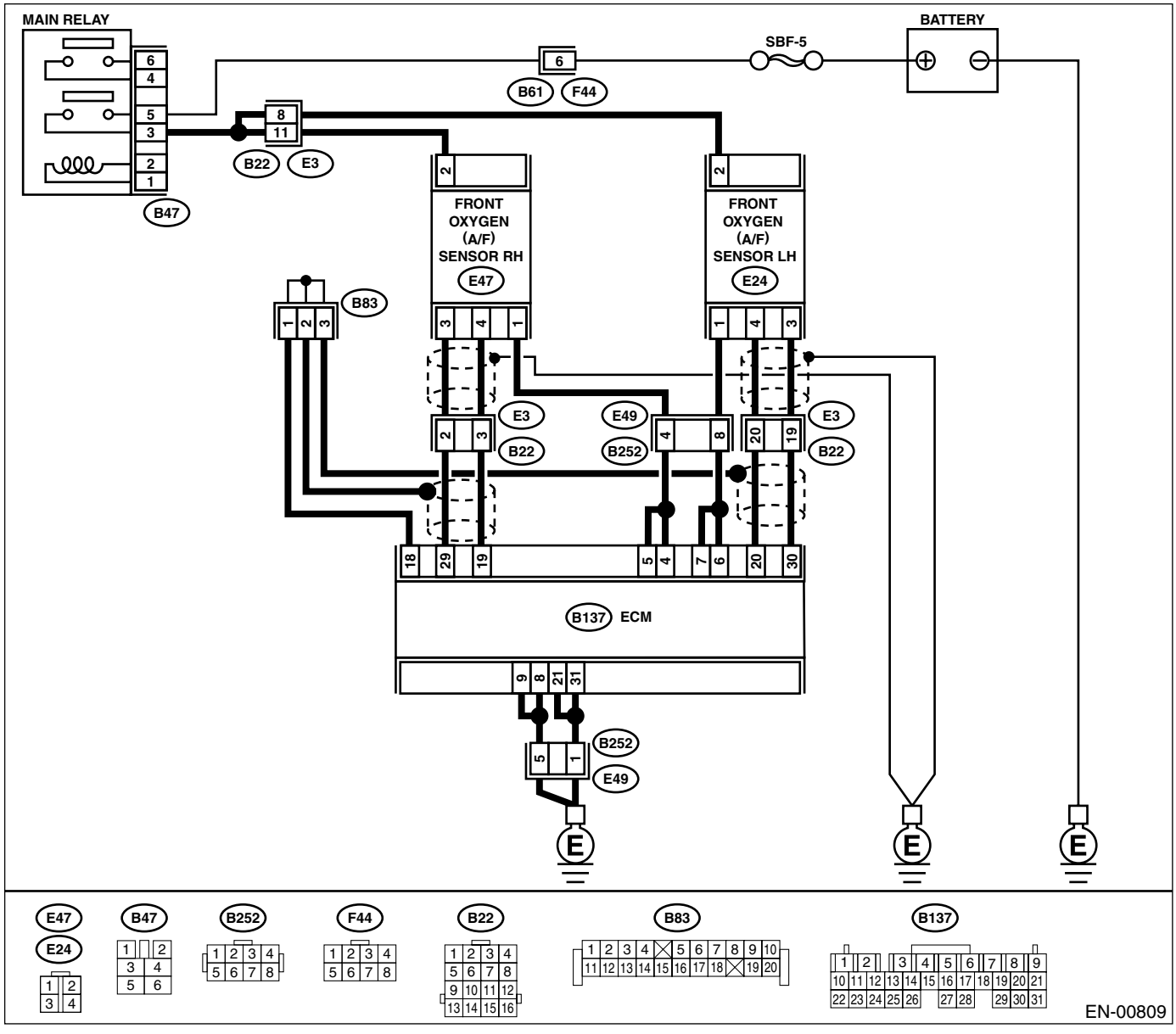
MEMO:

CX:DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



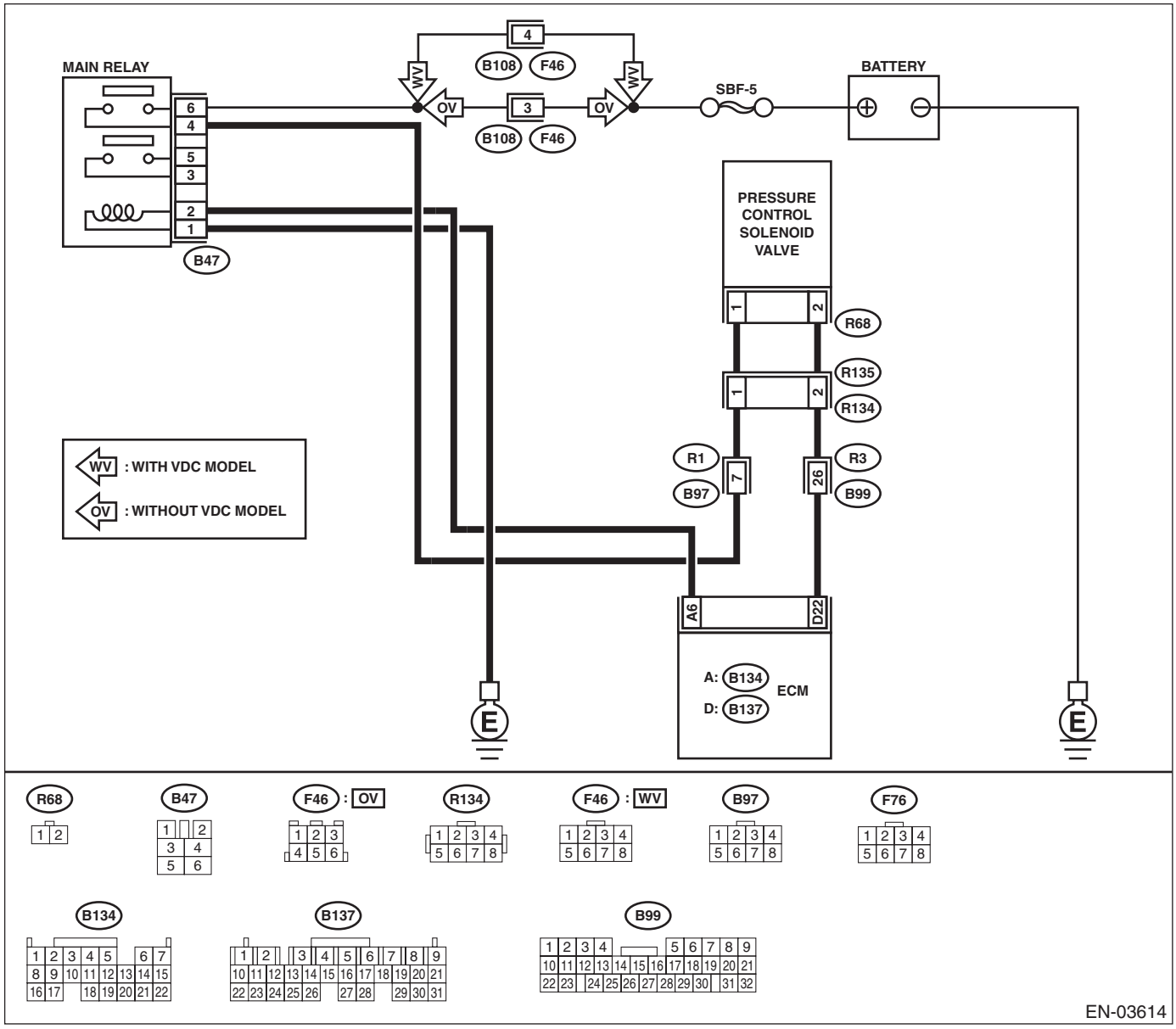
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal at idle using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.86 to 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

CY:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from pressure control solenoid valve and ECM. 3) Measure resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and pressure control solenoid valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 22 — (R68) No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connectors
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace pressure control solenoid valve. <Ref. to EC(H6DO)-17, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

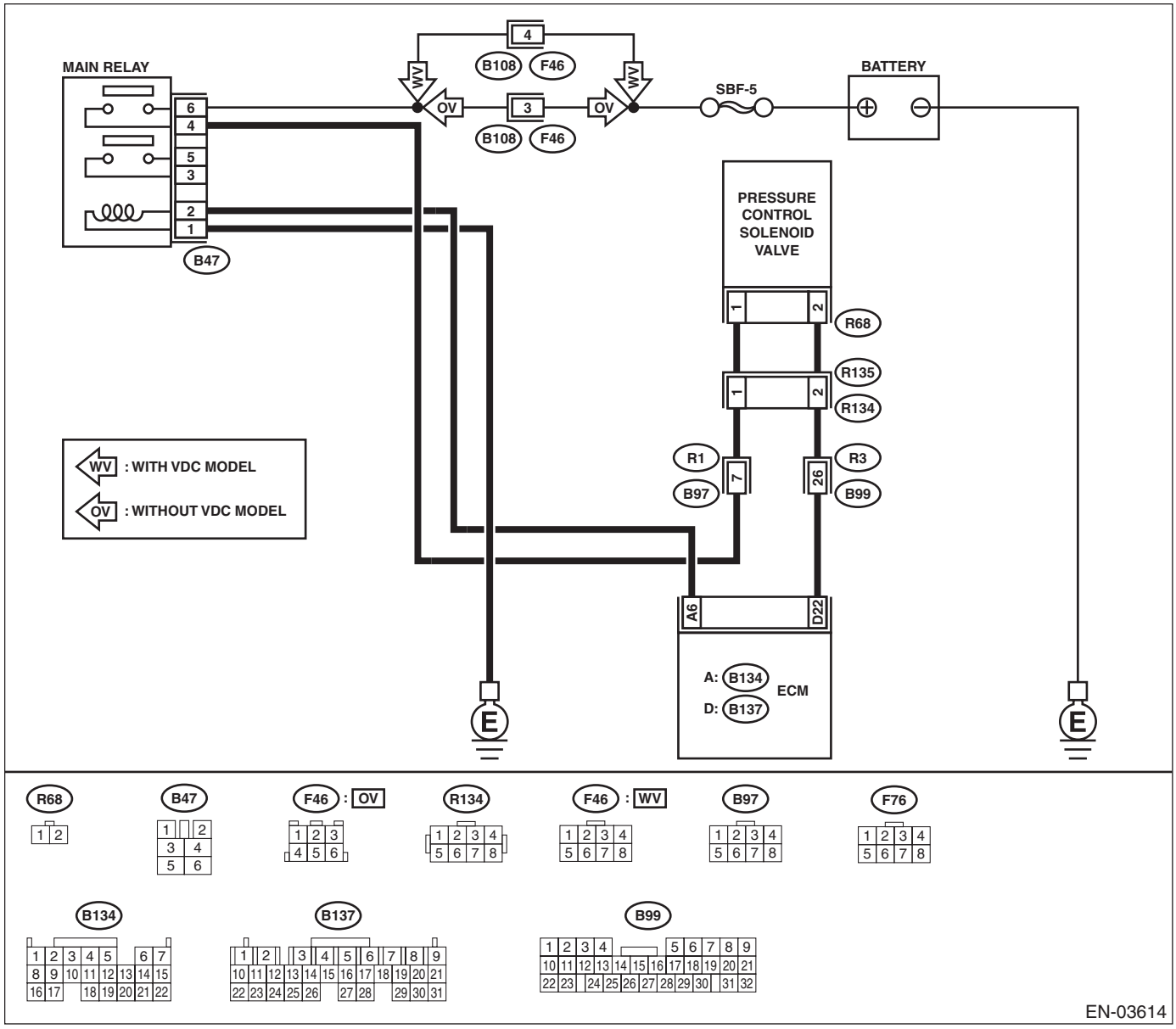
MEMO:

CZ:DTC P1420 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



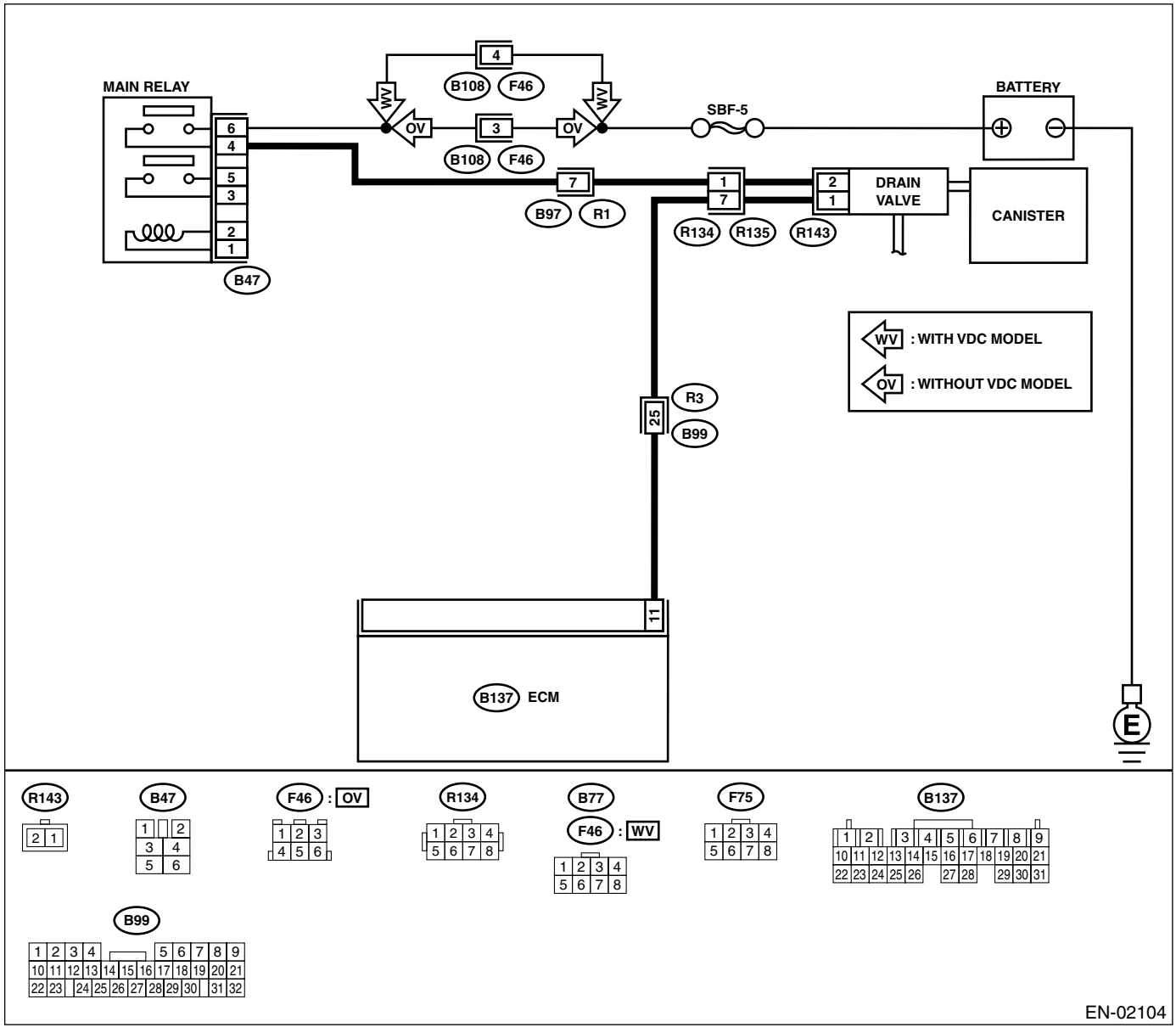
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) While operating pressure control solenoid valve, measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):*** NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Is the measured value within 0 to 10 V?	Go to step **2.**	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and pressure control solenoid valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace pressure control solenoid valve <Ref. to EC(H6DO)-17, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DA:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence
- **TROUBLE SYMPTOM:**
  - Improper fuel supply

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



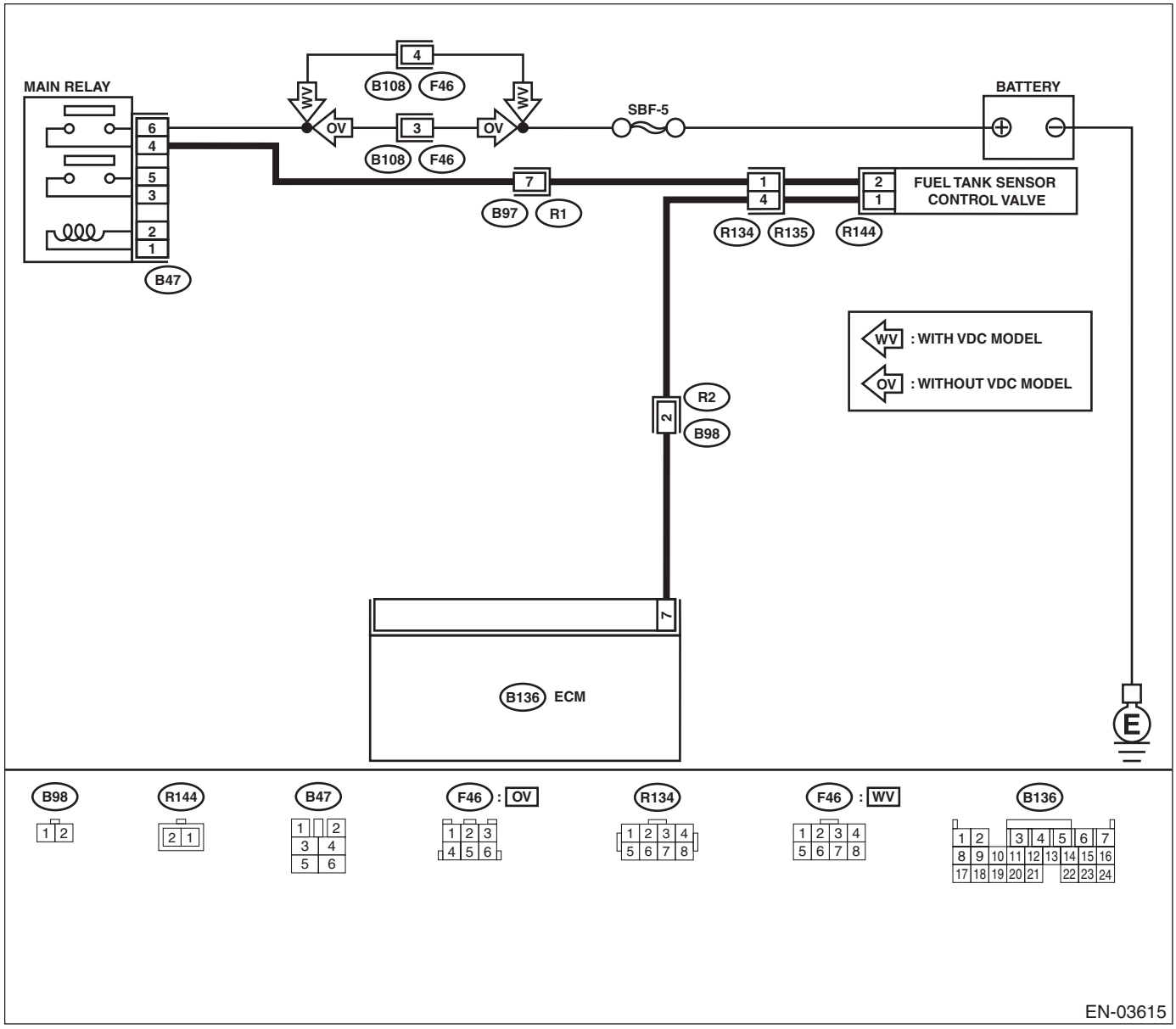
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CANISTER DRAIN HOSES.** Check the following item. •Clogging of canister drain hoses	Is there clogging of canister drain hoses?	Repair or replace the faulty part.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect test mode connector at the lower portion of instrument panel (on the driver's side), to the side of the center console box. 3) Turn ignition switch to ON. 4) Operate drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to the "Compulsory Valve Operation Check Mode".<Ref. to EN(H6DO)-59, Compulsory Valve Operation Check Mode.>	Does drain valve produce operating sound?	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace drain valve. <Ref. to EC(H6DO)-21, Drain Valve.>

DB:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connectors
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from fuel tank sensor control valve and ECM. 3) Measure resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B136) No. 7 — (R144) No. 1:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connectors
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value within 10 to 100 Ω?	Go to step **6.**	Replace fuel tank sensor control valve. <Ref. to EC(H6DO)-16, Fuel Tank Sensor Control Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connectors • Poor contact in main relay connector
7	**CHECK POOR CONTACT.** Check poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

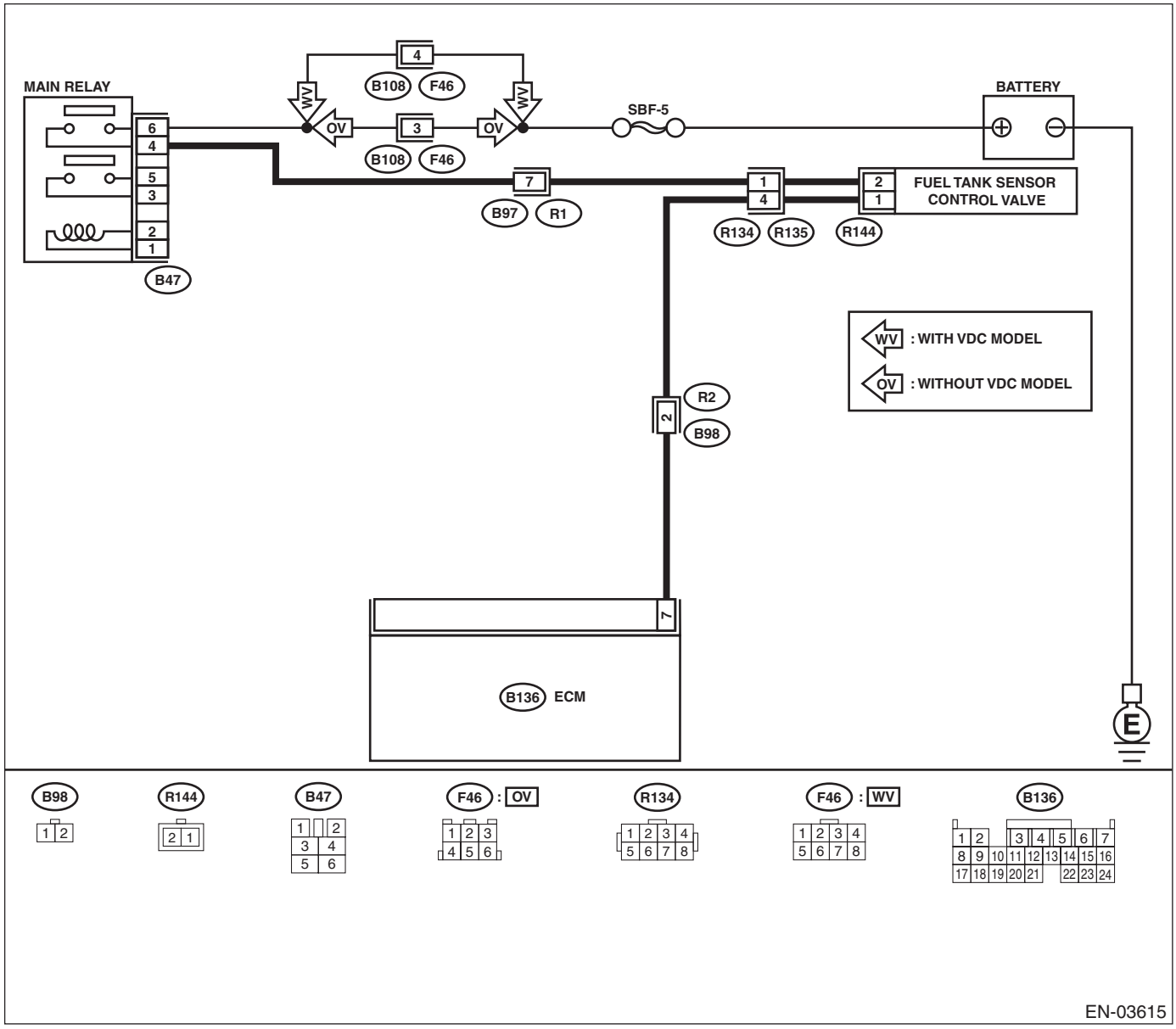
MEMO:

DC:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



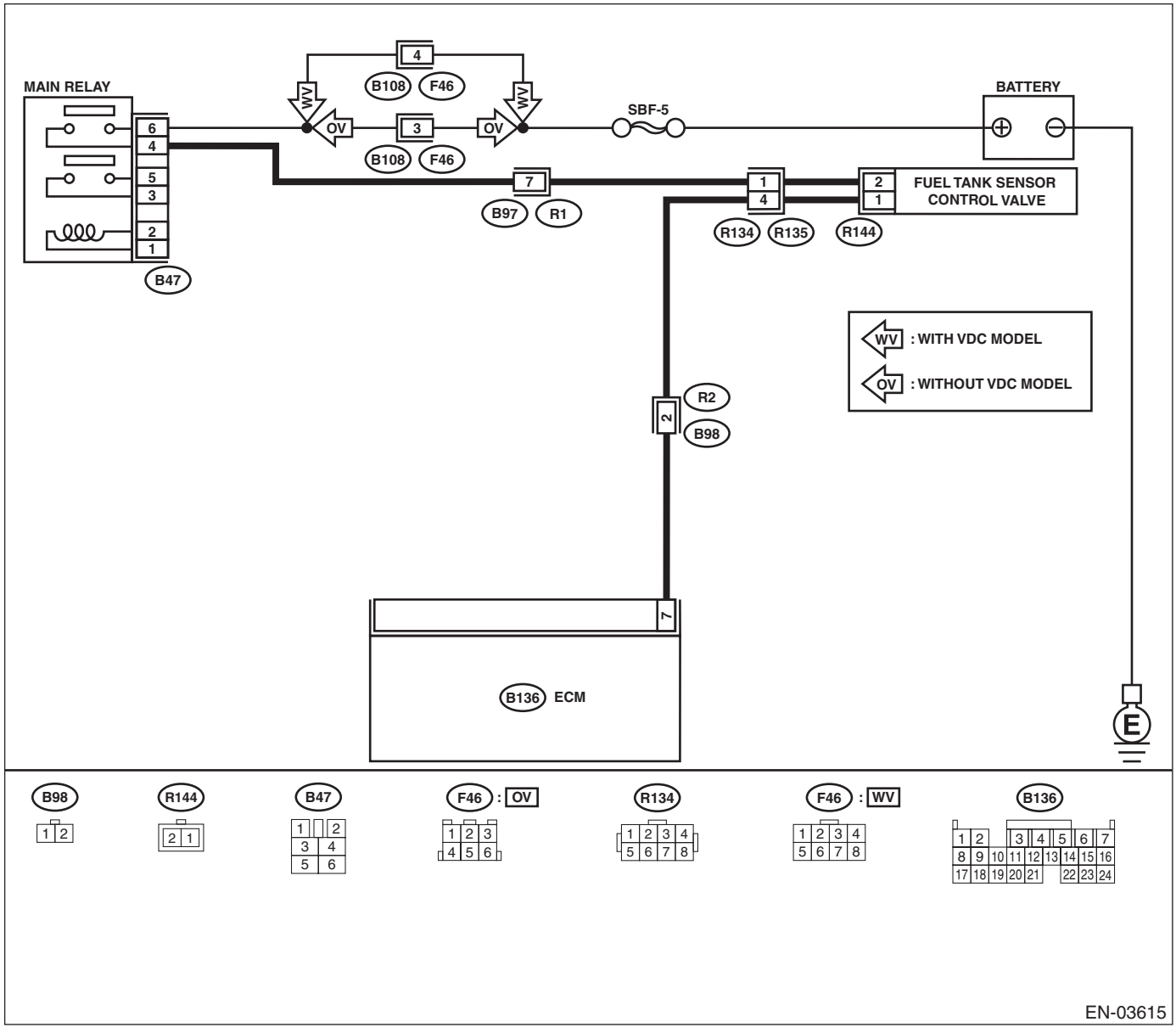
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and fuel tank sensor control valve connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Replace fuel tank sensor control valve <Ref. to EC(H6DO)-16, Fuel Tank Sensor Control Valve.> and ECM <Ref. to FU(H6DO)-46, Engine Control Module.>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>

DD:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



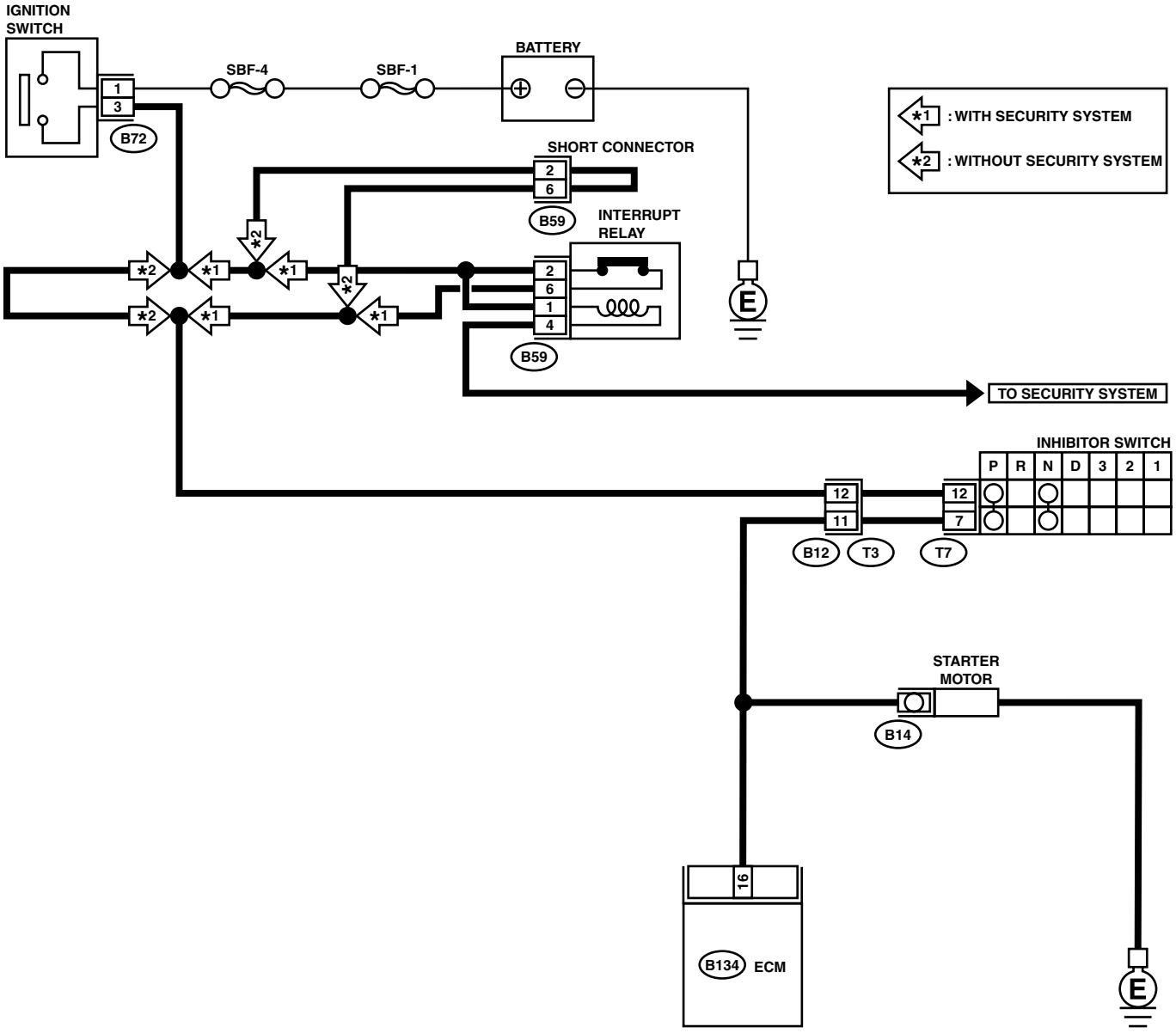
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is there any DTC on display?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace hoses and pipes.	Replace fuel tank sensor control valve. <Ref. to EC(H6DO)-16, Fuel Tank Sensor Control Valve.>

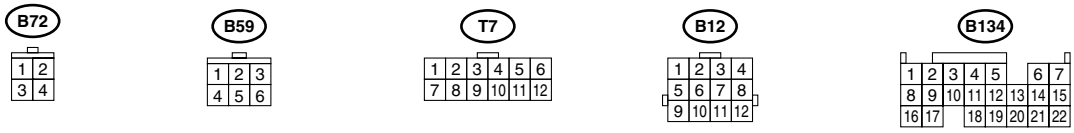
DE:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**





EN-00804

Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** NOTE: Place the inhibitor switch in the “P” or “N” position.	Does starter motor operate when turning ignition switch to “ST”?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H6DO)-76, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

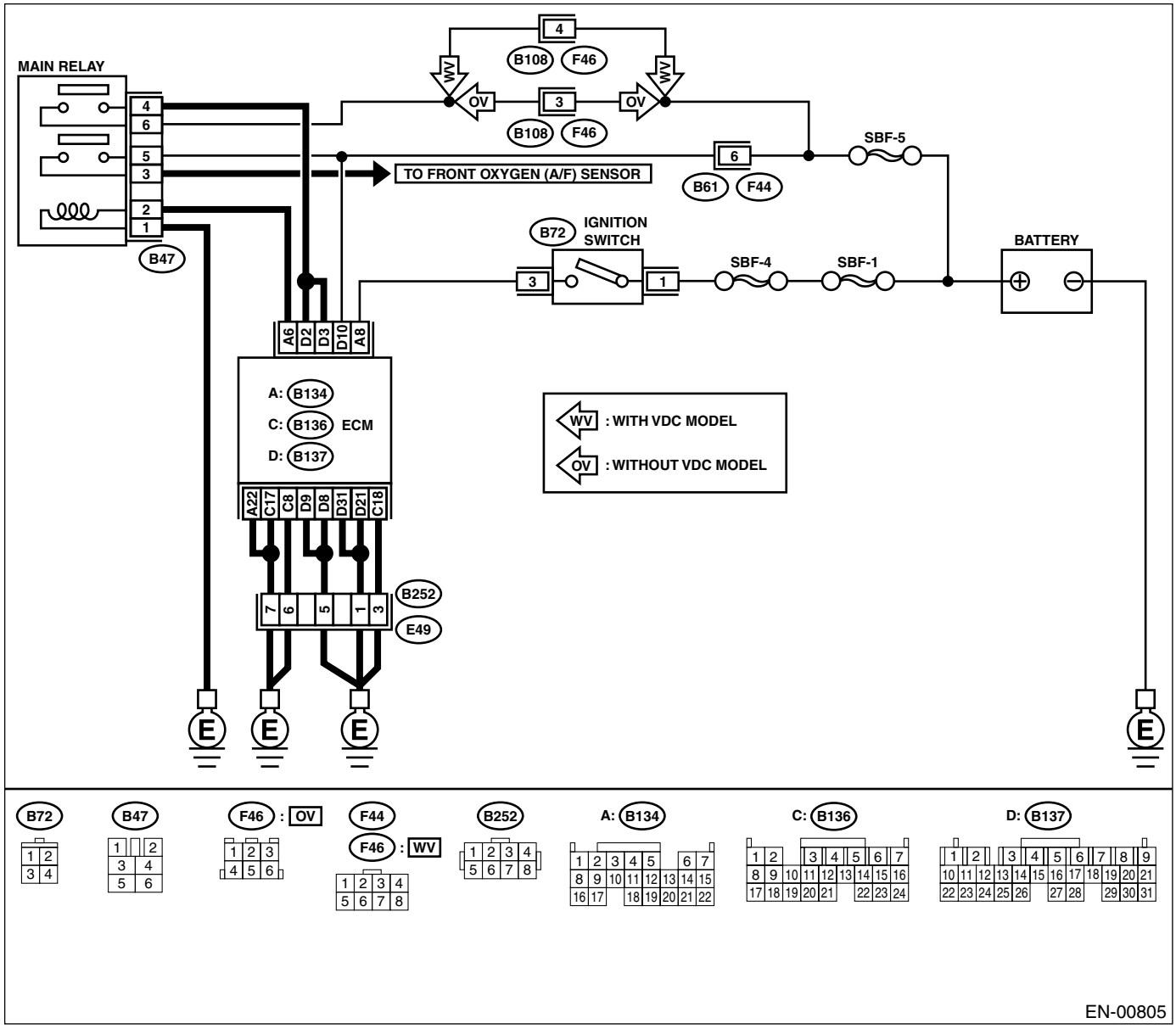
MEMO:

DF:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Detected simultaneously at fault occurrence

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



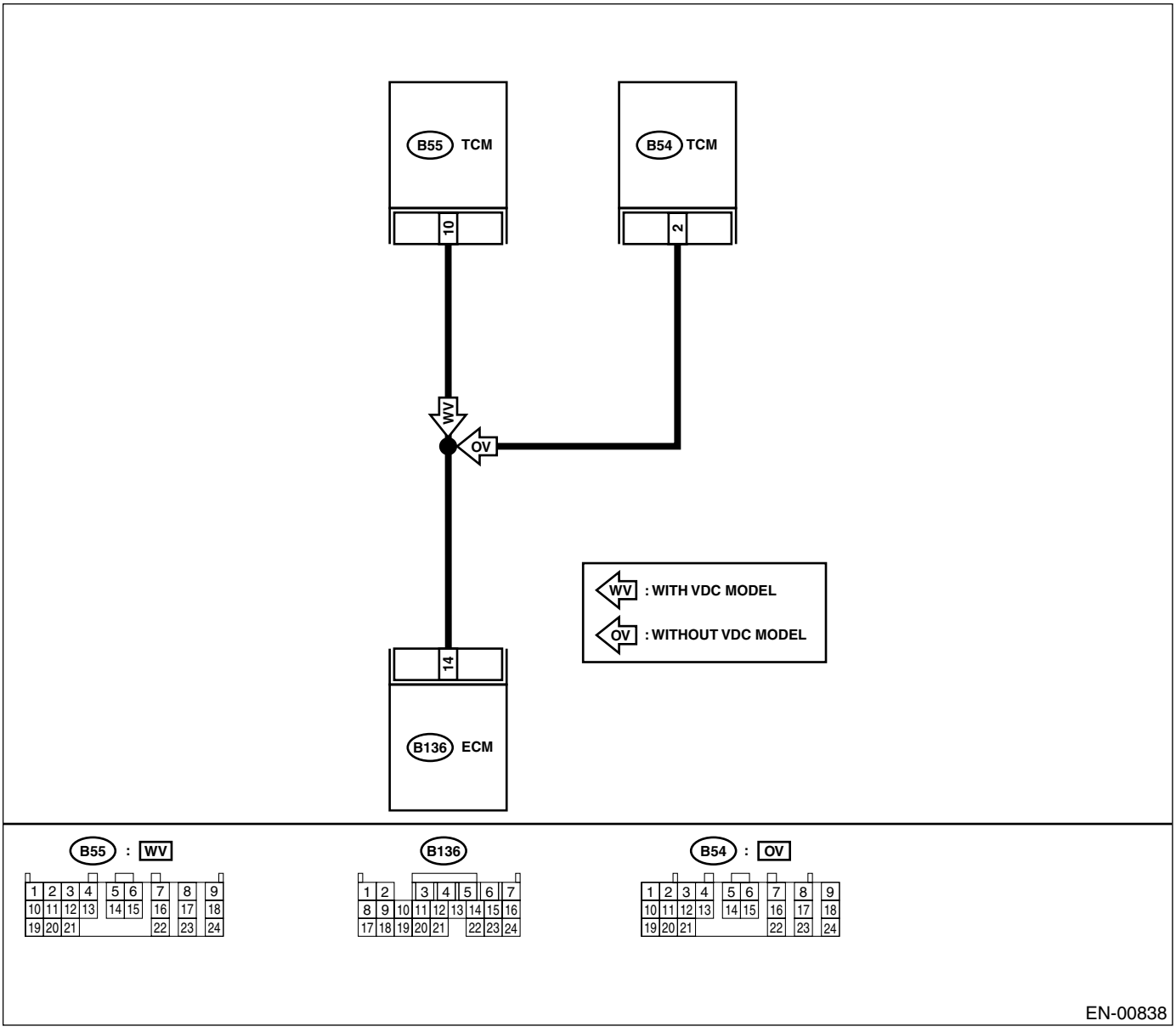
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect connector from ECM. 2) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is fuse blown?	Replace fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DG:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



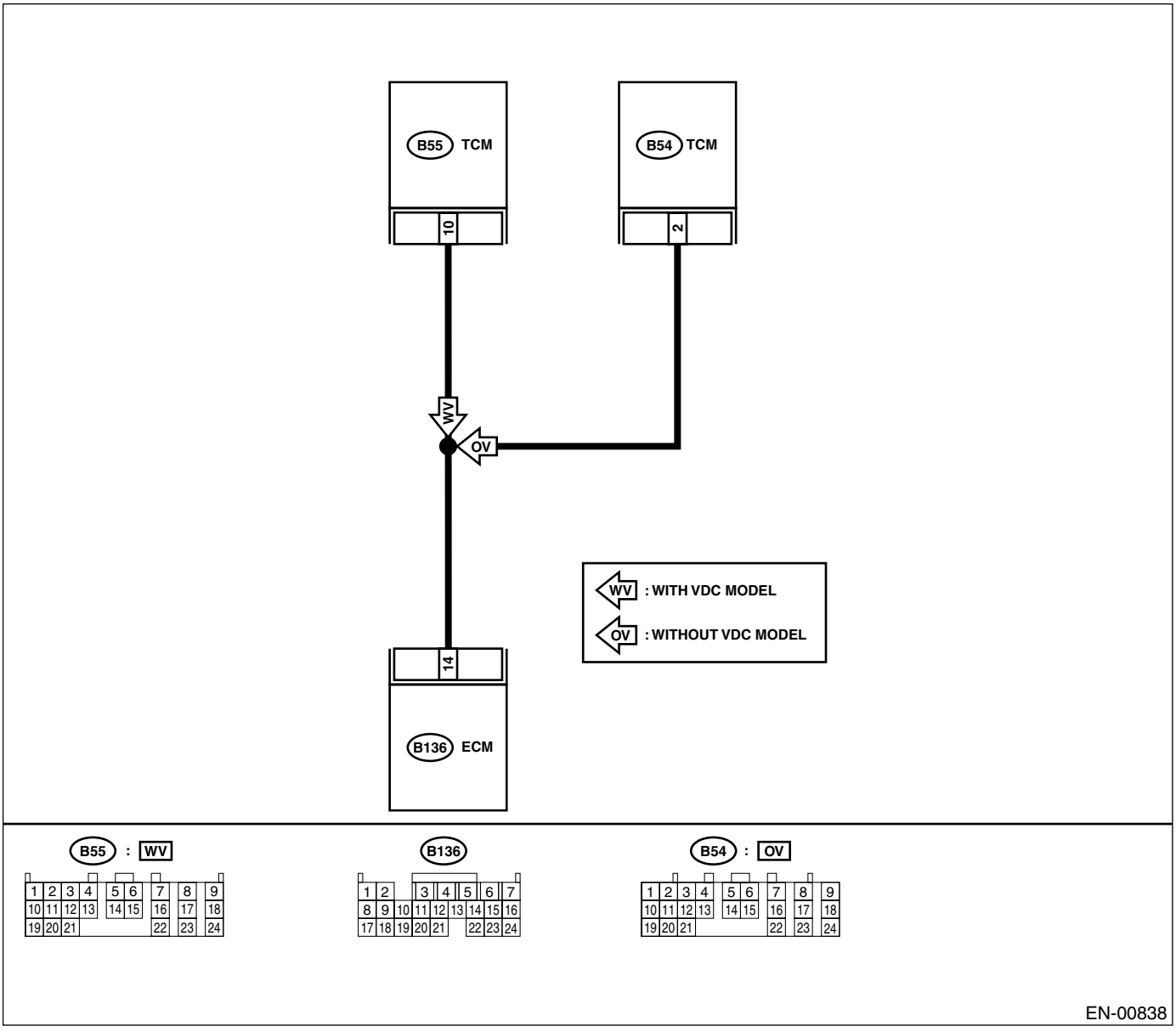
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):***	Is the measured value more than 3 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 14 — (B55) No. 20:***	Is the measured value less than 1 Ω?	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

DH:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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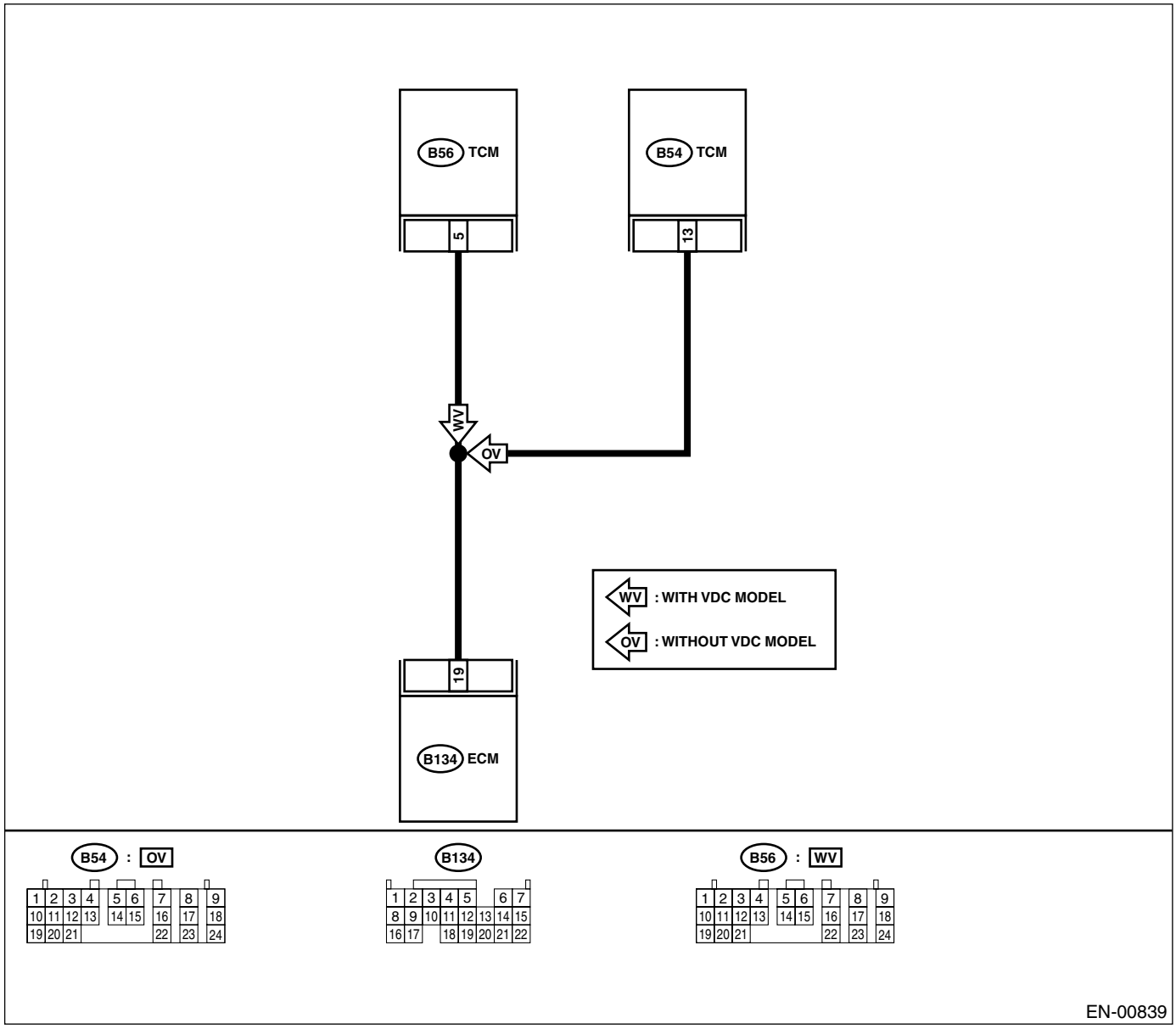
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start engine, and warm-up the engine. 2) Turn ignition switch to OFF. 3) Disconnect connector from TCM. 4) Turn ignition switch to ON. 5) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):***	Is the measured value more than 3 V?	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V by shaking harness and connector of ECM?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DI: DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



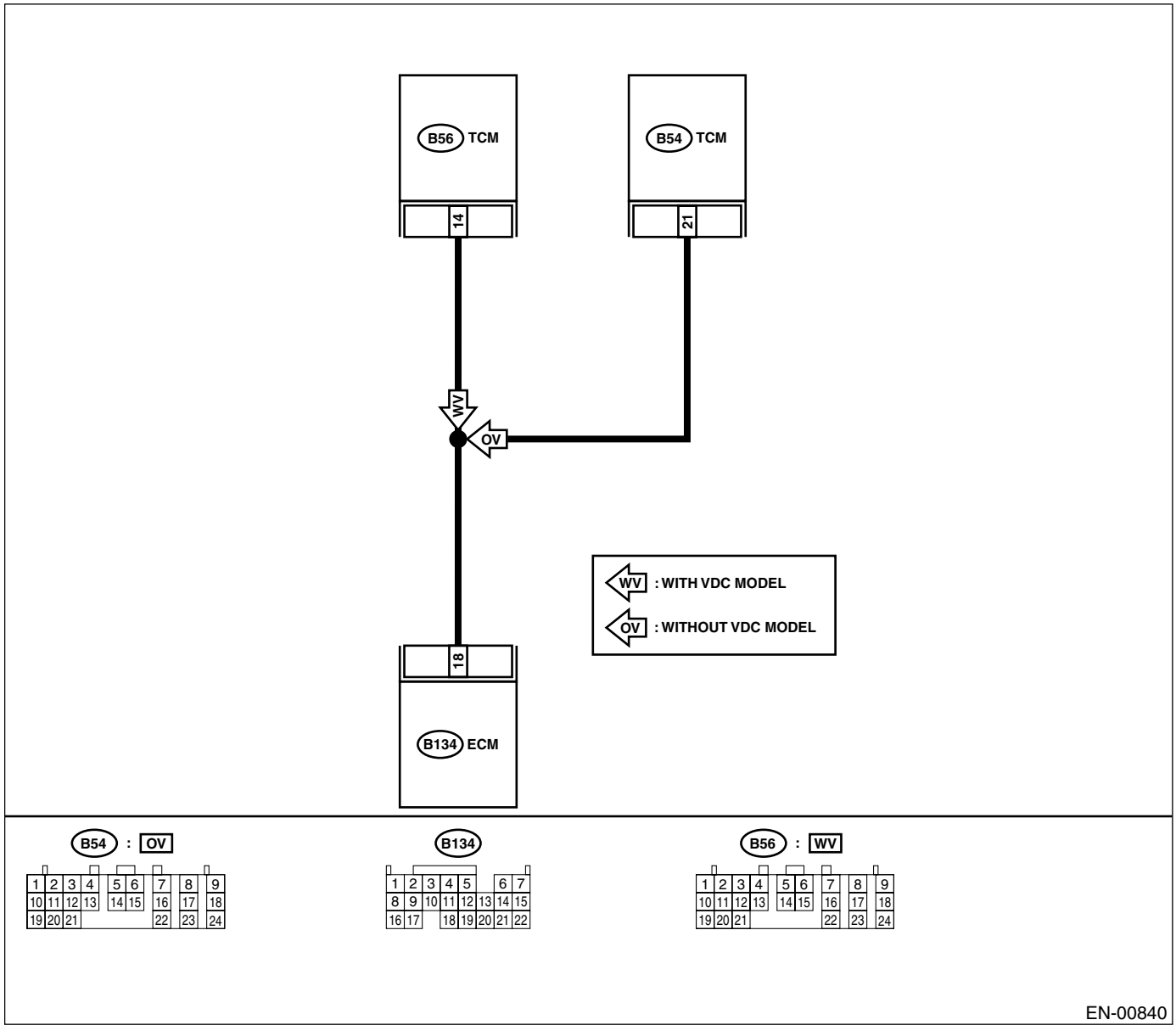
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***Model with VDC:*** ***(B134) No. 19 — (B56) No. 5:*** ***Model without VDC:*** ***(B134) No. 19 — (B54) No. 13:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DJ:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



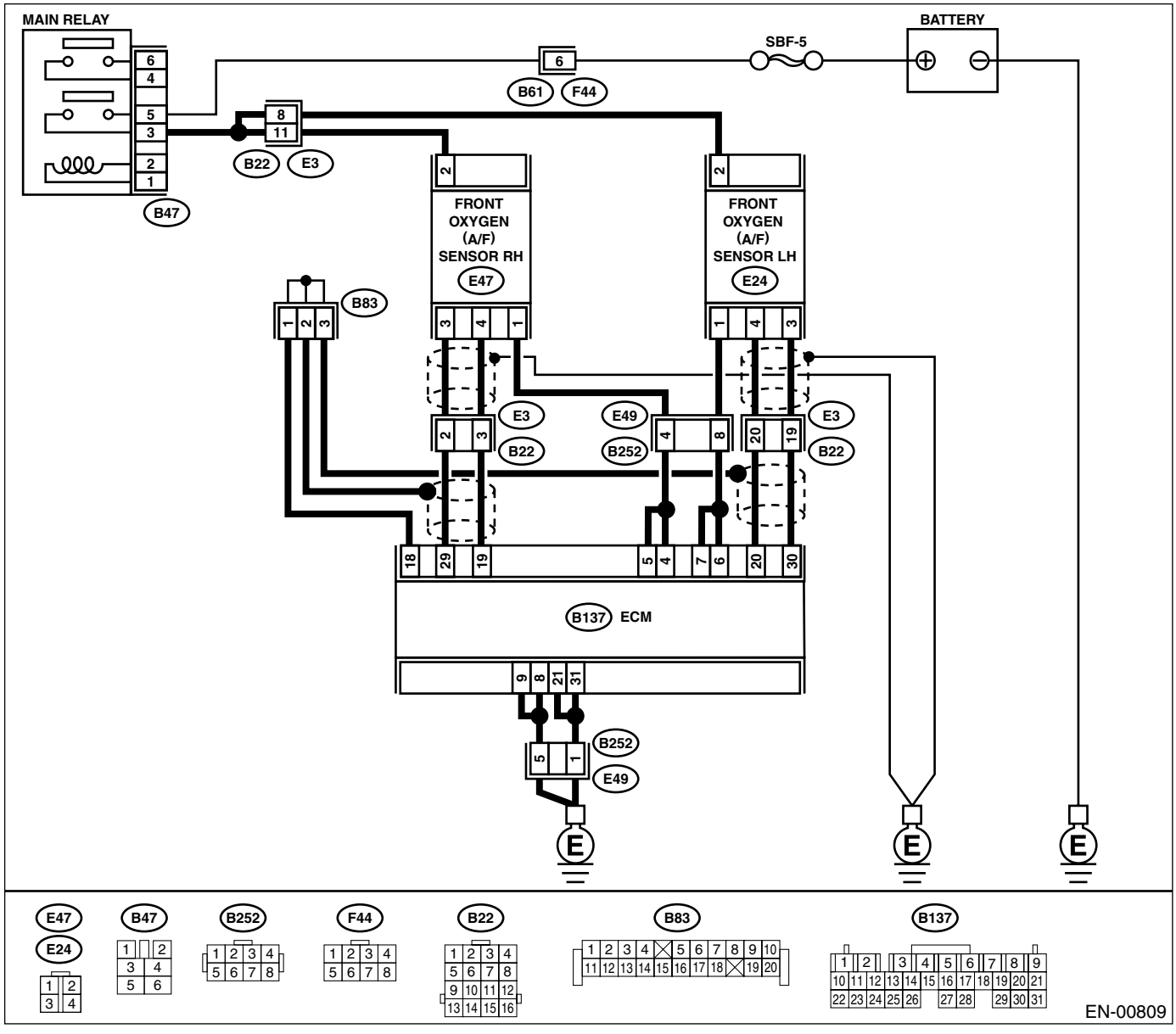
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA service center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and TCM. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***Model with VDC:*** ***(B134) No. 18 — (B56) No. 14:*** ***Model without VDC:*** ***(B134) No. 18 — (B54) No. 21:***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 — Chassis ground:***	Is the measured value less than 10 Ω?	Repair ground short circuit in harness between ECM and TCM connector.	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

DK:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOOL LEAN BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal at idle using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.86 to 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Go to step **5.**
5	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Lower fuel pressure. 1) Disconnect connector from fuel pump relay. 2) Start the engine and run it until it stalls. 3) After the engine stalls, crank it for five more seconds. 4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **7.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line
7	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **8.**	Repair the following items. **Fuel pressure too high** • Faulty pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove right bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step **9.**
9	**CHECK FUEL INJECTOR.** Measure resistance between terminals of fuel injector. ***Terminals*** ***No. 1 — No. 2***	Is the measured value within 5 to 20 Ω?	Go to step **10.**	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>

	Step	Check	Yes	No
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 75°C (167°F)?	Go to step **11.**	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
11	**CHECK INTAKE MANIFOLD PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg)at ignition ON and 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) at idling?	Go to step **12.**	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>
12	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value within –10 to 50°C (14 to 122°F) when ambient temperature is subtracted from intake air temperature?	Go to step **13.**	Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:*** ***(B137) No. 20 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **14.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
14	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 — Chassis ground:*** ***(B137) No. 30 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **15.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
15	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** ***(B137) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **16.**	Go to step **17.**
16	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** ***(B137) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.
17	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **18.**	Go to step **19.**
18	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.

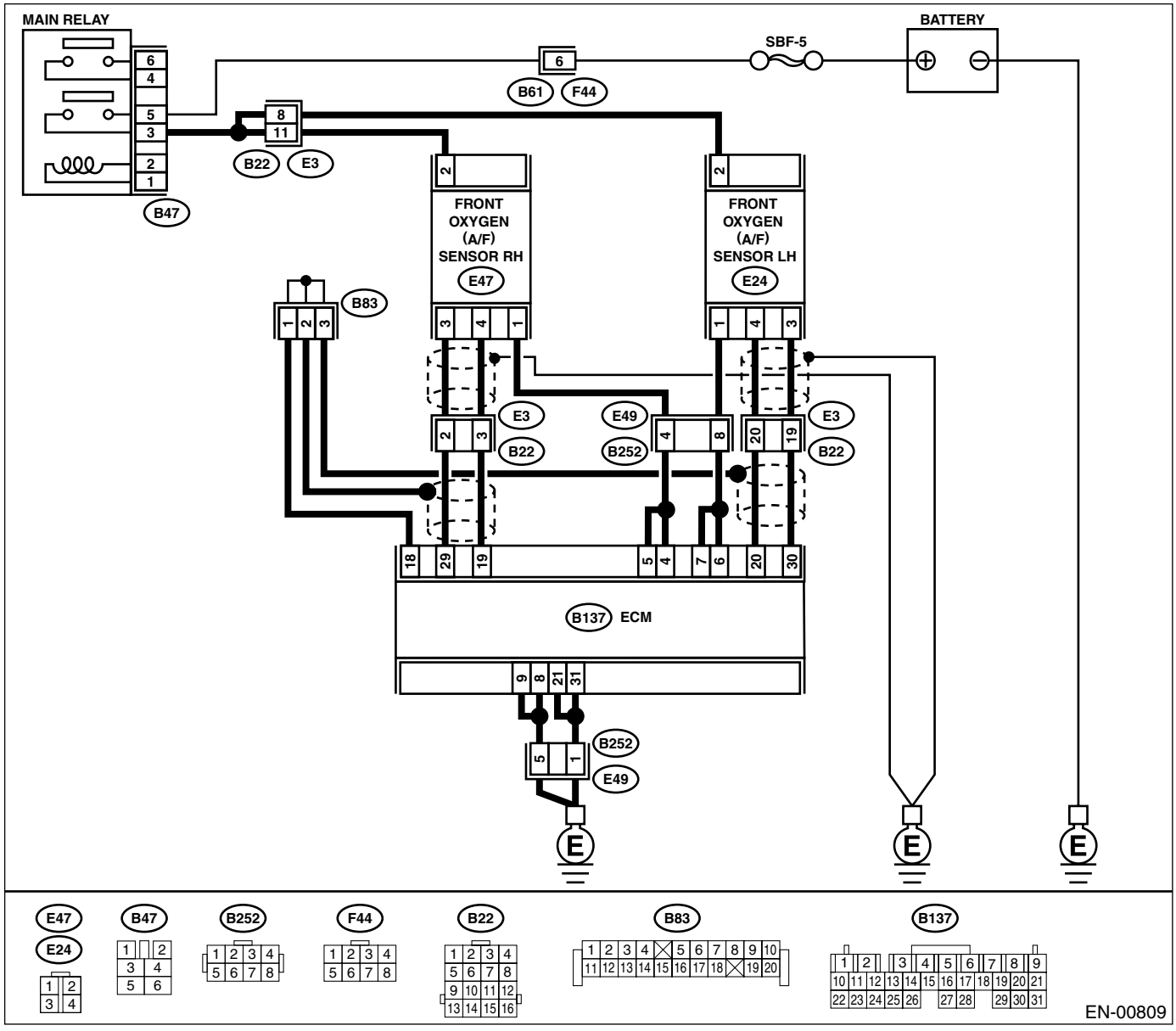
	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (E47) No. 4:*** ***(B137) No. 20 — (E24) No. 4:***	Is the measured value less than 1 Ω?	Go to step **20.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
20	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E47) No. 3:*** ***(B137) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **21.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
21	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

DL:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOOL RICH BANK 1 —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode<Ref. to EN(H6DO)-58, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)-51, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)-93, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 75°C (167°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read data of front oxygen (A/F) sensor signal at idle using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within 0.86 to 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check rear oxygen sensor circuit. <Ref. to FU(H6DO)-45, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Go to step **5.**
5	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Lower fuel pressure. 1) Disconnect connector from fuel pump relay. 2) Start the engine and run it until it stalls. 3) After the engine stalls, crank it for five more seconds. 4) Turn ignition switch to OFF. 2) Connect connector to fuel pump relay. 3) Disconnect fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value within 284 to 314 kPa (2.9 to 3.2 kg/cm^2, 41 to 46 psi)?	Go to step **7.**	Repair the following items. **Fuel pressure too high** • Clogged fuel return line or bent hose **Fuel pressure too low** • Improper fuel pump discharge • Clogged fuel supply line
7	**CHECK FUEL PRESSURE.** After connecting pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing fuel pressure gauge, lower fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value within 206 to 235 kPa (2.1 to 2.4 kg/cm^2, 30 to 34 psi)?	Go to step **8.**	Repair the following items. **Fuel pressure too high** • Faulty pressure regulator • Clogged fuel return line or bent hose **Fuel pressure too low** • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove right bank fuel injector. <Ref. to FU(H6DO)-39, REMOVAL, Fuel Injector.> 3) Check fuel injector	Is fuel injector clogged?	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>	Go to step **9.**
9	**CHECK FUEL INJECTOR.** Measure resistance between terminals of fuel injector. ***Terminals*** ***No. 1 — No. 2***	Is the measured value within 5 to 20 Ω?	Go to step **10.**	Replace fuel injector. <Ref. to FU(H6DO)-39, Fuel Injector.>

	Step	Check	Yes	No
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 75°C (167°F)?	Go to step **11.**	Replace engine coolant temperature sensor. <Ref. to FU(H6DO)-29, Engine Coolant Temperature Sensor.>
11	**CHECK INTAKE MANIFOLD PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 73.3 to 106.6 kPa (550 to 800 mmHg, 21.65 to 31.50 inHg)at ignition ON and 24.0 to 41.3 kPa (180 to 310 mmHg, 7.09 to 12.20 inHg) at idling?	Go to step **12.**	Replace intake manifold pressure sensor. <Ref. to FU(H6DO)-34, Intake Manifold Pressure Sensor.>
12	**CHECK INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 75°C (167°F). 2) Place the shift lever in neutral position. 3) Turn A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open front hood. 6) Measure ambient temperature. 7) Read data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)-38, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the value within –10 to 50°C (14 to 122°F) when ambient temperature is subtracted from intake air temperature?	Go to step **13.**	Check intake air temperature sensor. <Ref. to FU(H6DO)-35, Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:*** ***(B137) No. 20 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **14.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
14	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 — Chassis ground:*** ***(B137) No. 30 — Chassis ground:***	Is the measured value more than 10 Ω?	Go to step **15.**	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
15	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect connector to ECM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** ***(B137) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 4.5 V?	Go to step **16.**	Go to step **17.**
16	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (–):*** ***(B137) No. 20 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.
17	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 4.95 V?	Go to step **18.**	Go to step **19.**
18	**CHECK OUTPUT SIGNAL FOR ECM.** Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):*** ***(B137) No. 30 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair poor contact in ECM connector.

	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 19 — (E47) No. 4:*** ***(B137) No. 20 — (E24) No. 4:***	Is the measured value less than 1 Ω?	Go to step **20.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
20	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B137) No. 29 — (E47) No. 3:*** ***(B137) No. 30 — (E24) No. 3:***	Is the measured value less than 1 Ω?	Go to step **21.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
21	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace front oxygen (A/F) sensor. <Ref. to FU(H6DO)-43, Front Oxygen (A/F) Sensor.>

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-75, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Ignition parts (*1) 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) Fuel injection parts (*4) 10) EGR valve
2. Rough idling	1) Idle air control solenoid valve 2) Intake manifold pressure sensor 3) Intake air temperature sensor 4) Intake air temperature and pressure sensor 5) Engine coolant temperature sensor (*2) 6) Ignition parts (*1) 7) Air intake system (*5) 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Crankshaft position sensor (*3) 11) Camshaft position sensor (*3) 12) Oxygen sensor 13) Fuel pump and fuel pump relay 14) EGR valve
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Intake manifold pressure sensor 6) Intake air temperature sensor 7) Intake air temperature and pressure sensor 8) EGR valve
4. Poor acceleration	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Throttle position sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) Engine coolant temperature sensor (*2) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) A/C switch and A/C cut relay 11) Engine torque control signal circuit 12) Ignition parts (*1) 13) EGR valve

Symptom	Problem parts
5. Engine stalls or engine sags or hesitates at acceleration.	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Purge control solenoid valve 8) Fuel injection parts (*4) 9) Throttle position sensor 10) Fuel pump and fuel pump relay 11) EGR valve
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay 10) EGR valve
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Intake air temperature and pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(H4SO)-2, Basic Diagnostic Procedure.>

MEMO:

GENERAL DESCRIPTION

GD(H6DO)

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1. List of Diagnostic Trouble Code (DTC) 2
2. Diagnostic Trouble Code (DTC) Detecting Criteria 10

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Description	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-10, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-12, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-14, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-16, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-18, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-20, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-20, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-20, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Pressure Sensor Range/ Performance	<Ref. to GD(H6DO)-22, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H6DO)-26, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H6DO)-28, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H6DO)-30, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H6DO)-32, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H6DO)-34, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H6DO)-36, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H6DO)-38, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to GD(H6DO)-40, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H6DO)-44, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H6DO)-46, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H6DO)-48, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H6DO)-52, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Barometric Pressure Too Low	<Ref. to GD(H6DO)-54, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-56, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-58, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-62, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-64, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-66, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H6DO)-68, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0150	O_2 Sensor Circuit (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0150 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0153	O_2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0154	O_2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-71, DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H6DO)-72, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H6DO)-76, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System too Lean (Bank 2)	<Ref. to GD(H6DO)-79, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System too Rich (Bank 2)	<Ref. to GD(H6DO)-79, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H6DO)-80, DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H6DO)-84, DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H6DO)-86, DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H6DO)-88, DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H6DO)-90, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H6DO)-96, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H6DO)-96, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H6DO)-96, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0305	Cylinder 5 Misfire Detected	<Ref. to GD(H6DO)-96, DTC P0305 — CYLINDER 5 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0306	Cylinder 6 Misfire Detected	<Ref. to GD(H6DO)-96, DTC P0306 — CYLINDER 6 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-98, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-100, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0332	Knock Sensor 2 Circuit Low Input (Bank 2)	<Ref. to GD(H6DO)-102, DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0333	Knock Sensor 2 Circuit High Input (Bank 2)	<Ref. to GD(H6DO)-102, DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H6DO)-104, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H6DO)-106, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-108, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H6DO)-111, ECM OPERATING AT DTC SETTING, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H6DO)-112, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H6DO)-116, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H6DO)-120, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H6DO)-140, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H6DO)-142, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H6DO)-144, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H6DO)-146, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H6DO)-148, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H6DO)-150, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H6DO)-150, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H6DO)-152, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H6DO)-154, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/ Performance	<Ref. to GD(H6DO)-156, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H6DO)-158, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H6DO)-160, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H6DO)-162, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H6DO)-166, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H6DO)-167, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to GD(H6DO)-168, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System Rpm Lower Than Expected	<Ref. to GD(H6DO)-170, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System Rpm Higher Than Expected	<Ref. to GD(H6DO)-172, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0508	Idle Control System Circuit Low	<Ref. to GD(H6DO)-174, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0509	Idle Control System Circuit High	<Ref. to GD(H6DO)-176, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H6DO)-178, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H6DO)-180, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0565	Cruise Control ON Signal	<Ref. to GD(H6DO)-182, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H6DO)-183, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0661	Intake Manifold Tuning Valve Control Circuit Low — Bank 1	<Ref. to GD(H6DO)-184, DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW — BANK 1 — —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0662	Intake Manifold Tuning Valve Control Circuit High — Bank 1	<Ref. to GD(H6DO)-186, DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH — BANK 1 — —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H6DO)-188, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H6DO)-189, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to GD(H6DO)-190, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to GD(H6DO)-191, DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to GD(H6DO)-192, DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to GD(H6DO)-193, DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0720	Output Speed Sensor Circuit	<Ref. to GD(H6DO)-194, DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0726	Engine Speed Input Circuit Range/Performance	<Ref. to GD(H6DO)-195, DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0731	Gear 1 Incorrect Ratio	<Ref. to GD(H6DO)-196, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0732	Gear 2 Incorrect Ratio	<Ref. to GD(H6DO)-197, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0733	Gear 3 Incorrect Ratio	<Ref. to GD(H6DO)-198, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0734	Gear 4 Incorrect Ratio	<Ref. to GD(H6DO)-199, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0741	Torque Converter Clutch Circuit Performance or Stuck OFF	<Ref. to GD(H6DO)-200, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to GD(H6DO)-201, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to GD(H6DO)-202, DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0753	Shift Solenoid “A” Electrical	<Ref. to GD(H6DO)-203, DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0758	Shift Solenoid “B” Electrical	<Ref. to GD(H6DO)-204, DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0771	Shift Solenoid “E” Performance or Stuck OFF	<Ref. to GD(H6DO)-205, DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to GD(H6DO)-206, DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0785	Shift/Timing Solenoid	<Ref. to GD(H6DO)-207, DTC P0785 — SHIFT/TIMING SOLENOID —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(H6DO)-208, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(H6DO)-209, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0864	TCM Communication Circuit Range/Performance	<Ref. to GD(H6DO)-210, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0865	TCM Communication Circuit Low	<Ref. to GD(H6DO)-211, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0866	TCM Communication Circuit High	<Ref. to GD(H6DO)-212, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-213, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-214, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to GD(H6DO)-216, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-218, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H6DO)-222, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1154	O_2 Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-225, DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1155	O_2 Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to GD(H6DO)-225, DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H6DO)-226, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H6DO)-228, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H6DO)-230, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H6DO)-232, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H6DO)-234, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range Performance	<Ref. to GD(H6DO)-236, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H6DO)-240, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H6DO)-241, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to GD(H6DO)-242, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to GD(H6DO)-243, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1700	Throttle Position Sensor Circuit Malfunction For AT	<Ref. to GD(H6DO)-244, DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to GD(H6DO)-246, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to GD(H6DO)-247, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H6DO)-248, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H6DO)-250, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

MEMO:

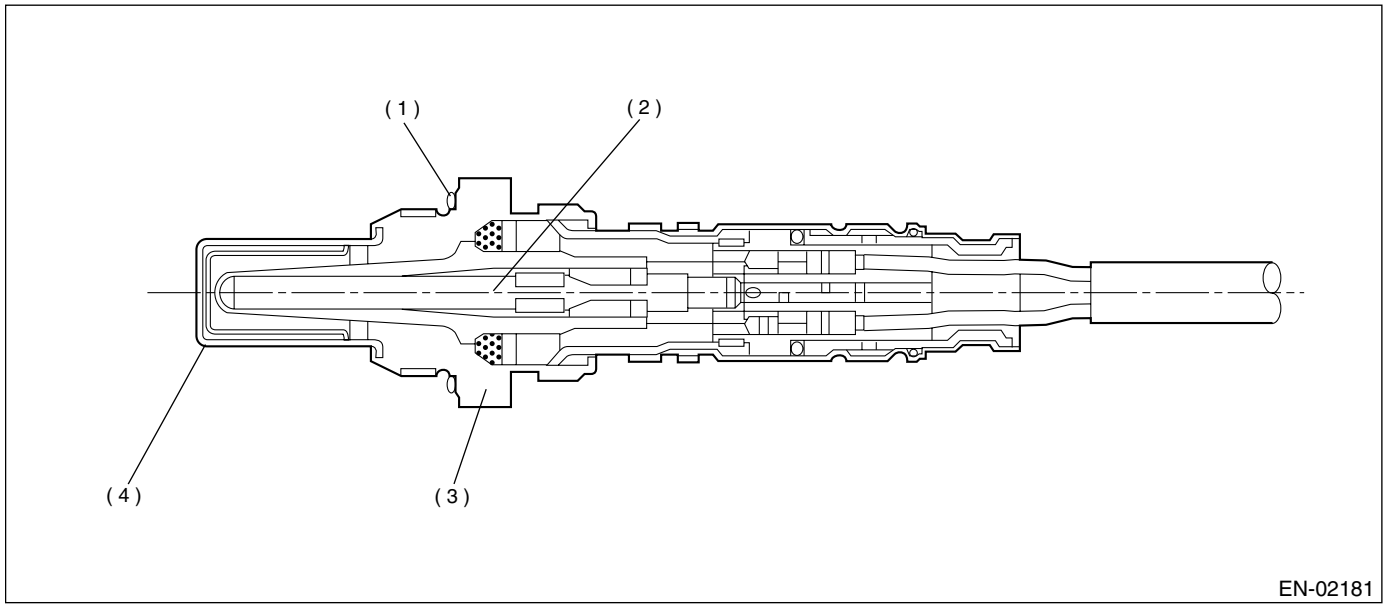
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



(1) Gasket
(2) Ceramic heater
(3) Sensor housing
(4) Protection tube

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After fuel shut off as follows	60 seconds or more
Battery voltage	> 10.9 V
Control duty ≥ 70%	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 30 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 52 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Rear oxygen (A/F) sensor sub learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

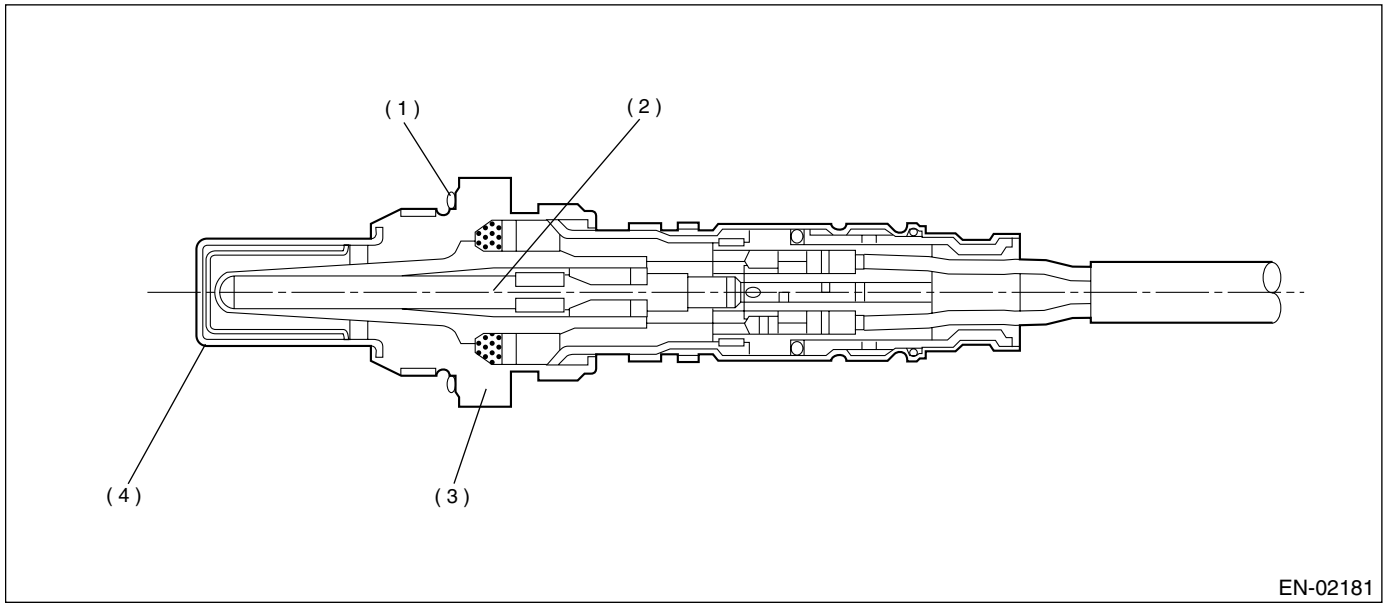
Memorize the freeze frame data. (For test mode $02)

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor IC judges NG when the data of voltage and current is abnormal with heater turned on or off.

2. COMPONENT DESCRIPTION



(1) Gasket
(2) Ceramic heater
(3) Sensor housing
(4) Protection tube

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor IC judges NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (4.5 seconds). Front oxygen (A/F) sensor IC judges OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	ON
• Voltage	< 5 V
• Current	< 1.5 A

Time Needed for Diagnosis: 4.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on heater
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Rear oxygen (A/F) sensor sub learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

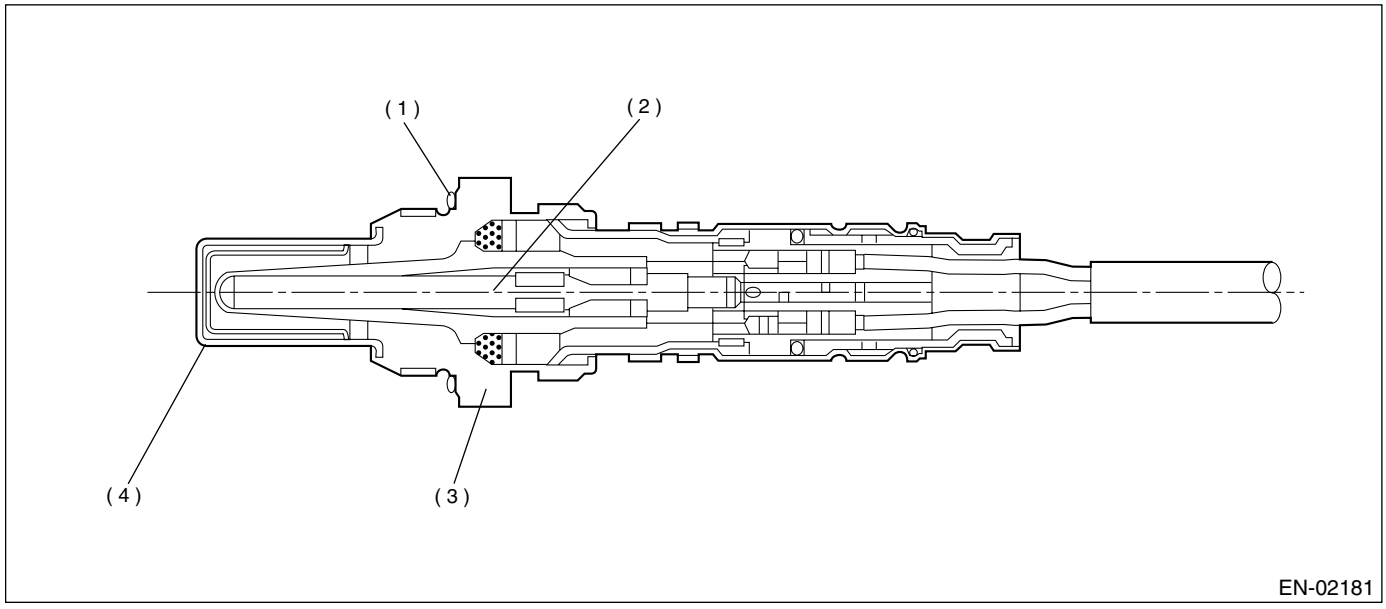
Memorize the freeze frame data. (For test mode $02)

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor IC judges NG when the data of voltage and current is abnormal with heater turned on or off.

2. COMPONENT DESCRIPTION



(1) Gasket
(2) Ceramic heater
(3) Sensor housing
(4) Protection tube

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor IC judges NG when the continuous time until completing one of the malfunction criteria below becomes more than the time needed for diagnosis (4.5 seconds). Front oxygen (A/F) sensor IC judges OK and clear NG when any of the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	OFF
• Voltage	> 5 V
• Current	> 1.5 A
• Heater current	≥ 23 A

Time Needed for Diagnosis: 4.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on heater
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Rear oxygen (A/F) sensor sub learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

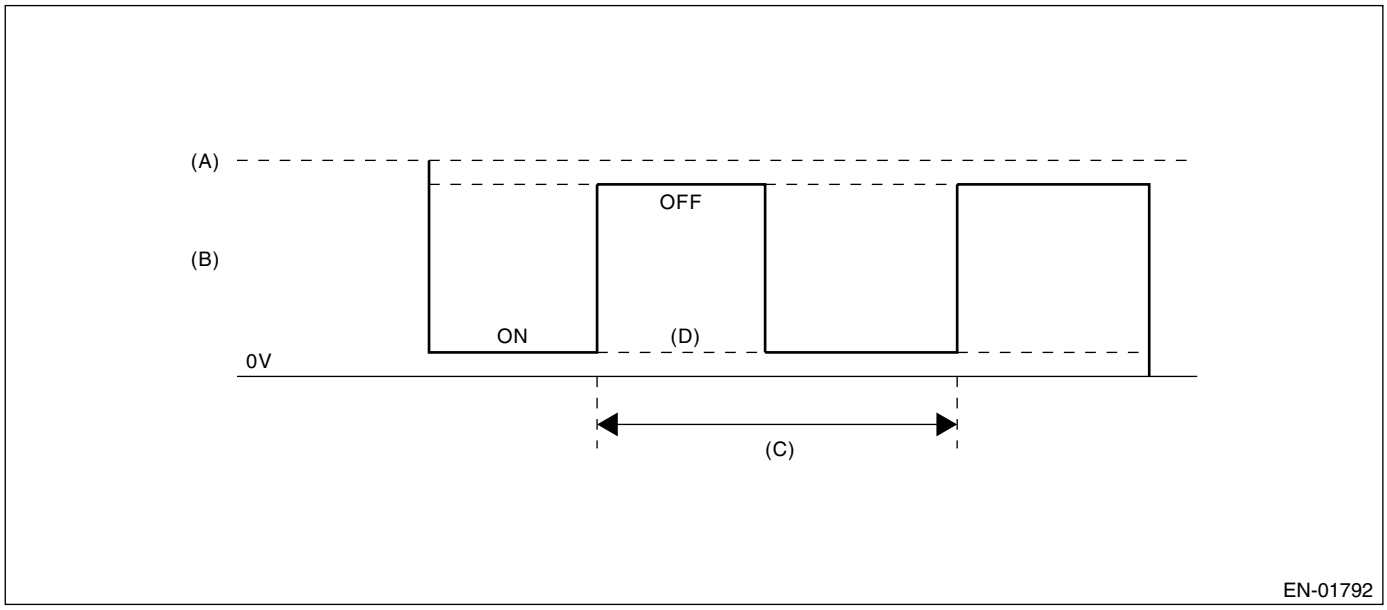
Memorize the freeze frame data. (For test mode $02)

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater. Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage. Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 262 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	> 10.9 V
Duty ratio of heater output	19.9 ←→ 79.6%
Engine speed	< 4500 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AD Max. value at heater OFF	< 10.12 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

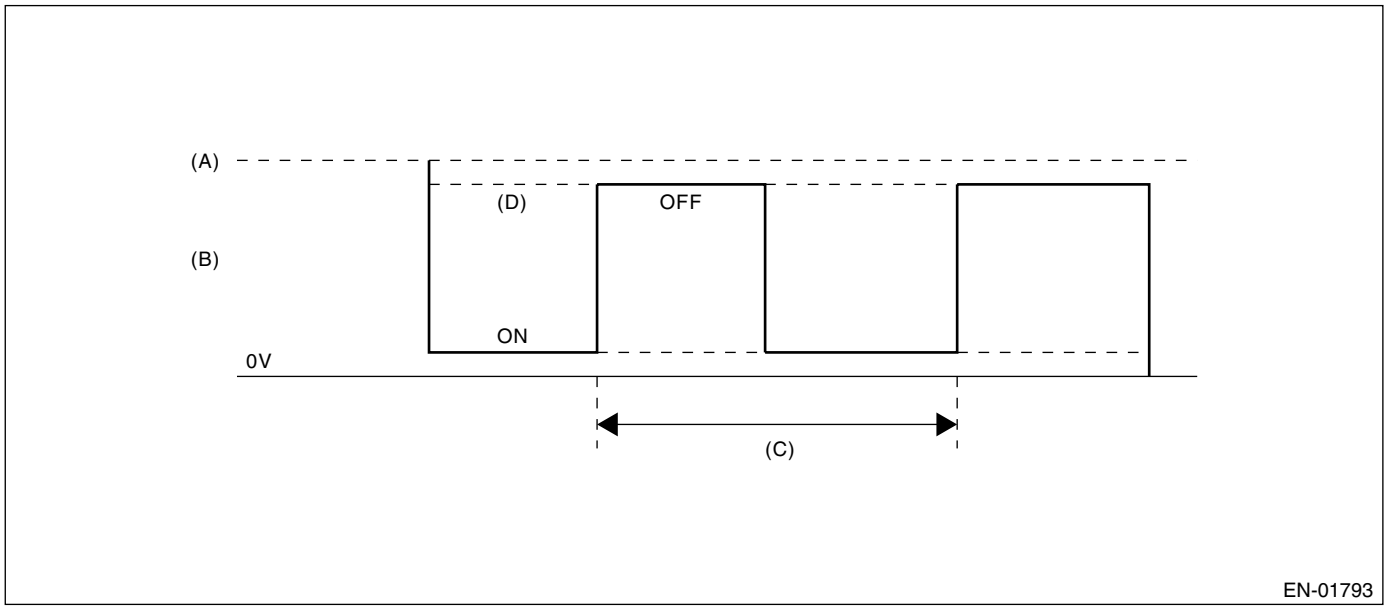
Memorize the freeze frame data. (For test mode $02)

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater. Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage. Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 262 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	> 10.9 V
Duty ratio of heater output	19.9 ←→ 79.6%
Engine speed	< 4500 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AD Min. value at heater ON	> 1.92 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

F: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

NOTE:
For detecting criteria, refer to P0030. <Ref. to GD(H6DO)-10, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

G: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —

NOTE:
For detecting criteria, refer to P0031. <Ref. to GD(H6DO)-12, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

H: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

NOTE:
For detecting criteria, refer to P0032. <Ref. to GD(H6DO)-14, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

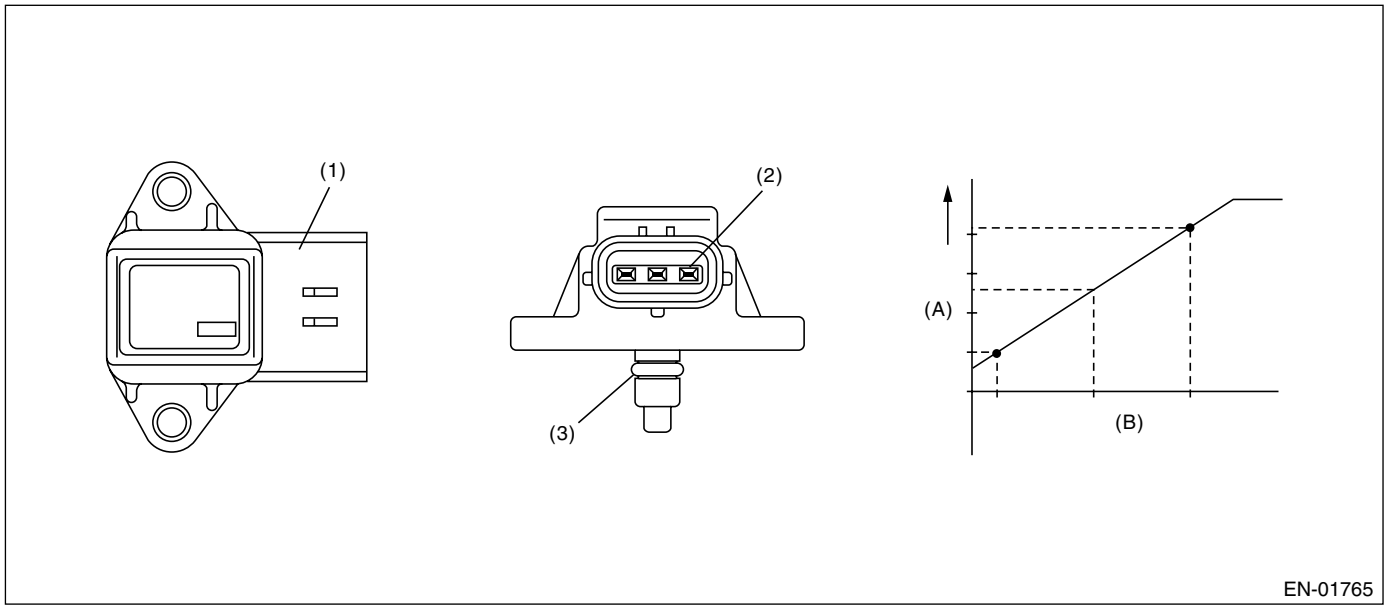
MEMO:

I: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	< 1.3 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.3 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine speed and throttle position. When also throttle position is NG, adopt 66.7 kPa (500 mmHg, 19.69 inHg) as definite value.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP density learning (Fuel): Not allowed to learn
- Knocking compensation

At normal condition: Self-learning ignition advance value = knock F/B advance + overall self-learning advance value + partial self-learning advance value
When malfunctioning: Self-learning ignition advance value = –6°CA (6°CA retard)
knock F/B advance value = 0°CA
Prohibit overall self-learning
Partially prohibit self-learning

- ISC control: Not allowed to calculate the amount of ISC feedback.

Amount of ISC open-loop compensation = Fixed at 6.82%

- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

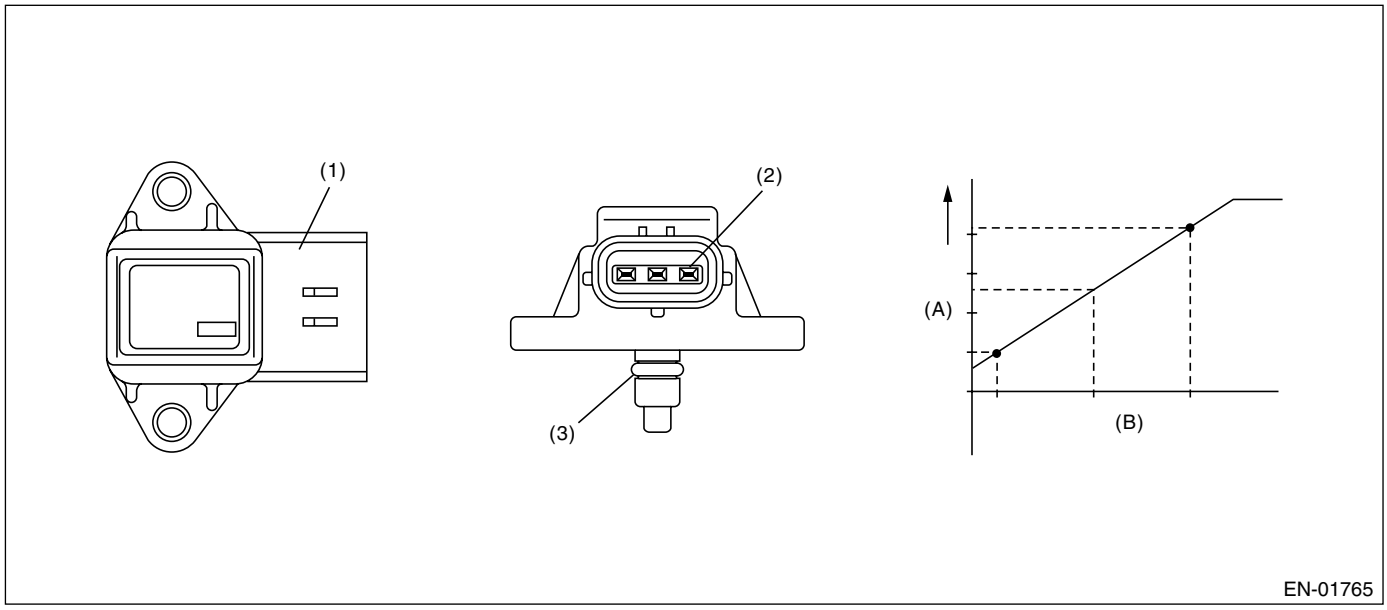
MEMO:

J: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.65 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine speed and throttle position.

When also throttle position is NG, adopt 66.7 kPa (500 mmHg, 19.69 inHg) as definite value.

- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP density learning (Fuel): Not allowed to learn
- Knocking compensation

At normal condition: Self-learning ignition advance value = knock F/B advance + overall self-learning advance value + partial self-learning advance value
When malfunctioning: Self-learning ignition advance value = –6°CA (6°CA retard)
knock F/B advance value = 0°CA
Prohibit overall self-learning
Partially prohibit self-learning

- ISC control: Not allowed to calculate the amount of ISC feedback.

Amount of ISC open-loop compensation = Fixed at 6.82%

- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

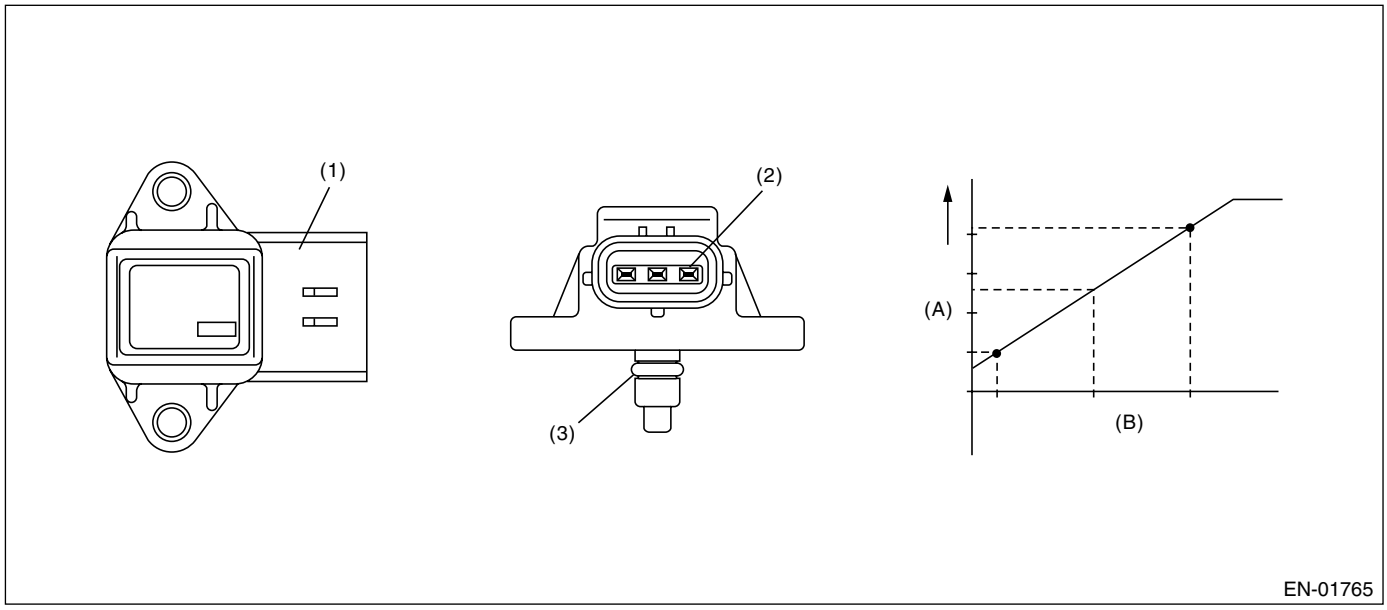
Memorize the freeze frame data. (For test mode $02)

K: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.5 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine speed and throttle position.

When also throttle position is NG, adopt 66.7 kPa (500 mmHg, 19.69 inHg) as definite value.

- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Fuel cut will operate at engine high speed.
- EVAP density learning (Fuel): Not allowed to learn
- Knocking compensation

At normal condition: Self-learning ignition advance value = knock F/B advance + overall self-learning advance value + partial self-learning advance value
When malfunctioning: Self-learning ignition advance value = –6°CA (6°CA retard)
knock F/B advance value = 0°CA
Prohibit overall self-learning
Partially prohibit self-learning

- ISC control: Not allowed to calculate the amount of ISC feedback.

Amount of ISC open-loop compensation = Fixed at 6.82%

- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

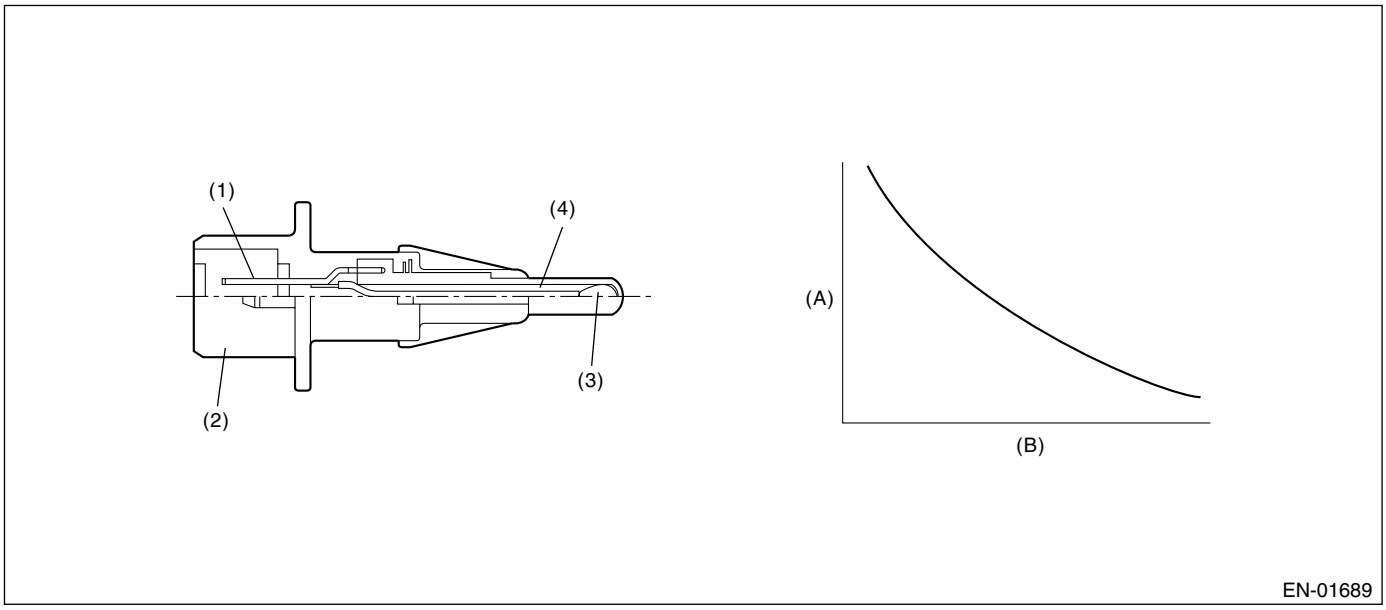
Memorize the freeze frame data. (For test mode $02)

L: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

Judge NG when the judgment value is within the range of the malfunction criteria below. Judge OK when it is not within the specified range.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (0.9°F) around 25°C (77°F).)

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

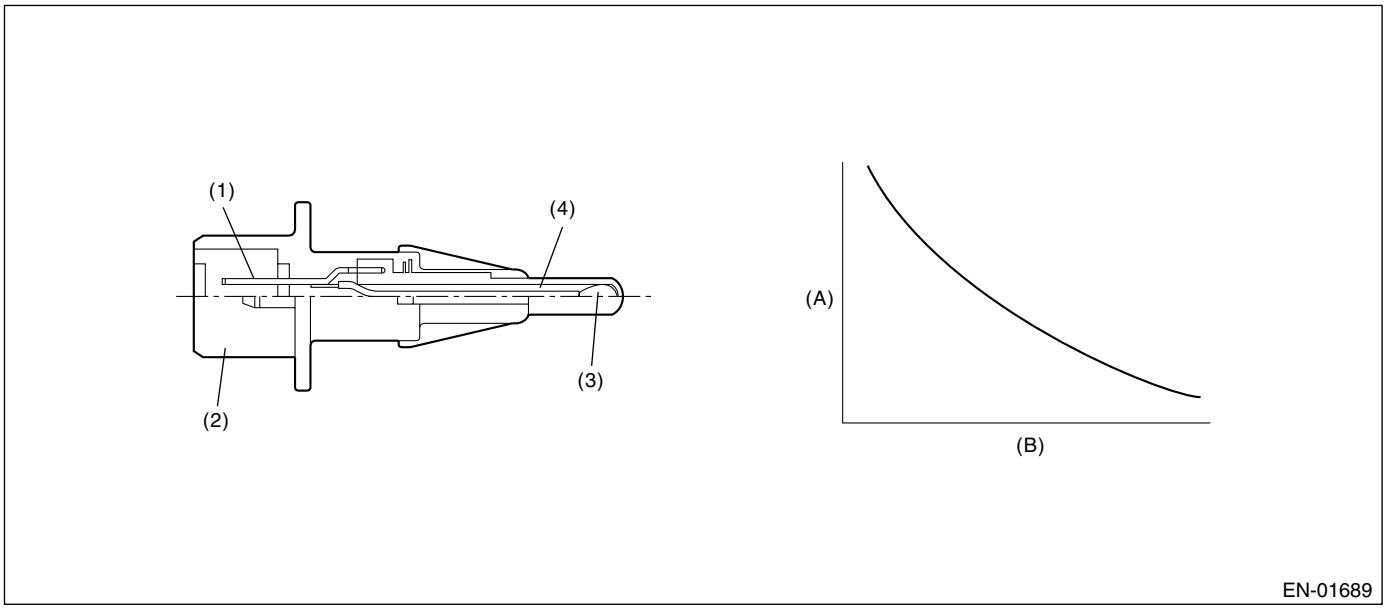
Memorize the freeze frame data. (For test mode $02)

M: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.23 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

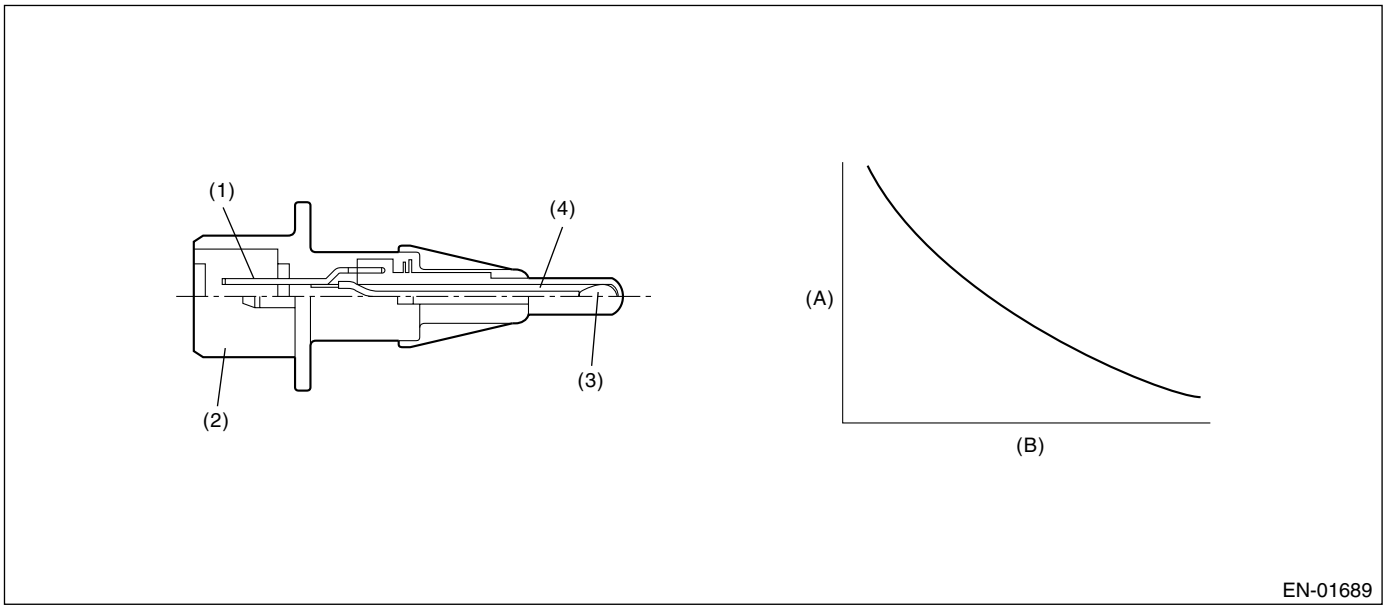
Memorize the freeze frame data. (For test mode $02)

N: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

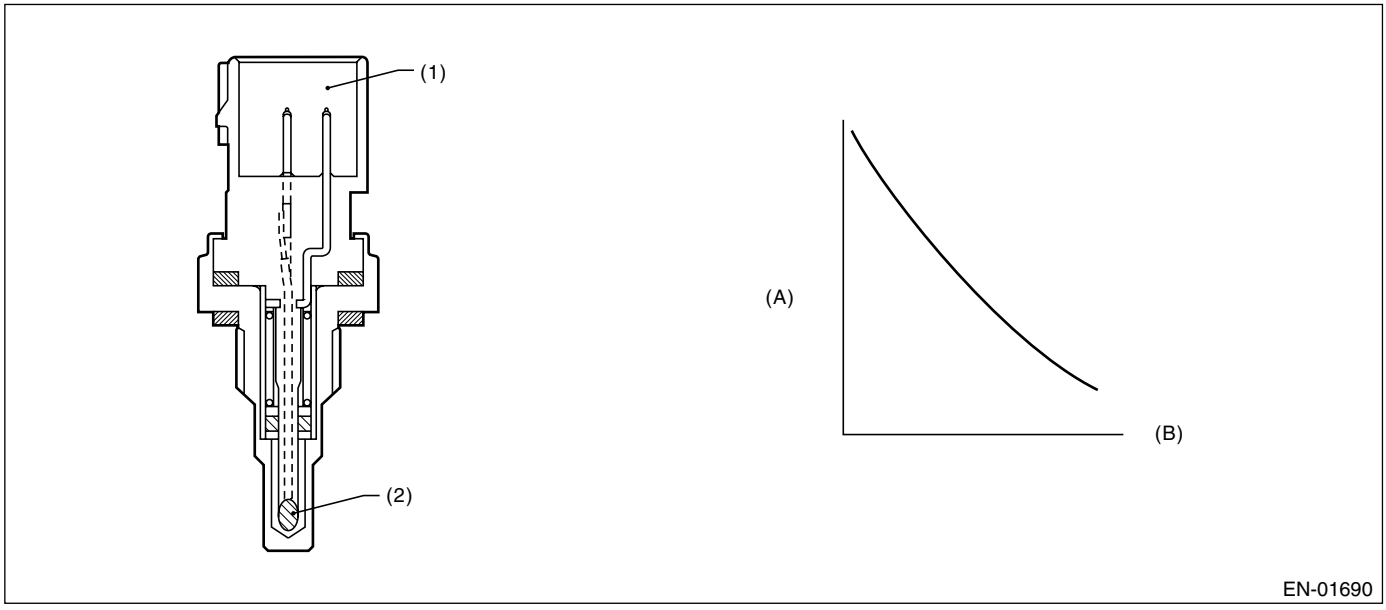
Memorize the freeze frame data. (For test mode $02)

O: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.23 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation coefficient at a high water temperature: The water temperature condition is disregarded and increased by approval of other condition, though usually increases by a high water temperature and approval of other condition.

9. ECM OPERATING AT DTC SETTING

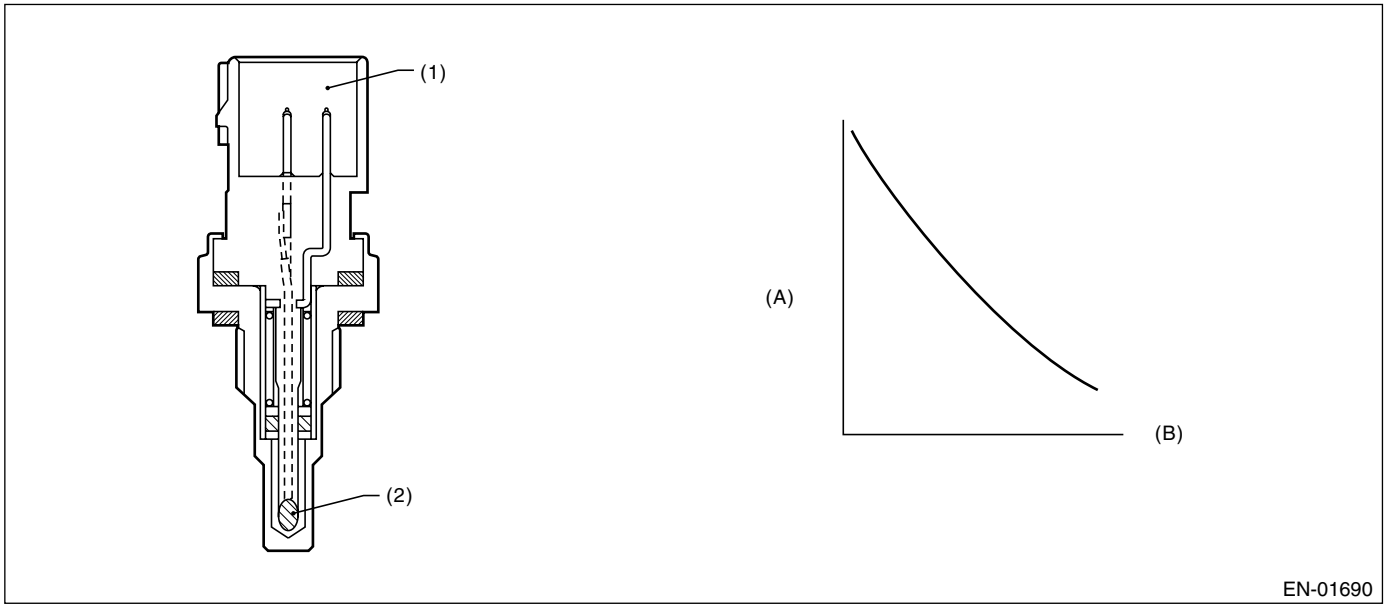
Memorize the freeze frame data. (For test mode $02)

P: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation coefficient at a high water temperature: The water temperature condition is disregarded and increased by approval of other condition, though usually increases by a high water temperature and approval of other condition.

9. ECM OPERATING AT DTC SETTING

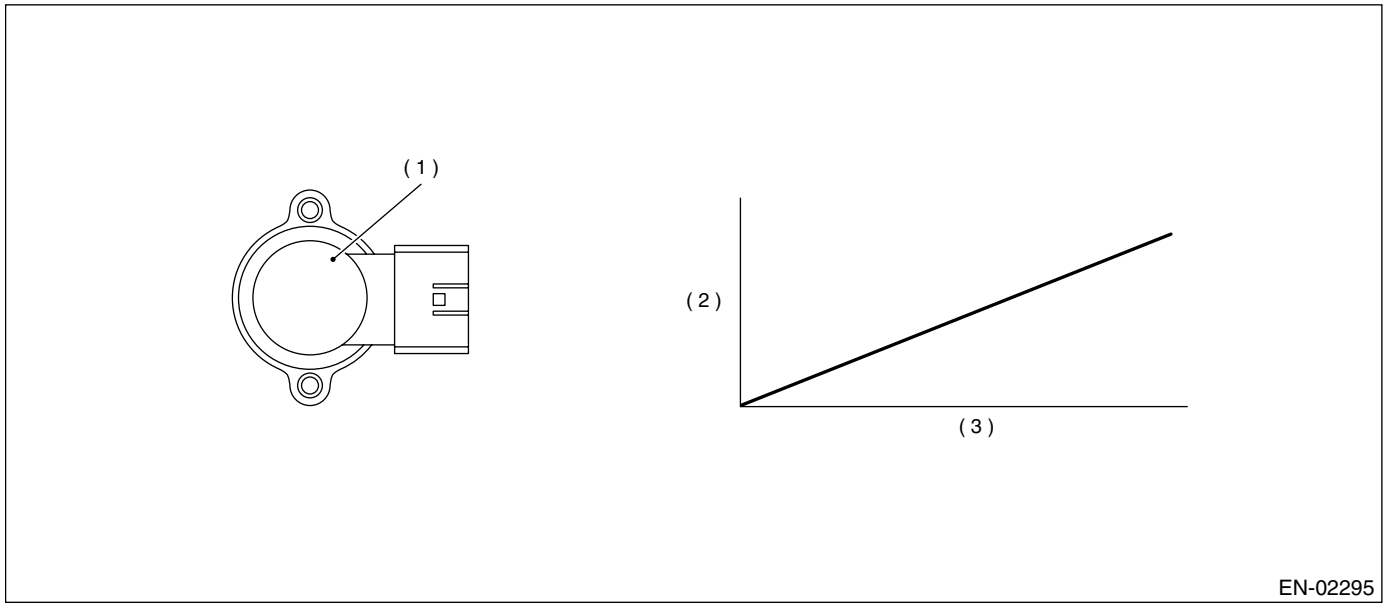
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of throttle position sensor output property. Judge NG when the throttle opening is largely different from the estimated value of throttle opening.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor (2) Voltage (V) (3) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	> 71°C (160°F)
Intake air temperature	> –10°C (14°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Fuel level	≥ 9.6 ℓ (2-1/2 US gal, 2-1/8 Imp gal)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when one of the malfunctions below is completed such as Low malfunction (1), Low malfunction (2) and High malfunction.

• Judgment Value

Malfunction Criteria	Threshold Value
Low malfunction (1): Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.	
(Estimated value of throttle opening — output) throttle angle	≥ 20.01°
Engine speed	1600 ←→ 3500 rpm
Change of manifold absolute pressure during 0.5 engine revs.	< 1.30 kPa (9.76 mmHg, 0.384 inHg)
Manifold absolute pressure	201.5 ←→ Atmospheric pressure −10.4 kPa (−78 mmHg, −3.07 inHg)
Low malfunction (2): Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds × 3 times.	
Engine speed	≥ 500 rpm
Intake manifold pressure	≥ 66.7 kPa (500 mmHg, 19.69 inHg)
Throttle opening	< 2°
Elapsed time after engine starting	≥ 5 seconds
EGR monitor	Not in operation
Closed throttle position learning	Complete
High malfunction: Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.	
(estimated value of throttle opening — Output) throttle angle	≥ 20.01°
Engine speed	1600 ←→ 3500 rpm
Change of manifold absolute pressure during 0.5 engine revs.	< 1.30 kPa (9.76 mmHg, 0.384 inHg)
Manifold absolute pressure	201.5 ←→ Atmospheric pressure −10.4 kPa (−78 mmHg, −3.07 inHg)

Estimated value of throttle opening: It is supposed from engine speed and intake manifold relative pressure.

Time Needed for Diagnosis:

Low malfunction (1), High malfunction	10 seconds
Low malfunction (2)	0.5 seconds × 3 times.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all of the malfunctions below are not completed such as Low malfunction (1), Low malfunction (2) and High malfunction.

• Judgment Value

Malfunction Criteria	Threshold Value
Low malfunction (1): Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.	
(Estimated value of throttle opening — output) throttle angle	< 20.01°
Engine speed	1600 ←→ 3500 rpm
Changing of manifold absolute pressure during 0.5 engine revs.	< 1.30 kPa (9.76 mmHg, 0.384 inHg)
Manifold absolute pressure	201.5 ←→ Atmospheric pressure −10.4 kPa (−78 mmHg, −3.07 inHg)
Low malfunction (2): Judge OK when the malfunction criteria below are completed.	
Throttle opening	≥ 20.01°
Elapsed time after engine starting	≥ 5 seconds
High malfunction: Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.	
(Output — estimated value of throttle opening) throttle angle	< 20.01°
Engine speed	1600 ←→ 3500 rpm
Changing of manifold absolute pressure during 0.5 engine revs.	< 1.30 kPa (9.76 mmHg, 0.384 inHg)
Manifold absolute pressure	201.5 ←→ Atmospheric pressure −10.4 kPa (−78 mmHg, −3.07 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Throttle position sensor process:

- Fix the throttle opening at 6.4°.
- Fix the closed throttle position learning value at 0°.
- ISC open loop compensation: Fix the amount of ISC open loop compensation at 6.82%.
- ISC feedback compensation: Not allowed to calculate the amount of ISC feedback compensation.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

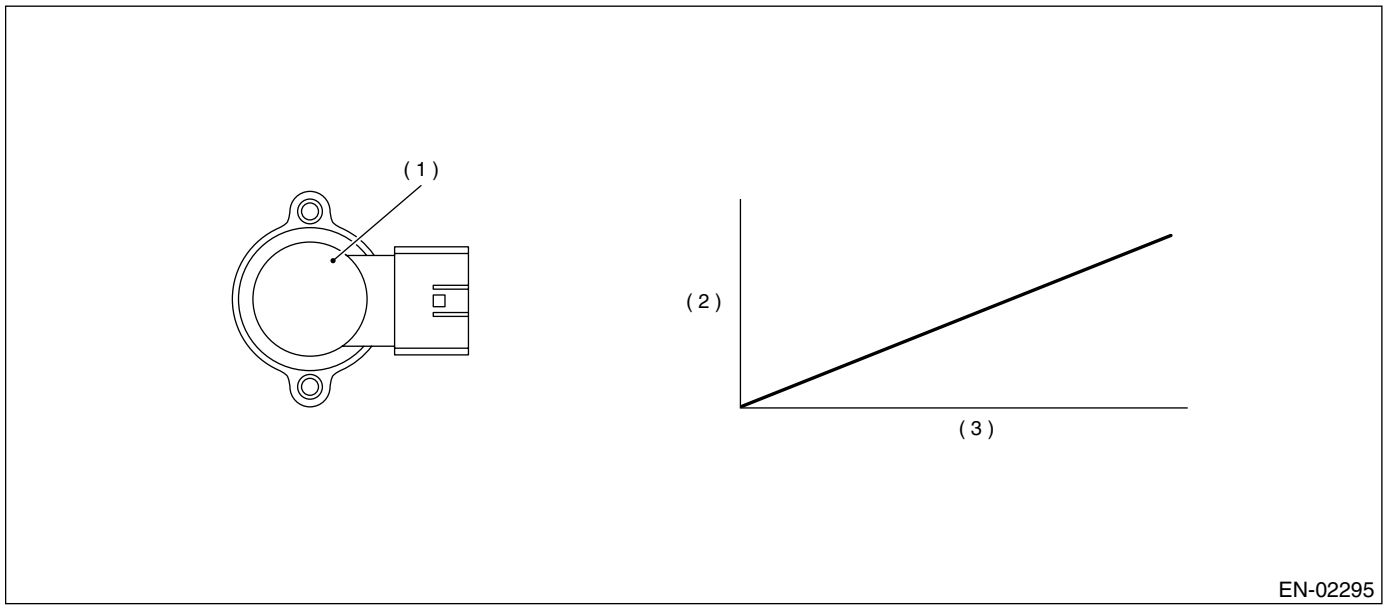
MEMO:

R: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor (2) Voltage (V) (3) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.14 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.14 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Throttle position sensor process:

- Fix the throttle opening at 6.4°.
- Fix the closed throttle position learning value at 0°.
- ISC open loop compensation: Fix the amount of ISC open loop compensation at 6.82%.
- ISC feedback compensation: Not allowed to calculate the amount of ISC feedback compensation.

9. ECM OPERATING AT DTC SETTING

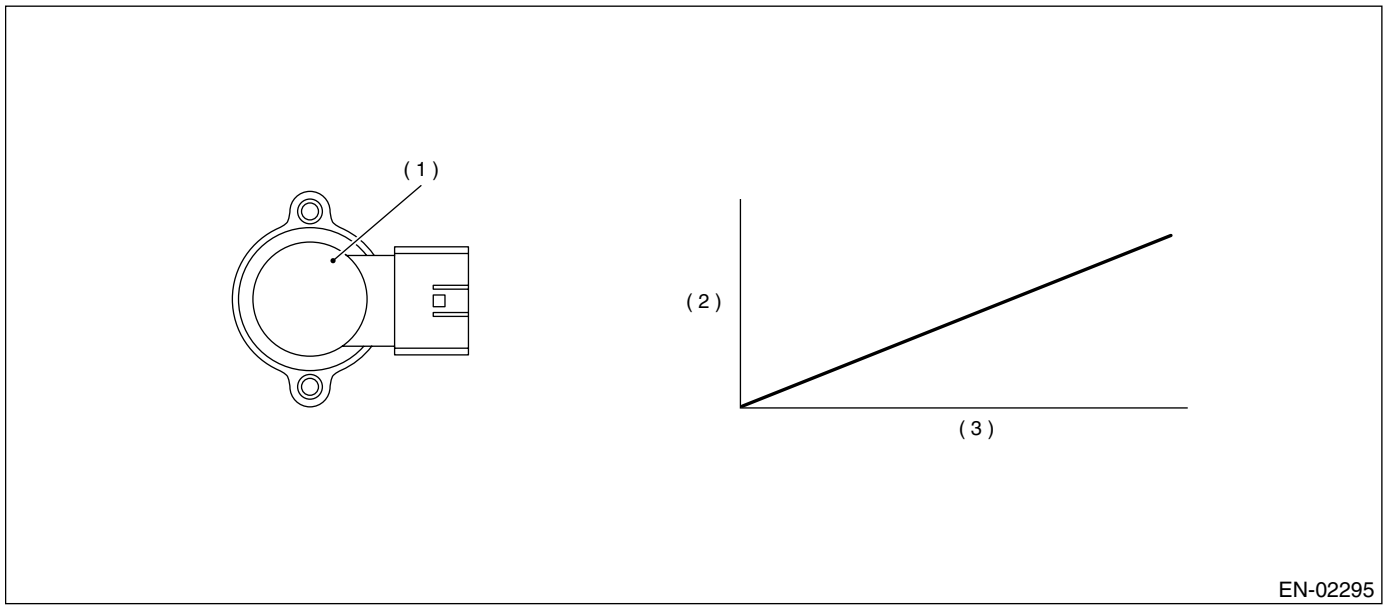
Memorize the freeze frame data. (For test mode $02)

S: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor (2) Voltage (V) (3) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Throttle position sensor process:

- Fix the throttle opening at 6.4°.
- Fix the closed throttle position learning value at 0°.
- ISC open loop compensation: Fix the amount of ISC open loop compensation at 6.82%.
- ISC feedback compensation: Not allowed to calculate the amount of ISC feedback compensation.

9. ECM OPERATING AT DTC SETTING

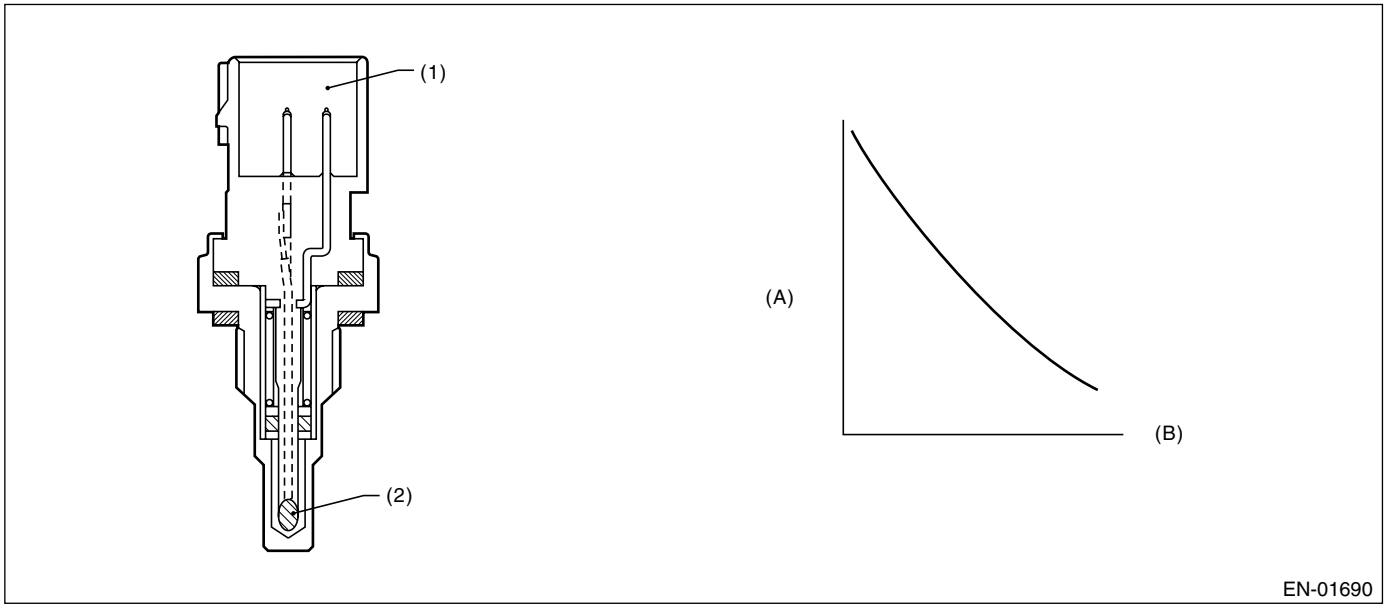
Memorize the freeze frame data. (For test mode $02)

T: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting
a) Timer stop at fuel cut mode.
b) During the driving conditions except a) above, timer count up by 65.5 milliseconds + TWCNT milliseconds at every 65.5 milliseconds.
Where,TWCNT is determined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

Temp. °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
–20 (–4)	0 ms	1.75 ms	3.5 ms	5.25 ms	13.8 ms	10.5 ms	20.6 ms	27.5 ms
–10 (14)	0 ms	13.8 ms	20.6 ms	34.4 ms	55.1 ms	79.3 ms	61.9 ms	48.2 ms
0 (32)	0 ms	19.1 ms	48.2 ms	79.3 ms	123 ms	166 ms	144 ms	115 ms
10 (50)	0 ms	41.3 ms	82.6 ms	124 ms	193 ms	255 ms	227 ms	186 ms
20 (68)	0 ms	5.25 ms	10.5 ms	20.6 ms	41.3 ms	61.9 ms	96.3 ms	131 ms

Judgment value of timer after engine starting
$t = 429.5 - 6.685 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation coefficient at a high water temperature: The water temperature condition is disregarded and increased by approval of other condition, though usually increases by a high water temperature and approval of other condition.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

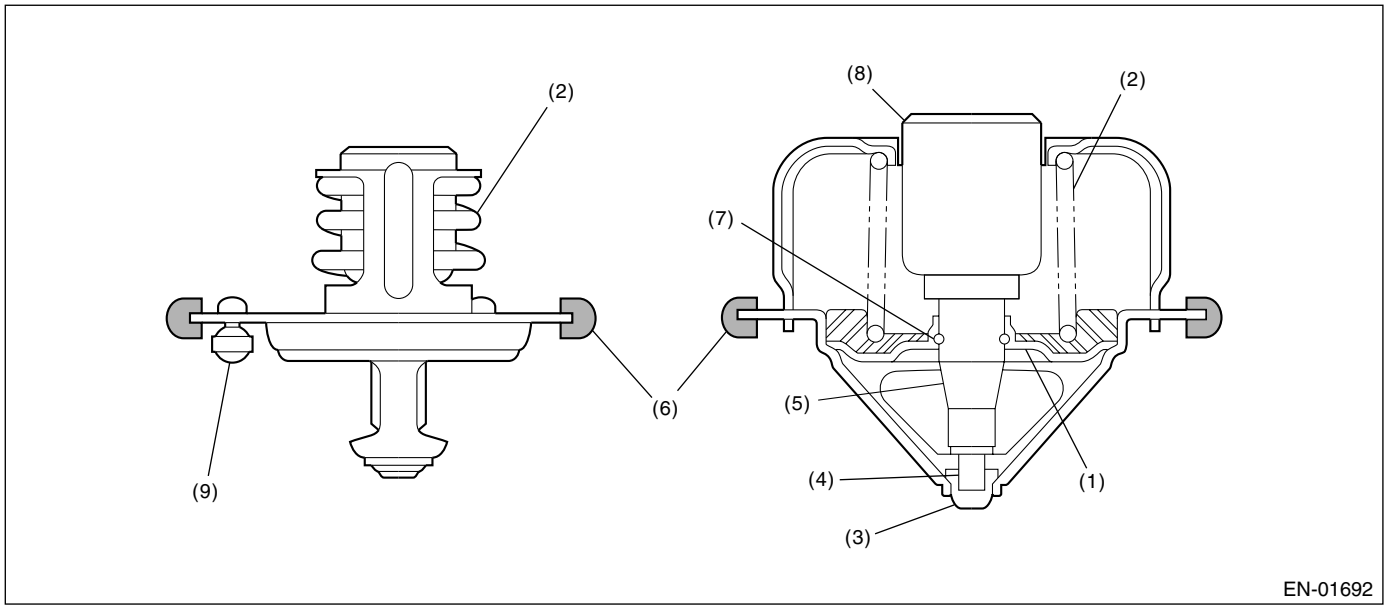
MEMO:

U: DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ –7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 75°C (167°F)
Engine coolant temperature	≤ 75°C (167°F)
(Estimated – measured) coolant temperature	> 20°C (68°F)

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ –7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 75°C (167°F)
(Estimated – measured) coolant temperature	≤ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

V: DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine starting	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for atmospheric pressure sensor property	Not finished

4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine starting – manifold absolute pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.262 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

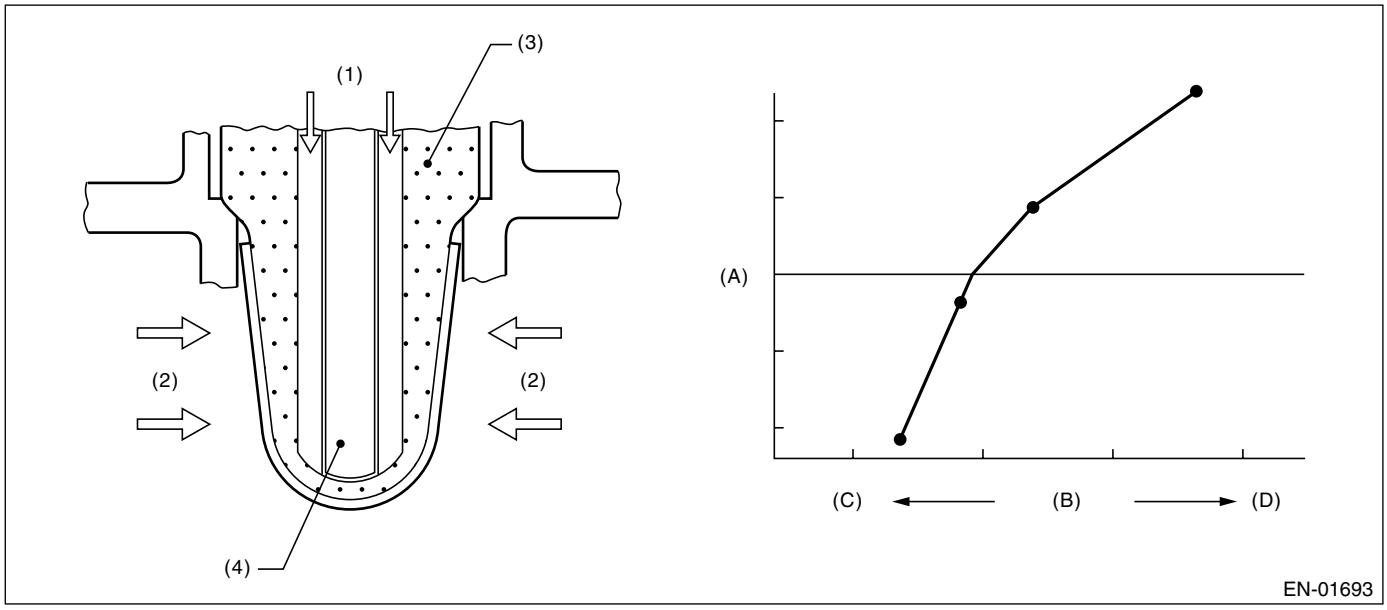
MEMO:

W: DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the short circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor judges NG when the data of voltage (AFC, AFV) is abnormal.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor judges NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (4.6 seconds). Front oxygen (A/F) sensor judges OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	(Battery voltage short) AFC > 4.5 V or AFV > 4.95 V (Ground short) AFC < 3.5 V or AFV < 2.5 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

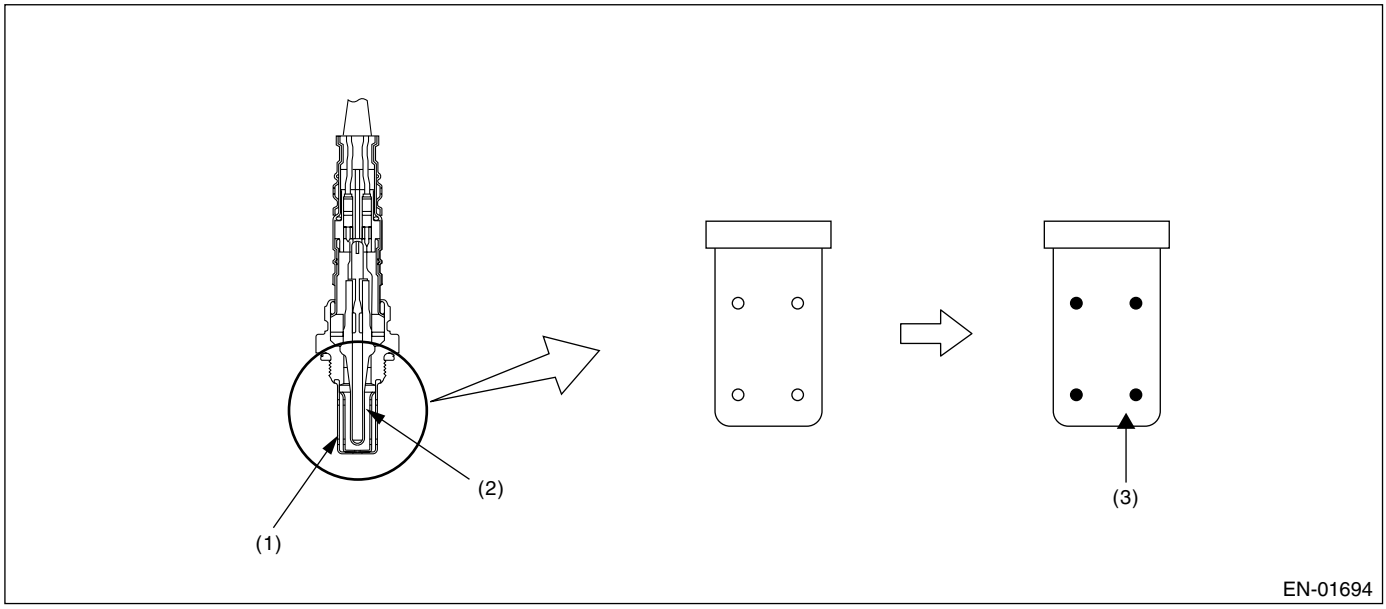
9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

X: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —

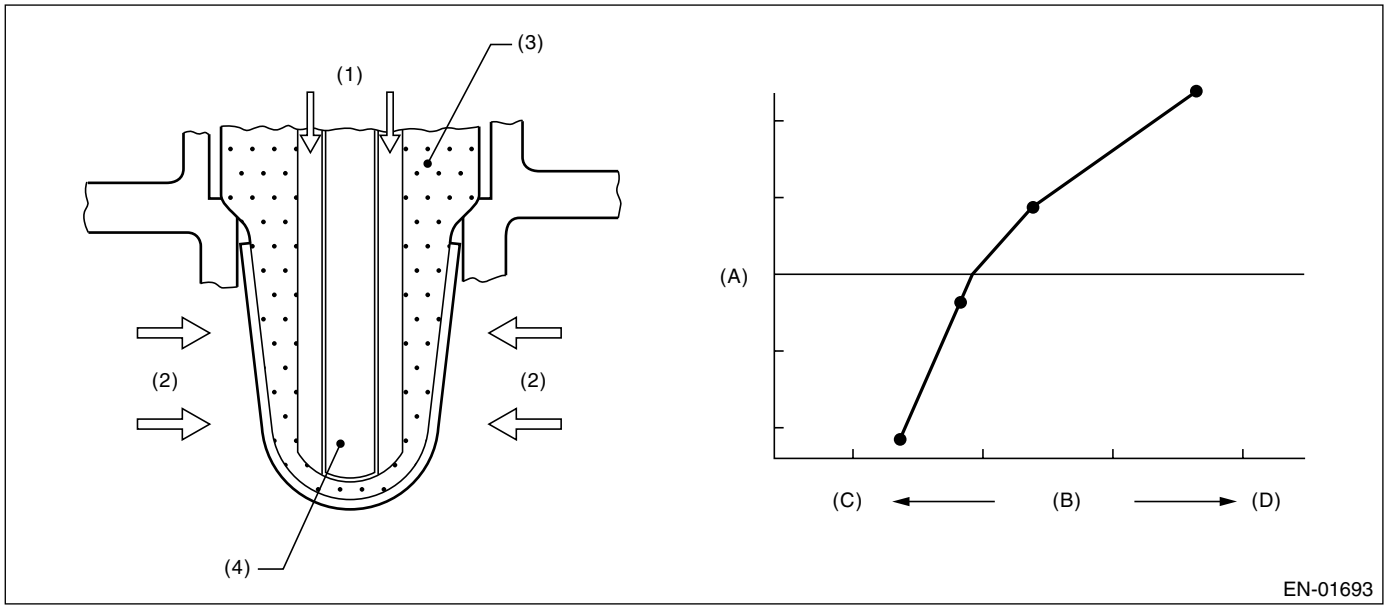
1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ←→ 52 Ω
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1000 ←→ 3200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	8 ←→ 40 g/s
Load variation during 0.5 engine revs.	≤ 1.95 kPa (14.6 mmHg, 0.575 inHg)
Purge control solenoid valve duty ratio	= 0% or ¼ 0%
All condition of EVAP canister purge	Execute
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.
After integrate 2343 times (300 seconds), calculate the diagnosis value.
Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up for a total of 300 seconds d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (n) = (lmd (n) – lmd (n–1)) – (lmd (n–1) – lmd (n–2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.25

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Rear oxygen (A/F) sensor sub learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

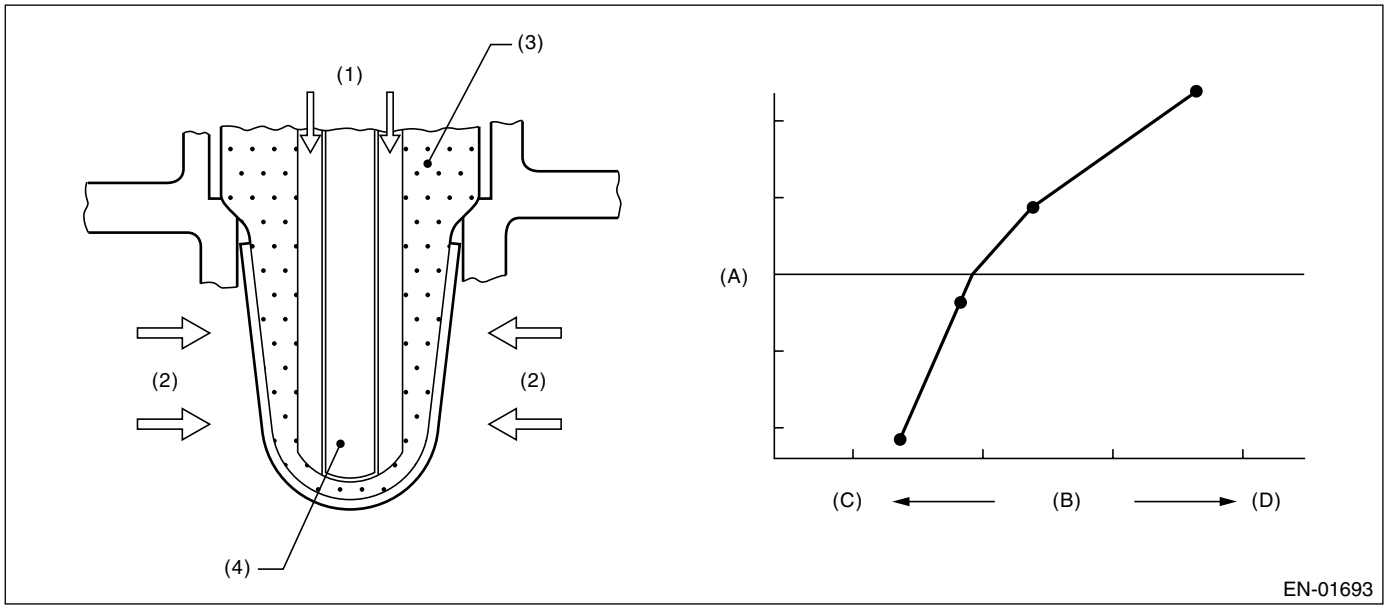
MEMO:

Y: DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor judges NG when the impedance of front oxygen (A/F) sensor is abnormal.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor judges NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds). Front oxygen (A/F) sensor judges OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor (open circuit)	> 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0.
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

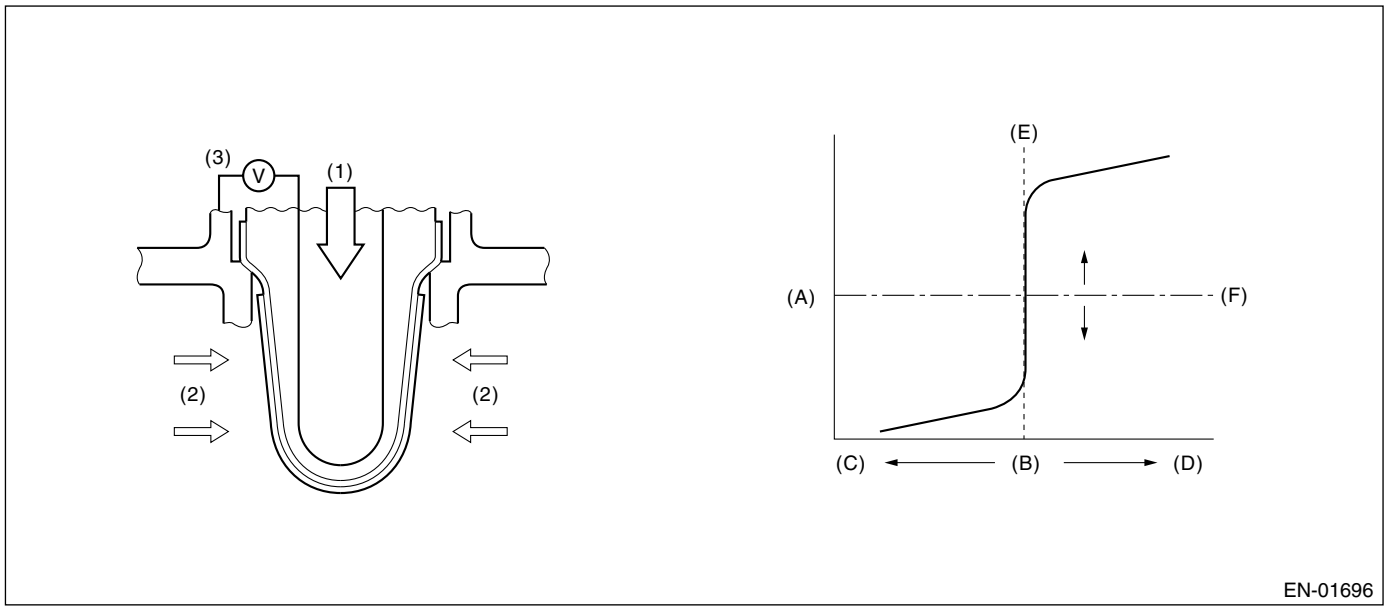
Memorize the freeze frame data. (For test mode $02)

Z: DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control with rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V
Amount of intake air	≥ 10 g/s
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	≤ 6 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 500 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 500 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

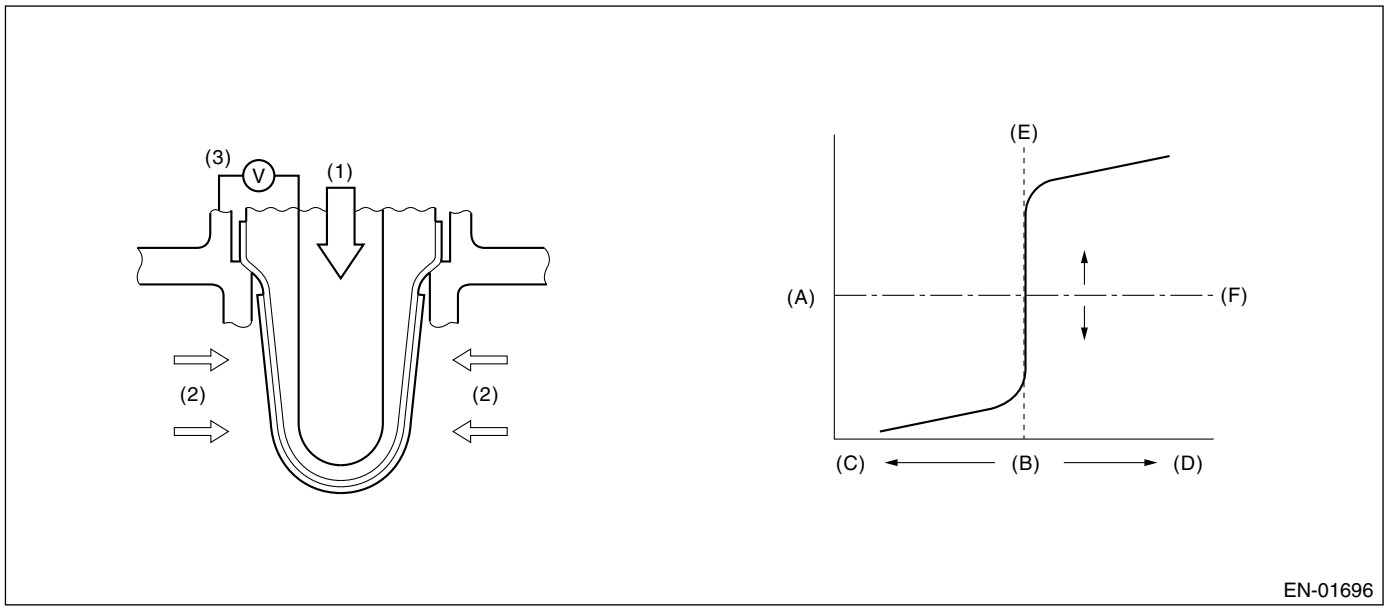
Memorize the freeze frame data. (For test mode $02)

AA:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control with rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V
Amount of intake air	≥ 10 g/s
Engine coolant temperature	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	≤ 6 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage with main feedback control	> 10.9 V
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 200 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 200 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AB:DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —

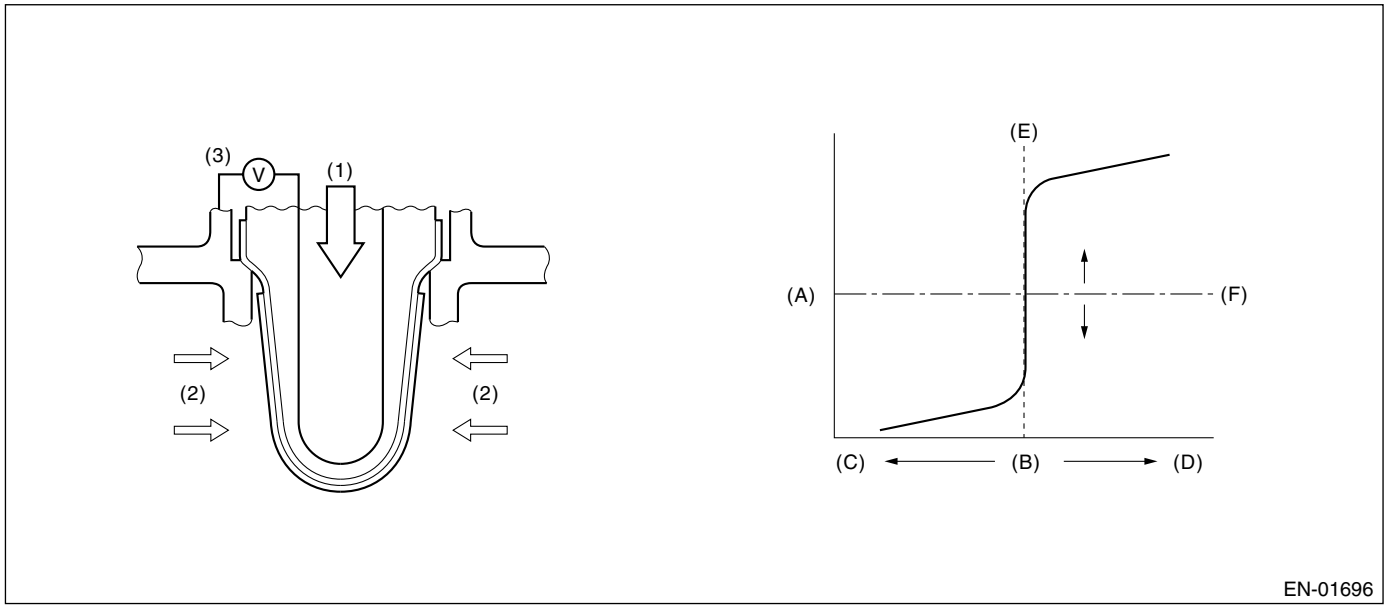
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

• Diagnostic Method

Measure the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

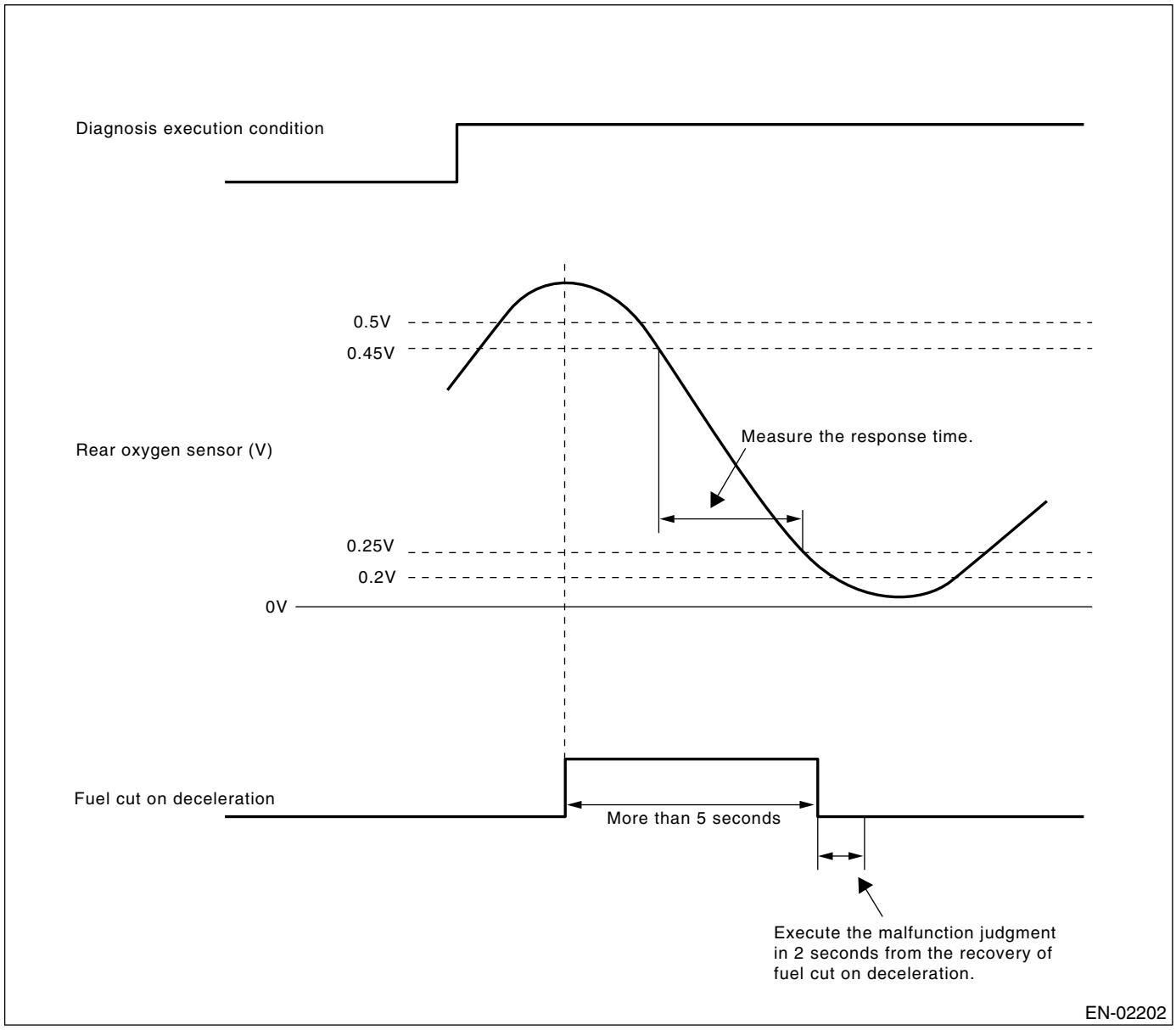
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Closed loop control with rear oxygen sensor	In operation
5 seconds or more fuel shut-off at deceleration	Experienced
After fuel shut-off	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration in order to calculate the diagnostic value.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.2 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.45 V to 0.25 V.



• Abnormality Judgment

Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 5 seconds after the recovery of fuel shut-off in deceleration which requires 5 seconds or more. Judge OK when the malfunction criteria below are not completed regardless of the fuel shut-off in deceleration.

• Judgment Value

Judge NG when the malfunction criteria below are completed.

Malfunction Criteria	Threshold Value
Shortest time change from rich (450 mV O_2 output) to lean (250 mV) if voltage reduces from 500 mV to 200 mV.	≥ 327 milliseconds

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AC:DTC P0150 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

NOTE:
For detecting condition, refer to DTC P0130. <Ref. to GD(H6DO)-56, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AD:DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

NOTE:
For detecting condition, refer to DTC P0133. <Ref. to GD(H6DO)-58, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AE:DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

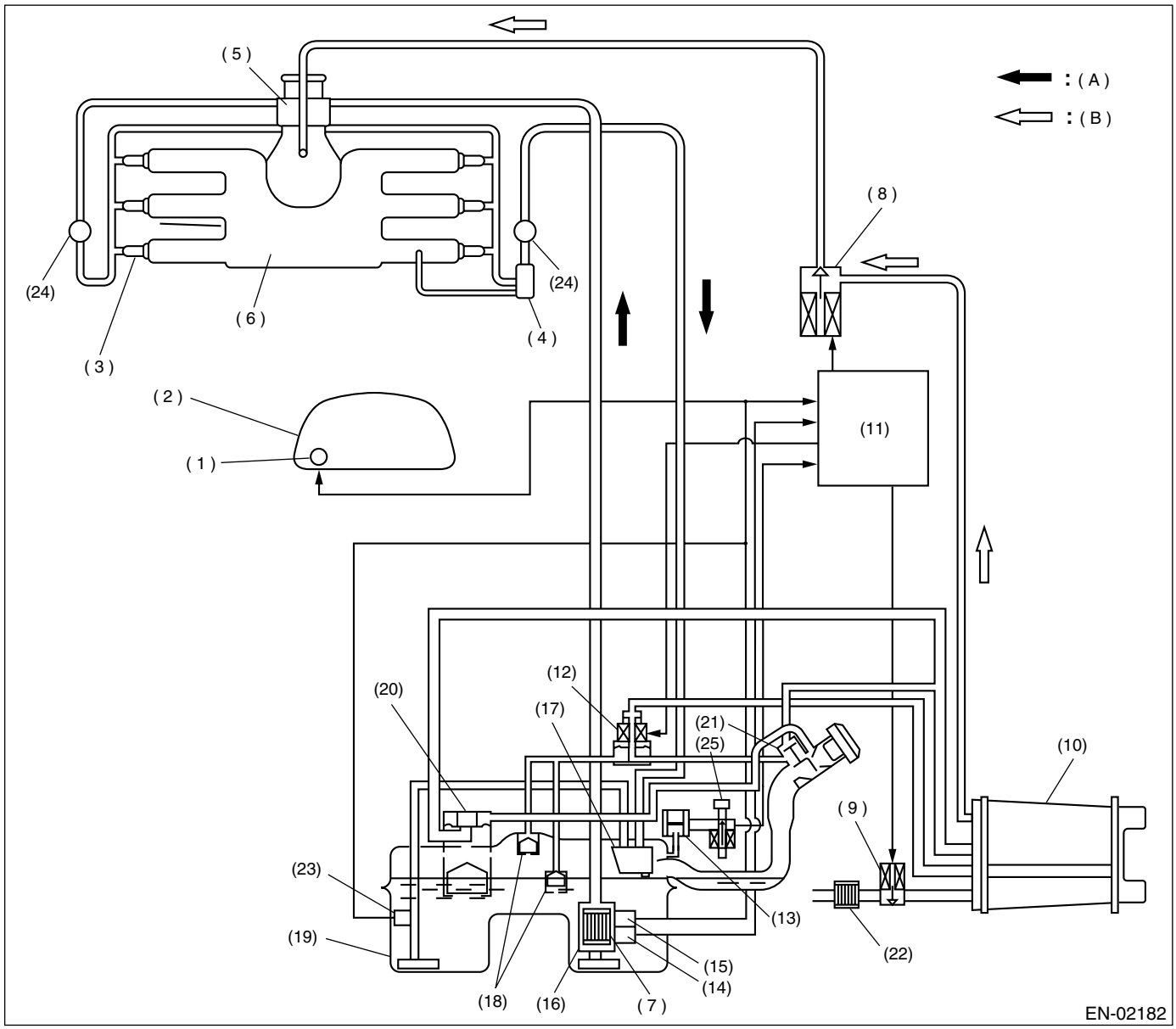
NOTE:
For detecting condition, refer to DTC P0134. <Ref. to GD(H6DO)-62, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AF:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Fuel meter
(2) Combination meter
(3) Fuel injector
(4) Pressure regulator
(5) Throttle body
(6) Intake manifold
(7) Fuel filter
(8) Purge control solenoid valve
(9) Drain valve
(10) Canister
(11) Engine control module (ECM)
(12) Pressure control solenoid valve
(13) Fuel tank pressure sensor
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel tank
(20) Vent valve
(21) Shut-off valve
(22) Drain filter
(23) Fuel sub level sensor
(24) Fuel damper
(25) Tank pressure switching solenoid valve
(A) Fuel line
(B) Evaporation line

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 ←→ 119 °C (167 ←→ 246°F)
Change of intake pressure every 0.5 engine rev.	< 1.9 kPa (14 mmHg, 0.55 inHg)
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	10 seconds or more
Intake manifold absolute pressure	≤ Map 1

Map 1

Engine speed (rpm)	Idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Intake manifold absolute pressure kPa (mmHg, inHg)	na	30.1 (226, 8.90)	23.9 (179, 7.05)	23.3 (175, 6.89)	24.0 (180, 7.09)	23.1 (173, 6.81)	24.7 (185, 7.28)	26.8 (201, 7.91)	28.9 (217, 8.54)	31.2 (234, 9.21)	33.3 (250, 9.84)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously idling after warm-up or at a constant vehicle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ fsobdL1
where,	See Map 4
sglmd = measured lambda	
tglmda = target lambda	fsobdL1 = lean side threshold value of fsobd
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

8. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

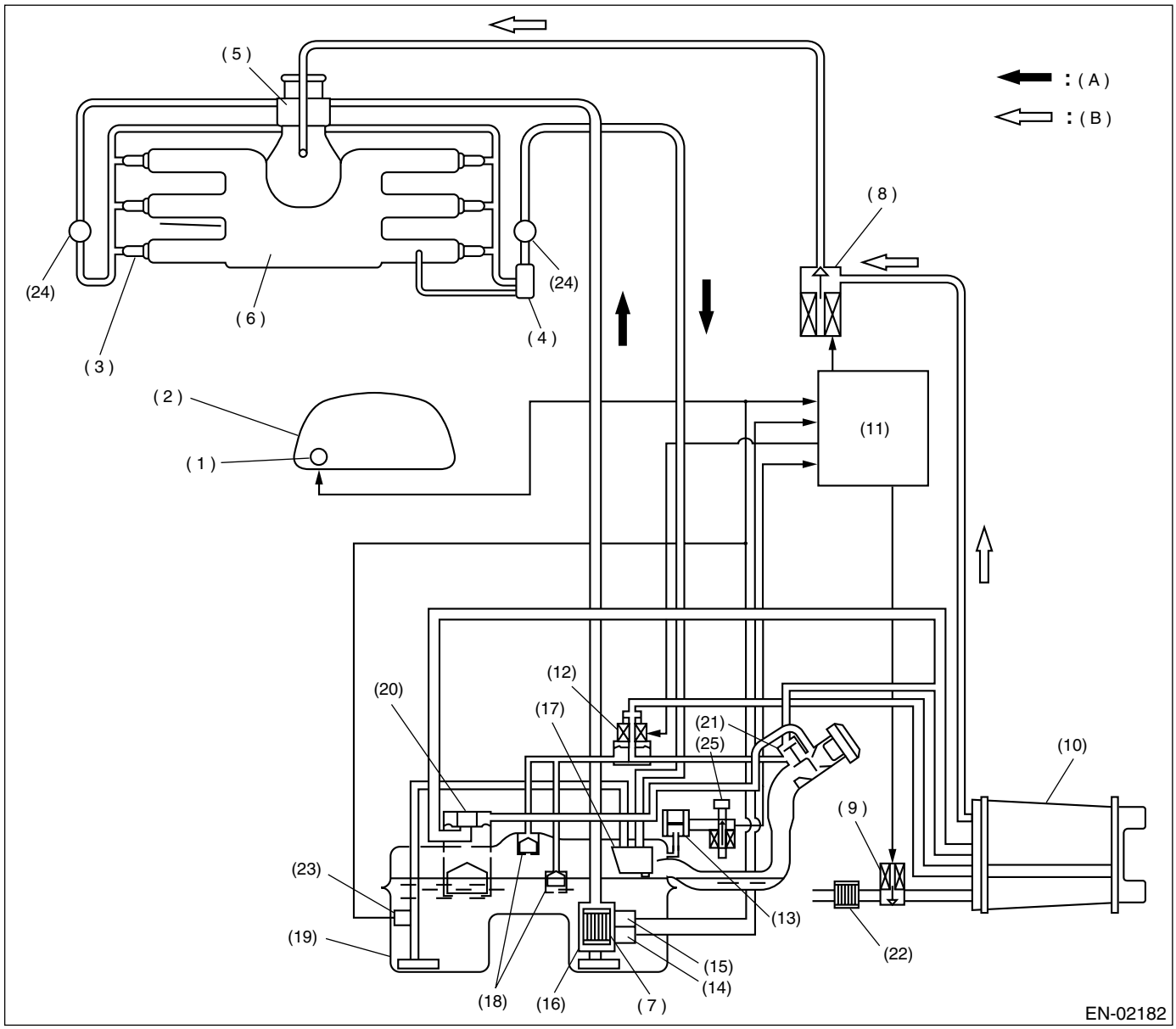
MEMO:

AG:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Fuel meter
(2) Combination meter
(3) Fuel injector
(4) Pressure regulator
(5) Throttle body
(6) Intake manifold
(7) Fuel filter
(8) Purge control solenoid valve
(9) Drain valve
(10) Canister
(11) Engine control module (ECM)
(12) Pressure control solenoid valve
(13) Fuel tank pressure sensor
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel tank
(20) Vent valve
(21) Shut-off valve
(22) Drain filter
(23) Fuel sub level sensor
(24) Fuel damper
(25) Tank pressure switching solenoid valve
(A) Fuel line
(B) Evaporation line

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 ←→ 119 °C (167 ←→ 246°F)
Change of intake pressure every 0.5 engine rev.	< 1.9 kPa (14 mmHg, 0.55 inHg)
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	10 seconds or more
Intake manifold absolute pressure	≤ Map 1

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously idling after warm-up or at a constant vehicle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≤ fsobdR1
where,	See Map 4
sglmd = measured lambda	fsobdR1 = rich side threshold value of fsobd
tglmda = target lambda	
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

• Map 4

Amount of air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdR1 (%)	–40	–40	–33.2	–26.5	–26.5	–26.5	26.5

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ –20%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AH:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

NOTE:
For detecting condition, refer to DTC P0171. <Ref. to GD(H6DO)-72, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AI: DTC P0175 — SYSTEM TOO RICH (BANK 2) —

NOTE:
For detecting condition, refer to DTC P0172. <Ref. to GD(H6DO)-76, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AJ:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

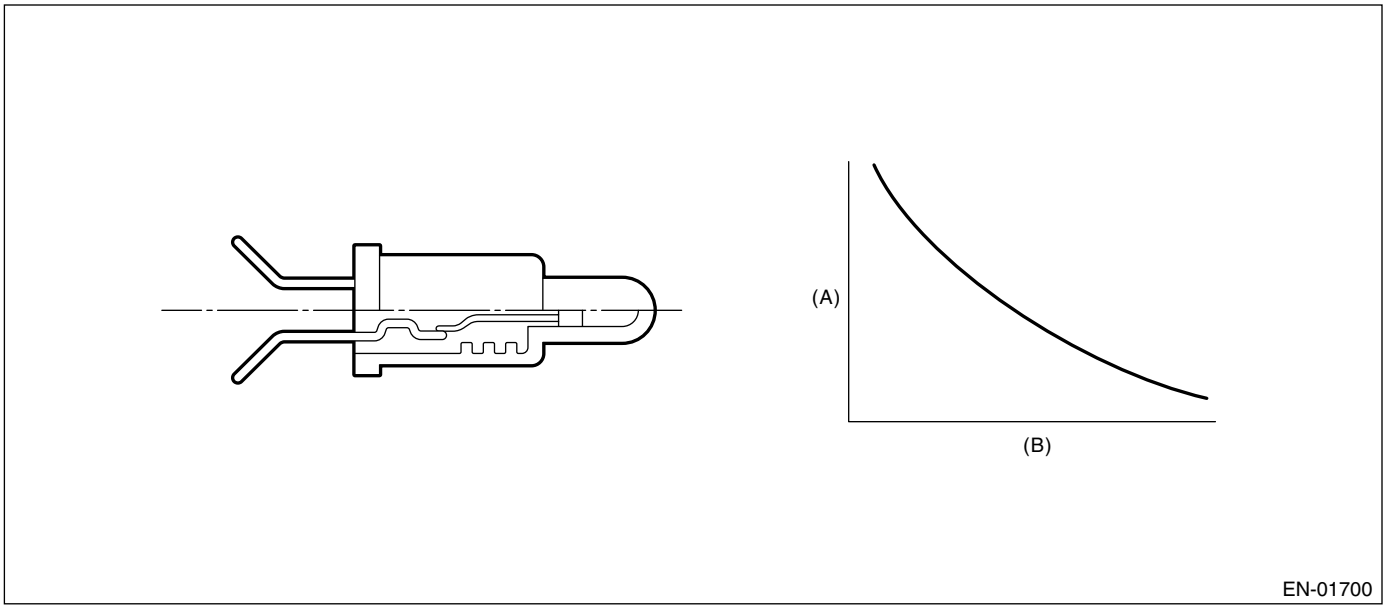
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – engine coolant temperature	≥ 10°C (18°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – engine coolant temperature	< 10°C (18°F)
Battery voltage	> 10.9 V

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 1100 kg (2425 lb)
Fuel temperature difference between Max. and Min.	< 3°C (5.4°F)

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 1100 kg (2425 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

None

12.ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

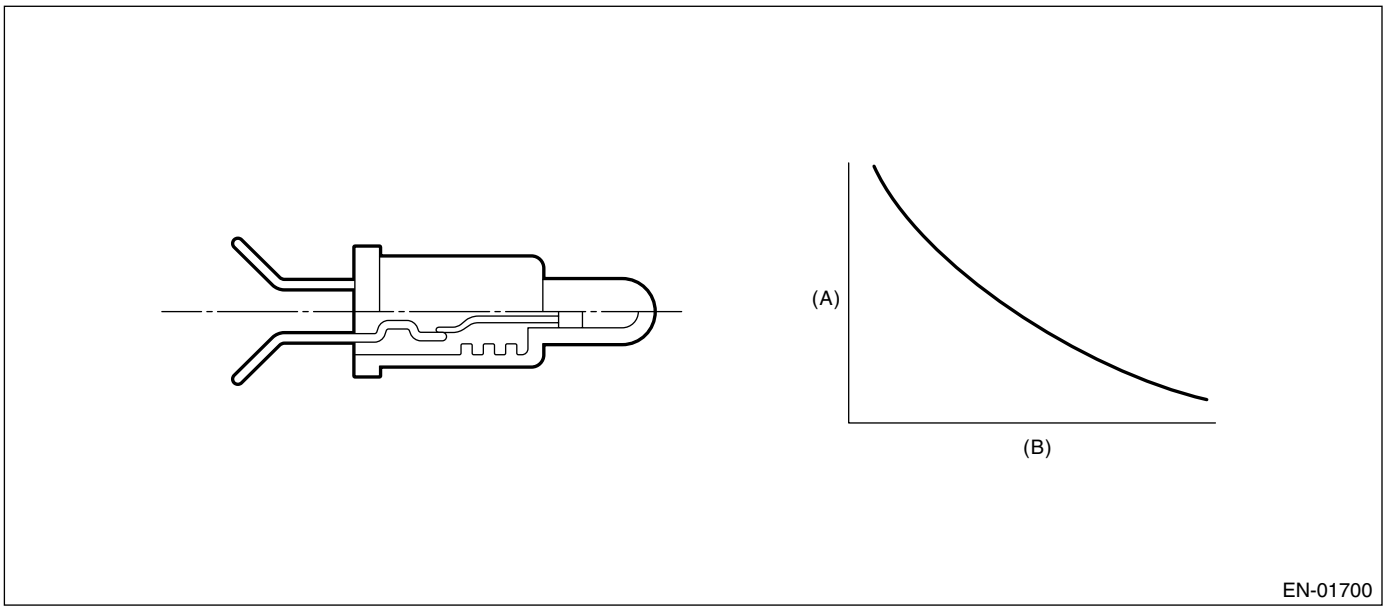
MEMO:

AK:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.245 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.245 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

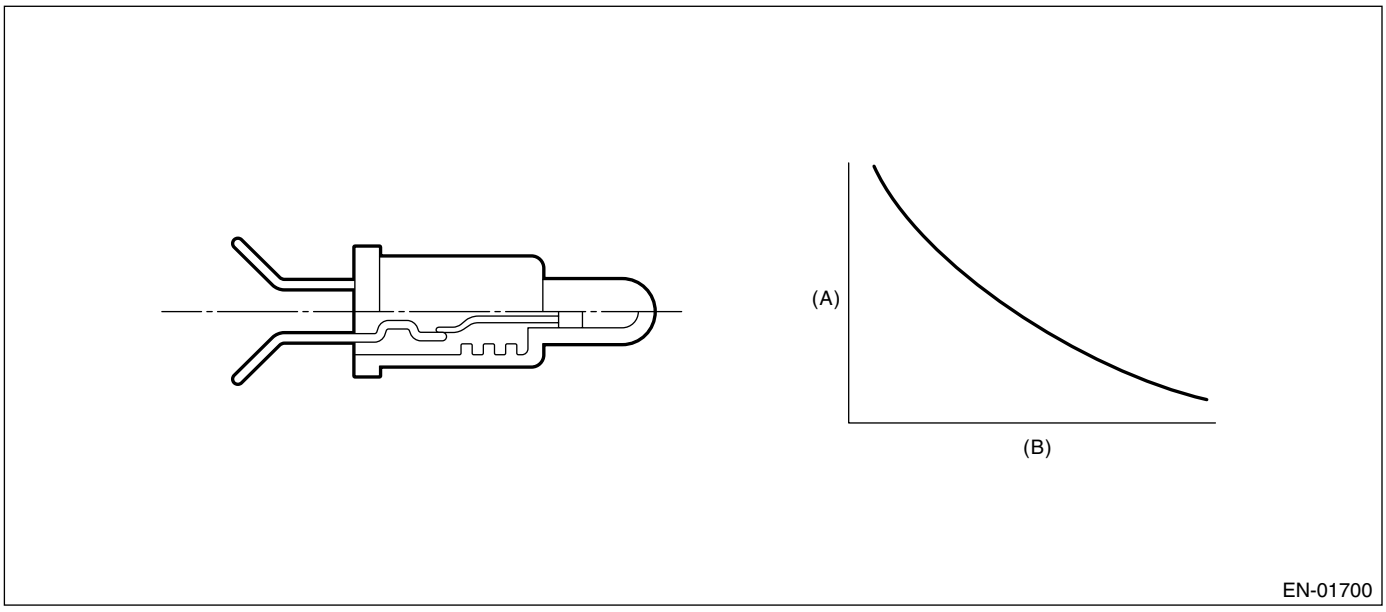
Memorize the freeze frame data. (For test mode $02)

AL:DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

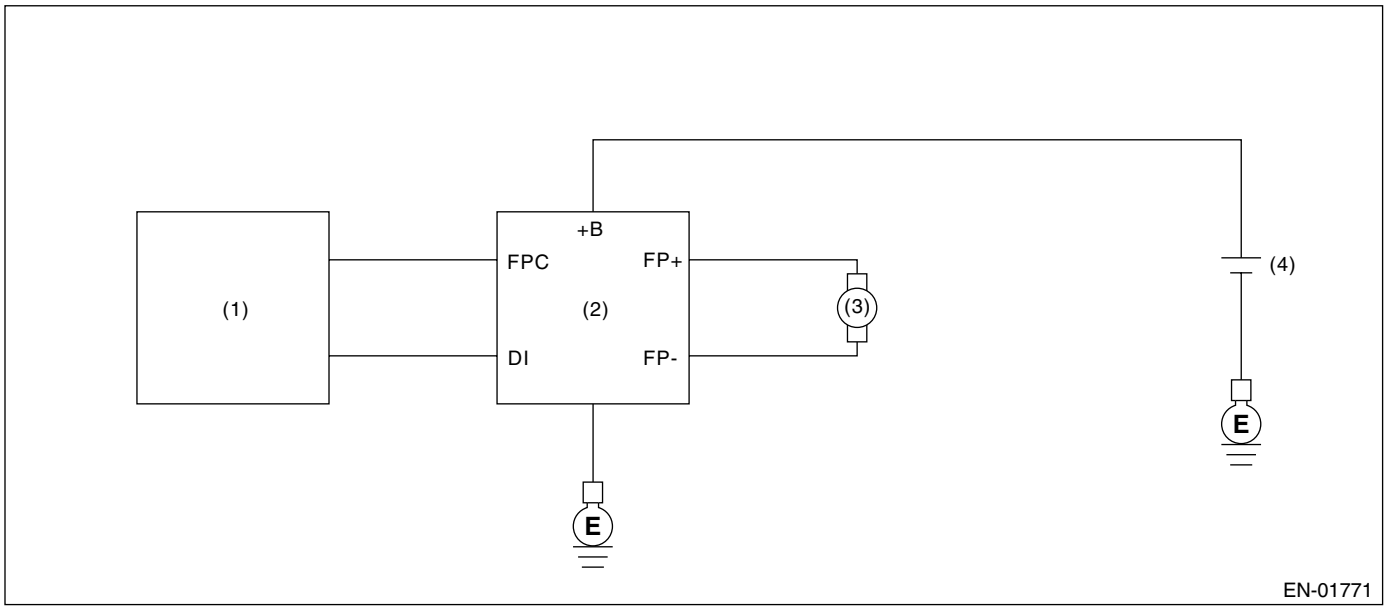
Memorize the freeze frame data. (For test mode $02)

AM:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AN:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire
- 120° Interval Difference Method
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Enable conditions of all secondary parameters	1 second or more
Intake manifold pressure change during 120°CA	< 4.56 kPa (34.18 mmHg, 1.346 inHg)
Engine speed change	< 500 rpm / 32 milliseconds
Throttle position change during 16 milliseconds	< 3.073°
Fuel shut-off function	Not operating
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Vehicle dynamic control or AT torque control	Not operating
Air condition	Not switching ON ←→ OFF
Radiator fan	Not switching ON ←→ OFF
Power steering switch	Not switching ON ←→ OFF
Starter	ON or OFF or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	400 — 6500 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Decided fuel parameters	Do not allow ultra low evaporation

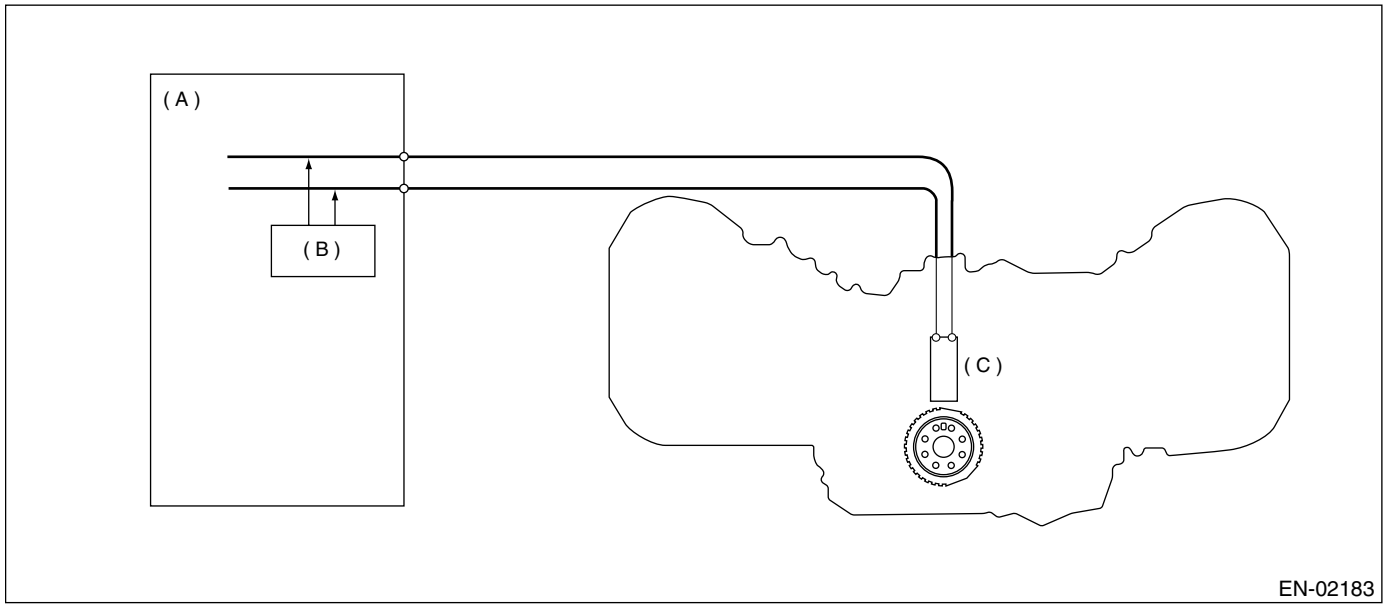
Map3

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	30.3 (227, 8.94)	24.3 (182, 7.17)	23.1 (173.0, 6.81)	23.9 (179, 7.05)	22.8 (171, 6.73)	25.7 (193, 7.60)	28.4 (213, 8.39)	31.1 (233, 9.17)	33.7 (253, 9.96)	36.4 (273, 10.75)	39.2 (294, 11.57)	41.9 (314, 12.36)	44.5 (334, 13.15)

3. GENERAL DRIVING CYCLE

- The misfire is detected from idling to high engine revolution speed if the condition is matched.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

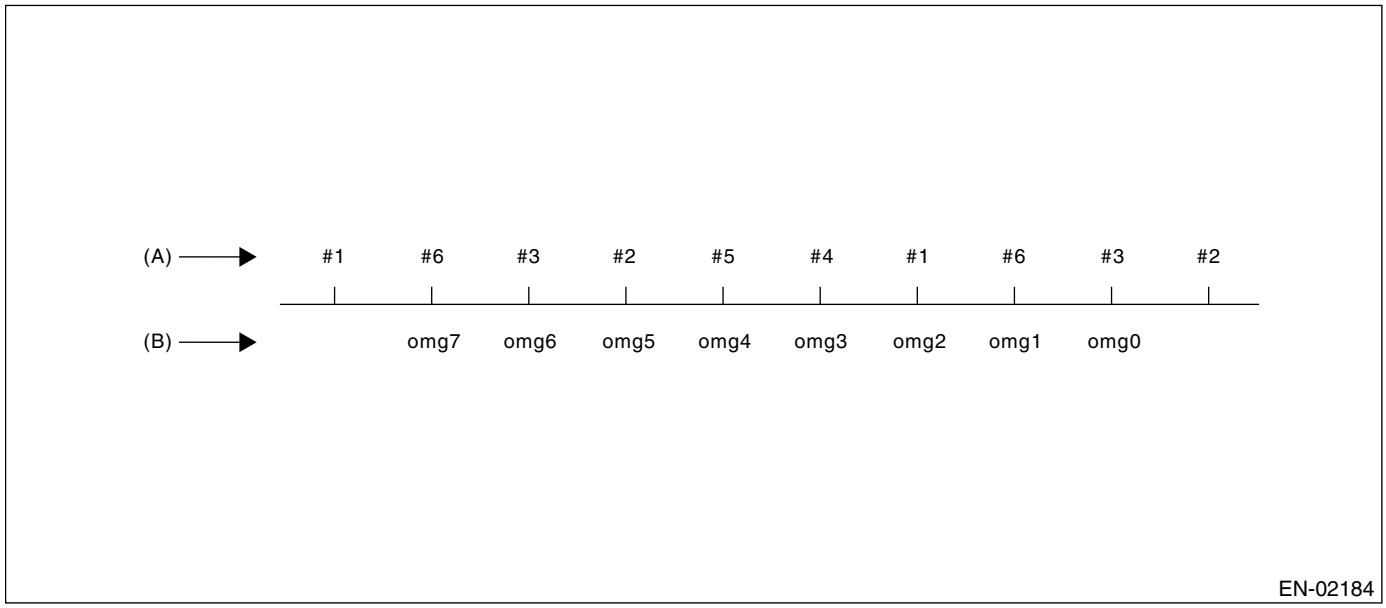


(A) Engine control module (ECM) (B) Diagnosis circuit (C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)	→	Misfire detection every single ignition (Compare diagnostic value with judgment value) • 120° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	→	NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment) • FTP1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



(A) Ignition order

(B) Crankshaft position speed

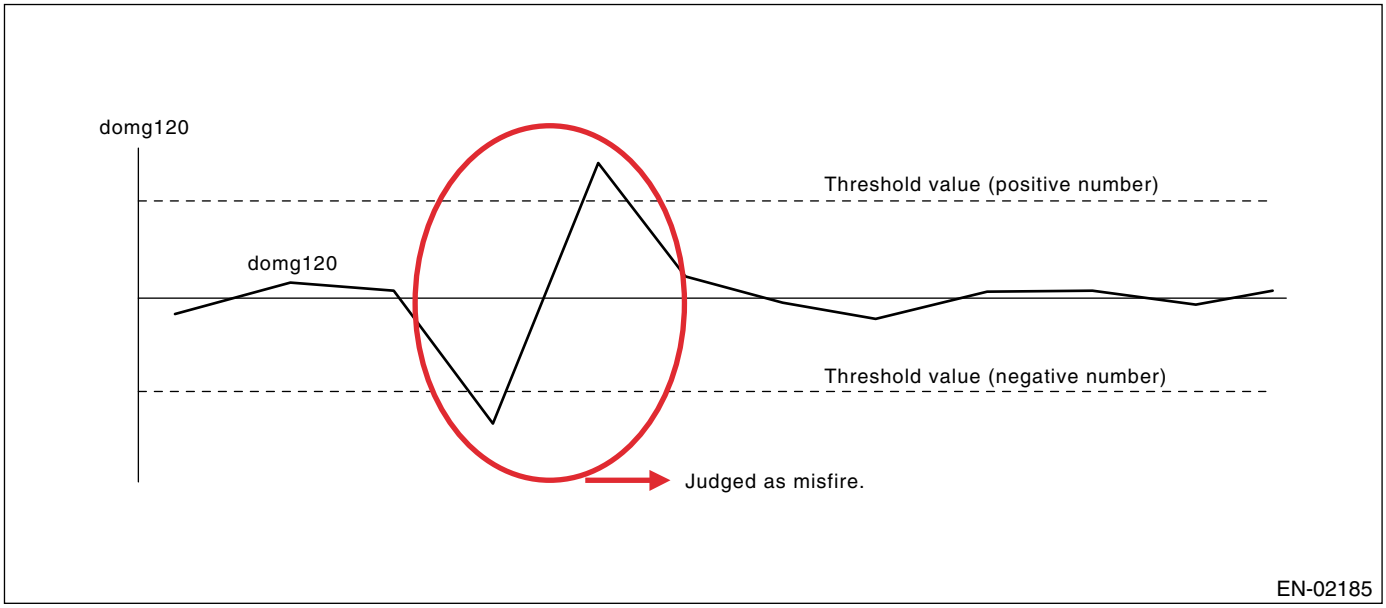
• 120° Interval Difference Method

Diagnosis value domg120 = (omg –1 omg 0) – (omg 7 – omg 1)/6

Judge misfire occurs in the following cases.

- domg 120 > judgment value of positive side
- domg 121 ≤ judgment value of negative side

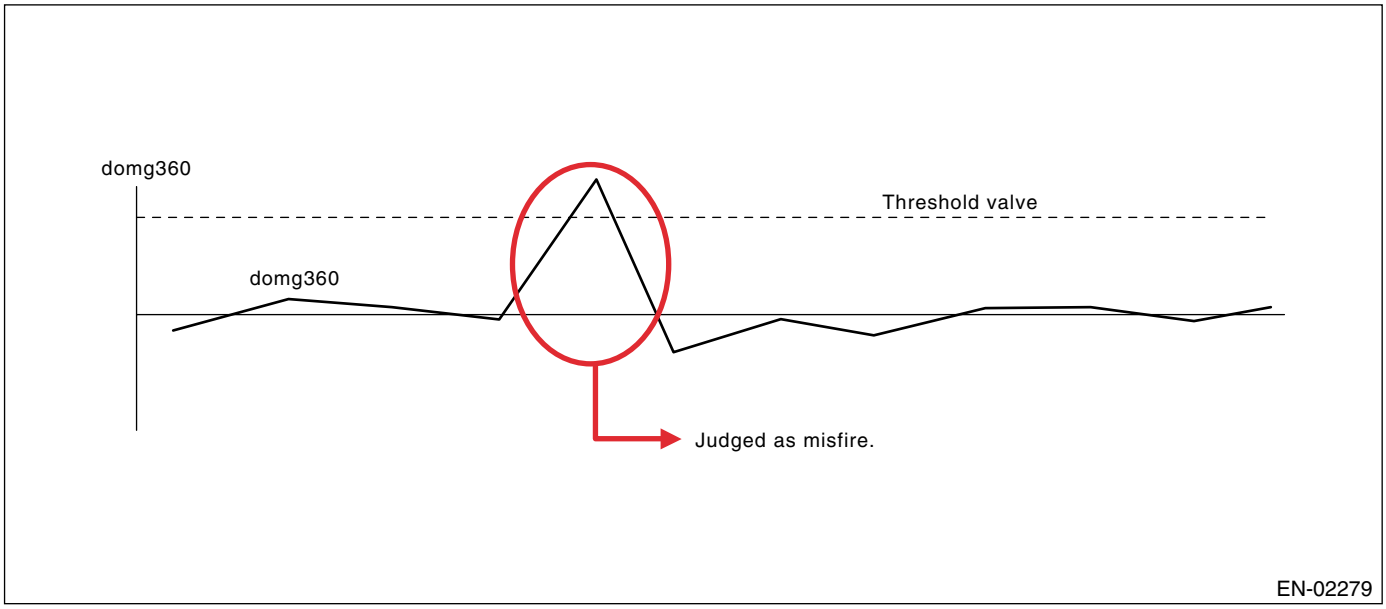
(judgment value before 120°CA)



• 360° Interval Difference Method

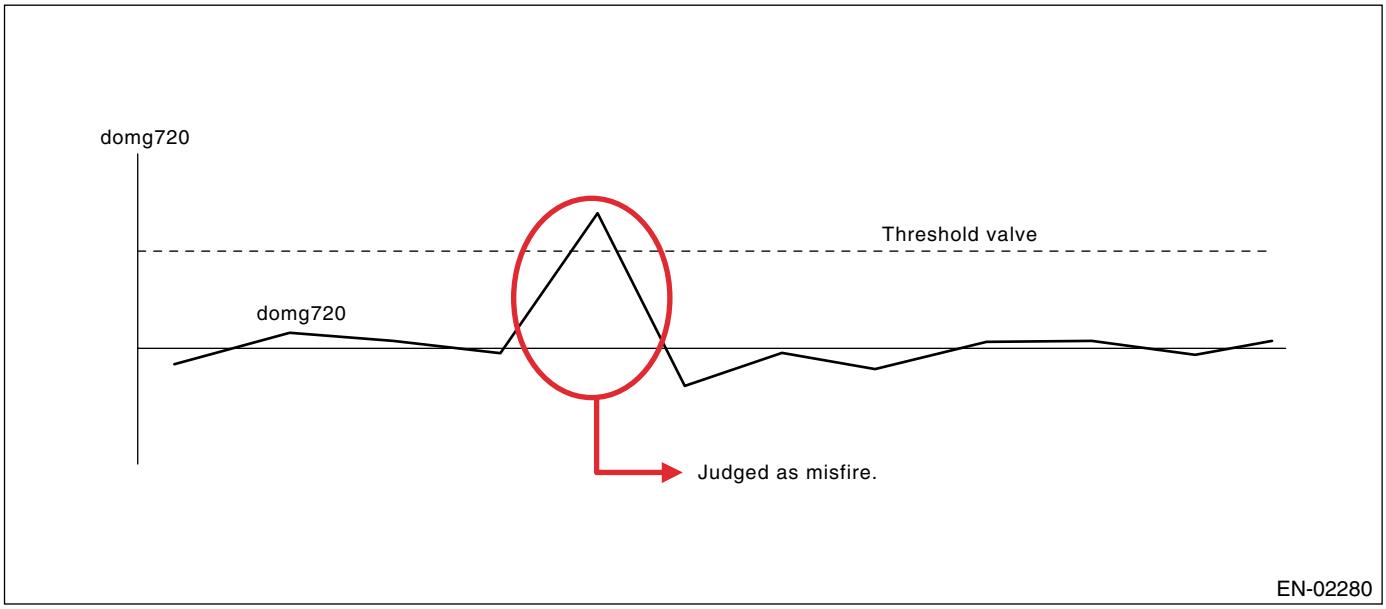
Diagnosis value domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)

Misfire judgment domg 360 > judgment value → Misfire occurs



• 720° Interval Difference Method

Diagnosis value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)		
Misfire judgment	domg 720 > judgment value	→	Misfire occurs



• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Catalyst damage misfire (Misfire occurrence level damaging catalyst)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (600 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

dEngine speed (rpm)	Intake manifold pressure kPa (mmHg, inHg)							
700	15	15	15	15	15	15	15	15
1000	15	15	15	15	15	15	15	15
1500	15	14.17	12.5	12.5	14.17	13.83	13.83	13.83
2000	12.5	15	15	14.17	13.5	12	8	8.333
2500	11.67	11.67	10.5	8.333	8.333	8.167	4.5	8.333
3000	10	8.333	8.333	7.833	8.333	8.333	3.833	5.833
3500	8.333	8.333	8.333	7.167	7.833	6.333	6.333	6.333
4000	6.833	5.5	3.833	2.833	2	4.167	5	5
4500	5	5	3.833	3.167	3.833	4.167	3.833	4.5
5000	5	4.5	2	2.667	3.333	3.5	3.833	3.833
5500	4.167	3.833	2	2	2	2	2	2
6000	4.167	3.833	2	2	2	2	2	2
6500	4.167	2.5	2	2.167	2	2	3	3.167
	28.17 (211.33, 8.32)	38.58 (289.45, 11.396)	49.00 (367.58, 14.47)	59.41 (445.7, 17.55)	69.83 (523.83, 20.623)	80.24 (601.95, 23.699)	90.65 (680.08, 26.775)	101.07 (758.2, 29.85)

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These figures mean the misfire ratio (%) in 600 ignitions; for example, 15 (%) means 600 (ignition) × 15 (%) = 90 (ignition) or more, so this case is judged misfire.
Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AO:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H6DO)-90, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AP:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H6DO)-90, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AQ:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H6DO)-90, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0305 — CYLINDER 5 MISFIRE DETECTED —

NOTE:
For detecting condition, refer to DTC P0301. <Ref. to GD(H6DO)-90, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AS:DTC P0306 — CYLINDER 6 MISFIRE DETECTED —

NOTE:
For detecting condition, refer to DTC P0301. <Ref. to GD(H6DO)-90, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

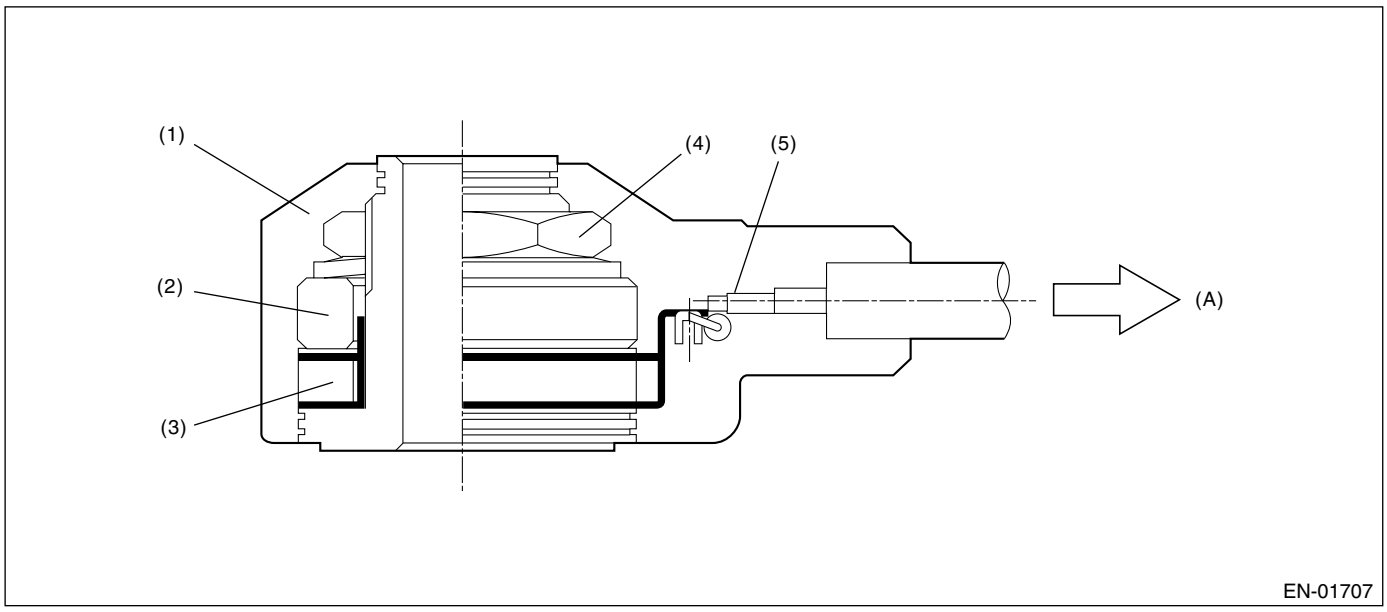
MEMO:

AT:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.2 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.2 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Knocking compensation

At normal condition: Self-learning ignition advance value = knock F/B advance + overall self-learning advance value + partial self-learning advance value
When malfunctioning: Self-learning ignition advance value = –6°CA (6°CA retard)
knock F/B advance value = 0°CA
Prohibit overall self-learning
Partially prohibit self-learning

9. ECM OPERATING AT DTC SETTING

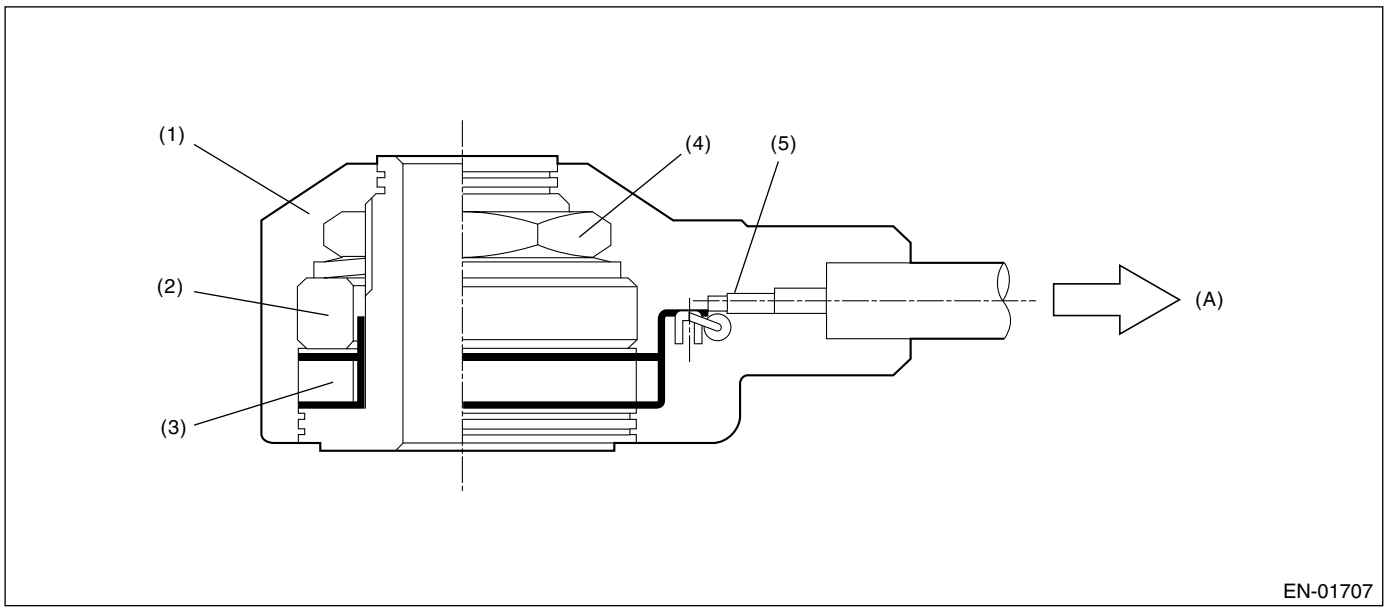
Memorize the freeze frame data. (For test mode $02)

AU:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.8 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.8 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Knocking compensation

At normal condition: Self-learning ignition advance value = knock F/B advance + overall self-learning advance value + partial self-learning advance value
When malfunctioning: Self-learning ignition advance value = –6°CA (6°CA retard)
knock F/B advance value = 0°CA
Prohibit overall self-learning
Partially prohibit self-learning

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AV:DTC P0332 — KNOCK SENSOR 2 CIRCUIT LOW INPUT (BANK 2) —

NOTE:
For the detection standard, refer to P0327. <Ref. to GD(H6DO)-98, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0333 — KNOCK SENSOR 2 CIRCUIT HIGH INPUT (BANK 2) —

NOTE:
For the detection standard, refer to P0328. <Ref. to GD(H6DO)-100, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

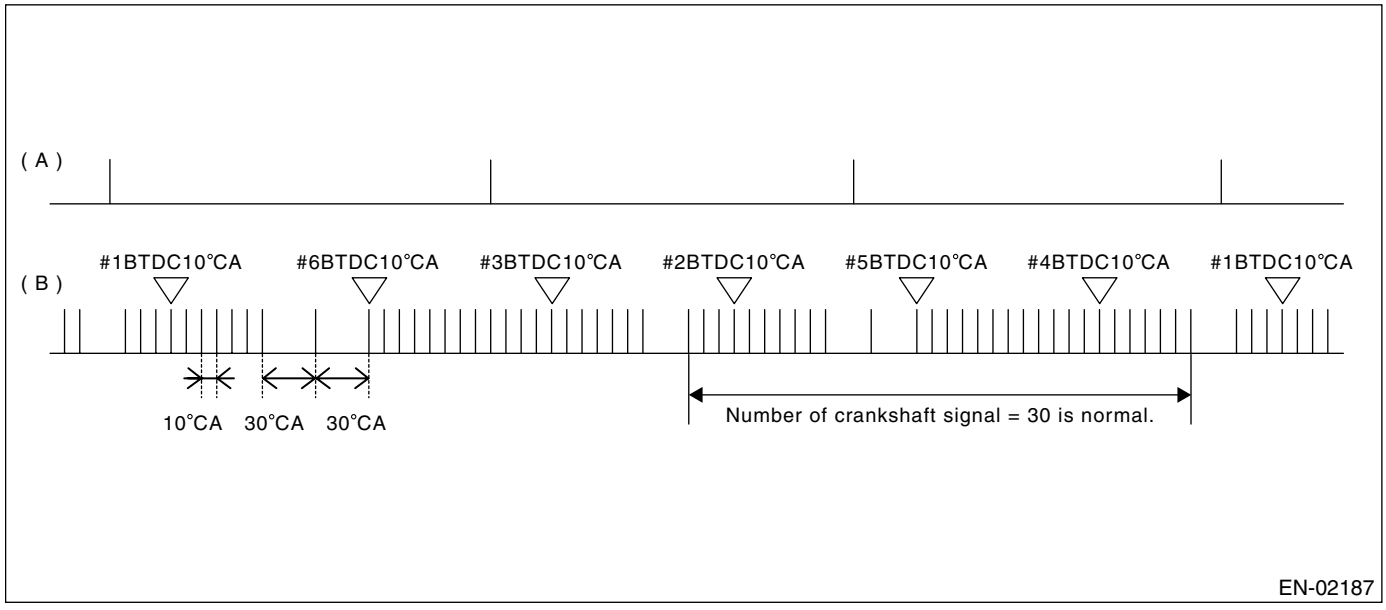
MEMO:

AX:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

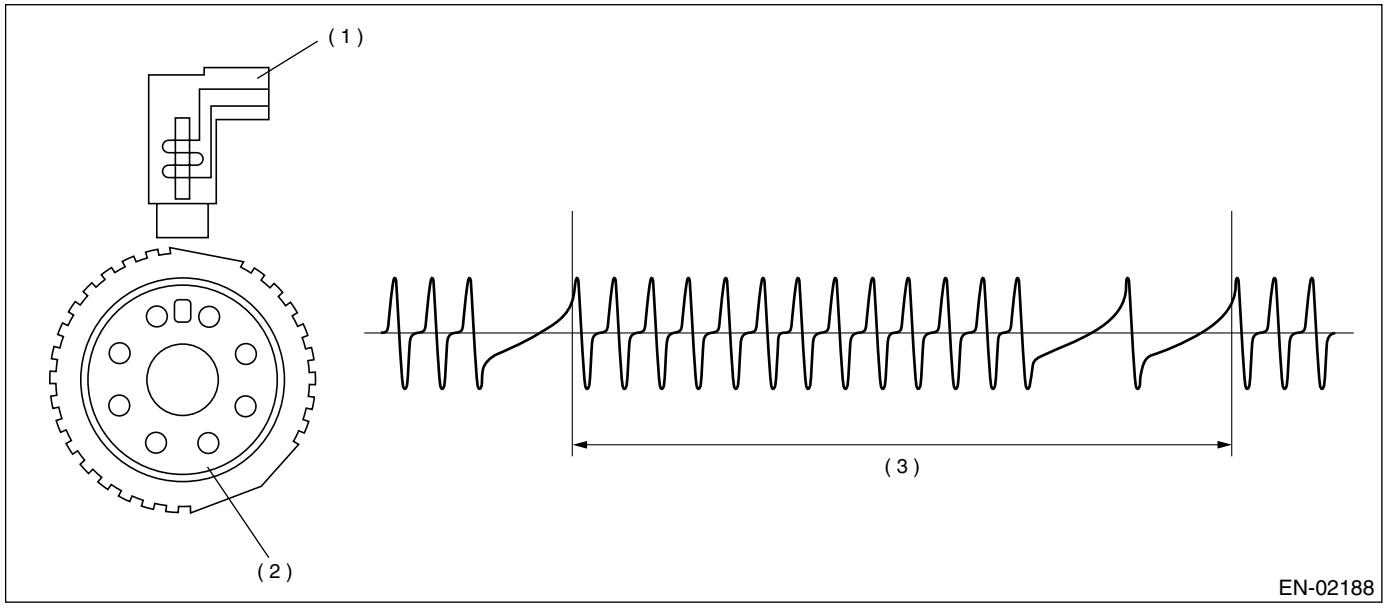
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (B) Crankshaft signal



(1) Crankshaft position sensor (2) Crankshaft sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

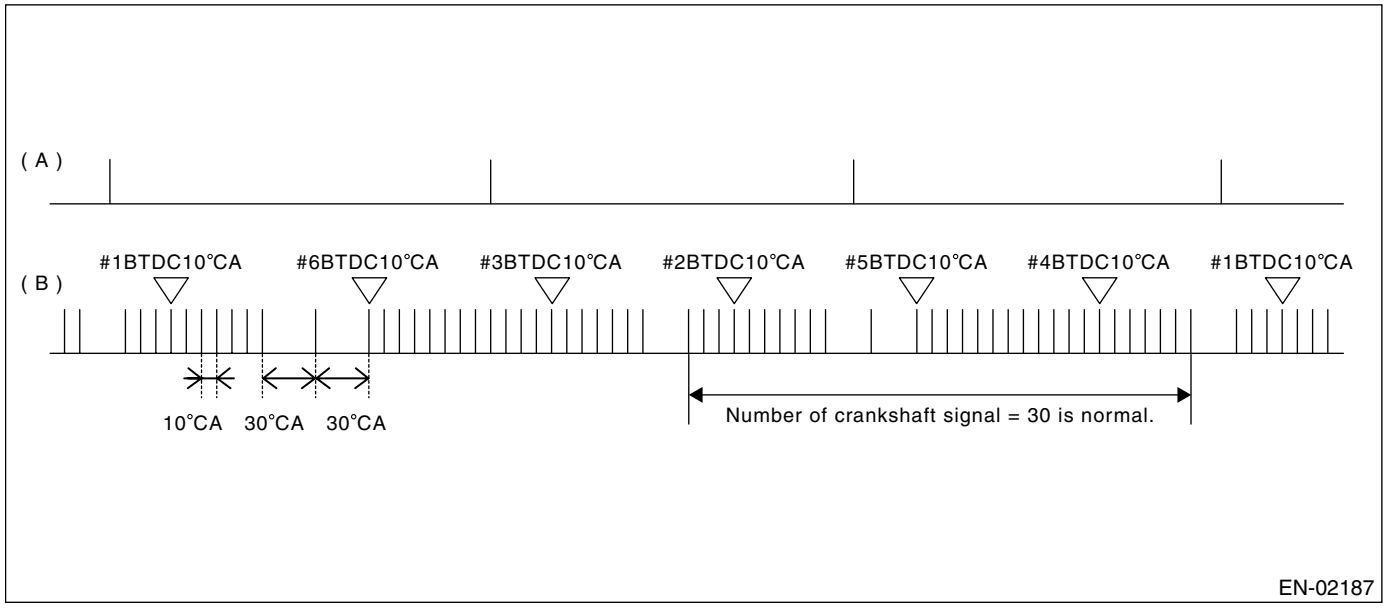
Memorize the freeze frame data. (For test mode $02)

AY:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

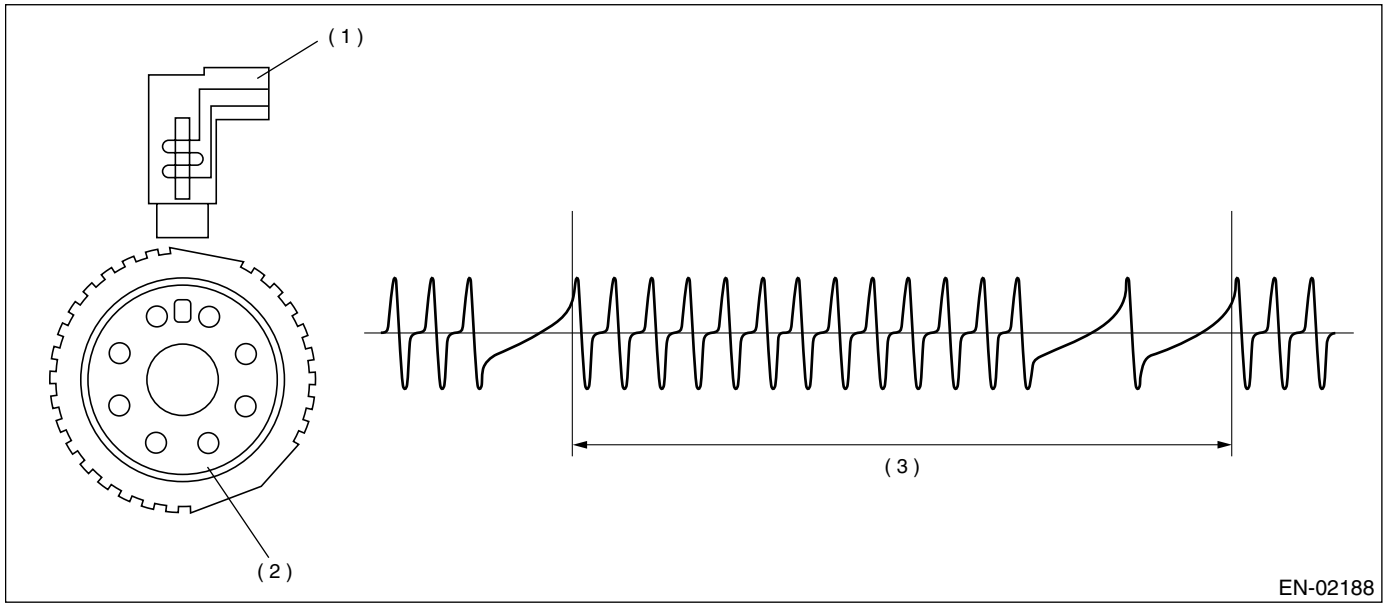
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (B) Crankshaft signal



(1) Crankshaft position sensor (2) Crankshaft sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

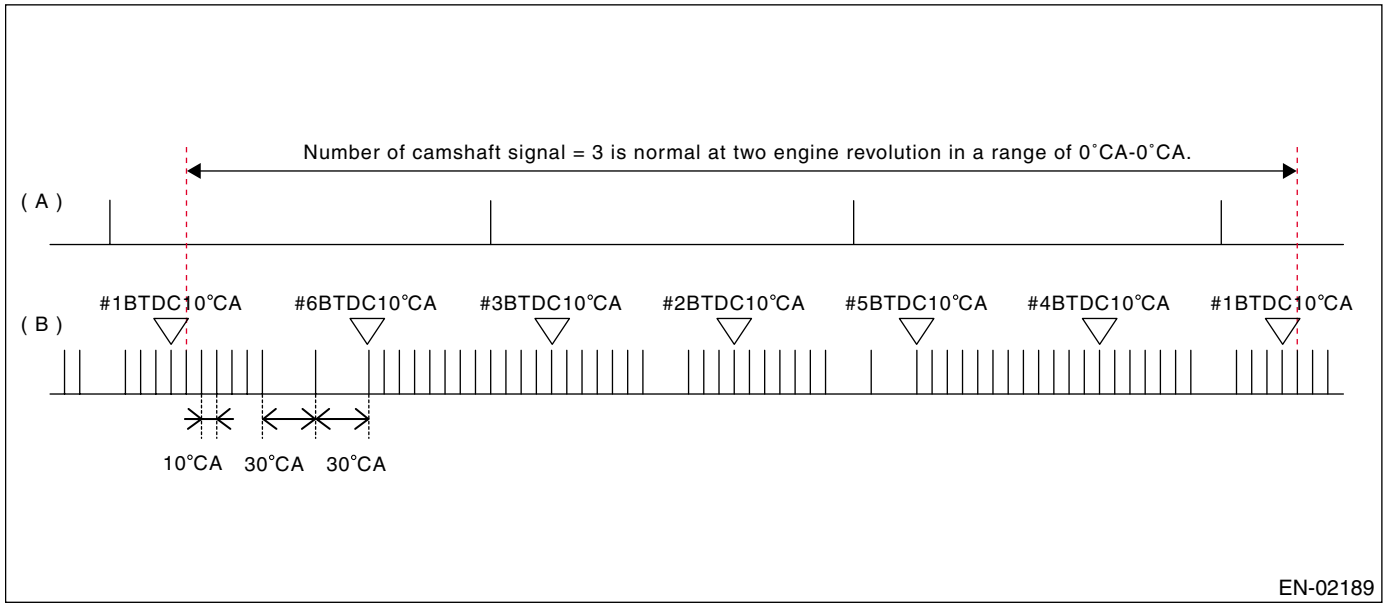
Memorize the freeze frame data. (For test mode $02)

AZ:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

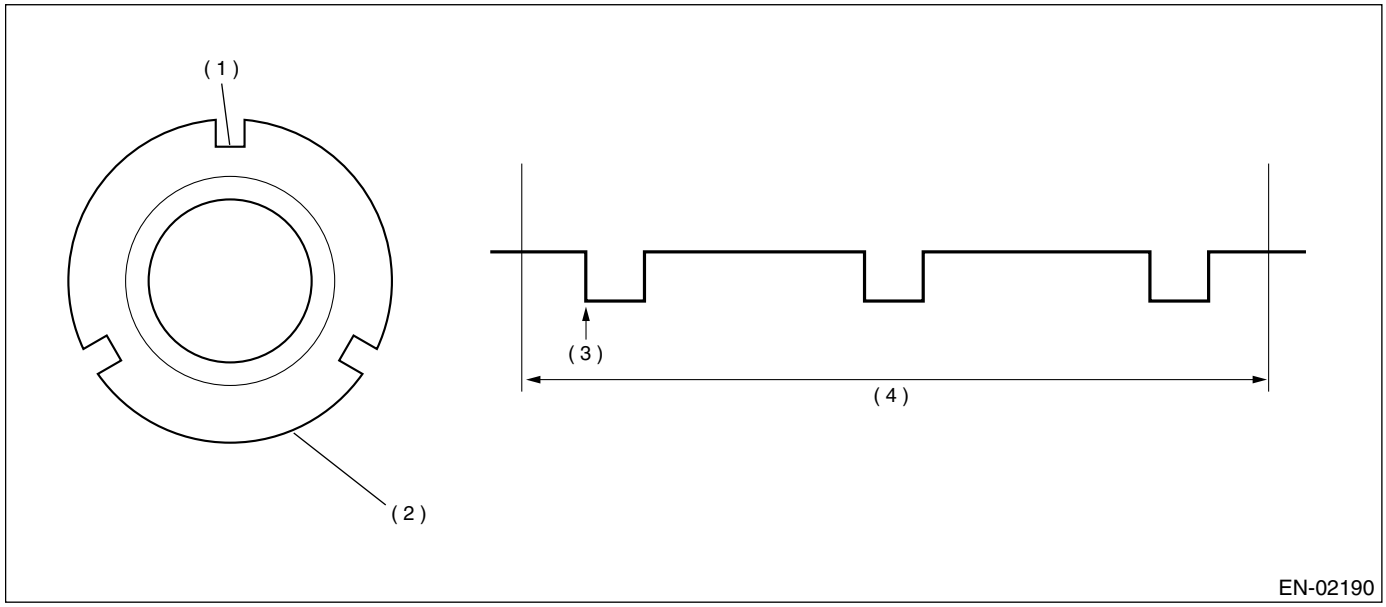
Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Slot

(2) Plate

(3) Sensing point

(4) Camshaft one revolution (Engine two revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the engine speed continues more than 8 revolutions.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Amount of camshaft sensor signal during 2 revs.	≠ 3

Time Needed for Diagnosis: 8 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Amount of camshaft sensor signal during 2 revs.	= 3

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

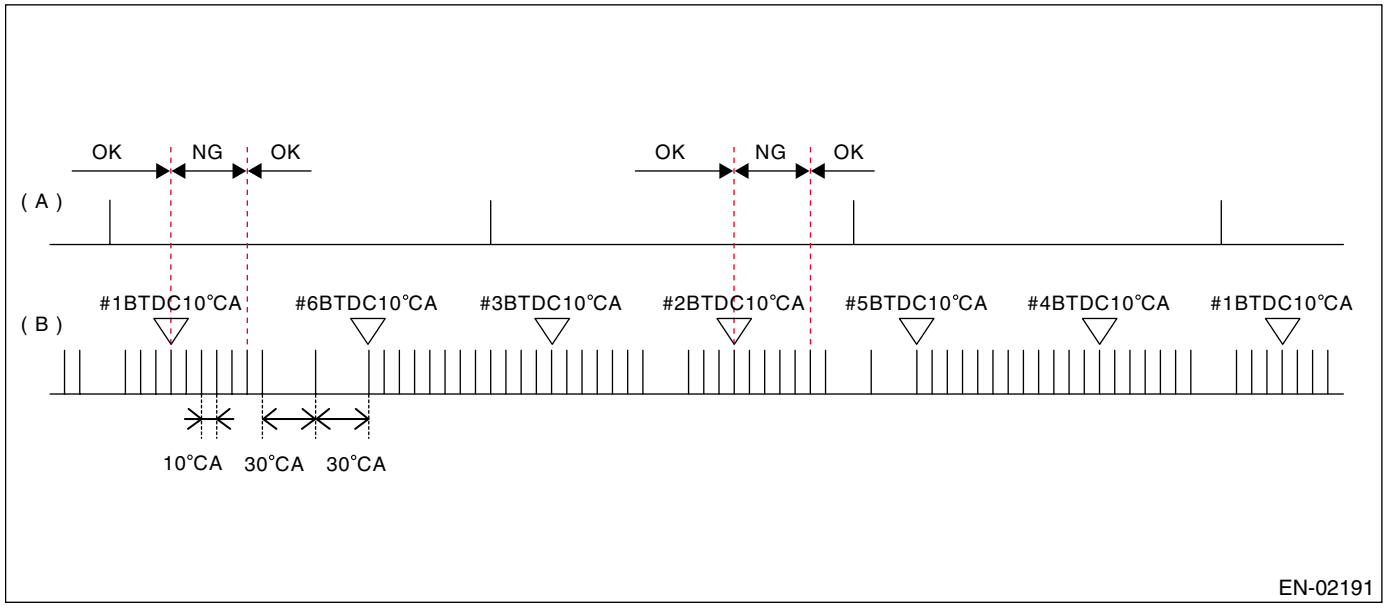
Memorize the freeze frame data. (For test mode $02)

BA:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

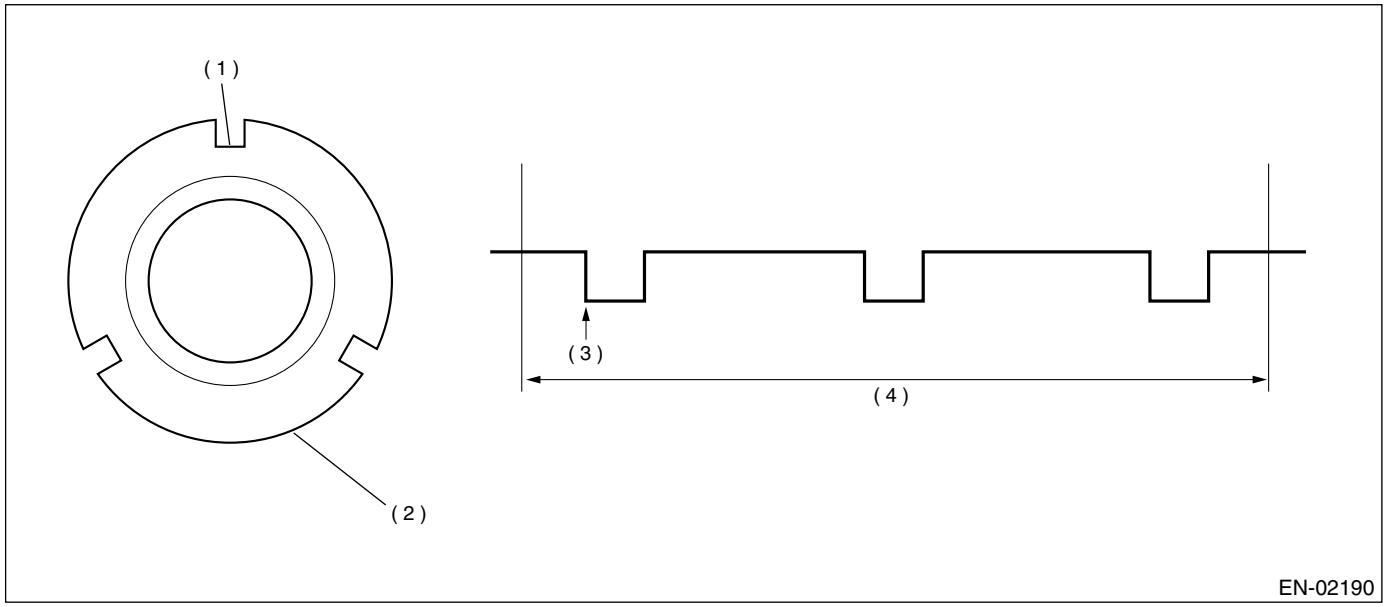
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of camshaft position sensor output property. Judge NG when the camshaft line signal input timing is shifted from the crankshaft signal because of timing belt tooth chip, etc.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Camshaft one revolution (Engine two revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Cylinder number distinction	Completed
Battery voltage	≥ 8 V
Engine speed	550 ←→ 1000 rpm
Engine operation	In idle
Misfire	Not detect

4. GENERAL DRIVING CYCLE

Perform the diagnosis at idling continuously.

5. DIAGNOSTIC METHOD

Judge NG when the engine speed continues 4 revolutions for the malfunction criteria below. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Position of camshaft position sensor signal	Between #1 BTDC 10°CA and #6 BTDC 80°CA or between #2 BTDC 10°CA and #5 BTDC 80°CA

Time Needed for Diagnosis: 4 revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

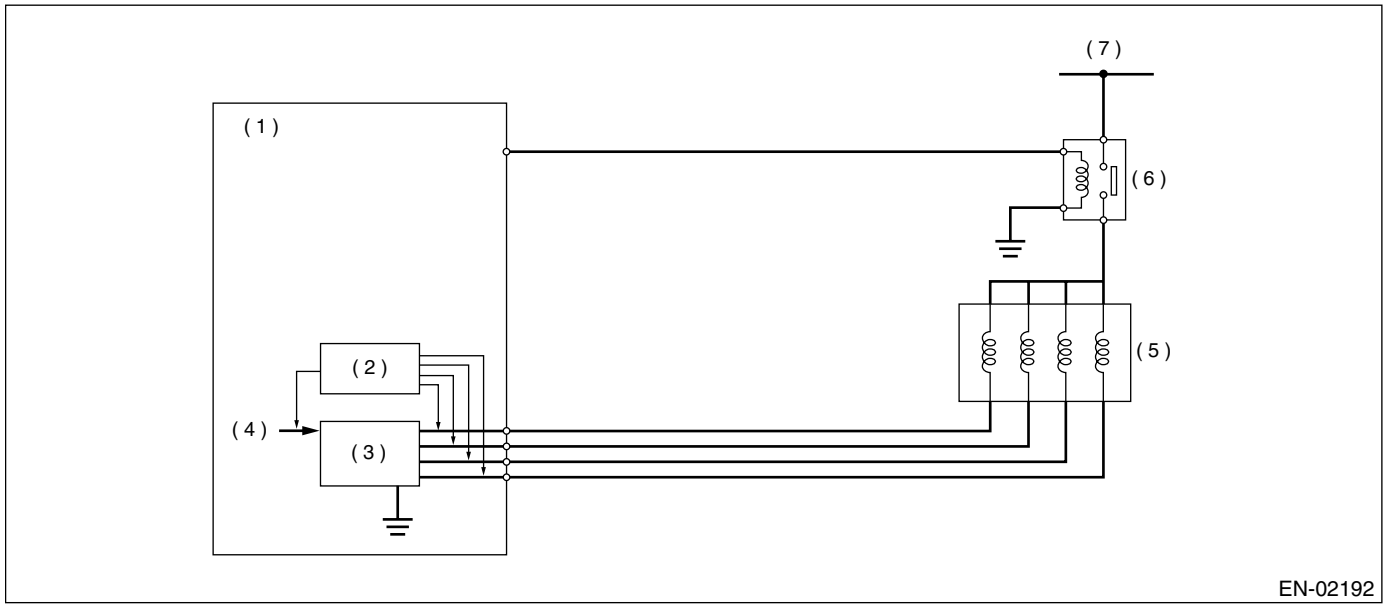
Memorize the freeze frame data. (For test mode $02)

BB:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of EGR system.
Intake manifold pressure (negative pressure) is stable because the throttle valve is fully closed during the fuel shut-off in deceleration. In this case, the intake manifold pressure changes when EGR valve is opened or closed. Judge EGR system is OK or NG according to intake manifold pressure change amount.

2. COMPONENT DESCRIPTION



(1) ECU
(2) Detecting circuit
(3) Switching circuit
(4) CPU
(5) EGR valve
(6) Main relay
(7) Battery power

3. ENABLE CONDITION

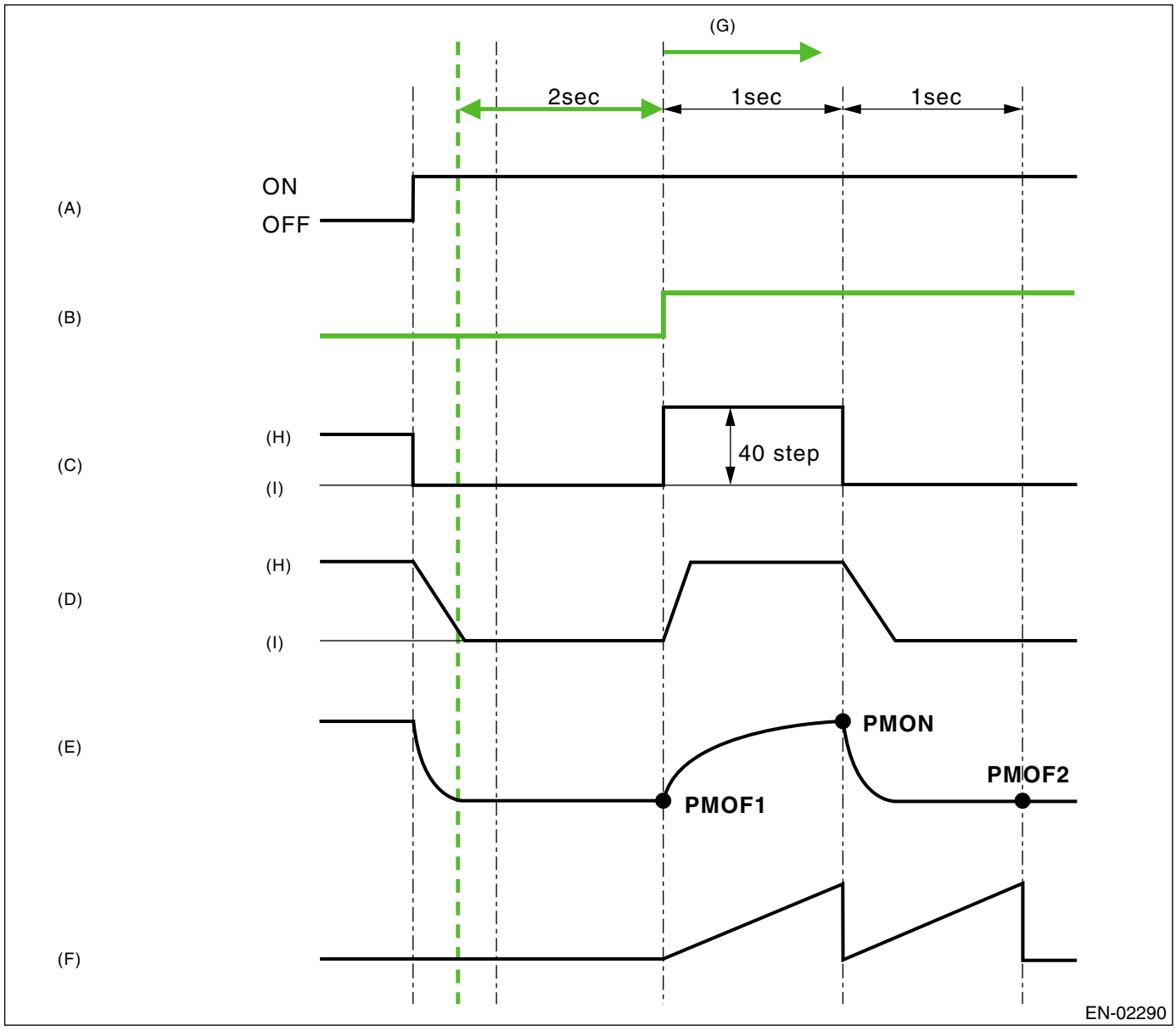
Secondary Parameters	Enable Conditions
After engine starting	40 secs. or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1050 — 3000 rpm
Intake manifold pressure (absolute pressure)	17.3 ←→ 33.3 kPa (130 ←→ 250 mmHg, 5.12 ←→ 9.84 inHg)
Estimated ambient temperature	≥ 5°C (41°F)
Throttle position	< 0.33°
Battery voltage	> 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Vehicle speed	≥ 49 km/h (30 MPH)
Fuel shut-off function	Operation
Neutral switch	Off or 5 seconds changing from “on” to “off”
After input switch operation (air conditioner, power steering, lights, rear defroster, heater fun and radiator fan)	There is no change for 5 seconds or more.
Intake manifold vacuum	–26.7 kPa (–200 mmHg, –7.87 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at the fuel shut-off in deceleration in vehicle speed 49 km/h (approx. 30 MPH). Pay attention to vehicle speed and engine speed. (The diagnosis is not completed if vehicle speed and engine speed are out of condition due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure in the following procedures when the enable conditions are completed, and then diagnosis by calculating the result.
(1) PMOF1 is equal to the intake manifold pressure at enable condition completed, and EGR target step is set to 40 steps (almost fully opened).
(2) PMON is equal to the intake manifold pressure in 1 second after EGR target step is set 40 steps (when enable conditions are completed), and EGR target step is set to 0 step.
(3) PMOF2 is equal to the intake manifold pressure in 1 second after EGR target step is set to 0 step (in 2 seconds after enable conditions are completed).



(A) Fuel shut-off in deceleration
(B) Diagnosis enable condition
(C) EGR target step
(D) EGR actual step
(E) Intake manifold pressure (At normal condition)
(F) Diagnosis mode timer
(G) Diagnosis starts.
(H) Open
(I) Close

4) Calculate the judged value using the following formula.
Judged value = [PMON - (PMOF1 + PMOF2)/2]
Judge NG when the malfunction criteria bellows are completed. Judge OK and clear NG when the malfunction criteria bellows are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Judged value	< 1.57 kPa (11.8 mmHg, 0.465 inHg)

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Decrease compensation when operating EGR operate
- Front O_2 (A/F) sensor main learning compensation
- Calculation of basic advance ignition timing
- Knock learning compensation
- ISC control
- EGR control

9. ECM OPERATION AT DTC SETTING

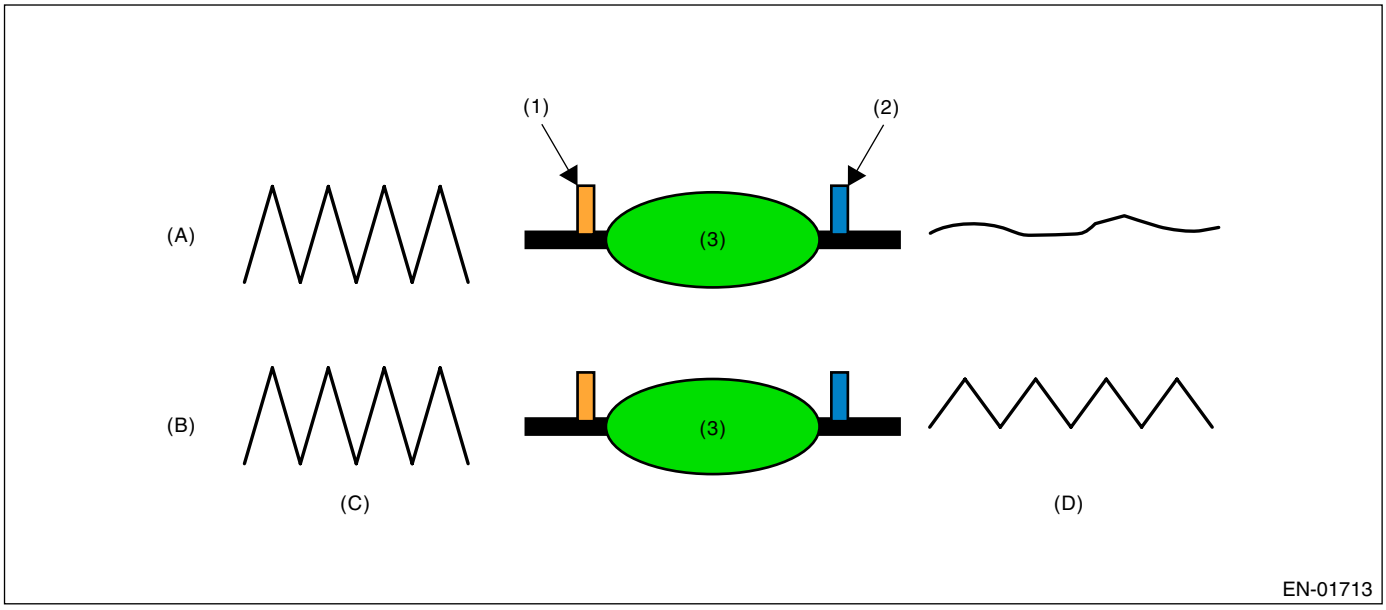
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

BC:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.
Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalyst
(A) Normal
(B) Deterioration
(C) Front oxygen (A/F) sensor waveform
(D) Rear oxygen sensor waveform

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1.2 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 60°C (140°F)
Catalyst warm-up counter on Map 2	≥ 8000
Misfire detection during 200 engine revs.	< 5 times
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (43 MPH)
Amount of intake air	10 ←→ 40 g (0.35 — 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 1.3 kPa (10 mmHg, 0.39 inHg)
Rear O_2 output change from below 600 mV to over	Experienced after fuel cut
After engine starting	150 milliseconds

• Map 2

Add the following value every 512 milliseconds.

Amount of intake air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)	22.4 (0.790)	25.6 (0.903)	28.8 (1.016)	32 (1.129)	35.2 (1.242)
Integrated value for warm-up counter	–5	–5	8	25	41	58	75	92	108	125	127	127

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed more than 70 km/h (43 MPH).

5. DIAGNOSTIC METHOD

After the malfunction criterias are completed, calculate the output fluctuation value of front oxygen (A/F) sensor (average of left and right) and output fluctuation value of rear oxygen sensor.
Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.
Regard the A/F response properties and diagnosis value as parameters for judgment value.
Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds × 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds × 4	≥ 2.6

Time Needed for Diagnosis: 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

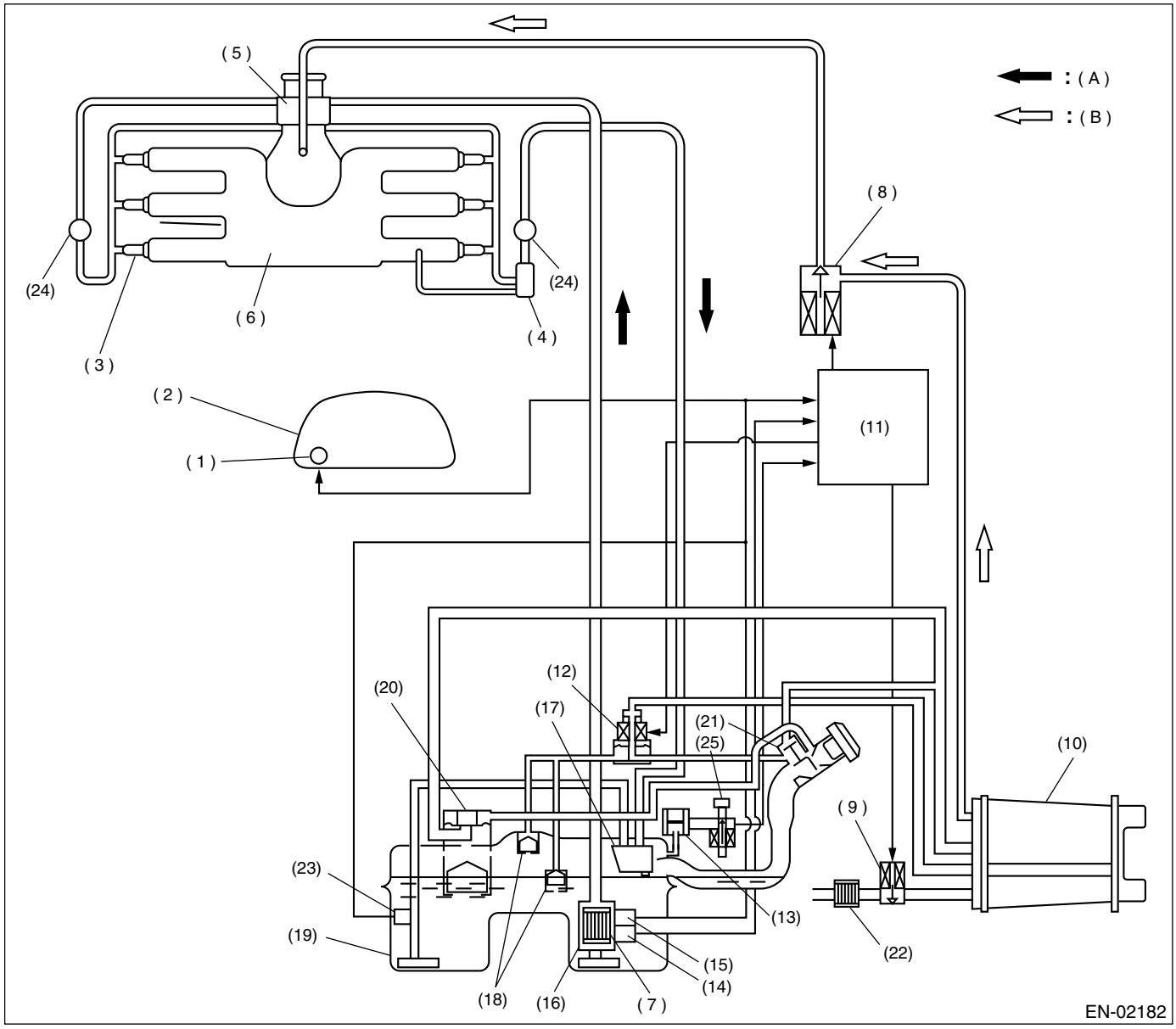
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

MEMO:

BD:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

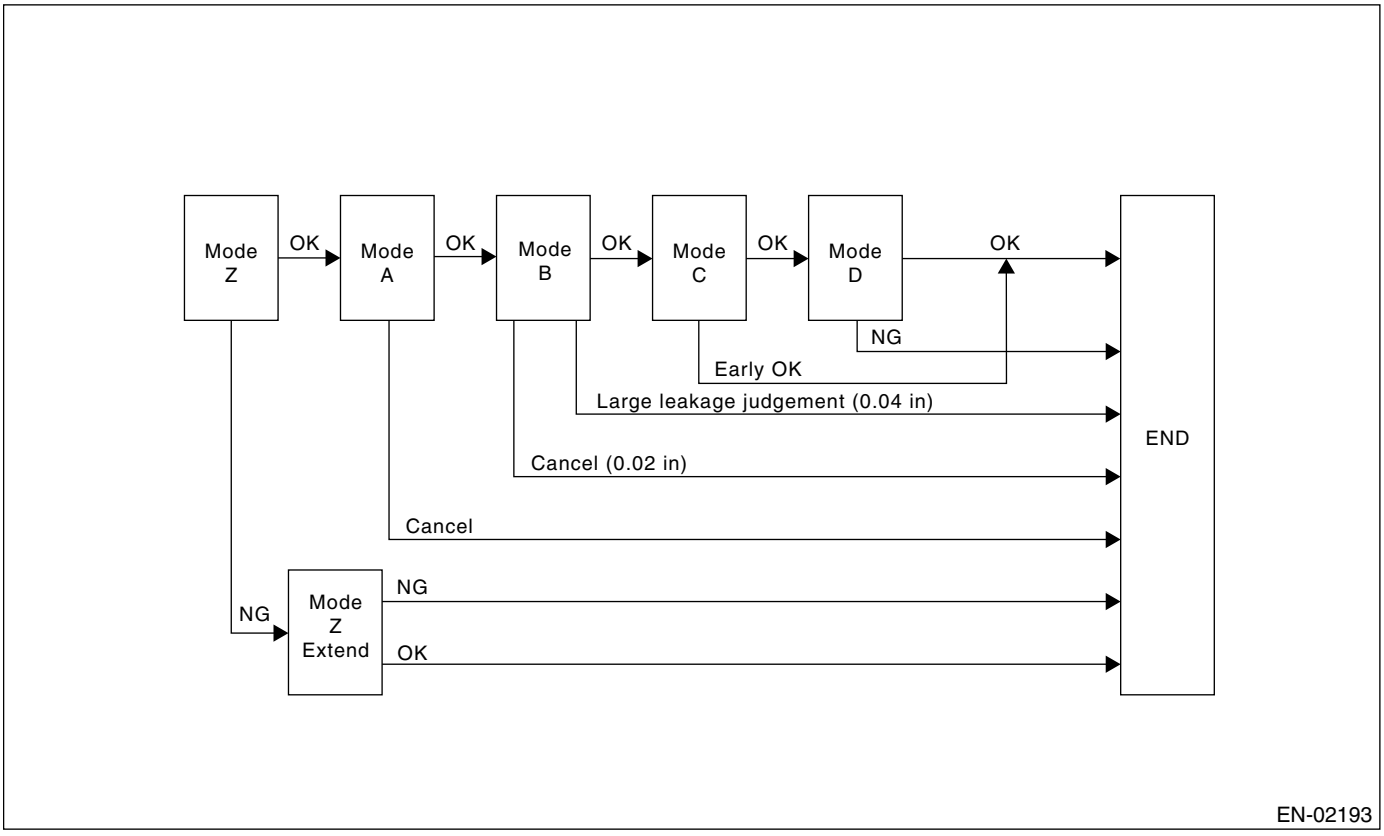
Perform the diagnosis of leakage of fuels system and valve functions.



(1) Fuel meter
(2) Combination meter
(3) Fuel injector
(4) Pressure regulator
(5) Throttle body
(6) Intake manifold
(7) Fuel filter
(8) Purge control solenoid valve
(9) Drain valve
(10) Canister
(11) Engine control module (ECM)
(12) Pressure control solenoid valve
(13) Fuel tank pressure sensor
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel tank
(20) Vent valve
(21) Shut-off valve
(22) Drain filter
(23) Fuel sub level sensor
(24) Fuel damper
(25) Tank pressure switching solenoid valve
(A) Fuel line
(B) Evaporation line

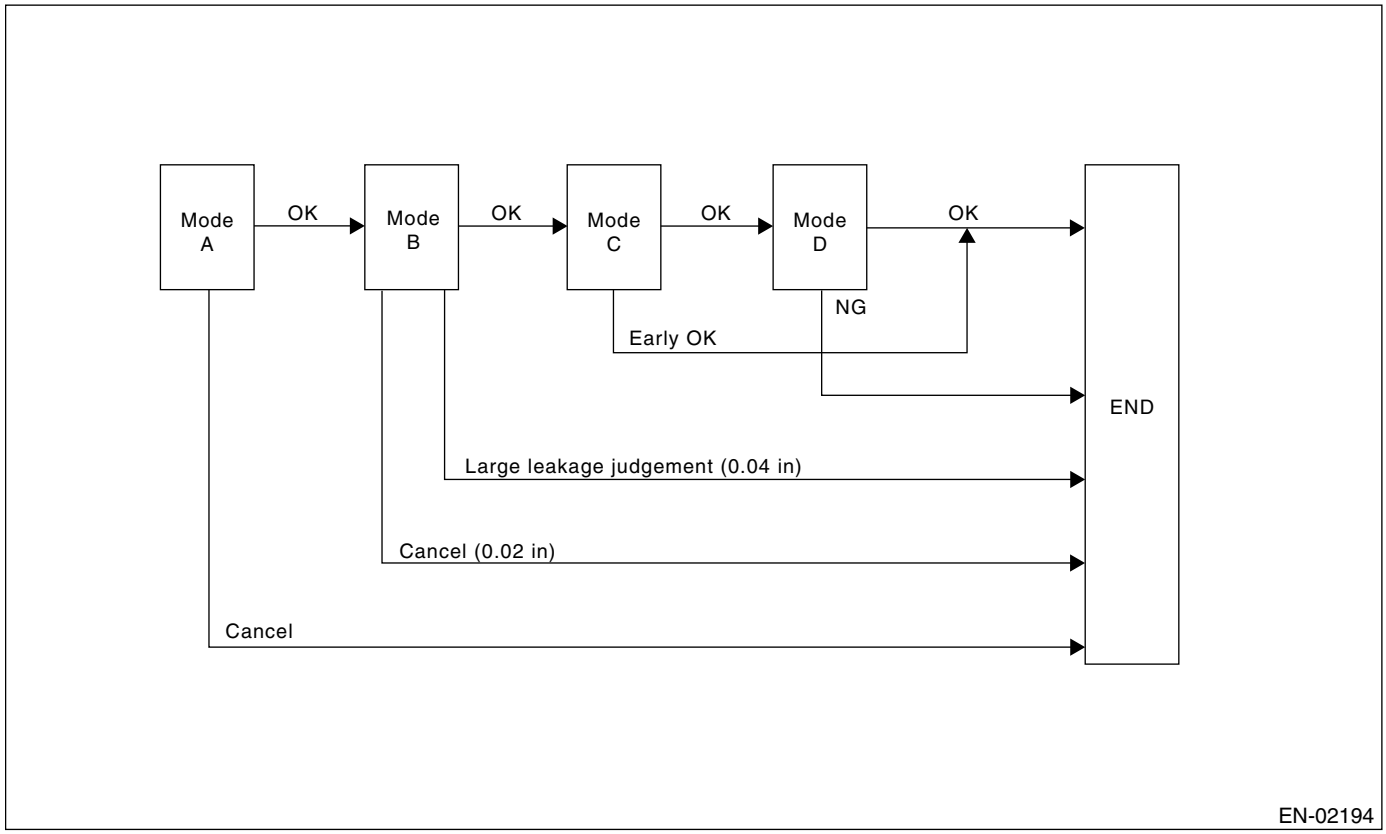
In this system diagnosis, filter tank pressure. And leakage and normality & abnormality of valve operation are judged by monitoring the pressure change status using the fuel tank pressure sensor.
0.04 inch diagnosis is performed in the order of Mode Z, Mode A, Mode B, Mode C, Mode D. 0.02 inch diagnosis is performed in the order of Mode A, Mode B, Mode C, Mode D.

0.04-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve open fail diagnosis)	Perform the diagnosis of purge control solenoid valve open fail depending on the amount of the tank pressure change.	3 — 16 seconds
Mode A (Evaluation of EVAP. generation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Negative pressure sealed/large leak judgment)	Operating the purge control solenoid valve, introduce the intake manifold pressure into the fuel tank. If the tank pressure cannot be reduced, diagnose that there is large leakage.	5 — 60 seconds
Mode C (Pressure increase check/premature OK judgment)	Wait until the tank pressure returns to the target value (pressure to start calculating P2). If the pressure does not return, perform the premature OK judgment.	1 — 15 seconds
Mode D (Negative pressure change amount measurement/EVAP. leakage diagnosis)	Calculate the tank pressure change amount (P2), and measure the diagnosis value using P1 calculated in Mode A. Perform the EVAP. leakage diagnosis using the diagnosis value.	10 seconds

0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode A (Evaluation of EVAP. generation amount)	Calculate the tank pressure change amount (P1).	26 seconds
Mode B (Negative pressure seal)	Introduce the intake manifold pressure into the fuel tank, and reduce the tank pressure to the target pressure.	5 — 15 seconds
Mode C (Pressure increase check/premature OK judgment)	Wait until the tank pressure returns to the target value (pressure to start calculating P2). If the tank pressure does not return, perform the premature OK judgment.	1 — 20 seconds
Mode D (Negative pressure change amount measurement/EVAP. leakage diagnosis)	Calculate the tank pressure change value (P2), measure the diagnosis value using P1 calculated in Mode A. Perform the EVAP. leakage diagnosis using the diagnosis value.	22 seconds

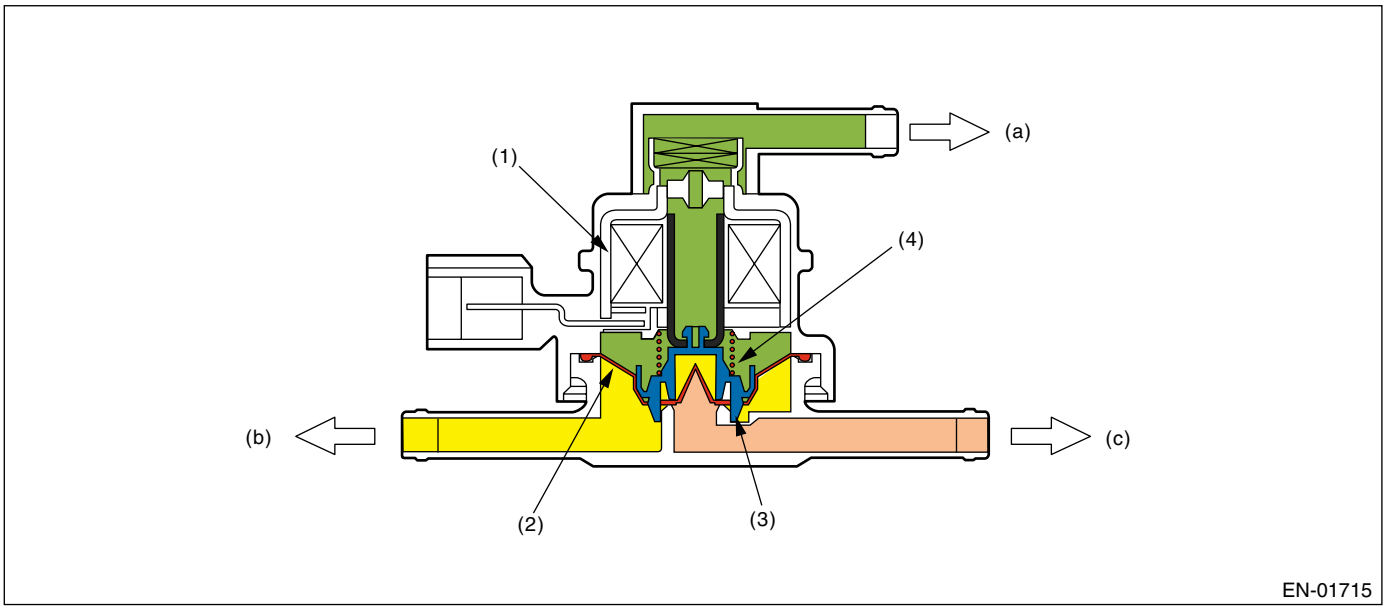
Mode table for Evaporative Emission Control System diagnosis

Mode	Normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	
Mode B	Negative pressure is formed due to intake manifold negative pressure	Judged as large leak	P0457
Mode C	Target pressure is undershot after CPC is closed.	—	—
Mode D	Pressure change is small.	EVAP system is judged to have small leak [1.0 mm (0.04 in)].	P0442
		P2 of small leak in system is measured and EVAP system is judged to have very small leak [0.5 mm (0.02 in)].	P0456

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

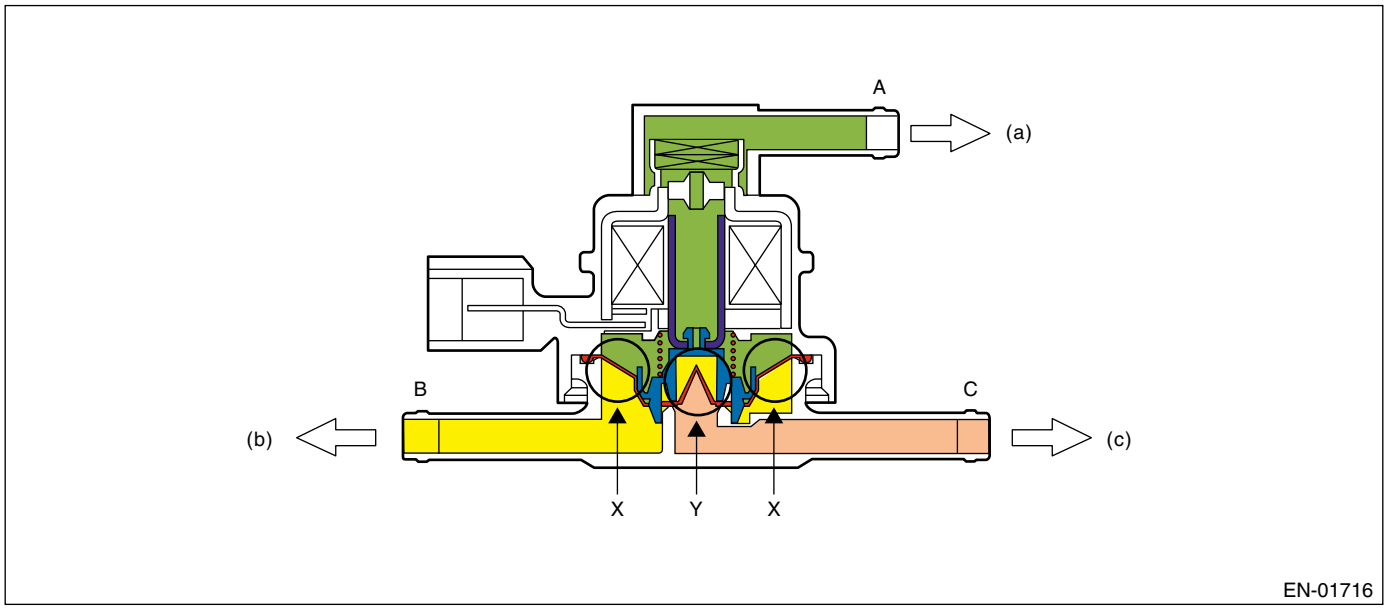
Pressure control solenoid valve maintains the fuel tank pressure equal to the atmospheric air pressure. Normally, the solenoid is set to OFF, and the valve mechanically opens and closes in accordance with the difference between the tank pressure and atmospheric air pressure, and the tank pressure and canister pressure.
During the diagnosis, the valve is forcibly opened by setting the solenoid to ON.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

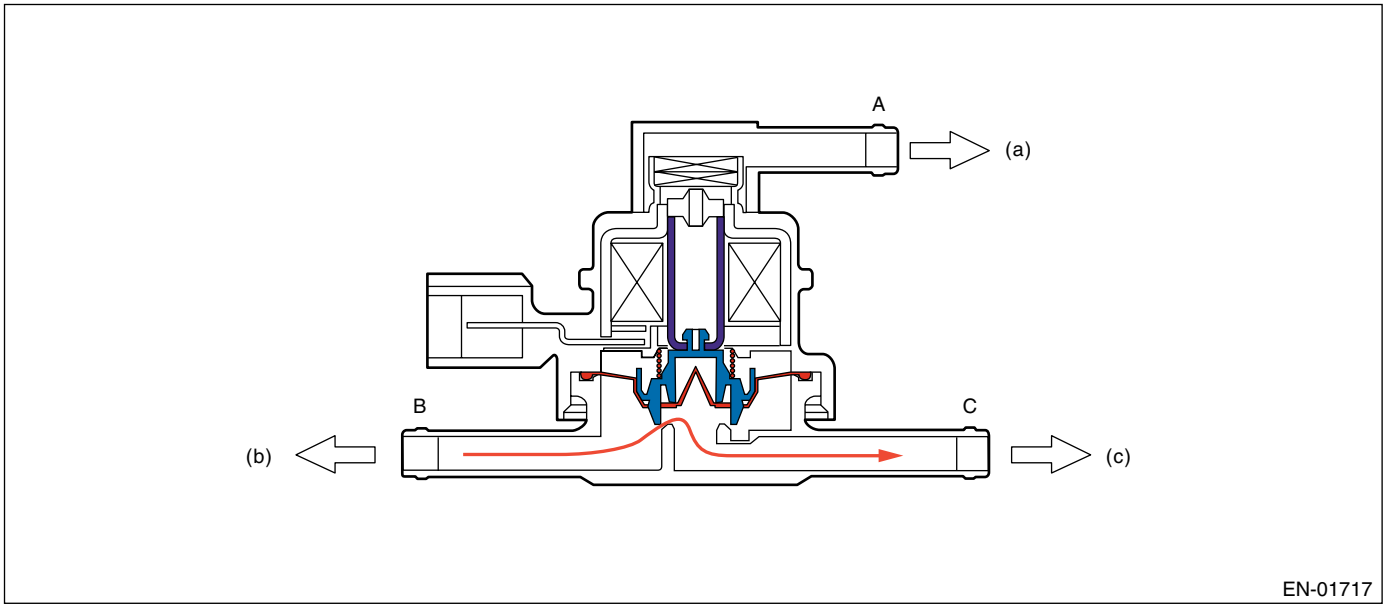
As in the X parts below, there are the area with atmospheric air pressure above the diaphragm and the area with tank pressure below the diaphragm. Also, as in the Y parts below, there are the area with tank pressure above the diaphragm and the area with canister pressure below the diaphragm. In the table below the air flow from each port in accordance with pressure difference is shown with the atmospheric air pressure port A, tank pressure port B and canister pressure port C.



(a) Atmospheric pressure (b) Fuel tank (c) Canister

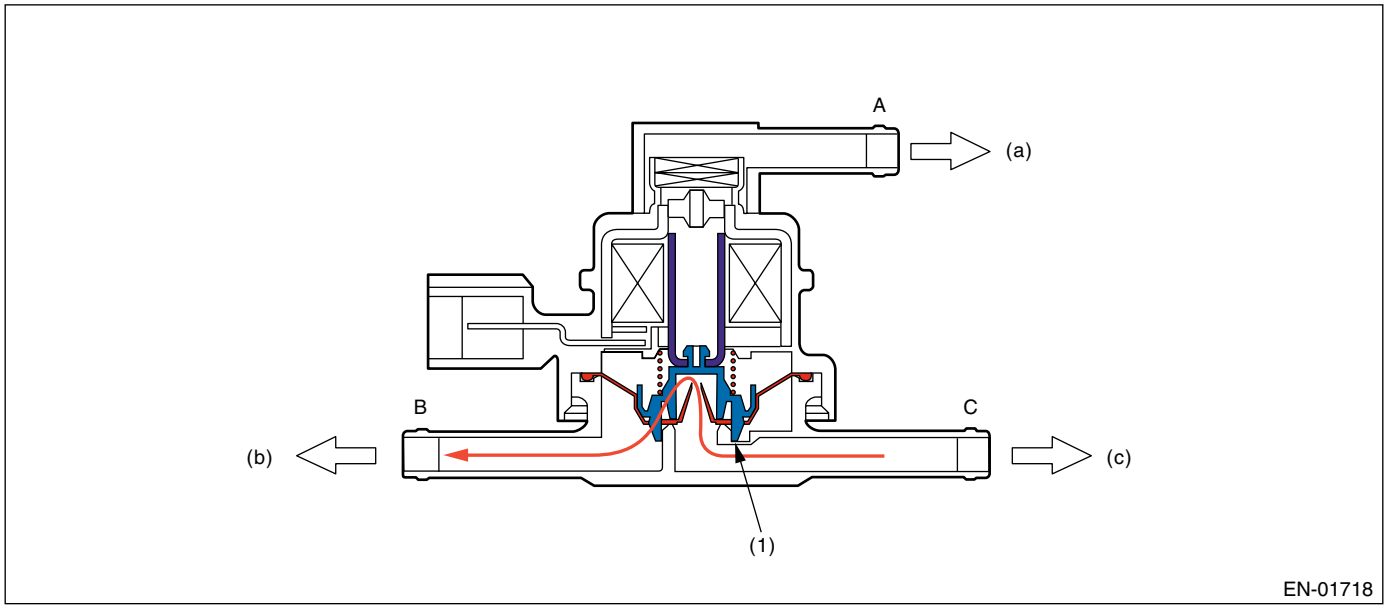
Pressure Status	Flow
A < B (Solenoid OFF)	B → C
B < C (Solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



(a) Atmospheric pressure (b) Fuel tank (c) Canister

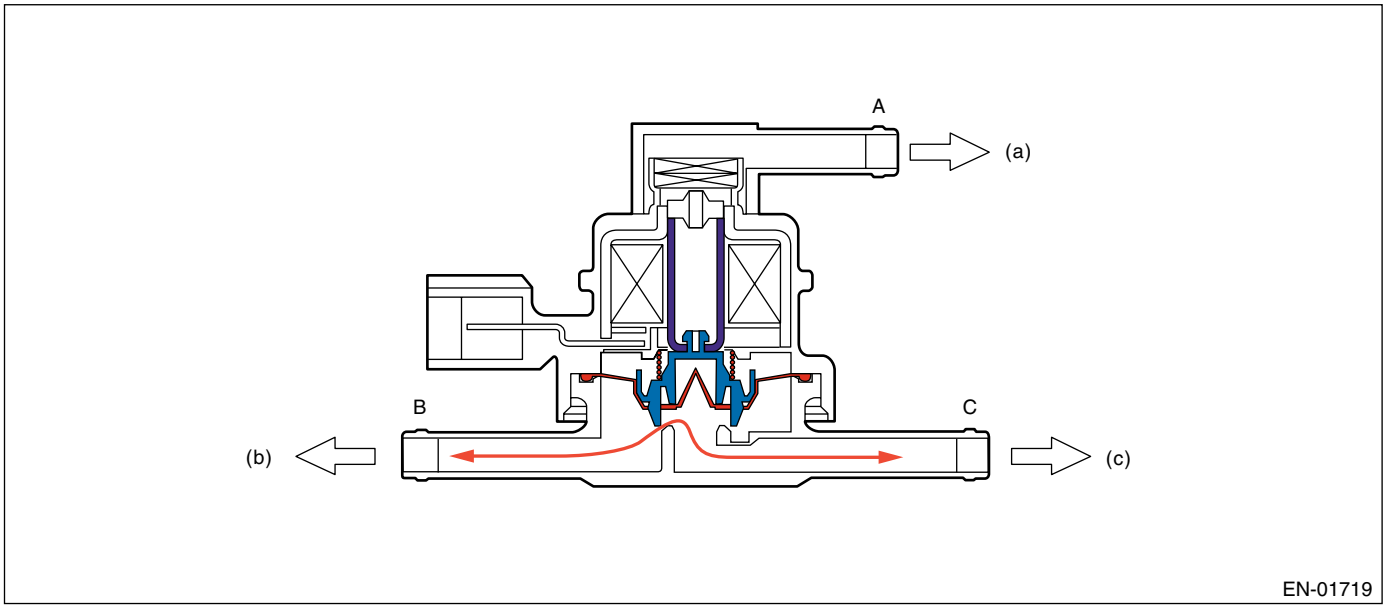
• When B < C (Solenoid OFF)



(1) Valve

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• When solenoid is ON



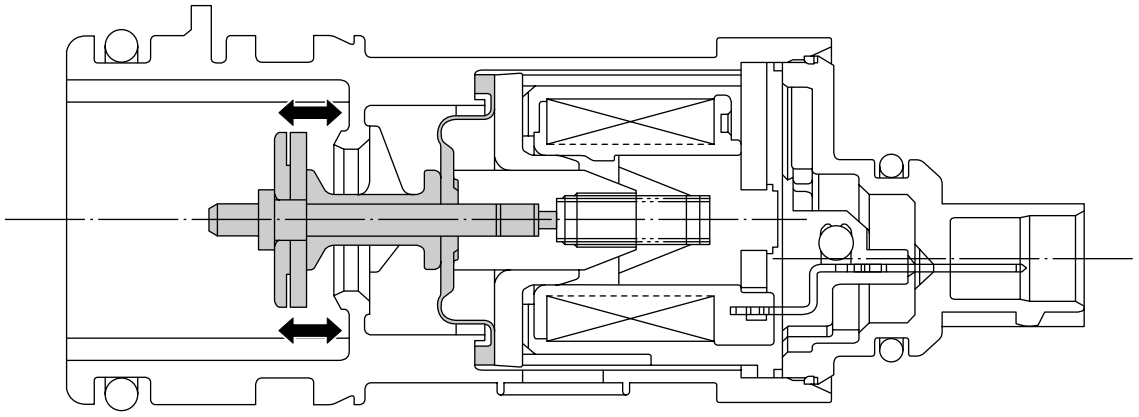
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

• Drain valve

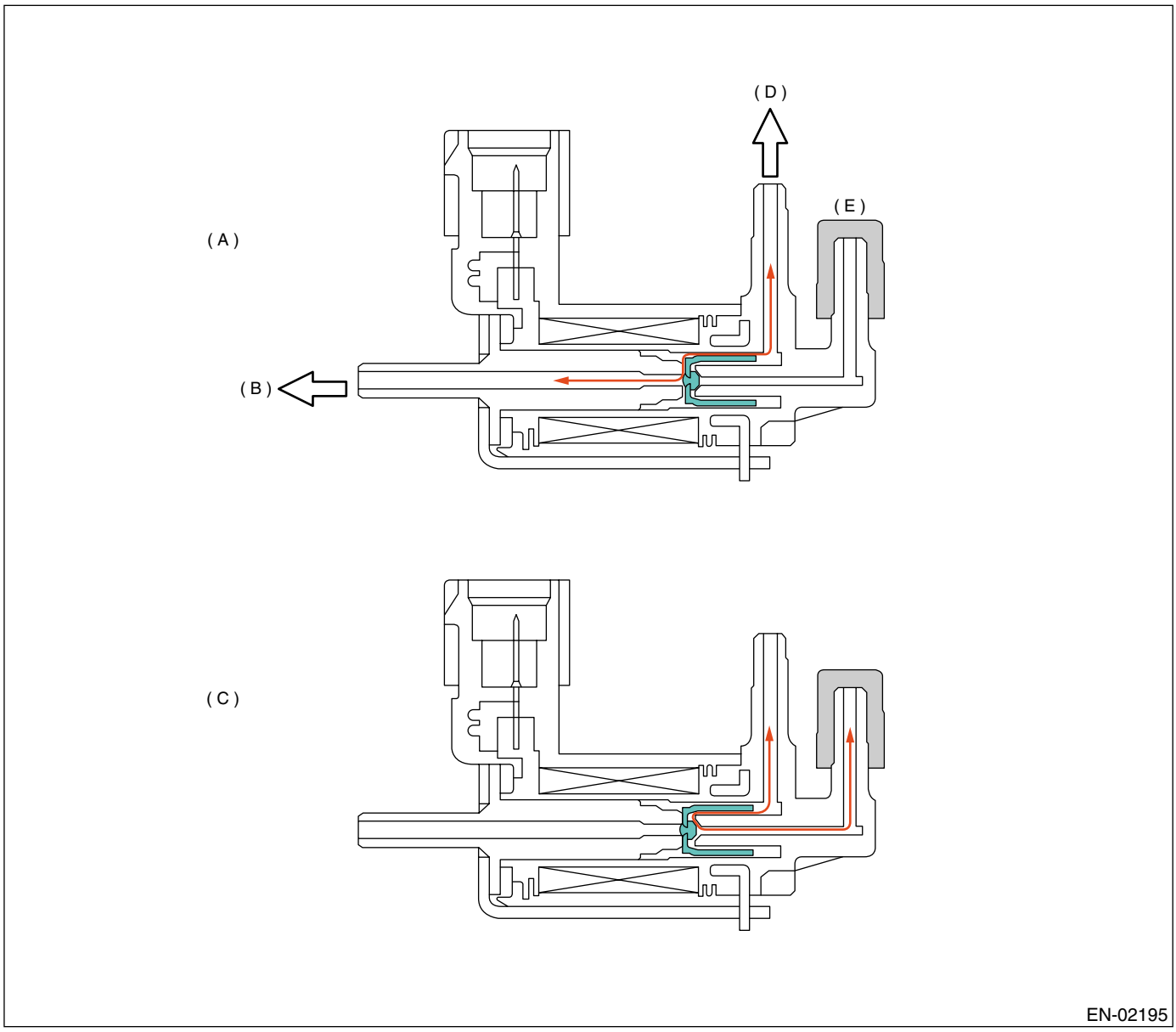
Drain valve controls the ambient air to be introduced to the canister. Normally the solenoid is set to OFF and the valve is open. The valve is closed when the solenoid is set to ON only at the time of diagnosis.



EN-02293

• Tank Pressure Switching Solenoid

Fuel tank sensor control valve is connected to fuel tank pressure sensor and opened to atmosphere.
In normal condition, fuel tank sensor control valve is OFF, and circuit of fuel pressure sensor is open to atmosphere. If fuel tank sensor control valve is ON, then circuit is closed.

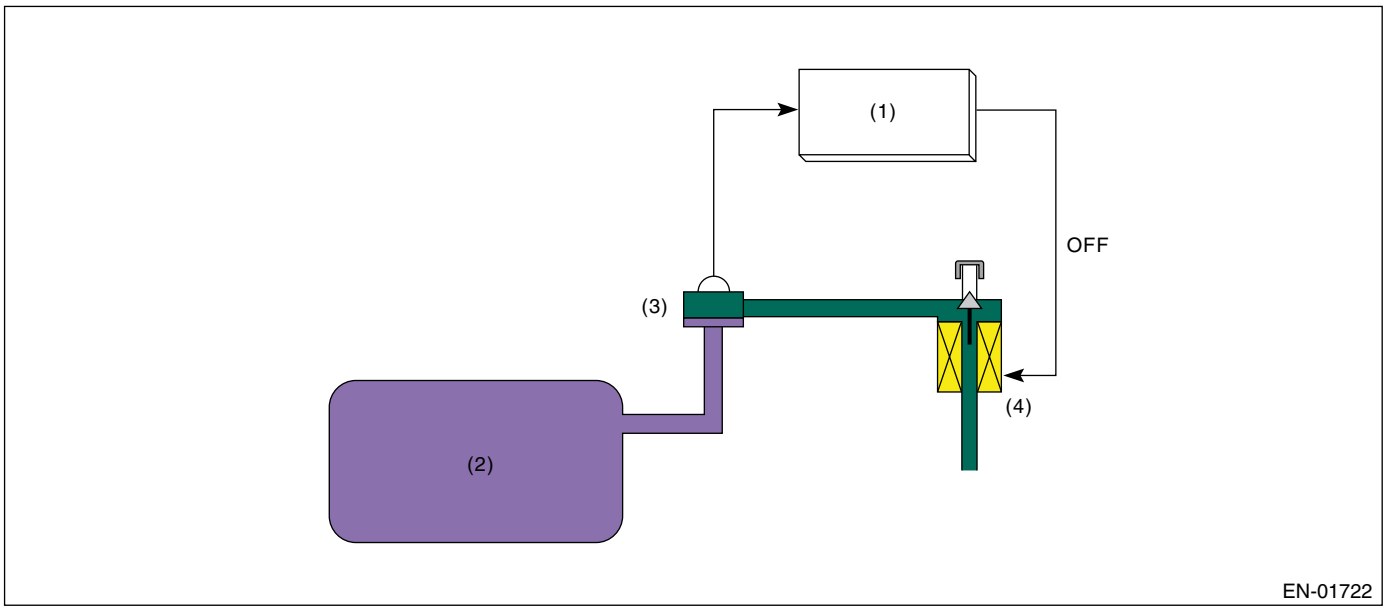


(A) Open atmosphere (solenoid OFF)
(B) Ambient air
(C) During trouble diagnosis (solenoid ON)
(D) To pressure sensor
(E) Plug

Purpose of this solenoid

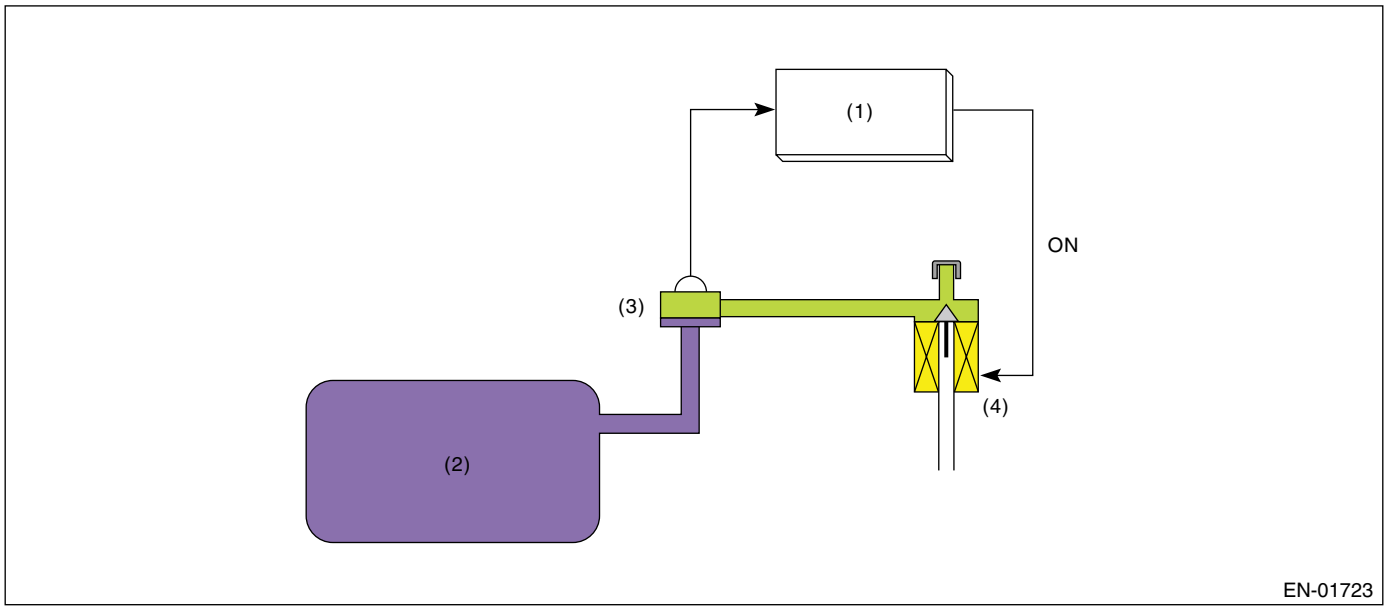
Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure, and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 inch)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53.3 to 107 kPa (400 to 800 mmHg, 15.7 to 31.6 inHg), it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.26 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg), and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
After engine starting	843 seconds or more
Learning value of evaporation gas density (both left and right)	≤ 0.16
Engine speed	1400 ←→ 3000 rpm
Fuel tank pressure	≥ –1.3 ←→ 1.3 kPa (–10 ←→ 9.5 mmHg, –0.39 ←→ 0.37 inHg)
Intake manifold vacuum (relative pressure)	≤ –40.0 kPa (–300 mmHg, –11.81 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9.75 ←→ 48 ℓ (10.3 ←→ 50.7 US gal, 8.6 ←→ 42.2 Imp gal)
A/F feedback control	In operation
Fuel temperature	≤ 45°C (113°F)
Intake air temperature	≥ –10°C (14°F)
Pressure change per second	< 0.13 kPa (0.96 mmHg, 0.04 inHg)
Min. pressure change per second – Max. pressure change per second	< 0.37 kPa (2.8 mmHg, 0.110 inHg)
Fuel level change	< 3 ℓ (3.2 US qt, 2.6 Imp qt)/131 milliseconds

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	> 120 seconds
After engine starting	335 second or more
Fuel temperature –10 ←→ 35°C (14 ←→ 95°F), or the time after engine start with coolant temperature of 40°C (104°F) or below	< 2400 seconds
Fuel level	9.75 ←→ 48 ℓ (2.6 ←→ 12.7 US gal, 2.1 ←→ 10.6 Imp gal)
(Ambient (estimate) – fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below –3.04 kPa (–22.8 mmHg, –0.88 inHg) (during same driving cycle, Intake manifold vacuum (relative pressure))	Up to 1 times
Intake manifold vacuum (relative pressure)	≤ –8.0 kPa (–60 mmHg, –2.36 inHg)
Fuel tank pressure	–0.1 to 0.93 kPa (–1 to 7 mmHg, –0.04 to 0.27 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
A/F feedback control	In operation
Engine speed	1400 ←→ 3000 rpm
P1	–0.20 ←→ 0.13 kPa (–1.5 ←→ 1 mmHg, –0.06 ←→ 0.04 inHg)
Pressure change per second	< 0.25 kPa (1.9 mmHg, 0.075 inHg)
Fuel level change	2 ←→ 3 ℓ (2.1 ←→ 3.2 US gal, 1.8 ←→ 2.6 Imp gal)/128 milliseconds
Tank pressure	< 0.9 kPa (7 mmHg, 0.28 inHg)
Min. tank pressure change per second – Max. tank pressure change per second	< 0.08 kPa (0.6 mmHg, 0.024 inHg)
Change of atmospheric pressure during P1 calculation	–0.11 ←→ 0.19 kPa (–0.85 ←→ 1.4 mmHg, –0.033 ←→ –0.055 inHg)
Change of atmospheric pressure during P2 calculation	–0.02 ←→ 0.13 kPa (–0.15 ←→ 0.95 mmHg, 0.006 ←→ 0.037 inHg)

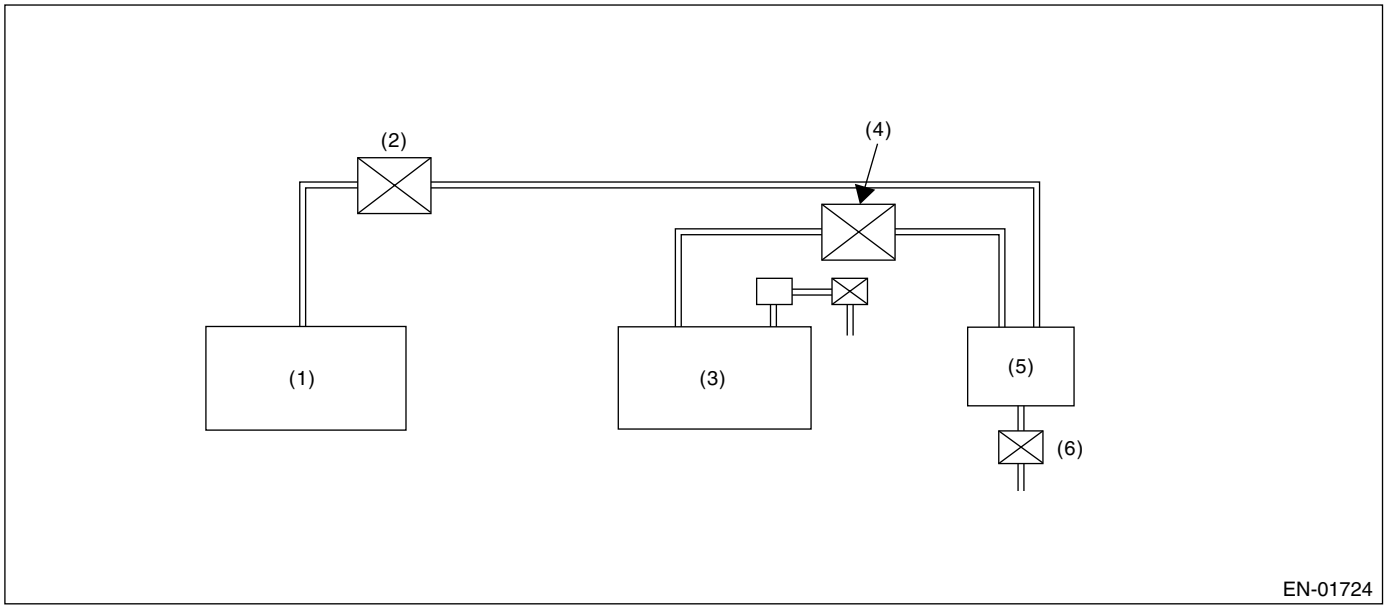
4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis
Perform the diagnosis only once in 843 seconds or more after starting the engine constantly at 32 km/h (19.9 MPH) or more.
Pay attention to the fuel temperature and fuel level.
0.02-inch Diagnosis
Perform the diagnosis in 335 seconds after starting the engine constantly at 68 km/h (42 MPH) or more, and perform OK/NG judgment.
If OK/NG judgment is not possible, repeat the diagnosis.
Pay attention to the fuel temperature and fuel level.

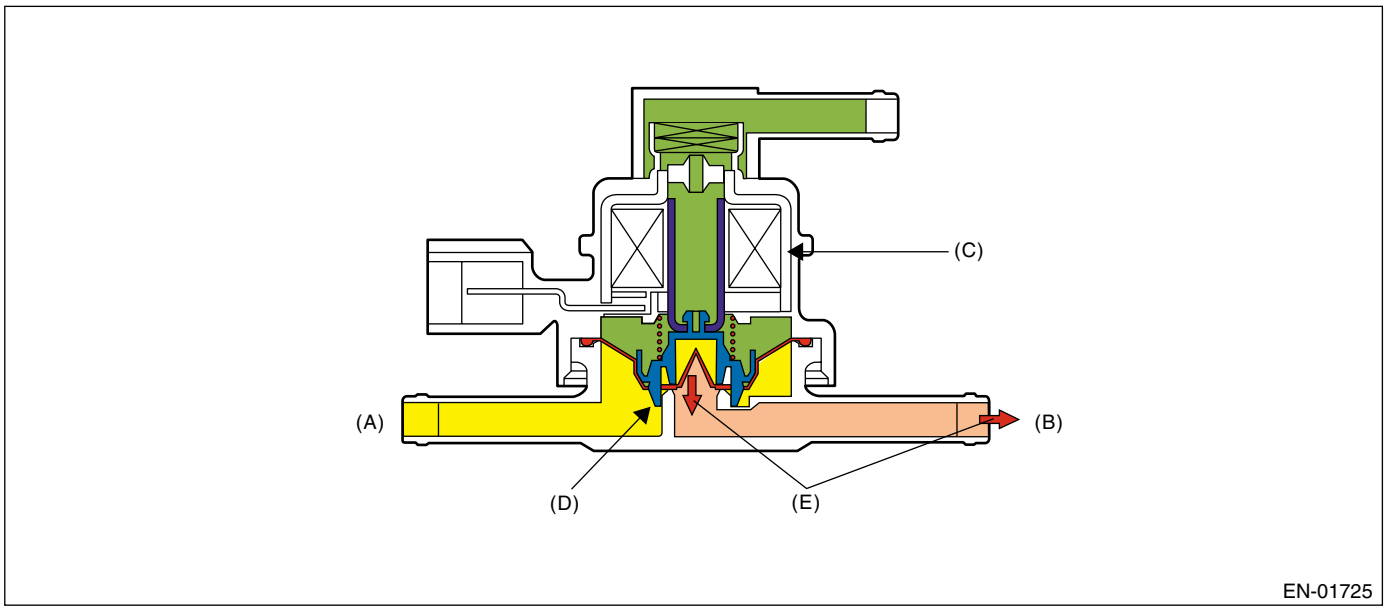
5. DIAGNOSTIC METHOD

• Diagnosing Function of Drain Valve and Purge Control Solenoid Valve

DTC
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)
Purpose of Mode Z
When performing the leakage diagnosis of EVAP system, and CPC have to operate normally. Therefore, mode Z is used to diagnose the CPC open fixation.
If the CPC open fixation trouble is detected, the evaporation system leakage diagnosis is cancelled.



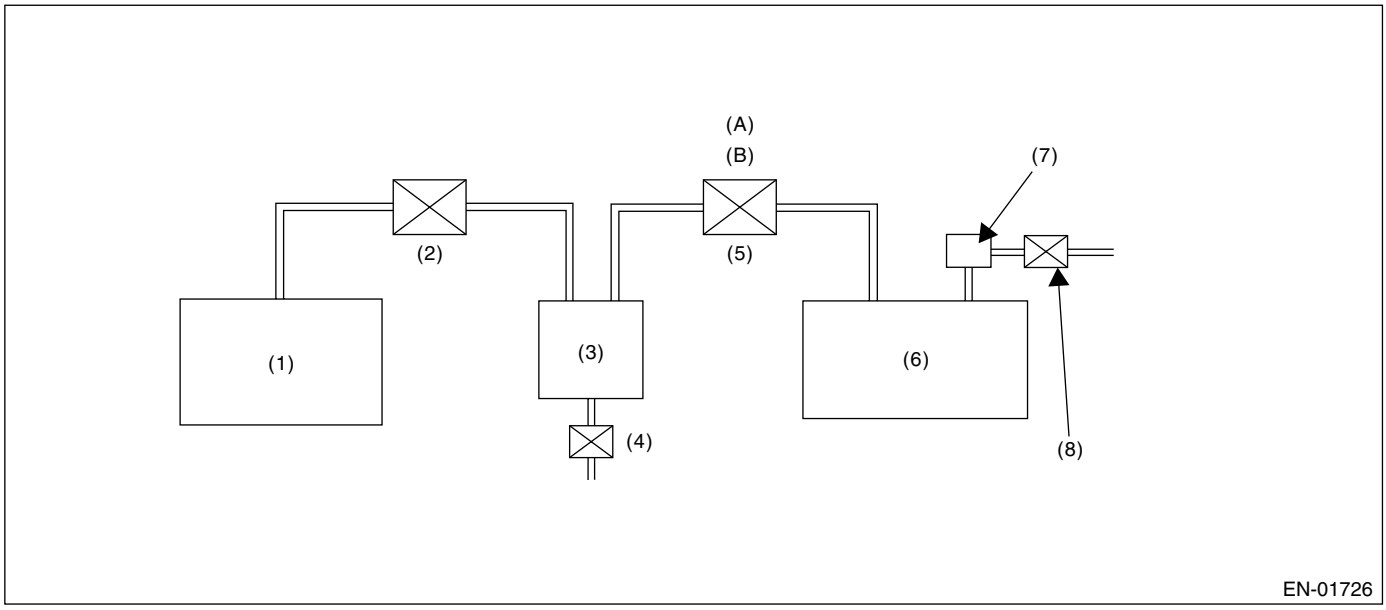
(1) Engine
(2) Purge control solenoid valve
(3) (Open)
(3) Fuel tank
(4) Pressure control solenoid valve (Close)
(5) Canister
(6) Drain valve (Stuck close)



(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

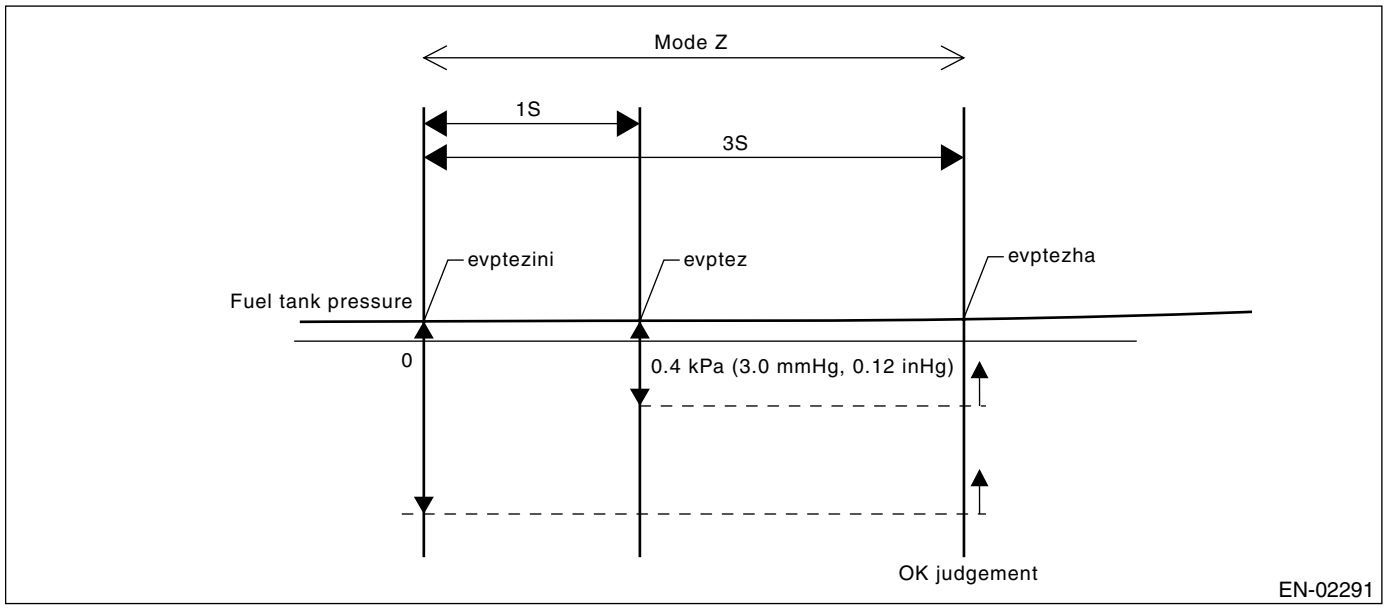
Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



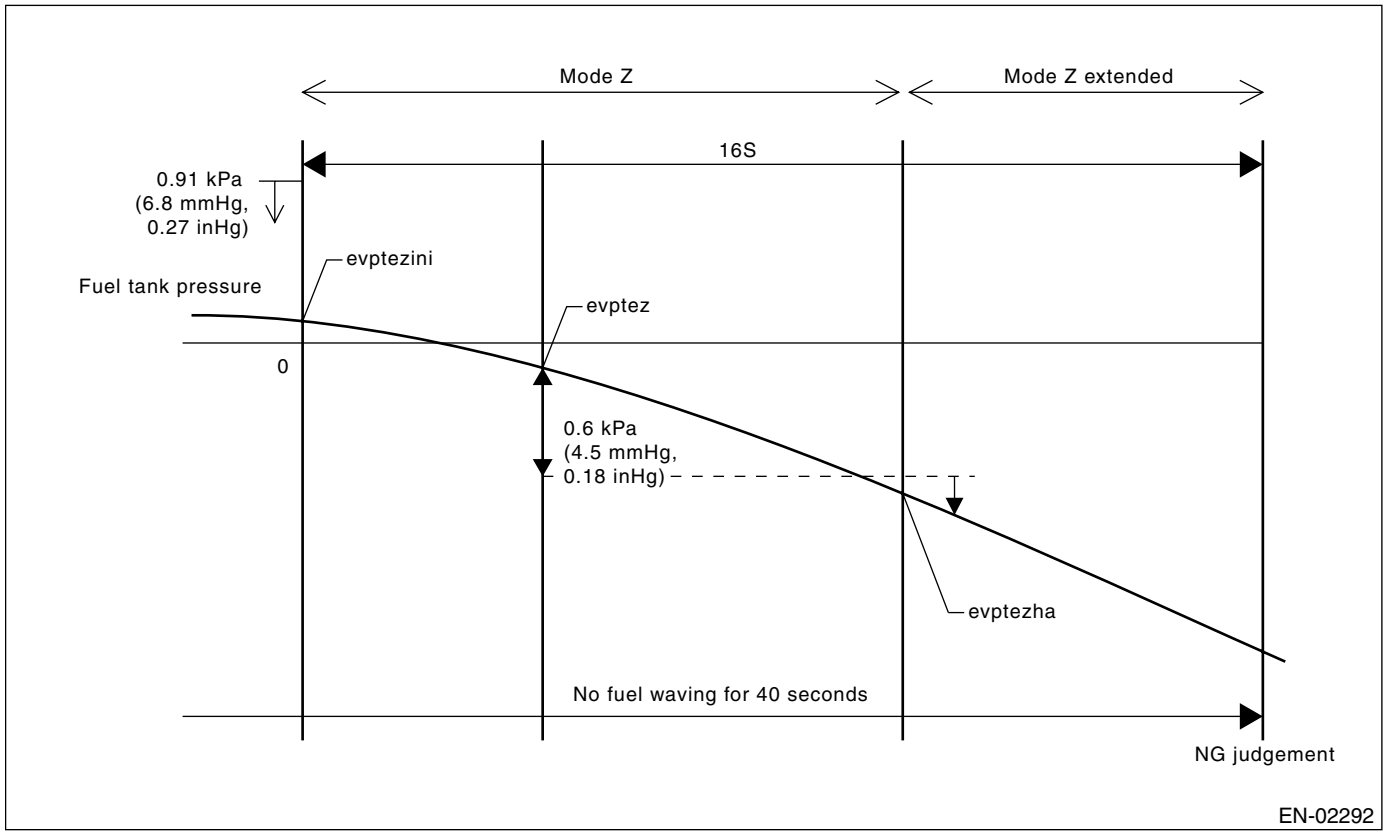
(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Atmospheric pressure switching solenoid
(A) At normal: Mechanical control
(B) At the time of diagnosis: Electronic control

• Normal



Judge normal when the following conditions are completed at once.
- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)

• Purge control solenoid valve open fixation



Judge NG when the following conditions are completed at once.
- evptez – evptezha > 0.6 kPa (4.5 mmHg, 0.18 inHg)
- evptezini ≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)
- Period without 2 L (2.1 US qt, 1.8 Imp qt) or more fuel waving is 40 seconds or more.

• Diagnosing Function of Purge Control Solenoid Valve [P0457]

By acting as the monitor of the fuel tank pressure in mode Z, functional diagnosis of a purge solenoid valve is performed.

Normality Judgment

Perform OK judgment in 3 seconds after starting Mode Z and move to Mode A if OK.

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when drain vale opened → closed) – (Tank pressure when terminating Mode Z)	> 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

Abnormality Judgment

If OK judgment is not possible, prolong Mode Z (16 seconds), and judge NG when all of malfunction criterias are completed after 16 seconds considering the following conditions.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure after 1 second when starting Mode Z) – (Τανκ πρεσσυρε ωηεν χομπλετινγ Μοδε Ζ)	> 0.60 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when starting Mode Z	≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)	
Period without 2 ℓ or more fuel waving	≥ 40 seconds	

Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous drive cycles. If the purge control solenoid valve open fixation NG judgment is performed, terminate the EVAP. diagnosis. If OK/NG judgment of the purge control solenoid valve open fixation is not possible in Mode Z, cancel the EVAP. diagnosis.

• Leakage Diagnosis

DTC

P0442 Evaporative Emission Control System Leak Detected (Small Leak)
P0456 Evaporative Emission Control System Leak Detected (Very Small Leak)
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Diagnostic Method

The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.

Mode A; (Estimation of evaporation abundance)

The variation amount of this tank pressure P1 calculate. Move to Mode B after calculating P1.

Mode B; (Seal negative pressure)

Introduce the negative pressure of the intake manifold into the tank.
Approx. 0 → –1.4 kPa (0 → –10.5 mmHg, 0 → –0.41 inHg) (0.04-inch diagnosis)
Approx. 0 → –3.05 kPa (0 → –22.875 mmHg, 0 → –0.9 inHg) (0.02-inch diagnosis)
Move to Mode C when reaching the pressure above (target pressure).
Then, if the tank pressure does not become negative, judge that there is large leakage in the system. In 0.04-inch diagnosis, judge that there is large leakage in 10 seconds and terminate the EVAP. diagnosis, cancel the diagnosis in 60 seconds. In 0.02-inch diagnosis, cancel the diagnosis in 15 seconds.

Abnormality Judgment

Judge NG (large leakage) when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis)		P0457
Mode B period	≥ 10 seconds	
(Tank Pressure Min. Value in Mode B) – (Tank Pressure when starting Mode B)	> 0.3 kPa (2 mmHg, 0.08 inHg)	

Mode C; (Check increasing pressure)
Close the purge control solenoid valve and stop the introduction of negative pressure. (Wait until returning to P2 calculation start tank pressure)
When returning to P2 calculation start tank pressure, move to Mode D.
Judge premature OK and move to Mode E when not returning in the determined period of time.

	P2 Calculation Start Tank Pressure	Premature OK Judgment Period
0.04-inch Diagnosis	–1.30 kPa (–9.75 mmHg, –0.38 inHg)	15 seconds
0.02-inch Diagnosis	–3.00 kPa (–22.5 mmHg, –0.89 inHg)	20 seconds

Mode D; (Measurement of negative pressure variation)
Monitor the tank pressure variation at Mode Z. In this case, the tank pressure increases (close to atmospheric pressure) because the evaporator is generated. However, if there is leakage, the pressure increases additionally. P2 means the variation amount of this tank pressure. After calculating P2, perform the small leakage diagnosis.
When Terminating Mode D
By assigning the variation values of tank pressure, P1 and P2, in the following formula, judge the system small leakage. If the calculated judgment value is larger than the threshold value, judge that there is a failure.
0.04-inch Diagnosis
Judge NG when the malfunction criteria below is completed, and judge OK when the malfunction criteria below is not completed.
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 \times P1$ P2: Change of tank pressure within 10 seconds on Mode D P1: Change of tank pressure within 10 seconds on Mode A	$\geq -0.32 \longleftrightarrow 0.53$ kPa ($-2.4 \longleftrightarrow 4$ mmHg, $-0.094 \longleftrightarrow 0.157$ inHg) *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

***1.5:** Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

• 0.02-inch Diagnosis

Abnormality Judgment
Judge NG when the criteria below are completed.
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 \times P1$ P2: Change of tank pressure within 22 seconds on Mode D P1: Change of tank pressure within 22 seconds on Mode A	> Value on Map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

• Map 8 Limit of malfunction criteria for 0.02-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.32 kPa (2.39 mmHg, 0.094 inHg)	0.37 kPa (2.77 mmHg, 0.109 inHg)	0.42 kPa (3.16 mmHg, 0.124 inHg)	0.47 kPa (3.55 mmHg, 0.140 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.36 kPa (2.68 mmHg, 0.106 inHg)	0.41 kPa (3.04 mmHg, 0.120 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.50 kPa (3.77 mmHg, 0.148 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.96 mmHg, 0.177 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.49 kPa (3.64 mmHg, 0.143 inHg)	0.53 kPa (3.98 mmHg, 0.157 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.48 kPa (3.58 mmHg, 0.141 inHg)	0.53 kPa (3.96 mmHg, 0.156 inHg)	0.58 kPa (4.35 mmHg, 0.171 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.51 kPa (3.86 mmHg, 0.151 inHg)	0.57 kPa (4.28 mmHg, 0.169 inHg)	0.63 kPa (4.71 mmHg, 0.185 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

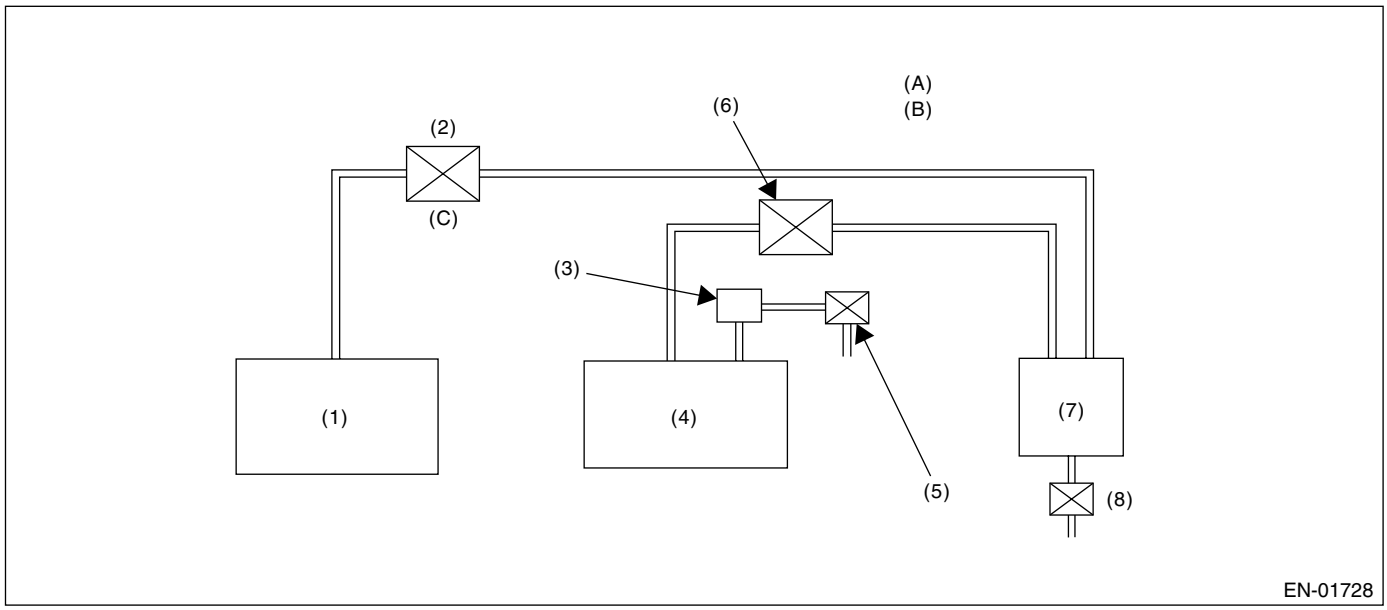
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	< Valve on Map 9.	P0456

• Map 9.

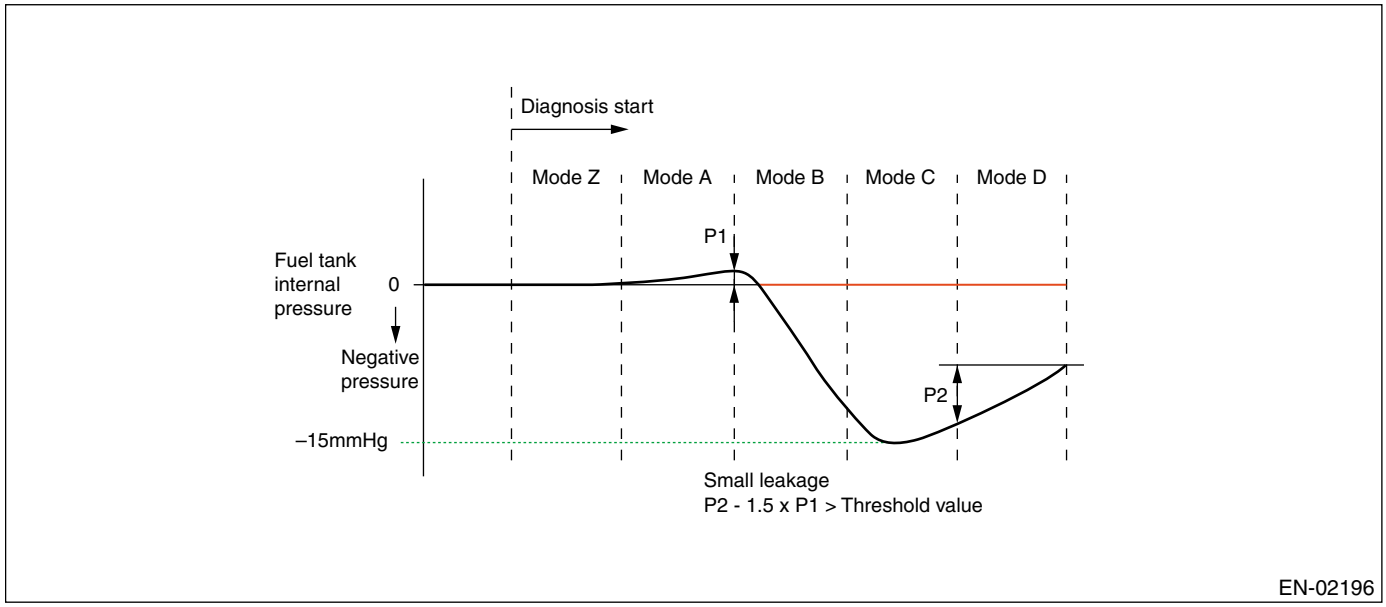
Fuel temperature & Fuel level	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.26 kPa (1.97 mmHg, 0.078 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)	0.37 kPa (2.74 mmHg, 0.107 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.33 kPa (2.45 mmHg, 0.096 inHg)	0.37 kPa (2.81 mmHg, 0.111 inHg)	0.42 kPa (3.17 mmHg, 0.125 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.39 kPa (2.92 mmHg, 0.115 inHg)	0.43 kPa (3.26 mmHg, 0.128 inHg)	0.48 kPa (3.59 mmHg, 0.141 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.27 kPa (2.01 mmHg, 0.079 inHg)	0.32 kPa (2.39 mmHg, 0.094 inHg)	0.37 kPa (2.77 mmHg, 0.109 inHg)	0.42 kPa (3.15 mmHg, 0.124 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.19 kPa (1.43 mmHg, 0.056 inHg)	0.18 kPa (1.36 mmHg, 0.054 inHg)	0.30 kPa (2.28 mmHg, 0.090 inHg)	0.36 kPa (2.71 mmHg, 0.107 inHg)

If OK/NG judgment is not possible, repeat the diagnosis.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve
(A) At normal: Mechanical control
(B) At the time of diagnosis: Electronic control

• 0.04-inch Diagnosis



Time Needed for Diagnosis:

0.04-inch:	30 to 100 seconds
0.02-inch:	80 to 100 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

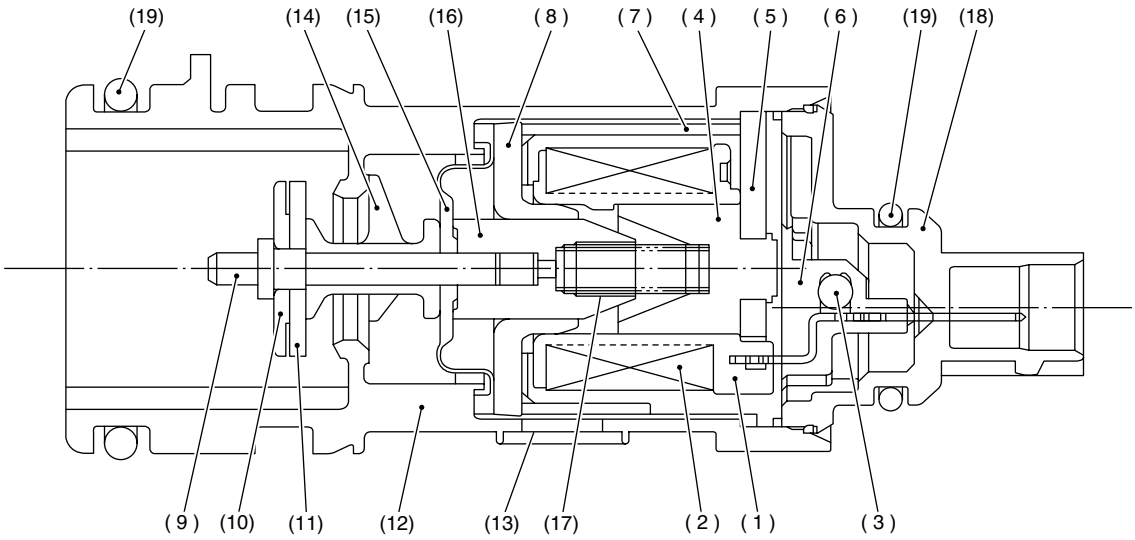
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BE:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

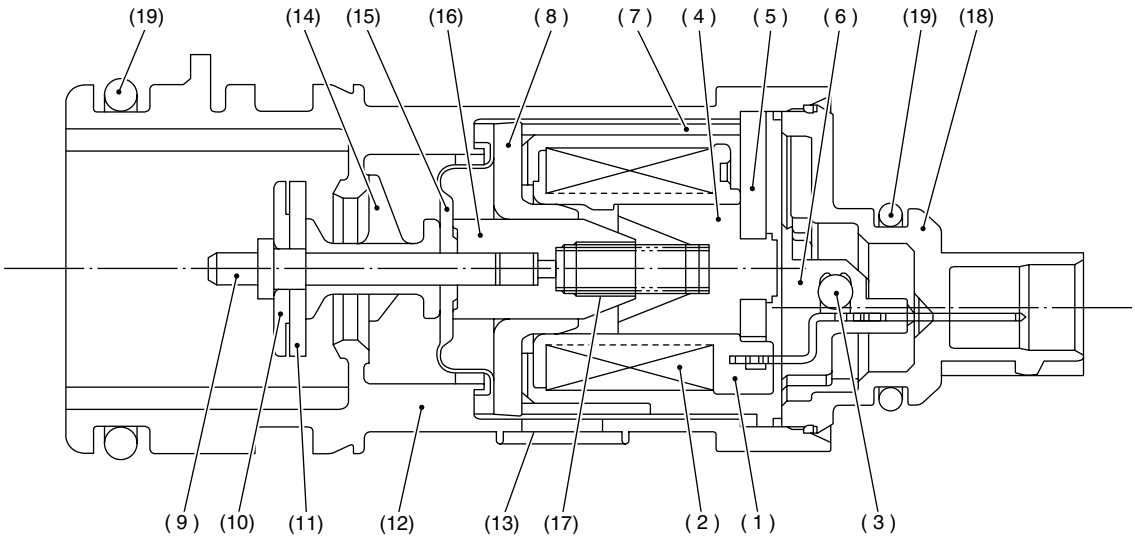
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

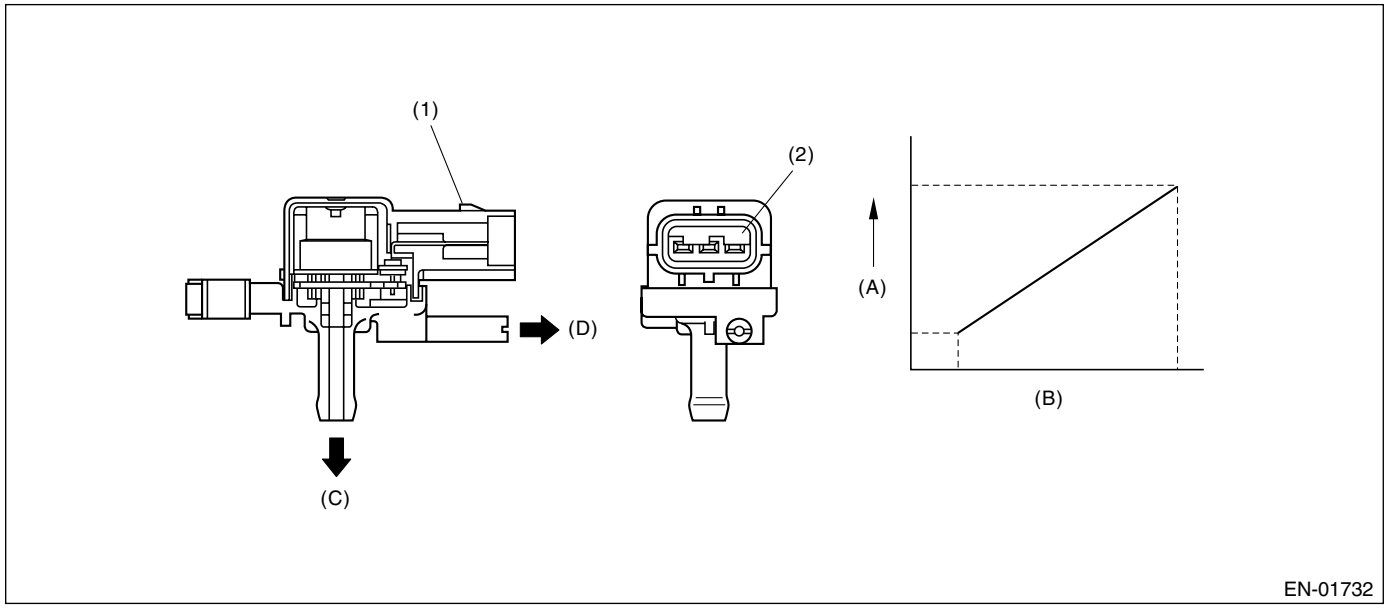
Memorize the freeze frame data. (For test mode $02)

BG:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
ON/OFF change of EVAP canister purge	Experienced
After starting the engine	60 second or more
Fuel level	≥ 18 ℓ (4.76 US gal, 3.96 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 5 ℓ (1.3 US gal, 1.1 Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 5 ℓ (1.3 US gal, 1.1 Imp gal), extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.
If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.
Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 5 ℓ (1.3 US gal, 1.1 Imp gal).
Time Needed for Diagnosis: 60 seconds × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

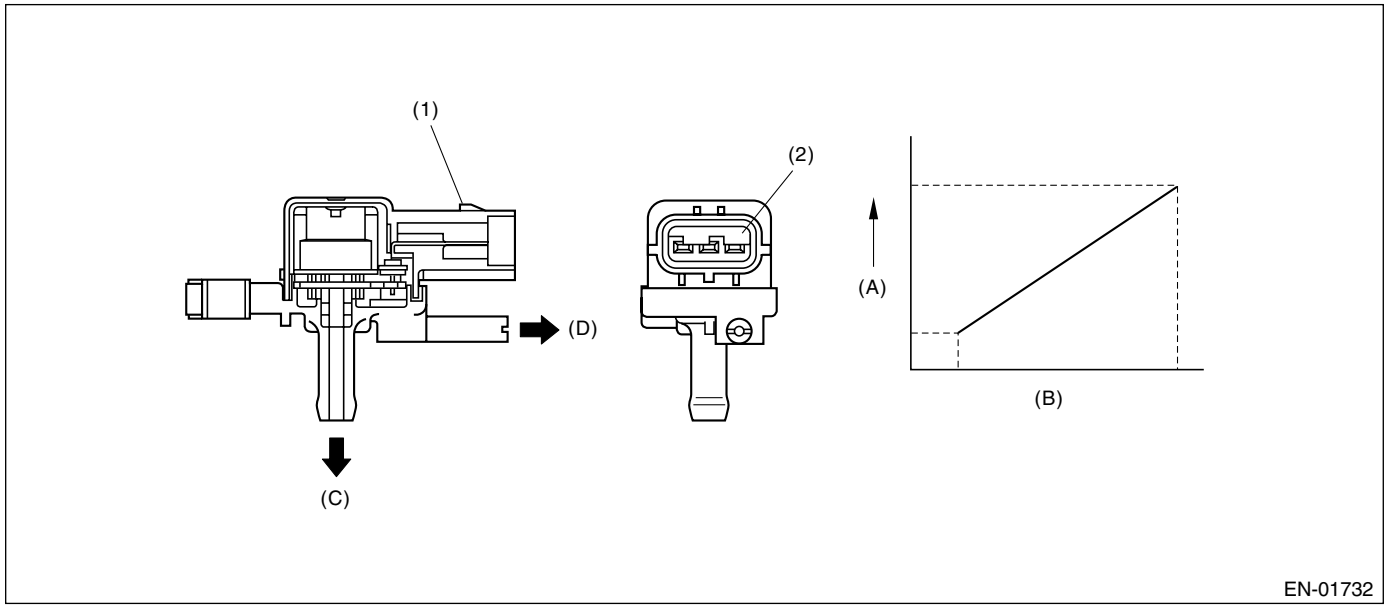
Memorize the freeze frame data. (For test mode $02)

BH:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.3 kPa (–55 mmHg, –2.17 inHg)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.3 kPa (–55 mmHg, –2.17 inHg)
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

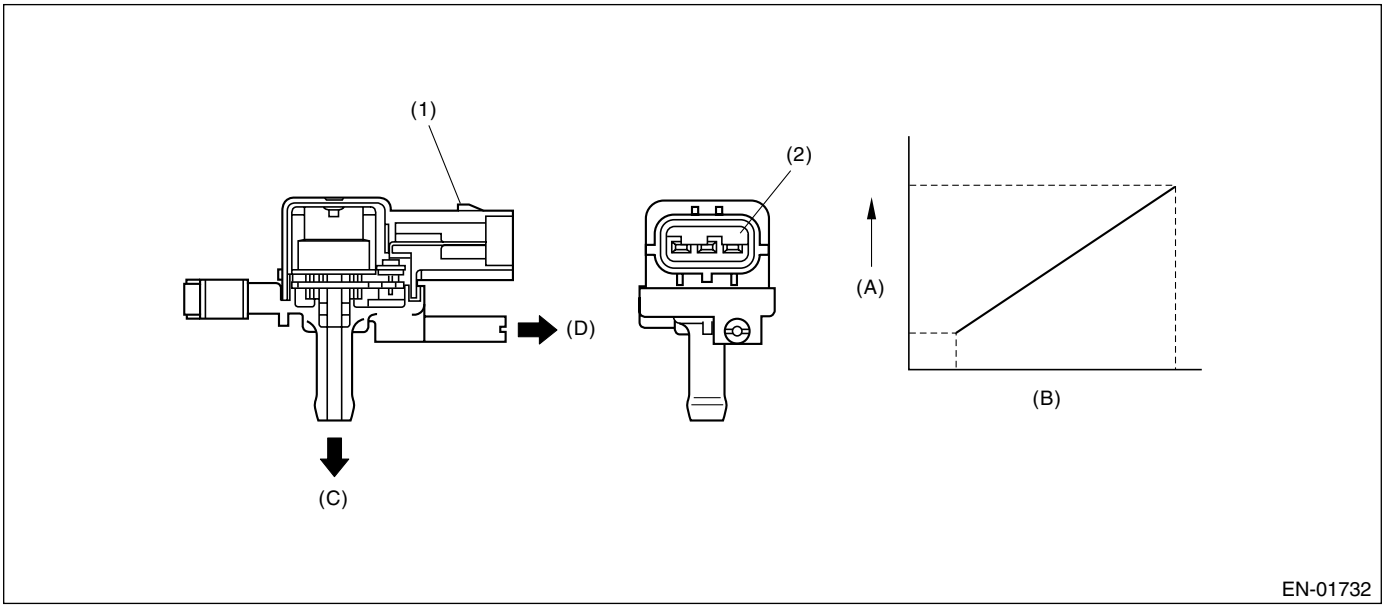
Memorize the freeze frame data. (For test mode $02)

BI: DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value (both left and right)	< 0.08
Main feedback compensation coefficient (both left and right)	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.3 kPa (55 mmHg, 2.17 inHg)
Fuel temperature	< 35°C (95°F)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.3 kPa (55 mmHg, 2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H6DO)-120, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BK:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H6DO)-120, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

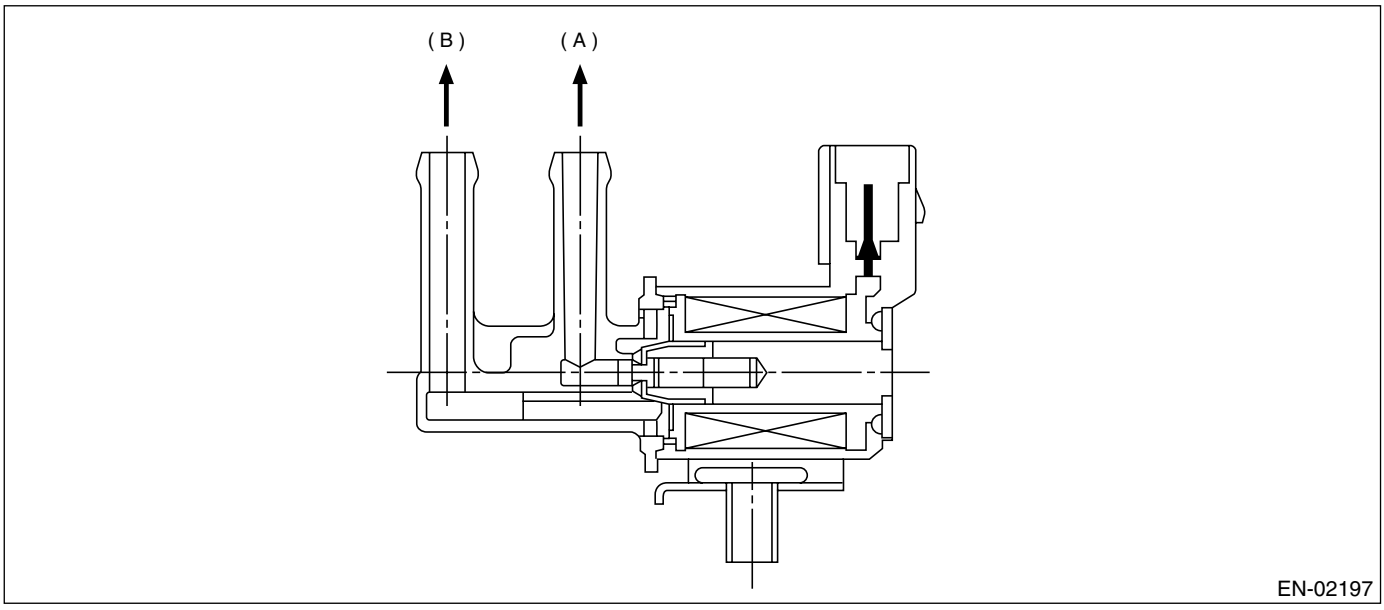
MEMO:

BL:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below becomes.

• Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of 'ON'	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

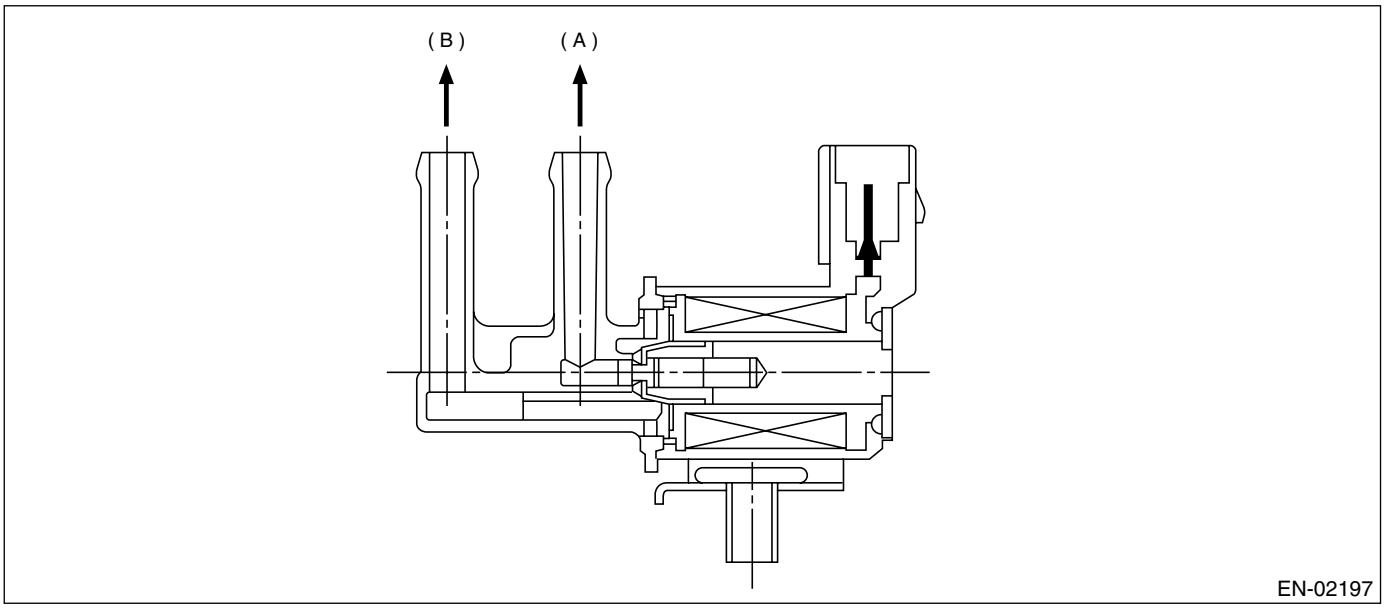
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of 'ON'	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

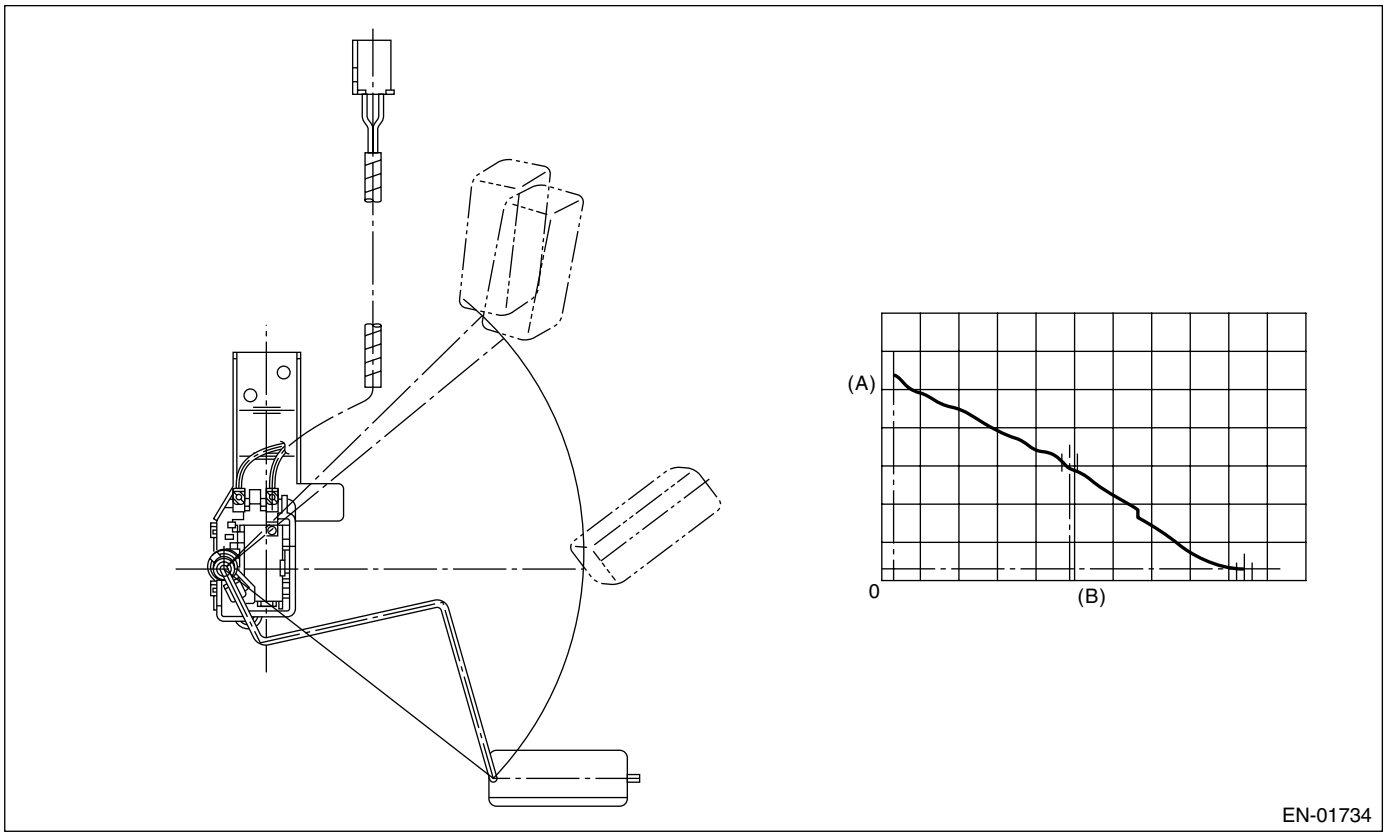
Memorize the freeze frame data. (For test mode $02)

BN:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



(A) Fuel level
(B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 3000 rpm
After engine starting	10 seconds or more

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 3000 rpm
After engine starting	10 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

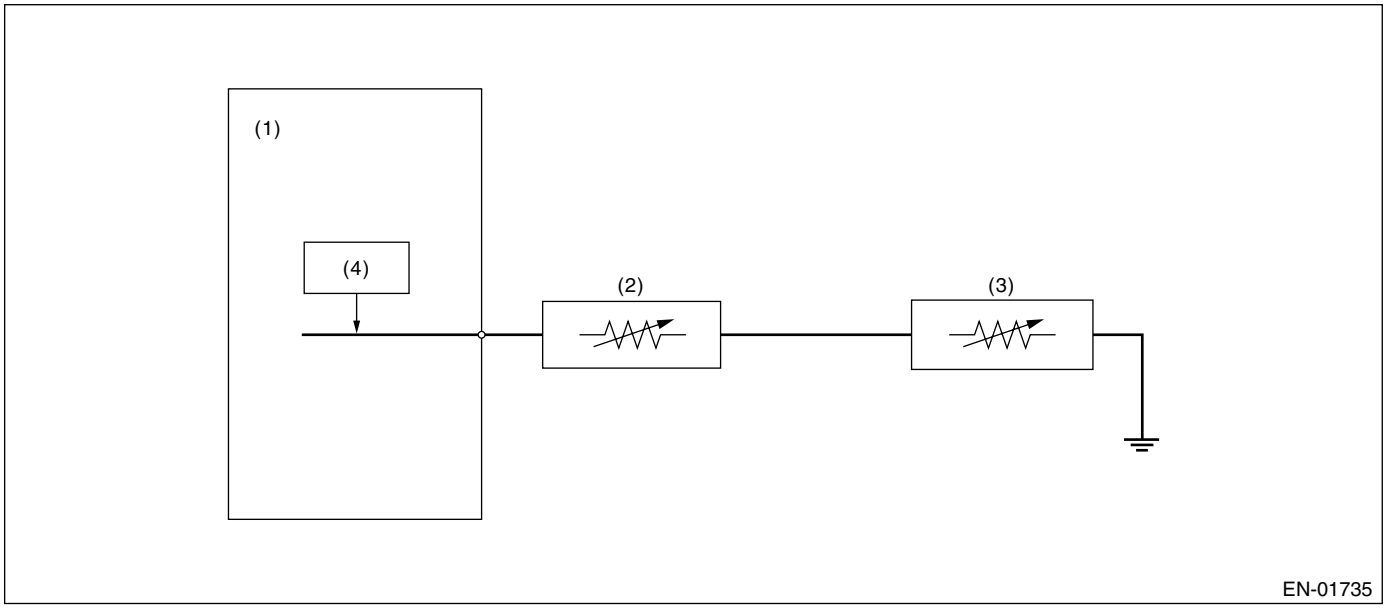
Memorize the freeze frame data. (For test mode $02)

BO:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.02 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.02 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

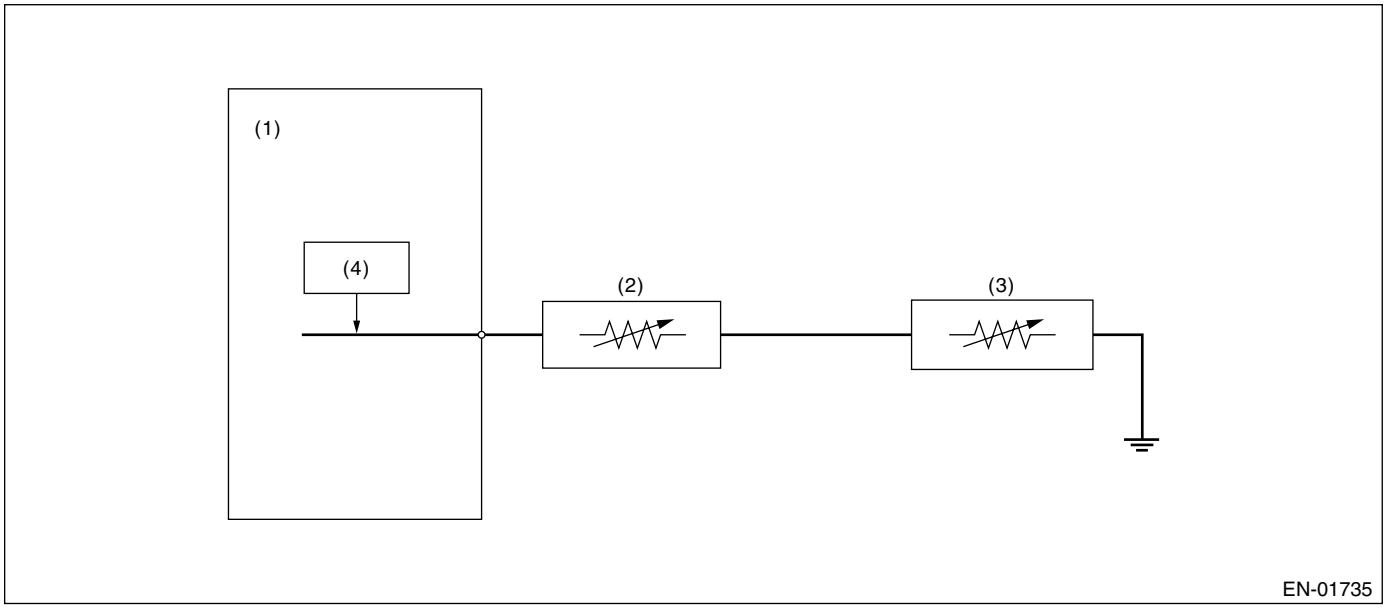
Memorize the freeze frame data. (For test mode $02)

BP:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 second).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.95 V

Time Needed for Diagnosis: 2.5 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.95 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.
Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

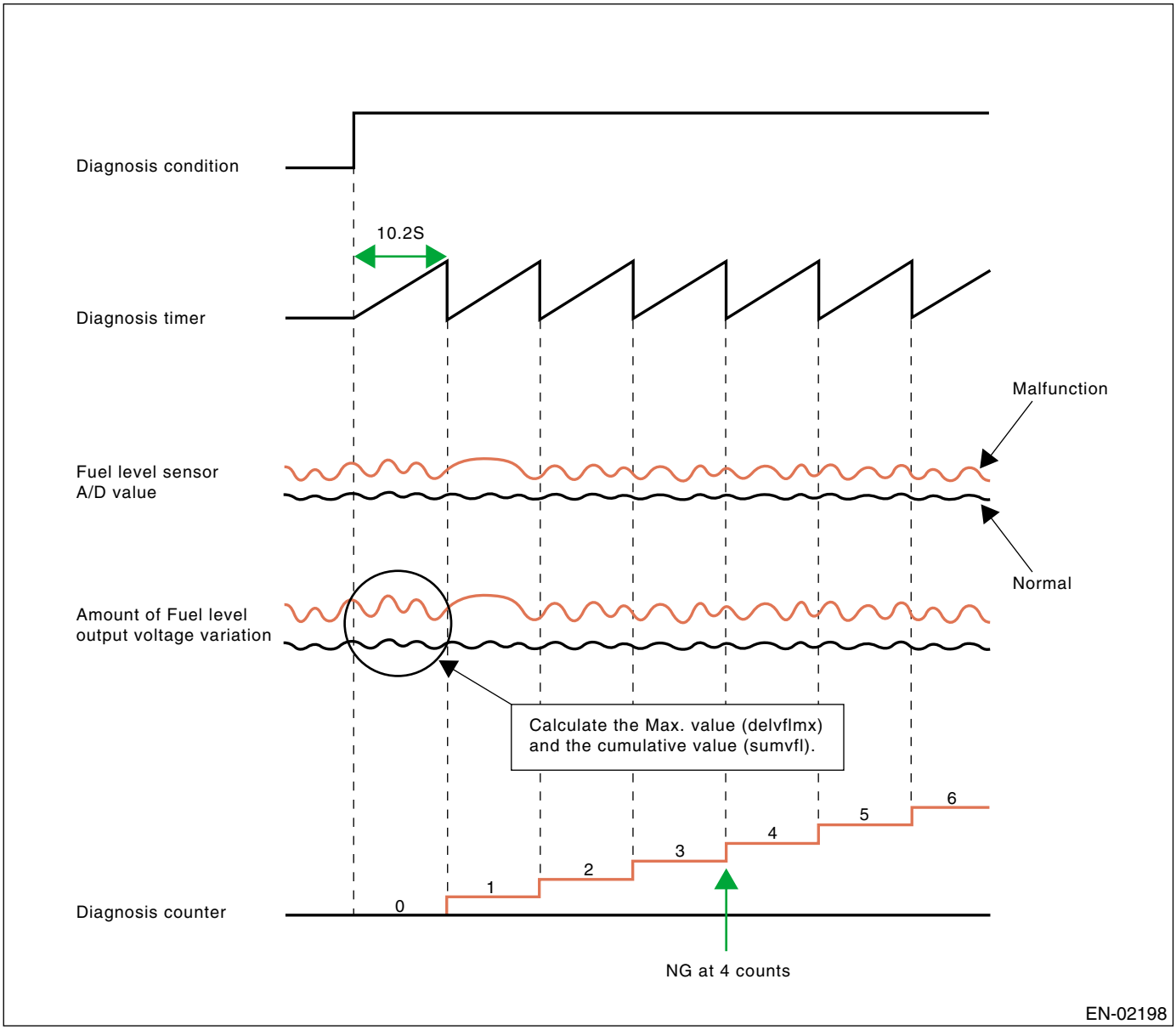
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.68 US gal, 2.11 ←→ 10.56 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 10.2 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 4 counts.



• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.2 V or SUMFL ≥ 16 V where, DELFLMAX is Max. deviation of sensor output during 10.2 seconds. SUMFL is integrated value of sensor output deviation during 10.2 seconds.	≥ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 10.2 seconds.

Max – Min of tank pressure during 10.2 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 10.2 seconds	≥ 0.275 V

Time Needed for Diagnosis: 10.2 seconds × 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 V
SUMFL Where, DELFLMAX is Max. deviation of sensor output during 10.2 seconds. SUMFL is integrated value of sensor output deviation during 10.2 seconds.	< 16 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

BR:DTC P0483 — COOLING FAN RATIONALITY CHECK —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	500 — 900 rpm
Idle switch	ON
Vehicle speed	= 0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 98°C (208°F)
Change of radiator fan signal	OFF to ON
Engine coolant temperature	Does not decrease

Time Needed for Diagnosis: 5 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Change of radiator fan signal	OFF to ON
Engine coolant temperature	Decrease

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BS:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter SW turns from ON to OFF.	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Throttle position sensor signal process: Fix the all closed position learning value at 0°.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Vehicle speed = 0 km/h (0 MPH) / Not allowed to carry out the fuel cut.
- ISC open loop compensation: Fix the open loop compensation at 6.82%
- ISC feedback control: Not allowed to calculate the amount of ISC feedback.
- Air conditioner control: Air conditioner cut signal is not allowed driving acceleration.
- Radiator fan control: Both main and sub fan are in High driving.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BT:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 240
Starter switch	OFF
Time after starter switch turns from ON to OFF.	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Throttle position sensor signal process: Fix the all closed position learning value at 0°.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Vehicle speed = 0 km/h (0 MPH) / Not allowed to carry out the fuel cut.
- ISC open loop compensation: Fix the open loop compensation at 5%
- ISC feedback control: Not allowed to calculate the amount of ISC feedback.
- Air conditioner control: Air conditioner cut signal is not allowed driving acceleration.
- Radiator fan control: Both main and sub fan are in High driving.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

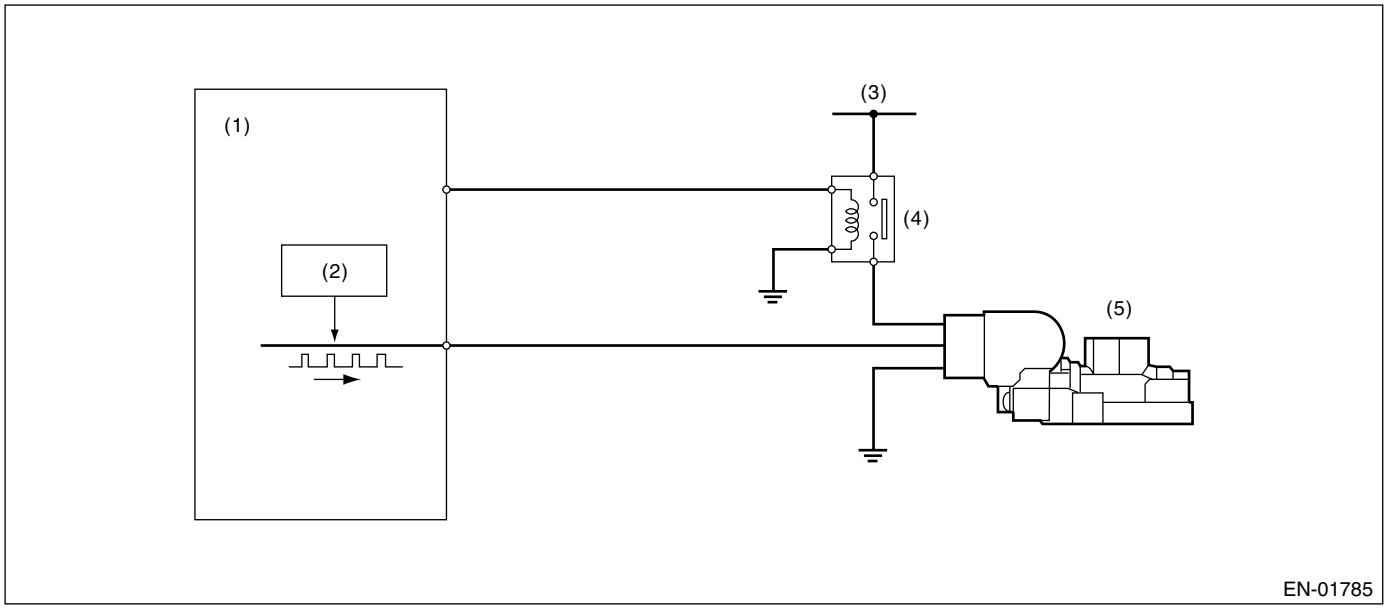
MEMO:

BU:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda (both left and right)	0.81 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

4. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after warm-up:

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< –100 rpm
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ –100 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

9. ECM OPERATION AT DTC SETTING

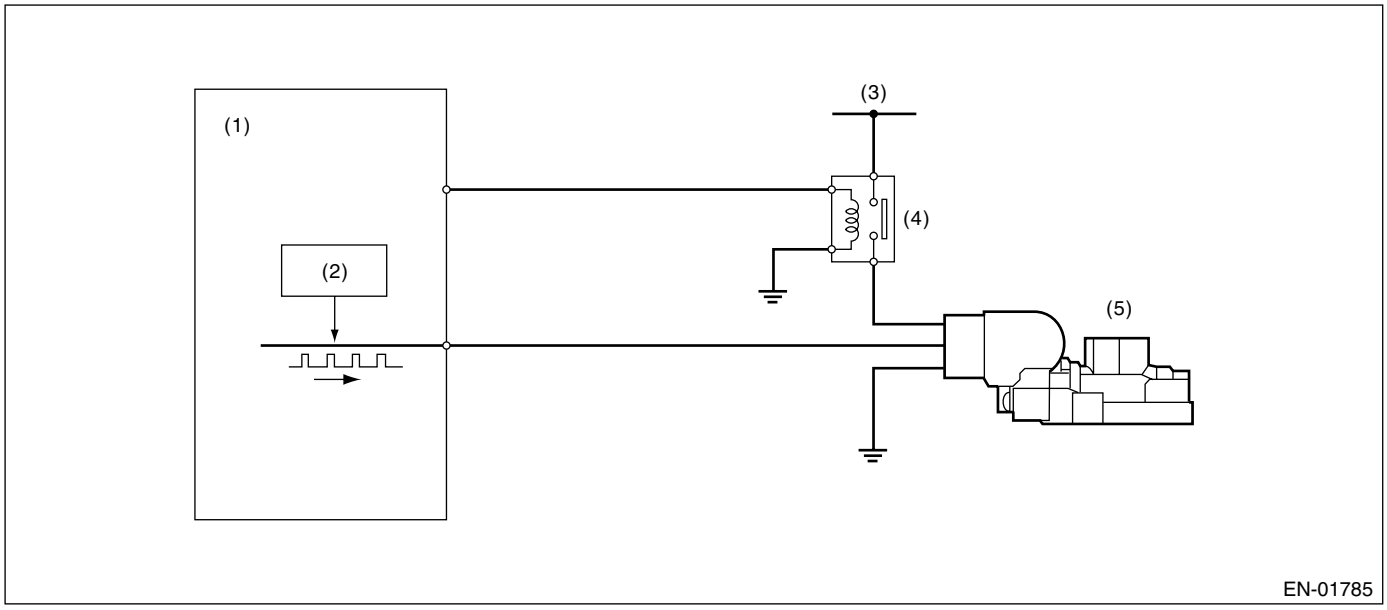
Memorize the freeze frame data. (For test mode $02)

BV:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda (both left and right)	0.81 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

4. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after warm-up.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

9. ECM OPERATION AT DTC SETTING

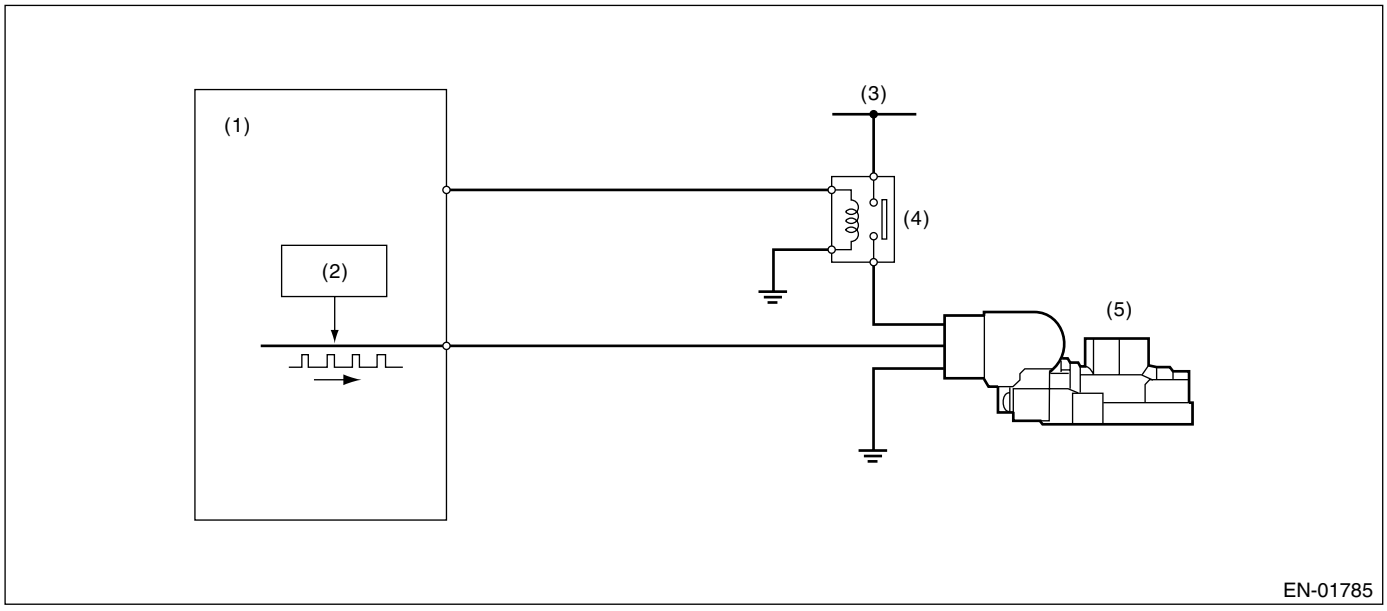
Memorize the freeze frame data. (For test mode $02)

BW:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in idle air control solenoid valve.
Period of idle air control solenoid valve is 4 milliseconds and it is too short.
Judge OK/NG in accordance with the number of change of OFF to ON signal.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Idle air control solenoid valve duty ratio	5 — 95%
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of change that idle air control solenoid valve signal during 64 milliseconds. (16 at normal since the cycle is 4 milliseconds)	≤ 8

Time Needed for Diagnosis: 64 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Idle air control solenoid valve feedback correction: Not allowed to calculate ifb (idle air control solenoid valve feedback amount)
- Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position
- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

9. ECM OPERATION AT DTC SETTING

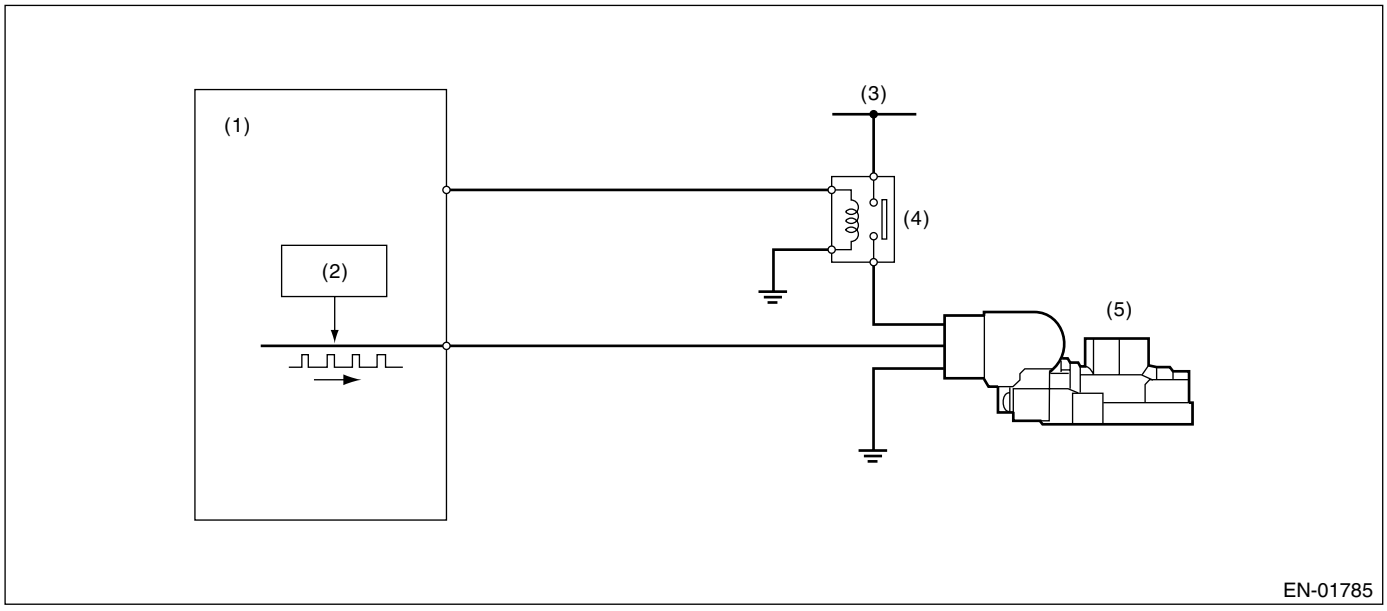
Memorize the freeze frame data. (For test mode $02)

BX:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in idle air control solenoid valve.
Period of idle air control solenoid valve is 4 milliseconds and it is too short.
Judge OK/NG in accordance with the number of change of OFF to ON signal.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Idle air control solenoid valve duty ratio	5 — 95%
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of change that idle air control solenoid valve signal during 64 milliseconds. (16 at normal since the cycle is 4 milliseconds)	≥ 225

Time Needed for Diagnosis: 64 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Idle air control solenoid valve feedback correction: Not allowed to calculate ifb (idle air control solenoid valve feedback amount)
- Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position
- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BY:DTC P0512 — STARTER REQUEST CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains to be on.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Undetected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

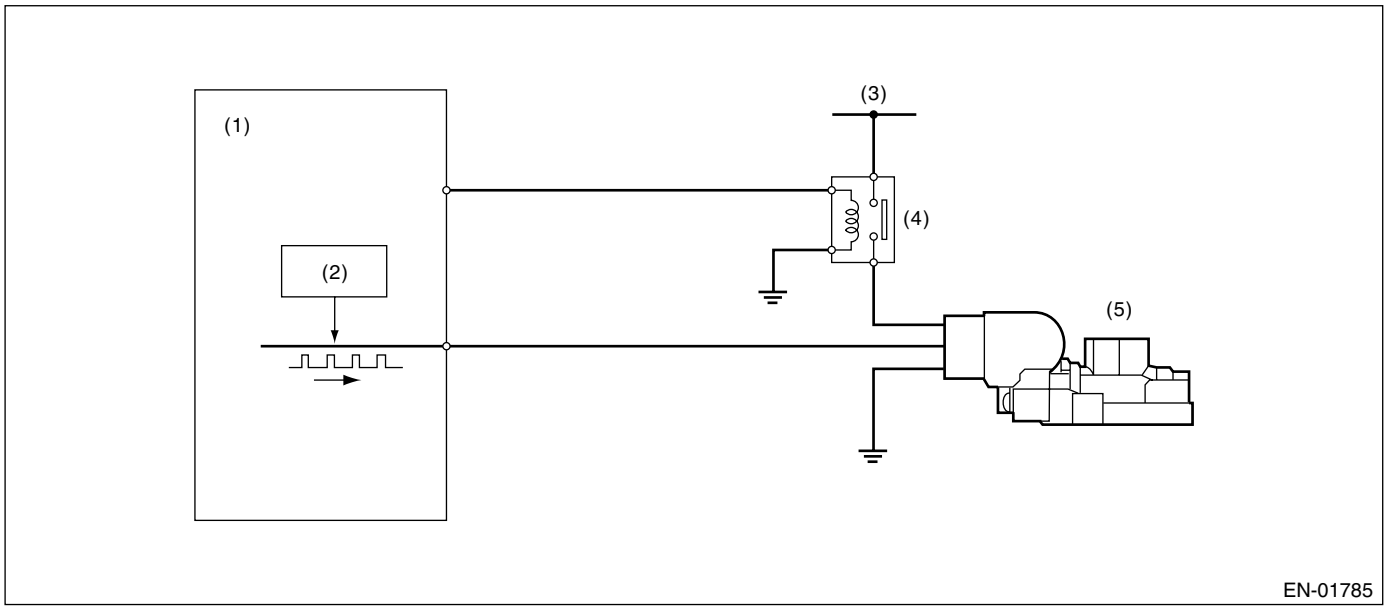
MEMO:

BZ:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

4. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 650 rpm
Feedback value for ISC	≤ 0
Engine speed change every 120°CA engine rev.	≥ –5 rpm

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA:DTC P0565 — CRUISE CONTROL ON SIGNAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the cruise control set signal is continued to be ON for a certain period of time at the vehicle speed less than 20 km/h (12 MPH).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≤ 20 km/h (12.4 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis at vehicle speed 20 km/h (12.4 MPH) or less.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Canceling signal	No signal

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Normally, zero-clear all the RAM area in the initial routine. And judge NG when the total of all the RAM after the clear is not $0000.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Total of all the RAM after the zero-clear the all the normal RAM area.	Not to 0

Time Needed for Diagnosis: Undecided
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

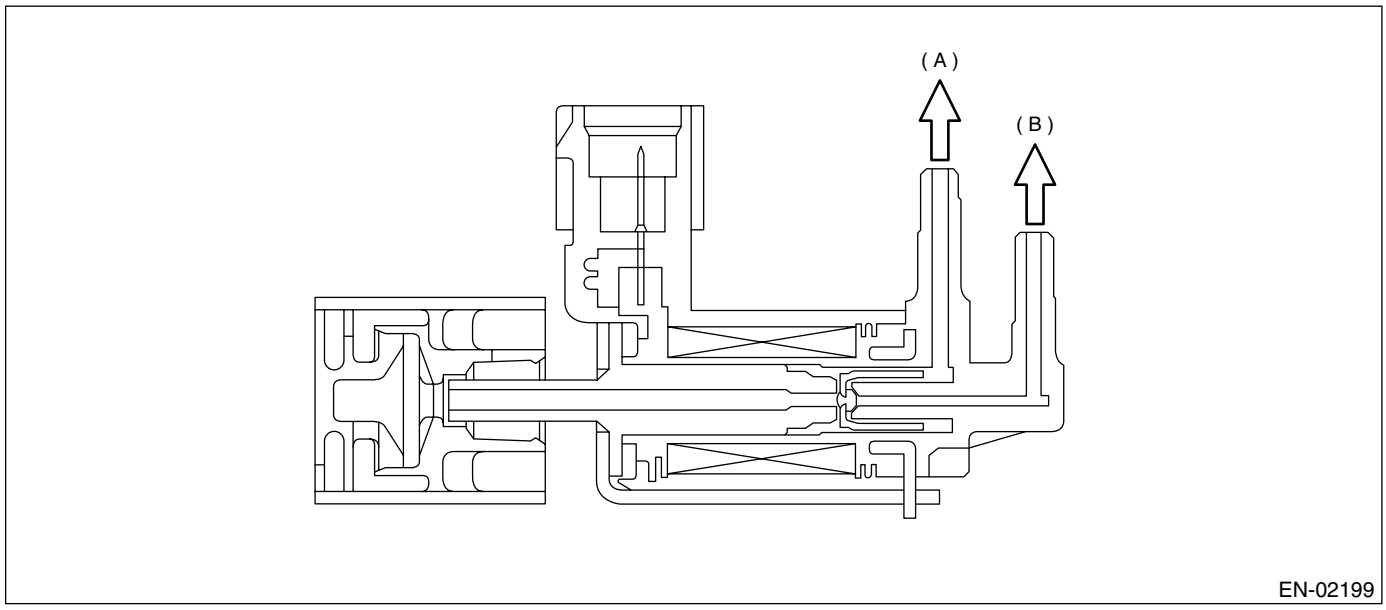
Memorize the freeze frame data. (For test mode $02)

CC:DTC P0661 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT LOW — BANK 1 — —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold tuning valve control.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To intake manifold (B) To variable intake valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition switch	ON
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

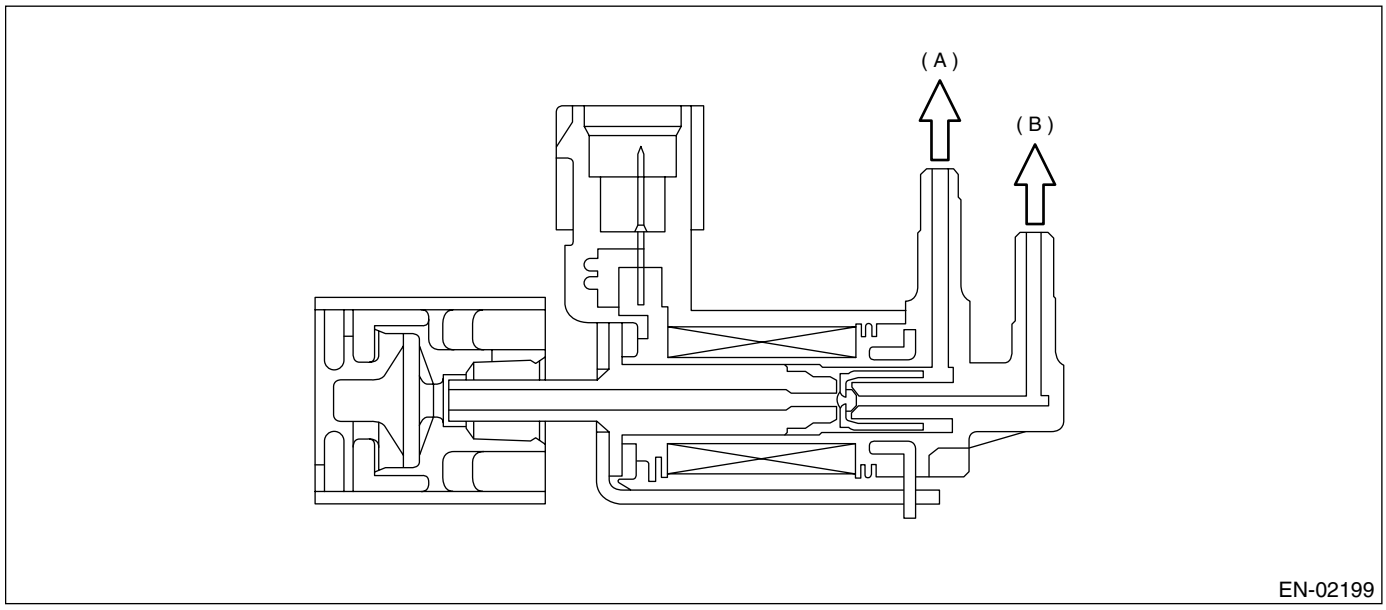
Memorize the freeze frame data. (For test mode $02)

CD:DTC P0662 — INTAKE MANIFOLD TUNING VALVE CONTROL CIRCUIT HIGH — BANK 1 — —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold tuning valve control.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To intake manifold (B) To variable intake valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition switch	ON
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CF:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the AT brake switch circuit becomes battery short, ground short or open circuit.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed change	30 to 0 km/h (18.6 to 0 MPH) 0 to 30 km/h (0 to 18.6 MPH)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
ON signal	No signal
OFF signal	No signal

Time Needed for Diagnosis: 15 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the “D” range switch becomes ground short or open circuit.

2. COMPONENT DESCRIPTION

Inhibitor switch ensures the safety at engine start. This switch is installed to the right side of transmission case, and operated by selector lever. When the selector lever is in the “P” or “N” range, the engine will start because the electric circuit in inhibitor switch is closed and the starter circuit is connected. When the selector lever is in the “R”, “D”, “3”, “2” or “1” range, the electric circuit in inhibitor switch is open; therefore, the engine cannot be cranked. In the “R” range, the back-up light will illuminate because the back-up light circuit in the switch is connected. In addition to the functions above, the inhibitor switch has the circuit which detects the selected range position at the present and transmits the range signal to the TCM.

3. ENABLE CONDITION

Secondary Parameters		Enable Conditions
(1)	Shift	“N” to “3”
	Vehicle speed	≥ 60 km/h (37 MPH)
(2)	Engine speed	> 500 rpm
	Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

	Malfunction Criteria	Threshold Value
(1)	“D” signal continuously	Not detected
(2)	Simultaneous signal	≥ 2

Time Needed for Diagnosis:

- 63.75 seconds (1)
- 10 seconds (2)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

- Judge NG when ATF temperature sensor becomes open circuit, battery short or ground short.
- Judge NG when ATF temperature sensor is faulty.

2. COMPONENT DESCRIPTION

ATF temperature sensor is installed to the hydraulic control valve body of transmission as a unit with transmission harness. This sensor detects ATF temperature and outputs it as electric resistance signal.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V
Output at ≥ 80 km/h (50 MPH) after 5 minutes from reaching more than 4.8 V	≥ 4.7 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control ATF temperature at a constant temperature 80°C (176°F)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CJ:DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the turbine speed signal is not transmitted for some reasons.

2. COMPONENT DESCRIPTION

Torque converter turbine speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the turbine speed of torque converter by the peripheral speed of high clutch drum connected to input shaft. And then it transmits the sine wave signal (32 pulses per rev.) to TCM. TCM calculates the ratio of the input shaft speed to vehicle speed, and then makes a judgment whether to shift or not.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 1500 rpm
Vehicle speed	≥ 40 km/h (25 MPH)
Range switch	“D”, “3”, “2” or “1”

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below were continued.
(1) Except “P”, “N”, “R” ranges and inhibitor switch is normal.
(2) Engine speed is more than 3000 rpm.
(3) Vehicle speed is 30 km/h (19 MPH) and vehicle speed sensor is normal.
(4) Turbine speed is more than 600 rpm.

Judgment Value

Malfunction Criteria	Threshold Value
Output from turbine shaft speed	< 600 rpm

Time Needed for Diagnosis: Perform the diagnosis immediately when the above conditions were continued.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CK:DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when an abnormal large signal is input to the front vehicle speed sensor, or no signal is input to the rear vehicle speed sensor.

2. COMPONENT DESCRIPTION

This vehicle speed sensor (output shaft speed sensor) is installed to the outside of transmission case.
This sensor detects the front wheel speed, and transmits the sine wave signal (32 pulses per rev.) to TCM.
TCM converts the signal to pulse signal, and transmits to both of the ECM and the combination meter.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 20 km/h (12 MPH)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis with more than 20 km/h (12 MPH) vehicle speed.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Number of speed sensor signals at every 1 second	≥ 4698 or no signal

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Use the normal vehicle speed sensor signal when either of them is normal.
- Use the vehicle speed calculated from the current gear position and turbine speed when both front and rear wheels are troubled.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL:DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is not input in the status of running the engine.

2. COMPONENT DESCRIPTION

Engine speed sensor is installed to the outside of engine body and crank part. This sensor detects the crank speed, and transmits the sine wave signal (2 pulses per rev.) to TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Output from mass air flow sensor	> 1.0 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≤ 400 rpm

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CM:DTC P0731 — GEAR 1 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(1st gear ratio) where, GR = (vehicle speed sensor 1 output)/ (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CN:DTC P0732 — GEAR 2 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(2nd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CO:DTC P0733 — GEAR 3 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(3rd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP:DTC P0734 — GEAR 4 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(4th gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is different from the turbine speed for some reasons at AT lock-up.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
In 4th gear position, duty ratio for duty solenoid valve	≥ 90%

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed ≥ (output shaft speed × 4th gear ratio × 9/8)	

Time Needed for Diagnosis: 10.2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Not allowed to lock up.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the lock-up duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Lock-up duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows the lock-up clutch to be connected or released smoothly by controlling the lock-up control valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CS:DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the line pressure duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Line pressure duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows controlling the pressure modifier valve and accumulator control valve A, and allows the line pressure to be adjusted to the pressure appropriate for driving condition.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CT:DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 1 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 1 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CU:DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 2 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 2 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CV:DTC P0771 — SHIFT SOLENOID "E" PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the low clutch timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Low clutch timing solenoid Low clutch timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the low clutch timing valve B and reverse inhibitor valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at "ON" signal from ECM	Low level
Vc at "OFF" signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CW:DTC P0778 — PRESSURE CONTROL SOLENOID "B" ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This solenoid decreases the change gear shock by adjusting the 2-4 brake pressure during 2-4 brake operation.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at "ON" signal from ECM	Low level
Vc at "OFF" signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CX:DTC P0785 — SHIFT/TIMING SOLENOID —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the 2-4 brake timing valve B and decreases the change gear shock.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CY:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the number of times of completing the malfunction criteria below becomes more than 10 times. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “ON” & any other switches = “OFF” on AT	OFF

Time Needed for Diagnosis: 10 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CZ:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the number of times of completing the malfunction criteria below becomes more than 10 times. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “OFF” & any other switches = “ON” on AT	ON

Time Needed for Diagnosis: 10 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DA:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect malfunction of communication of AT diagnosis.
Judge NG when communication format is disagreement.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform diagnosis during the vehicle running.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (60 seconds). Judge OK and clear NG when receiving normal data.

Judgment Value

Malfunction Criteria	Threshold Value
AT malfunction data reception control	Not receive normal data

Time Needed for Diagnosis: 60 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DB:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.
Judge NG when the AT diagnosis input line signal remains Low.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

4. GENERAL DRIVING CYCLE

Perform diagnosis during the vehicle running.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	Low

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DC:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.
Judge NG when the AT diagnosis input line signal remains High.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

4. GENERAL DRIVING CYCLE

Perform diagnosis during the vehicle running.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	High

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 1.0 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 1.0 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.7 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.7 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

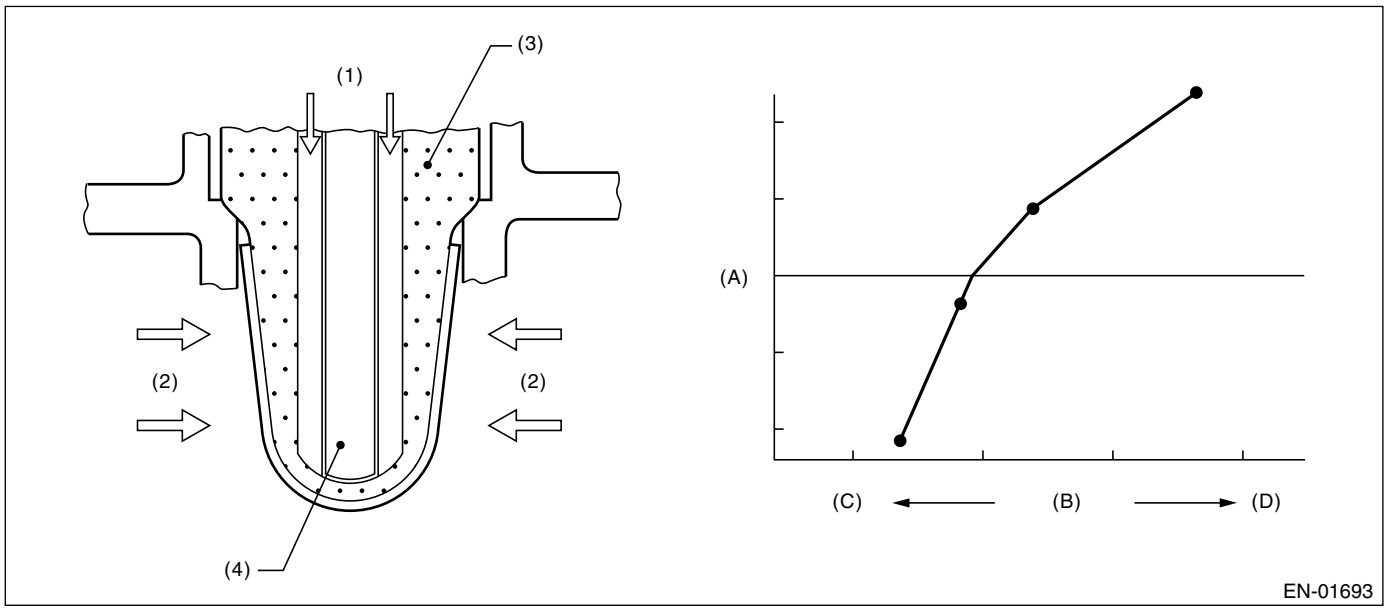
MEMO:

DF:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of IC communication.
Judge NG when the IC communication malfunction occurs.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous 6 times communication error to main CPU	≥ 2 sets

Time Needed for Diagnosis: Not determined
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Normal communication	2 times in a row

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F IC communication: Not allowed to communicate.
- A/F main learning compensation: Not allowed to calculate.
- Compensation at high temperature restart: Set min. value 0.06 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

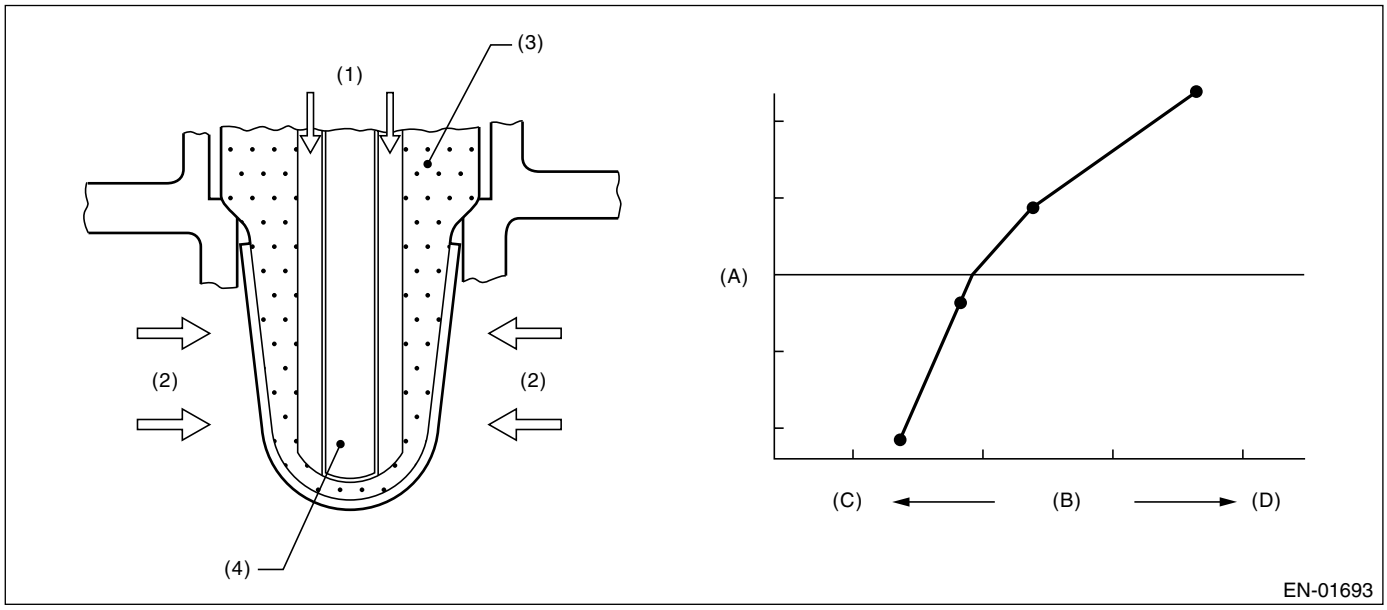
Memorize the freeze frame data. (For test mode $02)

DG:DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 8 g (0.28 oz)/s
Change of manifold pressure every 0.5 engine revolutions	≤ 1.95 kPa (14.6 mmHg, 0.575 inHg)
Impedance of front oxygen (A/F) sensor	0 ←→ 52 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Rear oxygen sensor sub learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

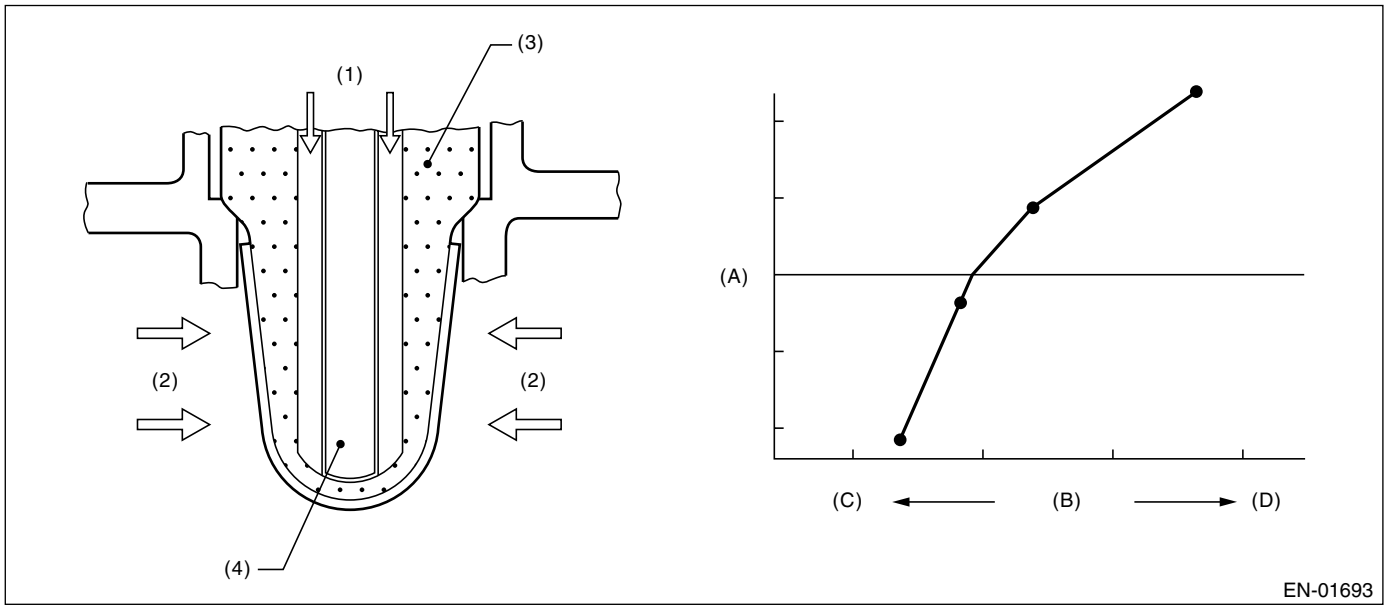
MEMO:

DH:DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 8 g (0.28 oz)/s
Change of manifold pressure every 0.5 engine revolutions	≤ 1.95 kPa (14.6 mmHg, 0.575 inHg)
Impedance of front oxygen (A/F) sensor	0 ←→ 52 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O_2 sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Rear oxygen sensor sub learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DI: DTC P1154 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —

NOTE:
For the detecting condition, refer to DTC P1152. <Ref. to GD(H6DO)-218, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DJ:DTC P1155 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1) —

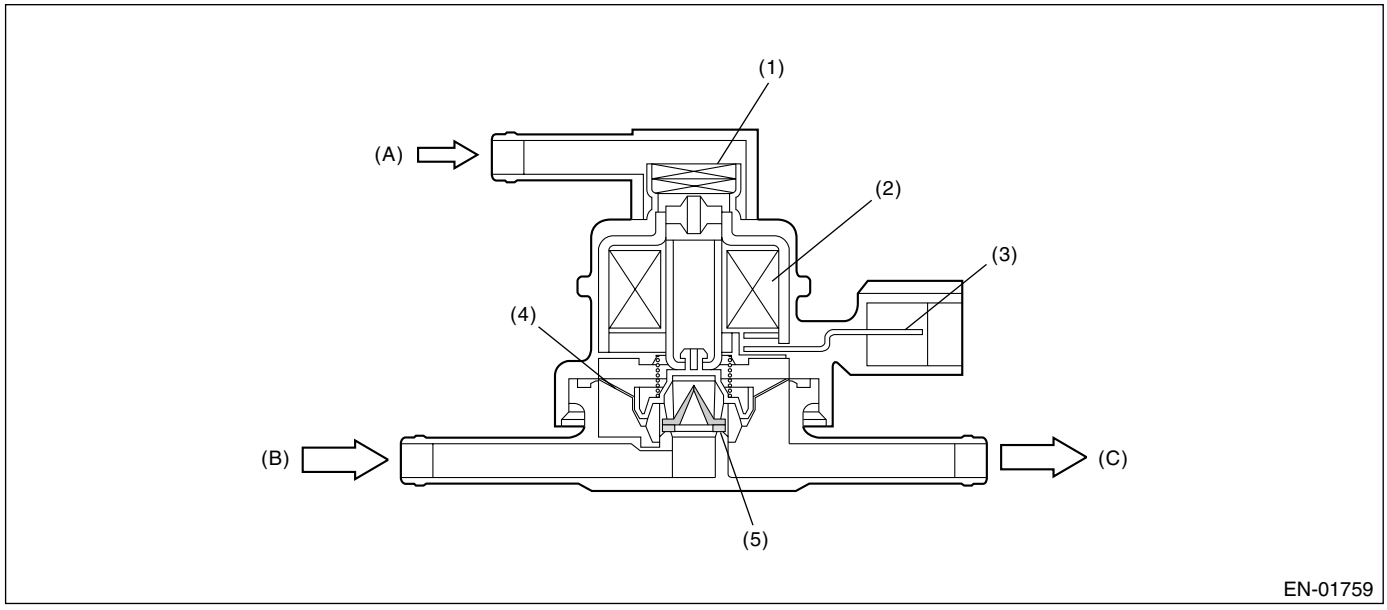
NOTE:
For the detecting condition, refer to DTC P1153. <Ref. to GD(H6DO)-222, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DK:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

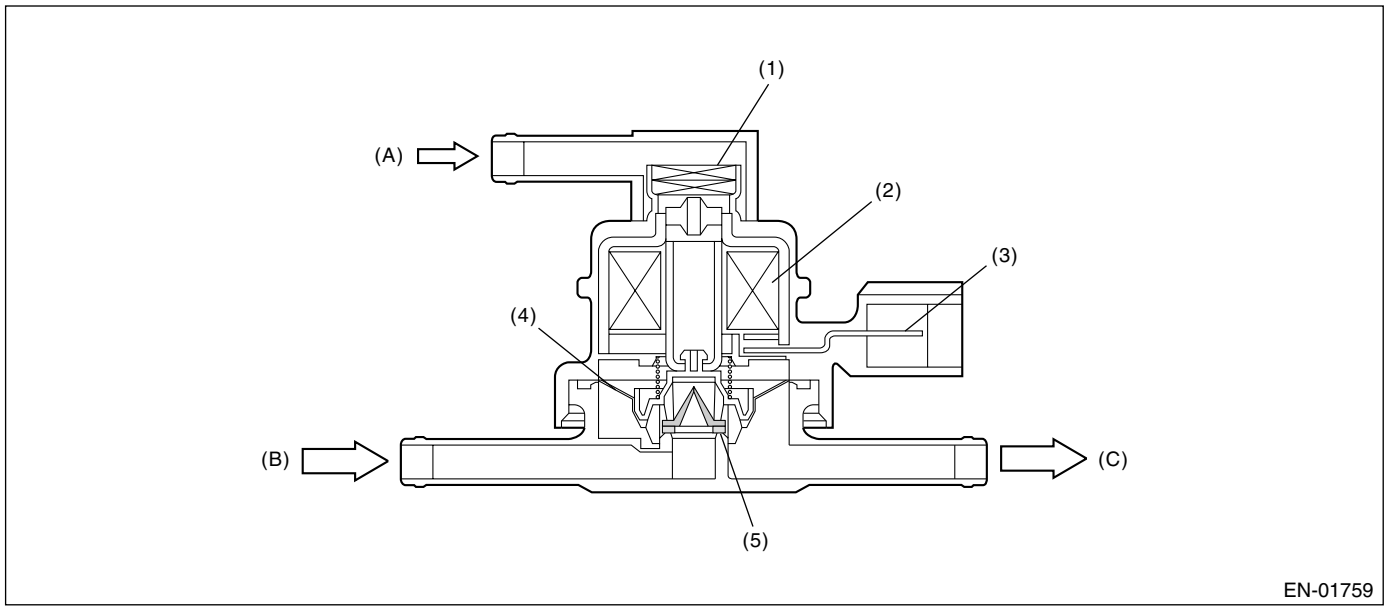
Memorize the freeze frame data. (For test mode $02)

DL:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

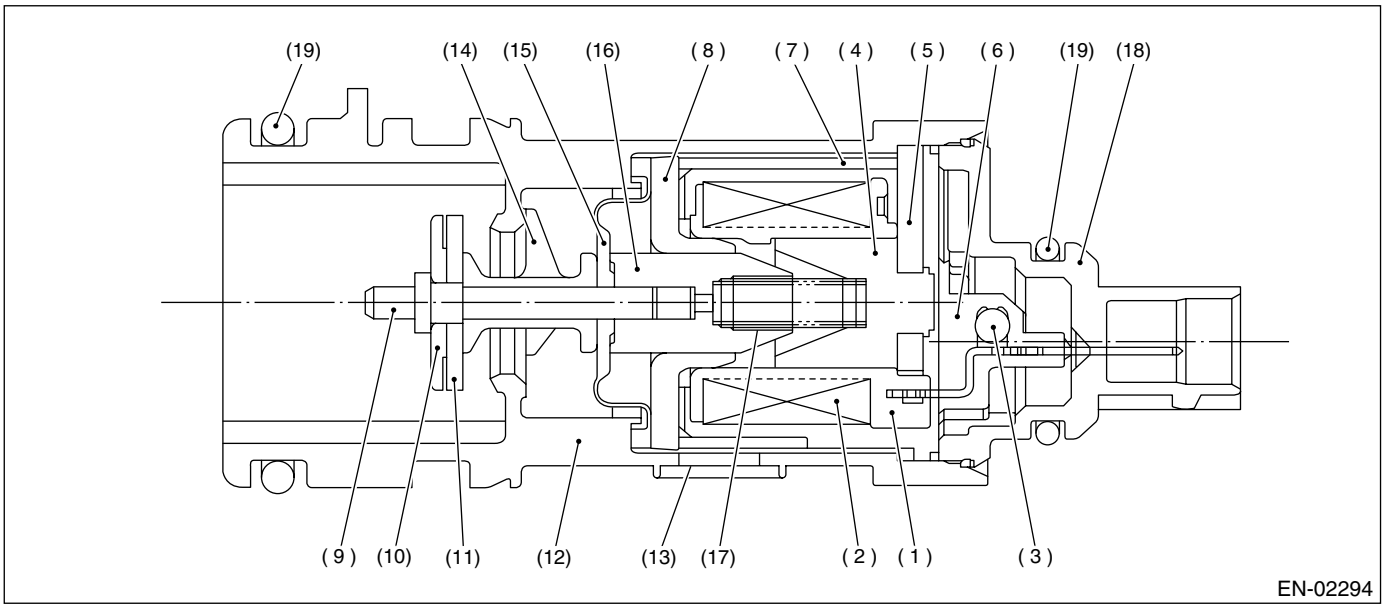
Memorize the freeze frame data. (For test mode $02)

DM:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect malfunction of drain valve (open fixing).
Judge NG when the fuel tank pressure becomes smaller.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Fitter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter SW OFF → ON	–5 ←→ 1.6 kPa (2 mmHg, 0.47 inHg)
Drain valve	Open

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	≤ –4.0 kPa (–30 mmHg, –1.18 inHg)

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	> –4.0 kPa (–30 mmHg, –1.18 inHg)
Cumulative time for completing the malfunction criteria below	≥ 30 seconds
Purge control solenoid valve duty ratio	Except 0
Fuel temperature	–10 ←→ 45°C (14 ←→ 133°F)
Intake manifold relative pressure	≤ –26.7 kPa (–200 mmHg, –7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

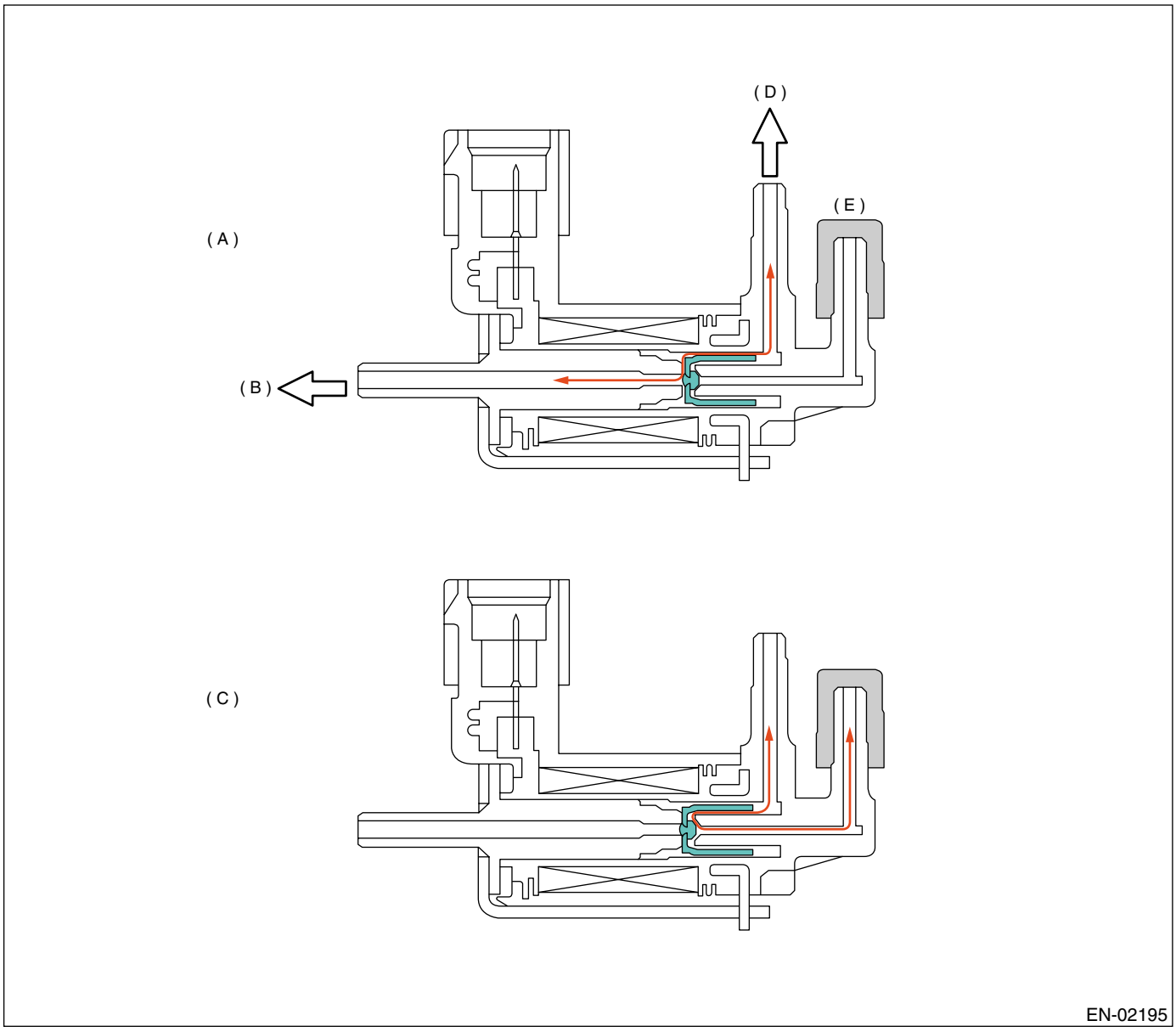
Memorize the freeze frame data. (For test mode $02)

DN:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Open atmosphere (solenoid OFF)
(B) Ambient air
(C) During trouble diagnosis (solenoid ON)
(D) To pressure sensor
(E) Plug

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition switch	ON
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

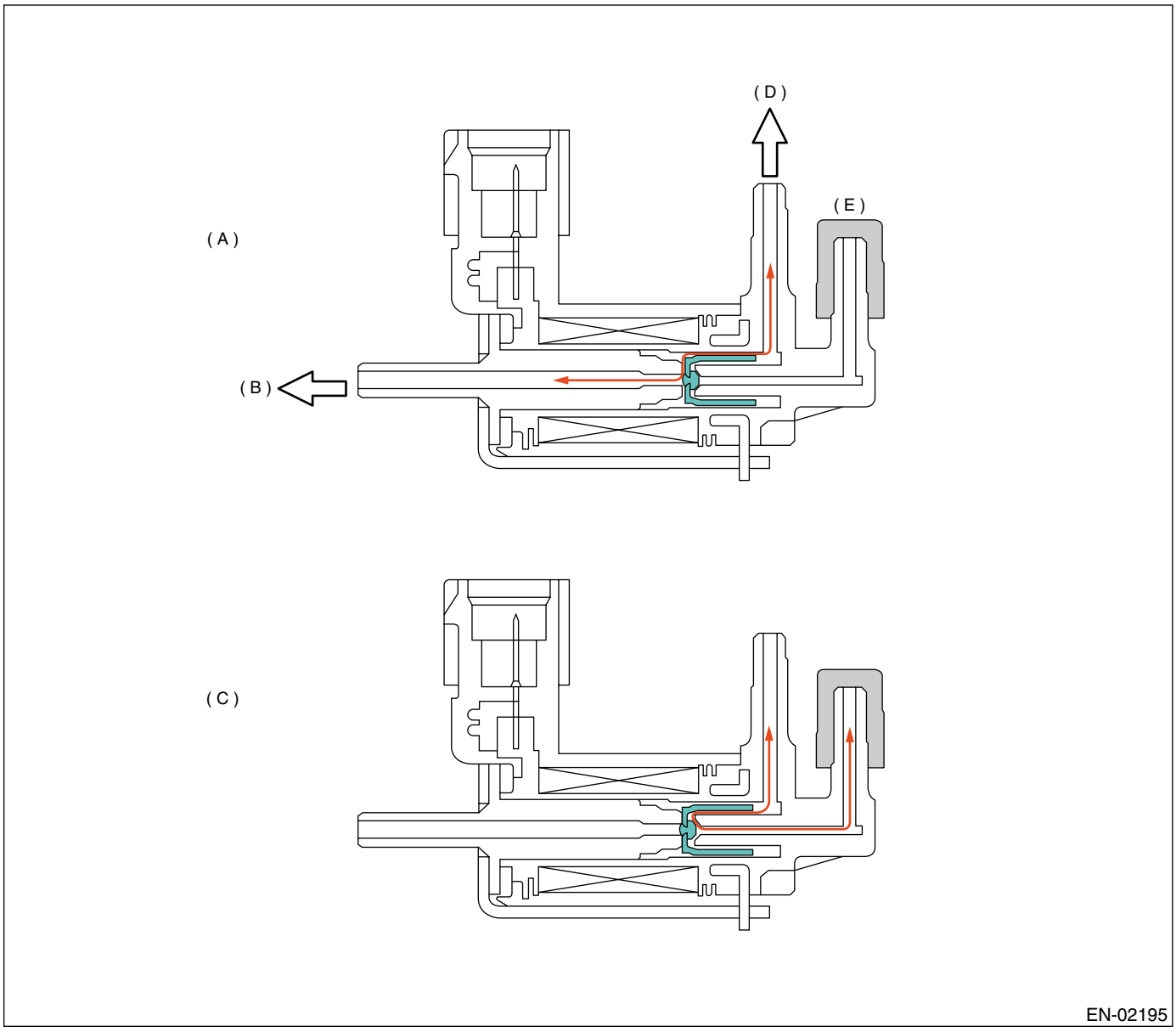
Memorize the freeze frame data. (For test mode $02)

DO:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Open atmosphere (solenoid OFF)
(B) Ambient air
(C) During trouble diagnosis (solenoid ON)
(D) To pressure sensor
(E) Plug

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition switch	ON
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

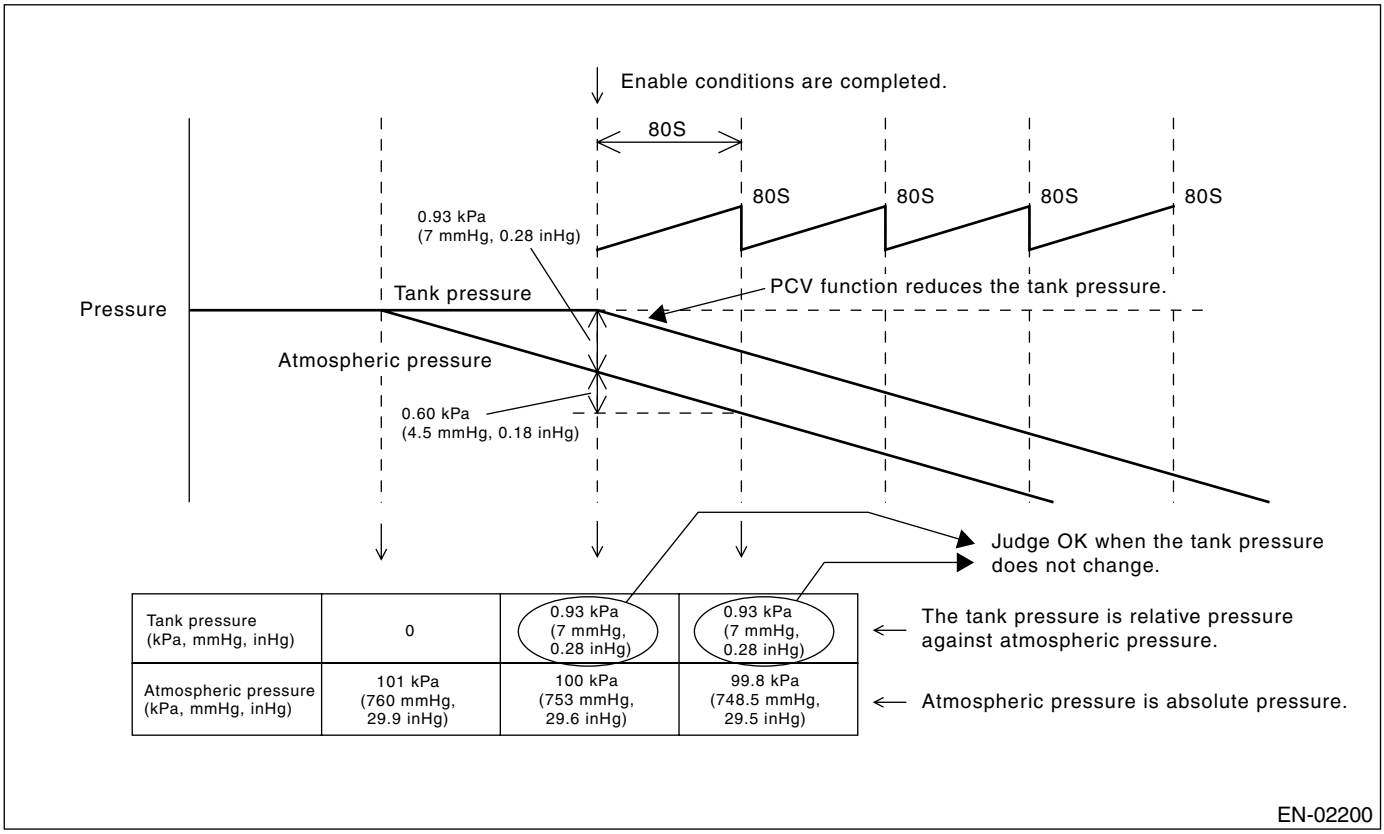
DP:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

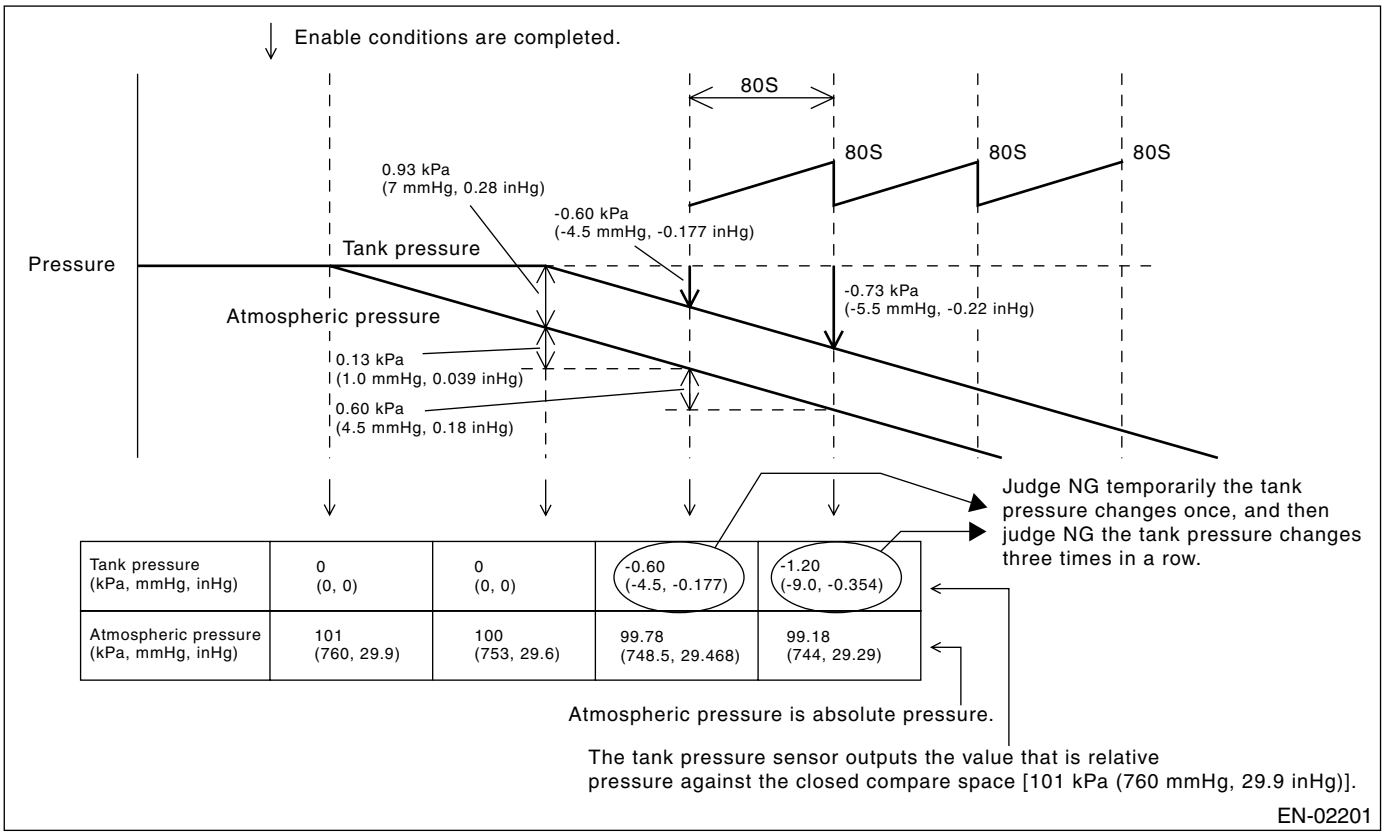
• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.60 kPa (4.5 mmHg, 0.18 inHg)) at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more per 80 seconds.

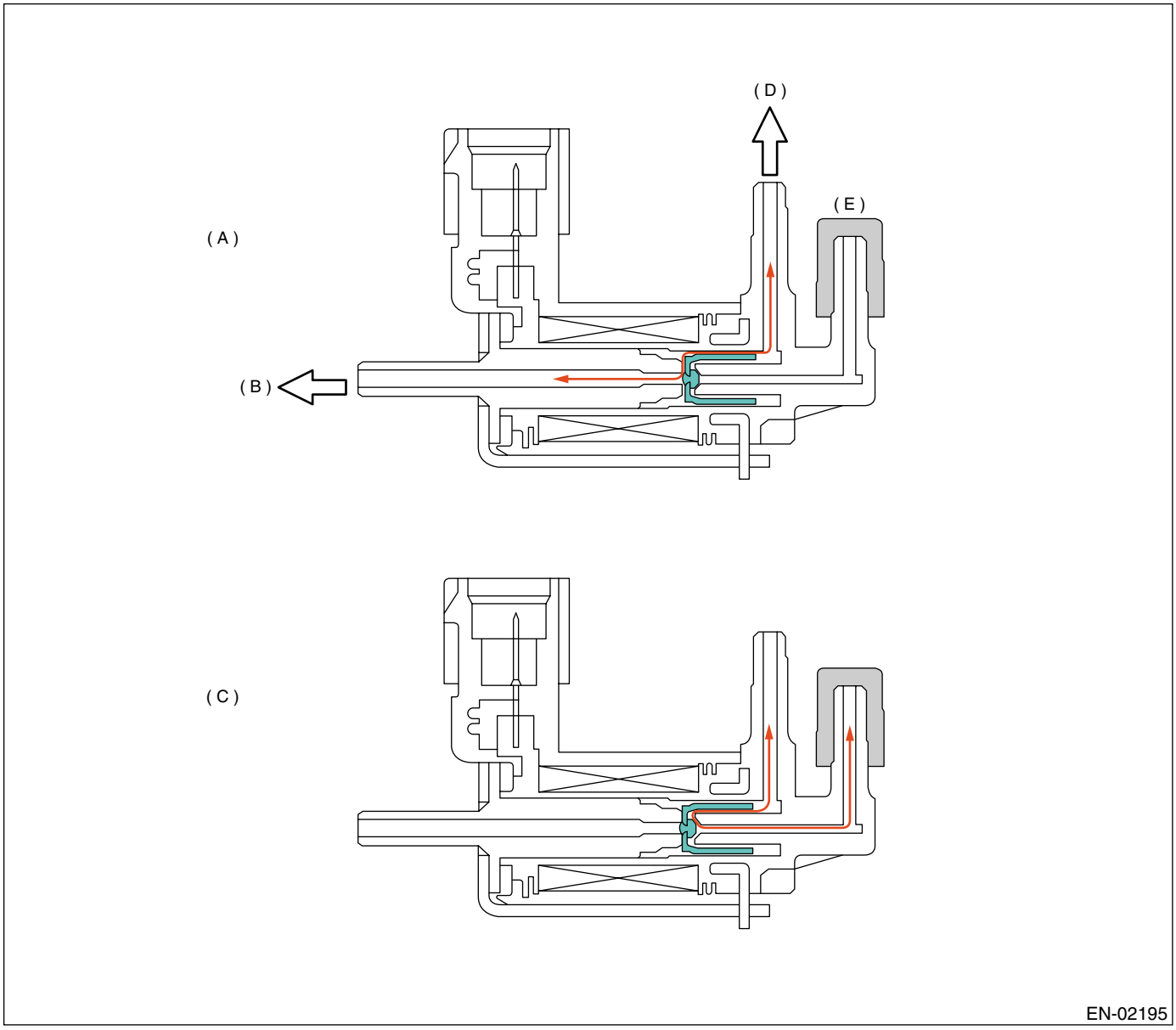


• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



2. COMPONENT DESCRIPTION



(A) Open atmosphere (solenoid OFF)
(B) Ambient air
(C) During trouble diagnosis (solenoid ON)
(D) To pressure sensor
(E) Plug

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9.6 ←→ 48 ℓ (2.54 ←→ 12.68 US gal, 2.11 ←→ 10.56 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	< 0.1 kPa (1 mmHg, 0.04 inHg) or > –0.93 kPa (7 mmHg, 0.28 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.60 kPa (4.5 mmHg, 0.18 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.60 kPa (4.5 mmHg, 0.18 inHg)
Fuel level change	< 3 ℓ (0.8 US gal, 0.7 Imp gal)

Time Needed for Diagnosis: 80 seconds × 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.60 kPa (4.5 mmHg, 0.18 inHg)
Fuel tank pressure change in 80 seconds	< 0.60 kPa (4.5 mmHg, 0.18 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DQ:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when the engine starts without starter ON experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after 0.8 second continuity.	< 500 rpm
Engine speed	≥ 500 ρπμ

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DR:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the voltage of back-up power becomes small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	< Battery voltage × 0.7
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	≥ Battery voltage × 0.7
Battery voltage	≥ 10.9 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DS:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM output is high (Timing of High → Low)	Low
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
After engine starting	1 second or more

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM output is high (Timing of High → Low)	High
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
After engine starting	1 second or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

AT torque down control is not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DT:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM output is high (Timing of Low → High)	High
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
After engine starting	1 second or more

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM output is high (Timing of Low → High)	Low
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
After engine starting	1 second or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

AT torque down control is not allowed.

8. ECM OPERATION AT DTC SETTING

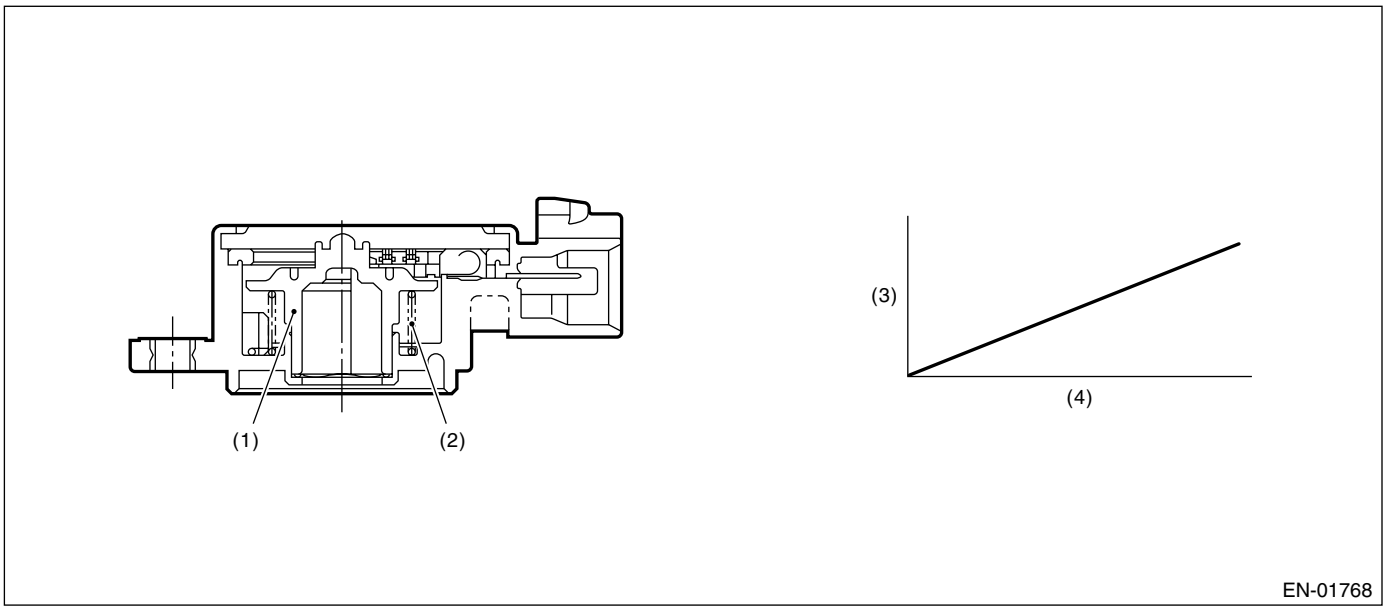
Memorize the freeze frame data. (For test mode $02)

DU:DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the voltage from throttle sensor is out of specified value.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 or ≥ 4.6 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the throttle angle to 3/8, and the line pressure and 2-4B pressure to maximum.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DV:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) at “ON” signal from TCM	High level
Collector voltage of transistor (Vc) at “OFF” signal from ECM	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DW:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	High level
Vc at “OFF” signal from ECM	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

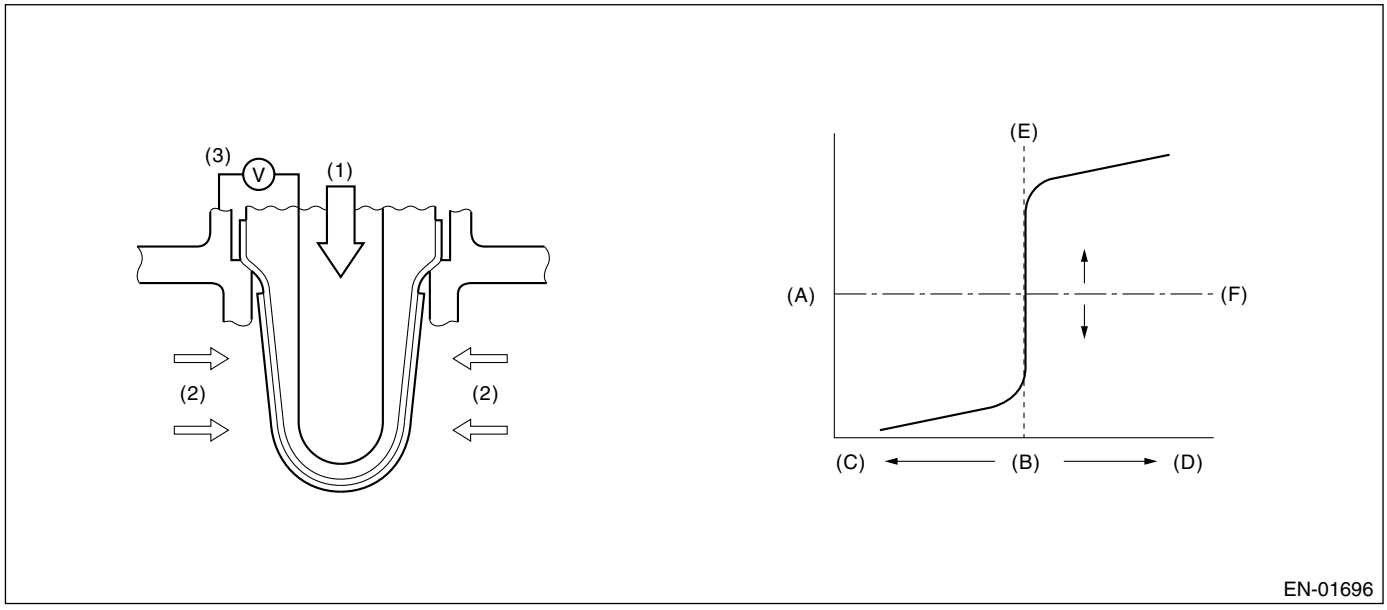
Memorize the freeze frame data. (For test mode $02)

DX:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to lean sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 16 g (0.56 oz)/sec
Sub feedback	Sticks to the limit value

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of more than 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

• Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 – rsl) where: rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> –2000 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 10 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

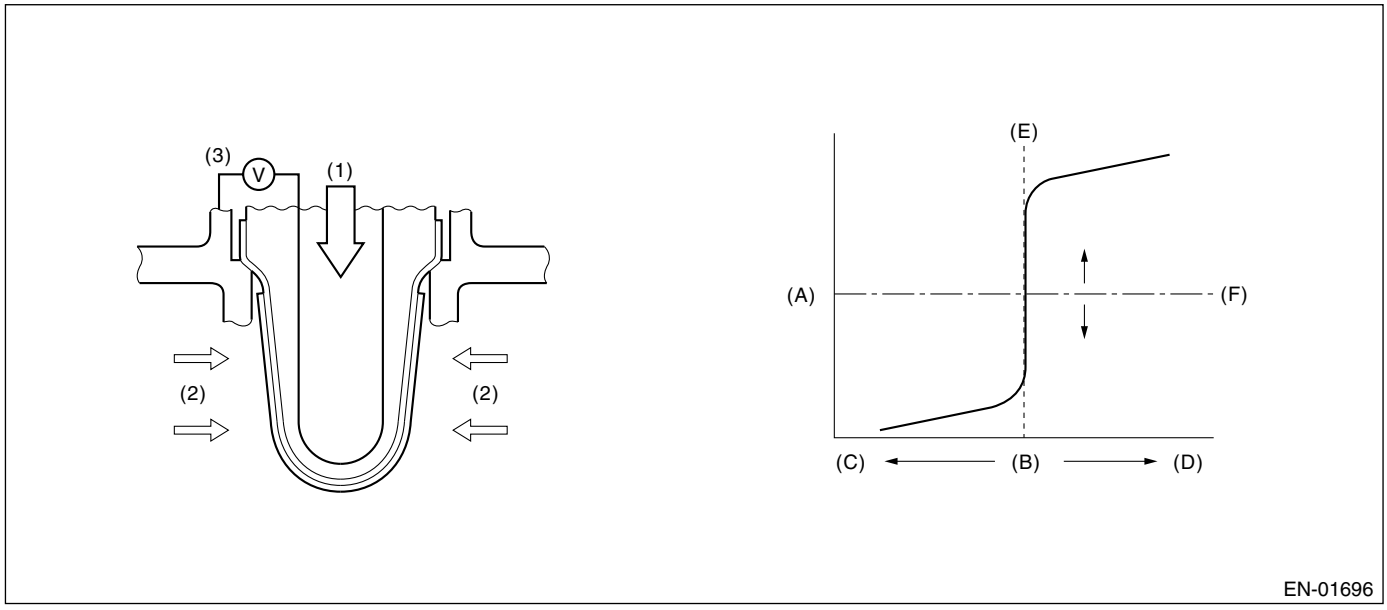
Memorize the freeze frame data. (For test mode $02)

DY:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to rich sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 16 g (0.56 oz)/sec
Sub feedback	Sticks to the limit value (rich side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of more than 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.

• Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 – rsl) where: rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> 478 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 10 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

MEMO:

CONTROL SYSTEMS

CS

		Page
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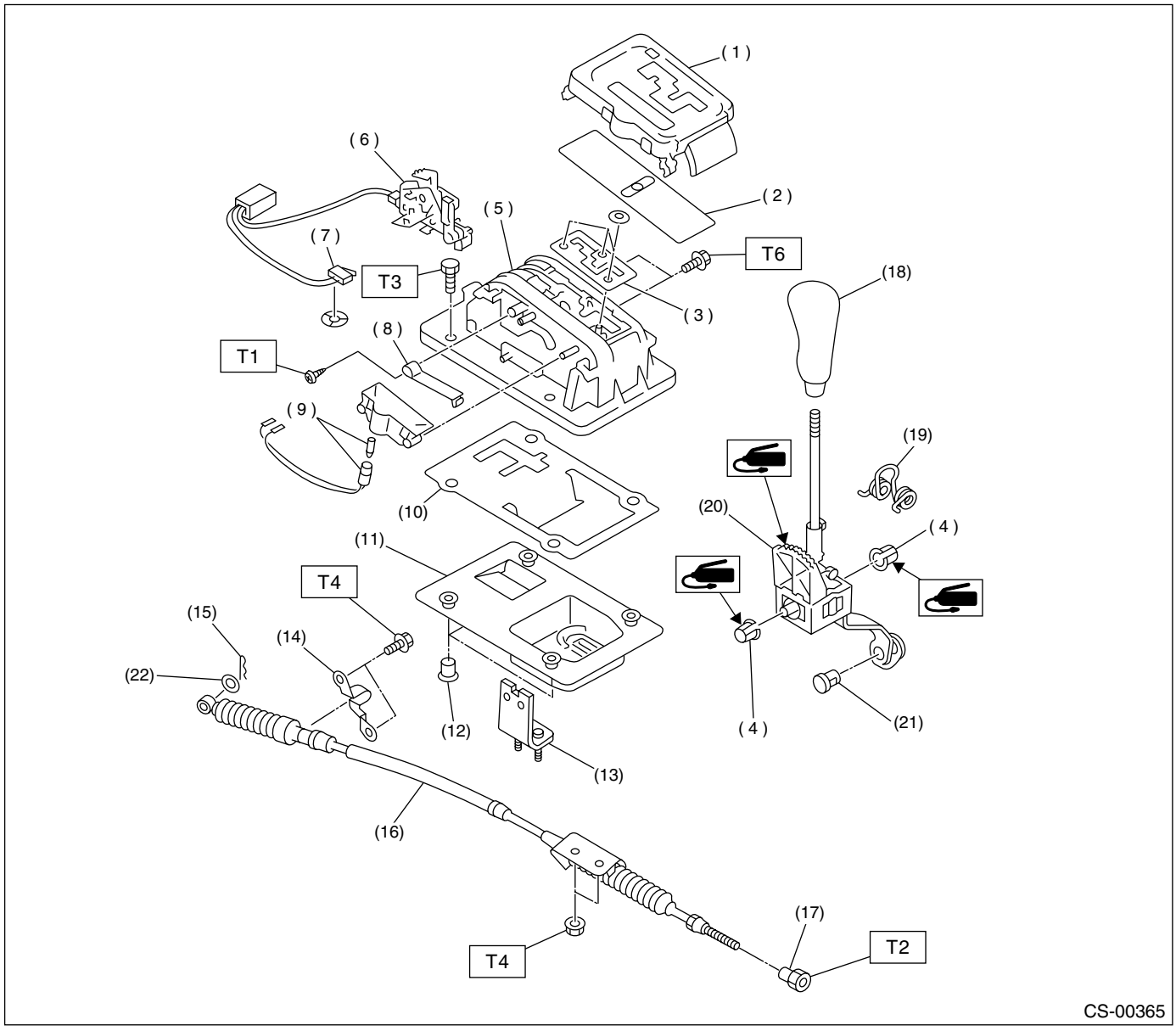
1. General Description

A: SPECIFICATIONS

Item		Specification
Swing torque of rod against MT gear shift lever	N (kgf, lb)	3.7 (0.38, 0.84) or less

B: COMPONENT

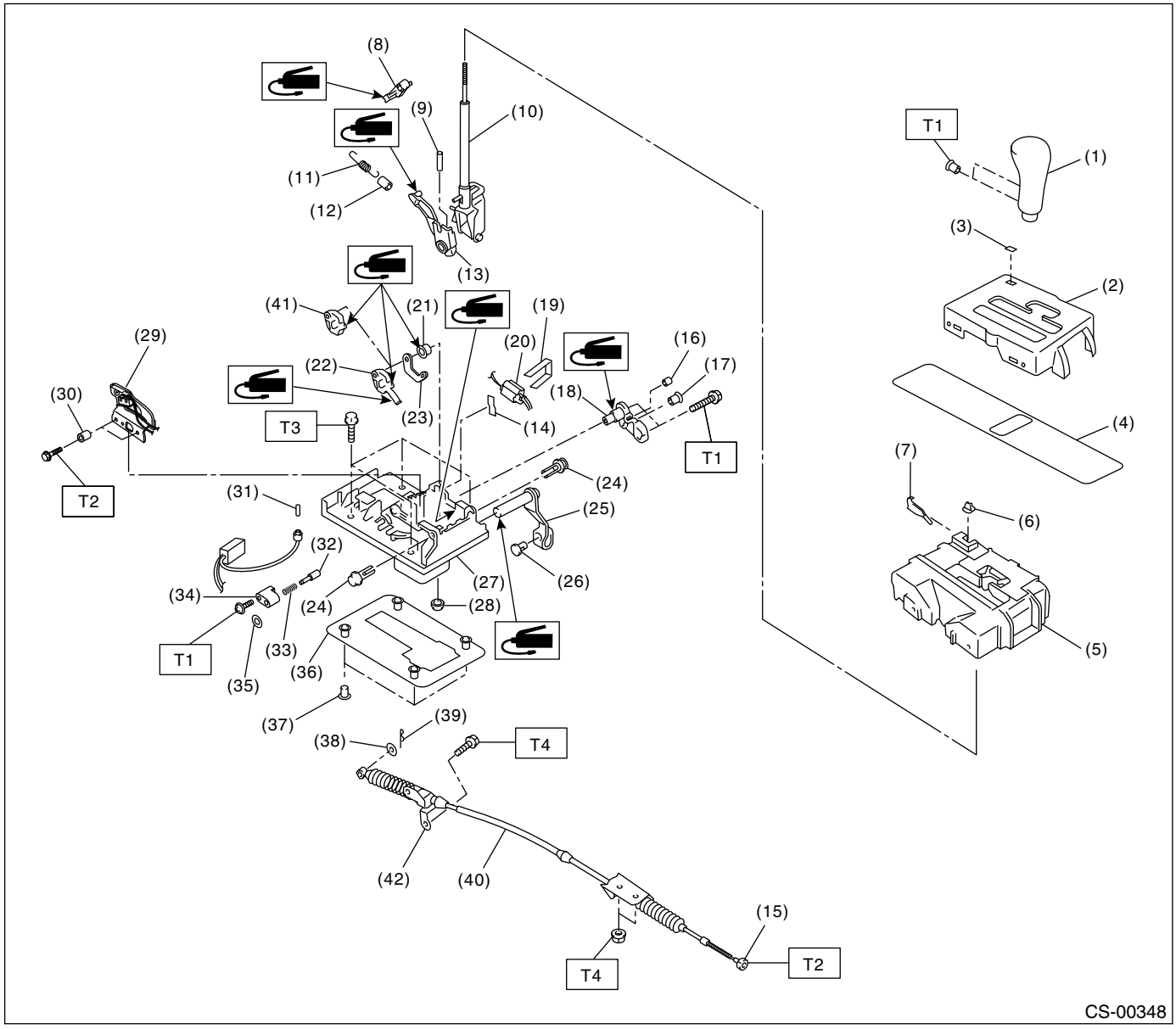
1. AT SELECT LEVER (EXCEPT SPORT SHIFT MODEL)



(1) Indicator cover
(2) Blind
(3) Cushion
(4) Bushing
(5) Plate
(6) Solenoid ASSY
(7) "P" position switch
(8) Detent spring
(9) Indicator bulb
(10) Plate
(11) Boot
(12) Spacer
(13) Cable bracket
(14) Cable clamp
(15) Snap pin
(16) Selector cable
(17) Nut A
(18) Grip
(19) Spring
(20) Select lever ASSY
(21) Bushing ASSY
(22) Washer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.9 (0.50, 3.6)
T2: 7.5 (0.76, 5.5)
T3: 13 (1.3, 9.4)
T4: 18 (1.8, 13.0)
T5: 33 (3.4, 25)
T6: 51 (5.2, 38)

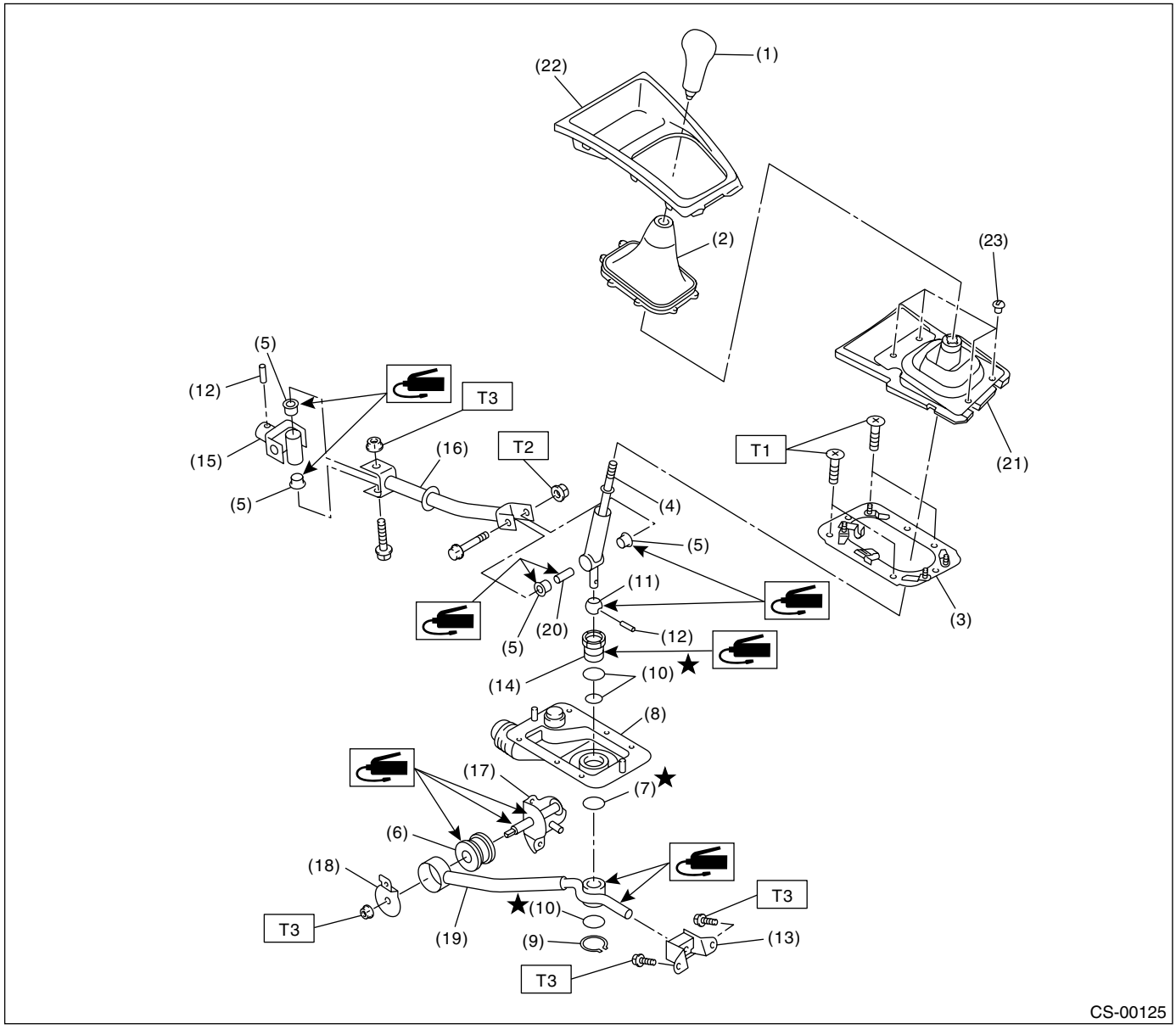
2. AT SELECT LEVER (SPORT SHIFT MODEL)



(1) Grip
(2) Indicator cover
(3) Cover
(4) Blind
(5) Guide plate
(6) Button
(7) Spring
(8) Detent arm
(9) Spring pin
(10) Lever ASSY
(11) Detent spring
(12) Tube
(13) Arm bracket
(14) Cushion
(15) Nut A
(16) Cushion
(17) Bushing
(18) Lock plate B
(19) Clamp
(20) Shift lock solenoid
(21) Bushing
(22) Lock plate A (Non-TURBO model)
(23) Lock plate C
(24) Clip
(25) Arm
(26) Bushing ASSY
(27) Base plate ASSY
(28) Grommet
(29) Bracket guide ASSY
(30) Spacer
(31) Indicator bulb
(32) Rod
(33) Spring
(34) Bushing
(35) Clip
(36) Packing
(37) Spacer
(38) Washer
(39) Snap pin
(40) Select cable
(41) Lock plate A (TURBO model)
(42) Cable lamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 2.0 (0.2, 1.4)
T2: 7.5 (0.76, 5.5)
T3: 13 (1.3, 9.4)
T4: 18 (1.8, 13.0)

3. MT GEAR SHIFT LEVER



(1) Gear shift knob
(2) Console boot
(3) Plate ASSY
(4) Lever
(5) Bushing
(6) Bushing
(7) Lock wire
(8) Boot
(9) Snap ring
(10) O-ring
(11) Bushing A
(12) Spring pin
(13) Cushion rubber
(14) Bushing B
(15) Joint
(16) Rod
(17) Bracket
(18) Washer
(19) Stay
(20) Spacer
(21) Boot and insulator ASSY
(22) Front cover
(23) Clamp

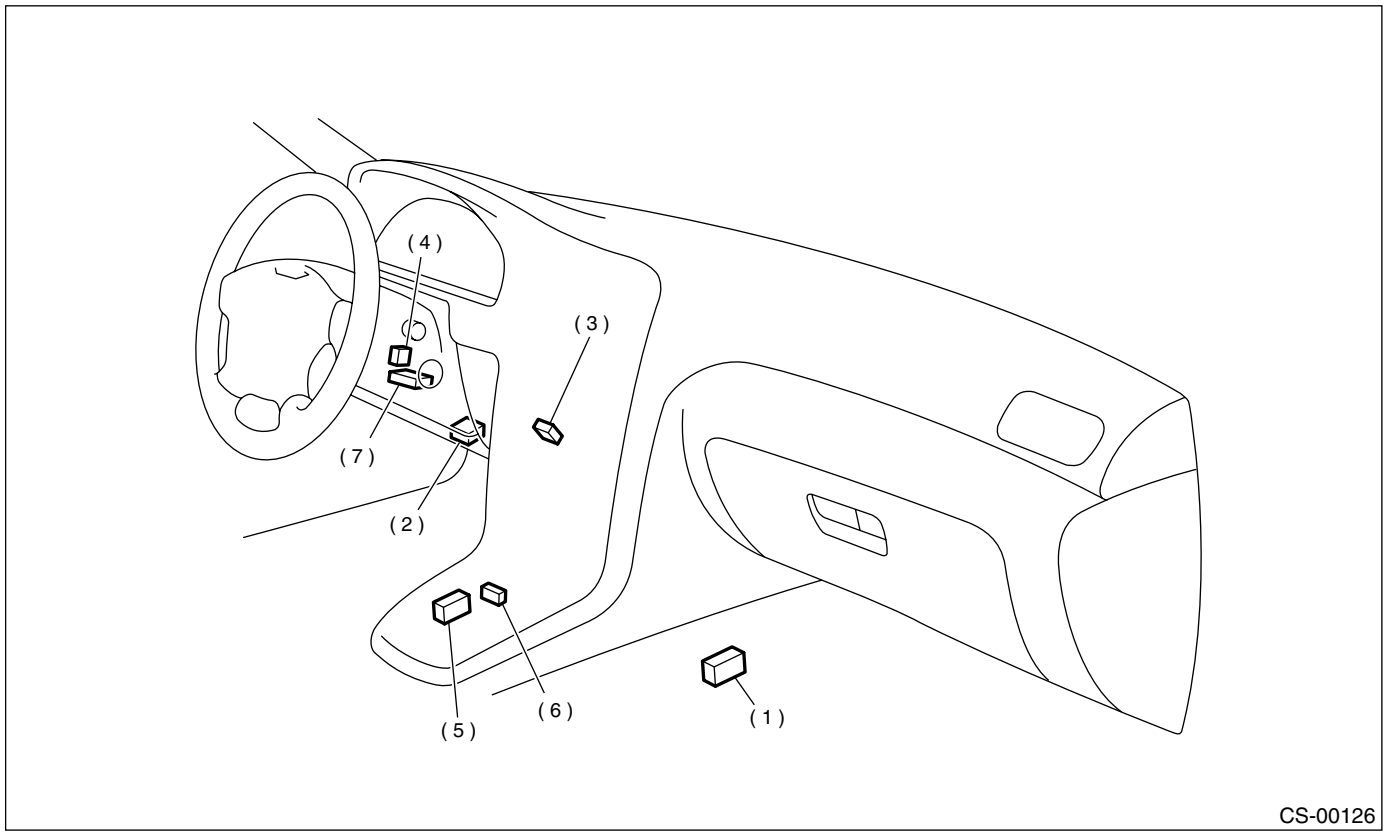
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 12 (1.2, 8.7)
T3: 18 (1.8, 13.0)

C: CAUTION

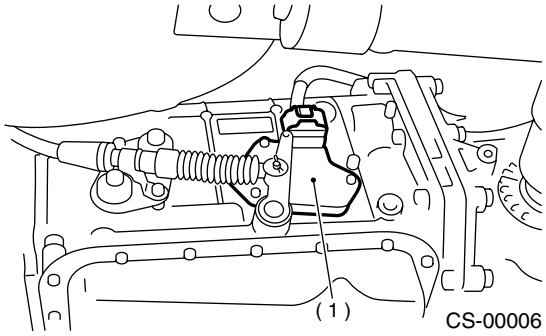
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Before disconnecting electrical connectors, be sure to disconnect the ground cable from battery.

2. Electrical Component

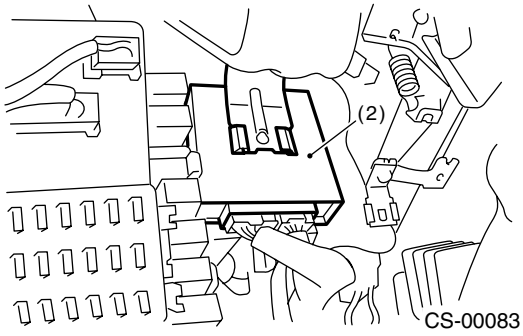
A: LOCATION



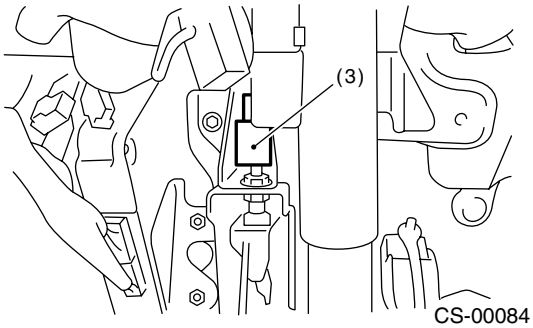
(1) Inhibitor switch
(2) Integrated module
(3) Stop light switch
(4) Key warning switch
(5) Shift lock solenoid
(6) “P” position switch
(7) Key lock solenoid



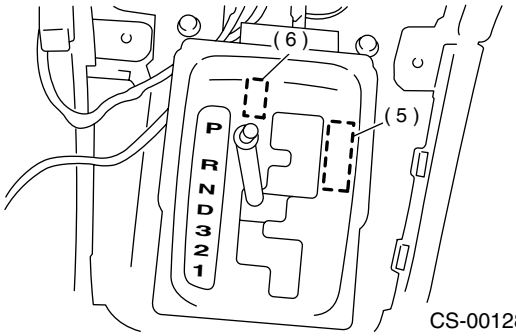
CS-00006



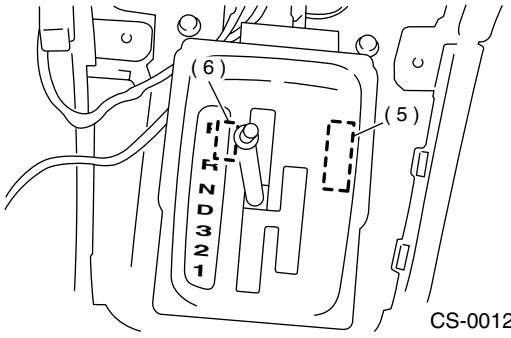
CS-00083



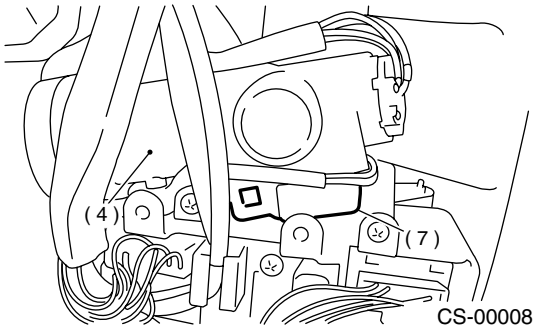
CS-00084



CS-00128



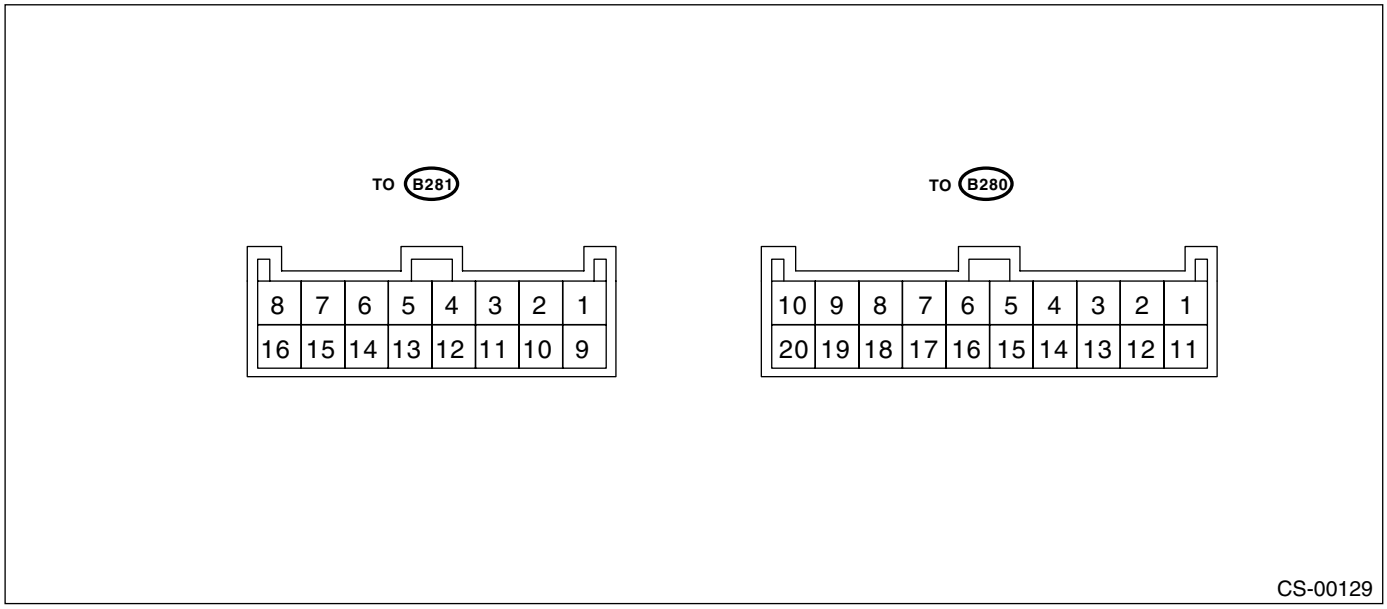
CS-00127



CS-00008

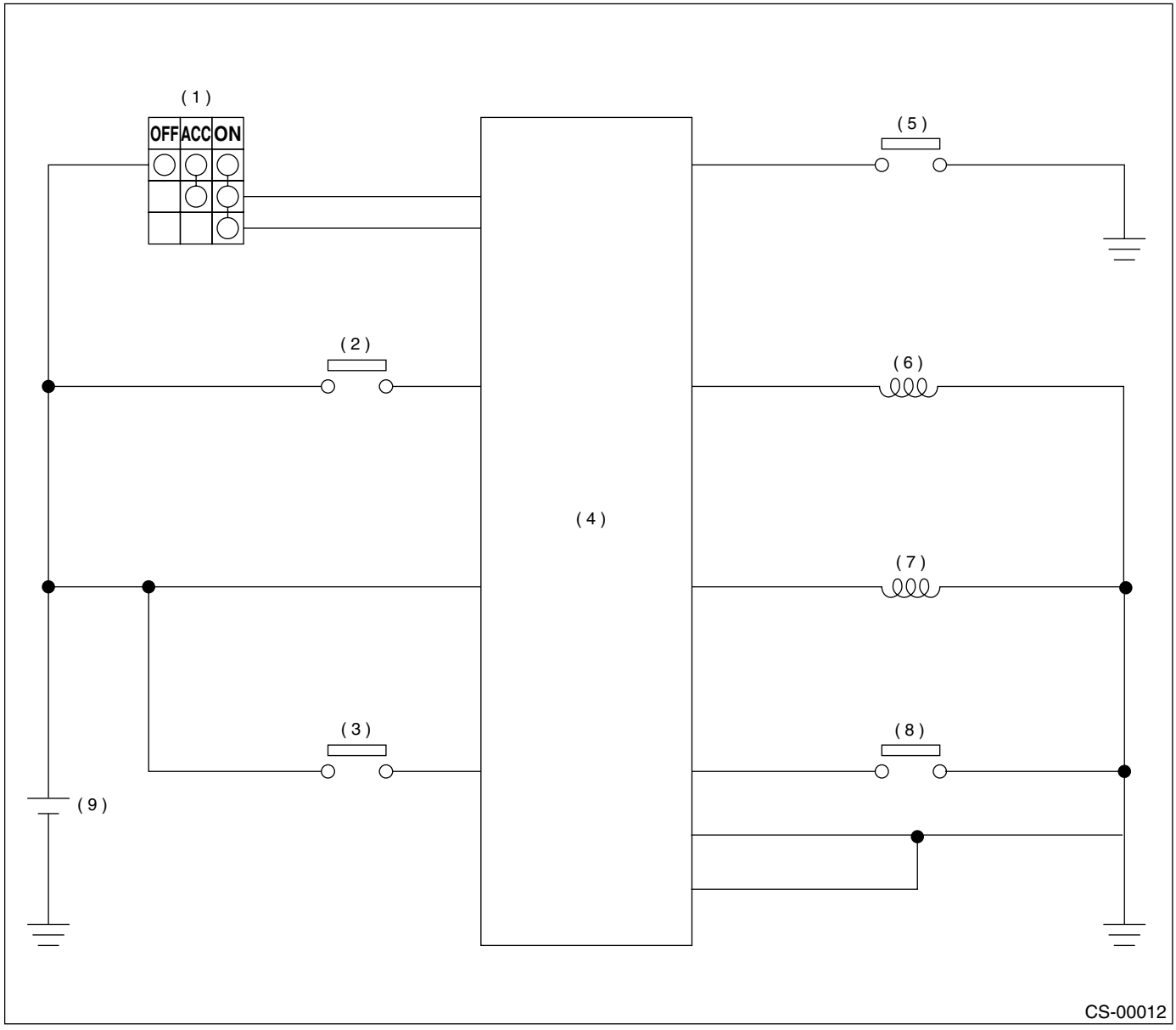
3. AT Shift Lock System

A: ELECTRICAL SPECIFICATION



Contents	To Connector No.	Terminal No.	Input/Output signal
			Measured value and measuring conditions
Battery power supply	B281	2	9 — 16 V
Ignition power supply	B280	19	10 — 15 V when ignition switch is at ON or START.
ACC power supply	B280	10	10 — 15 V when ignition switch is at ACC or ON.
Inhibitor Switch (“P” position)	B280	5	0 V when select lever is in “P” position. 9 — 16 V when select lever is in other positions than “P” position.
Stop light switch	B280	9	9 — 16 V when stop light switch is ON. 0 V when stop light switch is OFF.
“P” position switch	B280	6	0 V when select lever is in “P” position. 9 — 16 V when select lever is in other positions than “P” position.
Shift lock solenoid signal	B281	9	8.5 — 16 V when shift lock is released. 0 V when shift lock is operating.
Key warning switch signal	B280	20	9 — 16 V when key is inserted. 0 V when key is removed.
Key lock solenoid signal	B281	3	Pulse is output when switching key lock between locked and unlocked. 0 V at other conditions than above.
Ground	B281	4	—
Ground	B281	13	—

B: SCHEMATIC



(1) Ignition switch
(2) Stop light switch
(3) Key warning switch
(4) Integrated module
(5) Inhibitor switch
(6) Key lock solenoid
(7) Shift lock solenoid
(8) “P” position switch
(9) Battery

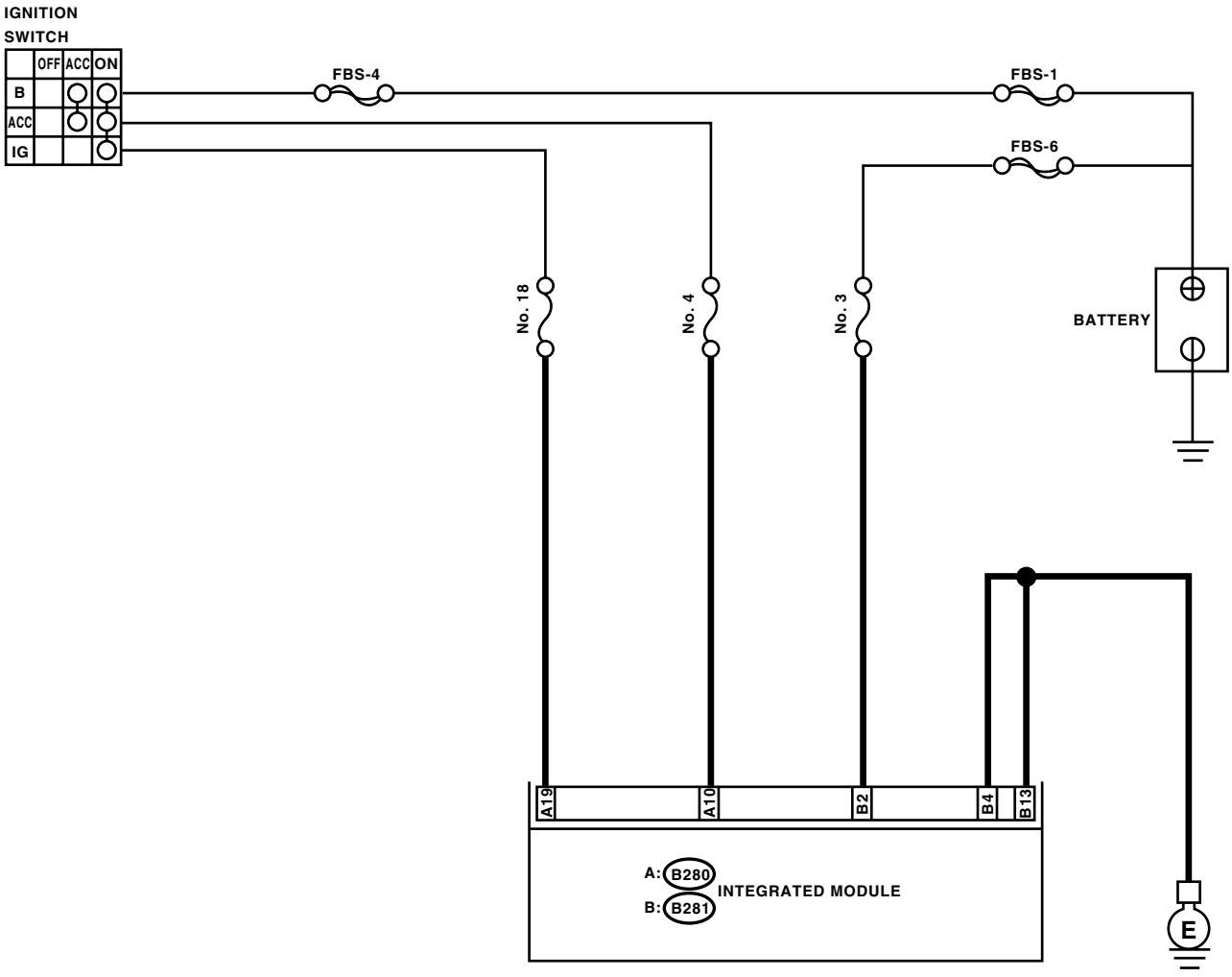
C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK.** 1) Turn the ignition switch ON. 2) Move the select lever to “P” position.	While the brake pedal is depressed, can select lever move from “P” range to other positions?	Go to step **2.**	Inspect “SELECT LEVER SHIFT LOCK CANNOT BE RELEASED”. <Ref. to CS-18, SELECT LEVER SHIFT LOCK CANNOT BE RELEASED, INSPECTION, AT Shift Lock System.>
2	**CHECK SHIFT LOCK.**	While the brake pedal is not depressed, can select lever move from “P” range to other positions?	Inspect “SELECT LEVER CANNOT BE SHIFT LOCKED”. <Ref. to CS-16, SELECT LEVER CANNOT BE SHIFT LOCKED, INSPECTION, AT Shift Lock System.>	Go to step **3.**
3	**CHECK KEY INTERLOCK.**	When the select lever is in other than “P” position, does ignition switch turn to “LOCK” position?	Inspect “KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-18, SELECT LEVER SHIFT LOCK CANNOT BE RELEASED, INSPECTION, AT Shift Lock System.>	Go to step **4.**
4	**CHECK KEY INTERLOCK.**	When the select lever is in “P” position, does ignition switch turn to “LOCK” position?	AT shift lock system is normal.	Inspect “KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-18, SELECT LEVER SHIFT LOCK CANNOT BE RELEASED, INSPECTION, AT Shift Lock System.>

MEMO:

1. INTEGRATED MODULE POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:

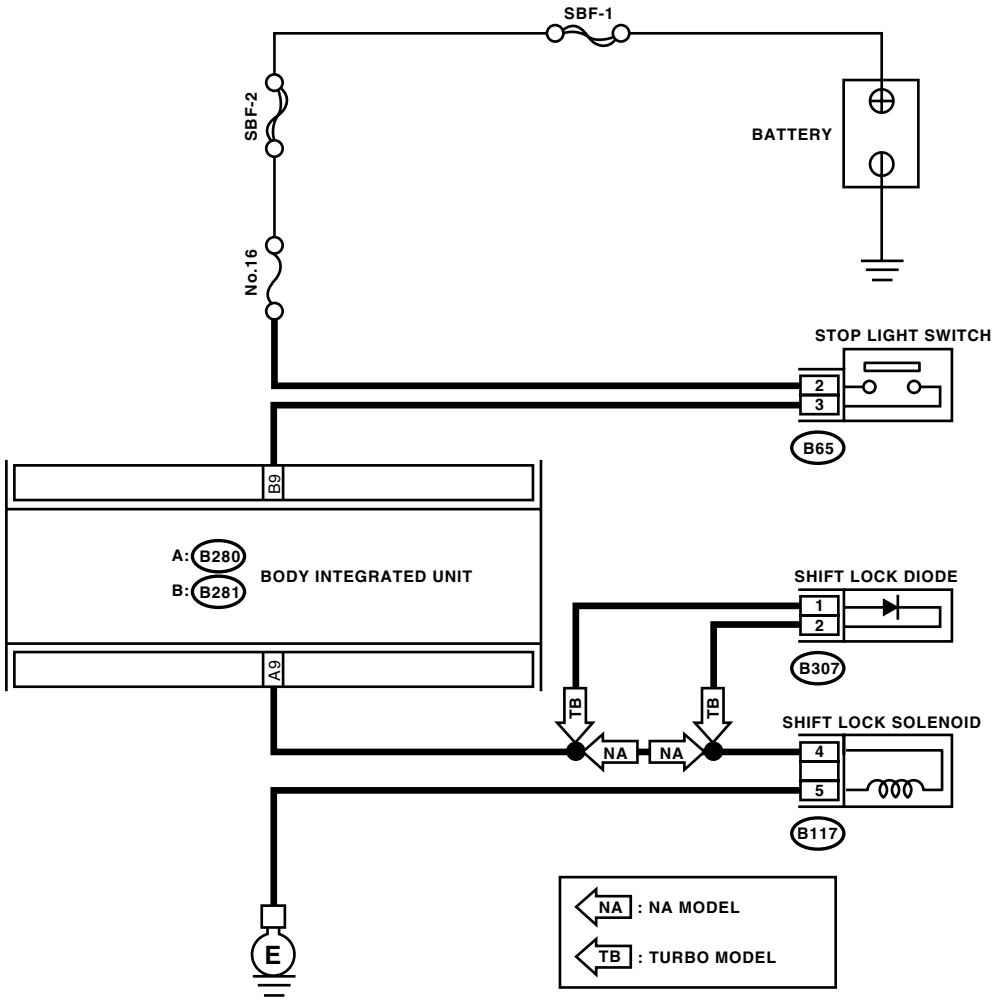


CS-00130

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove the fuse (No. 3, 4 and 18).	Is the fuse (No. 3, 4 or 18) blown out?	Replace the fuse (No. 3, 4 or 18). If the replaced fuse (No. 3, 4 or 18) has blown out easily, repair short circuit in harness between fuse and integrated module.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN INTEGRATED MODULE AND BODY GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 4 — Chassis ground:*** ***(B281) No. 13 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between integrated module and body ground.
3	**CHECK BATTERY POWER SUPPLY.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltages between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 2 (+) — Chassis ground (-):***	Is the measured value more than 9 V?	Go to step **4.**	Repair the open circuit harness between battery and integrated module, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ACC. 2) Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 10 (+) — Chassis ground (-):***	Is the measured value more than 9 V?	Go to step **5.**	Repair the open circuit harness between battery and integrated module, and poor contact in coupling connector.
5	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 19 (+) — Chassis ground (-):***	Is the measured value more than 9 V?	Go to step **6.**	Repair the open circuit harness between battery and integrated module, and poor contact in coupling connector.
6	**CHECK POOR CONTACT.**	Is there poor contact in power supply and ground line circuit?	Repair the poor contact.	Replace the integrated module.

2. SELECT LEVER CANNOT BE SHIFT LOCKED

WIRING DIAGRAM:

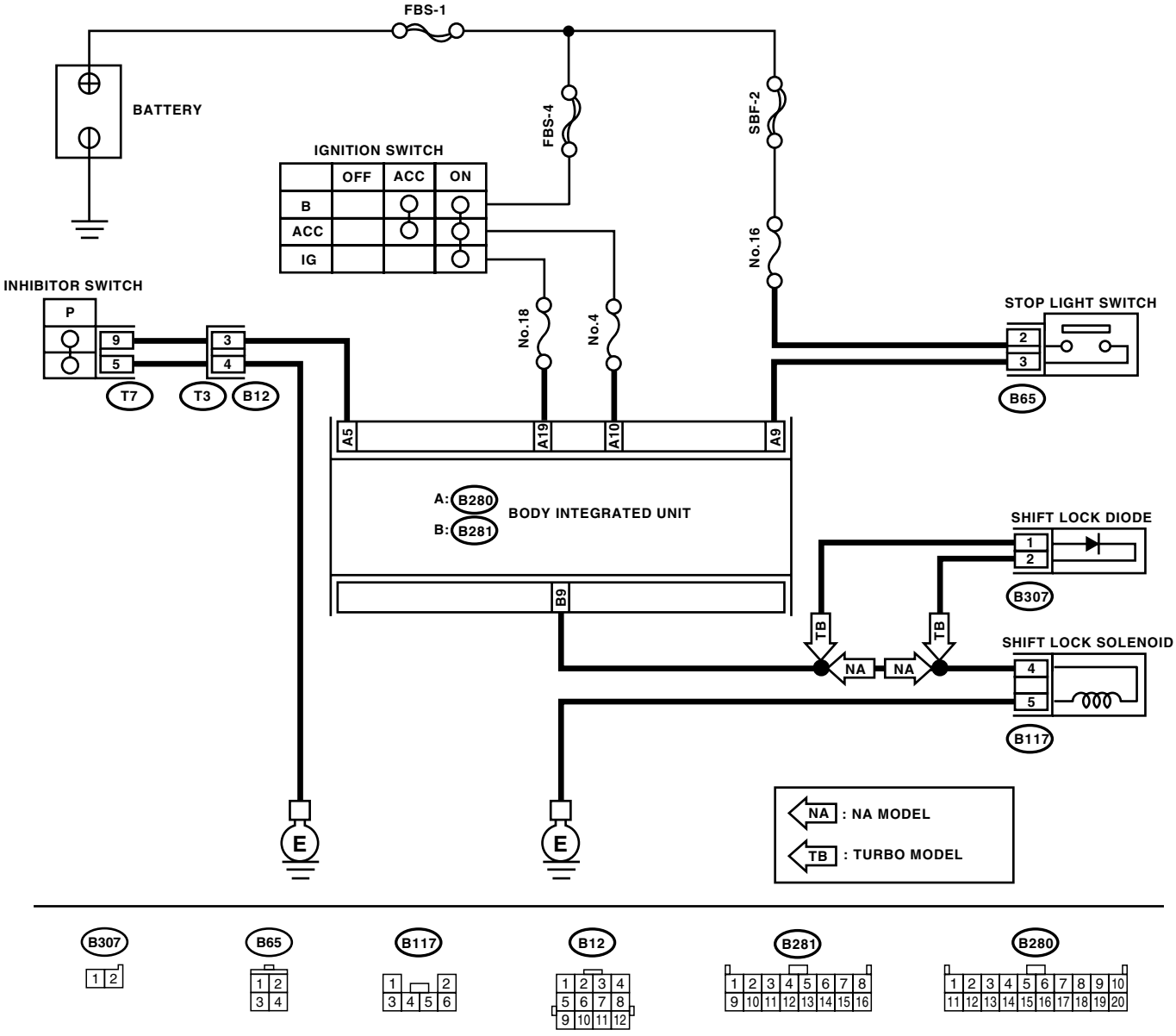


CS-00349

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **2.**	Inspect the stop light system.
2	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND INTEGRATED MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the integrated module and stop-light switch connector. 3) Measure the resistance of harness between stop light switch and integrated module. ***Connector & terminal*** ***(B65) No. 3 — (B280) No. 9:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between integrated module and stop light switch.	Go to step **3.**
3	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND INTEGRATED MODULE.** Measure the resistance of harness between stop light switch and chassis ground. ***Connector & terminal*** ***(B65) No. 3 — Chassis ground:***	Is the measured value less than 1 Ω?	Repair the short circuit in harness between integrated module and stop light switch.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** 1) Disconnect the shift lock solenoid connector. 2) Measure the resistance of harness between integrated module and shift lock solenoid. ***Connector & terminal*** ***(B117) No. 4 — (B281) No. 9:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between integrated module and shift lock solenoid.	Go to step **5.**
5	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 4 — Chassis ground:***	Is the measured value less than 1 Ω?	Repair the short circuit in harness between integrated module and shift lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 5 — Chassis ground:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between shift lock solenoid and body ground.	Go to step **7.**
7	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5:***	Is the measured value within 20 — 40 Ω?	Go to step **8.**	Replace the shift lock solenoid.
8	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (-):***	Does the shift lock solenoid operate properly?	Go to step **9.**	Replace the shift lock solenoid.
9	**CHECK POOR CONTACT.**	Is there poor contact in key lock circuit?	Repair the poor contact.	Replace the integrated module.

3. SELECT LEVER SHIFT LOCK CANNOT BE RELEASED

WIRING DIAGRAM:



CS-00350

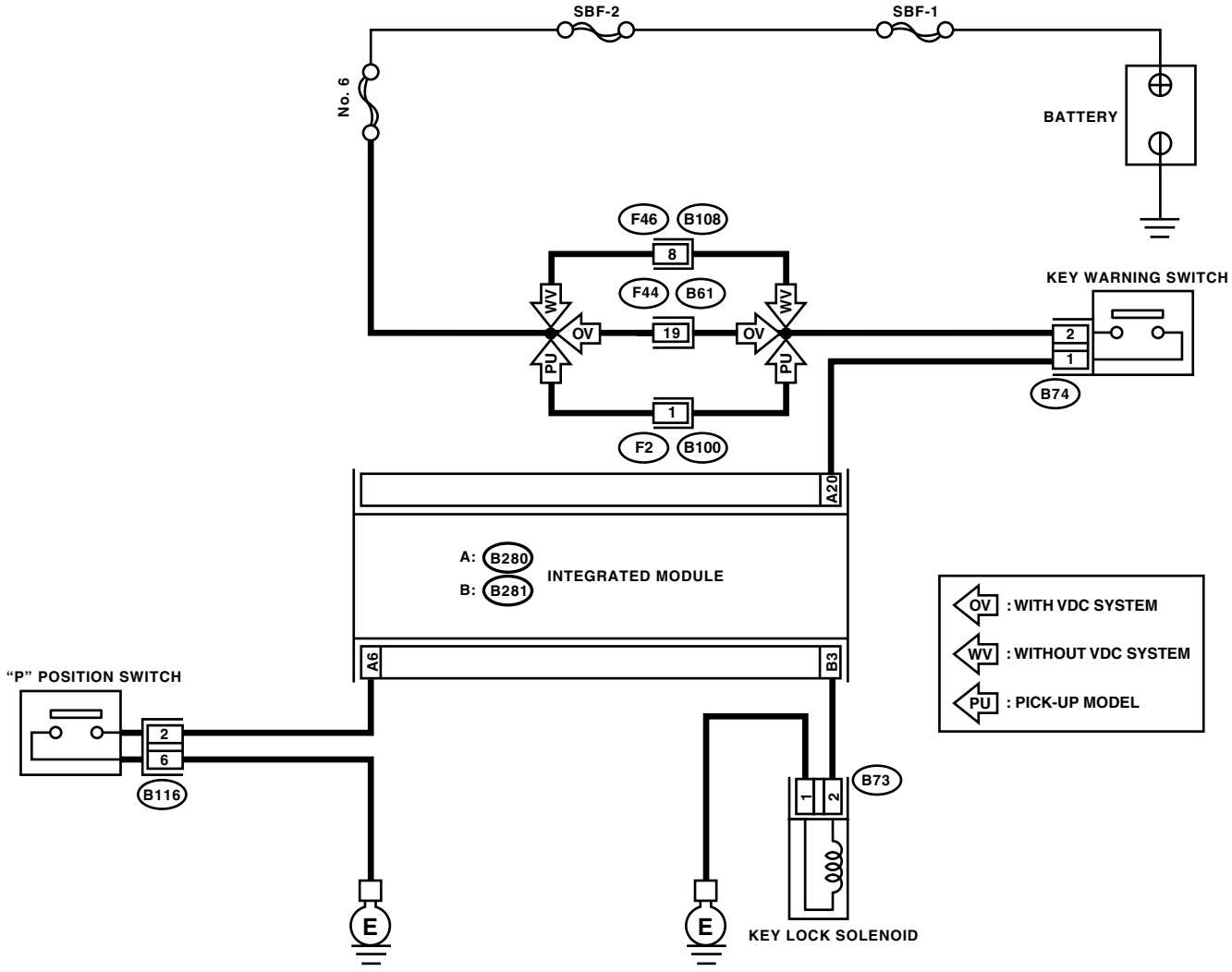
	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Move the select lever from “P” to “1” range.	Are combination meter indicator light and select lever “P”, “R”, “N”, “3”, “2” and “1” correctly matched?	Go to step **2.**	Adjust the inhibitor switch and select cable.
2	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 19 (+) — Chassis ground (-):***	Is the measured value more than 9 V?	Go to step **3.**	Repair the open circuit harness between battery and integrated module, and poor contact in coupling connector.
3	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND INTEGRATED MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of transmission harness and integrated module. 3) Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 5 — Chassis ground:***	Is the measured value less than 1 Ω?	Repair the short circuit in harness between integrated module and transmission connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND INTEGRATED MODULE.** Measure the resistance of harness between integrated module and inhibitor switch. ***Connector & terminal*** ***(B12) No. 3 — (B280) No. 5:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between integrated module and transmission connector	Go to step **5.**
5	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B12) No. 4 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between inhibitor switch and chassis ground.
6	**CHECK INHIBITOR SWITCH.** 1) Move the select lever to “P” position. 2) Measure the resistance of transmission harness connector terminals. ***Connector & terminal*** ***(T3) No. 3 — No. 4:***	Is the measured value more than 1 MΩ?	Repair or replace the inhibitor switch.	Go to step **7.**
7	**CHECK OUTPUT SIGNAL FOR INTEGRATED MODULE.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 5 (+) — Chassis ground (-):***	Is the measured value within 9 — 16 V?	Go to step **8.**	Go to step **16.**
8	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **9.**	Inspect the stop light system.
9	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND AT SHIFT LOCK CONTROL MODULE.** 1) Depress the brake pedal. 2) Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 9 (+) — Chassis ground (-):***	Is the measured value more than 9 V?	Go to step **10.**	Repair the open or short circuit in harness between integrated module and stop light switch.

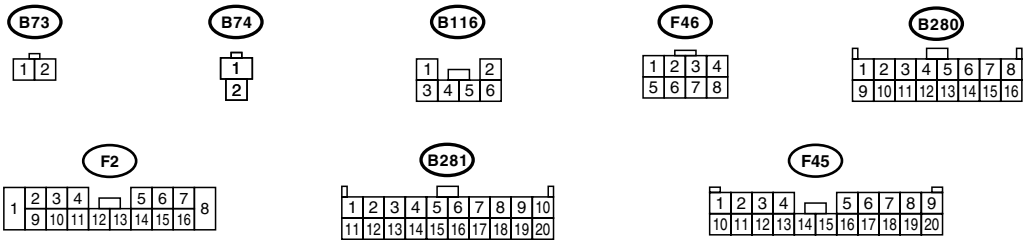
	Step	Check	Yes	No
10	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from shift lock solenoid and integrated module. 3) Measure the resistance of harness between integrated module and shift lock solenoid. ***Connector & terminal*** ***(B281) No. 9 — (B117) No. 4:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between integrated module and shift lock solenoid.	Go to step **11.**
11	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B281) No. 9 — Chassis ground:***	Is the measured value less than 10 Ω?	Go to step **12.**	Repair the short circuit in harness between integrated module and shift lock solenoid.
12	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 5 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between shift lock solenoid and chassis ground.
13	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5:***	Is the measured value within 20 — 40 Ω?	Go to step **14.**	Replace the shift lock solenoid.
14	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (-):***	Is the shift lock solenoid operating properly?	Go to step **15.**	Replace the shift lock solenoid.
15	**CHECK OUTPUT SIGNAL FOR AT SHIFT LOCK CONTROL MODULE.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 9 (+) — Chassis ground (-):***	Is the measured value more than 8.5 V?	Go to step **16.**	Replace the integrated module.
16	**CHECK POOR CONTACT.**	Is there poor contact in key lock circuit?	Repair the poor contact.	Replace the integrated module.

MEMO:

4. KEY INTERLOCK DOES NOT LOCK OR RELEASE

WIRING DIAGRAM:





CS-00351

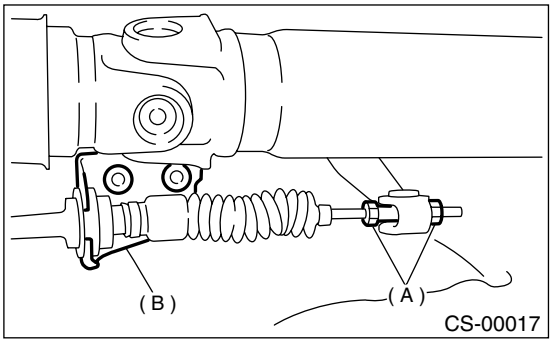
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH.** 1) Disconnect the connector key warning switch. 2) Measure the voltage of harness between key warning switch and chassis ground. ***Connector & terminal*** ***(B74) No. 2 (+) — Chassis ground (-):***	Is the measured value within 9 — 16 V?	Go to step **2.**	Repair the open or short circuit in harness between battery and key warning switch.
2	**CHECK KEY WARNING SWITCH.** Measure the resistance of key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	Replace the key warning switch.	Go to step **4.**
3	**CHECK KEY WARNING SWITCH.** 1) Remove the key. 2) Measure the resistance of key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace the key warning switch.
4	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND KEY WARNING SWITCH.** 1) Disconnect the integrated module connector. 2) Measure the voltage of harness integrated module and chassis ground. ***Connector & terminal*** ***(B280) No. 20 (+) — Chassis ground (-):***	Is the measured value more than 9 V?	Go to step **5.**	Repair the open circuit in harness between integrated module and key warning switch.
5	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND KEY LOCK SOLENOID.** 1) Disconnect the connector of key lock solenoid. 2) Measure the resistance of harness between integrated module and key lock solenoid. ***Connector & terminal*** ***(B73) No. 2 — (B281) No. 3:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between integrated module and key lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN INTEGRATED MODULE AND KEY LOCK SOLENOID.** Measure the resistance of harness between integrated module and chassis ground. ***Connector & terminal*** ***(B281) No. 3 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair the short circuit in harness between integrated module and key lock solenoid.
7	**CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between key lock solenoid and chassis ground. ***Connector & terminal*** ***(B73) No. 1 — Chassis ground:***	Is the measured value less than 10 Ω?	Go to step **8.**	Repair the open circuit in harness between key lock solenoid and chassis ground.
8	**CHECK KEY LOCK SOLENOID.** Measure the resistance of key lock solenoid connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the measured value within 4 — 8 Ω?	Go to step **14.**	Replace the key lock solenoid.

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN "P" POSITION SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" position switch and chassis ground. ***Connector & terminal*** ***(B116) No. 2 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **10.**	Repair the short circuit in harness between "P" position switch and integrated module.
10	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND "P" POSITION SWITCH.** 1) Disconnect the connector from "P" position switch. 2) Measure the resistance of harness between integrated module and "P" position switch. ***Connector & terminal*** ***(B116) No. 2 — (B281) No. 6:***	Is the measured value more than 1 MΩ?	Repair the open circuit in harness between integrated module and "P" position switch.	Go to step **11.**
11	**CHECK HARNESS BETWEEN "P" POSITION SWITCH AND CHASSIS GROUND.** Measure the resistance of harness "P" position switch and chassis ground. ***Connector & terminal*** ***(B116) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair the open circuit in harness between "P" position switch and chassis ground.
12	**CHECK "P" POSITION SWITCH.** 1) Move the select lever to "P" position. 2) Measure resistance between "P" position switch connector terminals. ***Terminal*** ***No. 2 — No. 6:***	Is the measured value less than 1 Ω?	Go to step **13.**	Replace the "P" position switch.
13	**CHECK "P" POSITION SWITCH.** 1) Move the select lever to other than "P" position. 2) Measure resistance between "P" position switch connector terminals. ***Terminal*** ***No. 2 — No. 6:***	Is the measured value more than 1 MΩ?	Go to step **14.**	Replace the "P" position switch.
14	**CHECK OUTPUT SIGNAL FOR INTEGRATED MODULE.** 1) Connect all connectors. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to "P" position. 4) Press the brake pedal. 5) Measure the voltage between integrated module connector and chassis ground. ***Connector & terminal*** ***(B281) No. 3 (+) — Chassis ground (-):***	Is the measured value within 7.5 — 16 V?	Go to step **15.**	Replace the integrated module.
15	**CHECK POOR CONTACT.**	Is there poor contact in AT shift lock circuit?	Repair the poor contact.	Replace the integrated module.

4. Select Lever

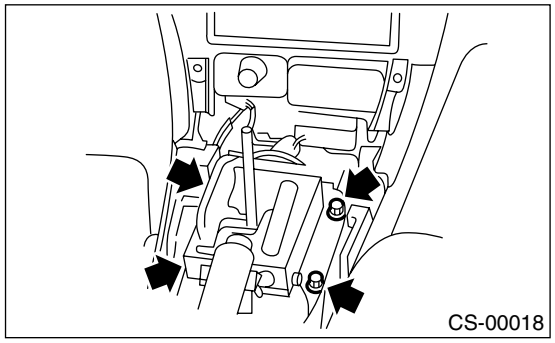
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever to “N” position.
4) Lift-up the vehicle.
5) Remove the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.>,<Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.>,<Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
6) Remove the heat shield cover. (If equipped)
7) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

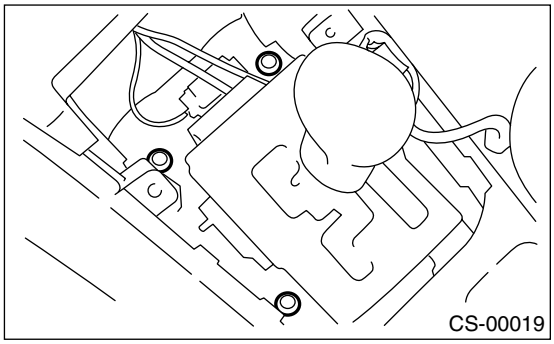
8) Lower the vehicle.
9) Remove the console box. <Ref. to EI-45, REMOVAL, Console Box.>
10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from body.



B: INSTALLATION

1) Mount the select lever onto the vehicle body.
2) Tighten the four bolts to install the select lever to vehicle body, then connect the connector.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3) Install the console box. <Ref. to EI-42, INSTALLATION, Glove Box.>
4) Set the location of select lever at “N” position.
5) Lift-up the vehicle.
6) Set the location of range select lever to “N” position.
7) Insert the thread portion of the other inner cable and into connector hole of the select lever, and fix the other outer cable end to bracket.

Tightening torque:
18 N·m (1.8kgf-m, 13.0 ft-lb)

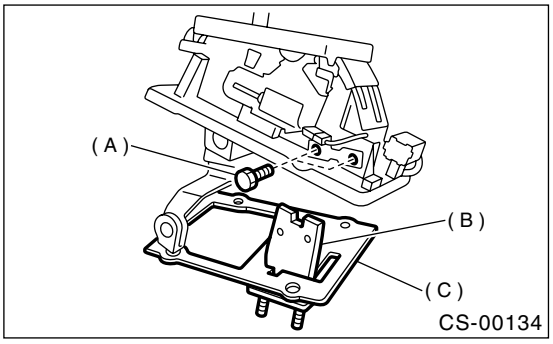
8) Adjust the select cable position. <Ref. to CS-32, ADJUSTMENT, Select Cable.>
9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install the heat shield cover. (If equipped)
11) Install the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>

2.5 L U5 model
<Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.>,<Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>
12) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-32, ADJUSTMENT, Select Cable.> and <Ref. to 4AT-51, ADJUSTMENT, Inhibitor Switch.>
(1) The engine starts operating when select lever is in position “P” or “N”, but not in other positions.
(2) The back-up light is lit when the select lever is in position “R”, but not in other positions.
(3) Select lever and indicator positions are matched.

C: DISASSEMBLY

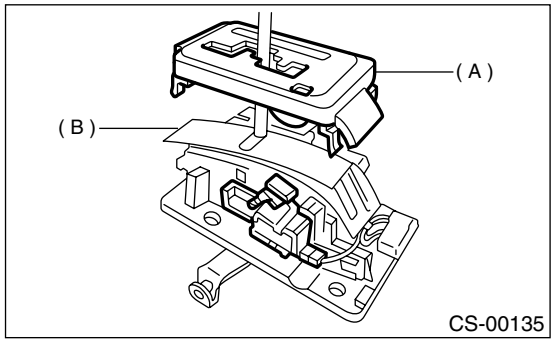
1. EXCEPT SPORT SHIFT MODEL

1) Remove four washers and then detach rubber boot.
2) Remove bolts and then remove cable bracket and plate.



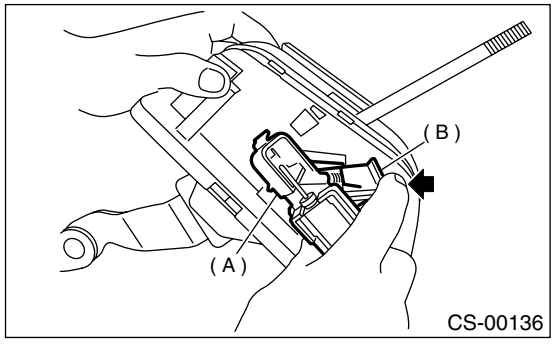
(A) Bolt
(B) Cable bracket
(C) Plate

3) Remove select lever grip.
4) Detach indicator cover and pattern plate.



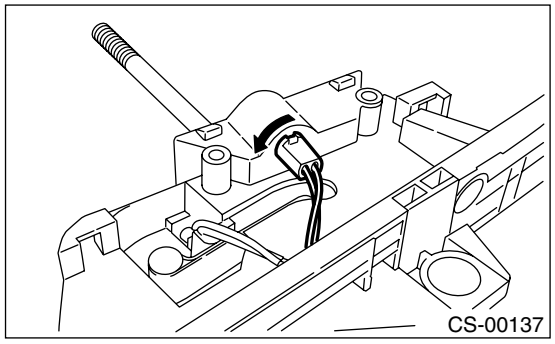
(A) Indicator cover
(B) Pattern plate

5) Disconnect solenoid assembly connector.
6) While pressing shift lock cancel button, remove shift lock solenoid assembly.



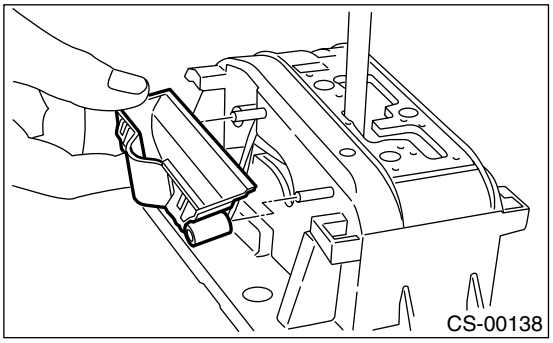
(A) Shift lock solenoid ASSY
(B) Button

7) Remove indicator light.

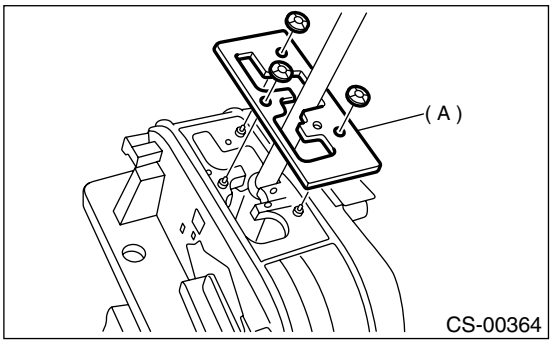


8) Remove indicator bulb.

9) Remove indicator light cover.

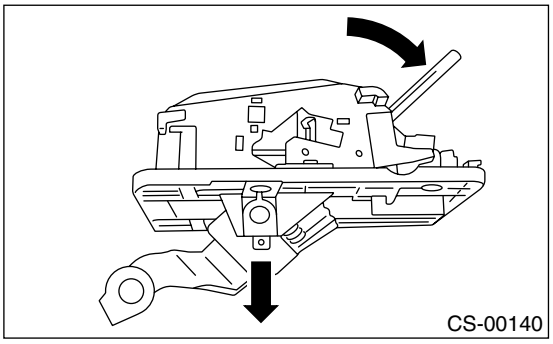


10) Remove cushion.

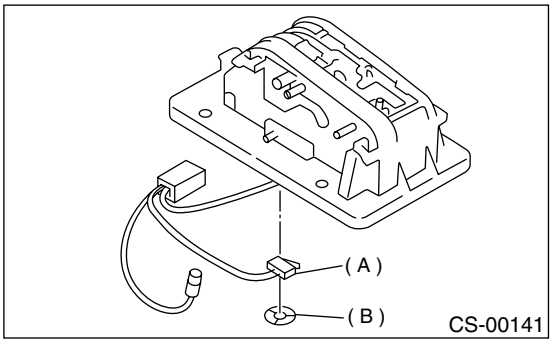


(A) Cushion

11) Tilt lever forward and pull down to separate it from frame.

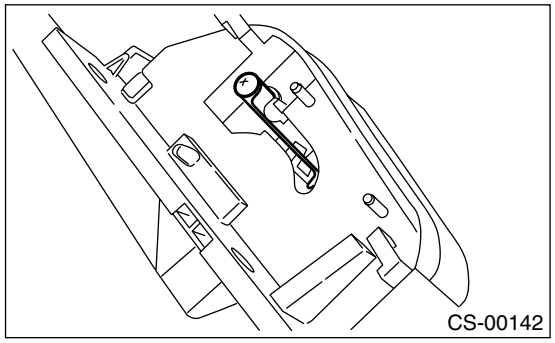


12) Remove clip, and “P” position switch with harness.



(A) “P” position switch
(B) Clip

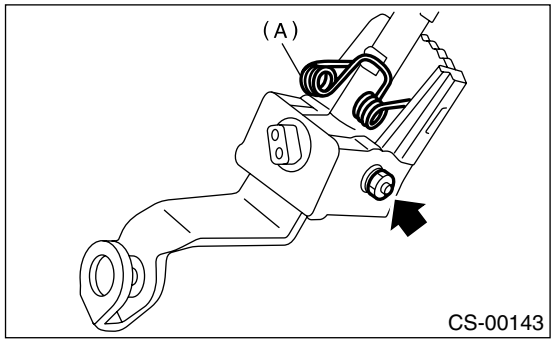
13) Remove detent spring



14) Remove spring.

CAUTION:
Wear goggles. Do not allow spring to fly out during removal.

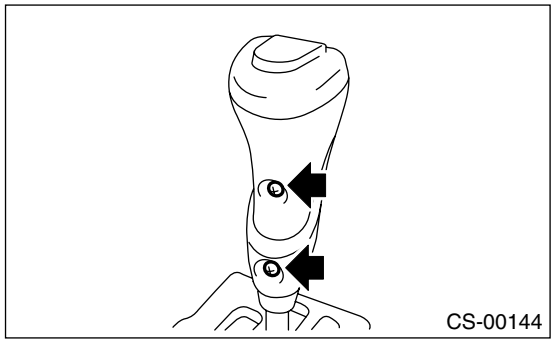
15) Remove bolt and then disconnect lever upper and lever lower.



(A) Spring

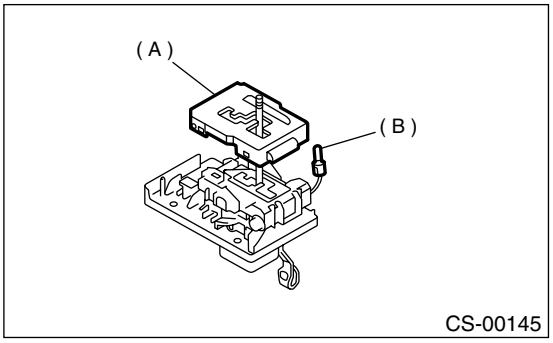
2. SPORT SHIFT MODEL

1) Remove the packing.
2) Remove the grip.



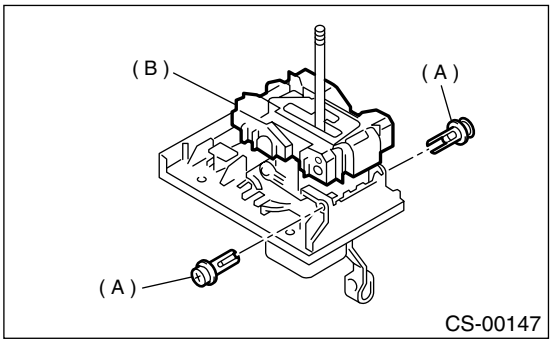
3) Remove the indicator light, and then remove the indicator cover.

NOTE:
Be careful not to break the indicator light during removal.



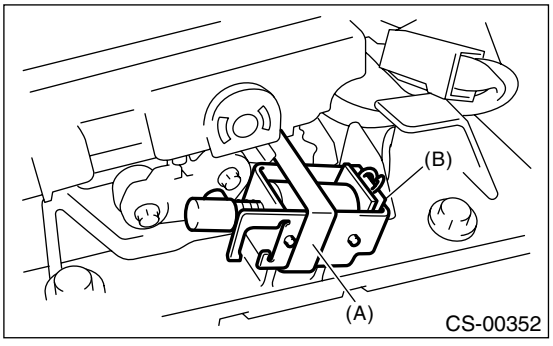
(A) Indicator cover
(B) Indicator light

4) Remove the blind.
5) Remove the clips, and then remove the guide plate.



(A) Clips
(B) Guide plate

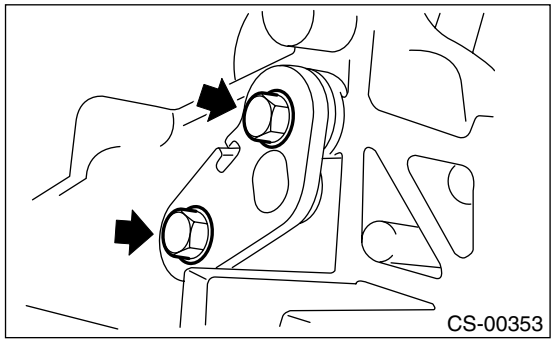
6) Remove the clamp, shift lock solenoid and cushion.



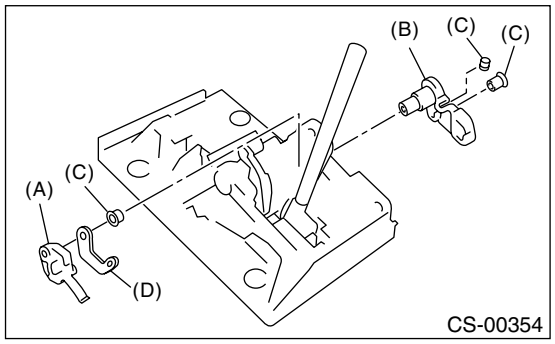
(A) Clamp
(B) Shift lock solenoid

7) Move select lever to “1” range.

8) Remove the bolt.

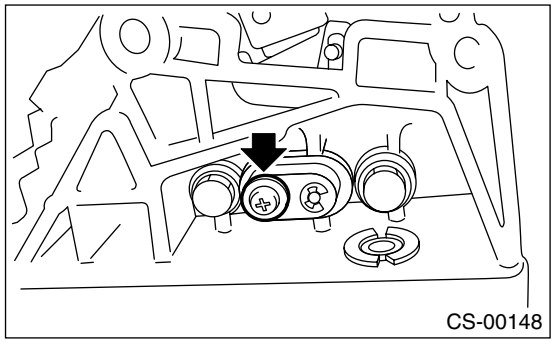


9) Remove the lock plate A, B, C and bushing.

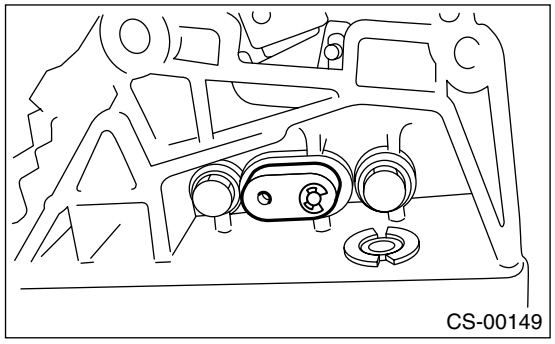


(A) Lock plate A
(B) Lock plate B
(C) Bushing
(D) Lock plate C

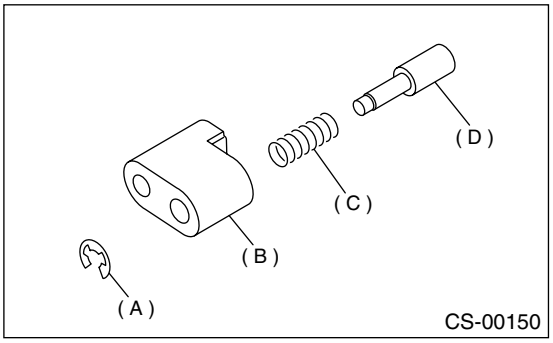
10) Remove the screw.



11) Remove the bushing.

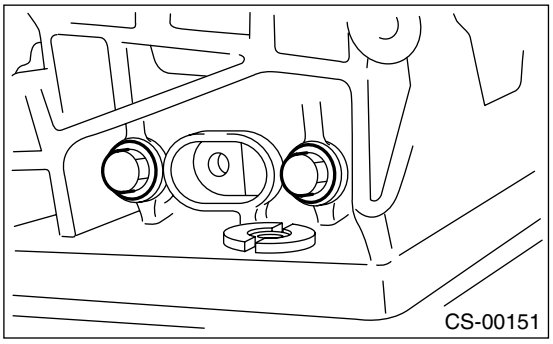


12) Remove the clip, and then remove the rod and the spring.

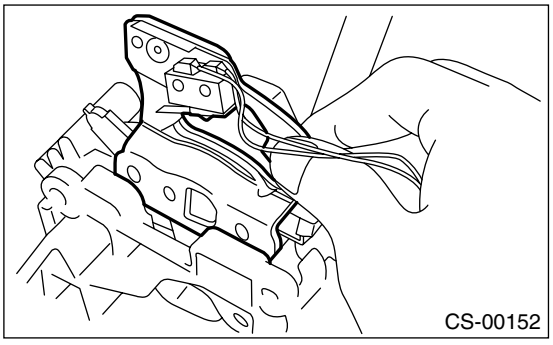


(A) Clip
(B) Bushing
(C) Spring
(D) Rod

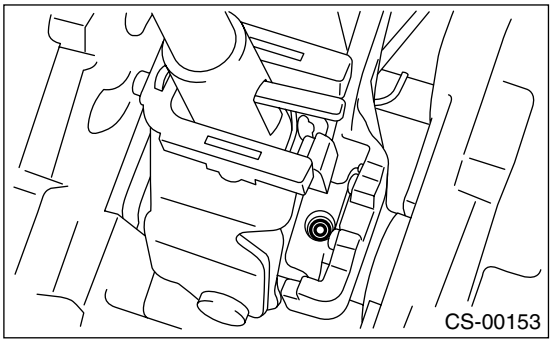
13) Remove the bolt.



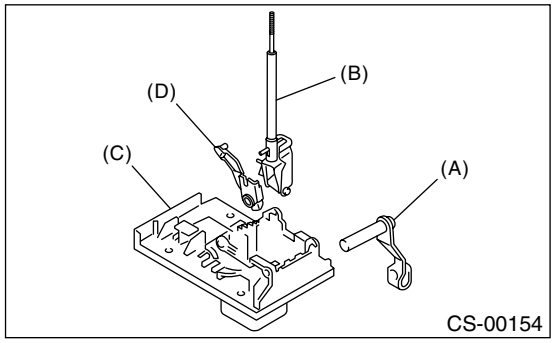
14) Remove the bracket guide ASSY.



15) Remove the grommet, and then extract spring pin from the top.



16) Remove the arm and then take away the lever and arm bracket from plate.



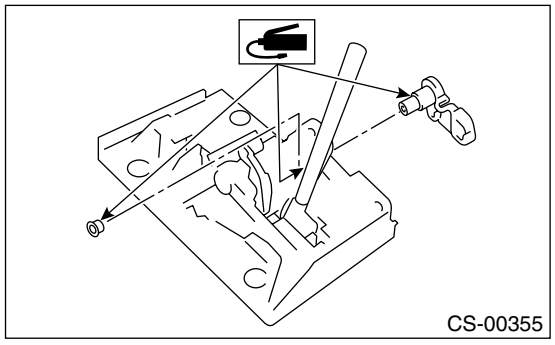
(A) Arm
(B) Lever
(C) Base plate
(D) Arm bracket

17) Remove the spring, and then remove the detent arm.

D: ASSEMBLY

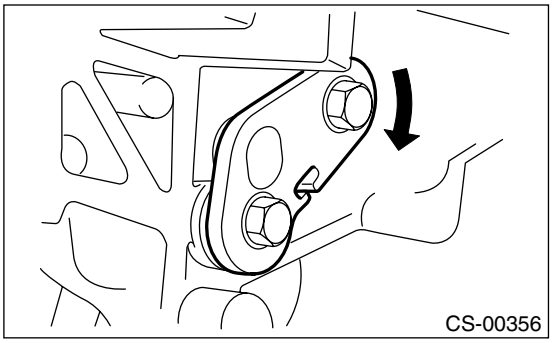
1) Clean all parts before assembly.
2) Apply grease [SUNLIGHT 2 (Part No. 003602010) or equivalent] and SUNCALL or equivalent to each parts. <Ref. to CS-3, AT SELECT LEVER (EXCEPT SPORT SHIFT MODEL), COMPONENT, General Description.> and <Ref. to CS-4, AT SELECT LEVER (SPORT SHIFT MODEL), COMPONENT, General Description.>

NOTE:
Do not apply SUNCALL to area except following parts.



3) Assembly is in the reverse order of disassembly.

NOTE:
• Refer to “COMPONENT” for tightening torque. <Ref. to CS-3, COMPONENT, General Description.>
• Tighten the lock plate bolt uniformly. After installation, locate the base plate upside down, and then push the lock plate up. Make sure the lock plate falls by its weight when releasing it. If not, retighten the bolt.



4) After completion of fitting, transfer the select lever to range “P” — “1”, then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

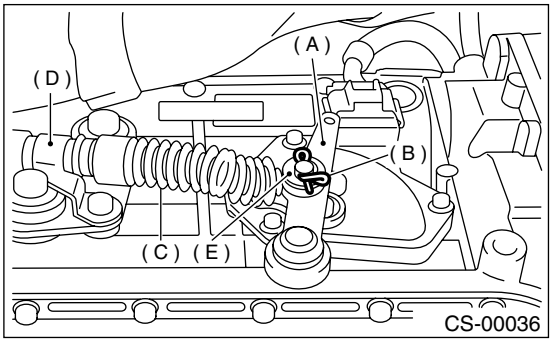
E: INSPECTION

1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
2) Confirm the following parts for operating condition before assembly. Moving condition of the select lever ASSY, it should move smoothly.

5. Select Cable

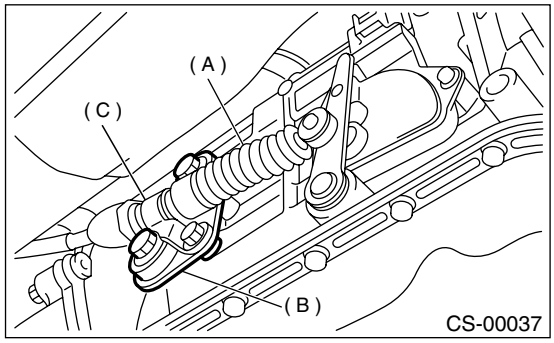
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Prior to removal, set the lever to “N” position.
4) Lift-up the vehicle.
5) Remove the front and center exhaust pipe. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
6) Remove center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
7) Remove the heat shield cover. (If equipped)
8) Remove the snap pin from range select lever.



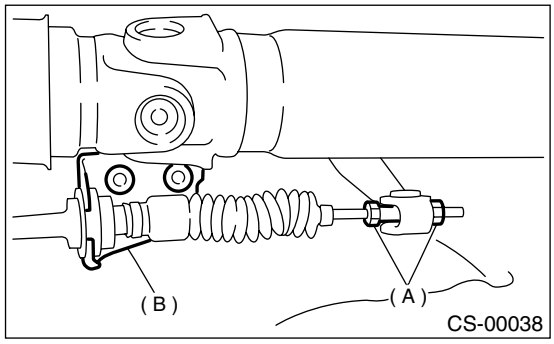
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

9) Remove the plate assembly from transmission case.



(A) Select cable
(B) Plate ASSY
(C) Clamp

10) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

11) Remove the select cable from plate assembly.

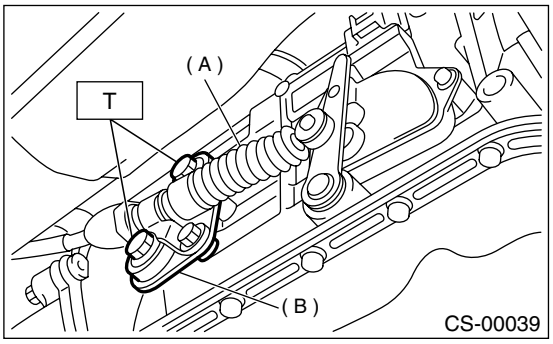
B: INSTALLATION

1) Install the select cable to base plate.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

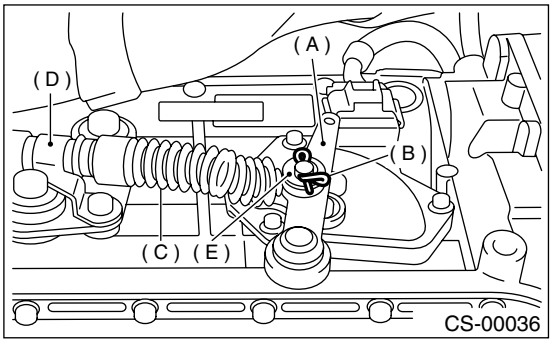
2) Install the select cable to range select lever.
3) Install the plate assembly to transmission.

Tightening torque:
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable
(B) Plate ASSY

4) Install the washer and snap pin to range select lever.



(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

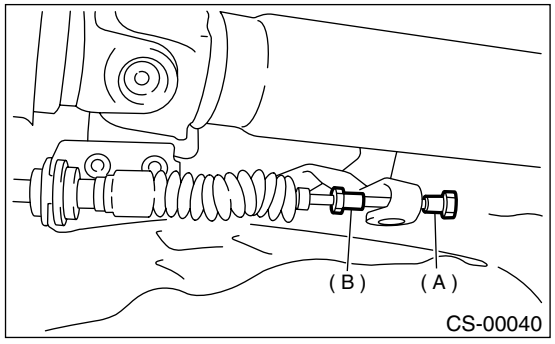
5) Move the select lever to “N” position, then adjust the select cable position. <Ref. to CS-32, ADJUSTMENT, Select Cable.>
6) Install the heat shield cover. (If equipped)
7) Install the front and center exhaust pipe. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>
8) Install center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>

C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.
5) Move the select lever from “P” position to “1” position. You should be able to feel the detentes in each position. If the detentes cannot be felt or the position pointer is improperly aligned, adjust the cable.

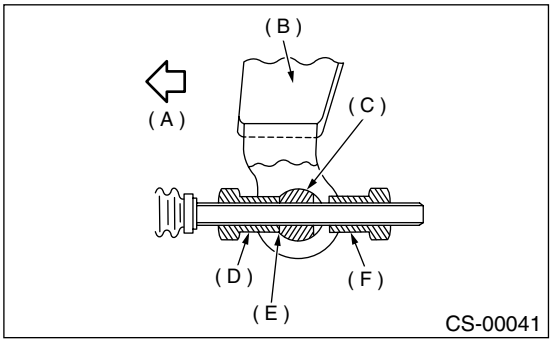
D: ADJUSTMENT

1) Set the vehicle on a lift.
2) Set the lever to “N” position.
3) Lift-up the vehicle.
4) Remove the rear exhaust pipe and muffler.
5) Remove the heat shield cover. (If equipped)
6) Loosen the adjusting nut on each side.



(A) Adjusting nut A
(B) Adjusting nut B

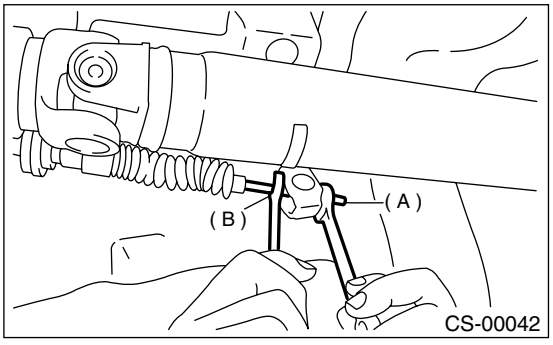
7) Turn the adjusting nut B until it lightly touches the connector.



(A) Front side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

8) While preventing the adjusting nut B from moving with a wrench, tighten the adjusting nut A.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



(A) Adjusting nut A
(B) Adjusting nut B

9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install in the reverse order of removal.

6. AT Shift Lock Solenoid and "P" Position Switch

A: REMOVAL

1) Remove the select lever. <Ref. to CS-25, REMOVAL, Select Lever.>
2) Remove AT shift lock solenoid and "P" position switch.<Ref. to CS-26, DISASSEMBLY, Select Lever.>

B: INSTALLATION

1) Install AT shift lock solenoid and "P" position switch. <Ref. to CS-29, ASSEMBLY, Select Lever.>
2) Install the select lever. <Ref. to CS-25, INSTALLATION, Select Lever.>

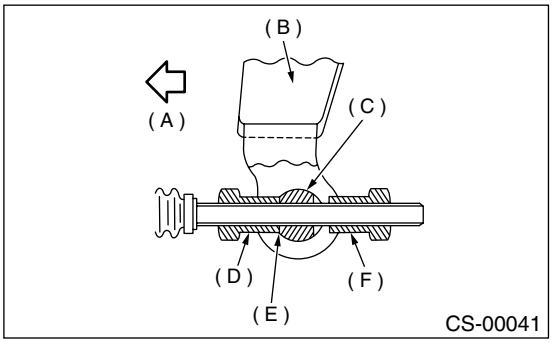
C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5***	Is the measured value within 20 — 40 Ω?	Go to step **2.**	Replace the shift lock solenoid and "P" position switch assembly.
2	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal, operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (-)***	Is the shift lock solenoid operating properly?	Go to step **3.**	Replace the shift lock solenoid and "P" position switch assembly.
3	**CHECK "P" POSITION SWITCH.** 1) Move the select lever to "P" position. 2) Measure resistance between "P" position switch connector terminals.	Is the measured value less than 1 Ω?	Go to step **4.**	Replace the "P" position switch.
4	**CHECK "P" POSITION SWITCH.** 1) Move the select lever to other than "P" position. 2) Measure resistance between "P" position switch connector terminals.	Is the measured value more than 1 MΩ?	Normal	Replace the "P" position switch.

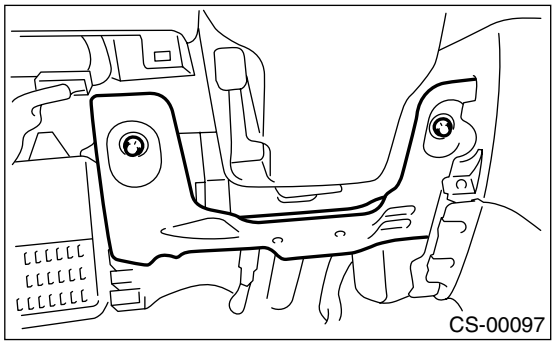
7. Integrated Module

A: REMOVAL

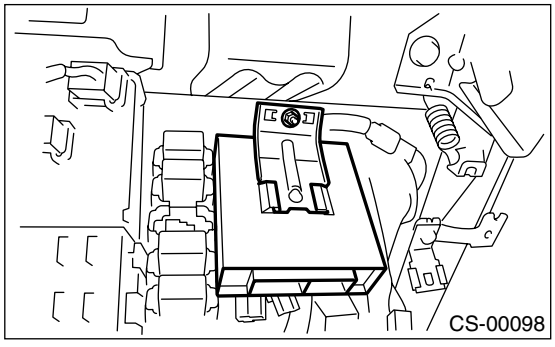
1) Disconnect the ground cable from battery.



2) Remove the lower cover.
3) Remove the knee bolster.



4) Disconnect the connector from integrated module.
5) Remove the integrated module.



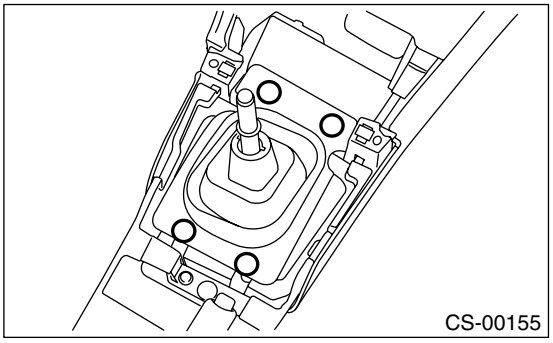
B: INSTALLATION

Install in the reverse order of removal.

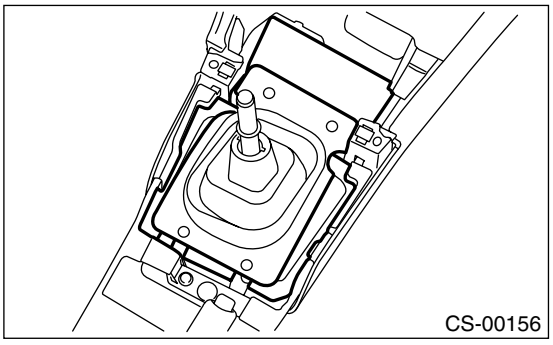
8. MT Gear Shift Lever

A: REMOVAL

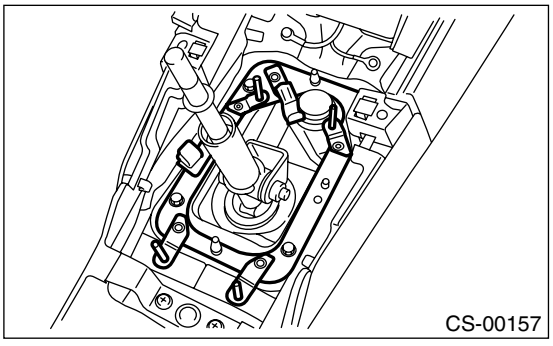
1) Set the vehicle on a lift.
2) Remove the gear shift knob.
3) Disconnect the ground cable from battery.
4) Remove the console box. <Ref. to EI-45, REMOVAL, Console Box.>
5) Remove the clamp.



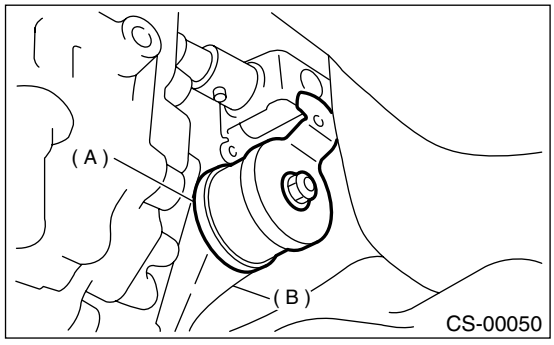
6) Remove the boot and insulator assembly.



7) Remove the plate ASSY from body.

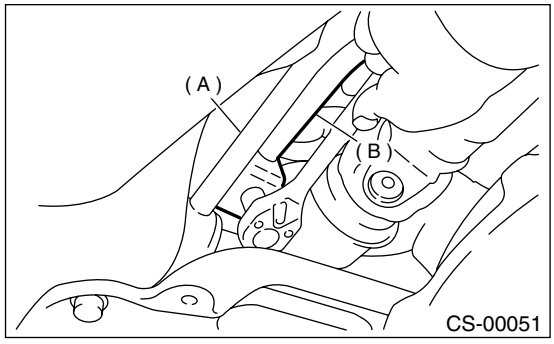


8) Lift-up the vehicle.
9) Remove the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
10) Remove the heat shield cover.
11) Remove the stay from transmission bracket.



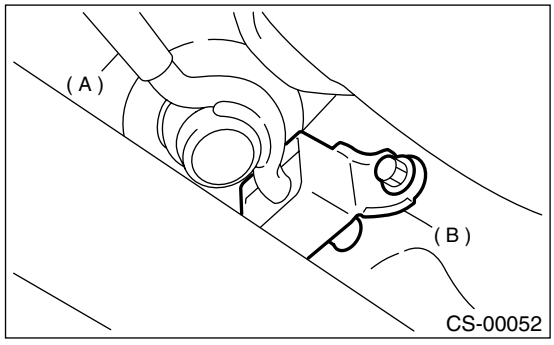
(A) Stay
(B) Transmission bracket

12) Remove the rod from joint.



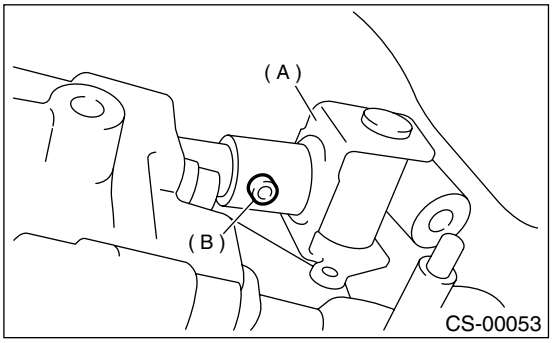
(A) Stay
(B) Rod

13) Remove the cushion rubber from body.



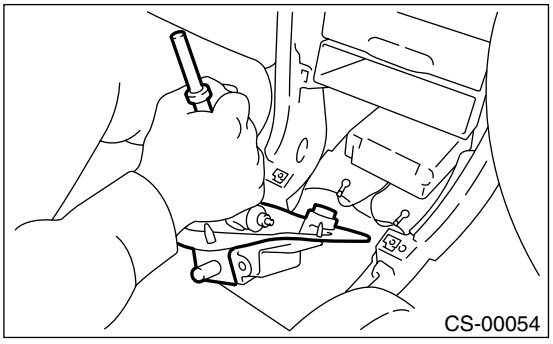
(A) Stay
(B) Cushion rubber

14) Remove the spring pin, and then extract the joint.



(A) Joint
(B) Spring pin

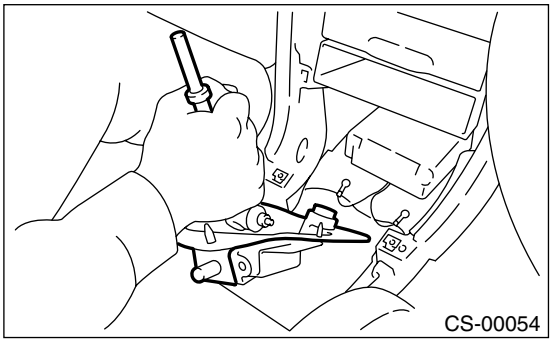
15) Lower the vehicle.
16) Remove the gear shift lever.



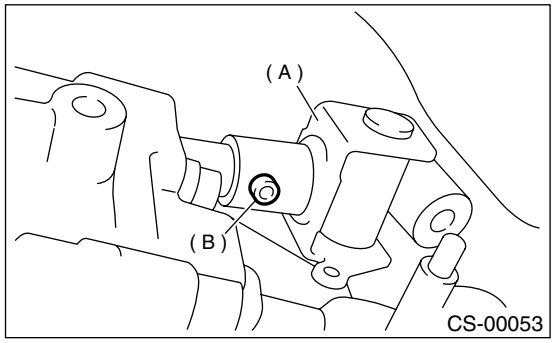
B: INSTALLATION

1) Install the joint to transmission and secure with the spring pin.
2) Insert the gear shift lever from room side.

NOTE:
After inserting the rod and stay, temporarily put them onto transmission mount.



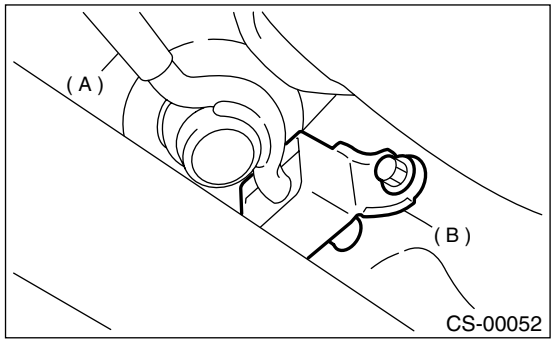
3) Lift-up the vehicle.
4) Install the joint to shifter arm.
5) Insert the spring pin.



(A) Joint
(B) Spring pin

6) Mount the cushion rubber on the body.

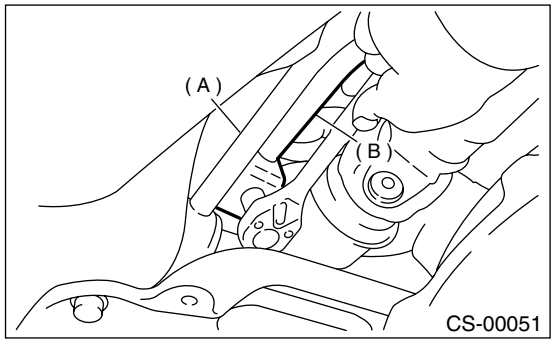
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Cushion rubber

7) Connect the rod to the joint.

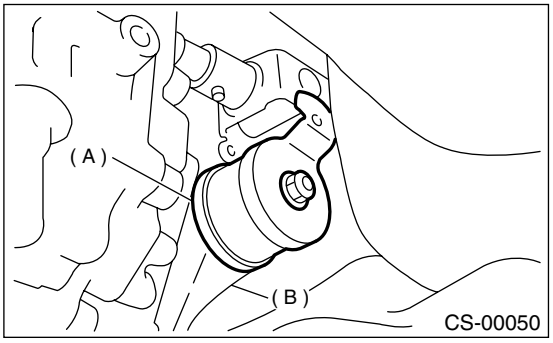
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Rod

8) Connect the stay to transmission bracket.

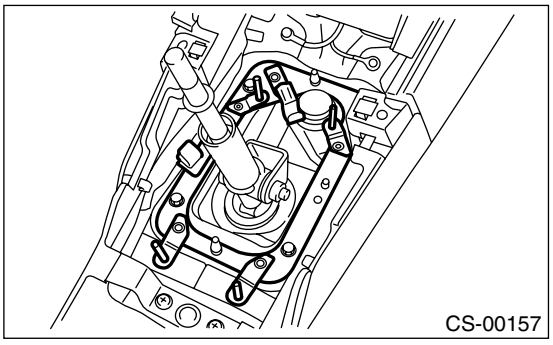
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



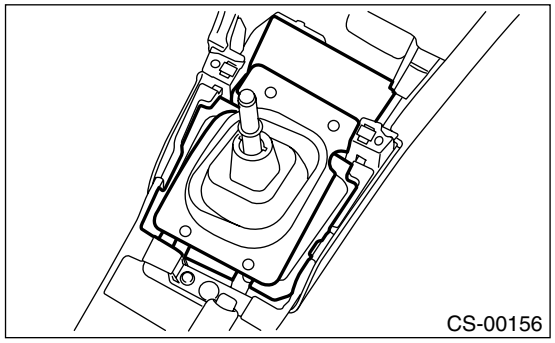
(A) Stay
(B) Transmission bracket

9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>
11) Lower the vehicle.
12) Install the plate ASSY to body.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



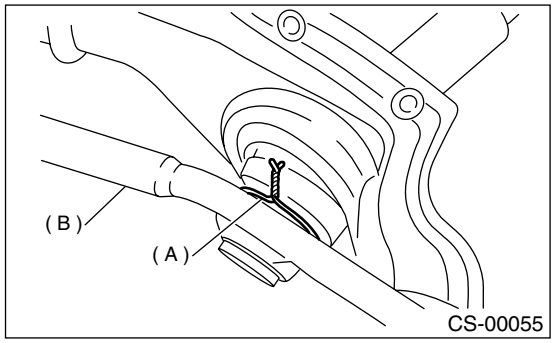
13) Install the boot and insulator assembly to vehicle in proper direction.



14) Install the clamp.
15) Install the console box. <Ref. to EI-45, INSTALLATION, Console Box.>

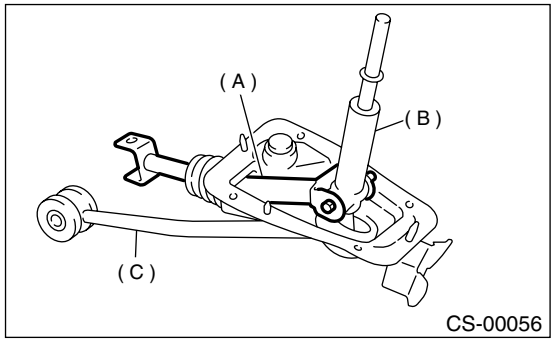
C: DISASSEMBLY

1) Disassemble the lock wire.



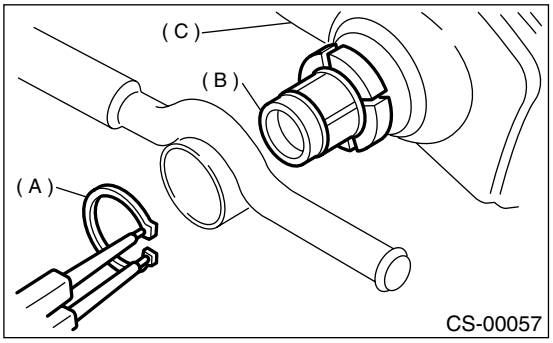
(A) Lock wire
(B) Stay

2) Remove the rod from lever.



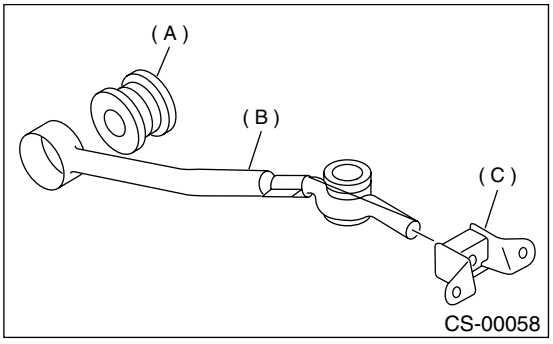
(A) Rod
(B) Lever
(C) Stay

3) Remove the snap ring from bushing B, and then disconnect the stay.



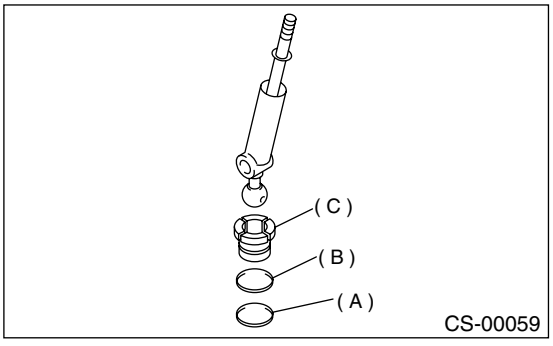
(A) Snap ring
(B) Bushing B
(C) Boot

4) Remove the boot from gear shift lever.
5) Remove the bushing and cushion rubber from stay.



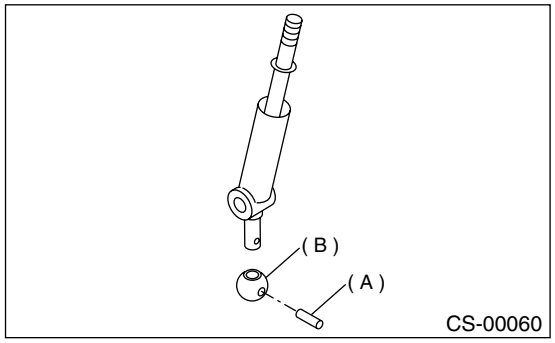
(A) Bushing
(B) Stay
(C) Cushion rubber

6) Remove the O-ring, and then disconnect the bushing B.



(A) O-ring
(B) O-ring
(C) Bushing B

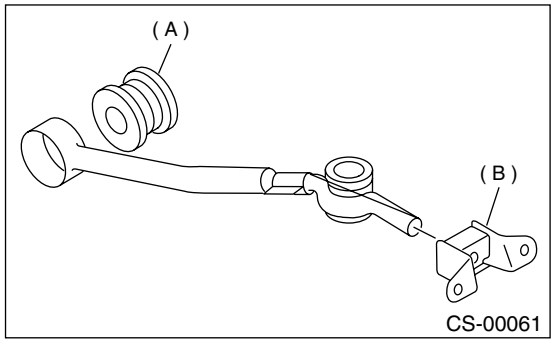
7) Draw out the spring pin, and then remove the bushing A from gear shift lever.



(A) Spring pin
(B) Bushing A

D: ASSEMBLY

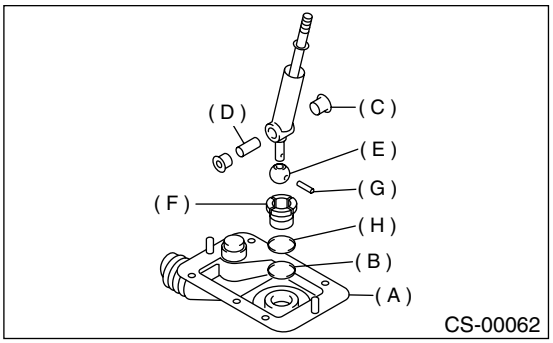
1) Clean all parts before assembly.
2) Mount the bushing and cushion rubber on the stay.



(A) Bushing
(B) Cushion rubber

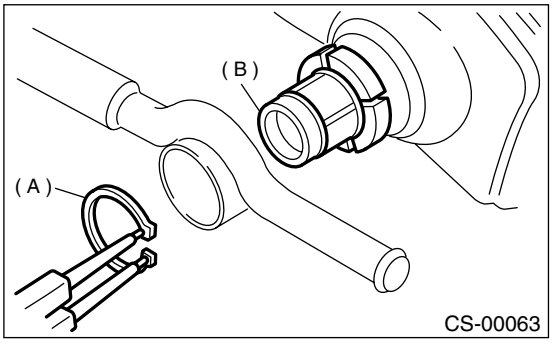
3) Mount each part; boot, O-ring, bushing A, spacer, bushing B, bushing and spring pin on the gear shift lever.

NOTE:
• Always use new O-rings.
• Apply grease [SUNLIGHT 2 (Part No.003602010) or equivalent] to the inner and side surfaces of the bushing when installing the spacer.



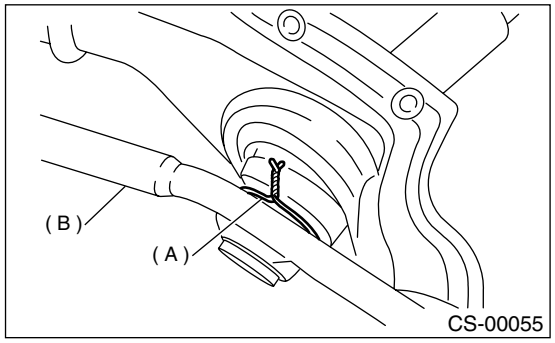
(A) Boot
(B) O-ring
(C) Bushing
(D) Spacer
(E) Bushing A
(F) Bushing B
(G) Spring pin
(H) O-ring

4) Insert the gear shift lever into boot hole.
5) Install the snap ring and stay to bushing B.



(A) Snap ring
(B) Bushing B

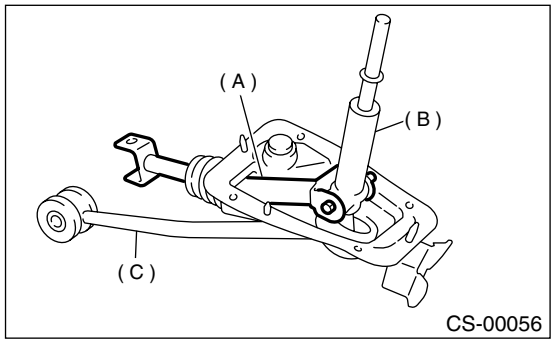
6) Tighten with a new lock wire to the extent that the boot will not come off.



(A) Lock wire
(B) Stay

7) Insert the rod into boot hole.
8) Connect the rod to gear shift lever.

Tightening torque:
11.8 N·m (1.2 kgf-m, 8.7 ft-lb)

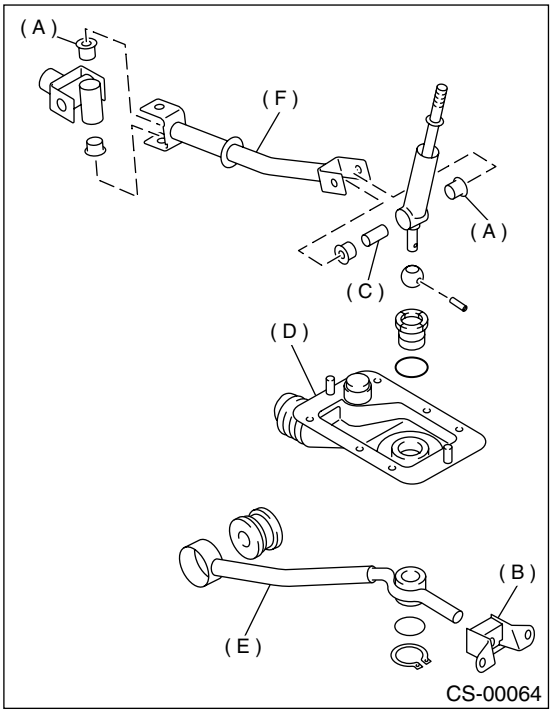


(A) Rod
(B) Lever
(C) Stay

9) Check the swing torque of the rod in relation to gear shift lever.
10) Check that there is no excessive play and that parts move smoothly.

E: INSPECTION

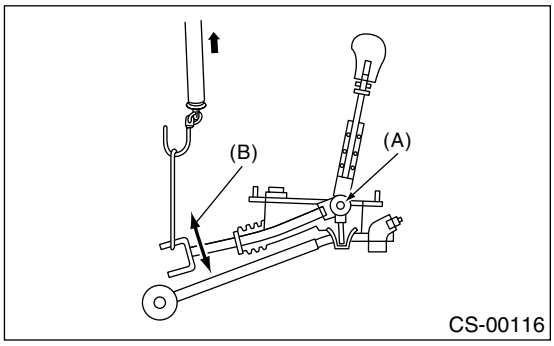
1) Check each part (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. Repair or replace any defective part. Determine defective parts by comparing with new parts.



(A) Bushing
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay
(F) Rod

2) Check the swing torque of the rod in relation of gear shift lever.
If the torque exceeds specification, replace the bushing or retighten nuts.

Swing torque:
3.7 N (0.38 kgf, 0.84 lb) or less



(A) Center of rotation
(B) Swing torque

9. General Diagnostic

A: INSPECTION

Symptom	Problem parts
Shift lock does not function.	• Stop light switch • Shift lock solenoid • Integrated module
Shift lock cannot be released.	• Stop light switch • Shift lock solenoid • Integrated module • Inhibitor switch
Key interlock does not function.	• Key warning switch • “P” position switch • Key lock solenoid • Integrated module
Key interlock cannot be released.	• Key warning switch • “P” position switch • Key lock solenoid • Integrated module
Starter does not run.	• Inhibitor switch • Select cable • Starter circuit
Back-up light does not light up.	• Inhibitor switch • Select cable • Back-up light circuit

AUTOMATIC TRANSMISSION

4AT

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1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	2.5 L Non-TURBO model		3.0 L model	2.5 L TURBO model
	Except OUT-BACK	OUT-BACK, BAJA		
Type	Symmetric, 3 element, single stage, 2 phase torque converter			
Stall torque ratio	1.9 — 2.1	2.1 — 2.3	1.8 — 2.0	2.1 — 2.3
Nominal diameter	246 mm (9.69 in)			
Stall speed (at sea level)	2,100 — 2,600 rpm	2,200 — 2,700 rpm	2,000 — 2,500 rpm	2,900 — 3,400 rpm
One-way clutch	Sprague type one-way clutch			

2. OIL PUMP

Type	Paracoid constant-displacement pump	
Driving method	Driven by engine	
Number of teeth	Inner rotor	9
	Outer rotor	10

3. TRANSMISSION CONTROL ELEMENT

Type	4-forward, 1-reverse, double-row planetary gears
Multi-plate clutch	3 sets
Multi-plate brake	2 sets
One-way clutch (sprague type)	1 sets

4. TRANSMISSION GEAR RATIO

Model	L, L-S, BAJA (TURBO model), OUTBACK (3.0 L model)	GT, GTLO, OUTBACK (2.5 L model), BAJA (Non-TURBO model)
1st	2.785	3.027
2nd	1.545	1.619
3rd	1.000	
4th	0.694	
Rev	2.272	

5. PLANETARY GEAR AND PLATE

	L, L-S	GT, GTLO, BAJA (Non-TURBO model), OUT-BACK (2.5 L model)	3.0 L model, BAJA (TTUR-BOURBO model)
Tooth number of front sun gear	33		
Tooth number of front pinion	21		
Tooth number of front inter-nal gear	75		
Tooth number of rear sun gear	42	37	42
Tooth number of rear pinion	17	19	17
Tooth number of rear inter-nal gear	75		
Drive & driven plate number of high clutch	4		5
Drive & driven plate number of low clutch	6		7
Drive & driven plate number of reverse clutch	2		
Drive & driven plate number of 2-4 brake	3		4
Drive & driven plate number of low & reverse brake	6		7

6. SELECTOR POSITION

P (Park)	Transmission in neutral, output member immovable, and engine start possible
R (Reverse)	Transmission in reverse for backing
N (Neutral)	Transmission in neutral and engine start possible
D (Drive)	Automatic gear change 1st ←→ 2nd ←→ 3rd ←→ 4th
3 (3rd)	Automatic gear change 1st ←→ 2nd ←→ 3rd ← 4th
2 (2nd)	2nd gear locked (Deceleration possible 2nd ← 3rd ← 4th)
1 (1st)	1st gear locked (Deceleration possible 1st ← 2nd ← 3rd ← 4th)
Control method	Select cable

7. HYDRAULIC CONTROL AND LUBRICATION

Type	Electronic/hydraulic control [Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening]
Fluid	Dexron III type
Fluid capacity	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)
Lubrication system	Forced feed lubrication with oil pump
Oil	Automatic transmission fluid (above mentioned)

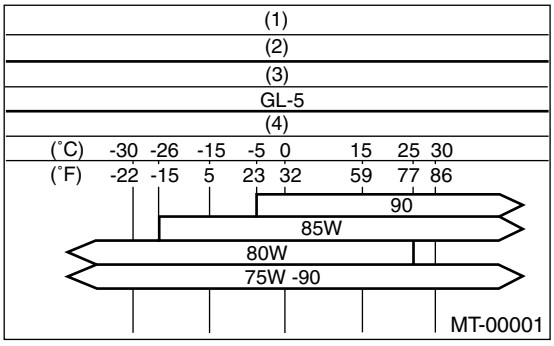
8. COOLING AND HARNESS

Cooling system	Liquid-cooled cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

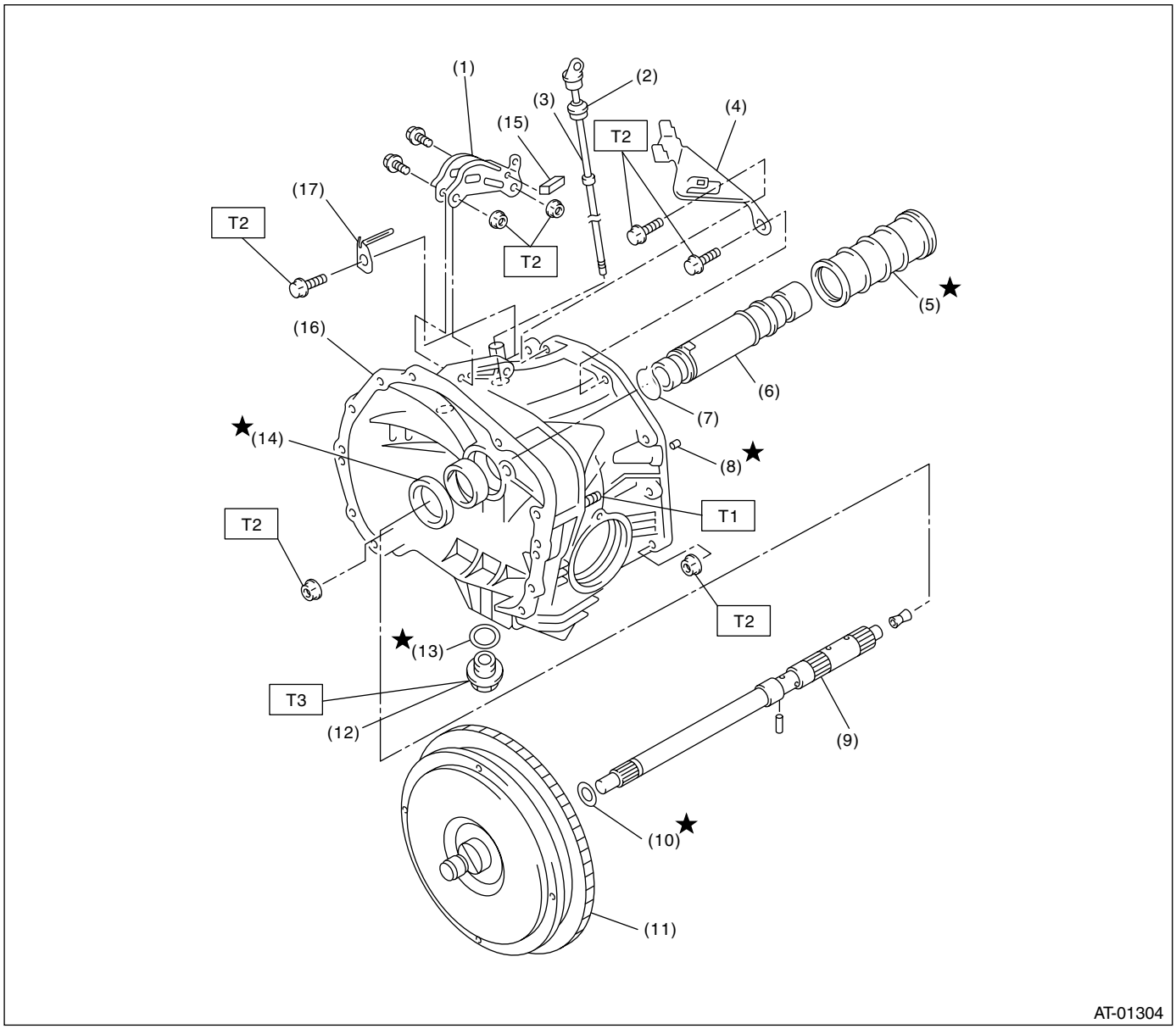
Model	MPT model		Turbo VTD model
	2.5 L	3.0 L	
Transfer type	Multi-plate transfer (MPT)		Variable torque distribution (VTD)
Drive & driven plate number of transfer clutch	5	6	3
Control method	Electronic, hydraulic type		
Lubricant	The same Automatic transmission fluid used in automatic transmission		
1st reduction gear ratio	1.000 (53/53)		

10.FINAL REDUCTION

Model	BAJA (TURBO model), 3.0 L model, L, L-S	BAJA (TURBO model), Except 3.0 L model, L, L-S
Front final gear ratio	4.111 (37/9)	4.444 (40/9)
Lubrication oil	 (1) Item (2) Front differential gear oil (3) API classification (4) SAE viscosity No. and applicable temperature	
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)	

B: COMPONENT

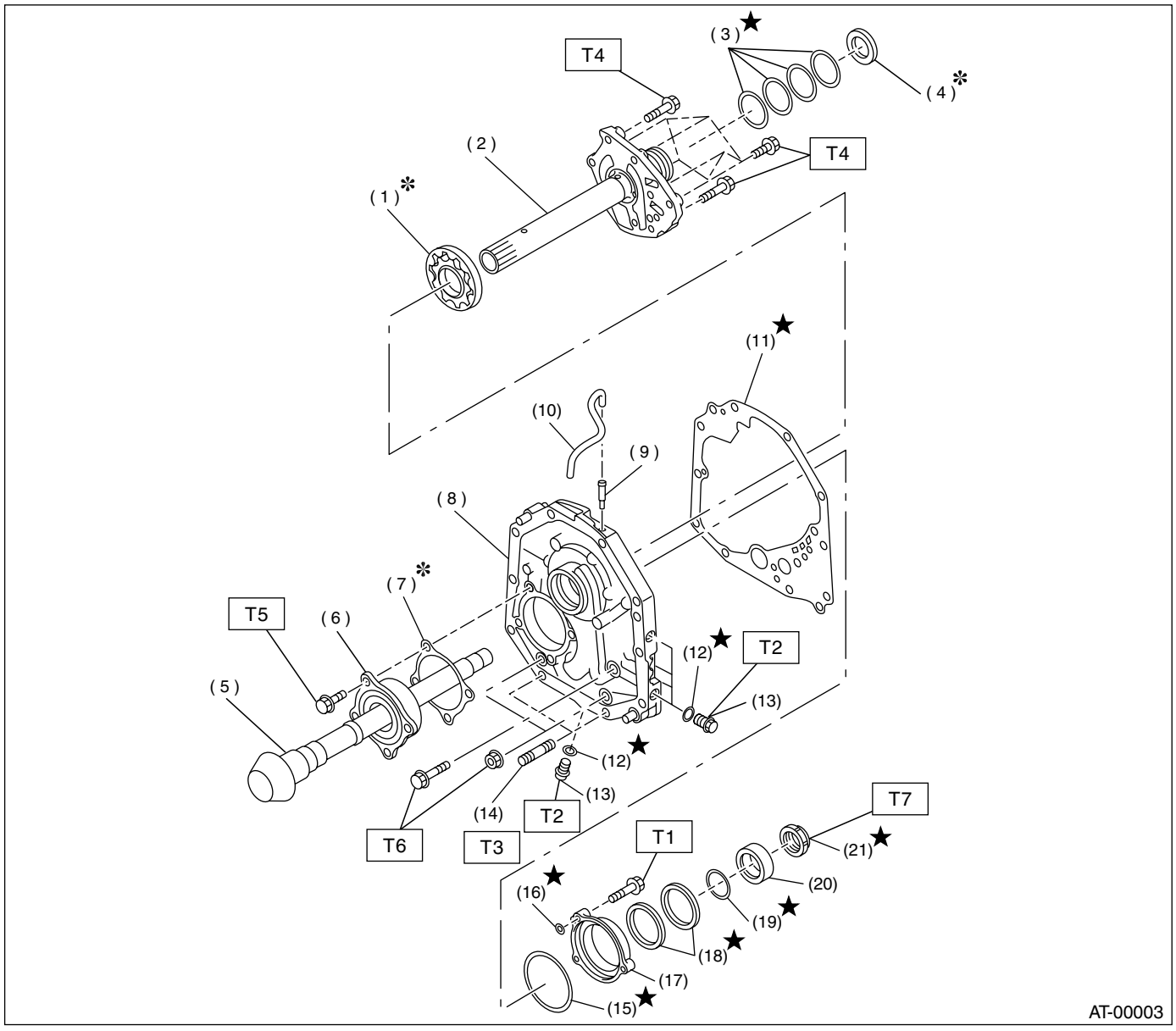
1. TORQUE CONVERTER CLUTCH AND CASE



(1) Pitching stopper bracket
(2) O-ring
(3) Differential oil level gauge
(4) Stay
(5) Seal pipe
(6) Oil pump shaft
(7) Clip
(8) Oil drain pipe
(9) Input shaft
(10) O-ring
(11) Torque converter clutch ASSY
(12) Drain plug
(13) Gasket
(14) Oil seal
(15) Clip (TURBO model)
(16) Torque converter clutch case
(17) Harness stay (Non-TURBO model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 41 (4.2, 30.4)
T3: 44 (4.5, 32.5)

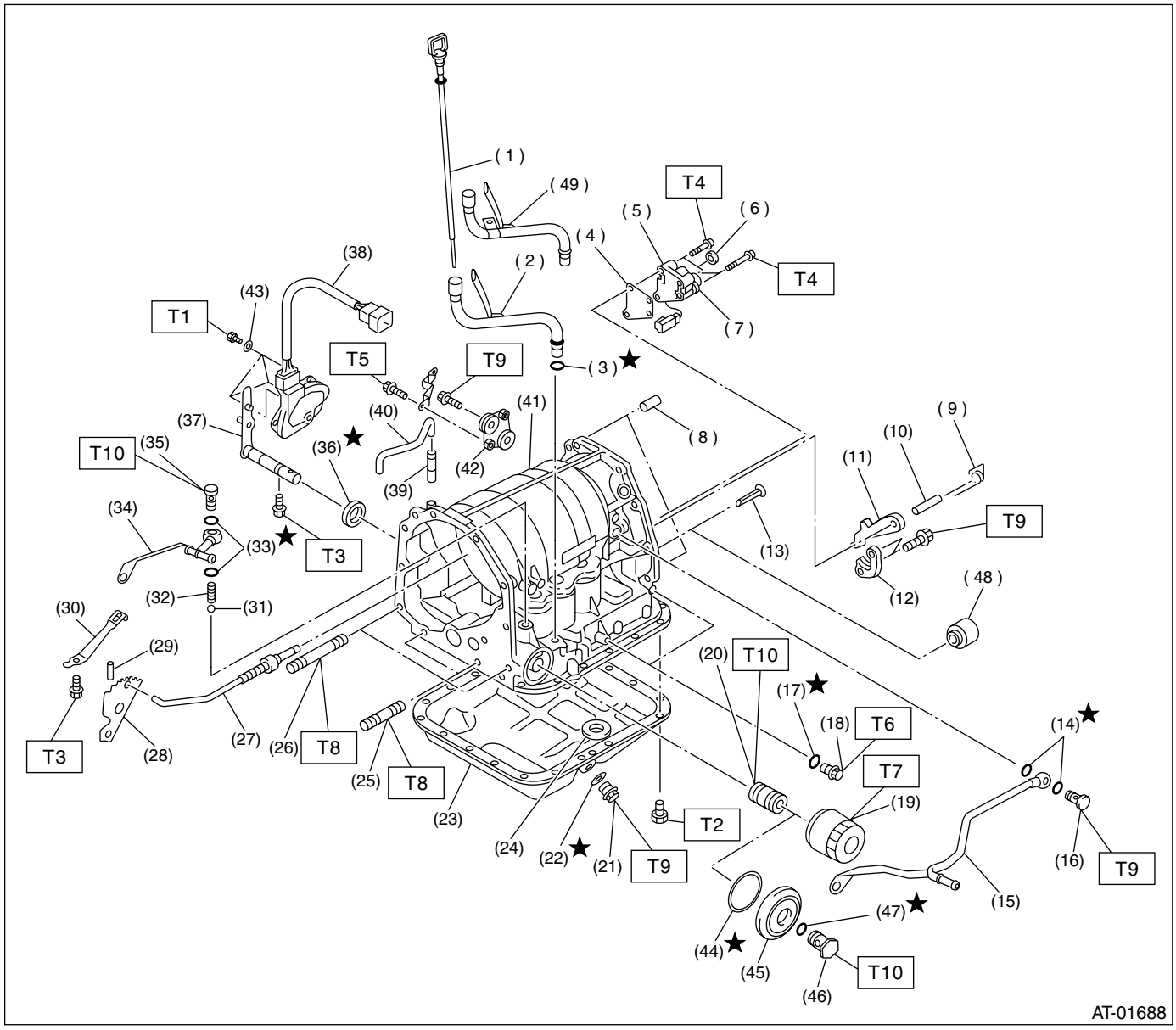
2. OIL PUMP



(1) Oil pump rotor
(2) Oil pump cover
(3) Seal ring
(4) Thrust needle bearing
(5) Drive pinion shaft
(6) Roller bearing
(7) Shim
(8) Oil pump housing
(9) Nipple
(10) Air breather hose
(11) Gasket
(12) O-ring
(13) Test plug
(14) Stud bolt
(15) O-ring
(16) O-ring
(17) Oil seal retainer
(18) Oil seal
(19) O-ring
(20) Drive pinion collar
(21) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 25 (2.5, 18.1)
T5: 40 (4.1, 30)
T6: 42 (4.3, 31)
T7: 116 (11.8, 85)

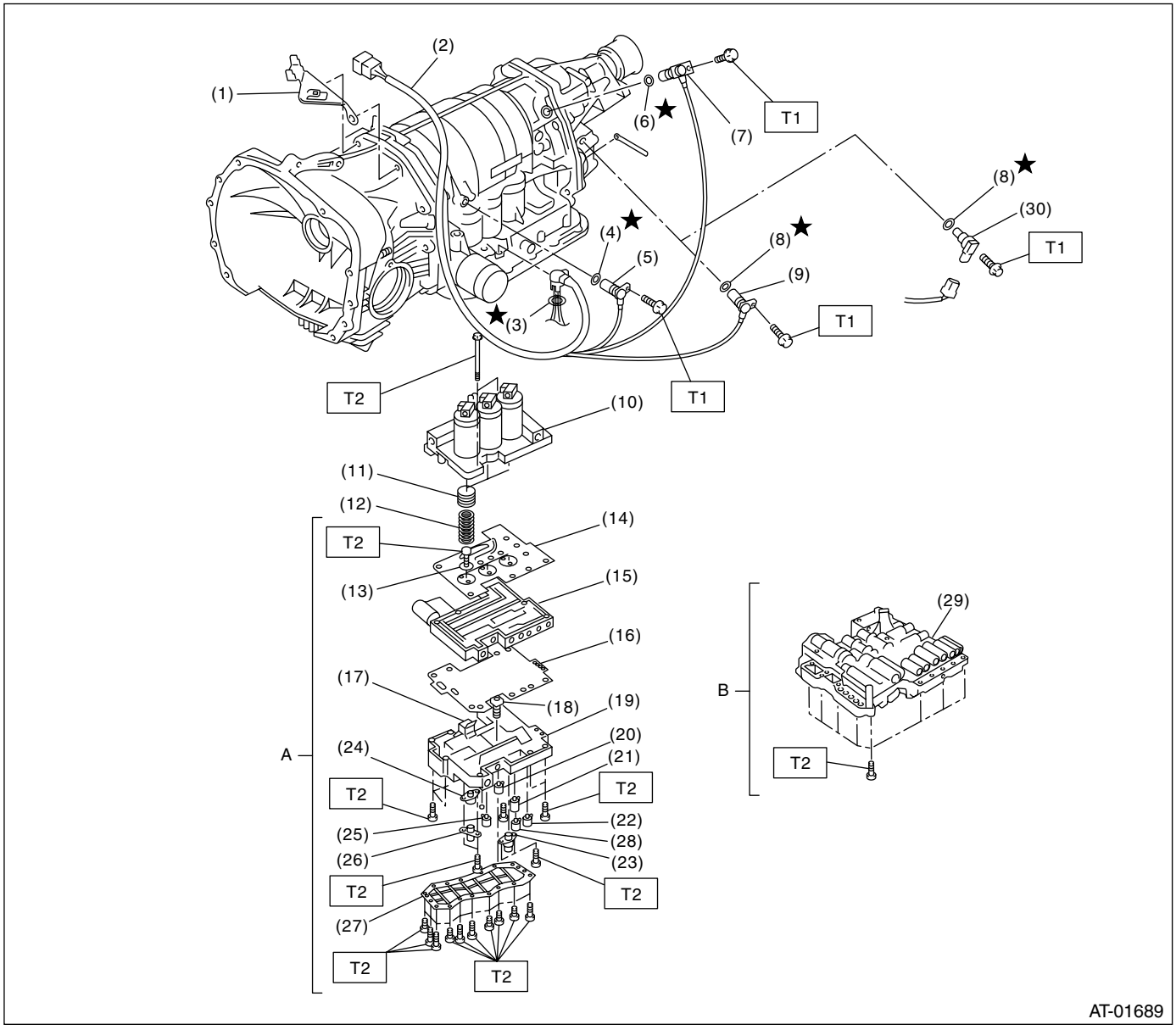
3. TRANSMISSION CASE AND CONTROL DEVICE



(1) ATF level gauge
(2) ATF charger pipe (Except U5 model)
(3) O-ring
(4) Transfer valve plate (Non-TURBO model)
(5) Transfer valve ASSY (Non-TURBO model)
(6) Transfer clutch seal (Non-TURBO model)
(7) Transfer duty solenoid (Non-TURBO model)
(8) Straight pin
(9) Return spring
(10) Shaft
(11) Parking pawl
(12) Parking support
(13) Inlet filter
(14) Gasket
(15) Inlet pipe
(16) Union screw
(17) O-ring
(18) Test plug
(19) Oil filter (Except 3.0 L and U5 model)
(20) Oil filter stud bolt
(21) Drain plug
(22) Gasket
(23) Oil pan
(24) Magnet
(25) Stud bolt (Short)
(26) Stud bolt (Long)
(27) Parking rod
(28) Manual plate
(29) Spring pin
(30) Detention spring
(31) Ball
(32) Spring
(33) Gasket
(34) Outlet pipe
(35) Union screw
(22) Gasket
(36) Oil seal
(37) Select lever
(38) Inhibitor switch ASSY
(39) Nipple
(40) Air breather hose
(41) Transmission case
(42) Plate ASSY
(43) Washer
(44) O-ring (3.0 L model and U5 model)
(45) Cover (3.0 L model and U5 model)
(46) Union screw
(47) Gasket
(48) Bushing (TURBO model)
(49) ATF charge pipe (U5 model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.4 (0.35, 2.5)
T2: 5 (0.5, 3.6)
T3: 6 (0.6, 4)
T4: 8 (0.8, 6)
T5: 12 (1.2, 8.7)
T6: 13 (1.3, 10)
T7: 14 (1.4, 10)
T8: 18 (1.8, 13)
T9: 25 (2.6, 18)
T10: 44 (4.5, 32)

4. CONTROL VALVE AND HARNESS ROUTING



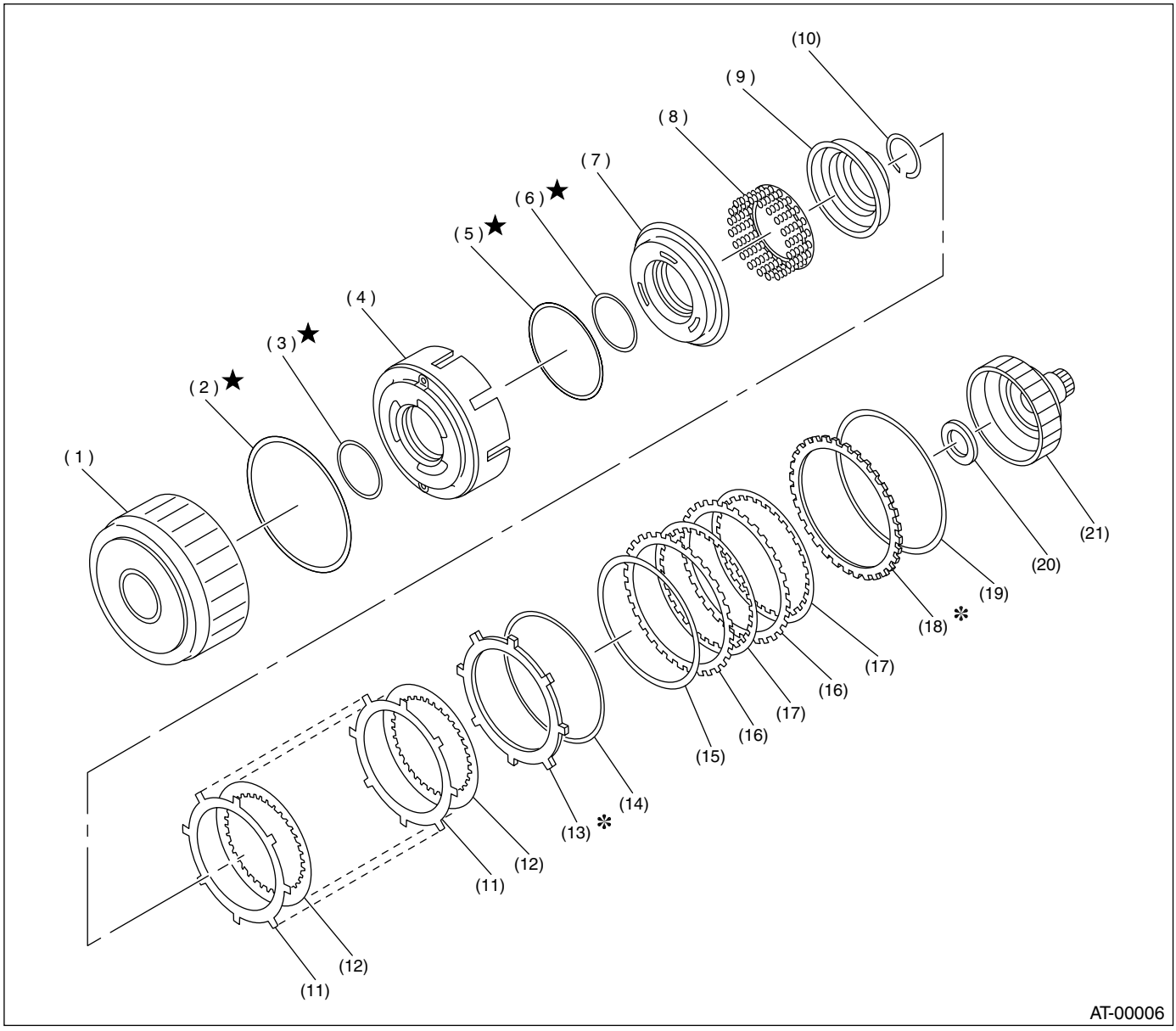
A: Non-TURBO model

B: TURBO model

(1) Stay
(2) Transmission harness
(3) O-ring
(4) O-ring
(5) Torque converter turbine speed sensor
(6) O-ring
(7) Front vehicle speed sensor
(8) O-ring
(9) Rear vehicle speed sensor (Non-TURBO model)
(10) Upper valve body
(11) Accumulator piston
(12) Accumulator spring
(13) Side plate
(14) Separate plate
(15) Middle valve body
(16) Separate plate
(17) Fluid filter
(18) Fluid filter
(19) Lower valve body
(20) Shift solenoid 2
(21) Shift solenoid 1
(22) 2-4 brake timing solenoid
(23) 2-4 brake duty solenoid
(24) Line pressure duty solenoid
(25) Low clutch timing solenoid
(26) Lock-up duty solenoid
(27) Oil strainer
(28) SPORT shift solenoid (if equipped)
(29) Control valve ASSY
(30) Rear vehicle speed sensor (TURBO model)

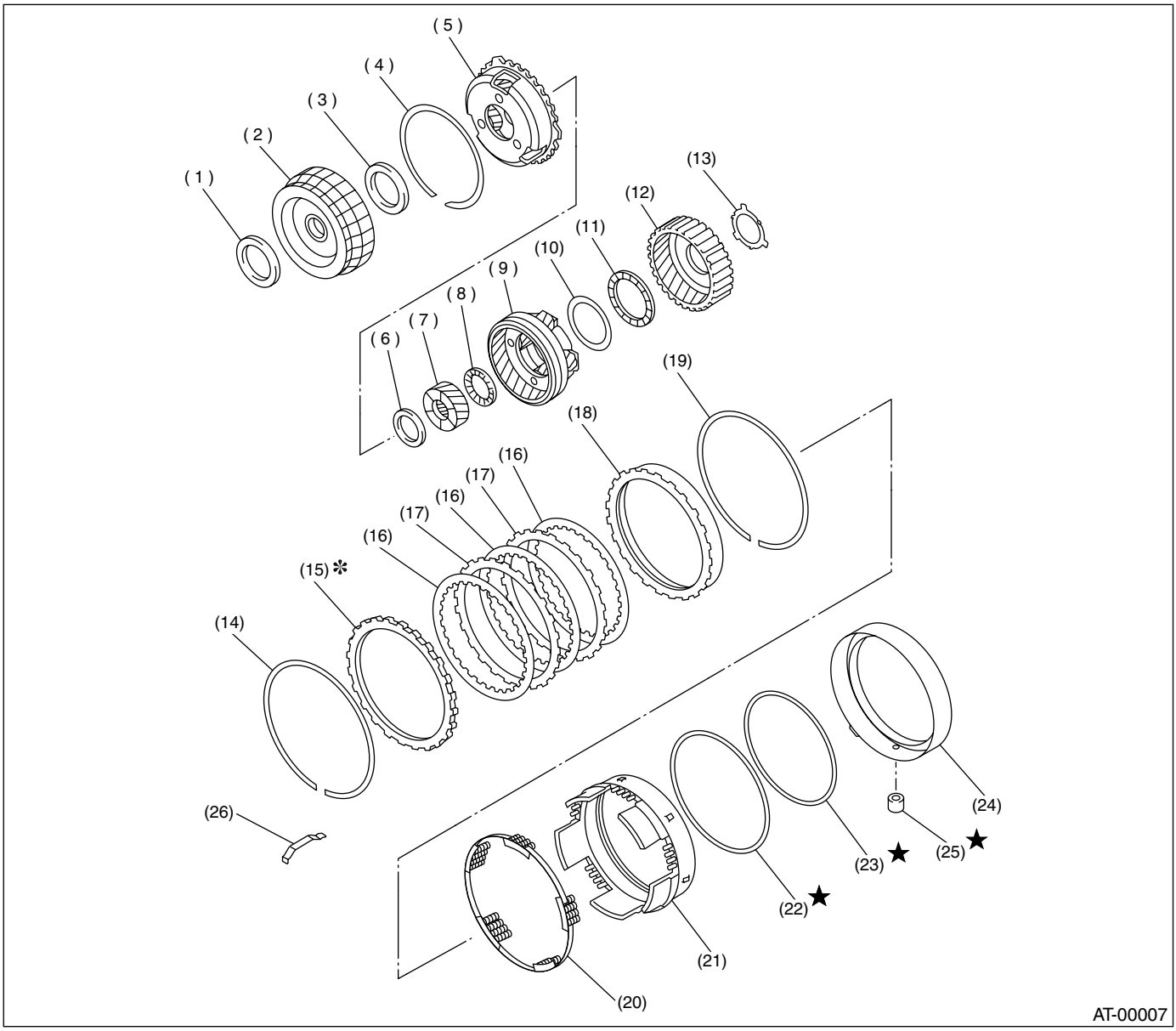
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 8 (0.8, 5.8)

5. HIGH CLUTCH AND REVERSE CLUTCH



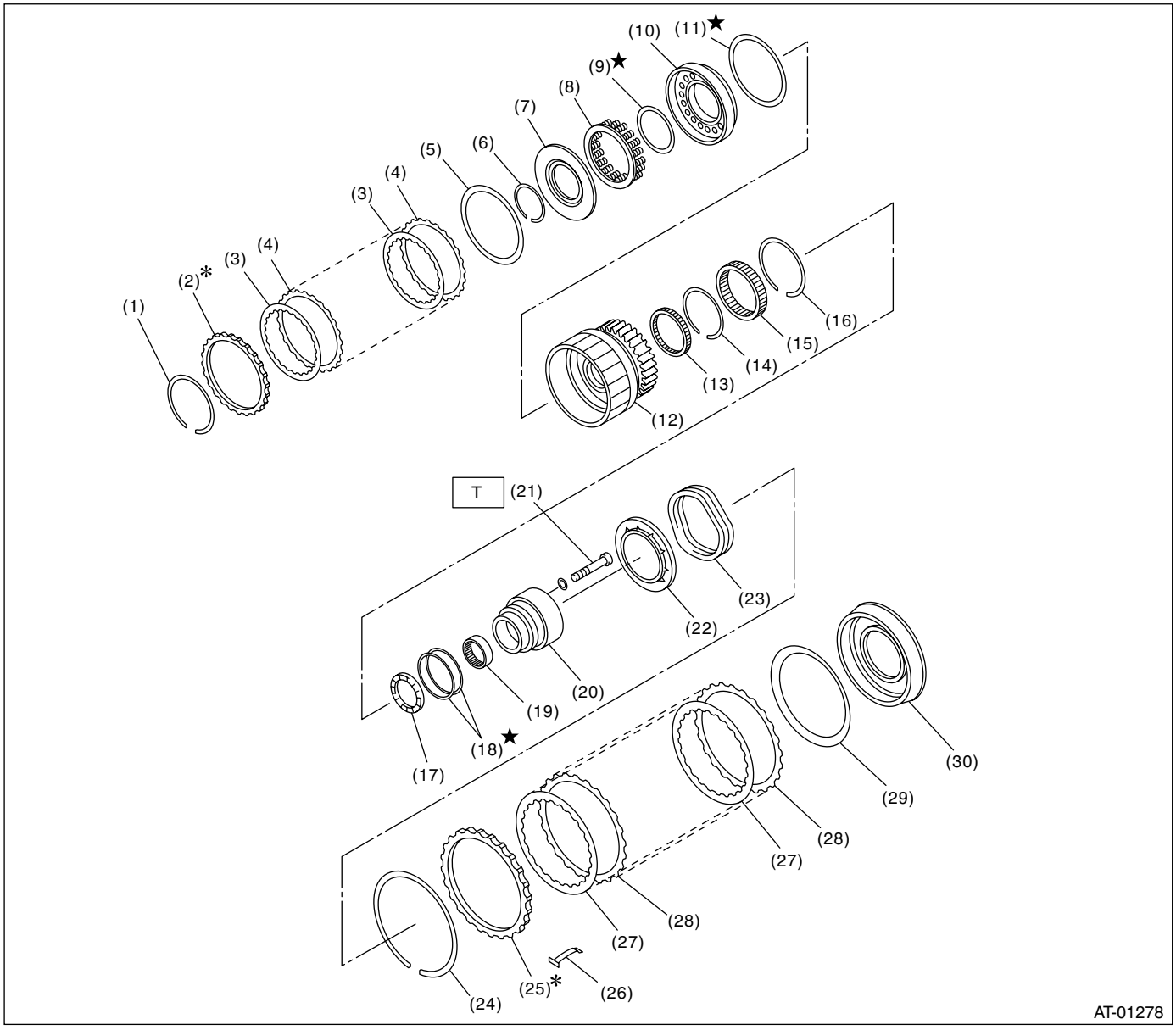
(1) High clutch drum
(2) Lip seal
(3) D-ring
(4) Reverse clutch piston
(5) D-ring
(6) D-ring
(7) High clutch piston
(8) Spring retainer
(9) Cover
(10) Snap ring
(11) Driven plate
(12) Drive plate
(13) Retaining plate
(14) Snap ring
(15) Dish plate
(16) Driven plate
(17) Drive plate
(18) Retaining plate
(19) Snap ring
(20) Thrust needle bearing
(21) High clutch hub

6. PLANETARY GEAR AND 2-4 BRAKE



(1) Thrust needle bearing
(2) Front sun gear
(3) Thrust needle bearing
(4) Snap ring
(5) Front planetary carrier
(6) Thrust needle bearing
(7) Rear sun gear
(8) Thrust needle bearing
(9) Rear planetary carrier
(10) Washer
(11) Thrust needle bearing
(12) Rear internal gear
(13) Washer
(14) Snap ring
(15) Retaining plate
(16) Drive plate
(17) Driven plate
(18) Pressure rear plate
(19) Snap ring
(20) Spring retainer
(21) 2-4 brake piston
(22) D-ring
(23) D-ring
(24) 2-4 brake piston retainer
(25) 2-4 brake seal
(26) Leaf spring

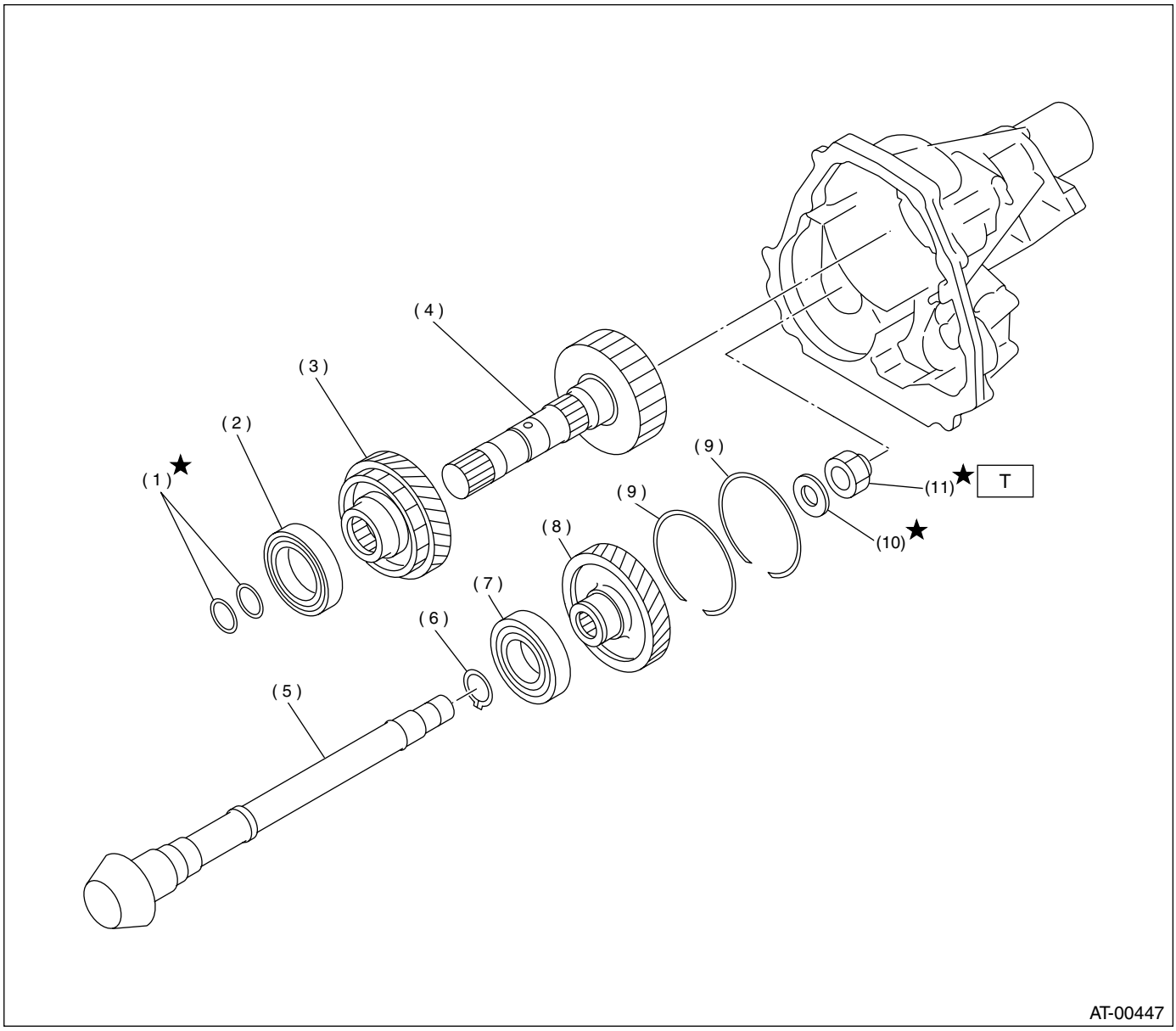
7. LOW CLUTCH AND LOW & REVERSE BRAKE



(1) Snap ring
(2) Retaining plate
(3) Drive plate
(4) Driven plate
(5) Dish plate
(6) Snap ring
(7) Cover
(8) Spring retainer
(9) D-ring
(10) Low clutch piston
(11) D-ring
(12) Low clutch drum
(13) Needle bearing
(14) Snap ring
(15) One-way clutch
(16) Snap ring
(17) Thrust needle bearing
(18) Seal ring
(19) Needle bearing
(20) One-way clutch inner race
(21) Socket bolt
(22) Spring retainer
(23) Return spring
(24) Snap ring
(25) Retaining plate
(26) Leaf spring
(27) Drive plate
(28) Driven plate
(29) Dish plate
(30) Low & reverse brake piston

Tightening torque: N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.1)

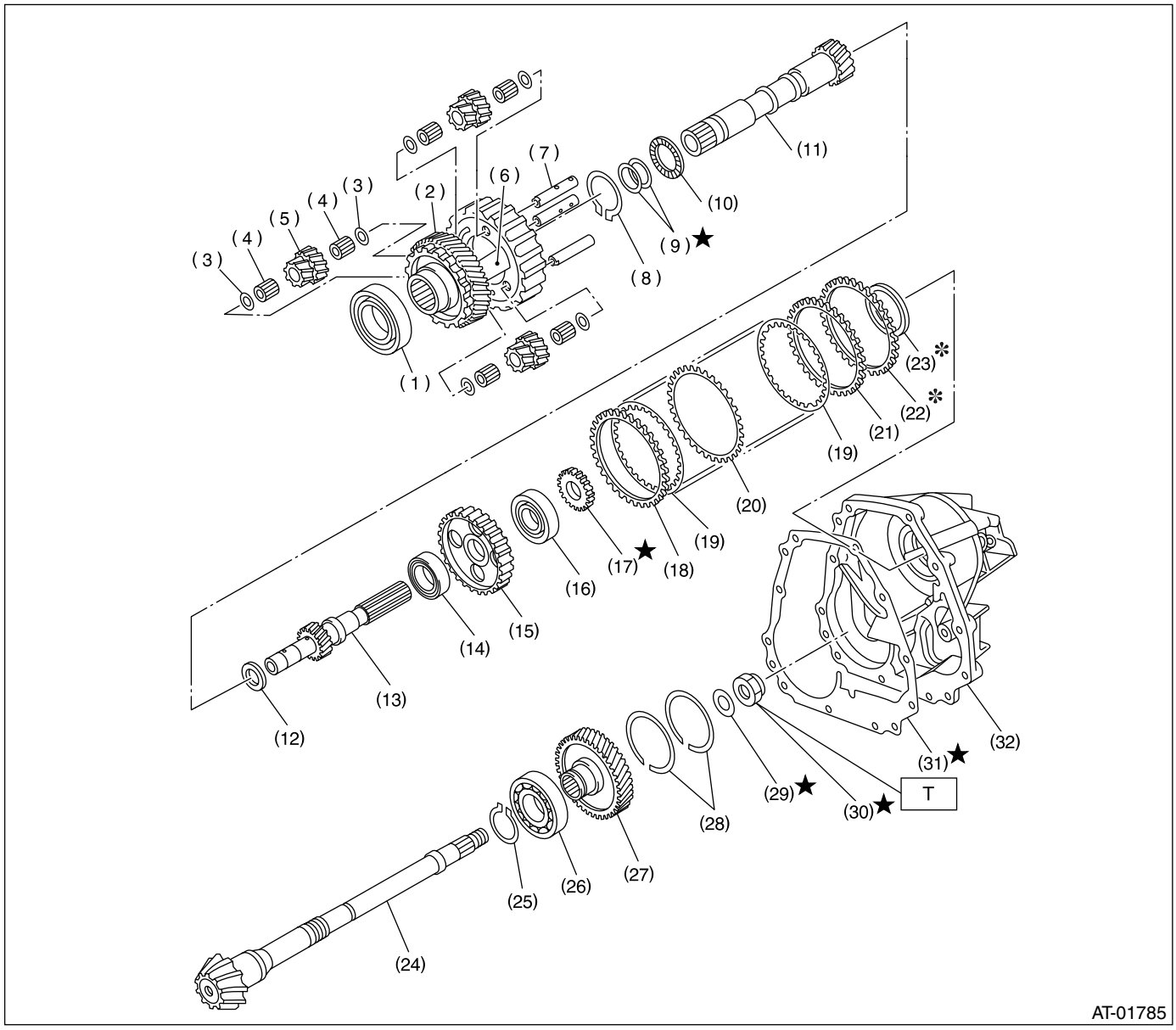
8. REDUCTION GEAR WITH MPT



(1) Seal ring
(2) Ball bearing
(3) Reduction drive gear
(4) Reduction drive shaft
(5) Drive pinion shaft
(6) Snap ring
(7) Ball bearing
(8) Reduction driven gear
(9) Snap ring
(10) Washer
(11) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 73.8)

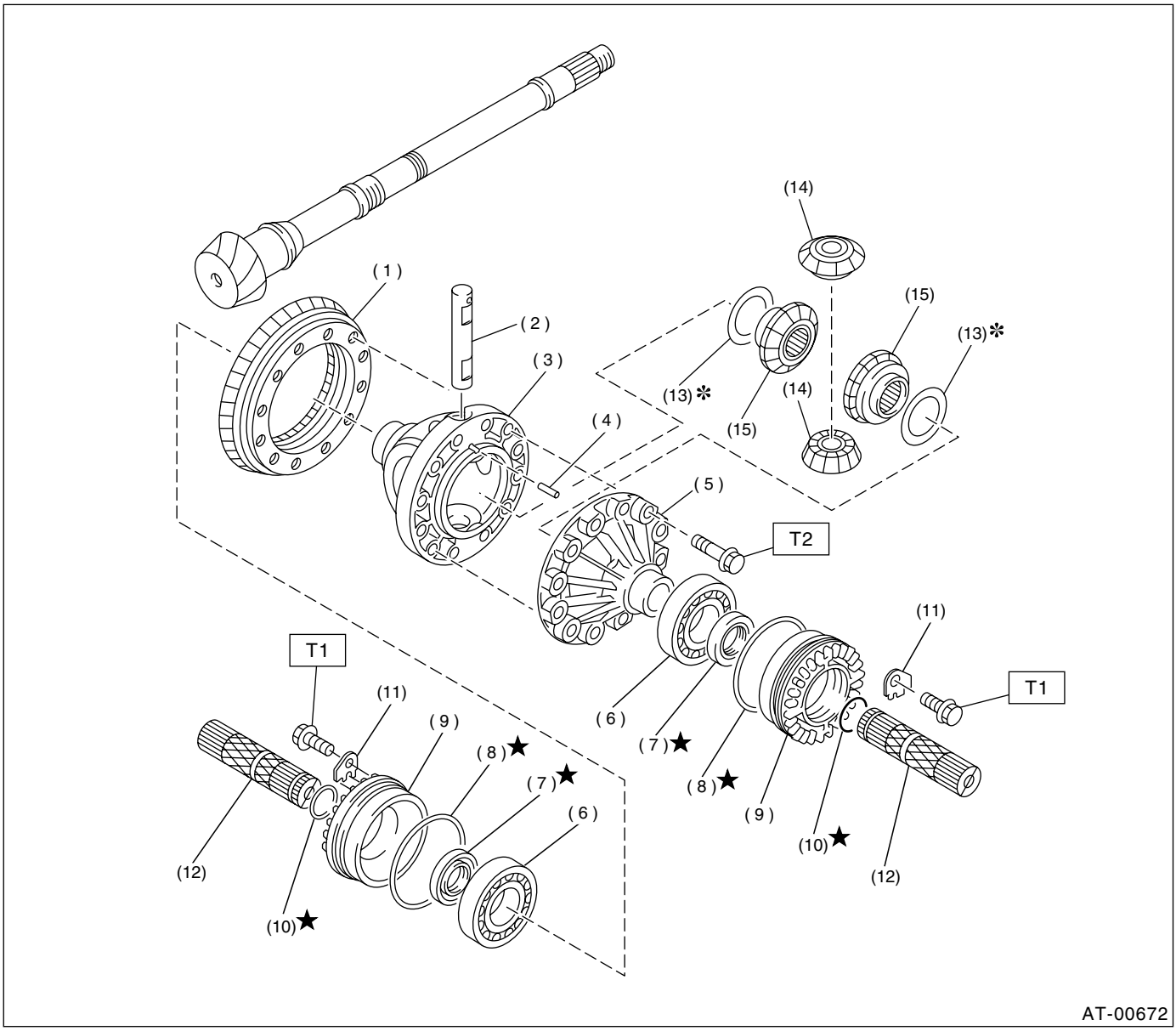
9. REDUCTION GEAR WITH VTD



(1) Ball bearing
(2) Reduction drive gear
(3) Washer
(4) Needle bearing
(5) Pinion gear
(6) Carrier
(7) Planetary pinion shaft
(8) Snap ring
(9) Seal ring
(10) Thrust needle bearing
(11) Intermediate shaft
(12) Thrust washer
(13) Rear drive shaft
(14) Ball bearing
(15) Multi-plate clutch (LSD) hub
(16) Ball bearing
(17) Revolution gear
(18) Driven plate (Thick)
(19) Driven plate
(20) Driven plate (Thin)
(21) Driven plate (Thick)
(22) Pressure plate
(23) Rear drive shaft shim
(24) Drive pinion shaft
(25) Snap ring
(26) Ball bearing
(27) Reduction driven gear
(28) Snap ring
(29) Lock washer
(30) Lock nut
(31) Gasket
(32) Extension case

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 73.8)

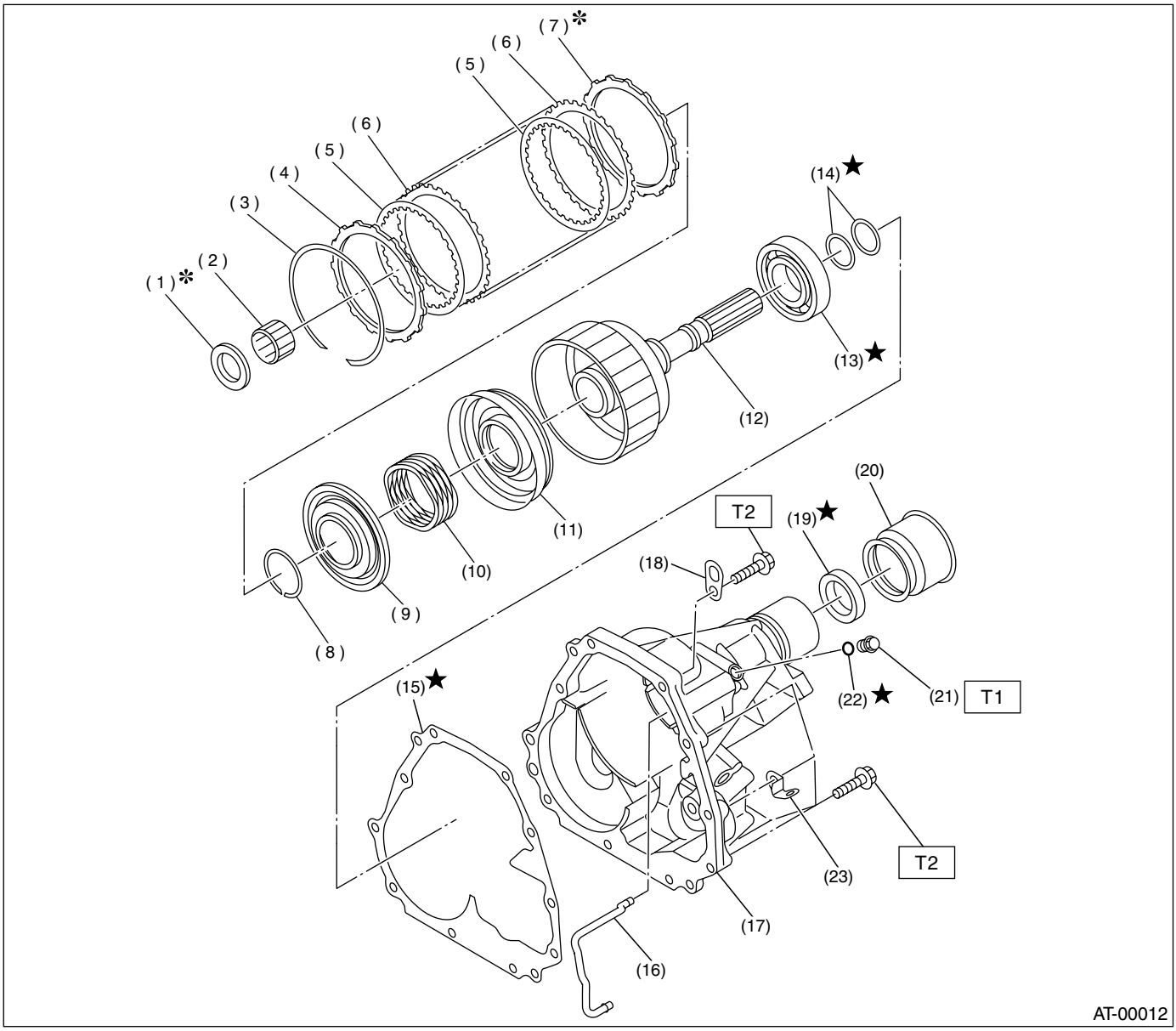
10.DIFFERENTIAL GEAR



(1) Crown gear
(2) Pinion shaft
(3) Differential case (RH)
(4) Straight pin
(5) Differential case (LH)
(6) Taper roller bearing
(7) Oil seal
(8) O-ring
(9) Differential side retainer
(10) Circlip (Non-TURBO model)
(11) Lock plate
(12) Axle shaft (Non-TURBO model)
(13) Washer
(14) Differential bevel pinion
(15) Differential bevel gear

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

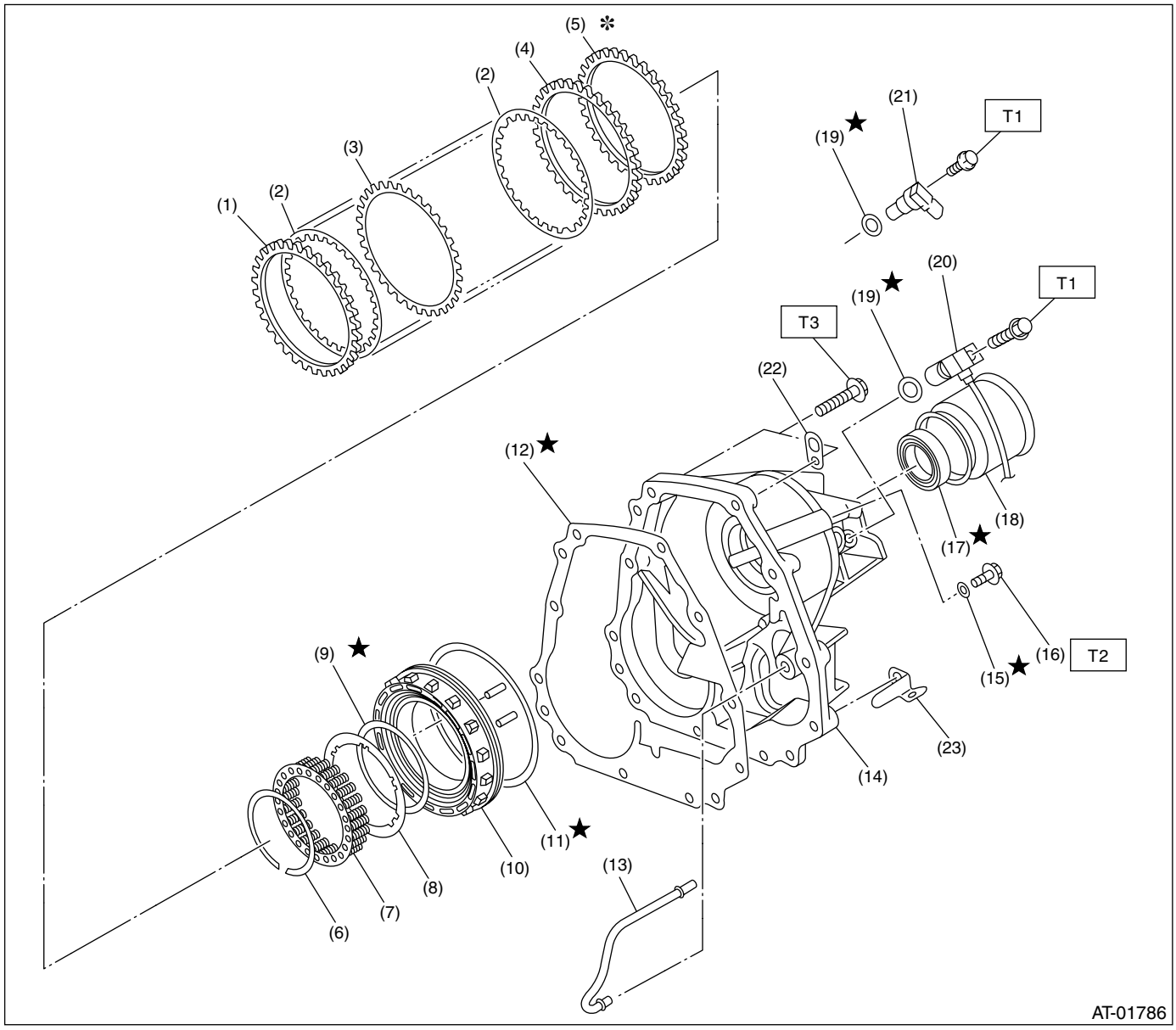
11.TRANSFER AND EXTENSION CASE WITH MPT



(1) Thrust needle bearing
(2) Needle bearing
(3) Snap ring
(4) Pressure plate
(5) Drive plate
(6) Driven plate
(7) Retaining plate
(8) Snap ring
(9) Transfer piston seal
(10) Return spring
(11) Transfer clutch piston
(12) Rear drive shaft
(13) Ball bearing
(14) Seal ring
(15) Gasket
(16) Transfer clutch pipe
(17) Extension case
(18) Transmission hanger
(19) Oil seal
(20) Dust cover
(21) Test plug
(22) O-ring
(23) Clip (3.0 L model and U5 model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 25 (2.5, 18.1)

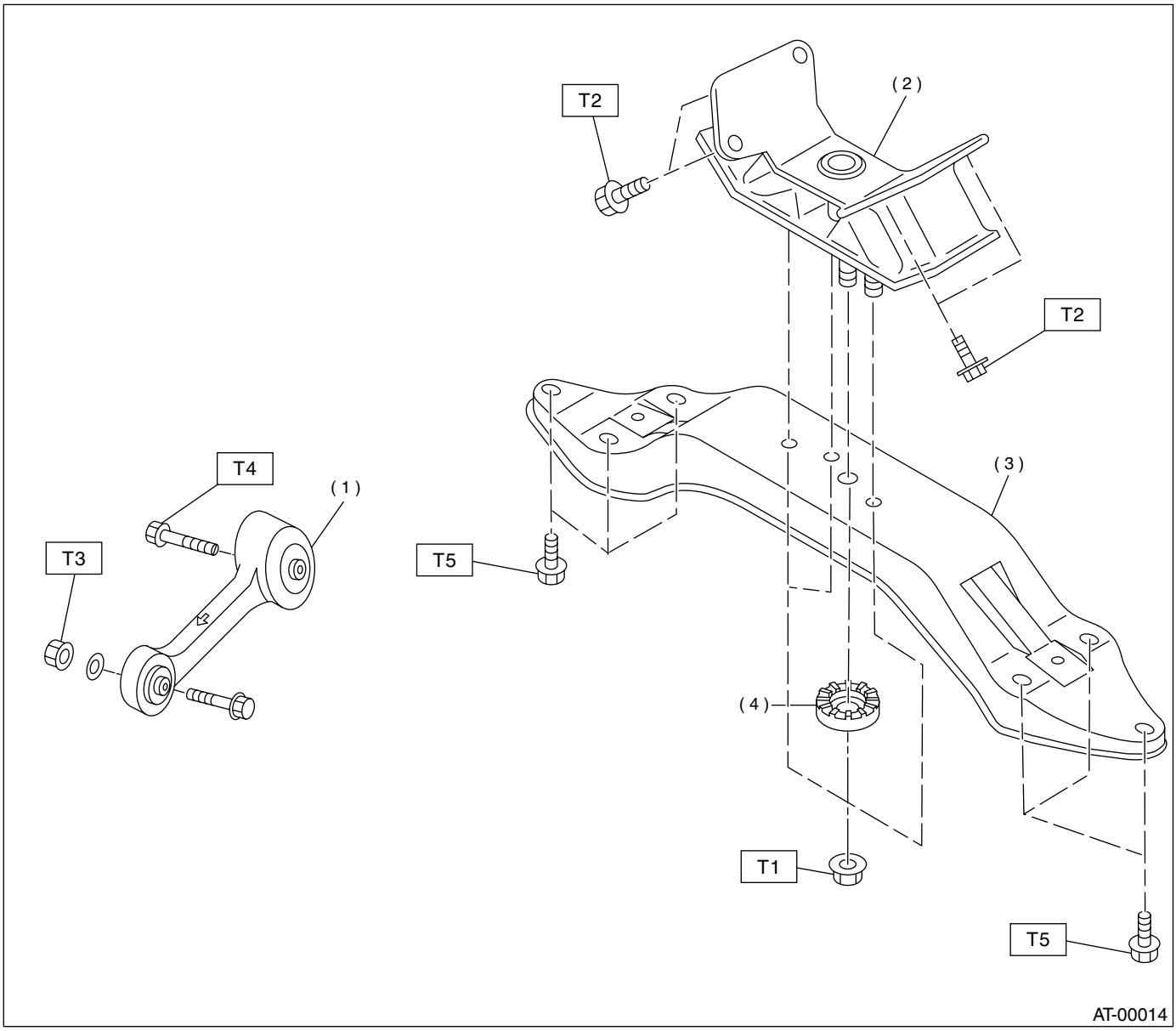
12.TRANSFER AND EXTENSION CASE WITH VTD



(1) Driven plate (Thick)
(2) Driven plate
(3) Driven plate (Thin)
(4) Driven plate (Thick)
(5) Retaining plate
(6) Snap ring
(7) Spring retainer
(8) Plate
(9) O-ring
(10) Multi-plate clutch (LSD) piston
(11) D-ring
(12) Gasket
(13) Multi-plate clutch (LSD) pipe
(14) Extension case
(15) O-ring
(16) Test plug
(17) Oil seal
(18) Dust cover
(19) O-ring
(20) Rear wheel sensor (Non-TURBO model)
(21) Rear vehicle speed sensor (TURBO model)
(22) Transmission hanger
(23) Clip (3.0 L model, TURBO model and U5 model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 13 (1.3, 9.4)
T3: 25 (2.5, 18.1)

13.TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Rear cushion rubber
(3) Crossmember
(4) Stopper

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26)
T2: 39 (4.0, 29)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 51)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Until the oil pan is installed, do not place with the oil pan inside facing up to prevent foreign matter from entering the valve body.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to open the case. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply appropriate gear oil or ATF onto sliding or revolving surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of ATF fluid to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

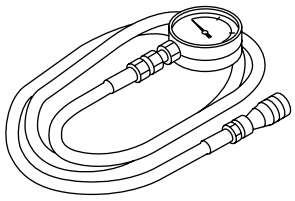
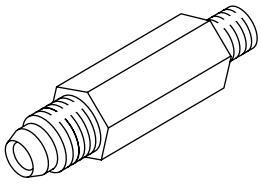
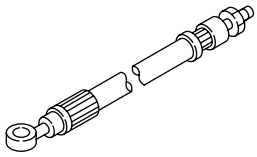
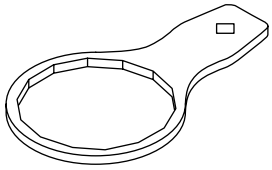
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498575400	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 ST-498897200	498897200	ADAPTER	Used oil pump housing when measuring reverse clutch pressure and line pressure.
 ST-498897700	498897700	ADAPTER SET	Used for measuring transfer clutch pressure.
 ST-498545400	498545400	FILTER WRENCH	Used for removing and installing ATF filter.

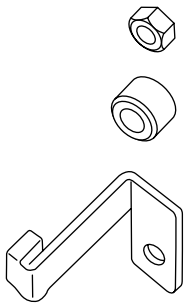
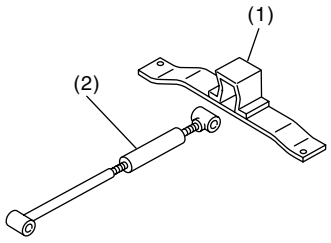
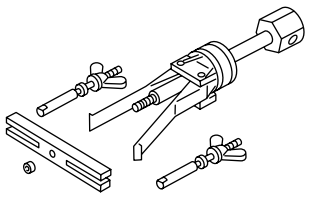
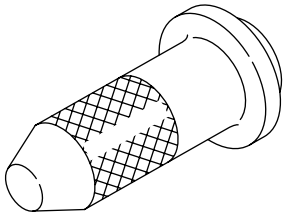
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.
 ST41099AA000	41099AA000	ENGINE SUPPORT ASSY	Used for supporting engine. (1) ENGINE SUPPORT BRACKET (41099AA010) (2) ENGINE SUPPORT (41099AA020)
 ST-398527700	398527700	PULLER ASSY	• Used for removing extension case roller bearing. • Used for removing extension oil seal. • Used for removing front differential side retainer bearing outer race. • Used for removing front differential side retainer bearing outer ball race.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.

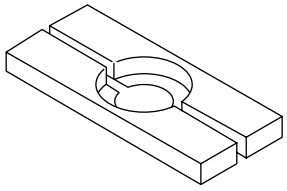
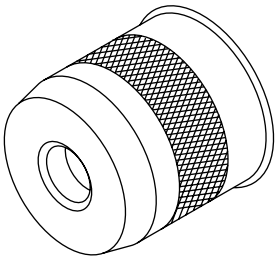
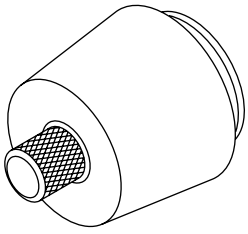
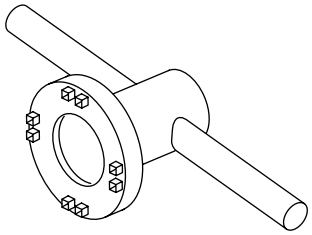
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077000	498077000	REMOVER	Used for removing differential taper roller bearing.
 ST-499247400	499247400	INSTALLER	• Used for installing transfer outer snap ring. • Used with GUIDE (499257300).
 ST-499257300	499257300	SNAP RING OUTER GUIDE	• Used for installing transfer outer snap ring. • Used with INSTALLER (499247400).
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.

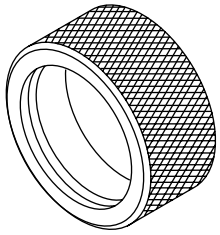
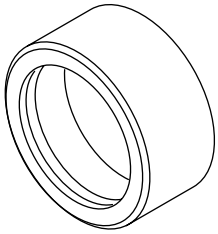
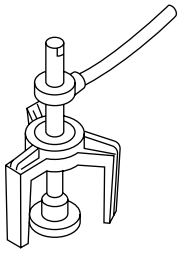
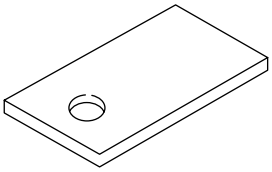
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398437700	398437700	DRIFT	Used for installing converter case oil seal.
 ST-398487700	398487700	INSTALLER	Used for installing taper roller bearing of front differential.
 ST-398673600	398673600	COMPRESSOR	Used for removing and installing clutch spring.
 ST-498255400	498255400	PLATE	Used for measuring backlash of hypoid gear.

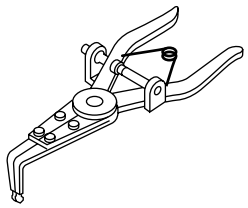
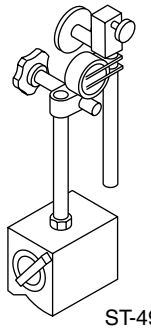
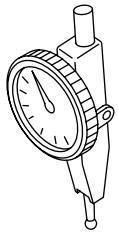
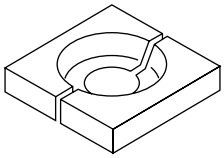
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399893600	399893600	PLIERS	Used for removing and installing clutch spring.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring gear backlash. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring gear backlash. • Used with MAGNET BASE (498247001).
 ST-498517000	498517000	REPLACER	Used for removing front roller bearing.

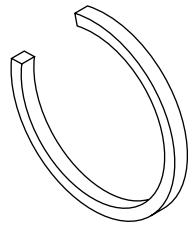
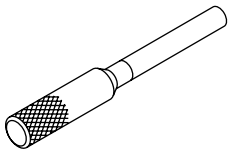
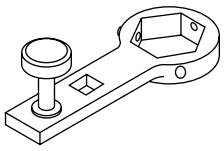
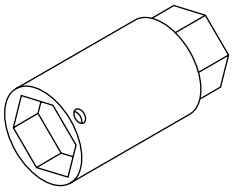
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398623600	398623600	SEAT	Used for removing spring of transfer clutch piston.
 ST-499267300	499267300	STOPPER PIN	Used for installing inhibitor switch.
 ST-499787700	499787700	WRENCH	Used for removing and installing drive pinion lock nut.
 ST-499787500	499787500	ADAPTER	Used for removing and installing drive pinion lock nut.

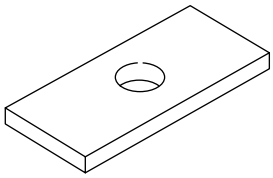
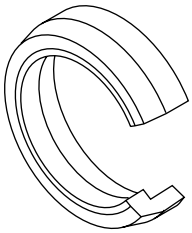
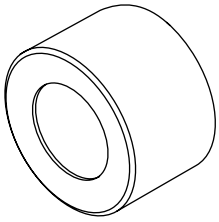
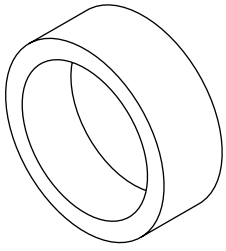
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-498627100	498627100	SEAT	Used for holding low clutch piston retainer spring when installing snap ring.
 ST-499577000	499577000	GAUGE	• Used for measuring the transmission case mating surface to the reduction gear end surface. • For MPT model.
 ST-398744300	398744300	GAUGE	• Use for measuring contact face between multiplate clutch end and transmission. • For VTD model.

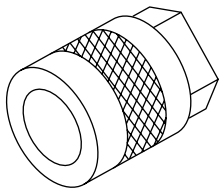
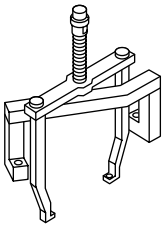
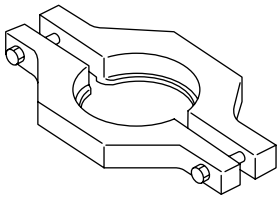
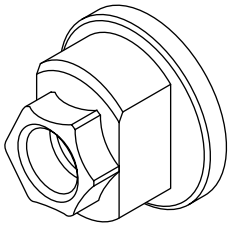
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499737000	499737000	PULLER	Used for removing reduction driven gear assembly.
 ST-499737100	499737100	PULLER SET	Used for removing reduction drive gear assembly.
 ST-498077600	498077600	REMOVER	Used for removing ball bearing.
 ST-498937110	498937110	HOLDER	Used for removing and installing drive pinion lock nut.

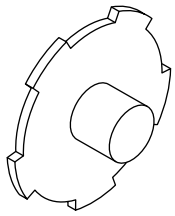
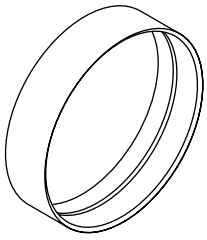
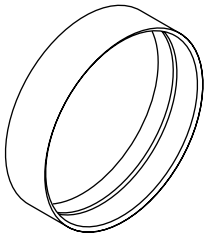
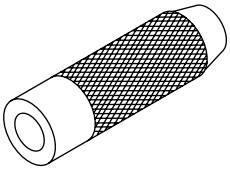
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498677100	498677100	COMPRESSOR	Used for installing 2-4 brake snap ring.
 ST-498437000	498437000	HIGH CLUTCH PISTON GUIDE	Used for installing high clutch piston.
 ST-498437100	498437100	LOW CLUTCH PISTON GUIDE	Used for installing low clutch piston.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the ball bearing for transfer clutch.

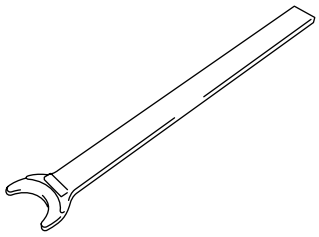
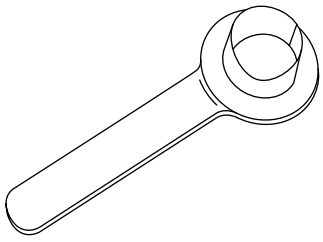
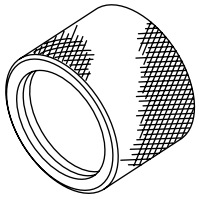
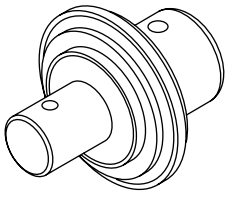
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399SA000	28399SA000	REMOVER	• Used for removing axle shaft. • TURBO model
 ST28399SA010	28399SA010	PROTECTOR	• Used for installing axle shaft. • TURBO model
 ST18675AA000	18675AA000	DIFFERENTIAL OIL SEAL INSTALLER	• Used for installing differential side retainer oil seal. • TURBO model
 ST-499247300	499247300	INSTALLER	• Used for removing axle shaft. • Used with REMOVER (499095500). • Non-TURBO model

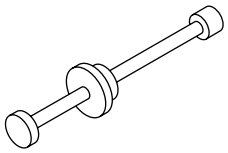
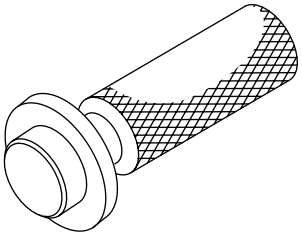
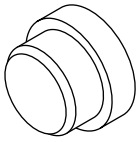
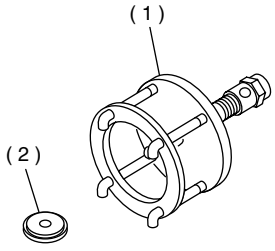
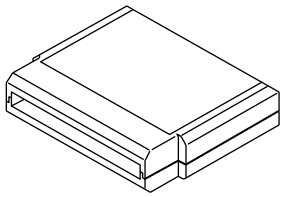
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499095500	499095500	REMOVER	• Used for removing axle shaft. • Non-TURBO model
 ST-499797000	499797000	INSTALLER	• Used for installing differential side retainer oil seal. • Non-TURBO model
 ST-398497701	398497701	SEAT	Used for installing needle bearing.
 ST-899524100	899524100	PULLER SET	• Using the bolt only. (1) Bolt • Used with PULLER SET (499737100). • Used with PULLER (499737000). (1) Puller (2) Cap

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

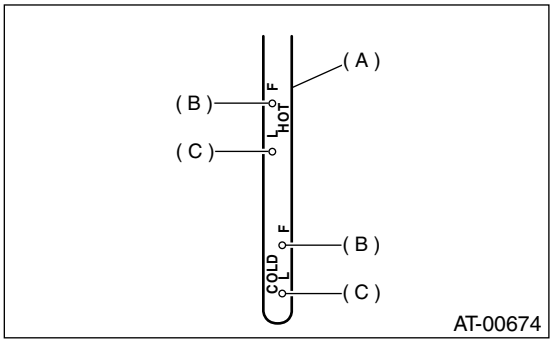
TOOL NAME	REMARKS
Depth gauge	Used for measuring transmission end play.
Thickness gauge	Used for measuring clearances of clutch, brake and oil pump.
Micro meter	Used for measuring thickness of drive pinion.
Spring balance	Used for measuring starting torque of drive pinion.
Circuit tester	Used for measuring resistance and voltage.
TORX® T70	Used for removing and installing differential gear oil drain plug.

2. Automatic Transmission Fluid

A: INSPECTION

NOTE:
The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on SUBARU Select Monitor. <Ref. to 4AT(H4SO)-27, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



(A) ATF level gauge
(B) Upper level
(C) Lower level

4) Make sure that ATF level is above the center of upper and lower marks at HOT side.
5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.
If the ATF level is below the lower mark, check for leaks of the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

CAUTION:
Use care not to exceed the upper limit level. Remember that the addition of ATF to the upper limit mark will result in overfilling of ATF, causing a transmission failure.

6) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.

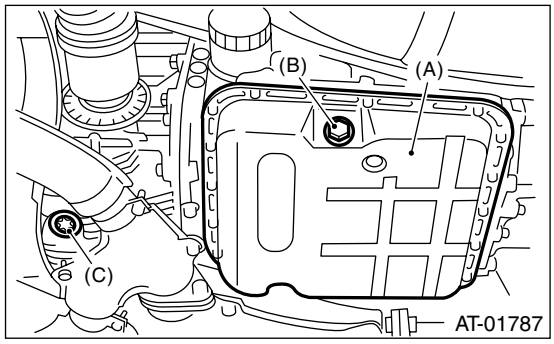
B: REPLACEMENT

1) Lift-up the vehicle.
2) Drain the ATF completely.

CAUTION:
Directly after the engine has been running, the ATF is hot. Be careful not to burn yourself.

3) Replace with a new gasket, and then tighten the ATF drain plug.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)
(C) Differential oil drain plug

4) Lower the vehicle.
5) Pour ATF into the oil charge pipe.

Recommended fluid:
Dexron III type automatic transmission fluid

Capacity:
Fill the same amount of ATF drained from drain plug hole.

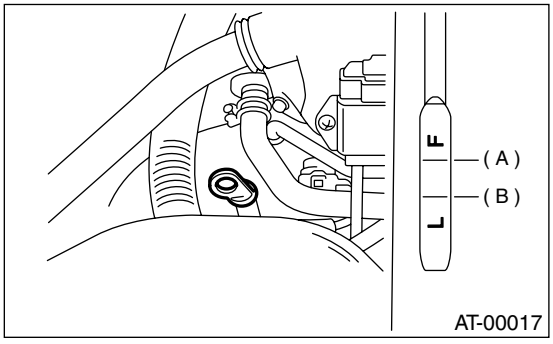
Capacity when transmission is overhauled:
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

6) Check the level and leaks of ATF.
<Ref. to 4AT-31, INSPECTION.>

3. Differential Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the differential gear oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) To prevent overfilling the differential gear oil, do not add oil above the “F” line.



(A) Upper level
(B) Lower level

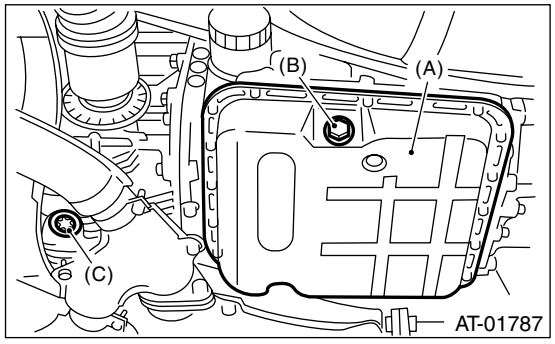
B: REPLACEMENT

1) Lift-up the vehicle.
2) Remove the differential gear oil drain plug using TORX® T70, and then drain the differential gear oil completely.

CAUTION:
• Directly after the engine has been running, the differential gear oil is hot. Be careful not to burn yourself.
• Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.

3) Replace the gasket with a new one, and then tighten the differential gear oil drain plug using TORX® T70.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Lower the vehicle.
5) Pour gear oil into the gauge hole.

Recommended fluid:
Use GL-5 (SAE: 75W — 90) or equivalent.

Gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

6) Check the level of differential gear oil.
<Ref. to 4AT-32, INSPECTION.>

4. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

NOTE:
When performing the test, do not exceed posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ←→ 2nd ←→ 3rd ←→ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check kick-down for each gear. Also check the kick-down shock level.

5. ENGINE BRAKE OPERATION

- Check the 3rd gear engine brake when shifting between D ←→ 3rd range while driving in 4th gear of D range [50 to 60 km/h (31 to 37 MPH)].
- Check the 2nd gear engine brake when shifting between 3 ←→ 2 range while driving in the 3 range 3rd gear [40 to 50 km/h (25 to 31 MPH)].
- Check the 1st gear engine brake when shifting between 2 ←→1 range while driving in the 2 range 2nd gear [20 to 30 km/h (12 to 19 MPH)].

6. LOCK-UP FUNCTION

Check that engine speed does not change sharply when the accelerator pedal is lightly depressed when driving on flat roads at normal speed in the lock-up range.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to “P” range. Check that the vehicle does not move when the parking brake is released.

8. UNUSUAL SOUNDS AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going up a grade.
- Check that the gear remains in 3rd when applying the brakes while going down a grade.

10.TRANSFER CLUTCH

Check if the tight corner braking occurs when the vehicle is started with steering wheel held at fully turned position. (MPT model)

11.OIL LEAKS

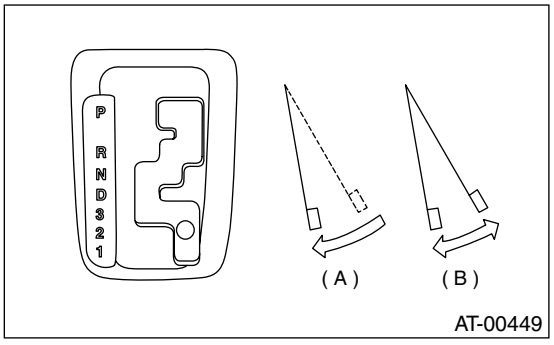
After the driving test, inspect for oil leaks.

5. Stall Test

A: INSPECTION

NOTE:
The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in “R” and “2” ranges.

Purposes of the stall test:
• To check the operation of the automatic transmission clutch.
• To check the operation of the torque converter clutch.
• To check engine performance.
1) Check that throttle valve opens fully.
2) Check that engine oil level is correct.
3) Check that coolant level is correct.
4) Check that ATF level is correct.
5) Check that differential gear oil level is correct.
6) Increase ATF temperature to 70 to 80°C (158 to 176°F) by idling the engine for approx. 30 minutes (with select lever set to “N” or “P”).
7) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
8) Move the manual linkage to ensure it operates properly, and shift the select lever to the “2” range.
9) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal
(B) Accelerator pedal

10) When the engine speed is stabilized, record that speed quickly and release the accelerator pedal.
11) Shift the select lever to “N” range, and cool down the engine by idling it for more than one minute.
12) If the stall speed in “2” range is higher than specifications, low clutch slipping and 2-4 brake slipping may occur. To identify it, conduct the same test as above in “R” range.
13) Perform the stall tests with the select lever in “D” range.

NOTE:
• Do not continue the stall test for MORE THAN 5 SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
• Be sure to cool down the engine for at least 1 minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed lower than 1,200 rpm.
• If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):
Except OUTBACK (2.5 L model): 2,100 — 2,600 rpm
OUTBACK (2.5 L model): 2,200 — 2,700 rpm
3.0 L model: 2,000 — 2,500 rpm
TURBO model: 2,600 — 3,200 rpm

Stall speed (at sea level)	Position	Cause
Less than specifications	2, R	• Throttle valve not fully open • Erroneous engine operation • Torque converter clutch’s one-way clutch slipping
Greater than specifications	D	• Line pressure too low • Low clutch slipping • One-way clutch malfunction
	R	• Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2	• Line pressure too low • Low clutch slipping • 2-4 brake slipping

6. Time Lag Test

A: INSPECTION

NOTE:
If the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

- Perform the test at normal operating fluid temperature 70 to 80°C (158 to 176°F).
- Be sure to allow a 1 minute interval between tests.
- Make three measurements and take the average value.

1) Fully apply the parking brake.
2) Start the engine.
Check the idling speed (A/C OFF).
3) Shift the select lever from “N” to “D” range.
Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds
If “N” → “D” time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly

4) In the same manner, measure the time lag for “N” → “R”.
Time lag: Less than 1.5 seconds
If “N” → “R” time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- Wear of D-ring

7. Line Pressure Test

A: MEASUREMENT

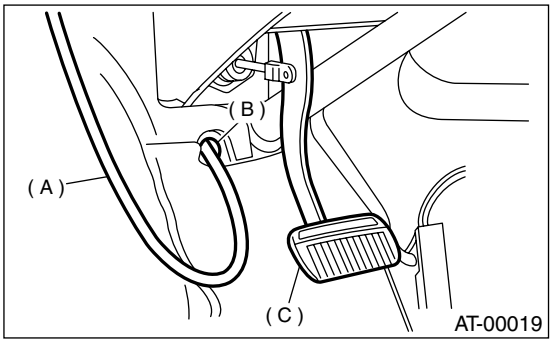
NOTE:
If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

• Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.

• Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake or control valve.

1) Line pressure measurement (under no load)
   (1) Before measuring the line pressure, jack-up all wheels.
   (2) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with select lever in “N” or “P”.)
2) Line pressure measurement (under heavy load)
   (1) Before measuring the line pressure, apply both foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).
   (2) Measure the line pressure when select lever is in “R”, “2” with engine under stall conditions.
   (3) Measure the line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle, and then stop it to cool down for at least one minute.)
   (4) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)
3) Temporarily attach the ST to a suitable place in the driver’s compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to engine compartment.

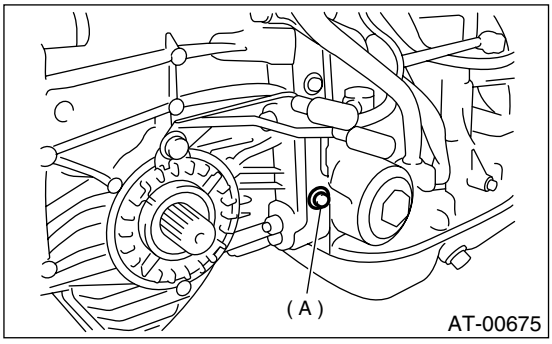
ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Pressure gauge hose
(B) Hole in toe board (blank cap hole)
(C) Brake pedal

4) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



(A) Test plug

5) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER
ST2 498575400 OIL PRESSURE GAUGE ASSY

6) Check for duty ratio changes by opening and closing the throttle valve using SUBARU Select Monitor.

- Non-TURBO model

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle position	Line pressure kPa (kg/cm^2, psi)
2	5	Fully open	1,128 — 1,304 (11.5 — 13.3, 164 — 189)
R	5	Fully open	1,520 — 1,716 (15.5 — 17.5, 220 — 249)
D	9 5	Fully closed	304 — 412 (3.1 — 4.2, 44 — 60)

- TURBO model

Standard line pressure			
Range position	Line pressure duty ratio (%)	Accelerator pedal opening	Line pressure kPa (kg/cm^2, psi)
2	25 — 35	Fully open	1,400 — 1,800 (14.28 — 18.36, 203.0 — 261.0)
R	15 — 25	Fully open	1,600 — 1,900(16.32 — 19.38, 232.0 — 275.5)
D	35 — 45	Fully closed	500 — 800 (5.10 — 8.16, 72.5 — 116.0)

8. Transfer Clutch Pressure Test

A: INSPECTION

• MPT MODEL

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to 4AT-36, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

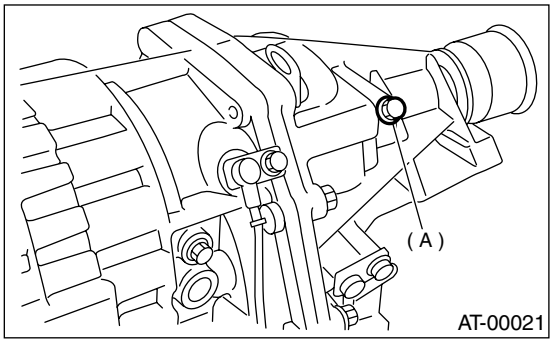
ST 498575400 OIL PRESSURE GAUGE ASSY

AWD mode: “D” range

FWD mode: “P” range, engine speed 2,000 rpm

NOTE:

Before setting in FWD mode, install the spare fuse on FWD mode switch.



(A) Test plug

NOTE:

If oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

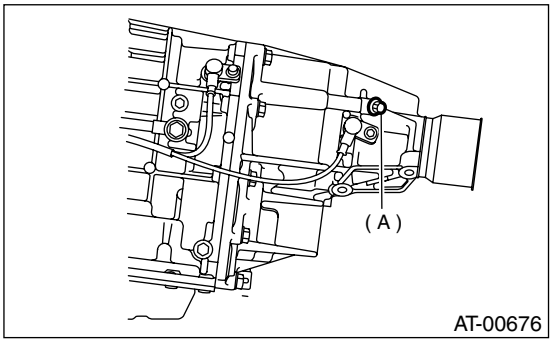
Standard transfer clutch pressure kPa (kg/cm^2, psi)				
Range position	ON Duty ratio (%)	Throttle position	AWD mode	FWD mode
D	95	Fully open	910 — 1,070 (9.28 — 10.91, 132.0 — 155.2)	—
D	60	Adjusts so that an ON duty ratio may become 60%.	410 — 490 (4.18 — 5.00, 59.5 — 71.1)	—
D	5	Fully closed	—	0 (0, 0)
N or P	5	Fully closed	0 (0, 0)	—

• VTD MODEL

Check transfer clutch pressure using the following chart. <Ref. to 4AT-36, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

ST 498575400 OIL PRESSURE GAUGE ASSY



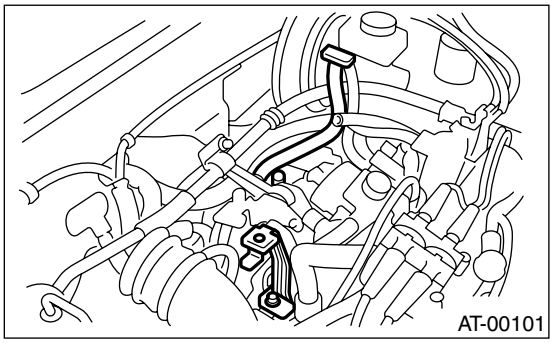
(A) Test plug

Range position	ON Duty ratio (%)	Accelerator pedal opening	Standard of transfer clutch pressure kPa (kg/cm^2, psi)
2	95	Fully open	930 — 1,100 (9.49 — 11.22, 134.9 — 159.5)
2	60	Adjusts so that an ON duty ratio may become 60%.	420 — 560 (4.28 — 5.71, 60.9 — 81.2)
N or P	5	Fully closed	0 (0, 0)

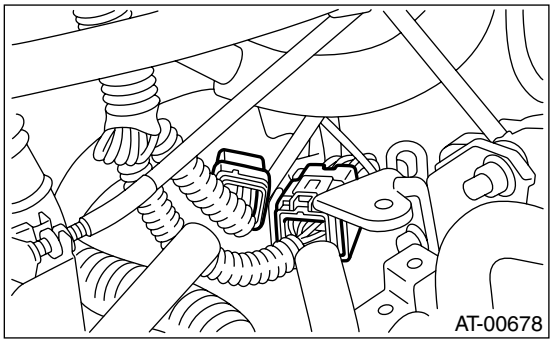
9. Automatic Transmission Assembly

A: REMOVAL

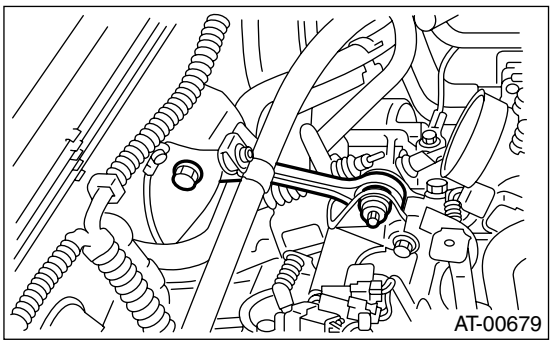
1) Set the vehicle on a lift.
2) Open the front hood fully, and support it with stay.
3) Disconnect the battery ground cable.
4) Remove the air intake duct. (Non-TURBO model)
<Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
5) Remove the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L models
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
6) Remove the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
7) Remove the air cleaner case stay. (Non-TURBO model)


AT-00101

8) Disconnect the following connectors.
(1) Transmission harness connector

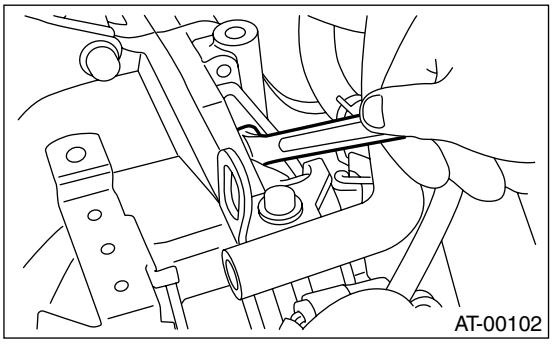

AT-00678

(2) Transmission ground terminal
9) Remove the starter.
2.5 L model
<Ref. to SC(H4SO)-7, REMOVAL, Starter.>
3.0 L model
<Ref. to SC(H6DO)-6, REMOVAL, Starter.>
10) Remove the pitching stopper.

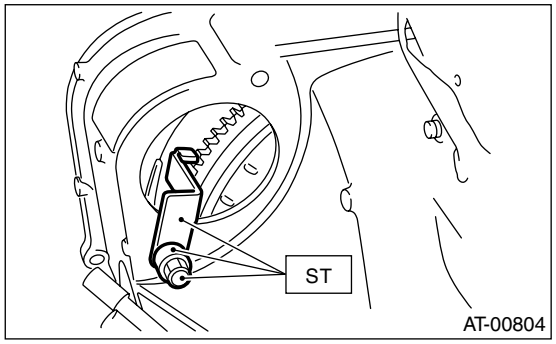

AT-00679

11) Separate the torque converter clutch from drive plate.
(1) Remove the V-belt cover.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Insert the wrench in the crankshaft pulley bolts, and remove all the bolts by slowly rotating the crankshaft pulley.

CAUTION:
Be careful not to drop the bolts into torque converter clutch housing.


AT-00102

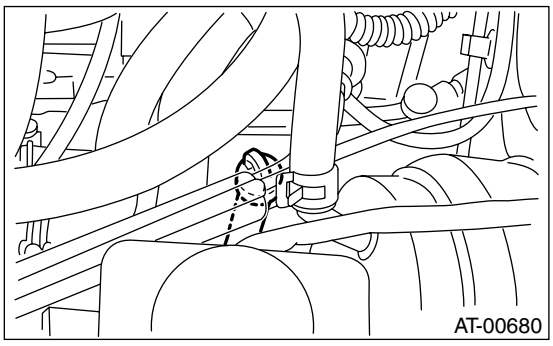
12) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



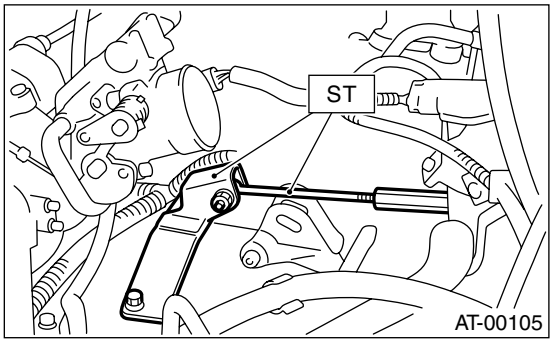
AT-00804

13) Remove the ATF level gauge.

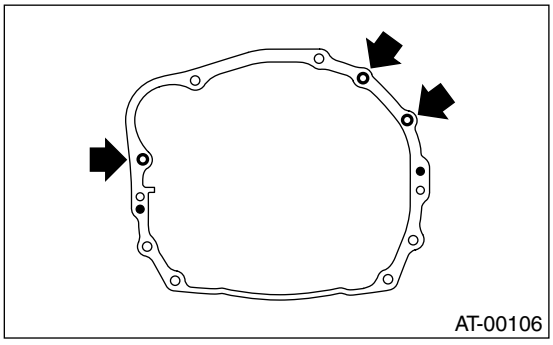
NOTE:
Plug the opening to prevent an entry of foreign particles into transmission fluid.



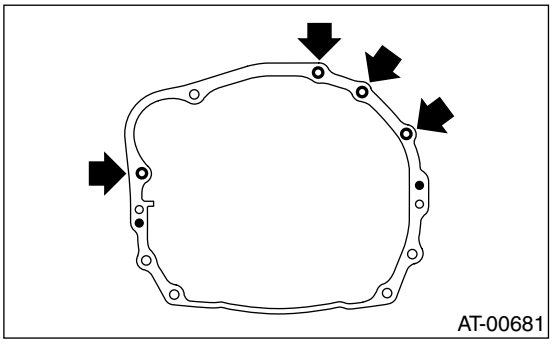
14) Set the ST.
ST 41099AA000 ENGINE SUPPORT ASSY



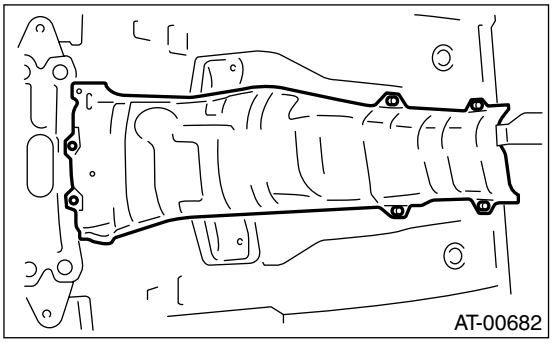
15) Remove the bolts which hold the right upper side of transmission to engine.
Except 3.0 L model



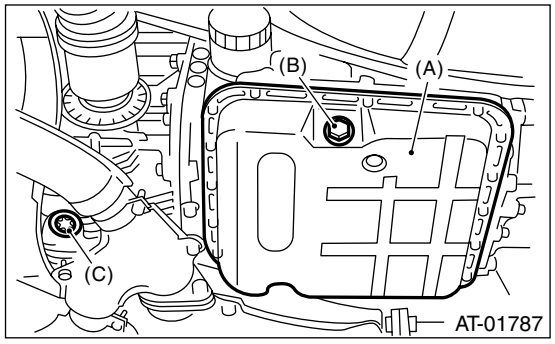
3.0 L model



16) Lift-up the vehicle.
17) Remove the under cover.
18) Remove the front, center and rear exhaust pipe, and muffler. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>
<Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
19) Remove the center and rear exhaust pipes, and muffler. (TURBO model)
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
20) Remove the heat shield cover. (If equipped)

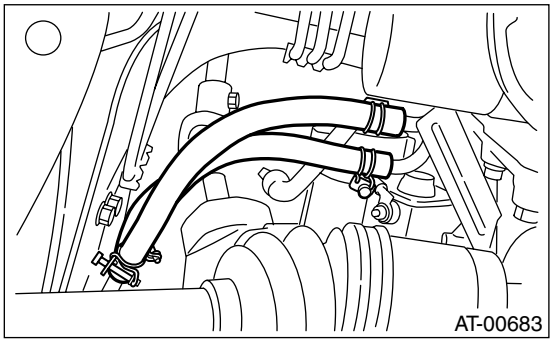


21) Drain ATF to remove the ATF drain plug.

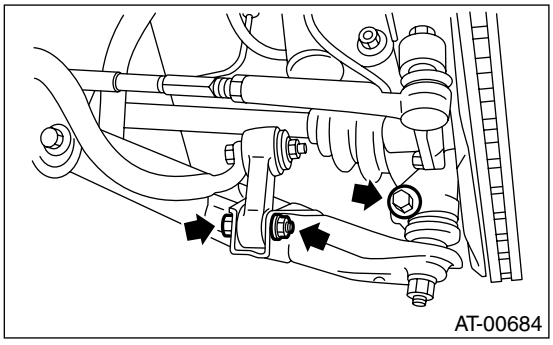


(A) Oil pan
(B) Drain plug (ATF)
(C) Differential oil drain plug

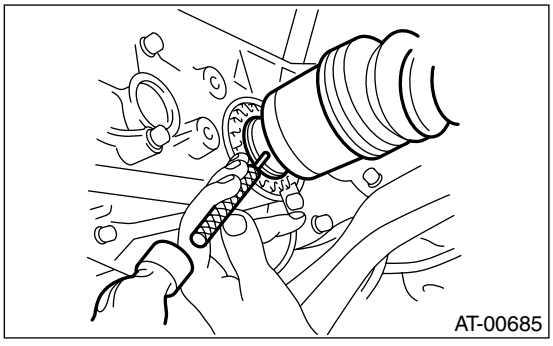
22) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the ATF level gauge guide.



23) Remove the propeller shaft.
<Ref. to DS-15, REMOVAL, Propeller Shaft.>
24) Remove the shift select cable.<Ref. to CS-31, REMOVAL, Select Cable.>
25) Disconnect the stabilizer link from transverse link.
26) Remove the bolt securing ball joint of transverse link to housing.

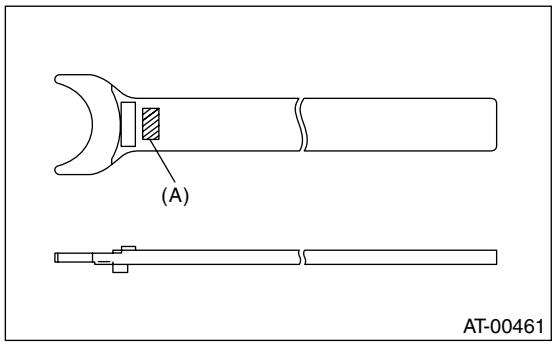


27) Remove the spring pins and separate the front drive shafts from each side of transmission. (Non-TURBO model)



28) Pull the front drive shaft out of transmission. (TURBO model)
(1) Face the “AT” letter stamped to transmission side.

ST 28399SA000 DRIVE SHAFT REMOVER

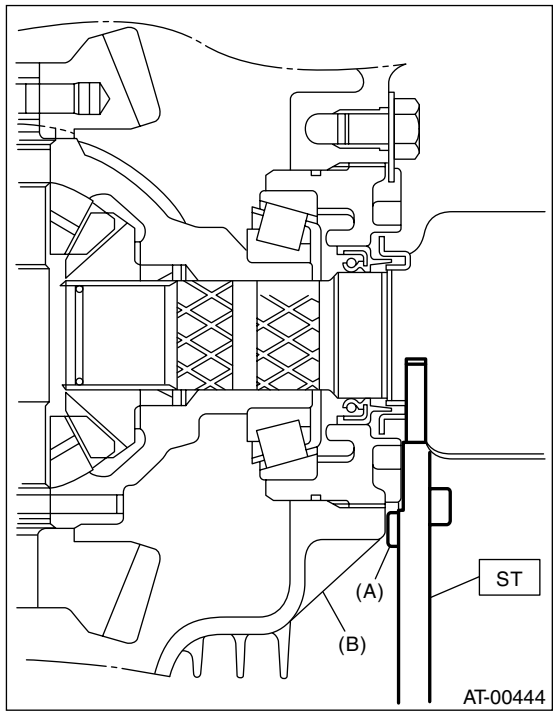


(A) Letter “AT”

(2) Insert the ST between transmission and front drive shaft.

NOTE:
Put the projection of ST on torque converter clutch housing.

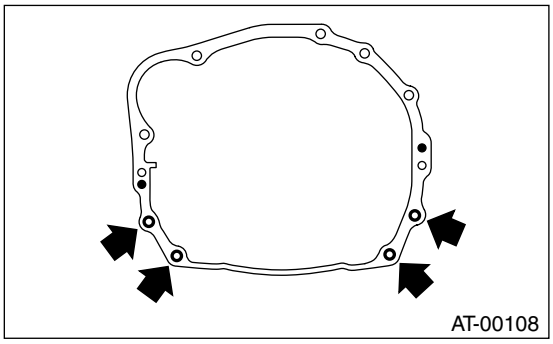
ST 28399SA000 DRIVE SHAFT REMOVER



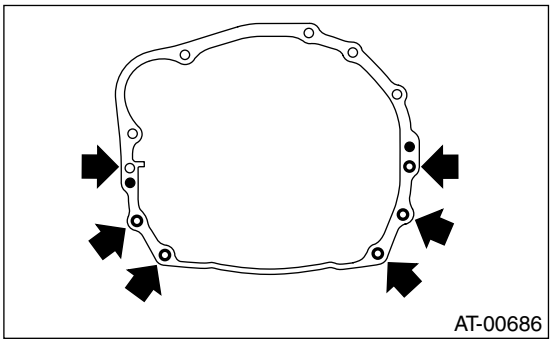
(A) ST projection
(B) Torque converter clutch housing

(3) While holding the joint portion of front drive shaft with your hand, push the housing outside to prevent AAR side of boot from stretching, and then remove the front drive shaft from transmission.

29) Remove the securing bolt of clutch housing cover.
30) Remove the nuts which hold the lower side of transmission to engine.
Except 3.0 L model



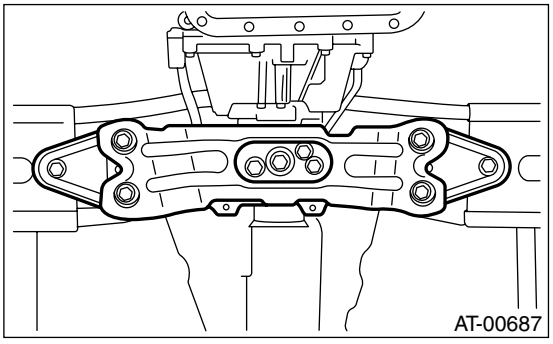
3.0 L model



31) Place the transmission jack under transmission.

NOTE:
Put cloth between the support plates of transmission jack and the oil pan.

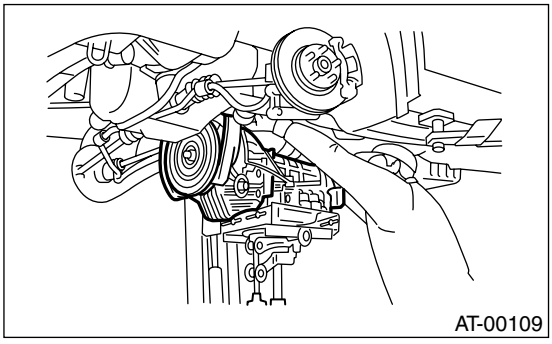
32) Remove the transmission rear crossmember from vehicle.



33) While lowering transmission gradually, tighten engine support fully and tilt the engine backward.

34) Remove the transmission.

CAUTION:
Move the transmission and torque converter as a unit away from engine.



35) Separate the transmission assembly and rear cushion rubber.

B: INSTALLATION

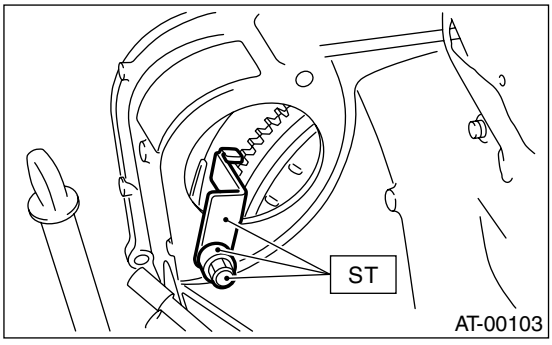
1) Replace rear differential side oil seal with new one. (TURBO model)

NOTE:
If new oil seal is installed, it is not necessary to replace it.

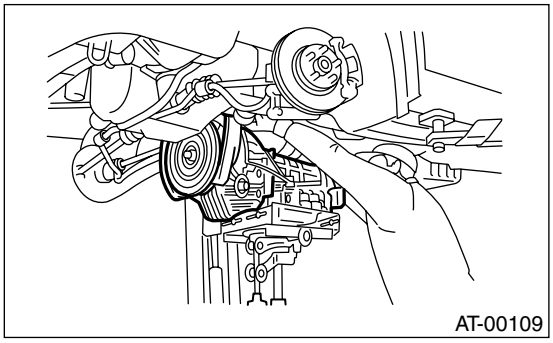
2) Install the rear cushion rubber to transmission assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 29 ft-lb)

3) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET

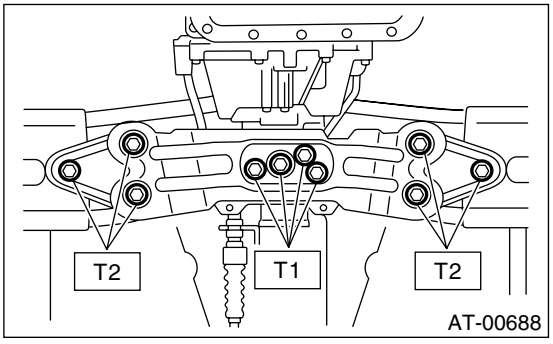


4) Install the transmission onto engine.
(1) Gradually raise the transmission with transmission jack.



(2) Engage them at splines.
(3) While lifting transmission gradually, turn the screw of engine support and tilt the engine forward.
5) Install the transmission rear crossmember.

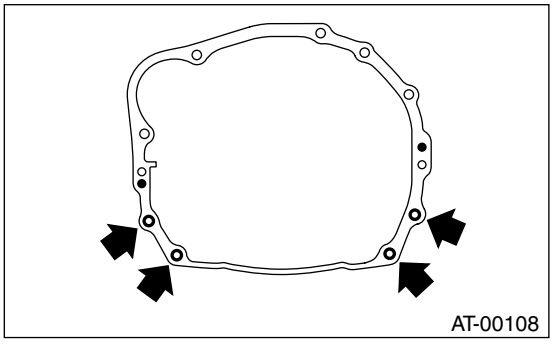
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



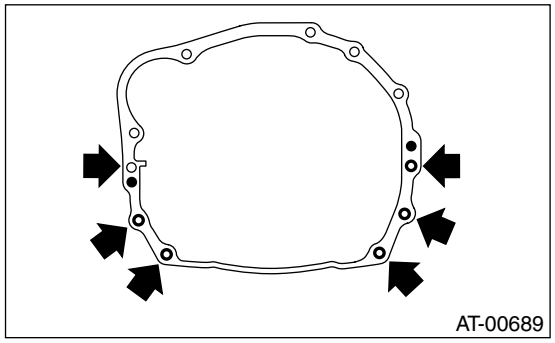
6) Take off the transmission jack.
7) Tighten the nuts and bolts which hold the lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

Except 3.0 L model



3.0 L model



8) Install clutch housing cover.
9) Lower the vehicle.
10) Connect the engine and transmission.
(1) Remove the ST from torque converter clutch case.

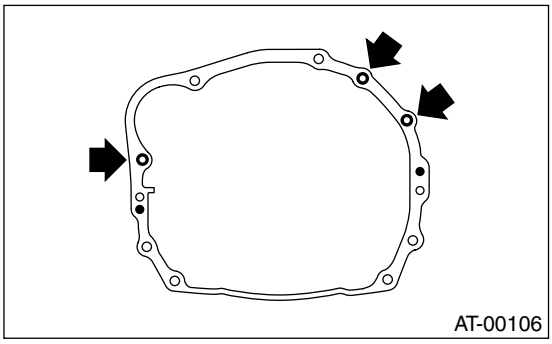
NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

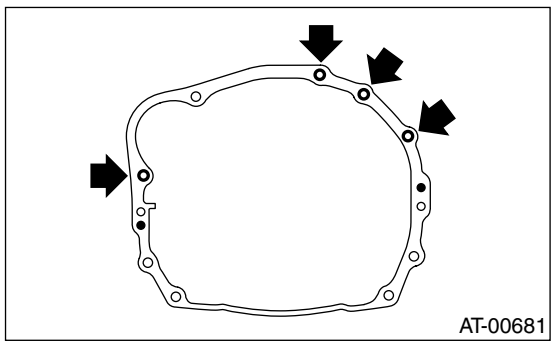
(2) Install the starter.
<Ref. to SC(H4SO)-7, INSTALLATION, Starter.>
(3) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

Except 3.0 L model

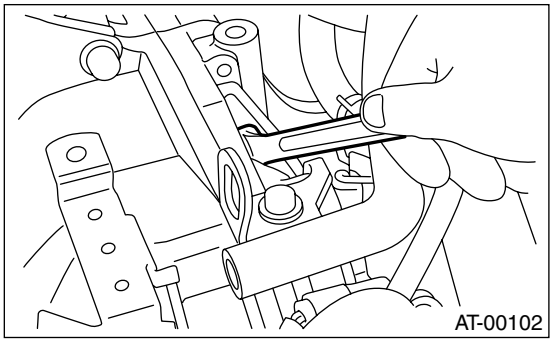


3.0 L model



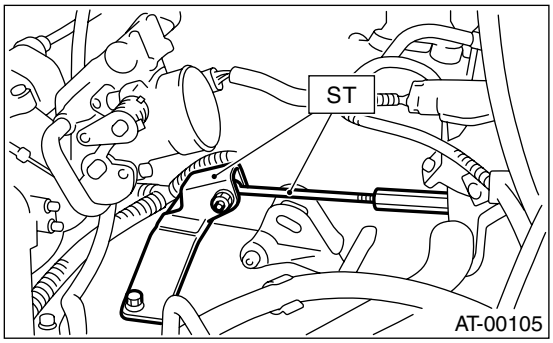
11) Install the torque converter clutch to drive plate.
(1) Tighten the bolts which hold the torque converter clutch to drive plate.
(2) Insert the wrench in the crankshaft pulley bolts, and tighten all the bolts by slowly rotating the crankshaft pulley.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



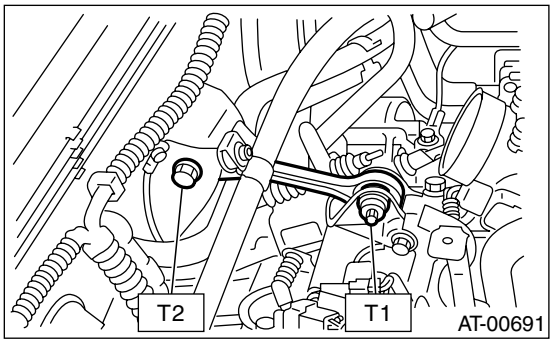
(3) Clog the plug onto service hole.
(4) Install the V-belt cover.

12) Remove the ST.



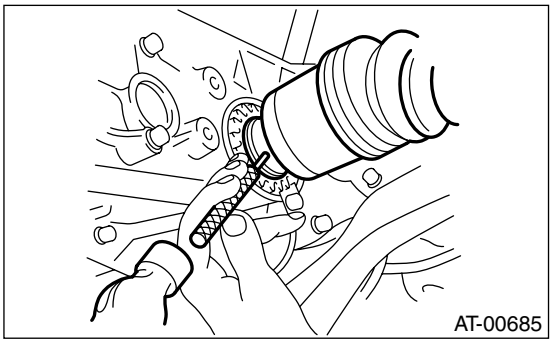
13) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)

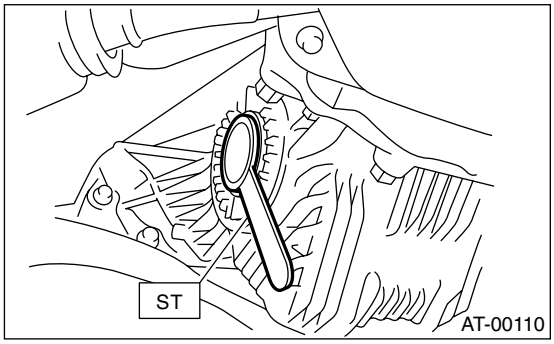


14) Lift-up the vehicle.

15) Install the front drive shaft into transmission. (Non-TURBO model)
(1) Lift-up the vehicle.
(2) Install the front drive shaft into transmission.
(3) Drive a new spring pin into chamfered hole of drive shaft.

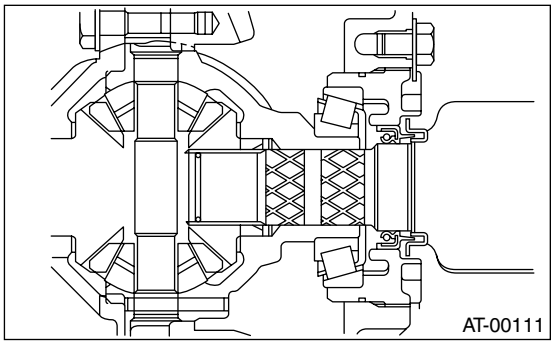


16) Set ST to side retainer. (TURBO model)
ST 28399SA010 OIL SEAL PROTECTOR



17) Align front drive shaft splines with differential bevel gear splines, insert drive shaft, and remove the ST. (TURBO model)
ST 28399SA010 OIL SEAL PROTECTOR

18) Push the front housing to securely insert the front drive shaft into the transmission. (TURBO model)

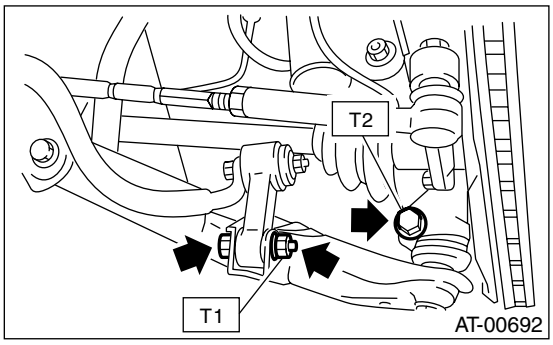


19) Insert the ball joint into housing.

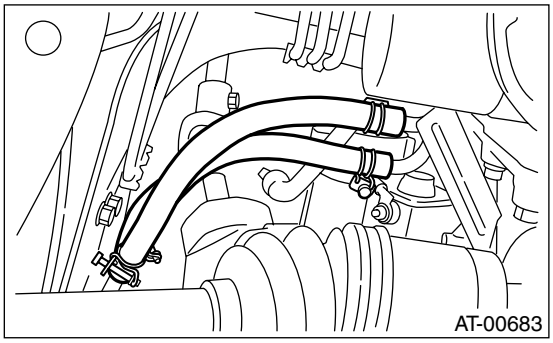
20) Connect the stabilizer link to transverse link, and tighten the bolts.

NOTE:
Discard the loosened self-locking nut and replace with a new one.

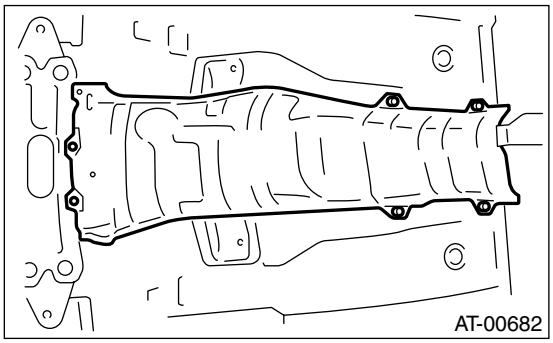
Tightening torque:
T1: 30 N·m (3.1 kgf-m, 22.4 ft-lb)
T2: 50 N·m (5.1 kgf-m, 37 ft-lb)



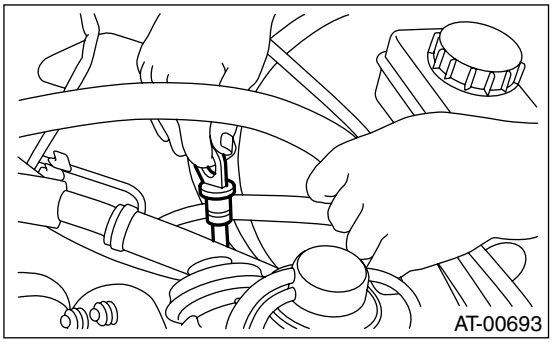
21) Install the shift select cable onto select lever.
<Ref. to CS-31, INSTALLATION, Select Cable.>
22) Install the ATF level gauge guide, and connect the ATF cooler hoses to pipe.



23) Install the propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
24) Install the heat shield cover. (If equipped)



25) Install the rear exhaust pipe and muffler assembly.
Non-TURBO model
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>
26) Install the front and center exhaust pipe. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>
27) Install the center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>
28) Install the under cover.
29) Lower the vehicle.
30) Install the ATF level gauge.



31) Connect the following connectors.
(1) Transmission harness connectors
(2) Transmission ground terminal
32) Connect the cruise control cable.
33) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

34) Install the air cleaner case or air intake chamber. (Non-TURBO model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
35) Install the air intake duct. (Non-TURBO model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
36) Install the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
37) Connect the battery ground cable.
38) Fill ATF by using the gauge hole. <Ref. to 4AT-31, Automatic Transmission Fluid.>
39) Take off the vehicle from lift arms.
40) Check select lever operation.
<Ref. to 4AT-51, INSPECTION.>
41) Check the ATF level. <Ref. to 4AT-31, Automatic Transmission Fluid.>
42) Perform the advance operation of learning control. (TURBO model)
(1) Set select lever to “P” range and apply parking brake, then lift up the vehicle.
(2) Connect Subaru Select Monitor to vehicle and turn on the switch.
(3) Select “Clear Memory — 2” on the SUBARU Select Monitor. <Ref. to 4AT(H4DOTC)-16, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>
(4) Using Subaru Select Monitor, check that the DTC is not output. <Ref. to 4AT(H4DOTC)-14, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>
(5) Using Subaru Select Monitor, warm up the engine until the ATF temperature becomes within 60 to 90°C (140 to 194°F). <Ref. to 4AT(H4DOTC)-15, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
(6) Shift the select lever to the “R” range.
(7) Set the switches for headlights, air conditioner, rear defogger, etc. to OFF.
(8) Turn the ignition switch OFF and then wait for more than 30 seconds.
(9) If the message “communication impossible” is displayed on SUBARU Select Monitor, depress the brake pedal deeply with left foot until the learning promotion task is completed, and then turn the ignition switch to ON.
(10)Check that Subaru Select Monitor is operating properly now.
(11)Set the select lever to “P” range, and then wait for more than three seconds.
(12)Set the select lever to “R” range, and then wait for more than three seconds.
(13)Set the select lever to “N” range, and then wait for more than three seconds.
(14)Set the select lever to “D” range, and then wait for more than three seconds.
(15)Set the select lever to “N” range, and then wait for more than three seconds.
(16)Slowly depress the accelerator pedal to the fully open position.
(17)Slowly release the accelerator pedal to the fully closed position.
(18)Start and idle the engine.
(19)Set the select lever to “D” range.
(20)Learning promotion task starts. ATF temperature warning light in the combination meter blinks at 2 Hz. If ATF temperature does not blink, turn the ignition switch OFF and repeat the procedure from step 4).
Learning promotion task is completed when blinking of ATF temperature warning light in the combination meter changes from 2 to 0.5 Hz.

NOTE:
Repeat the procedure from step 4) if blinking of AFT temperature warning light changes from 2 to 4 Hz.

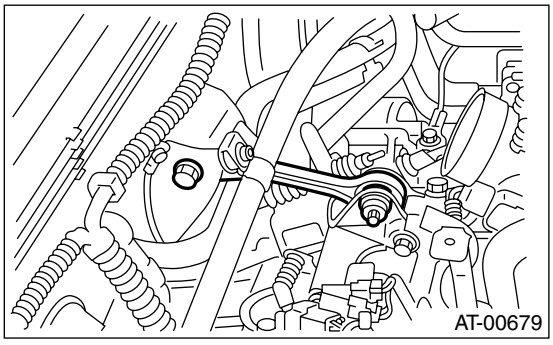
(21)Set the select lever to “N” range, and turn the ignition switch to OFF.

10.Transmission Mounting System

A: REMOVAL

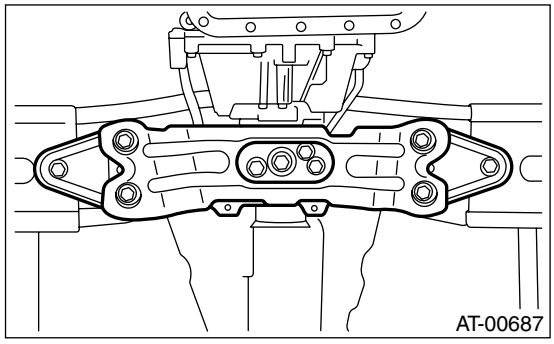
1. PITCHING STOPPER

1) Remove the air cleaner case or intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
2) Remove the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Remove the pitching stopper.



2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front, center, rear exhaust pipes and muffler. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.> , <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
4) Remove the center and rear exhaust pipes, and muffler. (TURBO model)
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
5) Remove the heat shield cover. (If equipped)
6) Set the transmission jack under the transmission. Make sure that the support plates of transmission jack don't touch the oil pan.
7) Remove the transmission rear crossmember.



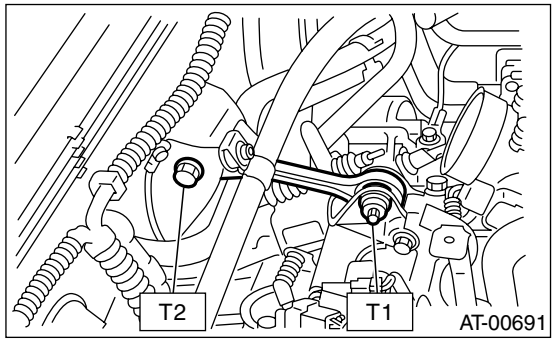
8) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>

3.0 L model
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
3) Remove the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

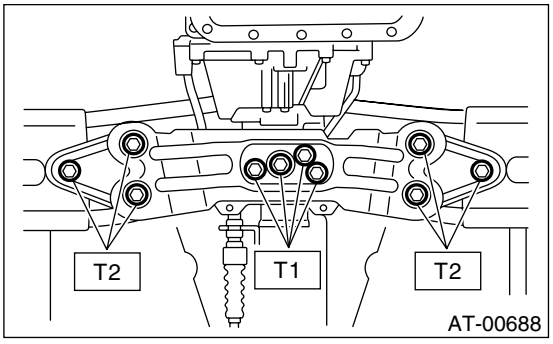
2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
39 N·m (4.0 kgf-m, 29 ft-lb)

2) Install the crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front, center, rear exhaust pipes and the muffler. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
6) Install center and rear exhaust pipes, and muffler. (TURBO model)
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

11.Extension Case Oil Seal

A: INSPECTION

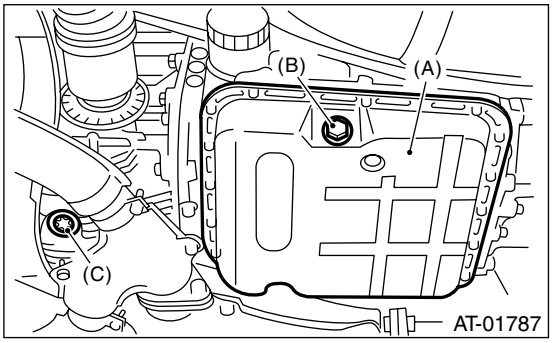
Make sure the ATF does not leak from the joint of transmission and propeller shaft. If so, replace the oil seal. <Ref. to 4AT-49, REPLACEMENT.>

B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the ATF completely.

NOTE:
Tighten the ATF drain plug after draining the ATF.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

3) Remove the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
4) Remove the heat shield cover. (If equipped)
5) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
6) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
7) Using the ST, install the oil seal.
ST 498057300 INSTALLER
8) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
TURBO model
<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>
11) Pour ATF and check the ATF level. <Ref. to 4AT-31, Automatic Transmission Fluid.>

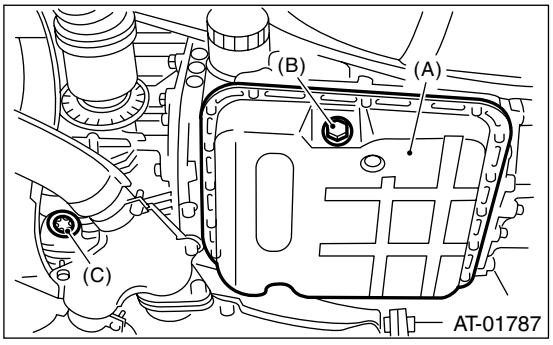
12.Differential Side Retainer Oil Seal

A: INSPECTION

Inspect if gear oil leaks from differential side retainer oil seal. Replace oil seal if leakage is detected.

B: REPLACEMENT

1) Lift up the vehicle.
2) Remove front exhaust pipe and center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
3) Remove the differential oil drain plug, and drain the differential gear oil.

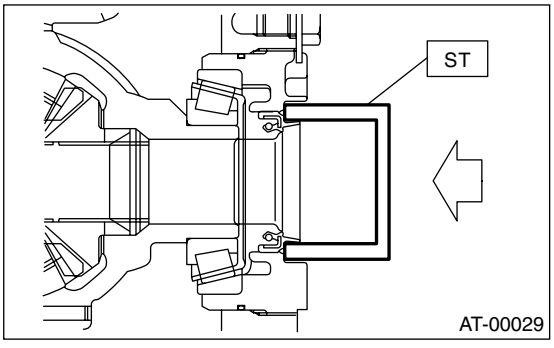


(A) Oil pan
(B) ATF drain plug
(C) Differential gear oil drain plug

4) Replace with a new gasket, and then tighten the differential oil drain plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

5) Separate the front drive shaft from the transmission.<Ref. to DS-29, REMOVAL, Front Drive Shaft.>
6) Remove the differential side retainer oil seal using a screwdriver wrapped with vinyl tape.
7) Install differential side retainer oil seal using the ST by tapping with a hammer little by little.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



8) Apply oil to the sealing lip of oil seal.
9) Install the front drive shaft.<Ref. to DS-31, INSTALLATION, Front Drive Shaft.>
10) Install the front exhaust pipe and the center exhaust pipe. <Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>
11) Lower the vehicle.
12) Fill gear oil from gauge hole.

Recommended gear oil:
GL-5 (SAE: 75W — 90) or equivalent

Gear oil capacity:
1.1 — 1.3 ℓ (1.3 — 1.4 US qt, 1.0 — 1.1 Imp qt)

13) Check for the amount of gear oil. <Ref. to 4AT-32, INSPECTION, Differential Gear Oil.>

13.Inhibitor Switch

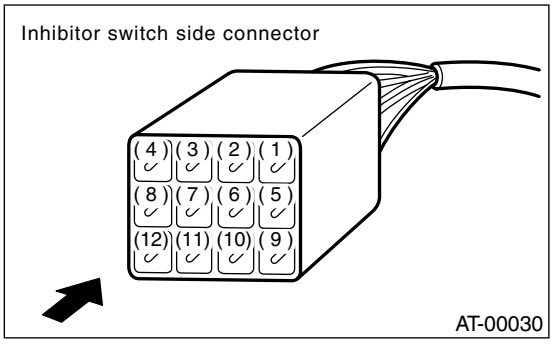
A: INSPECTION

When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

1) Disconnect the inhibitor switch connector.
2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

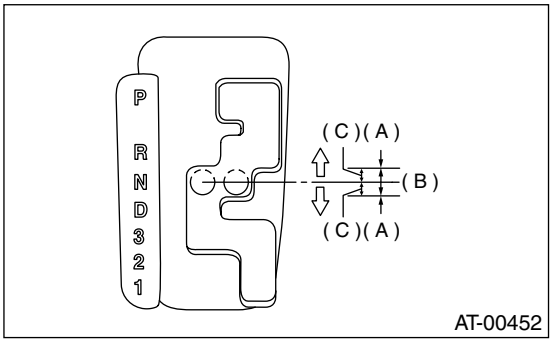
NOTE:
• Also check that continuity in ignition circuit does not exist when the select lever is in “R”, “D”, “3”, “2” and “1” ranges.
• If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

	Position	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
	3	4 — 7
	2	4 — 6
	1	4 — 5
Ignition circuit	P/N	12 — 11
Back-up light circuit	R	10 — 9



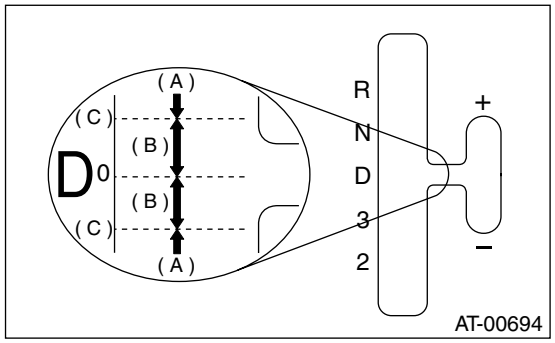
3) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from “N” range.
If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to 4AT-51, ADJUSTMENT.>

Except model with SPORTS shift



(A) Continuity does not exist.
(B) Continuity exists.
(C) 1.5°

Model with SPORT shift

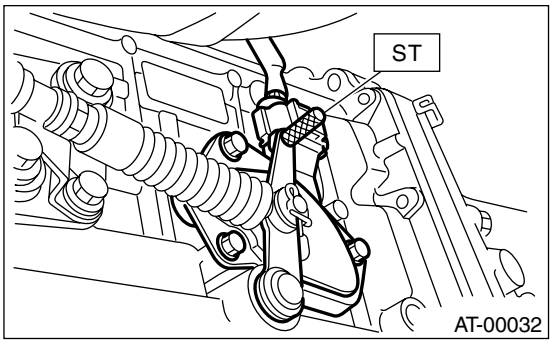


(A) Continuity does not exist.
(B) Continuity exists.
(C) 1.5°

4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-32, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

1) Shift the select lever to “N” range.
2) Loosen the three inhibitor switch securing bolts.
3) Insert the ST as vertical as possible into the holes in inhibitor switch lever and switch body.
ST 499267300 STOPPER PIN



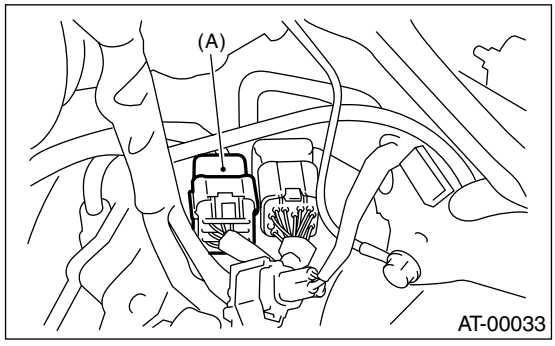
4) Tighten the three inhibitor switch bolts.

Tightening torque:
3.5 N·m (0.35 kgf-m, 2.5 ft-lb)

5) Repeat the above checks. If the inhibitor switch is determined to be “faulty”, replace it.

C: REMOVAL

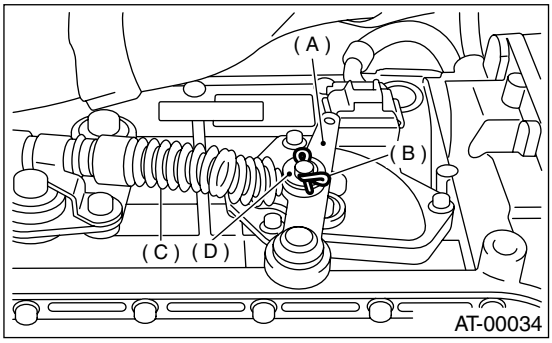
1) Set up the vehicle on a lift.
2) Move the select lever to “N” range.
3) Remove the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Remove the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Disconnect the inhibitor switch connector.



(A) Inhibitor switch connector

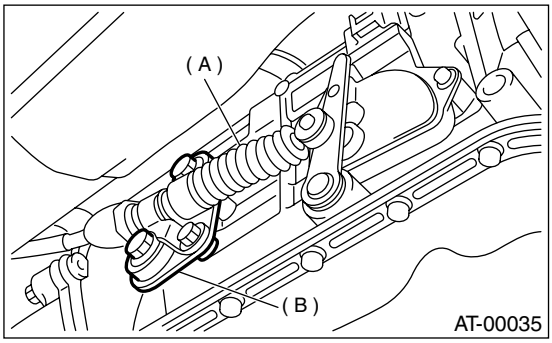
6) Remove the inhibitor switch connector from stay.
7) Lift-up the vehicle.
8) Remove the front and center exhaust pipes.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>
TURBO model
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>

9) Remove the snap pin and washer from range select lever.



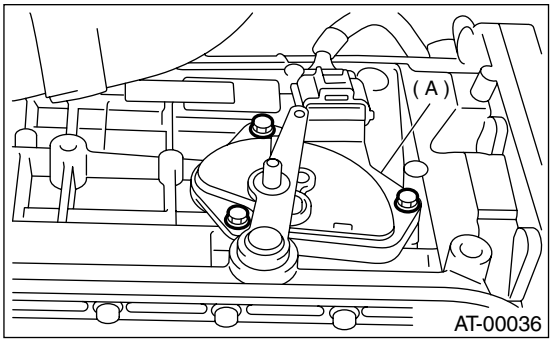
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

10) Remove the plate assembly from transmission case.



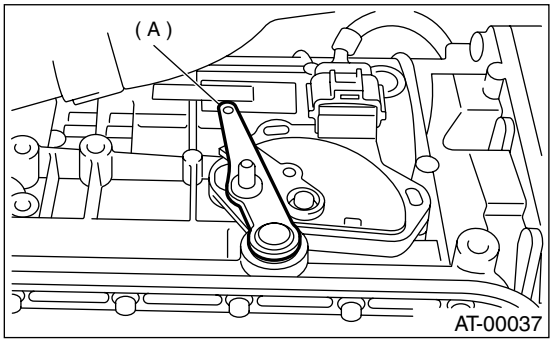
(A) Select cable
(B) Plate ASSY

11) Remove the bolts.



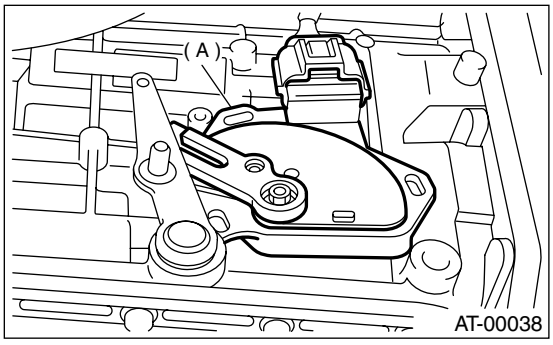
(A) Inhibitor switch

12) Move the range select lever to parking position (left side).



(A) Range select lever

13) Remove the inhibitor switch from transmission.

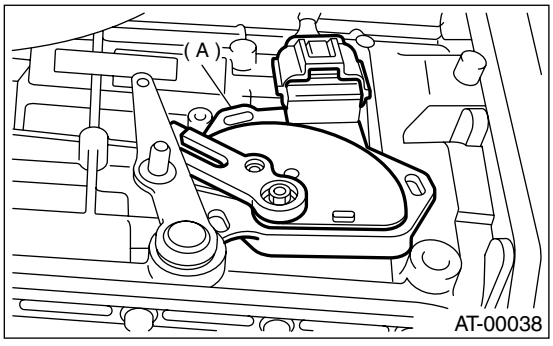


(A) Inhibitor switch

14) Disconnect the inhibitor switch harness connector from inhibitor switch.

D: INSTALLATION

1) Connect the inhibitor switch harness connector to inhibitor switch.
2) Install the inhibitor switch to transmission case.

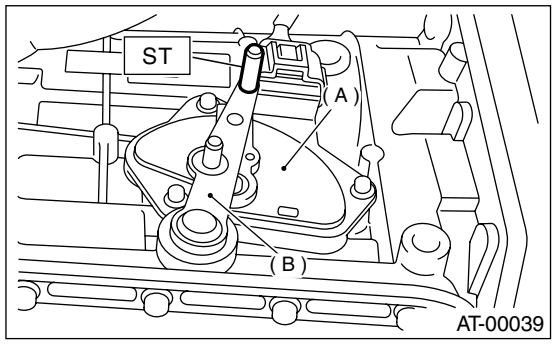


(A) Inhibitor switch

3) Move the range select lever to neutral position.

4) Using the ST, tighten the bolts of inhibitor switch.
ST 499267300 STOPPER PIN

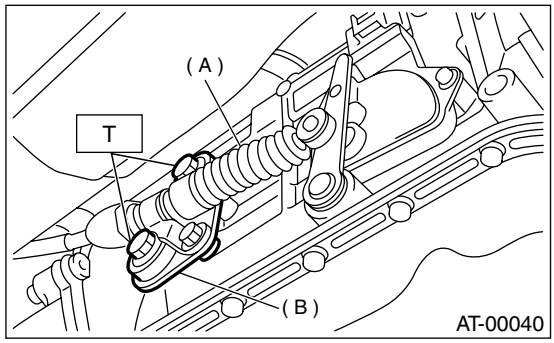
Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)



(A) Inhibitor switch
(B) Range select lever

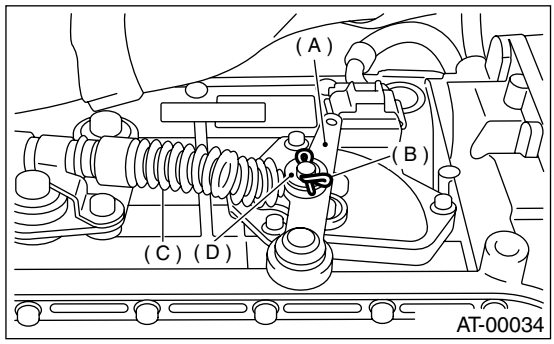
5) Install the select cable to range select lever.
6) Install the plate assembly to transmission.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



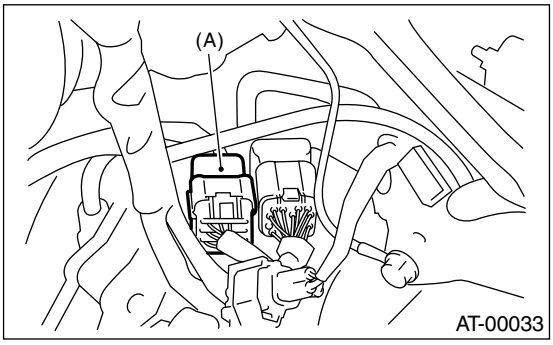
(A) Select cable
(B) Plate ASSY

7) Install the washer and snap pin to range select lever.



(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

8) Install the front and center exhaust pipes. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>
9) Install the center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Install the inhibitor switch connector from stay.
12) Connect the inhibitor switch connector.



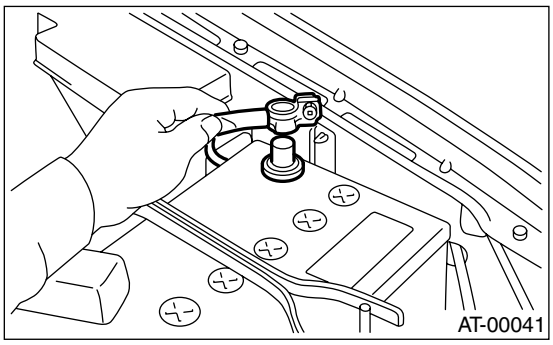
(A) Inhibitor switch connector

13) Install the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
14) Install the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
15) Inspect the inhibitor switch. <Ref. to 4AT-51, INSPECTION.>

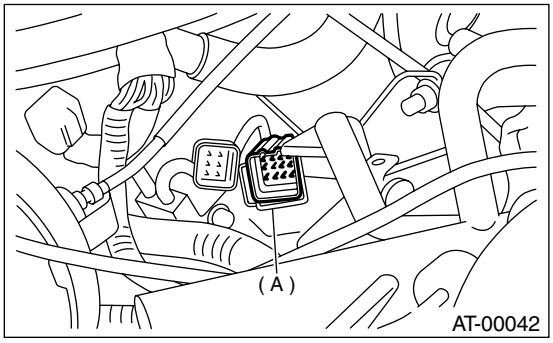
14.Front Vehicle Speed Sensor

A: REMOVAL

1) Set up the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Remove the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Remove the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Disconnect the transmission connector.

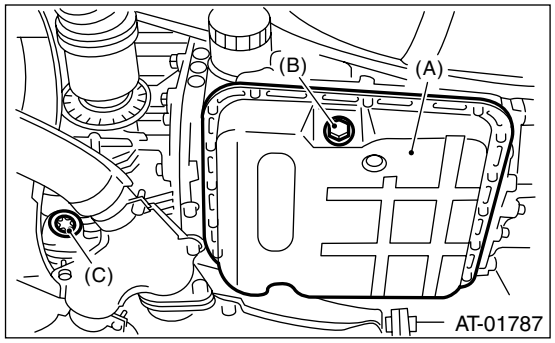


(A) Transmission connector

6) Remove the pitching stopper. <Ref. to 4AT-47, REMOVAL.>
7) Remove the transmission connector from stay.
8) Lift-up the vehicle.
9) Clean the transmission exterior.
10) Drain the ATF completely.

NOTE:
Tighten the ATF drain plug after draining the ATF.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

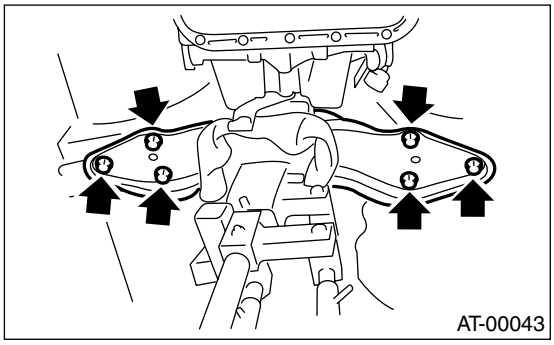


(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

11) Remove the front, center, exhaust pipes and muffler. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
12) Remove the center, rear exhaust pipe and muffler. (TURBO model)
<Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
13) Remove the shield cover. (If equipped)
14) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
15) Place the transmission jack under transmission.

NOTE:
Make sure that the support plates of transmission jack don't touch the crossmember.

16) Remove the transmission rear crossmember bolts.



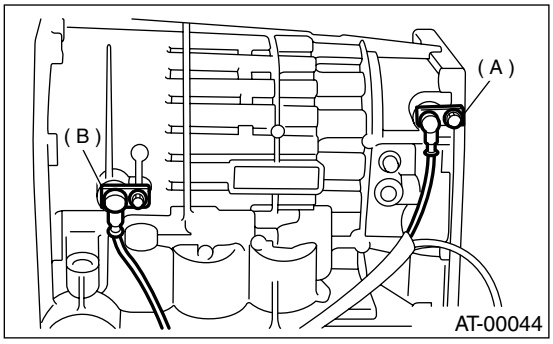
17) Lower the AT jack.

NOTE:
Do not separate the AT jack and transmission.

18) Remove the oil cooler inlet and outlet pipe.

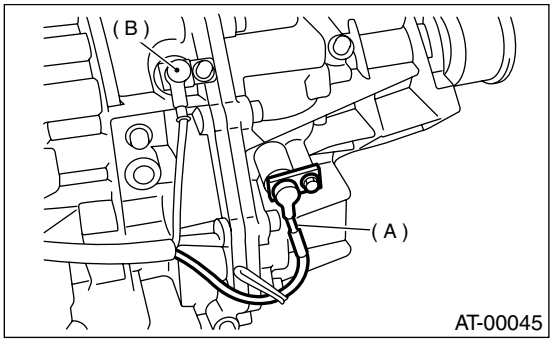
NOTE:
When removing the outlet pipe, be careful not to lose balls and springs used with retaining screws.

19) Remove the front vehicle speed sensor and torque converter turbine speed sensor.



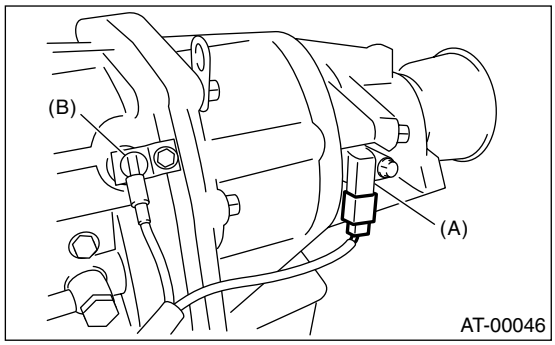
(A) Front vehicle speed sensor
(B) Torque converter turbine speed sensor

20) Remove the rear vehicle speed sensor. (Non-TURBO model)



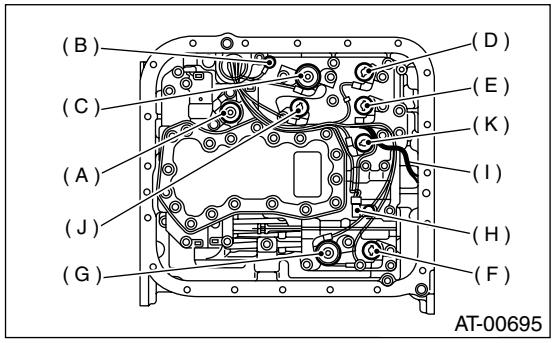
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

21) Disconnect rear vehicle speed sensor connector. (TURBO model)



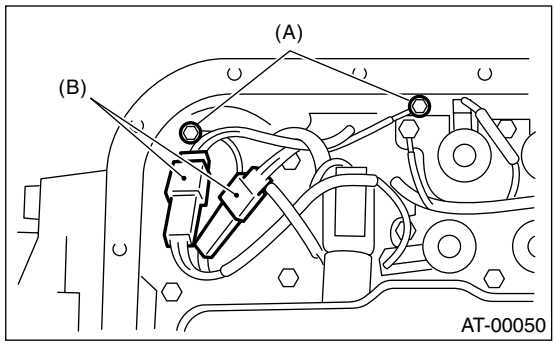
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

22) Remove the oil pan.
23) Disconnect the duty solenoid connectors, and then disconnect the ATF temperature sensor from control valve body. (Non-TURBO model)



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground
(K) SPORT shift solenoid (if equipped)

24) Disconnect control valve connector and transmission ground. (TURBO model)

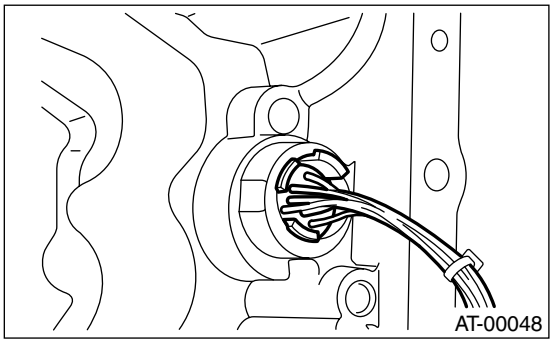


(A) Transmission ground cable
(B) Connector

25) Remove the harness assembly.

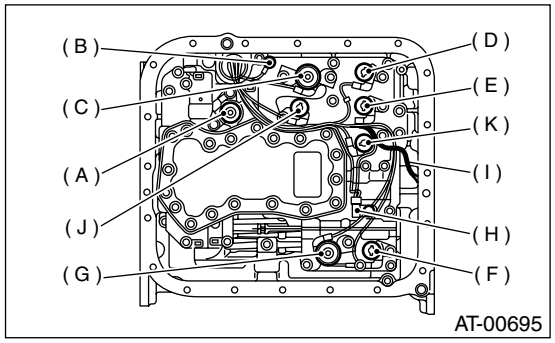
B: INSTALLATION

1) Pass the harness assembly through the hole in the transmission case.



2) Connect the harness connectors and ATF temperature sensor. (Non-TURBO model)
Connect the connectors of same color, and secure the harness to valve body using clips.

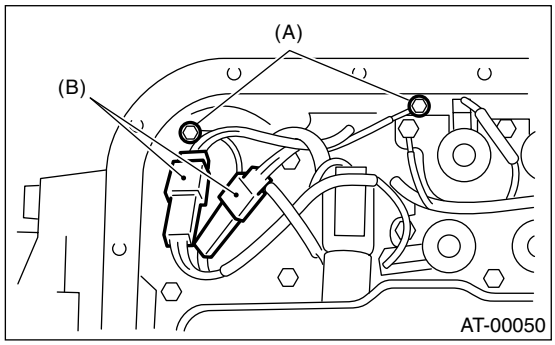
Tightening torque (Transmission ground cable ATF temperature sensor)
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Lock-up duty solenoid (Blue)
(B) Transmission ground
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Low clutch timing solenoid (Gray)
(K) SPORT shift solenoid (Beige) (if equipped)

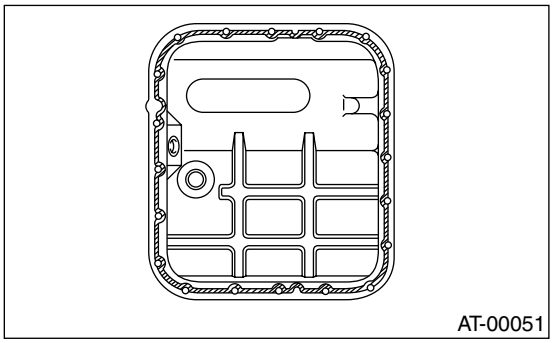
3) Connect control valve connector, and install transmission ground. (TURBO model)

Tightening torque Transmission ground cable:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



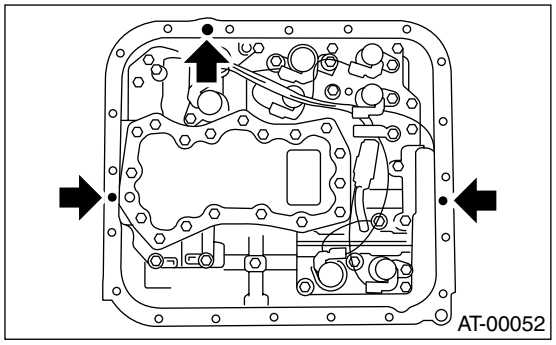
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

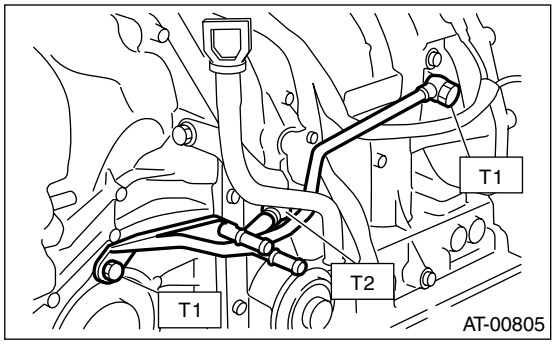
7) Install the front and rear vehicle speed sensor, and also the torque converter turbine speed sensor, and then fasten the harness.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

8) Install the oil cooler pipes.

NOTE:
Be sure to use a new copper washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



9) Install the transmission rear crossmember bolts.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)

10) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
11) Install the shield cover. (If equipped)
12) Install the front, center, rear exhaust pipes and muffler. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
13) Install the center, rear exhaust pipes and muffler. (TURBO model)
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>
14) Lower the vehicle.
15) Install the transmission connector to the stay.
16) Install the pitching stopper. <Ref. to 4AT-47, INSTALLATION.>

17) Install the air cleaner case. (Non-TURBO model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
18) Install the intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
19) Bleeding air from control valve body. (TURBO model) <Ref. to 4AT-71, Air Bleeding of Control Valve.>
20) Perform the advance operation of learning control. (TURBO model)
(1) Set select lever to “P” range and apply parking brake, then lift up the vehicle.
(2) Connect Subaru Select Monitor to vehicle and turn on the switch.
(3) Select “Clear Memory — 2” on the SUBARU Select Monitor. <Ref. to 4AT(H4DOTC)-16, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>
(4) Using Subaru Select Monitor, check that the DTC is not output. <Ref. to 4AT(H4DOTC)-14, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>
(5) Using Subaru Select Monitor, warm up the engine until the ATF temperature becomes within 60 to 90°C (140 to 194°F). <Ref. to 4AT(H4DOTC)-15, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
(6) Shift the select lever to the “R” range.
(7) Set the switches for headlights, air conditioner, rear defogger, etc. to OFF.
(8) Turn the ignition switch OFF and then wait for more than 30 seconds.
(9) If the message “communication impossible” is displayed on SUBARU Select Monitor, depress the brake pedal deeply with left foot until the learning promotion task is completed, and then turn the ignition switch to ON.
(10)Check that Subaru Select Monitor is operating properly now.
(11)Set the select lever to “P” range, and then wait for more than three seconds.
(12)Set the select lever to “R” range, and then wait for more than three seconds.
(13)Set the select lever to “N” range, and then wait for more than three seconds.
(14)Set the select lever to “D” range, and then wait for more than three seconds.
(15)Set the select lever to “N” range, and then wait for more than three seconds.
(16)Slowly depress the accelerator pedal to the fully open position.
(17)Slowly release the accelerator pedal to the fully closed position.
(18)Start and idle the engine.
(19)Set the select lever to “D” range.
(20)Learning promotion task starts. ATF temperature warning light in the combination meter blinks at 2 Hz. If ATF temperature does not blink, turn the ignition switch OFF and repeat the procedure from step 4).
Learning promotion task is completed when blinking of ATF temperature warning light in the combination meter changes from 2 to 0.5 Hz.

NOTE:
Repeat the procedure from step 4) if blinking of AFT temperature warning light changes from 2 to 4 Hz.

(21)Set the select lever to “N” range, and turn the ignition switch to OFF.

15.Rear Vehicle Speed Sensor

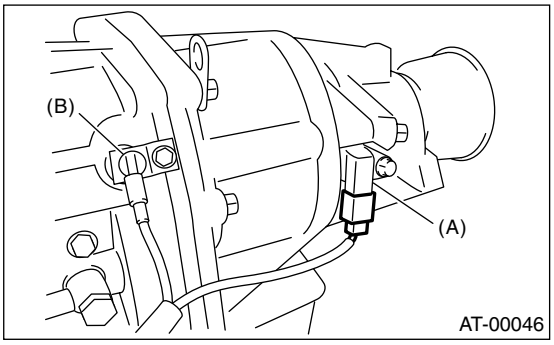
A: REMOVAL

1. NON-TURBO MODEL

When removing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor”.<Ref. to 4AT-55, REMOVAL, Front Vehicle Speed Sensor.>

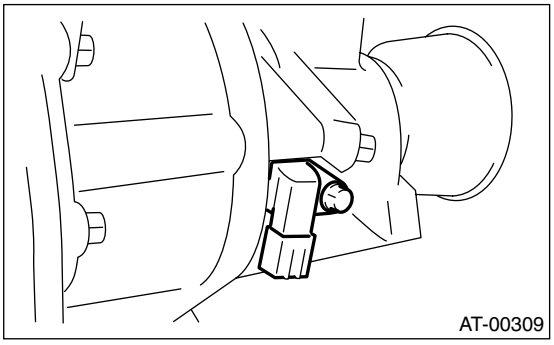
2. TURBO MODEL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift up the vehicle.
4) Disconnect rear vehicle speed sensor connector.



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

5) Remove rear vehicle speed sensor.



B: INSTALLATION

1. NON-TURBO MODEL

When installing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-57, INSTALLATION, Front Vehicle Speed Sensor.>

2. TURBO MODEL

Install in the reverse order of removal.

NOTE:
Replace O-ring with a new one.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

16.Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-55, REMOVAL.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-57, INSTALLATION.>

17.Control Valve Body

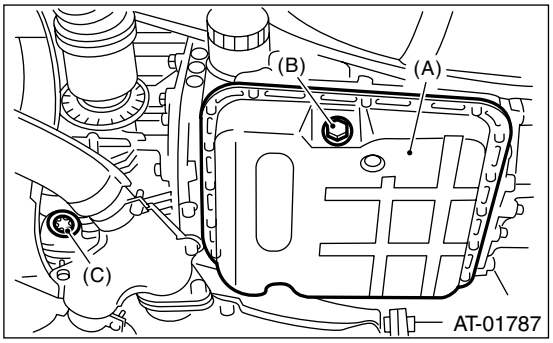
A: REMOVAL

1. NON-TURBO MODEL

1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Drain the ATF completely.

NOTE:
• Tighten the ATF drain plug after draining the ATF.
• Replace the gasket with a new one.

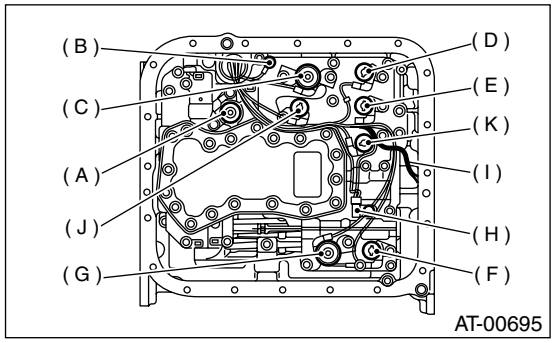
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Remove the oil pan.
5) Remove and clean the magnet.
6) Remove the old gasket on the oil pan and transmission case completely.

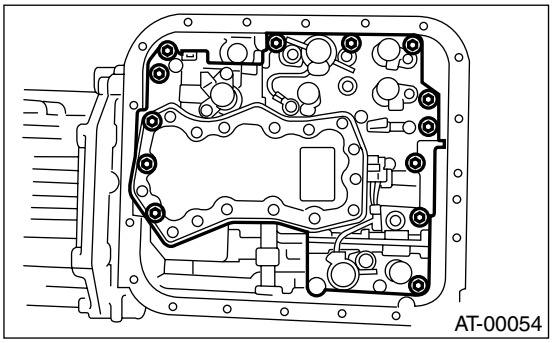
7) Disconnect each solenoid connector and remove ATF temperature sensor from control valve.



(A) Lock-up duty solenoid (Blue)
(B) Transmission ground
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Low clutch timing solenoid (Gray)
(K) SPORT shift solenoid (Beige) (if equipped)

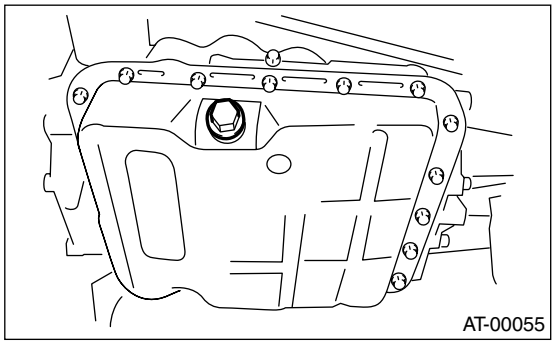
8) Remove the control valve.

NOTE:
When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.



2. TURBO MODEL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Lift-up the vehicle.
4) Clean the transmission exterior.
5) Remove the drain plug and gasket, and then drain ATF.

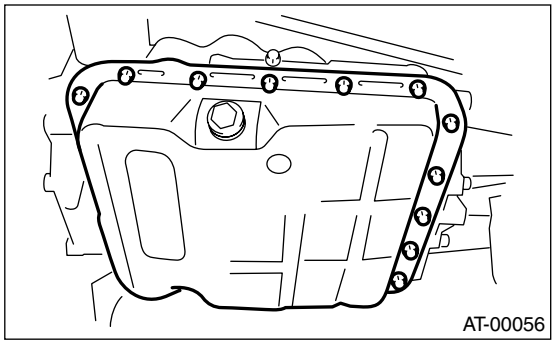


6) Replace the gasket with a new one, and then tighten the drain plug.

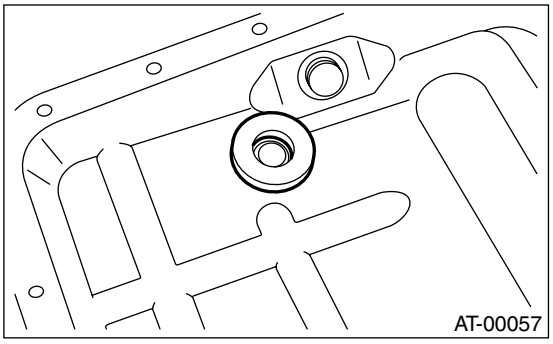
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

7) Remove the oil pan.

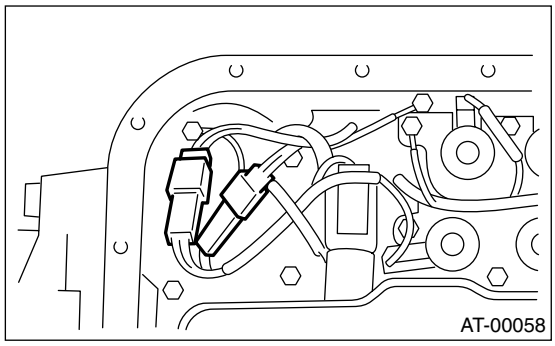
CAUTION:
Be careful not to allow dirt or dust to get into the oil pan.



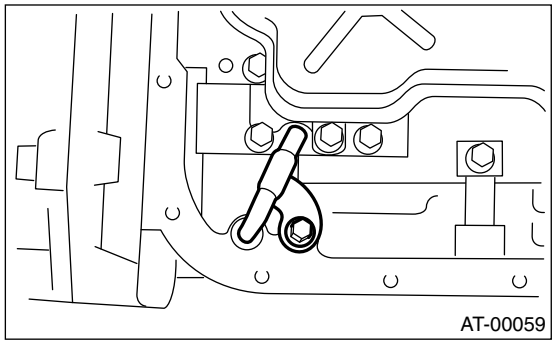
8) Remove the magnet.



9) Clean the magnet.
10) Remove the liquid gasket completely from oil pan and transmission case.
11) Remove the control valve connector.

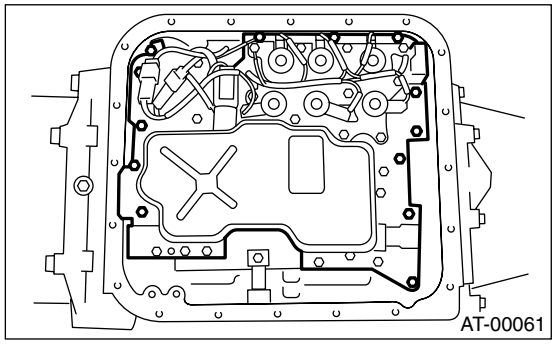


12) Remove the oil cooler pipe.



13) Remove the control valve body.

NOTE:
Replace the control valve body as assembly, because the control valve body can not be disassembled.



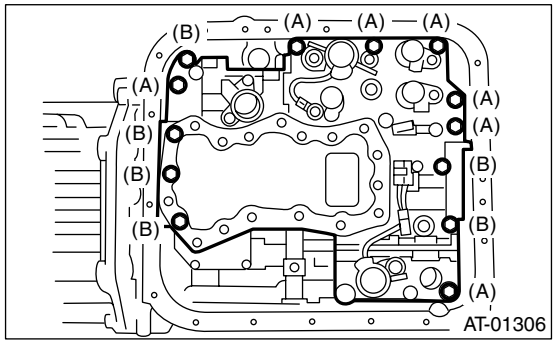
B: INSTALLATION

1. NON-TURBO MODEL

1) Set the range select lever in “N” range.

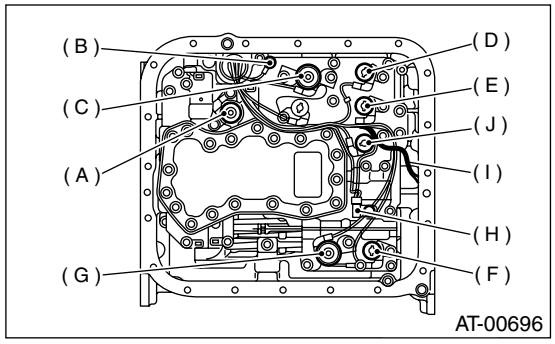
2) Install the control valve, ATF temperature sensor and ground connectors.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



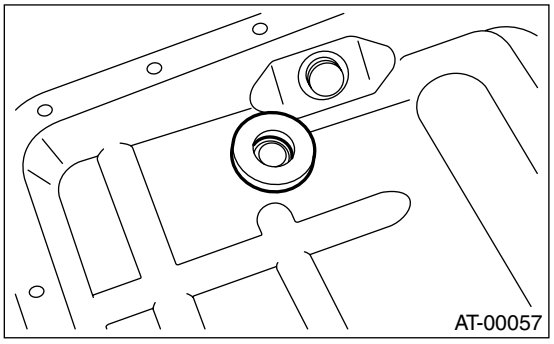
Bolt length mm (in)
(A) 30 (1.18)
(B) 55 (2.17)

3) Connect all connectors.



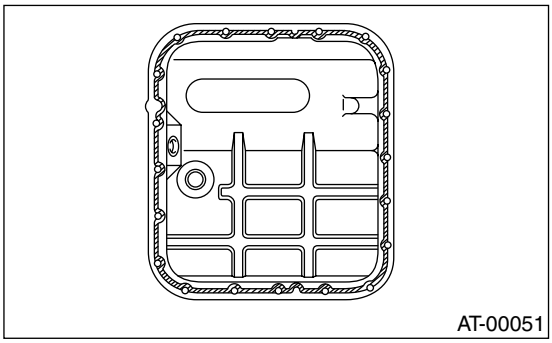
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) SPORT shift solenoid (Beige) (if equipped)

4) Attach the magnet at specified position.



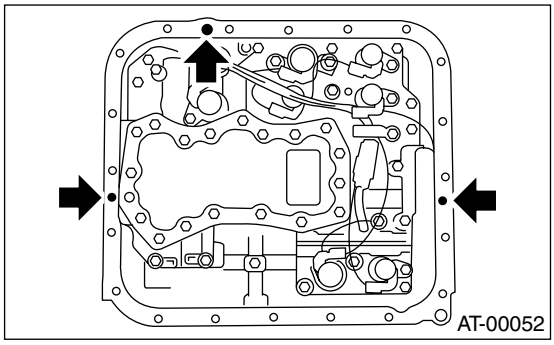
5) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



7) Install the oil pan by equally tightening the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

8) Pour ATF from the oil charge pipe.

Recommended fluid:
Dexron III

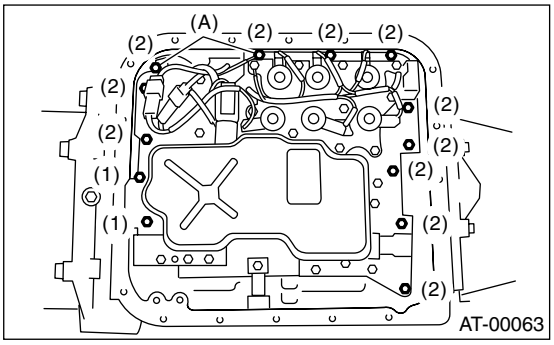
Fluid capacity:
Fill the same amount of fluid drained from drain plug hole.

9) Check the level of ATF.
<Ref. to 4AT-31, Automatic Transmission Fluid.>

2. TURBO MODEL

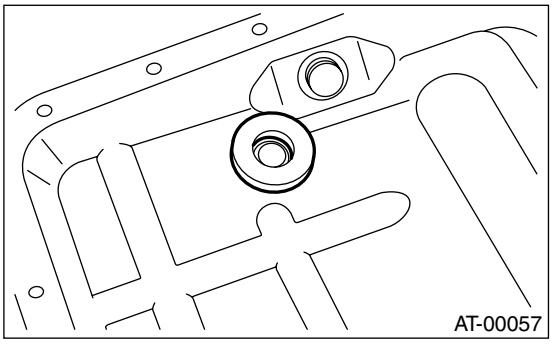
1) Check the control valve body for dirt and dust.
2) Install the control valve body and ground cable to transmission by tightening bolts evenly.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



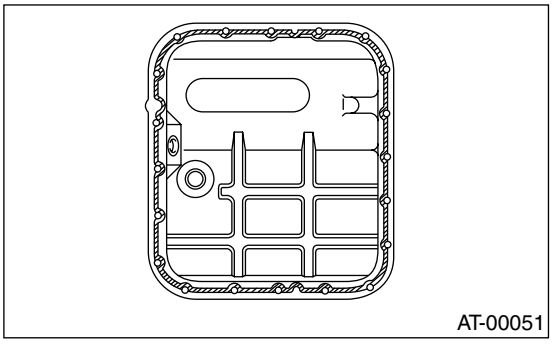
(A) Transmission ground
Bolt length mm (in)
(1) 30 (1.18)
(2) 35 (1.38)

3) Attach the magnet at specified position of oil pan.



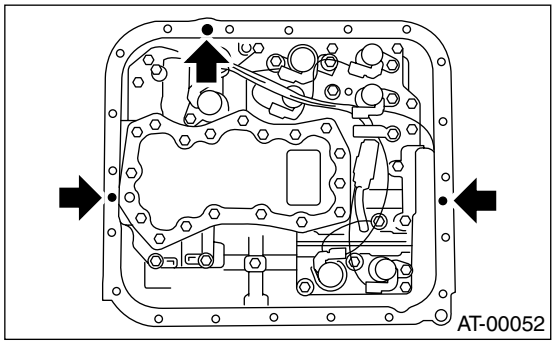
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



5) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan with tightening bolts evenly.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Pour ATF into the oil charge pipe.

Recommended fluid:
DEXRON III TYPE AUTOMATIC TRANSMISSION FLUID

Fluid capacity:
Fill the same amount of fluid drained from drain plug hole.

8) Bleed the air from control valve. <Ref. to 4AT-71, Air Bleeding of Control Valve.>
9) Check the level of ATF. <Ref. to 4AT-31, Automatic Transmission Fluid.>
10) Perform the advance operation of learning control. (TURBO model)
(1) Set the select lever to “P” range and apply parking brake, then lift-up the vehicle.
(2) Connect the SUBARU Select Monitor to vehicle.
(3) Using SUBARU Select Monitor, check that the DTC is not output.
(4) Select “Clear Memory - 2” on the Select Monitor. <Ref. to 4AT(H4DOTC)-14, OPERATION, Subaru Select Monitor.>
(5) Using SUBARU Select Monitor, warm up the engine until the ATF temperature becomes within 60 to 90°C (140 to 194° F). <Ref. to 4AT(H4DOTC)-14, OPERATION, Subaru Select Monitor.>
(6) Set the select lever to “R” range.
(7) Set the switches for headlights, air conditioner, rear defogger, etc. to OFF.
(8) Turn ignition switch to OFF, and wait for 30 seconds or more.
(9) Depress the brake pedal fully with left foot until learning promotion task is completed.

(10)Turn the ignition switch to ON.
(11)Confirm that the Select Monitor screen returns to normal.
(12)Set the select lever to “P” range, and then wait for more than three seconds.
(13)Set the select lever to “R” range, and then wait for more than three seconds.
(14)Set the select lever to “N” range, and then wait for more than three seconds.
(15)Set the select lever to “D” range, and then wait for more than three seconds.
(16)Set the select lever to “N” range, and then wait for more than three seconds.
(17)Slightly depress the accelerator pedal to full open.
(18)Slightly release the accelerator pedal to close.
(19)Start the engine.
(20)Set the select lever to “D” range.
(21)ATF temperature warning light in the combination meter blinks at 2 Hz. If ATF temperature warning light does not blink, repeat the procedure from step 4).
(22)Learning promotion task is completed when blinking of ATF temperature warning light in the combination meter changes from 2 to 0.5 Hz.

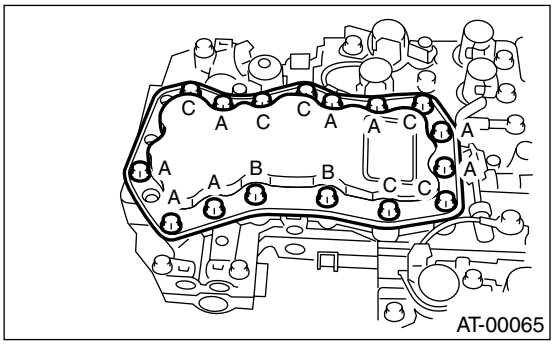
NOTE:
Repeat the procedure from step 4) if blinking of ATF temperature warning light changes from 2 Hz to 4 Hz.

(23)Set the select lever to “N” range, and turn the ignition switch to OFF.
(24)Set the select lever to “P” range to finish air bleeding.

C: DISASSEMBLY

1) Remove oil strainer from lower control valve body.

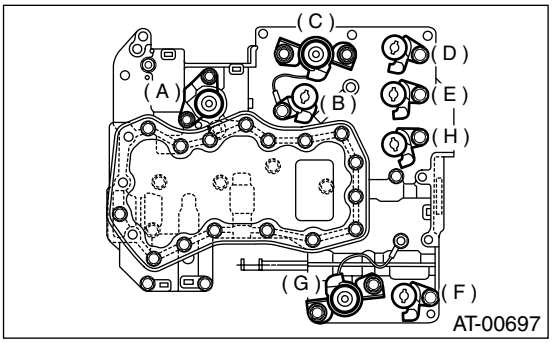
NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolt lengths are different.



(A) Short bolt
(B) Middle bolt
(C) Long bolt

2) Remove the duty solenoids, solenoids and sensor from the lower valve body.

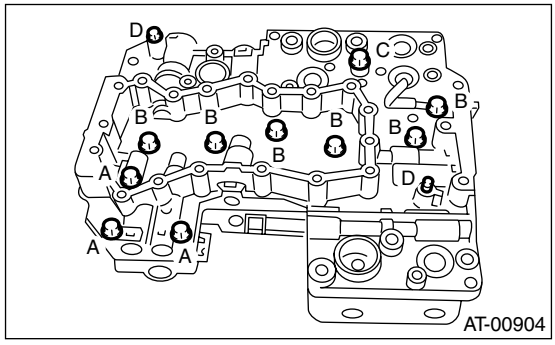
NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolt lengths are different.



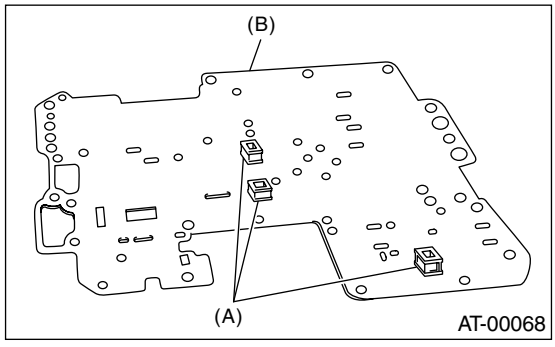
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 1 (Yellow)
(E) Shift solenoid 2 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) SPORT shift solenoid (Beige) (if equipped)

3) Remove the upper-lower valve body tightening bolts.

NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolt lengths are different.

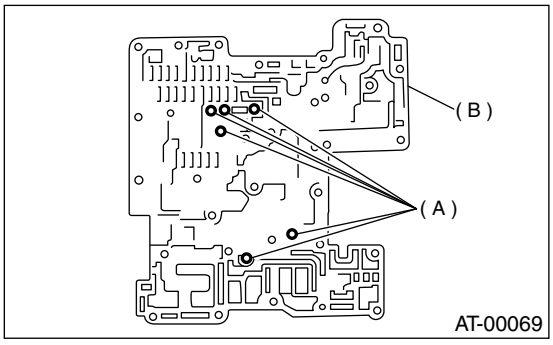


4) Remove the lower valve body.
5) Remove the oil filter and plate.



(A) Oil filter
(B) Plate

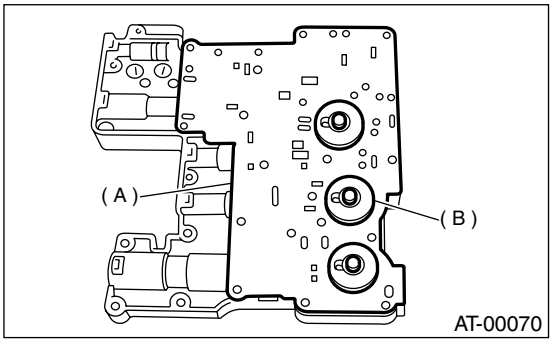
6) Remove six steel balls from middle valve body.



(A) Steel ball
(B) Middle valve body

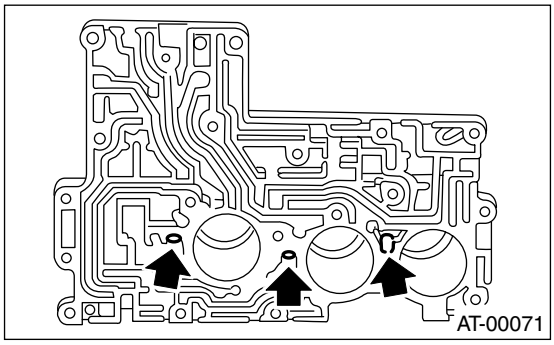
7) Remove the middle valve body.

8) Remove upper separator plate from middle valve body.

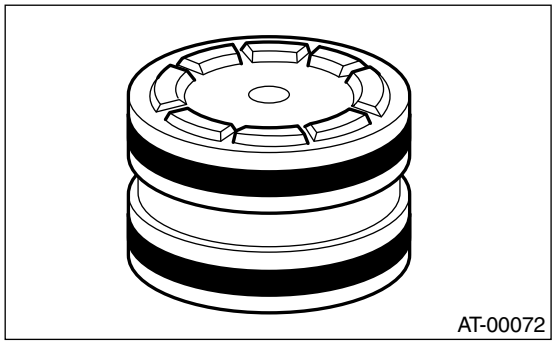


(A) Upper separator plate
(B) Side plate

9) Remove valve springs and four steel balls from upper valve body.
10) Place a shop cloth to the piston removal hole.
11) Using an air compressor, apply air slowly to each piston hole and remove the pistons.

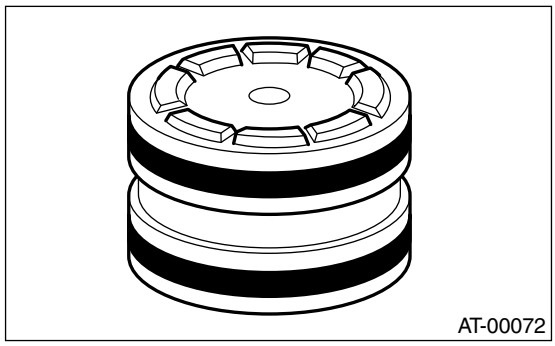


12) Remove the seal ring from piston.

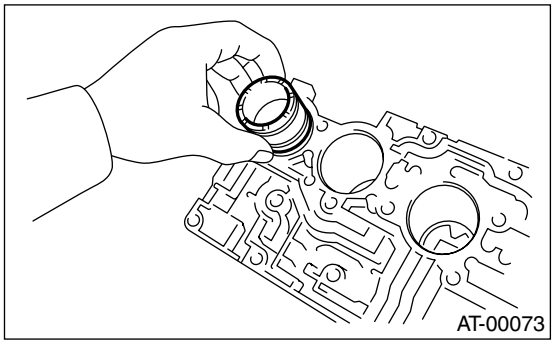


D: ASSEMBLY

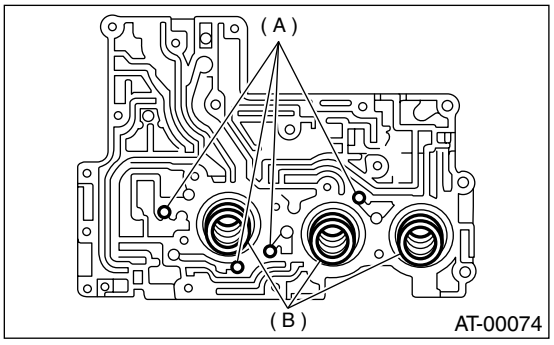
1) Install a new seal ring to piston.



2) Apply ATF to the seal ring.
3) Insert the piston fully into upper valve body.



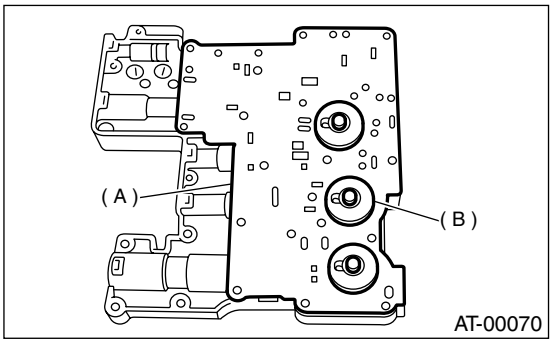
4) Install the spring and four steel balls to specified positions of upper valve body.



(A) Steel ball
(B) Spring

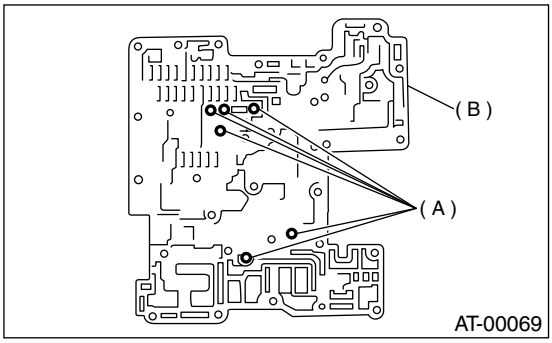
5) Align the hole in side plate with the hole in separator plate, and then install support plate and upper separator plate to middle valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Upper separator plate
(B) Side plate

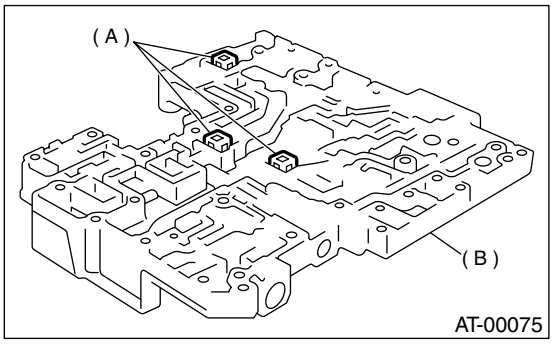
6) Insert six steel balls in their proper positions to middle valve body.



(A) Steel ball
(B) Middle valve body

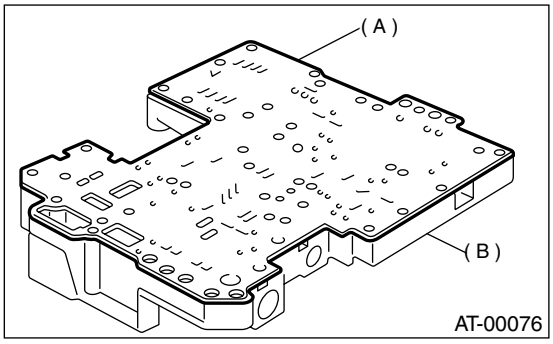
7) Install three filters to lower valve body.

NOTE:
Pay attention to the location of filters.



(A) Strainer
(B) Lower valve body

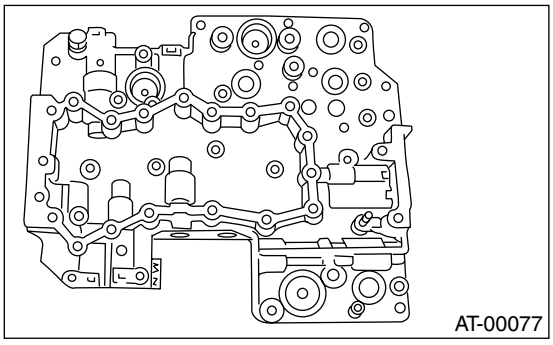
8) Install the lower separate plate to lower valve body.



(A) Lower separator plate
(B) Lower valve body

9) Temporarily assemble the valve body.

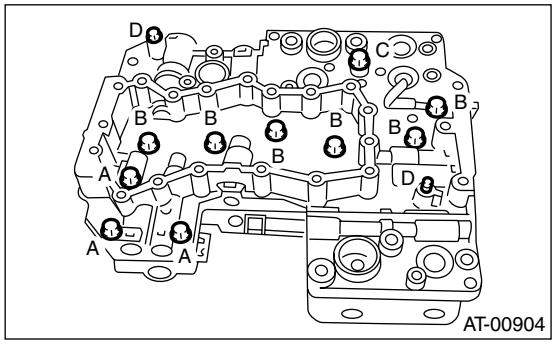
NOTE:
Be careful not to drop the middle valve body and upper body interior steel ball, or the lower body filter.



10) Tighten the bolts and nuts.

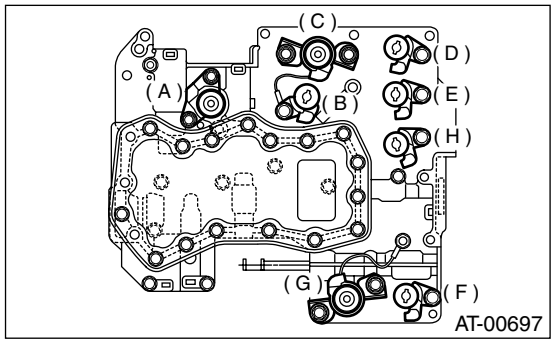
NOTE:
Install the bolts (D) from upper valve body side.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 40 (1.57)
(B) 62 (2.44)
(C) 73 (2.87)
(D) 79 (3.11)

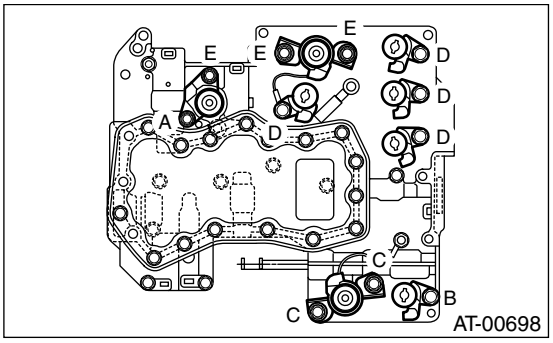
11) Install the sensor, solenoids and duty solenoids to specified positions.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 1 (Yellow)
(E) Shift solenoid 2 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) SPORT shift solenoid (Beige) (if equipped)

12) Tighten the bolts.

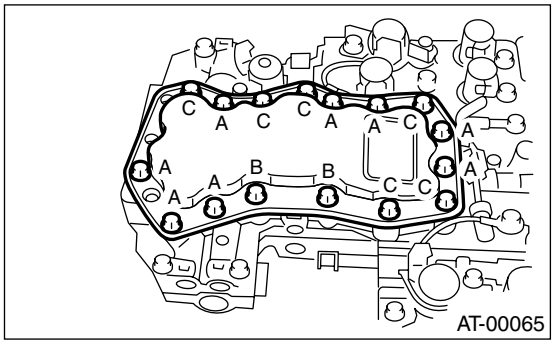
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

13) Install oil strainer to lower valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 62 (2.44)
(C) 81 (3.19)

E: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

18.Air Bleeding of Control Valve

A: PROCEDURE

1) Set the select lever to “P” range and apply parking brake, then lift-up the vehicle.
2) Connect the SUBARU Select Monitor to vehicle.
3) Using SUBARU Select Monitor, check that the DTC is not output.<Ref. to 4AT(H4DOTC)-14, OPERATION, Subaru Select Monitor.>
4) Using SUBARU Select Monitor, check that ATF temperature is less than 60°C (140° F). <Ref. to 4AT(H4DOTC)-14, OPERATION, Subaru Select Monitor.>
5) Set the SUBARU Select Monitor to OFF.
6) Set the ignition switch to OFF.
7) With pressing shift lock release button, set the select lever to “R” range.
8) Depress the brake pedal fully with left foot until air bleeding is complete.
9) Turn the ignition switch to ON.
10) Set the select lever to “P” range, and then wait for more than three seconds.
11) Set the select lever to “R” range, and then wait for more than three seconds.
12) Set the select lever to “N” range, and then wait for more than three seconds.
13) Set the select lever to “D” range, and then wait for more than three seconds.
14) Set the select lever to “N” range, and then wait for more than three seconds.
15) Slightly depress the accelerator pedal to full open.
16) Slightly release the accelerator pedal to close.
17) Start the engine.
18) Set the select lever to “D” range.
19) Turn the SUBARU Select Monitor power to ON.
20) On the SUBARU Select Monitor, select the “individual system inspection” of main menu.
21) On the “individual system inspection” selection menu, select the “individual system inspection” and air bleeding of control valve will start in transmission. At this time, ATF temperature warning light in the combination meter blinks at 2Hz. If ATF temperature warning light does not blink, repeat the procedure from step 4).
22) Air bleeding of control valve is completed when blinking of ATF temperature warning light in the combination meter changes from 2Hz to 0.5Hz.

NOTE:
Repeat the procedure from step 4) if blinking of ATF temperature warning light changes from 2Hz to 4Hz during air bleeding.

23) Set the select lever to “N” range, and turn the ignition switch to OFF.
24) Set the select lever to “P” range to finish air bleeding.

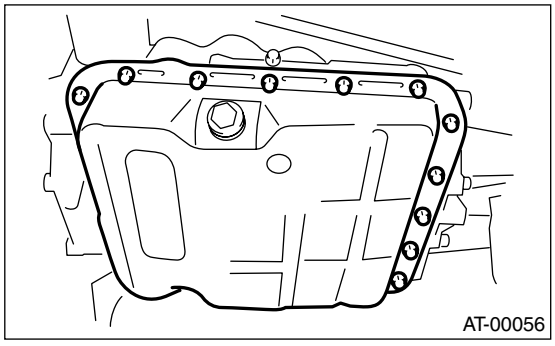
19.Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

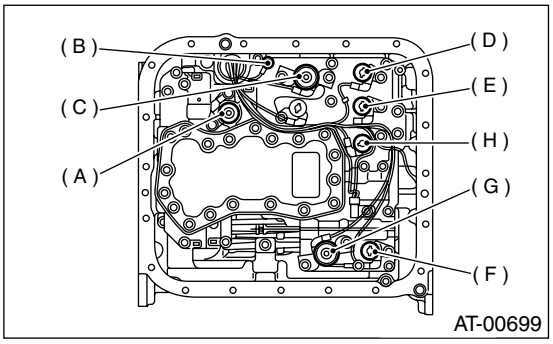
1. SHIFT SOLENOIDS AND DUTY SOLENOIDS

1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Replace the gasket with a new one, and tighten the drain plug.
4) Drain the ATF completely.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)


AT-00056

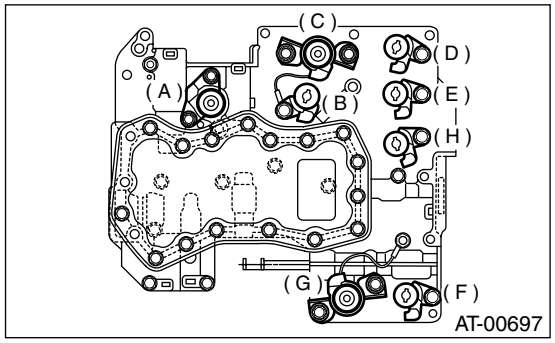
5) Remove the oil pan.
6) Disconnect the solenoid and duty solenoid connectors.



AT-00699

(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) SPORT shift solenoid (Beige) (if equipped)

7) Remove the solenoids and duty solenoids.



AT-00697

(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) SPORT shift solenoid (Beige) (if equipped)

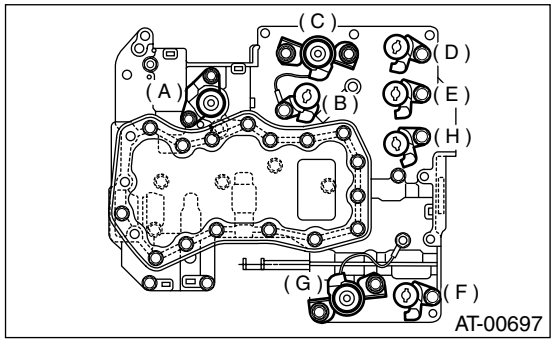
2. ATF TEMPERATURE SENSOR

For removal of ATF temperature sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-55, REMOVAL.>

B: INSTALLATION

1. SHIFT SOLENOIDS AND DUTY SOLENOIDS

1) Insert solenoid and duty solenoid to specified position.

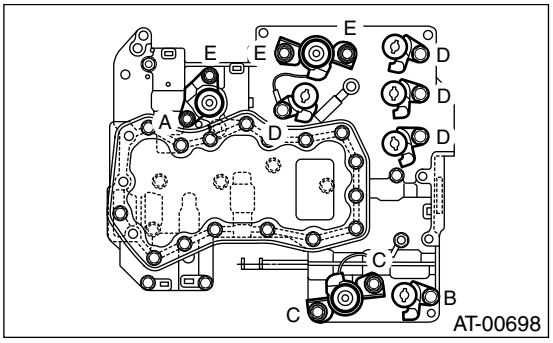


AT-00697

(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) SPORT shift solenoid (Beige) (if equipped)

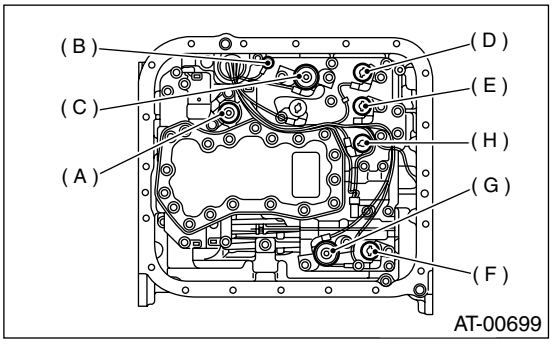
2) Tighten the bolts and nuts.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

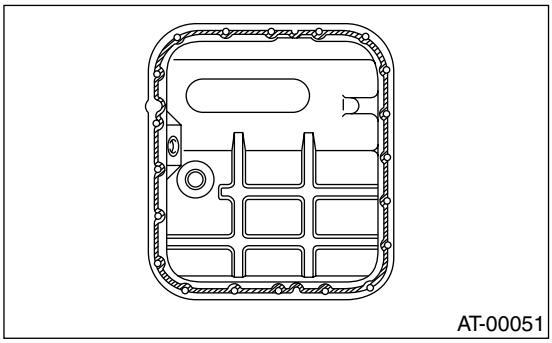
3) Connect the harness connectors.
Connect the connectors of same color, and secure the harness to valve body using clips.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) SPORT shift solenoid (Beige) (if equipped)

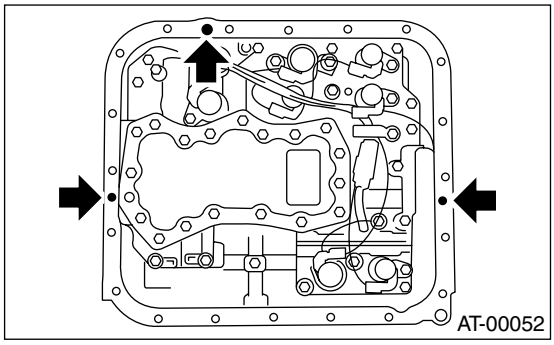
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



6) Tighten bolts evenly and install the oil pan.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Refill with the same amount of ATF that was drained.
8) Check the ATF level. <Ref. to 4AT-31, Automatic Transmission Fluid.>

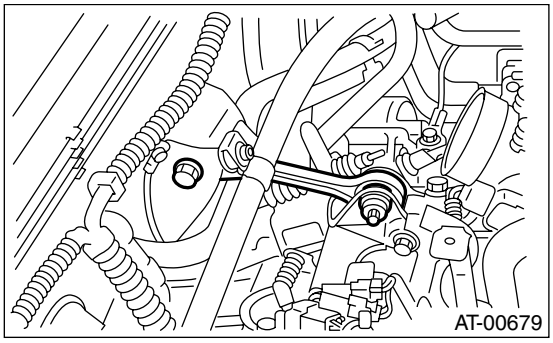
2. ATF TEMPERATURE SENSOR

For installation of ATF temperature sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-57, INSTALLATION.>

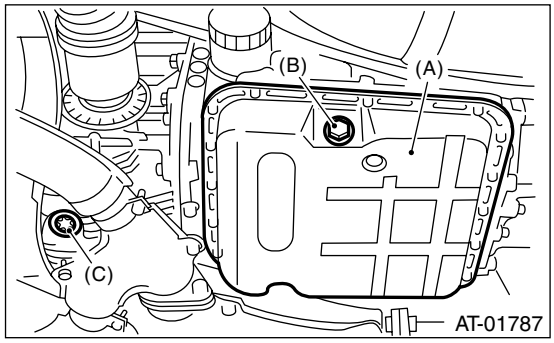
20.Transfer Duty Solenoid and Valve Body

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the air cleaner case or air intake chamber.
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
4) Remove the pitching stopper.

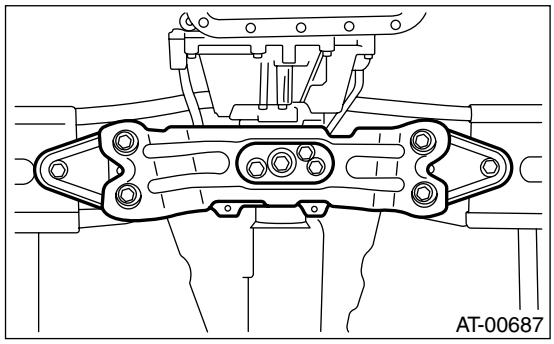


5) Remove the front exhaust pipe with center exhaust pipe. (Non-TURBO model)
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
6) Remove the rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-9, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, REMOVAL, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-9, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4SO U5)-10, REMOVAL, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, REMOVAL, Muffler.>
7) Raise the vehicle and drain the ATF.

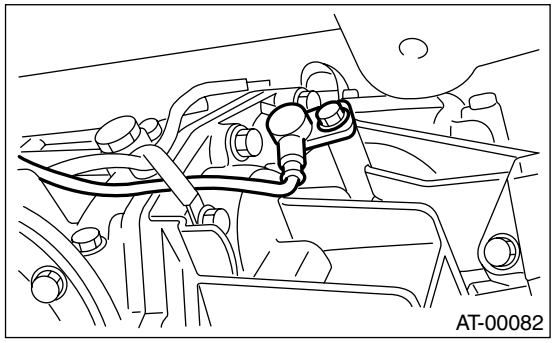


(A) Oil pan
(B) Drain plug
(C) Deferential oil drain plug

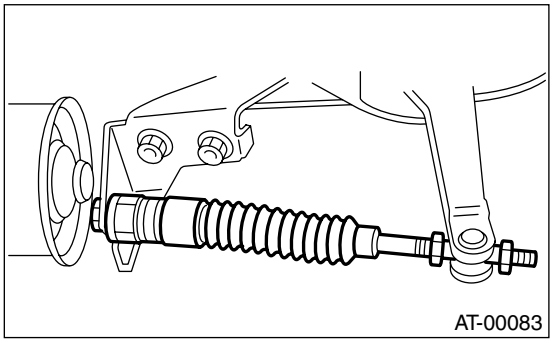
8) Remove the heat shield cover. (If equipped)
9) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
10) Remove the transmission rear crossmember.
(1) Support the transmission using a transmission jack and raise it slightly.
(2) Remove the bolts and nuts as shown in the figure.



11) Remove the rear vehicle speed sensor.

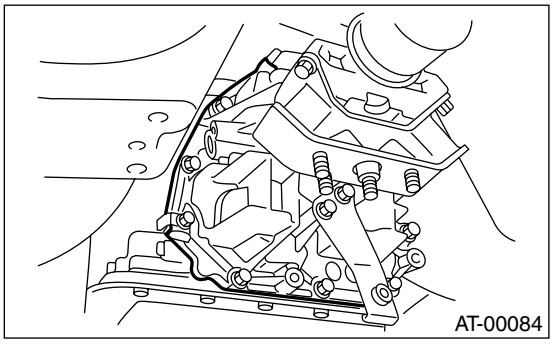


12) Remove the select cable nut.

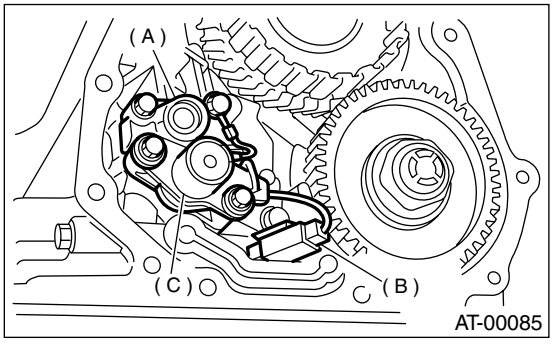


13) Move the gear select cable so that extension bolts can be removed.
14) Remove the bolts.
15) Remove the extension case.

NOTE:
Use a container to catch oil flowing from extension.



16) Disconnect the transfer duty solenoid connector.
17) Remove the transfer duty solenoid and transfer valve body.



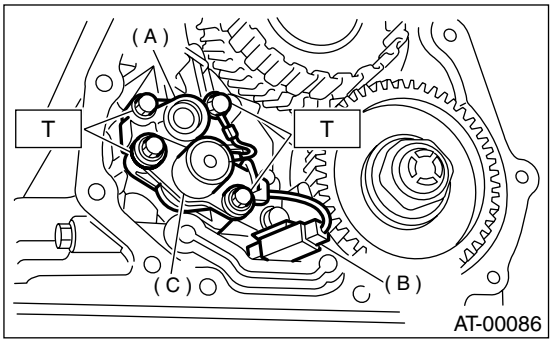
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

B: INSTALLATION

1) Install the transfer duty solenoid and transfer valve body.
(1) Install the transfer duty solenoid and transfer valve body.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

(2) Connect the transfer duty solenoid connector.



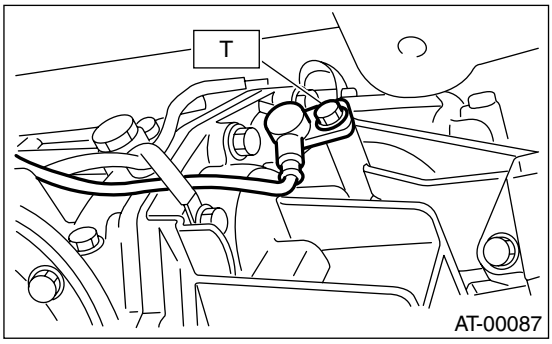
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

2) Install a new gasket and the extension case to transmission case.
(1) Tighten eleven bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

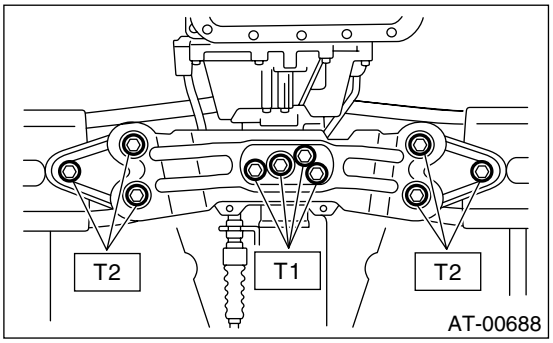
(2) Adjust the select cable. <Ref. to CS-32, ADJUSTMENT, Select Cable.>
3) Install the rear vehicle speed sensor.

Tightening torque:
T: 7 N·m (0.7 kgf-m, 5.1 ft-lb)

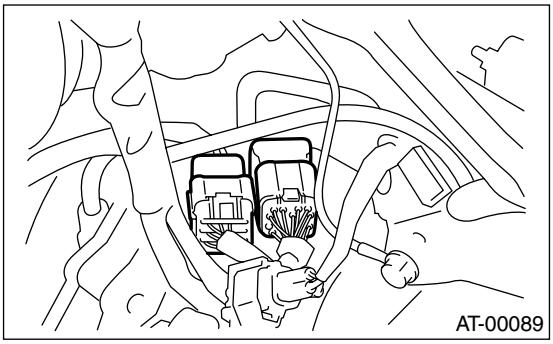


4) Install the transmission rear crossmember.
(1) Tighten the bolts.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)

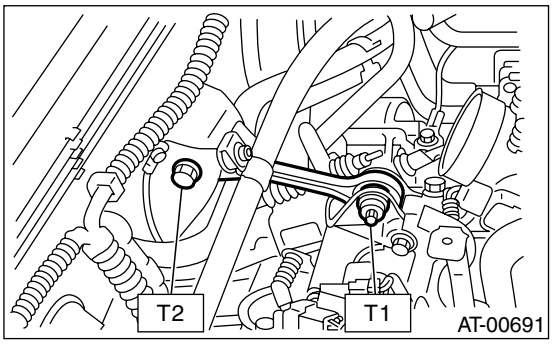


(2) Remove the transmission jack.
5) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
6) Install the front, center rear exhaust pipe and muffler.
Except 2.5 L U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-10, INSTALLATION, Muffler.>
2.5 L U5 model
<Ref. to EX(H4SO U5)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO U5)-9, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO U5)-10, INSTALLATION, Muffler.>
3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H6DO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H6DO)-9, INSTALLATION, Muffler.>
7) Connect the transmission harness connector.



8) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



9) Install the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
10) Fill with the same amount of ATF that was drained.
11) Check the ATF level. <Ref. to 4AT-31, Automatic Transmission Fluid.>

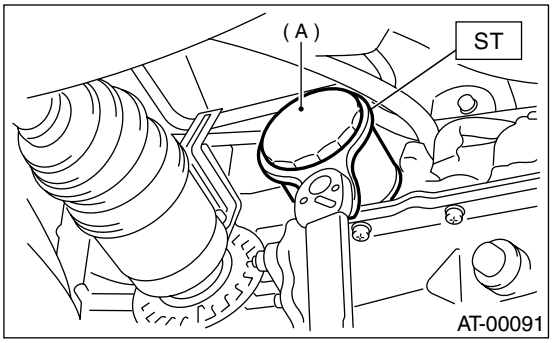
21.ATF Filter

A: REMOVAL

1. EXCEPT 3.0 L MODEL AND U5 MODEL

NOTE:
The ATF filter is maintenance free.

1) Lift-up the vehicle.
2) Using ST, remove ATF filter.
ST 498545400 OIL FILTER WRENCH



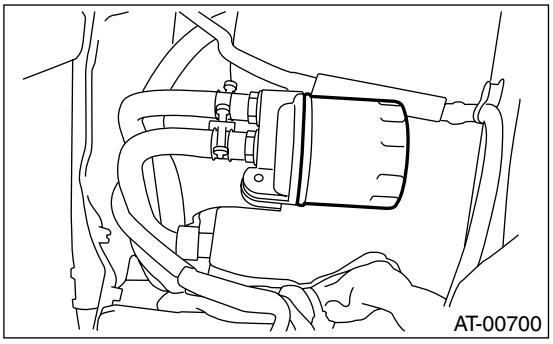
(A) ATF filter

2. 3.0 L MODEL AND U5 MODEL

• ATF Filter

NOTE:
The ATF filter is maintenance free.

1) Lift-up the vehicle.
2) Remove front left mud guard.
<Ref. to EI-31, REMOVAL, Mud Guard.>
3) Using ST, remove ATF filter.
ST 498548500 OIL FILTER WRENCH

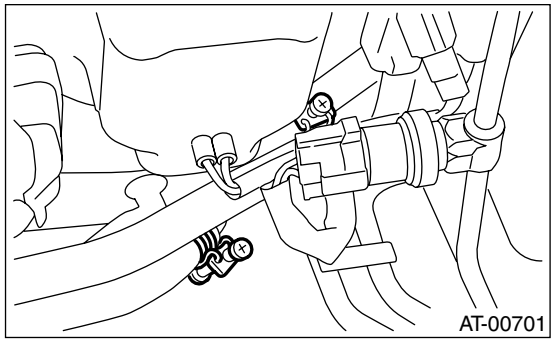


4) Get new ATF filter and apply a thin coat of ATF to the oil seal

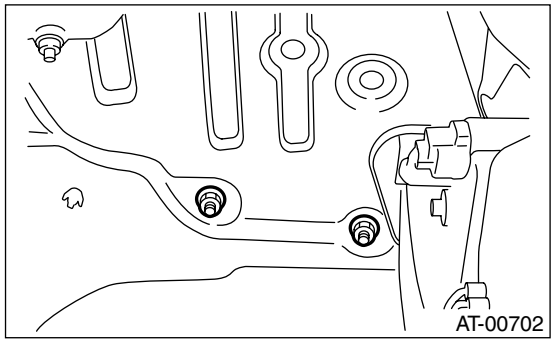
• ATF Filter Assembly

1) Remove battery.
2) Lift-up the vehicle.
3) Remove front left mud guard.
<Ref. to EI-31, REMOVAL, Mud Guard.>
4) Lower the vehicle.
5) Release clamp of IN, OUT of oil filter hose, and remove hose from pipe.

NOTE:
• Plug the pipe.
• Put a mark etc., to distinguish IN, OUT on pipe and hose.



6) Remove oil filter bracket installation nut.



7) Remove ATF filter assembly.
8) Remove ATF filter with attachment to bracket.

B: INSTALLATION

1. EXCEPT 3.0 L MODEL AND U5 MODEL

1) Get new ATF filter and apply a thin coat of ATF to the oil seal.
2) Install ATF filter. Turn it by hand, being careful not to damage oil seal.
3) Using ST, tighten ATF filter to transmission case.
Calculate ATF filter torque specifications using the following formula.
T2 = L2/(L1 + L2) × T1
T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST length 0.078 m (3.07 in)
L2: Torque wrench length
Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:
Align ST with torque wrench while tightening ATF filter.
ST 498545400 OIL FILTER WRENCH
4) Add ATF.
5) Inspect level of ATF. <Ref. to 4AT-31, Automatic Transmission Fluid.>

2. 3.0 L MODEL AND U5 MODEL

• ATF Filter

1) Get new ATF filter and apply a thin coat of ATF to the oil seal.
2) Install AT oil filter. Turn it by hand, being careful not to damage oil seal.
3) Using ST, tighten AT oil filter to attachment.
Calculate AT filter torque specifications using the following formula.
T2 = L2/(L1 + L2) × T1
T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST length 0.078 m (3.07 in)
L2: Torque wrench length
Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:
Align ST with torque wrench while tightening AT oil filter.
ST 498545400 OIL FILTER WRENCH
4) Install front left mud guard. <Ref. to EI-31, INSTALLATION, Mud Guard.>
5) Add ATF.
6) Inspect level of ATF. <Ref. to 4AT-31, Automatic Transmission Fluid.>

• ATF Filter Assembly

1) Install ATF filter with attachment to bracket.

Tightening torque:
14 N·m (1.4 kgf-m, 10 ft-lb)

2) Install ATF filter assembly to vehicle.

Tightening torque:
16 N·m (1.6 kgf-m, 12 ft-lb)

3) Install AT oil filter. Turn it by hand, being careful not to damage oil seal.
4) Using ST, tighten AT oil filter to transmission case.
Calculate AT filter torque specifications using the following formula.
T2 = L1/(L1 + L2) × T1
T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST length 0.078 m (3.07 in)
L2: Torque wrench length
Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:
Align ST with torque wrench while tightening AT oil filter.
ST 498545400 OIL FILTER WRENCH
5) Install hoses to pipe.

NOTE:
Install hoses to pipe aligning marks on them.

6) Install front left mud guard.
<Ref. to EI-31, INSTALLATION, Mud Guard.>
7) Add ATF.
8) Inspect level of ATF. <Ref. to 4AT-31, Automatic Transmission Fluid.>

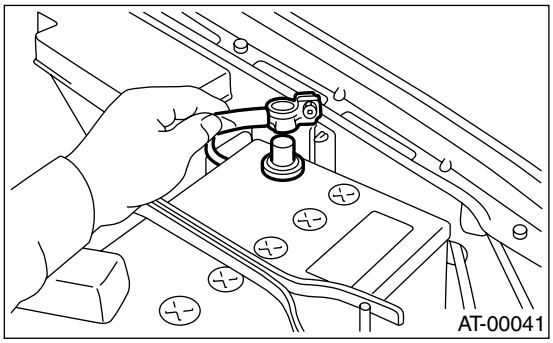
C: INSPECTION

Replace the part if any defect is found from the inspection.
Check for rust, hole, ATF leaks, and other damage.

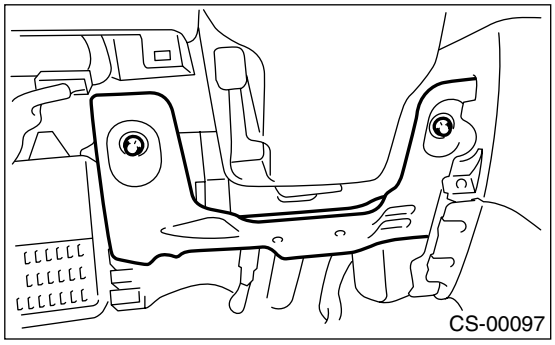
22.Transmission Control Module (TCM)

A: REMOVAL

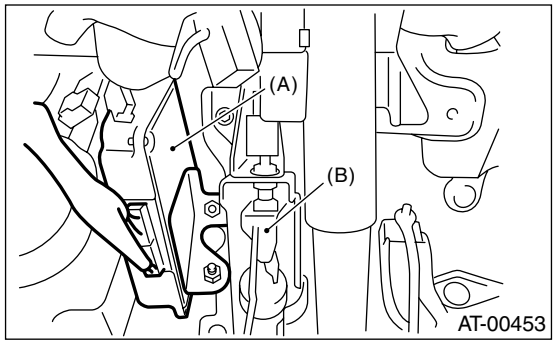
1) Disconnect the ground cable from battery.



2) Remove the lower cover and then disconnect the connector.
3) Remove the knee bolster.



4) Disconnect the connectors from TCM.



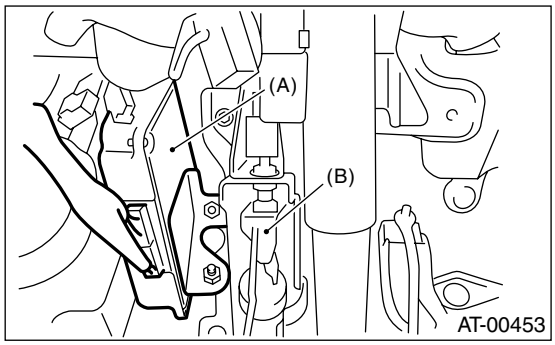
(A) Transmission control module (TCM)
(B) Brake pedal

5) Remove the TCM.

B: INSTALLATION

1) Install the TCM.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



(A) Transmission control module (TCM)
(B) Brake pedal

2) Connect the connectors to TCM.
3) Install in the reverse order of removal.
4) Perform learning control promotion task. (TURBO model)
(1) Set select lever to “P” range and apply parking brake, then lift up the vehicle.
(2) Connect Subaru Select Monitor to vehicle and turn on the switch.
(3) Select “Clear Memory — 2” on the SUBARU Select Monitor. <Ref. to 4AT(H4DOTC)-16, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>
(4) Using Subaru Select Monitor, check that the DTC is not output. <Ref. to 4AT(H4DOTC)-14, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>
(5) Using Subaru Select Monitor, warm up the engine until the ATF temperature becomes within 60 to 90°C (140 to 194°F). <Ref. to 4AT(H4DOTC)-15, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
(6) Shift the select lever to the “R” range.
(7) Set the switches for headlights, air conditioner, rear defogger, etc. to OFF.
(8) Turn the ignition switch OFF and then wait for more than 30 seconds.
(9) If the message “communication impossible” is displayed on SUBARU Select Monitor, depress the brake pedal deeply with left foot until the learning promotion task is completed, and then turn the ignition switch to ON.
(10)Check that Subaru Select Monitor is operating properly now.
(11)Set the select lever to “P” range, and then wait for more than three seconds.
(12)Set the select lever to “R” range, and then wait for more than three seconds.

(13)Set the select lever to “N” range, and then wait for more than three seconds.
(14)Set the select lever to “D” range, and then wait for more than three seconds.
(15)Set the select lever to “N” range, and then wait for more than three seconds.
(16)Slowly depress the accelerator pedal to the fully open position.
(17)Slowly release the accelerator pedal to the fully closed position.
(18)Start and idle the engine.
(19)Set the select lever to “D” range.
(20)Learning promotion task starts. ATF temperature warning light in the combination meter blinks at 2 Hz. If ATF temperature does not blink, turn the ignition switch OFF and repeat the procedure from step 4).
Learning promotion task is completed when blinking of ATF temperature warning light in the combination meter changes from 2 to 0.5 Hz.

NOTE:
Repeat the procedure from step 4) if blinking of AFT temperature warning light changes from 2 to 4 Hz.

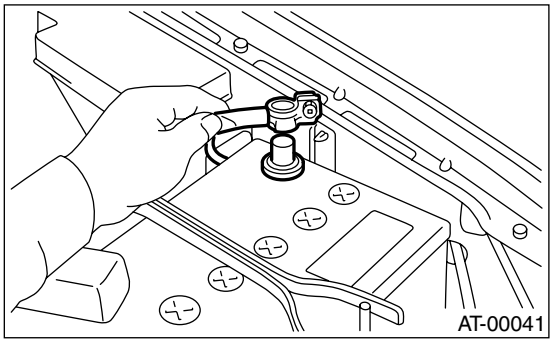
(21)Set the select lever to “N” range, and turn the ignition switch to OFF.

23.Dropping Resistor

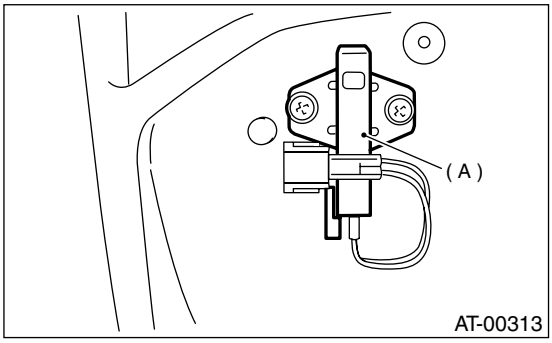
A: REMOVAL

NOTE:
Dropping resistor is installed except VDC or SPORT shift and U5 model.

1) Disconnect the ground cable from battery.



2) Remove the air intake duct.
2.5 L model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
3.0 L model
<Ref. to IN(H6DO)-7, REMOVAL, Air Intake Duct.>
3) Disconnect the connector from dropping resistor.
4) Remove the dropping resistor.

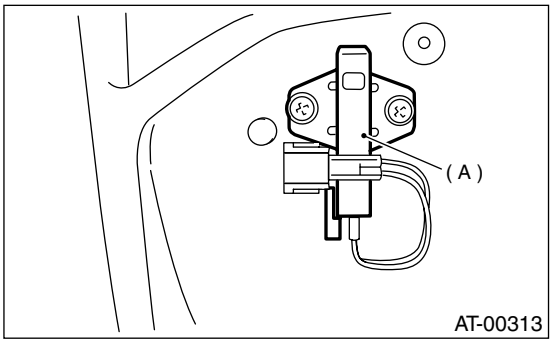


(A) Dropping resistor

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
13 N·m (1.3 kgf-m, 10 ft-lb)



(A) Dropping resistor

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK RESISTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from dropping resistor. 3) Measure the resistance between dropping resistor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 9 — 15 Ω?	Go to step **2.**	Replace the dropping resistor. <Ref. to 4AT-81, Dropping Resistor.>
2	**CHECK RESISTOR.** Measure the resistance between dropping resistor terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 9 — 15 Ω?	Dropping resistor is normal.	Replace the dropping resistor. <Ref. to 4AT-81, Dropping Resistor.>

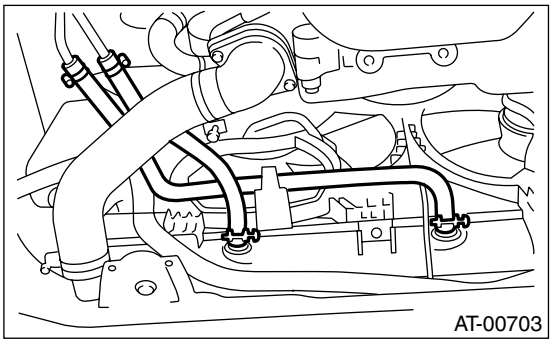
24.ATF Cooler Pipe and Hose

A: REMOVAL

1. EXCEPT 3.0 L MODEL AND U5 MODEL

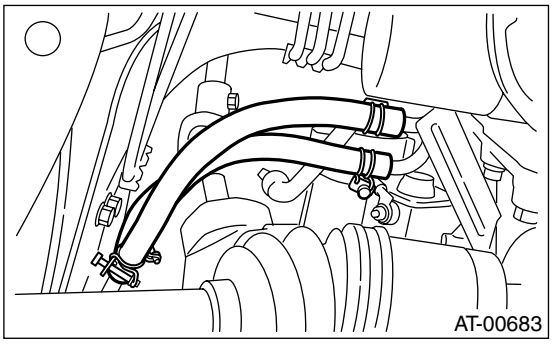
1) Set the vehicle on a lift.
2) Remove battery and washer tank.
3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect ATF cooler hose from radiator.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

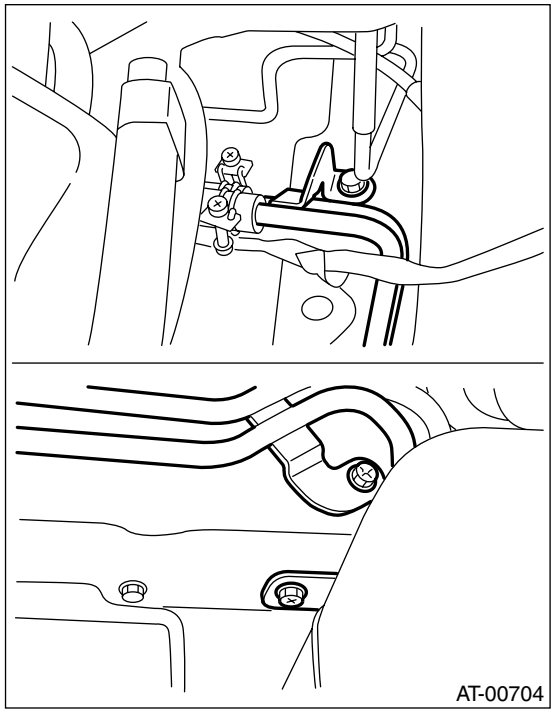


6) Disconnect ATF cooler hoses from pipes.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

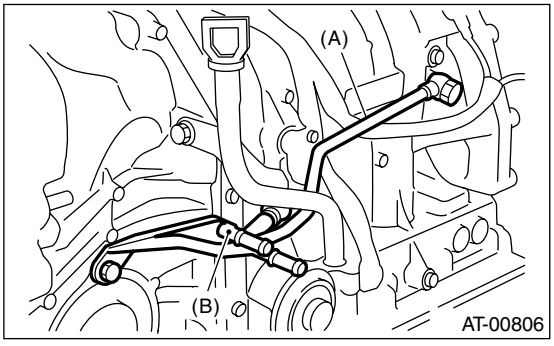


7) Remove ATF cooler pipe from frame.



8) Remove the oil cooler inlet and outlet pipes.

NOTE:
When removing outlet pipe, be careful not to lose ball and spring used with retaining screw.

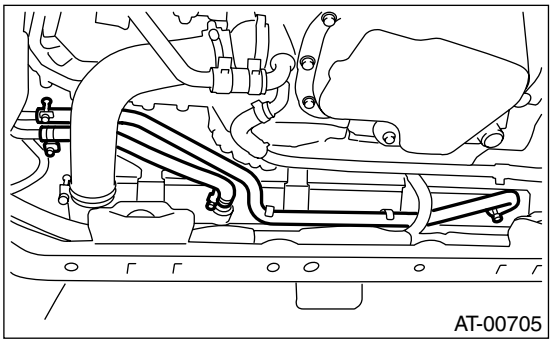


(A) Inlet pipe
(B) Outlet pipe

2. 3.0 L Model and u5 model

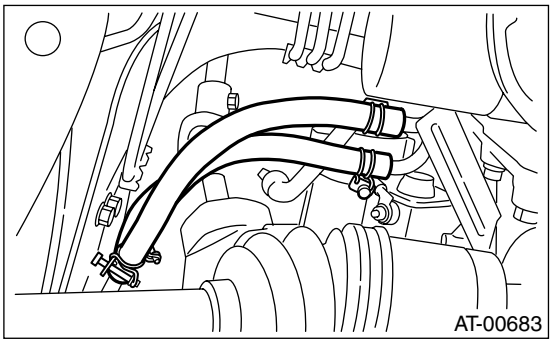
1) Set the vehicle on a lift.
2) Remove battery and washer tank.
3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect ATF cooler hose from radiator.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



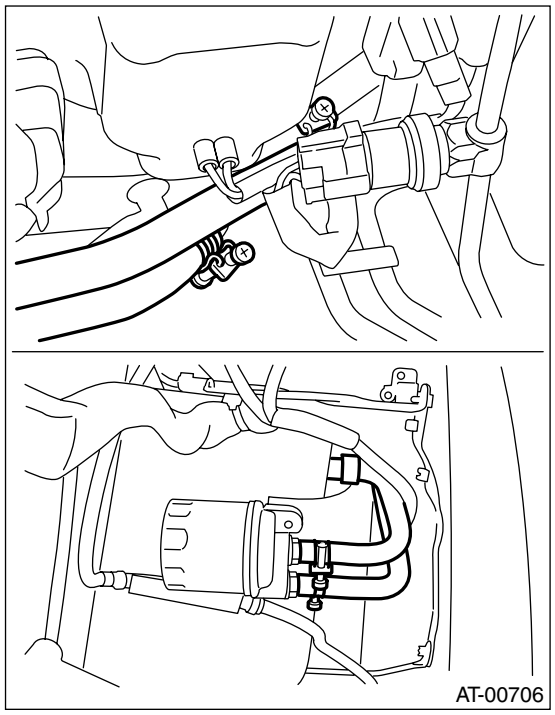
6) Disconnect ATF cooler hoses from transmission.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

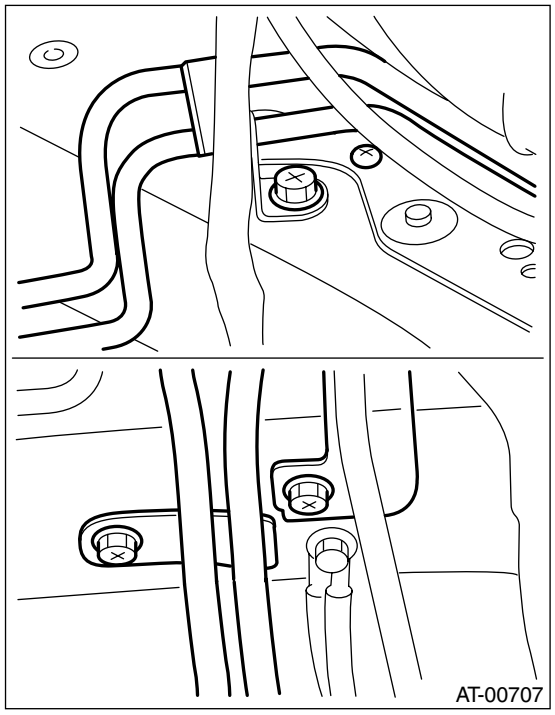


7) Remove front left mud guard.
<Ref. to EI-31, REMOVAL, Mud Guard.>
8) Disconnect ATF cooler hoses from ATF filter.

NOTE:
• Do not remove with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.

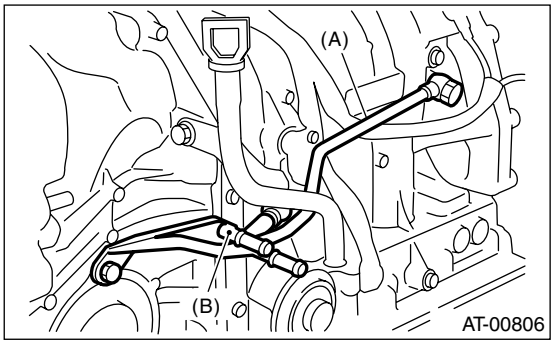


9) Remove AT cooler pipe from frame.



10) Remove the oil cooler inlet and outlet pipes.

NOTE:
When removing outlet pipe, be careful not to lose ball and spring used with retaining screw.



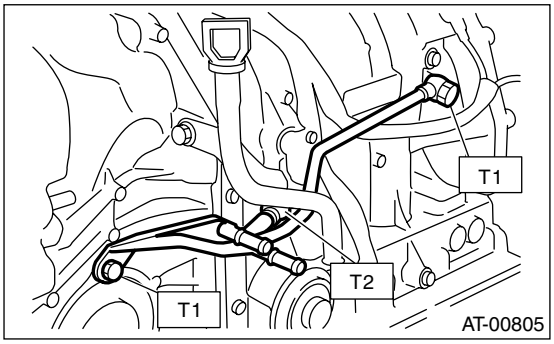
B: INSTALLATION

1. EXCEPT 3.0 L MODEL AND U5 MODEL

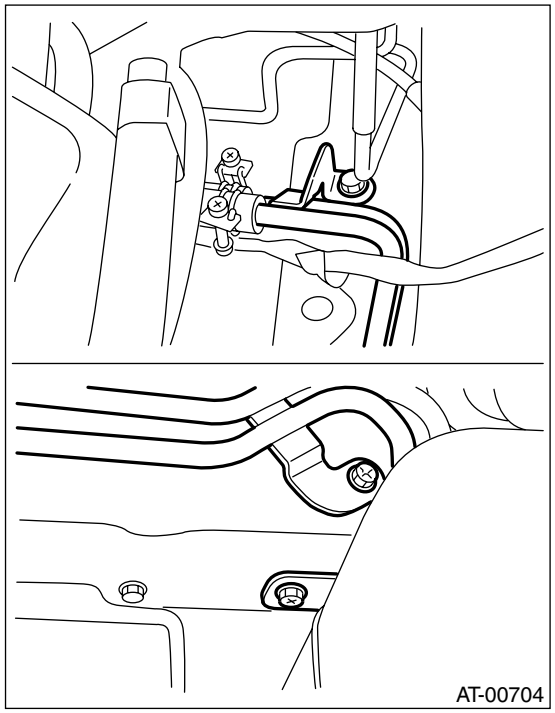
1) Install the oil cooler outlet and inlet pipes.

NOTE:
Be sure to use a new aluminum washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

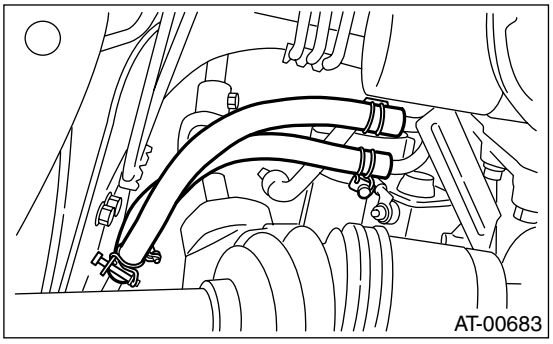


2) Install ATF cooler pipe to frame.



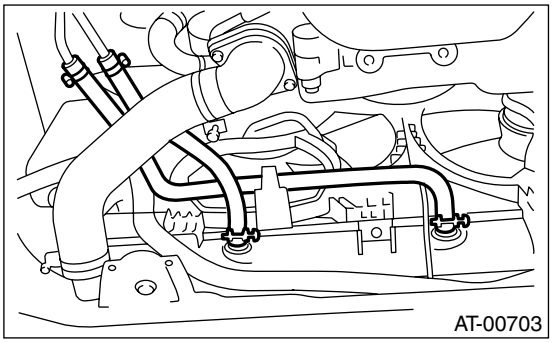
3) Connect ATF cooler hose to pipe transmission side.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



4) Connect ATF cooler hose to pipe of radiator side.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



5) Install the under cover.
6) Install battery and washer tank.
7) Fill ATF. <Ref. to 4AT-31, Automatic Transmission Fluid.>

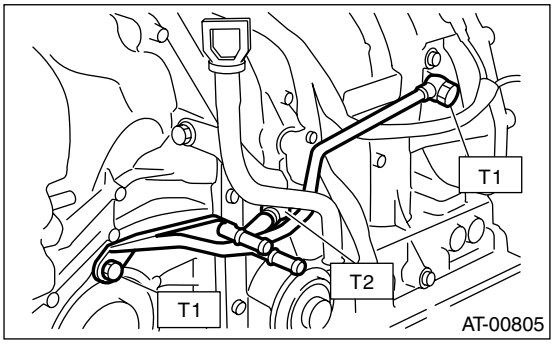
NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator, pipes, and hoses.

2. 3.0 L MODEL

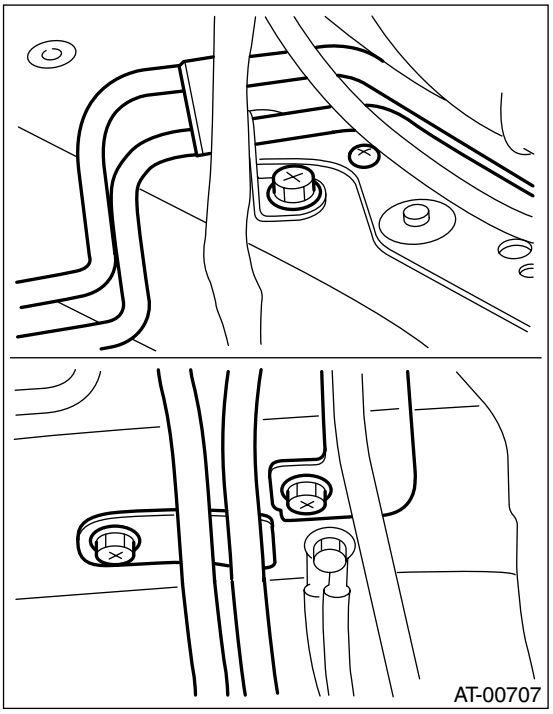
1) Install the oil cooler outlet and inlet pipes.

NOTE:
Be sure to use a new aluminum washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

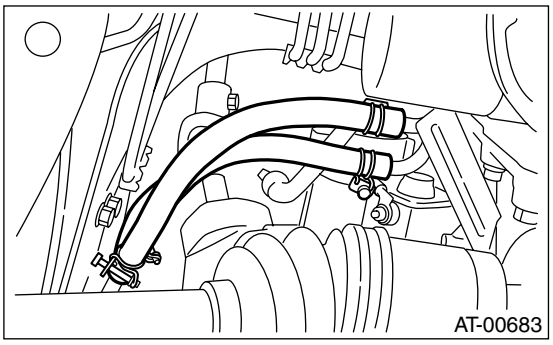


2) Install ATF cooler pipe to frame.



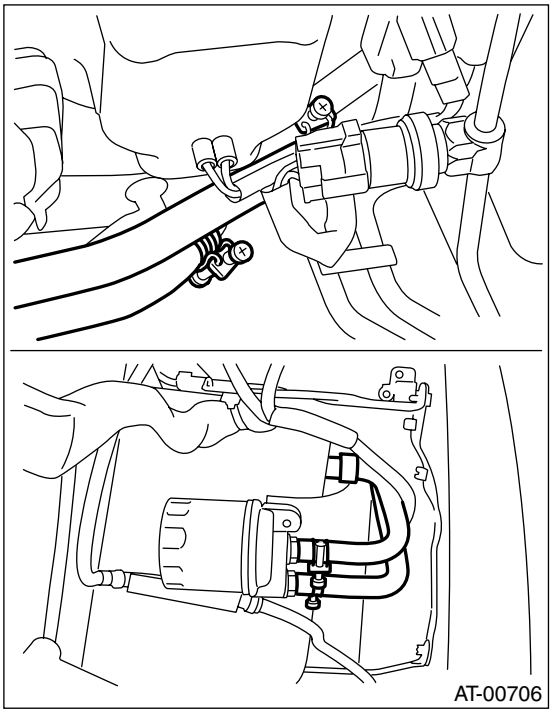
3) Connect ATF cooler hose to transmission.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



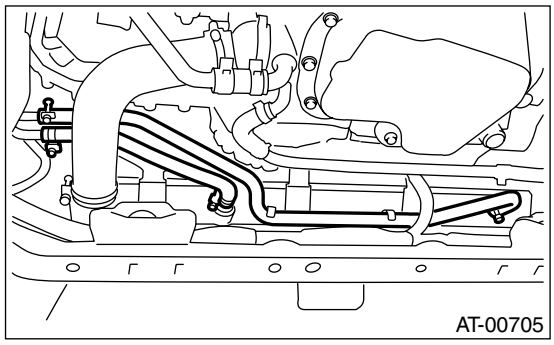
4) Connect ATF cooler hoses from ATF filter.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



5) Connect ATF cooler hoses from radiator.

NOTE:
• Install so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



6) Install front left mud guard. <Ref. to EI-31, INSTALLATION, Mud Guard.>
7) Install the under cover.
8) Install battery and washer tank.
9) Fill ATF. <Ref. to 4AT-31, Automatic Transmission Fluid.>

NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator pipes and hoses.

C: INSPECTION

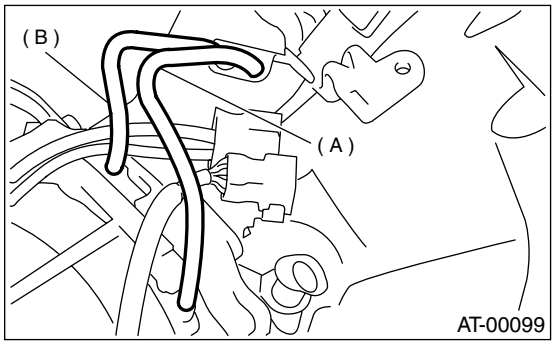
Repair or replace any defective hoses, pipes, clamps, and washers found from the inspection below.
1) Check for ATF leaks in joints between the transmission, radiator, pipes, and hoses.
2) Check for deformed clamps.
3) Lightly bend the hose and check for cracks in the surface and other damage.
4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was by pressing with your fingernail.
5) Check for peeling, cracks, and deformation at the tip of the hose.

25.Air Breather Hose

A: REMOVAL

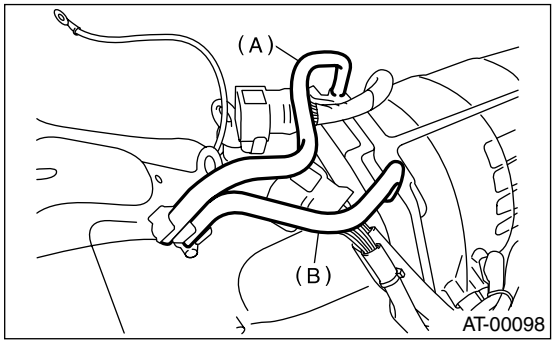
1) Remove the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
2) Remove intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the air breather hoses.

- NON-TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

- TURBO MODEL

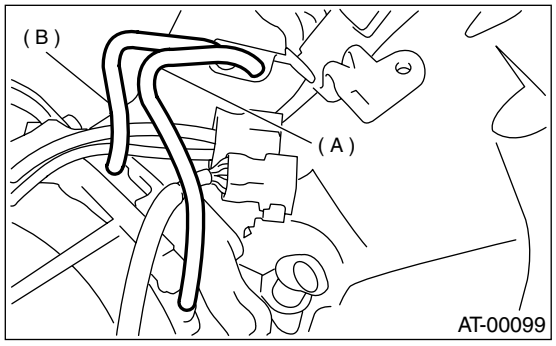


(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

B: INSTALLATION

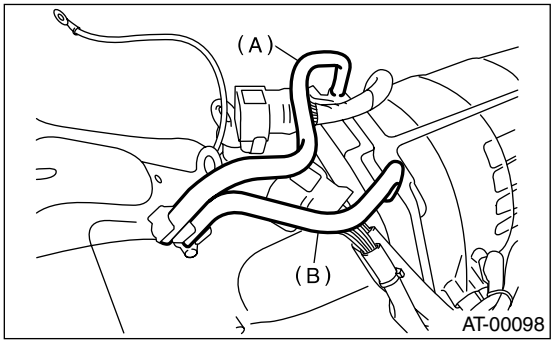
1) Install air breather hoses.

- NON-TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

- TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

2) Install the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
3) Install intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

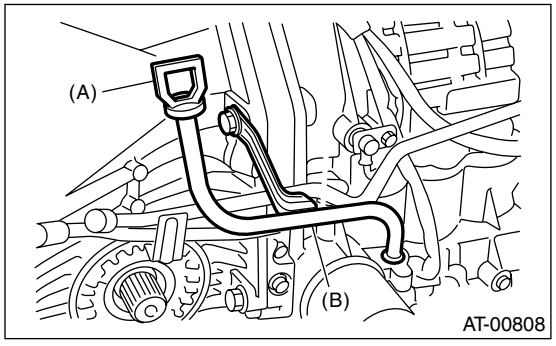
C: INSPECTION

Make sure the hose is not cracked or clogged.

26.Oil Charger Pipe

A: REMOVAL

1) Remove the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, REMOVAL, Air Intake Chamber.>
2) Remove intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Remove starter motor.
2.5 L model
<Ref. to SC(H4SO)-7, REMOVAL, Starter.>
3.0 L model
<Ref. to SC(H6DO)-6, REMOVAL, Starter.>
4) Remove the oil charger pipe, and remove the O-ring from the flange face.

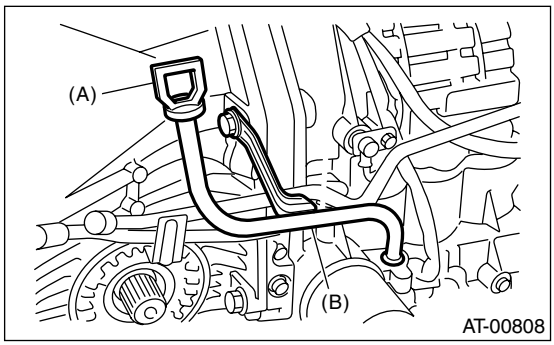


(A) Oil level gauge
(B) Oil charger pipe

B: INSTALLATION

1) Install the oil charger pipe with new O-ring.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



(A) Oil level gauge
(B) Oil charger pipe

2) Install starter motor.
2.5 L model
<Ref. to SC(H4SO)-7, INSTALLATION, Starter.>
3.0 L model
<Ref. to SC(H6DO)-6, INSTALLATION, Starter.>
3) Install the air cleaner case or air intake chamber. (Non-TURBO model)
Except 2.5 L U5 model
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
2.5 L U5 model
<Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
3.0 L model
<Ref. to IN(H6DO)-6, INSTALLATION, Air Intake Chamber.>
4) Install intercooler. (TURBO model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

C: INSPECTION

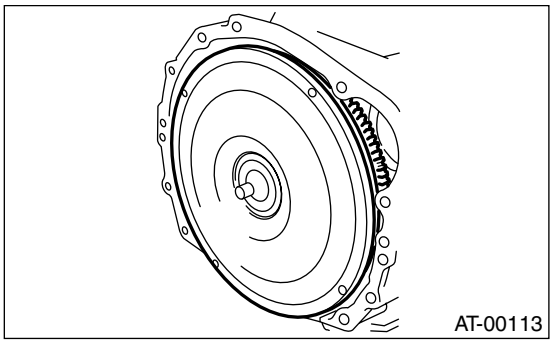
Make sure the oil charger pipe is not deformed or otherwise damaged.

27.Torque Converter Clutch Assembly

A: REMOVAL

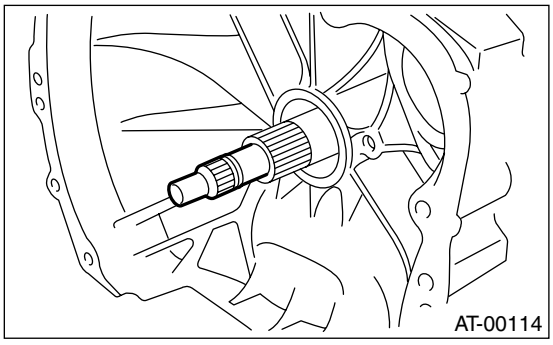
1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch and oil pump shaft horizontally.

NOTE:
Be careful not to scratch the bushing inside the oil pump shaft.



3) Remove the input shaft.

NOTE:
When the torque converter clutch assembly is removed, the input shaft will come out.

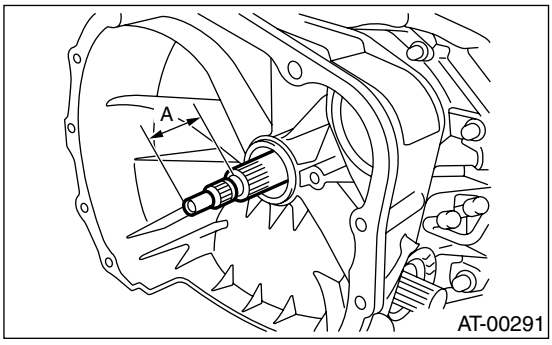


4) Remove the oil pump shaft from torque converter clutch as necessary.

B: INSTALLATION

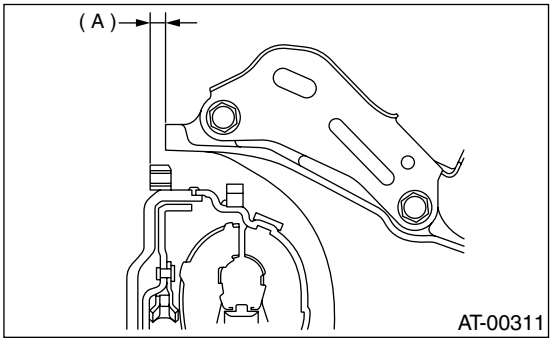
1) Install the oil pump shaft to torque converter clutch if it is removed.
2) Install the oil pump shaft to the torque converter clutch, and then check the clip fits securely in its groove.
3) Insert the input shaft while turning lightly by hand.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



4) Holding the torque converter clutch assembly by hand, carefully install it to the torque converter clutch case. Be careful not to damage the bushing. Also avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.
5) Rotate the shaft lightly by hand to engage the splines securely.

Dimension A:
2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

6) Install the transmission assembly to vehicle. <Ref. to 4AT-42, INSTALLATION.>

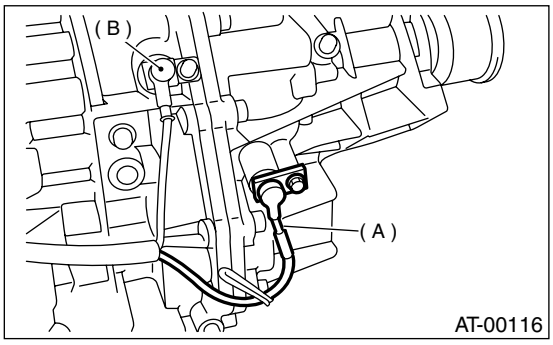
C: INSPECTION

Make sure the ring gear is not damaged and that the protrusion on the edge of the torque converter clutch is not deformed or otherwise damaged.

28.Extension Case

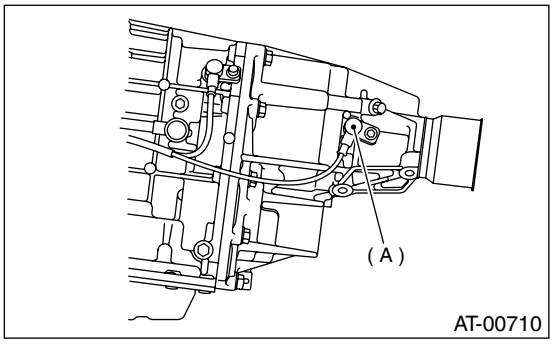
A: REMOVAL

1) Remove the transmission assembly. <Ref. to 4AT-39, REMOVAL.>
2) Remove rear vehicle speed sensor.
• MPT MODEL



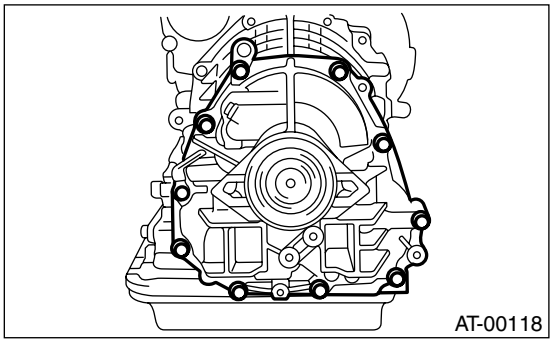
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

• VTD MODEL



(A) Rear vehicle speed sensor

3) Separate transmission case and extension case sections.



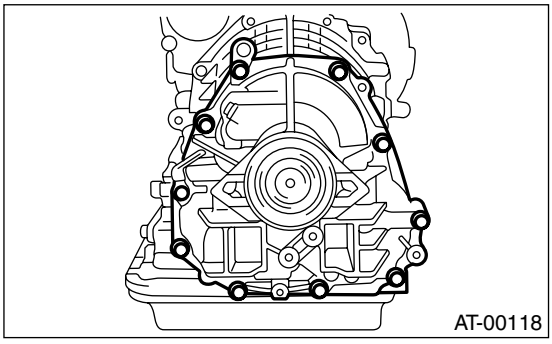
B: INSTALLATION

1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.

NOTE:
Install thrust needle bearing in the correct direction.

2) Install new gasket.
3) Install the extension case to the transmission case.
4) Tighten bolts to secure the case.

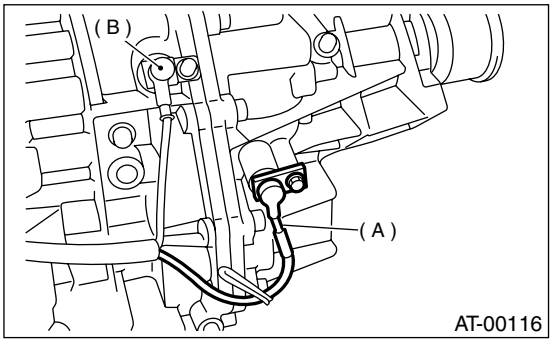
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



5) Install the rear vehicle speed sensor.

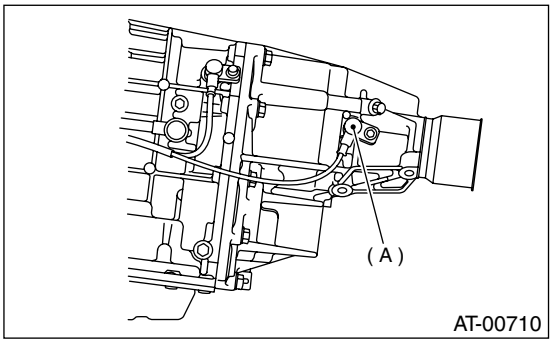
Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

• MPT MODEL



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

• VTD MODEL



(A) Rear vehicle speed sensor

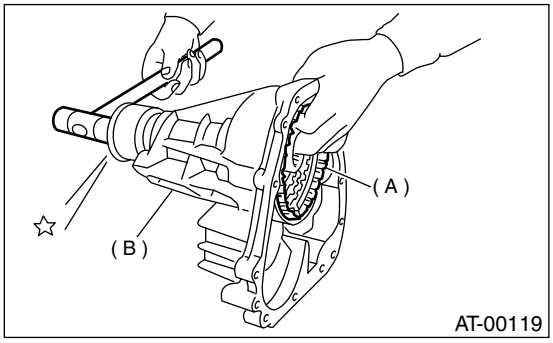
6) Install the transmission assembly. <Ref. to 4AT-42, INSTALLATION.>

C: DISASSEMBLY

1. MPT MODEL

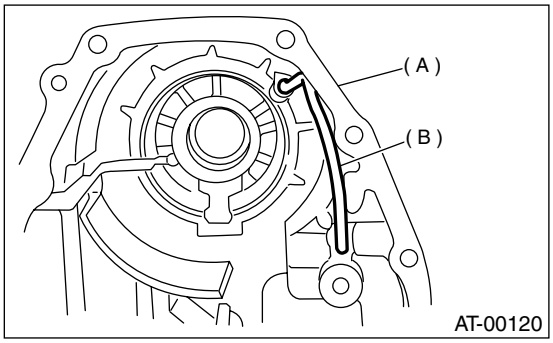
1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

NOTE:
Be careful not to damage the oil seal in the extension.



(A) Extension case
(B) Transfer clutch

2) Remove the transmission clutch pipe without bending pipe.

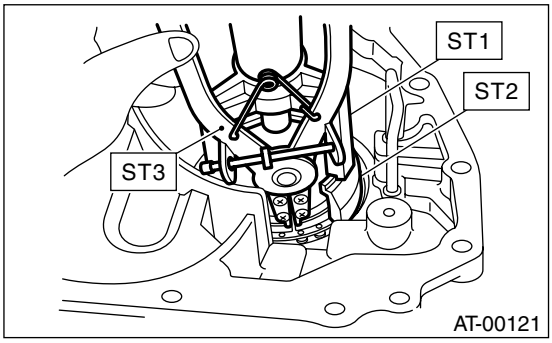


(A) Extension case
(B) Transfer clutch pipe

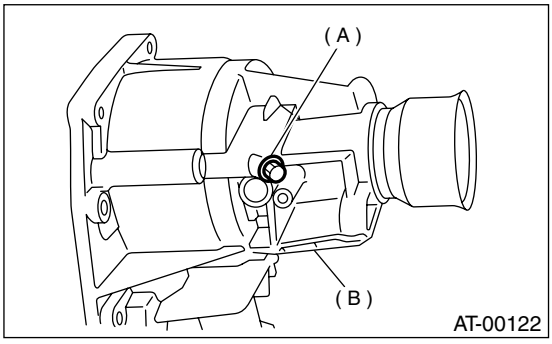
2. VTD MODEL

1) Remove snap ring using ST1, ST2, ST3 and a press.

ST1	398673600	COMPRESSOR
ST2	498627100	SHEAT
ST3	398663600	PLIERS

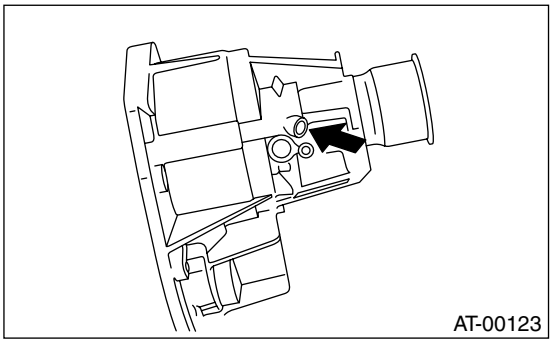


2) Remove test plug.

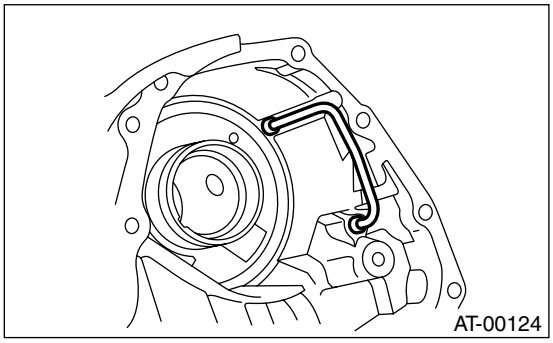


(A) Extension case
(B) Test plug

3) Remove clutch piston using compressed air.



4) Pay attention, not to bend pipe, and remove transfer clutch pipe.

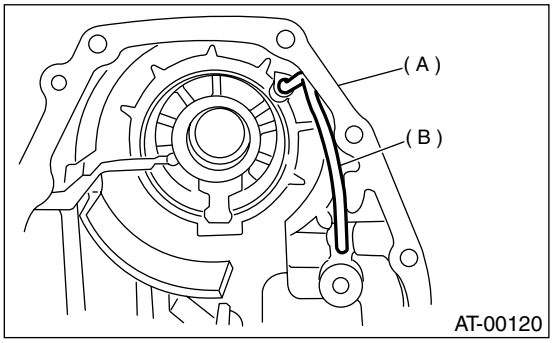


5) Remove the dust cover from the extension case.
6) Remove the oil seal from the extension case.

D: ASSEMBLY

1. MPT MODEL

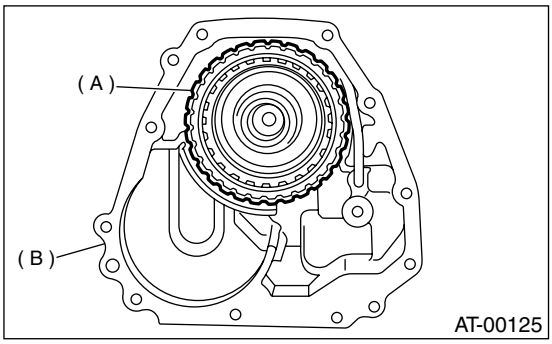
1) Using the ST and a press, press in a new oil seal.
ST 498057300 INSTALLER
2) Press in the dust cover.
3) Install the transfer clutch pipe to extension case without bending pipe.



(A) Extension case
(B) Transfer clutch pipe

4) Install the transfer clutch assembly to the case.

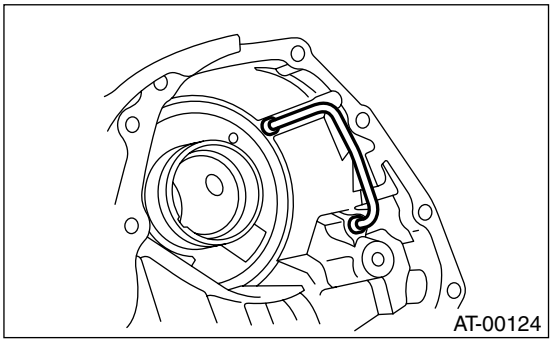
NOTE:
- Be careful not to damage the seal rings.
- Insert the clutch assembly fully into position until the bearing shoulder bottoms.



(A) Transfer clutch
(B) Extension case

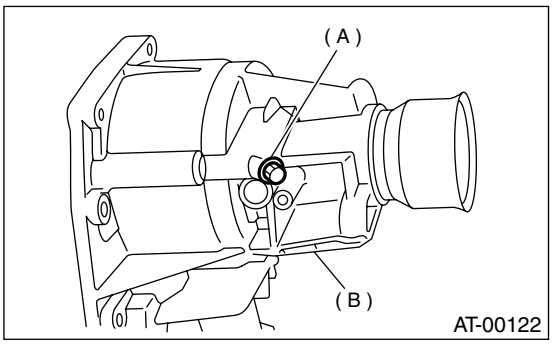
2. VTD MODEL

1) Press new oil seal using ST and a press.
ST 498057300 INSTALLER
2) Press dust cover.
3) Install the transfer clutch pipe onto the extension case, taking care not to bend the pipe.



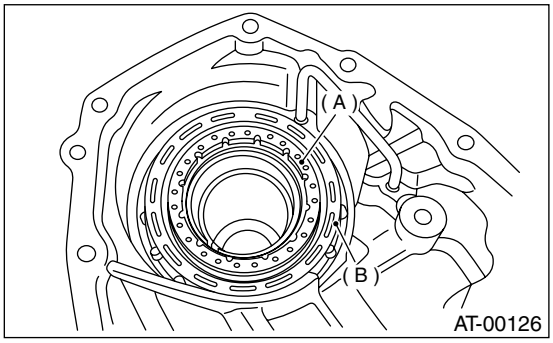
4) Install the test plug.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



(A) Test plug
(B) Extension case

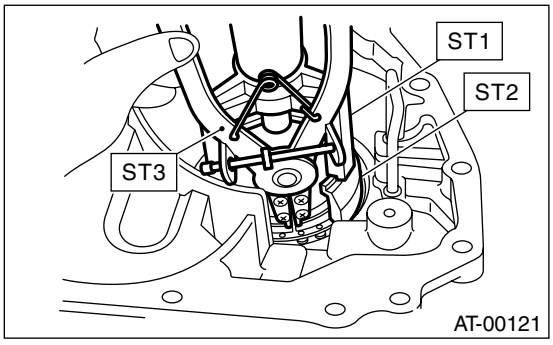
5) Insert the multi-plate clutch, drive plates, driven plates, and spring retainer.



(A) Spring retainer
(B) Multi-plate clutch (LSD) piston assembly

6) Install the snap ring using special tools 1, 2, and 3.

ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 398663600 PLIERS



E: INSPECTION

• Use forced air to make sure the transfer pipe and extension case routes are not clogged and do not leak.
• Measure the extension end play and adjust it to within specifications.

MPT model
<Ref. to 4AT-97, MPT MODEL.>
VTD model
<Ref. to 4AT-98, VTD MODEL.>

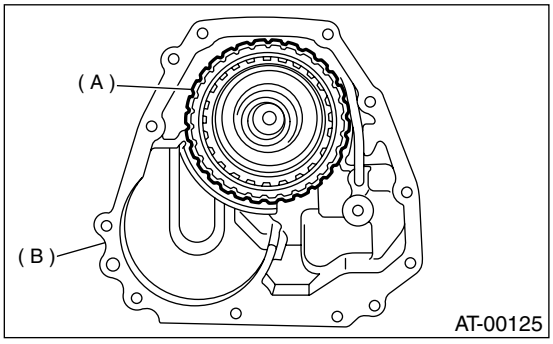
29.Transfer Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Remove the extension case and remove the transfer clutch. <Ref. to 4AT-90, REMOVAL.> and <Ref. to 4AT-90, REMOVAL.>

B: INSTALLATION

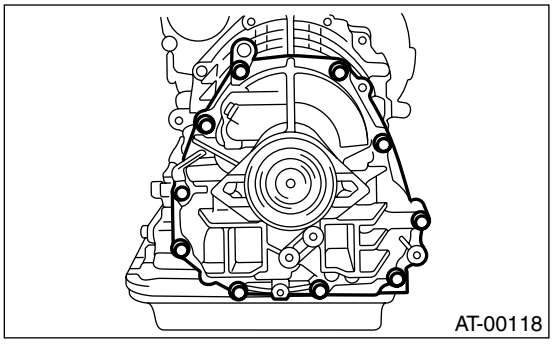
1) Select the thrust needle bearing. <Ref. to 4AT-97, ADJUSTMENT.>
2) Install the transfer clutch assembly to the case.



(A) Transfer clutch
(B) Extension case

3) Tighten bolts to secure the case.

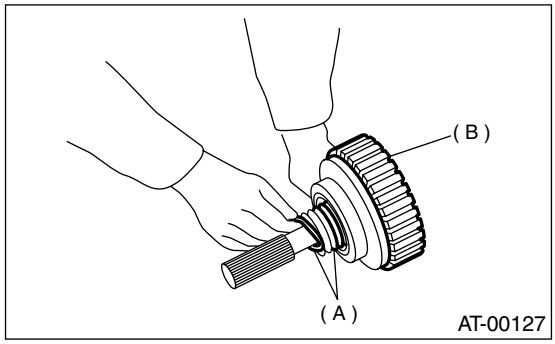
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the transmission assembly to vehicle. <Ref. to 4AT-42, INSTALLATION.>

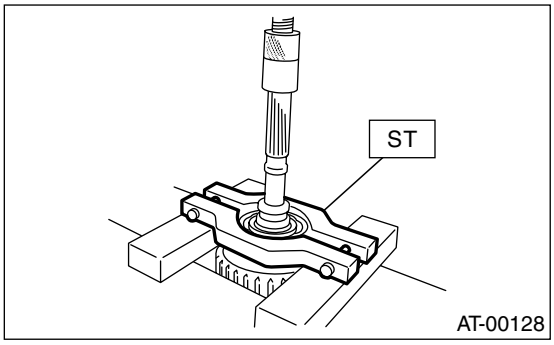
C: DISASSEMBLY

1) Remove the seal ring.

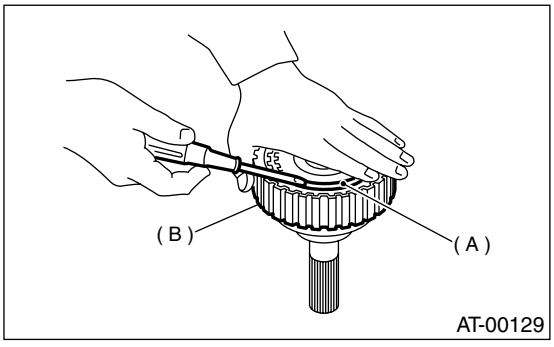


(A) Seal ring
(B) Transfer clutch

2) Using a press and ST, remove the ball bearing.
ST 498077600 REMOVER

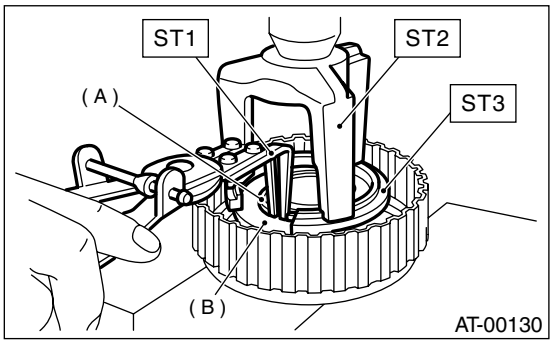


3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.



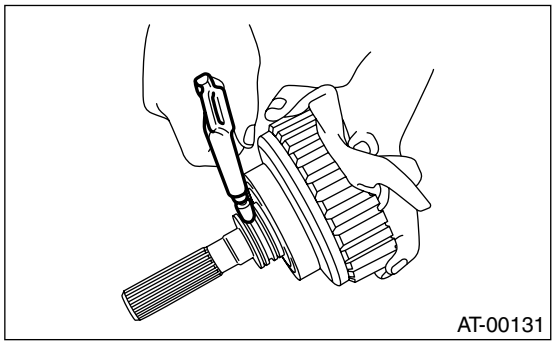
(A) Snap ring
(B) Transfer clutch

4) Remove the snap ring with ST1, ST2 and ST3, and take out the return spring and transfer clutch piston seal.
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR
ST3 398623600 SEAT



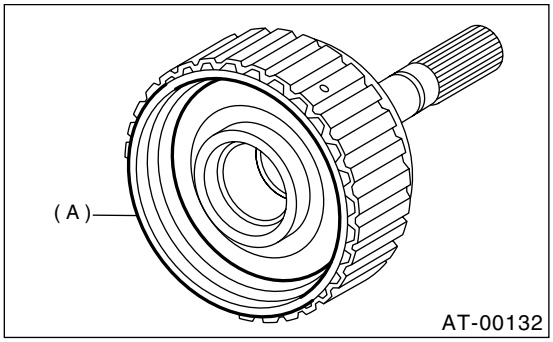
(A) Snap ring
(B) Transfer piston seal

5) Apply compressed air to the rear drive shaft to remove the piston.



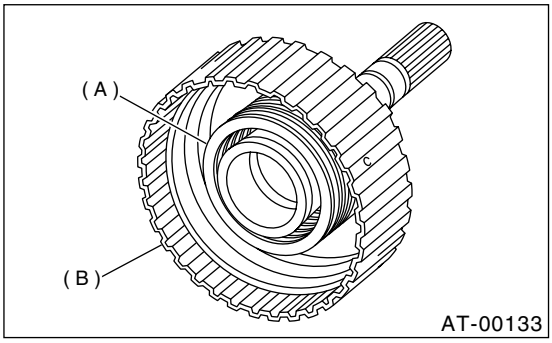
D: ASSEMBLY

1) Install the transfer clutch piston.



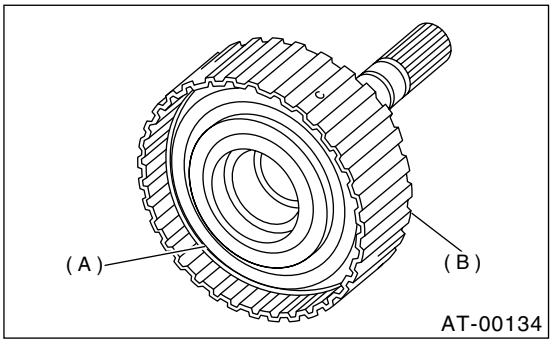
(A) Transfer clutch piston
(B) Rear drive shaft

2) Install return spring to transfer piston.



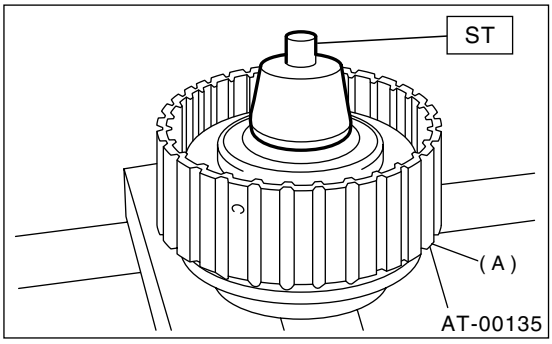
(A) Return spring
(B) Rear drive shaft

3) Install transfer clutch piston seal.



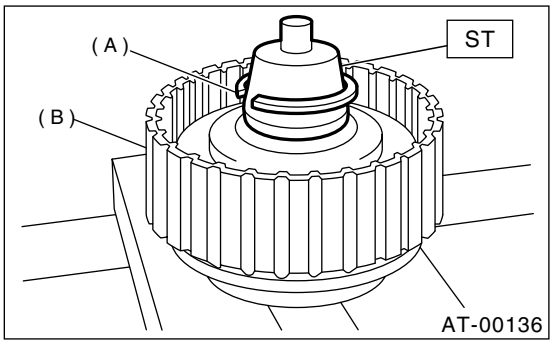
(A) Transfer clutch piston seal
(B) Rear drive shaft

4) Install ST to rear drive shaft.
ST 499257300 SNAP RING OUTER GUIDE



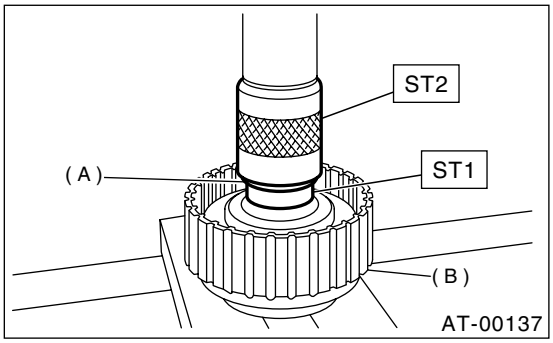
(A) Transfer clutch

5) Install snap ring to ST.
ST 499257300 SNAP RING OUTER GUIDE



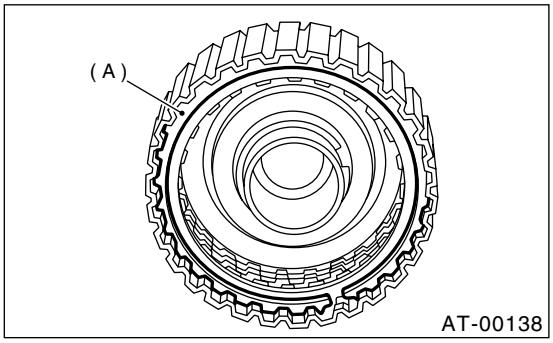
(A) Snap ring
(B) Transfer clutch

6) Using ST1 and ST2, install snap ring to rear drive shaft.
ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER



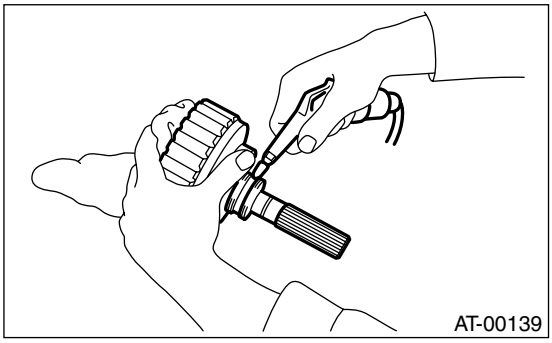
(A) Snap ring
(B) Transfer clutch

7) Install the driven plates, drive plates, pressure plate and snap ring.

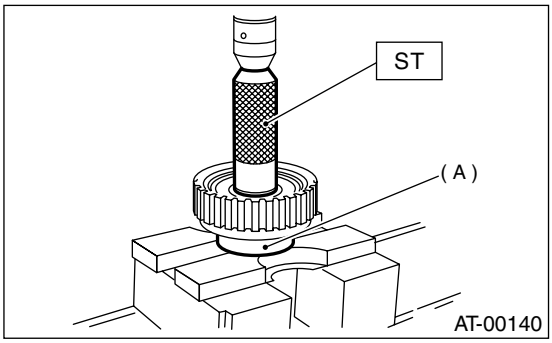


(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.



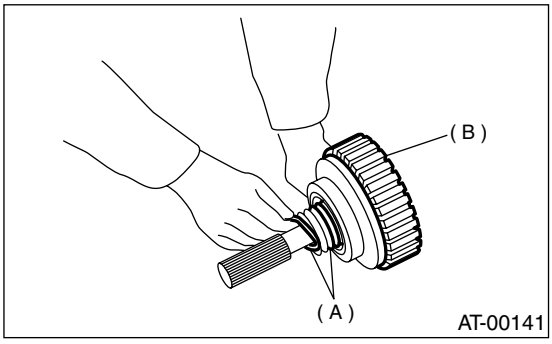
9) Check clearance between snap ring and pressure plate. <Ref. to 4AT-97, INSPECTION.>
10) Press-fit a new ball bearing with ST.
ST 899580100 INSTALLER



(A) Ball bearing

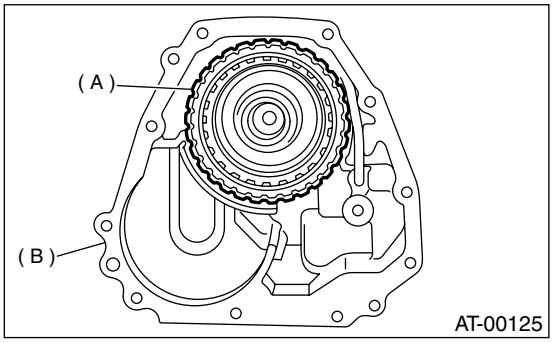
11) Coat a new seal ring with vaseline, and install it in the seal ring groove of the shaft.

NOTE:
Do not expand the seal ring excessively when installing.



(A) Snap ring
(B) Transfer clutch

12) Install the transfer clutch assembly without damaging seal ring.



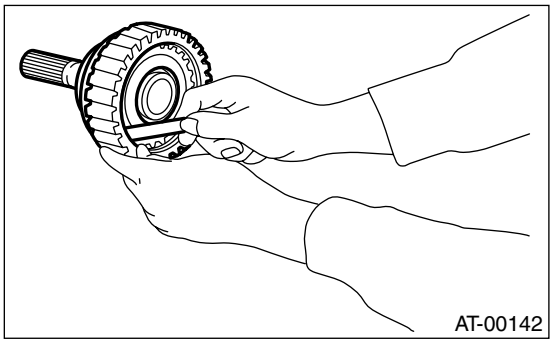
(A) Transfer clutch
(B) Extension case

E: INSPECTION

• Check the drive plate facing for wear and damage.
• Check the snap ring for wear, return spring for permanent set and breakage, and return spring for deformation.
• Check the lathe cut seal ring for damage.
• Measure the extension end play and adjust it to within specifications.
<Ref. to 4AT-97, ADJUSTMENT.>
1) Inspect clearance between snap ring and pressure plate.
2) Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
3) If the clearance is not within specification, adjust it by selecting a suitable pressure plate on the transfer clutch piston side.
If the clearance is above the limit, replace the drive plate with new one and adjust so that the clearance is within specification.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:
1.6 mm (0.063 in)



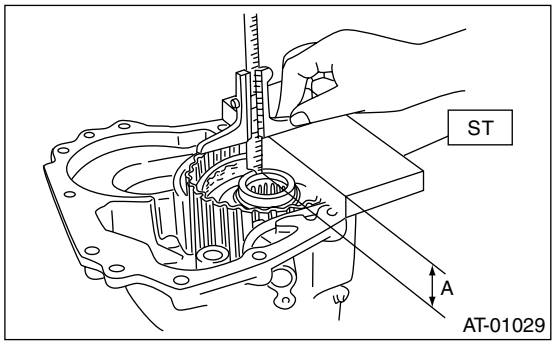
Pressure plates	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

4) Check if the tight corner braking does not occur when the vehicle is started with steering wheel held at fully turned position. If tight corner braking occurs, perform the following procedures.
(1) With the steering wheel held at fully turned position, drive the vehicle in “D” range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.
(2) If the tight corner braking still persists, drive the vehicle again in a circle for several laps.

F: ADJUSTMENT

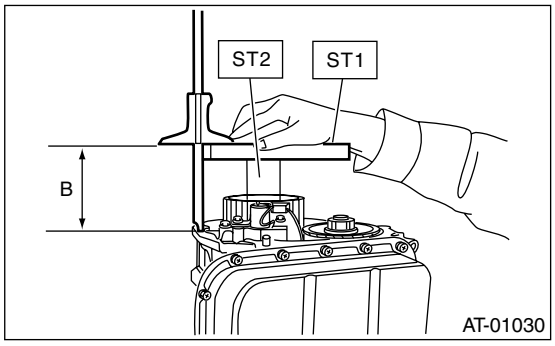
1. MPT MODEL

1) Measure distance “A” from end of extension case and rear drive shaft with ST.
ST 398643600 GAUGE



A: Measured value

2) Measure the distance “B” from the transmission case mating surface to the reduction drive gear end surface with ST1 and ST2.
ST1 398643600 GAUGE
ST2 499577000 GAUGE



B: Measured value

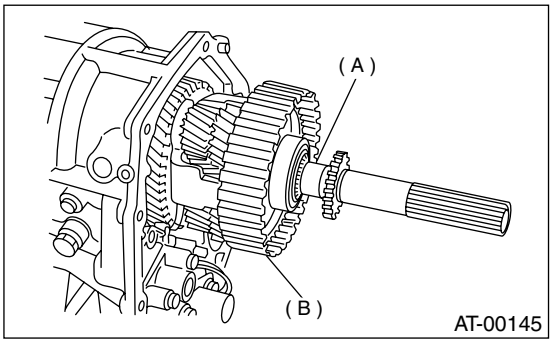
3) Calculation formula:

NOTE:
• Calculate “T”:
T = A – B + 35.4 mm
[T = A – B + 1.3937 in]
T: Thrust needle bearing thickness
A: Distance from end of extension case to end of rear drive shaft
B: Distance from end of transmission case to end of reduction drive gear
Example:
When, A = 33.6 mm (1.3228 in), B = 65.05 mm (2.5610 in)
T = 33.6 – 65.05 + 35.4 = 3.95
[T = 1.3228 – 2.5610 + 1.3937 = 0.1555]
After calculation, the value of “H” becomes 3.95, therefore select bearing thickness of 3.8.
• Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE, 499577000 GUAGE). When not using ST, apply
T = (A – α + 0.45 mm) – (B – β) – H
[T = (A – α + 0.0177 in) – (B – β) – H].
T: Thrust needle bearing thickness
A: Distance from end of extension case to end of reduction drive shaft
B: Distance from end of transmission case to end of rear drive shaft
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
H: Shim clearance

Thrust needle bearing	
Part No.	Thickness mm (in)
806536020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

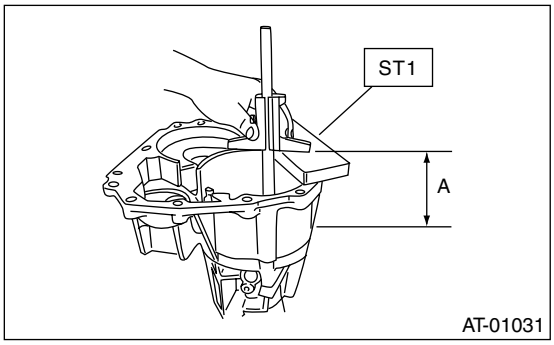
2. VTD MODEL

1) Insert the rear driveshaft into the reduction drive gear and center differential assembly.



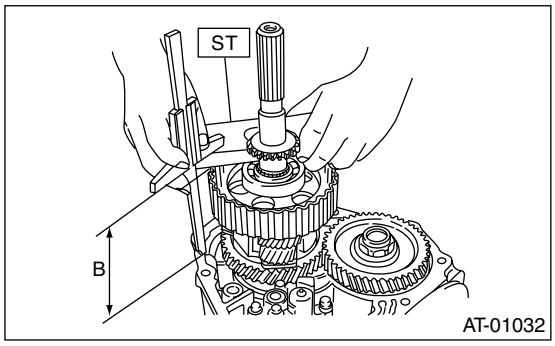
(A) Rear drive plate
(B) Center differential carrier

2) Using the special tool, measure the distance “A” between the mating surface of extension case and multi-plate clutch (LSD) piston.
ST 398643600 GAUGE



A: Measured value

3) Using the special tool, measure the distance “B” between the mating surface of transmission case and reduction drive gear edge.
ST 398643600 GAUGE



B: Measured value

4) Formula:

NOTE:
• Calculation of “T”:
When clearances are 0.05 mm (0.0020 in), select up to four adjusting shims from the table, suitable for clearance value.
When clearances are 0.05 mm (0.0020 in)
T = A – B + 0.40 mm
[T = A – B + 0.0157 in]
When clearances are 0.25 mm (0.0098 in)
T = A – B + 0.20 mm
[T = A – B + 0.0079 in]
T: Shim clearance
A: Distance between extension case edge and rear driveshaft edge
B: Distance between transmission case edge and reduction drive gear edge
T: Shim thickness
0.05 — 0.25 mm (0.0020 — 0.0098 in)
Example:
When, A = 90.50 mm (3.5630 in), B = 90.35 mm (3.5571 in)
Calculation for 0.05 mm (0.0020 in) of clearance
T = 90.50 – 90.35 + 0.4 = 0.55
[T = 3.5630 – 3.5571 + 0.0157 = 0.0216]
Calculation when clearance is 0.25 mm (0.0098 in)
T = 90.50 – 90.35 + 0.2 = 0.35
[T = 3.5630 – 3.5571 + 0.0079 = 0.0138]
• Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE). When not using ST, apply
T = (A – α + 0.45 mm) – (B – β) – H
[T = (A – α + 0.0177 in) – (B – β) – H].
T: Thrust needle bearing thickness
A: Distance from end of extension case to end of reduction drive shaft
B: Distance from end of transmission case to end of rear drive shaft
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
H: Shim clearance
After calculation, the value of “T” becomes between 0.35 mm (0.0138 in) and 0.55 mm (0.0216 in), therefore select two shims with thickness of 0.2 mm (0.010 in) or one shim with thickness of 0.5 mm (0.020 in).

Adjusting shim	
Part No.	Thickness mm (in)
33281AA001	0.2 (0.008)
33281AA011	0.5 (0.020)

30.Multi-plate Clutch

A: REMOVAL

Remove multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-90, REMOVAL.>

B: INSTALLATION

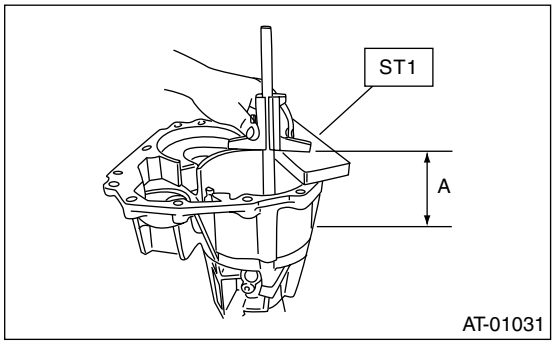
Install multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-90, INSTALLATION.>

C: INSPECTION

- Inspect drive plate facing for wear and damage.
- Make sure snap ring is not worn and return spring has no permanent distortion, damage, or deformation.
- Inspect D-ring for damage.
- Measure multi-plate clutch clearance and adjust it to within the specification range. <Ref. to 4AT-100, ADJUSTMENT.>

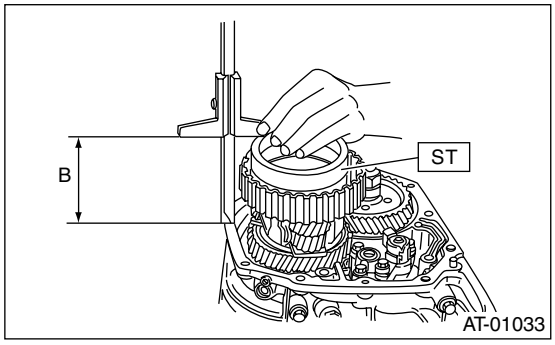
D: ADJUSTMENT

1) Remove drive plate and driven plate from center differential carrier.
2) Using the special tool, measure distance “A” from extension case joining surface to multi-plate clutch (LSD) piston.
ST 398643600 GAUGE



A: Measured value

3) Using ST, measure height “B” from transmission case joining edge to center differential clutch drum edge.
ST 398744300 GAUGE



B: Measured value

4) Calculation formula
$T = A - B + 0.45$ mm
[$T = A - B + 0.0177$ in]

NOTE:
- Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE, 398744300 GAUGE). When not using ST, apply
$T = (A - \alpha + 0.45\text{ mm}) - (B - \beta)$
[$T = (A - \alpha + 0.0177\text{ in}) - (B - \beta)$].
T: Thrust needle bearing thickness
A: Distance from end of extension case to end of reduction drive shaft
B: Distance from end of transmission case to end of rear drive shaft
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
- Measure multi-plate clutch (LSD) driven and drive plate thickness to find the clearance between measurement value and “T”.

Standard value:
0.2 — 0.6 mm (0.008 — 0.024 in)

Limit value:
0.9 mm (0.035 in)

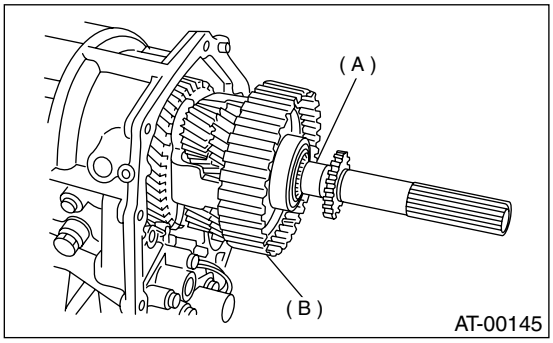
If outside the standard value, select a pressure plate that will bring clearance within the standard value.
If the clearance is above the limit, replace the drive plate with new one and adjust so that the clearance becomes within the standard value.

Pressure plates	
Part No.	Thickness mm (in)
31589AA041	1.6 (0.063)
31589AA050	2.0 (0.079)
31589AA060	2.4 (0.094)
31589AA070	2.8 (0.110)

31.Rear Drive Shaft

A: REMOVAL

1) Remove transmission assembly. <Ref. to 4AT-39, REMOVAL.>
2) Remove rear wheel speed sensor and separate extension case from transmission case. <Ref. to 4AT-90, REMOVAL.>
3) Pull out the rear driveshaft from the center differential assembly.



(A) Rear driveshaft
(B) Center differential carrier

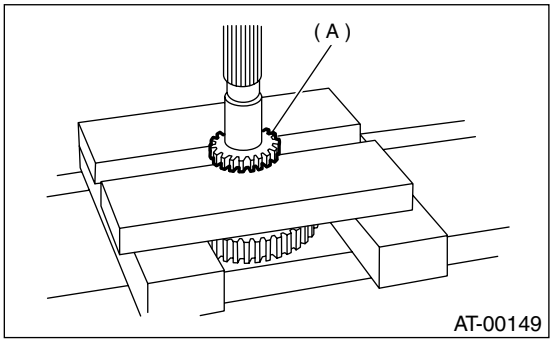
4) Remove drive plate and driven plate.

B: INSTALLATION

1) Select the appropriate shim. <Ref. to 4AT-98, VTD MODEL.>
2) Install drive plate and driven plate.
3) Insert rear driveshaft into the center differential assembly.
4) Join transmission case and extension case. Install rear wheel speed sensor. <Ref. to 4AT-90, INSTALLATION.>
5) Install transmission assembly. <Ref. to 4AT-42, INSTALLATION.>

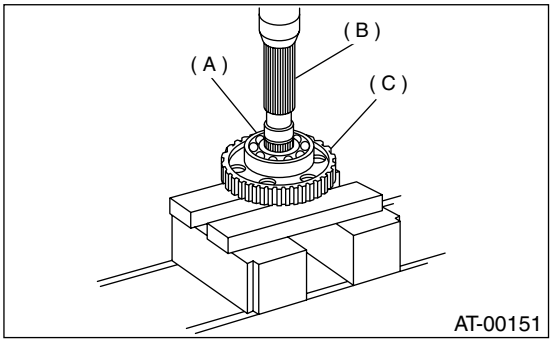
C: DISASSEMBLY

1) Using a press, remove revolution gear.



(A) Revolution gear

2) Using a press, remove the front and rear side ball bearings and clutch hub.

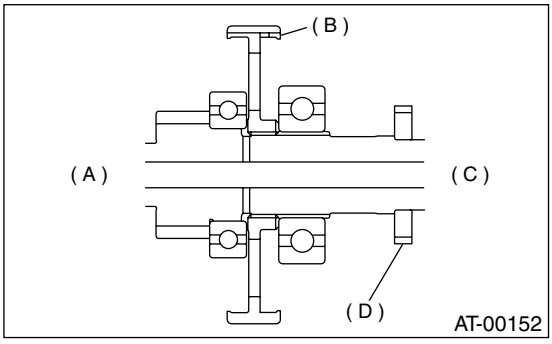


(A) Rear ball bearing
(B) Rear driveshaft
(C) Clutch hub

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
• Use a new revolution gear and ball bearings.
• Make sure the clutch hub is oriented in the correct direction.



(A) Front side
(B) Clutch hub
(C) Rear side
(D) Revolution gear

E: INSPECTION

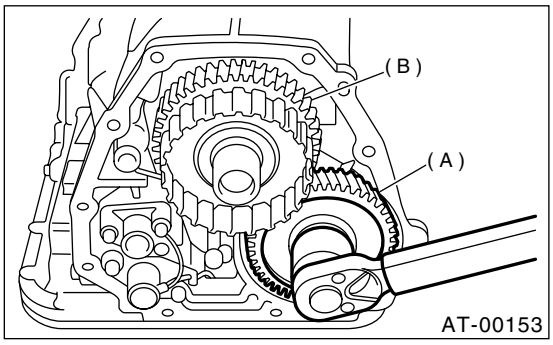
• Inspect parts to make sure there are no holes, cuts, and that they are not dusty.
• Inspect extension end play and adjust it to within the standard value. <Ref. to 4AT-98, VTD MODEL.>

32.Reduction Driven Gear

A: REMOVAL

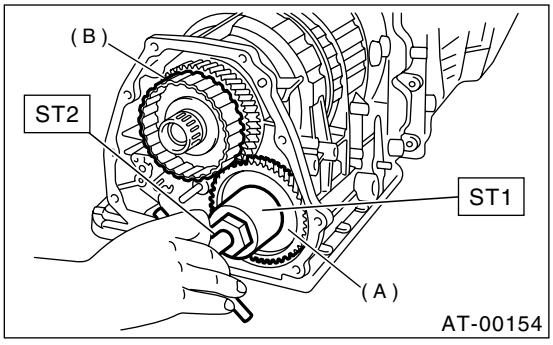
1. MPT MODEL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-90, REMOVAL.>
3) Set the range select lever to “P”.
4) Straighten the staked portion, and remove the lock nut.



(A) Reduction driven gear
(B) Reduction drive gear

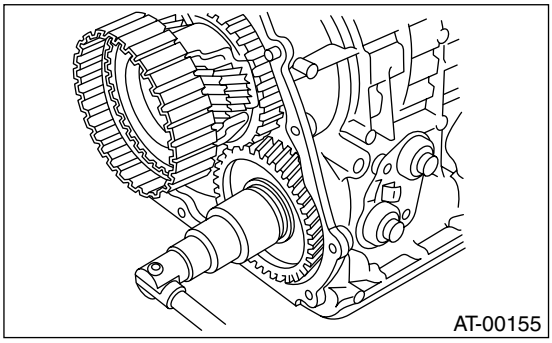
5) Using the ST1 and ST2, extract the reduction driven gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET



(A) Reduction driven gear
(B) Reduction drive gear

2. VTD MODEL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-90, REMOVAL.>
3) Remove the rear drive shaft. <Ref. to 4AT-101, REMOVAL.>
4) Set the range select lever to “P”.
5) Straighten the staked portion, and remove the lock nut.



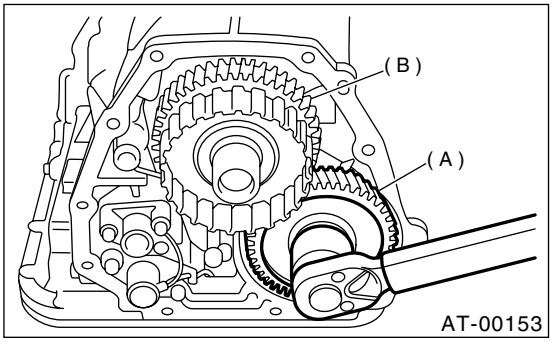
6) Using the ST1 and ST2, extract the reduction driven gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET
7) Pull out the center differential assembly. <Ref. to 4AT-106, REMOVAL.>

B: INSTALLATION

1. MPT MODEL

1) Set the select lever to “P” range.
2) Using a plastic hammer, install reduction driven gear assembly and new washer, and tighten new drive pinion lock nut.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)



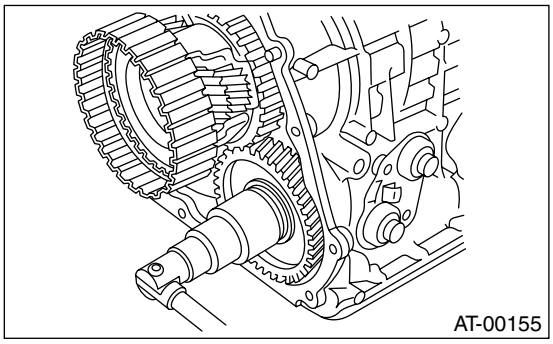
(A) Reduction driven gear
(B) Reduction drive gear

3) After tightening, stake the lock nut securely.
4) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-90, INSTALLATION.>
5) Install the transmission assembly to vehicle. <Ref. to 4AT-42, INSTALLATION.>

2. VTD MODEL

1) Set the select lever to “P” range.
2) Using a plastic hammer, install reduction driven gear assembly.
3) Using a plastic hammer, install the center differential assembly.
4) Install a new self-lock nut and a washer.

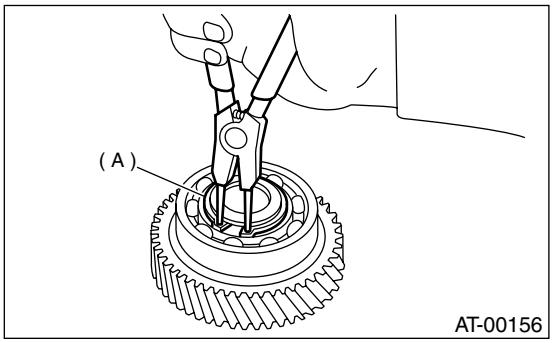
Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)



5) After tightening, stake the lock nut securely.
6) Insert the rear drive shaft assembly. <Ref. to 4AT-101, INSTALLATION.>
7) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-90, INSTALLATION.>
8) Install the transmission assembly to vehicle. <Ref. to 4AT-42, INSTALLATION.>

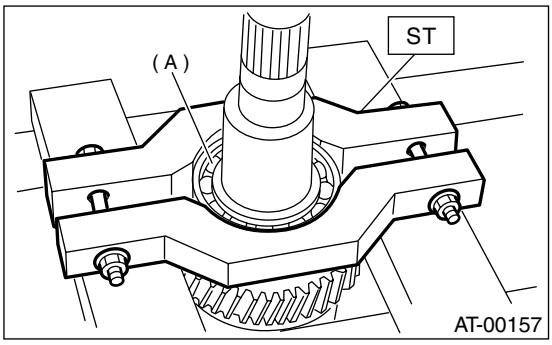
C: DISASSEMBLY

1) Remove snap ring from reduction driven gear.



(A) Snap ring

2) Using ST, remove ball bearing from reduction driven gear.
ST 498077600 REMOVER

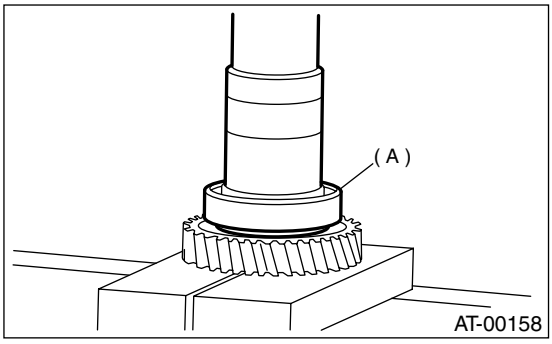


(A) Ball bearing

3) Remove snap ring reduction driven gear.

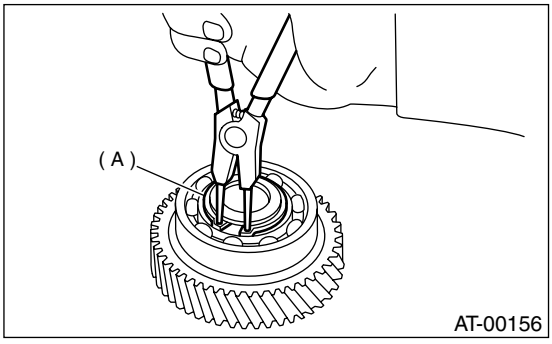
D: ASSEMBLY

1) Install snap ring to reduction driven gear.
2) Using a press, install a new ball bearing to reduction driven gear.



(A) Ball bearing

3) Install snap ring to reduction driven gear.



(A) Snap ring

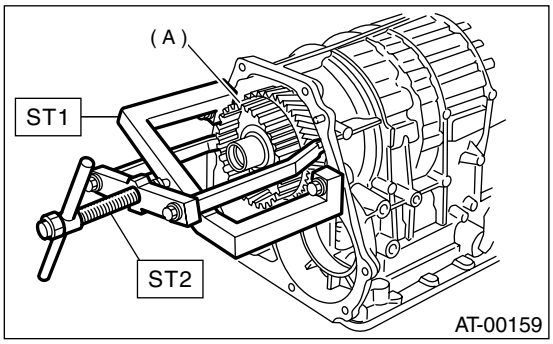
E: INSPECTION

Check ball bearing and gear for dents or damage.

33.Reduction Drive Gear

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-90, REMOVAL.>
3) Remove the reduction driven gear. <Ref. to 4AT-102, REMOVAL.>
4) Using ST, extract the reduction drive gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET

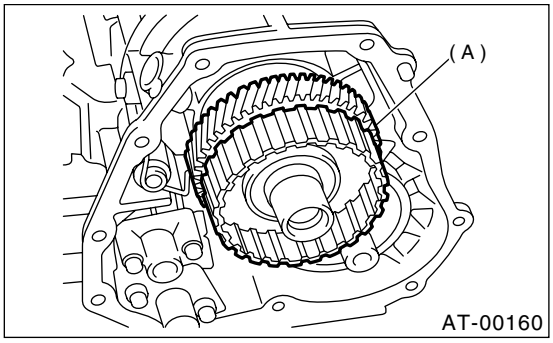


(A) Reduction drive gear

B: INSTALLATION

1) Install the reduction drive gear assembly.

NOTE:
Insert it fully into position until the bearing shoulder bottoms.

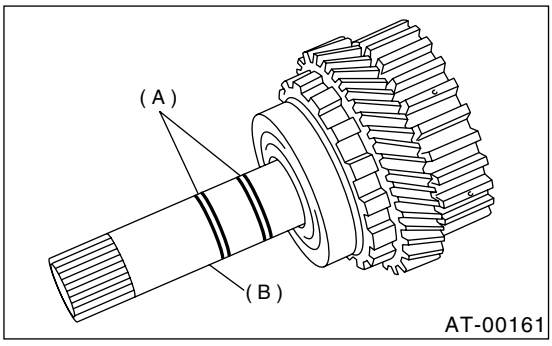


(A) Reduction drive gear

2) Install the reduction driven gear. <Ref. to 4AT-102, INSTALLATION.>
3) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-90, INSTALLATION.>
4) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

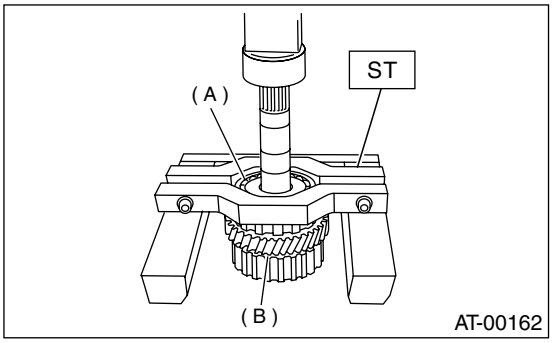
C: DISASSEMBLY

1) Take out the seal rings.



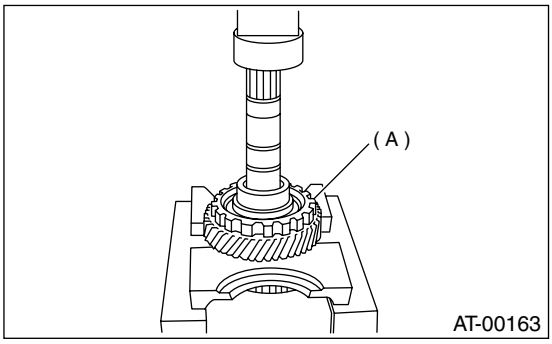
(A) Seal rings
(B) Reduction drive shaft

2) Using ST, remove the ball bearing.
ST 498077600 REMOVER



(A) Ball bearing
(B) Reduction drive gear

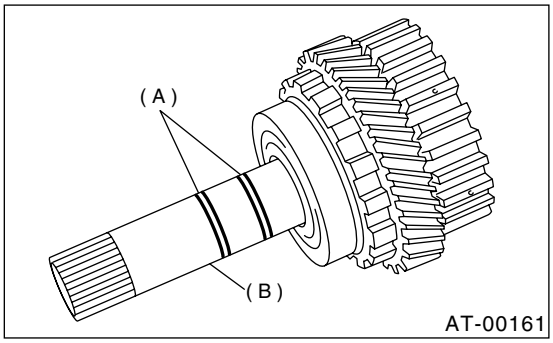
3) Using a press, remove the reduction drive gear.



(A) Reduction drive gear

D: ASSEMBLY

1) Press-fit the reduction drive gear to the shaft.
2) Press-fit a new ball bearing to the reduction drive gear.
3) Apply vaseline to the outer surface of seal ring and shaft groove.
4) Attach a new seal rings.



(A) Seal rings
(B) Reduction drive shaft

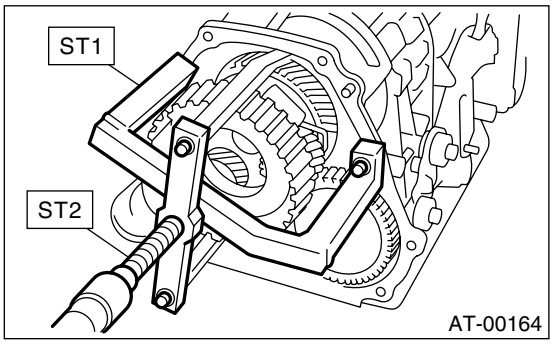
E: INSPECTION

- Rotate the bearing by hand, make sure it rotates smoothly.
- Make sure that each component is free of harmful gouges, cuts, or dust.
- Measure the extension end play and adjust it to within specifications.<Ref. to 4AT-97, ADJUSTMENT.>

34.Center Differential Carrier

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Remove the rear wheel speed sensor, and separate the extension case from the transmission case. <Ref. to 4AT-90, REMOVAL.>
3) Pull out the rear driveshaft. <Ref. to 4AT-101, REMOVAL.>
4) Using the special tools, pull out the center differential carrier assembly.
ST1 499737000 PULLER
ST2 899524100 PULLER SET

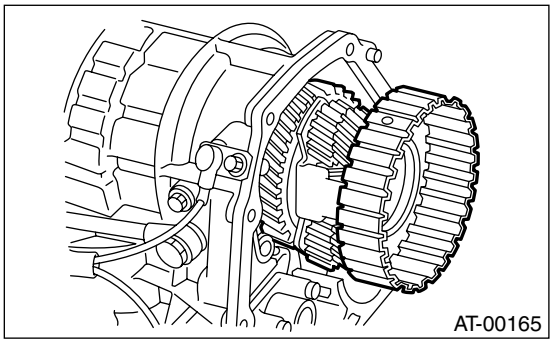


5) Pull out the shim(s) from transmission case.

B: INSTALLATION

1) Install the center differential assembly with the shim(s).

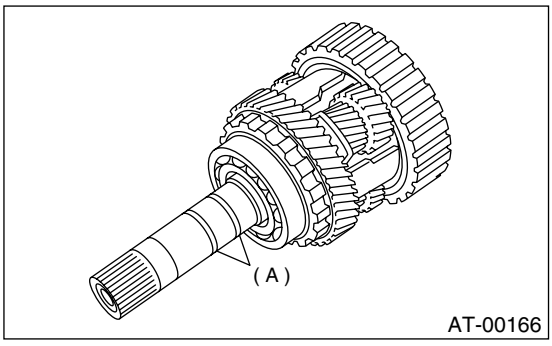
NOTE:
Insert the center differential assembly and shim(s) completely into the bearing shoulder bottom.



2) Insert the rear driveshaft. <Ref. to 4AT-101, INSTALLATION.>
3) Connect the transmission case and extension case, and install the rear wheel speed sensor. <Ref. to 4AT-90, INSTALLATION.>
4) Install the transmission assembly onto vehicle. <Ref. to 4AT-42, INSTALLATION.>

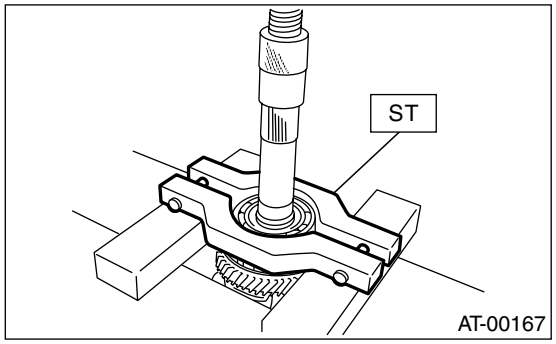
C: DISASSEMBLY

1) Remove the seal rings.

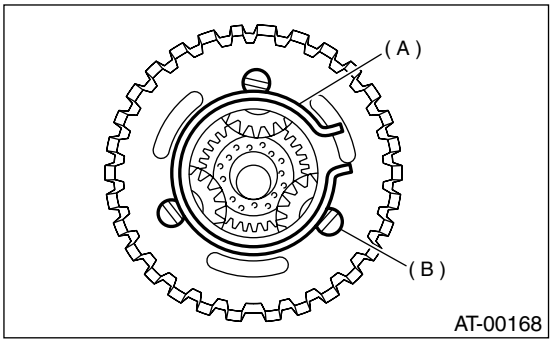


(A) Seal ring

2) Using a press and the ST, remove the ball bearing.
ST 498077600 REMOVER

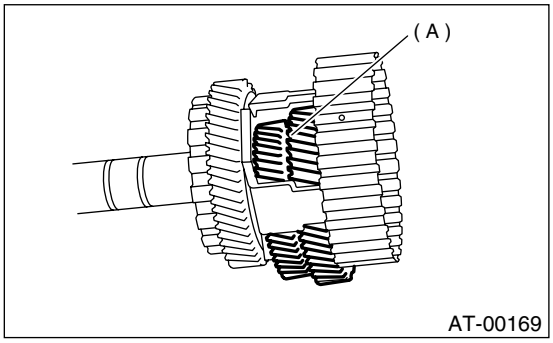


3) Remove the snap ring, and pull out the shaft from the center differential assembly.



(A) Snap ring
(B) Shaft

4) Remove the thrust washers, pinion gears, and washers from the center differential assembly.

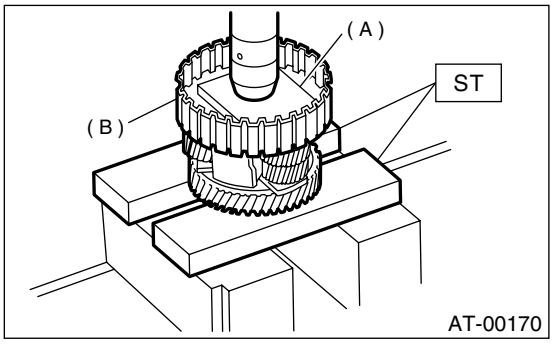


(A) Pinion gear

5) Pull out the intermediate shaft and thrust bearing.

D: ASSEMBLY

1) Install the thrust washer onto the intermediate shaft.
2) Install thrust bearing onto the intermediate shaft.
3) Install the pinion gears and washers.
4) Insert the shaft into the center differential assembly.
5) Install the snap ring.
6) Using a press, install a new ball bearing into the center differential assembly.
ST 498077000 REMOVER



(A) Plate
(B) Center differential carrier

7) Apply Vaseline onto the seal ring outer surface and shaft grooves.
8) Install new seal rings.

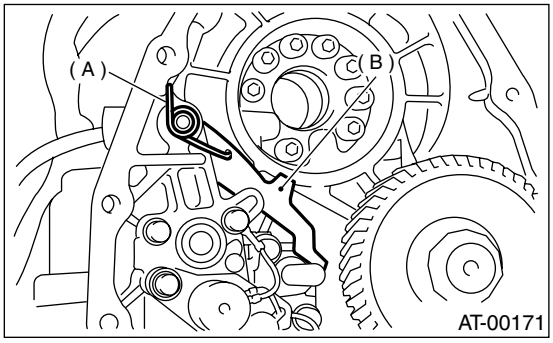
E: INSPECTION

- Check all parts for hole, score, or dirt.
- Check the play of the extension end, and if necessary, adjust it. <Ref. to 4AT-98, VTD MODEL.>

35.Parking Pawl

A: REMOVAL

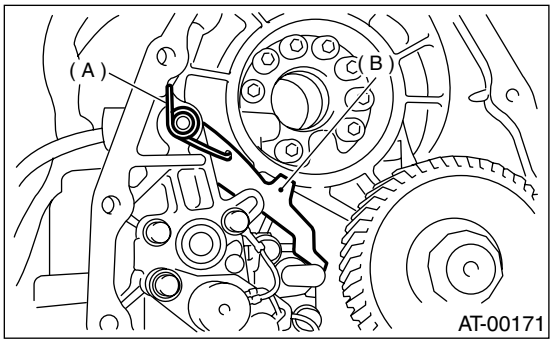
1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Remove rear vehicle speed sensor and separate transmission case and extension case sections. <Ref. to 4AT-90, REMOVAL.>
3) Remove the reduction drive gear. (MPT model) <Ref. to 4AT-104, REMOVAL.>
4) Remove the center differential carrier. (VTD model) <Ref. to 4AT-106, REMOVAL.>
5) Remove the parking pawl, return spring and shaft.



(A) Return spring
(B) Parking pawl

B: INSTALLATION

1) Install the parking pawl, shaft and return spring.



(A) Return spring
(B) Parking pawl

2) Install the reduction drive gear. <Ref. to 4AT-104, INSTALLATION.>
3) Install the center differential carrier. (VTD model) <Ref. to 4AT-106, INSTALLATION.>
4) Install the rear vehicle speed sensor and extension case. <Ref. to 4AT-90, INSTALLATION.>
5) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

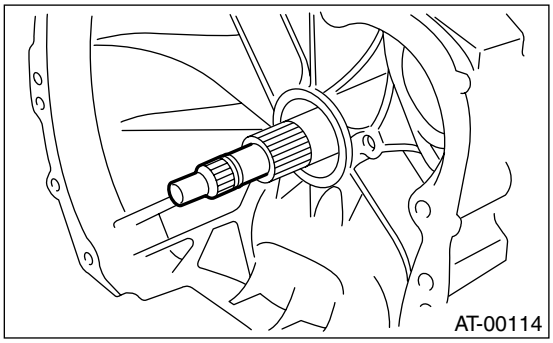
C: INSPECTION

Make sure that the tab of the packing pole on the reduction gear is not worn or otherwise damaged.

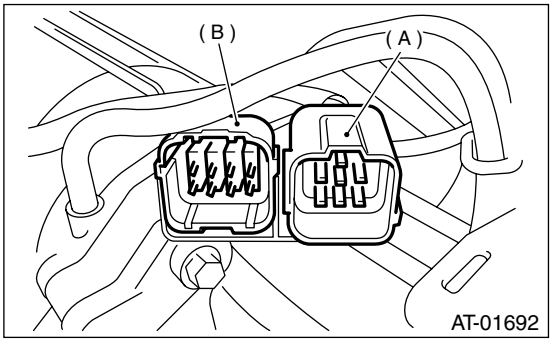
36.Torque Converter Clutch Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-89, REMOVAL.>
3) Remove the input shaft.



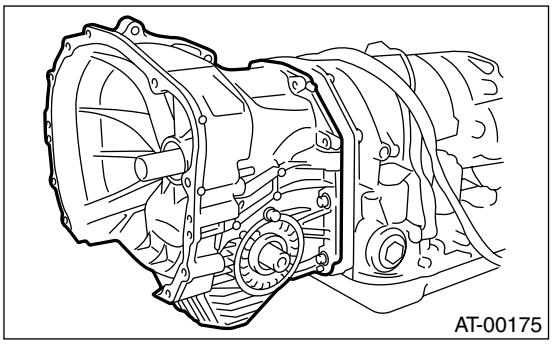
4) Lift-up lever behind the connector and disconnect it from stay.
5) Disconnect inhibitor switch connector from stay.



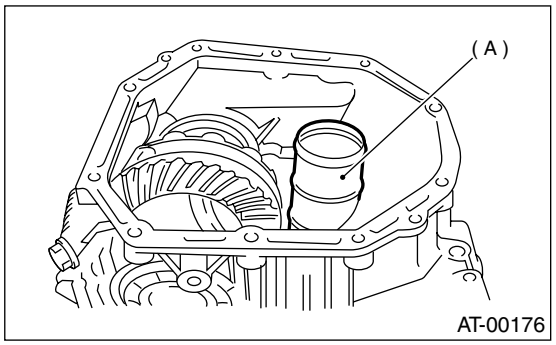
(A) Transmission harness
(B) Inhibitor switch harness

6) Remove the oil charger pipe. <Ref. to 4AT-88, REMOVAL.>
7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-82, REMOVAL.>
8) Lightly tapping the torque converter clutch case with plastic hammer, separate the transmission case and torque converter clutch case.

NOTE:
• Be careful not to damage the oil seal and bushing inside the torque converter clutch case by the oil pump cover.
• Be careful not to lose the rubber seal.



9) Remove the seal pipe if it is attached. (Reusing is not allowed.)

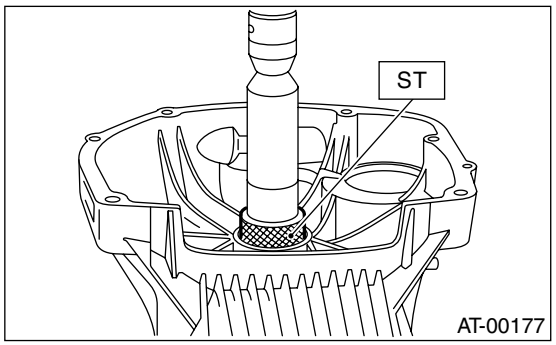


(A) Seal pipe

10) Remove the differential assembly. <Ref. to 4AT-121, REMOVAL.>
11) Remove the oil seal from torque converter clutch case.

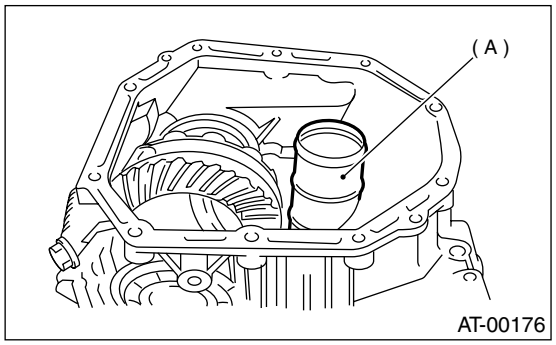
B: INSTALLATION

1) Check the appearance of each component and clean.
2) Force-fit the oil seal to the torque converter clutch case with ST.
ST 398437700 DRIFT



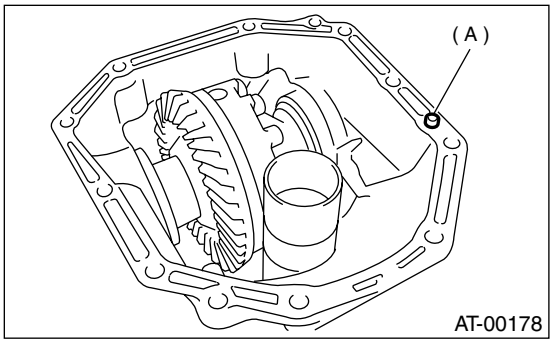
3) Install the differential assembly to the case. <Ref. to 4AT-121, INSTALLATION.>
4) Install the left and right side retainers. <Ref. to 4AT-125, ADJUSTMENT.>

5) Install the new seal pipe to the torque converter clutch case.



(A) Seal pipe

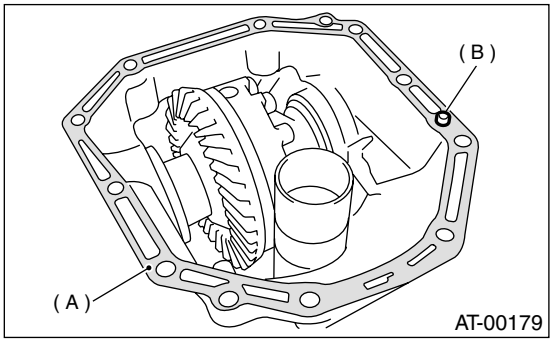
6) Install the rubber seal to the torque converter clutch case.



(A) Rubber seal

7) Apply proper amount of liquid gasket to the entire torque converter clutch case mating surface.

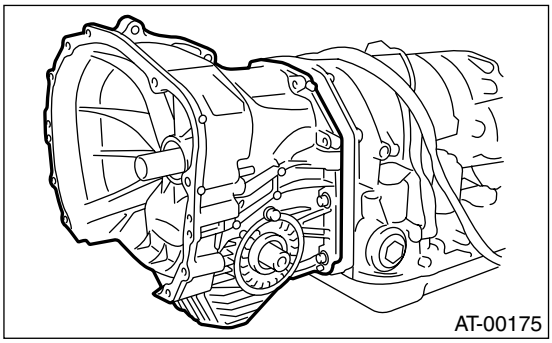
Liquid gasket:
THREE BOND 1215 (Part No. 004403007)



(A) THREE BOND 1215
(B) Rubber seal

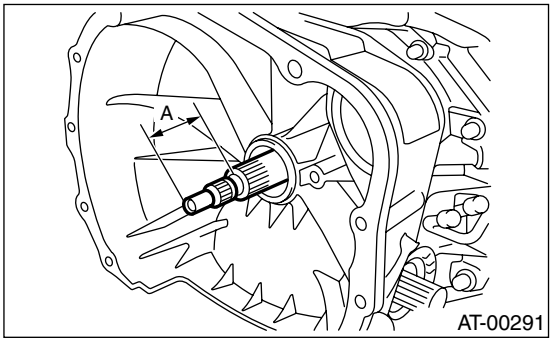
8) Install the torque converter clutch case assembly without damaging bush and oil seal and secure with six bolts and four nuts.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



9) Insert inhibitor switch and transmission connector into stay.
10) Install air breather hose. <Ref. to 4AT-87, INSTALLATION.>
11) Install the oil cooler pipes. <Ref. to 4AT-84, INSTALLATION.>
12) Install the oil charger pipe with O-ring. <Ref. to 4AT-88, INSTALLATION.>
13) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



14) Install the torque converter clutch assembly. <Ref. to 4AT-89, INSTALLATION.>
15) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

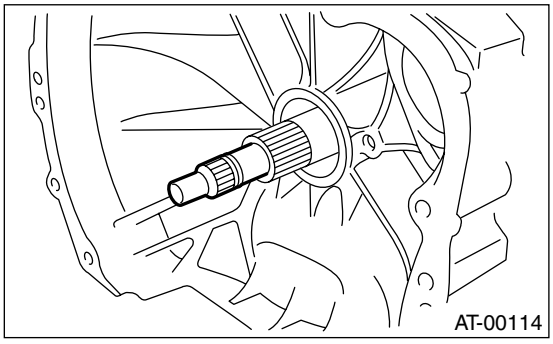
C: INSPECTION

Measure the backlash and adjust to within specifications. <Ref. to 4AT-118, ADJUSTMENT.>

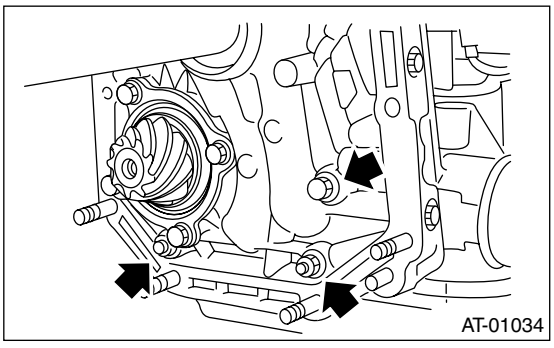
37.Oil Pump Housing

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-89, REMOVAL.>
3) Remove the input shaft.

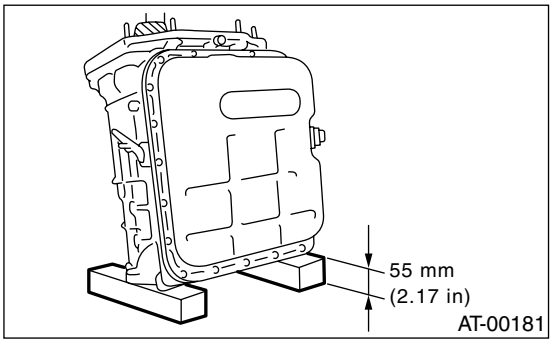


4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Remove the oil charger pipe. <Ref. to 4AT-88, REMOVAL.>
7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-82, REMOVAL.>
8) Separate the torque converter clutch case and transmission case sections. <Ref. to 4AT-109, REMOVAL.>
9) Separate the transmission case and extension case sections. <Ref. to 4AT-90, REMOVAL.>
10) Remove the reduction drive gear. (MPT model) <Ref. to 4AT-104, REMOVAL.>
11) Remove the center differential carrier. (VTD model) <Ref. to 4AT-106, REMOVAL.>
12) Remove the reduction driven gear. <Ref. to 4AT-102, REMOVAL.>
13) Loosen the oil pump housing mounting bolts.

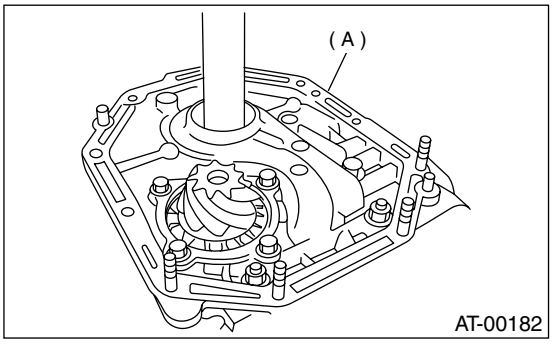


14) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

NOTE:
• Be careful not to scratch the rear mating surface of the transmission case.
• Note that the parking rod and drive pinion protrude from the mating surface.



15) Remove the oil pump housing and adjusting thrust washer.

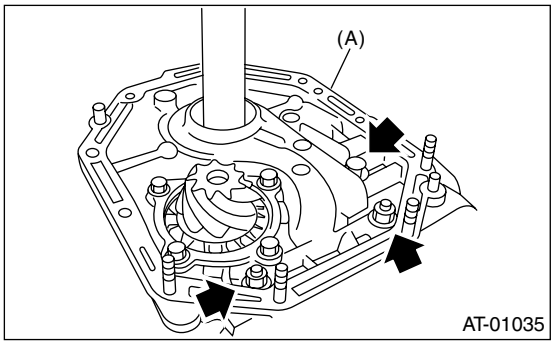


(A) Oil pump housing

B: INSTALLATION

1) Secure the oil pump housing with two nuts and the bolt.

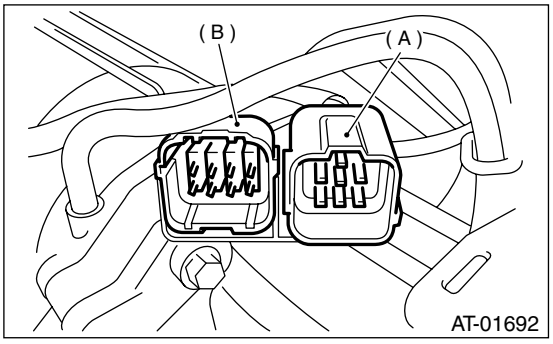
Tightening torque:
42 N·m (4.3 kgf-m, 31 ft-lb)



(A) Oil pump housing

2) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to 4AT-89, INSTALLATION.>
3) Install reduction driven gear. <Ref. to 4AT-102, INSTALLATION.>

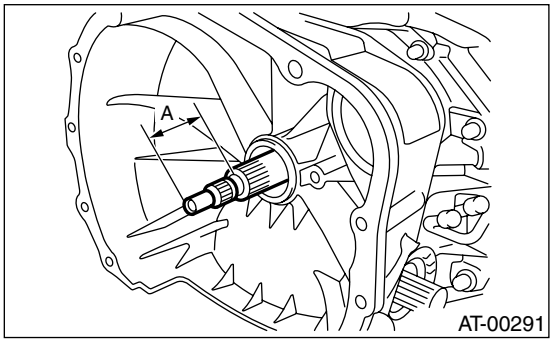
4) Install the reduction drive gear. (MPT model) <Ref. to 4AT-104, INSTALLATION.>
5) Install the center differential carrier. (VTD model) <Ref. to 4AT-106, INSTALLATION.>
6) Combine the extension case with the transmission case, and install vehicle speed sensor 1 (rear). <Ref. to 4AT-90, INSTALLATION.>
7) Insert inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

8) Install the oil cooler pipe. <Ref. to 4AT-84, INSTALLATION.>
9) Install the oil charger pipe with O-ring. <Ref. to 4AT-88, INSTALLATION.>
10) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

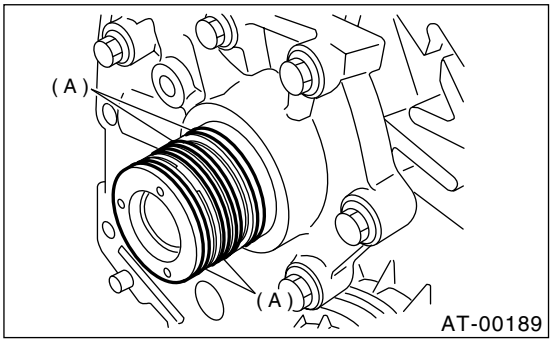


11) Install the torque converter clutch assembly. <Ref. to 4AT-89, INSTALLATION.>
12) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

C: DISASSEMBLY

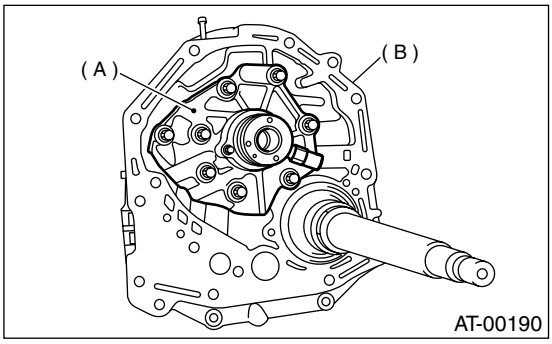
1. OIL PUMP COVER

1) Remove four seal rings.



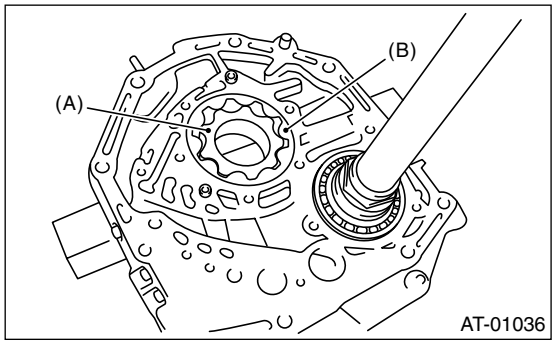
(A) Seal rings

2) Lightly tap the end of the stator shaft to remove the cover.



(A) Oil pump cover
(B) Oil pump housing

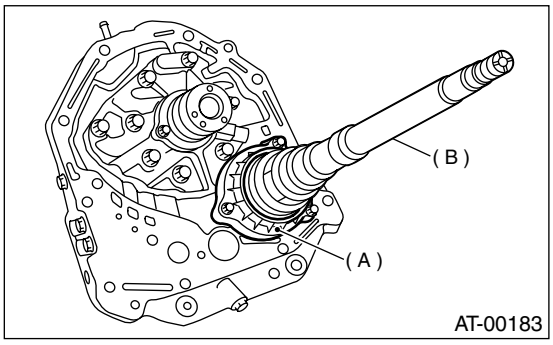
3) Remove the inner and outer rotor.



(A) Inner rotor
(B) Outer rotor

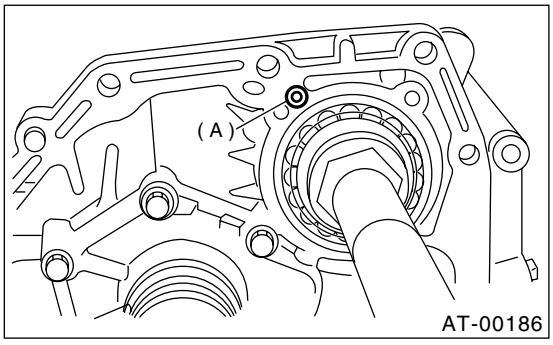
2. OIL SEAL RETAINER

1) Remove the oil seal retainer.



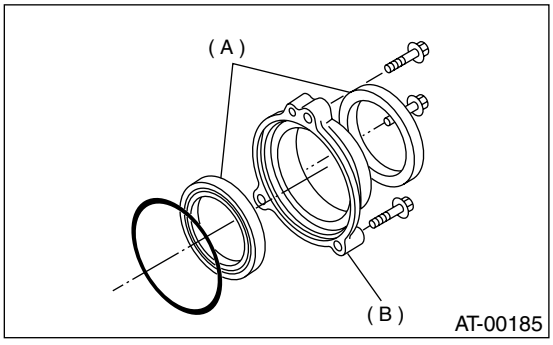
(A) Oil seal retainer
(B) Drive pinion shaft

2) Remove the O-ring.



(A) O-ring

3) Remove the oil seal from oil seal retainer.

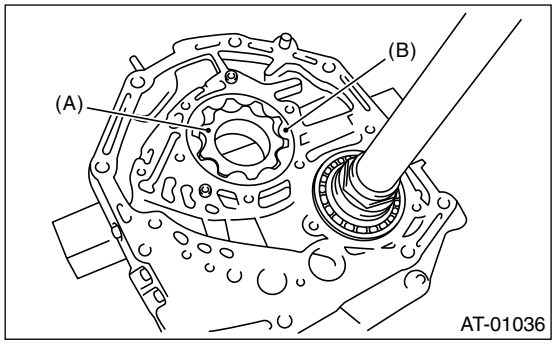


(A) Oil seal
(B) Oil seal retainer

D: ASSEMBLY

1. OIL PUMP COVER

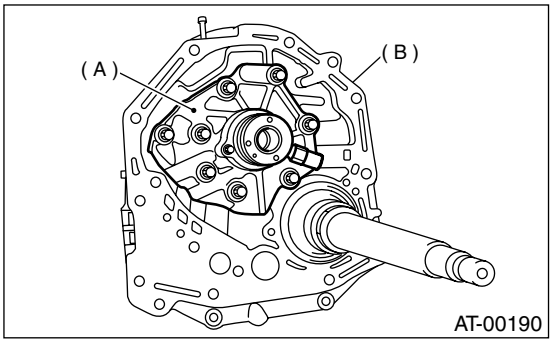
1) Install oil pump rotor assembly to oil pump housing.



(A) Inner rotor
(B) Outer rotor

2) Align both pivots with the pivot holes of the cover, and install the oil pump cover being careful not to apply undue force to the pivots.

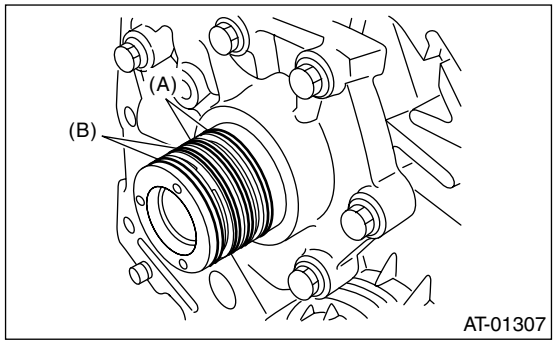
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pump cover
(B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.

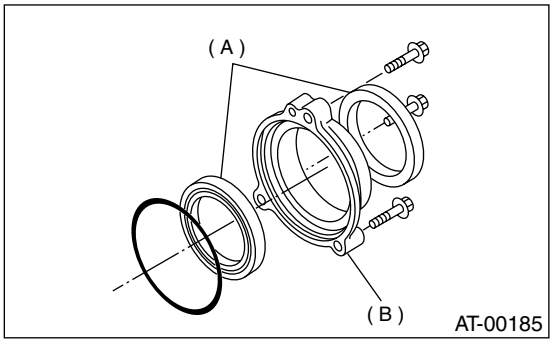
4) Install the oil seal retainer and new seal rings. After adjusting the drive pinion backlash and tooth contact.



(A) Seal rings (Black)
(B) Seal rings (Brown)

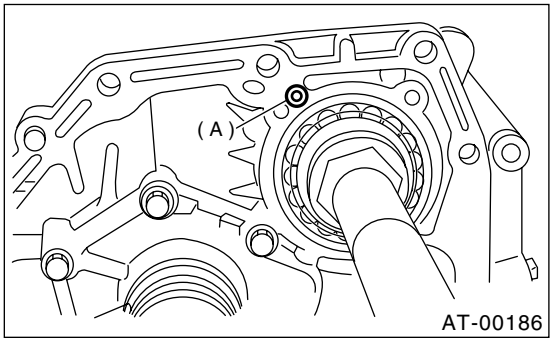
2. OIL SEAL RETAINER

1) Install two new oil seals to the oil seal retainer in proper position using ST.
ST 499247300 INSTALLER



(A) Oil seal
(B) Oil seal retainer

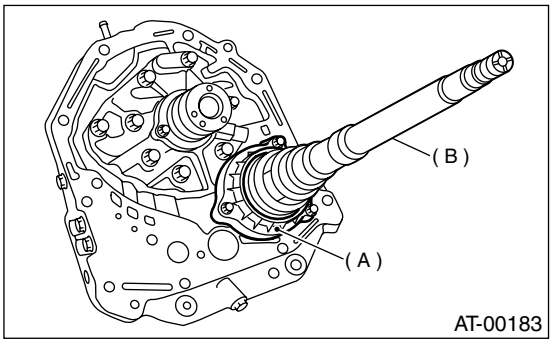
2) Install a new O-ring to the oil seal retainer using vaseline. Install the seal to oil pump housing bore.



(A) O-ring

3) Install the oil seal and secure it using three bolts being careful not to damage oil seal lip.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

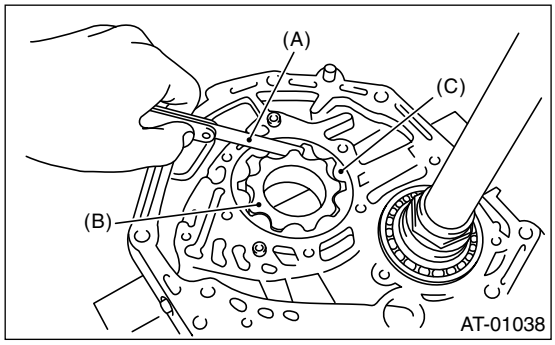


(A) Oil seal retainer
(B) Drive pinion shaft

E: INSPECTION

1) Check seal ring and O-ring oil seal for breaks or damage.
2) Check other parts for dents or abnormalities.
3) Selection of oil pump rotor assembly
(1) Tip clearance
Install inner rotor and outer rotor to oil pump. With rotor gears facing each other, measure crest-to-crest clearance.

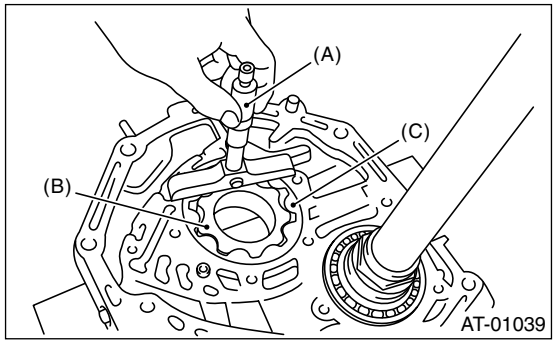
Tip clearance:
0.02 — 0.15 mm (0.0008 — 0.0059 in)



(A) Thickness gauge
(B) Inner rotor
(C) Outer rotor

(2) Side clearance
Set a depth gauge to oil pump housing, then measure oil pump housing-to-rotor clearances.

Side clearance:
0.02 — 0.04 mm (0.0008 — 0.0016 in)



(A) Depth gauge
(B) Inner rotor
(C) Outer rotor

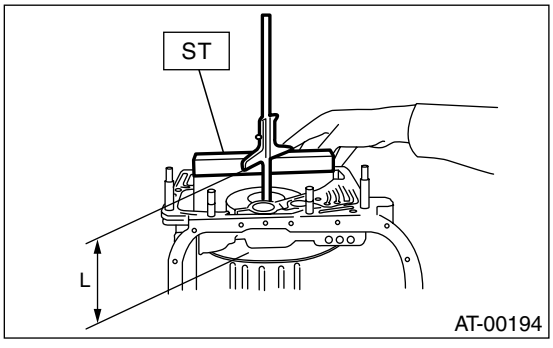
(3) If depth and/or side clearances are outside specifications, replace rotor assembly.

Oil pump rotor assembly	
Part No.	Thickness mm (in)
15008AA060	11.37 — 11.38 (0.4476 — 0.4480)
15008AA070	11.38 — 11.39 (0.4480 — 0.4484)
15008AA080	11.39 — 11.40 (0.4484 — 0.4488)

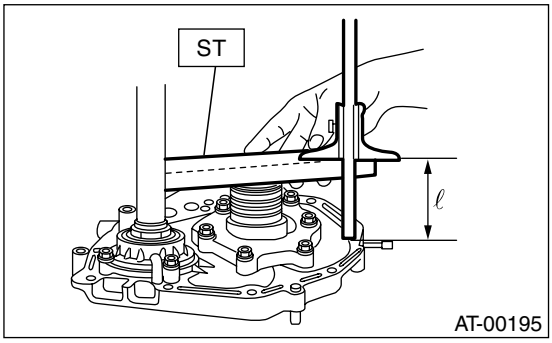
Measure the total end play and adjust to within specifications. <Ref. to 4AT-115, ADJUSTMENT, Oil Pump Housing.>

F: ADJUSTMENT

1) Using ST, measure the distance from the transmission case mating surface to the recessed portion of the high clutch drum “L”.
ST 398643600 GAUGE

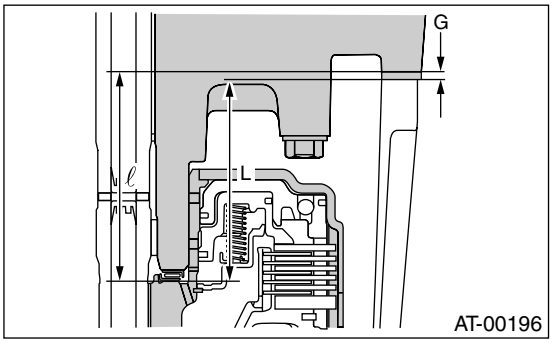


2) Using ST, measure the distance from the oil pump housing mating surface to the top surface of the oil pump cover with thrust needle bearing.
ST 398643600 GAUGE



3) Calculation of total end play
Select suitable bearing race from among those listed in this table so that clearance C is in the 0.25 to 0.55 mm (0.0098 to 0.0217 in) range.
C = (L + G) − ℓ

C	Clearance between concave portion of high clutch and end of clutch drum support
L	Length from case mating surface to concave portion of high clutch
G	Gasket thickness [0.28 mm (0.0110 in)]
ℓ	Height from housing mating surface to upper surface of clutch drum support



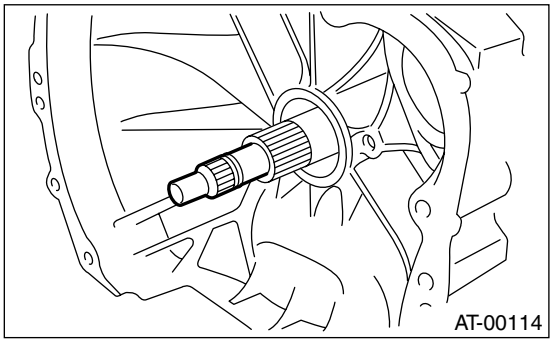
Thrust needle bearing	
Part No.	Thickness mm (in)
806528050	4.1 (0.161)
806528060	4.3 (0.169)
806528070	4.5 (0.177)
806528080	4.7 (0.185)
806528090	4.9 (0.193)
806528100	5.1 (0.201)

4) After completing end play adjustment, insert the bearing race in the recess of the high clutch. Attach the thrust needle bearing to the oil pump cover with vaseline.
5) After correctly installing the new gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of the case.
6) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

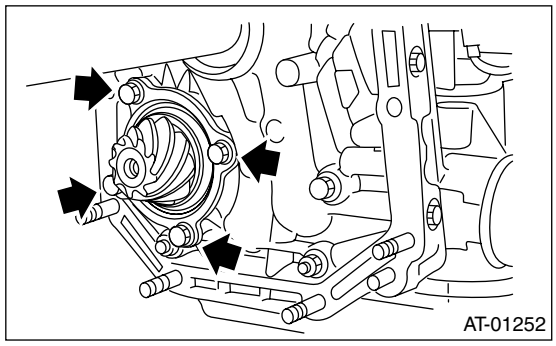
38.Drive Pinion Shaft

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-89, REMOVAL.>
3) Remove the input shaft.



4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose. <Ref. to 4AT-87, REMOVAL.>
7) Remove the oil charger pipe. <Ref. to 4AT-88, REMOVAL.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-82, REMOVAL.>
9) Separate the torque converter clutch case and transmission case sections. <Ref. to 4AT-109, REMOVAL.>
10) Separate the transmission case and extension case sections. <Ref. to 4AT-90, REMOVAL.>
11) Remove the reduction drive gear. (MPT model) <Ref. to 4AT-104, REMOVAL.>
12) Remove the center differential carrier. (VTD model) <Ref. to 4AT-106, REMOVAL.>
13) Remove the reduction driven gear.
<Ref. to 4AT-102, REMOVAL.>
14) Remove the drive pinion shaft mounting bolt and remove the drive shaft assembly from oil pump housing.

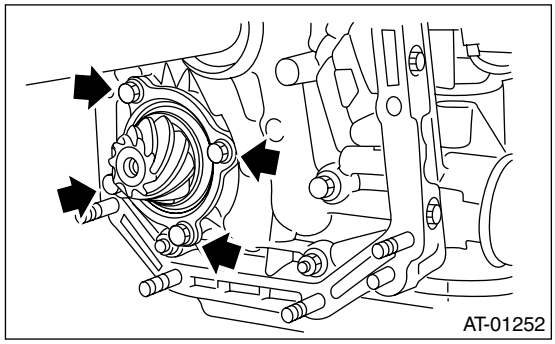


B: INSTALLATION

1) Assemble the drive pinion assembly to the oil pump housing.

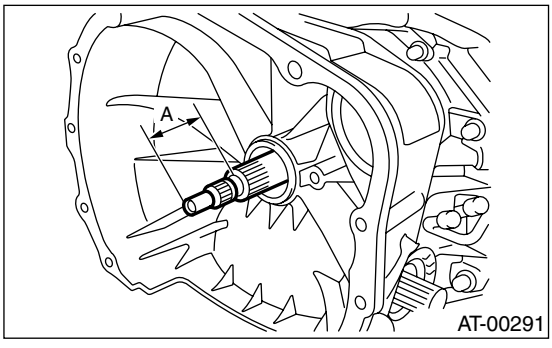
NOTE:
- Pay attention not to bend the shim.
- Pay attention not to press the pinion into housing bore.

Tightening torque:
40 N·m (4.0 kgf-m, 30 ft-lb)



2) Combine the torque converter case with the transmission case. <Ref. to 4AT-109, INSTALLATION.>
3) Install the reduction driven gear.
<Ref. to 4AT-102, INSTALLATION.>
4) Install the reduction drive gear. (MPT model) <Ref. to 4AT-104, INSTALLATION.>
5) Install the center differential carrier. (VTD model) <Ref. to 4AT-106, INSTALLATION.>
6) Combine the extension case with the transmission case, and install vehicle speed sensor 1 (rear). <Ref. to 4AT-90, INSTALLATION.>
7) Insert inhibitor switch and transmission connector into stay.
8) Install the oil cooler inlet and outlet pipes. <Ref. to 4AT-84, INSTALLATION.>
9) Install the oil charger pipe with O-ring.
10) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

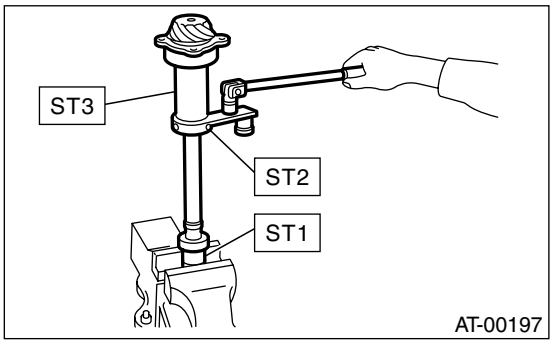


11) Install the torque converter clutch assembly. <Ref. to 4AT-89, INSTALLATION.>

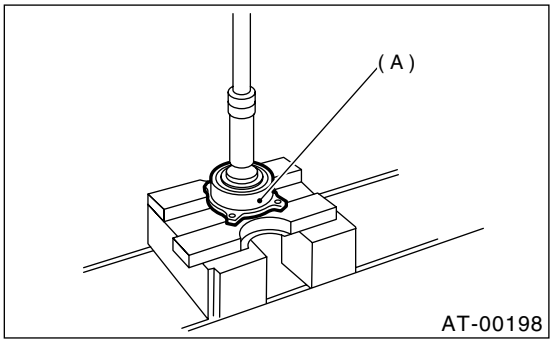
12) Install the transmission assembly to vehicle. <Ref. to 4AT-42, INSTALLATION.>

C: DISASSEMBLY

1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft with ST1 and ST2. Then pull off the drive pinion collar.
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

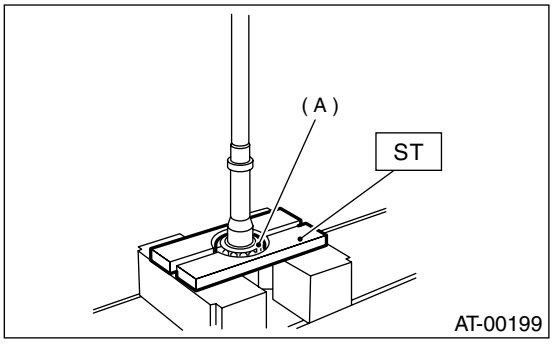


2) Remove the O-ring.
3) Using a press, separate the rear roller bearing and outer race from the shaft.



(A) Outer race

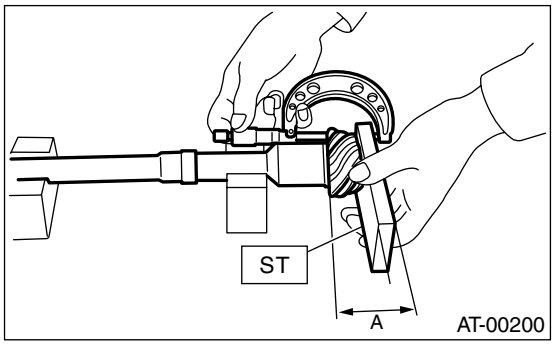
4) Using a press and ST, separate the front roller bearing from the shaft.
ST 498517000 REPLACER



(A) Front roller bearing

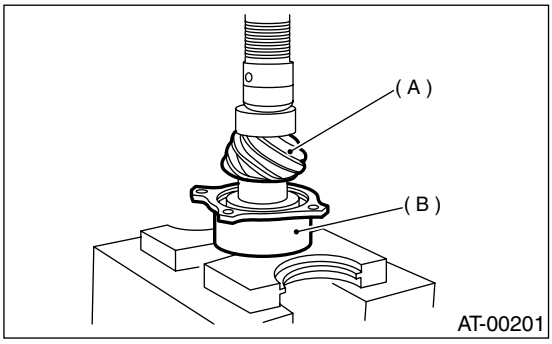
D: ASSEMBLY

1) Measure dimension “A” of the drive pinion shaft.
ST 398643600 GAUGE



2) Using a press, force-fit a new roller bearing in position.

NOTE:
If too much pressure is applied, the roller bearing will not turn easily.



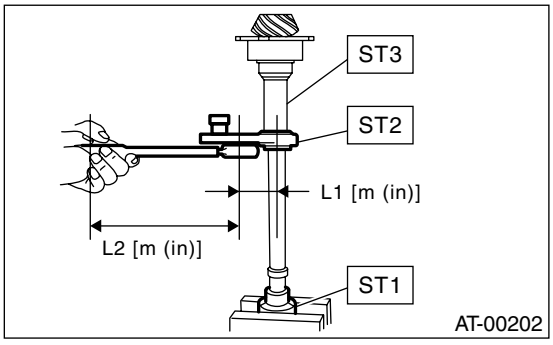
(A) Drive pinion shaft
(B) Roller bearing

3) After fitting a new O-ring to the shaft, attach the drive pinion collar to the shaft.
4) Install the lock washer to drive pinion shaft in proper direction.
5) Tighten a new lock nut with ST1, ST2 and ST3.
Calculate lock washer and lock nut specifications using the following formula.
$T2 = L2/(L1 + L2) \times T1$
T1: 116 N·m (11.8 kgf-m, 85.3 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST2 length 0.072 m (2.83 in)
L2: Torque wrench length
Example:

Torque wrench length m (in)	Tightening torque 2 (kgf-m, ft-lb)
0.4 (15.75)	98 (10.0, 72)
0.45 (17.72)	100 (10.2, 73.8)
0.5 (19.69)	101 (10.3, 74.5)
0.55 (21.65)	102 (10.4, 75)

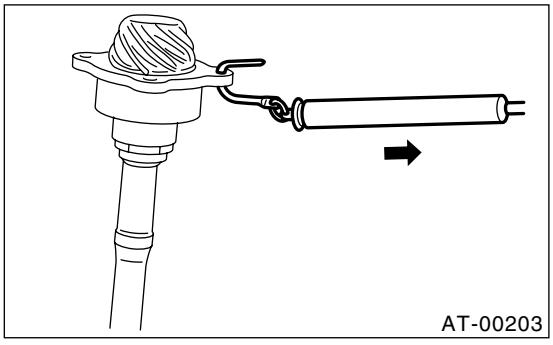
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

NOTE:
Install ST2 and torque wrench as straight as possible.

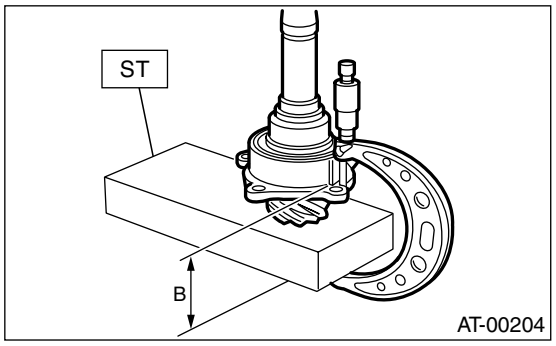


6) Measure the starting torque of the bearing. Make sure the starting torque is within the specified range. If out of the allowable range, replace the roller bearing.

Starting torque:
7.6 — 38.1 N (0.776 — 3.88 kgf, 1.7 — 8.6 lb)



7) Stake the lock nut securely at two places.
8) Measure dimension “B” of the drive pinion shaft.
ST 398643600 GAUGE



9) The thickness “t” (mm) of the drive pinion shim.
t = 6.5±0.0625 − (B − A)

10) Select three or less shims from following table.

Available drive pinion shims	
Part No.	Thickness mm (in)
31451AA050	0.150 (0.0059)
31451AA060	0.175 (0.0069)
31451AA070	0.200 (0.0079)
31451AA080	0.225 (0.0089)
31451AA090	0.250 (0.0098)
31451AA100	0.275 (0.0108)

E: INSPECTION

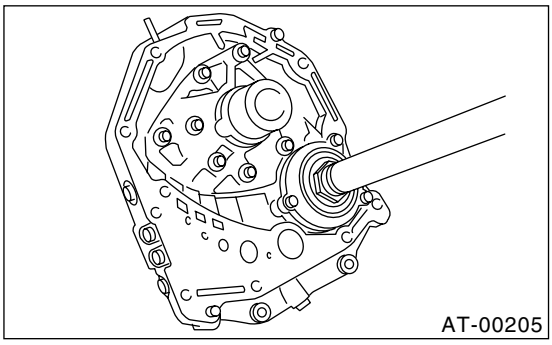
• Make sure that all component parts are free of harmful cuts, gouges, and other faults.
• Adjust the teeth alignment. <Ref. to 4AT-118, ADJUSTMENT.>

F: ADJUSTMENT

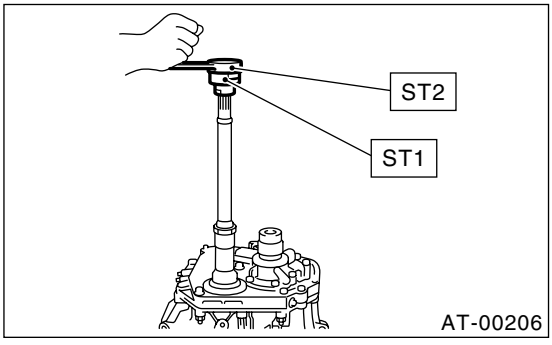
1) Thoroughly remove the liquid gasket from the case mating surface beforehand.
2) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



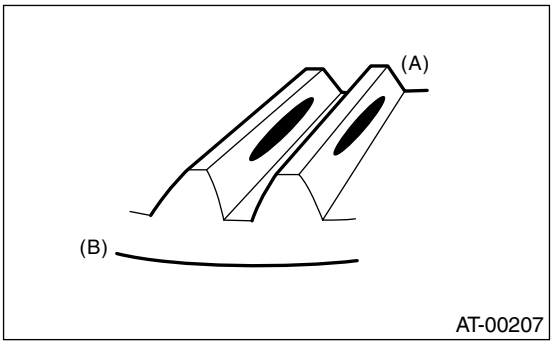
3) Rotate the drive pinion several times with ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH



4) Adjust the backlash between drive pinion and crown gear. <Ref. to 4AT-125, ADJUSTMENT.>
5) Apply red lead evenly to the surfaces of three or four teeth of the crown gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.
If tooth contact is improper, readjust the backlash or shim thickness.<Ref. to 4AT-125, ADJUSTMENT.>

• Tooth contact

Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]

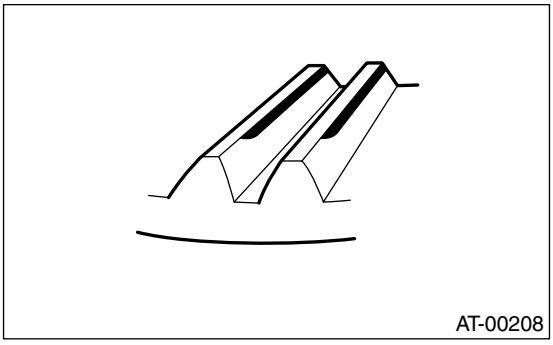


(A) Toe side
(B) Heel side

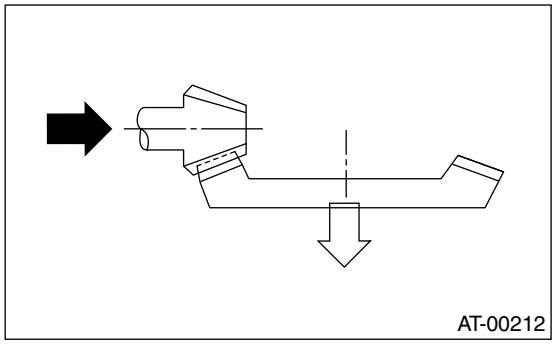
• Face contact

Checking item: Backlash is too large.

Contact pattern



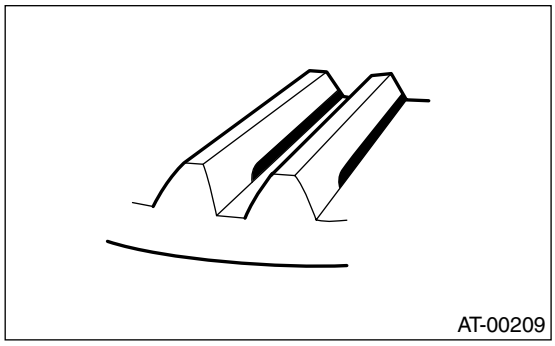
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



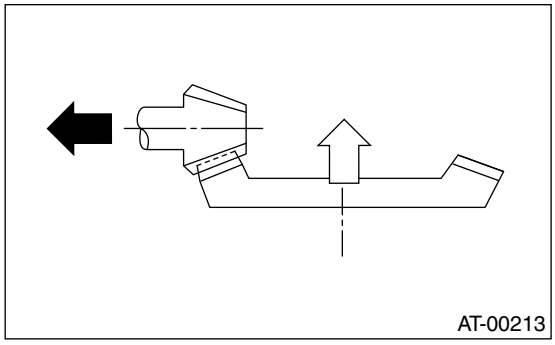
• Flank contact

Checking item: Backlash is too small.

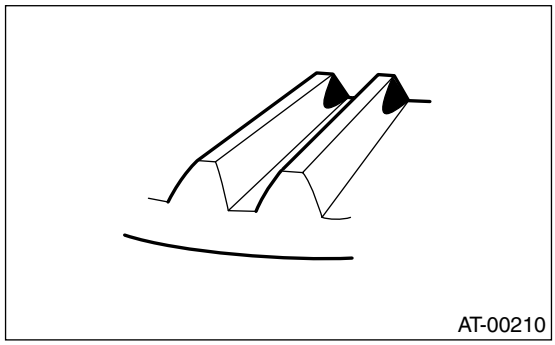
Contact pattern



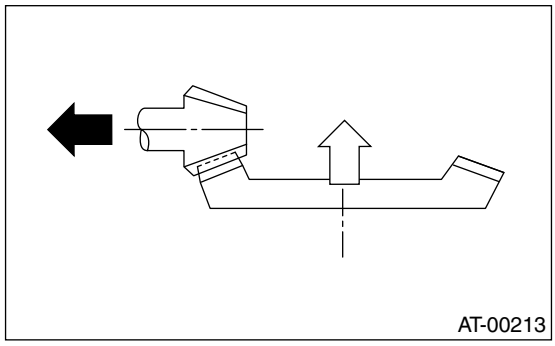
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



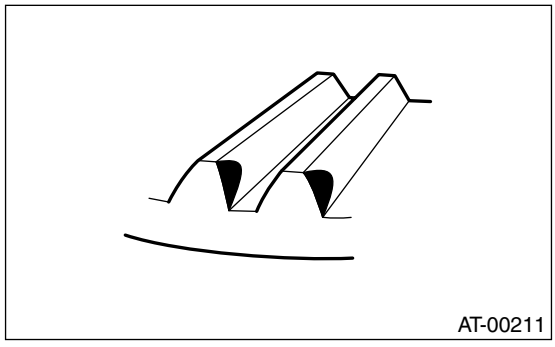
• Toe contact (Inside end contact)
Checking item: Contact areas is small.
Contact pattern



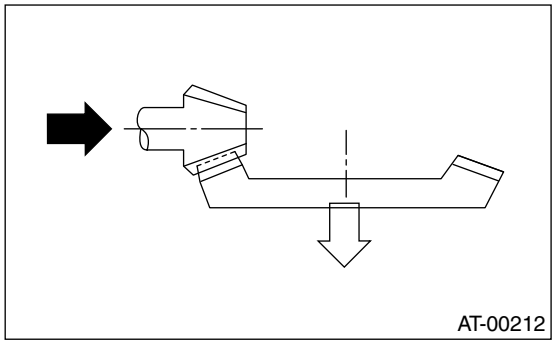
Corrective action: Decrease thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



• Heel contact (Outside end contact)
Checking item: Contact areas is small.
Contact pattern

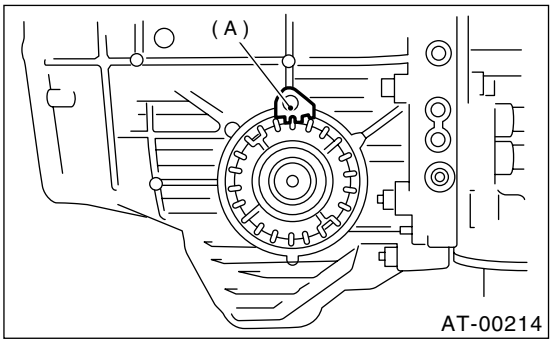


Corrective action: Increase thickness of drive pinion height adjusting shim in order to move drive pinion close to crown gear.



6) If tooth contact is correct, mark the retainer position and loosen it. After fitting a new O-ring and oil seal, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

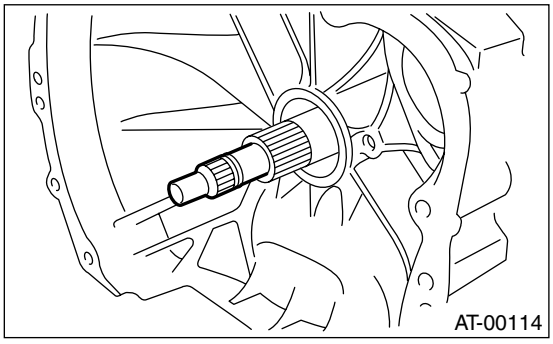


(A) Lock plate

39.Front Differential

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-89, REMOVAL.>
3) Remove the input shaft.



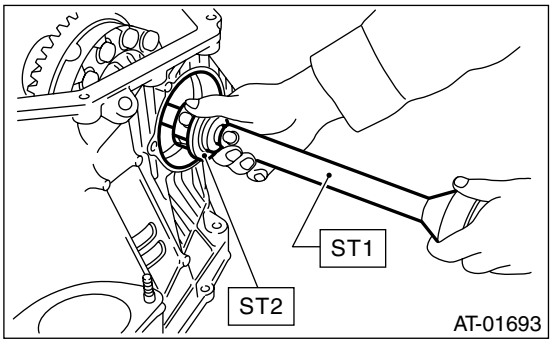
4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch from stay.
6) Remove the oil charger pipe. <Ref. to 4AT-88, REMOVAL.>
7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-82, REMOVAL.>
8) Separate the torque converter clutch case and transmission case.<Ref. to 4AT-109, REMOVAL.>
9) Remove the seal pipe.
10) Wrap axle shaft with vinyl tape. (Except TURBO model)
11) Remove the differential side retainer with ST.

NOTE:
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of the torque converter clutch case.

ST 499787000 WRENCH ASSY

12) Remove axle shaft using ST1 and ST2.

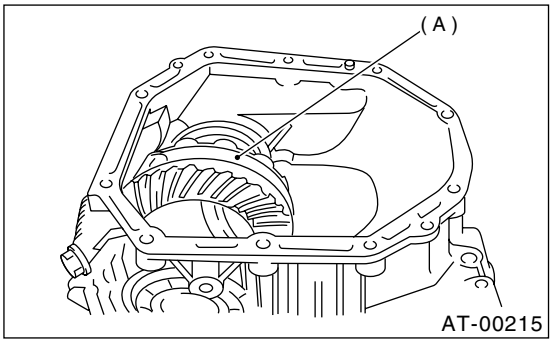
ST 499095500 REMOVER
ST 499247300 INSTALLER



13) Remove the differential assembly without damaging installation part of retainer.

B: INSTALLATION

1) Install the differential assembly to the case, paying special attention not to damage the inside of the case (particularly, the differential side retainer contact surface).



(A) Differential assembly

2) Install the new circlip to the axle shaft, insert the shaft into the differential assembly, and tap it into position with a plastic hammer. (Except TURBO model)

NOTE:
If no play is felt, check whether the shaft is fully inserted. If shaft insertion is correct, replace the axle shaft.

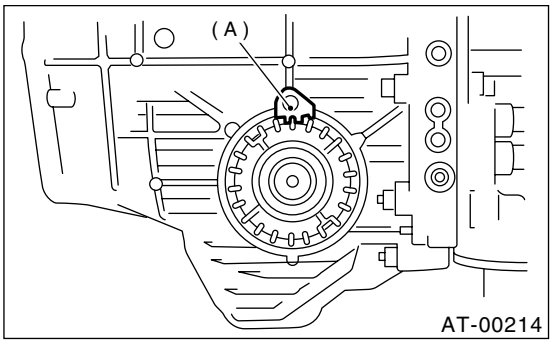
Thrust play:
0.3 — 0.5 mm (0.012 — 0.020 in)

3) Wrap vinyl tape around the splined portion of the axle shaft. (Except TURBO model)
4) Install the O-rings from left and right side retainer.
5) Using ST, install the side retainers. <Ref. to 4AT-121, REMOVAL.>

ST 499787000 WRENCH ASSY

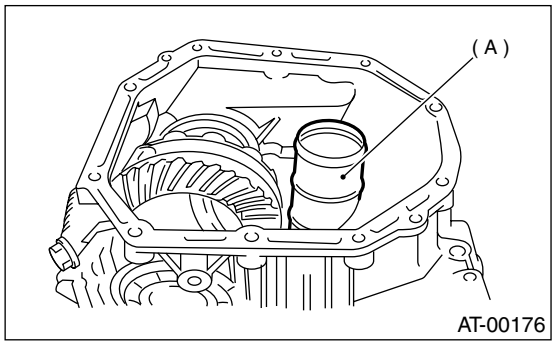
6) Adjust the front differential backlash. <Ref. to 4AT-125, ADJUSTMENT.>
7) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



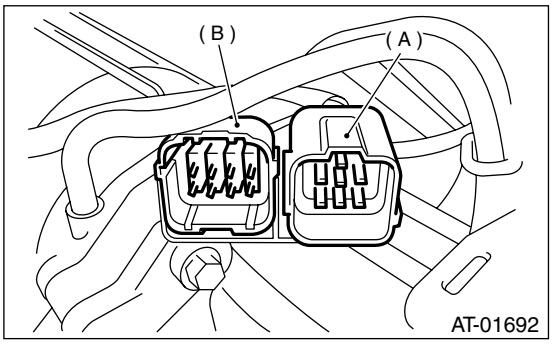
(A) Lock plate

8) Install a new seal pipe to the torque converter clutch case.



(A) Seal pipe

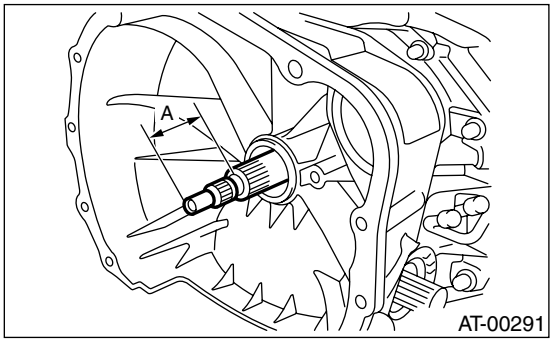
9) Install the torque converter clutch case to transmission case. <Ref. to 4AT-109, INSTALLATION.>
10) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

11) Install the oil cooler pipes. <Ref. to 4AT-84, INSTALLATION.>
12) Install the oil charger pipe with O-ring <Ref. to 4AT-88, INSTALLATION.>
13) Insert the input shaft while turning it lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

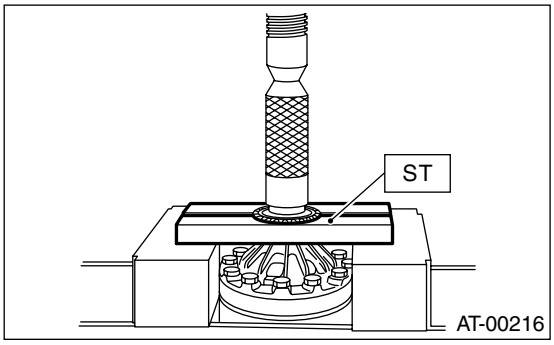


14) Install the torque converter clutch assembly. <Ref. to 4AT-89, INSTALLATION.>
15) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

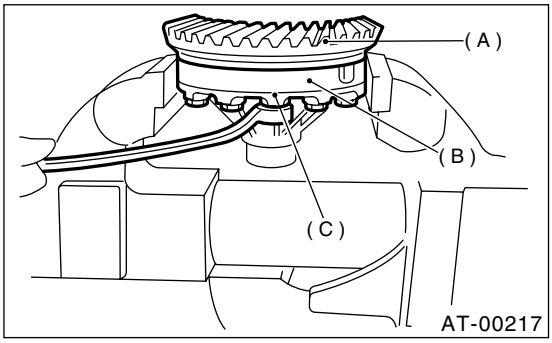
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Using a press and ST, remove the taper roller bearing.
ST 498077000 REMOVER

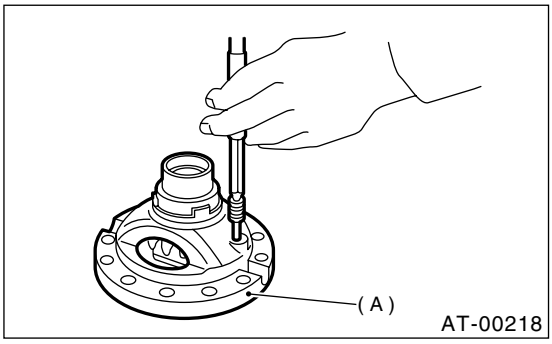


2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).



(A) Crown gear
(B) Differential case (RH)
(C) Differential case (LH)

3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.

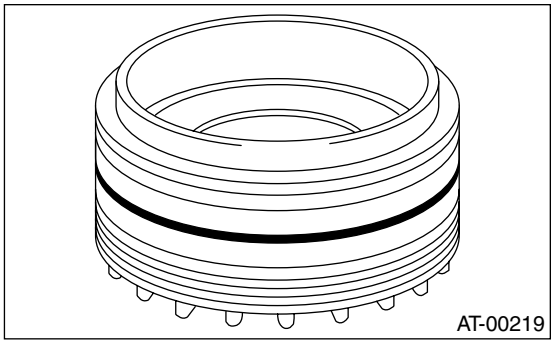


(A) Differential case (RH)

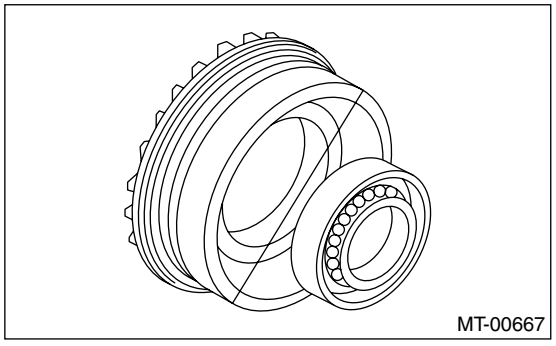
2. SIDE RETAINER

NOTE:
After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.

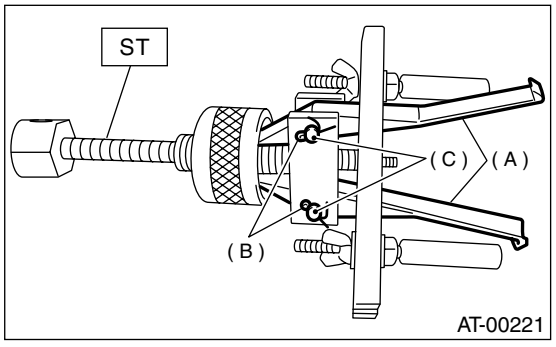
1) Remove O-ring.



2) Remove oil seal.

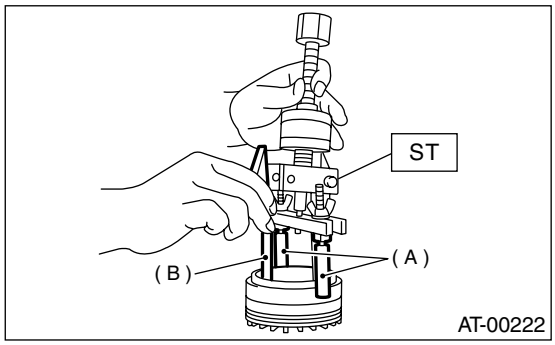


3) Take out either split pin, remove claw.
ST 398527700 PULLER ASSY



(A) Claw
(B) Split pin
(C) Pin

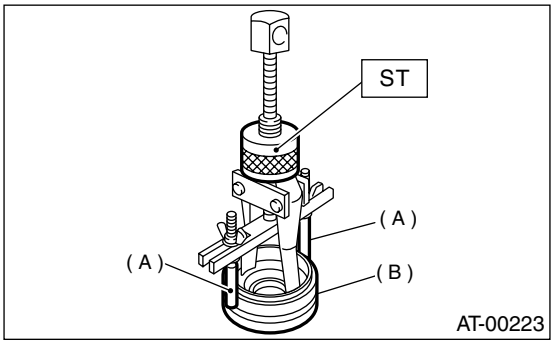
4) Securely attach two claws to outer race, set ST to side retainer.
ST 398527700 PULLER ASSY



(A) Shaft
(B) Claw

5) Return removed claw to the original position, and install pin and split pin.
6) Hold the shaft of ST to avoid removing from side retainer, and then remove the bearing outer race.
ST 398527700 PULLER ASSY

NOTE:
Replace bearing inner and outer races as a single unit.



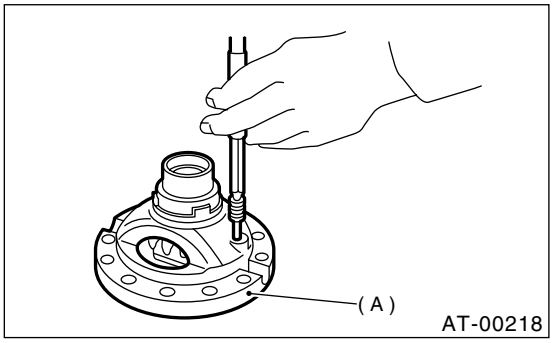
(A) Shaft
(B) Side retainer

D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft.

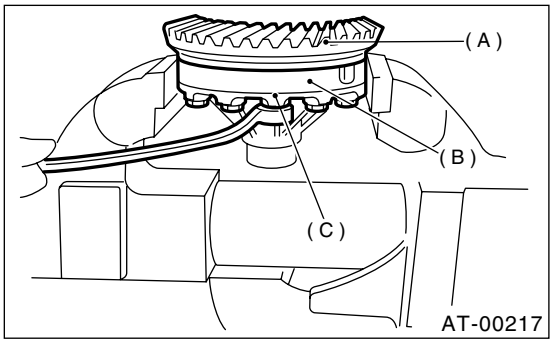
2) Install straight pin from reverse direction.



(A) Differential case (RH)

3) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.
4) Install the crown gear and secure by tightening the bolt.

Standard tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)



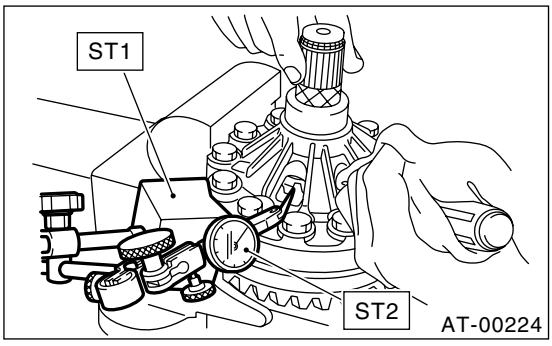
(A) Crown gear
(B) Differential case (RH)
(C) Differential case (LH)

5) Measurement of backlash (Selection of washer)
(1) Install SUBARU genuine axle shaft to differential case. (TURBO model)
(2) Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of the case.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

NOTE:
• Measure the backlash by applying a pinion tooth between two bevel gear teeth.
• Fix bevel pinion gear in place with a screwdriver or similar tool when measuring.

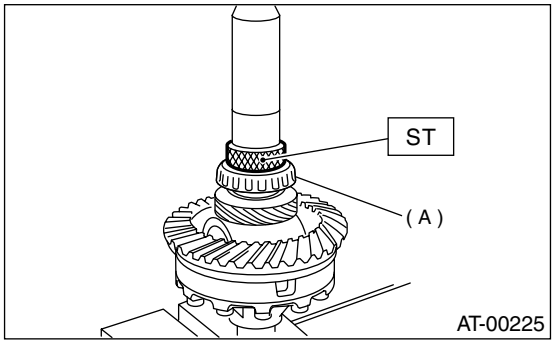
Standard value:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



(3) If backlash is not as specified, select a washer from the table below.

Washer	
Part No.	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

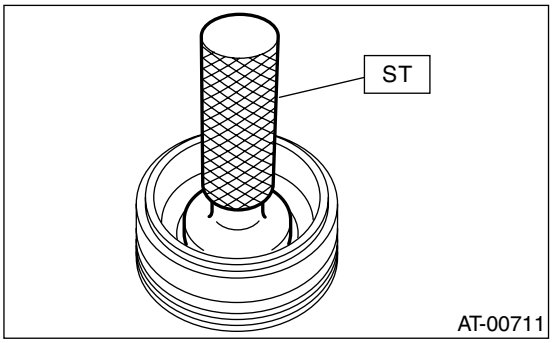
6) Using ST, install taper roller bearing.
ST 398437700 DRIFT



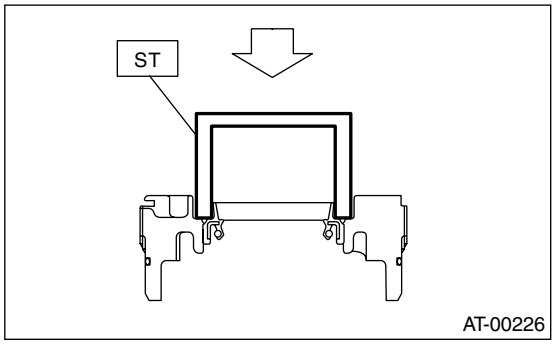
(A) Taper roller bearing

2. SIDE RETAINER

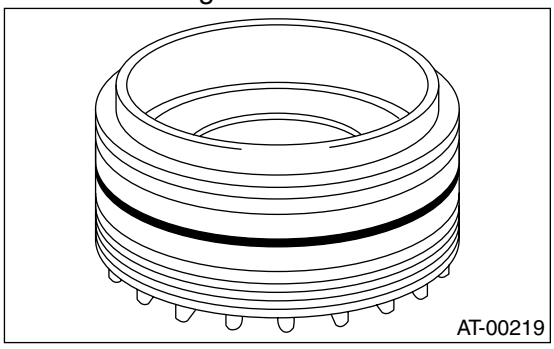
1) Install bearing outer race to side retainer.
2) Install a new oil seal using the ST and hammer.
ST 499797000 INSTALLER



3) Using the ST and hammer, install a new oil seal. (TURBO model)
ST 18675AA000 INSTALLER



4) Install new O-ring.



E: INSPECTION

- Check each component for harmful cuts, damage and other faults.
- Measure the backlash and adjust to within specifications.

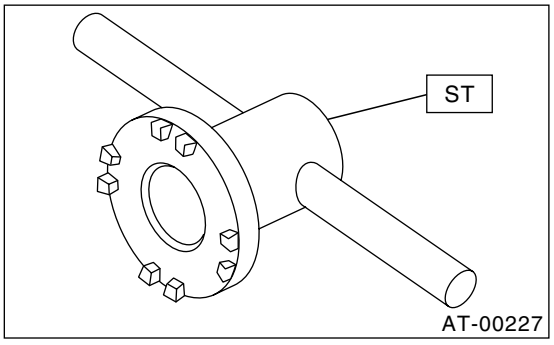
<Ref. to 4AT-125, ADJUSTMENT.>

F: ADJUSTMENT

1) Using ST, screw in the retainer until light contact is felt.

NOTE:
Screw in the RH side slightly deeper than the LH side.

ST 499787000 WRENCH ASSY

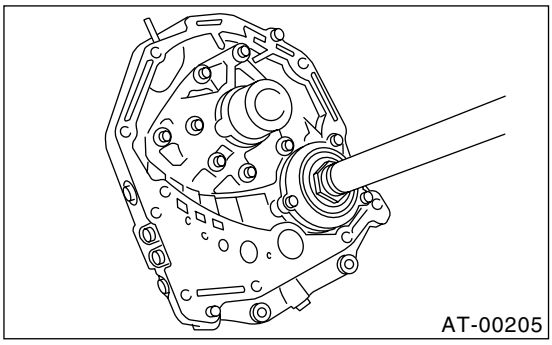


2) Remove the oil pump housing.
3) Thoroughly remove the liquid gasket from the case mating surface beforehand.

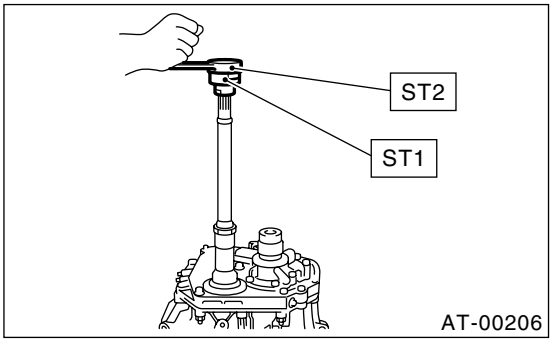
4) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

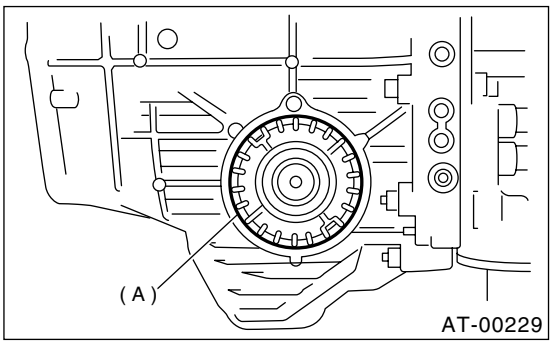
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



5) Rotate the drive pinion several times with ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH

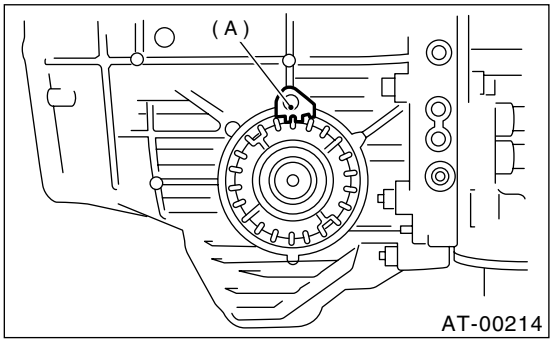


6) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the “zero” state.



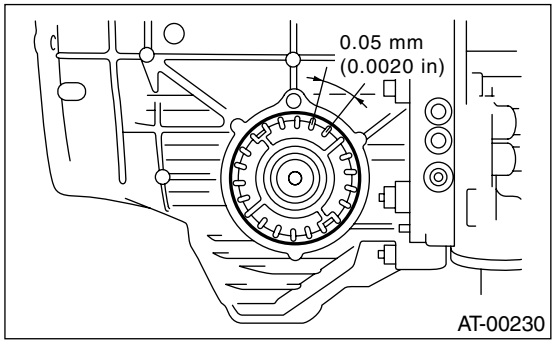
(A) Retainer

7) After the “zero” state is established, back off the LH retainer 3 notches and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Rotate drive pinion a few times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its lock plate.



(A) Lock plate

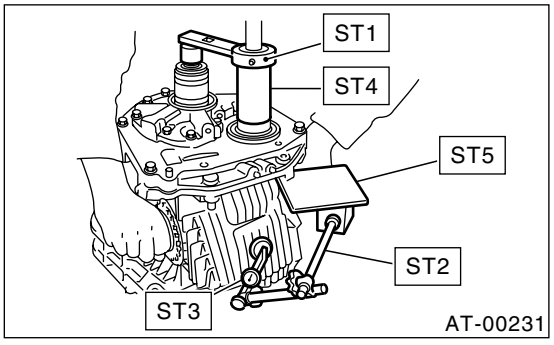
NOTE:
Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).



8) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2, ST3, ST4 and ST5.

ST1	499787700	WRENCH
ST2	498247001	MAGNET BASE
ST3	498247100	DIAL GAUGE
ST4	499787500	ADAPTER
ST5	498255400	PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

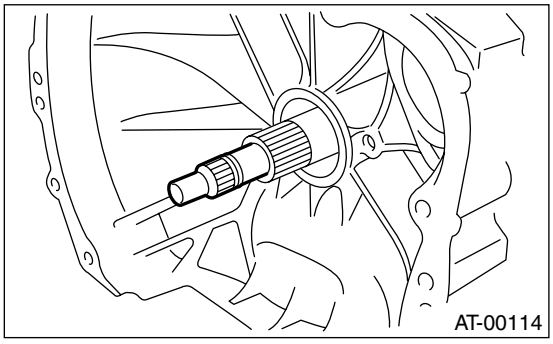


9) Adjust the tooth contact between front differential and drive shaft. <Ref. to 4AT-118, ADJUSTMENT.>

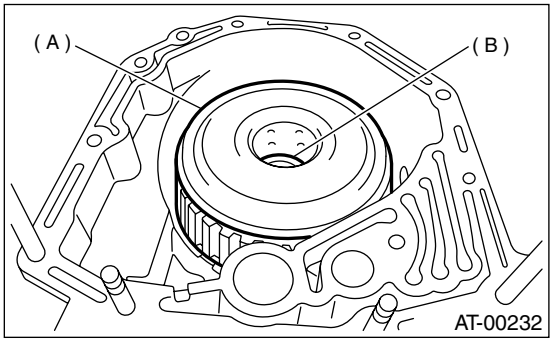
40.AT Main Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-89, REMOVAL.>
3) Remove the input shaft.

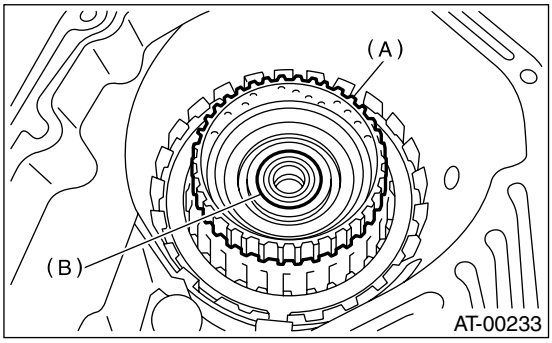


4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose.
7) Remove the oil charger pipe. <Ref. to 4AT-88, REMOVAL.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-82, REMOVAL.>
9) Separate the torque converter clutch case and transmission case.<Ref. to 4AT-109, REMOVAL.>
10) Remove the oil pump housing.
<Ref. to 4AT-111, REMOVAL, Oil Pump Housing.>
11) Take out the high clutch, thrust needle bearing and reverse clutch assembly.



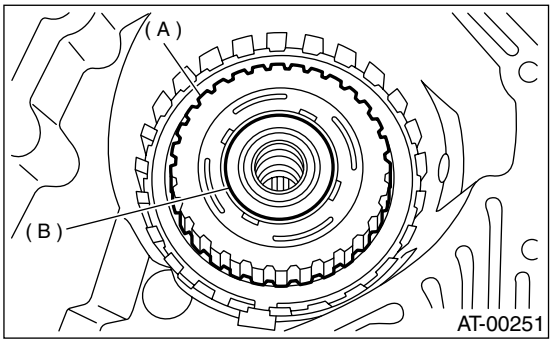
(A) High clutch and reverse clutch assembly
(B) Thrust needle bearing

12) Take out the high clutch hub and the thrust bearing.



(A) High clutch hub
(B) Thrust needle bearing

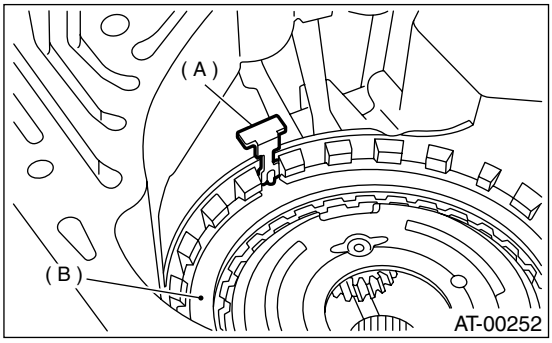
13) Take out the front sun gear and the thrust bearing.



(A) Front sun gear
(B) Thrust needle bearing

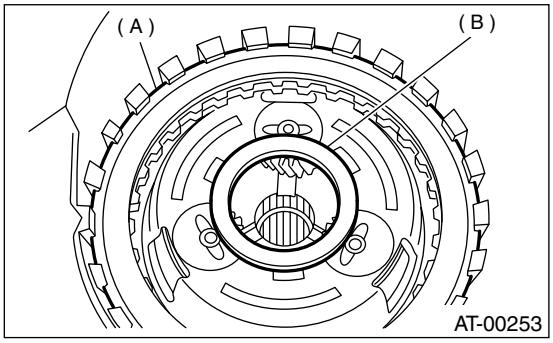
14) Pull out the leaf spring without folding.

NOTE:
Remove it while pressing the lower leaf spring down.



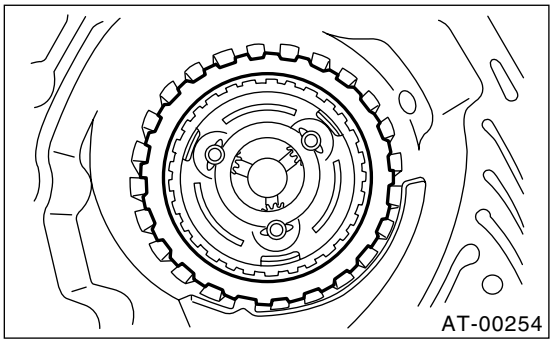
(A) Leaf spring
(B) Retaining plate

15) Remove the snap ring and thrust needle bearing.

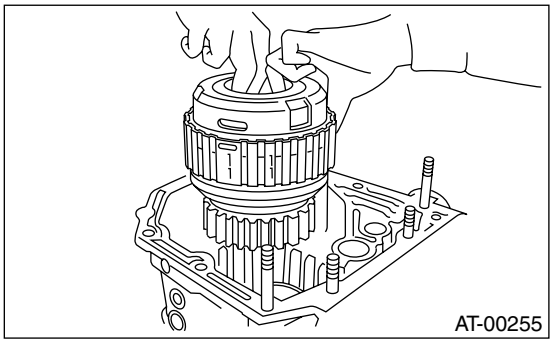


(A) Snap ring
(B) Thrust needle bearing

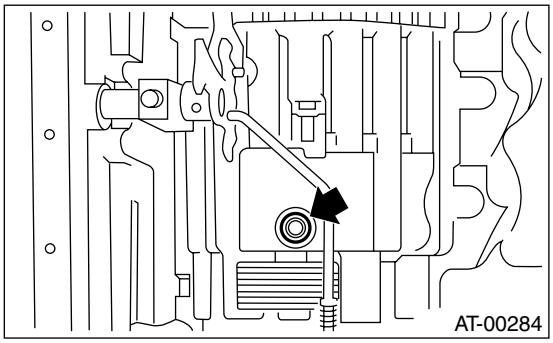
16) Take out the retaining plate, drive plate and driven plate of 2-4 brake.



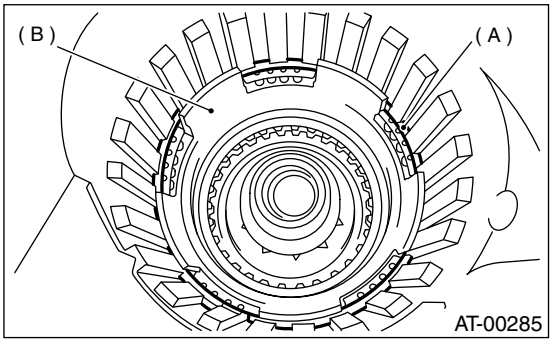
17) Take out the thrust needle bearing, planetary gear assembly and the low clutch assembly.



18) Remove the 2-4 brake seal.

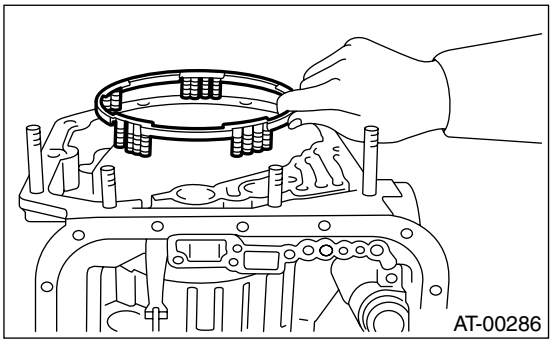


19) Remove the snap ring.

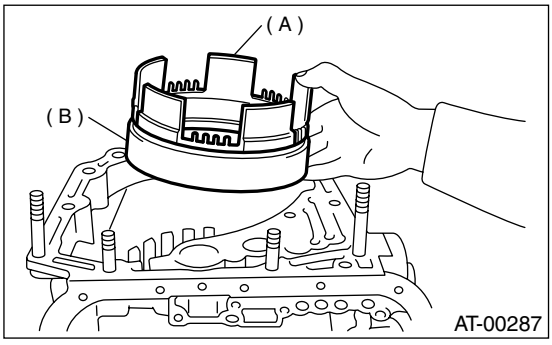


(A) Snap ring
(B) 2-4 brake piston

20) Take out the 2-4 brake return spring.

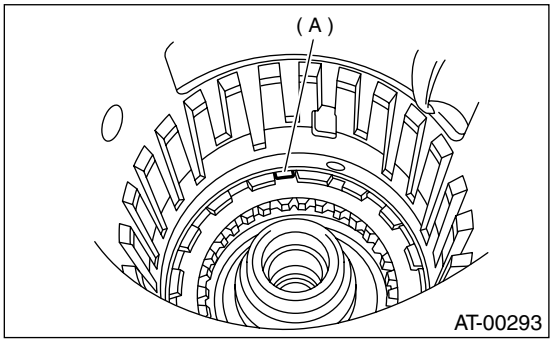


21) Remove the 2-4 brake piston and piston retainer without damaging.



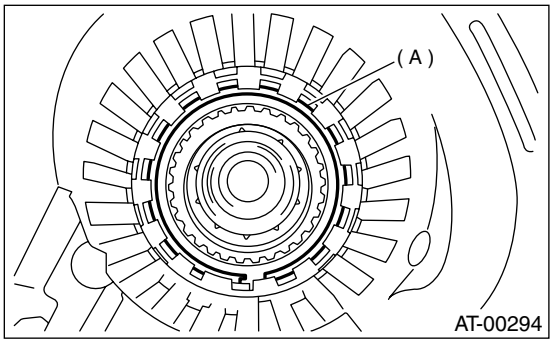
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

22) Pull out the leaf spring without folding.



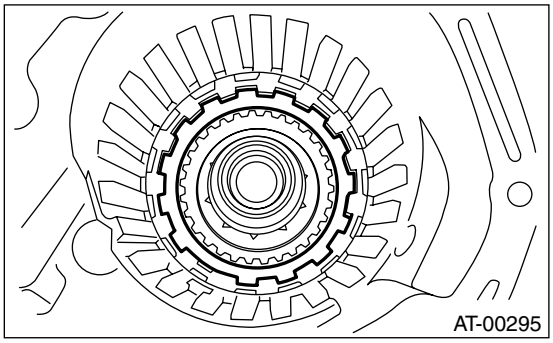
(A) Leaf spring

23) Remove the snap ring.

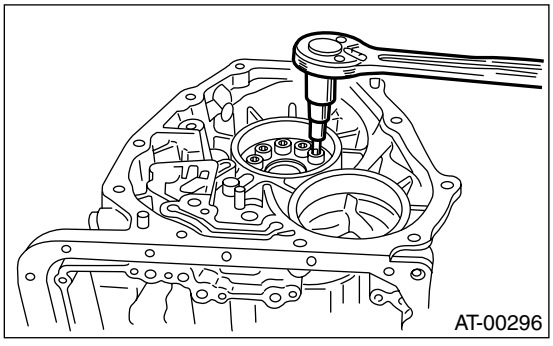


(A) Snap ring

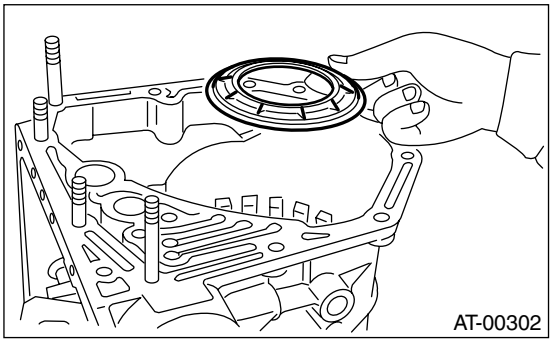
24) Take out the retaining plate, drive plate, driven plate and dish plate.



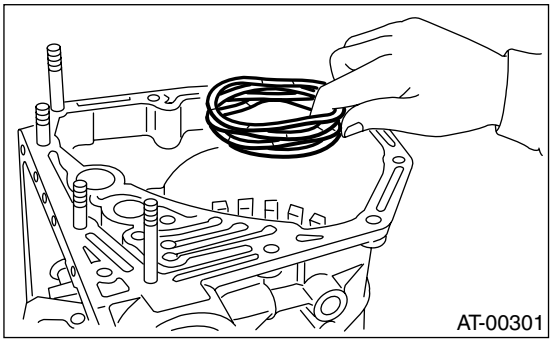
25) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race with hand.



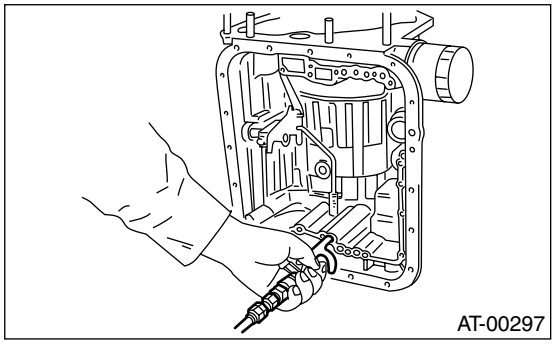
26) Take out the spring retainer.



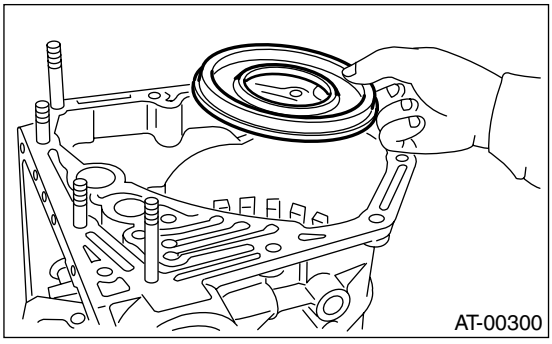
27) Take out the return spring.



28) Apply compressed air.



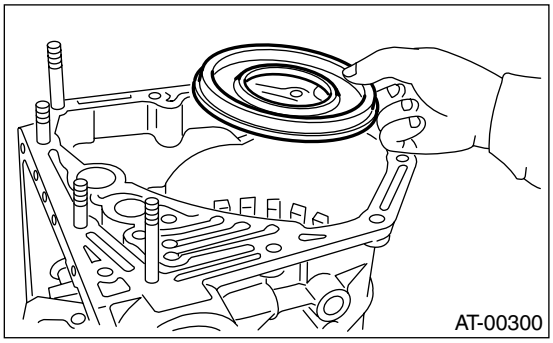
29) Take out the low & reverse piston.



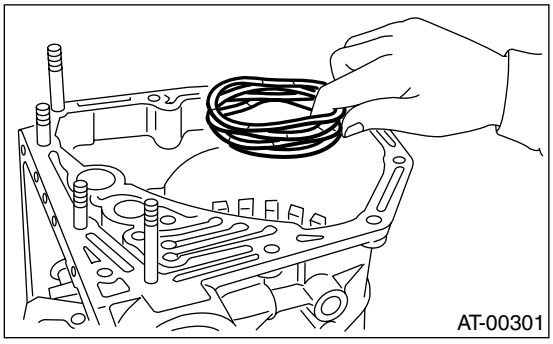
B: INSTALLATION

1) Install the low and reverse piston without tilting.

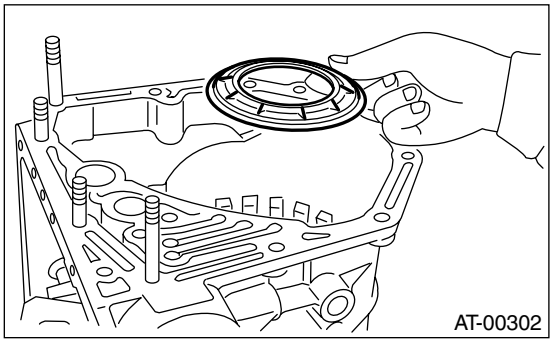
NOTE:
Be careful not to damage the lip seal.



2) Install the return spring.



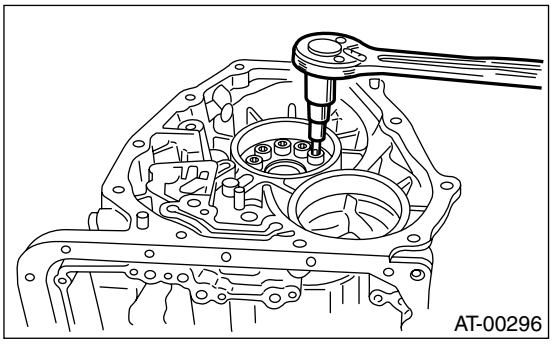
3) Install the spring retainer.



4) Install the one-way clutch inner race, spring retainer and return spring.

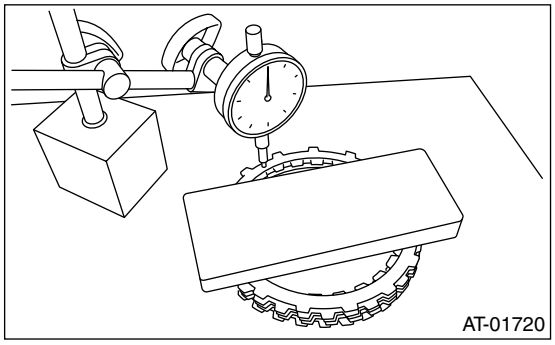
5) Tighten the socket head bolts evenly from the rear side of transmission case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

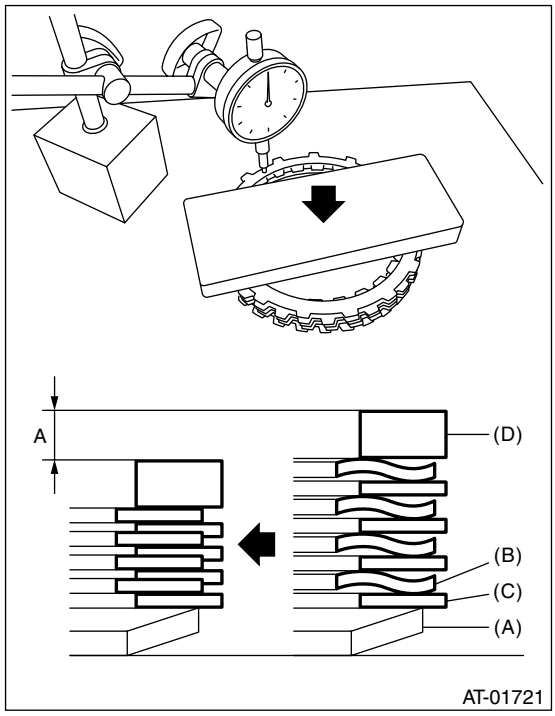


6) Place the front side of transmission body upward.
7) Install thrust needle bearing.
8) Place dish plate, driven plate, and retaining plate on a surface plate in order.
9) Set the micro gauge, read the scale, and then place a flat plate on the plate.

NOTE:
The value of the scale shall be from 0 starting point.



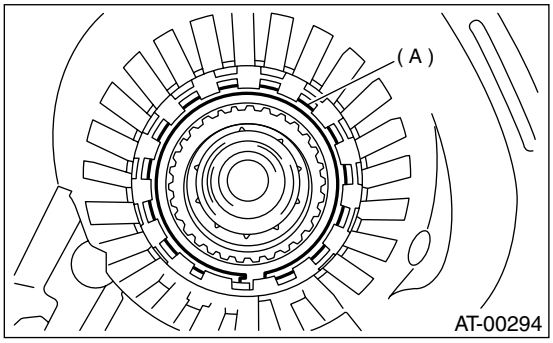
10) Press at the center of the retaining plate with 83 N (8.5 kgf, 18.7 lb), using push gauge and pull gauge. Then measure and record the height A. Measure more than three points at even intervals and calculate the average.



(A) Dish plate
(B) Driven plate
(C) Drive plate
(D) Retaining plate

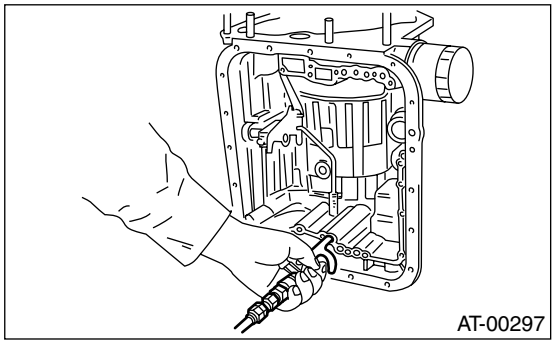
11) Installation of the low & reverse brake:
Install dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

NOTE:
Pay attention to the orientation of the dish plate.

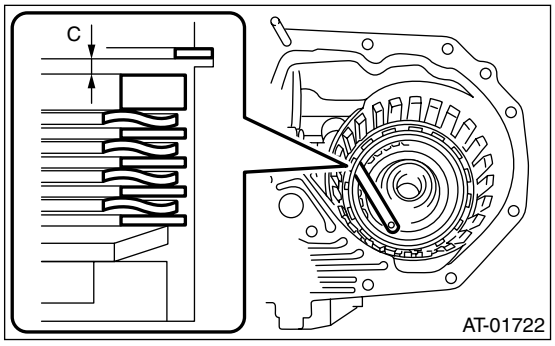


(A) Snap ring

12) Apply compressed air intermittently to check for operation.



13) Measure the clearance. Place the same thickness of shim on both sides to prevent the retaining plate from tilting.



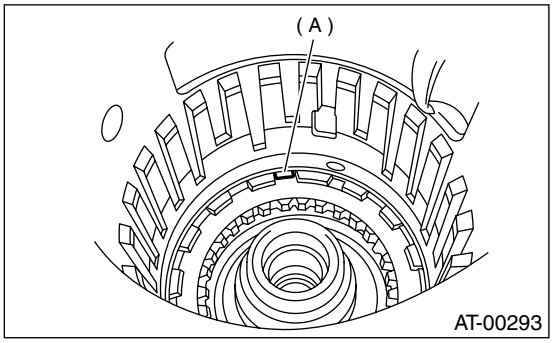
14) Calculation of piston stroke
Calculate piston stroke from the recorded measurement A and B, and select the retaining plate so that the piston stroke is within the standard value.
If the value from the equation exceeds the service limit, replace the drive plate with new one and adjust it to be within the standard.
T = A + C
T: Piston stroke
A: Amount of the flattened drive plate
B: Clearance between the retaining plate and the snap ring

3.0 L model and TURBO model
Standard value:
2.7 — 3.2 mm (0.106 — 0.126)
Limit value:
4.2 mm (0.165 in)

Except 3.0 L model and TURBO model
Standard value:
2.4 — 2.9 mm (0.094 — 0.114 in)
Limit value:
3.9 mm (0.154 in)

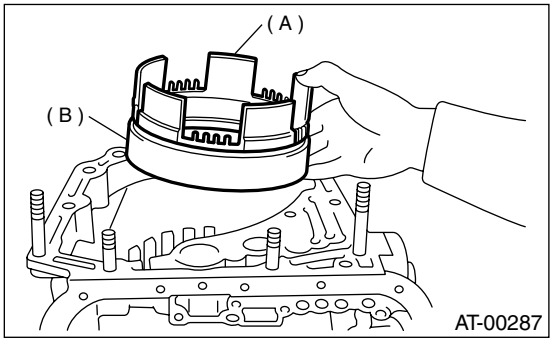
Retaining plates	
Part No.	Thickness mm (in)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

15) Install the low & reverse brake leaf spring.



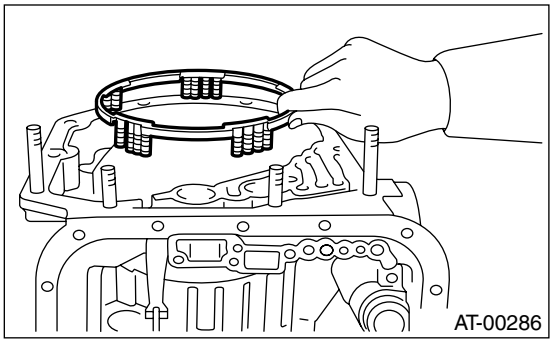
(A) Leaf spring

16) Install the 2-4 brake piston and 2-4 brake retainer by aligning the hole of 2-4 brake retainer and the hole of transmission case.

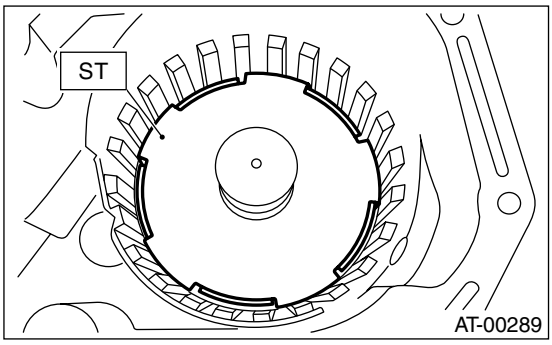


(A) 2-4 brake piston
(B) 2-4 brake piston retainer

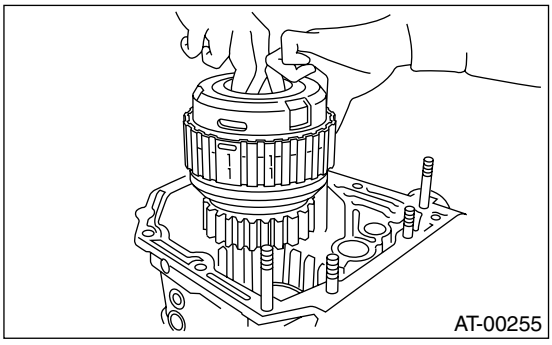
17) Install the 2-4 brake piston return spring to transmission case.



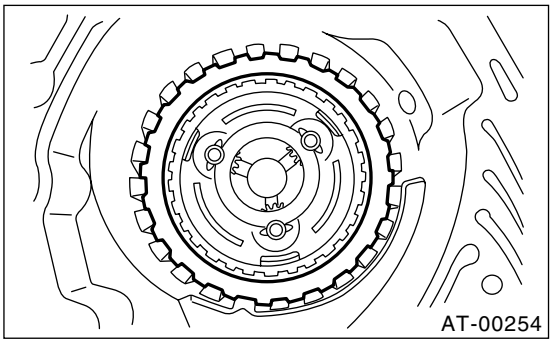
18) Position the snap ring in transmission. Using ST, press the snap ring into place.
ST 498677100 COMPRESSOR



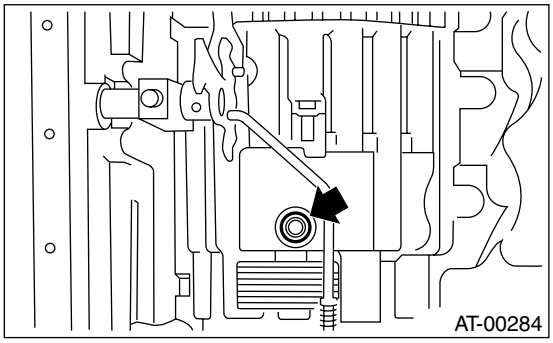
19) Install the planetary gear and low clutch assembly to transmission case.
Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring.



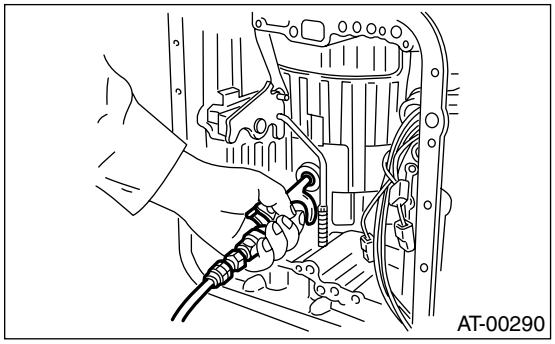
20) Install pressure plate, drive plate, driven plate, retaining plate and snap ring.



21) Install a new 2-4 brake oil seal to transmission case.



22) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of the brake.



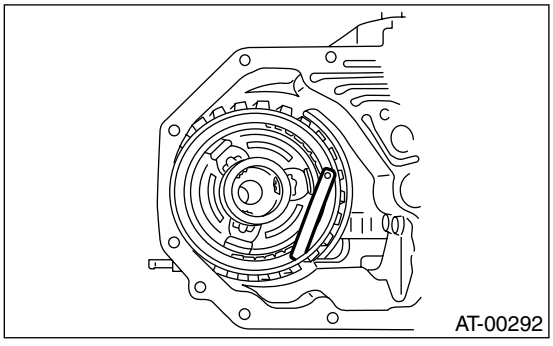
23) Check the clearance between the retaining plate and the snap ring.

NOTE:
Select a retaining plate with a suitable value from the following table, so that the clearance becomes the standard value.

If the clearance is above the limit, replace the drive plate with new one and adjust so that the clearance becomes the standard value.

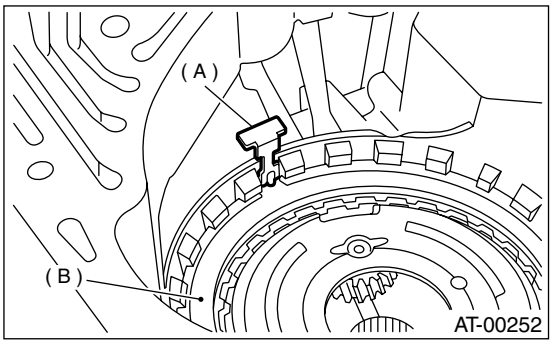
Standard value:
0.8 — 1.2 mm (0.031 — 0.047 in)

Allowable limit:
1.5 mm (0.059 in)



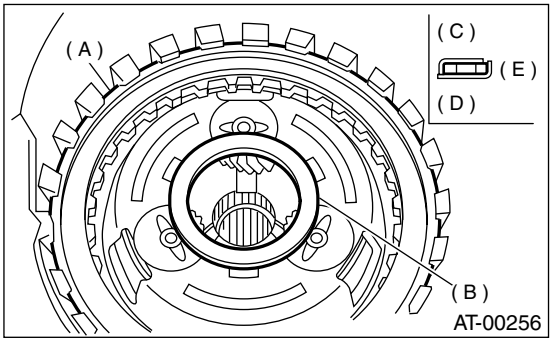
Retaining plates	
Part No.	Thickness mm (in)
31567AA612	5.6 (0.220)
31567AA622	5.8 (0.228)
31567AA632	6.0 (0.236)
31567AA642	6.2 (0.244)
31567AA652	6.4 (0.252)
31567AA662	6.6 (0.260)

24) Be careful not to mistake the location of the leaf spring to be inserted.



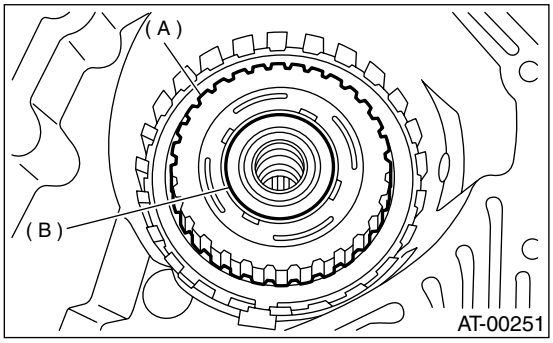
(A) Leaf spring
(B) Retaining plate

25) Install thrust needle bearing in the correct direction.



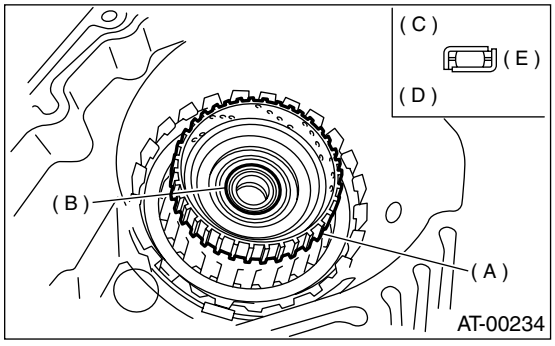
(A) Snap ring
(B) Thrust needle bearing
(C) Upside
(D) Downside

26) Install front sun gear and thrust needle bearing.



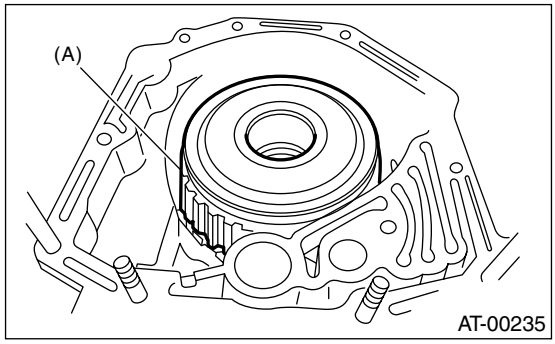
(A) Front sun gear
(B) Thrust needle bearing

27) Install the high clutch hub.
Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.
28) Install the thrust needle bearing in proper direction.



(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

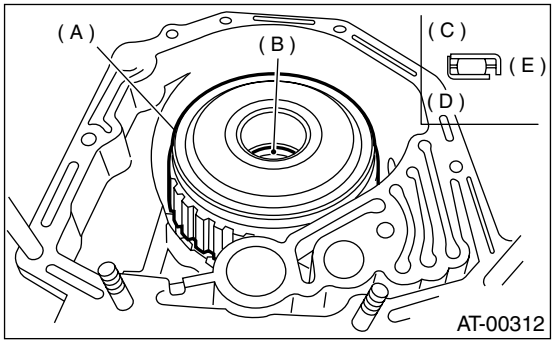
29) Install the high clutch assembly.



(A) High clutch and reverse clutch assembly

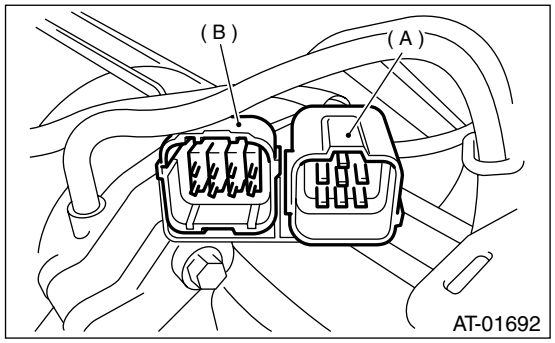
30) Adjust total end play. <Ref. to 4AT-115, ADJUSTMENT, Oil Pump Housing.>

31) Install the thrust needle bearing in proper direction.



(A) High clutch and reverse clutch ASSY
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

32) Install the oil pump housing assembly.
33) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to 4AT-109, INSTALLATION.>
34) Insert inhibitor switch and transmission connector into stay.
35) Install air breather hose. <Ref. to 4AT-87, INSTALLATION.>

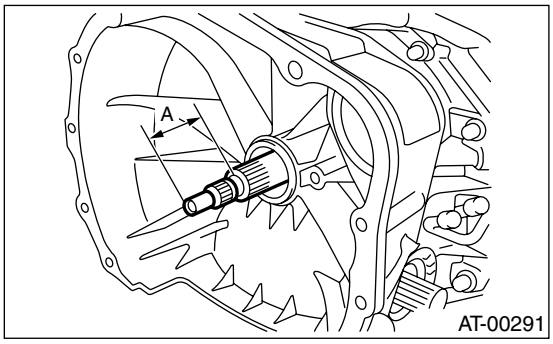


(A) Transmission harness
(B) Inhibitor switch harness

36) Install oil cooler pipes. <Ref. to 4AT-84, INSTALLATION.>
37) Install the oil charger pipe with O-ring. <Ref. to 4AT-88, INSTALLATION.>

38) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

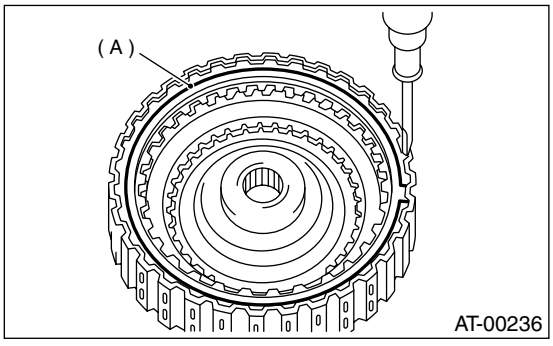


39) Install the torque converter clutch assembly. <Ref. to 4AT-89, INSTALLATION.>
40) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

C: DISASSEMBLY

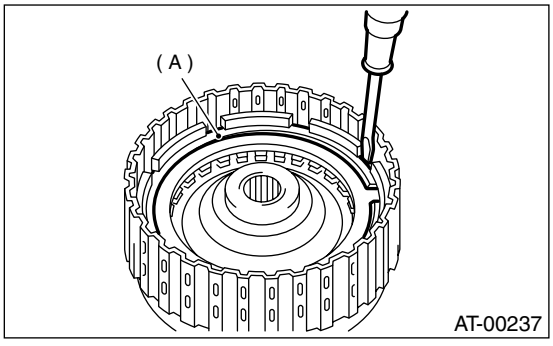
1. HIGH CLUTCH, REVERSE CLUTCH

1) Remove the snap ring, and take out the retaining plate, drive plates, driven plates.



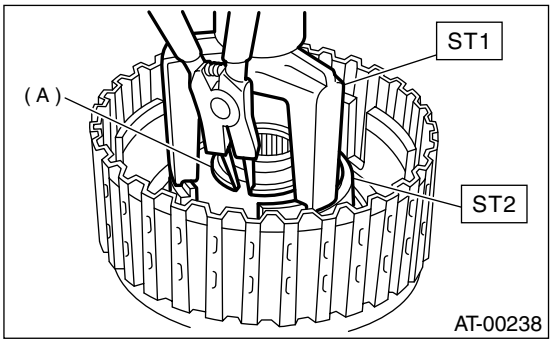
(A) Snap ring

2) Remove snap ring, and take out the retaining plate, drive plates and driven plates.



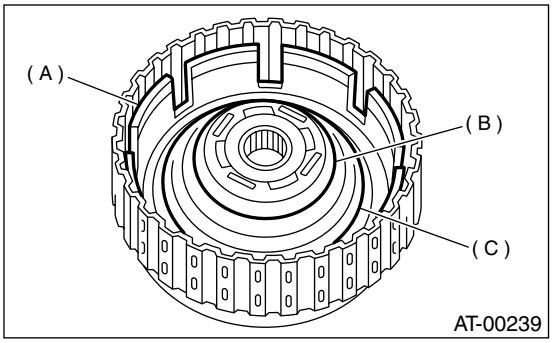
(A) Snap ring

3) Using ST1 and ST2, remove snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT



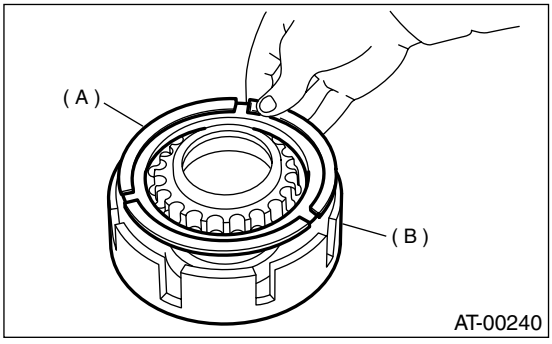
(A) Snap ring

4) Take out clutch cover, spring retainer, high clutch piston and reverse clutch piston.



(A) Reverse clutch piston
(B) Cover
(C) Return spring

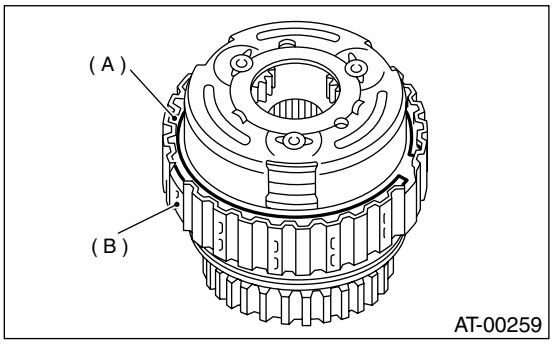
5) Remove seal rings and lip seal from high clutch piston and reverse clutch piston.



(A) High clutch piston
(B) Reverse clutch piston

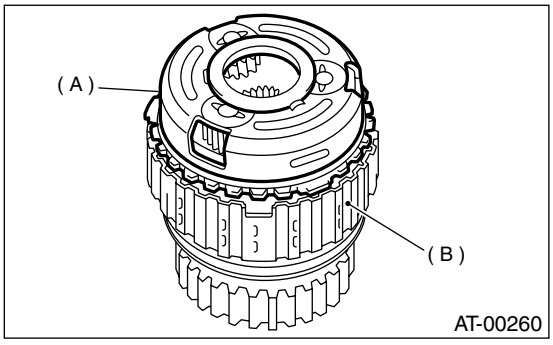
2. PLANETARY GEAR, LOW CLUTCH

1) Remove snap ring from the low clutch drum.



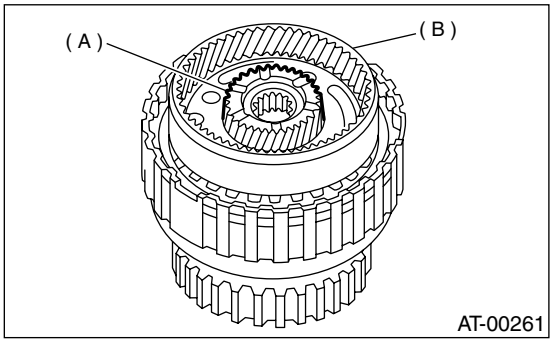
(A) Snap ring
(B) Low clutch drum

2) Take out front planetary carrier.



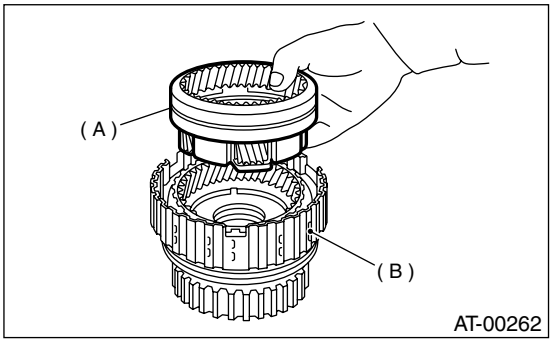
(A) Front planetary carrier
(B) Low clutch drum

3) Take out rear sun gear.



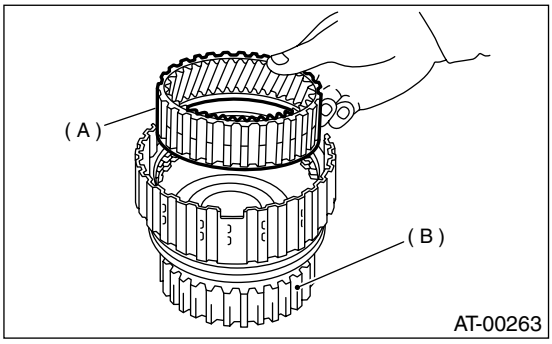
(A) Rear sun gear
(B) Rear planetary carrier

4) Take out rear planetary carrier, washer and thrust needle bearing.



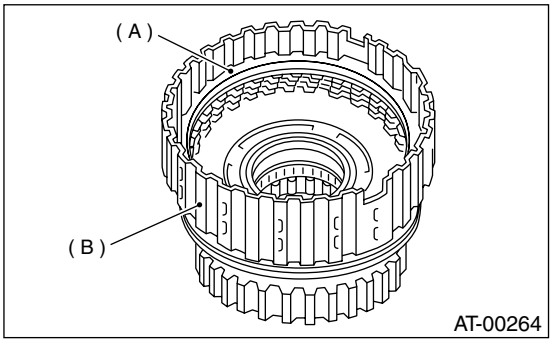
(A) Rear planetary carrier
(B) Low clutch drum

5) Take out rear internal gear.



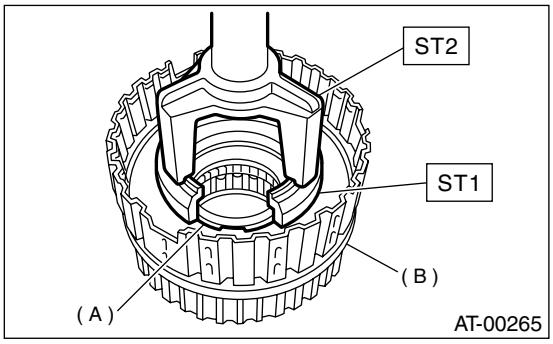
(A) Rear internal gear
(B) Low clutch drum

6) Remove the snap ring from the low clutch drum.



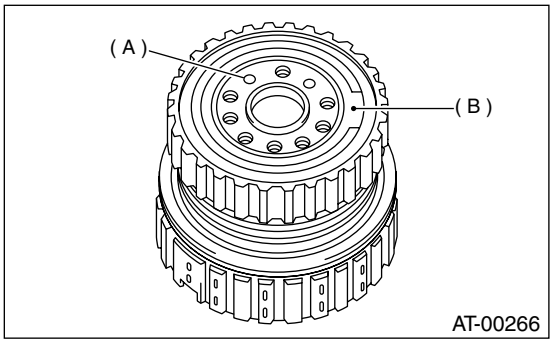
(A) Snap ring
(B) Low clutch drum

7) Compress the spring retainer, and remove the snap ring from the low clutch drum, by using ST1 and ST2.
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



(A) Snap ring
(B) Low clutch drum

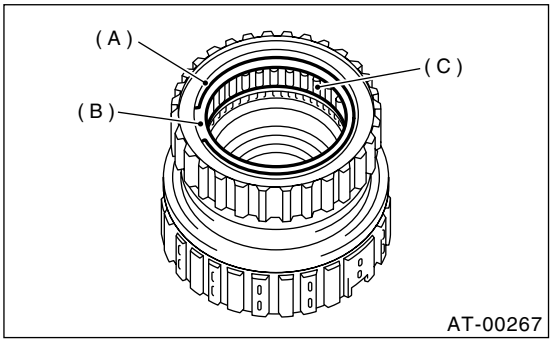
8) Remove one-way clutch. <Ref. to 4AT-127, REMOVAL, AT Main Case.>
9) Install the one-way clutch inner race to the low clutch drum, and apply compressed air to remove the low clutch piston.



(A) Apply compressed air
(B) One-way clutch inner race

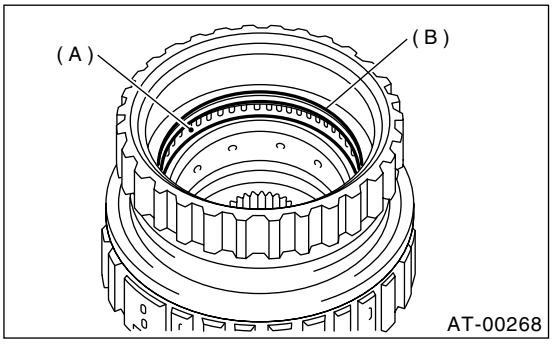
10) Remove the one-way clutch inner race.

11) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

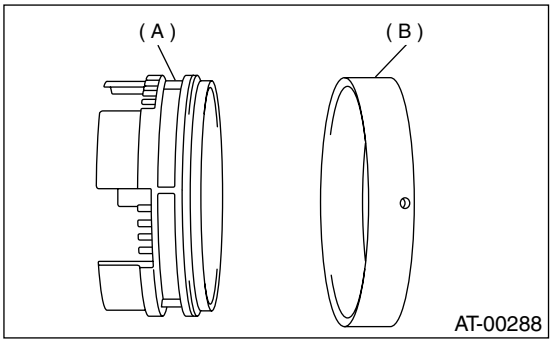
12) Remove the needle bearing after taking out the snap ring.



(A) Needle bearing
(B) Snap ring

3. 2-4 BRAKE

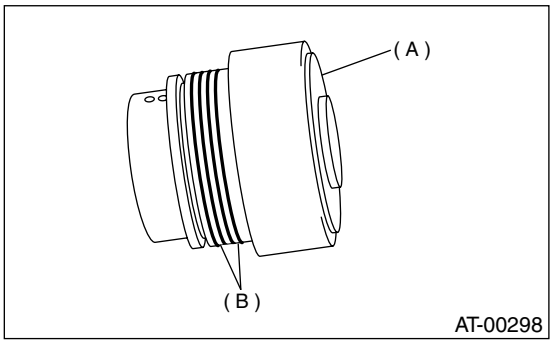
1) Separate 2-4 brake piston and piston retainer.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Remove seal rings.

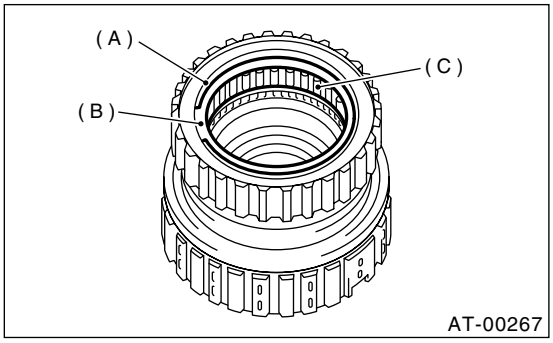


(A) One way clutch inner race
(B) Seal rings

2) Using ST, remove needle bearing.
ST 398527700 PULLER ASSY

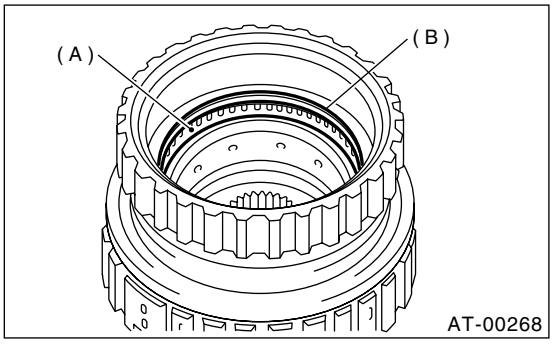
5. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.

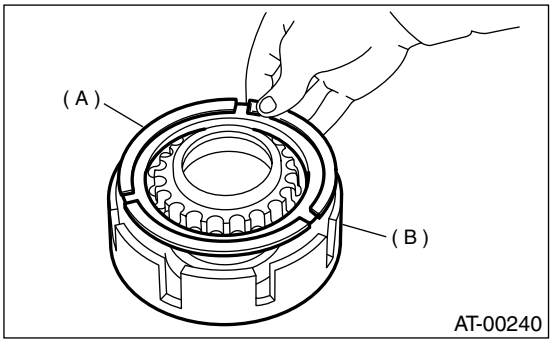


(A) Needle bearing
(B) Snap ring

D: ASSEMBLY

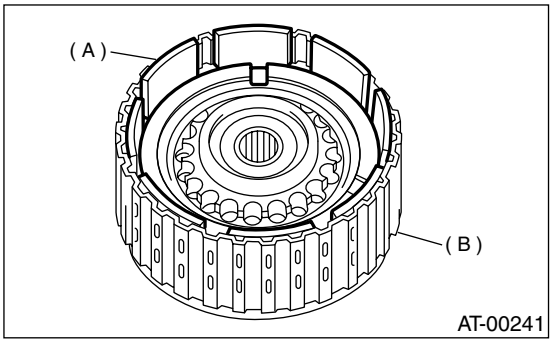
1. HIGH CLUTCH, REVERSE CLUTCH

1) Install seal rings and lip seal to high clutch piston and reverse clutch piston.
2) Install high clutch piston to reverse clutch piston.



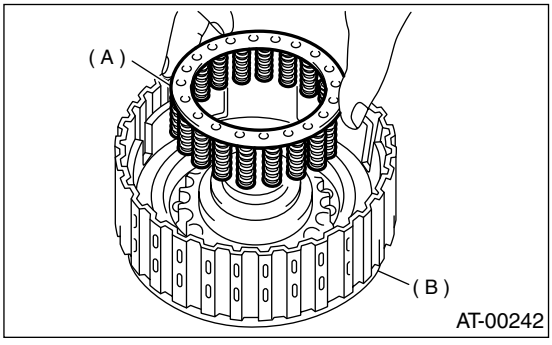
(A) High clutch piston
(B) Reverse clutch piston

3) Install reverse clutch to high clutch drum.
Align the groove on the reverse clutch piston with the groove on the high clutch drum during installation.



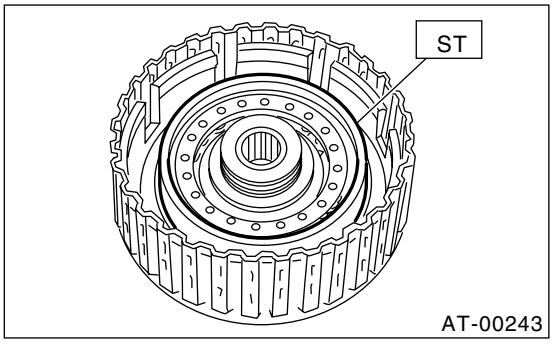
(A) Reverse clutch piston
(B) High clutch drum

4) Install spring retainer to high clutch piston.

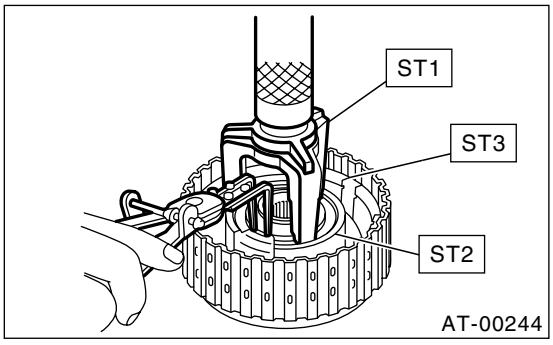


(A) Return spring
(B) High clutch drum

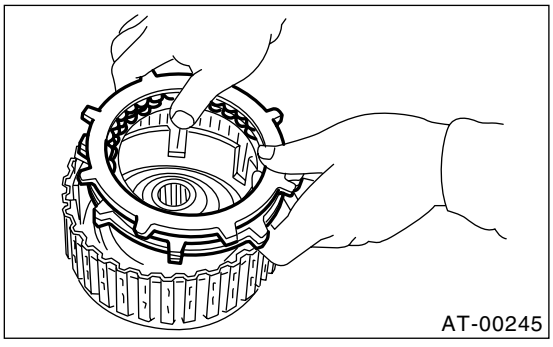
5) Install ST to high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GUIDE



6) Avoid folding the high clutch piston seal, when installing the cover to high clutch piston.
7) Using ST1 and ST2, install snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 498437000 HIGH CLUTCH PISTON GUIDE

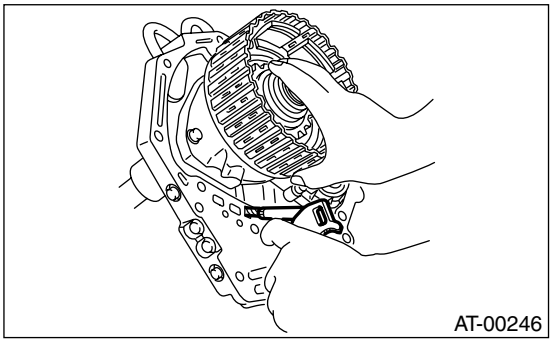


8) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.



9) Install snap ring to high clutch drum.

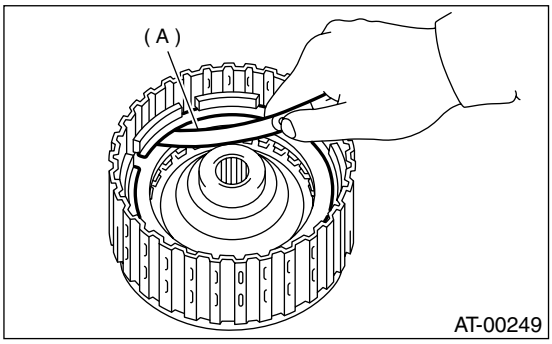
10) Apply compressed air intermittently to check for operation.



11) Measure the clearance between the retaining plate and snap ring (High clutch). At this time, do not press down retaining plate.

Standard value:
0.8 — 1.1 mm (0.031 — 0.043 in)

Allowable limit:
1.5 mm (0.059 in)

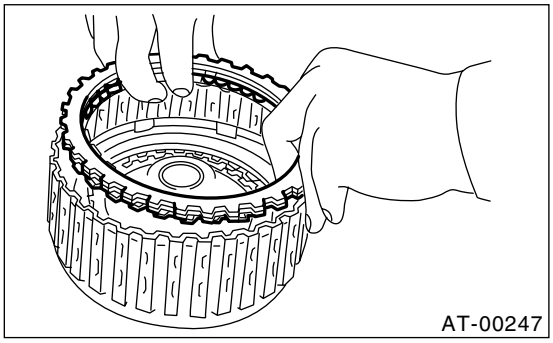


(A) Thickness gauge

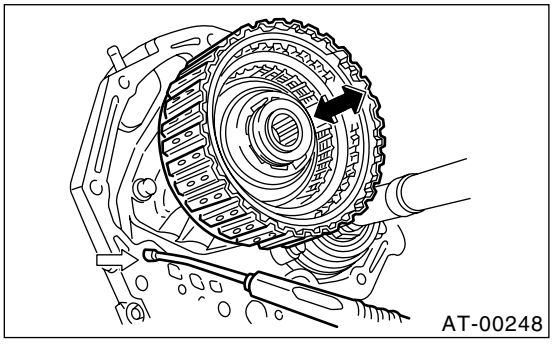
If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.
If the clearance is above the limit, replace the drive plate with new one and adjust so that the clearance becomes within the specified value.

High clutch retaining plate	
Part No.	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

12) Install driven plate, drive plate, retaining plate and snap ring.



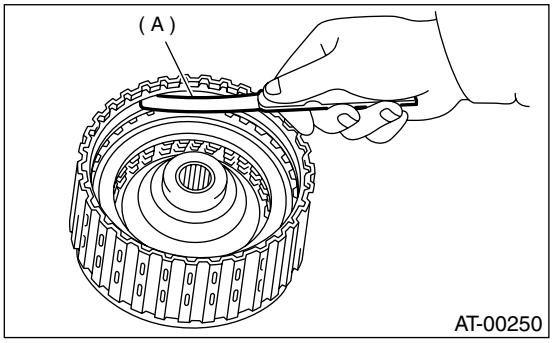
13) Apply compressed air intermittently to check for operation.



14) Measure the clearance between the retaining plate and snap ring (Reverse clutch). At this time, do not press down retaining plate.

Standard value:
0.5 — 0.8 mm (0.020 — 0.031 in)

Allowable limit:
1.2 mm (0.047 in)



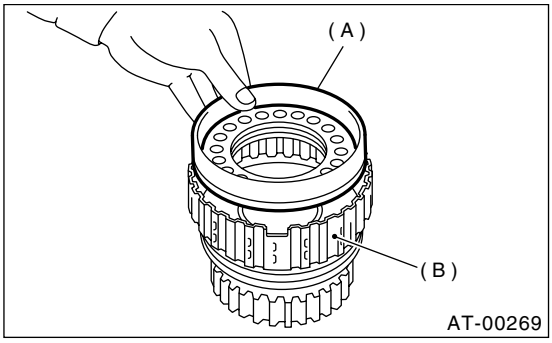
(A) Thickness gauge

If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.
If the clearance is above the limit, replace the drive plate with new one, so that the clearance becomes within the specified value.

Reverse clutch retaining plates	
Part No.	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

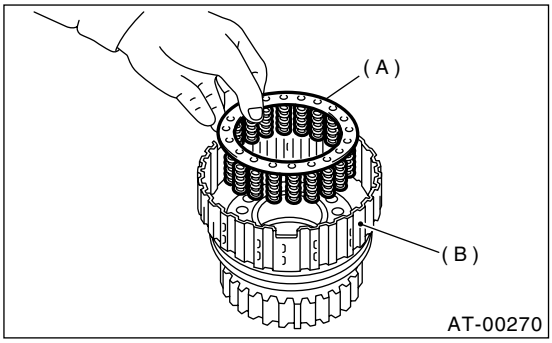
2. PLANETARY GEAR, LOW CLUTCH

1) Install new D-ring to low clutch piston.
2) Fit the low clutch piston to the low clutch drum.



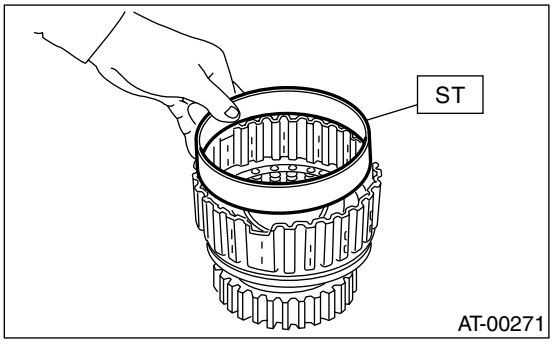
(A) Low clutch piston
(B) Low clutch drum

3) Install spring retainer to low clutch piston.

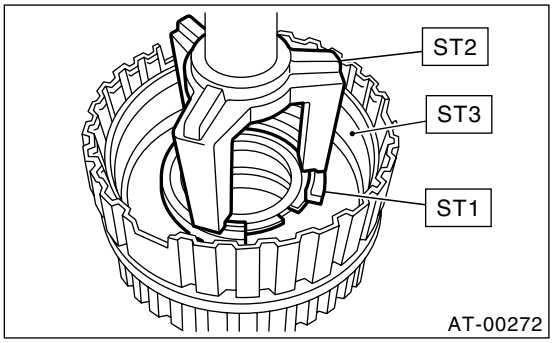


(A) Spring retainer
(B) Low clutch drum

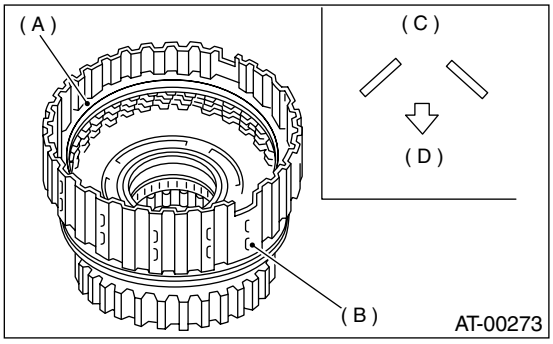
4) Install ST to low clutch drum.
ST 498437100 LOW CLUTCH PISTON GUIDE



5) Set the cover on the piston with a press using ST1 and ST2, and attach the snap ring. At this time, be careful not to fold cover seal during installation.
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR
ST3 498437100 LOW CLUTCH PISTON GUIDE

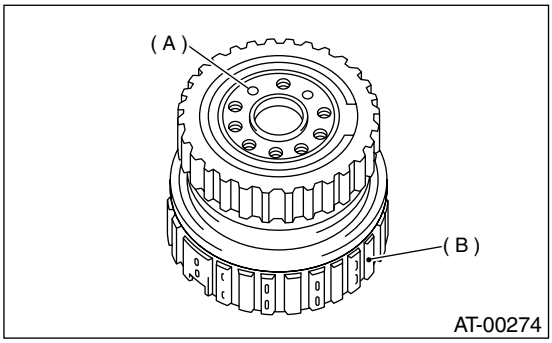


6) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring.



(A) Snap ring
(B) Low clutch drum
(C) Dish plate
(D) Low clutch piston side

7) Check the low clutch for operation.
(1) Remove one-way clutch. <Ref. to 4AT-127, REMOVAL, AT Main Case.>
(2) Set the one-way clutch inner race, and apply compressed air for checking.

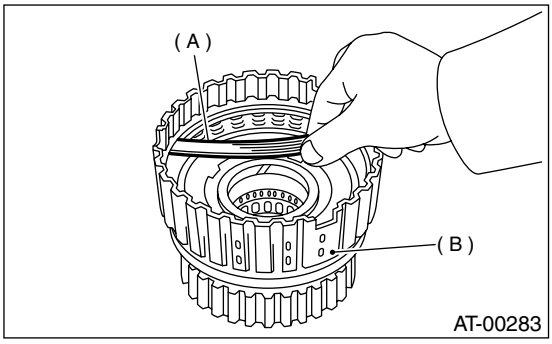


(A) Apply compressed air
(B) Low clutch drum

8) Checking low clutch clearance.
(1) Place the same thickness of shim on both sides to prevent retaining plate from tilting.
(2) Inspect clearance between retaining plate and operation of the low clutch.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:
1.6 mm (0.063 in)

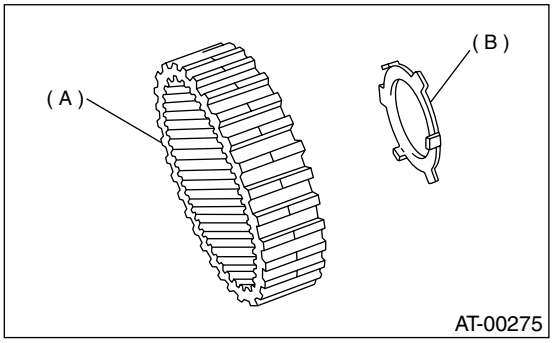


(A) Thickness gauge
(B) Low clutch drum

If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.
If the clearance is above the limit, replace the drive plate with new one, so that the clearance becomes within the specified value.

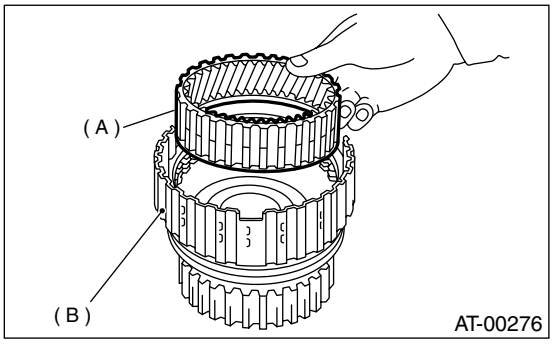
Available retaining plates	
Part No.	Thickness mm (in)
31567AA830	3.8 (0.150)
31567AA840	4.0 (0.157)
31567AA850	4.2 (0.165)
31567AA860	4.4 (0.173)
31567AA870	4.6 (0.181)

9) Install washer to rear internal gear.



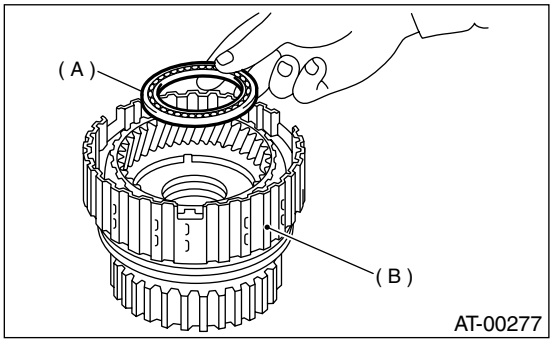
(A) Rear internal gear
(B) Washer

10) Install rear internal gear.



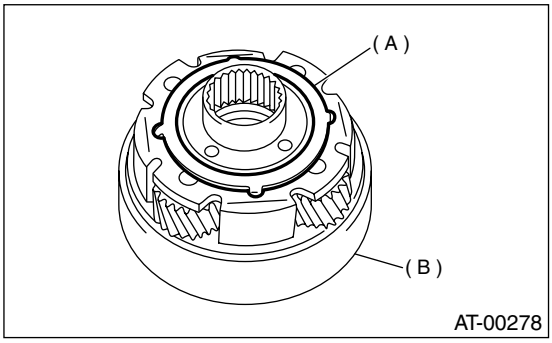
(A) Rear internal gear
(B) Low clutch drum

11) Install thrust needle bearing in the correct direction.



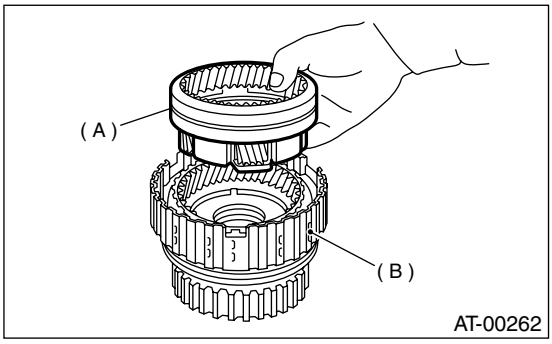
(A) Thrust needle bearing
(B) Low clutch drum

12) Install the washer by aligning protrusion of washer and hole of rear planetary carrier.



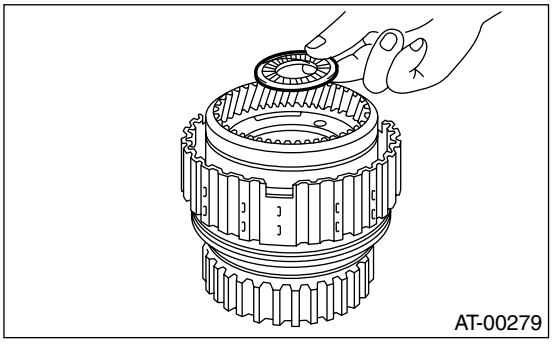
(A) Washer
(B) Rear planetary carrier

13) Install rear planetary carrier to low clutch drum.

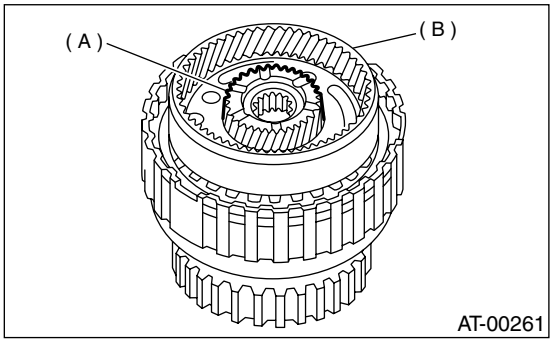


(A) Rear planetary carrier
(B) Low clutch drum

14) Install thrust needle bearing in the correct direction.

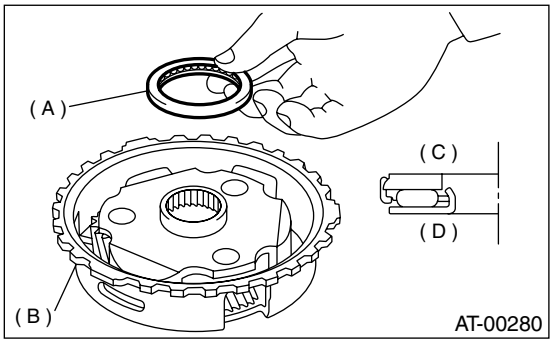


15) Install the rear sun gear in proper direction.



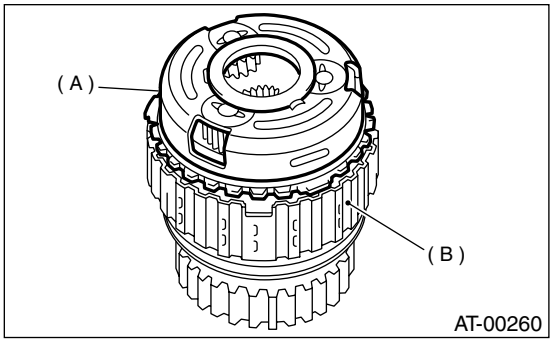
(A) Rear sun gear
(B) Rear planetary carrier

16) Install the thrust needle bearing in proper direction.



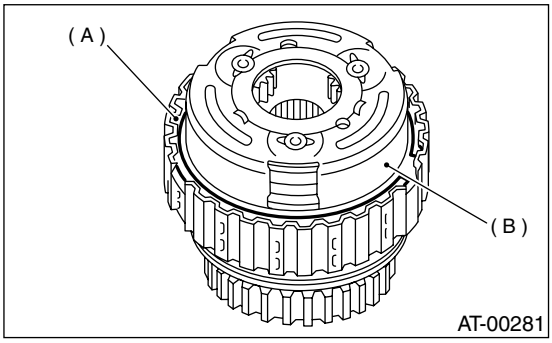
(A) Thrust needle bearing
(B) Front planetary carrier
(C) Rear sun gear side
(D) Front planetary carrier side

17) Install front planetary carrier to low clutch drum.



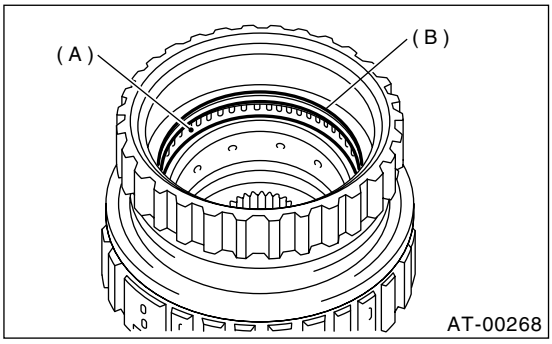
(A) Front planetary carrier
(B) Low clutch drum

18) Install snap ring to low clutch drum.



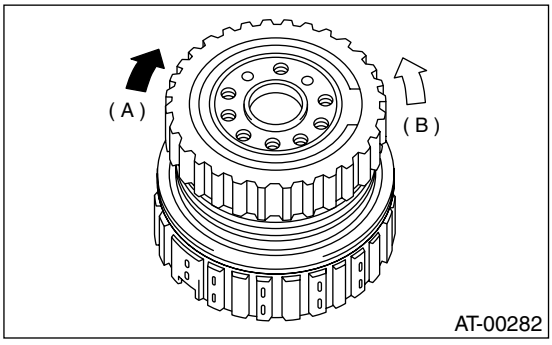
(A) Snap ring
(B) Front planetary carrier

19) Install the needle bearing, and secure with the snap ring.



(A) Needle bearing
(B) Snap ring

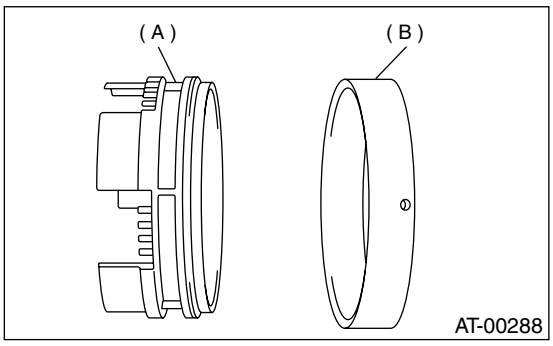
20) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.
21) Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



(A) Locked
(B) Free

3. 2-4 BRAKE

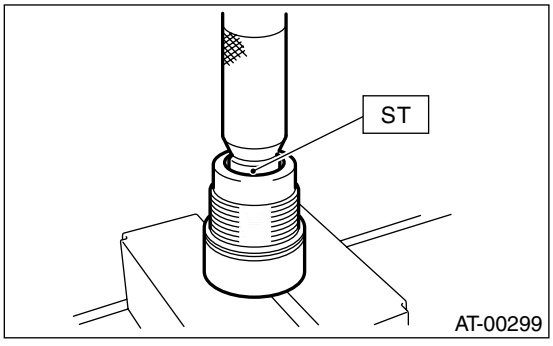
1) Install 2-4 brake piston to 2-4 brake piston retainer.



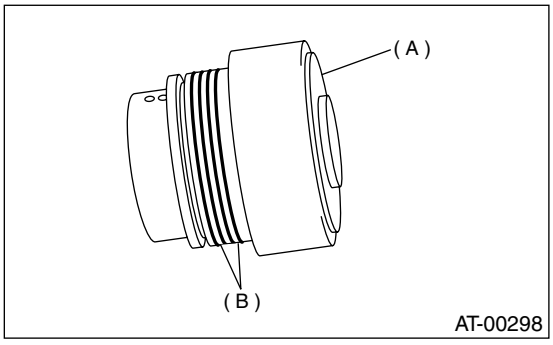
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Using a press and ST, install the needle bearing to the inner race.
ST 398497701 SEAT



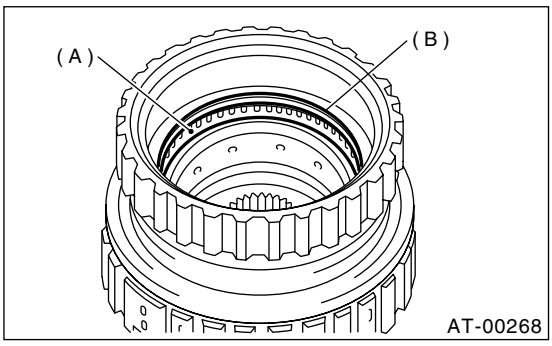
2) Apply vaseline to the groove of the inner race and to the seal ring.
3) Install two seal rings to one-way clutch inner race.



(A) One way clutch inner race
(B) Seal rings

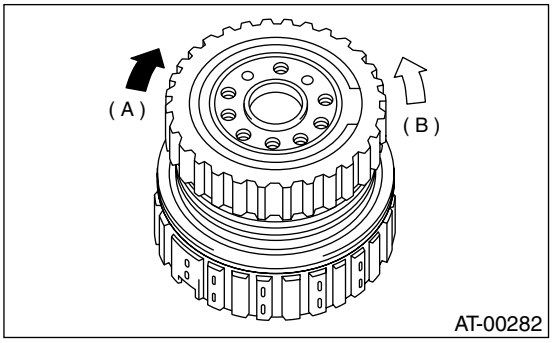
5. ONE-WAY CLUTCH OUTER RACE

1) Install the needle bearing, and secure with the snap ring.



(A) Needle bearing
(B) Snap ring

2) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.
3) Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



(A) Locked
(B) Free

E: INSPECTION

1. HIGH CLUTCH AND REVERSE CLUTCH

Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
- Lip seal and D-ring for damage
- Piston and drum check ball for operation
- Adjust total end play. <Ref. to 4AT-115, ADJUSTMENT, Oil Pump Housing.>

2. PLANETARY GEAR AND LOW CLUTCH

Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
- Lip seal and D-ring for damage
- Piston check ball for operation
- Measure the total end play and adjust to within specifications.

<Ref. to 4AT-115, ADJUSTMENT, Oil Pump Housing.>

3. 2-4 BRAKE

Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear and spring retainer for deformation
- Lip seal and D-ring for damage
- Measure the total end play and adjust to within specifications.<Ref. to 4AT-115, ADJUSTMENT, Oil Pump Housing.>

4. ONE-WAY CLUTCH

- Make sure the snap ring is not worn and the seal rings are not damaged.
- Measure the total end play and adjust to within specifications. <Ref. to 4AT-115, ADJUSTMENT, Oil Pump Housing.>

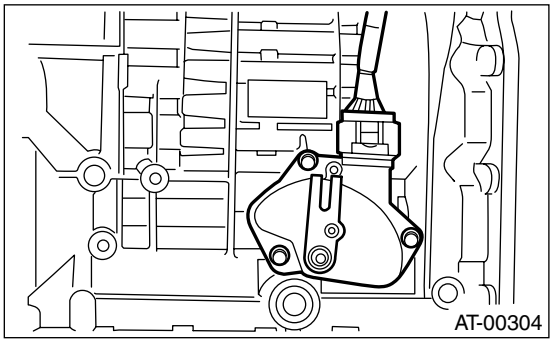
5. LOW AND REVERSE BRAKE

Check for the following.
- Drive plate facing for wear or damage
- Snap ring for wear and spring retainer for deformation

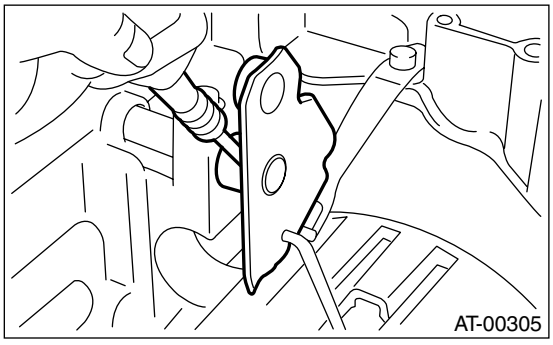
41.Transmission Control Device

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-39, REMOVAL.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-89, REMOVAL.>
3) Remove the input shaft.
4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the air breather hoses. <Ref. to 4AT-87, REMOVAL.>
6) Disconnect the inhibitor switch connector from stay.
7) Wrap the nipple attached to the air breather hose around with a vinyl tape.
8) Remove pitching stopper bracket.
9) Remove the inhibitor switch.

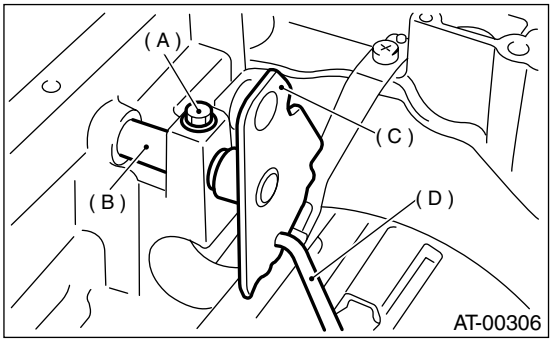


10) Remove the control valve body assembly. <Ref. to 4AT-62, REMOVAL.>
11) Pull off the straight pin of manual plate.



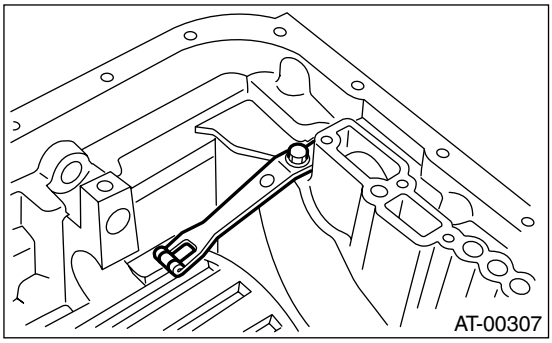
12) Remove the bolts securing select lever, then remove the select lever, manual plate and parking rod.

NOTE:
Be careful not to damage the lips of the press-fitted oil seal in the case.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

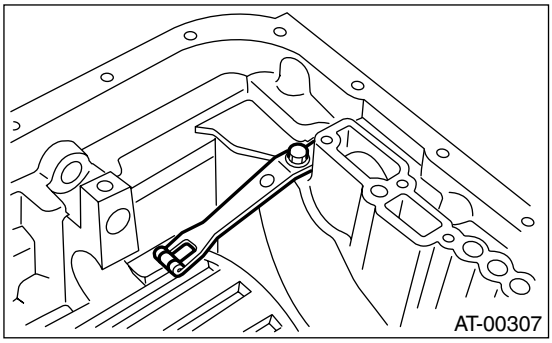
13) Remove the detention spring.



B: INSTALLATION

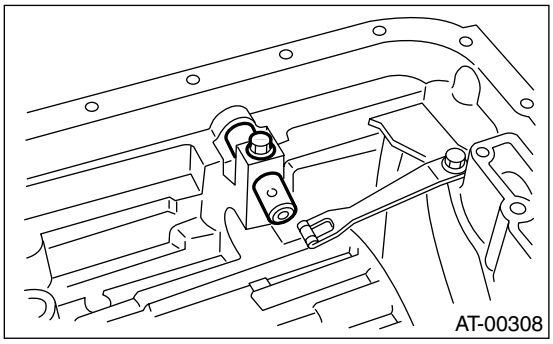
1) Install the detention spring to transmission case.

Tightening torque:
6 N·m (0.6 kgf-m, 4.3 ft-lb)

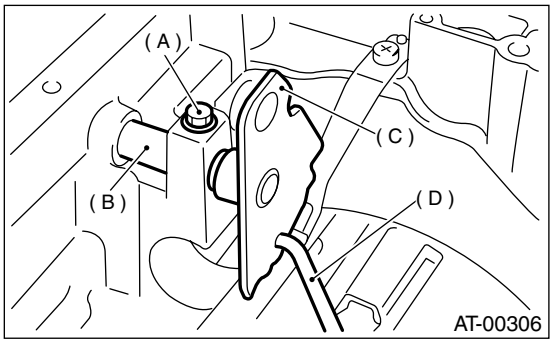


2) Insert the range select lever, and tighten the bolt.

Tightening torque:
6 N·m (0.6 kgf-m, 4.3 ft-lb)

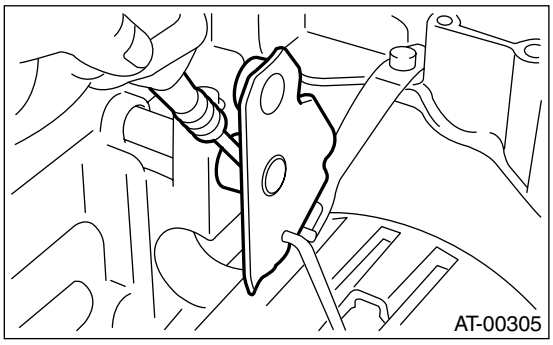


3) Insert the manual plate and parking rod.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

4) Insert the spring pin to manual plate.

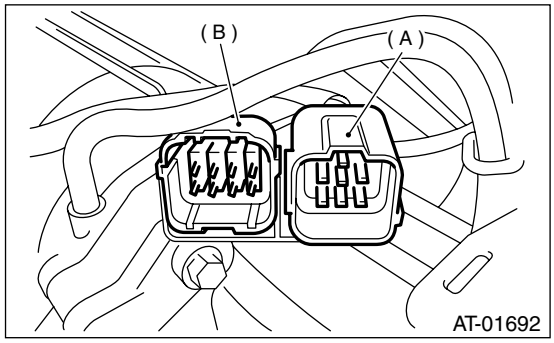


5) Install the control valve assembly and oil pan. <Ref. to 4AT-63, INSTALLATION.>
6) Turn over the transmission case to its original position.
7) Install the pitching stopper bracket.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

8) Install the inhibitor switch and adjust the inhibitor switch. <Ref. to 4AT-51, Inhibitor Switch.>

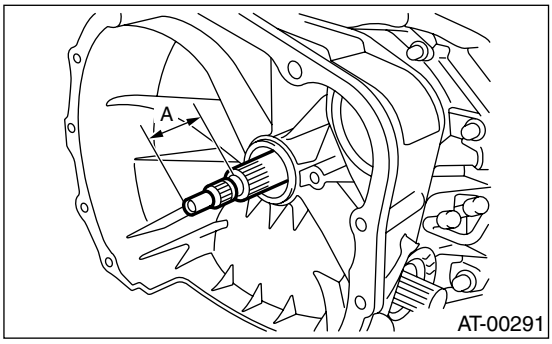
9) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

10) Install the air breather hose. <Ref. to 4AT-87, INSTALLATION.>
11) Insert the input shaft while turning it lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to 4AT-89, INSTALLATION.>
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-42, INSTALLATION.>

C: INSPECTION

Make sure the manual lever and detention spring are not worn or otherwise damaged.

MEMO:

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4AT(H4SO)

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4.	Electrical Components Location	8
5.	Transmission Control Module (TCM) I/O Signal	13
6.	Subaru Select Monitor	27
7.	Read Diagnostic Trouble Code (DTC)	30
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9.	Clear Memory Mode	33
10.	AT OIL TEMP Warning Light Display	34
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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to 4AT(H4SO)-4, Check List for Interview.> 2) Before performing the diagnosis, inspect following items which might influence the AT problems. •General inspection <Ref. to 4AT(H4SO)-5, INSPECTION, General Description.> •Make sure that each harness connector connections are tight. •Visually inspect the harness and check for any damage. •Oil leak •Stall speed test <Ref. to 4AT-34, Stall Test.> •Line pressure test <Ref. to 4AT-36, Line Pressure Test.> •Transfer clutch pressure test <Ref. to 4AT-38, Transfer Clutch Pressure Test.> •Time lag test <Ref. to 4AT-35, Time Lag Test.> •Road test <Ref. to 4AT-33, Road Test.> •Inhibitor switch <Ref. to 4AT-51, Inhibitor Switch.>	Is the unit that might influence AT problem normal?	Go to step **2.**	Repair or replace each item.
2	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON.	Does the AT OIL TEMP warning light illuminate?	Go to step **4.**	Go to step **3.**
3	**CHECK AT OIL TEMP WARNING LIGHT.** 1) Turn the ignition switch to OFF. 2) Repair the AT OIL TEMP warning light circuit or power supply and ground line circuit. <Ref. to 4AT(H4SO)-37, Diagnostic Procedure for AT OIL TEMP Warning Light.> 3) Turn the ignition switch to ON.	Is the AT OIL TEMP warning light illuminate?	Go to step **4.**	Go to step **5.**
4	**CHECK INDICATION OF DTC.** Calling up the DTC. Without Subaru Select Monitor <Ref. to 4AT(H4SO)-30, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to 4AT(H4SO)-31, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of select monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(H4SO)-46, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>	Is the DTC displayed?	Go to step **6.** NOTE: Record all DTC.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostic Procedure without DTC”.<Ref. to 4AT(H4SO)-142, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using “Symptom Related Diagnostic”. <Ref. to 4AT(H4SO)-174, Symptom Related Diagnostic.> 3) Perform the clear memory mode. Without Subaru Select Monitor <Ref. to 4AT(H4SO)-33, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With Subaru Select Monitor <Ref. to 4AT(H4SO)-33, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to 4AT(H4SO)-32, Inspection Mode.> 5) Calling up the DTC. Without Subaru Select Monitor <Ref. to 4AT(H4SO)-30, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to 4AT(H4SO)-31, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC displayed?	Complete the diagnosis.	Go to step **6.**
6	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with DTC”. <Ref. to 4AT(H4SO)-50, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(H4SO)-35, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. Without Subaru Select Monitor <Ref. to 4AT(H4SO)-33, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With Subaru Select Monitor <Ref. to 4AT(H4SO)-33, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to 4AT(H4SO)-32, Inspection Mode.> 5) Calling up the DTC. Without Subaru Select Monitor <Ref. to 4AT(H4SO)-30, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to 4AT(H4SO)-31, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC displayed?	Complete the diagnosis.	Inspect using “Diagnostics Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(H4SO)-50, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Date of purchase			
Date of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km/h or miles		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT diagnostic indicator light (AT OIL TEMP warning light)	❑ Continuously lit	❑ Not lit	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ 3 ❑ 2 ❑ 1 ❑ Sport shift mode		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH/❑ LH)	❑ While idling ❑ While cruising
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Others ( )		

3. General Description

A: CAUTION

• Supplemental Restraint System "Airbag"

The airbag system wiring harness is routed near the transmission control module (TCM).

CAUTION:

• All airbag system wiring harness and connectors are colored yellow. Do not use an electrical test equipment on these circuit.

• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

• Measurement

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.256 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V or more

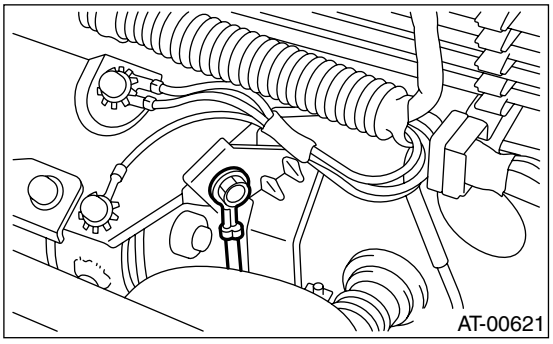
Specific gravity: Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

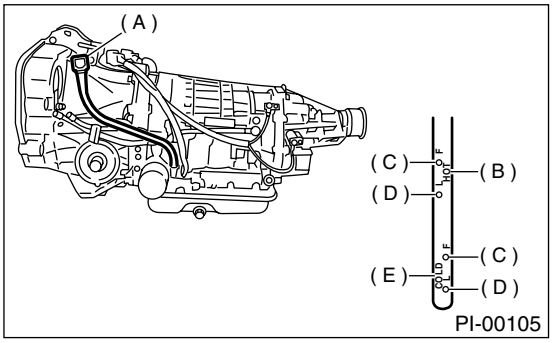
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

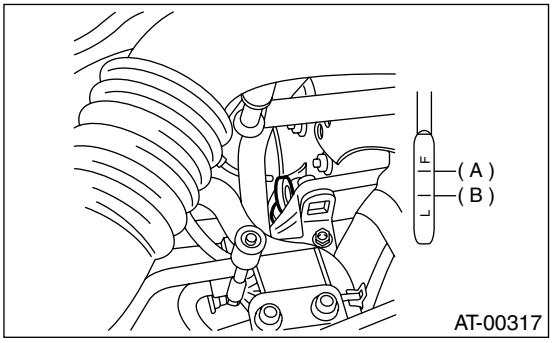
Make sure that ATF level is in the specification. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>



(A) Level gauge
(B) "HOT" side
(C) Upper level
(D) Lower level
(E) "COLD" side

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that the front differential oil level is in specification. <Ref. to 4AT-32, INSPECTION, Differential Gear Oil.>



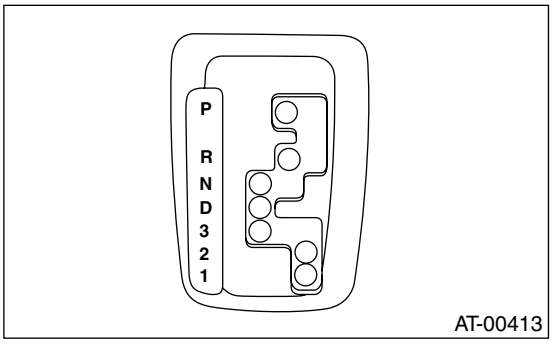
(A) Upper level
(B) Lower level

5. OPERATION OF SHIFT SELECT LEVER

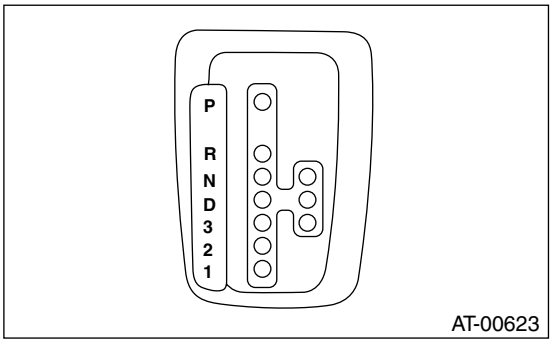
Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of selector lever.

- Without SPORT shift

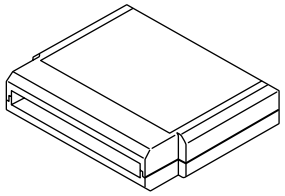


- With SPORT shift



C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

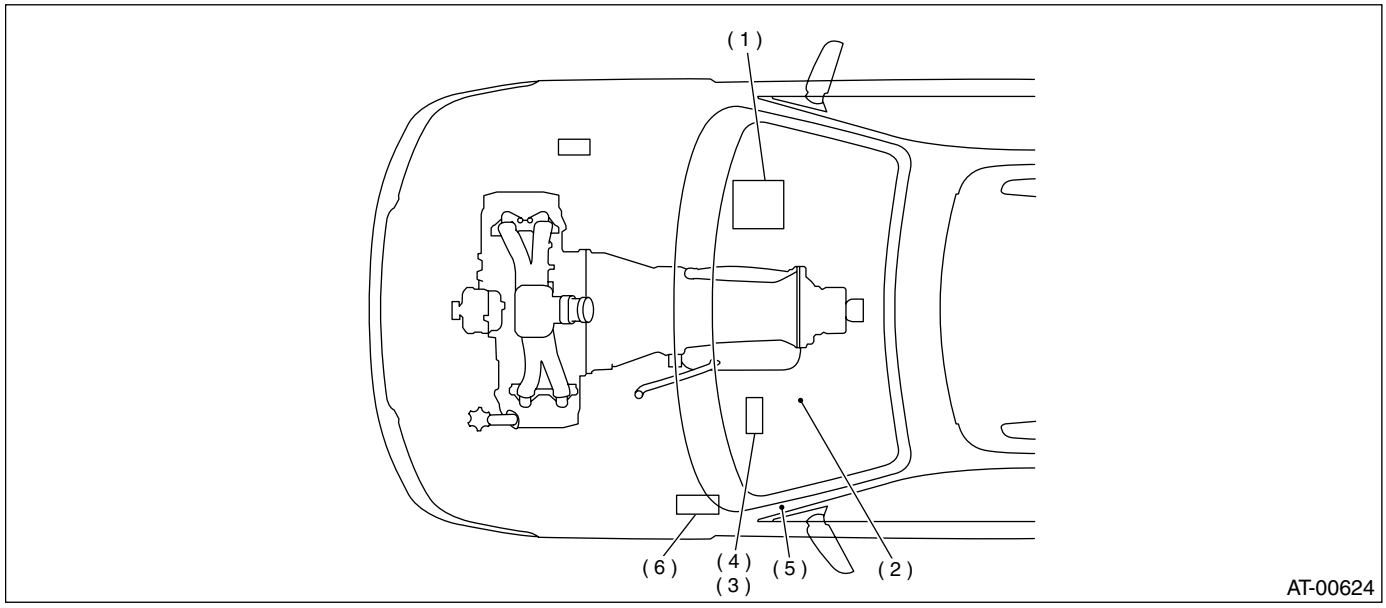
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

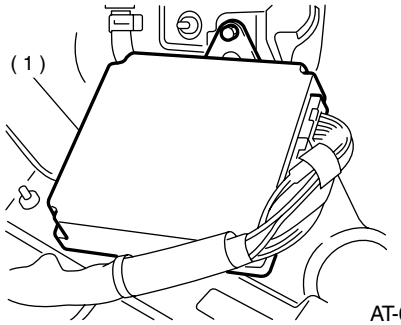
4. Electrical Components Location

A: LOCATION

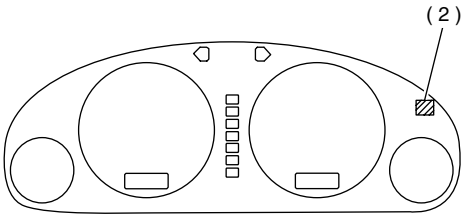
1. CONTROL MODULE



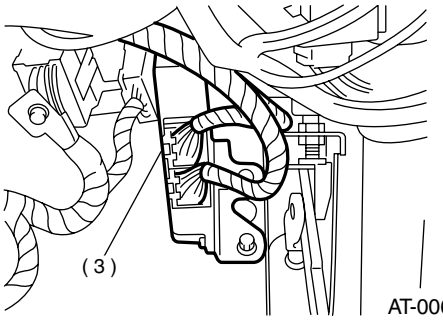
(1) Engine control module (ECM)
(2) AT OIL TEMP warning light (AT diagnostic indicator light)
(3) Transmission control module (TCM) (Without VDC system and SPORT shift)
(4) Transmission control module (TCM) (With VDC system or SPORT shift)
(5) Data link connector
(6) Vehicle dynamic control module (With VDC system)



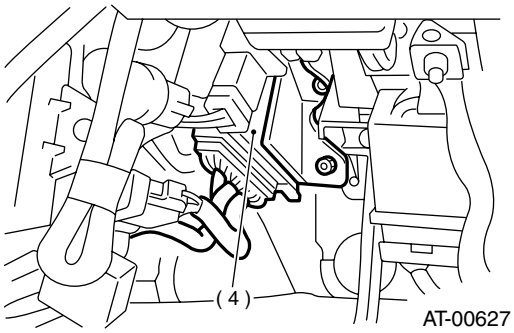
AT-00323



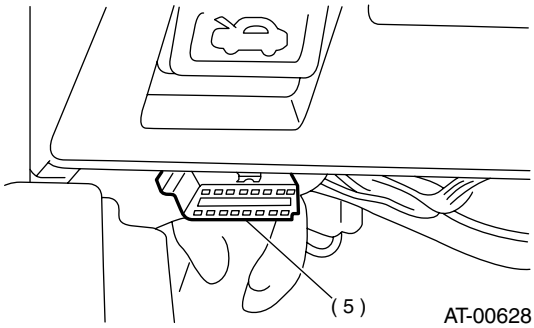
AT-00625



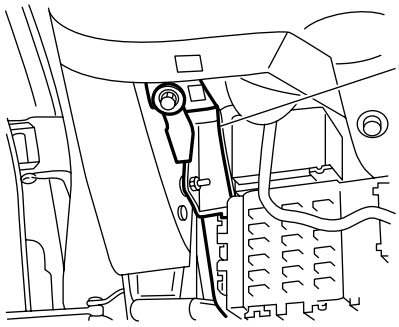
AT-00626



AT-00627

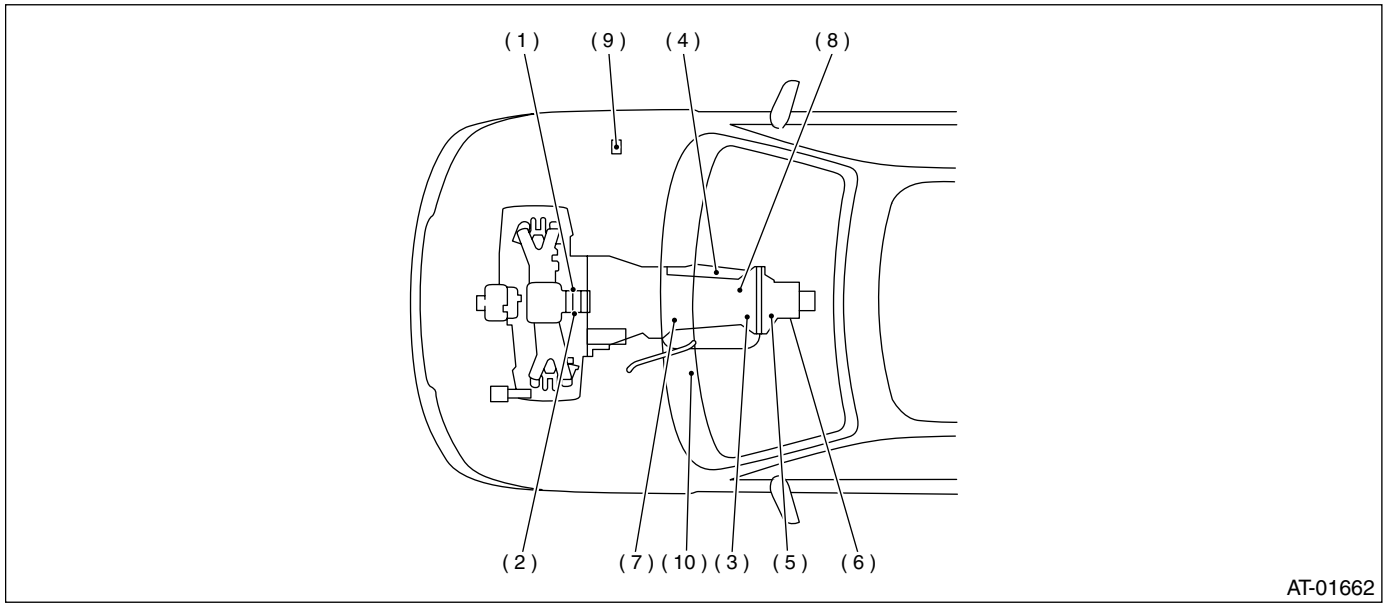


AT-00628

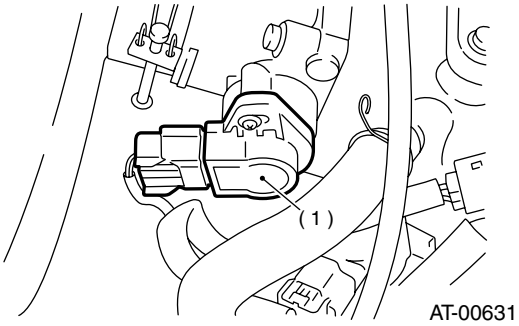


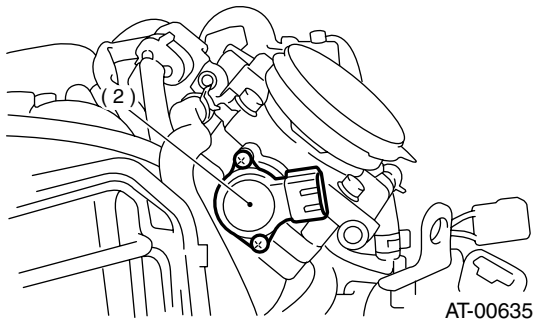
AT-00629

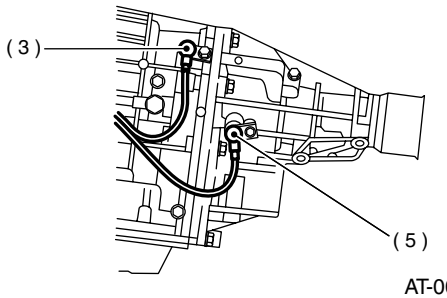
2. SENSOR

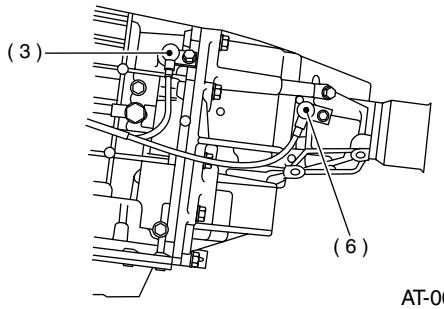


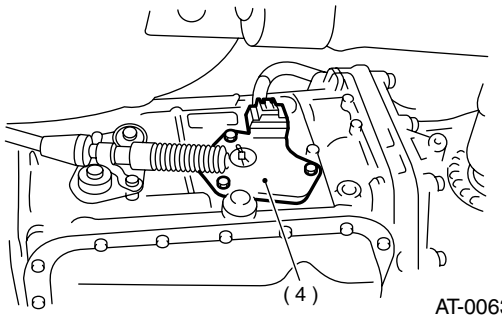
(1) Throttle position sensor (Except 2.5 L U5 model)
(2) Throttle position sensor (3.0 L model)
(3) Front vehicle speed sensor
(4) Inhibitor switch
(5) Rear vehicle speed sensor (Without VDC system and SPORT shift)
(6) Rear vehicle system sensor (With VDC system or SPORT shift)
(7) Torque converter turbine speed signal
(8) ATF temperature sensor (Non-TURBO model)
(9) Dropping resistor (With VDC system or SPORT shift)
(10) Accelerator pedal position sensor (2.5 L U5 model)





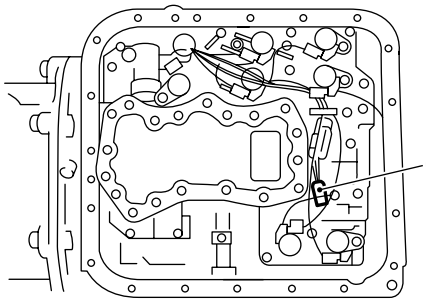






AT-00633

AT-00637



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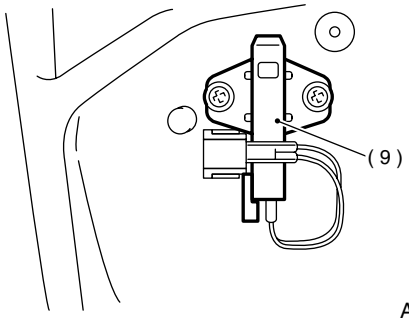
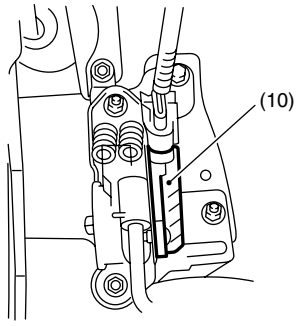
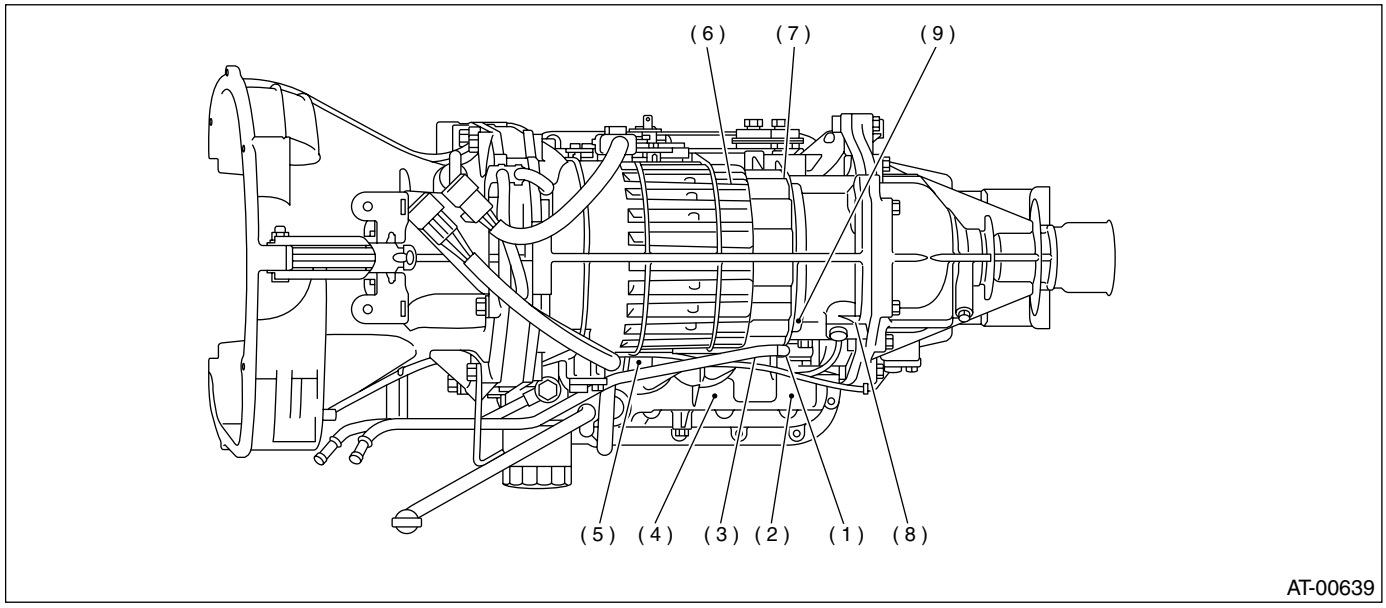


AT-00638

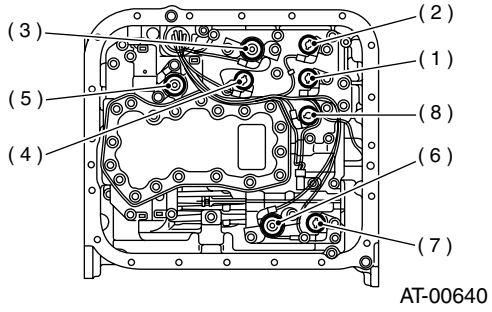


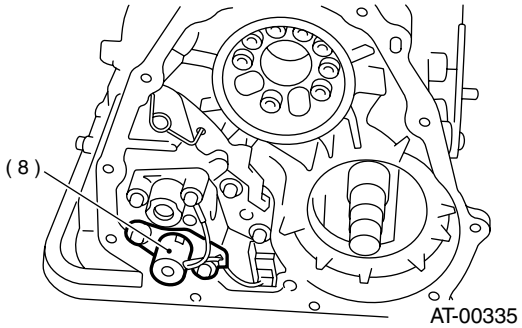
AT-01663

3. SOLENOID



(1) Solenoid 1
(2) Solenoid 2
(3) Line pressure duty solenoid
(4) Low clutch timing solenoid
(5) Lock-up duty solenoid
(6) 2-4 brake duty solenoid
(7) 2-4 brake timing solenoid
(8) Transfer duty solenoid
(9) SPORT shift solenoid (With SPORT shift)

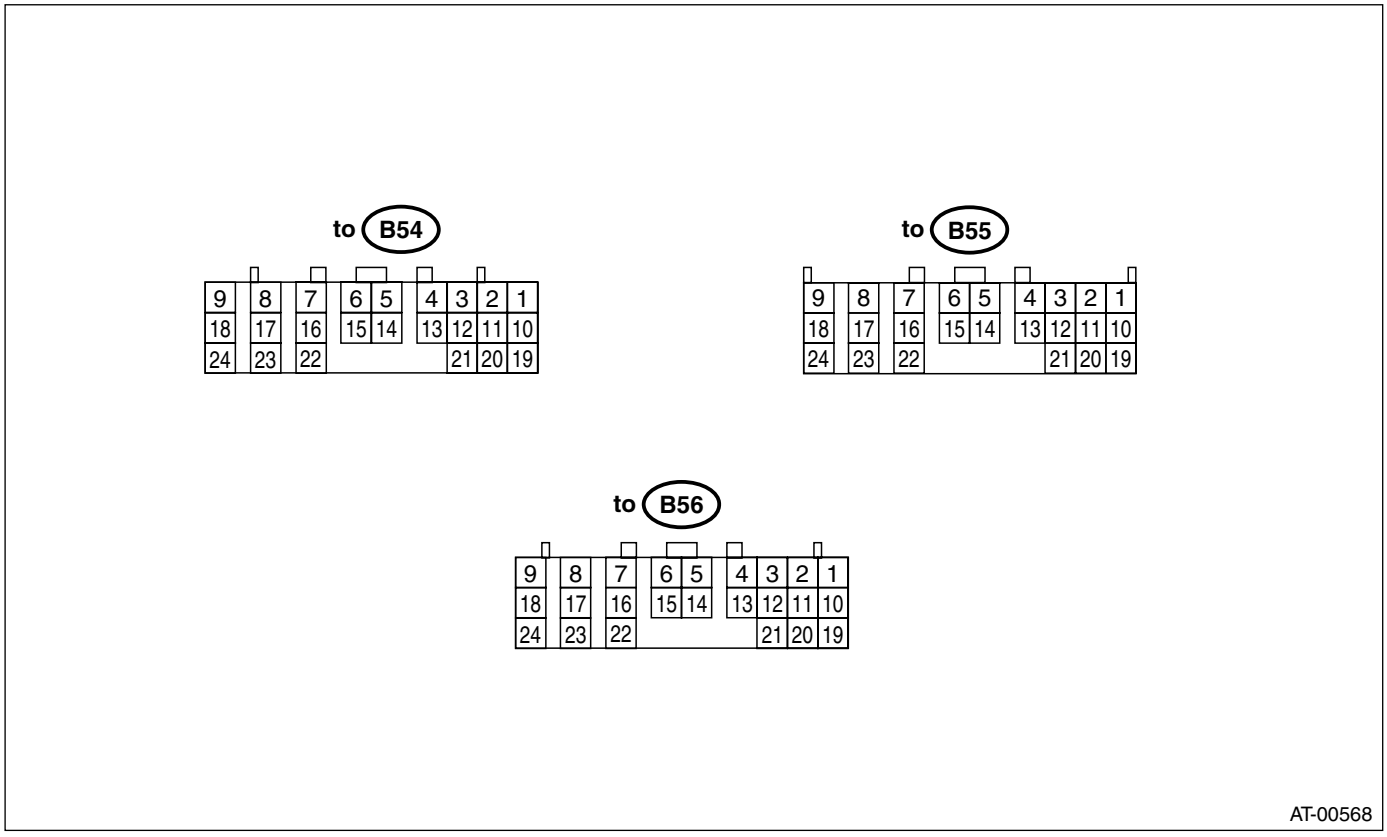




5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

1. WITH VDC SYSTEM OR SPORT SHIFT

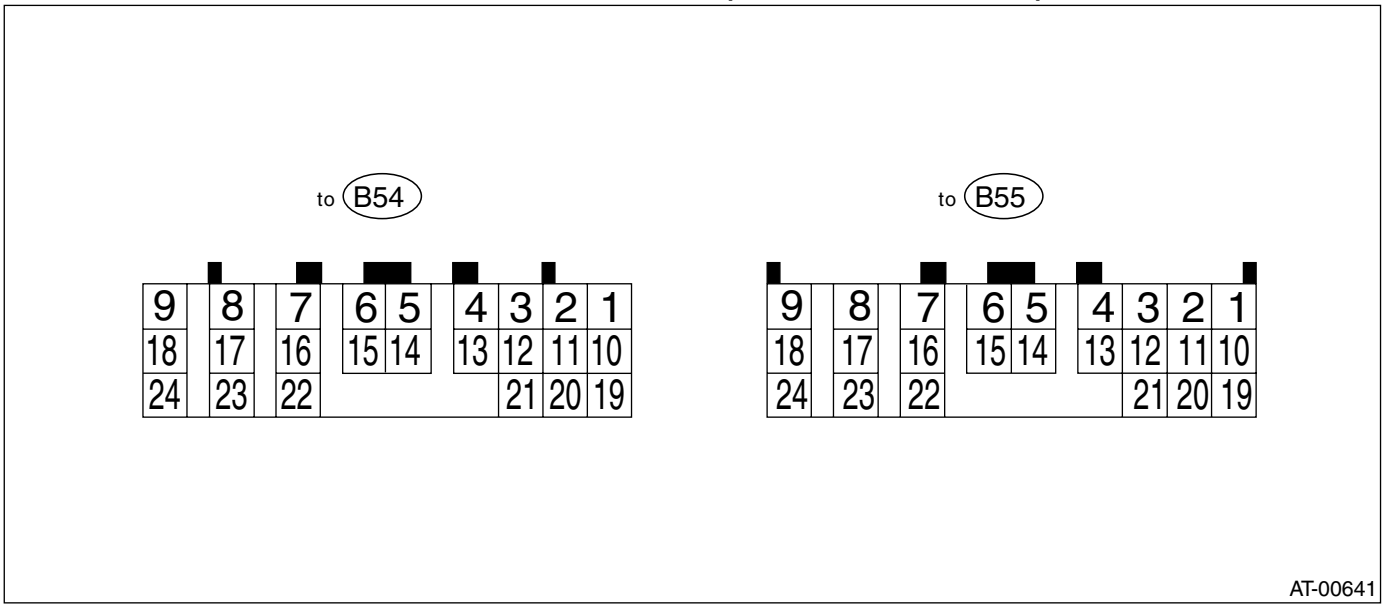


Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	1	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	14	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	3	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	5	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	7	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
AT OIL TEMP warning light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor (Except U5 model)	B54	3	Throttle fully closed.	0.2 — 1.0	—
			Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply (Except U5 model)	B54	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
Accelerator pedal position sensor (U5 model)	B54	3	Throttle fully closed	0.2 — 1.0	—
			Throttle fully open.	4.2 — 4.7	
Accelerator pedal position sensor supply (U5 model)	B54	2	Ignition switch ON	4.8 — 5.3	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B55	24	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	18	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	8	Engine idling after warm-up. (D range)	0	450 — 650
			Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal	B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal (Except U5 model)	B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set. (SET lamp ON)	Less than 1	—
			When cruise control is not set. (SET lamp OFF)	More than 6.5	
Torque control signal 1 (Except U5 model)	B56	5	Ignition switch ON (with engine ON)	More than 4	—
Torque control signal 2 (Except U5 model)	B56	14	Ignition switch ON (with engine ON)	More than 4	—
Torque control cut signal (Except U5 model)	B55	10	Ignition switch ON	8	—
Mass air flow signal (Except U5 model)	B54	1	Engine idling after warm-up.	0.9 — 1.4	—
Shift solenoid 1	B54	22	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF). Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF). Throttle fully open after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
VDC communication signal + (With VDC)	B56	9	Ignition switch ON	(+) — (–) Pulse signal	—
VDC communication signal – (With VDC)	B56	18		(+) — (–) Pulse signal	—
CAN communication signal + (U5 model)	B56	9	Ignition switch ON	Pulse signal	—
CAN communication signal – (U5 model)	B56	18		Pulse signal	—
Transfer duty solenoid	B54	6	Throttle fully closed.	More than 8.5	10 — 17
			Throttle fully open.	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
ABS signal (Without VDC system)	B55	21	ABS switch ON	Less than 1	—
			ABS switch OFF	6.5 — 15	—
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	21			
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
SPORT shift solenoid (with SPORT shift)	B54	14	SPORT shift activated	More than 8	10 — 17
			SPORT shift deactivated	Less than 1	
SPORT shift mode switch (with SPORT shift)	B55	15	SPORT shift mode switch ON	Less than 1	—
			SPORT shift mode switch OFF	More than 8	
Shift up switch (with SPORT shift)	B55	13	Shift up switch ON	Less than 1	—
			Shift up switch OFF	More than 8	
Shift down switch (with SPORT shift)	B55	2	Shift down switch ON	Less than 1	—
			Shift down switch OFF	More than 8	
Buzzer (with SPORT shift)	B56	21	ON	Less than 1	—
			OFF	More than 8	
SPORT shift indicator (with SPORT shift)	B56	12	SPORT shift mode OFF	More than 4	—
			Shift down indicator ON	Less than 1	
SPORT shift indicator (with SPORT shift)	B56	13	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 4th gear	Less than 1	
SPORT shift indicator (with SPORT shift)	B56	3	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 2nd and 3rd gear	Less than 1	
SPORT shift indicator (with SPORT shift)	B56	4	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 1st and 3rd gear	Less than 1	

2. WITHOUT VDC SYSTEM AND SPORT SHIFT (EXCEPT U5 MODEL)

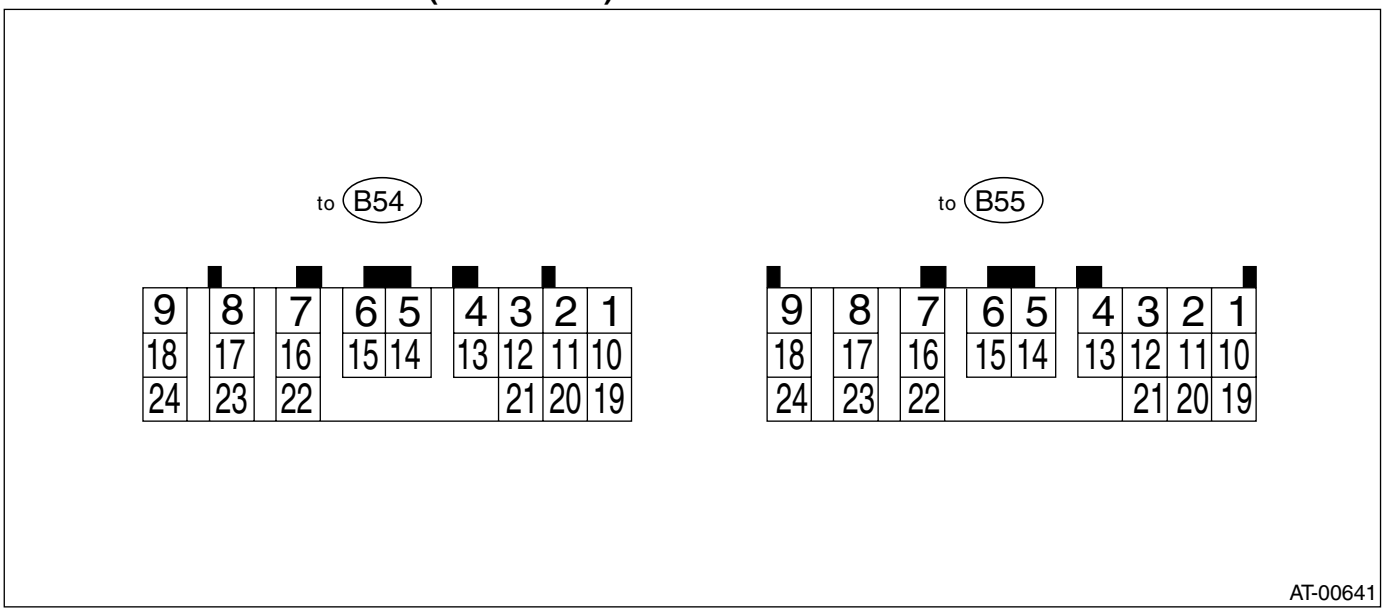


Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B55	6	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	23	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	22	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	17	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	8	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	18	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B54	10	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B54	1	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	24	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
ABS signal		B54	19	ABS switch ON	Less than 1	—
				ABS switch OFF	More than 6.5	
AT OIL TEMP warning light		B54	3	Light ON	Less than 1	—
				Light OFF	More than 9	
Throttle position sensor		B55	2	Throttle fully closed.	0.2 — 1.0	—
				Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply		B55	1	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor		B55	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
				ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Rear vehicle speed sensor	B55	3	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	5	Vehicle stopped	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	12	Engine idling after warm-up (“D” range)	0	450 — 650
			Engine idling after warm-up (“N” range)	More than 1 (AC range)	
Vehicle speed output signal	B55	13	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal	B55	4	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	0 — 13 or more	
Cruise set signal	B54	11	When cruise control is set (SET light ON)	Less than 1	—
			When cruise control is not set (SET light OFF)	More than 6.5	
Torque control signal 1	B54	13	Ignition switch ON (with engine ON)	More than 4.0	—
Torque control signal 2	B54	21	Ignition switch ON (with engine ON)	More than 4.0	—
Torque control cut signal	B54	2	Ignition switch ON	8	—
Intake manifold pressure signal	B55	20	Engine idling after warm-up.	0.4 — 1.6	—
Shift solenoid 1	B54	7	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	6	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF). Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF). Throttle fully open after warm-up.	Less than 1	
Dropping resistor	B54	18	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	16	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	15	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	5	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	14	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Sensor ground line 1	B55	10	—	0	Less than 1
Sensor ground line 2	B55	21	—	0	Less than 1
System ground line	B55	9	—	0	Less than 1
		19			
FWD switch	B55	14	Fuse removed.	More than 9	—
			Fuse installed.	Less than 1	
FWD indicator light	B54	12	Fuse ONFWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
AT diagnosis signal (Pulse signal)	B54	4	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B55	7	—	—	—

3. WITHOUT SPORT SHIFT (U5 MODEL)



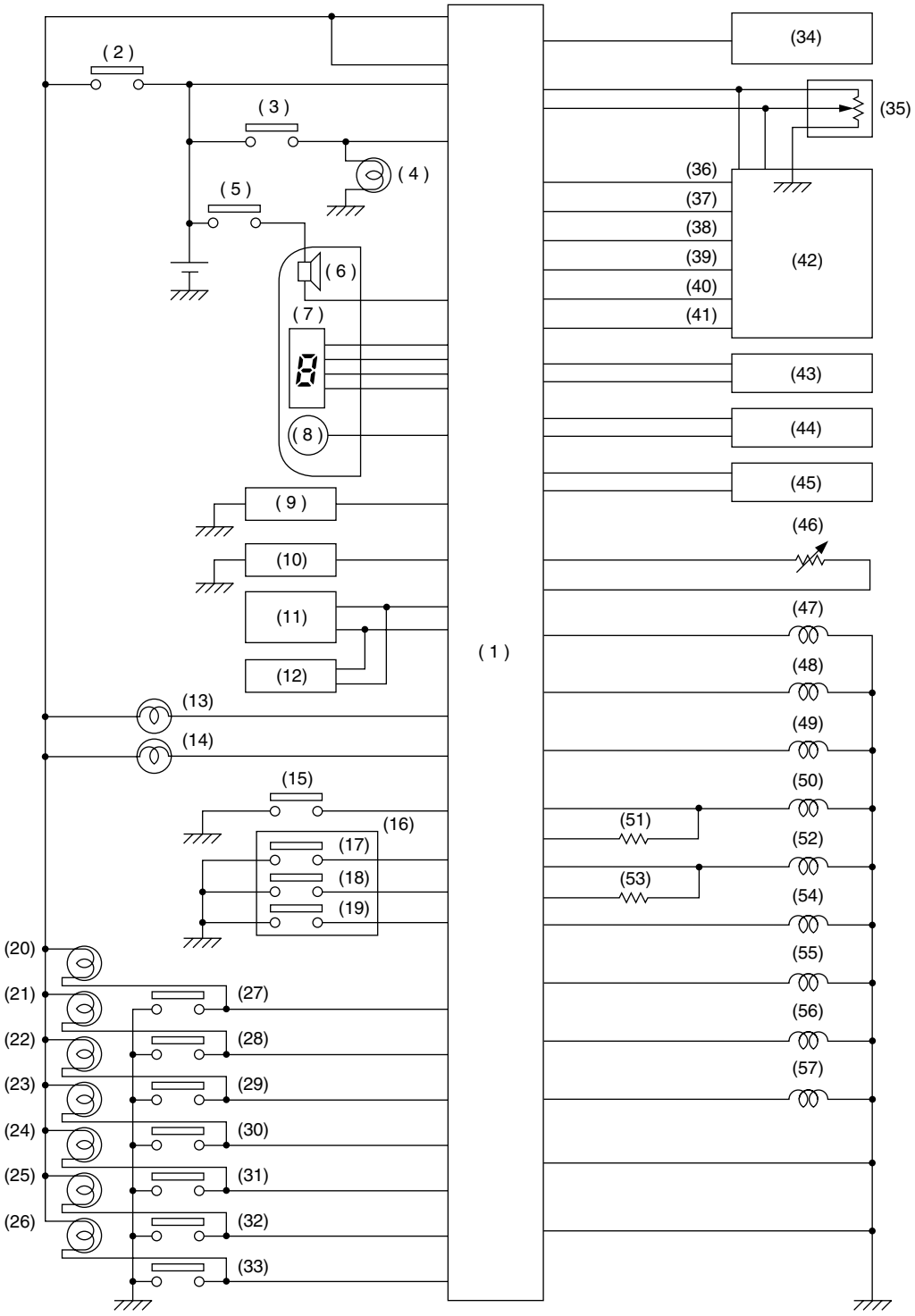
Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B55	24	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	3	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	2	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	13	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	14	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	22	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	5	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
ABS signal		B55	15	ABS switch ON	Less than 1	—
				ABS switch OFF	More than 6.5	
AT OIL TEMP warning light		B54	5	Light ON	Less than 1	—
				Light OFF	More than 9	
Accelerator pedal position sensor		B54	4	Throttle fully closed.	0.2 — 1.0	—
				Throttle fully open.	4.2 — 4.7	
Accelerator pedal position sensor power supply		B54	3	Ignition switch ON (With engine OFF)	4.8 — 5.3	—

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
ATF temperature sensor	B54	12	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B54	2	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	11	Vehicle stopped	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B54	1	Engine idling after warm-up (“D” range)	0	450 — 650
			Engine idling after warm-up (“N” range)	More than 1 (AC range)	
Vehicle speed output signal	B55	8	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Shift solenoid 1	B54	7	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	6	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF). Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF). Throttle fully open after warm-up.	Less than 1	
Lock-up duty solenoid	B54	18	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	17	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line 1	B54	11	—	0	Less than 1
Sensor ground line 2	B54	10	—	0	Less than 1
Sensor ground line 3	B55	21	—	0	Less than 1
Sensor ground line 4	B55	10	—	0	Less than 1
System ground line	B55	9	—	0	Less than 1
		19			
FWD switch	B54	21	Fuse removed.	More than 9	—
			Fuse installed.	Less than 1	
FWD indicator light	B55	17	Fuse ONFWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
CAN communication signal (+)	B54	14	—	Pulse signal	—
CAN communication signal (–)	B54	13	—	Pulse signal	—
AT diagnosis signal	B54	22	Ignition switch ON	Less than 1 ← → More than 4	—

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Data link signal (Subaru Select Monitor)	B55	7	—	—	—

B: SCHEMATIC

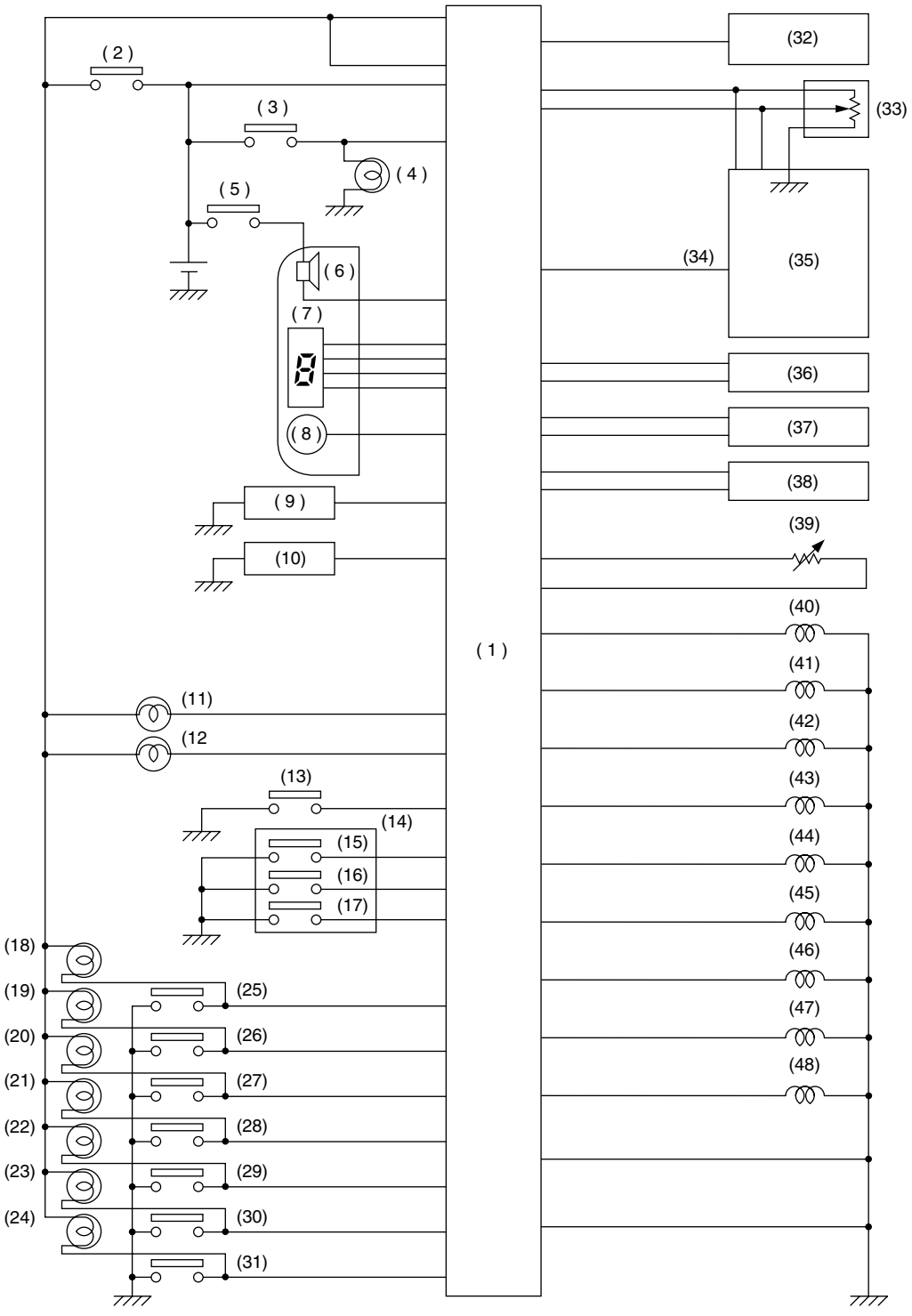
1. EXCEPT U5 MODEL



AT-00643

(1) Transmission control module
(2) Ignition switch
(3) Brake switch
(4) Brake light
(5) Ignition relay
(6) Buzzer (with SPORT shift)
(7) SPORT shift indicator (with SPORT shift)
(8) Speedometer
(9) Cruise control module
(10) ABS control module (without VDC system)
(11) VDC control module (with VDC system)
(12) Steering angle sensor (with VDC system)
(13) FWD indicator light (without VDC system and SPORT shift)
(14) "AT OIL TEMP" warning light
(15) FWD switch (without VDC system and SPORT shift)
(16) SPORT shift (with SPORT shift)
(17) SPORT shift mode switch
(18) Up switch
(19) Down switch
(20) "P" range indicator light
(21) "R" range indicator light
(22) "N" range indicator light
(23) "D" range indicator light
(24) "3" range indicator light
(25) "2" range indicator light
(26) "1" range indicator light
(27) "P" range switch
(28) "R" range switch
(29) "N" range switch
(30) "D" range switch
(31) "3" range switch
(32) "2" range switch
(33) "1" range switch
(34) Data link connector
(35) Throttle position sensor
(36) Engine speed signal
(37) Torque control cut signal
(38) Torque control signal 2
(39) Torque control signal 1
(40) Intake manifold pressure signal
(41) AT diagnosis signal
(42) Engine control module
(43) Front vehicle speed sensor
(44) Rear vehicle speed sensor
(45) Torque converter turbine speed sensor
(46) ATF temperature sensor
(47) Shift solenoid 1
(48) Shift solenoid 2
(49) 2-4 brake timing solenoid
(50) 2-4 brake duty solenoid
(51) 2-4 brake dropping resistor (without VDC system and SPORT shift)
(52) Line pressure duty solenoid
(53) Line pressure dropping resistor (without VDC system and SPORT shift)
(54) Lock-up duty solenoid
(55) Low clutch timing solenoid
(56) Transfer duty solenoid
(57) SPORT shift solenoid (with SPORT shift)

2. U5 MODEL



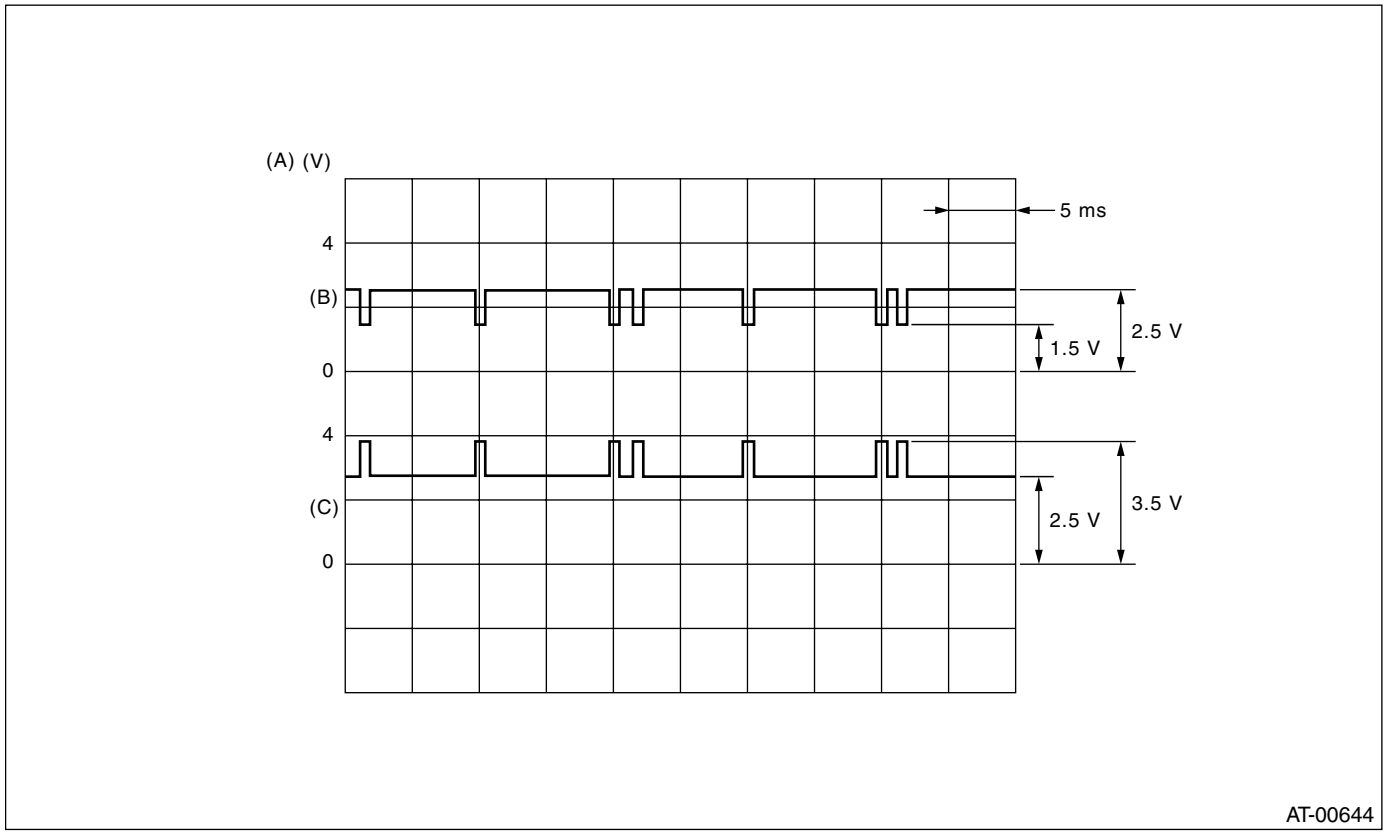
AT-01664

(1) Transmission control module
(2) Ignition switch
(3) Brake switch
(4) Brake light
(5) Ignition relay
(6) Buzzer (with SPORT shift)
(7) SPORT shift indicator (with SPORT shift)
(8) Speedometer
(9) Cruise control module
(10) ABS control module
(11) FWD indicator light (without SPORT shift)
(12) "AT OIL TEMP" warning light
(13) FWD switch (without SPORT shift)
(14) SPORT shift (with SPORT shift)
(15) SPORT shift mode switch
(16) Up switch
(17) Down switch
(18) "P" range indicator light
(19) "R" range indicator light
(20) "N" range indicator light
(21) "D" range indicator light
(22) "3" range indicator light
(23) "2" range indicator light
(24) "1" range indicator light
(25) "P" range switch
(26) "R" range switch
(27) "N" range switch
(28) "D" range switch
(29) "3" range switch
(30) "2" range switch
(31) "1" range switch
(32) Data link connector
(33) Accelerator pedal position sensor
(34) CAN communication signal
(35) Engine control module
(36) Front vehicle speed sensor
(37) Rear vehicle speed sensor
(38) Torque converter turbine speed sensor
(39) ATF temperature sensor
(40) Shift solenoid 1
(41) Shift solenoid 2
(42) 2-4 brake timing solenoid
(43) 2-4 brake duty solenoid
(44) Line pressure duty solenoid
(45) Lock-up duty solenoid
(46) Low clutch timing solenoid
(47) Transfer duty solenoid
(48) SPORT shift solenoid (with SPORT shift)

C: MEASUREMENT

Only for models with VDC system, measure input/output signal voltage.

1. WAVEFORM



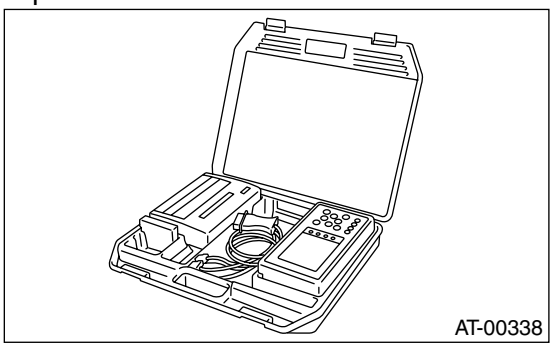
(A) Can communication line
(B) Terminal No.:
(B56) No. 9 — (B55) No. 9
(C) Terminal No.:
(B56) No. 18 — (B55) No. 9

6. Subaru Select Monitor

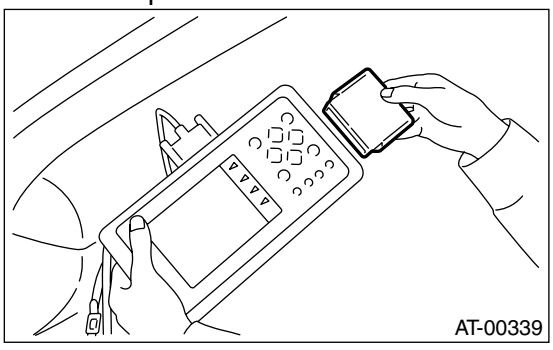
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.

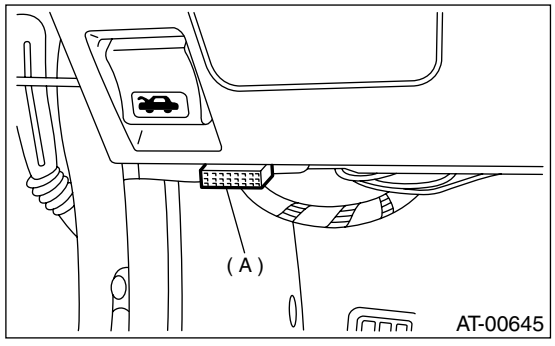


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to 4AT(H4SO)-7, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

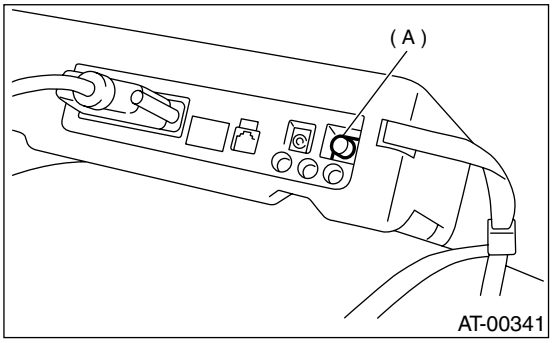
(1) Data link connector located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

NOTE:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) POWER switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
8) Press the [YES] key after the information of transmission type is displayed.
9) On the «Transmission Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
10) On the «DTC Display» display screen, select the {Memorized DTC} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the Subaru Select Monitor OPERATION MANUAL.
• For details concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to 4AT(H4SO)-35, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.

6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position sensor	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio (AWD model)	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
Throttle position	Throttle Opening Angle	%
Up shift signal (With SPORT Shift)	Up switch	ON or OFF
Down shift signal (With SPORT Shift)	Down switch	ON or OFF
SPORT shift mode signal (With SPORT Shift)	Tip mode switch	ON or OFF
2 wheel drive switch signal	FWD Switch	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid 1	Shift Solenoid #1	ON or OFF
Shift control solenoid 2	Shift Solenoid #2	ON or OFF
Torque control output signal #1 (Except U5)	Torque Control Signal 1	ON or OFF
Torque control output signal #2 (Except U5)	Torque Control Signal 2	ON or OFF
Torque control cut signal (Except U5)	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF
Automatic transmission fluid temperature lamp	ATF Temperature Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the Subaru Select Monitor OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the “Done” and “Turn Ignition Switch OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the Subaru Select Monitor OPERATION MANUAL.

7. Read Diagnostic Trouble Code (DTC)

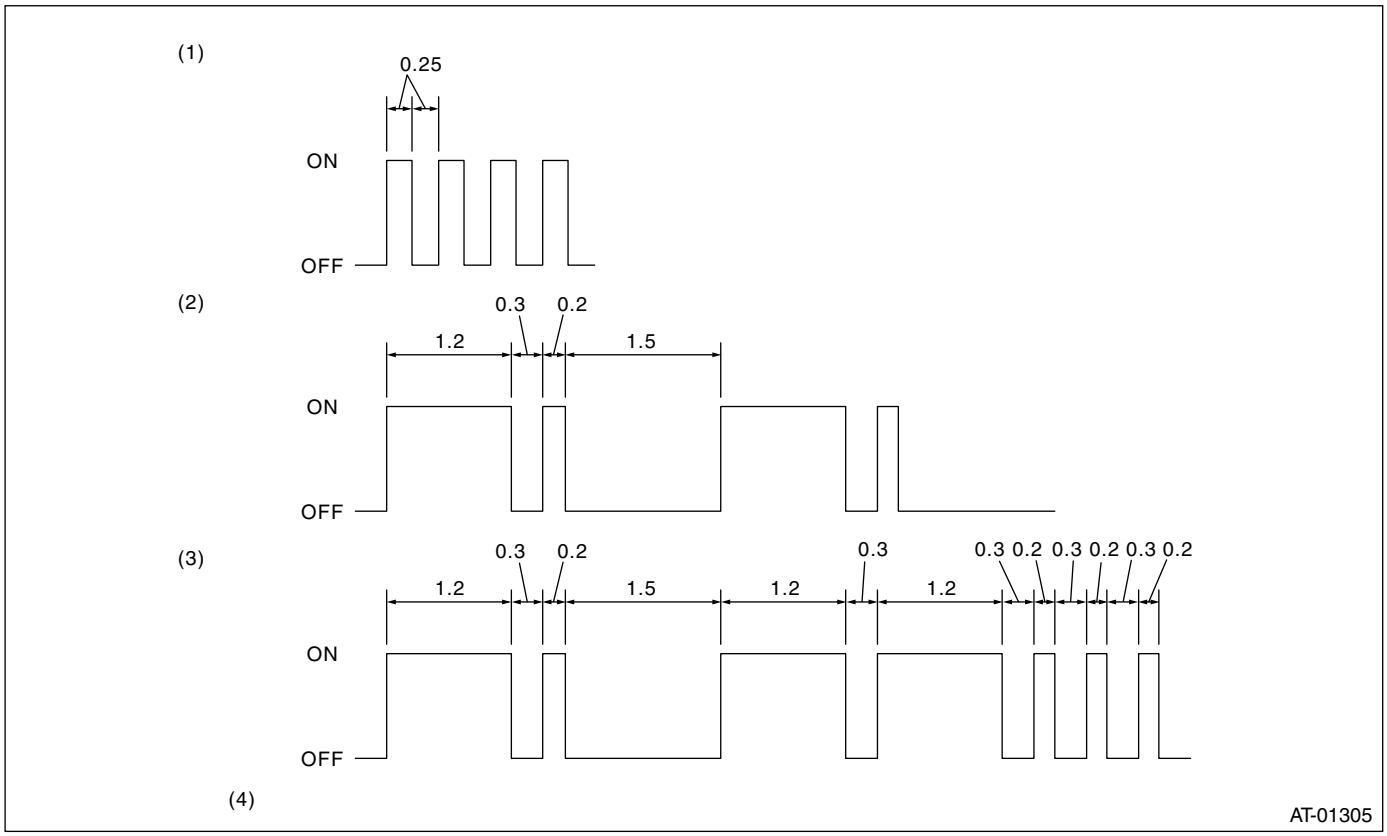
A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Step		Check	Yes	No
1	**PERFORM READ DTC.** 1) Warm-up the engine. 2) Turn the ignition switch to OFF. 3) Turn the ignition switch to ON. 4) Start the engine. 5) Drive the vehicle at speeds greater than 20 km/h (12 MPH). 6) Stop the vehicle. 7) The brake pedal depressed and move select lever to 1 range. 8) Turn the ignition switch to OFF. 9) Turn the ignition switch to ON. 10)Move the select lever “2” range. 11)Move the select lever “1” range. 12)Move the select lever “2” range. 13)Move the select lever “3” range. 14)Move the select lever “D” range.	Does the AT OIL TEMP warning light blink at 4 Hz intervals? NOTE: Blinks every 0.125 (1/8) seconds (until the ignition switch is turned OFF).	Repair the power supply and ground circuit. <Ref. to 4AT(H4SO)-42, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for AT OIL TEMP Warning Light.>	Go to step **2.**
2	**CHECK AT OIL TEMP WARNING LIGHT.**	Does the AT OIL TEMP warning light blink at 2 Hz intervals? NOTE: Blinks every 0.25 (1/4) seconds (until ignition switch is turned to OFF).	The AT system is normal.	Go to step **3.**
3	**CHECK AT OIL TEMP WARNING LIGHT.**	Is the DTC outputted by the blink of AT OIL TEMP warning light?	Inspect the problem corresponding with DTC. NOTE: Record all DTCs.	Go to step **4.**
4	**CHECK AT OIL TEMP WARNING LIGHT.**	Does the AT OIL TEMP warning light remain illuminated?	Repair the AT OIL TEMP warning light circuit <Ref. to 4AT(H4SO)-37, Diagnostic Procedure for AT OIL TEMP Warning Light.>, or Inspect inhibitor switch, wiring, TCM, etc.	Calling up the DTC again.

• The way of reading DTC

The AT OIL TEMP warning light flashes the code corresponding to faulty part.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.2 sec on) signifies a “one”.



(1) Normal code
(2) DTC 11
(3) DTC 11 and 23
(4) Unit: Seconds

2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to obtain and understand DTC. <Ref. to 4AT(H4SO)-27, OPERATION, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

Shift the select lever to D range, and drive continuously for 10 seconds or more at 60 km/h (37 MPH).

WARNING:
Observe the road traffic law.

9. Clear Memory Mode

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Current DTC shown on display are cleared by turning the ignition switch to OFF after conducting on-board diagnostics operation. Previous DTC, however, cannot be cleared since they are stored in the TCM memory which is operating on back-up power supply. These DTC can be cleared by removing the specified TCM connector for at least two minutes.

CLEAR MEMORY:

Without VDC system and SPORT shift
Remove the TCM connector (B55) for at least two minutes.

With VDC system or SPORT shift
Remove the TCM connector (B56) for at least two minutes.

• TCM connector is located in the line to memory back-up power supply of TCM. Removal of this connector clears the previous DTC stored in TCM memory.

• Be sure to remove TCM connector for at least the specified length of time. Otherwise, the DTC may not be cleared.

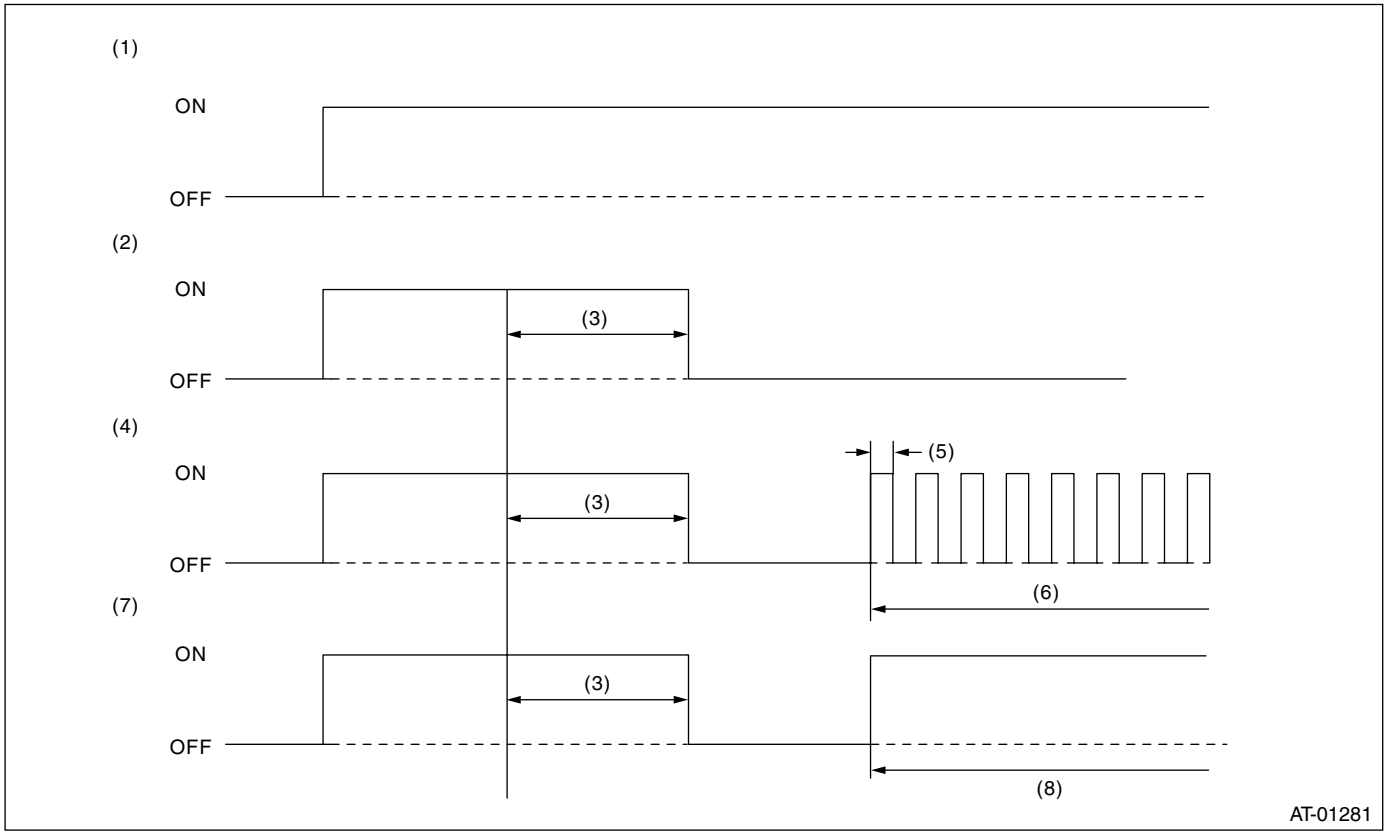
2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to clear DTC.
<Ref. to 4AT(H4SO)-29, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

10.AT OIL TEMP Warning Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on AT OIL TEMP warning light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the AT OIL TEMP warning light does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The AT OIL TEMP warning light signal is as shown in the figure.



(1) Ignition switch (engine OFF)
(2) Normal
(3) 2 secs
(4) Abnormal (Trouble occurs)
(5) 0.25 secs
(6) Blink
(7) Normal (ATF temperature is low)
(8) ATF temperature is high

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnosis	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-50, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-54, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor (Except U5 model) Accelerator pedal position sensor (U5 model)	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-70, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-76, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-80, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Intake manifold pressure signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-84, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-86, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-90, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-94, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-98, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-102, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-108, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-114, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
78	SPORT shift solenoid	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-120, DTC 78 SPORT SHIFT SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(H4SO)-124, DTC 79 TRANSFER DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
86	CAN communication signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-130, DTC 86 CAN COMMUNICATION SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Content of diagnosis	Index
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(H4SO)-136, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure for AT OIL TEMP Warning Light

A: AT OIL TEMP WARNING LIGHT DOES NOT COME ON OR GO OFF

DIAGNOSIS:

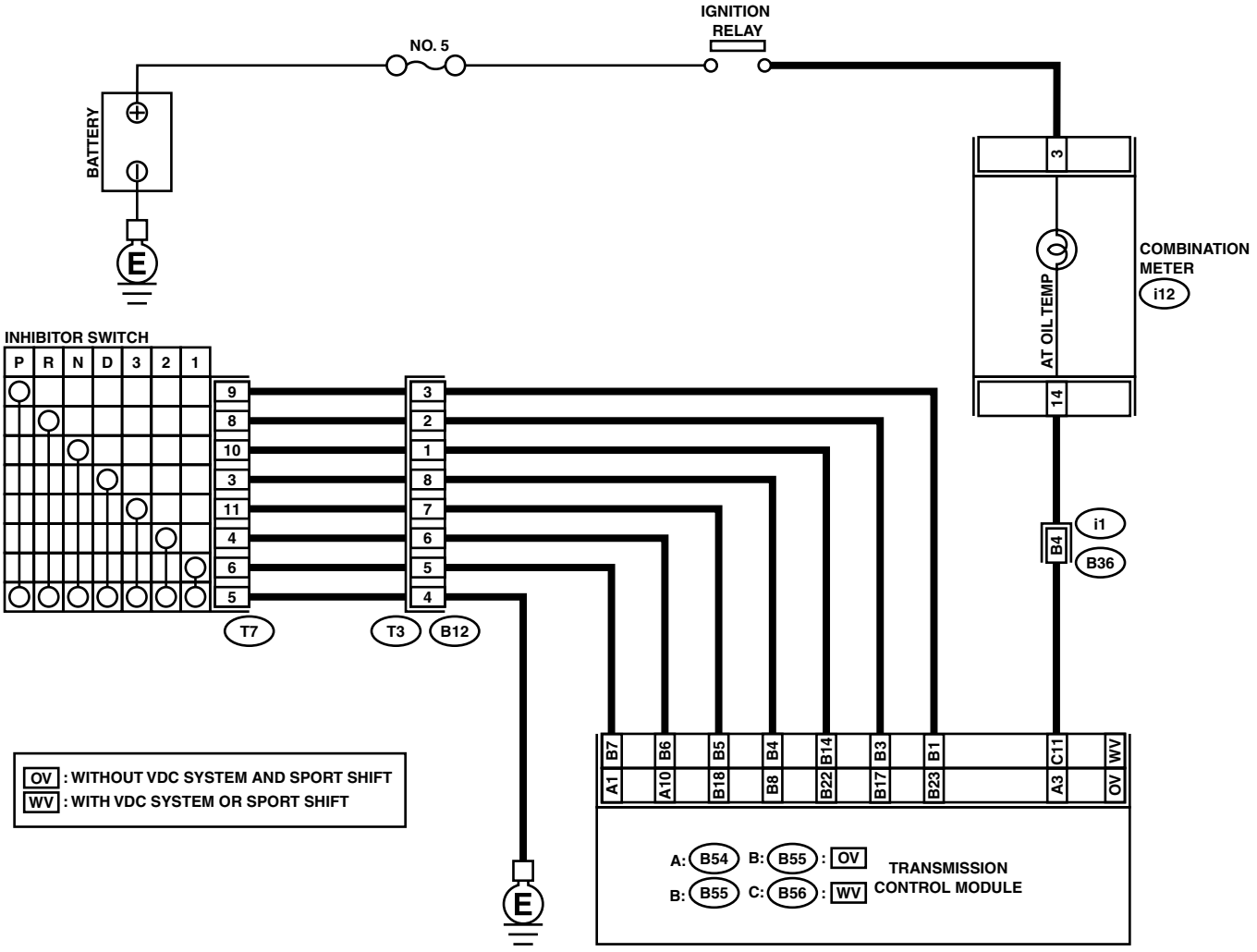
The AT OIL TEMP warning light circuit is open or shorted.

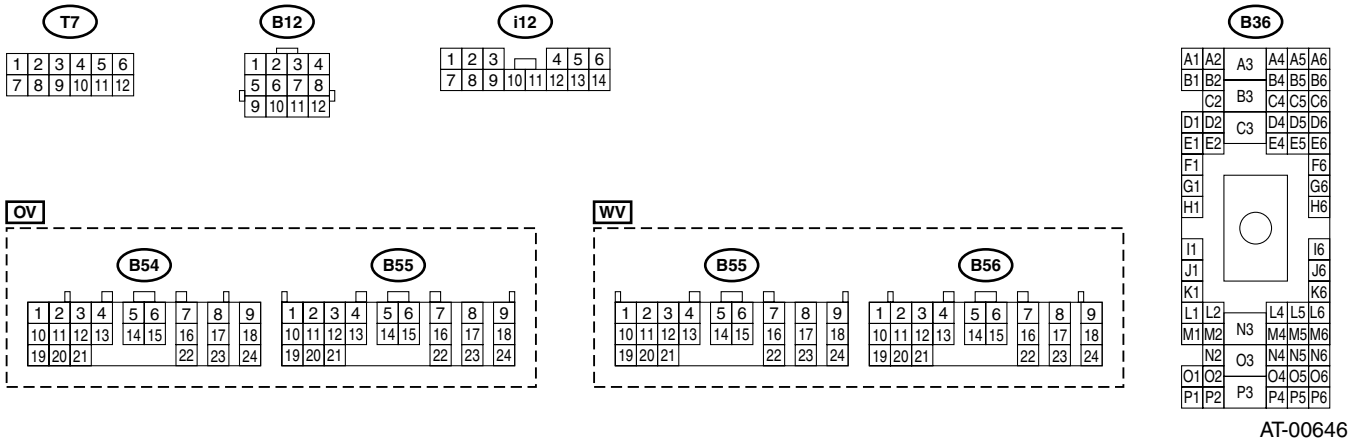
TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), AT OIL TEMP warning light does not illuminate.
- When the on-board diagnostics is performed, AT OIL TEMP warning light remains illuminated.

WIRING DIAGRAM:

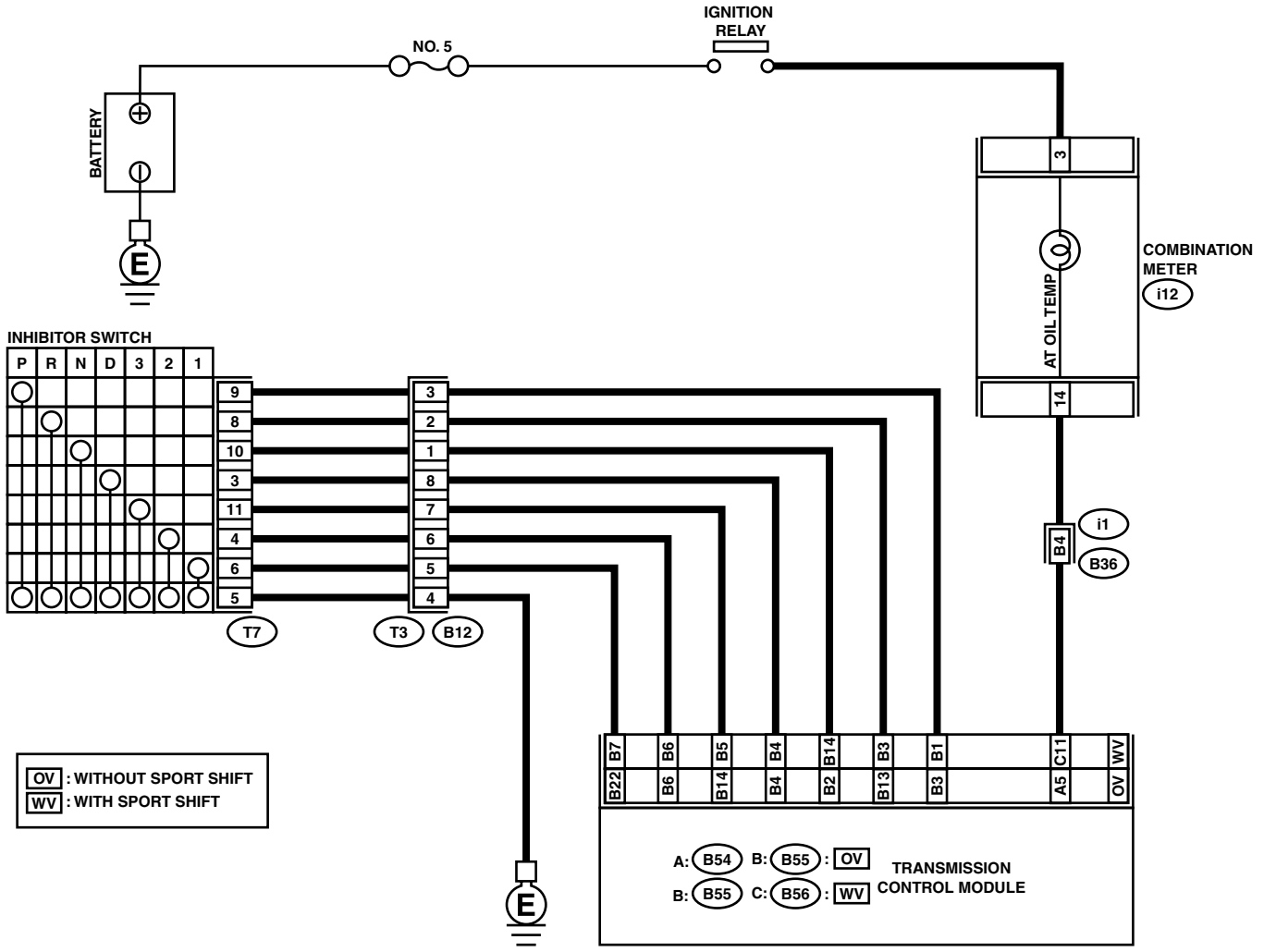
- Except 2.5L U5 model and 3.0L model

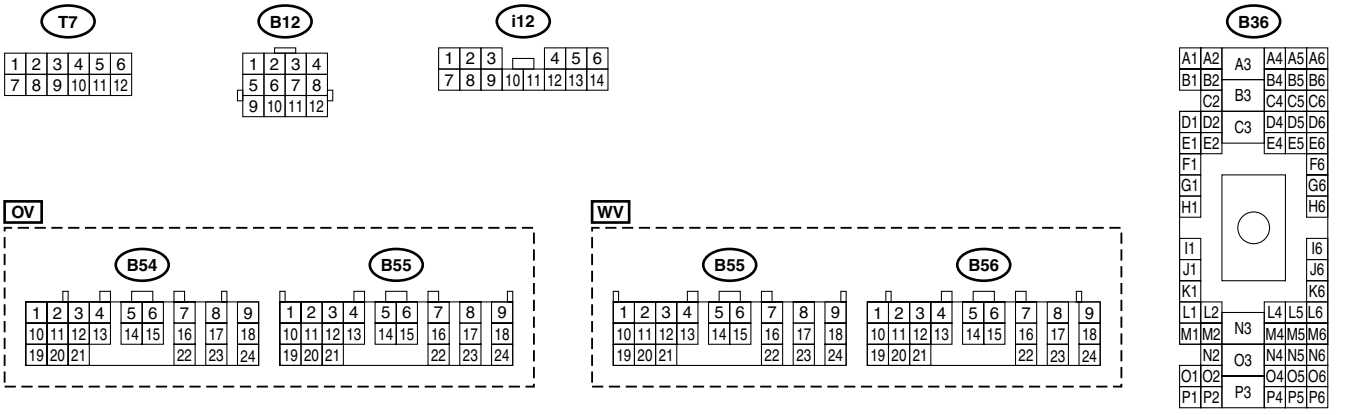




AT-00646

- 2.5L U5 model





AT-01665

DIAGNOSTIC PROCEDURE FOR AT OIL TEMP WARNING LIGHT

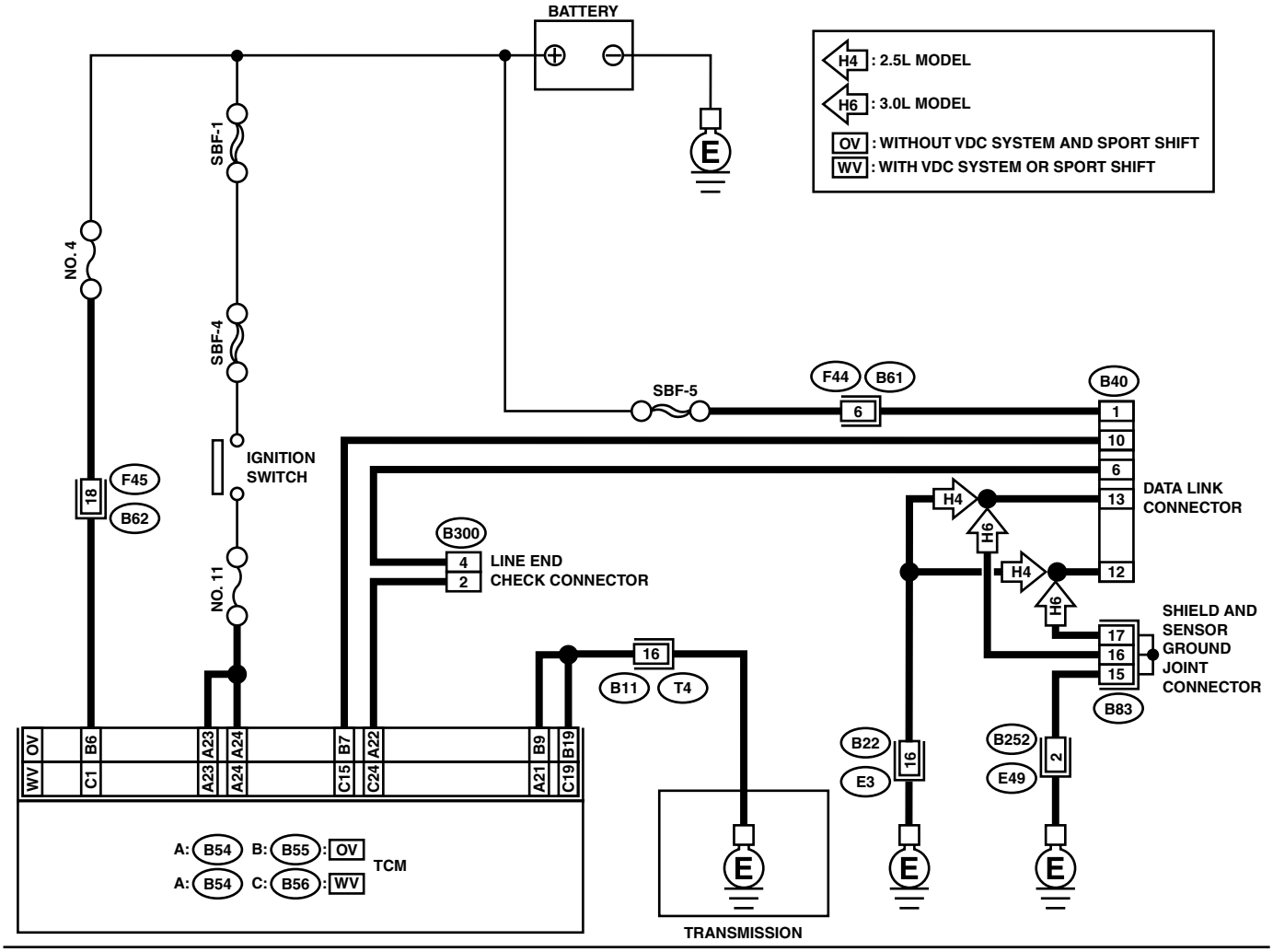
	Step	Check	Yes	No
1	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON (engine OFF).	Does the AT OIL TEMP warning light illuminate?	Go to step **3.**	Go to step **2.**
2	**CHECK AT OIL TEMP WARNING LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter.	Is the AT OIL TEMP warning light bulb OK?	Go to step **4.**	Check the combination meter.
3	**CHECK AT OIL TEMP WARNING LIGHT.** Perform “Read Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(H4SO)-30, Read Diagnostic Trouble Code (DTC).>	Does the AT OIL TEMP warning light blink?	A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM, inhibitor switch and combination meter.	Go to step **9.**
4	**CHECK FUSE (No. 5).** Remove the fuse (No. 5).	Is the fuse (No. 5) blown out?	Replace the fuse (No. 5). If replaced fuse (No. 5) is blown out easily, repair short circuit in harness between fuse (No. 5) and combination meter.	Go to step **5.**
5	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **6.**	Repair the open circuit in harness between combination meter and battery.
6	**CHECK COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 9 V?	Repair the combination meter. <Ref. to IDI-13, Combination Meter Assembly.>	Go to step **7.**
7	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter connector. 3) Measure the resistance of harness between combination meter. ***Connector & terminal*** ***With VDC system or SPORT shift*** ***(B56) No. 11 — (i12) No. 14:*** ***Without SPORT shift (Except U5 model)*** ***(B54) No. 3 — (i12) No. 14:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 5 — (i12) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.

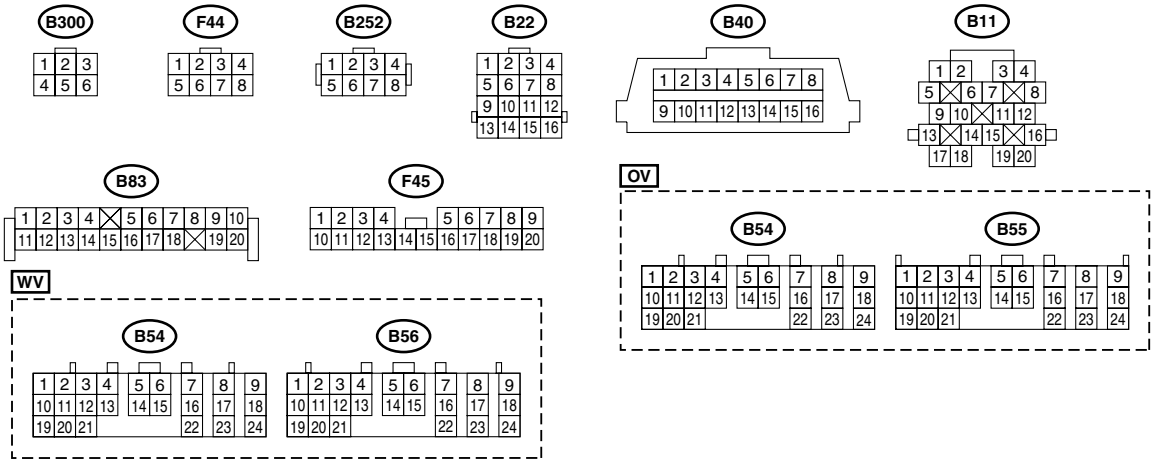
	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and combination meter. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without SPORT shift (Except U5 model) (B54) No. 3 (+) — Chassis ground (–):*** ***Without SPORT shift (Except U5 model) (B54) No. 5 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B56) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
9	**CHECK INHIBITOR SWITCH.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Turn the Subaru Select Monitor to ON. 4) Read the data of range switch using Subaru Select Monitor. •Range switch is indicated in ON ←→ OFF.	When each range is selected, does the LED of Subaru Select Monitor light up?	Go to step **10.**	Check the inhibitor switch circuit. <Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
10	**CHECK SHORT CIRCUIT OF HARNESS.** 1) Disconnect the connector from TCM. 2) Remove the combination meter. 3) Disconnect the connector from combination meter. 4) Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***Without SPORT shift (Except U5 model) (B54) No. 13 — Chassis ground:*** ***Without SPORT shift (U5 model) (B54) No. 5 — Chassis ground:*** ***With VDC system or SPORT shift (B56) No. 11 — Chassis ground:***	Is the resistance less than 1 MΩ?	Check the TCM power supply and ground line. <Ref. to 4AT(H4SO)-42, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for AT OIL TEMP Warning Light.>	Repair the short circuit in harness between combination meter connector and TCM connector.

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:

- Except U5 model





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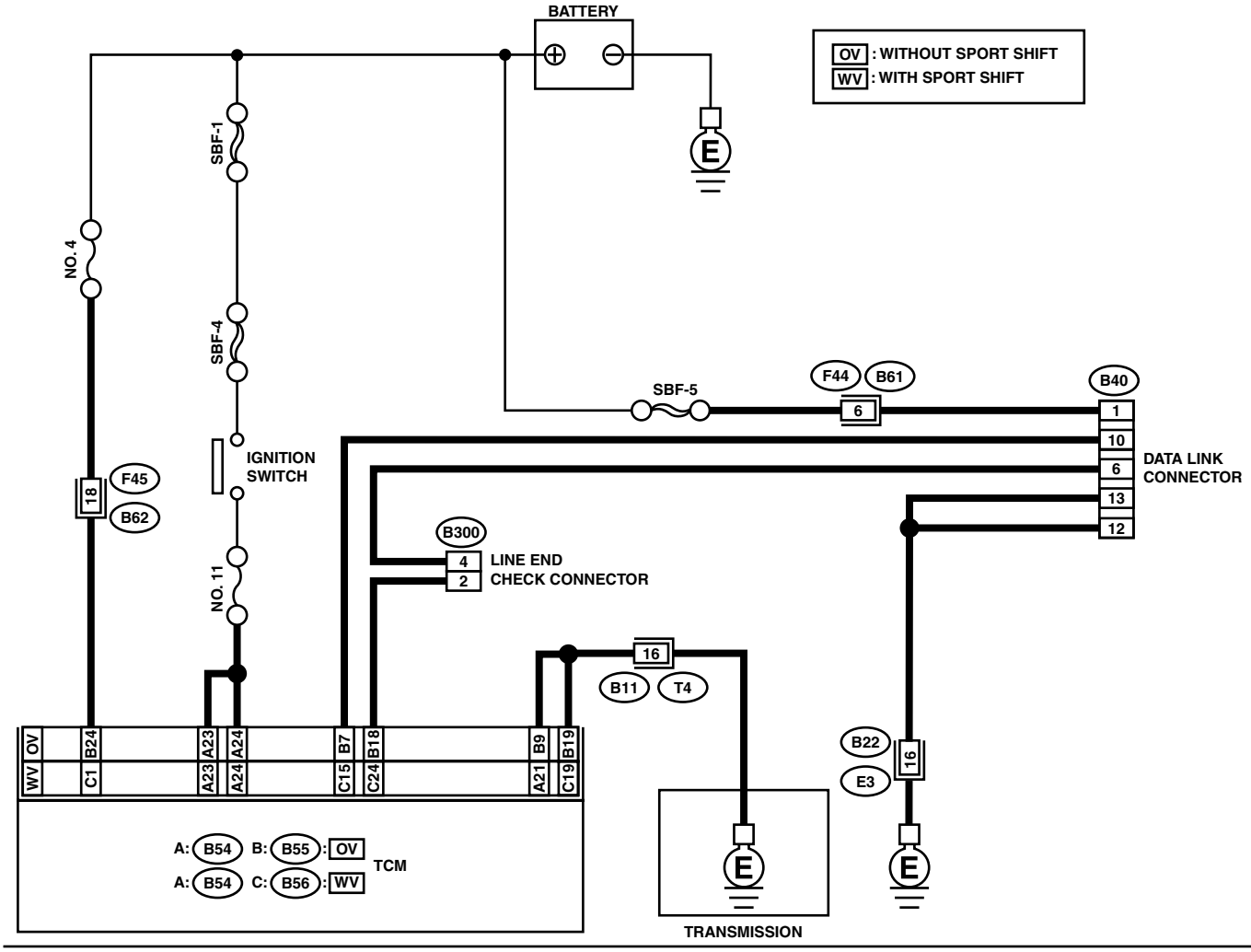
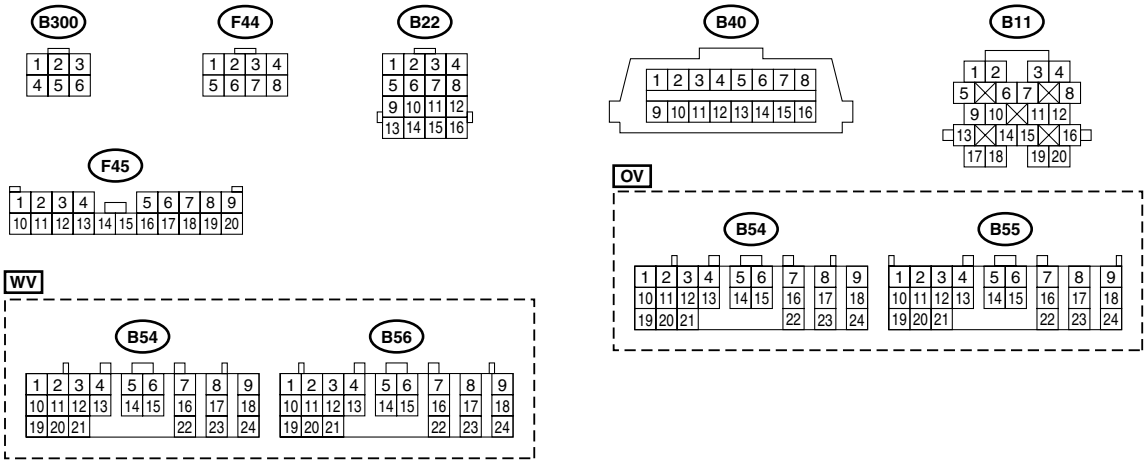
- U5 model





AT-01666

DIAGNOSTIC PROCEDURE FOR AT OIL TEMP WARNING LIGHT

	Step	Check	Yes	No
1	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **2.**
2	**CHECK POWER SUPPLY OF TCM.** 1) Disconnect the connector from TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without SPORT shift (Except U5 model)*** ***(B55) No. 6 (+) — Chassis ground (–):*** ***With SPORT shift for (U5 model)*** ***(B55) No. 24 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B56) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FUSE (NO. 4).** Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 23 (+) — Chassis ground (–):*** ***(B54) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (NO. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without SPORT shift (Except U5 model)*** ***(B54) No. 21 — (B11) No. 16:*** ***(B56) No. 19 — (B11) No. 16:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 9 — (B11) No. 16:*** ***(B55) No. 19 — (B11) No. 16:*** ***With VDC system or SPORT shift*** ***(B56) No. 19 — (B11) No. 16:*** ***(B54) No. 21 — (B11) No. 16:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.

	Step	Check	Yes	No
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 16 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between transmission and transmission ground.
8	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

13.Diagnostic Procedure for Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:

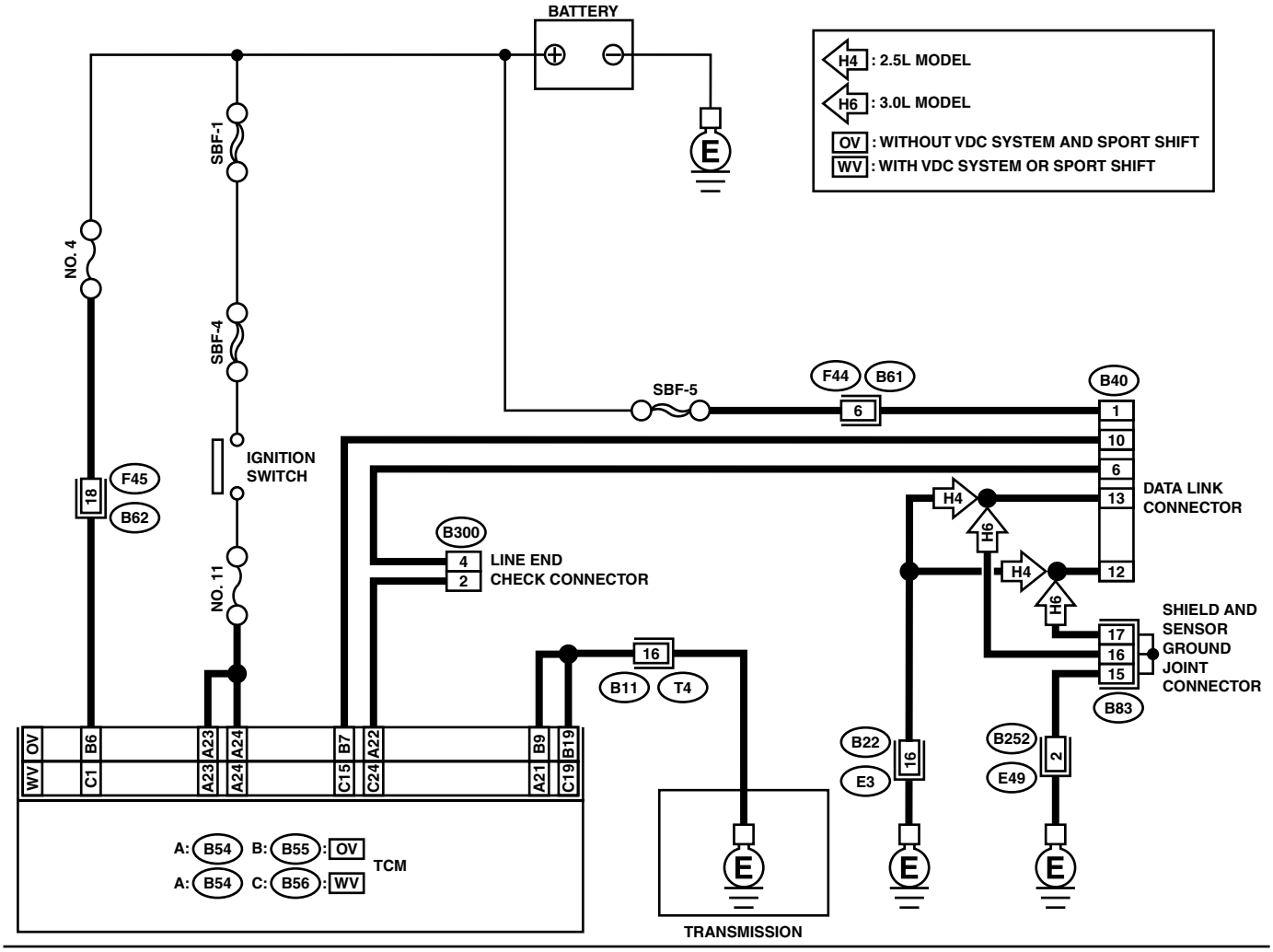
- Faulty harness connector

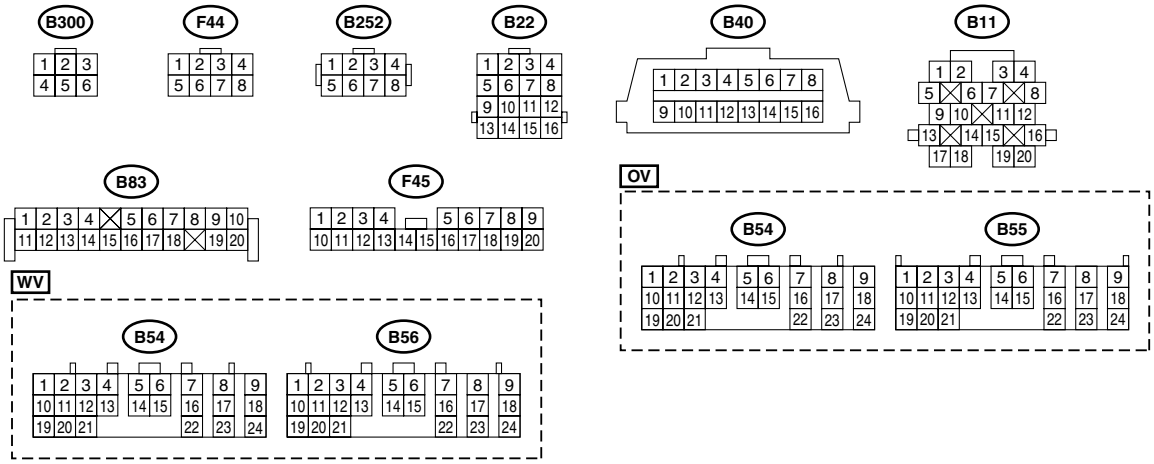
TROUBLE SYMPTOM:

- Select monitor communication failure

WIRING DIAGRAM:

- Except U5 model





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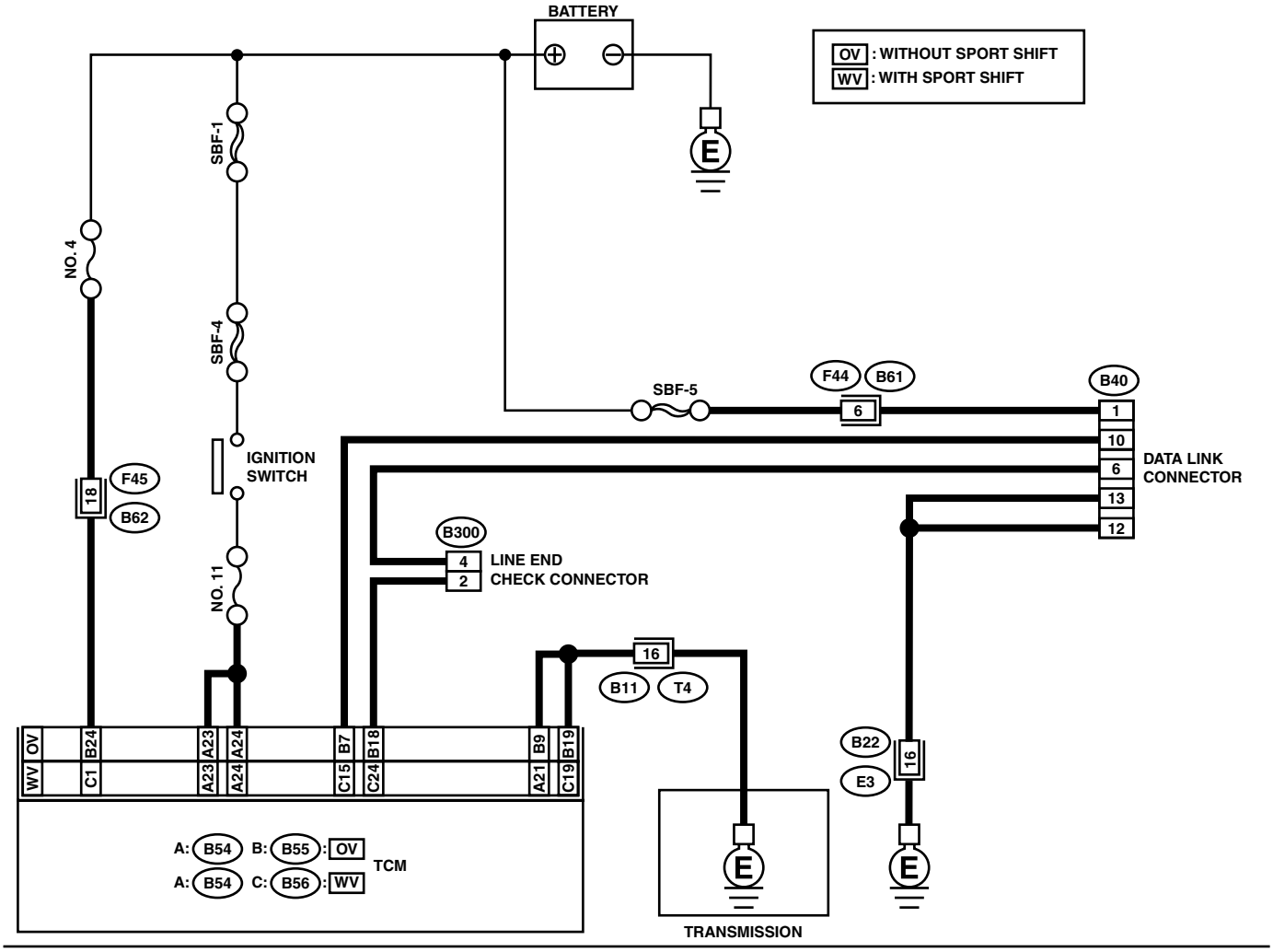
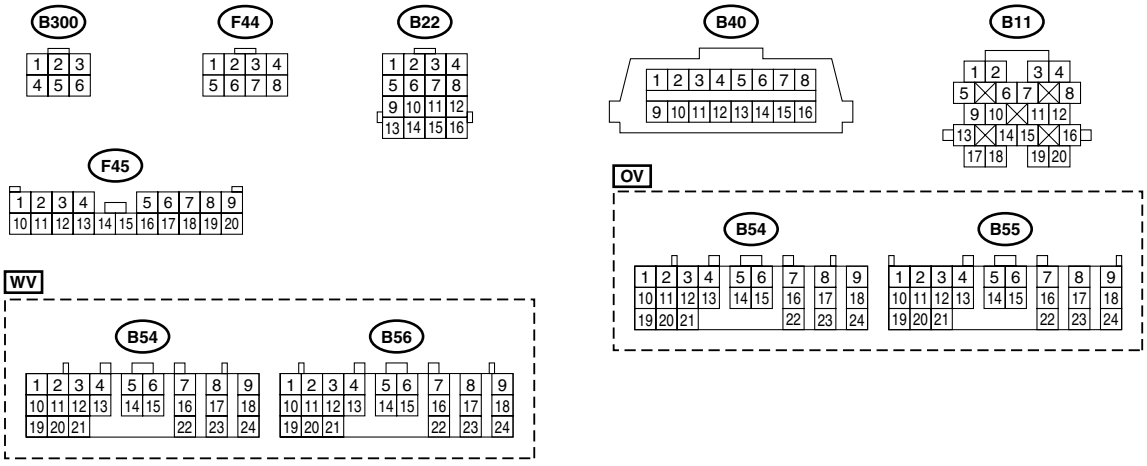
- U5 model





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	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 12 — Chassis ground:*** ***(B40) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **6.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ECM connector. 4) Check whether communication to transmission systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Inspect the ECM.	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM, ECM, ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:*** ***(B40) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (–):*** ***(B40) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 7 — (B40) No. 10:*** ***With VDC system or SPORT shift (B56) No. 15 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between TCM and data link connector.
9	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM and data link connector. ***Connector & terminal*** ***Without SPORT shift (Except U5 model) (B54) No. 22 — (B40) No. 6:*** ***Without SPORT shift (U5 model) (B55) No. 8 — (B40) No. 6:*** ***With VDC system or SPORT shift (B56) No. 24 — (B40) No. 6:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness and connector between TCM and data link connector.
10	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is the TCM connector inserted into TCM?	Go to step **11.**	Insert the TCM connector into TCM.
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module and data link connector?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

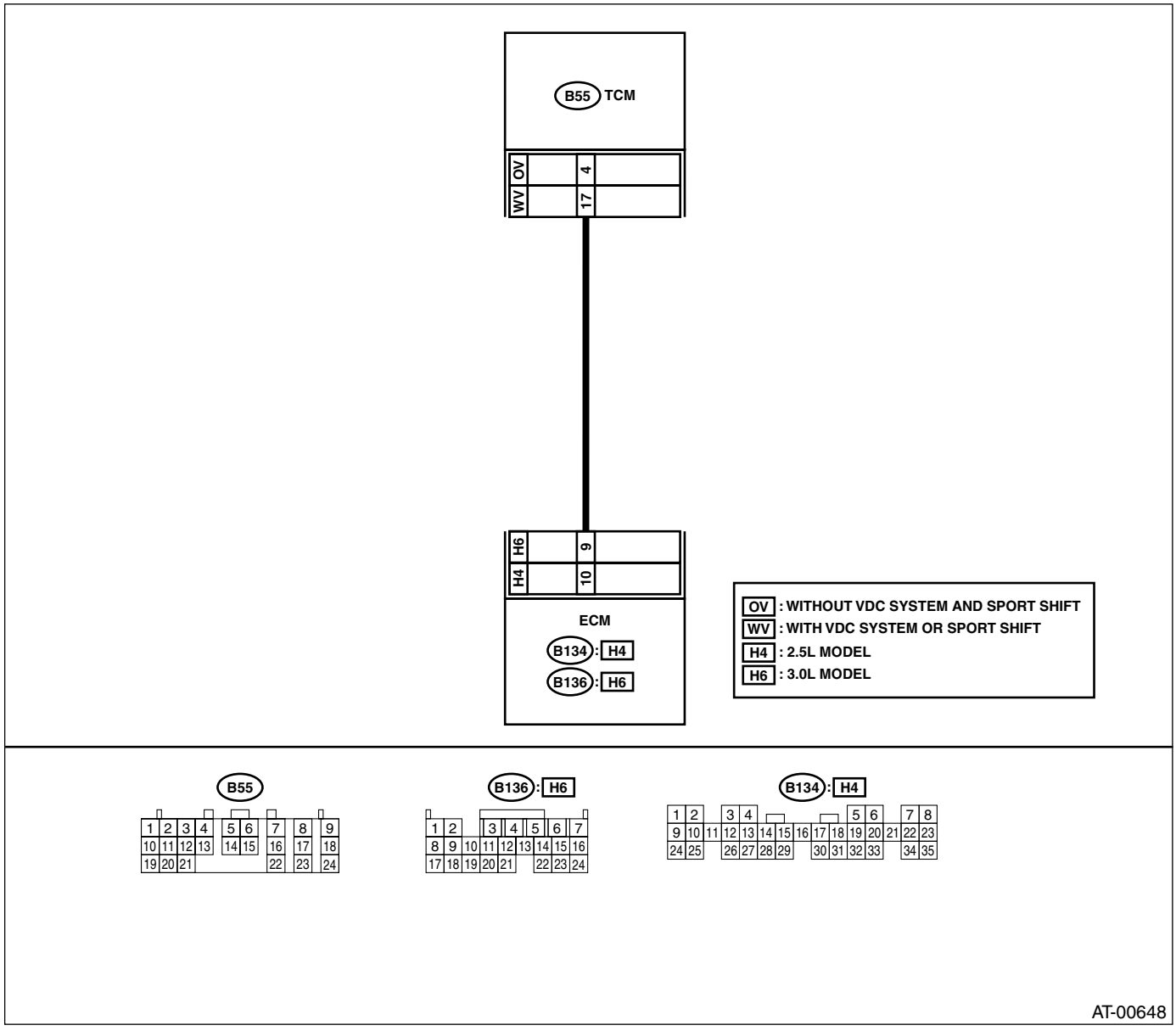
DIAGNOSIS:

The engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The AT OIL TEMP warning light remains on when vehicle speed is “0”.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***2.5 L model without SPORT shift (B55) No. 4 — (B134) No. 10:*** ***2.5 L model with SPORT shift (B55) No. 17 — (B135) No. 10:*** ***3.0 L model without VDC system (B55) No. 4 — (B136) No. 9:*** ***3.0 L model with VDC system (B55) No. 17 — (B137) No. 9:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 4 — Chassis ground:*** ***With VDC system or SPORT shift (B55) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 4 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B55) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
5	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of engine speed using Subaru Select Monitor. •Display shows the engine speed signal value sent from ECM.	Is the revolution value same as tachometer reading shown on combination meter?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step **7.**

Step		Check	Yes	No
7	**CONFIRM DTC 11.**	Replace the ECM with a new one. Does the DTC appear again, after memory has been cleared?	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Replace the ECM.

MEMO:

B: DTC 27 ATF TEMPERATURE SENSOR

DIAGNOSIS:

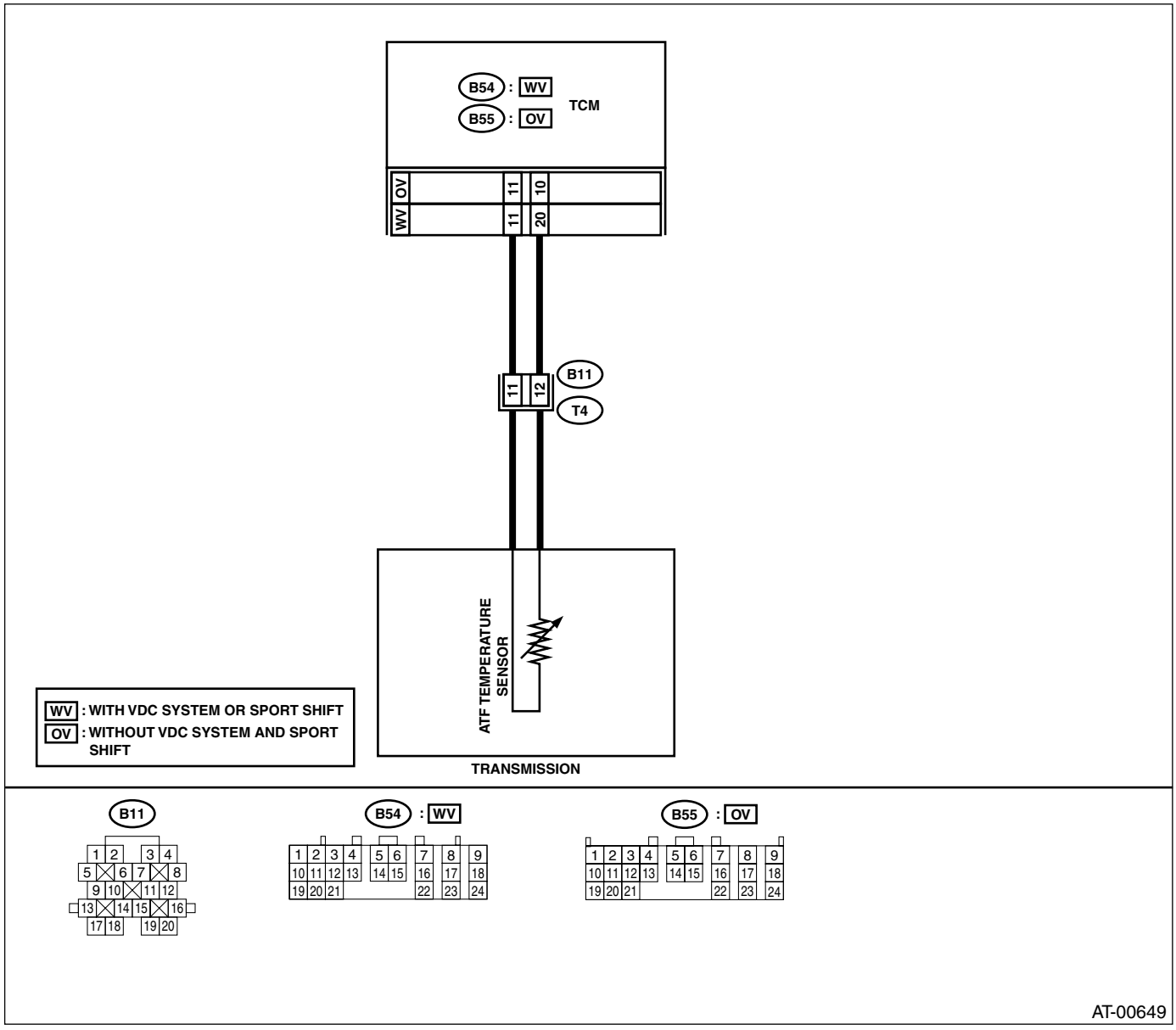
The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

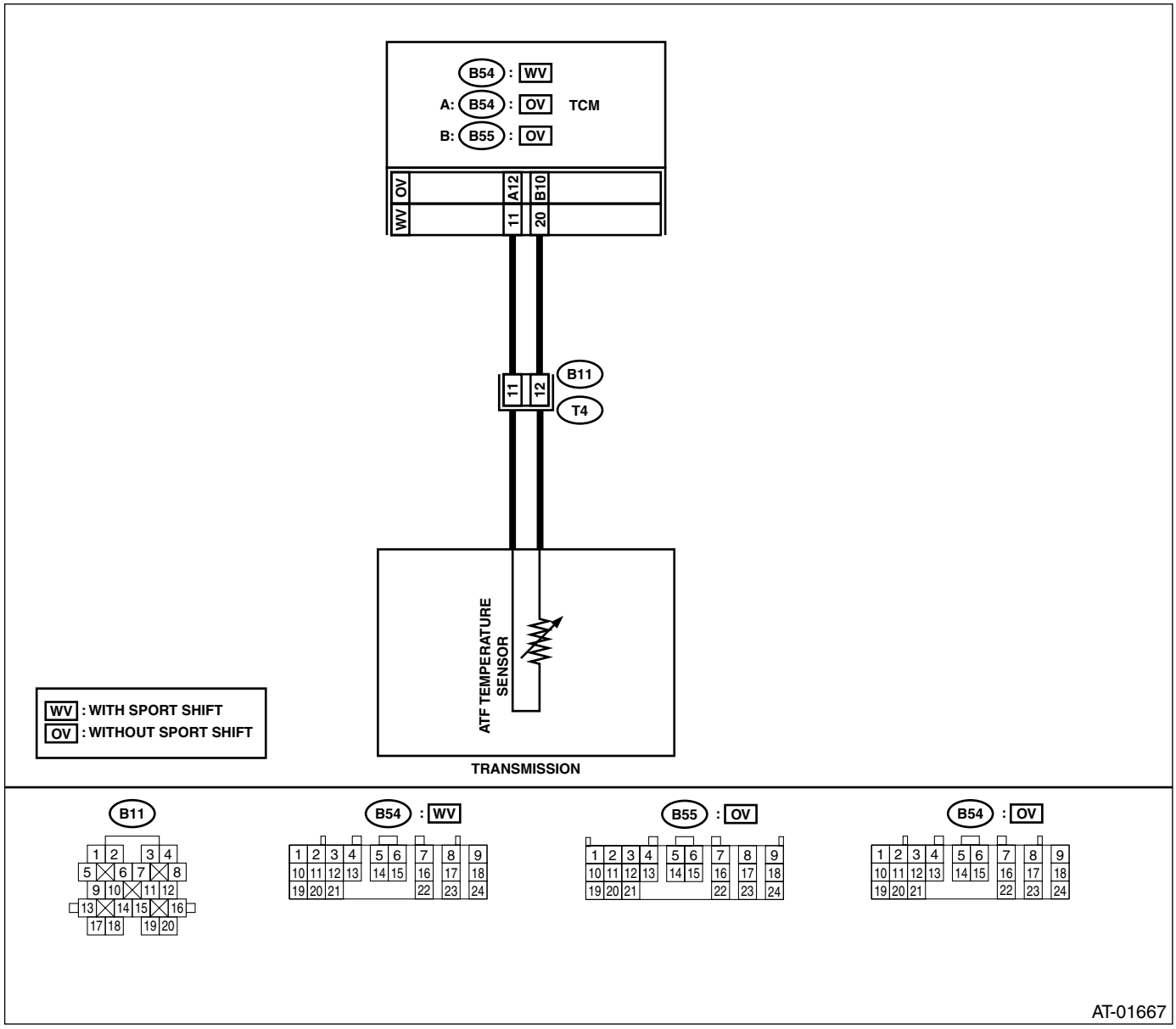
WIRING DIAGRAM:

- Except U5 model



AT-00649

- U5 model


B54 : WV
A: B54 : OV
B: B55 : OV
TCM
OV
WV
A12
B10
11
20
B11
T4
11
12
ATF TEMPERATURE SENSOR
TRANSMISSION
WV : WITH SPORT SHIFT
OV : WITHOUT SPORT SHIFT
B11
B54 : WV
B55 : OV
B54 : OV
AT-01667

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 10 — (B11) No. 12:*** ***With VDC system or SPORT shift (B54) No. 20 — (B11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without SPORT shift (Except U5 model) (B55) No. 11 — (B11) No. 11:*** ***Without SPORT shift (U5 model) (B54) No. 12 — (B11) No. 12:*** ***With VDC system or SPORT shift (B54) No. 11 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 10 — Chassis ground:*** ***With VDC system or SPORT shift (B54) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Without SPORT shift (Except U5 model) (B55) No. 11 — Chassis ground:*** ***Without SPORT shift (Except U5 model) (B54) No. 12 — Chassis ground:*** ***With VDC system or SPORT shift (B54) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
5	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:***	Is the resistance 275 — 375 Ω?	Go to step **6.**	Replace the ATF temperature sensor. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
6	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:***	Does the resistance value increase while ATF temperature decreases?	Go to step **7.**	Replace the ATF temperature sensor. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***Without SPORT shift (Except U5 model)*** ***(B55) No. 11 (+) — No. 10 (–):*** ***Without SPORT shift (U5 model)*** ***(B54) No. 12 (+) — (B55) No. 10 (–):*** ***With VDC system or SPORT shift*** ***(B54) No. 11 (+) — No. 20 (–):***	Is the voltage 0.4 — 0.9 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

C: DTC 31 THROTTLE POSITION SENSOR

DIAGNOSIS:

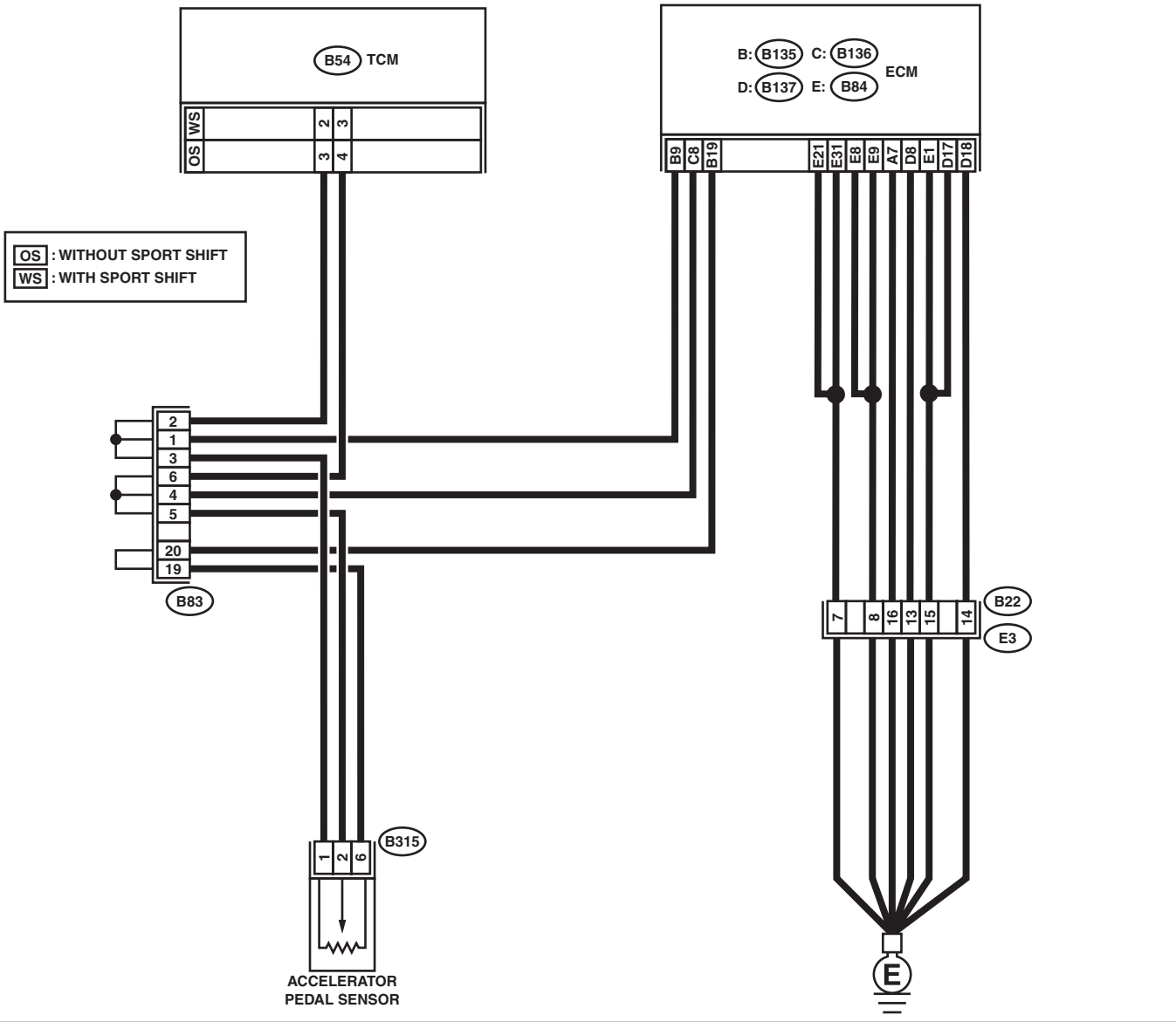
The input signal circuit of throttle position sensor is open or shorted.

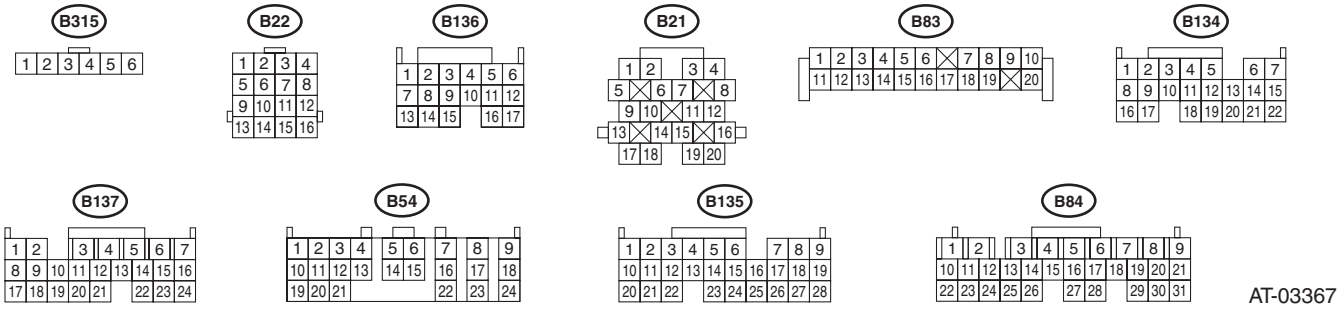
TROUBLE SYMPTOM:

Shift point too high or too low; excessive shift shock; excessive tight corner “braking”.

WIRING DIAGRAM:

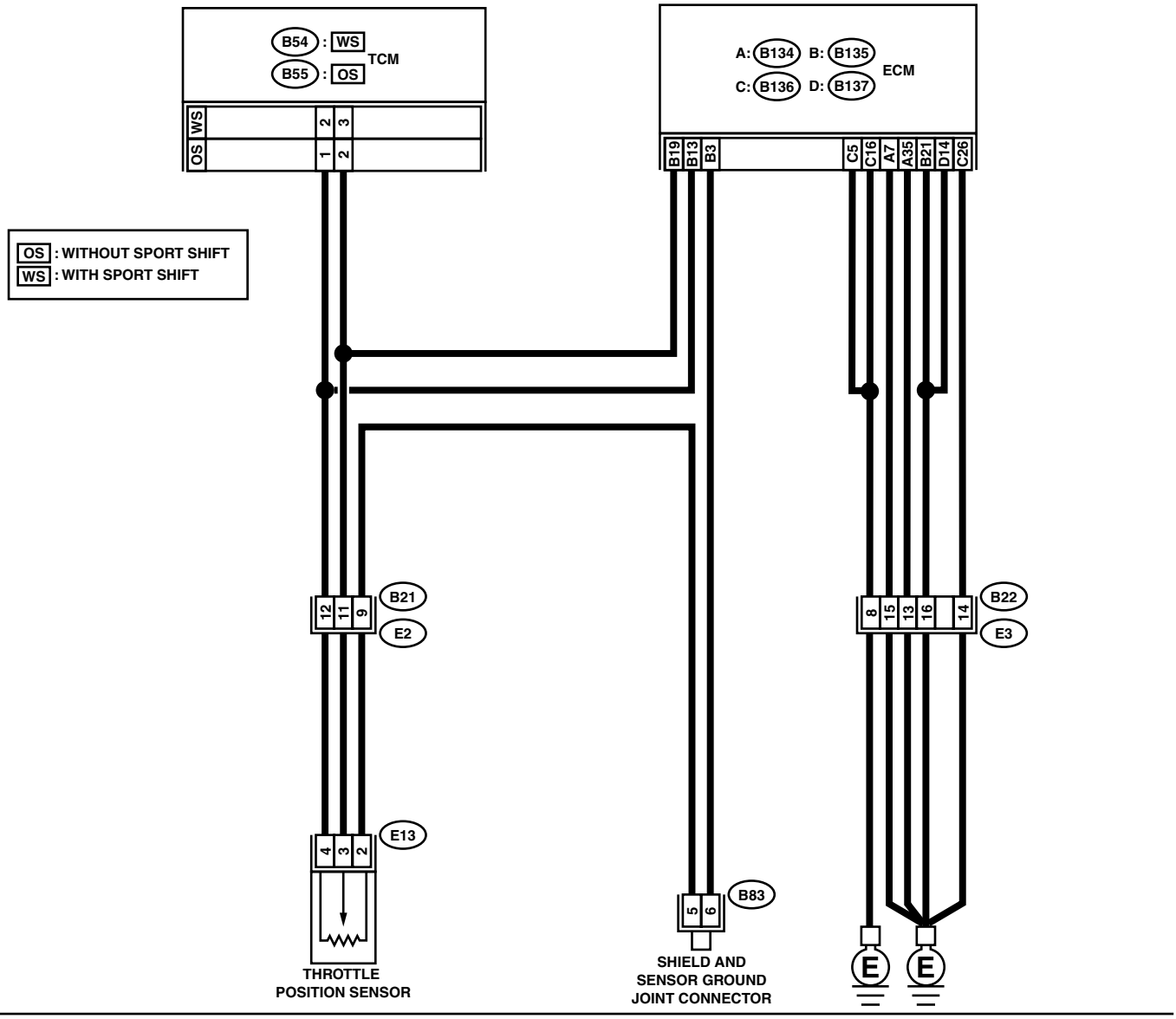
- 2.5L U5 model

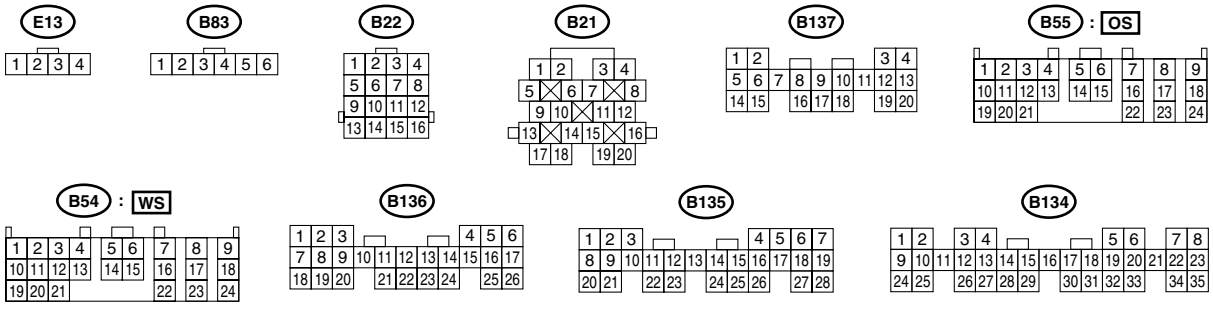




AT-03367

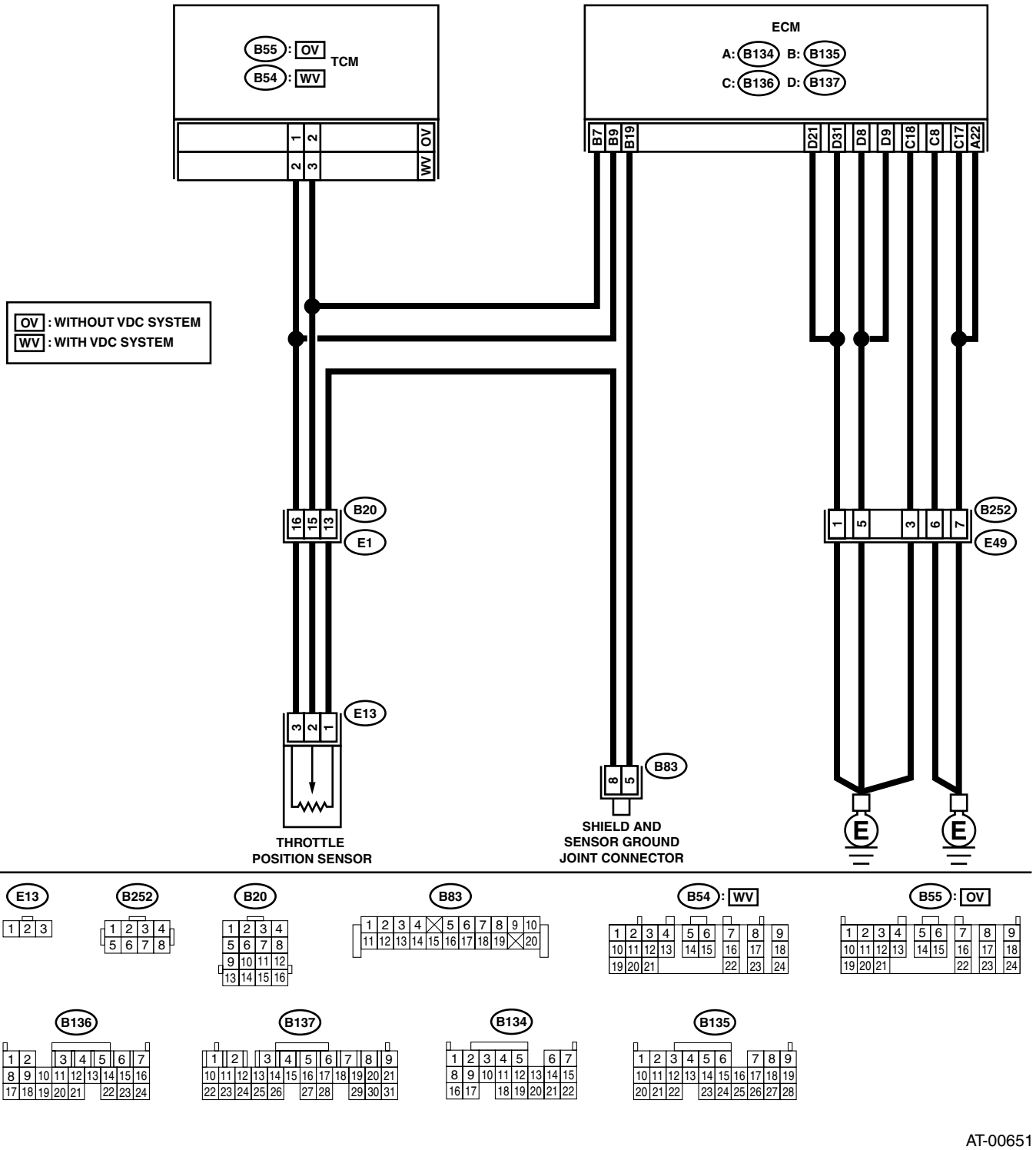
- Except 2.5L U5 model





AT-01668

- 3.0 L model



AT-00651

	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is vehicle being diagnosed for U5 model?	Go to step **20.**	Tighten the engine ground terminals.
2	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been tightened?	Go to step **3.**	Tighten the engine ground terminals.
3	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***EXCEPT 3.0 L MODEL*** ***(B134) No. 7 — Engine ground:*** ***(B134) No. 35 — Engine ground:*** ***(B136) No. 5 — Engine ground:*** ***(B136) No. 16 — Engine ground:*** ***(B136) No. 26 — Engine ground:*** ***(B135) No. 21 — Engine ground:*** ***(B137) No. 14 — Engine ground:*** ***3.0 L MODEL*** ***(B134) No. 22 — Engine ground:*** ***(B136) No. 8 — Engine ground:*** ***(B136) No. 17 — Engine ground:*** ***(B136) No. 18 — Engine ground:*** ***(B137) No. 8 — Engine ground:*** ***(B137) No. 9 — Engine ground:*** ***(B137) No. 21 — Engine ground:*** ***(B137) No. 31 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
4	**CHECK THROTTLE POSITION SENSOR.** 1) Disconnect the connector from throttle position sensor. 2) Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***2.5 L MODEL*** ***No. 4 — No. 2:*** ***3.0 L MODEL*** ***No. 1 — No. 2:***	Is the resistance 3.0 — 4.2 kΩ?	Go to step **5.**	Replace the throttle position sensor.
5	**CHECK THROTTLE POSITION SENSOR.** Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***2.5 L MODEL*** ***No. 2 — No. 3:*** ***3.0 L MODEL*** ***No. 1 — No. 2:***	Is the resistance 0.35 — 0.5 kΩ?	Go to step **6.**	Replace the throttle position sensor.

	Step	Check	Yes	No
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***2.5 L MODEL without SPORT shift*** ***(B55) No. 2 — (E13) No. 3:*** ***2.5 L MODEL with SPORT shift*** ***(B54) No. 3 — (E13) No. 3:*** ***3.0 L MODEL without VDC system*** ***(B55) No. 2 — (E13) No. 2:*** ***3.0 L MODEL with VDC system*** ***(B54) No. 3 — (E13) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***2.5 L MODEL without SPORT shift*** ***(B55) No. 1 — (E13) No. 4:*** ***2.5 L MODEL with SPORT shift*** ***(B54) No. 2 — (E13) No. 4:*** ***3.0 L MODEL without VDC system*** ***(B55) No. 1 — (E13) No. 3:*** ***3.0 L MODEL with VDC system*** ***(B54) No. 2 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B55) No. 2 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***With VDC system or SPORT shift*** ***(B54) No. 2 — Chassis ground:*** ***Without VDC system and SPORT shift*** ***(B55) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***2.5 L MODEL without SPORT shift*** ***(B55) No. 2 — (B135) No. 19:*** ***2.5 L MODEL with SPORT shift*** ***(B54) No. 3 — (B135) No. 19:*** ***3.0 L MODEL with VDC system*** ***(B54) No. 3 — (B135) No. 7:*** ***3.0 L MODEL without VDC system*** ***(B55) No. 2 — (B135) No. 7:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***2.5 L MODEL without SPORT shift (B55) No. 1 — (B135) No. 13:*** ***2.5 L MODEL with SPORT shift (B54) No. 2 — (B135) No. 13:*** ***3.0 L MODEL with VDC system (B54) No. 2 — (B135) No. 9:*** ***3.0 L MODEL without VDC system (B55) No. 1 — (B135) No. 9:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between TCM and ECM connector.
12	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **15.**	Go to step **13.**
13	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 2 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B54) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 1.0 V?	Go to step **14.**	Go to step **19.**
14	**CHECK INPUT SIGNAL FOR TCM.** 1) Open the throttle completely and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B55) No. 2 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B54) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.2 — 4.7 V?	Go to step **19.**	Go to step **19.**
15	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Throttle fully closed. 6) Read the data of throttle position sensor using Subaru Select Monitor. •Throttle position sensor input signal is indicated.	Is the value voltage 0.2 — 1.0 V?	Go to step **16.**	Go to step **19.**
16	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** Throttle fully open. NOTE: Must be changed correspondingly with the accelerator pedal operation (from “released” to “depressed” position).	Is the value voltage 4.2 — 4.7 V?	Go to step **17.**	Go to step **18.**

	Step	Check	Yes	No
17	**CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY).** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B55) No. 1 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B54) No. 2 (+) — Chassis ground (–):***	Is the voltage 4.8 — 5.3 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **19.**
18	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR (THROTTLE POSITION SENSOR POWER SUPPLY).** Read the data of throttle position sensor power supply using Subaru Select Monitor. •Throttle position sensor power supply voltage is indicated.	Is the value voltage 4.8 — 5.3 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **19.**
19	**CHECK POOR CONTACT.**	Is there poor contact in throttle position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
20	**CHECK ENGINE GROUND TERMINALS.**	Are engine ground terminals tightened?	Go to step **21.**	Tighten the engine terminals.
21	**CHECK GROUND TERMINAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 7 — Engine ground:*** ***(B136) No. 8 — Engine ground:*** ***(B136) No. 17 — Engine ground:*** ***(B136) No. 18 — Engine ground:*** ***(B84) No. 1 — Engine ground:*** ***(B84) No. 8 — Engine ground:*** ***(B84) No. 9 — Engine ground:*** ***(B84) No. 21 — Engine ground:*** ***(B84) No. 31 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **22.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
22	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect connector from accelerator pedal position sensor. 2) Measure the resistance between accelerator pedal position sensor connectors. ***Connector & terminal*** ***No. 1 — No. 6:***	Is the resistance within 0.75 to 3.15 kΩ?	Go to step **23.**	Replace the accelerator position sensor.

	Step	Check	Yes	No
23	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 2 — No. 6:***	Is the resistance within 0.15 to 0.63 kΩ?	Go to step **24.**	Replace the accelerator position sensor.
24	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect connector from TCM. 2) Measure the resistance of harness between TCM and accelerator pedal position sensor connector. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 3 — (B315) No. 1:*** ***(B54) No. 4 — (B315) No. 2:*** ***With SPORT shift*** ***(B54) No. 2 — (B315) No. 1:*** ***(B54) No. 3 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **25.**	Repair open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
25	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 3 — Chassis ground:*** ***(B54) No. 4 — Chassis ground:*** ***With SPORT shift*** ***(B54) No. 2 — Chassis ground:*** ***(B54) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Repair short circuit in harness between TCM connector and throttle sensor connector.
26	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Disconnect connector from ECM. 2) Measure the resistance between TCM connector and ECU connector. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 3 — (B136) No. 8:*** ***(B54) No. 4 — (B136) No. 9:*** ***With SPORT shift*** ***(B54) No. 2 — (B135) No. 9:*** ***(B54) No. 3 — (B136) No. 8:***	Is the resistance less than 1 Ω?	Go to step **27.**	Repair open circuit in harness between TCM and ECM connector, and poor contact in coupling connector.
27	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **30.**	Go to step **28.**

	Step	Check	Yes	No
28	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 3 (+) — Chassis ground (–):*** ***(B54) No. 4 (+) — Chassis ground (–):*** ***With SPORT shift*** ***(B54) No. 2 (+) — Chassis ground (–):*** ***(B54) No. 3 (+) — Chassis ground (–):***	Is the voltage within 0.2 to 1.0 V?	Go to step **29.**	Go to step **34.**
29	**CHECK INPUT SIGNAL FOR TCM.** 1) Open the throttle completely and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 3 (+) — Chassis ground (–):*** ***(B54) No. 4 (+) — Chassis ground (–):*** ***With SPORT shift*** ***(B54) No. 2 (+) — Chassis ground (–):*** ***(B54) No. 3 (+) — Chassis ground (–):***	Is the voltage within 4.2 to 4.7 V?	Go to step **32.**	Go to step **34.**
30	**CHECK TCM INPUT SIGNAL USING SUBARU SELECT MONITOR.** 1) Connect all connector. 2) Connect Subaru Select Monitor to data link connector. 3) Turn the ignition to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Accelerator pedal fully closed. 6) Read the data of accelerator pedal position sensor using Subaru Select Monitor. •Accelerator pedal position sensor input signal is indicated.	Is the voltage within 0.2 to 1.0 V?	Go to step **31.**	Go to step **34.**
31	**CHECK TCM INPUT SIGNAL USING SUBARU SELECT MONITOR.** 1) Accelerator pedal fully open. 2) Read the data of accelerator pedal position sensor using Subaru Select Monitor. •Accelerator pedal position sensor input signal is indicated.	Is the voltage within 4.2 to 4.7 V?	Go to step **34.**	Go to step **33.**
32	**CHECK INPUT SIGNAL FOR TCM (ACCELERATOR PEDAL POSITION SENSOR SUPPLY).** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 3 (+) — Chassis ground (–):*** ***(B54) No. 4 (+) — Chassis ground (–):*** ***With SPORT shift*** ***(B54) No. 2 (+) — Chassis ground (–):*** ***(B54) No. 3 (+) — Chassis ground (–):***	Is the voltage within 4.8 to 5.3 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness maybe the cause. Repair the harness or connector in accelerator pedal position sensor circuit.	Go to step **34.**

	Step	Check	Yes	No
33	**CHECK TCM INPUT SIGNAL USING SUBARU SELECT MONITOR (ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY).** Read the data of accelerator pedal position sensor using Subaru Select Monitor. •Accelerator pedal position sensor power supply voltage is indicated.	Is the voltage within 4.8 to 5.3 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness maybe the cause. Repair the harness or connector in accelerator pedal position sensor circuit.	Go to step **34.**
34	**CHECK POOR CONTACT.**	Is there poor contact in accelerator pedal position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

D: DTC 33 FRONT VEHICLE SPEED SENSOR

DIAGNOSIS:

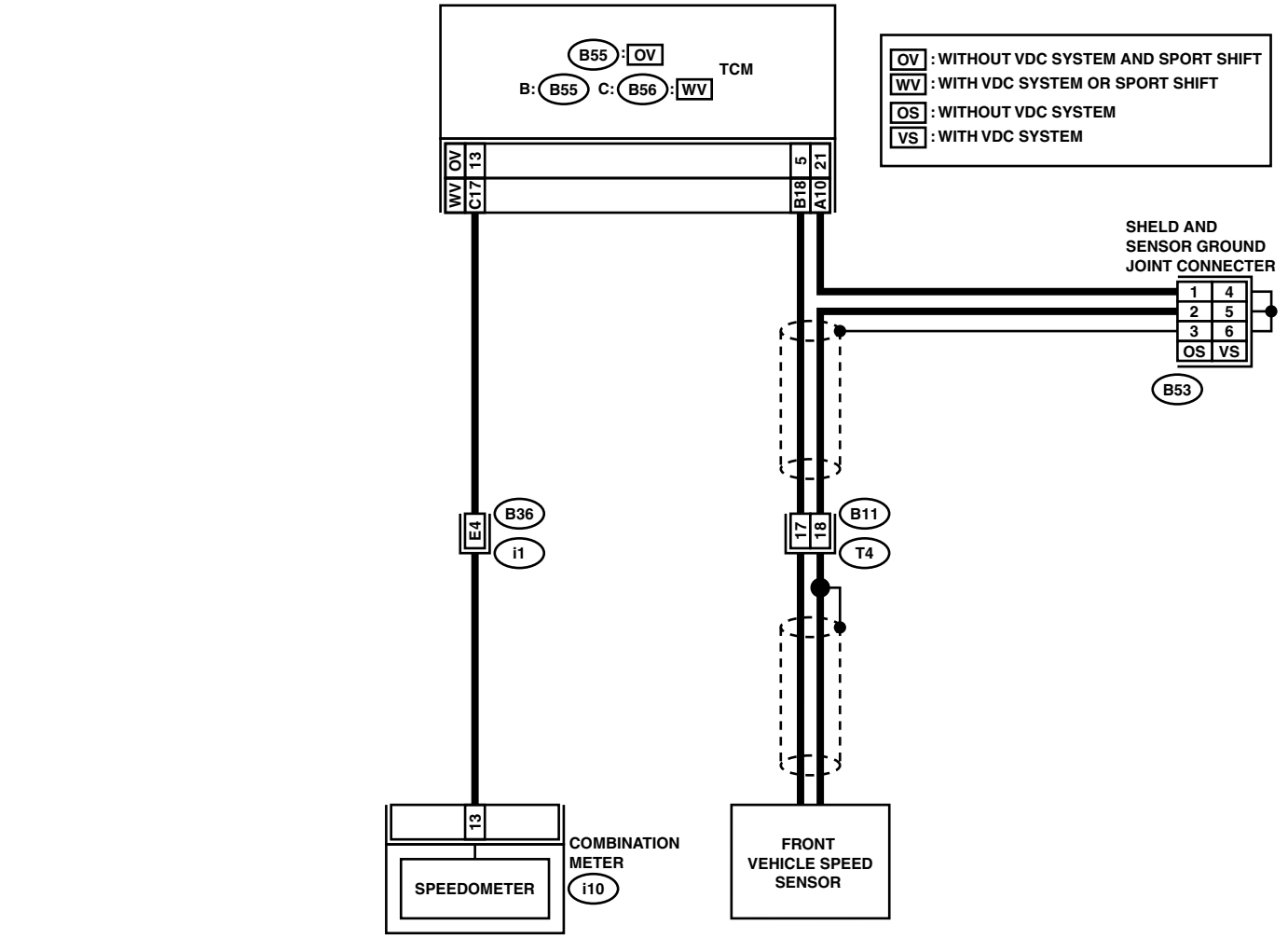
- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

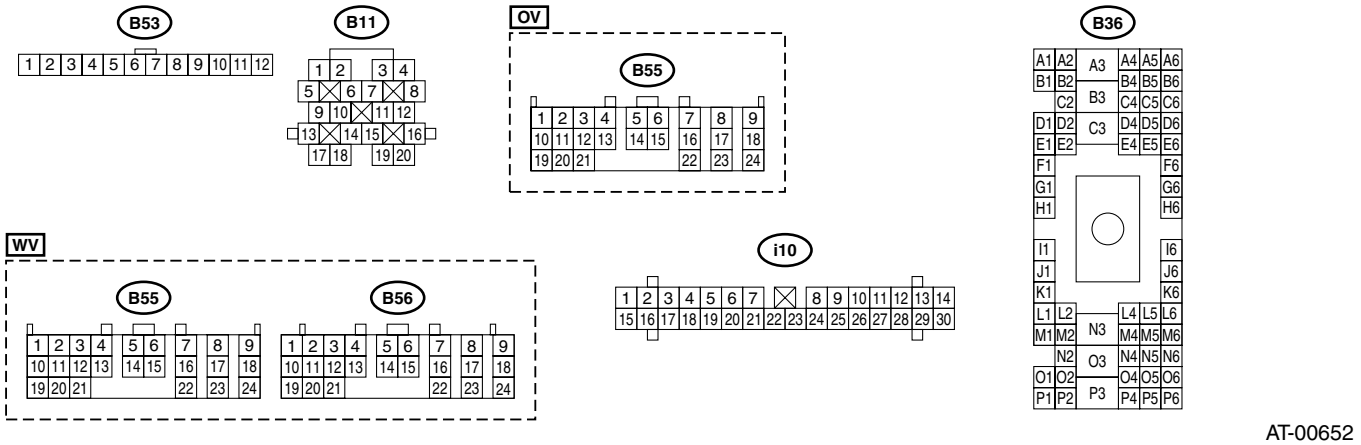
TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

WIRING DIAGRAM:

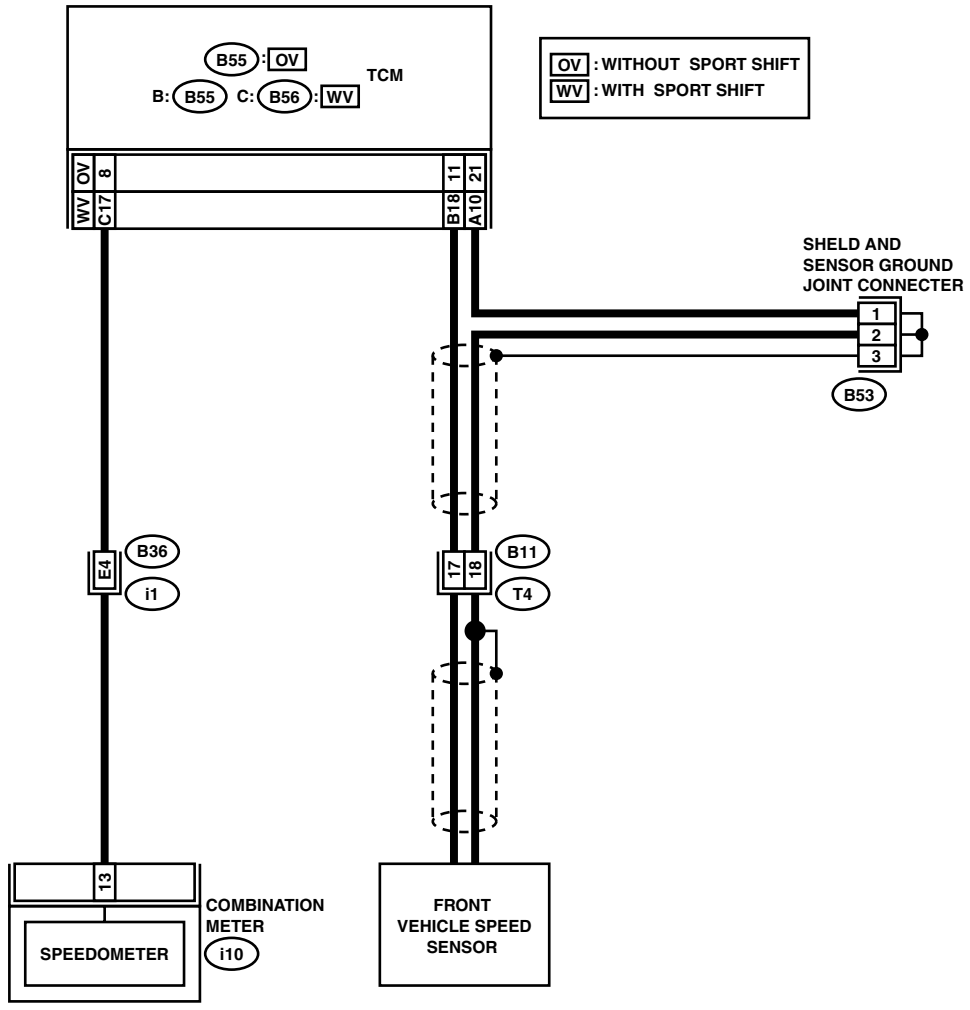
- Except U5 model

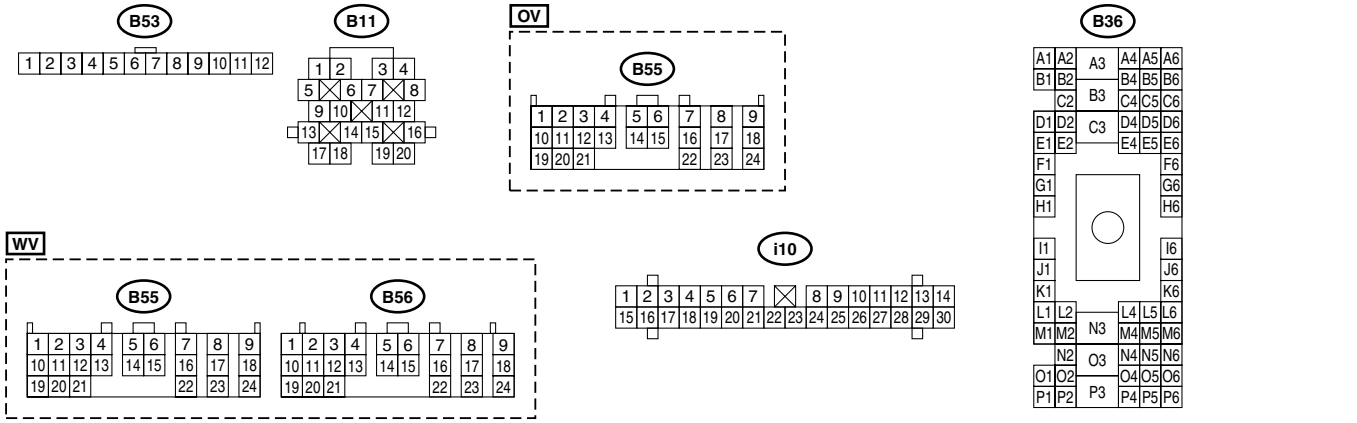




AT-00652

- U5 model





AT-01670

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 5 — (B11) No. 17:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 11 — (B11) No. 17:*** ***With VDC system or SPORT shift*** ***(B55) No. 18 — (B11) No. 17:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B55) No. 21 — (B11) No. 18:*** ***With VDC system or SPORT shift*** ***(B54) No. 10 — (B11) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B55) No. 21 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 5 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 11 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 17 — No. 18:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to 4AT-55, Front Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **9.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 5 (+) — (B55) No. 21 (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 11 (+) — (B55) No. 21 (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 18 (+) — (B54) No. 10 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in the front vehicle speed sensor circuit.	Go to step **11.**
9	**CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***Positive probe; (B55) No. 5:*** ***Without SPORT shift (U5 model)*** ***Positive probe; (B55) No. 11:*** ***Ground lead; (B55) No. 21:*** ***With VDC system or SPORT shift*** ***Positive probe; (B55) No. 18:*** ***Ground lead; (B54) No. 10:*** 4) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the voltage more than AC 4 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Does the speedometer indication increase as Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in front vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

E: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

DIAGNOSIS:

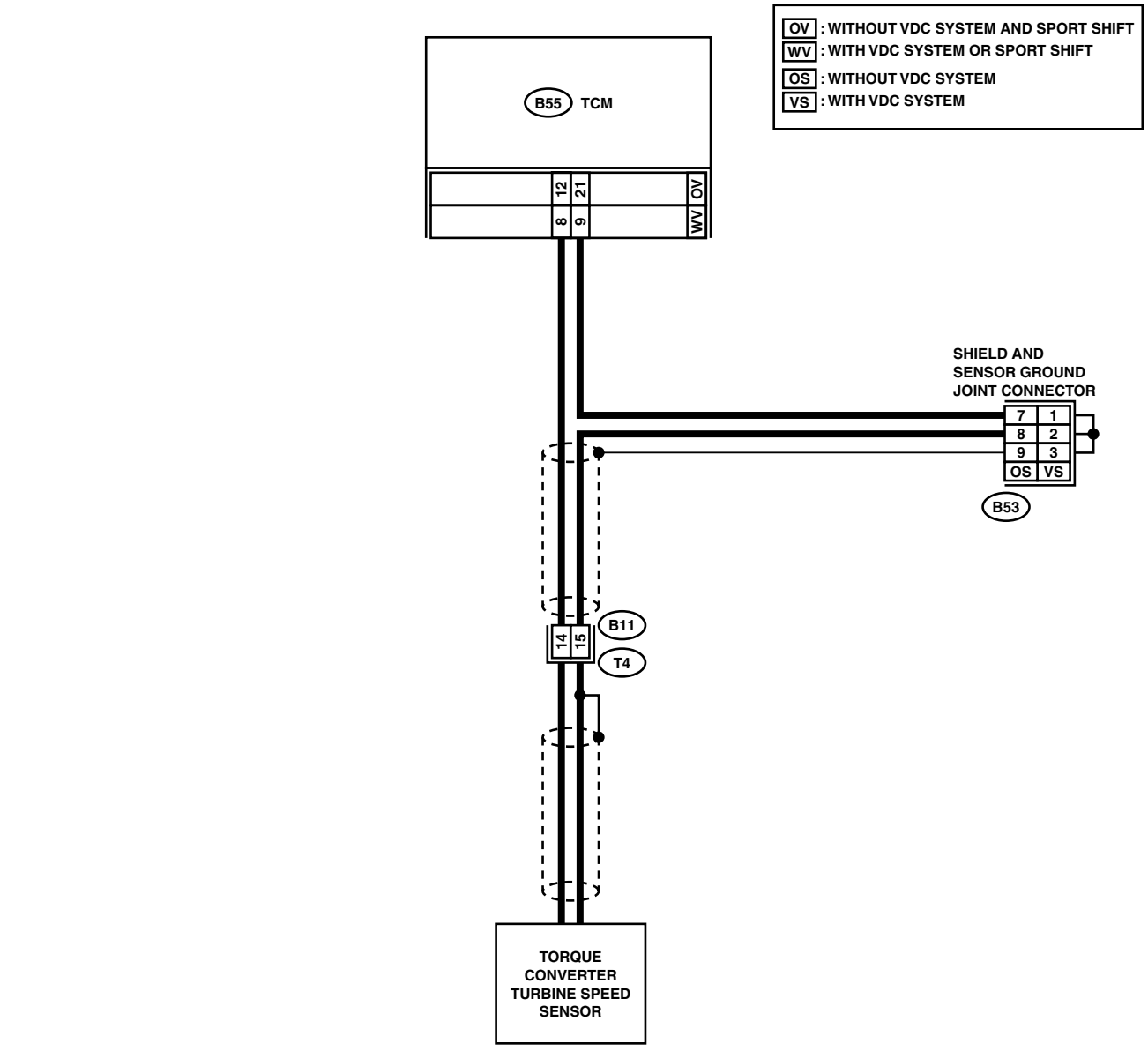
The input signal circuit of TCM is open or shorted.

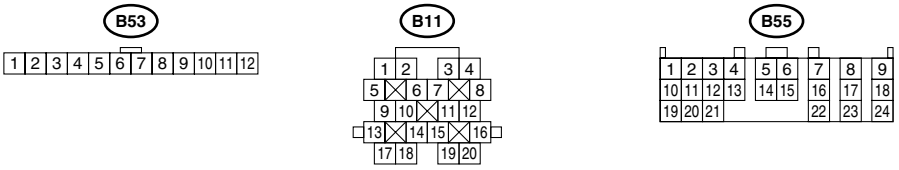
TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:

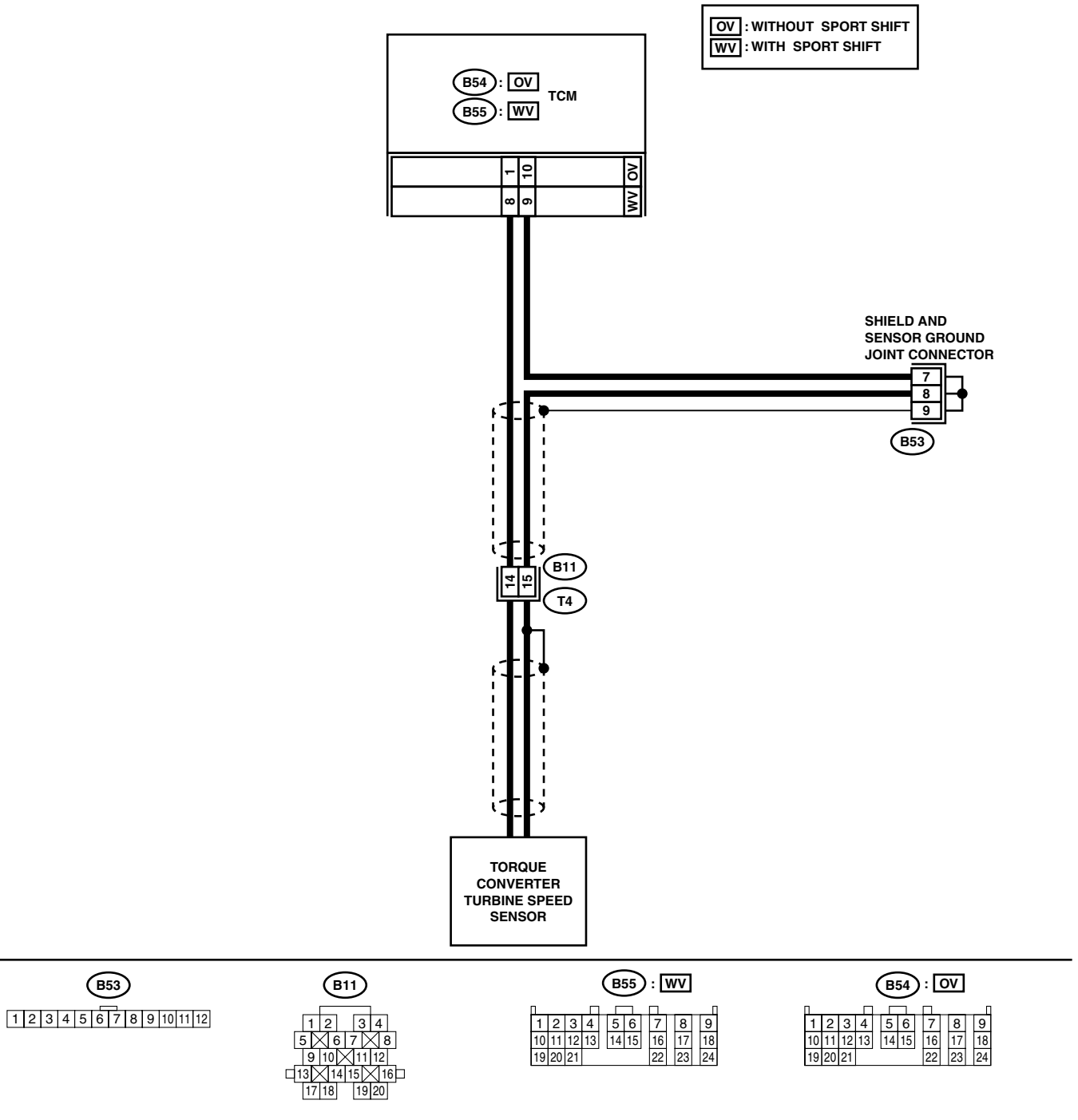
- Except U5 model





AT-00653

- U5 model



AT-01671

	Step	Check	Yes	No
1	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 15:***	Is the resistance 450 — 650 Ω?	Go to step **2.**	Replace the turbine speed sensor. <Ref. to 4AT-61, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 12 — (B11) No. 14:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 1 — (B11) No. 14:*** ***With VDC system or SPORT shift*** ***(B55) No. 8 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 21 — (B11) No. 15:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 10 — (B11) No. 15:*** ***With VDC system or SPORT shift*** ***(B55) No. 9 — (B11) No. 15:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 21 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 10 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 12 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 1 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**

Step		Check	Yes	No
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Start the engine and move select lever to "P" or "N" range. 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 12 (+) — No. 21 (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 1 (+) — (B54) No. 1 (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 8 (+) — No. 9 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4) Start the engine. 5) Move the select lever to "P" or "N" range. 6) Read the data of turbine speed using Subaru Select Monitor. •Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***Positive probe; (B55) No. 12:*** ***Ground lead; (B55) No. 21:*** ***Without SPORT shift (U5 model)*** ***Positive probe; (B55) No. 1:*** ***Ground lead; (B55) No. 10:*** ***With VDC system or SPORT shift*** ***Positive probe; (B55) No. 8:*** ***Ground lead; (B55) No. 9:*** 3) Start the engine and move select lever to "P" or "N" range.	Is the signal voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

F: DTC 38 TORQUE CONTROL SIGNAL

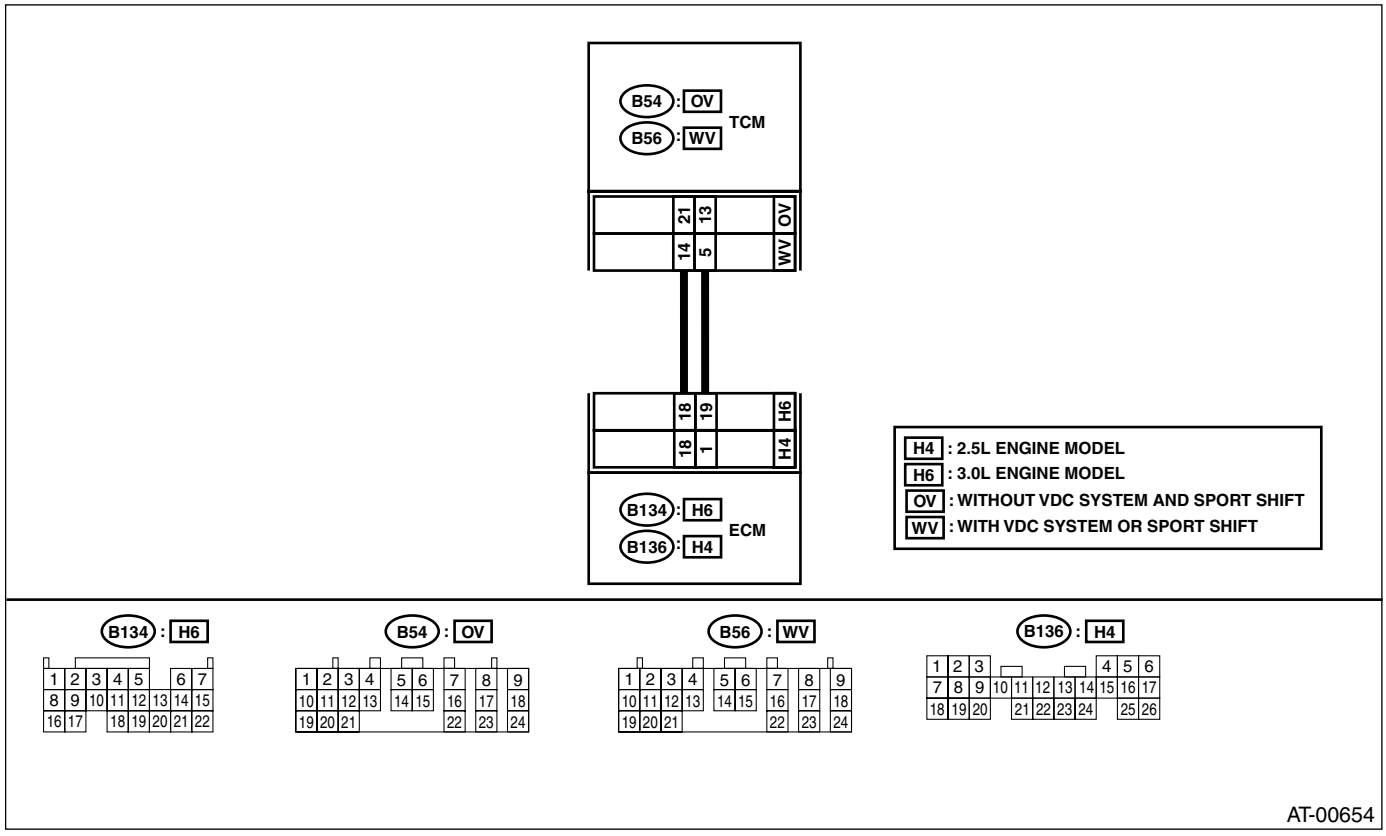
DIAGNOSIS:

- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***2.5 L model without SPORT shift*** ***(B54) No. 21 — (B136) No. 18:*** ***(B54) No. 13 — (B136) No. 1:*** ***2.5 L model with SPORT shift*** ***(B56) No. 14 — (B136) No. 18:*** ***(B56) No. 5 — (B136) No. 1:*** ***3.0 L model without VDC system*** ***(B54) No. 21 — (B134) No. 18:*** ***(B54) No. 13 — (B134) No. 19:*** ***3.0 L model with VDC system*** ***(B56) No. 14 — (B134) No. 18:*** ***(B56) No. 5 — (B134) No. 19:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B54) No. 21 — Chassis ground:*** ***(B54) No. 13 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B56) No. 14 — Chassis ground:*** ***(B56) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B54) No. 21 (+) — Chassis ground (–):*** ***(B54) No. 13 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 4.8 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **4.**
4	**CHECK POOR CONTACT.**	Is there poor contact in torque control signal circuit?	Repair the poor contact.	Go to step **5.**
5	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body.	Is there any dirt or rust at the ground line installing point?	Remove dirt and rust.	Go to step **6.**
6	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body. ***Tightening torque:*** ***10 — 16 N·m (1.0 — 1.6 kgf-m, 7.2 — 11.6 ft-lb)***	Is the tightening torque value within specification?	Go to step **7.**	Tighten to the specified torque.

	Step	Check	Yes	No
7	**CHECK GROUND LINE INSIDE TRANSMISSION.** 1) Drain the ATF and remove oil pan. 2) Check the tightening torque value of ground line installing bolt. ***Tightening torque:*** ***7 — 9 N·m (0.7 — 0.9 kgf-m, 5.1 — 6.5 ft-lb)***	Is the tightening torque value within specification?	Go to step **9.**	Tighten to the specified torque.
8	**CHECK GROUND CIRCUIT OF ECM.** <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **9.**
9	**RECHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift*** ***(B54) No. 21 (+) — Chassis ground (–):*** ***(B54) No. 13 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):***	Is each voltage more than 4 V?	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Replace the ECM.

MEMO:

G: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL

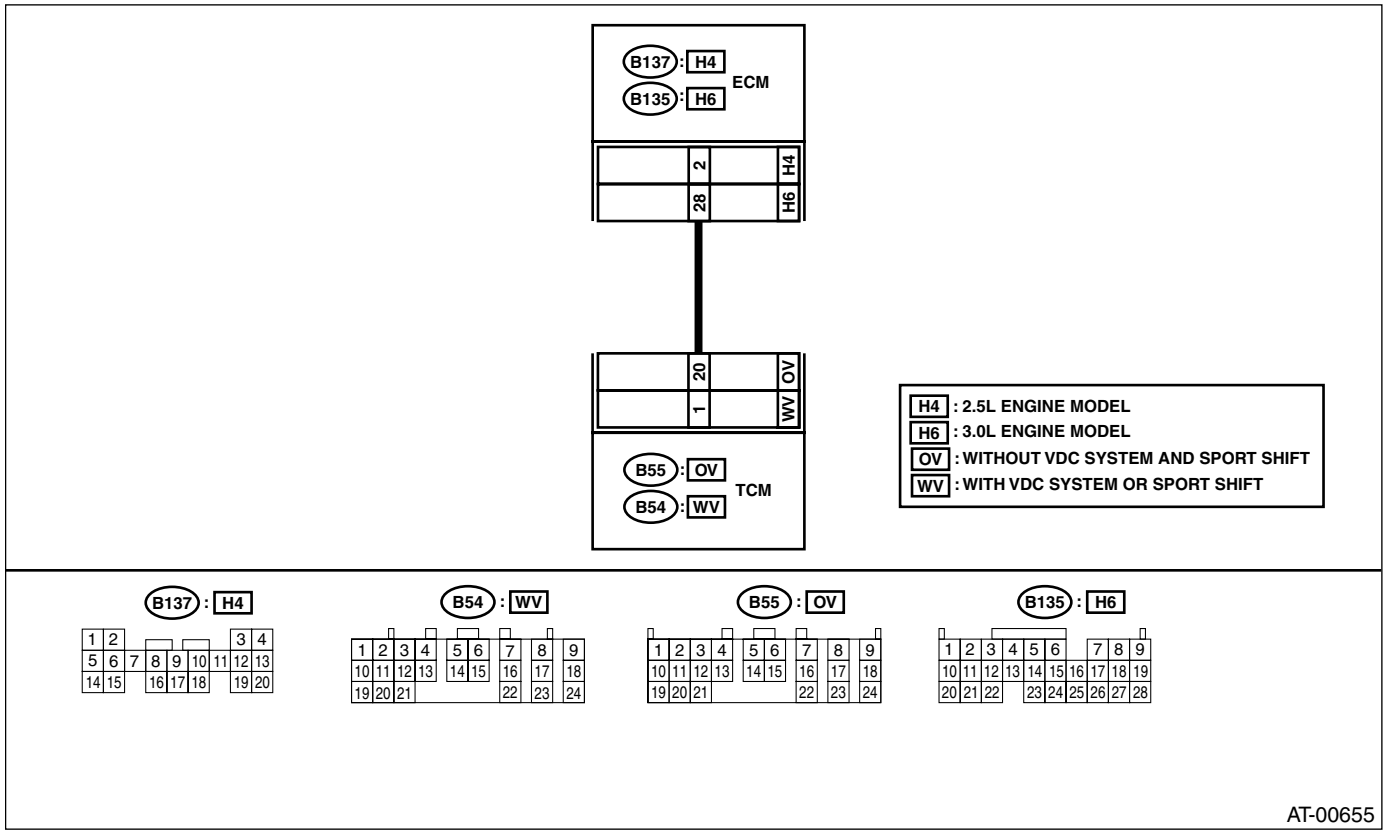
DIAGNOSIS:

The input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM** <Ref. to 4AT(H4SO)-60, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***3.0 L model with VDC system (B54) No. 1 - (B135) No. 28:*** ***3.0 L model without VDC system (B54) No. 20 - (B135) No. 28:*** ***2.5 L model with SPORT shift (B54) No. 1 - (B135) No. 2:*** ***2.5 L model without SPORT shift (B54) No. 20 - (B135) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***With VDC system or SPORT shift (B54) No. 1 - Chassis ground:*** ***Without VDC system and SPORT shift (B54) No. 20 - Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Idle the engine. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***With VDC system or SPORT shift (B54) No. 1 (+) - Chassis ground (–):*** ***Without VDC system and SPORT shift (B54) No. 20 (+) - Chassis ground (–):***	Is the voltage 0.4 — 1.6 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of intake manifold pressure signal using Subaru Select Monitor. •Display shows the intake manifold pressure signal value sent from ECM.	Is the value voltage 0.4 — 1.6 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in intake manifold pressure signal circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

H: DTC 71 SHIFT SOLENOID 1

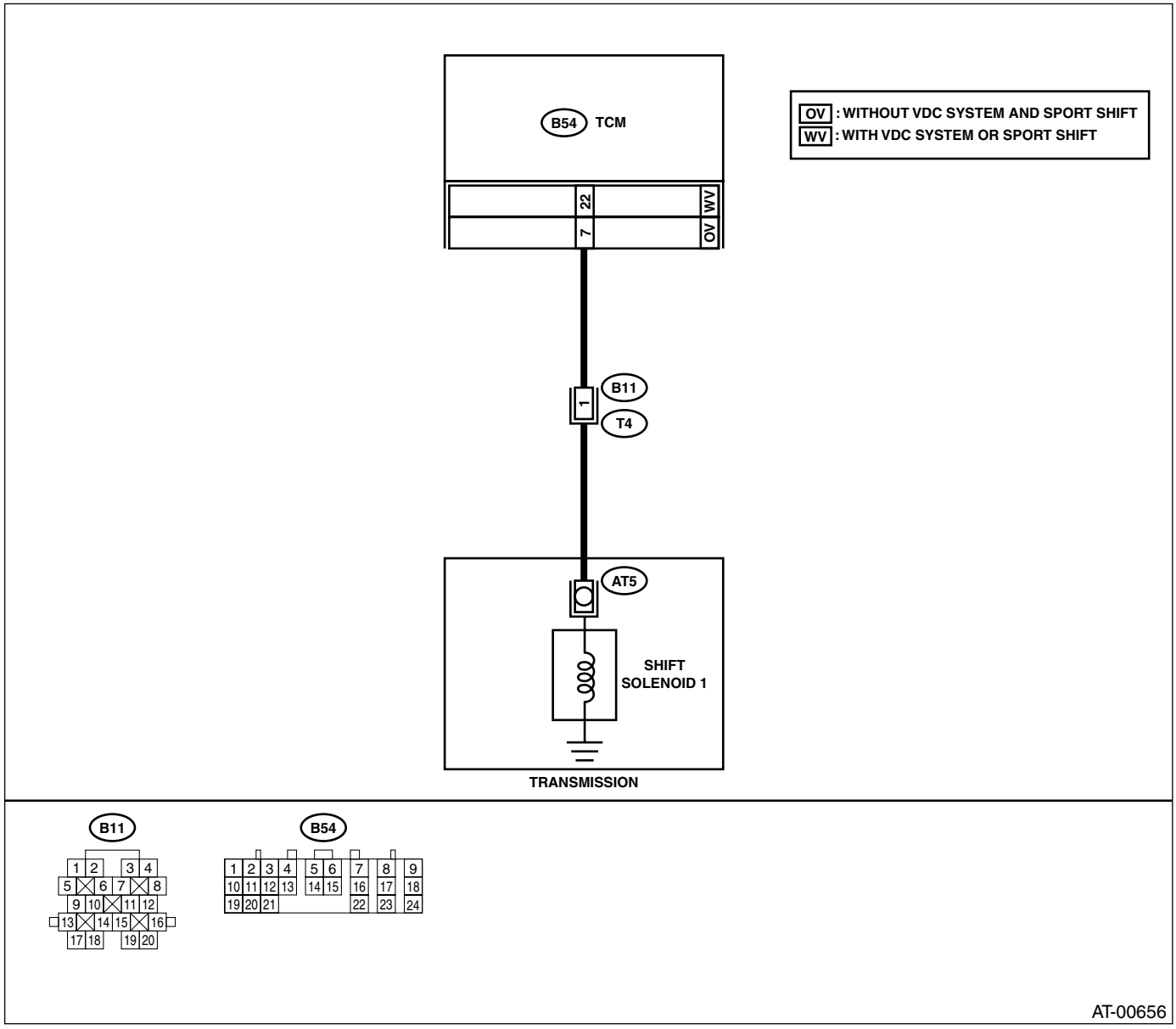
DIAGNOSIS:

The output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 7 — (B11) No. 1:*** ***With VDC system or SPORT shift (B54) No. 22 — (B11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 7 — Chassis ground:*** ***With VDC system or SPORT shift (B54) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 1.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “D” range. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 7 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B54) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the select lever to “2” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 7 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B54) No. 22 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 1 circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from shift solenoid 1. 5) Measure the resistance between shift solenoid 1 connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the shift solenoid 1. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 and transmission connector. ***Connector & terminal*** ***(T4) No. 1 — (AT5) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between shift solenoid 1 and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 1 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 1 and transmission.	Repair the short circuit harness between shift solenoid 1 and transmission connector.

MEMO:

I: DTC 72 SHIFT SOLENOID 2

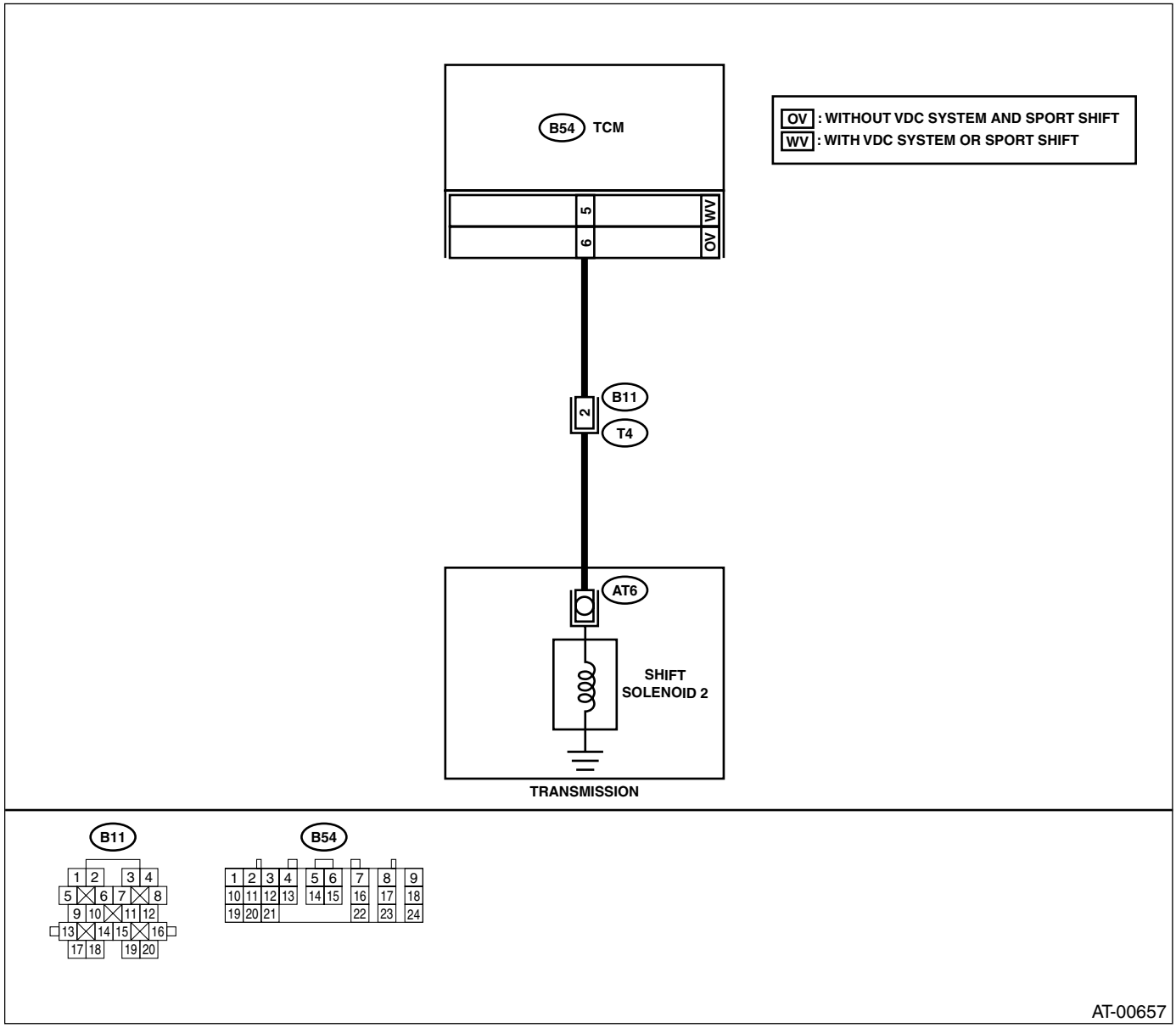
DIAGNOSIS:

The output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 2 connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 6 — (B11) No. 2:*** ***With VDC system or SPORT shift (B54) No. 5 — (B11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 6 — Chassis ground:*** ***With VDC system or SPORT shift (B54) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 2.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 2 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **6.**

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "D" range, and slowly increase vehicle speed to 50 km/h (31 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (B54) No. 6 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift (B54) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **5.**
5	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 2 circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
6	**CHECK SHIFT SOLENOID 2 (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from shift solenoid 2. 4) Measure the resistance between shift solenoid 2 connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **7.**	Replace the shift solenoid 2. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 and transmission connector. ***Connector & terminal*** ***(AT6) No. 1 — (T4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between shift solenoid 2 and transmission connector.

	Step	Check	Yes	No
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 2 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 2 and transmission.	Repair the short circuit harness between shift solenoid 2 and transmission connector.

J: DTC 73 LOW CLUTCH TIMING SOLENOID

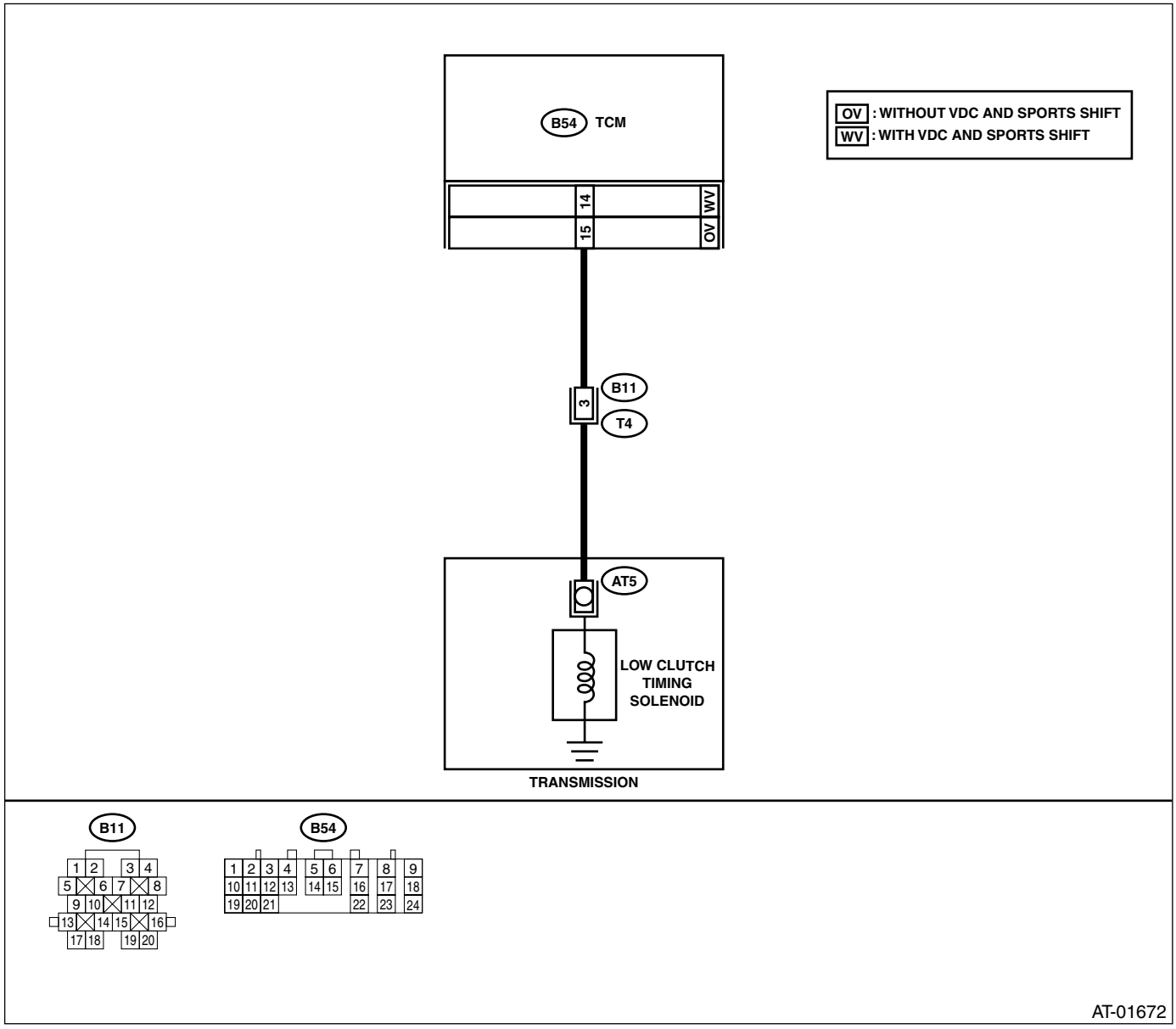
DIAGNOSIS:

The output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 14 — (B11) No. 3:*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 15 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 14 — Chassis ground:*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW CLUTCH TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 3 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “D” range. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 14 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Set the select lever to “2” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 14 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM and transmission.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.**	Is there poor contact in low clutch timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
7	**CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from low clutch timing solenoid. 5) Measure the resistance between low clutch timing solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the low clutch timing solenoid. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid and transmission connector. ***Connector & terminal*** ***(AT9) No. 1 — (T4) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between low clutch timing solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch timing solenoid and transmission.	Repair the short circuit harness between low clutch timing solenoid and transmission connector.

MEMO:

K: DTC 74 2-4 BRAKE TIMING SOLENOID

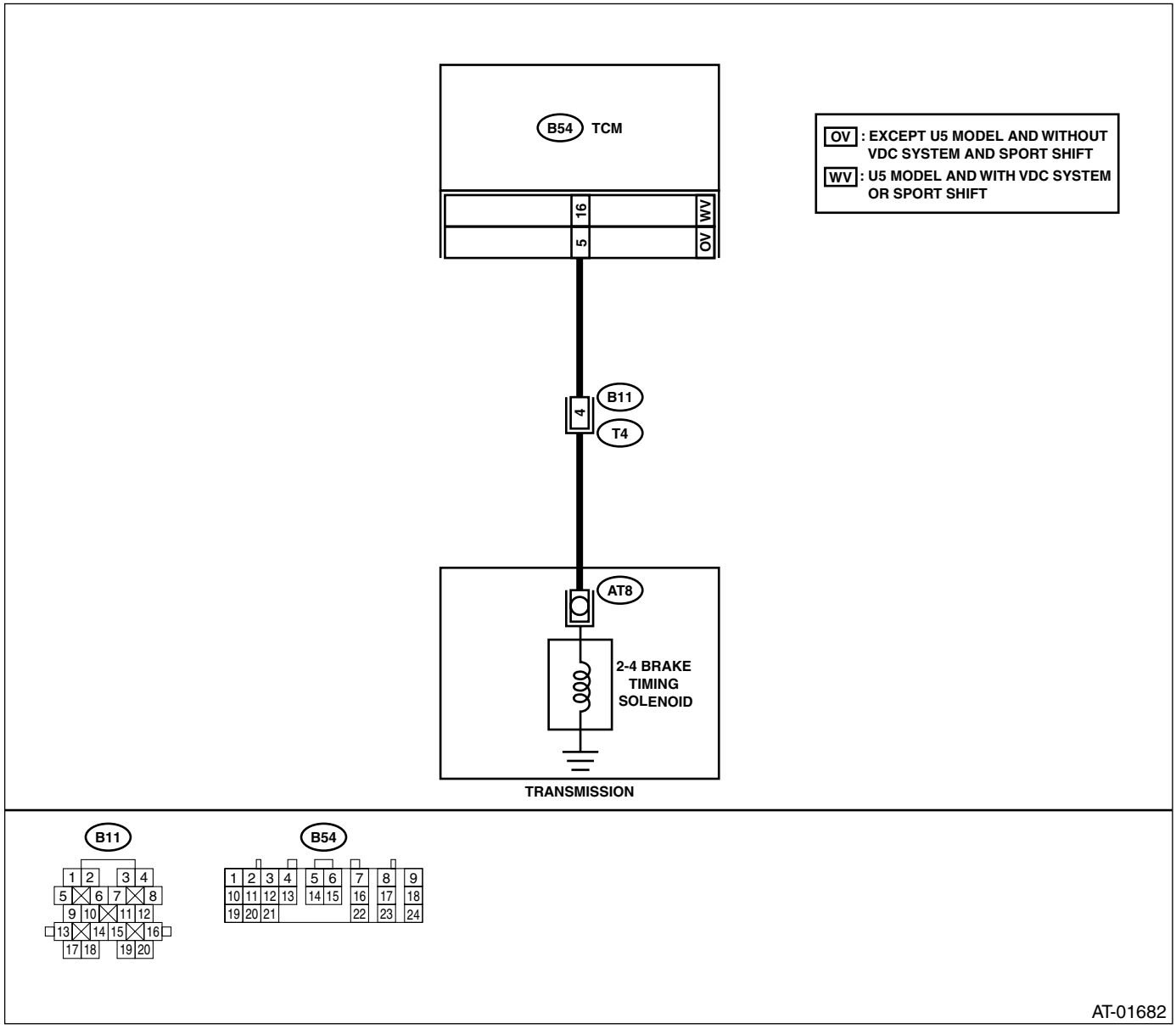
DIAGNOSIS:

The output signal circuit of 2-4 brake timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 5 — (B11) No. 4:*** ***U5 model and With VDC system or SPORT shift*** ***(B54) No. 16 — (B11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***Except U5 model, without VDC system and SPORT shift*** ***(B54) No. 5 — Chassis ground:*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 4 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "1" range, and slowly increase vehicle speed to 10 km/h (6 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 5 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the selector lever to "D" range, and slowly increase vehicle speed to 65 km/h (40 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 5 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transmission.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
7	**CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from 2-4 brake timing solenoid. 5) Measure the resistance between 2-4 brake timing solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the 2-4 brake timing solenoid. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid and transmission connector. ***Connector & terminal*** ***(AT8) No. 1 — (T4) No. 4:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between 2-4 brake timing solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in 2-4 brake timing solenoid and transmission.	Repair the short circuit harness between 2-4 brake timing solenoid and transmission connector.

L: DTC 75 LINE PRESSURE DUTY SOLENOID

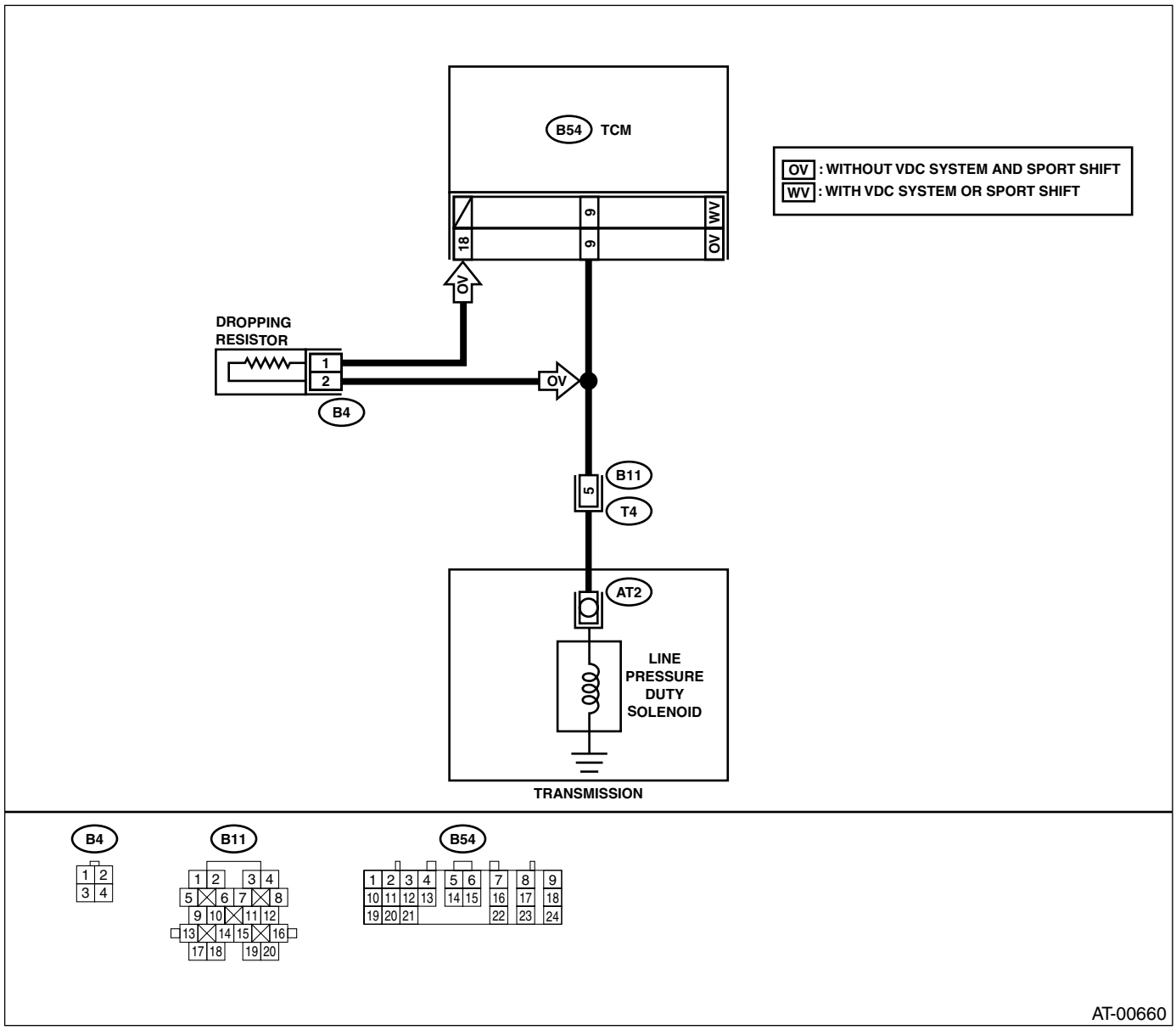
DIAGNOSIS:

Output signal circuit of line pressure duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is vehicle being diagnosed for U5 model and models with VDC system or SPORT shift?	Go to step **7.**	Go to step **2.**
2	**CHECK RESISTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from dropping resistor. 3) Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 9 — 15 Ω?	Go to step **3.**	Replace the dropping resistor. <Ref. to 4AT-81, Dropping Resistor.>
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and dropping resistor connector. ***Connector & terminal*** ***(B54) No. 18 — (B4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and dropping resistor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and dropping resistor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** 1) Disconnect the connector from transmission. 2) Measure the resistance of harness between transmission and dropping resistor connector. ***Connector & terminal*** ***(B4) No. 2 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between dropping resistor and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair short circuit in harness between dropping resistor and transmission connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 9 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
9	**CHECK LINE PRESSURE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminals*** ***(T4) No. 5 — No. 16:***	Is the resistance between 2.0 and 4.5 Ω?	Go to step **10.**	Go to step **16.**
10	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **13.**	Go to step **11.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Throttle fully closed. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):***	Is the voltage 1.5 — 5.0 V?	Go to step **12.**	Go to step **15.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Throttle fully open and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **15.**

	Step	Check	Yes	No
13	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Throttle is fully closed. •Line pressure duty solenoid is indicated in "%". 8) Read the data of line pressure duty solenoid using Subaru Select Monitor.	Is the value 100%?	Go to step **14.**	Go to step **15.**
14	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open.	Is the value less than 25%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **15.**
15	**CHECK POOR CONTACT.**	Is there poor contact in line pressure duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
16	**CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from line pressure duty solenoid. 4) Measure the resistance between line pressure duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **17.**	Replace the line pressure duty solenoid. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

Step		Check	Yes	No
17	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between line pressure duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 5 — (AT2) No. 1:***	Is the resistance less than 1 Ω?	Go to step **18.**	Repair the open circuit in harness between line pressure duty solenoid and transmission connector.
18	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 5 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between line pressure duty solenoid and transmission connector.

MEMO:

M: DTC 76 2-4 BRAKE DUTY SOLENOID

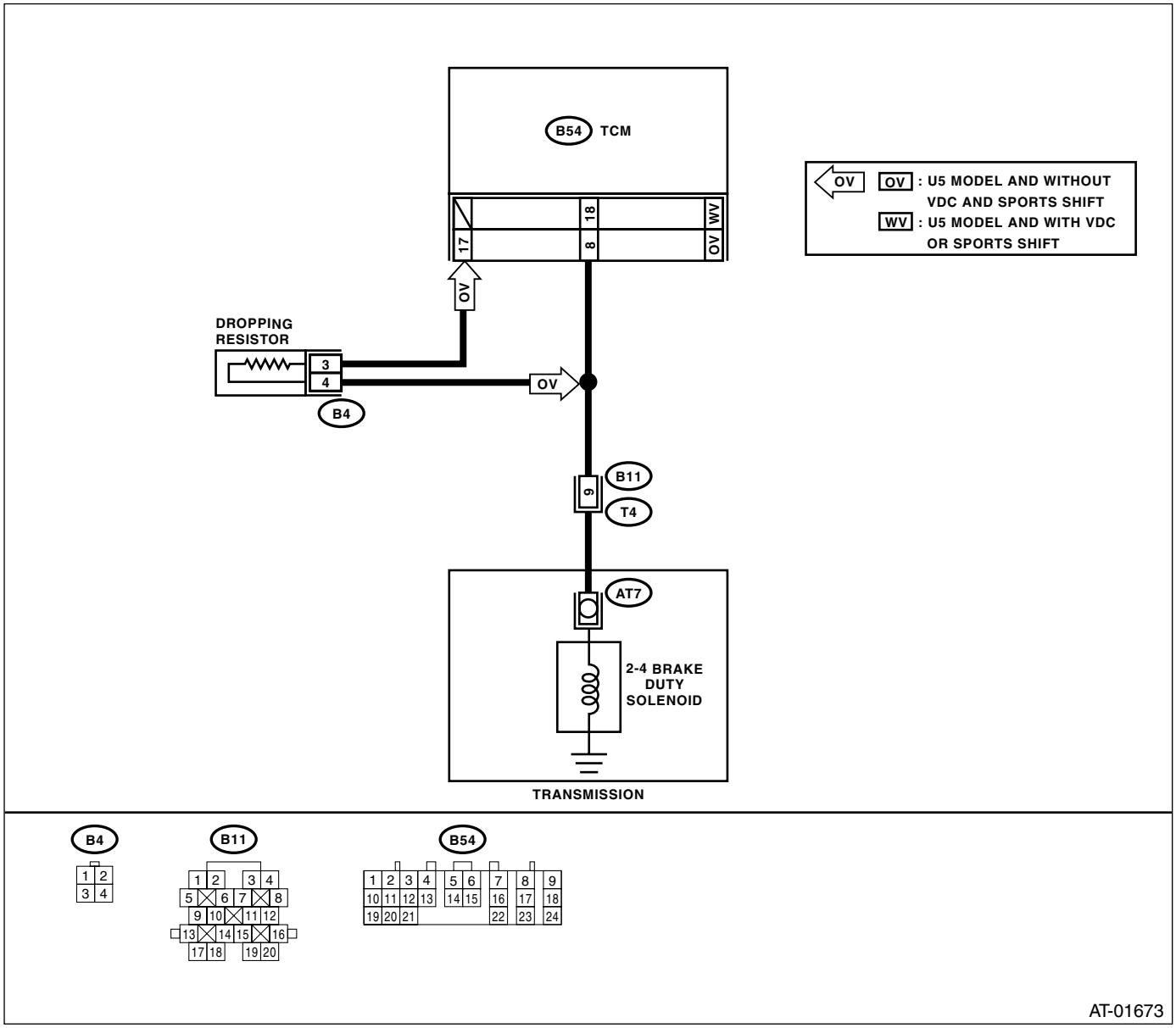
DIAGNOSIS:

Output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is vehicle being diagnosed for U5 model and models with VDC system or SPORT shift?	Go to step **2.**	Go to step **7.**
2	**CHECK RESISTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from dropping resistor. 3) Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 9 — 15 Ω?	Go to step **3.**	Replace the dropping resistor. <Ref. to 4AT-81, Dropping Resistor.>
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and dropping resistor connector. ***Connector & terminal*** ***(B54) No. 17 — (B4) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and dropping resistor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and dropping resistor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** 1) Disconnect the connector from transmission. 2) Measure the resistance of harness between transmission and dropping resistor connector. ***Connector & terminal*** ***(B4) No. 4 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between dropping resistor and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair short circuit in harness between dropping resistor and transmission connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 8 — (B11) No. 9:*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 18 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 8 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 8 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and transmission connector.
9	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminals*** ***(T4) No. 16 — No. 9:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **10.**	Go to step **16.**
10	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **13.**	Go to step **11.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Throttle fully closed. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 8 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 18 (+) — Chassis ground (–):***	Is the voltage 1.5 — 5.0 V?	Go to step **12.**	Go to step **15.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Throttle fully open and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 8 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B54) No. 18 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **15.**

	Step	Check	Yes	No
13	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Throttle is fully closed. •2-4 brake duty solenoid is indicated in "%". 8) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor.	Is the value 100%?	Go to step **14.**	Go to step **15.**
14	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open.	Is the value less than 25%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **15.**
15	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
16	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure the resistance between 2-4 brake duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **17.**	Replace the 2-4 brake duty solenoid. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

	Step	Check	Yes	No
17	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 9 — (AT7) No. 1:***	Is the resistance less than 1 Ω?	Go to step **18.**	Repair the open circuit in harness between 2-4 brake duty solenoid and transmission connector.
18	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 9 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between 2-4 brake duty solenoid and transmission connector.

MEMO:

N: DTC 77 LOCK-UP DUTY SOLENOID

DIAGNOSIS:

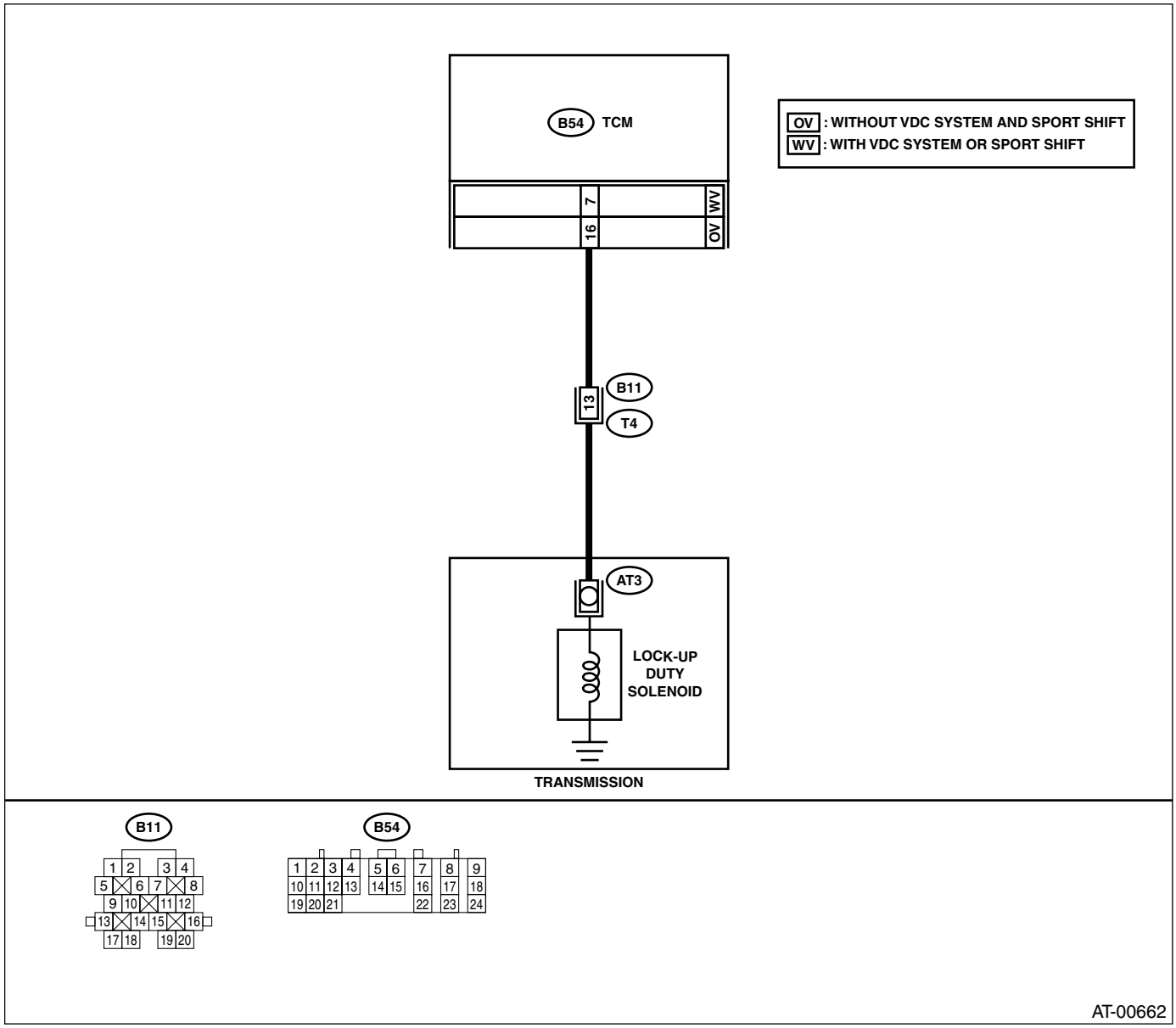
The output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

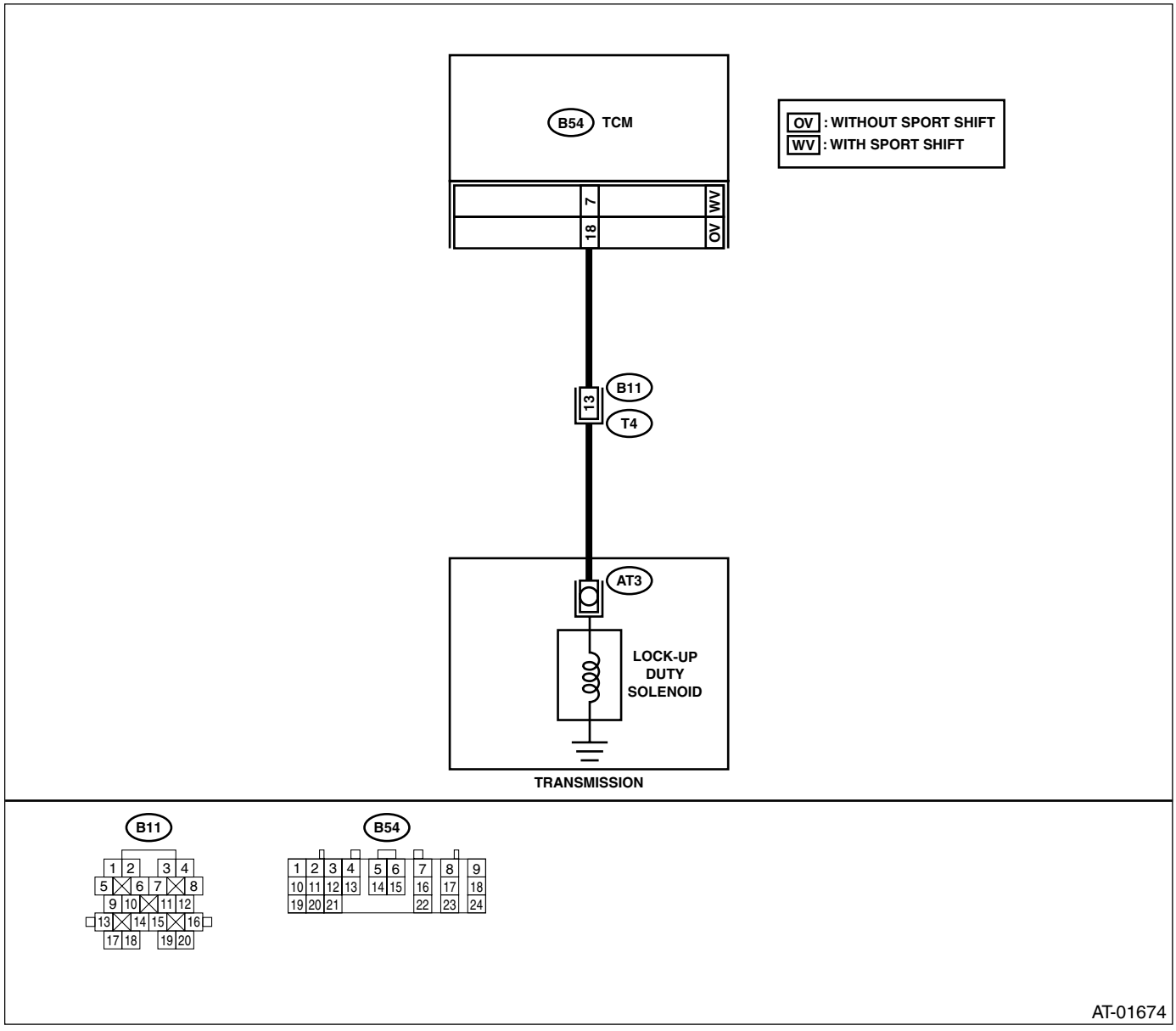
No “lock-up” (after engine warm-up).

WIRING DIAGRAM:

- Except U5 model



- U5 model


B54 TCM
OV : WITHOUT SPORT SHIFT
WV : WITH SPORT SHIFT
7
18
WV
OV
B11
13
T4
AT3
LOCK-UP
DUTY
SOLENOID
TRANSMISSION
B11
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B54
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24
AT-01674

	Step	Check	Yes	No
1	**CHECK DTC.**	Do multiple DTCs appear in the on-board diagnostics test mode?	Go to another DTC.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 16 — (B11) No. 13:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 18 — (B11) No. 13:*** ***With VDC system or SPORT shift*** ***(B54) No. 7 — (B11) No. 13:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 16 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 18 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 13 — No. 16:***	Is the resistance 10 — 17 Ω?	Go to step **5.**	Go to step **11.**
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **8.**	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "D" range and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 16 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B54) No. 18 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B54) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8.5 V?	Go to step **7.**	Go to step **10.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Return the engine to idling speed and move select lever to "N" range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 16 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B54) No. 18 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B54) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine and turn Subaru Select Monitor switch to ON. 5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6) Read the data of lock-up duty solenoid using Subaru Select Monitor. •Lock-up duty solenoid is indicated in "%". 7) Move the selector lever to "D" range and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 95%?	Go to step **9.**	Go to step **10.**
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** Return the engine to idling speed and move selector lever to "N" range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 5%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in lock-up duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
11	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from lock-up duty solenoid. 4) Measure the resistance between lock-up duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 17 Ω?	Go to step **12.**	Replace the lock-up duty solenoid. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
12	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between lock-up duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 13 — (AT3) No. 1:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between TCM and transmission connector.
13	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 13 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

O: DTC 78 SPORT SHIFT SOLENOID

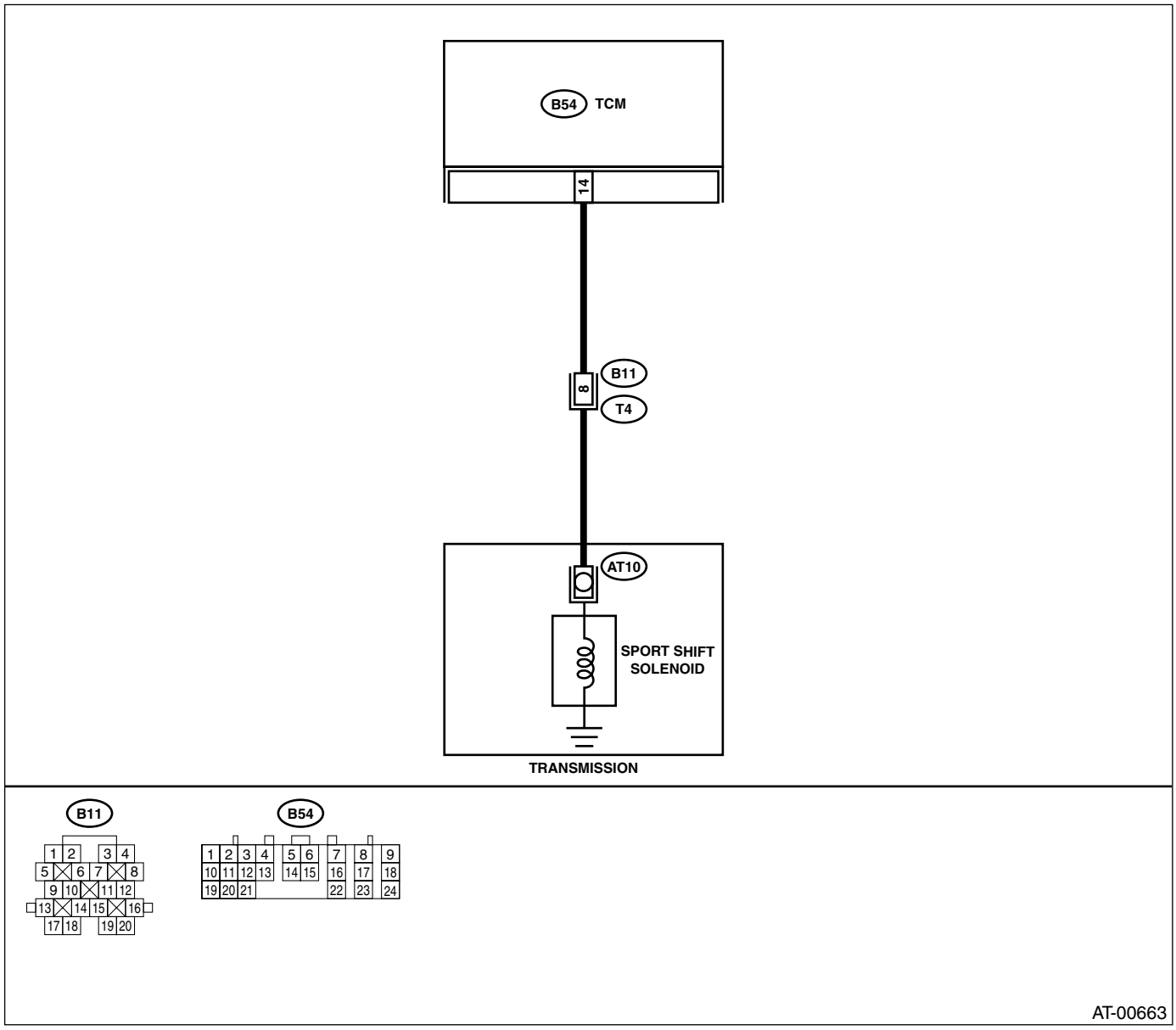
DIAGNOSIS:

Output signal circuit of SPORT shift solenoid is open or shorted.

TROUBLE SYMPTOM:

Engine brake is effected when select lever is in “D” or “3” range with 1st gear.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and transmission. 3) Measure resistance of harness between TCM and SPORT shift solenoid connector. ***Connector & terminal*** ***(B54) No. 14 — (B11) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 1.** Measure resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 8 — No. 16:***	Is the resistance 10 - 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect connectors to TCM and transmission. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move select lever to SPORT shift mode. 2) Measure voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if AT OIL TEMP warning light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or contact in the TCM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in SPORT shift solenoid circuit?	Repair poor contact.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK SPORT SHIFT SOLENOID (IN TRANSMISSION).** 1) Remove transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: On AWD models, raise all wheels off ground. 3) Drain automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 4) Remove oil pan, and disconnect connector from SPORT shift solenoid. 5) Measure resistance between SPORT shift solenoid connector and transmission ground. ***Terminal*** ***No. 1 — Transmission ground:***	Is the resistance 10 - 16 Ω?	Go to step **8.**	Replace SPORT shift solenoid. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN SPORT SHIFT SOLENOID AND TRANSMISSION.** Measure resistance of harness between SPORT shift solenoid and transmission connector. ***Connector & terminal*** ***(AT10) No. 1 — (T4) No. 8:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between SPORT shift solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN SPORT SHIFT SOLENOID AND TRANSMISSION.** Measure resistance of harness between SPORT shift solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 8 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if AT OIL TEMP warning light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in SPORT shift solenoid and transmission.	Repair short circuit harness between SPORT shift solenoid and transmission connector.

MEMO:

P: DTC 79 TRANSFER DUTY SOLENOID

DIAGNOSIS:

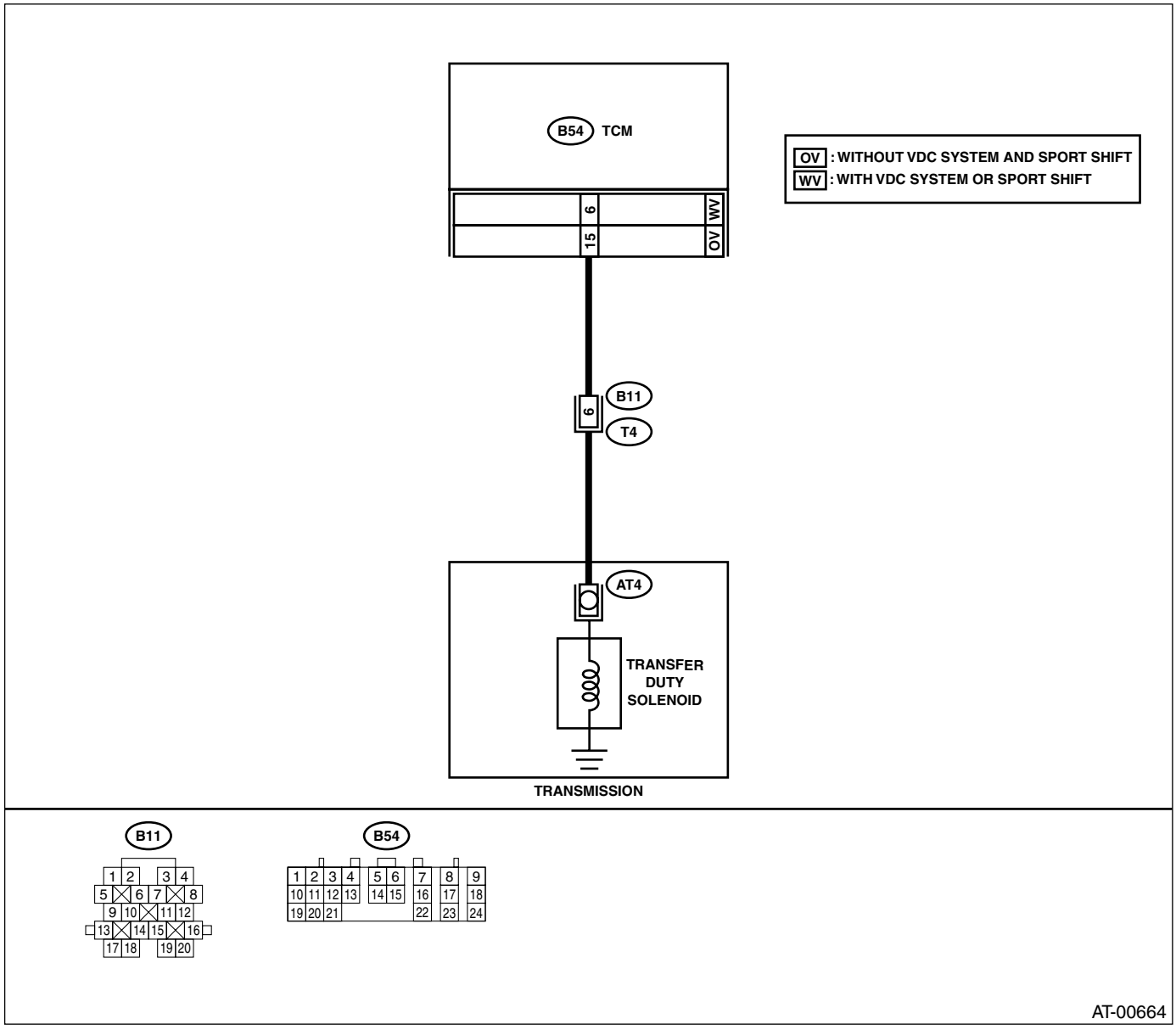
The output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

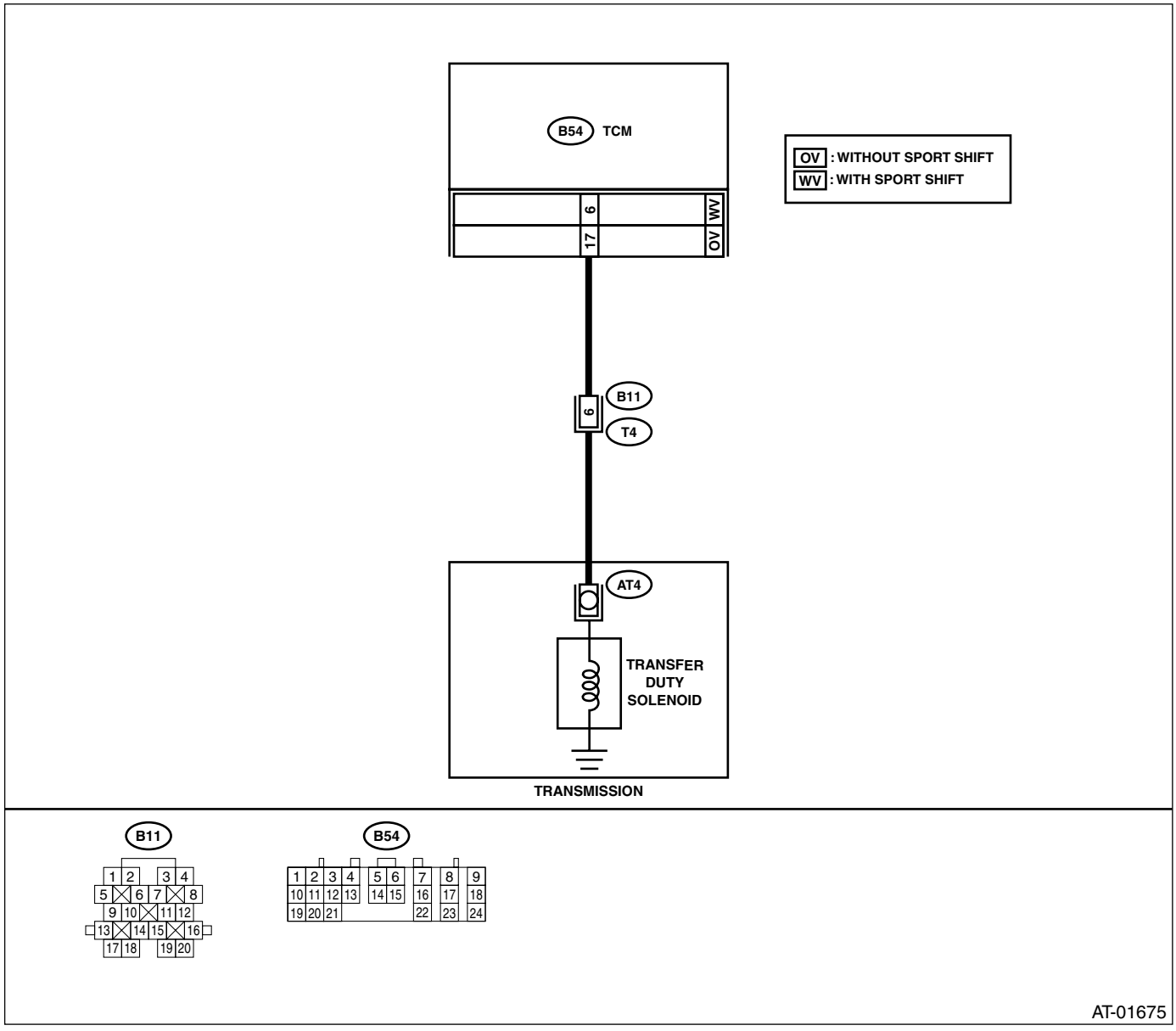
Excessive “braking” in tight corners.

WIRING DIAGRAM:

- Except U5 model



- U5 model


B54
TCM
OV : WITHOUT SPORT SHIFT
WV : WITH SPORT SHIFT
6
17
WV
OV
B11
6
T4
AT4
TRANSFER
DUTY
SOLENOID
TRANSMISSION
B11
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B54
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24
AT-01675

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 15 — (B11) No. 6:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 17 — (B11) No. 6:*** ***With VDC system or SPORT shift*** ***(B54) No. 6 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 15 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 17 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK TRANSFER DUTY SOLENOID.** Measure the resistance between transmission connector and transmission terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 16:***	Is the resistance 10 — 17 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Throttle is fully closed. 4) Move the select lever to “P” range. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 15 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B54) No. 17 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B54) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **9.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the select lever to “D” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 15 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B54) No. 17 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B54) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 8.5 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Move the select lever to “D” range with throttle fully open (vehicle speed 0 km/h or 0 MPH). 5) Read the data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in “%”.	Is the value 80 — 95%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to “N” range with throttle fully close (vehicle speed 0 km/h or 0 MPH). 2) Read the data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in “%”.	Is the value approx. 5 — 10%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transfer duty solenoid and TCM connector.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
10	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 2) Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3) Remove the extension case and disconnect connector from transfer duty solenoid. 4) Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT4) No. 1 — Transmission ground:***	Is the resistance 10 — 17 Ω?	Go to step **11.**	Replace the transfer duty solenoid.
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between transfer duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.	Repair the short circuit in harness between transfer duty solenoid and transmission connector.

MEMO:

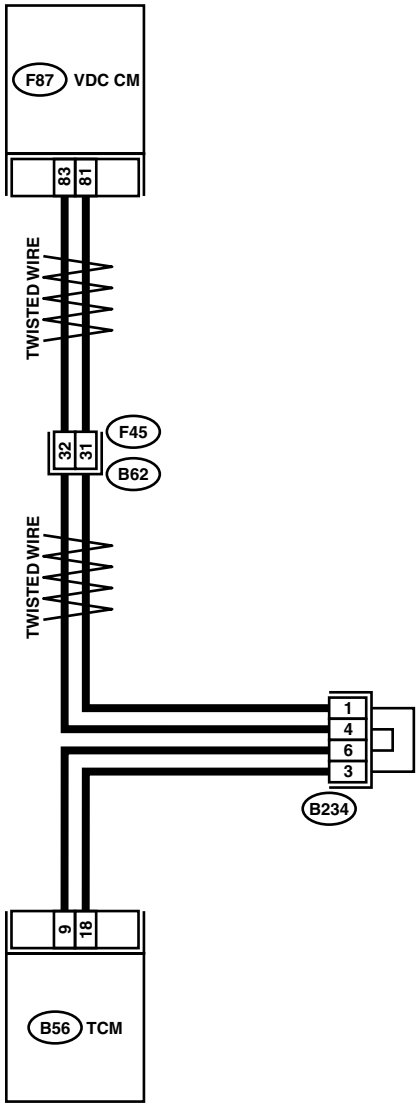
Q: DTC 86 CAN COMMUNICATION SIGNAL

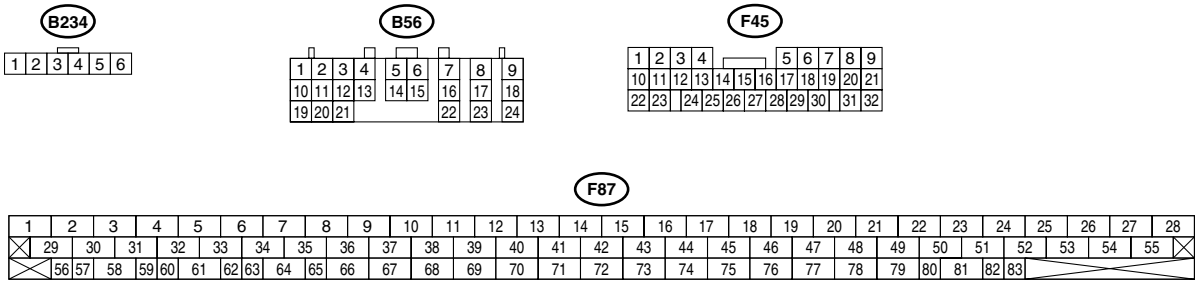
DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

WIRING DIAGRAM:

- With VDC system





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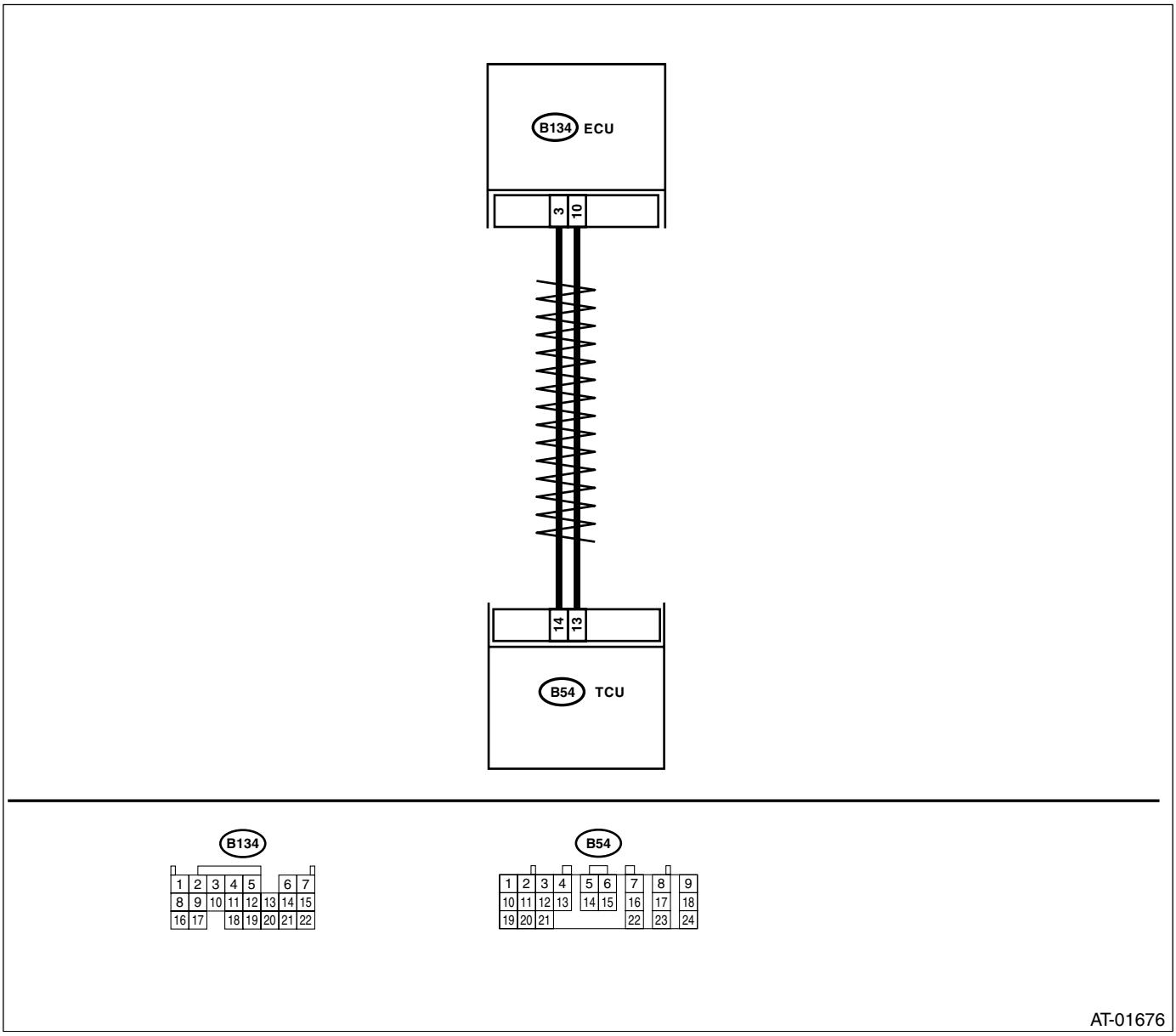
- U5 model


B134
ECU
3
10
14
13
B54
TCU
B134
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15
16 17 18 19 20 21 22
B54
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24
AT-01676

	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is vehicle being diagnosed for models with VDC system?	Go to step **2.**	Go to step **12.**
2	**CHECK TROUBLE CODE.** Do multiple trouble codes appear in the on-board diagnostics test mode?	DTC indicated.	Go to another trouble code.	Go to step **2.**
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and VDCCM. 3) Measure resistance of harness between TCM and VDCCM connector. ***Connector & terminal*** ***(B56) No. 18 — (F87) No. 81:*** Is the measured value less than the specified value?	1 Ω	Go to step **3.**	Repair open circuit in harness between TCM and VDCCM, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM.** Measure resistance of harness between TCM and VDCCM connector. ***Connector & terminal*** ***(B56) No. 9 — (F87) No. 83:*** Is the measured value less than the specified value?	1 Ω	Go to step **4.**	Repair open circuit in harness between TCM and VDCCM, and poor contact in coupling connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM.** Measure resistance of harness between TCM and VDCCM connector. ***Connector & terminal*** ***(B56) No. 18 — Chassis ground:*** Does the measured value exceed the specified value?	1 MΩ	Go to step **5.**	Repair short circuit in harness between TCM and VDCCM connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM.** Measure resistance of harness between TCM and VDCCM connector. ***Connector & terminal*** ***(B56) No. 9 — Chassis ground:*** Is the measured value less than the specified value?	1 MΩ	Go to step **6.**	Repair short circuit in harness between TCM and VDCCM connector.
7	**PREPARE OSCILLOSCOPE.** Do you have oscilloscope?	Oscilloscope is available.	Go to step **8.**	Go to step **7.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connectors to TCM and VDCCM. 2) Turn ignition switch to ON (engine OFF). 3) Measure voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 9 (+) — Chassis ground (–):*** ***(B56) No. 18 (+) — Chassis ground (–):*** Does input voltage value change?	Input voltage value changes.	Go to step **10.**	Repair poor contact in VDCCM.

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Set oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B56) No. 9*** ***Ground; (B55) No. 9*** 2) Turn ignition switch to ON (engine OFF). Check signal waveform pattern on oscilloscope. <Ref. to 4AT(H4SO)-26, WAVEFORM, MEASUREMENT, Transmission Control Module (TCM) I/O Signal.> Is waveform pattern same as that shown in the figure?	Waveform pattern is same as that shown in the figure.	Go to step **9.**	Repair poor contact in VDCCM.
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Set oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B56) No. 18*** ***Ground; (B55) No. 9*** 2) Turn ignition switch to ON (engine OFF). Check signal waveform pattern on oscilloscope. <Ref. to 4AT(H4SO)-26, WAVEFORM, MEASUREMENT, Transmission Control Module (TCM) I/O Signal.> Is waveform pattern same as that shown in the figure?	Waveform pattern is same as that shown in the figure.	Go to step **10.**	Repair poor contact in VDCCM.
11	**CHECK POOR CONTACT.** Is there poor contact in TCM?	There is poor contact.	Repair poor contact.	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
12	**CHECK DIAGNOSIS CODE.** Connect connectors to TCM and VDCCM.	Any other diagnosis trouble code is indicated.	Go on other diagnosis trouble code.	Go to step **13.**
13	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect connector from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 13 — (B134) No. 10:*** ***With SPORT shift*** ***(B56) No. 18 — (B134) No. 10:***	Is the resistance less than 1 Ω?	Go to step **14.**	Repair open circuit in harness between TCM and ECM, and poor contact in connect connector.
14	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 14 — (B134) No. 3:*** ***With SPORT shift*** ***(B56) No. 9 — (B134) No. 3:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair open circuit in harness between TCM and ECM, and poor contact in connect connector.

Step		Check	Yes	No
15	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without SPORT shift*** ***(B54) No. 13 — Chassis ground:*** ***(B54) No. 14 — Chassis ground:*** ***With SPORT shift*** ***(B56) No. 9 — Chassis ground:*** ***(B56) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Abnormal of TCM and ECM is possible (replace and check again).	Repair the open circuit in harness between TCM and ECM connector.

MEMO:

R: DTC 93 REAR VEHICLE SPEED SENSOR

DIAGNOSIS:

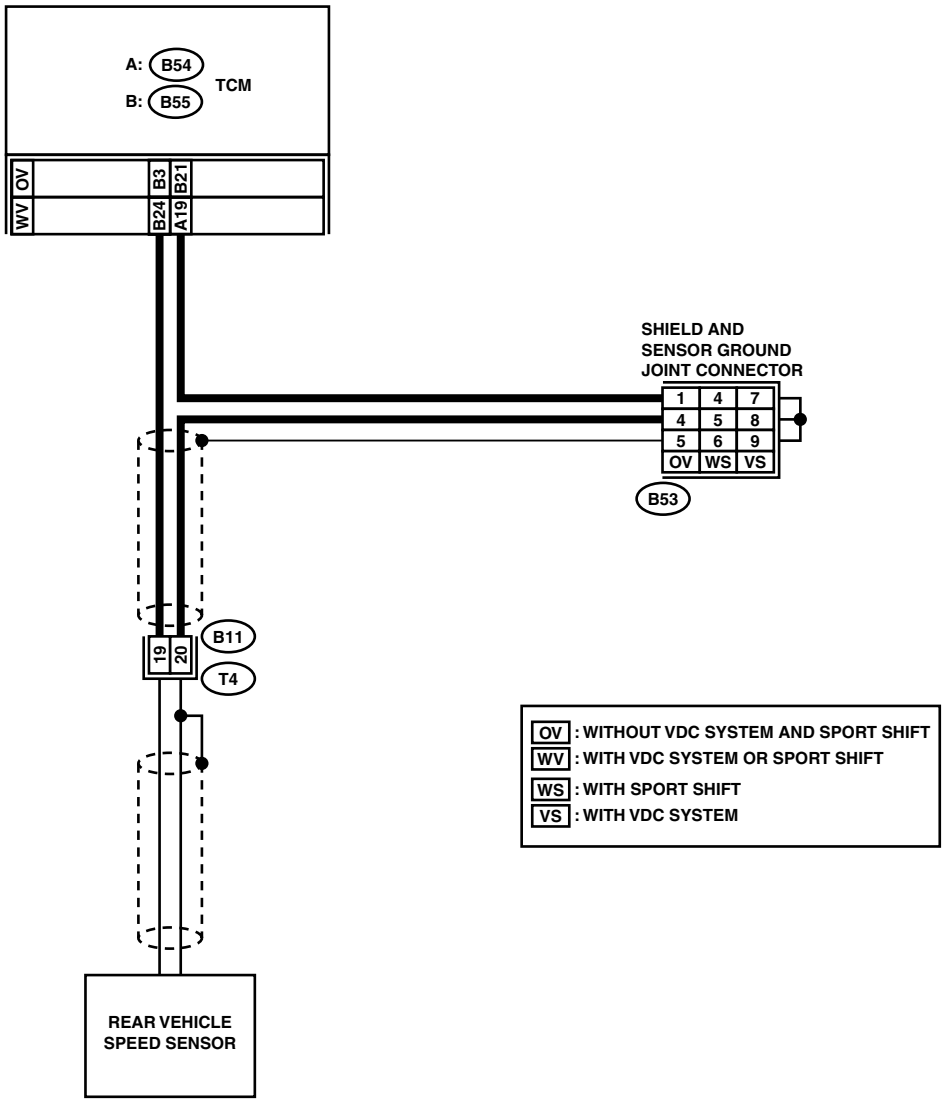
The input signal circuit of TCM is open or shorted.

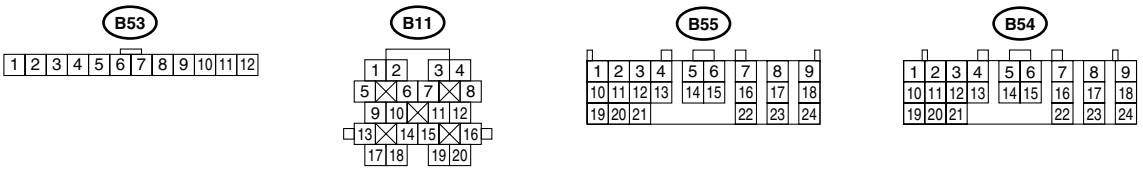
TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”.

WIRING DIAGRAM:

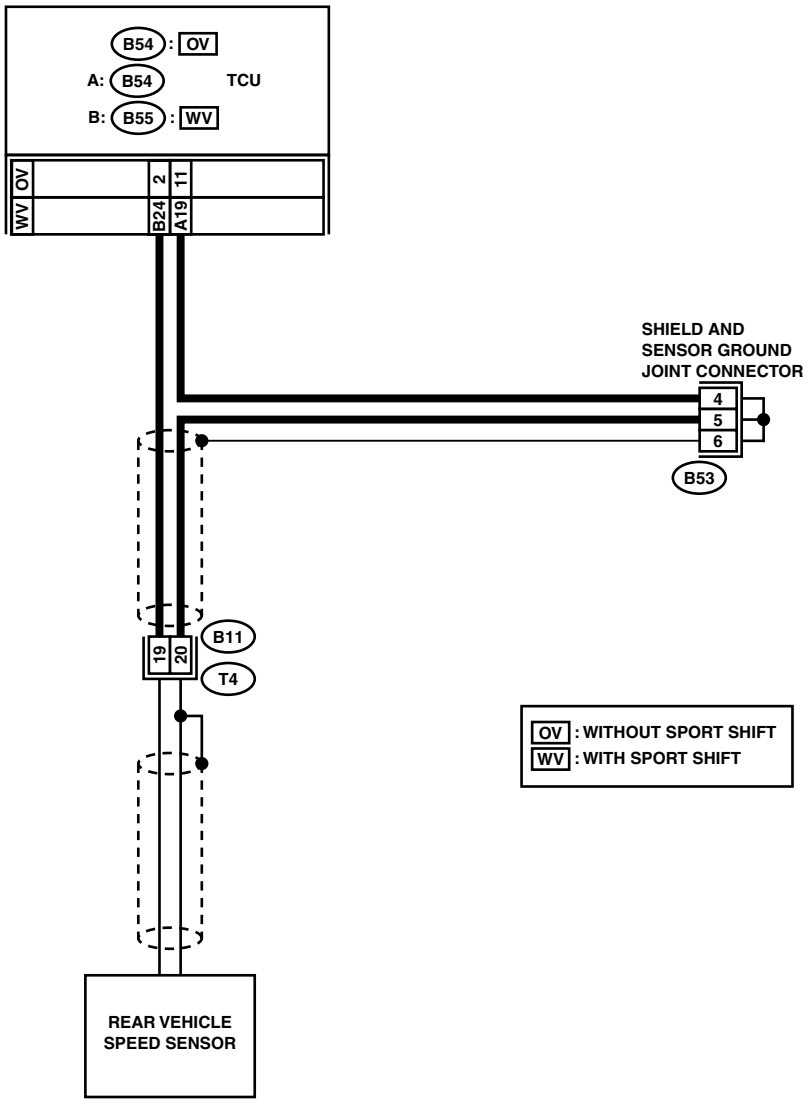
- Except U5 model

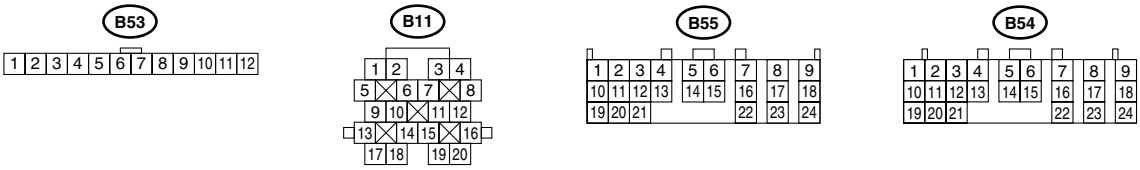




AT-00666

- U5 model





AT-01677

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 3 — (B11) No. 19:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 11 — (B11) No. 19:*** ***With VDC system or SPORT shift*** ***(B55) No. 24 — (B11) No. 19:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 21 — (B11) No. 20:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 11 — (B11) No. 20:*** ***With VDC system or SPORT shift*** ***(B54) No. 19 — (B11) No. 20:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 3 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 11 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 21 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B54) No. 11 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B54) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK REAR VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 19 — No. 20:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the rear vehicle speed sensor. <Ref. to 4AT-60, Rear Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 3 (+) — (B55) No. 21 (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 11 (+) — (B54) No. 11 (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 24 (+) — (B54) No. 19 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Does the speedometer indication increase as the Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***Positive probe; (B55) No. 3:*** ***Ground lead; (B55) No. 21:*** ***Without SPORT shift (U5 model)*** ***Positive probe; (B55) No. 11:*** ***Ground lead; (B54) No. 11:*** ***With VDC system or SPORT shift*** ***Positive probe; (B55) No. 24:*** ***Ground lead; (B54) No. 19:*** 4) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the signal voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in rear vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

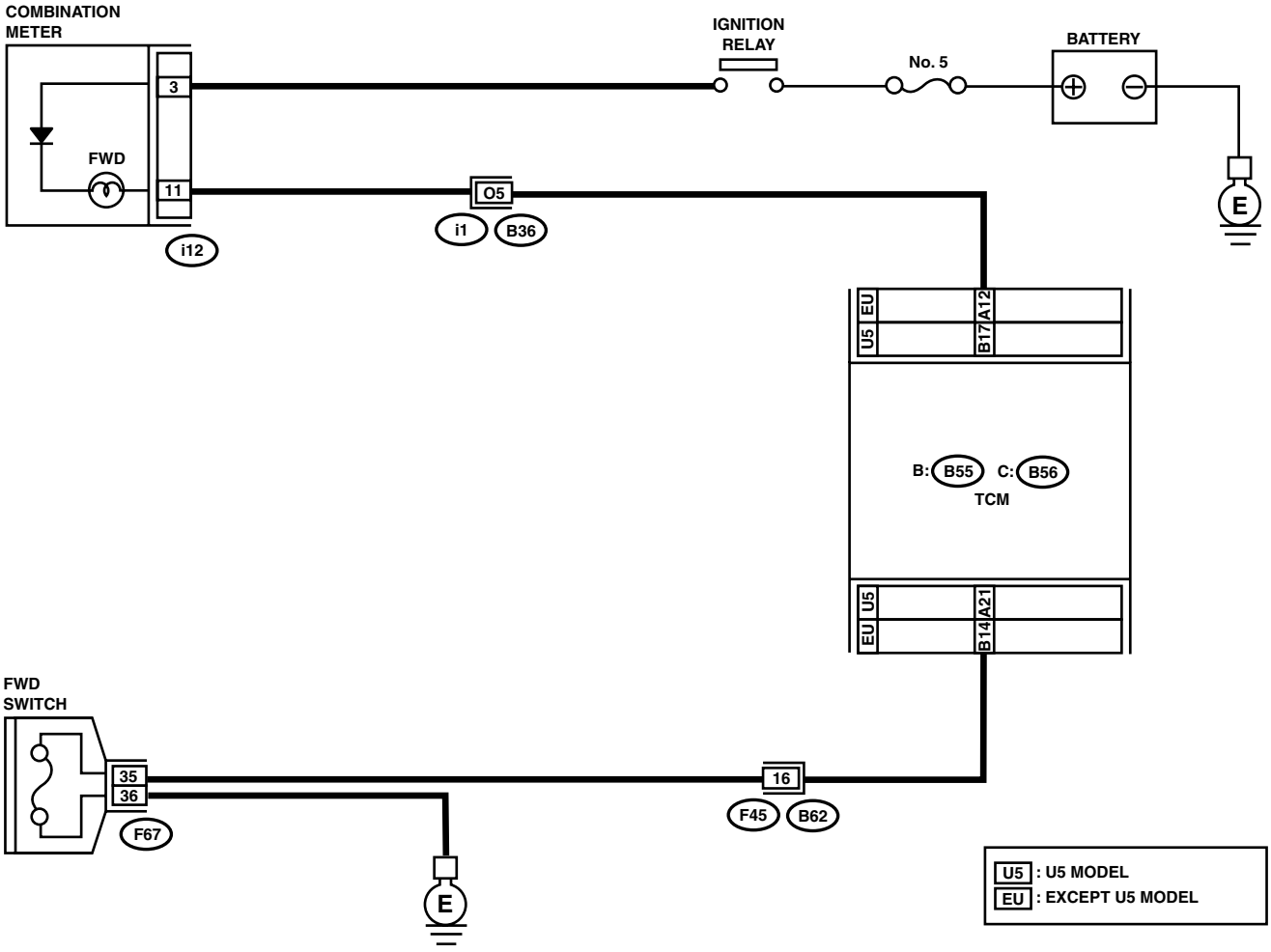
15.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

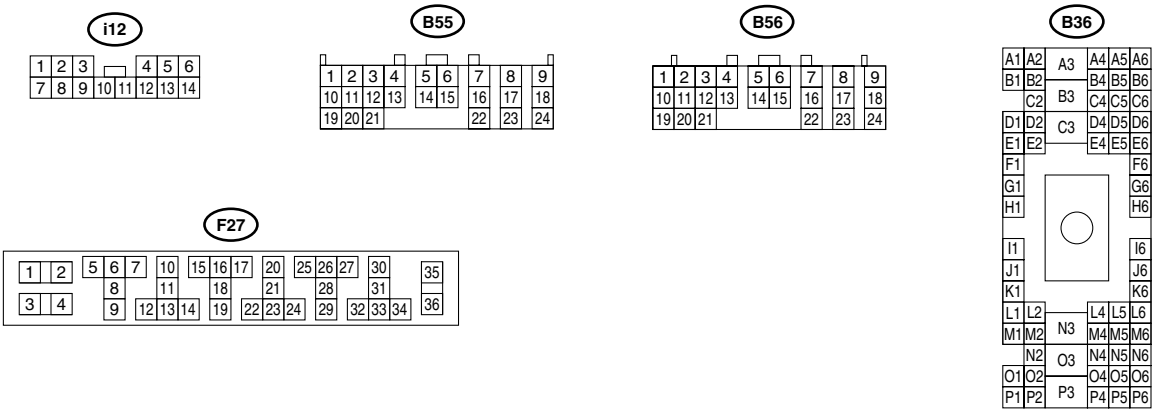
A: CHECK FWD SWITCH

DIAGNOSIS:

- The LED does not come on even if FWD switch is ON.
- The FWD switch circuit is open or short.

WIRING DIAGRAM:





AT-01678

	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is vehicle being diagnosed for models with VDC system or SPORTS shift?	Go to step CHECK BRAKE SWITCH. <Ref. to 4AT(H4SO)-146, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FWD SWITCH.** Connect Select Monitor to data link connector, and display the LED monitor.	When the fuse is inserted to FWD switch, does LED light up?	Go to step CHECK BRAKE SWITCH.<Ref. to 4AT(H4SO)-146, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK FWD INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter.	Is the FWD indicator light bulb OK?	Go to step **4.**	Check the FWD indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance of harness between TCM and FWD switch connector. ***Connector & terminal*** ***Except U5 model*** ***(B55) No. 14 — (F27) No. 36:*** ***U5 model*** ***(B54) No. 21 — (F27) No. 36:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between TCM and FWD switch connector.
5	**CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between FWD switch and chassis ground. ***Connector & terminal*** ***(F27) No. 35 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between FWD switch connector and chassis ground.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** Measure the resistance of harness connector between TCM and body to make sure that circuit does not short. ***Connector & terminal*** ***Except U5 model*** ***(B55) No. 14 — Chassis ground:*** ***U5 model*** ***(B54) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the short circuit in harness between TCM and FWD switch connector.

	Step	Check	Yes	No
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector. ***Connector & terminal*** ***Except U5 model*** ***(B55) No. 14 (+) — Chassis ground (–):*** ***U5 model*** ***(B55) No. 21 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8.**	Go to step **12.**
8	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***Except U5 model*** ***(B55) No. 14 (+) — Chassis ground (–):*** ***U5 model*** ***(B54) No. 21 (+) — Chassis ground (–):***	Is the voltage 6 — 9.1 V?	Go to step **9.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance of harness between TCM and diagnosis connector. ***Connector & terminal*** ***Except U5 model*** ***(B54) No. 12 — (i12) No. 11:*** ***U5 model*** ***(B55) No. 17 — (i12) No. 11:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit in harness between TCM and combination meter and poor contact in connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***Except U5 model*** ***(B54) No. 12 — Chassis ground:*** ***U5 model*** ***(B55) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the short circuit in harness between TCM and combination meter connector.
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and combination meter. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector. ***Connector & terminal*** ***Except U5 model*** ***(B54) No. 12 (+) — Chassis ground (–):*** ***U5 model*** ***(B55) No. 17 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **12.**	Go to step **13.**

Step		Check	Yes	No
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***Except U5 model*** ***(B54) No. 12 (+) — Chassis ground (–):*** ***U5 model*** ***(B55) No. 17 (+) — Chassis ground (–):***	Is the voltage 6 — 9.1 V?	Go to step **13.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
13	**CHECK POOR CONTACT.**	Is there poor contact in FWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

B: CHECK BRAKE SWITCH

Step		Check	Yes	No
1	**CHECK BRAKE SWITCH.**	When the brake pedal is depressed, does LED light up?	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to 4AT(H4SO)-147, CHECK CRUISE CONTROL SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Check the brake switch circuit.

C: CHECK CRUISE CONTROL SWITCH

Step		Check	Yes	No
1	**CHECK CRUISE CONTROL SWITCH.**	When the cruise control is set, does LED light up?	Go to step CHECK INHIBITOR SWITCH. <Ref. to 4AT(H4SO)-148, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Check the cruise control. Turbo and U5 model <Ref. to CC(H4DOTC)-2, Basic Diagnostic Procedure.> Except turbo and U5 model <Ref. to CC(H4SO)-2, Basic Diagnostic Procedure.>

D: CHECK INHIBITOR SWITCH

DIAGNOSIS:

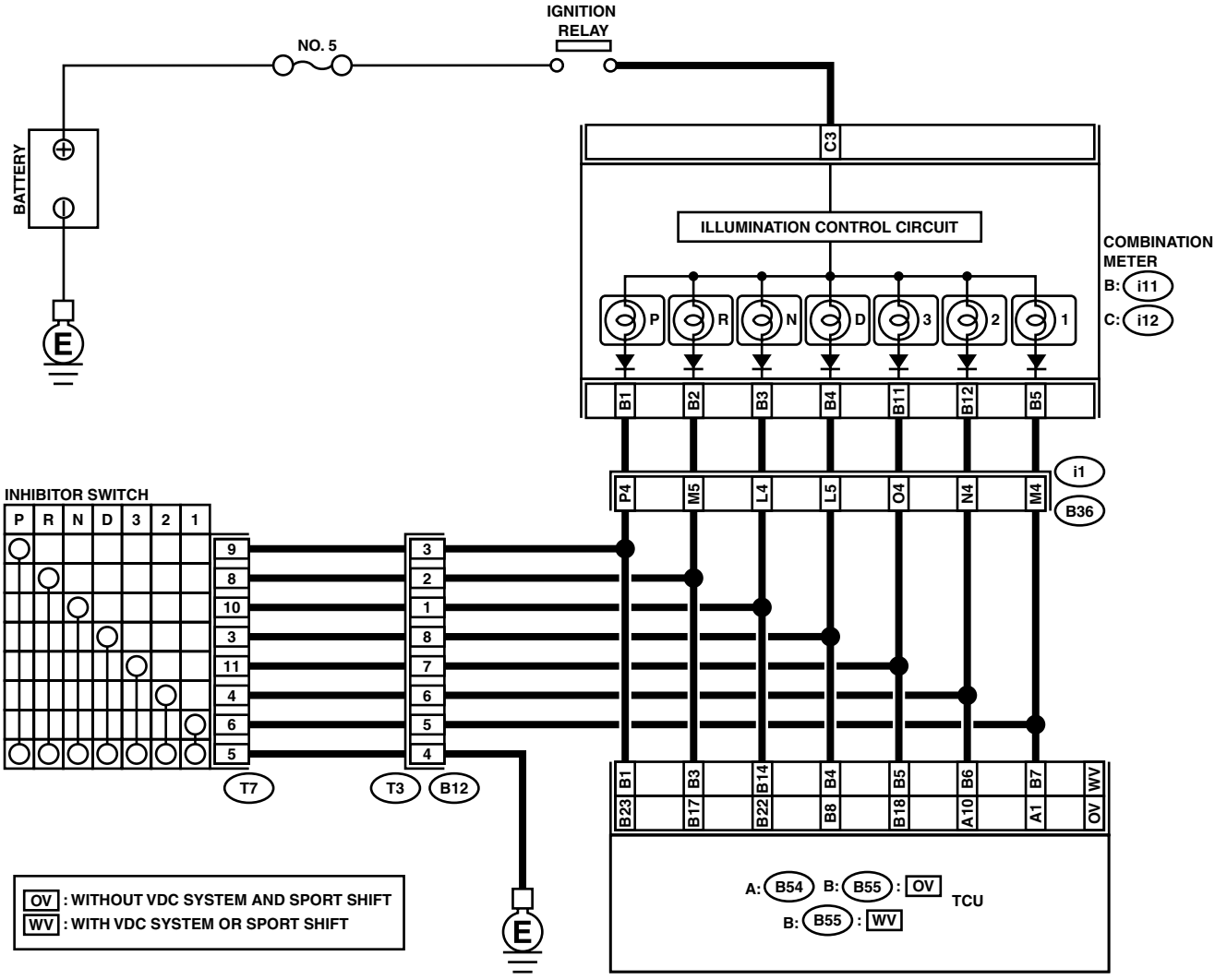
The input signal circuit of inhibitor switch is open or shorted.

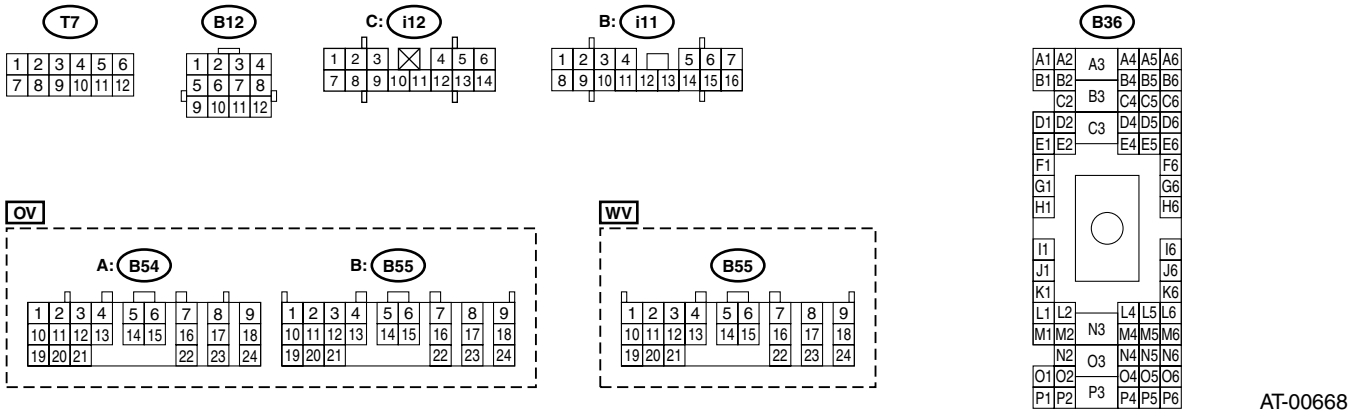
TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake is not effected when selector lever is in “3” range.
- Engine brake is not effected when selector lever is in “2” range.
- Engine brake is not effected when selector lever is in “1” range.

WIRING DIAGRAM:

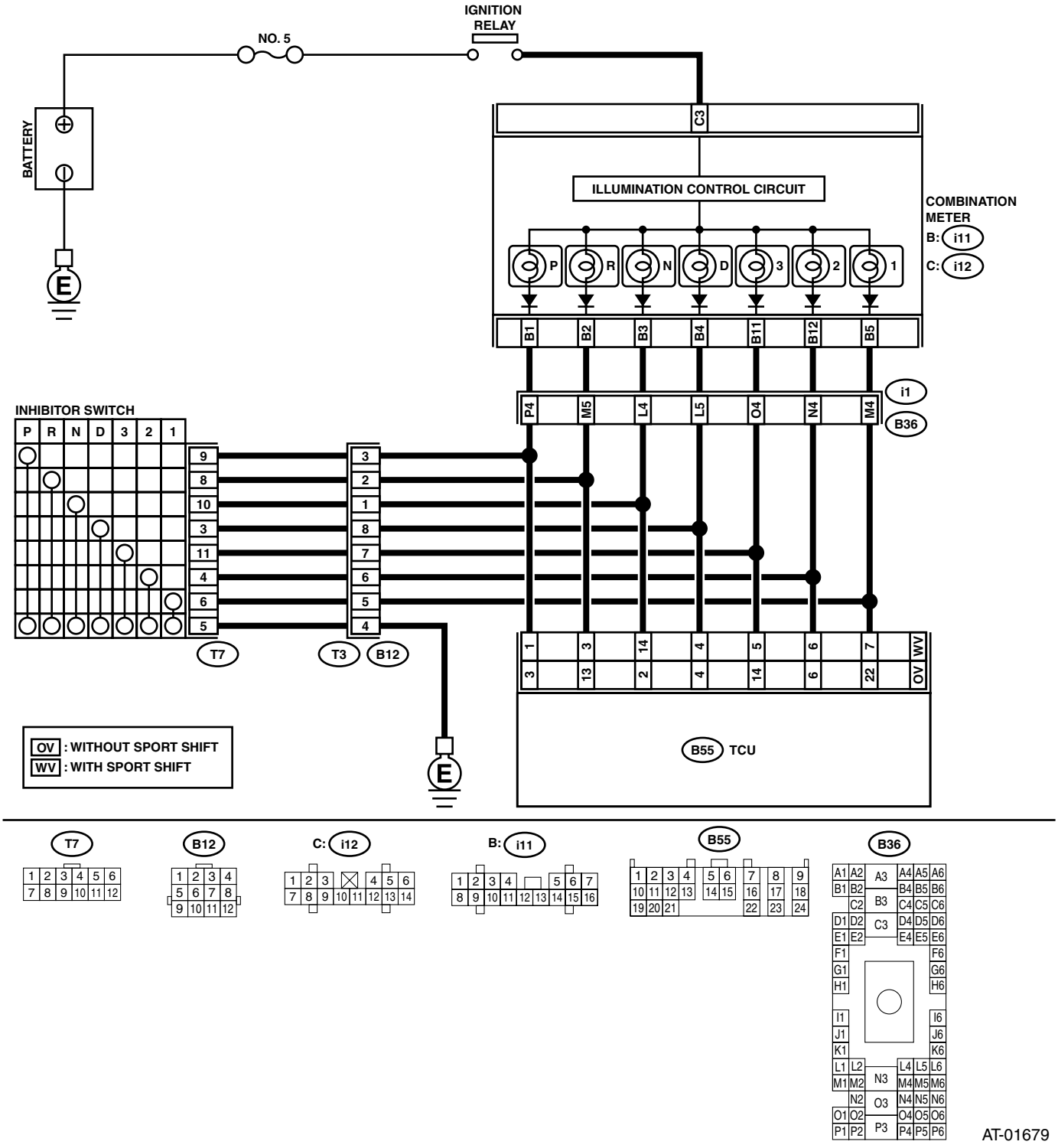
- Except U5 model





AT-00668

- U5 model


IGNITION RELAY
NO. 5
BATTERY
C3
ILLUMINATION CONTROL CIRCUIT
COMBINATION METER
B: i11
C: i12
P R N D 3 2 1
B1 B2 B3 B4 B11 B12 B5
i1
B36
P4 M5 L4 L5 O4 N4 M4
INHIBITOR SWITCH
P R N D 3 2 1
9 8 10 3 11 4 6 5
T7
3 2 1 8 7 6 5 4
T3
B12
1 3 14 4 5 6 7 WV
3 13 2 4 14 6 22 OV
B55 TCU
OV : WITHOUT SPORT SHIFT
WV : WITH SPORT SHIFT
E
T7
B12
C: i12
B: i11
B55
B36
A3 B3 C3 N3 O3 P3
AT-01679

Step		Check	Yes	No
1	**CHECK "P" RANGE SWITCH.**	When the "P" range is selected, does LED light up?	Go to step **2.**	Go to step **22.**
2	**CHECK INDICATOR LIGHT.**	Does the combination meter "P" range indicator illuminate?	Go to step **3.**	Go to step **26.**
3	**CHECK "P" RANGE SWITCH.**	When the "R" range is selected, does "P" range LED light up?	Go to step **28.**	Go to step **4.**
4	**CHECK "R" RANGE SWITCH.**	When the "R" range is selected, does LED light up?	Go to step **5.**	Go to step **29.**
5	**CHECK INDICATOR LIGHT.**	Does the combination meter "R" range indicator illuminate?	Go to step **6.**	Go to step **32.**
6	**CHECK "R" RANGE SWITCH.**	When the "N" range is selected, does "R" range LED light up?	Go to step **34.**	Go to step **7.**
7	**CHECK "N" RANGE SWITCH.**	When the "N" range is selected, does LED light up?	Go to step **8.**	Go to step **35.**
8	**CHECK INDICATOR LIGHT.**	Does the combination meter "N" range indicator illuminate?	Go to step **9.**	Go to step **38.**
9	**CHECK "N" RANGE SWITCH.**	When the "D" range is selected, does "N" range LED light up?	Go to step **40.**	Go to step **10.**
10	**CHECK "D" RANGE SWITCH.**	When the "D" range is selected, does LED light up?	Go to step **11.**	Go to step **41.**
11	**CHECK INDICATOR LIGHT.**	Does the combination meter "D" range indicator illuminate?	Go to step **12.**	Go to step **44.**
12	**CHECK "D" RANGE SWITCH.**	When the "3" range is selected, does "D" range LED light up?	Go to step **46.**	Go to step **13.**
13	**CHECK "3" RANGE SWITCH.**	When the "3" range is selected, does LED light up?	Go to step **14.**	Go to step **47.**
14	**CHECK INDICATOR LIGHT.**	Does the combination meter "3" range indicator illuminate?	Go to step **15.**	Go to step **50.**
15	**CHECK "3" RANGE SWITCH.**	When the "2" range is selected, does "3" range LED light up?	Go to step **52.**	Go to step **16.**
16	**CHECK "2" RANGE SWITCH.**	When the "2" range is selected, does LED light up?	Go to step **17.**	Go to step **53.**
17	**CHECK INDICATOR LIGHT.**	Does the combination meter "2" range indicator illuminate?	Go to step **18.**	Go to step **56.**
18	**CHECK "2" RANGE SWITCH.**	When the "1" range is selected, does "2" range LED light up?	Go to step **58.**	Go to step **19.**
19	**CHECK "1" RANGE SWITCH.**	When the "1" range is selected, does LED light up?	Go to step **20.**	Go to step **59.**
20	**CHECK INDICATOR LIGHT.**	Does the combination meter "1" range indicator illuminate?	Go to step **21.**	Go to step **62.**
21	**CHECK "1" RANGE SWITCH.**	When the "2" range is selected, does "1" range LED light UP?	Go to step **64.**	Go to step Check SPORT SHIFT SWITCH. <Ref. to 4AT(H4SO)-164, CHECK SPORT SHIFT SWITCH., Diagnostic Procedure without Diagnostic Trouble Code (DTC).>

	Step	Check	Yes	No
22	**CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. ***Connector & terminal*** ***(T7) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 23 — (T7) No. 9:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 3 — (T7) No. 9:*** ***With VDC system or SPORT shift*** ***(B55) No. 1 — (T7) No. 9:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “P” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 23 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 3 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **25.**	Go to step **65.**
25	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than “P” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 23 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 3 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

Step		Check	Yes	No
26	**CHECK "P" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "P" range indicator light bulb from combination meter.	Is the "P" range indicator light bulb OK?	Go to step **27.**	Replace the "P" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
27	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 23 — (i12) No. 14:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 3 — (i11) No. 1:*** ***With VDC system or SPORT shift*** ***(B55) No. 1 — (i12) No. 14:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector.
28	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 23 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 3 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 1 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **29.**	Repair the ground short circuit in "P" range circuit.
29	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 17 — (T7) No. 8:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 13 — (T7) No. 8:*** ***With VDC system or SPORT shift*** ***(B55) No. 3 — (T7) No. 8:***	Is the resistance less than 1 Ω?	Go to step **30.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
30	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “R” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 17 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 13 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **31.**	Go to step **65.**
31	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than “R” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 17 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 13 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
32	**CHECK “R” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “R” range indicator light bulb from combination meter.	Is “R” range indicator light bulb OK?	Go to step **33.**	Replace the “R” range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
33	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 17 — (i11) No. 2:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 13 — (i11) No. 2:*** ***With VDC system or SPORT shift*** ***(B55) No. 3 — (i11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.

	Step	Check	Yes	No
34	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 17 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 13 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **35.**	Repair the ground short circuit in "R" range circuit.
35	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 22 — (T7) No. 10:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 2 — (T7) No. 10:*** ***With VDC system or SPORT shift*** ***(B55) No. 14 — (T7) No. 10:***	Is the resistance less than 1 Ω?	Go to step **36.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
36	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "N" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 2 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **37.**	Go to step **65.**
37	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "N" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 2 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
38	**CHECK "N" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "N" range indicator light bulb from combination meter.	Is the "N" range indicator light bulb OK?	Go to step **39.**	Replace the "N" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
39	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 22 — (i12) No. 12:*** ***Without SPORT shift (U5 model)*** ***(B39) No. 2 — (i11) No. 3:*** ***With VDC system or SPORT shift*** ***(B55) No. 14 — (i1) No. 3:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
40	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 22 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 2 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **41.**	Repair the ground short circuit in "N" range circuit.
41	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 8 — (T7) No. 3:*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 4 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **42.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
42	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "D" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **43.**	Go to step **65.**
43	**CHECK INPUT SIGNAL FOR TCM.** 1) Position select lever to any other than "D" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
44	**CHECK "D" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "D" range indicator light bulb from combination meter.	Is the "D" range indicator light bulb OK?	Go to step **45.**	Replace the "D" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
45	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 8 — (i11) No. 4:*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 4 — (i11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and TCM connector.
46	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 8 — Chassis ground:*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **47.**	Repair the ground short circuit in "D" range circuit.

	Step	Check	Yes	No
47	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 18 — (T7) No. 11:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 14 — (T7) No. 11:*** ***With VDC system or SPORT shift*** ***(B55) No. 5 — (T7) No. 11:***	Is the resistance less than 1 Ω?	Go to step **48.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “3” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 18 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 14 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **49.**	Go to step **65.**
49	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than “3” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 18 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 14 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
50	**CHECK “3” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “3” range indicator light bulb from combination meter.	Is the “3” range indicator light bulb OK?	Go to step **51.**	Replace the “3” range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>

	Step	Check	Yes	No
51	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 18 — (i11) No. 11:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 14 — (i11) No. 11:*** ***With VDC system or SPORT shift*** ***(B55) No. 5 — (i11) No. 11:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
52	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B55) No. 18 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 14 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **53.**	Repair the ground short circuit in “3” range circuit.
53	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 10 — (T7) No. 4:*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 6 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **54.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “2” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 10 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **55.**	Go to step **65.**

	Step	Check	Yes	No
55	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "2" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 10 (+) — Chassis ground (–):*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
56	**CHECK "2" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "2" range indicator light bulb from combination meter.	Is the "2" range indicator light bulb OK?	Go to step **57.**	Replace the "2" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
57	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 10 — (i11) No. 12:*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 6 — (i11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
58	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 10 — Chassis ground:*** ***U5 model and with VDC system or SPORT shift*** ***(B55) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **59.**	Repair the ground short circuit in "2" range circuit.

	Step	Check	Yes	No
59	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 1 — (T7) No. 6:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 22 — (T7) No. 6:*** ***With VDC system or SPORT shift*** ***(B55) No. 7 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **60.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “1” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 1 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **61.**	Go to step **65.**
61	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than “1” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 1 (+) — Chassis ground (–):*** ***Without SPORT shift (U5 model)*** ***(B55) No. 22 (+) — Chassis ground (–):*** ***With VDC system or SPORT shift*** ***(B55) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
62	**CHECK “1” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “1” range indicator light bulb from combination meter.	Is the “1” range indicator light bulb OK?	Go to step **63.**	Replace the “1” range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>

	Step	Check	Yes	No
63	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 1 — (i11) No. 5:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 22 — (i11) No. 5:*** ***With VDC system or SPORT shift*** ***(B55) No. 7 — (i11) No. 5:***	Is the resistance less than 1Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, poor contact in TCM connector.
64	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***Without VDC system and SPORT shift (Except U5 model)*** ***(B54) No. 1 — Chassis ground:*** ***Without SPORT shift (U5 model)*** ***(B55) No. 22 — Chassis ground:*** ***With VDC system or SPORT shift*** ***(B55) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **65.**	Repair the ground short circuit in “1” range circuit.
65	**CHECK POOR CONTACT.**	Is there poor contact in inhibitor switch circuit?	Repair the poor contact.	Adjust the inhibitor switch and select cable. <Ref. to 4AT-51, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-31, Select Cable.>

MEMO:

E: CHECK SPORT SHIFT SWITCH.

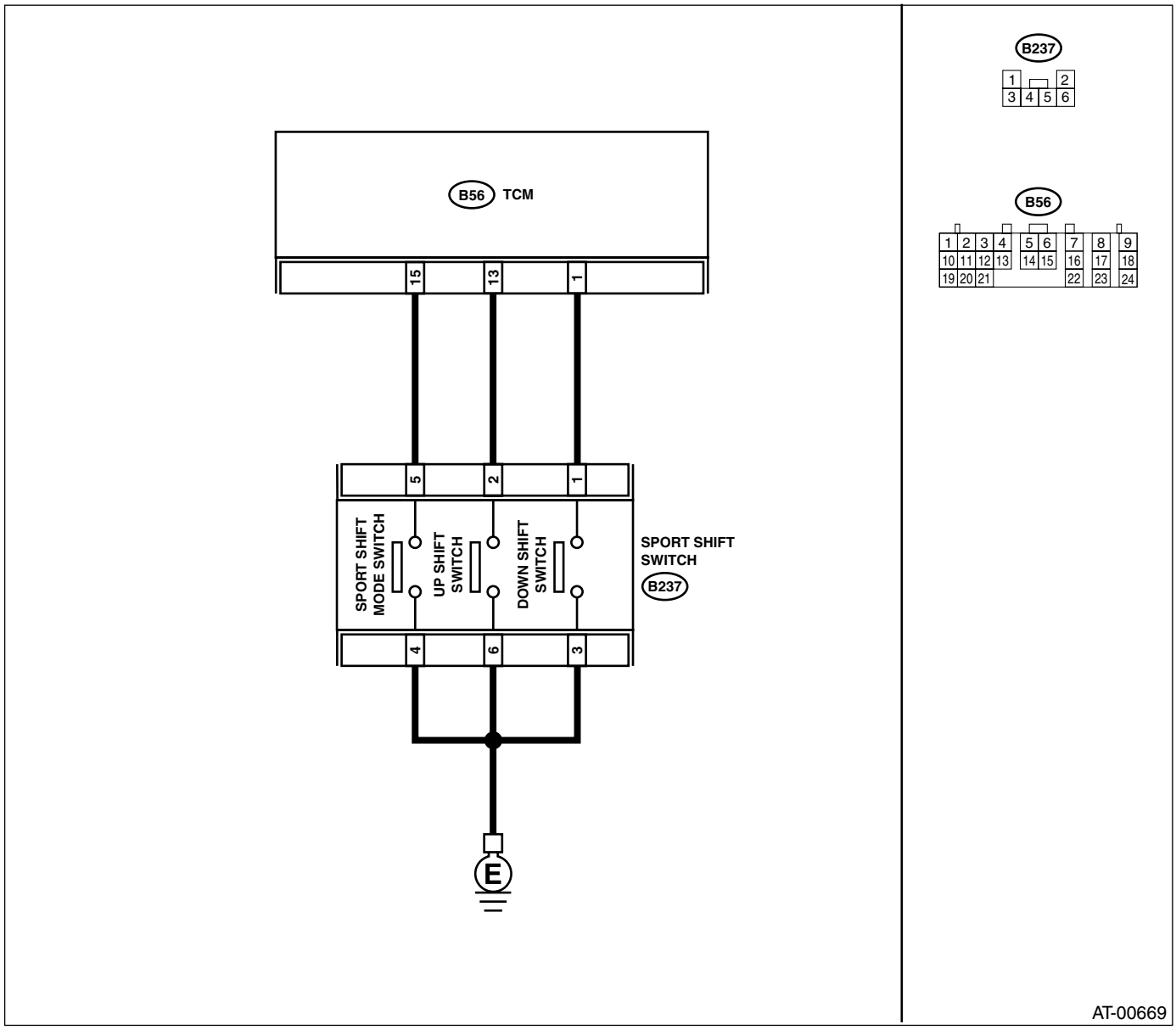
DIAGNOSIS:

SPORT shift switch input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No SPORT shift mode occurs.
- Does not shift gears in SPORT shift mode.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is the target model equipped with SPORT shift?	Go to step **2.**	Go to step SYMPTOM RELATED DIAGNOSTIC. <Ref. to 4AT(H4SO)-174, Symptom Related Diagnostic.>
2	**CHECK SPORT SHIFT SWITCH.**	Does LED light up when select lever is moved to SPORT shift mode?	Go to step **3.**	Go to step **5.**
3	**CHECK SPORT SHIFT SWITCH.**	Does LED light up when select lever is moved to shift up side?	Go to step **4.**	Go to step **12.**
4	**CHECK SPORT SHIFT SWITCH.**	Does LED light up when select lever is moved to shift down side?	Go to step CHECK SPORT SHIFT INDICATOR. <Ref. to 4AT(H4SO)-170, CHECK SPORT SHIFT INDICATOR., Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **19.**
5	**CHECK SPORT SHIFT SWITCH GROUND LINE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from SPORT shift switch. 3) Measure resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 4 —- Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between SPORT shift switch and chassis ground.
6	**CHECK SPORT SHIFT SWITCH.** Measure resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 4 —- No. 5:***	Is the resistance less than 1 MΩ?	Go to step **7.**	Replace lever plate assembly.
7	**CHECK SPORT SHIFT SWITCH.** 1) Move select lever to SPORT shift mode. 2) Measure resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 4 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace lever plate assembly.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B237) No. 5 — (B56) No. 15:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect connector from TCM. 2) Measure resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair short circuit in harness between SPORT shift switch connector and TCM connector.
10	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connector to TCM and SPORT shift switch. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Move select lever to normal mode. 4) Measure signal voltage for TCM. ***Connector & terminal*** ***(B56) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **11.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
11	**CHECK INPUT SIGNAL FOR TCM.** 1) Move select lever to SPORT shift mode. 2) Measure signal voltage for TCM. ***Connector & terminal*** ***(B56) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **26.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
12	**CHECK SPORT SHIFT SWITCH GROUND LINE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from SPORT shift switch. 3) Measure resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 6 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair open circuit in harness between SPORT shift switch and chassis ground.
13	**CHECK SPORT SHIFT SWITCH.** 1) Measure resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 6 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Replace guide plate assembly.
14	**CHECK SPORT SHIFT SWITCH.** 1) Move select lever to SPORT shift mode. 2) Measure resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 6 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **15.**	Replace guide plate assembly.
15	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B237) No. 2 — (B56) No. 13:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
16	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect connector from TCM. 2) Measure resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 2 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **17.**	Repair short circuit in harness between SPORT shift switch connector and TCM connector.

	Step	Check	Yes	No
17	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connector to TCM and SPORT shift switch. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Measure signal voltage for TCM. ***Connector & terminal*** ***(B56) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **18.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
18	**CHECK INPUT SIGNAL FOR TCM.** 1) Move select lever to shift up side. 2) Measure signal voltage for TCM. ***Connector & terminal*** ***(B56) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **26.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
19	**CHECK SPORT SHIFT SWITCH GROUND LINE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from SPORT shift switch. 3) Measure resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **20.**	Repair open circuit in harness between SPORT shift switch and chassis ground.
20	**CHECK SPORT SHIFT SWITCH.** Measure resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 3 — No. 1:***	Is the resistance more than 1 MΩ?	Go to step **21.**	Replace guide plate assembly.
21	**CHECK SPORT SHIFT SWITCH.** 1) Move select lever to SPORT shift mode. 2) Measure resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 3 — No. 1:***	Is the resistance less than 1 Ω?	Go to step **22.**	Replace guide plate assembly.
22	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect connector from TCM. 2) Measure resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B237) No. 1 — (B56) No. 2:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect connector from TCM. 2) Measure resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 1 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **24.**	Repair short circuit in harness between SPORT shift switch connector and TCM connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect connector to TCM and SPORT shift switch. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Measure signal voltage for TCM. ***Connector & terminal*** ***(B56) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **25.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

Step		Check	Yes	No
25	**CHECK INPUT SIGNAL FOR TCM.** 1) Move select lever to shift up side. 2) Measure signal voltage for TCM. ***Connector & terminal*** ***(B56) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **26.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
26	**CHECK POOR CONTACT.** Is there poor contact in SPORT shift switch circuit?	There is poor contact.	Repair poor contact.	Intermittent poor contact in SPORT shift switch circuit connector or harness

MEMO:

F: CHECK SPORT SHIFT INDICATOR.

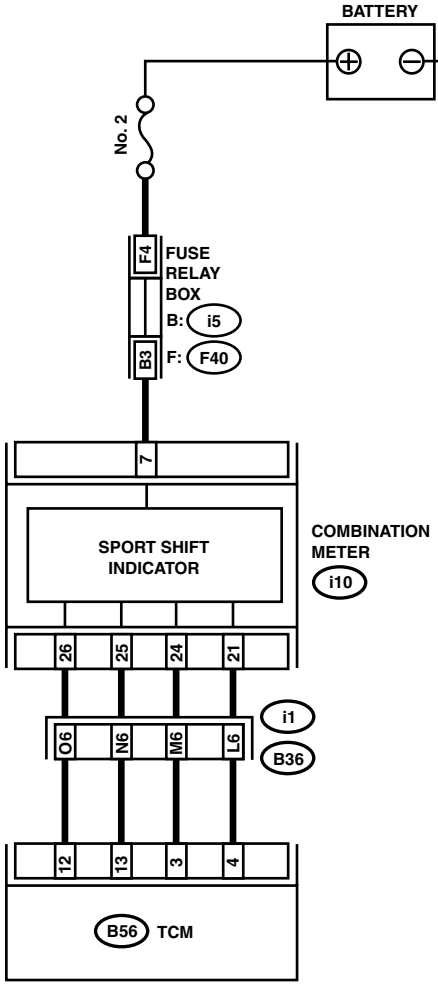
DIAGNOSIS:

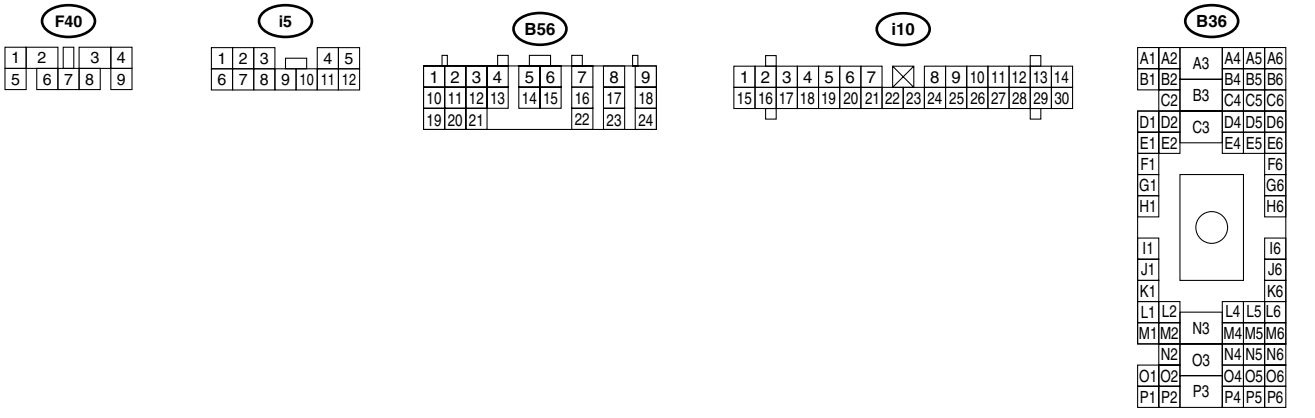
SPORT shift indicator output signal circuit is open or shorted.

TROUBLE SYMPTOM:

- SPORT shift indicator does not illuminate or remains illuminated.
- SPORT shift indicator display does not change.

WIRING DIAGRAM:





AT-01680

	Step	Check	Yes	No
1	**CHECK SPORT SHIFT INDICATOR.**	Does SPORT shift indicator operate normally when driving in SPORT shift mode?	<Ref. to 4AT(H4SO)-172, CHECK BUZZER., Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK COMBINATION METER.**	Do meters and indicators other than SPORT shift indicator operate normally?	Go to step **3.**	Check combination meter.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from TCM and combination meter. 3) Measure resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B56) No. 3 — (i10) No. 24:*** ***(B56) No. 4 — (i10) No. 21:*** ***(B56) No. 12 — (i10) No. 26:*** ***(B56) No. 13 — (i10) No. 25:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and combination meter connector and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure resistance between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 3 — Chassis ground:*** ***(B56) No. 4 — Chassis ground:*** ***(B56) No. 12 — Chassis ground:*** ***(B56) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and combination meter connector.
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect connector to TCM and combination meter. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Measure voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 3 (+) — Chassis ground (–):*** ***(B56) No. 4 (+) — Chassis ground (–):*** ***(B56) No. 12 (+) — Chassis ground (–):*** ***(B56) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **6.**	Replace combination meter.
6	**CHECK POOR CONTACT.** Is there poor contact in SPORT shift indicator circuit?	There is poor contact.	Repair poor contact.	Replace TCM.

G: CHECK BUZZER.

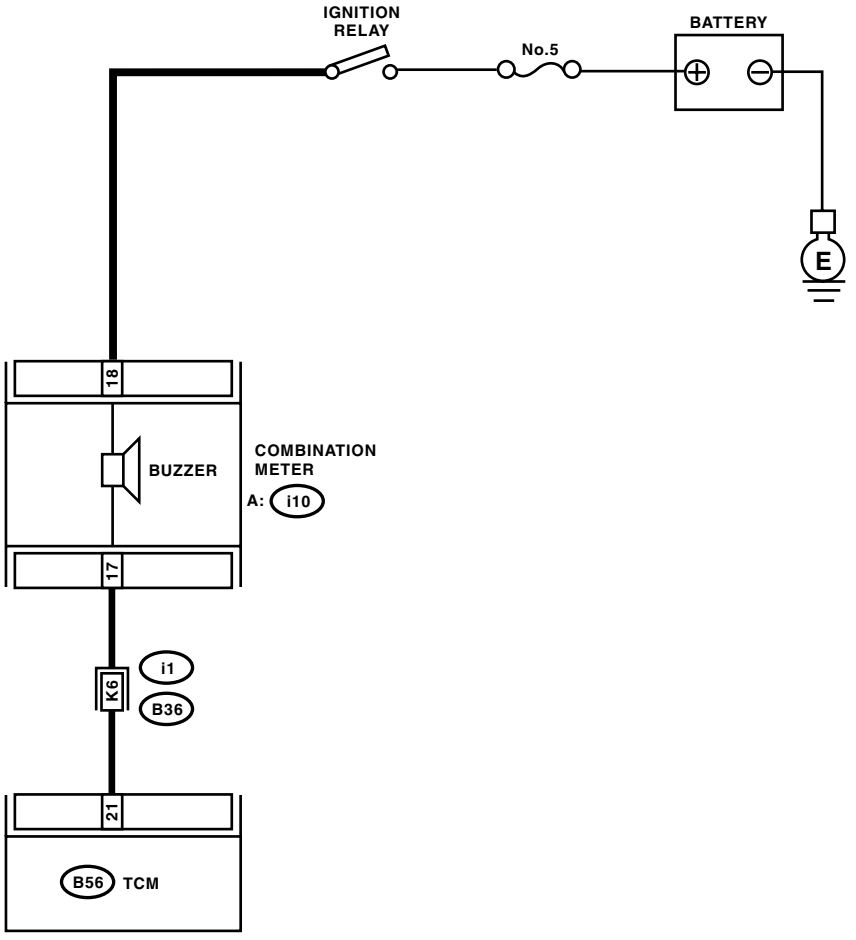
DIAGNOSIS:

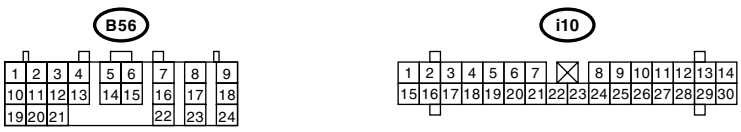
Buzzer output signal circuit is open or shorted.

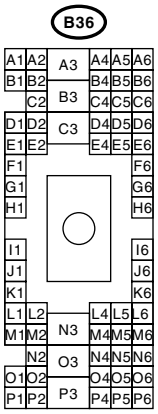
TROUBLE SYMPTOM:

Buzzer remains sounded.

WIRING DIAGRAM:







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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter and TCM. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit in harness between TCM and combination meter connector.
2	**CHECK COMBINATION METER.** 1) Connect the connector to combination meter. 2) Turn the ignition switch to ON. (Engine is stopped.)	Does the buzzer sound?	Replace the combination meter.	Go to step **3.**
3	**CHECK POOR CONTACT.**	Is there poor contact in buzzer circuit?	Repair the poor contact.	Replace the TCM.

16.Symptom Related Diagnostic

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N” range; starter rotates when select lever is in “R”, “D”, “3” or “2” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in “P” or “N” range.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in “N” range.	• TCM • Low clutch
Shock occurs when select lever is moved from “N” to “D” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “D” range.	• Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when select lever is moved from “N” to “R” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	• Parking brake mechanism • Planetary gear

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	• Strainer • Line pressure duty solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket transmission case
Vehicle does not start in “R” range only (engine revving up).	• Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D”, “3” range only (engine revving up).	• Low clutch • One-way clutch
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	• Low clutch
Vehicle does not start in “D”, “3” or “2” range only (engine stalls).	• Reverse clutch
Vehicle starts in “R” range only (engine revving up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• Control valve • Low clutch • Reverse clutch • ATF level too low • Front gasket transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	• TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Shift solenoid 1 • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	• TCM • Control valve • High clutch • Shift solenoid 2

Symptom	Problem parts
No shift occurs from 3rd to 4th gear.	• TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in “3” range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in “3” or “2” range.	• Control valve
Engine brake is not effected when select lever is in “1” range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	• ATF level too high
Differential oil spurts out.	• Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid • High clutch

Symptom	Problem parts
Shock occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • 2-4 brake timing solenoid
Shock occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake timing solenoid • 2-4 brake • ATF deterioration • Engine performance • Low clutch timing solenoid • Low clutch
Slippage occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “3” to “2” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “D” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid

Symptom	Problem parts
Shock occurs when select lever is moved from “2” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Shock occurs when accelerator pedal is released at medium speeds.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns (tight corner “braking” phenomenon).	• TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • FWD switch • Throttle position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	• TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detente spring • Manual plate
Select lever is too high to move (unreasonable resistance).	• Detente spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detente spring • Manual plate

AUTOMATIC TRANSMISSION (DIAGNOSTICS) 4AT(H4SO U5)

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1. General Description

A: NOTE

The diagnostic procedure for U5 models is described in 4AT (H4SO) section.
<Ref. to 4AT(H4SO)-2, Basic Diagnostic Procedure.>

AUTOMATIC TRANSMISSION (DIAGNOSTICS) 4AT(H4DOTC)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to 4AT(H4DOTC)-4, Check List for Interview.> 2) Before performing the diagnosis, inspect following items which might influence the AT problems. •General inspection <Ref. to 4AT(H4DOTC)-5, INSPECTION.> •Oil leak •Check each harness connector to ensure it is connected securely. •Visually check harness for any damage. •Stall speed test <Ref. to 4AT-34, Stall Test.> •Line pressure test <Ref. to 4AT-36, Line Pressure Test.> •Transfer clutch pressure test <Ref. to 4AT-38, Transfer Clutch Pressure Test.> •Time lag test <Ref. to 4AT-35, Time Lag Test.> •Road test <Ref. to 4AT-33, Road Test.> •Inhibitor switch <Ref. to 4AT-51, Inhibitor Switch.>	Is the unit that might influence AT problem normal?	Go to step **2.**	Repair or replace each item.
2	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON.	Does the AT OIL TEMP warning light turn on?	Go to step **4.**	Go to step **3.**
3	**CHECK AT OIL TEMP WARNING LIGHT.** 1) Turn the ignition switch to OFF. 2) Repair the AT OIL TEMP warning light or power supply and ground line circuit. <Ref. to 4AT(H4DOTC)-24, DIAGNOSTIC PROCEDURE FOR “AT OIL TEMP” WARNING LIGHT, .> 3) Turn the ignition switch to ON.	Does the AT OIL TEMP warning light blink?	Go to step **4.**	Go to step **5.**
4	**READ OF DTC.** Calling up the DTC. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(H4DOTC)-30, COMMUNICATION FOR INITIALIZING IMPOSSIBLE.>	Is the DTC displayed?	Go to step **6.** NOTE: Record all DTC.	Go to step **5.**
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostics Procedure without Diagnostic Trouble Code (DTC)”.<Ref. to 4AT(H4DOTC)-120, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using “Symptom Related Diagnostic”. <Ref. to 4AT(H4DOTC)-128, Symptom and Related Malfunction.> 3) Perform the inspection mode. <Ref. to 4AT(H4DOTC)-18, Inspection Mode.> 4) Calling up the DTC.	Is the DTC displayed?	Go to step **6.**	Complete the diagnosis.

	Step	Check	Yes	No
6	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Procedure with DTC”. <Ref. to 4AT(H4DOTC)-33, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For DTC table, refer to “List of DTC”. <Ref. to 4AT(H4DOTC)-21, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. 4) Perform the inspection mode. <Ref. to 4AT(H4DOTC)-18, Inspection Mode.> 5) Calling up the DTC.	Is the DTC displayed?	Inspect using “Diagnostics procedure with Subaru Select Monitor”. <Ref. to 4AT(H4DOTC)-33, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Date of purchase			
Date of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km/h or miles		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT diagnostic indicator light (AT OIL TEMP warning light)	❑ Continuously blinking	❑ Not blinking	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ 3 ❑ 2 ❑ 1 ❑ SPORT shift mode		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH/❑ LH)	❑ While idling ❑ While cruising
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Others ( )		

3. General Description

A: CAUTION

• Supplemental Restraint System "Airbag"

The airbag system wiring harness is routed near the TCM.

CAUTION:

• All airbag system wiring harness and connectors are colored yellow. Do not use an electrical test equipment on these circuit.

• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

• Measurement

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.026 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V or more

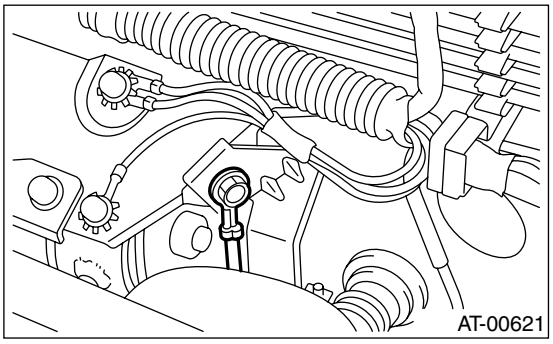
Specific gravity: Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

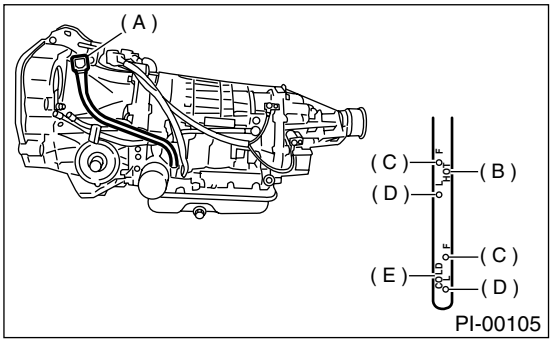
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

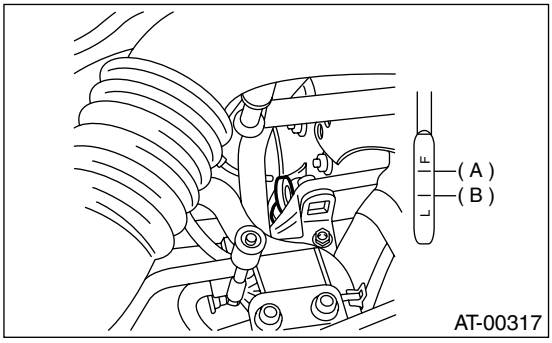
Make sure that ATF level is in the specification. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>



(A) Level gauge
(B) "HOT" side
(C) Upper level
(D) Lower level
(E) "COLD" side

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification. <Ref. to 4AT-32, INSPECTION, Differential Gear Oil.>

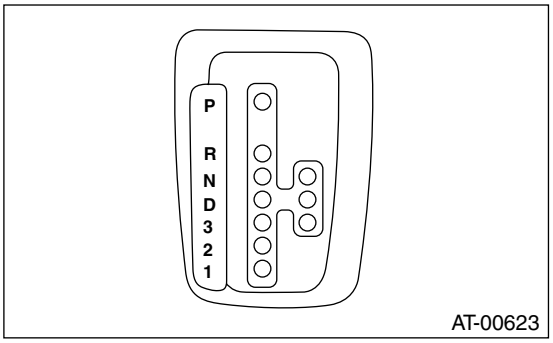


(A) Upper level
(B) Lower level

5. OPERATION OF SELECT LEVER

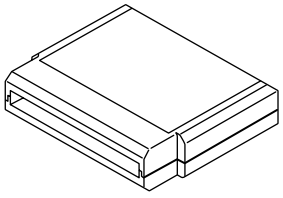
Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of select lever.



C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

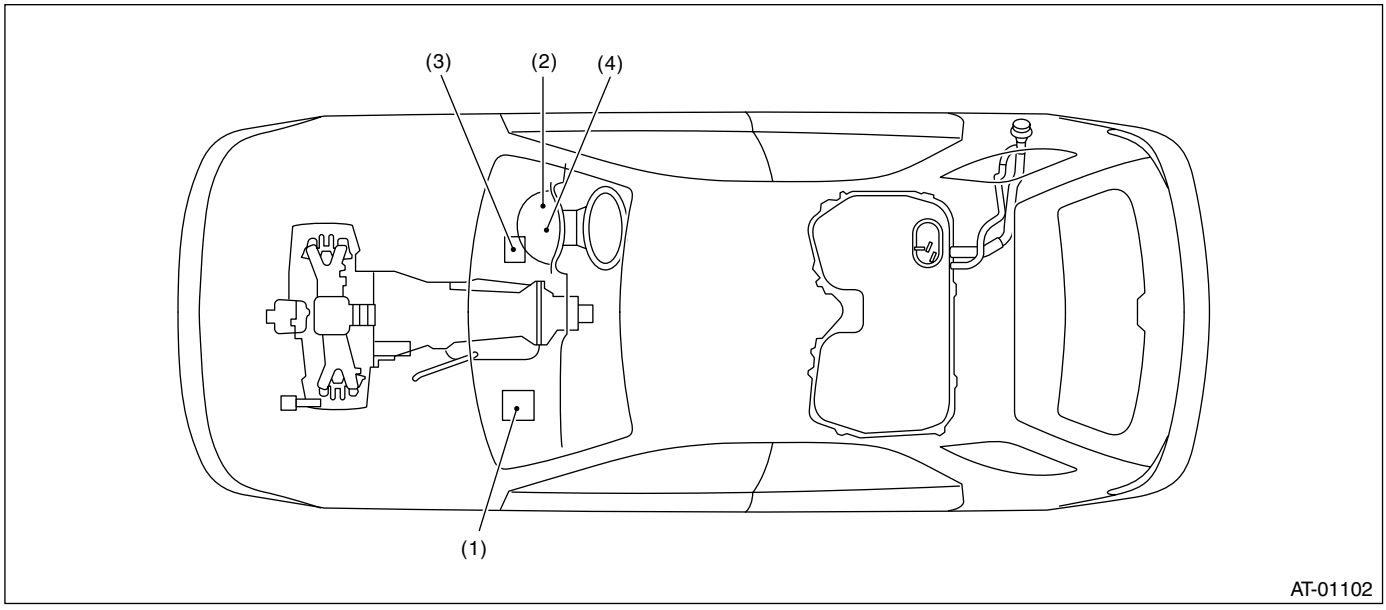
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

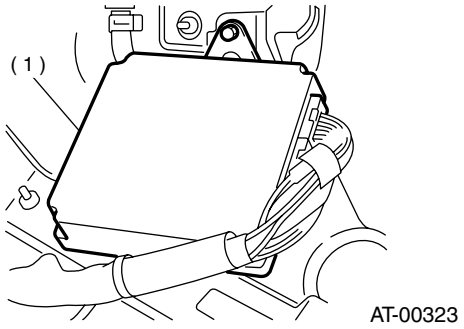
4. Electrical Components Location

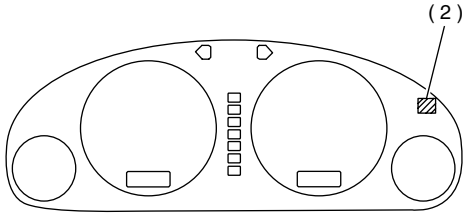
A: LOCATION

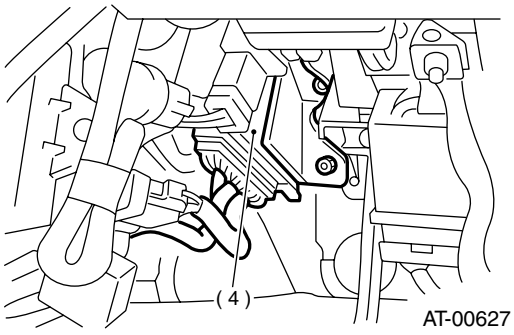
1. CONTROL MODULE

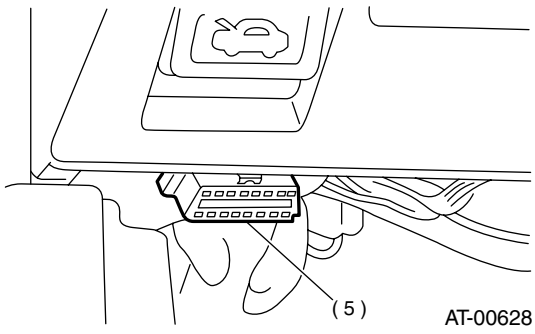


(1) Engine control module (ECM)
(2) AT OIL TEMP warning light (AT diagnostic indicator light)
(3) Transmission control module (TCM)
(4) Data link connector

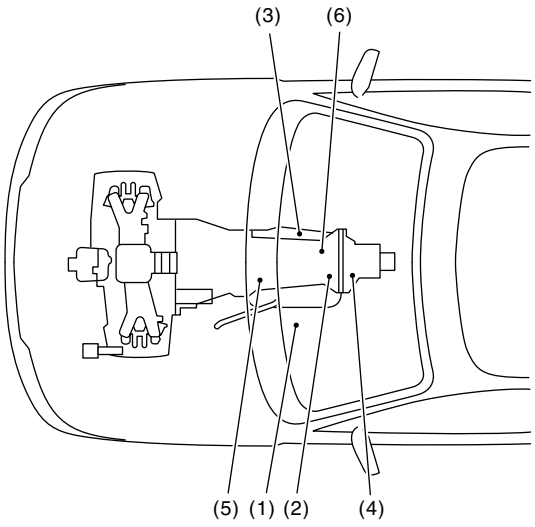






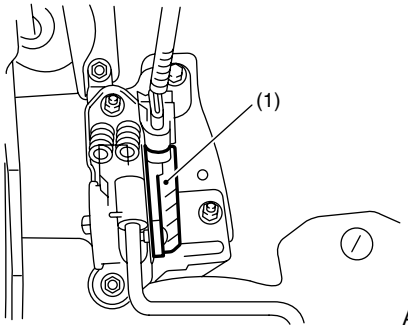


2. SENSOR

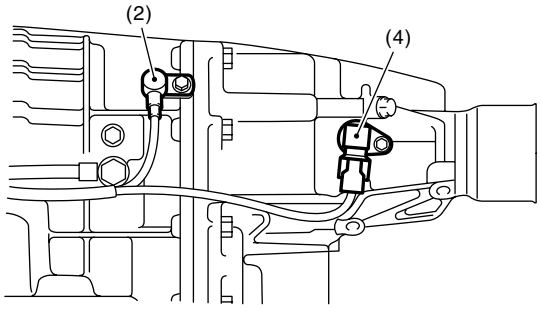


AT-01614

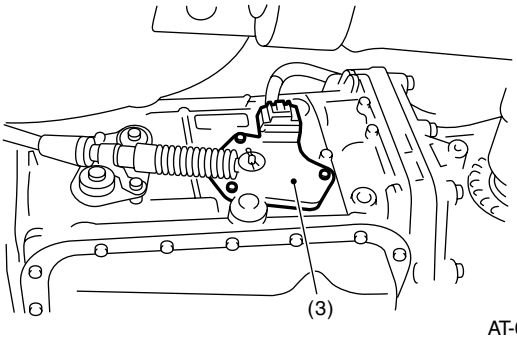
(1) Accelerator pedal position sensor
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Rear vehicle speed sensor
(5) Torque converter turbine speed sensor
(6) ATF temperature sensor



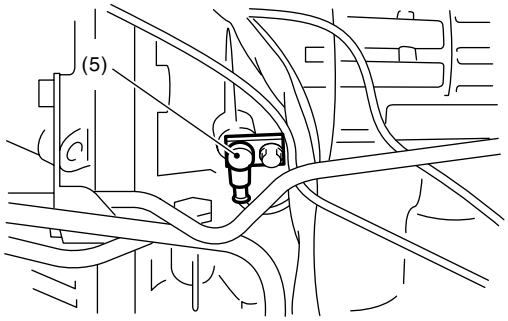
AT-00375



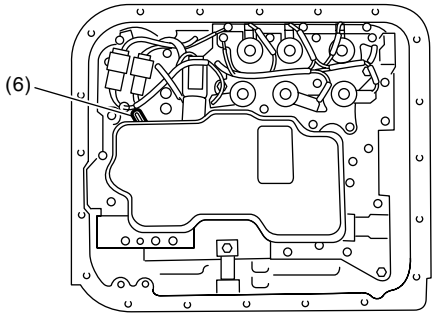
AT-01106



AT-00330

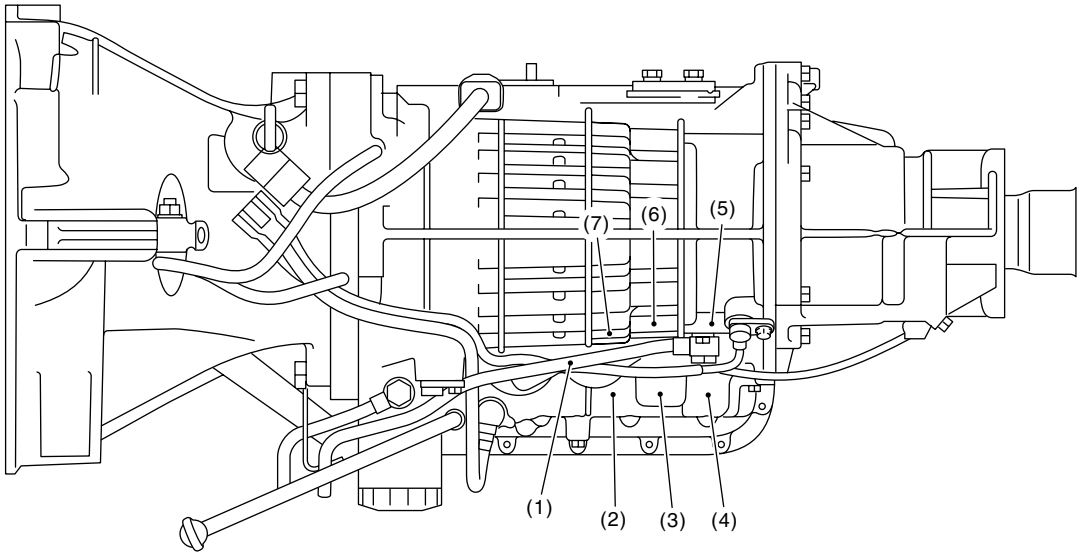


AT-00331

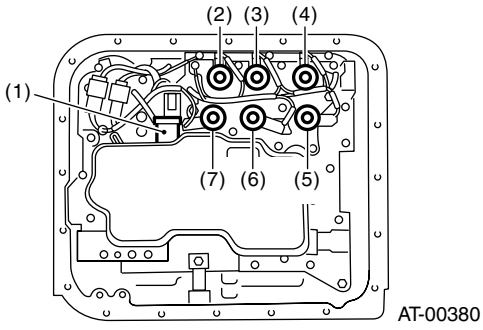


AT-00378

3. SOLENOID

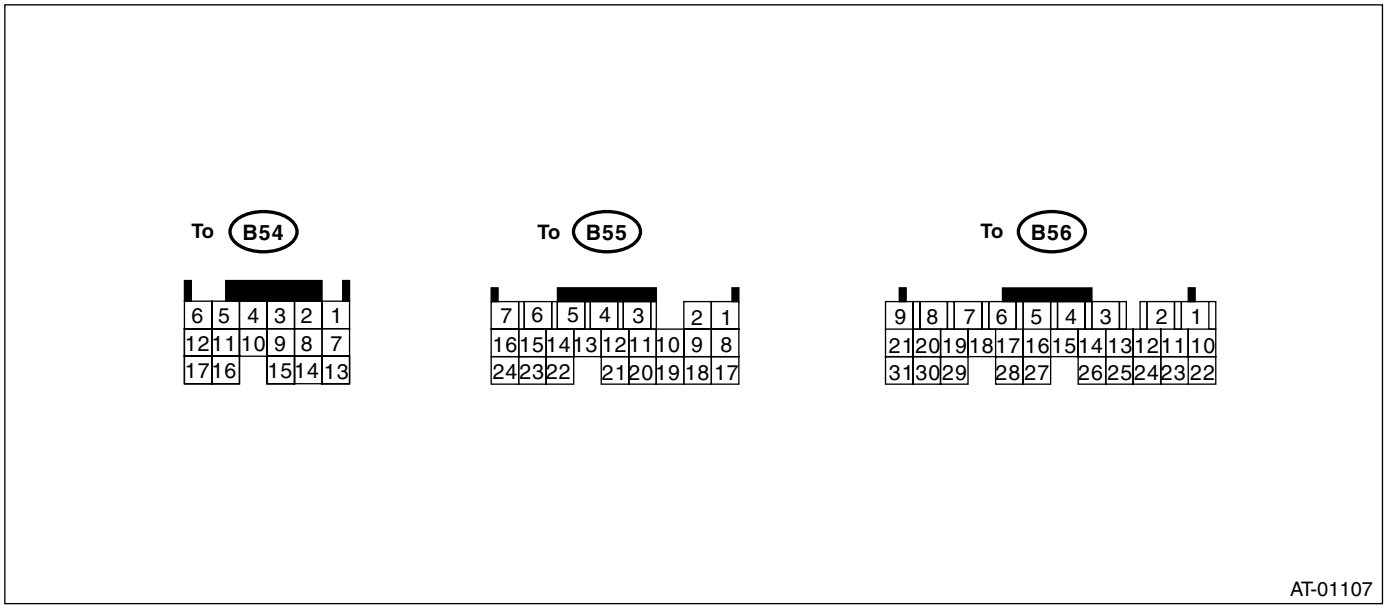


(1) Line pressure linear solenoid
(2) High clutch duty solenoid
(3) 2-4 brake duty solenoid
(4) Low clutch duty solenoid
(5) Transfer duty solenoid
(6) Low & reverse duty solenoid
(7) Lock-up duty solenoid



5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (Ω)
Back-up power supply		B56	27	Ignition switch OFF	10 — 13	—
			28			
			29			
ACC power supply		B56	16	Ignition switch ACC	10 — 13	—
Ignition power supply		B56	21	Ignition switch ON (with engine OFF)	10 — 13	—
		B56	31			
Inhibitor switch	"P" range switch	B55	5	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	22	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range	More than 8	
	"R" range switch	B55	14	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B54	16	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B54	4	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B54	10	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	20	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (Ω)
Throttle position sensor	B55	19	Throttle fully closed.	More than 0.2	—
			Throttle fully open.	Less than 4.6	
Throttle position sensor power supply	B55	10	Ignition switch ON (with engine OFF)	Approx. 5	—
ATF temperature sensor	B55	21	ATF temperature 20°C (68°F)	3.5 — 4.3	3.9 k — 4.7 k
			ATF temperature 80°C (176°F)	1.5 — 1.9	500 — 600
Rear vehicle speed sensor	B55	23	Vehicle speed at least 20 km/h (12 MPH)	More than 2 (AC range)	—
Front vehicle speed sensor	B55	6	Vehicle stopped.	0	450 — 750
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	7	Engine idling after warm-up. (“D” range)	0	450 — 750
			Engine idling after warm-up. (“N” range)	More than 1 (AC range)	
Vehicle speed output signal	B56	1	Vehicle speed at least 10 km/h (6 MPH)	Less than 1← →More than 4	—
Engine speed signal	B55	13	Ignition switch ON (with engine OFF)	Less than 1	—
			Ignition switch ON (with engine ON)	More than 5 (AC range)	
Line pressure linear solenoid	B56	20	Ignition switch ON (with engine OFF) Throttle fully closed after warm-up. (“R” range)	6.1 — 7.5	4.0 — 6.0
			Ignition switch ON (with engine OFF) Throttle fully open after warm-up. (“R” range)	4.6 — 5.6	
Lock-up duty solenoid	B56	5	When lock up occurs.	More than 10.5	2.0 — 4.5
			When lock up is released.	Less than 1	
Transfer duty solenoid	B56	4	“P” or “N” range	Less than 1	2.0 — 4.5
			Throttle fully open and with select lever in 1st gear.	More than 10.5	
2-4 brake duty solenoid	B56	6	“P” or “N” range	More than 10.5	2.0 — 4.5
			2nd or 4th gear	Less than 1	
High clutch duty solenoid	B56	8	3rd or 4th gear	Less than 1	2.0 — 4.5
			“P” or “N” range	More than 10.5	
Low clutch duty solenoid	B56	9	1st or 2nd gear	Less than 1	2.0 — 4.5
			“P” or “N” range	More than 10.5	
Low & reverse duty solenoid	B56	7	“P” or “N” range	More than 10.5	2.0 — 4.5
			“1” range	More than 5	
AT OIL TEMP warning light	B56	13	Light ON	Less than 1	—
			Light OFF	More than 9	
ABS signal	B54	12	ABS switch ON	Less than 1	—
			ABS switch OFF	6.5 — 15	
Front vehicle speed sensor ground	B55	15	—	0	Less than 1
Rear vehicle speed sensor ground	B55	24	—	0	Less than 1

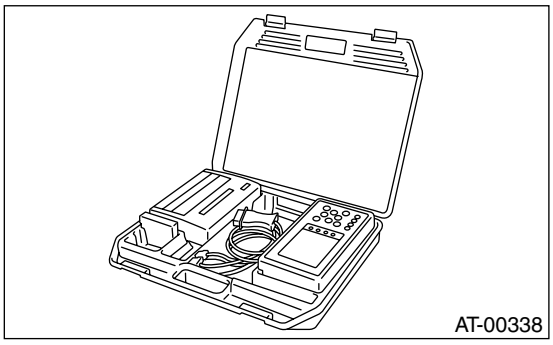
Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (Ω)
Torque converter turbine speed sensor ground	B55	16	—	0	Less than 1
System ground line	B55	17	—	0	Less than 1
	B56	2			
	B56	3			
	B55	8			
Sensor ground line	B55	9	—	0	Less than 1
	B55	16	—	0	Less than 1
Range lock signal	B56	18	"D" range 0 km/h (0 mile)	More than 10.5	20 — 40
			"D" range 20 km/h (12 mile/h)	Less than 1	
Data link signal (Subaru Select Monitor)	B56	12	—	—	—
SPORT shift mode switch	B54	3	SPORT shift mode switch ON	Less than 1	—
			SPORT shift mode switch OFF	More than 8	
Shift up switch	B54	9	Shift up switch ON	Less than 1	—
			Shift up switch OFF	More than 8	
Shift down switch	B54	15	Shift down switch ON	Less than 1	—
			Shift down switch OFF	More than 8	
Buzzer	B56	24	ON	Less than 1	—
			OFF	More than 8	
SPORT shift indicator 4	B54	7	SPORT shift mode OFF	More than 4	—
			Shift down indicator ON	Less than 1	
SPORT shift indicator 3	B54	5	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 4th gear	Less than 1	
SPORT shift indicator 2	B54	17	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 2nd and 3rd gear	Less than 1	
SPORT shift indicator 1	B54	6	SPORT shift mode OFF	More than 4	—
			SPORT shift mode with 1st and 3rd gear	Less than 1	

6. Subaru Select Monitor

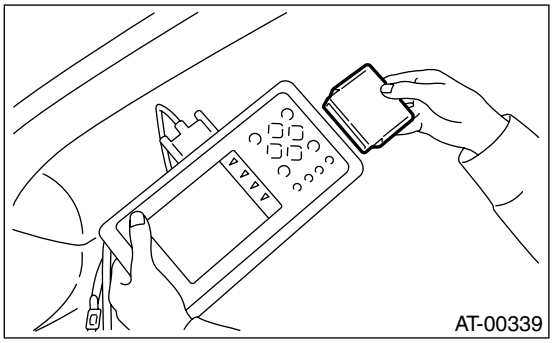
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare the Subaru Select Monitor kit.

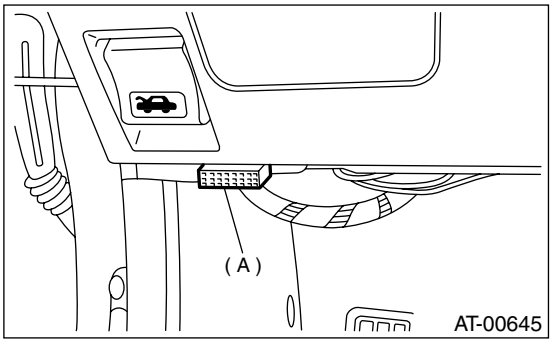


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to 4AT(H4DOTC)-6, PREPARATION TOOL.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on driver's side).

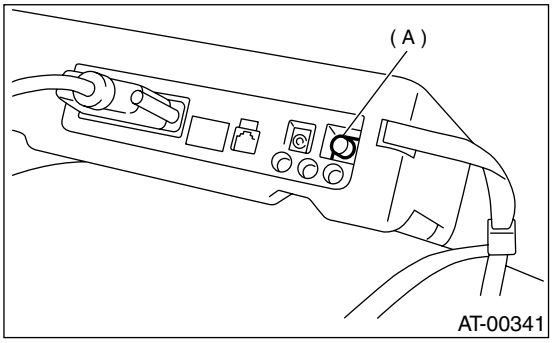


(A) Data link connector

(2) Connect the diagnosis cable to data link connector.

NOTE:
Do not connect scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) POWER switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
8) Press the [YES] key after the information of transmission type is displayed.
9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning the DTC, refer to the DTC LIST. <Ref. to 4AT(H4DOTC)-21, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Transmission Diagnosis» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
ATF temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Throttle opening angle	Throttle Opening Angle	%
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Power Supply	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Low clutch duty ratio	L/C Duty	%
High clutch duty ratio	H/C Duty	%
Low & reverse brake duty ratio	L&R/B Duty	%
Stop light switch signal	Stop Light Switch	ON or OFF
ABS signal	ABS Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
AT diagnosis indicator lamp	Diagnosis Lamp	ON or OFF
Shift up signal	Up Switch	ON or OFF
Shift down signal	Down Switch	ON or OFF
Tip signal	Tip Mode Switch	ON or OFF
Shift lock solenoid signal	Shift Lock solenoid	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.

NOTE:
DTC and memory of self-learning control are cleared if {Clear Memory 2} is selected. If it is selected, perform the promotion work of self learning control.

(1) Set select lever to “P” range and apply parking brake, then lift up the vehicle.
(2) Connect Subaru Select Monitor to vehicle and turn on the switch.
(3) Select “Clear Memory - 2” on the SUBARU Select Monitor.
<Ref. to 4AT(H4DOTC)-16, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>
(4) Using Subaru Select Monitor, check that the DTC is not output.
<Ref. to 4AT(H4DOTC)-14, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>
(5) Using Subaru Select Monitor, warm up the engine until the ATF temperature becomes within 60 - 90°C (140 - 194 °F).
<Ref. to 4AT(H4DOTC)-15, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
(6) Set the switches for headlights, air conditioner, rear defogger, etc. to OFF.
(7) Turn the ignition switch OFF and then wait for more than 30 seconds.
(8) Push shift lock select button, and shift the select lever to the “R” range.
(9) If the message “communication impossible” is displayed on SUBARU Select Monitor, depress the brake pedal deeply with left foot until the learning promotion task is completed, and then turn the ignition switch to ON.
(10)Check that SUBARU Select Monitor is operating properly now.
(11)Set the select lever to “P” range, and then wait for more than three seconds.
(12)Set the select lever to “R” range, and then wait for more than three seconds.
(13)Set the select lever to “N” range, and then wait for more than three seconds.
(14)Set the select lever to “D” range, and then wait for more than three seconds.
(15)Set the select lever to “N” range, and then wait for more than three seconds.
(16)Slowly depress the accelerator pedal to the fully open position.
(17)Slowly release the accelerator pedal to until it reaches to the fully closed position.
(18)Start and idle the engine.
(19)Set the select lever to “D” range.
(20)Learning promotion task starts. AT OIL TEMP warning light in the combination meter blinks at 2 Hz. If ATF temperature does not blink, turn the ignition switch OFF and repeat the procedure from step 4).
Learning promotion task is completed when blinking of AT OIL TEMP warning light in the combination meter changes from 2 Hz to 0.5 Hz.

NOTE:
Repeat the procedure from step 4) if blinking of AFT temperature warning light changes from 2 Hz to 4 Hz.

(21)Set the select lever to “N” range, and turn the ignition switch to OFF.

5) When the “Done” is shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

Refer to Subaru Select Monitor for information about how to obtain and understand DTC. <Ref. to 4AT(H4DOTC)-14, OPERATION.>

NOTE:
DTC can not be read through AT OIL TEMP warning light.

8. Inspection Mode

A: OPERATION

WARNING:
Observe the road traffic law.

1) Move the select lever to “D” range, and then drive the vehicle at 60 km/h (37 MPH) for at least 10 seconds.
2) Drive vehicle in SPORT shift mode.

9. Clear Memory Mode

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Current diagnostic trouble codes (DTC) shown on display are cleared by turning the ignition switch to OFF after conducting on-board diagnostics operation. Previous diagnostic trouble codes (DTC), however, cannot be cleared since they are stored in the TCM memory which is operating on back-up power supply. These diagnostic trouble codes (DTC) can be cleared by removing the TCM connector for at least two minutes.

CLEAR MEMORY:

Removal of TCM connector (B56) (for at least two minutes)

- The TCM connector (B56) is located in the line to memory back-up power supply of TCM. Removal of this connector clears the previous diagnostic trouble codes (DTC) stored in TCM memory.
- Be sure to remove the TCM connector (B56) for at least the specified length of time. Otherwise, the diagnostic trouble codes (DTC) may not be cleared.

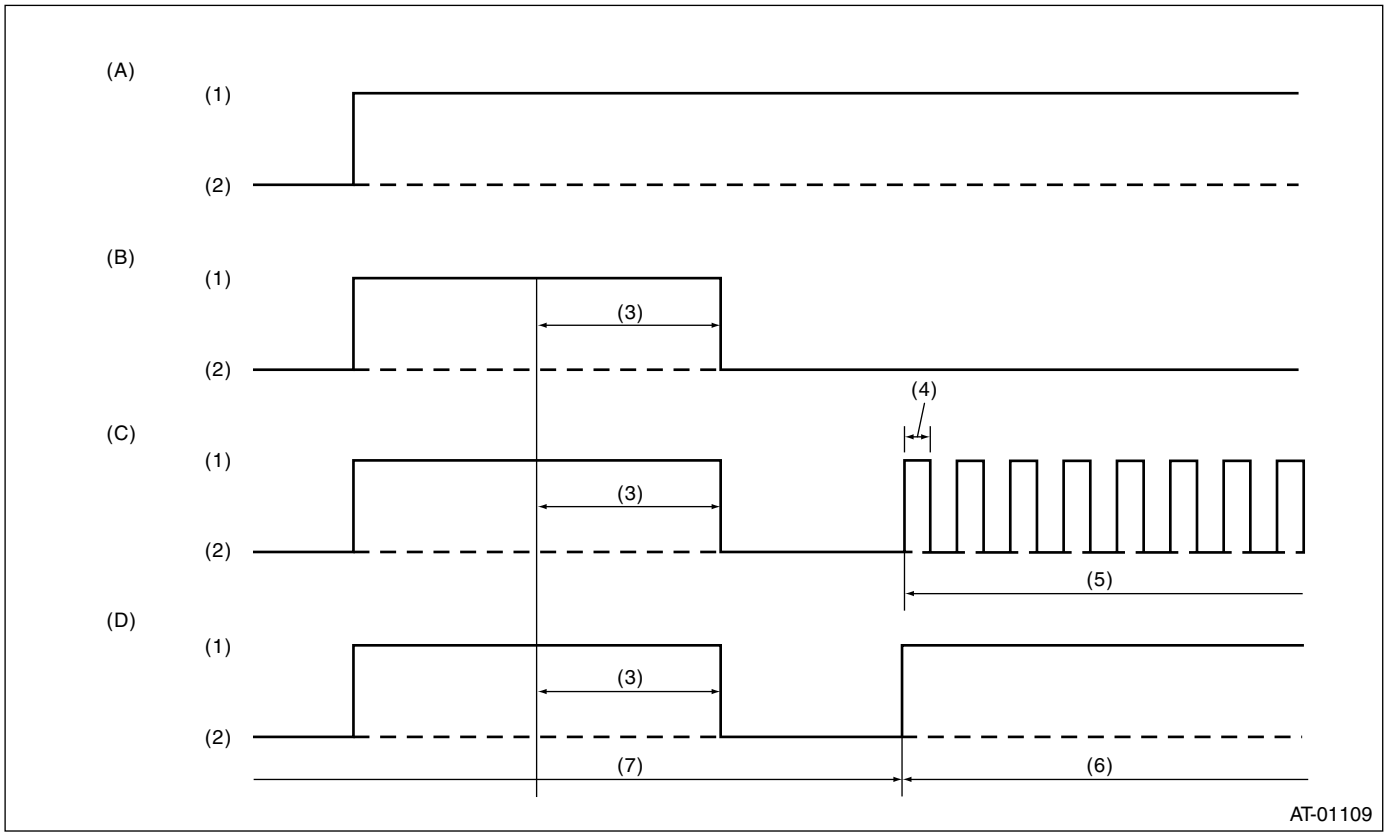
2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to clear DTC.
<Ref. to 4AT(H4DOTC)-16, CLEAR MEMORY MODE.>

10.“AT OIL TEMP” Warning Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on AT OIL TEMP warning light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the AT OIL TEMP warning light does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The AT OIL TEMP warning light signal is as shown in the figure.



(A) Ignition switch (engine OFF)
(B) Normal (engine ON)
(C) Faulty (engine ON)
(D) Normal (POWER switch ON)

(1) ON
(2) OFF
(3) 2 sec.
(4) 0.25 sec.
(5) Blink
(6) ATF temperature (High)
(7) ATF temperature (Low)

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Diagnosis content	Reference
P0705	Transmission Range Sensor Circuit (PRNDL Input)	Inhibitor switch malfunction, open or short circuit	<Ref. to 4AT(H4DOTC)-33, DTC P0705 — TRANSMISSION RANGE SENSOR —.>
P0712	Transmission Fluid Temperature Sensor Circuit Low Input	ATF temperature sensor malfunction, open input signal circuit	<Ref. to 4AT(H4DOTC)-44, DTC P0712 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT —.>
P0713	Transmission Fluid Temperature Sensor Circuit High Input	ATF temperature sensor malfunction, open input signal circuit	<Ref. to 4AT(H4DOTC)-48, DTC P0713 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT —.>
P0715	Input/Turbine Speed Sensor Circuit	Torque converter turbine speed sensor malfunction, open or short input signal circuit	<Ref. to 4AT(H4DOTC)-52, DTC P0715 — INPUT/TURBINE SPEED SENSOR CIRCUIT —.>
P0719	Torque Converter/Brake Switch “B” Circuit Low	Brake switch malfunction, open input signal circuit	<Ref. to 4AT(H4DOTC)-56, DTC P0719 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT LOW —.>
P0720	AT Vehicle Speed Sensor Circuit	Front vehicle speed sensor malfunction, open or short input signal circuit	<Ref. to 4AT(H4DOTC)-58, DTC P0720 — AT VEHICLE SPEED SENSOR CIRCUIT —.>
P0724	Torque Converter/Brake Switch “B” Circuit High	Brake switch malfunction, short input signal circuit	<Ref. to 4AT(H4DOTC)-62, DTC P0724 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT HIGH —.>
P0725	Engine Speed Input Circuit	Open or short engine speed output signal circuit	<Ref. to 4AT(H4DOTC)-64, DTC P0725 — ENGINE SPEED INPUT CIRCUIT —.>
P0731	Gear 1 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(H4DOTC)-66, DTC P0731 — GEAR 1 INCORRECT RATIO —.>
P0732	Gear 2 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(H4DOTC)-66, DTC P0732 — GEAR 2 INCORRECT RATIO —.>
P0733	Gear 3 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(H4DOTC)-66, DTC P0733 — GEAR 3 INCORRECT RATIO —.>
P0734	Gear 4 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(H4DOTC)-66, DTC P0734 — GEAR 4 INCORRECT RATIO —.>
P0736	Reverse Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(H4DOTC)-67, DTC P0736 — REVERSE INCORRECT RATIO —.>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	Lock up clutch malfunction or locking of valve	<Ref. to 4AT(H4DOTC)-69, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —.>
P0743	Torque Converter Clutch Circuit Electrical	Lock up solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-70, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —.>
P0748	Pressure Control Solenoid “A” Electrical	Line pressure linear solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-74, DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —.>
P0753	Shift Solenoid “A” Electrical	Low clutch duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-78, DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —.>

DTC	Item	Diagnosis content	Reference
P0758	Shift Solenoid “B” Electrical	2-4 brake duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-82, DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —.>
P0763	Shift Solenoid “C” Electrical	High clutch duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-86, DTC P0763 — SHIFT SOLENOID “C” ELECTRICAL —.>
P0768	Shift Solenoid “D” Electrical	Low & reverse clutch duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-90, DTC P0768 — SHIFT SOLENOID “D” ELECTRICAL —.>
P0801	Reverse Inhibitor Control Circuit	Shift lock solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-94, DTC P0801 — REVERSE INHIBITOR CONTROL CIRCUIT —.>
P1706	AT Vehicle Speed Sensor Circuit Malfunction (rear wheel)	Rear vehicle speed sensor malfunction, open or short input signal circuit	<Ref. to 4AT(H4DOTC)-96, DTC P1706 — AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL) —.>
P1707	AT AWD Solenoid Valve Circuit Malfunction	Transfer duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(H4DOTC)-100, DTC P1707 — AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION —.>
P1708	Throttle Position Sensor Circuit Low Input	Accelerator pedal position sensor malfunction, open input signal circuit	<Ref. to 4AT(H4DOTC)-104, DTC P1708 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —.>
P1709	Throttle Position Sensor Circuit High Input	Accelerator pedal position sensor malfunction, open input signal circuit	<Ref. to 4AT(H4DOTC)-108, DTC P1709 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —.>
P1714	Throttle Position Sensor Power Supply Circuit	Accelerator pedal position sensor malfunction, open or short input signal circuit	<Ref. to 4AT(H4DOTC)-112, DTC P1714 — THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT —.>
P1718	CAN Communication Circuit Malfunction	Open or short CAN communication signal circuit	<Ref. to 4AT(H4DOTC)-114, DTC P1718 — CAN COMMUNICATION CIRCUIT MALFUNCTION —.>
P1817	SPORT Mode Switch Circuit (Manual Switch)	Sport shift mode switch malfunction, open or short input signal circuit	<Ref. to 4AT(H4DOTC)-116, DTC P1817 — SPORT MODE SWITCH CIRCUIT (MANUAL SWITCH) —.>

MEMO:

12.Diagnostic Procedure for “AT OIL TEMP” Warning Light

A: AT OIL TEMP WARNING LIGHT DOES NOT COME ON OR GO OFF

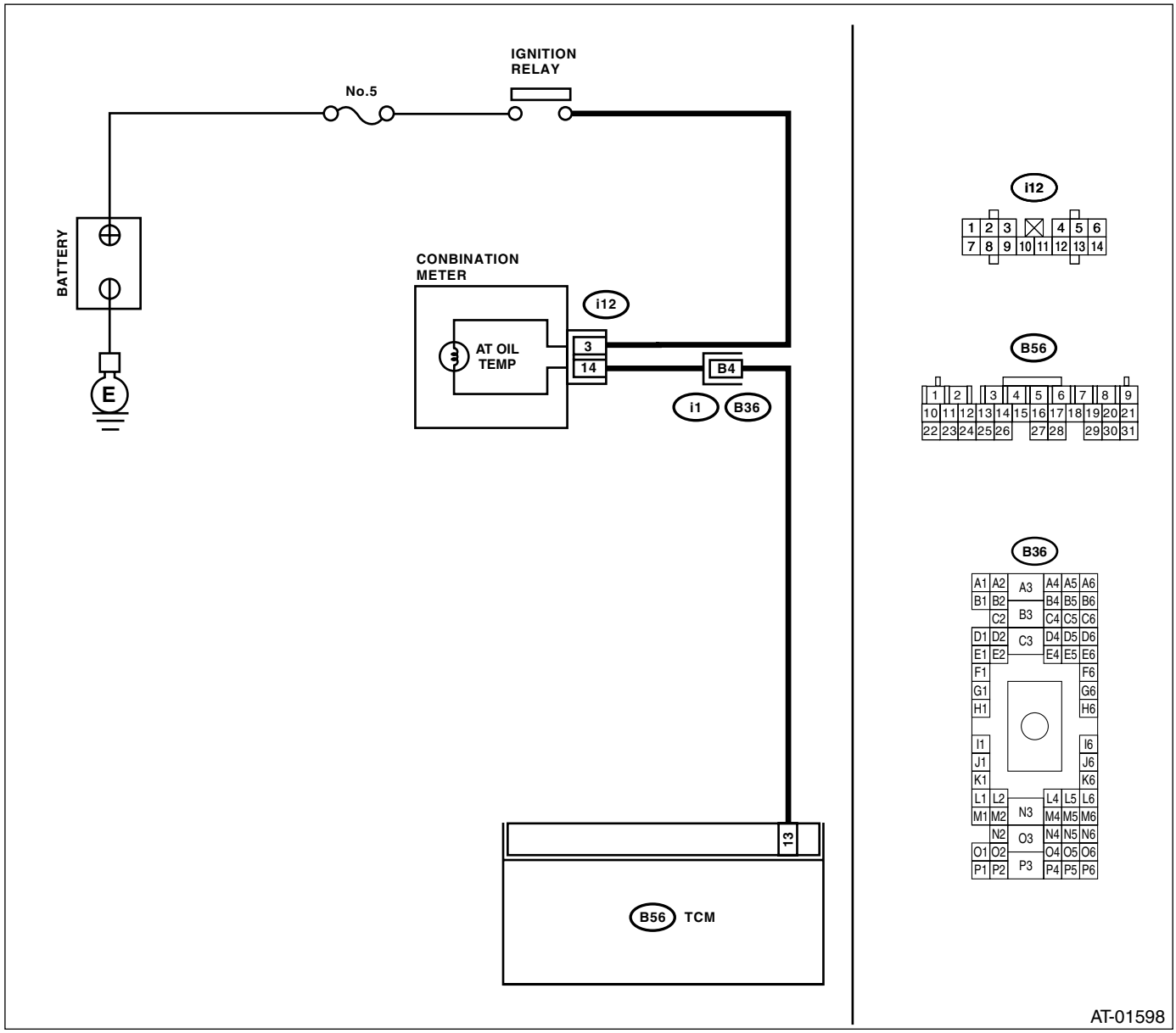
DIAGNOSIS:

AT OIL TEMP warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), AT OIL TEMP warning light does not turn on.

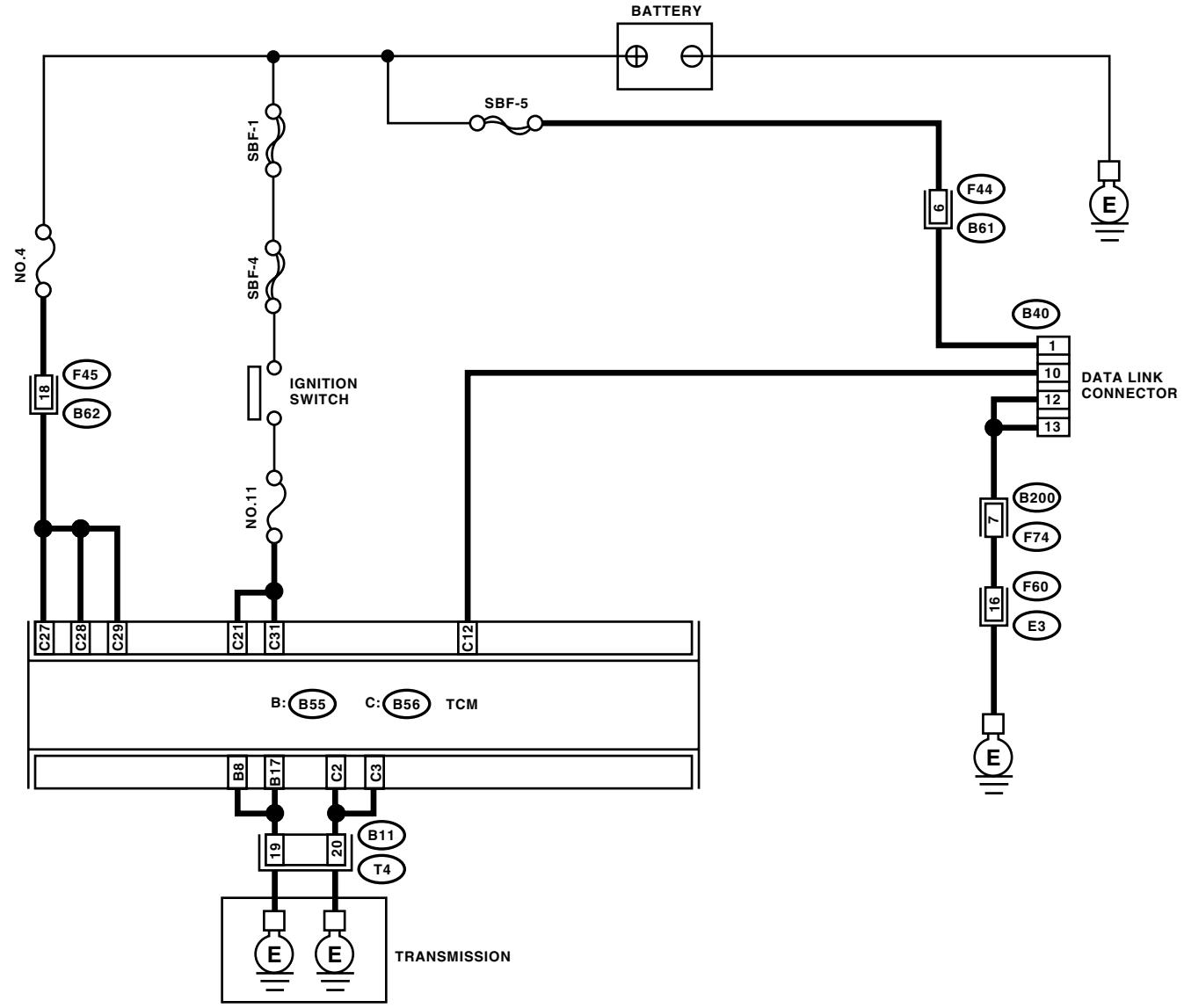
WIRING DIAGRAM:

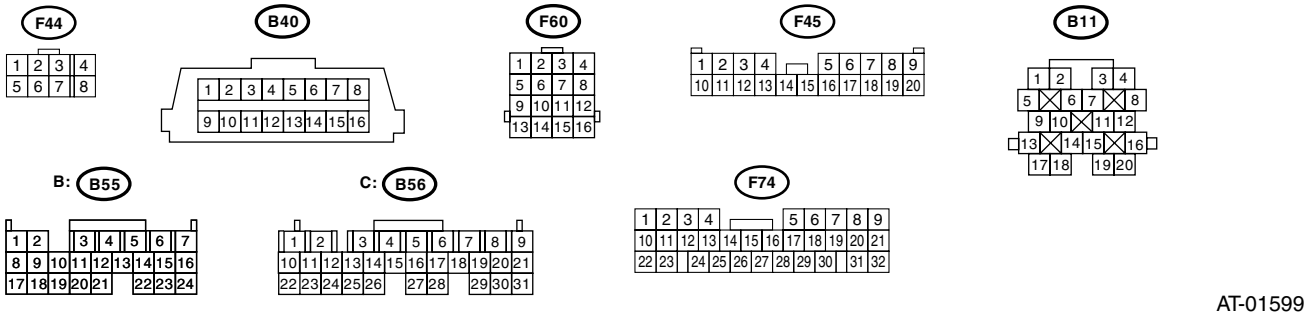


	Step	Check	Yes	No
1	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON (engine OFF).	Does the AT OIL TEMP warning light turn on?	Go to step **3.**	Go to step **2.**
2	**CHECK AT OIL TEMP WARNING LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the AT OIL TEMP warning light bulb from combination meter.	Is the AT OIL TEMP warning light bulb OK?	Go to step **4.**	Replace the AT OIL TEMP warning light bulb.
3	**CHECK FUSE (No. 5).** Remove the fuse (No. 5).	Is the fuse (No. 5) blown out?	Replace the fuse (No. 5). If replaced fuse (No. 5) is blown out easily, repair short circuit in harness between fuse (No. 5) and combination meter.	Go to step **4.**
4	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Repair the open circuit in harness between combination meter and battery.
5	**CHECK COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 9 V?	Repair the combination meter. <Ref. to IDI-13, Combination Meter Assembly.>	Go to step **6.**
6	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter connector. 3) Measure the resistance of harness between combination meter. ***Connector & terminal*** ***(B56) No. 13 — (i12) No. 14:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and combination meter. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
8	**INSPECT AT OIL TEMP WARNING LIGHT.**	Does the AT OIL TEMP warning light turn on?	Diagnose according to basic diagnostic procedure.	Inspect power supply and ground line.

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact in battery terminal?	Repair or tighten the battery terminal.	Go to step **2.**
2	**CHECK POWER SUPPLY OF TCM.** 1) Disconnect the connector from TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 27 (+) — Chassis ground (–):*** ***(B56) No. 28 (+) — Chassis ground (–):*** ***(B56) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FUSE (NO. 4).** 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 21 (+) — Chassis ground (–):*** ***(B56) No. 31 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (NO. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 11) and TCM, or fuse (No. 11) and battery, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 8 — (B11) No. 19:*** ***(B55) No. 17 — (B11) No. 19:*** ***(B56) No. 2 — (B11) No. 20:*** ***(B56) No. 3 — (B11) No. 20:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 19 — Transmission ground:*** ***(T4) No. 20 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between transmission and transmission ground.

Step	Check	Yes	No
8 **CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

13.Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

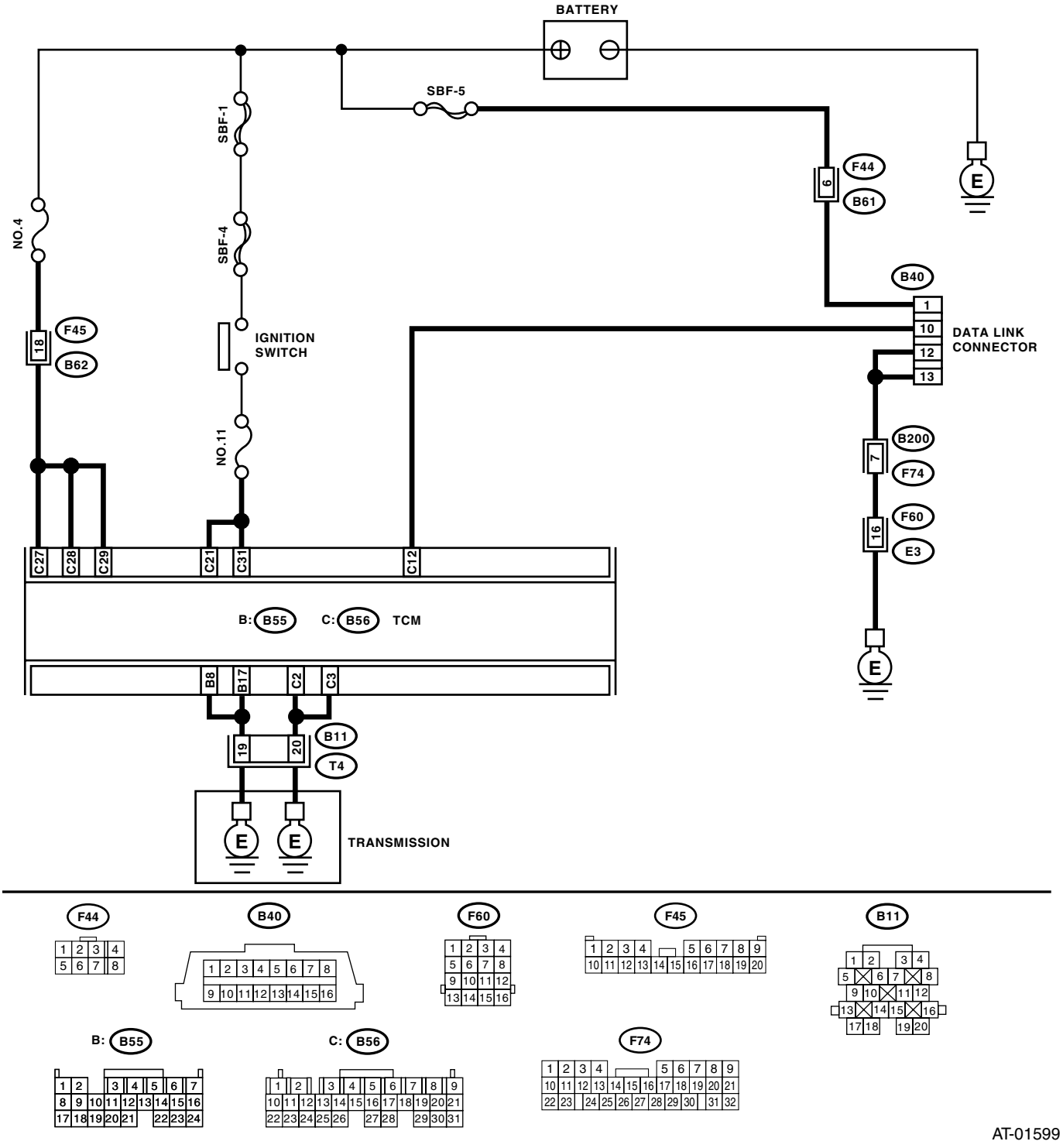
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- Subaru Select Monitor communication failure

WIRING DIAGRAM:



AT-01599

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 12 — Chassis ground:*** ***(B40) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to transmission systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **4.**
4	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **6.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ECM connector. 4) Check whether communication to transmission systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Inspect the ECM.	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and ECM connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step **8.**
8	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***(B56) No. 12 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between TCM and data link connector.
9	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is the TCM connector inserted into TCM?	Go to step **10.**	Insert the TCM connector into TCM.

Step		Check	Yes	No
10	**INSPECTION OF TRANSMISSION HARNESS CONNECTOR.**	Is the transmission harness connector inserted into bulkhead harness connector?	Go to step **11.**	Connect the bulkhead harness connector to transmission harness connector.
11	**CHECK POOR CONTACT IN CONNECTORS.**	There is poor contact. Is there poor contact in control module and data link connector?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0705 — TRANSMISSION RANGE SENSOR —

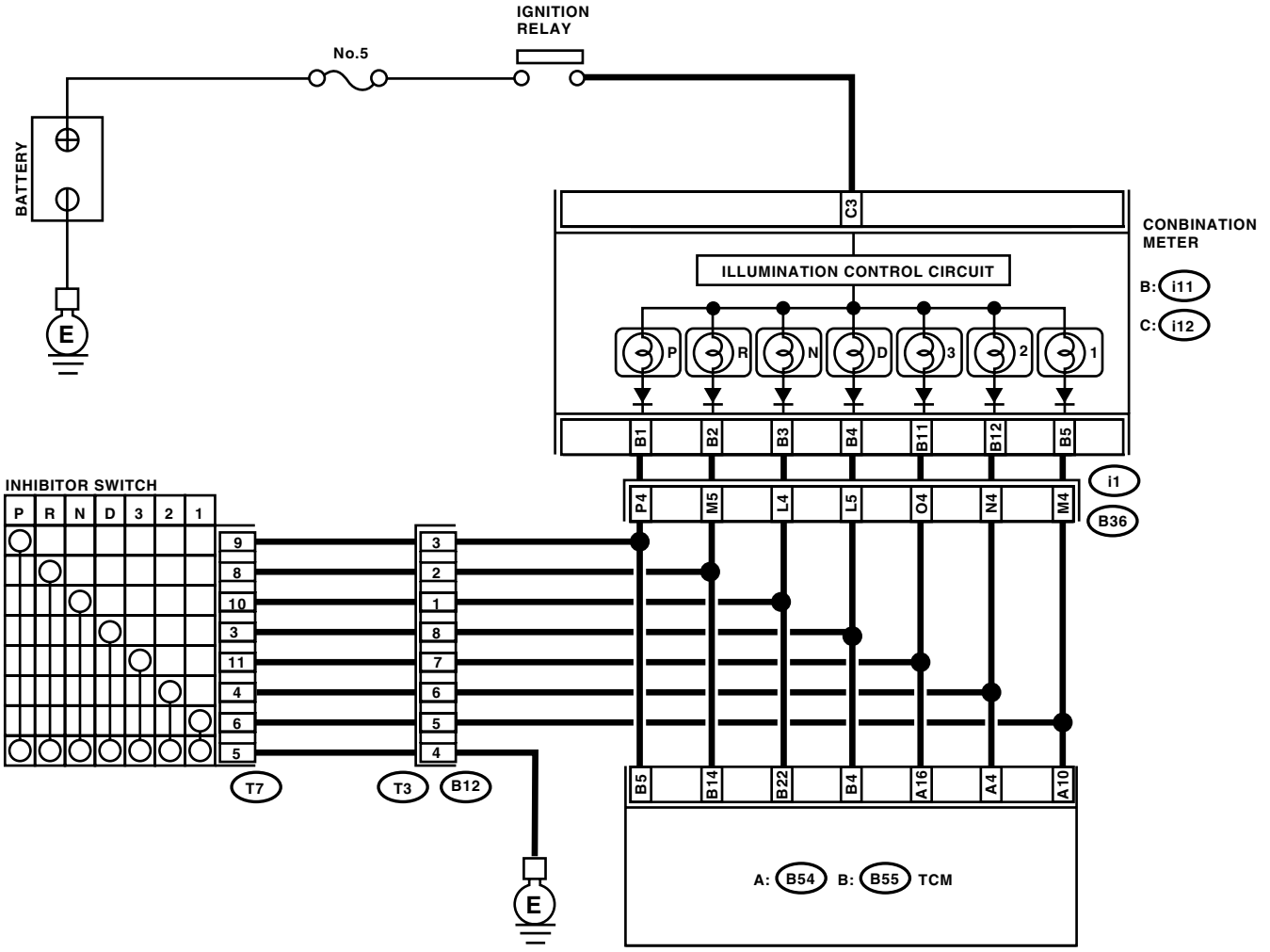
DIAGNOSIS:

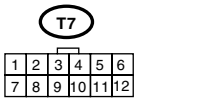
- There is malfunction in inhibitor switch.
- The input signal circuit of inhibitor switch is open or shorted.

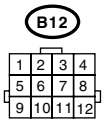
TROUBLE SYMPTOM:

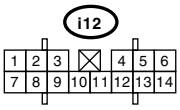
- Shift characteristics are erroneous.
- Engine brake is not effected when select lever is in “3” range.
- Engine brake is not effected when select lever is in “2” range.
- Engine brake is not effected when select lever is in “1” range.

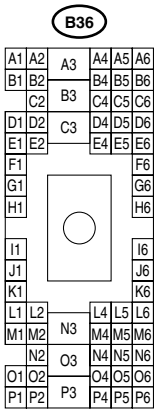
WIRING DIAGRAM:

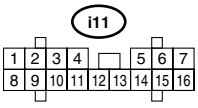


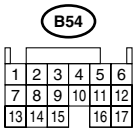


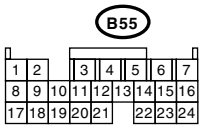












AT-01600

Step		Check	Yes	No
1	**CHECK "P" RANGE SWITCH.**	When the "P" range is selected, does LED light up?	Go to step **2.**	Go to step **22.**
2	**CHECK INDICATOR LIGHT.**	Does the combination meter "P" range indicator illuminate?	Go to step **3.**	Go to step **26.**
3	**CHECK "P" RANGE SWITCH.**	When the "R" range is selected, does "P" range LED light up?	Go to step **28.**	Go to step **4.**
4	**CHECK "R" RANGE SWITCH.**	When the "R" range is selected, does LED light up?	Go to step **5.**	Go to step **29.**
5	**CHECK INDICATOR LIGHT.**	Does the combination meter "R" range indicator illuminate?	Go to step **6.**	Go to step **32.**
6	**CHECK "R" RANGE SWITCH.**	When the "N" range is selected, does "R" range LED light up?	Go to step **34.**	Go to step **7.**
7	**CHECK "N" RANGE SWITCH.**	When the "N" range is selected, does LED light up?	Go to step **8.**	Go to step **35.**
8	**CHECK INDICATOR LIGHT.**	Does the combination meter "N" range indicator illuminate?	Go to step **9.**	Go to step **38.**
9	**CHECK "N" RANGE SWITCH.**	When the "D" range is selected, does "N" range LED light up?	Go to step **40.**	Go to step **10.**
10	**CHECK "D" RANGE SWITCH.**	When the "D" range is selected, does LED light up?	Go to step **11.**	Go to step **41.**
11	**CHECK INDICATOR LIGHT.**	Does the combination meter "D" range indicator illuminate?	Go to step **12.**	Go to step **44.**
12	**CHECK "D" RANGE SWITCH.**	When the "3" range is selected, does "D" range LED light up?	Go to step **46.**	Go to step **13.**
13	**CHECK "3" RANGE SWITCH.**	When the "3" range is selected, does LED light up?	Go to step **14.**	Go to step **47.**
14	**CHECK INDICATOR LIGHT.**	Does the combination meter "3" range indicator illuminate?	Go to step **15.**	Go to step **50.**
15	**CHECK "3" RANGE SWITCH.**	When the "2" range is selected, does "3" range LED light up?	Go to step **52.**	Go to step **16.**
16	**CHECK "2" RANGE SWITCH.**	When the "2" range is selected, does LED light up?	Go to step **17.**	Go to step **53.**
17	**CHECK INDICATOR LIGHT.**	Does the combination meter "2" range indicator illuminate?	Go to step **18.**	Go to step **56.**
18	**CHECK "2" RANGE SWITCH.**	When the "1" range is selected, does "2" range LED light up?	Go to step **58.**	Go to step **19.**
19	**CHECK "1" RANGE SWITCH.**	When the "1" range is selected, does LED light up?	Go to step **20.**	Go to step **59.**
20	**CHECK INDICATOR LIGHT.**	Does the combination meter "1" range indicator illuminate?	Go to step **21.**	Go to step **62.**
21	**CHECK "1" RANGE SWITCH.**	When the "2" range is selected, does "1" range LED light up?	Go to step **64.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
22	**CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. ***Connector & terminal*** ***(T7) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 5 — (T7) No. 9:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “P” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **25.**	Go to step **65.**
25	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for “P” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
26	**CHECK “P” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “P” range indicator light bulb from combination meter.	Is the “P” range indicator light bulb OK?	Go to step **27.**	Replace the “P” range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
27	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 5 — (i11) No. 1:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector.
28	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **29.**	Repair the ground short circuit in “P” range circuit.

	Step	Check	Yes	No
29	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 14 — (T7) No. 8:***	Is the resistance less than 1 Ω?	Go to step **30.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
30	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “R” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **31.**	Go to step **65.**
31	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for “R” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
32	**CHECK “R” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “R” range indicator light bulb from combination meter.	Is “R” range indicator light bulb OK?	Go to step **33.**	Replace the “R” range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
33	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 14 — (i11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
34	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **35.**	Repair the ground short circuit in “R” range circuit.
35	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 22 — (T7) No. 10:***	Is the resistance less than 1 Ω?	Go to step **36.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
36	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "N" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **37.**	Go to step **65.**
37	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever to except for "N" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
38	**CHECK "N" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "N" range indicator light bulb from combination meter.	Is the "N" range indicator light bulb OK?	Go to step **39.**	Replace the "N" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
39	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 22 — (i11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
40	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **41.**	Repair the ground short circuit in "N" range circuit.
41	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 4 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **42.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
42	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "D" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **43.**	Go to step **65.**

	Step	Check	Yes	No
43	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "D" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
44	**CHECK "D" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "D" range indicator light bulb from combination meter.	Is the "D" range indicator light bulb OK?	Go to step **45.**	Replace the "D" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
45	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 4 — (i11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and TCM connector.
46	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **47.**	Repair the ground short circuit in "D" range circuit.
47	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B54) No. 16 — (T7) No. 11:***	Is the resistance less than 1 Ω?	Go to step **48.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "3" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **49.**	Go to step **65.**
49	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "3" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

	Step	Check	Yes	No
50	**CHECK "3" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "3" range indicator light bulb from combination meter.	Is the "3" range indicator light bulb OK?	Go to step **51.**	Replace the "3" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
51	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 16 — (i11) No. 11:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
52	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **53.**	Repair the ground short circuit in "3" range circuit.
53	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B54) No. 4 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **54.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "2" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **55.**	Go to step **65.**
55	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "2" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
56	**CHECK "2" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "2" range indicator light bulb from combination meter.	Is the "2" range indicator light bulb OK?	Go to step **57.**	Replace the "2" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>

	Step	Check	Yes	No
57	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 4 — (i11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
58	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **59.**	Repair the ground short circuit in "2" range circuit.
59	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B54) No. 10 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **60.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "1" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **61.**	Go to step **65.**
61	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "1" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
62	**CHECK "1" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "1" range indicator light bulb from combination meter.	Is the "1" range indicator light bulb OK?	Go to step **63.**	Replace the "1" range indicator light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
63	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 10 — (i11) No. 5:***	Is the resistance less than 1Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, poor contact in TCM connector.

	Step	Check	Yes	No
64	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **65.**	Repair the ground short circuit in "1" range circuit.
65	**CHECK POOR CONTACT.**	Is there poor contact in inhibitor switch circuit?	Repair the poor contact.	Go to step **66.**
66	**CHECK INHIBITOR SWITCH.**	Is the inhibitor switch in proper position?	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Adjust the inhibitor switch and select cable. <Ref. to 4AT-51, Inhibitor Switch.> and <Ref. to CS-31, Select Cable.>

MEMO:

B: DTC P0712 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT —

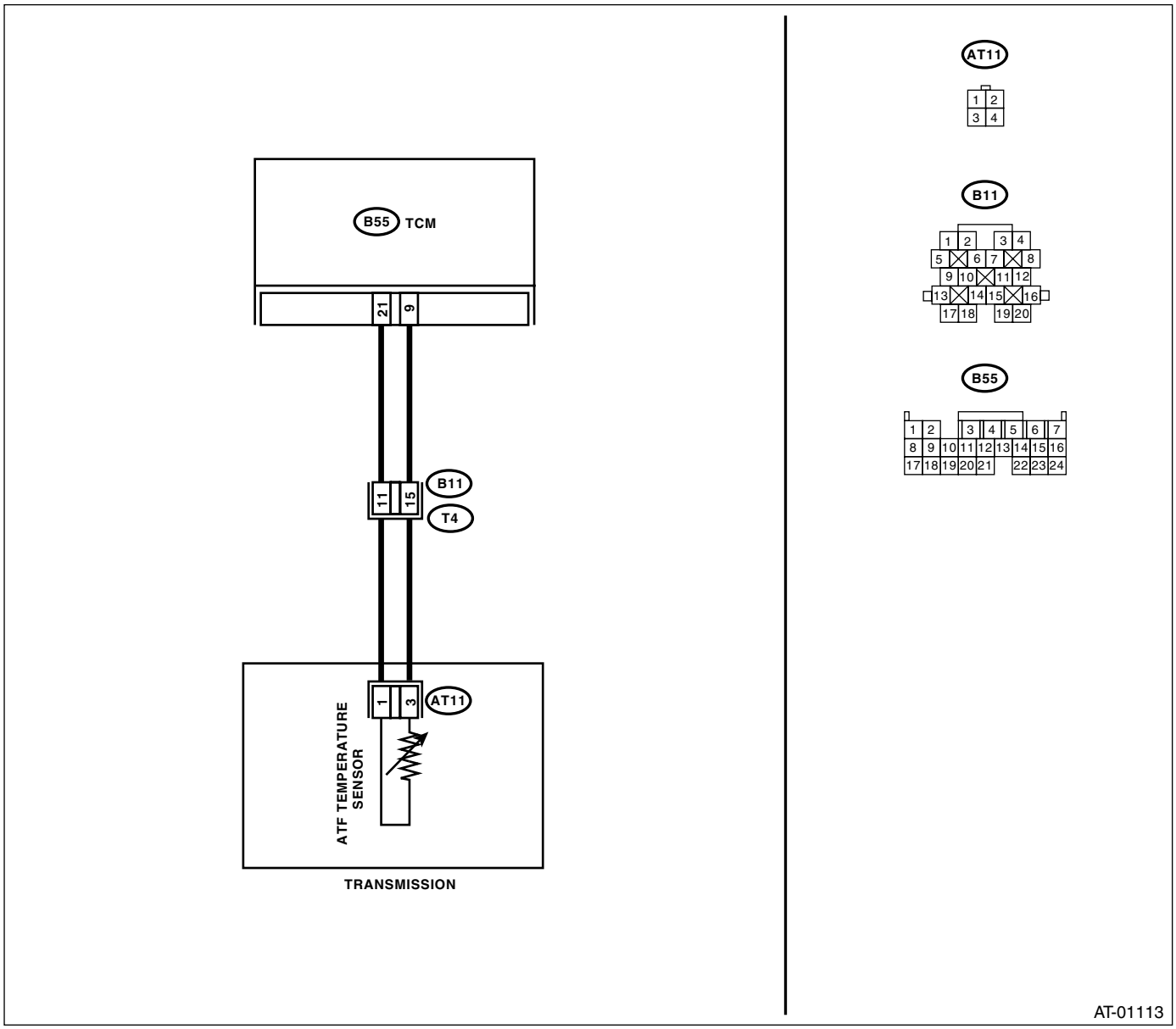
DIAGNOSIS:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 21 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 9 — (B11) No. 15:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Is the resistance 500 — 600 Ω?	Go to step **6.**	Go to step **11.**
6	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Does the resistance value increase when ATF temperature decreases?	Go to step **7.**	Go to step **11.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***(B55) No. 9 (+) — No. 21 (–):***	Is the voltage 1.5 — 1.9 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Remove the transmission connector from bracket. 4) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off floor. 5) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 6) Remove the oil pan, and disconnect the connector from ATF temperature sensor connector. 7) Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 11 — (AT11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between ATF temperature sensor and transmission connector.

	Step	Check	Yes	No
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 15 — (AT11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between ATF temperature sensor and transmission connector.
13	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 11 — Transmission ground:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Repair the short circuit in harness between ATF temperature sensor and transmission connector.
14	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 15 — Transmission ground:***	Is the resistance more than 1 MΩ?	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>	Repair the short circuit in harness between ATF temperature sensor and transmission connector.

C: DTC P0713 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

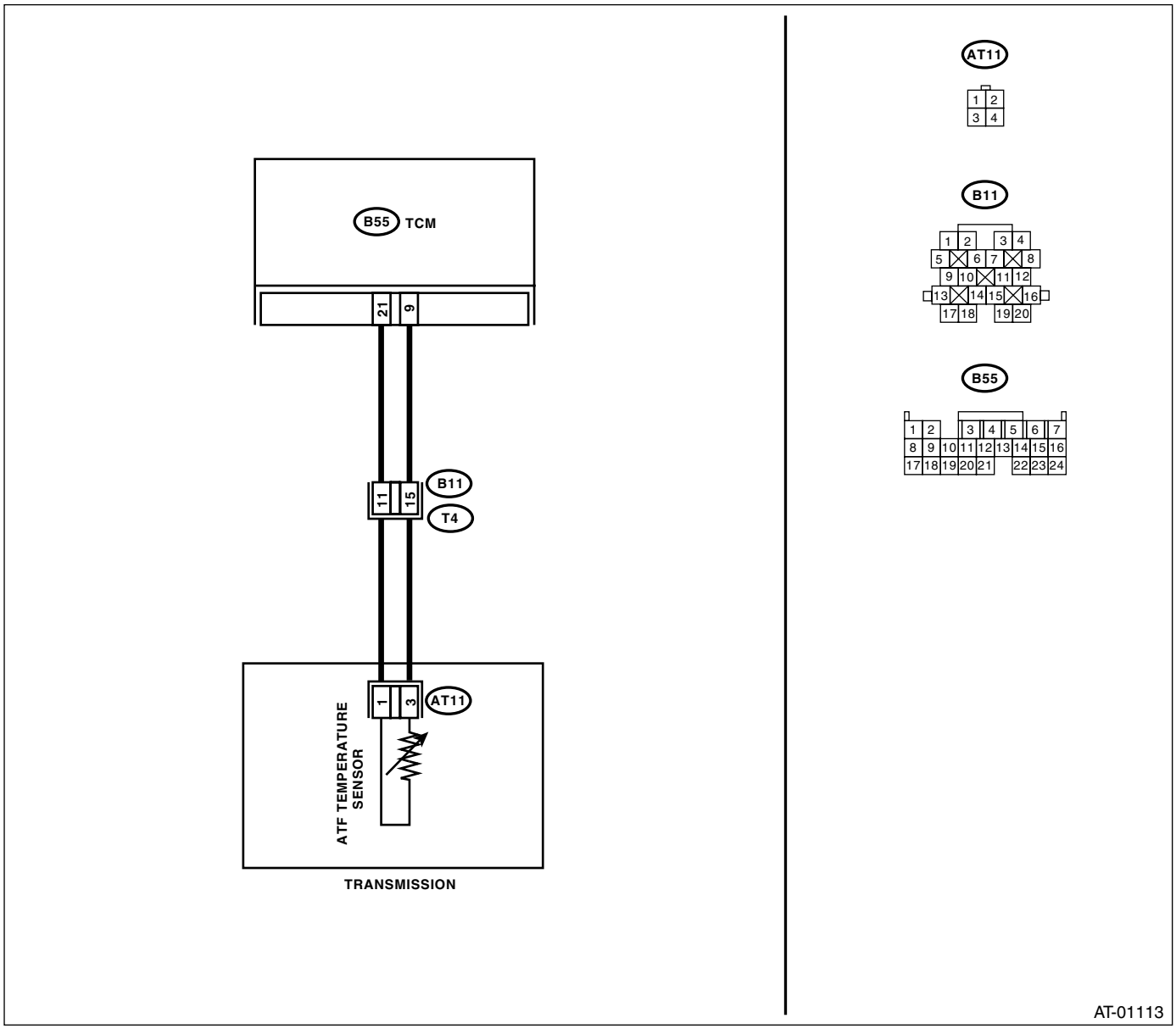
DIAGNOSIS:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 21 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2.**	Repair the short circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the voltage of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Is the resistance 500 — 600 Ω?	Go to step **4.**	Replace control valve body.
4	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Does the resistance value increase when ATF temperature decreases?	Go to step **7.**	Replace control valve body.
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***(B55) No. 9 (+) — No. 21 (–):***	Is the voltage 1.5 — 1.9 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **8.**

	Step	Check	Yes	No
7	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **8.**
8	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

D: DTC P0715 — INPUT/TURBINE SPEED SENSOR CIRCUIT —

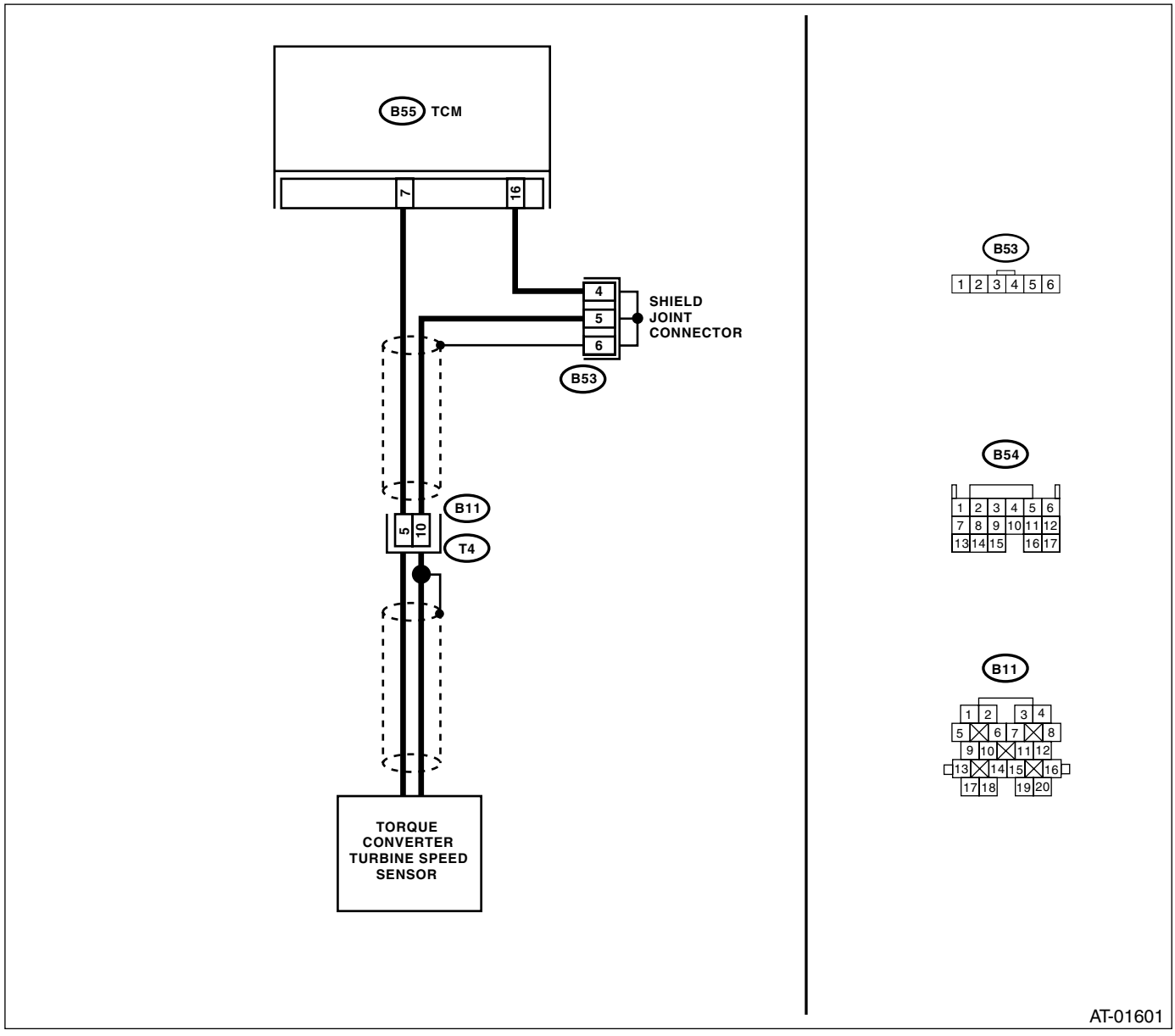
DIAGNOSIS:

The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 5 — No. 10:***	Is the resistance 450 — 650 Ω?	Go to step **2.**	Replace the turbine speed sensor. <Ref. to 4AT-61, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 7 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 16 — (B11) No. 10:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Start the engine and move select lever to "P" or "N" range. 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 7 (+) — No. 16 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4) Start the engine. 5) Move the select lever to “P” or “N” range. 6) Read the data of turbine speed using Subaru Select Monitor. •Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 7:*** ***Earth lead; (B55) No. 16:*** 3) Start the engine and move select lever to “P” or “N” range.	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

E: DTC P0719 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT LOW —

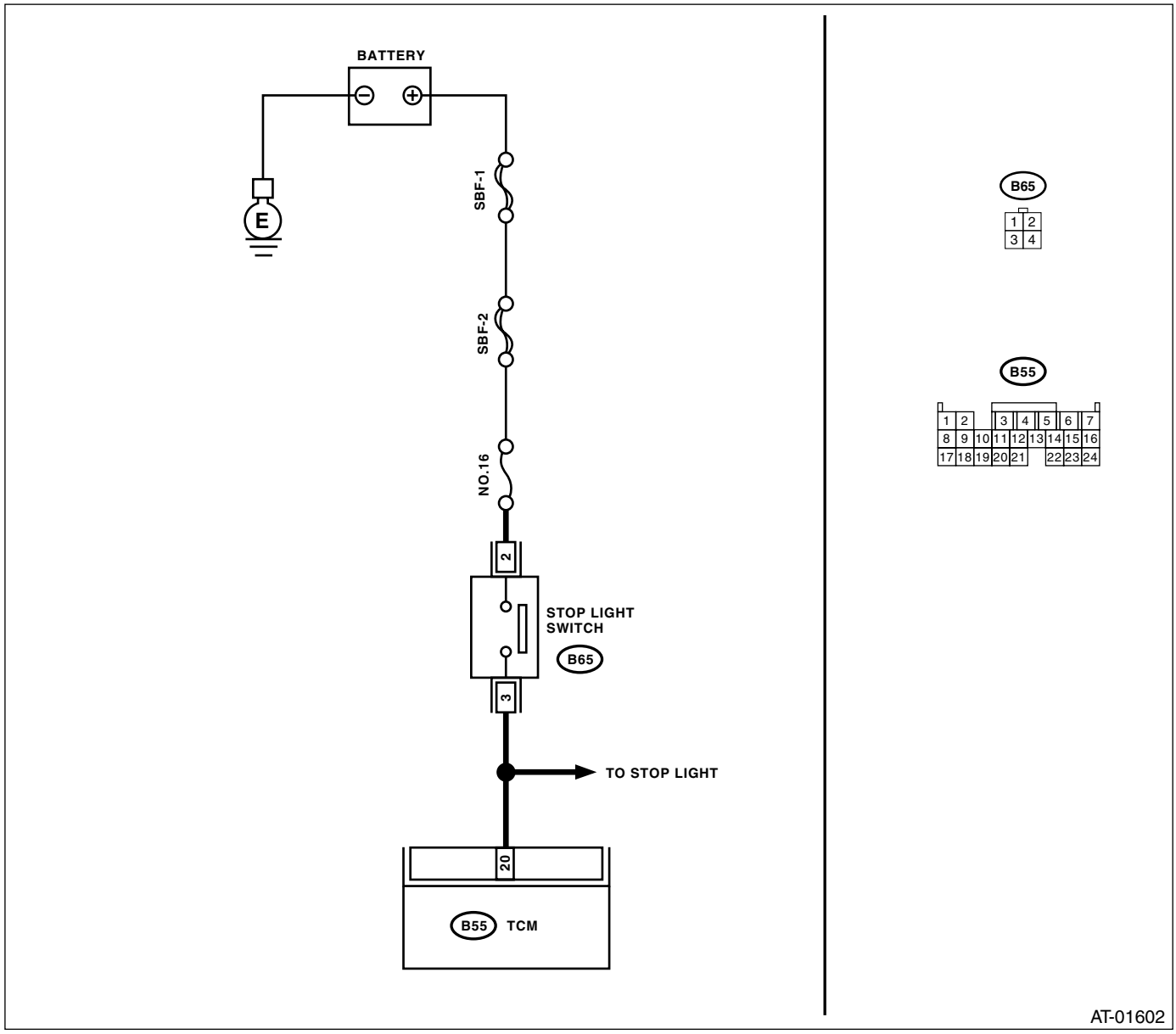
DIAGNOSIS:

Brake switch malfunction or input signal open circuit.

TROUBLE SYMPTOM:

Gear is not shifted down when climbing hill.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.** Depress the brake pedal.	Does the brake light illuminate?	Go to step **2.**	Check the brake light circuit.
2	**CHECK TCM INPUT SIGNAL.** 1) Depress the brake pedal. 2) Measure the voltage of harness between TCM and stop light switch. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Go to step **3.**
3	**HECK HARNESS CONNECTOR BETWEEN TCM AND BRAKE LIGKT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and stop light switch. 3) Measure the resistance between TCM and stop light switch. ***Connector & terminal*** ***(B55) No. 20 — (B65) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness between TCM and stop light switch.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND BRAKE LIGKT SWITCH.** Measure the resistance between TCM and stop light switch. ***Connector & terminal*** ***(B55) No. 20 — (B65) No. 3:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short harness between TCM and stop light switch.
5	**INSPECT POOR CONTACT.**	Is there poor contact in the brake switch input signal circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

F: DTC P0720 — AT VEHICLE SPEED SENSOR CIRCUIT —

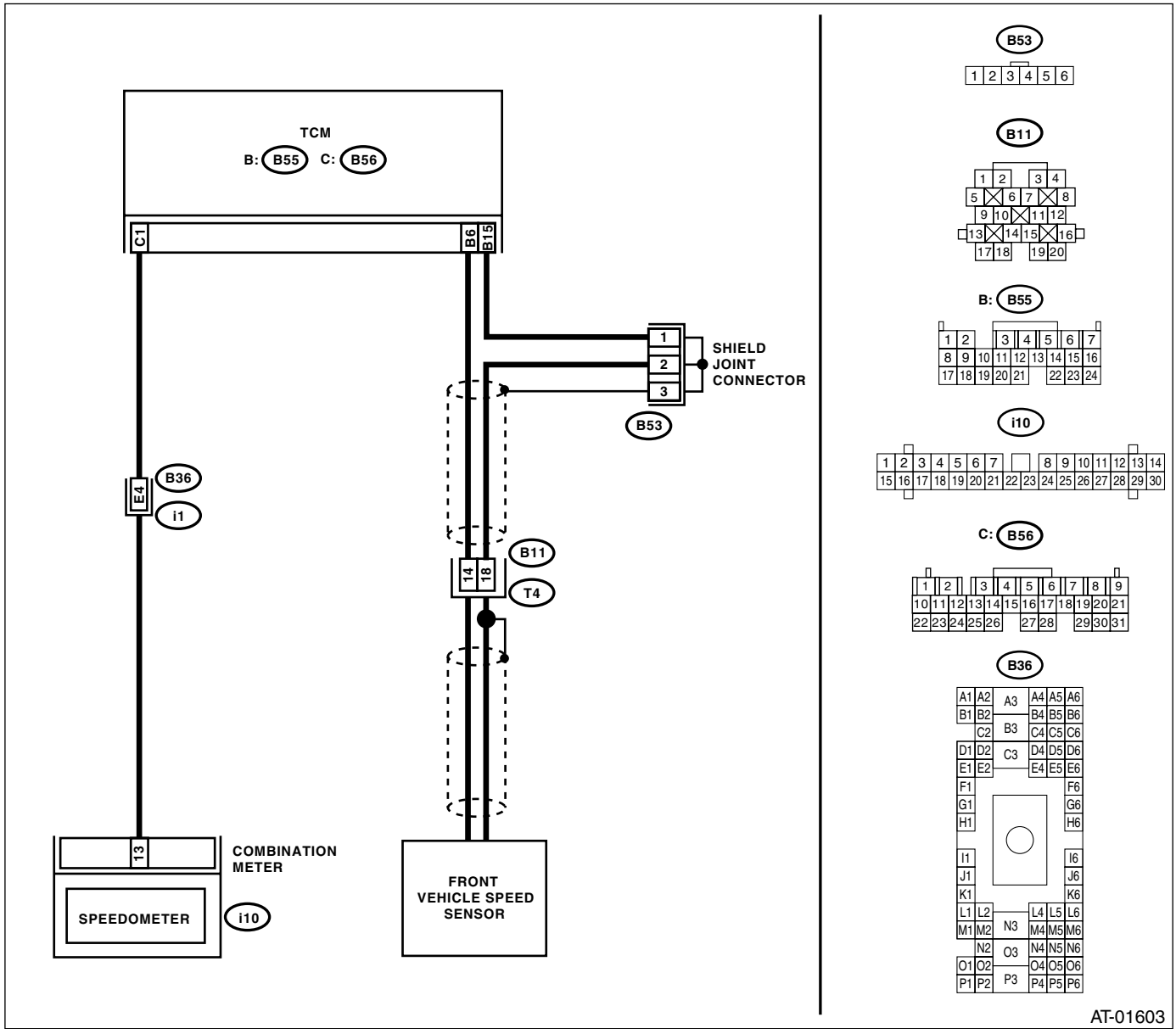
DIAGNOSIS:

- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 6 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 15 — (B11) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 18:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to 4AT-55, Front Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **9.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 6 (+) — No. 15 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in the front vehicle speed sensor circuit.	Go to step **11.**

	Step	Check	Yes	No
9	**CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 6:*** ***Earth lead; (B55) No. 15:*** 4) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the voltage more than AC 4 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Does the speedometer indication increase as Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in front vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

G: DTC P0724 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT HIGH —

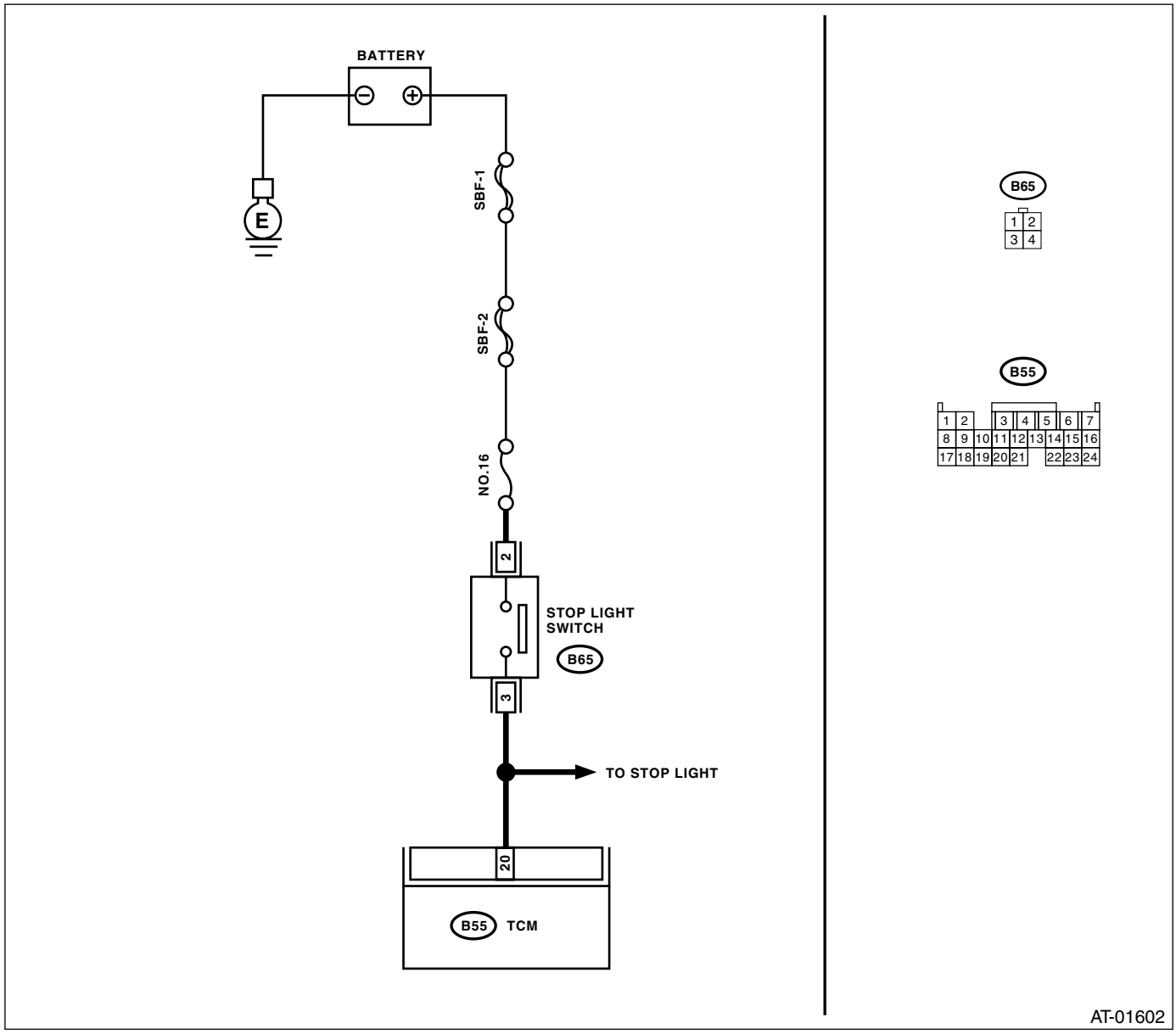
DIAGNOSIS:

Brake switch malfunction or open brake switch input signal circuit.

TROUBLE SYMPTOM:

Gear is not shifted down when climbing hill.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TCM INPUT SIGNAL.** 1) Disconnect the harness connector from TCM. 2) Measure the voltage of harness between TCM and stop light switch. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch OFF. 2) Disconnect the connector from stop light switch. 3) Measure the resistance between stop light switch connector. ***Connector & terminal*** ***No. 2 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the stop light switch.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH.** 1) Turn the ignition switch ON. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Repair the short in power supply circuit to harness between TCM and stop light switch.
4	**INSPECT POOR CONTACT.**	Is there poor contact in the brake switch input signal circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

H: DTC P0725 — ENGINE SPEED INPUT CIRCUIT —

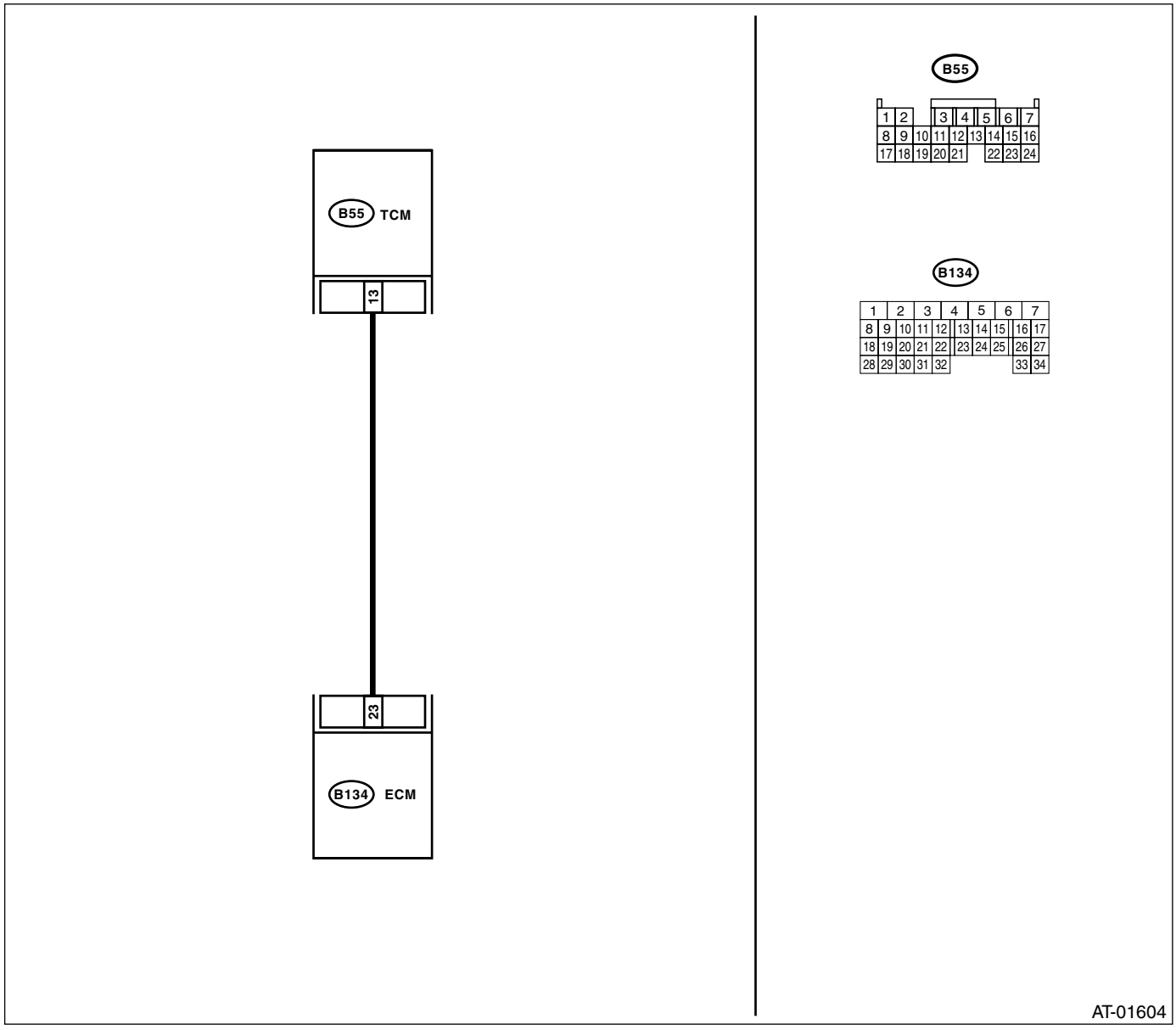
DIAGNOSIS:

The engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The AT OIL TEMP warning light remains on when vehicle speed is “0”.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B55) No. 13 — (B134) No. 23:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
5	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Idle the engine. 5) Read the data of engine speed using Subaru Select Monitor. •Display shows the engine speed signal value sent from ECM.	Is the revolution value same as tachometer reading shown on combination meter?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step **7.**
7	**CONFIRM DTC P0725.** Replace the ECM with a new one.	Does the DTC appear again, after memory has been cleared?	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Replace the ECM.

I: DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(H4DOTC)-67, DTC P0736 — REVERSE INCORRECT RATIO —.>

J: DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(H4DOTC)-67, DTC P0736 — REVERSE INCORRECT RATIO —.>

K: DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(H4DOTC)-67, DTC P0736 — REVERSE INCORRECT RATIO —.>

L: DTC P0734 — GEAR 4 INCORRECT RATIO —

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(H4DOTC)-67, DTC P0736 — REVERSE INCORRECT RATIO —.>

M: DTC P0736 — REVERSE INCORRECT RATIO —

DIAGNOSIS:

Vehicle speed sensor malfunction and torque converter turbine speed sensor malfunction, etc. or control valve malfunction.

TROUBLE SYMPTOM:

- Shift point is too high or too low.
- Excessive shift shock.
- Tight cornering condition is occurred.
- Gear is not shifted to reverse.
- Gear position is held by fail safe function.

	Step	Check	Yes	No
1	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **2.**	Go to step **5.**
2	**CHECK THROTTLE POSITION SENSOR.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Read the value of accelerator pedal position sensor.	Does the value of accelerator pedal position sensor change from 0% to 100% smoothly when throttle position sensor was operated from fully closing to fully opening?	Go to step **3.**	Check accelerator pedal position sensor. <Ref. to 4AT(H4DOTC)-104, DTC P1708 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —.>
3	**FRONT VEHICLE SPEED SENSOR.** 1) Lift-up the vehicle and place safety stand. 2) Start the engine. 3) Move the select lever “D” range and slowly increase vehicle speed. NOTE: The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system.	Does the vehicle speed displayed by Subaru Select Monitor almost correspond with vehicle speed indicated by combination meter?	Go to step **4.**	Check the front vehicle speed sensor.
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Move the select lever to “P” or “N” range. 2) Idle the engine.	Does the turbine speed sensor revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?	There are malfunctions in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.	Check the torque converter turbine speed sensor circuit.
5	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Fully close the throttle. 3) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 19 (+) — Chassis ground (–):***	Is the voltage 0.8 — 1.2 V?	Go to step **6.**	Check the accelerator position sensor circuit. <Ref. to 4AT(H4DOTC)-104, DTC P1708 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —.>

	Step	Check	Yes	No
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Fully close the throttle. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 19 (+) — Chassis ground (–):***	Is the voltage 3.3 — 4.0 V?	Go to step **7.**	Check the accelerator pedal position sensor circuit. <Ref. to 4AT(H4DOTC)-104, DTC P1708 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —.>
7	**CHECK FRONT VEHICLE SPEED SENSOR.** Check according to DTC P0720 procedure.	Is the front vehicle speed sensor circuit normal?	Go to step **8.**	Repair or replace the front vehicle speed sensor.
8	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** Check according to DTC P0715 procedure.	Is the torque converter turbine speed sensor circuit normal?	There is malfunction in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.	Repair or replace the torque converter turbine speed sensor circuit.

N: DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

DIAGNOSIS:

- Lock up clutch malfunction
- Locking of valve

TROUBLE SYMPTOM:

Lock up is not operated.

	Step	Check	Yes	No
1	**CHECK LOCK UP DUTY SOLENOID CIRCUIT.** Check according as DTC P0743 procedure.	Is there malfunction?	Repair or replace the lock up duty solenoid circuit.	Go to step **2.**
2	**CHECK INHIBITOR SWITCH CIRCUIT.** Check according as DTC P0705 procedure.	Is there malfunction?	Repair or replace the inhibitor switch circuit.	Go to step **3.**
3	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check according as DTC P0719 and DTC P0724 procedure.	Is there malfunction?	Repair or replace the stop light switch circuit.	Go to step **4.**
4	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check according to DTC P0712 and DTC P0713 procedure.	Is there malfunction?	Repair or replace the ATF temperature circuit.	Go to step **5.**
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **9.**
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Read the value of accelerator pedal position sensor.	Does the value of accelerator pedal position sensor change from 0% to 100% smoothly when throttle position sensor was operated from fully closing to fully opening?	Go to step **7.**	Check the accelerator pedal position sensor circuit.
7	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Move the select lever to “P” or “N” range. 2) Idle the engine.	Does the engine revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?	Go to step **8.**	Check the torque converter turbine speed sensor circuit.
8	**CHECK ENGINE SPEED SIGNAL.** Idle the engine.	Does the turbine revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?	There is malfunction in TCM, TCM connector poor contact, or transmission assembly mechanical malfuction.	Check the engine speed signal circuit.
9	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Check according to DTC P1708, DTC 1709 and DTC P1714 procedure.	Is there a malfunction?	Go to step **10.**	Repair or replace the accelerator pedal position sensor circuit.
10	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** Check according to DTC P0715 procedure.	Is there a malfunction?	Go to step **11.**	Repair or replace the torque converter turbine speed sensor circuit.
11	**CHECK ENGINE SPEED SIGNAL.** Check according to DTC P0725 procedure.	Is there a malfunction?	Repair or replace the engine speed signal circuit.	There is malfunction in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.

O: DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —

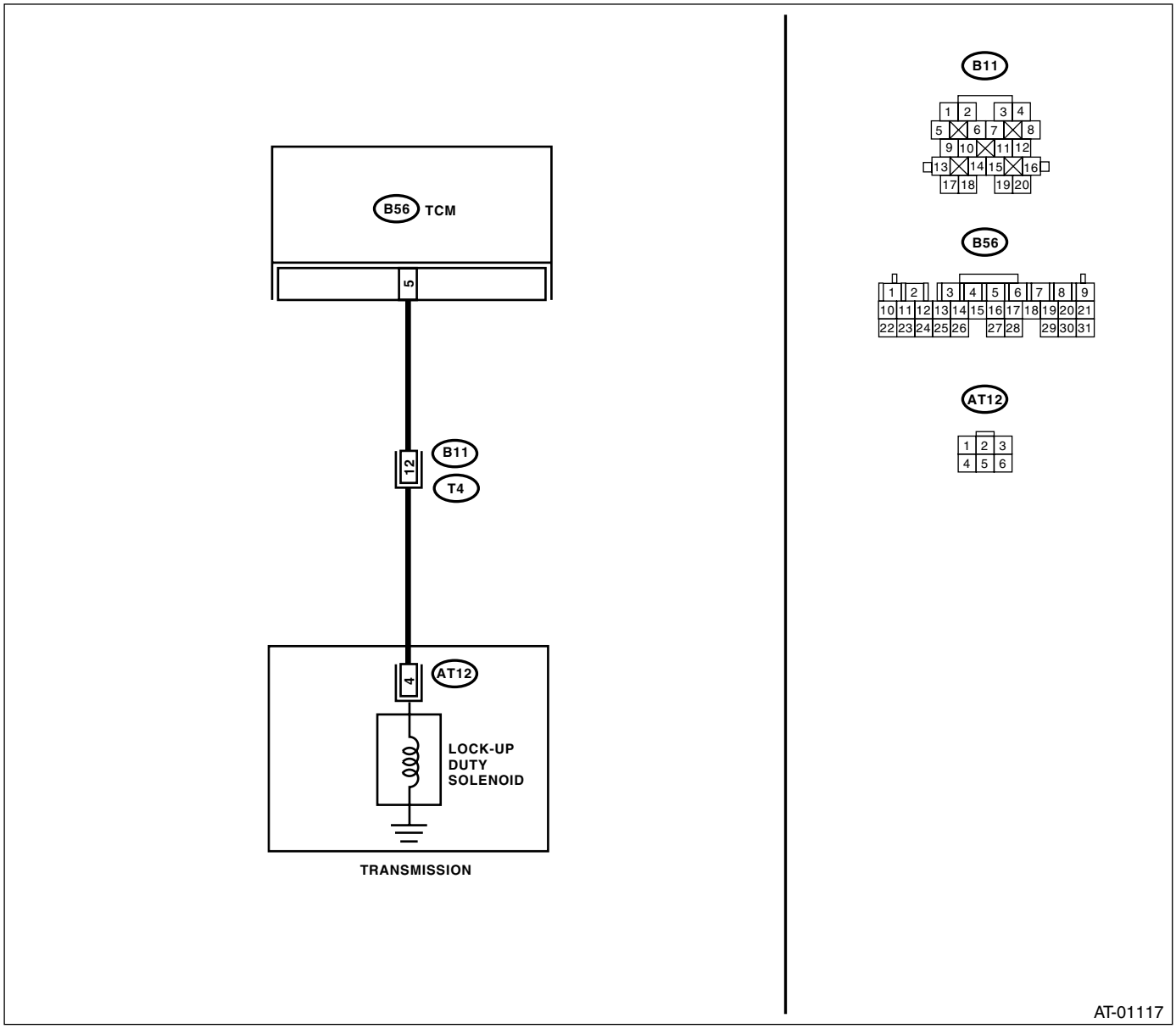
DIAGNOSIS:

The output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No “lock-up” (after engine warm-up).

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.**	Do multiple DTCs appear in the on-board diagnostics test mode?	Go to another DTC.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 5 — (B11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 12 — No. 19:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **5.**	Go to step **11.**
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **8.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the select lever to "D" range and slowly increase vehicle speed to 60 km/h (37 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Go to step **7.**	Go to step **10.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Return the engine to idling speed and move select lever to "N" range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine and turn Subaru Select Monitor switch to ON. 5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6) Read the data of lock-up duty solenoid using Subaru Select Monitor. •Lock-up duty solenoid is indicated in "%". 7) Move the select lever to "D" range and slowly increase vehicle speed to 60 km/h (37 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 95%?	Go to step **9.**	Go to step **10.**
9	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** Return the engine to idling speed and move select lever to "N" range, read the data. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 5%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK POOR CONTACT.**	Is there poor contact in lock-up duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
11	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1) Disconnect the transmission connector. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from lock-up duty solenoid. 4) Measure the resistance between lock-up duty solenoid and transmission ground. ***Connector & terminal*** ***(AT12) No. 4 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **12.**	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
12	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between lock-up duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 12 — (AT12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between TCM and transmission connector.
13	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 12 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

P: DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —

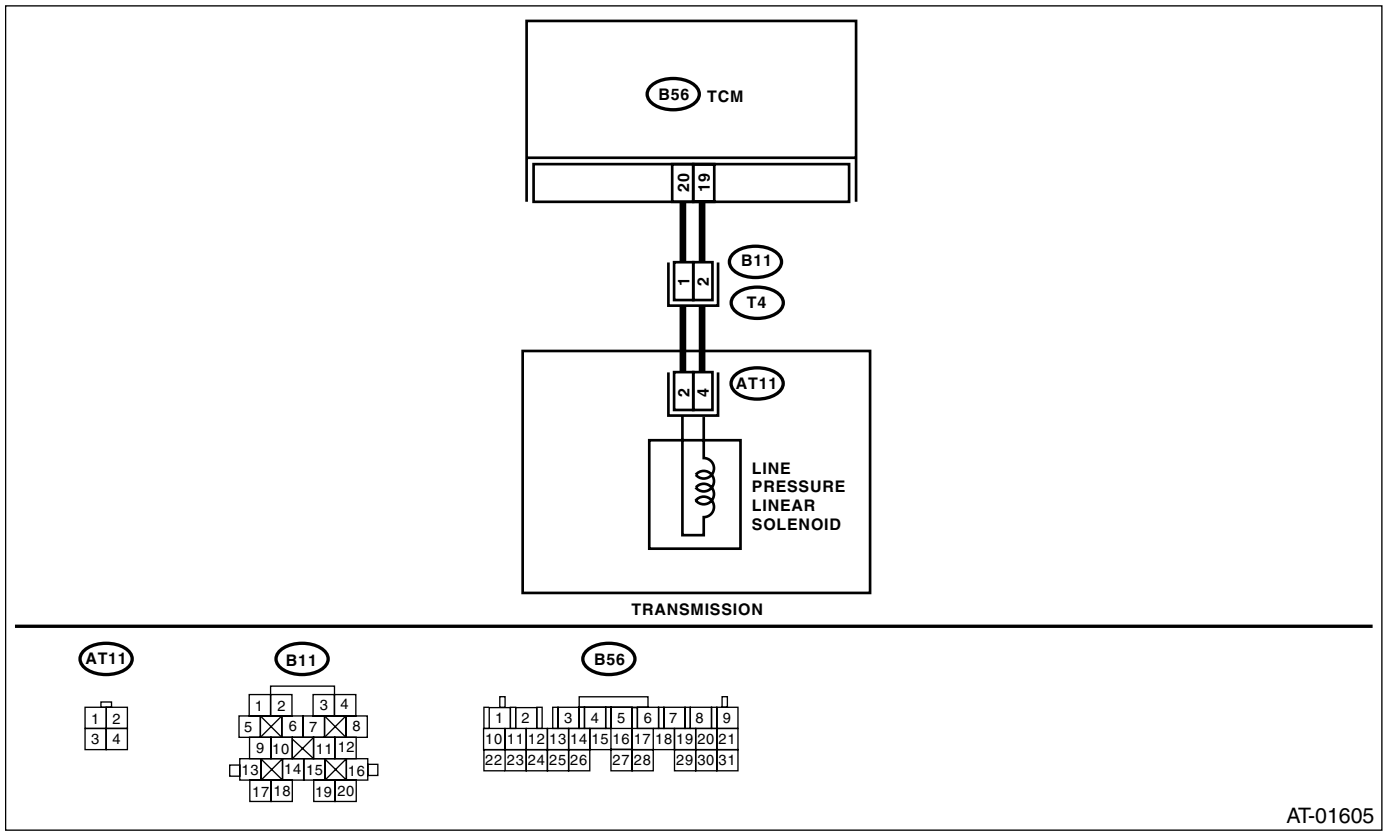
DIAGNOSIS:

The output signal circuit of line pressure linear solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 19 — (B11) No. 2:*** ***(B56) No. 20 — (B11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 19 — Chassis ground:*** ***(B56) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LINE PRESSURE LINEAR SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 2:***	Is the resistance 4 — 6 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "R" range. 5) Close the throttle fully. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 20 (+) — Chassis ground (–):***	Is the voltage 4.0 — 5.0 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Open the throttle fully. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 20 (+) — Chassis ground (–):***	Is the voltage 1.5 — 2.5 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "R" range. 7) Read the data of line pressure linear solenoid using Subaru Select Monitor. •Line pressure linear solenoid is indicated in "%". 8) Throttle is fully open.	Is the value 45 — 50%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to "R" range. (engine OFF) 2) Fully close the throttle.	Is the value 20 — 30%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in line pressure linear solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK LINE PRESSURE LINEAR SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from line pressure linear solenoid. 4) Measure the resistance between line pressure linear solenoid connector and transmission ground. ***Connector & terminal*** ***(AT11) No. 2 — No. 4:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>

Step		Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID.** Measure the resistance of harness between line pressure linear solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 2 — (AT11) No. 4:*** ***(T4) No. 1 — (AT11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between line pressure linear solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 1 — Transmission ground:*** ***(T4) No. 2 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure linear solenoid and transmission.	Repair the short circuit in harness between line pressure linear solenoid and transmission connector.

Q: DTC P0753 — SHIFT SOLENOID "A" ELECTRICAL —

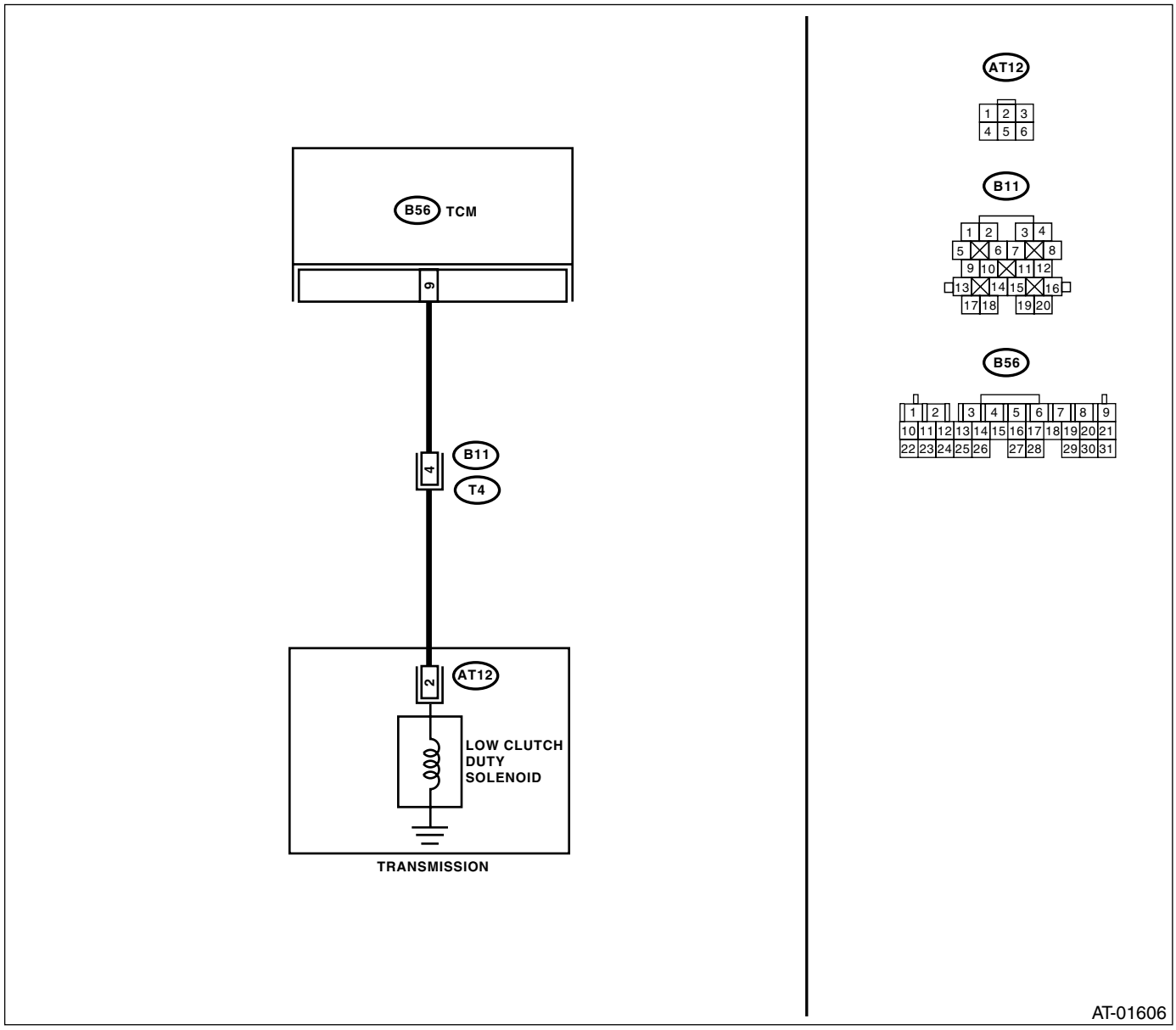
DIAGNOSIS:

The output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***(B56) No. 9 — (B11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW CLUTCH TIMING.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 4 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **7.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to “P” or “N” range. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Move the select lever to “D” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "P" or "N" range. 7) Read the data of low clutch duty solenoid using Subaru Select Monitor. •Low clutch duty solenoid is indicated in "%".	Is the value 100%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Move the select lever to "D" range. 3) Read the data of low clutch duty solenoid.	Is the value 0%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in low clutch duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK LOW CLUTCH DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from low clutch duty solenoid. 4) Measure the resistance between low clutch duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 2 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.** Measure the resistance of harness between low clutch duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 4 — (AT12) No. 2:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between low clutch duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch duty solenoid and transmission.	Repair the short circuit in harness between low clutch duty solenoid and transmission connector.

R: DTC P0758 — SHIFT SOLENOID "B" ELECTRICAL —

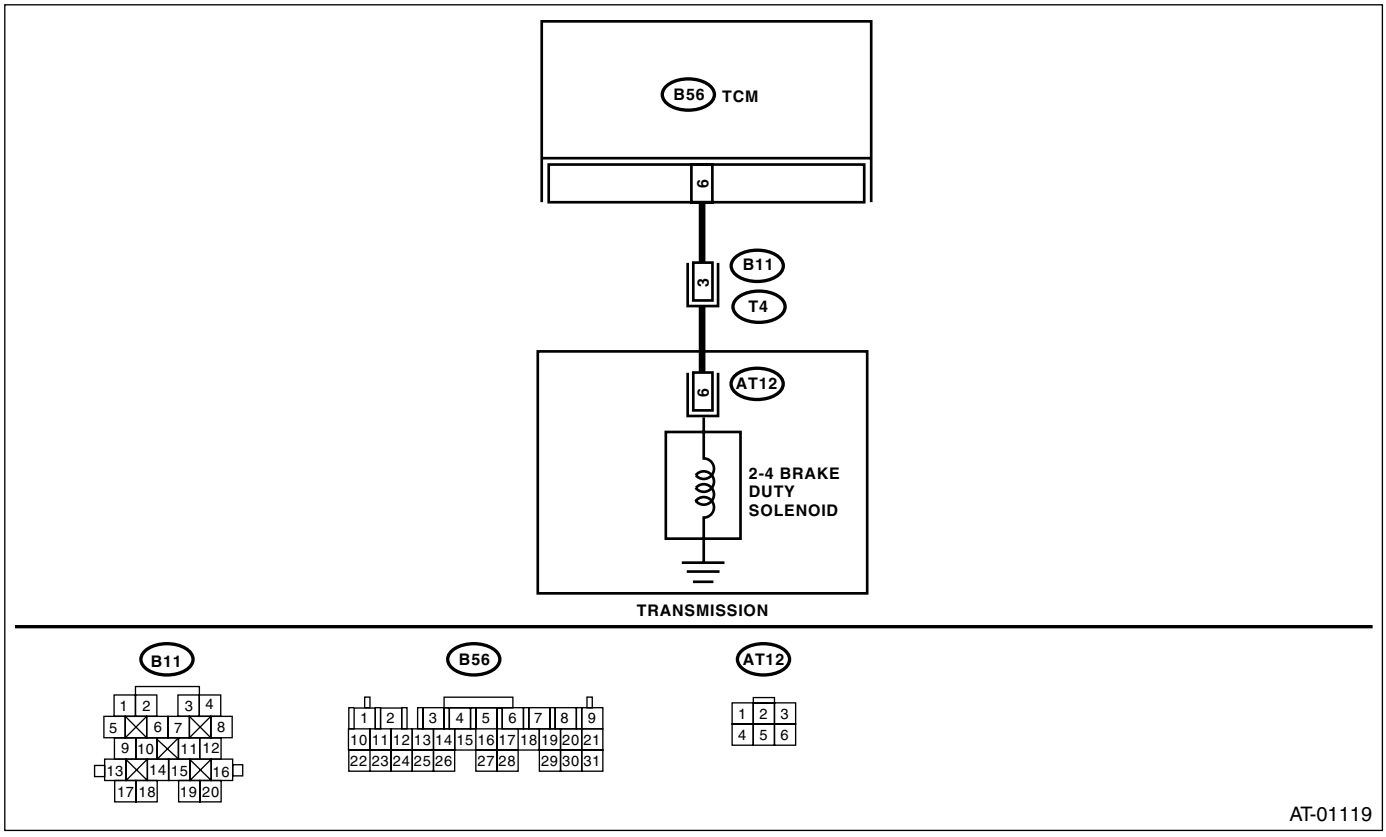
DIAGNOSIS:

The output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift transmission connector. ***Connector & terminal*** ***(B56) No. 6 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 3 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to “N” range. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Move the select lever to “2” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor. •2-4 brake duty solenoid is indicated in "%".	Is the value 100%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** Move the select lever to "2" range.	Is the value 0%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure the resistance between 2-4 brake duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 6 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace control valve body. <Ref. to 4AT-62, Control Valve Body.>
11	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 3 — (AT12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair open circuit in harness between 2-4 brake duty solenoid and transmission connector.

	Step	Check	Yes	No
12	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.	Repair short circuit in harness between 2-4 brake duty solenoid and transmission connector.

S: DTC P0763 — SHIFT SOLENOID “C” ELECTRICAL —

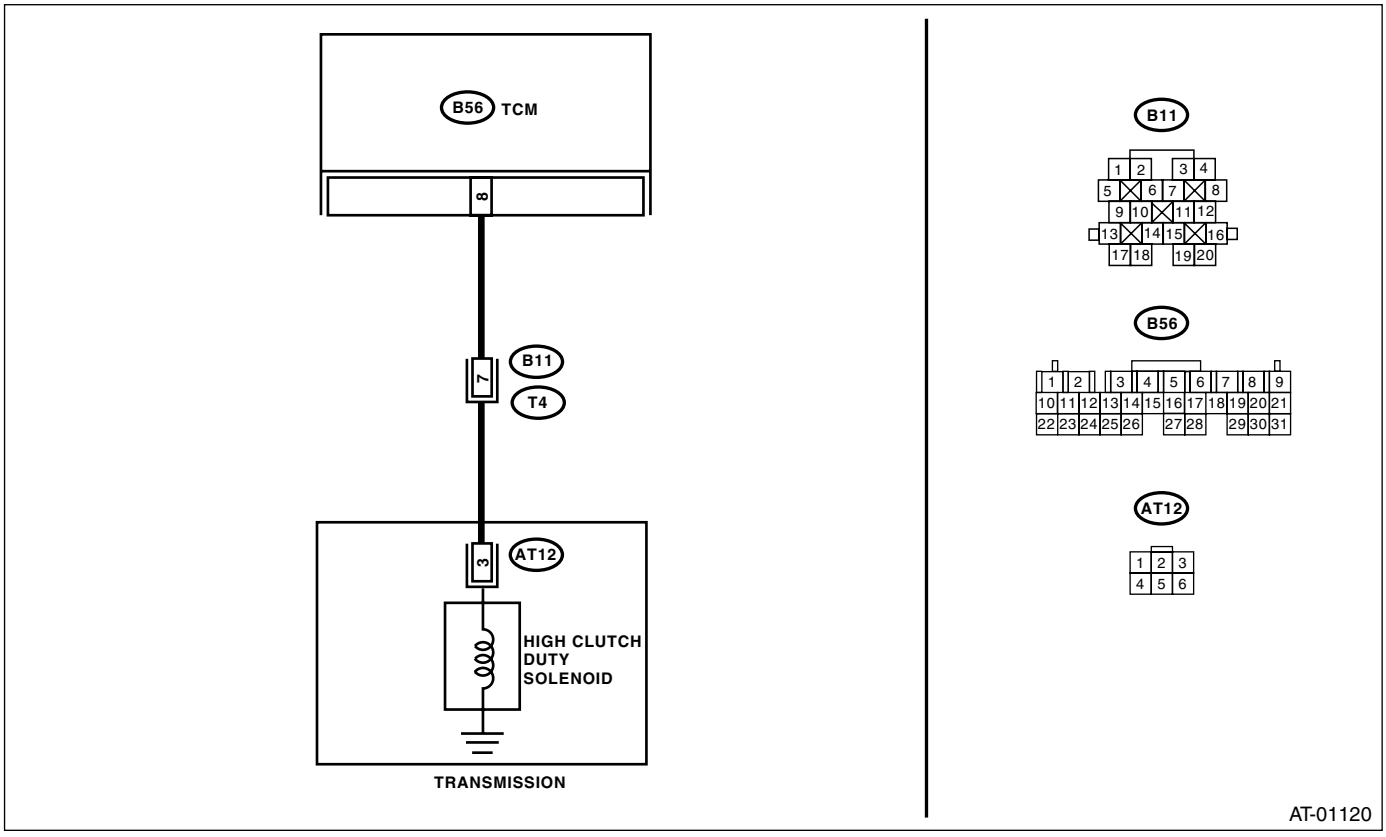
DIAGNOSIS:

The output signal circuit of high clutch duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 8 — (B11) No. 7:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK HIGH CLUTCH DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 7 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the select lever to "D" range and slowly increase vehicle speed and measure at 3rd or 4th gear. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 8 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **9.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Return the engine to idling speed and move select lever to "N" range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
7	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine and turn Subaru Select Monitor switch to ON. 5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6) Read the data of high clutch duty solenoid using Subaru Select Monitor. •High clutch duty solenoid is indicated in "%". 7) Move the select lever to "D" range and slowly increase vehicle speed and measure at 3rd or 4th gear. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 100%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** Return the engine to idling speed and move select lever to "N" range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.>	Is the value 100%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK POOR CONTACT.**	Is there poor contact in high clutch duty circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK HIGH CLUTCH DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from high clutch duty solenoid. 4) Measure the resistance between high clutch duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 3 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
11	**CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between high clutch duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 7 — (AT12) No. 3:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between TCM and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 7 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.	Repair the short circuit in harness between high clutch duty solenoid and transmission connector.

T: DTC P0768 — SHIFT SOLENOID “D” ELECTRICAL —

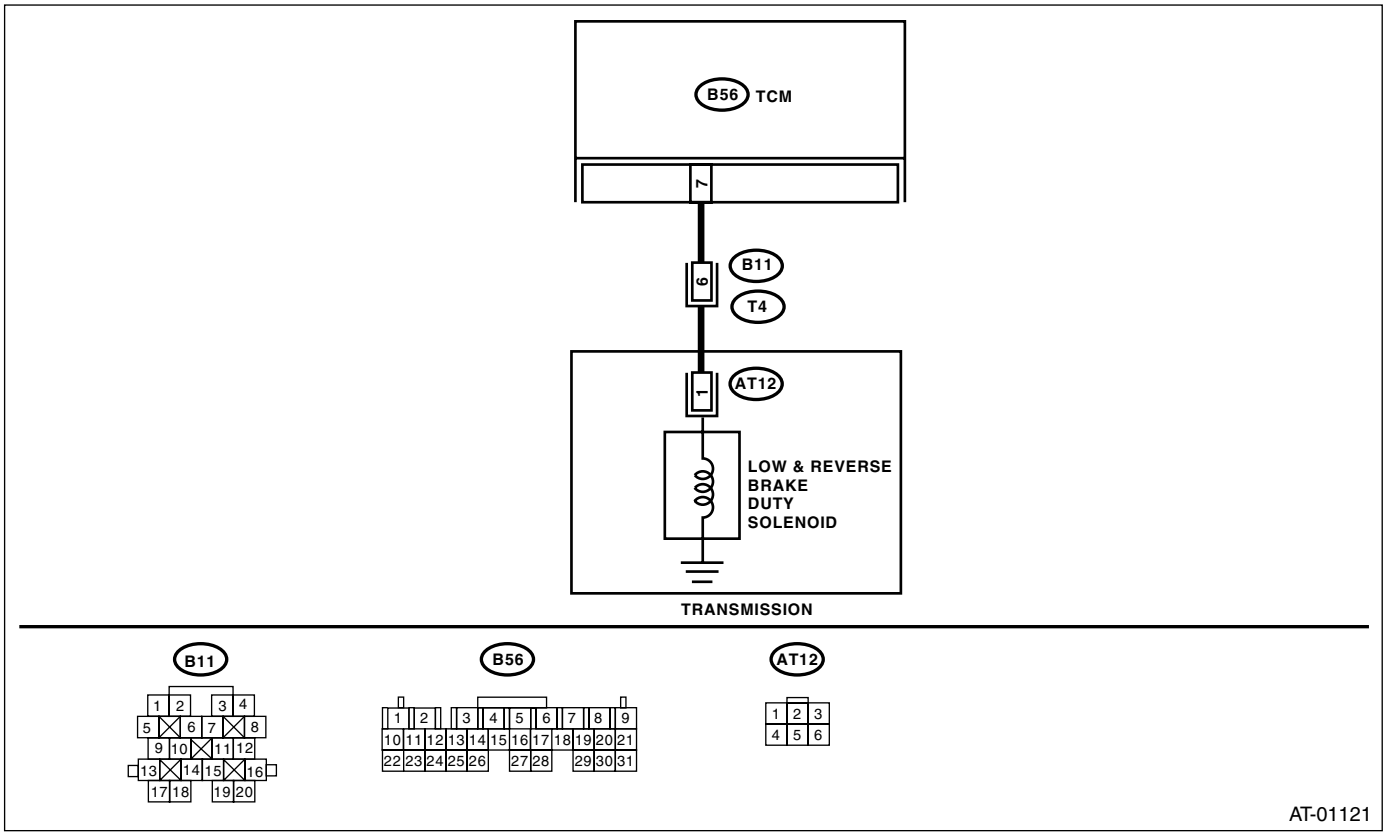
DIAGNOSIS:

The output signal circuit of low & reverse duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Gear is not changed.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 7 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW & REVERSE BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Move the select lever to "1" range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Read the data of low & reverse duty solenoid using Subaru Select Monitor. •Low & reverse duty solenoid is indicated in "%".	Is the value 100%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to "1" range. 2) Read the data of low & reverse duty solenoid.	Is the value 61.5%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in low & reverse duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK LOW & REVERSE BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from low & reverse duty solenoid. 4) Measure the resistance between low & reverse duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW & REVERSE DUTY SOLENOID.** Measure the resistance of harness between low & reverse duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT12) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between low & reverse brake duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW & REVERSE BRAKE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low & reverse brake duty solenoid and transmission.	Repair the short circuit in harness between low & reverse brake duty solenoid and transmission connector.

U: DTC P0801 — REVERSE INHIBITOR CONTROL CIRCUIT —

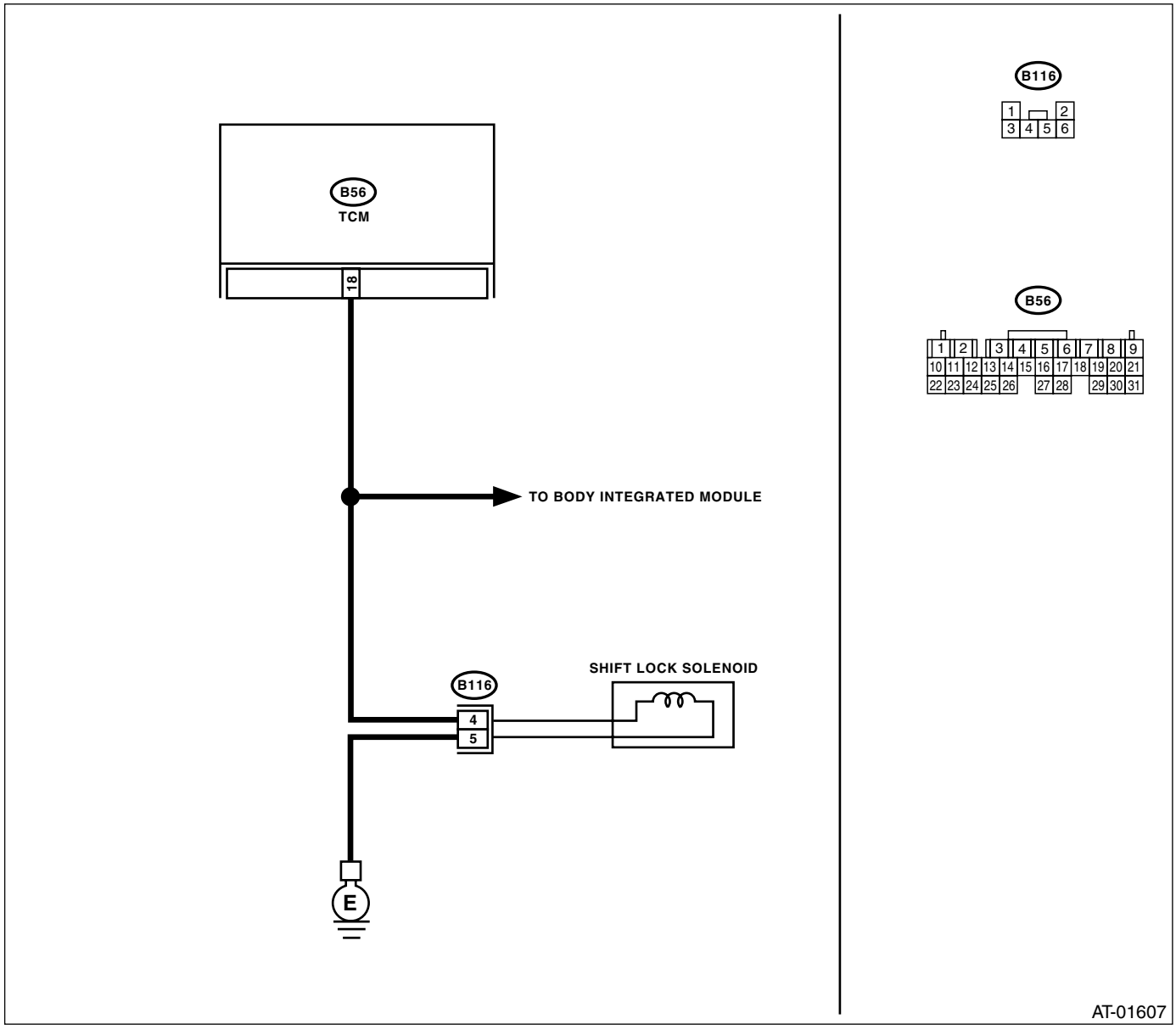
DIAGNOSIS:

Shift lock solenoid malfunction, open or short reverse inhibitor control circuit.

TROUBLE SYMPTOM:

- Gear is shifted from “N” range to “R” range during driving at 20 km/h (12 MPH) or more.
- Gear can not be shifted from “N” range to “R” range.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and shift lock solenoid. 3) Measure the resistance harness between TCM and shift lock solenoid connector. ***Connector & terminal*** ***(B56) No. 18 — (B116) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and shift lock solenoid connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and shift lock solenoid connector.
3	**CHECK HARNESS CONNECTOR BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B116) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between chassis ground terminal and shift lock solenoid connector.
4	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance between shift lock solenoid. ***Connector & terminal*** ***(B116) No. 5 — No. 4:***	Is the resistance 20 — 40 Ω?	Go to step **5.**	Replace the shift lock solenoid.
5	**CHECK TCM OUTPUT SIGNAL.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Move the select lever to “D” range. 4) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 18 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Go to step **6.**	Go to step **7.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 2) Start the engine. 3) Move the select lever “D” range and slowly increase vehicle speed to 20 km/h (12 MPH). NOTE: The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. 4) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 18 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be cause. Repair the harness or connector in reverse inhibitor control circuit.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in the reverse inhibitor control circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

V: DTC P1706 — AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL) —

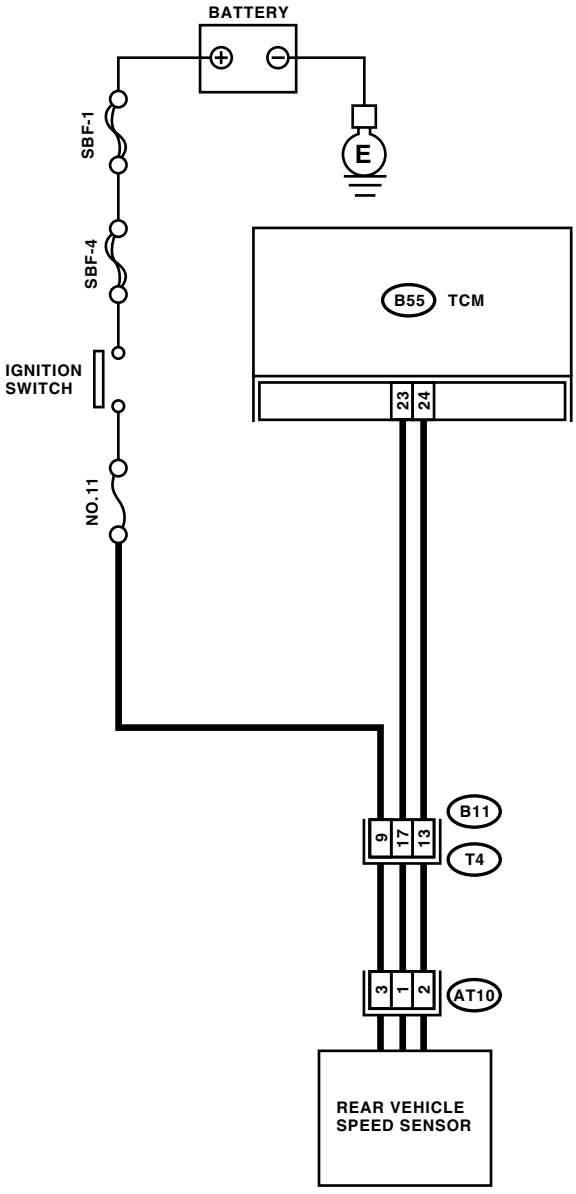
DIAGNOSIS:

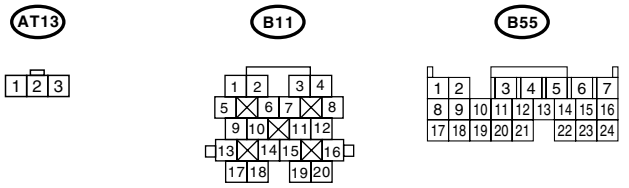
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”.

WIRING DIAGRAM:





AT-01608

	Step	Check	Yes	No
1	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear vehicle speed sensor. 3) Measure the ignition power supply between rear vehicle speed sensor connector and transmission ground. ***Connector & terminal*** ***(AT10) No. 3 (+) — Transmission ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check harness between rear vehicle speed sensor and battery for open circuit, short or poor contact. Repair the harness if required.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 23 — (AT10) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit or poor contact of connector in harness between TCM and rear vehicle speed sensor connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 24 — (AT10) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit or poor contact of connector in harness between TCM and rear vehicle speed sensor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and rear vehicle speed sensor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the short circuit in harness between TCM and rear vehicle speed sensor connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **8.**	Go to step **7.**
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off ground. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 4) Measure the AC voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 24 (+) — No. 23 (–):***	Is the voltage more than AC 2 V?	Go to step **9.**	Replace the rear vehicle speed sensor.

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off ground. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 24:*** ***Earth lead; (B55) No. 23:*** 4) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the voltage more than AC 2 V?	Go to step **9.**	Replace the rear vehicle speed sensor.
9	**CHECK POOR CONTACT.**	Is there poor contact in rear vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

W: DTC P1707 — AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION —

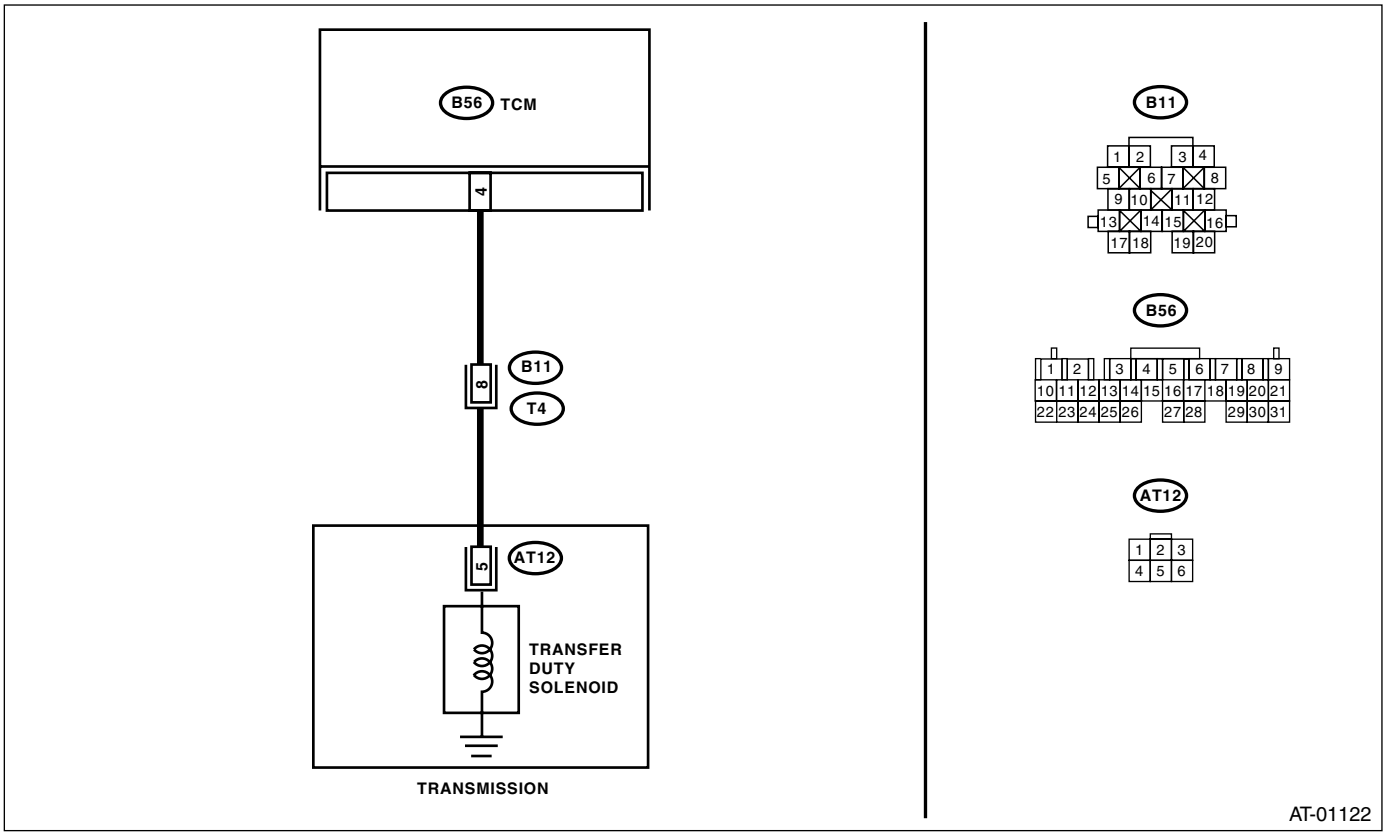
DIAGNOSIS:

The output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive tight corner “braking”.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 4 — (B11) No. 8:***	Is the resistance less than 1 Ω	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK TRANSFER DUTY SOLENOID.** Measure the resistance between transmission connector and transmission terminals. ***Connector & terminal*** ***(T4) No. 8 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “P” range. 4) Throttle is fully closed. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Move the select lever to “D” range. 2) Measure the voltage between TCM connector and chassis ground with throttle fully open. ***Connector & terminal*** ***(B56) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Even if the AT OIL TEMP warning light, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Move the select lever to "N" range with throttle fully close (vehicle speed 0 km/h or 0 MPH). 5) Read data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%".	Is the value 5%?	Go to step **8.**	Go to step **9.**
8	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to "D" range with throttle fully open (vehicle speed 0 km/h or 0 MPH). 2) Read the data of transfer duty solenoid using Subaru Select Monitor. •Transfer duty solenoid is indicated in "%".	Is the value 90 — 95%?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **8.**
9	**CHECK POOR CONTACT.**	Is there poor contact in transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 2) Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3) Remove the extension case and disconnect connector from transfer duty solenoid. 4) Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 5 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 8 — (AT12) No. 5:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between transfer duty solenoid and transmission connector.

	Step	Check	Yes	No
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 8 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.	Repair the short circuit in harness between transfer duty solenoid and transmission connector.

X: DTC P1708 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

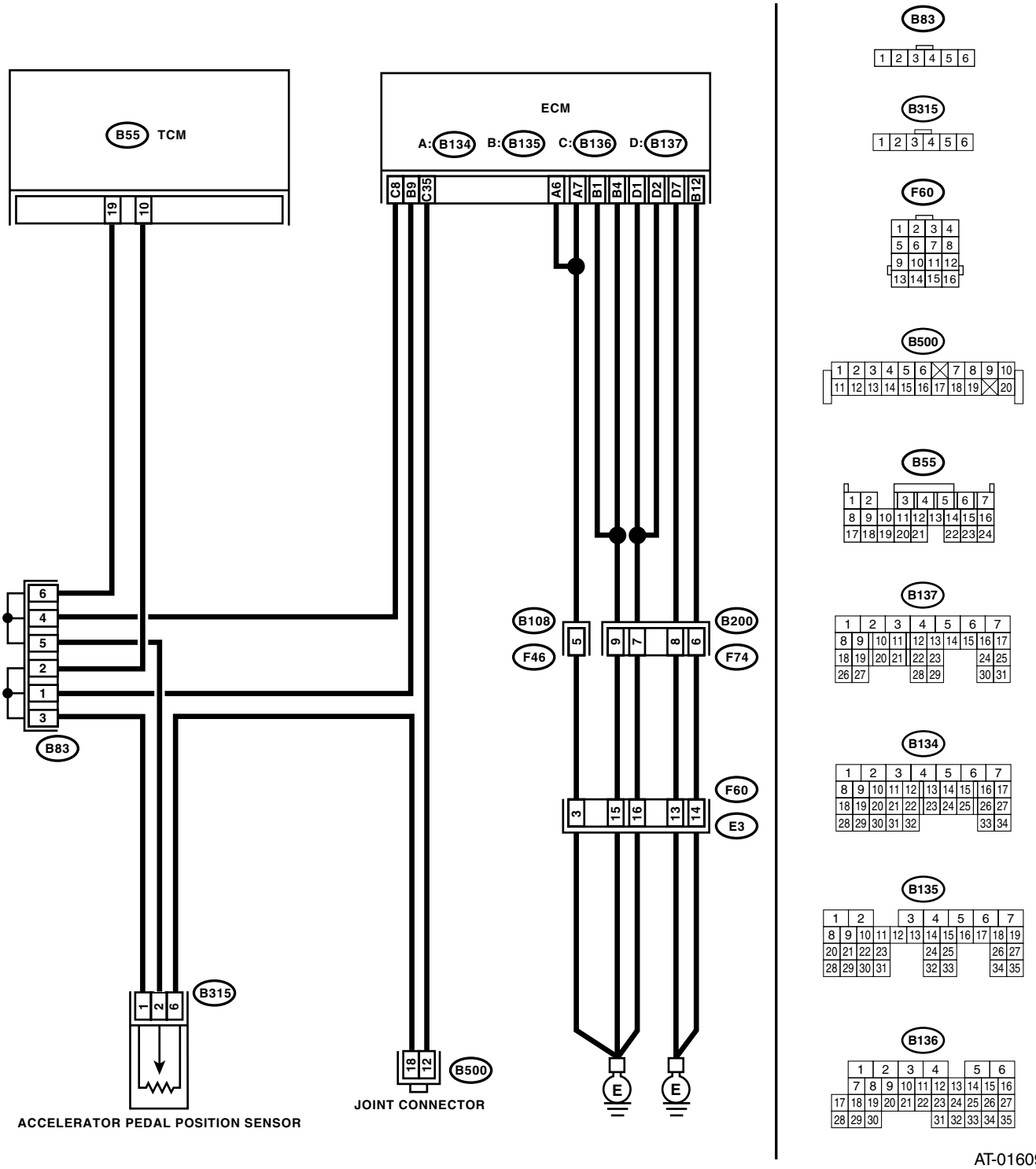
DIAGNOSIS:

The input signal circuit of accelerator pedal position sensor is open or shorted.

TROUBLE SYMPTOM:

- Shift point too high or too low.
- Excessive shift shock.
- Excessive tight corner “braking”.

WIRING DIAGRAM:



AT-01609

	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been tightened?	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 7 — Engine ground:*** ***(B134) No. 6 — Engine ground:*** ***(B135) No. 1 — Engine ground:*** ***(B135) No. 4 — Engine ground:*** ***(B135) No. 12 — Engine ground:*** ***(B137) No. 2 — Engine ground:*** ***(B137) No. 1 — Engine ground:*** ***(B137) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from accelerator pedal position sensor. 2) Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **4.**	Replace the accelerator pedal position sensor.
4	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 6 — No. 2:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **5.**	Replace the accelerator pedal position sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B55) No. 19 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between TCM and accelerator pedal position sensor connector, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between TCM and accelerator pedal position sensor connector.
7	**CHECK HARNESS CONNECTOR BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between accelerator pedal position sensor and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between ECM and accelerator pedal position sensor.
8	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 0.4 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Throttle fully closed. 6) Read the data of accelerator pedal position sensor using Subaru Select Monitor. •Accelerator pedal position sensor input signal is indicated.	Is the voltage more than 0.4 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in accelerator pedal position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

Y: DTC P1709 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

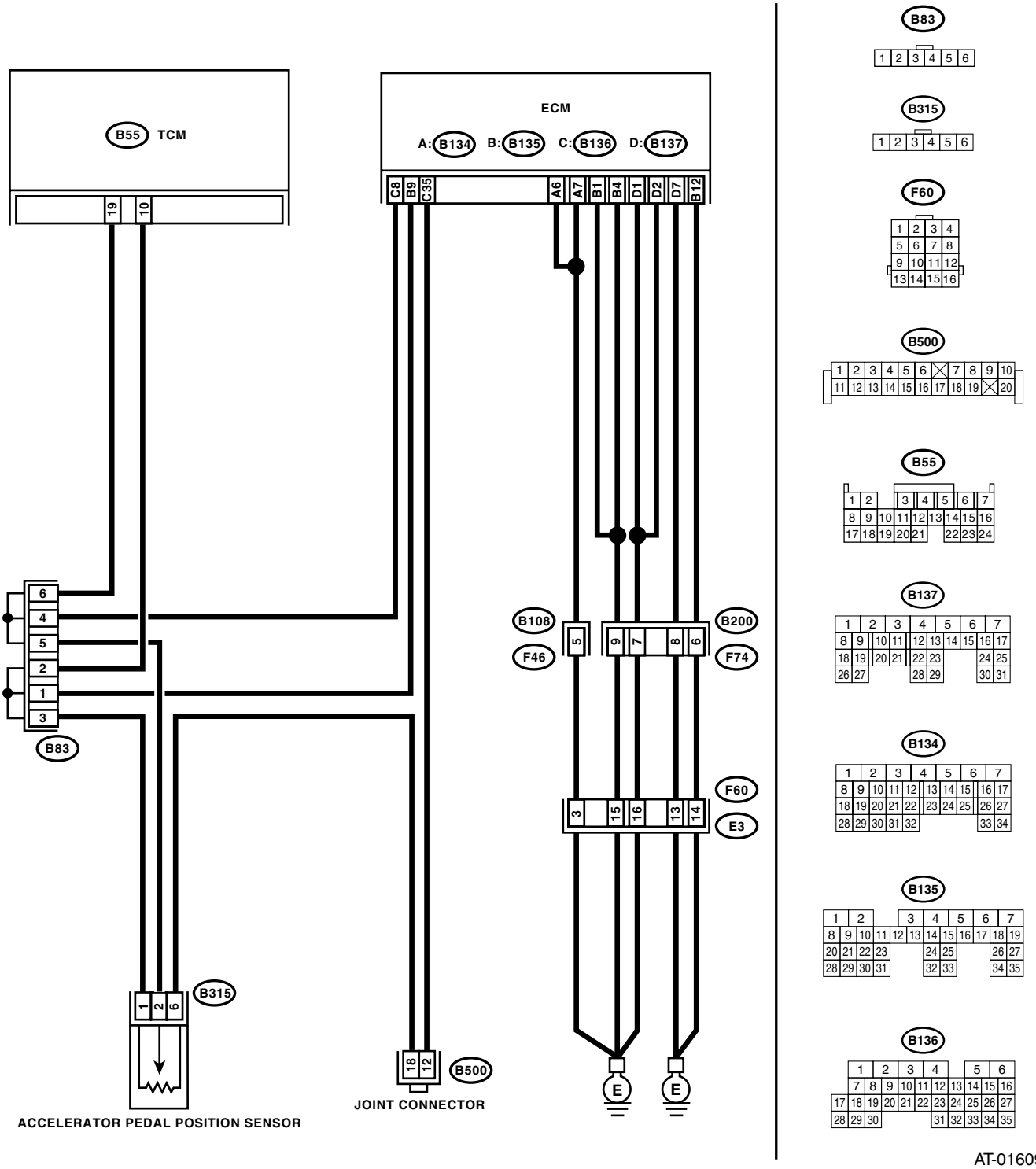
DIAGNOSIS:

The input signal circuit of accelerator pedal position sensor is shorted.

TROUBLE SYMPTOM:

- Shift point too high or too low.
- Excessive shift shock.
- Excessive tight corner “braking”.

WIRING DIAGRAM:



AT-01609

	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been tightened securely?	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 6 — Engine ground:*** ***(B135) No. 7 — Engine ground:*** ***(B135) No. 1 — Engine ground:*** ***(B135) No. 4 — Engine ground:*** ***(B137) No. 12 — Engine ground:*** ***(B137) No. 1 — Engine ground:*** ***(B137) No. 2 — Engine ground:*** ***(B137) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from accelerator pedal position sensor. 2) Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **4.**	Replace the accelerator pedal position sensor.
4	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **5.**	Replace the accelerator pedal position sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the short circuit in harness between TCM and accelerator pedal position sensor connector.
6	**CHECK HARNESS CONNECTOR BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B315) No. 6 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the short circuit in harness between ECM and accelerator pedal position sensor connector.
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Throttle fully opened. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 4.6 V?	Go to step **10.**	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Throttle fully opened. 6) Read the data of accelerator pedal position sensor using Subaru Select Monitor. •Accelerator pedal position sensor input signal is indicated.	Is the voltage more than 4.6 V?	Go to step **10.**	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.
10	**CHECK POOR CONTACT.**	Is there poor contact in accelerator pedal position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

Z: DTC P1714 — THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT —

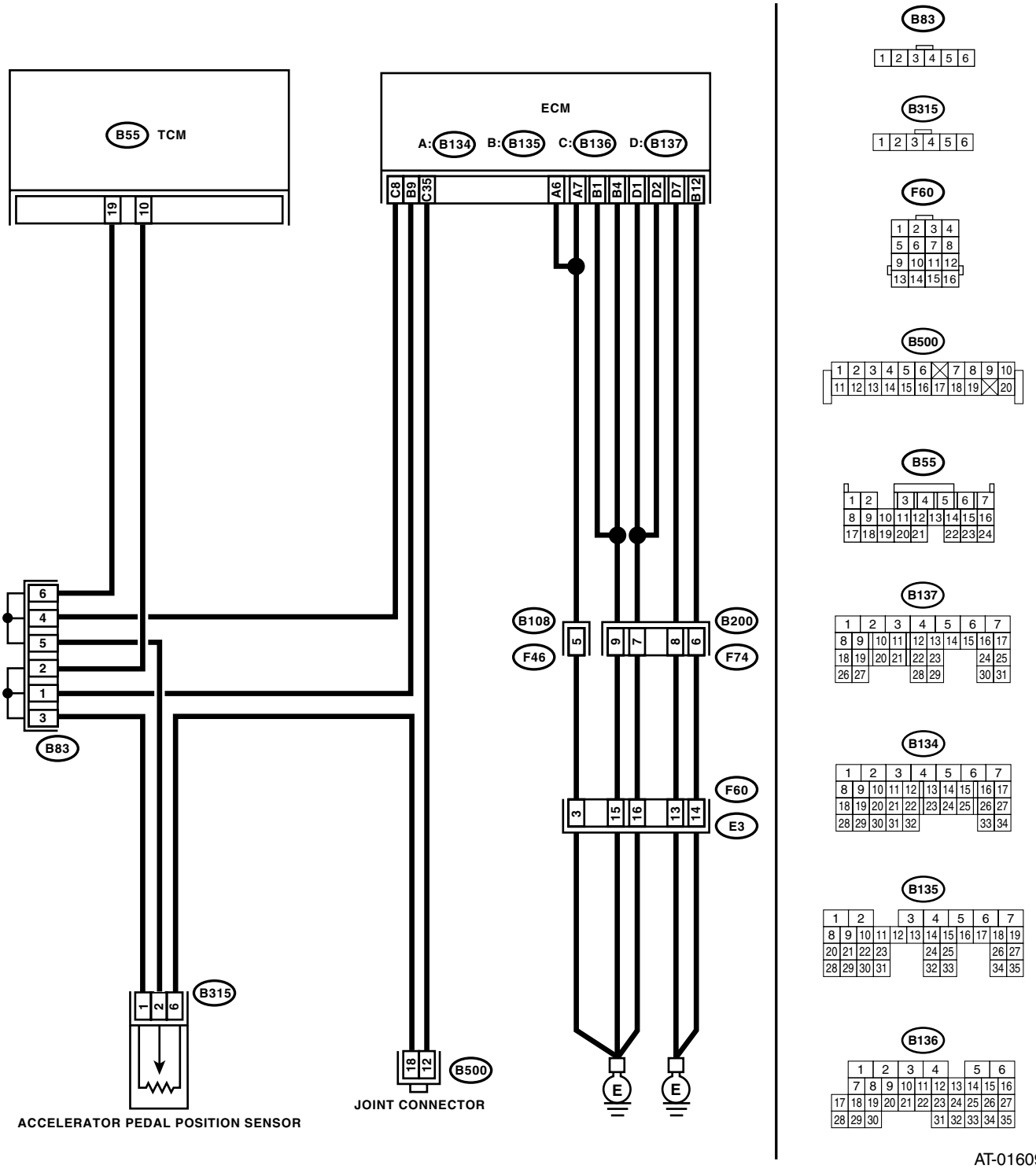
DIAGNOSIS:

The power supply circuit of accelerator pedal position sensor is open or shorted.

TROUBLE SYMPTOM:

- Shift point too high or too low.
- Excessive shift shock.
- Excessive tight corner “braking”.

WIRING DIAGRAM:



AT-01609

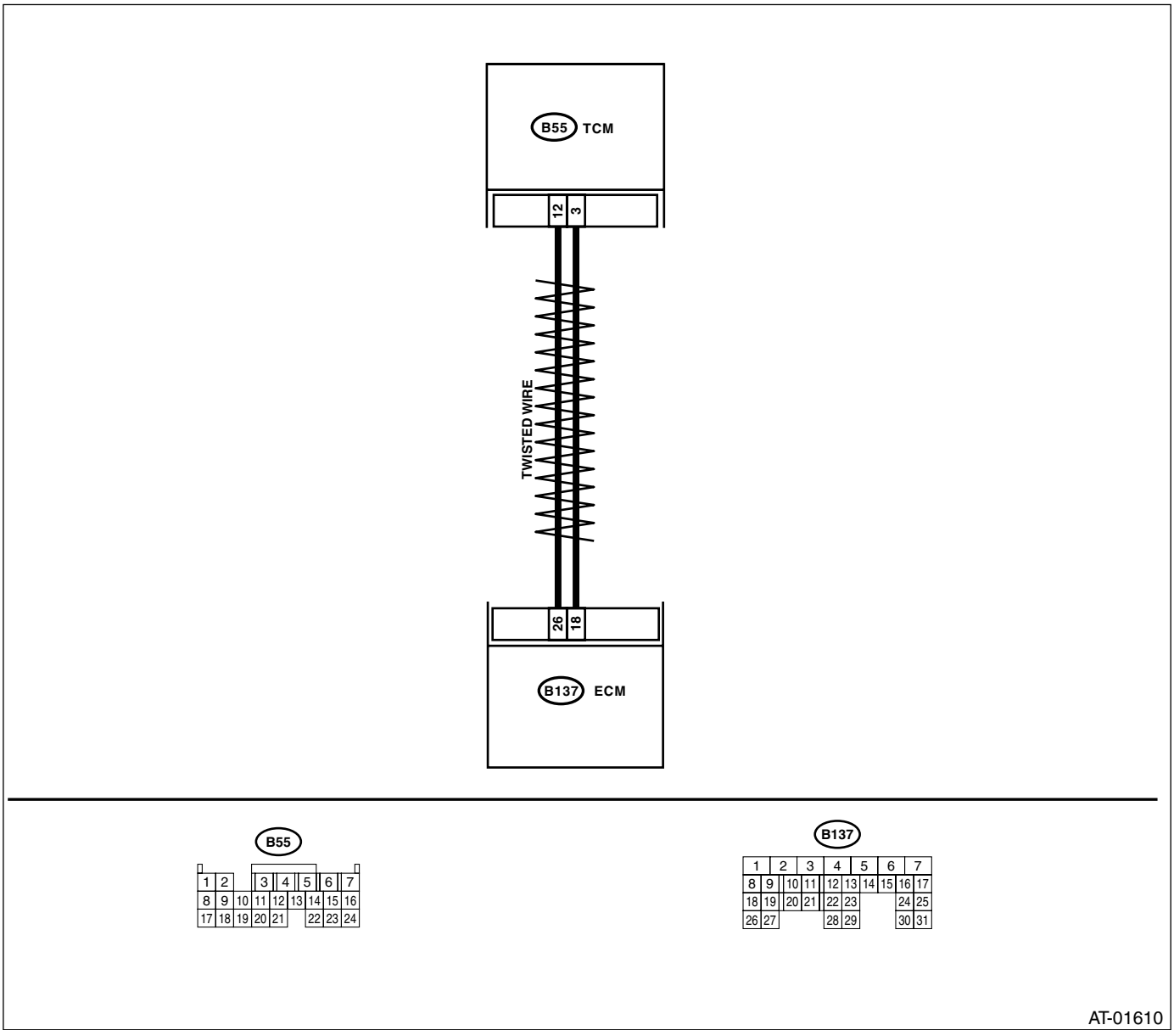
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B55) No. 10 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and accelerator pedal position sensor connector, and poor contact in coupling connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and accelerator pedal position sensor connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (–):***	Is the voltage approx. 5 V?	Go to step **4.**	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.
4	**CHECK POOR CONTACT.**	Is there poor contact in accelerator pedal position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

AA:DTC P1718 — CAN COMMUNICATION CIRCUIT MALFUNCTION —

DIAGNOSIS:

Input signal circuit of TCM is open or shorted.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Check if multiple trouble codes appear in the on-board diagnostics test mode.	Are multiple DTCs displayed?	Go to other DTC.	Go to step **2.**
2	**CHECK HERNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect TCM and ECM connectors. 3) Measure resistance of harness between ECM and TCM connector. ***Connector & Terminal*** ***(B55) No. 3 — (B137) No. 18:***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between TCM and ECM, or poor contact in coupling connector.
3	**CHECK HERNESS CONNECTOR BETWEEN TCM AND ECM.** Measure resistance of harness between ECM and TCM connector. ***Connector & Terminal*** ***(B55) No. 12 — (B137) No. 26:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and ECM, or poor contact in coupling connector.
4	**CHECK HERNESS CONNECTOR BETWEEN TCM AND ECM.** Measure resistance of harness between TCM and chassis ground. ***Connector & Terminal*** ***(B55) No. 3 — Chassis ground:*** ***(B55) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	There is failure in the TCM or ECM. (Replace and check again)	Repair short circuit in harness between TCM and ECM.

AB:DTC P1817 — SPORT MODE SWITCH CIRCUIT (MANUAL SWITCH) —

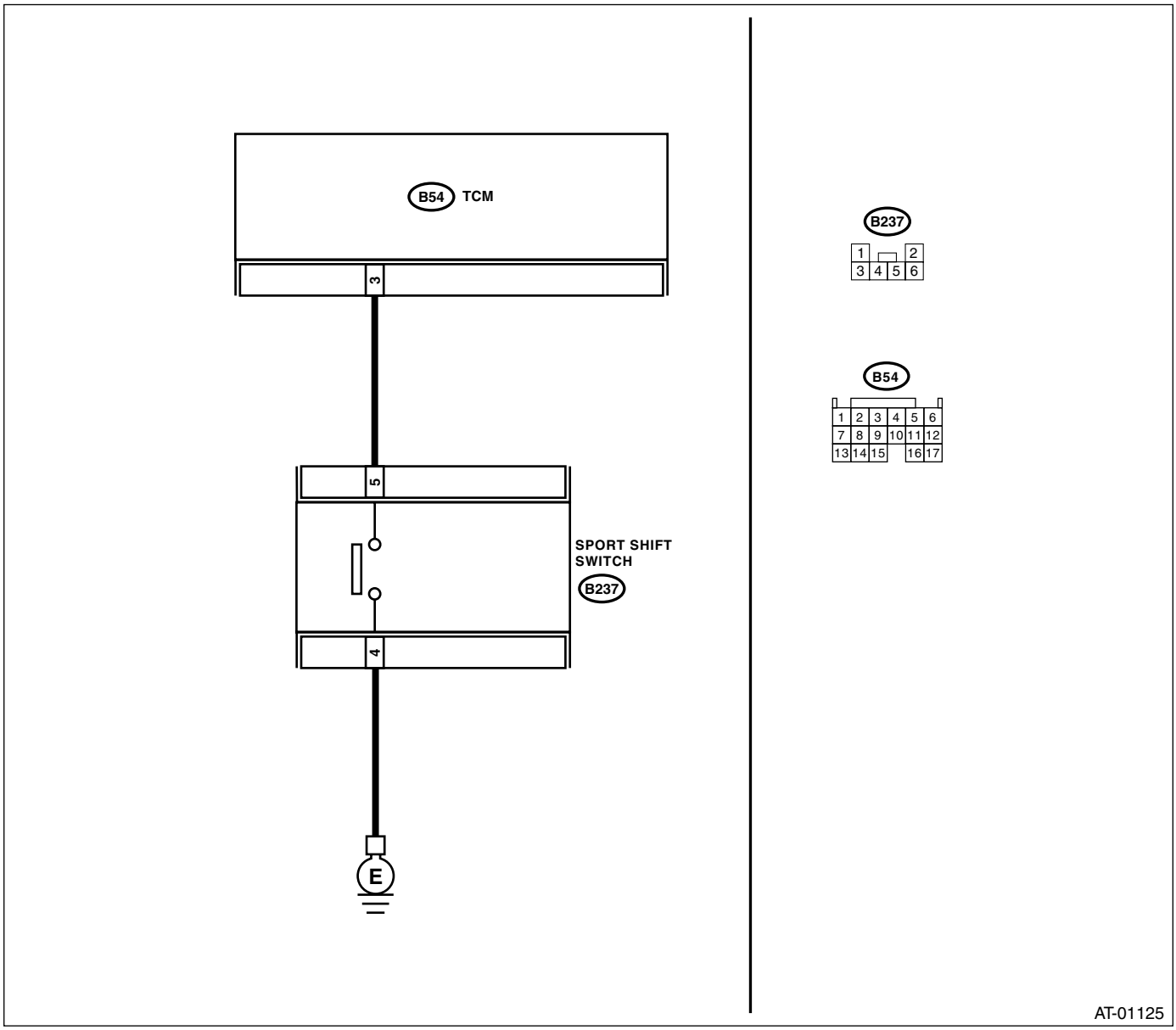
DIAGNOSIS:

The SPORT shift switch input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No SPORT shift mode occurs.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPORT SHIFT SWITCH GROUND LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from SPORT shift switch. 3) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 4 —- Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between SPORT shift switch and chassis ground.
2	**CHECK SPORT SHIFT SWITCH.** Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 4 —- No. 5:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the lever plate assembly.
3	**CHECK SPORT SHIFT SWITCH.** 1) Move the select lever to SPORT shift mode. 2) Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 4 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the lever plate assembly.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B237) No. 5 — (B54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between SPORT shift switch connector and TCM connector.
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and SPORT shift switch. 2) Turn ignition switch to ON. (Engine is stopped.) 3) Move the select lever to normal mode. 4) Measure the signal voltage for TCM. ***Connector & terminal*** ***(B54) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **7.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

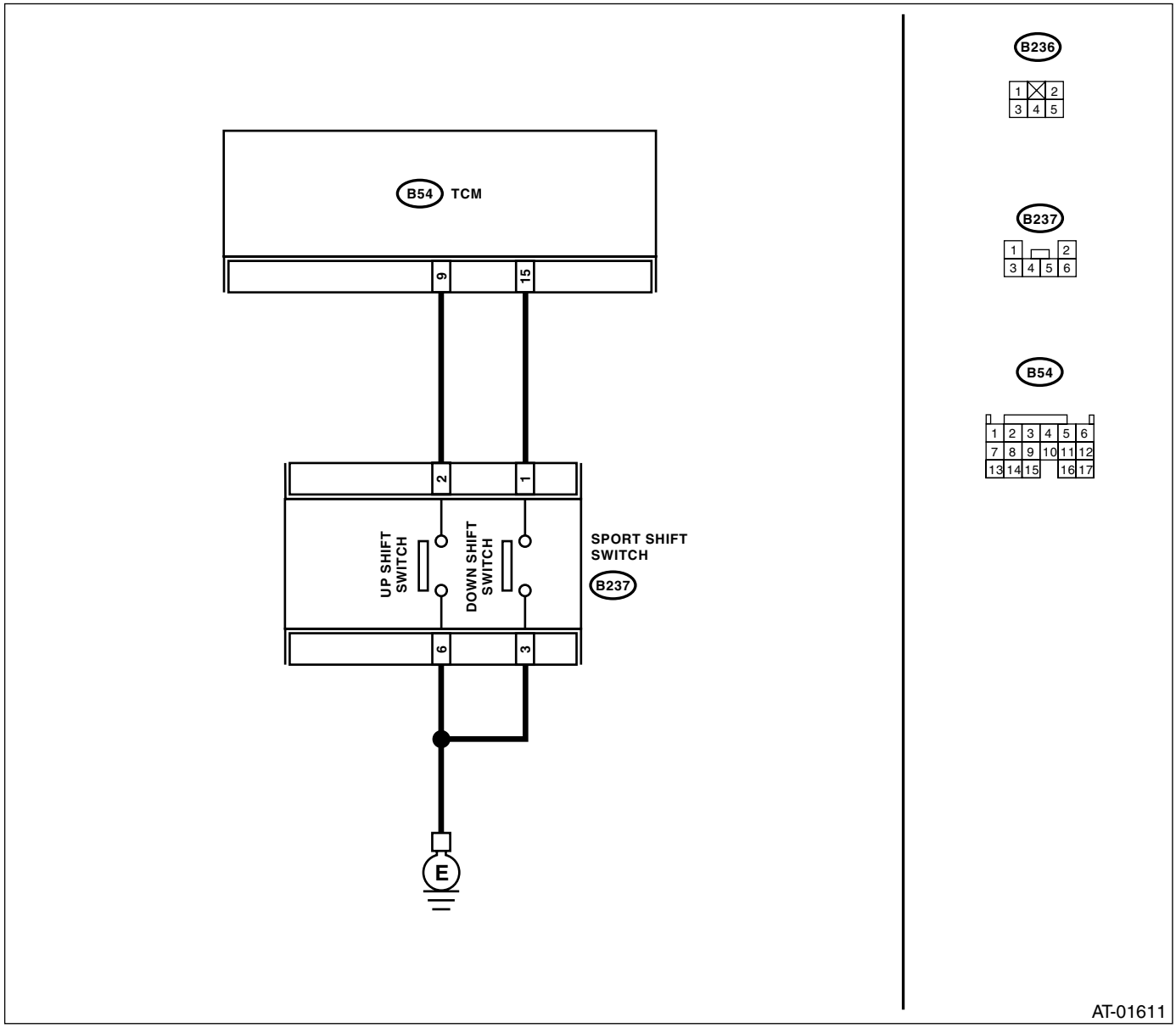
Step		Check	Yes	No
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever to SPORT shift mode. 2) Measure the signal voltage for TCM. ***Connector & terminal*** ***(B55) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the connector or harness in SPORT shift switch circuit.	Go to step **8.**
8	**CHECK POOR CONTACT.**	Is there poor contact in SPORT shift switch circuit?	Repair the poor the contact.	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

MEMO:

15.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

A: CHECK SPORT SHIFT SWITCH

DIAGNOSIS:
SPORT shift switch input signal circuit is open or shorted.
TROUBLE SYMPTOM:
Does not shift gears in SPORT shift mode.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPORT SHIFT SWITCH.** 1) Connect the Subaru Select Monitor to vehicle and turn the ignition switch ON and Subaru Select Monitor ON. 2) Subaru Select Monitor is set with LED display screen. 3) Move the select lever to sport shift mode. 4) Move and hold the select lever to up side.	Does the LED of Subaru Select Monitor light up?	Go to step **2.**	Go to step **3.**
2	**CHECK SPORT SHIFT SWITCH.** Move and hold the select lever to down side.	Does the LED of Subaru Select Monitor light up?	Go to "Inspection of SPORT shift indicator" procedures. <Ref. to 4AT(H4DOTC)-124, CHECK SPORT SHIFT INDICATOR.>	Go to step **12.**
3	**CHECK SPORT SHIFT SWITCH GROUND LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from SPORT shift switch. 3) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 6 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between SPORT shift switch and chassis ground.
4	**CHECK SPORT SHIFT SWITCH.** Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 6 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the guide plate assembly.
5	**CHECK SPORT SHIFT SWITCH.** 1) Move the select lever to SPORT shift mode. 2) Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 6 — No. 2:*** Is the measured value less than the specified value?	Is the resistance less than 1 Ω?	Go to step **6.**	Replace the guide plate assembly.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B237) No. 2 — (B54) No. 9:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from steering roll connector. 2) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between SPORT shift switch connector and TCM connector.

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Turn the ignition switch to ON. (Engine is stopped.) 3) Measure the signal voltage for TCM. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):***	Is the voltage mode than 9 V?	Go to step **9.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
9	**CHECK INPUT SIGNAL FOR TCM.** 1) Move select lever to shift up side. 2) Measure the signal voltage for TCM. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
10	**CHECK SPORT SHIFT SWITCH GROUND LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from SPORT shift switch. 3) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open circuit in harness between SPORT shift switch and chassis ground.
11	**CHECK SPORT SHIFT SWITCH.** Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 3 — No. 1:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Replace the guide plate assembly.
12	**CHECK SPORT SHIFT SWITCH.** 1) Move the select lever to SPORT shift mode. 2) Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B237) No. 3 — No. 1:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the guide plate assembly.
13	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B237) No. 1 — (B54) No. 15:***	Is the resistance less than 1 Ω?	Go to step **14.**	Repair the open circuit in harness between SPORT shift switch connector and TCM connector and poor contact in coupling connector.
14	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the steering roll connector. 2) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B237) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **15.**	Repair the short circuit in harness between SPORT shift switch connector and TCM connector.
15	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Turn the ignition switch to ON. (Engine is stopped.) 3) Measure the signal voltage for TCM. ***Connector & terminal*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **16.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>

Step		Check	Yes	No
16	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever to shift down side. 2) Measure the signal voltage for TCM. ***Connector & terminal*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **17.**	Replace the TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
17	**CHECK POOR CONTACT.**	Is there poor contact in SPORT shift switch circuit?	Repair the poor contact.	Intermittent poor contact in SPORT shift switch circuit connector or harness

B: CHECK SPORT SHIFT INDICATOR

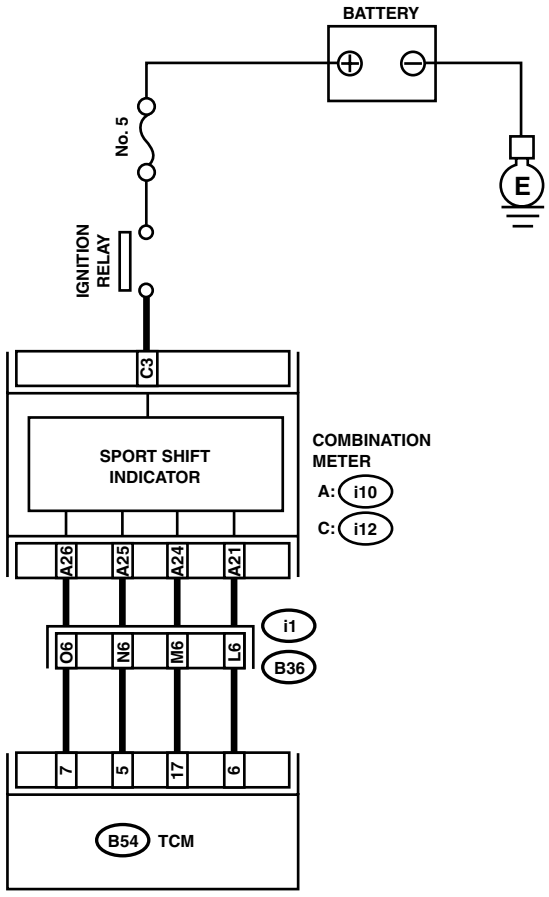
DIAGNOSIS:

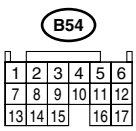
The SPORT shift indicator output signal circuit is open or shorted.

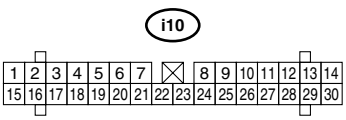
TROUBLE SYMPTOM:

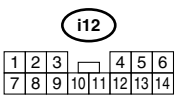
- SPORT shift indicator does not illuminate or remains illuminated.
- SPORT shift indicator display does not change.

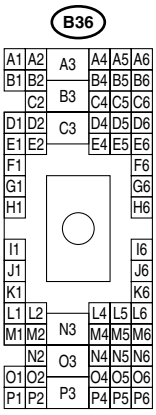
WIRING DIAGRAM:











AT-01612

	Step	Check	Yes	No
1	**CHECK SPORT SHIFT INDICATOR.**	Does SPORT shift indicator operate normally when driving in SPORT shift mode?	Go to "CHECK BUZZER". <Ref. to 4AT(H4DOTC)-126, CHECK BUZZER.>	Go to step **2.**
2	**CHECK COMBINATION METER.**	Do meters and indicators other than SPORT shift indicator operate normally?	Go to step **3.**	Check the combination meter.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 6 — (i10) No. 21:*** ***(B54) No. 17 — (i10) No. 24:*** ***(B54) No. 5 — (i10) No. 25:*** ***(B54) No. 7 — (i10) No. 26:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and combination meter connector and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 6 — Chassis ground:*** ***(B54) No. 17 — Chassis ground:*** ***(B54) No. 7 — Chassis ground:*** ***(B54) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and combination meter connector.
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connector to TCM and combination meter. 2) Turn the ignition switch to ON. (Engine is stopped.) 3) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 6 (+) — Chassis ground (–):*** ***(B54) No. 17 (+) — Chassis ground (–):*** ***(B54) No. 7 (+) — Chassis ground (–):*** ***(B54) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **6.**	Replace the combination meter.
6	**CHECK POOR CONTACT.**	Is there poor contact in SPORT shift indicator circuit?	Repair the poor contact.	Replace the TCM.

C: CHECK BUZZER

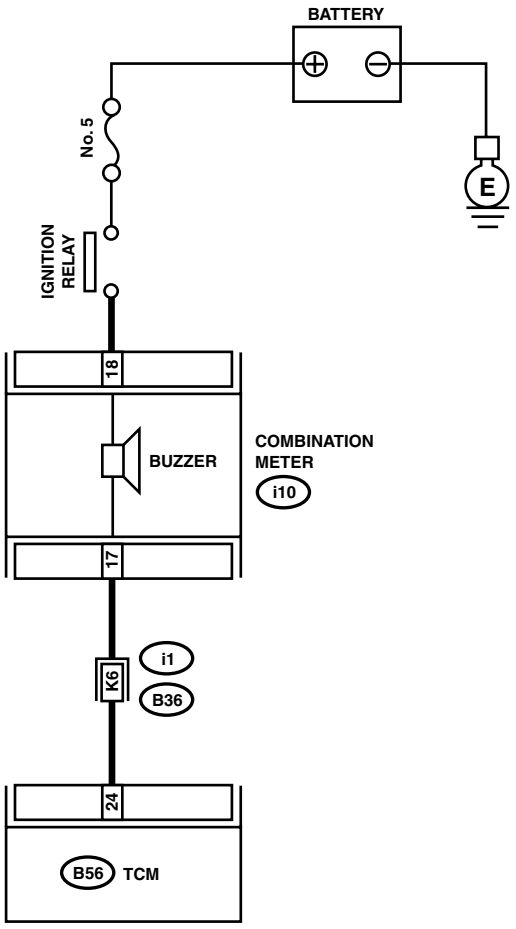
DIAGNOSIS:

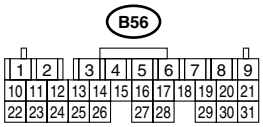
Buzzer output signal circuit is open or shorted.

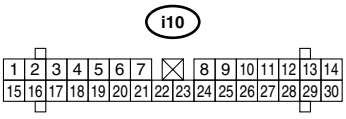
TROUBLE SYMPTOM:

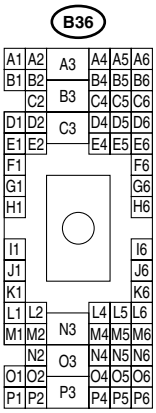
Buzzer remains sounded.

WIRING DIAGRAM:









AT-01613

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from combination meter and TCM. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit in harness between TCM and combination meter connector.
2	**CHECK COMBINATION METER.** 1) Connect connector to combination meter. 2) Turn ignition switch to ON. (Engine is stopped.)	Does buzzer sound?	Replace the combination meter.	Go to step **3.**
3	**CHECK POOR CONTACT.**	Is there poor contact in buzzer circuit?	Repair the poor contact.	Replace the TCM.

16.Symptom and Related Malfunction

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N” range, starter rotates when select lever is in “R”, “D”, “3” or “2” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in “P” or “N” range.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from “1” range to another.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in “N” range.	• Select cable • Inhibitor switch • TCM • Low clutch
Shock occurs when select lever is moved from “N” to “D” range.	• Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Low clutch duty solenoid • Low clutch • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “D” range.	• Control valve • Low clutch • Line pressure linear solenoid • Seal ring • Front gasket of transmission case
Shock occurs when select lever is moved from “N” to “R” range.	• Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • TCM • Harness • Control valve • ATF deterioration

Symptom	Problem parts
Excessive time lag occurs when select lever is moved from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure linear solenoid • Seal ring • Front gasket of transmission case
Vehicle does not start in any shift range (engine stalls).	• Parking brake mechanism • Planetary gear
Vehicle does not start in any shift range (engine revving up).	• Strainer • Line pressure linear solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket of transmission case
Vehicle does not start in “R” range only (engine revving up).	• Select cable • Select lever • Line pressure linear solenoid • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D”, “3” range only (engine revving up).	• Low clutch • One-way clutch
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	• Low clutch
Vehicle does not start in “D”, “3” or “2” range only (engine stalls).	• Reverse clutch
Vehicle starts in “R” range only (engine revving up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• Control valve • Low clutch • Reverse clutch • ATF level too low • ATF deterioration • Front gasket of transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear

Symptom	Problem parts
No shift occurs from 1st to 2nd gear.	• TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	• TCM • Control valve • High clutch
No shift occurs from 3rd to 4th gear.	• TCM • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in “3” range.	• Inhibitor switch • TCM • Accelerator pedal position sensor • Control valve
Engine brake is not effected when select lever is in “3” or “2” range.	• Control valve
Engine brake is not effected when select lever is in “1” range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Accelerator pedal position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Torque converter turbine speed sensor • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	• ATF level too high
Differential oil spurts out.	• Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • Low & reverse duty solenoid

Symptom	Problem parts
Slippage occurs from 1st to 2nd gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake
Shock occurs from 2nd to 3rd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Low & reverse duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • High clutch duty solenoid
Slippage occurs from 2nd to 3rd gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • High clutch • 2-4 brake • Low & reverse duty solenoid
Shock occurs from 3rd to 4th gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • Low clutch duty solenoid • 2-4 brake • ATF deterioration • Engine performance
Slippage occurs from 3rd to 4th gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake
Shock occurs when select lever is moved from “3” to “2” range.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • High clutch duty solenoid

Symptom	Problem parts
Shock occurs when select lever is moved from “D” to “1” range.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • ATF deterioration • Low & reverse brake duty solenoid • Low & reverse clutch solenoid
Shock occurs when select lever is moved from “2” to “1” range.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • Low & reverse brake duty solenoid
Shock occurs when accelerator pedal is released at medium speeds.	• TCM • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • Lock-up damper • Engine performance
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns (tight corner “braking” phenomenon).	• TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	• TCM • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detente spring • Manual plate
Select lever is too high to move (unreasonable resistance).	• Detente spring • Manual plate

Symptom	Problem parts
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detente spring • Manual plate
System does not shift to SPORT shift mode.	• SPORT shift switch

MEMO:

AUTOMATIC TRANSMISSION (DIAGNOSTICS) 4AT(H6DO)

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1. General Description

A: NOTE

The diagnostic procedure for H6 models is described in 4AT (H4SO) section. <Ref. to 4AT(H4SO)-2, Basic Diagnostic Procedure.>

MANUAL TRANSMISSION AND DIFFERENTIAL

5MT

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1. General Description

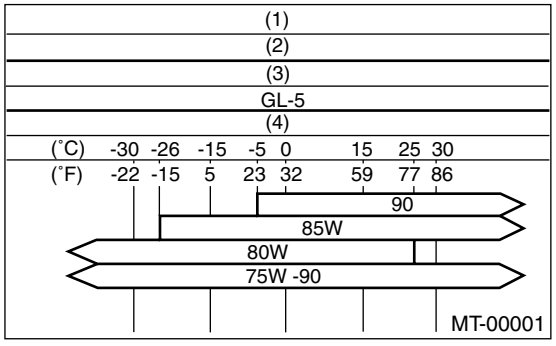
A: SPECIFICATIONS

1. Manual Transmission and Differential

Item Type			Model			
			L, L-S	GT, GTLO	OUTBACK, BAJA (Non-TURBO model)	BAJA (TURBO model)
Type			5-forward speeds with synchromesh and 1 reverse			
Transmission gear ratio		1st	3.454			
		2nd	2.062			1.947
		3rd	1.448			1.366
		4th	1.088			0.972
		5th	0.780		0.871	0.738
		Reverse	3.333			
Front reduction gear	Final	Type of gear	Hypoid			
		Gear ratio	3.900	4.111		4.444
Rear reduction gear	Transfer	Type of gear	Helical			
		Gear ratio	1.000			
	Final	Type of gear	Hypoid			
		Gear ratio	3.900	4.111		4.444
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)			
Center differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)			
Transmission gear oil			GL-5			
Transmission gear oil capacity			3.5 ℓ (3.7 US qt, 3.1 Imp qt)			

2. TRANSMISSION GEAR OIL

Recommended oil



(1) Item
(2) Transmission gear oil
(3) API classification
(4) SAE viscosity No. and applicable temperature

3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment
Hypoid gear backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Selection of main shaft rear plate

Main shaft rear plate		
Dimension “A” mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing
Starting torque
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. MAIN SHAFT

Snap ring (Outer-25) to synchronizer hub clearance
0.060 — 0.100 mm (0.0024 — 0.0039 in)

Snap ring (Outer-25)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805025051	2.42 (0.0953)	805025055	2.62 (0.1031)
805025052	2.47 (0.0972)	805025056	2.67 (0.1051)
805025053	2.52 (0.0992)	805025057	2.72 (0.1071)
805025054	2.57 (0.1012)	805025058	2.37 (0.0933)

6. REVERSE IDLER GEAR

Adjustment of reverse idler gear position
Reverse idler gear to transmission case (LH) wall clearance
6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to the case wall

After installing a suitable reverse shifter lever, adjust the reverse idler gear to transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers.

Washer (20.5 × 26 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

7. SHIFTER FORK AND ROD

Select the suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.
Rod end clearance
A: 1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)
B: 3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA071	No mark	Standard
32810AA101	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork (Non-TURBO model)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	No mark	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in)

5th shifter fork (Turbo model)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA241	No mark	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in)

8. TRANSFER CASE OR REAR CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

9. EXTENSION ASSEMBLY

Preload (specified protrusion amount) of taper roller bearing:
0.15 — 0.20 mm (0.006 — 0.008 in)

NOTE:
Be sure to keep the preload within specifications.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

Thrust washer to center differential side clearance
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

10.FRONT DIFFERENTIAL

Bevel gear to pinion backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 × 50 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

Pinion shaft to axle drive shaft clearance
0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-28)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805028011	1.05 (0.0413)	805028012	1.20 (0.0472)

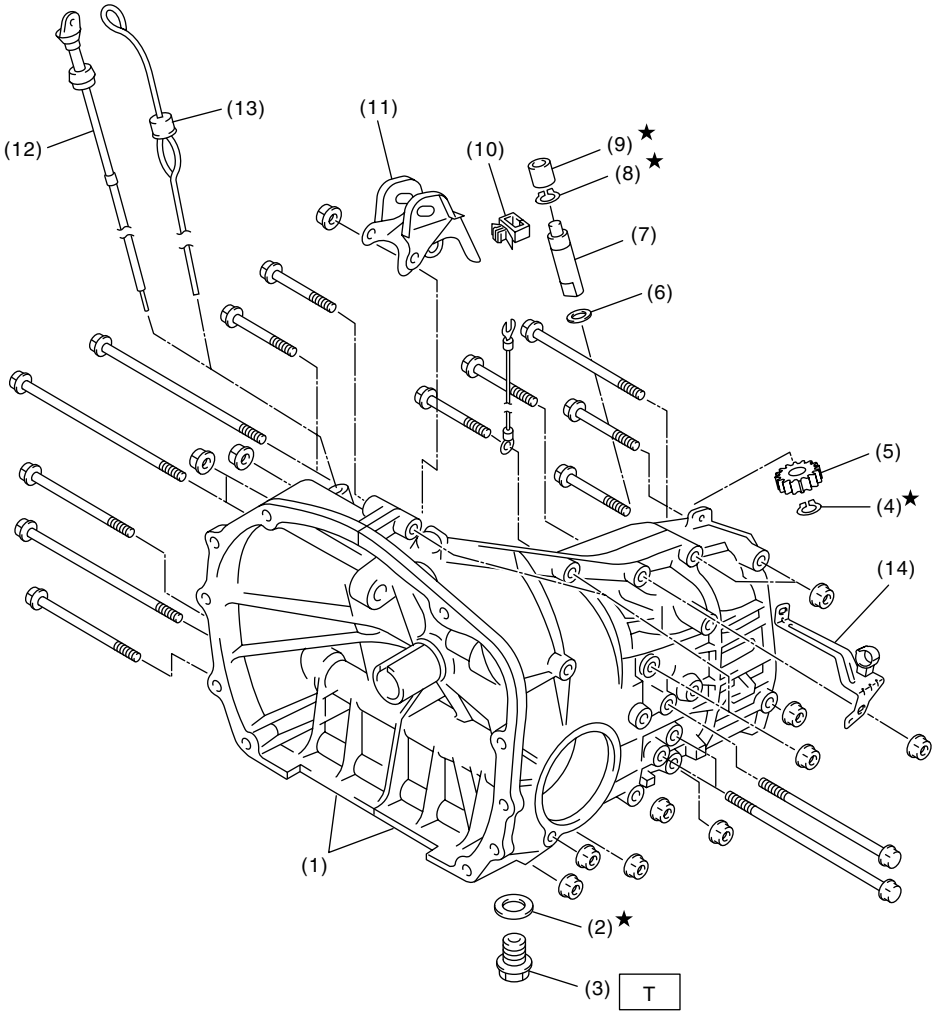
11.TRANSFER DRIVE GEAR

Snap ring (Outer-30) to ball bearing clearance
0.01 — 0.15 mm (0.0004 — 0.0059 in)

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

B: COMPONENT

1. TRANSMISSION CASE

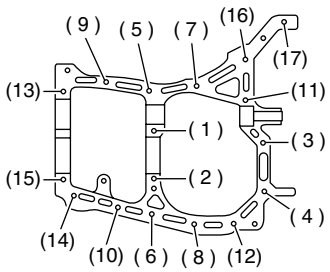


MT-00974

(1) Transmission case ASSY
(2) Gasket
(3) Drain plug
(4) Snap ring (Outer)
(5) Speedometer driven gear
(6) Washer
(7) Speedometer shaft
(8) Snap ring (Outer)
(9) Oil seal
(10) Clamp
(11) Pitching stopper bracket
(12) Oil level gauge (Non-TURBO model)
(13) Oil level gauge (Turbo model)
(14) Harness bracket (Non-TURBO model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51)

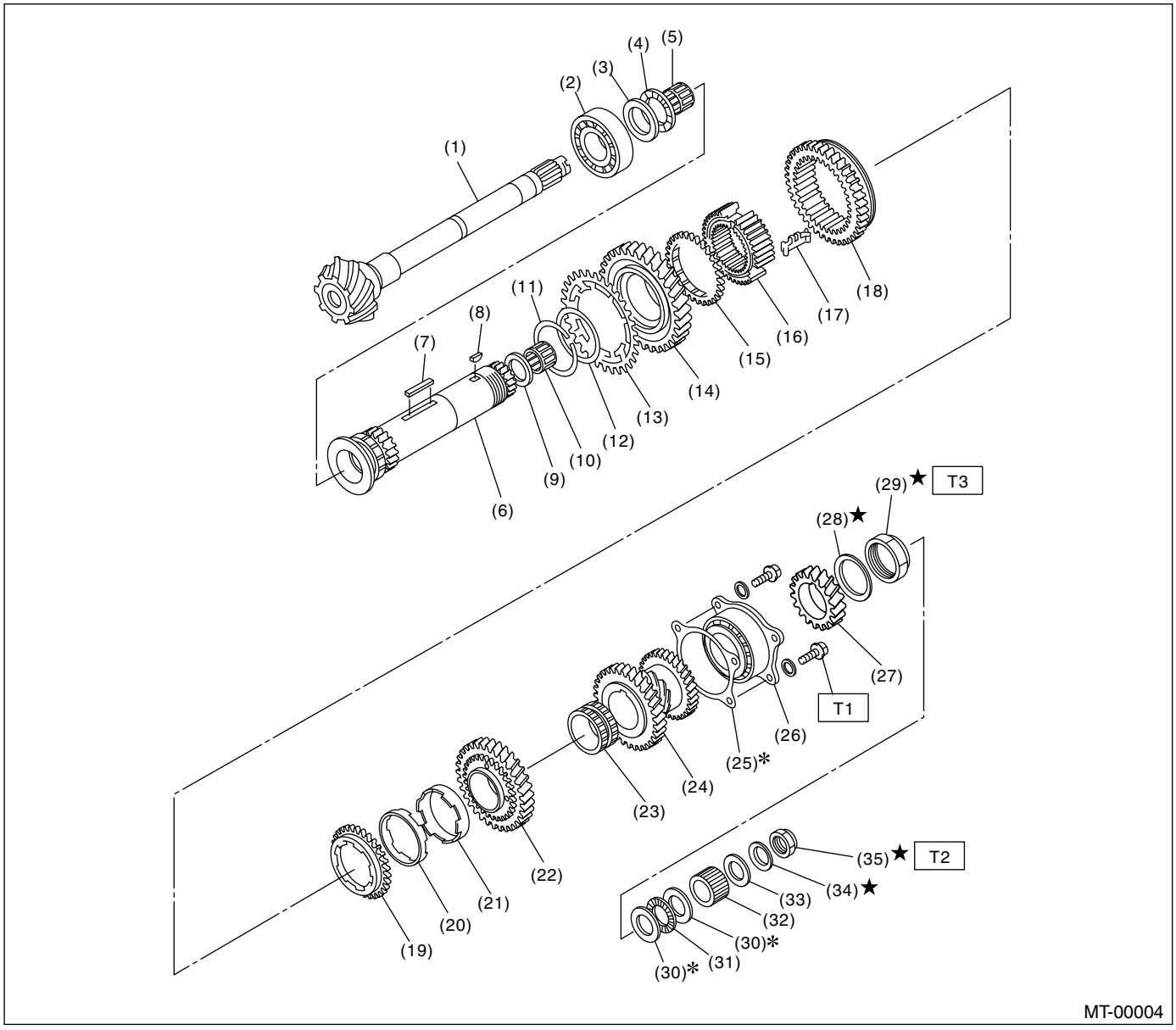
• Transmission case tightening torque



MT-00003

Bolt No.	Bolt size	Tightening torque: N·m (kgf-m, ft-lb)
<5> to <15>	8 mm	25 (2.5, 18.1)
<1> to <4> <16>, <17>	10 mm	39 (4.0, 28.9)

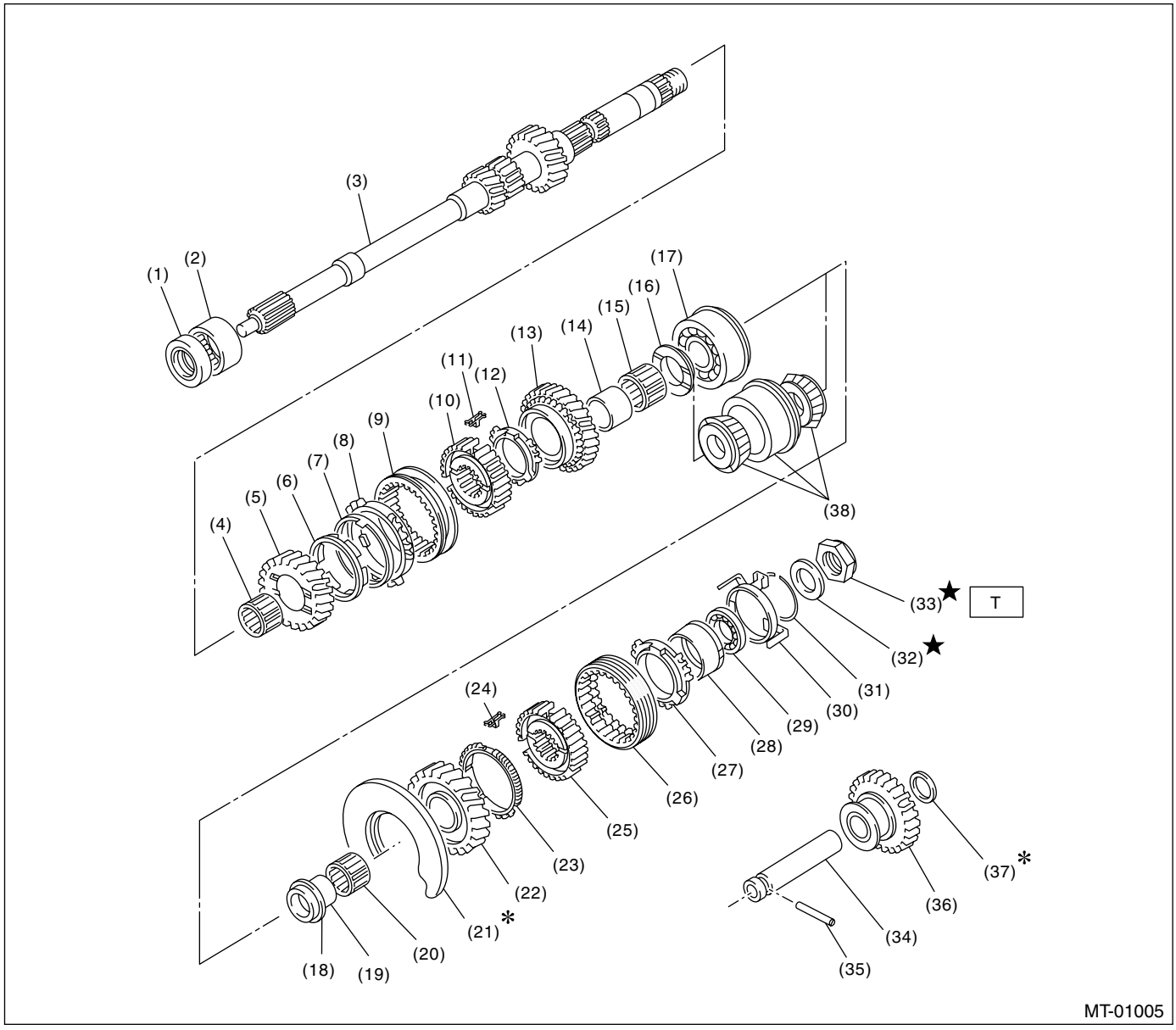
2. DRIVE PINION ASSEMBLY



(1) Drive pinion shaft
(2) Roller bearing
(3) Washer
(4) Thrust bearing
(5) Needle bearing
(6) Driven shaft
(7) Key
(8) Woodruff key
(9) Drive pinion collar
(10) Needle bearing
(11) Snap ring (Outer)
(12) Washer
(13) Sub gear
(14) 1st driven gear
(15) Baulk ring
(16) 1st-2nd synchronizer hub
(17) Insert key
(18) Reverse driven gear
(19) Outer baulk ring
(20) Synchro cone
(21) Inner baulk ring
(22) 2nd driven gear
(23) 2nd driven gear bush
(24) 3rd-4th driven gear
(25) Driven pinion shim
(26) Roller bearing
(27) 5th driven gear
(28) Lock washer
(29) Lock nut
(30) Washer
(31) Thrust bearing
(32) Differential bevel gear sleeve
(33) Washer
(34) Lock washer
(35) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.4)
T2: 120 (12.2, 88.5)
T3: 260 (26.5, 191.7)

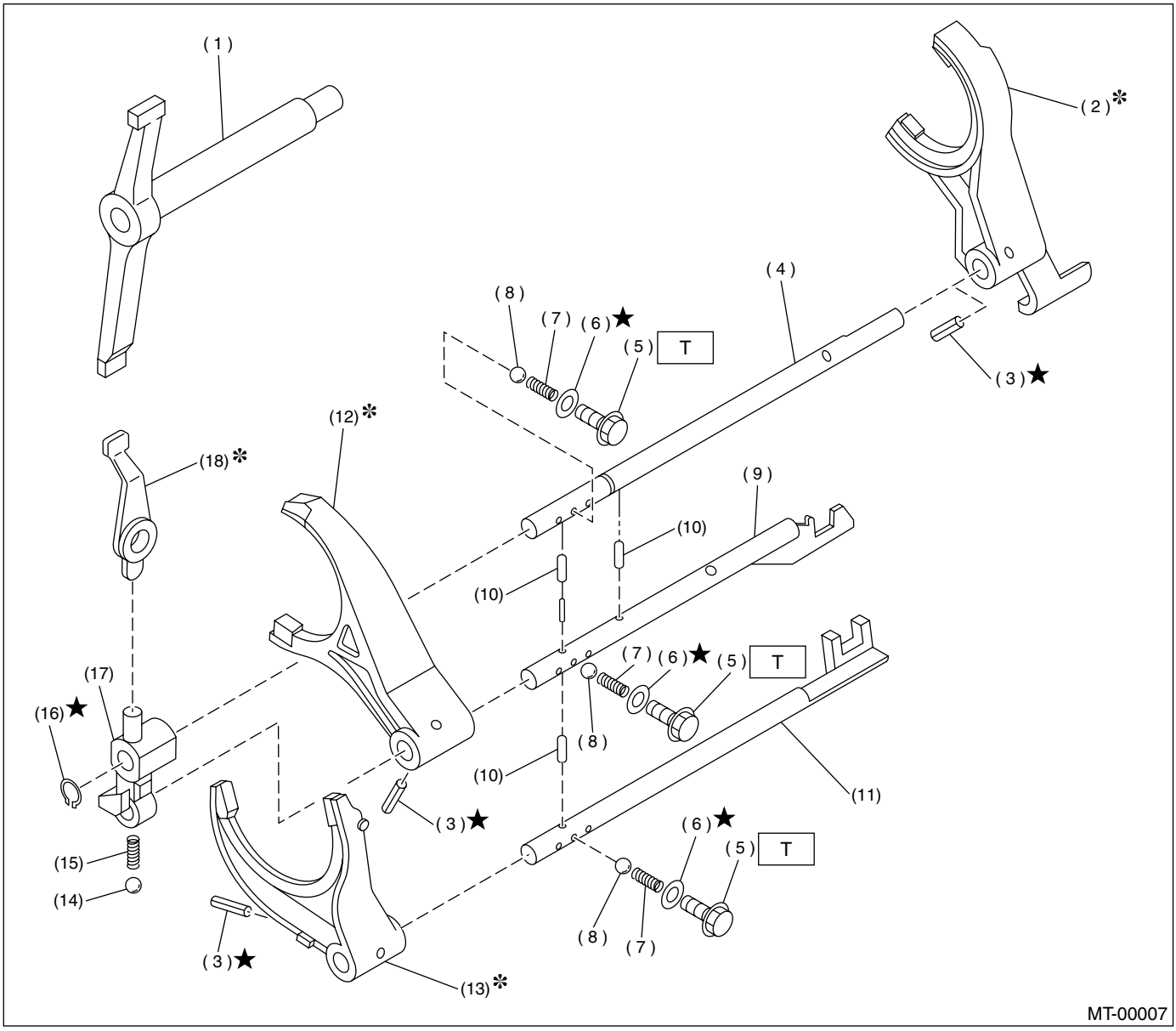
3. MAIN SHAFT ASSEMBLY



(1) Oil seal
(2) Needle bearing
(3) Transmission main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) 3rd synchro cone
(8) Outer baulk ring
(9) 3rd-4th coupling sleeve
(10) 3rd-4th synchronizer hub
(11) 3rd-4th shifting insert key
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Ball bearing (Non-TURBO model)
(18) 5th gear thrust washer (Non-TURBO model)
(19) 5th needle bearing race
(20) Needle bearing
(21) Main shaft rear plate
(22) 5th drive gear
(23) 5th baulk ring
(24) 5th-Rev shifting insert key
(25) 5th-Rev synchronizer hub
(26) 5th-Rev coupling sleeve
(27) Rev baulk ring
(28) Rev synchro cone
(29) Ball bearing
(30) Synchro cone stopper
(31) Snap ring
(32) Lock washer
(33) Lock nut
(34) Reverse idler gear shaft
(35) Straight pin
(36) Reverse idler gear
(37) Washer
(38) Taper roller bearing (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 120 (12.2, 88.5)

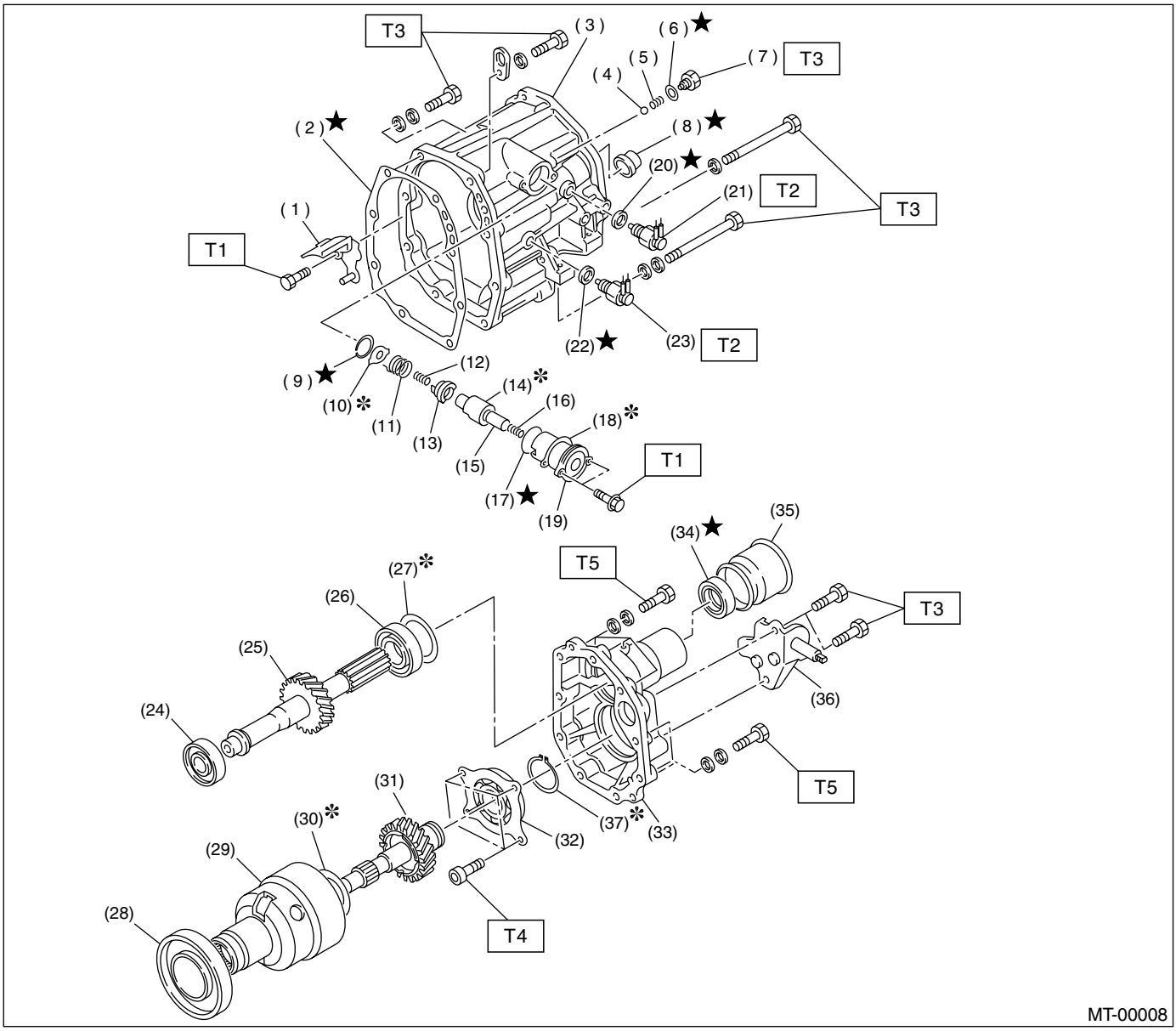
4. SHIFTER FORK AND SHIFTER ROD



(1) Shifter arm
(2) 5th shifter fork
(3) Straight pin
(4) Reverse fork rod
(5) Checking ball plug
(6) Gasket
(7) Checking ball spring
(8) Ball
(9) 3rd-4th fork rod
(10) Interlock plunger
(11) 1st-2nd fork rod
(12) 3rd-4th shifter fork
(13) 1st-2nd shifter fork
(14) Ball
(15) Spring
(16) Snap ring (Outer)
(17) Reverse fork rod arm
(18) Reverse shifter lever

Tightening torque: N·m (kgf-m, ft-lb)
T: 20 (2.0, 14.4)

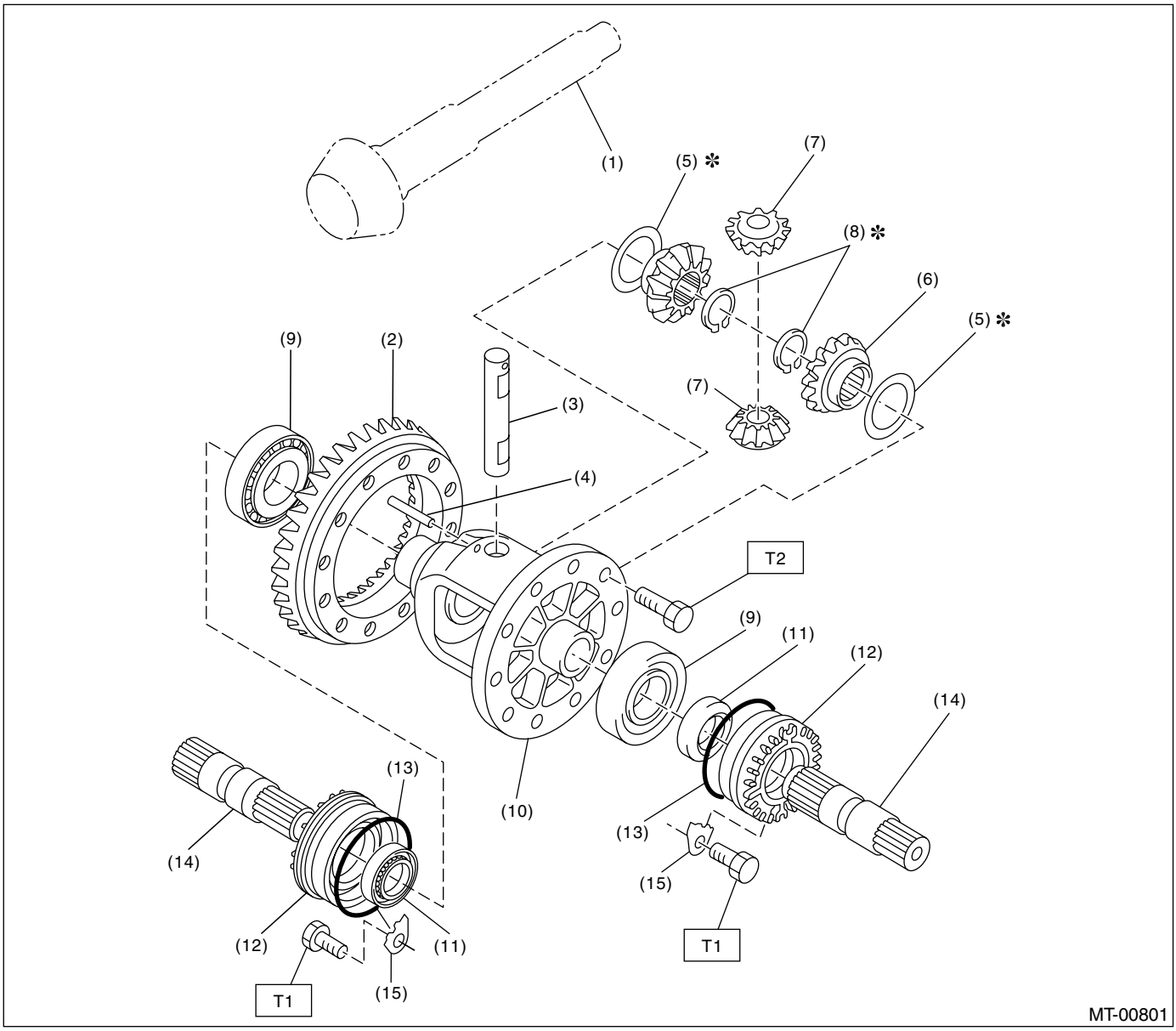
5. TRANSFER CASE AND EXTENSION



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Snap ring (Inner)
(10) Reverse check plate
(11) Reverse check spring
(12) Reverse return spring
(13) Reverse check cam
(14) Reverse accent shaft
(15) Return spring cap
(16) Return spring
(17) O-ring
(18) Adjusting select shim
(19) Reverse check sleeve
(20) Gasket
(21) Neutral switch
(22) Gasket
(23) Back-up light switch
(24) Roller bearing
(25) Transfer driven gear
(26) Roller bearing
(27) Adjusting washer
(28) Ball bearing
(29) Center differential
(30) Adjusting washer
(31) Transfer drive gear
(32) Ball bearing
(33) Extension case
(34) Oil seal
(35) Dust cover
(36) Shift bracket
(37) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 26 (2.7, 20)
T5: 40 (4.1, 29.7)

6. FRONT DIFFERENTIAL

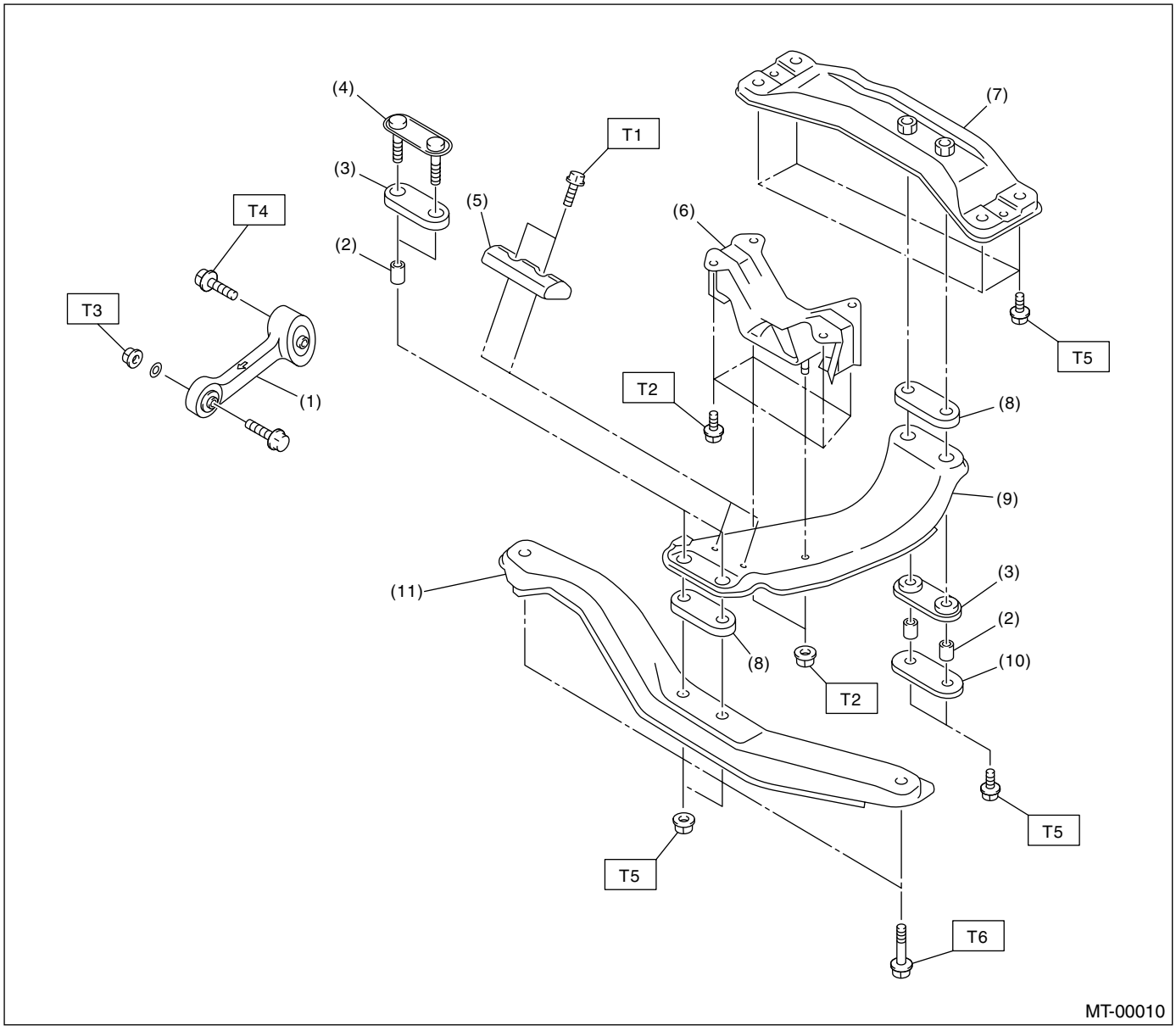


(1) Drive pinion shaft
(2) Hypoid driven gear
(3) Pinion shaft
(4) Straight pin
(5) Washer
(6) Differential bevel gear
(7) Differential bevel pinion
(8) Snap ring (Non-TURBO model)
(9) Roller bearing
(10) Differential case
(11) Oil seal
(12) Differential side retainer
(13) O-ring
(14) Axle drive shaft (Non-TURBO model)
(15) Retainer lock plate

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

7. TRANSMISSION MOUNTING

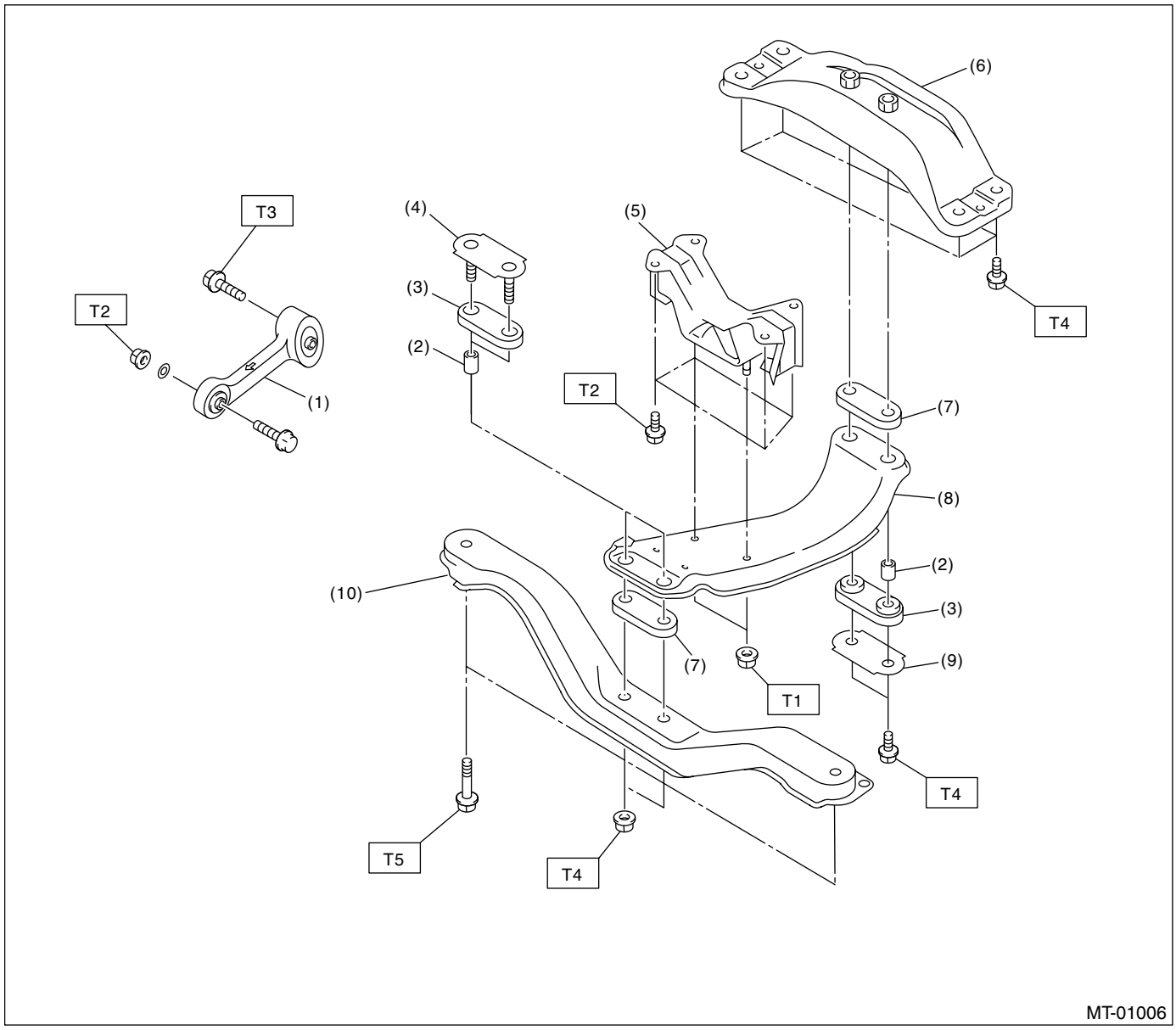
• Except U5 model



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) Dynamic damper (Outback model)
(6) Rear cushion rubber
(7) Rear crossmember
(8) Cushion D
(9) Center crossmember
(10) Rear plate
(11) Front crossmember

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 35 (3.6, 26)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 51)
T6: 140 (14.3, 103)

• U5 model



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) Rear cushion rubber
(6) Rear crossmember
(7) Cushion D
(8) Center crossmember
(9) Rear plate
(10) Front crossmember

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26)
T2: 50 (5.1, 37)
T3: 58 (5.9, 43)
T4: 70 (7.1, 51)
T5: 140 (14.3, 103)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

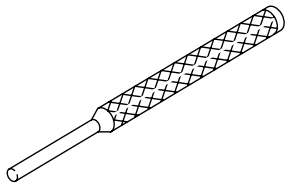
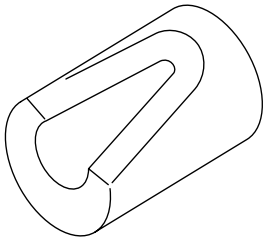
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398791700	398791700	REMOVER	Used for removing and installing spring pin (6 mm).
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.

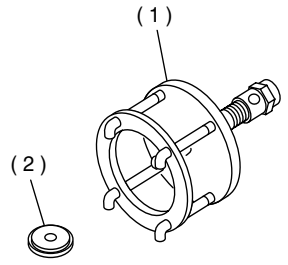
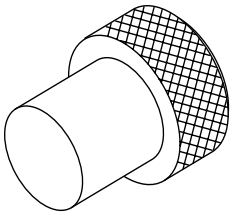
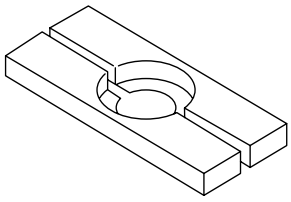
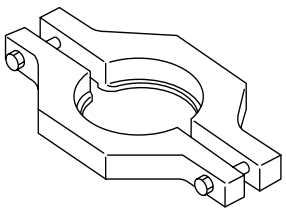
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899524100	899524100	PULLER SET	Used for removing and installing roller bearing (Differential). (1) PULLER (2) CAP
 ST-399780104	399780104	WEIGHT	Used for measuring preload on roller bearing.
 ST-498077000	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 ST-498077300	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.

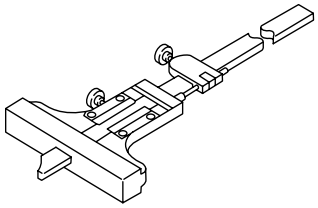
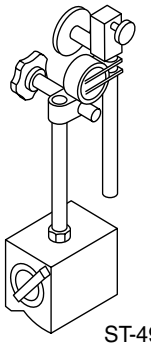
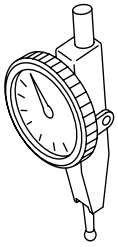
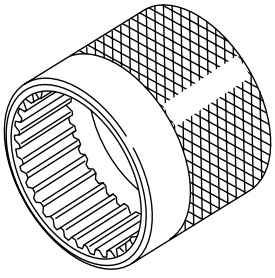
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498147000	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 ST-498427100	498427100	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.

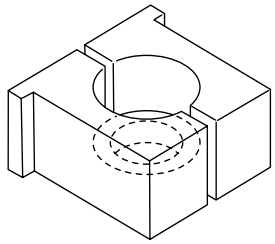
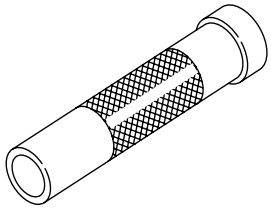
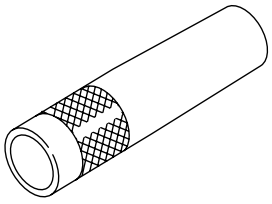
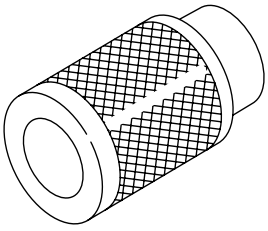
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937000	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 ST-499277100	499277100	BUSH 1-2 INSTALLER	• Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush. • Used for installing roller bearing outer races to differential case.
 ST-499277200	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings and 5th driven gear onto the driven shaft.
 ST-499757002	499757002	INSTALLER	• Used for installing snap ring (OUT 25) and ball bearing ($25 \times 26 \times 17$). • Used for installing bearing cone of transfer driven gear (extension core side).

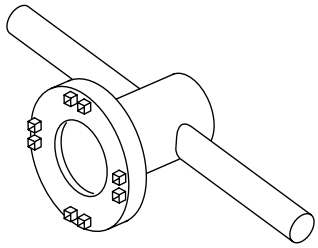
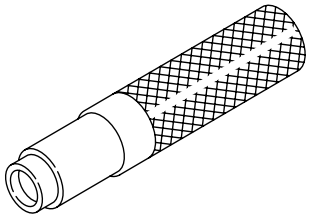
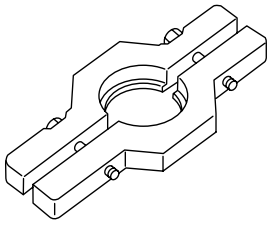
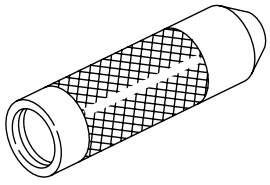
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-499827000	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 ST-499857000	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.
 ST-499877000	499877000	RACE 4-5 INSTALLER	• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).

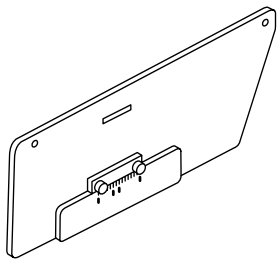
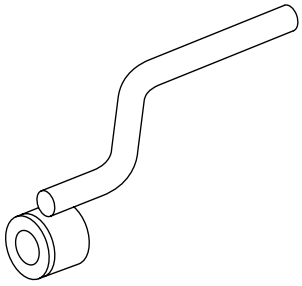
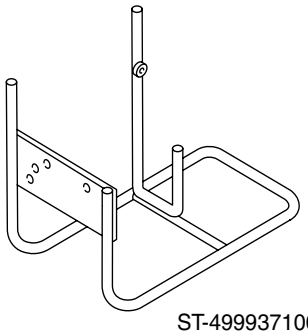
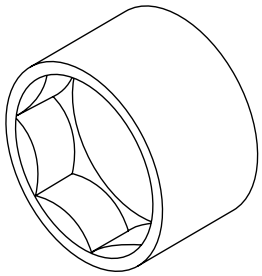
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499917500	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 ST-499927100	499927100	HANDLE	Used for fitting transmission main shaft.
 ST-499937100	499937100	TRANSMISSION STAND SET	Stand used for transmission disassembly and assembly.
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.

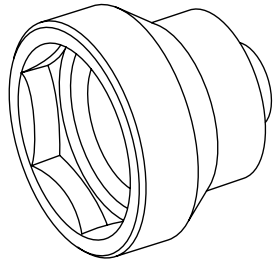
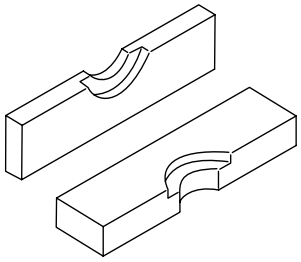
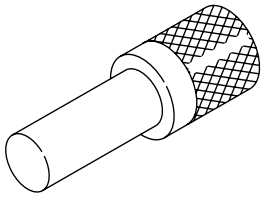
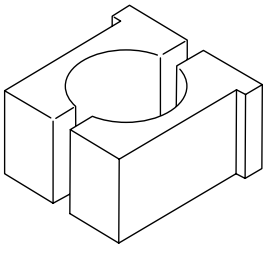
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987300	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 ST-899714110	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion and rear drive shaft.
 ST-899864100	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.
 ST-899884100	899884100	HOLDER	Used for tightening lock nut on sleeve.

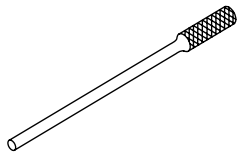
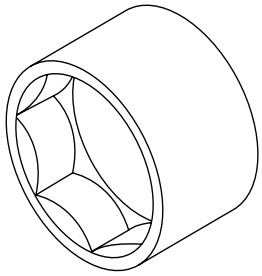
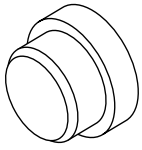
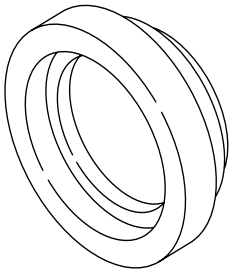
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	REMOVER	Used for removing and installing straight pin.
 ST-899988608	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 ST-398497701	398497701	ADAPTER	• Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).
 ST-499587000	499587000	INSTALLER	Used for installing driven gears to driven shaft.

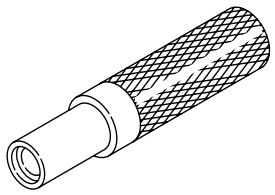
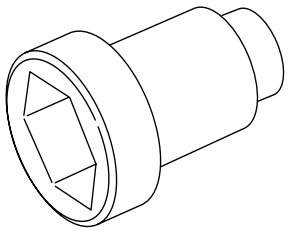
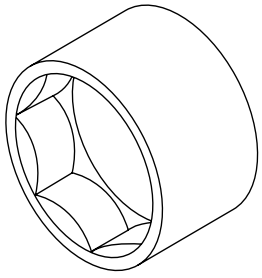
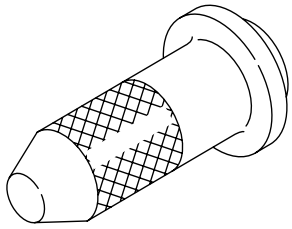
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899824100	899824100	PRESS	Used for installing speedometer shaft oil seal.
 ST-499987100	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-899984103	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.

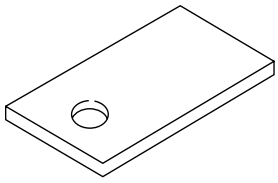
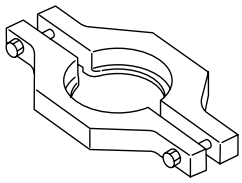
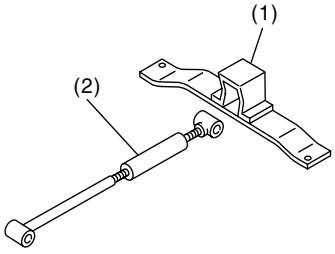
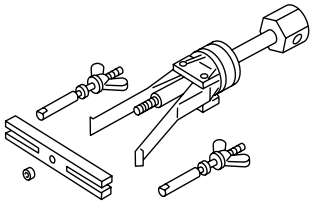
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring backlash.
 ST-498077400	498077400	SYNCHRONIZER CONE REMOVER	• Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 ST41099AA000	41099AA000	ENGINE SUPPORT BRACKET	Used for supporting engine. (1) Engine support bracket (41099AA010) (2) Engine support (41099AA020)
 ST-398527700	398527700	PULLER ASSY	Used for removing extension case roller bearing.

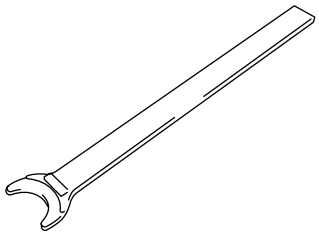
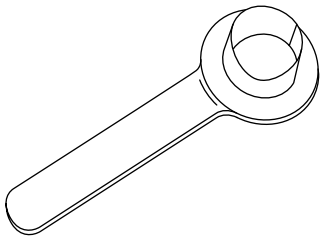
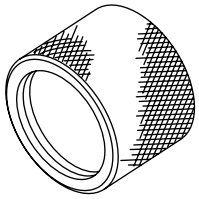
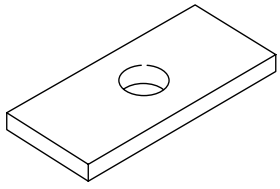
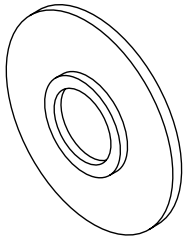
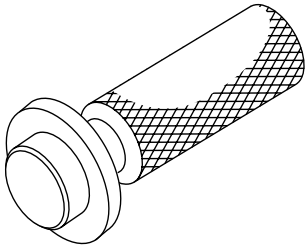
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399SA000	28399SA000	FRONT DRIVE SHAFT REMOVER	• Used for removing front drive shaft (AT and MT vehicle). • TURBO model
 ST28399SA010	28399SA010	FRONT DRIVE SHAFT OIL SEAL PROTECTOR	• Used for protecting oil seal from scratches while installing front drive shaft. • TURBO model
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	• Used for installing differential side retainer oil seal. • TURBO model
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	38177700	INSTALLER	• Used for installing bearing cone of transfer driven gear (transfer case side). • Used for installing ball bearing of transfer drive gear.
 ST-499797000	499797000	INSTALLER	• Used for installing differential side retainer oil seal. • Non-TURBO model

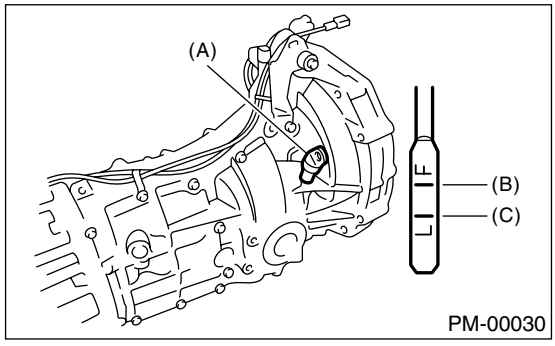
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Transmission Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Turn the ignition switch to OFF, and then wait until the engine cools.
3) Remove the oil level gauge and wipe it clean.
4) Reinsert the level gauge all the way. Be sure the level gauge is correctly inserted and in the proper direction.
5) Pull out the oil level gauge again and check the oil level on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



(A) Oil level gauge
(B) Upper level
(C) Lower level

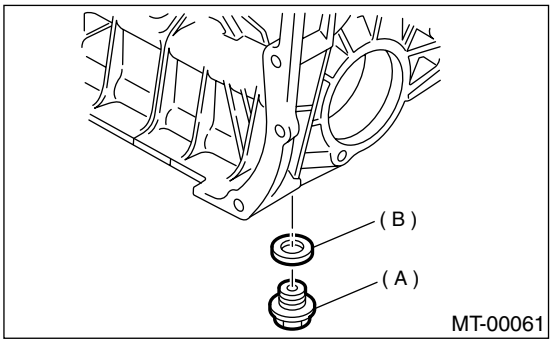
B: REPLACEMENT

1) Pull out the oil level gauge.
2) Lift-up the vehicle.
3) Drain the transmission gear oil completely.

CAUTION:
Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.
Be careful not to spill the transmission gear oil on exhaust pipe to prevent it from emitting smoke or fire. If transmission gear oil splashes on exhaust pipe, wipe it clean.

NOTE:
Tighten the transmission gear oil drain plug after draining the transmission gear oil.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)



(A) Drain plug
(B) Gasket

4) Lower the vehicle.
5) Pour gear oil into the gauge hole.

Recommended gear oil:
Use GL-5 (75W-90) or equivalent.

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

6) Check the level of the transmission gear oil.

CAUTION:
When inserting the level gauge into transmission, align the protrusion on the side of the top part of level gauge with the notch in the gauge hole.

NOTE:
The level should be within the specified range marked on the gauge.

3. Manual Transmission Assembly

A: REMOVAL

1) Open the front hood fully, and support with stay or the air intake chamber.
2) Disconnect ground cable from battery.
3) Remove the air intake duct and cleaner case or the air intake chamber. (Non-TURBO model)

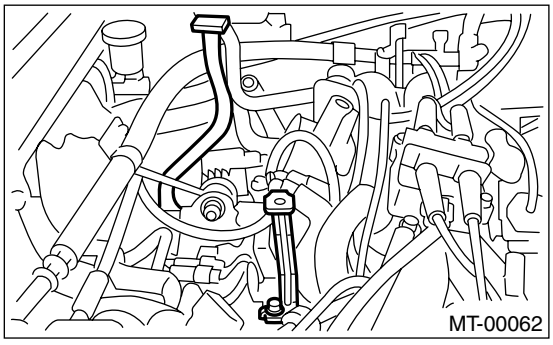
U5 model

<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
<Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>

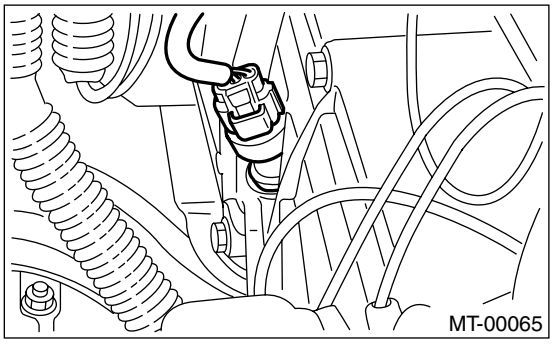
Except U5 model

<Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

4) Remove the air cleaner case stay. (Non-TURBO model)

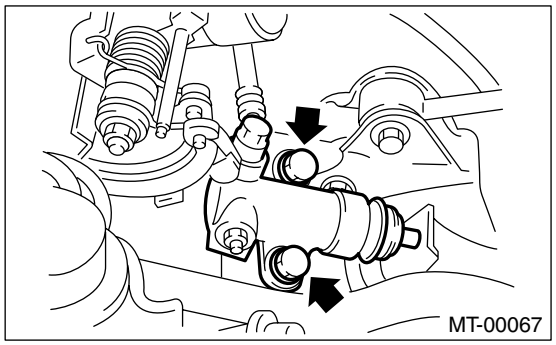

MT-00062

5) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
6) Disconnect the following connectors:
   (1) Neutral position switch connector
   (2) Back-up light switch connector
   (3) Vehicle speed sensor

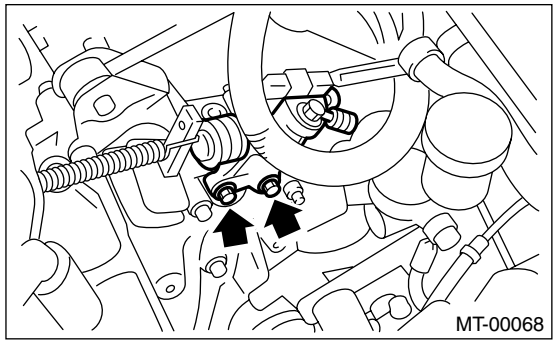

MT-00065

7) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
8) Remove the operating cylinder from transmission.

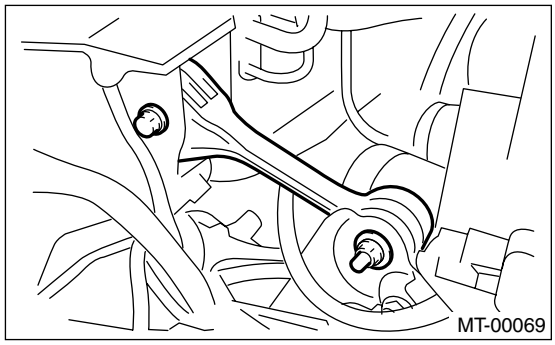
- NON-TURBO MODEL


MT-00067

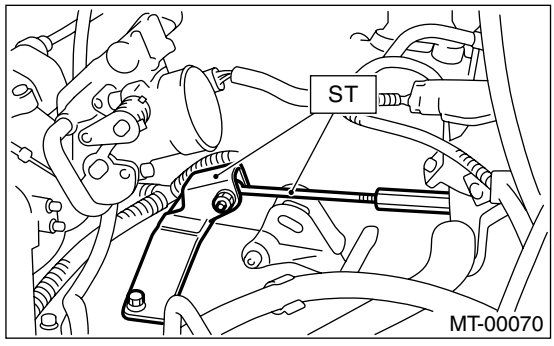
- TURBO MODEL


MT-00068

9) Remove the pitching stopper.


MT-00069

10) Set the ST.
ST 41099AA000 ENGINE SUPPORT ASSY

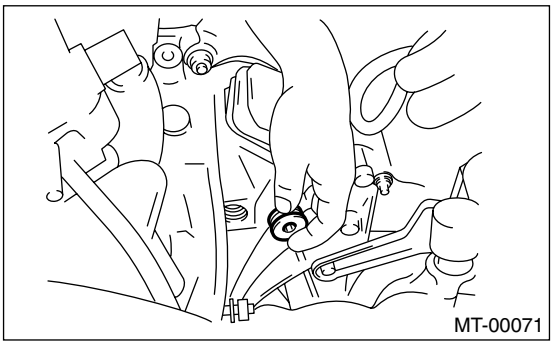


MT-00070

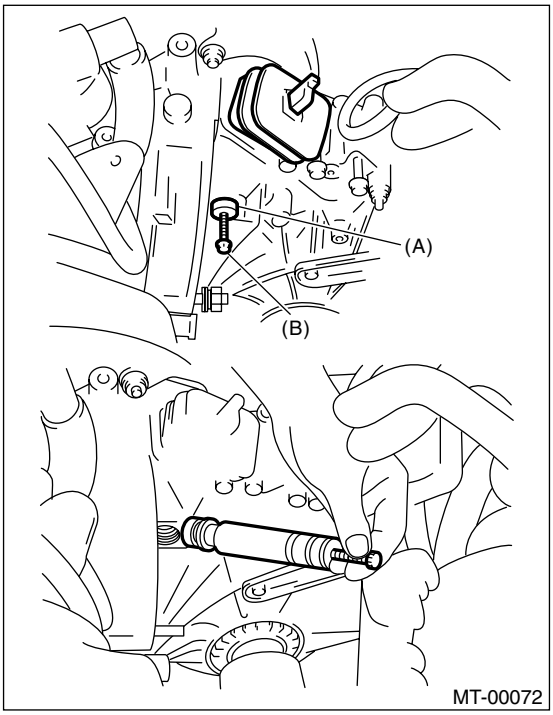
11) Separate the clutch release fork from release bearing. (Turbo model)

(1) Remove the clutch operating cylinder from transmission.

(2) Remove the plug using 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and then remove it.

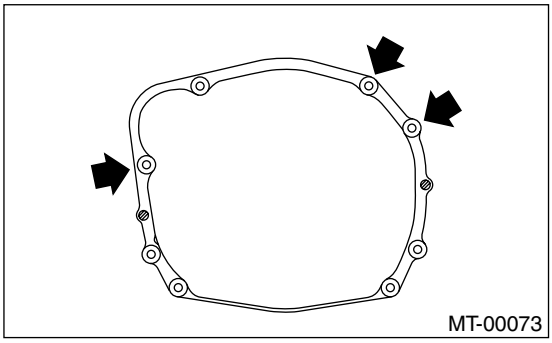


(A) Shaft
(B) Bolt

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

12) Remove the bolt which holds the right upper side of transmission to engine.



13) Remove the front and center exhaust pipes. (Non-TURBO model) <Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

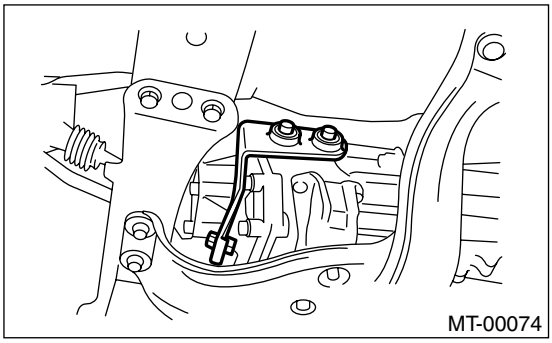
14) Remove the center exhaust pipe. (Turbo model). <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>

15) Remove the rear exhaust pipe and muffler.

CAUTION:
When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

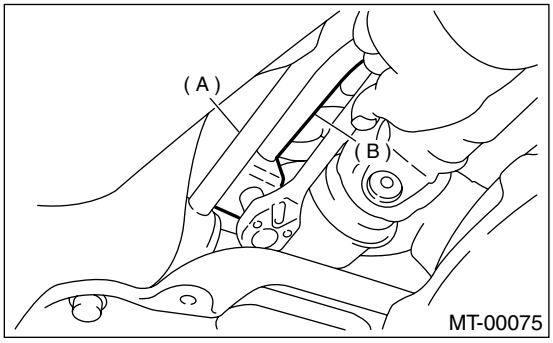
16) Remove the heat shield cover. (If equipped)

17) Remove the hanger bracket from right side of transmission.



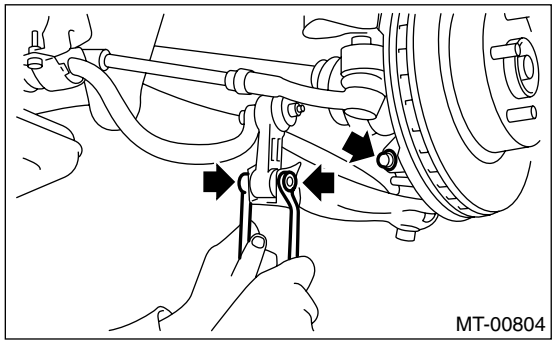
18) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>

19) Remove the gear shift rod and stay from transmission.
(1) Disconnect the stay from transmission.
(2) Disconnect the rod from transmission.



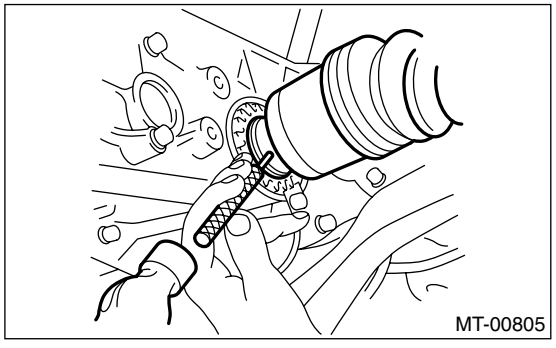
(A) Stay
(B) Rod

20) Disconnect the stabilizer link from transverse link.



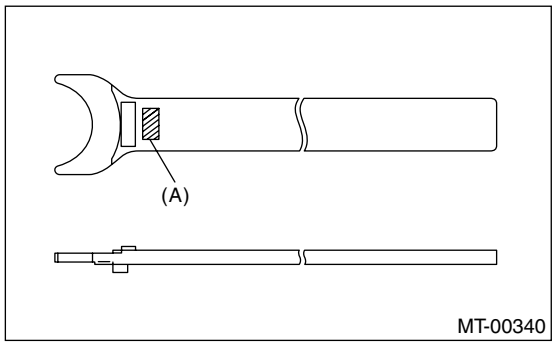
21) Remove the bolt securing ball joint of transverse link to housing.
22) Remove the spring pins and separate the front drive shafts from each side of transmission (Non-TURBO model).

NOTE:
Discard the removing spring pin. Replace with a new one.



23) Pull out the front drive shaft from transmission (TURBO model).
(1) Face the “MT” mark on ST toward transmission side.

ST 28399SA000 DRIVE SHAFT REMOVER

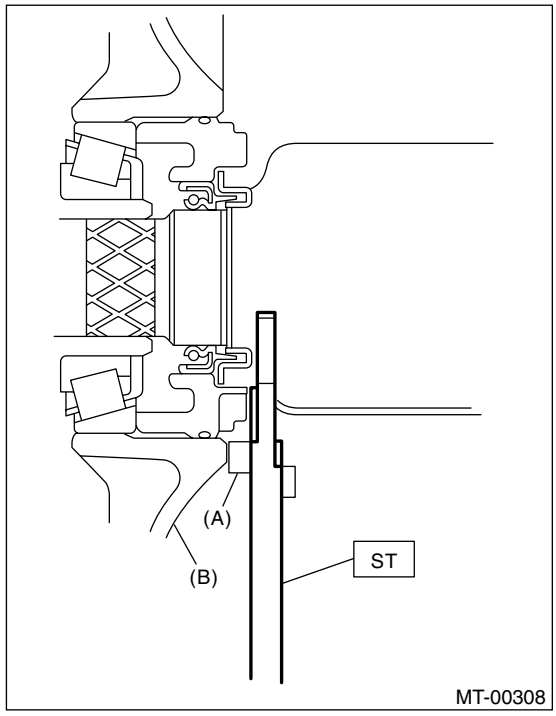


(A) “MT” mark

(2) Insert the ST into between transmission and front drive shaft.

NOTE:
Contact the protrusion part of ST to transmission case.

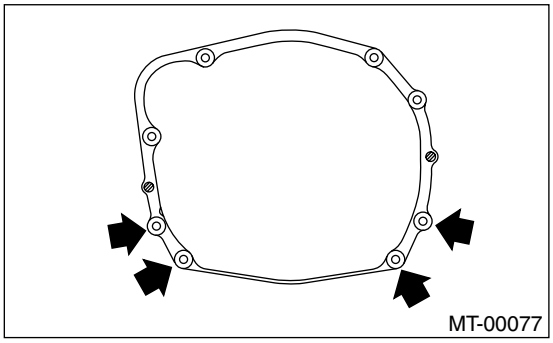
ST 28399SA000 DRIVE SHAFT REMOVER



(A) Protrusion part of ST
(B) Transmission case

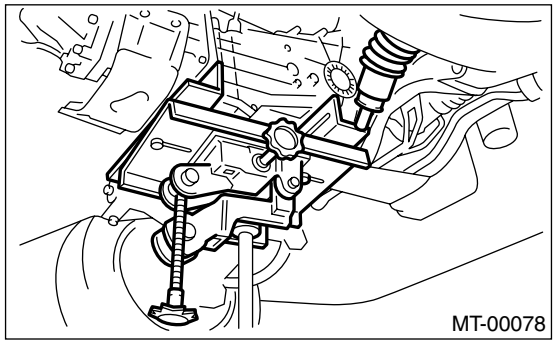
(3) While holding the joint portion (AAR) of front drive shaft with your hand, push the housing outside to remove from transmission.

24) Remove the nuts which hold the lower side of transmission to engine.

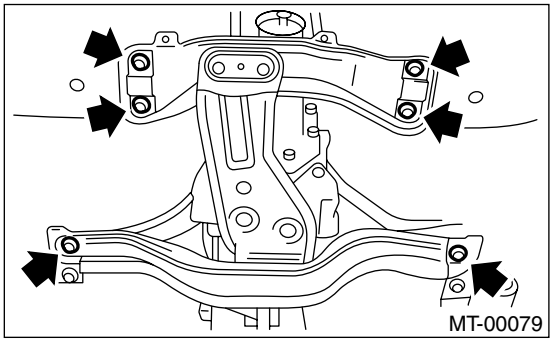


25) Place the transmission jack under transmission.

CAUTION:
Always support the transmission case with a transmission jack.



26) Remove the transmission rear crossmember from vehicle.



27) Remove the transmission.

NOTE:
Move the transmission jack toward rear until main shaft is withdrawn from clutch cover.

28) Separate the transmission assembly and rear cushion rubber.
29) Remove the clutch release bearing from engine side. (Turbo model) <Ref. to CL-15, REMOVAL, Release Bearing and Lever.>

B: INSTALLATION

1) Replace the differential side oil seal with a new one. <Ref. to 5MT-38, REPLACEMENT, Differential Side Retainer Oil Seal.>

NOTE:
It is not necessary to replace the oil seal if a new one installed.

2) Install the rear cushion rubber to transmission assembly.

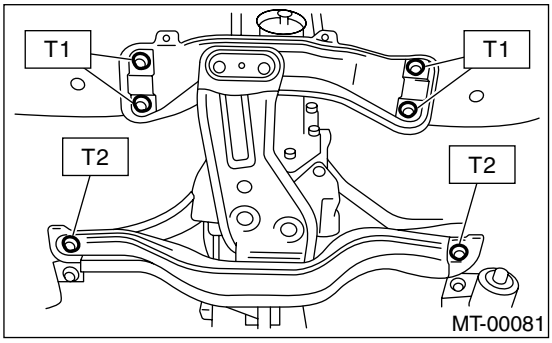
Tightening torque:
35 N·m (3.57 kgf-m, 25.8 ft-lb)

3) Install the clutch release lever and bearing onto transmission. (Turbo model) <Ref. to CL-15, INSTALLATION, Release Bearing and Lever.>
4) Install the transmission onto engine.
(1) Gradually raise the transmission with transmission jack.
(2) Engage them at splines.

NOTE:
Be careful not to strike the main shaft against clutch cover.

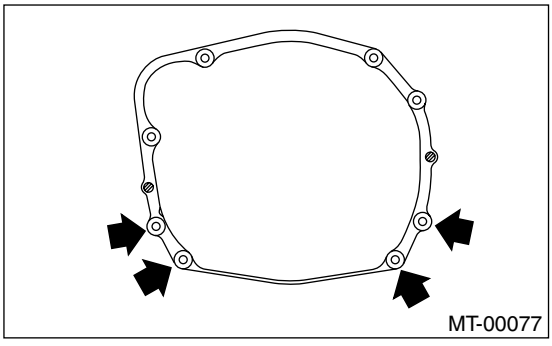
5) Install the transmission rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



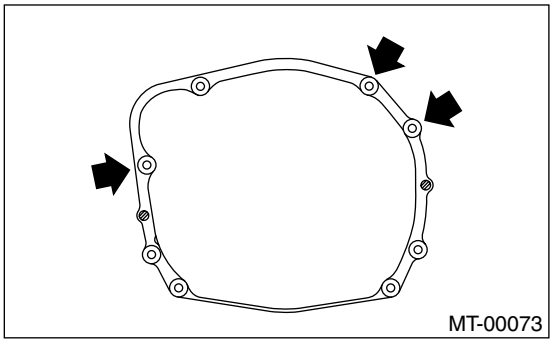
6) Take off the transmission jack.
7) Tighten the nuts which hold the lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

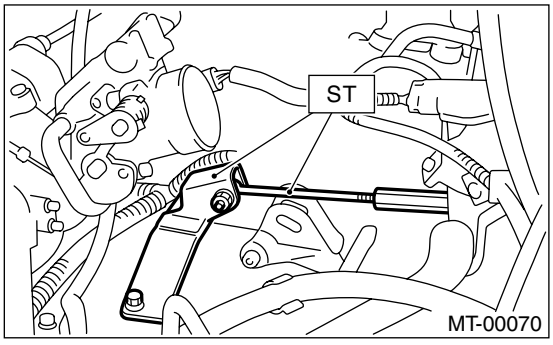


8) Connect the engine and transmission.
(1) Install the starter.
<Ref. to SC(H4SO)-7, INSTALLATION, Starter.>
(2) Tighten the bolt which holds right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

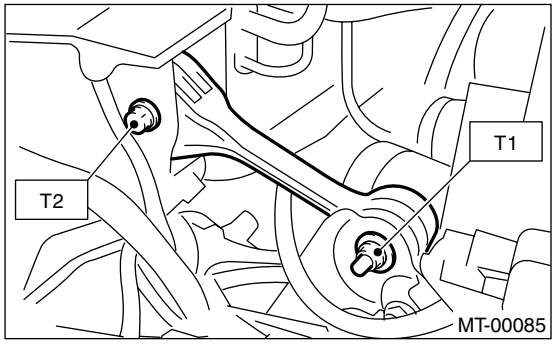


9) Remove the ST.



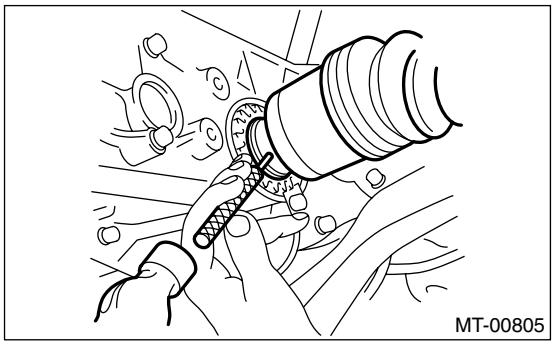
10) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



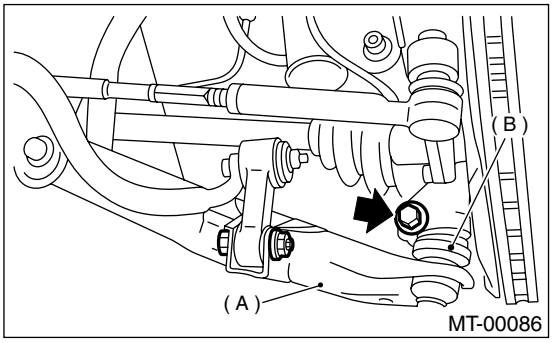
11) Lift-up the vehicle.
12) Install the front drive shaft into transmission.
13) Drive the spring pin into chamfered hole of drive shaft. (Non-TURBO model)

NOTE:
Always use a new spring pin.



14) Replace the circlip with a new one, and insert the front drive shaft to transmission. (TURBO model) <Ref. to DS-29, REMOVAL, Front Drive Shaft.>
ST 28399SA010 FRONT DRIVE SHAFT OIL SEAL PROTECTOR
15) Install the ball joints of lower arm into knuckle arm of housing, and tighten the installing bolts.

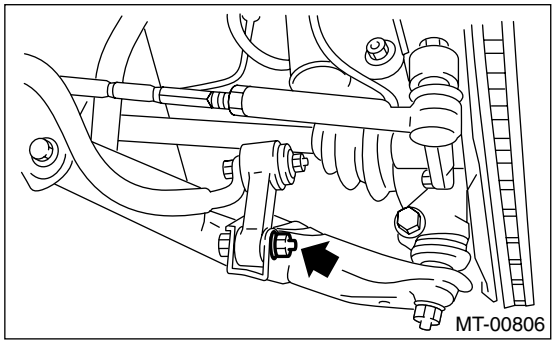
Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)



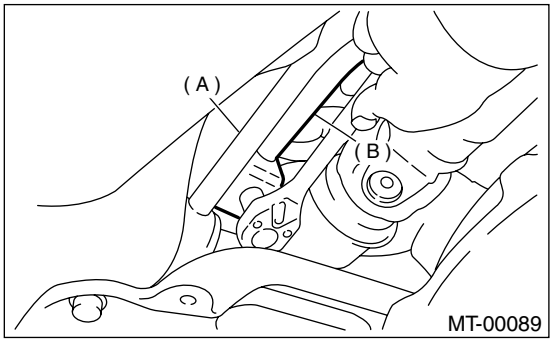
(A) Transverse link
(B) Ball joint

16) Install the stabilizer link from transverse link.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

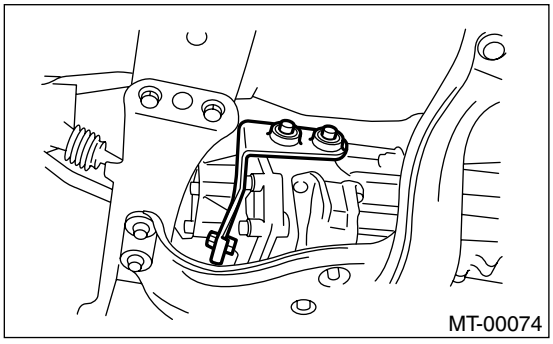


17) Install the gear shift rod and stay.
(1) Install the gear shift rod onto transmission.

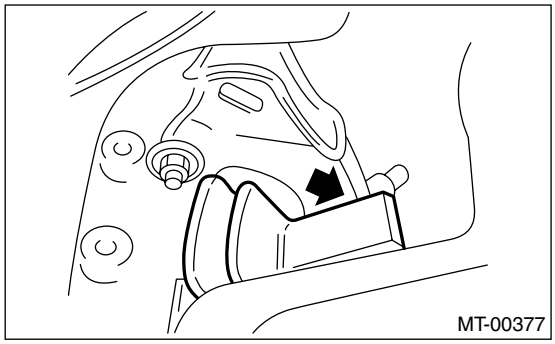


(A) Stay
(B) Rod

(2) Install the stay onto transmission.
18) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
19) Install the heat shield cover. (If equipped)
20) Install the hanger bracket on right side of transmission.



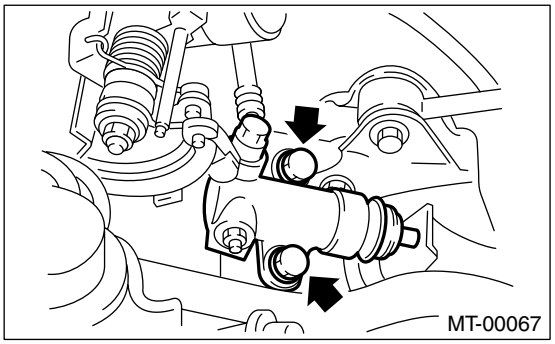
21) Install the rear exhaust pipe and muffler.
22) Install the front exhaust pipe and center exhaust pipe. (Non-TURBO model)
Except U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
U5 model
<Ref. to EX(H4DOTC)-7, INSTALLATION, Front Exhaust Pipe.>
23) Install the center exhaust pipe. (TURBO model)<Ref. to EX(H4DOTC)-7, INSTALLATION, Front Exhaust Pipe.>
24) Install the under cover.
25) Push the clutch release lever to fit the bearing into clutch cover. (TURBO model)



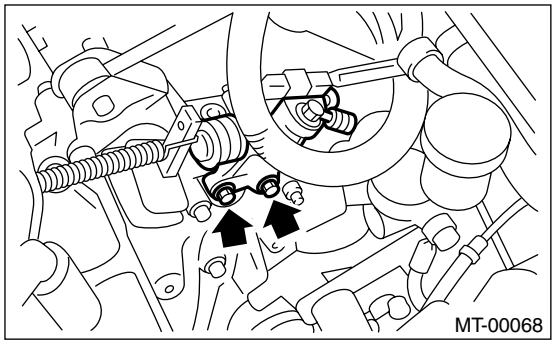
26) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

- Non-TURBO MODEL



- TURBO MODEL



27) Connect the following connectors:
(1) Transmission ground cable

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Vehicle speed sensor connector
(3) Neutral position switch connector
(4) Back-up light switch connector

28) Install the air cleaner case stay. (Non-TURBO model)

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

29) Install the air cleaner case or the air intake chamber and duct. (Non-TURBO model)

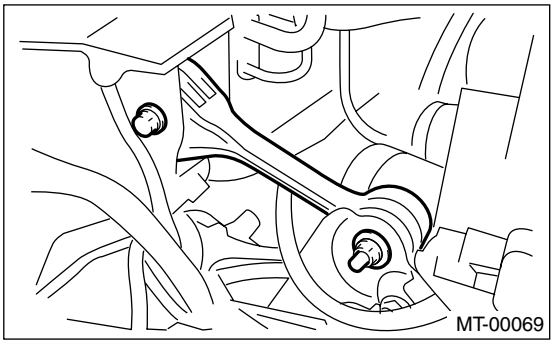
30) Install the intercooler. (TURBO model)

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Remove the air intake duct. (Non-TURBO model) <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
2) Remove the air cleaner case or the air intake chamber. (Non-TURBO model)
Except U5 model
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
U5 model
<Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3) Remove the intercooler. (TURBO model) <Ref. to IN(H4DOTC)-10, INTERCOOLER, .>
4) Remove the pitching stopper.

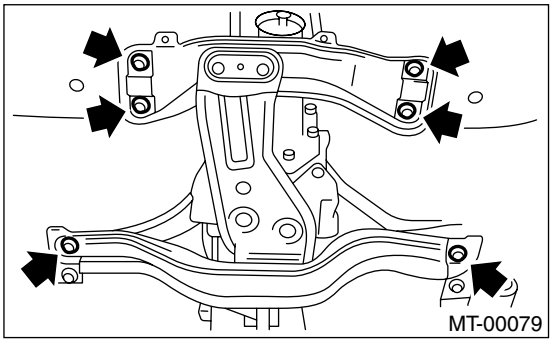

MT-00069

2. CROSSMEMBER AND CUSHION RUBBER

1) Disconnect ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front and center exhaust pipes. (Non-TURBO model)
Except U5 model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>
U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>
4) Remove the center exhaust pipe. (TURBO model) <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
5) Remove the rear exhaust pipe and muffler.
6) Remove the heat shield cover. (If equipped)
7) Set the transmission jack under the transmission body.

CAUTION:
Always support the transmission case with a transmission jack.

8) Remove the rear crossmember.


MT-00079

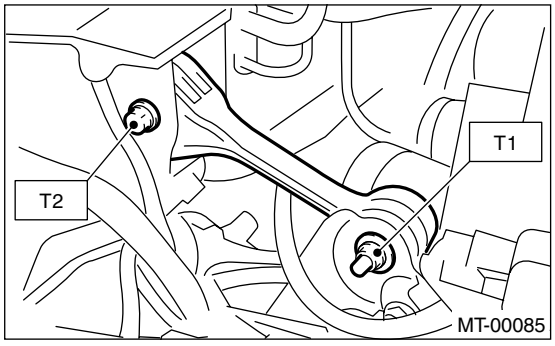
9) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



MT-00085

2) Install the air intake duct and cleaner case or the air intake chamber. (Non-TURBO model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.

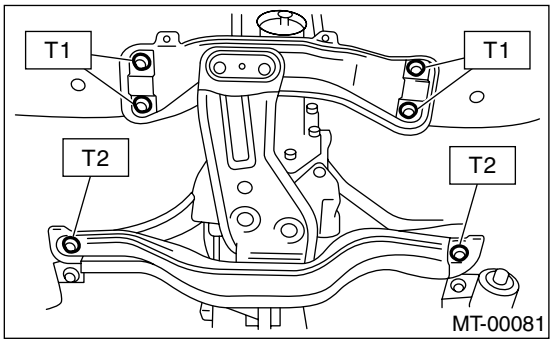
2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front and center exhaust pipes. (Non-TURBO model)
Except U5 model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>
U5 model
<Ref. to EX(H4SO U5)-5, REMOVAL, Front Exhaust Pipe.>
6) Install the center exhaust pipe. (TURBO model)
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>
7) Install the rear exhaust pipe and muffler.

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure the pitching stopper is not bent or damaged. Make sure the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure the crossmember is not bent or damaged. Make sure the cushion rubber is not stiff, cracked, or otherwise damaged.

5. Oil Seal

A: INSPECTION

Check the oil seal portion for leakage. If leakage is found, replace the oil seal with a new one.

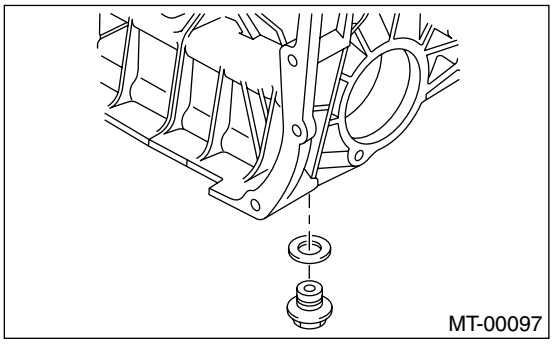
B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the gear oil completely.

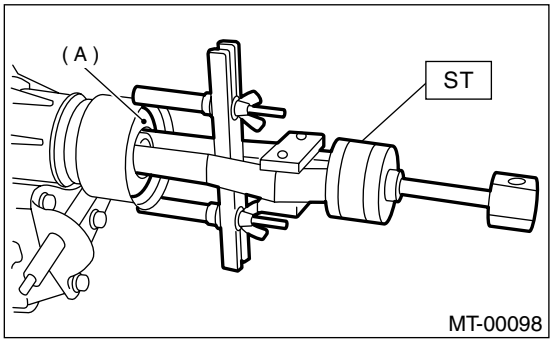
CAUTION:
• Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.
• Be careful not to spill the transmission gear oil on exhaust pipe to prevent it from emitting smoke or fire. If transmission gear oil splashes on exhaust pipe, wipe it clean.

NOTE:
Tighten the drain plug after draining gear oil.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)

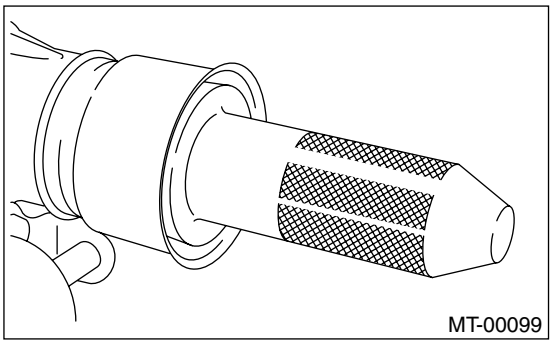


3) Remove the rear exhaust pipe and muffler.
4) Remove the heat shield cover. (If equipped)
5) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
6) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

7) Using the ST, install the oil seal.
ST 498057300 INSTALLER



8) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
11) Pour gear oil and check the oil level. <Ref. to 5MT-27, REPLACEMENT, Transmission Gear Oil.>

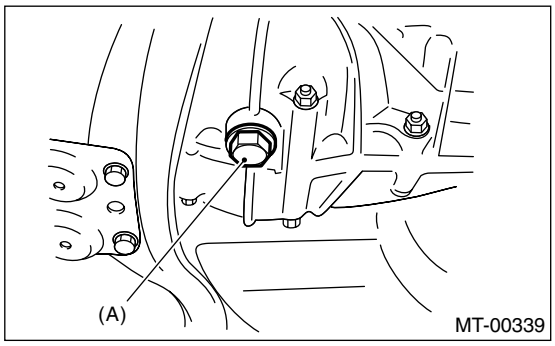
6. Differential Side Retainer Oil Seal

A: Inspection

Check the differential side retainer oil seal for leakage of gear oil. If oil leaks, replace the oil seal.

B: Replacement

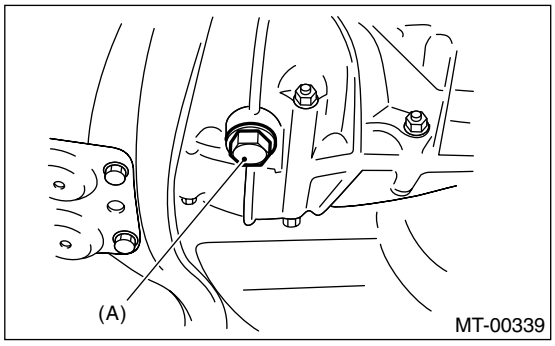
1) Lift-up the vehicle.
2) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
3) Drain the gear oil from oil drain plug.



(A) Drain plug

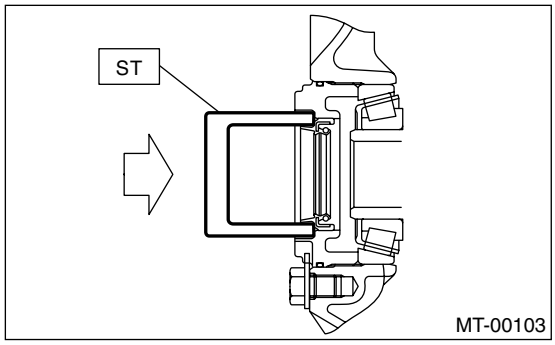
4) Replace the gasket with new one, and then tighten the differential oil drain plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Drain plug

5) Separate the front drive shaft from transmission. <Ref. to DS-29, REMOVAL, Front Drive Shaft.>
6) Remove differential side retainer oil seal using screwdriver wrapped with vinyl tape.
7) Using the ST, install the differential side retainer oil seal tapping ST lightly with a hammer.
ST 18675AA000 DIFFERENTIAL OIL SEAL INSTALLER



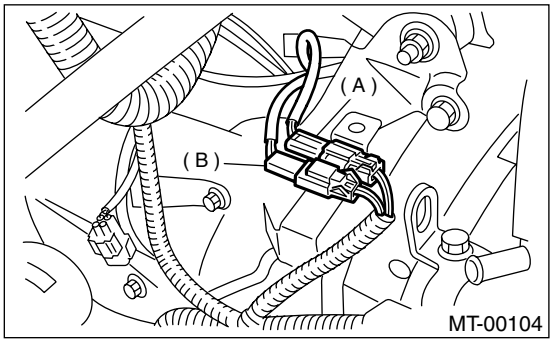
8) Install the front drive shaft. <Ref. to DS-31, INSTALLATION, Front Drive Shaft.>
9) Install the front exhaust pipe and center exhaust pipe <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>.
10) Lower the vehicle.
11) Fill gear oil into the gauge hole. <Ref. to 5MT-27, REPLACEMENT, Transmission Gear Oil.>

7. Switches and Harness

A: REMOVAL

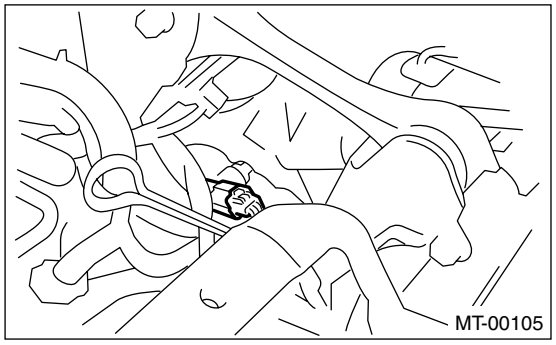
1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

1) Disconnect ground cable from battery.
2) Remove the air intake duct and cleaner case or the air intake chamber. (Non-TURBO model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.>
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Disconnect the connector of back-up light switch and neutral position switch.
• NON-TURBO MODEL

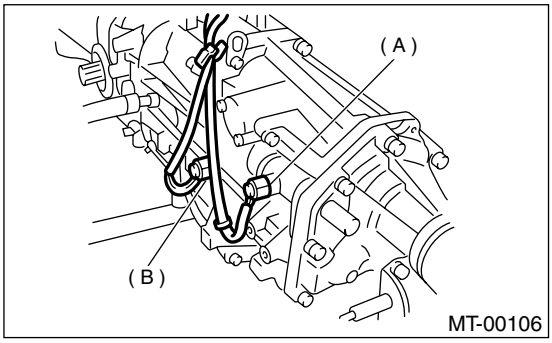


(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

• TURBO MODEL



5) Lift-up the vehicle.
6) Remove the back-up light switch and neutral position switch with harness.



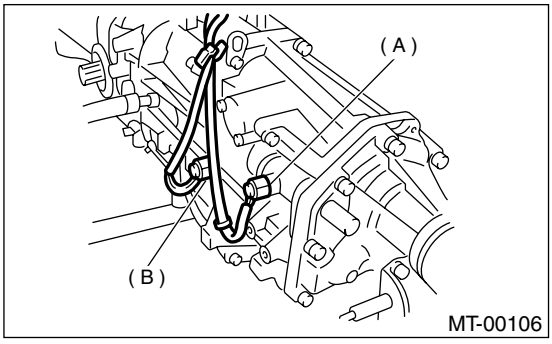
(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

1) Install the back-up light switch and neutral position switch with harness.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Neutral switch
(B) Back-up light switch

2) Connect the connector of back-up light switch and neutral position switch.
3) Install the air intake duct and cleaner case or the air intake chamber. (Non-TURBO model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> or <Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.>
4) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
5) Connect the battery ground cable to battery.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

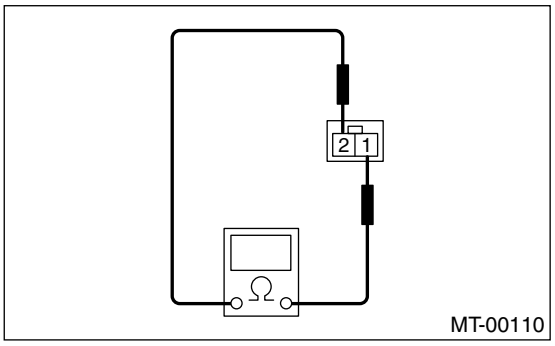
Inspect the back-up light switch. <Ref. to LI-7, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the connector of neutral position switch.
3) Measure the resistance between neutral position switch terminals.

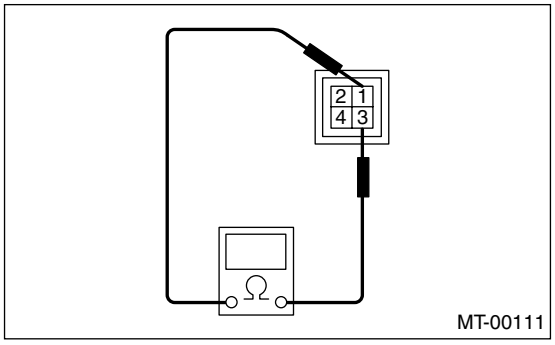
Non-TURBO model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ



Turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		More than 1 MΩ

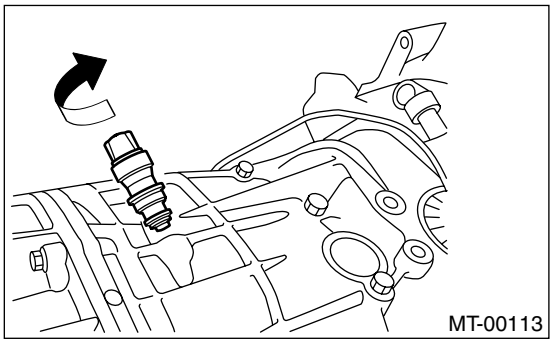


4) Replace defective parts.

8. Vehicle Speed Sensor

A: REMOVAL

1) Disconnect ground cable from battery.
2) Lift-up the vehicle.
3) Remove the front, center rear exhaust pipes and muffler.
4) Disconnect the connector from vehicle speed sensor.
5) Turn and remove the vehicle speed sensor.



B: INSTALLATION

NOTE:
• Discard the vehicle speed sensor and after removal, replace with a new one.
• Ensure the sensor mounting hole is clean and free of foreign matter.
• Align the tip end of key with key groove on end of speedometer shaft during installation.

1) Hand tighten the vehicle speed sensor.
2) Tighten the vehicle speed sensor using suitable tool.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

3) Connect the connector to vehicle speed sensor.
4) Install the front, center exhaust pipes and muffler.
5) Lower the vehicle.
6) Connect the battery ground cable to battery.

C: INSPECTION

The vehicle speed sensor can not be inspected as a single unit. Check if speedometer operates normally. If it does not operate normally, inspect the combination meter system. <Ref. to IDI-4, INSPECTION, Combination Meter System.>

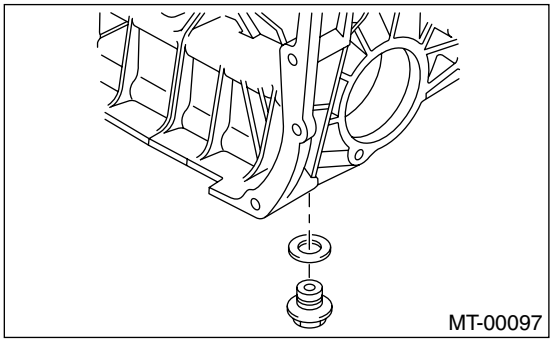
9. Preparation for Overhaul

A: PROCEDURE

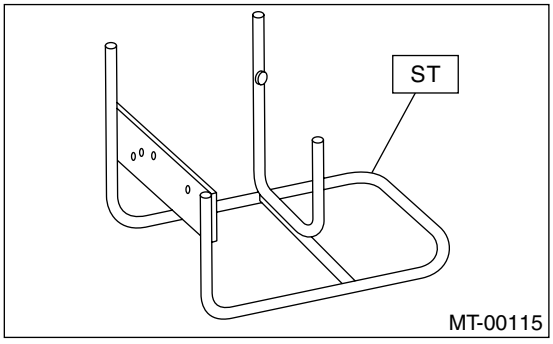
1) Clean oil, grease, dirt and dust from transmission.
2) Remove the drain plug to drain oil. After draining, retighten it as before.

NOTE:
Replace the gasket with a new one.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)



3) Attach the transmission to ST.

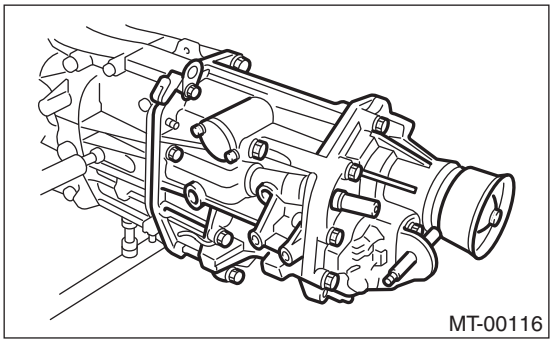


4) Rotating parts should be coated with oil prior to assembly.
5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
6) Gaskets, lock washers and lock nut must be replaced with new ones.
7) Liquid gasket should be used where specified to prevent leakage.

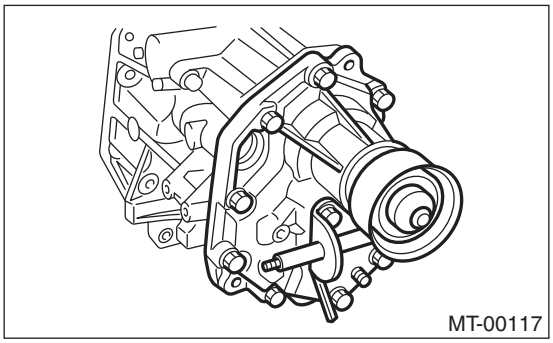
10.Transfer Case and Extension Case Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly.

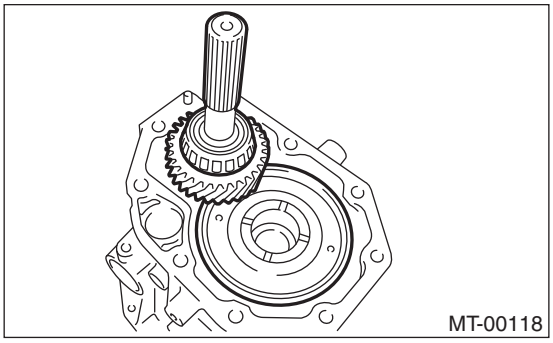

MT-00116

4) Remove the shifter arm.
5) Remove the extension case assembly.

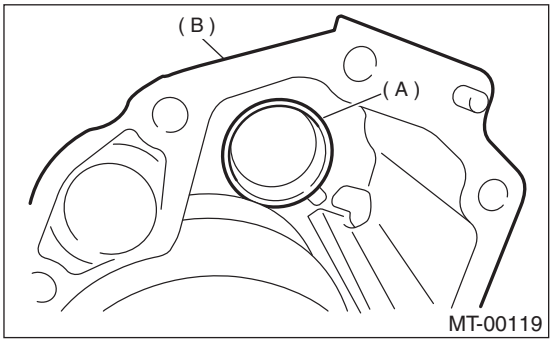

MT-00117

B: INSTALLATION

1) Install the center differential and transfer driven gear into transfer case.


MT-00118

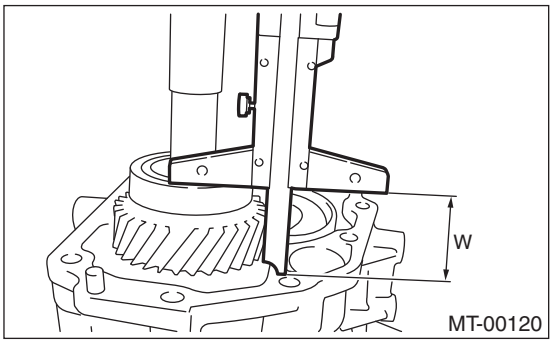
2) Remove the bearing outer race from the extension case.



MT-00119

(A) Bearing outer race
(B) Extension case

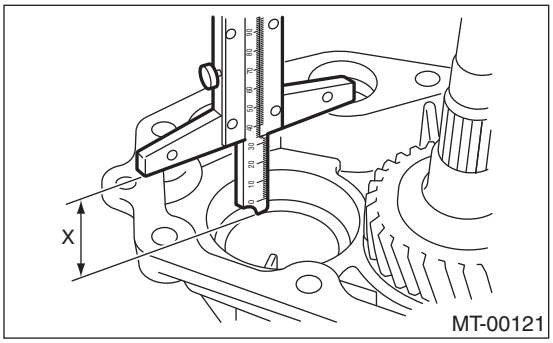
3) While pressing the bearing outer race horizontally, turn the driven shaft ten rotations.
4) Measure the height “W” between transfer case and taper roller bearing on the transfer driven gear.



MT-00120

5) Measure the depth “X”.

NOTE:
Measure with bearing outer race and thrust washer removed.



MT-00121

6) Calculate the thrust washer thickness “t” using the following equation: t = X – W + 0.15 to 0.20 mm (0.008 to 0.012 in)

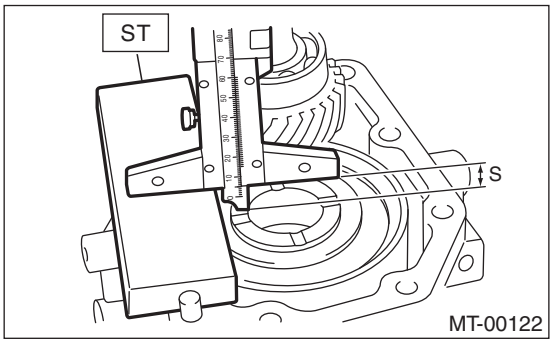
7) Select the nearest washer in the following table:

Preload (specified protrusion amount) of thrust washer:
0.15 — 0.20 mm (0.006 — 0.008 in)

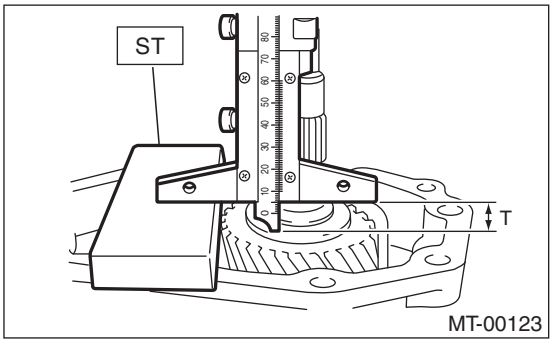
NOTE:
Be sure to keep the preload within specifications.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

8) Fit the thrust washers on transfer drive shaft.
9) Install the bearing outer race into extension case.
10) Measure the depth “S” between transfer case and center differential.
ST 398643600 GAUGE



11) Measure the depth “T” between extension case and transfer drive gear.
ST 398643600 GAUGE



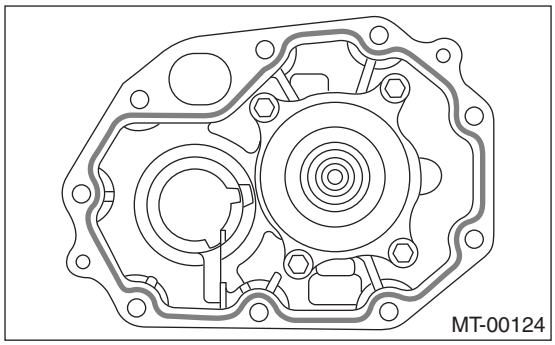
12) Calculate the space “U” using the following equation: U = S + T – 30 mm (1.18 in) [Thickness of ST]
13) Select the suitable washer in the following table:

Standard clearance:
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

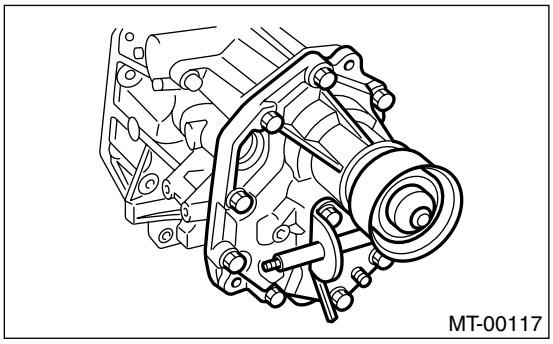
14) Fit the thrust washer on center differential.
15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

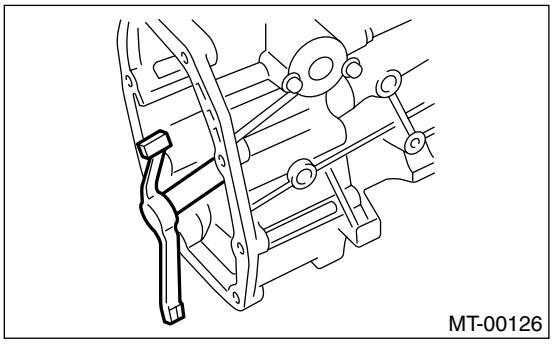


16) Install the extension assembly into transfer case.

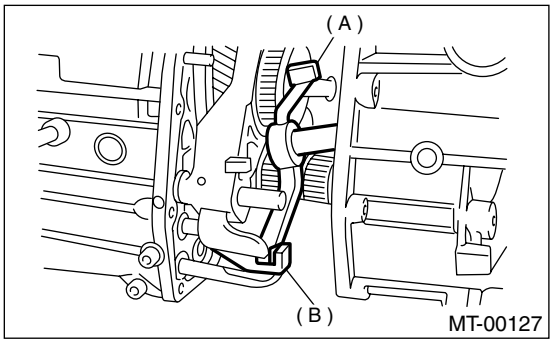
Tightening torque:
40 N·m (4.1 kgf-m, 29.7 ft-lb)



17) Install the shifter arm to transfer case.



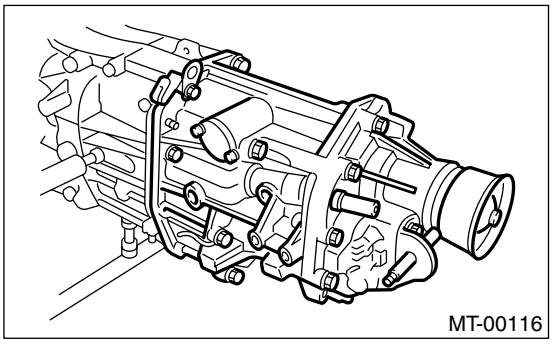
18) Hang the shifter arm on 3rd-4th fork rod.



(A) Shifter arm
(B) 3rd-4th fork rod

19) Install the transfer case with extension case assembly to transmission case.

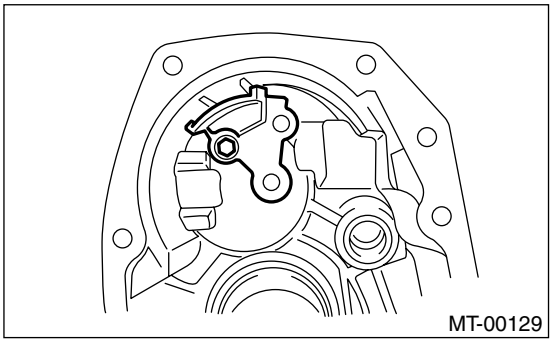
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



C: DISASSEMBLY

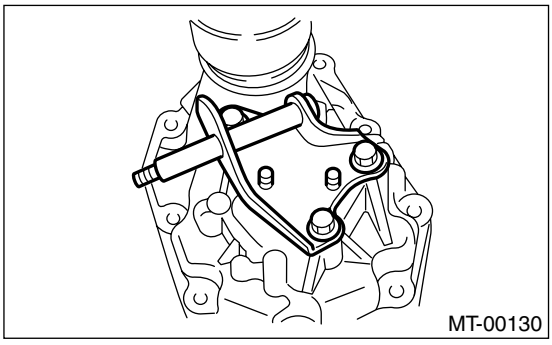
1. TRANSFER CASE

1) Remove the reverse check assembly. <Ref. to 5MT-52, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.



2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to 5MT-47, REMOVAL, Transfer Drive Gear.>
2) Remove the shift bracket.



3) Remove the oil seal from extension case. <Ref. to 5MT-37, Oil Seal.>

D: ASSEMBLY

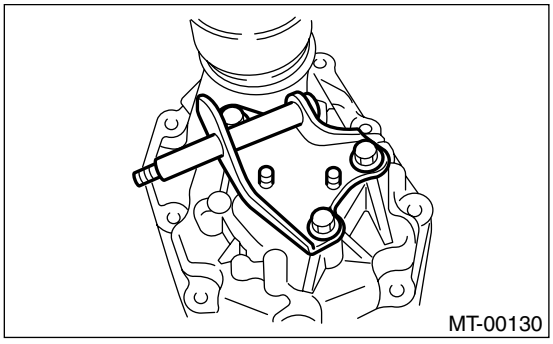
1. EXTENSION CASE

1) Using the ST, install the oil seal to extension case. <Ref. to 5MT-37, Oil Seal.>

NOTE:
Use a new oil seal.

2) Install the shift bracket to extension case.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

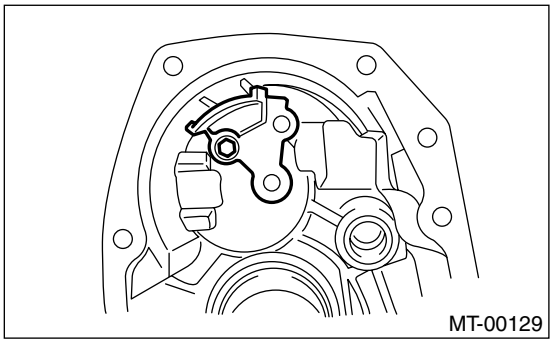


3) Install the transfer drive gear to extension case. <Ref. to 5MT-47, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Install the oil guide to transfer case.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

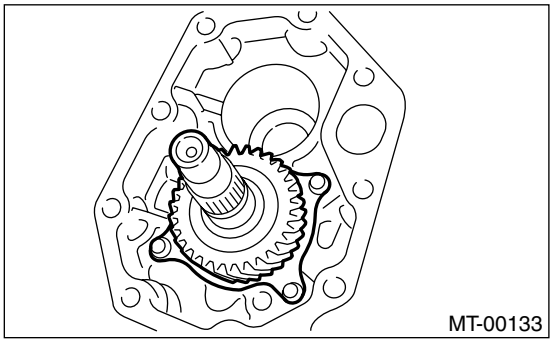


2) Install the reverse check sleeve assembly to transfer case. <Ref. to 5MT-52, INSTALLATION, Reverse Check Sleeve.>

11.Transfer Drive Gear

A: REMOVAL

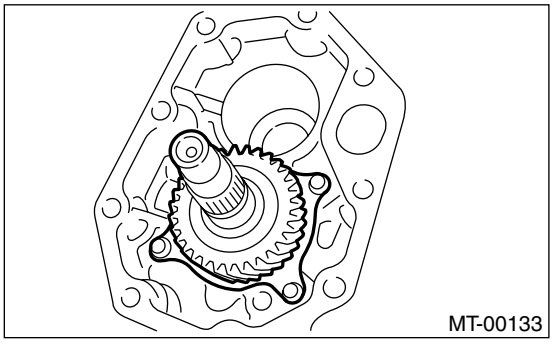
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.
6) Remove the transfer drive gear.


MT-00133

B: INSTALLATION

1) Install the transfer drive gear.

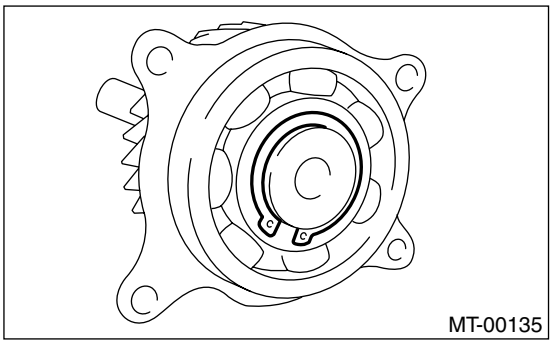
Tightening torque:
26 N·m (2.7 kgf-m, 20 ft-lb)


MT-00133

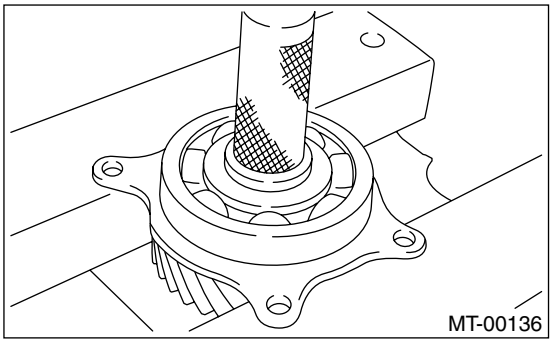
2) Install the transfer driven gear.
3) Install the extension case assembly.
4) Install the transfer case and extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-39, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly from vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.


MT-00135

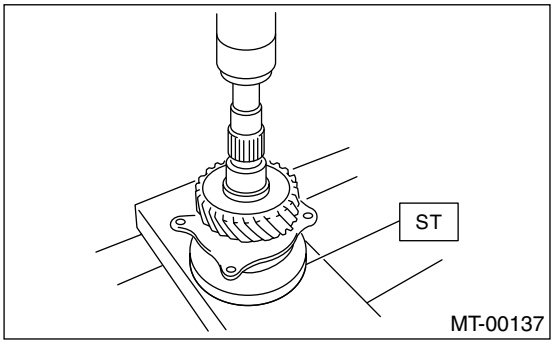
2) Remove the ball bearing.


MT-00136

D: ASSEMBLY

1) Set the ST applying to inner race of bearing and install to drive shaft.
ST 398177700 INSTALLER

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



MT-00137

2) Install the snap ring on transfer drive shaft.
3) Check the clearance between snap ring and ball bearing. <Ref. to 5MT-48, INSPECTION, Transfer Drive Gear.>

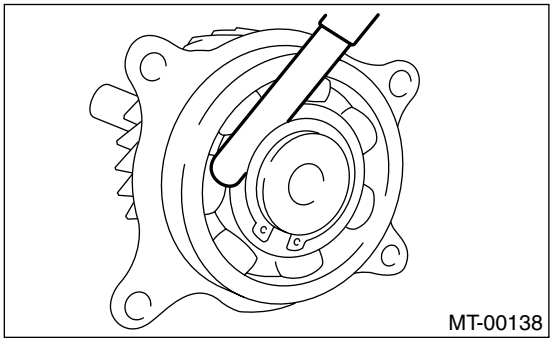
E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Drive gear
Replace the drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:
0.01 — 0.15 mm (0.0004 — 0.0059 in)



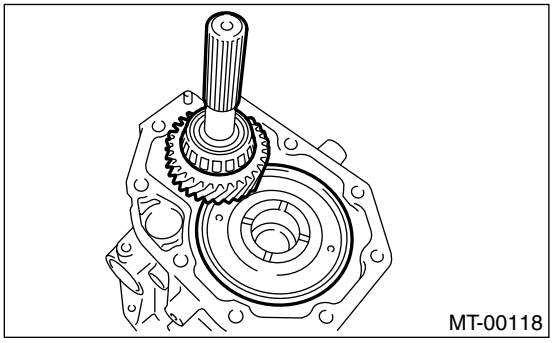
If the measurement is not within specification, select a suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

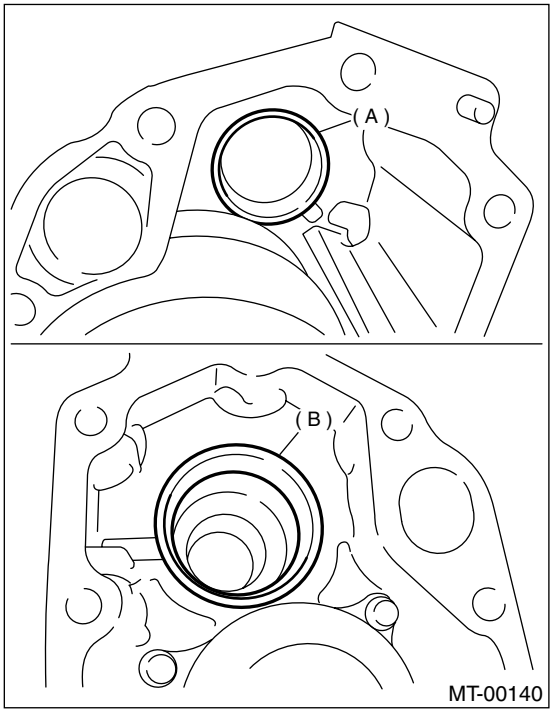
12.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.



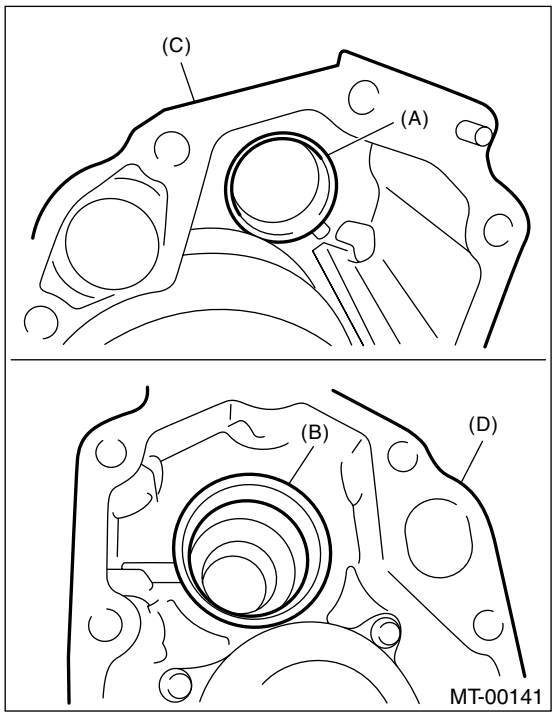
6) Remove the bearing outer race from extension case and transfer case.



(A) Bearing outer race (transfer case)
(B) Bearing outer race (extension case)

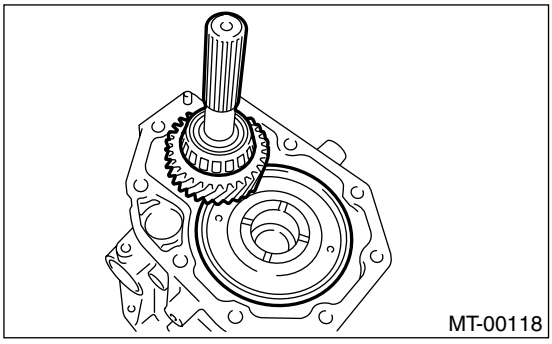
B: INSTALLATION

1) Install the bearing outer race to extension case and transfer case.



(A) Bearing outer race
(B) Bearing outer race
(C) Transfer case
(D) Extension case

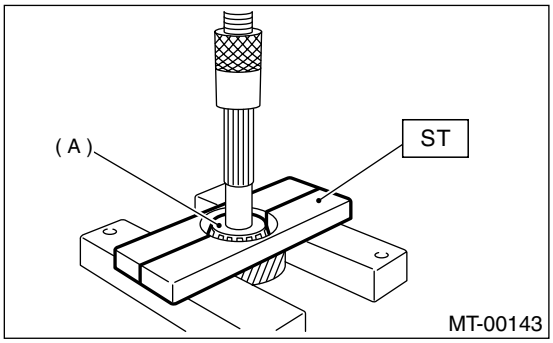
2) Install the transfer driven gear.



3) Install the transfer case and extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the back-up light switch and neutral position switch. <Ref. to 5MT-39, INSTALLATION, Switches and Harness.>
5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

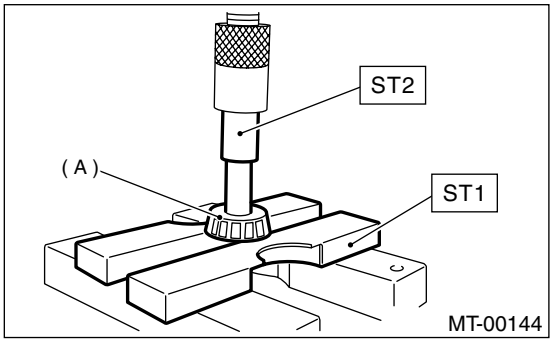
C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).
ST 498077000 REMOVER



(A) Roller bearing

2) Using the ST1 and ST2, remove the roller bearing (transfer case side).
ST1 498077000 REMOVER
ST2 899864100 REMOVER

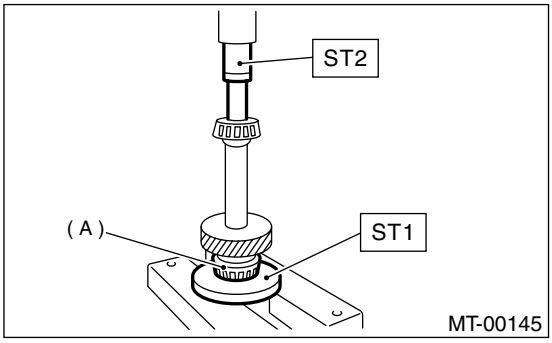


(A) Roller bearing

D: ASSEMBLY

1) Using the ST, install the roller bearing (extension case side).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER

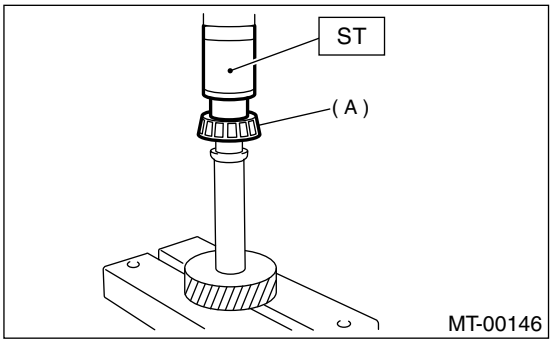
NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

2) Using the ST, install the roller bearing (transfer case side).
ST 499757002 INSTALLER

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Driven gear
Replace the drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

13.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transfer driven gear. <Ref. to 5MT-49, REMOVAL, Transfer Driven Gear.>
5) Remove the center differential.

B: INSTALLATION

1) Install the center differential into transfer case.
2) Install the transfer driven gear. <Ref. to 5MT-49, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

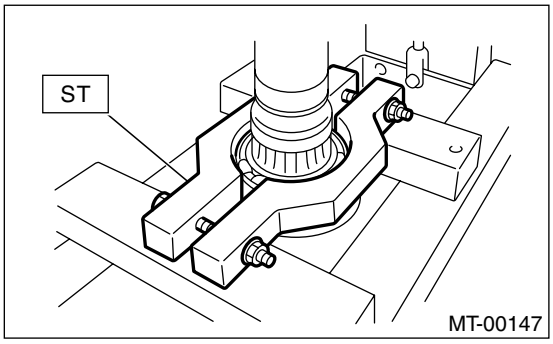
C: DISASSEMBLY

NOTE:
Do not disassemble the center differential because it is a non-disassemble part.

Remove the ball bearing using ST.

NOTE:
Do not reuse the ball bearing.

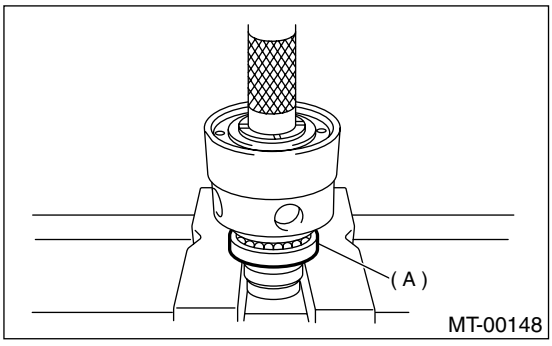
ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER



D: ASSEMBLY

Install the ball bearing to center differential assembly.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

E: INSPECTION

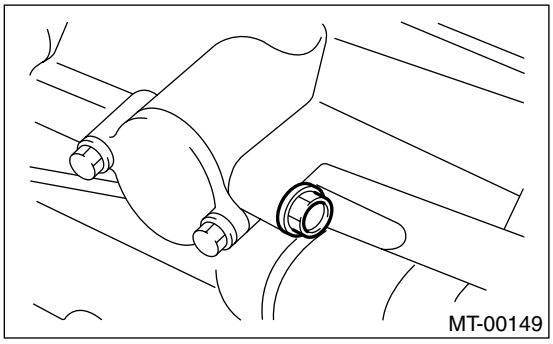
1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Center differential
Replace the center differential assembly in the following case:
- Worn or damaged

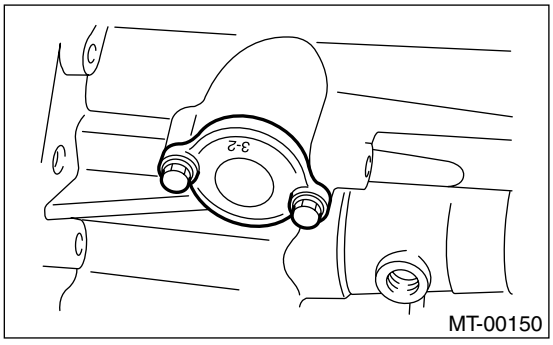
14.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the shifter arm.
4) Remove the plug, spring, washer and reverse check ball.



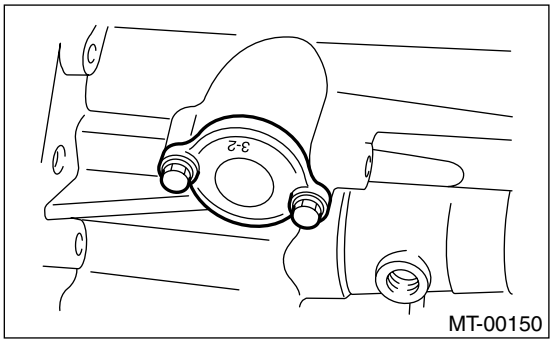
5) Remove the reverse check sleeve.



B: INSTALLATION

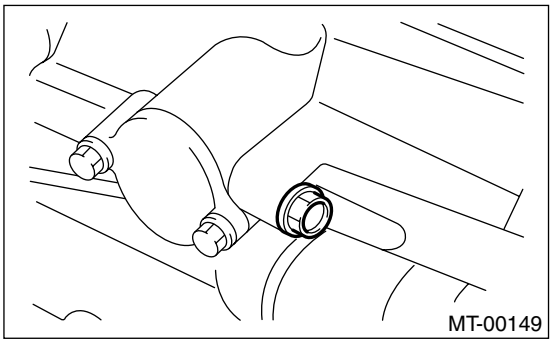
1) Install the reverse check sleeve.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install the ball, spring, washer and plug to transfer case.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

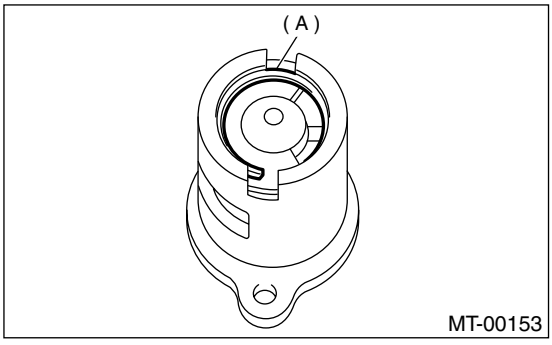


3) Install the shifter arm to transfer case assembly.
4) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

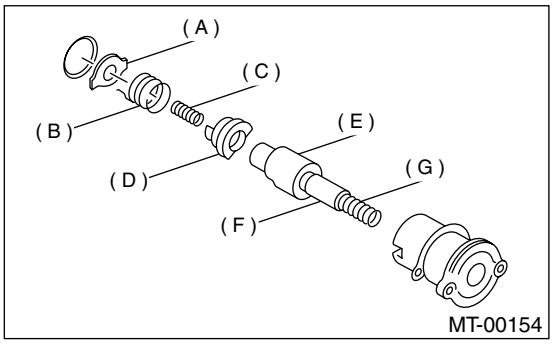
1) Cover the reverse check sleeve with a rag, and remove the snap ring using a screwdriver.

NOTE:
Replace the snap ring with a new one if deformed or weakened.



(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

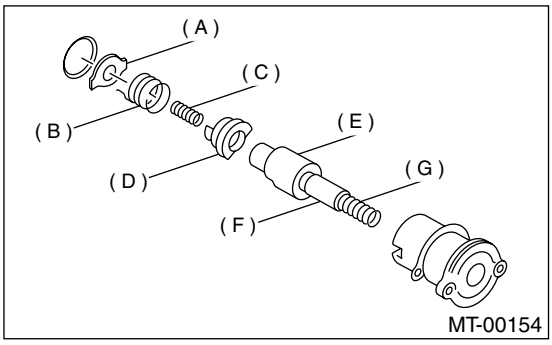
3) Remove the O-ring.

NOTE:
• Reverse check sleeve assembly uses an O-ring which should not be scratched.
• Be careful not to break the adjustment shim placed between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

NOTE:
Be sure the bent section of reverse check spring is positioned in the groove in check cam.

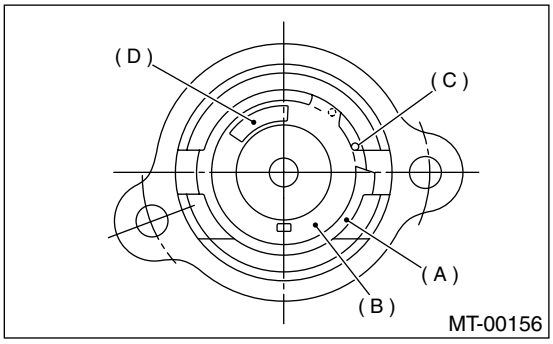


(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

2) Hook the bent section of reverse check spring over reverse check plate.
3) Rotate the cam so that the protrusion of reverse check cam is at the opening in plate.
4) With the cam held in that position, install the plate onto reverse check sleeve and hold with snap ring.
5) Position the O-ring in groove in sleeve.

E: INSPECTION

• Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
• Spin the cam by hand for smooth rotation.
• Move the cam and shaft all the way toward plate and release.
If the cam does not return properly, replace the reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace the spring.



(A) Snap ring
(B) Reverse check plate
(C) Reverse check spring
(D) Reverse check cam

• Select a suitable reverse accent shaft and reverse check plate. <Ref. to 5MT-54, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

1) Shift the gear into 3rd gear position.
2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of return spring, until arm contacts the stopper.
3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
4) To adjust, remove the bolts holding reverse check sleeve assembly to the case, move the sleeve assembly outward, and place adjustment shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.

CAUTION:
Be careful not to break the O-ring when placing shim(s).

NOTE:
• When the shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
• If the shims alone cannot adjust clearance, replace the reverse accent shaft and re-adjust.

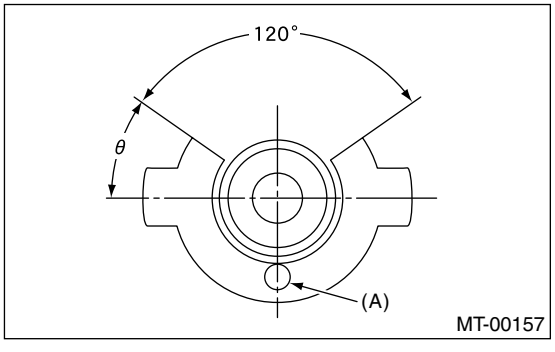
Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st gear.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

1) Shift the shifter arm to “5th” and then to reverse to see if reverse check mechanism operates properly.
2) Also check to see if the arm returns to neutral when released from reverse position. If the arm does not return properly, replace the reverse check plate.

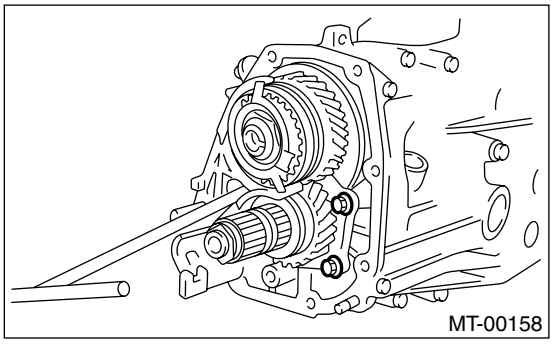
Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



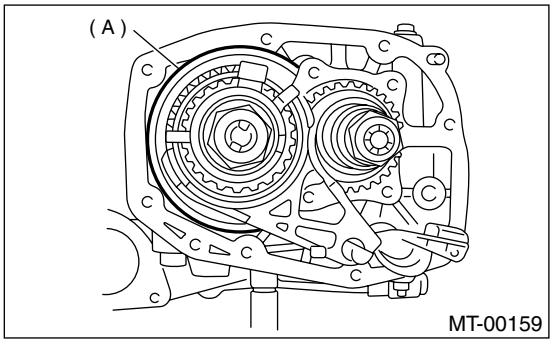
15.Transmission Case

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-15, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the bearing mounting bolts.

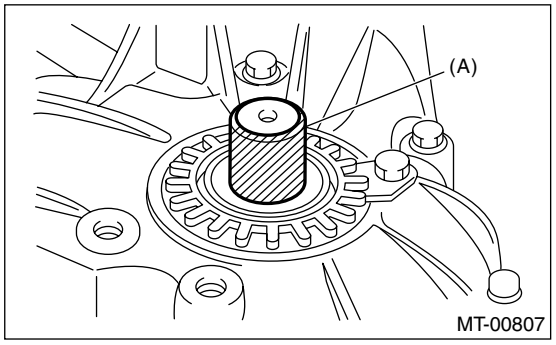


5) Remove the main shaft rear plate.



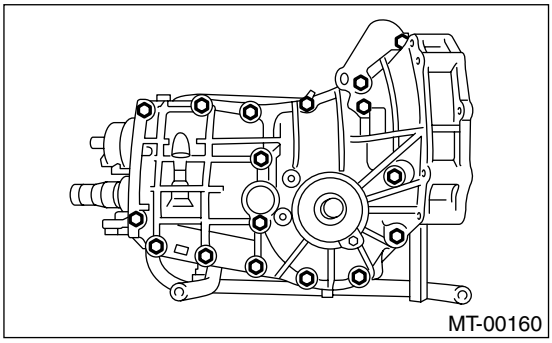
(A) Main shaft rear plate

6) Put vinyl tape around the splines of right and left axle drive shafts to prevent damage to oil seal. (Non-TURBO model)



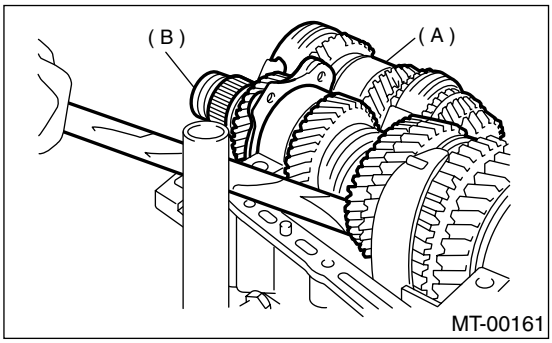
(A) Vinyl tape

7) Separate the transmission case into right and left cases by loosening the coupling bolts and nuts.



8) Remove the drive pinion shaft assembly from left side transmission case.

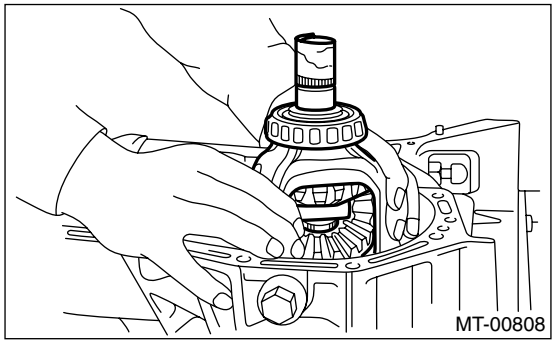
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

9) Remove the main shaft assembly.
10) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



B: INSTALLATION

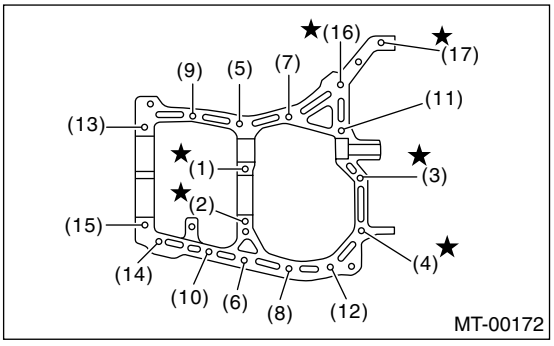
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.
3) Install the main shaft assembly.
Install the transmission case knock pin into needle bearing knock pin hole.
4) Install the drive pinion shaft assembly.
Install the transmission case knock pin into roller bearing knock pin hole.
5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

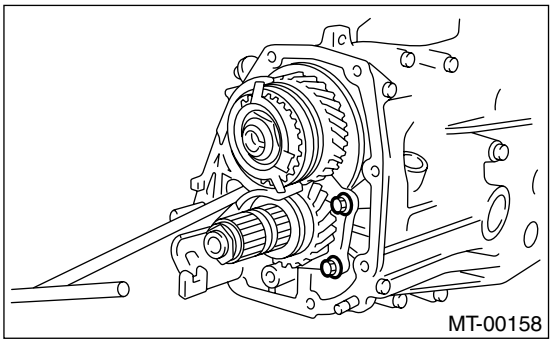
NOTE:
• Insert the bolts from bottom and tighten the nuts at top.
• Put the cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that the speedometer gear is meshed.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
★ 10 mm bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)



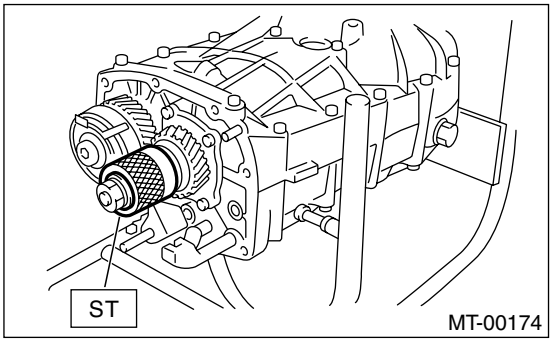
7) Tighten the ball bearing attachment bolts.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)

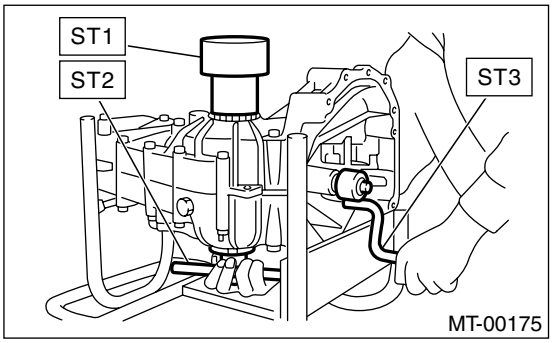


8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing:

NOTE:
Support the drive pinion assembly with ST.
ST 498427100 STOPPER



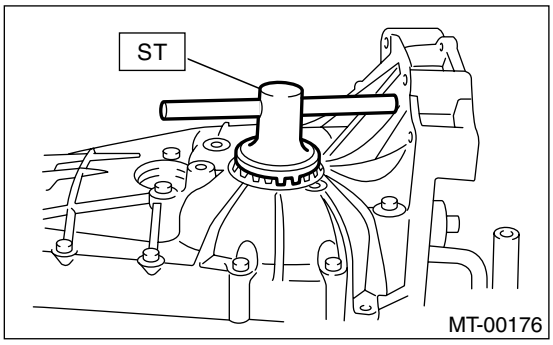
9) Place the transmission with case left side facing downward and put ST1 on bearing cup.
10) Screw the retainer assembly into left case from the bottom using ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2. This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



11) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



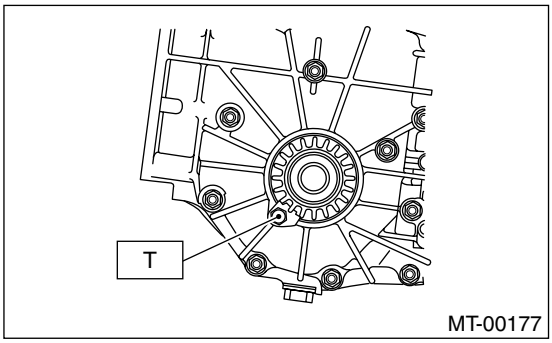
12) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on upper side by the same amount in order to obtain the backlash.

NOTE:
The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

13) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
14) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
15) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.
16) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to 5MT-76, INSPECTION, Front Differential Assembly.>
17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in.
Tighten the lock plate.

NOTE:
Carry out this job on both upper and lower retainers.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



18) Selecting of main shaft rear plate. <Ref. to 5MT-63, ADJUSTMENT, Main Shaft Assembly.>
19) Install the clutch release lever and bearing. <Ref. to CL-15, INSTALLATION, Release Bearing and Lever.>
20) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
21) Install the manual transmission assembly into the vehicle.<Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

16.Main Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-64, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.

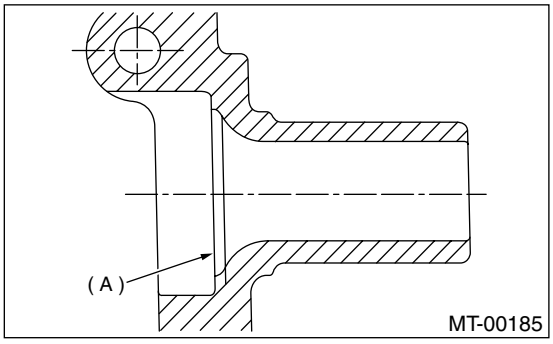
B: INSTALLATION

1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

NOTE:
• Wrap the clutch splined section with vinyl tape to prevent damage to oil seal.
• Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.
• Use a new one.

2) Install the needle bearing outer race knock pin hole into transmission case knock pin.

NOTE:
Align the end face of seal with surface (A) when installing oil seal.



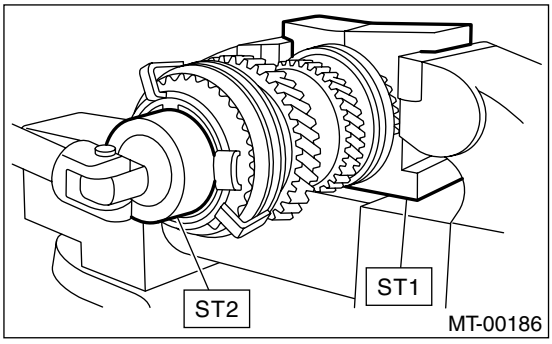
3) Install the drive pinion assembly. <Ref. to 5MT-64, INSTALLATION, Drive Pinion Shaft Assembly.>
4) Install the transmission case. <Ref. to 5MT-56, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

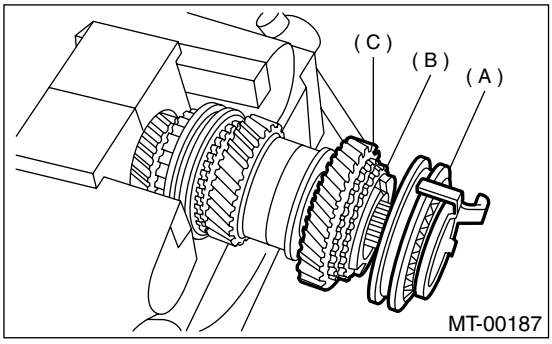
1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the lock nut from transmission main shaft assembly.

NOTE:
Remove the caulking before removing lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

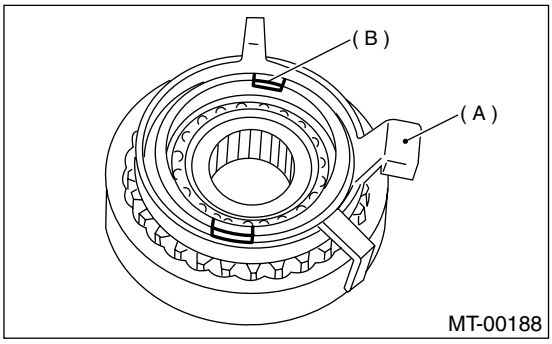


3) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



(A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

4) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.

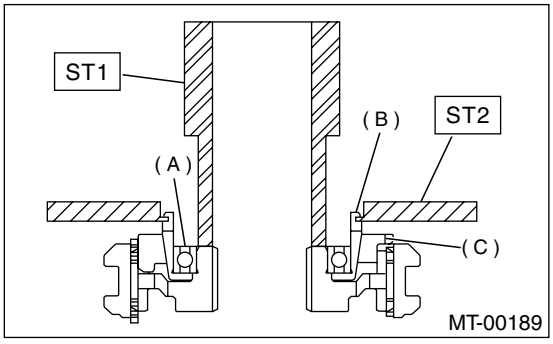


(A) Synchro cone stopper
(B) Snap ring

5) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:
• Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
• Do not reuse the ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

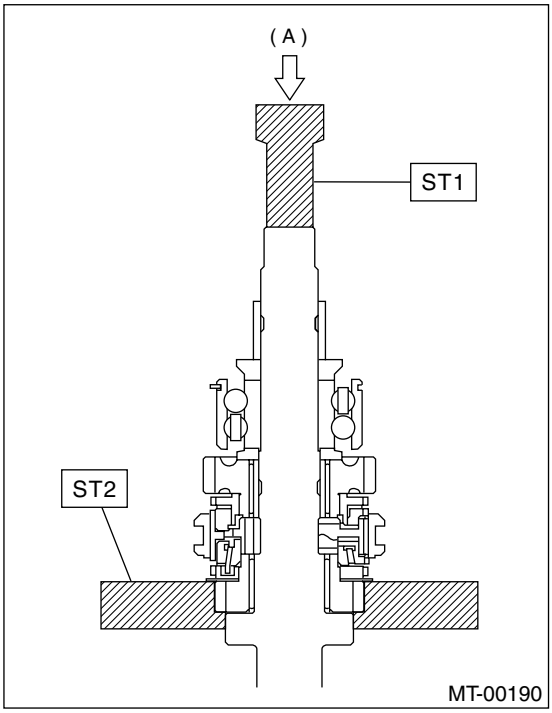


(A) Ball bearing
(B) Synchro cone
(C) Baulk ring

6) Using the ST1 and ST2, remove rest of the parts.

NOTE:
Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 899864100 REMOVER
ST2 899714110 REMOVER

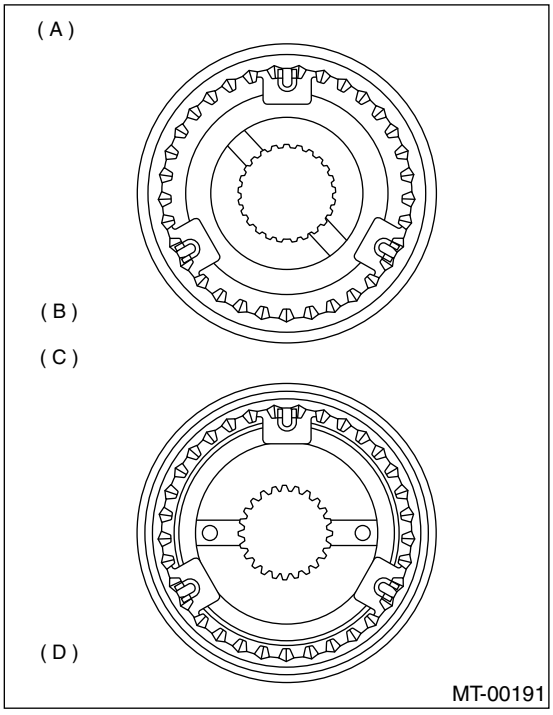


(A) Press

D: ASSEMBLY

1) Assemble each sleeve and hub assembly.

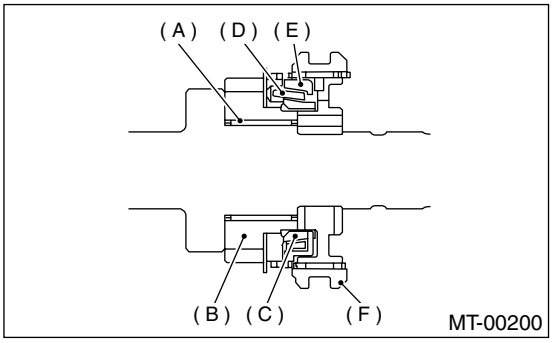
NOTE:
Position the open ends of spring 120° apart.



(A) 3rd-4th hub ASSY
(B) 3rd gear side
(C) 5th-Rev hub ASSY
(D) 5th gear side

2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.

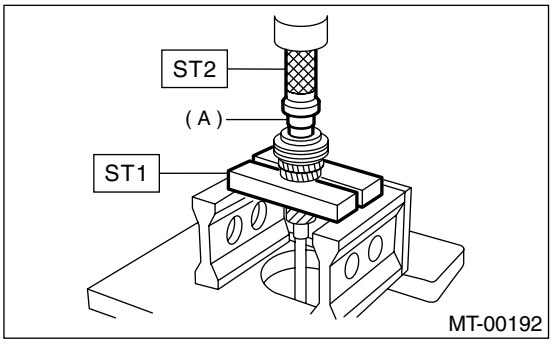


(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve and hub ASSY

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

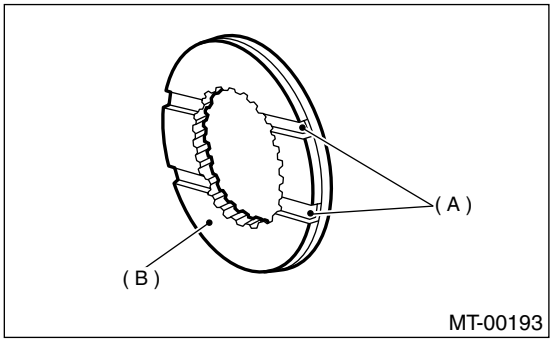
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Align the baulk ring and gear & hub assembly with key groove.

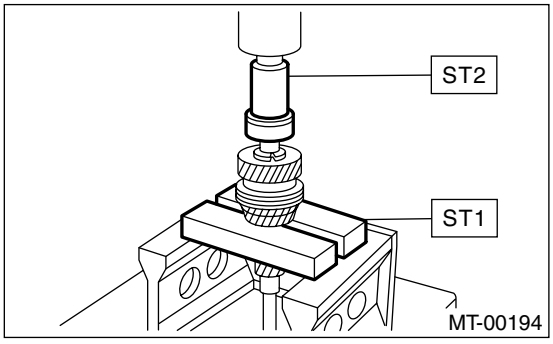


(A) Groove
(B) 4th gear side

5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

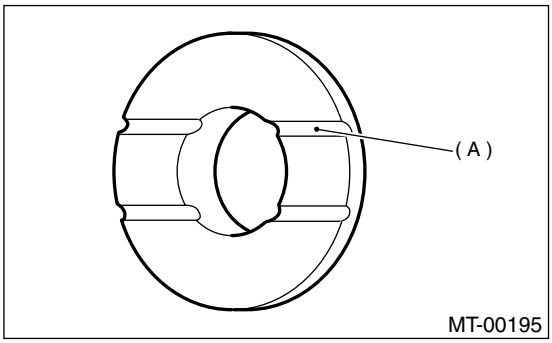
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Face the thrust washer in correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

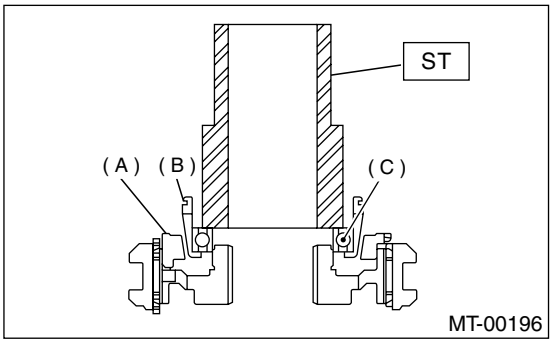


(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.
8) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

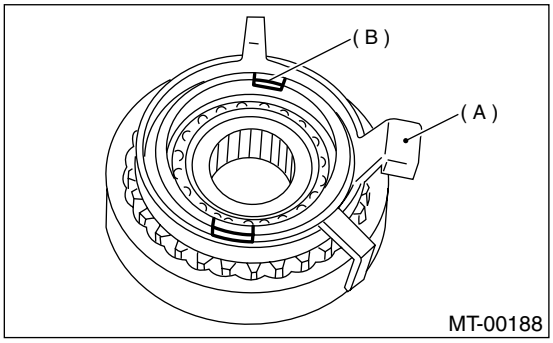
NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Use a new ball bearing.
• After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

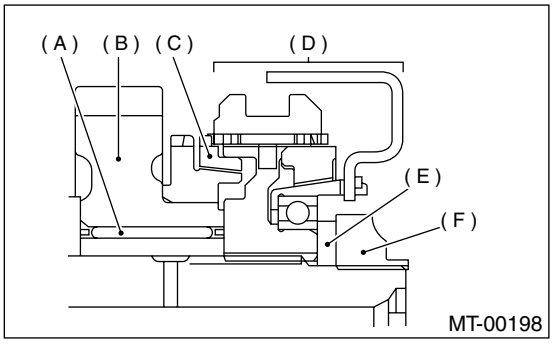
9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



(A) Synchro cone stopper
(B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve and hub ASSY
(E) Lock washer
(F) Lock nuts

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE:
Secure the lock nuts in two places after tightening.

ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

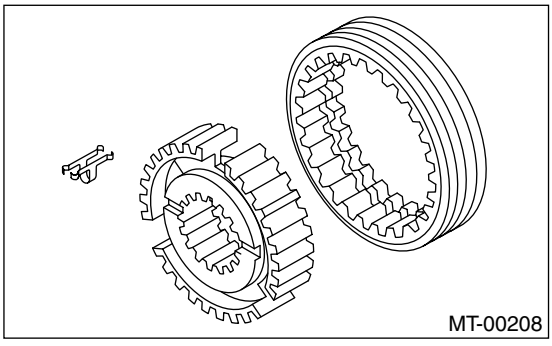
1) Bearings
Replace the bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
• Bearings having other defects

2) Bushing (each gear)
Replace the bushing in the following cases:
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.

3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.

4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key
Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

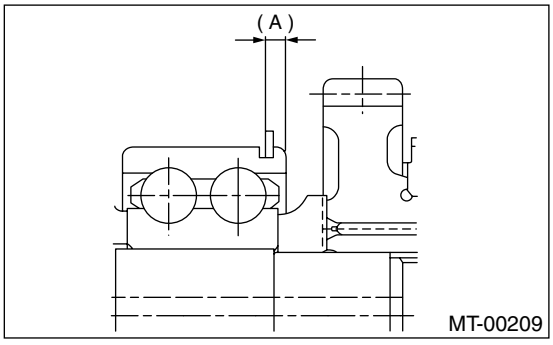
F: ADJUSTMENT

Selection of main shaft rear plate:
Using the ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

NOTE:
Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

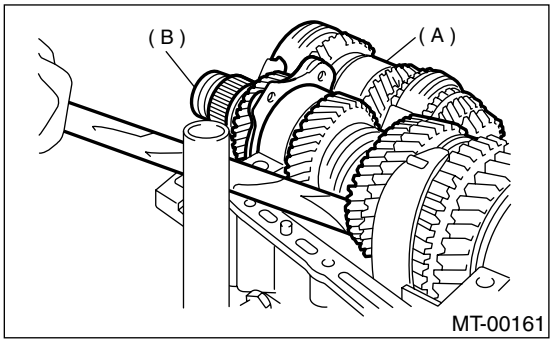


17.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-55, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly.

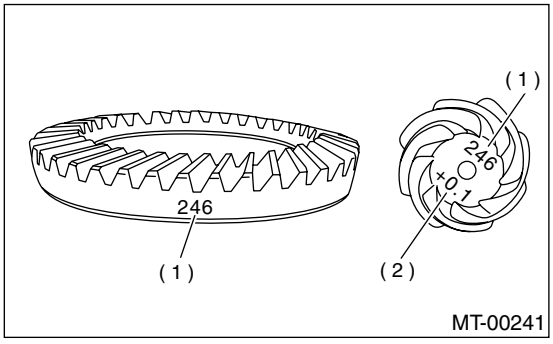
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

B: INSTALLATION

1) Remove the differential assembly.
2) Alignment marks/numbers on hypoid gear set:
The upper number on drive pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.

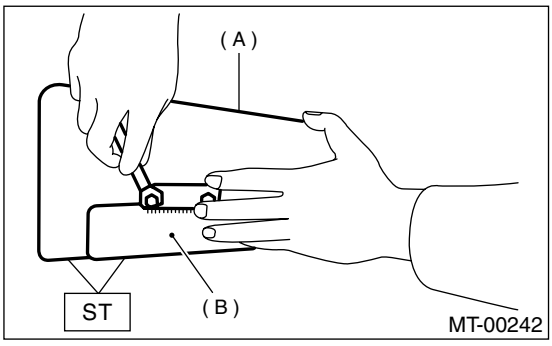


(A) Match number
(B) Shim adjust number

3) Place the drive pinion shaft assembly on right hand transmission main case without shim and tighten the bearing mounting bolts.
4) Inspection and adjustment of ST:

NOTE:
• Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
• Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



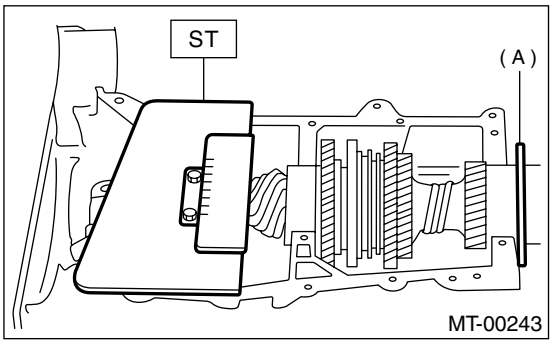
(A) Plate
(B) Scale

5) Position the ST by inserting the knock pin of ST into the knock hole in transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



(A) Adjust clearance to zero without shim.

7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by −.)

ST 499917500 DRIVE PINION GAUGE ASSY

8) Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the indicated value.

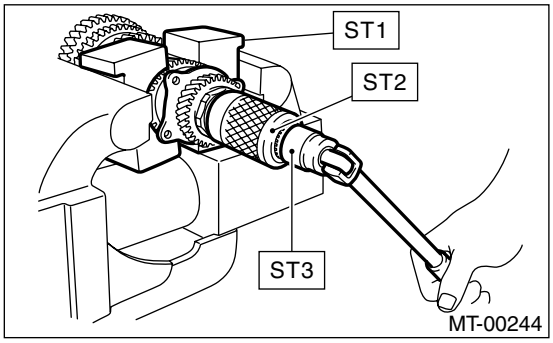
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the differential assembly. <Ref. to 5MT-72, INSTALLATION, Front Differential Assembly.>
10) Set the transmission main shaft assembly and drive pinion assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect the suitable 1st-2nd, 3rd-4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to 5MT-69, INSPECTION, Drive Pinion Shaft Assembly.>
11) Install the transmission case. <Ref. to 5MT-56, INSTALLATION, Transmission Case.>
12) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
13) Install the manual transmission assembly to vehicle. <Ref. to 5MT-28, Manual Transmission Assembly.>

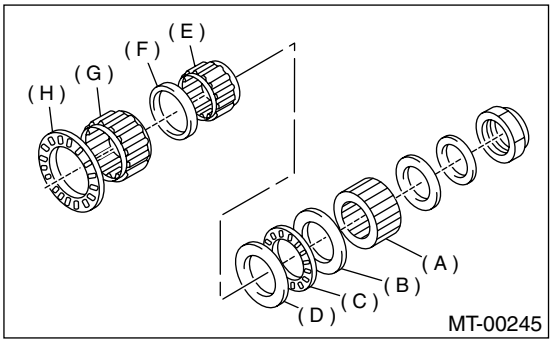
C: DISASSEMBLY

NOTE:
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) to prevent damage during disassembly or reassembly.

1) Straighten the lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)



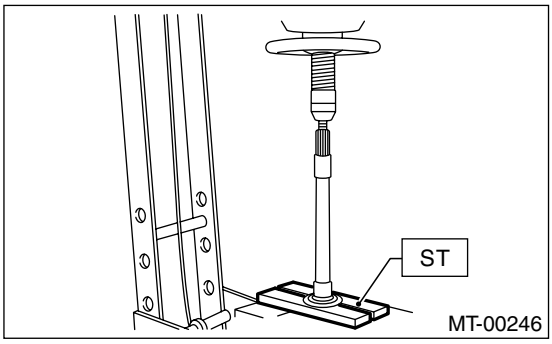
2) Withdraw the drive pinion from driven shaft. Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing, drive pinion collar, needle bearing and thrust bearing.



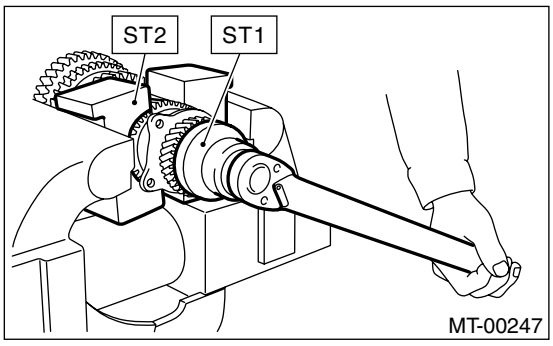
(A) Differential bevel gear sleeve
(B) Washer No. 1 ($25 \times 37.5 \times t$)
(C) Thrust bearing ($25 \times 37.5 \times 3$)
(D) Washer No. 2 ($25 \times 37.5 \times 4$)
(E) Needle bearing ($25 \times 30 \times 20$)
(F) Drive pinion collar
(G) Needle bearing ($30 \times 37 \times 23$)
(H) Thrust bearing ($33 \times 50 \times 3$)

3) Remove the roller bearing and washer using ST and press.

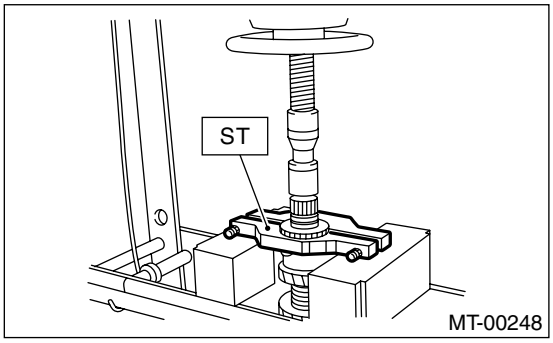
NOTE:
Do not reuse the roller bearing.
ST 498077000 REMOVER



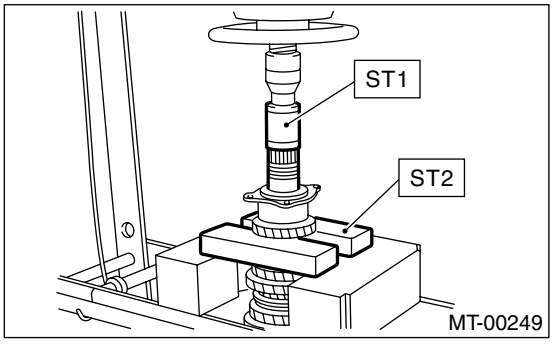
4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.
ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.
ST 499857000 5TH DRIVEN GEAR REMOVER

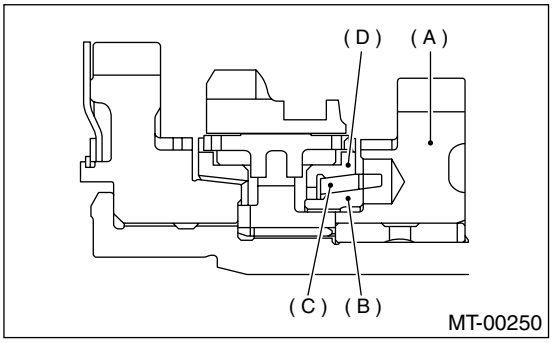


6) Remove the woodruff key.
7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.
ST1 499757002 INSTALLER
ST2 899714110 REMOVER



8) Remove the key.

9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.

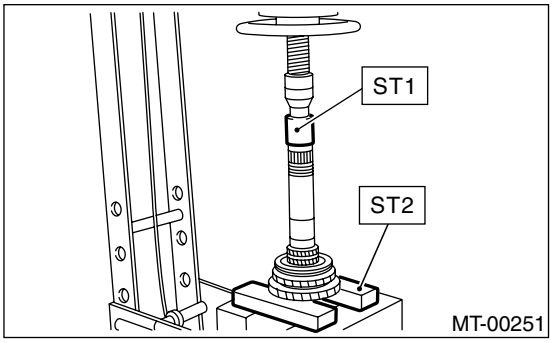


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

10) Remove the 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.

NOTE:
Replace the gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they should be disassembled, mark engagement point beforehand.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER

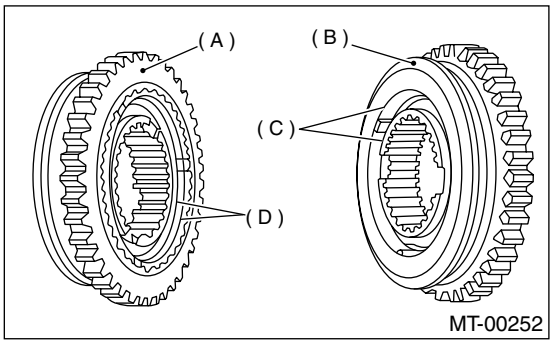


11) Remove the sub gear for 1st driven gear.

D: ASSEMBLY

1) Install the sleeve and hub assembly by matching alignment marks.

NOTE:
Use a new gear and hub assembly, if gear or hub have been replaced.



(A) 1st gear side
(B) 2nd gear side
(C) Flush surface
(D) Stepped surface

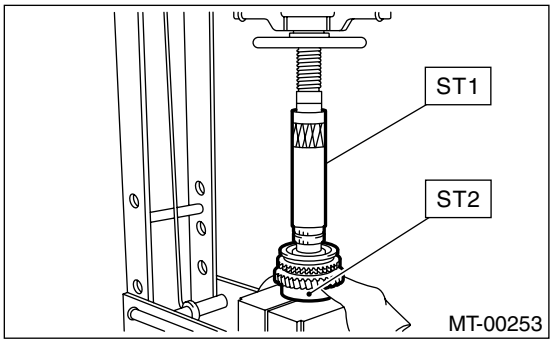
2) Install the washer, snap ring and sub gear to 1st driven gear.
3) Install the 1st driven gear, 1st baulk ring, gear and hub assembly onto driven shaft.

NOTE:
• Take care to install the gear and hub assembly in proper direction.
• Align the baulk ring and gear & hub assembly with key groove.

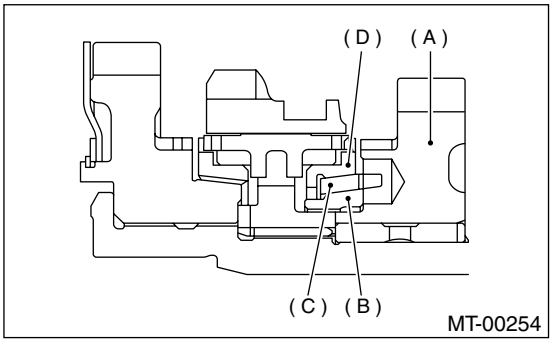
4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Attach a cloth to the end of driven shaft to prevent damage.
• When press fitting, align the oil holes of shaft and bush.

ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner baulk ring, synchro cone, outer baulk ring and insert onto driven shaft.

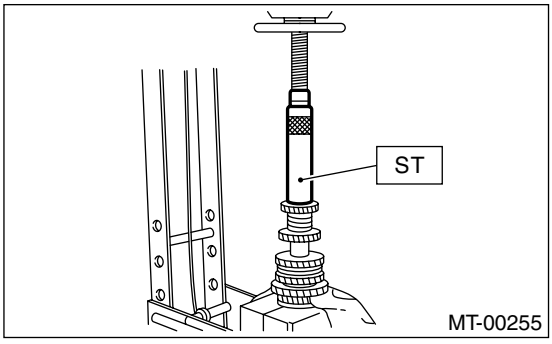


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

6) After installing the key on driven shaft, install the 3rd-4th driven gear using ST and press.

NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Align the groove in baulk ring with insert.

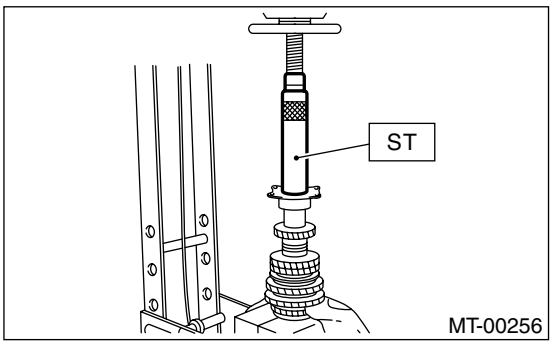
ST 499277200 INSTALLER



7) Install a set of roller bearings onto the driven shaft using ST and press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

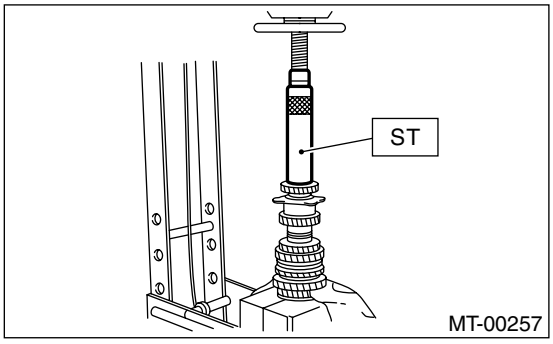
ST 499277200 INSTALLER



8) Position the woodruff key in groove on the rear of driven shaft. Install the 5th driven gear onto driven shaft using ST and press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

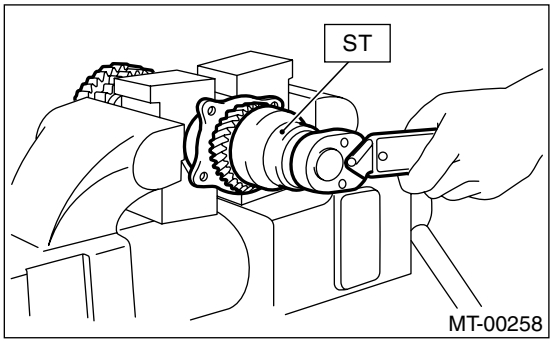
ST 499277200 INSTALLER



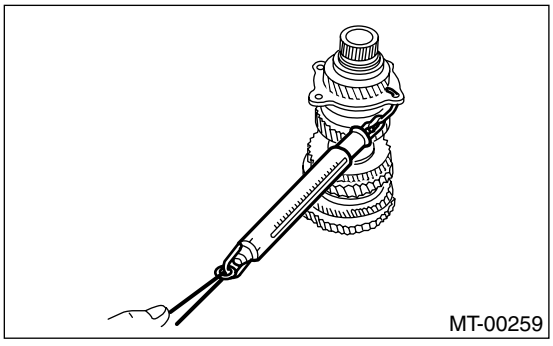
9) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

Tightening torque:
260 N·m (26.5 kgf-m, 191.7 ft-lb)

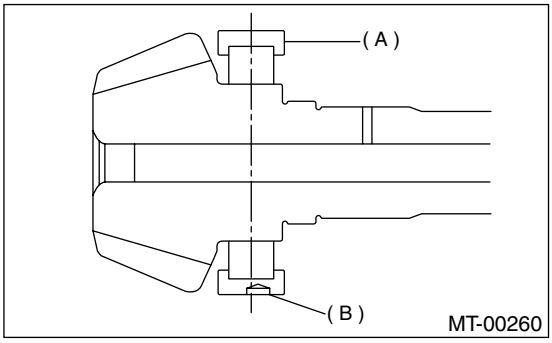


NOTE:
- Stake the lock nut at two points.
- Using the spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.3 3 ft).



10) Install the roller bearing onto drive pinion.

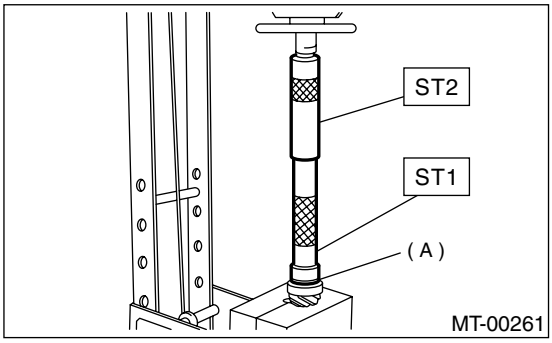
NOTE:
When installing the roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.



(A) Roller bearing
(B) Knock pin hole

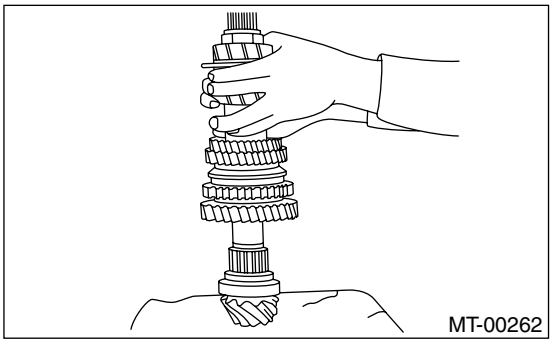
11) Install the washer using ST1, ST2 and press.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



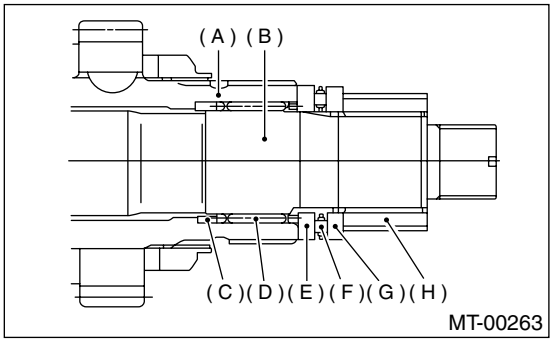
(A) Washer

12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



13) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in that order.

NOTE:
Be careful because the spacer must be installed in proper direction.

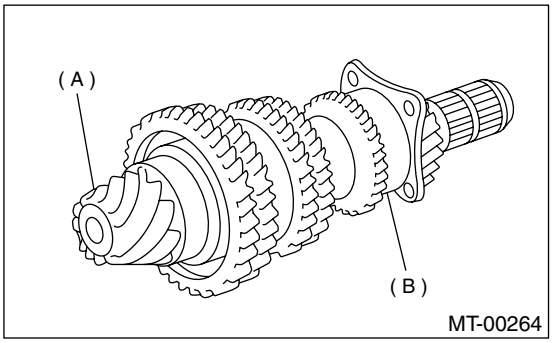


(A) Driven shaft
(B) Drive shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Washer No. 2 (25 × 36 × 4)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

14) Adjust the thrust bearing preload. <Ref. to 5MT-70, ADJUSTMENT, Drive Pinion Shaft Assembly.>

E: INSPECTION

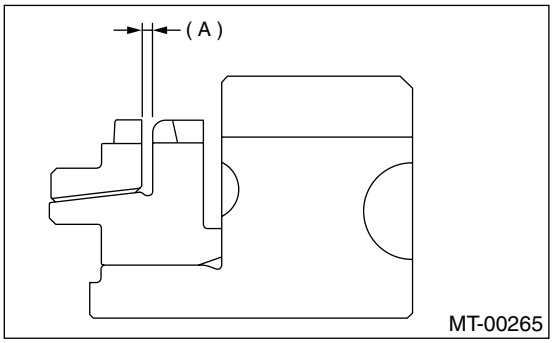
Disassembled parts should be washed clean first and then inspected carefully.
1) Bearings
Replace the bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
• The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.



(A) Drive pinion shaft
(B) Ball bearing

• Bearings having other defects
2) Bushing (each gear)
Replace the bushing in the following cases:
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.
3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Replace if the cone that contacts the baulk ring is rough or damaged.
• Repair or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

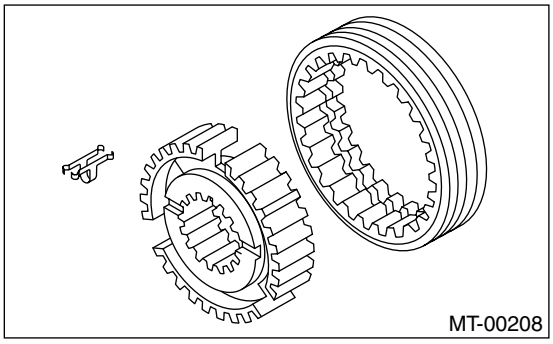
Clearance (A):
0.5 — 1.0 mm (0.020 — 0.040 in)



• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

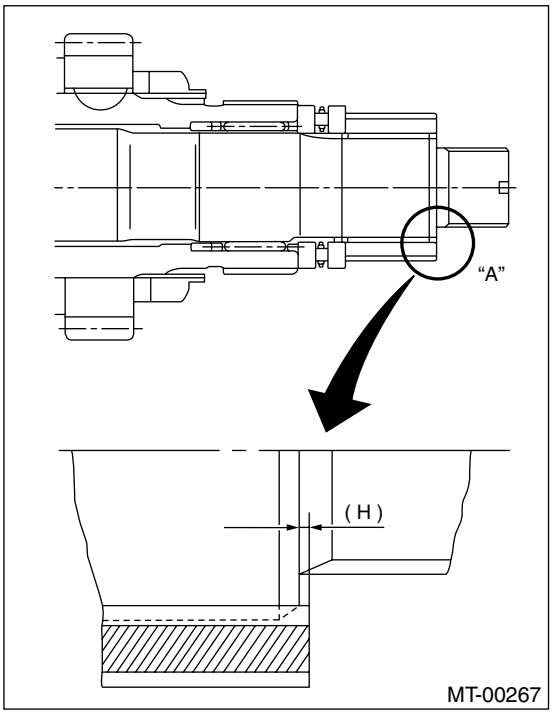
7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

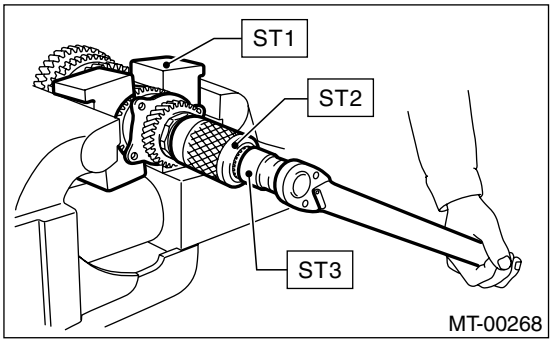
1) Select the adjusting washer No. 1 so that dimension (H) is zero through visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install the lock nut (18 × 13.5).



2) Using the ST1, ST2 and ST3, tighten the new lock nut to specified torque.

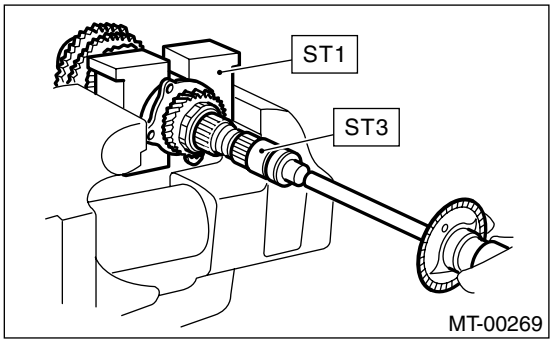
ST1	899884100	HOLDER
ST2	498427100	STOPPER
ST3	899988608	SOCKET WRENCH (27)

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

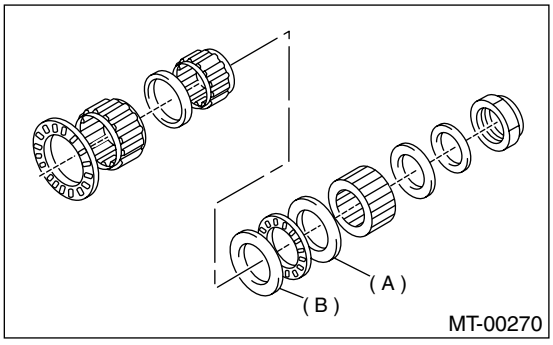


3) After removing the ST2, measure the starting torque using torque driver.
ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)



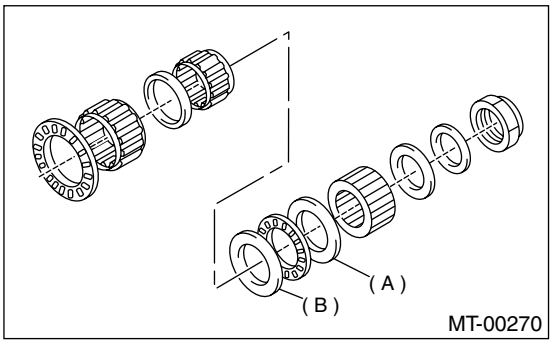
4) If the starting torque is not within specified limit, select a new adjusting washer No. 1 and recheck starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If the specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

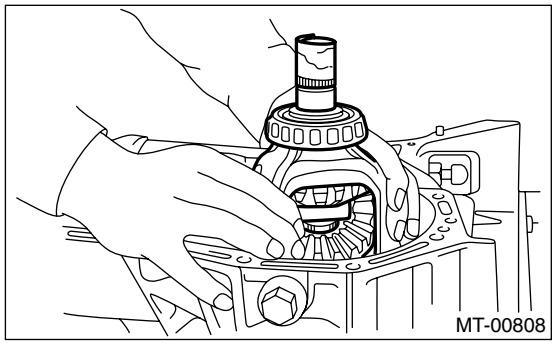
6) Recheck that the starting torque is within specified range, then clinch the lock nut at four positions.

18.Front Differential Assembly

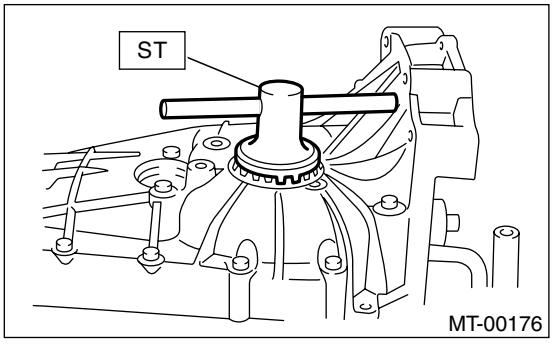
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-55, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-64, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.
<Ref. to 5MT-58, REMOVAL, Main Shaft Assembly.>
6) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



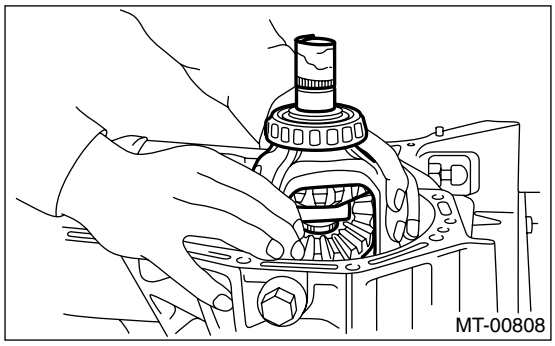
7) Remove the differential side retainers using ST.
ST 499787000 WRENCH ASSY



B: INSTALLATION

1) Install the differential side retainers using ST.
ST 499787000 WRENCH ASSY
2) Install the bearing outer race to transmission case.
3) Install the differential assembly.

NOTE:
• Be careful not to fold the sealing lip of oil seal.
• Wrap the right and left spline sections of axle shaft with vinyl tape to prevent scratches.



4) Install the main shaft assembly.
<Ref. to 5MT-58, INSTALLATION, Main Shaft Assembly.>
5) Install the drive pinion assembly. <Ref. to 5MT-64, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to 5MT-56, INSTALLATION, Transmission Case.>
7) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

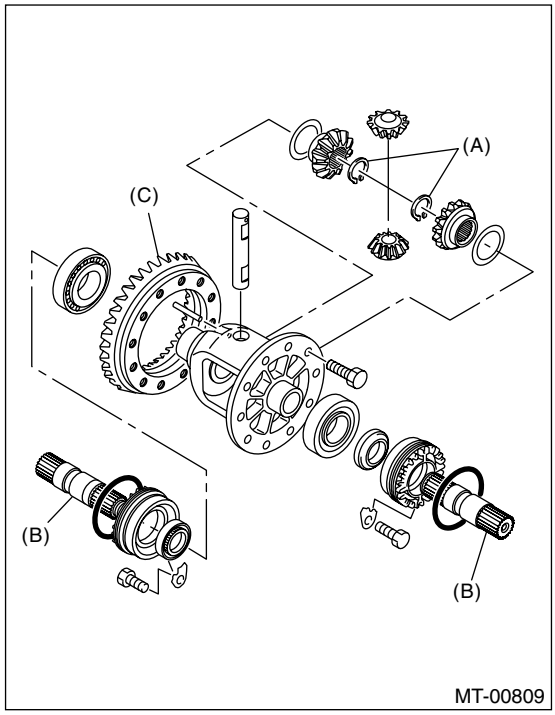
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Remove the right and left snap rings from differential, and then remove the two axle drive shafts. (Non-TURBO model)

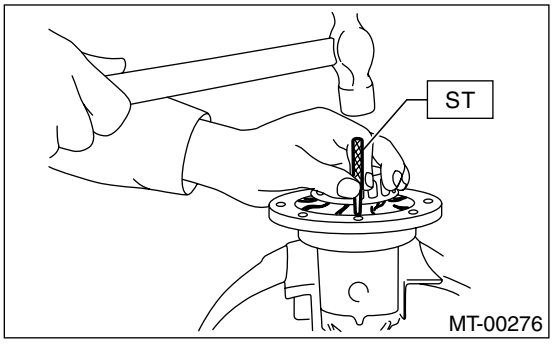
NOTE:
During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

2) Loosen the twelve bolts and remove the hypoid driven gear.

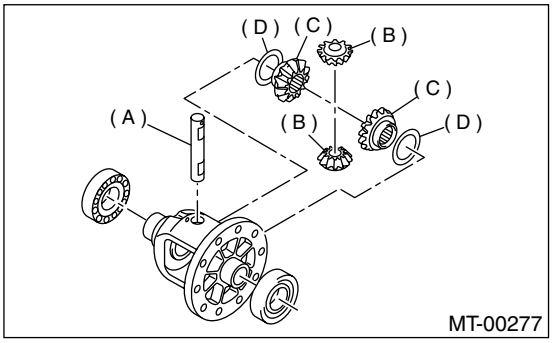


(A) Snap ring
(B) Axle drive shaft (Non-TURBO model)
(C) Hypoid driven gear

3) Drive out the straight pin from differential assembly toward hypoid driven gear.
ST 899904100 REMOVER

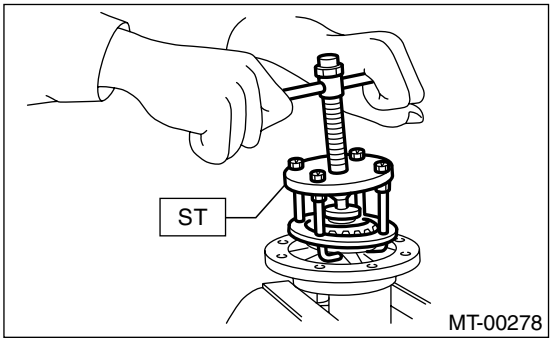


4) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



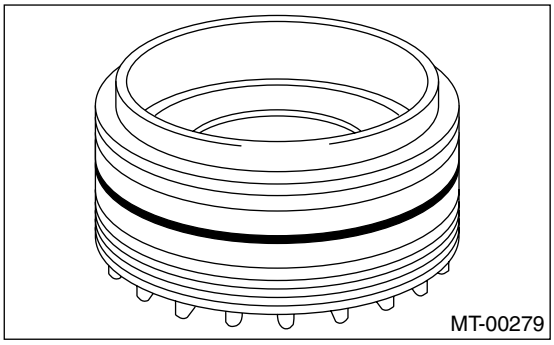
(A) Pinion shaft
(B) Bevel pinion
(C) Bevel gear
(D) Washer

5) Remove the roller bearing using ST.
ST 899524100 PULLER SET



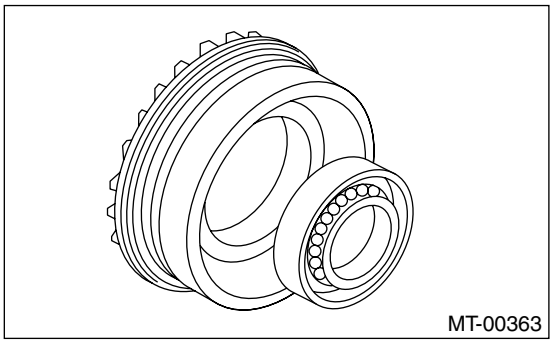
2. SIDE RETAINER

1) Remove the O-ring.



2) Remove the oil seal.

NOTE:
Do not reuse the oil seal. Prepare a new oil seal.

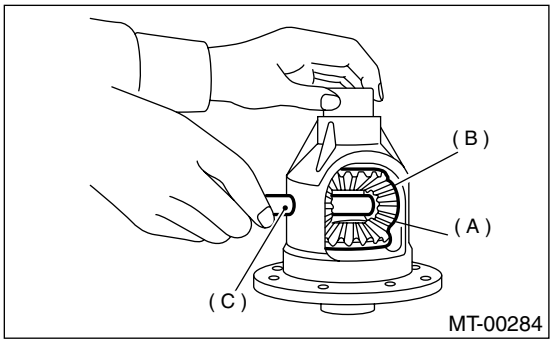


D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the bevel gear and bevel pinion together with washers, and insert pinion shaft.

NOTE:
Face the chamfered side of washer toward gear.



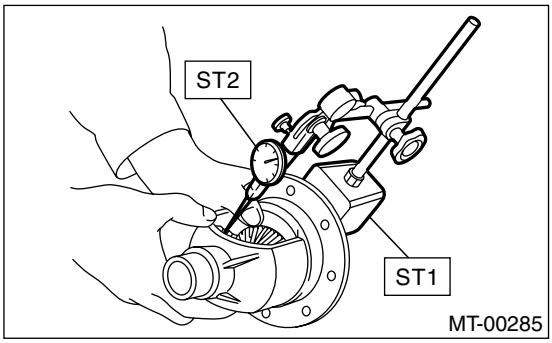
(A) Bevel pinion
(B) Bevel gear
(C) Pinion shaft

2) Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to 5MT-77, ADJUSTMENT, Front Differential Assembly.>

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

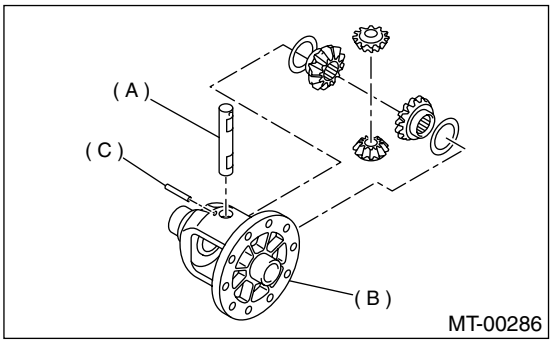
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



3) Align the pinion shaft and differential case at their holes, and drive the straight pin into holes from the hypoid driven gear side, using ST.

NOTE:
Lock the straight pin after installing.

ST 899904100 REMOVER

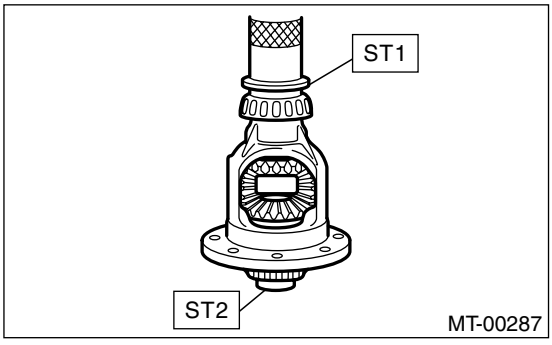


(A) Pinion shaft
(B) Differential case
(C) Straight pin

4) Install the roller bearing to differential case.

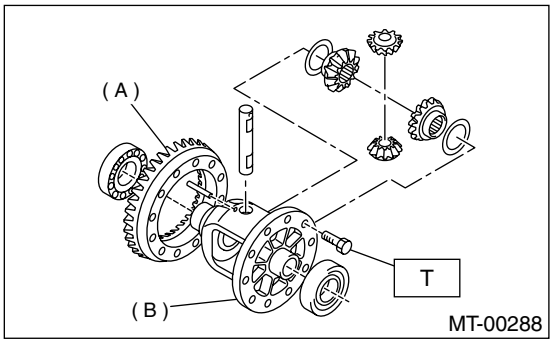
NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Be careful because the roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install the hypoid driven gear to differential case using twelve bolts.

Tightening torque:
T: 62 N·m (6.3 kgf-m, 45.6 ft-lb)



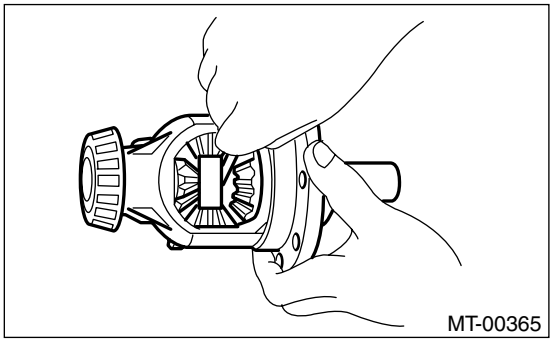
(A) Hypoid driven gear
(B) Differential case

6) Set the drive axle shaft into differential case and hold it using outer spring. Measure the shaft to case clearance to check if it is within specifications using thickness gauge. (Non-TURBO model)

NOTE:
Replace the snap ring with suitable one, if the measurement is not within specifications.

Snap ring (Outer)	
Part No.	Thickness mm (in)
805028011	1.05 (0.0413)
805028012	1.20 (0.0472)

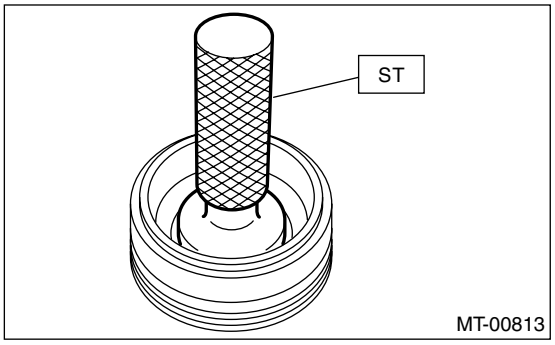
Clearance
0 — 0.2 mm (0 — 0.008 in)



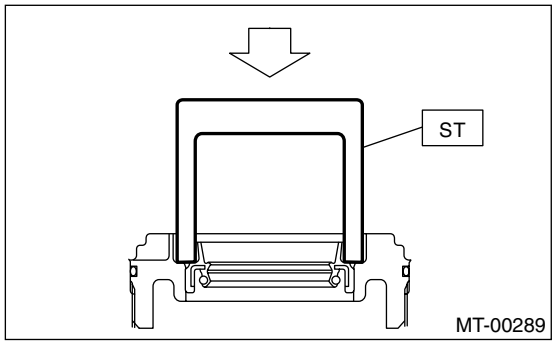
2. SIDE RETAINER

1) Install a new oil seal. (Non-TURBO model)

ST 49979700 INSTALLER

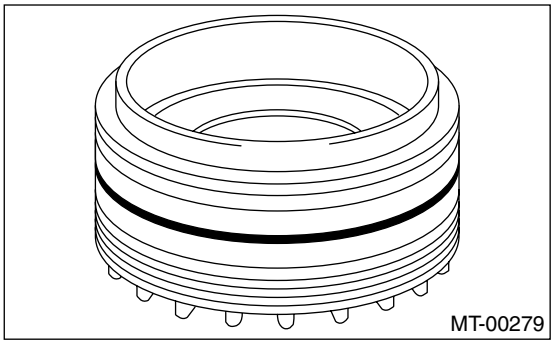


2) Install a new oil seal. (TURBO model)
ST 18675AA000 DIFFERENTIAL OIL SEAL INSTALLER



3) Install a new O-ring.

NOTE:
Do not stretch or damage the O-ring.



E: INSPECTION

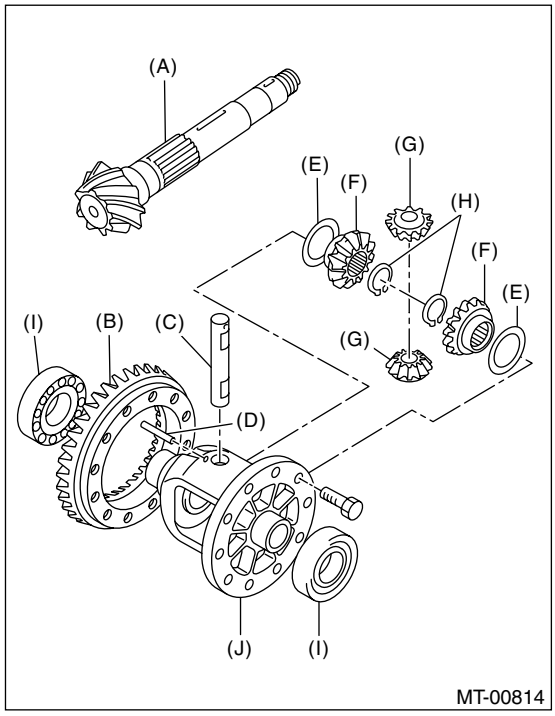
Repair or replace the differential gear in the following cases:

• The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.

• The roller bearing on the drive pinion shaft has a worn or damaged roller path.

• There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.

• The differential case has worn or damaged sliding surfaces.



(A) Drive pinion shaft
(B) Hypoid driven gear
(C) Pinion shaft
(D) Straight pin
(E) Washer
(F) Differential bevel gear
(G) Differential bevel pinion
(H) Snap ring
(I) Roller bearing
(J) Differential case

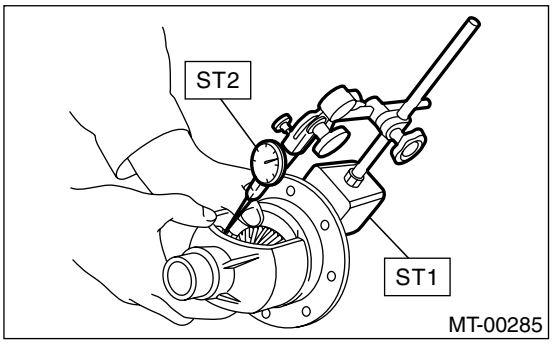
1. BEVEL PINION GEAR BACKLASH

Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

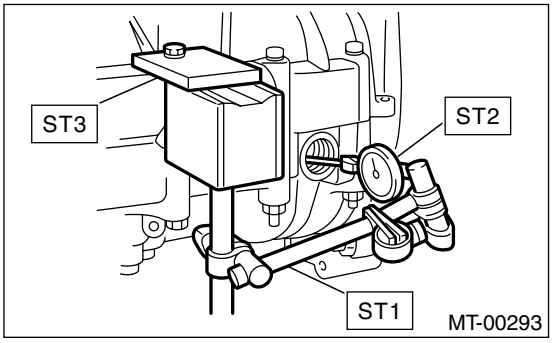
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



2. HYPOID GEAR BACKLASH

1) Insert the SUBARU genuine axle shaft into the left and right side retainer holes. (TURBO model)
ST 38415AA000 AXLE SHAFT
2) Set the ST1, ST2 and ST3 . Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

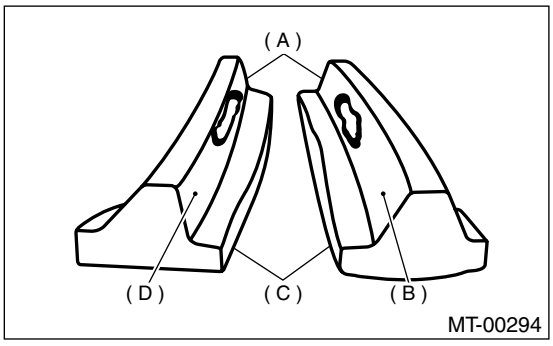


NOTE:
If the backlash is outside specified range, adjust it by turning the holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check the tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to 5MT-77, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



(A) Toe
(B) Coast side
(C) Heel
(D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

1) Disassemble the front differential. <Ref. to 5MT-72, REMOVAL, Front Differential Assembly.>
2) Select a differential washer from the table and install.

Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

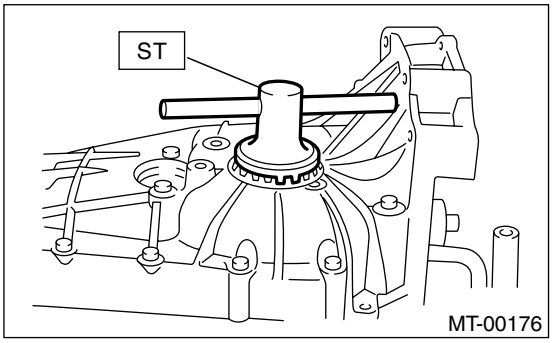
3) Adjust until the specified value is obtained.

Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

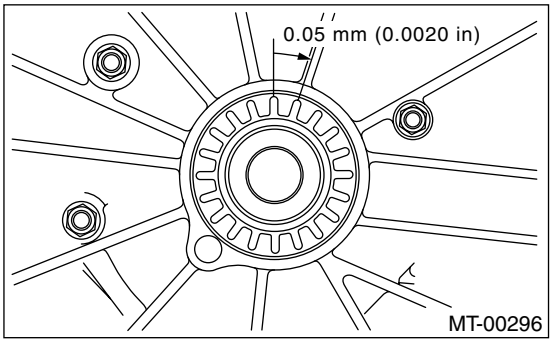
2. HYPOID GEAR BACKLASH

Adjust backlash by turning the holder in right side case.

ST 499787000 WRENCH ASSY



NOTE:
Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).

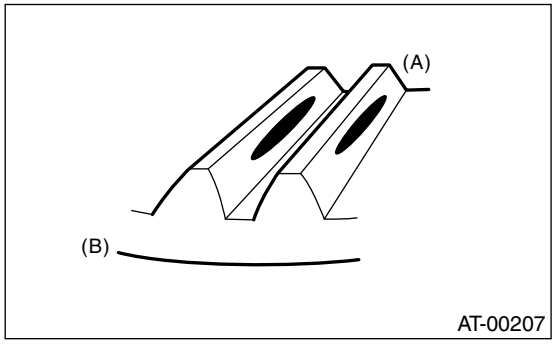


3. TOOTH CONTACT OF HYPOID GEAR

1) Adjust until the tooth contact is correct.
2) Check and adjust the tooth contact with following.

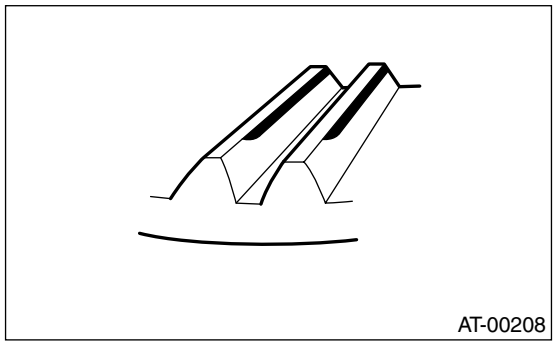
- Tooth contact

Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]

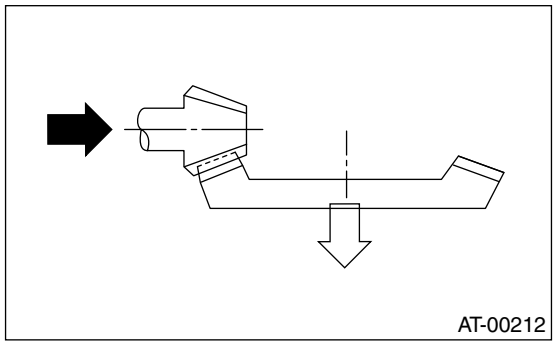


(A) Toe side
(B) Heel side

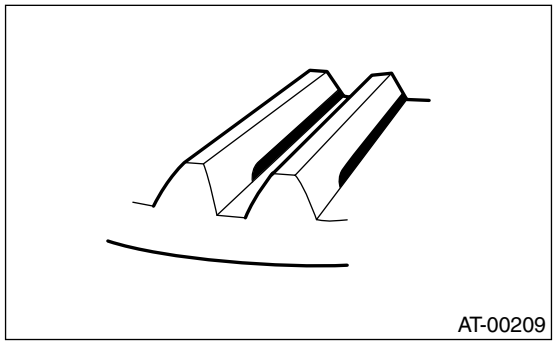
• Face contact
Checking item: Backlash is too large.
Contact pattern



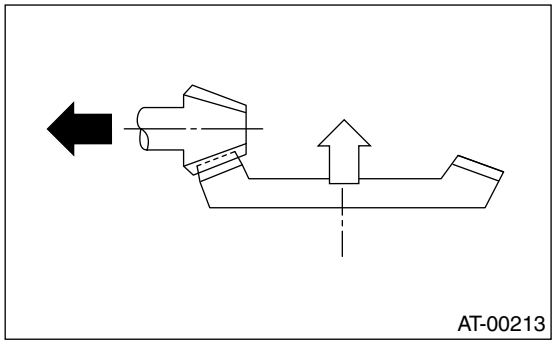
Corrective action: Reduce thickness of drive pinion shim in order to bring drive pinion close to driven gear.



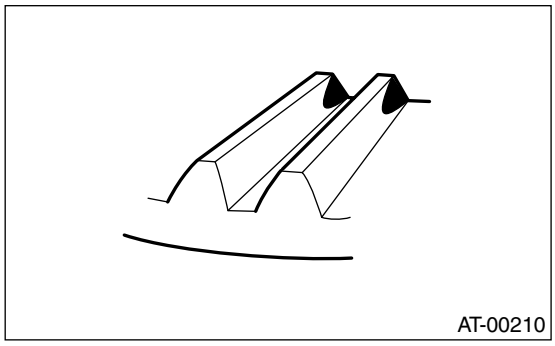
• Flank contact
Checking item: Backlash is too small.
Contact pattern



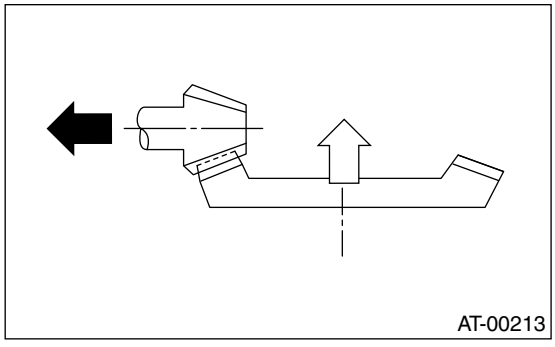
Corrective action: Increase thickness of drive pinion shim in order to move drive pinion away from driven gear.



• Toe contact (Inside end contact)
Checking item: Contact area is small.
Contact pattern

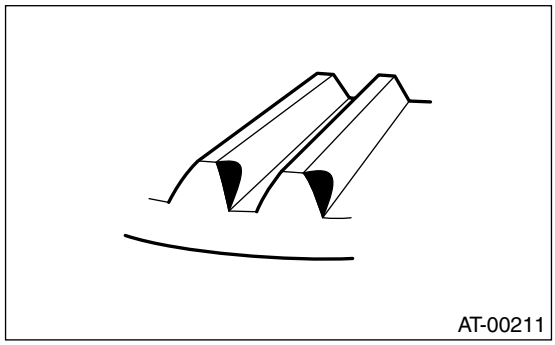


Corrective action: Increase thickness of drive pinion shim in order to bring drive pinion close to driven gear.

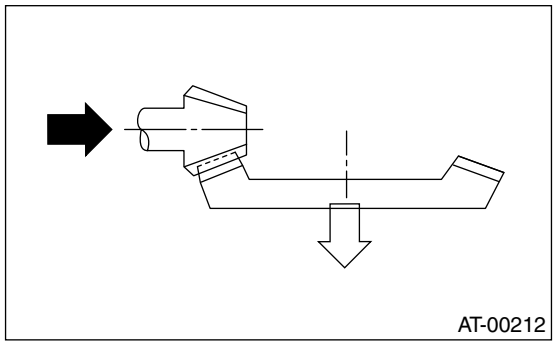


- Heel contact (Outside end contact)

Checking item: Contact area is small.
Contact pattern



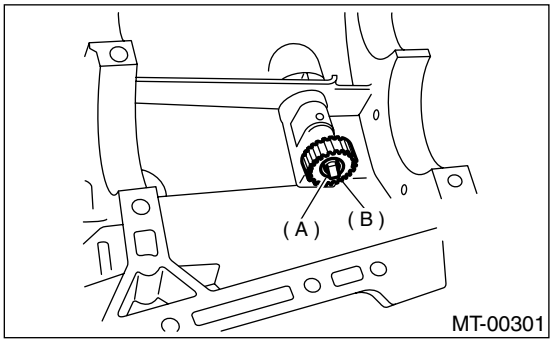
Corrective action: Reduce thickness of drive pinion shim in order to move drive pinion away from driven gear.



19.Speedometer Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-55, REMOVAL, Transmission Case.>
5) Remove the vehicle speed sensor. <Ref. to 5MT-41, REMOVAL, Vehicle Speed Sensor.>
6) Remove the outer snap ring and pull out speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



(A) Outer snap ring
(B) Speedometer driven gear

B: INSTALLATION

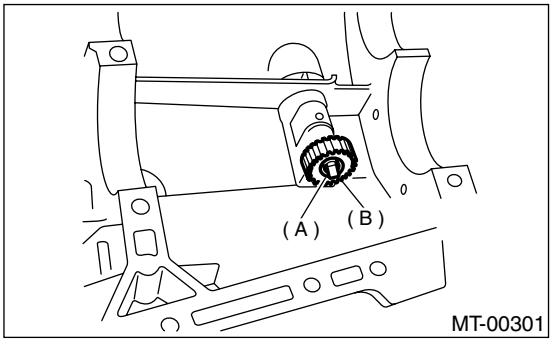
1) Install the washer and speedometer shaft, and press fit the oil seal with ST.

NOTE:
Use a new oil seal, if it has been removed.

ST 899824100 or 499827000PRESS

2) Install the vehicle speed sensor. <Ref. to 5MT-41, INSTALLATION, Vehicle Speed Sensor.>
3) Install the speedometer driven gear and snap ring.

NOTE:
Use a new snap ring, if it has been removed.



(A) Outer snap ring
(B) Speedometer driven gear

4) Install the transmission case. <Ref. to 5MT-56, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and neutral position switch. <Ref. to 5MT-39, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

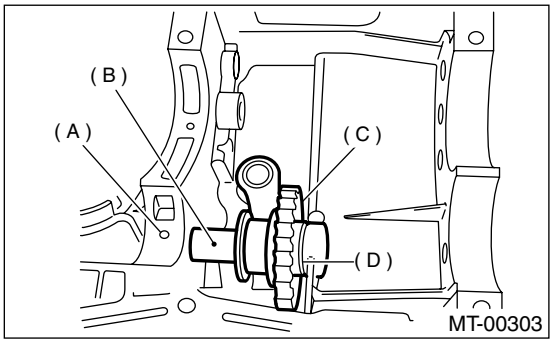
C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

20.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-64, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-64, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
<Ref. to 5MT-58, REMOVAL, Main Shaft Assembly.>
7) Remove the differential assembly. <Ref. to 5MT-72, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to 5MT-83, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the idler gear shaft, reverse idler gear and washer.



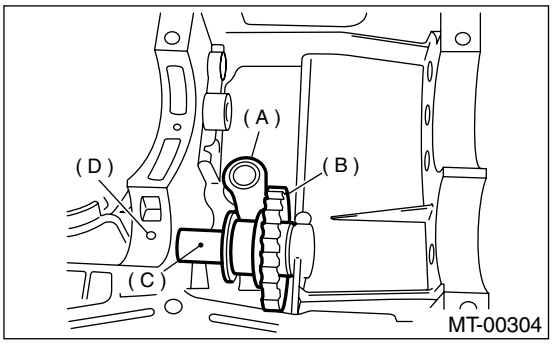
(A) Straight pin
(B) Idler gear shaft
(C) Idler gear
(D) Washer

10) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

NOTE:
Be sure to install the reverse idler shaft from rear side.



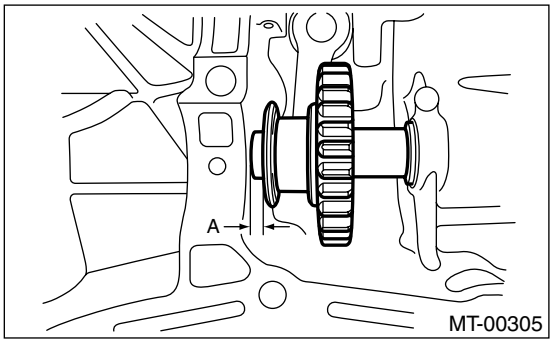
(A) Reverse shifter lever
(B) Reverse idler gear
(C) Reverse idler gear shaft
(D) Straight pin

2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to 5MT-81, INSTALLATION, Reverse Idler Gear.> and <Ref. to 5MT-81, INSTALLATION, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to 5MT-83, INSTALLATION, Shifter Fork and Rod.>
4) Install the differential assembly. <Ref. to 5MT-72, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly.
<Ref. to 5MT-58, INSTALLATION, Main Shaft Assembly.>
6) Install the drive pinion shaft assembly. <Ref. to 5MT-64, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install the transmission case. <Ref. to 5MT-56, INSTALLATION, Transmission Case.>
8) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
9) Install the back-up light switch and neutral position switch. <Ref. to 5MT-39, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

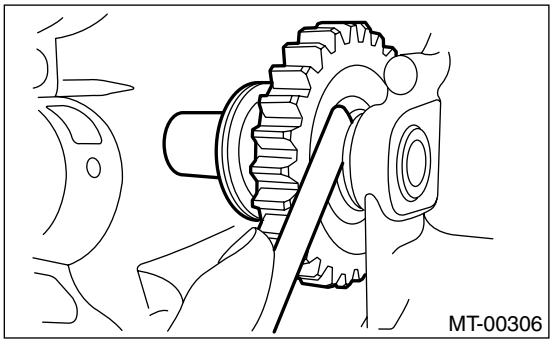
1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



2) After installing a suitable reverse shifter lever, shift into neutral. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate washer and adjust.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

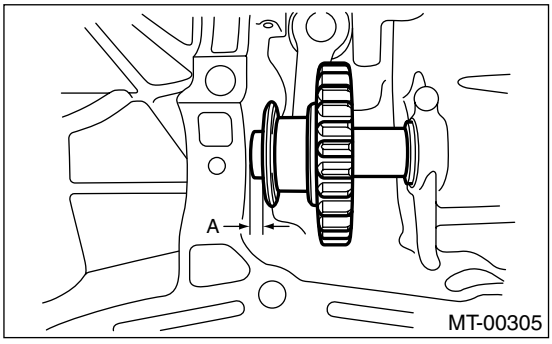


3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

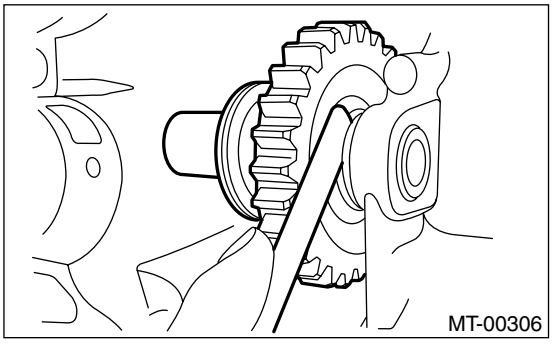
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

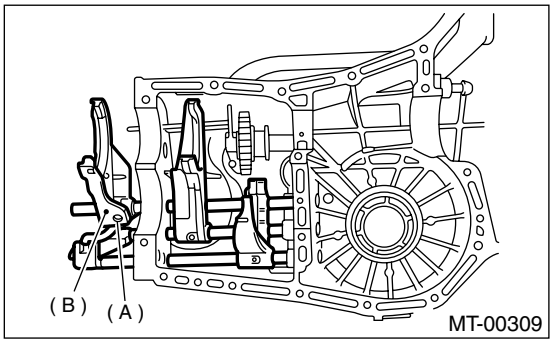


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

21.Shifter Fork and Rod

A: REMOVAL

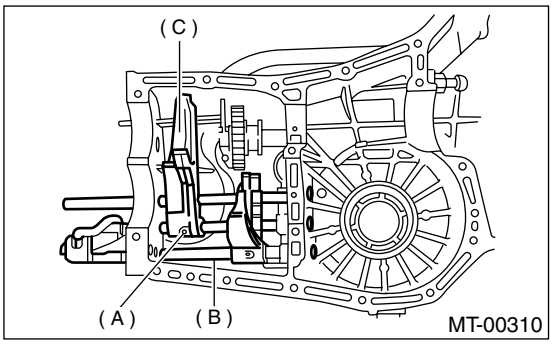
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-39, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-43, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-55, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-64, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
<Ref. to 5MT-58, REMOVAL, Main Shaft Assembly.>
7) Remove the differential assembly. <Ref. to 5MT-72, REMOVAL, Front Differential Assembly.>
8) Drive out the straight pin with ST, and 5th shifter fork.
ST 398791700 STRAIGHT PIN REMOVER



(A) Straight pin
(B) 5th shifter fork

9) Remove the plugs, springs and checking balls.
10) Drive out the straight pin, and pull out 3-4 fork rod and shifter fork.

NOTE:
When removing the rod, keep other rods in neutral. Also, when pulling out the straight pin, remove it toward the inside of case so that it does not hit against the case.



(A) Straight pin
(B) 3-4 fork rod
(C) Shifter fork

11) Drive out the straight pin, and pull out 1-2 fork rod and shifter fork.
12) Remove the outer snap ring, and pull out the reverse shifter rod arm from reverse fork rod. Then take out the ball, spring and interlock plunger from rod.
And then remove the rod.

NOTE:
When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

13) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert the reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.

NOTE:
Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER
2) Position the ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.
3) Install the 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.
4) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

NOTE:
- Set other rods to neutral.
- Make sure the interlock plunger is on the 3-4 fork rod side.

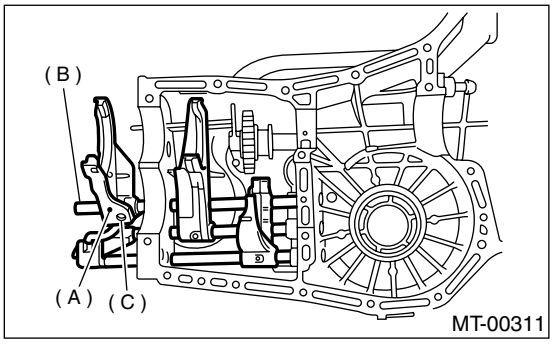
ST 398791700 STRAIGHT PIN REMOVER
5) Install the interlock plunger onto 3-4 fork rod.

NOTE:
Apply a coat of grease to plunger to prevent it from falling.

6) Install the 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.
7) Align the holes in rod and fork, and new drive straight pin into these holes.

NOTE:
• Set the reverse fork rod to neutral.
• Make sure the interlock plunger (installing before) is on the reverse fork rod side.

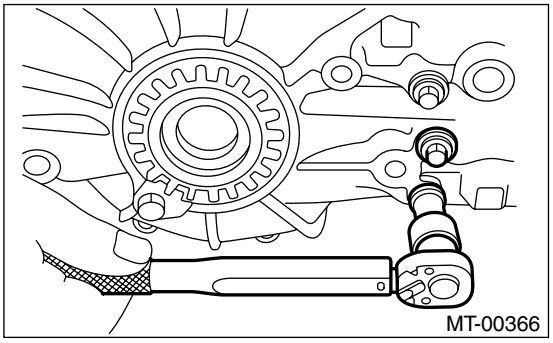
ST 398791700 STRAIGHT PIN REMOVER
8) Install the 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and new drive straight pin into place.
ST 398791700 STRAIGHT PIN REMOVER



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

9) Position the balls, checking ball springs and new gaskets into 3-4 and 1-2 rod holes, and install plugs.

Tightening torque:
20 N·m (2.0 kgf-m, 14.1 ft-lb)

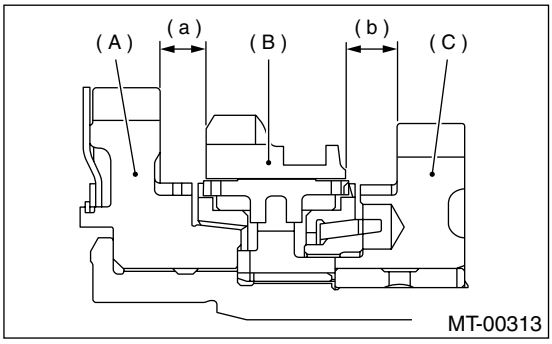


10) Install the differential assembly. <Ref. to 5MT-72, INSTALLATION, Front Differential Assembly.>
11) Install the main shaft assembly.
<Ref. to 5MT-58, INSTALLATION, Main Shaft Assembly.>
12) Install the drive pinion shaft assembly. <Ref. to 5MT-64, INSTALLATION, Drive Pinion Shaft Assembly.>
13) Install the transmission case. <Ref. to 5MT-56, INSTALLATION, Transmission Case.>
14) Install the transfer case with extension case assembly. <Ref. to 5MT-43, INSTALLATION, Transfer Case and Extension Case Assembly.>
15) Install the back-up light switch and neutral position switch. <Ref. to 5MT-39, INSTALLATION, Switches and Harness.>
16) Install the manual transmission assembly to vehicle. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.
2) Gearshift mechanism:
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.
3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.5 mm (0.374 in)

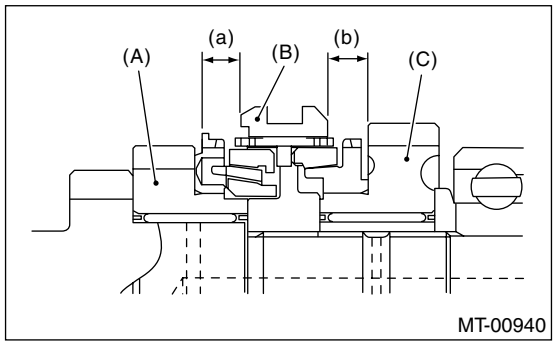


(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).
32804AA070	—	Standard
32804AA080	3	Become distant from 2nd gear by 0.2 mm (0.008 in).

4) Inspect the clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.3 mm (0.366 in)

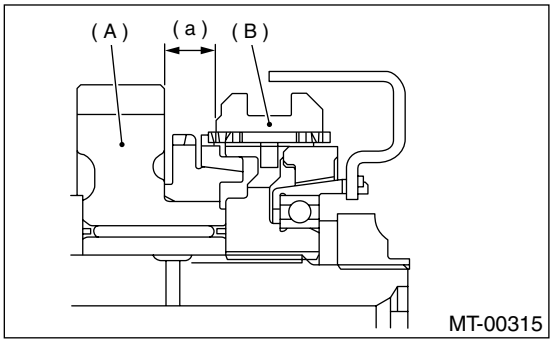


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	—	Standard
32810AA101	3	Become distant from 3rd gear by 0.2 mm (0.008 in).

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



(A) 5th drive gear
(B) Coupling sleeve

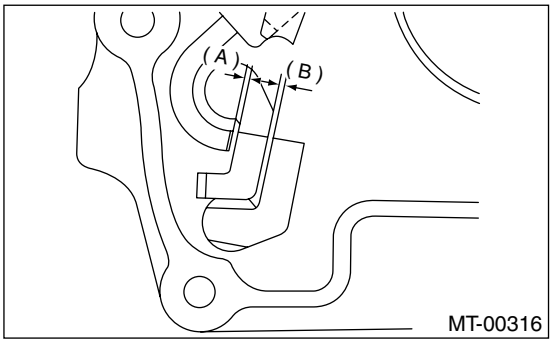
5th shifter fork (Non-TURBO)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	—	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA241	—	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
1st-2nd to 3rd-4th:
0.4 — 1.4 mm (0.016 — 0.055 in)

Clearance (B):
3rd-4th to 5th:
0.5 — 1.3 mm (0.020 — 0.051 in)



22.General Diagnostic

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Adjust.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)	Replace.
	(g) Worn 1st driven gear and driven shaft	Replace.
	(h) Worn 2nd driven gear and bushing	Replace.
	(i) Worn 3rd drive gear and needle bearing	Replace.
	(j) Worn 4th drive gear and needle bearing	Replace.
	(k) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	Replace.

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
1. Broken differential (case, gear, bearing, etc.) NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	(a) Insufficient or improper oil	Disassemble the differential and replace broken components and at the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Readjust the bearing preload and backlash and face contact of gears.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
	(e) Excessive backlash due to worn differential side gear, washer or differential pinion vehicle under severe operating conditions.	Add recommended oil to specified level. Do not use the vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. • Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

MEMO:

CLUTCH SYSTEM

CL

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1. General Description

A: SPECIFICATIONS

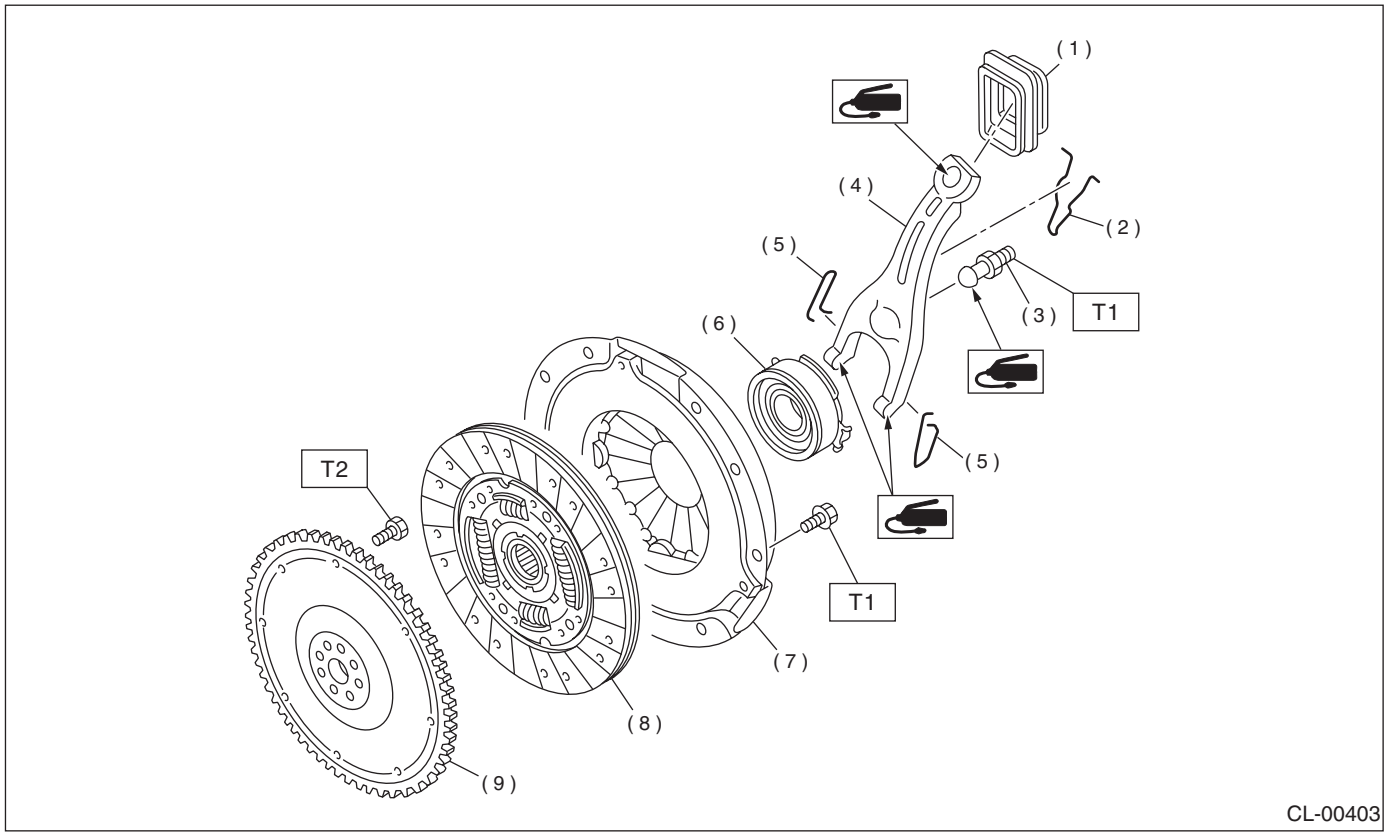
Item			Non-TURBO model	TURBO model
Clutch cover	Type		Push type	Pull type
	Diaphragm set load kg (lb)		580 (1,276)	800 (1,764)
Clutch disc	Facing material		Woven (Non asbestos)	Woven (Non asbestos)
	O.D. × I.D. × thickness mm (in)	Flywheel side	225 × 150 × 3.5 (8.86 × 5.91 × 0.138)	230 × 155 × 3.5 (9.06 × 6.10 × 0.1)
		Pressure plate side		230 × 155 × 3.2 (9.06 × 6.10 × 0.126)
	Spline O.D. mm (in)		25.2 (0.992), (No. of teeth: 24)	25.2 (0.992), (No. of teeth: 24)
Clutch release lever ratio			1.6	1.7
Release bearing			Grease-packed self-aligning	Grease-packed self-aligning
Clutch pedal	Full stroke mm (in)		130 — 135 (5.12 — 5.31)	130 — 135 (5.12 — 5.31)
	Free play mm (in)		4 — 13 (0.16 — 0.51)	4 — 13 (0.16 — 0.51)
Clutch disc	Depth of rivet head mm (in)	Standard	1.65 — 2.25 (0.065 — 0.089)	1.3 — 1.9 (0.051 — 0.075)
		Limit of sinking	0.3 (0.012)	0.3 (0.012)
	Limit for deflection mm (in)		0.8 (0.031) at R = 107 (4.21)	0.8 (0.031) at R = 110 (4.33)

I.D.: Inner diameter
O.D.: Outer diameter

B: COMPONENT

1. CLUTCH ASSEMBLY

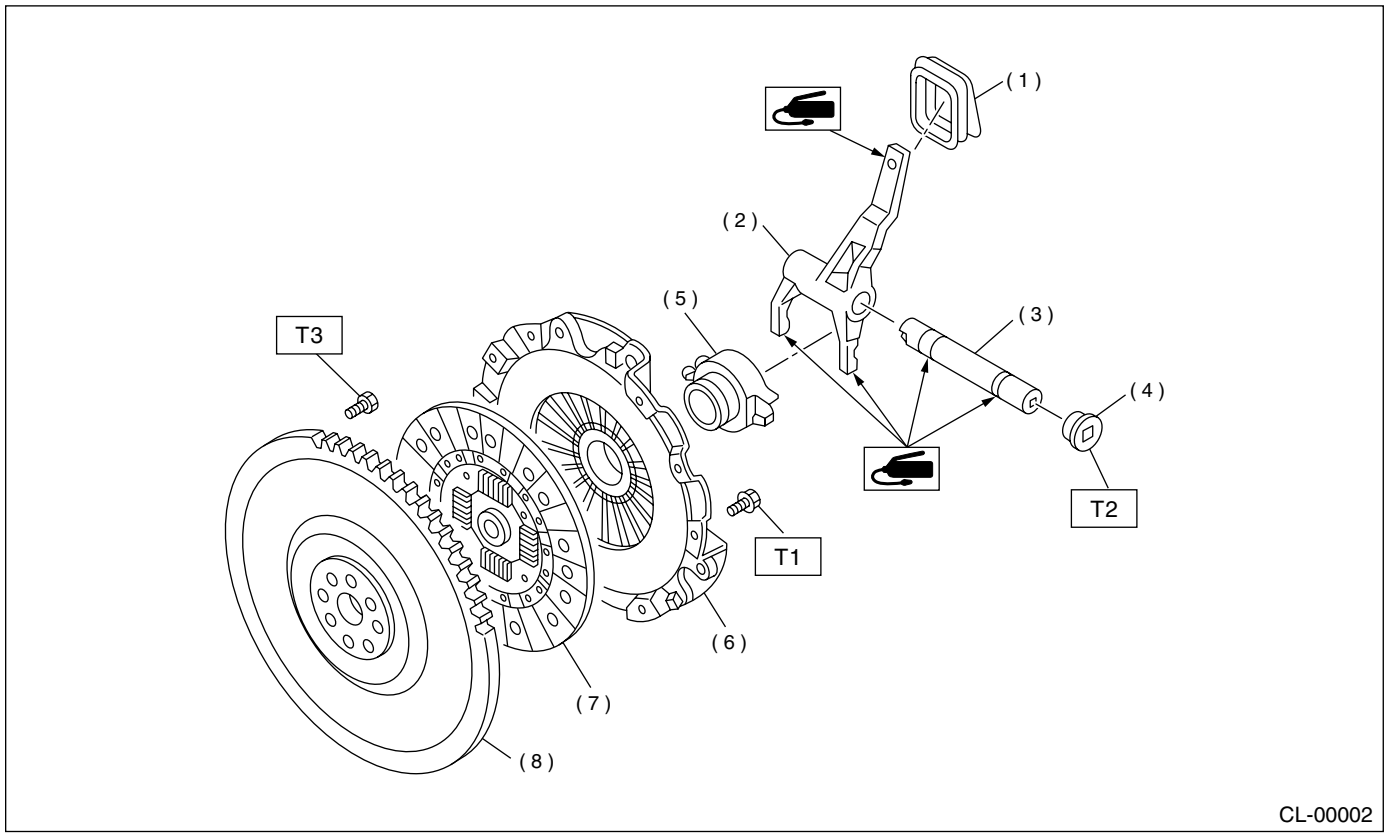
• Non-TURBO model



(1) Dust cover
(2) Retainer spring
(3) Pivot
(4) Clutch release lever
(5) Clip
(6) Clutch release bearing
(7) Clutch cover
(8) Clutch disc
(9) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 72 (7.3, 52.8)

• TURBO model

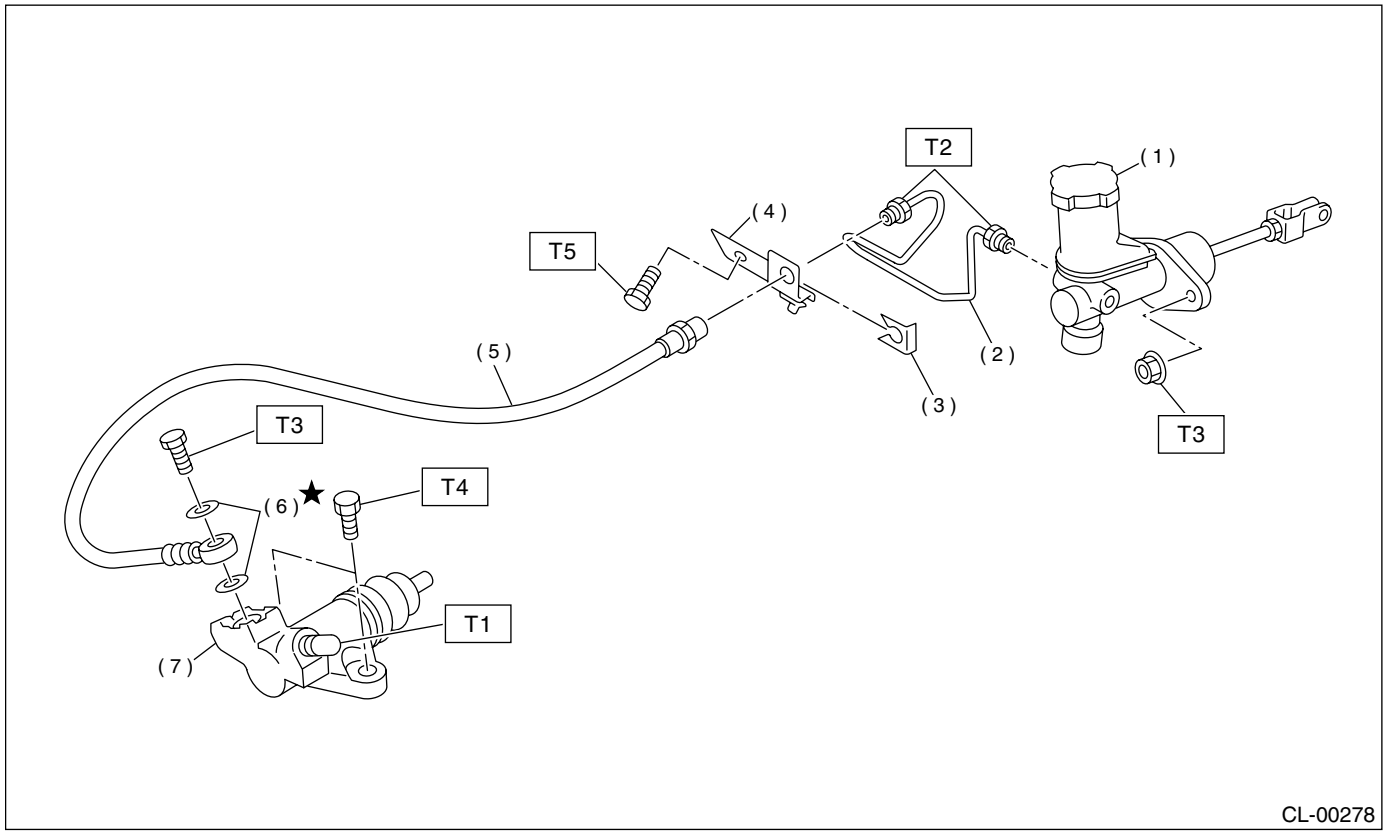


(1) Dust cover
(2) Clutch release lever
(3) Clutch release shaft
(4) Plug
(5) Clutch release bearing
(6) Clutch cover
(7) Clutch disc
(8) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 44 (4.5, 32.5)
T3: 72 (7.3, 52.8)

2. CLUTCH PIPE AND HOSE

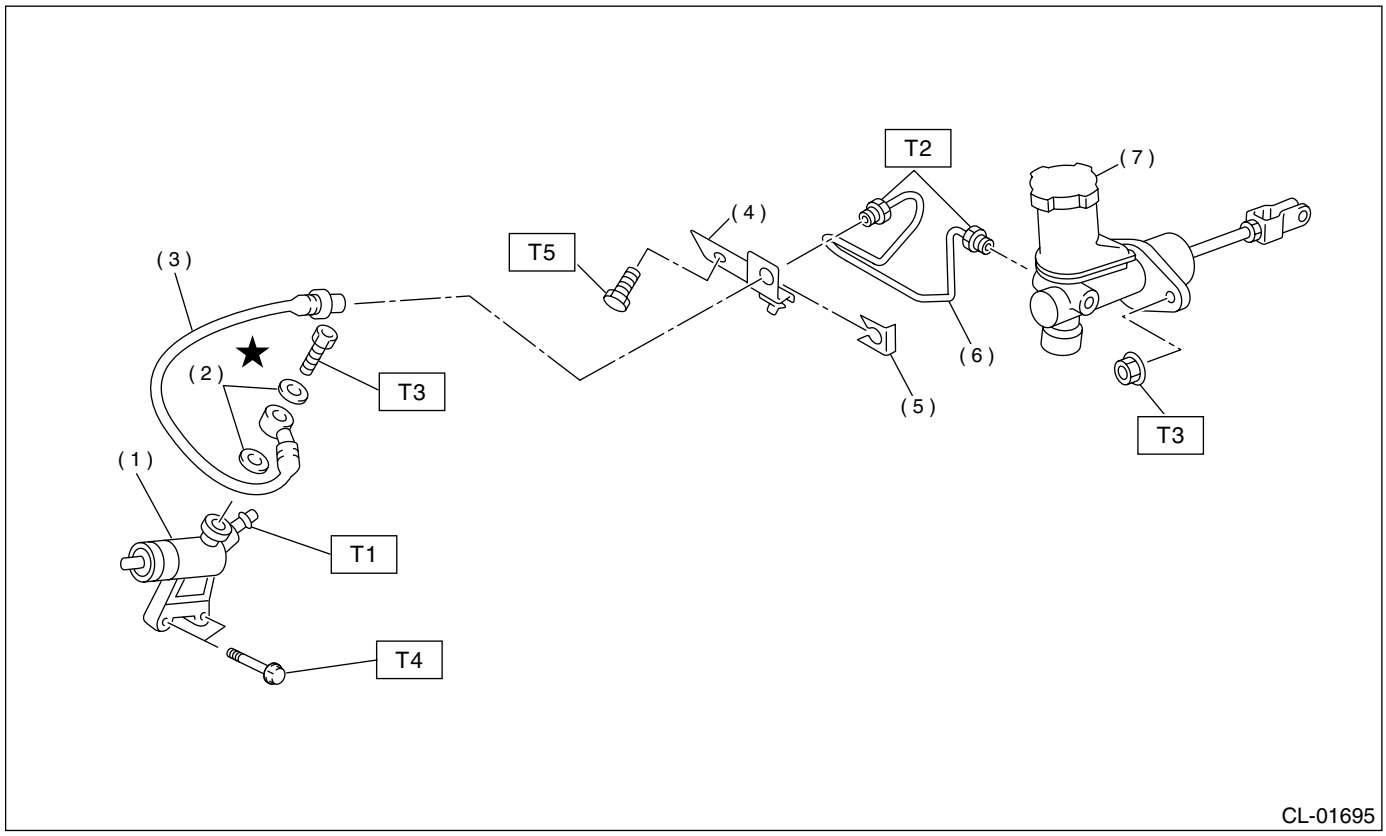
• Non-TURBO model



(1) Master cylinder ASSY
(2) Clutch pipe
(3) Clip
(4) Bracket
(5) Clutch hose
(6) Washer
(7) Operating cylinder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.8(0.8, 5.8)
T2: 15 (1.5, 10.8)
T3: 18 (1.8, 13.0)
T4: 37 (3.8, 27.5)
T5: 25 (2.5, 18.1)

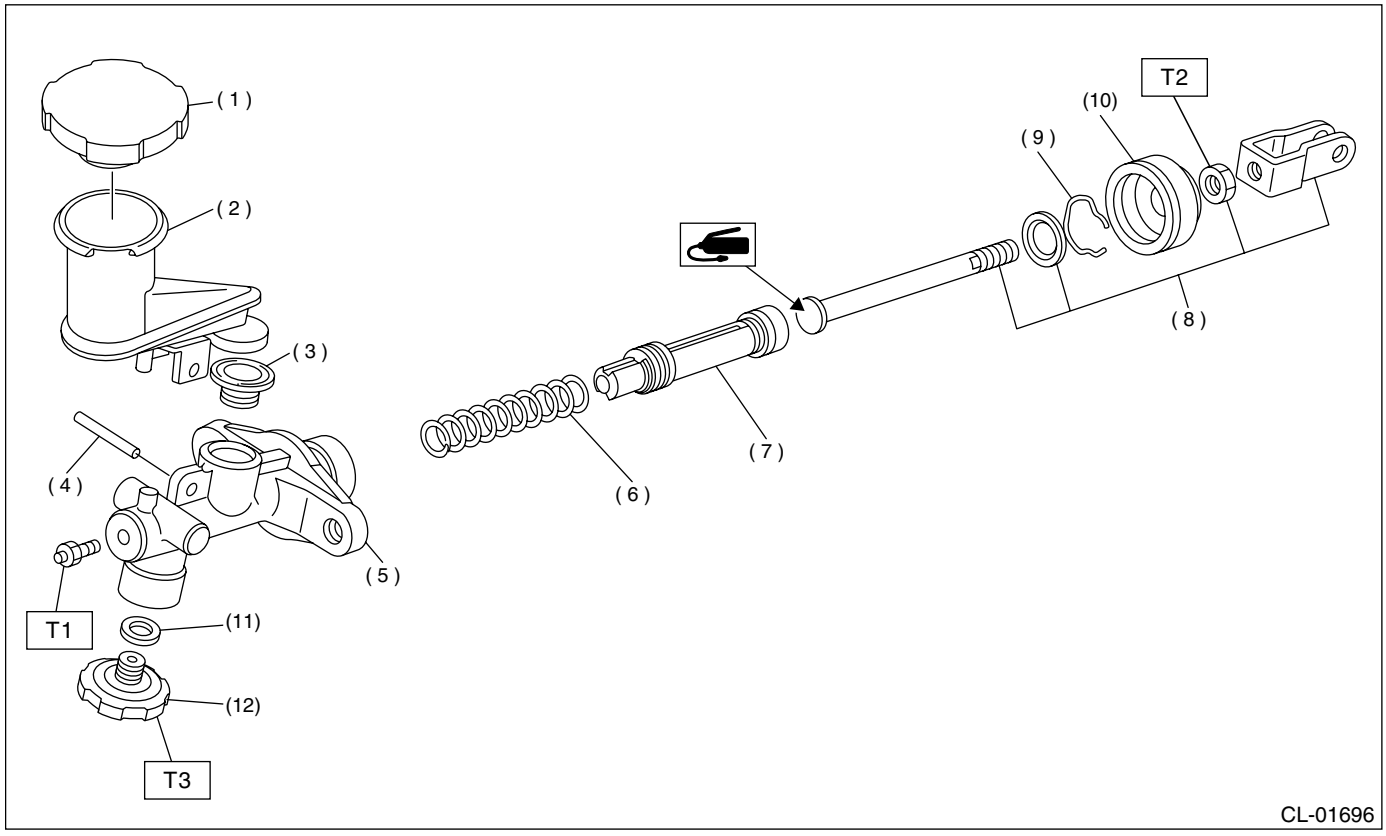
• TURBO model



(1) Operating cylinder
(2) Washer
(3) Clutch hose
(4) Bracket
(5) Clip
(6) Pipe
(7) Master cylinder ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.8 (0.8, 5.8)
T2: 15 (1.5, 10.8)
T3: 18 (1.8, 13.0)
T4: 37 (3.8, 27.5)
T5: 25 (2.5, 18.1)

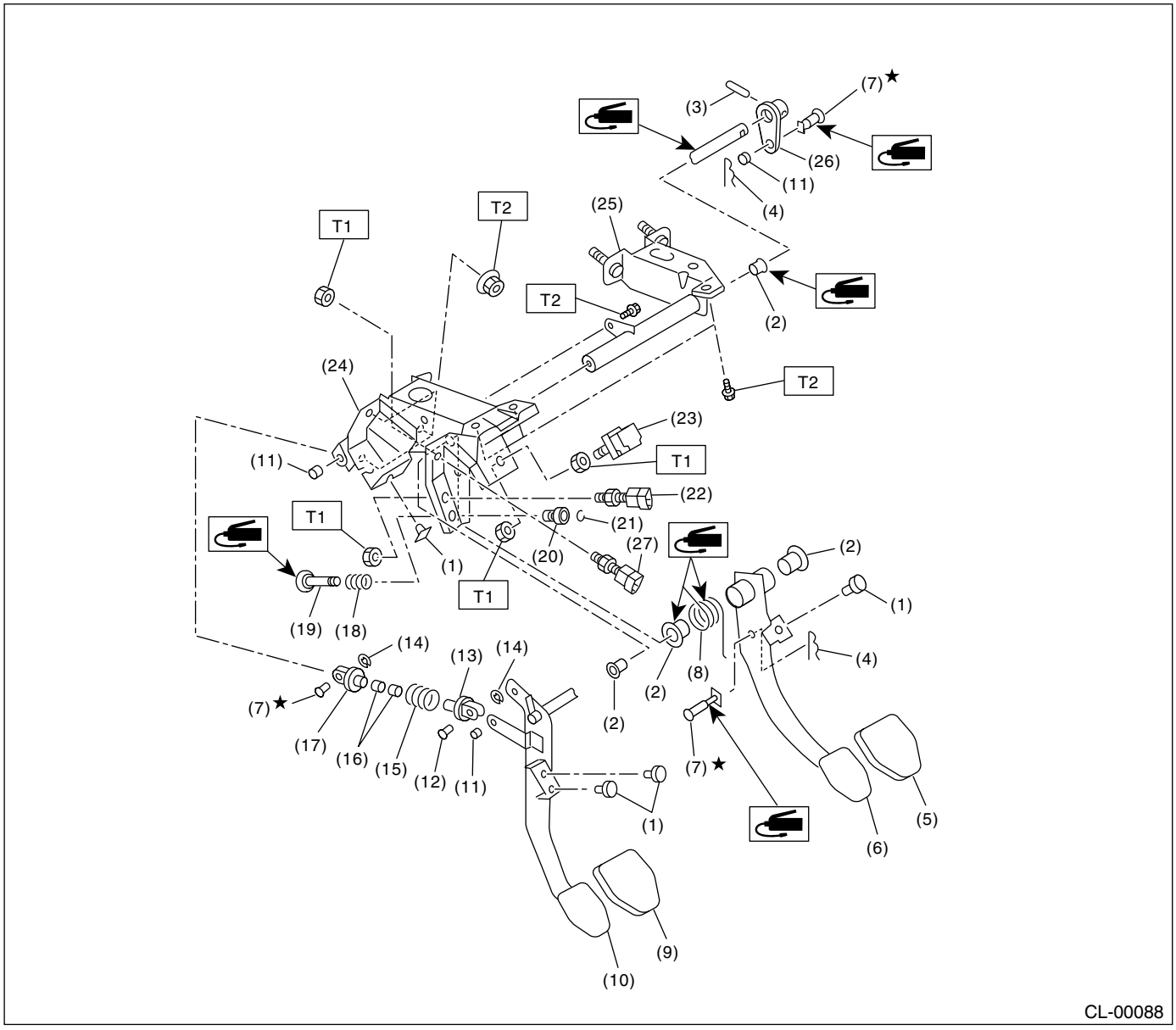
3. MASTER CYLINDER



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Return spring
(7) Piston
(8) Push rod
(9) Piston stop ring
(10) Cylinder boot
(11) Gasket (Turbo model)
(12) Clutch damper (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7)
T3: 46.6 (4.8, 34)

4. CLUTCH PEDAL



CL-00088

(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevisp pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) Clip
(22) Clutch switch (Cruise control)
(23) Stop light switch
(24) Pedal bracket
(25) Clutch master cylinder bracket
(26) Lever
(27) Clutch switch (Starter interlock)

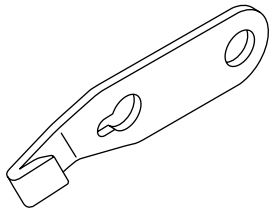
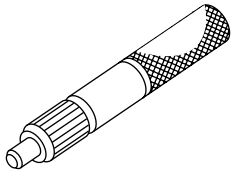
Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 ST-499747100	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.

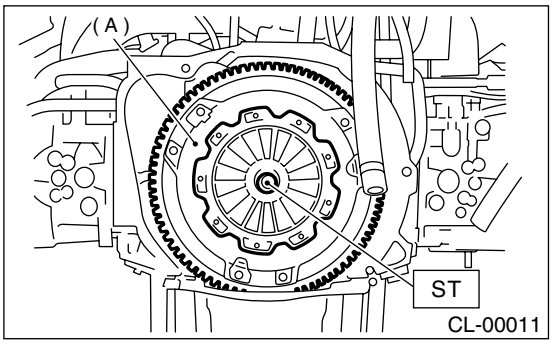
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Dial Gauge	Used for measuring clutch disk run-out.

2. Clutch Disc and Cover

A: REMOVAL

1) Remove the transmission assembly from vehicle body. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Install the ST on flywheel.
ST 499747100 CRANKSHAFT STOPPER



(A) Clutch cover

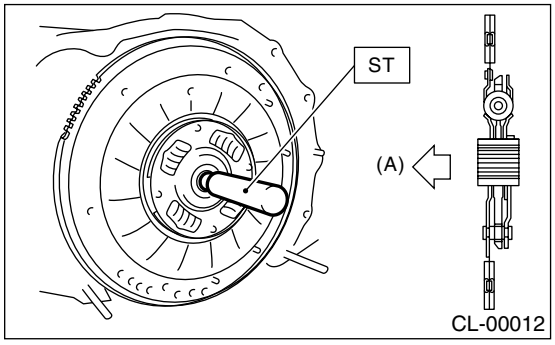
3) Remove the clutch cover and clutch disc.

NOTE:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.

B: INSTALLATION

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:
When installing the clutch disc, be careful to its direction.
ST 499747100 CLUTCH DISC GUIDE

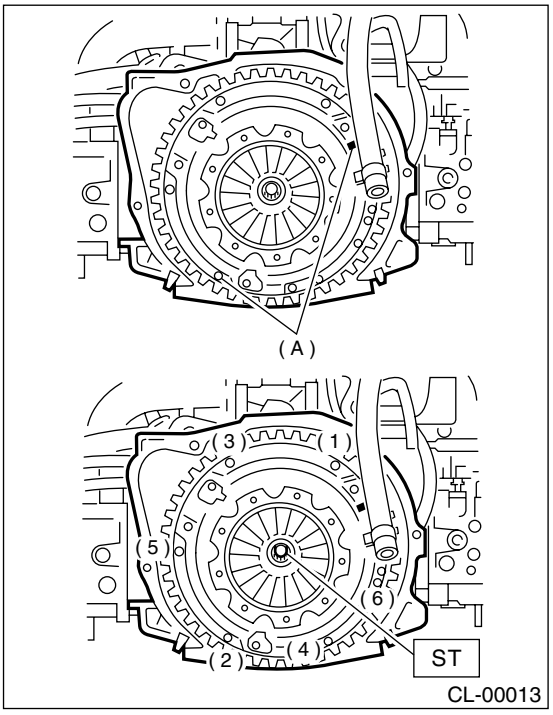


(A) Flywheel side

2) Position “0” marks on clutch cover and flywheel 120° apart, and then tighten the clutch cover installation bolts diagonallly.

NOTE:
• “0” marks indicate the directions of residual unbalance.
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) “0” marks

3) Remove the ST.
ST 499747100 CLUTCH DISC GUIDE
4) Install the transmission assembly. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

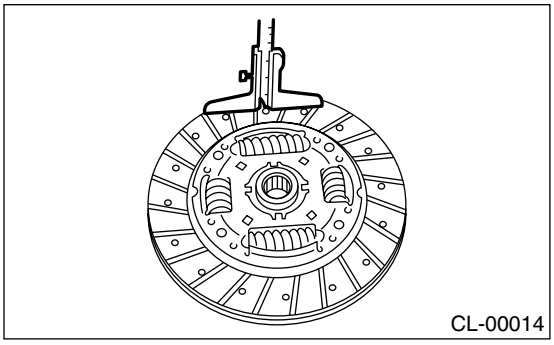
C: INSPECTION

1. CLUTCH DISC

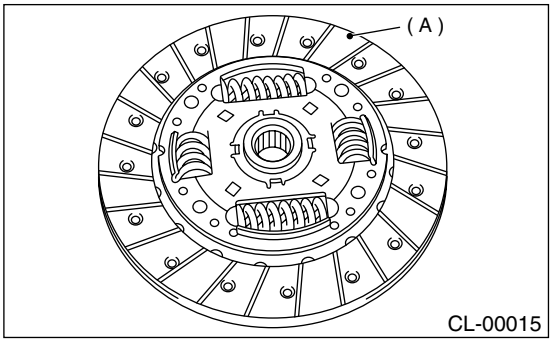
1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

Depth of rivet head:
Limit of sinking
0.3 mm (0.012 in)

NOTE:
Do not wash the clutch disc with any cleaning fluid.

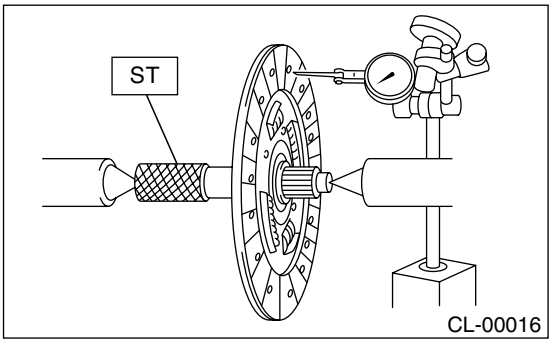


2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace the clutch disc (A) and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

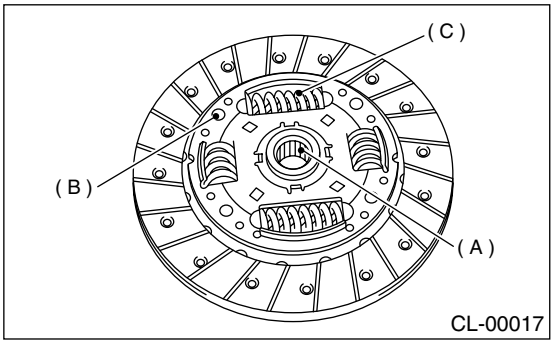


4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of facing, replace.
ST 499747100 CLUTCH DISC GUIDE

Limit for deflection:
Non-TURBO model;
0.8 mm (0.031 in) at R = 107 mm (4.21 in)
TURBO model;
0.8 mm (0.031 in) at R = 110 mm (4.33 in)



5) Worn spline, loose rivets and torsion spring failure
If defective,replace clutch disc.

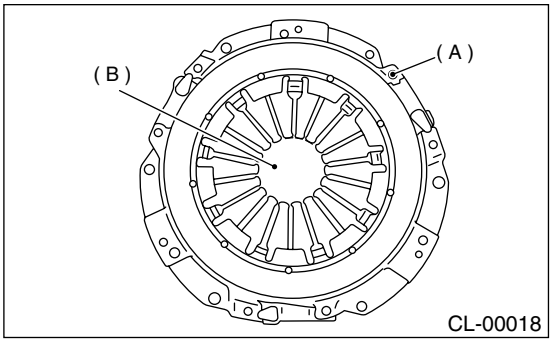


(A) Spline
(B) Rivet
(C) Torsion spring

2. CLUTCH COVER

NOTE:
Visually check for the following items without disassembling, and replace if defective.

1) Loose thrust rivet.
2) Damaged or worn bearing contact area at center of diaphragm spring.

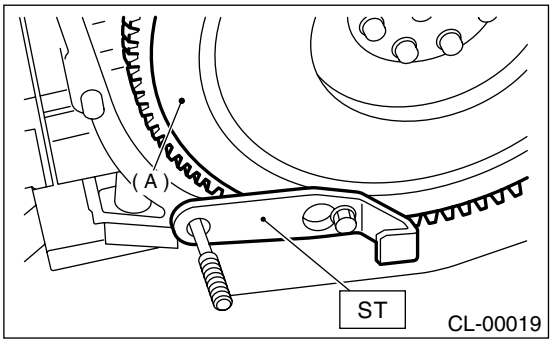


(A) Thrust rivet
(B) Diaphragm spring

3. Flywheel

A: REMOVAL

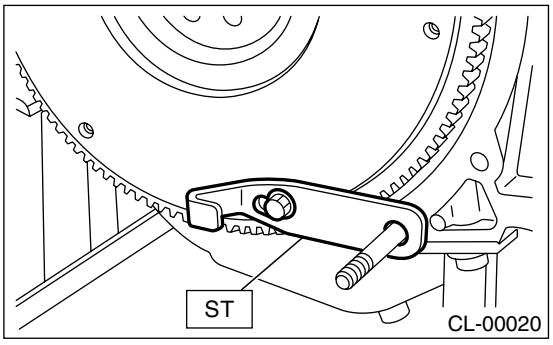
1) Remove the transmission assembly. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
3) Using the ST, remove the flywheel.
ST 498497100 CRANKSHAFT STOPPER



(A) Flywheel

B: INSTALLATION

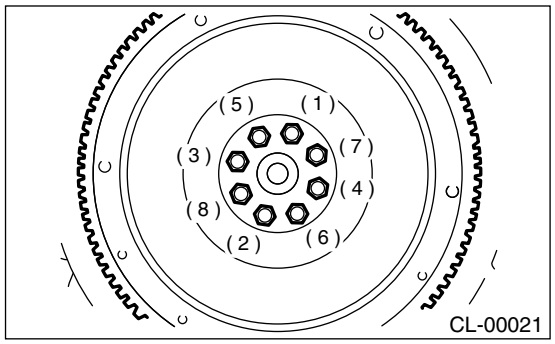
1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:
Tighten the flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

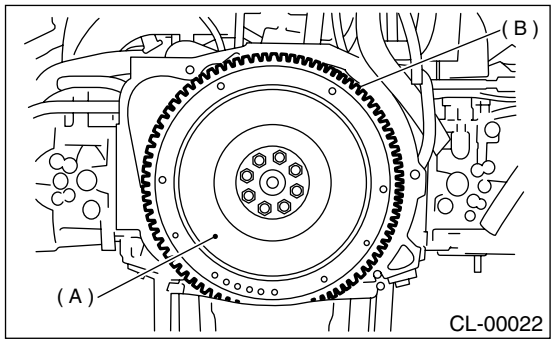


3) Install the clutch disc and cover. <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>
4) Install the transmission assembly. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

CAUTION:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.

1) Damage of facing, sliding surface and ring gear
If defective, replace the flywheel.



(A) Flywheel
(B) Ring gear

2) Smoothness of rotation
Rotate the ball bearing applying pressure in thrust direction.
3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

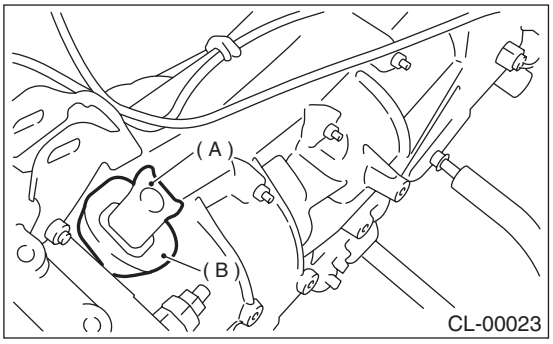
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from clutch release lever and remove the release bearing.

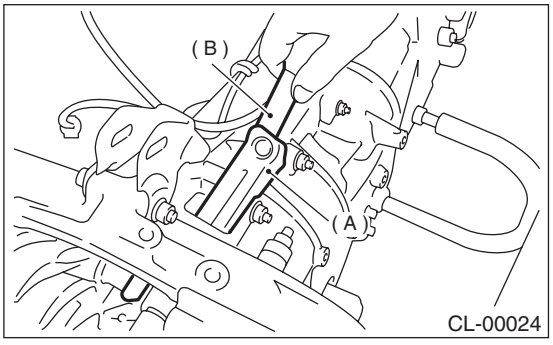
CAUTION:
Be careful not to deform clips.

3) Remove the dust cover.



(A) Clutch release lever
(B) Dust cover

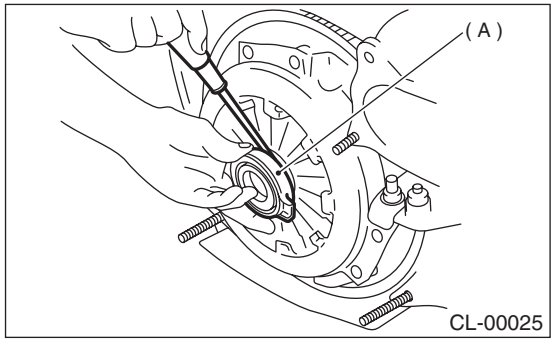
4) Remove the retainer spring from pivot with a screwdriver by accessing it through release lever hole. Then remove the release lever.



(A) Clutch release lever
(B) Screwdriver

2. TURBO MODEL

1) Remove the transmission assembly from vehicle body.
<Ref. to 5MT-28, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever from transmission.
3) Put the clutch release bearing in engine side.
4) Remove the clutch release bearing from the clutch cover using flat-type screwdriver.



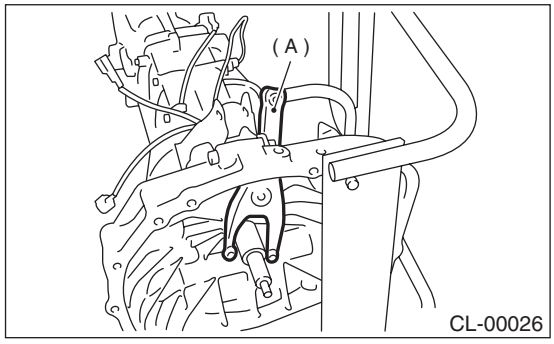
(A) Clutch release bearing

B: INSTALLATION

1. NON-TURBO MODEL

1) Before assembly, lubricate the following points with a coat of grease.
- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulphide.)
- Contact surface of lever and operating cylinder

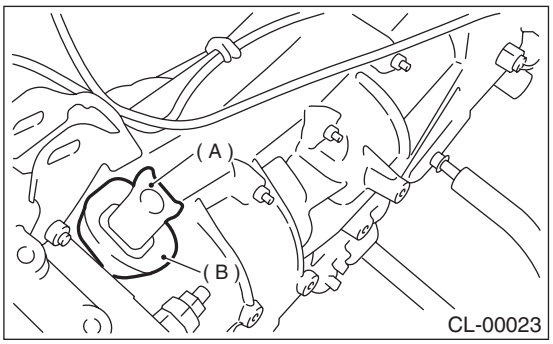
2) While pushing the fork to pivot and twisting it to both sides, fit the retainer spring onto the constricted portion of pivot.
Apply grease (KOPR-KOTE: P/N 003603001) to the contact point of release lever and operating cylinder.
3) Confirm that the retainer spring is securely fitted by observing it through the release lever hole.



(A) Release lever

4) Install the release bearing and fasten it with two clips.

5) Install the release lever dust cover.

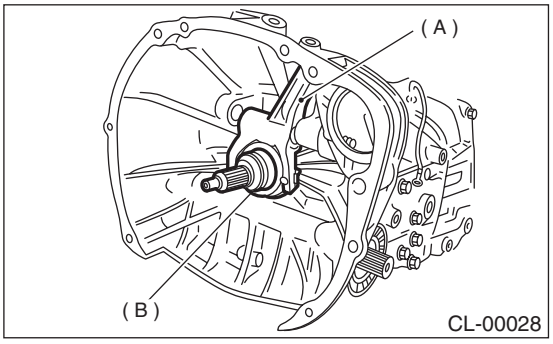


(A) Release lever
(B) Dust cover

6) Verify that the bearing moves smoothly with operating release fork.
7) Install the transmission assembly. <Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

2. TURBO MODEL

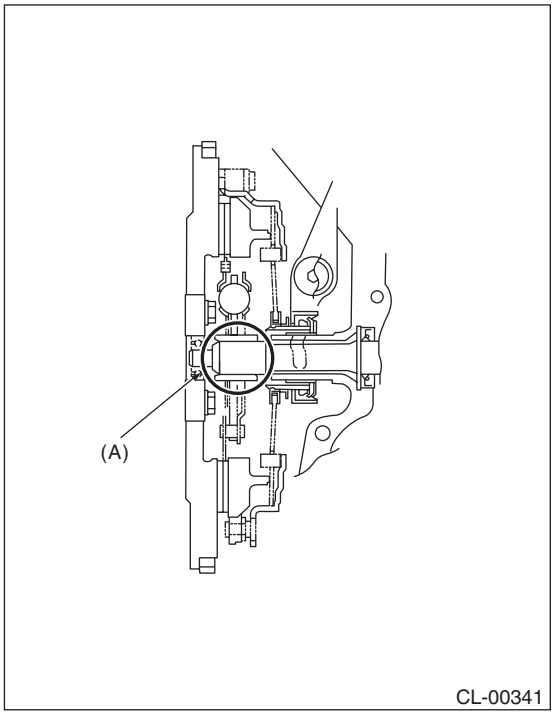
1) Install the release bearing on transmission.
2) Insert the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

3) Apply grease to the specified points:

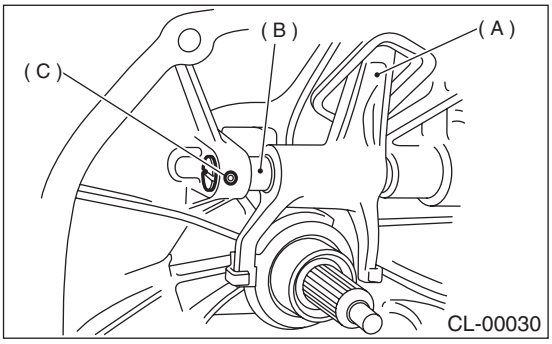
Grease:
NICHIMORI N-130



(A) Spline

4) Insert the fork shaft into release fork.

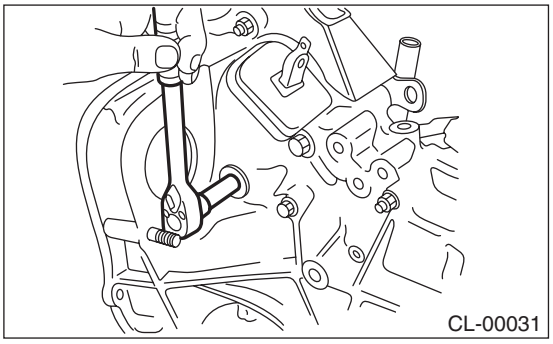
NOTE:
Make sure the cutout portion of fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

5) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



6) Install the transmission assembly.
<Ref. to 5MT-31, INSTALLATION, Manual Transmission Assembly.>

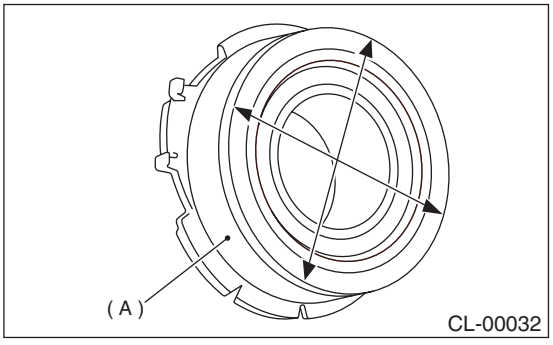
C: INSPECTION

1. RELEASE BEARING

NOTE:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

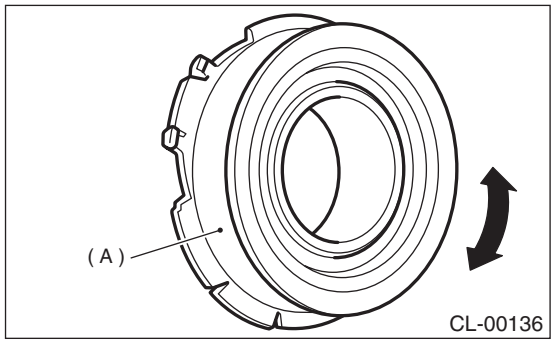
1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
1.6 mm (0.063 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

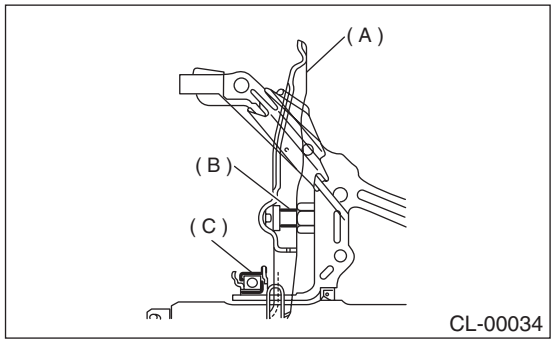


(A) Bearing case

3) Check wear and damage of the bearing case surface contacting with lever.

2. RELEASE LEVER

1) Check the lever pivot portion and the point of contact with release bearing case for wear.



(A) Clutch release lever
(B) Pivot
(C) Clutch release bearing

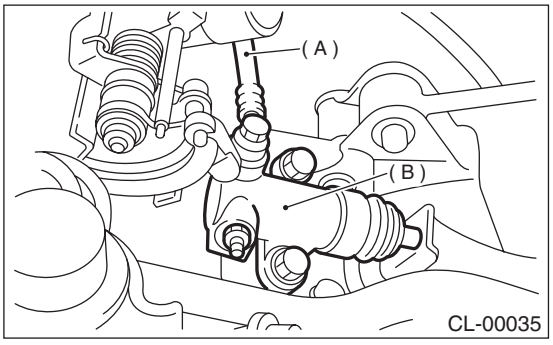
5. Operating Cylinder

A: REMOVAL

1) Remove the air cleaner case and air intake duct. (Except U5 model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove the air intake chamber and air intake duct. (U5 model) <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
3) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Remove the clutch hose from operating cylinder.

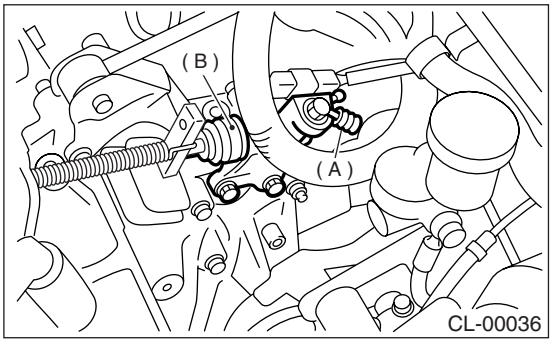
NOTE:
Cover the hose joint to prevent clutch fluid from flowing out.

- Non-TURBO model



(A) Clutch hose
(B) Operating cylinder

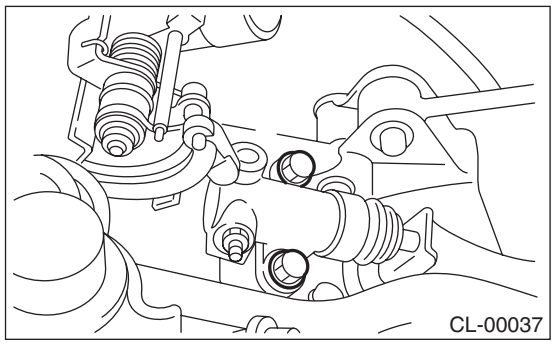
- TURBO model



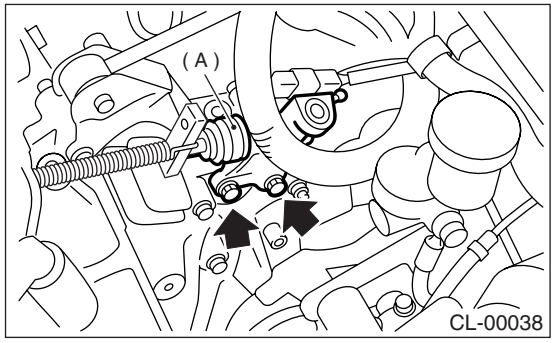
(A) Clutch hose
(B) Operating cylinder

5) Remove the operating cylinder from transmission.

- Non-TURBO model



- TURBO model



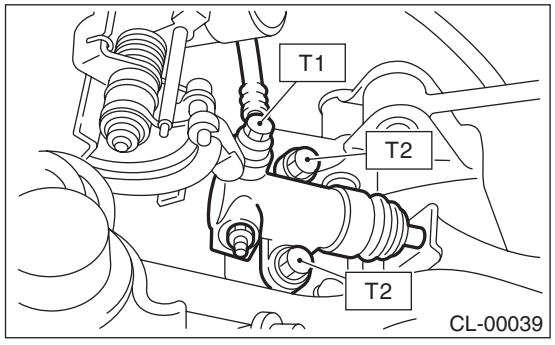
B: INSTALLATION

1) Install in the reverse order of removal.

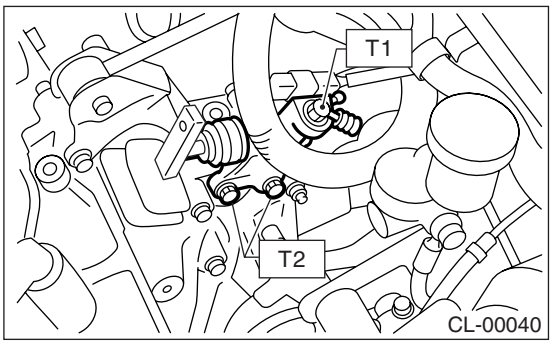
NOTE:
Before installing the operating cylinder, apply grease (KOPR-KOTE: P/N 003603001) to contact point of the release lever and operating cylinder.

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

- Non-TURBO model



- TURBO model



2) After bleeding air from the operating cylinder, ensure that clutch operates properly. <Ref. to CL-25, Clutch Fluid Air Bleeding.>

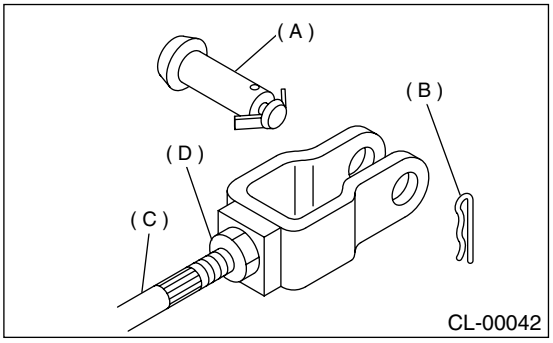
C: INSPECTION

1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.
2) Check the operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace the operating cylinder.

6. Master Cylinder

A: REMOVAL

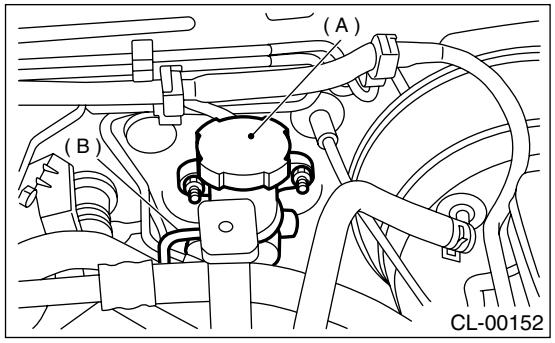
1) Thoroughly drain the brake fluid from reservoir tank.
2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

3) Remove the air cleaner case and air intake duct. (Except U5 model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
4) Remove the air intake chamber and air intake duct. (U5 model) <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
5) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
6) Remove the clutch pipe from master cylinder.
7) Remove the master cylinder with reservoir tank.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; immediately flush it away with water, and then wipe it off if spilt.



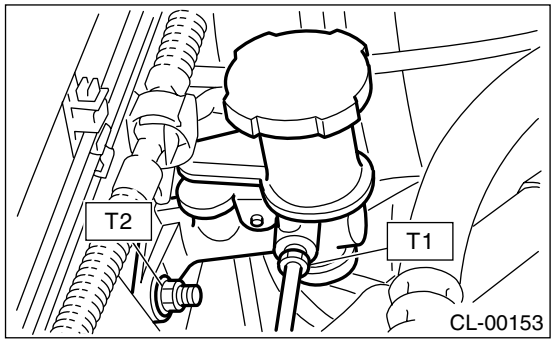
(A) Master cylinder
(B) Clutch pipe

B: INSTALLATION

1) Install the master cylinder to body, and install the clutch pipe to master cylinder.

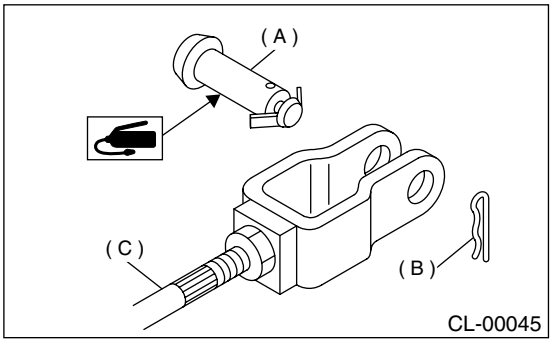
NOTE:
Check that the pipe is routed properly.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



2) Apply a coat of grease to the clevis pin.

3) Connect the push rod of master cylinder to clutch pedal, and install the new clevis pin and snap pin.

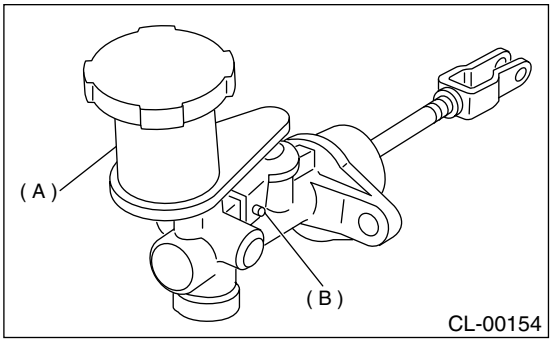


(A) Clevis pin
(B) Snap pin
(C) Push rod

4) After bleeding air from the system, ensure that clutch operates properly.
5) Adjust the clutch pedal. <Ref. to CL-29, ADJUSTMENT, Clutch Pedal.>
6) Install the air cleaner case and air intake duct. (Except U5 model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
7) Install the air intake chamber and air intake duct. (U5 models) <Ref. to IN(H4SO U5)-6, INSTALLATION, Air Intake Chamber.> and <Ref. to IN(H4SO U5)-7, INSTALLATION, Air Intake Duct.>
8) Install the intercooler. (TURBO model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

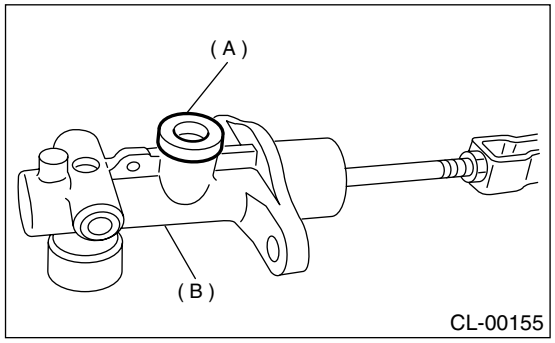
C: DISASSEMBLY

1) Remove the straight pin and reservoir tank.



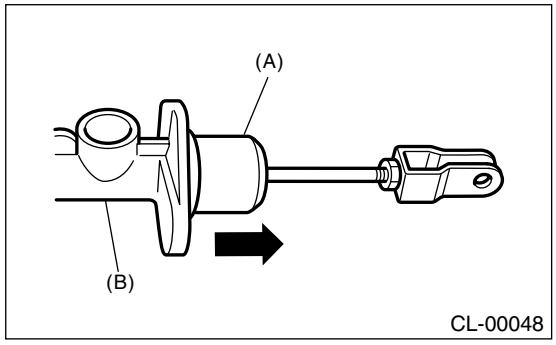
(A) Reservoir tank
(B) Straight pin

2) Remove the oil seal.



(A) Oil seal
(B) Master cylinder

3) Move the cylinder boot backward.



(A) Cylinder boot
(B) Master cylinder

4) Remove the stop ring.

CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

5) Remove the clutch damper. (Turbo model)

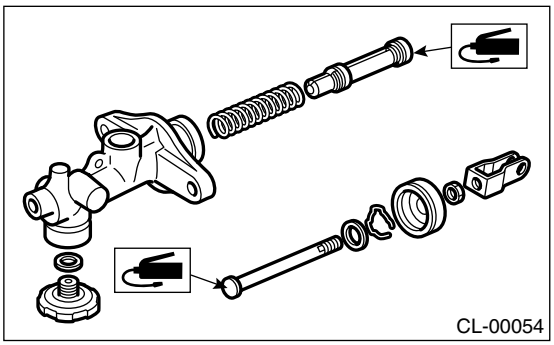
D: ASSEMBLY

1) Install the clutch damper. (Turbo model)

Tightening torque:
46.6 N·m (4.8 kgf-m, 34 ft-lb)

2) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G40M (Part No. 004404003)

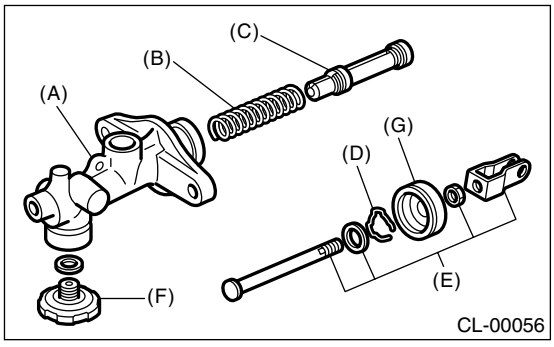


3) To assemble the master cylinder, reverse the sequence of disassembly procedure.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, cylinder boot and hose replace the faulty part.

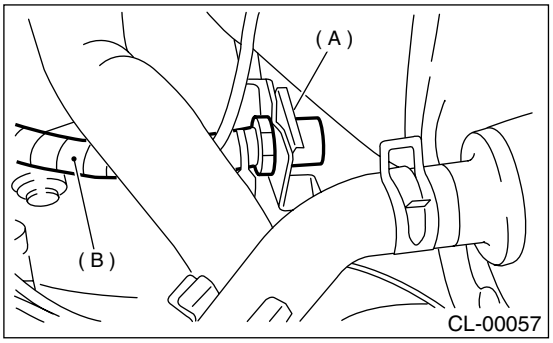


(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Stop ring
(E) Rod ASSY
(F) Clutch damper
(G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

1) Remove the air cleaner case and air intake duct. (Except U5 model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove the air intake chamber and air intake duct. (U5 models) <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
3) Remove the intercooler. (TURBO model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Drain the clutch fluid. <Ref. to CL-24, REPLACEMENT, Clutch Fluid.>
5) Remove the clutch pipe from the clutch hose and master cylinder.
6) Pull out the clamp, then remove the clutch hose from bracket.



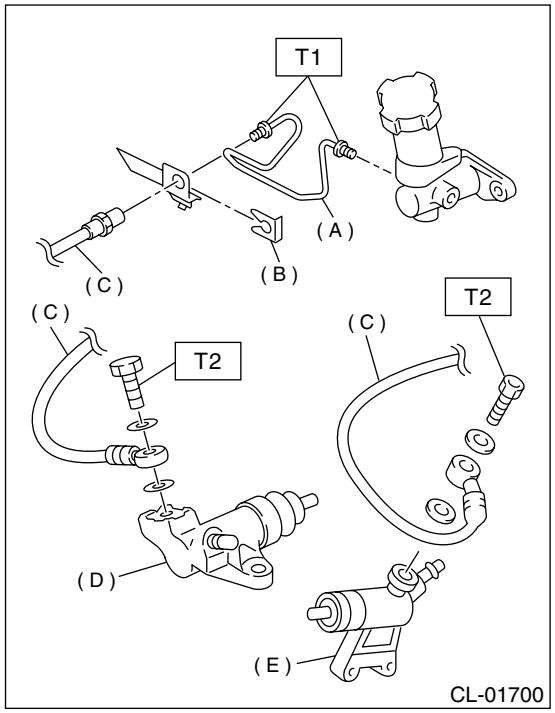
(A) Clamp
(B) Clutch hose

7) Remove the hose from operating cylinder.
8) Remove the bracket.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Clutch pipe
(B) Clip
(C) Clutch hose
(D) Master cylinder (Non-TURBO model)
(E) Master cylinder (TURBO model)

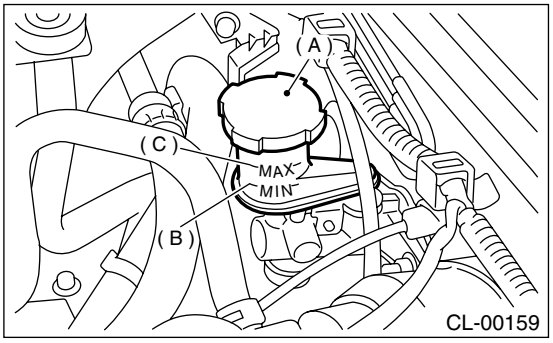
C: INSPECTION

Check the pipes and hoses for cracks, breakage, or damage. Check the joints for fluid leakage. If any cracks, breakage, damage, or leakage is found, repair or replace the applicable pipe or hose.

8. Clutch Fluid

A: INSPECTION

1) Park the vehicle on a level surface.
2) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below “MIN”, add fluid to bring it up to “MAX”, and also inspect for leakage.



(A) Reservoir tank
(B) Min. level
(C) Max. level

B: REPLACEMENT

CAUTION:
• The FMVSS No. 116, fresh DOT3 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• For convenience and safety, it is advisable to have two men working.

1) Remove the air cleaner case and air duct.
2) Draw out the brake fluid from reservoir tank with syringe.
3) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 brake fluid

4) Drain fluid in the same method as air bleeding.
5) Refill the brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
6) Repeat the above procedure until the contaminated fluid is completely drained.

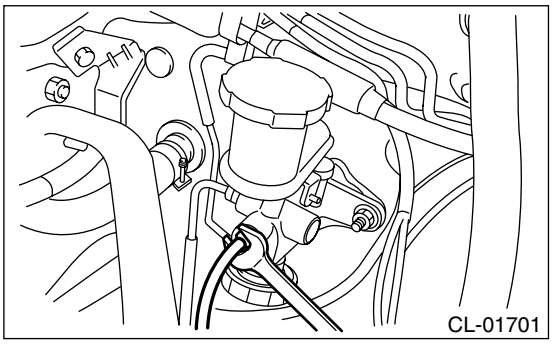
9. Clutch Fluid Air Bleeding

A: PROCEDURE

1. NON-TURBO MODEL

NOTE:
Bleed air from the oil line with help of co-worker.

1) Remove the air cleaner case and air intake duct. (Except U5 model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove the air intake chamber and air intake duct. (U5 model) <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
3) Attach one end of a vinyl tube into the air bleeder of master cylinder and put the other end into a brake fluid container.
4) Slowly depress the clutch pedal and keep it. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the brake pedal.



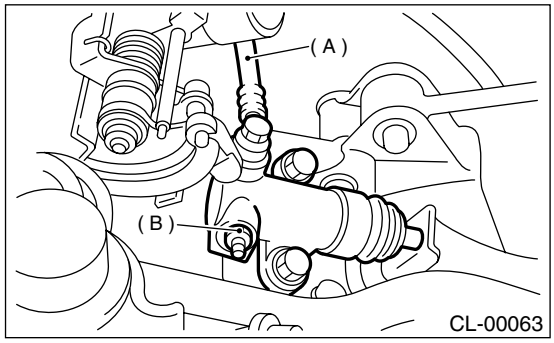
5) Repeat the above steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

6) Tighten the air bleeder.

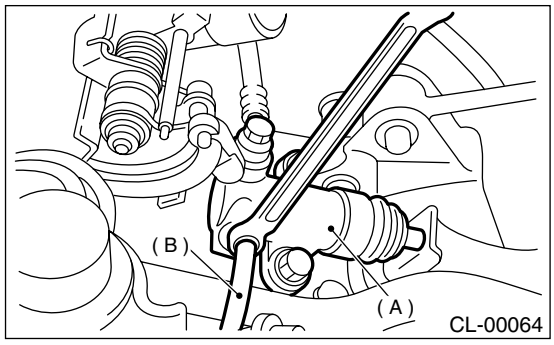
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

7) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



(A) Clutch hose
(B) Air bleeder

8) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



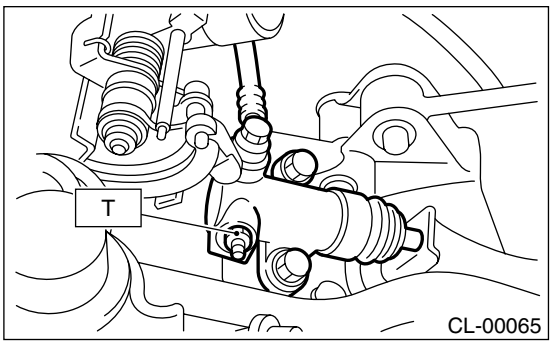
(A) Operating cylinder
(B) Vinyl tube

9) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

10) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



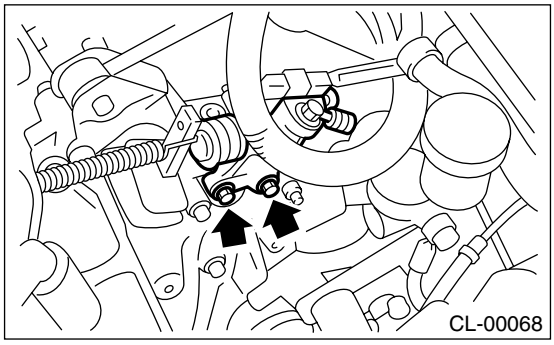
11) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
12) After bleeding air from the system, ensure that clutch operates properly.

2. TURBO MODEL

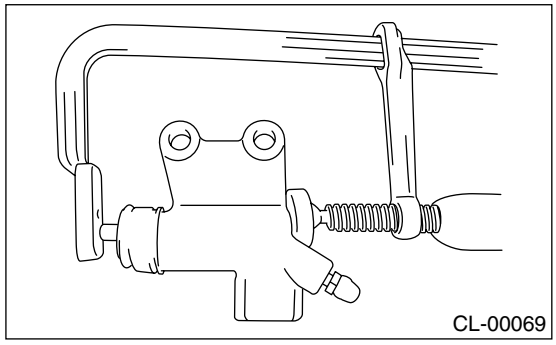
NOTE:
Bleed air from the oil line with help of a co-worker.

1) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
2) Remove the operating cylinder.

NOTE:
Do not remove the clutch hose.

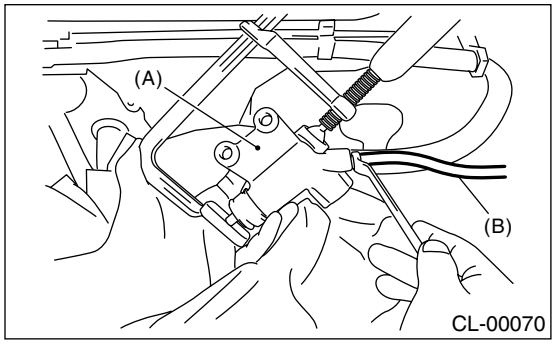


3) Fix the piston with clamp to avoid the piston from jumping out of cylinder.



4) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.
5) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

NOTE:
Set the air breather part higher than tip of operating cylinder when performing this procedure.



(A) Operating cylinder
(B) Vinyl tube

6) Repeat these steps until there are no more air bubbles in the vinyl tube.

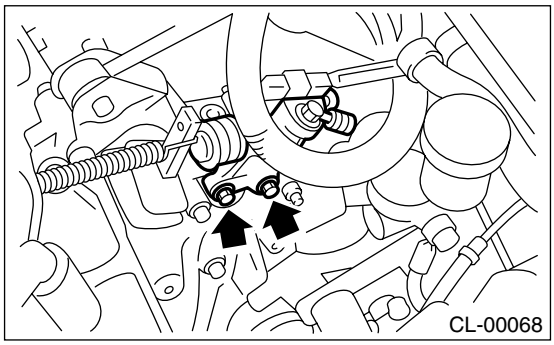
CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

7) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Install the operation clylinder.

Tightening torque:
T: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

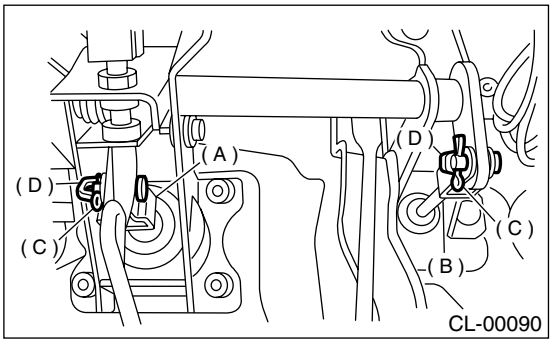


9) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
10) After bleeding air from the system, ensure that the clutch operates properly.
11) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

10.Clutch Pedal

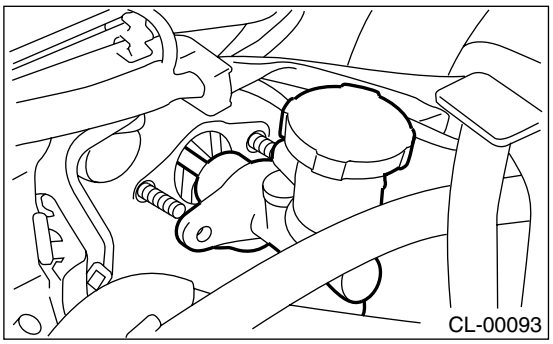
A: REMOVAL

1) Remove the steering column. <Ref. to PS-21, REMOVAL, Tilt Steering Column.>
2) Disconnect the connectors from stop light and clutch switches.
3) Remove the snap pins which secure lever to push rod and operating rod.
4) Remove the clevis pins which secure lever to push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

5) Remove the accelerator pedal.
<Ref. to SP(H4SO)-3, REMOVAL, Accelerator Pedal.>
6) Remove the air intake chamber and air intake duct. (U5 model) <Ref. to IN(H4SO U5)-6, REMOVAL, Air Intake Chamber.> and <Ref. to IN(H4SO U5)-7, REMOVAL, Air Intake Duct.>
7) Remove the air cleaner case and intake duct. (Except U5 model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
8) Remove the intercooler. (TURBO model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
9) Remove the nut which secures clutch master cylinder.



10) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal assembly.

B: INSTALLATION

1) Install in the reverse order of removal.

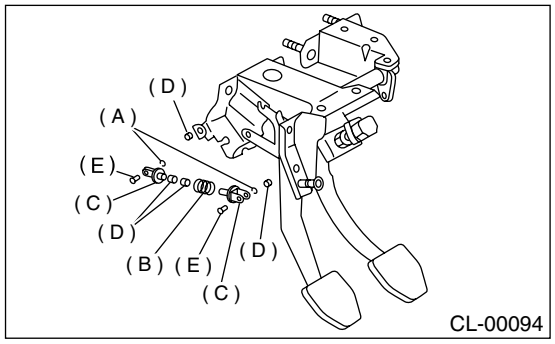
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

NOTE:
- Be careful not to kink the accelerator cable.
- Always use new clevis pins.

2) Adjust the clutch pedal after installation. <Ref. to CL-29, ADJUSTMENT, Clutch Pedal.>
3) Adjust the clutch switch (starter interlock). <Ref. to CL-33, ADJUSTMENT, Clutch Switch.>

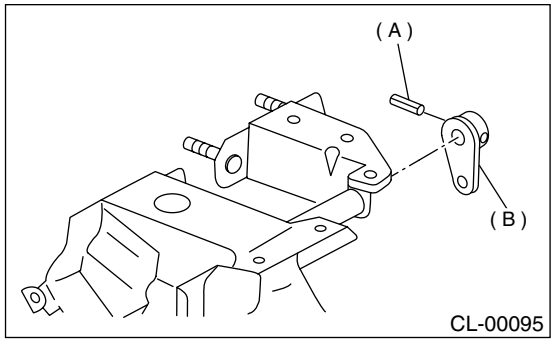
C: DISASSEMBLY

1) Remove the clips, assist spring, rod and bushing.



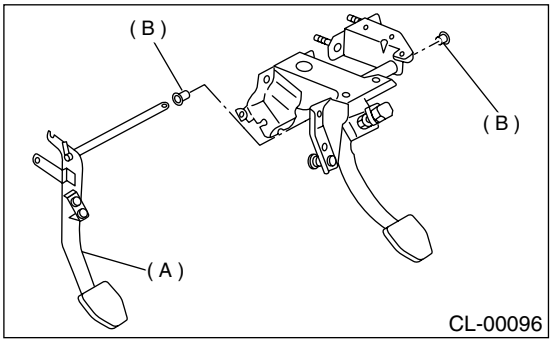
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

2) Remove the spring pin and lever.



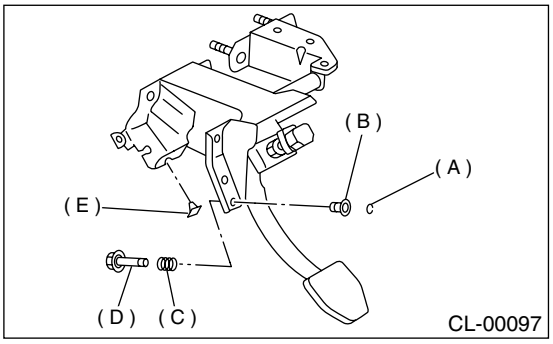
(A) Pin
(B) Lever

3) Remove the clutch pedal and bushings.



(A) Clutch pedal
(B) Bushing

4) Remove the stopper, clip, rod S, and then remove the spring and bushing S.



(A) Clip
(B) Bushing S
(C) Spring S
(D) Rod S
(E) Stopper

5) Remove the stoppers from clutch pedal.
6) Remove the clutch pedal pad.

D: ASSEMBLY

1) Attach the stopper, etc. to pedal bracket temporarily.
2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.

Grease:
SUNLIGHT No.2 (Part No. 003602010) or equivalent

3) Align bores of pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, assist rods, spring, and bushing.

NOTE:
Clean up inside of bushings and apply grease before installing the spacer.

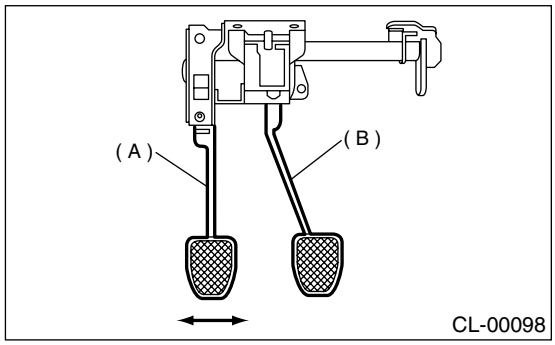
E: INSPECTION

1. CLUTCH PEDAL

Move the clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

NOTE:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of clutch pedal:
Service limit
5.0 mm (0.197 in) or less



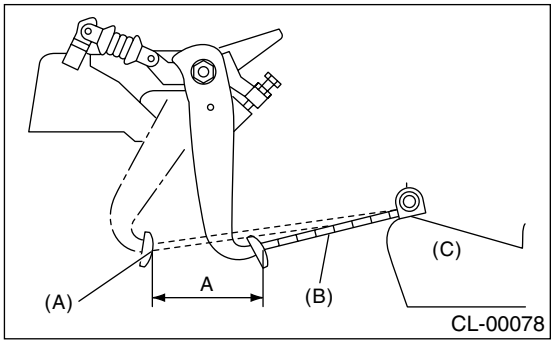
(A) Clutch pedal
(B) Brake pedal

F: ADJUSTMENT

1) Measure the full stroke amount of clutch pedal.

NOTE:
• Measure the length between seat cushion front end and center portion of clutch pedal.
• Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

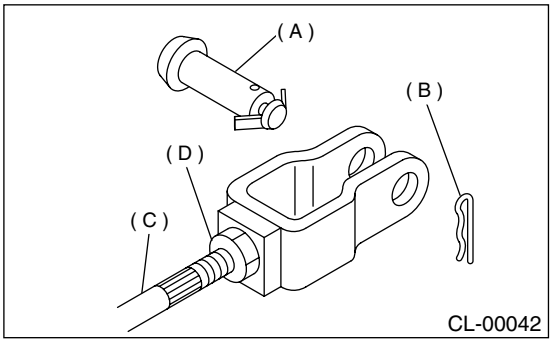


(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

2) If not as specified, loosen the clutch stopper nut to adjust it.

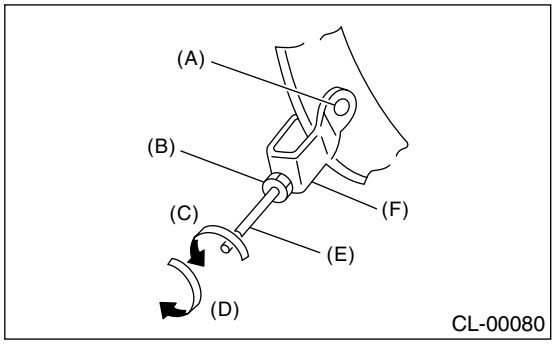
Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

3) Loosen the push rod lock nut.



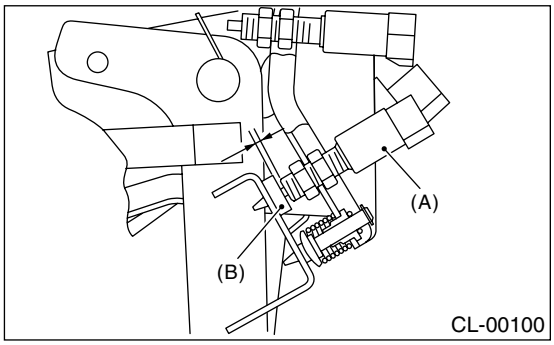
(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

4) Turn the push rod to adjust.
(1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.
(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



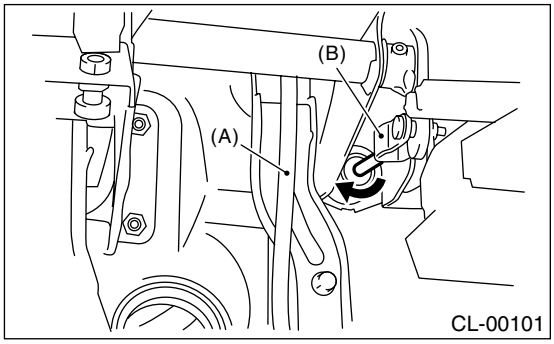
(A) Clevis hole
(B) Push rod lock nut
(C) Lengthening direction
(D) Shortening direction
(E) Push rod
(F) U shaped bracket

5) Turn the push rod clockwise to shorten until clearance is made at clutch switch.



(A) Clutch switch
(B) Stopper

6) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to clutch switch.
7) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



(A) Accelerator pedal
(B) Clevis

8) Move the clevis pin in lateral direction to ensure it moves smoothly.

9) Tighten the push rod lock nut.

Tightening torque :
10 N·m (1.0 kgf-m, 7.2 ft-lb)

10) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

11) Install the clutch start switch. <Ref. to CL-32, INSTALLATION, Clutch Switch.>

11.Clutch Switch

A: REMOVAL

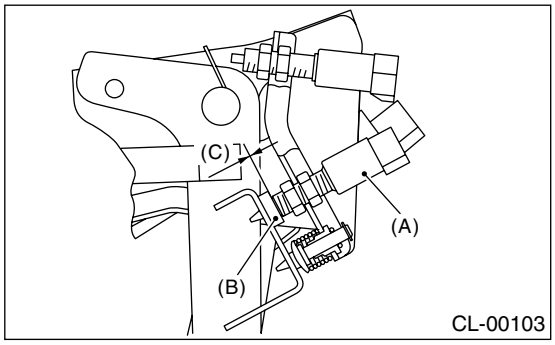
1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover.
3) Disconnect the connector from clutch switch.
4) Remove the clutch switch.

B: INSTALLATION

1. CLUTCH SWITCH (WITH CRUISE CONTROL)

1) Install the clutch switch and clutch pedal stopper so that the gap between them is 0 mm (0 in).

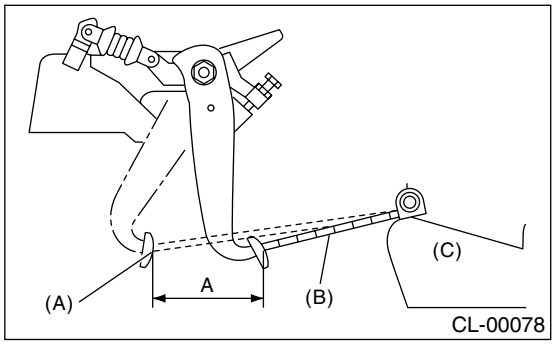
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Clutch swsitch
(B) Stopper
(C) 0 mm (0 in)

2) Measure stroke of clutch pedal.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)



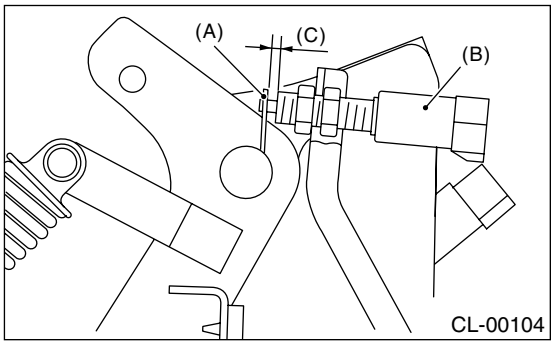
(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

3) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-29, ADJUSTMENT, Clutch Pedal.>
4) Connect clutch switch connector.

2. CLUTCH SWITCH (STARTER INTERLOCK)

1) Fully depress the clutch pedal.
2) Install the clutch pedal plate and clutch pedal so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in), and then tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 13.0 ft-lb)



(A) Plate
(B) Clutch pedal
(C) 3 — 3.5 mm (0.12 — 0.14 in)

3) Connect the clutch switch connector.
4) Confirm that the engine does not start when the clutch pedal is released.
5) Confirm that the engine starts when the clutch pedal is fully depressed.

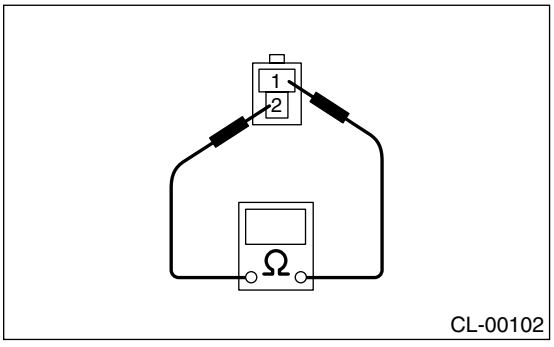
C: INSPECTION

1) Confirm that the engine does not start when the clutch pedal is released. If the engine starts, adjust the clutch switch and inspect the starter interlock circuit.
2) Confirm that the engine starts when the clutch pedal is fully depressed. If the engine does not start, adjust the clutch switch and inspect the starter interlock circuit.
3) Check the clutch switch continuity. If continuity is not as specified, replace the switch.
   (1) Disconnect the clutch switch connector.
   (2) Measure the resistance between 1 and 2 of switch terminal.

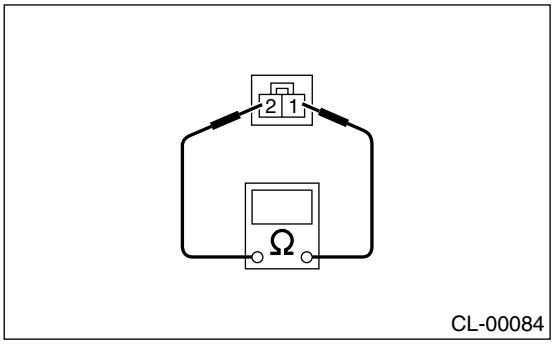
Terminals/Specified resistance
When clutch pedal depressed:
1 — 2/Less than 1 Ω

Terminals/Specified resistance
When clutch pedal not depressed:
1 — 2/More than 1 M Ω

Clutch switch (Starter interlock)

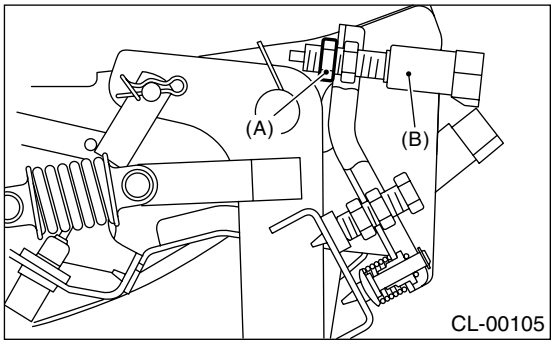


Clutch switch (Cruise control)



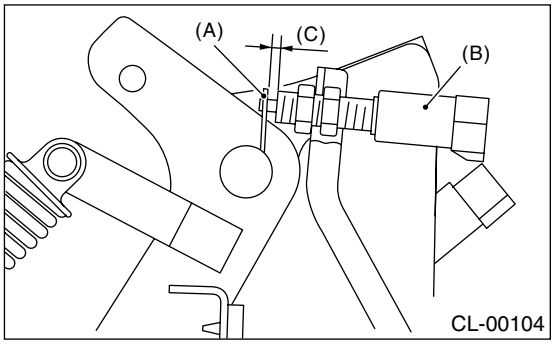
D: ADJUSTMENT

1) Loosen the clutch switch mounting lock nut (Starter interlock).



(A) Lock nut
(B) Clutch switch (Starter interlock)

2) Fully depress the clutch pedal.
3) Adjust the clutch pedal plate and clutch switch so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in).



(A) Plate
(B) Clutch switch (Starter interlock)
(C) 3 — 3.5 mm (0.12 — 0.14 in)

4) Tighten the lock nut.

Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 13.0 ft-lb)

12.General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective action
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms • Engine speed up when shifting. • High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. • Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. • Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.	(a) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or flywheel	Correct or replace.
	(e) Defective release bearing holder	Correct or replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. • Method of testing: <Ref. to CL-35, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc facing	Replace.
	(c) Malfunction of crankshaft pilot bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Sticked clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	(a) Adhesion of oil on the facing	Replace the clutch disc.
	(b) Weak or broken torsion spring	Replace the clutch disc.
	(c) Defective facing contact or excessive disc worn	Replace the clutch disc defection.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace the mounting.
	(g) Improper adjustment of pitching stopper	Adjustment.
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or unlubricated release bearing	Replace the release bearing.
	(b) Insufficient lubrication of pilot bearing	Replace the clutch disc.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose torsion spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken torsion spring	Replace the clutch disc.

Symptom	Possible cause	Corrective action
5. Clutch grabs. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace the clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace the mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Trouble	Corrective action
Insufficient pedal play	Adjust pedal play.
Clutch pedal free play insufficient	Adjust pedal free play.
Excessively worn and damaged pedal shaft and/or bushing	Replace the bushing and/or shaft with a new one.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

	Step	Check	Yes	No
1	**CHECK GEAR NOISE.** 1) Start the engine. 2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.	Is there any abnormal noise from the transmission gear?	Go to step **2.**	Clutch is normal.
2	**CHECK GEAR NOISE.** Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.	Is there any abnormal noise from the transmission gear?	Go to step **3.**	Defective transmission or excessive clutch drag torque. Inspect the pilot bearing, clutch disc, transmission and clutch disc hub spline.
3	**CHECK GEAR NOISE.** 1) Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2) With the clutch disengaged, shift from N to R, R to N several times.	Is there any abnormal noise from the transmission gear?	Defect in clutch disengaging. Inspect the clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc, spline of clutch disc hub.

MEMO:

FRONT SUSPENSION

FS

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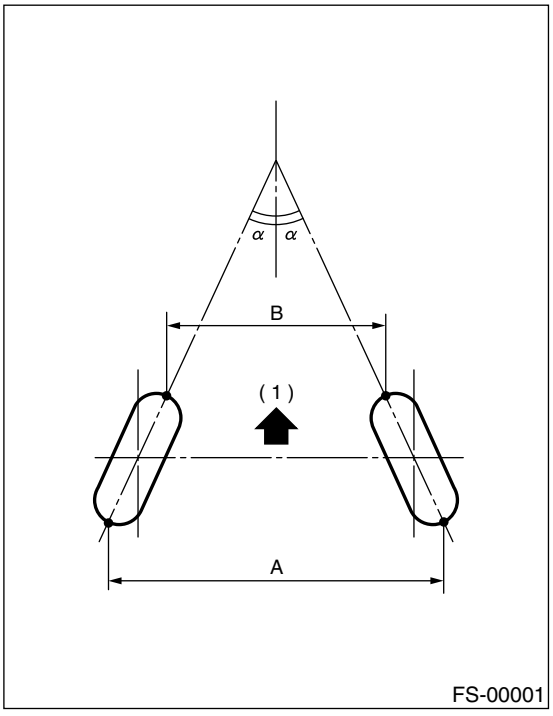
4.	Front Ball Joint	17
5.	Front Strut	18
6.	Front Stabilizer	22
7.	Front Crossmember	23
8.	General Diagnostic Table	24

1. General Description

A: SPECIFICATIONS

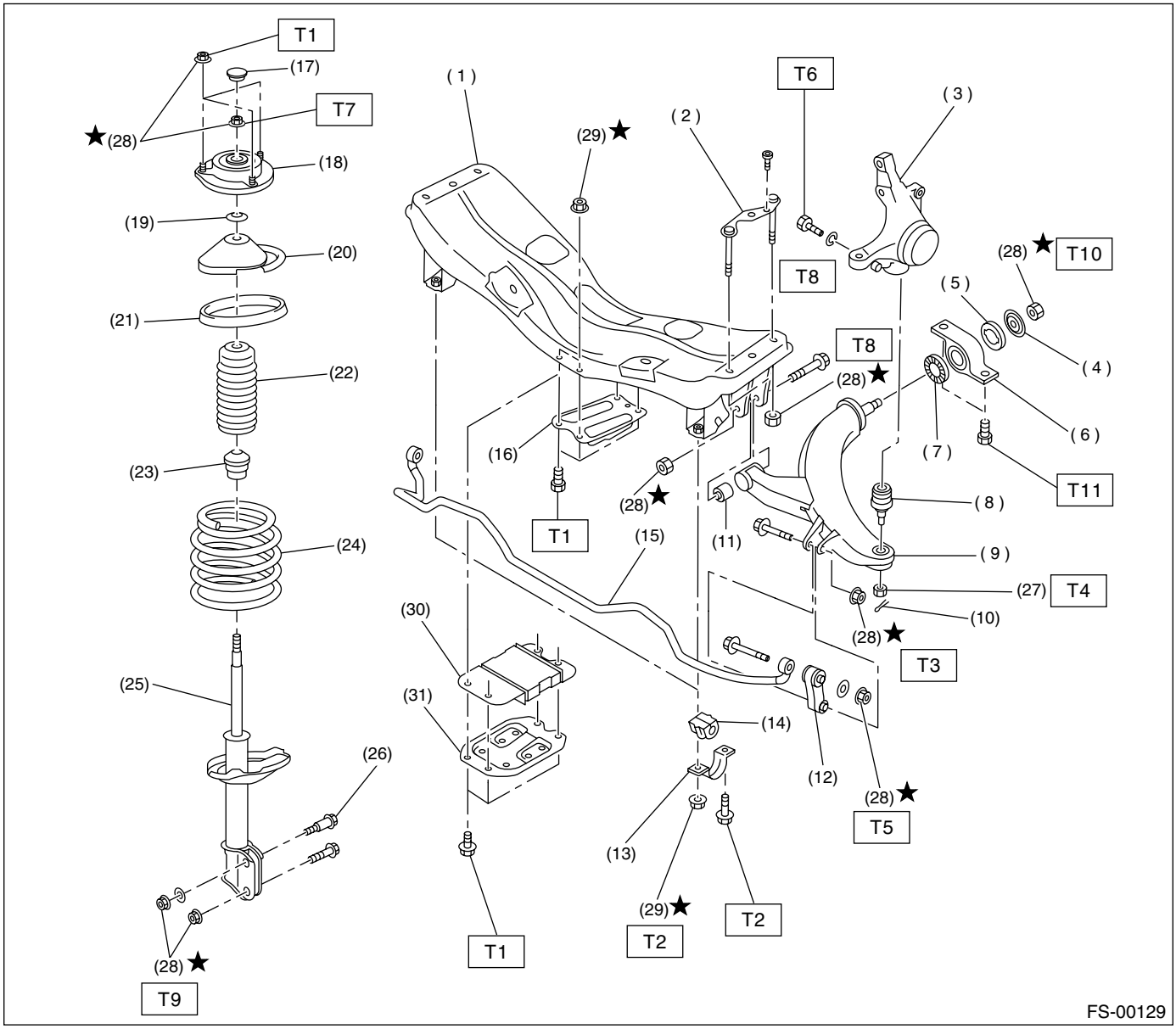
	Model	Sedan	Wagon	OUTBACK	PICKUP
Front	Camber (Tolerance: ±0°45′ Adjustment standard: ±0°30′)	–0°05′	–0°05′	0°20′	0°40′
	Caster	3°05′	2°50′	2°40′	2°45′
	Toe-in	Tolerance: 0±3 mm (0±0.12 in), Toe angle (The sum of both wheels): ±0°15′ Tolerance: 0±2 mm (0±0.08 in), Toe angle (The sum of both wheels): ±0°10′			
	Kingpin angle	14°15′	14°15′	13°30′	13°00′
	Wheel arch height [Tolerance: +12/–24 mm (+0.47/–0.94 in)]	388 mm (15.28 in)	388 mm (15.28 in)	424 mm (16.69 in)	436 mm (17.17 in)
	Diameter of stabilizer	21 mm (0.83 in)			
Rear	Camber (Tolerance: ±0°45′ Adjustment standard: ±0°30′)	–0°30′	–0°20′	0°10′	0°05′
	Toe-in	Tolerance: 0±3 mm (0±0.12 in), Toe angle (The sum of both wheels): ±0°15′ Tolerance: 0±2 mm (0±0.08 in), Toe angle (The sum of both wheels): ±0°10′			
	Wheel arch height [Tolerance: +12/–24 mm (+0.47/–0.94 in)]	371 mm (14.61 in)	381 mm (15.00 in)	421 mm (16.57 in)	441 mm (17.36 in)
	Thrust angle	Tolerance: ±0°30′, Adjustment standard: ±0°20′			
	Diameter of stabilizer	16 mm (0.63 in)			

NOTE:
• Front and rear toe-in and front camber can be adjusted. If toe-in or camber exceeds tolerance, adjust toe-in and camber to the adjustment standard.
• The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front
A – B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT



(1) Front crossmember
(2) Bolt ASSY
(3) Housing
(4) Washer
(5) Stopper rubber (Rear)
(6) Rear bushing
(7) Stopper rubber (Front)
(8) Ball joint
(9) Transverse link
(10) Cotter pin
(11) Front bushing
(12) Stabilizer link
(13) Clamp
(14) Bushing
(15) Stabilizer
(16) Jack-up plate
(17) Dust seal
(18) Strut mount
(19) Spacer
(20) Upper spring seat
(21) Rubber seat
(22) Dust cover
(23) Helper
(24) Coil spring
(25) Damper strut
(26) Adjusting bolt
(27) Castle nut
(28) Self-locking nut
(29) Flange nut
(30) Dynamic damper (Non-TURBO, MT model)
(31) Dynamic plate (Non-TURBO, MT model)

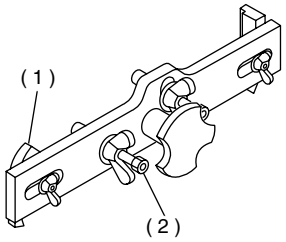
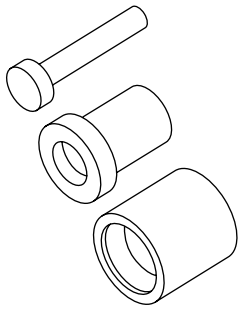
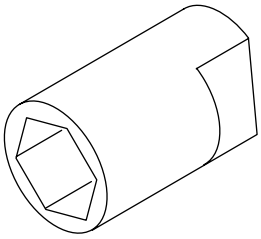
Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 25 (2.5, 18.1)
T3: 30 (3.1, 22)
T4: 39 (4, 29)
T5: 45 (4.6, 33)
T6: 50 (5.1, 37)
T7: 54 (5.5, 39.8)
T8: 95 (9.7, 71)
T9: 152 (16, 116)
T10: 186 (19.0, 137)
T11: 245 (25.0, 181)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.

2. Wheel Alignment

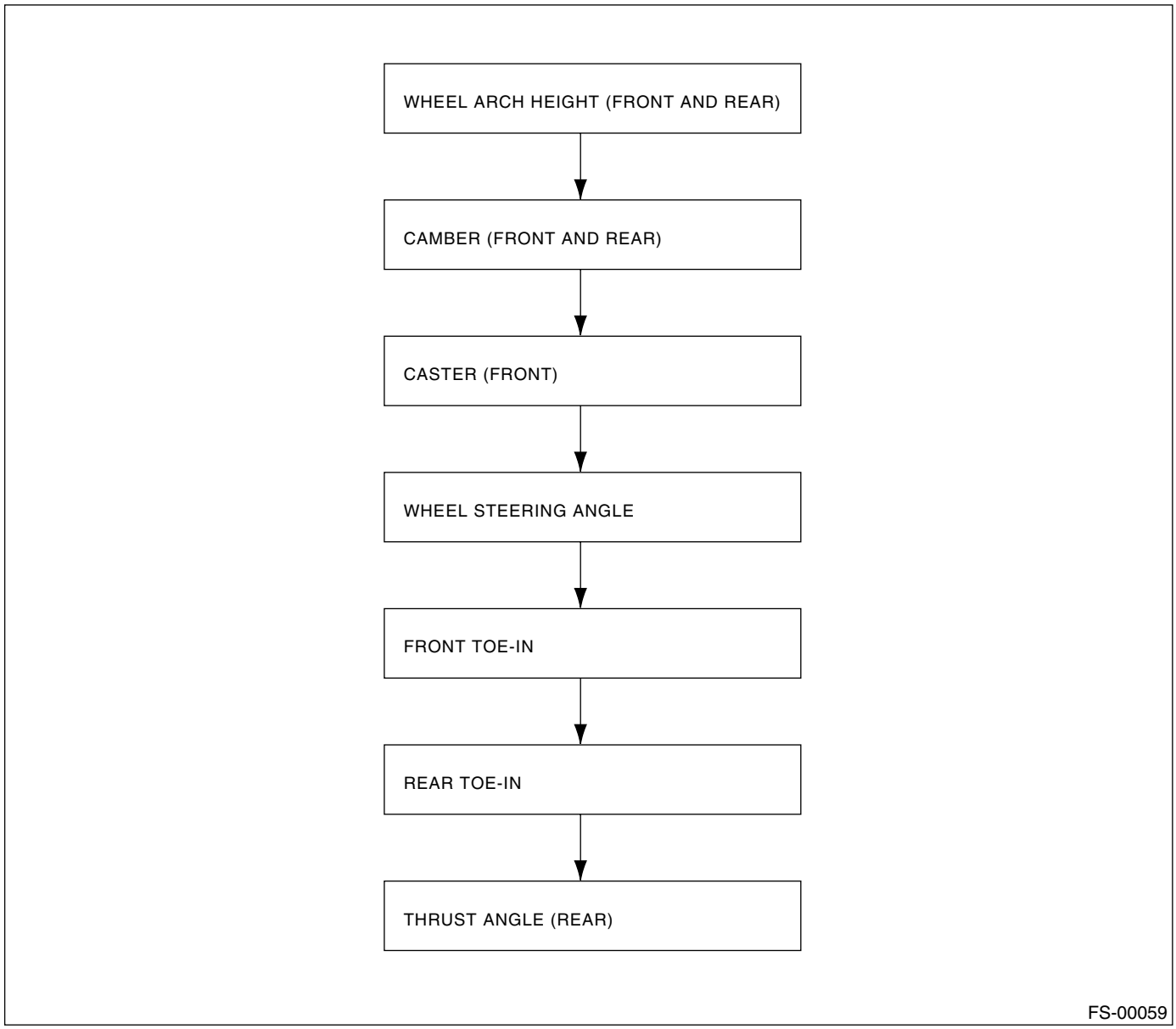
A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

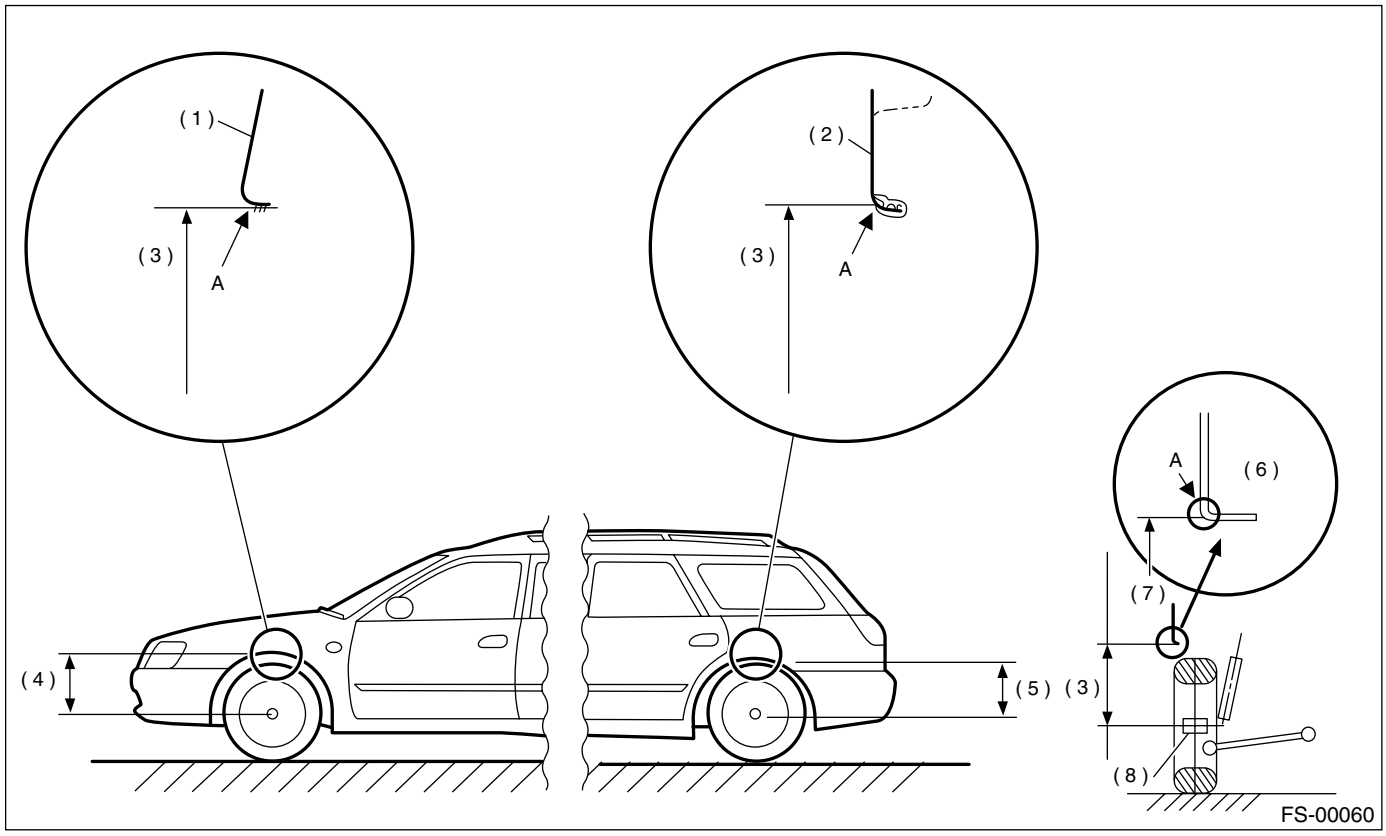
- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

Check, adjust and/or measure wheel alignment in accordance with procedures indicated in figure:



1. WHEEL ARCH HEIGHT

1) Set vehicle on a level surface.
2) Set vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set steering wheel in a straight line, then move the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
4) Suspend thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
5) Measure distance between measuring point “A” and center of wheel.



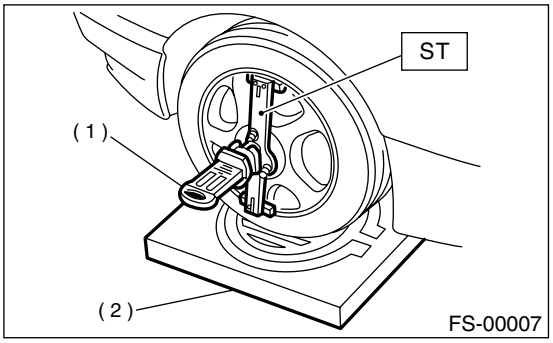
(1) Front fender
(2) Outer rar quarter
(3) Wheel arch height
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Cross-section of arch
(7) Measuring point
(8) End of spindle

Model	Specified wheel arch height	
	Front	Rear
Sedan	388^{+12}_{-24} mm ($15.28^{+0.47}_{-0.94}$ in)	371^{+12}_{-24} mm ($14.61^{+0.47}_{-0.94}$ in)
Wagon	388^{+12}_{-24} mm ($15.28^{+0.47}_{-0.94}$ in)	381^{+12}_{-24} mm ($15.00^{+0.47}_{-0.94}$ in)
OUTBACK	424^{+12}_{-24} mm ($16.69^{+0.47}_{-0.94}$ in)	421^{+12}_{-24} mm ($16.51^{+0.47}_{-0.94}$ in)
PICKUP	436^{+12}_{-24} mm ($17.17^{+0.47}_{-0.94}$ in)	441^{+12}_{-24} mm ($17.36^{+0.47}_{-0.94}$ in)

2. CAMBER

• Inspection

1) Place front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set ST into the center of the wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure the camber angle.

NOTE:
Refer to the “SPECIFICATIONS” for the camber values.
Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>
Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

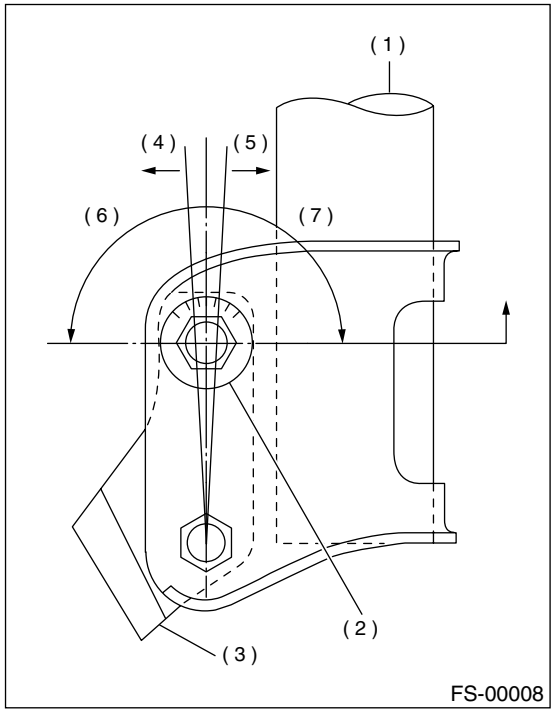
• Front Camber Adjustment

When exceeding the tolerance, adjust it as follows.
1) Loosen two self-locking nuts located at lower front portion of strut.

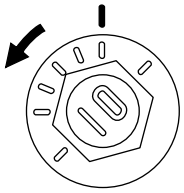
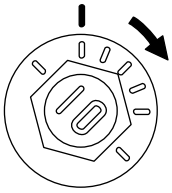
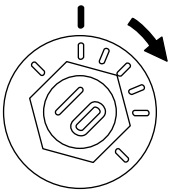
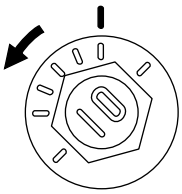
CAUTION:
• When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.
• When self-locking nut is removed, replace with a new one.

2) Turn camber adjusting bolt so that camber is set at the specification.

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approximately 0°15′.



(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased.
(7) Camber is decreased.

	Left side	Right side
Camber is increased.	 FS-00009 Rotate counter-clockwise.	 FS-00010 Rotate clockwise.
Camber is decreased.	 FS-00010 Rotate clockwise.	 FS-00009 Rotate counter-clockwise.

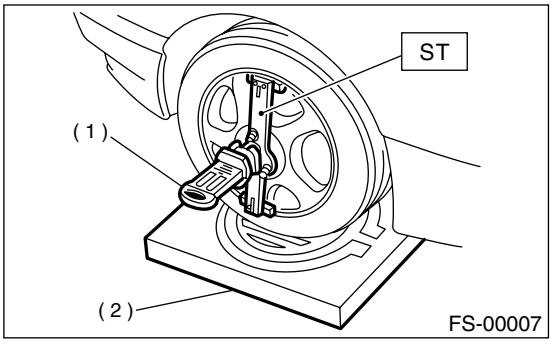
3) Tighten the two self-locking nuts.

Tightening torque:
152 N·m (16 kgf-m, 116 ft-lb)

3. CASTER

• Inspection

1) Place front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set ST into the center of the wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure the caster angle.

NOTE:
Refer to the “SPECIFICATIONS” for the caster values. <Ref. to FS-2, SPECIFICATIONS, General Description.>

4. STEERING ANGLE

• Inspection

1) Place vehicle on a turning radius gauge.
2) While depressing brake pedal, turn steering wheel fully to the left and right. With steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

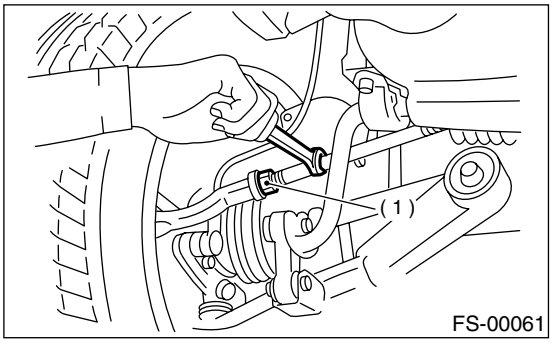
Steering angle:

Model	*Others*	*OUTBACK,PICKUP*
Inner wheel	*36.3°±1.5°*	*34.5°±1.5°*
Outer wheel	*31.6°±1.5°*	*30.3°±1.5°*

• Adjustment

Turn tie-rod to adjust steering angle of both inner and outer wheels.

CAUTION:
- **Check toe-in.**
- **Correct boot if it is twisted.**



(1) Lock nut

5. FRONT WHEEL TOE-IN

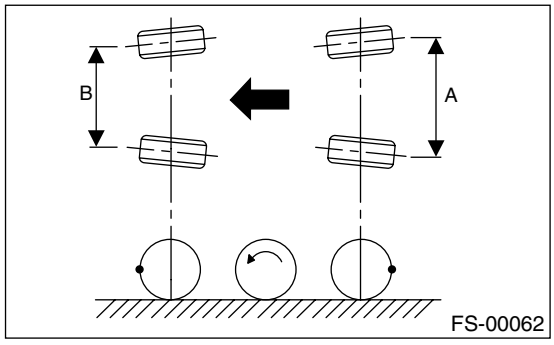
• Inspection

1) Using a toe gauge, measure front wheel toe-in.

Toe-in:
0±3 mm (0±0.12 in) (tolerance)

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “A” between marks.
3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.
4) Measure distance “B” between left and right marks. Toe-in can then be obtained by the following equation:

A – B = Toe-in

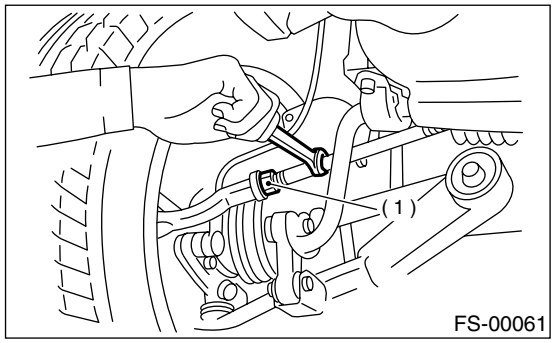


• Adjustment

When exceeding the tolerance, adjust it as follows.
1) Loosen the left and right side steering tie-rods lock nuts.
2) Turn the left and right tie rods equal amounts until the toe-in is at the adjustment standard.

Toe-in:
0±2 mm (0±0.08 in) (adjustment standard)

Both the left and right tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from the inside of the vehicle).



(1) Lock nut

3) Tighten tie-rod lock nut.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

CAUTION:
Correct tie-rod boot, if it is twisted.

NOTE:
Check the left and right wheel steering angle is within specifications.

6. REAR WHEEL TOE-IN

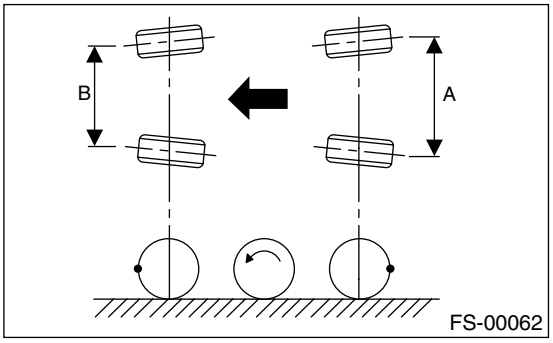
• Inspection

1) Using a toe-in gauge, measure rear wheel toe-in.

Toe-in:
0±3 mm (0±0.12 in) (tolerance)

2) Mark rear sides of left and right tires at height corresponding to center of spindles and measure distance “A” between marks.
3) Move vehicle forward so that marks line up with front sides at height corresponding to center of spindles.
4) Measure distance “B” between left and right marks. Toe-in can then be obtained by the following equation:

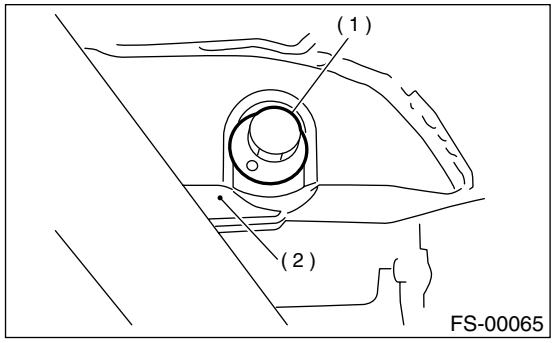
A – B = Toe-in



• Adjustment

When exceeding the tolerance,adjust it as follows.
1) Loosen self-locking nut on inner side of link rear.

CAUTION:
• When loosening or tightening adjusting bolt, hold bolt head and turn self-locking nut.
• When self-locking nut is removed, replace with a new one.

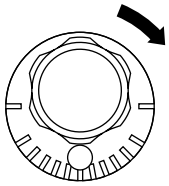
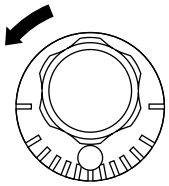
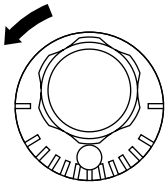
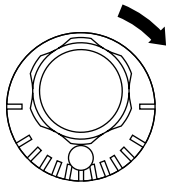


(1) Adjusting bolt
(2) Link rear

2) Turn adjusting bolt head until toe-in is at the adjustment standard.

Toe-in:
0±2 mm (0±0.08 in) (adjustment standard)

NOTE:
When left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approximately 6 mm (0.24 in).

	Left side	Right side
Toe-in is increased.	 FS-00066 Rotate clockwise.	 FS-00067 Rotate counter-clockwise.
Toe-in is decreased.	 FS-00067 Rotate counter-clockwise.	 FS-00066 Rotate clockwise.

3) Tighten self-locking nut.

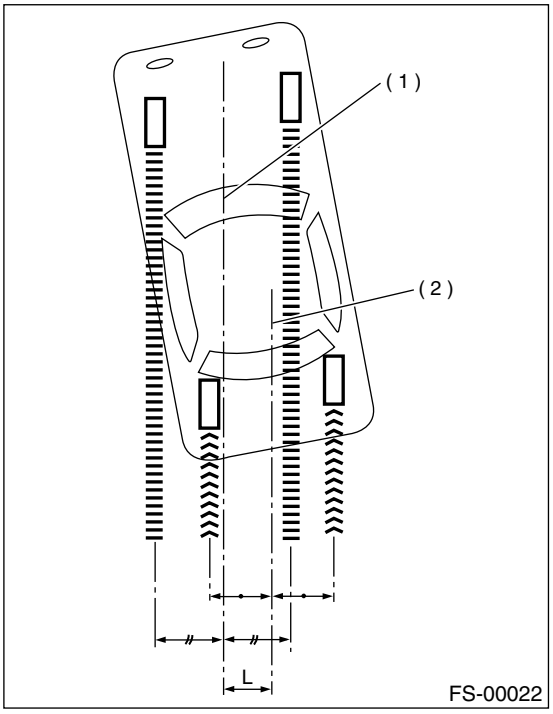
Tightening torque:
120 N·m (12.2 kgf-m, 88 ft-lb)

7. THRUST ANGLE

• Inspection

1) Position vehicle on a level surface.
2) Move vehicle 3 to 4 meters directly forward.
3) Determine locus of both front and rear axles.
4) Measure distance "L" between center line of loci of the axles.

Thrust angle: 0°±30′ (tolerance)
[Less than 30′ when "L" is equal to or less than 23 mm (0.91 in).]



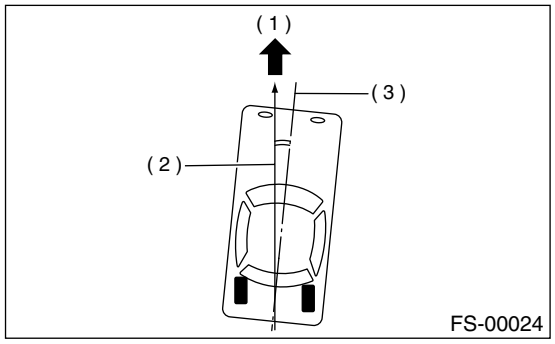
(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• Adjustment

When exceeding the tolerance, adjust it as follows.
1) Make thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When left and right adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approximately 15′ ["L" is almost equal to 11 mm (0.46 in)].

Thrust angle:
0°±20′ (adjustment standard)
[Less than 20′ when "L" is equal to or less than 15 mm (0.59 in).]

NOTE:
Thrust angle refers to a mean value of left and right rear wheel toe angles in relation to vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.

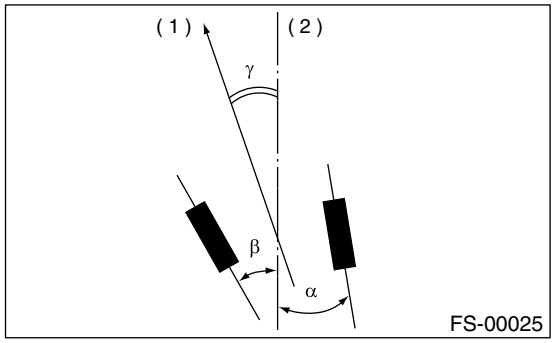


(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: r = (α – β)/2

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle

NOTE:
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.

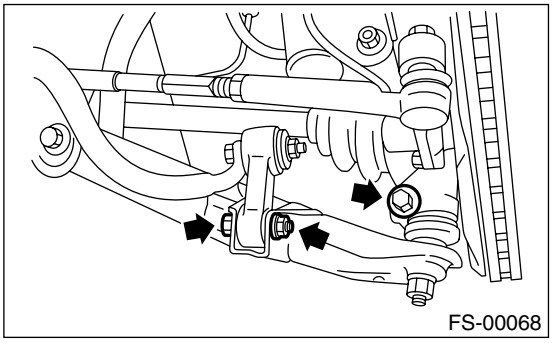


(1) Front
(2) Body center line

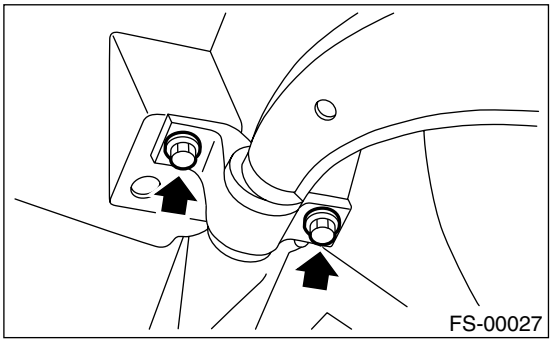
3. Front Transverse Link

A: REMOVAL

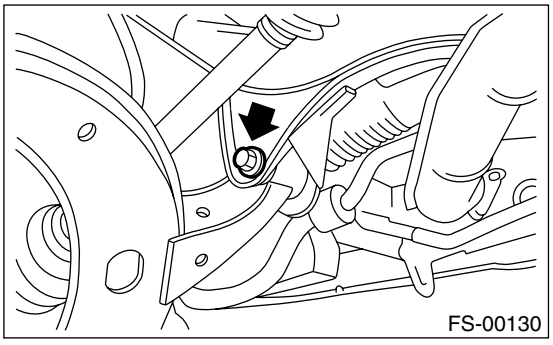
1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up the vehicle and remove the wheel.
4) Disconnect stabilizer link from transverse link.
5) Remove bolt securing ball joint of transverse link to housing.



6) Remove nut (do not remove bolt.) securing transverse link to crossmember.
7) Remove two bolts securing bushing bracket of transverse link to vehicle body at rear bushing location.



8) Extract ball joint from housing.
9) Remove bolt securing transverse link to crossmember and extract transverse link from crossmember.



B: INSTALLATION

1) Temporarily tighten the two bolts used to secure rear bushing of the transverse link to body.

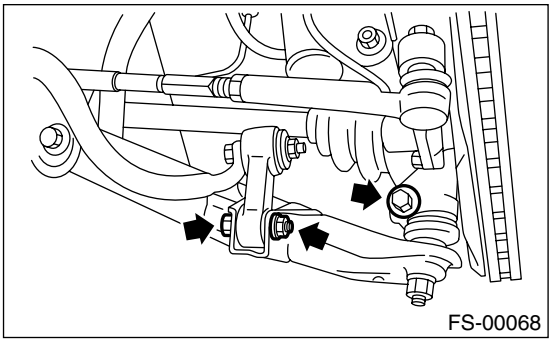
NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install bolts used to connect transverse link to crossmember and temporarily tighten with nut.

CAUTION:
When self-locking nut is removed, replace with a new one.

3) Insert ball joint into housing.
4) Connect stabilizer link to transverse link, and temporarily tighten bolts.

CAUTION:
When self-locking nut is removed, replace with a new one.



5) Tighten the following points in the order shown below when wheels are in full contact with the ground and vehicle is at curb weight.
(1) Transverse link and stabilizer

Tightening torque:
30 N·m (3.1 kgf-m, 22 ft-lb)

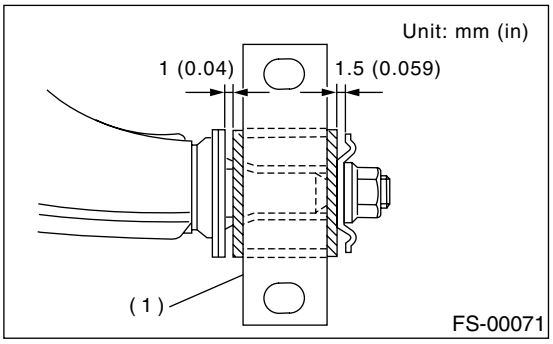
(2) Transverse link and crossmember

Tightening torque:
95 N·m (9.7 kgf-m, 71 ft-lb)

(3) Transverse link rear bushing and body

Tightening torque:
245 N·m (25 kgf-m, 181 ft-lb)

NOTE:
• Move rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in figure.) before tightening.
• Check wheel alignment and adjust if necessary.

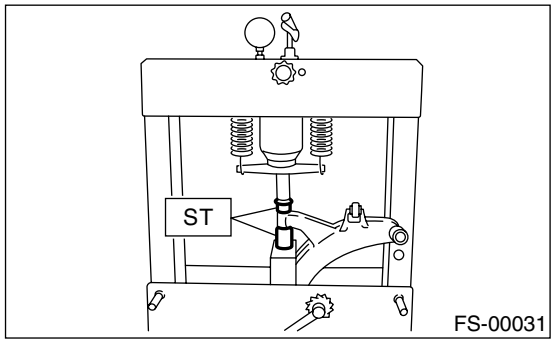


(1) Rear bushing

C: DISASSEMBLY

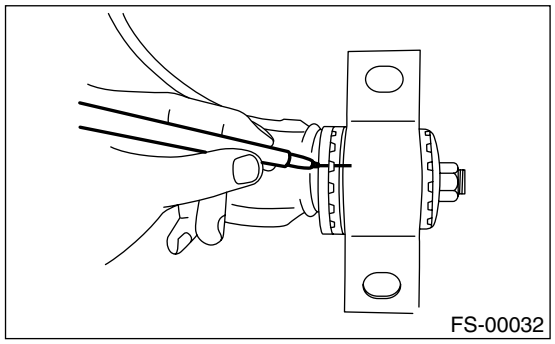
1. FRONT BUSHING

Using ST, press front bushing out of place.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Scribe an aligning mark on transverse link and rear bushing.
2) Loosen nut and remove rear bushing.

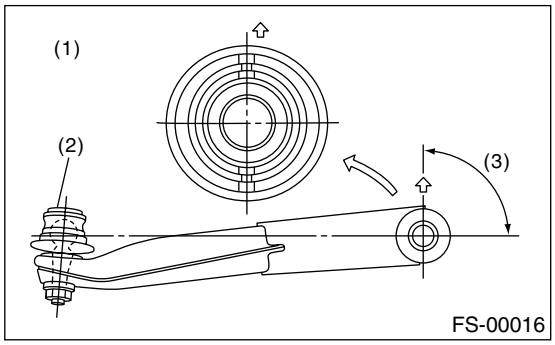


D: ASSEMBLY

1. FRONT BUSHING

To reassemble, reverse disassembly procedures.

CAUTION:
Install front bushing in correct direction, as shown in figure.



(1) Face bushing toward center of ball joint
(2) Ball joint

2. REAR BUSHING

1) Install rear bushing to transverse link and align aligning marks scribed on the two.
2) Tighten self-locking nut.

CAUTION:
• When self-locking nut is removed, replace with a new one.
• While holding rear bushing so as not to change position of aligning marks, tighten self-locking nut.

Tightening torque:
186 N·m (19.0 kgf-m, 137 ft-lb)

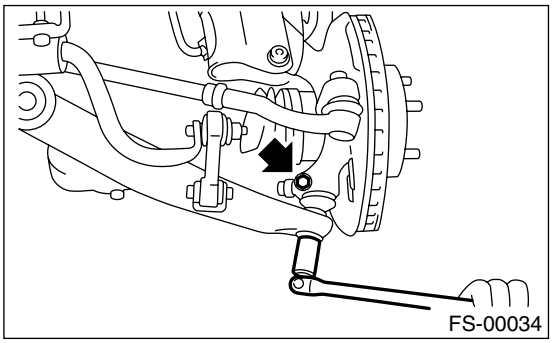
E: INSPECTION

1) Check transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check bushings for cracks, fatigue or damage.
3) Check rear bushing for oil leaks.

4. Front Ball Joint

A: REMOVAL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up the vehicle and remove the wheel.
4) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
5) Remove the bolt securing the ball joint to the housing.



6) Extract the ball joint from the housing.

B: INSTALLATION

1) Install ball joint onto housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:
Do not apply grease to tapered portion of ball stud.

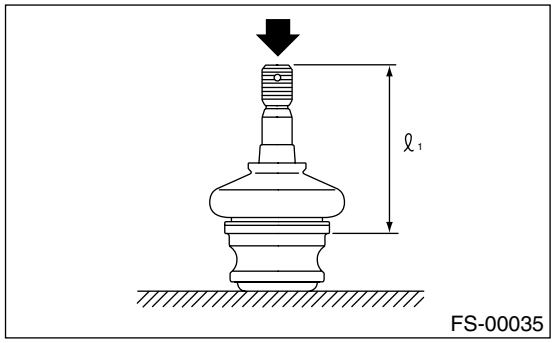
2) Connect ball joint to transverse link.

Tightening torque (Castle nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

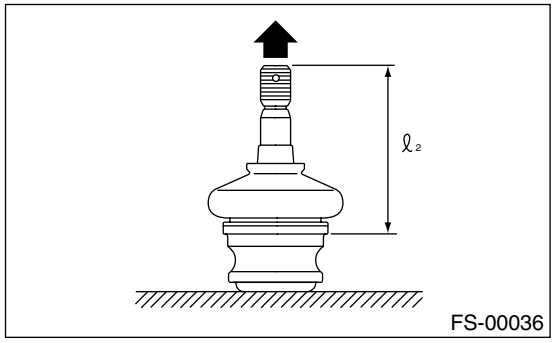
3) Retighten castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert new cotter pin and bend it around castle nut.
4) Install front wheel.

C: INSPECTION

1) Measure free play of ball joint by the following procedures. Replace with a new one when the free play exceeds the specified value.
(1) With 686 N (70 kgf, 154 lb) loaded in the direction shown in the figure, measure dimension ℓ_1.



(2) With 686 N (70 kgf, 154 lb) loaded in the opposite direction shown in the figure, measure dimension ℓ_2.



(3) Calculate free play from the following formula. $S = \ell_2 - \ell_1$
(4) When free play is larger than the following value, replace with a new one.

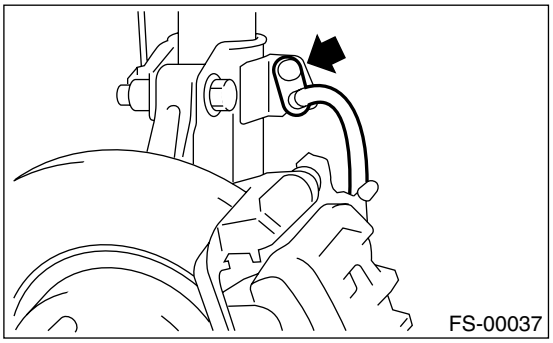
FRONT BALL JOINT
Standard for replacement: S
Less than 0.3 mm (0.012 in)

2) When free play is smaller than the specified value, visually inspect the dust cover.
3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
4) If the dust cover is damaged, replace with the new ball joint.

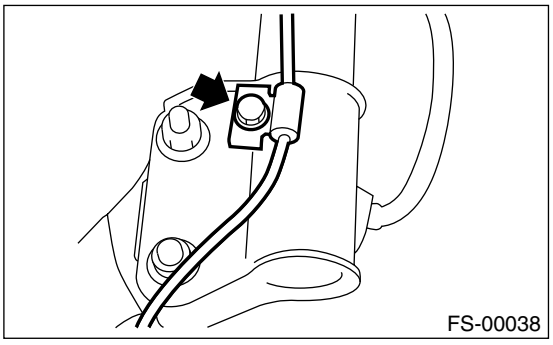
5. Front Strut

A: REMOVAL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up the vehicle and remove the wheel.
4) Remove bolt securing brake hose to strut.



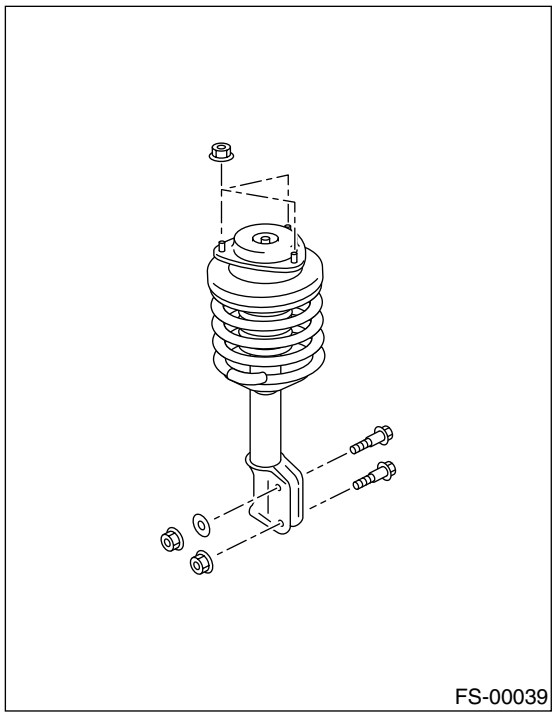
5) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
6) Remove bolt securing the ABS sensor harness.



7) Remove two bolts securing housing to strut.

CAUTION:
While holding head of adjusting bolt, loosen self-locking nut.

8) Remove the three nuts securing strut mount to body.



B: INSTALLATION

1) Install strut mount at upper side of strut to body and tighten with nuts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Position aligning mark on camber adjustment bolt with aligning mark on lower side of strut.

CAUTION:
• While holding head of adjusting bolt, tighten self-locking nut.
• When self-locking nut is removed, replace with a new one.

Tightening torque:
152 N·m (16 kgf-m, 112 ft-lb)

3) Install ABS sensor harness to strut.

Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

4) Install bolts which secure brake hose to strut.

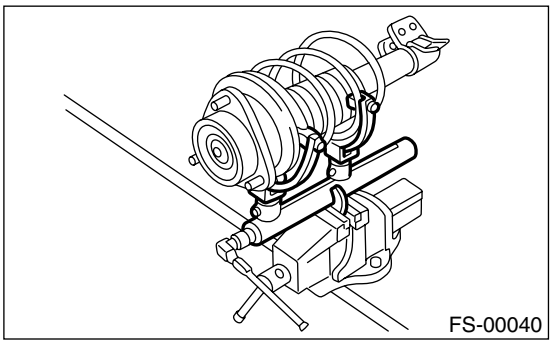
Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

5) Install wheels.

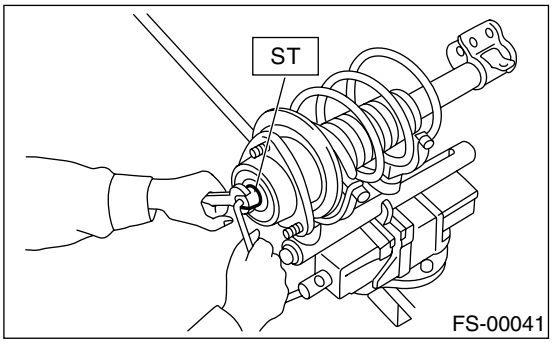
NOTE:
Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

1) Using a coil spring compressor, compress coil spring.



2) Using ST, remove self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



3) Remove strut mount, upper spring seat and rubber seat from strut.
4) Gradually decreasing compression force, and remove coil spring.
5) Remove dust cover and helper spring.

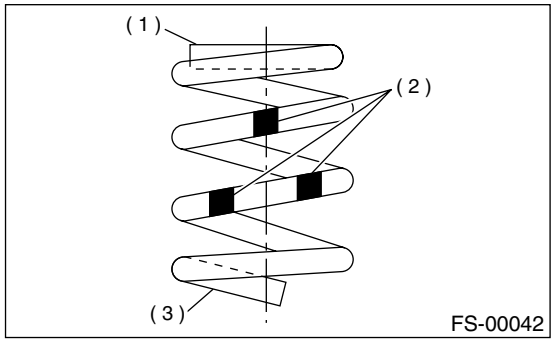
D: ASSEMBLY

1) Before installing coil spring, strut mount, etc., on the strut, check for the presence of air in the dampening force generating mechanism of the strut since air prevents proper dampening force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with the piston rod facing up.
   (2) Move the piston rod to the center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.
3) Air purging procedure
   (1) Place the strut vertically with the piston rod facing up.
   (2) Fully extend the piston rod.
   (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
   (4) Fully contract the piston rod.
   (5) Repeat 3 or 4 times from the first step.

NOTE:
After completely purging air from the strut, be sure to place the strut with the piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under “Checking for the presence of air”.

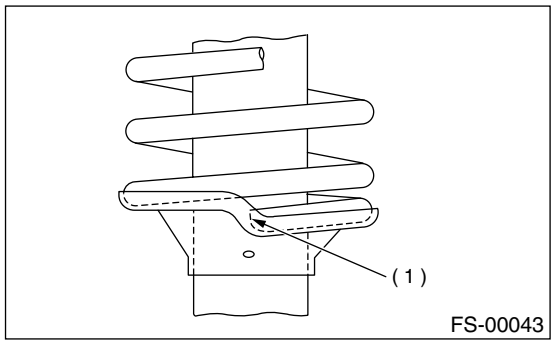
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the vertical installing direction of coil spring is as shown in figure.



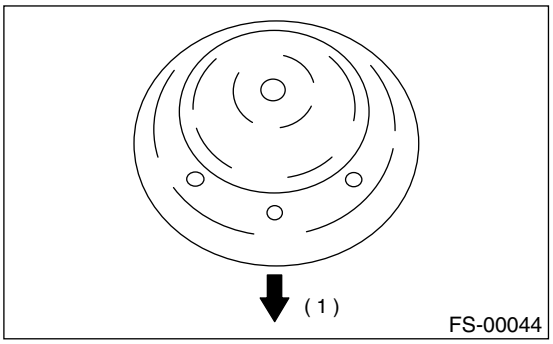
(1) Flat (top side)
(2) Identification paint
(3) Inclined (bottom side)

5) Set the coil spring correctly so that its end face (1) fits well into the spring seat as shown in the figure.



6) Install helper and dust cover to the piston rod.
7) Pull the piston rod fully upward, and install rubber seat and upper spring seat.

NOTE:
Ensure that upper spring seat is positioned as shown in figure.



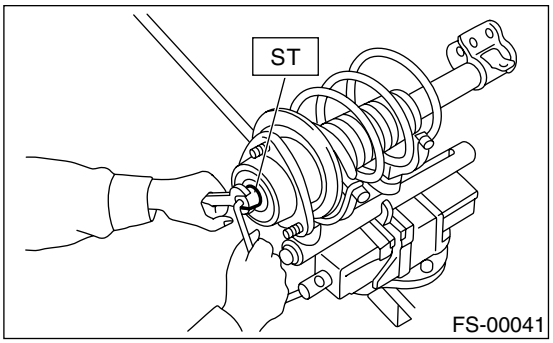
(1) Outside of body

8) Install strut mount to the piston rod, and tighten the self-locking nut temporarily.

CAUTION:
Be sure to use a new self-locking nut.

9) Using hexagon wrench to prevent strut rod from turning, tighten self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.6 kgf-m, 41 ft-lb)



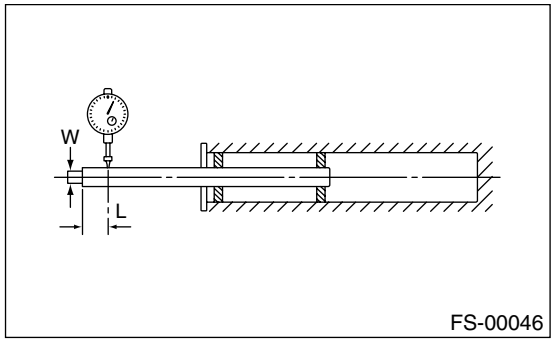
10) Loosen the coil spring carefully.

E: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

1. DAMPER STRUT

1) Check for oil leakage.
2) Move the piston rod up and down to check it operates smoothly without any binding.
3) Play of piston rod
• Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of the rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lb)] to threaded portion. With the force of 20 N (2 kgf, 4 lb) applied, read dial gauge indication: P_1. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of "W", then read dial gauge indication: P_2.



The free play is determined by the following equation:

Play = P_1, P_2

Standard of play:
Less than 0.8 mm (0.031 in)

If the play is greater than the standard, replace the strut.

2. STRUT MOUNT

Check rubber part for creep, cracks and deterioration, and replace it with new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

One having permanent strain should be replaced with a new one. When vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

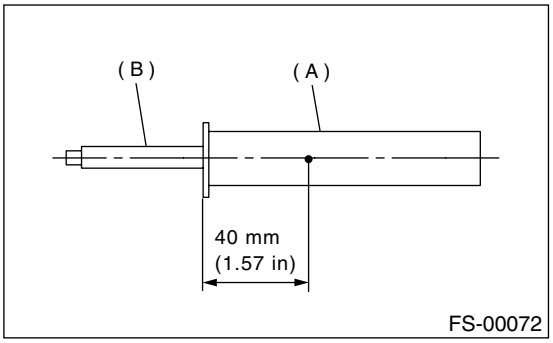
5. HELPER

Replace it with new one if cracked or damaged.

F: DISPOSAL

CAUTION:
• Do not disassemble the strut damper or place it into a fire.
• Drill a hole before disposal of strut.
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.

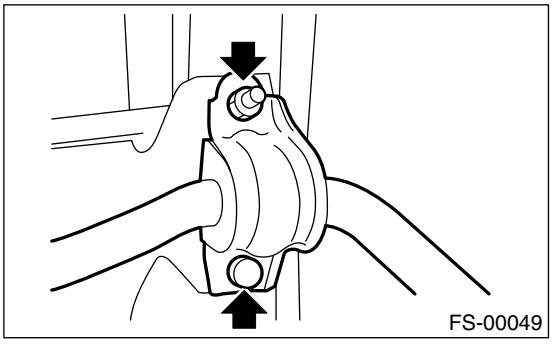
1) Place the gas filled strut (A) on a flat and level surface with piston rod (B) fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make a hole in area shown in the figure.



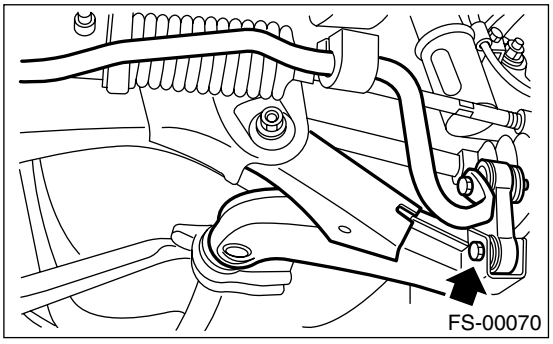
6. Front Stabilizer

A: REMOVAL

1) Jack-up the front part of the vehicle and support it with safety stand (rigid racks).
2) Remove jack-up plate from lower part of crossmember.
3) Remove bolts which secure stabilizer to crossmember.



4) Remove bolts which secure stabilizer link to front transverse link.

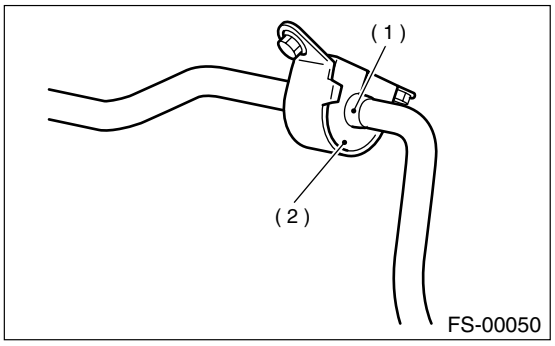


B: INSTALLATION

CAUTION:
When self-locking nut is removed, replace with a new one.

1) Install in the reverse order of removal.

NOTE:
• Install bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight.

Tightening torque:
Jack-up plate to crossmember:
20 N·m (2.0 kgf-m, 14 ft-lb)
Stabilizer link to front transverse link:
30 N·m (3.1 kgf-m, 22 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

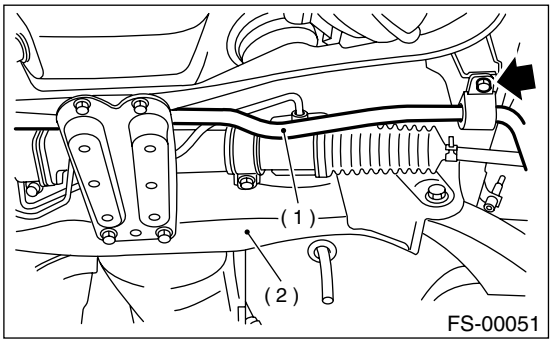
C: INSPECTION

1) Check bushing for cracks, fatigue or damage.
2) Check stabilizer link for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

7. Front Crossmember

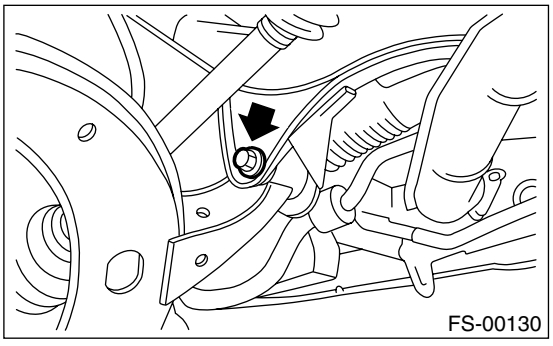
A: REMOVAL

1) Set vehicle on a lift.
2) Disconnect ground cable from battery.
3) Lift-up vehicle and remove front tires and wheels.
4) Remove both stabilizer and jack-up plate.

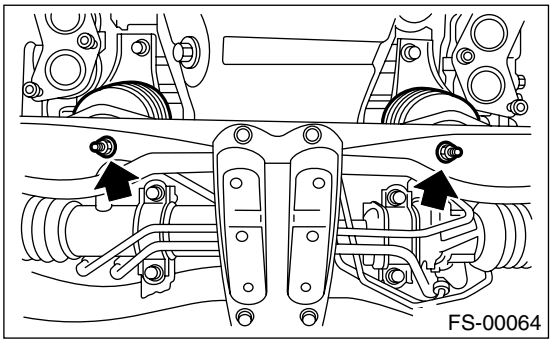


(1) Front stabilizer
(2) Front crossmember

5) Disconnect tie-rod end from housing.
6) Remove front exhaust pipe.
7) Remove front transverse link from front crossmember and body.



8) Remove nuts attaching engine mount cushion rubber to crossmember.



9) Remove steering universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
10) Disconnect power steering hose from steering gear box.
11) Lift engine by approx. 10 mm (0.39 in) by using chain block.
12) Support crossmember with a jack, remove nuts securing crossmember to body and gradually lower crossmember along with steering gearbox.

CAUTION:
When removing crossmember downward, be careful that tie-rod end does not interfere with SFJ boot.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Always tighten rubber bushing when wheels are in full contact with the ground and vehicle is at curb weight.

Tightening torque:
Transverse link bushing to crossmember:
95 N·m (9.7 kgf-m, 71 ft-lb)
Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
75 N·m (7.6 kgf-m, 55 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
95 N·m (9.7 kgf-m, 71 ft-lb)
Gearbox to steering hose:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

2) Purge air from power steering system.

NOTE:
Check wheel alignment and adjust if necessary.

C: INSPECTION

Check crossmember for wear, damage and cracks, and correct or replace if defective.

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

REAR SUSPENSION

RS

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2.	Wheel Alignment	8
3.	Rear Stabilizer	9
4.	Rear Arm	10
5.	Link Upper	14
6.	Rear Shock Absorber	16
7.	Link Front	18
8.	Link Rear	19
9.	Support Sub Frame Front	21
10.	Rear Sub Frame	22
11.	Helper	23
12.	General Diagnostic Table	24

1. General Description

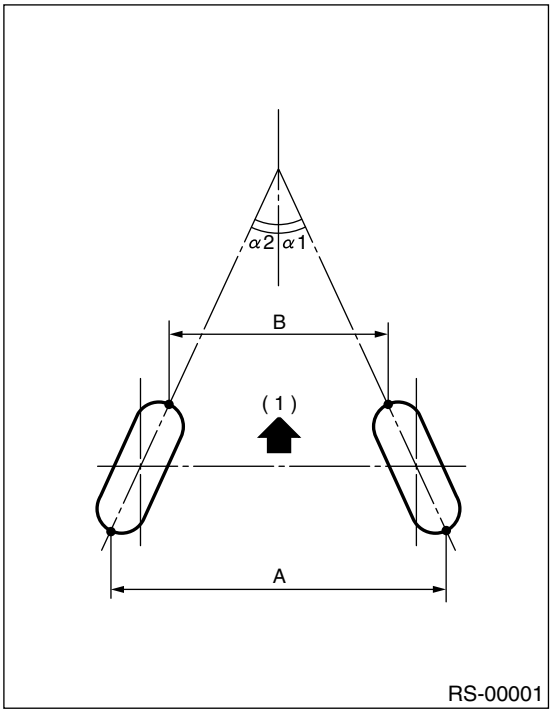
A: SPECIFICATIONS

Refer to “General Description” of FS section about value of wheel alignment. <Ref. to FS-2, General Description.>

NOTE:

• Front and rear toe-in and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the adjustment standard value.

• The other items indicated in the specification table cannot be adjusted. If the other items exceed specifications, check suspension parts and connections for deformities; replace with new ones as required.



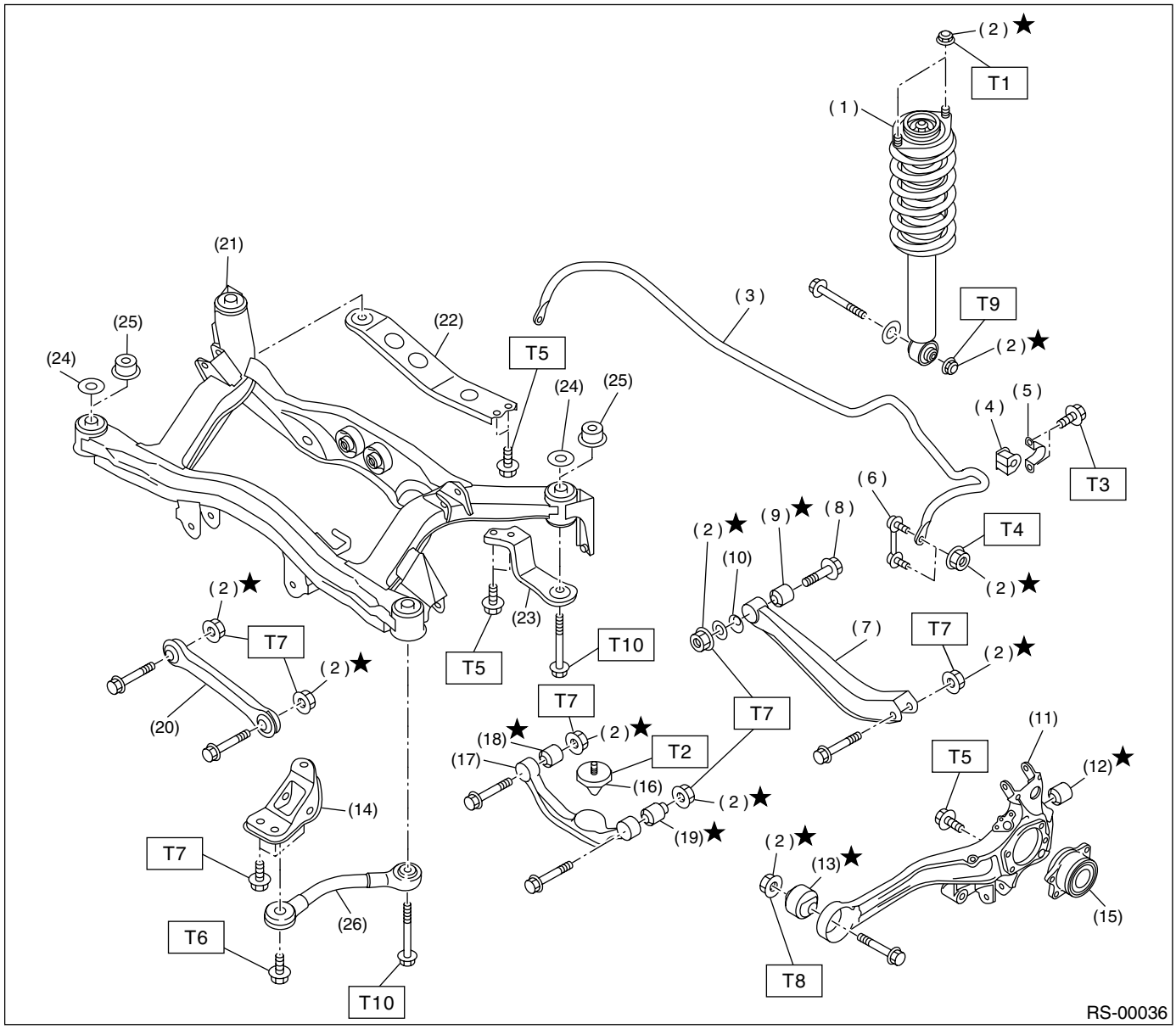
(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α1, α2: Each toe-in angle

B: COMPONENT

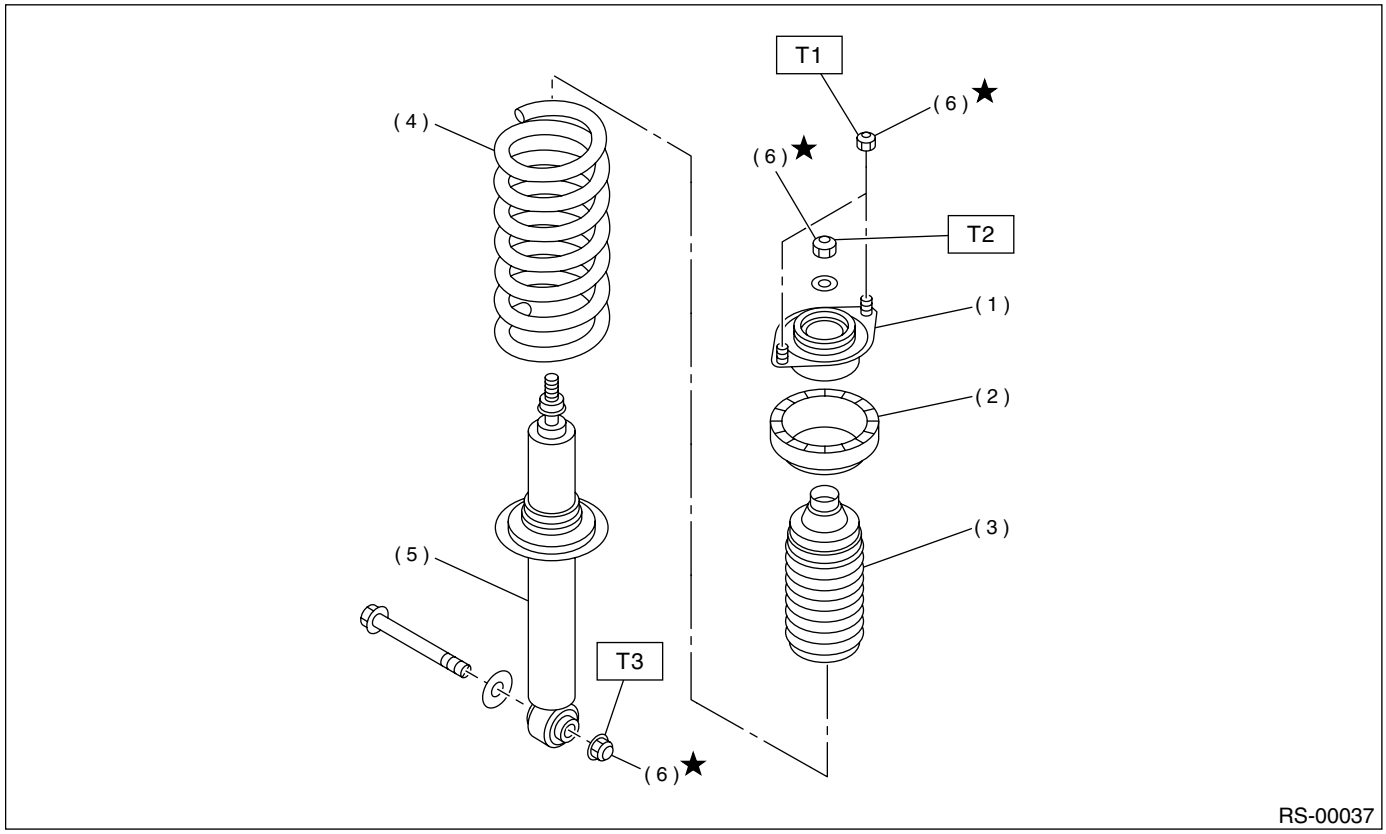
1. REAR SUSPENSION



(1) Shock absorber
(2) Self-locking nut
(3) Stabilizer
(4) Stabilizer bushing
(5) Clamp
(6) Stabilizer link
(7) Link rear
(8) Adjusting bolt
(9) Link rear bushing
(10) Adjusting washer
(11) Rear arm
(12) Rear arm rear bushing
(13) Rear arm front bushing
(14) Rear arm bracket
(15) Hub bearing unit
(16) Helper
(17) Link upper
(18) Link upper bushing (Inside)
(19) Link upper bushing (Outside)
(20) Link front
(21) Rear sub frame
(22) Support sub frame (RH)
(23) Support sub frame (LH)
(24) Stopper upper (Except OUTBACK model)
(25) Stopper upper (OUTBACK MODEL)
(26) Support sub frame front

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.4)
T2: 32 (3.3, 24)
T3: 40 (4.1, 30)
T4: 44 (4.5, 32.5)
T5: 65 (6.6, 48)
T6: 80 (8.2, 59)
T7: 120 (12.2, 88)
T8: 150 (15.3, 111)
T9: 160 (16.3, 118)
T10: 175 (17.8, 129)

2. SHOCK ABSORBER



(1) Mount
(2) Rubber seat upper
(3) Dust cover
(4) Coil spring
(5) Shock absorber
(6) Self-locking nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.4)
T2: 35 (3.6, 26)
T3: 160 (16.3, 118)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.

D: PREPARATION TOOL

1. SPECIAL TOOLS

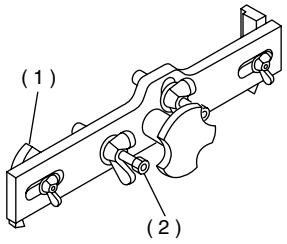
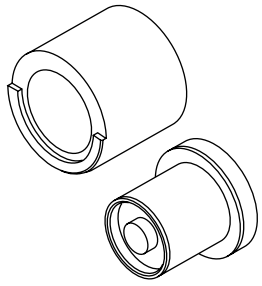
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST20099AE000	20099AE000	INSTALLER & REMOVER	Used for replacing link rear bushing.

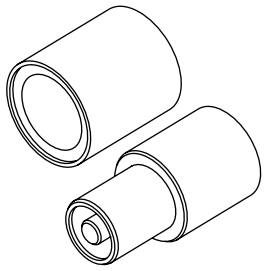
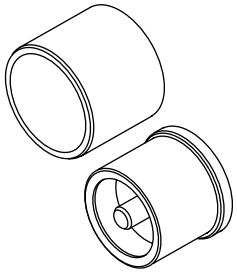
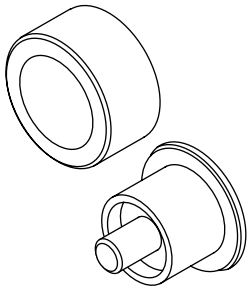
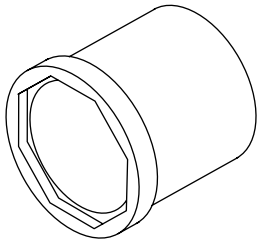
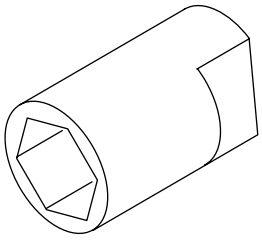
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE010	20099AE010	INSTALLER & REMOVER	Used for replacing link upper bushing.
 ST20099AE020	20099AE020	INSTALLER & REMOVER SET	Used for replacing rear arm front bushing.
 ST20099AE040	20099AE040	INSTALLER & REMOVER SET	Used for replacing rear arm rear bushing.
 ST20099AE030	20099AE030	HELPER SOCKET WRENCH	Used for replacing helper.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for suspension assembly/disassembly.
Bearing puller	Used for removing bushings.

2. Wheel Alignment

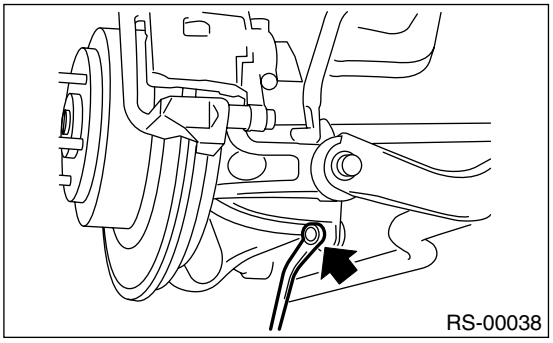
A: INSPECTION

NOTE:
The front and rear wheel alignment must be measured and/or adjusted at once to obtain accuracy.
Measure and/or adjust the rear wheel alignment together with the front.
Follow the procedure in “FS” section “Wheel Alignment” for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, Wheel Alignment.>

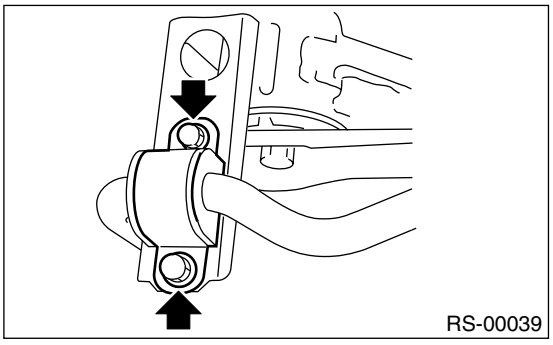
3. Rear Stabilizer

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Remove bolts which secure stabilizer link to rear arm.



3) Remove bolts which secure stabilizer to sub frame.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Ensure that bushing and stabilizer have the same identification colors when installing.

CAUTION:
Use a new self-locking nut.

Tightening torque:
Stabilizer link to rear arm
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Clamp to sub frame
40 N·m (4.1 kgf-m, 30 ft-lb)

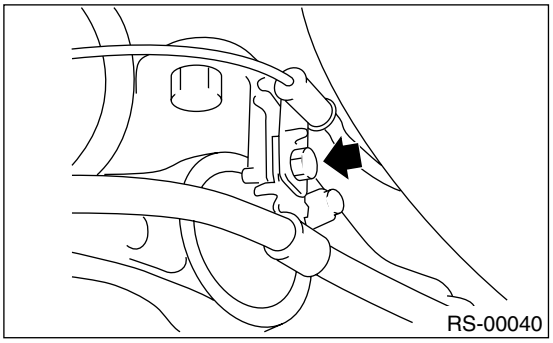
C: INSPECTION

1) Check bushing for cracks, fatigue or damage.
2) Check stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

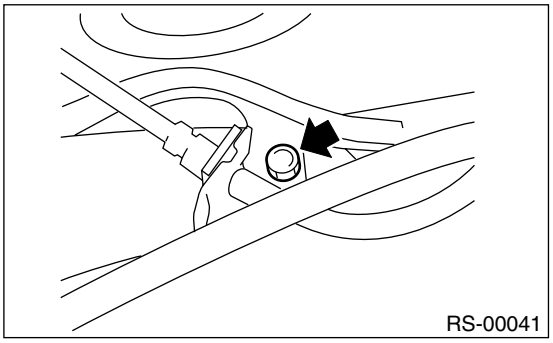
4. Rear Arm

A: REMOVAL

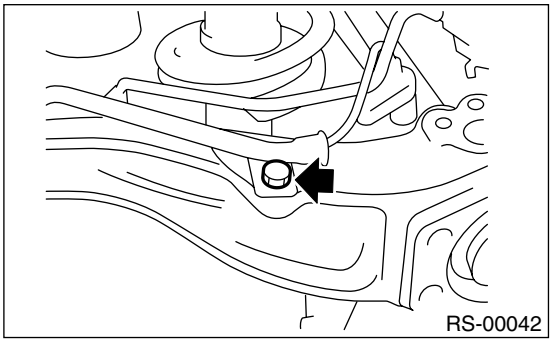
1) Lift-up the vehicle and remove rear wheel.
2) Remove support sub frame front.
<Ref. to RS-21, REMOVAL, Support Sub Frame Front.>
3) Remove bearing unit.
<Ref. to DS-24, REMOVAL, Hub Unit Bearing.>
4) Remove bolt securing parking brake cable clamp to rear arm.



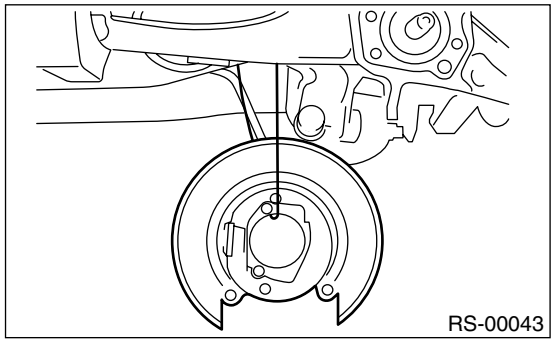
5) Remove bolt securing brake hose to rear arm.



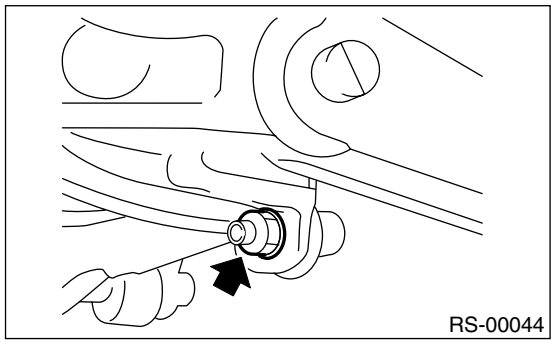
6) Remove bolt securing ABS sensor to rear arm.



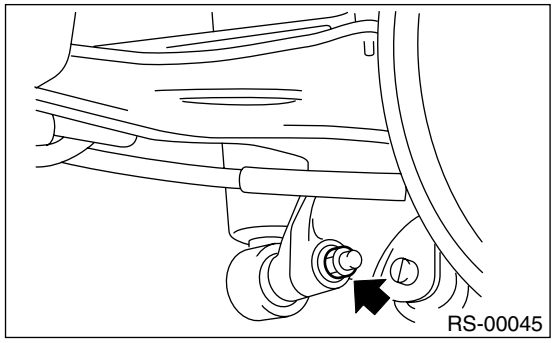
7) Suspend the back plate from sub frame.



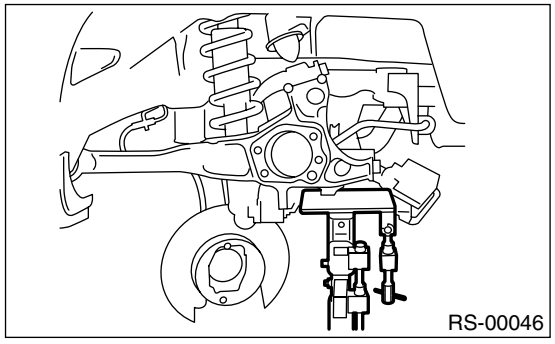
8) Remove nut securing stabilizer link to rear arm.



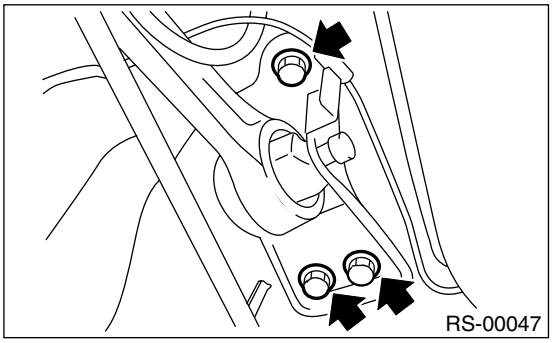
9) Remove bolt securing shock absorber to rear arm.



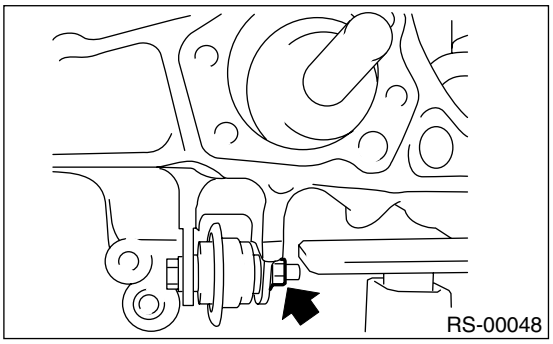
10) Use transmission jack to support rear arm horizontally.



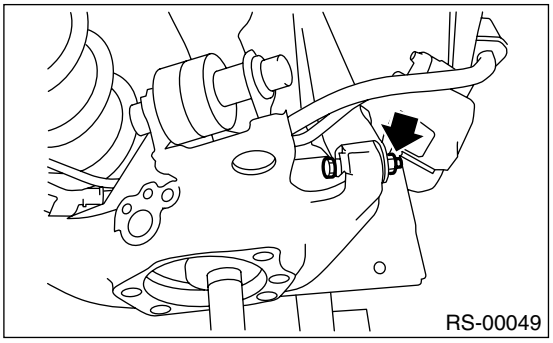
11) Remove bolt securing rear arm to body.


RS-00047

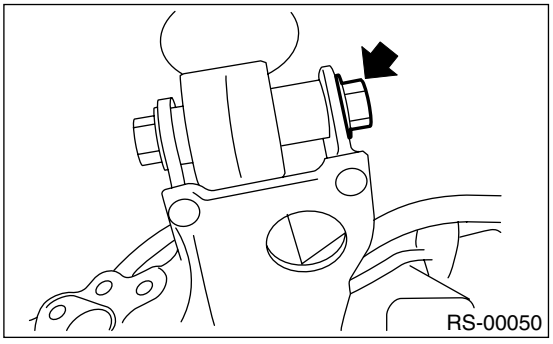
12) Loosen nut securing link front to rear arm.


RS-00048

13) Loosen nut securing link rear to rear arm.


RS-00049

14) Loosen nut securing link upper to rear arm.


RS-00050

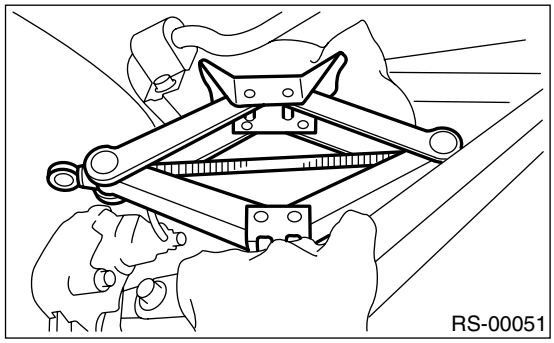
15) Remove bolts securing rear arm to links and remove rear arm.

B: INSTALLATION

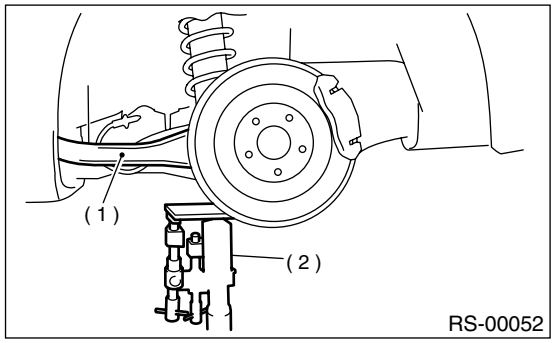
CAUTION:
Use a new self-locking nut.

1) Use a transmission jack to support the rear arm.
2) Install rear arm and temporarily tighten bolts securing rear arm to links.
3) Install bearing unit.
<Ref. to DS-25, INSTALLATION, Hub Unit Bearing.>
4) Install bolt securing ABS sensor to rear arm.
5) Install bolt securing brake hose to rear arm.
6) Install bolt securing parking brake cable clamp to rear arm.
7) Place jack (furnished with vehicle) upside down and position it between link rear and sub frame. Adjust jack position so rear shock absorber is aligned with rear arm at their corresponding holes. Install lower shock absorber bolts.

CAUTION:
Put a cloth between jack and its mating area to protect link rear and sub frame from scratches.


RS-00051

8) Using transmission jack, support rear arm horizontally and tighten nuts and bolts securing rear arm, link front, link rear, link upper and shock absorber.



RS-00052

(1) Rear arm
(2) Transmission jack

9) Install support sub frame front.

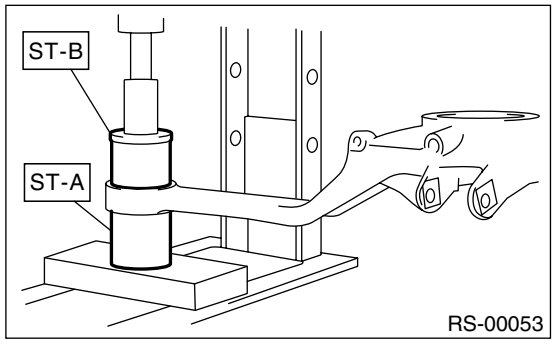
NOTE:
Check wheel alignment and adjust if necessary.

Tightening torque:
Refer to COMPONENT of General Description for tightening torque. <Ref. to RS-3, REAR SUSPENSION, COMPONENT, General Description.>

C: DISASSEMBLY

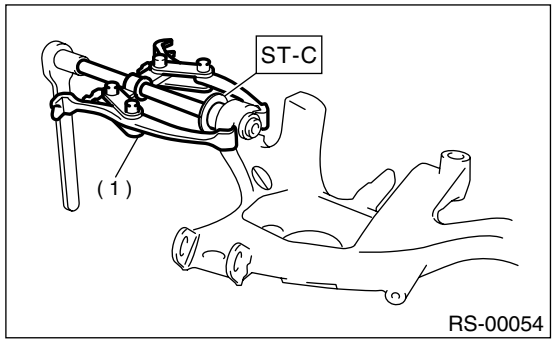
1. FRONT BUSHING

1) Using ST-A, B, press front bushing out of place.
ST-A, B 20099AE020INSTALLER & REMOVER SET
(1) Set ST-A in position with larger inside diameter side facing up.
(2) Set rear arm with protruded bushing side facing down.
(3) Place ST-B on upper side of bushing, then press bushing out of position.



2. REAR BUSHING

Using ST-C and bearing puller, press rear bushing out of place.
ST-C 20099AE040INSTALLER & REMOVER SET



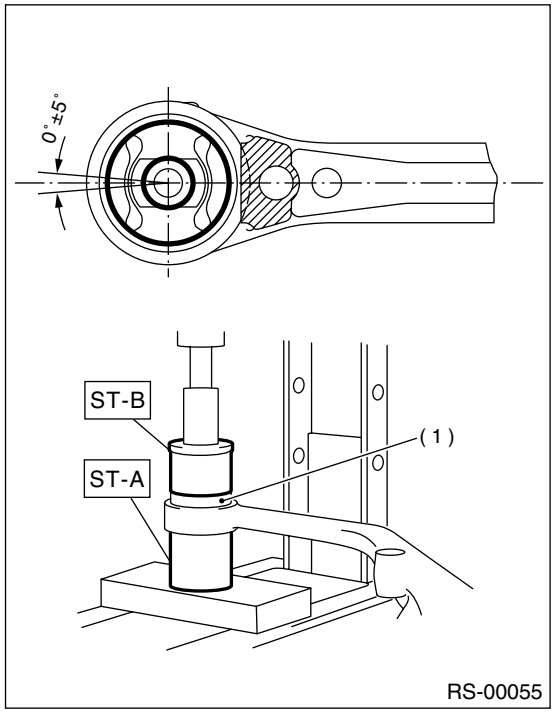
(1) Bearing puller

D: ASSEMBLY

1. FRONT BUSHING

1) Using ST-A, B, press bushing into rear arm.
ST-A, B 20099AE020INSTALLER & REMOVER SET
(1) Set ST-A in position with smaller inside diameter side facing up.
(2) Set rear arm in position with outer side of vehicle body facing down.
(3) Place bushing on upper side of rear arm.
(4) Place ST-B on upper side of bushing, then press bushing into position.

CAUTION:
• Install bushing with painted side facing up.
• Install front bushing in the proper direction, as shown in figure.



(1) Bushing

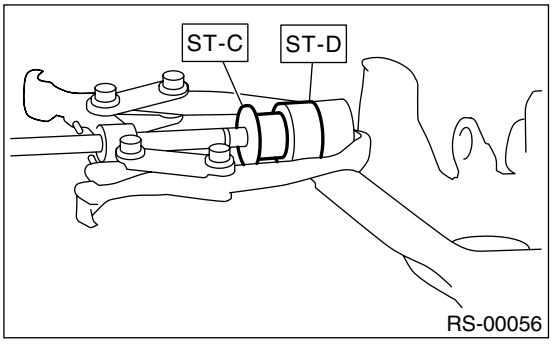
2. REAR BUSHING

1) Using ST-C, D and bearing puller, press bushing into rear arm.

ST-C, D 20099AE040INSTALLER & REMOVER SET

(1) Insert bushing into bore in ST-D.

(2) Set ST-C, ST-D and bearing puller in position, as shown in the figure, and press bushing into position.



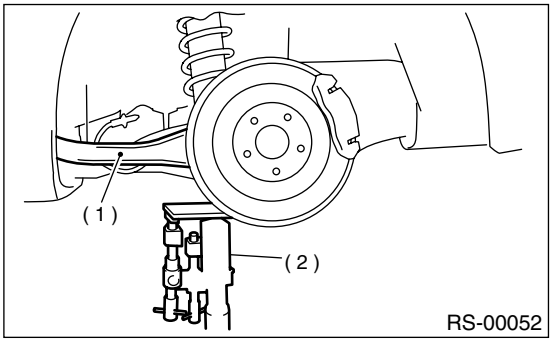
E: INSPECTION

Check rear arm for bends, corrosion or damage.

5. Link Upper

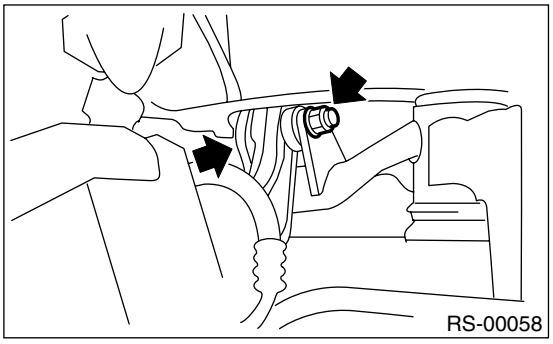
A: REMOVAL

1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
2) Use transmission jack to support rear arm horizontally.

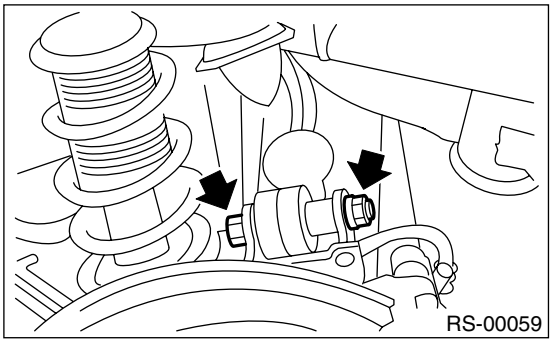


(1) Rear arm
(2) Transmission jack

3) Remove bolt securing link upper to sub frame.



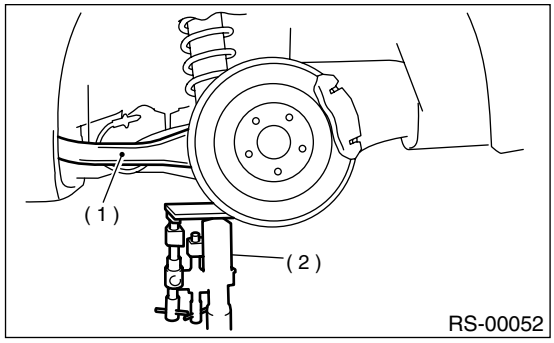
4) Remove bolts which secure link upper to rear arm and detach link upper.



B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:
Using transmission jack, support rear arm horizontally, install link upper and tighten nuts to specified torque.



(1) Rear arm
(2) Transmission jack

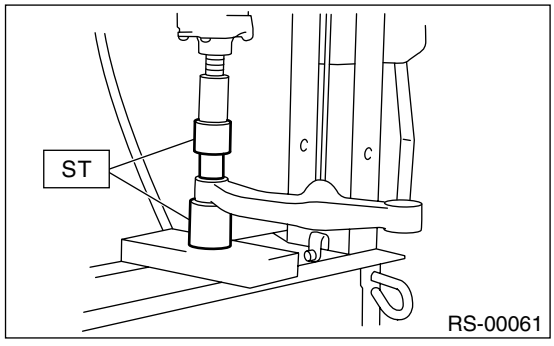
CAUTION:
- **Tighten nut when installing adjusting bolt.**
- **Use a new self-locking nut.**

NOTE:
Check wheel alignment and adjust if necessary.

Tightening torque:
120 N·m (12.2 kgf-m, 88 ft-lb)

C: DISASSEMBLY

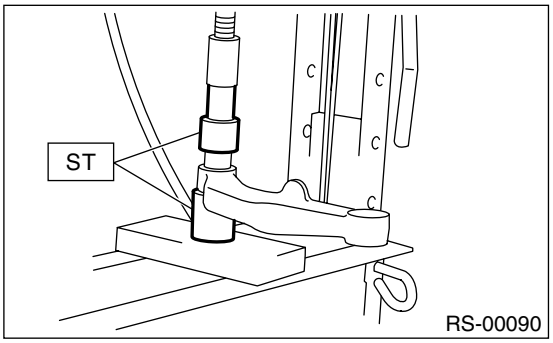
Using ST, press bushing out of place.
ST 20099AE010 INSTALLER & REMOVER



D: ASSEMBLY

1) Using ST, press bushing into place.
ST 20099AE010 INSTALLER & REMOVER

CAUTION:
Outer bushing has a “directional” design. Be sure to install bushing with longer inner housing side facing vehicle rear.



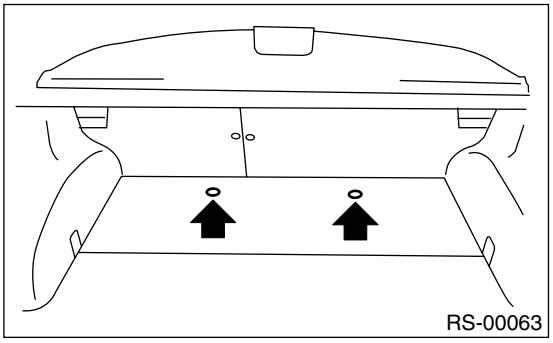
E: INSPECTION

Visually check link upper for damage or bends.

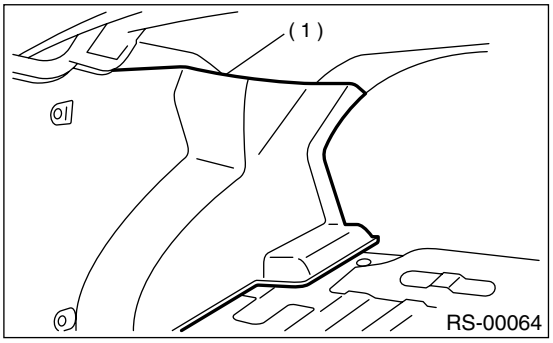
6. Rear Shock Absorber

A: REMOVAL

1) Lift-up vehicle and remove rear wheels.
2) Remove clip and detach floor mat. (Wagon model)

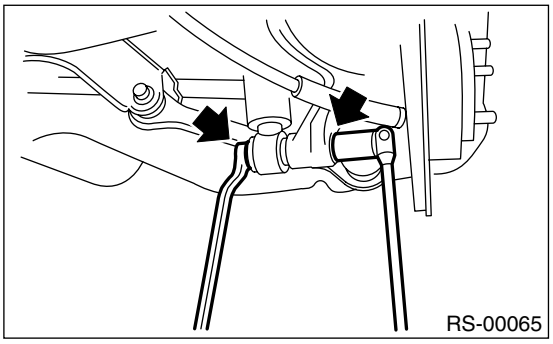


3) Detach trunk mat. (Sedan model)
4) Roll up the trunk side trim. (Sedan model)



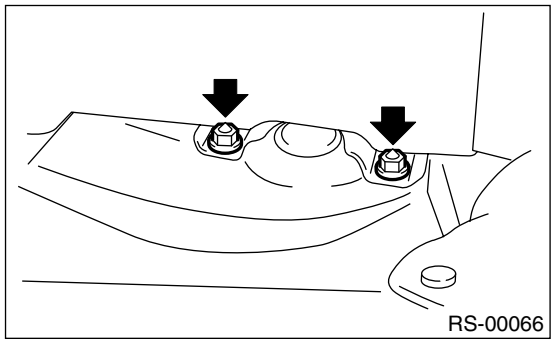
(1) Trunk side trim

5) Remove bolt securing shock absorber to rear arm.

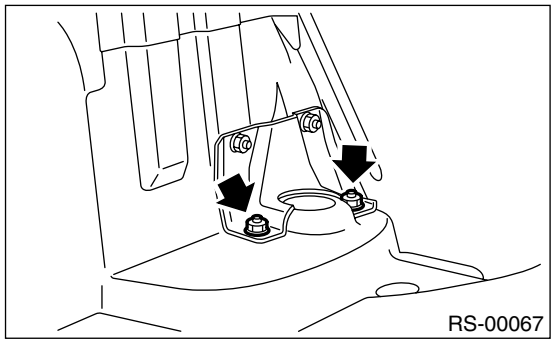


6) Use a jack to support the shock absorber.
7) Remove nuts securing shock absorber mount to body.

• Wagon



• Sedan



8) Remove shock absorber.

B: INSTALLATION

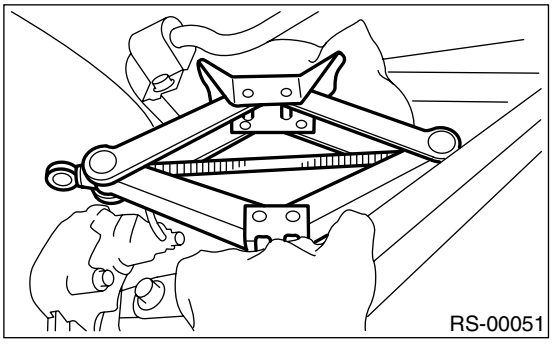
1) Use a jack to support the shock absorber.
2) Tighten self-locking nut used to secure shock absorber to vehicle body.

CAUTION:
Use a new self-locking nut.

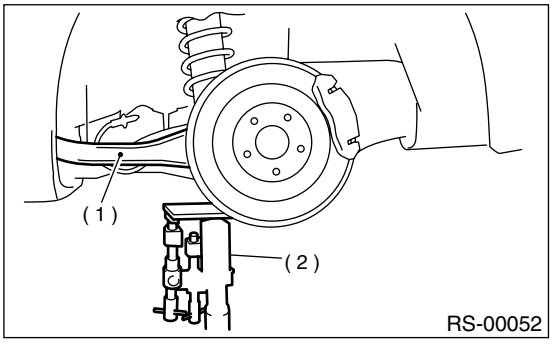
Tightening torque:
30 N·m (3.1 kgf-m, 22 ft-lb)

3) Place jack (furnished with vehicle) upside down and position it between link rear and sub frame. Adjust jack position so rear shock absorber is aligned with rear arm at their corresponding holes. Install lower shock absorber bolts.

CAUTION:
Put a cloth between jack and its mating area to protect link rear and sub frame from scratches.


RS-00051

4) Using transmission jack, support rear arm horizontally and tighten shock absorber nuts and bolts to specified torque.



RS-00052

(1) Rear arm
(2) Transmission jack

Tightening torque:
160 N·m (16.3 kgf-m, 118 ft-lb)

CAUTION:
Use a new self-locking nut.

5) Install floor mat. (Wagon model)
6) Set trunk side trim. (Sedan model)
7) Install trunk mat. (Sedan model)

NOTE:
Check wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of shock absorber, refer to procedures outlined under front strut as a guide.
<Ref. to FS-19, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures.
<Ref. to FS-19, ASSEMBLY, Front Strut.>

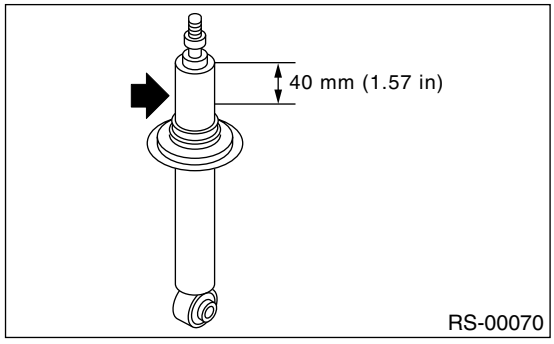
E: INSPECTION

Refer to Front Strut as a guide for inspection procedures.
<Ref. to FS-20, INSPECTION, Front Strut.>

F: DISPOSAL

CAUTION:
• Before handling shock absorber, be sure to wear goggles to protect eyes from gas, oil and/or filings.
• Completely discharge the gas from the shock absorber before disposal. Follow the disposal procedure outlined below.
• Do not disassemble shock absorber or place into a fire.
• Drill holes before disposing of shock absorber.

1) Place shock absorber on a flat and level surface with piston rod fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, drill 30 mm (1.18 in) deep holes in areas shown in the figure.

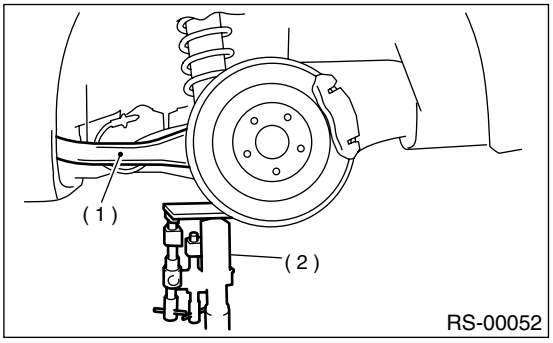


RS-00070

7. Link Front

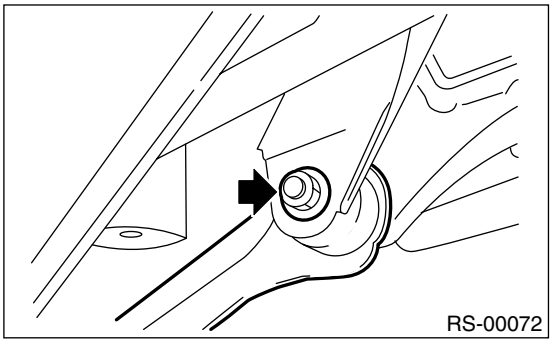
A: REMOVAL

1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
2) Use transmission jack to support rear arm horizontally.

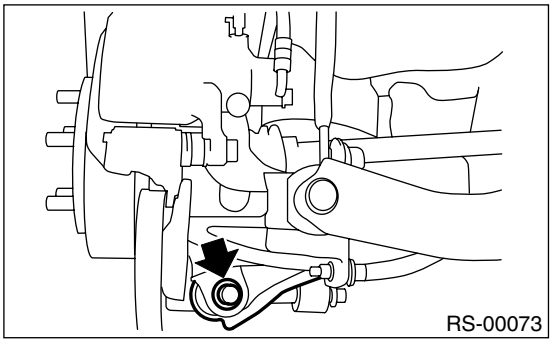


(1) Rear arm
(2) Transmission jack

3) Remove bolt securing link front to sub frame.



4) Remove bolts which secure link front to rear arm and detach link front.

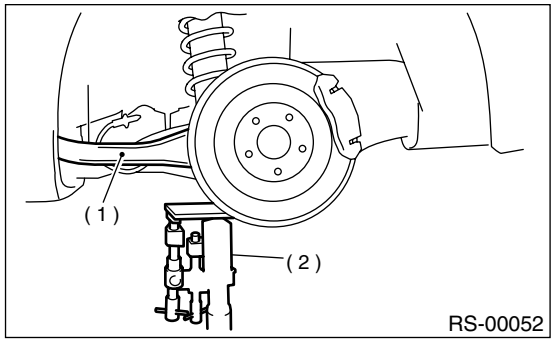


NOTE:
Link front bushing cannot be replaced alone. Always replace link front and bushing as a single unit.

B: INSTALLATION

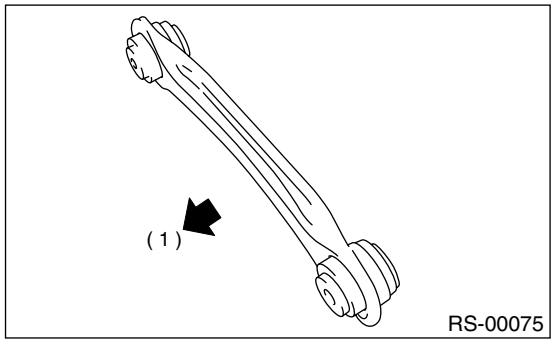
Install in the reverse order of removal, observing the following instructions.

CAUTION:
• Using transmission jack, support rear arm horizontally, install link front and tighten nuts to specified torque.



(1) Rear arm
(2) Transmission jack

• Install link front with protruded side facing front.



(1) Front

CAUTION:
Use a new self-locking nut.

NOTE:
Check wheel alignment and adjust if necessary.

Tightening torque:
120 N·m (12.2 kgf-m, 88 ft-lb)

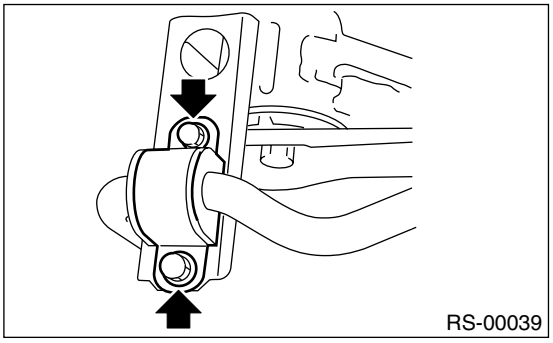
C: INSPECTION

Visually check link front for damage or bends.

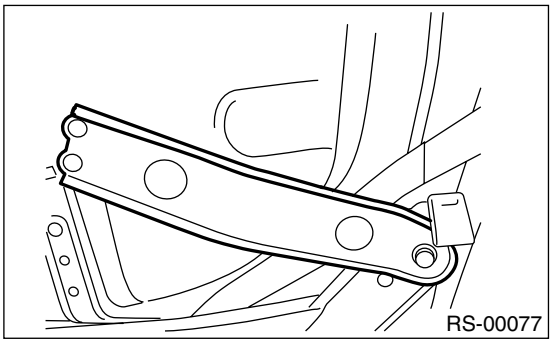
8. Link Rear

A: REMOVAL

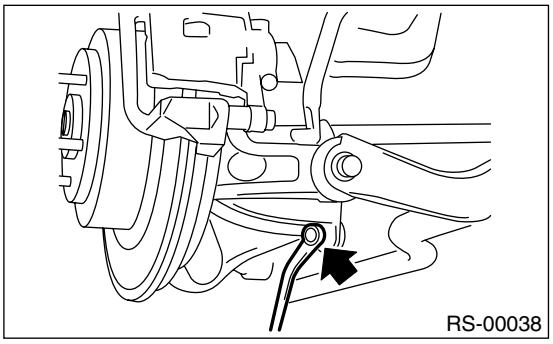
1) Loosen wheel nuts. Lift-up vehicle and remove wheel.
2) Remove bolt securing stabilizer clamps to sub frame.



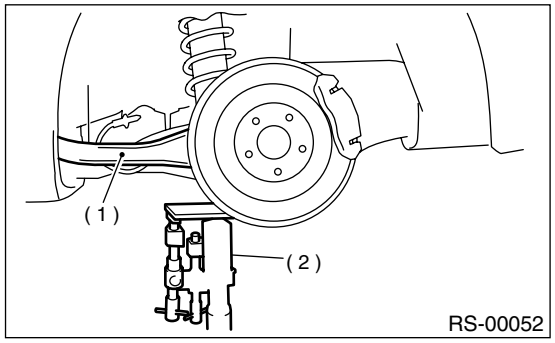
3) Remove support sub frame RH. (When removing RH side link rear.)



4) Remove stabilizer link.

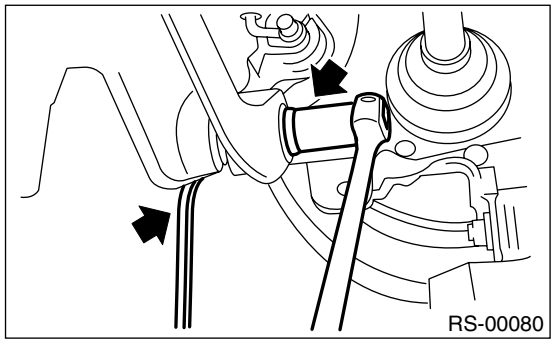


5) Use transmission jack to support rear arm horizontally.



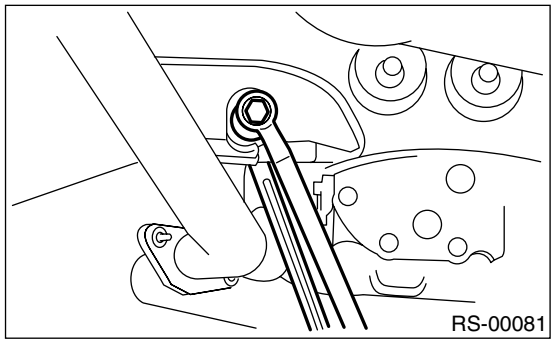
(1) Rear arm
(2) Transmission jack

6) Remove bolt securing link rear to rear arm.



7) Scribe an alignment mark on link rear adjusting bolt and sub frame.
8) Remove bolts securing link rear to sub frame, detach link rear.

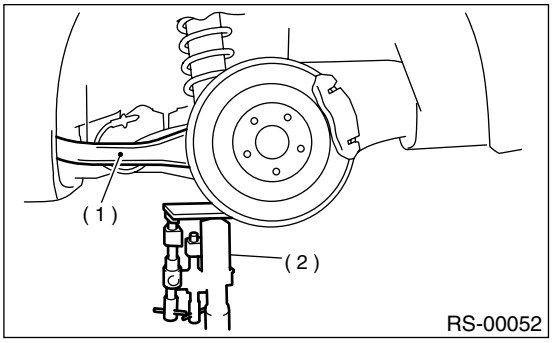
CAUTION:
To loosen adjusting bolt, always loosen nut while holding the head of adjusting bolt.



B: INSTALLATION

Install in the reverse order of removal, observing the following instructions.

CAUTION:
Using transmission jack, support rear arm horizontally, install link rear and tighten nuts to specified torque.



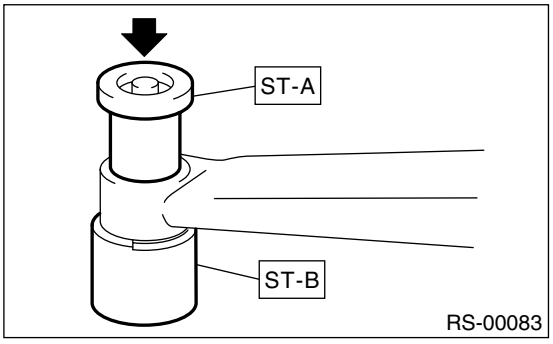
(1) Rear arm
(2) Transmission jack

CAUTION:
- **Tighten nut when installing adjusting bolt.**
- **Use a new self-locking nut.**

NOTE:
Check wheel alignment and adjust if necessary.

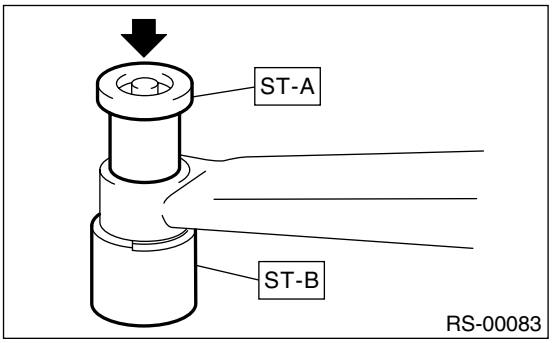
C: DISASSEMBLY

Using ST-A, B, press bushing out of place.
ST-A, B 20099AE000INSTALLER & REMOVER



D: ASSEMBLY

Using ST-A and ST-B, press bushing into place.
ST-A, B 20099AE000INSTALLER & REMOVER



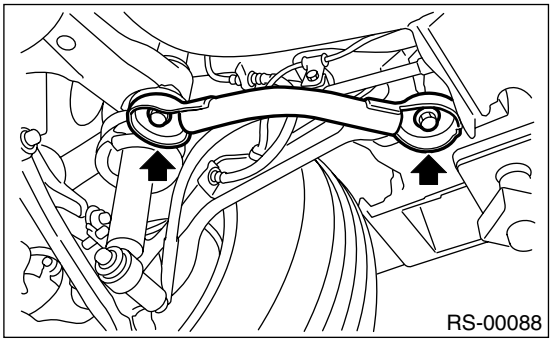
E: INSPECTION

Visually check link rear for damage or bends.

9. Support Sub Frame Front

A: REMOVAL

1) Lift-up the vehicle, using support stand to support rear sub frame.
2) Remove support sub frame front.



B: INSTALLATION

1) Install in reverse order of removal.

Tightening torque:
Support sub frame front to rear arm bracket
80 N·m (8.2 kgf-m, 59 ft-lb)
Support sub frame front to rear sub frame
175 N·m (17.8 kgf-m, 129 ft-lb)

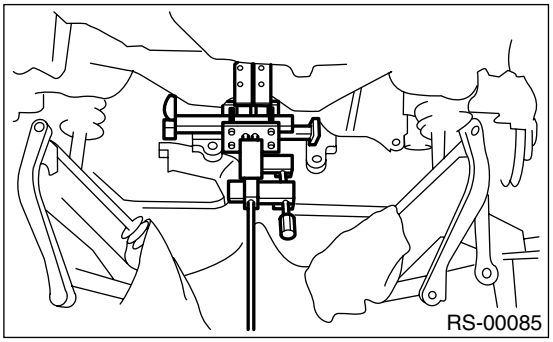
C: INSPECTION

Visually check support sub frame front for damage or bends.

10.Rear Sub Frame

A: REMOVAL

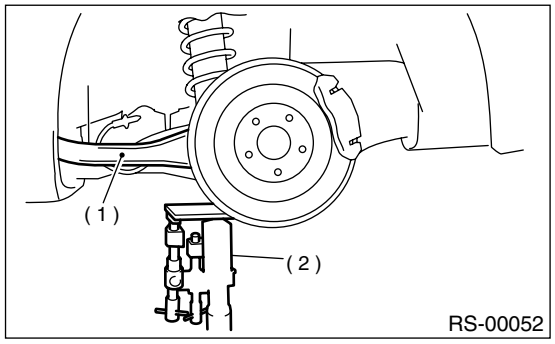
1) Separate front exhaust pipe and rear exhaust pipe.
2) Remove rear exhaust pipe and muffler.
3) Remove rear differential.
With T-type
<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>
With VA-type
<Ref. to DI-42, REMOVAL, Rear Differential for VA-type.>
4) Disconnect link front from sub frame.
<Ref. to RS-18, REMOVAL, Link Front.>
5) Disconnect link rear from sub frame.
<Ref. to RS-19, REMOVAL, Link Rear.>
6) Disconnect link upper from sub frame.
<Ref. to RS-14, REMOVAL, Link Upper.>
7) Place transmission jack under sub frame.



8) Remove support sub frame front.
9) After removing bolts, remove sub frame and support sub frame from vehicle body.

B: INSTALLATION

1) Install in reverse order of removal.
2) For installation and tightening torque of rear differential.
With T-type
<Ref. to DI-26, INSTALLATION, Rear Differential for T-type.>
With VA-type
<Ref. to DI-43, INSTALLATION, Rear Differential for VA-type.>
3) Using transmission jack, support rear arm horizontally and tighten nuts and bolts securing rear arm, link front, link rear, link upper and shock absorber.



(1) Rear arm
(2) Transmission jack

4) Install support sub frame front.

NOTE:
Check wheel alignment and adjust if necessary.

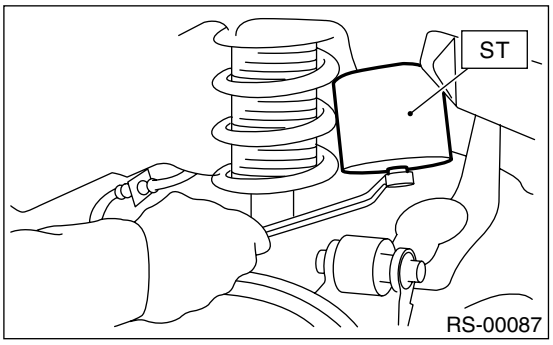
C: INSPECTION

Check removed parts for wear, damage and cracks, and correct or replace if defective.

11.Helper

A: REMOVAL

1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
2) Using ST, remove helper.
ST 20099AE030 HELPER SOCKET WRENCH



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

C: INSPECTION

Check helper for cracks, fatigue or damage.

12.General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

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7.	Full Wheel Cap	12
8.	Spare Tire Hoist	13
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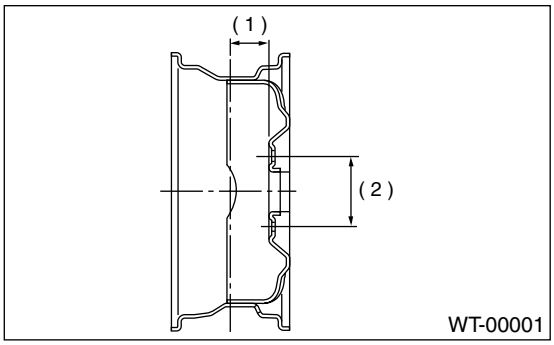
1. General Description

A: SPECIFICATIONS



(1) Offset
(2) P.C.D.

		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Except OUTBACK and PICKUP	Front and Rear	P205/60R15 90H	15 × 6JJ	55 (2.17)	100 (3.94) dia.
		P205/55R16 89H	16 × 6 1/2JJ	55 (2.17)	
	T-type tire	T135/70R16, T145/80R16	16 × 4T	50 (1.97)	
OUTBACK and PICKUP	Front and Rear	P225/60R16 97H	16 × 6 1/2JJ	48 (1.89)	
	T-type tire	T145/80R16	16 × 4T	50 (1.97)	

		Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
			Light load	Trailler towing
Except OUTBACK and PICKUP	Front and Rear	P205/60R15 90H	Ft: 220 (2.2, 32) Rr: 210 (2.1, 30)	—
		P205/55R16 89H	Ft: 210 (2.1, 30) Rr: 200 (2.0, 29)	
	T-type tire	T135/70R16, T145/80R16	420 (4.2, 60)	—
OUTBACK	Front and Rear	P225/60R16 97H	Ft: 210 (2.1, 30) Rr: 200 (2.0, 29)	Ft: 210 (2.1, 30) Rr: 220 (2.2, 32)
	T-type tire	T145/80R16	420 (4.2, 60)	—
PICKUP	Front and Rear	P225/60R16 97H	Ft: 230 (2.3, 33) Rr: 230 (2.3, 33)	Ft: 230 (2.3, 33) Rr: 230 (2.3, 33)
	T-type tire	T145/80R16	420 (4.2, 60)	—

NOTE:
“T-type” tire for temporary use is supplied as a spare tire.

1. SERVICE DATA

Item	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

2. ADJUSTING PARTS

Wheel balancing	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

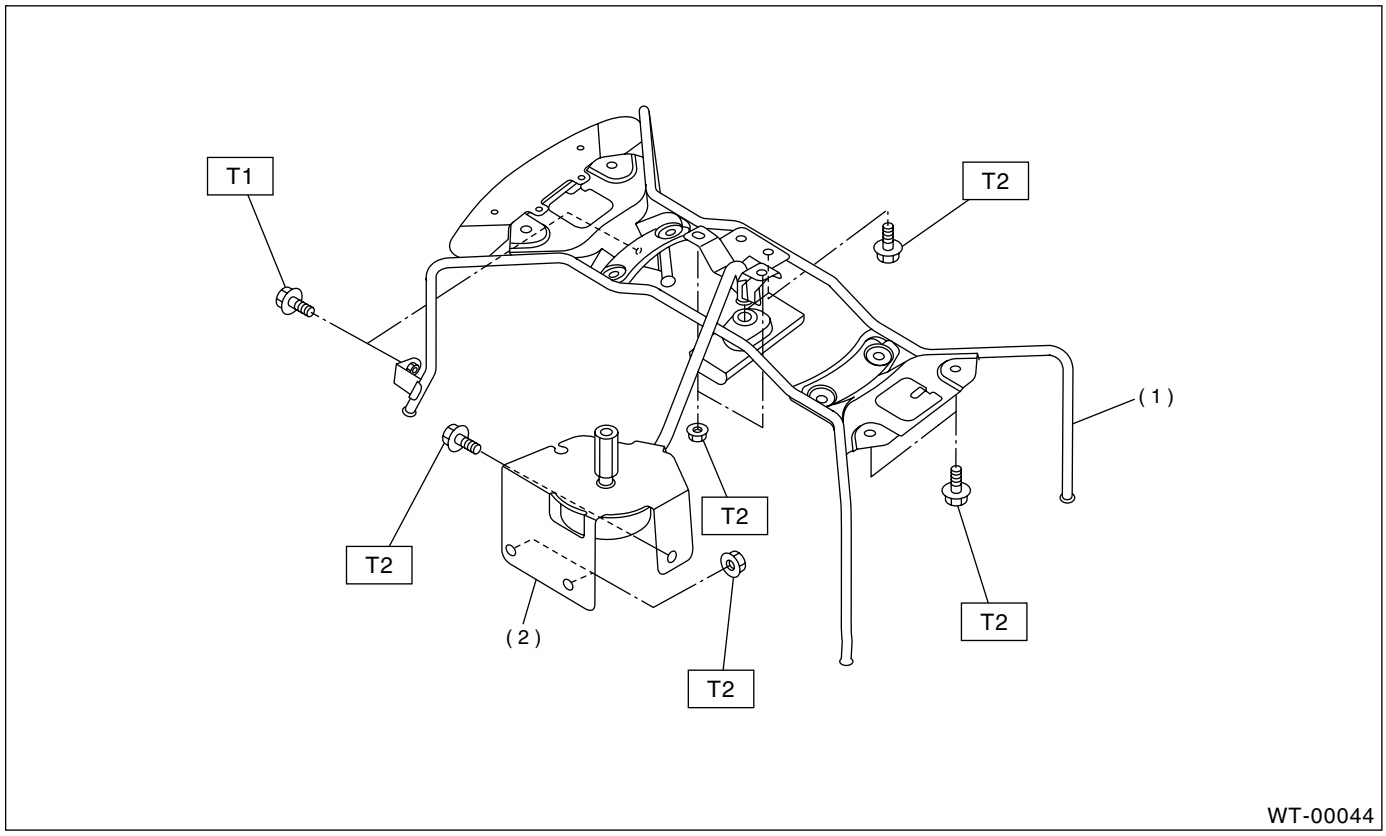
Balance weight part number (For steel wheel)	Weight
28101AA001	5 g (0.18 oz)
28101AA011	10 g (0.35 oz)
28101AA021	15 g (0.53 oz)
28101AA031	20 g (0.71 oz)
28101AA041	25 g (0.88 oz)
28101AA051	30 g (1.06 oz)
28101AA061	35 g (1.23 oz)
28101AA071	40 g (1.41 oz)
28101AA081	45 g (1.59 oz)
28101AA091	50 g (1.76 oz)
—	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (Stick-on type for aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

Balance weight part number (Paste-on type for aluminum wheel)	Weight
28101AE00A	5 g (0.18 oz)
28101AE01A	7.5 g (0.26 oz)
28101AE02A	10 g (0.35 oz)
28101AE03A	12.5 g (0.44 oz)
28101AE04A	15 g (0.53 oz)
28101AE05A	17.5 g (0.62 oz)
28101AE06A	20 g (0.71 oz)
28101AE07A	22.5 g (0.79 oz)
28101AE08A	25 g (0.88 oz)
28101AE09A	27.5 g (0.97 oz)
28101AE10A	30 g (1.06 oz)
28101AE11A	32.5 g (1.15 oz)
28101AE12A	35 g (1.23 oz)
28101AE13A	37.5 g (1.32 oz)
28101AE14A	40 g (1.41 oz)
28101AE15A	42.5 g (1.50 oz)
28101AE16A	45 g (1.59 oz)
28101AE17A	47.5 g (1.68 oz)
28101AE18A	50 g (1.76 oz)
28101AE19A	52.5 g (1.85 oz)
28101AE20A	55 g (1.94 oz)
28101AE21A	57.5 g (2.03 oz)
28101AE22A	60 g (2.12 oz)
28101AE23A	62.5 g (2.20 oz)
28101AE24A	65 g (2.29 oz)
28101AE25A	67.5 g (2.38 oz)
28101AE26A	70 g (2.47 oz)
28101AE27A	72.5 g (2.56 oz)
28101AE28A	75 g (2.65 oz)
28101AE29A	77.5 g (2.73 oz)
28101AE30A	80 g (2.82 oz)
28101AE31A	82.5 g (2.91 oz)
28101AE32A	85 g (3.00 oz)
28101AE33A	87.5 g (3.09 oz)
28101AE34A	90 g (3.17 oz)
28101AE35A	92.5 g (3.26 oz)
28101AE36A	95 g (3.35 oz)
28101AE37A	97.5 g (3.44 oz)
28101AE38A	100 g (3.53 oz)

B: COMPONENT

1. SPARE TIRE HOIST



(1) Spare tire guide
(2) Spare tire hoist

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)

C: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Air Pressure Gauge	Used for measuring tire air pressure.
Dial Gauge	Used for measuring wheel runout.

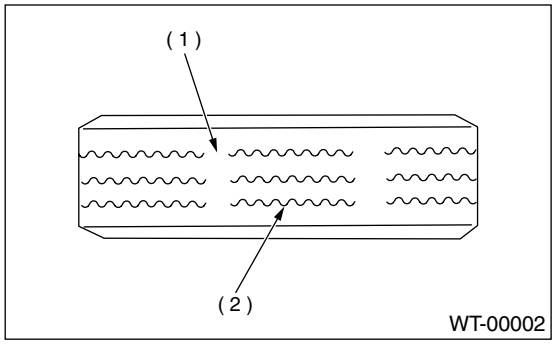
2. Tire

A: INSPECTION

1) Take stone, glass, nail etc. off the tread groove.
2) Replace tire:

CAUTION:
• When replacing a tire, make sure to use only the same size, construction and load range as originally installed.
• Avoid mixing radial, belted bias or bias tires on the vehicle.

(1) When large crack on side wall, damage or crack on tread is found.
(2) When the “tread wear indicator” appears as a solid band across the tread.



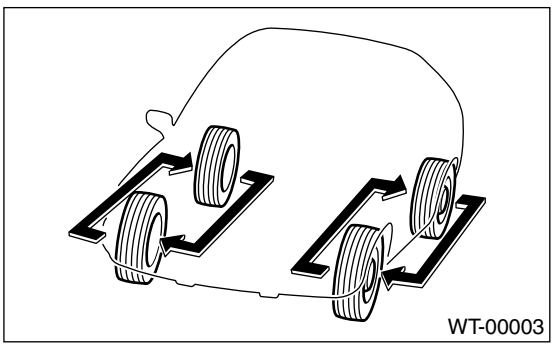
(1) Tread wear indicator
(2) Tire tread

3) When extremely biased wear on tire tread can been seen, after replacing tire, check wheel alignment. <Ref. to FS-6, Wheel Alignment.>

1. TIRE ROTATION

If tires are maintained at the same positions for a long period of time, uneven wear results. Therefore, they should be periodically rotated.
This lengthens service life of tires.

CAUTION:
When rotating tires, replace unevenly worn or damaged tires with new ones.



3. Steel Wheel

A: REMOVAL

1) Apply parking brake, and position select lever to "P" or "LOW".
2) Set shop jacks or a lift to the specified point, and support the vehicle with its wheels slightly contacting the floor.
3) Loosen wheel nuts.
4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
5) Remove wheel nuts and wheels.

NOTE:
• While removing wheels, prevent hub bolts from damage.

NOTE:
• Place wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

1) Attach the wheel to the hub by aligning the wheel bolt hole with the hub bolt.
2) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
3) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to the guide portion of hub.
4) Tighten the wheel nuts in a diagonal selection to the specified torque. Use a wheel nut wrench.

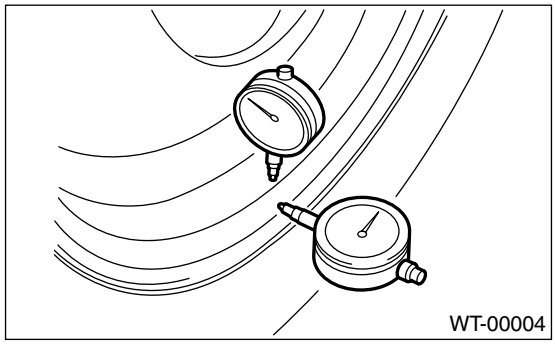
Wheel nut tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to "judder".
• Do not depress the wrench with a foot; Always use both hands when tightening.
• Make sure the bolt, nut and the nut seating surface of the wheel are free from oils.

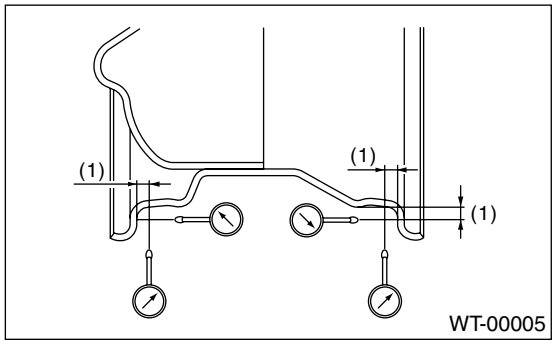
5) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack, or damage, and repair or replace as necessary.
2) Jack-up vehicle until wheels clear the floor.
3) Slowly rotate wheel to check rim "runout" using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	



(1) Approx. 7 mm (0.28 in)

4) If rim runout exceeds the limit, remove tire from rim and check runout while attaching dial gauge to positions shown in figure.
5) If measured runout still exceeds the limit, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to Steel Wheel for removal procedure of aluminum wheels.
<Ref. to WT-7, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to Steel Wheel for installation procedure of aluminum wheels.
<Ref. to WT-7, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to Steel Wheel for inspection procedure of aluminum wheels.
<Ref. to WT-7, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:
1) Do not damage aluminum wheels during removal, disassembly, installation, wheel balancing, etc. After removing aluminum wheels, place them on a rubber mat, etc.
2) While vehicle is being driven, be careful not to ride over sharp obstacles or allow aluminum wheels to contact the shoulder of the road.
3) When installing tire chain, be sure to install it properly not to have a slack; otherwise it may hit wheel while driving.
4) When washing aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

5. Wheel Balancing

A: REPLACEMENT

1. STICK-ON TYPE BALANCE WEIGHT

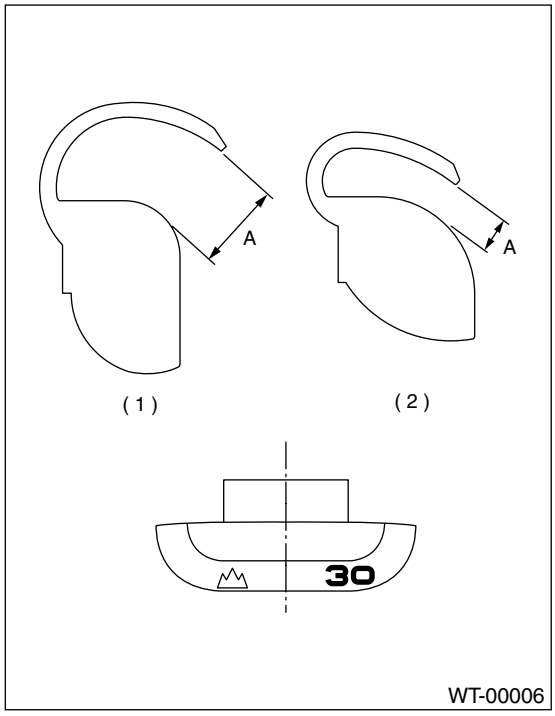
1) Remove balance weights.
2) Using dynamic balancing, measure wheel balance.
3) Select a weight close to the value measured by dynamic balancing.

Balance weight part number (For steel wheel)	Weight
28101AA001	5 g (0.18 oz)
28101AA011	10 g (0.35 oz)
28101AA021	15 g (0.53 oz)
28101AA031	20 g (0.71 oz)
28101AA041	25 g (0.88 oz)
28101AA051	30 g (1.06 oz)
28101AA061	35 g (1.23 oz)
28101AA071	40 g (1.41 oz)
28101AA081	45 g (1.59 oz)
28101AA091	50 g (1.76 oz)
—	55 g (1.94 oz)
28101AA111	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
23141GA462	5 g (0.18 oz)
23141GA472	10 g (0.35 oz)
23141GA482	15 g (0.53 oz)
23141GA492	20 g (0.71 oz)
23141GA502	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

4) Install the selected weight to the point designated by dynamic balancing.
5) Using dynamic balancing, measure wheel balance again. Check that wheel balance is correctly adjusted.

Service limit: A
Balance weight for steel wheel;
2.16 mm (0.085 in)
Balance weight for aluminum wheel;
4.5 mm (0.177 in)



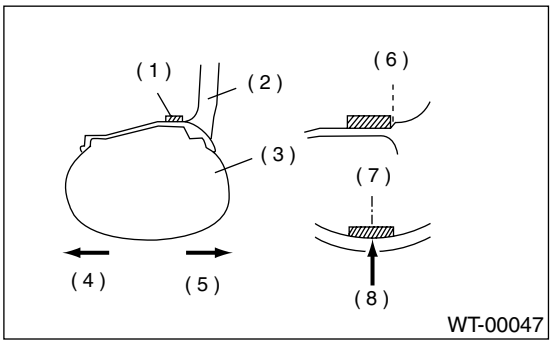
(1) Balance weight for aluminum wheel
(2) Balance weight for steel wheel

CAUTION:
• Use genuine balance weights.
• Balance weights are available for use with any of 14- to 16-inch wheels.

2. PASTE-ON TYPE BALANCE WEIGHT

1) Remove balance weights.
2) Remove traces of two-sided tape on wheel and clean adhesive layer.
3) Set balancing (dynamic balancing for stick-on balance weight is available) and measure wheel balance.
4) Multiply the measured weight by 1.6 to select a weight.
5) Select a weight close to the calculated value, clean the point designated by balancing and paste on the weight there.

Example of selecting balance weight:
Measured wheel balance: 34 g
34 g × 1.6 = 54.4
Weight to be selected: 55g



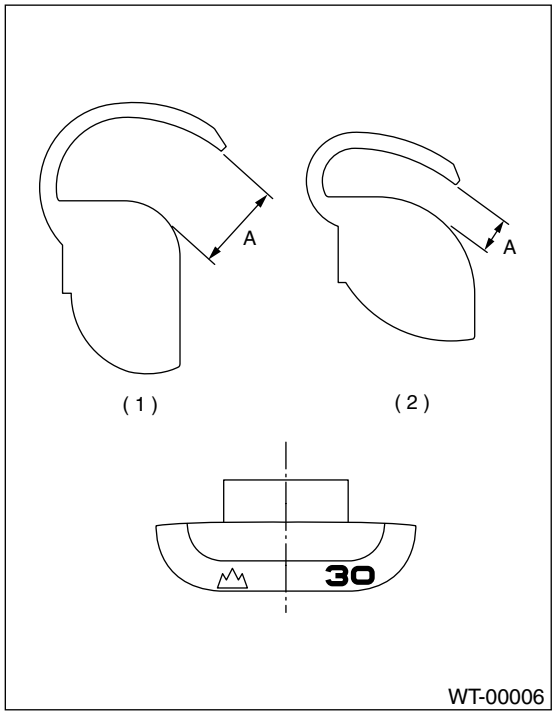
(1) Paste-on type balance weight
(2) Wheel
(3) Tire
(4) Inside
(5) Outside
(6) Clamp the balance on the step
(7) Center of balance weight
(8) Point designated by balancing

CAUTION:
• Press on the weight for more than 2 seconds with a force of 25 N·m (2.6 kgf-m, 18 ft-lb) or more per 5 g to paste on.
• Adjust weight balance from outside first and then inside.
• The weight to be pasted on must be under 100 g.

B: INSPECTION

1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
2) To check for dynamic balance, use a dynamic balancer. Drive in the balance weight on both the top and rear sides of the rim.
3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.

Service limit: A
Balance weight for steel wheel;
2.16 mm (0.085 in)
Balance weight for aluminum wheel;
4.5 mm (0.177 in)



(1) Balance weight for aluminum wheel
(2) Balance weight for steel wheel

CAUTION:
• Use genuine balance weights.
• Balance weights are available for use with any of 14- to 16-inch wheels.

6. "T-type" Tire

A: NOTE

"T-type" tire for temporary use is prepared as a spare tire.

CAUTION:
• Do not use a tire chain with the "T-type" tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
• Do not drive at a speed greater than 80 km/h (50 MPH).
• Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to Removal and Installation of Steel Wheel for removal/installation of "T-type" tires. <Ref. to WT-7, Steel Wheel.>

CAUTION:
Replace with a conventional tire as soon as possible since the "T-type" tire is only for temporary use.

C: INSPECTION

1) Check tire inflation pressure.

Specification:
420 kPa (4.2 kg/cm^2, 60 psi)

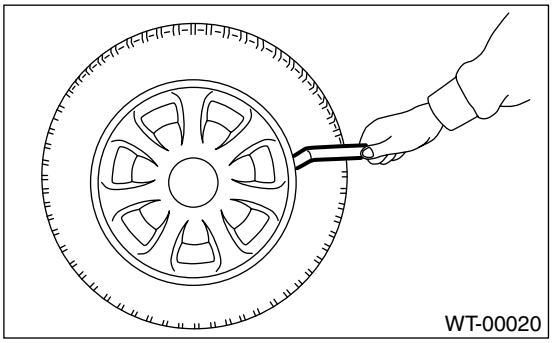
2) Take stones, glass, nails, etc. out of the tread groove.
3) Check tires for deformation, cracks, partial wear, or wear.

CAUTION:
Replace the tire with a new one.

7. Full Wheel Cap

A: REMOVAL

Pry off the full wheel cap with a wheel cap remover inserted between openings in the cap.



B: INSTALLATION

Align the valve hole in the wheel cap with the valve on the wheel and secure the wheel cap by tapping four points by hand.

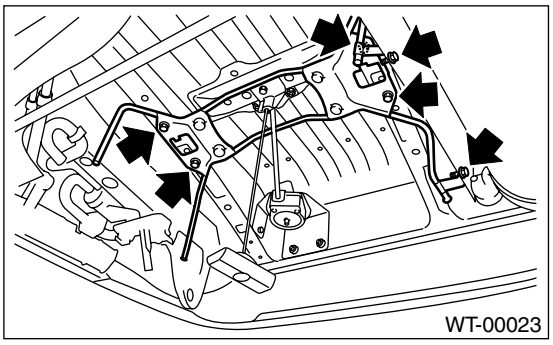
C: INSPECTION

1) Check wheels for missing wheel caps.
2) Check pawls of wheel caps for damage or bend.
3) Check wheel caps for cracks.

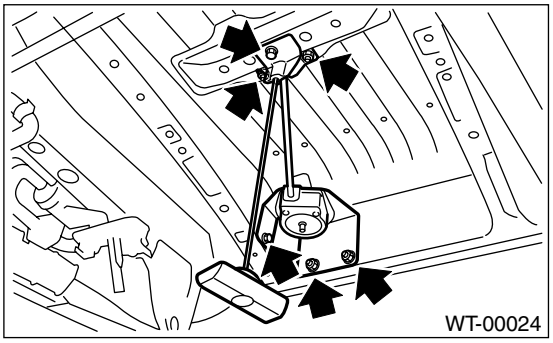
8. Spare Tire Hoist

A: REMOVAL

1) Remove spare tire from the vehicle.
2) Lift up the vehicle.
3) Remove spare tire guide.



4) Remove spare tire hoist.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Spare guide to body;
18 N·m (1.8 kgf-m, 13.0 ft-lb)
Spare guide to heat shield plate;
13 N·m (1.3 kgf-m, 9.4 ft-lb)

9. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Front wheel shimmy	• Worn or improperly inflated of tire.	Replace
	• Wheel is out of balance.	Adjustment
Abnormal tire wear	• Improperly inflated of tire.	Replace
Sways/pitches	• Worn or improperly inflated of tire.	Replace
Wander/pulls	• Worn or improperly inflated of tire.	Replace

DIFFERENTIALS

DI

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1.	General Description	2
2.	Differential Gear Oil	22
3.	Front Differential	24
4.	Rear Differential for T-type	25
5.	Rear Differential for VA-type	42
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8.	General Diagnostic Table	62

1. General Description

A: SPECIFICATIONS

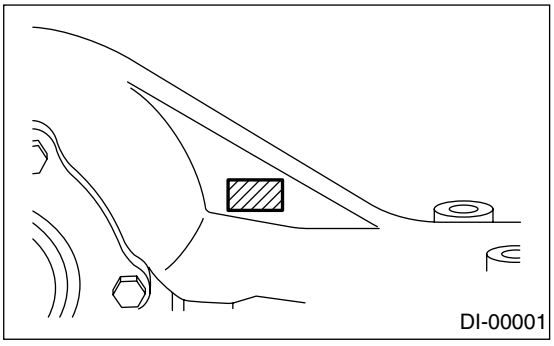
When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:
Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise.

MODEL	2.5 L Non-turbo					
	L-S and L		Except BAJA, L-S and L		BAJA	
	MT	AT	MT	AT	MT	AT
	T-type	VA-type	T-type		T-type	VA-type
Rear differential type	T1	XJ	JE (with LSD)	CD (with LSD)	J (with LSD)	XS (with LSD)
Gear	Hypoid gear					
Gear ratio (Number of gear teeth)	3.900 (39/10)	4.111 (37/9)	4.111 (37/9)	4.444 (40/9)	4.111 (37/9)	4.444 (40/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

MODEL	2.5 L turbo		3.0 L	
	BAJA		OUTBACK SEDAN, OUTBACK	
	MT	AT	With VDC	Without VDC
	T-type		T-type	
Rear differential type	F (with LSD)		T2	JE (with LSD)
Gear	Hypoid gear		Hypoid gear	
Gear ratio (Number of gear teeth)	4.444 (40/9)		4.111 (37/9)	
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)			
Rear differential gear oil	GL-5		GL-5	

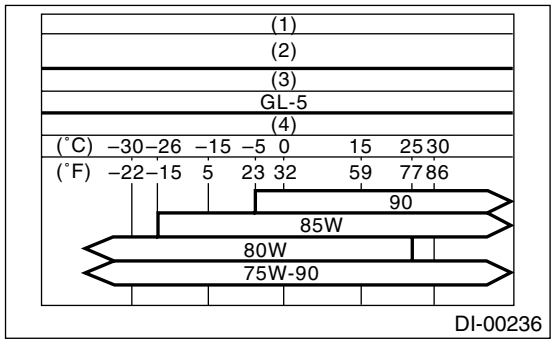
• Identification



• Rear differential gear oil

Recommended oil

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



(1) Item
(2) Rear differential gear oil
(3) API Classification
(4) SAE Viscosity No. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	T-type	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
	VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
Side gear backlash mm (in)	T-type	0.10 — 0.20 (0.0039 — 0.0079)
	VA-type	0.05 — 0.15 (0.0020 — 0.0059)
Side bearing standard width mm (in)		20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)	T-type	0.10 — 0.20 (0.0039 — 0.0079)
	VA-type	0.10 — 0.15 (0.0039 — 0.0059)
Crown gear runout on its back surface mm (in)	T-type only	0.05 (0.0020) or less

2. ADJUSTING PARTS

• VA-type

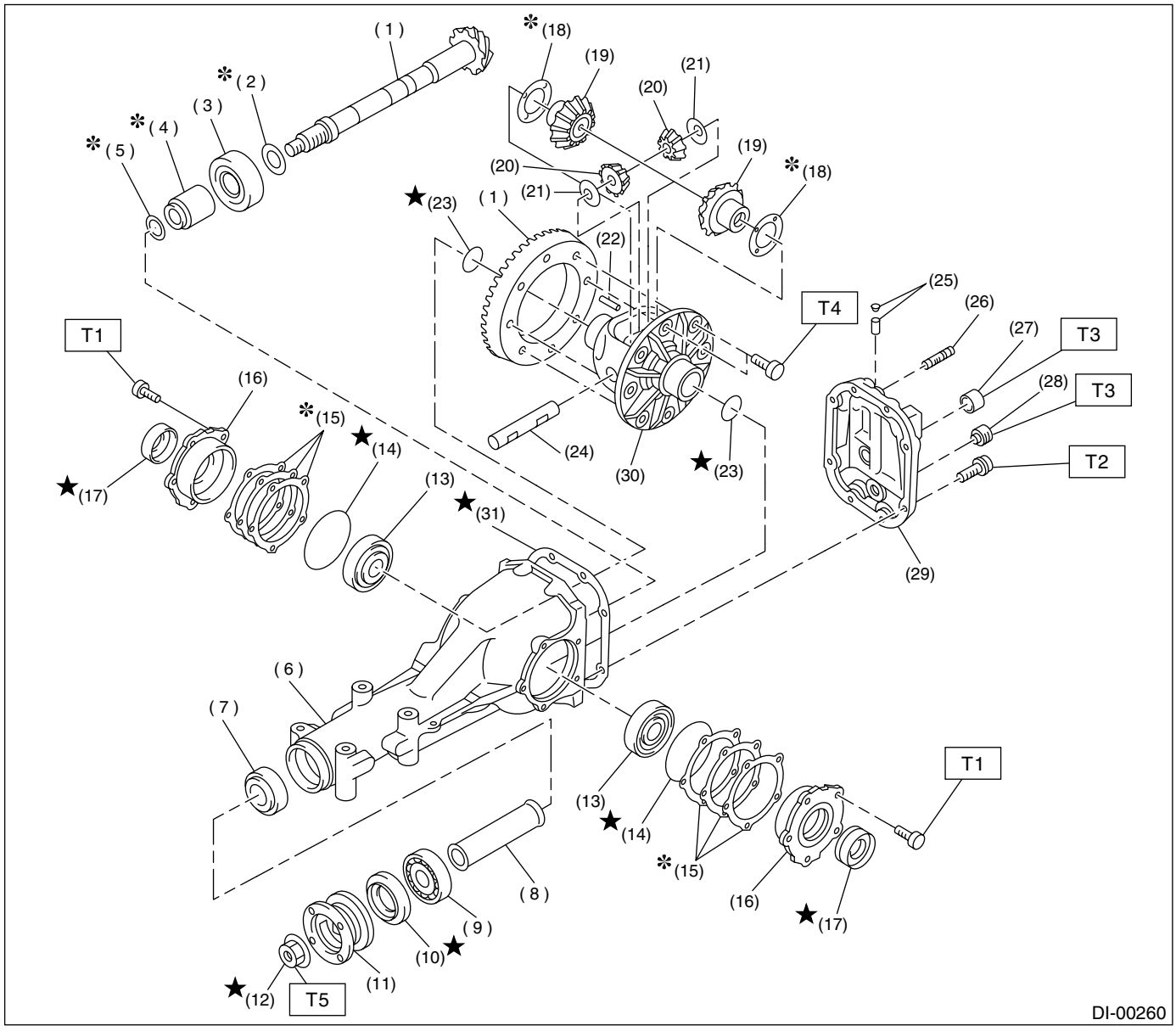
Item	Part No.	Length or thickness
Preload adjusting spacer	32288AA040	52.3 mm (2.059 in)
	32288AA050	52.5 mm (2.067 in)
	31454AA100	52.6 mm (2.071 in)
	32288AA060	52.7 mm (2.075 in)
	31454AA110	52.8 mm (2.079 in)
	32288AA070	52.9 mm (2.083 in)
	31454AA120	53.0 mm (2.087 in)
	32288AA080	53.1 mm (2.091 in)
	32288AA090	53.3 mm (2.098 in)
Preload adjusting washer	38336AA000	1.500 mm (0.0591 in)
	38336AA120	1.513 mm (0.0596 in)
	38336AA010	1.525 mm (0.0600 in)
	38336AA130	1.538 mm (0.0606 in)
	38336AA020	1.550 mm (0.0610 in)
	38336AA140	1.563 mm (0.0615 in)
	38336AA030	1.575 mm (0.0620 in)
	38336AA150	1.588 mm (0.0625 in)
	38336AA040	1.600 mm (0.0630 in)
	38336AA160	1.613 mm (0.0635 in)
	38336AA050	1.625 mm (0.0640 in)
	38336AA170	1.638 mm (0.0645 in)
	38336AA060	1.650 mm (0.0650 in)
	38336AA180	1.663 mm (0.0655 in)
	38336AA070	1.675 mm (0.0659 in)
	38336AA190	1.688 mm (0.0665 in)
	38336AA080	1.700 mm (0.0669 in)
	38336AA200	1.713 mm (0.0674 in)
	38336AA090	1.725 mm (0.0679 in)
	38336AA210	1.738 mm (0.0684 in)
	38336AA100	1.750 mm (0.0689 in)
	38336AA220	1.763 mm (0.0694 in)
	38336AA110	1.775 mm (0.0699 in)
Pinion height adjusting shim	32295AA200	0.150 mm (0.0059 in)
	32295AA210	0.175 mm (0.0069 in)
	32295AA220	0.200 mm (0.0079 in)
	32295AA230	0.225 mm (0.0089 in)
	32295AA240	0.250 mm (0.0098 in)
	32295AA250	0.275 mm (0.0108 in)
Side gear thrust washer (Without LSD)	803135011	0.925 — 0.950 mm (0.0364 — 0.0374 in)
	803135012	0.950 — 0.975 mm (0.0374 — 0.0384 in)
	803135013	0.975 — 1.000 mm (0.0384 — 0.0394 in)
	803135014	1.000 — 1.025 mm (0.0394 — 0.0404 in)
	803135015	1.025 — 1.050 mm (0.0404 — 0.0413 in)

• T-type

Item	Part No.	Length or thickness
Preload adjusting spacer	383695201	56.2 mm (2.213 in)
	383695202	56.4 mm (2.220 in)
	383695203	56.6 mm (2.228 in)
	383695204	56.8 mm (2.236 in)
	383695205	57.0 mm (2.244 in)
	383695206	57.2 mm (2.252 in)
Preload adjusting washer	383705200	2.59 mm (0.1020 in)
	383715200	2.57 mm (0.1012 in)
	383725200	2.55 mm (0.1004 in)
	383735200	2.53 mm (0.0996 in)
	383745200	2.51 mm (0.0988 in)
	383755200	2.49 mm (0.0980 in)
	383765200	2.47 mm (0.0972 in)
	383775200	2.45 mm (0.0965 in)
	383785200	2.43 mm (0.0957 in)
	383795200	2.41 mm (0.0949 in)
	383805200	2.39 mm (0.0941 in)
	383815200	2.37 mm (0.0933 in)
	383825200	2.35 mm (0.0925 in)
	383835200	2.33 mm (0.0917 in)
	383845200	2.31 mm (0.0909 in)
Pinion height adjusting shim	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	3.33 mm (0.1311 in)
	383585200	3.36 mm (0.1323 in)
	383595200	3.39 mm (0.1335 in)
	383605200	3.42 mm (0.1346 in)
	383615200	3.45 mm (0.1358 in)
	383625200	3.48 mm (0.1370 in)
	383635200	3.51 mm (0.1382 in)
	383645200	3.54 mm (0.1394 in)
	383655200	3.57 mm (0.1406 in)
	383665200	3.60 mm (0.1417 in)
	383675200	3.63 mm (0.1429 in)
	383685200	3.66 mm (0.1441 in)
Side gear thrust washer (Without LSD)	383445201	0.75 — 0.80 mm (0.0295 — 0.0315 in)
	383445202	0.80 — 0.85 mm (0.0315 — 0.0335 in)
	383445203	0.85 — 0.90 mm (0.0335 — 0.0354 in)
Side bearing retainer shim	383475201	0.20 mm (0.0079 in)
	383475202	0.25 mm (0.0098 in)
	383475203	0.30 mm (0.0118 in)
	383475204	0.40 mm (0.0157 in)
	383475205	0.50 mm (0.0197 in)

B: COMPONENT

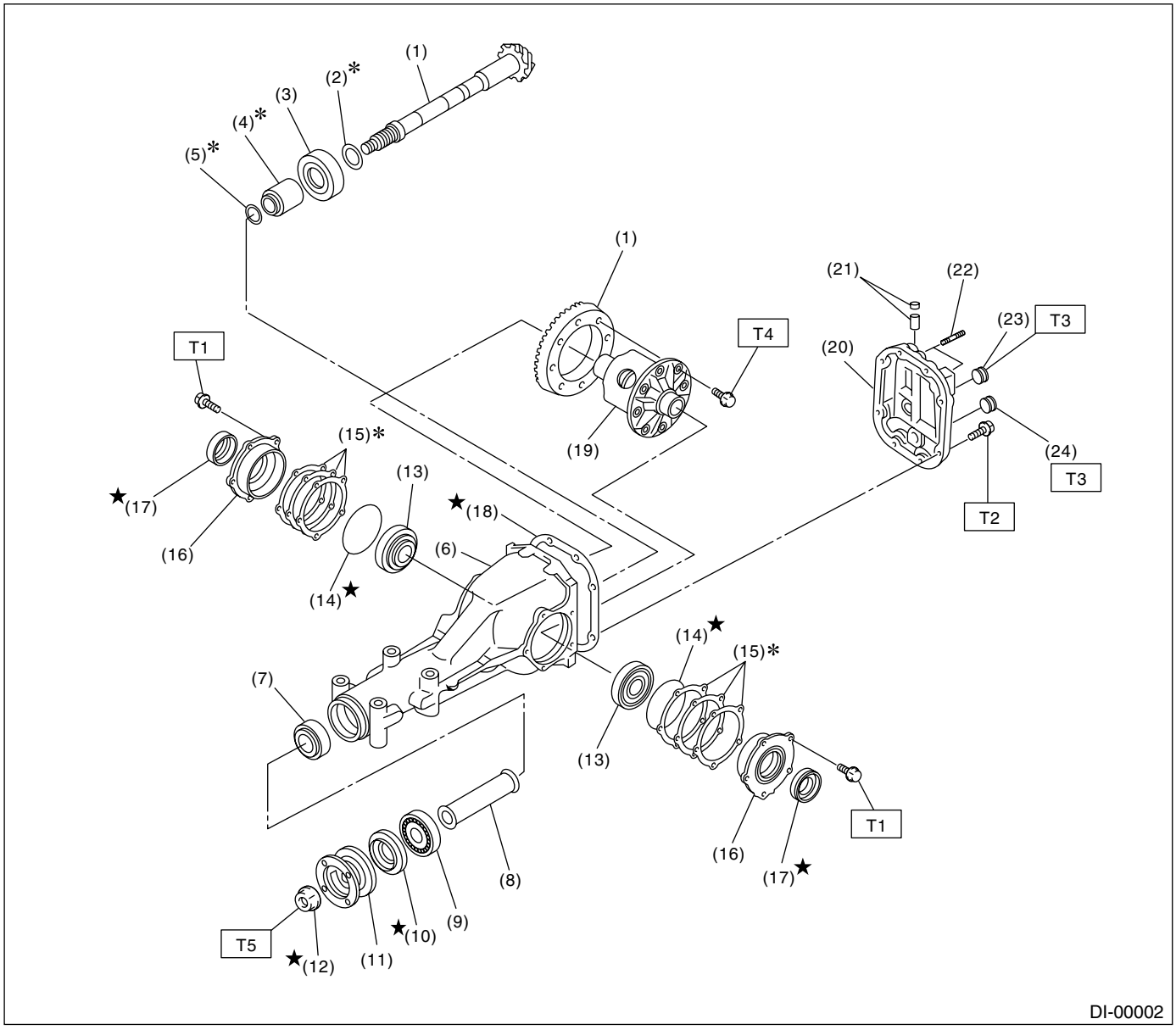
1. REAR DIFFERENTIAL FOR T-TYPE WITHOUT LSD



(1) Pinion crown gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion mate gear washer
(22) Pinion shaft lock pin
(23) Circlip
(24) Pinion mate shaft
(25) Air breather cap
(26) Stud bolt
(27) Oil filler plug
(28) Oil drain plug
(29) Rear cover
(30) Differential case
(31) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.3 (1.05, 7.6)
T2: 29 (3.00, 21.7)
T3: 49.0 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

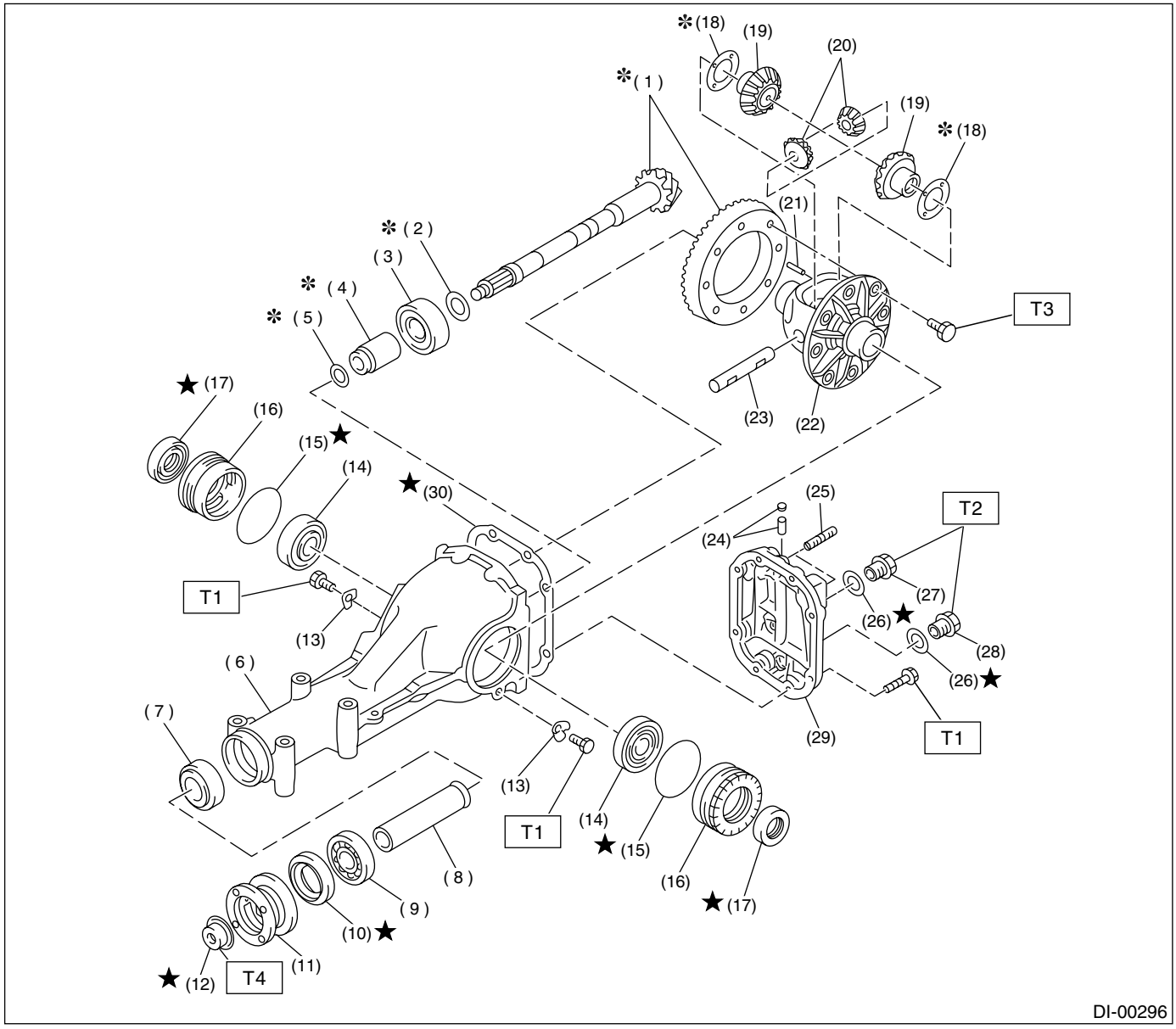
2. REAR DIFFERENTIAL FOR T-TYPE WITH LSD



(1) Pinion crown gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case ASSY
(20) Rear cover
(21) Air breather cap
(22) Stud bolt
(23) Oil filler plug
(24) Oil drain plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.3 (1.05, 7.6)
T2: 29.0 (3.00, 21.7)
T3: 49.0 (5.00, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

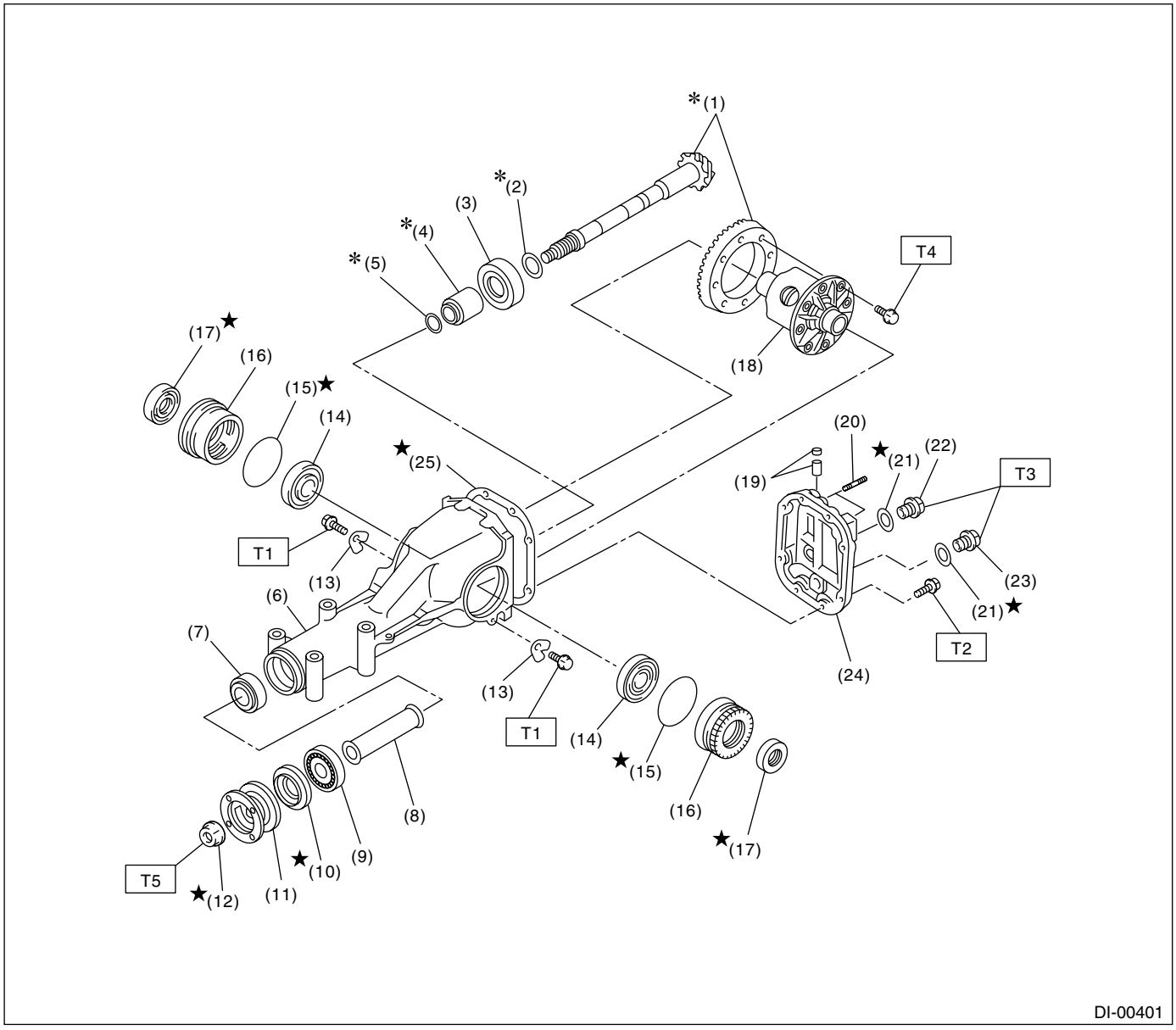
3. REAR DIFFERENTIAL FOR VA-TYPE WITHOUT LSD



(1) Pinion crown gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Lock plate
(14) Side bearing
(15) O-ring
(16) Axle shaft holder
(17) Side oil seal
(18) Side gear thrust washer
(19) Side gear
(20) Pinion mate gear
(21) Pinion shaft lock pin
(22) Differential case
(23) Pinion mate shaft
(24) Air breather cap
(25) Stud bolt
(26) Gasket
(27) Oil filler plug
(28) Oil drain plug
(29) Rear cover
(30) Gasket

Tightening torque: N·m ***(kgf-m, ft-lb)***
T1: 25 (2.5, 18.1)
T2: 34 (3.5, 25.3)
T3: 62 (6.3, 45.6)
T4: 191 (19.5, 141)

4. REAR DIFFERENTIAL FOR VA-TYPE WITH LSD

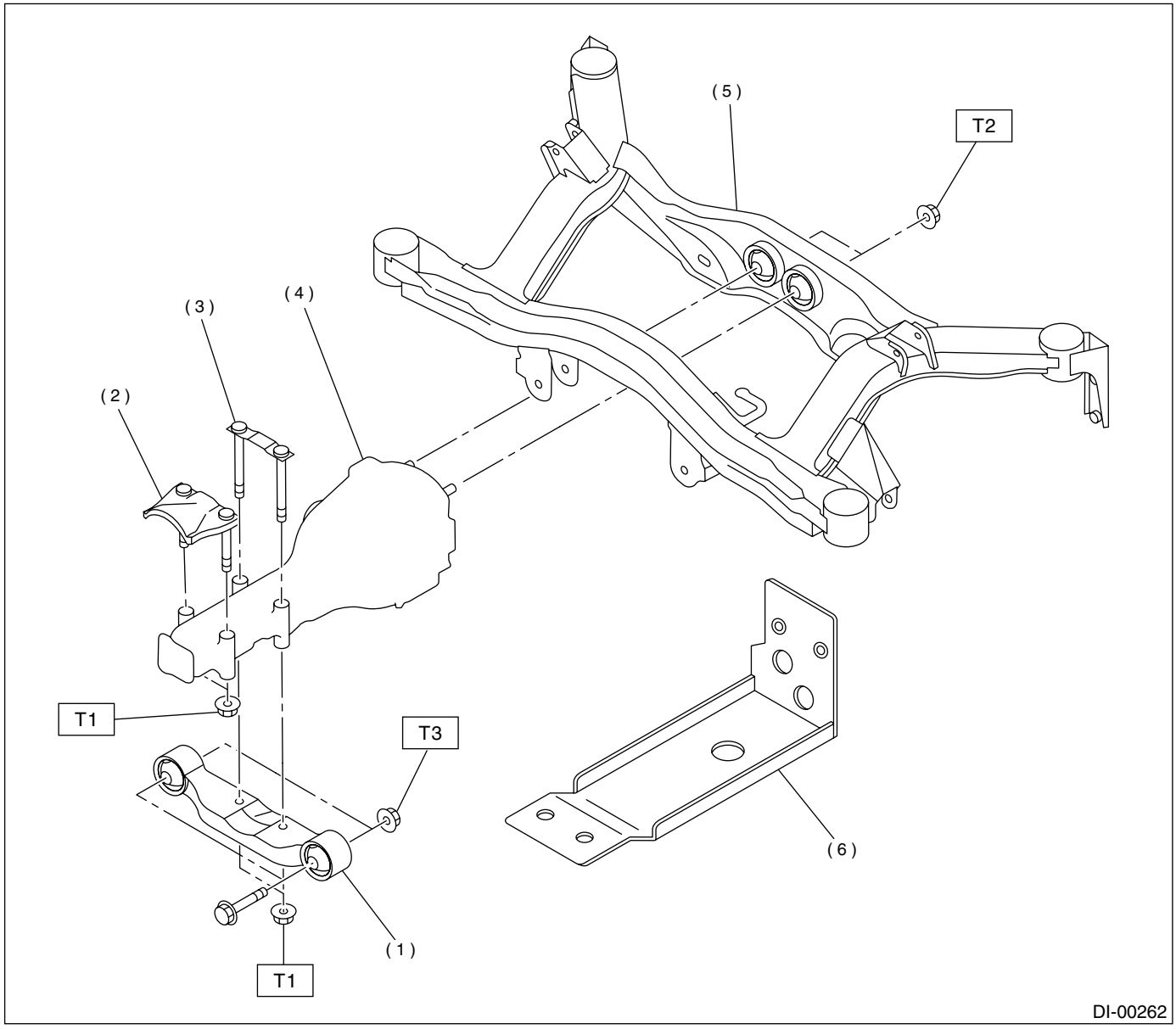


DI-00401

(1)	Pinion crown gear and drive pinion set	(11)	Companion flange	(22)	Oil filler plug
(2)	Pinion height adjusting shim	(12)	Self-locking nut	(23)	Oil drain plug
(3)	Rear bearing	(13)	Lock plate	(24)	Rear cover
(4)	Bearing preload adjusting spacer	(14)	Side bearing	(25)	Gasket
(5)	Bearing preload adjusting washer	(15)	O-ring		
(6)	Differential carrier	(16)	Axle shaft holder		
(7)	Front bearing	(17)	Side oil seal		
(8)	Collar	(18)	Differential case ASSY		
(9)	Pilot bearing	(19)	Air breather cap		
(10)	Front oil seal	(20)	Stud bolt		
		(21)	Gasket		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 25 (2.5, 18.1)
T3: 34 (3.5, 25.3)
T4: 62 (6.3, 45.6)
T5: 191 (19.5, 141)

5. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Rear differential front member
(2) Protector
(3) Rear differential member plate
(4) Rear differential ASSY
(5) Sub frame
(6) Rear differential protector (if equipped)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 65 (6.6, 48)
T2: 70 (7.1, 51)
T3: 110 (11.2, 81)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating face of the case.

D: PREPARATION TOOL

1. SPECIAL TOOLS

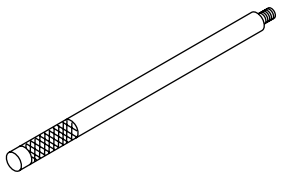
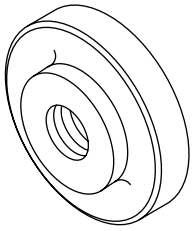
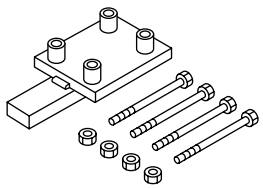
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (front).
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.

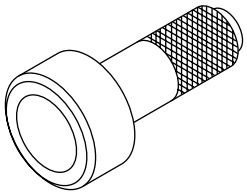
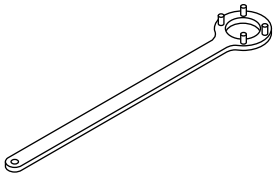
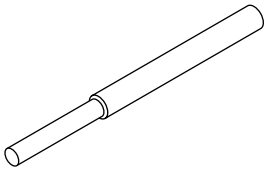
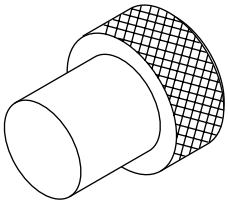
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447120	498447120	INSTALLER	Used for installing front oil seal.
 ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-lock nut.
 ST-398467700	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.

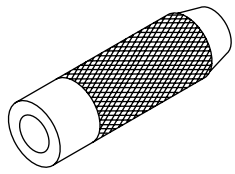
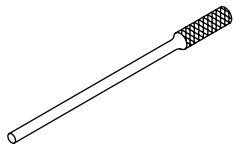
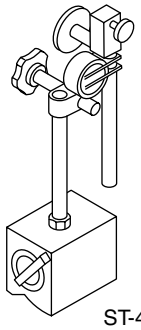
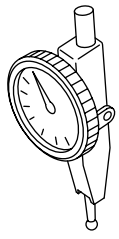
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).

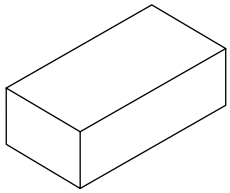
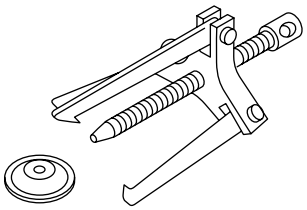
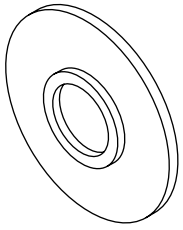
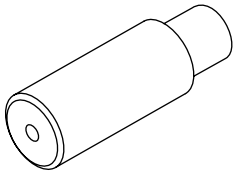
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.
 ST-399703600	399703600	PULLER ASSY	Use for removing companion flange.
 ST-398177700	398177700	INSTALLER	• Used for installing rear bearing cone. • For T-type.
 ST-398457700	398457700	ATTACHMENT	• Used for removing side bearing retainer. • For T-type.

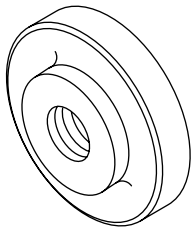
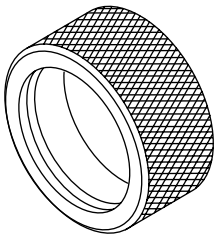
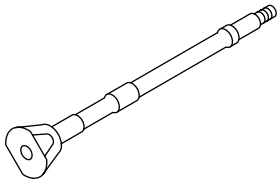
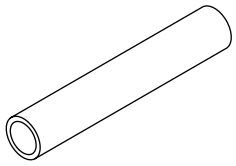
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477703	398477703	DRIFT 2	• Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.
 ST-398437700	398437700	DRIFT	• Used for installing side oil seal. • For T-type.
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For T-type.
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For T-type.

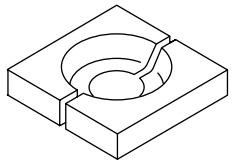
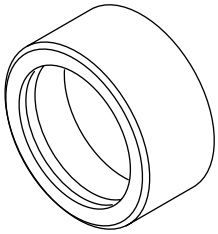
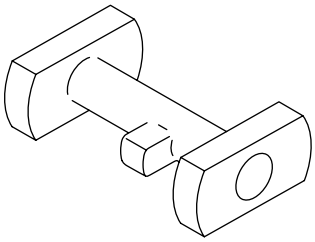
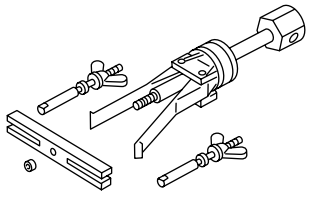
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type.
 ST-398487700	398487700	DRIFT	• Used for press-fitting the side bearing cone. • For T-type.
 ST-398507701	398507701	GAUGE	• Used for adjusting pinion height. • For T-type.
 ST-398527700	398527700	PULLER ASSY	• Used for removing oil seal and side bearing cup. • For T-type.

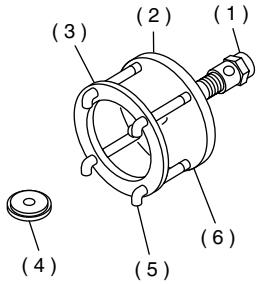
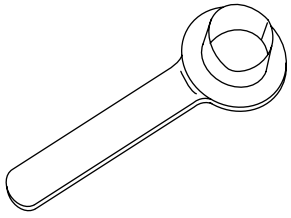
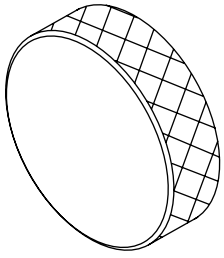
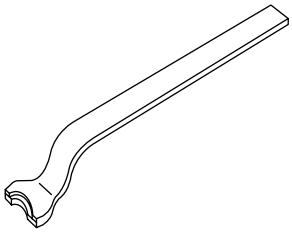
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399527700	399527700	PULLER SET	• Used for extracting side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000) • For T-type.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST-398237700	398237700	GAUGE	• Used for installing side bearing. • For T-type.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential. • For T-type.

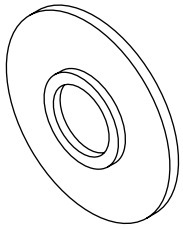
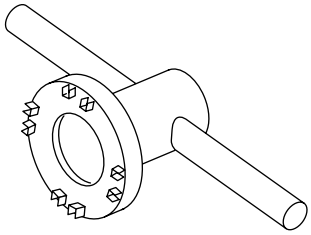
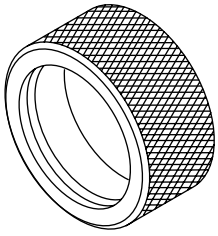
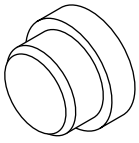
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498175500	498175500	INSTALLER	• Used for installing rear bearing cone. • For VA-type.
 ST-499785500	499785500	WRENCH ASSY	• Used for removing and installing side oil seal holder. • For VA-type.
 ST-498447100	498447100	INSTALLER	• Used for installing oil seal. • For VA-type.
 ST-399520105	399520105	SEAT	• Used for removing side bearing cone. • Used with PULLER SET (899524100). • For VA-type.

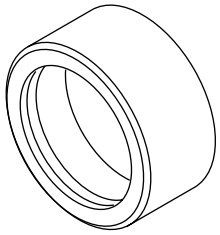
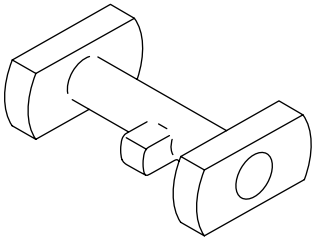
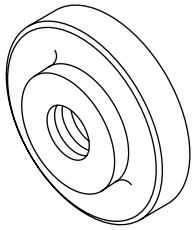
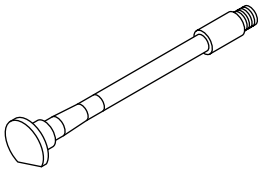
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA-type.
 ST-498505501	498505501	GAUGE	• Used for adjusting pinion height. • For VA-type.
 ST-498447110	498447110	BEARING OUTER RACE DRIFT	• Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and pre-load. • For VA-type.

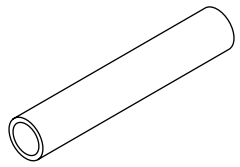
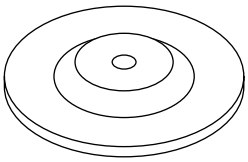
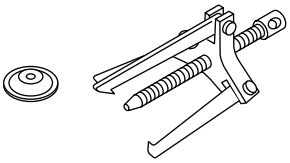
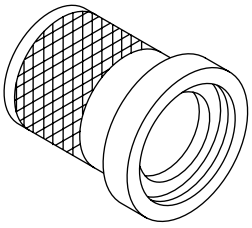
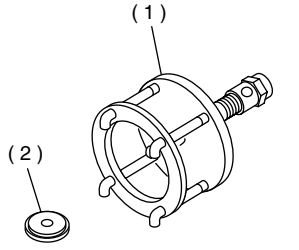
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST32285AA000	32285AA000	DUMMY COLLAR	• Used for adjusting pinion height and pre-load. • For VA-type.
 ST-499705404	499705404	SEAT	• Used for removing side bearing race. • Used with PULLER ASSY (499705401). • For VA-type.
 ST-499705401	499705401	PULLER ASSY	• Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.
 ST-899874100	899874100	INSTALLER	• Used for installing companion flange. • For VA-type.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899524100	899524100	DIFFERENTIAL BEARING PULLER SET	• Used for removing side bearing cone of differential. • For VA-type. (1) Puller (2) Cap

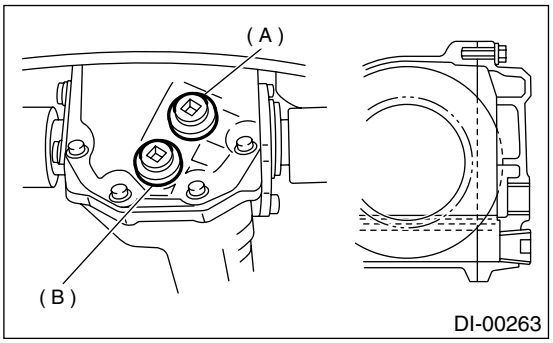
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Transmission Jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer. (T-type)
Thickness Gauge	Used for measuring clearance.
Tire Lever	Used for removal of rear drive shaft. (VA-type)

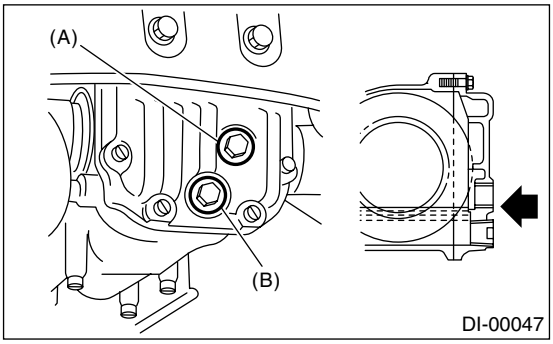
2. Differential Gear Oil

A: INSPECTION

1) Take out filler plug, and replace gear oil if it is contaminated or deteriorated. <Ref. to DI-22, REPLACEMENT, Differential Gear Oil.>
2) Check gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.



(A) Filler plug
(B) Drain plug

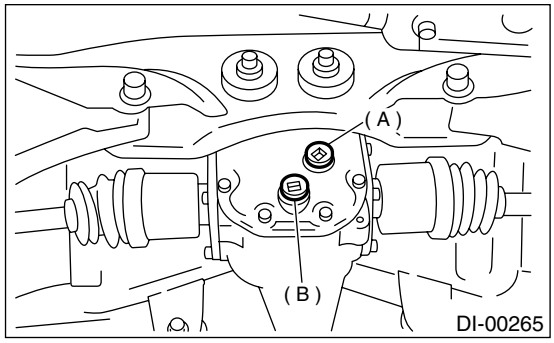


(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Disconnect ground cable from battery.
2) Jack-up vehicle and support it with sturdy racks.
3) Remove the oil drain plug and filler plug, and drain the gear oil.

CAUTION:
Be careful not to burn your hands, because gear oil becomes extremely hot after running.



(A) Filler plug
(B) Drain plug

4) Tighten oil drain plug.

NOTE:
- Apply fluid gasket to drain plug for T-type.
- VA-type uses a new aluminum gasket.

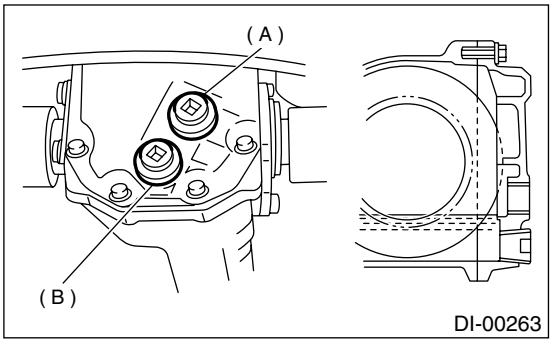
Fluid gasket:
THREE BOND 1105 (Part No.: 004403010) or equivalent

Tightening torque:
T-type;
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) Fill differential carrier with gear oil to the upper plug level.

CAUTION:
Carefully refill gear oil while watching the level. Excess or insufficient oil must be avoided.

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)



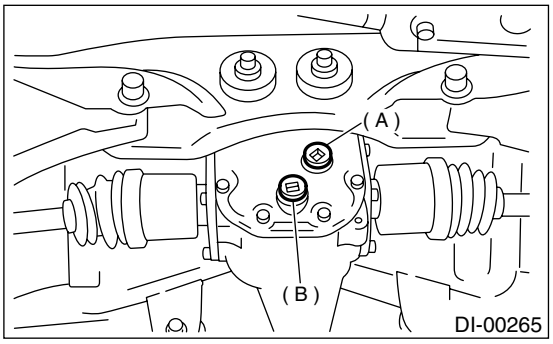
(A) Filler plug
(B) Drain plug

6) Install filler plug.

NOTE:
- Apply fluid gasket to filler plug for T-type.
- VA-type uses a new aluminum gasket.

Fluid gasket:
THREE BOND 1105 (Part No.: 004403010) or equivalent

Tightening torque:
T-type;
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type;
34 N·m (3.5 kgf-m, 25.3 ft-lb)



(A) Filler plug
(B) Drain plug

3. Front Differential

A: NOTE

1. AT MODEL

For front differential of automatic transmission, refer to "AT" section. <Ref. to 4AT-121, Front Differential.>

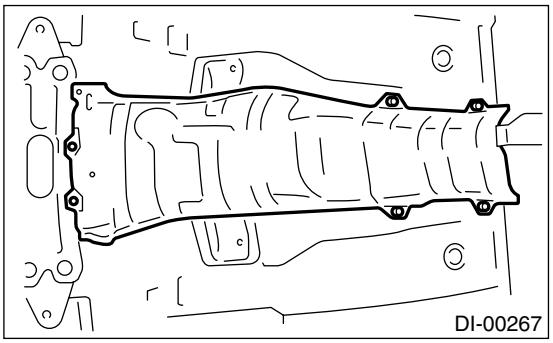
2. MT MODEL

For front differential of manual transmission, refer to “MT” section. <Ref. to 5MT-72, Front Differential Assembly.>

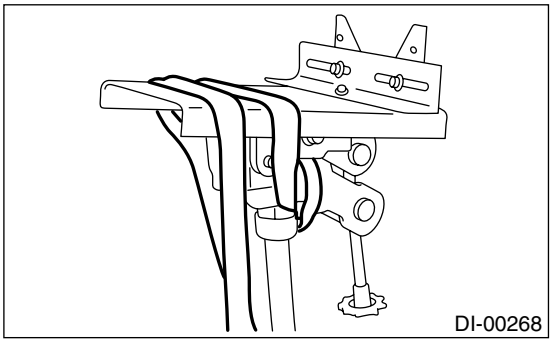
4. Rear Differential for T-type

A: REMOVAL

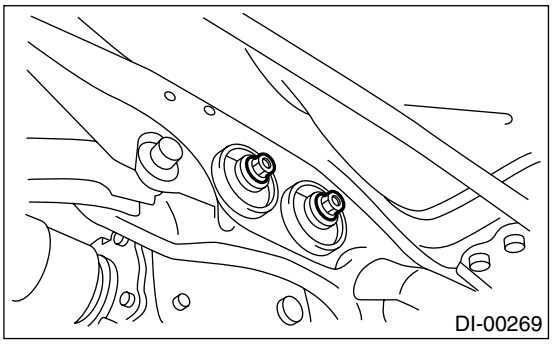
1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Loosen wheel nuts.
4) Release the parking brake.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
8) Remove heat shield cover.


DI-00267

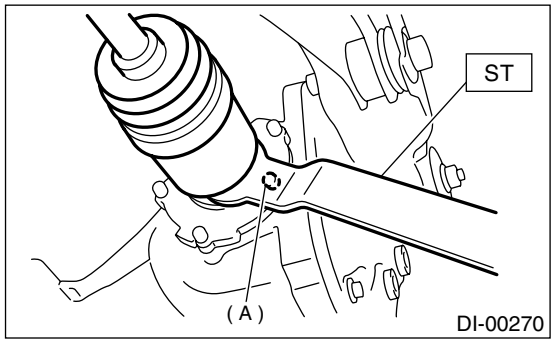
9) Remove propeller shaft.
<Ref. to DS-15, REMOVAL, Propeller Shaft.>
10) Remove rear differential protector (if equipped).
11) Prepare a transmission jack and a band.


DI-00268

12) Loosen self-locking nuts connecting rear differential to rear crossmember.


DI-00269

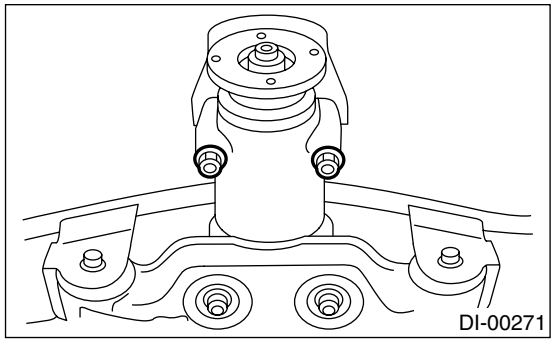
13) Remove DOJ of rear drive shaft from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER



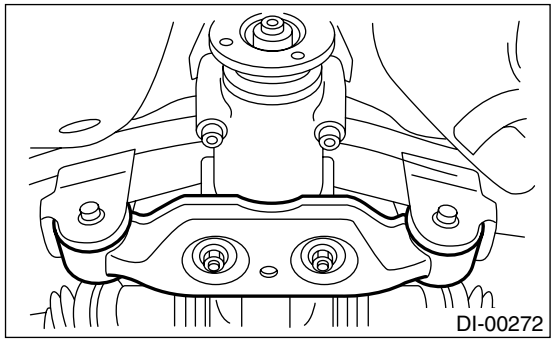
DI-00270

(A) Bolt

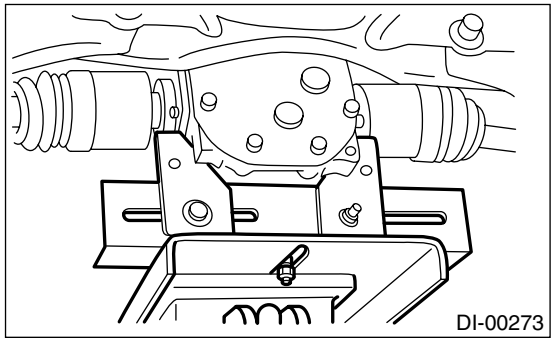
14) Remove protector nuts.


DI-00271

15) Remove rear differential front member.

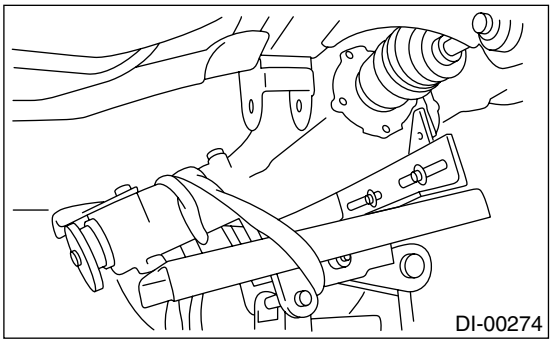

DI-00272

16) Support rear differential with transmission jack.

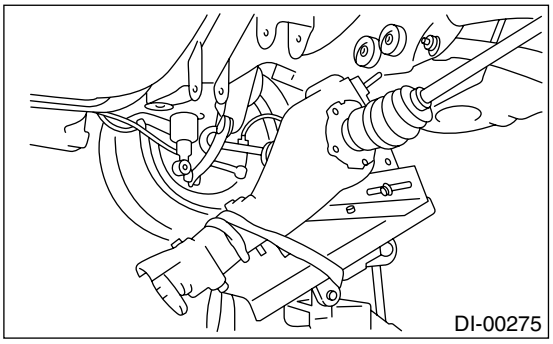

DI-00273

17) Be sure to secure differential to transmission jack by hand.
18) Remove self-locking nuts connecting rear differential to crossmember.
19) Remove rear differential stud bolt from rear crossmember bushing.

NOTE:
Carefully adjust angle and position of transmission jack and jack stand as required during stud bolt removal.


DI-00274

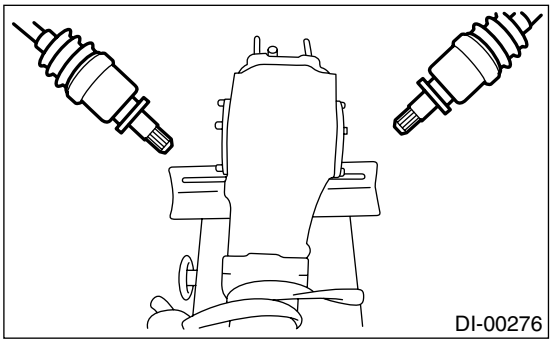
20) After removing rear differential stud bolt from rear crossmember, lower transmission jack stand. Do not allow rear drive shaft to strike lateral link bolt.


DI-00275

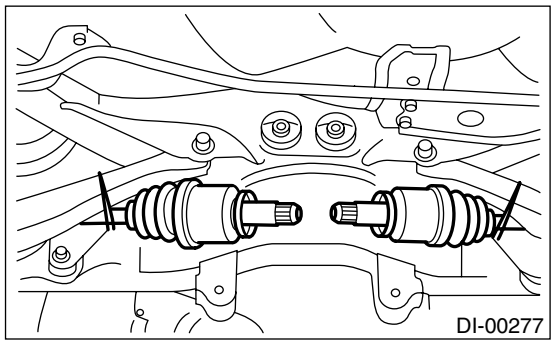
21) Pull out axle shaft from rear differential.

NOTE:
If axle shaft is difficult to remove from rear differential, use ST to remove it.

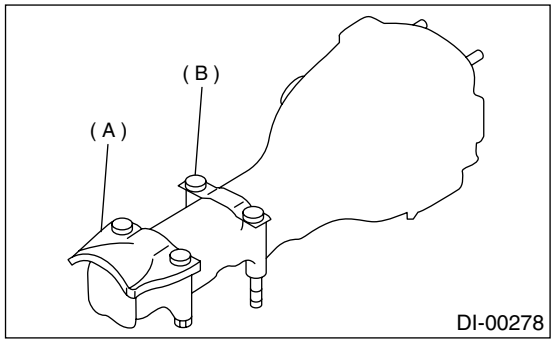
ST 28099PA100 DRIVE SHAFT REMOVER


DI-00276

22) Take down transmission jack.
23) Secure rear drive shaft to lateral link use wire.


DI-00277

24) Remove protector and rear differential member plate from rear differential.

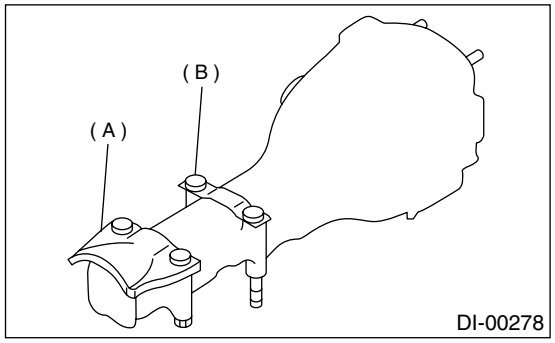


DI-00278

(A) Protector
(B) Rear differential member plate

B: INSTALLATION

1) Install protector and rear differential member plate to rear differential.



DI-00278

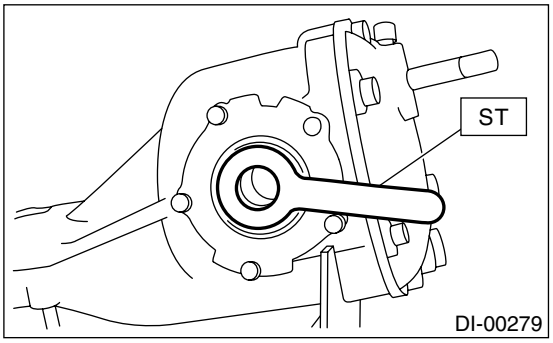
(A) Protector
(B) Rear differential member plate

2) Set rear differential to transmission jack.

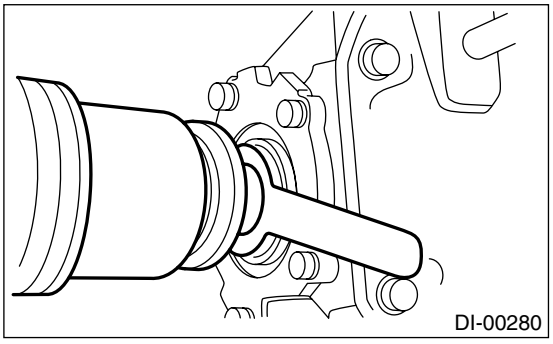
NOTE:
Secure rear differential to transmission jack using a band.

3) Install ST to rear differential.

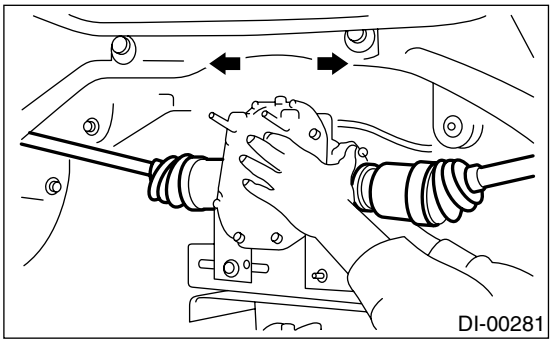
ST 28099PA090 OIL SEAL PROTECTOR



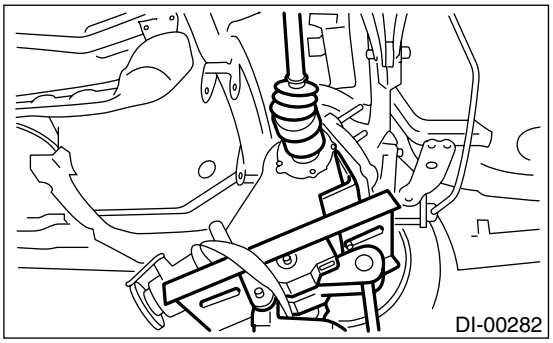
4) Insert the spline shaft until the spline portion is inside the side oil seal.



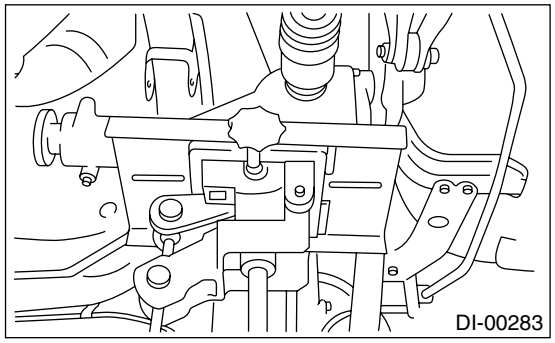
5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Completely insert axle shaft into rear differential by pressing rear differential.



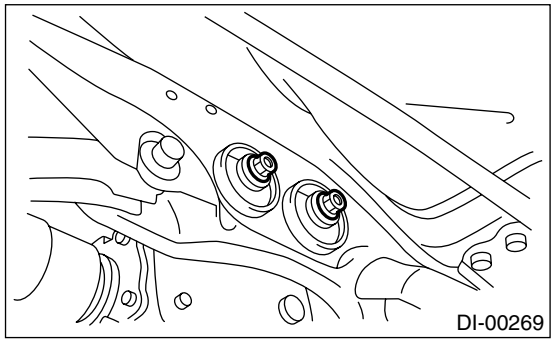
7) Adjust transmission jack as required so rear differential stud bolt is properly inserted into rear crossmember bushing.



8) After rear differential stud bolt has been inserted into rear crossmember bushing, raise transmission jack to make jack rear differential level.

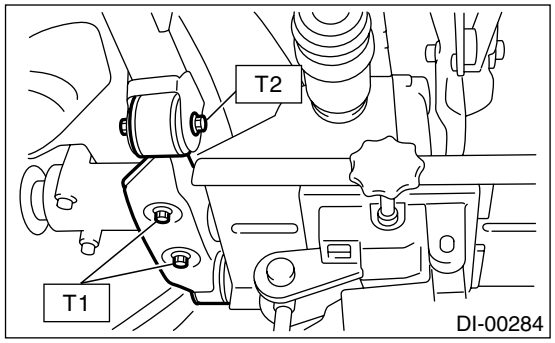


9) Temporarily tighten rear crossmember self-locking nuts.



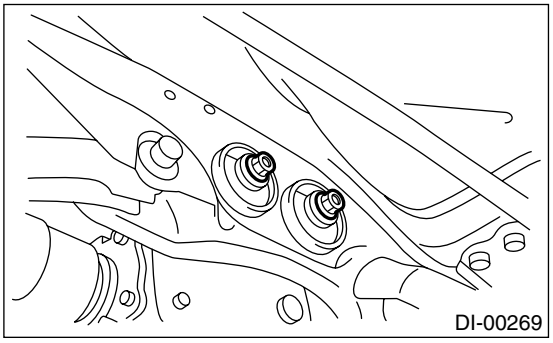
10) Remove band from rear differential. Raise rear differential just enough to move transmission jack away from it.
11) Install rear differential front member.

Tightening torque:
T1: 65 N·m (6.6 kgf-m, 48 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



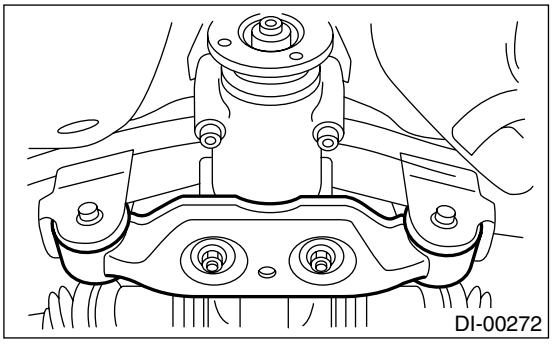
12) Tighten self-locking nuts.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)



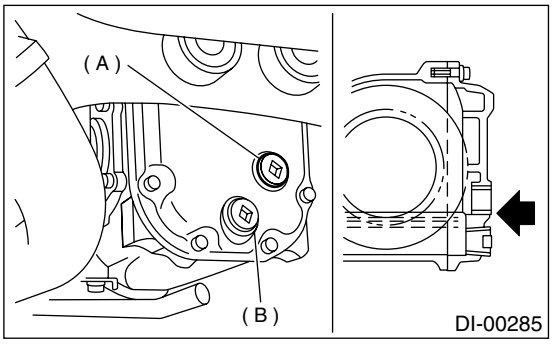
13) Tighten protector nut.

Tightening torque:
65 N·m (6.6 kgf-m, 48.0 ft-lb)



14) Take down transmission jack.
15) Install propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
16) Install heat shield cover.
17) Install rear exhaust pipe and muffler.
18) After installing rear differential carrier on vehicle, remove filler plug and replenish gear oil up to upper level mark.

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Drain plug

19) Tighten filler plug.

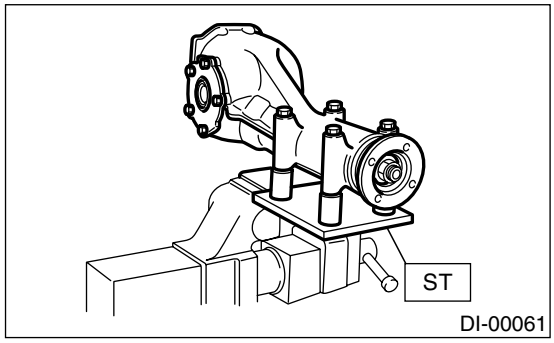
NOTE:
Apply fluid gasket to plug.

Fluid gasket:
THREE BOND 1105 (Part No. 04403010) or equivalent

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

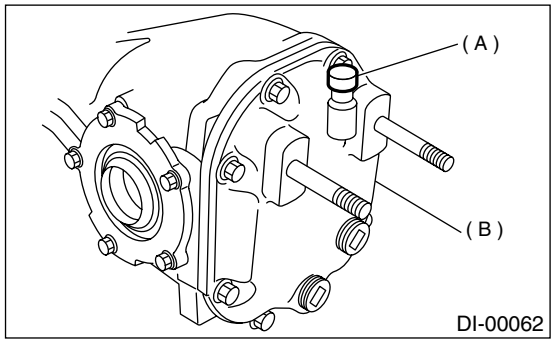
C: DISASSEMBLY

To detect real cause of trouble, inspect the following items before disassembling.
• Tooth contact of crown gear and pinion, and backlash
• Runout of crown gear at its back surface
• Turning resistance of drive pinion
1) Set ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT



2) Drain gear oil by removing plug.
3) Remove the air breather cap.

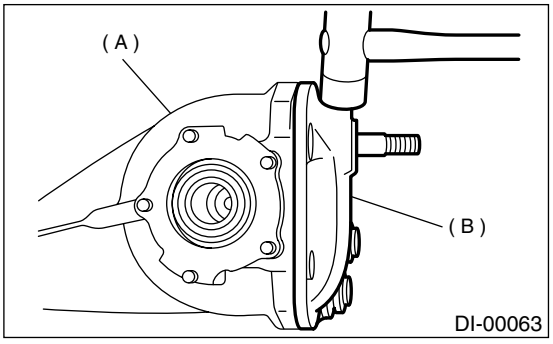
NOTE:
• Do not attempt to remove the air breather cap unless necessary.
• When the air breather cap is removed, replace it with a new one.



(A) Air breather cap
(B) Rear cover

4) Remove rear cover by loosening bolts.

NOTE:
Remove rear cover while tapping it lightly with plastic hammer, if it is hard to remove.

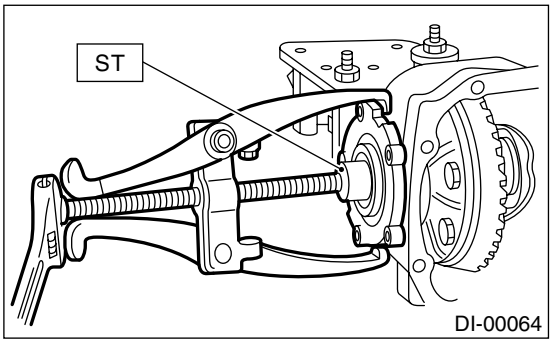


(A) Rear cover
(B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove side bearing retainer attaching bolts, set ST to differential case, and extract right and left side bearing retainers with a puller.

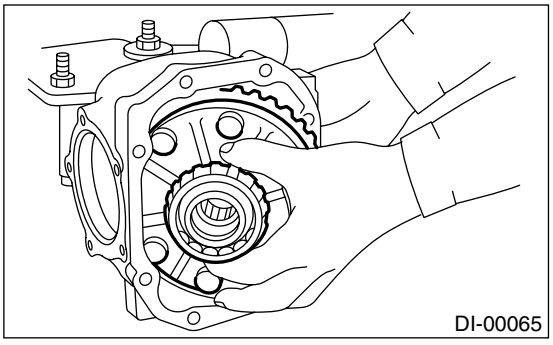
NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



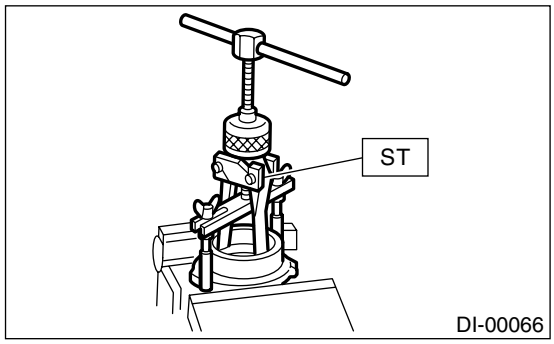
6) Pull out differential case assembly from differential carrier.

CAUTION:
Be careful not to hit the teeth against the case.



7) Remove O-ring from side bearing retainer.
8) Remove oil seal from side bearing retainer.
9) Remove bearing cup from side bearing retainer using ST.

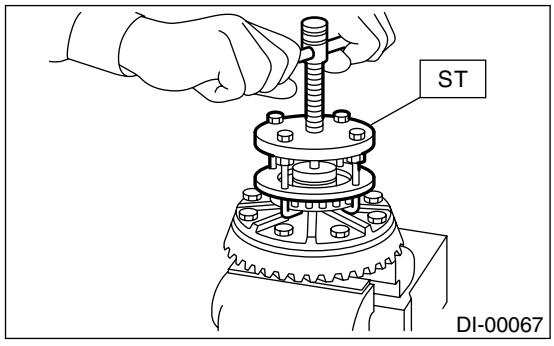
ST 398527700 PULLER ASSY



10) Extract bearing cone with ST.

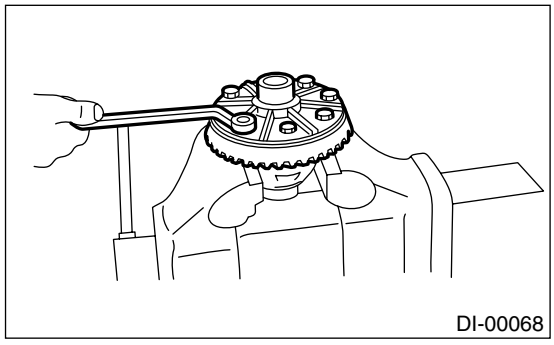
NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set puller so that its claws catch the edge of the bearing cone.
• Never mix up the right and left hand bearing races and cones.

ST 399527700 PULLER SET



11) Remove crown gear by loosening crown gear bolts.

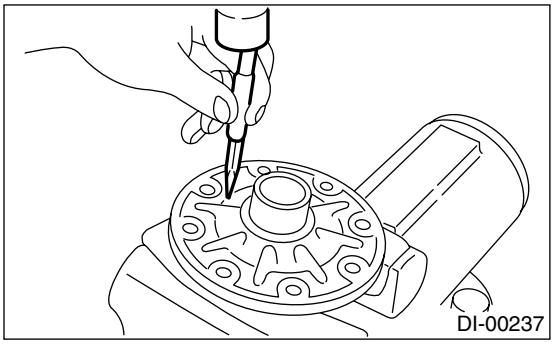
NOTE:
Further disassembling is not allowed.



12) Drive out pinion shaft lock pin from crown gear side. (Without LSD)

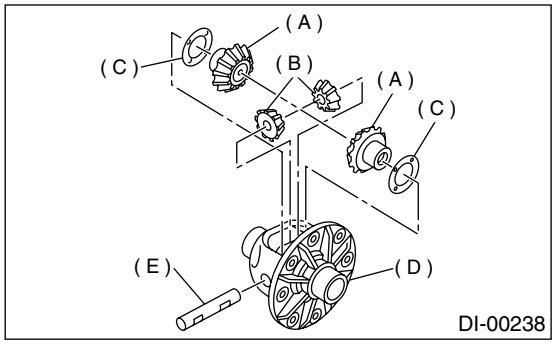
NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

ST 899904100 STRAIGHT PIN REMOVER



13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Without LSD)

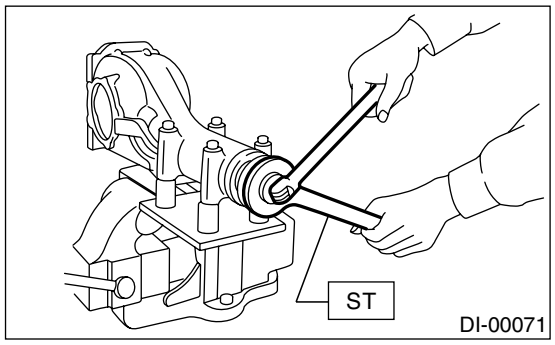
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



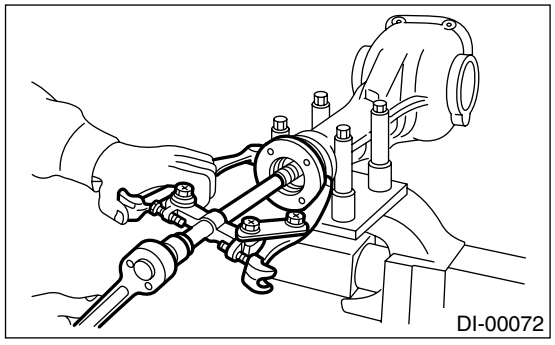
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

14) Hold companion flange with ST and remove drive pinion nut.

ST 498427200 FLANGE WRENCH



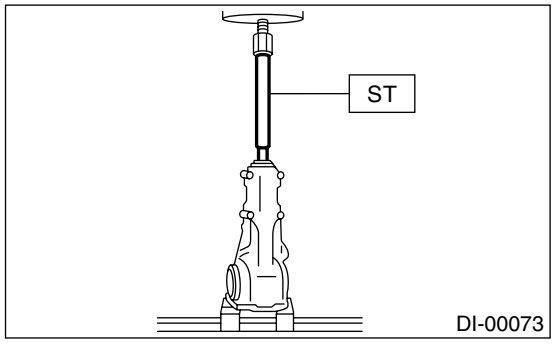
15) Extract the companion flange with a puller.



16) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.

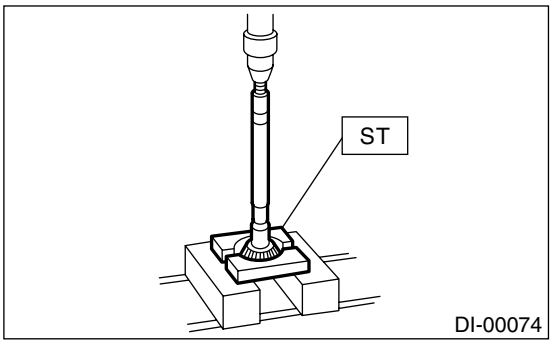
ST 398467700 DRIFT



17) Remove rear bearing cone from drive pinion by supporting cone with ST.

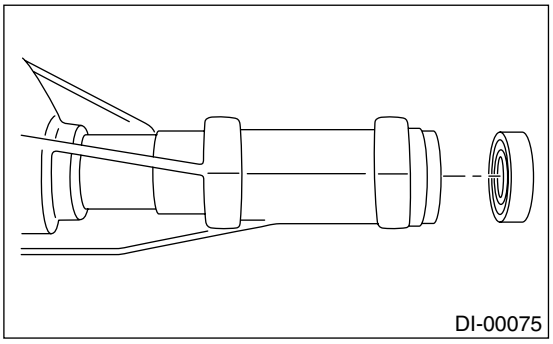
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



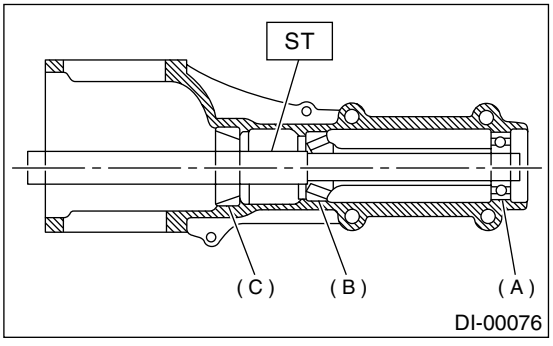
18) Remove front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



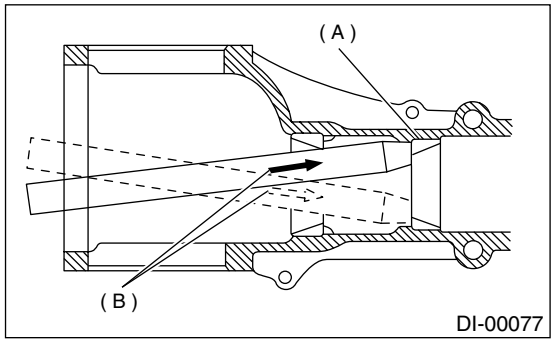
19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



(A) Pinion bearing
(B) Front bearing
(C) Rear bearing cup

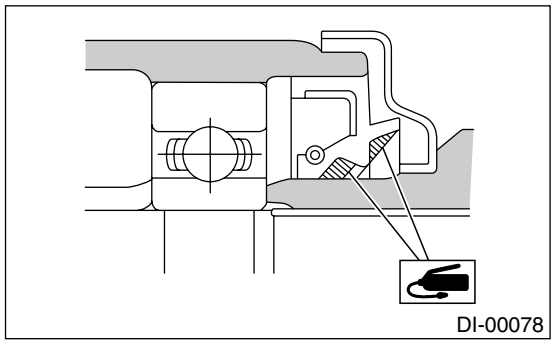
20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not misinstalled.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.

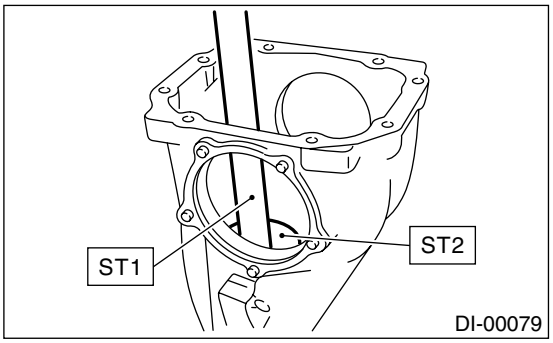


- Use new O-ring and gasket.

1) Adjusting preload for front and rear bearings
• Adjust the bearing preload with spacer and washer between front and rear bearings.
• Pinion height adjusting washer are not affected by this adjustment.
• The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race rear into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install rear bearing race (front) in differential carrier using ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477702 DRIFT

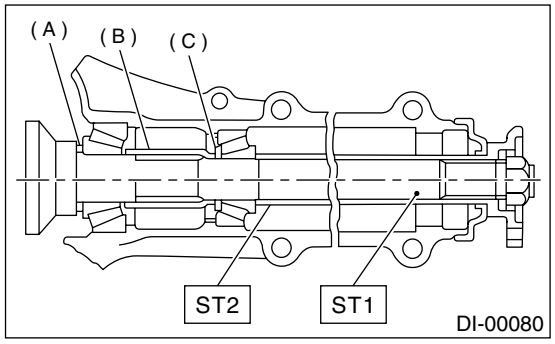
(3) Mesure and record the thickness of pinion height adjusting washer.

NOTE:
The used washer can be used after checking that it is not deformed when the tooth contact of drive gear and driven gear is correct during pre-disassembly.

(4) Insert ST1 into carrier with pinion height adjusting washer and new rear bearing cone fitted onto it.

(5) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



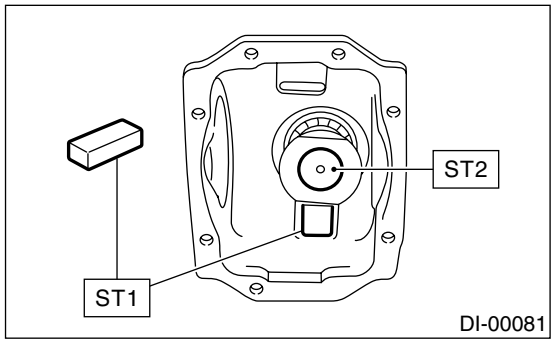
(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

(6) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

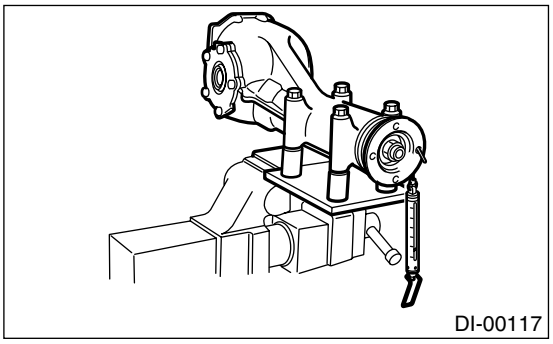
NOTE:
• Use a new lock nut.
• Be careful not to give excessive preload.
• When tightening the drive pinion nut, lock ST2 with ST1 as shown in the figure.

ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



Front and rear bearing preload
For new bearing: 18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.71 lb) at companion flange bolt hole

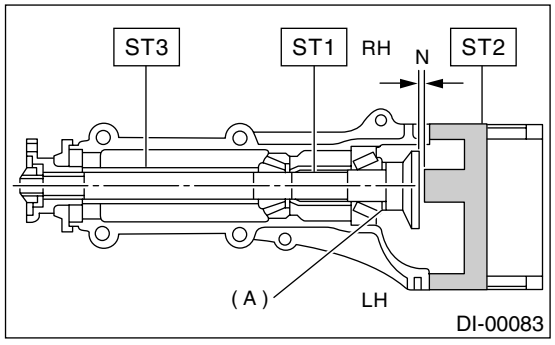


	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
Preload adjusting spacer	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

2) Adjusting drive pinion height
Adjust drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

(1) Set ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR

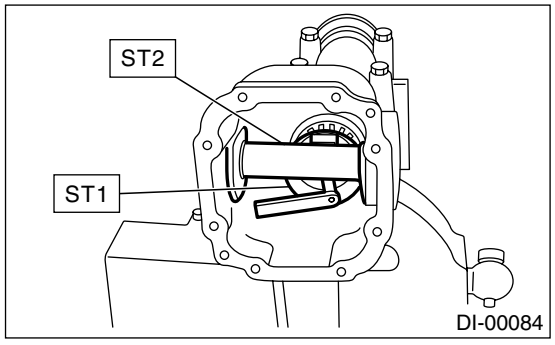


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

T = To + N – (H x 0.01) – 0.20 mm (0.0079 in)

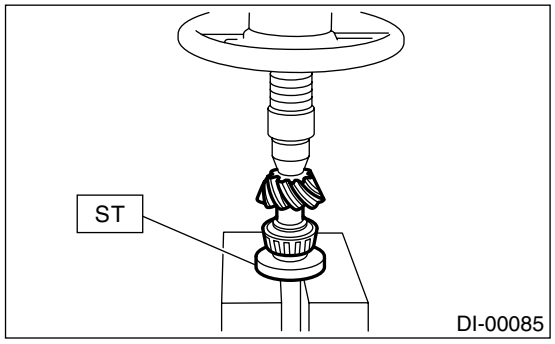
NOTE:
Use copies of this page.

T	Thickness of pinion height adjusting shim mm (in)	
To	Thickness of shim temporarily inserted mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

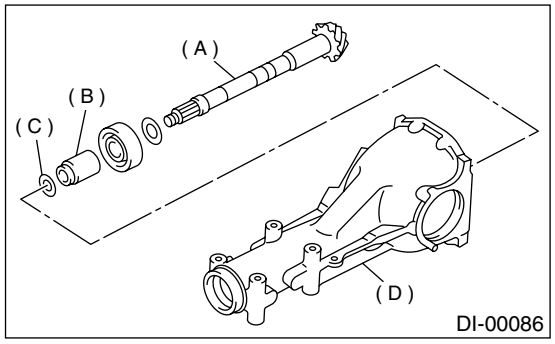
(Example of calculation)
T = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm
H = + 1
T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the shim 383605200.

Pinion height adjusting shim	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.
ST 398177700 INSTALLER

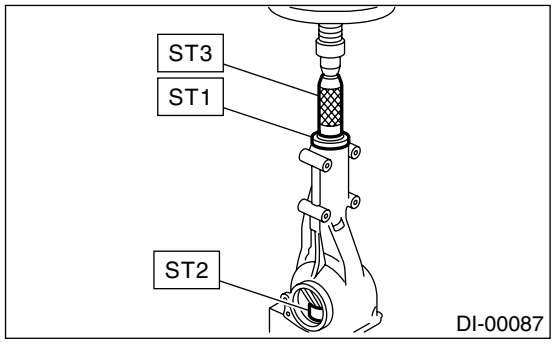


4) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

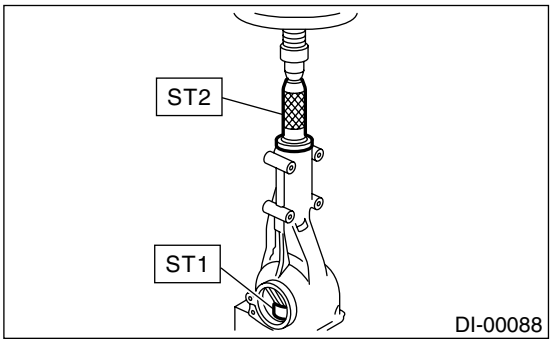


(A) Drive pinion
(B) Bearing adjusting spacer
(C) Bearing adjusting washer
(D) Differential carrier

5) Press-fit front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER

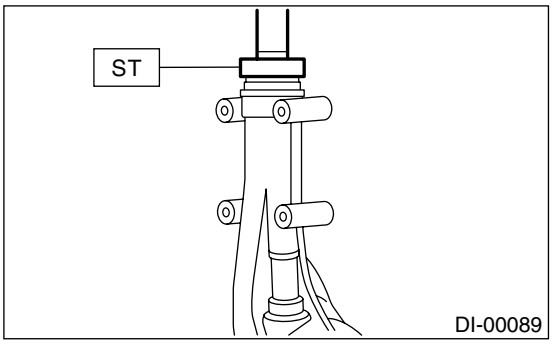


6) Insert spacer, then press-fit pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



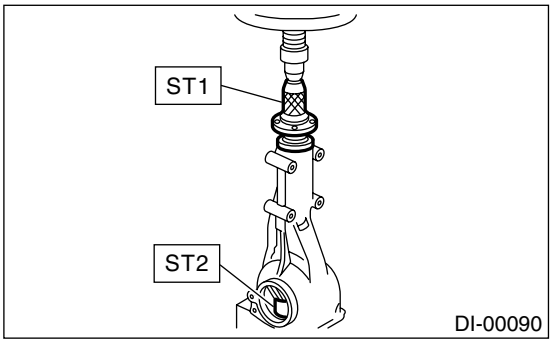
7) Fit a new oil seal with ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.
ST 498447120 OIL SEAL INSTALLER



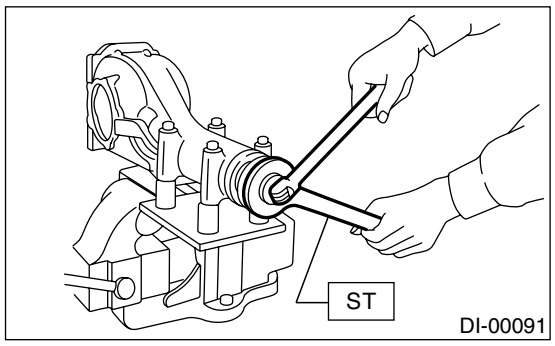
8) Press-fit companion flange with ST1 and ST2.

NOTE:
Be careful not to damage bearing.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



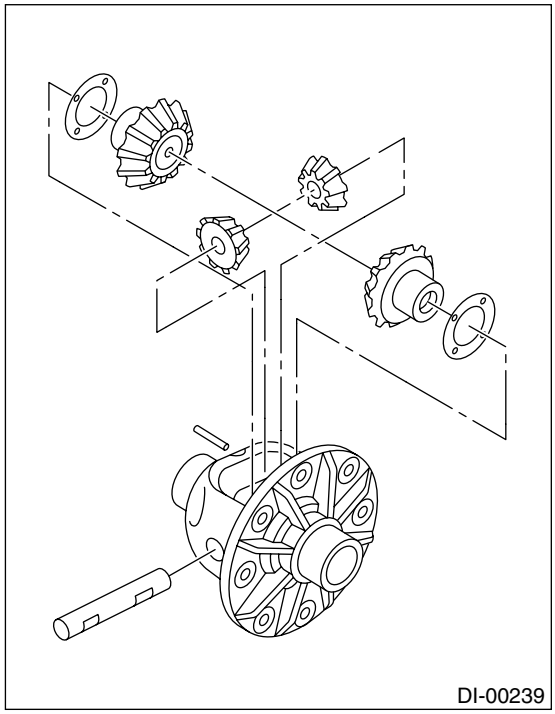
9) Install new self-locking nut. Then fix and tighten companion flange with ST.
ST 498427200 FLANGE WRENCH

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



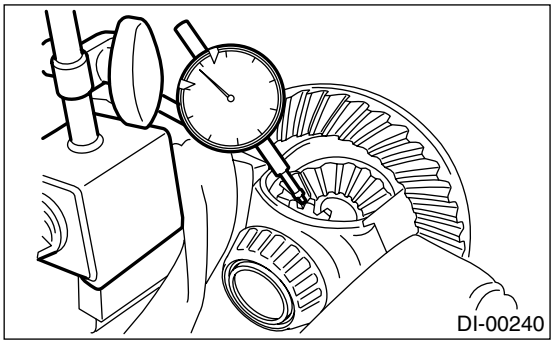
10) Assembling differential case (Without LSD)
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

NOTE:
• Apply gear oil on both sides of the washer and on the side gear shaft before installing.
• Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear back clearance:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



(2) Adjust the backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

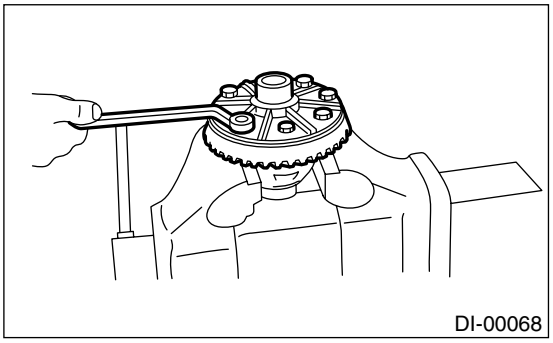
11) Install crown gear on differential case.

NOTE:
• Before installing bolts, apply Lock Tite to bolt threads.

Lock Tite:
THREE BOND 1324 (Part No. 004403042) or equivalent

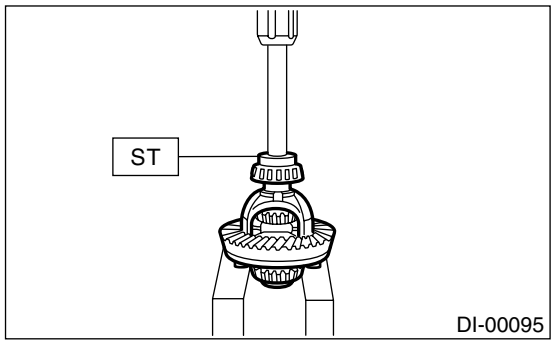
• Tighten diagonally while tapping the bolt heads.

Tightening torque:
105 N·m (10.7 kgf-m, 77.4 ft-lb)



12) Press side bearing onto differential case with ST.
ST 398237700 DRIFT

NOTE:
When replacing bearing cone, replace it with bearing cap as a set.



13) Install bearing cup to side bearing retainer.

NOTE:
• Press in while be careful not to scratch bearing cup and side bearing retainer.
• When replacing bearing cup, replace it with bearing cone as a set.

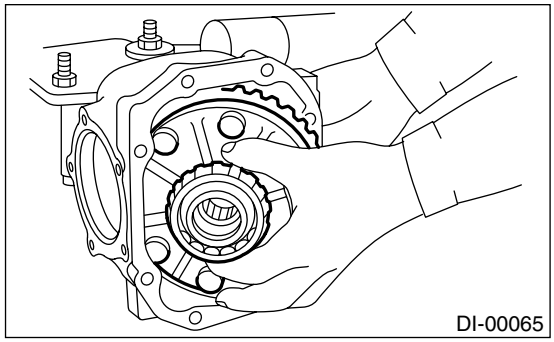
14) Using ST, press in new oil seal to side bearing retainer.
ST 398437700 DRIFT

NOTE:
Apply thin oil gear oil on the mating surface of side bearing retainer and oil seal.

15) Adjusting side bearing retainer shims

(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.



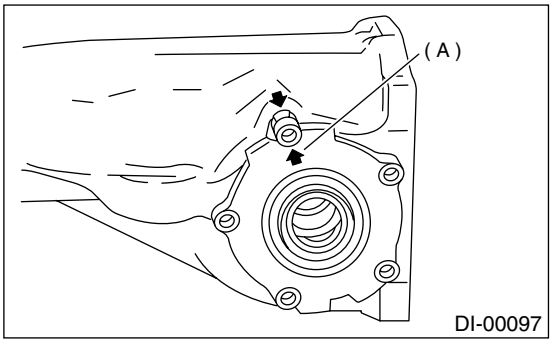
(3) Install side retainer shims to the left and right retainers from which they were removed.

NOTE:
Replace broken or corroded side retainer shim with new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align arrow marked on differential carrier with that marked on side retainer during installation.

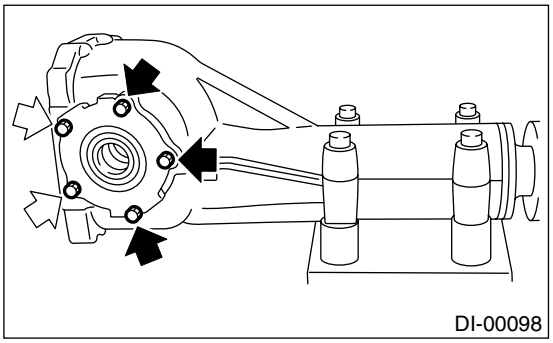
NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

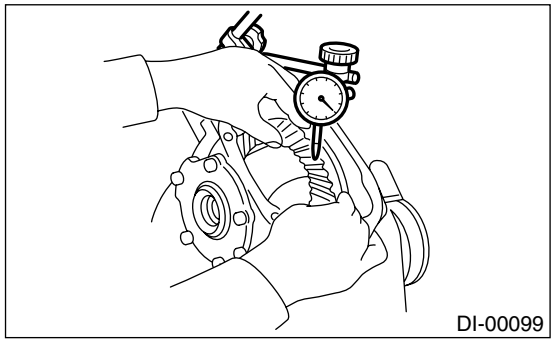
(5) Tighten side bearing retainer bolts.

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash. Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.
If the measured backlash is not within the specified range, adjust side bearing retainer shims as follows:
Backlash is over 0.2 mm (0.008 in):
Reduce the shim thickness of crown gear backside and increase crown gear tooth-side.
Backlash is less than 0.1 mm (0.004 in):
Increase the shim thickness of crown gear backside and reduce crown gear tooth-side.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

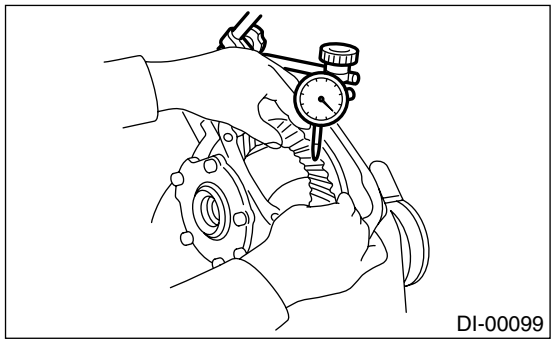


(7) At the same time, measure the turning resistance of drive pinion. Compare with the resistance when differential case is not installed, if the increase of the resistance is not within the specified range, adjust thickness of side bearing retainer shims so that the back- and tooth-sides are the same thickness.

Turning resistance increase:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)

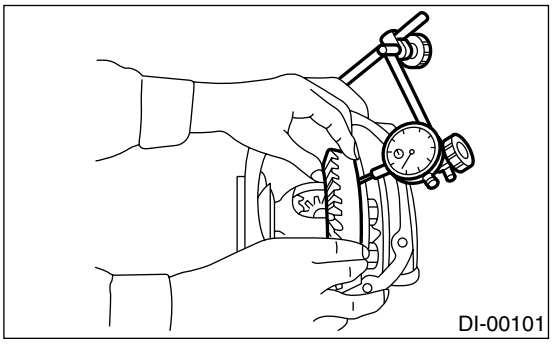
16) Re-check crown gear-to-pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



17) Check the crown gear runout on its back surface, and make sure pinion and crown gear rotate smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)



18) Checking and adjusting tooth contact of crown gear

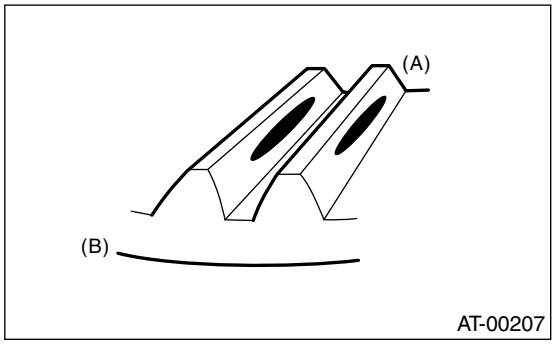
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

• Correct tooth contact

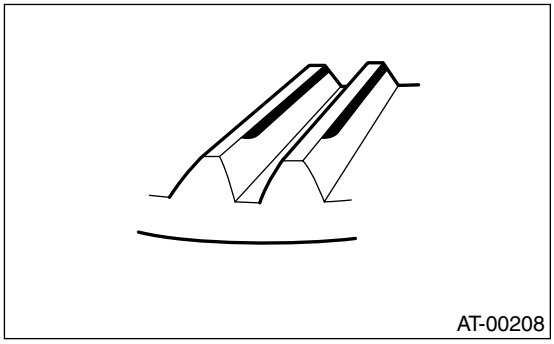
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



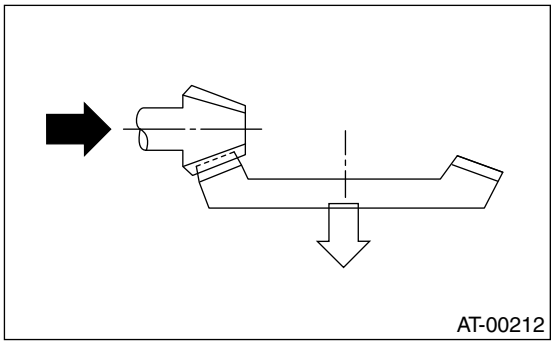
(A) Toe side
(B) Heel side

• Face contact

Checking item: Backlash is too large.
Contact pattern

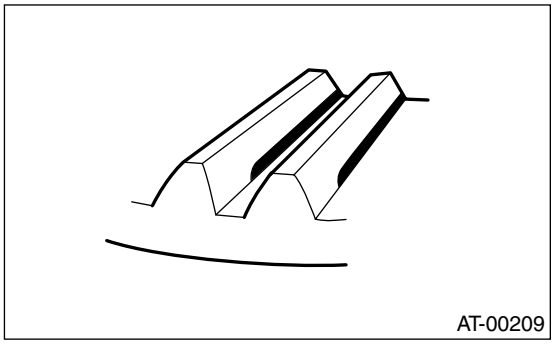


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

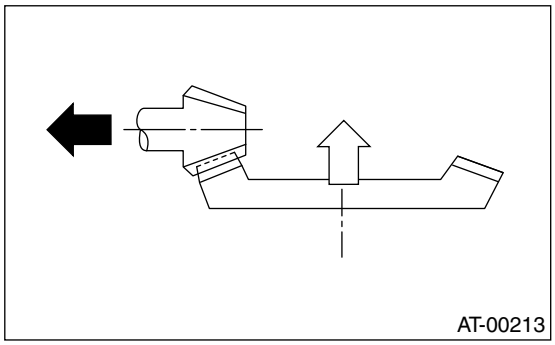


• Flank contact

Checking item: Backlash is too small.
Contact pattern

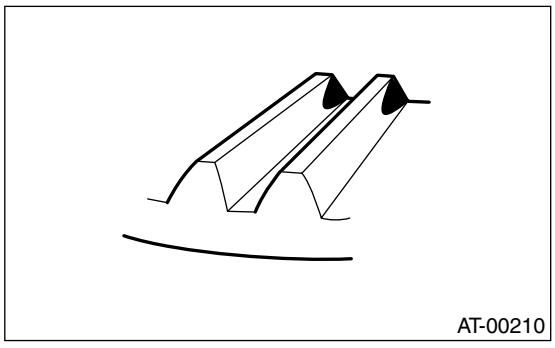


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

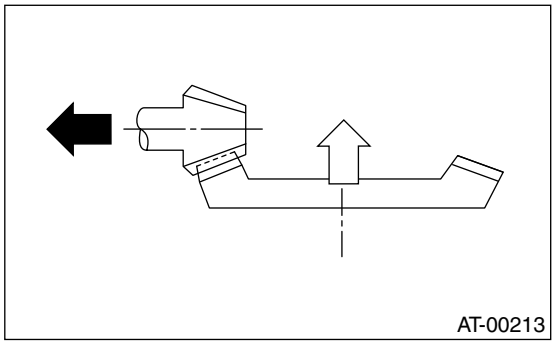


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

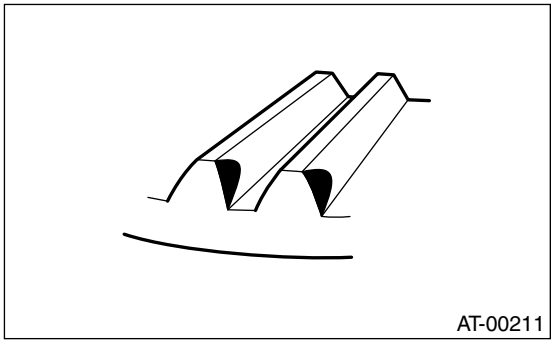


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

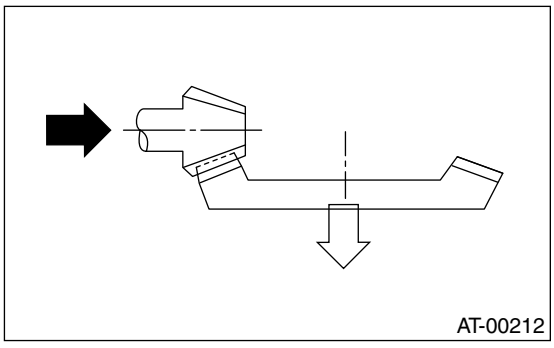


- Heel contact (Outside end contact)

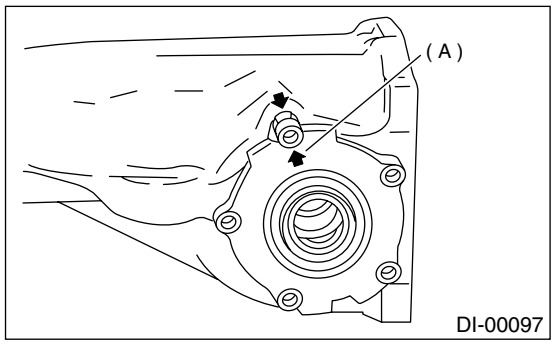
Checking item: Contact area is small.
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



19) If proper tooth contact is not obtained, once again adjust the drive pinion height changing RH and LH side bearing retainer shims and the hypoid gear backlash.
20) Remove left and right side retainer.
21) Install left and right side bearing retainer, new O-rings and side retainer shims.
22) Align the arrow mark on differential carrier with the mark on side retainer during installation.

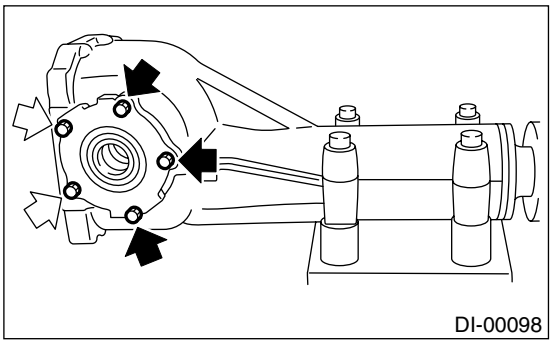


(A) Arrow mark

23) Tighten the side bearing retainer bolts.

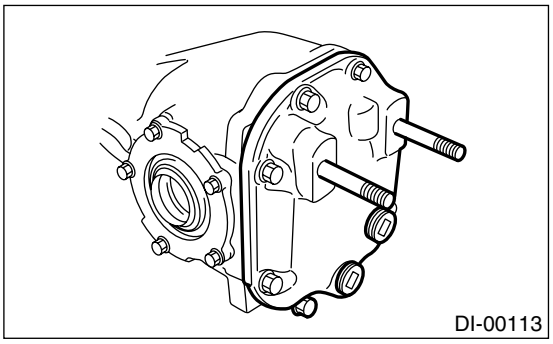
Lock Tite:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)


DI-00098

24) Install new gasket and rear cover, and tighten bolts to specified torque.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)


DI-00113

E: INSPECTION

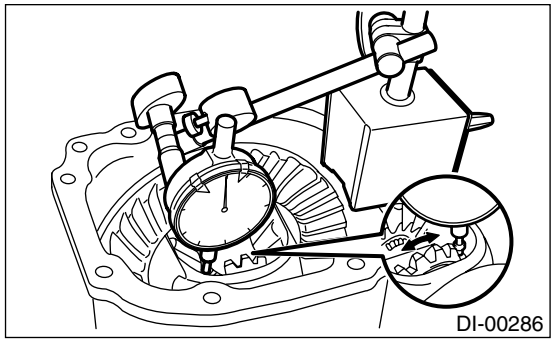
Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.
1) Crown gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
2) Side gear and pinion mate gear
• Replace if crack, score, or other defects are evident on tooth surface.
• Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.
3) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.
4) Thrust washers of side gear and pinion mate gear
Replace if seizure, flaw, abnormal wear or other defect is evident.
5) Oil seal
Replace if deformed or damaged, and at every disassembling.
6) Differential carrier
Replace if the bearing bores are worn or damaged.
7) Differential case
Replace if its sliding surfaces are worn or cracked.
8) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

Side gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If side gear backlash is not within the specification, adjust clearance as specified by selecting side gear thrust washer.

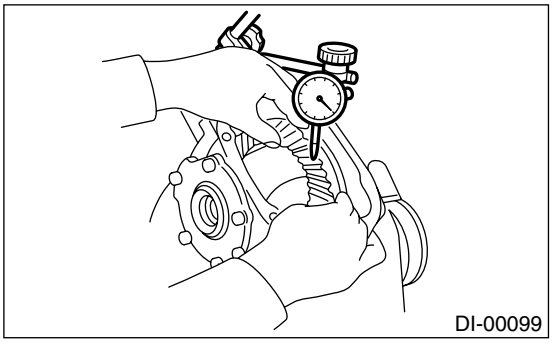

DI-00286

2. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.

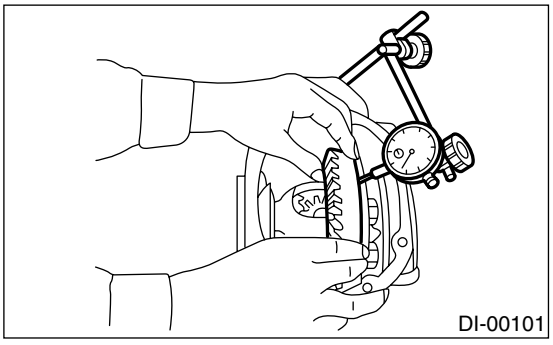

DI-00099

3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:
Less than 0.05 mm (0.0020 in)

If the crown gear runout exceeds 0.05 mm (0.0020 in), replace the crown gear.


DI-00101

4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

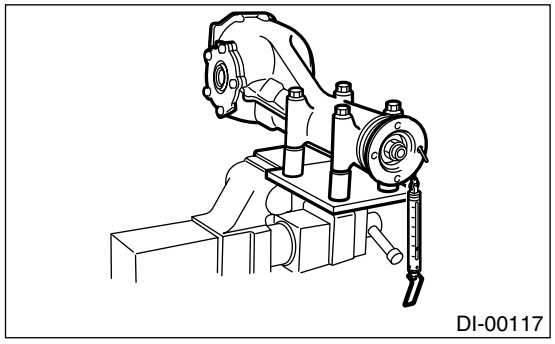
Inspect tooth contact between crown gear and driven pinion. <Ref. to DI-31, ASSEMBLY, Rear Differential for T-type.>

5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Turning resistance increase:
2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

If the increase of the resistance is not within the specification, adjust the side bearing retainer shims.


DI-00117

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.
<Ref. to DI-31, ASSEMBLY, Rear Differential for T-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.
<Ref. to DI-31, ASSEMBLY, Rear Differential for T-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.
<Ref. to DI-31, ASSEMBLY, Rear Differential for T-type.>

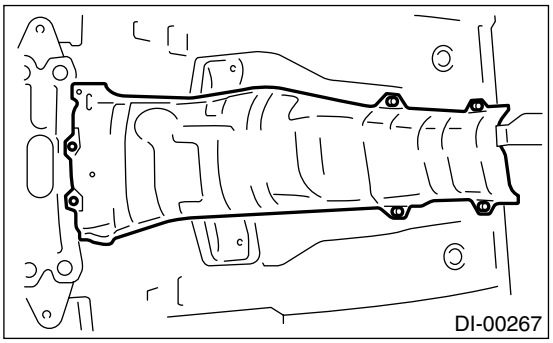
4. TOTAL PRELOAD

Adjust side bearing shim.
<Ref. to DI-31, ASSEMBLY, Rear Differential for T-type.>

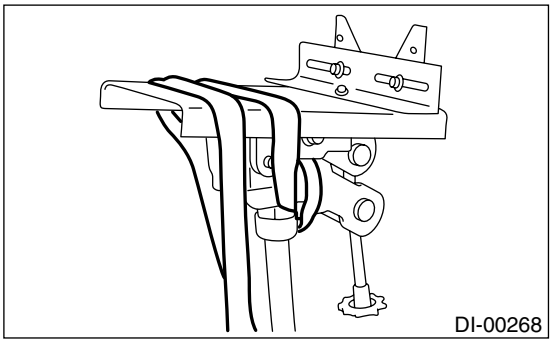
5. Rear Differential for VA-type

A: REMOVAL

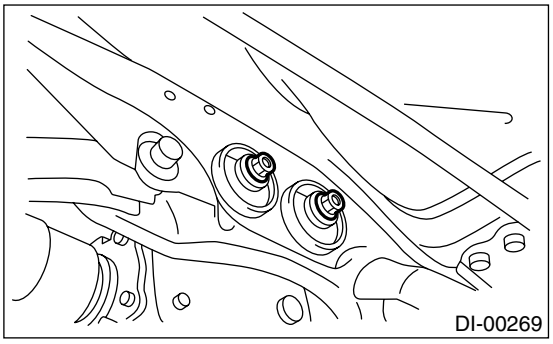
1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Loosen wheel nuts.
4) Release the parking brake.
5) Jack-up vehicle and support it with sturdy racks.
6) Remove wheels.
7) Remove rear exhaust pipe and muffler.
8) Remove heat shield cover.



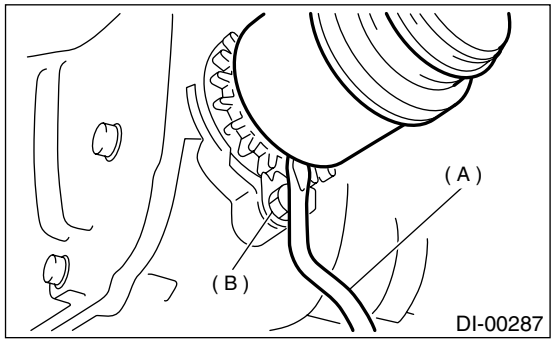
9) Remove propeller shaft.
<Ref. to DS-15, REMOVAL, Propeller Shaft.>
10) Prepare a transmission jack and a band.



11) Loosen self-locking nuts connecting rear differential to rear crossmember.

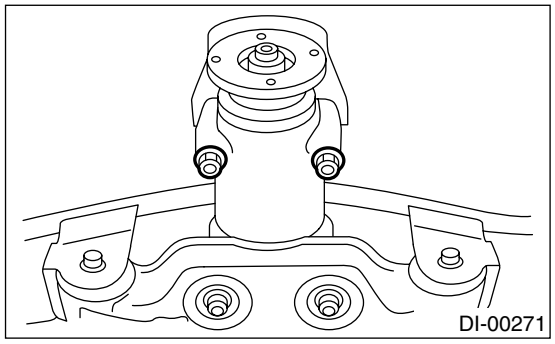


12) Remove DOJ of rear drive shaft from rear differential.

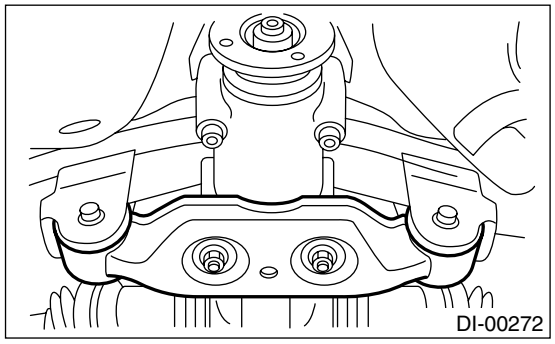


(A) Tire lever
(B) Bolt

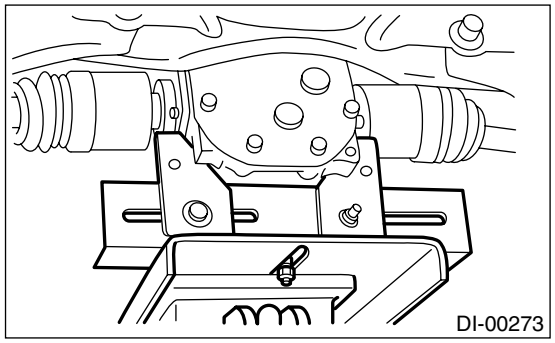
13) Remove protector nuts.



14) Remove nuts which secure rear differential front member.

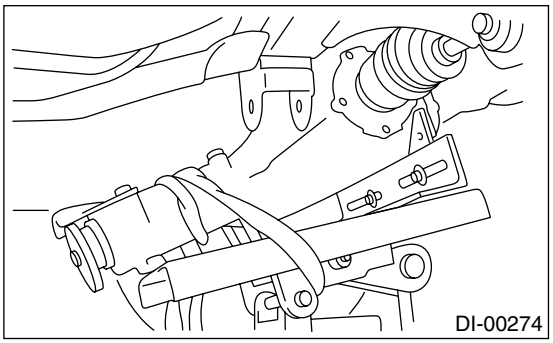


15) Support rear differential with transmission jack.

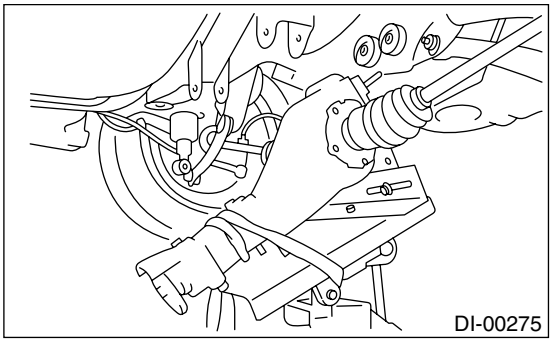


16) Remove rear differential front member.
17) Fix rear differential at band.
18) Remove self-locking nuts connecting rear differential to rear crossmember.
19) Remove rear differential stud bolt from rear crossmember bushing.

NOTE:
Carefully adjust angle and position of transmission jack and jack stand as required during stud bolt removal.

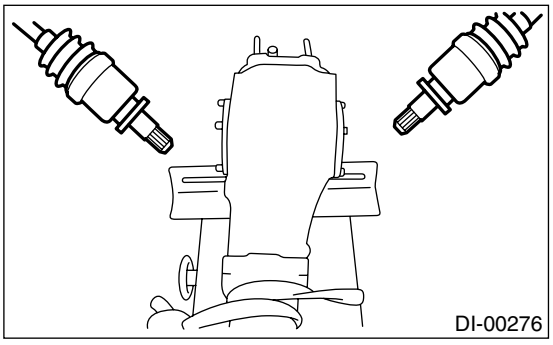


20) After removing rear differential stud bolt from rear crossmember, lower transmission jack stand. Do not allow rear drive shaft to strike lateral link bolt.

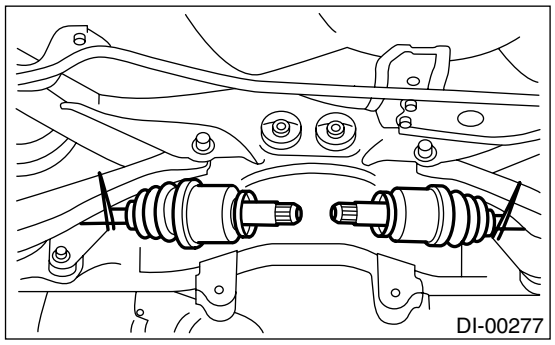


21) Pull out axle shaft from rear differential.

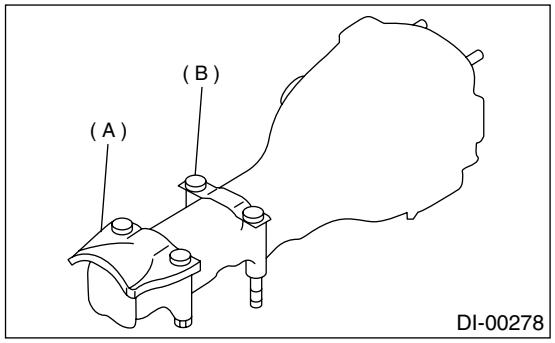
NOTE:
If axle shaft is difficult to remove from rear differential, use a tire lever to remove it.



22) Take down transmission jack.
23) Secure rear drive shaft to lateral link using wire.



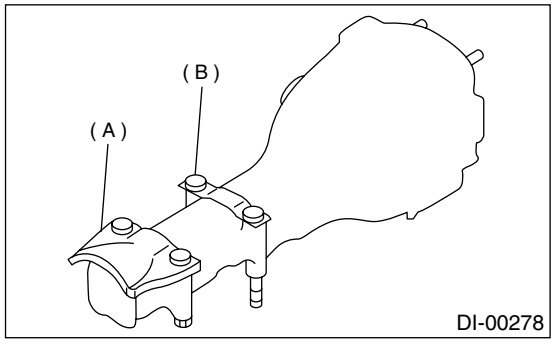
24) Remove protector and rear differential member plate from rear differential.



(A) Protector
(B) Rear differential member plate

B: INSTALLATION

1) Insert protector and plate to rear differential.

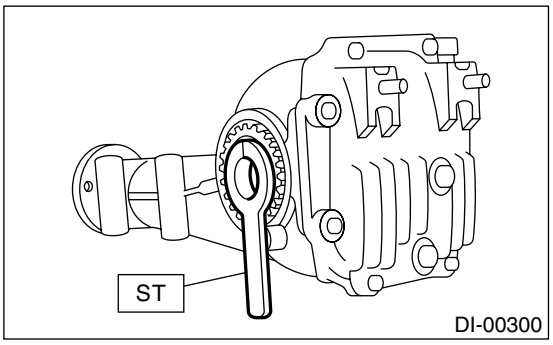


(A) Protector
(B) Rear differential member plate

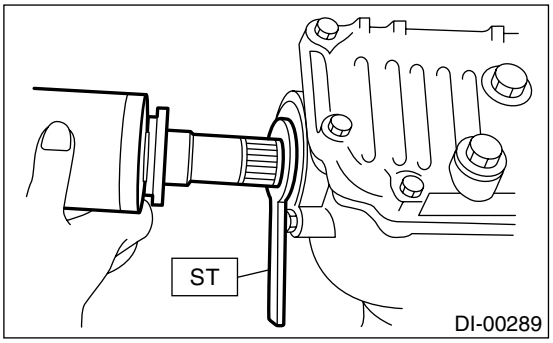
2) Set rear differential to transmission jack.

NOTE:
Secure rear differential to transmission jack using a band.

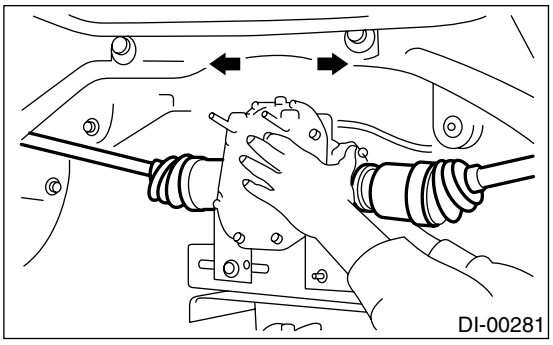
3) Install ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



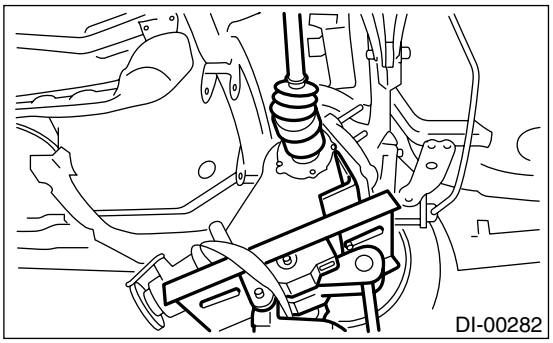
4) Insert the spline shaft until the spline portion is inside the side oil seal.



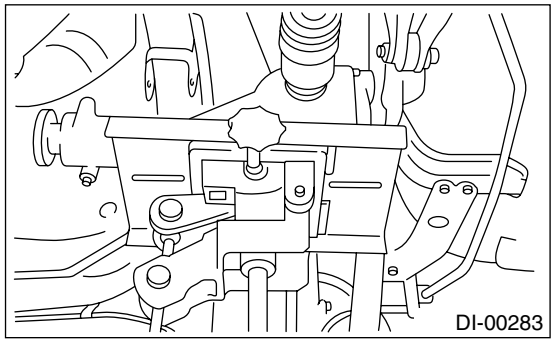
5) Remove ST from rear differential.
ST 28099PA090 OIL SEAL PROTECTOR
6) Completely insert axle shaft into rear differential by pressing rear differential.



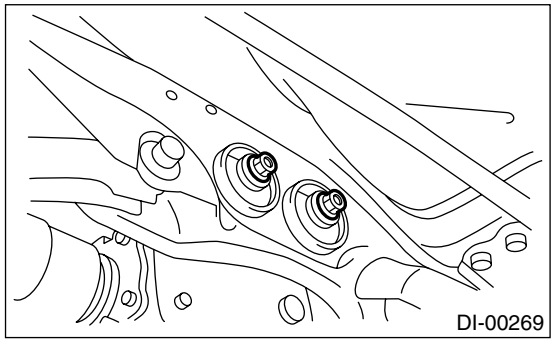
7) Adjust transmission jack as required so rear differential stud bolt is properly inserted into rear crossmember bushing.



8) After rear differential stud bolt has been inserted into rear crossmember bushing, raise transmission jack to make jack rear differential level.

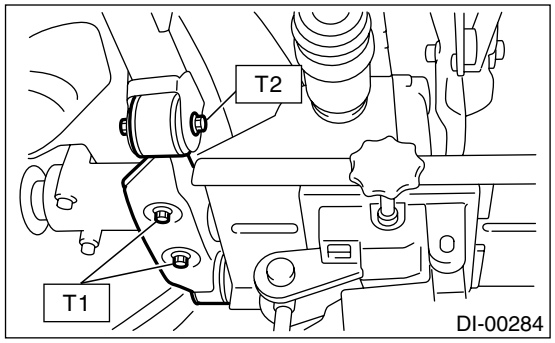


9) Temporarily tighten rear crossmember self-locking nuts.



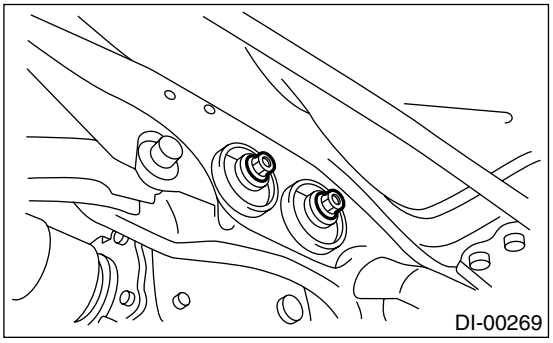
10) Remove band from rear differential. Raise rear differential just enough to move transmission jack away from it.
11) Install rear differential front member.

Tightening torque:
T1: 65 N·m (6.6 kgf-m, 48 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



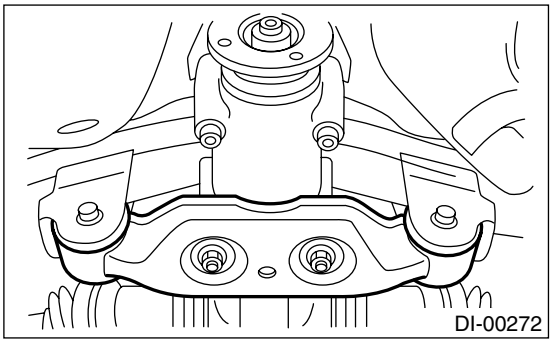
12) Tighten self-locking nuts.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)



13) Tighten protector nut.

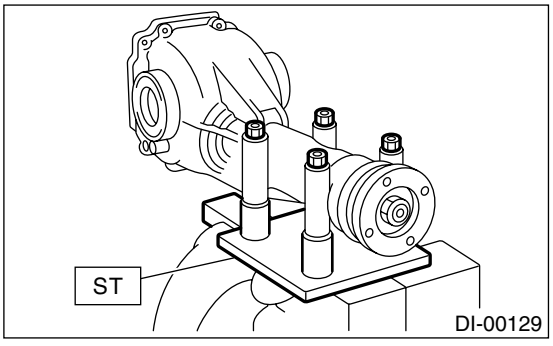
Tightening torque:
65 N·m (6.6 kgf-m, 48.0 ft-lb)



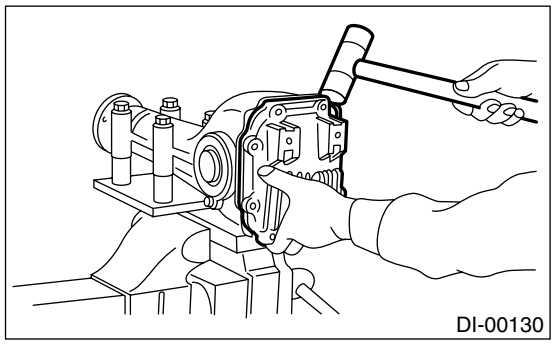
14) Take down transmission jack.
15) Install propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
16) Install heat shield cover.
17) Install rear exhaust pipe and muffler.

C: DISASSEMBLY

To detect real cause of trouble, inspect the following items before disassembling.
• Tooth contact of crown gear and pinion, and backlash
• Runout of crown gear at its back surface
• Turning resistance of drive pinion
1) Set ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT

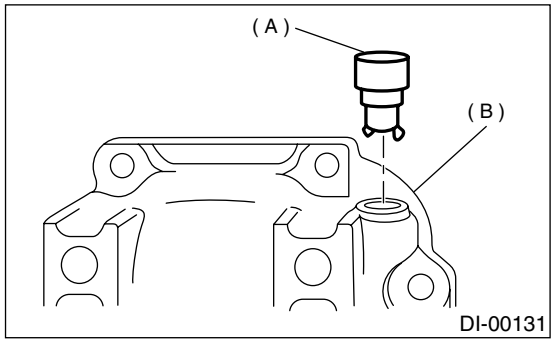


2) Drain gear oil by removing plug.
3) Remove rear cover by loosening retaining bolts.



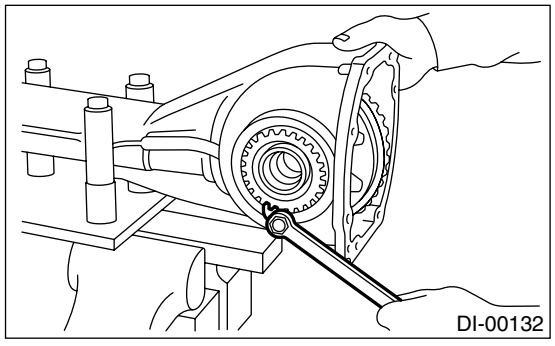
4) Replace air breather cap.

NOTE:
Do not attempt to replace the air breather cap unless necessary.

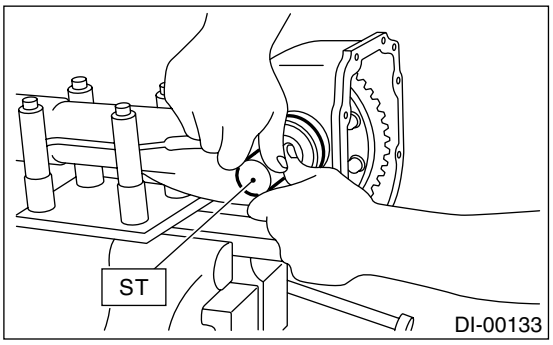


(A) Air breather cap
(B) Rear cover

5) Remove right and left lock plates.

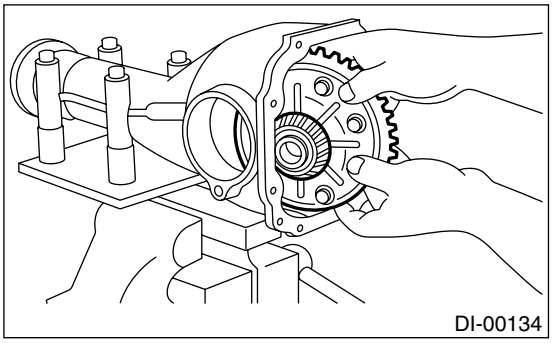


6) Remove right and left holders with ST.
ST 499785500 WRENCH

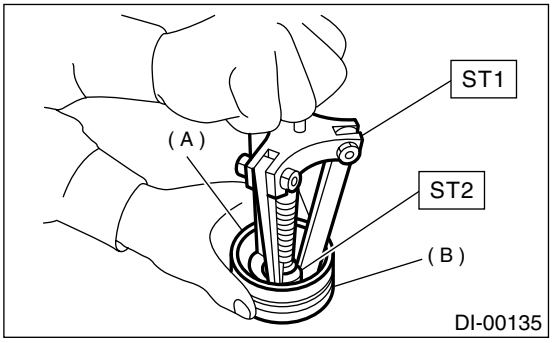


7) Pull out differential assembly from differential case.

NOTE:
Be careful not to hit the teeth against the case.

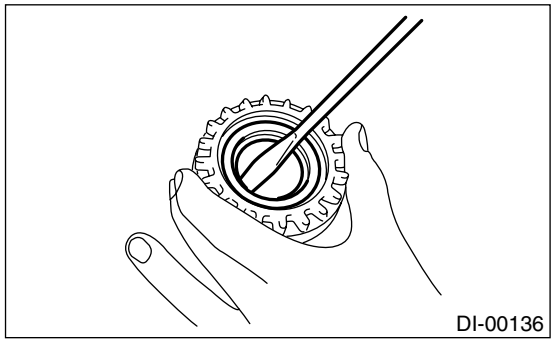


8) Remove bearing race from right and left holders with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Holder

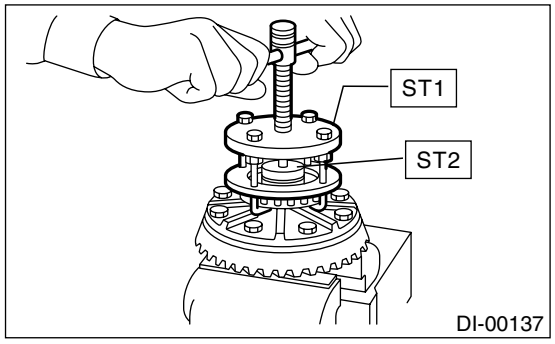
9) Remove oil seal from right and left holders with screwdriver.



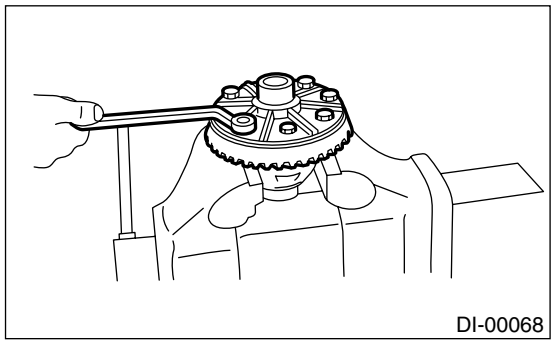
10) Extract bearing cone with ST1 and ST2.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set puller so that its claws catch the edge of the bearing cone.
• Never mix up the right and left hand bearing races and cones.

ST1 899524100 PULLER SET
ST2 399520105 SEAT



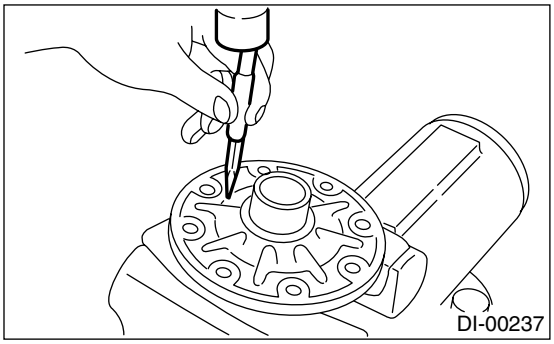
11) Remove crown gear by loosening crown gear bolts.



12) Drive out pinion shaft lock pin from crown gear side. (Without LSD)

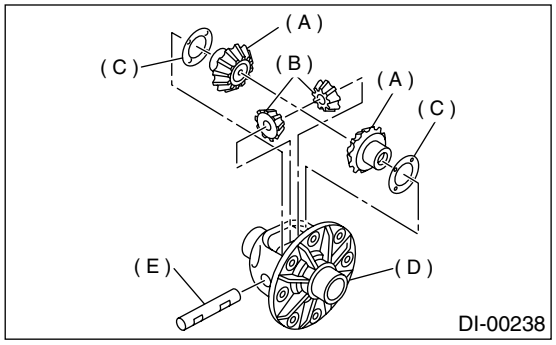
NOTE:
The lock pin is staked at the pin hole end on the differential case; do not drive it out forcibly before unstaking it.

ST 899904100 STRAIGHT PIN REMOVER



13) Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Without LSD)

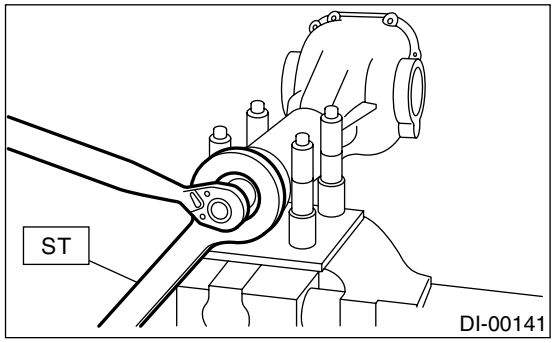
NOTE:
The gears as well as thrust washers should be marked or kept separated left and right, and front and rear.



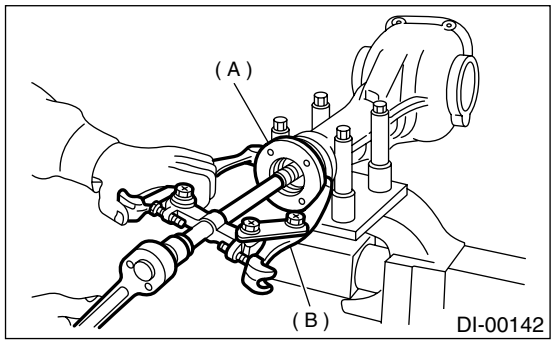
(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

14) Hold companion flange with ST and remove self-locking nut.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.

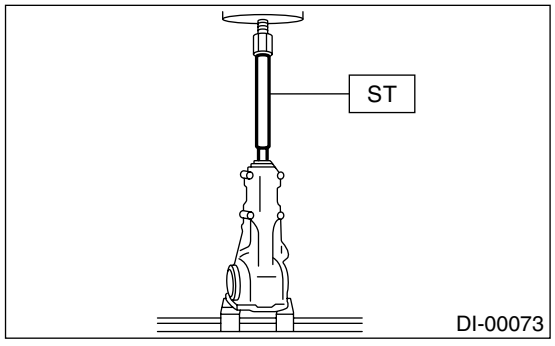


(A) Companion flange
(B) Puller

16) Press the end of drive pinion shaft and extract it together with rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.

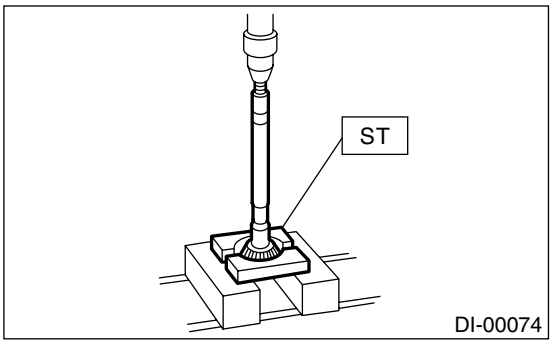
ST 398467700 DRIFT



17) Remove rear bearing cone from drive pinion by supporting cone with ST.

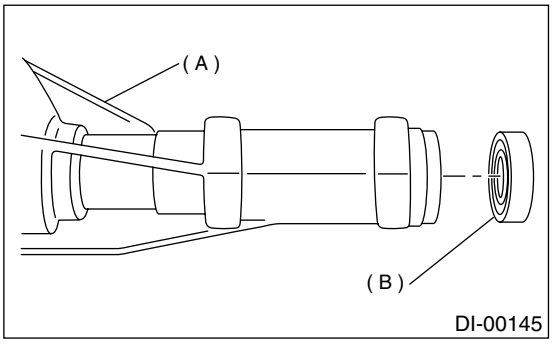
NOTE:
Place ST so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



18) Remove front oil seal from differential carrier using ST.

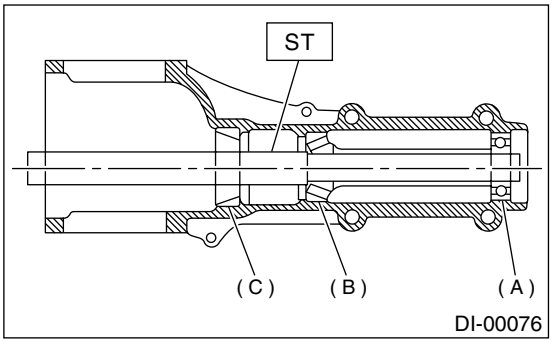
ST 398527700 PULLER ASSY



(A) Differential carrier
(B) Front oil seal

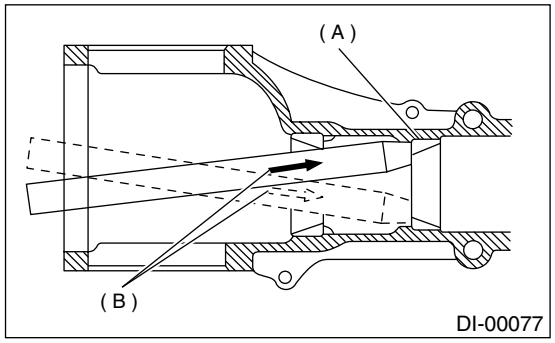
19) Remove pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT



(A) Pilot bearing
(B) Front bearing
(C) Rear bearing cup

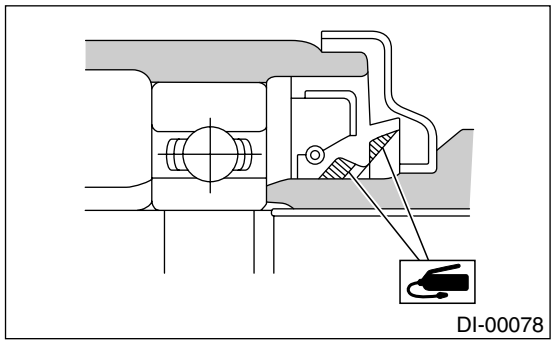
20) When replacing bearings, tap front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not misinstalled.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the right and left hand races of the bearings.
- Replace the oil seal with new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



- Use new O-ring and gasket.

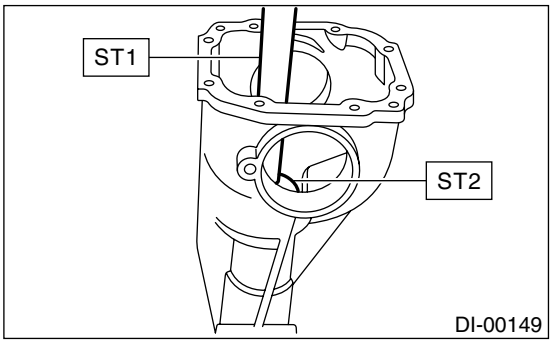
1) Adjust preload for front and rear bearings.
- Adjust the bearing preload with spacer and washer between front and rear bearings.
- Pinion height adjusting washer are not affected by this adjustment.
- The adjustment must be carried out without oil seal inserted.

(1) Press rear bearing race (rear) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477702 DRIFT

(2) Press front bearing race (front) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT



(3) Insert new front bearing cone.

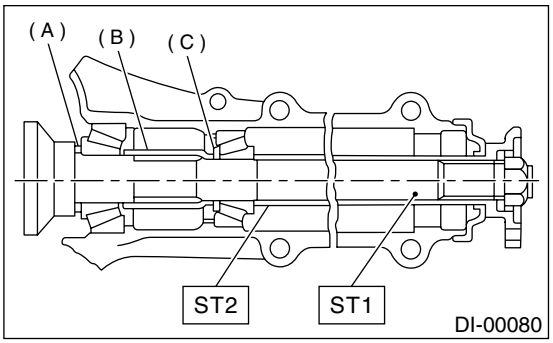
(4) Measure and record the thickness of pinion height adjusting washer.

NOTE:
The used washer can be used after checking that it is not deformed when the tooth contact of drive gear and driven gear is correct during pre-disassembly.

(5) Insert ST1 into case with pinion height adjusting shim and new rear bearing cone fitted onto it.

(6) Then install preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



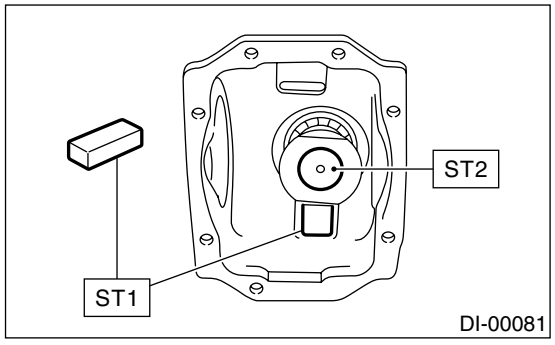
(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

(7) Turn ST1 with hand to make it seated, and tighten drive pinion nut while measuring the preload with spring balance. Select preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

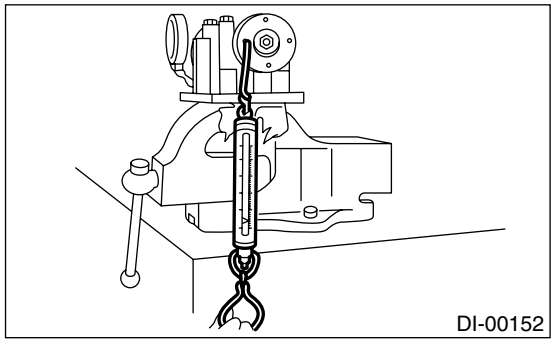
NOTE:
Use a new self-locking nut.
- Measure the preload in direction of tangent.
- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST2 with ST1 as shown in the figure.

ST1 398507704 BLOCK
ST2 498447150 DUMMY SHAFT

Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) at companion flange bolt hole



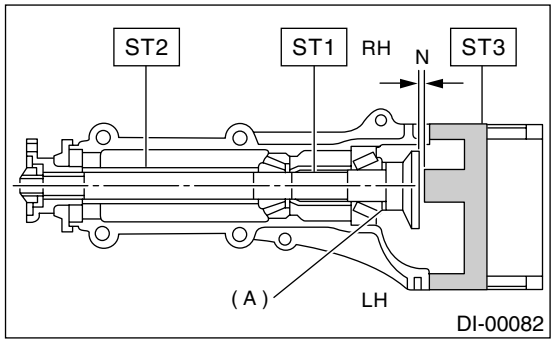
	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
	Part No.	Length mm (in)
Preload adjusting spacer	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

2) Adjusting drive pinion height

Adjust drive pinion height with shim installed between rear bearing cone and the back of pinion gear.

(1) Set ST3.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR
ST3 498505501 DIFFERENTIAL CARRIER GAUGE

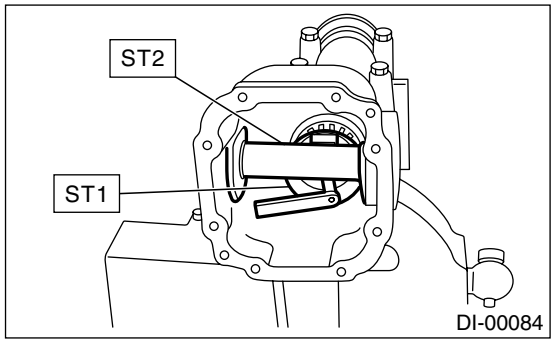


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST3 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST3.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed shim with this one.

NOTE:
Use 1 to 3 shims as required for adjustment.

T = To + N − 0.05 (mm)

where

T = Thickness of pinion height adjusting shim (mm)

To = Thickness of shim originally installed (mm)

N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

(Example of calculation)

To = 0.15 mm

N = 0.1 mm

T = 0.15 + 0.1 − 0.05 = 0.2 mm

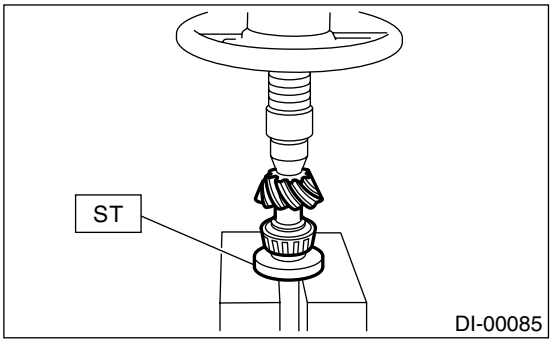
Result: Thickness = 0.2 mm

Therefore use the 32295AA220.

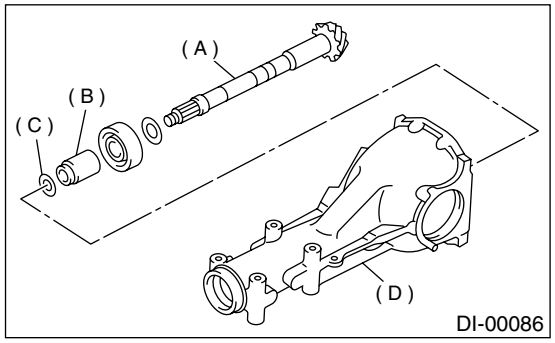
Pinion height adjusting shim	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER



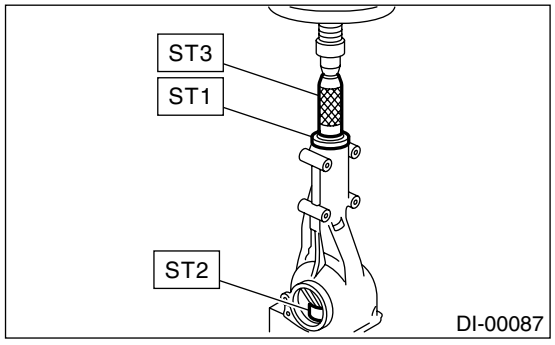
4) Insert drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

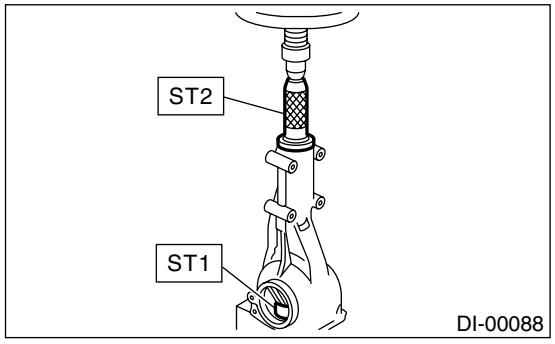
5) Press-fit front bearing cone into carrier with ST1, ST2 and ST3.

ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



6) Insert spacer, then press-fit pilot bearing with ST1 and ST2.

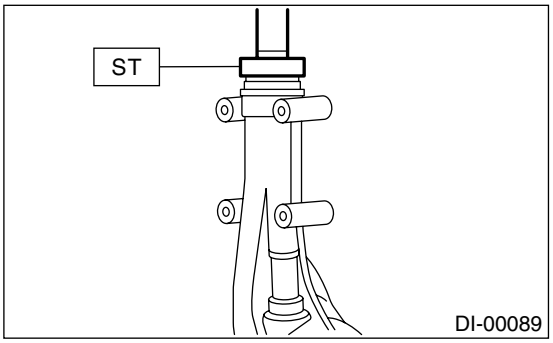
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

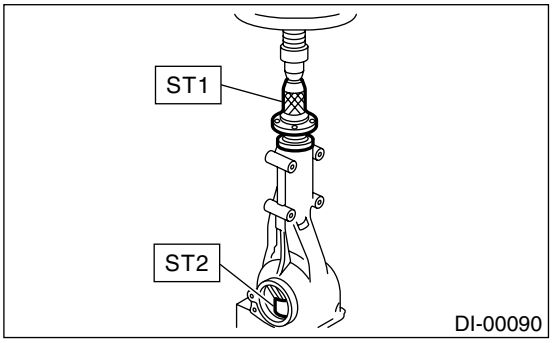
ST 498447120 OIL SEAL INSTALLER



8) Press-fit companion flange with ST1 and ST2.

NOTE:
Be careful not to damage bearing.

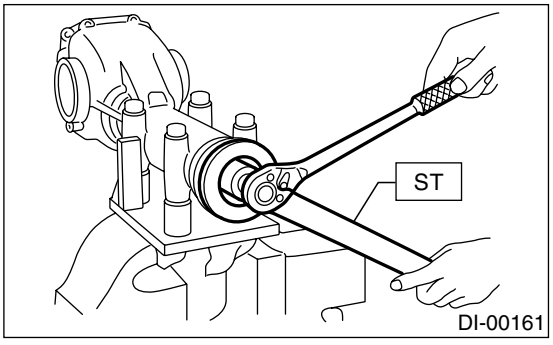
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install self-locking nut. Then tighten it with ST.

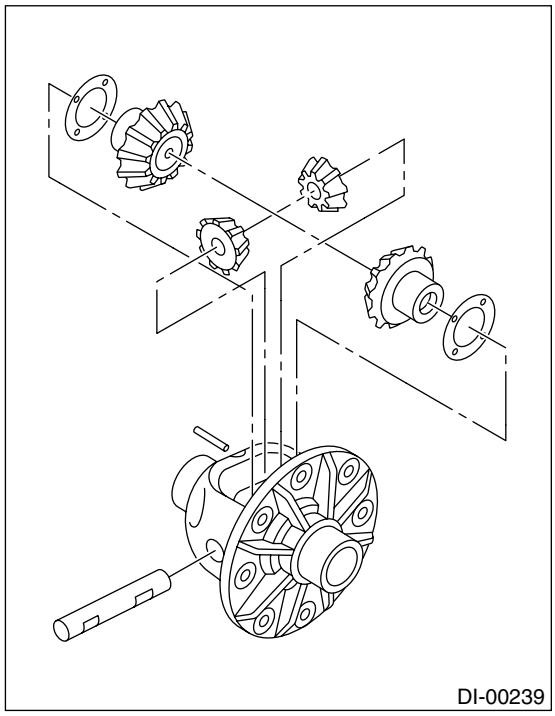
ST 398427200 FLANGE WRENCH

Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



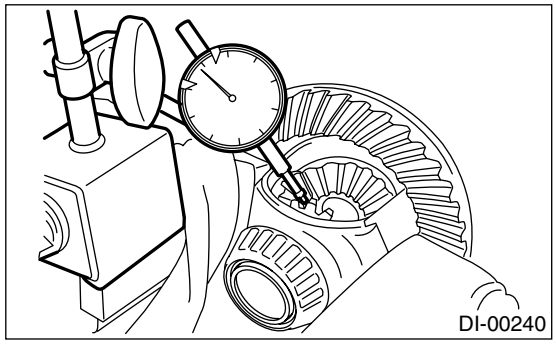
10) Assembling differential case (Without LSD)
Install side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

NOTE:
• Apply gear oil on both sides of the washer and on the side gear shaft before installing.
• Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear back clearance:
0.05 — 0.15 mm (0.0020 — 0.0059 in)



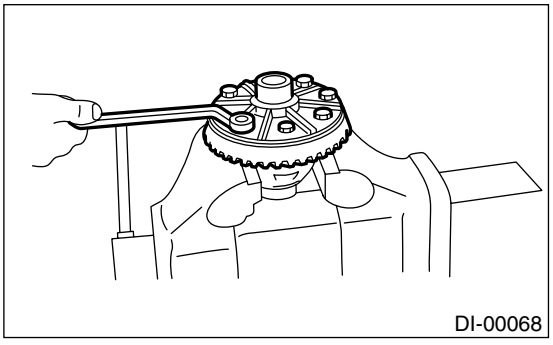
(2) Adjust the side gear backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)
803135012	0.950 — 0.975 (0.0374 — 0.0384)
803135013	0.975 — 1.000 (0.0384 — 0.0394)
803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135015	1.025 — 1.050 (0.0404 — 0.0413)

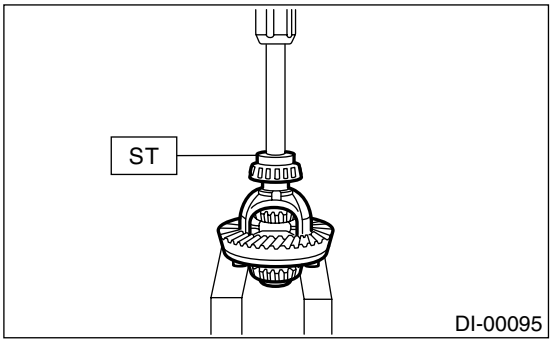
(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.
(4) After driving in pinion shaft lock pin, stake the both sides of the hole to prevent pin from falling off.
(5) Install crown gear on differential case.

NOTE:
Tighten diagonally while tapping the bolt heads.

Tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)

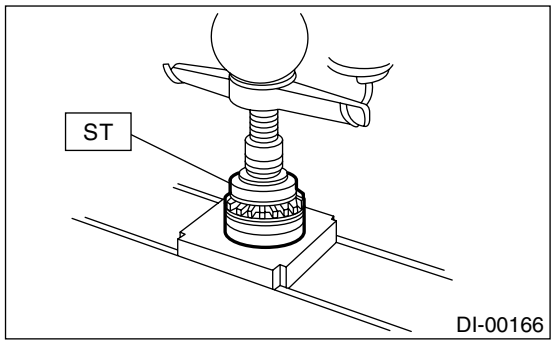

DI-00068

11) Press side bearing cone onto differential case with ST.
ST 498485400 DRIFT



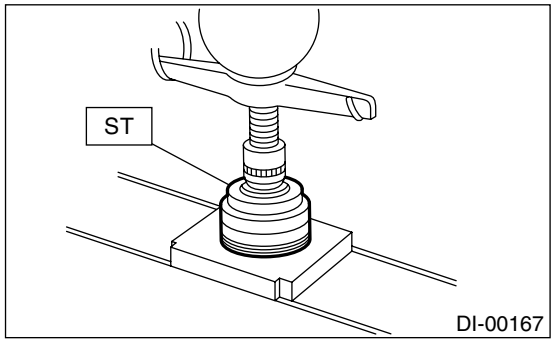
DI-00095

12) Assemble holders.
(1) Install oil seal into right and left holders.
ST 498447100 INSTALLER



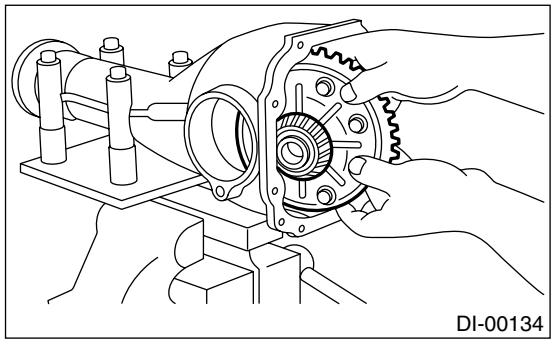
DI-00166

(2) Install bearing race into right and left holders.
ST 398477702 BEARING OUTER RACE DRIFT



DI-00167

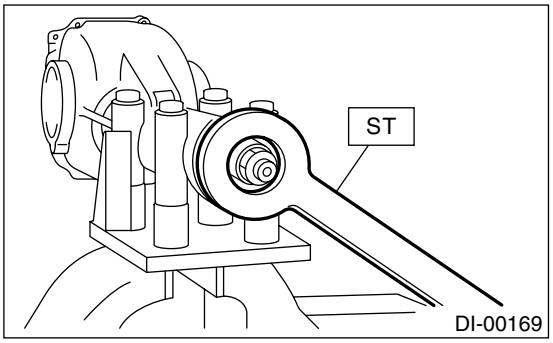
(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.


DI-00134

13) Perform adjustment of backlash of pinion crown gear set and adjustment of preload of differential side bearing.

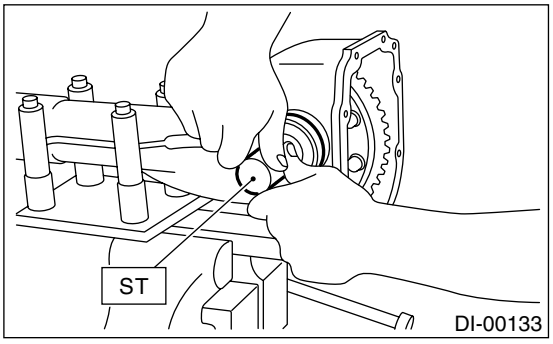
(1) Turn drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



(2) Screw in side (left-side) holder until light contact is made with ST.

ST 499785500 WRENCH



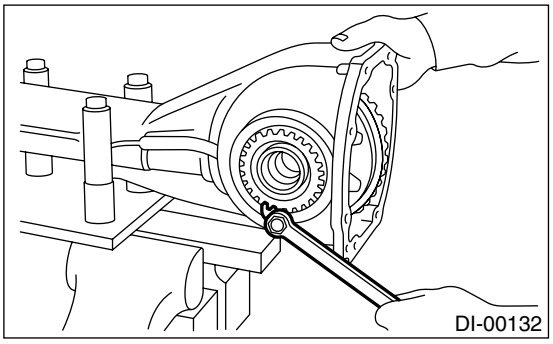
(3) Back off side (left-side) holder approximately 1 1/2 teeth of holder, and tighten left-side holder by approximately 2 teeth (approximately 1 1/2 + 1/2 teeth).

[Back off amount of side (left-side) holder + 1/2 tooth.]

This + 1/2 tooth gives preload.

(4) Temporarily tighten lock plate.

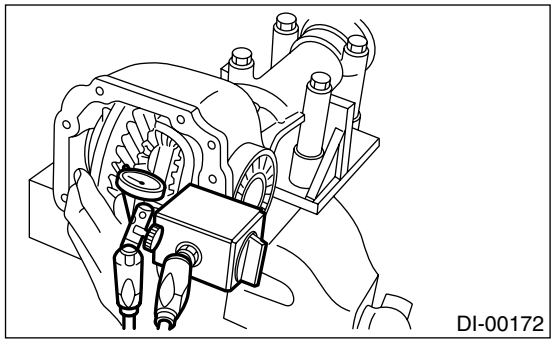
NOTE:
Turn over lock plate to displace holder 1/2 tooth.



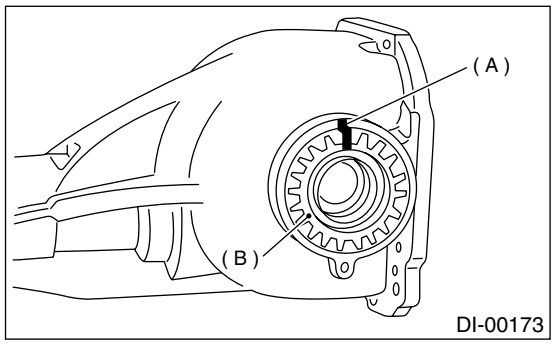
(5) Measure the crown gear-to-drive pinion backlash. Set magnet base on differential carrier. Align contact point of dial gauge with tooth face of crown gear, and move crown gear while holding drive pinion still. Read value indicated on dial gauge.

NOTE:
If measured backlash is not within specified range, repeat procedures for pinion crown gear set backlash adjustment and differential side bearing preload adjustment.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)



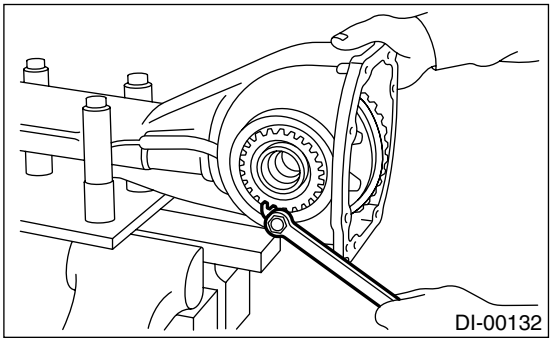
14) Draw a matching mark on both differential carrier and holder. Remove holder one side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Matching mark
(B) Holder

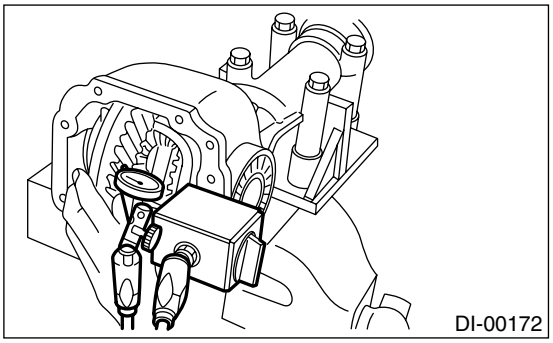
15) Tighten bolt of lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



16) Re-check crown gear-to-pinion backlash.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)



17) Checking and adjusting tooth contact of crown gear.

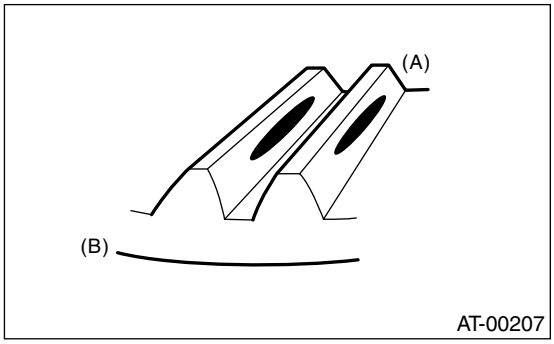
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

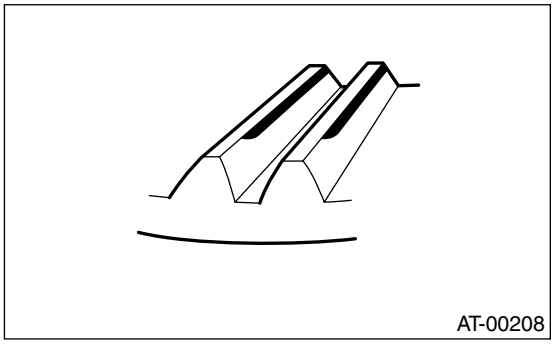
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



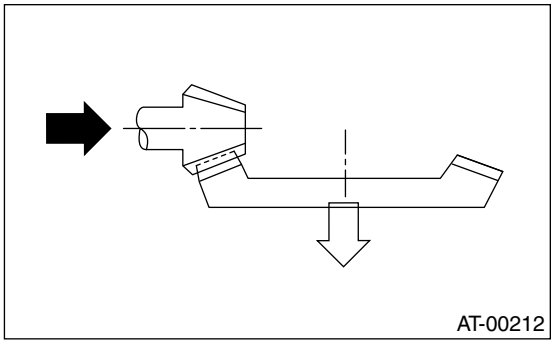
(A) Toe side
(B) Heel side

- Face contact

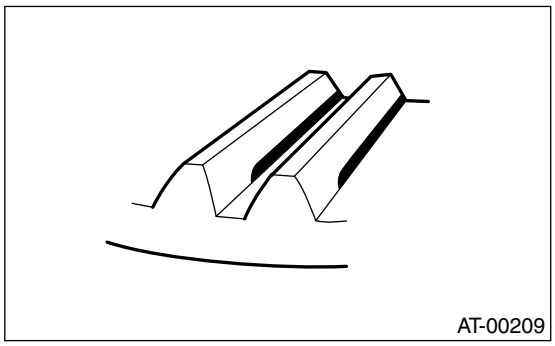
Checking item: Backlash is too large.
Contact pattern



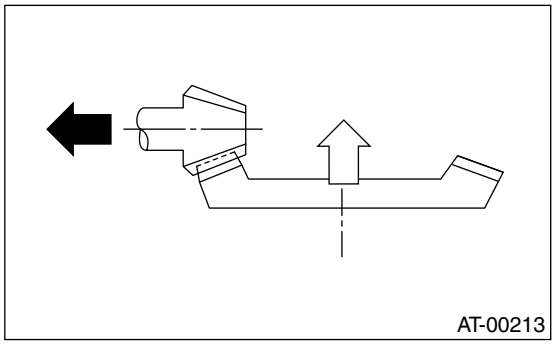
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



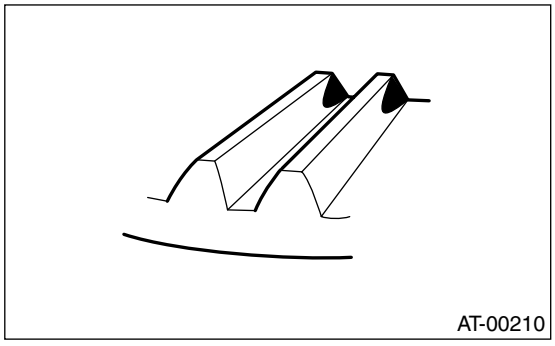
• Flank contact
Checking item: Backlash is too small.
Contact pattern



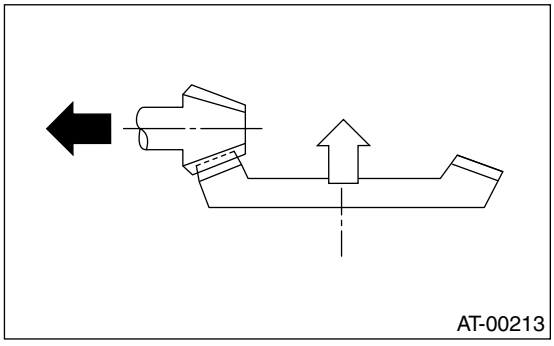
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



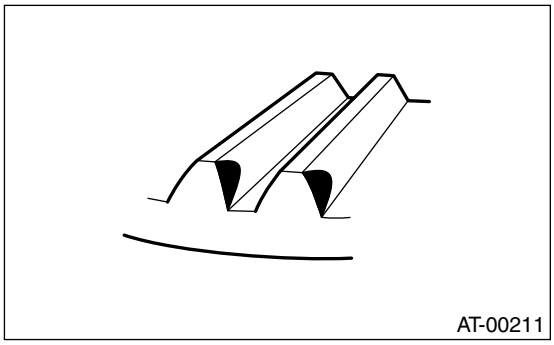
• Toe contact (Inside end contact)
Checking item: Contact area is small.
Contact pattern



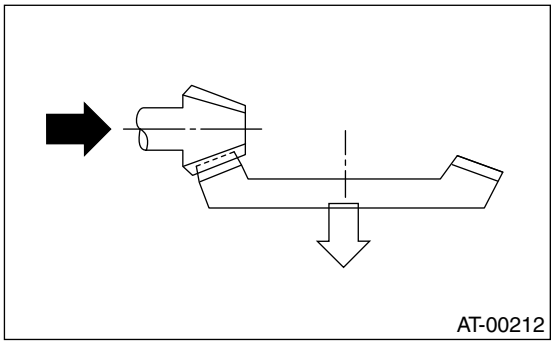
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



• Heel contact (Outside end contact)
Checking item: Contact area is small.
Contact pattern



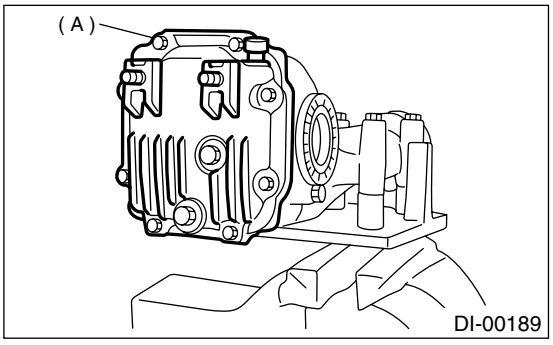
Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.
19) Install new gasket and rear cover, and tighten bolts to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Rear cover

E: INSPECTION

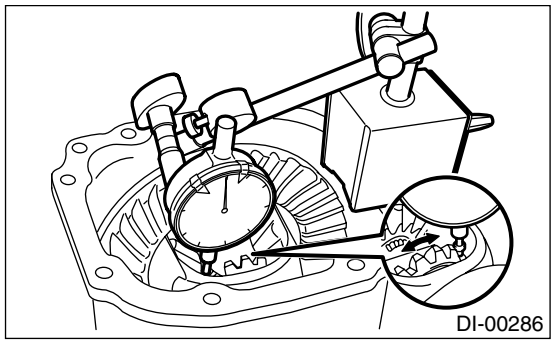
Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.
1) Crown gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
2) Side gear and pinion mate gear
• Replace if crack, score, or other defects are evident on tooth surface.
• Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.
3) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.
4) Thrust washers of side gear and pinion mate gear
Replace if seizure, flaw, abnormal wear or other defect is evident.
5) Oil seal
Replace if deformed or damaged, and at every disassembling.
6) Differential carrier
Replace if the bearing bores are worn or damaged.
7) Differential case
Replace if its sliding surfaces are worn or cracked.
8) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

Side gear backlash:
0.05 — 0.15 mm (0.0020 — 0.0059 in)

If side gear backlash is not within the specification, adjust clearance as specified by selecting side gear trust washer.

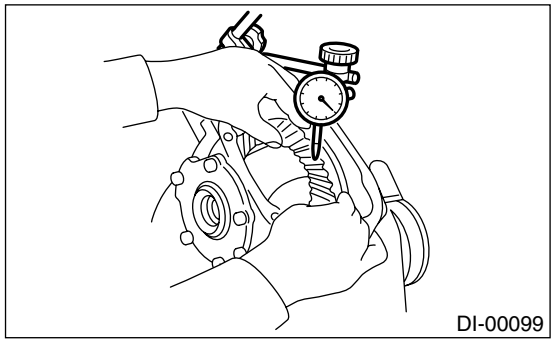


2. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

If crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Inspect tooth contact between crown gear and drive pinion.
<Ref. to DI-48, ASSEMBLY, Rear Differential for VA-type.>

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust side gear backlash.
<Ref. to DI-48, ASSEMBLY, Rear Differential for VA-type.>

2. CROWN GEAR BACKLASH

Adjust crown gear backlash.
<Ref. to DI-48, ASSEMBLY, Rear Differential for VA-type.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear.
<Ref. to DI-48, ASSEMBLY, Rear Differential for VA-type.>

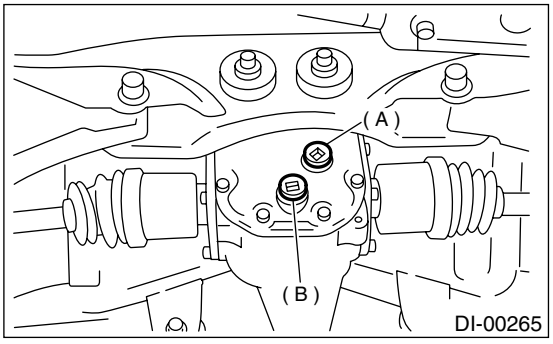
6. Rear Differential Front Oil Seal

A: INSPECTION

Check front oil seal portion for oil leakage, if any leak is found, replace the oil seal and inspect propeller shaft.

B: REPLACEMENT

1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Remove oil drain plug, and drain gear oil.



(A) Filler plug
(B) Drain plug

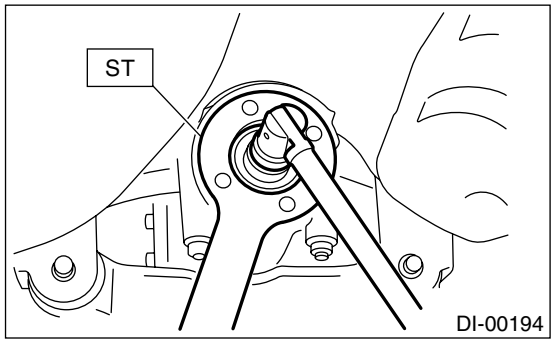
5) Install oil drain plug.

NOTE:
- Apply fluid gasket to oil drain plug for T-type.
- VA-type uses a new aluminum gasket.

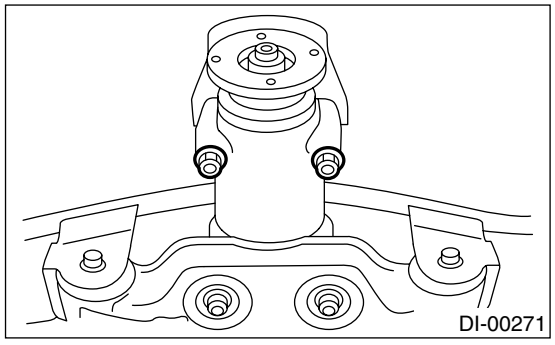
Fluid packing:
THREE BOND 1105 (Part No.:004403010) or equivalent

Tightening torque:
T-type;
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type;
34 N·m (3.5 kgf-m, 25.3 ft-lb)

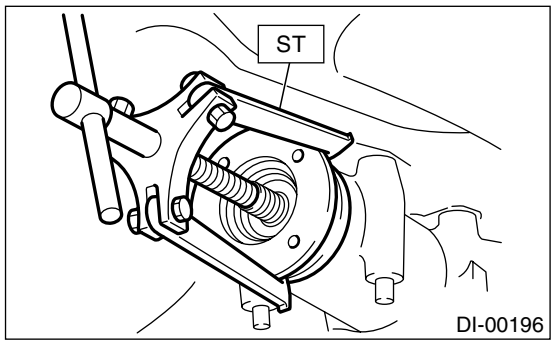
6) Jack-up rear wheels and support the vehicle body with sturdy racks.
7) Remove rear exhaust pipe and muffler.
8) Remove propeller shaft from body. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
9) Remove self-locking nut while holding companion flange with ST.
ST 498427200 FLANGE WRENCH



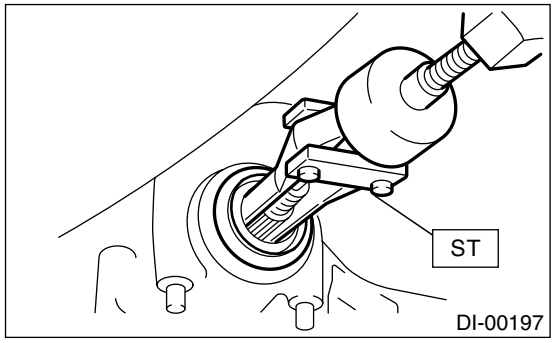
10) Remove protector nuts.



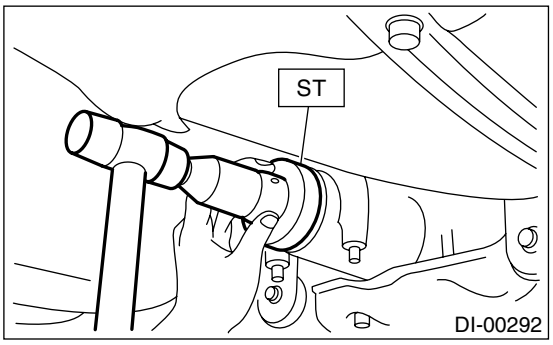
11) Extract companion flange using ST.
ST 399703600 PULLER ASSY



12) Remove oil seal using ST.
ST 398527700 PULLER ASSY



13) Fit a new oil seal using ST.
ST 498447120 OIL SEAL INSTALLER

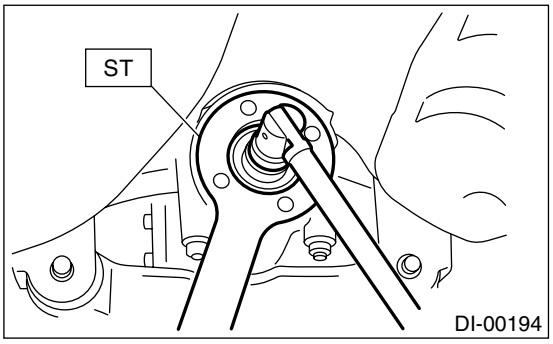


14) Install companion flange.

NOTE:
Use a plastic hammer to install companion flange.

15) Tighten new self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.
ST 498427200 FLANGE WRENCH

Tightening torque:
T-type
181 N·m (18.5 kgf-m, 134 ft-lb)
VA-type
191 N·m (19.5 kgf-m, 141 ft-lb)

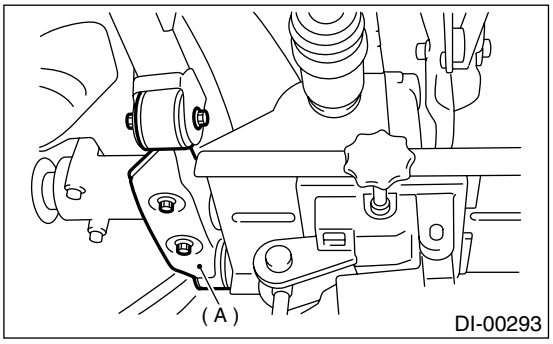


16) Reassembling procedure hereafter is the reverse of the disassembling.

7. Rear Differential Front Member

A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up the vehicle.
3) Using a transmission jack, support rear differential, and remove rear differential front member.

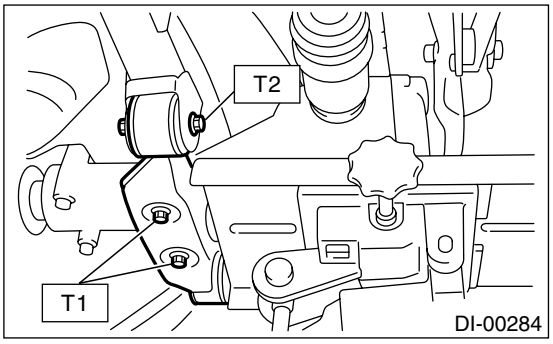


(A) Rear differential front member

B: INSTALLATION

1) Install rear differential front member.

Tightening torque:
T1: 65 N·m (6.6 kgf-m, 48 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81 ft-lb)



C: INSPECTION

1) Check rear differential front member for damage, bend, or corrosion.
If damage, bend, or corrosion is excessive, replace rear differential front member.
2) Check bushings of rear differential front member for cracking, hardening, or damage.
If cracking, hardening, or damage is excessive, replace rear differential front member.

8. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
	Clogged or damaged air breather.	Clean, repair or replace.
	Loose bolts on side retainer, or incorrectly fitted O-ring.	Tighten bolts to specified torque. Replace O-ring.
	Loose rear cover attaching bolts or damaged gasket.	Tighten bolts to specified torque. Replace gasket and apply liquid packing.
	Loose oil filler or drain plug.	Retighten and apply liquid packing.
	Wear, damage or incorrectly fitting for side retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	Insufficient backlash for hypoid gear.	Readjust or replace.
	Excessive preload for side, rear, or front bearing.	Readjust or replace.
	Insufficient or improper oil used.	Replace seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	Improper backlash for hypoid gear.	Replace.
	Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	Excessive backlash for differential gear.	Replace gear or thrust washer.
	Loose bolts and nuts such as crown gear bolt.	Retighten.
	Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	Excessive backlash for hypoid gear.	Readjust.
	Excessive backlash for differential gear.	Replace gear or thrust washer.
	Insufficient preload for front or rear bearing.	Readjust.
	Loose drive pinion nut.	Tighten to specified torque.
	Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	Damaged differential gear.	Replace.
	Excessive wear or damage of thrust washer.	Replace.
	Broken pinion mate shaft.	Replace.
	Seized or damaged side bearing.	Replace.
6. Gear noises NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
	Improper backlash for hypoid gear.	Readjust.
	Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	Seized hypoid gear.	Replace hypoid gear set.
	Improper preload for front or rear bearings.	Readjust.
	Seized, scored, or chipped front or rear bearing.	Replace.
	Seized, scored, or chipped side bearing.	Replace.
	Vibrating differential carrier.	Replace.

TRANSFER CASE

TC

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3.	Transfer Clutch and Extension (4AT)	4
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1. General Description

A: NOTE

For general description, refer to “4AT” or “5MT” section.
4AT model: <Ref. to 4AT-2, General Description.>
5MT model: <Ref. to 5MT-2, General Description.>

2. Transfer Case and Extension (5MT)

A: NOTE

For removal, installation and inspection work, refer to “5MT” section.
5MT model: <Ref. to 5MT-43, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch and Extension (4AT)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-94, Transfer Clutch.>, <Ref. to 4AT-90, Extension Case.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to “4AT” or “5MT” section.
4AT model: <Ref. to 4AT-49, Extension Case Oil Seal.>
5MT model: <Ref. to 5MT-37, Oil Seal.>

5. Transfer Drive Gear (5MT)

A: NOTE

For removal, installation and inspection work, refer to “5MT” section.
5MT model: <Ref. to 5MT-47, Transfer Drive Gear.>

6. Transfer Driven Gear (5MT)

A: NOTE

For removal, installation and inspection work, refer to “5MT” section.
5MT model: <Ref. to 5MT-49, Transfer Driven Gear.>

7. Reduction Drive Gear (4AT without VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-104, Reduction Drive Gear.>

8. Reduction Drive Gear (4AT with VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-104, Reduction Drive Gear.>

9. Reduction Driven Gear (4AT without VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-102, Reduction Driven Gear.>

10.Reduction Driven Gear (4AT with VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-102, Reduction Driven Gear.>

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to “4AT” or “5MT” section.
4AT model: <Ref. to 4AT-106, Center Differential Carrier.>
5MT model: <Ref. to 5MT-51, Center Differential.>

12.Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to “4AT” section. <Ref. to 4AT-38, Transfer Clutch Pressure Test.>

13.Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-72, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DRIVE SHAFT SYSTEM

DS

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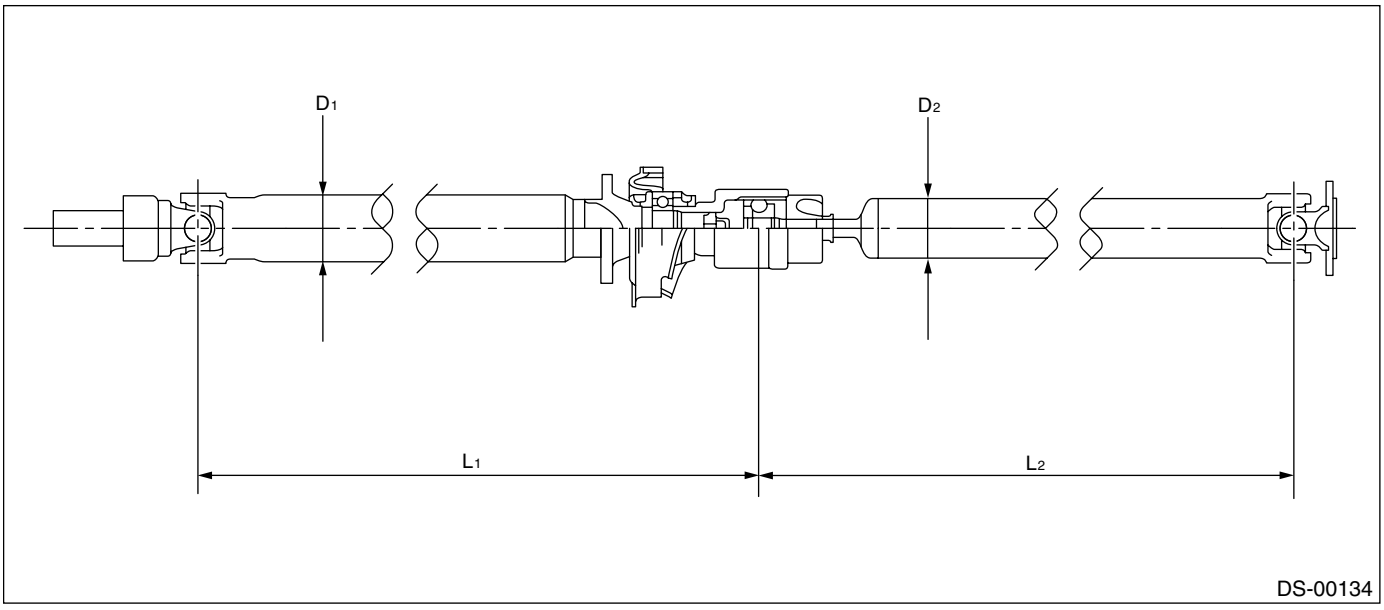
1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

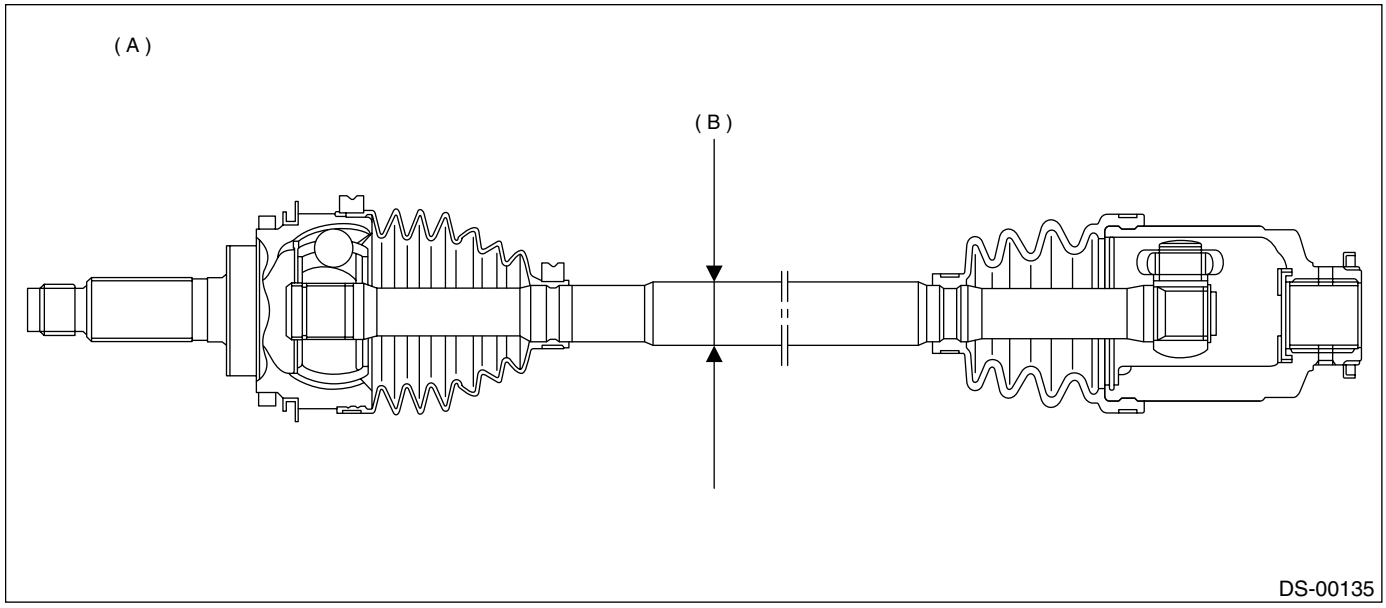
Propeller shaft type		DOJ type
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	629 (24.76)
	MT	688 (27.09)
Rear propeller shaft Joint-to-joint length: L_2 mm (in)	773 (30.43)	
Outside diameter of tube: mm (in)	D_1	63.5 (2.500)
	D_2	57.0 (2.244)



2. FRONT DRIVE SHAFT ASSEMBLY

• Non-TURBO model

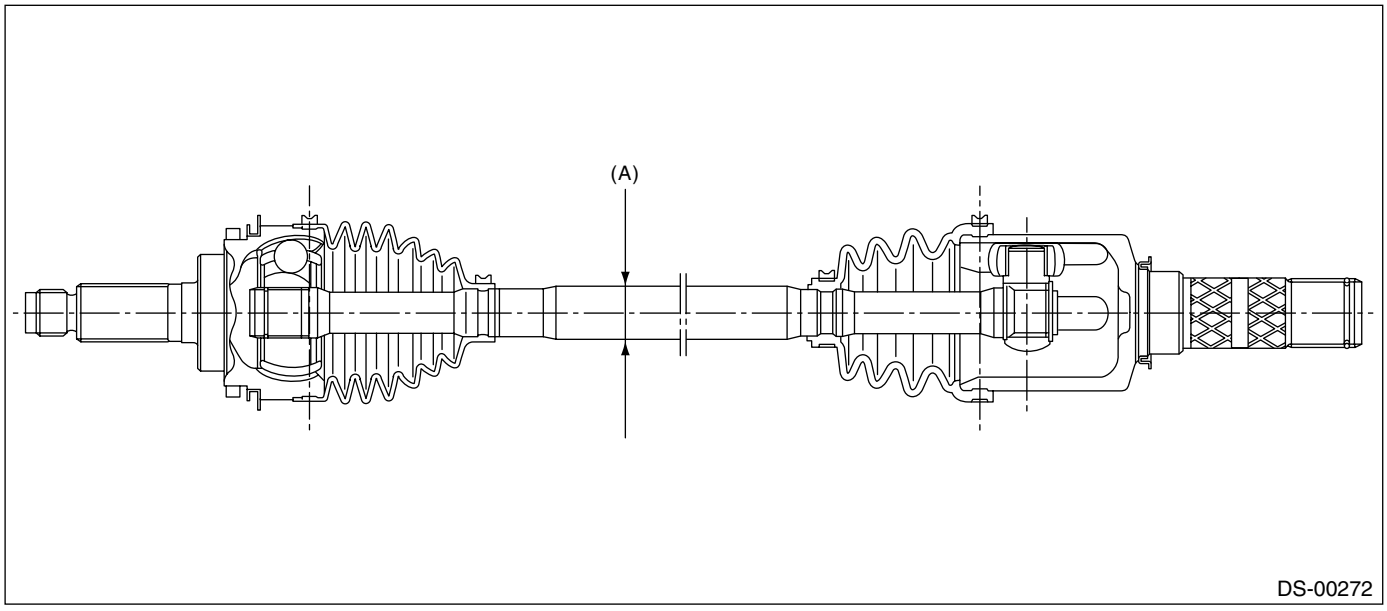
Size	ϕ mm (in)
BJ87+SFJ82	26 mm (1.02 in)



(A) BJ87+SFJ82
(B) Measuring point

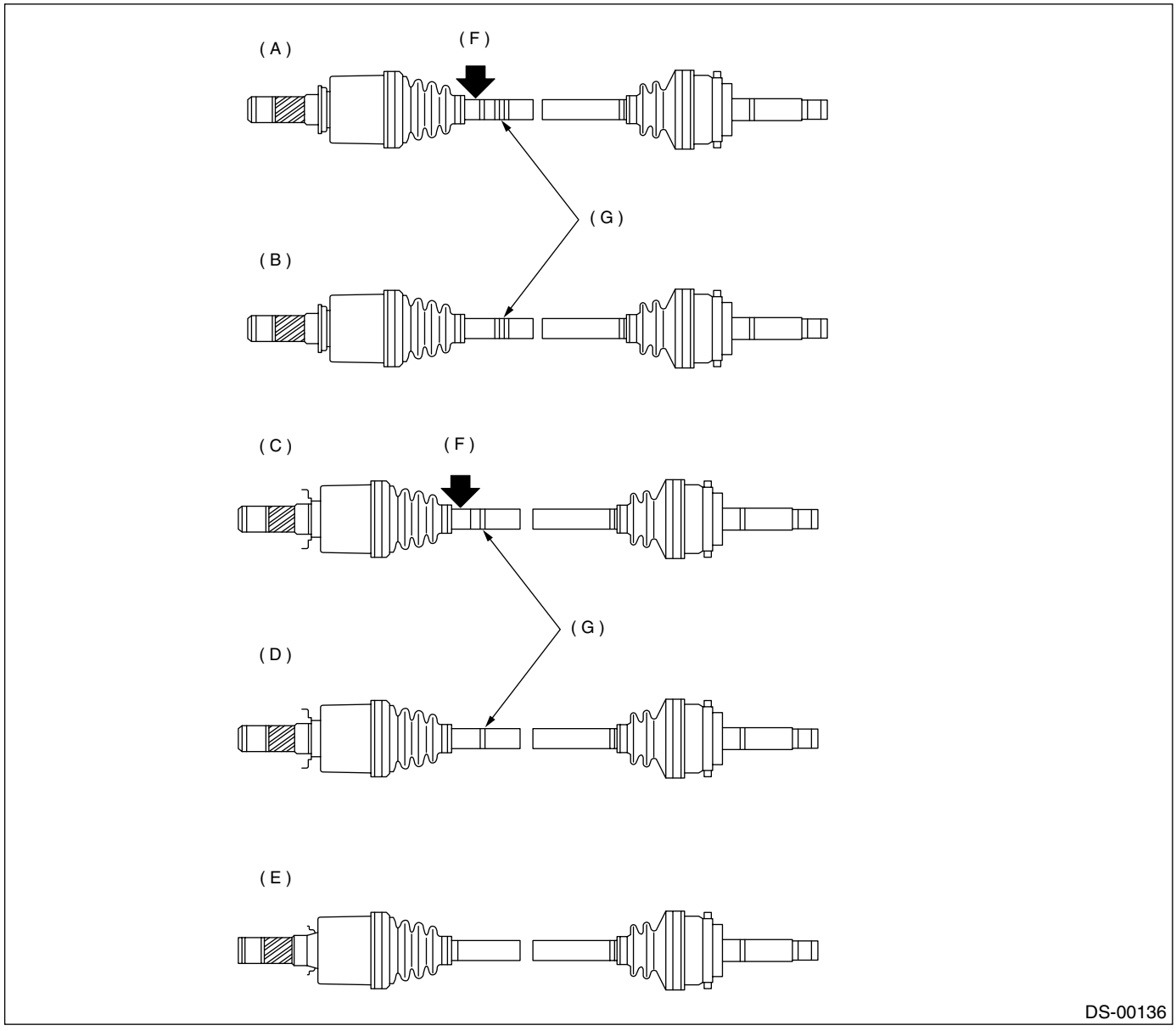
• TURBO model

Size	mm (in)	ϕ D mm (in)
AC2300/AAR2300i	513 (20.2)	24.9 (0.98)



3. REAR DRIVE SHAFT ASSEMBLY

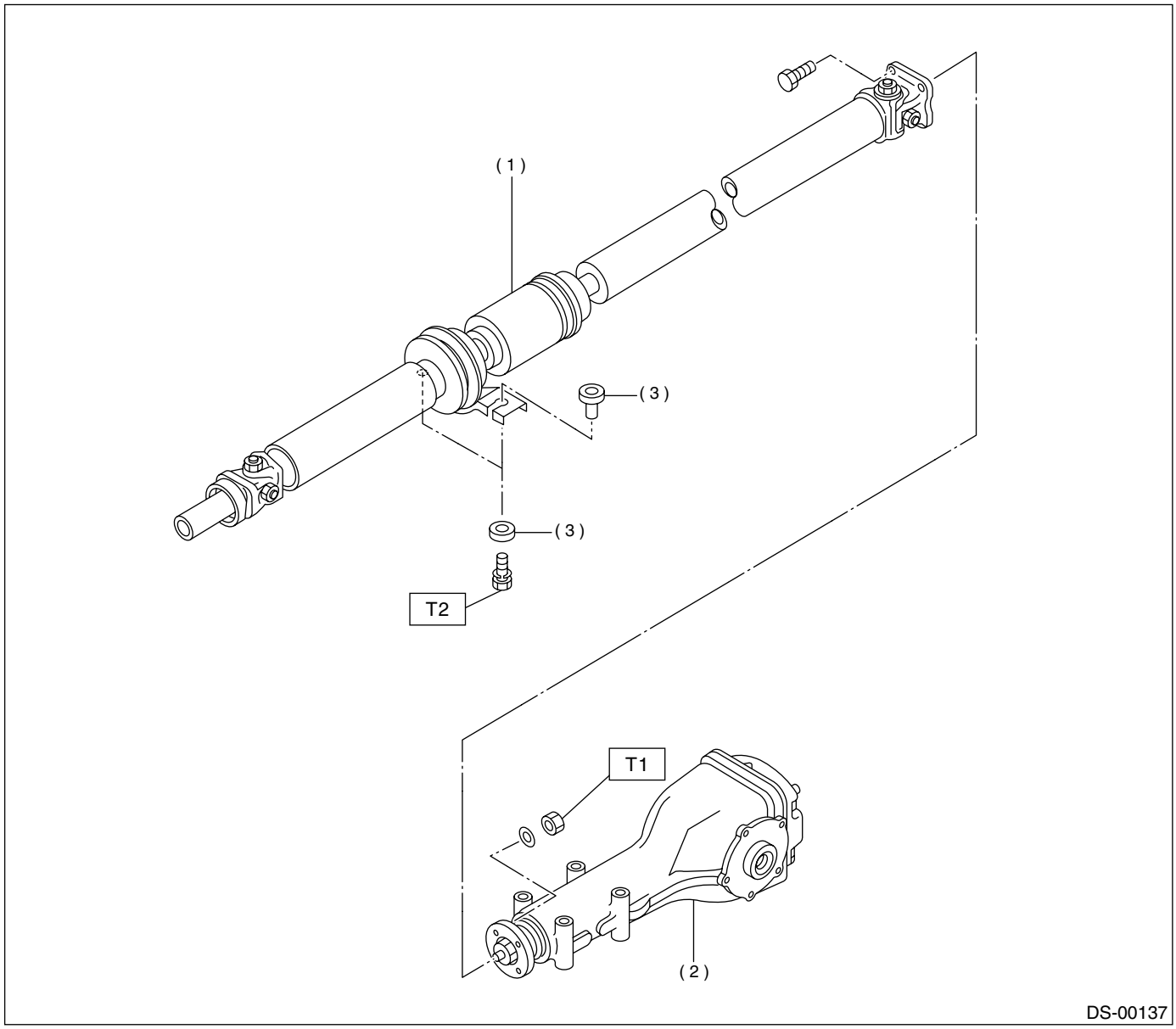
Type of axle shaft assembly	SHAFT
	No. of identification, protrusion on shaft
82AC-RH, 82AC-LH	2 (Two)
79AC-RH, 79AC-LH	1 (One)
79AC	None



(A) 82AC-RH
(B) 82AC-LH
(C) 79AC-RH
(D) 79AC-LH
(E) 79AC
(F) Indication mark of RH
(G) Identification protrusion

B: COMPONENT

1. PROPELLER SHAFT

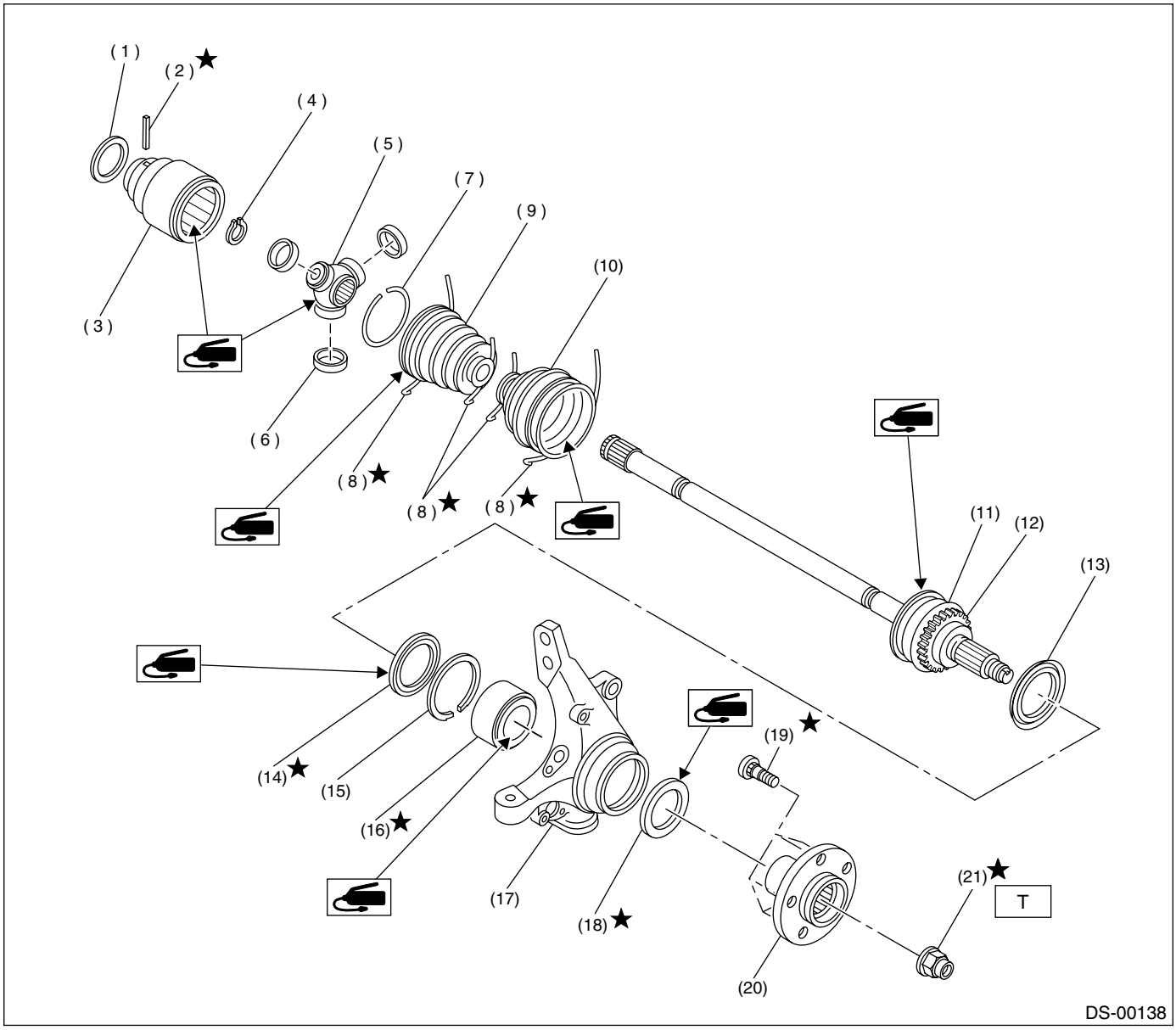


(1) Propeller shaft
(2) Rear differential
(3) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 31 (3.2, 23.1)
T2: 52 (5.3, 38.3)

2. FRONT AXEL

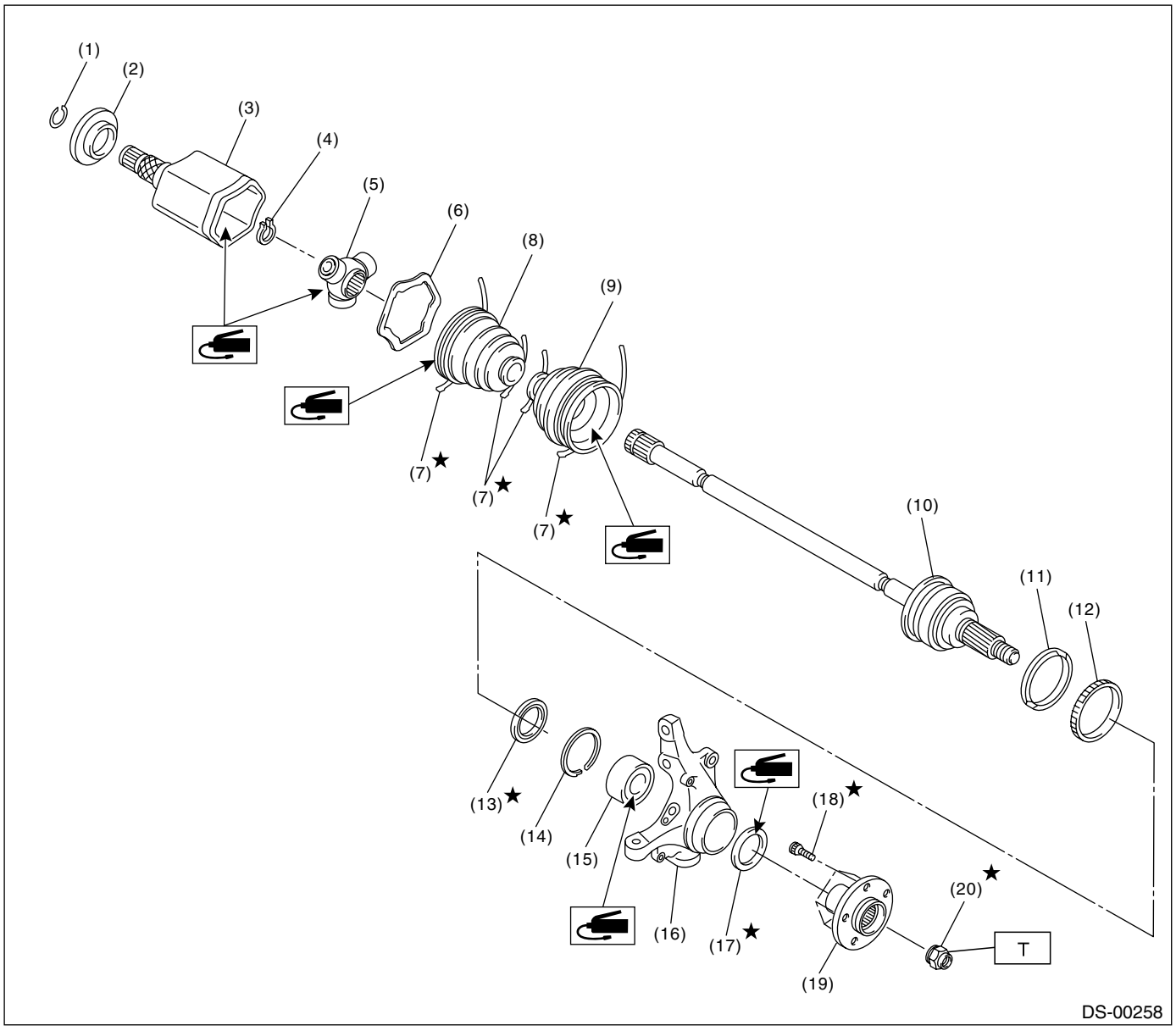
• Non-TURBO model



(1) Baffle plate (SFJ)
(2) Spring pin
(3) Outer race (SFJ)
(4) Snap ring
(5) Trunnion
(6) Free ring
(7) Circlip
(8) Boot band
(9) Boot (SFJ)
(10) Boot (BJ)
(11) BJ ASSY
(12) Tone wheel
(13) Baffle plate
(14) Oil seal (IN)
(15) Snap ring
(16) Bearing
(17) Housing
(18) Oil seal (OUT)
(19) Hub bolt
(20) Hub
(21) Axle nut (Olive color)

Tightening torque: N·m (kgf-m, ft-lb)
T: 216 (22, 159)

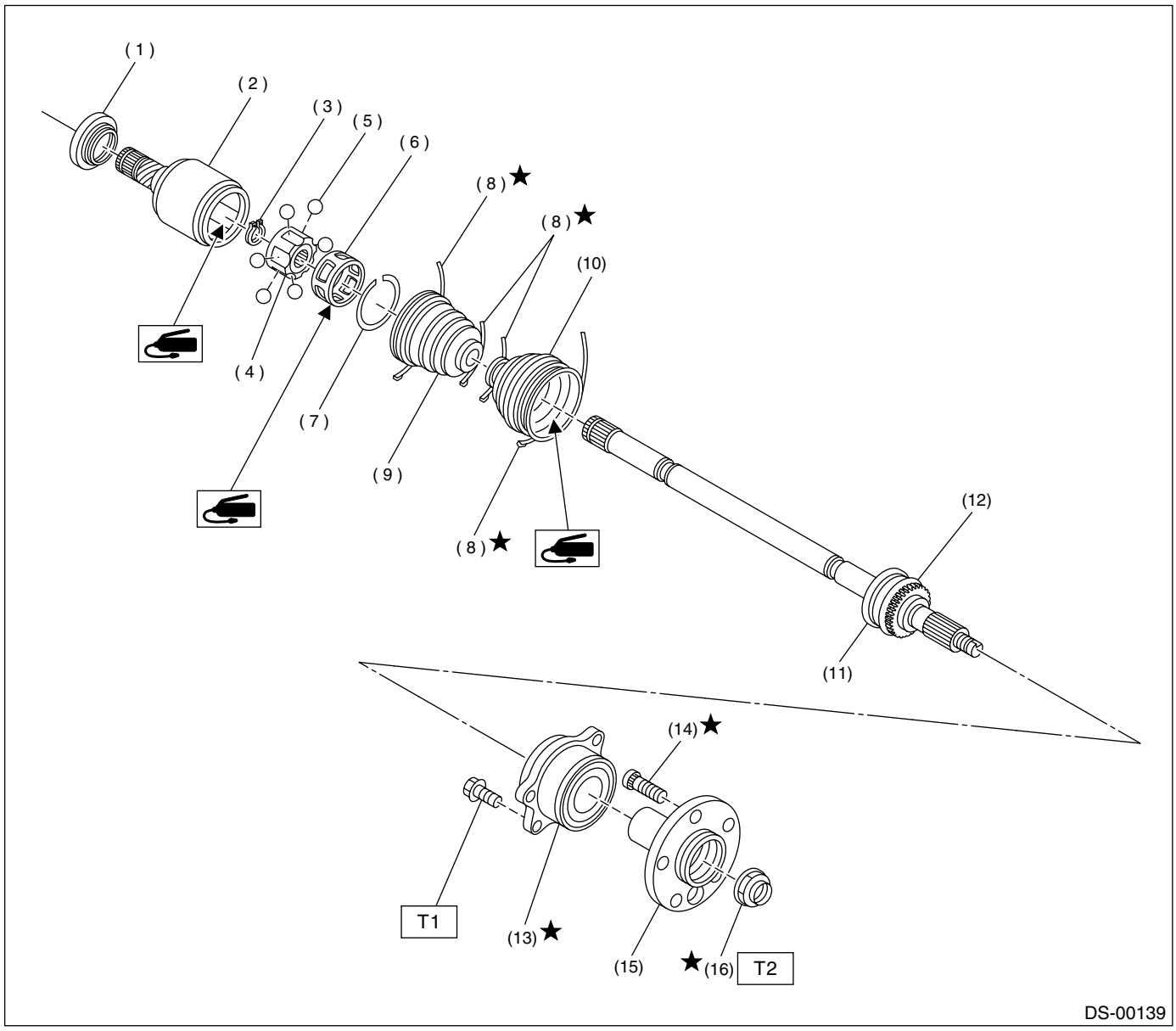
• TURBO model



(1) Spring pin
(2) Baffle plate (AAR)
(3) Outer race (AAR)
(4) Snap ring
(5) Trunnion
(6) Retainer
(7) Boot band
(8) Boot (AAR)
(9) Boot (AC)
(10) AC ASSY
(11) Tone wheel
(12) Baffle plate
(13) Oil seal (IN)
(14) Snap ring
(15) Bearing
(16) Housing
(17) Oil seal (OUT)
(18) Hub bolt
(19) Hub
(20) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 216 (22, 159)

3. REAR AXLE



(1) Baffle plate (DOJ)
(2) Outer race (DOJ)
(3) Snap ring
(4) Inner race
(5) Ball
(6) Cage
(7) Circlip
(8) Boot band
(9) Boot (DOJ)
(10) Boot (BJ)
(11) BJ ASSY
(12) Tone wheel
(13) Hub unit bearing
(14) Hub bolt
(15) Hub
(16) Axle nut (Olive color)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 66 (6.7, 48.5)
T2: 235 (24, 174)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

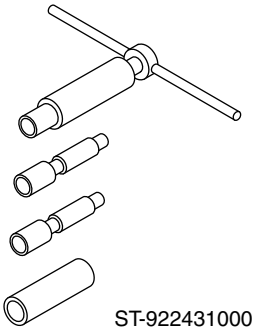
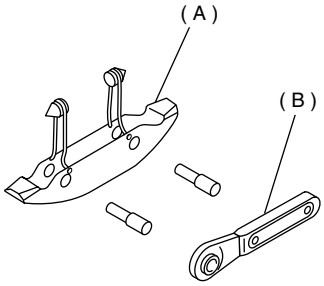
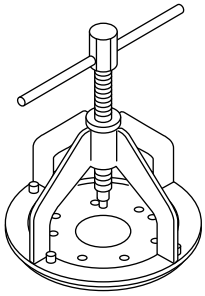
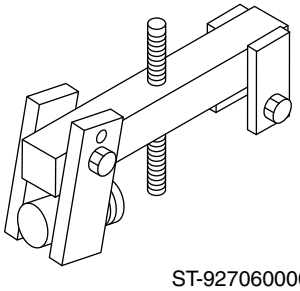
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	• Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST-927060000	927060000	HUB REMOVER	• Used for removing front hub. • Used with HUB STAND (927080000).

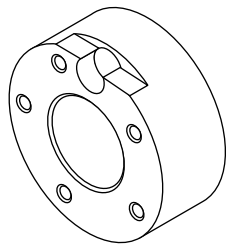
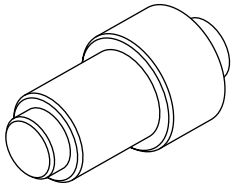
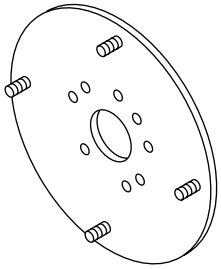
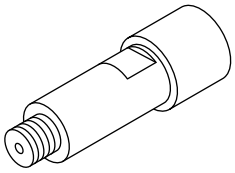
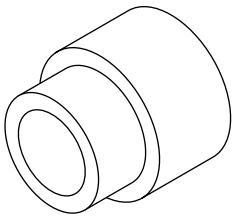
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 ST-927140000	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).
 ST-927390000	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).

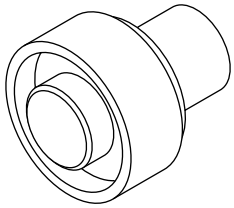
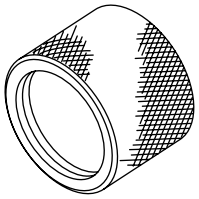
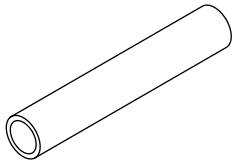
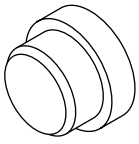
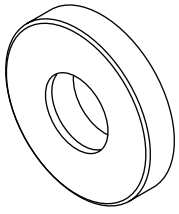
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST-398507703	398507703	DUMMY COLLAR	Used for removing hub ASSY from hub unit.
 ST-399520105	399520105	SEAT	Used for removing inner race from hub ASSY.
 ST28499AE000	28499AE000	BEARING SPACER	Used for installing hub unit into hub ASSY.

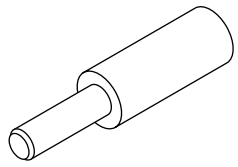
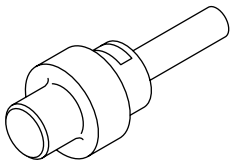
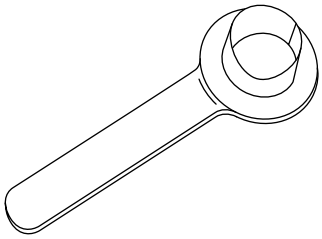
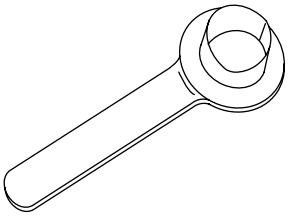
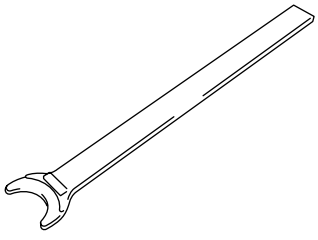
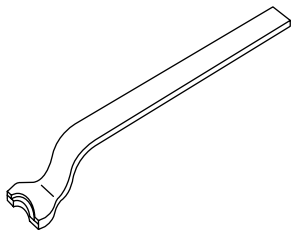
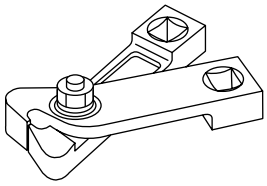
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927120000	927120000	HUB INSTALLER	Used for installing hub.
 ST-927450000	927450000	HUB INSTALLER	• Used for installing hub unit into hub ASSY. • Used with BEARING SPACER (28499AE000) and HUB STAND (927080000).
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting oil seal.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28399SA000	28399SA000	DRIVE SHAFT REMOVER	Used for removing front drive shaft from front differential.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.

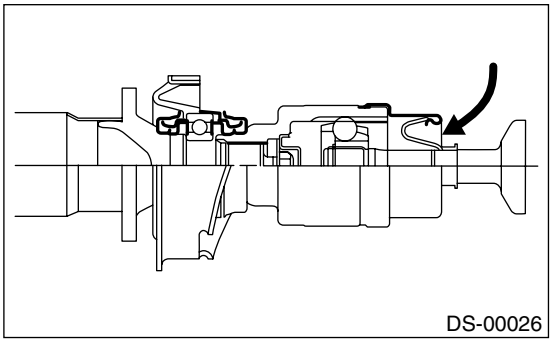
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Puller	Used for removing ball joint from knuckle arm.
Dial Gauge	Used for inspecting propeller shaft run-out.
Snap Ring Pliers	Used for installing and removing snap ring.

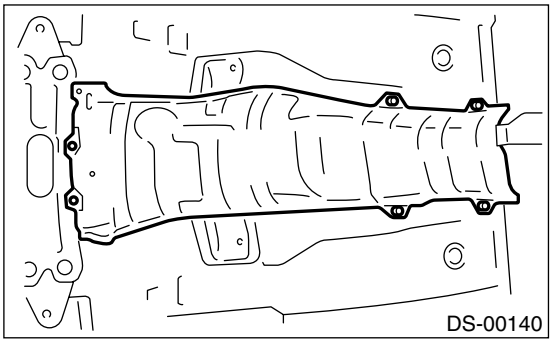
2. Propeller Shaft

A: REMOVAL

NOTE:
• Before removing propeller shaft, wrap metal parts with a cloth or rubber material.
• In case of DOJ type, before removing propeller shaft, wrap metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the DOJ during removal.



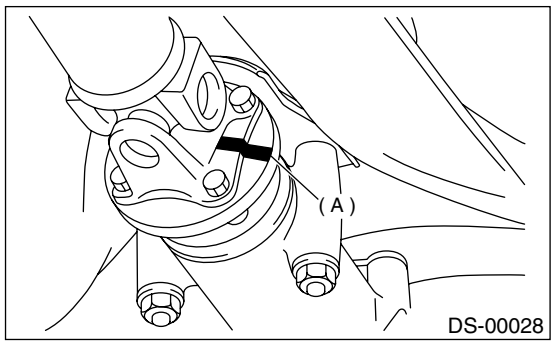
1) Disconnect ground cable from battery.
2) Move select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up vehicle and support it with safety stands.
5) Remove center exhaust pipes.
6) Remove rear exhaust pipe and muffler.
7) Remove heat shield cover.



8) Put matching marks on propeller shaft and rear differential.

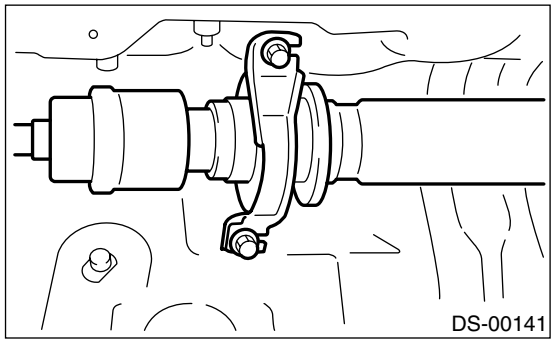
9) Remove the four bolts which hold propeller shaft to rear differential.

NOTE:
Remove all but one bolt.



(A) Matching mark

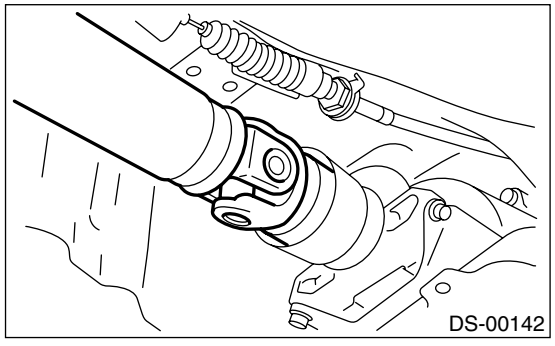
10) Remove the two bolts which hold center bearing to vehicle body.



11) Remove propeller shaft from transmission.

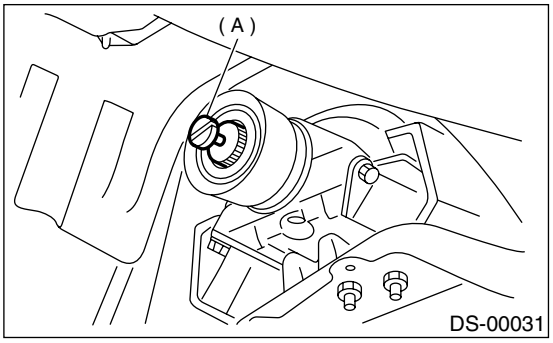
CAUTION:
Be careful not to damage oil seals and the mating surface of sleeve yoke.

NOTE:
• Be sure to use an empty oil can to catch oil flowing out when removing propeller shaft.
• Be sure to plug the opening in transmission after removal of propeller shaft.



12) Install the extension cap to transmission.

NOTE:
If extension cap is not available, cover the opening with a vinyl etc. and hold it with tape or code. Be careful not to spill gear oil or ATF leakage on the floor.

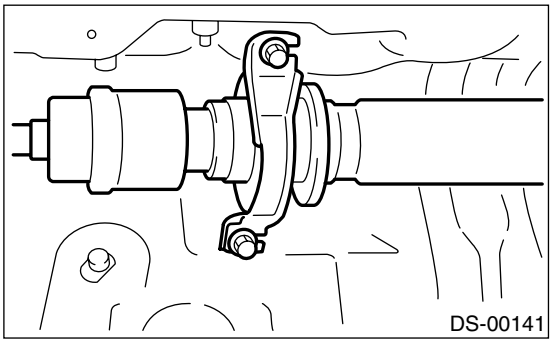


(A) Extension cap

B: INSTALLATION

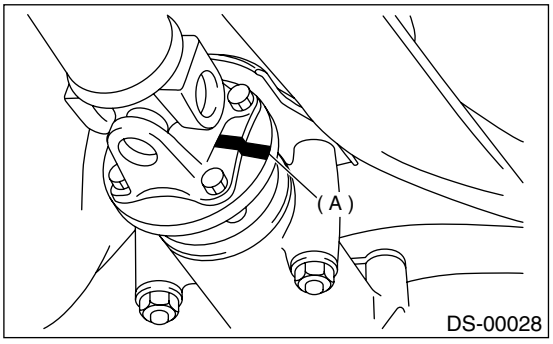
1) Insert sleeve yoke into transmission and attach center bearing to vehicle body.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align matching marks and connect flange yoke and rear differential.

Tightening torque:
31 N·m (3.2 kgf-m, 23.1 ft-lb)



(A) Matching mark

3) Install heat shield cover.
4) Install center exhaust pipes.
5) Install rear exhaust pipe and muffler.

C: INSPECTION

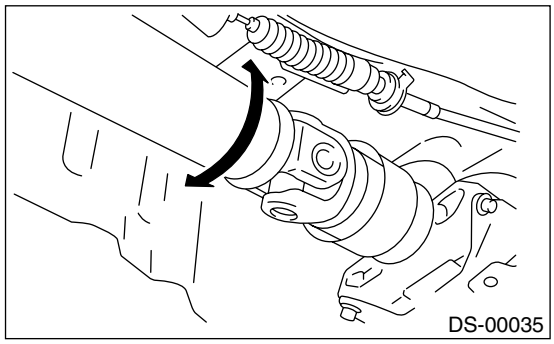
NOTE:
Do not disassemble propeller shaft. Check the following and replace if defective.
1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or abnormal noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

1) Remove center exhaust pipes.
2) Remove heat shield cover.
3) Check for any looseness of yoke flange connecting bolts and center bearing retaining bolts.

2. SPLINES AND BEARING LOCATIONS

1) Remove center exhaust pipes.
2) Remove rear exhaust pipe and muffler.
3) Remove heat shield cover.
4) Turn propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to check if abnormal free play exists at spiders and bearings.

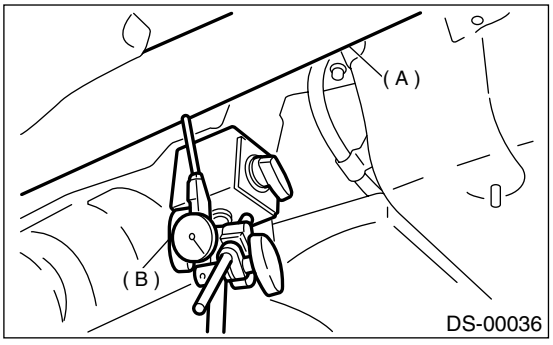


3. RUNOUT OF PROPELLER SHAFT

1) Remove center exhaust pipes.
2) Remove rear exhaust pipe and muffler.
3) Remove heat shield cover.
4) Turn rear wheels by hand to check for “runout” of propeller shaft.

NOTE:
Measure runout with a dial gauge at the center of front and rear propeller shaft tubes.

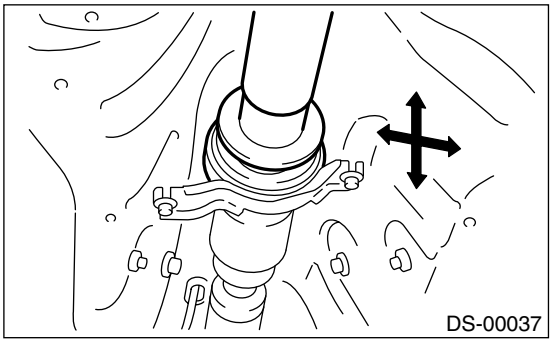
Runout:
Limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

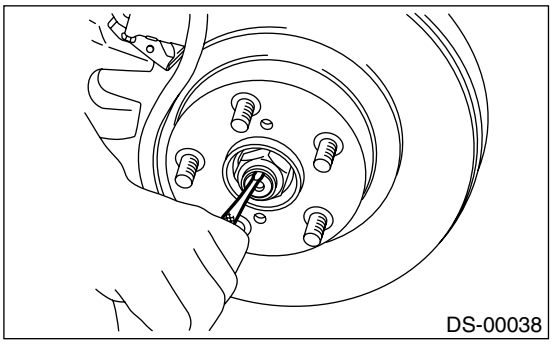
1) Remove front and center exhaust pipes.
2) Remove rear exhaust pipe and muffler.
3) Remove heat shield cover.
4) While holding propeller shaft near center bearing with your hand, move it up and down, and left and right to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

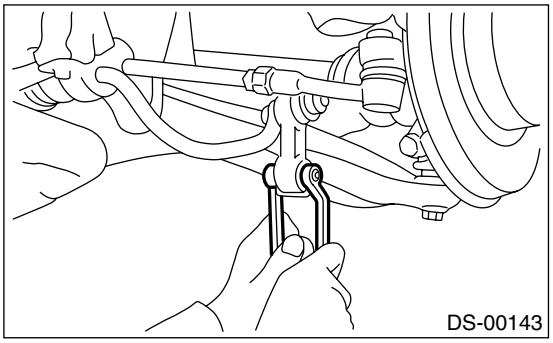
1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands, and remove front wheels.
3) Unlock axle nut.


DS-00038

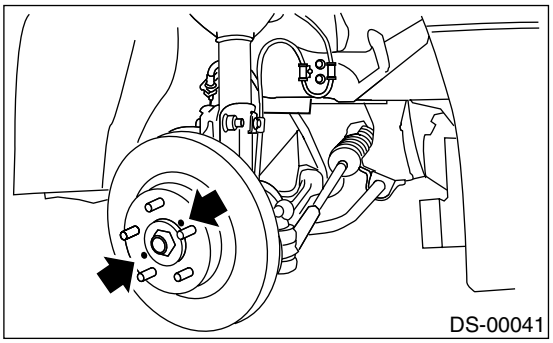
4) Remove axle nut while depressing brake pedal to prevent front drive shaft from turning.

CAUTION:
Be sure to loose and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

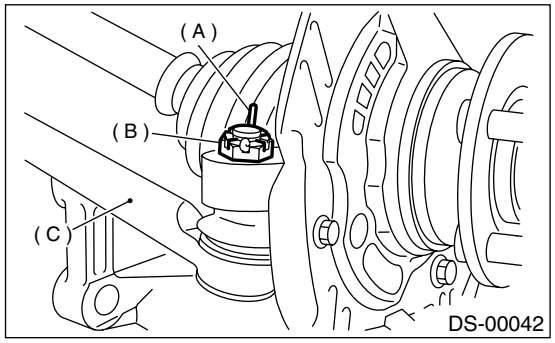
5) Remove stabilizer link.


DS-00143

6) Remove disc brake caliper from housing, and suspend it from strut using a wire.
7) Remove disc rotor from hub.
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.


DS-00041

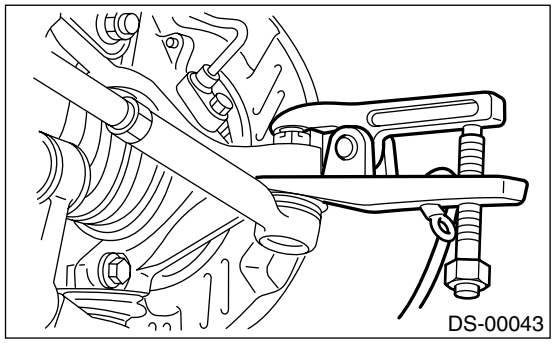
8) Remove cotter pin and castle nut which secure tie-rod end to housing knuckle arm.



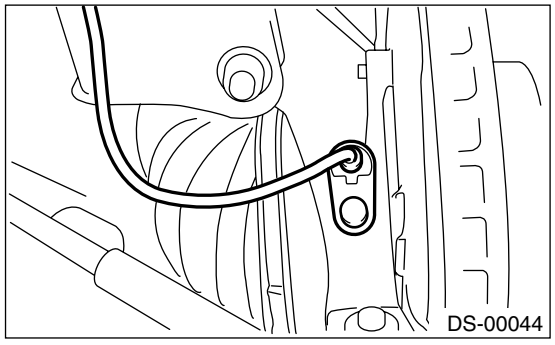
DS-00042

(A) Cotter pin
(B) Castle nut
(C) Tie-rod

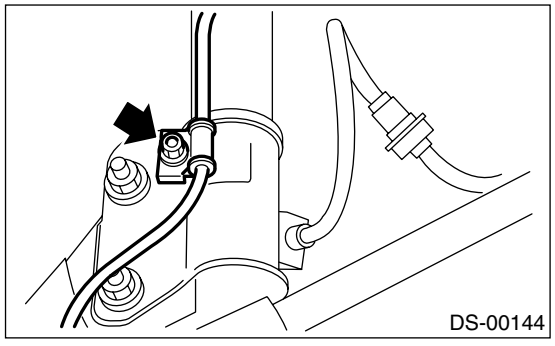
9) Using a puller, remove tie-rod ball joint from knuckle arm.


DS-00043

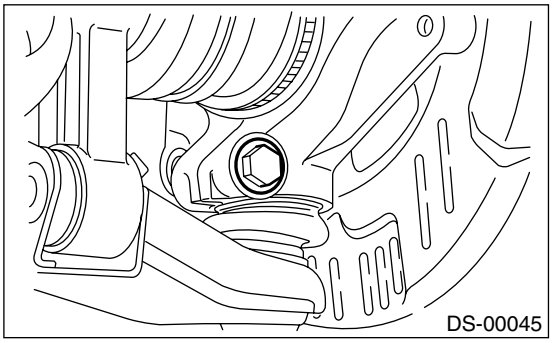
10) Remove ABS sensor assembly and harness.


DS-00044

11) Remove bolt which secures sensor harness to strut.


DS-00144

12) Remove transverse link ball joint from housing.

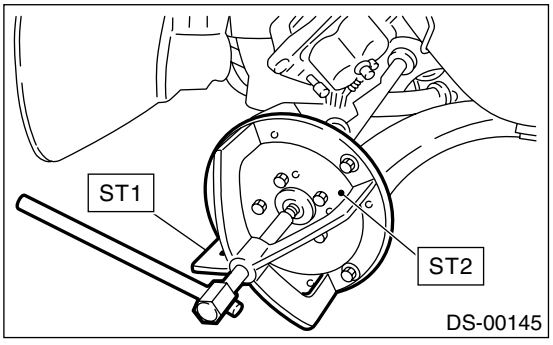


13) Remove inner joint from transmission spindle.

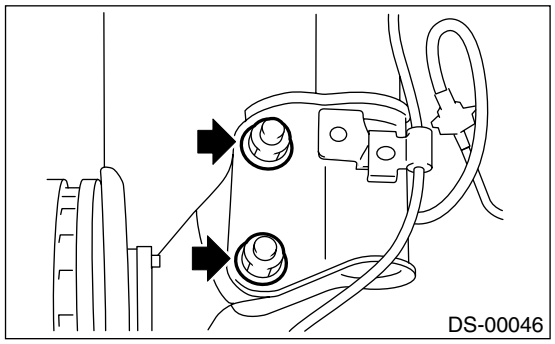
CAUTION:
Do not pull inner joint when removing front drive shaft.

14) Remove front drive shaft assembly from hub. If it is hard to remove, use STs.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
• Be careful not to damage oil seal lip and tone wheel when removing front drive shaft.
• If front drive shaft is removed, replace inner oil seal with new one.



15) After scribing an alignment mark on camber adjusting bolt head, remove bolts which connect housing and strut, and disconnect housing from strut.



B: INSTALLATION

1) While aligning alignment mark on camber adjusting bolt head, connect housing and strut.

CAUTION:
When self-locking nut is removed, replace it with new one.

Tightening torque:
177 N·m (18.0 kgf-m, 130 ft-lb)

2) Install front drive shaft. <Ref. to DS-31, INSTALLATION, Front Drive Shaft.>
3) Install transverse link ball joint to housing.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

4) Install ABS sensor harness on strut.
5) Install ABS sensor on housing.

Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

6) Install disc rotor on hub.
7) Install disc brake caliper on housing.

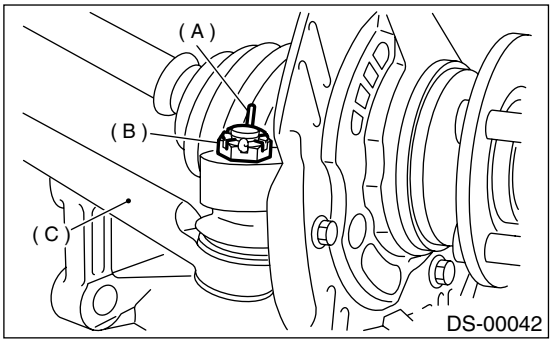
Tightening torque:
78 N·m (8 kgf-m, 57.9 ft-lb)

8) Connect stabilizer link.
9) Install tie-rod end.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
Do not hammer the bottom of tie-rod end when installing it.

10) After tightening castle nut to specified torque, retighten it further within 60° until a slot in castle nut is aligned with the ball joint hole. Insert cotter pin, and then bend the cotter pin around castle nut to secure it.



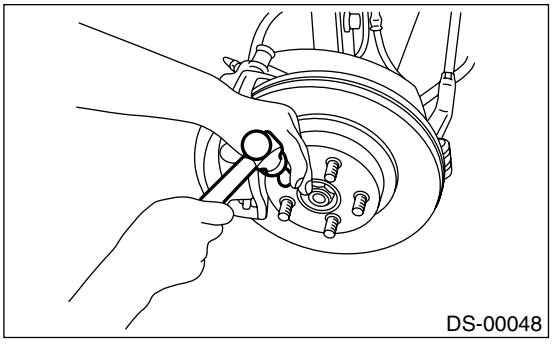
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

11) While depressing brake pedal to prevent front drive shaft from turning, tighten axle nut to specified torque .

Tightening torque:
216 N·m (22 kgf-m, 159 ft-lb)

CAUTION:
• When axle nut is removed, replace it with new one. (3.0 L model: Olive color, 2.5 L model: Gold color).
• Always tighten axle nut before installing wheel on vehicle.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

12) After tightening axle nut, lock it securely.

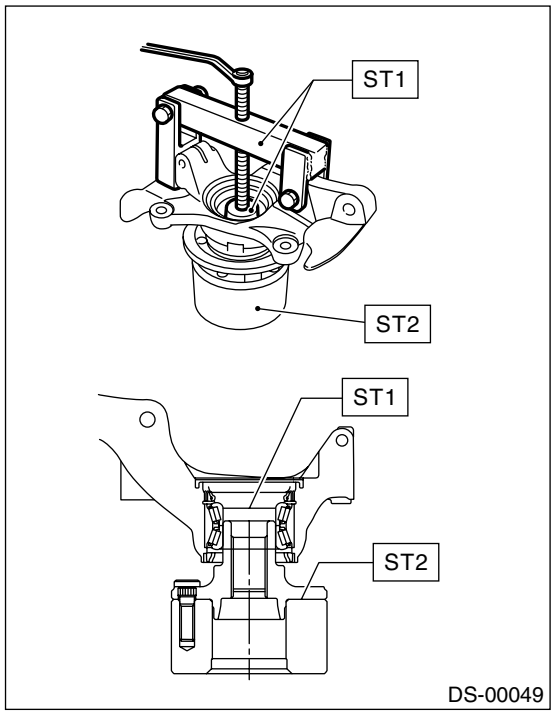


13) Install wheel and tighten wheel nuts to specified torque.

Tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

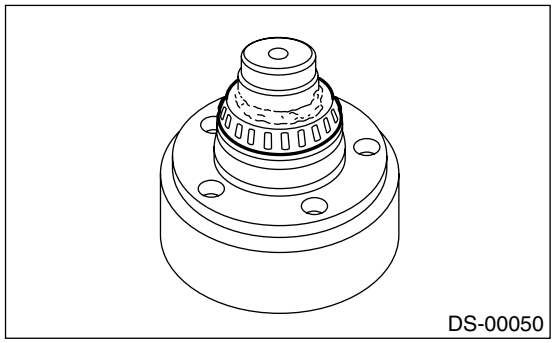
C: DISASSEMBLY

1) Using ST1, support housing and hub securely.
2) Attach ST2 to housing and drive hub out.
ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND

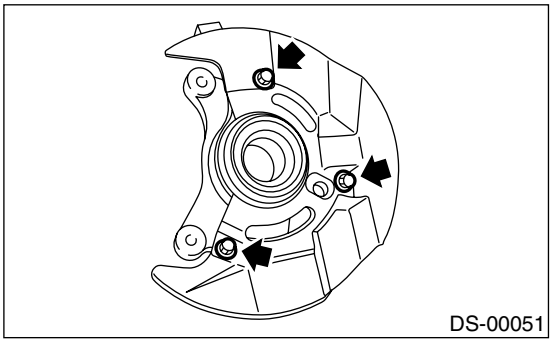


If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:
• Be careful not to scratch polished area of hub.
• Be sure to install inner race on the side of outer race from which it was removed.
• Replace the removed hub with new one.



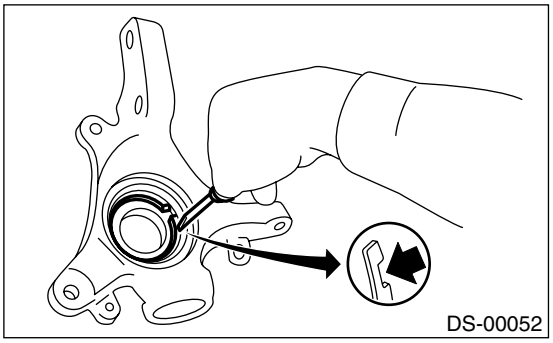
3) Remove disc cover from housing.



4) Using a screwdriver, remove outer and inner oil seals.

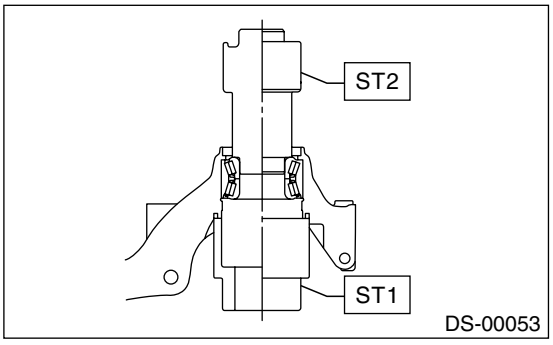
CAUTION:
Replace the removed oil seal with new one.

5) Using flat-bladed screwdriver, remove snap ring.



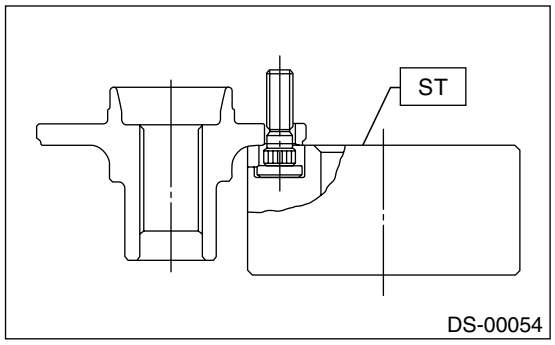
6) Using ST1, support housing securely.
7) Using ST2, press inner race to drive out outer bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

CAUTION:
• Do not remove outer race unless it is faulty.
• Replace the removed outer race with new one.
• Do not replace inner or outer race separately; always replace as a unit.



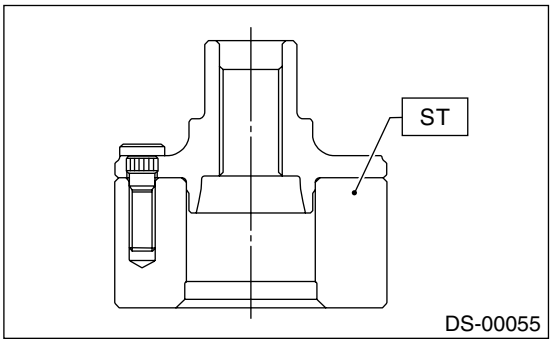
8) Using ST and a hydraulic press, drive hub bolts out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer hub bolts. This may deform hub.



D: ASSEMBLY

1) Attach hub to ST securely.
ST 927080000 HUB STAND



2) Using a hydraulic press, press new hub bolts into place.

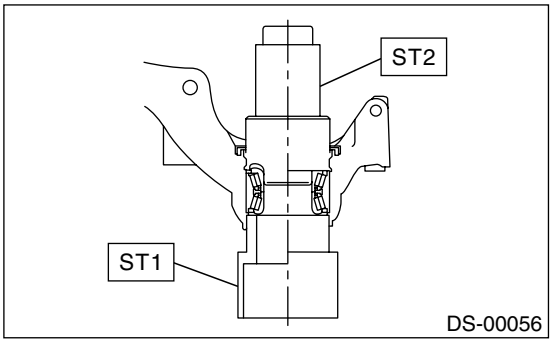
CAUTION:
Be sure to press hub bolts until their seating surfaces contact the hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

3) Clean dust or foreign particles from inside the housing.
4) Using ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING REMOVER

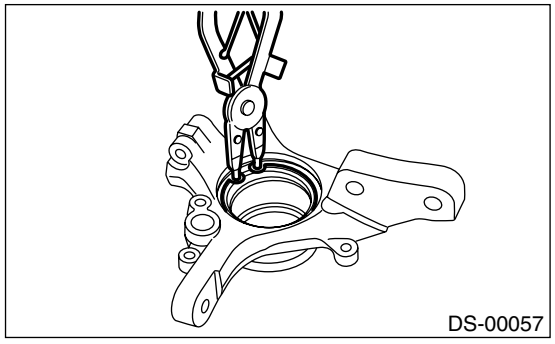
CAUTION:
• Always press outer race when installing bearing.
• Be careful not to remove plastic lock from inner race when installing bearing.
• Charge bearing with new grease when outer race is not removed.

Specified grease:
SHELL 6459N

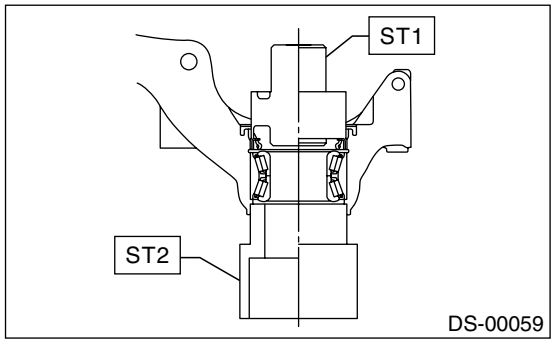


5) Using snap ring pliers, install snap ring in its groove.

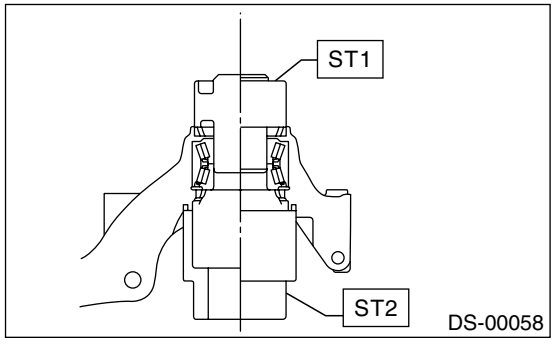
CAUTION:
Make sure to install it firmly to groove.



6) Using ST1 and ST2, press inner oil seal until it contacts circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Invert ST and housing.
ST 927400000 HOUSING STAND
8) Using ST1 and ST2, press outer oil seal until it contacts the bottom of housing.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



9) Apply sufficient grease to oil seal lip portion.

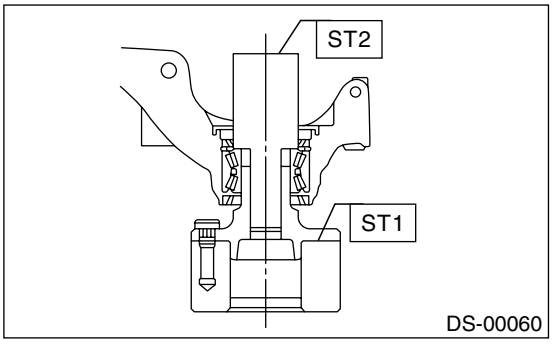
Specified grease
SHELL 6459N

CAUTION:
• If specified grease is not available, remove bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install disc cover to housing the three bolts.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

11) Attach hub to ST1 securely.
12) Clean dust or foreign particles from the polished surface of hub.
13) Using ST2, press bearing into hub by driving inner race.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



E: INSPECTION

When hub is removed, replace bearing with new one.

CAUTION:
• If bearing is faulty, replace it as a set with new bearing set.
• Replace the removed oil seal with new one.

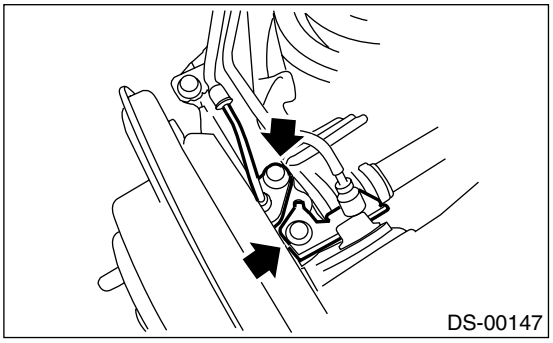
4. Hub Unit Bearing

A: REMOVAL

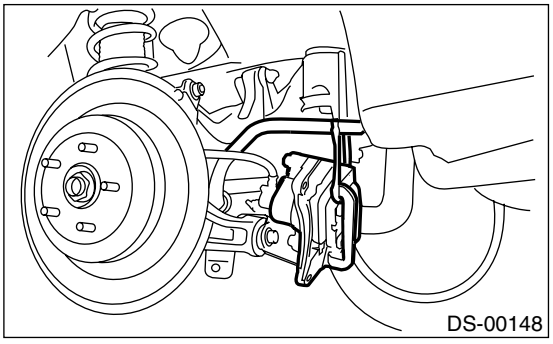
1) Disconnect ground cable from battery.
2) Jack-up vehicle, and remove rear wheel while supporting with safety stands.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Remove axle nut while depressing brake pedal to prevent front drive shaft from turning.
5) Return parking brake lever.
6) Remove ABS sensor.


DS-00147

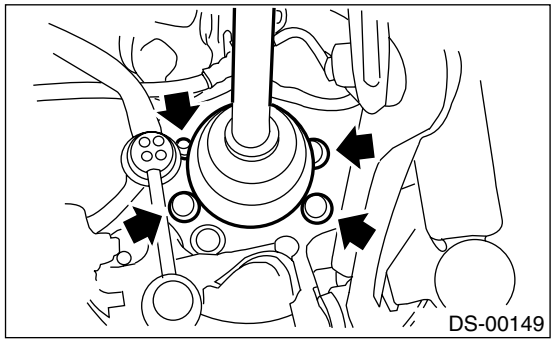
7) Remove brake caliper from back plate and suspend it from stabilizer using a piece of wire.


DS-00148

8) Remove disc rotor from hub.

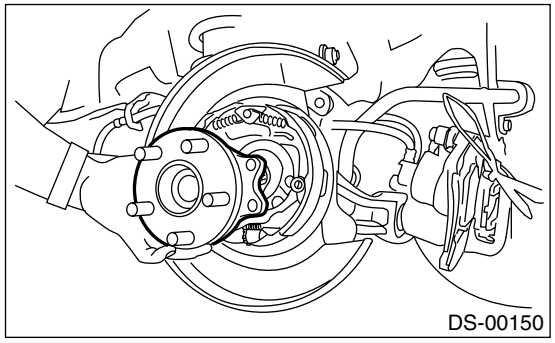
NOTE:
• Mark matching marks on hub and disc rotor, before removing.
• If disc rotor seizes up within hub, drive it out by installing an 8 mm bolt into disc rotor bolt hole.

9) Remove four bolts from rear arm.

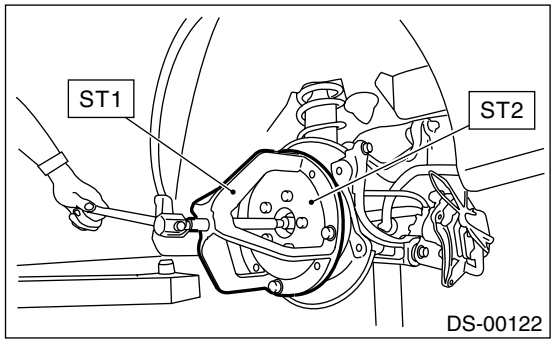

DS-00149

10) Remove hub unit bearing.

CAUTION:
Be careful not to damage tone wheel.


DS-00150

If it is hard to remove, use STs.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

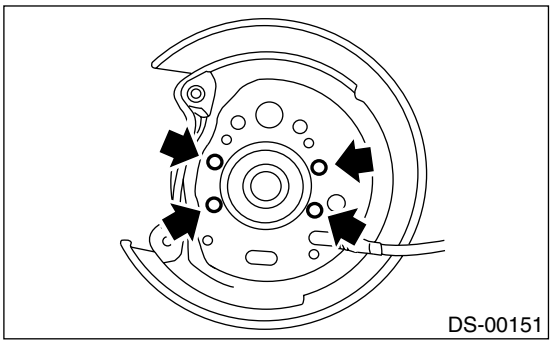


DS-00122

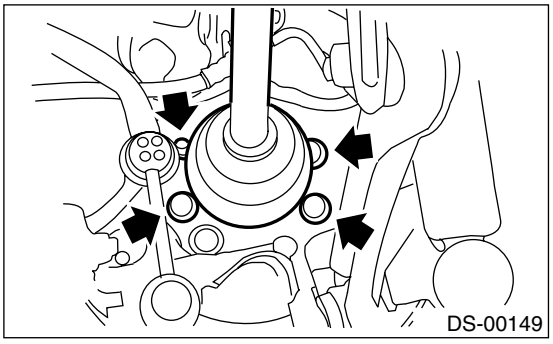
B: INSTALLATION

1) Align hub unit bearing with back plate at mounting holes and install hub unit assembly and back plate. Temporarily tighten axle nuts.

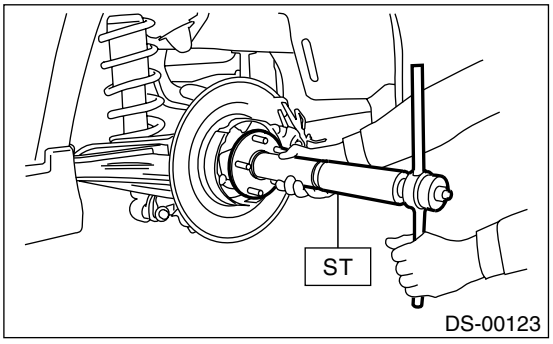
CAUTION:
Be careful not to damage tone wheel.



2) Tighten four bolts to back plate.

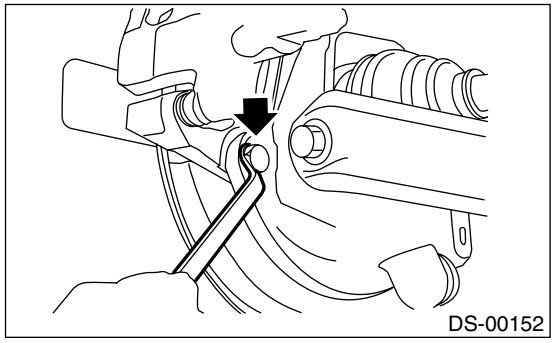


3) Remove axle nut.
4) Using ST1 and ST2, pull axle shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADADPTER

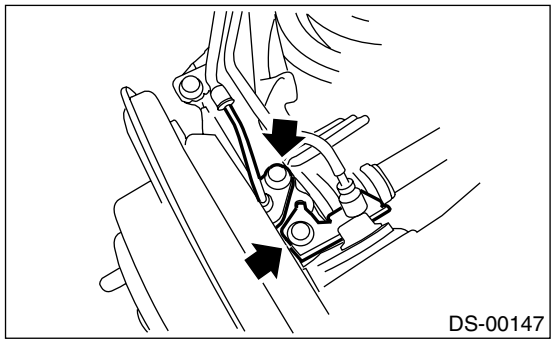


5) Temporarily tighten axle nuts.
6) Install disc rotor on hub.
7) Install disc brake caliper on back plate.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



8) Install rear ABS sensor and brake cable bracket.

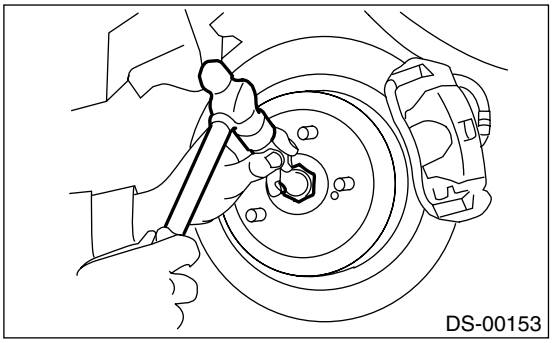


9) Adjust parking brake lever stroke by turning adjuster. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

10) Move brake lever back to apply brakes. While depressing brake pedal to prevent axle shaft from turning, tighten axle nut.
11) Securely lock axle nut after tightening.

Tightening torque:
235 N·m (24 kgf-m, 174 ft-lb)

CAUTION:
• Replace the removed axle nuts with new one. Use an axle nut for rear use only (Olive color).
• Always tighten axle nut before installing wheel on vehicle.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.



12) Install rear wheel and tighten wheel nuts to specified torque.

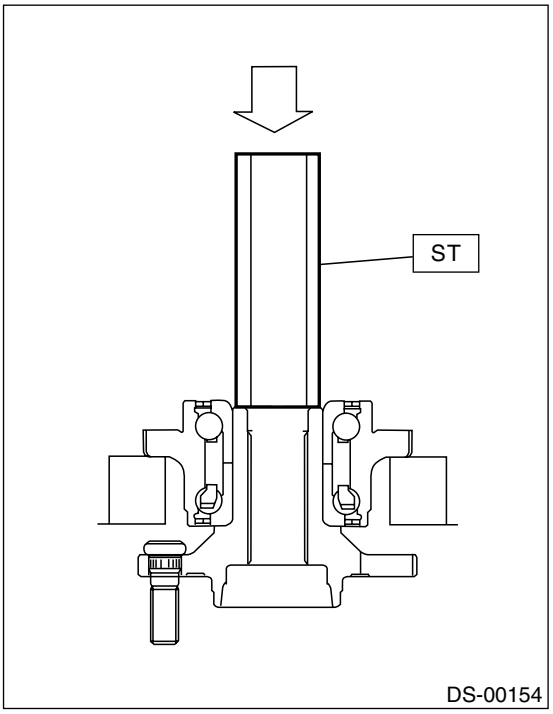
Tightening torque:
88 N·m (9 kgf-m, 65 ft-lb)

C: DISASSEMBLY

1) Using ST, remove hub unit from hub assembly.

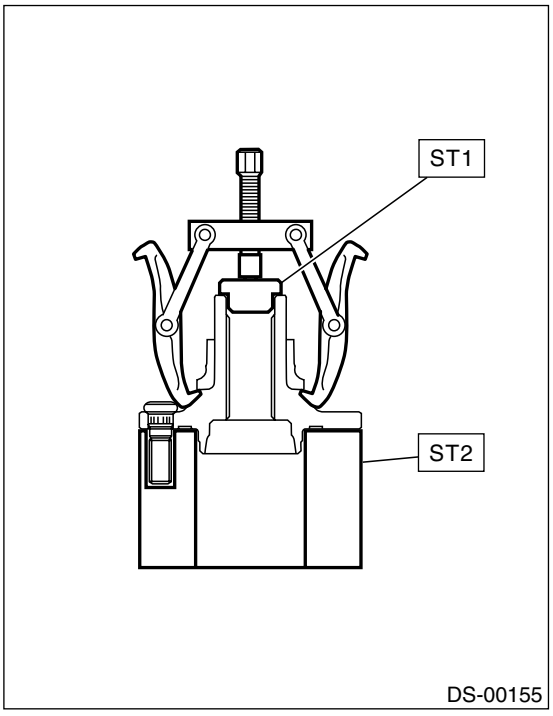
CAUTION:
Securely set hub assembly so that it does not lean.

ST 398507703 DUMMY COLLAR



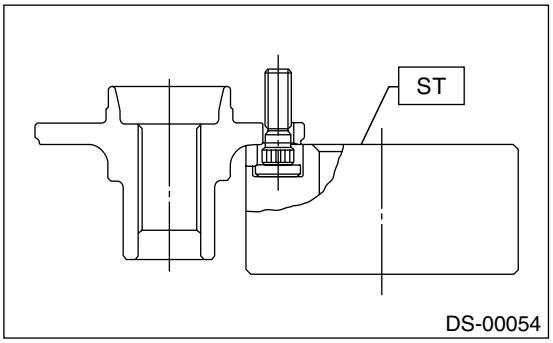
2) Using ST and a puller (common hand tool), remove bearing inner race.
ST1 399520105 SEAT
ST2 927080000 HUB STAND

CAUTION:
• Do not remove hub unit bearing unless damaged.
• Replace the removed hub unit bearing with new one.



3) Using ST, press hub bolt out.
ST 927080000 HUB STAND

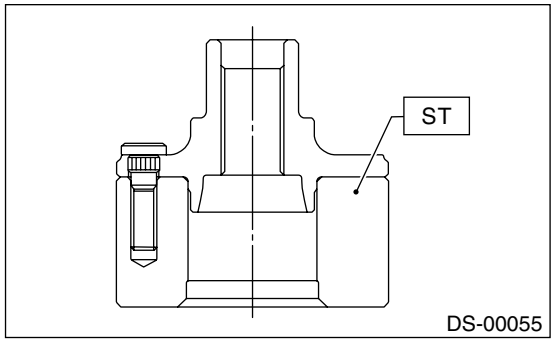
CAUTION:
Be careful not to hammer hub bolts. This may deform hub.



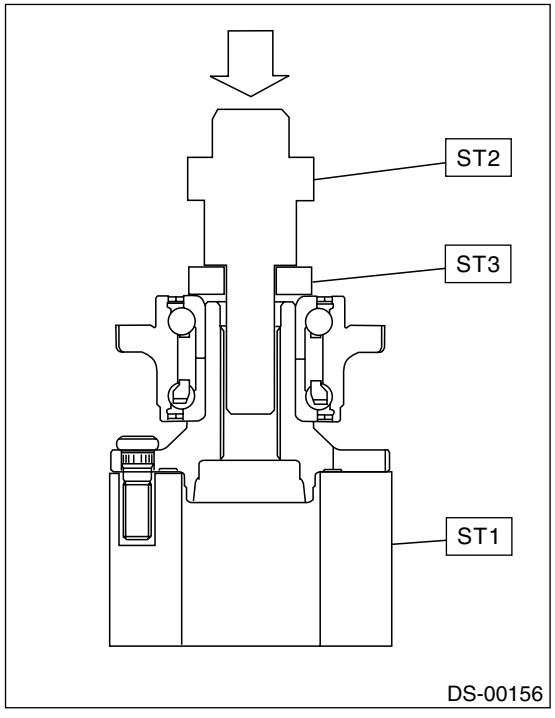
D: ASSEMBLY

1) Using ST, press new hub bolt into place.

CAUTION:
• Be sure to press hub bolt until their seating surfaces contact the hub.
• Using a 12 mm (0.47 in) hole in the ST, be careful not to tilt hub bolt during installation.
ST 927080000 HUB STAND



2) Using ST1, ST2 and ST3, press hub unit bearing into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER
ST3 28499AE000 SPACER



CAUTION:
• Always press inner race when installing hub unit bearing.
• Replace the removed hub unit bearing with new one.

E: INSPECTION

Check the removed parts for wear and damage. If defective, replace with new ones.

CAUTION:
If a bearing is faulty, replace bearing and races as a set with newone.

5. Front Drive Shaft

A: REMOVAL

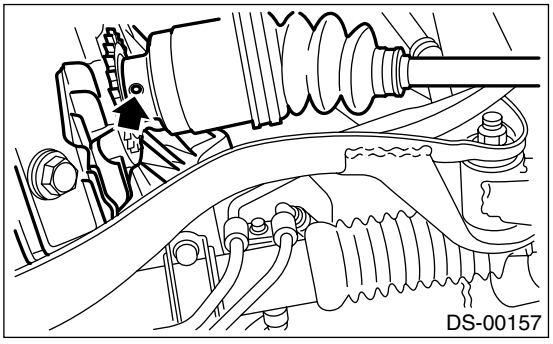
1. NON-TURBO MODEL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, and remove front wheel while supporting with safety stands.
3) Unlock axle nut.
4) Depress brake pedal to prevent front drive shaft from turning and remove axle nut.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

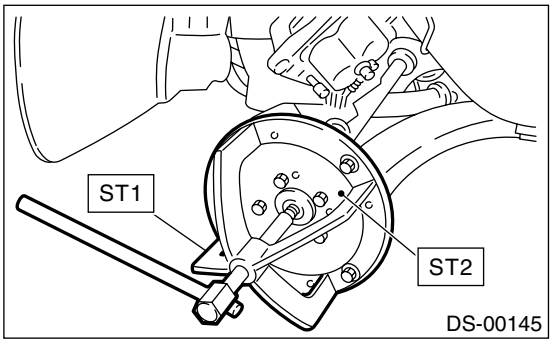
5) Remove stabilizer link from transverse link.
6) Disconnect transverse link from housing.
7) Remove spring pin which secures transmission spindle to inner joint.

CAUTION:
When drive shaft is removed, replace spring pin with new one.



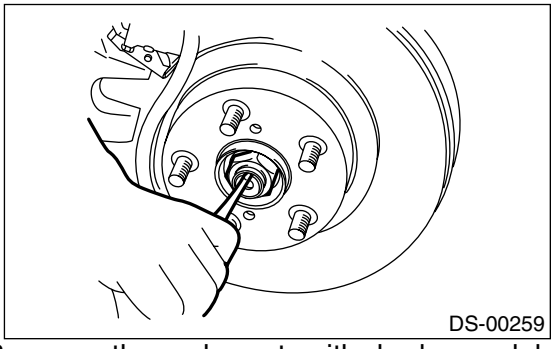
8) Remove front drive shaft assembly. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
• Be careful not to damage oil seal lip and tone wheel when removing front drive shaft.
• When front drive shaft is removed, also replace inner oil seal with new one.



2. TURBO-MODEL

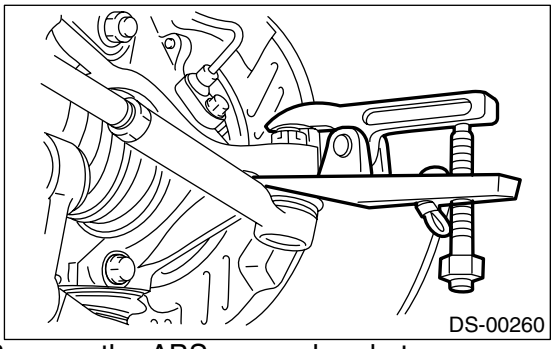
1) Lift-up the vehicle, and then remove the front wheels while supporting with safety stands.
2) Drain the transmission oil.
3) Unlock the axle nut.



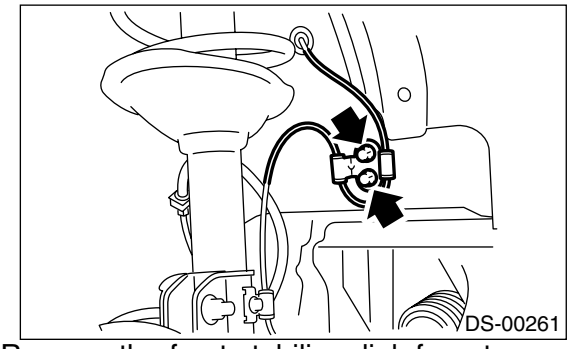
4) Remove the axle nut with brake pedal depressed to prevent front drive shaft from turning.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle.

5) Remove the cotter pin and castle nut. Remove the tie-rod end using a puller.

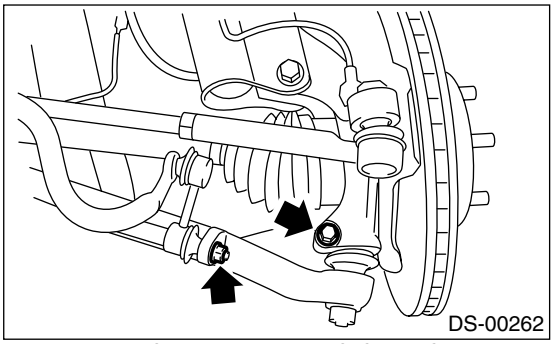


6) Remove the ABS sensor bracket.



7) Remove the front stabilizer link from transverse link.

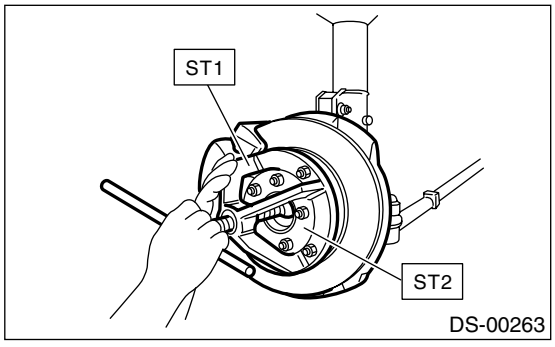
8) Remove the bolt securing ball joint, and then remove the transverse link from front housing.



9) Remove the front drive shaft from front axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

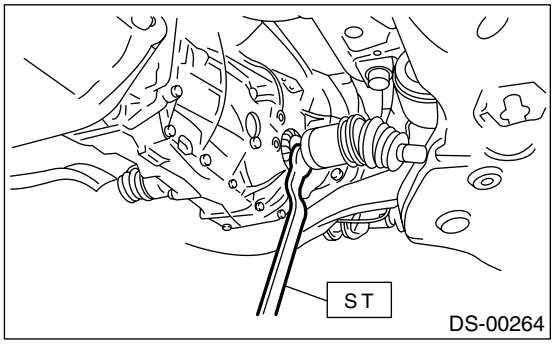
CAUTION:
• Do not pull inner joint when removing front drive shaft.
• Do not hammer the drive shaft when removing.
• Be careful not damage the oil seal and tone wheel.



10) Remove the front drive shaft from transmission using ST.

ST 28399SA000 DRIVE SHAFT REMOVER

NOTE:
• ST usage is different depending on type of transmission equipped.
• For AT vehicles, face the “AT” letter stamped on ST to transmission side. For MT vehicles, face the “MT” letter stamped on ST to transmission side.
• Do not contact the ST to holder area.



B: INSTALLATION

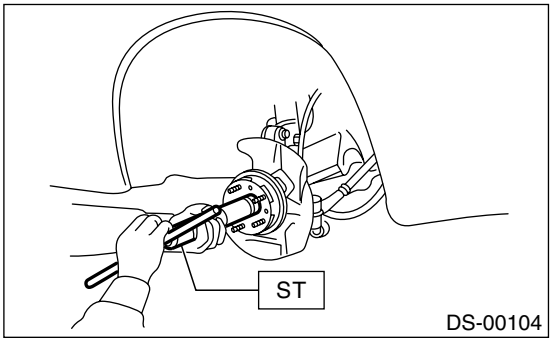
1. NON-TURBO MODEL

1) Insert outer joint into hub splines.

CAUTION:
Be careful not to damage inner oil seal lip and tone wheel.

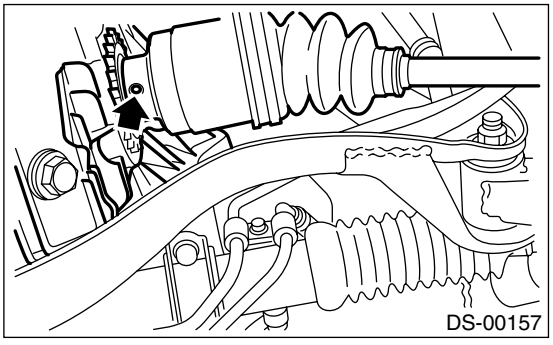
2) Using ST1 and ST2, pull drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.



3) Tighten axle nut temporarily.
4) Install inner joint on transmission spindle and drive spring pin into place.

CAUTION:
When front drive shaft is removed, replace spring pin with new one.



5) Connect transverse link to housing.

Tightening torque (self-locking nut):
49 N·m (5.0 kgf-m, 36 ft-lb)

CAUTION:
Replace the reomved self-locking nut with new one.

6) Install stabilizer bracket.

7) While depressing brake pedal to prevent front drive shaft from turning, tighten axle nut.

Tightening torque:
216 N·m (22 kgf-m, 159 ft-lb)

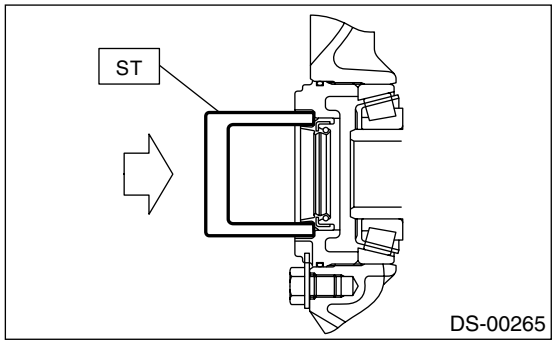
CAUTION:
• Replace the removed axle nut with new one. (3.0 L model: Olive color, 2.5 L model: Gold color).
• Always tighten axle nut before installing wheel on vehicle.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

8) After tightening axle nut, lock it securely.

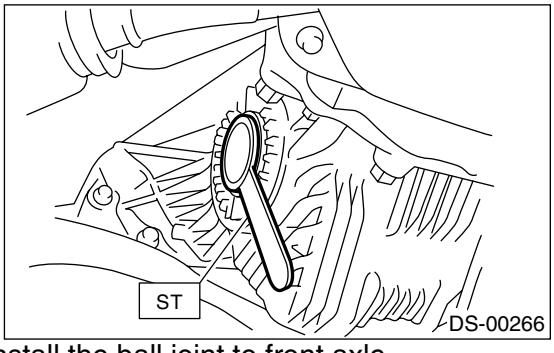
2. TURBO MODEL

1) Using the ST, replace the differential side retainer oil seal with a new one.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

CAUTION:
Be sure to replace the oil seal with a new one when removing drive shaft.



2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Install the front drive shaft to transmission using ST.
ST 28399SA010 OIL SEAL PROTECTOR

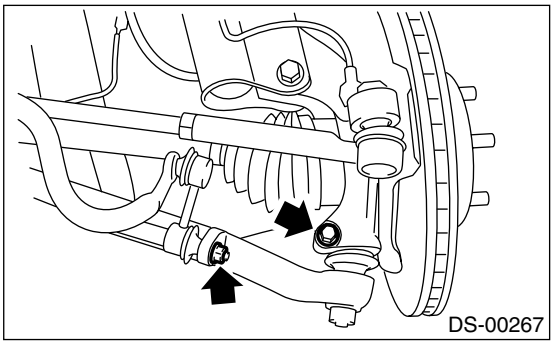


5) Install the ball joint to front axle.

Tightening torque (self-locking nut):
50 N·m (5.1 kgf-m, 37 ft-lb)

6) Install the stabilizer link.

Tightening torque (self-locking nut):
45 N·m (4.6 kgf-m, 33 ft-lb)

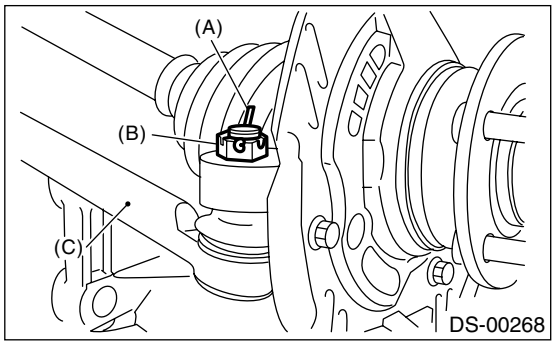


7) Install the tie-rod end.

Tightening torque (self-locking nut):
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

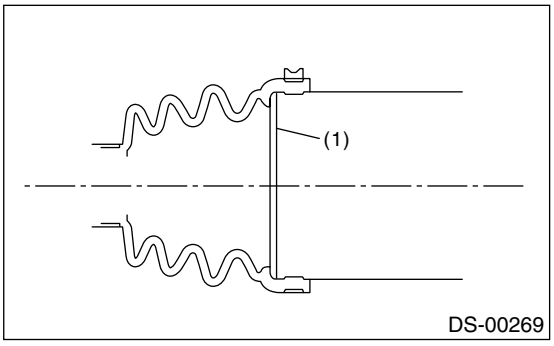
CAUTION:
When installing, do not hit the bottom of tie-rod with hammer.

8) Tighten the castle nut to the specified torque and tighten further within 60° until pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



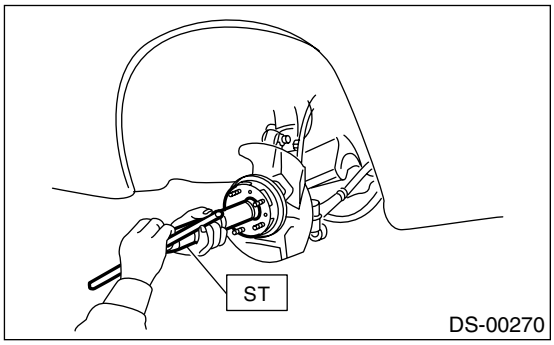
(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

9) Make sure the inner joint retainer is in proper position.



(1) Retainer

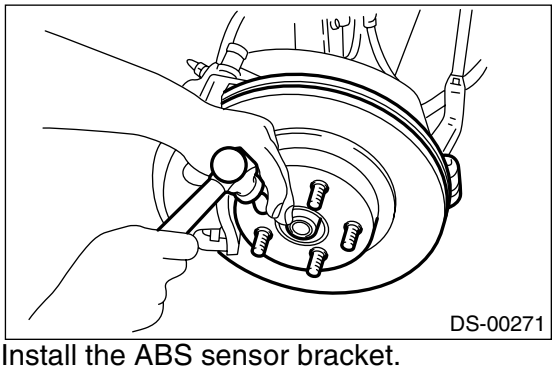
10) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER



11) Tighten a new axle nut with brake pedal depressed to prevent front drive shaft from turning.

Tightening torque:
216 N·m (22 kgf-m, 159 ft-lb)

12) Tighten the axle nut and lock securely.



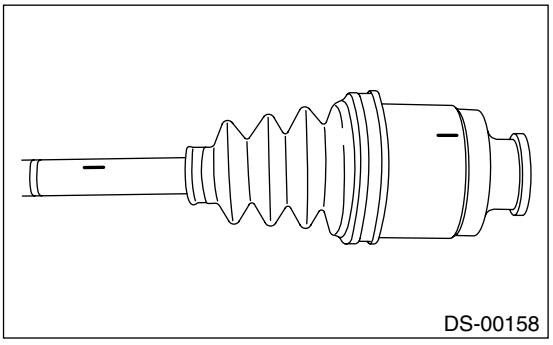
13) Install the ABS sensor bracket.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

14) Add the transmission oil.
15) Install the front wheel and tighten wheel nut to the specified torque.

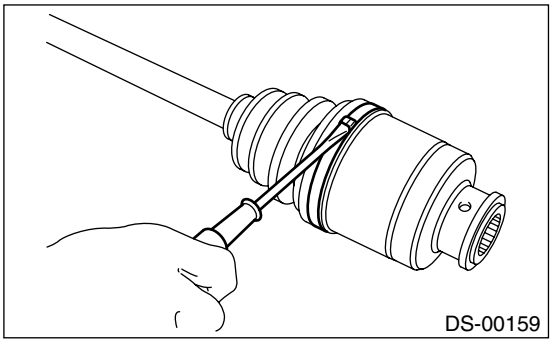
C: DISASSEMBLY

1) Place alignment marks on shaft and outer race.

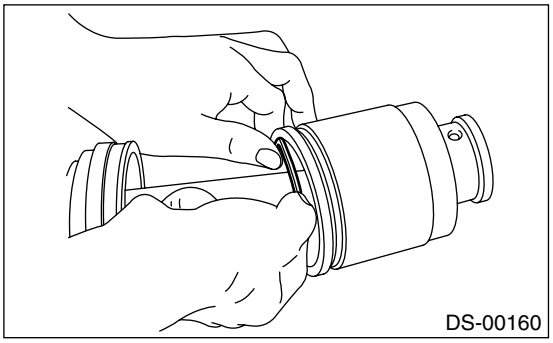


2) Remove inner joint boot band and boot.

CAUTION:
Be careful not to damage boot.



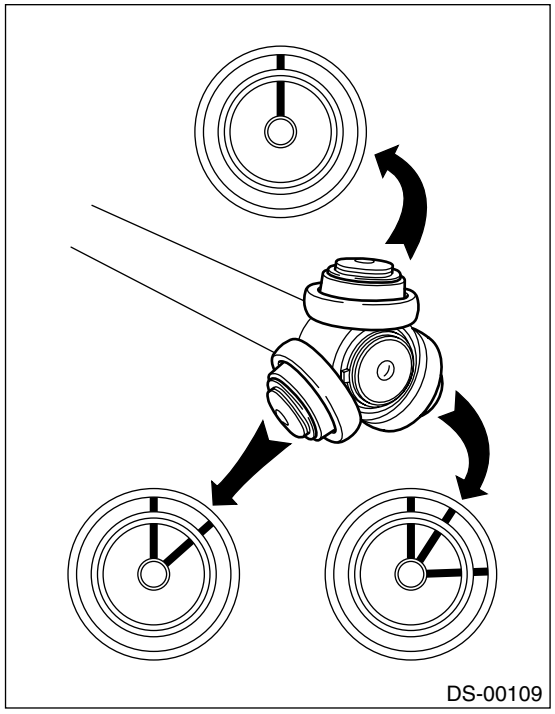
3) Remove circlip from inner joint outer race using screwdriver.



4) Remove inner joint outer race from shaft assembly.
5) Wipe off grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

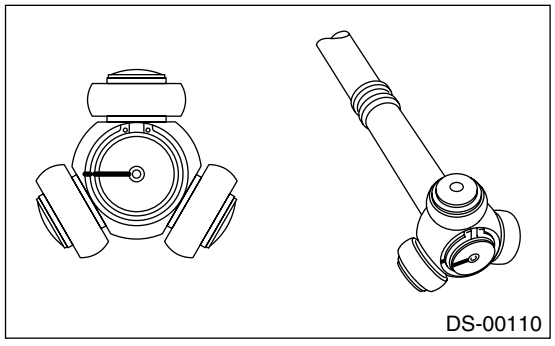
6) Place alignment mark on free ring and trunnion.



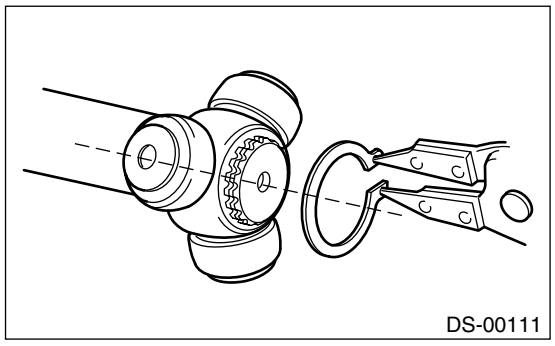
7) Remove free ring from trunnion.

CAUTION:
Be careful with the free ring position.

8) Place alignment mark on trunnion and shaft.



9) Remove snap ring and trunnion.



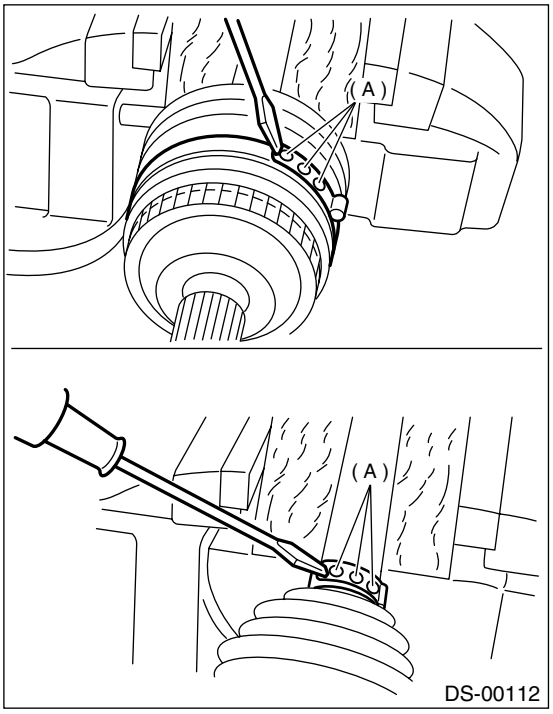
CAUTION:
Be careful not to damage boot by wrapping shaft splines with vinyl tape.

10) Remove inner joint boot.

11) Place drive shaft in a vise between wooden blocks.

CAUTION:
Do not place drive shaft directly in the vise; use wooden block.

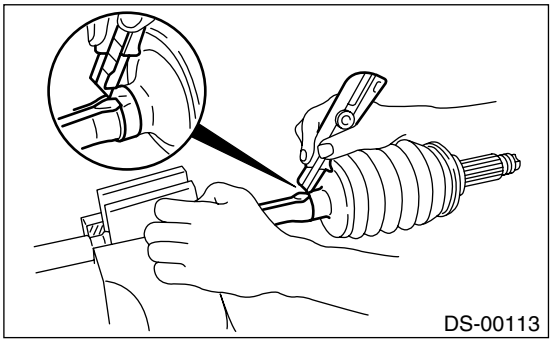
12) Raise boot band claws by means of screwdriver and hammer.



(A) Boot band claws

13) Cut and remove the boot.

CAUTION:
Replace the removed boot with a new one.



14) Thus, disassembly of axle is completed, but outer joint cannot be disassembled.

D: ASSEMBLY

CAUTION:
Use specified grease.

BJ side (Non-TURBO model, outside):
NTG2218 (Part No. 28093AA000)

SFJ side (Non-TURBO model, inside):
SSG6003 (Part No. 28093TA000)

AC side (TURBO model, outside):
HTBJ (Part No. 28395SA010)

AAR side (TURBO model, inside):
One luber C (Part No. 28395SA000)

1) Place outer joint boot and small boot band on outer joint side of shaft.

CAUTION:
Be careful not to damaged boot by wrapping shaft splines with vinyl tape.

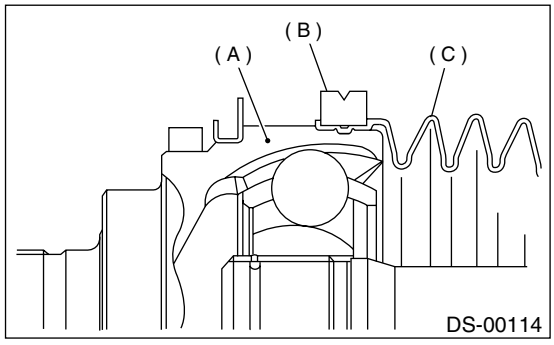
2) Place drive shaft in a vise.

CAUTION:
Do not place drive shaft directly in the vise; use wooden blocks.

3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to outer joint.
4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.

NOTE:
The inside of the larger end of outer joint boot and the boot groove shall be cleaned so as to be free from grease and other substances.

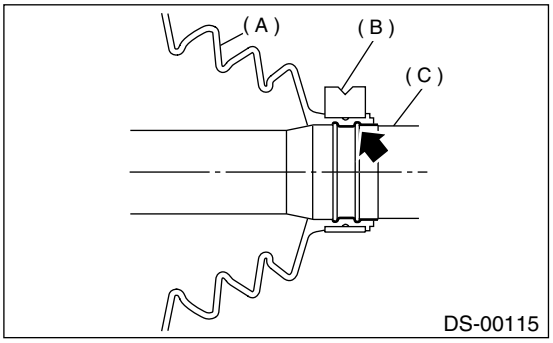
5) Install boot projecting portion to outer joint groove.



(A) Outer joint
(B) Large boot band
(C) Boot

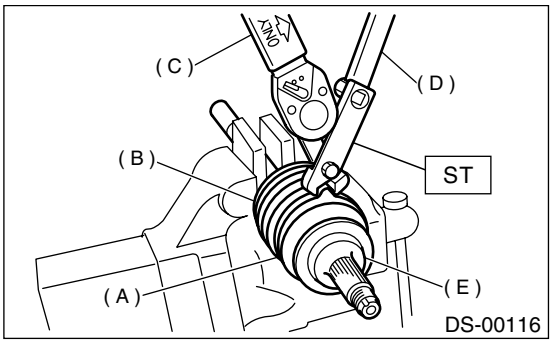
6) Set large boot band in place.

7) Install boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

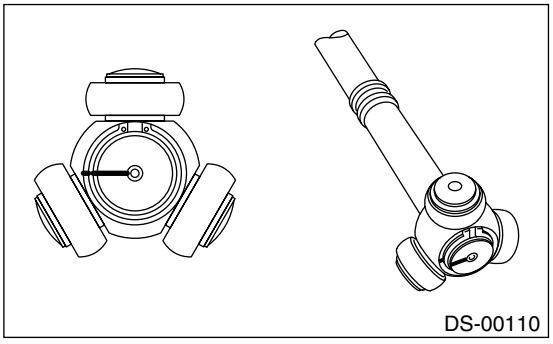
8) Tighten boot bands using ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) Outer joint

Tightening torque:
Large boot band
157 N·m (16.0 kgf-m, 116 ft-lb) or more
Small boot band
133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place inner joint boot at the center of shaft.
10) Align alignment marks and install trunnion on shaft.

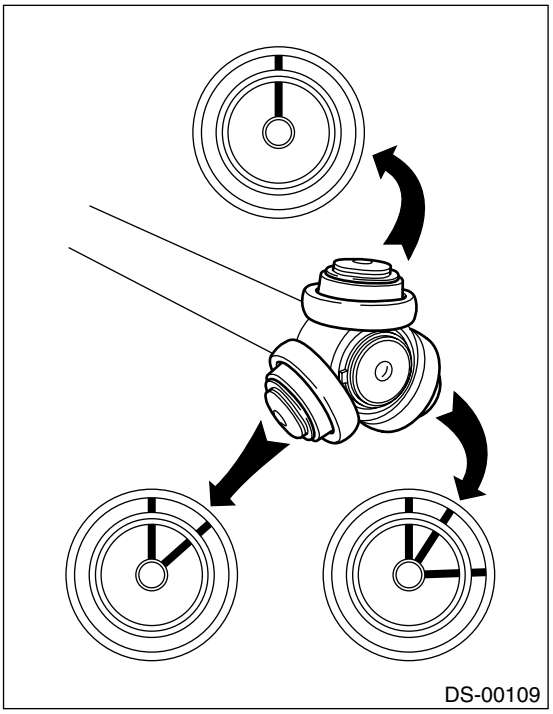


11) Install snap ring to shaft.

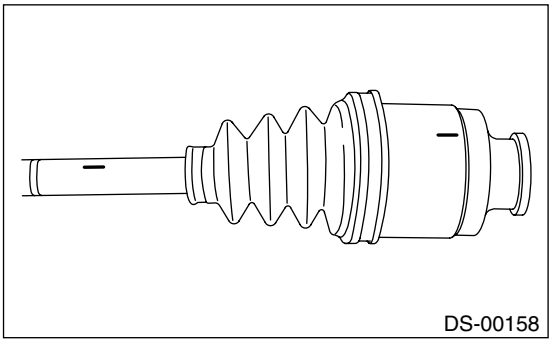
CAUTION:
Confirm that the snap ring is completely fitted in the shaft groove.

12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of inner joint outer race.
13) Apply a coat of specified grease to free ring and trunnion.
14) Align alignment marks on free ring and trunnion and install free ring.

CAUTION:
Be careful with the free ring position.



15) Align alignment marks on shaft and outer race, and install outer race.



16) Install circlip in the groove on inner joint outer race.

CAUTION:
Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

17) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
18) Install inner joint boot taking care not to twist it.

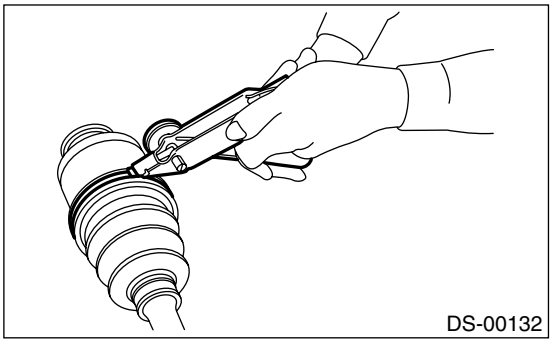
CAUTION:
• The inside of the larger end of inner joint boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing inner joint boot, position outer race of inner joint at center of its travel.

19) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:
Replace the removed boot band with a new one.

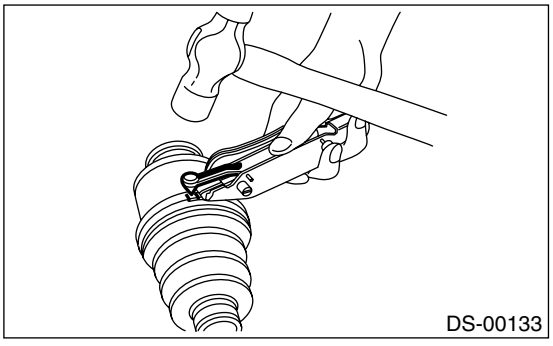
20) Tighten band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.


DS-00132

21) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.


DS-00133

22) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Bend the band so that its end is in close contact with clip.

23) Fix up boot on outer joint in the same manner.
24) Extend and retract inner joint to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) Inner joint
Check seizure, corrosion, damage, wear and excessive play.
2) Outer joint
Check seizure, corrosion, damage and excessive play.
3) Shaft
Check excessive bending, twisting, damage and wear.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or dilution.

6. Rear Drive Shaft

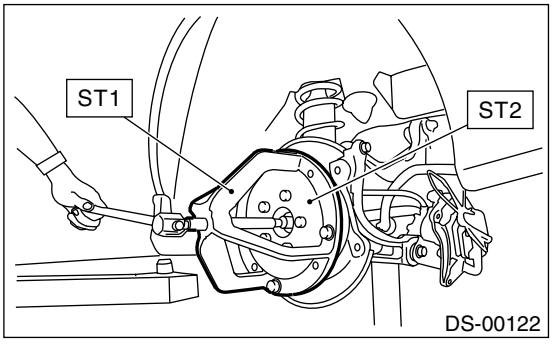
A: REMOVAL

1) Disconnect ground cable from battery.
2) Jack-up vehicle, support it with safety stands, and remove rear wheels.

CAUTION:
Be sure to loosen and retighten axle nut after removing wheel from vehicle. Failure to follow this rule may damage wheel bearings.

3) Unlock axle nut.
4) Have another technician depress brake pedal so that rear drive shaft does not rotate, while removing axle nut.
5) Remove rear differential assembly.
With T-type
<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>
With VA-type
<Ref. to DI-42, REMOVAL, Rear Differential for VA-type.>
6) Remove axle nut and drive shaft. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 PLATE

CAUTION:
Be careful not to damage tone wheel when removing rear drive shaft.



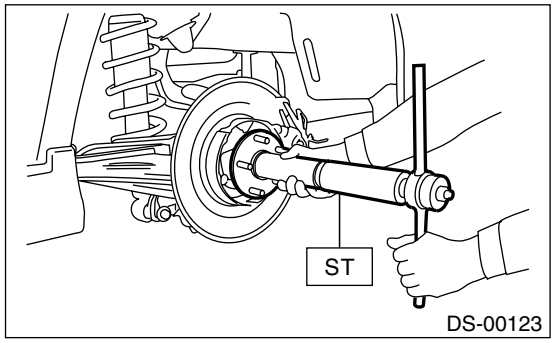
B: INSTALLATION

1) Insert outer joint into rear hub splines.

CAUTION:
Be careful not to damage tone wheel.

2) Using ST1 and ST2, pull drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

CAUTION:
Do not hammer drive shaft when installing it.



3) Tighten axle nut temporarily.
4) Install rear differential.
With T-type
<Ref. to DI-26, INSTALLATION, Rear Differential for T-type.>
With VA-type
<Ref. to DI-43, INSTALLATION, Rear Differential for VA-type.>
5) Have another technician depress brake pedal so that rear drive shaft does not rotate, while tightening axle nut.

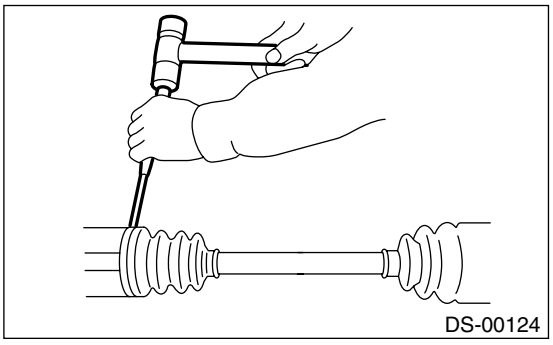
Tightening torque:
235 N·m (24 kgf-m, 174 ft-lb)

CAUTION:
• Replace the removed axle nut with a new one. Use an axle nut for rear use only (Olive color).
• Always tighten axle nut before installing wheel on vehicle.
• Be sure to tighten axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

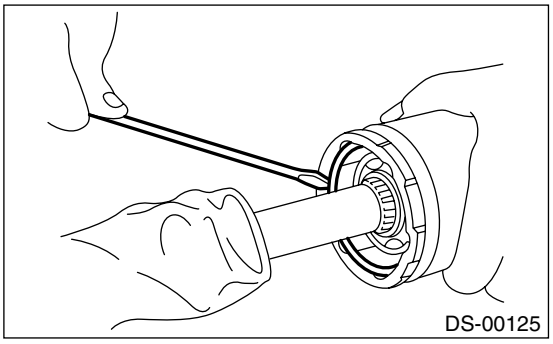
6) After tightening axle nut, lock it securely.

C: DISASSEMBLY

1) Straighten bent claw of large band which is installed on inner joint boot.
2) Loosen band by means of screwdriver or pliers, being careful not to damage the boot.



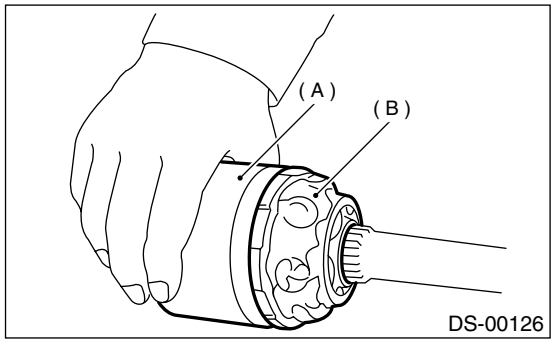
3) Remove small band which is installed on inner joint boot in the same manner.
4) Remove larger end of inner joint boot from outer race of inner joint.
5) Remove inner snap ring of inner joint outer race.



6) Take out inner joint outer race from shaft assembly.
7) Wipe off grease and take out balls.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

NOTE:
Disassemble exercising care not to lose balls (6 pcs).



(A) Outer race
(B) Grease

8) To remove the cage from the inner race, turn the cage by a half pitch to the track groove of the inner race and shift the cage.
9) Remove snap ring, which fixes inner race to shaft, by using pliers.
10) Take out inner joint inner race.
11) Take off inner joint cage from shaft and remove inner joint boot.

CAUTION:
Be careful not to damage boot by wrapping shaft splines with vinyl tape.

12) Remove outer joint boot in the same procedure as inner joint boot.
13) Thus, disassembly of axle is completed, but outer joint is unable to be disassembled.

D: ASSEMBLY

CAUTION:
Use specified grease.

BJ side (outer joint):
Molylex No. 2 (Part No. 723223010)

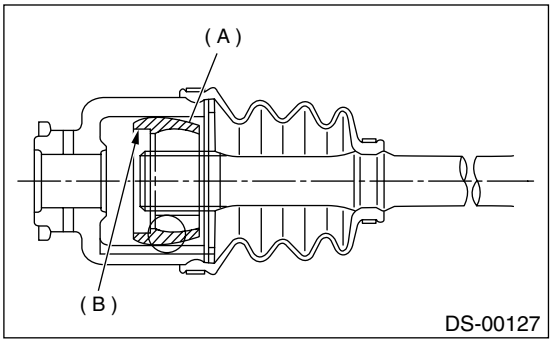
DOJ side (inner joint):
VU-3A702 (Yellow) (Part No. 23223GA050)

1) Install outer joint boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place inner joint boot at the center of shaft.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to prevent boot from scratches.

3) Insert inner joint cage onto shaft.

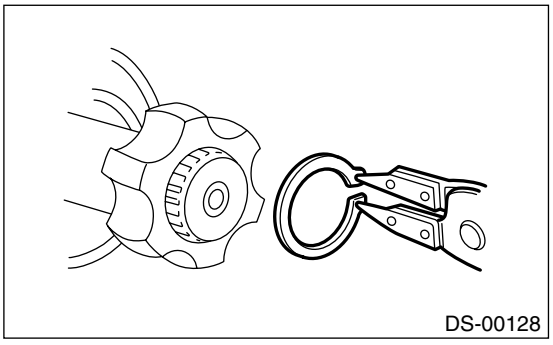
NOTE:
Insert the cage with the cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

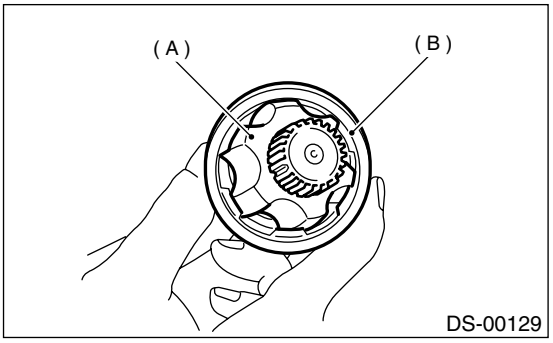
4) Install inner joint inner race on shaft and fit snap ring with snap ring pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.



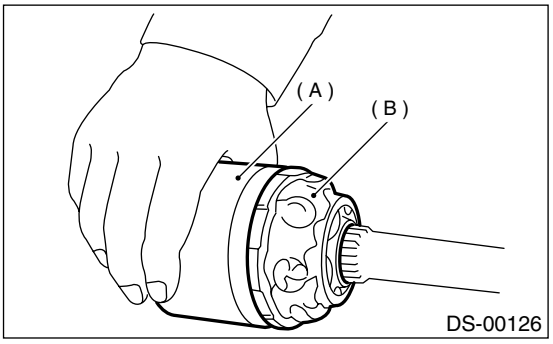
5) Install cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with the protruded part aligned with the track on the inner race and then turn by a half pitch.



(A) Inner race
(B) Cage

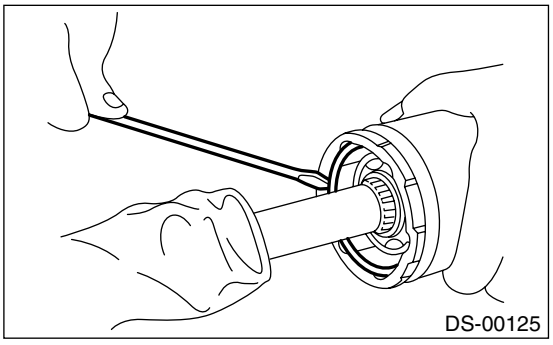
6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of inner joint outer race.
7) Apply a coat of specified grease to the cage pocket and six balls.
8) Insert six balls into the cage pocket.
9) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.



(A) Outer race
(B) Grease

10) Install circlip in the groove on inner joint outer race.

NOTE:
• Assure that the balls, cage and inner race are completely fitted in the outer race of inner joint.
• Exercise care not to place the matched position of circlip in the ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in the groove.


DS-00125

11) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
12) Install inner joint boot taking care not to twist it.

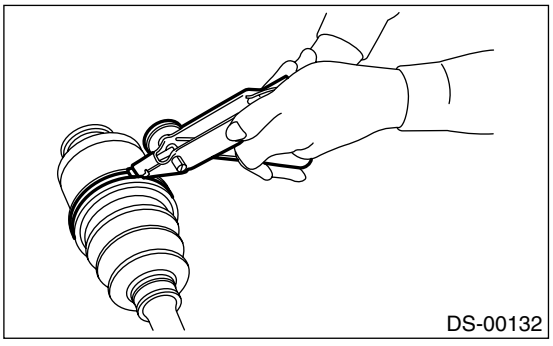
CAUTION:
• The inside of the larger end of inner joint boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing inner joint boot, position outer race of inner joint at center of its stroke.

13) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:
The boot must be replaced with a new one whenever it is removed.

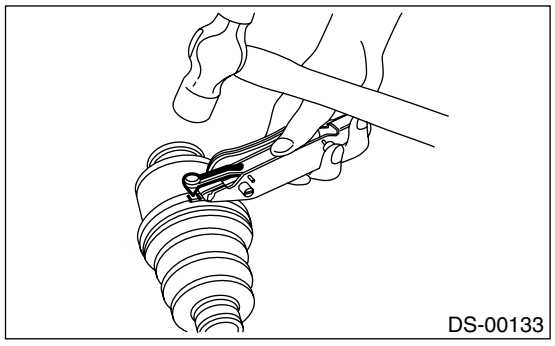
14) Tighten band by using ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten band until it cannot be moved by hand.


DS-00132

15) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.


DS-00133

16) Cut off band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Bend the band so that its end is in close contact with clip.

17) Fix up boot on outer joint in the same manner.
18) Extend and retract inner joint so that the grease in inner joint may spread equally.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) Inner joint
Check seizure, corrosion, damage, wear and excessive play.
2) Outer joint
Check seizure, corrosion, damage and excessive play.
3) Shaft
Check excessive bending, twisting, damage and wear.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or dilution.

7. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Remedy
1. Vibration of propeller shaft NOTE: Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increases in proportion to vehicle speed.	(1) Worn or damaged universal joint.	Replace.
	(2) Unbalanced propeller shaft due to bend or dent.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft.	(1) Worn or damaged universal joint.	Replace.
	(2) Worn spline of sleeve yoke.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Loose installation of joint.	Replace.
	(5) Worn or damaged center bearing and damaged center mounting rubber.	Replace.

MEMO:

ABS

Page

1. General Description 2
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U) 6
3. ABS Sequence Control 9
4. Front ABS Sensor 12
5. Rear ABS Sensor 15
6. Front Tone Wheel 19
7. Rear Tone Wheel 20
8. G Sensor 21

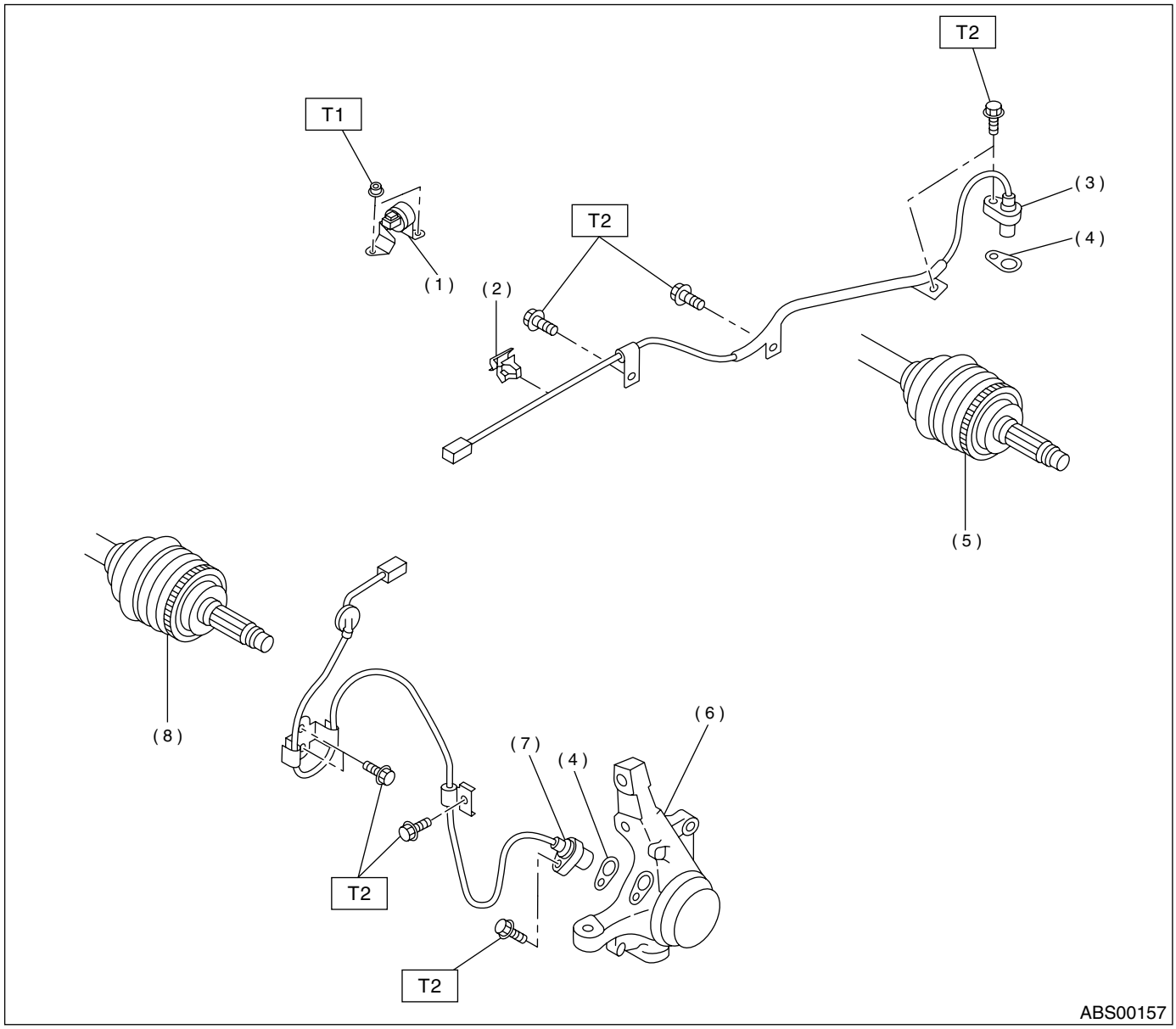
1. General Description

A: SPECIFICATIONS

Item				Standard or remarks
ABS sensor	ABS sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.44 — 0.94 mm (0.0173 — 0.0370 in)
	ABS sensor resistance			1.25±0.25 kΩ
	Marks of the harness	Front LH	Except OUTBACK, PICKUP	Yellow
			OUTBACK, PICKUP	Brown
		Front RH	Except OUTBACK, PICKUP	White
			OUTBACK, PICKUP	Light blue
		Rear LH		Yellow
		Rear RH		White
G sensor	G sensor voltage			2.3±0.2 V
ABS control module and hydraulic control unit (ABSCM&H/U) marks	AT (Except OUTBACK, PICKUP)			CG
	MT (Except OUTBACK, PICKUP)			CH
	AT (OUTBACK, PICKUP)			CI
	MT (OUTBACK, PICKUP)			CJ

B: COMPONENT

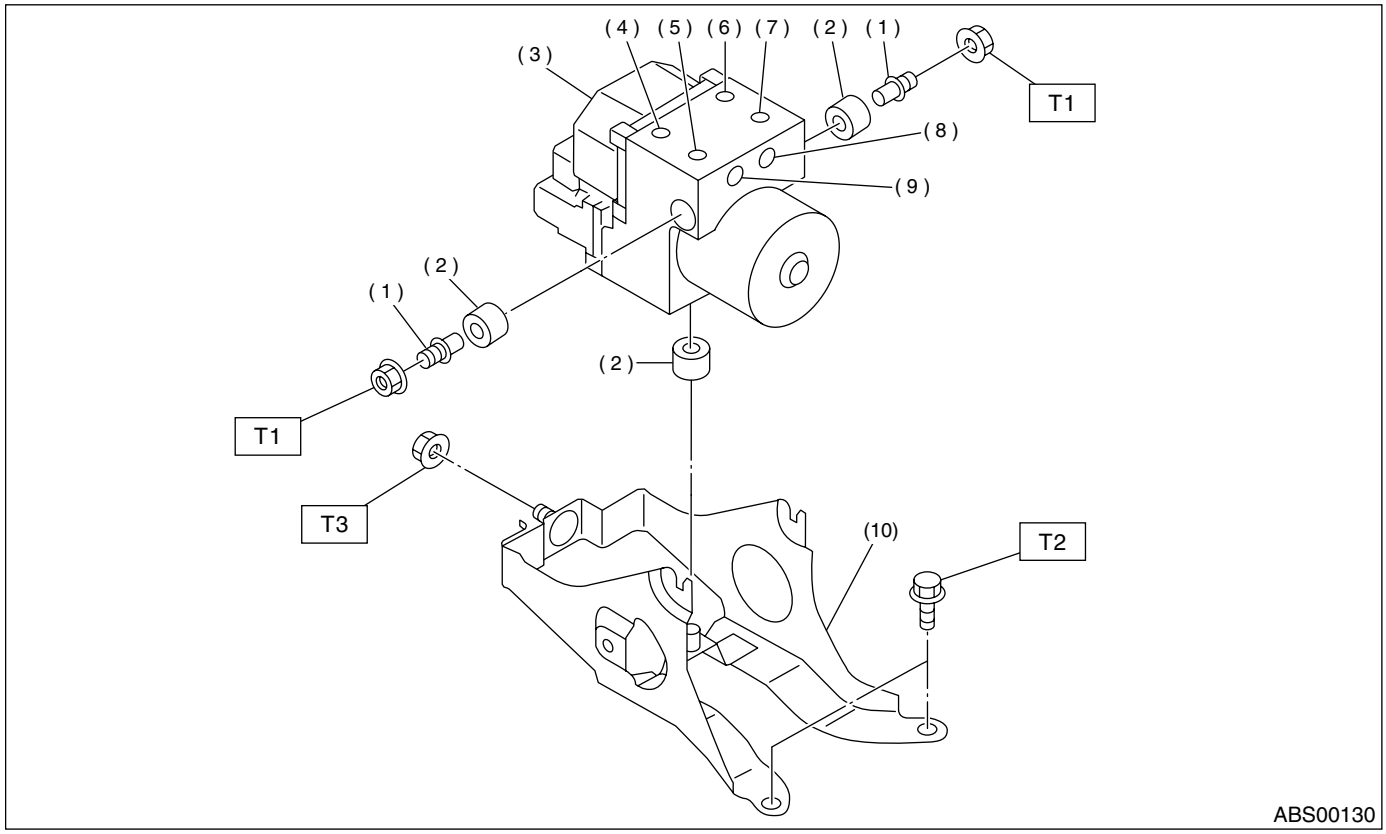
1. SENSOR



(1) G sensor
(2) Clip
(3) Rear ABS sensor LH
(4) ABS spacer
(5) Tone wheel (Rear)
(6) Housing
(7) Front ABS sensor LH
(8) Tone wheel (Front)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.77, 6)
T2: 33 (3.4, 24)

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1) Stud bolt
(2) Damper
(3) ABS control module and hydraulic control unit
(4) Front-LH outlet
(5) Secondary inlet
(6) Front-RH outlet
(7) Primary inlet
(8) Rear-LH outlet
(9) Rear-RH outlet
(10) Bracket

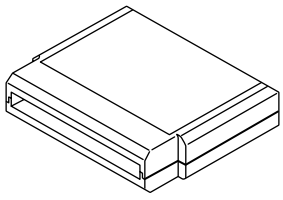
Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.06)
T2: 33 (3.4, 24)
T3: 38 (3.9, 28)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

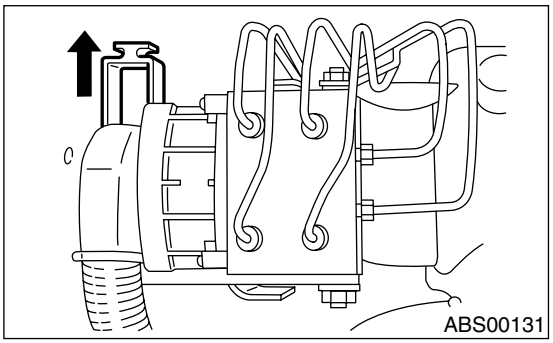
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
3) Use an air gun to get rid of water around the ABSCM&H/U.

CAUTION:
The contact will be insufficient if the terminal gets wet.

4) Pull off the lock of the ABSCM&H/U connector to remove it.



5) Disconnect connector from ABSCM&H/U.

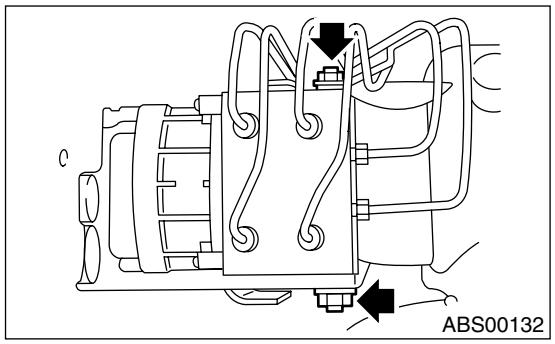
CAUTION:
Be careful not to let water or other foreign matter contact the ABSCM&H/U terminal.

6) Unlock cable clip.
7) Disconnect brake pipes from ABSCM&H/U.

CAUTION:
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

8) Remove ABSCM&H/U ground terminal from bracket.
9) Remove ABSCM&H/U from engine compartment.

CAUTION:
• ABSCM&H/U cannot be disassembled. Do not attempt to loosen bolts and nuts.
• Do not drop or bump ABSCM&H/U.
• Do not turn the ABSCM&H/U upside down or place it on its side.
• Be careful to prevent foreign particles from getting into ABSCM&H/U.
• Apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
• Do not pull harness when disconnecting connector.



B: INSTALLATION

1) Install ABSCM&H/U.

CAUTION:
Confirm that the specifications of the ABSCM&H/U conforms to the vehicle specifications.

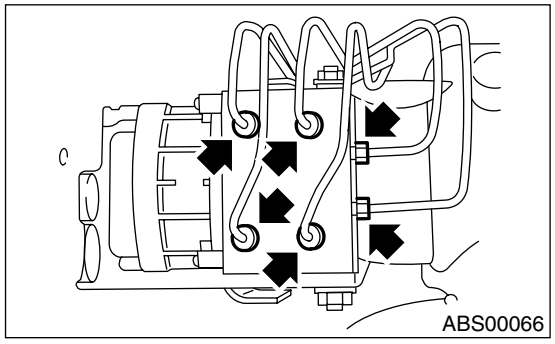
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Install ABSCM&H/U ground terminal to bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24 ft-lb)

3) Connect brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



4) Using cable clip, secure ABSCM&H/U harness to bracket.
5) Connect connector to ABSCM&H/U.

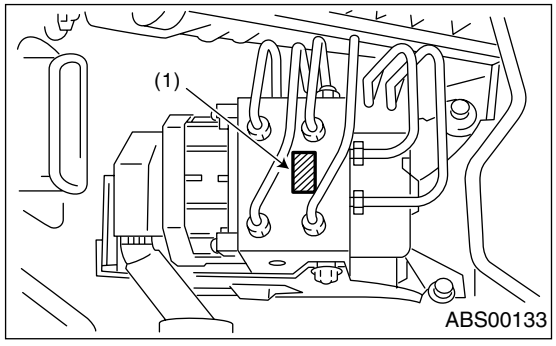
CAUTION:
• Be sure to remove all foreign matter from inside the connector before connecting.
• Ensure that the ABSCM&H/U connector is securely locked.

6) Install air intake duct.
7) Connect ground cable to battery.
8) Bleed air from the brake system.

C: INSPECTION

1) Check connected and fixed condition of connector.
2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CG	AT (Except OUTBACK)
CH	MT (Except OUTBACK)
CI	AT (OUTBACK)
CJ	MT (OUTBACK)



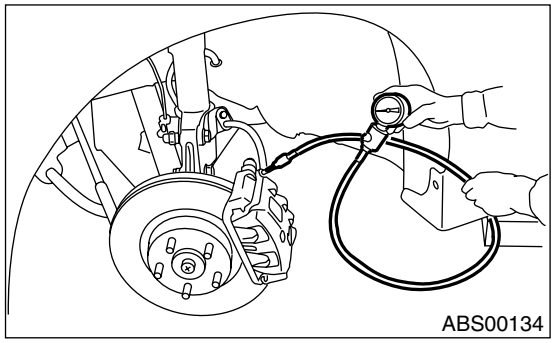
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauges.
5) Perform ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

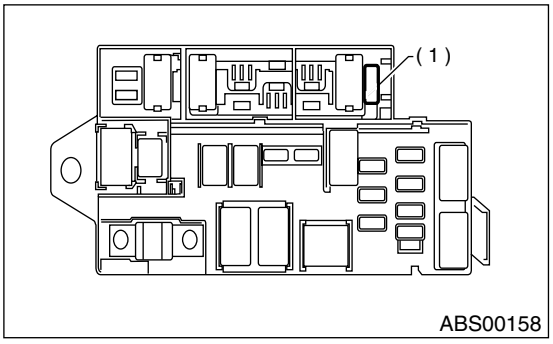
	Front wheel	Rear wheel
Initial value	3,432 kPa (35 kg/cm^2, 498 psi)	3,432 kPa (35 kg/cm^2, 498 psi)
When decompressed	490 kPa (5 kg/cm^2, 71 psi) or less	490 kPa (5 kg/cm^2, 71 psi) or less
When compressed	3,432 kPa (35 kg/cm^2, 498 psi) or more	3,432 kPa (35 kg/cm^2, 498 psi) or more

8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.

17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.

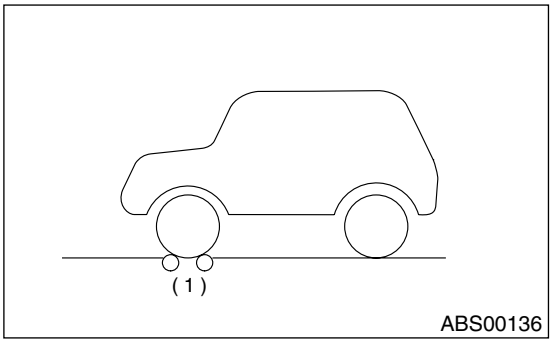
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) In the case of AWD AT vehicles, install a spare fuse with the FWD connector in the main fuse box to simulate FWD vehicles.

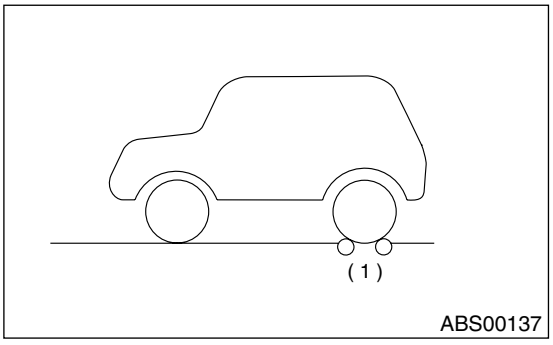


(1) FWD connector

2) Prepare for operating ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at “neutral”.



(1) Brake tester



(1) Brake tester

4) Operate the brake tester.
5) Perform ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
6) Hydraulic unit begins to work; and check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

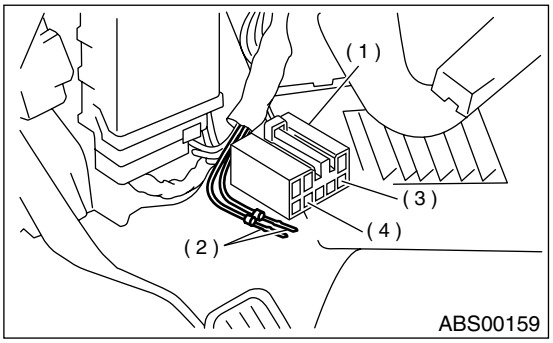
3. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) Immediately after ignition switch is turned ON, depress the brake pedal within 0.5 seconds after the ABS warning light goes out, and hold the brake pedal.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must not operate.

5) After completion of ABS sequence control, turn ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH SELECT MONITOR

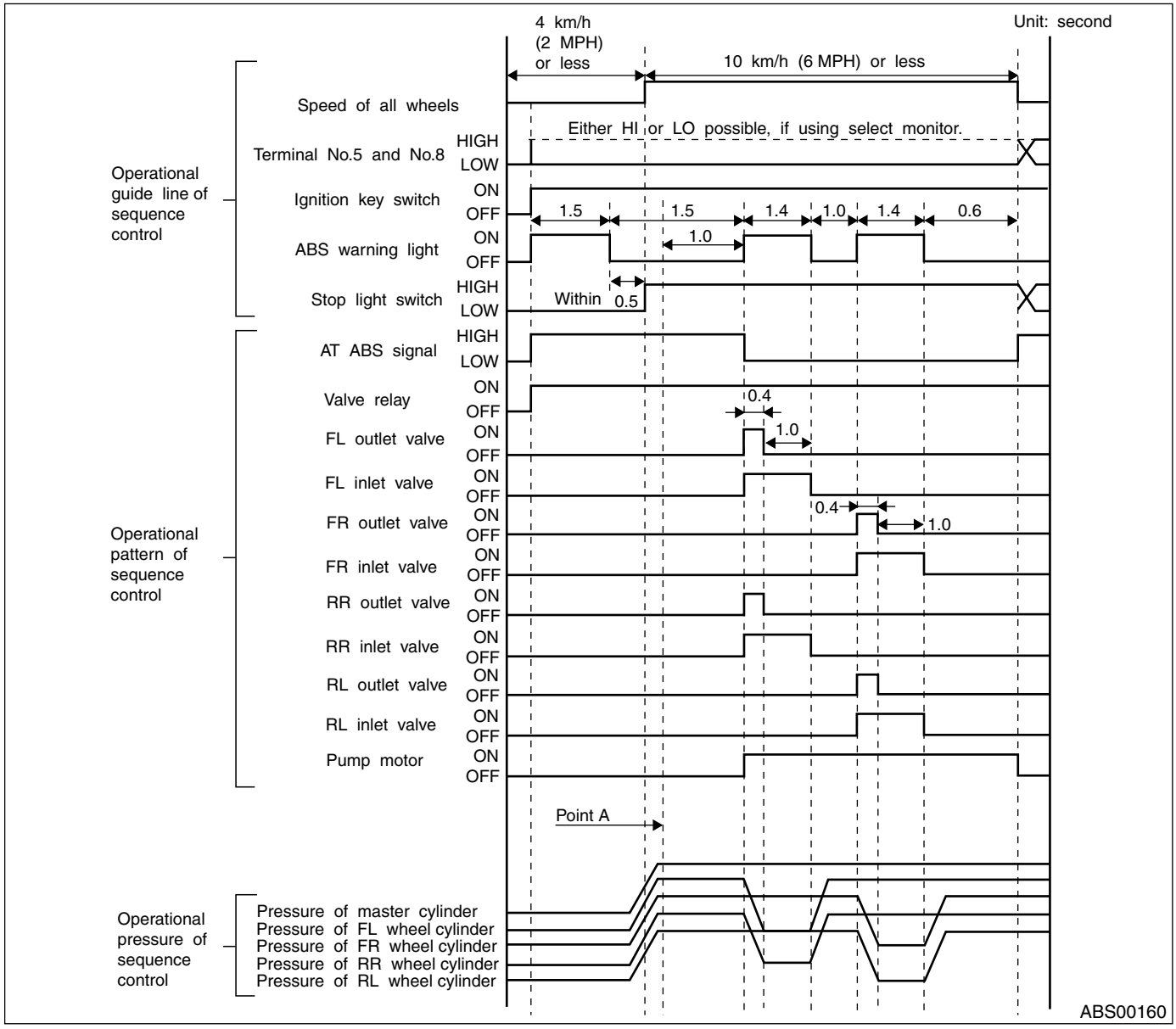
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to ABS-9, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector under driver's seat instrument panel lower cover.
2) Turn ignition switch ON.
3) Turn select monitor switch ON.
4) Put select monitor to “BRAKE CONTROL” mode.
5) When “Function check sequence” is selected, `ABS sequence control' will start.
6) The message `Press Brake Pedal Firmly' is displayed as follows:
(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kgf, 221 lb).
(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal.

7) When the message “Press YES” is displayed, press «YES» key.
8) Operation points will be displayed on select monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:
- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

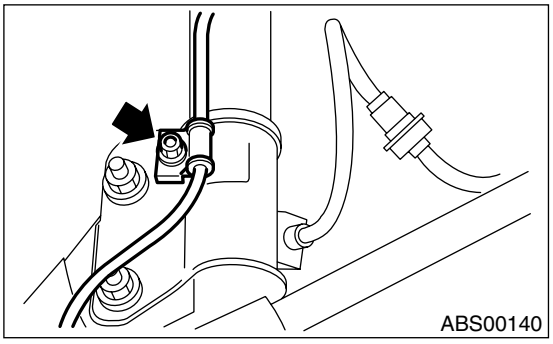
1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

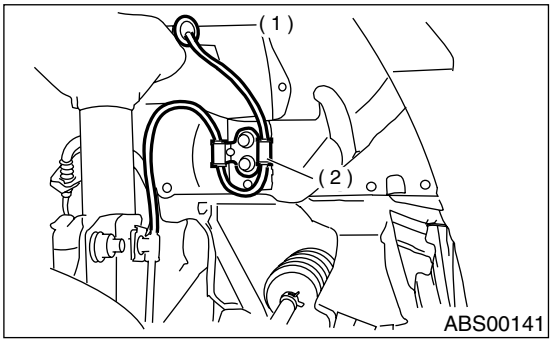
4. Front ABS Sensor

A: REMOVAL

1) Disconnect ground cable from battery.
2) Disconnect front ABS sensor connector located next to front strut mounting house in engine compartment.
3) Remove bolts which secure sensor harness to strut.



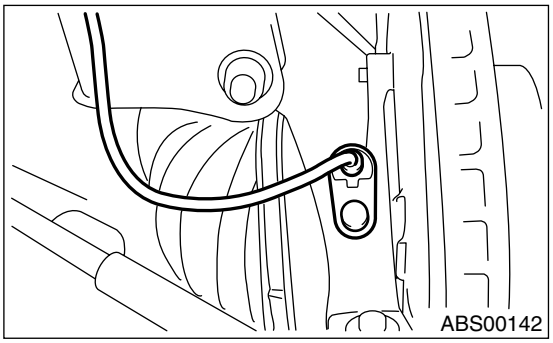
4) Remove bolts which secure sensor harness to body.



(1) To front ABS sensor connector
(2) Bracket

5) Remove bolts which secure front ABS sensor to housing, and remove front ABS sensor.

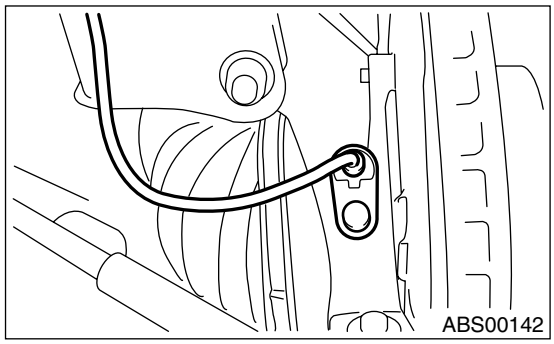
CAUTION:
• Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull sensor harness during removal.



B: INSTALLATION

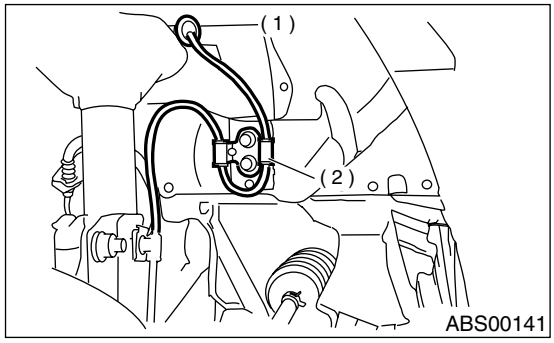
1) Temporarily install front ABS sensor on housing.

CAUTION:
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.



2) Install front ABS sensor on strut and wheel apron bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24 ft-lb)

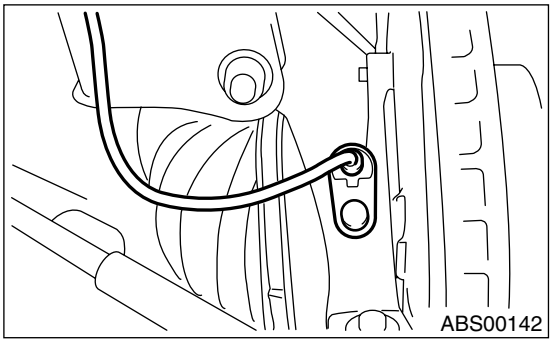


(1) To front ABS sensor connector
(2) Bracket

3) Place a thickness gauge between ABS sensor's pole piece and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on housing to specified torque.

ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)



CAUTION:
Check the marks on the harness to make sure that no distortion exists.

Model	LH	RH
Except OUTBACK	Yellow	White
OUTBACK	Brown	Light blue

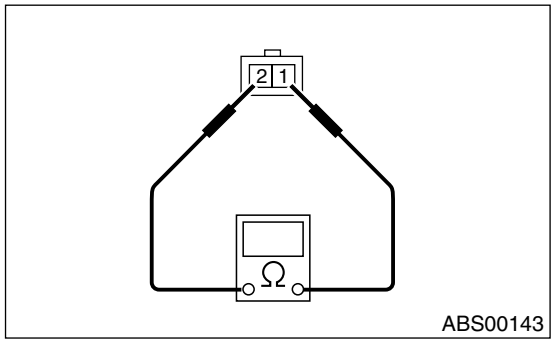
NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

4) After confirmation of the ABS sensor clearance, connect connector to ABS sensor.
5) Connect connector to battery ground cable.

C: INSPECTION

1. ABS SENSOR

1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.
2) Measure ABS sensor resistance.



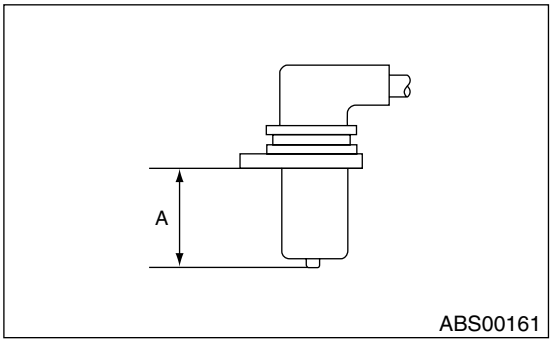
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
If resistance is outside the standard value, replace ABS sensor with new one.

NOTE:
Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

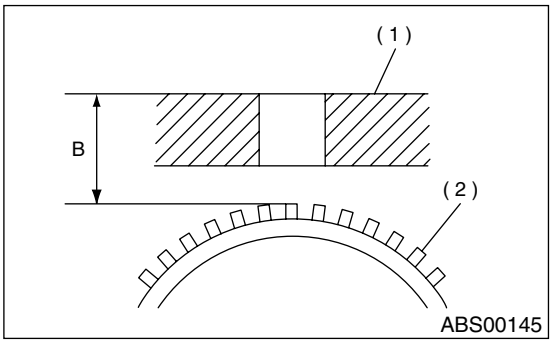
2. SENSOR GAP

1) Measure the distance “A” between ABS sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured valves in the formula below and calculating.

ABS sensor clearance = B – A

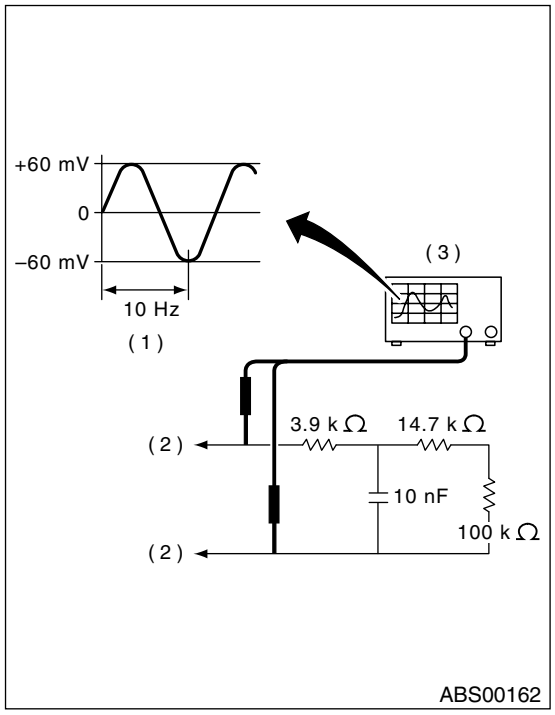
ABS sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:
Regarding terminal No., please refer to item 1. ABS SENSOR.



(1) Standard output voltage:
Approx. 120 mV (When it is 10 Hz)
(2) To terminal
(3) Oscilloscope

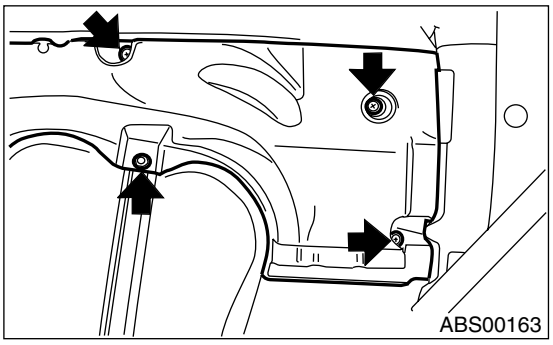
D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

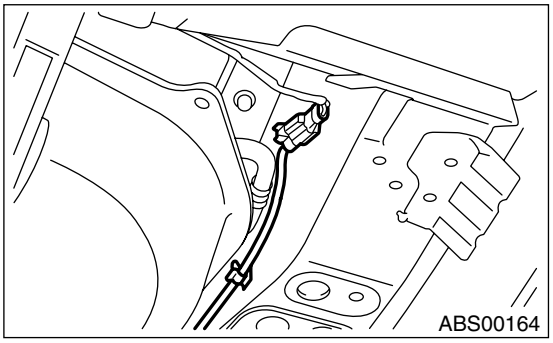
5. Rear ABS Sensor

A: REMOVAL

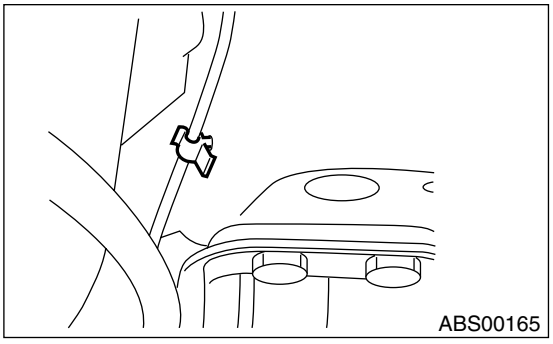
1) Disconnect ground cable from battery.
2) Lift-up the vehicle.
3) Remove fuel tank cover.



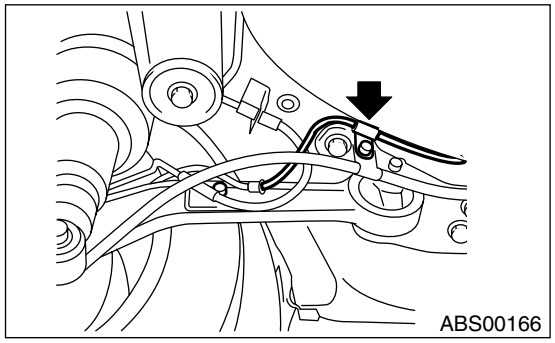
4) Disconnect rear ABS sensor connector.

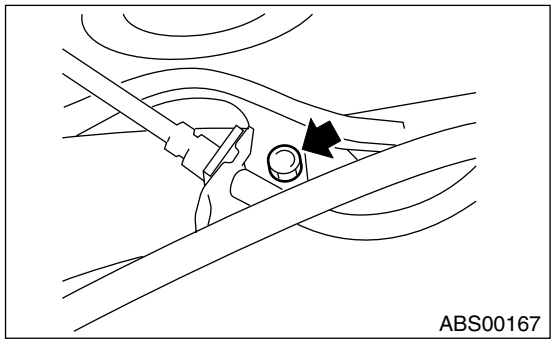


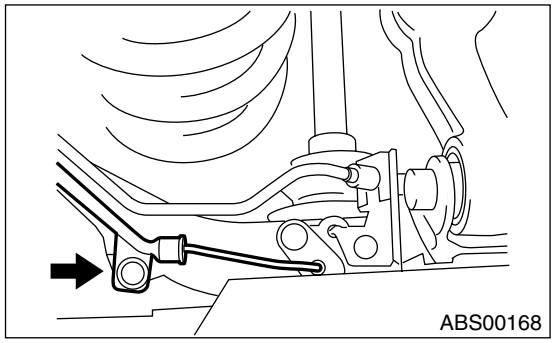
5) Remove rear sensor harness from clip on body side.



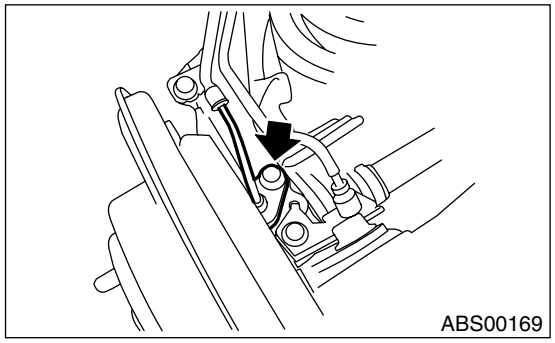
6) Remove bolts which hold rear sensor harness brackets.







7) Remove rear ABS sensor from rear arm.



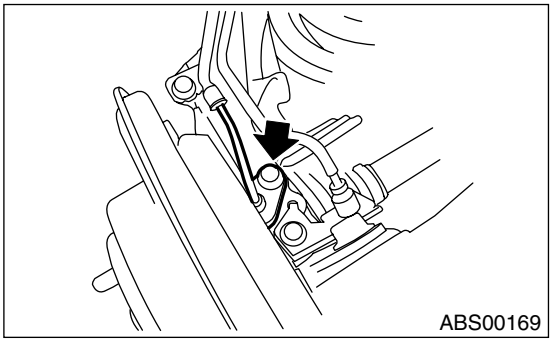
8) When inspecting rear tone wheel, remove rear drive shaft as rear tone wheel is unitized with BJ assembly of rear drive shaft.
<Ref. to DS-37, REMOVAL, Rear Drive Shaft.>

CAUTION:
• Be careful not to damage pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull sensor harness during removal.

B: INSTALLATION

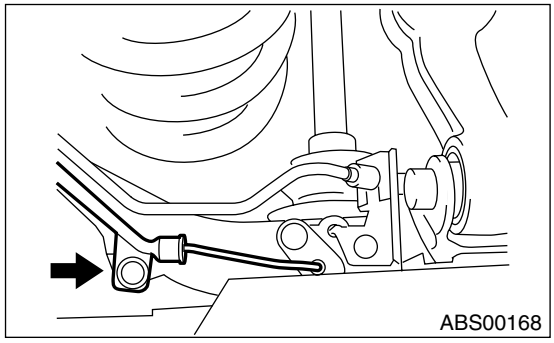
1) Install rear drive shaft to the vehicle.
<Ref. to DS-37, INSTALLATION, Rear Drive Shaft.>
2) Temporarily install rear ABS sensor on rear arm.

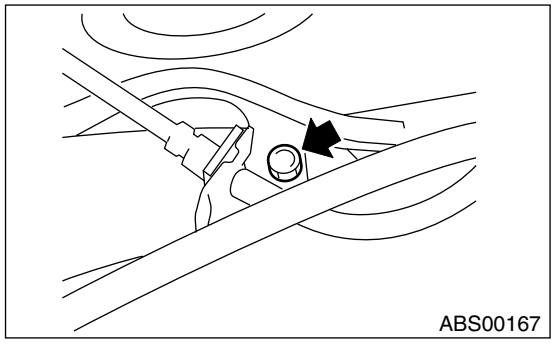
CAUTION:
Be careful not to strike ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.


ABS00169

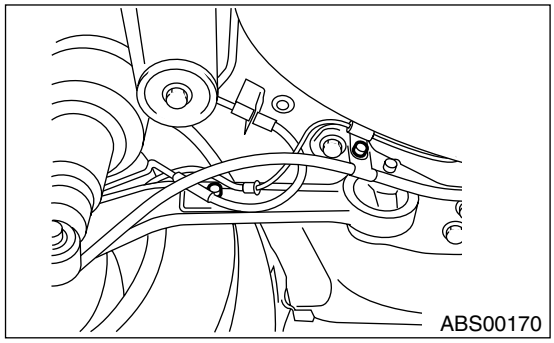
3) Install rear sensor harness brackets in the original positions and install harness on the clip.

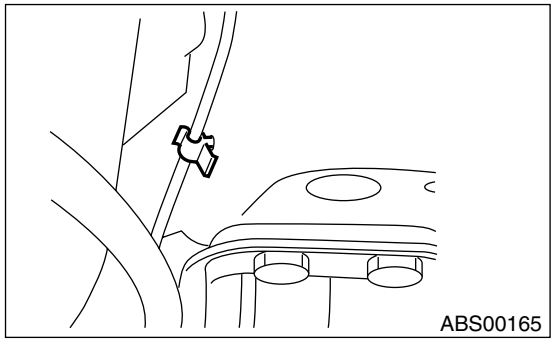
Tightening torque:
33 N·m (3.4 kgf-m, 24 ft-lb)


ABS00168


ABS00167

Tightening torque:
33 N·m (3.4 kgf-m, 24 ft-lb)


ABS00170


ABS00165

4) Place a thickness gauge between ABS sensor's and tone wheel's tooth face. After standard clearance is obtained over the entire perimeter, tighten ABS sensor on rear arm to specified torque.

ABS sensor standard clearance:
0.44 — 0.94 mm (0.0173 — 0.0370 in)

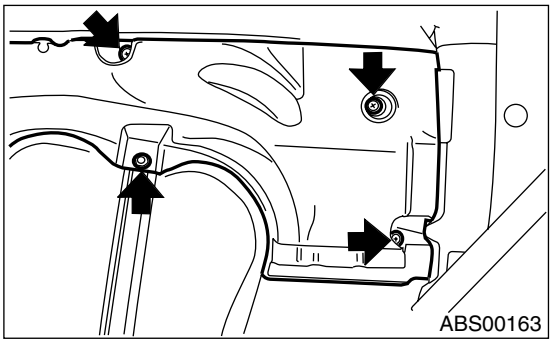
Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

CAUTION:
Check the marks on the harness to make sure that no distortion exists.

	LH	RH
Mark	Yellow	White

NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

5) After confirmation of the ABS sensor clearance, connect connector to ABS sensor and install fuel tank cover.

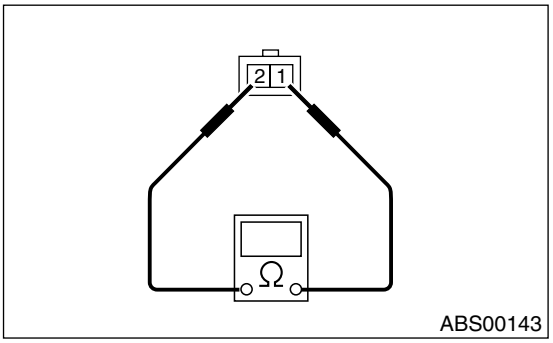


6) Connect connector to battery ground cable.

C: INSPECTION

1. ABS SENSOR

1) Check pole piece of ABS sensor for foreign particles or damage. If necessary, clean pole piece or replace ABS sensor.
2) Measure ABS sensor resistance.



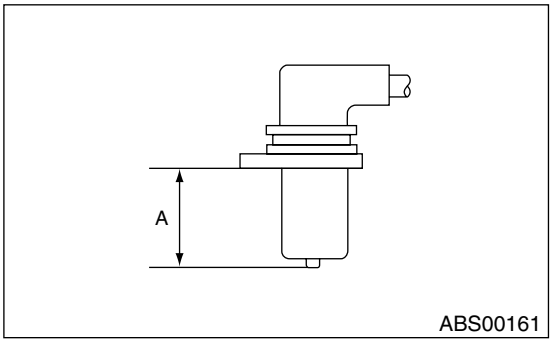
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
If resistance is outside the standard value, replace ABS sensor with new one.

NOTE:
Check ABS sensor cable for discontinuity. If necessary, replace with a new one.

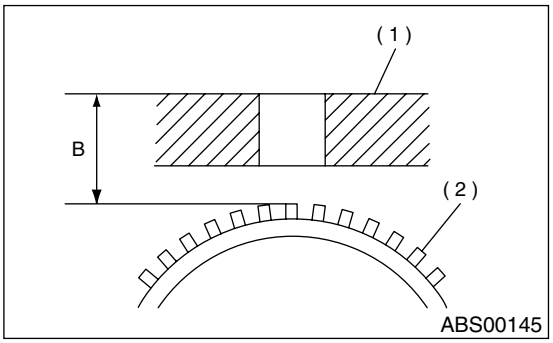
2. SENSOR GAP

1) Measure the distance “A” between ABS sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

ABS sensor clearance = B – A

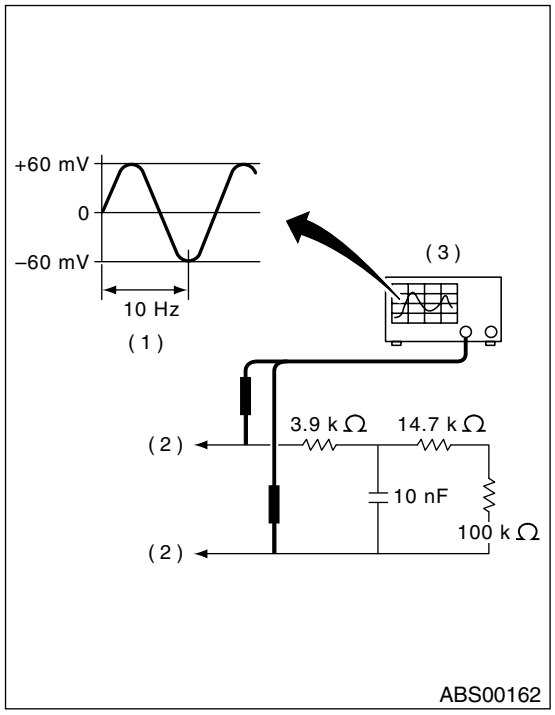
ABS sensor standard clearance:
0.44 — 0.94 mm (0.0173 — 0.0370 in)

NOTE:
If the clearance is outside specifications, adjust the gap using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install resistor and condenser, then rotate wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:
Regarding terminal No., refer to item 1. ABS SENSOR.



(1) Standard output voltage:
Approx. 120 mV (When it is 10 Hz)
(2) To terminal
(3) Oscilloscope

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-29, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-31, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

NOTE:
Replace BJ assembly with new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Drive Shaft, because rear tone wheel is integrated with rear drive shaft.
<Ref. to DS-37, REMOVAL, Rear Drive Shaft.>

B: INSTALLATION

Refer to Rear Drive Shaft, because rear tone wheel is integrated with rear drive shaft.
<Ref. to DS-37, INSTALLATION, Rear Drive Shaft.>

C: INSPECTION

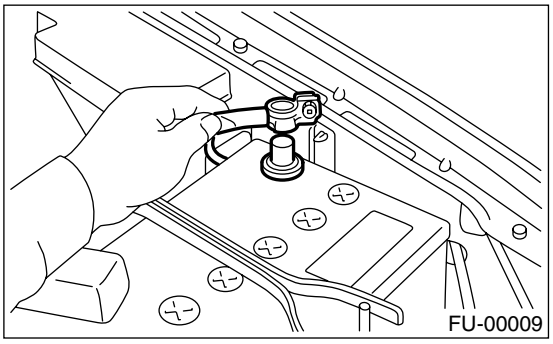
Visually check tone wheels teeth (44 pieces) for cracks or dents. If necessary, replace tone wheel with a new one.

NOTE:
Replace BJ assembly with new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

8. G Sensor

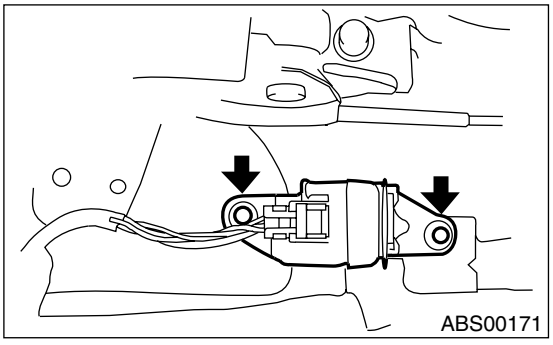
A: REMOVAL

1) Disconnect ground cable from battery.



2) Remove console cover.
<Ref. to EI-45, REMOVAL, Console Box.>
3) Disconnect connector from G sensor.
4) Remove G sensor from body.

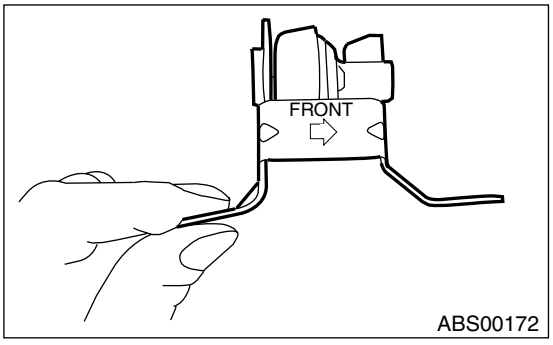
CAUTION:
Do not drop or bump G sensor.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Do not install G sensor in the wrong direction. There is an arrow mark on the sensor showing which side faces the vehicle front.



C: INSPECTION

Step		Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have SUBARU SELECT MONITOR?	Go to step **5.**	Go to step **2.**
2	**CHECK G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal:*** ***(R70) No. 2 (+) — No. 3 (–)***	Is the voltage 2.1 — 2.5 V when G sensor is horizontal?	Go to step **3.**	Replace G sensor.
3	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal:*** ***(R70) No. 2 (+) — No. 3 (–)***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace G sensor.
4	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal:*** ***(R70) No. 2 (+) — No. 3 (–)***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace G sensor.
5	**CHECK G SENSOR.** 1) Turn ignition switch to OFF. 2) Connect select monitor connector to data link connector. 3) Turn select monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output voltage.	Is the indicated reading 2.1 — 2.5 V when the vehicle is in horizontal position?	Go to step **6.**	Replace G sensor.
6	**CHECK G SENSOR.** 1) Remove console box. 2) Remove G sensor from vehicle. (Do not disconnect connector.) 3) Read the select monitor display.	Is the indicated reading 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **7.**	Replace G sensor.
7	**CHECK G SENSOR.** Read the select monitor display.	Is the indicated reading 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace G sensor.

ABS (DIAGNOSTICS)

ABS

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
• To check harness for broken wires or short circuits, shake it while holding it or the connector.
• When ABS warning light illuminates, read and record diagnostic trouble code (DTC) indicated by ABS warning light.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-5, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.>	Is the component part that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>	Is ABS warning light normal?	Go to step **3.**	Inspect using diagnostic chart for ABS warning light failure.<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: Call up diagnostic trouble code (DTC) again after inspecting ABS warning light. <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** NOTE: Record all diagnostic trouble codes (DTC).	Is only the start code displayed?	Go to step **4.**	Go to step **5.**
4	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to ABS-145, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> Calling up the diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>	Is only the start code displayed?	Complete the diagnosis.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Diagnostic Connector”.<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostics Trouble Code (DTC)”. <Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-19, Read Diagnostic Trouble Code (DTC).>	Is only the start code displayed?	Complete the diagnosis.	Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to ABS-25, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS-5, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the ABS problem. <Ref. to ABS-8, INSPECTION, General Description.>	Is unit that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF TROUBLE CODE DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn ignition switch to ON and SUBARU SELECT MONITOR to ON. NOTE: If the communication function of the select monitor cannot be executed normally, check the communication circuit. <Ref. to ABS-78, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.> 4) Read diagnostic trouble code (DTC). <Ref. to ABS-17, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5) Record all diagnostic trouble codes (DTC) and frame data.	Is the DTC displayed?	Go to step **4.**	Go to step **3.**

Step		Check	Yes	No
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to ABS-145, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 4) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Confirm that no DTC is displayed.	Does ABS warning light remain off?	Complete the diagnosis.	Go to step **4.**
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Subaru Select Monitor”.<Ref. to ABS-78, Diagnostics Chart with Subaru Select Monitor.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostics Trouble Code (DTC)”. <Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS-17, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to ABS-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Confirm that no DTC is displayed.	Does ABS warning light remain off?	Complete the diagnosis.	Inspect using “Diagnostics Chart with Subaru Select Monitor”. <Ref. to ABS-<Ref. to ABS-78, Diagnostics Chart with Subaru Select Monitor.>, Diagnostics Chart with Subaru Select Monitor.>

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:			
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)			
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.			
	❑ When advancing		km/h to	km/h
			MPH to	MPH
	❑ While traveling at a constant speed	km/h		MPH
	❑ When decelerating		km/h to	km/h
			MPH to	MPH
	❑When turning to right	Steering angle:		deg
		Steering time:		sec
	❑ When turning to left	Steering angle:		deg
		Steering time:		sec
	❑ When moving other electrical parts			
	• Parts name: • Operating condition:			

2. SYMPTOMS

ABS operating condition	❑ Performs no work.		
	❑ Operates only when abruptly applying brakes.	Vehicle speed:	km/h MPH
	• How to step on brake pedal:		
	a) Operating time:		sec
	b) Operating noise: ❑ Produce / ❑ Does not produce		
	• What kind of noise?	❑ Knock ❑ Gong gong ❑ Bong ❑ Buzz ❑ Gong gong buzz ❑ Others:	
	c) Reaction force of brake pedal		
		❑ Stick ❑ Press down once with a clunk ❑ Press and released ❑ Others:	
Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes: ❑ Yes / ❑ No		
	• When:	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others:	
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating: ❑ Yes / ❑ No		
	• When:	❑ Vehicle turns to right ❑ Vehicle turns to left ❑ Spins ❑ Others:	
	c) Brakes are out of order: ❑ Yes / ❑ No		
	• What:	❑ Braking distance is long ❑ Brakes lock or drag ❑ Pedal stroke is long ❑ Pedal sticks ❑ Others:	
	d) Poor acceleration: ❑ Yes / ❑ No		
	• What:	❑ Fails to accelerate ❑ Engine stalls ❑ Others:	
	e) Occurrence of vibration: ❑ Yes / ❑ No		
	• Where • What kind:		
	f) Occurrence of abnormal noise: ❑ Yes / ❑ No		
	• Where • What kind:		
	g) Occurrence of other phenomena: ❑ Yes / ❑ No		
	• What kind:		

3. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:
	b) Ambient temperature	°F (°C)
	c) Road	❑ Urban area ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others:
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others:
Condition	a) Brakes	Deceleration: g
		❑ Continuous / ❑ Intermittent
	b) Accelerator	Acceleration: g
		❑ Continuous / ❑ Intermittent
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ Turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	e) Degree of wear	Front RH tire:
		Front LH tire:
		Rear RH tire:
		Rear LH tire:
	f) Genuine parts are used.: ❑ Yes / ❑ No	
	g) Chain is passed around tires.: ❑ Yes / ❑ No	
	h) T tire is used.: ❑ Yes / ❑ No	
	i) Condition of suspension alignment:	
	j) Loading state:	
	k) Repair parts are used.: ❑ Yes / ❑ No	
	• What:	
	l) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

1) Check brake fluid level.
2) Check brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• Without brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

4. BRAKE DRAG

Check brake drag.

5. BRAKE PAD AND ROTOR

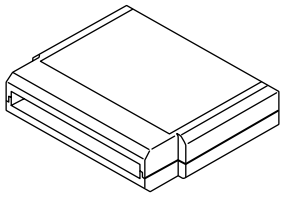
Check brake pad and rotor.
• Front <Ref. to BR-14, INSPECTION, Front Brake Pad.> and <Ref. to BR-15, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-19, INSPECTION, Rear Brake Pad.> and <Ref. to BR-20, INSPECTION, Rear Disc Rotor.>

6. TIRE

Check tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOLS

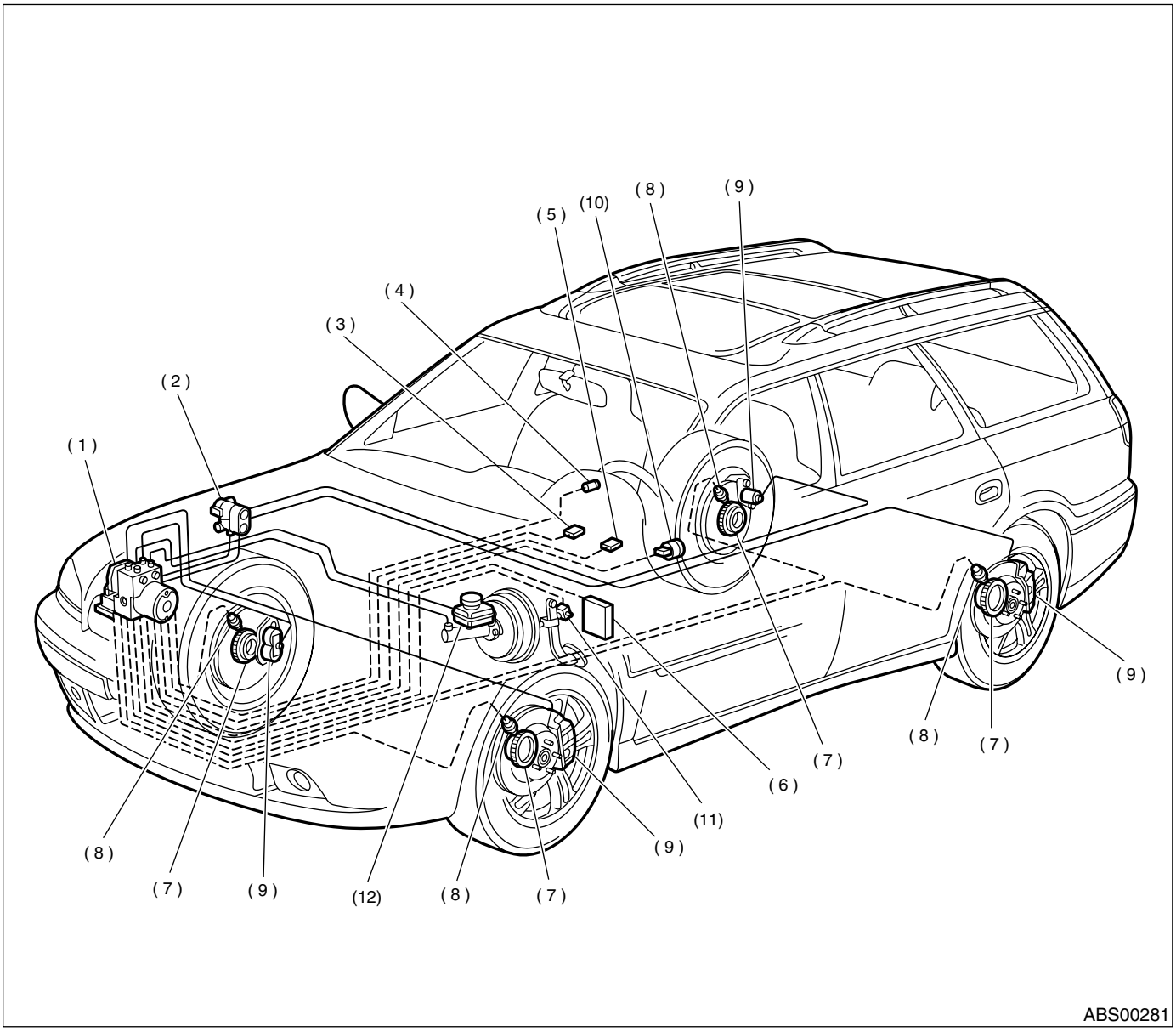
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

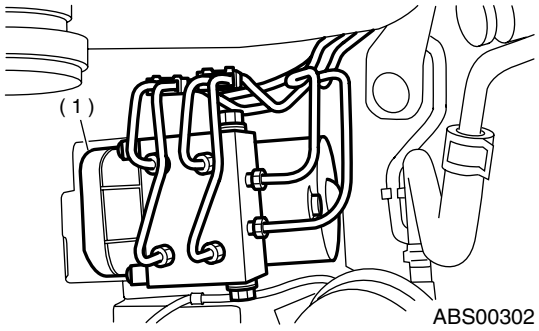
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Components Location

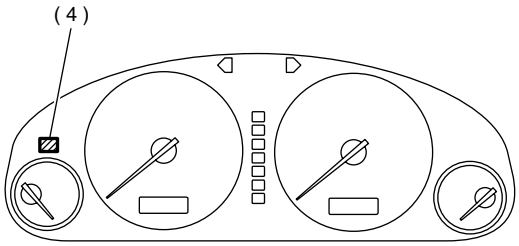
A: LOCATION



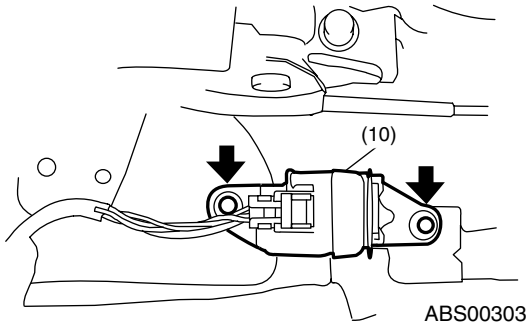
(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Proportioning valve
(3) Diagnosis connector
(4) ABS warning light
(5) Data link connector (for Subaru select monitor)
(6) Transmission control module (AT models)
(7) Tone wheel
(8) ABS sensor
(9) Wheel cylinder
(10) G sensor
(11) Stop light switch
(12) Master cylinder



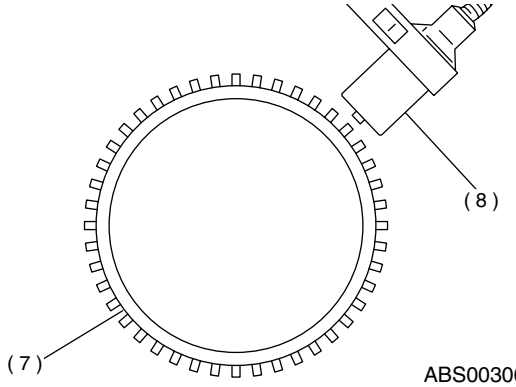
ABS00302



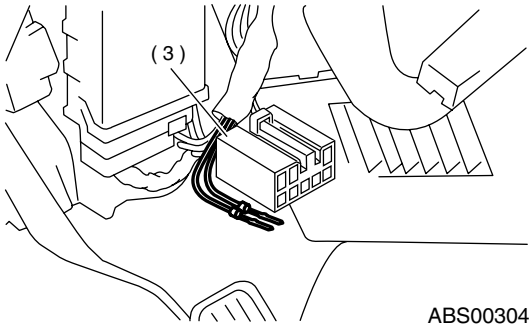
ABS00305



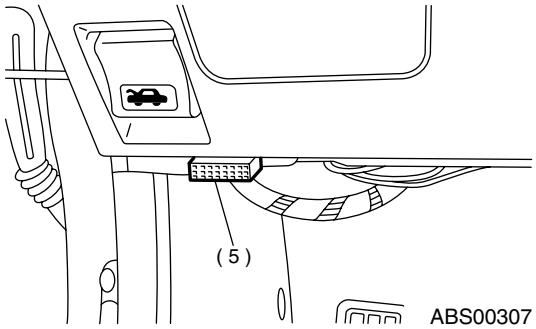
ABS00303



ABS00306



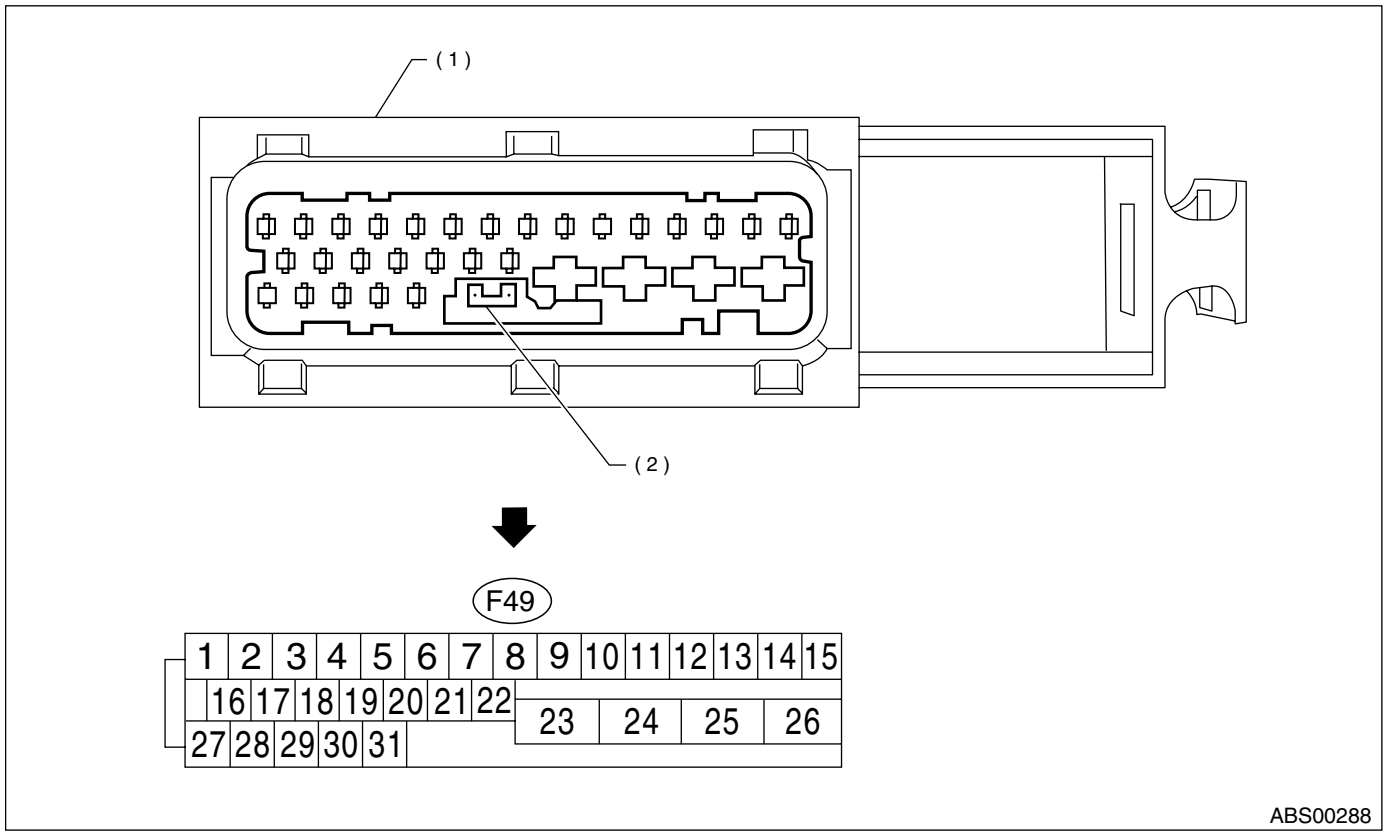
ABS00304



ABS00307

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



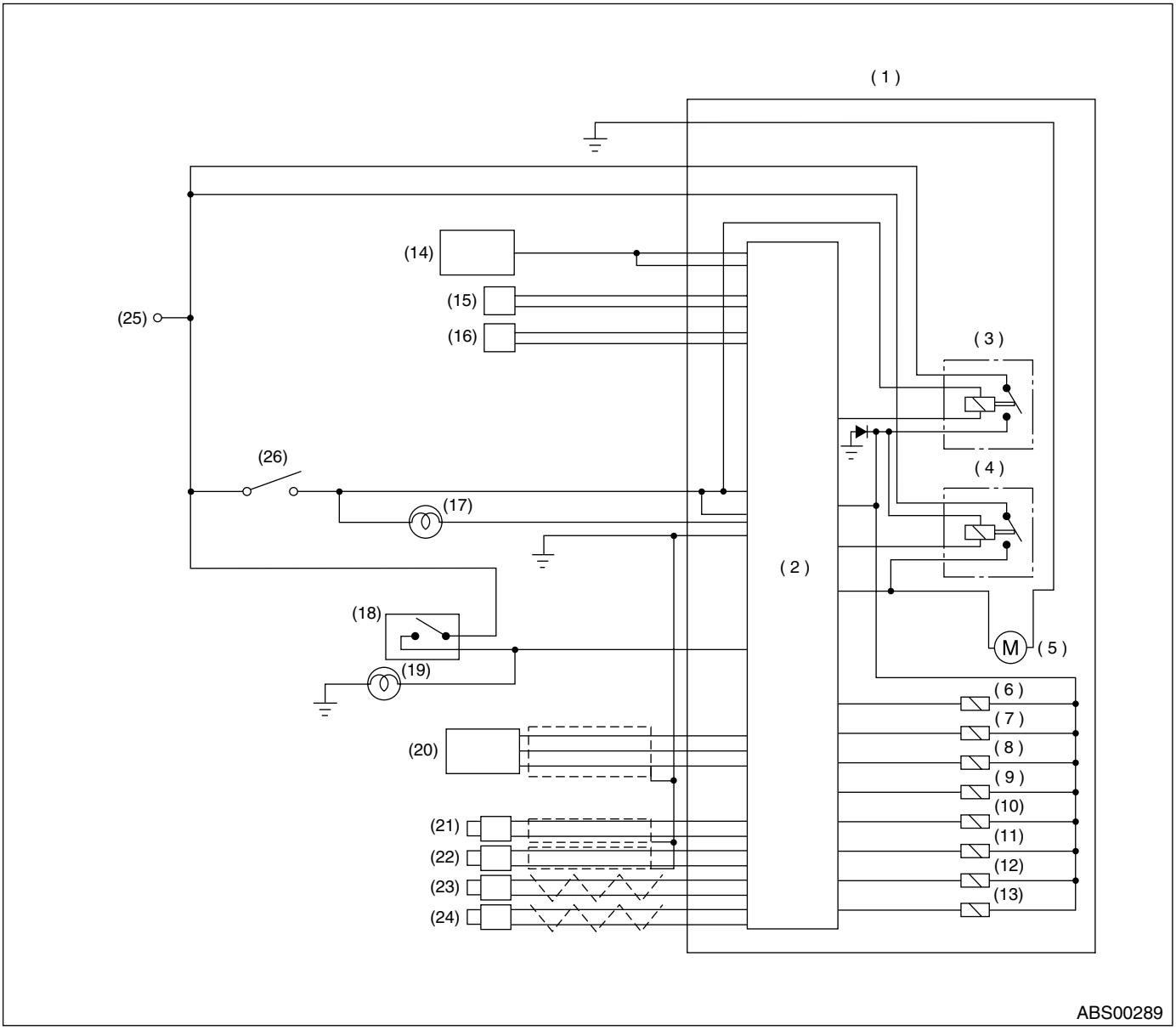
(1) ABSCM&HU connector
(2) Connector switch

NOTE:
• The terminal numbers in the ABS control module and hydraulic control unit connector are as shown in the figure.
• When the connector is removed from the ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

Contents		Terminal No. (+)—(–)	Input/Output signal Measured value and measuring conditions
ABS sensor*2 (Wheel speed sensor)	Front left wheel	9—10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11—12	
	Rear left wheel	7—8	
	Rear right wheel	14—15	
Valve relay power supply		24—23	10 — 15 V
Motor relay power supply		25—23	10 — 15 V
G sensor*2	power supply	30—28	4.75 — 5.25 V
	ground	28	—
	output	6—28	2.3±0.2 V when vehicle is in horizontal position.
Stop light switch*1		2—23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.
ABS warning light*2		22—23	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
AT ABS signal*2 (AT model only)		31—23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
ABS operation signal monitor*2		3—23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
Select monitor*2	Data is received.	20—23	Less than 1.5 V when no data is received.
	Data is sent.	5—23	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector*2	Terminal No. 3	29—23	10 — 15 V when ignition switch is ON.
	Terminal No. 6	4—23	10 — 15 V when ignition switch is ON.
Power supply*1		1—23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

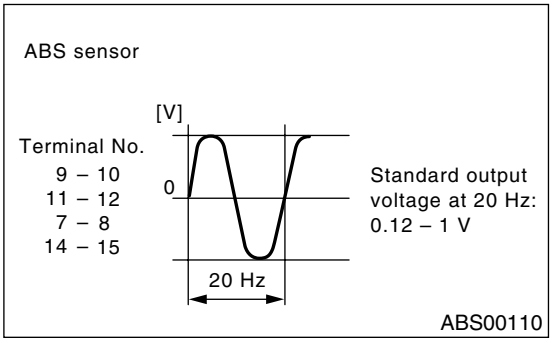
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.
*2: Measure the I/O signal voltage at connector (B62) or (F55).

B: SCHEMATIC



(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) ABS control module area
(3) Valve relay
(4) Motor relay
(5) Motor
(6) Front left inlet solenoid valve
(7) Front left outlet solenoid valve
(8) Front right inlet solenoid valve
(9) Front right outlet solenoid valve
(10) Rear left inlet solenoid valve
(11) Rear left outlet solenoid valve
(12) Rear right inlet solenoid valve
(13) Rear right outlet solenoid valve
(14) Transmission control module (only AT model)
(15) Diagnosis connector
(16) Data link connector
(16) Data link connector
(17) ABS warning light
(18) Stop light switch
(19) Stop light
(20) G sensor
(21) Front left ABS sensor
(22) Front right ABS sensor
(23) Rear left ABS sensor
(24) Rear right ABS sensor
(25) Battery
(26) IGN

C: WAVEFORM

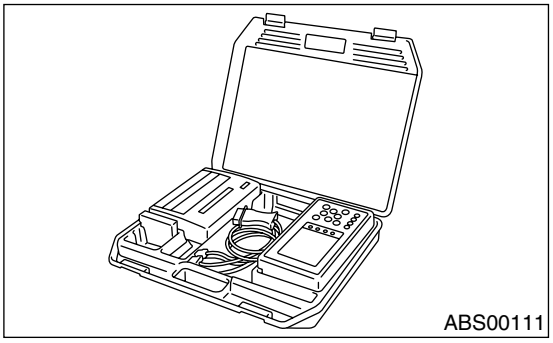

ABS sensor
[V]
Terminal No.
9 – 10
11 – 12
7 – 8
14 – 15
0
20 Hz
Standard output voltage at 20 Hz: 0.12 – 1 V
ABS00110

6. Subaru Select Monitor

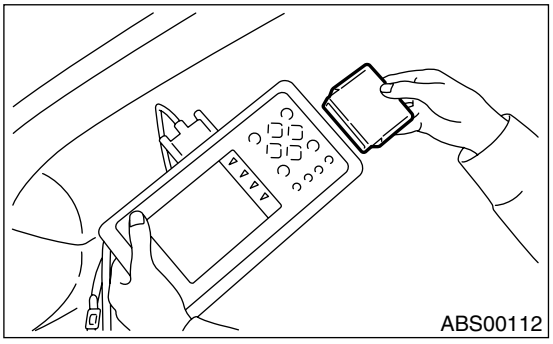
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare Subaru Select Monitor kit.

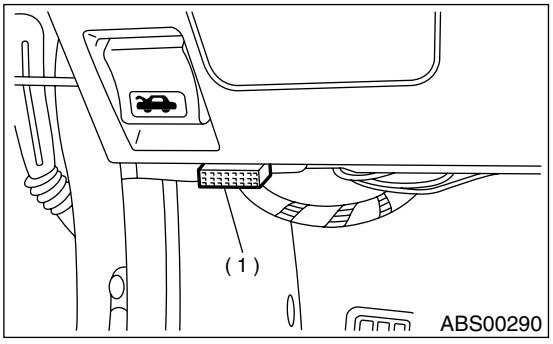


2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to ABS-9, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

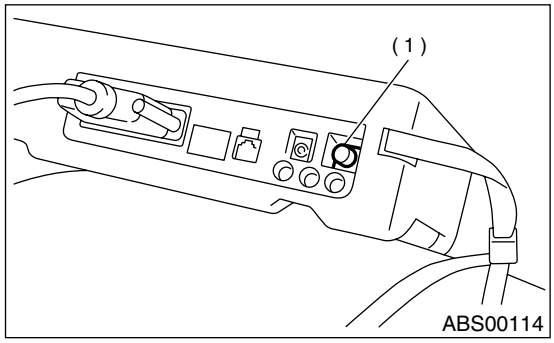
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

(2) Connect diagnosis cable to data link connector.

5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.
8) Press the [YES] key after displayed the information of ABS type.
9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the LIST OF DIAGNOSTICS TROUBLE CODE. <Ref. to ABS-24, List of Diagnostics Trouble Code (DTC).>
• A maximum of 3 DTC are displayed in order of occurrence.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark “?”, appears on the select monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent trouble code appears on the select monitor display.
Old	The second most recent trouble code appears on the select monitor display.
Older	The third most recent trouble code appears on the select monitor display.
Reference	A specified period of time proceeding trouble code appears on the select monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the «YES» key.
2) On the «System Selection Menu» display screen, select the {Brake Control System} and press the «YES» key.
3) Press the «YES» key after displayed the information of ABS type.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press the «YES» key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the «YES» key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by the Front Right ABS sensor is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by the Front Left ABS sensor is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by the Rear Right ABS sensor is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by the Rear Left ABS sensor is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
G sensor output Signal	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Signal to TCM	ABS operation signal from ABS control module to TCM	ON or OFF
ABS Warning Lamp	ON operation of the ABS warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of the motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the «YES» key.
2) On the «System Select Menu» display screen, select {Brake System} and press the «YES» key.
3) Press the «YES» key after displayed the information of ABS type.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing trouble code.

5) When the “Done” and “turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-9, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:
- Data stored at the time of trouble occurrence is shown on display.
- Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
- If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark "?", appears on the select monitor display. This shows it may be an unreliable reading.
- In case of no trouble code, the initial value of freeze frame data will be displayed.

Display screen	Contents to be monitored	Initial value
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.	255 km/h [158 mile/h]
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.	↑
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.	↑
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed in km/h or mile/h.	↑
ABSCM power voltage	Power (in volts) supplied to ABSCM&H/U appears on the select monitor display.	18 V
G sensor output voltage	Refers to vehicle acceleration detected by the analog G sensor. It appears on the select monitor display in volts.	5 V
Motor relay monitor	Motor relay operation monitor signal	ON
Stop light switch	Stop light switch signal	OFF
ABS signal to TCM	ABS operation signal from ABS control module to TCM	OFF
ABS-AT control	ABS operation signal from ABS control module to TCM	OFF
ABS operation signal	ABS operation signal	ON

6. ANALOG DATA ARE DISPLAYED.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed in km/h or mile/h.
Stop light switch	Stop light switch monitor voltage is displayed.
G sensor output voltage	Refers to vehicle acceleration detecting by the analog G sensor. It appears on the select monitor display in volts.

7. ON/OFF DATA ARE DISPLAYED.

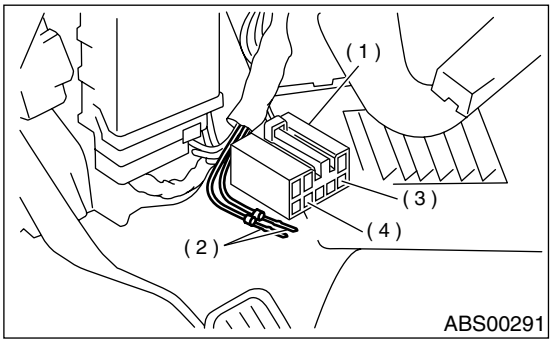
Display screen	Contents to be monitored
Stop light switch	Stop light switch signal
Valve relay signal	Valve relay signal
Motor relay signal	Motor relay signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS warning light	ABS warning light
Valve relay monitor	Valve relay operation monitor signal
Motor relay monitor	Motor relay operation monitor signal
CCM signal	ABS operation signal from ABS control module to TCM

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

1) Take out diagnosis connector from side of driver's seat heater unit.

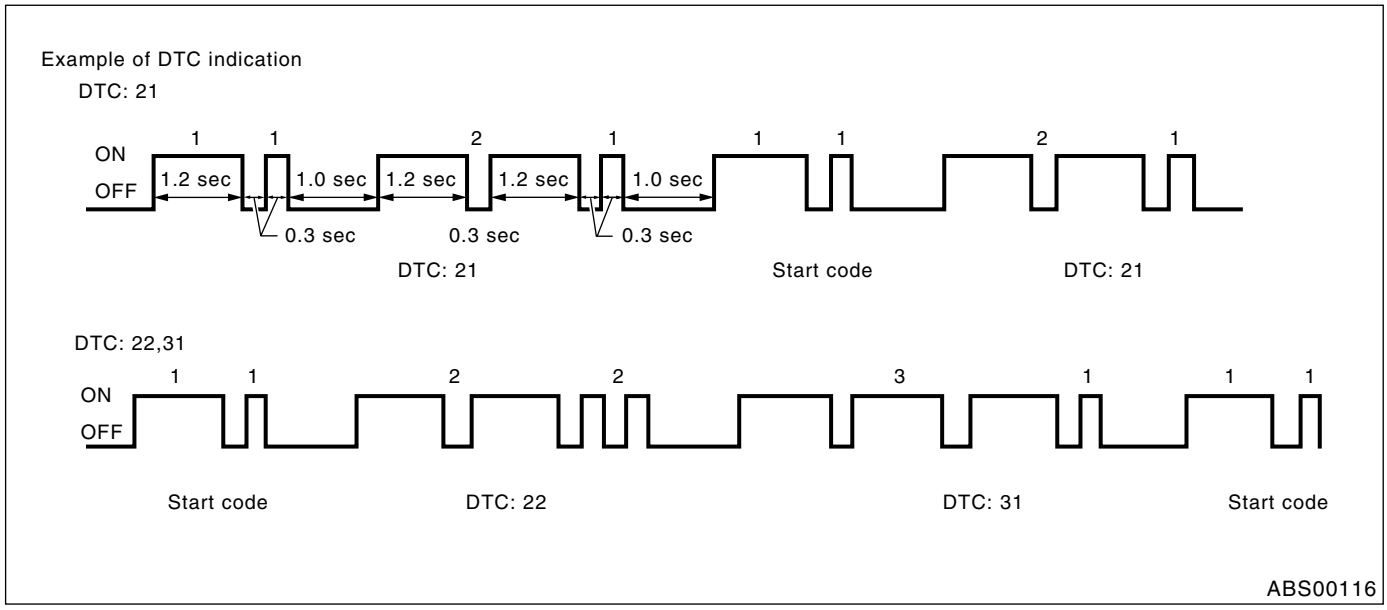


(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Turn ignition switch OFF.
3) Connect diagnosis connector terminal 8 to diagnosis terminal.
4) Turn ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).

6) After the start code (11) is shown, the diagnostic trouble codes (DTC) will be shown in order of the last information first.
These repeat for a maximum of 3 minutes.

NOTE:
• When there are no diagnostic trouble codes (DTC) in memory, only the start code (11) is shown.
• When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTC). <Ref. to ABS-16, Subaru Select Monitor.>

8. Inspection Mode

A: OPERATION

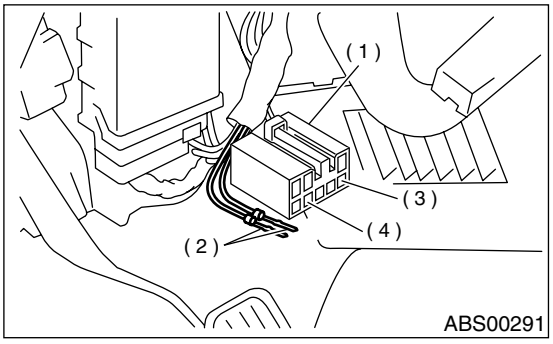
Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

9. Clear Memory Mode

A: OPERATION

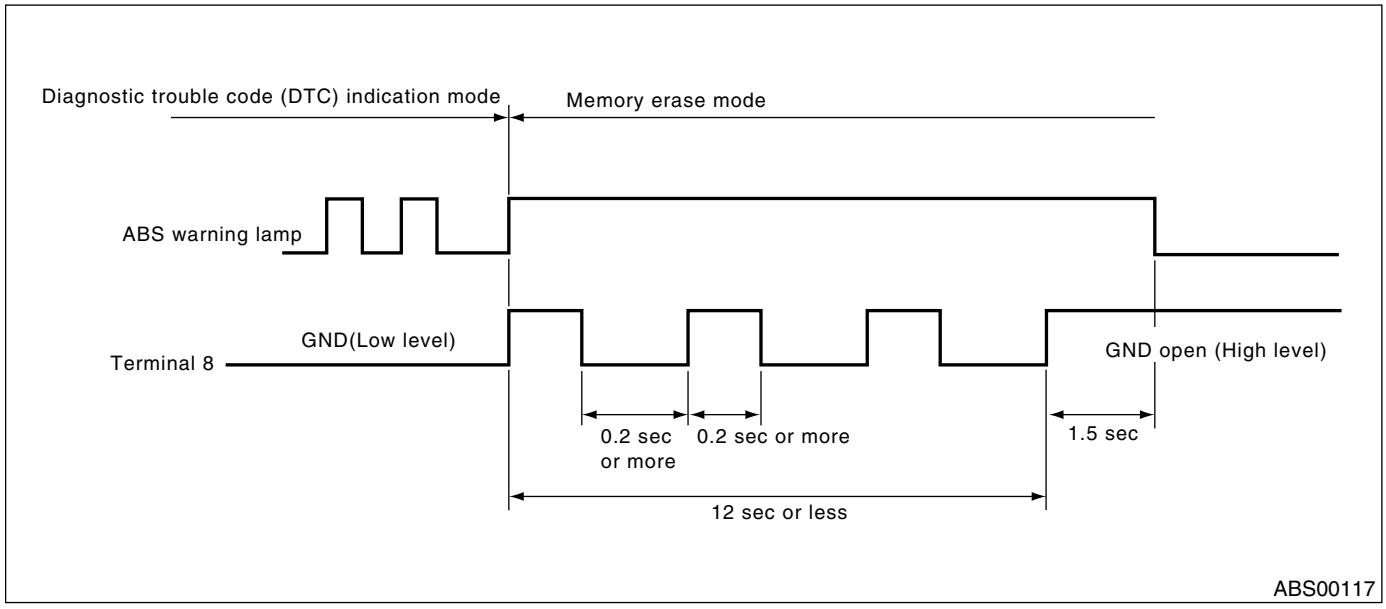
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect diagnosis connector terminal 8 from diagnosis terminal.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 8 and diagnosis terminal for at least 0.2 seconds each time.



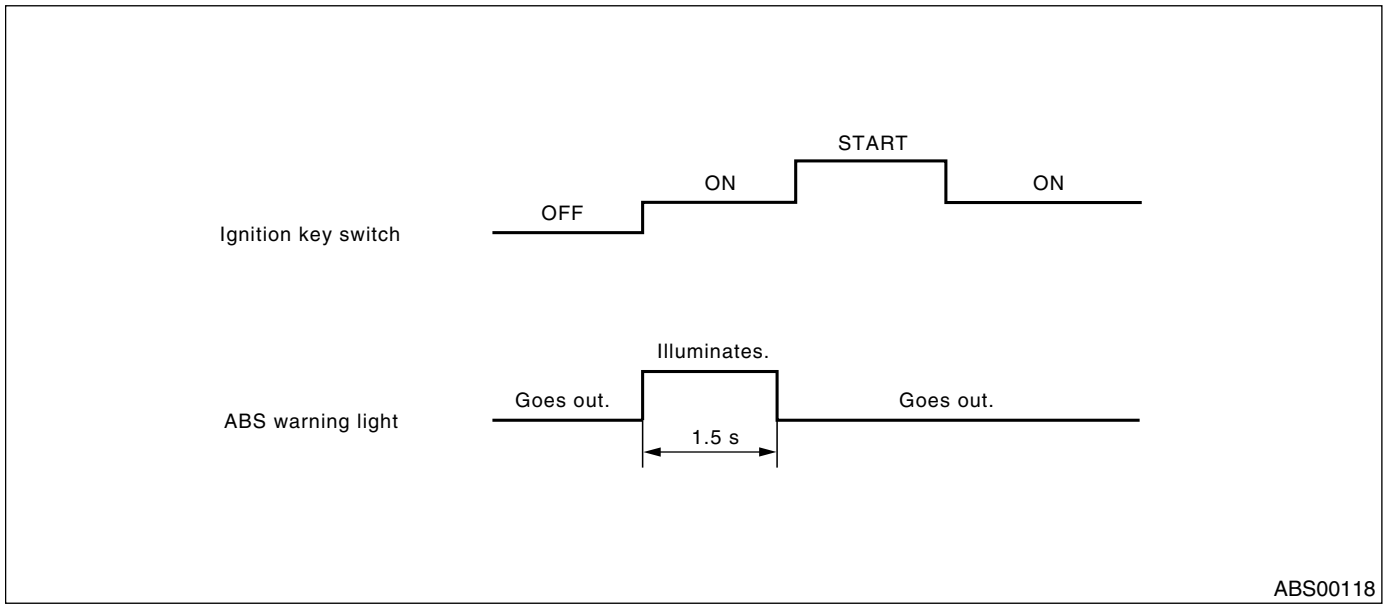
NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear diagnostic trouble codes (DTC). <Ref. to ABS-16, Subaru Select Monitor.>

10.ABS Warning Light Illumination Pattern

A: INSPECTION



1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.>

NOTE:
Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.

11.List of Diagnostics Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	<Ref. to ABS-38, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to ABS-38, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to ABS-38, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	<Ref. to ABS-44, DTC 22 ABNORMAL ABS SENSOR (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to ABS-44, DTC 24 ABNORMAL ABS SENSOR (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to ABS-44, DTC 26 ABNORMAL ABS SENSOR (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-50, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>
31	Abnormal solenoid valve circuit(s) in ABS control module and hydraulic unit	Front right inlet valve	<Ref. to ABS-53, DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve	<Ref. to ABS-56, DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve	<Ref. to ABS-53, DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve	<Ref. to ABS-56, DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve	<Ref. to ABS-53, DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve	<Ref. to ABS-56, DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve	<Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve	<Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis	Index No.
41	Abnormal ABS control module	<Ref. to ABS-60, DTC 41 ABNORMAL ABS CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.	<Ref. to ABS-62, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal	<Ref. to ABS-64, DTC 44 A COMBINATION OF AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay	<Ref. to ABS-68, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay	<Ref. to ABS-70, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch	<Ref. to ABS-72, DTC 54 ABNORMAL STOP LIGHT SWITCH, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage	<Ref. to ABS-74, DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-78, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light remains on.	<Ref. to ABS-81, NO TROUBLE CODE, Diagnostics Chart with Subaru Select Monitor.>
21	Open or short circuit in front right ABS sensor circuit	Open or short circuit in front right ABS sensor circuit	<Ref. to ABS-84, DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
22	Front right ABS sensor abnormal signal	Front right ABS sensor abnormal signal	<Ref. to ABS-91, DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
23	Open or short circuit in front left ABS sensor circuit	Open or short circuit in front left ABS sensor circuit	<Ref. to ABS-84, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
24	Front left ABS sensor abnormal signal	Front left ABS sensor abnormal signal	<Ref. to ABS-91, DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
25	Open or short circuit in rear right ABS sensor circuit	Open or short circuit in rear right ABS sensor circuit	<Ref. to ABS-84, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
26	Rear right ABS sensor abnormal signal	Rear right ABS sensor abnormal signal	<Ref. to ABS-91, DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
27	Open or short circuit in rear left ABS sensor circuit	Open or short circuit in rear left ABS sensor circuit	<Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
28	Rear left ABS sensor abnormal signal	Rear left ABS sensor abnormal signal	<Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>
29	Abnormal ABS sensor signal on any one of four sensor	Abnormal ABS sensor signal on any one of four	<Ref. to ABS-98, DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostics Chart with Subaru Select Monitor.>
31	Front right inlet valve malfunction	Front right inlet valve malfunction	<Ref. to ABS-101, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
32	Front right outlet valve malfunction	Front right outlet valve malfunction	<Ref. to ABS-104, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

DTC No.	Display screen	Contents of diagnosis	Index No.
33	Front left inlet valve malfunction	Front left inlet valve malfunction	<Ref. to ABS-101, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
34	Front left outlet valve malfunction	Front left outlet valve malfunction	<Ref. to ABS-104, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
35	Rear right inlet valve malfunction	Rear right inlet valve malfunction	<Ref. to ABS-101, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
36	Rear right outlet valve malfunction	Rear right outlet valve malfunction	<Ref. to ABS-104, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
37	Rear left inlet valve malfunction	Rear left inlet valve malfunction	<Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
38	Rear left outlet valve malfunction	Rear left outlet valve malfunction	<Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
41	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-108, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-110, DTC 42 POWER SUPPLY VOLTAGE TOO LOW, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-112, DTC 42 POWER SUPPLY VOLTAGE TOO HIGH, Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-114, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-116, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-118, DTC 51 VALVE RELAY MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-120, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-122, DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
52	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-124, DTC 52 MOTOR RELAY ON FAILURE, Diagnostics Chart with Subaru Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to ABS-126, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-128, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>
56	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-130, DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-134, DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>
56	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-126, DTC 56 ABNORMAL G SENSOR HIGH μ OUTPUT, Diagnostics Chart with Subaru Select Monitor.>
56	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-142, DTC 56 DETECTION OF G SENSOR STICK, Diagnostics Chart with Subaru Select Monitor.>

MEMO:

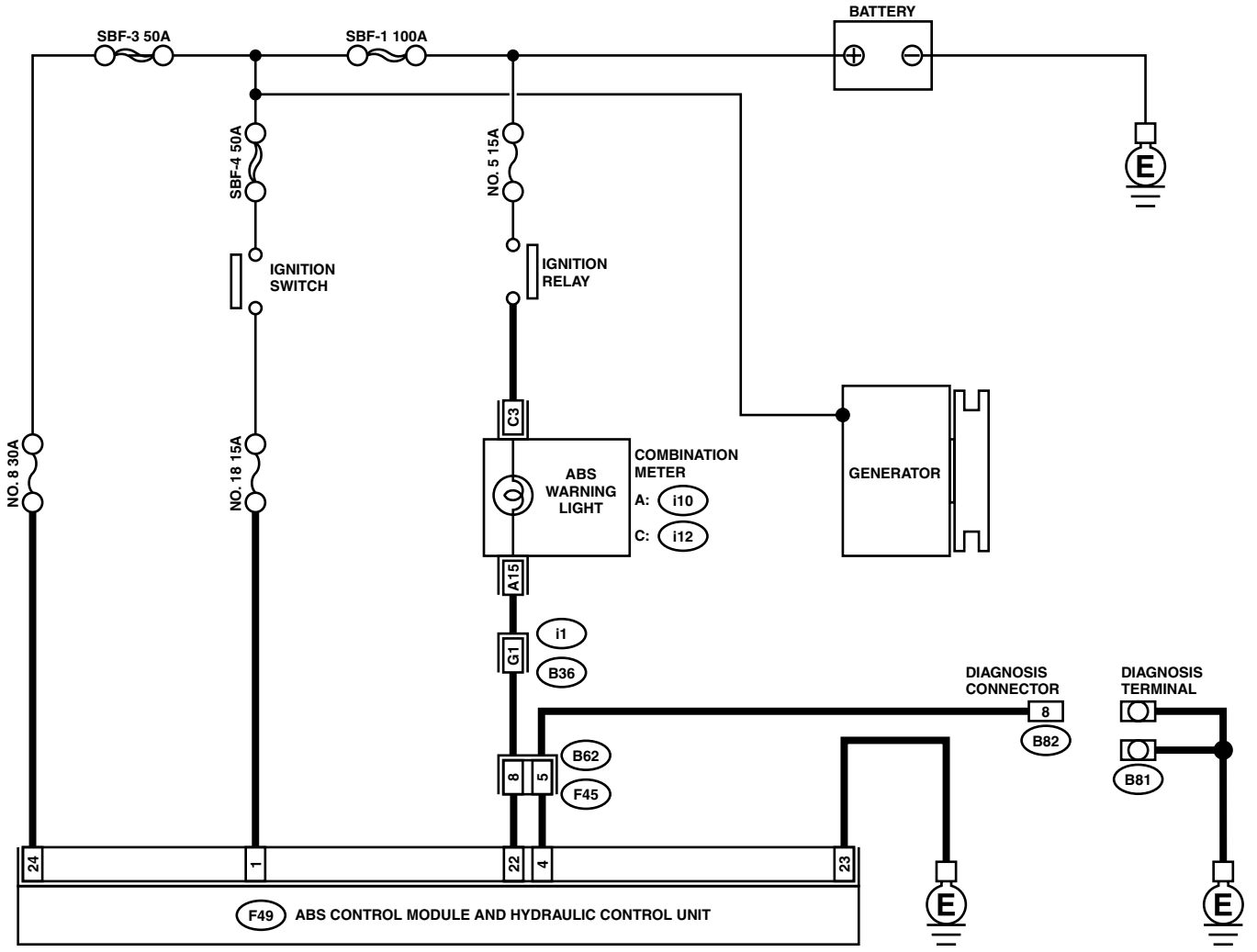
12.Diagnostics Chart with Diagnosis Connector

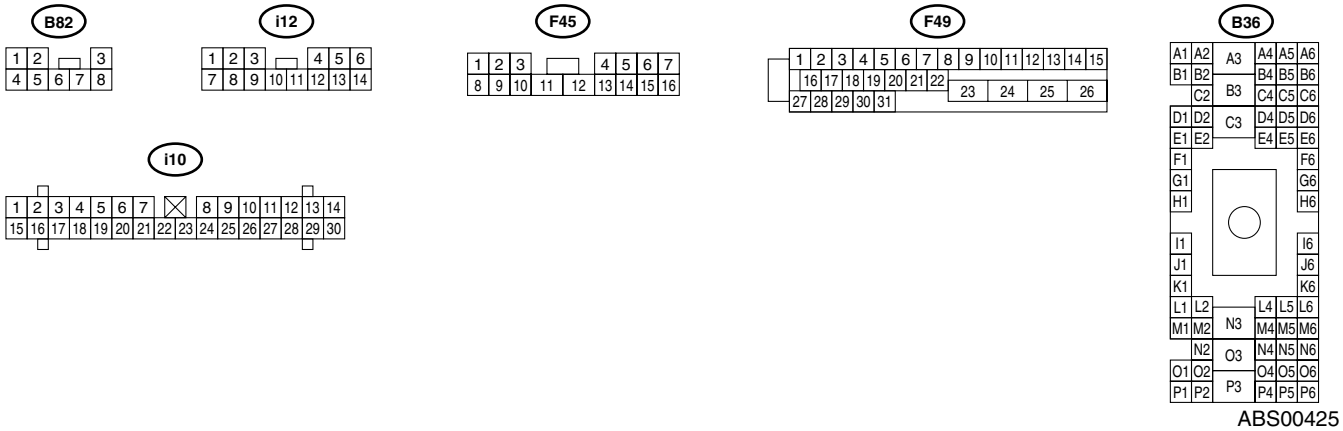
A: ABS WARNING LIGHT DOES NOT COME ON.

DIAGNOSIS:
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:
- When ignition switch is turned ON (engine OFF), ABS warning light does not come on

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn ignition switch to ON (engine OFF).	Do other warning lights turn on?	Go to step **2.**	Repair combination meter. -<Ref. to IDI-13, Combination Meter Assembly.>
2	**CHECK ABS WARNING LIGHT BULB.** 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove ABS warning light bulb from combination meter.	Is ABS warning light bulb OK?	Go to step **3.**	Replace ABS warning light bulb. <Ref. to IDI-13, Combination Meter Assembly.>
3	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Disconnect connector (B62) from connector (F45). 2) Measure voltage between connector (B62) and chassis ground. ***Connector & terminal*** ***(B62) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 3 V?	Go to step **4.**	Repair warning light harness.
4	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between connector (B62) and chassis ground. ***Connector & terminal*** ***(B62) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 3 V?	Go to step **5.**	Repair warning light harness.
5	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Install ABS warning light bulb from combination meter. 3) Install combination meter. 4) Turn ignition switch to ON. 5) Measure voltage between connector (B62) and chassis ground. ***Connector & terminal*** ***(B62) No. 8 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Repair wiring harness.
6	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 3 V?	Go to step **7.**	Repair wiring harness.
7	**CHECK BATTERY SHORT OF ABS WARNING LIGHT HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 3 V?	Go to step **8.**	Repair wiring harness.
8	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **9.**	Repair ABSCM&H/U ground harness.
9	**CHECK WIRING HARNESS.** Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Repair harness/ connector.

Step		Check	Yes	No
10	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connectors between combination meter and ABSCM&H/U?	Replace ABSCM&H/U.	<Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

MEMO:

B: ABS WARNING LIGHT DOES NOT GO OFF.

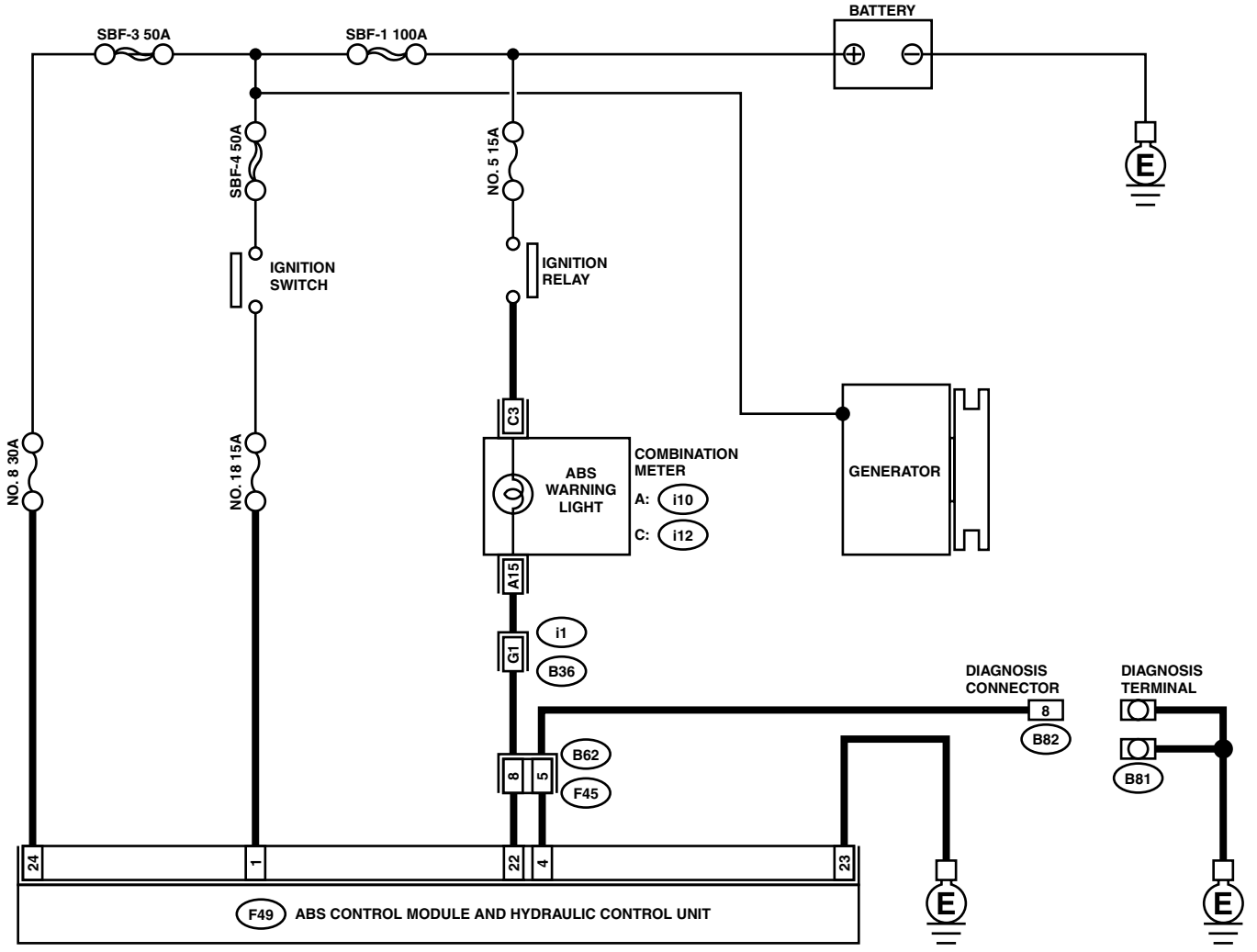
DIAGNOSIS:

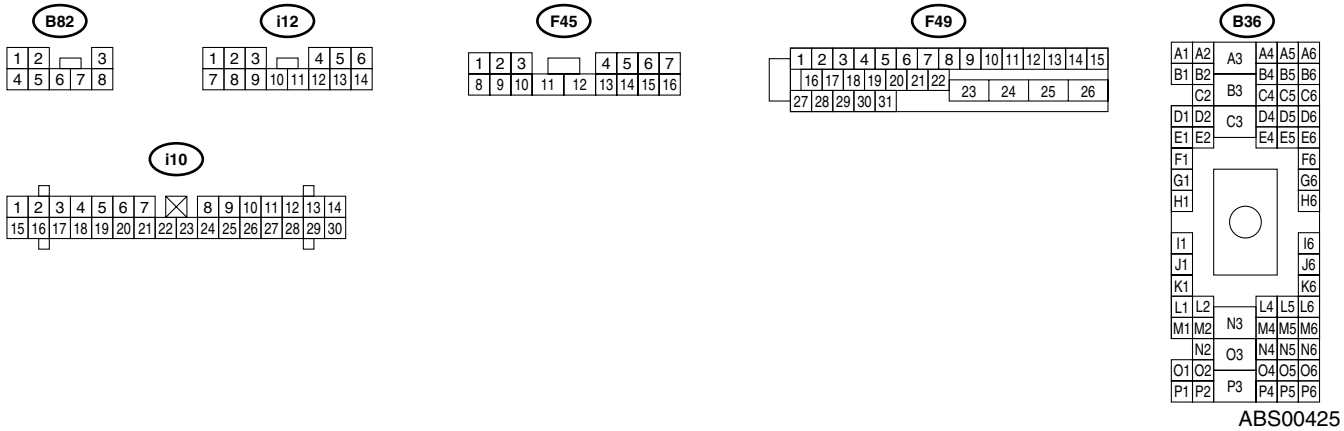
- ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while ABS warning light is kept ON.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn ignition switch to OFF.	Is ABSCM&H/U connector inserted into ABSCM until the clamp locks onto it?	Go to step **2.**	Insert ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
2	**CHECK DIAGNOSIS TERMINAL.** Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair diagnosis terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 4 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Repair harness connector between ABSCM&H/U and diagnosis connector.
4	**CHECK GENERATOR.** 1) Start the engine. 2) Idle the engine. 3) Measure voltage between generator and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **5.**	Repair generator. H4 engine model: <Ref. to SC(H4SO)-15, Generator.> H6 engine model: <Ref. to SC(H6DO)-14, Generator.>
5	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF.	Is there poor contact at battery terminal?	Repair battery terminal.	Go to step **6.**
6	**CHECK POWER SUPPLY OF ABSCM.** 1) Disconnect connector from ABSCM&H/U. 2) Start engine. 3) Idle the engine. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **7.**	Repair ABSCM&H/U power supply circuit.
7	**CHECK WIRING HARNESS.** 1) Disconnect connector (F45) from connector (B62). 2) Turn ignition switch to ON.	Does the ABS warning light turn on?	Repair front wiring harness.	Go to step **8.**
8	**CHECK ABSCM&H/U TERMINAL.** 1) Turn ignition switch to OFF. 2) Check for damage at the ABSCM&H/U terminal.	Is the any damage on terminanl?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9.**
9	**CHECK ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminal*** ***No. 22 — No. 23:***	Is the measured value more than 1 MΩ?	Go to step **10.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
10	**CHECK WIRING HARNESS.** Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **11.**	Repair harness.
11	**CHECK WIRING HARNESS.** 1) Connect connector to ABSCM&H/U. 2) Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair harness.
12	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.**	Is there poor contact in ABSCM&H/U connector?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

MEMO:

C: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

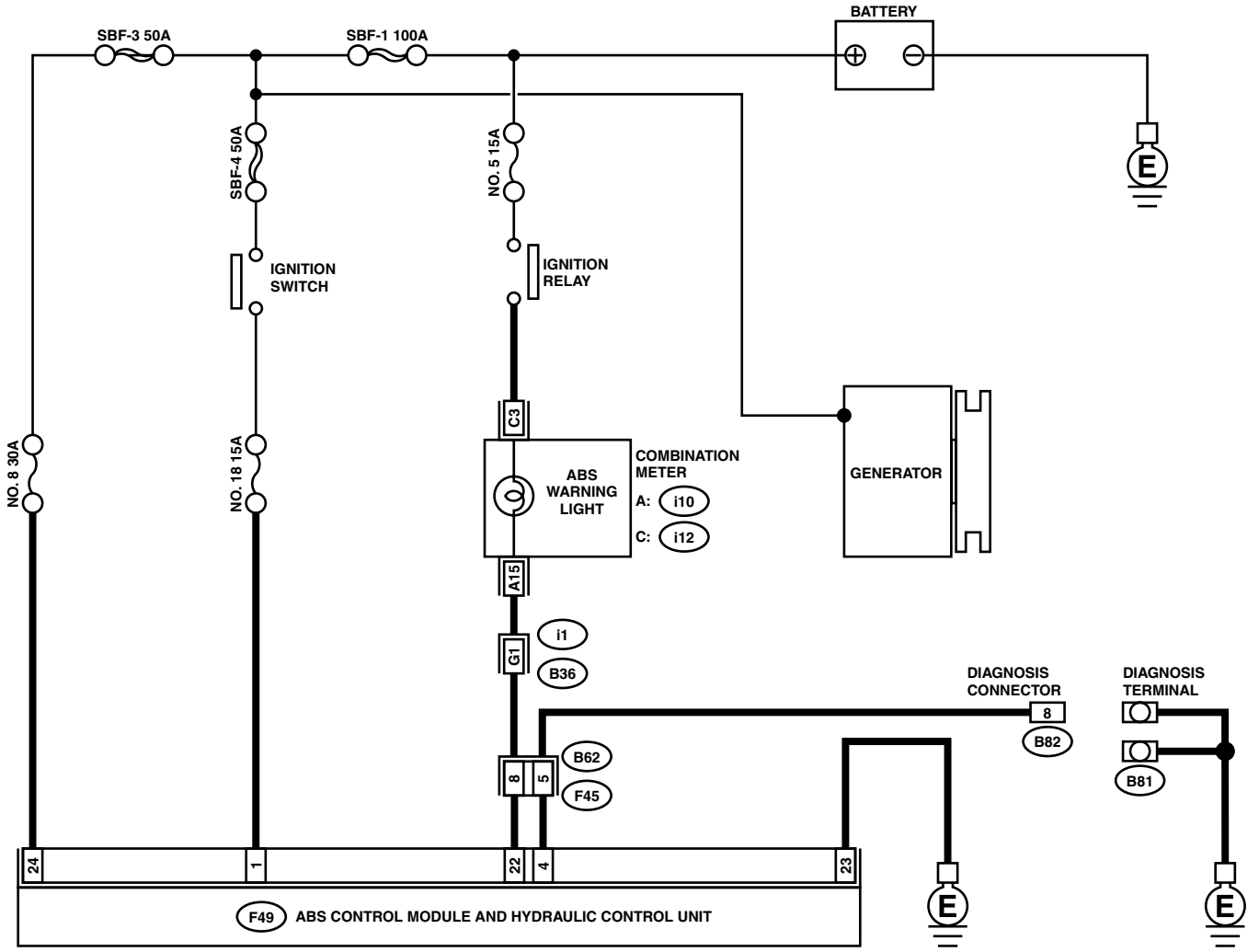
DIAGNOSIS:

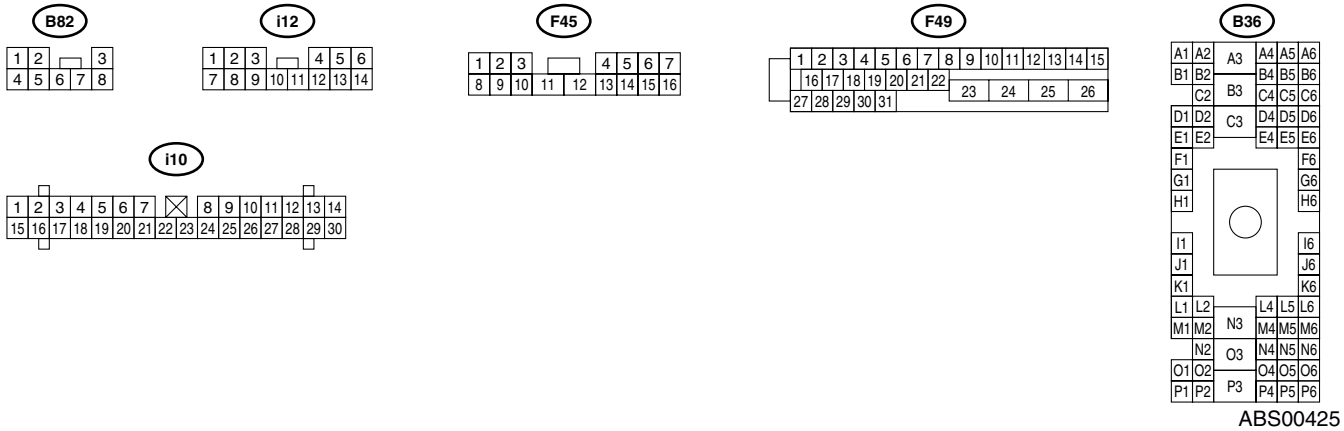
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:





ABS00425

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK DIAGNOSIS TERMINAL.** 1) Turn ignition switch to OFF. 2) Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair diagnosis terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 4 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair harness connector between ABSCM&H/U and diagnosis connector.
3	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.**	Is there poor contact in ABSCM&H/U connector?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Repair connector.

D: DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

E: DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

F: DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

MEMO:

G: DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

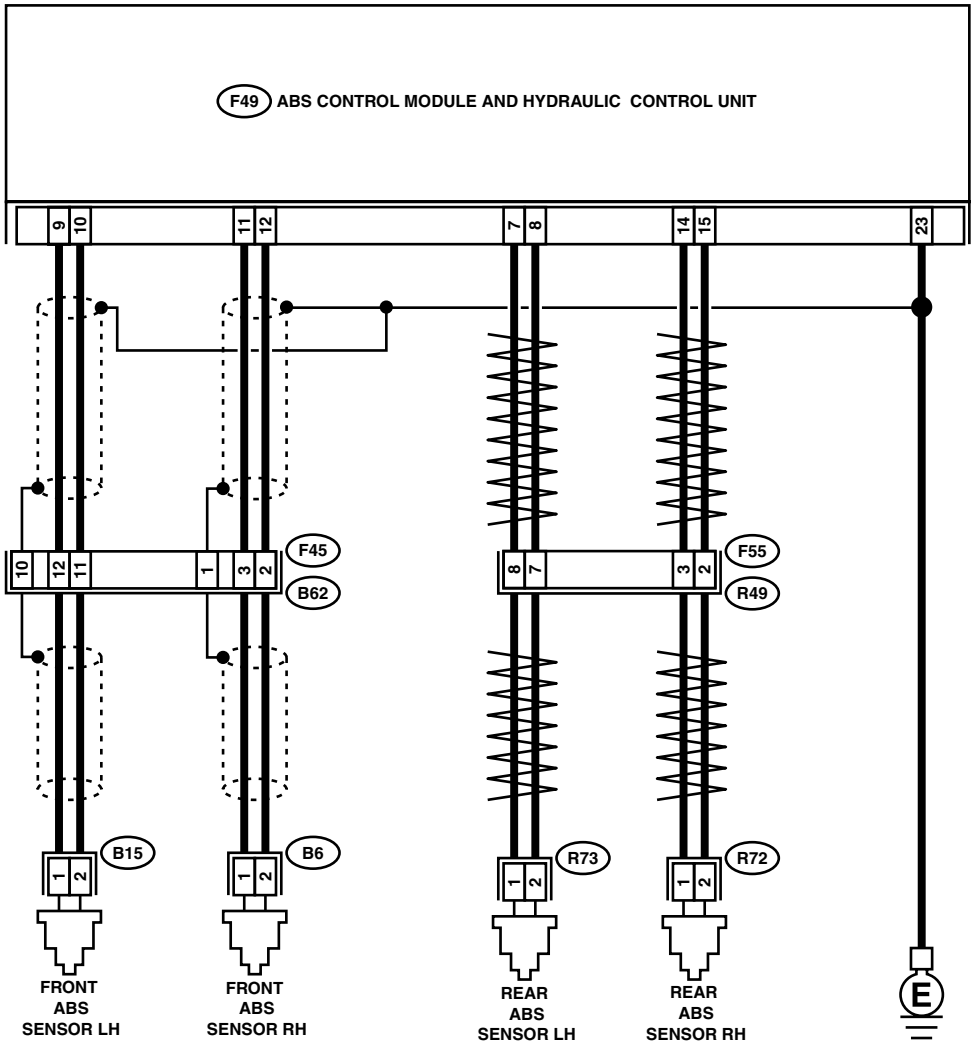
DIAGNOSIS:

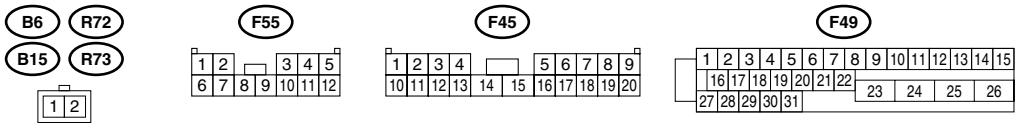
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **2.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
2	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from ABSCM&H/U. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
3	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
4	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — No. 12:*** ***DTC 23 / (F49) No. 9 — No. 10:*** ***DTC 25 / (F49) No. 14 — No. 15:*** ***DTC 27 / (F49) No. 7 — No. 8:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **5.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.

	Step	Check	Yes	No
5	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair harness between ABSCM&H/U and ABS sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between ABSCM&H/U and ABS sensor.
7	**CHECK INSTALLATION OF ABS SENSOR.** Turn ignition switch to OFF.	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **8.**	Tighten ABS sensor installation bolts securely.
8	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel.	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
9	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **10.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
10	**CHECK GROUND SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
11	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — Chassis ground:*** ***DTC 23 / (F49) No. 9 — Chassis ground:*** ***DTC 25 / (F49) No. 14 — Chassis ground:*** ***DTC 27 / (F49) No. 7 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair harness between ABSCM&H/U and ABS sensor. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.

H: DTC 22 ABNORMAL ABS SENSOR (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

I: DTC 24 ABNORMAL ABS SENSOR (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

J: DTC 26 ABNORMAL ABS SENSOR (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-46, DTC 28 ABNORMAL ABS SENSOR (REAR LH), Diagnostics Chart with Diagnosis Connector.>

MEMO:

K: DTC 28 ABNORMAL ABS SENSOR (REAR LH)

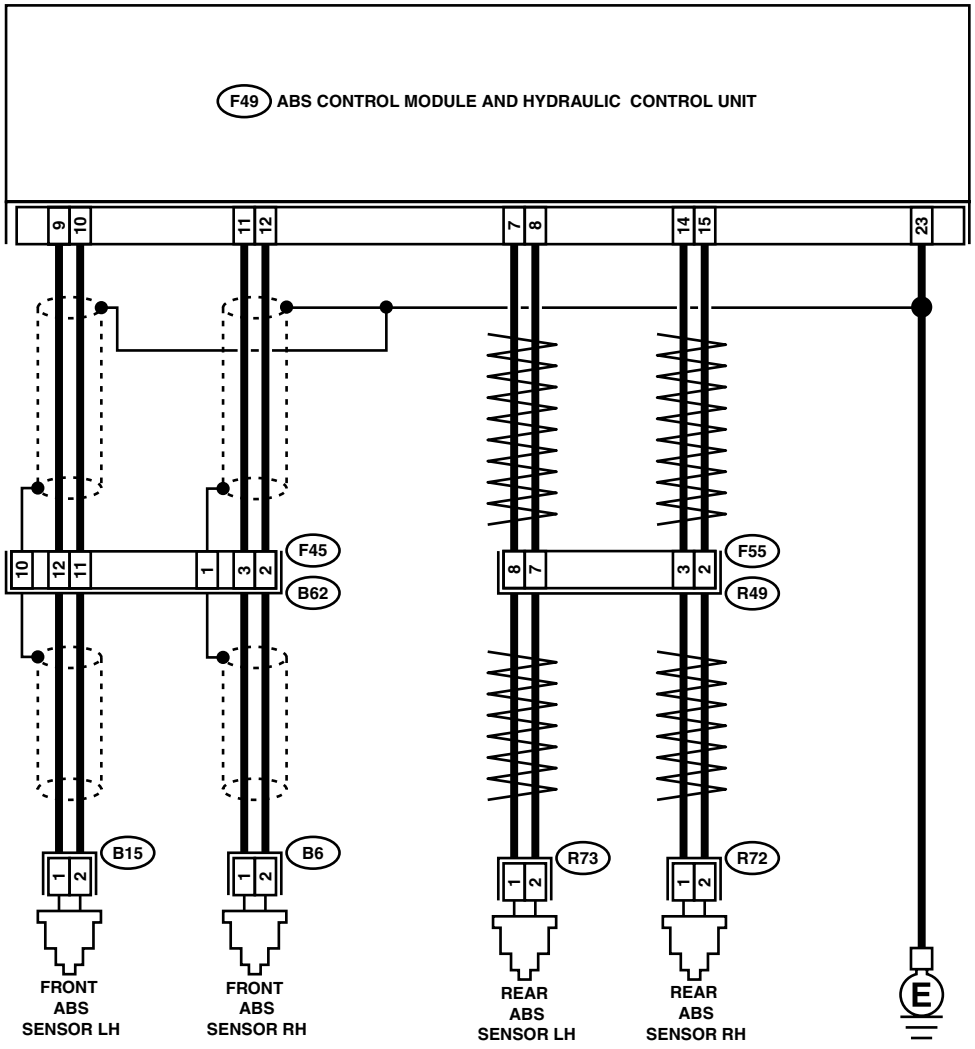
DIAGNOSIS:

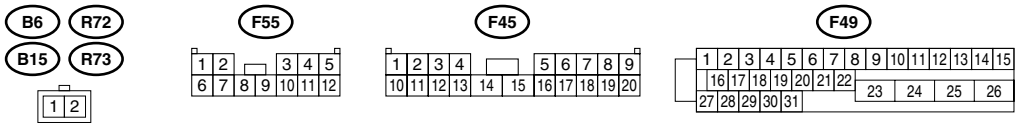
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABS SENSOR.** Turn ignition switch to OFF.	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **2.**	Tighten ABS sensor installation bolts securely.
2	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel.	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **4.**	Go to step **5.**
4	**CHECK ABS SENSOR SIGNAL.** 1) Lift-up the vehicle. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores the trouble code 29. ***Connector & terminal*** ***DTC 22 / (B62) No. 3 (+) — No. 2 (–):*** ***DTC 24 / (B62) No. 12 (+) — No. 11 (–):*** ***DTC 26 / (F55) No. 3 (+) — No. 2 (–):*** ***DTC 28 / (F55) No. 8 (+) — No. 7 (–):***	Is the oscilloscope pattern the same as that shown in the figure?	Go to step **8.**	Go to step **7.**
5	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor or drum from hub in accordance with trouble code.	Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	Thoroughly remove mud or other foreign matter.	Go to step **6.**
6	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS sensor piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>	Go to step **7.**
7	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **8.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
8	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **9.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
9	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **10.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
10	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — No. 12:*** ***DTC 24 / (F49) No. 9 — No. 10:*** ***DTC 26 / (F49) No. 14 — No. 15:*** ***DTC 28 / (F49) No. 7 — No. 8:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **11.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
11	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — Chassis ground:*** ***DTC 24 / (F49) No. 9 — Chassis ground:*** ***DTC 26 / (F49) No. 14 — Chassis ground:*** ***DTC 28 / (F49) No. 7 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
12	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — GND:***	Is the measured value less than 0.5 Ω?	Go to step **13.**	Repair ABSCM&H/U ground harness.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair connector.	Go to step **14.**
14	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **15.**	Properly install the car telephone or the wireless transmitter.
15	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **16.**

	Step	Check	Yes	No
16	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (B62) No. 1 — Chassis ground:*** ***DTC 24 / (B62) No. 10 — Chassis ground:*** NOTE: For the **DTC 26** and **28**: Go to step **17.**	Is the measured value less than 0.5 Ω?	Go to step **17.**	Repair shield harness.
17	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **18.**
18	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary noise interference.

L: DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

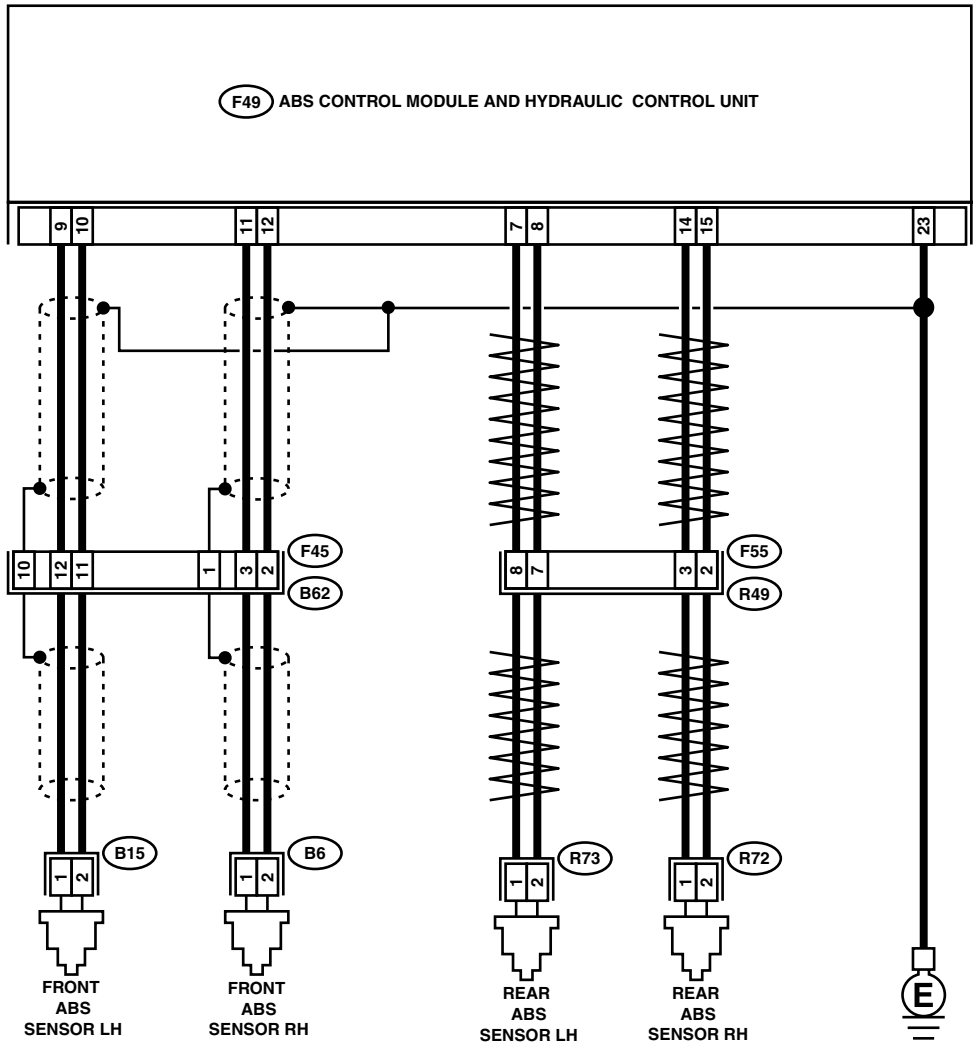
DIAGNOSIS:

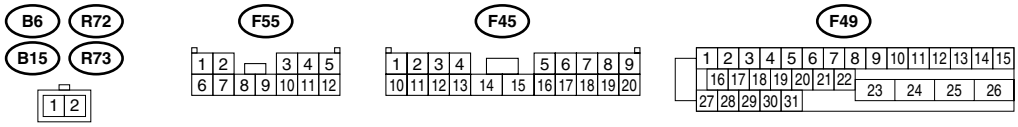
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Turning wheels freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00293

	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Do wheels turn freely?	NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur. The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.** ***Tightening torque:***	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **6.**	Tighten ABS sensor installation bolts.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel.	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Lift up the vehicle. 2) Turn ignition switch OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***(B62) No. 3 (+) — No. 2 (–) (Front RH):*** ***(B62) No. 12 (+) — No. 11 (–) (Front LH):*** ***(F55) No. 3 (+) — No. 2 (–) (Rear RH):*** ***(F55) No. 8 (+) — No. 7 (–) (Rear LH):***	Is the oscilloscope pattern the same as that shown in the figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub.	Is the ABS sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Go to step **10.**	Thoroughly remove dirt or other foreign matter.

	Step	Check	Yes	No
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

M: DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

N: DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

O: DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-54, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

P: DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

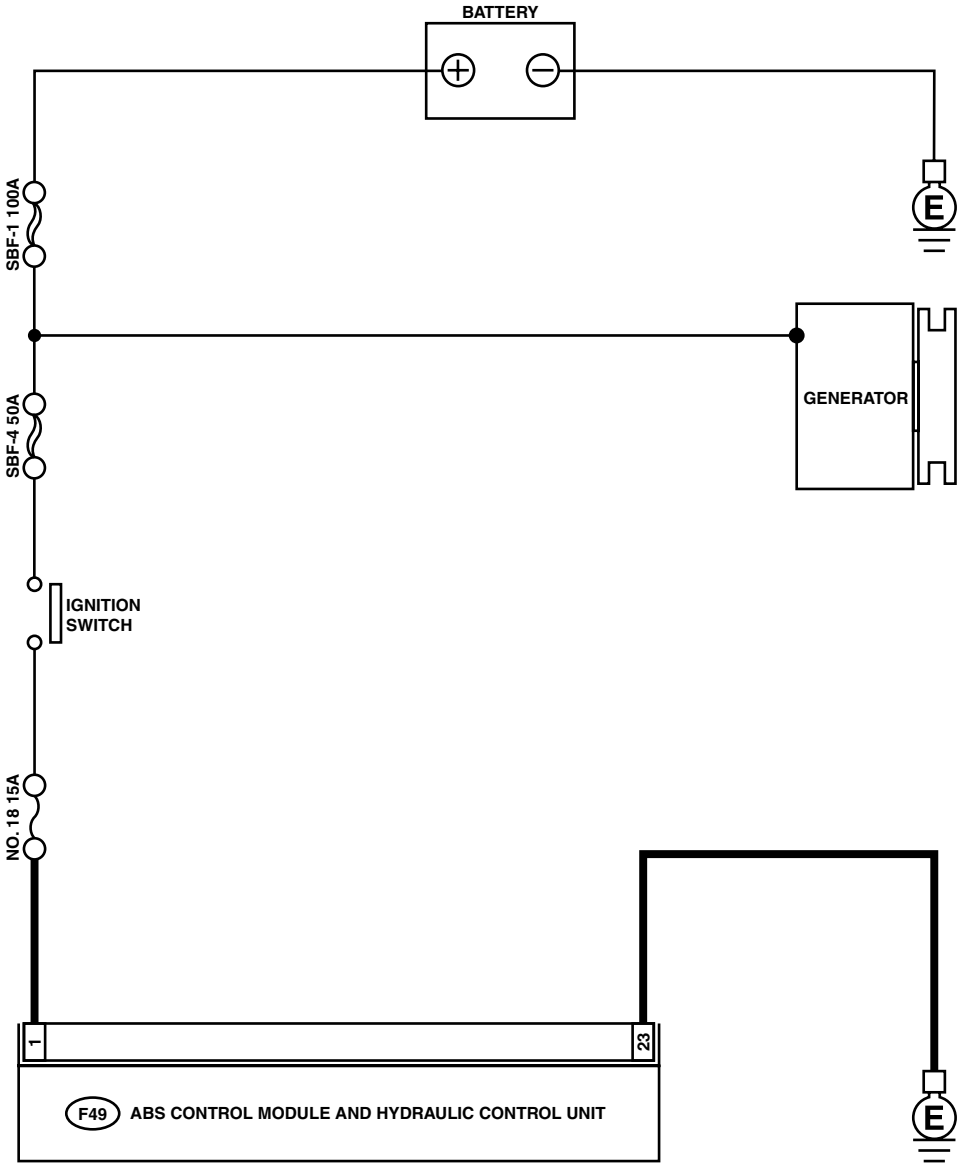
DIAGNOSIS:

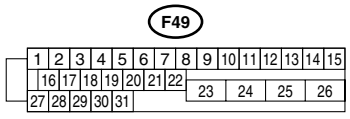
- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

Q: DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

R: DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

S: DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-58, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Chart with Diagnosis Connector.>

MEMO:

T: DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

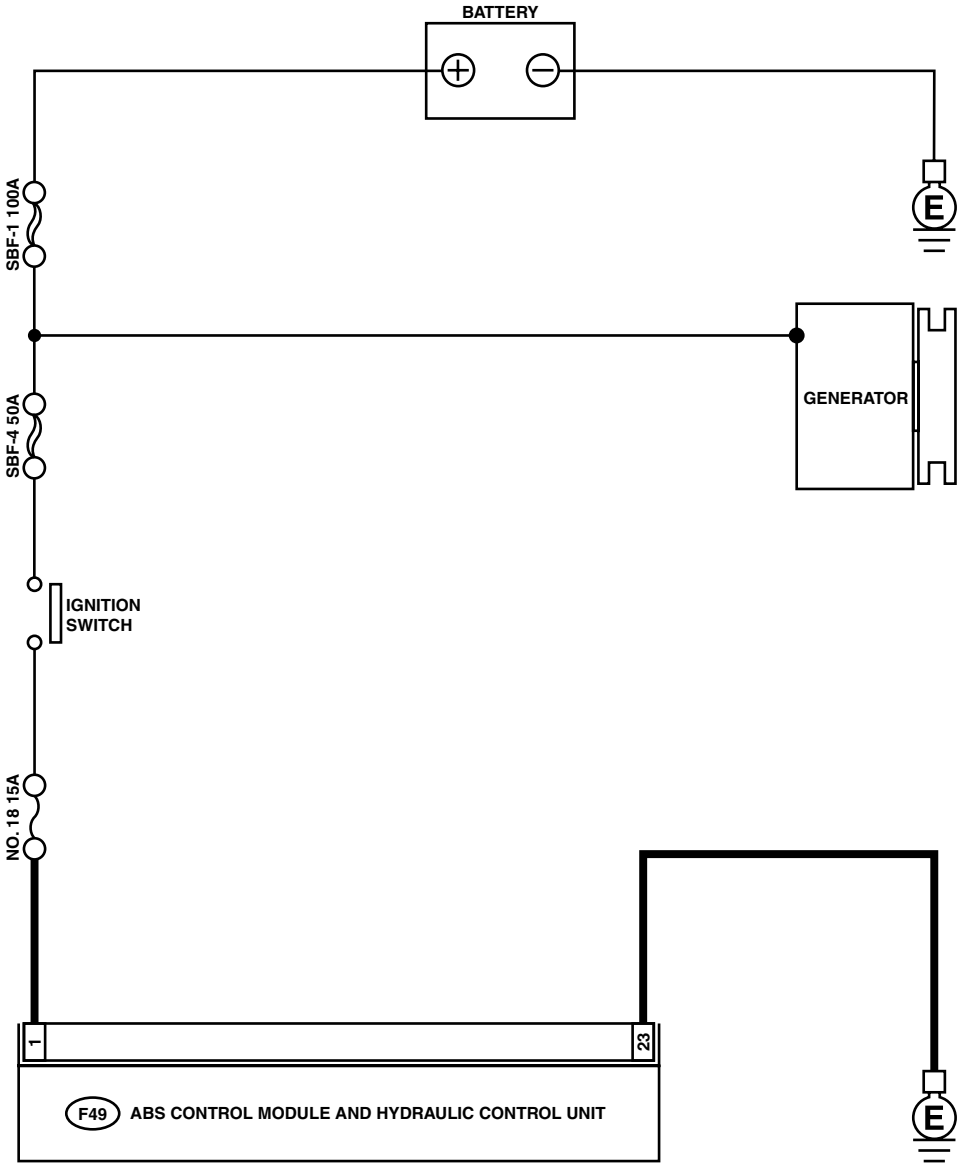
DIAGNOSIS:

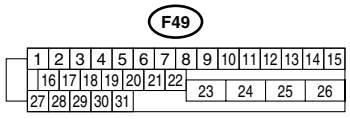
- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to15 V?	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

U: DTC 41 ABNORMAL ABS CONTROL MODULE

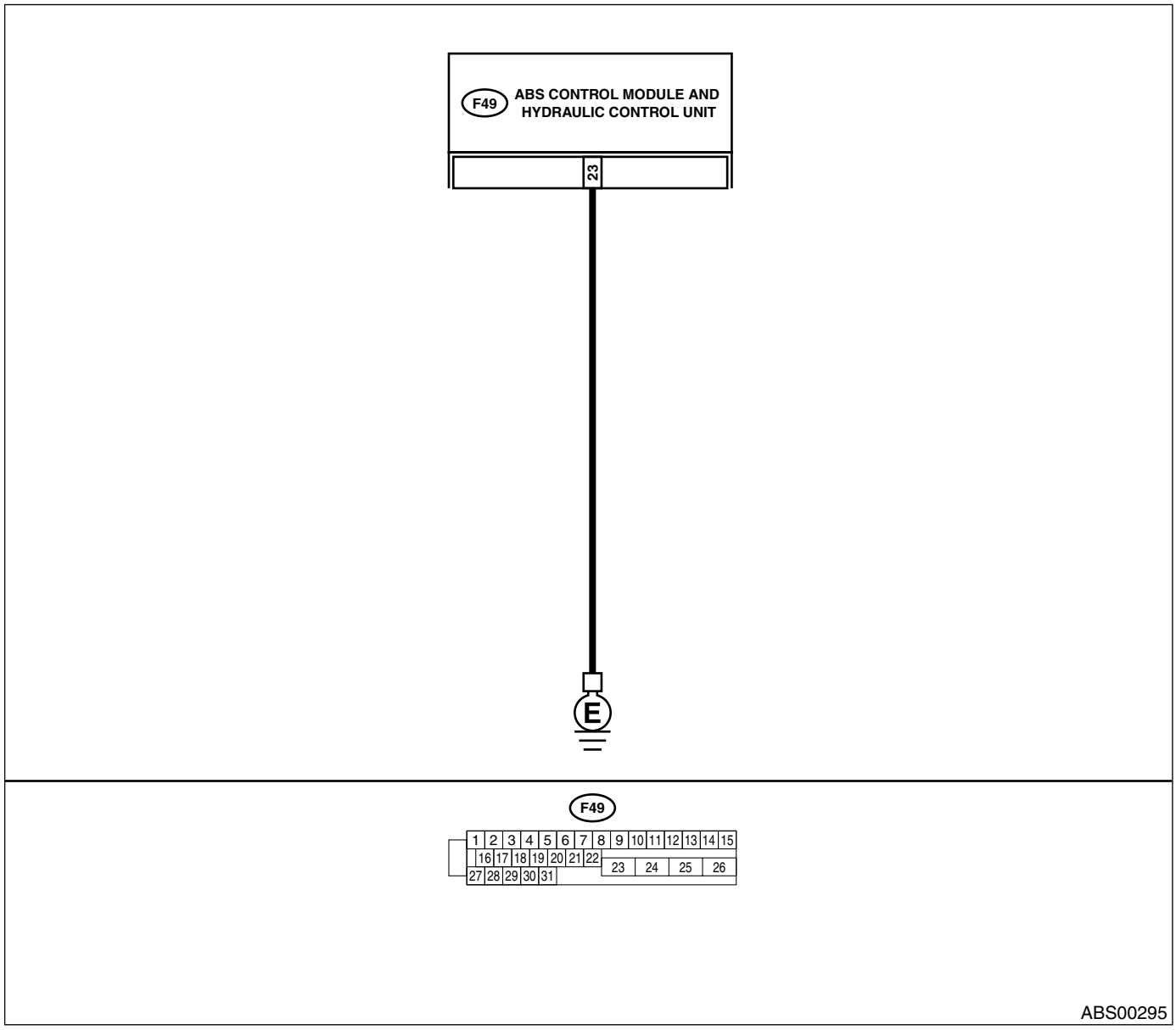
DIAGNOSIS:

- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair connector.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Properly install the car telephone or the wireless transmitter.	Go to step **4.**
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

V: DTC 42 SOURCE VOLTAGE IS ABNORMAL.

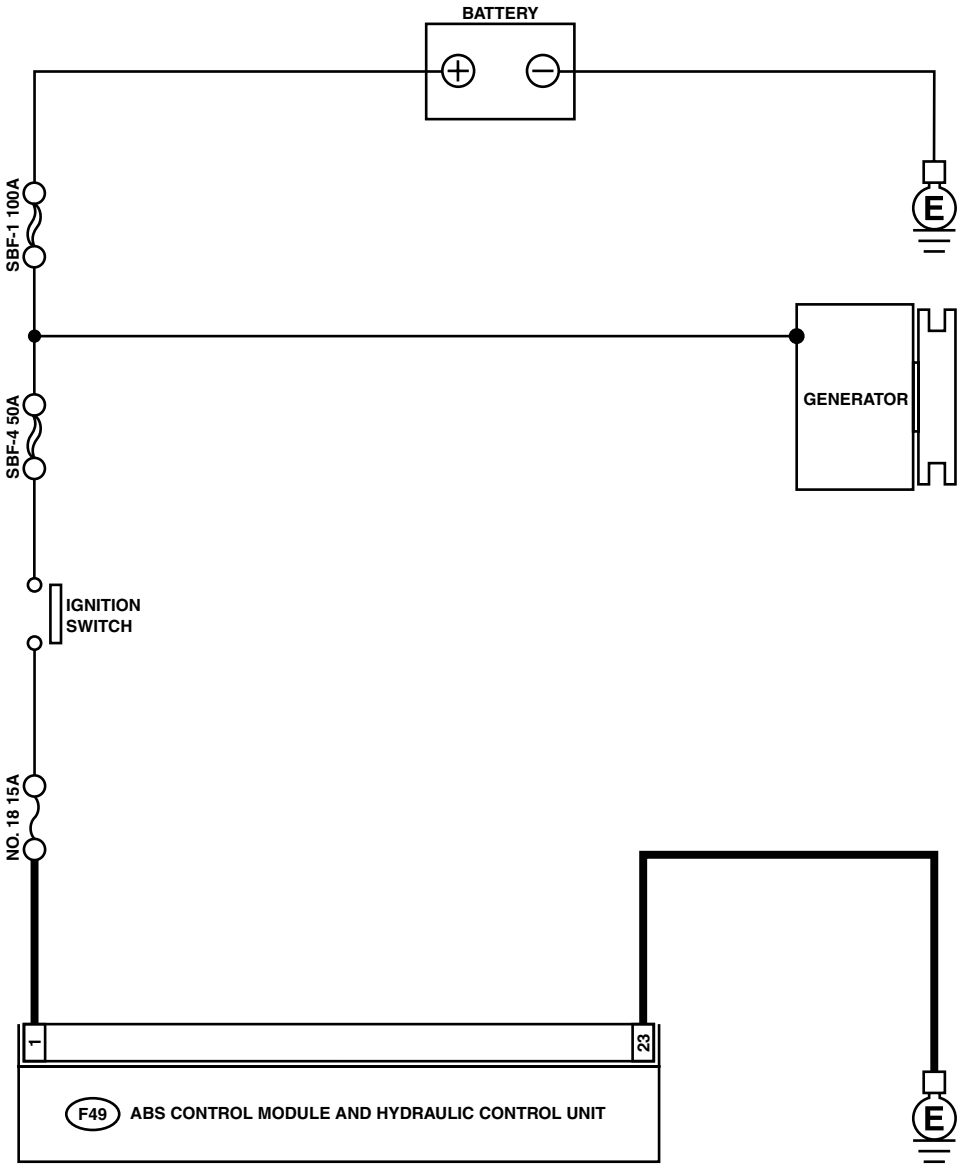
DIAGNOSIS:

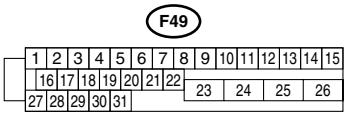
- Power source voltage of the ABSCM&H/U is low or high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	Is the measured value within 10 to 17 V?	Go to step **2.**	Repair generator. H4 engine model: <Ref. to SC-<Ref. to SC(H4SO)-15, Generator.>, Generator.> H6 engine model: <Ref. to SC(H6)-<Ref. to SC(H6DO)-14, Generator.>, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 17 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

W: DTC 44 A COMBINATION OF AT CONTROL ABNORMAL

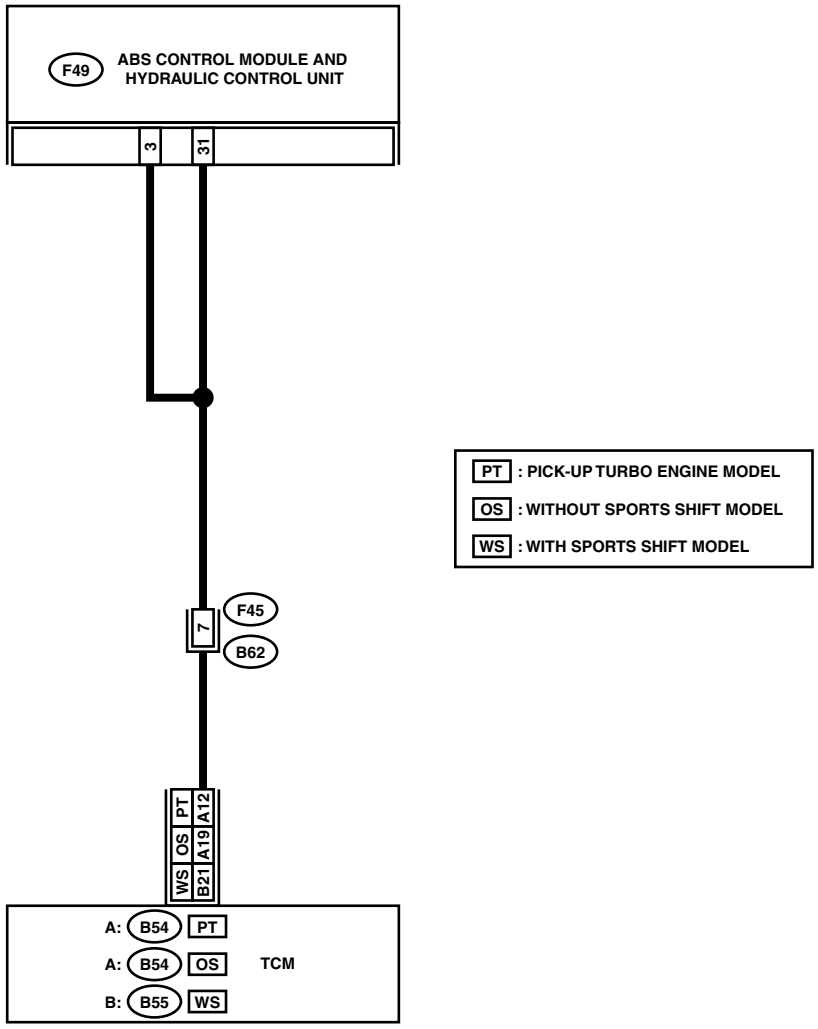
DIAGNOSIS:

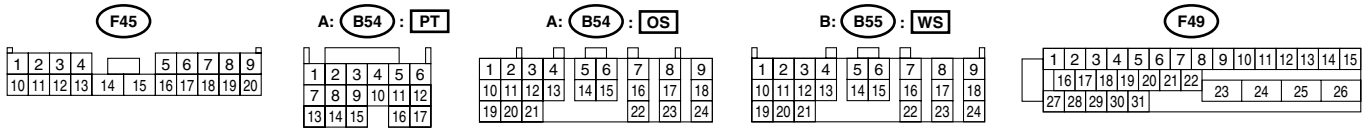
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00426

	Step	Check	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CG: AT (Except OUTBACK,BAJA)*** ***CH: MT (Except OUTBACK,BAJA)*** ***CI: AT (OUTBACK,BAJA)*** ***CJ: MT (OUTBACK,BAJA)***	Do the vehicle specification and the specification of ABSCM&HU match?	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 — Chassis ground:***	Is the measured value less than 1 MΩ?	Go to step **3.**	Repair harness between TCM and ABSCM&H/U.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Repair harness between TCM and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Repair harness between TCM and ABSCM&H/U.
5	**CHECK TCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn ignition switch to ON. 4) Measure voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***PT: (B54) No. 12 (+) — Chassis ground (–):*** ***DS: (B54) No. 19 (+) — Chassis ground (–):*** ***WS: (B55) No. 21 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **7.**	Go to step **6.**
6	**CHECK AT.**	Is the AT functioning normally?	Replace TCM.	Repair AT.
7	**CHECK OPEN CIRCUIT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **8.**	Repair harness/ connector between TCM and ABSCM&H/U.
8	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair connector.	Go to step **9.**
9	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **10.**

Step		Check	Yes	No
10	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

MEMO:

X: DTC 51 ABNORMAL VALVE RELAY

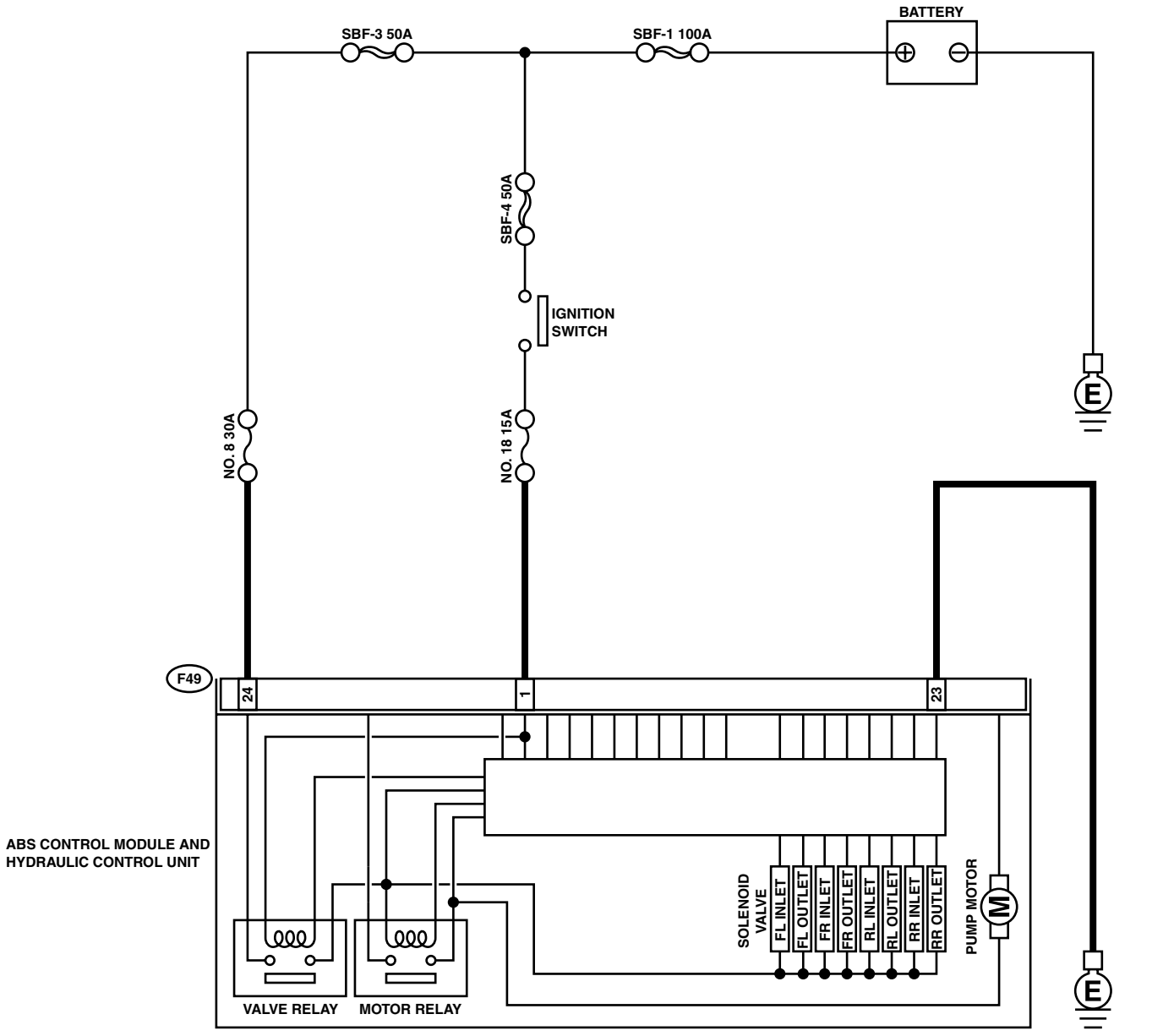
DIAGNOSIS:

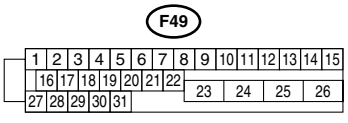
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00297

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure resistance between ABSCM&H/U and terminals. ***Terminals*** ***No. 23 (+) — No. 24 (–):***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

Y: DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

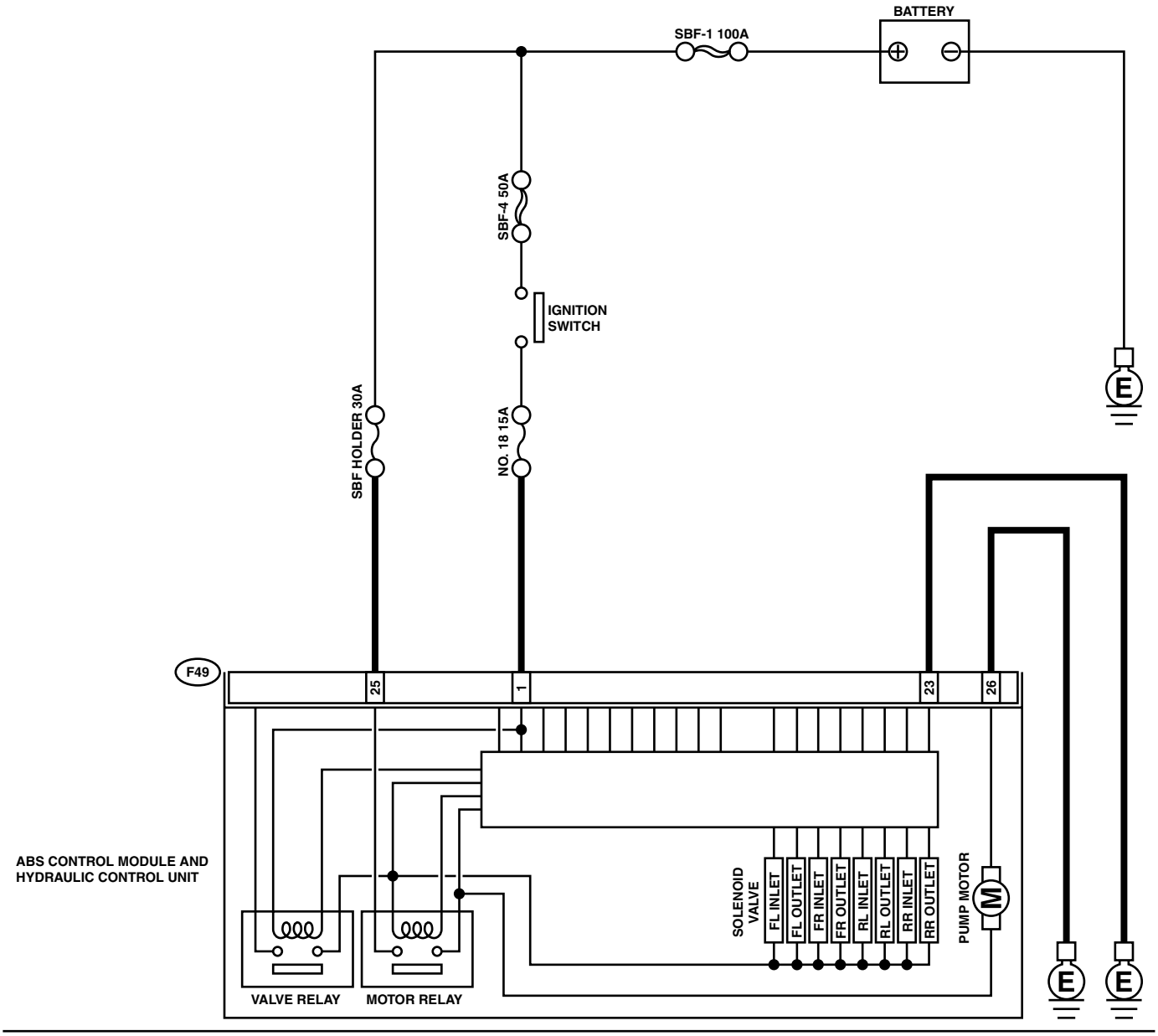
DIAGNOSIS:

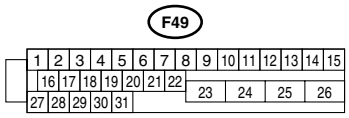
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00427

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF-holder.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 26 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

Z: DTC 54 ABNORMAL STOP LIGHT SWITCH

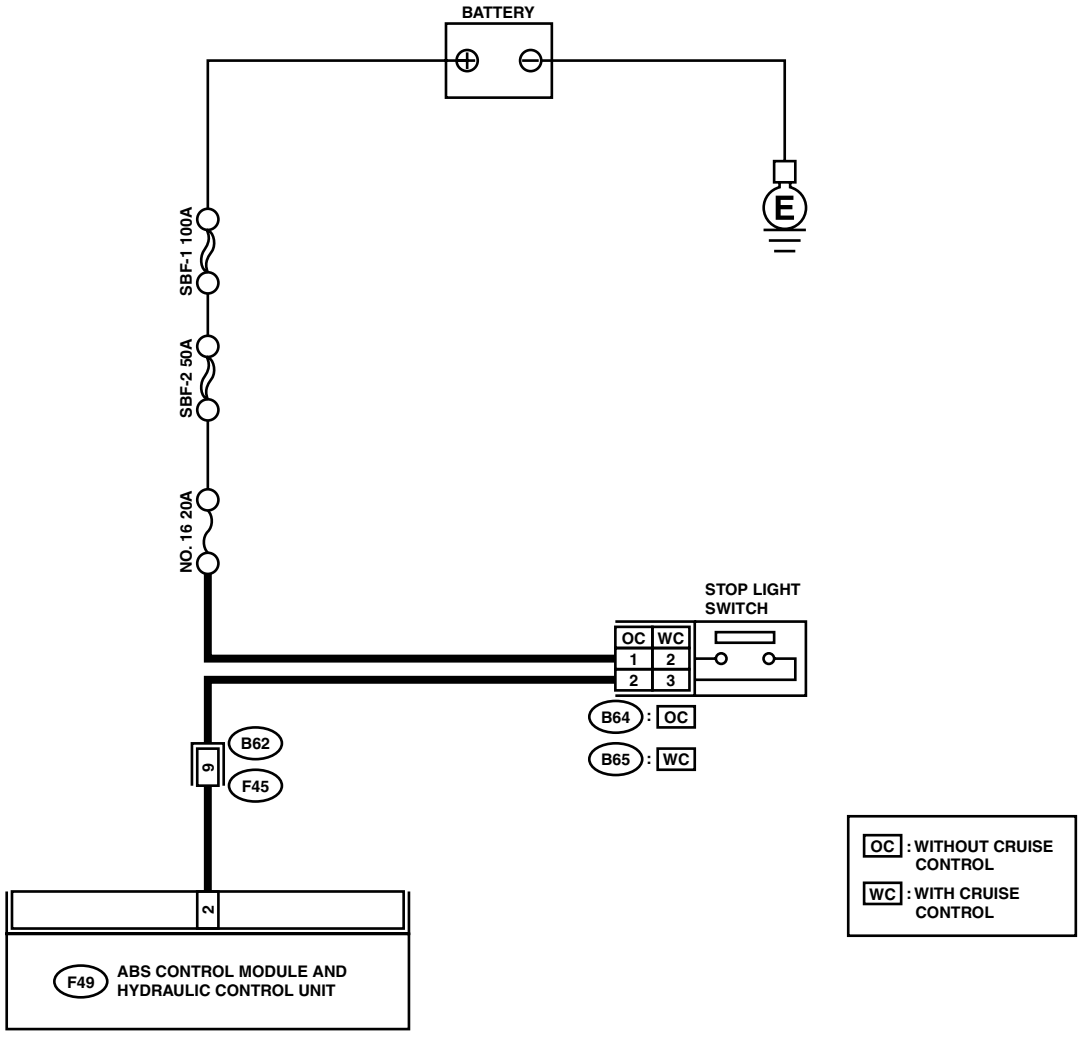
DIAGNOSIS:

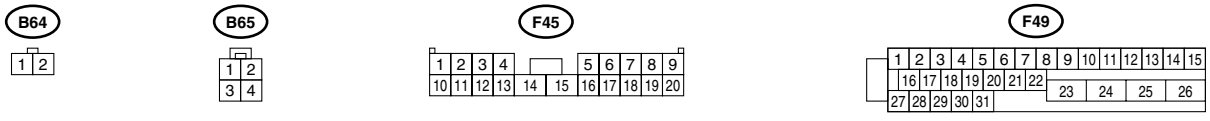
- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00428

	Step	Check	Yes	No
1	**CHECK STOP LIGHTS COME ON.** Depress the brake pedal.	Do stop lights come on?	Go to step **2.**	Repair stop lights circuit.
2	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Depress brake pedal. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 2 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **3.**	Repair harness between stop light switch and ABSCM&H/U.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AA:DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE

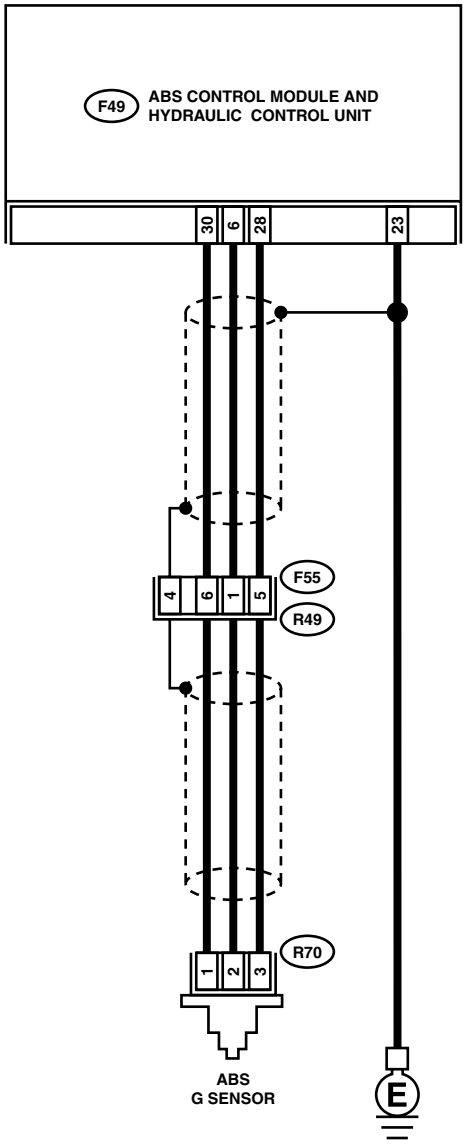
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00429

	Step	Check	Yes	No
1	**CHECK WHEELS FOR FREE TURNING.** Check if the wheels have been turned freely such as when the vehicle is lifted up, or operated on a rolling road.	Have wheels turned freely?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK SPECIFICATIONS OF ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CG: AT (Except OUTBACK)*** ***CH: MT (Except OUTBACK)*** ***CI: AT (OUTBACK)*** ***CJ: MT (OUTBACK)***	Does the vehicle specification and the ABSCM&H/U specification match?	Go to step **3.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> **CAUTION:** **Be sure to turn ignition switch to OFF when removing ABSCM&H/U.**
3	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 1 (+) — No. 3 (–):***	Is the measured value within 4.75 to 5.25 V?	Go to step **4.**	Repair harness/ connector between G sensor and ABSCM&H/U.
4	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:***	Is the measured value within 5.0 to 5.6 kΩ?	Go to step **5.**	Repair harness/ connector between G sensor and ABSCM&H/U.
5	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect connector from G sensor. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair harness between G sensor and ABSCM&H/U.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between G sensor and ABSCM&H/U.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **8.**	Repair harness between G sensor and ABSCM&H/U.

	Step	Check	Yes	No
8	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 28 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9	**CHECK G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 2.1 to 2.5 V when G sensor is horizontal?	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
10	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 3.7 to 4.1 V when G sensor is inclined forward to 90°?	Go to step **11.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
11	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 0.5 to 0.9 V when G sensor is inclined backward to 90°?	Go to step **12.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

MEMO:

13.Diagnostics Chart with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

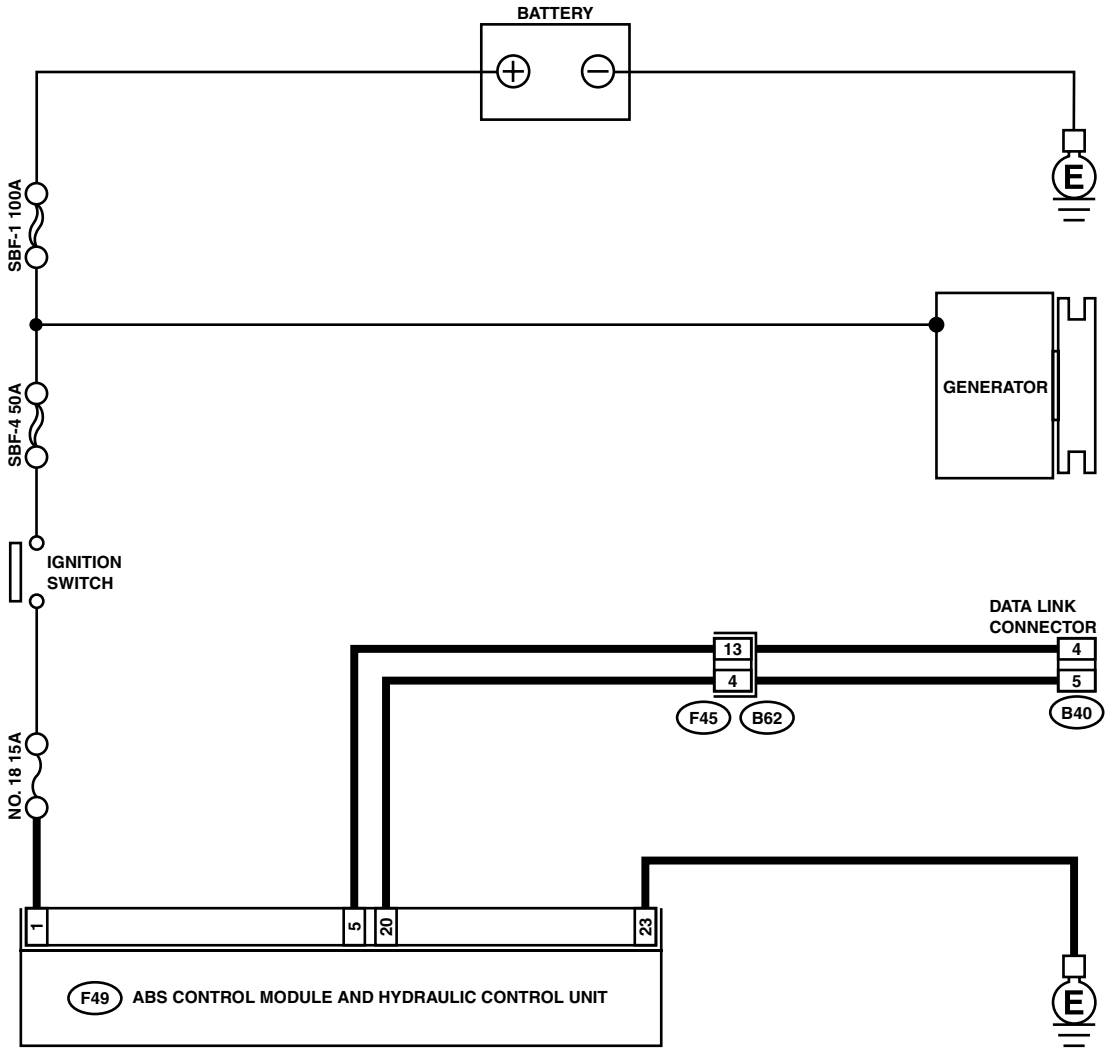
DIAGNOSIS:

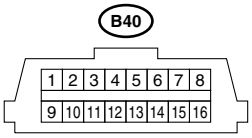
- Faulty harness connector

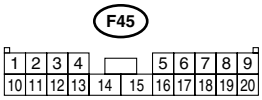
TROUBLE SYMPTOM:

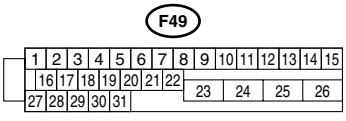
- ABS warning light remains on.

WIRING DIAGRAM:









ABS00301

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is ignition switch to ON?	Go to step **2.**	Turn ignition switch to ON, and select ABS mode using the select monitor.
2	**CHECK BATTERY.** 1) Turn ignition switch to OFF. 2) Measure battery voltage.	Is the measured value more than 11 V?	Go to step **3.**	Charge or replace battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten battery terminal.	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Disconnect ABSCM&H/U connector. 3) Check whether communication to other systems can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **7.**	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM&H/U.** 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 (+) — Chassis ground (–):*** ***(B40) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 1 V?	Repair harness and connector between each control module and data link connector.	Go to step **8.**
8	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***(F49) No. 20 — (B40) No. 5:*** ***(F49) No. 5 — (B40) No. 4:***	Is the measured value less than 0.5 Ω?	Repair harness and connector between ABSCM&H/U and data link connector.	Go to step **9.**
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn ignition switch to OFF.	Is ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Go to step **10.**	Insert ABSCM&H/U connector into ABSCM&H/U.

	Step	Check	Yes	No
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **11.**	Repair open circuit in harness between ABSCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U and transmission. 3) Measure resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **12.**	Repair open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

B: NO TROUBLE CODE

DIAGNOSIS:

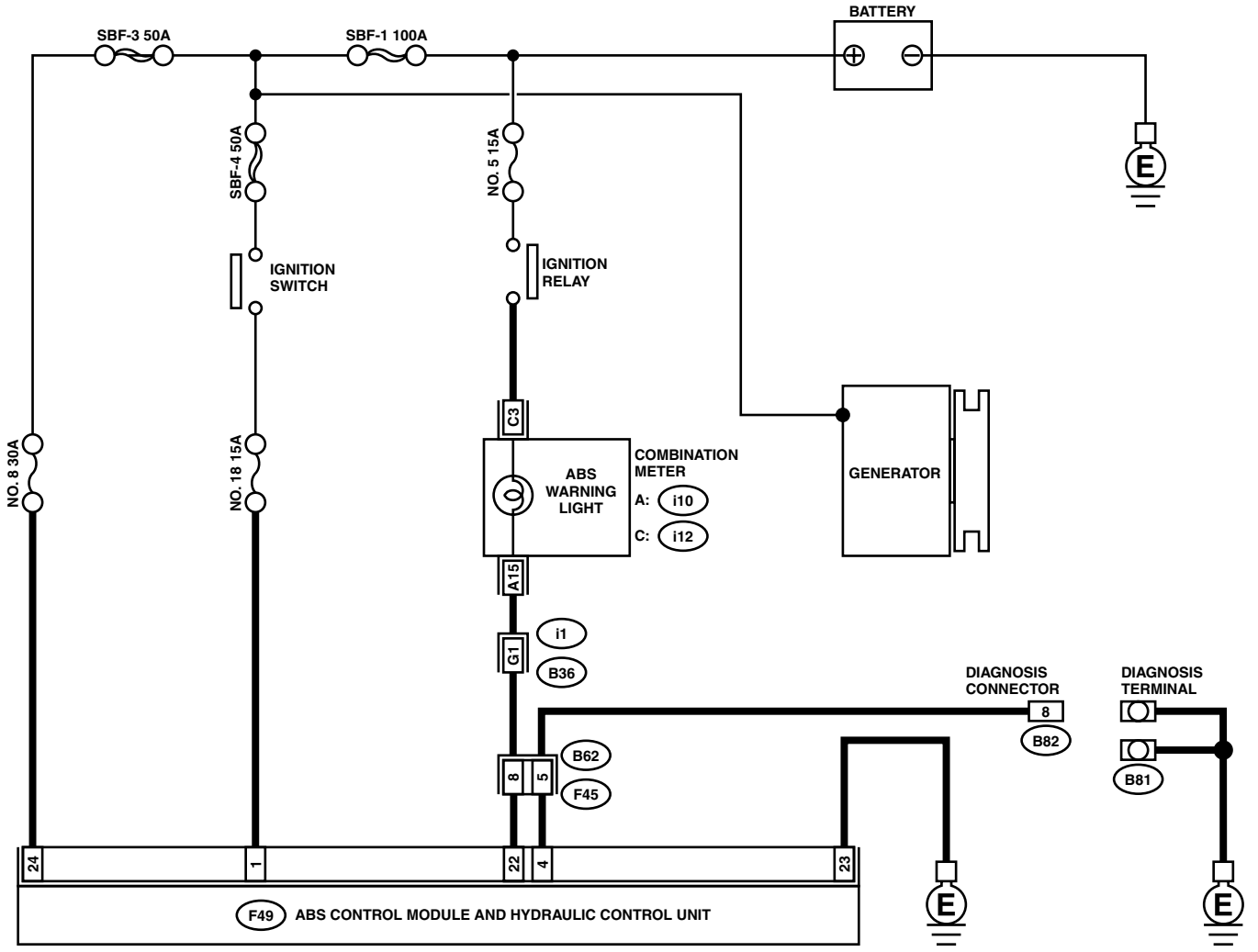
- ABS warning light circuit is shorted.

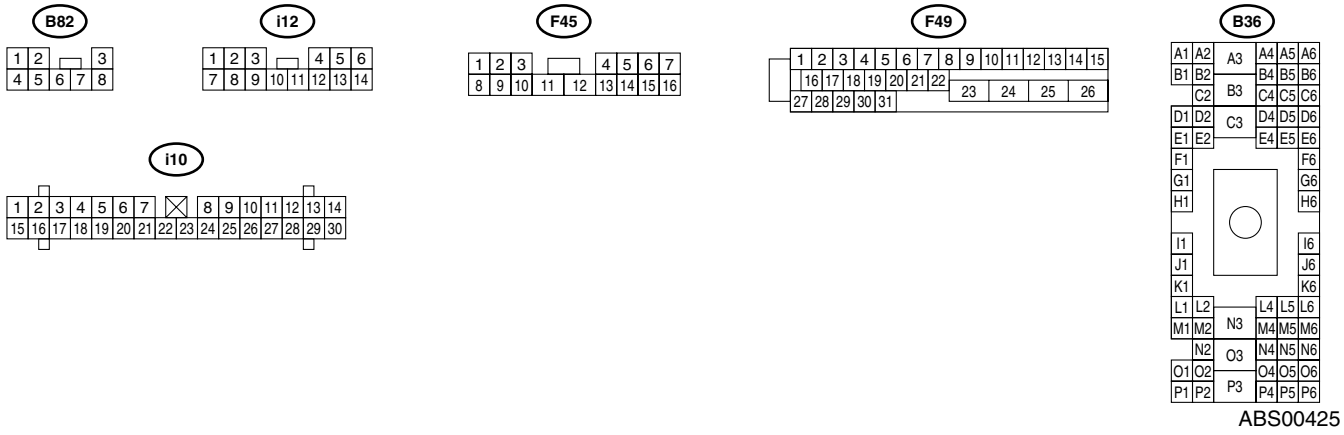
TROUBLE SYMPTOM:

- ABS warning light remains on.
- NO TROUBLE CODE displayed on the select monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on the select monitor, the system is in normal condition.

WIRING DIAGRAM:





ABS00425

Step		Check	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F45) from connector (B62). 3) Turn ignition switch to ON.	Does the ABS warning light turn on?	Go to step **2.**	Repair front wiring harness.

	Step	Check	Yes	No
2	**CHECK PROJECTION AT ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Check for broken projection at the ABSCM&H/U terminal.	Is there any damage on ABSCM&HU terminal?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **3.**
3	**CHECK ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 22 — No. 23:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK WIRING HARNESS.** Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair harness.
5	**CHECK WIRING HARNESS.** 1) Connect connector to ABSCM&H/U. 2) Measure resistance between connector (F45) and chassis ground. ***Connector & terminal*** ***(F45) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair harness.
6	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.**	Is there poor contact in ABSCM&H/U connector?	Repair connector.	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: DTC 21 OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

D: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

E: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-86, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT, Diagnostics Chart with Subaru Select Monitor.>

MEMO:

F: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT

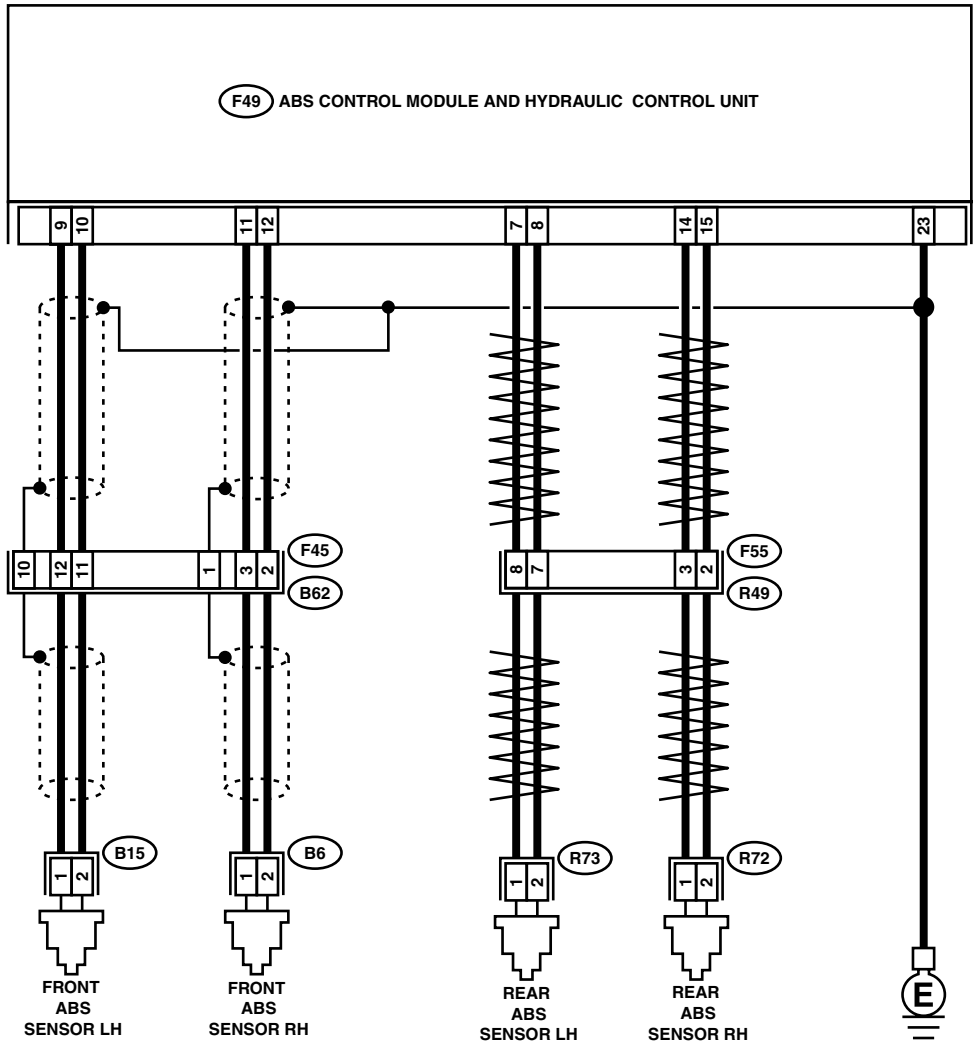
DIAGNOSIS:

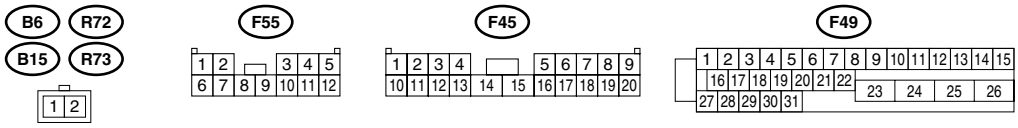
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00293

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **3.**	Tighten ABS sensor installation bolts securely.
3	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel. Is the measured value within the specified range?	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **5.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.
8	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **9.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from ABSCM&H/U. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **10.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
10	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **11.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — No. 12:*** ***DTC 23 / (F49) No. 9 — No. 10:*** ***DTC 25 / (F49) No. 14 — No. 15:*** ***DTC 27 / (F49) No. 7 — No. 8:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **12.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Repair harness between ABSCM&H/U and ABS sensor.

	Step	Check	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 (+) — Chassis ground (–):*** ***DTC 23 / (F49) No. 9 (+) — Chassis ground (–):*** ***DTC 25 / (F49) No. 14 (+) — Chassis ground (–):*** ***DTC 27 / (F49) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **14.**	Repair harness between ABSCM&H/U and ABS sensor.
14	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **15.**	Tighten ABS sensor installation bolts securely.
15	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel.	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **17.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
17	**CHECK GROUND SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **18.**	Replace ABS sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21 / (F49) No. 11 — Chassis ground:*** ***DTC 23 / (F49) No. 9 — Chassis ground:*** ***DTC 25 / (F49) No. 14 — Chassis ground:*** ***DTC 27 / (F49) No. 7 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **19.**	Repair harness between ABSCM&H/U and ABS sensor. And replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

Step		Check	Yes	No
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair connector.	Go to step **20.**
20	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U.	Go to step **21.**
21	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact. NOTE: Check harness and connectors between ABSCM&H/U and ABS sensor.

G: DTC 22 FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

H: DTC 24 FRONT LEFT ABNORMAL ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

I: DTC 26 REAR RIGHT ABNORMAL ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-92, DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL, Diagnostics Chart with Subaru Select Monitor.>

J: DTC 28 REAR LEFT ABNORMAL ABS SENSOR SIGNAL

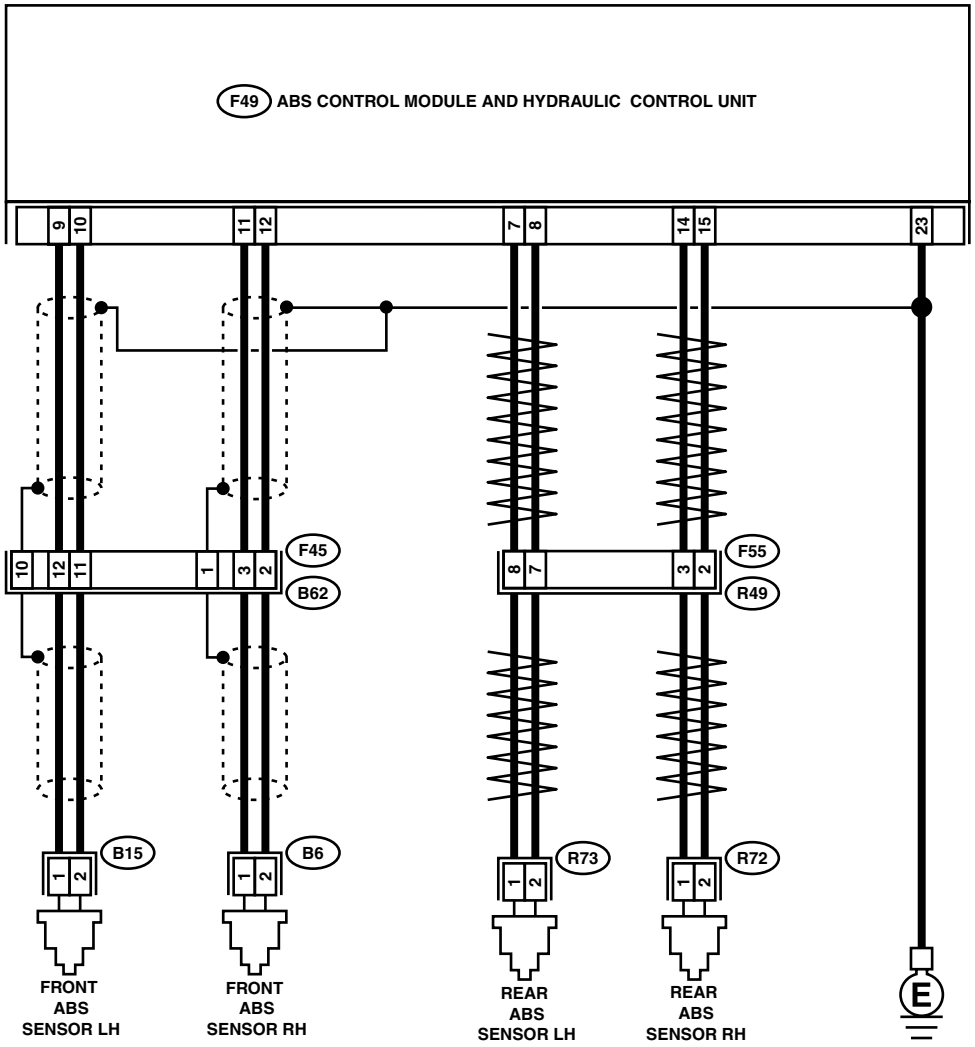
DIAGNOSIS:

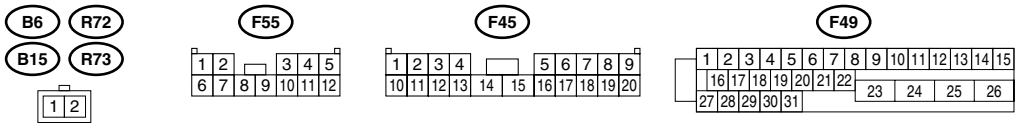
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00293

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK SHIELD CIRCUIT.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (B62) No. 1 — Chassis ground:*** ***DTC 24 / (B62) No. 10 — Chassis ground:*** NOTE: For the **DTC 26** and **28**: Go to step **6.**	Is the measured value less than 0.5 Ω?	Go to step **6.**	Repair shield harness.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary noise interference.
8	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **9.**	Tighten ABS sensor installation bolts securely.
9	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel.	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
10	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **11.**	Go to step **12.**

	Step	Check	Yes	No
11	**CHECK ABS SENSOR SIGNAL.** 1) Lift-up the vehicle. 2) Turn ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn ignition switch to ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the trouble code 29. ***Connector & terminal*** ***DTC 22 / (B62) No. 3 (+) — No. 2 (–):*** ***DTC 24 / (B62) No. 12 (+) — No. 11 (–):*** ***DTC 26 / (F55) No. 3 (+) — No. 2 (–):*** ***DTC 28 / (F55) No. 8 (+) — No. 7 (–):***	Is the oscilloscope pattern the same as that shown in the figure?	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub in accordance with diagnostic trouble code.	Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **13.**
13	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS sensor piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>	Go to step **14.**
14	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **15.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
15	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **16.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>

	Step	Check	Yes	No
16	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **17.**	Replace ABS sensor. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.>
17	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — No. 12:*** ***DTC 24 / (F49) No. 9 — No. 10:*** ***DTC 26 / (F49) No. 14 — No. 15:*** ***DTC 28 / (F49) No. 7 — No. 8:***	Is the measured value within 1 to 1.5 kΩ?	Go to step **18.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F49) No. 11 — Chassis ground:*** ***DTC 24 / (F49) No. 9 — Chassis ground:*** ***DTC 26 / (F49) No. 14 — Chassis ground:*** ***DTC 28 / (F49) No. 7 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **19.**	Repair harness/ connector between ABSCM&H/U and ABS sensor.
19	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — GND:***	Is the measured value less than 0.5 Ω?	Go to step **20.**	Repair ABSCM&H/U ground harness.
20	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair connector.	Go to step **21.**
21	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **22.**	Properly install the car telephone or the wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **23.**
23	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (B62) No. 1 — Chassis ground:*** ***DTC 24 / (B62) No. 10 — Chassis ground:*** NOTE: For the **DTC 26** and **28**: Go to step **24.**	Is the measured value less than 0.5 Ω?	Go to step **24.**	Repair shield harness.

Step		Check	Yes	No
24	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **25.**
25	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary noise interference.

MEMO:

K: DTC 29 ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

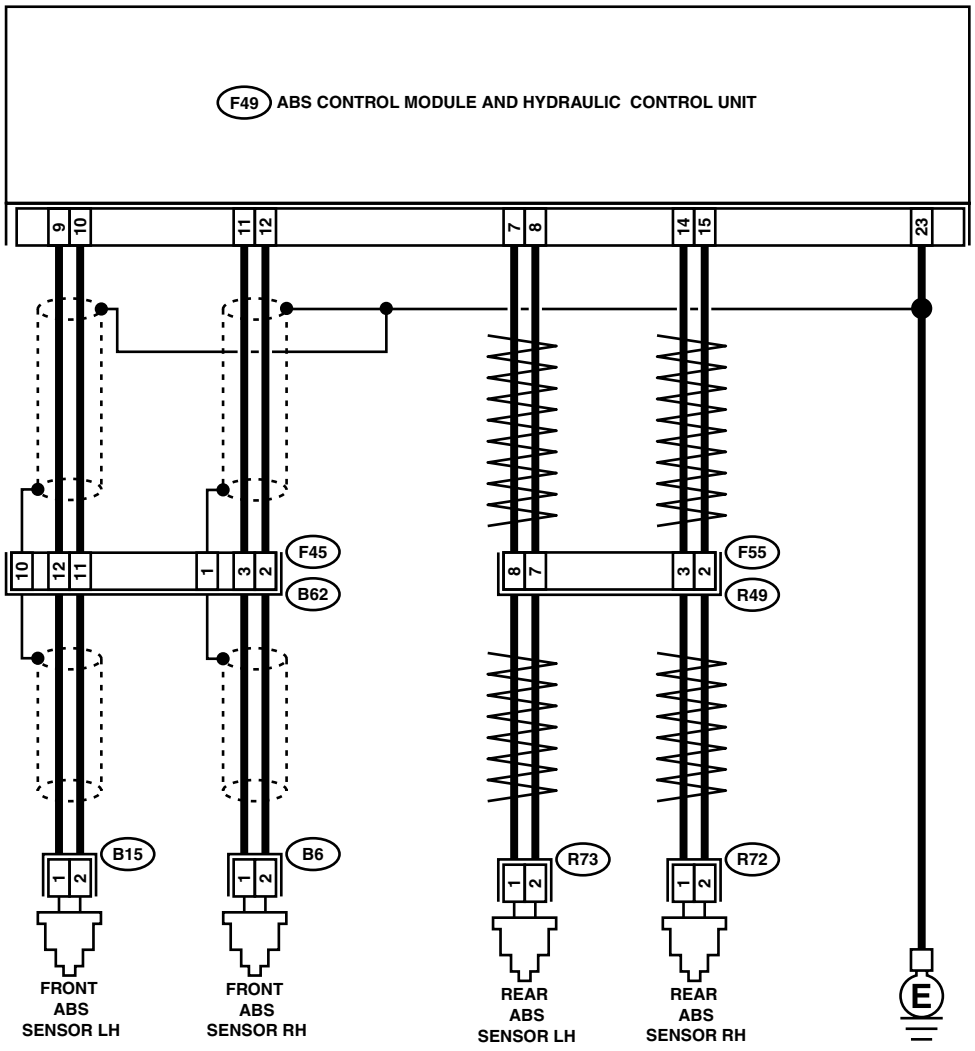
DIAGNOSIS:

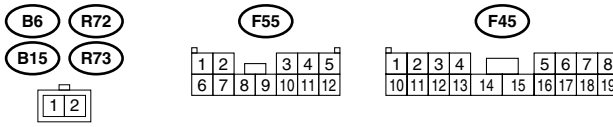
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00293

	Step	Check	Yes	No
1	**CHECK WHEELS FOR FREE TURNING.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Have wheels turned freely?	The ABS is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kgf-m, 25 ft-lb)?	Go to step **6.**	Tighten ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to ABS sensor piece gap over entire perimeter of the wheel.	Is the measured value within the range indicated below? Front wheel 0.3 — 0.8 mm (0.012 — 0.031 in) and Rear wheel 0.44 — 0.94 mm (0.0173 — 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Lift up the vehicle. 2) Turn ignition switch to OFF. 3) Connect the oscilloscope to the connector (B62) in accordance with trouble code. 4) Turn ignition switch to ON. 5) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***(B62) No. 3 (+) — No. 2 (–) (Front RH):*** ***(B62) No. 12 (+) — No. 11 (–) (Front LH):*** ***(F55) No. 3 (+) — No. 2 (–) (Rear RH):*** ***(F55) No. 8 (+) — No. 7 (–) (Rear LH):***	Is the oscilloscope pattern the same as that shown in the figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub.	Is the ABS sensor piece or the tone wheel contaminated by mud or other foreign matter?	Thoroughly remove mud or other foreign matter.	Go to step **10.**

Step		Check	Yes	No
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS sensor piece or the tone wheel?	Replace ABS sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Sensor.> Rear: <Ref. to ABS-15, Rear ABS Sensor.> and Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace tone wheel. Front: <Ref. to ABS-19, Front Tone Wheel.> Rear: <Ref. to ABS-20, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

L: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

M: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

N: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-102, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

O: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

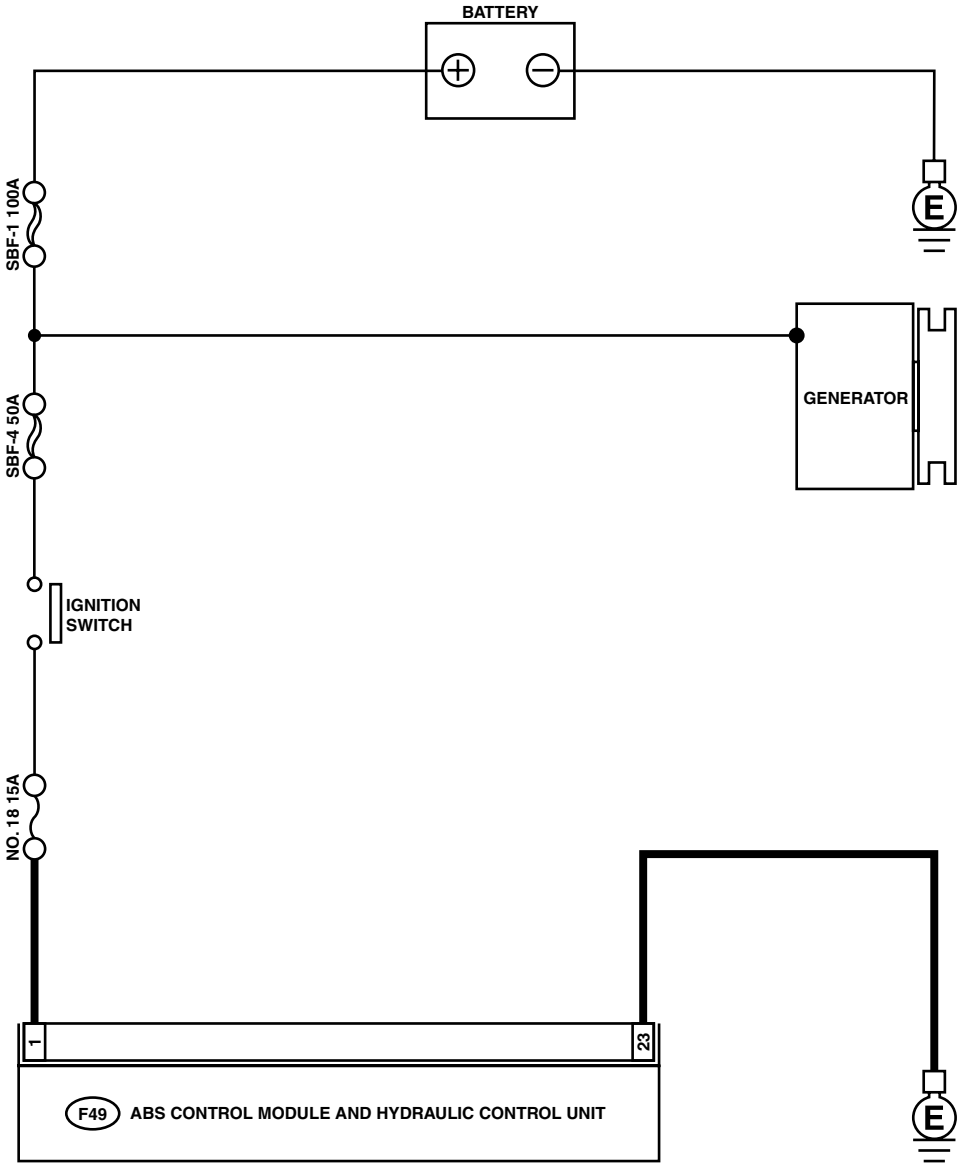
DIAGNOSIS:

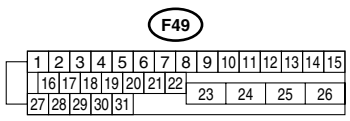
- Faulty harness/connector
- Faulty inlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

P: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

Q: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

R: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-106, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Chart with Subaru Select Monitor.>

MEMO:

S: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

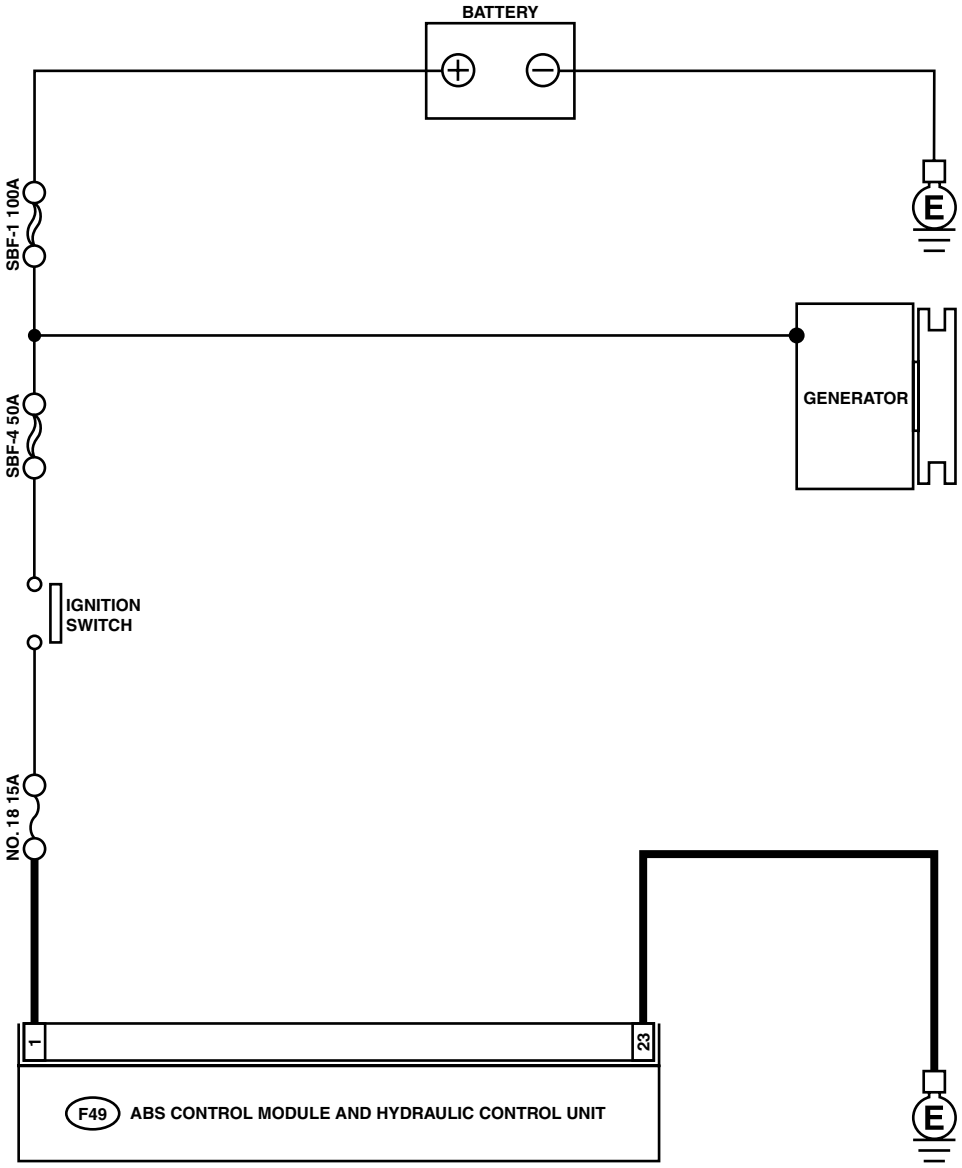
DIAGNOSIS:

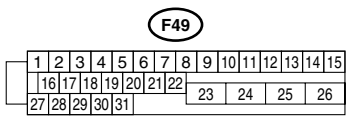
- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

T: DTC 41 ABS CONTROL MODULE MALFUNCTION

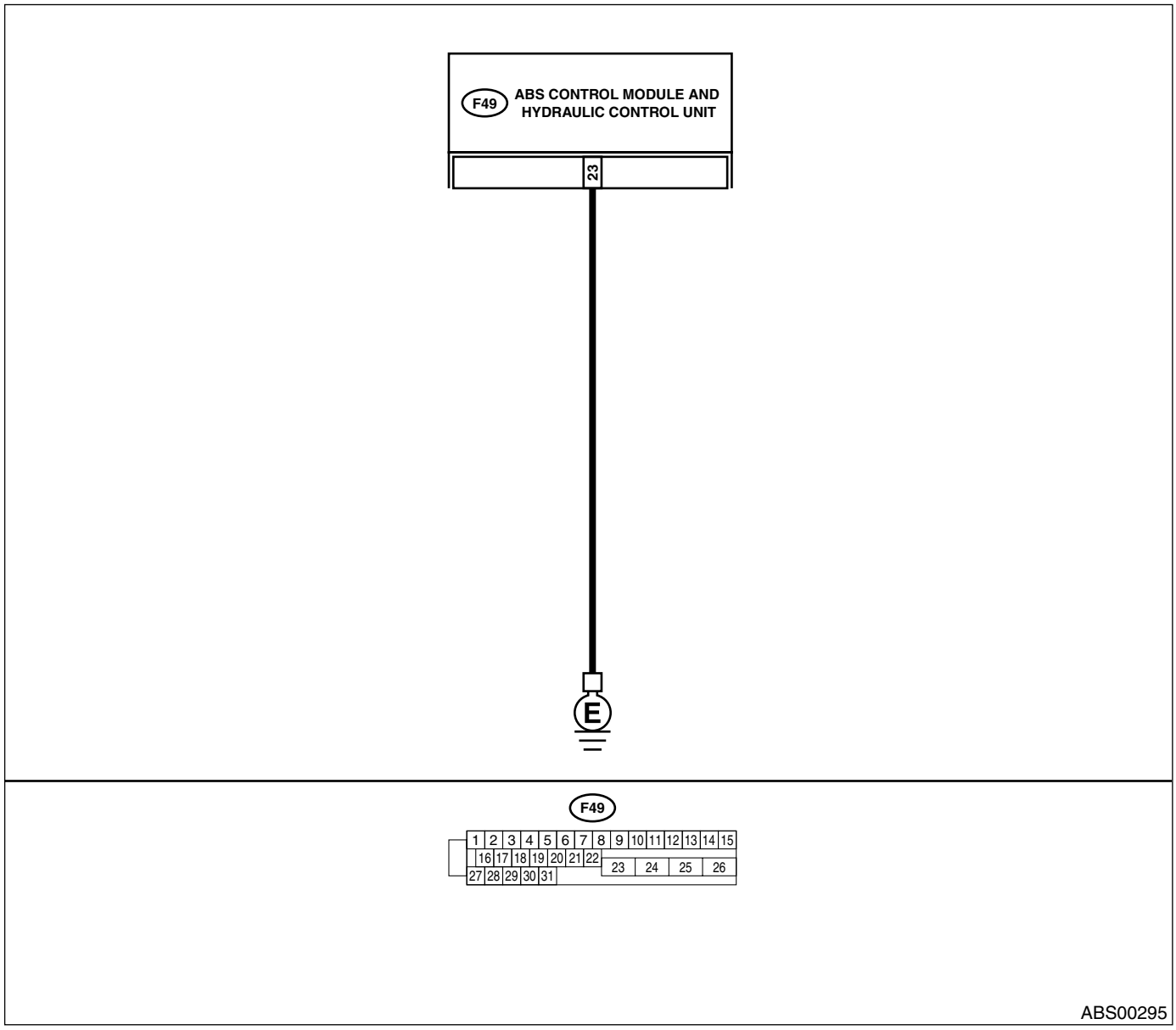
DIAGNOSIS:

- Faulty ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair connector.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

U: DTC 42 POWER SUPPLY VOLTAGE TOO LOW

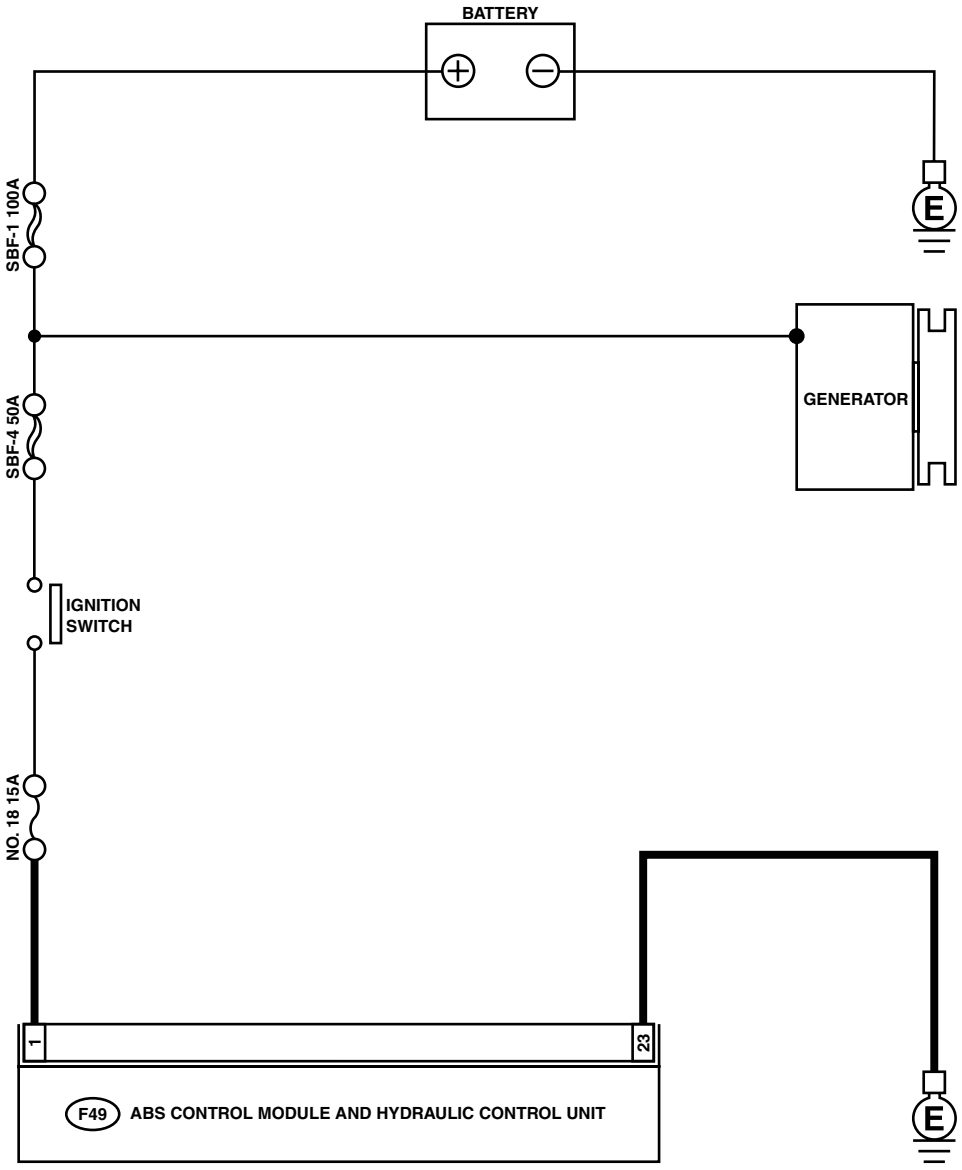
DIAGNOSIS:

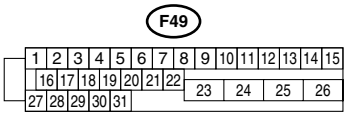
- Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **2.**	i) Repair generator. ii) H4 engine model: iii) <Ref. to SC(H4SO)-15, Generator.> iv) H6 engine model: v) <Ref. to SC(H6DO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

V: DTC 42 POWER SUPPLY VOLTAGE TOO HIGH

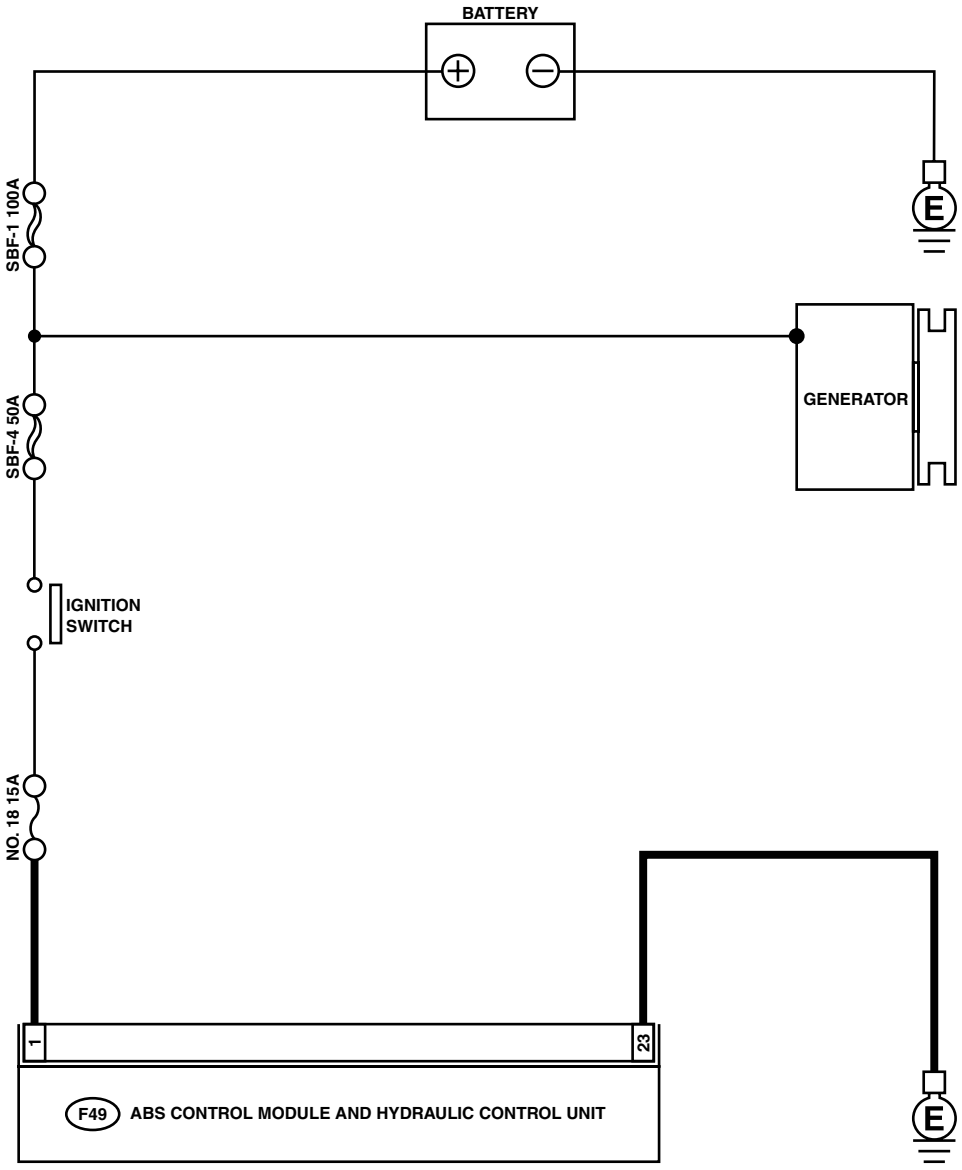
DIAGNOSIS:

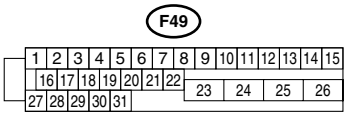
- Power source voltage of the ABSCM&H/U is high.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00294

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	Is the measured value within 10 to 17 V?	Go to step **2.**	i) Repair generator. ii) H4 engine model: iii) <Ref. to SC(H4SO)-15, Generator.> iv) H6 engine model: v) <Ref. to SC(H6DO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 17 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

W: DTC 44 ABS-AT CONTROL (NON CONTROLLED)

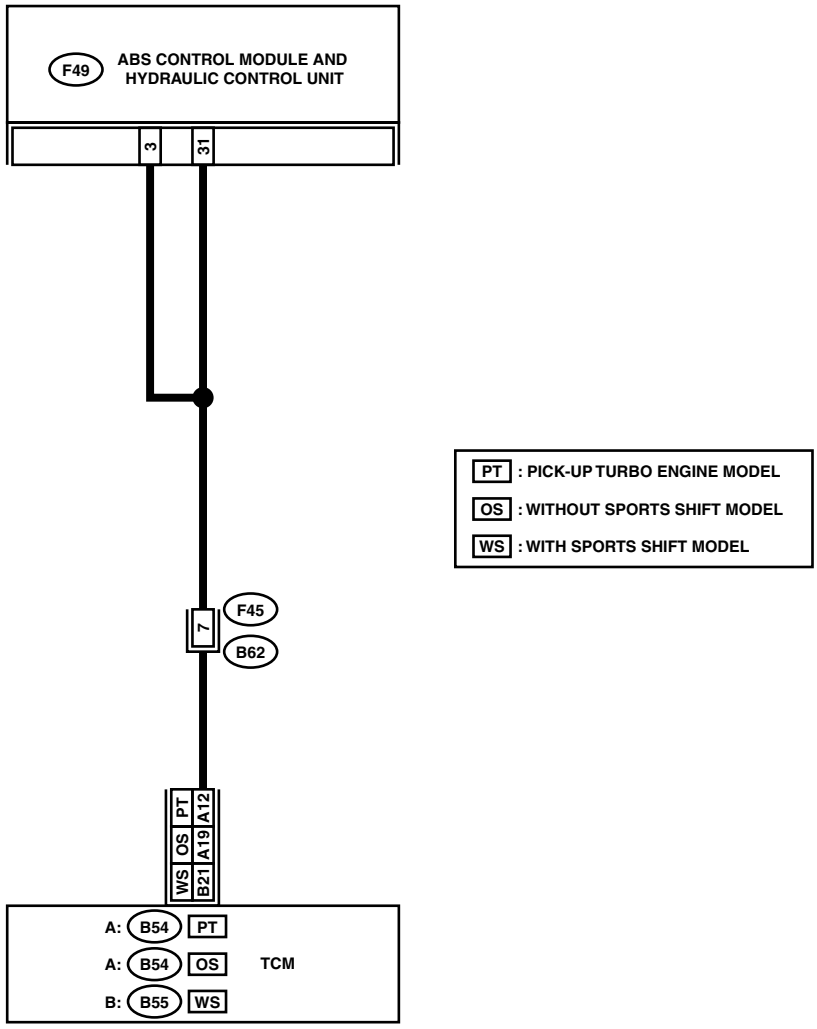
DIAGNOSIS:

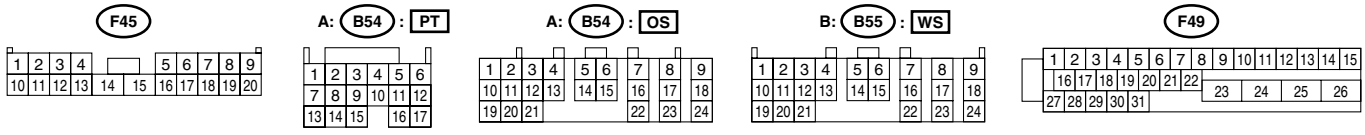
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00426

	Step	Check	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of the mark to the ABSCM&H/U. ***CG: AT (except OUTBACK,BAJA)*** ***CH: MT (except OUTBACK,BAJA)*** ***CI: AT (OUTBACK,BAJA)*** ***CJ: MT (OUTBACK,BAJA)***	Do the vehicle specification and the specification of ABSCM&HU match?	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair harness between TCM and ABSCM&H/U.
3	**CHECK TCM.** 1) Connect all connectors to TCM. 2) Turn ignition switch to ON. 3) Measure voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***PT: (B54) No. 12 (+) — Chassis ground (–):*** ***OS: (B54) No. 19 (+) — Chassis ground (–):*** ***WS: (B55) No. 21 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **5.**	Go to step **4.**
4	**CHECK AT.**	Is the AT functioning normally?	Replace TCM.	Repair AT.
5	**CHECK OPEN CIRCUIT OF HARNESS.** Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Repair harness/ connector between TCM and ABSCM&H/U.
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

X: DTC 44 ABS-AT CONTROL (CONTROLLED)

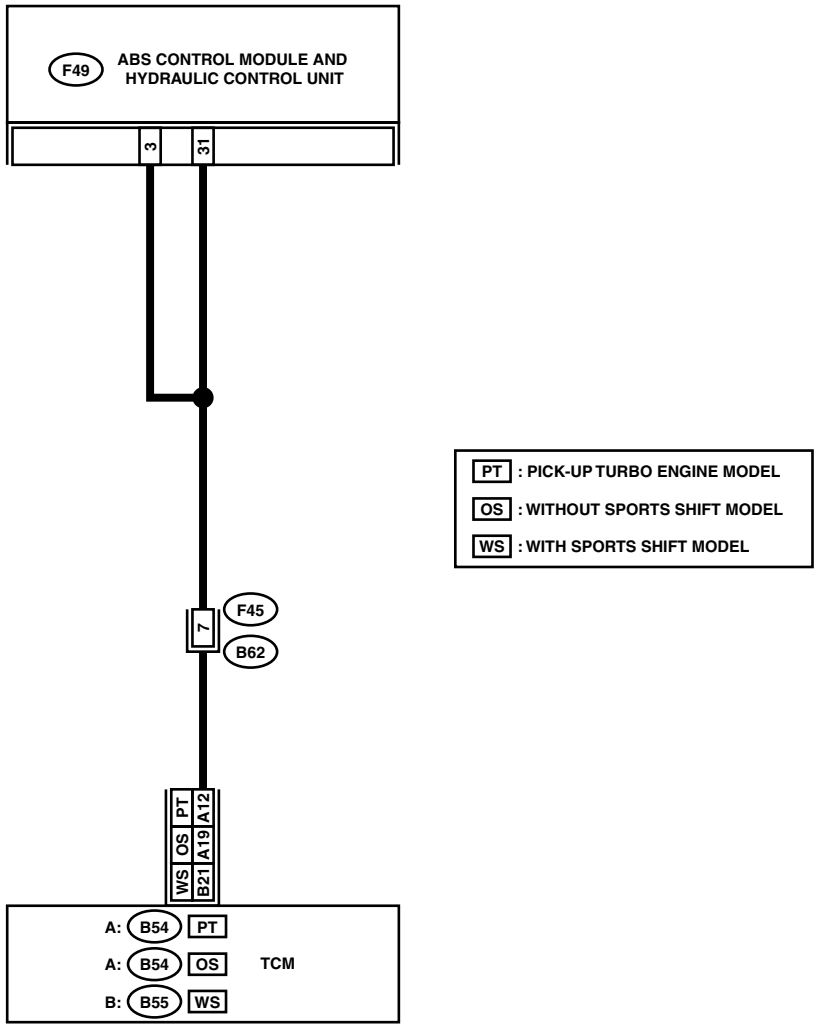
DIAGNOSIS:

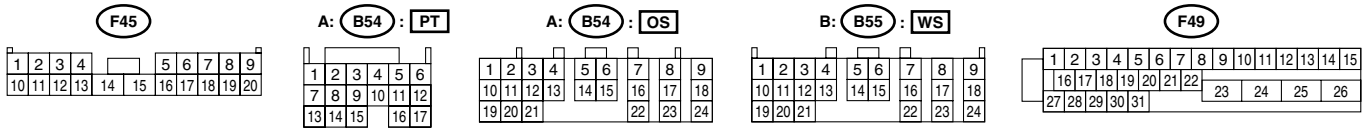
- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00426

	Step	Check	Yes	No
1	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Disconnect connector from ABSCM&H/U. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **2.**	Repair harness between TCM and ABSCM&H/U.
2	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Repair harness between TCM and ABSCM&H/U.
3	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 3 (+) — Chassis ground (–):*** ***(F49) No. 31 (+) — Chassis ground (–):***	Is the measured value within 10 to 13 V?	Go to step **4.**	Repair harness/ connector between TCM and ABSCM&H/U.
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF. Is there poor contact in connectors between TCM and ABSCM&H/U?	There is no poor contact.	Go to step **5.**	Repair connector.
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

Y: DTC 51 VALVE RELAY MALFUNCTION

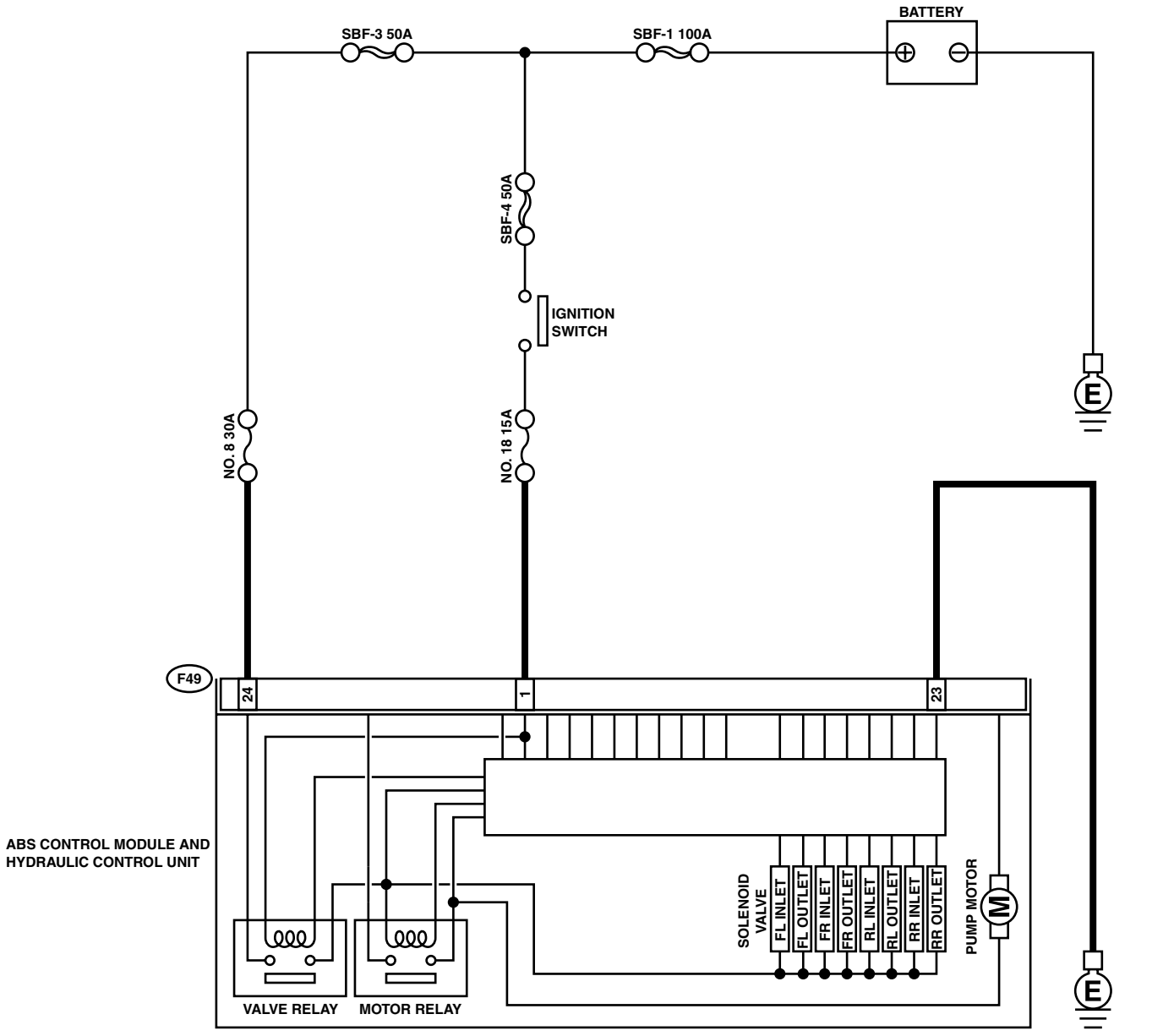
DIAGNOSIS:

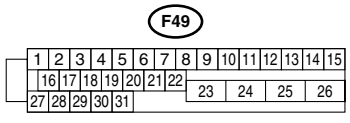
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00297

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***(F49) No. 24 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

Z: DTC 51 VALVE RELAY ON FAILURE

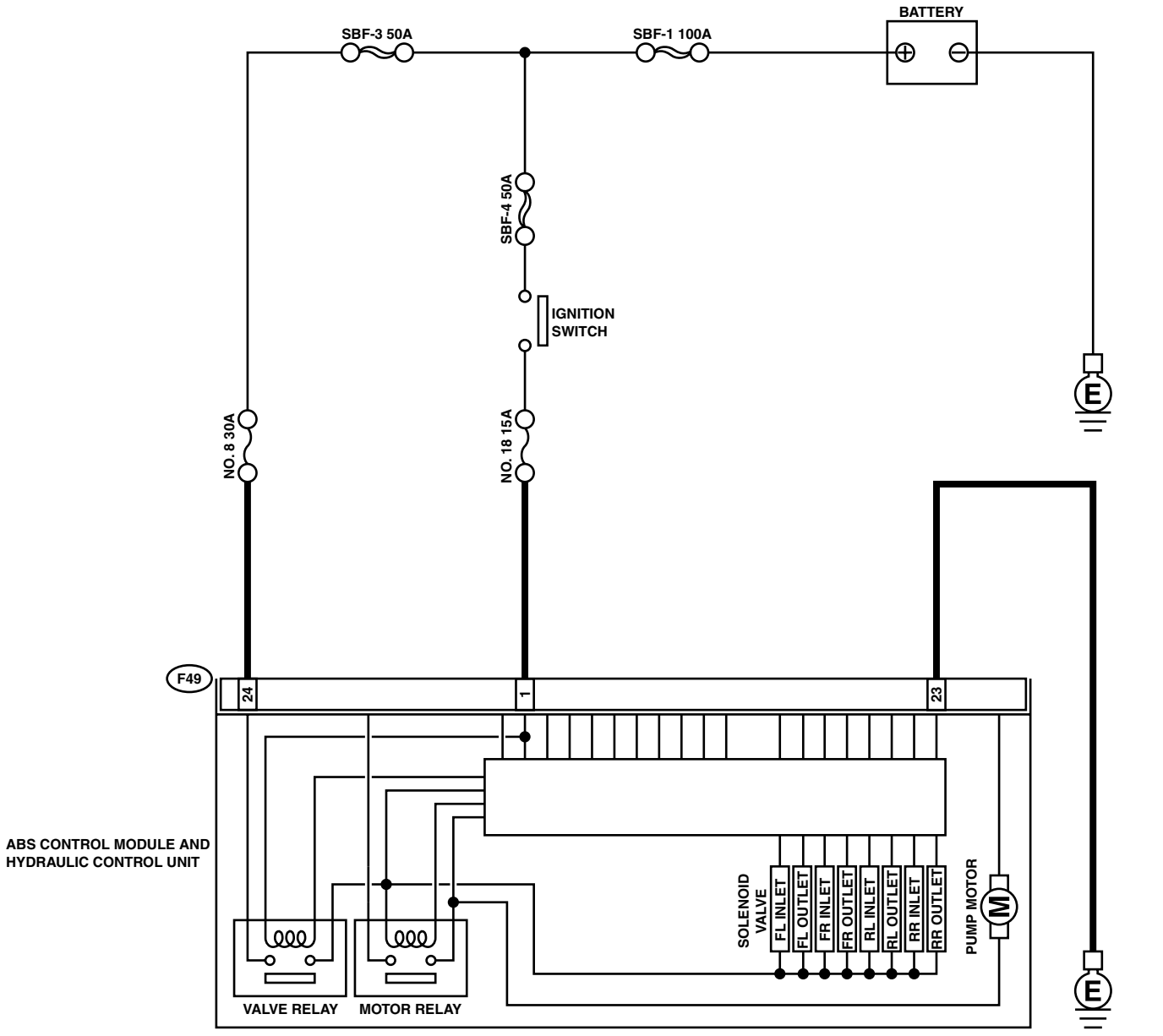
DIAGNOSIS:

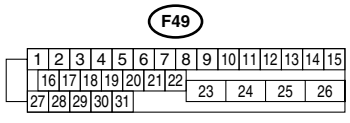
- Faulty valve relay

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00297

	Step	Check	Yes	No
1	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 23 (+) — No. 24 (–):***	Is the measured value more than 1 MΩ?	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AA:DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT

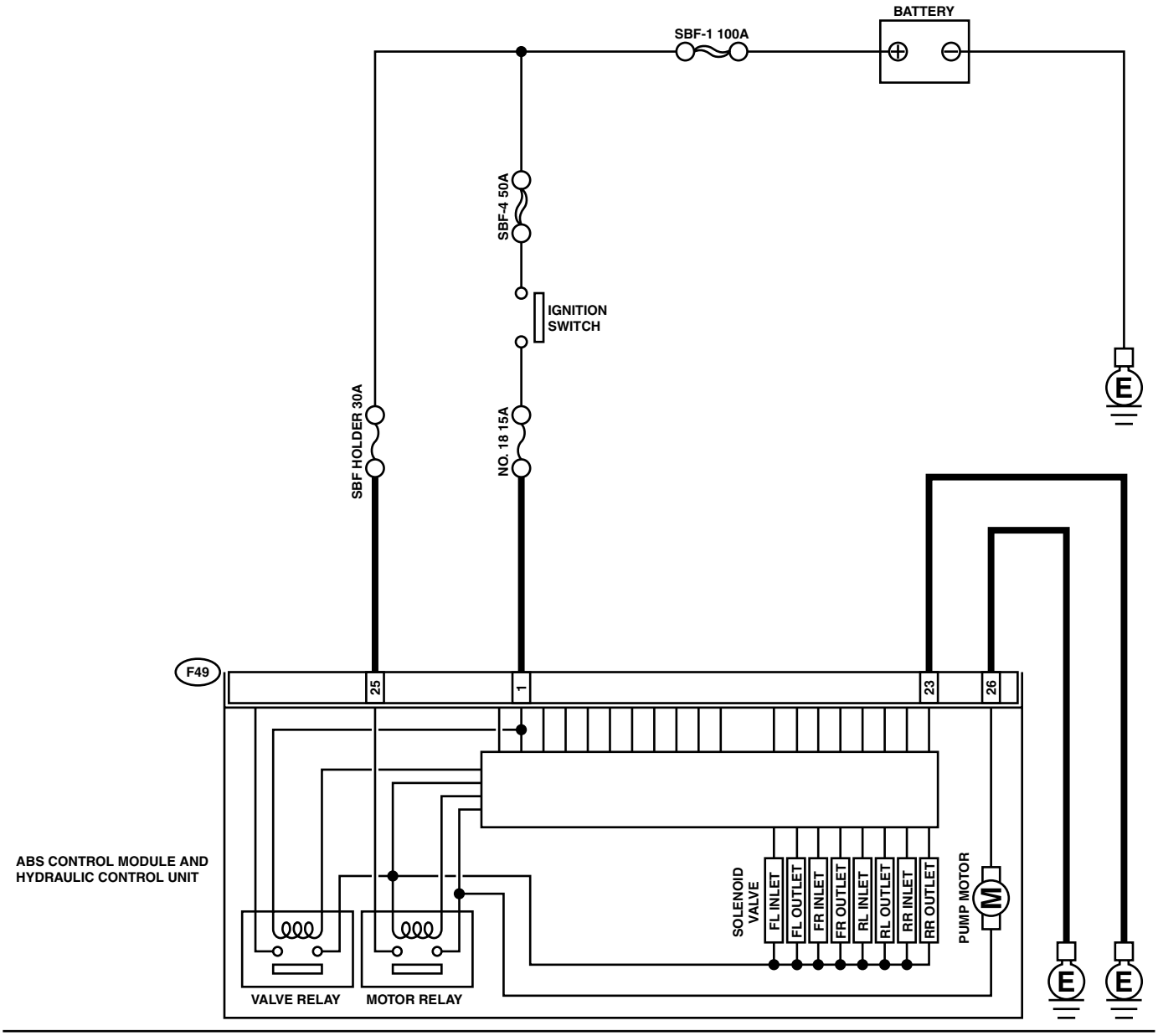
DIAGNOSIS:

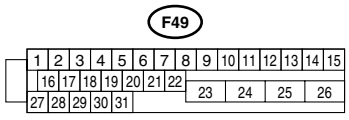
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00427

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF7.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 26 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence?	Go to step **4.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AB:DTC 52 MOTOR RELAY ON FAILURE

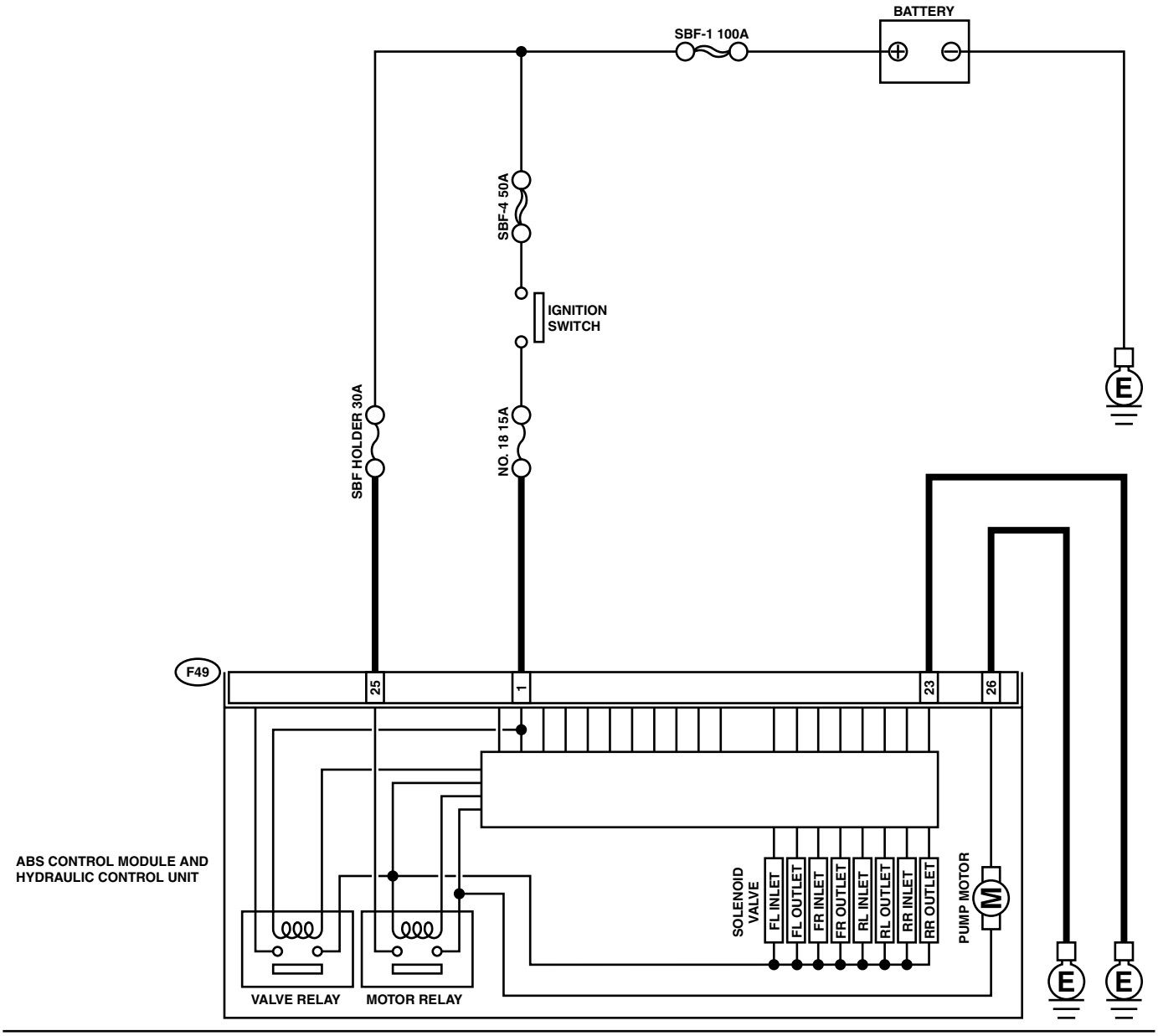
DIAGNOSIS:

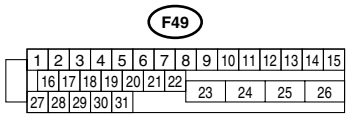
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00427

	Step	Check	Yes	No
1	**CHECK MOTOR RELAY IN ABSCM&H/U.** Measure resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 25 — No. 26:***	Is the measured value more than 1 MΩ?	Go to step **2.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step **3.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AC:DTC 52 MOTOR MALFUNCTION

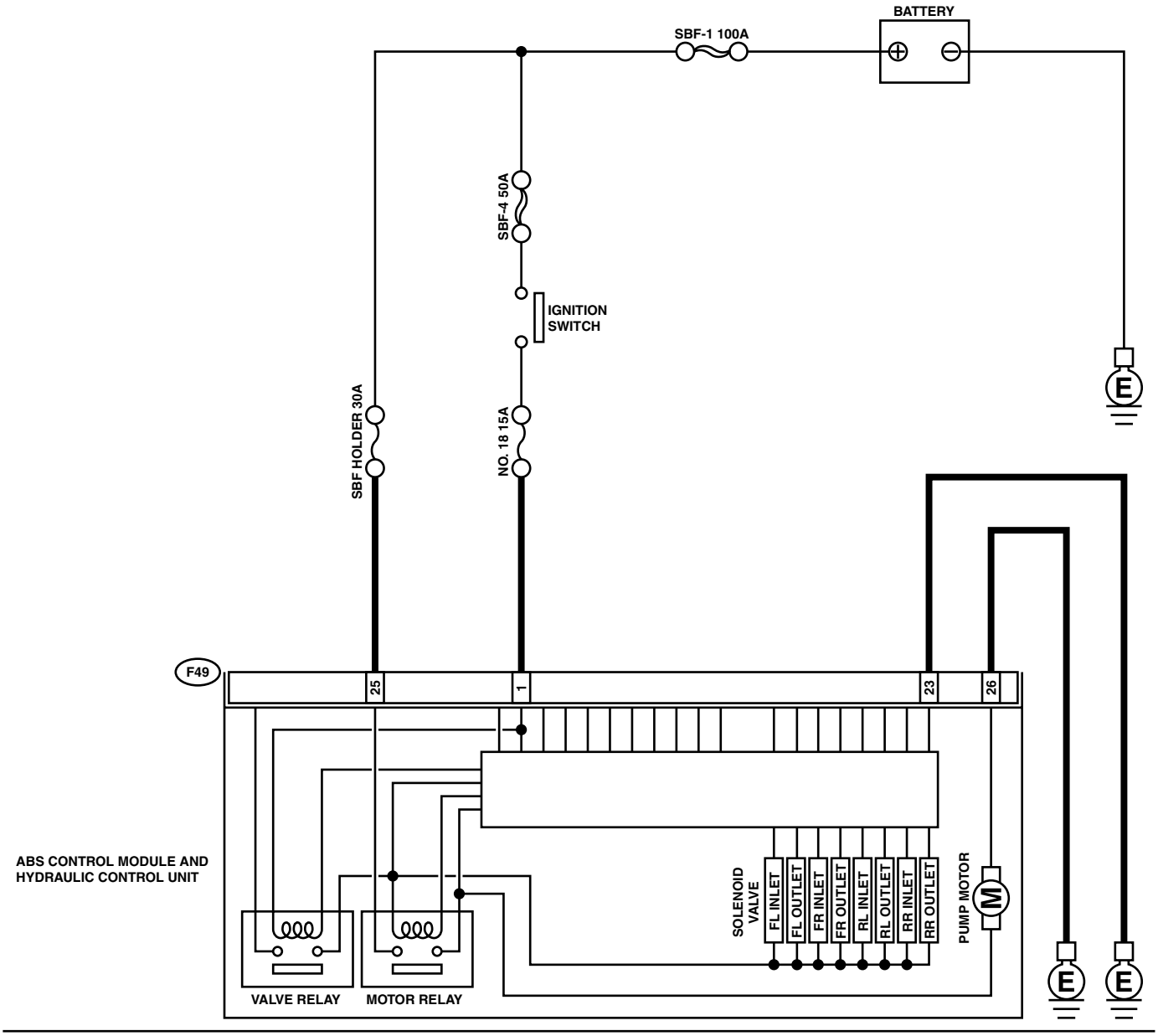
DIAGNOSIS:

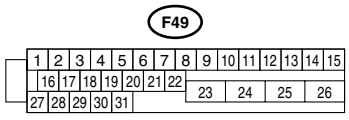
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00427

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 25 (+) — Chassis ground (–):***	Is the measured value within 10 to 13 V?	Go to step **2.**	Repair harness/ connector between battery and ABSCM&H/U and check fuse SBF7.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 26 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 23 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step **6.**	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AD:DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

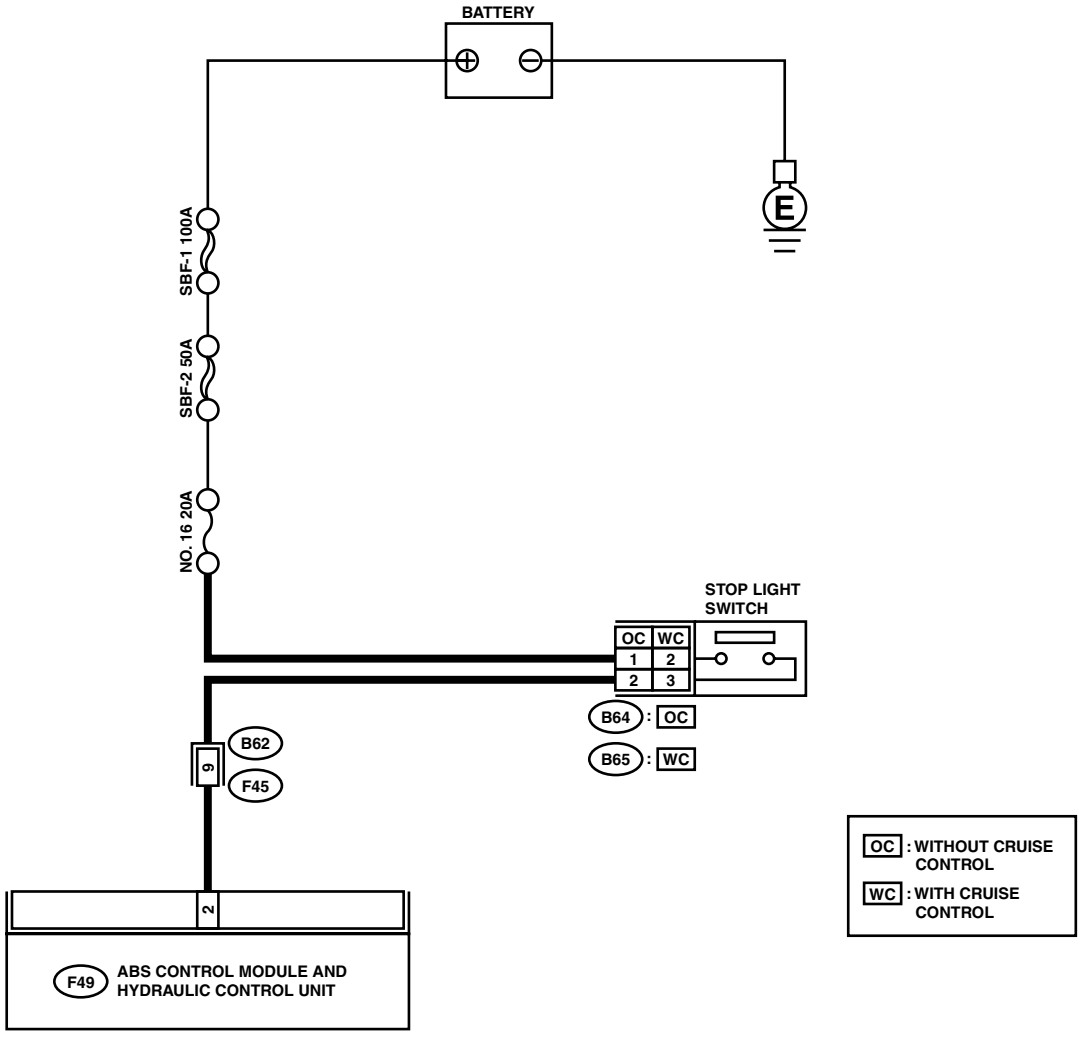
DIAGNOSIS:

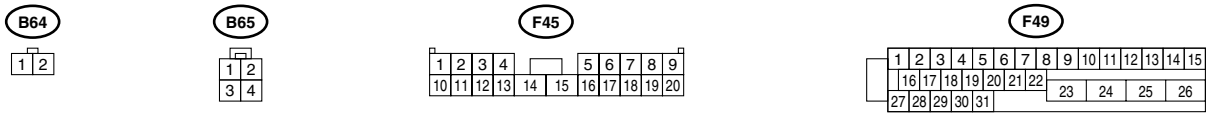
- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:





ABS00428

	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Release the brake pedal. 3) Read the stop light switch output in the select monitor data display.	Is the reading indicated on monitor display less than 1.5 V?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in the select monitor data display.	Is the reading indicated on monitor display within 10 to 15 V?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Do stop lights turn on?	Go to step **4.**	Repair stop lights circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Depress brake pedal. 4) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 2 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **5.**	Repair harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Repair connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AE:DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT

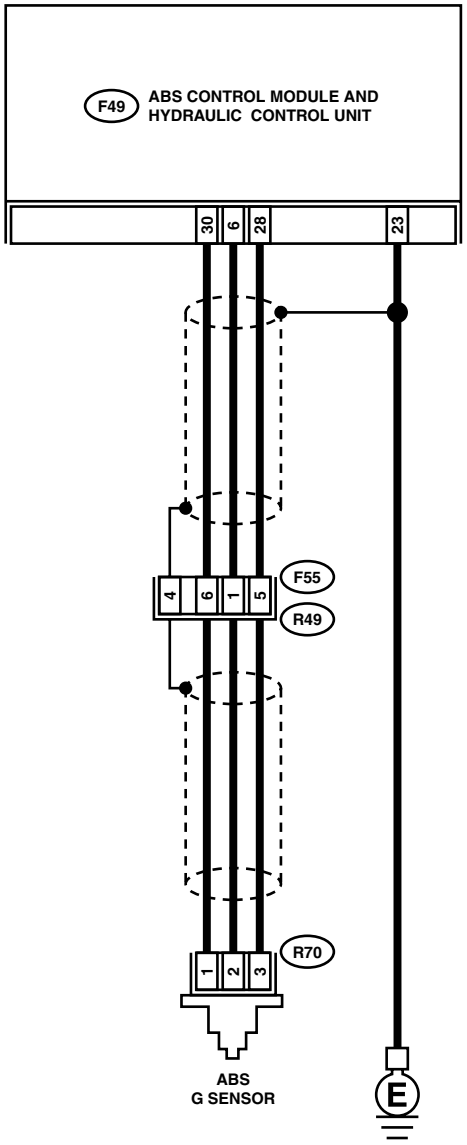
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00429

	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select "Current data display & Save" on the select monitor. 2) Read the G sensor output in select monitor data display.	Is the G sensor output on the monitor display within 2.1 to 2.5 V when the G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 1 (+) — No. 3 (–):***	Is the measured value within 4.75 to 5.25 V?	Go to step **6.**	Repair harness/ connector between G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:***	Is the measured value within 5.0 to 5.6 kΩ?	Go to step **7.**	Repair harness/ connector between G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect connector from G sensor. 2) Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between G sensor and ABSCM&H/U.
8	**CHECK G SENSOR.** 1) Connect connector to G sensor. 2) Connect connector to ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 2.1 to 2.5 V when G sensor is horizontal?	Go to step **9.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
9	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 3.7 to 4.1 V when G sensor is inclined forwards to 90°?	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>

	Step	Check	Yes	No
10	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 0.5 to 0.9 V when G sensor is inclined backwards to 90°?	Go to step **11.**	Replace G sensor. <Ref. to ABS-21, G SENSOR, .>
11	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

MEMO:

AF:DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT

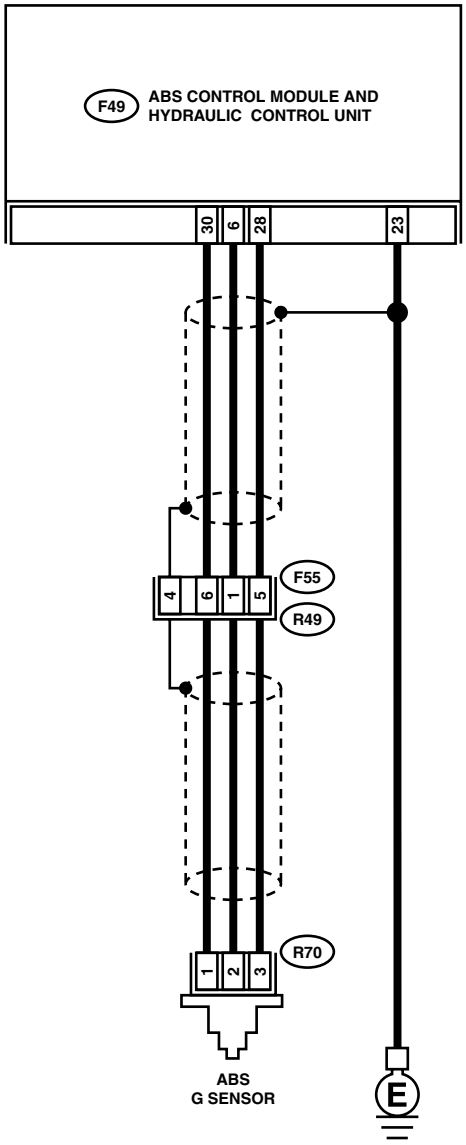
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00429

	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the G sensor output in select monitor data display.	Is the G sensor output on the monitor display between within 2.1 to 2.5 V when the G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.
5	**CHECK FREEZE FRAME DATA.** 1) Select “Freeze frame data” on the select monitor. 2) Read front right wheel speed on the select monitor display.	Is the front right wheel speed on the monitor display to 0 km/h (0 MPH)?	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the select monitor display.	Is the front left wheel speed on the monitor display to 0 km/h (0 MPH)?	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the select monitor display.	Is the rear right wheel speed on the monitor display to 0 km/h (0 MPH)?	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the select monitor display.	Is the rear left wheel speed on the monitor display to 0 km/h (0 MPH)?	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read G sensor output on the select monitor display.	Is the G sensor output on the monitor display more than 3.65 V?	Go to step **10.**	Go to step **16.**
10	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:***	Is the measured value within 5.0 to 5.6 kΩ?	Go to step **11.**	Repair harness/ connector between G sensor and ABSCM&H/U.
11	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from G sensor. 4) Disconnect connector from ABSCM&H/U. 5) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **12.**	Repair harness between G sensor and ABSCM&H/U.

	Step	Check	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Repair harness between G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **14.**
14	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **15.**
15	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.
16	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect G sensor from body. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 1 (+) — No. 3 (–):***	Is the measured value within 4.75 to 5.25 V?	Go to step **17.**	Repair harness/ connector between G sensor and ABSCM&H/U.
17	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:***	Is the measured value within 5.0 to 5.6 kΩ?	Go to step **18.**	Repair harness/ connector between G sensor and ABSCM&H/U.
18	**CHECK G SENSOR.** 1) Connect connector to G sensor. 2) Connect connector to ABSCM&H/U. 3) Turn ignition switch to ON. 4) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 2.1 to 2.5 V when G sensor is horizontal?	Go to step **19.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
19	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 3.7 to 4.1 V when G sensor is inclined forwards to 90°?	Go to step **20.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
20	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 0.5 to 0.9 V when G sensor is inclined backwards to 90°?	Go to step **21.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **22.**

Step		Check	Yes	No
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**
23	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

AG:DTC 56 ABNORMAL G SENSOR HIGH μ OUTPUT

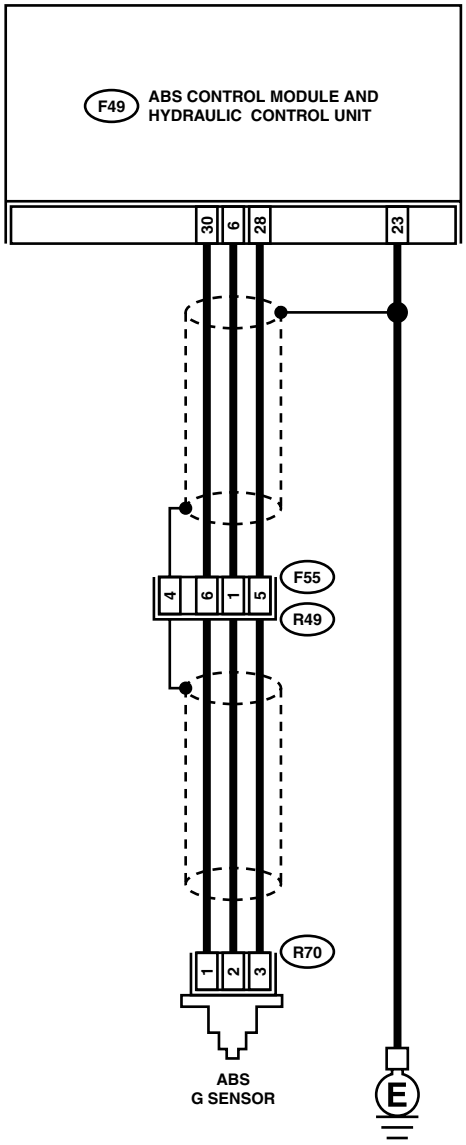
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



ABS00429

	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read G sensor output on the select monitor display.	Is the G sensor output on monitor display within 2.1 to 2.5 V when the G sensor is in horizontal position?	Go to step **2.**	Go to step **6.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.
5	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:***	Is the measured value within 5.0 to 5.6 kΩ?	Go to step **6.**	Repair harness/ connector between G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 28 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair harness between G sensor and ABSCM&H/U. Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK G SENSOR.** 1) Remove console box. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 2.1 to 2.5 V when G sensor is horizontal?	Go to step **8.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
8	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 3.7 to 4.1 V when G sensor is inclined forwards to 90°?	Go to step **9.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
9	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 0.5 to 0.9 V when G sensor is inclined backwards to 90°?	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>

Step		Check	Yes	No
10	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**
11	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

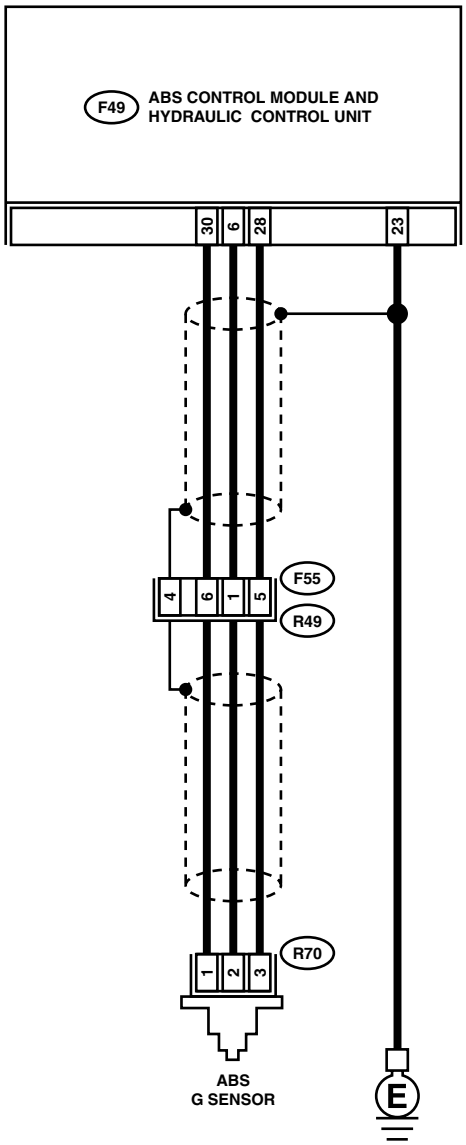
MEMO:

AH:DTC 56 DETECTION OF G SENSOR STICK

DIAGNOSIS:
- Faulty G sensor output voltage

TROUBLE SYMPTOM:
- ABS does not operate.

WIRING DIAGRAM:



ABS00429

	Step	Check	Yes	No
1	**CHECK WHEELS FOR FREE TURNING.** Check if the wheels have been turned freely such as when the vehicle is lifted up, or operated on a rolling road.	Have wheels turned freely?	The ABS is normal. Erase the trouble code.	Go to step **2.**
2	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Select "Current data display & Save" on the select monitor. 2) Read the select monitor display.	Is the G sensor output on the monitor display within 2.1 to 2.5 V when the vehicle is in horizontal position?	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Remove G sensor from vehicle. (Do not disconnect connector.) 4) Turn ignition switch to ON. 5) Select "Current data display & Save" on the select monitor. 6) Read the select monitor display.	Is the G sensor output on the monitor display within 3.7 to 4.1 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.** Read the select monitor display.	Is the G sensor output on the monitor display within 0.5 to 0.9 V when G sensor is inclined backwards to 90°?	Go to step **5.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.
8	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABSCM&H/U. 3) Measure resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(F49) No. 6 — No. 28:***	Is the measured value within 5.0 to 5.6 kΩ?	Go to step **9.**	Repair harness/ connector between G sensor and ABSCM&H/U.
9	**CHECK G SENSOR.** 1) Remove console box. 2) Remove G sensor from vehicle. 3) Connect connector to G sensor. 4) Connect connector to ABSCM&H/U. 5) Turn ignition switch to ON. 6) Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 2.1 to 2.5 V when G sensor is horizontal?	Go to step **10.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>

	Step	Check	Yes	No
10	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 3.7 to 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
11	**CHECK G SENSOR.** Measure voltage between G sensor connector terminals. ***Connector & terminal*** ***(R70) No. 2 (+) — No. 3 (–):***	Is the measured value within 0.5 to 0.9 V when G sensor is inclined backwards to 90°?	Go to step **12.**	Replace G sensor. <Ref. to ABS-21, G Sensor.>
12	**CHECK ABSCM&H/U.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the DTC.	Is the same DTC still being output?	Replace ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

14.General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS sensor • Incorrect wiring or piping connections
	Brake dragging	• ABSCM&H/U (solenoid valve) • ABS sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS sensor • Brake piping
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping Suspension play or fatigue

MEMO:

VDC

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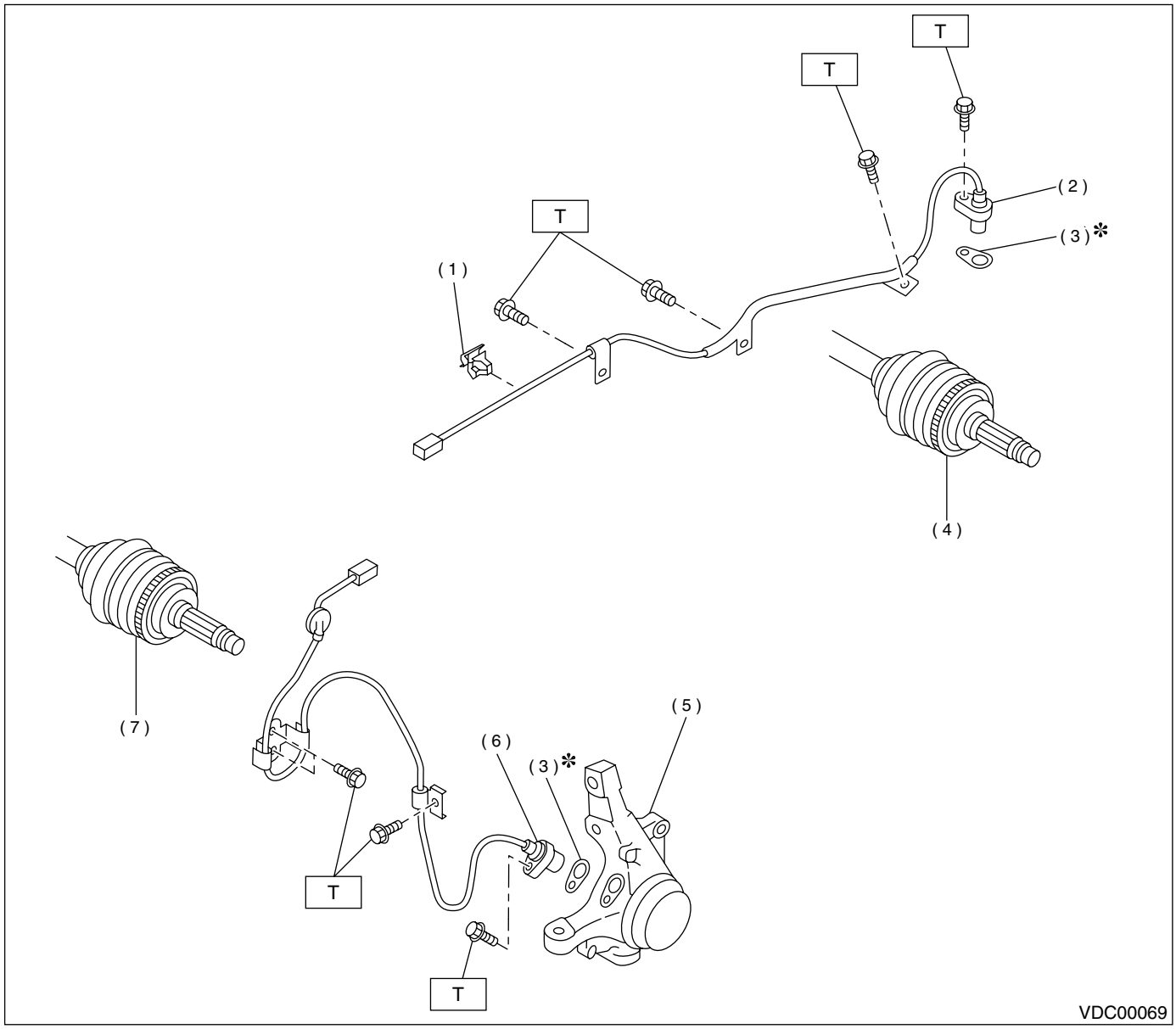
1. General Description

A: SPECIFICATIONS

Item			Standard or remarks
ABS sensor	ABS sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)
		Rear	0.44 — 0.94 mm (0.0173 — 0.0370 in)
	ABS sensor resistance		1.25±0.25 kΩ
	Marks of the harness	Front LH	Brown
		Front RH	Light blue
		Rear LH	Yellow
		Rear RH	White
Yaw rate and lateral G sensor	Lateral G sensor voltage		2.5±0.2 V
VDC hydraulic control unit marks			D2
VDC control module marks			P

B: COMPONENT

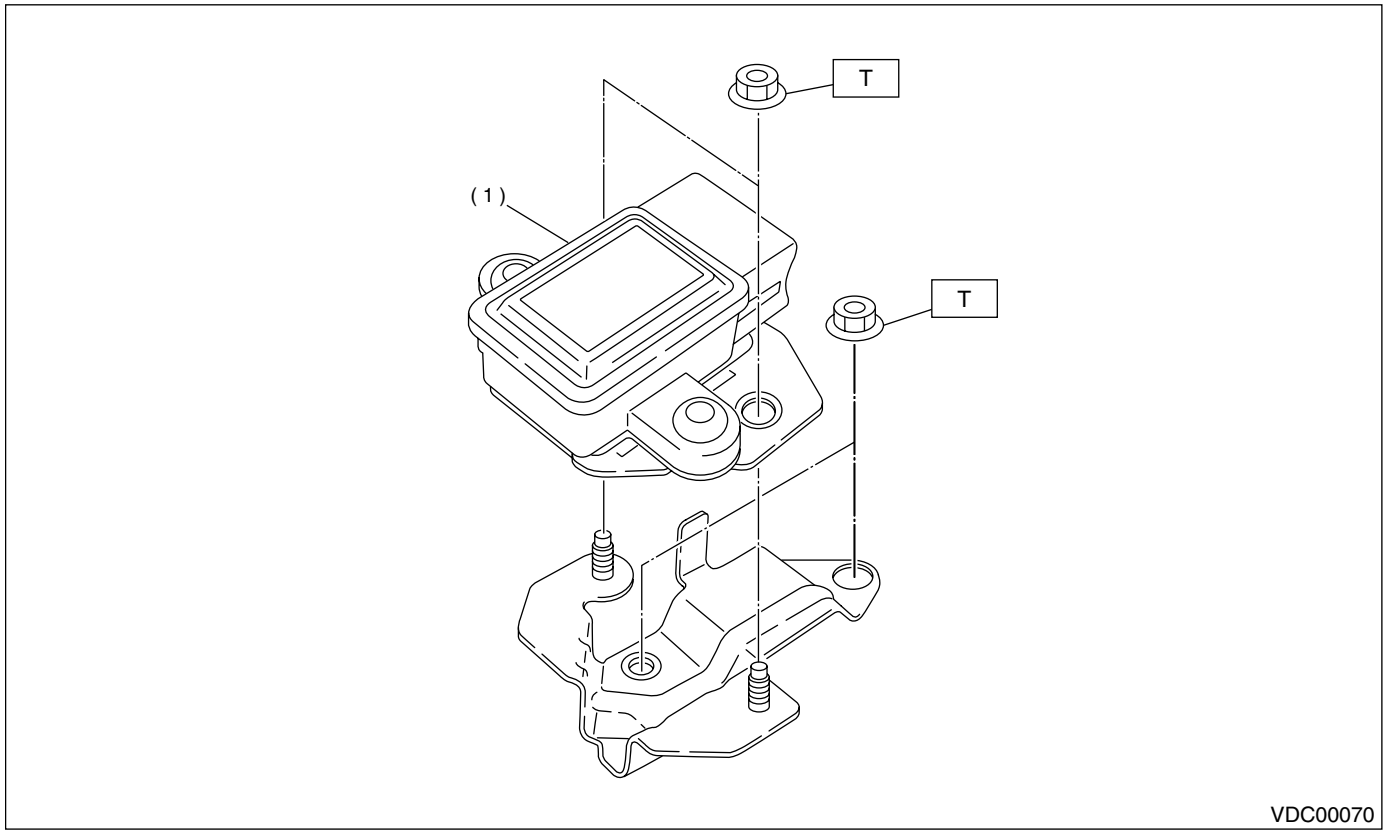
1. ABS SENSOR



(1) Clip
(2) Rear ABS sensor
(3) ABS spacer
(4) Tone wheel (Rear)
(5) Housing
(6) Front ABS sensor
(7) Tone wheel (Front)

Tightening torque: N·m (kgf-m, ft-lb)
T: 33 (3.4, 24)

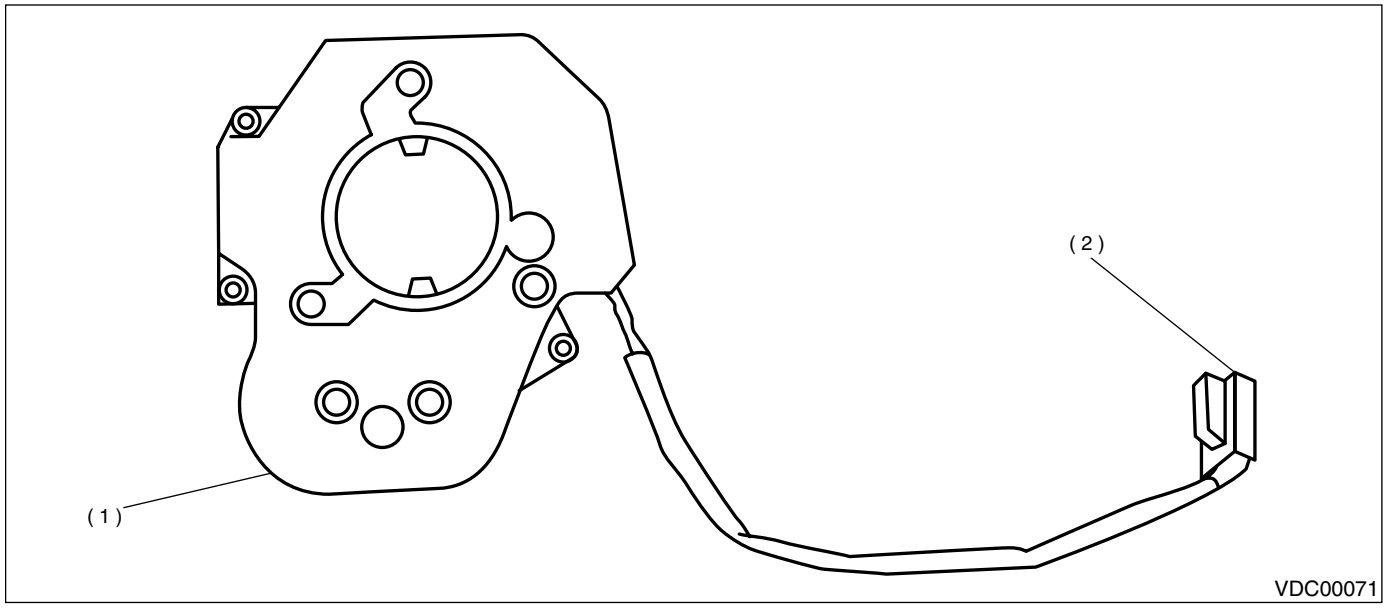
2. YAW RATE AND LATERAL G SENSOR



(1) Yaw rate and lateral G sensor

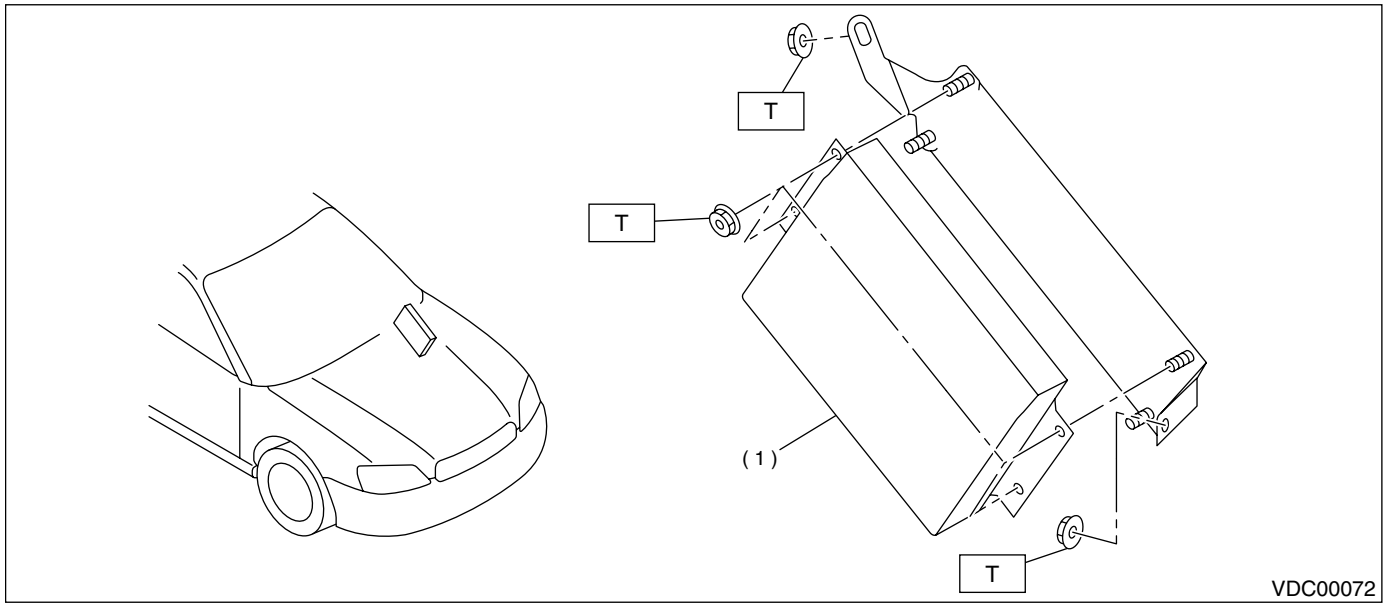
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor (2) Connector

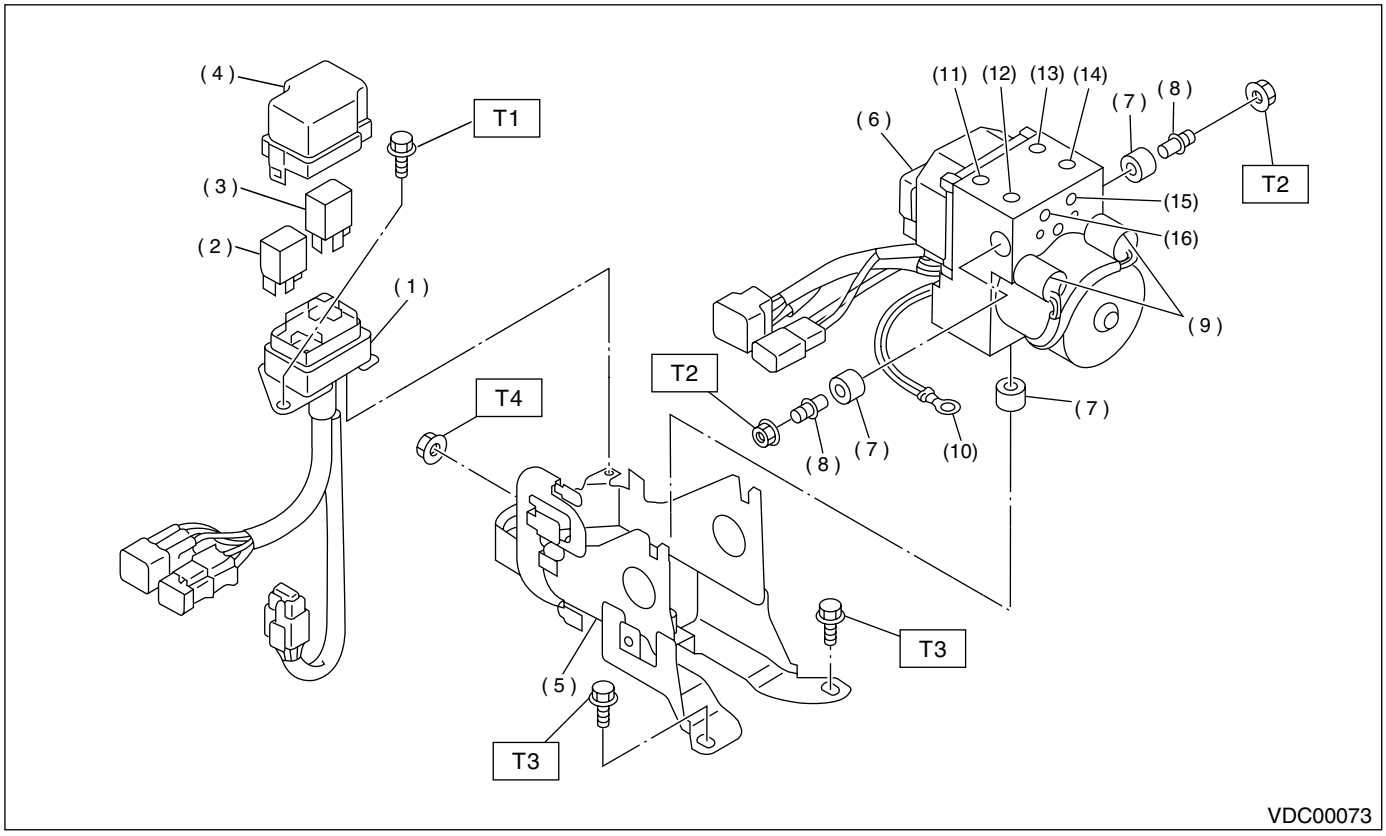
4. VDC CONTROL MODULE (VDCCM)



(1) VDC control module

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

5. HYDRAULIC CONTROL UNIT (H/U)



(1) Relay box
(2) Motor relay
(3) Valve relay
(4) Cap
(5) Bracket
(6) Hydraulic control unit
(7) Damper
(8) Stud bolt
(9) Pressure sensor
(10) Ground terminal
(11) Front-LH outlet
(12) Secondary inlet
(13) Front-RH outlet
(14) Primary inlet
(15) Rear-LH outlet
(16) Rear-RH outlet

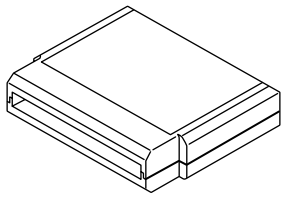
Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 24.6)
T4: 38 (3.9, 28)

C: CAUTION

• Wear working clothing, including, a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting harness connectors of sensors or units, be sure to disconnect ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

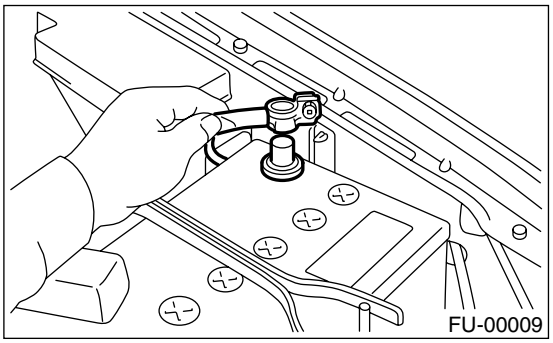
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

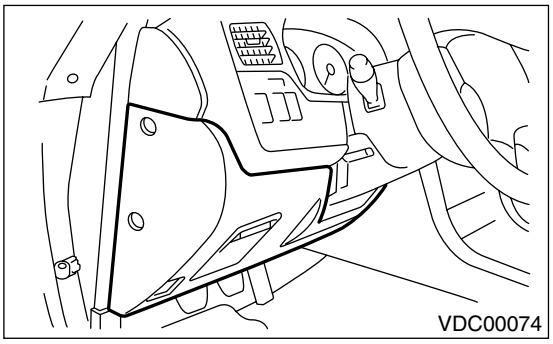
2. VDC Control Module (VDC-CM)

A: REMOVAL

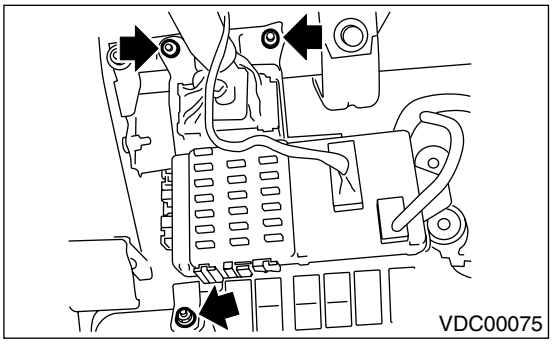
1) Disconnect ground cable from battery.



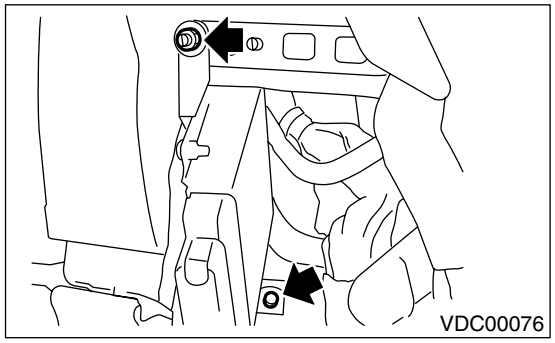
2) Remove lower cover of instrument panel and disconnect connectors on the back side of the cover.



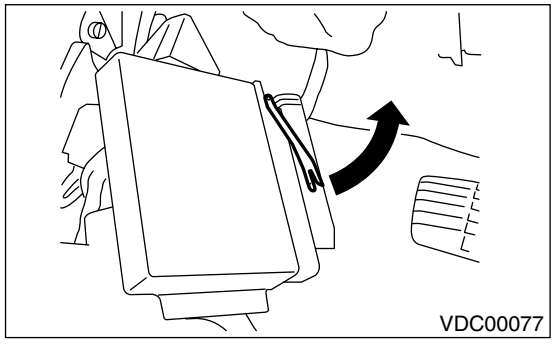
3) Remove three bolts which secure the fuse box onto body side, then move the fuse box aside.



4) Remove two bolts which install VDCCM onto body side bracket.



5) Disconnect connector from VDCCM by pulling up the securing holder.



6) Remove VDCCM.

B: INSTALLATION

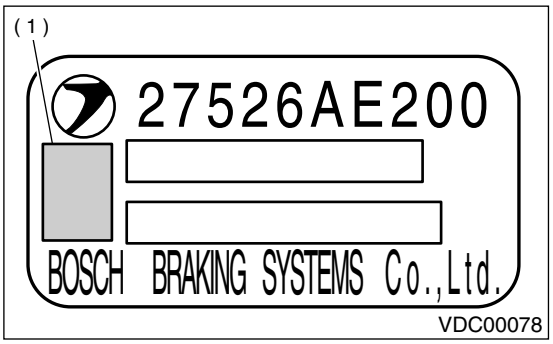
Install in the reverse order of removal.

CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Steering angle sensor center positioning**
- **Yaw rate and lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

Check the VDCCM identification mark.



(1) Specification mark

Vehicle specifications	VDCCM identification mark
Six cylinder engine	P

D: ADJUSTMENT

Always conduct steering angle sensor center positioning and yaw rate and lateral G sensor 0 positioning whenever you have replaced, removed or installed the following items.

- VDCCM
- Steering angle sensor
- Yaw rate and lateral G sensor
- Steering wheel parts (including airbag)
- Suspension parts
- Adjustment of wheel alignment

1. WITHOUT SUBARU SELECT MONITOR

1) Park the vehicle in a straight ahead position on a horizontal surface.
2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
3) Drive the vehicle approx. 10 km (6 MPH) preferably on a straight road, then turn ignition switch OFF. Then drive the vehicle approx. 10 km (6 MPH) again confirming that ABS and VDC warning lights do not go ON while vehicle is being driven. Also make sure there are no abnormalities of the VDC function or steering operation.

NOTE:
If it is not possible to drive the vehicle, use SUBARU SELECT MONITOR.
<Ref. to VDC-9, WITH SUBARU SELECT MONITOR, ADJUSTMENT, VDC Control Module (VDCCM).>

4) If there are any abnormalities found, conduct the procedure over again.

2. WITH SUBARU SELECT MONITOR

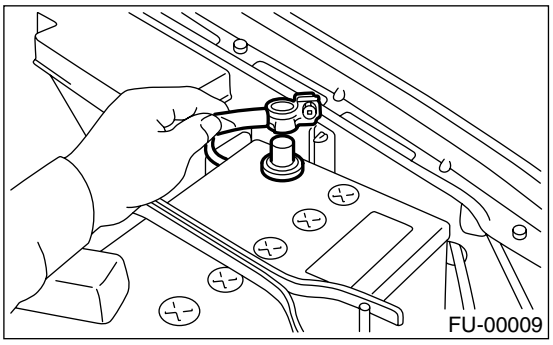
1) Park the vehicle in a straight ahead position on a horizontal surface. (Engine running in gear position of P or N)
2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
3) Set the SUBARU SELECT MONITOR on the vehicle and select “Set Mode Str.A.Sen.N & Lat.Gsen.0p” in “Function Check Sequence” display menu. (Follow the instructions in the display.)
4) Select “Current Data display & Save” in {Brake Control System} display menu and confirm if the steering angle sensor is indicated as “0 deg”.
5) If the display does not indicate {0 deg}, conduct the procedure over again and make sure it indicates “0 deg”.
6) Drive the vehicle approx. 10 minutes and confirm that ABS and VDC warning lights do not go ON while vehicle is being driven.
7) If there are any abnormalities in VDC function or steering operation found while vehicle is being driven, conduct the procedure over again.

3. Hydraulic Control Unit (H/U)

A: REMOVAL

1. HYDRAULIC UNIT (H/U)

1) Disconnect ground cable from battery.



2) Remove air intake duct from engine compartment to facilitate removal of hydraulic unit.
3) Disconnect connector from hydraulic unit.

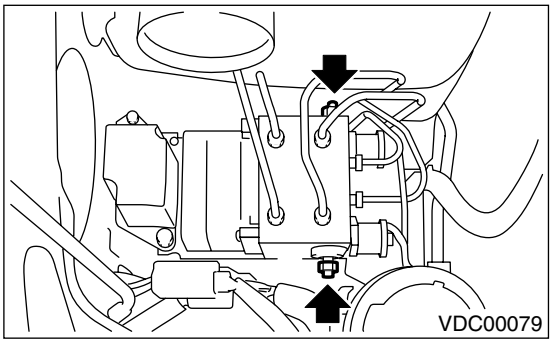
CAUTION:
Be careful not to let water or other foreign matter contact the H/U terminal.

4) Unlock cable clip.
5) Disconnect brake pipes from hydraulic unit.

CAUTION:
Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

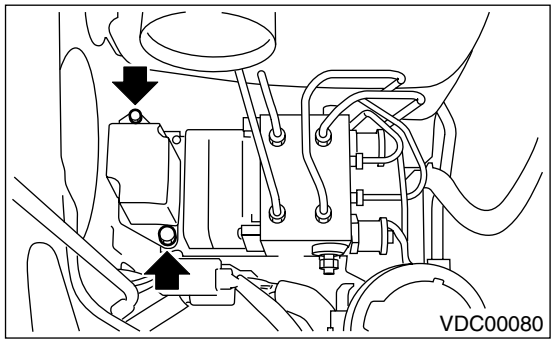
6) Remove nuts and bolt which secure hydraulic unit bracket, and remove hydraulic unit from engine compartment.

CAUTION:
• Hydraulic unit cannot be disassembled. Do not attempt to loosen bolts and nuts.
• Do not drop or bump hydraulic unit.
• Do not turn the hydraulic unit upside down or place it on its side.
• Be careful to prevent foreign particles from getting into hydraulic unit.
• When a new hydraulic unit is installed, apply a coat of rust-preventive wax (Nippeco LT or GB) to bracket attaching bolt after tightening.
• Do not pull harness disconnecting harness connector.



2. RELAY BOX

1) Disconnect ground cable from battery.
2) Remove air intake duct from engine compartment to facilitate removal of relay box.
3) Disconnect connector from relay box.
4) Unlock cable clip.
5) Remove nuts which secure relay box, and remove relay box and connector bracket.

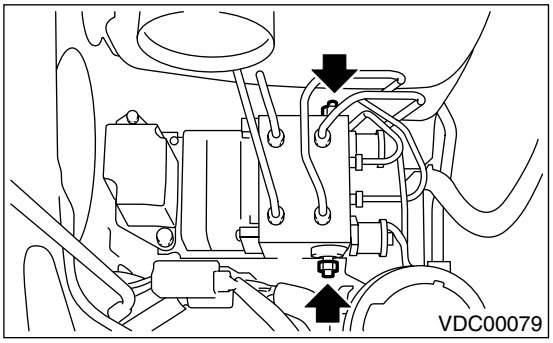


CAUTION:
Do not drop or bump relay box.

B: INSTALLATION

1. HYDRAULIC UNIT (H/U)

1) Install hydraulic unit.



Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

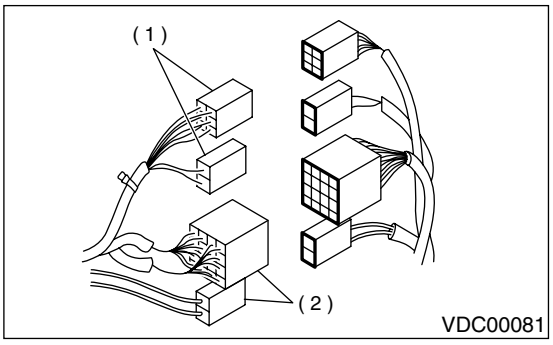
2) Connect hydraulic unit ground cable to body.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

3) Connect brake pipes to their correct hydraulic unit connections.
4) Secure hydraulic unit connector to connector bracket.

CAUTION:
Align connector with mating receptacle.

5) Connect connector to hydraulic unit.



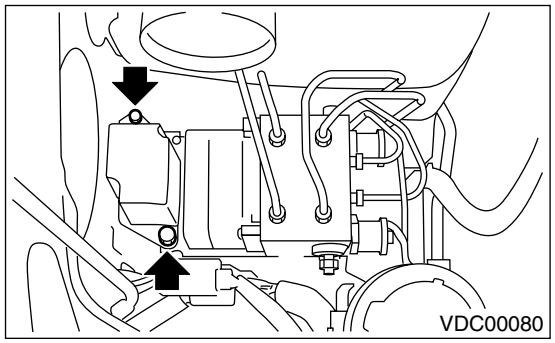
(1) Relay box connector
(2) Hydraulic unit connector

6) Install air intake duct.
7) Connect ground cable to battery.
8) Bleed air from the brake system.

2. RELAY BOX

1) Install relay box and connector bracket.

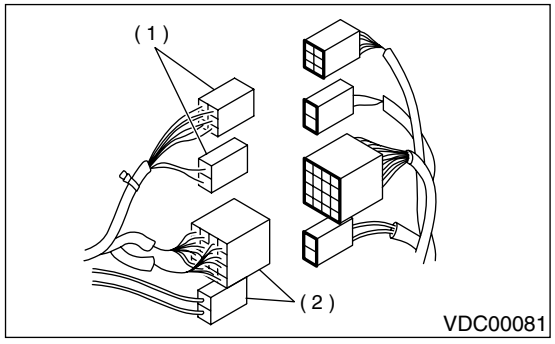
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



2) Secure relay box connector to connector bracket.

CAUTION:
Align connector with mating receptacle.

3) Connect connector to relay box.

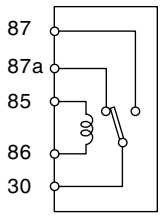
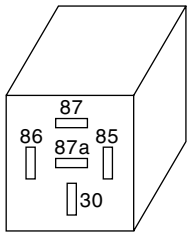
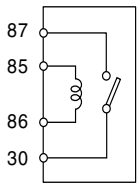
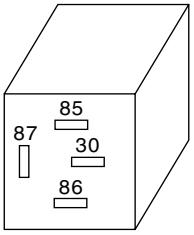


(1) Relay box connector
(2) Hydraulic unit connector

4) Install air intake duct.
5) Connect ground cable to battery.

C: INSPECTION

1) Check connected and fixed condition of connector.
2) Check valve relay and motor relay for discontinuity or short circuits.

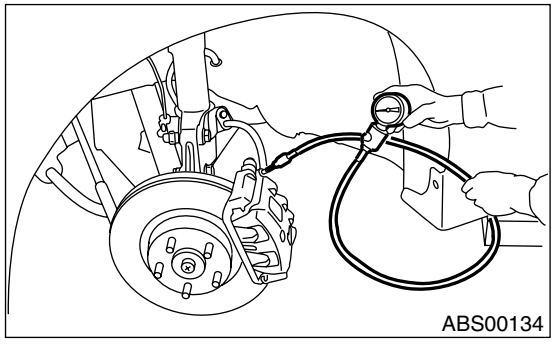
	Condition	Terminal number	Standard	Diagram	Terminal location
Valve relay	Turning off electricity.	85 — 86	103±10 Ω	 VDC00082	 VDC00083
		30 — 87a	Less than 0.5 Ω		
		30 — 87	More than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87a	More than 1 MΩ		
		30 — 87	Less than 0.5 Ω		
Motor relay	Turning off electricity.	85 — 86	80±10 Ω	 VDC00084	 VDC00085
		30 — 87	More than 1 MΩ		
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87	Less than 0.5 Ω		

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.


ABS00134

4) Bleed air from the pressure gauges.
5) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.

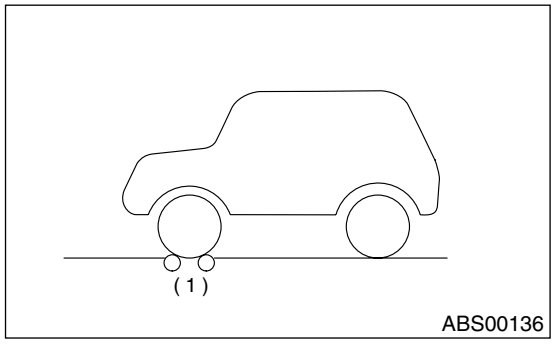
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,432 kPa (35 kg/cm^2, 498 psi)	3,432 kPa (35 kg/cm^2, 498 psi)
When decompressed	490 kPa (5 kg/cm^2, 71 psi) or less	490 kPa (5 kg/cm^2, 71 psi) or less
When compressed	3,432 kPa (35 kg/cm^2, 498 psi) or more	3,432 kPa (35 kg/cm^2, 498 psi) or more

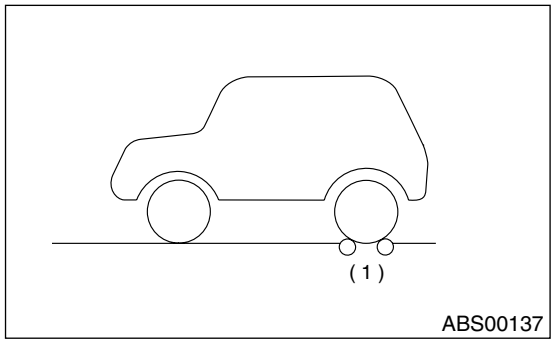
8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard values.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

1) Prepare for operating ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
2) Set the front wheels or rear wheels on the brake tester and set the select lever's position at “neutral”.



(1) Brake tester



(1) Brake tester

3) Operate the brake tester.
4) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
5) When the hydraulic unit begins to work, check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

6) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

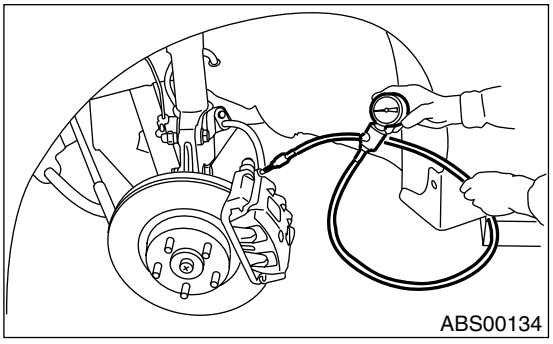
7) After checking, also check if any irregular brake pedal tightness is felt.

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE

1) Lift-up vehicle and remove wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



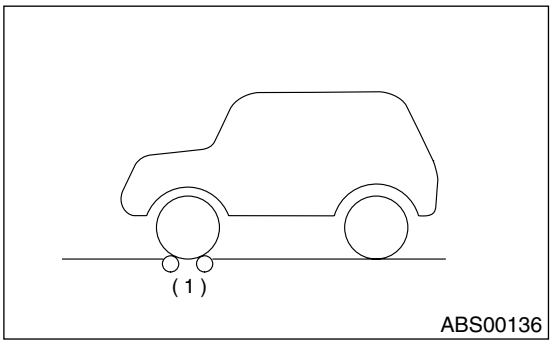
4) Bleed air from the pressure gauges.
5) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
When compressed	2,942 kPa (30 kg/cm^2, 427 psi) or more	1,961 kPa (20 kg/cm^2, 284 psi) or more
When decompressed	490 kPa (5 kg/cm^2, 71 psi) or less	490 kPa (5 kg/cm^2, 71 psi) or less

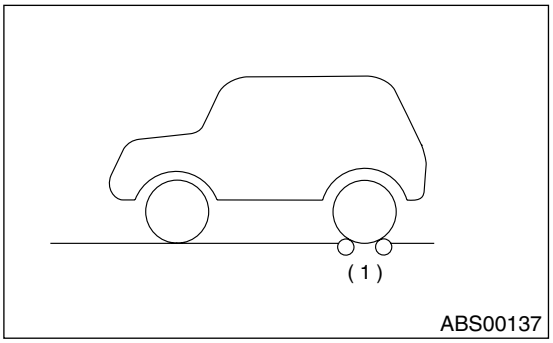
8) Remove pressure gauges from FL and FR caliper bodies.
9) Remove air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from brake line.

4. CHECKING THE HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

1) Prepare for operating VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
2) Set the front wheels or rear wheels on the brake tester and set the select lever's position at “neutral”.



(1) Brake tester



(1) Brake tester

3) Operate the brake tester.
4) Perform ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
5) When the hydraulic unit begins to work, check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.
6) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
When compressed	1,961 N (200 kgf, 441 lb) or more	981 N (100 kgf, 221 lb) or more
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less

7) After checking, also check if any irregular brake pedal tightness is felt.

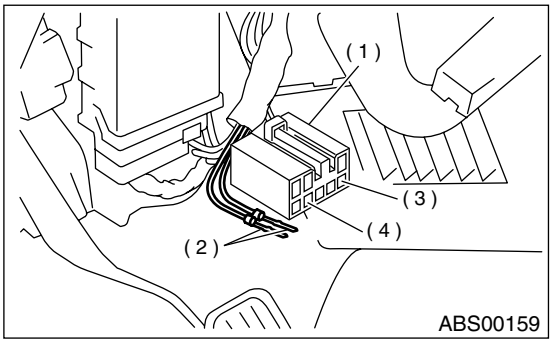
4. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) After ignition switch is turned ON, depress the brake pedal within 0.5 seconds after VDC warning light goes out, and then hold it.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must not operate.

5) After completion of ABS sequence control, turn ignition switch OFF.

2. ABS SEQUENCE CONTROL WITH SELECT MONITOR

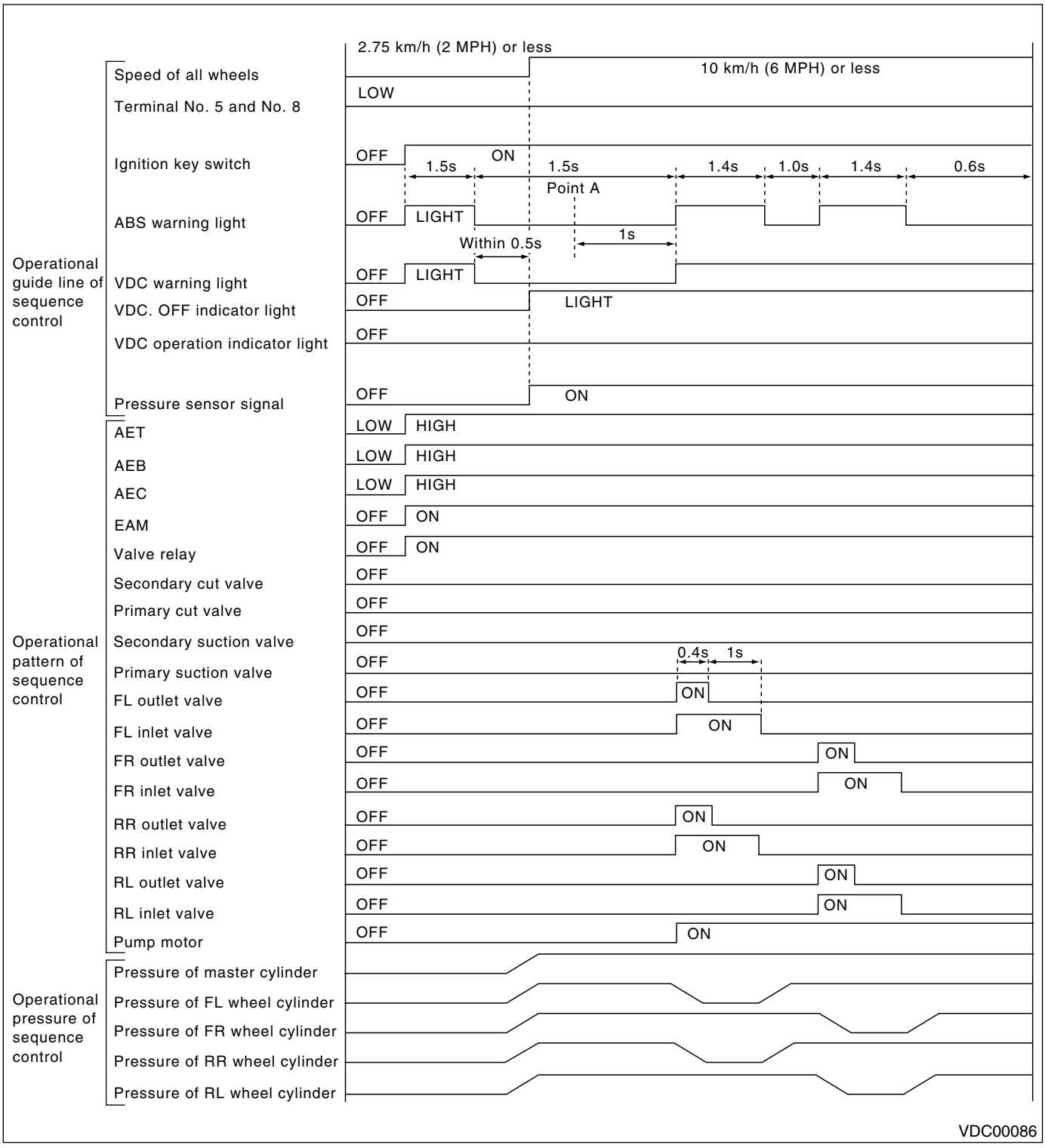
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to VDC-16, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector beside driver's seat instrument panel lower cover.
2) Turn ignition switch ON.
3) Turn select monitor switch ON.
4) Put select monitor to “BRAKE CONTROL” mode.
5) When “Function check sequence” is selected, `ABS sequence control' will start.
6) The message `Press Brake Pedal Firmly' is displayed as follows:
(1) When using the brake tester, depress brake pedal with braking force of 981 N (100 kgf, 221 lb).
(2) When using the pressure gauge, depress brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kg/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal.

7) When the message “Press YES” is displayed, press «YES» key.
8) Operation points will be displayed on select monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:
- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

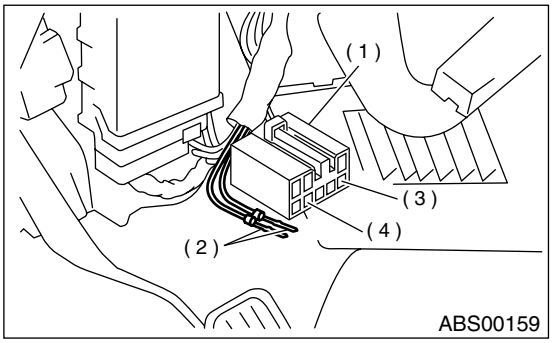
5. VDC Sequence Control

A: OPERATION

1) Under the VDC sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) VDC sequence control can be started by diagnosis connector or select monitor.

1. VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect diagnosis terminals to terminals No. 5 and No. 8 of the diagnosis connector beside driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Set the speed of all wheels at 2.75 km/h (2 MPH) or less.
3) Turn ignition switch OFF.
4) Turn ignition switch ON and start engine immediately, confirming that ABS and VDC warning light goes ON and then OFF. After ABS and VDC warning light goes OFF, within 0.5 seconds depress the brake pedal once, then within 3 second depress the brake pedal twice more and release it.

CAUTION:
Do not depress the clutch pedal.

NOTE:
• When the ignition switch is set to on, the brake pedal must not be depressed.
• Engine must operate.
• If the VDC sequence control does not start, do the procedure over again.

5) After completion of VDC sequence control, turn ignition switch OFF.

2. VDC SEQUENCE CONTROL WITH SELECT MONITOR

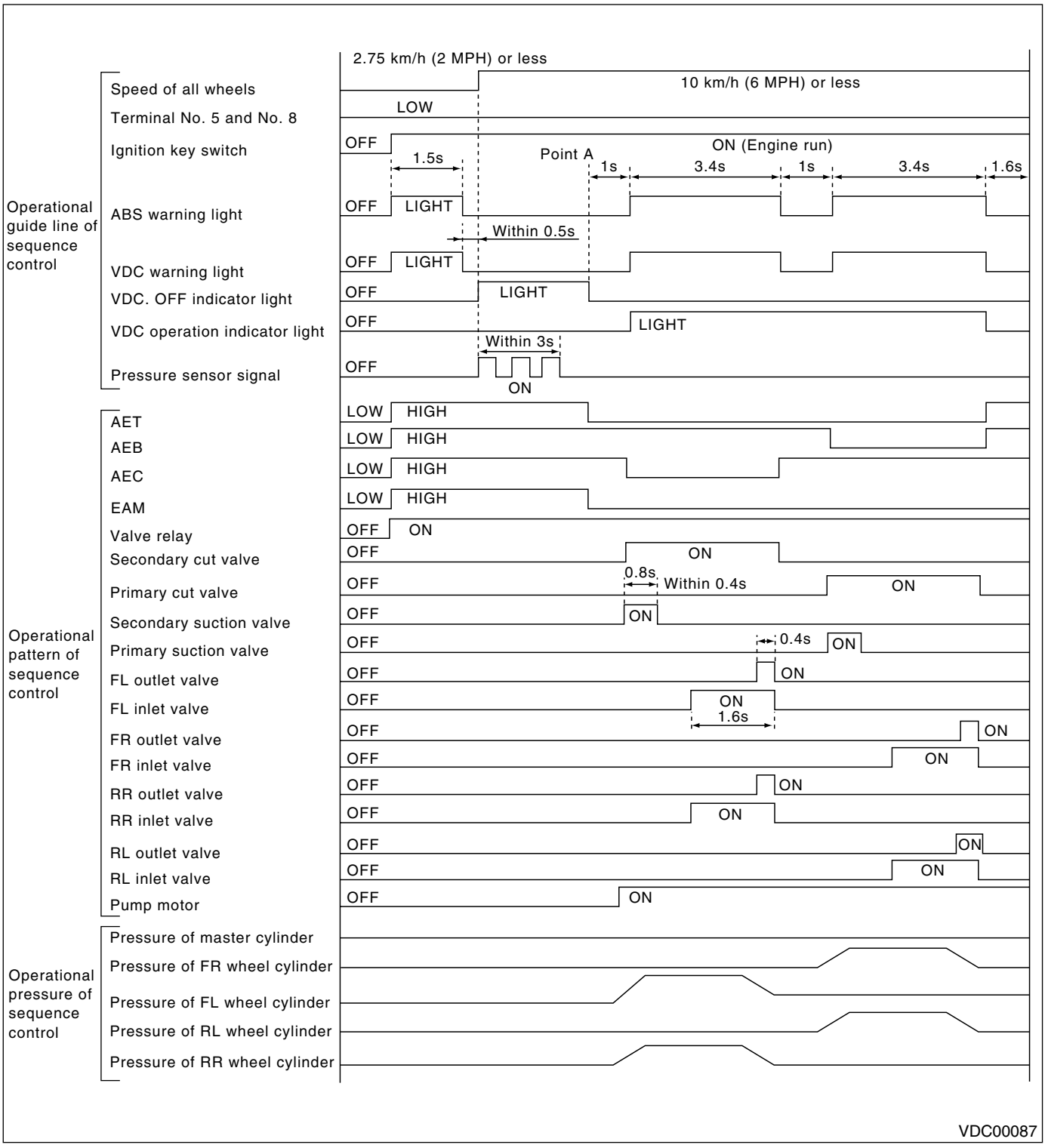
NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to “VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR”.
<Ref. to VDC-19, VDC SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, VDC Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect select monitor to data link connector beside driver's seat instrument panel lower cover.
2) Turn ignition switch ON.
3) Turn select monitor switch ON.
4) Put select monitor to “BRAKE CONTROL” mode.
5) Select “VDC Check Mode” in {Function check sequence} menu to start `VDC sequence control'.

CAUTION:
Do not depress the clutch pedal.

6) When the message “Press YES” is displayed, press «YES» key.
7) Operation points will be displayed on select monitor.

3. CONDITIONS FOR VDC SEQUENCE CONTROL



NOTE:
- When select monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector.
- HIGH means high voltage.
- LOW means low voltage.

B: SPECIFICATION

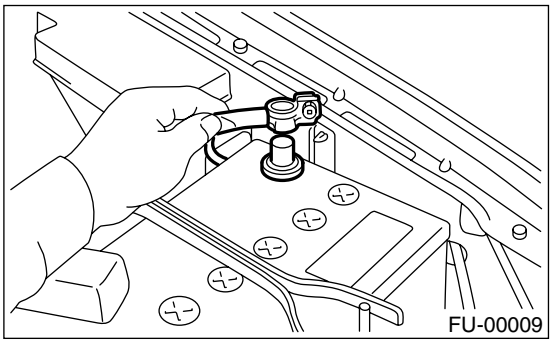
1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 5 or No. 8 are separated from diagnosis terminals. (When select monitor is not used.)
3) When the brake pedal is depressed during sequence control and the braking lamp switch is set to ON.
4) When brake pedal is depressed after ignition key is turned to ON, and before VDC warning light goes out. (When select monitor is not used.)
5) When brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after VDC warning light goes out. (When select monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When select monitor is used.)

6. Yaw Rate and Lateral G Sensor

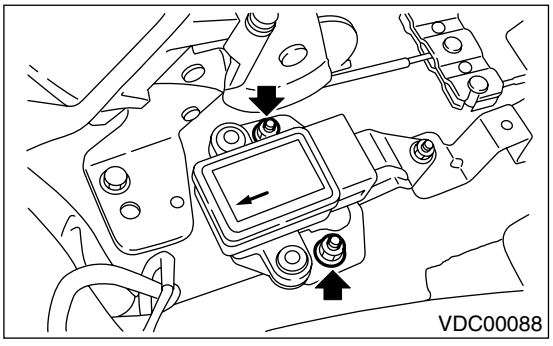
A: REMOVAL

1) Disconnect ground cable from battery.

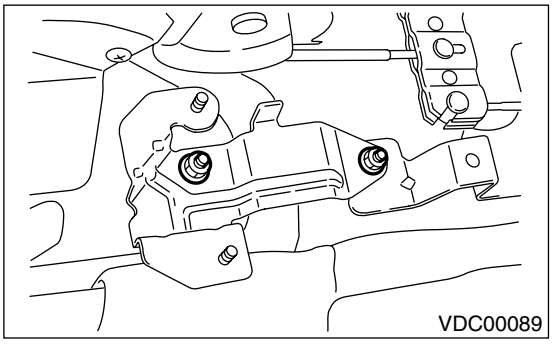


2) Remove console cover.
<Ref. to EI-45, Console Box.>
3) Disconnect connector from yaw rate and lateral G sensor.
4) Remove yaw rate and lateral G sensor.

CAUTION:
Do not drop or bump yaw rate and lateral G sensor.



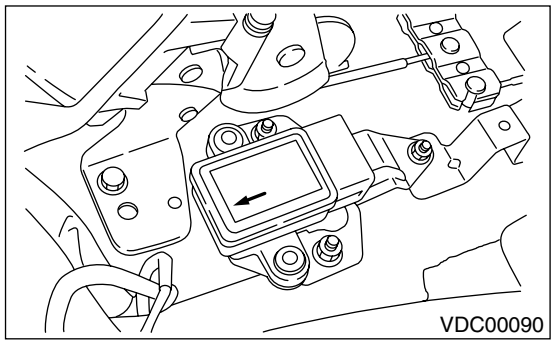
5) Remove bracket from body.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Do not install yaw rate and lateral G sensor in the wrong direction. There is an arrow on the sensor showing which side faces the front of the vehicle.



CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Steering angle sensor center positioning**
- **Yaw rate and lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

1. LATERAL G SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have SUBARU select Monitor?	Go to step **5.**	Go to step **2.**
2	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Move the vehicle to a flat location. 2) Turn ignition switch to OFF. 3) Connect connector to yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–)***	Is the measured value within 2.3 — 2.7 V when yaw rate and lateral G sensor is horizontal?	Go to step **3.**	Replace yaw rate and lateral G sensor.
3	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Remove yaw rate and lateral G sensor from vehicle. 2) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–)*** NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.	Is the measured value within 3.3 — 3.7 V when yaw rate and lateral G sensor is inclined right to 90°?	Go to step **4.**	Replace yaw rate and lateral G sensor.
4	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–)*** NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.	Is the measured value within 1.3 — 1.7 V when yaw rate and lateral G sensor is inclined left to 90°?	Go to step **5.**	Replace yaw rate and lateral G sensor.
5	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Connect select monitor connector to data link connector. 3) Turn ignition switch to ON. 4) Turn select monitor into {BRAKE CONTROL} mode. 5) Set the display in the {Current Data Display & Save} mode. 6) Read the yaw rate and lateral G sensor output voltage. NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.	Is the indicated reading within 2.3 — 2.7 V when the vehicle is in horizontal position?	Go to step **6.**	Replace yaw rate and lateral G sensor.

	Step	Check	Yes	No
6	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Remove console box. 2) Remove yaw rate and lateral G sensor from vehicle. (Do not disconnect connector.) 3) Read the select monitor display. NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.	Is the measured value within 3.3 — 3.7 V when yaw rate and lateral G sensor is inclined right to 90°?	Go to step **7.**	Replace yaw rate and lateral G sensor.
7	**CHECK YAW RATE AND LATERAL G SENSOR.** Read the select monitor display. NOTE: If the yaw rate and lateral G sensor is moved, the VDC (Yaw rate sensor) may be stored into the memory.	Is the measured value within 1.3 — 1.7 V when yaw rate and lateral G sensor is inclined left to 90°?	Yaw rate and lateral G sensor is normal.	Replace yaw rate and lateral G sensor.

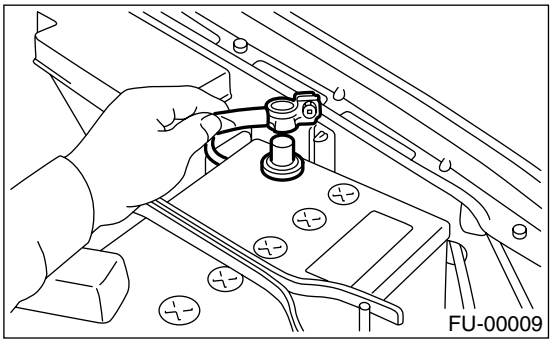
2. YAW RATE SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK YAW RATE AND LATERAL G SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Set oscilloscope to yaw rate sensor connector terminals. Positive probe; (R100) No. 4 Earth lead; (R100) No. 6 3) Start the engine. 4) Measure signal voltage indicated on oscilloscope. <Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the measured value within 2.1 — 2.9 V?	Go to step **2.**	Replace yaw rate and lateral G sensor is normal.
2	**CHECK YAW USING OSCILLOSCOPE.** 1) Turn ignition switch to OFF. 2) Set oscilloscope to yaw rate sensor connector terminals. Positive probe; (R100) No. 2 Earth lead; (R100) No. 6 3) Start the engine. 4) Measure signal voltage indicated on oscilloscope. <Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the measured value within 1 — 5 V?	Yaw rate and lateral G sensor is normal.	Replace yaw rate and lateral G sensor.

7. Steering Angle Sensor

A: REMOVAL

1) Disconnect ground cable from battery.

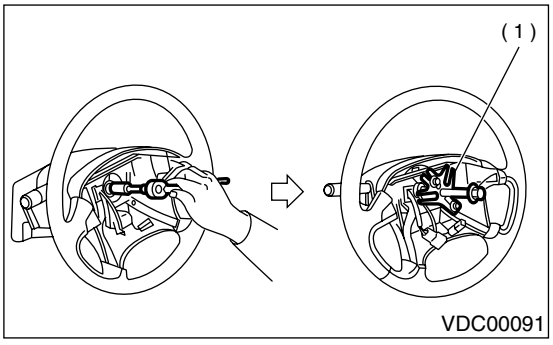


2) Remove airbag module.
<Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped).
<Ref. to AB-3, CAUTION, General Description.>

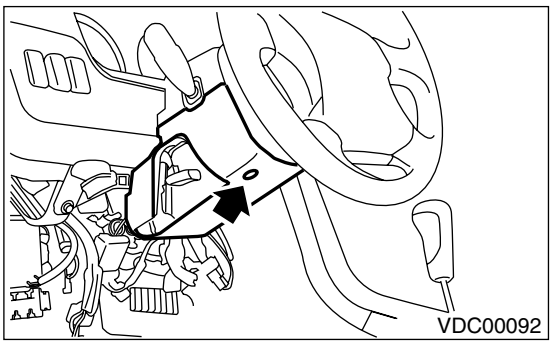
3) Remove steering wheel nut, then draw out steering wheel from shaft using steering puller.

NOTE:
Steering wheel must be removed at the straight ahead position.

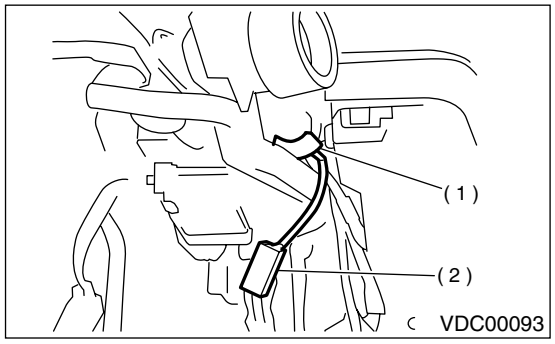


(1) Steering puller

4) Remove the screw securing lower steering column cover.

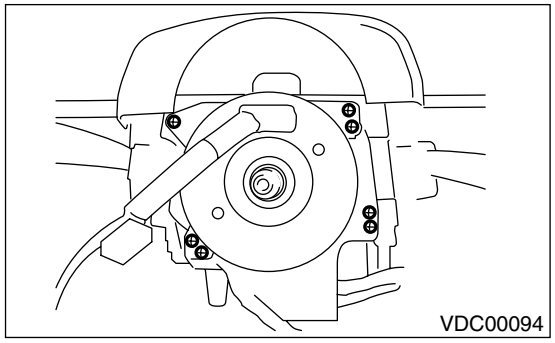


5) Remove two screws securing upper steering column cover.
6) Release the lock of harness band and disconnect connector of steering angle sensor.

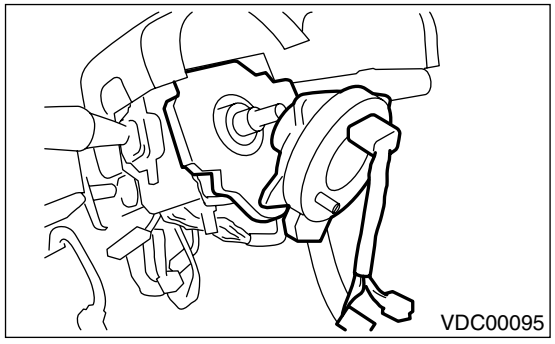


(1) Harness band
(2) Connector

7) Remove bolts which hold roll connector and steering angle sensor onto steering column.



8) Remove roll connector and steering angle sensor.

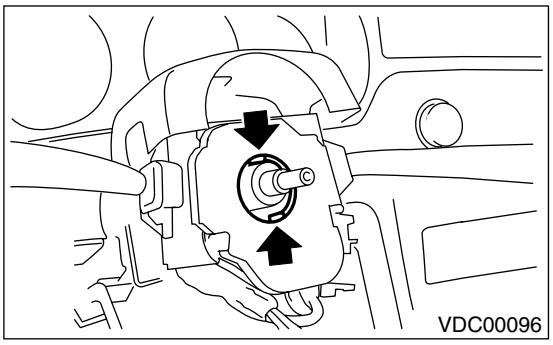


NOTE:
Do not turn steering angle sensor as it's center position has been recognized by VDCCM.

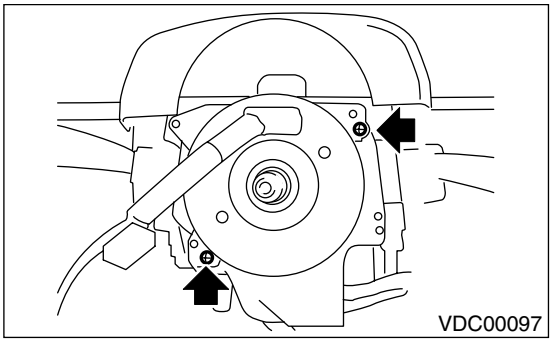
B: INSTALLATION

CAUTION:
Ensure that front wheels are set in straight forward direction.

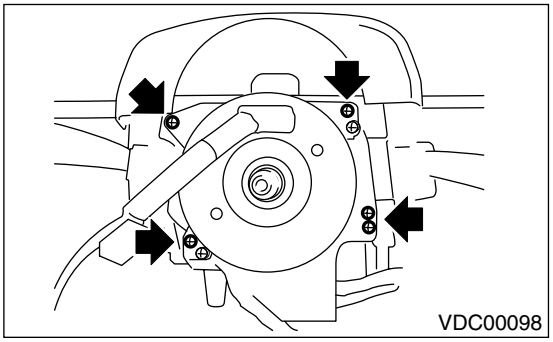
1) Place steering angle sensor on steering column, confirming that the sensor is positioned as in the figure.



2) Conduct centering of roll connector.
<Ref. to AB-20, INSTALLATION, Roll Connector.>
3) Place roll connector over steering angle sensor and tighten bolts which secure roll connector and steering angle sensor.



4) Tighten bolts which install roll connector and steering angle sensor onto steering column.



5) Set steering wheel to neutral and install it onto steering shaft.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

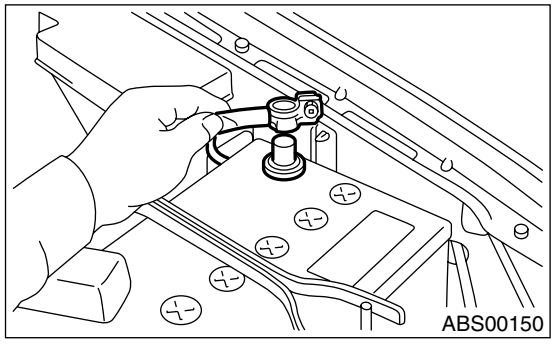
Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

6) Install airbag module to steering wheel.
<Ref. to AB-13, INSTALLATION, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing the service operation.
<Ref. to AB-3, CAUTION, General Description.>

7) Connect battery ground cable.



CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Steering angle sensor center positioning**
- **Yaw rate and lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

Refer to "VDC section" for inspection procedures of steering angle sensor.
<Ref. to VDC-106, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>

8. Front ABS Sensor

A: NOTE

The ABS sensor installed on VDC equipped vehicles is the same as the one on ABS equipped vehicles; therefore, for removal, inspection and installation, refer to “ABS” section.
<Ref. to ABS-12, Front ABS Sensor.>

9. Rear ABS Sensor

A: NOTE

The ABS sensor installed on VDC equipped vehicles is the same as the one on ABS equipped vehicles; therefore, for removal, inspection and installation, refer to “ABS” section.
<Ref. to ABS-15, Rear ABS Sensor.>

10.Front Tone Wheel

A: NOTE

As front tone wheel is integrated with front drive shaft, refer to “DS section” for removal, installation, and inspection procedures.
<Ref. to DS-29, Front Drive Shaft.>

11.Rear Tone Wheel

A: NOTE

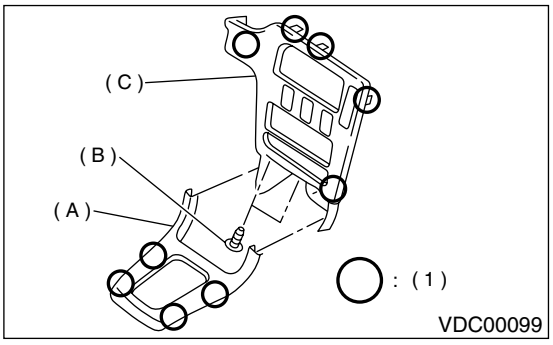
As rear tone wheel is integrated with rear drive shaft, refer to “DS section” for removal, installation, and inspection procedures.
<Ref. to DS-37, Rear Drive Shaft.>

12.VDC Off Switch

A: REMOVAL

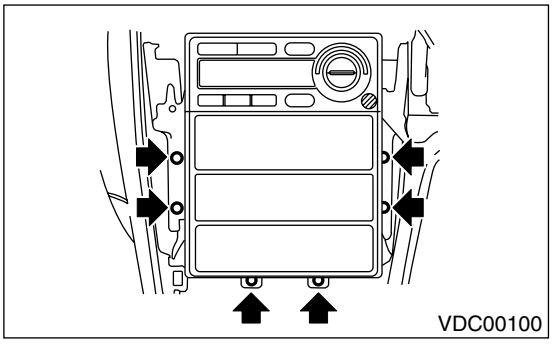
1. LHD MODEL

1) Remove screws and clip from instrument panel lower cover.
2) Remove front cover (A) while disconnecting connector.
3) Remove two screws (B) and then remove center panel (C) while disconnecting harness connector.

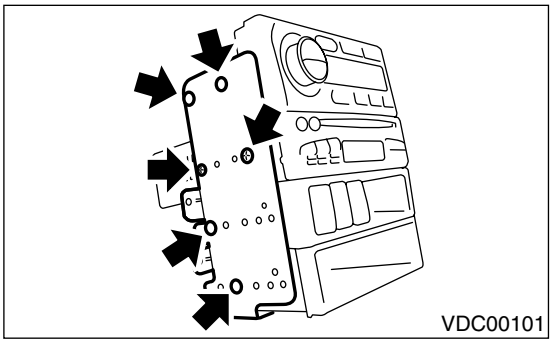


(1) Hook pawl

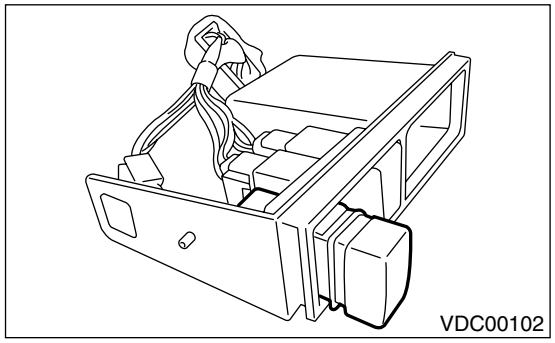
4) Remove fitting screws, and slightly pull radio and switch assembly out from center console.



5) Disconnect harness connectors and antenna feeder cord and then disconnect heater control unit.
6) Remove screw and detach the bracket and then remove switch panel.



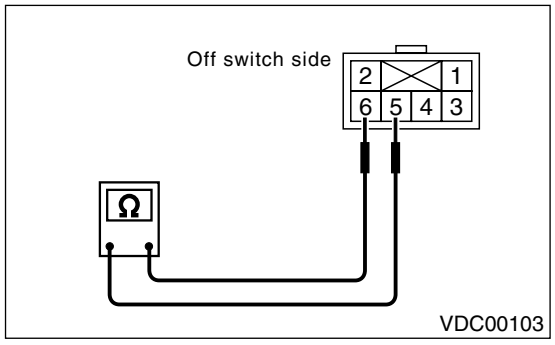
7) Remove VDC off switch by pushing it outward.



B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION



Check continuity between VDC off switch terminals.

Switch position	Tester connection	Specified condition
OFF	6 — 5	More than 1 MΩ
ON	6 — 5	Less than 1 Ω

If NG, replace VDC off switch.

VDC (DIAGNOSTICS)

VDC

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC-6, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the VDC problem. <Ref. to VDC-9, INSPECTION, General Description.>	Is unit that might influence the VDC problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** Calling up diagnostic trouble code (DTC). <Ref. to VDC-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is diagnostic trouble code (DTC) readable?	Go to step **3.**	Inspect using diagnostic chart for warning light failure. <Ref. to VDC-34, Diagnostics Chart with Diagnosis Connector.> NOTE: Call up diagnostic trouble code (DTC) again after inspecting warning light. <Ref. to VDC-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** NOTE: Record all diagnostic trouble codes (DTCs).	Is only the start code issued?	Go to step **4.**	Go to step **5.**
4	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to VDC-249, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC-26, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC-25, Inspection Mode.> Calling up the diagnostic trouble code (DTC). <Ref. to VDC-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Diagnostic Connector”.<Ref. to VDC-34, Diagnostics Chart with Diagnosis Connector.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC-28, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to VDC-26, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to VDC-25, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to VDC-34, Diagnostics Chart with Diagnosis Connector.>

CAUTION:
Remove foreign matter (dust, water, etc.) from the VDCCM connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- When ABS and/or VDC warning light illuminates, read and record diagnostic trouble code (DTC) indicated by ABS warning light.

2. WITH SUBARU SELECT MONITOR

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC-6, Check List for Interview.> 2) Before performing diagnosis, inspect unit which might influence the VDC problem. <Ref. to VDC-9, INSPECTION, General Description.>	Is unit that might influence the VDC problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF TROUBLE CODE DISPLAY.** 1) Turn ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn ignition switch to ON and SUBARU SELECT MONITOR to ON. 4) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-24, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all diagnostic trouble codes (DTCs) and frame data.	Is the corresponding DTC displayed?	Go to step **3.**	Go to step **4.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to VDC-249, INSPECTION, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC-26, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC-25, OPERATION, Inspection Mode.> 4) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-24, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is no diagnostic trouble code (DTC) displayed or do VDC and ABS warning lights constantly remain on?	Complete the diagnosis.	Go to step **4.**
4	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with Subaru Select Monitor”.<Ref. to VDC-122, Diagnostics Chart with Select Monitor.> NOTE: For diagnostic trouble code (DTC) list, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC-30, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to VDC-26, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to VDC-25, OPERATION, Inspection Mode.> 5) Calling up the diagnostic trouble code (DTC). <Ref. to VDC-24, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is no diagnostic trouble code (DTC) displayed or do VDC and ABS warning lights constantly remain on?	Complete the diagnosis.	Inspect using “Diagnostics Chart with Subaru Select Monitor”. <Ref. to VDC-122, Diagnostics Chart with Select Monitor.>

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.

- Check list for interview. <Ref. to VDC-6, Check List for Interview.>

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS AND/OR VDC WARNING LIGHT

ABS and/or VDC warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:			
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine running)			
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.			
	❑ When advancing		km/h to	km/h
			MPH to	MPH
	❑ While traveling at a constant speed	km/h		MPH
	❑ When decelerating		km/h to	km/h
			MPH to	MPH
	❑When turning to right	Steering angle:		deg
		Steering time:		sec
	❑ When turning to left	Steering angle:		deg
		Steering time:		sec
	❑ When moving other electrical parts			
	• Parts name: • Operating condition:			

2. STATE OF VDC OFF INDICATOR LIGHT

VDC OFF indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:			
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)			
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.			
	❑ When advancing		km/h to	km/h
			MPH to	MPH
	❑ While traveling at a constant speed	km/h		MPH
	❑ When decelerating		km/h to	km/h
			MPH to	MPH
	❑When turning to right	Steering angle:		deg
		Steering time:		sec
	❑ When turning to left	Steering angle:		deg
		Steering time:		sec
	❑ When moving other electrical parts			
	• Parts name: • Operating condition:			

3. STATE OF VDC OPERATION INDICATOR LIGHT

VDC operation indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine running) ❑ On after starting (Engine stopped)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing	km/h to	km/h
		MPH to	MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating	km/h to	km/h
		MPH to	MPH
	❑When turning to right	Steering angle:	deg
		Steering time:	sec
	❑ When turning to left	Steering angle:	deg
		Steering time:	sec
	❑ When moving other electrical parts		
	• Parts name: • Operating condition:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Urban area ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight ❑ Sharp curve ❑ Slow curve ❑ S-shaped curve ❑ Road with inclination on each side ❑ Others:
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others:

CHECK LIST FOR INTERVIEW

Condition	a) Brakes	Deceleration: g
		❑ Continuous / ❑ Intermittent
	b) Accelerator	Acceleration: g
		❑ Continuous / ❑ Intermittent
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ Turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	e) Degree of wear	Front RH tire:
		Front LH tire:
		Rear RH tire:
		Rear LH tire:
	f) Steering wheel	❑ Sharp turn ❑ Slow turn ❑ Straight-ahead operation ❑ Returned slowly ❑ Returned quickly
	g) Tire/wheel size	❑ Specified ❑ Other than specified ( )
	h) Tire type	❑ Summer tire ❑ Studless tire (Brand name:)
	i) Chain is passed around tires. : ❑ Yes / ❑ No	
	j) T tire is used. : ❑ Yes / ❑ No	
	k) Condition of suspension alignment:	
	l) Loading state:	
	m) Repair parts are used. : ❑ Yes / ❑ No	
	• What:	
	n) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage airbag system wiring harness when servicing the ABS sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect VDC problems:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

1) Check brake fluid level.
2) Check brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit VDC.
• With brake tester <Ref. to VDC-13, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, Hydraulic Control Unit (H/U).>
• Without brake tester <Ref. to VDC-14, CHECKING THE HYDRAULIC UNIT VDC OPERATION BY PRESSURE GAUGE, INSPECTION, Hydraulic Control Unit (H/U).>

4. BRAKE DRAG

Check brake drag.

5. BRAKE PAD AND ROTOR

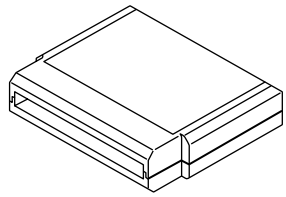
Check brake pad and rotor.
• Front <Ref. to BR-14, INSPECTION, Front Brake Pad.><Ref. to BR-15, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-19, INSPECTION, Rear Brake Pad.><Ref. to BR-20, INSPECTION, Rear Disc Rotor.>

6. TIRE

Check tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-2082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

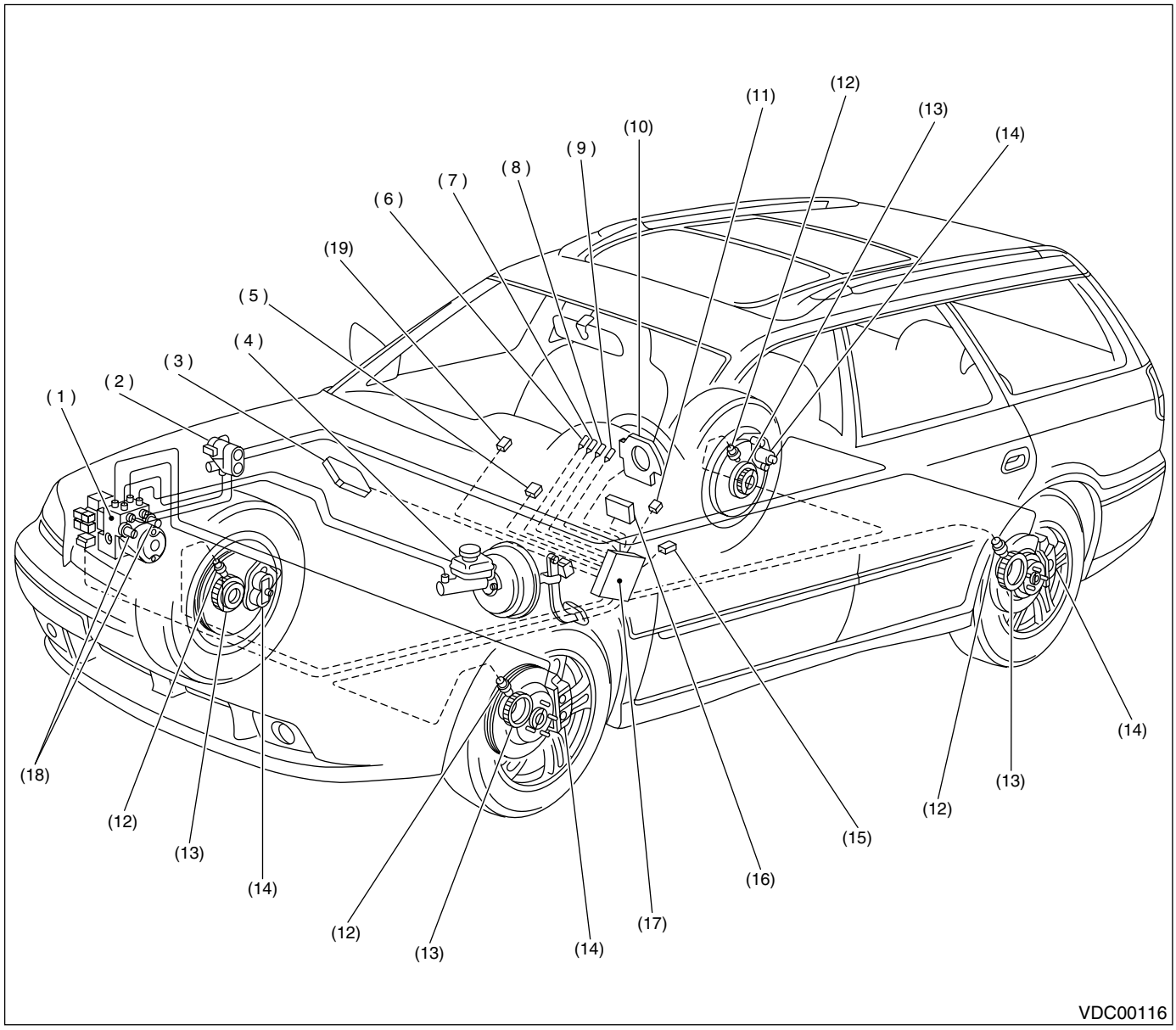
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

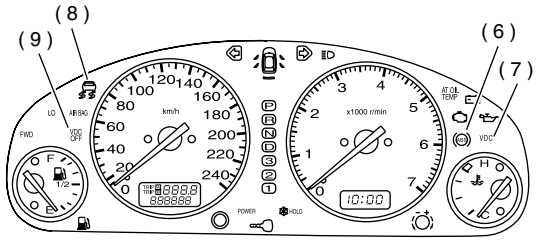
MEMO:

4. Electrical Components Location

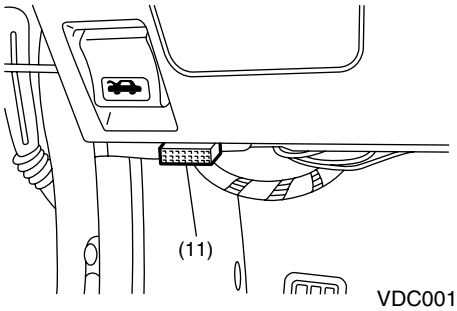
A: LOCATION



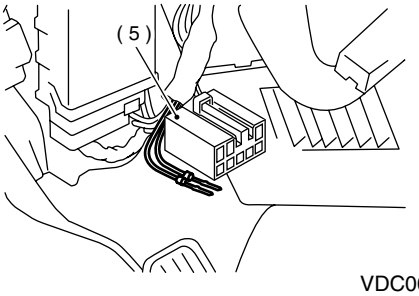
(1) VDC hydraulic control unit (VDCH/U)
(2) Proportioning valve
(3) Engine control module
(4) Master cylinder
(5) Diagnosis connector
(6) ABS warning light
(7) VDC warning light
(8) VDC operating indicator light
(9) VDC OFF indicator light
(10) Steering angle sensor
(11) Data link connector (for SUBARU select monitor)
(12) ABS sensor
(13) Tone wheel
(14) Wheel cylinder
(15) Yaw rate & lateral G sensor
(16) Transmission control module
(17) VDC control module (VDCCM)
(18) Pressure sensor
(19) VDC OFF switch



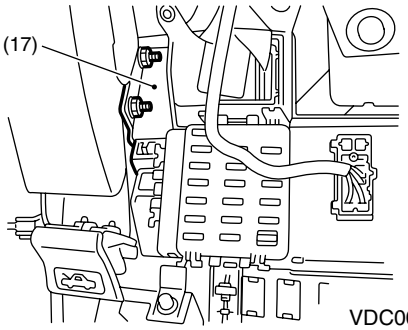
VDC00156



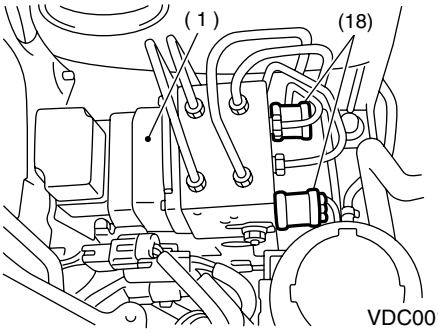
VDC00118



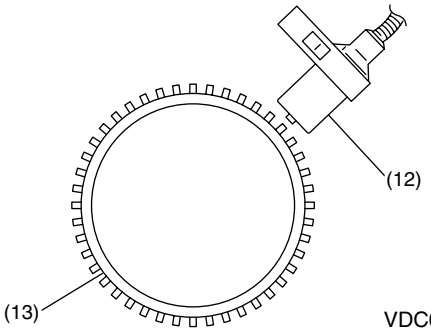
VDC00119



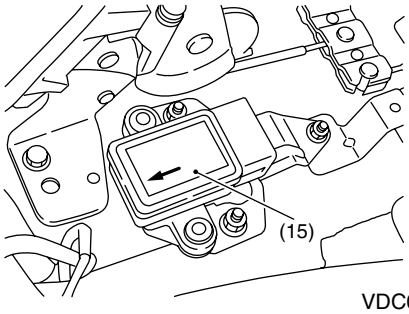
VDC00157



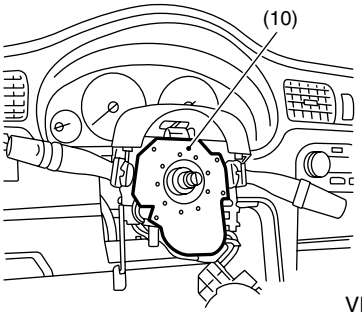
VDC00121



VDC00122



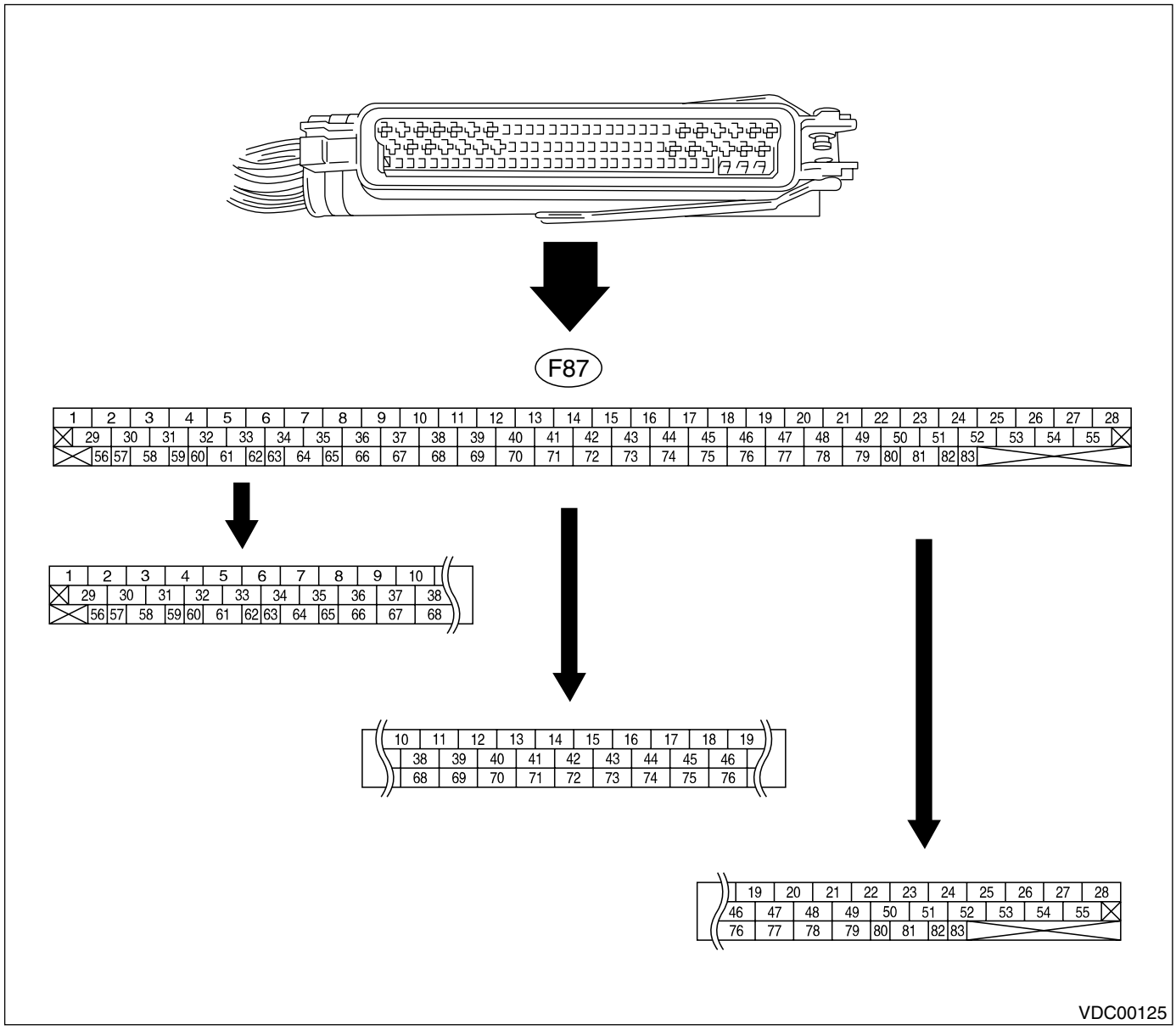
VDC00123



VDC00124

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

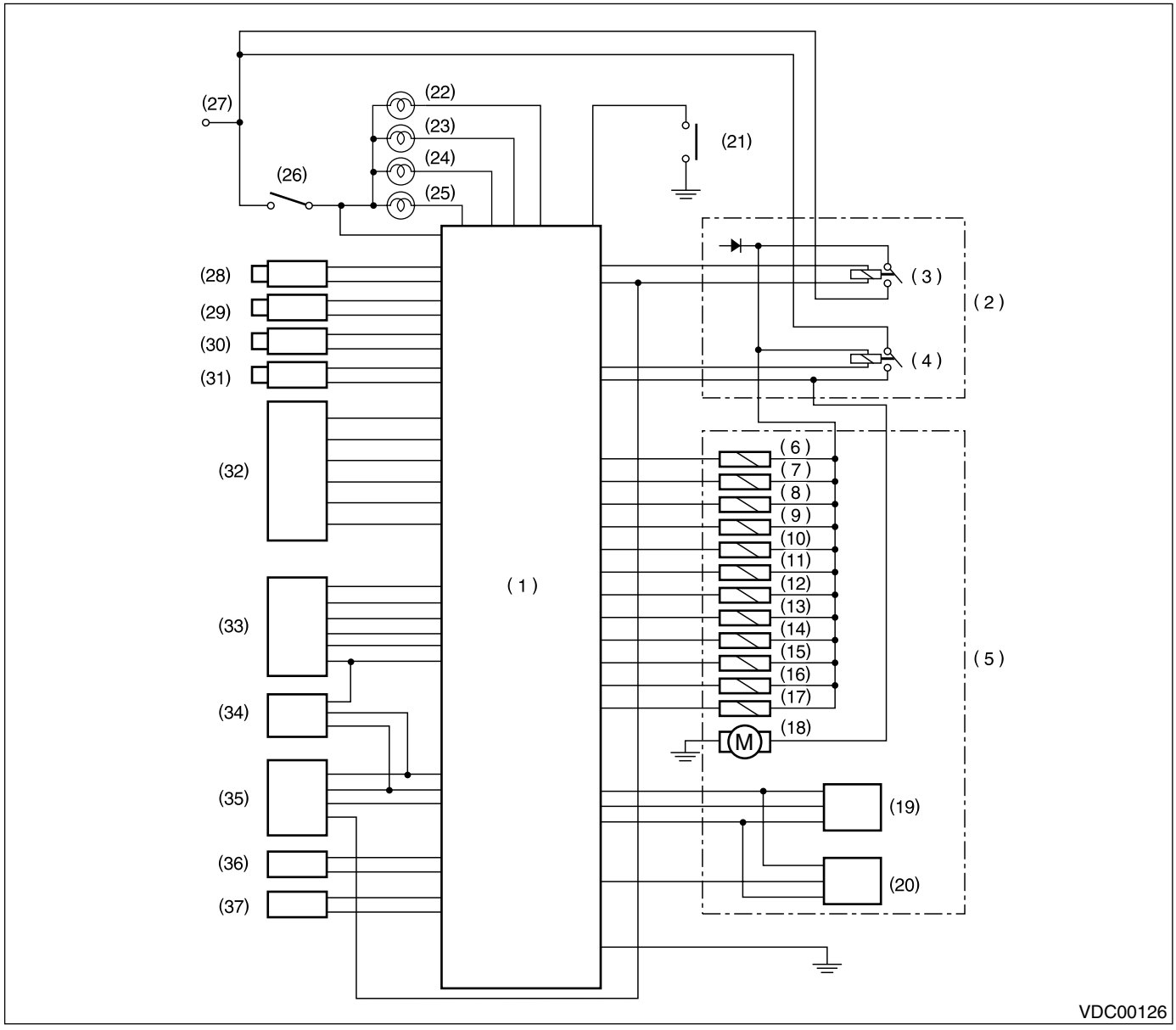


NOTE:
- The terminal numbers in the VDC control module connector are as shown in the figure.
- When the connector is removed from the VDCCM, the connector switch closes the circuit between terminal No. 53, No. 54 and No. 55. The ABS and VDC warning light illuminate.

Contents		Terminal No. (+)—(–)	Input/Output signal Measured value and measuring condition
Ignition switch		28—1	10 — 15 V when ignition switch is ON.
ABS sensor (Wheel speed sensor)	Front left wheel	49—19	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	14—15	
	Rear left wheel	16—17	
	Rear right wheel	18—46	
Yaw rate and lateral G sensor	Output (Lateral G sensor)	70—64	2.2 — 2.8 V when vehicle is in horizontal position.
	Power supply	63—64	10 — 15 V when ignition switch is ON.
	Output (Yaw rate sensor)	65—64	Wave form <Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Reference (Yaw rate sensor)	66—64	2.1 — 2.9 V
	Test	67—64	40 ms pulse signal with a cycle of 5 — 1 V <Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground	64	—
CAN communication line (+)		81—1	2.5 — 1.5 V pulse signal <Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
CAN communication line (–)		83—1	3.5 — 2.5 V pulse signal <Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
Engine module	AET	21—1	1.5 V or less (ABS/TCS/VDC operating); 10 V or more (ABS/TCS/VDC not operating)
	AEB	43—1	10 — 15 V (Ignition switch ON and vehicle at standstill)
	AEC	8—1	10 — 15 V (Ignition switch ON and vehicle at standstill)
	EAS	75—1	3.5 — 1.5 V pulse signal
	EAC	45—1	3.5 — 1.5 V pulse signal
	Revolution	9—1	10 — 1.5 V pulse signal
Relay box	Valve relay power supply	27—1	10 — 15 V when ignition switch is ON.
	Valve relay coil	47—1	Less than 1.5 V when ignition switch is ON.
	Motor relay coil	22—1	1.5 V or less (ABS/TCS/VDC operating); 10 V or more (ABS/TCS/VDC not operating)
	Motor monitoring	10—1	10 V or less (ABS/TCS/VDC operating); 1.5 V or more (ABS/TCS/VDC not operating)
Hydraulic control unit	Front left inlet solenoid valve	24—1	10 — 15 V when the valve is OFF and less than 1.5 V when the valve is ON.
	Front right inlet solenoid valve	30—1	
	Rear left inlet solenoid valve	31—1	
	Rear right inlet solenoid valve	23—1	
	Front left outlet solenoid valve	51—1	
	Front right outlet solenoid valve	3—1	
	Rear left outlet solenoid valve	4—1	
	Rear right outlet solenoid valve	50—1	
	Primary cut solenoid valve	25—1	
	Secondary cut solenoid valve	26—1	
	Primary suction solenoid valve	29—1	
	Secondary suction solenoid valve	2—1	
Pressure sensor	Power supply	78—76	4.75 — 5.25 V when ignition switch is ON.
	Primary output	77—76	0.48 — 0.72 V (Brake pedal released)
	Ground	76	—
	Secondary output	36—76	0.48 — 0.72 V (Brake pedal released)
VDC operation indicator light		32—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
VDC OFF indicator light		52—1	1.5 V or less (Ignition switch ON and VDC OFF indicator light ON); 10 — 15 V (Ignition switch ON and VDC OFF indicator light OFF)

VDC warning light		53—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
ABS warning light		54—1	Less than 1.5 V during 1.5 seconds when ignition switch is ON, and 10 — 15 V after 1.5 seconds.
Diagnosis connector	Terminal No. 8	13	—
	Terminal No. 5	74	—
Select monitor	Data is received.	11—1	Less than 1.5 V when no data is received.
	Data is sent.	38—1	4.75 — 5.25 V when no data is sent.
VDC OFF switch		40—1	10 — 15 V when ignition switch is ON. 0 V (While pushing the switch)
Ground		1	—
Ground		55	—

B: SCHEMATIC



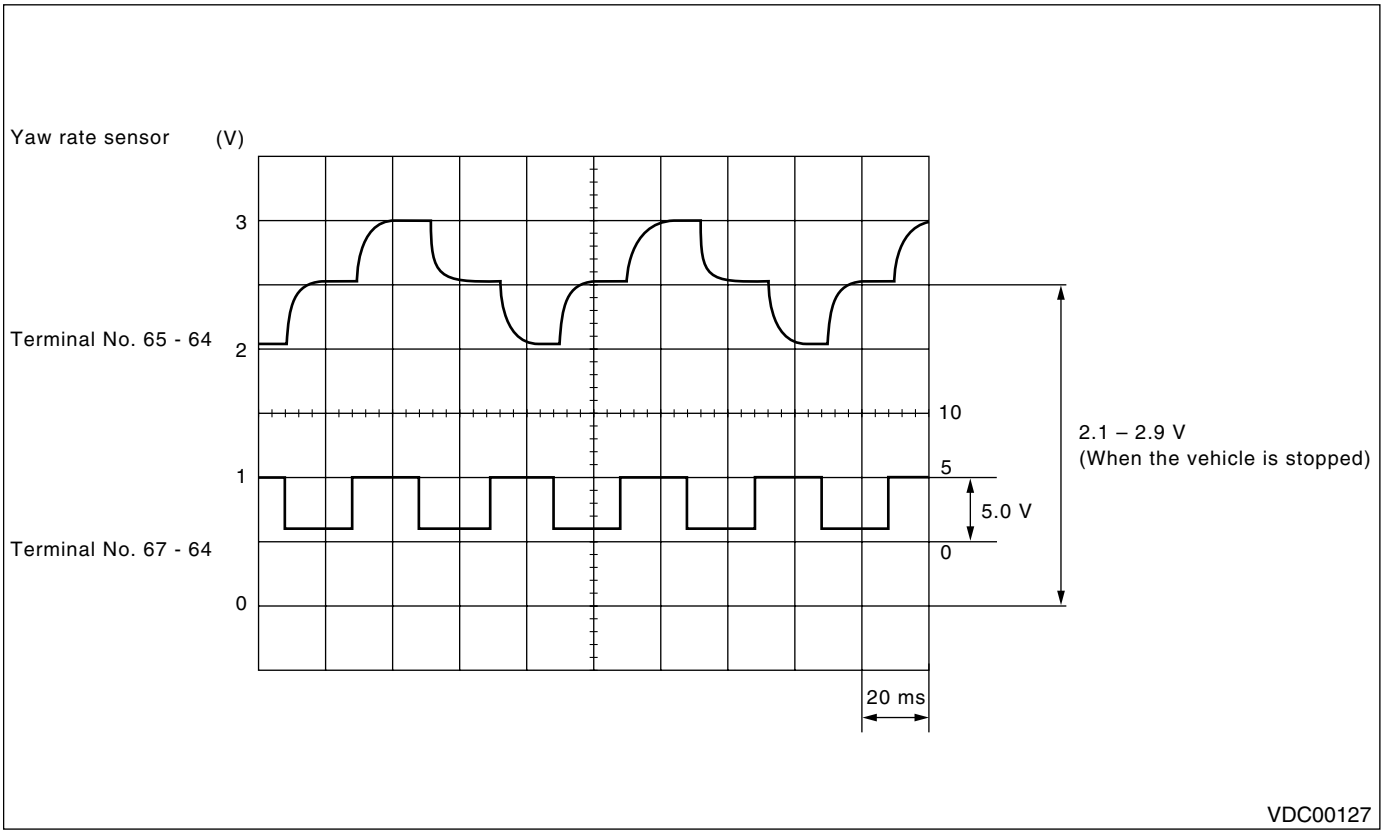
(1) VDC control module
(2) Relay box
(3) Valve relay
(4) Motor relay
(5) Hydraulic control unit
(6) Front left inlet solenoid valve
(7) Front left outlet solenoid valve
(8) Front right inlet solenoid valve
(9) Front right outlet solenoid valve
(10) Rear left inlet solenoid valve
(11) Rear left outlet solenoid valve
(12) Rear right inlet solenoid valve
(13) Rear right outlet solenoid valve
(14) Primary suction solenoid valve
(15) Primary cut solenoid valve
(16) Secondary suction solenoid valve
(17) Secondary cut solenoid valve
(18) Motor
(19) Primary pressure sensor
(20) Secondary pressure sensor
(21) VDC OFF switch
(22) ABS warning light
(23) VDC warning light
(24) VDC operating indicator light
(25) VDC OFF indicator light
(26) Ignition relay
(27) BATTERY
(28) Front left ABS sensor
(29) Front right ABS sensor
(30) Rear left ABS sensor
(31) Rear right ABS sensor
(32) Yaw rate and lateral G sensor
(33) Engine control module
(34) Transmission control module
(35) Steering angle sensor
(36) Diagnosis connector
(37) Data link connector

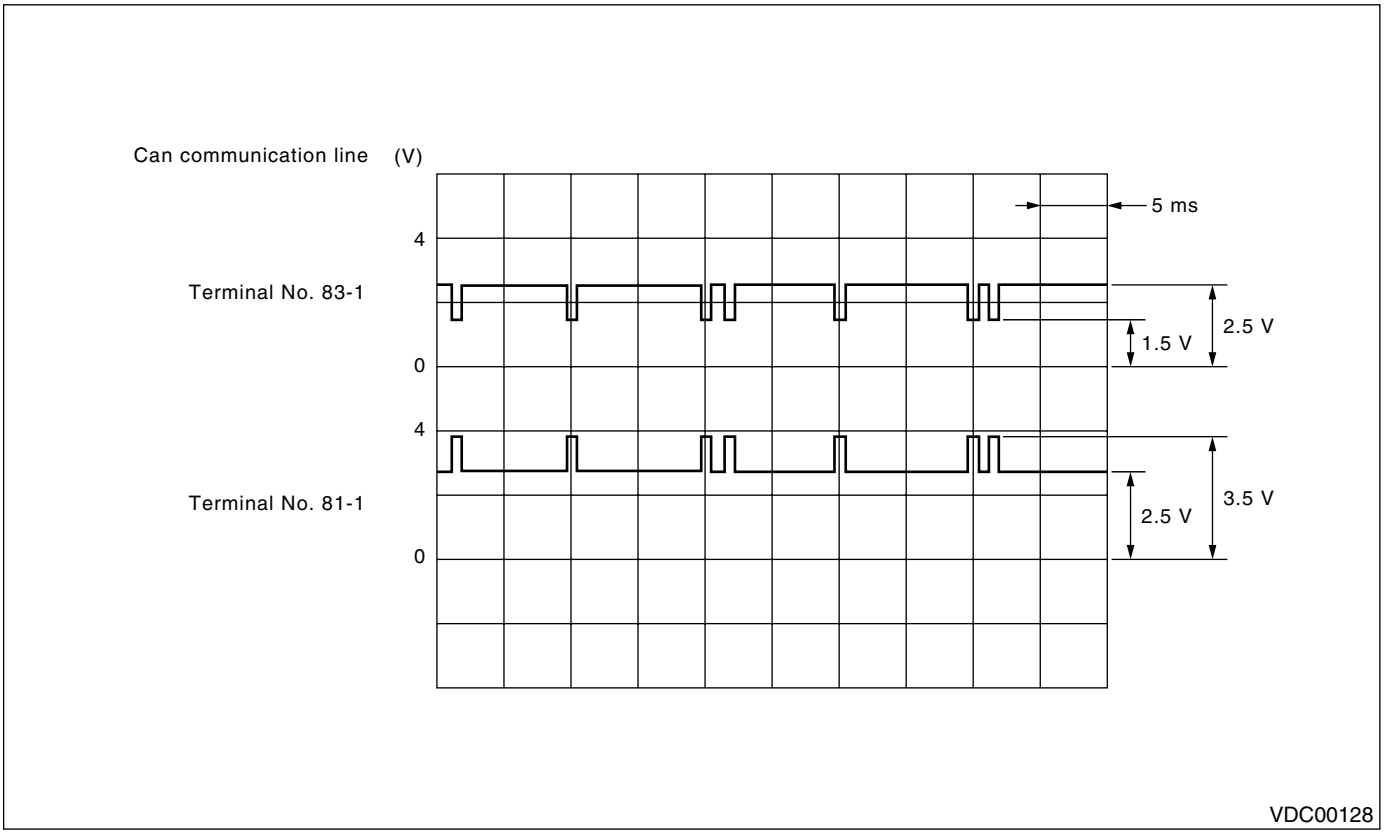
C: MEASUREMENT

Measure input/output signal voltage.

NOTE:
Measure with the VDCCM connector cover removed. <Ref. to VDC-20, VDCCM Connector Cover.>

1. WAVEFORM


Yaw rate sensor
(V)
3
2
1
0
Terminal No. 65 - 64
Terminal No. 67 - 64
10
5
0
5.0 V
2.1 – 2.9 V
(When the vehicle is stopped)
20 ms
VDC00127

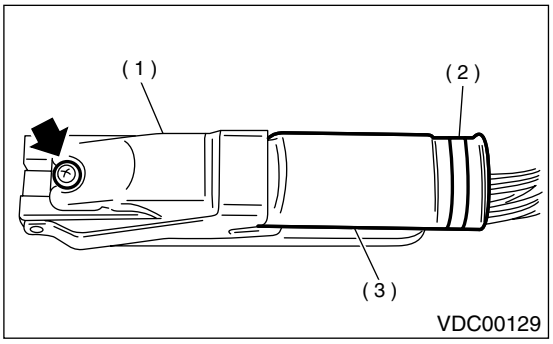

Can communication line
(V)
4
0
4
0
Terminal No. 83-1
Terminal No. 81-1
5 ms
2.5 V
1.5 V
3.5 V
2.5 V
VDC00128

6. VDCCM Connector Cover

A: REMOVE

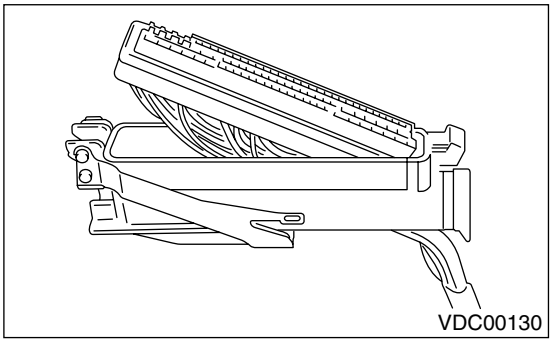
1) Turn ignition switch OFF.
2) Disconnect connector from VDCCM.
3) Remove band.
4) Remove cable clamp cover.
5) Remove screws securing connector cover.

CAUTION:
Do not allow harness to catch on adjacent parts during installation.



(1) Connector cover
(2) Band
(3) Cable clamp cover

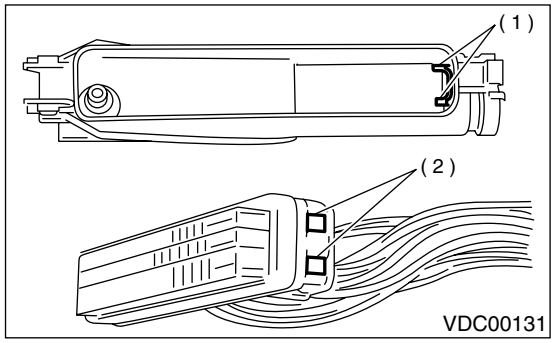
6) Remove connector cover.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Align connector cover rib with connector hole before installation.



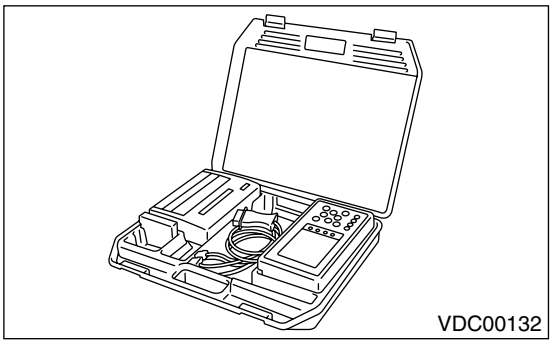
(1) Rib
(2) Hole

7. Subaru Select Monitor

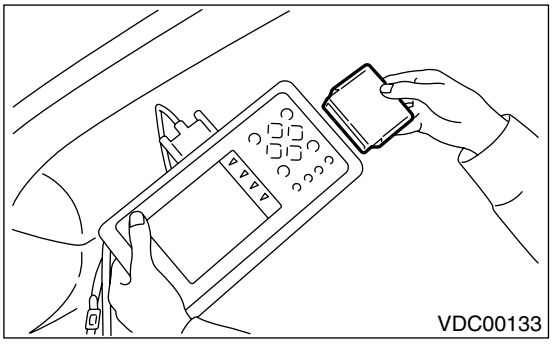
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare Subaru Select Monitor kit.

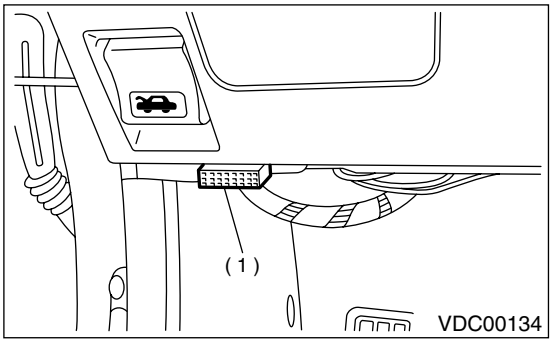


2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to VDC-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect Subaru Select Monitor to data link connector.

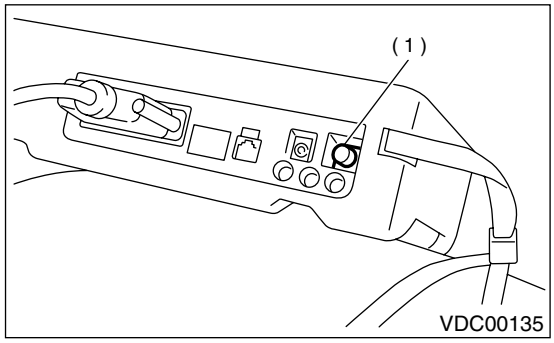
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

(2) Connect diagnosis cable to data link connector.

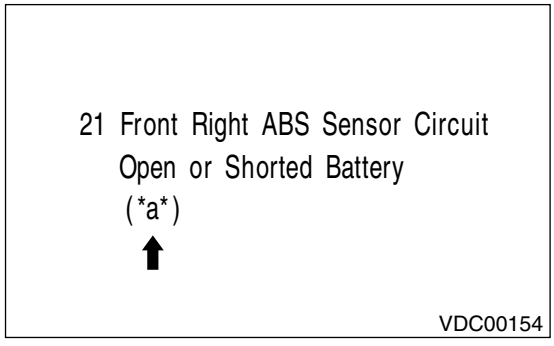
5) Turn ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press the [YES] key.
8) Press the [YES] key after displayed the information of engine type.
9) On the «Brake Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the DIAGNOSTIC TROUBLE CODE LIST.
<Ref. to VDC-28, List of Diagnostic Trouble Code (DTC).>
• A maximum of 3 trouble codes are displayed in order of occurrence.



a refers to the troubles in order of occurrence (Latest, Old, Older).

Display screen	Contents to be monitored
Latest	The most recent trouble code appears on the select monitor display.
Old	The second most recent trouble code appears on the select monitor display.
Older	The third most recent trouble code appears on the select monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select {Each System Check} and press the «YES» key.
2) On the «System Selection Menu» display screen, select {Brake Control System} and press «YES» key.
3) Press the «YES» key after the VDC type is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Current Data Display & Save} and press the «YES» key.
5) On the «Data Display Menu» display screen, select {Data Display} and press the «YES» key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Display screen	Contents to be monitored.	Unit of measure
FR wheel speed	Wheel speed detected by the Front Right ABS sensor is displayed.	km/h or MPH
FL wheel speed	Wheel speed detected by the Front Left ABS sensor is displayed.	km/h or MPH
RR wheel speed	Wheel speed detected by the Rear Right ABS sensor is displayed.	km/h or MPH
RL wheel speed	Wheel speed detected by the Rear Left ABS sensor is displayed.	km/h or MPH
Steering angle sensor	Steering wheel angle detected by the steering angle sensor is displayed.	deg
Yaw rate sensor	Vehicle's angular velocity detected by the yaw rate sensor is displayed.	deg/s
Lateral G sensor	Vehicle's lateral acceleration detected by the lateral G sensor is displayed.	V
Pressure sensor 1	Brake fluid pressure detected by the primary pressure sensor is displayed.	V
Pressure sensor 2	Brake fluid pressure detected by the secondary pressure sensor is displayed.	V
Longitudinal G sensor	Longitudinal G sensor is not equipped on vehicles after '00MY. But longitudinal G sensor will remain on monitor and 0 V will be displayed.	V
ABS CM power voltage	Voltage supplied to VDCCM is displayed.	V
Torque driver requires	Engine torque requested by the driver is displayed.	N·m
Current torque	Current engine torque is displayed.	N·m
Valve relay signal	Drive condition of the valve relay is displayed.	ON or OFF
Motor relay signal	Drive condition of the motor relay is displayed.	ON or OFF
VDC OFF lamp	ON operation of the VDC OFF indicator lamp is displayed.	ON or OFF
Motor relay monitor	Operating condition of the motor relay is displayed.	High or Low
PW signal	Accelerator position signal is displayed.	1 or 0
AET signal	Engine control start signal is displayed.	OPEN or GND
AEB signal	Engine control signal is displayed.	OPEN or GND
AEC signal	Engine control signal is displayed.	OPEN or GND
EAM signal	Engine control command signal is displayed.	1 or 0

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select {2. Each System Check} and press the «YES» key.
2) On the «System Select Menu» display screen, select {Brake System} and press the «YES» key.
3) Press the «YES» key after the engine type is displayed.
4) On the «Brake Control Diagnosis» display screen, select {Clear Memory} and press the «YES» key.
5) When `Done' and `turn ignition switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. FUNCTION CHECK

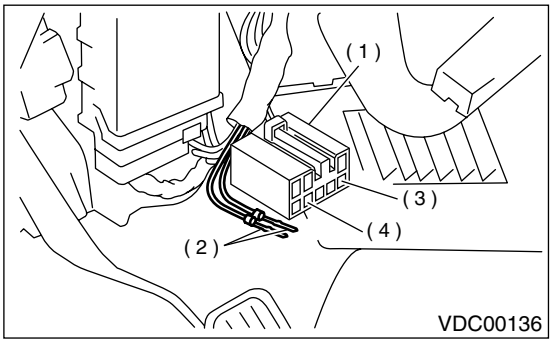
Display screen	Contents to be monitored	Index No.
ABS sequence control mode	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to VDC-16, ABS Sequence Control.>
VDC check mode	Perform VDC sequence control by operating valve and pump motor sequentially.	<Ref. to VDC-19, VDC Sequence Control.>
Set mode St. r. A. Sen. N & Lat. G Sen. Op	Set both the neutral position of the steering angle sensor and the zero “0” point of the lateral G sensor.	<Ref. to VDC-26, Steering Angle Sensor.>

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

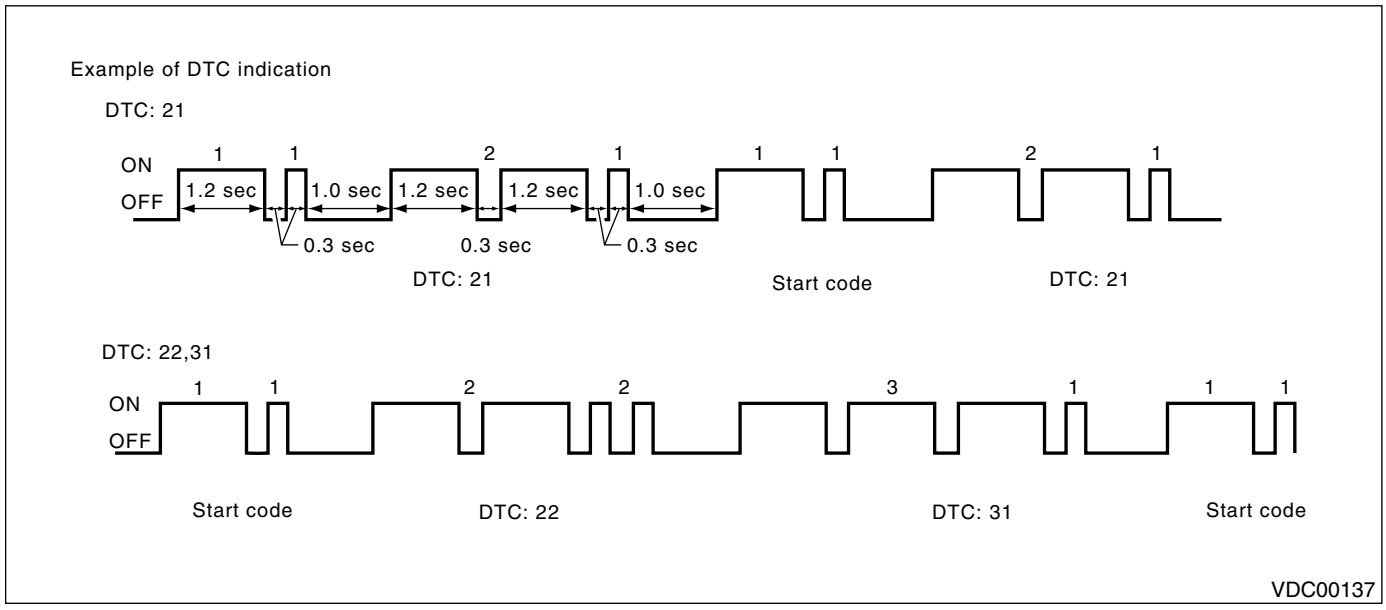
1) Take out diagnosis connector from side of driver's seat heater unit.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Turn ignition switch OFF.
3) Connect diagnosis connector terminal 8 to diagnosis terminal.
4) Turn ignition switch ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify diagnostic trouble code (DTC).
6) After the start code (11) is shown, the diagnostic trouble codes (DTCs) will be shown in order of the last information first.
These repeat for a maximum of 5 minutes.

NOTE:
• When there are no diagnostic trouble codes (DTCs) in memory, only the start code (11) is shown.
• When on-board diagnosis of the VDC control module detects a problem, the information (up to a maximum of three) will be stored in the EEP ROM as a diagnostic trouble code (DTC). When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand diagnostic trouble codes (DTCs). <Ref. to VDC-<Ref. to VDC-21, Subaru Select Monitor.>, Subaru Select Monitor.>

9. Inspection Mode

A: OPERATION

Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at least ten minutes.

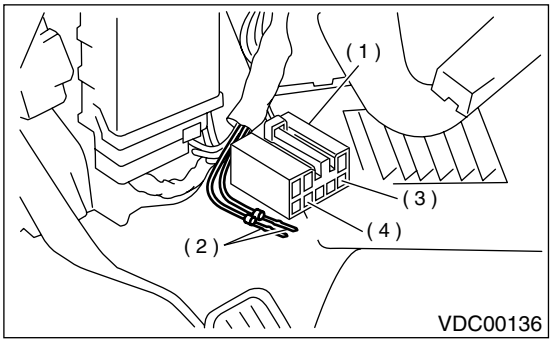
NOTE:
Make sure vehicle does not pull to one side during normal driving.

10.Clear Memory Mode

A: OPERATION

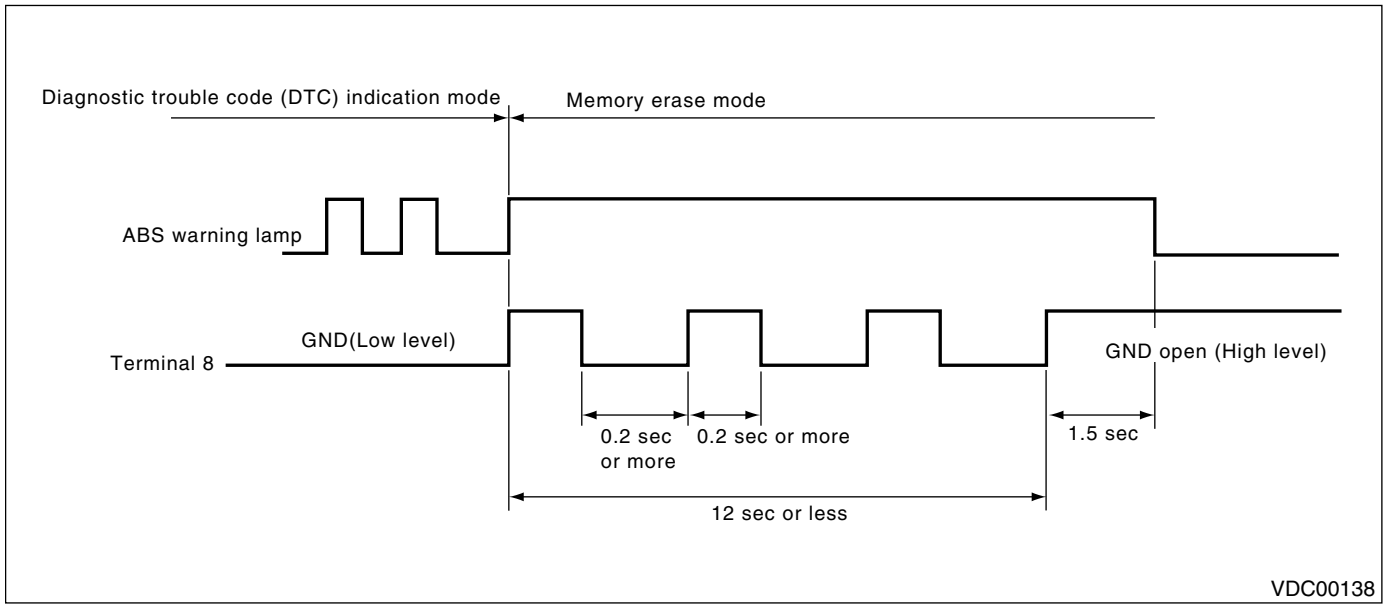
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a diagnostic trouble code (DTC), disconnect diagnosis connector terminal 8 from diagnosis terminal.



(1) Diagnosis connector
(2) Diagnosis terminal
(3) 8 terminal
(4) 5 terminal

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 8 and diagnosis terminal for at least 0.2 seconds each time.



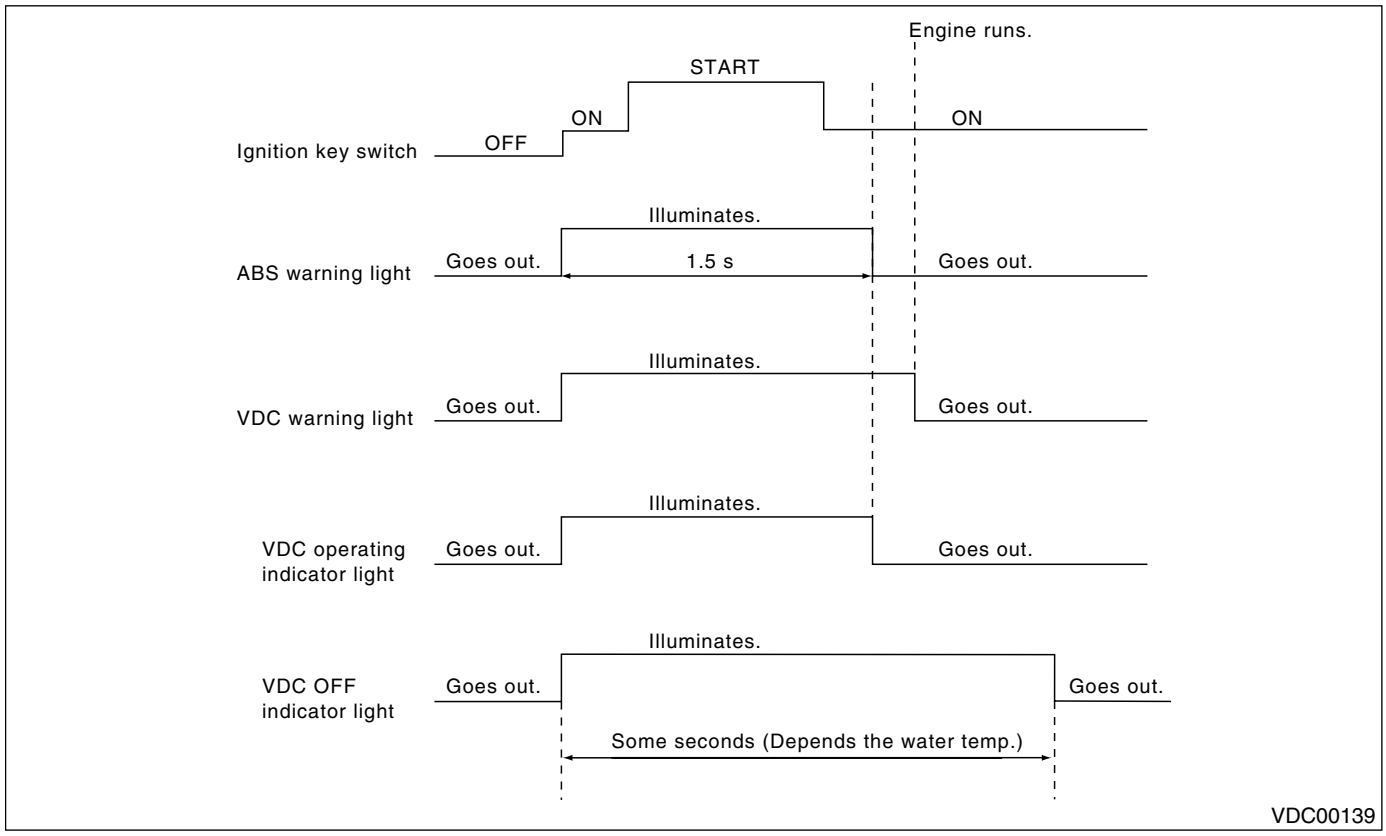
NOTE:
After diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear diagnostic trouble codes (DTCs). <Ref. to VDC-21, Subaru Select Monitor.>

11.Warning Light Illumination Pattern

A: INSPECTION



1) When the warning and/or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the warning and/or indicator lights remain constantly OFF, repair the warning and/or indicator lights circuit or diagnosis circuit. <Ref. to VDC-34, ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON., Diagnostics Chart with Diagnosis Connector.>

NOTE:
• Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the VDC system operates normally when the warning light goes out while driving at approximately 12 km/h (7 MPH). However, the Anti-lock brakes do not work while the ABS warning light is illuminated.
• It may take a few minutes for the VDC OFF indicator light to go out when the vehicle is exposed for some time in a low temperature area. This is not a problem because of low engine coolant temperatures.
• If a vehicle wheel is stuck or free-spinning for approximately 1 minute, power transfer fluctuation to the remaining wheels will occur. Power transfer conditions will differ from those occurring during normal vehicle operation. The ABS sensor will detect this condition. The ABS and VDC warning lights will illuminate. If the vehicle is operated with the four wheels lifted off the ground or with the four wheels placed on rollers, the VDCCM will detect a problem with the speed sensor and the ABS and VDC warning lights may illuminate. In this case, there is no abnormality. Clear the diagnostic code from memory.
• When the engine is started and vehicle movement begins, the VDCH/U motor pump and solenoid valve will operate for a few seconds. This permits checking of VDC function. Normal motor pump and solenoid valve operational noise will be heard. Normal brake pedal kick back will be felt when the brake pedal is depressed. In this case, there is no abnormality.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	<Ref. to VDC-48, DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to VDC-48, DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to VDC-48, DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	<Ref. to VDC-54, DTC 22 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH), Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to VDC-54, DTC 24 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH), Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to VDC-54, DTC 26 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH), Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to VDC-60, DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR), Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis		Index No.
31	Abnormal solenoid valve circuit(s)	Front right inlet valve	<Ref. to VDC-63, DTC 31 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT RH INLET), Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve	<Ref. to VDC-68, DTC 32 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT RH OUTLET), Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve	<Ref. to VDC-63, DTC 33 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT LH INLET), Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve	<Ref. to VDC-68, DTC 34 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT LH OUTLET), Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve	<Ref. to VDC-63, DTC 35 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR RH INLET), Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve	<Ref. to VDC-68, DTC 36 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR RH OUTLET), Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve	<Ref. to VDC-63, DTC 37 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR LH INLET), Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve	<Ref. to VDC-68, DTC 38 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR LH OUTLET), Diagnostics Chart with Diagnosis Connector.>
61		Primary cut valve	<Ref. to VDC-63, DTC 61 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (PRIMARY CUT), Diagnostics Chart with Diagnosis Connector.>
62		Secondary cut valve	<Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>
63		Primary suction valve	<Ref. to VDC-68, DTC 63 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (PRIMARY SUCTION), Diagnostics Chart with Diagnosis Connector.>
64		Secondary suction valve	<Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>
41	Abnormal VDC control module		<Ref. to VDC-74, DTC 41 ABNORMAL VDC CONTROL MODULE, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.		<Ref. to VDC-76, DTC 42 SOURCE VOLTAGE IS ABNORMAL., Diagnostics Chart with Diagnosis Connector.>
43	Faulty VDCCM-ECM communication line		<Ref. to VDC-78, DTC 43 FAULTY VDCCM — ECM COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
44	A communication with AT control abnormal		<Ref. to VDC-82, DTC 44 A COMMUNICATION WITH AT CONTROL ABNORMAL, Diagnostics Chart with Diagnosis Connector.>
45	Control module out of specification		<Ref. to VDC-84, DTC 45 CONTROL MODULE OUT OF SPECIFICATION, Diagnostics Chart with Diagnosis Connector.>
46	Abnormal voltage of 5 V power supply		<Ref. to VDC-86, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Diagnosis Connector.>
47	Faulty CAN communication line		<Ref. to VDC-88, DTC 47 FAULTY CAN COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
48	Faulty ECM-VDCCM communication line		<Ref. to VDC-92, DTC 48 FAULTY ECM — VDCCM COMMUNICATION LINE, Diagnostics Chart with Diagnosis Connector.>
49	Abnormal engine speed signal		<Ref. to VDC-94, DTC 49 ABNORMAL ENGINE SPEED SIGNAL, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay		<Ref. to VDC-96, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Chart with Diagnosis Connector.>

DTC No.	Contents of diagnosis	Index No.
52	Abnormal motor and/or motor relay	<Ref. to VDC-102, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Chart with Diagnosis Connector.>
71	Abnormal steering angle sensor	<Ref. to VDC-106, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
72	Abnormal yaw rate sensor	<Ref. to VDC-110, DTC 72 ABNORMAL YAW RATE SENSOR, Diagnostics Chart with Diagnosis Connector.>
73	Abnormal lateral G sensor	<Ref. to VDC-114, DTC 73 ABNORMAL LATERAL G SENSOR, Diagnostics Chart with Diagnosis Connector.>
74	Abnormal pressure sensor	<Ref. to VDC-118, DTC 74 ABNORMAL PRESSURE SENSOR, Diagnostics Chart with Diagnosis Connector.>

If any of the following multiple diagnostic trouble codes (DTCs) are present in memory, check the area corresponding to the first diagnostic trouble code (DTC). If no problem is detected, check the areas corresponding to the other diagnostic trouble codes (DTCs) in order of their appearance.

Combination of DTC No.	Problem area	Index No.
46, 74	(F87) — No. 78, 68 or 69 lead circuit is shorted to ground or battery.	<Ref. to VDC-86, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Diagnosis Connector.>
44, 71	(F87) — No. 83 or 81 lead circuit is open.	<Ref. to VDC-106, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
51, 48, 71	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-106, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
71, 51, 44	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-106, DTC 71 ABNORMAL STEERING ANGLE SENSOR, Diagnostics Chart with Diagnosis Connector.>
72, 73	(F87) — No. 63 lead circuit is open.	<Ref. to VDC-114, DTC 73 ABNORMAL LATERAL G SENSOR, Diagnostics Chart with Diagnosis Connector.>

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to VDC-122, COMMUNICATION FOR INITIALIZING IMPOSSIBLE (SELECT MONITOR COMMUNICATION FAILURE), Diagnostics Chart with Select Monitor.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light and/or VDC warning light and/or VDC operating indicator light and/or VDC OFF indicator light remains on.	<Ref. to VDC-34, Diagnostics Chart with Diagnosis Connector.>
—	No trouble code	Although no diagnostic trouble code appears on the select monitor display, the ABS warning light and/or VDC warning light and/or VDC operating indicator light and/or VDC OFF indicator light remains off.	<Ref. to VDC-34, Diagnostics Chart with Diagnosis Connector.>
21	Front right ABS sensor circuit open or shorted battery	Open or short circuit in front right ABS sensor circuit	<Ref. to VDC-125, DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
22	Front right ABS sensor signal	Front right ABS sensor abnormal signal	<Ref. to VDC-130, DTC 22 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

DTC No.	Display screen	Contents of diagnosis	Index No.
23	Front left ABS sensor circuit open or shorted battery	Open or short circuit in front left ABS sensor circuit	<Ref. to VDC-125, DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
24	Front left ABS sensor signal	Front left ABS sensor abnormal signal	<Ref. to VDC-130, DTC 24 FRONT LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
25	Rear right ABS sensor circuit open or shorted battery	Open or short circuit in rear right ABS sensor circuit	<Ref. to VDC-125, DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
26	Rear right ABS sensor signal	Rear right ABS sensor abnormal signal	<Ref. to VDC-130, DTC 26 REAR RIGHT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
27	Rear left ABS sensor circuit open or shorted battery	Open or short circuit in rear left ABS sensor circuit	<Ref. to VDC-126, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>
28	Rear left ABS sensor signal	Rear left ABS sensor abnormal signal	<Ref. to VDC-132, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
29	Any one of four ABS sensor signal	Abnormal ABS sensor signal on any one of four sensor	<Ref. to VDC-138, DTC 29 ANY ONE OF FOUR ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
31	FR hold valve malfunction	Front right inlet solenoid valve	<Ref. to VDC-141, DTC 31 FR HOLD VALVE MALFUNCTION (FRONT RIGHT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
32	FR pressure reducing valve malfunction	Front right outlet solenoid valve malfunction	<Ref. to VDC-146, DTC 32 FR PRESSURE REDUCING VALVE MALFUNCTION (FRONT RIGHT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
33	FL hold valve malfunction	Front left inlet solenoid valve malfunction	<Ref. to VDC-141, DTC 33 FL HOLD VALVE MALFUNCTION (FRONT LEFT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
34	FL pressure reducing valve malfunction	Front left outlet solenoid valve	<Ref. to VDC-146, DTC 34 FL PRESSURE REDUCING VALVE MALFUNCTION (FRONT LEFT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
35	RR hold valve malfunction	Rear right inlet solenoid valve malfunction	<Ref. to VDC-141, DTC 35 RR HOLD VALVE MALFUNCTION (REAR RIGHT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
36	RR pressure reducing valve malfunction	Rear right outlet solenoid valve	<Ref. to VDC-146, DTC 36 RR PRESSURE REDUCING VALVE MALFUNCTION (REAR RIGHT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
37	RL hold valve malfunction	Rear left inlet solenoid valve malfunction	<Ref. to VDC-141, DTC 37 RL HOLD VALVE MALFUNCTION (REAR LEFT INLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
38	RL pressure reducing valve malfunction	Rear left outlet solenoid valve	<Ref. to VDC-146, DTC 38 RL PRESSURE REDUCING VALVE MALFUNCTION (REAR LEFT OUTLET VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
41	Electrical control module	VDC control module malfunction	<Ref. to VDC-152, DTC 41 ELECTRICAL CONTROL MODULE (VDC CONTROL MODULE MALFUNCTION), Diagnostics Chart with Select Monitor.>
42	Power supply voltage low	Power supply voltage too low	<Ref. to VDC-154, DTC 42 POWER SUPPLY VOLTAGE LOW, Diagnostics Chart with Select Monitor.>
43	AET communication line malfunction	AET communication line malfunction	<Ref. to VDC-156, DTC 43 AET COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
43	AEB communication line malfunction	AEB communication line malfunction	<Ref. to VDC-160, DTC 43 AEB COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
43	AEC communication line malfunction	AEC communication line malfunction	<Ref. to VDC-164, DTC 43 AEC COMMUNICATION LINE MALFUNCTION, Diagnostics Chart with Select Monitor.>
44	TCM communication circuit	TCM communication line malfunction	<Ref. to VDC-168, DTC 44 TCM COMMUNICATION CIRCUIT, Diagnostics Chart with Select Monitor.>
45	Incorrect VDC control module	Incorrect VDC control module	<Ref. to VDC-170, DTC 45 INCORRECT VDC CONTROL MODULE, Diagnostics Chart with Select Monitor.>

DTC No.	Display screen	Contents of diagnosis	Index No.
45	TCM malfunction specifications	TCM malfunction specifications	<Ref. to VDC-171, DTC 45 TCM MALFUNCTION SPECIFICATIONS, Diagnostics Chart with Select Monitor.>
46	Abnormal voltage of 5 V power supply	Abnormal voltage of 5 V power supply	<Ref. to VDC-172, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Select Monitor.>
47	Improper CAN communication	CAN communication line malfunction	<Ref. to VDC-174, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostics Chart with Select Monitor.>
48	Improper EAC communication	EAC communication line malfunction	<Ref. to VDC-178, DTC 48 IMPROPER EAC COMMUNICATION, Diagnostics Chart with Select Monitor.>
48	EAS communication line grounding shorted	EAS communication line grounding	<Ref. to VDC-180, DTC 48 EAS COMMUNICATION LINE GROUNDING SHORTED, Diagnostics Chart with Select Monitor.>
48	Erroneous communication from EGI to VDC	Faulty ECM-VDCCM communication line	<Ref. to VDC-182, DTC 48 ERRONEOUS COMMUNICATION FROM EGI TO VDC, Diagnostics Chart with Select Monitor.>
49	Abnormal engine speed signal	Abnormal engine speed signal	<Ref. to VDC-184, DTC 49 ABNORMAL ENGINE SPEED SIGNAL, Diagnostics Chart with Select Monitor.>
51	Valve relay	Valve relay malfunction	<Ref. to VDC-186, DTC 51 VALVE RELAY, Diagnostics Chart with Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to VDC-192, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor and motor relay OFF failure	Motor and motor relay OFF failure	<Ref. to VDC-196, DTC 52 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor and motor relay ON failure	Motor and motor relay ON failure	<Ref. to VDC-200, DTC 52 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostics Chart with Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to VDC-204, DTC 52 MOTOR MALFUNCTION, Diagnostics Chart with Select Monitor.>
61	Normal opening valve 2 malfunction	Primary cut valve malfunction	<Ref. to VDC-141, DTC 61 NORMAL OPENING VALVE 2 MALFUNCTION (PRIMARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
62	Normal opening valve 1 malfunction	Secondary cut valve malfunction	<Ref. to VDC-142, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
63	Normal closing valve 2 malfunction	Primary suction valve malfunction	<Ref. to VDC-146, DTC 63 NORMAL CLOSING VALVE 2 MALFUNCTION (PRIMARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
64	Normal closing valve 1 malfunction	Secondary suction valve malfunction	<Ref. to VDC-148, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>
71	Steering angle sensor offset is too big.	Steering angle sensor offset is too big.	<Ref. to VDC-208, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG., Diagnostics Chart with Select Monitor.>
71	Change range of steering angle sensor is too big.	Change range of steering angle sensor is too big.	<Ref. to VDC-210, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>
71	Steering angle sensor malfunction	Steering angle sensor malfunction	<Ref. to VDC-212, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostics Chart with Select Monitor.>
71	No signal from steering angle sensor	No signal from steering angle sensor	<Ref. to VDC-214, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
72	Abnormal yaw rate sensor output	Abnormal yaw rate sensor output	<Ref. to VDC-218, DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostics Chart with Select Monitor.>
72	Voltage inputted to yaw rate sensor exceeds specification.	Voltage inputted to yaw rate sensor exceeds specification.	<Ref. to VDC-220, DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION., Diagnostics Chart with Select Monitor.>
72	Abnormal yaw rate sensor reference voltage	Abnormal yaw rate sensor reference voltage	<Ref. to VDC-222, DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE, Diagnostics Chart with Select Monitor.>
72	Change range of yaw rate sensor signal is too big.	Change range of yaw rate sensor signal is too big.	<Ref. to VDC-226, DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG., Diagnostics Chart with Select Monitor.>

DTC No.	Display screen	Contents of diagnosis	Index No.
73	Lateral G sensor offset is too big.	Lateral G sensor offset is too big.	<Ref. to VDC-229, DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG., Diagnostics Chart with Select Monitor.>
73	Abnormal lateral G sensor output	Abnormal lateral G sensor output	<Ref. to VDC-229, DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostics Chart with Select Monitor.>
73	Change range of lateral G sensor is too big.	Change range of lateral G sensor is too big.	<Ref. to VDC-229, DTC 73 CHANGE RANGE OF LATERAL G SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>
73	Excessive lateral G sensor signal	Excessive lateral G sensor signal	<Ref. to VDC-230, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>
73	Voltage inputted to lateral G sensor exceeds specification.	Voltage inputted to lateral G sensor exceeds specification.	<Ref. to VDC-232, DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION., Diagnostics Chart with Select Monitor.>
74	Voltage inputted to pressure sensor 1 exceeds specification.	Voltage inputted to primary pressure sensor exceeds specification.	<Ref. to VDC-236, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION. (PRIMARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Voltage inputted to pressure sensor 2 exceeds specification.	Voltage inputted to secondary pressure sensor exceeds specification.	<Ref. to VDC-240, DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Pressure sensor 1 offset is too big.	Primary pressure sensor offset is too big.	<Ref. to VDC-243, DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG. (PRIMARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Pressure sensor 2 offset is too big.	Secondary pressure sensor offset is too big.	<Ref. to VDC-244, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>
74	Differential pressure of pressure sensor is too big.	Differential pressure of pressure sensor is too big.	<Ref. to VDC-246, DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG., Diagnostics Chart with Select Monitor.>

If any of the following multiple diagnostic trouble codes (DTCs) are present in memory, check the area corresponding to the first diagnostic trouble code (DTC). If no problem is detected, check the areas corresponding to the other diagnostic trouble codes (DTCs) in order of their appearance.

Combination of DTC No.	Problem area	Index No.
46 Abnormal voltage of 5 V power supply 74 Voltage inputted to pressure sensor 2 exceeds specification.	(F87) — No. 78, 68 or 69 lead circuit is shorted to ground or battery.	<Ref. to VDC-172, DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY, Diagnostics Chart with Select Monitor.>
44 TCM communication circuit 71 No signal from steering angle sensor	(F87) — No. 83 or 81 lead circuit is open.	<Ref. to VDC-214, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
51 Valve relay 48 Improper EAC communication 71 No signal from steering angle sensor	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-214, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
71 No signal from steering angle sensor 51 Valve relay 44 TCM communication circuit	(F87) — No. 27 lead circuit is open.	<Ref. to VDC-214, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostics Chart with Select Monitor.>
73 Voltage inputted to lateral G sensor exceeds specification. 72 Voltage inputted to yaw rate sensor exceeds specifications.	(F87) — No. 23 lead circuit is open.	<Ref. to VDC-230, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

13.Diagnostics Chart with Diagnosis Connector

A: ABS WARNING LIGHT, VDC WARNING LIGHT, VDC OPERATING INDICATOR LIGHT OR VDC OFF INDICATOR LIGHT DOES NOT COME ON.

DIAGNOSIS:

- ABS warning light circuit is open or shorted.
- VDC warning light circuit is open or shorted.
- VDC operating indicator light circuit is open or shorted.
- VDC OFF indicator light circuit is open or shorted.

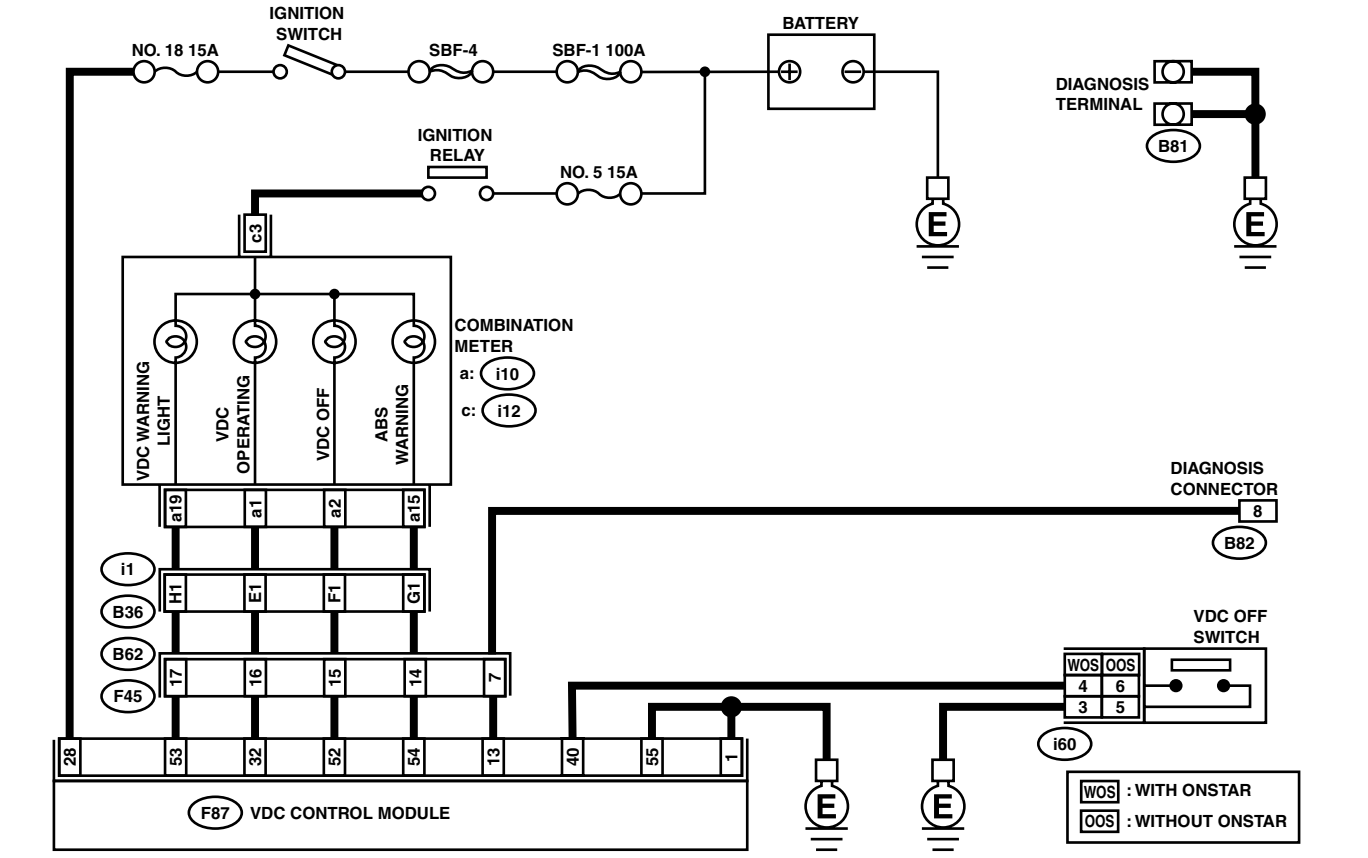
TROUBLE SYMPTOM:

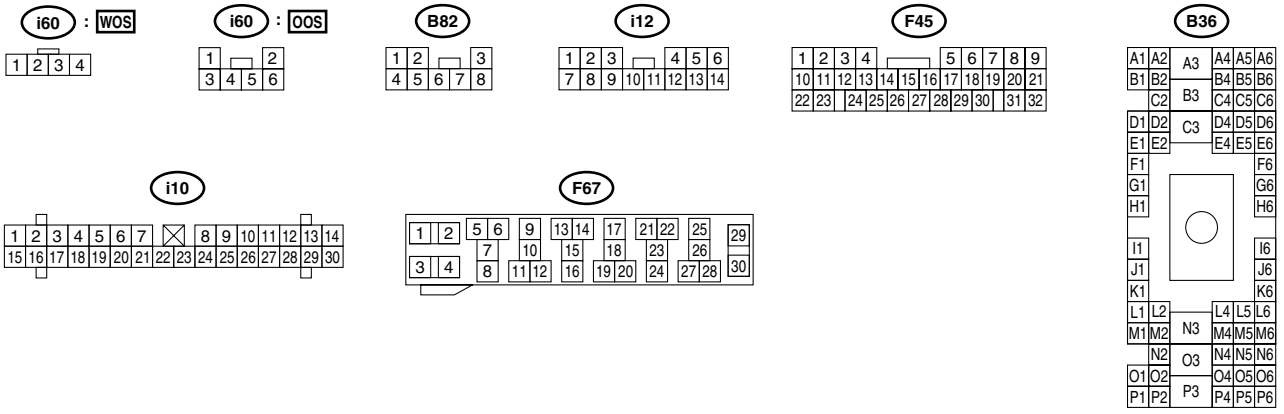
- When ignition switch is turned ON (engine OFF), ABS warning light, VDC warning light, VDC operating indicator light or VDC OFF indicator light does not come on.

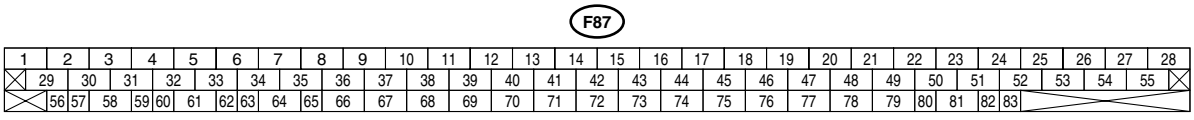
NOTE:
When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.

MEMO:

WIRING DIAGRAM:







VDC00140

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn ignition switch to ON (engine OFF).	Do other warning lights turn on?	Go to step **2.**	Repair combination meter. <Ref. to IDI-13, Combination Meter Assembly.>
2	**CHECK LIGHT BULB.** 1) Turn ignition switch to OFF. 2) Remove combination meter. 3) Remove ABS warning light bulb, VDC warning light bulb, VDC operating indicator light bulb or VDC OFF indicator light bulb from combination meter.	Is light bulb OK?	Go to step **3.**	Replace faulty light bulb. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>
3	**CHECK BATTERY SHORT OF LIGHT HARNESS.** 1) Disconnect VDCCM connector from VDCCM. 2) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 3) Turn ignition switch to ON. 4) Measure voltage between VDC connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(F87) No. 54 (+) — Chassis ground (–):*** ***VDC warning light*** ***(F87) No. 53 (+) — Chassis ground (–):*** ***VDC operating indicator light*** ***(F87) No. 32 (+) — Chassis ground (–):*** ***VDC OFF indicator light*** ***(F87) No. 52 (+) — Chassis ground (–):***	Is the measured value more than 3 V?	Go to step **4.**	Repair light harness.
4	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Install ABS warning light bulb from combination meter. 3) Install combination meter. 4) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(F87) No. 54 (+) — Chassis ground (–):*** ***VDC warning light*** ***(F87) No. 53 (+) — Chassis ground (–):*** ***VDC operating indicator light*** ***(F87) No. 32 (+) — Chassis ground (–):*** ***VDC OFF indicator light*** ***(F87) No. 52 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **5.**	Repair wiring harness.
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connectors between combination meter and VDCCM?	Repair connector.	Go to step **6.**
6	**CHECK WARNING AND INDICATOR LIGHTS.** 1) Connect connector to VDCCM. 2) Turn ignition switch to ON.	Do ABS warning light, VDC warning light, VDC operating indicator light and VDC OFF indicator light turn on?	A temporary poor contact.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

B: ABS AND VDC WARNING LIGHTS DO NOT GO OFF.

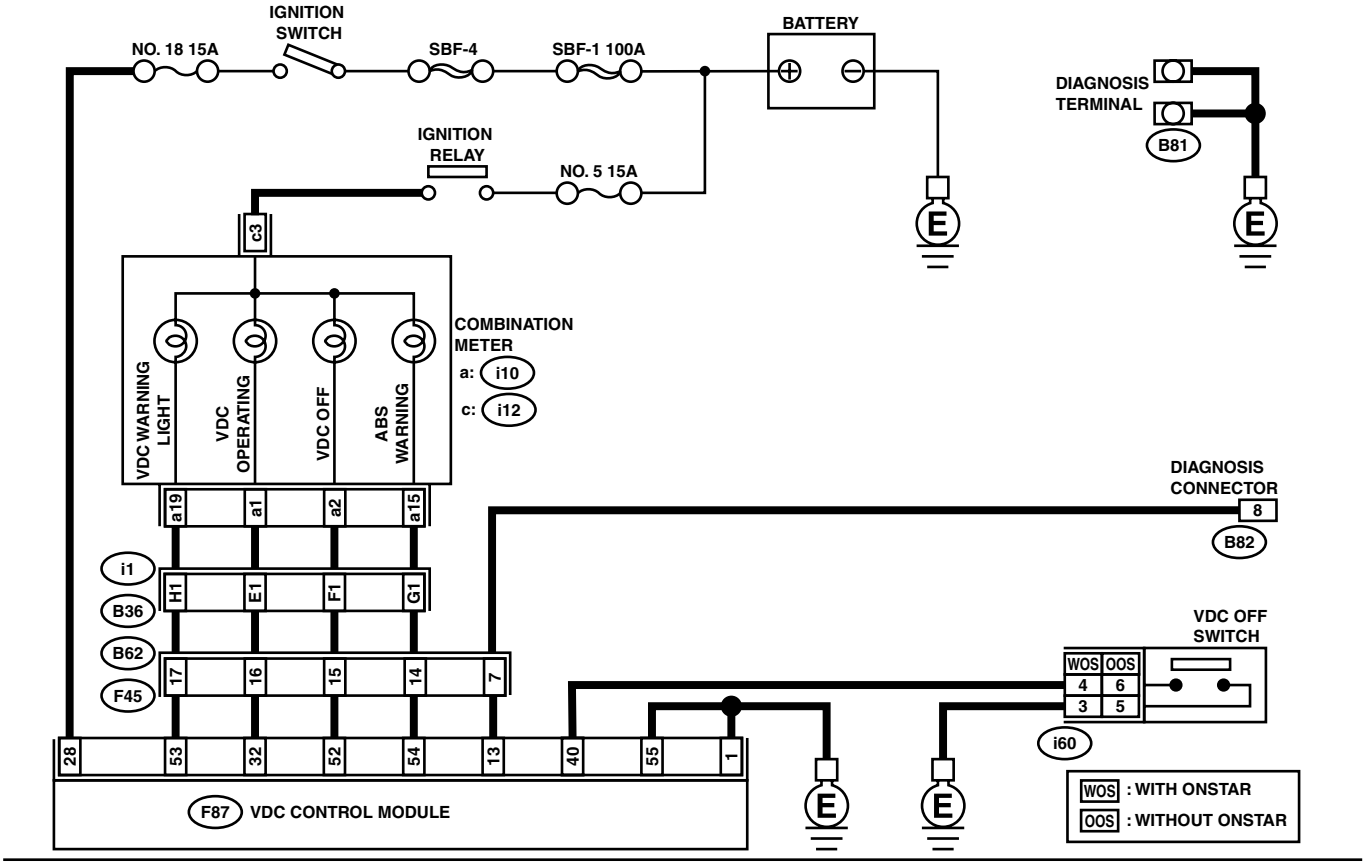
DIAGNOSIS:

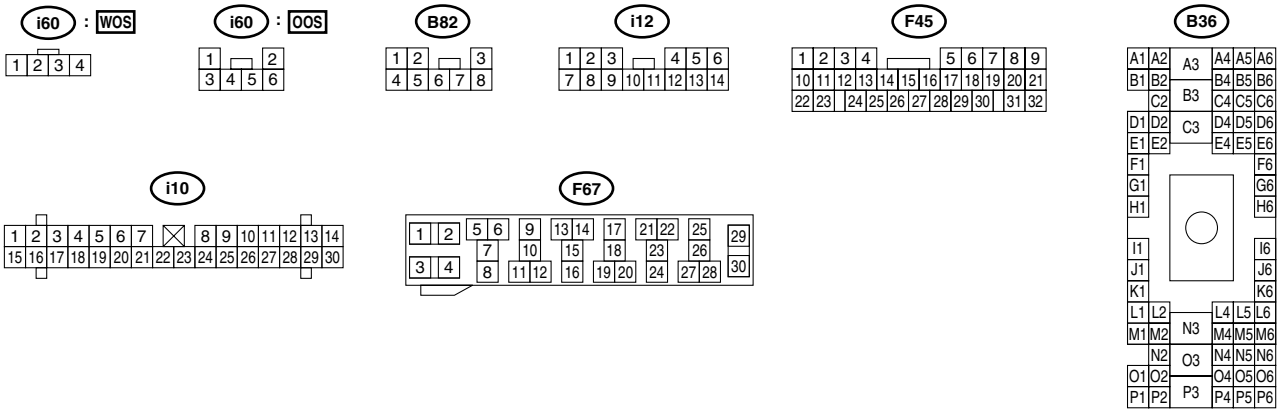
- ABS warning light circuit is open or shorted.
- VDC warning light circuit is open or shorted.
- Diagnosis circuit is open.

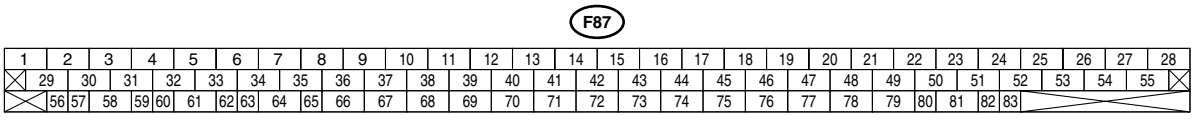
TROUBLE SYMPTOM:

- When starting the engine and while ABS and/or VDC warning light is kept ON.

WIRING DIAGRAM:







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	Step	Check	Yes	No
1	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn ignition switch to OFF.	Is VDCCM connector inserted into VDCCM until the clamp locks onto it?	Go to step **2.**	Insert VDCCM connector into VDCCM until the clamp locks onto it.
2	**CHECK DIAGNOSIS TERMINAL.** Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair diagnosis terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 13 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Repair harness connector between VDCCM and diagnosis connector.
4	**CHECK WIRING HARNESS.** 1) Place a sheet of thick paper [thickness 1.5 mm (0.059 in)] in switch area of VDCCM connector. 2) Turn ignition switch to ON.	Do the ABS warning light and VDC warning light remain off?	Go to step **5.**	Repair front wiring harness.
5	**CHECK VDCCM TERMINAL.** 1) Turn ignition switch to OFF. 2) Check, if there is any faulty condition of VDCCM terminal.	Is there any faulty condition of VDCCM terminal?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6.**
6	**CHECK POWER SUPPLY OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Start engine. 3) Idle the engine. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **7.**	Repair VDCCM power supply circuit.
7	**CHECK POOR CONTACT IN VDCCM CONNECTOR.**	Is there poor contact in VDCCM connector?	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

C: VDC OPERATING INDICATOR LIGHT DOES NOT GO OFF.

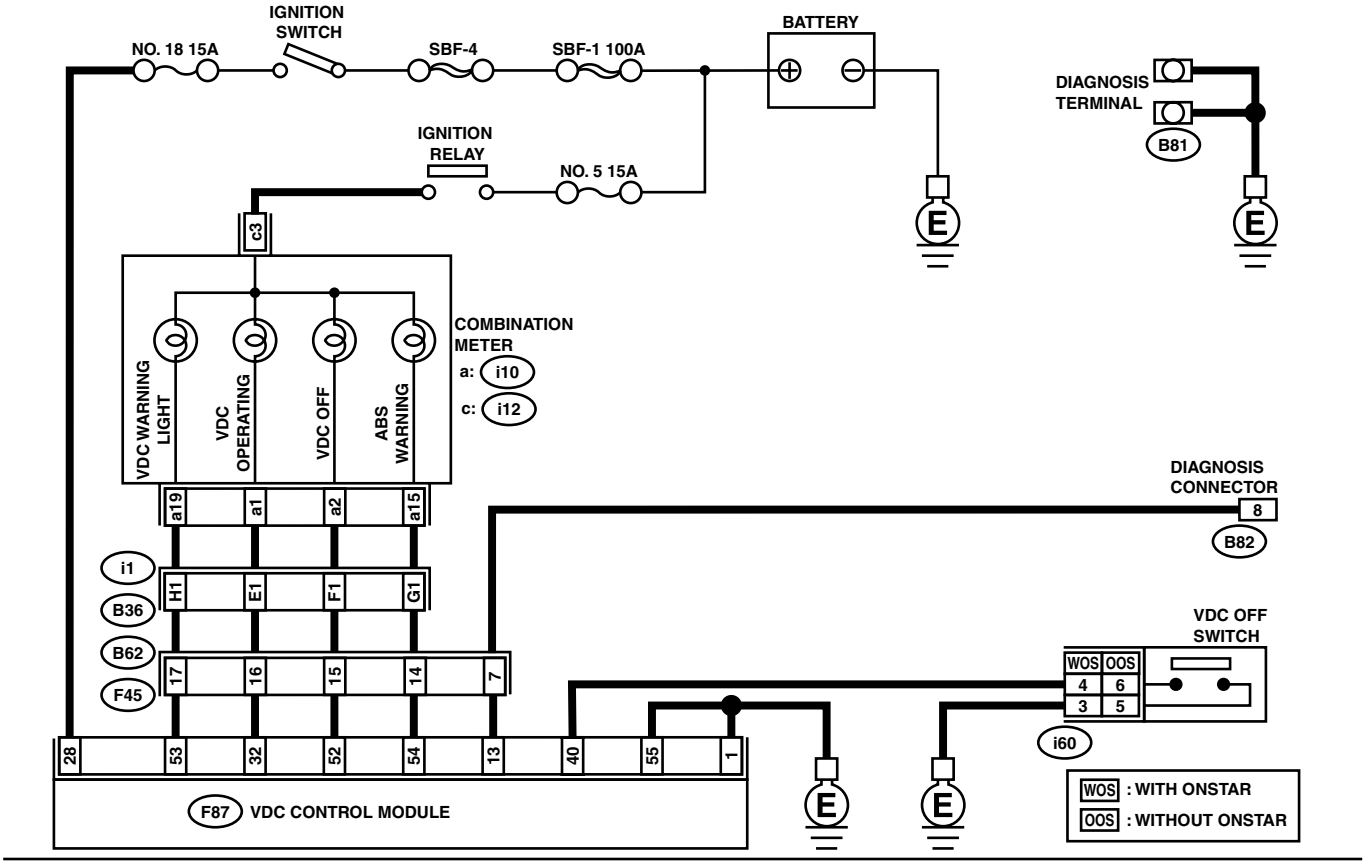
DIAGNOSIS:

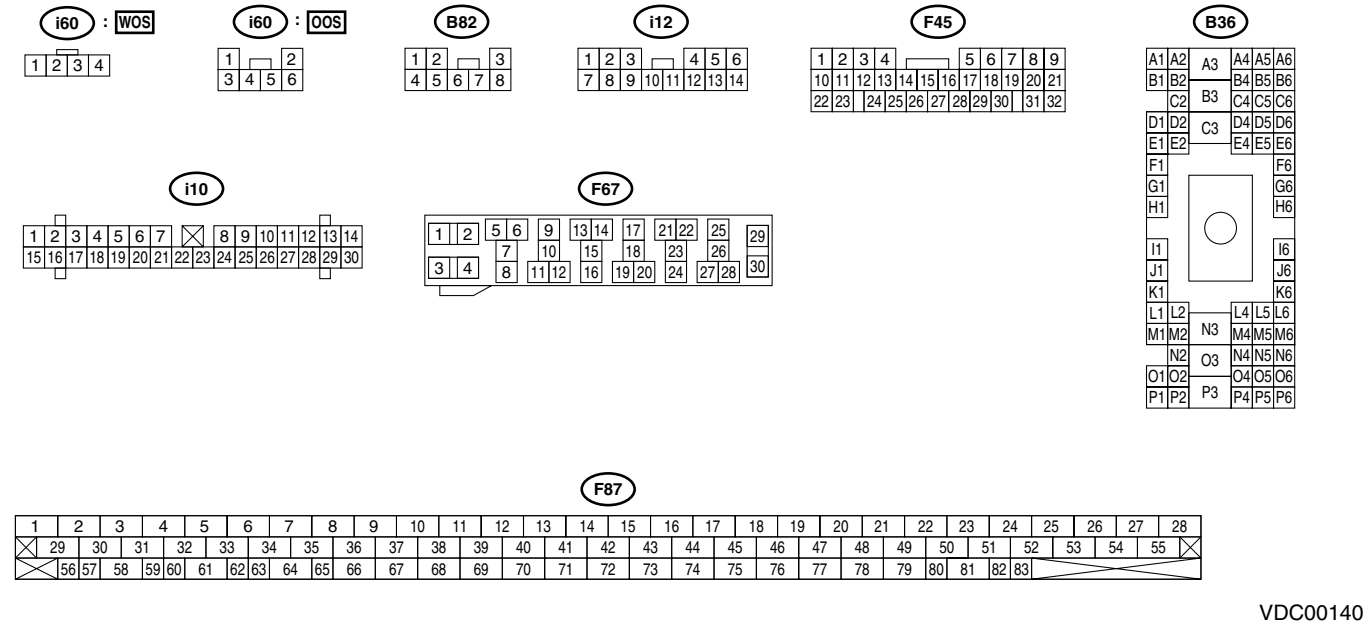
- VDC operating indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

- When starting the engine and while VDC operating indicator light is kept ON.

WIRING DIAGRAM:





VDC00140

	Step	Check	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector from VDCCM. 3) Turn ignition switch to ON.	Does the VDC operating indicator light remain off?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair wiring harness.

MEMO:

D: VDC OFF INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:

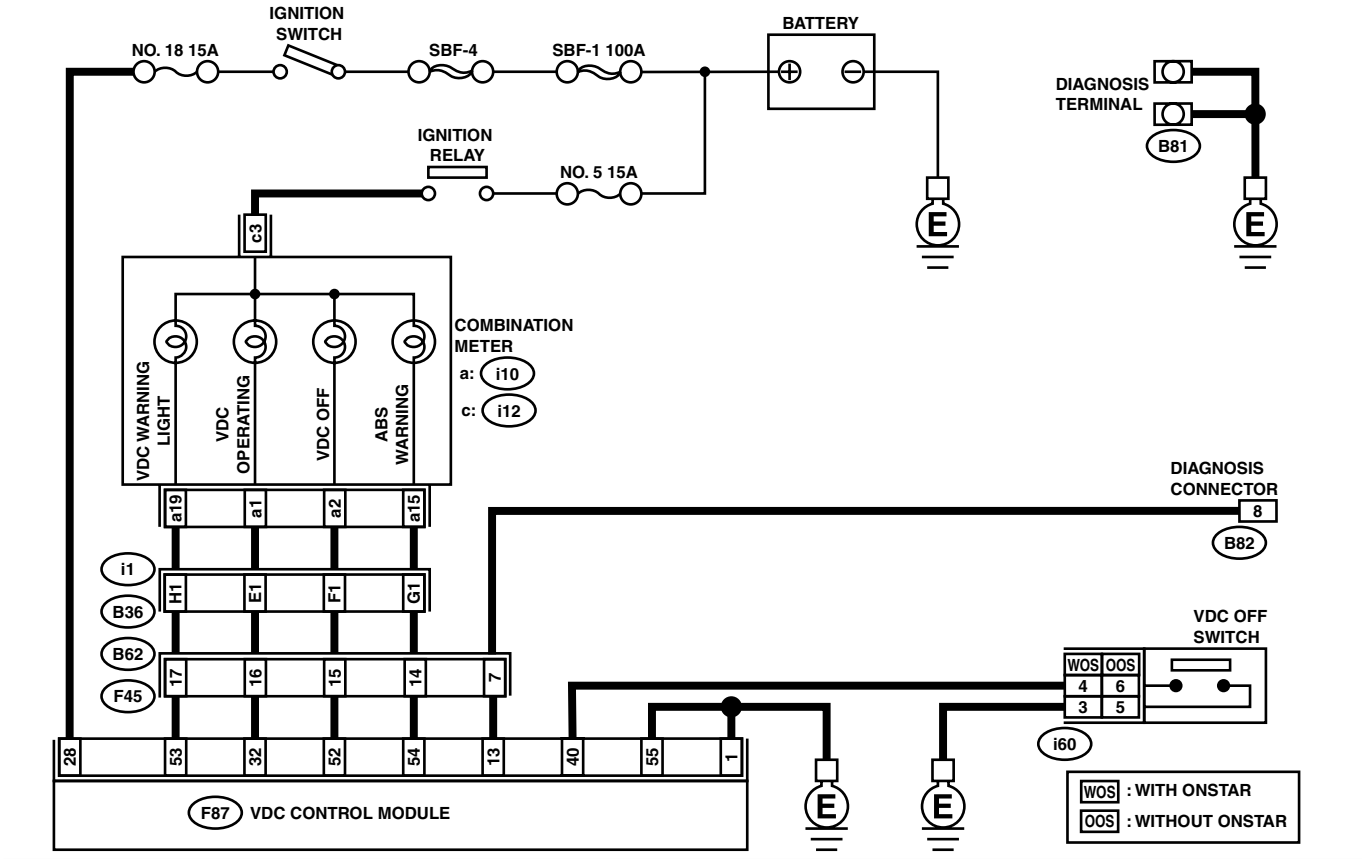
- VDC OFF indicator light circuit is open or shorted.
- VDC OFF switch is shorted.

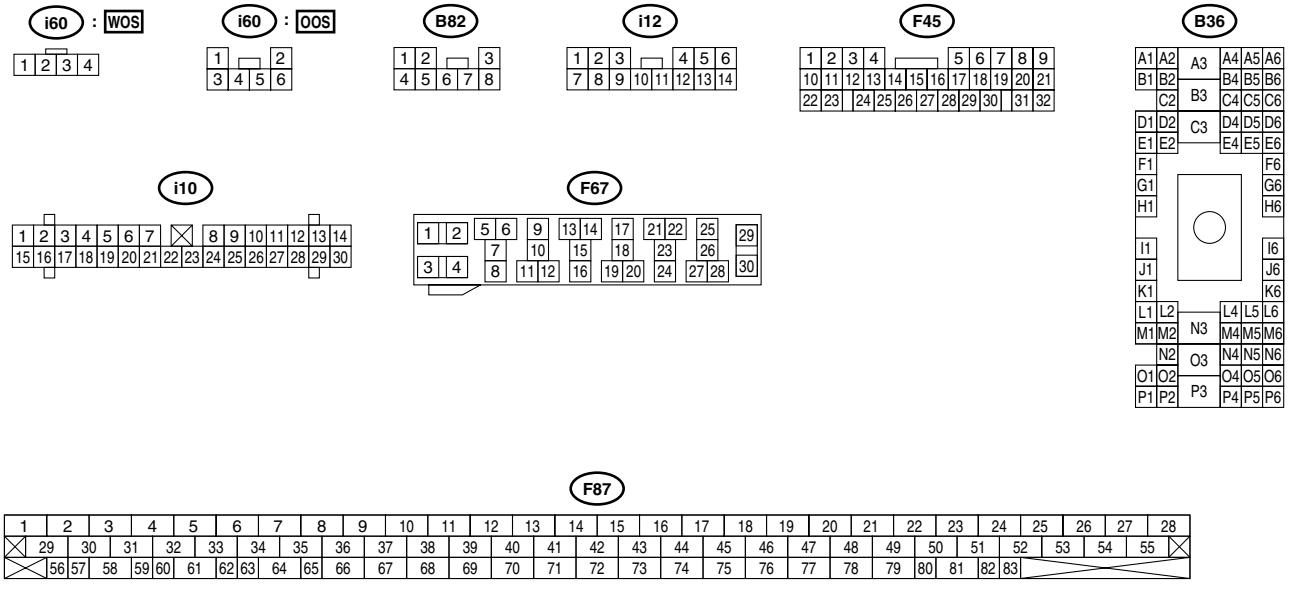
TROUBLE SYMPTOM:

- When starting the engine and while VDC OFF indicator light is kept ON.

NOTE:
When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.

WIRING DIAGRAM:





VDC00140

	Step	Check	Yes	No
1	**OPERATE VDC OFF SWITCH.** 1) Operate VDC OFF switch. 2) Turn ignition switch OFF, then turn ignition switch ON.	Is VDC OFF indicator light off?	The VDC is normal.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.**	Does VDC OFF indicator light come on when engine coolant temperature is too low? Does it go out after engine has warmed up?	The VDC is normal.	Go to step **3.**
3	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch. <Ref. to VDC-32, VDC Off Switch.>	Is VDC OFF switch OK?	Go to step **4.**	Replace VDC OFF switch.
4	**CHECK WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector from VDCCM. 3) Turn ignition switch to ON.	Does the VDC OFF indicator light remain off?	Go to step **5.**	Repair wiring harness.
5	**CHECK VDC OFF SWITCH LINE.** 1) Disconnect fuse from VDC OFF switch. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 40 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair VDC OFF switch circuit.

E: DIAGNOSTIC TROUBLE CODE (DTC) DOES NOT APPEAR.

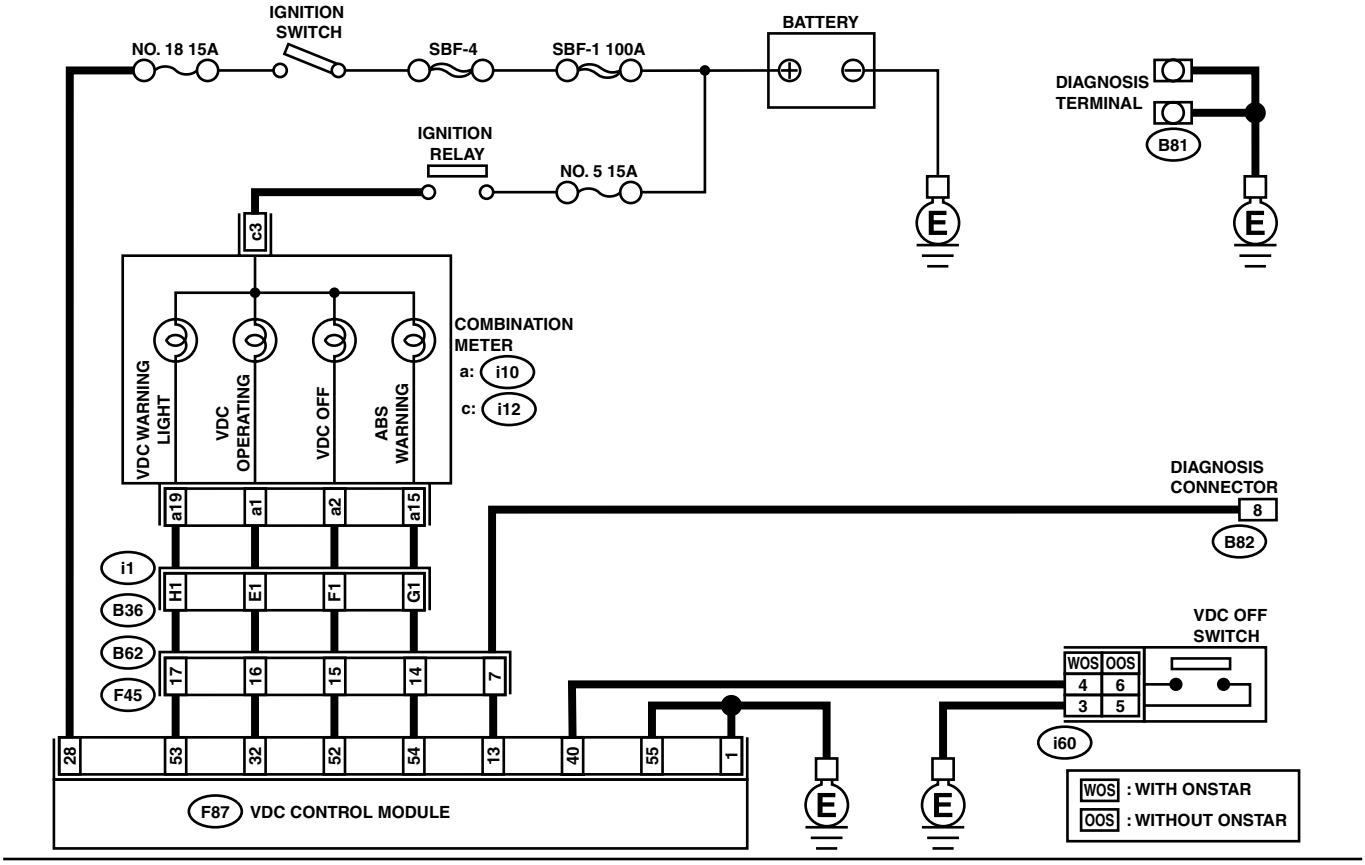
DIAGNOSIS:

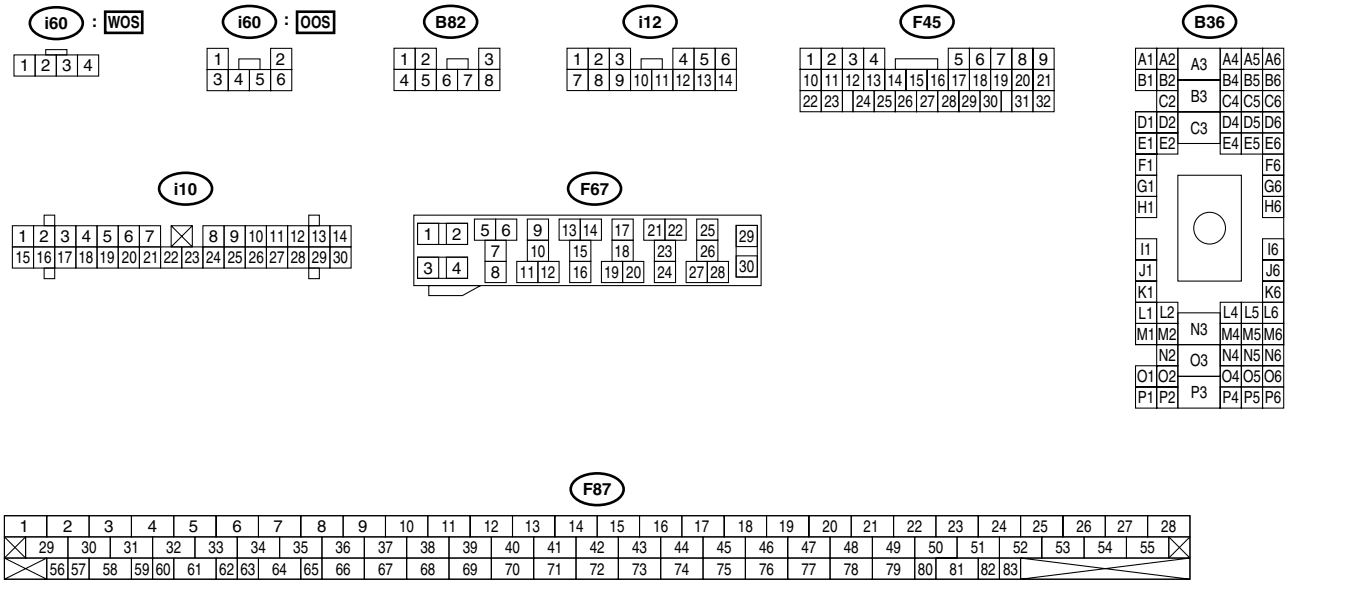
- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in the diagnostic mode.

WIRING DIAGRAM:





VDC00140

	Step	Check	Yes	No
1	**CHECK DIAGNOSIS TERMINAL.** Measure resistance between diagnosis terminals (B81) and chassis ground. ***Terminals*** ***Diagnosis terminal (A) — Chassis ground:*** ***Diagnosis terminal (B) — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair diagnosis terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1) Turn ignition switch to OFF. 2) Connect diagnosis terminal (B81) to diagnosis connector (B82) No. 8. 3) Disconnect connector from VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 13 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair harness connector between VDCCM and diagnosis connector.
3	**CHECK POOR CONTACT IN VDCCM CONNECTOR.**	Is there poor contact in VDCCM connector?	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

F: DTC 21 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

G: DTC 23 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

H: DTC 25 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-50, DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

MEMO:

I: DTC 27 ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

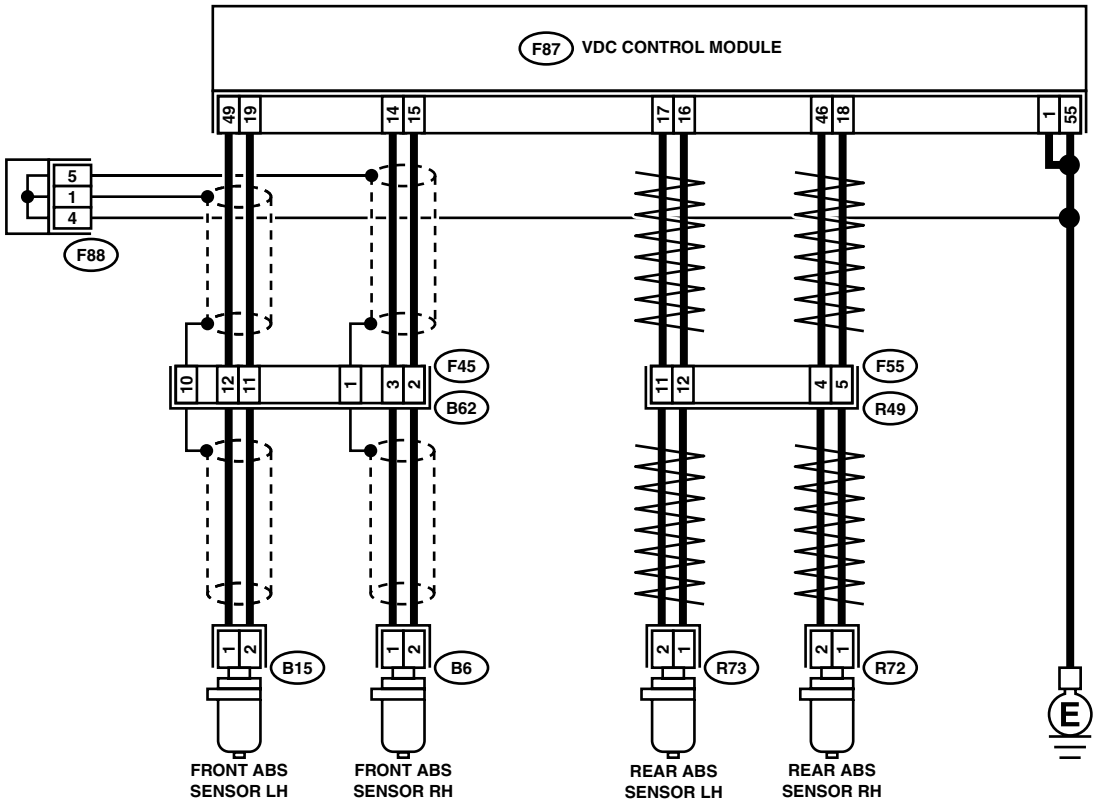
DIAGNOSIS:

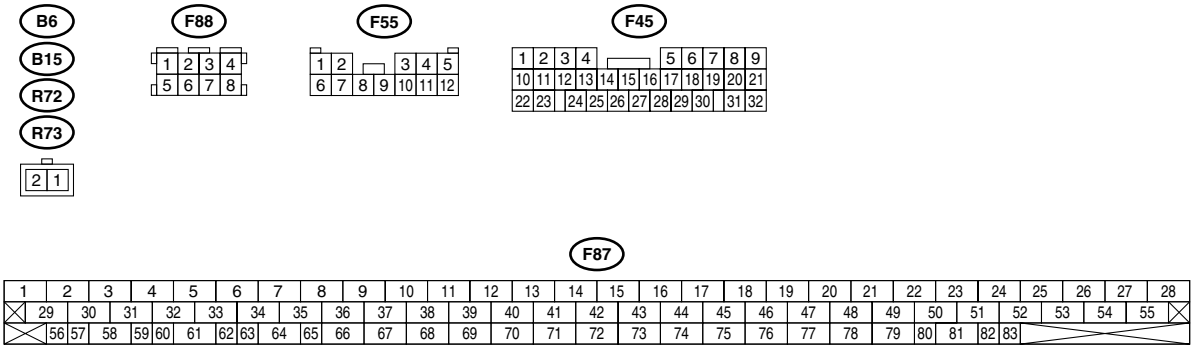
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00141

	Step	Check	Yes	No
1	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measure value within 1.0 to 1.5 kΩ?	Go to step **2.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
2	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **3.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
3	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
4	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 — No. 15:*** ***DTC 23 / (F87) No. 49 — No. 19:*** ***DTC 25 / (F87) No. 18 — No. 46:*** ***DTC 27 / (F87) No. 16 — No. 17:***	Is the measure value within 1.0 to 1.5 kΩ?	Go to step **5.**	Repair harness/ connector between VDCCM and ABS sensor.

	Step	Check	Yes	No
5	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair harness between VDCCM and ABS sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between VDCCM and ABS sensor.
7	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **8.**	Tighten ABS sensor installation bolts securely.
8	**CHECK ABS SENSOR GAP.** Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
9	**CHECK HUB AND TONE WHEEL RUNOUT.** Measure hub and tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **10.**	Repair hub and tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
10	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and ABS sensor?	Repair connector.	Go to step **11.**
11	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **12.**

Step		Check	Yes	No
12	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

J: DTC 22 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH)

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

K: DTC 24 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH)

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

L: DTC 26 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH)

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-56, DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH), Diagnostics Chart with Diagnosis Connector.>

MEMO:

M: DTC 28 ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH)

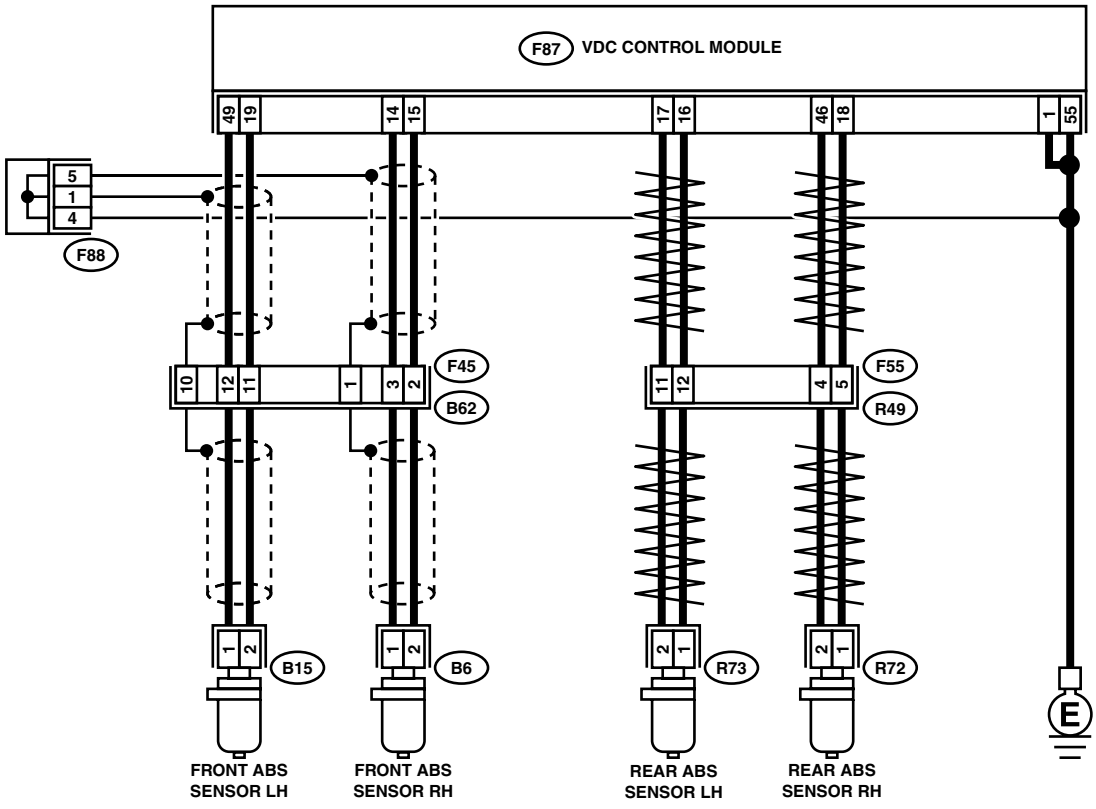
DIAGNOSIS:

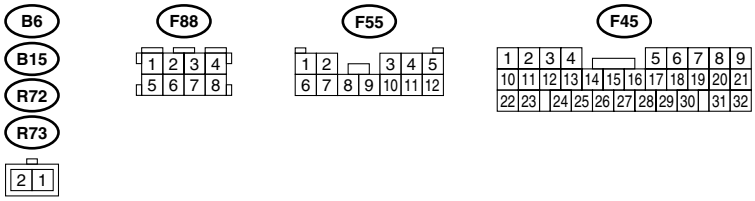
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

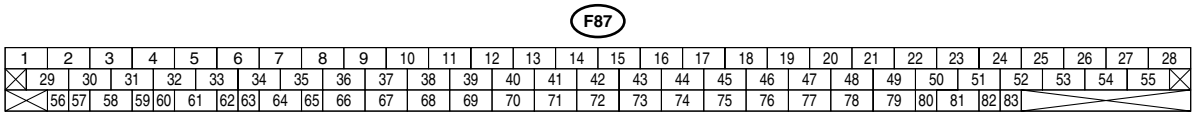
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







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	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **2.**	Tighten ABS sensor installation bolts securely.
2	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
3	**CHECK OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **4.**	Go to step **5.**
4	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-20, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 (+) — No. 15 (–):*** ***DTC 24 / (F87) No. 49 (+) — No. 19 (–):*** ***DTC 26 / (F87) No. 18 (+) — No. 46 (–):*** ***DTC 28 / (F87) No. 16 (+) — No. 17 (–):***	Is oscilloscope pattern smooth, as shown in figure?	Go to step **8.**	Go to step **5.**
5	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub in accordance with diagnostic trouble code.	Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **6.**
6	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS sensor pole piece or the tone wheel?	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **7.**
7	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **8.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

	Step	Check	Yes	No
8	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1.0 to 1.5 kΩ?	Go to step **9.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
9	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **10.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
10	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance at VDCCM connector terminals. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — No. 15:*** ***DTC 24 / (F87) No. 49 — No. 19:*** ***DTC 26 / (F87) No. 18 — No. 46:*** ***DTC 28 / (F87) No. 16 — No. 17:***	Is the measured value within 1.0 to 1.5 kΩ?	Go to step **11.**	Repair harness/ connector between VDCCM and ABS sensor.
11	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — Chassis ground:*** ***DTC 24 / (F87) No. 49 — Chassis ground:*** ***DTC 26 / (F87) No. 18 — Chassis ground:*** ***DTC 28 / (F87) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair harness/ connector between VDCCM and ABS sensor.
12	**CHECK GROUND CIRCUIT OF VDCCM.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **13.**	Repair VDCCM ground harness.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and ABS sensor?	Repair connector.	Go to step **14.**
14	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **15.**	Properly install the car telephone or the wireless transmitter.
15	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **16.**

	Step	Check	Yes	No
16	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F45) No. 1 — Chassis ground:*** ***DTC 24 / (F45) No. 10 — Chassis ground:*** NOTE: For the DTC 26 and 28, Go to step **17.**	Is the measured value less than 0.5 Ω?	Go to step **17.**	Repair shield harness.
17	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **18.**
18	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

N: DTC 29 ABNORMAL ABS SENSOR SIGNAL (ANY ONE OF FOUR)

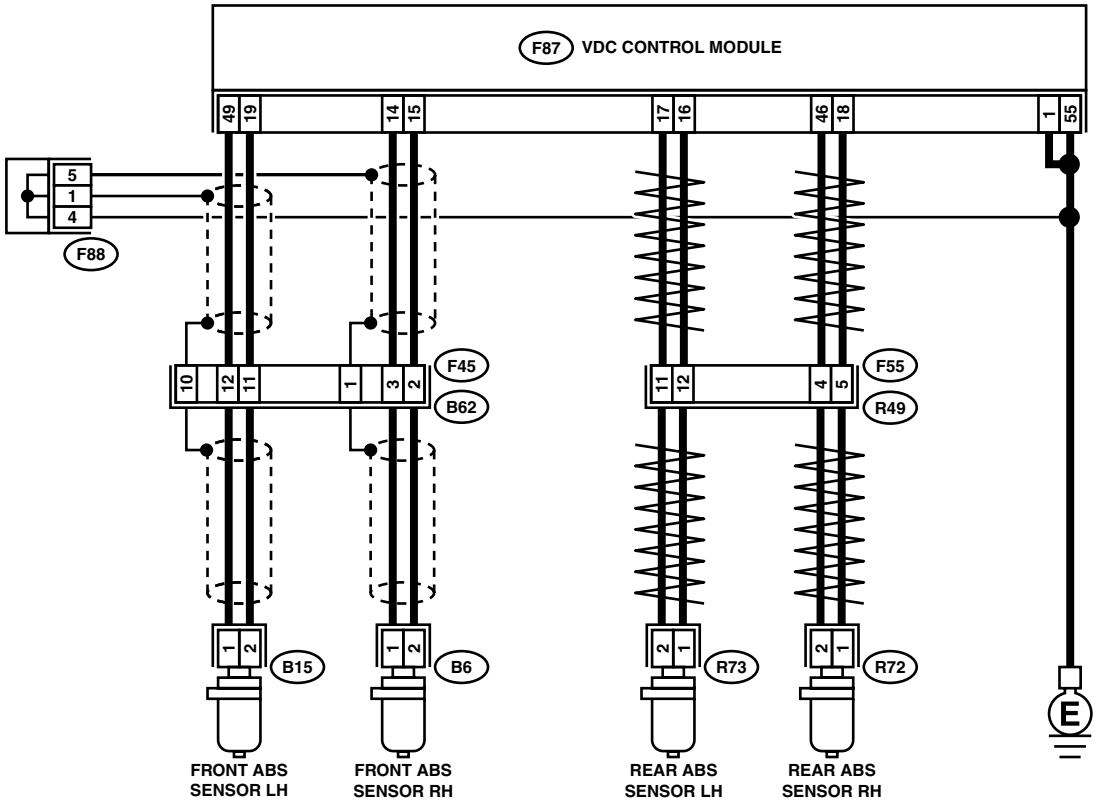
DIAGNOSIS:

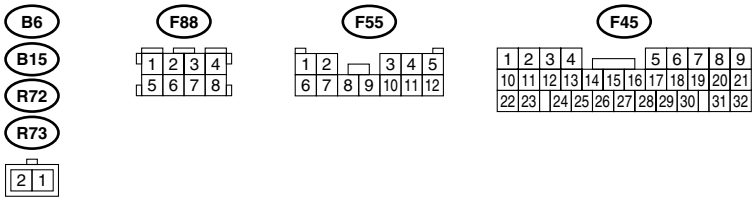
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

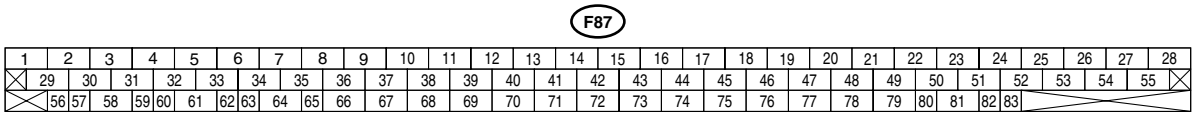
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00141

	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Did the wheels turn freely over 1 minute?	The VDC is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.**	Are the tire specifications correct?	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **6.**	Tighten ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**CHECK OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-20, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***(F87) No. 14 (+) — No. 15 (–) (Front RH):*** ***(F87) No. 49 (+) — No. 19 (–) (Front LH):*** ***(F87) No. 18 (+) — No. 46 (–) (Rear RH):*** ***(F87) No. 16 (+) — No. 17 (–) (Rear LH):***	Is oscilloscope pattern smooth, as shown in figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub.	Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **12.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
12	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the diagnostic same trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

O: DTC 31 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT RH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

P: DTC 33 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (FRONT LH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

Q: DTC 35 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR RH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

R: DTC 37 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (REAR LH INLET)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

S: DTC 61 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (PRIMARY CUT)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-64, DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT), Diagnostics Chart with Diagnosis Connector.>

T: DTC 62 ABNORMAL INLET AND CUT SOLENOID VALVE CIRCUIT(S) (SECONDARY CUT)

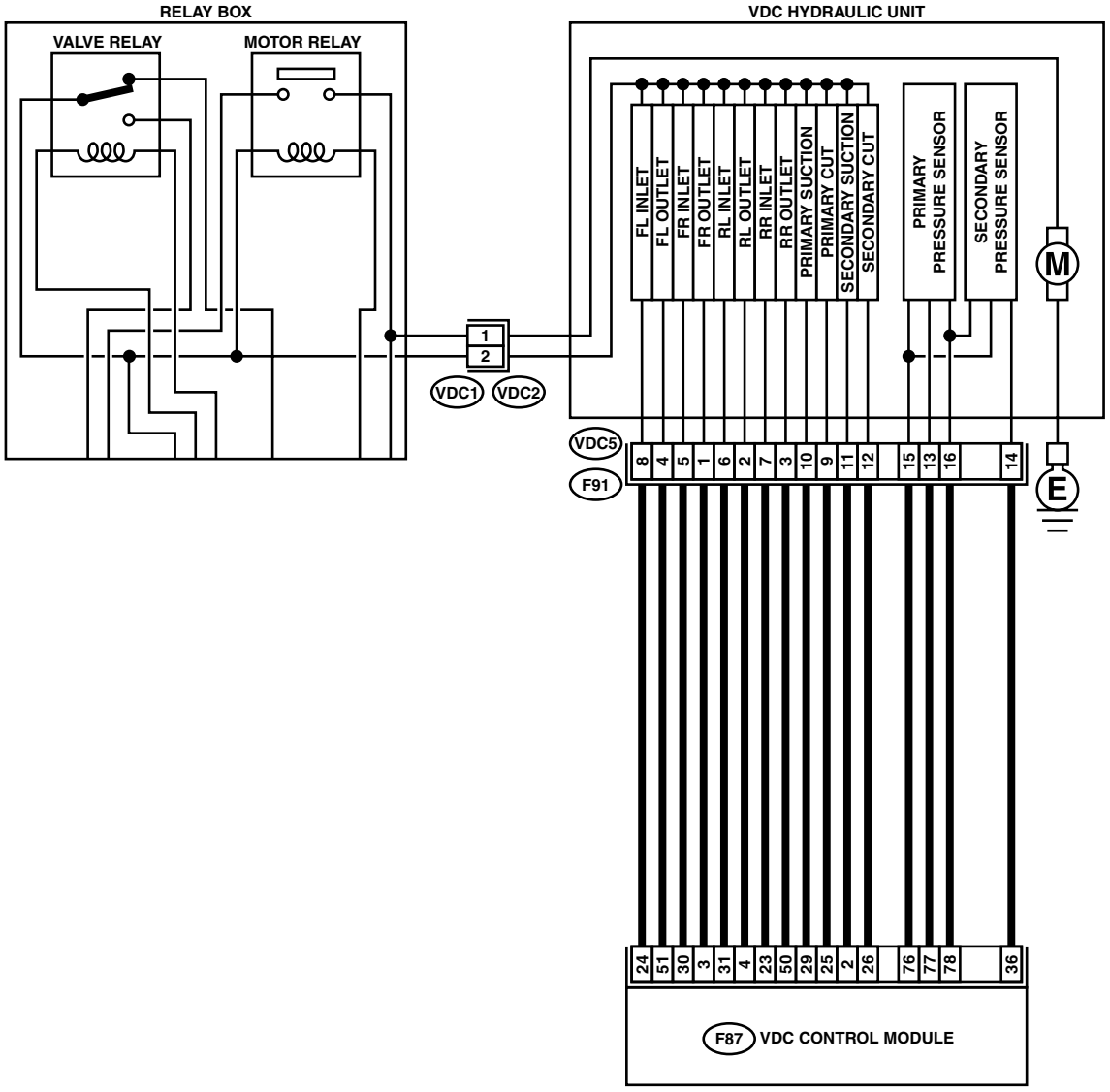
DIAGNOSIS:

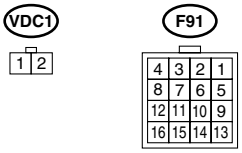
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

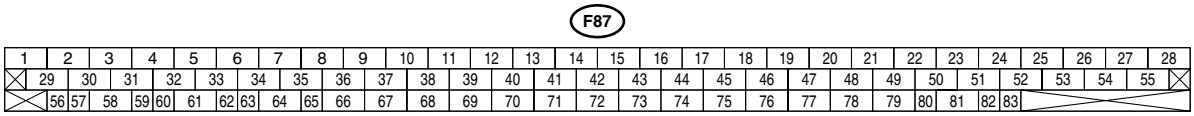
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00142

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — (VDC2) No. 2:*** ***DTC 33/(VDC5) No. 8 — (VDC2) No. 2:*** ***DTC 35/(VDC5) No. 7 — (VDC2) No. 2:*** ***DTC 37/(VDC5) No. 6 — (VDC2) No. 2:*** ***DTC 61/(VDC5) No. 9 — (VDC2) No. 2:*** ***DTC 62/(VDC5) No. 12 — (VDC2) No. 2:***	Is the measured value within 8.04 to 9.04 Ω?	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — Chassis ground:*** ***DTC 33/(VDC5) No. 8 — Chassis ground:*** ***DTC 35/(VDC5) No. 7 — Chassis ground:*** ***DTC 37/(VDC5) No. 6 — Chassis ground:*** ***DTC 61/(VDC5) No. 9 — Chassis ground:*** ***DTC 62/(VDC5) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — Chassis ground:*** ***DTC 33/(F87) No. 24 — Chassis ground:*** ***DTC 35/(F87) No. 23 — Chassis ground:*** ***DTC 37/(F87) No. 31 — Chassis ground:*** ***DTC 61/(F87) No. 25 — Chassis ground:*** ***DTC 62/(F87) No. 26 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — (VDC2) No. 2:*** ***DTC 33/(F87) No. 24 — (VDC2) No. 2:*** ***DTC 35/(F87) No. 23 — (VDC2) No. 2:*** ***DTC 37/(F87) No. 31— (VDC2) No. 2:*** ***DTC 61/(F87) No. 25 — (VDC2) No. 2:*** ***DTC 62/(F87) No. 26 — (VDC2) No. 2:***	Is the measured value within 7 to 10 Ω?	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Repair VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

U: DTC 32 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT RH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

V: DTC 34 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (FRONT LH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

W: DTC 36 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR RH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

X: DTC 38 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (REAR LH OUTLET)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

Y: DTC 63 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (PRIMARY SUCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-70, DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION), Diagnostics Chart with Diagnosis Connector.>

MEMO:

Z: DTC 64 ABNORMAL OUTLET AND SUCTION SOLENOID VALVE CIRCUIT(S) (SECONDARY SUCTION)

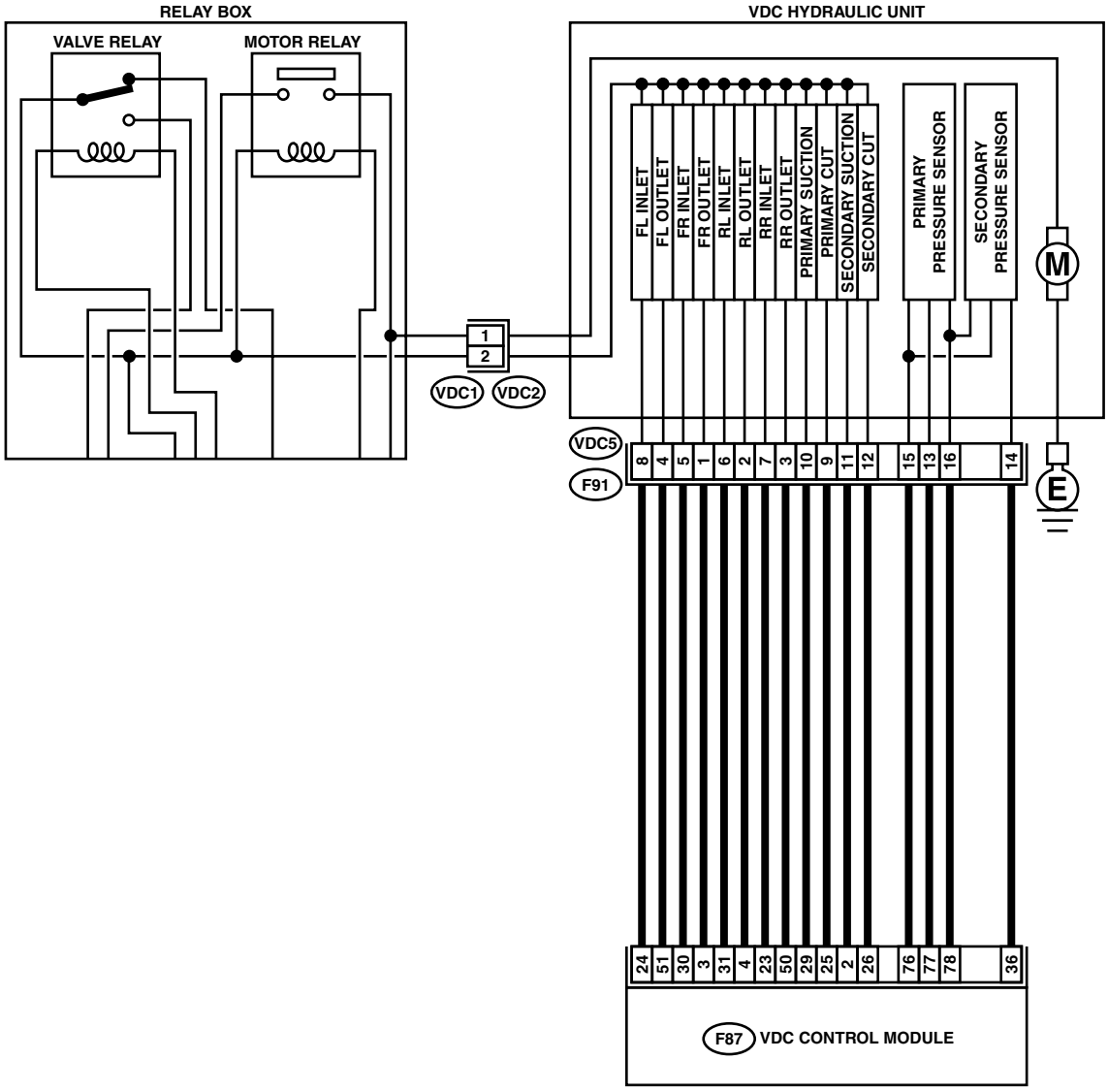
DIAGNOSIS:

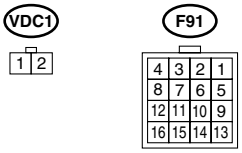
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

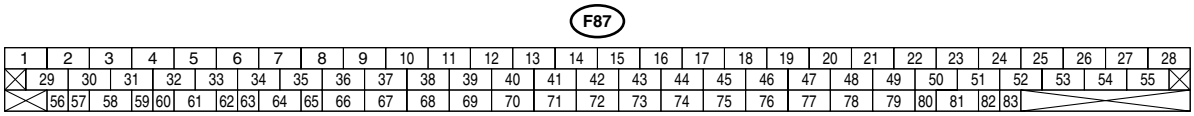
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00142

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — (VDC2) No. 2:*** ***DTC 34/(VDC5) No. 4 — (VDC2) No. 2:*** ***DTC 36/(VDC5) No. 3 — (VDC2) No. 2:*** ***DTC 38/(VDC5) No. 2 — (VDC2) No. 2:*** ***DTC 63/(VDC5) No. 10 — (VDC2) No. 2:*** ***DTC 64/(VDC5) No. 11 — (VDC2) No. 2:***	Is the measured value within 3.8 to 4.8 Ω?	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — Chassis ground:*** ***DTC 34/(VDC5) No. 4 — Chassis ground:*** ***DTC 36/(VDC5) No. 3 — Chassis ground:*** ***DTC 38/(VDC5) No. 2 — Chassis ground:*** ***DTC 63/(VDC5) No. 10 — Chassis ground:*** ***DTC 64/(VDC5) No. 11 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — Chassis ground:*** ***DTC 34/(F87) No. 51 — Chassis ground:*** ***DTC 36/(F87) No. 50 — Chassis ground:*** ***DTC 38/(F87) No. 4 — Chassis ground:*** ***DTC 63/(F87) No. 29 — Chassis ground:*** ***DTC 64/(F87) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — (VDC2) No. 1:*** ***DTC 34/(F87) No. 51 — (VDC2) No. 1:*** ***DTC 36/(F87) No. 50 — (VDC2) No. 1:*** ***DTC 38/(F87) No. 4 — (VDC2) No. 1:*** ***DTC 63/(F87) No. 29 — (VDC2) No. 1:*** ***DTC 64/(F87) No. 2 — (VDC2) No. 1:***	Is the measured value within 3 to 6 Ω?	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AA:DTC 41 ABNORMAL VDC CONTROL MODULE

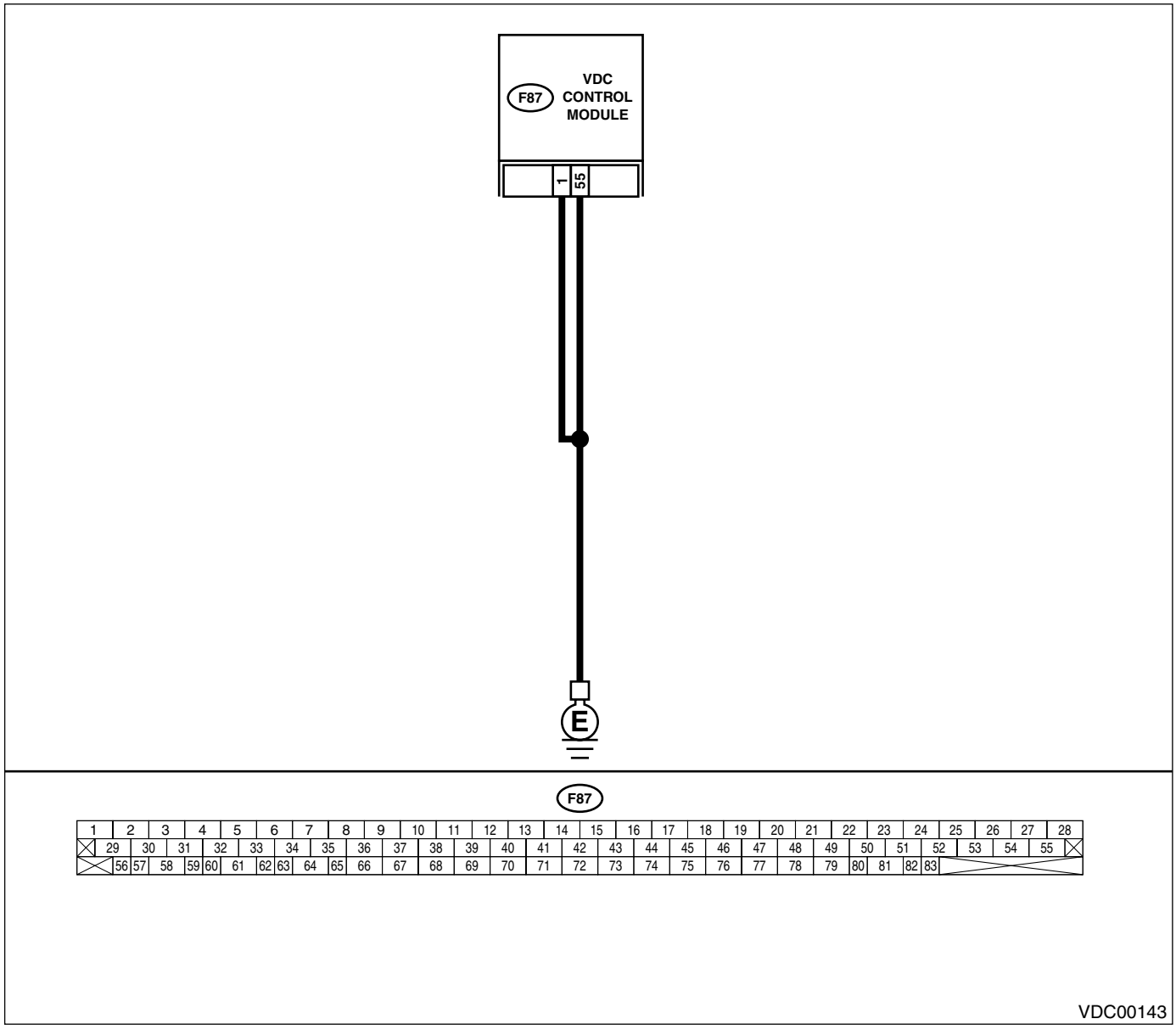
DIAGNOSIS:

- Faulty VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair VDCCM ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and VDCCM?	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AB:DTC 42 SOURCE VOLTAGE IS ABNORMAL.

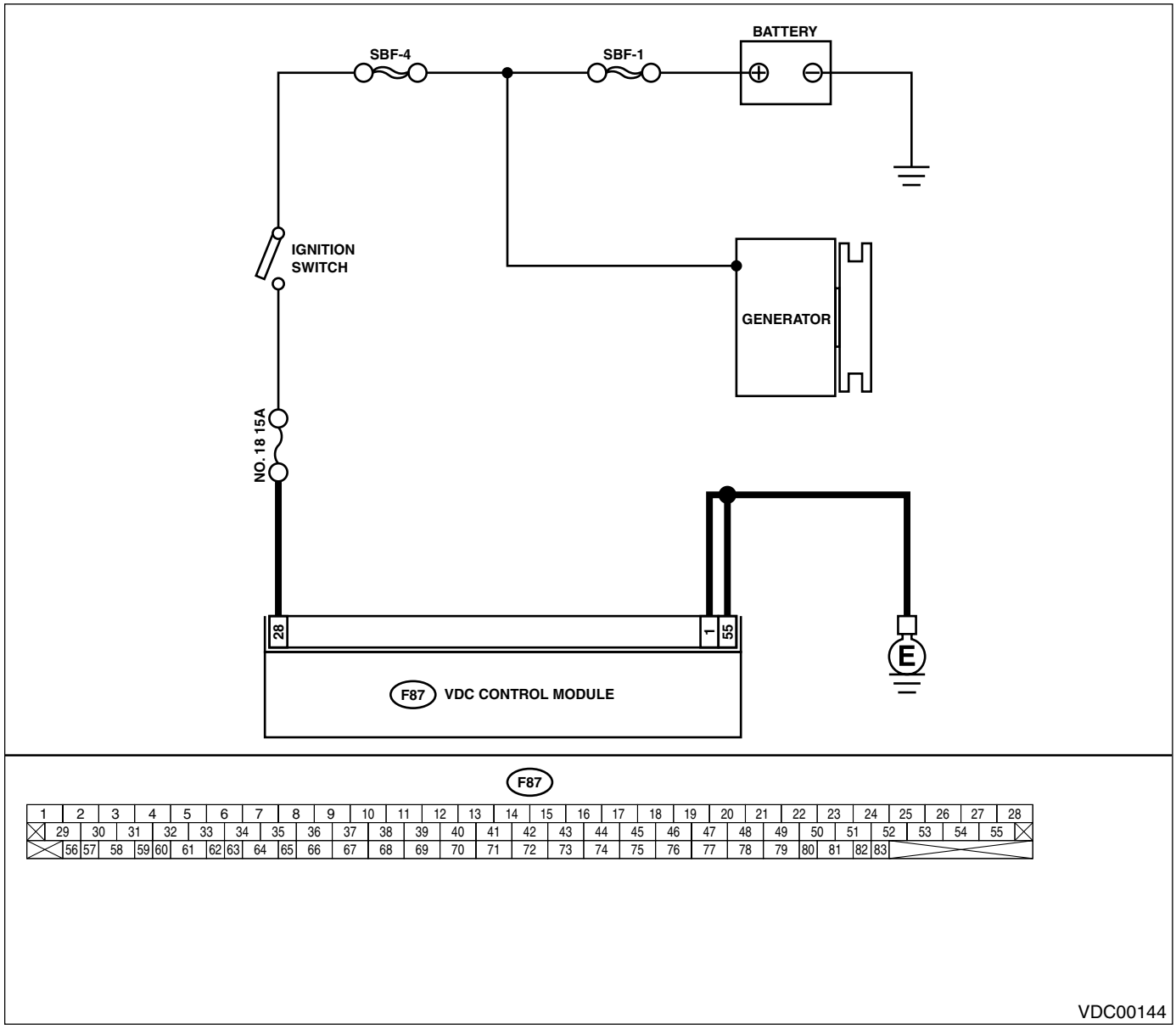
DIAGNOSIS:

- Power source voltage of the VDCCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair generator.
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Run the engine at idle. 3) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and VDCCM.
4	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair VDCCM ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and VDCCM?	Repair connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AC:DTC 43 FAULTY VDCCM — ECM COMMUNICATION LINE

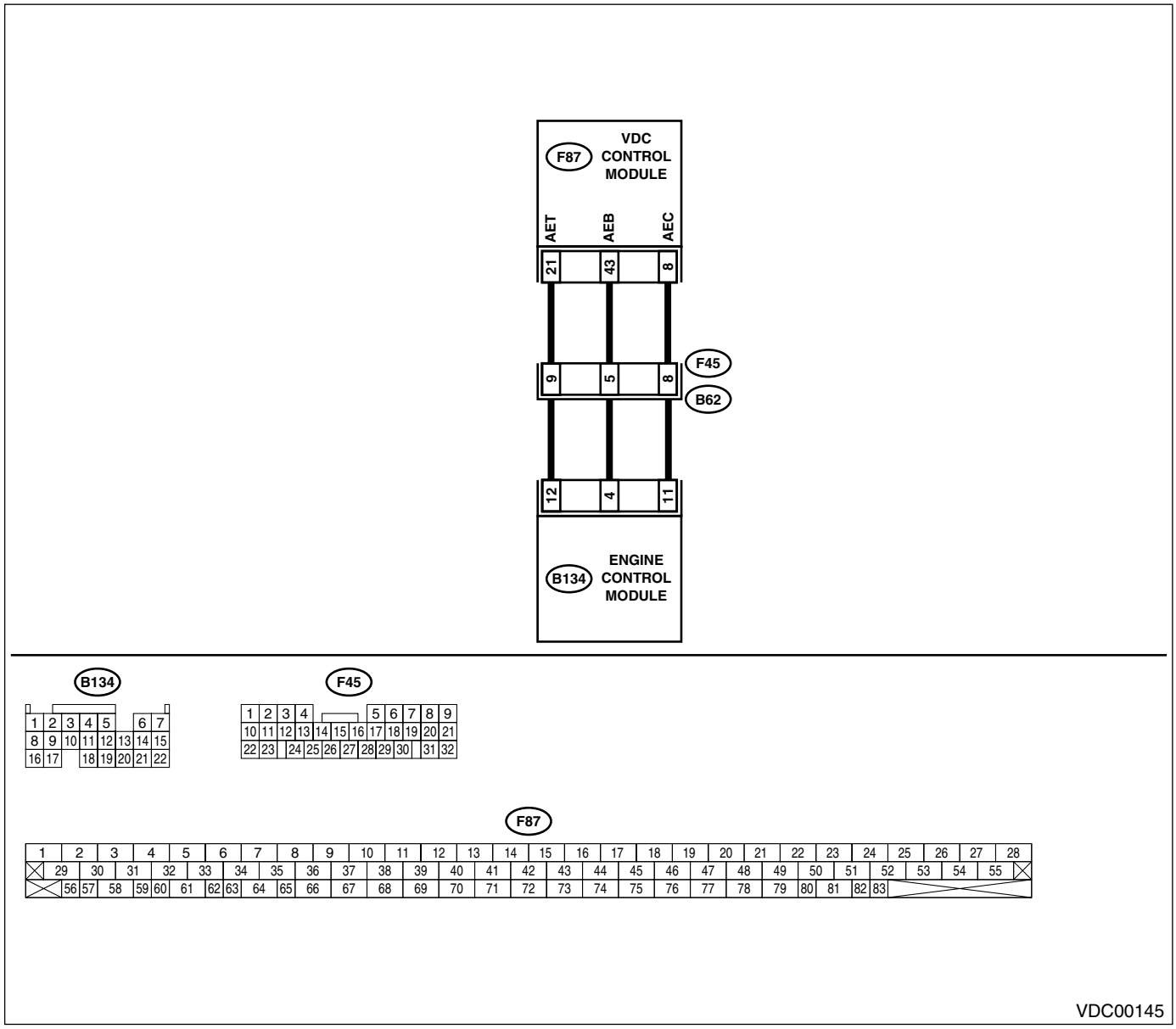
DIAGNOSIS:

- AET communication line is broken or short circuited.
- AEB communication line is broken or short circuited.
- AEC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 21 — (B134) No. 12:*** ***(F87) No. 43 — (B134) No. 4:*** ***(F87) No. 8 — (B134) No. 11:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 — Chassis ground:*** ***(F87) No. 43 — Chassis ground:*** ***(F87) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** ***(F87) No. 43 (+) — Chassis ground (–):*** ***(F87) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** ***(F87) No. 43 (+) — Chassis ground (–):*** ***(F87) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):*** ***(F87) No. 43 (+) — Chassis ground (–):*** ***(F87) No. 8 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ECM and VDCCM?	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

	Step	Check	Yes	No
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):*** ***(B134) No. 4 (+) — Chassis ground (–):*** ***(B134) No. 11 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector ECM?	Repair connector.	Go to step **11.**
11	**CHECK ENGINE.**	Is the engine functioning normally?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

AD:DTC 44 A COMMUNICATION WITH AT CONTROL ABNORMAL

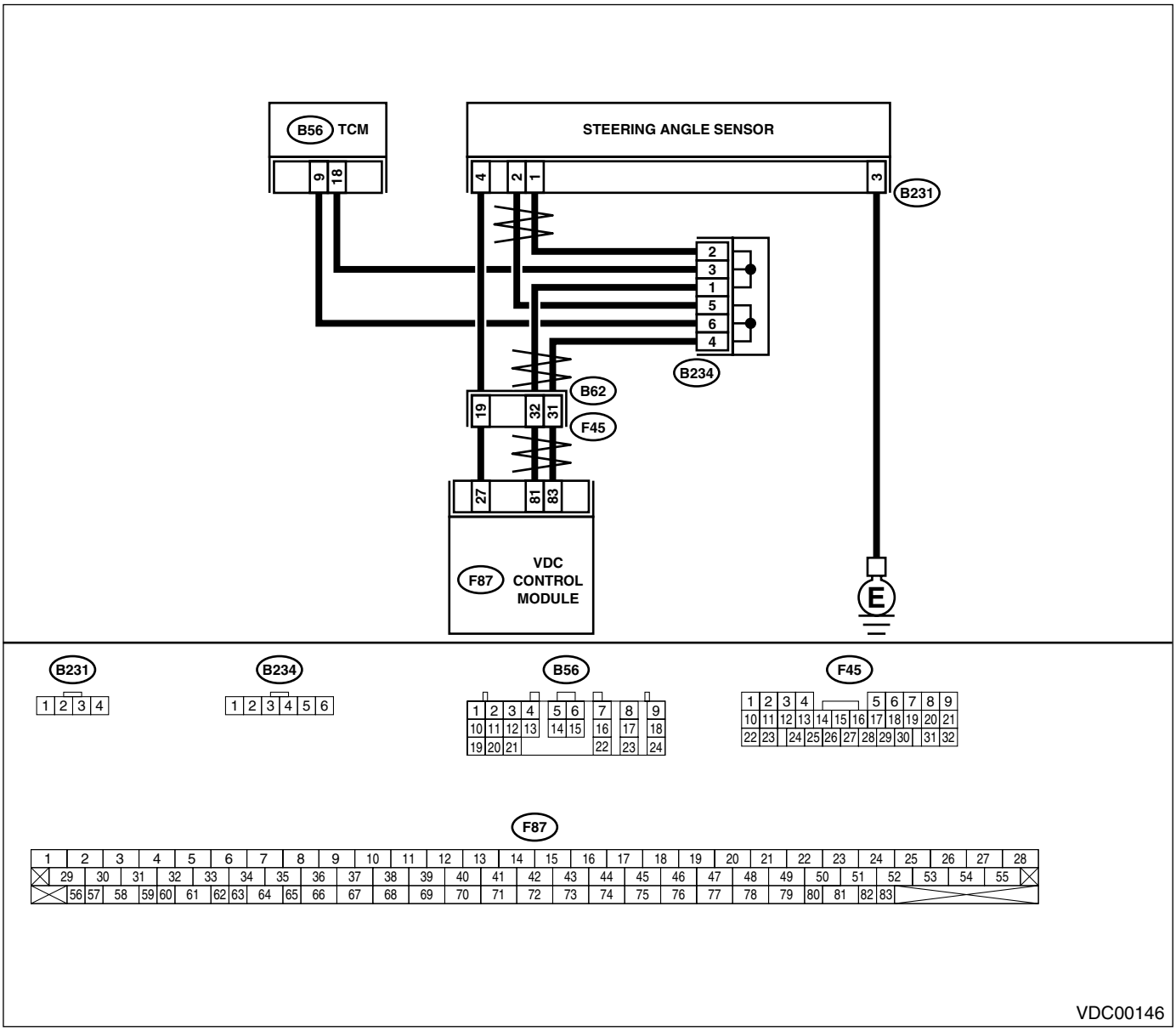
DIAGNOSIS:

- Communication with AT control faults

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK RESISTANCE OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Measure resistance between TCM connector terminals. ***Connector & terminal (B56) No. 9 — No. 18:***	Is the measured value within 57 to 63 Ω?	Go to step **2.**	Repair harness between TCM and VDCCM.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM connectors?	Repair connector.	Go to step **3.**
3	**CHECK TCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AE:DTC 45 CONTROL MODULE OUT OF SPECIFICATION

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK TCM.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **2.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
2	**CHECK VDCCM SPECIFICATIONS.** Check the VDCCM identification mark. ***VDCCM identification mark*** ***P***	Does the VDCCM identification mark agree with the vehicle specifications?	Go to step **3.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK TCM SPECIFICATIONS.** Check the TCM identification mark. ***TCM identification mark*** ***HN***	Does the TCM identification mark agree with the vehicle specifications?	Go to step **4.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
4	**CHECK TCM.** 1) Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **5.**	The original TCM has been faulty.
5	**CHECK VDCCM.** 1) Install original TCM. 2) Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **6.**	The original VDCCM has been faulty.
6	**CHECK VDCCM.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the diagnostic trouble code.

MEMO:

AF:DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY

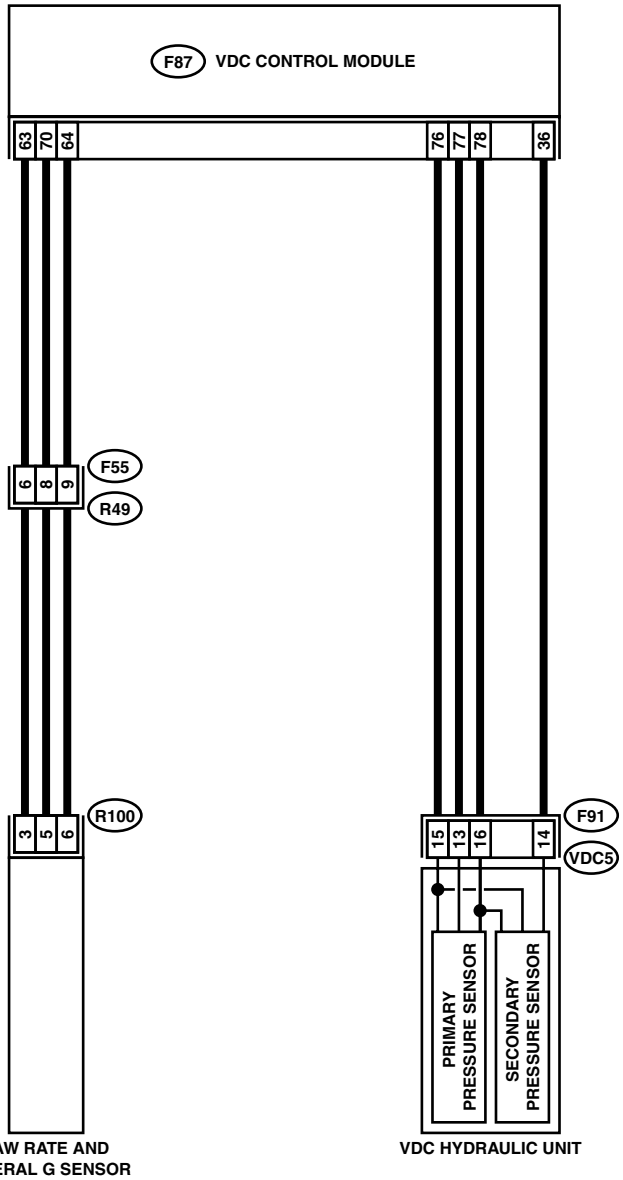
DIAGNOSIS:

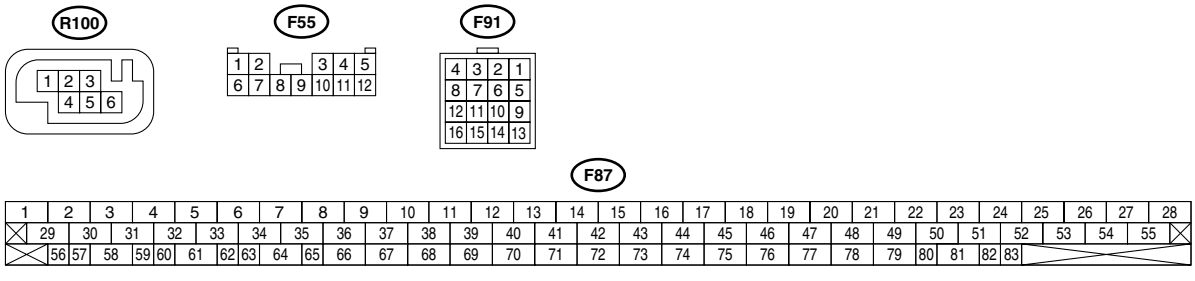
- 5 volt power supply is abnormal.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00147

	Step	Check	Yes	No
1	**CHECK GROUND SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):***	Is the measured value more than 1 MΩ?	Go to step **3.**	Go to step **2.**
2	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect connector from faulty sensors. 2) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):***	Is the measured value more than 1 MΩ?	Replace faulty sensors.	Repair or replace harness connector between VDCCM and faulty sensor.
3	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from faulty sensors. 3) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Go to step **6.**	Repair or replace harness connector between VDCCM and faulty sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Replace faulty sensor.	Repair or replace harness connector between VDCCM and faulty sensor.

AG:DTC 47 FAULTY CAN COMMUNICATION LINE

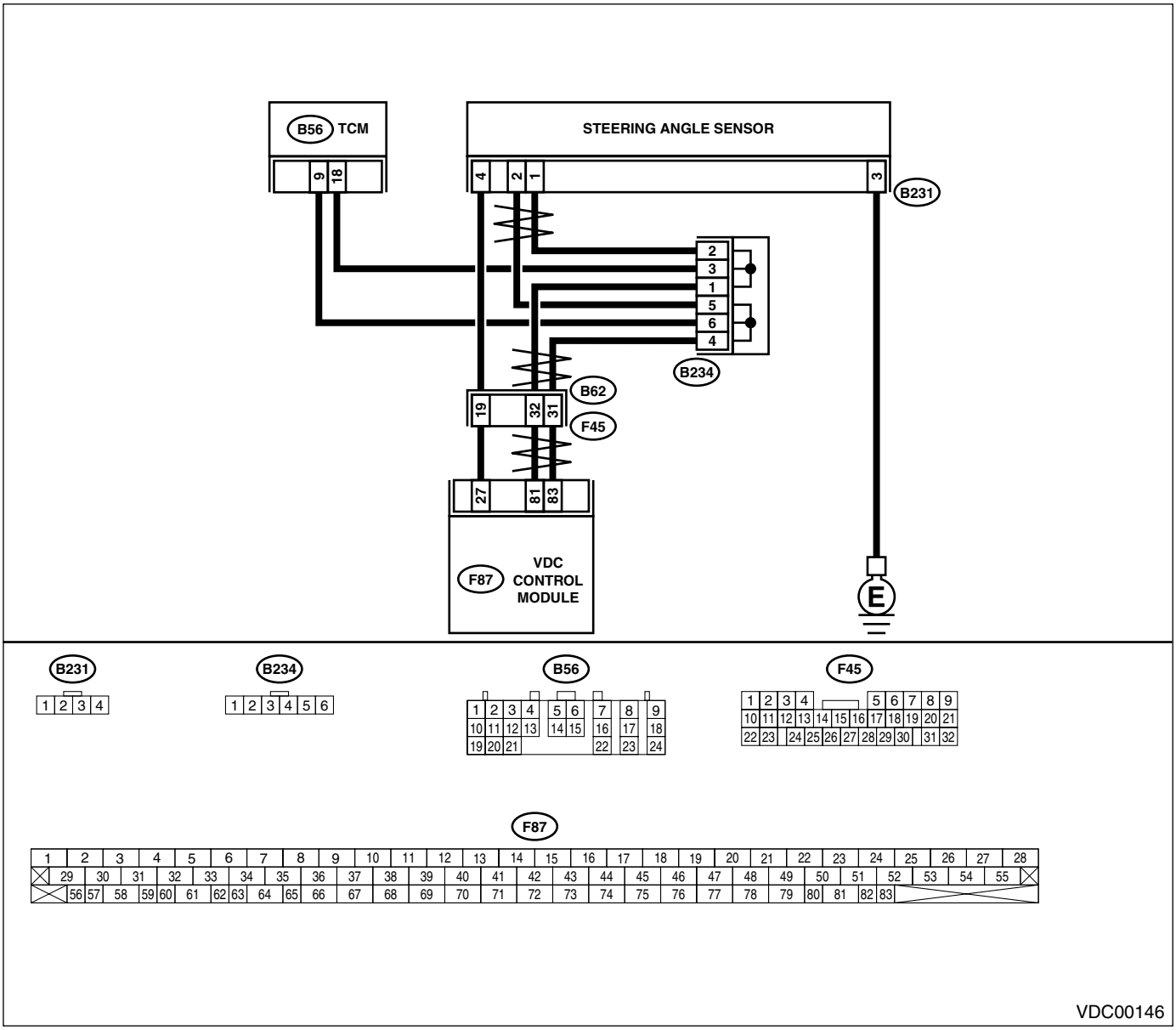
DIAGNOSIS:

- CAN communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM, TCM and steering angle sensor. 3) Measure resistance between VDCCM, TCM and steering angle sensor. ***Connector & terminal*** ***(F87) No. 83 — (B56) No. 9:*** ***(F87) No. 81 — (B56) No. 18:*** ***(F87) No. 83 — (B231) No. 2:*** ***(F87) No. 81 — (B231) No. 1:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.** Measure resistance between TCM and steering angle sensor. ***Connector & terminal*** ***(B56) No. 9 — (B231) No. 2:*** ***(B56) No. 18 — (B231) No. 1:***	Is the measured value less than 0.5 Ω?	Repair or replace harness connector between VDCCM and steering angle sensor.	Repair or replace harness connector between TCM and steering angle sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
4	**CHECK BATTERY SHORT OF SENSOR.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **5.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
5	**CHECK BATTERY SHORT OF SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **6.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to steering angle sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 83 — No. 81:***	Is the measured value within 114 to 126 Ω?	Go to step **8.**	Go to step **7.**
7	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in steering angle sensor?	Replace steering angle sensor.	Repair or replace steering angle sensor connector.
8	**CHECK VDCCM.** 1) Connect connector to VDCCM. 2) Disconnect connector from steering angle sensor. 3) Measure resistance between steering angle sensor connector terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the measured value within 114 to 126 Ω?	Go to step **10.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in steering angle sensor?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair or replace VDCCM connector.
10	**CHECK TCM.** 1) Connect connector to TCM. 2) Disconnect connector from VDCCM. 3) Measure resistance between steering angle sensor terminals. ***Connector & terminal (B231) No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Go to step **11.**
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in steering angle sensor?	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Repair or replace TCM connector.
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Are other diagnostic trouble codes being output?	Go to step **13.**	A temporary poor contact.
13	**CHECK DIAGNOSTIC TROUBLE CODE.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **14.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
14	**CHECK AT SYSTEM DIAGNOSTIC TROUBLE CODE.**	Is the AT system diagnostic trouble code DTC 86?	Replace steering angle sensor.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

MEMO:

AH:DTC 48 FAULTY ECM — VDCCM COMMUNICATION LINE

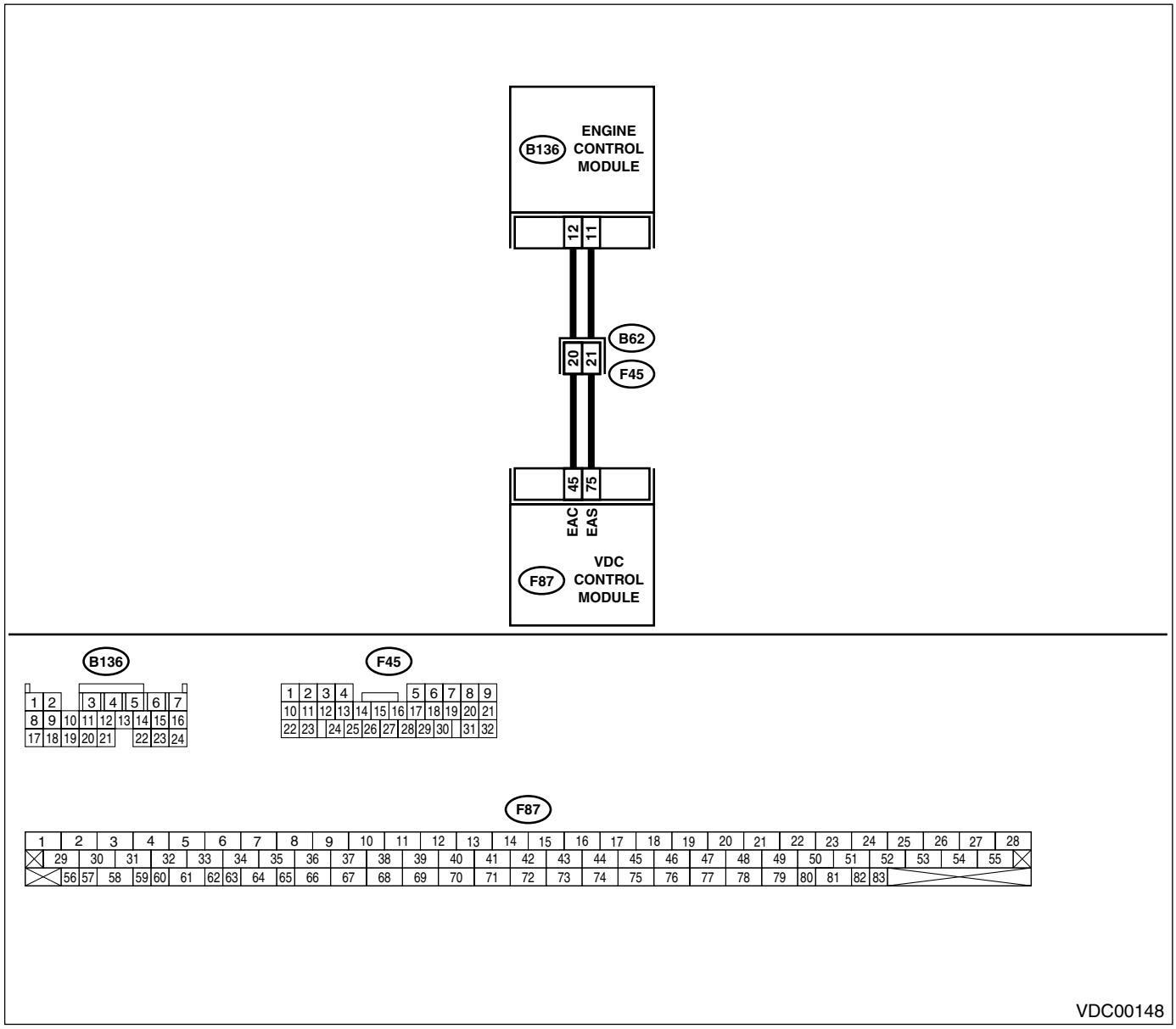
DIAGNOSIS:

- EAS communication line is broken or short circuited.
- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00148

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — (B136) No. 11:*** ***(F87) No. 45 — (B136) No. 12:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair or replace open circuit between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** ***(F87) No. 45 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair or replace ground short circuit between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** ***(F87) No. 45 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair or replace battery short circuit between VDCCM and ECM.
4	**CHECK INPUT VOLTAGE TO ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **5.**
5	**CHECK POOR CONTACT IN ECM CONNECTORS.**	Is there poor contact in ECM connector?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
6	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory.	Can the memory be erased?	Go to step **7.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AI: DTC 49 ABNORMAL ENGINE SPEED SIGNAL

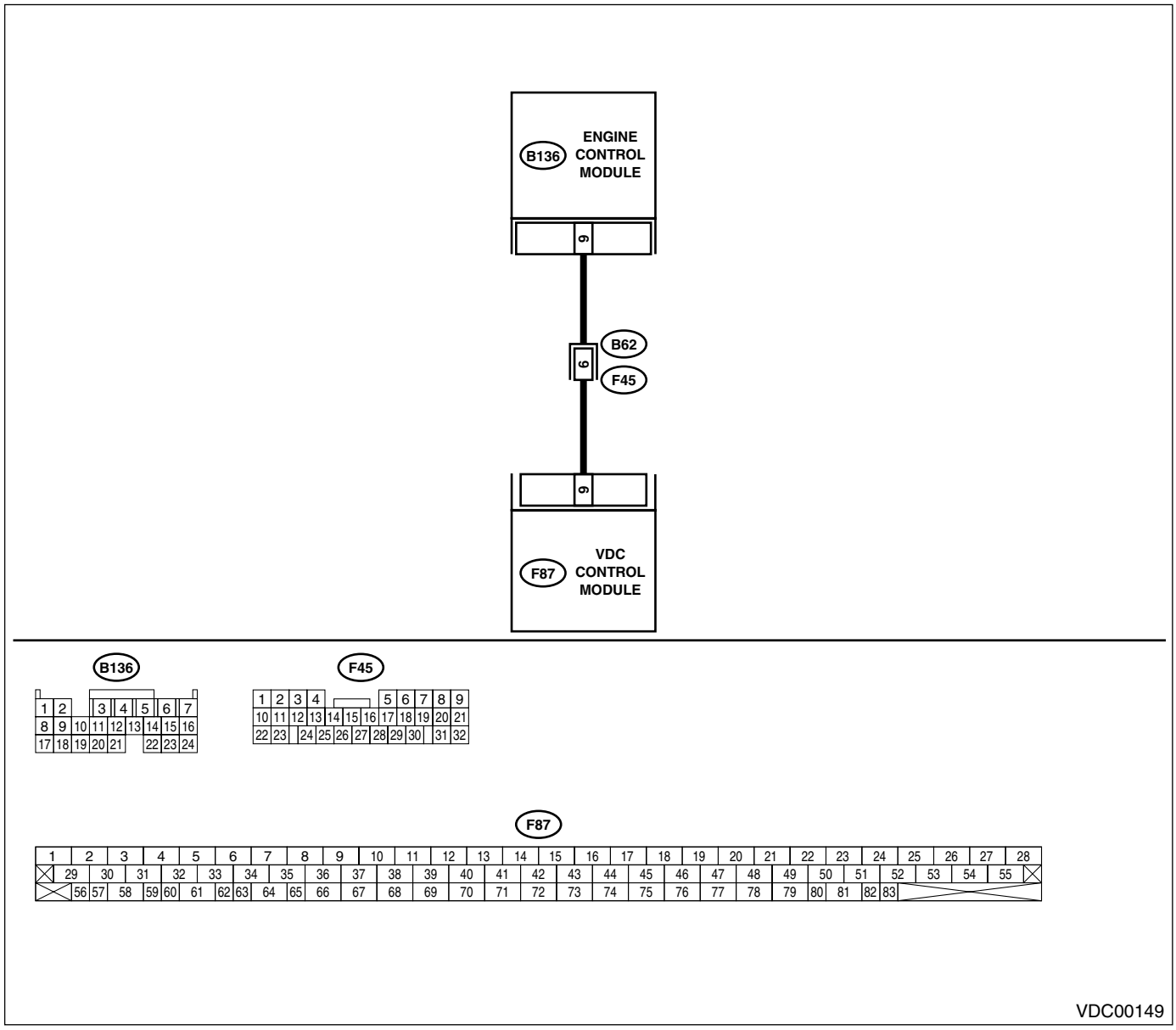
DIAGNOSIS:

- Engine speed signal line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TACHOMETER OPERATION IN COMBINATION METER.**	Does tachometer operate normally?	Go to step **2.**	Repair tachometer.
2	**CHECK HARNESS BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 9 — (B136) No. 9:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair harness connector between VDCCM and ECM.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and ECM?	Repair connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AJ:DTC 51 ABNORMAL VALVE RELAY

DIAGNOSIS:

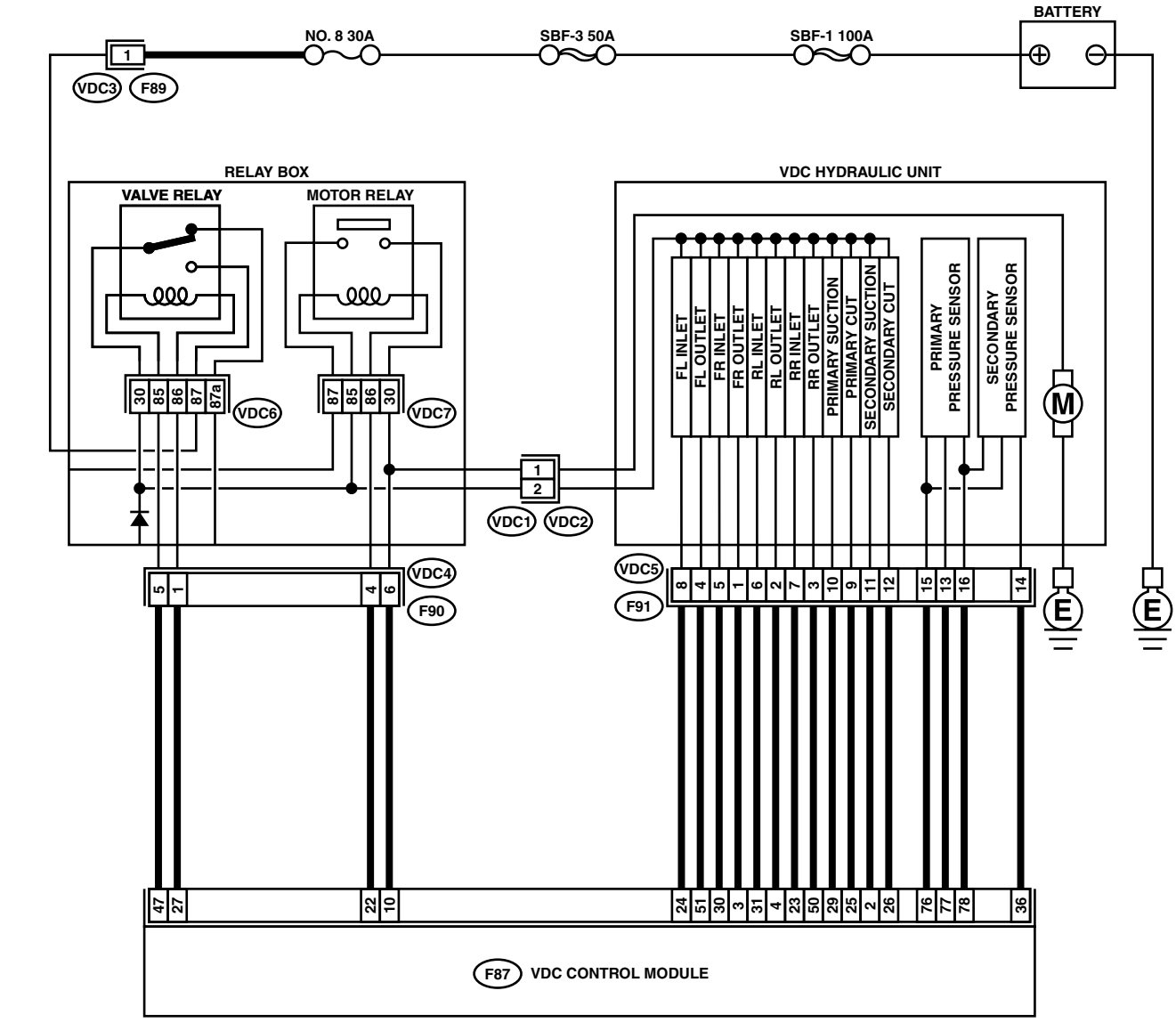
- Faulty valve relay

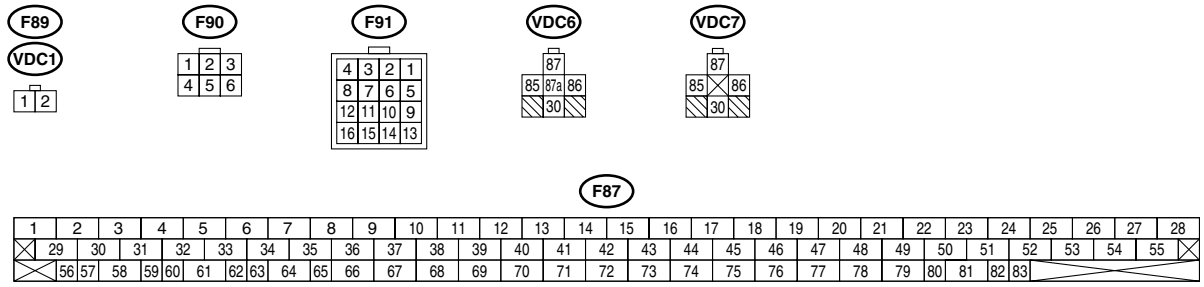
NOTE:
When DTC 74 ABNORMAL PRESSURE SENSOR procedure 4 is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00150

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Measure resistance between valve relay terminals. ***Terminals*** ***No. 85 — No. 86:***	Is the measured value within 93 to 113 Ω?	Go to step **2.**	Replace valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Connect battery to valve relay terminals No. 85 and No. 86. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Replace valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Replace valve relay.
5	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the measured value less than 0.5 Ω?	Go to step **6.**	Replace valve relay.
6	**CHECK SHORT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Replace valve relay.
7	**CHECK POWER SUPPLY FOR VALVE RELAY.** 1) Disconnect connector (F89) from relay box. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **8.**	Repair harness between battery and relay box connector. Check fuse No. 8.
8	**CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.** 1) Disconnect connector (VDC1) from VDCH/U. 2) Connect connector (F89) to relay box. 3) Measure voltage of relay box. ***Connector & terminal*** ***(VDC6) No. 87 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **9.**	Replace relay box and check fuse No. 8.

	Step	Check	Yes	No
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F90) from relay box. 3) Measure resistance between relay box connector and valve relay installing point. ***Connector & terminal*** ***(VDC4) No. 5 — (VDC6) No. 85:*** ***(VDC4) No. 1 — (VDC6) No. 86:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Replace relay box.
10	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 — Chassis ground:*** ***(VDC4) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace relay box and check fuse No. 8.
11	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **12.**	Replace relay box. Check fuse No. 8.
12	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Replace relay box. Check fuse No. 8.
13	**CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 47 — (F90) No. 5:*** ***(F87) No. 27 — (F90) No. 1:***	Is the measured value less than 0.5 Ω?	Go to step **14.**	Repair harness between VDCCM and relay box.
14	**CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 47 — Chassis ground:*** ***(F87) No. 27 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **15.**	Repair harness between VDCCM and relay box and check all fuses.
15	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **16.**	Repair harness between VDCCM and relay box.

	Step	Check	Yes	No
16	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **17.**	Repair harness between VDCCM and relay box.
17	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and valve relay installing point. ***Connector & terminal*** ***(VDC1) No. 2 — (VDC6) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **18.**	Replace relay box.
18	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **19.**	Replace relay box and check fuse No. 8.
19	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **20.**	Replace relay box. Check fuse No. 8.
20	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **21.**	Replace relay box. Check fuse No. 8.
21	**CHECK RESISTANCE OF INLET AND CUT SOLENOID VALVES.** 1) Disconnect connector from VDCH/U. 2) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 8 — (VDC2) No. 2:*** ***(VDC5) No. 5 — (VDC2) No. 2:*** ***(VDC5) No. 6 — (VDC2) No. 2:*** ***(VDC5) No. 7 — (VDC2) No. 2:*** ***(VDC5) No. 9 — (VDC2) No. 2:*** ***(VDC5) No. 12 — (VDC2) No. 2:***	Is the measured value within 8.04 to 9.04 Ω?	Go to step **22.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
22	**CHECK RESISTANCE OF OUTLET SOLENOID VALVE.** Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 4 — (VDC2) No. 2:*** ***(VDC5) No. 1 — (VDC2) No. 2:*** ***(VDC5) No. 2 — (VDC2) No. 2:*** ***(VDC5) No. 3 — (VDC2) No. 2:*** ***(VDC5) No. 10 — (VDC2) No. 2:*** ***(VDC5) No. 11 — (VDC2) No. 2:***	Is the measured value within 4.04 to 4.54 Ω?	Go to step **23.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
23	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **24.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
24	**CHECK BATTERY SHORT OF SOLENOID VALVE.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **25.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
25	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **26.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
26	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **27.**	Repair harness between VDCH/U and VDCCM and check all fuses.
27	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **28.**	Repair harness between VDCH/U and VDCCM and check all fuses.

	Step	Check	Yes	No
28	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 — Chassis ground:*** ***(F87) No. 24 — Chassis ground:*** ***(F87) No. 23 — Chassis ground:*** ***(F87) No. 31 — Chassis ground:*** ***(F87) No. 26 — Chassis ground:*** ***(F87) No. 25 — Chassis ground:*** ***(F87) No. 3 — Chassis ground:*** ***(F87) No. 51 — Chassis ground:*** ***(F87) No. 50 — Chassis ground:*** ***(F87) No. 4 — Chassis ground:*** ***(F87) No. 2 — Chassis ground:*** ***(F87) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **29.**	Repair harness between VDCH/U and VDCCM.
29	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***(F87) No. 30 — (VDC2) No. 2:*** ***(F87) No. 24 — (VDC2) No. 2:*** ***(F87) No. 23 — (VDC2) No. 2:*** ***(F87) No. 31 — (VDC2) No. 2:*** ***(F87) No. 26 — (VDC2) No. 2:*** ***(F87) No. 25 — (VDC2) No. 2:***	Is the measured value within 8.0 to 10.0 Ω?	Go to step **30.**	Repair harness/ connector between VDCH/U and VDCCM.
30	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***(F87) No. 3 — (VDC2) No. 2:*** ***(F87) No. 51 — (VDC2) No. 2:*** ***(F87) No. 50 — (VDC2) No. 2:*** ***(F87) No. 4 — (VDC2) No. 2:*** ***(F87) No. 2 — (VDC2) No. 2:*** ***(F87) No. 29 — (VDC2) No. 2:***	Is the measured value within 4.0 to 6.0 Ω?	Go to step **31.**	Repair harness/ connector between VDCH/U and VDCCM.
31	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and VDCH/U?	Repair connector.	Go to step **32.**
32	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **33.**
33	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AK:DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

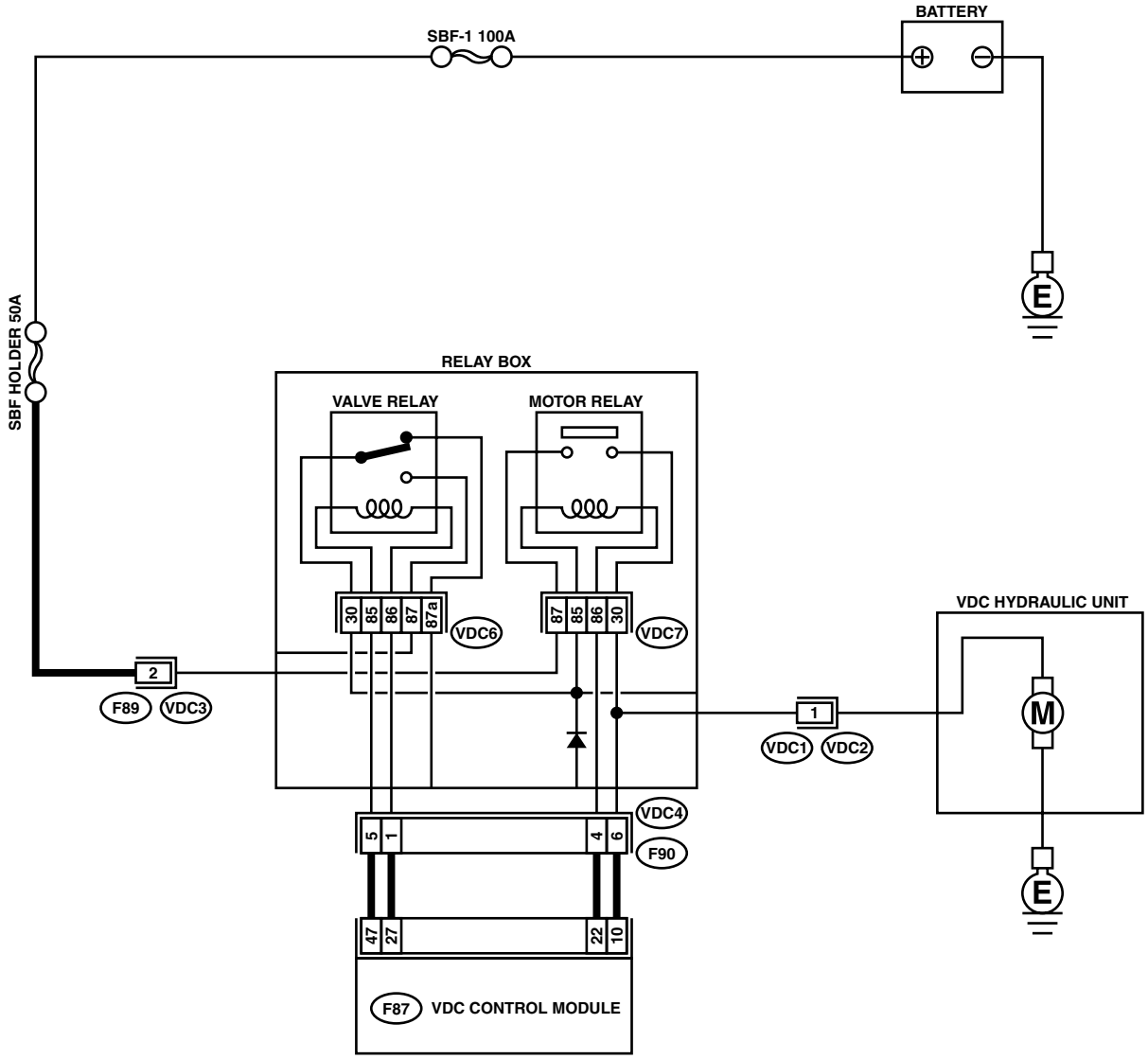
DIAGNOSIS:

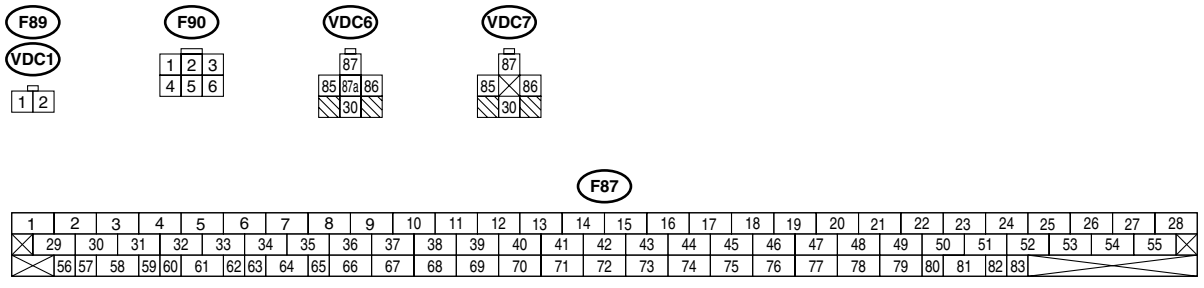
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00155

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 86:***	Is the measured value within 70 to 90 Ω?	Go to step **2.**	Replace motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Connect battery to motor relay terminals No. 85 and No. 86. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Replace motor relay.
3	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Disconnect battery from motor relay terminals. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace motor relay.
4	**CHECK SHORT OF MOTOR RELAY.** Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Replace motor relay.
5	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Repair harness/ connector between battery and relay box, and check fuse SBF holder.
6	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Connect connector (F89) to relay box. 2) Measure voltage between relay box and chassis ground. ***Connector & terminal*** ***(VDC7) No. 87 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **7.**	Replace relay box.
7	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connectors (VDC2, F90) from relay box. 3) Measure resistance between relay box connector unit and motor relay installing portion. ***Connector & terminal*** ***(VDC1) No. 1 — (VDC7) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **8.**	Replace relay box.
8	**CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and motor relay installing point. ***Connector & terminal*** ***(VDC4) No. 6 — (VDC7) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **9.**	Replace relay box.

	Step	Check	Yes	No
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** Measure resistance between motor relay installing point and relay box connector. ***Connector & terminal*** ***(VDC4) No. 4 — (VDC7) No. 86:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Replace relay box.
10	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Remove valve relay from relay box. 2) Measure resistance between motor relay installing point and valve relay installing point. ***Connector & terminal*** ***(VDC7) No. 85 — (VDC6) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **11.**	Replace relay box.
11	**CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector unit and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** ***(VDC4) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Replace relay box.
12	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 (+) — Chassis ground (–):*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Replace relay box.
13	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 (+) — Chassis ground (–):*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **14.**	Replace relay box.
14	**CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 22 — (F90) No. 4:*** ***(F87) No. 10 — (F90) No. 6:***	Is the measured value less than 0.5 Ω?	Go to step **15.**	Repair harness connector between VDCCM and relay box.
15	**CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 — Chassis ground:*** ***(F87) No. 10 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **16.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
16	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 (+) — Chassis ground (–):*** ***(F87) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **17.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.

	Step	Check	Yes	No
17	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 (+) — Chassis ground (–):*** ***(F87) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **18.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
18	**CHECK CONDITION OF MOTOR GROUND.** ***Tightening torque:*** ***32±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)***	Is the motor ground terminal clamped to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **19.**	Tighten the clamp of motor ground terminal.
19	**CHECK VDCCM MOTOR DRIVE TERMINAL.** 1) Turn ignition switch OFF. 2) Remove VDC connector cover. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install motor relay and valve relay to relay box. 5) Operate the ABS check sequence. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 22 (+) — No. 1 (–):***	Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?	Go to step **20.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
20	**CHECK MOTOR OPERATION.** Operate the check sequence. <Ref. to VDC-19, VDC Sequence Control.>	Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Go to step **21.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCH/U, relay box and VDCCM?	Repair connector.	Go to step **22.**
22	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AL:DTC 71 ABNORMAL STEERING ANGLE SENSOR

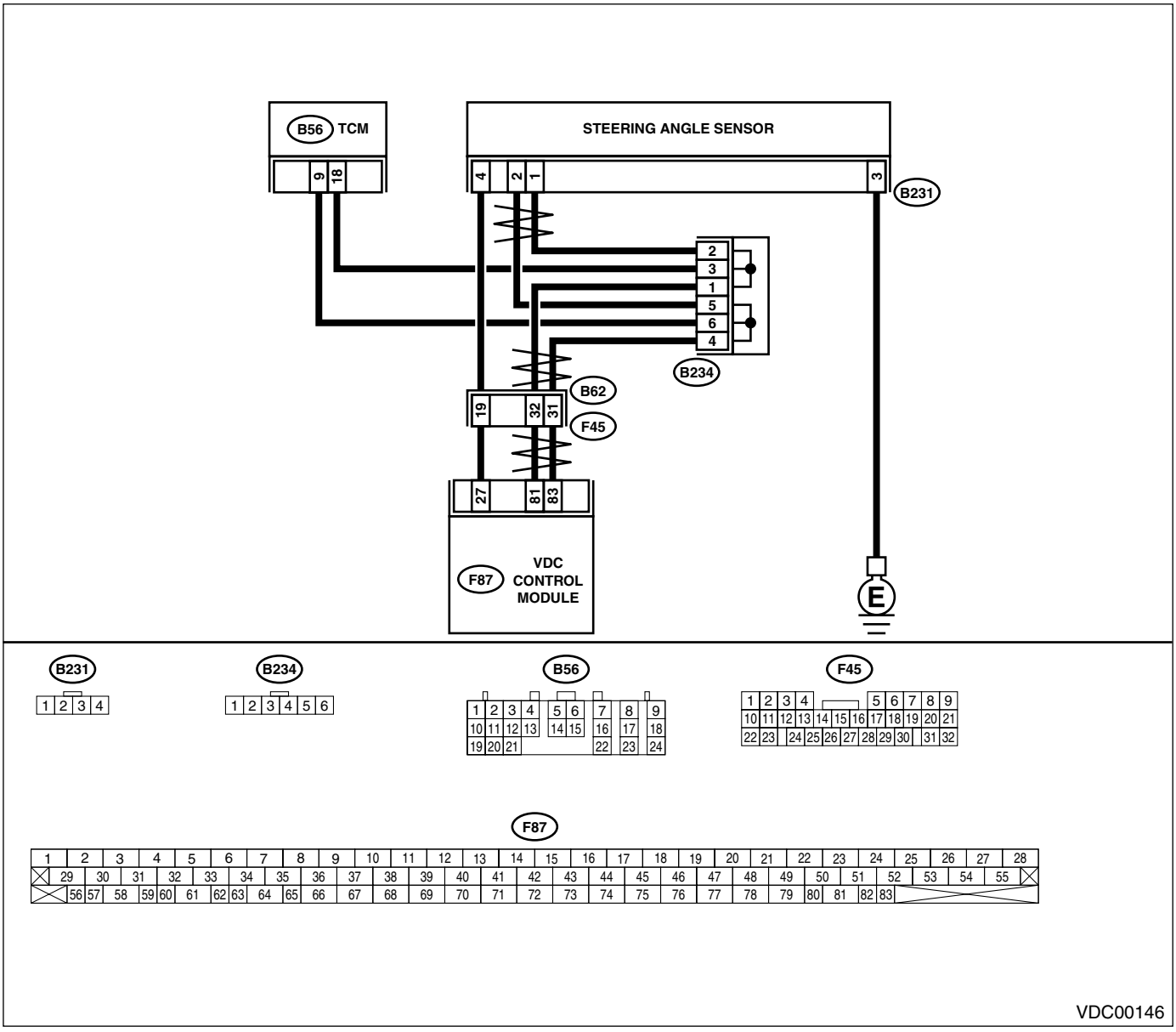
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel.	Is the angle of steering wheel alignment less than 5° from the straight-ahead position?	Go to step **2.**	Perform centering alignment of steering.
2	**CHECK RUNNING FIELD.** Check if the vehicle was driven on banked road surfaces or sandy surfaces (not dirt road surfaces).	Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory trouble code.	Go to step **3.**
3	**CHECK POWER SUPPLY OF STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from steering angle sensor. 3) Turn ignition switch to ON. 4) Measure voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 27 — Chassis ground:***	Is the measured value within 10 to 15 V?	Repair harness between yaw rate sensor and VDCCM.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in yaw rate sensor connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure resistance between steering sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **7.**	Repair steering angle sensor ground harness.
7	**CHECK HARNESS OF STEERING ANGLE SENSOR.** 1) Connect connector to steering angle sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 81 — No. 83:***	Is the measured value within 114 to 126 Ω?	Repair harness between steering angle sensor and VDCCM.	Go to step **8.**
8	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **10.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
10	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Replace steering angle sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original steering angle sensor has been faulty.

MEMO:

AM:DTC 72 ABNORMAL YAW RATE SENSOR

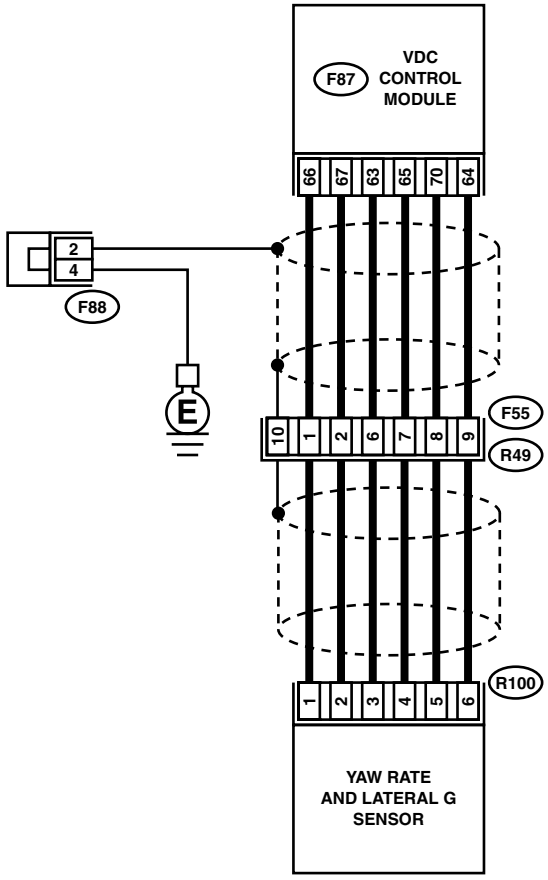
DIAGNOSIS:

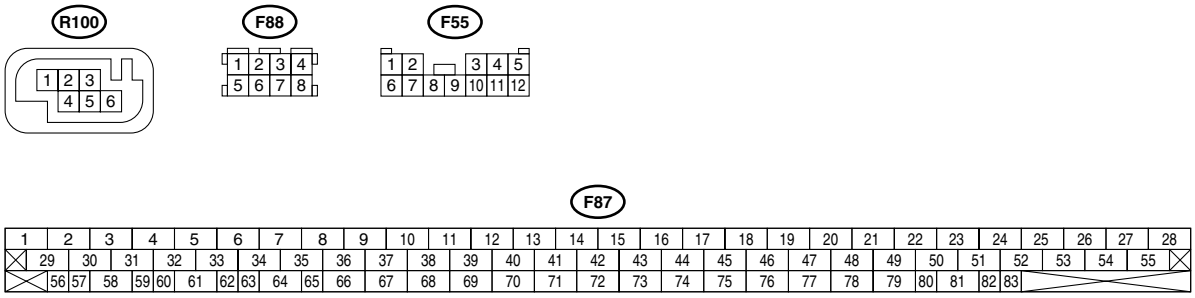
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

	Step	Check	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel.	Is the angle of steering wheel alignment less than 5° from the straight-ahead position?	Go to step **2.**	Perform centering alignment of steering.
2	**CHECK RUNNING FIELD.**	Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces) or surfaces with holes or bumps at high speeds?	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) or surfaces with holes or bumps at high speeds, sometimes results in a VDCCM memory trouble code.	Go to step **3.**
3	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor.	Is the yaw rate and lateral G sensor fixed securely?	Go to step **4.**	Install yaw rate and lateral G sensor securely.
4	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:***	Is the measured value within 10 to 15 V?	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in yaw rate and lateral G sensor connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK GROUND CIRCUIT OF YAW RATE AND LATERAL G SENSOR.** Measure resistance between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 6 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM connector. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 64 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **9.**
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
10	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 65 — (R100) No. 4:*** ***(F87) No. 66 — (R100) No. 1:*** ***(F87) No. 67 — (R100) No. 2:***	Is the measured value less than 0.5 Ω?	Go to step **11.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
11	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** ***(F87) No. 66 — Chassis ground:*** ***(F87) No. 67 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** ***(F87) No. 66 (+) — Chassis ground (–):*** ***(F87) No. 67 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **13.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** ***(F87) No. 66 (+) — Chassis ground (–):*** ***(F87) No. 67 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **14.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
14	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Connect all connectors. 4) Turn ignition switch to ON. 5) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 66 (+) — No. 64 (–):***	Is the measured value within 2.1 to 2.9 V?	Go to step **15.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

	Step	Check	Yes	No
15	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to ON. 2) Check oscilloscope signal pattern between VDCCM connector terminals.<Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> ***Connector & terminal*** ***(F87) No. 67 (+) — No. 64 (–):***	Is the oscilloscope pattern the same as shown in the figure?	Go to step **16.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
16	**CHECK YAW RATE SENSOR.** Check oscilloscope pattern between yaw rate and lateral G sensor terminals.<Ref. to VDC-19, WAVEFORM, MEASUREMENT, Control Module I/O Signal.> ***Connector & terminal*** ***(F87) No. 65 (+) — No. 64 (–):***	Is the oscilloscope pattern the same as shown in the figure?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-8, VDC Control Module (VDCCM).>

AN:DTC 73 ABNORMAL LATERAL G SENSOR

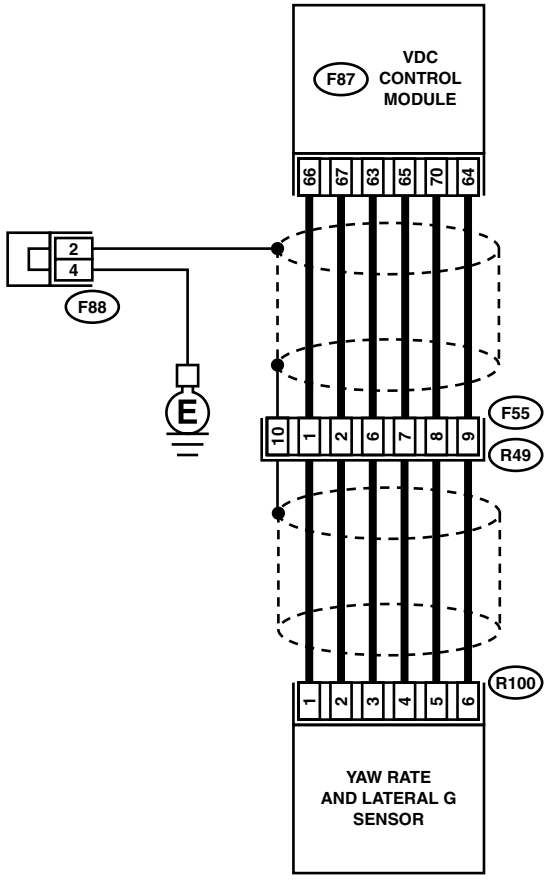
DIAGNOSIS:

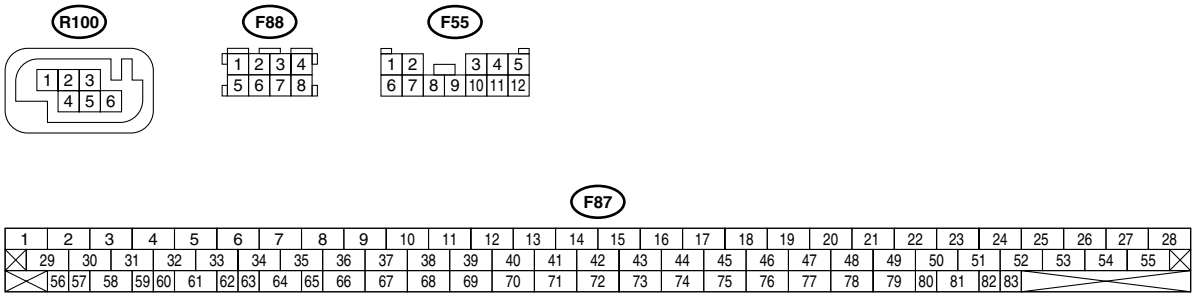
- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK INSTALLATION OF LATERAL G SENSOR.** Check installation of lateral G sensor.	Is the yaw rate and lateral G sensor fixed securely?	Go to step **2.**	Install yaw rate and lateral G sensor securely.
2	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 3 (+) — No. 6 (–):***	Is the measured value within 10 to 15 V?	Go to step **3.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
3	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between yaw rate and lateral G sensor terminals. ***Terminals*** ***No. 3 — No. 5:***	Is the measured value within 4.3 to 4.9 kΩ?	Go to step **4.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
4	**CHECK OPEN CIRCUIT IN YAW RATE AND LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Connect connector to yaw rate and lateral G sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 63 — No. 70:***	Is the measured value within 4.3 to 4.9 kΩ?	Go to step **5.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT IN YAW RATE AND LATERAL G SENSOR HARNESS.** 1) Disconnect connector from yaw rate and lateral G sensor. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** ***(F87) No. 70 — Chassis ground:*** ***(F87) No. 64 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–):*** ***(F87) No. 70 (+) — Chassis ground (–):*** ***(F87) No. 64 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–):*** ***(F87) No. 70 (+) — Chassis ground (–):*** ***(F87) No. 64 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **8.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

	Step	Check	Yes	No
8	**CHECK LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove yaw rate and lateral G sensor from vehicle. 3) Connect connector to yaw rate and lateral G sensor. 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):***	Is the measured value within 2.3 to 2.7 V when yaw rate and lateral G sensor is horizontal?	Go to step **9.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
9	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):***	Is the measured value within 3.3 to 3.7 V when yaw rate and lateral G sensor is inclined 90° to left?	Go to step **10.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
10	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):***	Is the measured value within 1.3 to 1.7 V when yaw rate and lateral G sensor is inclined 90° to right?	Go to step **11.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	Repair connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

AO:DTC 74 ABNORMAL PRESSURE SENSOR

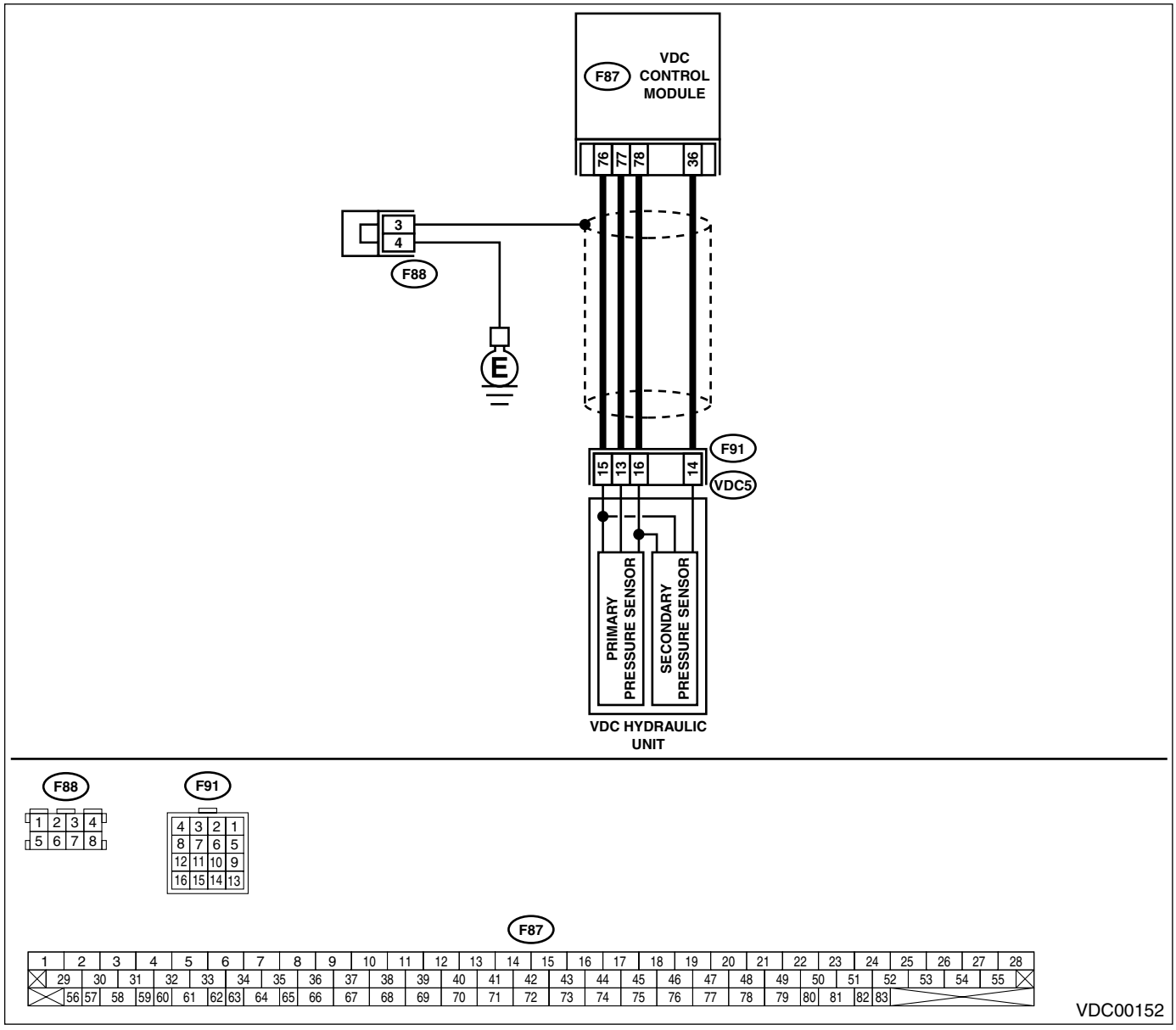
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 76 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Replace harness between VDCH/U and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY OF PRESSURE SENSOR.** NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):***	Is the measured value within 4.75 to 5.25 V?	Go to step **7.**	Go to step **5.**
5	**CHECK POWER SUPPLY OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 78 (+) — No. 76 (–):***	Is the measured value within 4.75 to 5.25 V?	Repair harness between VDCH/U and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:*** ***(F91) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCH/U and VDCCM.

	Step	Check	Yes	No
8	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **9.**	Repair harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **10.**	Repair harness between VDCH/U and VDCCM.
10	**CHECK OUTPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 77 (+) — No. 76 (–):*** ***(F87) No. 36 (+) — No. 76 (–):***	Is the measured value within 0.48 to 0.72 V?	Go to step **11.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
11	**CHECK BRAKE FLUID LEAKAGE.** Inspect fluid leakage between brake master cylinder and VDCH/U.	Does brake fluid leak?	Retighten or replace.	Go to step **12.**
12	**CHECK BRAKE MASTER CYLINDER.** Inspect brake master cylinder hydraulic pressure. <Ref. to BR-29, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.>	Is hydraulic pressure normal?	Go to step **13.**	Replace master cylinder.
13	**CHECK BRAKE PEDAL STROKE.** Measure the stroke between non-forced pedal position and forced pedal position with 50 kg (110 lb).	Is the measured value less than 95 mm (3.74 in)?	Go to step **14.**	Perform bleeding.
14	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Depress the brake pedal with 50 kg (110 lb). 2) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***A (F87) No. 77 (+) — No. 76 (–):*** ***B (F87) No. 36 (+) — No. 76 (–):***	Is the voltage difference between A and B more than 0.2 V?	Go to step **15.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
15	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and pressure sensor?	Repair connector.	Go to step **16.**
16	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **17.**

Step		Check	Yes	No
17	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

14.Diagnostics Chart with Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE (SELECT MONITOR COMMUNICATION FAILURE)

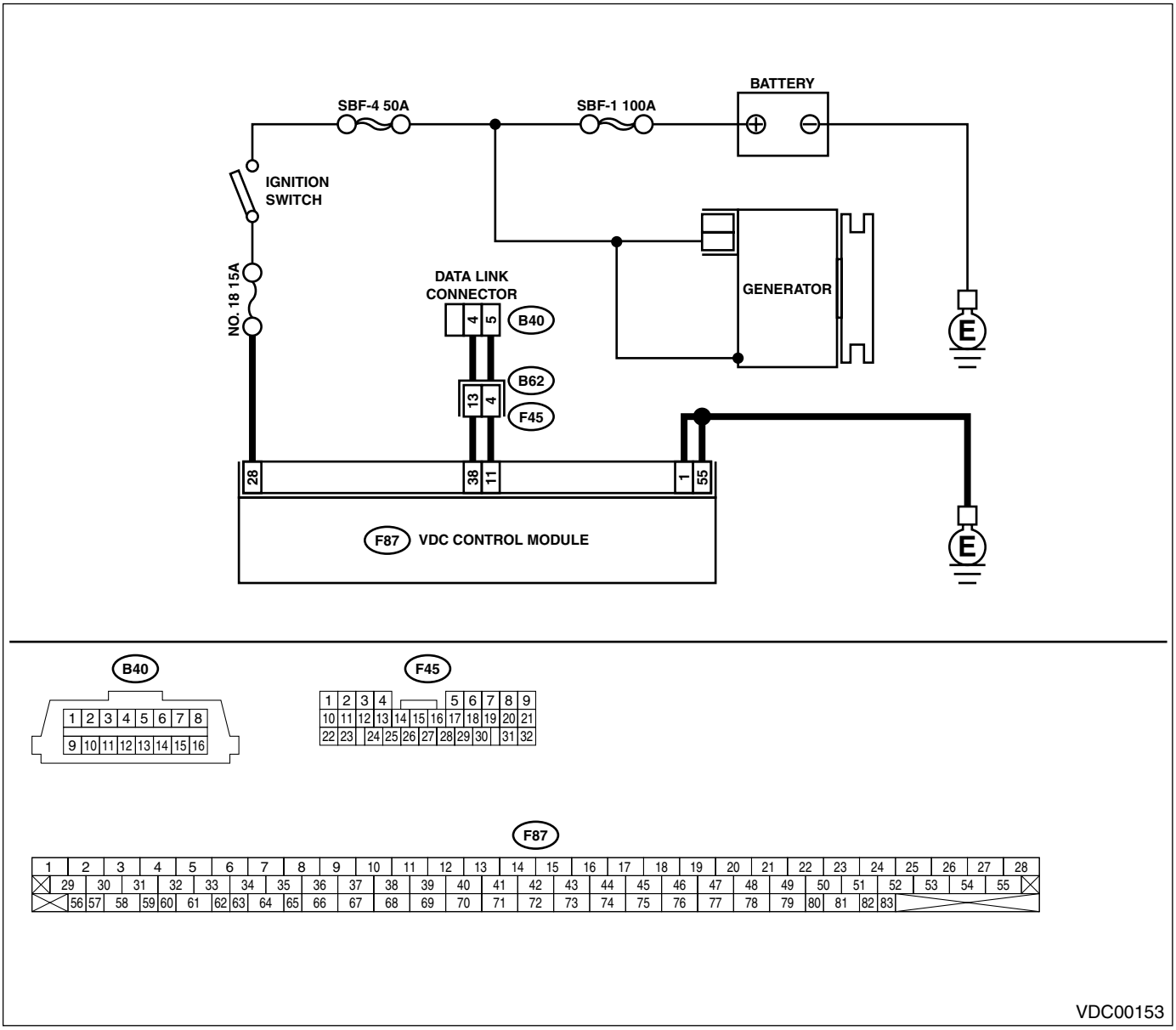
DIAGNOSIS:

- Faulty harness connector

TROUBLE SYMPTOM:

- ABS warning light remains on.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SELECT MONITOR

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is ignition switch to ON?	Go to step **2.**	Turn ignition switch to ON, and select VDCCM mode using the select monitor.
2	**CHECK BATTERY.** 1) Turn ignition switch to OFF. 2) Measure battery voltage.	Is the measured value more than 11 V?	Go to step **3.**	Charge or replace battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten battery terminal.	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to ON. 2) Using the select monitor, check whether communication to other systems can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **9.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM connector. 3) Check whether communication to other systems can be executed normally.	Are the name and year of the system displayed on the select monitor?	Go to step **10.**	Go to step **6.**
6	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn ignition switch to OFF. 2) Connect VDCCM module connector. 3) Disconnect cruise control module connector. 4) Check whether communication to other systems can be executed normally. NOTE: If the vehicle is not equipped with cruise control: Go to step **7.**	Are the name and year of the system displayed on the select monitor?	Inspect cruise control module.	Go to step **7.**
7	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect VDCCM, and cruise control module connectors. 3) Measure resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness and connector between each control module and data link connector.
8	**CHECK OUTPUT SIGNAL FOR VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:***	Is the measured value less than 1 V?	Repair harness and connector between each control module and data link connector.	Go to step **9.**
9	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND DATA LINK CONNECTOR.** Measure resistance between VDCCM connector and data link connector. ***Connector & terminal*** ***(F87) No. 11 — (B40) No. 5:*** ***(F87) No. 38 — (B40) No. 4:***	Is the measured value more than 0.5 Ω?	Repair harness and connector between VDCCM and data link connector.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn ignition switch to OFF.	Is VDCCM connector inserted into VDCCM until the clamp locks onto it?	Go to step **11.**	Insert VDCCM connector into VDCCM until the clamp locks onto it.
11	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn ignition switch to ON (engine OFF). 2) Measure ignition power supply voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **12.**	Repair open circuit in harness between VDCCM and battery.
12	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND CHASSIS GROUND.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and transmission. 3) Measure resistance of harness between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **13.**	Repair open circuit in harness between VDCCM and inhibitor side connector, and poor contact in coupling connector.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

B: DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-126, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

C: DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-126, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

D: DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
For diagnostic procedure, refer to DTC 27. <Ref. to VDC-126, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostics Chart with Select Monitor.>

E: DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

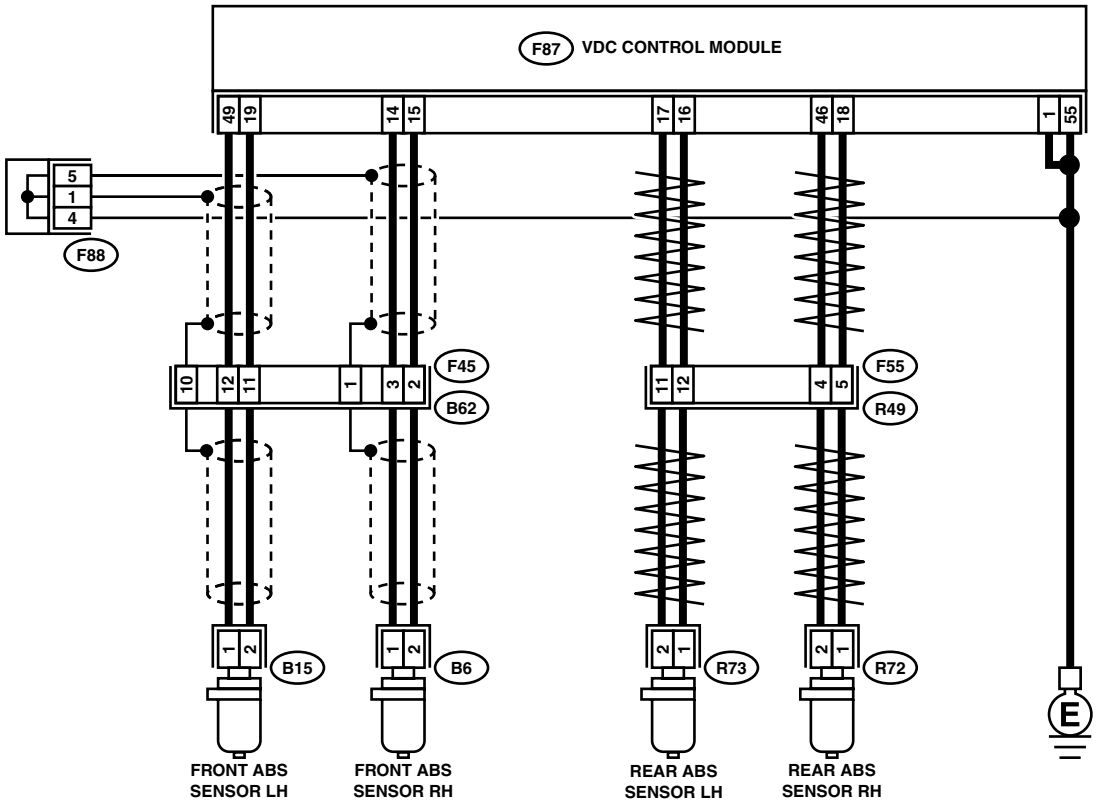
DIAGNOSIS:

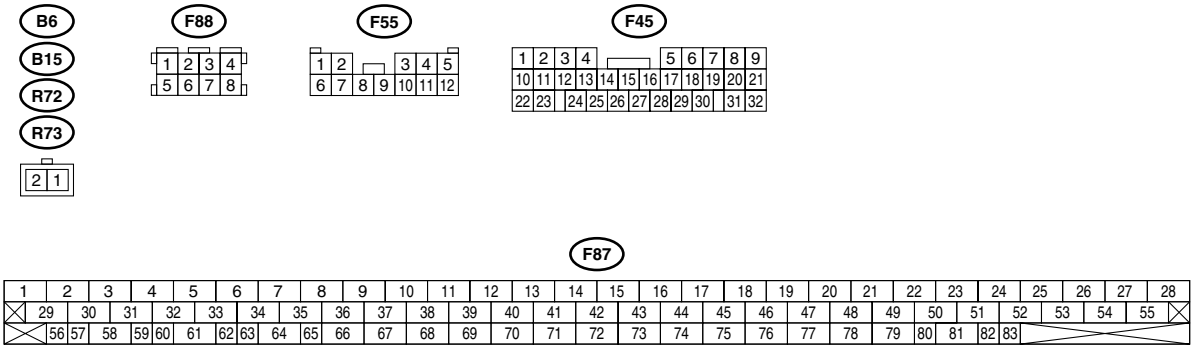
- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2.**	Go to step **9.**
2	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **3.**	Tighten ABS sensor installation bolts securely.
3	**CHECK ABS SENSOR GAP.** Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **5.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS sensor?	Repair connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.
8	**CHECK ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance of ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1.0 to 1.5 kΩ?	Go to step **9.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **10.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
10	**CHECK BATTERY SHORT OF ABS SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **11.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to ABS sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 — No. 15:*** ***DTC 23 / (F87) No. 49 — No. 19:*** ***DTC 25 / (F87) No. 18 — No. 46:*** ***DTC 27 / (F87) No. 16 — No. 17:***	Is the measured value within 1.0 to 1.5 kΩ?	Go to step **12.**	Repair harness/ connector between VDCCM and ABS sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Repair harness between VDCCM and ABS sensor.

	Step	Check	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21 / (F87) No. 14 (+) — Chassis ground (–):*** ***DTC 23 / (F87) No. 49 (+) — Chassis ground (–):*** ***DTC 25 / (F87) No. 18 (+) — Chassis ground (–):*** ***DTC 27 / (F87) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **14.**	Repair harness between VDCCM and ABS sensor.
14	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **15.**	Tighten ABS sensor installation bolts securely.
15	**CHECK ABS SENSOR GAP.** Measure tone wheel-to-pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
16	**CHECK HUB AND TONE WHEEL RUNOUT.** Measure hub and tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **17.**	Repair hub and tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
17	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and ABS sensor?	Repair connector.	Go to step **18.**
18	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19.**
19	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact. NOTE: Check harness and connectors between VDCCM and ABS sensor.

F: DTC 22 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-132, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

G: DTC 24 FRONT LEFT ABS SENSOR SIGNAL

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-132, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

H: DTC 26 REAR RIGHT ABS SENSOR SIGNAL

NOTE:
For diagnostic procedure, refer to DTC 28. <Ref. to VDC-132, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

MEMO:

I: DTC 28 REAR LEFT ABS SENSOR SIGNAL

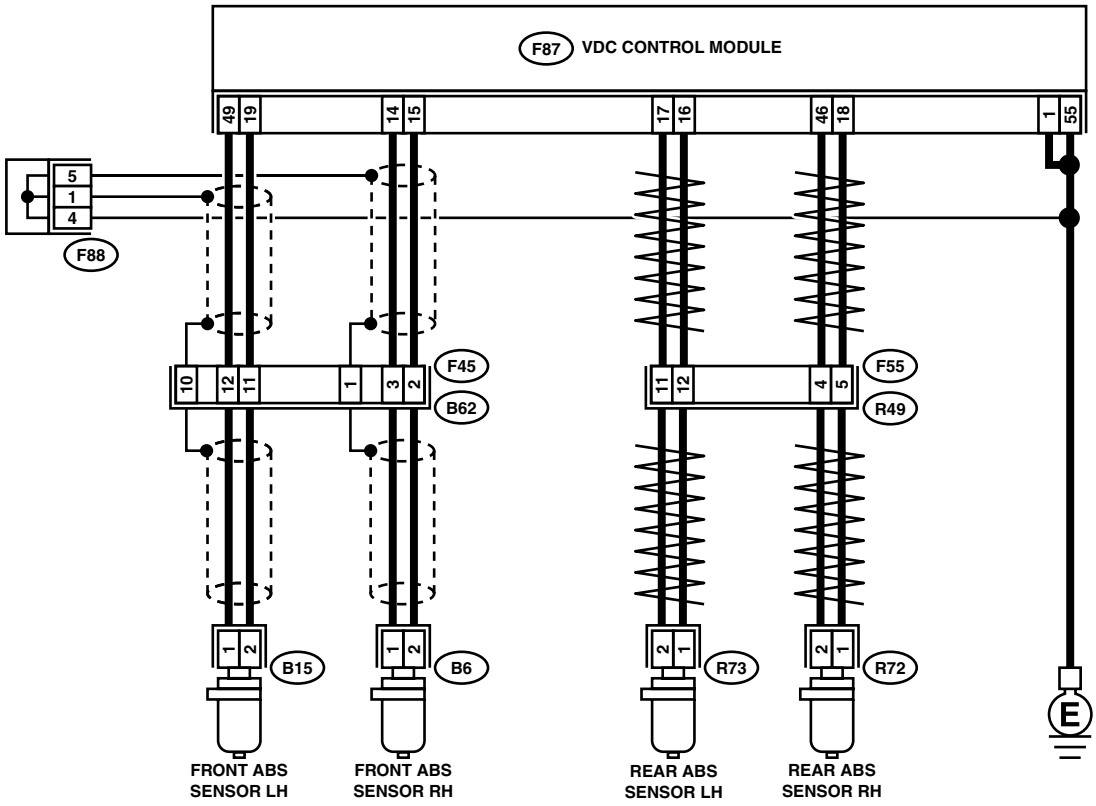
DIAGNOSIS:

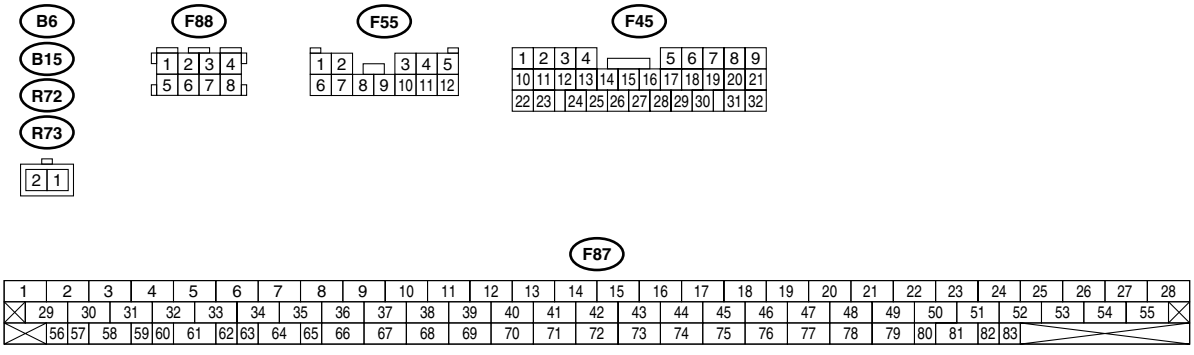
- Faulty ABS sensor signal (noise, irregular signal)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00141

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.** 1) Select "Current data display & Save" on the select monitor. 2) Read the ABS sensor output corresponding to the faulty system in the select monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS sensor?	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK SHIELD CIRCUIT.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F45) No. 1 — Chassis ground:*** ***DTC 24 / (F45) No. 10 — Chassis ground:*** NOTE: For the DTC 26 and 28, Go to step **6.**	Is the measured value less than 0.5 Ω?	Go to step **6.**	Repair shield harness.
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.
8	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **9.**	Tighten ABS sensor installation bolts securely.
9	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
10	**CHECK OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **11.**	Go to step **12.**

Step		Check	Yes	No
11	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-20, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 (+) — No. 15 (–):*** ***DTC 24 / (F87) No. 49 (+) — No. 19 (–):*** ***DTC 26 / (F87) No. 18 (+) — No. 46 (–):*** ***DTC 28 / (F87) No. 16 (+) — No. 17 (–):***	Is oscilloscope pattern smooth, as shown in figure?	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub in accordance with diagnostic trouble code.	Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **13.**
13	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS sensor pole piece or the tone wheel?	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **14.**
14	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **15.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
15	**CHECK RESISTANCE OF ABS SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ABS sensor. 3) Measure resistance between ABS sensor connector terminals. ***Terminal*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the measured value within 1.0 to 1.5 kΩ?	Go to step **16.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>
16	**CHECK GROUND SHORT OF ABS SENSOR.** Measure resistance between ABS sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **17.**	Replace ABS sensor. Front <Ref. to VDC-28, Front ABS Sensor.> Rear <Ref. to VDC-29, Rear ABS Sensor.>

	Step	Check	Yes	No
17	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ABS SENSOR.** 1) Connect connector to ABS sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance at VDCCM connector terminals. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — No. 15:*** ***DTC 24 / (F87) No. 49 — No. 19:*** ***DTC 26 / (F87) No. 18 — No. 46:*** ***DTC 28 / (F87) No. 16 — No. 17:***	Is the measured value within 1.0 to 1.5 kΩ?	Go to step **18.**	Repair harness/ connector between VDCCM and ABS sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F87) No. 14 — Chassis ground:*** ***DTC 24 / (F87) No. 49 — Chassis ground:*** ***DTC 26 / (F87) No. 18 — Chassis ground:*** ***DTC 28 / (F87) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **19.**	Repair harness/ connector between VDCCM and ABS sensor.
19	**CHECK GROUND CIRCUIT OF VDCCM.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **20.**	Repair VDCCM ground harness.
20	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and ABS sensor?	Repair connector.	Go to step **21.**
21	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **22.**	Properly install the car telephone or the wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **23.**
23	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22 / (F45) No. 1 — Chassis ground:*** ***DTC 24 / (F45) No. 10 — Chassis ground:*** NOTE: For the DTC 26 and 28, Go to step **25.**	Is the measured value less than 0.5 Ω?	Go to step **24.**	Repair shield harness.
24	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **25.**

Step		Check	Yes	No
25	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary noise interference.

MEMO:

J: DTC 29 ANY ONE OF FOUR ABS SENSOR SIGNAL

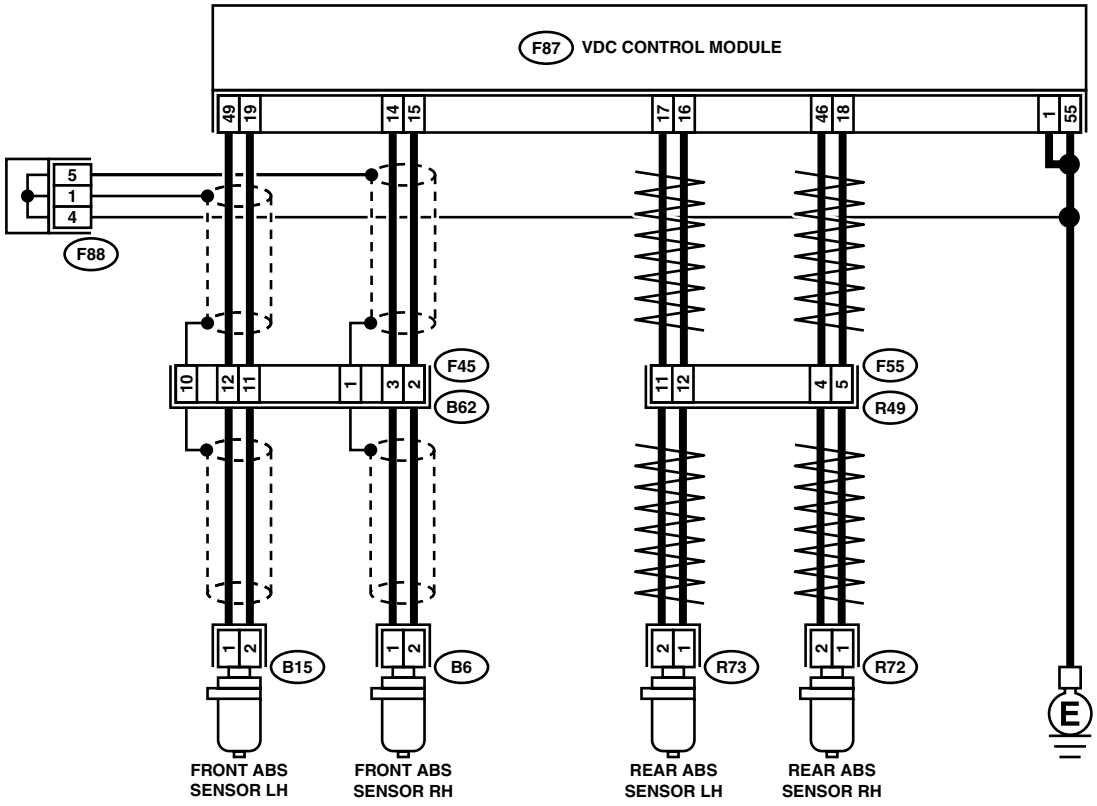
DIAGNOSIS:

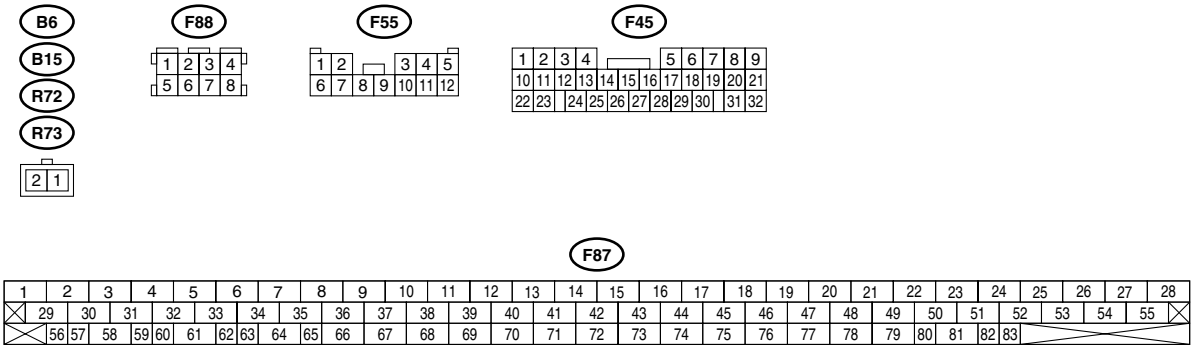
- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY.** Check if the wheels have been turned freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Did the wheels turn freely over 1 minute?	The VDC is normal. Erase the diagnostic trouble code. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or under full-lock cornering locked in full, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.**	Are the tire specifications correct?	Go to step **3.**	Replace tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS SENSOR.**	Are the ABS sensor installation bolts tightened to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **6.**	Tighten ABS sensor installation bolts securely.
6	**CHECK ABS SENSOR GAP.** Measure tone wheel to pole piece gap over entire perimeter of the wheel.	Is the measured value within the range below? Front wheel 0.3 - 0.8 mm (0.012 - 0.031 in) and Rear wheel 0.44 - 0.94 mm (0.0173 - 0.0370 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If spacers cannot correct the gap, replace worn sensor or worn tone wheel.
7	**CHECK OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS SENSOR SIGNAL.** 1) Raise all four wheels of ground. 2) Turn ignition switch OFF. 3) Remove VDCCM connector cover. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn ignition switch ON. 6) Rotate wheels and measure voltage at specified frequency. <Ref. to ABS-15, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***(F49) No. 14 (+) — No. 15 (–) (Front RH):*** ***(F49) No. 49 (+) — No. 19 (–) (Front LH):*** ***(F49) No. 18 (+) — No. 46 (–) (Rear RH):*** ***(F49) No. 16 (+) — No. 17 (–) (Rear LH):***	Is oscilloscope pattern smooth, as shown in figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL.** Remove disc rotor from hub.	Is the ABS sensor pole piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS sensor pole piece or the tone wheel?	Replace ABS sensor or tone wheel. Front <Ref. to VDC-28, Front ABS Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-29, Rear ABS Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure tone wheel runout.	Is the measured value less than 0.05 mm (0.0020 in)?	Go to step **12.**	Repair tone wheel. Front <Ref. to VDC-30, Front Tone Wheel.> Rear <Ref. to VDC-31, Rear Tone Wheel.>
12	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

K: DTC 31 FR HOLD VALVE MALFUNCTION (FRONT RIGHT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-142, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

L: DTC 33 FL HOLD VALVE MALFUNCTION (FRONT LEFT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-142, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

M: DTC 35 RR HOLD VALVE MALFUNCTION (REAR RIGHT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-142, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

N: DTC 37 RL HOLD VALVE MALFUNCTION (REAR LEFT INLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-142, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

O: DTC 61 NORMAL OPENING VALVE 2 MALFUNCTION (PRIMARY CUT VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 62. <Ref. to VDC-142, DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

P: DTC 62 NORMAL OPENING VALVE 1 MALFUNCTION (SECONDARY CUT VALVE MALFUNCTION)

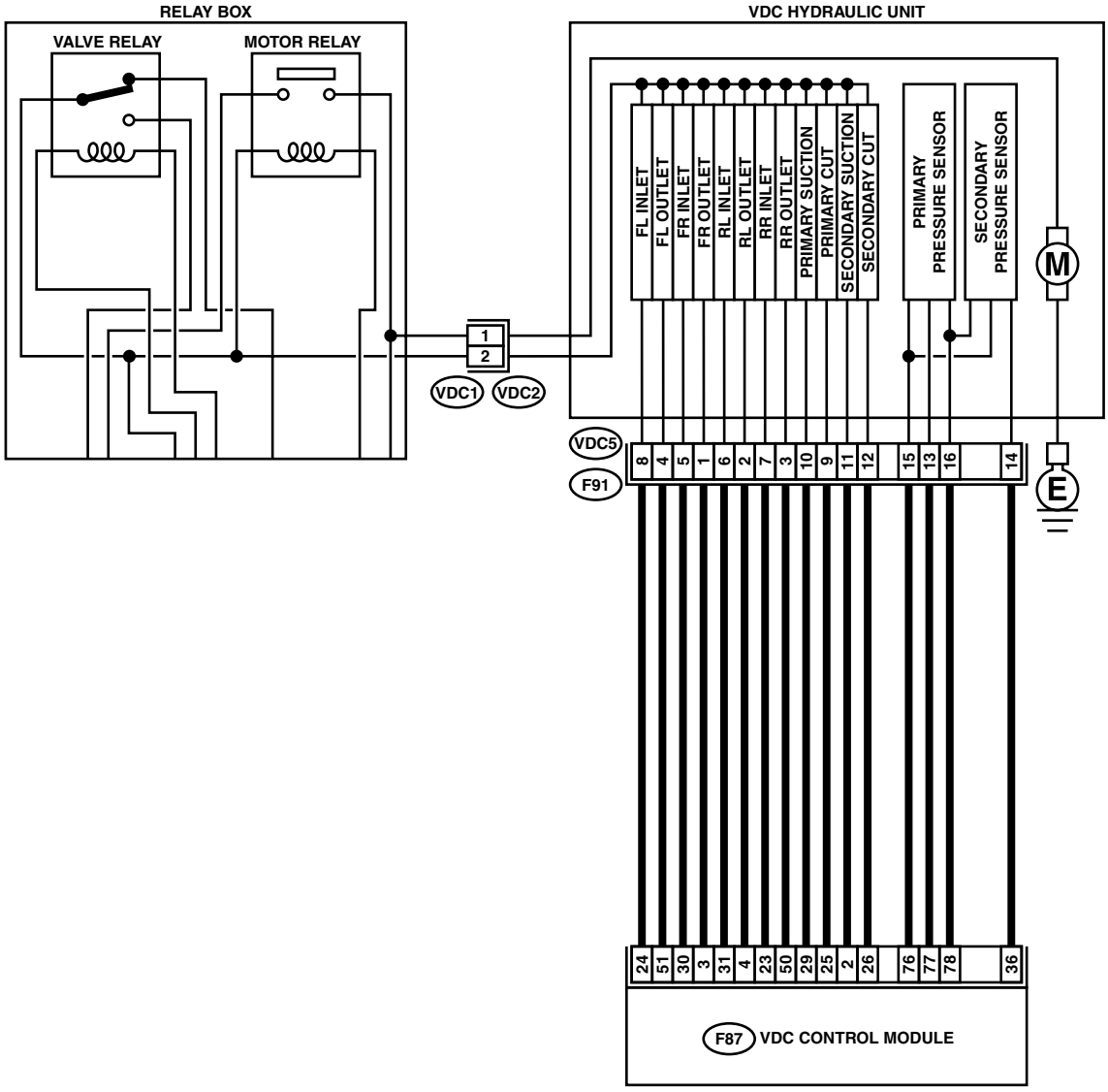
DIAGNOSIS:

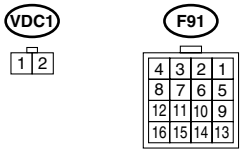
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

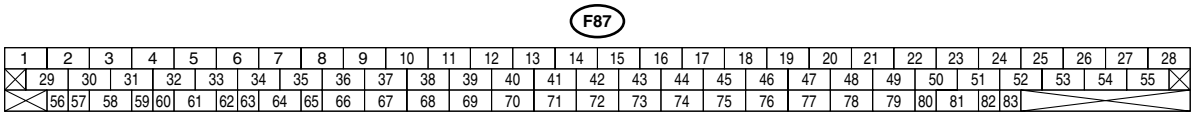
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00142

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — (VDC2) No. 2:*** ***DTC 33/(VDC5) No. 8 — (VDC2) No. 2:*** ***DTC 35/(VDC5) No. 7 — (VDC2) No. 2:*** ***DTC 37/(VDC5) No. 6 — (VDC2) No. 2:*** ***DTC 61/(VDC5) No. 9 — (VDC2) No. 2:*** ***DTC 62/(VDC5) No. 12 — (VDC2) No. 2:***	Is the measured value within 8.04 to 9.04 Ω?	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 — Chassis ground:*** ***DTC 33/(VDC5) No. 8 — Chassis ground:*** ***DTC 35/(VDC5) No. 7 — Chassis ground:*** ***DTC 37/(VDC5) No. 6 — Chassis ground:*** ***DTC 61/(VDC5) No. 9 — Chassis ground:*** ***DTC 62/(VDC5) No. 12 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Step		Check	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31/(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33/(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35/(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37/(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61/(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62/(VDC5) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 (+) — Chassis ground (–):*** ***DTC 33/(F87) No. 24 (+) — Chassis ground (–):*** ***DTC 35/(F87) No. 23 (+) — Chassis ground (–):*** ***DTC 37/(F87) No. 31 (+) — Chassis ground (–):*** ***DTC 61/(F87) No. 25 (+) — Chassis ground (–):*** ***DTC 62/(F87) No. 26 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — Chassis ground:*** ***DTC 33/(F87) No. 24 — Chassis ground:*** ***DTC 35/(F87) No. 23 — Chassis ground:*** ***DTC 37/(F87) No. 31 — Chassis ground:*** ***DTC 61/(F87) No. 25 — Chassis ground:*** ***DTC 62/(F87) No. 26 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 31/(F87) No. 30 — (VDC2) No. 2:*** ***DTC 33/(F87) No. 24 — (VDC2) No. 2:*** ***DTC 35/(F87) No. 23 — (VDC2) No. 2:*** ***DTC 37/(F87) No. 31 — (VDC2) No. 2:*** ***DTC 61/(F87) No. 25 — (VDC2) No. 2:*** ***DTC 62/(F87) No. 26 — (VDC2) No. 2:***	Is the measured value within 7 to 10 Ω?	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Repair VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Q: DTC 32 FR PRESSURE REDUCING VALVE MALFUNCTION (FRONT RIGHT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-148, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

R: DTC 34 FL PRESSURE REDUCING VALVE MALFUNCTION (FRONT LEFT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-148, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

S: DTC 36 RR PRESSURE REDUCING VALVE MALFUNCTION (REAR RIGHT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-148, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

T: DTC 38 RL PRESSURE REDUCING VALVE MALFUNCTION (REAR LEFT OUTLET VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-148, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

U: DTC 63 NORMAL CLOSING VALVE 2 MALFUNCTION (PRIMARY SUCTION VALVE MALFUNCTION)

NOTE:
For diagnostic procedure, refer to DTC 64. <Ref. to VDC-148, DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION), Diagnostics Chart with Select Monitor.>

MEMO:

V: DTC 64 NORMAL CLOSING VALVE 1 MALFUNCTION (SECONDARY SUCTION VALVE MALFUNCTION)

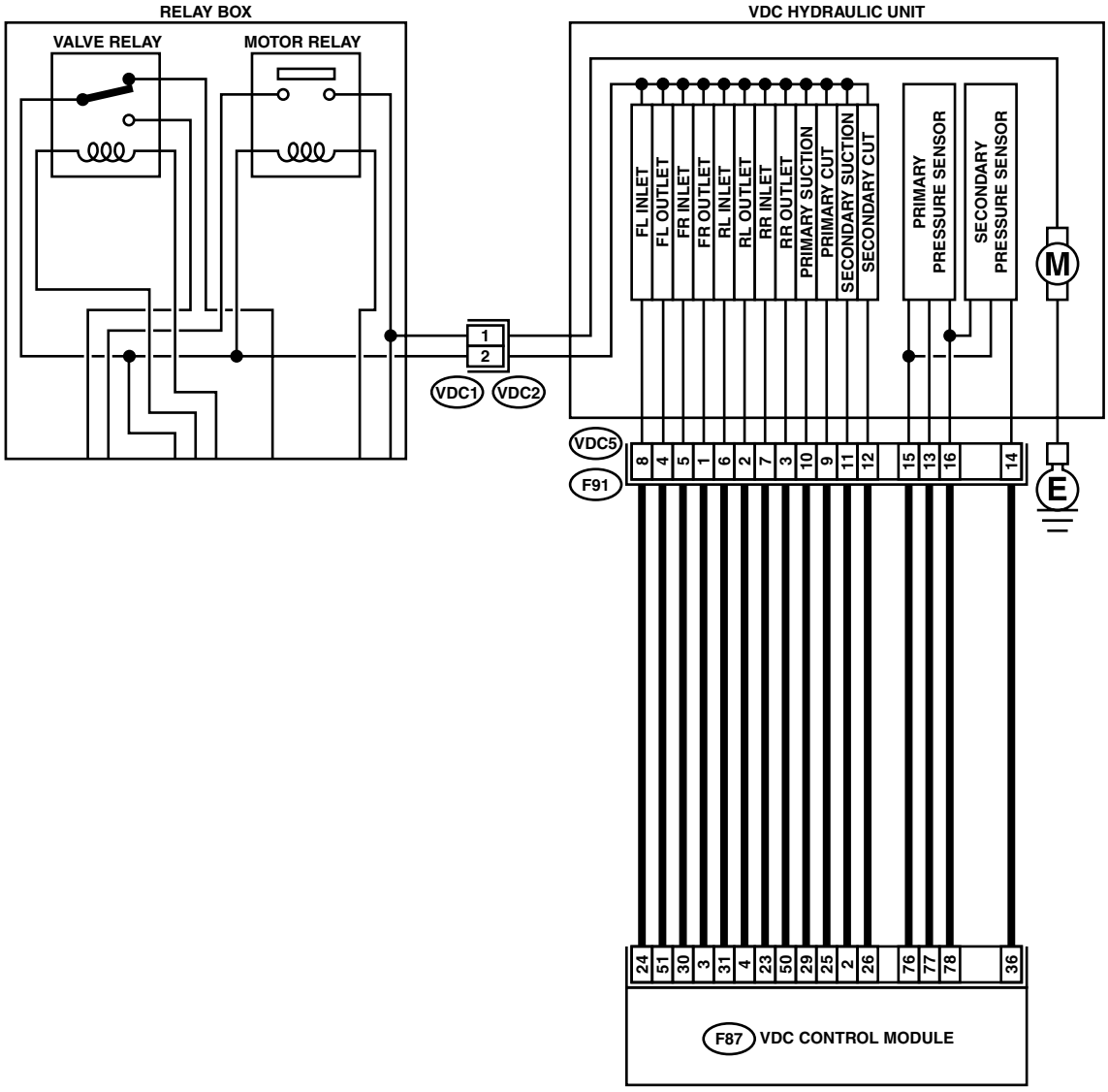
DIAGNOSIS:

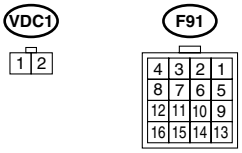
- Faulty harness/connector
- Faulty solenoid valve in VDCH/U

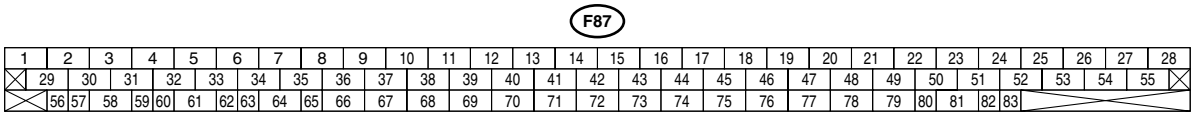
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00142

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors (VDC1, F91) from VDCH/U. 3) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — (VDC2) No. 2:*** ***DTC 34/(VDC5) No. 4 — (VDC2) No. 2:*** ***DTC 36/(VDC5) No. 3 — (VDC2) No. 2:*** ***DTC 38/(VDC5) No. 2 — (VDC2) No. 2:*** ***DTC 63/(VDC5) No. 10 — (VDC2) No. 2:*** ***DTC 64/(VDC5) No. 11 — (VDC2) No. 2:***	Is the measured value within 3.8 to 4.8 Ω?	Go to step **2.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 — Chassis ground:*** ***DTC 34/(VDC5) No. 4 — Chassis ground:*** ***DTC 36/(VDC5) No. 3 — Chassis ground:*** ***DTC 38/(VDC5) No. 2 — Chassis ground:*** ***DTC 63/(VDC5) No. 10 — Chassis ground:*** ***DTC 64/(VDC5) No. 11 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect connector from VDCCM. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Step		Check	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32/(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34/(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36/(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38/(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63/(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64/(VDC5) No. 11 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 (+) — Chassis ground (–):*** ***DTC 34/(F87) No. 51 (+) — Chassis ground (–):*** ***DTC 36/(F87) No. 50 (+) — Chassis ground (–):*** ***DTC 38/(F87) No. 4 (+) — Chassis ground (–):*** ***DTC 63/(F87) No. 29 (+) — Chassis ground (–):*** ***DTC 64/(F87) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Repair harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — Chassis ground:*** ***DTC 34/(F87) No. 51 — Chassis ground:*** ***DTC 36/(F87) No. 50 — Chassis ground:*** ***DTC 38/(F87) No. 4 — Chassis ground:*** ***DTC 63/(F87) No. 29 — Chassis ground:*** ***DTC 64/(F87) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCCM and VDCH/U.
8	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 32/(F87) No. 3 — (VDC2) No. 1:*** ***DTC 34/(F87) No. 51 — (VDC2) No. 1:*** ***DTC 36/(F87) No. 50 — (VDC2) No. 1:*** ***DTC 38/(F87) No. 4 — (VDC2) No. 1:*** ***DTC 63/(F87) No. 29 — (VDC2) No. 1:*** ***DTC 64/(F87) No. 2 — (VDC2) No. 1:***	Is the measured value within 3 to 6 Ω?	Go to step **9.**	Repair harness/ connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

W: DTC 41 ELECTRICAL CONTROL MODULE (VDC CONTROL MODULE MALFUNCTION)

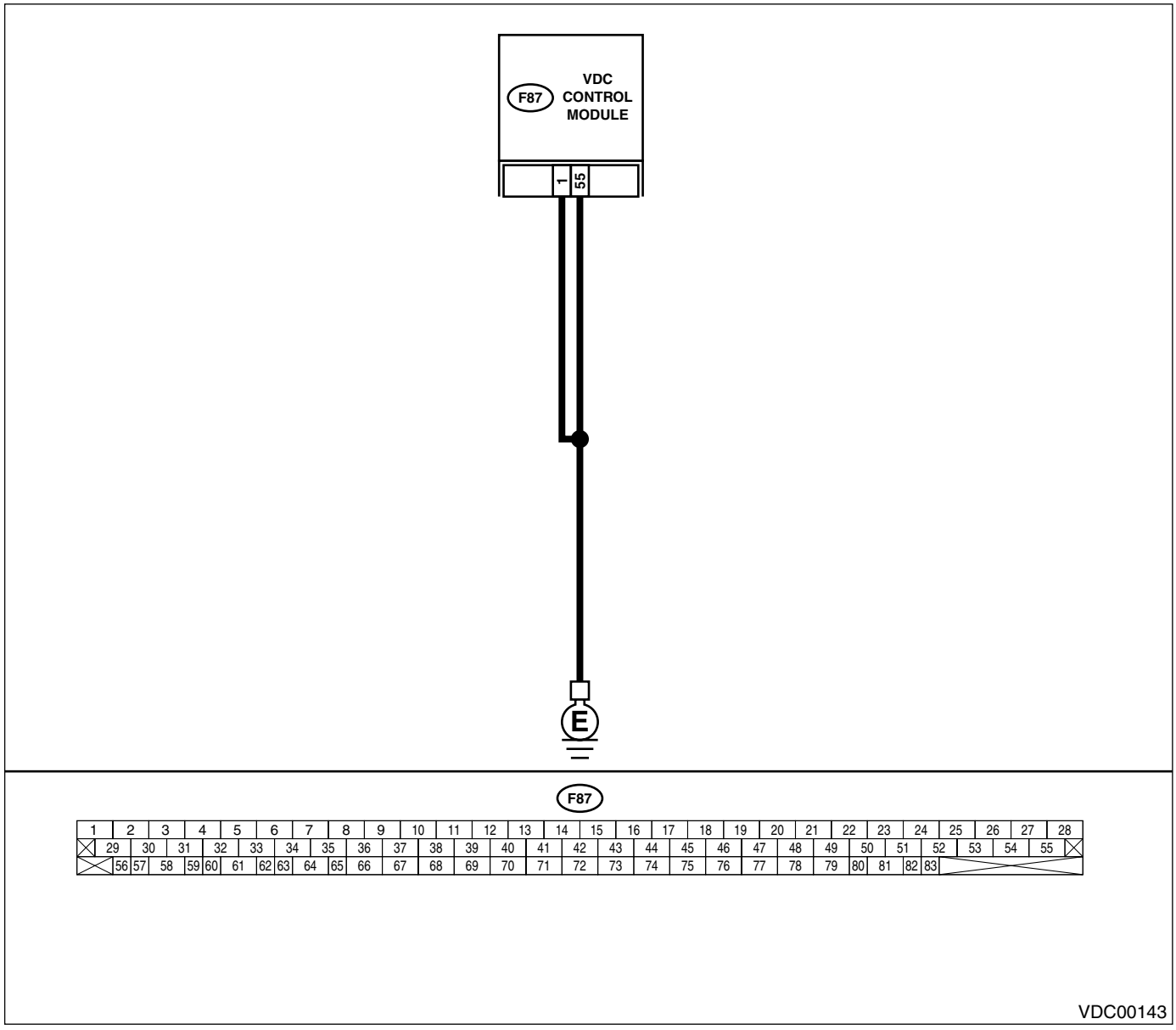
DIAGNOSIS:

- Faulty VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair VDCCM ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and VDCCM?	Repair connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or the wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

X: DTC 42 POWER SUPPLY VOLTAGE LOW

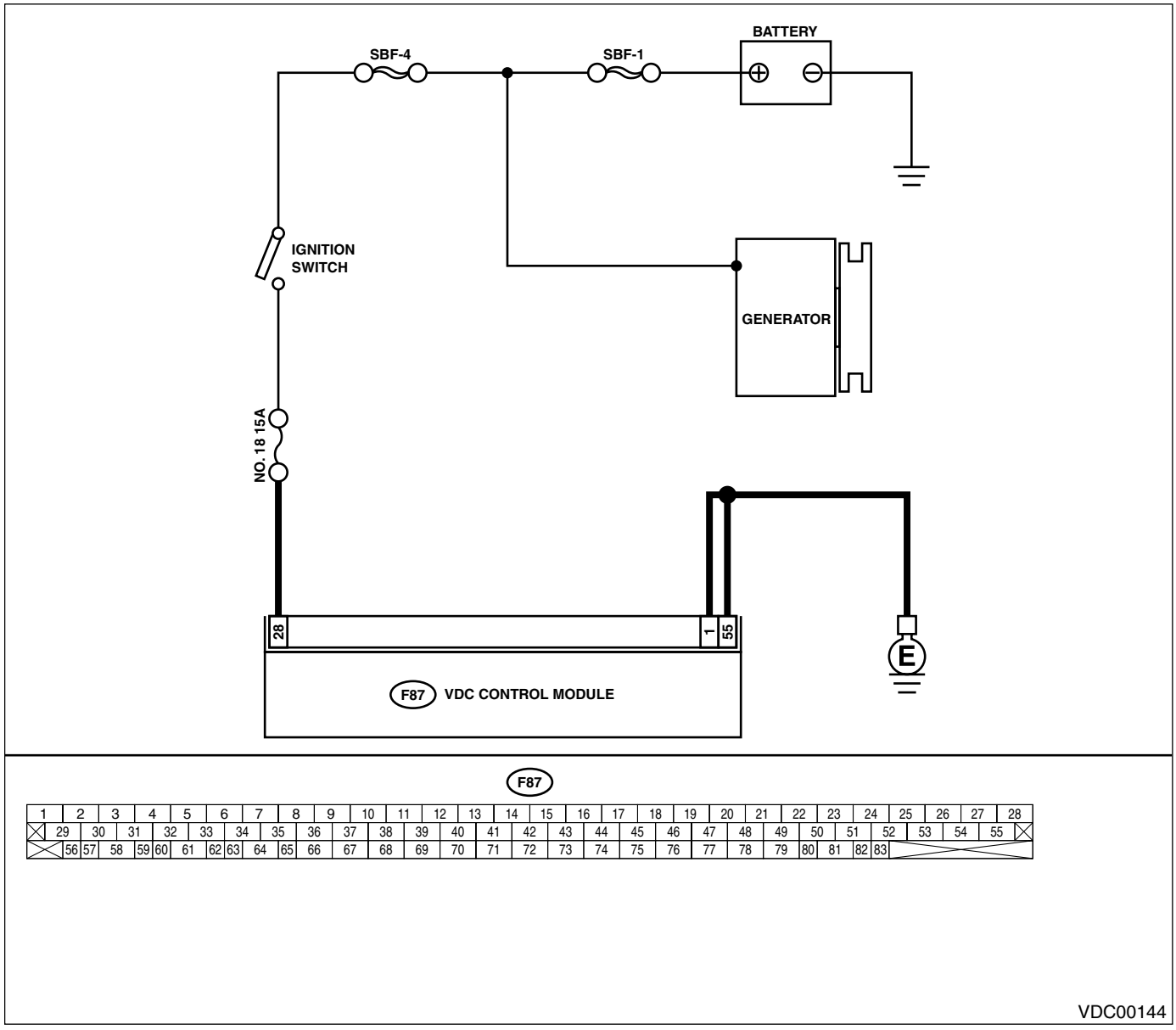
DIAGNOSIS:

- Power source voltage of the VDCCM is low.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start engine. 2) Idling after warm-up. 3) Measure voltage between generator B terminal and chassis ground. ***Terminal*** ***Generator B terminal — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **2.**	Repair generator.
2	**CHECK BATTERY TERMINAL.** Turn ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Run the engine at idle. 3) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 28 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Repair harness connector between battery, ignition switch and VDCCM.
4	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 1 — Chassis ground:*** ***(F87) No. 55 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair VDCCM ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and VDCCM?	Repair connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

Y: DTC 43 AET COMMUNICATION LINE MALFUNCTION

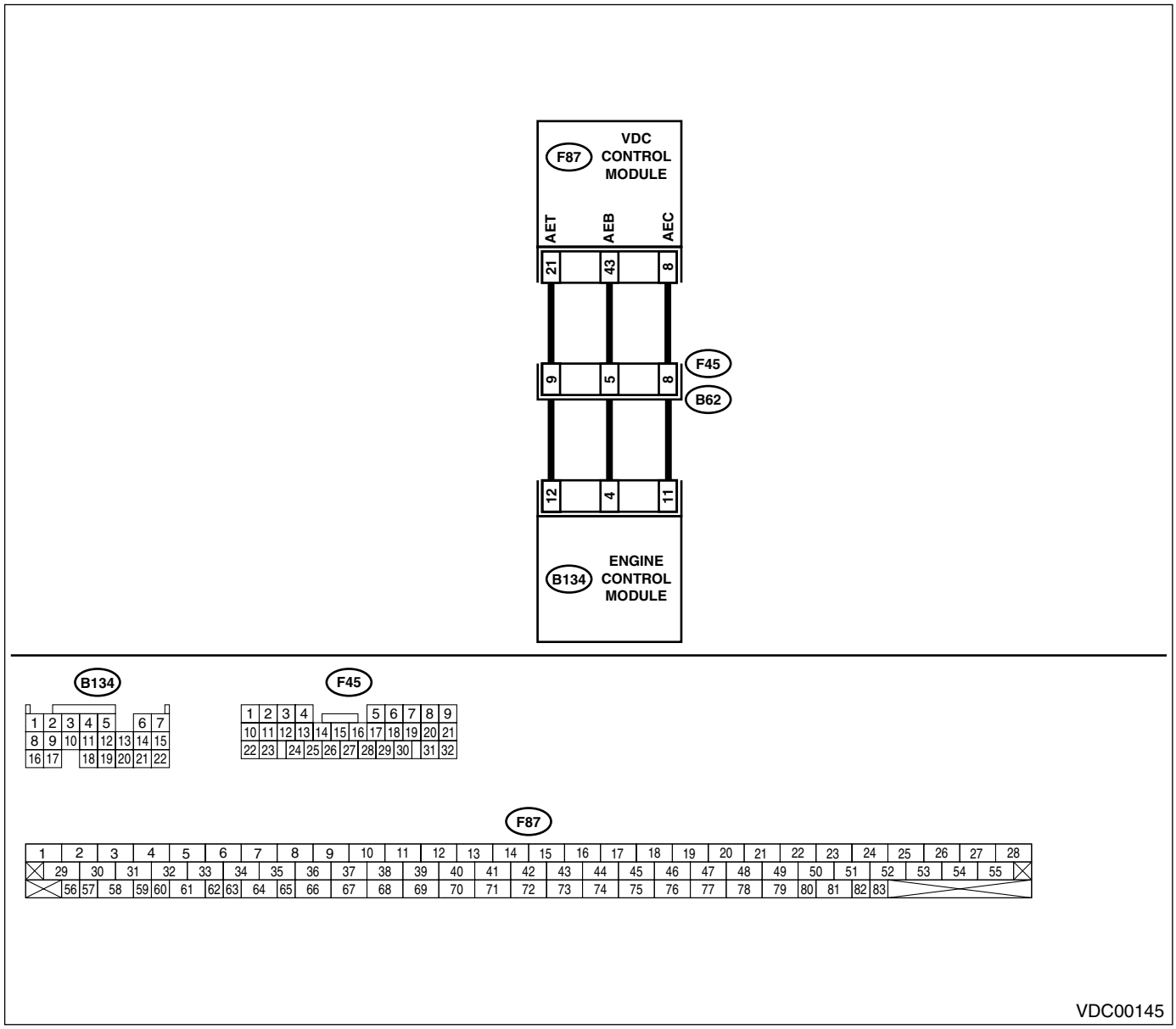
DIAGNOSIS:

- AET communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 21 — (B134) No. 12:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Terminal*** ***(F87) No. 21 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Terminal*** ***(F87) No. 21 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 21 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ECM and VDCCM?	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector ECM?	Repair connector.	Go to step **11.**

Step	Check	Yes	No
11 **CHECK ENGINE.**	Is the engine functioning normally?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

Z: DTC 43 AEB COMMUNICATION LINE MALFUNCTION

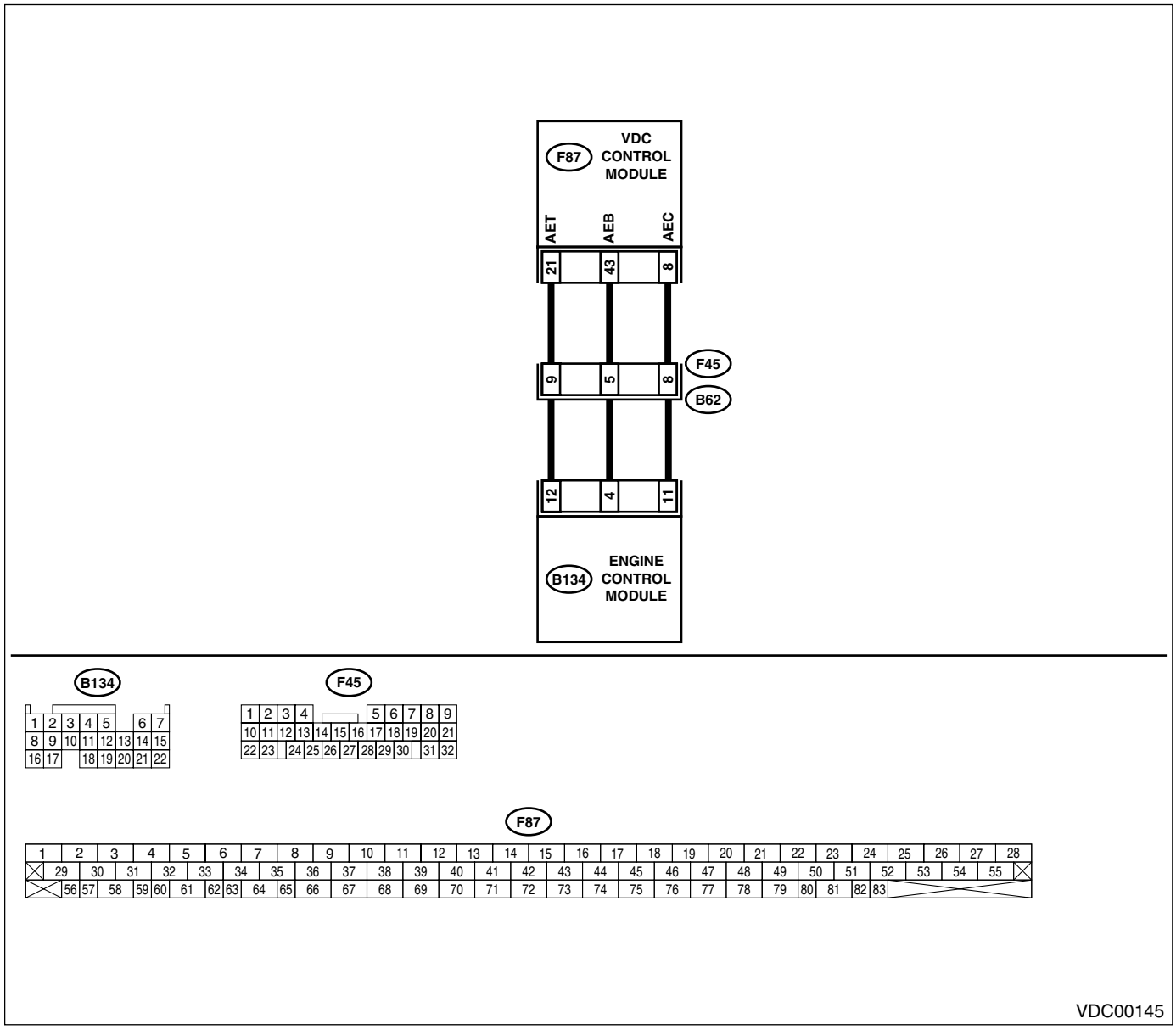
DIAGNOSIS:

- AEB communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 43 — (B134) No. 4:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 43 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ECM and VDCCM?	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector ECM?	Repair connector.	Go to step **11.**

Step	Check	Yes	No
11 **CHECK ENGINE.**	Is the engine functioning normally?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

AA:DTC 43 AEC COMMUNICATION LINE MALFUNCTION

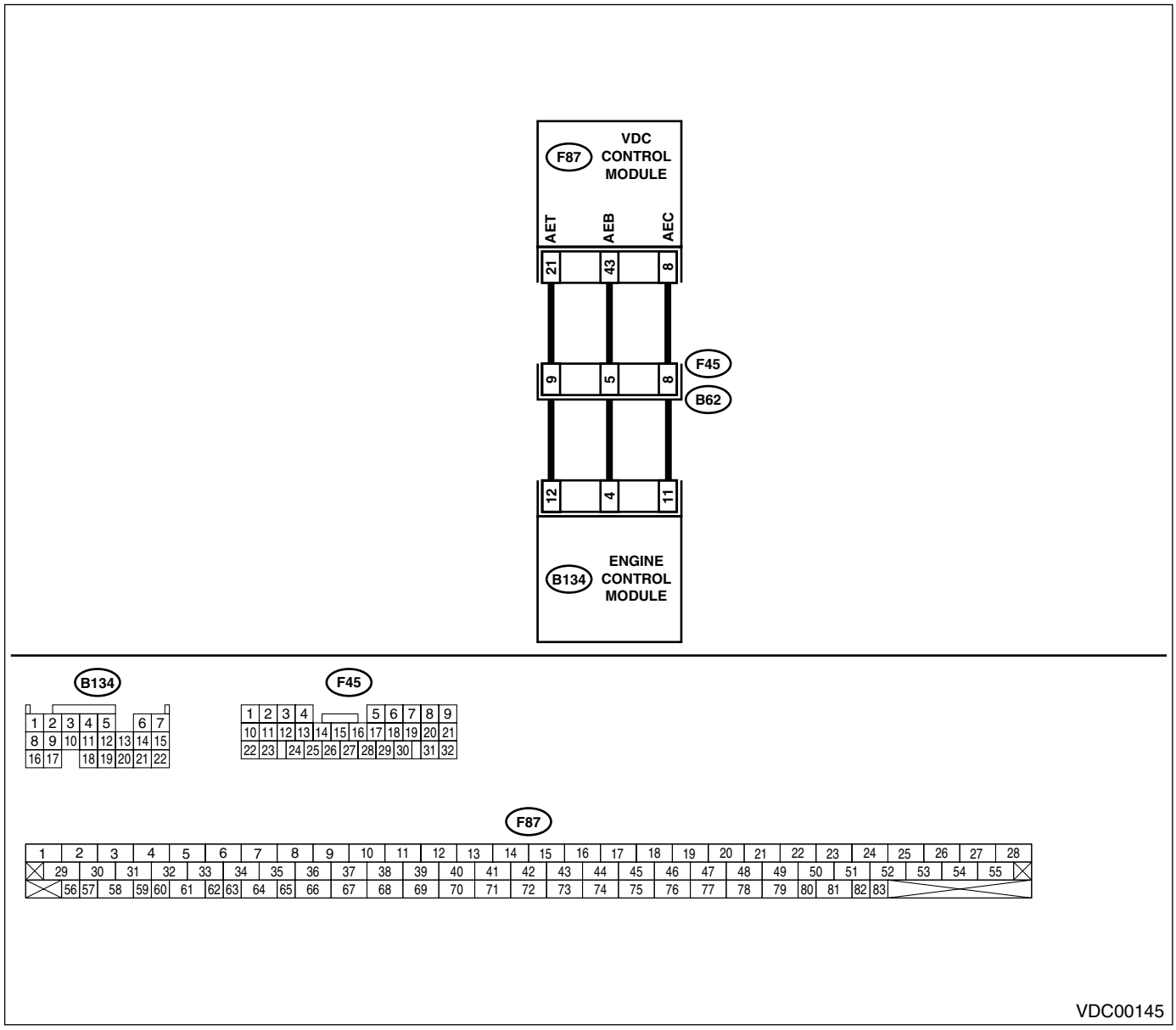
DIAGNOSIS:

- AEC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from ECM. 4) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 8 — (B134) No. 11:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair harness/ connector between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair harness/ connector between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair harness/ connector between VDCCM and ECM.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Repair harness/ connector between VDCCM and ECM.
5	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to ECM. 3) Turn ignition switch to ON. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 8 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **9.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ECM and VDCCM?	Repair connector.	Go to step **7.**
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
9	**CHECK ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B134) No. 11 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Repair harness/ connector between ECM and VDCCM.	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector ECM?	Repair connector.	Go to step **11.**

Step	Check	Yes	No
11 CHECK ENGINE.	Is the engine functioning normally?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair engine.

MEMO:

AB:DTC 44 TCM COMMUNICATION CIRCUIT

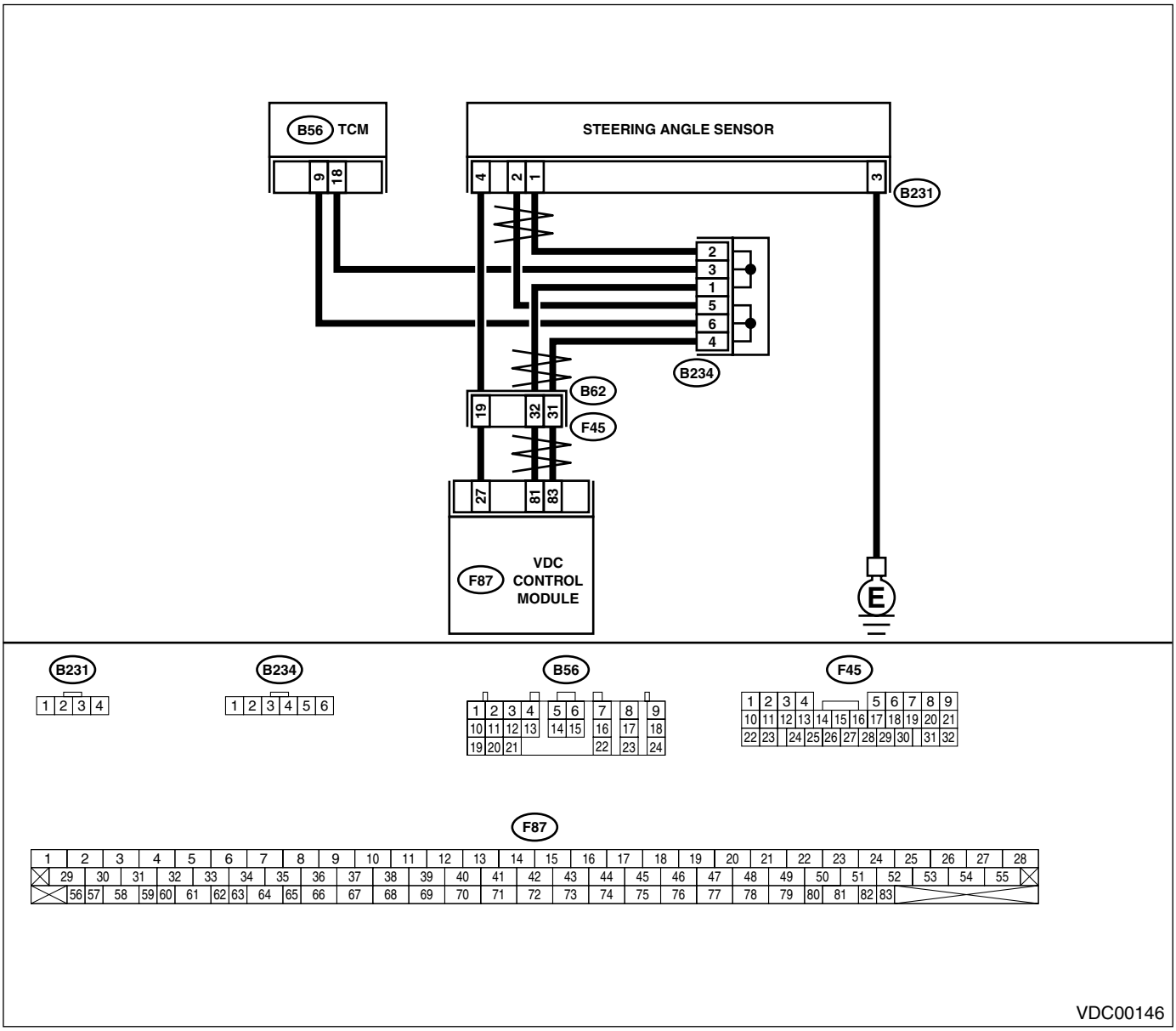
DIAGNOSIS:

- Communication with AT control faults

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect two connectors from TCM. 3) Measure resistance between TCM connector terminals. ***Connector & terminal (B56) No. 9 — No. 18:***	Is the measured value within 57 to 63 Ω?	Go to step **2.**	Repair harness between TCM and VDCCM.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM connectors?	Repair connector.	Go to step **3.**
3	**CHECK TCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AC:DTC 45 INCORRECT VDC CONTROL MODULE

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK VDCCM SPECIFICATIONS.** Check the VDCCM identification mark. ***VDCCM identification mark*** ***P***	Does the VDCCM identification mark agree with the vehicle specifications?	Go to step **2.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK TCM SPECIFICATIONS.** Check the TCM identification mark. ***TCM identification mark*** ***HN***	Does the TCM identification mark agree with the vehicle specifications?	Go to step **3.**	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>
3	**CHECK TCM.** 1) Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **4.**	The original TCM has been faulty.
4	**CHECK TCM.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **5.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
5	**CHECK VDCCM.** 1) Install original TCM. 2) Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **6.**	The original VDCCM has been faulty.
6	**CHECK VDCCM.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the diagnostic trouble code.

AD:DTC 45 TCM MALFUNCTION SPECIFICATIONS

DIAGNOSIS:

- Control module out of specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step		Check	Yes	No
1	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check AT system diagnostic trouble code.	Is the AT system diagnostic trouble code is same with the specification?	Repair AT system.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

AE:DTC 46 ABNORMAL VOLTAGE OF 5 V POWER SUPPLY

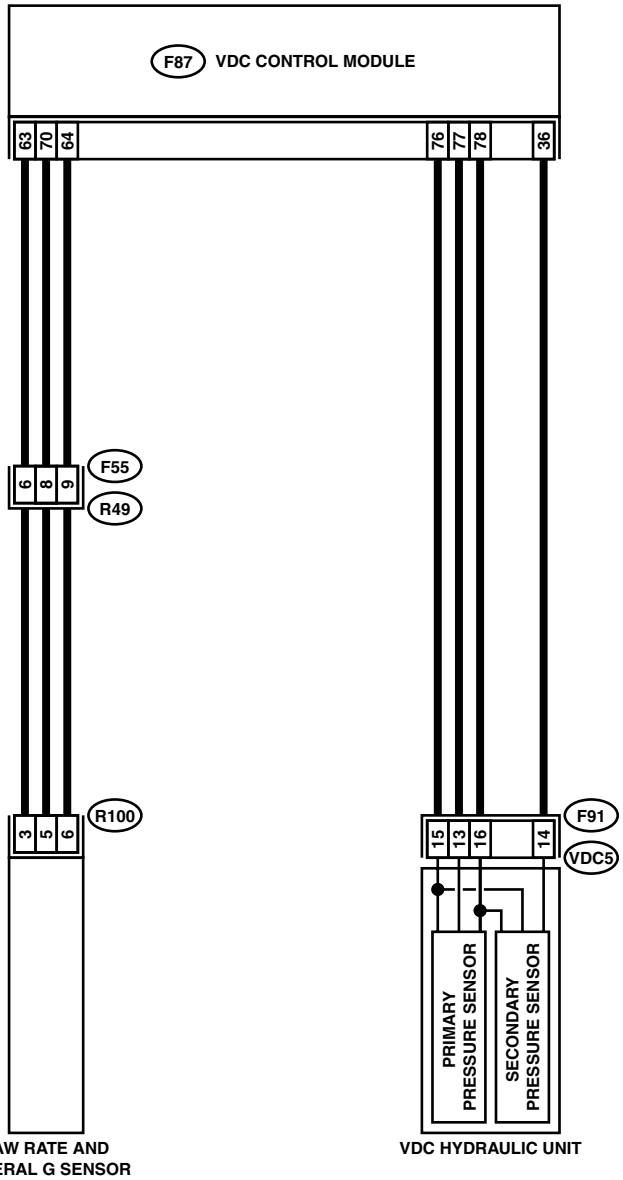
DIAGNOSIS:

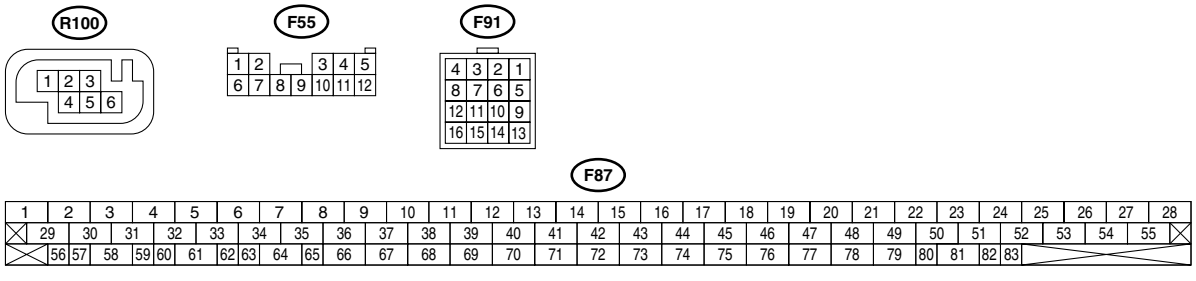
- 5 volt power supply is abnormal.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00147

	Step	Check	Yes	No
1	**CHECK GROUND SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):***	Is the measured value more than 1 MΩ?	Go to step **3.**	Go to step **2.**
2	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect connector from faulty sensors. 2) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground (Lateral G sensor):*** ***(F87) No. 78 — Chassis ground (Pressure sensor):***	Is the measured value more than 1 MΩ?	Replace faulty sensors.	Repair or replace harness connector between VDCCM and faulty sensor.
3	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from faulty sensors. 3) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Go to step **6.**	Repair or replace harness connector between VDCCM and faulty sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 (+) — Chassis ground (–) (Lateral G sensor):*** ***(F87) No. 78 (+) — Chassis ground (–) (Pressure sensor):***	Is the measured value less than 0.5 V?	Replace faulty sensor.	Repair or replace harness connector between VDCCM and faulty sensor.

AF:DTC 47 IMPROPER CAN COMMUNICATION

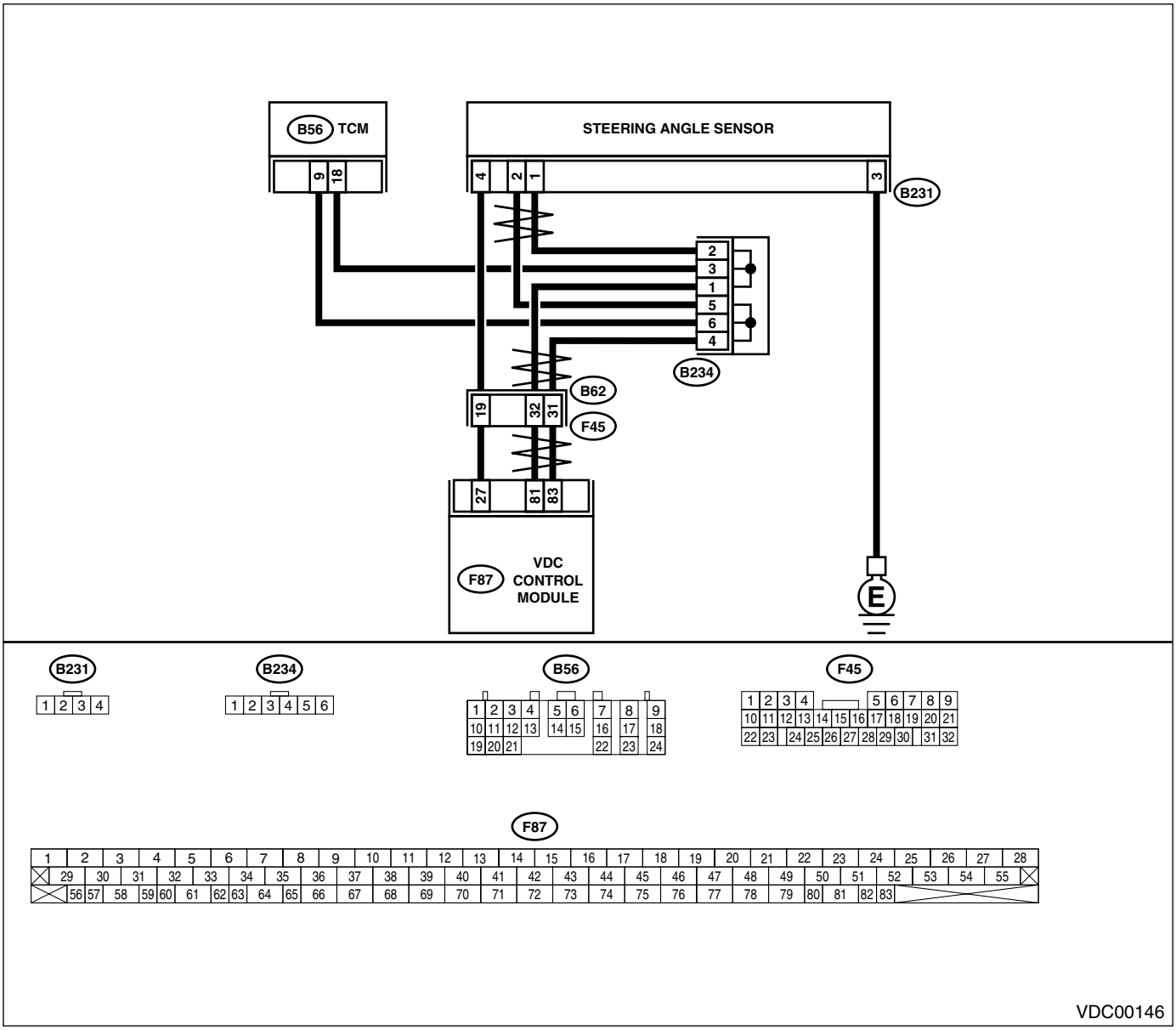
DIAGNOSIS:

- CAN communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM, TCM and steering angle sensor. 3) Measure resistance between VDCCM, TCM and steering angle sensor. ***Connector & terminal*** ***(F87) No. 83 — (B56) No. 9:*** ***(F87) No. 81 — (B56) No. 18:*** ***(F87) No. 83 — (B231) No. 2:*** ***(F87) No. 81 — (B231) No. 1:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.** Measure resistance between TCM and steering angle sensor. ***Connector & terminal*** ***(B56) No. 9 — (B231) No. 2:*** ***(B56) No. 18 — (B231) No. 1:***	Is the measured value less than 0.5 Ω?	Repair or replace harness connector between VDCCM and steering angle sensor.	Repair or replace harness connector between TCM and steering angle sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
4	**CHECK BATTERY SHORT OF SENSOR.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **5.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
5	**CHECK BATTERY SHORT OF SENSOR.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 83 — Chassis ground:*** ***(F87) No. 81 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **6.**	Repair or replace harness connector between VDCCM, TCM and steering angle sensor.
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect connector to steering angle sensor. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 83 — No. 81:***	Is the measured value within 114 to 126 Ω?	Go to step **8.**	Go to step **7.**
7	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in steering angle sensor?	Replace steering angle sensor.	Repair or replace steering angle sensor connector.
8	**CHECK VDCCM.** 1) Connect connector to VDCCM. 2) Disconnect connector from steering angle sensor. 3) Measure resistance between steering angle sensor connector terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the measured value within 114 to 126 Ω?	Go to step **10.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in steering angle sensor?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair or replace VDCCM connector.
10	**CHECK TCM.** 1) Connect connector to TCM. 2) Disconnect connector from VDCCM. 3) Measure resistance between steering angle sensor terminals. ***Connector & terminal (B231) No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	Go to step **12.**	Go to step **11.**
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in steering angle sensor?	Replace TCM. <Ref. to 4AT-79, Transmission Control Module (TCM).>	Repair or replace TCM connector.
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Are other diagnostic trouble codes being output?	Go to step **13.**	A temporary poor contact.
13	**CHECK DIAGNOSTIC TROUBLE CODE.**	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **14.**	Proceed with the diagnosis corresponding to the diagnostic trouble code.
14	**CHECK AT SYSTEM DIAGNOSTIC TROUBLE CODE.**	Is the AT system diagnostic trouble code DTC 86?	Replace steering angle sensor.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

MEMO:

AG:DTC 48 IMPROPER EAC COMMUNICATION

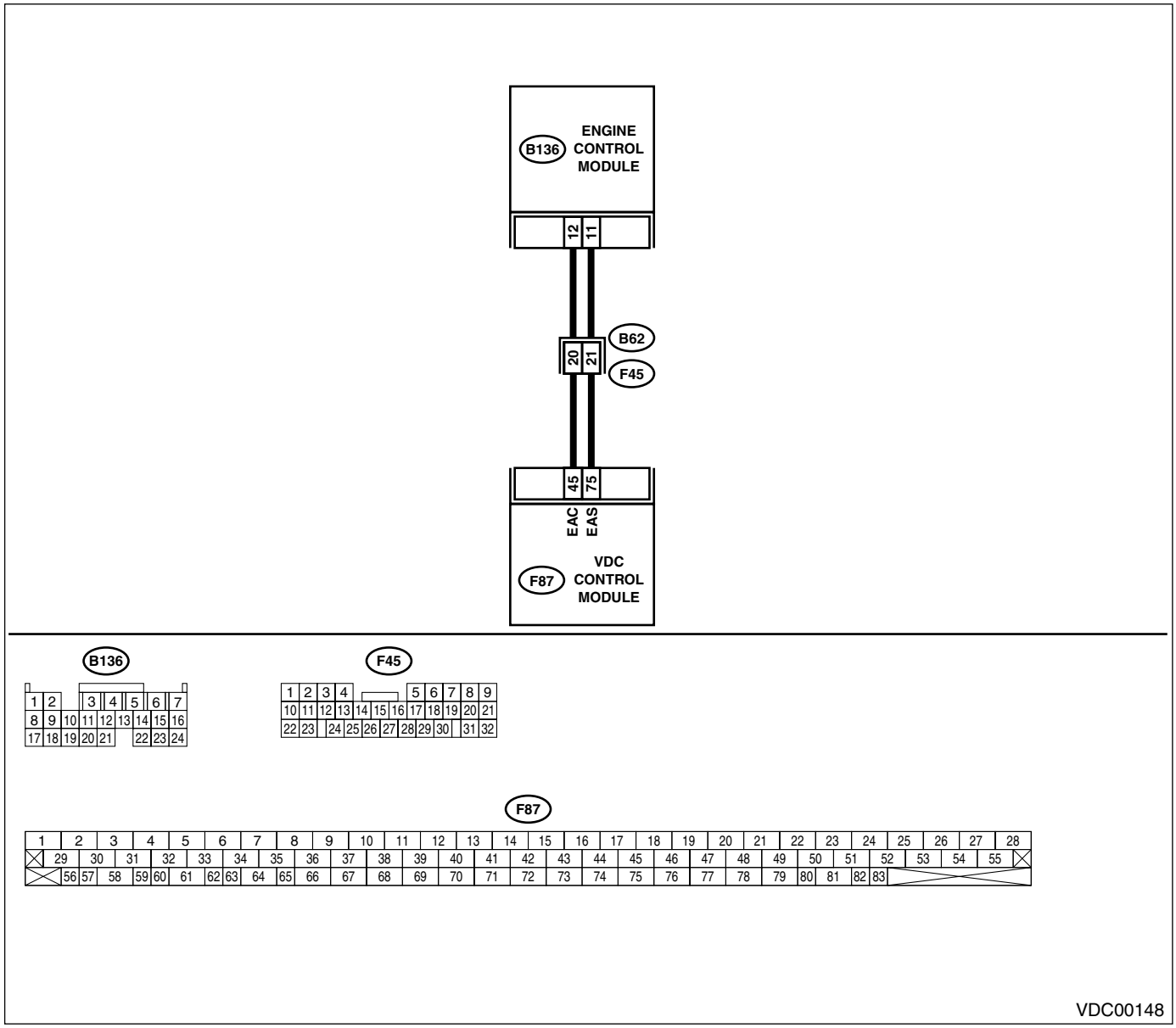
DIAGNOSIS:

- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 45 — (B136) No. 12:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair or replace open circuit between VDCCM and ECM.
2	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 45 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair or replace ground short circuit between VDCCM and ECM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 45 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair or replace battery short circuit between VDCCM and ECM.
4	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **5.**
5	**CHECK POOR CONTACT IN ECM CONNECTORS.**	Is there poor contact in ECM connector?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
6	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory.	Can the memory be erased?	Go to step **7.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AH:DTC 48 EAS COMMUNICATION LINE GROUNDING SHORTED

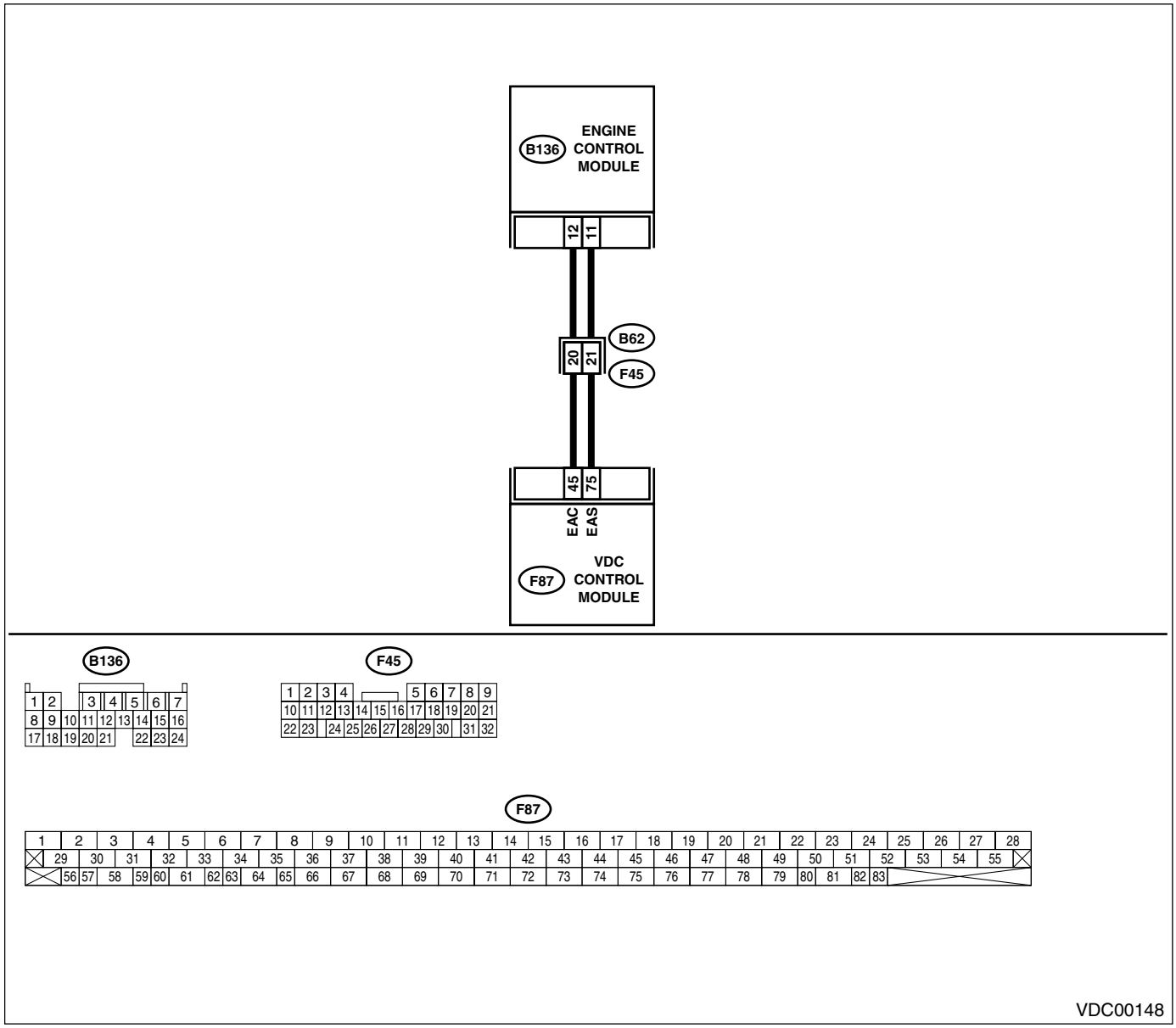
DIAGNOSIS:

- EAS communication line is short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **2.**	Repair or replace ground short circuit between VDCCM and ECM.
2	**CHECK INPUT VOLTAGE FROM ECM.** 1) Connect connector to VDCCM. 2) Turn ignition switch to ON. 3) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT IN ECM CONNECTORS.**	Is there poor contact in ECM connector?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
4	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory.	Can the memory be erased?	Go to step **5.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AI: DTC 48 ERRONEOUS COMMUNICATION FROM EGI TO VDC

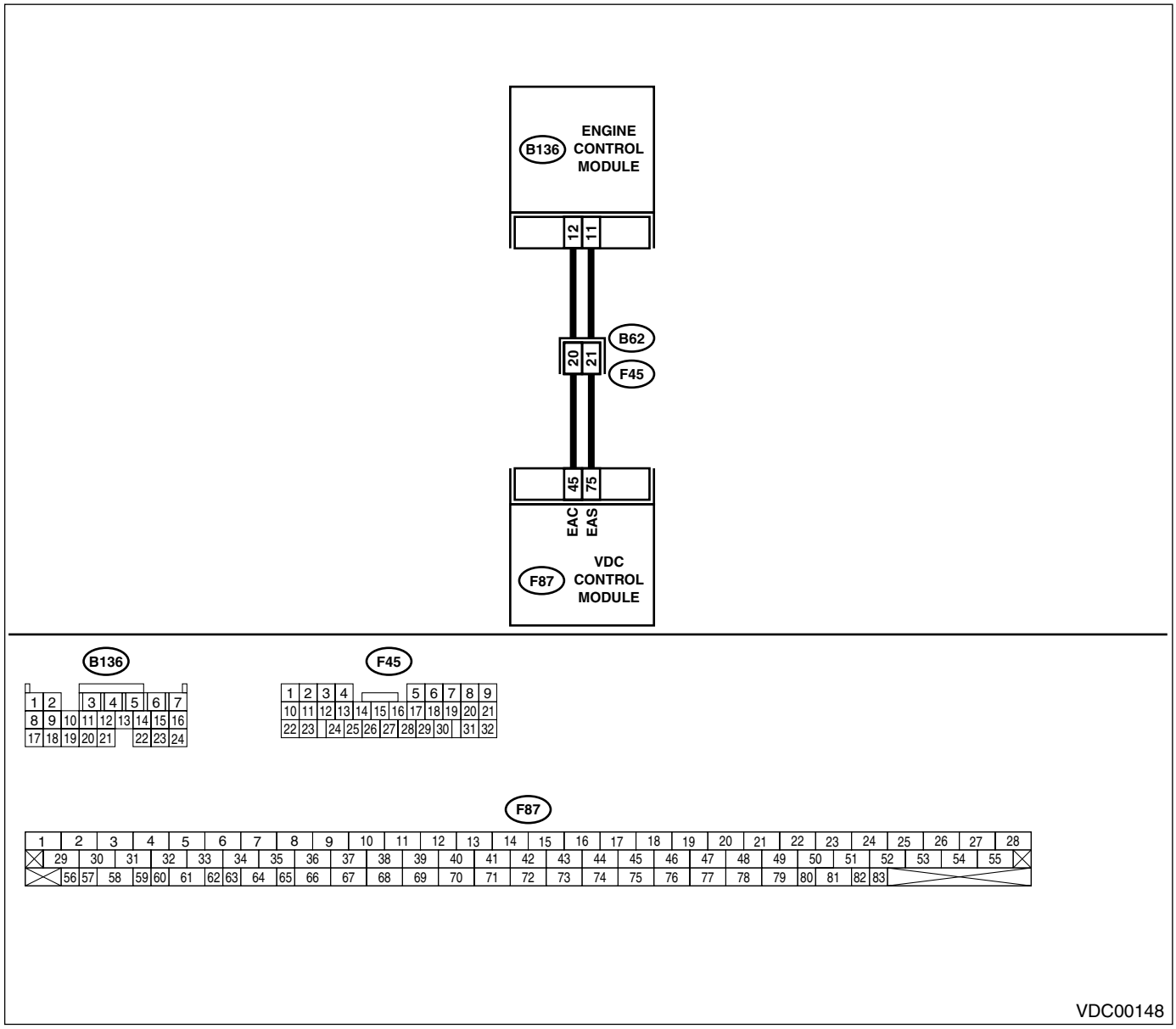
DIAGNOSIS:

- EAS communication line is broken or short circuited.
- EAC communication line is broken or short circuited.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM and ECM. ***Connector & terminal*** ***(F87) No. 75 — (B136) No. 11:*** ***(F87) No. 45 — (B136) No. 12:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair or replace open circuit between VDCCM and ECM.
2	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 75 — Chassis ground:*** ***(F87) No. 45 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **3.**	Repair or replace battery short circuit between VDCCM and ECM.
3	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn ignition switch to OFF. 2) Connect connector to VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***(B136) No. 12 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **5.**	Go to step **4.**
4	**CHECK POOR CONTACT IN ECM CONNECTORS.**	Is there poor contact in ECM connector?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	Repair or replace ECM connector.
5	**ERASE MEMORY.** 1) Connect all connectors. 2) Erase the memory.	Can the memory be erased?	Go to step **6.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK DIAGNOSTIC TROUBLE CODE.** 1) Perform inspection mode. 2) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace ECM. <Ref. to FU(H6DO)-46, Engine Control Module.>	A temporary poor contact.

AJ:DTC 49 ABNORMAL ENGINE SPEED SIGNAL

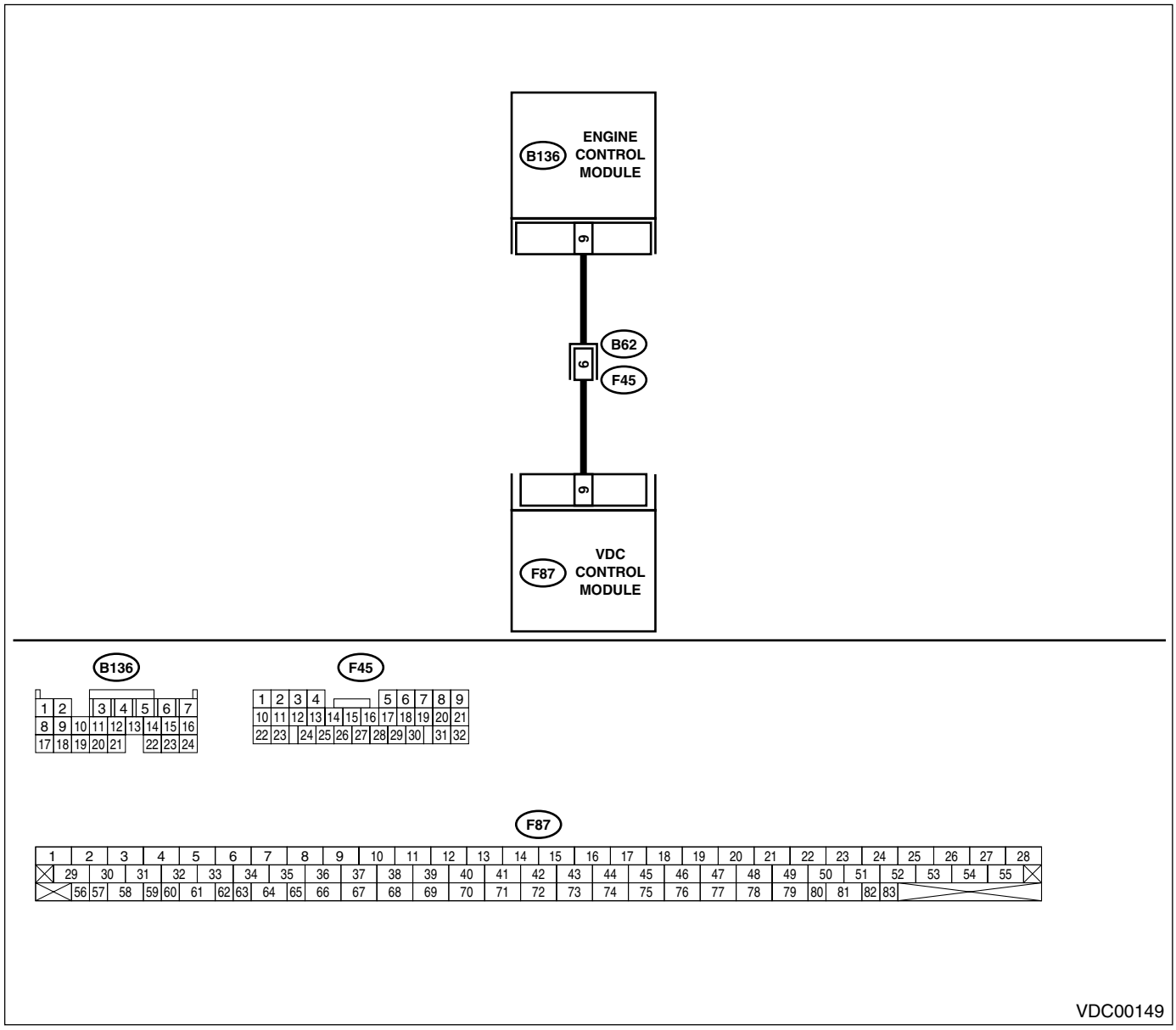
DIAGNOSIS:

- Engine speed signal line is broken or short circuited.

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TACHOMETER OPERATION IN COMBINATION METER.**	Does tachometer operate normally?	Go to step **2.**	Repair tachometer.
2	**CHECK HARNESS BETWEEN VDCCM AND ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM and ECM. 3) Measure resistance between VDCCM connector and ECM. ***Connector & terminal*** ***(F87) No. 9 — (B136) No. 9:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair harness connector between VDCCM and ECM.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between VDCCM and ECM?	Repair connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AK:DTC 51 VALVE RELAY

DIAGNOSIS:

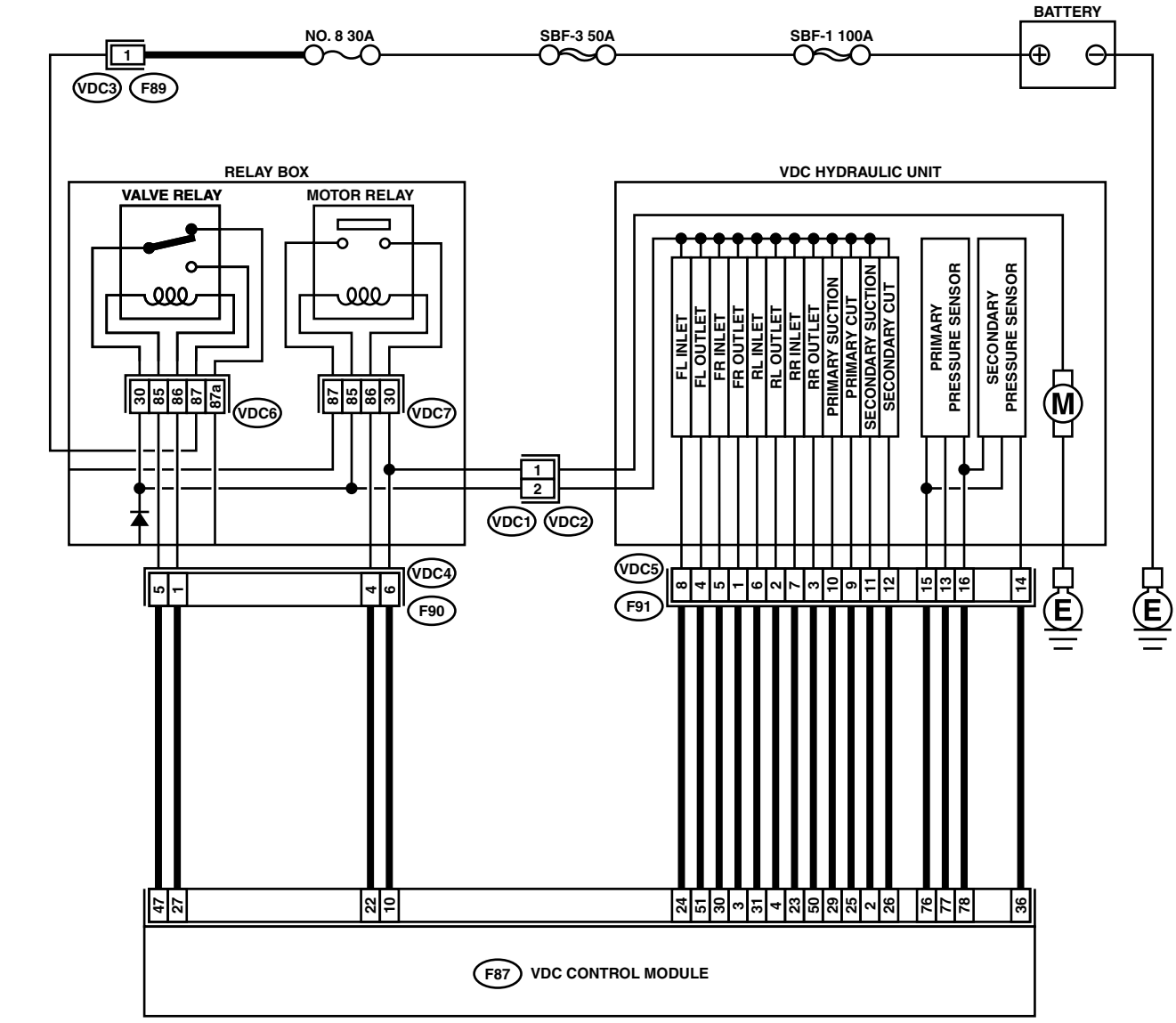
- Faulty valve relay

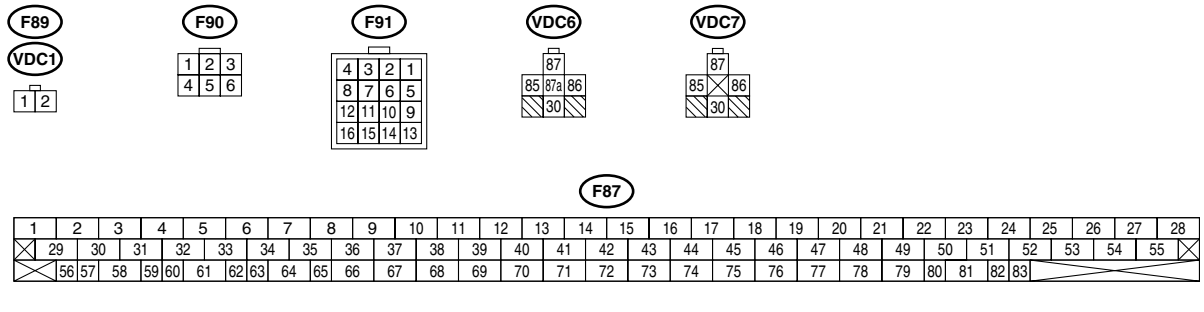
NOTE:
When DTC 74 inspection is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00150

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Measure resistance between valve relay terminals. ***Terminals*** ***No. 85 — No. 86:***	Is the measured value within 93 to 113 Ω?	Go to step **2.**	Replace valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Connect battery to valve relay terminals No. 85 and No. 86. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Replace valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Replace valve relay.
5	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the measured value less than 0.5 Ω?	Go to step **6.**	Replace valve relay.
6	**CHECK SHORT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Replace valve relay.
7	**CHECK POWER SUPPLY FOR VALVE RELAY.** 1) Disconnect connector (F89) from relay box. 2) Turn ignition switch to ON. 3) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 1 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **8.**	Repair harness between battery and relay box connector. Check fuse No. 8.
8	**CHECK OPEN CIRCUIT AND GROUND SHORT IN POWER SUPPLY CIRCUIT OF RELAY BOX.** 1) Disconnect connector (VDC1) from VDCH/U. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage of relay box. ***Connector & terminal*** ***(VDC6) No. 87 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **9.**	Replace relay box and check fuse No. 8.

	Step	Check	Yes	No
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F90) from relay box. 3) Measure resistance between relay box connector and valve relay installing point. ***Connector & terminal*** ***(VDC4) No. 5 — (VDC6) No. 85:*** ***(VDC4) No. 1 — (VDC6) No. 86:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Replace relay box.
10	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 — Chassis ground:*** ***(VDC4) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace relay box and check fuse SBF6.
11	**CHECK OPEN CIRCUIT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 47 — (F90) No. 5:*** ***(F87) No. 27 — (F90) No. 1:***	Is the measured value less than 0.5 Ω?	Go to step **12.**	Repair harness between VDCCM and relay box.
12	**CHECK GROUND SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 47 — Chassis ground:*** ***(F87) No. 27 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **13.**	Repair harness between VDCCM and relay box.
13	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and valve relay installing point. ***Connector & terminal*** ***(VDC1) No. 2 — (VDC6) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **14.**	Replace relay box.
14	**CHECK GROUND SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **15.**	Replace relay box and check fuse No. 8.
15	**CHECK RESISTANCE OF INLET AND CUT SOLENOID VALVES.** 1) Disconnect connector from VDCH/U. 2) Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 8 — (VDC2) No. 2:*** ***(VDC5) No. 5 — (VDC2) No. 2:*** ***(VDC5) No. 6 — (VDC2) No. 2:*** ***(VDC5) No. 7 — (VDC2) No. 2:*** ***(VDC5) No. 9 — (VDC2) No. 2:*** ***(VDC5) No. 12 — (VDC2) No. 2:***	Is the measured value within 8.04 to 9.04 Ω?	Go to step **16.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
16	**CHECK RESISTANCE OF OUTLET SOLENOID VALVE.** Measure resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 4 — (VDC2) No. 2:*** ***(VDC5) No. 1 — (VDC2) No. 2:*** ***(VDC5) No. 2 — (VDC2) No. 2:*** ***(VDC5) No. 3 — (VDC2) No. 2:*** ***(VDC5) No. 10 — (VDC2) No. 2:*** ***(VDC5) No. 11 — (VDC2) No. 2:***	Is the measured value within 4.04 to 4.54 Ω?	Go to step **17.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
17	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **18.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 — Chassis ground:*** ***(F87) No. 24 — Chassis ground:*** ***(F87) No. 23 — Chassis ground:*** ***(F87) No. 31 — Chassis ground:*** ***(F87) No. 26 — Chassis ground:*** ***(F87) No. 25 — Chassis ground:*** ***(F87) No. 3 — Chassis ground:*** ***(F87) No. 51 — Chassis ground:*** ***(F87) No. 50 — Chassis ground:*** ***(F87) No. 4 — Chassis ground:*** ***(F87) No. 2 — Chassis ground:*** ***(F87) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **19.**	Repair harness between VDCH/U and VDCCM.
19	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect connector (F91) to VDCH/U. 2) Measure resistance between VDCCM connector and VDCH/U ***Connector & terminal*** ***(F87) No. 30 — (VDC2) No. 2:*** ***(F87) No. 24 — (VDC2) No. 2:*** ***(F87) No. 23 — (VDC2) No. 2:*** ***(F87) No. 31 — (VDC2) No. 2:*** ***(F87) No. 26 — (VDC2) No. 2:*** ***(F87) No. 25 — (VDC2) No. 2:***	Is the measured value within 8.0 to 10.0 Ω?	Go to step **20.**	Repair harness/ connector between VDCH/U and VDCCM.
20	**CHECK HARNESS/CONNECTOR BETWEEN VDCCM AND VDCH/U.** Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 3 — (VDC2) No. 2:*** ***(F87) No. 51 — (VDC2) No. 2:*** ***(F87) No. 50 — (VDC2) No. 2:*** ***(F87) No. 4 — (VDC2) No. 2:*** ***(F87) No. 2 — (VDC2) No. 2:*** ***(F87) No. 29 — (VDC2) No. 2:***	Is the measured value within 4.0 to 6.0 Ω?	Go to step **21.**	Repair harness/ connector between VDCH/U and VDCCM.
21	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and VDCH/U?	Repair connector.	Go to step **22.**

Step		Check	Yes	No
22	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23.**
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

AL:DTC 51 VALVE RELAY ON FAILURE

DIAGNOSIS:

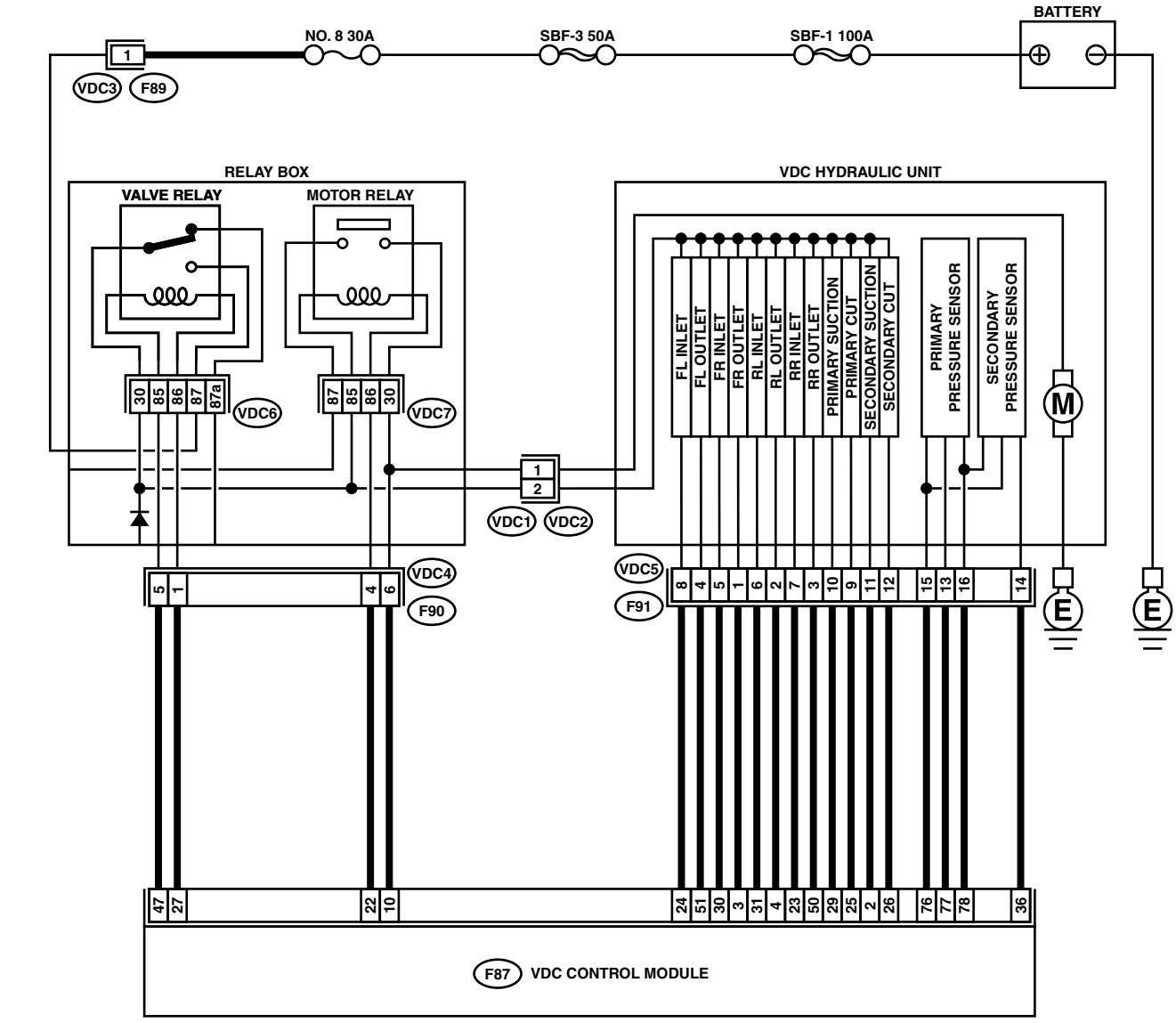
- Faulty valve relay

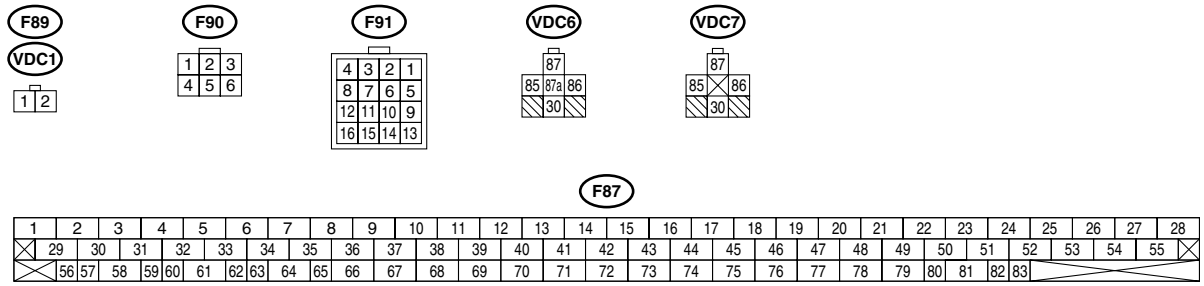
NOTE:
When DTC 74 inspection is carried out, DTC 51 is memorized.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00150

	Step	Check	Yes	No
1	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Remove valve relay from relay box. 3) Connect battery to valve relay terminals No. 85 and No. 86. 4) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Replace valve relay.
2	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace valve relay.
3	**CHECK CONTACT POINT OF VALVE RELAY.** 1) Disconnect battery from valve relay terminals. 2) Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace valve relay.
4	**CHECK CONTACT POINT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 30 — No. 87a:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Replace valve relay.
5	**CHECK SHORT OF VALVE RELAY.** Measure resistance between valve relay terminals. ***Terminals*** ***No. 86 — No. 87:*** ***No. 86 — No. 87a:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Replace valve relay.
6	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Disconnect connector (F90) from relay box. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **7.**	Replace relay box. Check fuse No. 8 and SBF3.
7	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (–):*** ***(VDC4) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **8.**	Replace relay box. Check fuse No. 8 and SBF3.

	Step	Check	Yes	No
8	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector from VDCH/U. 4) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **9.**	Repair harness between VDCCM and relay box and check all fuses.
9	**CHECK BATTERY SHORT IN CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 27 (+) — Chassis ground (–):*** ***(F87) No. 47 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **10.**	Repair harness between VDCCM and relay box and check all fuses.
10	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Disconnect connector VDC1 from relay box. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **11.**	Replace relay box.
11	**CHECK BATTERY SHORT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **12.**	Replace relay box.
12	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>
13	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **14.**	Replace VDCH/U and check all fuses. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
14	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **15.**	Repair harness between VDCH/U and VDCCM and check all fuses.
15	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 30 (+) — Chassis ground (–):*** ***(F87) No. 24 (+) — Chassis ground (–):*** ***(F87) No. 23 (+) — Chassis ground (–):*** ***(F87) No. 31 (+) — Chassis ground (–):*** ***(F87) No. 26 (+) — Chassis ground (–):*** ***(F87) No. 25 (+) — Chassis ground (–):*** ***(F87) No. 3 (+) — Chassis ground (–):*** ***(F87) No. 51 (+) — Chassis ground (–):*** ***(F87) No. 50 (+) — Chassis ground (–):*** ***(F87) No. 4 (+) — Chassis ground (–):*** ***(F87) No. 2 (+) — Chassis ground (–):*** ***(F87) No. 29 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **16.**	Repair harness between VDCH/U and VDCCM and check all fuses.
16	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCCM and VDCH/U?	Repair connector.	Go to step **17.**
17	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **18.**
18	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AM:DTC 52 MOTOR AND MOTOR RELAY OFF FAILURE

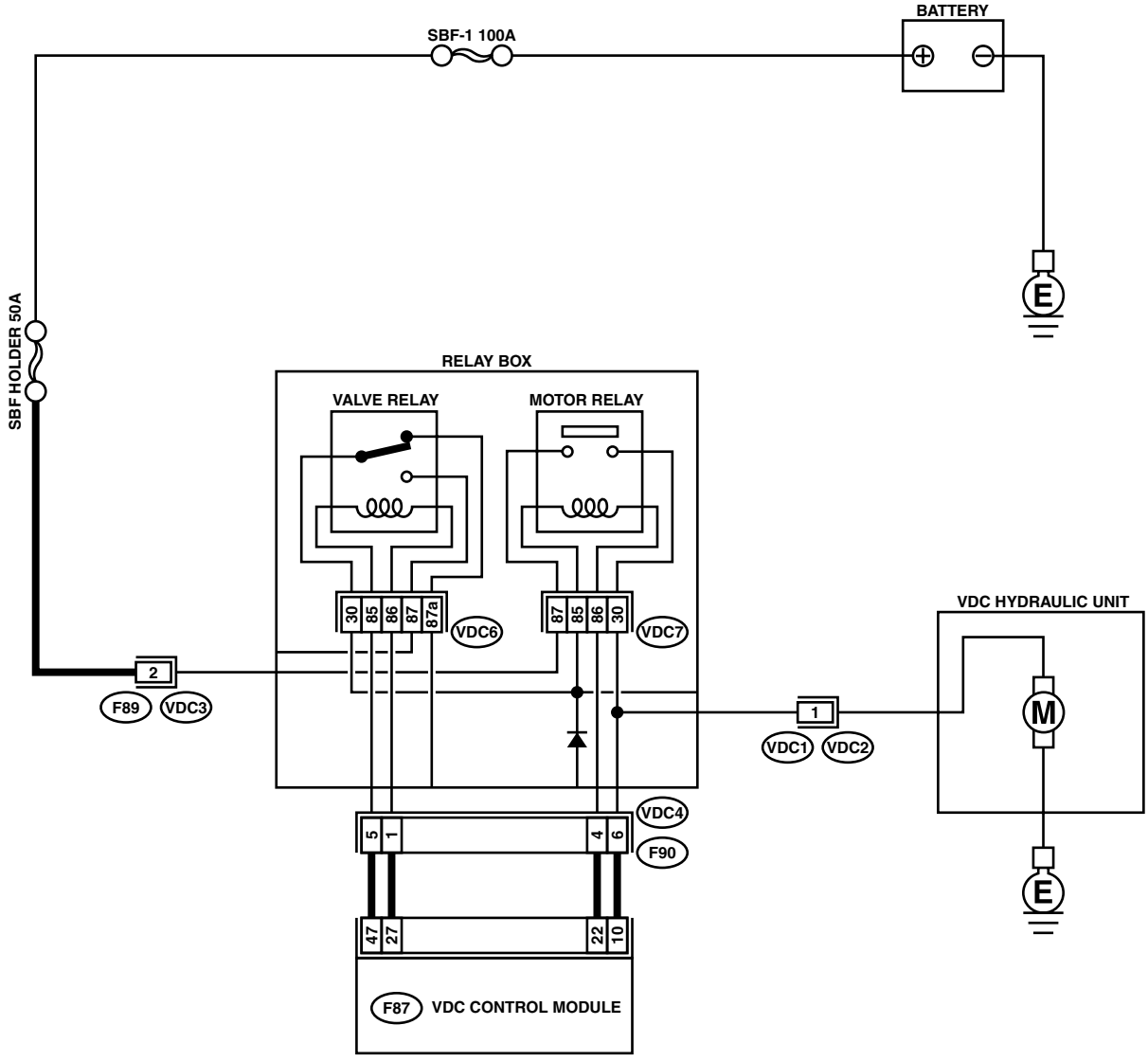
DIAGNOSIS:

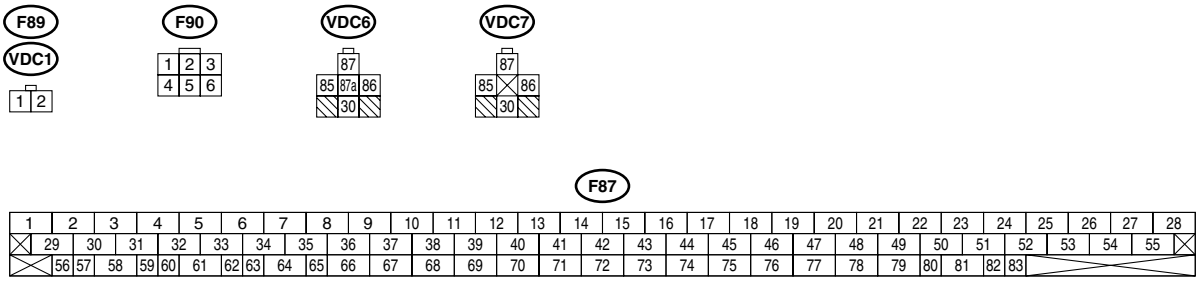
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00155

	Step	Check	Yes	No
1	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **2.**	Replace motor relay.
2	**CHECK SHORT OF MOTOR RELAY.** Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace motor relay.
3	**CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX.** 1) Disconnect connector (F90) from relay box. 2) Measure resistance between relay box connector unit and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace relay box.
4	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Replace relay box.
5	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Replace relay box.
6	**CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
7	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **8.**	Repair harness between VDCCM and relay box.
8	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **9.**	Repair harness between VDCCM and relay box.
9	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCH/U, relay box and VDCCM?	Repair connector.	Go to step **10.**

Step		Check	Yes	No
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

AN:DTC 52 MOTOR AND MOTOR RELAY ON FAILURE

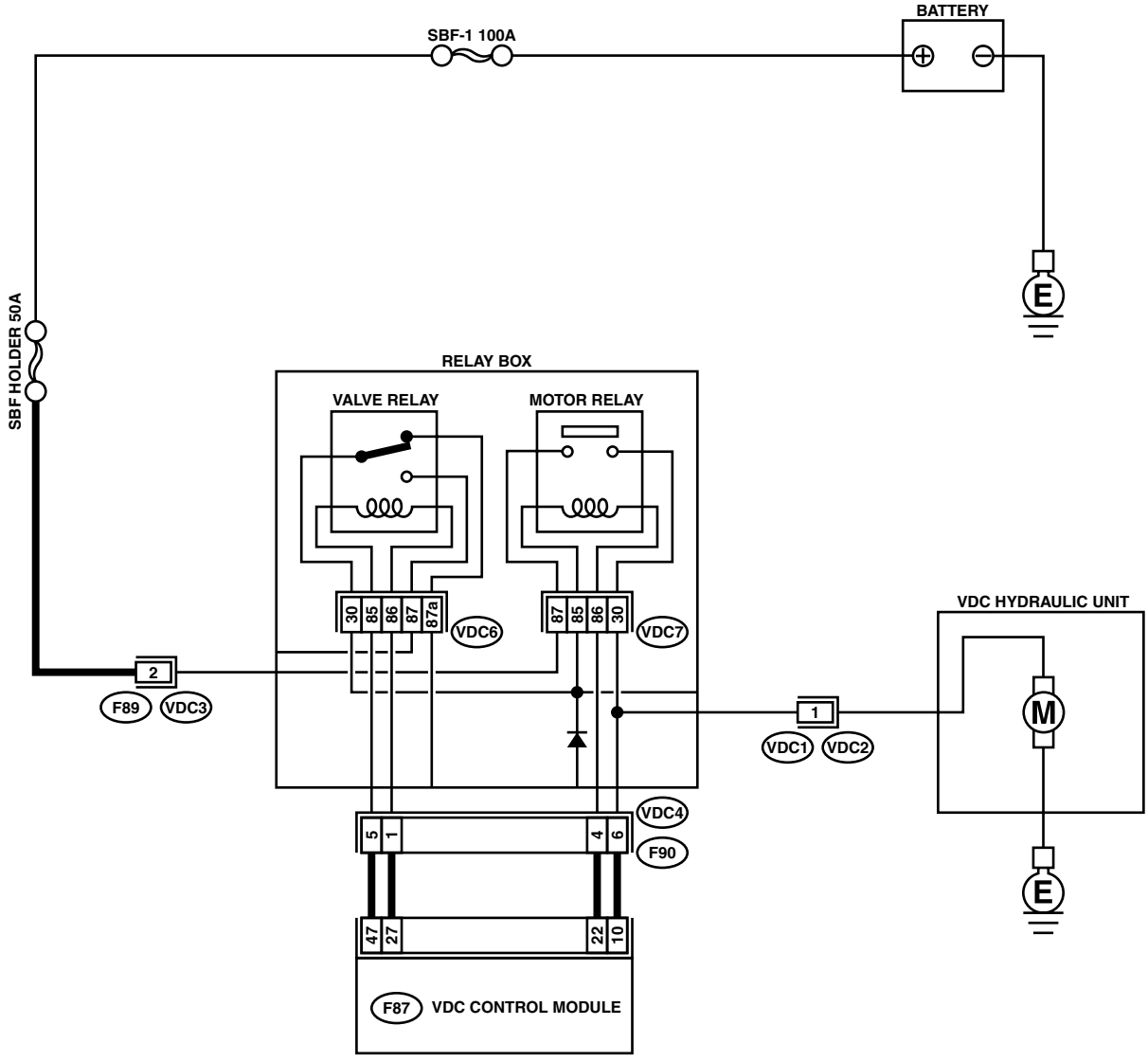
DIAGNOSIS:

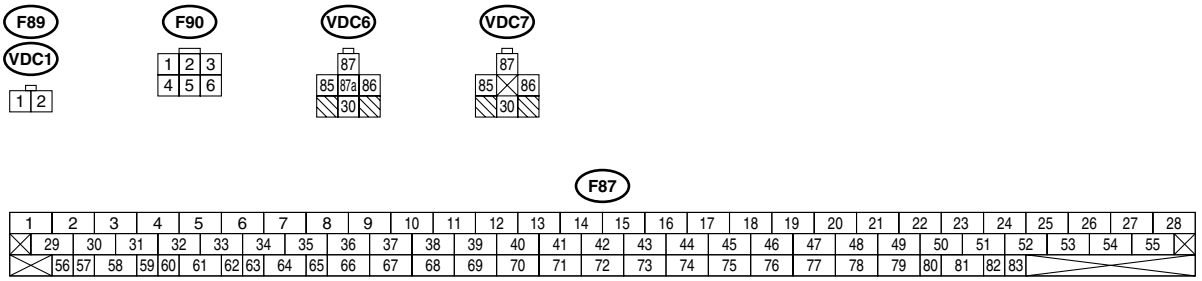
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00155

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 86:***	Is the measured value within 70 to 90 Ω?	Go to step **2.**	Replace motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Connect battery to motor relay terminals No. 85 and No. 86. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Replace motor relay.
3	**CHECK SHORT OF MOTOR RELAY.** Measure resistance between motor relay terminals. ***Terminals*** ***No. 85 — No. 30:*** ***No. 85 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace motor relay.
4	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **5.**	Repair harness/ connector between battery and relay box, and check fuse SBF holder.
5	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage between relay box and chassis ground. ***Connector & terminal*** ***(VDC7) No. 87 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Replace relay box.
6	**CHECK OPEN CIRCUIT IN CONTACT POINT CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to OFF. 2) Disconnect connectors (VDC2, F90) from relay box. 3) Measure resistance between relay box connector unit and motor relay installing portion. ***Connector & terminal*** ***(VDC1) No. 1 — (VDC7) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **7.**	Replace relay box.
7	**CHECK OPEN CIRCUIT IN MONITOR SYSTEM CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and motor relay installing point. ***Connector & terminal*** ***(VDC4) No. 6 — (VDC7) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **8.**	Replace relay box.

Step		Check	Yes	No
8	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** Measure resistance between motor relay installing point and relay box connector. ***Connector & terminal*** ***(VDC4) No. 4 — (VDC7) No. 86:***	Is the measured value less than 0.5 Ω?	Go to step **9.**	Replace relay box.
9	**CHECK OPEN CIRCUIT IN CONTROL CIRCUIT OF RELAY BOX.** 1) Remove valve relay from relay box. 2) Measure resistance between motor relay installing point and valve relay installing point. ***Connector & terminal*** ***(VDC7) No. 85 — (VDC6) No. 30:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Replace relay box.
10	**CHECK GROUND SHORT IN CIRCUIT OF RELAY BOX.** Measure resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** ***(VDC4) No. 6 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Replace relay box.
11	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **12.**	Replace relay box.
12	**CHECK BATTERY SHORT IN CIRCUIT OF RELAY BOX.** 1) Turn ignition switch to ON. 2) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **13.**	Replace relay box.
13	**CHECK OPEN CIRCUIT IN RELAY CONTROL SYSTEM HARNESS.** Measure resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(F87) No. 22 — (F90) No. 4:*** ***(F87) No. 10 — (F90) No. 6:***	Is the measured value less than 0.5 Ω?	Go to step **14.**	Repair harness connector between VDCCM and relay box.
14	**CHECK GROUND SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 22 — Chassis ground:*** ***(F87) No. 10 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **15.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
15	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **16.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.

	Step	Check	Yes	No
16	**CHECK BATTERY SHORT IN HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **17.**	Repair harness between VDCCM and relay box. Check fuse SBF holder.
17	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCH/U, relay box and VDCCM?	Repair connector.	Go to step **18.**
18	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19.**
19	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AO:DTC 52 MOTOR MALFUNCTION

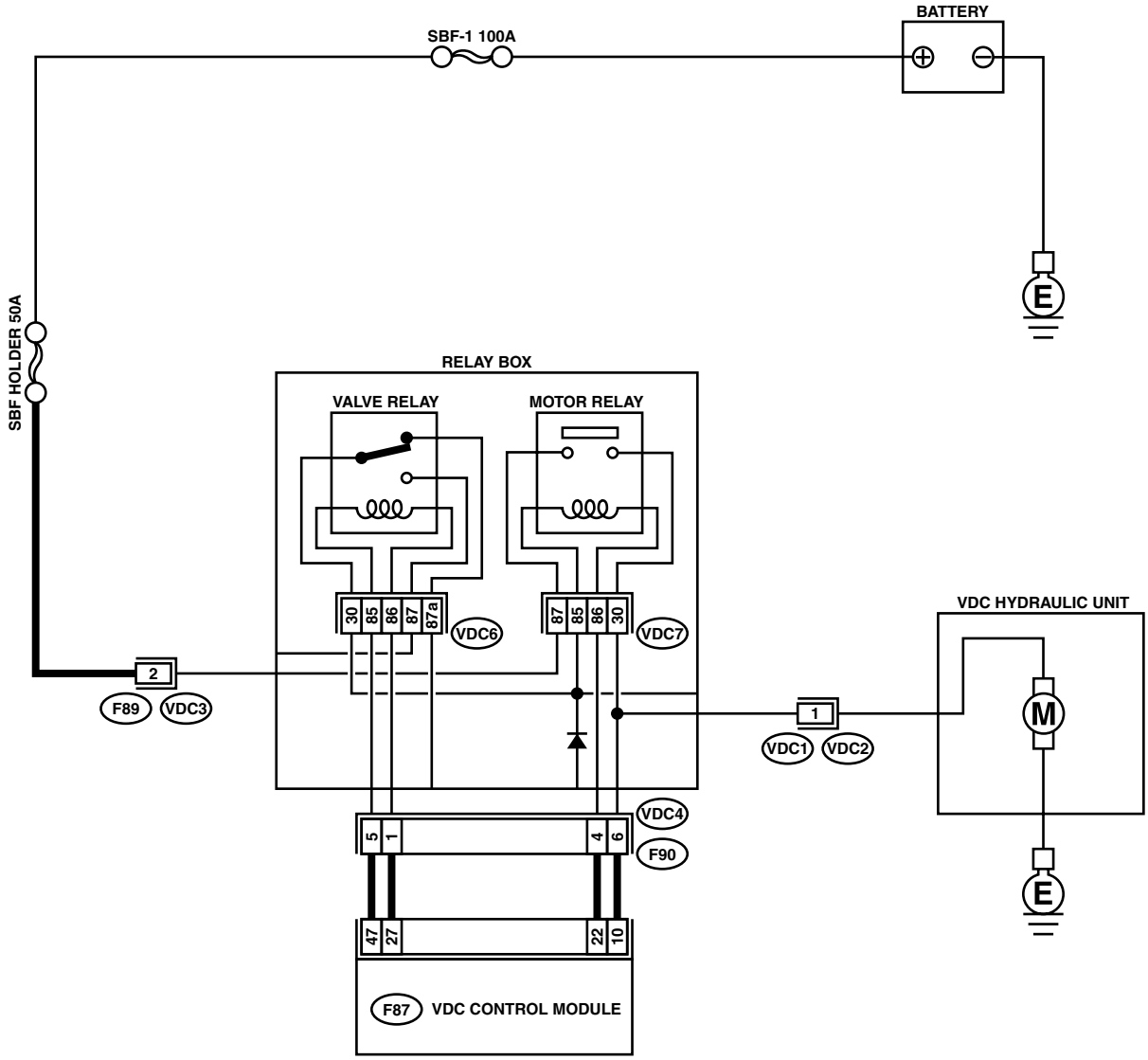
DIAGNOSIS:

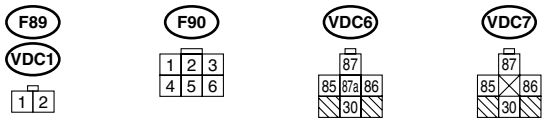
- Faulty motor
- Faulty motor relay
- Faulty harness connector

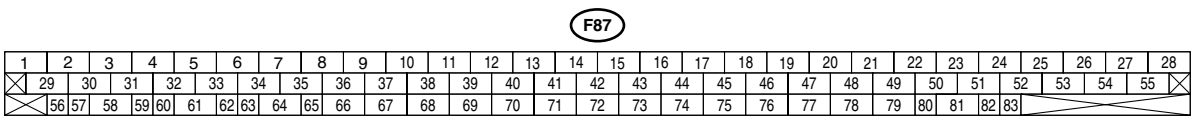
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:







VDC00155

	Step	Check	Yes	No
1	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove motor relay from relay box. 3) Connect battery to motor relay terminals No. 85 and No. 86. 4) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Replace motor relay.
2	**CHECK CONTACT POINT OF MOTOR RELAY.** 1) Disconnect battery from motor relay terminals. 2) Measure resistance between motor relay terminals. ***Terminals*** ***No. 30 — No. 87:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Replace motor relay.
3	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect connector (F89) from relay box. 2) Disconnect connector from VDCCM. 3) Turn ignition switch to ON. 4) Measure voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **4.**	Repair harness/ connector between battery and relay box, and check fuse SBF holder.
4	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Connect connector (F89) to relay box. 3) Turn ignition switch to ON. 4) Measure voltage between relay box and chassis ground. ***Connector & terminal*** ***(VDC7) No. 87 (+) — Chassis ground (–):***	Is the measured value within 10 to 15 V?	Go to step **5.**	Replace relay box.
5	**CHECK CONDITION OF MOTOR GROUND.**	Is the motor ground terminal clamped to 33 N·m (3.4 kg-m, 25 ft-lb)?	Go to step **6.**	Tighten the clamp of motor ground terminal.
6	**CHECK VDCCM MOTOR DRIVE TERMINAL.** 1) Turn ignition switch OFF. 2) Remove VDC connector cover. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 3) Connect all connectors. 4) Install motor relay. 5) Operate the ABS check sequence. <Ref. to VDC-16, ABS Sequence Control.> 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 22 (+) — No. 1 (–):***	Does the voltage drop from between 10 V and 13 V to less than 1.5 V, and rise to between 10 V and 13 V again when carrying out the check sequence?	Go to step **7.**	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK MOTOR OPERATION.** Operate the check sequence. <Ref. to VDC-19, VDC Sequence Control.>	Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Go to step **8.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
8	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCH/U, relay box and VDCCM?	Repair connector.	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **10.**
10	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

AP:DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG.

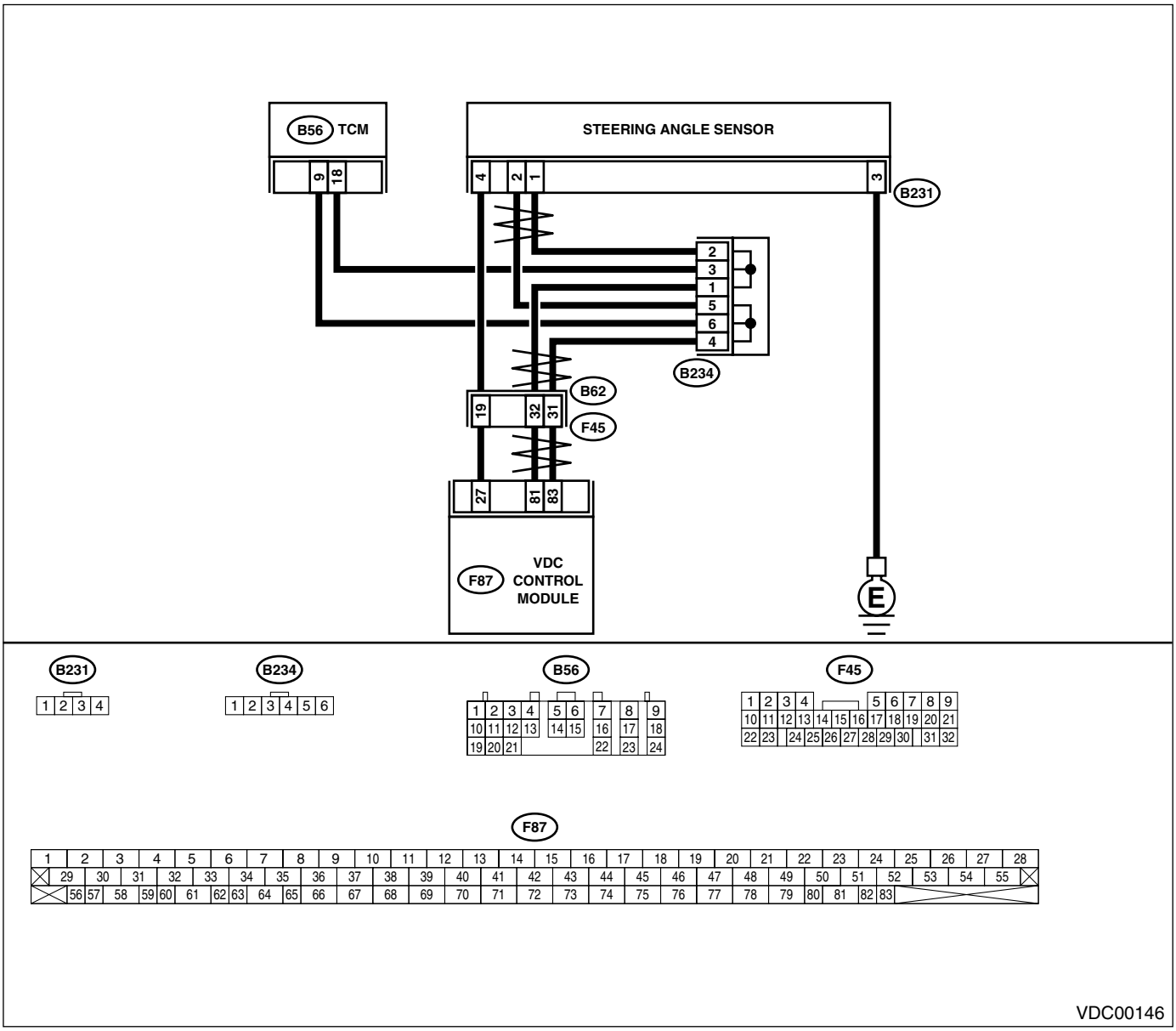
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel.	Is the angle of steering wheel alignment less than 5° from the straight-ahead position?	Go to step **2.**	Perform centering alignment of steering wheel.
2	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **3.**
3	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AQ:DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG.

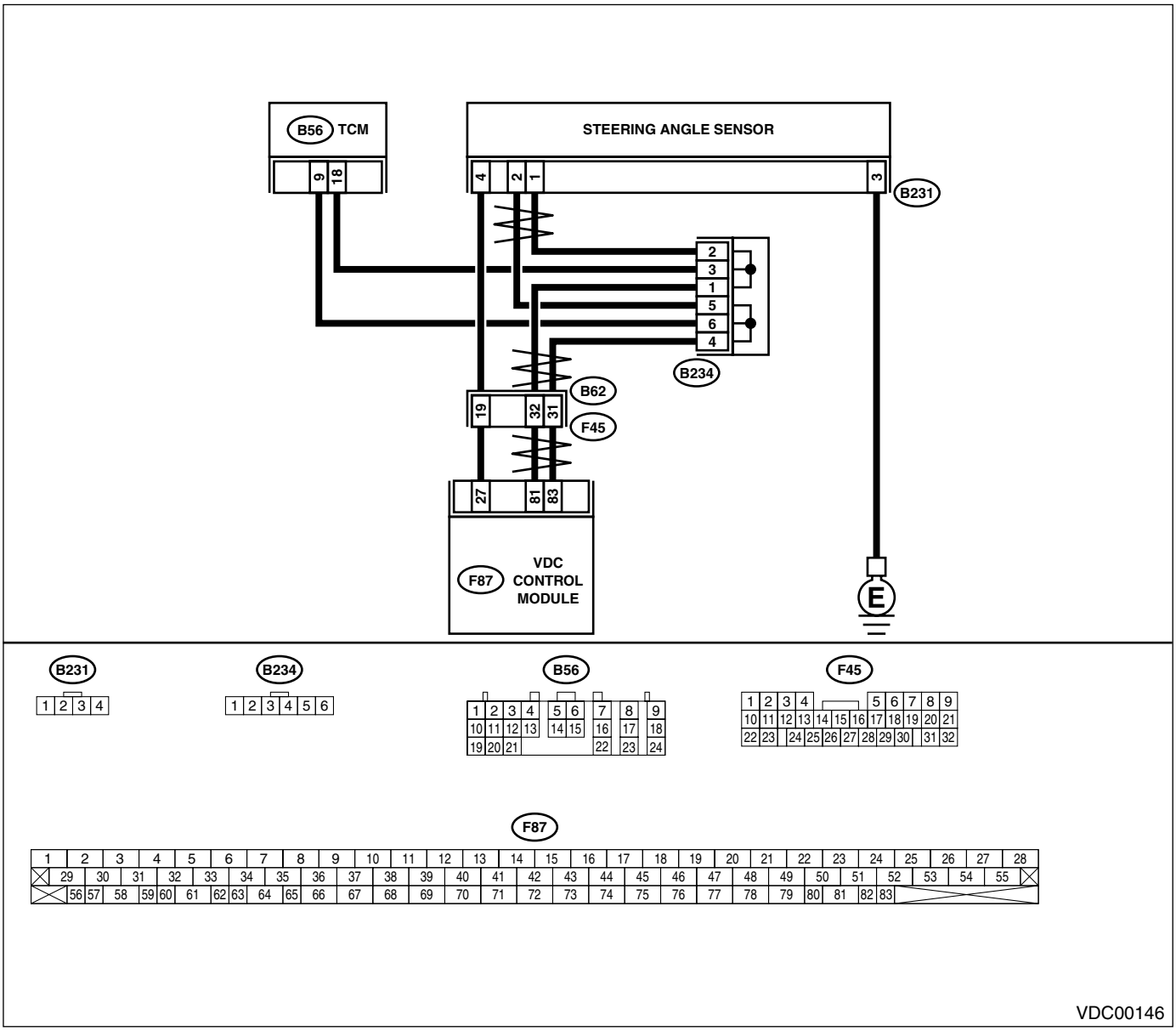
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **2.**
2	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AR:DTC 71 STEERING ANGLE SENSOR MALFUNCTION

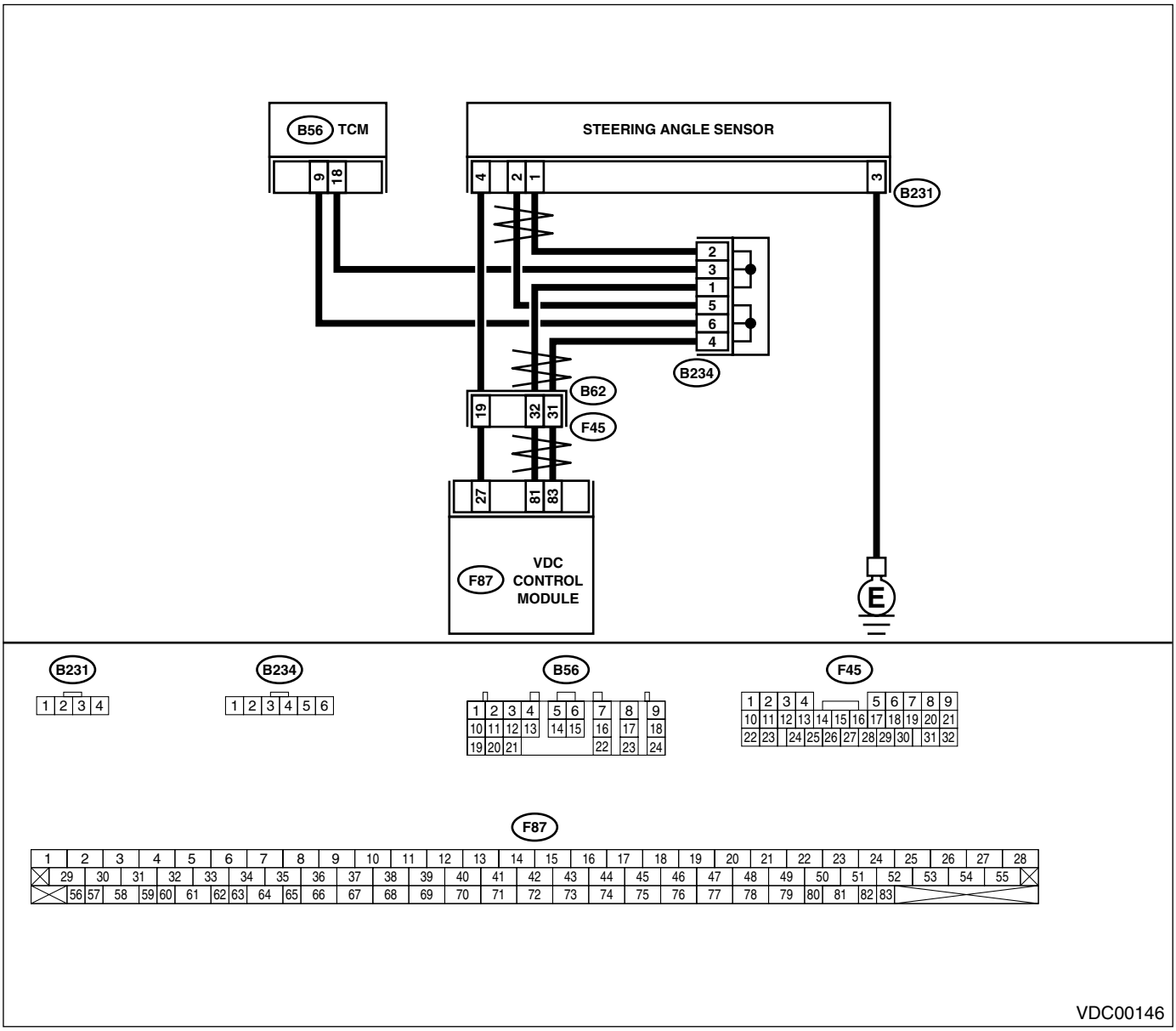
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK THE STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Check the angle of steering wheel.	Is the angle of steering wheel alignment less than 5° from the straight-ahead position?	Go to step **2.**	Perform centering alignment of steering.
2	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read steering angle sensor output on the select monitor display.	Does the steering angle sensor output (value) change on the monitor display when the steering wheel is turned in either direction?	Go to step **3.**	Replace steering angle sensor.
3	**CHECK RUNNING FIELD.** Check if the vehicle was driven on banked road surfaces or sandy surfaces (not dirt road surfaces).	Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory trouble code.	Go to step **4.**
4	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

AS:DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR

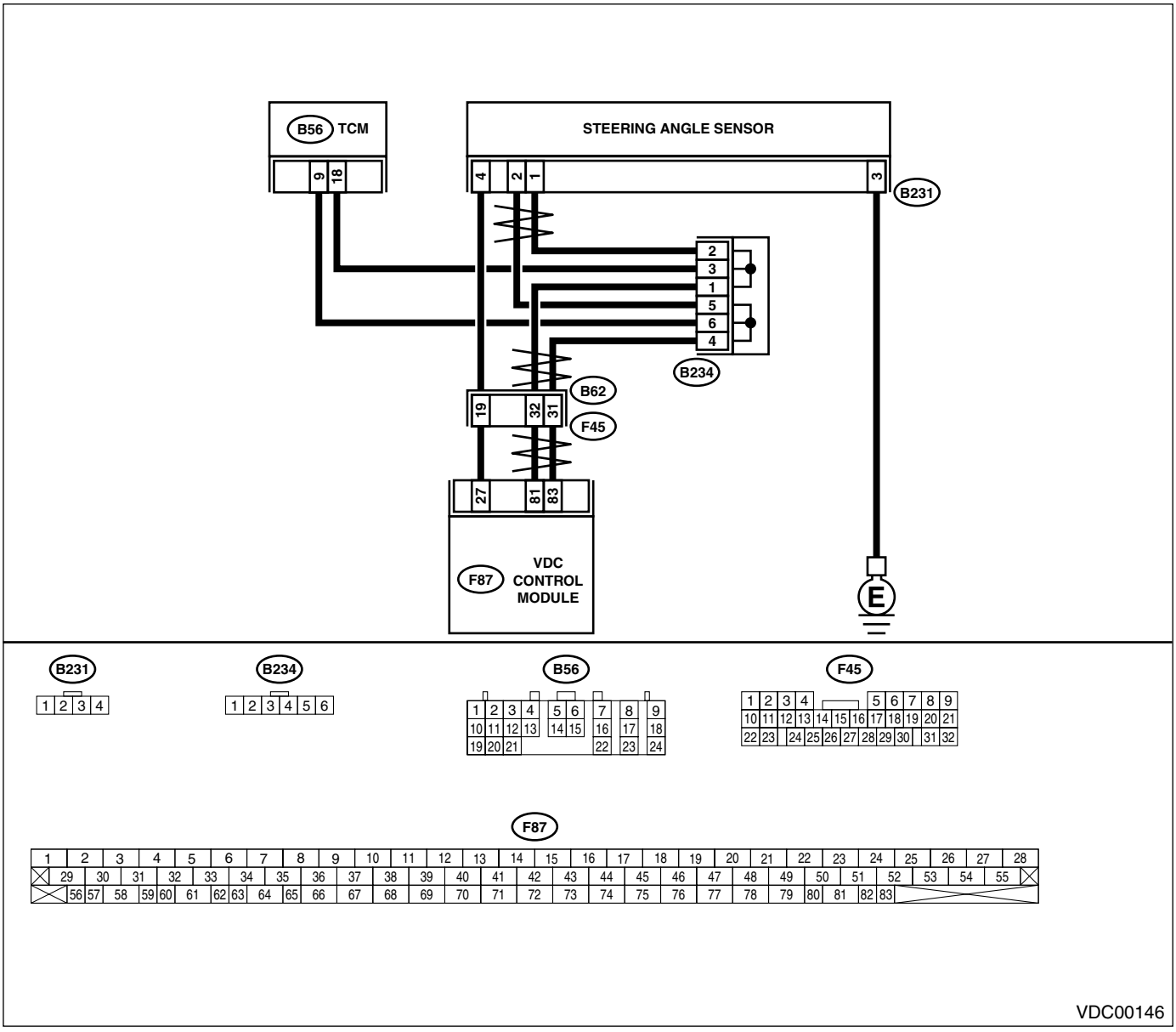
DIAGNOSIS:

- Faulty steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00146

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from steering angle sensor. 3) Turn ignition switch to ON. 4) Measure voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-19, VDC Sequence Control.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 27 — Chassis ground:***	Is the measured value within 10 to 15 V?	Repair harness between yaw rate sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in yaw rate sensor connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR.** Measure resistance between steering sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair steering angle sensor ground harness.
5	**CHECK HARNESS OF STEERING ANGLE SENSOR.** 1) Connect connector to steering angle sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 81 — No. 83:***	Is the measured value within 114 to 126 Ω?	Repair harness between steering angle sensor and VDCCM.	Go to step **6.**
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **8.**	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
8	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Replace steering angle sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **9.**

Step		Check	Yes	No
9	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original steering angle sensor has been faulty.

MEMO:

AT:DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT

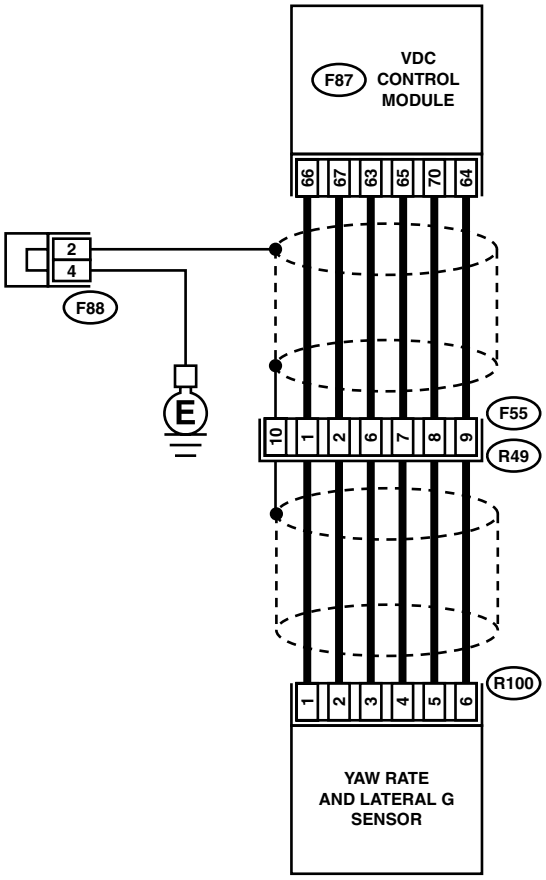
DIAGNOSIS:

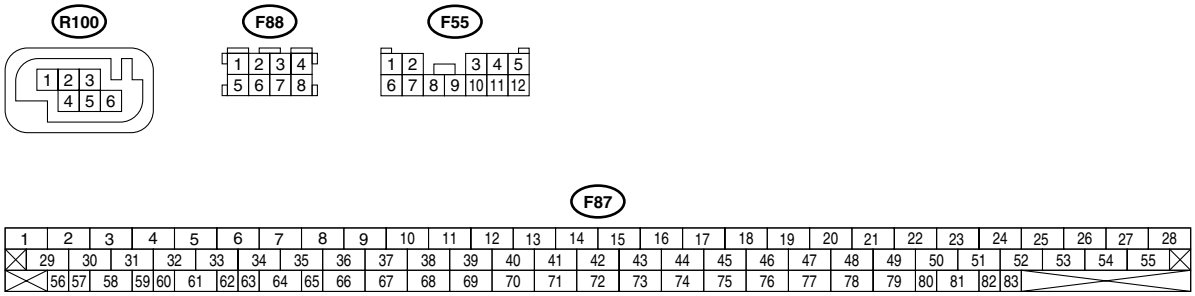
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

	Step	Check	Yes	No
1	**CHECK RUNNING FIELD.**	Was the vehicle driven on banked road surfaces or sandy surfaces (not dirt road surfaces)?	Driving on banked road surfaces or sandy surfaces (not dirt road surfaces) sometimes results in a VDCCM memory diagnostic trouble code.	Go to step **2.**
2	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor.	Is the yaw rate and lateral G sensor fixed securely?	Go to step **3.**	Install yaw rate and lateral G sensor securely.
3	**CHECK OUTPUT OF YAW RATE AND LATERAL G SENSOR USING SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Select “Current data display & Save” on the select monitor. 4) Read yaw rate and lateral G sensor output on the select monitor display.	Is the displayed value within 0±5.25 deg/s?	Go to step **4.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight line. 3) Select “Current data display & Save” on the select monitor. 4) Read steering angle sensor output on the select monitor display.	Is the displayed value within 0±2.5 deg?	Go to step **5.**	Perform centering alignment of steering wheel.
5	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Go to step **6.**	Go to step **7.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
7	**CHECK VDCCM.** 1) Turn ignition switch to OFF. 2) Replace yaw rate and lateral G sensor. 3) Erase the memory. 4) Perform inspection mode. 5) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **8.**
8	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	The original yaw rate and lateral G sensor has been faulty.

AU:DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION.

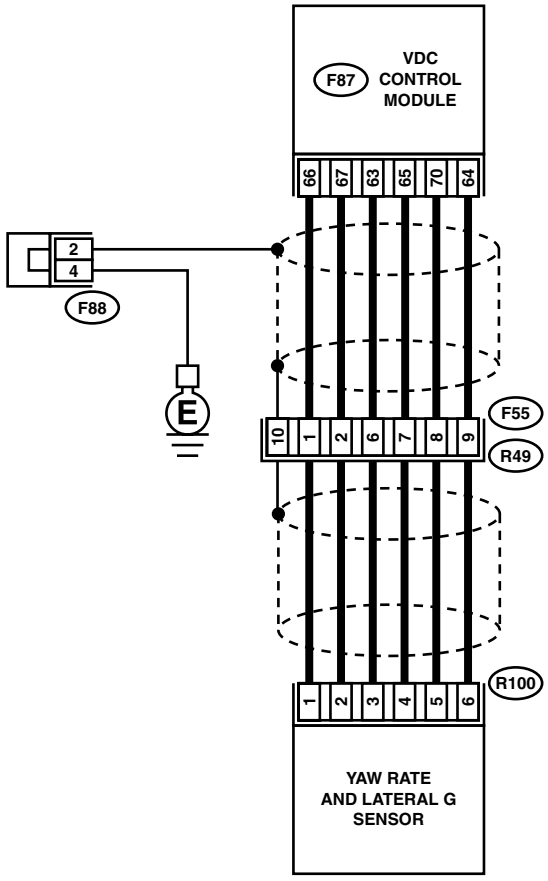
DIAGNOSIS:

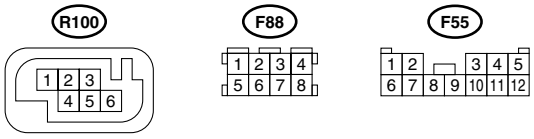
- Faulty yaw rate sensor

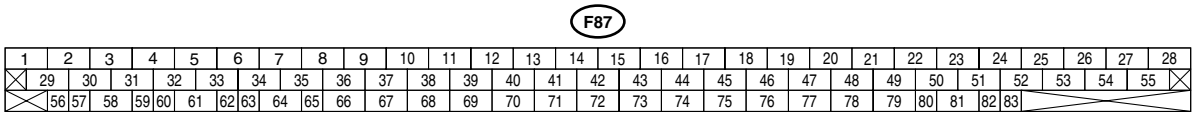
TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:







VDC00151

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-20, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:***	Is the measured value within 10 to 15 V?	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in yaw rate and lateral G sensor connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 65 — (R100) No. 4:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **7.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>	Repair harness between yaw rate and lateral G sensor and VDCCM.

AV:DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE

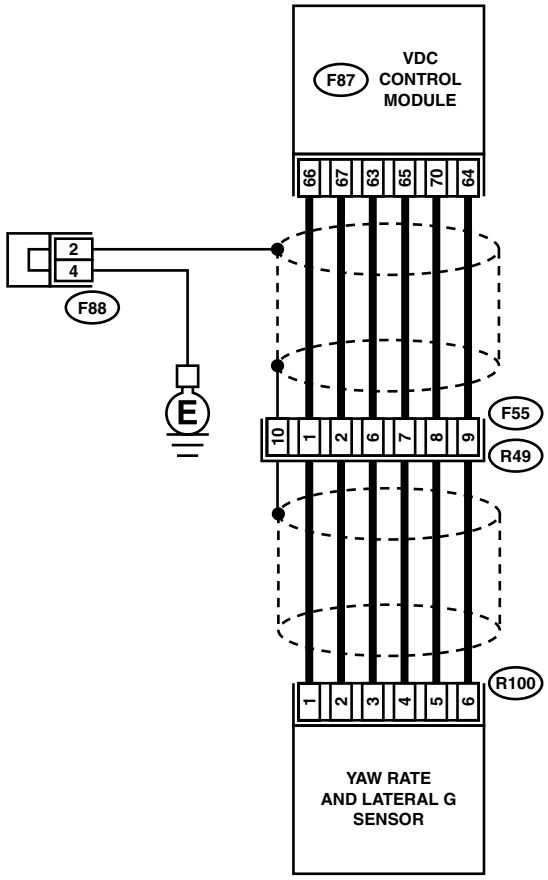
DIAGNOSIS:

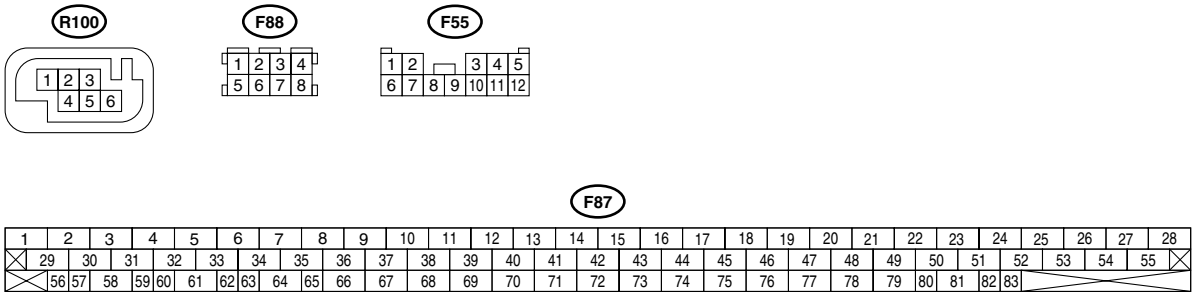
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:***	Is the measured value within 10 to 15 V?	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in yaw rate and lateral G sensor connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 66 — (R100) No. 1:***	Is the measured value less than 0.5 Ω?	Go to step **5.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminalDoes the measured value exceed the specified value?*** ***(F87) No. 66 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **6.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 66 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **7.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 66 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **8.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

	Step	Check	Yes	No
8	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Remove VDCCM connector cover. <Ref. to VDC-20, VDCCM Connector Cover.> 4) Connect all connectors. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 66 (+) — No. 64 (–):***	Is the measured value within 2.1 to 2.9 V?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

MEMO:

AW:DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG.

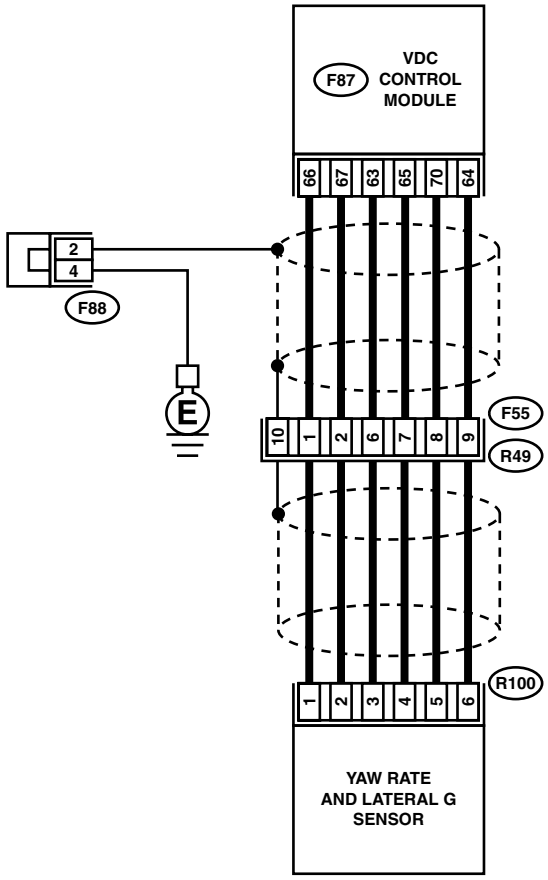
DIAGNOSIS:

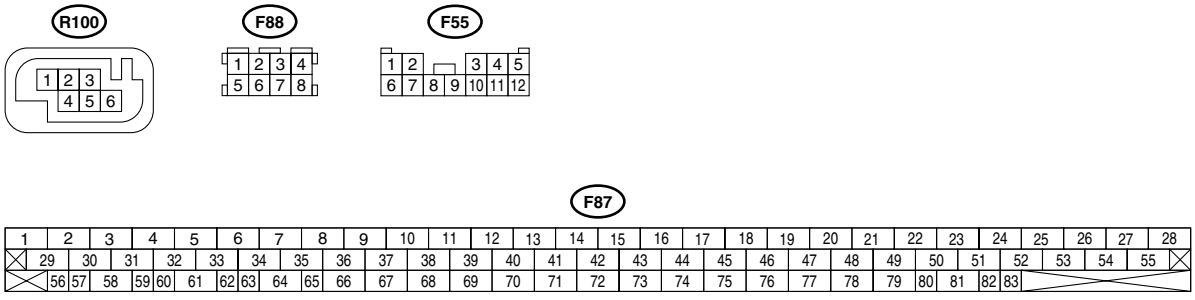
- Faulty yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.

WIRING DIAGRAM:





VDC00151

	Step	Check	Yes	No
1	**CHECK RUNNING FIELD.**	Was the vehicle driven on surfaces with holes or bumps at high speeds?	When driving on surfaces with holes or bumps at high speeds, VDCCM sometimes records trouble codes in memory.	Go to step **2.**
2	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor.	Is the yaw rate and lateral G sensor fixed securely?	Go to step **3.**	Install yaw rate and lateral G sensor securely.
3	**CHECK POWER SUPPLY OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from yaw rate and lateral G sensor. 3) Turn ignition switch to ON. 4) Measure voltage between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 3 — Chassis ground:***	Is the measured value within 10 to 15 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT VOLTAGE OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover for VDCCM connector. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:***	Is the measured value within 10 to 15 V?	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in yaw rate and lateral G sensor connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK GROUND CIRCUIT OF YAW RATE AND LATERAL G SENSOR.** Measure resistance between yaw rate and lateral G sensor and chassis ground. ***Connector & terminal*** ***(R100) No. 6 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **9.**	Go to step **7.**
7	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM connector. <Ref. to VDC-20, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 64 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Repair harness between yaw rate and lateral G sensor and VDCCM.	Go to step **8.**
8	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
9	**CHECK HARNESS OF YAW RATE AND LATERAL G SENSOR.** 1) Disconnect connector from VDCCM. 2) Measure resistance between VDCCM and yaw rate and lateral G sensor. ***Connector & terminal*** ***(F87) No. 65 — (R100) No. 4:*** ***(F87) No. 66 — (R100) No. 1:*** ***(F87) No. 67 — (R100) No. 2:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
10	**CHECK GROUND SHORT OF HARNESS.** Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** ***(F87) No. 66 — Chassis ground:*** ***(F87) No. 67 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
11	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 (+) — Chassis ground (–):*** ***(F87) No. 66 (+) — Chassis ground (–):*** ***(F87) No. 67 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **12.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 65 — Chassis ground:*** ***(F87) No. 66 — Chassis ground:*** ***(F87) No. 67 — Chassis ground:***	Is the measured value less than 0.5 V?	Go to step **13.**	Repair harness between yaw rate and lateral G sensor and VDCCM.
13	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Install yaw rate and lateral G sensor to body. 3) Connect all connectors. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(F87) No. 66 (+) — No. 64 (–):***	Is the measured value within 2.1 to 2.9 V?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

AX:DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG.

NOTE:
For diagnostic procedure, refer to DTC 73. <Ref. to VDC-230, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

AY:DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:
For diagnostic procedure, refer to DTC 73. <Ref. to VDC-230, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

AZ:DTC 73 CHANGE RANGE OF LATERAL G SENSOR IS TOO BIG.

NOTE:
For diagnostic procedure, refer to DTC 73. <Ref. to VDC-230, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostics Chart with Select Monitor.>

BA:DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL

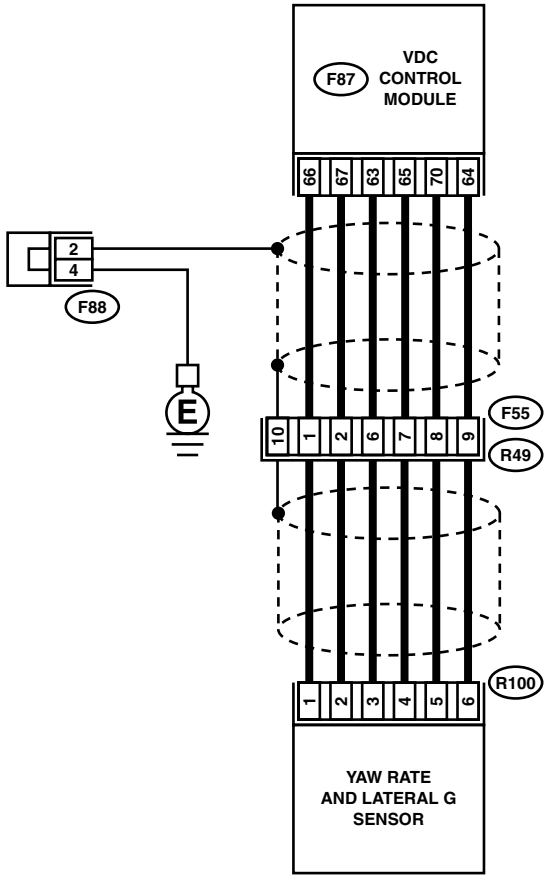
DIAGNOSIS:

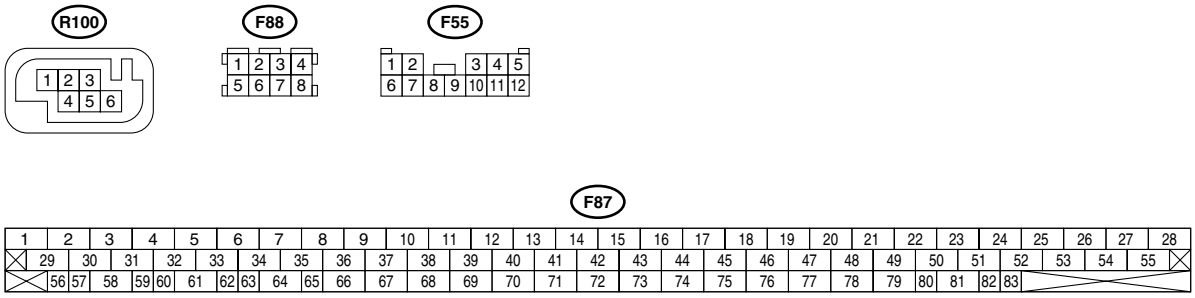
- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF YAW RATE AND LATERAL G SENSOR.** Check installation of yaw rate and lateral G sensor.	Is the yaw rate and lateral G sensor fixed securely?	Go to step **2.**	Install yaw rate and lateral G sensor securely.
2	**CHECK OUTPUT OF LATERAL G SENSOR USING SELECT MONITOR.** 1) Stop the vehicle on a flat road. 2) Select “Current data display & Save” on the select monitor. 3) Read yaw rate and lateral G sensor output on the select monitor display.	Is the measured value within 2.3 to 2.7 V?	Go to step **3.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
3	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	Repair connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

BB:DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION.

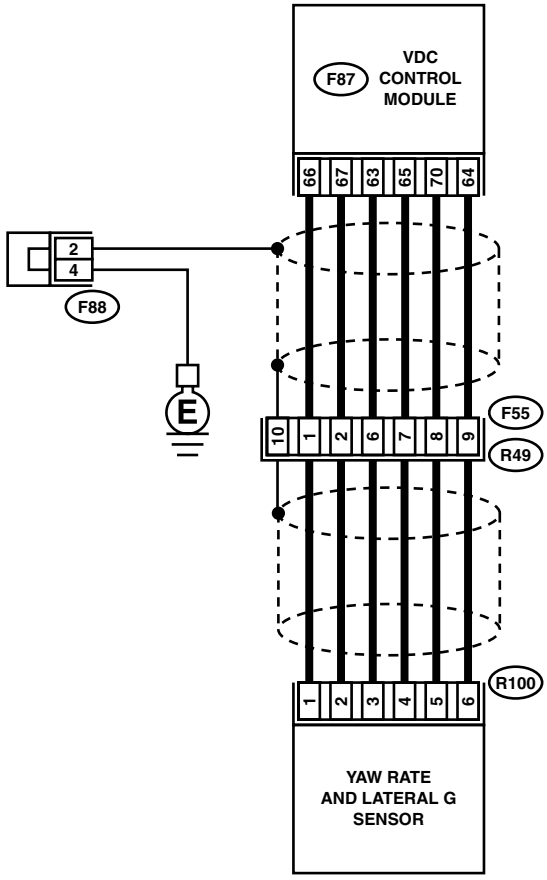
DIAGNOSIS:

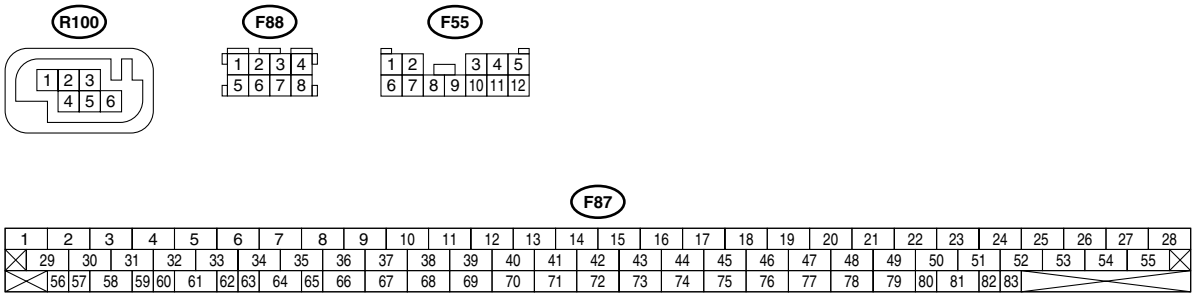
- Faulty lateral G sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00151

	Step	Check	Yes	No
1	**CHECK OUTPUT OF YAW RATE AND LATERAL G SENSOR USING SELECT MONITOR.** 1) Stop the vehicle on a flat road. 2) Select “Current data display & Save” on the select monitor. 3) Read yaw rate and lateral G sensor output on the select monitor display.	Is the measured value within 2.3 to 2.7 V?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	Repair connector.	Go to step **3.**
3	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove console box. 3) Disconnect connector from yaw rate and lateral G sensor. 4) Turn ignition switch to ON. 5) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 3 (+) — No. 6 (–):***	Is the measured value within 10 to 15 V?	Go to step **6.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
6	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Measure resistance between yaw rate and lateral G sensor terminals. ***Terminals*** ***No. 3 — No. 5:***	Is the measured value within 4.3 to 4.9 kΩ?	Go to step **7.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
7	**CHECK OPEN CIRCUIT IN YAW RATE AND LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Connect connector to yaw rate and lateral G sensor. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 70 — No. 64:***	Is the measured value within 4.3 to 4.9 kΩ?	Go to step **8.**	Repair harness/ connector between yaw rate and lateral G sensor and VDCCM.
8	**CHECK GROUND SHORT IN YAW RATE AND LATERAL G SENSOR HARNESS.** 1) Disconnect connector from yaw rate and lateral G sensor. 2) Measure resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(F87) No. 63 — Chassis ground:*** ***(F87) No. 70 — Chassis ground:*** ***(F87) No. 64 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Repair harness between yaw rate and lateral G sensor and VDCCM.

	Step	Check	Yes	No
9	**CHECK YAW RATE AND LATERAL G SENSOR.** 1) Turn ignition switch to OFF. 2) Remove yaw rate and lateral G sensor from vehicle. 3) Connect connector to yaw rate and lateral G sensor. 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):***	Is the measured value within 2.3 to 2.7 V when yaw rate and lateral G sensor is horizontal?	Go to step **10.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
10	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):***	Is the measured value within 3.3 to 3.7 V when yaw rate and lateral G sensor is inclined 90° to left?	Go to step **11.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
11	**CHECK YAW RATE AND LATERAL G SENSOR.** Measure voltage between yaw rate and lateral G sensor connector terminals. ***Connector & terminal*** ***(R100) No. 5 (+) — No. 6 (–):***	Is the measured value within 1.3 to 1.7 V when yaw rate and lateral G sensor is inclined 90° to right?	Go to step **12.**	Replace yaw rate and lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and yaw rate and lateral G sensor?	Repair connector.	Go to step **13.**
13	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **14.**
14	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

BC:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 1 EXCEEDS SPECIFICATION. (PRIMARY PRESSURE SENSOR)

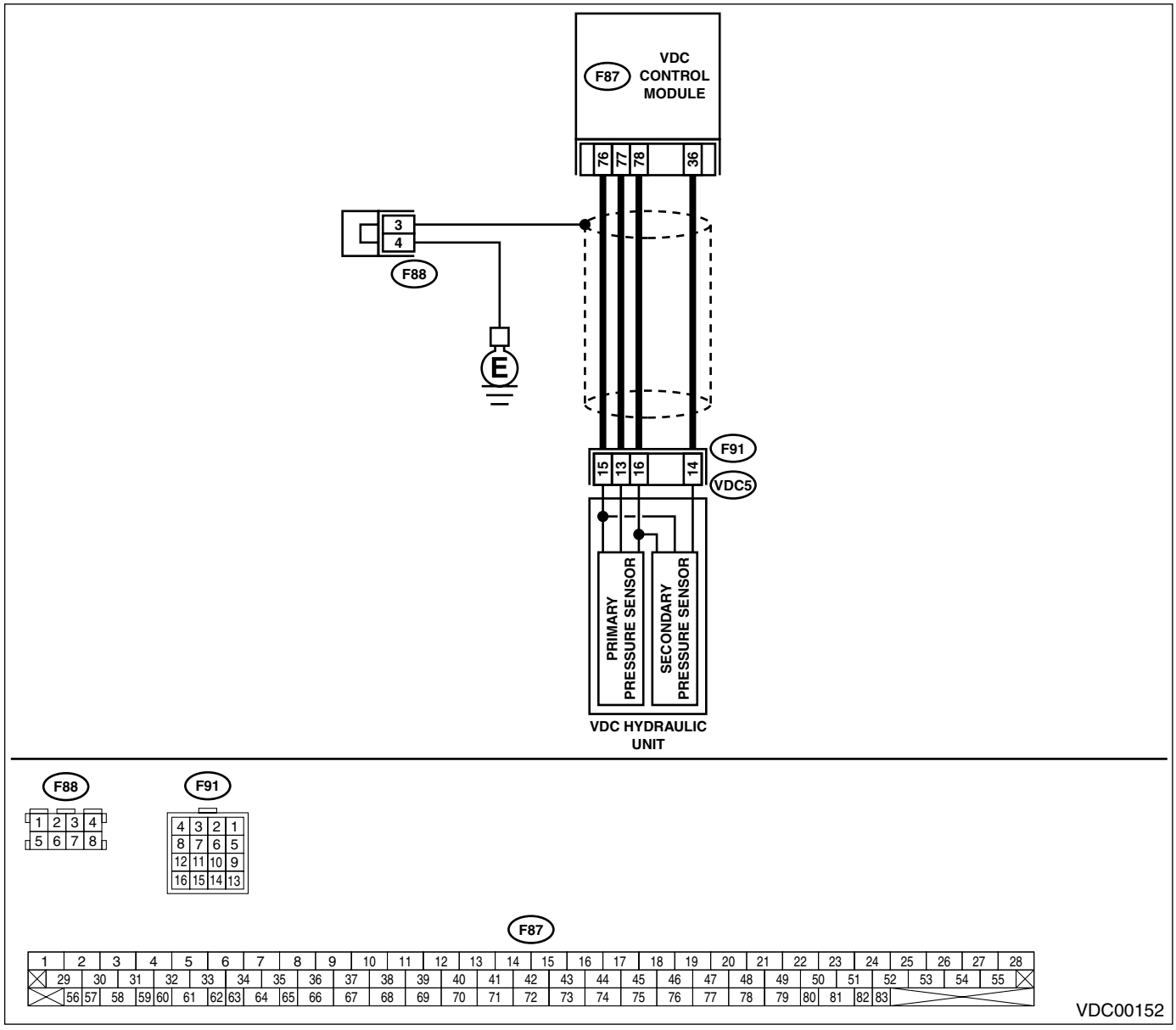
DIAGNOSIS:

- Faulty primary pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-20, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 76 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Replace harness between VDCH/U and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY OF PRESSURE SENSOR.** NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):***	Is the measured value within 4.75 to 5.25 V?	Go to step **7.**	Go to step **5.**
5	**CHECK POWER SUPPLY OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 78 (+) — No. 76 (–):***	Is the measured value within 4.75 to 5.25 V?	Repair harness between VDCH/U and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCH/U and VDCCM.

	Step	Check	Yes	No
8	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **9.**	Repair harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **10.**	Repair harness between VDCH/U and VDCCM.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 77 (+) — No. 76 (–):***	Is the measured value within 0.48 to 0.72 V?	Go to step **11.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and pressure sensor?	Repair connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

MEMO:

BD:DTC 74 VOLTAGE INPUTTED TO PRESSURE SENSOR 2 EXCEEDS SPECIFICATION. (SECONDARY PRESSURE SENSOR)

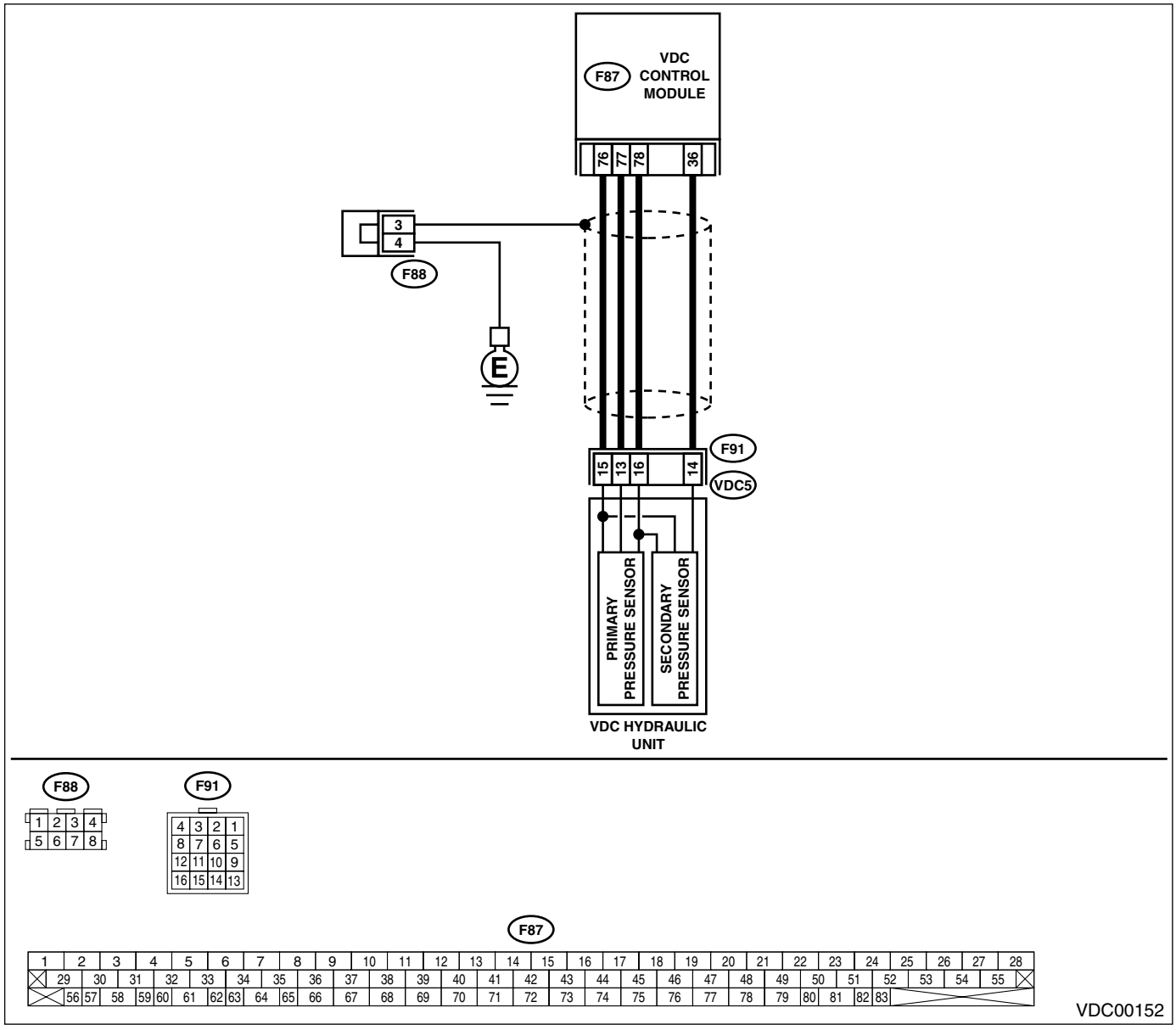
DIAGNOSIS:

- Faulty secondary pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector (F91) from VDCH/U. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect connector from VDCCM. 2) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 3) Connect connector to VDCCM. 4) Measure resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(F87) No. 76 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Replace harness between VDCH/U and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY OF PRESSURE SENSOR.** NOTE: When this inspection is carried out, DTC 51 ABNORMAL VALVE RELAY is memorized, but this does not indicate valve relay malfunction. 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):***	Is the measured value within 4.75 to 5.25 V?	Go to step **7.**	Go to step **5.**
5	**CHECK POWER SUPPLY OF VDCCM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Turn ignition switch to ON. 6) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 78 (+) — No. 76 (–):***	Is the measured value within 4.75 to 5.25 V?	Repair harness between VDCH/U and VDCCM.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in VDCCM connector?	Repair or replace VDCCM connector.	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair harness between VDCH/U and VDCCM.

Step		Check	Yes	No
8	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **9.**	Repair harness between VDCH/U and VDCCM.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **10.**	Repair harness between VDCH/U and VDCCM.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 36 (+) — No. 76 (–):***	Is the measured value within 0.48 to 0.72 V?	Go to step **11.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and pressure sensor?	Repair connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

BE:DTC 74 PRESSURE SENSOR 1 OFFSET IS TOO BIG. (PRIMARY PRESSURE SENSOR)

NOTE:
For diagnostic procedure, refer to DTC 74. <Ref. to VDC-244, DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR), Diagnostics Chart with Select Monitor.>

BF:DTC 74 PRESSURE SENSOR 2 OFFSET IS TOO BIG. (SECONDARY PRESSURE SENSOR)

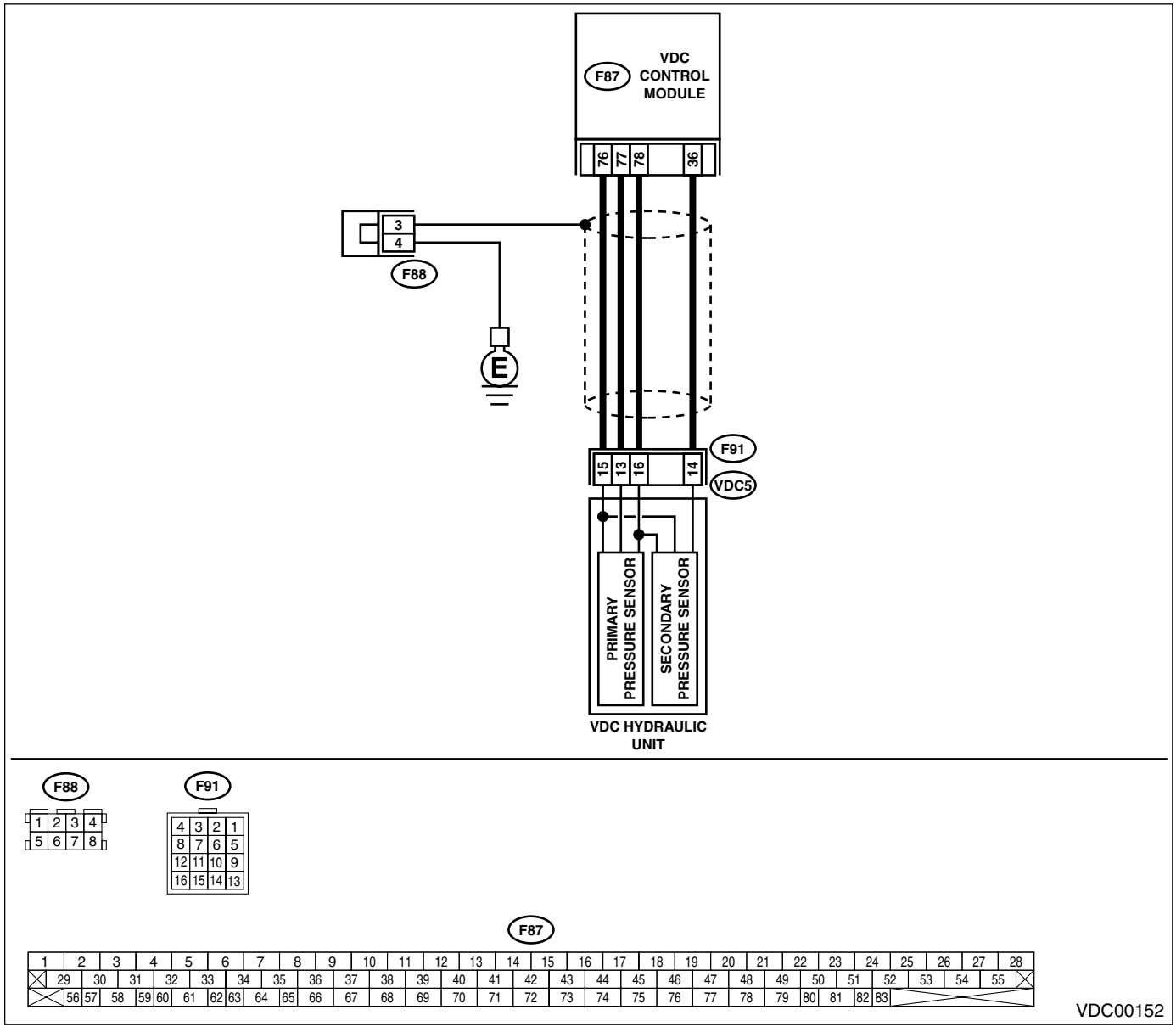
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING TECHNIC.** Check the driver's technic.	Are the accelerator and brake pedals depressed simultaneously while driving?	The VDC is normal. Erase the diagnostic trouble code. NOTE: Driving the vehicle with both the accelerator pedal and brake pedal depressed may store a diagnostic trouble code in the memory.	Go to step **2.**
2	**CHECK OUTPUT OF PRESSURE SENSOR USING SELECT MONITOR.** 1) Select “Current data display & Save” on the select monitor. 2) Read pressure sensor output on the select monitor display.	Is the measured value within 0.48 to 0.72 V when brake pedal is depressed?	Go to step **3.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
3	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4.**
4	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

BG:DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG.

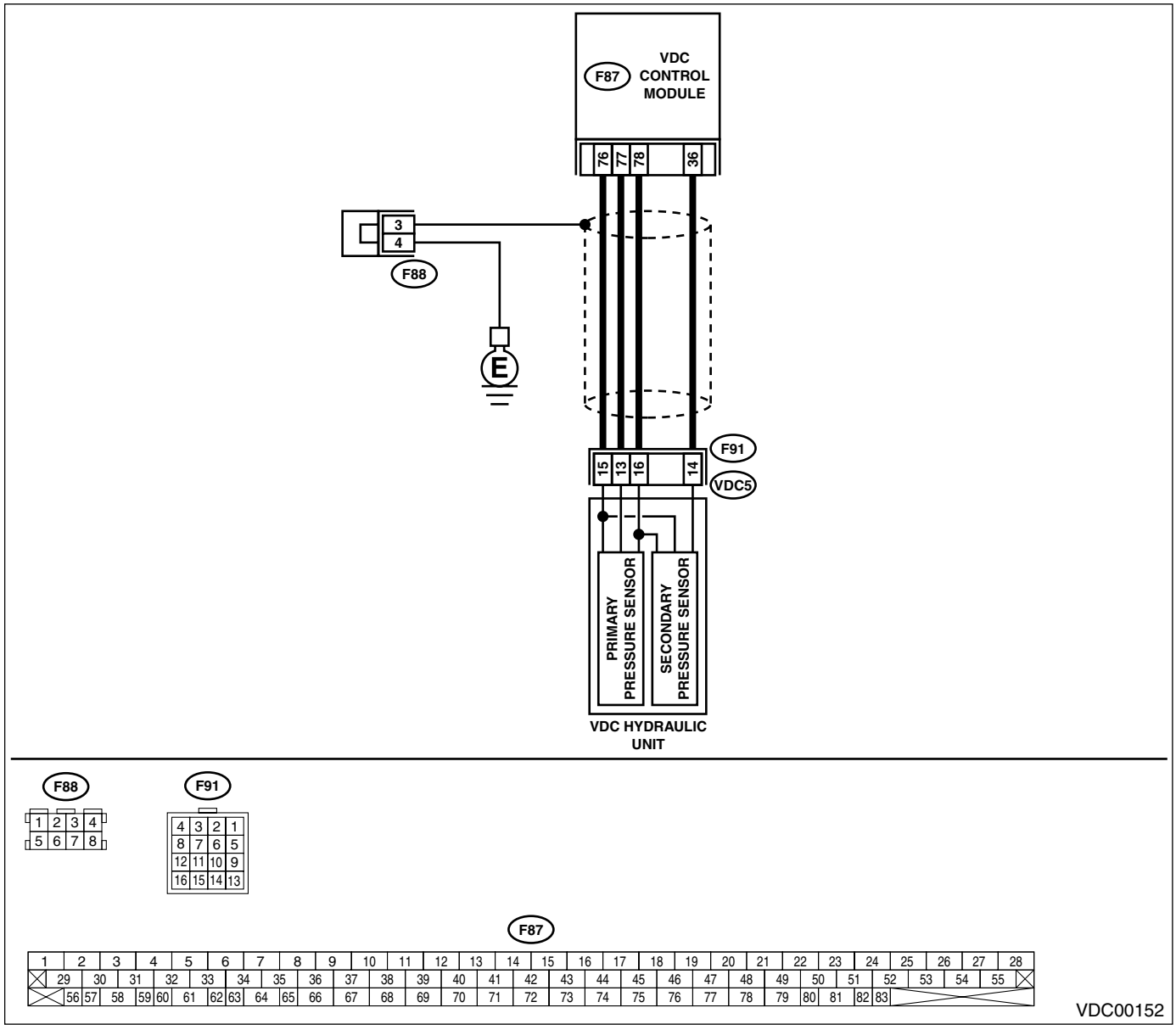
DIAGNOSIS:

- Faulty pressure sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND SHORT OF HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Disconnect connector (F91) from VDCH/U. 4) Measure resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:*** ***(F91) No. 14 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **2.**	Repair harness between VDCH/U and VDCCM.
2	**CHECK BATTERY SHORT OF HARNESS.** Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **3.**	Repair harness between VDCH/U and VDCCM.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (–):*** ***(F91) No. 14 (+) — Chassis ground (–):***	Is the measured value less than 0.5 V?	Go to step **4.**	Repair harness between VDCH/U and VDCCM.
4	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from VDCCM. 3) Remove cover from VDCCM. <Ref. to VDC-20, REMOVE, VDCCM Connector Cover.> 4) Connect connector to VDCCM. 5) Connect all connectors. 6) Turn ignition switch to ON. 7) Do not depress brake pedal. 8) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***(F87) No. 77 (+) — No. 76 (–):*** ***(F87) No. 36 (+) — No. 76 (–):***	Is the measured value within 0.48 to 0.72 V?	Go to step **5.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>
5	**CHECK BRAKE FLUID LEAKAGE.** Inspect fluid leakage between brake master cylinder and VDCH/U.	Does brake fluid leak?	Retighten or replace.	Go to step **6.**
6	**CHECK BRAKE MASTER CYLINDER.** Inspect brake master cylinder hydraulic pressure. <Ref. to BR-29, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.>	Is hydraulic pressure normal?	Go to step **7.**	Replace master cylinder.
7	**CHECK BRAKE PEDAL STROKE.** Measure the stroke between non-forced pedal position and forced pedal position with 50 kg (110 lb).	Is the measured value less than 95 mm (3.74 in)?	Go to step **8.**	Perform bleeding from brake system.
8	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Depress the brake pedal with 50 kg (110 lb). 2) Measure voltage between VDCCM connector terminals. ***Connector & terminal*** ***A (F87) No. 77 (+) — No. 76 (–):*** ***B (F87) No. 36 (+) — No. 76 (–):***	Is the voltage difference between A and B more than 0.2 V?	Go to step **9.**	Replace VDCH/U. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
9	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between VDCCM and pressure sensor?	Repair connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the diagnostic trouble code.	Is the same diagnostic trouble code as in the current diagnosis still being output?	Replace VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES APPEARANCE.**	Are other diagnostic trouble codes being output?	Proceed with the diagnosis corresponding to the diagnostic trouble code.	A temporary poor contact.

15.General Diagnostic Table

A: INSPECTION

Symptom		Primary probable cause	Secondary probable cause
Poor braking effectiveness	Long braking distance	VDCH/U VDCCM Brake pads Air in brake line Tire specifications, wear and pressures Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Proportioning valve Master cylinder Brake caliper Disc rotor Brake pipe Brake booster
	Wheel locks	VDCH/U VDCCM Faulty ABS sensor or sensor gap Incorrect wiring or piping	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Proportioning valve Brake caliper Brake pipe
	Brake dragging	VDCH/U VDCCM Faulty ABS sensor or sensor gap Master cylinder Brake caliper Parking brake Axle & wheels Brake pedal play	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Brake pipe
	Long brake pedal stroke	Air in brake line Brake pedal play	VDCH/U Proportioning valve Master cylinder Brake caliper Brake pads Brake pipe Brake booster
	Vehicle pitching	VDCH/U VDCCM Uneven road Suspension play or fatigue (reduced damping) Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Unstable or uneven braking	VDCH/U VDCCM Faulty ABS sensor or sensor gap Brake caliper Brake pads Uneven road Tire specifications, wear and pressures Incorrect wiring or piping	Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Master cylinder Disc rotor Brake pipe Axle & wheels Crowned road or banked road Suspension play or fatigue (reduced damping)

GENERAL DIAGNOSTIC TABLE

Symptom		Primary probable cause	Secondary probable cause
Vibration and/or noise • During abrupt braking • During rapid acceleration • During slippery road driving	Excessive brake pedal vibration	Uneven road Incorrect wiring or piping	VDCH/U Proportioning valve Brake booster Suspension play or fatigue (reduced damping)
	Noise from VDCH/U	VDCH/U (mount bushing) Faulty ABS sensor or sensor gap Brake pipe	VDCCM Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Noise from front of vehicle	VDCH/U (mount bushing) Faulty ABS sensor or sensor gap Master cylinder Brake caliper Brake pads Disc rotor Brake pipe Brake booster Suspension play or fatigue (reduced damping)	Axle & wheels Tire specifications, wear and pressures
	Noise inside passenger compartment		VDCCM Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation
	Noise from rear of vehicle	Faulty ABS sensor or sensor gap Brake caliper Brake pads Disc rotor Parking brake Brake pipe Suspension play or fatigue (reduced damping)	Axle & wheels Tire specifications, wear and pressures
Engine does not accelerate or engine stalls during rapid acceleration or on slippery roads.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Master cylinder Brake caliper Parking brake Incorrect wiring or piping	Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Brake pipe

Symptom		Primary probable cause	Secondary probable cause
Poor TCS's directional operation stability	Deviation in either left or right direction	VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake caliper Brake pads Wheel alignment Uneven road Crowned road or banked road Tire specifications, wear and pressures Incorrect wiring or piping	Proportioning valve Disc rotor Brake pipe Axle & wheels Suspension play or fatigue (reduced damping)
	Vehicle spin	VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Brake pads Tire specifications, wear and pressures Incorrect wiring or piping	Proportioning valve Brake caliper Brake pipe
Steering wheel drags during operation.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Incorrect wiring or piping connections Power steering system	Brake caliper Brake pads Disc rotor Wheel alignment Uneven road Crowned road or banked road Suspension play or fatigue (reduced damping) Tire specifications, wear and pressures
VDC activates during ordinary driving.		VDCH/U VDCCM Faulty ABS sensor or sensor gap Faulty steering angle sensor or improper neutral position Faulty yaw rate and lateral G sensor or improper installation Wheel alignment Uneven road Crowned road or banked road Suspension play or fatigue (reduced damping) Tire specifications, wear and pressures Incorrect wiring or piping Power steering system	
VDC OFF indicator light does not illuminate when VDC OFF switch is pushed. NOTE: When pushing the VDC OFF switch for 10 seconds or more while revving the engine, the VDC OFF indicator light goes off and operations cannot be continued. Turn ignition switch from OFF to ON again to recover the previous condition.		Harness Indicator light bulb VDC OFF switch	

MEMO:

BRAKE

BR

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1. General Description

A: SPECIFICATIONS

Front disc brake	Size	15 inch type	16 inch type	
			Non-TURBO	With TURBO model
	Type	Disc (Floating type, ventilated)		
	Effective disc diameter	228 mm (8.98 in)	244 mm (9.76 in)	
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)	
	Effective cylinder diameter	42.8 mm (1.685 in) × 2		
	Pad dimensions (length × width × thickness)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)		
	Clearance adjustment	Automatic adjustment		
Rear disc brake	Type	Disc (Floating type)		
	Effective disc diameter	254 mm (10.0 in)		
	Disc thickness × Outer diameter	10 × 290 mm (0.39 × 11.42 in)		
	Effective cylinder diameter	38.1 mm (1.500 in)		
	Pad dimensions (length × width × thickness)	82.4 × 33.7 × 9.0 mm (3.244 × 1.327 × 0.354 in)		
	Clearance adjustment	Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter	26.99 mm (17/16 in)		25.4 mm (1 in)
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)		
Brake booster	Type	Vacuum suspended		
	Effective diameter	205 + 230 mm (8.07 + 9.06 in)		
Proportioning valve	Split point	2,942 kPa (30 kg/cm^2, 427 psi)	3,678 kPa (without VDC) (37.5 kg/cm^2, 533 psi) 2,942 kPa (without VDC) (30 kg/cm^2, 427 psi)	
	Reducing ratio	0.3		
Brake line		Dual circuit system		
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.** **• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.** **• Use fresh DOT3 or 4 brake fluid when replacing or refilling the fluid.**		FMVSS No. 116, DOT3 or DOT4		

NOTE:
Refer to “PB section” for parking brake SPECIFICATIONS.

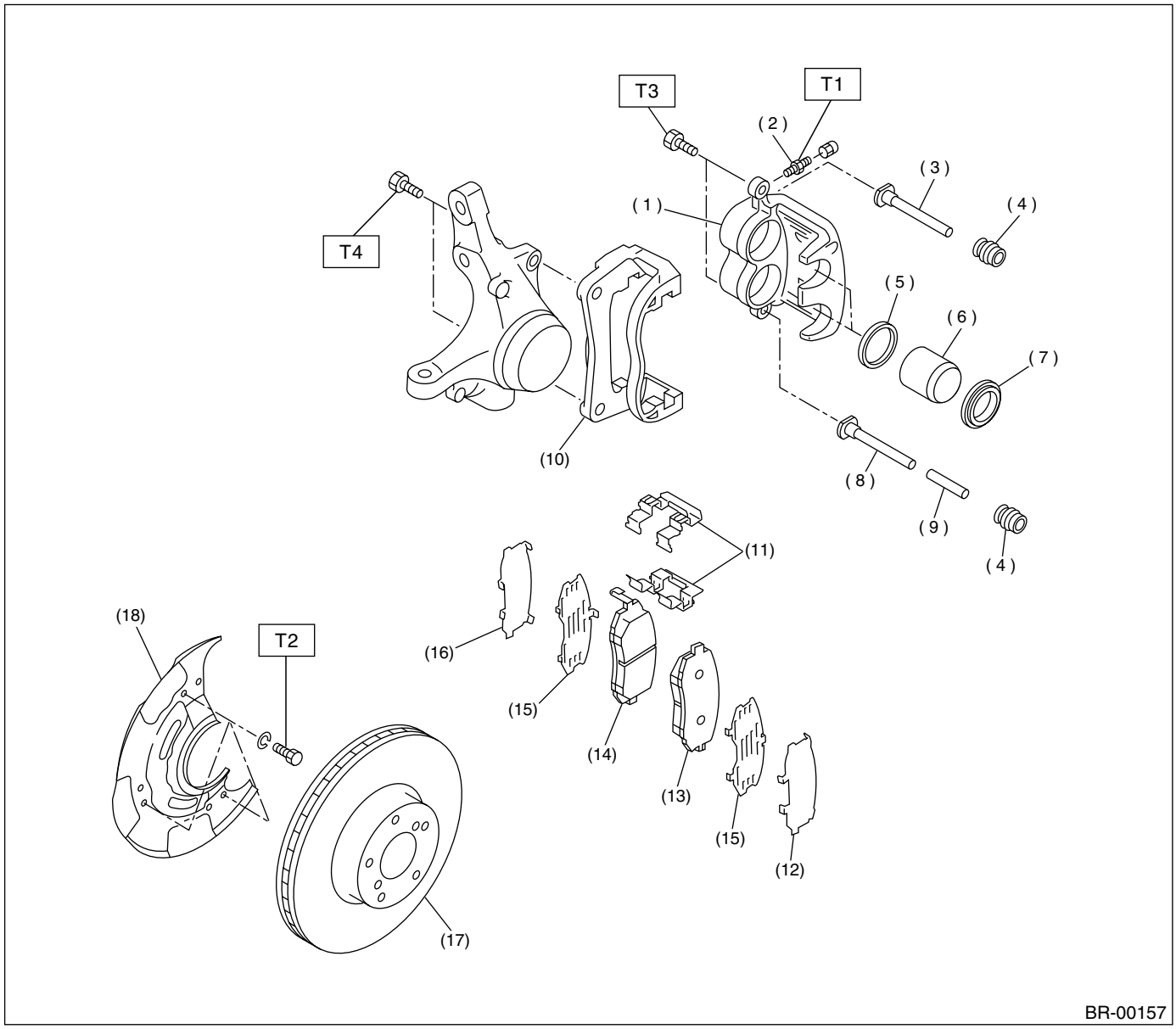
ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness (including back metal)	17 mm (0.67 in)	7.5 mm (0.295 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake	Pad thickness (including back metal)	14 mm (0.55 in)	6.5 mm (0.256 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc runout	—	0.070 mm (0.0028 in)
Parking brake	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
	Lever stroke	7 to 8 notches/196 N (20 kgf, 44 lb)	

		Brake pedal force	Fluid pressure	
			15 inch type	16 inch type
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	588 kPa (6 kg/cm^2, 85 psi)	
		294 N (30 kgf, 66 lb)	1,569 kPa (16 kg/cm^2, 228 psi)	
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	6,178 kPa (63 kg/cm^2, 896 psi)	
		294 N (30 kgf, 66 lb)	9,709 kPa (99 kg/cm^2, 1,408 psi)	

Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]

B: COMPONENT

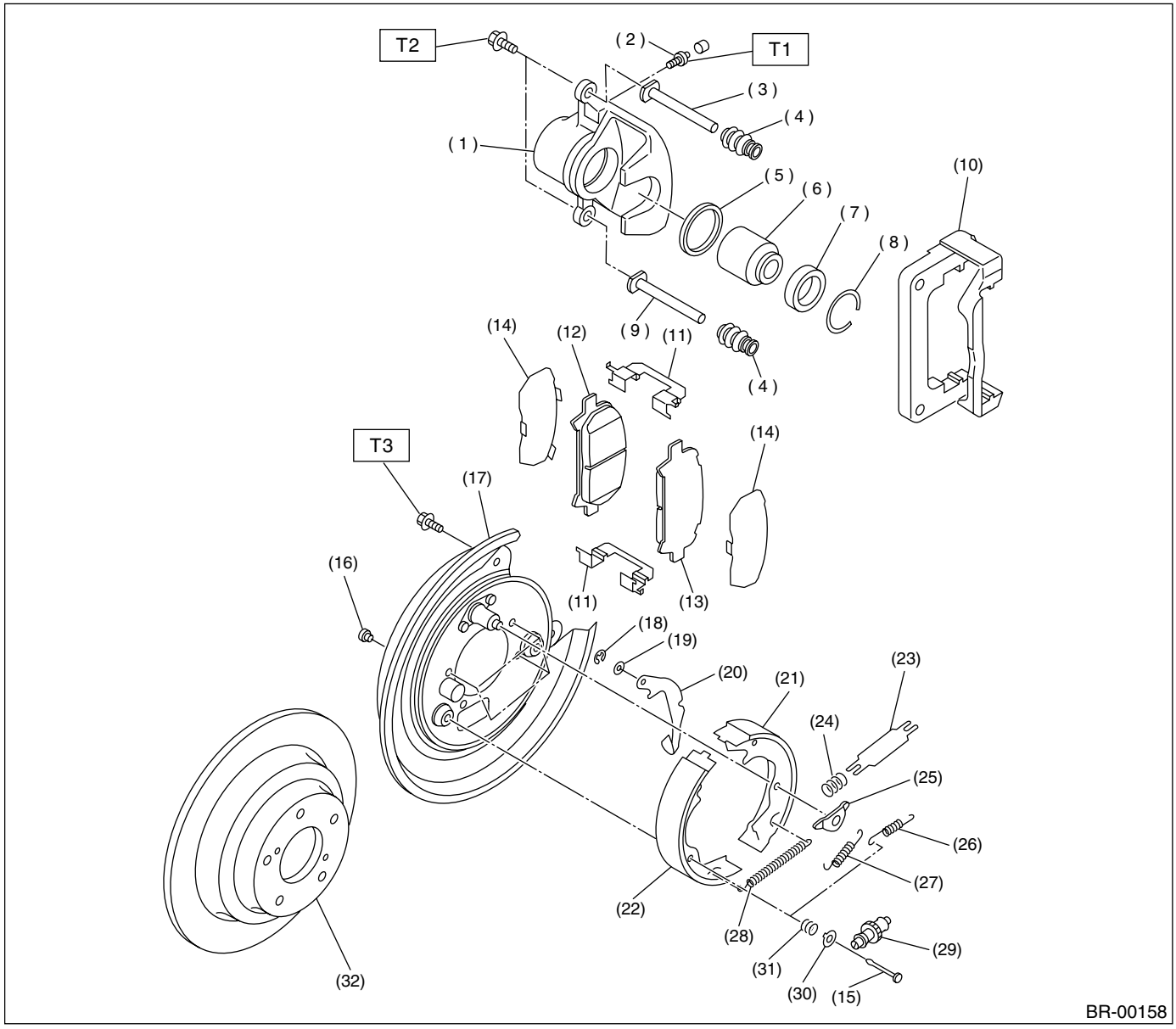
1. FRONT DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Bushing
(10) Support
(11) Pad clip
(12) Outer shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Rubber coated shim
(16) Inner shim
(17) Disc rotor
(18) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 37 (3.8, 27.5)
T4: 80 (8.2, 59)

2. REAR DISC BRAKE

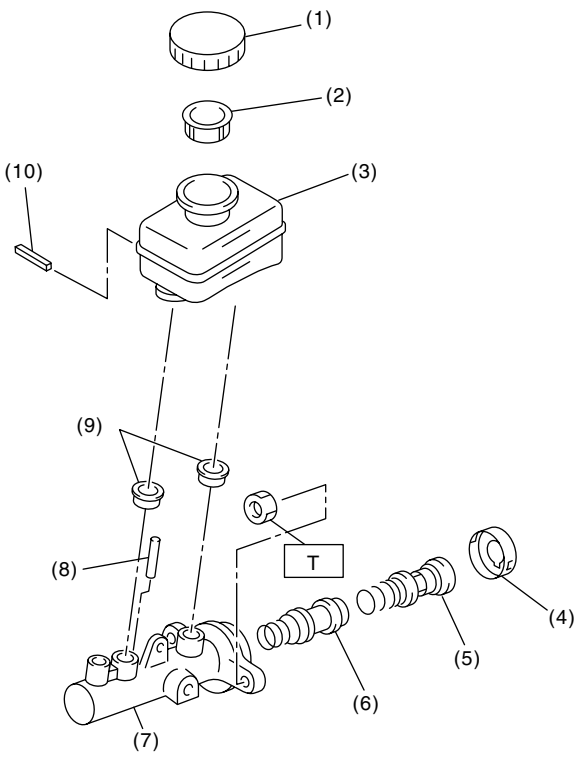


(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Boot ring
(9) Lock pin (Yellow)
(10) Support
(11) Pad clip
(12) Inner pad
(13) Outer pad
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(20) Parking brake lever
(21) Parking brake shoe (Secondary)
(22) Parking brake shoe (Primary)
(23) Strut
(24) Strut shoe spring
(25) Shoe guide plate
(26) Secondary shoe return spring
(27) Primary shoe return spring
(28) Adjusting spring
(29) Adjuster
(30) Shoe hold-down cup
(31) Shoe hold-down spring
(32) Disc rotor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 39 (4.0, 28.9)
T3: 52 (5.3, 38.3)

3. MASTER CYLINDER

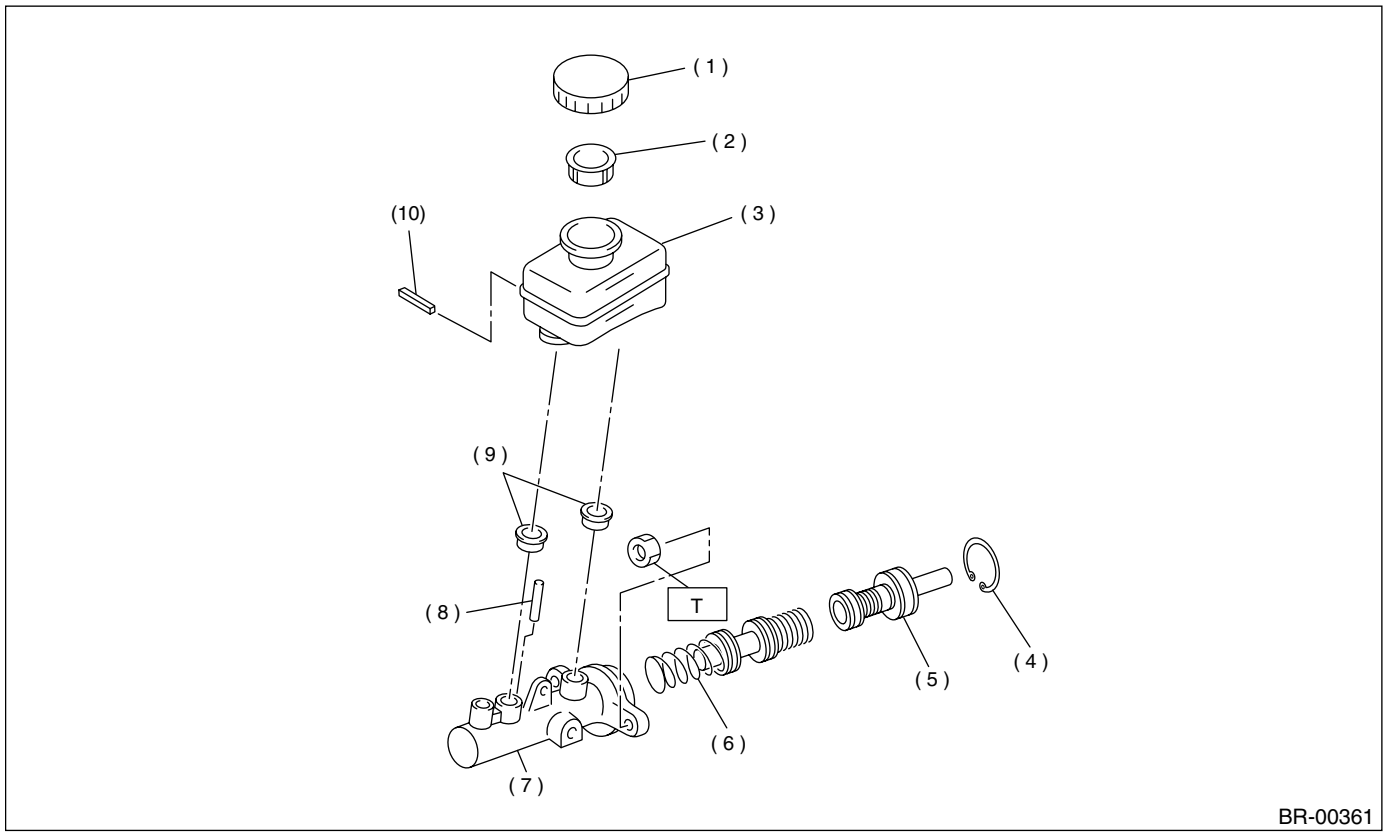
• Models without VDC



(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin (With ABS)
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.4, 10.1)

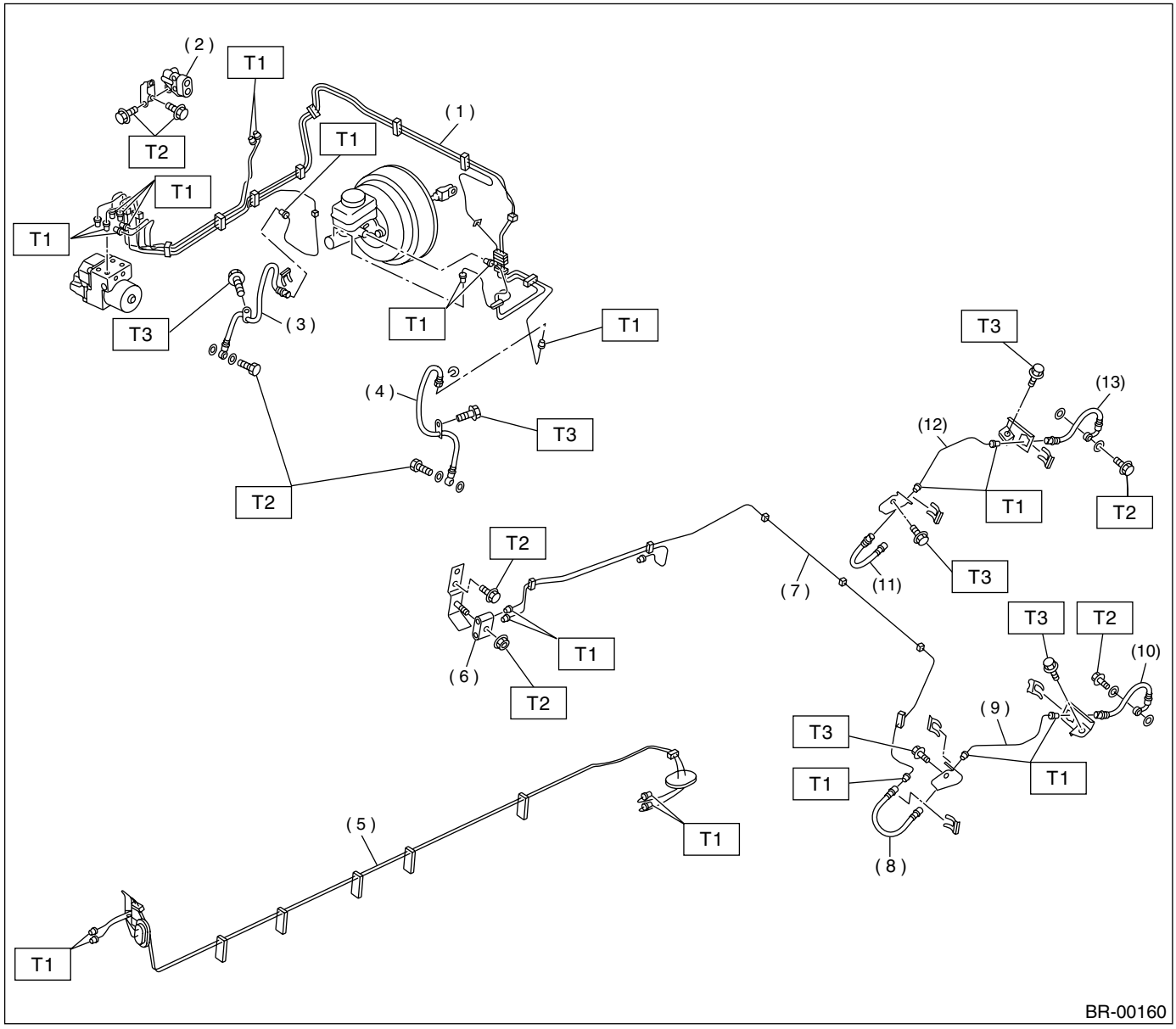
• Model with VDC



(1) Cap
(2) Filter
(3) Reservoir tank
(4) C-ring
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.4, 10.1)

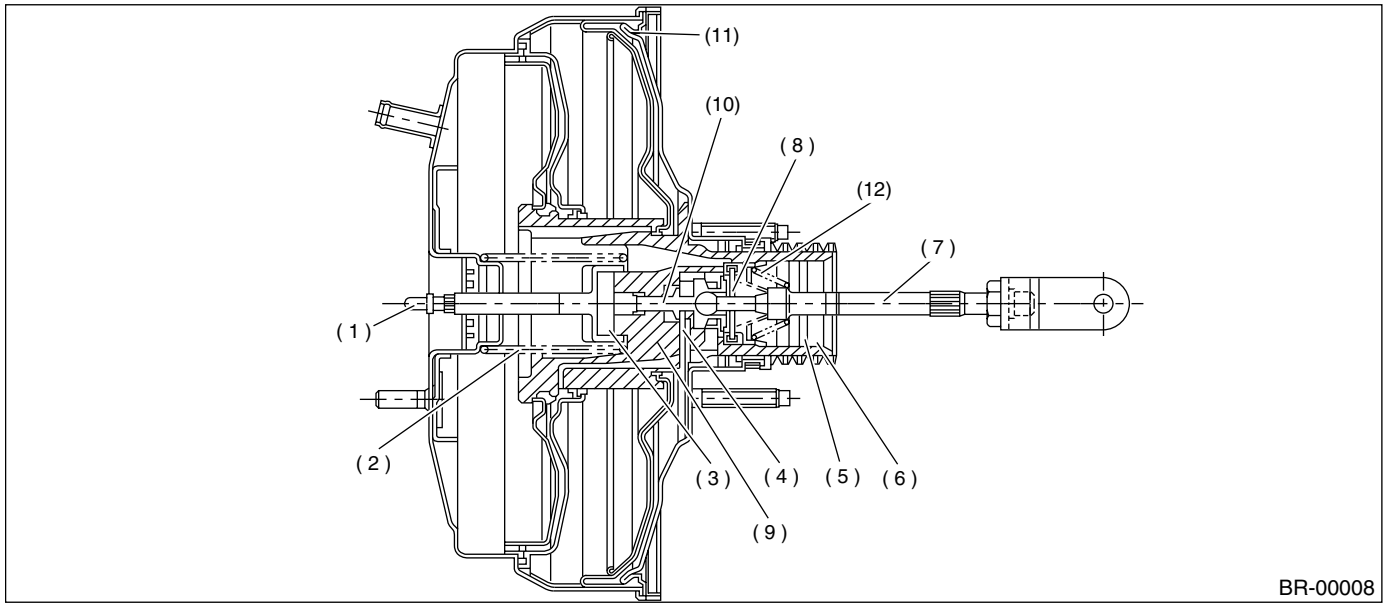
4. BRAKE PIPES AND HOSE



(1) Front brake pipe assembly
(2) Proportioning valve
(3) Front brake hose RH
(4) Front brake hose LH
(5) Center brake pipe assembly
(6) Two-way connector
(7) Rear brake pipe assembly
(8) Rear brake hose LH
(9) Rear brake pipe LH
(10) Rear brake hose rear LH
(11) Rear brake hose RH
(12) Rear brake pipe RH
(13) Rear brake hose rear RH

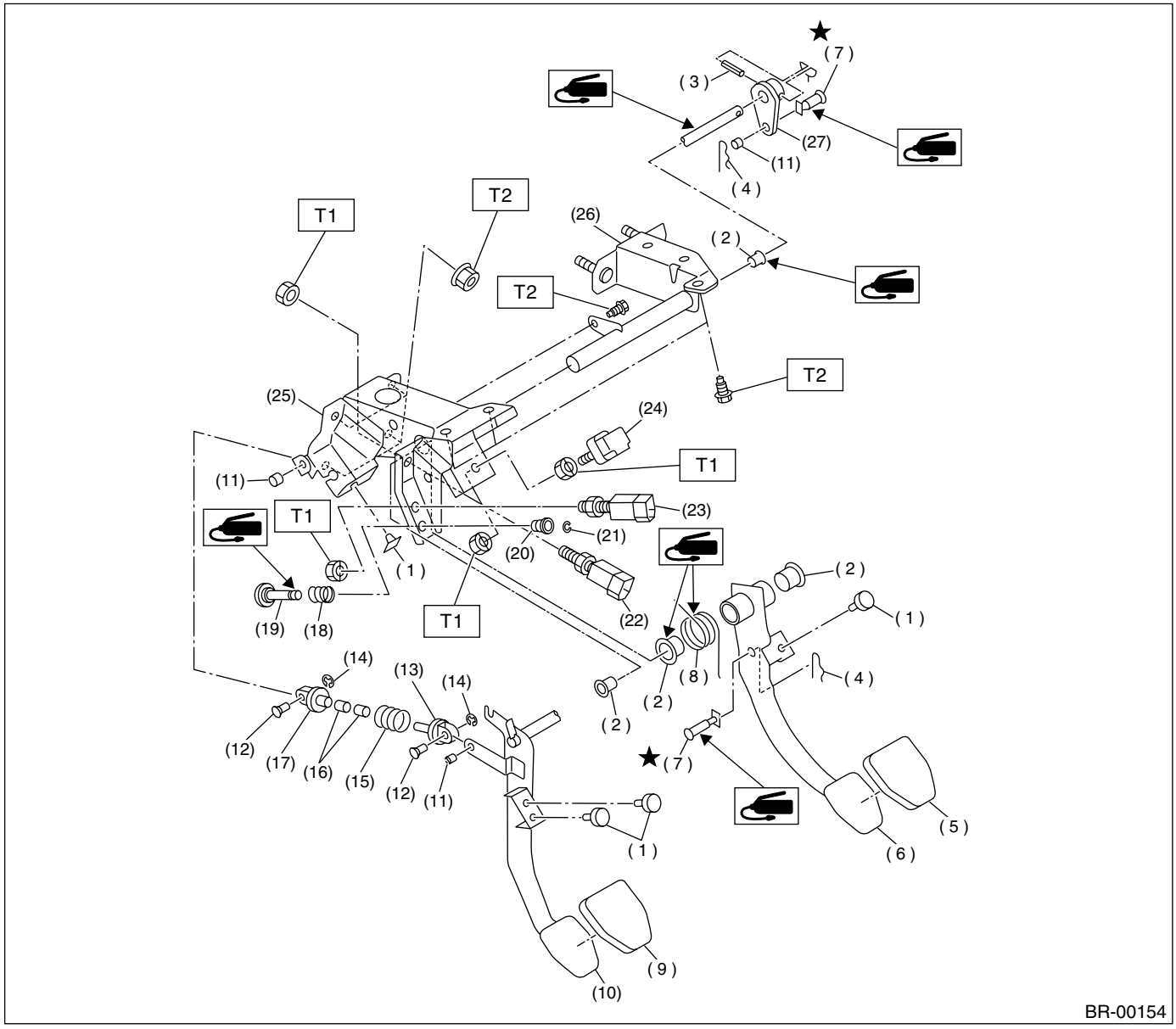
Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 33 (3.3, 23.8)

5. BRAKE BOOSTER



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

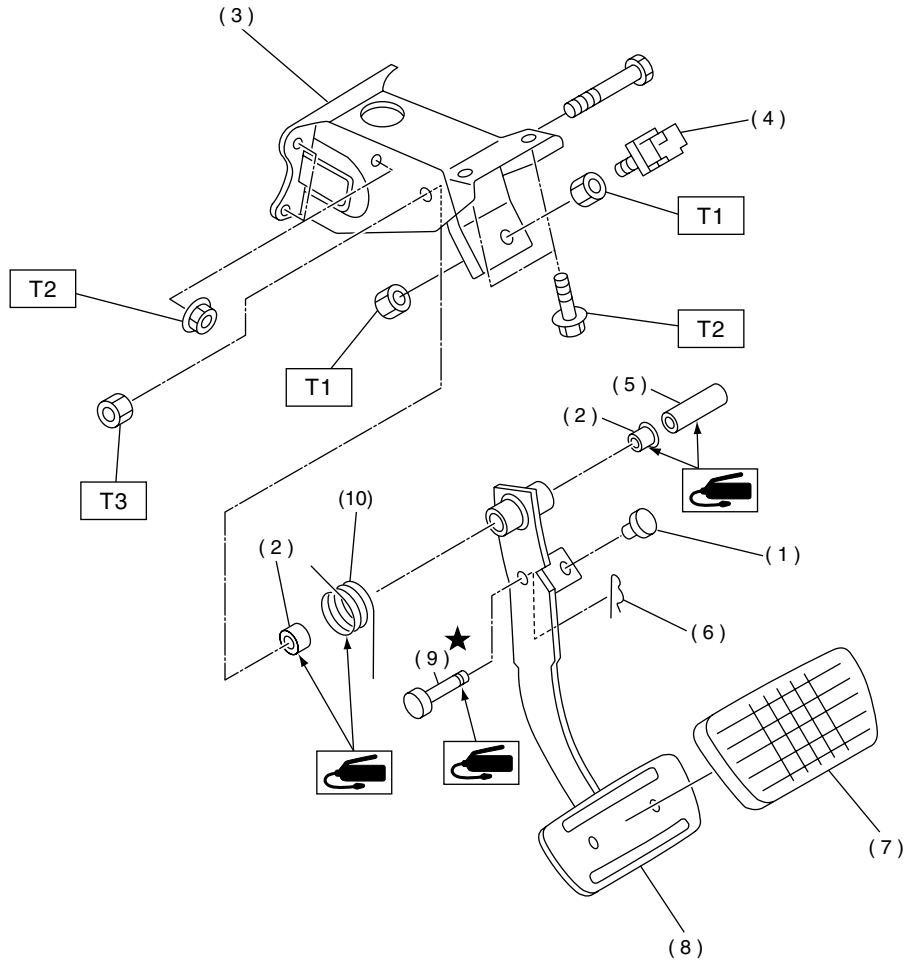
6. BRAKE PEDAL FOR MT MODEL



(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) Clip
(22) Clutch switch (Starter interlock)
(23) Clutch switch (With cruise control)
(24) Stop light switch
(25) Pedal bracket
(26) Clutch master cylinder bracket
(27) Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

7. BRAKE PEDAL FOR AT MODEL



(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Stop light switch
(5) Spacer
(6) Snap pin
(7) Brake pedal pad
(8) Brake pedal
(9) Clevis pin
(10) Brake pedal spring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 29 (3.0, 21.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolving surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Do not put fluid on body. If the body is tainted, wash away with water.

D: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Snap Ring Pliers	Used for removing and installing snap ring.

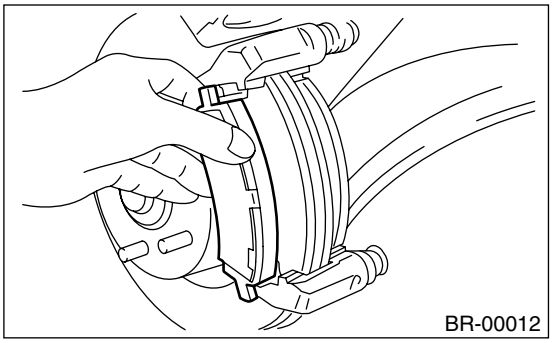
2. Front Brake Pad

A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove bottom bolt.
3) Raise caliper body and suspend it securely.

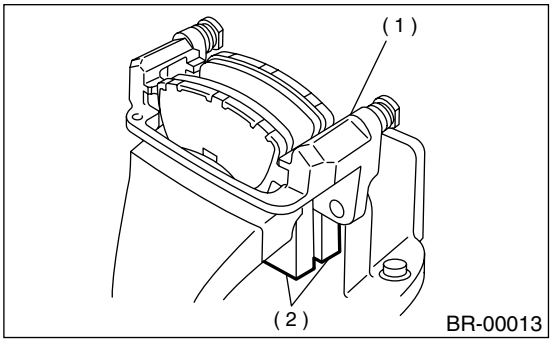
NOTE:
Do not disconnect brake hose from caliper body.

4) Remove pad.



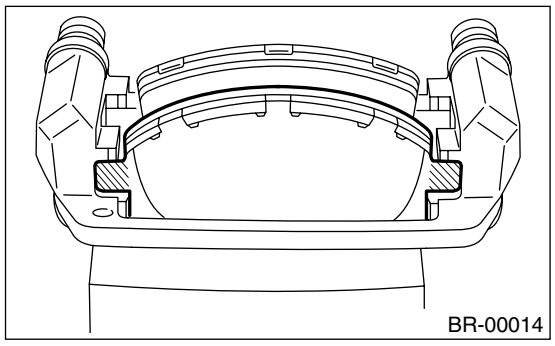
NOTE:
If brake pad is difficult to remove, proceed as follows:

(1) Remove caliper body and fasten it provisionally to coil spring.
(2) Remove support.
(3) Place a support in a vise between wooden blocks.



(1) Support
(2) Wooden blocks

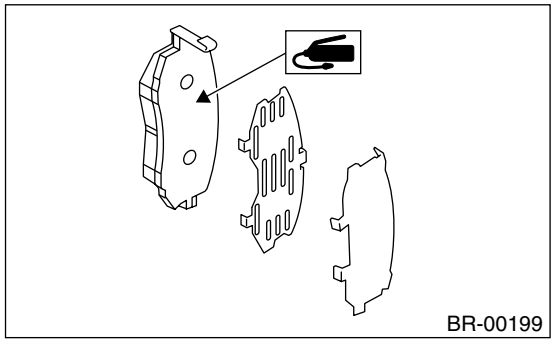
(4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



B: INSTALLATION

1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
2) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad inner shim.

CAUTION:
Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.



3) Check disc rotor thickness and runout.
<Ref. to BR-15, INSPECTION, Front Disc Rotor.>
4) Install pads on support.
5) Install caliper body on support.

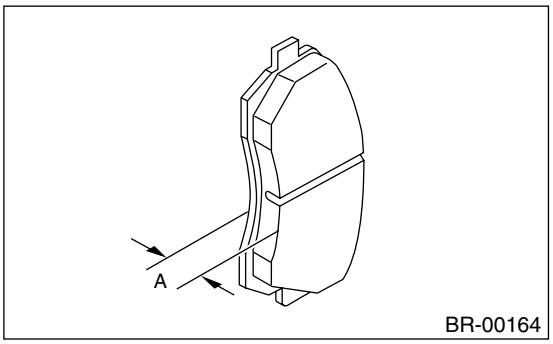
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

6) Depress brake pedal several times.
7) Check that brake fluid level is at max. line.

C: INSPECTION

Check pad thickness A.



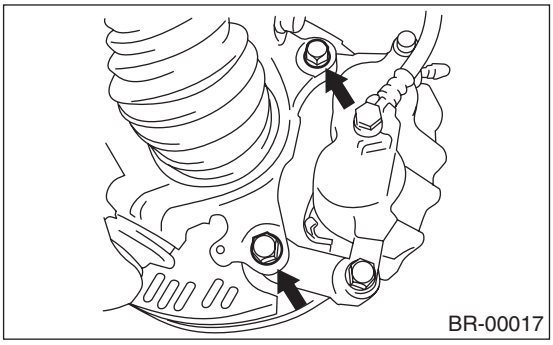
Pad thickness (including back metal)	Standard value	17 mm (0.67 in)
	Wear limit	7.5 mm (0.295 in)

CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace pad if there is oil or grease on it.

3. Front Disc Rotor

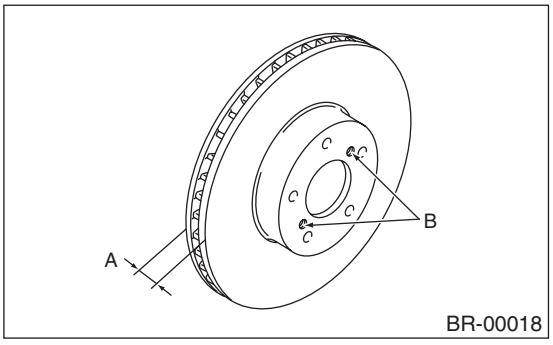
A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove caliper body from housing, and suspend it from strut using a wire.


BR-00017

3) Remove the disc rotor.

NOTE:
If disc rotor seizes up within the hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



BR-00018

4) Clean mud and foreign particles from caliper body assembly and support.

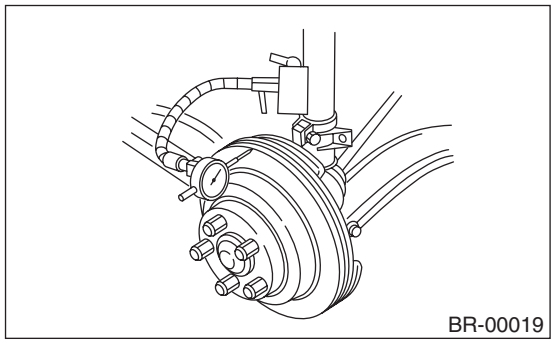
B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body to housing.

Tightening torque:
78 N·m (8 kgf-m, 58 ft-lb)

C: INSPECTION

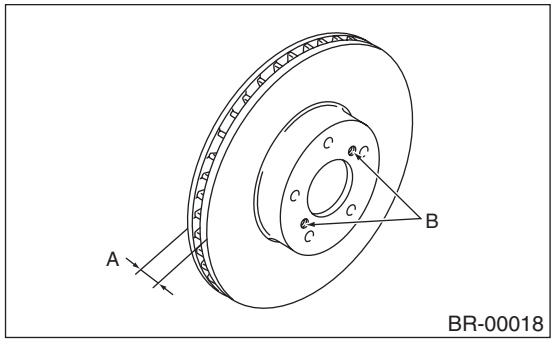
1) Secure disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.


BR-00019

NOTE:
• Make sure that dial gauge is set 10 mm (0.39 in) inward of rotor outer perimeter.
• If disc rotor runout is above standard value, inspect play of hub bearing axial direction and runout of axle hub.
<Ref. to DS-23, INSPECTION, Front Axle.>
If bearing and hub are normal, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 3.

Disc rotor runout limit:
0.075 mm (0.0030 in)

3) Measure disc rotor thickness.
If thickness of disc rotor is below service limit, replace disc rotor.



BR-00018

NOTE:
Make sure that micrometer is set 10 mm (0.39 in) inward of rotor outer perimeter.

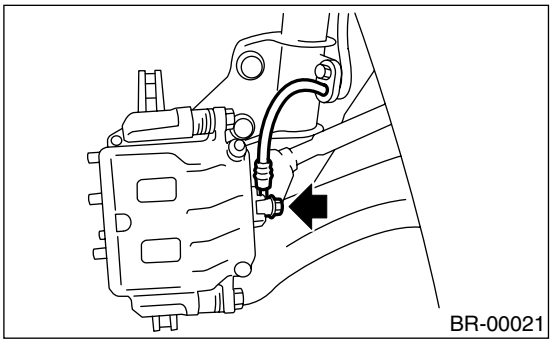
		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15″	24.0 mm (0.945 in)	22.0 mm (0.866 in)	277 mm (10.91 in)
	16″	24.0 mm (0.945 in)	22.0 mm (0.866 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

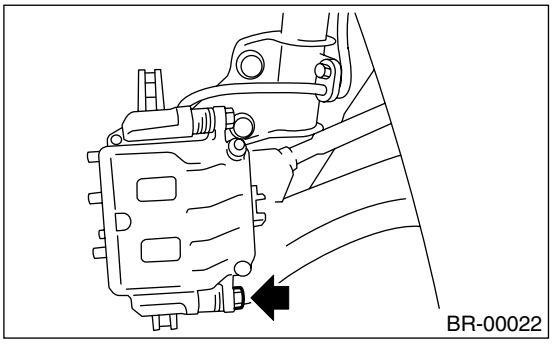
A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove union bolt and disconnect brake hose from caliper body assembly.

CAUTION:
Do not spill brake fluid on painted surface. Wash it off immediately.

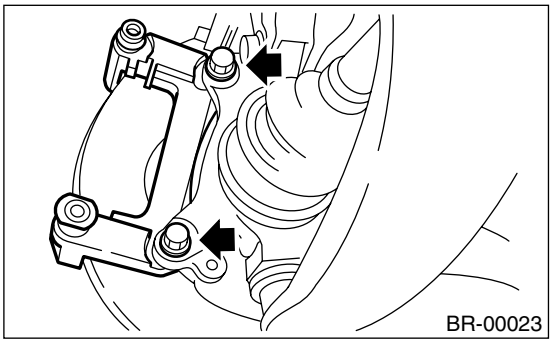


3) Remove bolt securing lock pin to caliper body.



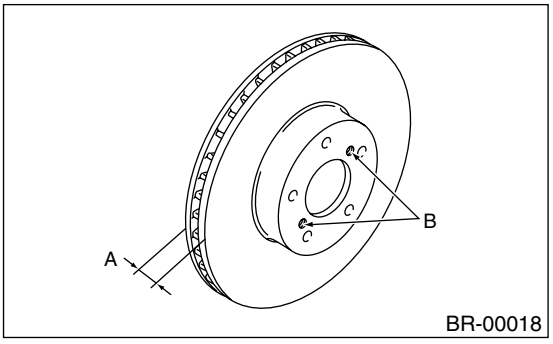
4) Raise caliper body and move it toward vehicle center to separate it from support.
5) Remove support from housing.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.



6) Remove disc rotor from hub.

NOTE:
If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



7) Clean mud and foreign particles from caliper body assembly and support.

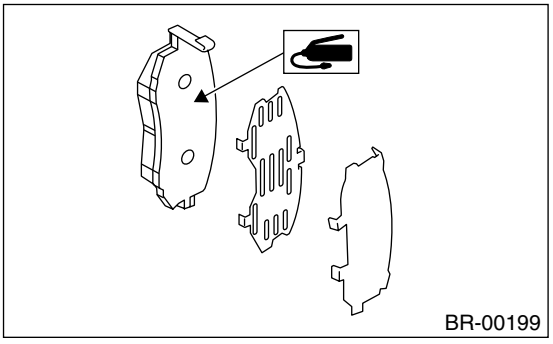
B: INSTALLATION

1) Install disc rotor on hub.
2) Install support on housing.

Tightening torque:
78 N·m (8 kgf-m, 58 ft-lb)

CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• When replacing the pads, replace pads of the right and left wheels at the same time.

3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
4) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and inner shim.



5) Install pads on support.

6) Install caliper body on support.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

7) Connect brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
Replace brake hose gaskets with new ones.

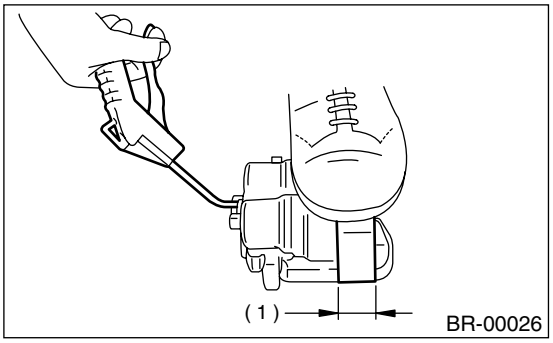
8) Bleed air from brake system.

C: DISASSEMBLY

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

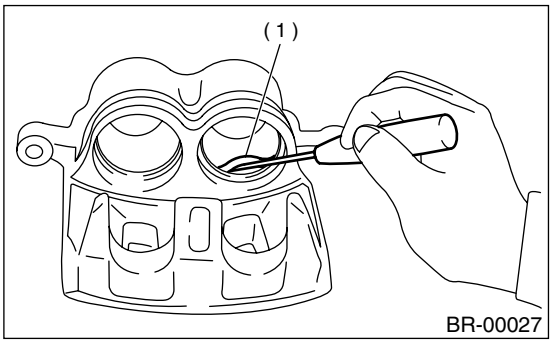
2) Remove the boot from piston end.
3) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply compressed air via inlet of the brake hose to force piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Be careful not to scratch the inner surface of cylinder and piston seal groove.



(1) Piston seal

5) Remove the lock pin boot and guide pin boot.

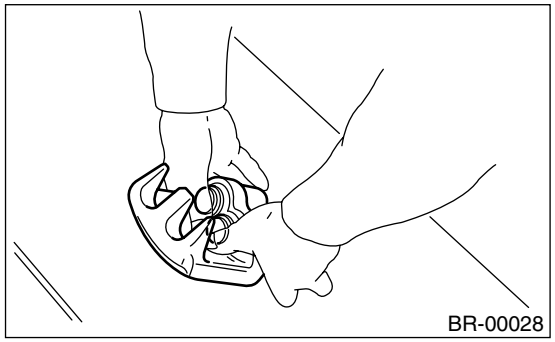
D: ASSEMBLY

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

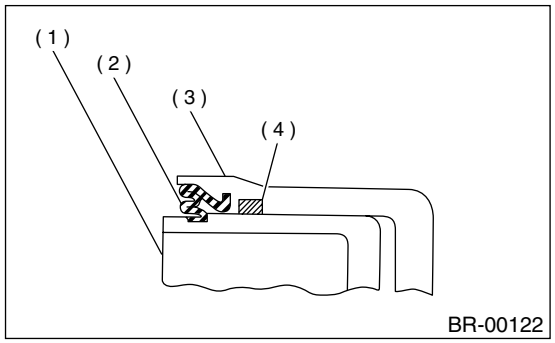
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



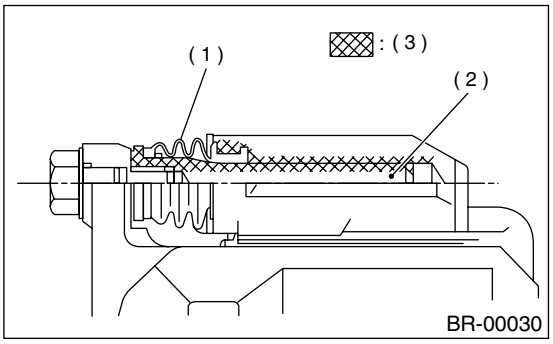
6) Position the boot in grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin, outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the lock pin boot and guide pin boot on support.

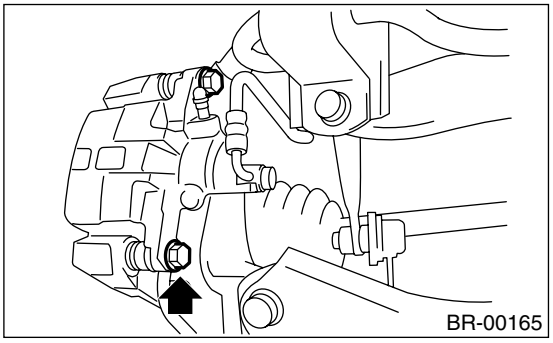
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Remove bottom bolt.

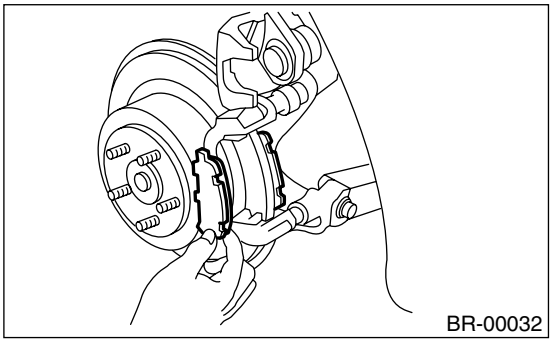


3) Raise caliper body and suspend it securely.

NOTE:
Do not disconnect brake hose from caliper body.

4) Remove pad from support.

NOTE:
If brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-13, REMOVAL, Front Brake Pad.>



B: INSTALLATION

1) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

CAUTION:
Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.

2) Check disc rotor thickness and runout.
<Ref. to BR-20, INSPECTION, Rear Disc Rotor.>
3) Install pad on support.
4) Install caliper body on support.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

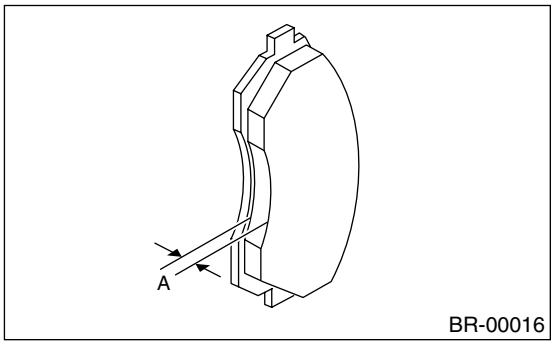
NOTE:
If it is difficult to push piston during pad replacement, loosen air bleeder to facilitate work.

5) Depress brake pedal several times.
6) Check that brake fluid level is at max. line.

C: INSPECTION

Check pad thickness (including back metal).

Pad thickness: A
Standard value
14.0 mm (0.551 in)
Wear limit
6.5 mm (0.256 in)

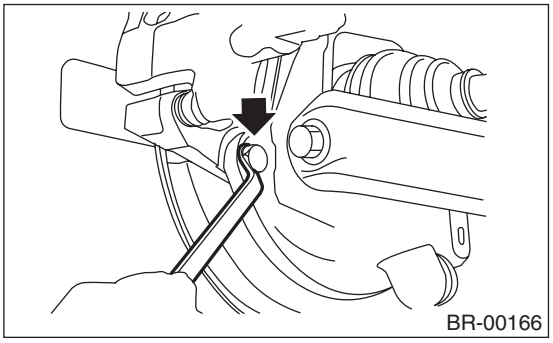


CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

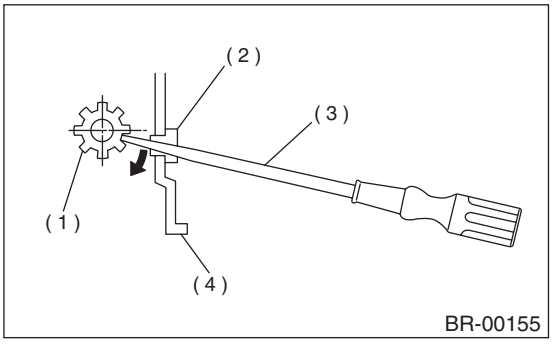
1) Lift-up vehicle and remove wheels.
2) Remove the two mounting bolts and remove the disc brake assembly.



3) Suspend the disc brake assembly so that the hose is not stretched.
4) Pull down and release parking brake.
5) Remove the disc rotor.

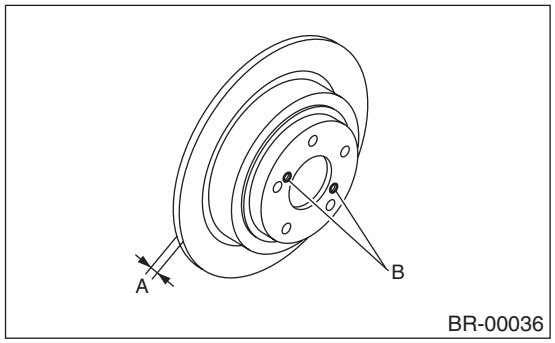
NOTE:
If the disc rotor is difficult to remove try the following two methods in order.

(1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.



(1) Adjusting screw
(2) Cover
(3) Slot-type screwdriver
(4) Back plate

(2) If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



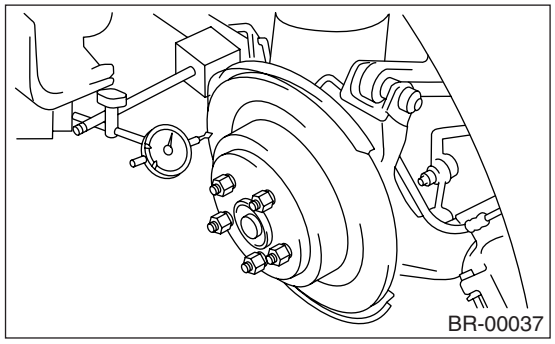
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>

C: INSPECTION

1) Secure disc rotor by tightening the five wheel nuts.
2) Set a dial gauge on the disc rotor. Turn disc rotor to check runout.

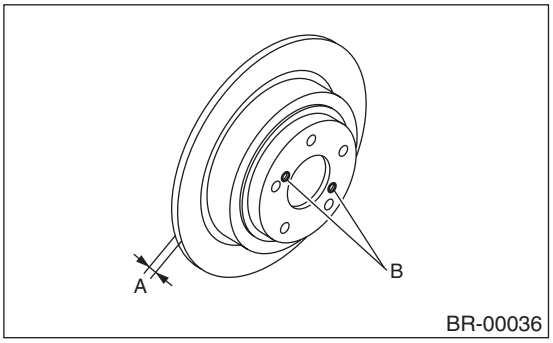
CAUTION:
Securely fix disc rotor to hub.



NOTE:
• Make sure that dial gauge is set 10 mm (0.39 in) inward of rotor outer perimeter.
• If disc rotor runout is above standard value, inspect play of hub bearing axial direction and runout of axle hub.
<Ref. to DS-28, INSPECTION, Hub Unit Bearing.>
If the hub bearing is okay, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 3.

Disc rotor runout limit:
0.075 mm (0.0030 in)

3) Measure disc rotor thickness. If the thickness of disc rotor is below service limit, replace the disc rotor.



NOTE:
Make sure that micrometer is set 10 mm (0.39 in) inward of rotor outer perimeter.

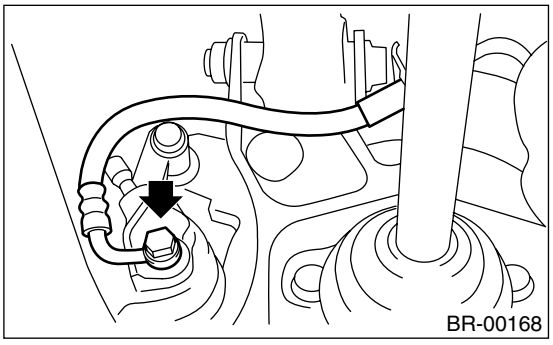
Disc rotor thickness: A
Standard value
10 mm (0.39 in)
Service limit
8.5 mm (0.335 in)

7. Rear Disc Brake Assembly

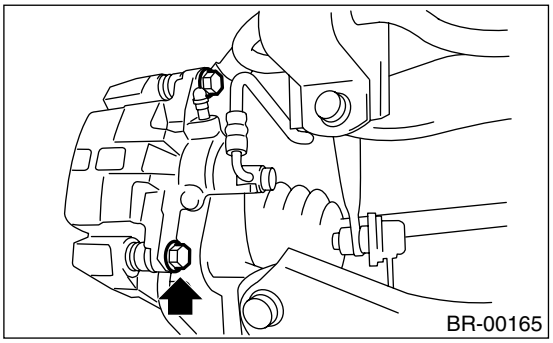
A: REMOVAL

1) Lift-up vehicle and remove wheels.
2) Disconnect brake hose from caliper body assembly.

CAUTION:
Do not spill brake fluid on painted surface. Wash it off immediately.



3) Remove bolt securing lock pin to caliper body.



4) Raise caliper body and move it toward vehicle center to separate it from support.
5) Remove support from back plate.

NOTE:
Remove support only when replacing it or the rotor. It need not be removed when servicing caliper body assembly.

6) Clean mud and foreign particles from caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

B: INSTALLATION

1) Install disc rotor on hub.
2) Install support on back plate.

Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)

CAUTION:
• Always replace the pads for both the left and right wheels at the same time. Also replace pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of the wear indicator contacts the disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace pads if there is oil or grease on them.

3) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.

CAUTION:
Do not allow oil or grease to adhere to the sliding surface of pad and disc rotor.

4) Install pads on support.
5) Install caliper body on support.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

6) Connect brake hose.

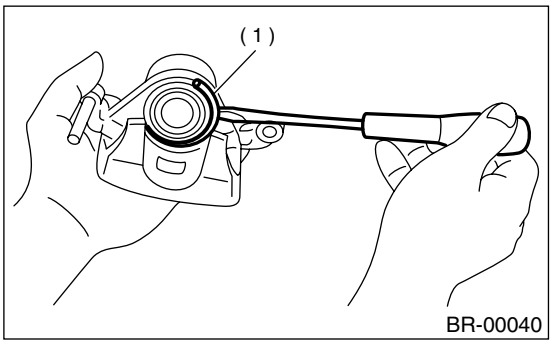
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
• The brake hose must be connected without any twist.
• Replace brake hose gaskets with new ones.

7) Bleed air from brake system.
<Ref. to BR-34, Air Bleeding.>

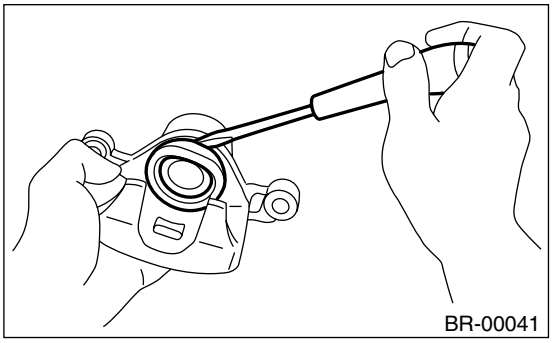
C: DISASSEMBLY

1) Remove the boot ring.



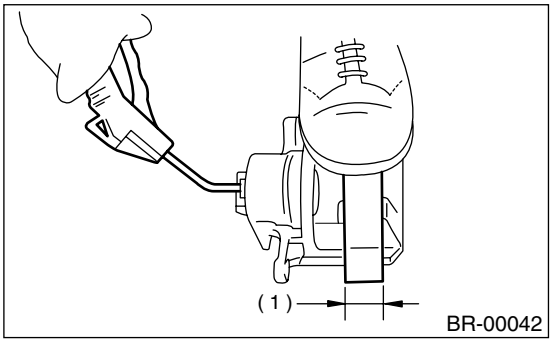
(1) Boot ring

2) Remove the piston boot.



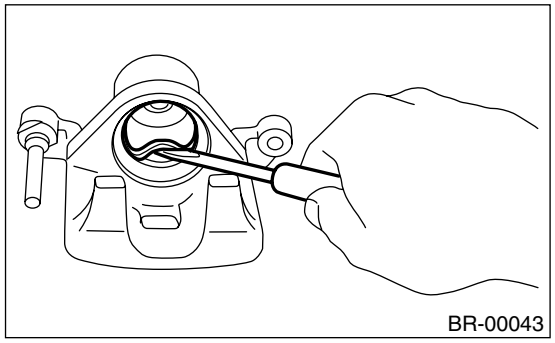
3) Gradually supply compressed air via inlet of caliper body to force piston out.

CAUTION:
• Place a wooden block as shown in Figure to prevent damage to piston.
• Do not apply excessively high-pressure.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove piston seal from caliper body cylinder.



5) Remove lock pin sleeve and boot from caliper body.
6) Remove guide pin boot.

D: ASSEMBLY

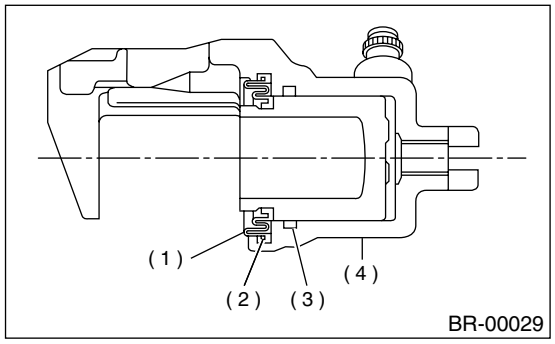
1) Clean caliper body interior using brake fluid.
2) Apply a coat of brake fluid to piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Insert piston into cylinder.

CAUTION:
Do not force piston into cylinder.

5) Apply a coat of specified grease to boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. 003606000)

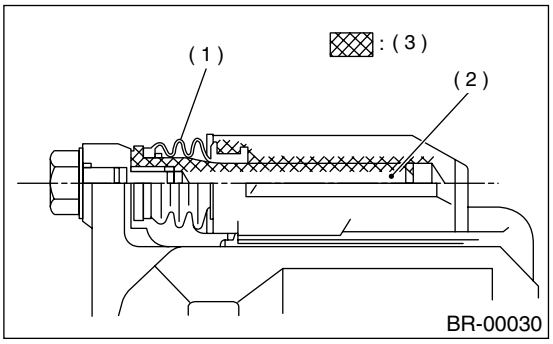
6) Install the piston boot to the caliper body, and attach boot ring.



(1) Piston boot
(2) Piston
(3) Piston seal
(4) Caliper body

7) Apply a coat of specified grease to guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. 003606000)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install guide pin boot on caliper body.
9) Install lock pin boot on caliper body and insert lock pin sleeve into place.

E: INSPECTION

1) Repair or replace faulty parts.
2) Check caliper body and piston for uneven wear, damage or rust.
3) Check rubber parts for damage or deterioration.

8. Master Cylinder

A: REMOVAL

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect fluid level indicator harness connector.
3) Remove brake pipes from master cylinder.
4) Remove master cylinder mounting nuts, and take out master cylinder from brake booster.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.

B: INSTALLATION

To install the master cylinder to the body, reverse the sequence of removal procedure.

Tightening torque:
Master cylinder mounting nut
14 N·m (1.4 kgf-m, 10.1 ft-lb)
Piping flare nut
15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

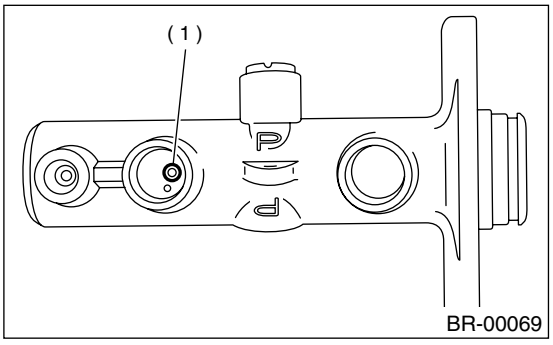
C: DISASSEMBLY

1. PRECAUTIONS FOR DISASSEMBLING

1) Remove mud and dirt from the surface of brake master cylinder.
2) Prepare tools necessary for disassembly operation, and arrange them neatly on work bench.
3) Clean work bench.

2. DISASSEMBLING PROCEDURE

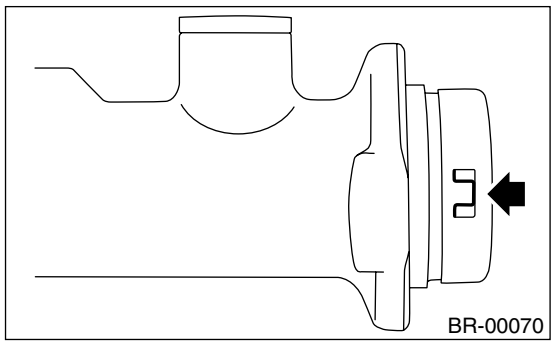
1) Remove pin with drift pin which secures reserve tank to master cylinder.
2) Remove cylinder pin with magnetic pick-up tool while pushing in primary piston.



(1) Cylinder pin

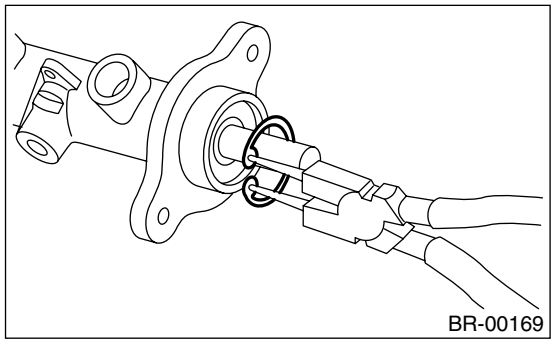
3) Pry up the pawl and remove the piston retainer. (Without VDC)

NOTE:
Piston may jump out from master cylinder.



4) Using pliers, remove C-ring. (With VDC)

NOTE:
Piston may jump out from master cylinder.



5) Extract primary piston assembly and secondary piston assembly.

CAUTION:
• Do not disassemble the piston assembly; otherwise, the spring set value may be changed.
• Use brake fluid or methanol to wash inside wall of cylinder, pistons and piston cups. Be careful not to damage parts when washing. If methanol is used for washing, do not dip rubber parts, such as piston cups, in it for more than 30 seconds; otherwise, they may become swelled.

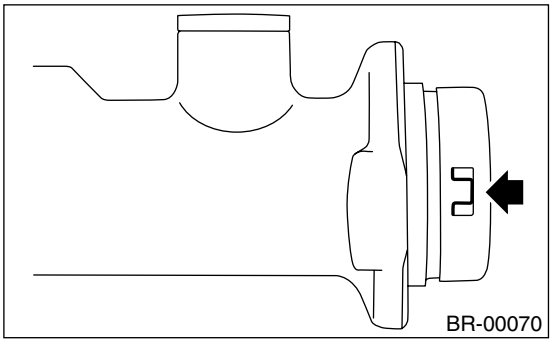
D: ASSEMBLY

1. PRECAUTIONS FOR ASSEMBLING

1) When assembling, be sure to use recommended brake fluid.
2) Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
3) Be extremely careful not to damage, scratch, or dent cylinder inside wall, pistons, and piston cups.
4) Do not drop parts. Never attempt to use any part that has been dropped accidentally.

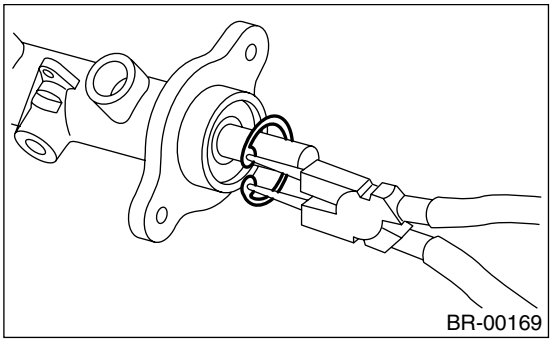
2. ASSEMBLING PROCEDURE

1) Assembling piston assembly:
Apply recommended brake fluid to inside wall of cylinder, and to outer surface of piston assembly, and install piston assemblies carefully into cylinder.
2) Assembling cylinder pin:
3) Press the pawl and install the piston retainer into the master cylinder. (Without VDC)

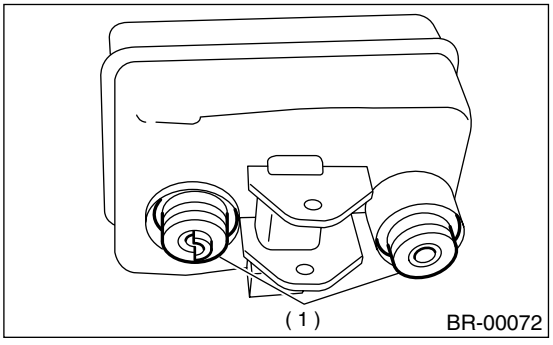


4) Using pliers, install C-ring in its groove. (With VDC)

CAUTION:
Make sure to install it firmly to groove.



5) Install seal to reservoir tank.



(1) Seal

6) Install pin with drift pins which secures reservoir tank to master cylinder.

E: INSPECTION

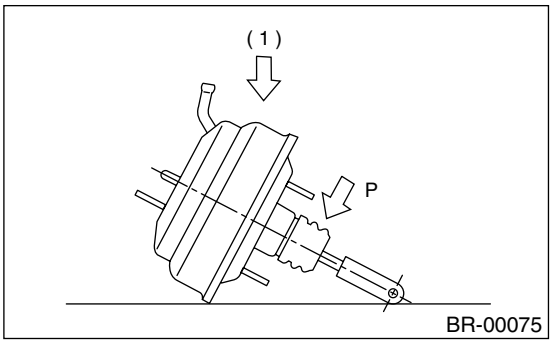
If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply valve stopper, or gasket, replace the faulty part.

CAUTION:
• The primary and secondary pistons must be replaced as complete assemblies.
• The service limit of the clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).
• When handling parts, be extremely careful not to damage or scratch the parts, or let any foreign matter get on them.

9. Brake Booster

A: REMOVAL

CAUTION:
If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.

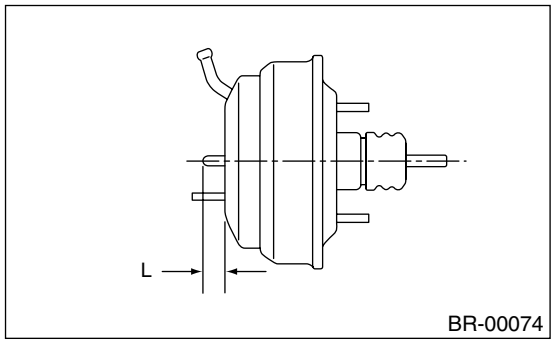


(1) Force

1) Pull up parking brake lever, and block tires.
2) Disconnect ground cable from battery.
3) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect connector for brake fluid level indicator.
   (2) Remove brake pipes from master cylinder.
   (3) Remove master cylinder installing nuts.
   (4) Disconnect vacuum hose from brake booster.
4) Remove the following parts from the pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts
5) Remove brake booster while shunning brake pipes.

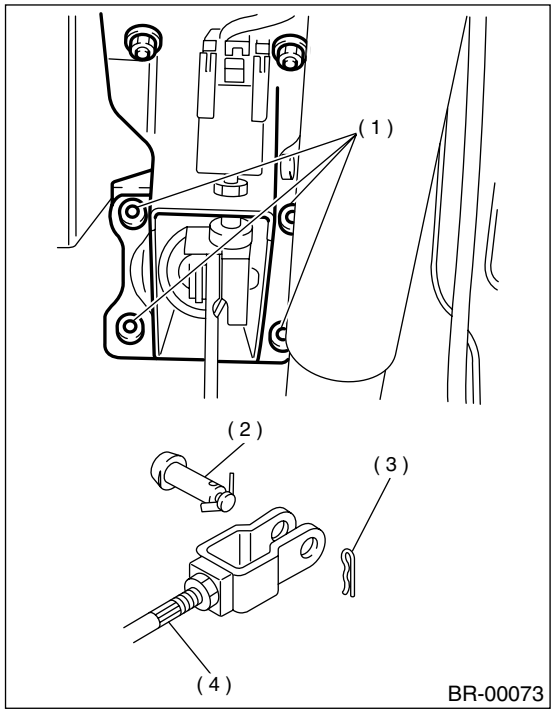
NOTE:
• Be careful not to drop brake booster. Brake booster should be discarded if it has been dropped.
• Use special care when handling operating rod.
If excessive force is applied to operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.
• Use care when placing brake booster on the floor.
• Do not change the push rod length. If it has been changed, reset the projected length "L" to the standard length.

Standard:
Without VDC
L = 10 mm (0.39 in)
With VDC
L = 1.8 mm (0.071 in)



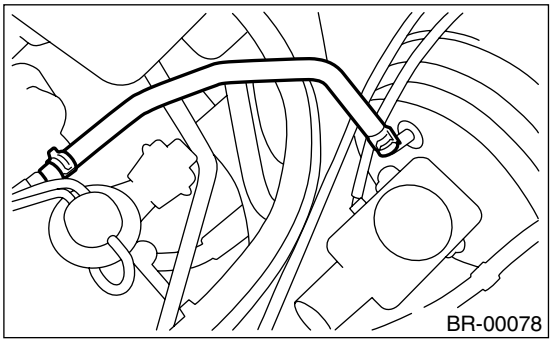
B: INSTALLATION

1) Mount brake booster in position.
2) Connect operating rod to brake pedal with clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

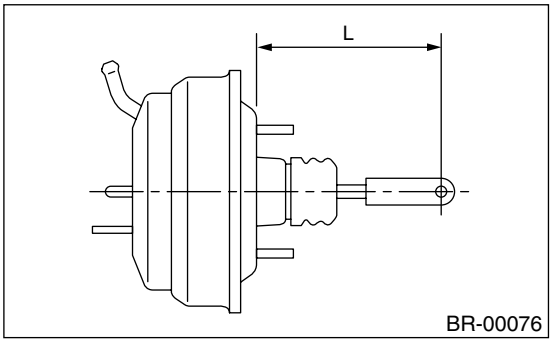
3) Connect vacuum hose to brake booster.



4) Mount master cylinder onto brake booster.
5) Connect brake pipes to master cylinder.
6) Connect electric connector for brake fluid level indicator.
7) Adjust operating rod of brake booster.

Standard: L
145.3 mm (5.72 in)

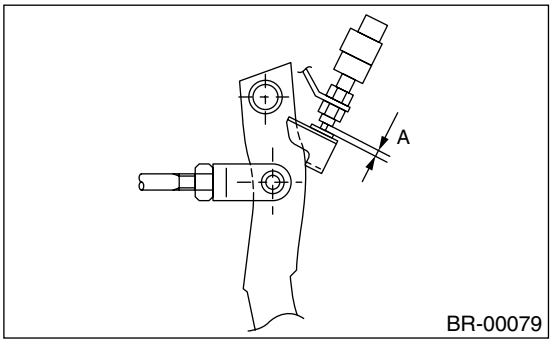
If it is not in specified value, adjust it by adjusting brake booster operating rod.



8) Measure the clearance between threaded end of stop light switch and stopper.
If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



9) Apply grease to operating rod connecting pin to prevent it from wearing.

10) Bleed air from brake system.

Tightening torque (Air bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

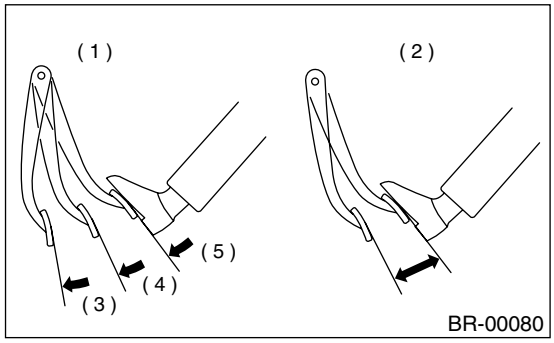
CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of the failure if checking is conducted in accordance with the following procedures.

• Air tightness check

Start engine, and run it for 1 to 2 minutes, then turn it off. Depress brake pedal several times applying the same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on the 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, brake booster is faulty.

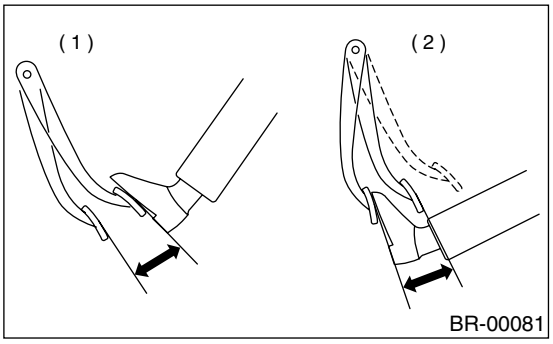


(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of the check valve and vacuum hose.
• Replace them if faulty and conduct the test again.
• If no improvement is observed, check precisely with gauges.

• Operation check

1) With engine off, depress brake pedal several times applying the same pedal force and make sure that the pedal height does not vary with each depression of the pedal.



(1) When engine is stopped
(2) When engine is started

2) With brake pedal depressed, start engine.
3) As engine starts, brake pedal should move slightly toward the floor. If no change occurs in the pedal height, brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• Loaded air tightness check

Depress brake pedal while engine is running, and turn off engine while the pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, brake booster is functioning normally; if the pedal height increases, it is faulty.

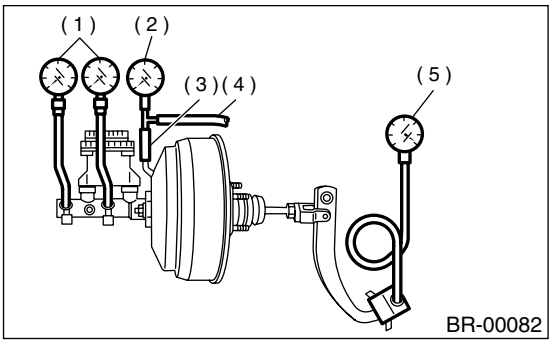
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

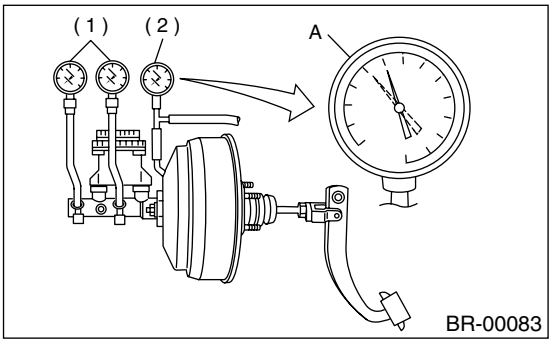
Connect gauges as shown in Figure. After bleeding air from pressure gauges, proceed to each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• Air tightness check

1) Start engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress brake pedal.



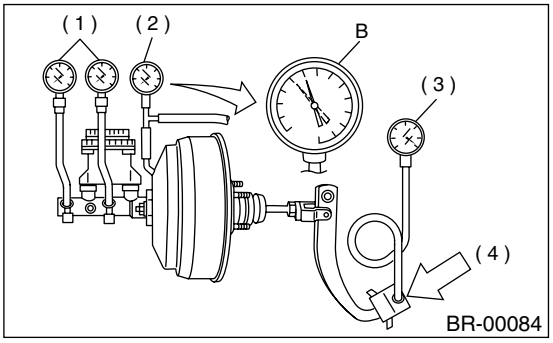
(1) Pressure gauge
(2) Vacuum gauge

2) Stop engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, the cause may be one of those listed below.
• Check valve malfunction
• Leak from vacuum hose
• Leak from the shell jointed portion or stud bolt welded portion

- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

• Loaded air tightness check

1) Start engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lb). Keep engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 in-Hg) = point B is indicated on vacuum gauge while the pedal is still depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depress

2) Stop engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-28, INSPECTION, Brake Booster.>

• Lack of boosting action check

Turn off engine, and set the vacuum gauge reading at “0”. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	588 kPa (6 kg/cm^2, 85 psi)	1,569 kPa (16 kg/cm^2, 228 psi)

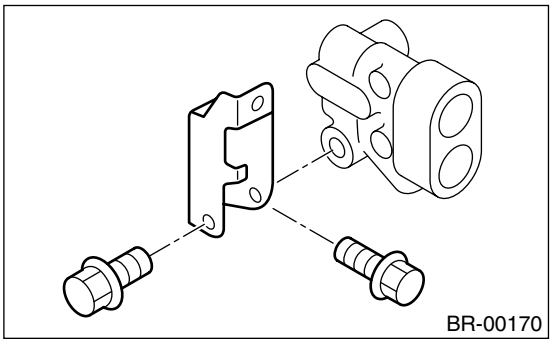
• Boosting action check

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	6,178 kPa (63 kg/cm^2, 896 psi)	9,709 kPa (99 /cm^2, 1,408 psi)

10.Proportioning Valve

A: REMOVAL



1) Pull up parking brake lever, and block the tires.
2) Remove brake pipe from proportioning valve at four places.
3) Remove proportioning valve from its bracket.

CAUTION:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

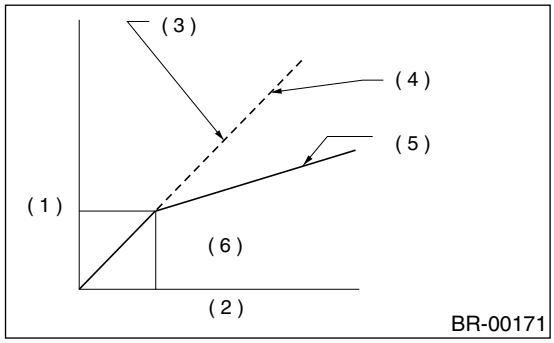
B: INSTALLATION

1) Install proportioning valve to bracket.
2) Connect brake pipes correctly to proportioning valve.
3) Bleed air, then check each joint of brake pipe for oil leaks.

Tightening torque:
Proportioning valve to brake pipe flare nut:
15 N·m (1.5 kgf-m, 10.8 ft-lb)
Proportioning valve to bracket:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

1) Install oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in Figure.



(1) Rear wheel cylinder fluid pressure: P3
(2) Master cylinder fluid pressure: P2
(3) In case of failure in one circuit
(4) Without ABS model
(5) With ABS model
(6) When both circuits are normal

4) For the oil pressure in case of split point, refer to “SPECIFICATIONS”.
<Ref. to BR-2, SPECIFICATIONS, General Description.>

11.Brake Fluid

A: INSPECTION

1) Check that brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If fluid level becomes close to “MIN”, refill fluid.
2) Check fluid for discoloration. If fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

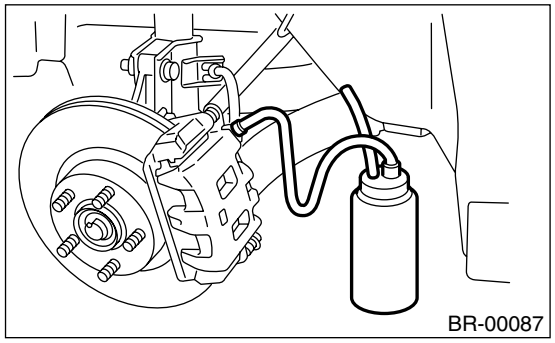
CAUTION:
• Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

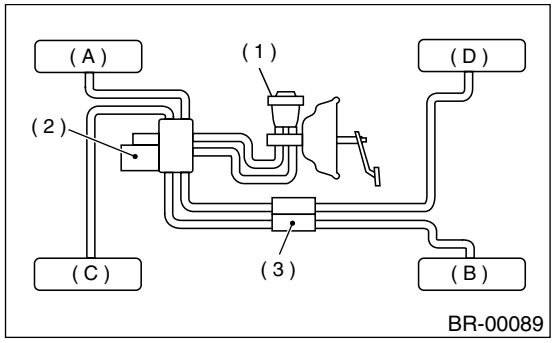
1) Either jack-up vehicle and place a safety stand under it, or lift up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

5) Install one end of a vinyl tube onto the air bleeder and insert the other end into a container to collect the brake fluid.



CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen bleeder screw approximately 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 7) above.

11) Depress brake pedal with a force of approximately 294 N (30 kgf, 66 lb) and hold it there for approximately 20 seconds. At this time check pedal to see if it shows any unusual movement.
Visually inspect bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install wheels, and drive vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

12.Air Bleeding

A: PROCEDURE

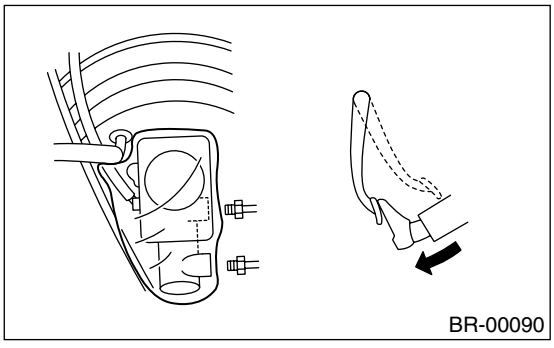
CAUTION:
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.
• Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the painted surface; wash it off quickly if spilt.

NOTE:
• Start with the brakes (wheels) connected to the secondary chamber of the master cylinder.
• The time interval between two brake pedal operations (from the time when the pedal is released to the time when it is depressed another time) should be approximately 3 seconds.
• The air bleeder on each brake should be released for 1 to 2 seconds.

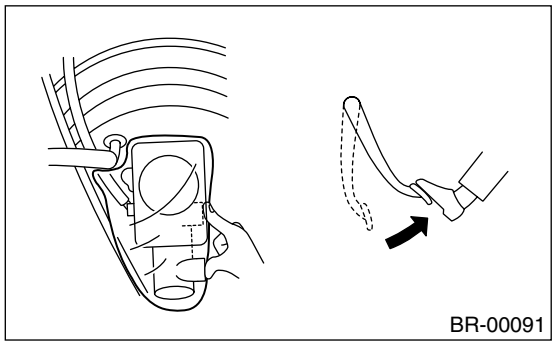
1. MASTER CYLINDER

NOTE:
• If master cylinder is disassembled or reservoir tank is empty, bleed master cylinder.
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, two people should do the work.

1) Loosen wheel nuts, jack-up vehicle, support it with safety stands, and remove wheel.
2) Disconnect brake line at primary and secondary sides.
3) Put plastic bag cover on the master cylinder.
4) Carefully depress and hold brake pedal.


BR-00090

5) Close outlet plug with your finger, and release brake pedal.


BR-00091

6) Repeat above steps 4) and 5) until master cylinder is completely bled.
7) Install brake pipes to master cylinder.

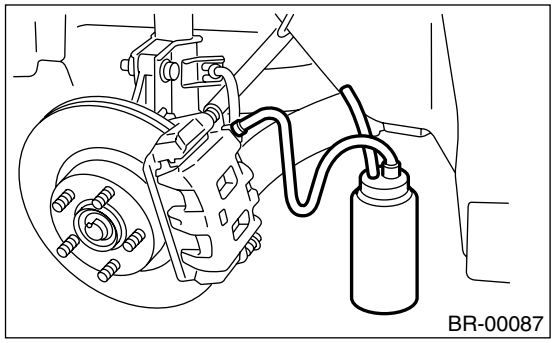
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Cleanly wash away brake fluid spilt on master cylinder etc.
9) Bleed air from brake system. <Ref. to BR-34, BRAKE LINE, PROCEDURE, Air Bleeding.>

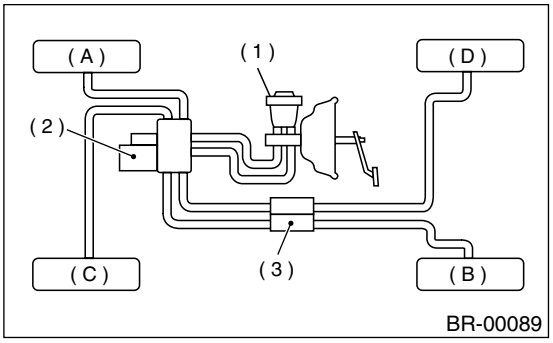
2. BRAKE LINE

NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• Brake pedal operation must be very slow.
• For convenience and safety, two people should do the work.

1) Make sure that there is no leak from joints and connections of the brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:
Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

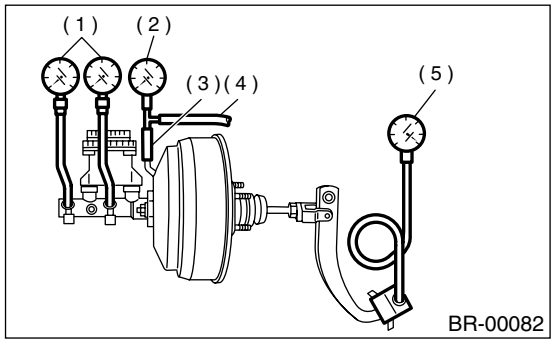
NOTE:
Brake pedal operating must be very slow.

4) Tighten air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

5) Perform these steps for the brakes connecting to the secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approximately 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between the pedal and steering wheel again. The difference between the two measurements must be more than specified.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

Specified pedal stroke:
95 mm (3.74 in)
When depressing brake pedal with a 490 N (50 kgf, 110 lb) load.

7) If the distance is more than specifications, there is a possibility that air is in the brake line. Bleed brake line until pedal stroke meets the specification.
8) Operate hydraulic control unit in the sequence control mode.
With ABS: <Ref. to ABS-9, ABS Sequence Control.>
With VDC: <Ref. to VDC-19, VDC Sequence Control.>
9) Recheck the brake stroke.
10) If the distance is more than specifications, there is a possibility air is in the inside of the hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.
11) Add brake fluid to the required level (MAX. level) of reservoir tank.
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

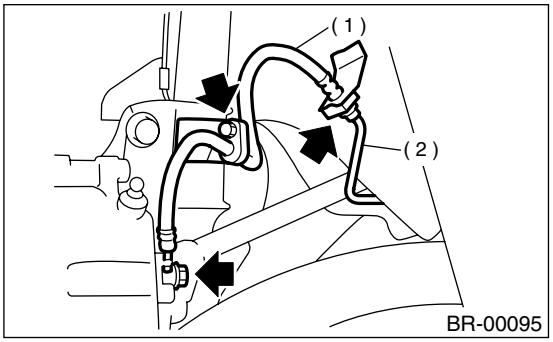
13.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

1) Separate brake pipe from brake hose.

NOTE:
Always use flare nut wrench and be careful not to deform flare nut.



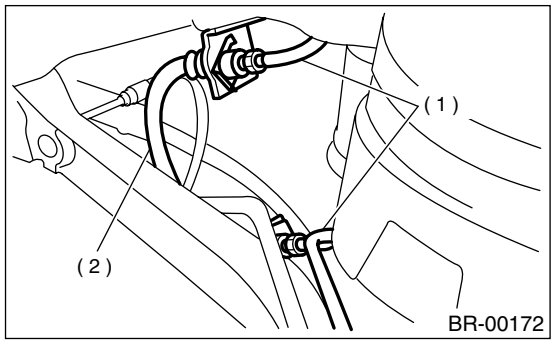
(1) Brake hose
(2) Brake pipe

2) Pull out clamp to remove brake hose.
3) Remove bolt at strut and union bolt.

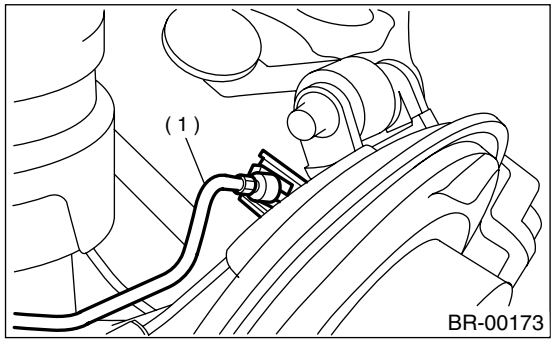
2. REAR BRAKE HOSE

1) Separate brake pipe from brake hose.

NOTE:
Always use flare nut wrench and be careful not to deform flare nut.



(1) Brake pipe
(2) Brake hose



(1) Brake pipe

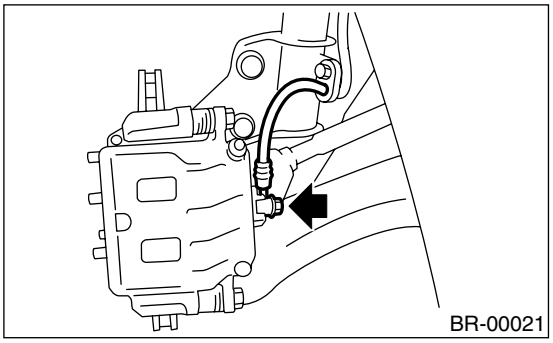
2) Pull out clamp to remove brake hose.

B: INSTALLATION

1. FRONT BRAKE HOSE

1) Route end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
2) Tighten end of brake hose at caliper using a union bolt.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Secure middle fitting of brake hose to bracket at strut location using a clamp.
4) Position disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

5) Temporarily tighten flare nut to connect brake pipe and hose.
6) Fix brake hose with clamp at wheel apron bracket.
7) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

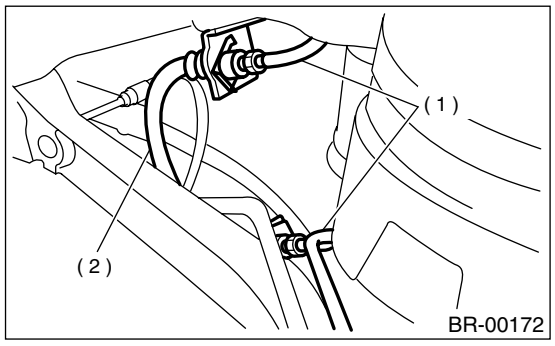
Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

8) Bleed air from the brake system.

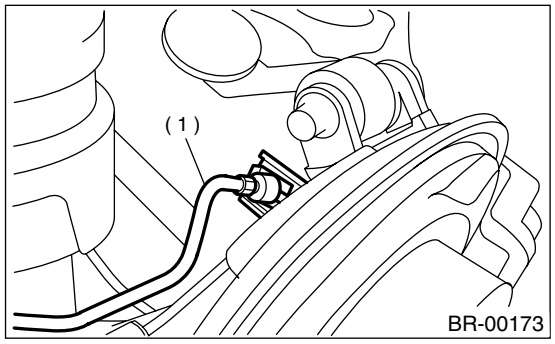
2. REAR BRAKE HOSE

1) Pass brake hose through the hole of bracket, and lightly tighten flare nut to connect brake pipe.
2) Insert clamp upward to fix brake hose.
3) While holding hexagonal part of brake hose fitting with a wrench, tighten flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose



(1) Brake pipe

4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on hoses. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace hose.

14.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, make sure that it is not bent.
• After installing the brake pipe and hose, bleed the air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace pipe.

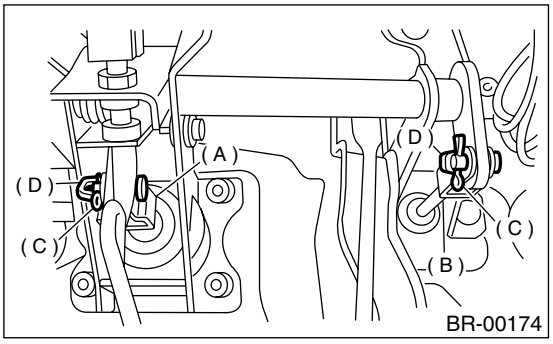
NOTE:
Use a mirror when inspecting low-visible part or back side.

15.Brake Pedal

A: REMOVAL

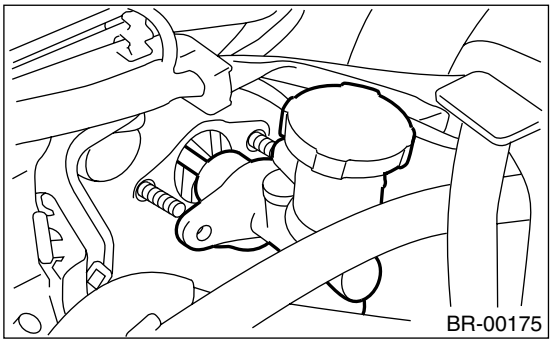
1. MT MODEL

1) Pull up parking brake lever and block tires.
2) Disconnect ground cable from battery.
3) Remove steering column.
<Ref. to PS-21, REMOVAL, Tilt Steering Column.>
4) Disconnect connectors from stop light and clutch switches.
5) Remove snap pins which secure lever to push rod and operating rod.
6) Remove clevis pins which secure lever to push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

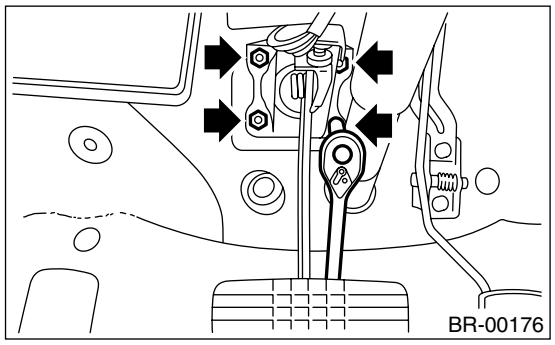
7) Remove nut which secures clutch master cylinder.



8) Remove bolts and nuts which secure brake and clutch pedals, and remove pedal assembly.

2. AT MODEL

1) Pull up parking brake lever.
2) Disconnect ground cable from battery.
3) Remove instrument panel lower cover from instrument panel.
4) Remove clevis pin which secures brake pedal to brake booster operating rod. Also disconnect stop light switch connector.
5) Remove AT unit from brake panel (2 nuts).
6) Remove two bolts and four nuts which secure brake pedal to pedal.



B: INSTALLATION

1) Install in the reverse order of removal.

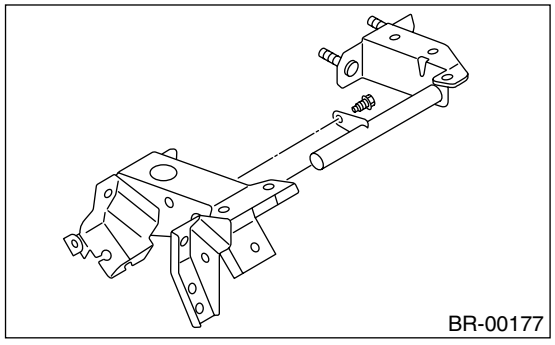
CAUTION:
• If cable clamp is damaged, replace it with a new one.
• Never fail to cover outer cable end with boot.
• Be careful not to kink accelerator cable.
• Always use new clevis pins.

2) Adjustment of clutch pedal <Ref. to BR-40, ASSEMBLY, Brake Pedal.>
3) Inspect after pedal installation <Ref. to BR-41, INSPECTION, Brake Pedal.>

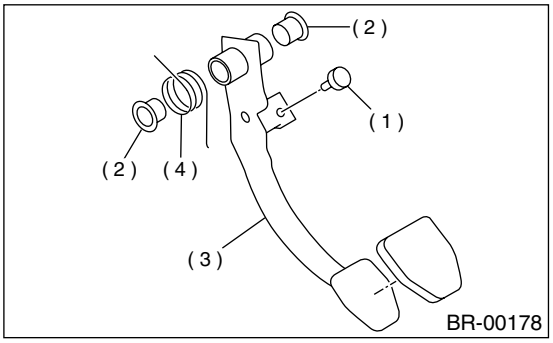
C: DISASSEMBLY

1. MT MODEL

1) Remove the brake switch.
<Ref. to BR-42, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal.
<Ref. to CL-28, DISASSEMBLY, Clutch Pedal.>
3) Remove the clutch master cylinder bracket.



4) Remove bushing, spring and stopper.

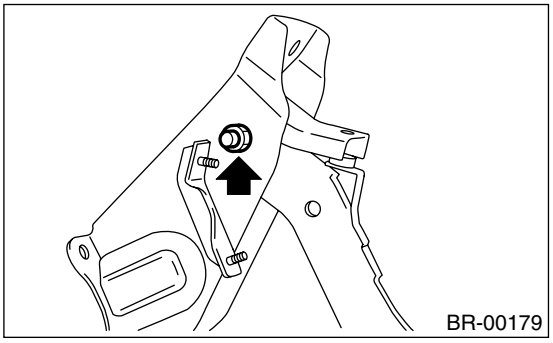


(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

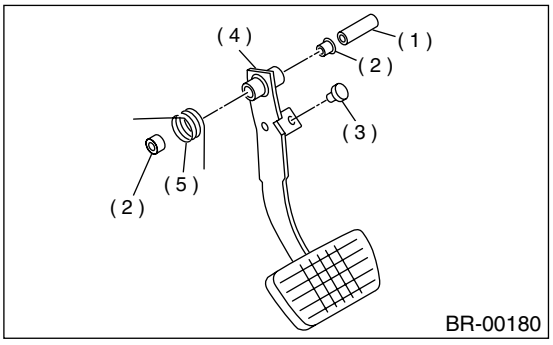
5) Remove the brake pedal pad.

2. AT MODEL

1) Remove the brake switch.
2) Unbolt, and then remove the brake pedal.



3) Remove bushing, spacer and spring.



(1) Spacer
(2) Bushing
(3) Stopper
(4) Brake pedal
(5) Brake pedal spring

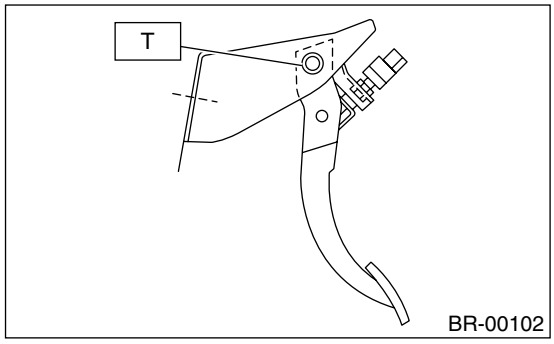
4) Remove the brake pedal pad.

D: ASSEMBLY

1) Attach stop light switch, etc. to pedal bracket temporarily.
2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
3) Align bores of pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install pedal bolt.

NOTE:
Clean up inside of bushings and apply grease before installing spacer.

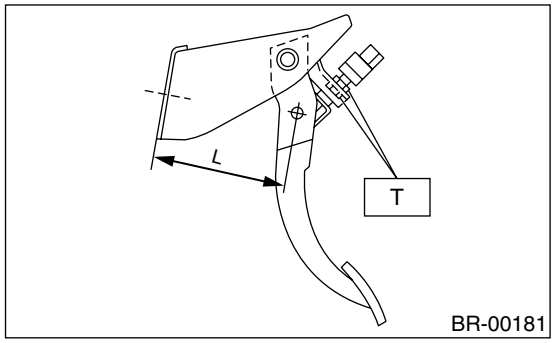
Tightening torque:
T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



4) Set brake pedal position by adjusting position of stop light switch.

Pedal position: L
126.4 mm (4.98 in)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

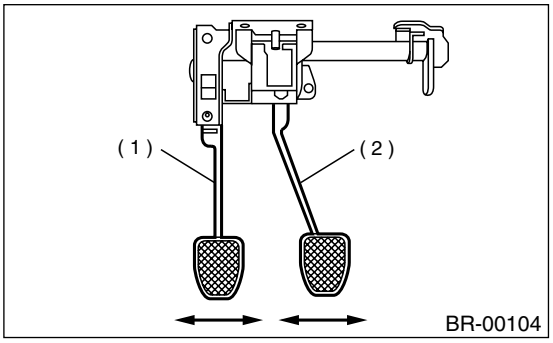


E: INSPECTION

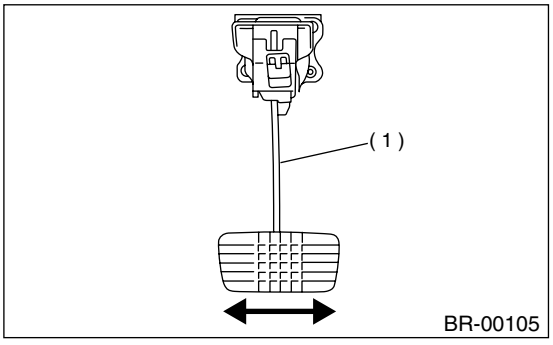
1) Move brake and clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace bushings with new ones.

Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less



(1) Clutch pedal
(2) Brake pedal

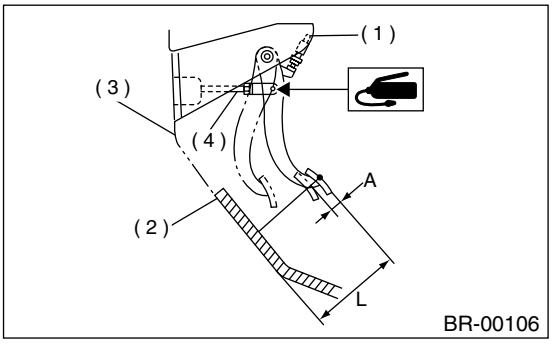


(1) Brake pedal

2) Check position of pedal pad.

Pedal height: L
AT: 158 mm (6.22 in)
MT: 153 mm (6.02 in)

Brake pedal free play: A
1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]



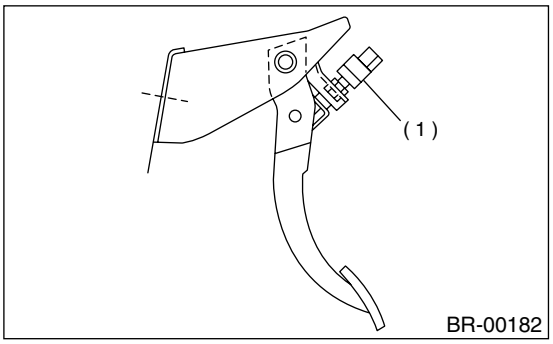
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not in specified value, adjust it by adjusting brake booster operating rod length.

16.Stop Light Switch

A: REMOVAL

1) Disconnect ground cable from battery.
2) Disconnect stop light switch connector.
3) Loosen nuts, and unscrew stop light switch to remove.

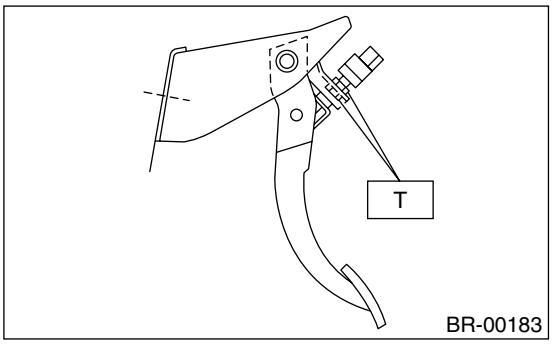


(1) Stop light switch

B: INSTALLATION

1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
2) Adjust stop light switch position, and then tighten the nut.
<Ref. to BR-43, ADJUSTMENT, Stop Light Switch.>

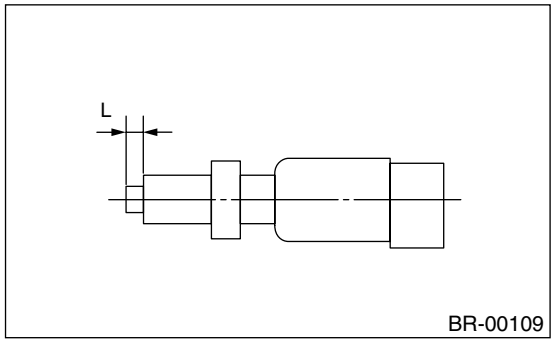
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

1) If stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

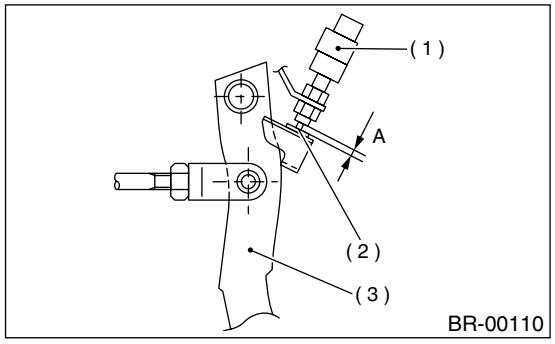
Specified position: L
$2^{+1.5}_{0}$ mm ($0.079^{+0.059}_{0}$ in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



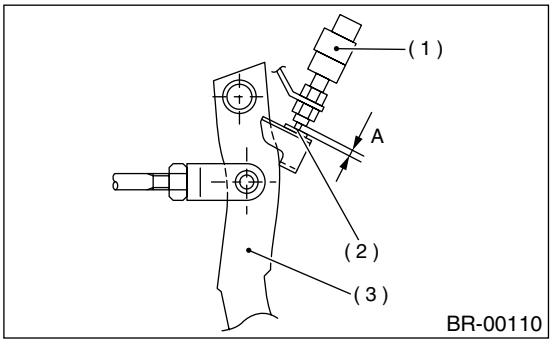
(1) Stop light switch
(2) Stopper
(3) Brake pedal

3) If it is not in specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust stop light switch position until the clearance (A) between threaded end of the stop light switch and the stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.



(1) Stop light switch
(2) Stopper
(3) Brake pedal

17.General Diagnostics

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Rotor eccentricity	Correct or replace the rotor.
	(3) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(4) Deformed back plate	Correct or replace.
	(5) Improper tire inflation	Inflate to correct pressure.
	(6) Disordered wheel alignment	Adjust alignment.
	(7) Loosened back plate or the support installing bolts	Retighten.
	(8) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(9) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(10) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Improper adjusted wheel bearing	Adjust or replace.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty rotor	Clean the rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent rotor	Retighten or replace.
7. Brake noise (3) (click sound)	(1) Excessively worn pad or the support	Replace the pad or the support.
	(2) Excessively worn shoe ridge	Replace the back plate.
	(3) Lack of oil on the shoe ridge surface and anchor	Add more grease.

PARKING BRAKE

PB

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4. Parking Brake Assembly 8
5. General Diagnostic Table....11

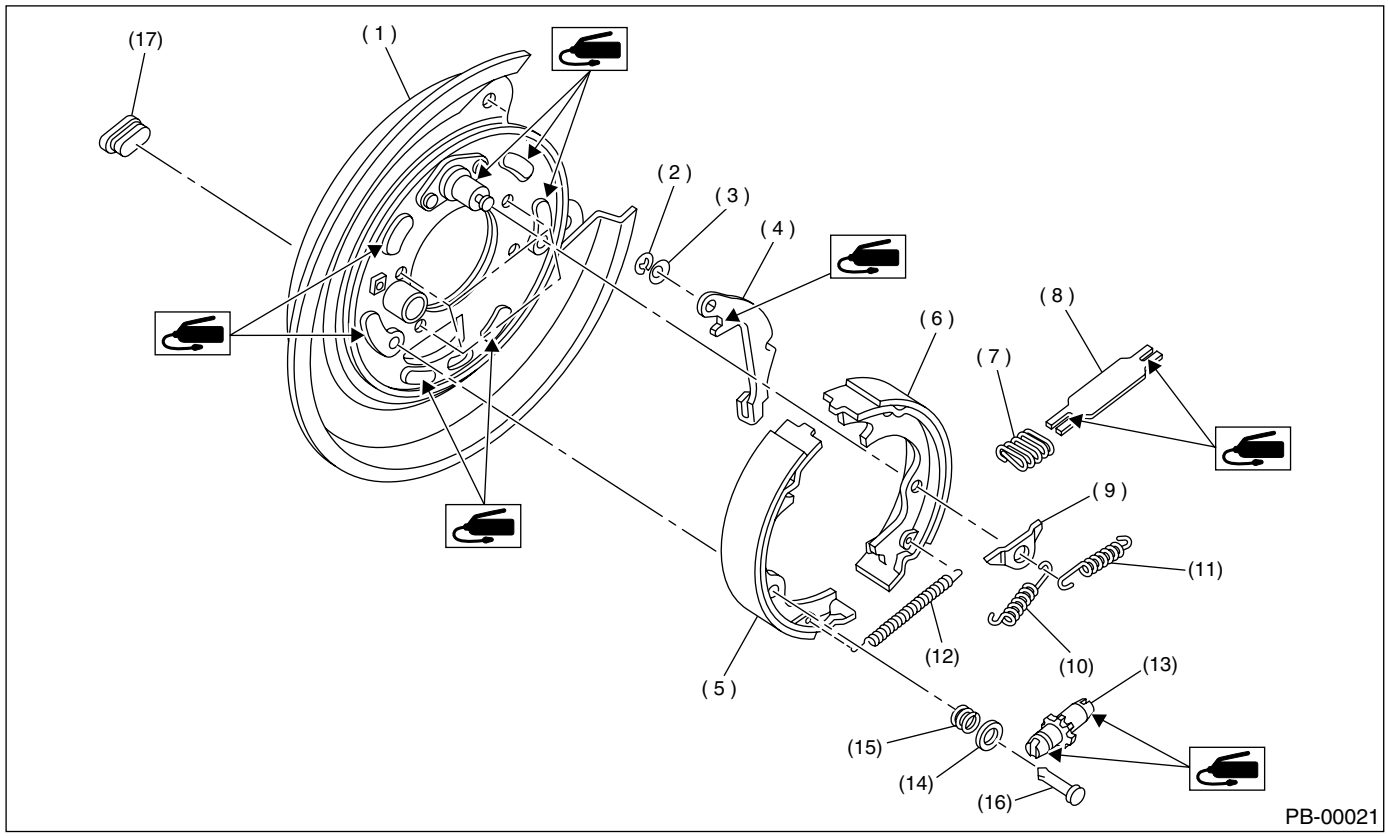
1. General Description

A: SPECIFICATIONS

Type		Mechanical on rear brakes, drum in disc
Effective drum diameter	mm (in)	170 (6.69)
Lining dimensions (length × width × thickness)	mm (in)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)
Clearance adjustment		Manual adjustment
Lever stroke	notches/N (kgf, lb)	7 to 8/196 (20, 44)

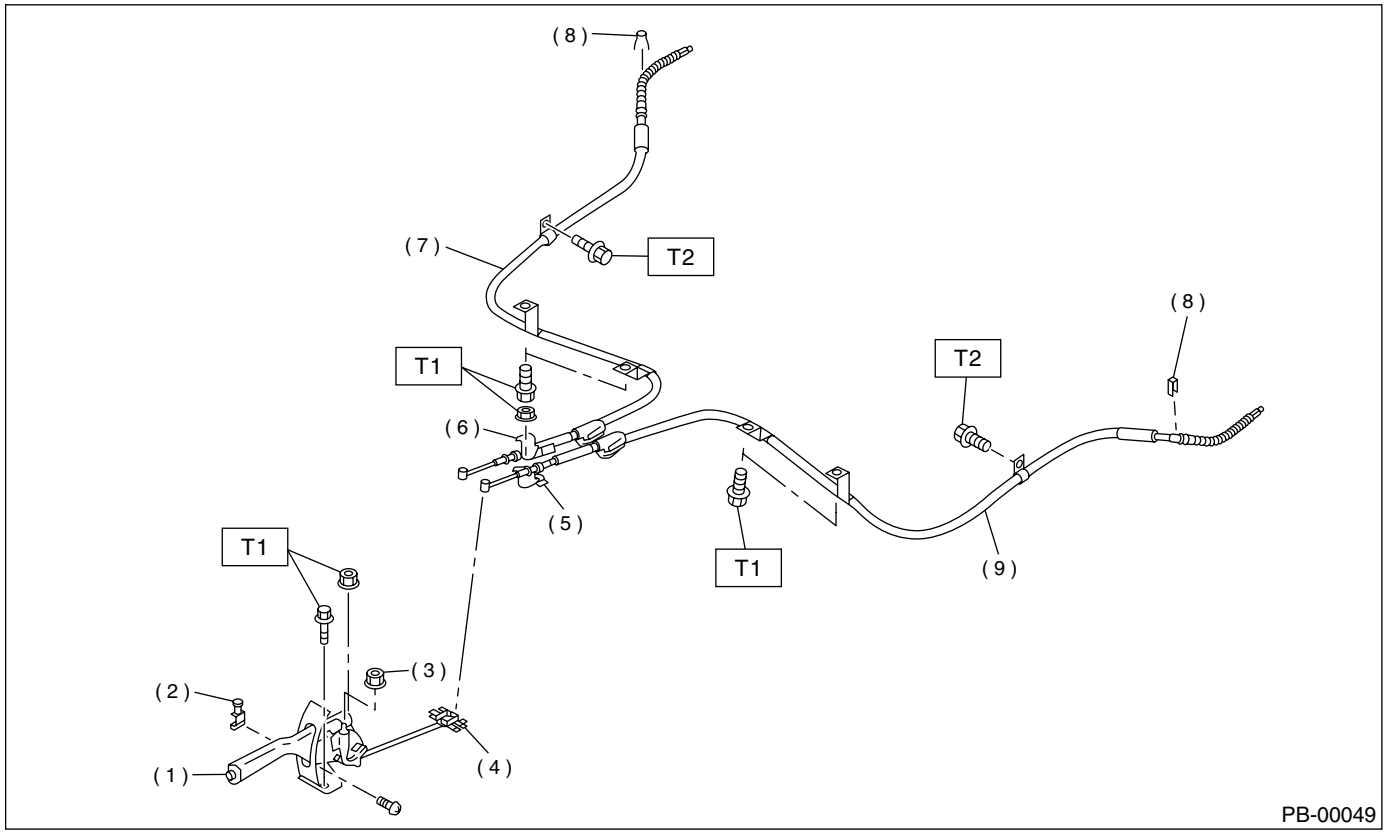
B: COMPONENT

1. PARKING BRAKE



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake show (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Adjusting nut (Self-lock nut)
(4) Equalizer
(5) Bracket
(6) Clamp
(7) Parking brake cable RH
(8) Clamp (Rear disc brake model only)
(9) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 32 (3.3, 24)

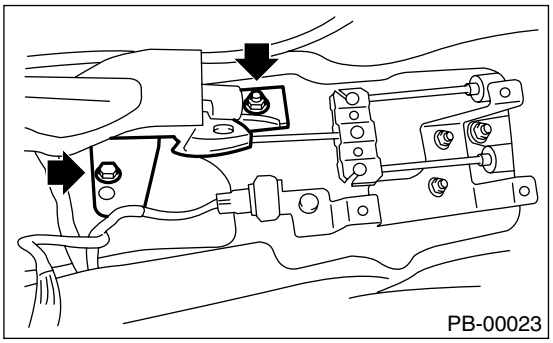
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep grease etc. away from parking brake shoes.

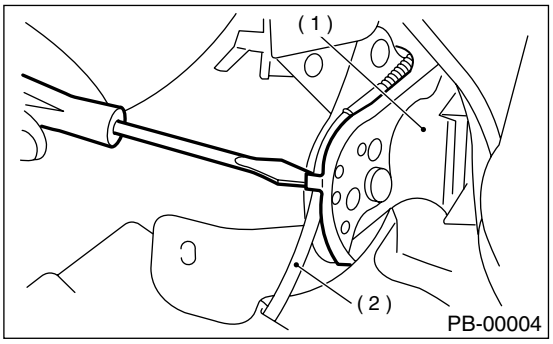
2. Parking Brake Lever

A: REMOVAL

1) Lift-up the vehicle.
2) Remove rear tire and wheel.
3) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
4) Loosen parking cable adjusting nut and console bracket.
5) Remove parking brake lever.



6) Unbend parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13.0 ft-lb)

NOTE:
• Be sure to pass cable through guide inside the tunnel.
• Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

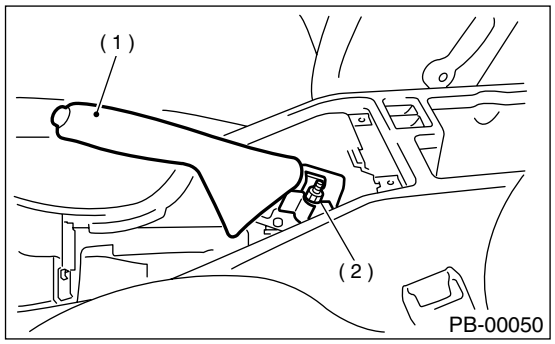
Incorrect, adjust the parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>

D: ADJUSTMENT

1) Remove console cover.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

CAUTION:
Replace the removed adjusting nut (self-lock nut) with a new one.



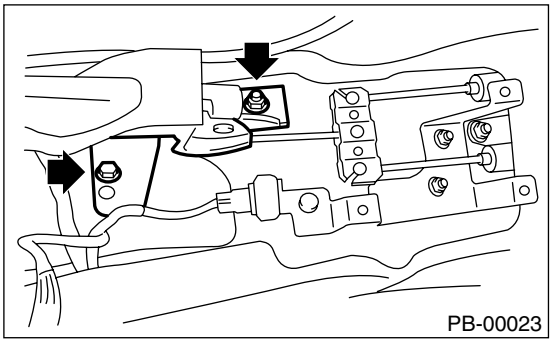
(1) Parking brake lever
(2) Adjusting nut (Self-lock nut)

4) Install console cover.

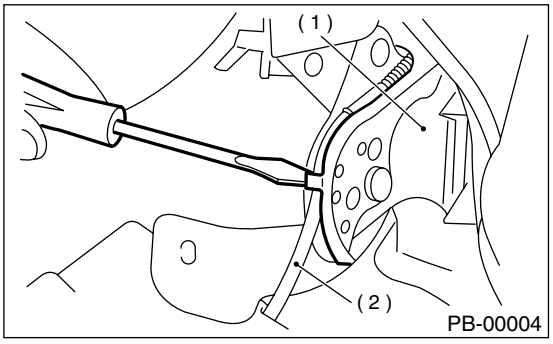
3. Parking Brake Cable

A: REMOVAL

1) Lift-up vehicle.
2) Remove rear tires and wheels.
3) Remove rear seat cushion. <Ref. to SE-18, Rear Seat.>
4) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
5) Loosen parking cable adjusting nut and console bracket.
6) Remove parking brake lever.

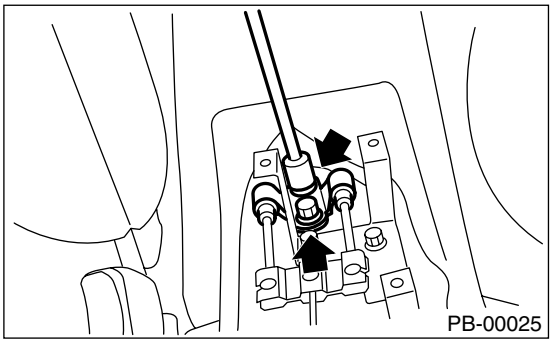


7) Unbend parking brake lever pawls and remove cable.

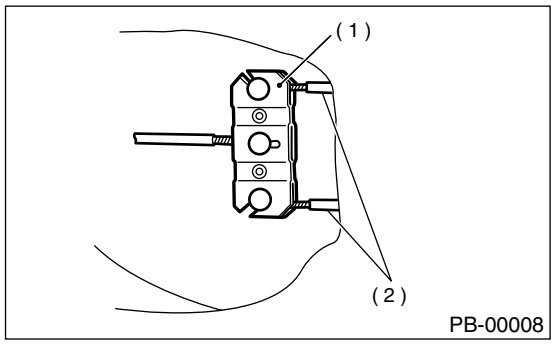


(1) Parking brake lever
(2) Cable

8) Roll up floor mat and remove clamps.

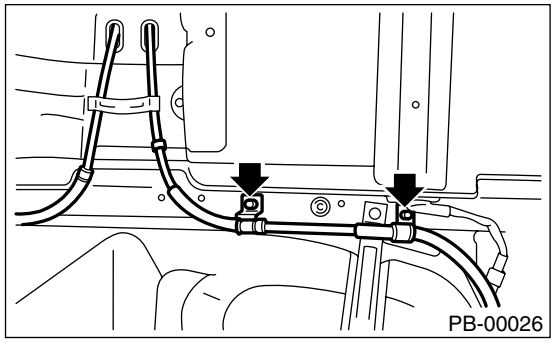


9) Remove equalizer cover.
10) Remove inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

11) Pull out parking brake cable from rear brake. <Ref. to PB-8, REMOVAL, Parking Brake Assembly.>
12) Pull out clamp from rear brake.
13) Remove bolt and bracket from trailing link bracket.
14) Remove bolt and clamp from rear floor.



15) Detach grommet from rear floor.
16) Remove cable assembly from cabin by forcibly pulling it backward.
17) Detach parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

Install (new) parking brake assembly in the reverse order of removal.

NOTE:
• Be sure to pass cable through cable guide inside the tunnel.
• Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

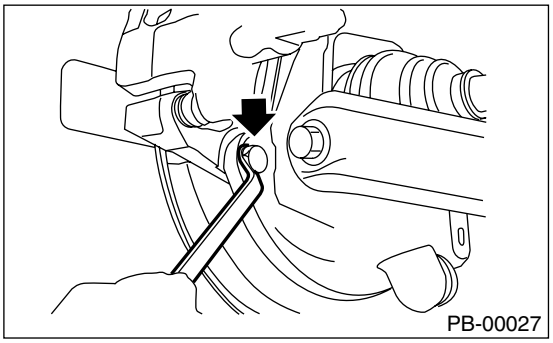
C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.

4. Parking Brake Assembly

A: REMOVAL

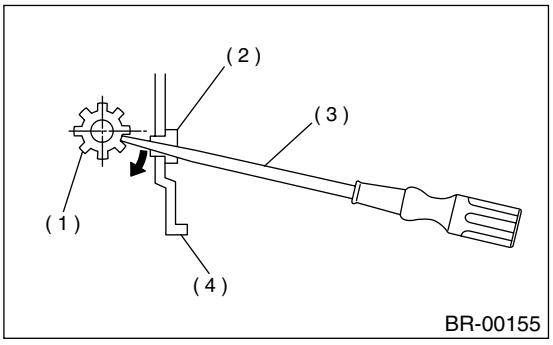
1) Remove the two mounting bolts and remove the disc brake assembly.



2) Suspend the disc brake assembly so that the hose is not stretched.
3) Pull down and release parking brake.
4) Remove the disc rotor.

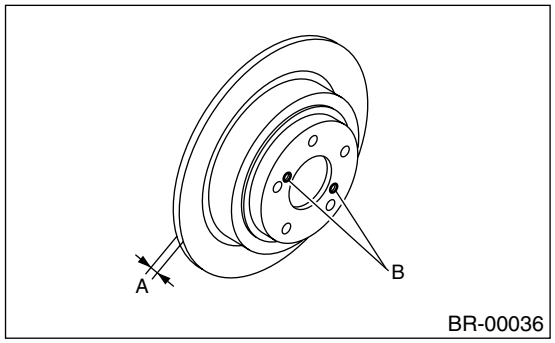
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.

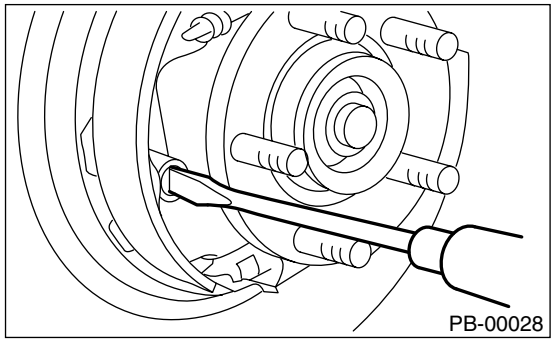


(1) Adjusting screw
(2) Cover (rubber)
(3) Slot-type screwdriver
(4) Back plate

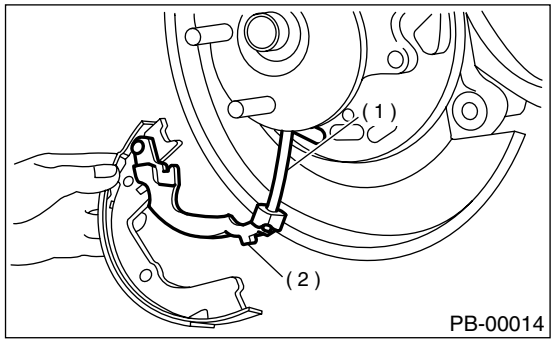
(2) If disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in holes B on the rotor.



5) Remove shoe return spring from parking brake assembly.
6) Using a standard screwdriver, remove front shoe hold-down spring and pin.



7) Remove strut and strut spring.
8) Remove adjuster assembly from parking brake assembly.
9) Using a standard screwdriver, remove rear shoe hold-down spring and pin.
10) Remove brake shoe.
11) Remove parking cable from parking lever.



(1) Parking brake cable
(2) Parking brake lever

12) Using a standard screwdriver, raise retainer. Remove parking lever and washer from brake shoe.

B: INSTALLATION

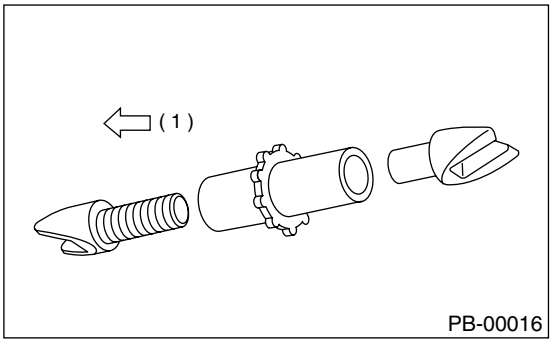
CAUTION:
Be sure lining surface is free from oil contamination.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 725191460)

1) Apply brake grease to the following places.
• Six contact surfaces of shoe rim and back plate packing
• Contact surface of shoe wave and anchor pin
• Contact surface of lever and strut
• Contact surface of shoe wave and adjuster assembly
• Contact surface of shoe wave and strut
• Contact surface of lever and shoe wave
2) Install in reverse order of removal.

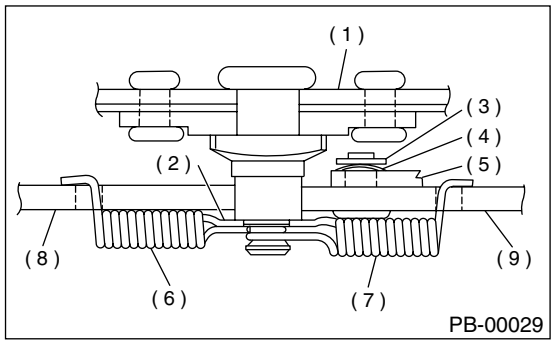
CAUTION:
• Use new retainers and clinch them when installing brake shoes to levers.
• Ensure that parking lever moves smoothly.
• Do not confuse left parking lever with right one.
• Do not confuse left strut with right one.

NOTE:
Ensure that adjuster assembly is securely installed with screw in the left side, facing vehicle front.



(1) LEFT

NOTE:
Ensure that shoe return spring is installed as shown in Figure.



(1) Back plate
(2) Shoe guide plate
(3) Retainer
(4) Spring washer
(5) Lever
(6) Primary shoe return spring (Blue)
(7) Secondary shoe return spring (Yellow)
(8) Parking brake shoe (Primary)
(9) Parking brake shoe (Secondary)

3) Adjust parking brakes. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly.>

CAUTION:
After replacing parking brake lining, be sure to drive vehicle for "break-in" purposes.
(1) Drive the vehicle about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust parking brakes.

C: INSPECTION

1) Measure brake disc inside diameter. If the disc is scored or worn, replace the brake disc.

Disc inside diameter:
Standard
170 mm (6.69 in)
Service limit
171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace shoe assembly.

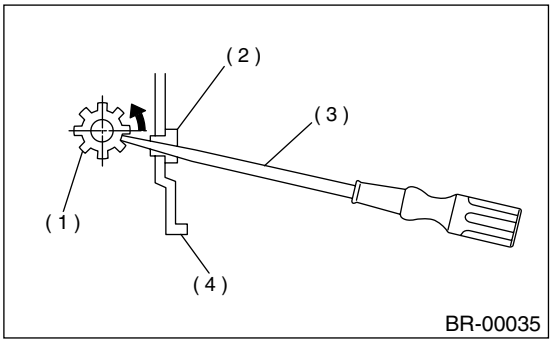
Lining thickness:
Standard
3.2 mm (0.126 in)
Service limit
1.5 mm (0.059 in)

CAUTION:
Replace the brake shoes on the right and left brake assembly at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove adjusting hole cover from back plate.
2) Turn adjusting screw using a slot-type screwdriver until brake shoe is in close contact with disc rotor.

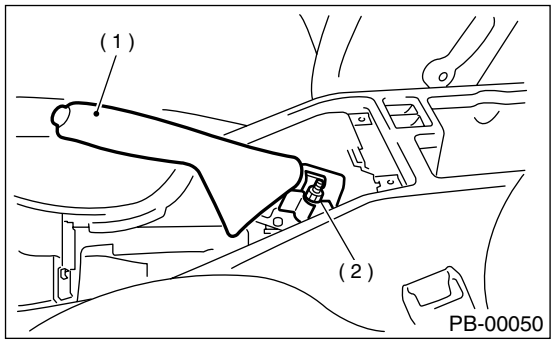


(1) Adjusting screw
(2) Cover (rubber)
(3) Slot-type screwdriver
(4) Back plate

3) Turn back (downward) adjusting screw 3 or 4 notches.
4) Install adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove console box cover.
2) Forcibly pull parking brake lever 3 to 5 times.
3) Adjust parking brake lever by turning adjuster until parking brake lever stroke is set at 6 notches with operating force of 196 N (20 kgf, 44 lb).



(1) Parking brake lever
(2) Adjusting nut (Self-lock nut)

4) Install console box cover.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	• Parking brake lever is maladjusted.	• Adjustment.
	• Parking brake cable does not move.	• Repair or replace.
	• Parking brake shoe clearance is maladjusted.	• Adjustment.
	• Return spring is faulty.	• Replace.
Noise from brake	• Return spring is faulty.	• Replace.
	• Shoe hold-down spring is faulty.	• Replace.

GENERAL DIAGNOSTIC TABLE

MEMO:

POWER ASSISTED SYSTEM (POWER STEERING)

PS

		Page
1.	General Description	2
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5.	Steering Gearbox	24
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1. General Description

A: SPECIFICATIONS

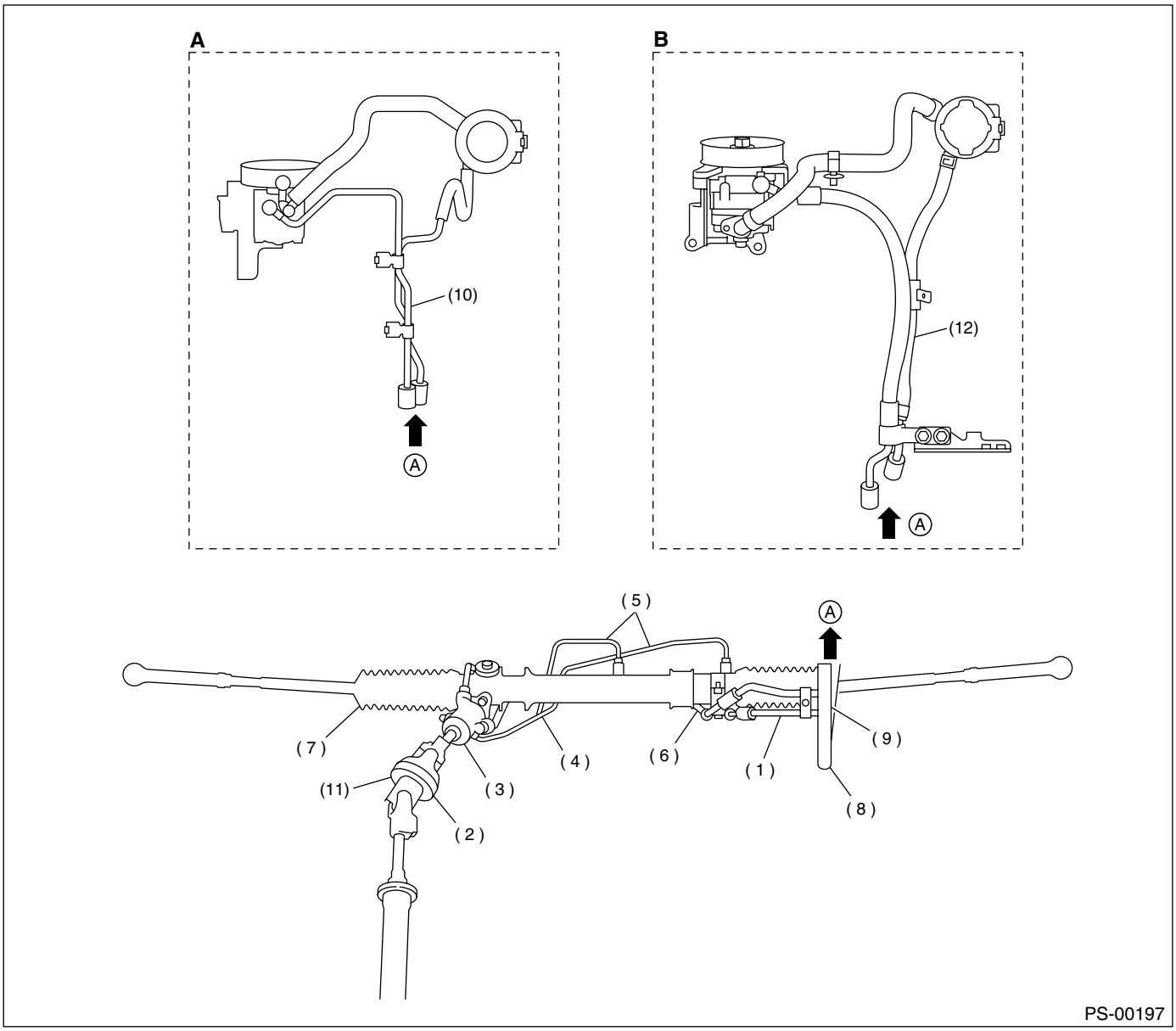
Model			Except OUTBACK	Pick-up	OUTBACK	
			Non-TURBO model	TURBO model	2.5 L model	3.0 L model
Whole system	Minimum turning radius	m (ft)	5.4±0.5 (17.7±1.6)	5.6±0.5 (18.4±1.6)	5.6±0.5 (18.4±1.6)	
	Steering angle (Inside — Outside)		36.3°±1.5° — 31.6°±1.5°	34.5°±1.5° — 30.3°±1.5°	34.5°±1.5° — 30.3°±1.5°	
	Steering wheel diameter	mm (in)	385 (15.16)			
	Overall gear ratio		16.5	19.0	19.0	
	Turns lock to lock		3.2	3.4	3.4	
Gearbox	Type		Rack and pinion, Integral			
	Backlash		0 (Automatically adjustable)			
	Valve (Power steering system)		Rotary valve			
Pump (Power steering system)	Type		Vane pump			
	Oil tank		Installed on body			
	Output	cm^3 (cu in)/rev.	7.2 (0.439)	8.5 — 0.6 (0.582 — 0.037)	7.2 (0.439)	9.6 — 0.65 (0.586 — 0.040)
	Relief pressure	kPa (kg/cm^2, psi)	9,807 (100, 1,422)	7,846 (80, 1,138)	9,807 (100, 1,422)	7,846 (80, 1,138)
	Hydraulic fluid control		Dropping in response to increased engine revolutions			
	Hydraulic fluid	ℓ (US qt, Imp qt)	1,000 rpm: 6 (6.3, 5.3) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)	
	Range of revolution		500 — 9,000			500 — 8,000
	Revolving direction		Clockwise			
Working fluid (Power steering system)	Name		ATF DEXRON IIE or III			
	Capacity	Oil tank ℓ (US qt, Imp qt)	0.3 (0.3, 0.3)			
		Total ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)			

Steering wheel	Free play	mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	Except OUTBACK, Pick-up model	36.3°±1.5°
		OUTBACK, Pick-up model	34.5°±1.5°
	Outer tire & wheel	Except OUTBACK, Pick-up model	31.6°±1.5°
		OUTBACK, Pick-up model	30.3°±1.5°
Steering shaft	Clearance between steering wheel and column cover	mm (in)	3.0 (0.118)
Steering gearbox (Power steering system)	Sliding resistance	N (kgf, lb)	304.0 (31.0, 68.4) or less
	Rack shaft play in radial direction	Right-turn steering mm (in)	0.15 (0.0059) or less
		Left-turn steering mm (in)	Horizontal movement: 0.3 (0.012) or less Vertical movement: 0.15 (0.0059) or less
	Input shaft play	In radial direction mm (in)	0.18 (0.0071) or less
		In axial direction mm (in)	0.1 (0.004) or less
	Turning resistance	N (kgf, lb)	Within 30 mm (1.18 in) from rack center in straight ahead position: Less than 11.18 (1.14, 2.51) Maximum allowable value: 12.7 (1.3, 2.9)
Oil pump (Power steering system)	Pulley shaft	Radial play mm (in)	0.4 (0.016) or less
		Axial play mm (in)	0.6 (0.024) or less
	Pulley	Ditch deflection mm (in)	1.0 (0.039) or less
		Resistance to rotation N (kgf, lb)	9.22 (0.94, 2.07) or less
	Regular pressure	kPa (kg/cm^2, psi)	981 (10, 142) or less
	Relief pressure	kPa (kg/cm^2, psi)	9,807 (100, 1,422)
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road	N (kgf, lb)	29.4 (3.0, 6.6) or less
	At standstill with engine stalled on a concrete road	N (kgf, lb)	294.2 (30, 66.2) or less

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

CAUTION:
This table lists various clearances that must be correctly adjusted to ensure normal vehicle driving without interfering noise, or any other faults.

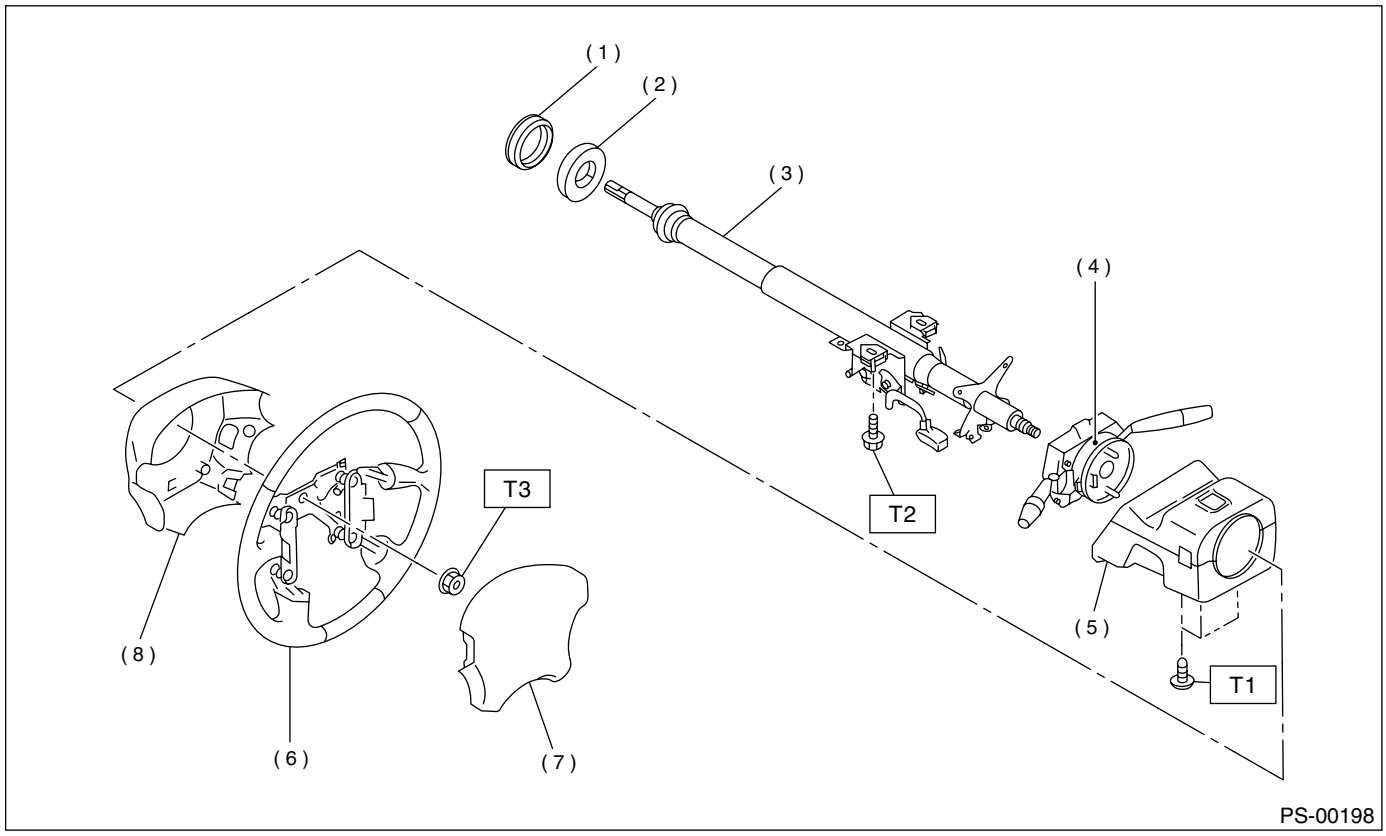
Location	Minimum allowance	
	2.5 L model	3.0 L model
(1) Crossmember — Pipe	5 mm (0.20 in)	
(2) DOJ — Shaft or joint	14 mm (0.55 in)	
(3) DOJ — Valve housing	11 mm (0.43 in)	
(4) Pipe — Pipe	2 mm (0.08 in)	
(5) Stabilizer — Pipe	5 mm (0.20 in)	
(6) Exhaust pipe — Pipe	15 mm (0.59 in)	
(7) Exhaust pipe — Gearbox boot	15 mm (0.59 in)	
(8) Side frame — Hose A and B	15 mm (0.59 in)	
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)	
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)	—
(11) AT cooling hose — Joint	20 mm (0.79 in)	—
(12) Pressure hose — Return hose	—	3.0 mm (0.12 in)



(A) 2.5 L model (B) 3.0 L model

B: COMPONENT

1. STEERING WHEEL AND COLUMN

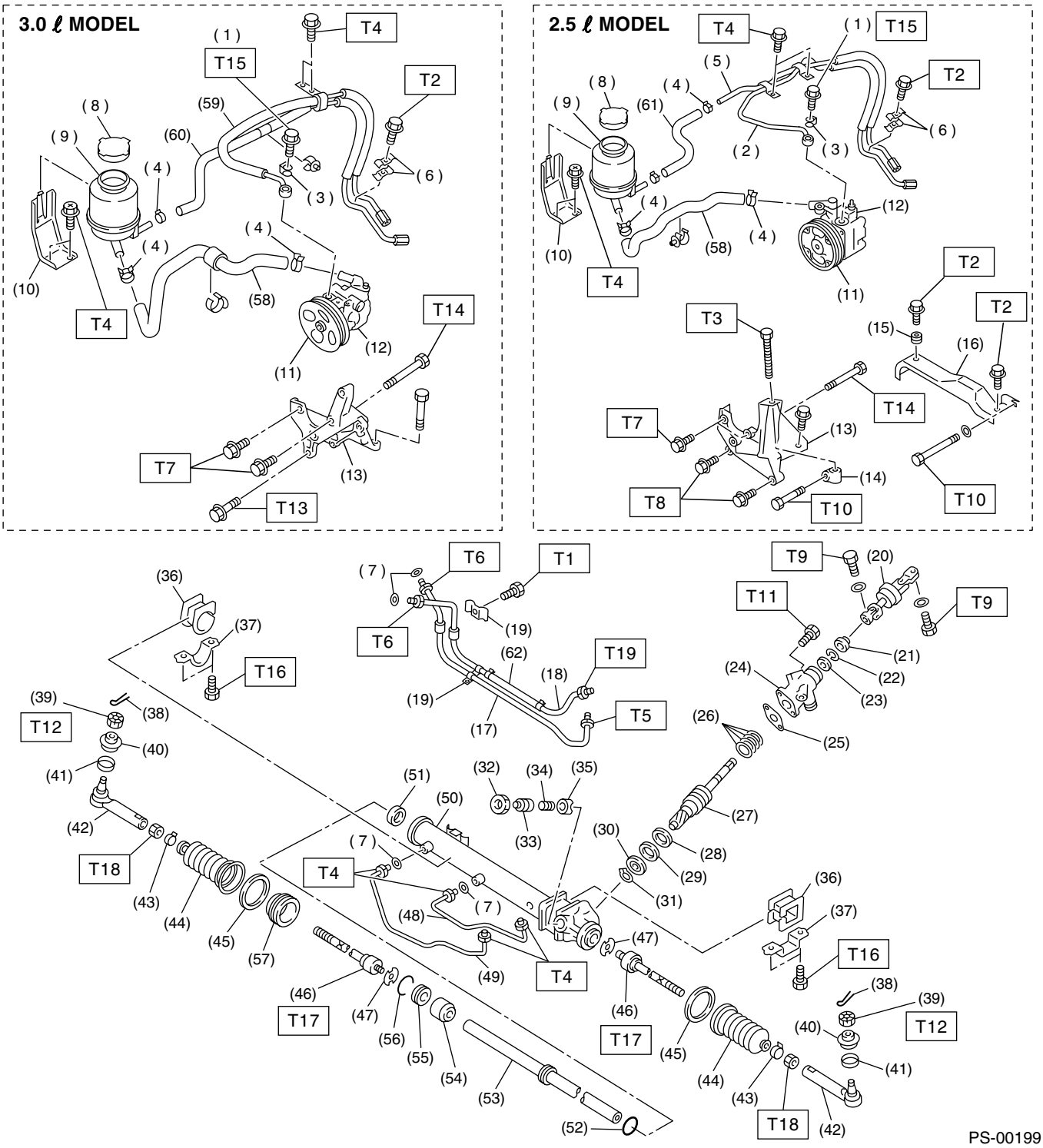


(1) Bushing
(2) Seal
(3) Steering shaft
(4) Steering roll connector
(5) Column cover
(6) Steering wheel
(7) Airbag module
(8) Lower steering wheel cover

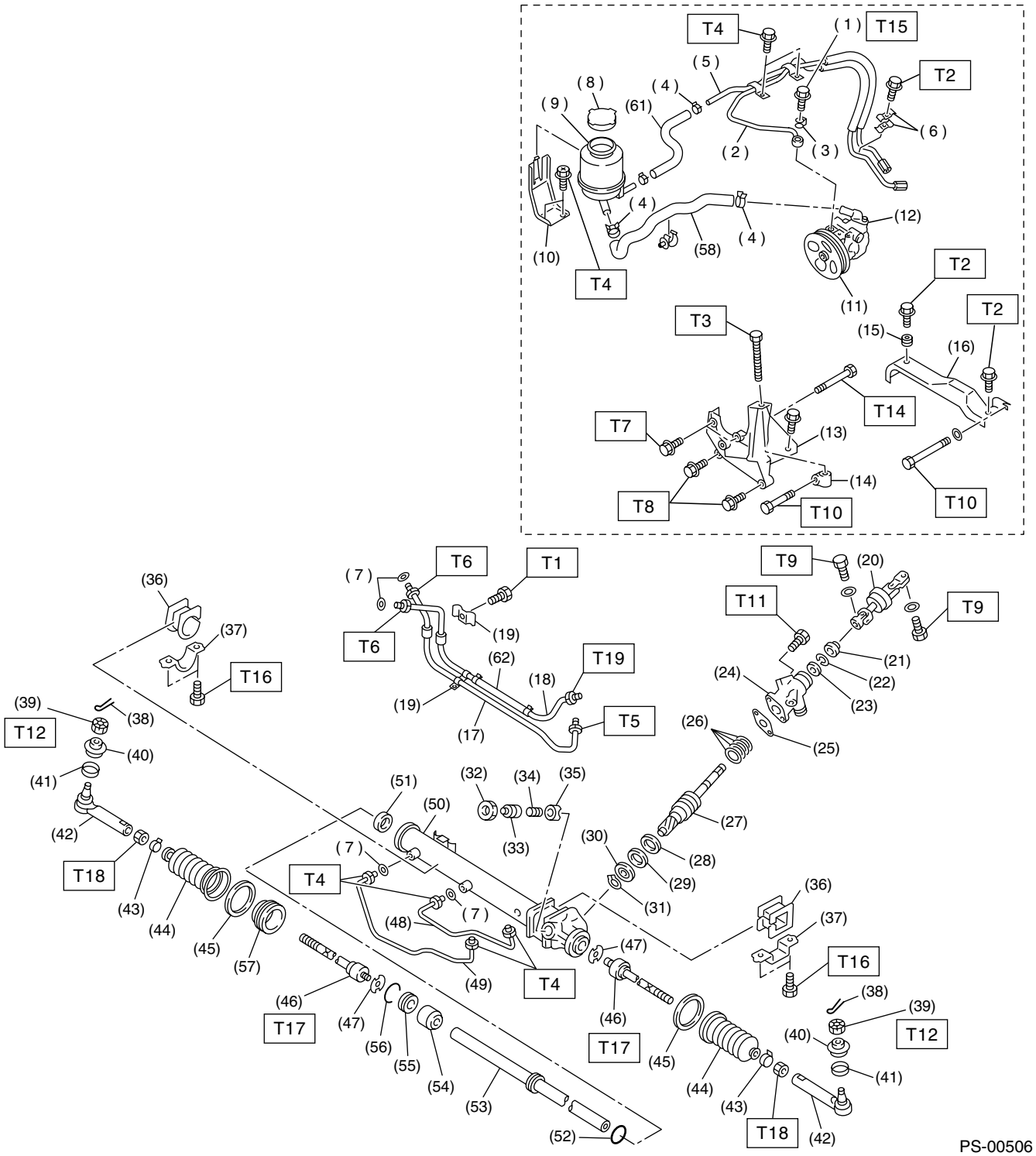
Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.2 (0.12, 0.9)
T2: 25 (2.5, 18.1)
T3: 44 (4.5, 32.5)

2. POWER ASSISTED SYSTEM

• Except TURBO model



• TURBO model



PS-00506

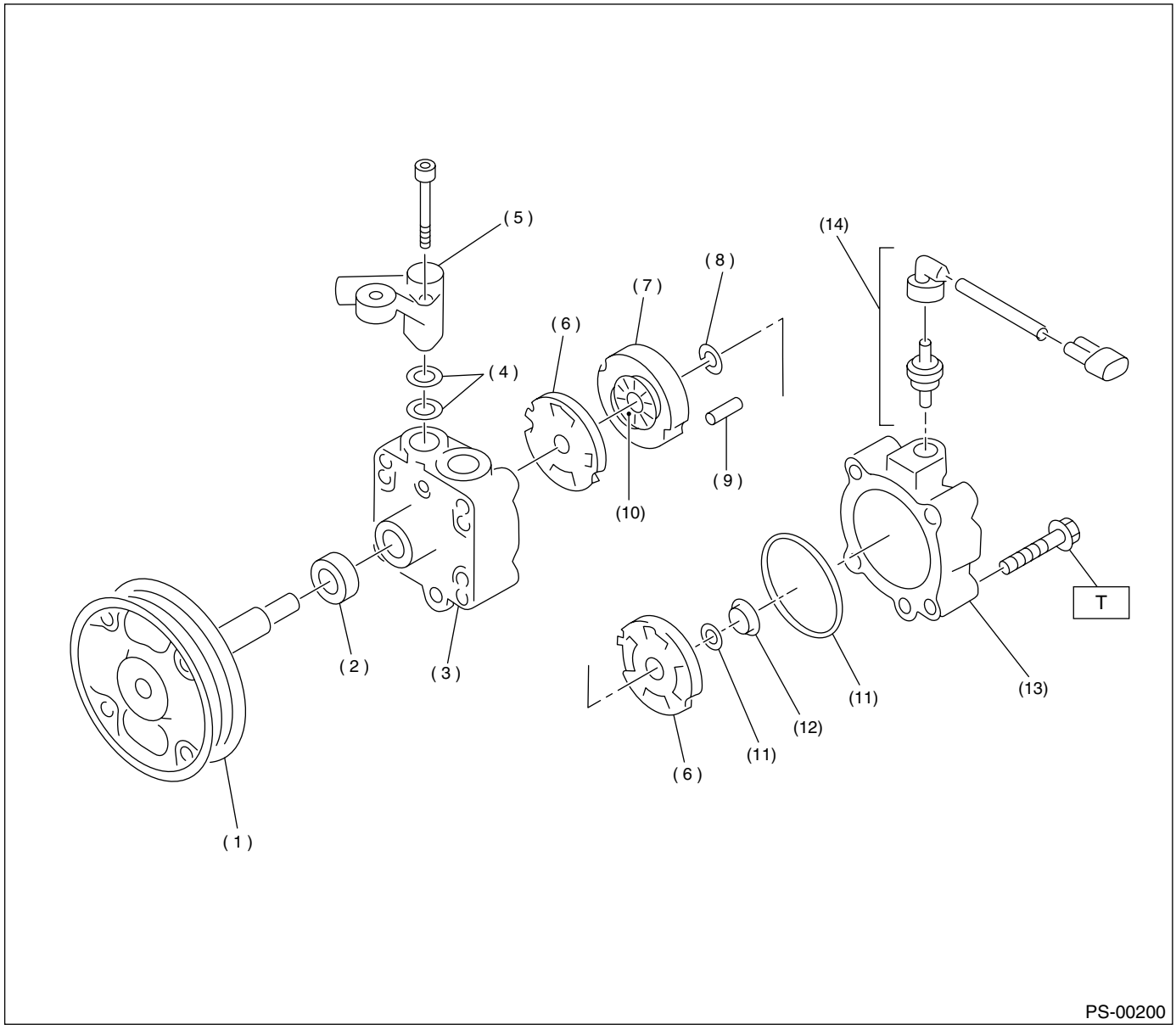
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bushing
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) C-ring
(23) Oil seal
(24) Valve housing
(25) Gasket
(26) Seal ring
(27) Pinion and valve ASSY
(28) Oil seal
(29) Back-up washer
(30) Ball bearing
(31) Snap ring
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Band
(46) Tie-rod
(47) Lock washer
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Piston ring
(53) Rack
(54) Rack bushing
(55) Rack stopper
(56) Circlip
(57) Spacer
(58) Suction hose
(59) Pressure hose ASSY
(60) Return hose ASSY
(61) Return hose
(62) Hose

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6 (0.6, 4.3)
T2: 7.4 (0.75, 5.4)
T3: 8 (0.8, 5.8)
T4: 13 (1.3, 9.4)
T5: 15 (1.5, 10.8)
T6: 15 (1.5, 10.8)
T7: 15.7 (1.6, 11.6)
T8: 22 (2.2, 15.9)
T9: 24 (2.4, 17.4)
T10: 24.5 (2.5, 18.1)
T11: 25 (2.5, 18.1)
T12: 27 (2.75, 19.9)
T13: 33 (3.4, 25)
T14: 37.3 (3.8, 27.5)
T15: 39 (4.0, 28.9)
T16: 59 (6.0, 43)
T17: 78 (8.0, 58)
T18: 83 (8.5, 61.5)
T19: 25 (2.5, 18.1)

3. OIL PUMP

NOTE:
The illustration for 2.5 L Non-TURBO model is shown below. (Not shown for TURBO model and 3.0 L model because it cannot be disassembled.)



(1) Pulley
(2) Oil seal
(3) Front casing
(4) O-ring
(5) Socket
(6) Pressure plate
(7) Cam ring
(8) Circlip
(9) Straight pin
(10) Rotor
(11) O-ring
(12) Seal ring
(13) Rear body
(14) Connector

Tightening torque: N·m (kgf-m, ft-lb)
T: 27.5 (2.8, 20.3)

C: CAUTION

• This section includes Airbag related repair works. For those corresponding to the repair procedures, read carefully CAUTION items in AB section before working and be sure to follow the instructions.
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply steering fluid onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of steering fluid to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

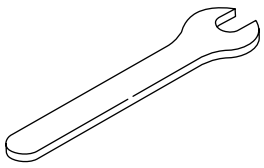
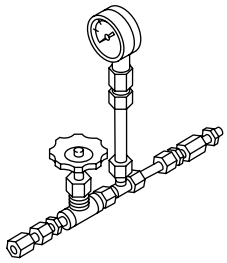
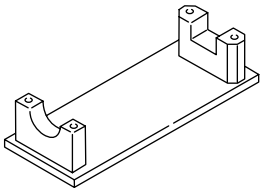
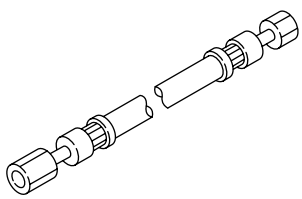
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

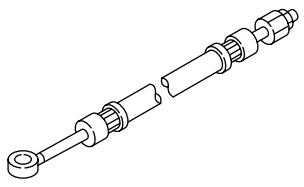
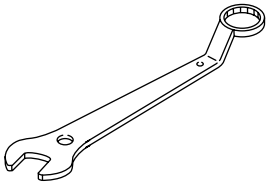
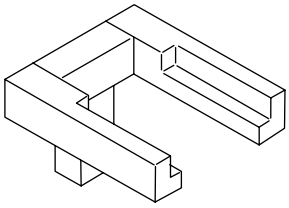
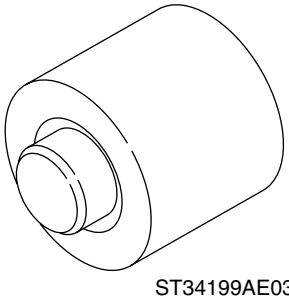
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	• For the lock nut when adjusting backlash of gearbox. • Measurement of rotating resistance of gearbox assembly.
 ST34199AE020	34199AE020	MOUNT	Used for disassembling oil pump.
 ST34199AE030	34199AE030	INSTALLER	Used for installing oil seal into oil pump.

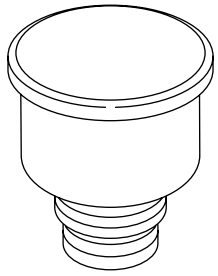
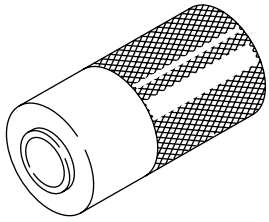
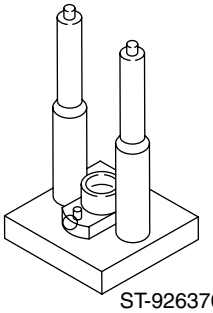
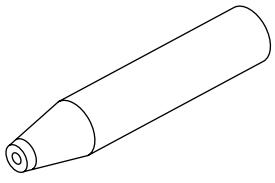
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering oil.
 ST-927640000	927640000	INSTALLER B	Used for installing ball bearing into housing.
 ST-926370000	926370000	INSTALLER A	• Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (927630000).
 ST-926390001	926390001	COVER & REMOVER ASSY	Used for assembling rack assembly.

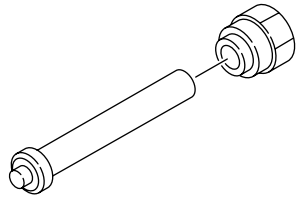
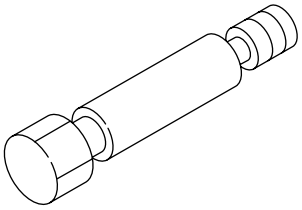
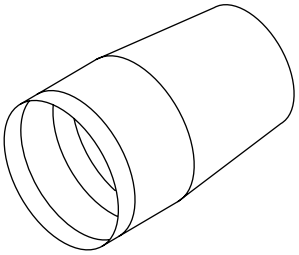
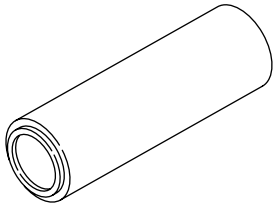
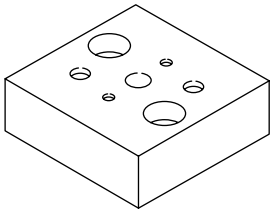
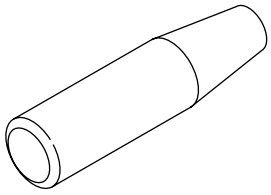
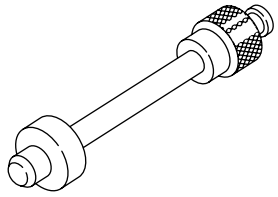
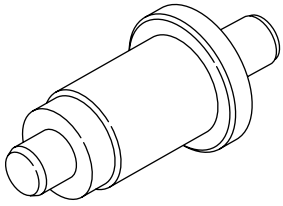
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926400000	926400000	GUIDE	• Right side of rack when installing rack bushing. • Used with GUIDE (927660000).
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bushing. • Used with GUIDE (926400000).
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927630000	927630000	STAND BASE	Used for assembling power steering gearbox.
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 ST34199AE060	34199AE060	INSTALLER	Used for installing oil seal.
 ST-927610000	927610000	INSTALLER & REMOVER SEAL	Used for installing valve housing oil seal.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.

2. Steering Wheel

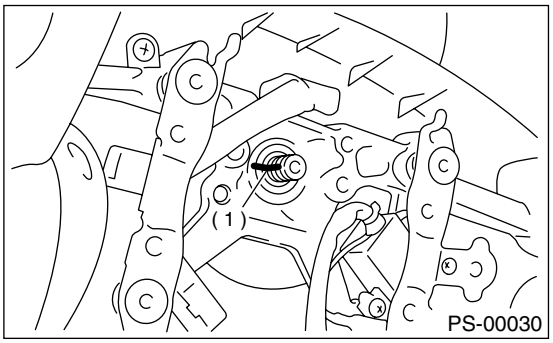
A: REMOVAL

1) Disconnect ground cable from battery.
2) Set tires to straight-ahead position.
3) Remove airbag module. <Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

4) Remove steering wheel nut, and then draw out steering wheel from shaft using steering puller.

NOTE:
Make matching marks on steering wheel and steering column in advance.



(1) Matching mark

B: INSTALLATION

1) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching marks on steering wheel and steering column.

Tightening torque:
4.5 N·m (4.5 kgf-m, 32.5 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

C: INSPECTION

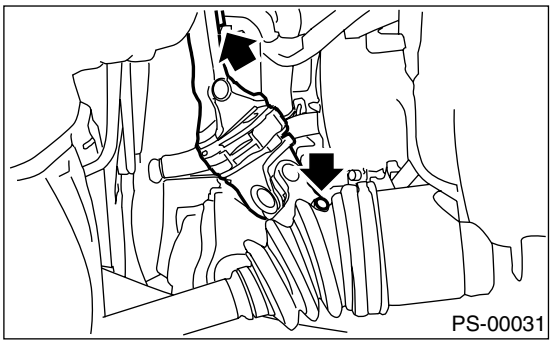
1) Check steering wheel for deformation. If the deformation is excessive, replace steering wheel.
2) Check splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

3. Universal Joint

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
3) Lift-up the vehicle.
4) Remove universal joint bolts and then remove universal joint.

CAUTION:
Scribe alignment marks on universal joint so that it can be reassembled at the original serration.



B: INSTALLATION

1) Install universal joint.
   (1) Align bolts hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and insert universal joint.
   (2) Align bolt hole on the short yoke side of universal joint with the cutout at the serrated section of gearbox assembly. Lower universal joint completely.
   (3) Temporarily tighten bolt on the short yoke side. Raise universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
   (4) Tighten bolt on the long yoke, then that on the short yoke side.

Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure that universal joint bolt is tightened through notch in shaft serration.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 15 mm (0.59 in)

2) Lower the vehicle.
3) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

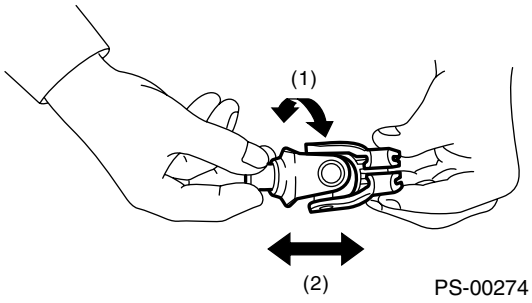
CAUTION:
Ensure that front wheel are set straight forward direction.

4) Install steering wheel and airbag module. <Ref. to PS-18, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.> and <Ref. to AB-13, INSTALLATION, Driver's Airbag Module.>

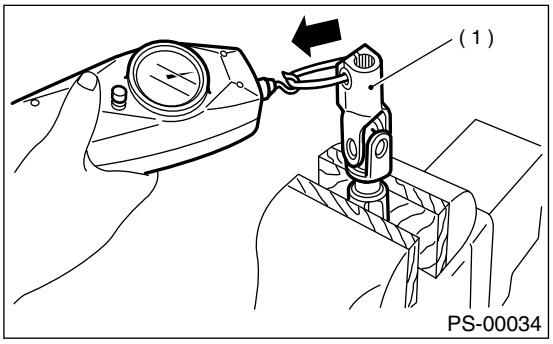
C: INSPECTION

Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
(1) Free play (2) Swinging torque Yawing torque Looseness  **Standard value of universal joint free play: 0 mm (0 in)** **Max. value of universal joint swinging torque: 0.3 N·m (0.03 kgf-m, 0.2 ft-lb)**	Replace if faulty.

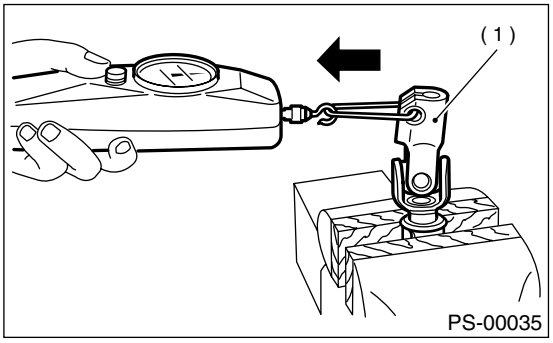
Measurement of folding torque of universal joint is as shown in the figures.

Service limit:
Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less



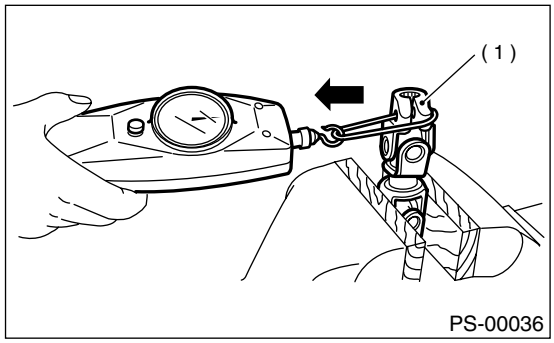
(1) Long yoke

Service limit:
Maximum load; 5.49 N (0.56 kgf, 1.23 lb) or less



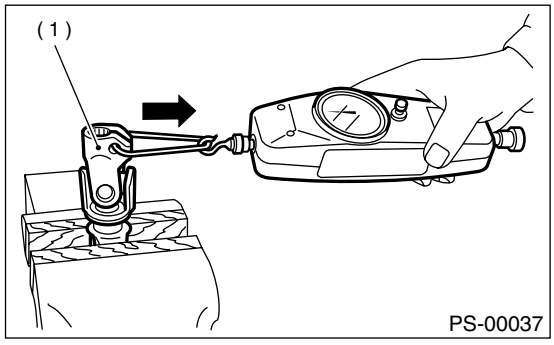
(1) Long yoke

Service limit:
Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less



(1) Short yoke

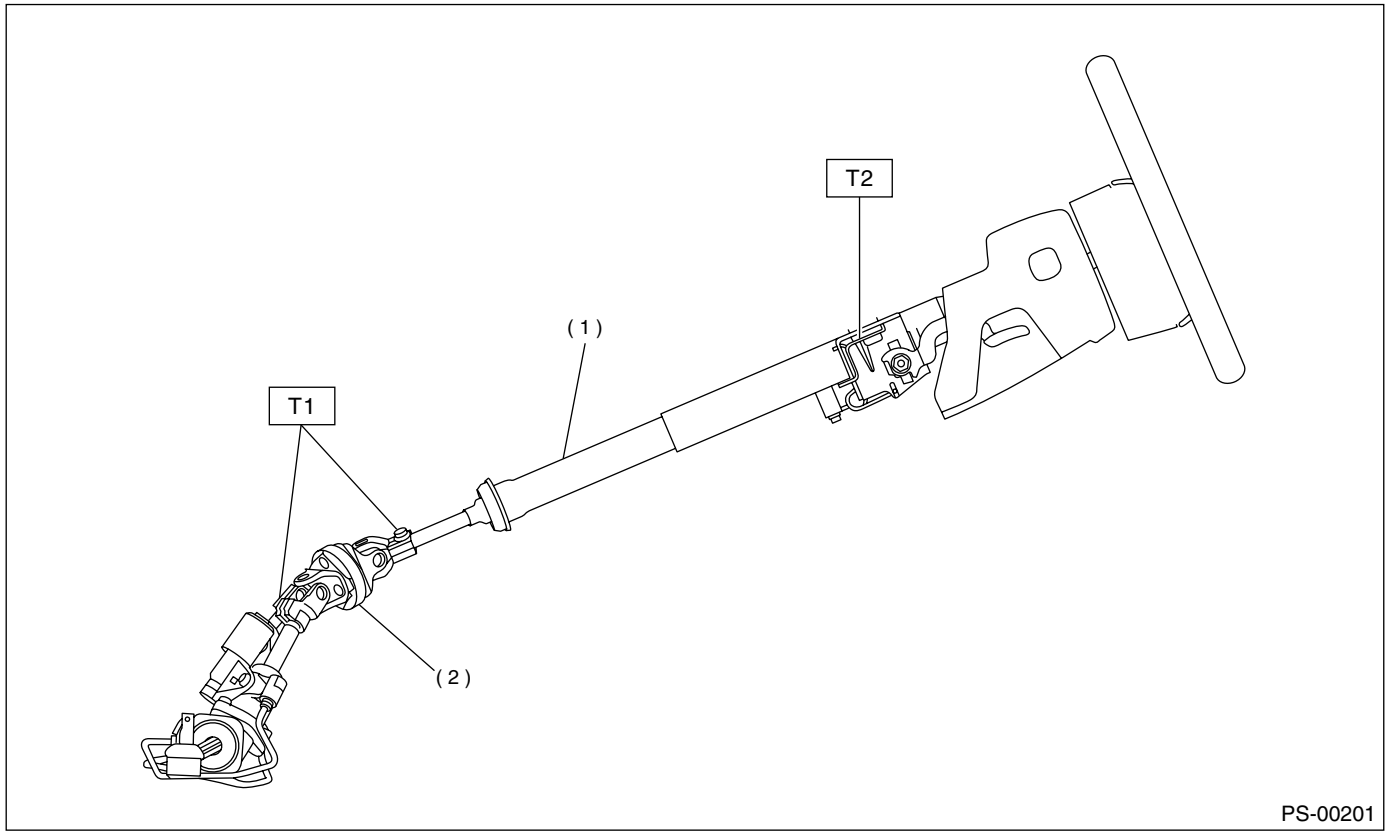
Service limit:
Maximum load; 8.43 N (0.86 kgf, 1.90 lb) or less



(1) Short yoke

4. Tilt Steering Column

A: REMOVAL



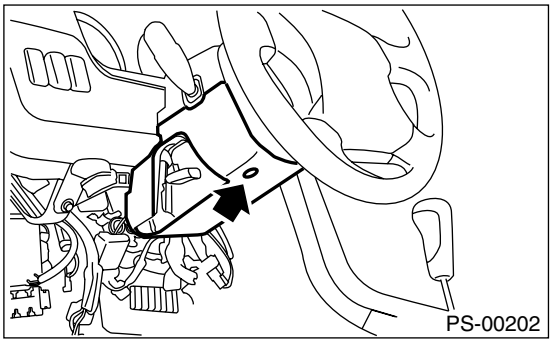
(1) Tilt steering column
(2) Universal joint

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

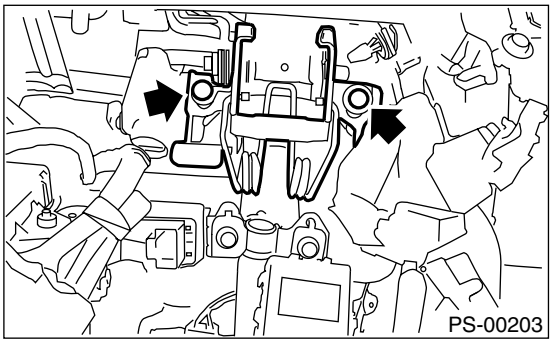
1) Set the vehicle on the lift.
2) Disconnect battery minus ground cable.
3) Remove airbag module. <Ref. to AB-13, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service (if so equipped). <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

4) Remove steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
5) Lift-up the vehicle.
6) Remove universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
7) Lower the vehicle.
8) Remove trim panel under instrument panel.
9) Remove the screw securing lower steering column cover.


PS-00202

10) Remove all connectors from steering column.
11) Remove the two bolts under instrument panel securing steering column.

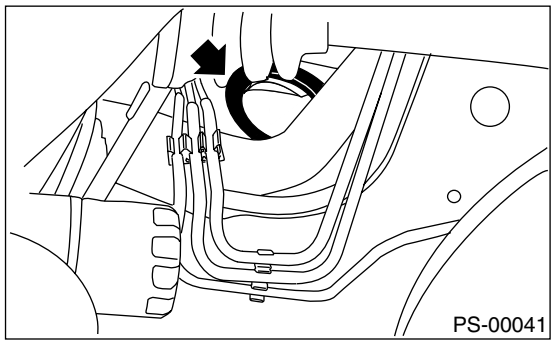

PS-00203

12) Pull out steering shaft assembly from hole on toe board.

CAUTION:
Be sure to remove universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.

B: INSTALLATION

1) Set grommet to toe board.


PS-00041

2) Insert end of steering shaft into toe board grommet.
3) Tighten steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

4) Connect all connectors under instrument panel.
5) Connect airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

6) Install lower column cover with tilt lever held in the lowered position.
7) Install universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
8) Align center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

CAUTION:
Ensure that front wheels are set in straight forward direction.

9) Install steering wheel. <Ref. to PS-18, INSTALLATION, Steering Wheel.>
Set steering wheel to neutral and install it onto steering shaft.

CAUTION:
Insert roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

10) Install airbag module to steering wheel.

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and the two screws securing combination switch, then remove related parts.

D: ASSEMBLY

1) Insert combination switch to upper column shaft, and install upper column cover. Then route ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

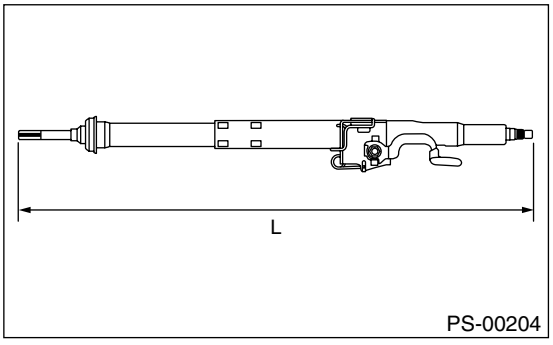
CAUTION:
Don't overtorque screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of steering column and if it is out of standard value, replace it.

Standard value:
Overall length (L)
Except OUTBACK model: $849^{+1.5}_{-0.5}$ mm ($33.425\ ^{+0.059}_{-0.020}$ in)
OUTBACK model: $817\ ^{+1.5}_{-0.5}$ mm ($32.197\ ^{+0.059}_{-0.020}$ in)



2. AIRBAG MODEL INSPECTION

WARNING:
For airbag model inspection procedures, refer to "Airbag System". <Ref. to AB-13, INSPECTION, Driver's Airbag Module.>

5. Steering Gearbox

A: REMOVAL

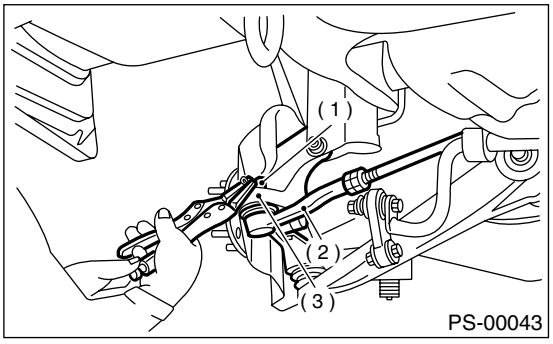
1) Disconnect battery ground cable.
2) Loosen front wheel nut.
3) Lift vehicle and remove front wheels.
4) Remove front exhaust pipe assembly.

2.5 L model
<Ref. to EX(H4SO)-5, REMOVAL, Front Exhaust Pipe.>

3.0 L model
<Ref. to EX(H6DO)-5, REMOVAL, Front Exhaust Pipe.>

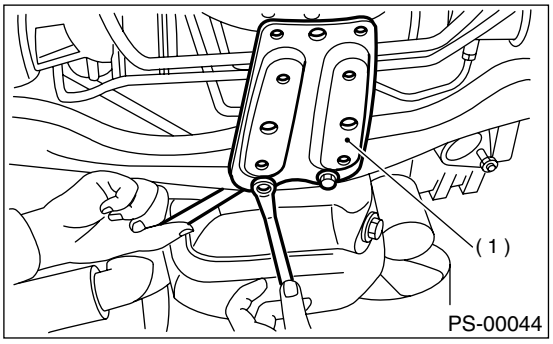
WARNING:
Be careful, exhaust pipe is hot.

5) Using a puller, remove tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



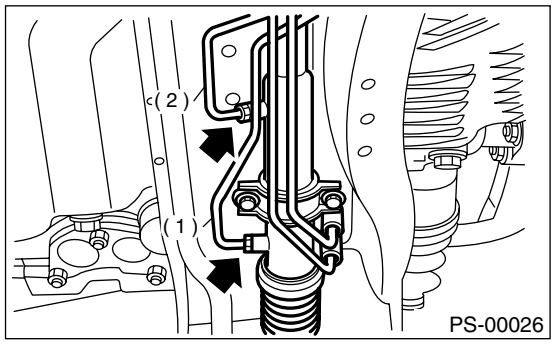
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Remove jack-up plate and front stabilizer. <Ref. to FS-22, REMOVAL, Front Stabilizer.>



(1) Jack-up plate

7) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

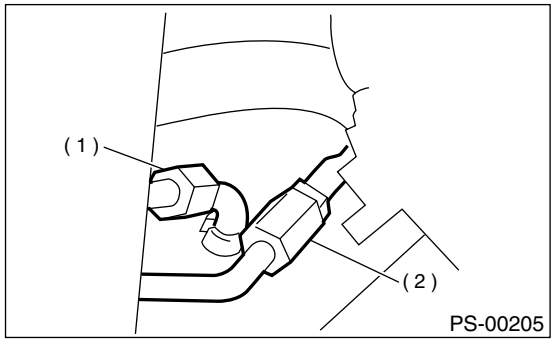


(1) Pipe A
(2) Pipe B

8) Remove universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
9) Disconnect pipes C (Pressure pipe assembly) and D (Return pipe assembly) from pipe of gearbox.

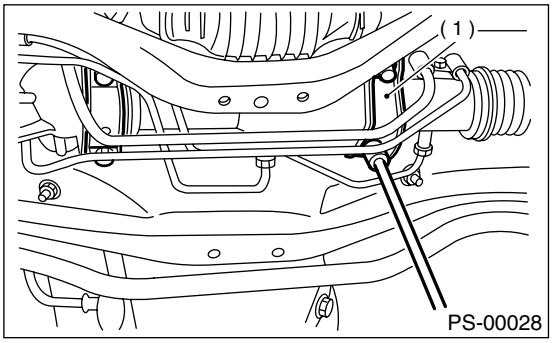
CAUTION:
Be careful not to damage these pipes.

NOTE:
Disconnect upper pipe D (Return hose assembly) first, and lower pipe C (Pressure hose assembly) second.



(1) Pipe C
(2) Pipe D

10) Remove clamp bolts securing gearbox to crossmember, and remove gearbox.

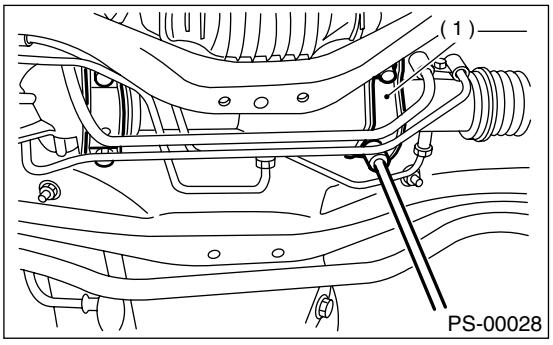


(1) Clamp

B: INSTALLATION

1) Insert gearbox into crossmember, being careful not to damage gearbox boot.
2) Tighten gearbox to crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:
59 N·m (6.0 kgf-m, 43 ft-lb)

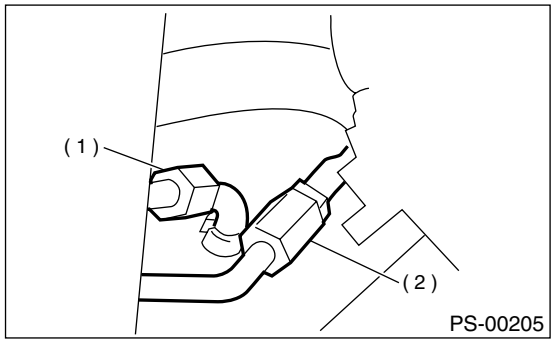


(1) Clamp

3) Connect pipes C and D to pipe of gearbox.

NOTE:
Connect lower pipe C first, and upper pipe D second.

CAUTION:
Be careful not to damage these pipes.

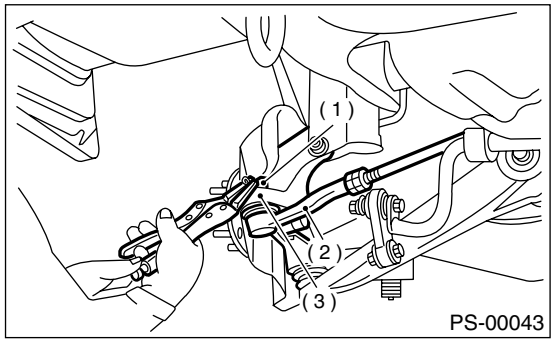


(1) Pipe C
(2) Pipe D

4) Install universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
5) Connect tie-rod end and knuckle arm, and tighten with castle nut. Fit cotter pin into the nut and bend the pin to lock.

Castle nut tightening torque:
Tighten to 27.0 N·m (2.75 kgf-m, 19.9 ft-lb), and tighten further within 60° until cotter pin hole is aligned with a slot in the nut.

CAUTION:
When connecting, do not hit cap at the bottom of tie-rod end with hammer.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

6) Install front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>

7) Install front exhaust pipe assembly. <Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

2.5 L model
<Ref. to EX(H4SO)-6, INSTALLATION, Front Exhaust Pipe.>

3.0 L model
<Ref. to EX(H6DO)-6, INSTALLATION, Front Exhaust Pipe.>

8) Install tires.
9) Tighten wheel nuts to the specified torque.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

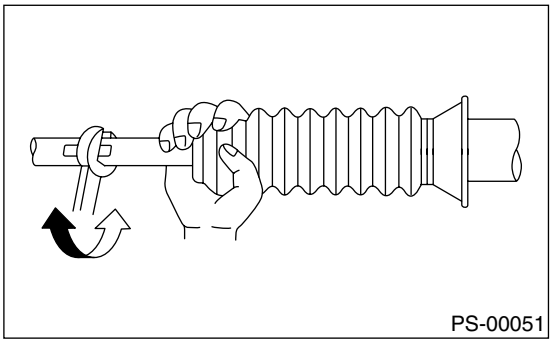
10) Connect battery ground cable.
11) Pour fluid into oil tank, and bleed air.
<Ref. to PS-64, Power Steering Fluid.>
12) Check for fluid leaks. <Ref. to PS-41, OIL LEAKING, INSPECTION, Steering Gearbox.>
13) Install jack-up plate.

WARNING:
Be careful, exhaust manifold is hot.

14) Lower vehicle.
15) Check fluid level in oil tank.
16) After adjusting toe-in and steering angle, tighten lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

CAUTION:
When adjusting toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.

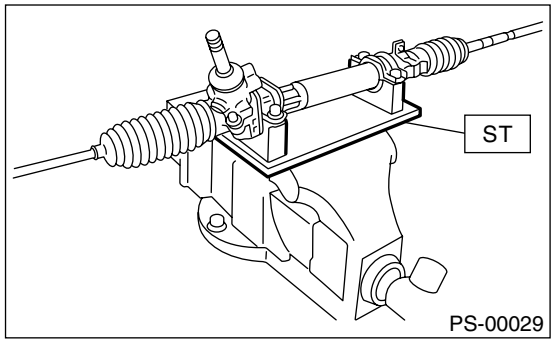

PS-00051

C: DISASSEMBLY

1. RACK HOUSING ASSEMBLY

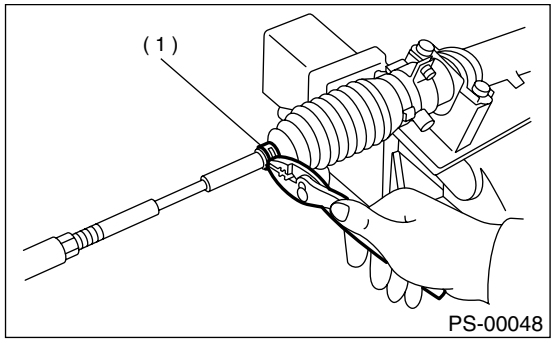
1) Disconnect four pipes from gearbox.
2) Secure gearbox removed from vehicle in vise using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using the ST as shown. Do not attempt to secure it without this ST.



PS-00029

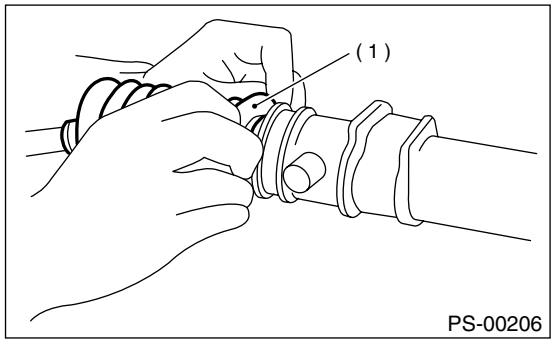
3) Remove tie-rod end and lock nut from gearbox.
4) Remove small clip from boot using pliers, and move boot to tie-rod end side.



PS-00048

(1) Clip

5) Remove boot with large clips.

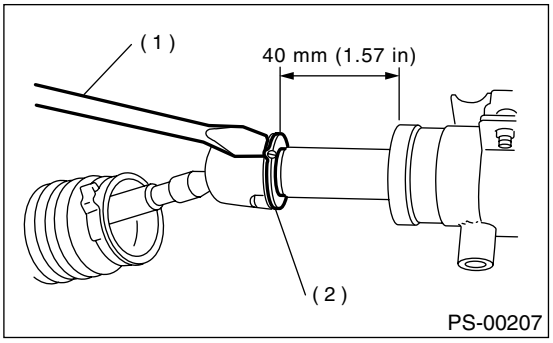


PS-00206

(1) Boot

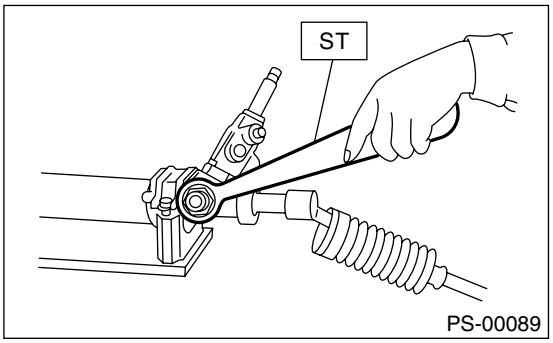
6) Extend rack approximately 40 mm (1.57 in) out. Unlock lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

CAUTION:
Be careful not to scratch rack surface as oil leaks may result.

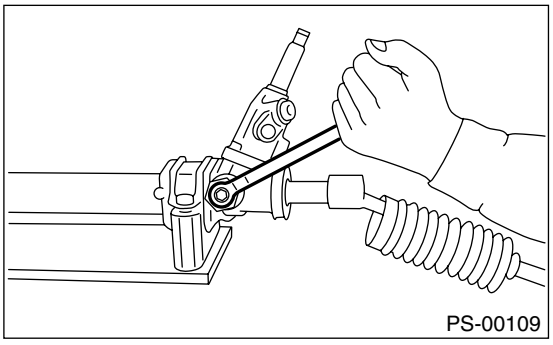


(1) Standard screwdriver
(2) Lock washer

7) Using ST, loosen lock nut.
ST 926230000 SPANNER

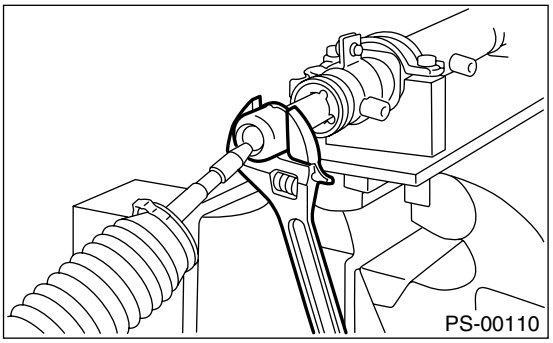


8) Tighten adjusting screw until it no longer tightens.



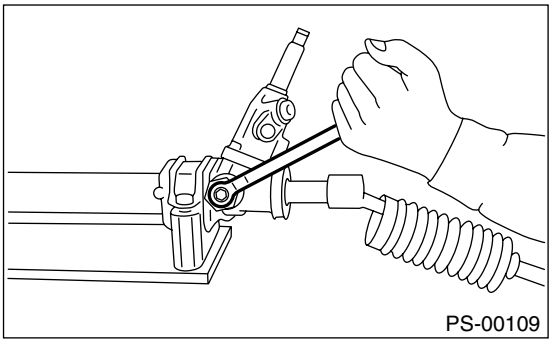
9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove tie-rod.

CAUTION:
• Check ball joint for free play, and tie-rod for bends. Replace if necessary.
• Check dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.

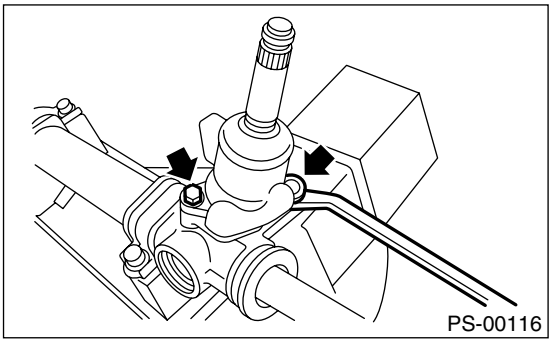


10) Loosen adjusting screw and remove spring and sleeve.

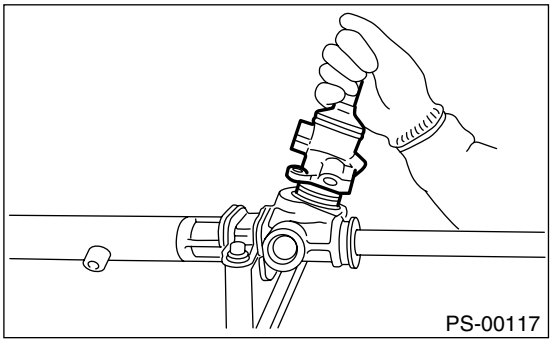
CAUTION:
Replace spring and/or sleeve if damaged.



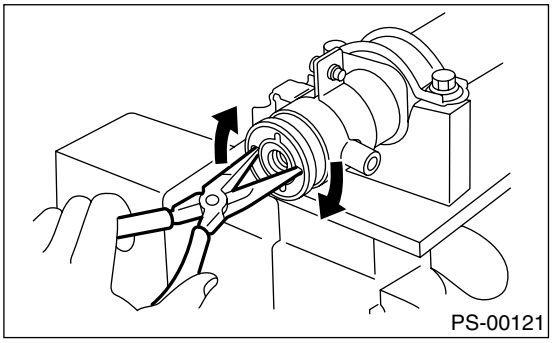
11) Remove two bolts securing valve assembly.



12) Carefully draw out input shaft and remove valve assembly.

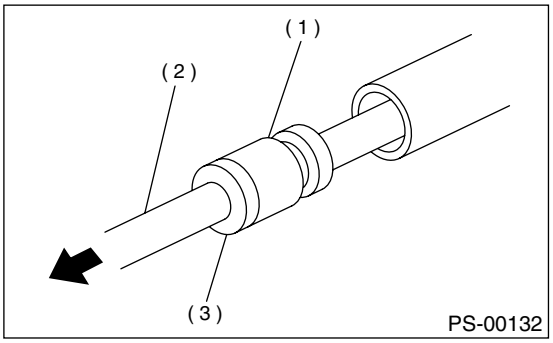


13) Using a sharp pointed pliers, rotate the rack stopper in the direction of the arrow until the end of the circlip comes out of the stopper. Rotate the circlip in the opposite direction and pull it out.



14) Pull rack assembly from cylinder side, and draw out rack bushing and rack stopper together with rack assembly.

CAUTION:
Be careful not to contact rack to inner wall of cylinder when drawing out. Any scratch on cylinder inner wall will cause oil leakage.

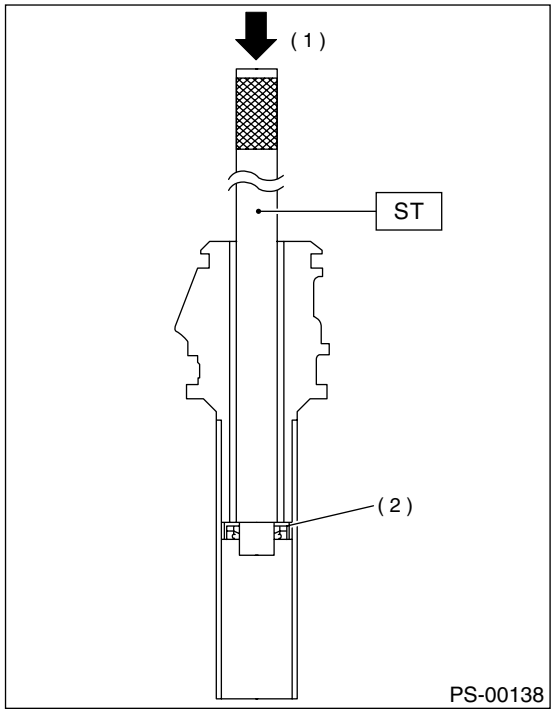


(1) Rack bushing
(2) Rack ASSY
(3) Rack stopper

15) Remove rack bushing and rack stopper from rack assembly.

CAUTION:
Do not reuse removed rack bushing and circlip.

16) Insert ST from pinion housing side and remove oil seal using a press.
ST 34199AE050 OIL SEAL REMOVER



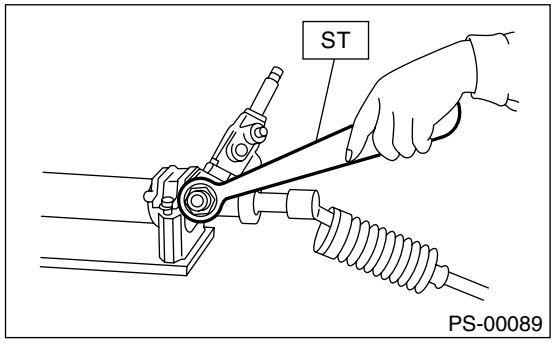
(1) Press
(2) Oil seal

NOTE:
Discard removed oil seal.

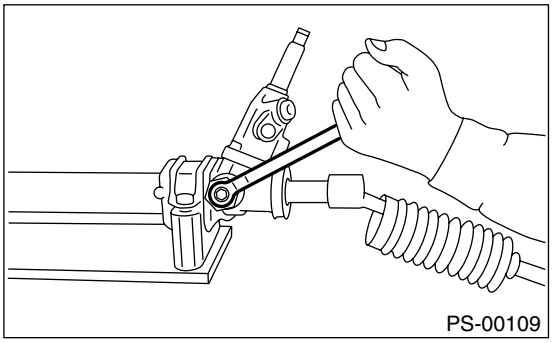
2. CONTROL VALVE ASSEMBLY

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

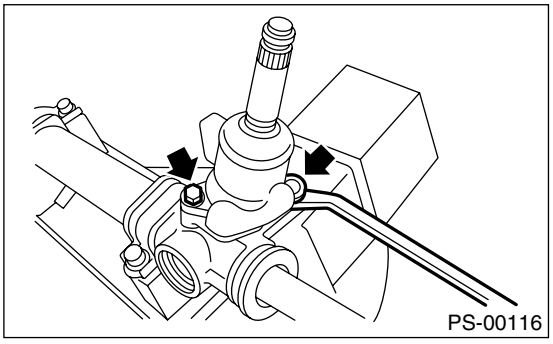
1) Using ST, loosen lock nut.
ST 926230000 SPANNER



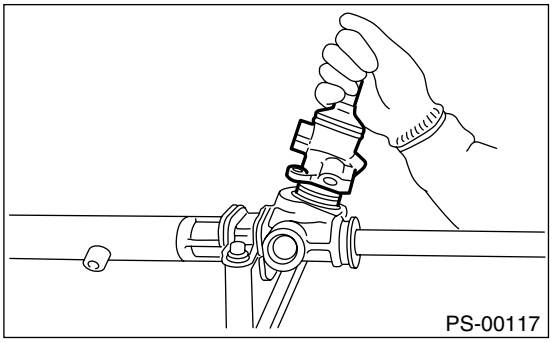
2) Tighten adjusting screw until it no longer tightens.



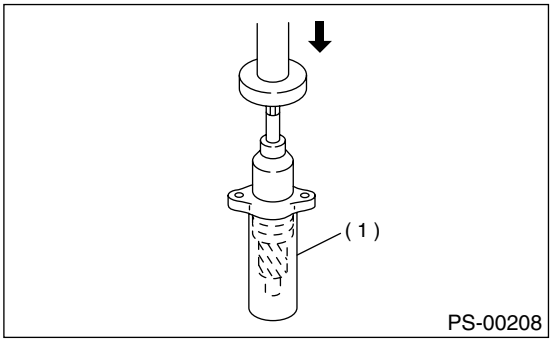
3) Remove two bolts securing valve assembly.



4) Carefully draw out input shaft and remove valve assembly.



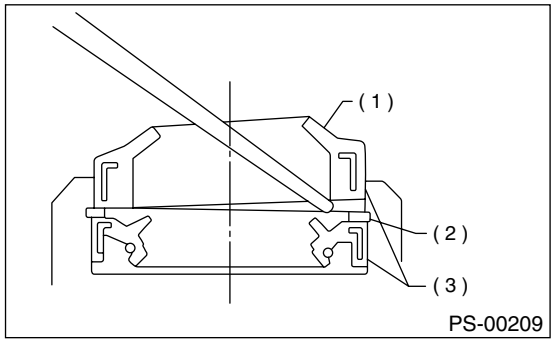
5) Draw out pinion and valve assembly from valve housing, using pipe of I.D. 44 to 46 mm (1.73 to 1.81 in) and a press.



(1) Pipe

6) Pry off dust seal using screwdriver.

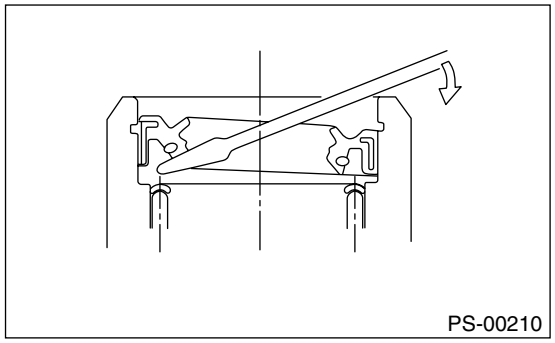
7) Remove snap ring using snap ring pliers.



(1) Dust seal
(2) Snap ring
(3) Oil seal

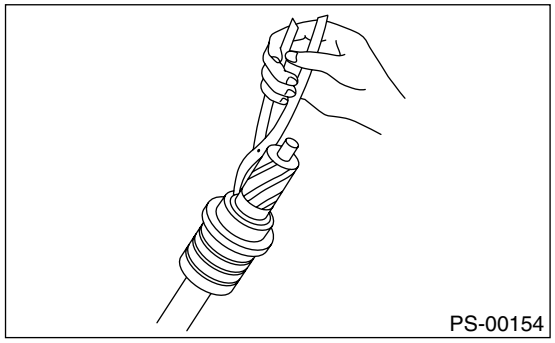
8) Pry off oil seal using screwdriver.

CAUTION:
After removing, check inside surface of valve housing for damage. If oil seal contacting surface is damaged, replace valve housing with a new one.



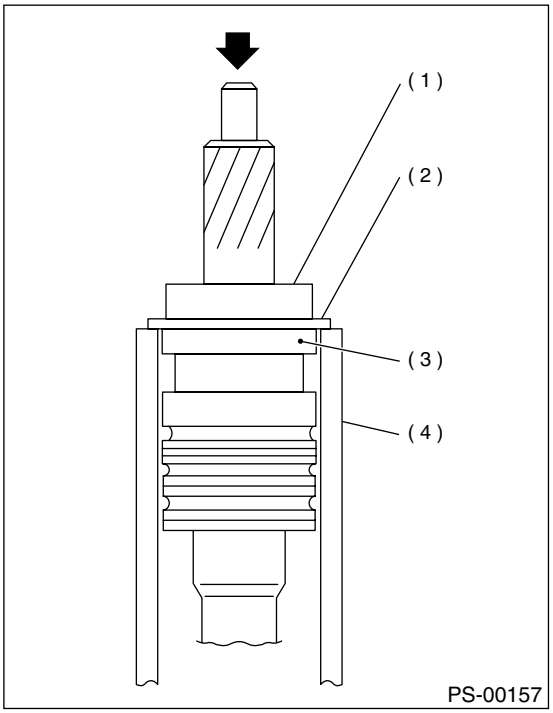
9) Remove snap ring using snap ring pliers.

CAUTION:
- **Do not reuse removed snap ring.**
- **Be careful not to scratch pinion and valve assembly.**



10) Press out bearing together with backing washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.

CAUTION:
Do not reuse removed bearing.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

11) Remove oil seal.

CAUTION:
Do not reuse removed oil seal.

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

CAUTION:
Use only SUBARU genuine grease for gearbox.

Grease:
VALIANT GREASE M2
[Part No. 003608001, net 0.5 kg (1.1 lb)]

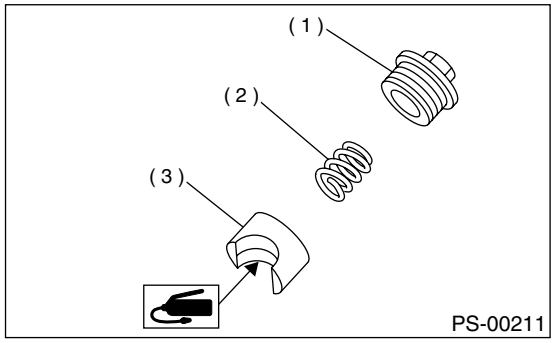
1) Clean all parts and tools before reassembling.
2) Apply grease to teeth of rack so that grease applied is about as high as teeth, and also apply a thin film of grease to sliding portion of rack shaft.

CAUTION:
• When moving rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
• Do not apply grease to threaded portion at end of rack shaft.
• Move rack shaft to stroke end two (2) or three (3) times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

3) Apply grease to sleeve insertion hole.
4) Apply grease to dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

5) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.

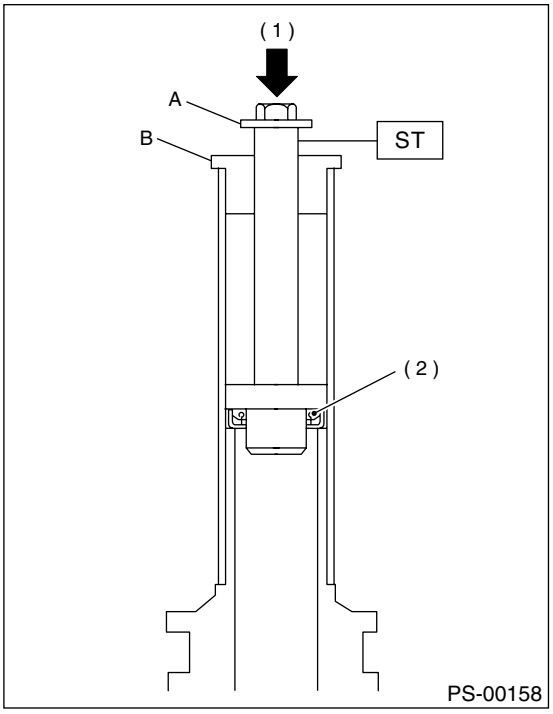


(1) Adjusting screw
(2) Spring
(3) Sleeve

6) Force-fit oil seal using ST.
ST 34199AE060 INSTALLER

CAUTION:
Be careful not to damage or scratch cylinder inner wall.

NOTE:
• Apply specified power steering fluid to oil seal.
• Pay special attention not to install oil seal in wrong direction.
• Push oil seal until the stepped portion of A contacts end face of B.

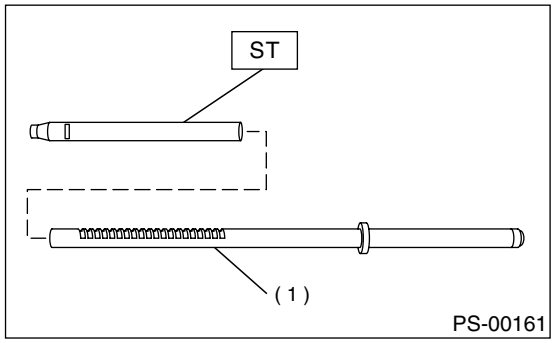


(1) Press
(2) Oil seal

7) Fixing rack housing
Fix rack housing in vise using ST.
ST 926200000 STAND

CAUTION:
• When fixing rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
• When using old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

8) Fit ST over toothed portion of rack assembly, and check for binding or unsmooth insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.
ST 926390001 COVER & REMOVER



(1) Rack ASSY

9) Apply genuine grease to teeth of thoroughly washed rack assembly, and fit ST over the toothed portion.

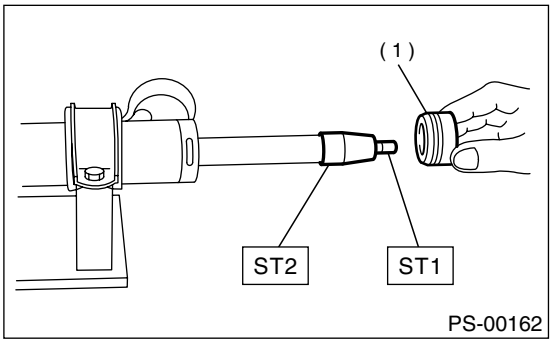
CAUTION:
• Be careful not to block air passage hole with grease. Remove excessive grease.
• After fitting cover, check air passage hole for clogging. If clogged, open by removing grease from the hole.
• Check rack shaft for damage.
• Apply specified power steering fluid to this ST and surface of piston ring to prevent seal from being damaged.

10) Insert rack assembly into rack housing from cylinder side, and remove ST after it has passed completely through oil seal.

NOTE:
Before inserting rack assembly, apply a coat of specified power steering fluid to surfaces of ST and rack piston.
ST 926390001 COVER & REMOVER

11) Fit ST1 and ST2 over the end of rack, and install rack bushing.
ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
• If burrs, or nicks are found on this guide and rack shaft portion, remove by filing.
• Dip rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.

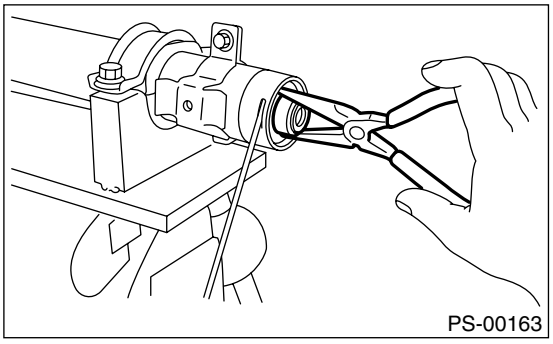


(1) Rack bushing ASSY

12) Insert rack stopper into cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn rack stopper with ST so that rack stopper hole is seen through cylinder slits.
13) Insert rack stopper into rack housing, and wrap circlip using a sharp pointed pliers to secure rack stopper in position.

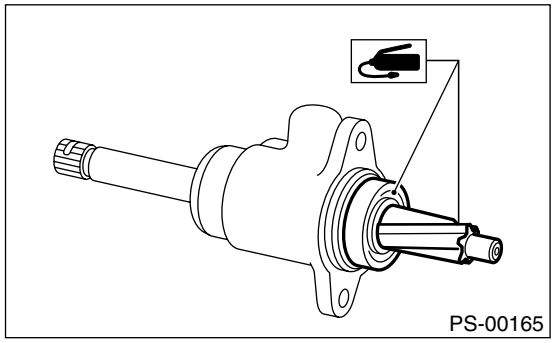
CAUTION:
Be careful not to scratch rack while winding circlip.

NOTE:
Rotate wrench another 90 to 180° after the end of circlip has been wrapped in.



14) Fit mounting rubber onto rack housing.

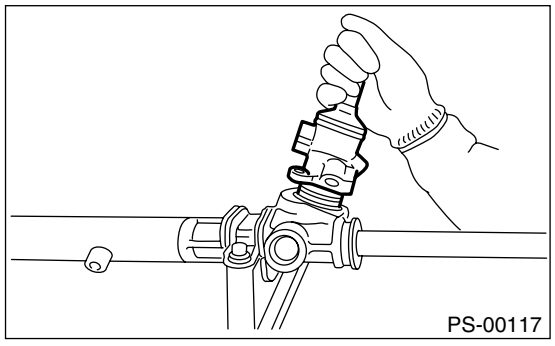
15) Apply genuine grease to pinion gear and bearing of valve assembly.



16) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



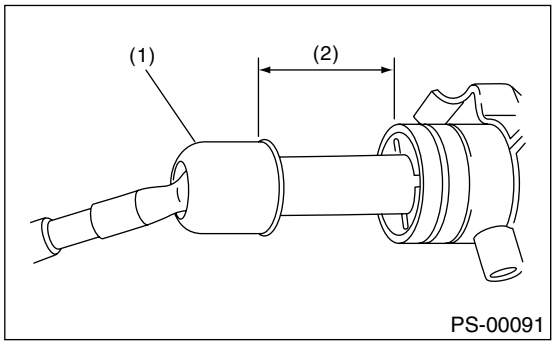
17) Tighten bolts alternately to secure valve assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten bolts.

18) Install lock washers and tighten left and right tie-rods into rack ends.

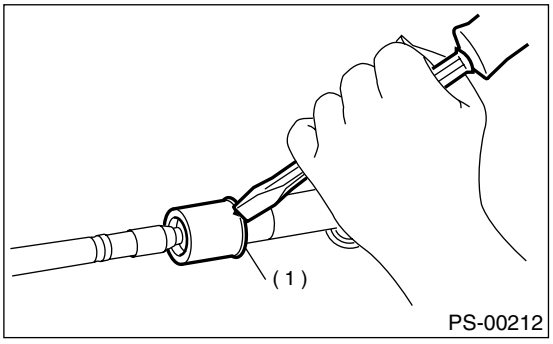
Tightening torque:
78 N·m (8.0 kgf-m, 58 ft-lb)



(1) Tie-rod
(2) Approx. 40 mm (1.57 in)

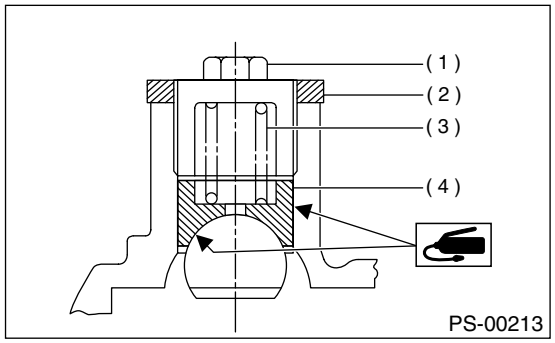
19) Bend lock washer, using chisel.

CAUTION:
Be careful not to scratch rack when bending lock washer.



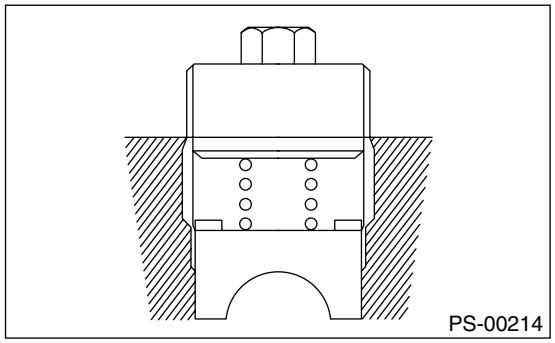
(1) Lock washer

20) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.



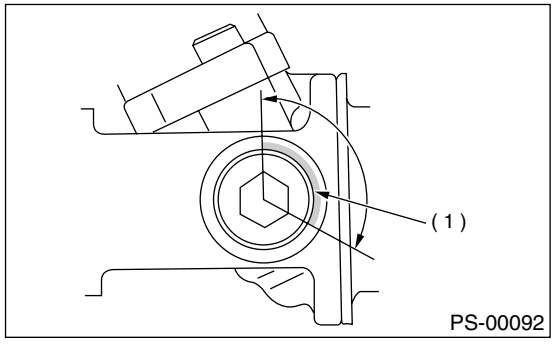
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



(1) Apply liquid packing to at least 1/3 of entire perimeter.

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

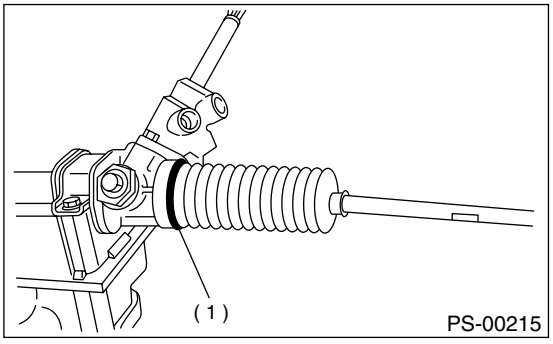
Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
• Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
• Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

21) Inspect for service limit as per article of “Service limit”. <Ref. to PS-39, SERVICE LIMIT, INSPECTION, Steering Gearbox.> Make replacement and adjustment if necessary.
22) Install boot to housing.

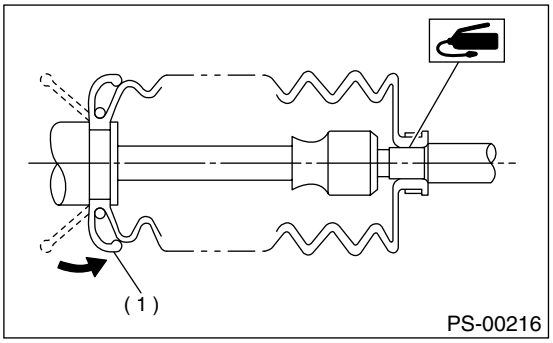
NOTE:
• Before installing boot, be sure to apply grease to the groove of tie-rod.
• Install fitting portions of boots to the following portions in both sides of assembled steering gearbox.
The groove on gearbox
The groove on the rod
• Make sure that boot is installed without unusual inflation or deflation.

23) Fit clip (large) to boot, and then install boot to gearbox while holding boot flange. After installing boot, fold back boot flange to the extent that large clip cannot be seen.



(1) Clip (large)

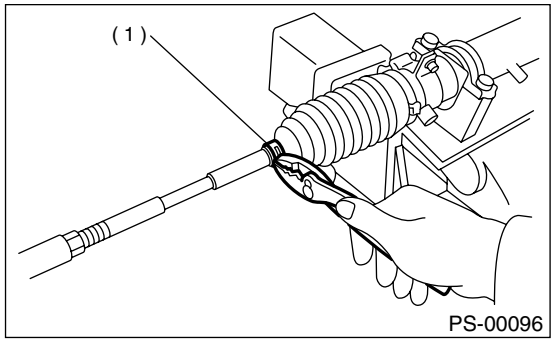
24) Turn boot until it seats well on gearbox and rubber mounting, then bend boot flange back.



(1) Reverse after installing

25) Fix boot end with clip (small).

CAUTION:
After installing, check boot end is positioned into groove on tie-rod.

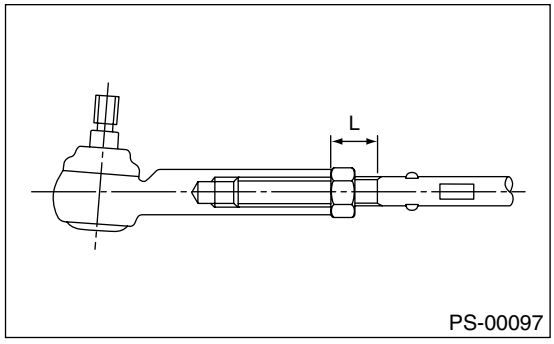


(1) Clip

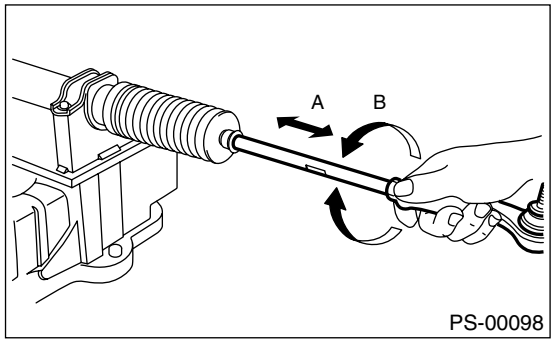
26) If tie-rod end was removed, screw in lock nut and tie-rod end to screwed portion of tie-rod, and tighten lock nut temporarily in a position as shown in figure.

Installed tie-rod length: L
15 mm (0.59 in)

NOTE:
Pay attention to difference between right and left tie-rod ends.



27) Inspect gearbox as follows:
“A” Holding tie-rod end, repeat lock to lock two or three times as quickly as possible.
“B” Holding tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that boot is installed in the specified position without deflation.

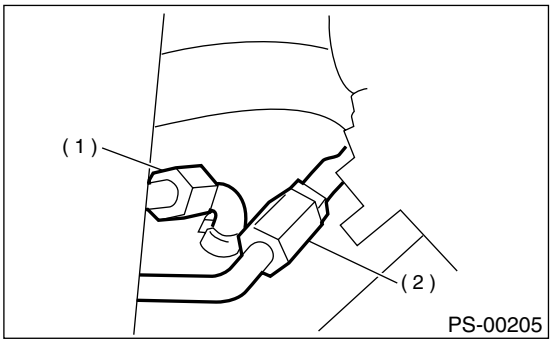


28) Remove gearbox from ST.
ST 926200000 STAND
29) Install four pipes on gearbox.
(1) Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect pipes C and D to gearbox.
Connect lower pipe C first, and upper pipe D second.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



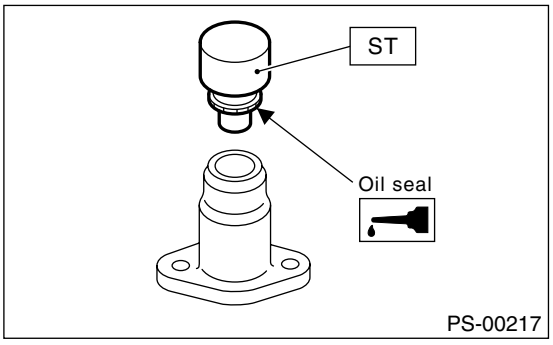
(1) Pipe C
(2) Pipe D

2. CONTROL VALVE ASSEMBLY

Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.
2) Press-fit oil seal into valve housing using ST and press.
ST 927610000 INSTALLER

NOTE:
Before fitting, coat oil seal fully with ATF DEXRON ATF DEXRON III or equivalent.



3) Fit snap ring in snap ring groove using snap ring pliers.

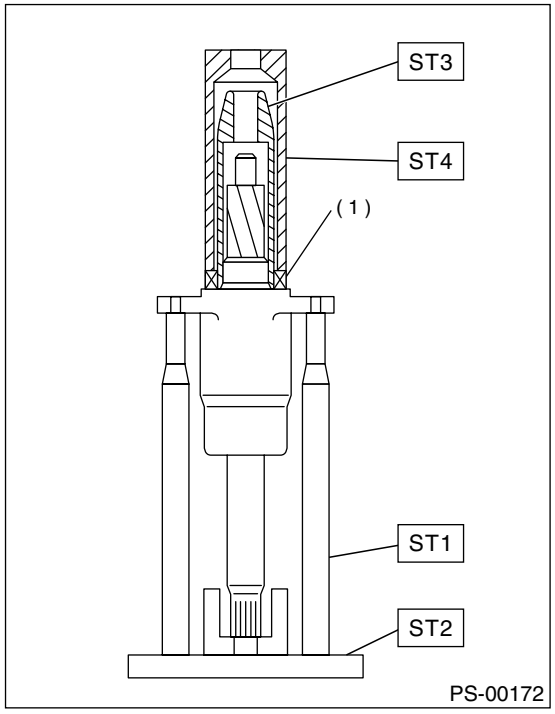
CAUTION:
Be careful not to scratch oil seal with snap ring pliers.

NOTE:
Rotate snap ring to check for proper installation.

4) Put vinyl tape around pinion shaft splines to protect oil seal from damage.
5) Fit pinion and valve assembly into valve housing.

NOTE:
Apply specified power steering fluid to outer diameter surface of input shaft and outer surface of valve body seal ring, and pay special attention not to damage seal when inserting pinion and valve assembly.

6) Secure valve assembly to ST1 and ST2.
7) Put ST3 over pinion, and insert oil seal, then force-fit oil seal into housing using ST4.
ST1 926370000 INSTALLER A
ST2 927630000 STAND BASE
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B

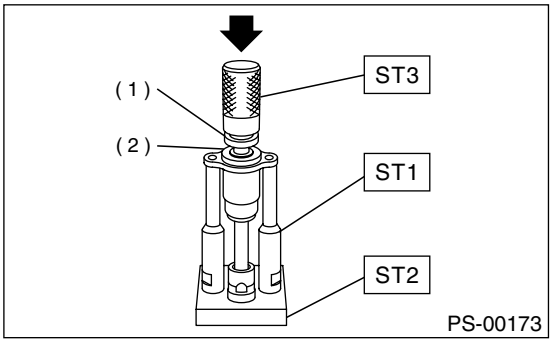


(1) Oil seal

NOTE:
• Apply specified power steering fluid to oil seal and ST3, being careful not to damage oil seal lip.
• Push oil seal until ST3 contacts housing end face.

8) Remove ST3, and fit backing washer.

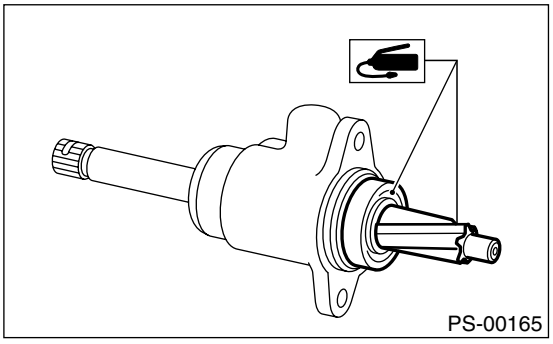
9) Force-fit ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



(1) Ball bearing
(2) Backing washer

NOTE:
Be careful not to tilt ball bearing during installation.

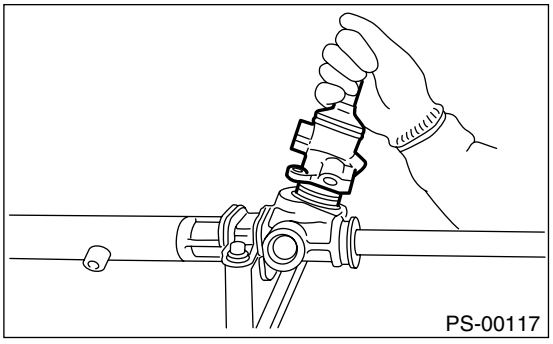
10) Apply genuine grease to pinion gear and bearing of valve assembly.



11) Install gasket on valve assembly. Insert valve assembly into place while facing rack teeth toward pinion.

CAUTION:
Be sure to use a new gasket.

NOTE:
Do not allow packing to be caught when installing valve assembly.



12) Tighten bolts alternately to secure valve assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

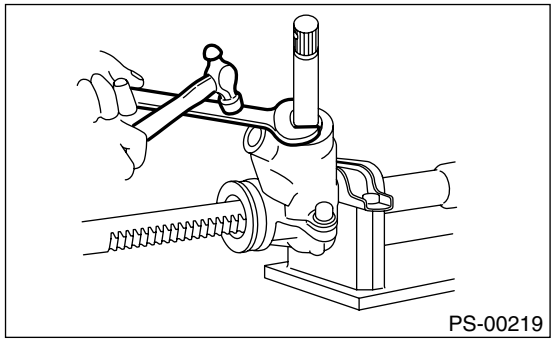
CAUTION:
Be sure to alternately tighten bolts.

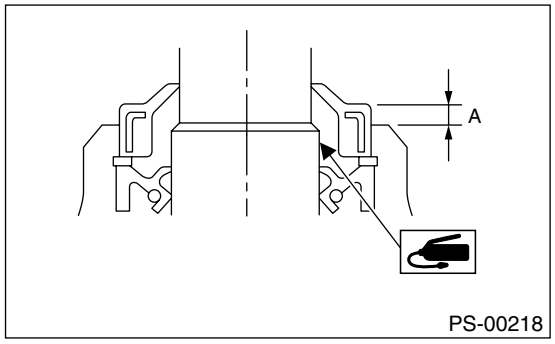
13) Apply grease to sleeve insertion hole.
14) Apply grease to dust seal insertion hole.

CAUTION:
Apply clean grease with clean hands. If material having a sharp edge is used for applying grease, oil seal at the inside might be damaged.

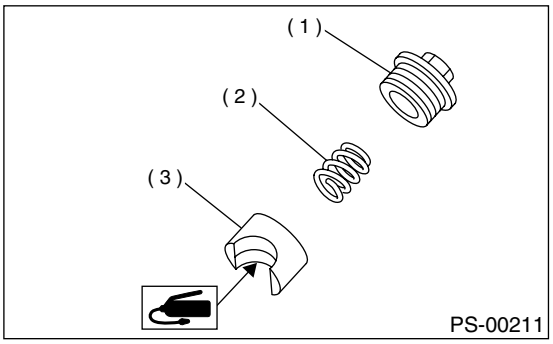
15) Press-fit dust seal into gearbox housing while tapping it via a spanner or the like so that stepping between gearbox and dust seal is normally 2 mm (0.08 in).

Depth: A
2 mm (0.08 in)



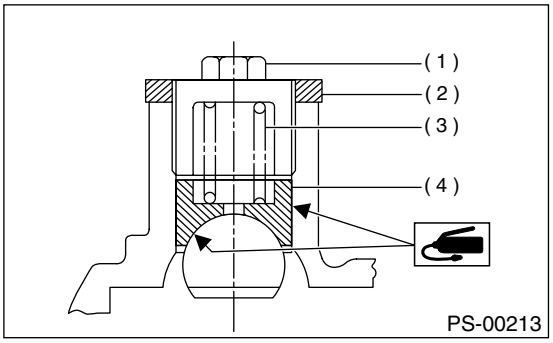


16) Apply grease to sliding surface of sleeve and spring seat, then insert sleeve into pinion housing. Fit spring into sleeve screw, pack grease inside of screw, then install the screw.



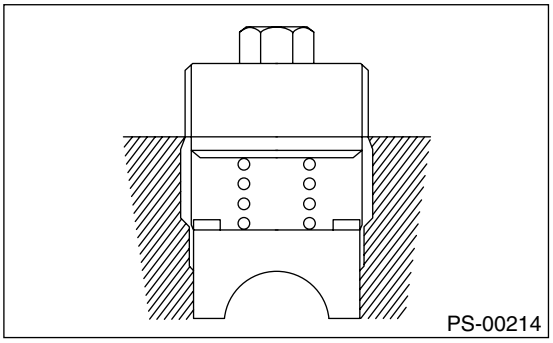
(1) Adjusting screw
(2) Spring
(3) Sleeve

17) Rack and pinion backlash adjustment
(1) Loosen adjusting screw.
(2) Rotate input shaft so that rack is in the straight ahead direction.
(3) Apply grease to sleeve.



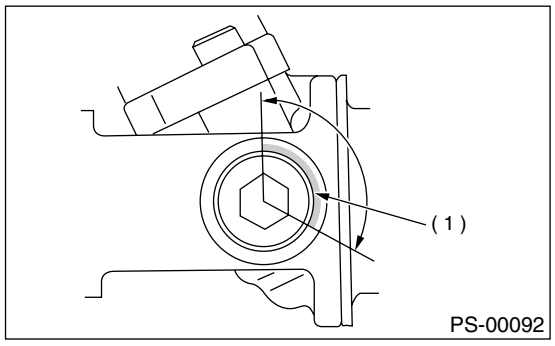
(1) Adjusting screw
(2) Lock nut
(3) Spring
(4) Sleeve

(4) Tighten adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



(1) Apply liquid packing to at least 1/3 of entire perimeter.

(6) Tighten adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and back off 25°.
(7) Install lock nut. While holding adjusting screw with a wrench, tighten lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

NOTE:
• Hold adjusting screw with a wrench to prevent it from turning while tightening lock nut.
• Make adjustment so that steering wheel can be rotated fully from lock to lock without binding.

18) Check for service limit as per article of “Service limit”. <Ref. to PS-39, SERVICE LIMIT, INSPECTION, Steering Gearbox.> Make replacement and adjustment if necessary.

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check inside of gearbox for water. If any water is found, carefully check boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If bend or damage is excessive, replace entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If outer wall slips, lip is worn out or damage is found, replace it with new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust backlash properly. By measuring turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace gearbox with new one.
		(4) Wear or damage on rack bush	If free play of rack shaft in radial direction is out of the specified range, replace gearbox with new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If free plays of input shaft in radial and axial directions are out of the specified ranges, replace gearbox with new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

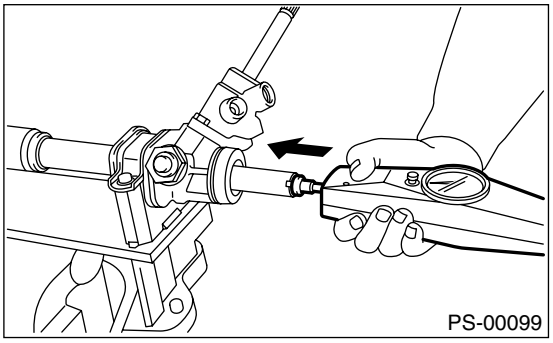
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

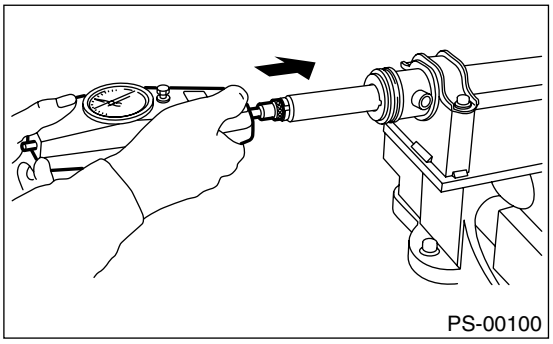
NOTE:
When making a measurement, vise gearbox by using ST. Never vise gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
304 N (31 kgf, 68 lb) or less



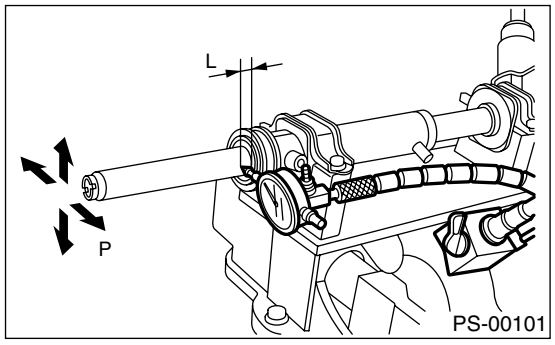


3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

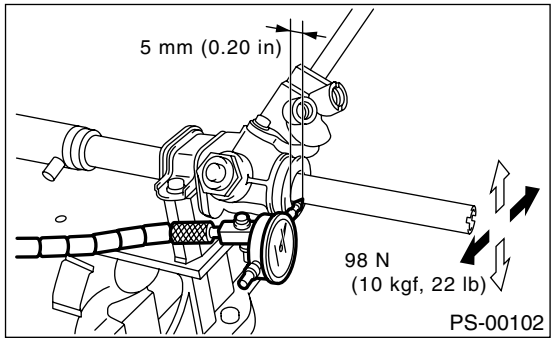
Service limit
0.19 mm (0.0075 in) or less

On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)



Left-turn steering:

Service limit
Direction ⇔
0.3 mm (0.012 in) or less
Direction ⬌
0.15 mm (0.0059 in) or less

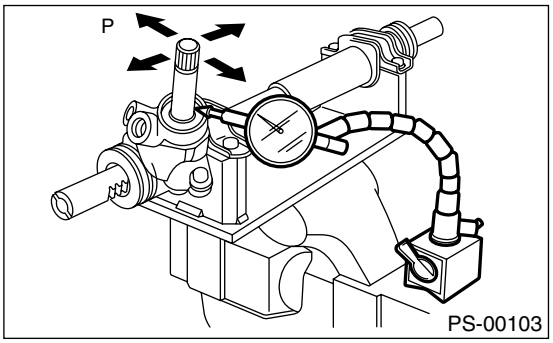


4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

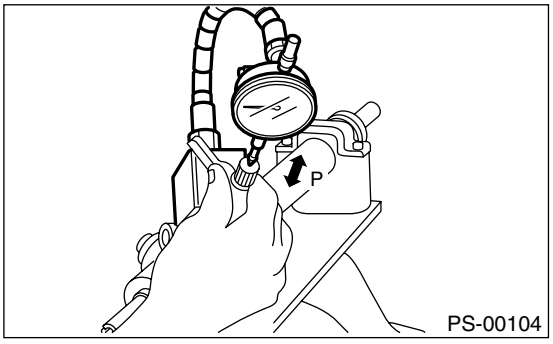
On condition
P: 98 N (10 kgf, 22 lb)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

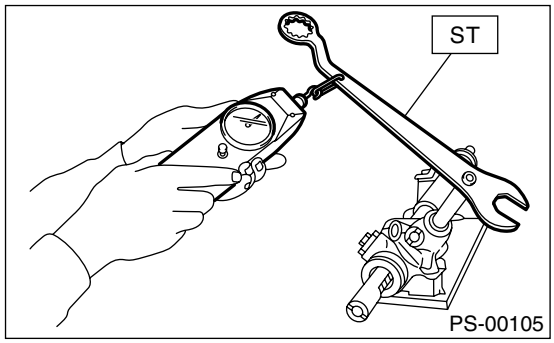
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



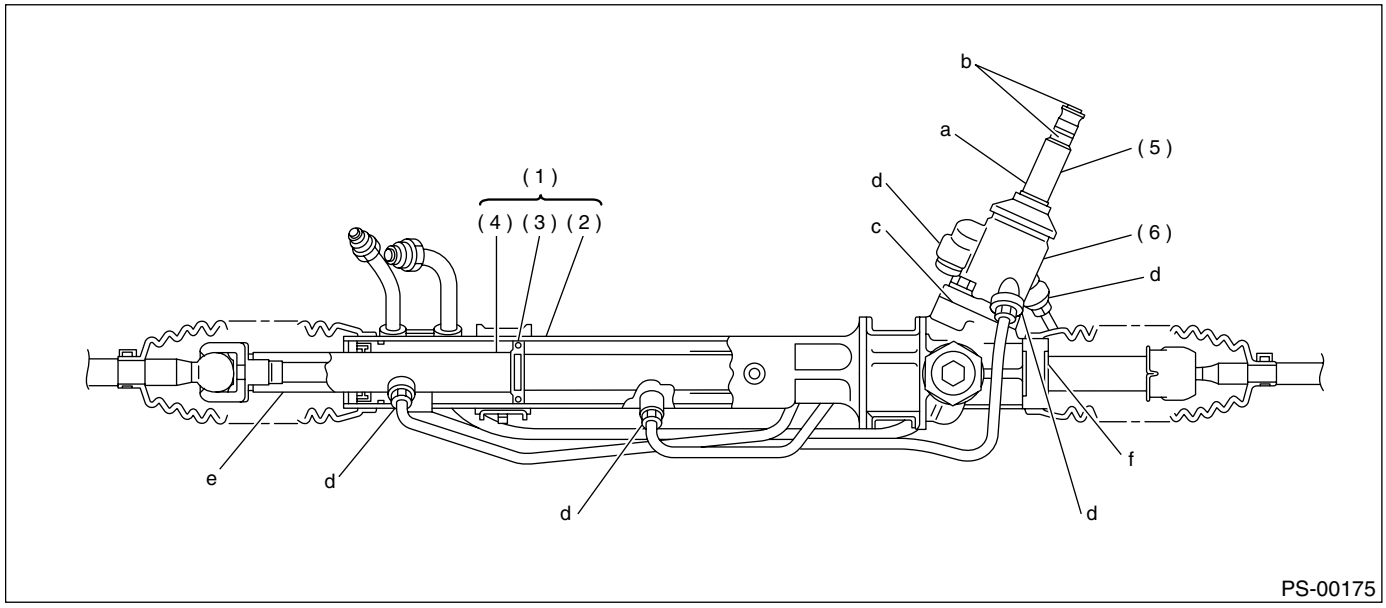
5. TURNING RESISTANCE OF GEARBOX

Using ST, measure gearbox turning resistance.
ST 926230000 SPANNER

Service limit:
Straight-ahead position within 30 mm (1.18 in) from rack center
Less than 11.18 N (1.14 kgf, 2.51 lb)
Maximum allowable resistance
12.7 N (1.3 kgf, 2.9 lb)



6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

• Oil leaking points

1) If leak point is other than a, b, c, or d, perform the 5th step in "Oil leak check procedure and replacement parts" before dismounting gearbox from vehicle. <Ref. to "Oil leak check procedure and replacement parts".> If gearbox is dismounted without confirming where the leak is, it must be mounted again to locate the leak point.
2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the oil from the suspected portion and turn the steering wheel from lock to lock about 30 to 40 times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
3) Before starting oil leak repair work, be sure to clean the gearbox, hoses, pipes, and surrounding parts. After completing repair work, clean these areas again.

• Oil leak check procedure and replacement parts

NOTE:
Parts requiring replacement are described in the smallest unit of spare parts including damaged parts and spare parts damaged. In actual disassembly work, accidental damage as well as inevitable damage to some related parts must be taken into account, and spare parts for them must also be prepared. However, it is essential to pinpoint the cause of trouble, and limit the number of replacement parts as much as possible.

1) Leakage from "a"
The oil seal is damaged. Replace valve assembly with a new one.
2) Leakage from "b"
The torsion bar O-ring is damaged. Replace valve assembly with a new one.
3) Leakage from "c"
The oil seal is damaged. Replace valve assembly or oil seal with a new one.
4) Leakage from "d"
The pipe is damaged. Replace the faulty pipe or O-ring.
5) If leak is other than a, b, c, or d, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove oil from the surrounding portions. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.
(1) Leakage from "e"
The cylinder seal is damaged. Replace rack bush with a new one.
(2) Leakage from "f"
There are two possible causes. Take following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then make comparison of the leaked portion between im-

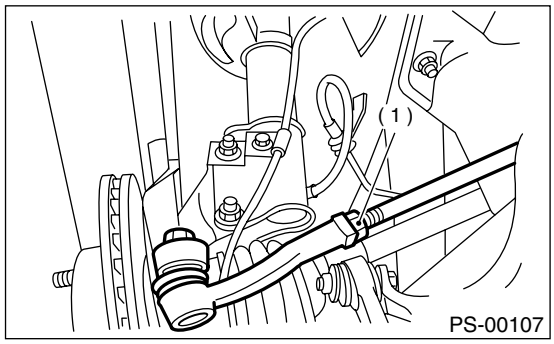
mediately after and several hours after this operation.

CAUTION:
• If leakage from "f" is noted again:
The oil seal of pinion and valve assembly is damaged. Replace pinion and valve assembly with a new one. Or replace the oil seal and the parts that are damaged during disassembly with new ones.
• If oil stops leaking from "f":
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust front toe.

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



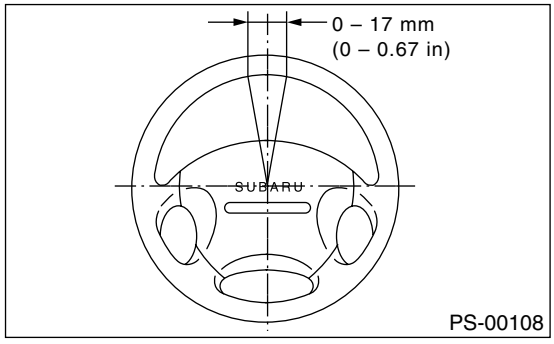
(1) Lock nut

2) Adjust steering angle of wheels.

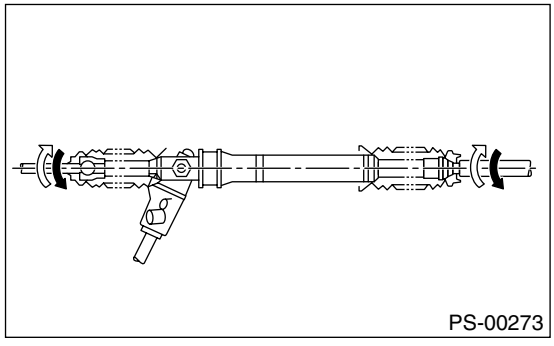
Standard of steering angle:

Model	*Except OUTBACK, Pick-up*	*OUTBACK, Pick-up*
Inner wheel	*36.3°±1.5°*	*34.5°±1.5°*
Outer wheel	*31.6°±1.5°*	*30.3°±1.5°*

3) If steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



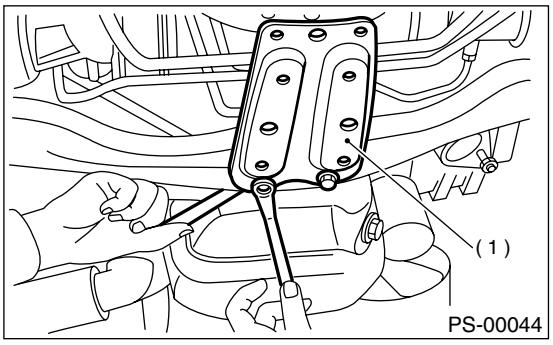
4) If steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the same direction by the same turns.



6. Pipe Assembly

A: REMOVAL

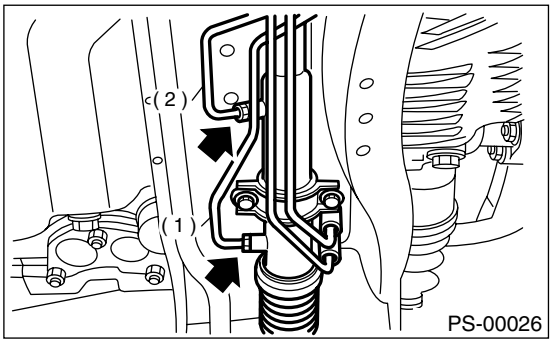
1) Set the vehicle on the lift.
2) Disconnect battery ground cable.
3) Lift vehicle and remove jack-up plate.



(1) Jack-up plate

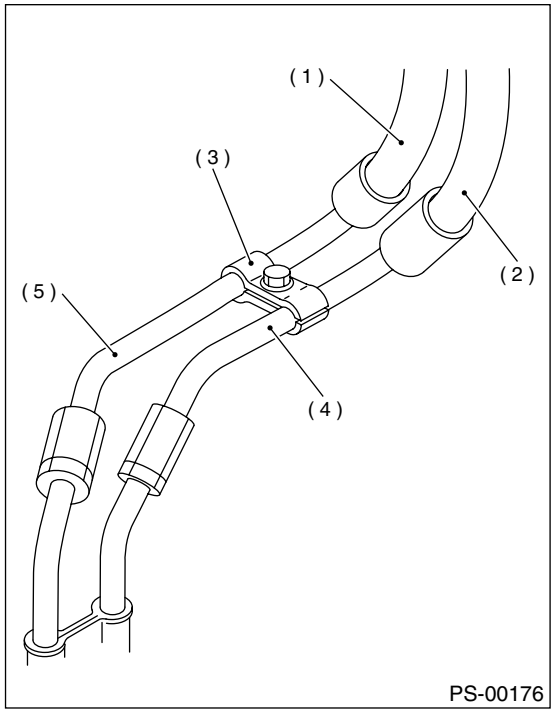
4) Remove one pipe joint at the center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

CAUTION:
Improper removal and installation of parts often causes fluid leak trouble. To prevent this, clean the surrounding portions before disassembly and reassembly, and pay special attention to keep dirt and other foreign matter from mating surfaces.



(1) Pipe A
(2) Pipe B

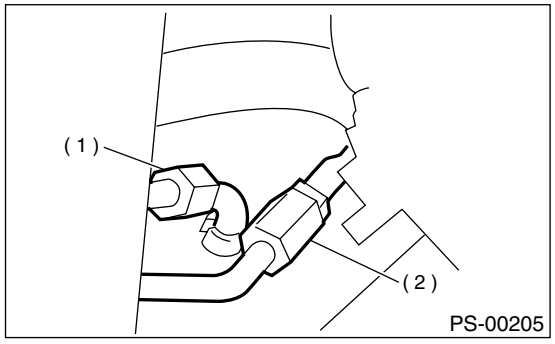
5) Remove clamp E from pipes.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

6) Disconnect pipe C·D.
Disconnect pipe C·D from pipe (on the gearbox side).

CAUTION:
• When disconnecting pipe C·D, use two wrenches to prevent deformities.
• Be careful to keep pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

2.5 L model

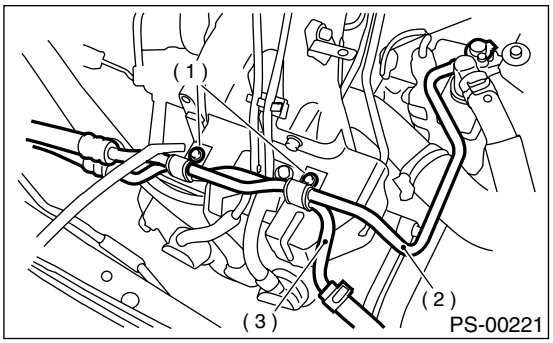
Disconnect pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:

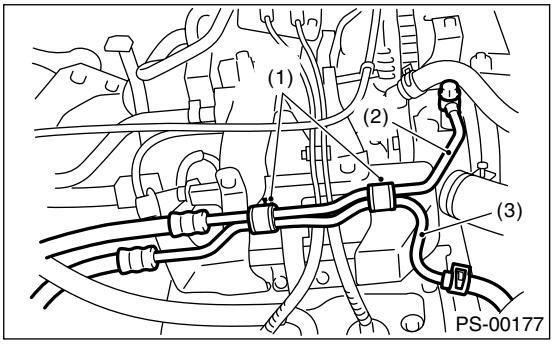
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

Non-TURBO model



TURBO model



(1) Bolt A
(2) Pipe C
(3) Pipe D

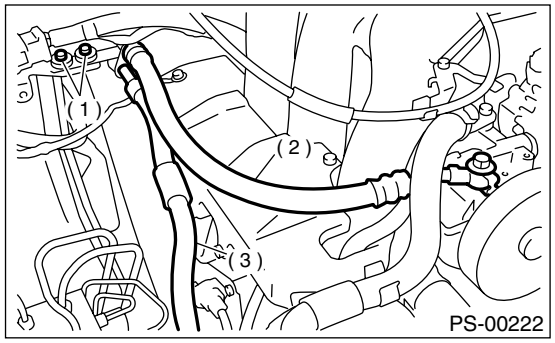
3.0 L model

Disconnect pressure hose from oil pump. Disconnect return hose from reservoir tank.

CAUTION:

• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



(1) Bolt A
(2) Pressure hose
(3) Return hose

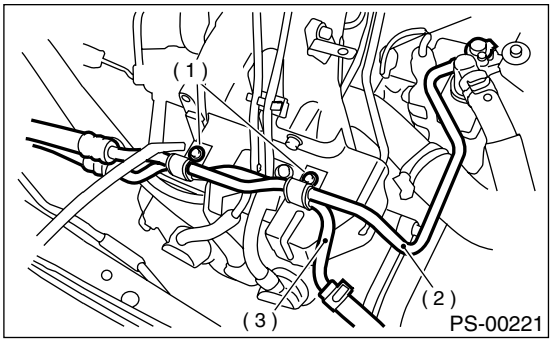
B: INSTALLATION

1) Tighten bolt A.

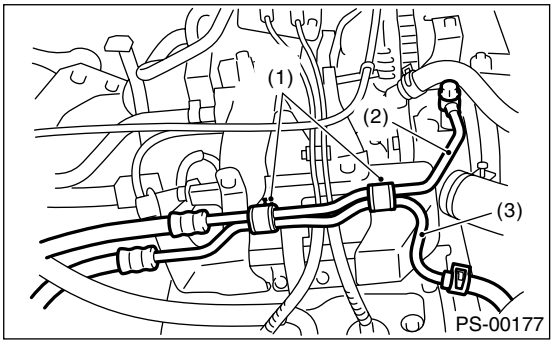
CAUTION:
Visually check that hose between tank and pipe D is free from bending or twisting.

2.5 L model

Non-TURBO model

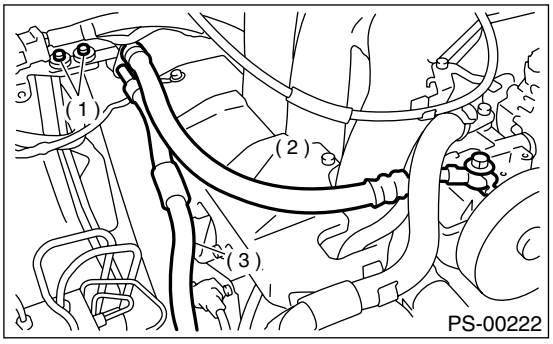


TURBO model



(1) Bolt A
(2) Pipe C
(3) Pipe D

3.0 L model



(1) Bolt A
(2) Pressure hose
(3) Return hose

(1) Connect pipe D or return hose to oil tank.
(2) Connect pipe C or pressure hose to oil pump.

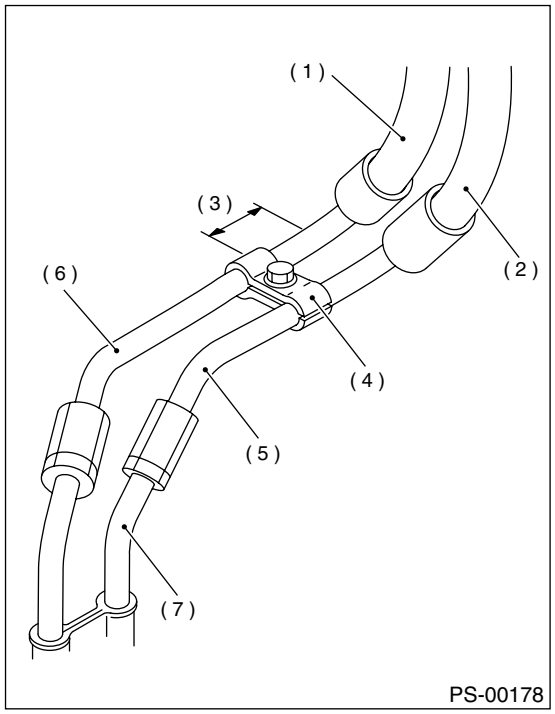
CAUTION:
Use anew gasket.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten bolt A.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Temporarily connect pipes C and D.

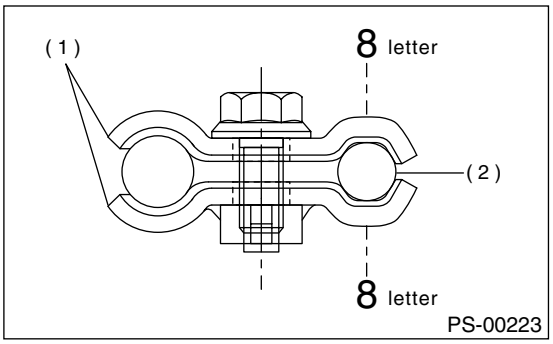


(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe
(7) Pipe (on gearbox side)

3) Temporarily install clamp E on pipes C and D, and tighten clamp E firmly.

CAUTION:
Ensure that the letter "8" on each clamp are diagonally opposite each other as shown in figure.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



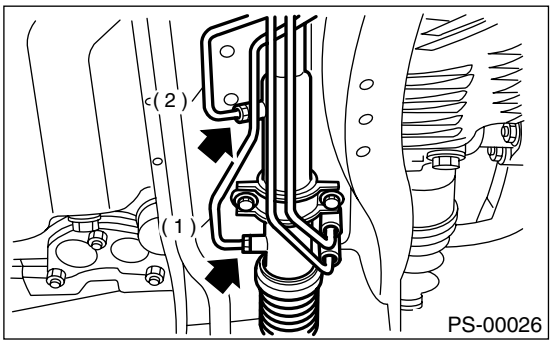
(1) Clamp E
(2) Pipe C

4) Tighten joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Connect pipe A and B.
Connect pipes A and B to four pipe joints of gearbox. Connect upper pipe B first, and lower pipe A second.

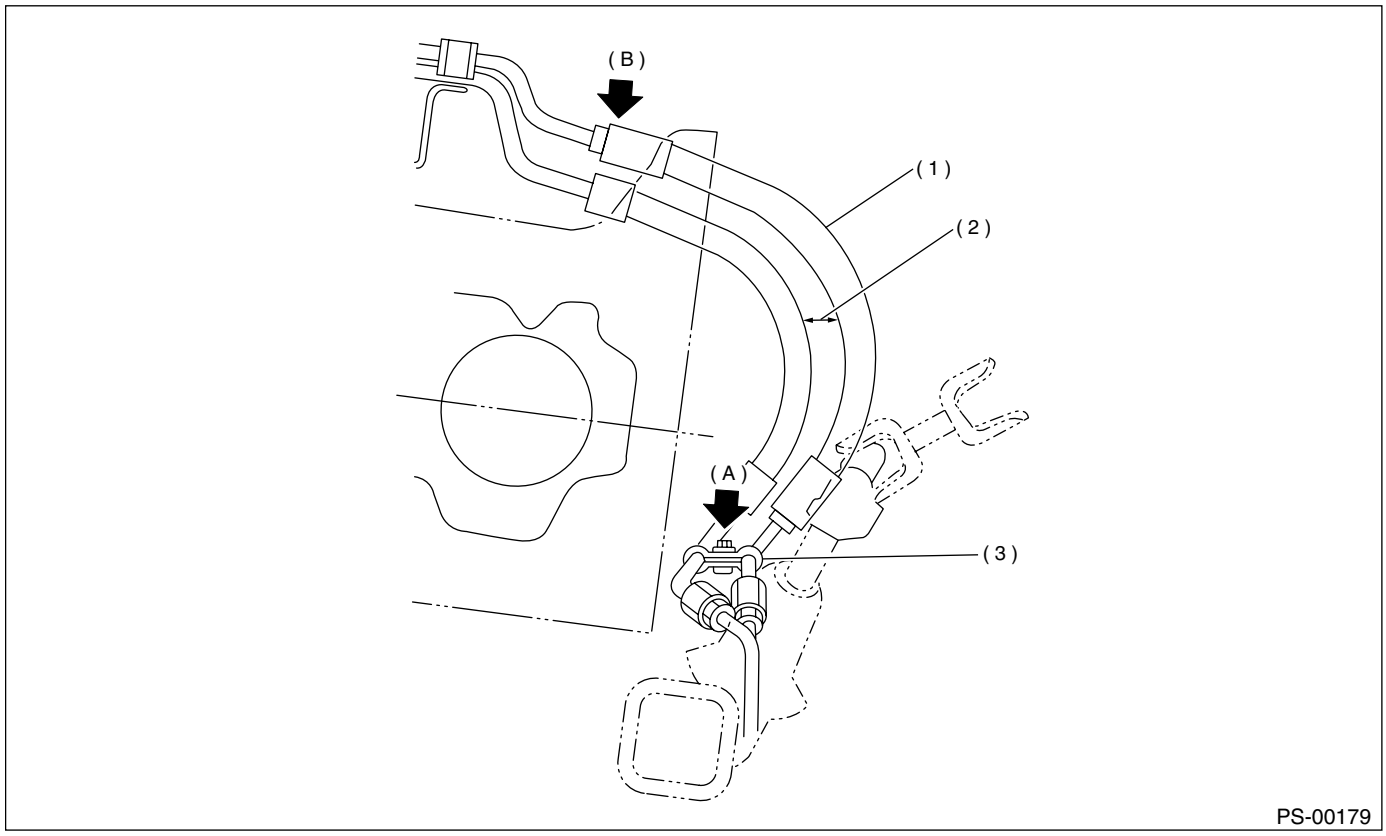
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



(1) Pipe A
(2) Pipe B

6) Install jack-up plate.
7) Connect battery ground cable.
8) Feed the specified fluid.

NOTE:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.



(1) High-pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 - 8 mm (0.12 - 0.31 in)

9) Finally check clearance between pipes and/or hoses, as shown above.
If clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

(1) Move clamped section (A) (refer to figure above.) down to a point where pipe is close to crossmember.

Pipe-to-crossmember clearance:
10 mm (0.39 in), min.

(2) Check that clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend section (B) down until a clearance of at least 10 mm (0.39 in) is obtained.

C: INSPECTION

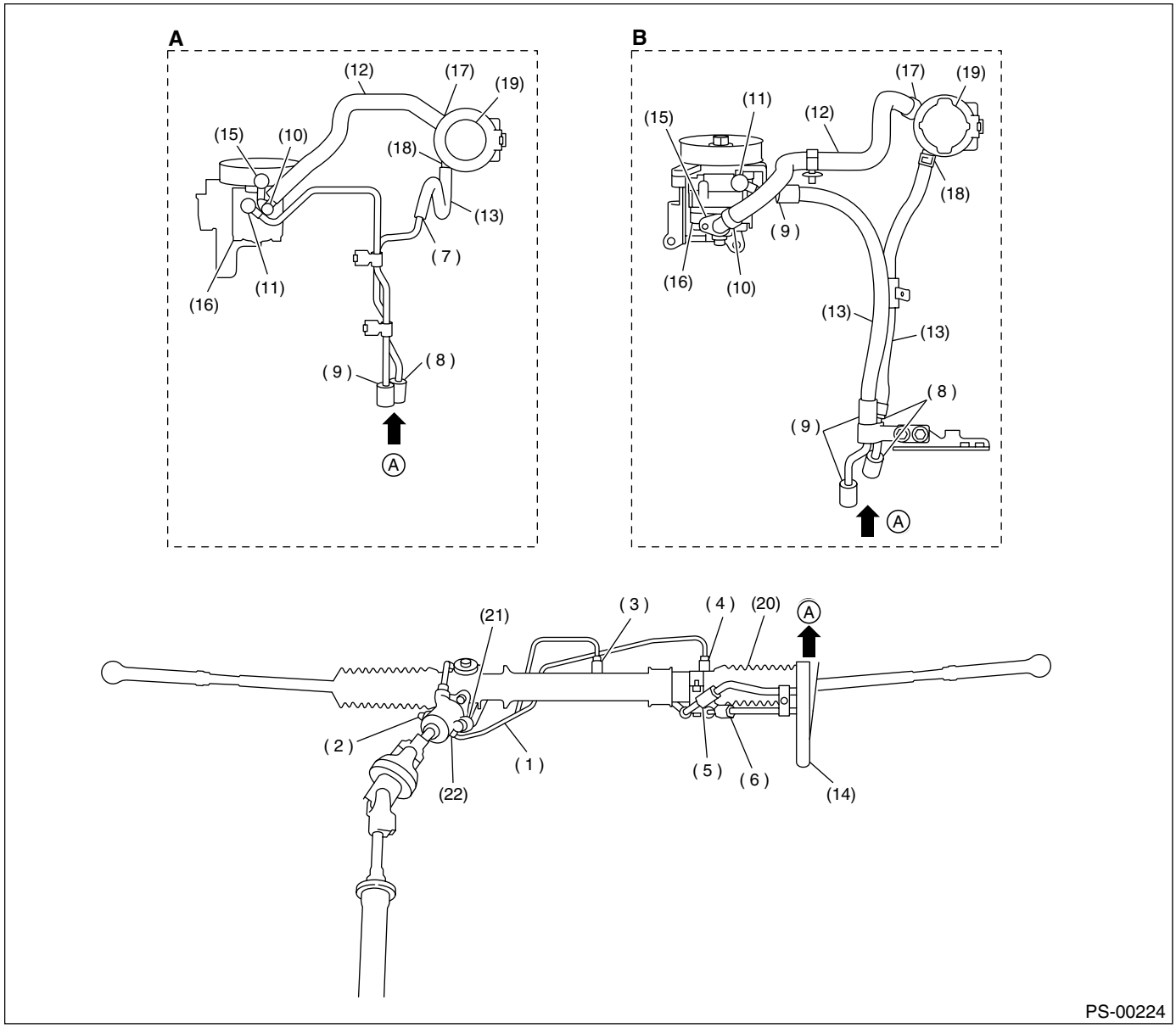
Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with new one.
Clamp	• Clamps for weak clamping force	Replace with new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with new one.

CAUTION:
Although surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and/or a driving condition in which many steering operations are required in short time.
Particularly continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.
So, avoid to keep this kind of condition when servicing as well as driving.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct customers.
	Malfunction of relief valve	Replace oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace defective parts.
	Improper stop position of pitching stopper	Replace defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct customers.

CAUTION:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



(A) 2.5 L model (B) 3.0 L model

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (11) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace clamp.
	Damaged O-ring or gasket	Replace O-ring or gasket pipe or hose with new one, if ineffective, replace gear-box also.
Leakage from hose (12), (13) and (14) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (15) and (16) in figure	Damaged O-ring	Replace oil pump.
	Damaged gasket	Replace oil pump.
Leakage from oil tank (17) and (18) in figure	Crack in oil tank	Replace oil tank.
Leakage from filler neck (19)	Damaged cap packing	Replace cap.
	Crack in root of filler neck	Replace oil tank.
	High fluid level *1	Adjust fluid level.
Leakage from surrounding of power cylinder of gearbox (20) in figure	Damaged oil seal	Replace oil seal.
Leakage from control valve of gear-box (21) and (22) in figure	Damaged packing or oil seal	Replace problem parts.
	Damage in control valve	Replace control valve.

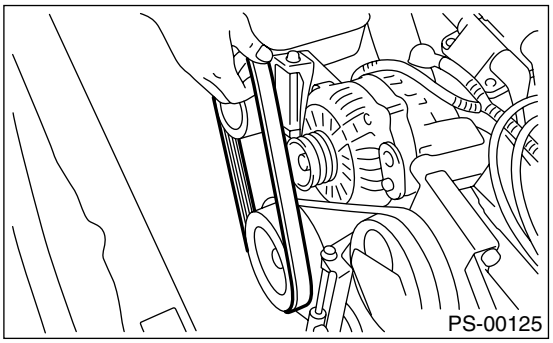
NOTE:
Fluid level is specified at optimum position (range) for ordinary use. Accordingly, if the vehicle is used often under hard conditions such as on very rough roads or in mountainous areas, fluid may bleed out from cap air vent hole. This is not a problem. If a customer complains strongly and is not likely to be satisfied with the leakage, lower the fluid level to the extent that fluid will not bleed out under the conditions described, and have the customer check the fluid level and its quality more frequency than usual.

7. Oil Pump

A: REMOVAL

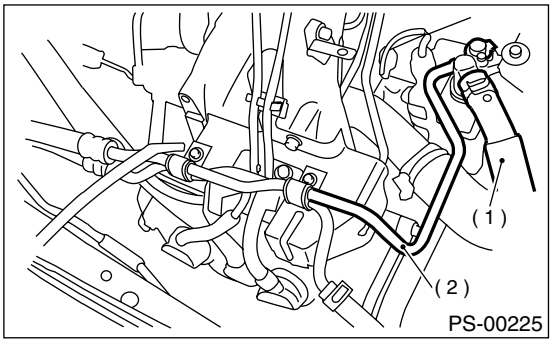
1. 2.5 L MODEL

1) Remove ground cable from battery.
2) Remove pulley belt cover bracket.
3) Loosen lock bolt and slider bolt and remove power steering pump drive V-belt.



4) Disconnect connector from power steering pump switch.
5) Disconnect pipe C and suction hose from oil pump.

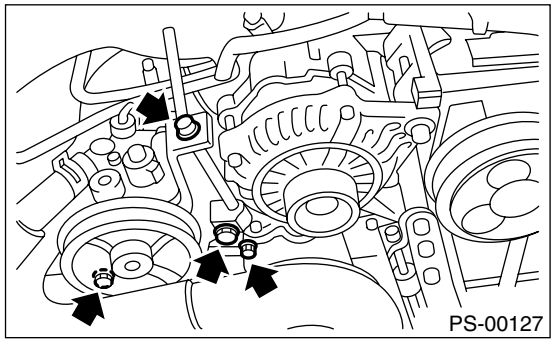
CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



(1) Suction hose
(2) Pipe C

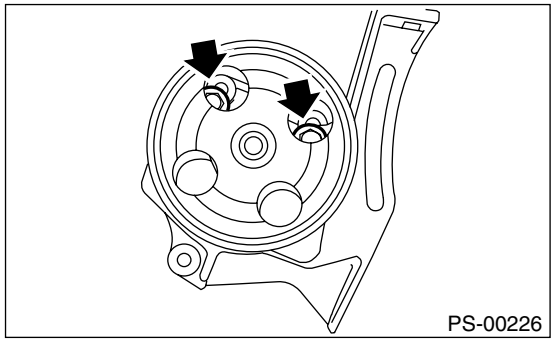
10) Disassemble oil pump and bracket by inserting a screwdriver as shown in the figure.

6) Remove bolts which install power steering pump bracket.

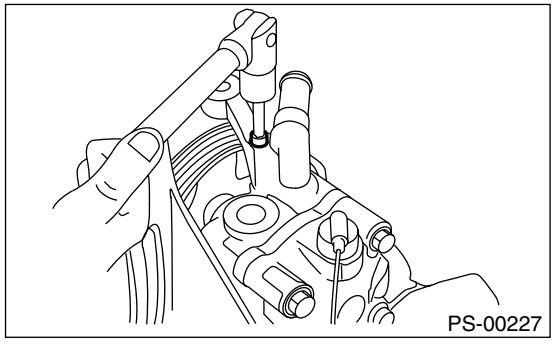


7) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

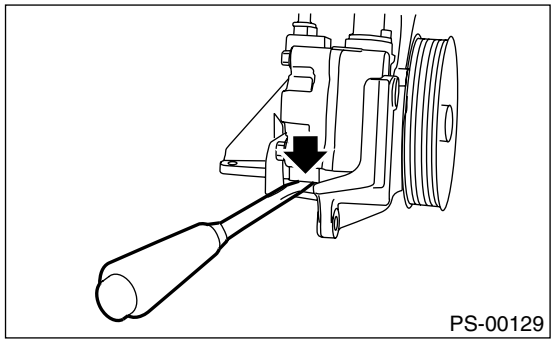
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



8) Remove socket from oil pump.



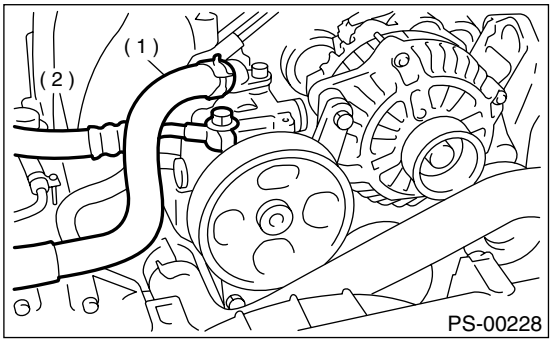
9) Remove bolt from the rear side of oil pump.



2. 3.0 L MODEL

1) Remove ground cable from battery.
2) Remove pulley belt cover.
3) Remove V-belt.
4) Disconnect connector from power steering pressure switch.
5) Remove tensioner adjuster.
6) Disconnect pressure hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.

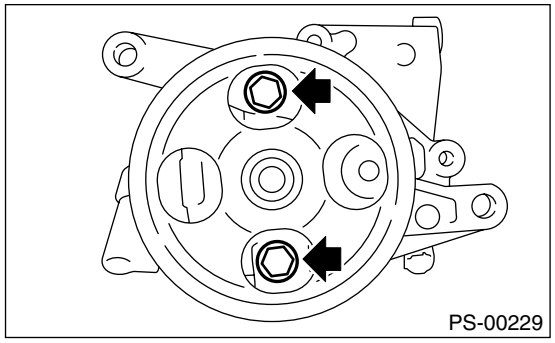


(1) Pressure hose
(2) Suction hose

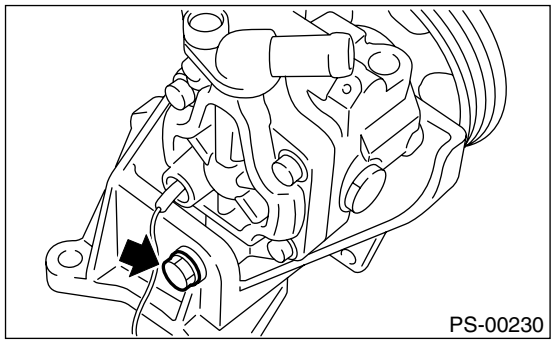
7) Remove bolts, which install power steering pump bracket.

8) Place oil pump bracket in a vise, remove two bolts from the front side of oil pump.

CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



9) Remove bolt from the rear side of oil pump.



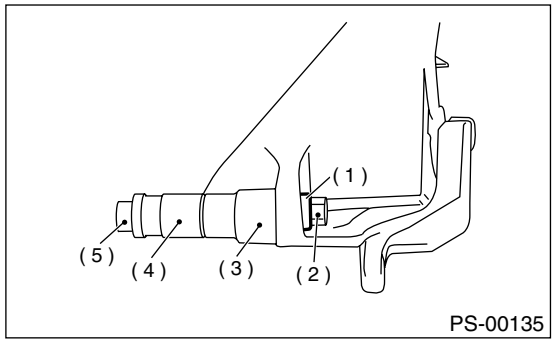
10) Remove oil pump from bracket.

B: INSTALLATION

1. 2.5 L MODEL

1) Install oil pump to bracket.
(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2″) type 14- and 21-mm box wrench until it is in contact with oil pump mounting surface.

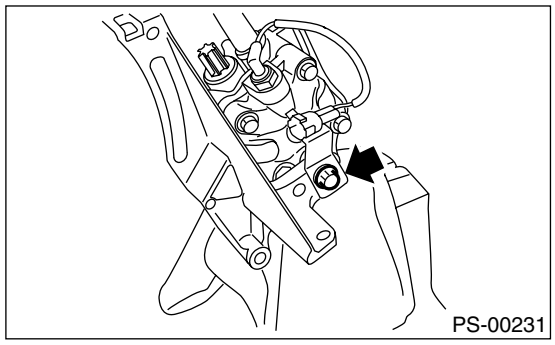
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



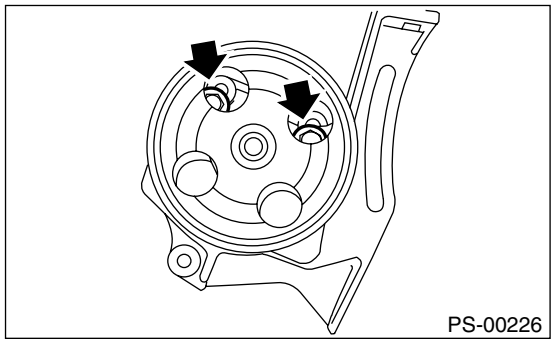
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten bolt which installs oil pump and switch bracket to bracket.

Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)

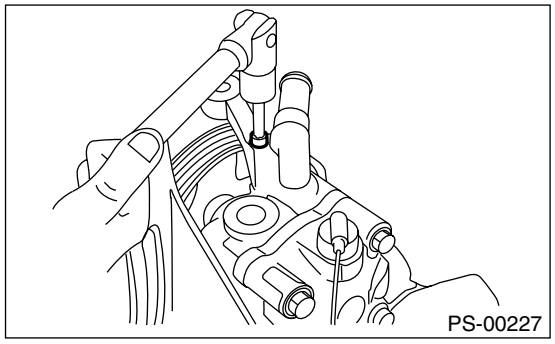


Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



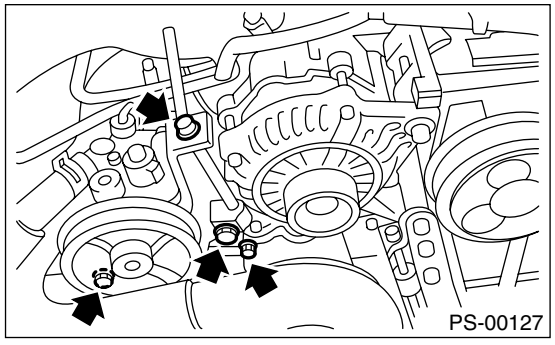
2) Install socket to oil pump.

Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



3) Tighten bolts which install power steering pump bracket.

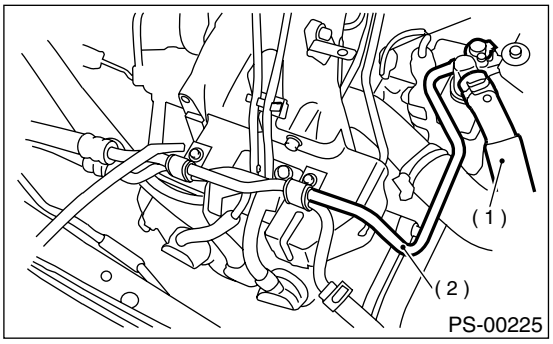
Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



4) Interconnect pipes C and suction hose.

Tightening torque:
Joint nut
39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pipe C

5) Connect connector to power steering oil pressure switch.
6) Install pulley belt to oil pump.
7) Check pulley belt tension. <Ref. to ME(H4SO)-43, V-belt.> and <Ref. to ME(H6DO)-28, V-belt.>
8) Tighten lock bolt.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Tighten bolt belt tension.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

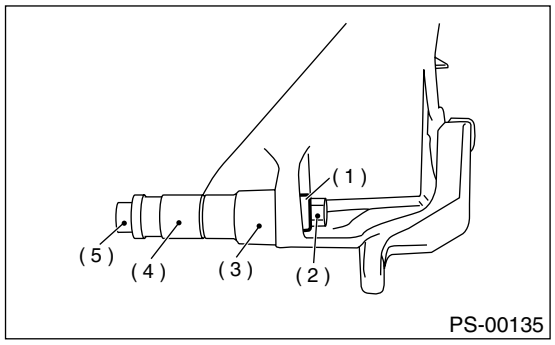
10) Install pulley belt cover bracket.
11) Connect ground terminal of battery.
12) Feed the specified power steering fluid <Ref. to PS-64, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

2. 3.0 L MODEL

1) Install oil pump to bracket.
(1) Place oil pump bracket in a vise. Tighten bushing using a 12.7 mm (1/2″) type 14 and 21-mm box wrench until it is in contact with oil pump mounting surface.

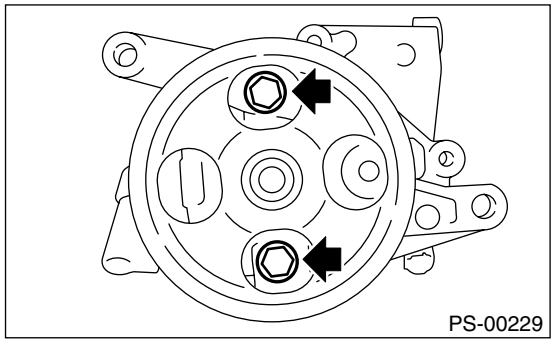
CAUTION:
Do not place oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



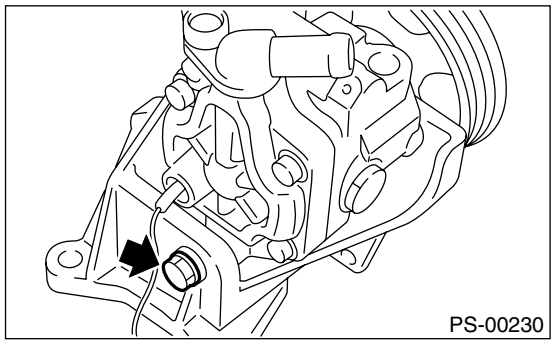
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten bolt which installs oil pump to bracket.

Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)

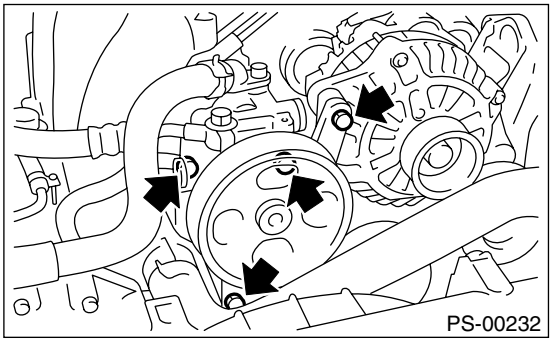


Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



2) Tighten bolts which install power steering pump bracket.

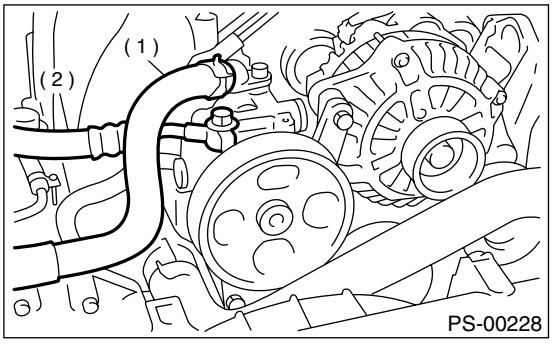
Tightening torque:
33.3 N·m (3.4 kgf-m, 24.5 ft-lb)



3) Interconnect pressure hose and suction hose.

Tightening torque:
Eye bolt
39.2 N·m (4 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pressure hose

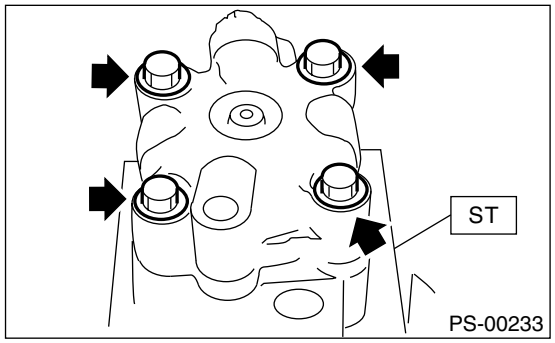
4) Connect connector to power steering oil pressure switch.
5) Install tensioner adjuster.
6) Install V-belt.
7) Install pulley belt cover.
8) Connect ground terminal of battery.
9) Feed the specified power steering fluid. <Ref. to PS-64, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

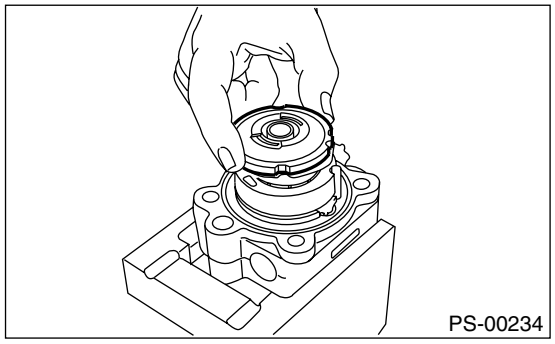
C: DISASSEMBLY

NOTE:
Oil pump for TURBO model and 3.0 L model cannot be disassembled. If the oil pump is malfunctioning, replace the oil pump as an assembly.

1) Using ST, place oil pump in a vise and remove four bolts which secure rear cover.
ST 34199AE020 ATTACHMENT

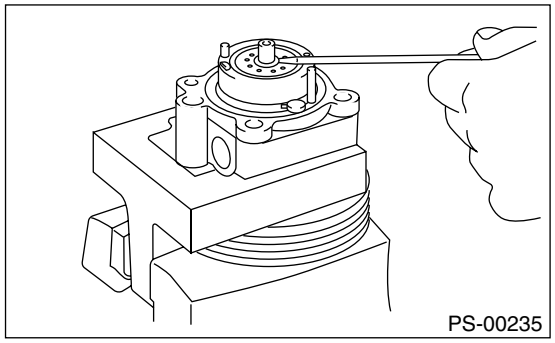


2) Remove pressure plate.



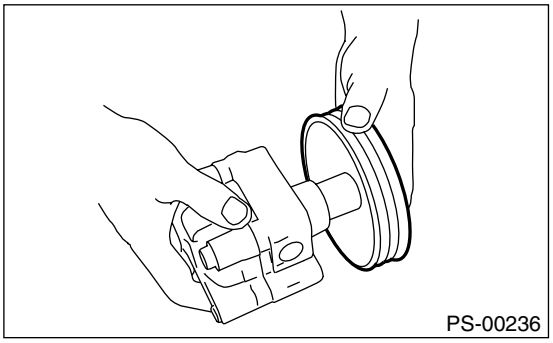
3) Using a screwdriver, pry retaining ring off.

CAUTION:
Do not remove cam ring, rotor, etc.



4) Install pressure plate.
5) Temporarily install rear cover to front casing.

6) Remove oil pump pulley.

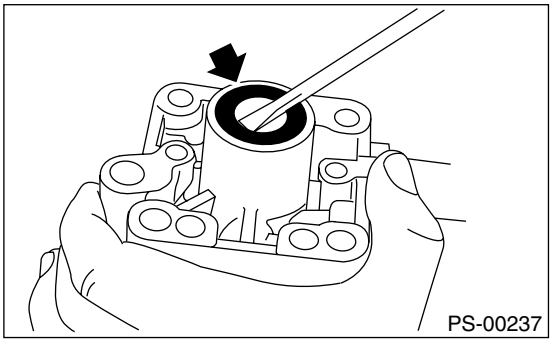


7) Place oil pump in a vise.

CAUTION:
Do not place oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

8) Pry oil seal off using a screwdriver.

CAUTION:
Be careful not to scratch inner surface of casing.



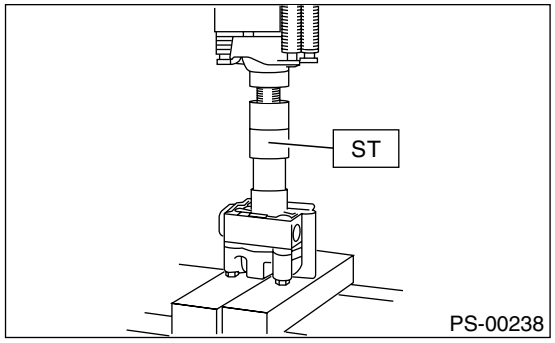
D: ASSEMBLY

1) Reassembly precautions
(1) Whenever O-rings, oil seals, and snap rings are removed, they must be replaced with new ones.
(2) Thoroughly wash parts and allow to dry. They must be kept free from cleaning oil and dust.
(3) Reassembly procedure must be performed in clean place. Ensure that parts are kept away from waste threads or other dust particles.
(4) Cleaning oil tends to stay inside the front casing. Remove it completely by blowing compressed air.
(5) Ensure that parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
(6) Reverse the sequence of disassembly procedures.

2) Apply grease to oil seal and inner surface of front casing (at bearing location).

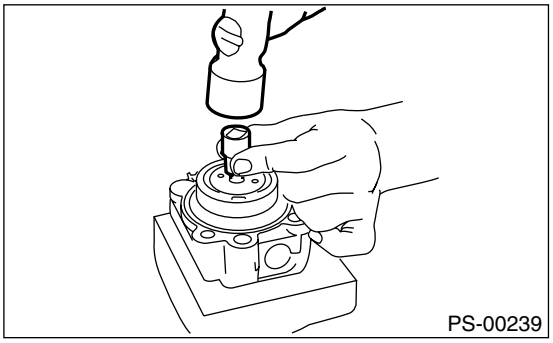
CAUTION:
Make sure that the front body internal surfaces are free from damage.

3) Temporarily install rear cover to front body.
4) Attach ST to front body. Using a press, install oil seal.
ST 34199AE030 INSTALLER

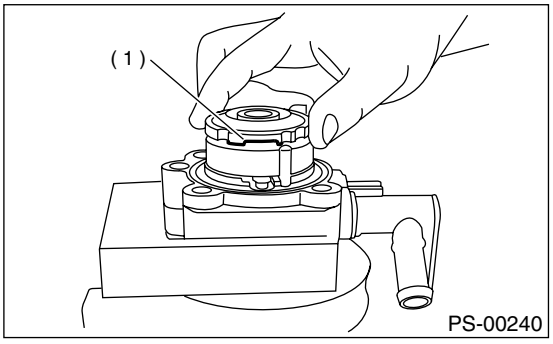


5) Install pump pulley to front body.
6) Using ST, place oil pump in a vise.
ST 34199AE020 ATTACHMENT
7) Remove rear cover.

8) Using 10-mm box wrench, tap retaining ring into shaft groove.



9) Install pressure plate as shown in the figure.

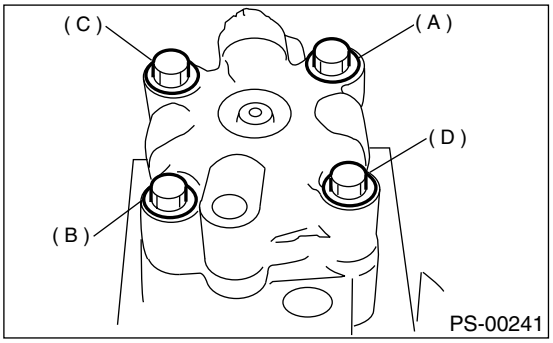


(1) Groove

10) Apply specified hydraulic oil to O-rings and fit them into front casing and pressure plate.
11) Install seal ring to pressure plate.
12) With knock pin positions aligned, install rear cover.

Tightening torque:
27.5 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:
Loosely tighten bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.



13) When reassembly procedures have been completed, turn shaft by hand to ensure it turns smoothly. If it binds or other unusual conditions are evident, disassemble again and check for foreign matter trapped on sliding surfaces and improper installation. Eliminate the cause of trouble.
14) Check followings by referring to “CHECK” article.
- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

E: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Pressure plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source)	
	3) Damage resulting from snap ring removal	Correct with oil stone. If damage is serious, replace with a new cartridge assembly.
8. Connector	Damage on threads	Replace with a new one.
9. Spring	Damage	Replace with a new one.
10. Bolts and nuts	Damage on threads	Replace with a new one.

• In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace oil pump with a new one.
		(2) Play of pulley shaft	Measure radial play and axial play. If any of these exceeds the service limit, replace oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure V ditch deflection. If it exceeds the service limit, replace pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check resistance to rotation of pulley. If it is past the service limit, replace oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

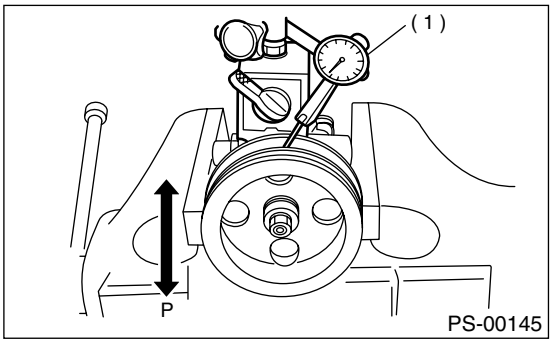
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix oil pump on a vise to make a measurement. At this time, hold oil pump with the least possible force between two wood pieces.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of pulley shaft

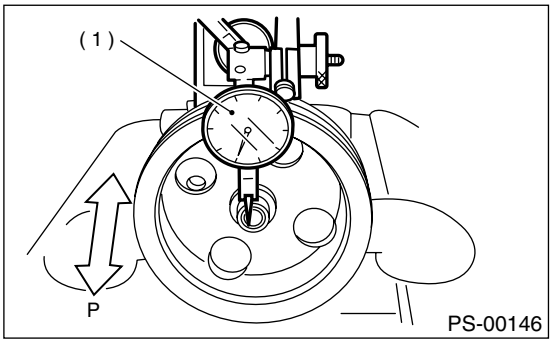
On condition:
P: 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Radial play (Direction ⟷)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⟺)
0.6 mm (0.024 in) or less

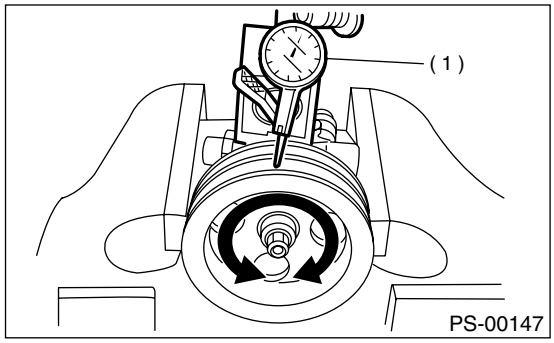


(1) Dial indicator

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

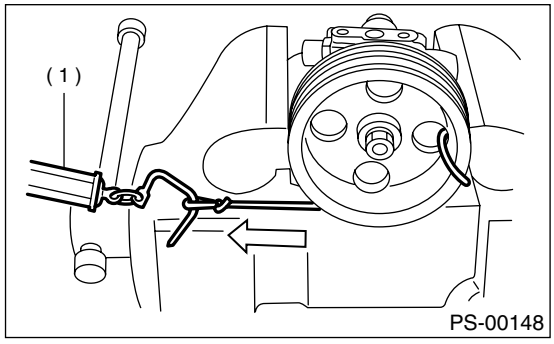


(1) Dial indicator

3) Resistance to rotation of pulley

Service limit:
Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation and make a judgment.



(1) Spring balance

3. HYDRAULIC PRESSURE

CAUTION:
• Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-66, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
• Put cotton cloth waste at a place where fluid drops before pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

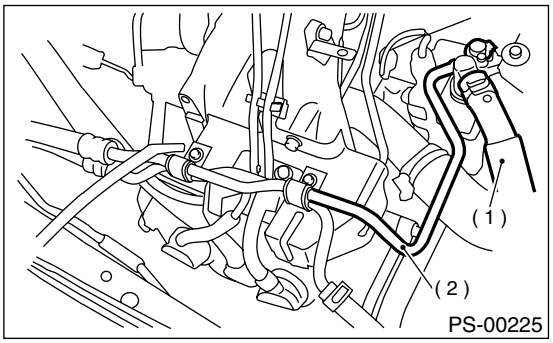
NOTE:
Keep engine idling during the measurement.

1) REGULAR PRESSURE MEASUREMENT
(1) Connect ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

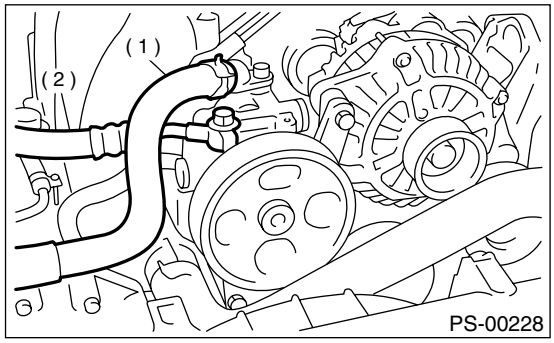
(2) Disconnect pressure hose from the pump.
(3) Using gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), instal ST2 to the pump instead of pressure hose.

2.5 L model:



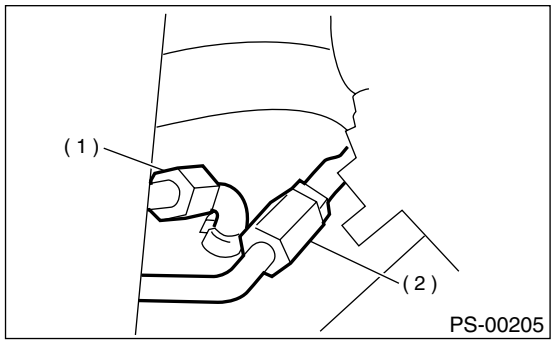
(1) Suction hose
(2) Pressure hose

3.0 L model:



(1) Suction hose
(2) Pressure hose

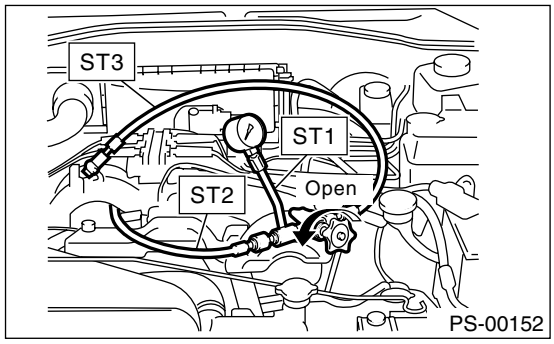
(4) Disconnect pipe C form pipe (on gearbox side).
(5) Install ST3 to pipe C.



(1) Pipe C
(2) Pipe D

(6) Replenish power steering fluid up to specified level.
(7) Open valve, and start the engine.
(8) Measure regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

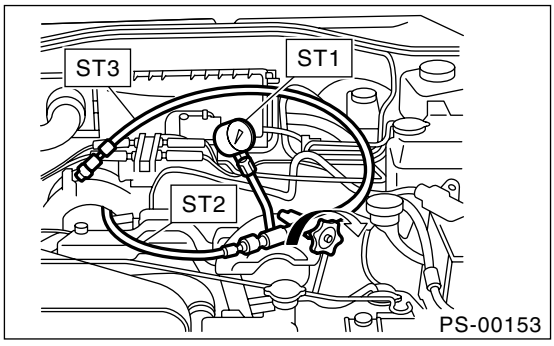


Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

(9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure relief pressure.
(1) Using STs, measure relief pressure.
(2) Close valve.
(3) Measure relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

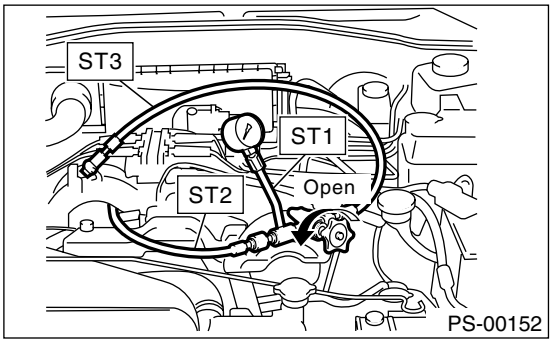


Service limit:
2.5 L model
9,611 — 10,199 kPa (98 — 104 kg/cm^2, 1,394 — 1,479 psi)
TURBO model and 3.0 L model
7,650 — 8,340 kPa (78.03 — 88.13 kg/cm^2, 1,109 — 1,209 psi)

(4) If it is not within the specified value, replace the oil pump.

3) Measure working pressure.
(1) Using STs, measure working pressure.
(2) Open valve.
(3) Measure working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:
2.5 L model
9,611 — 10,199 kPa (98 — 104 kg/cm^2, 1,394 — 1,479 psi)
TURBO model and 3.0 L model
7,650 — 8,340 kPa (78.03 — 88.13 kg/cm^2, 1,109 — 1,209 psi)

(4) If it is within the specified value, measure steering effort. <Ref. to PS-69, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace control valve itself or control valve and pinion as a single unit with new ones.

8. Reservoir Tank

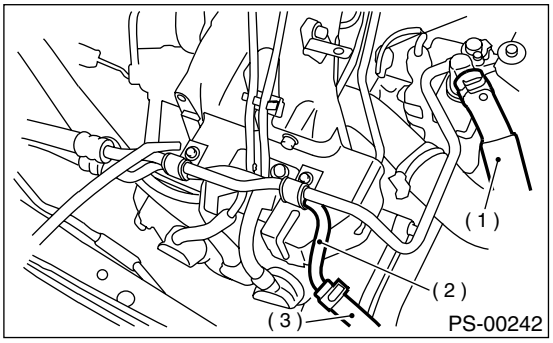
A: REMOVAL

1. 2.5 L MODEL

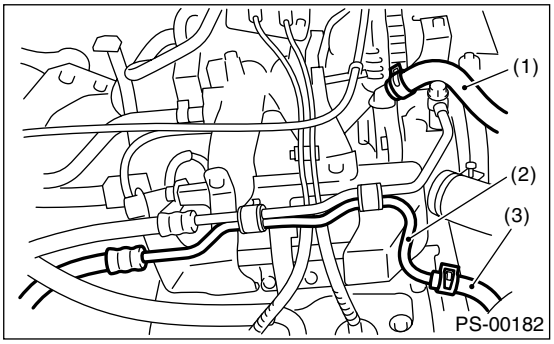
1) Drain fluid from the reservoir tank.
2) Disconnect pipe D from return hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

Non-TURBO model



TURBO model



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Remove reservoir tank from bracket by pulling it upwards.

2. 3.0 L MODEL

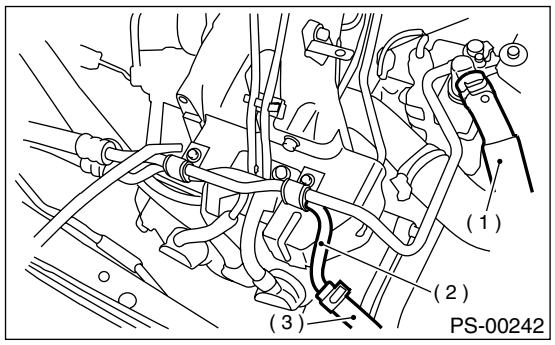
1) Drain fluid from the reservoir tank.
2) Disconnect return hose and suction hose from reservoir tank.

B: INSTALLATION

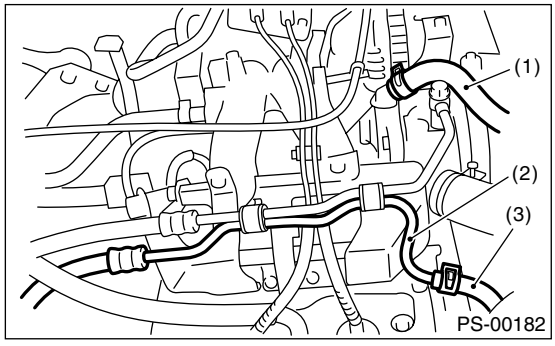
1. 2.5 L MODEL

1) Install reservoir tank to bracket.
2) Connect pipes D to return hose and suction hose to oil pump.

Non-TURBO model



TURBO model

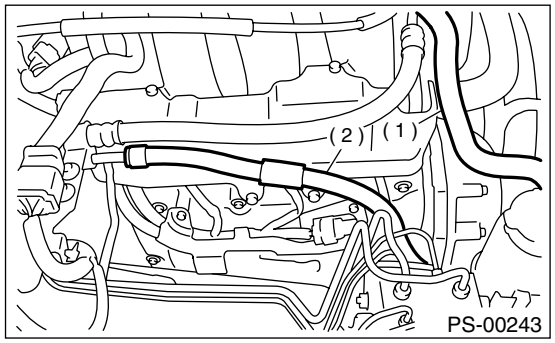


(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-64, Power Steering Fluid.>

2. 3.0 L MODEL

1) Install reservoir tank to bracket.
2) Connect return hose and suction hose to reservoir tank.



(1) Suction hose
(2) Return hose

3) Feed the specified power steering fluid. <Ref. to PS-64, Power Steering Fluid.>

C: INSPECTION

Check reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace reservoir tank.

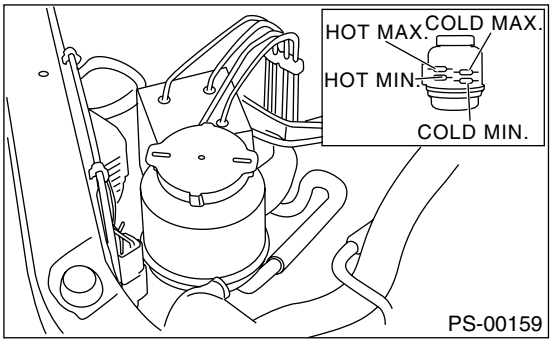
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

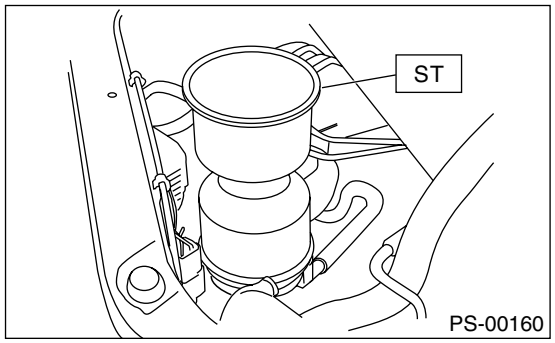
B: INSPECTION

1) Check power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.
If the level is at lower point or below, add fluid to keep the level in the specified range of the indicator. If at upper point or above, drain fluid by using a syringe or the like.
(1) Check at temperature 20°C (68°F) on reservoir surface of oil pump; read the fluid level on the "COLD" side.
(2) Check at temperature 80°C (176°F) on reservoir surface of oil pump; read the fluid level on the "HOT" side.



C: INSTALLATION

1) Set ST on top of reservoir tank and fill it about half way with the specified fluid.
ST 34199AE040 OIL CHARGE GUIDE



2) Jack-up vehicle and support it with safety stands, then turn steering wheel with engine stopped.
3) Continue to turn steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.
4) In case air is absorbed to deliver bubbles into piping because the fluid level is lower, leave it about half an hour and then do the step 2) all over again.
5) Start and idle the engine.
6) Continue to turn steering wheel slowly from lock to lock again until bubbles stop appearing in the tank while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel.
7) In case bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 5) all over again.
8) Stop the engine, and take out safety stands after jacking up vehicle again.
Then lower the vehicle, and idle the engine.
9) Continue to turn steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
10) In case the following happens, leave it about half an hour and then do step 8) again.
(1) The fluid level changes over 3 mm (0.12 in).
(2) Bubbles remain on the upper surface of the fluid.
(3) Grinding noise is generated from oil pump.
11) Check the fluid leakage at flare nuts after turning steering wheel from lock to lock with engine running.

CAUTION:
• Before checking, wipe off any fluid on flare nuts and piping.
• In case the fluid leaks from flare nut, it is caused by dust (or the like) and/or damage between flare and tapered seat in piping.

• Remove the flare nut and tighten again it to the specified torque after cleaning flare and tapered seat. If flare or tapered seat is damaged, replace with a new one.

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys except oil pump pulley • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and rim • Improper tires out of specification • Improper rims out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct customer.
	5. Measure hydraulic pressure.<Ref. to PS-58, INSPECTION, Oil Pump.>	Replace problem parts.
	6. Measure steering effort.<Ref. to PS-66, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and rim • Flat tire • Mix use of different tires • Mix use of different rims • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct customer.
	5. Measure steering effort.<Ref. to PS-66, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.
*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
• Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
• When stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
• There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in “D” range for automatic transmission vehicle.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check clearance. Correct if necessary. <Ref. to PS-48, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace bad parts of the gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace oil pump.
	Pulley bearing seizing of oil pump	Replace oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix wrong part causing aeration. Replace fluid and vent air.
	Damaged pipe of gearbox	Replace pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace bad parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace bad parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Too low engine speed at start	Adjust and instruct customers.
	Vane pump aeration	Fix wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace oil pump, bad parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install spring scale on the steering wheel. 5) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort. NOTE: When turning steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lb)?	Go to step **2.**	Adjustment backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lb)?	Go to step **3.**	Adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove universal joint. 2) Measure steering wheel effort.	Is the maximum force steering wheel effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step **4.**	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure steering wheel effort.	Is the fluctuation width less than 1.08 N (0.11 kgf, 0.24 lb)?	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure folding torque of the joint (short yoke). <Ref. to PS-20, INSPECTION, Universal Joint.>	Is the fluctuation width less than 8.43 N (0.86 kgf, 1.90 lb)?	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure folding torque of the joint (long yoke). <Ref. to PS-20, INSPECTION, Universal Joint.>	Is the folding torque less than 5.49 N (0.56 kgf, 1.23 lb)?	Go to step **7.**	Replace with new one.
7	**CHECK FRONT WHEEL.**	Are there unsteady revolution or rattling of front wheels and dragging of brake?	Inspect, readjust and replace if necessary.	Go to step **8.**
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Are there unsteady revolution or rattling of tie-rod ends of suspension?	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.**	Are there unsteady revolution or rattling of ball joints of suspension?	Inspect and replace if necessary.	Go to step **10.**
10	**CHECK GEARBOX.** Measure rotating of gearbox. <Ref. to PS-40, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the measured rotating resistance the same as the following values: 11.18 N (1.14 kgf, 2.51 lb) or less at straight position / 15.79 N (1.61 kgf, 3.55 lb) or less at any other positions within 20% difference between clockwise and counterclockwise?	Go to step **11.**	Readjust backlash, and if ineffective, replace bad parts.
11	**CHECK GEARBOX.** Measure sliding of gearbox. <Ref. to PS-39, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the measured sliding resistance within the following value: 304 N (31 kgf, 68 lb) or less within 20% difference between left and right directions?	Steering effort is normal.	Readjust backlash, and if ineffective, replace bad parts.

MEMO:

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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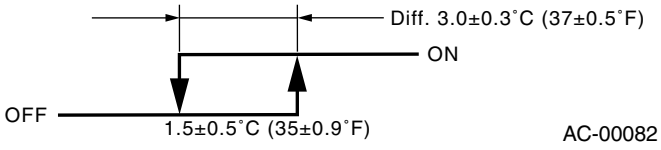
1. General Description

A: SPECIFICATIONS

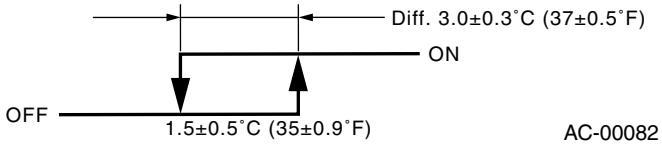
1. HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	• Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		300 m^3 (10,593 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		500 m^3 (17,655 cu ft)/h	• Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
Heater core size (height × length × width)		193.5 × 152 × 35.0 mm (7.62 × 5.98 × 1.378 in)	—
Blower motor	Type	Magnet motor 220 W or less	at 12 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

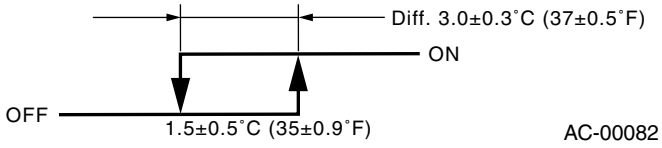
2. A/C SYSTEM (4 CYLINDER NON-TURBO MODEL)

Item			Specifications
Type of air conditioner			Reheat air-mix type
Cooling capacity			5.2 kW (4,471 kcal/h, 17,741 BTU/h)
Refrigerant			HFC-134a (CH_2FCF_3) [0.65±0.05 kg (1.43±0.11 lb)]
Compressor		Type	5-vane rotary, fix volume (DKV-14G)
		Discharge	140 cm^3 (8.54 cu in)/rev
		Max. permissible speed	7,000 rpm
Magnet clutch		Type	Dry, single-disc type
		Power consumption	45 W
		Type of belt	V-Ribbed 4 PK
		Pulley dia. (effective dia.)	125 mm (4.92 in)
		Pulley ratio	1.064
Condenser		Type	Corrugated fin (Multi-flow)
		Core face area	0.21 m^2 (2.26 sq ft)
		Core thickness	24 mm (0.94 in)
		Radiation area	6.52 m^2 (70 sq ft)
Receiver drier		Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve		Type	External equalizing
Evaporator		Type	Single tank
		Dimensions (W × H × T)	235 × 224 × 60 mm (9.25 × 8.82 × 2.36 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	220 W at 12 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	75 W at 12 V
		Fan outer diameter	300 mm (11.81 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	75 W at 12 V
		Fan outer diameter	300 mm (11.81 in)
Idling speed (A/C ON)		MPFI model	850±100 rpm
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm^2, 25.6±3.6 psi)
		OFF → ON	$216^{+39}/_{-25}$ kPa ($2.2^{+0.4}/_{-0.25}$ kg/cm^2, $31^{+5.7}/_{-3.6}$ psi)
	High-pressure switch operating pressure	ON → OFF	2,942±196 kPa (30±2 kg/cm^2, 427±28 psi)
		DIFF	588±196 kPa (6±2 kg/cm^2, 85±28 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			

3. A/C SYSTEM (4 CYLINDER TURBO MODEL)

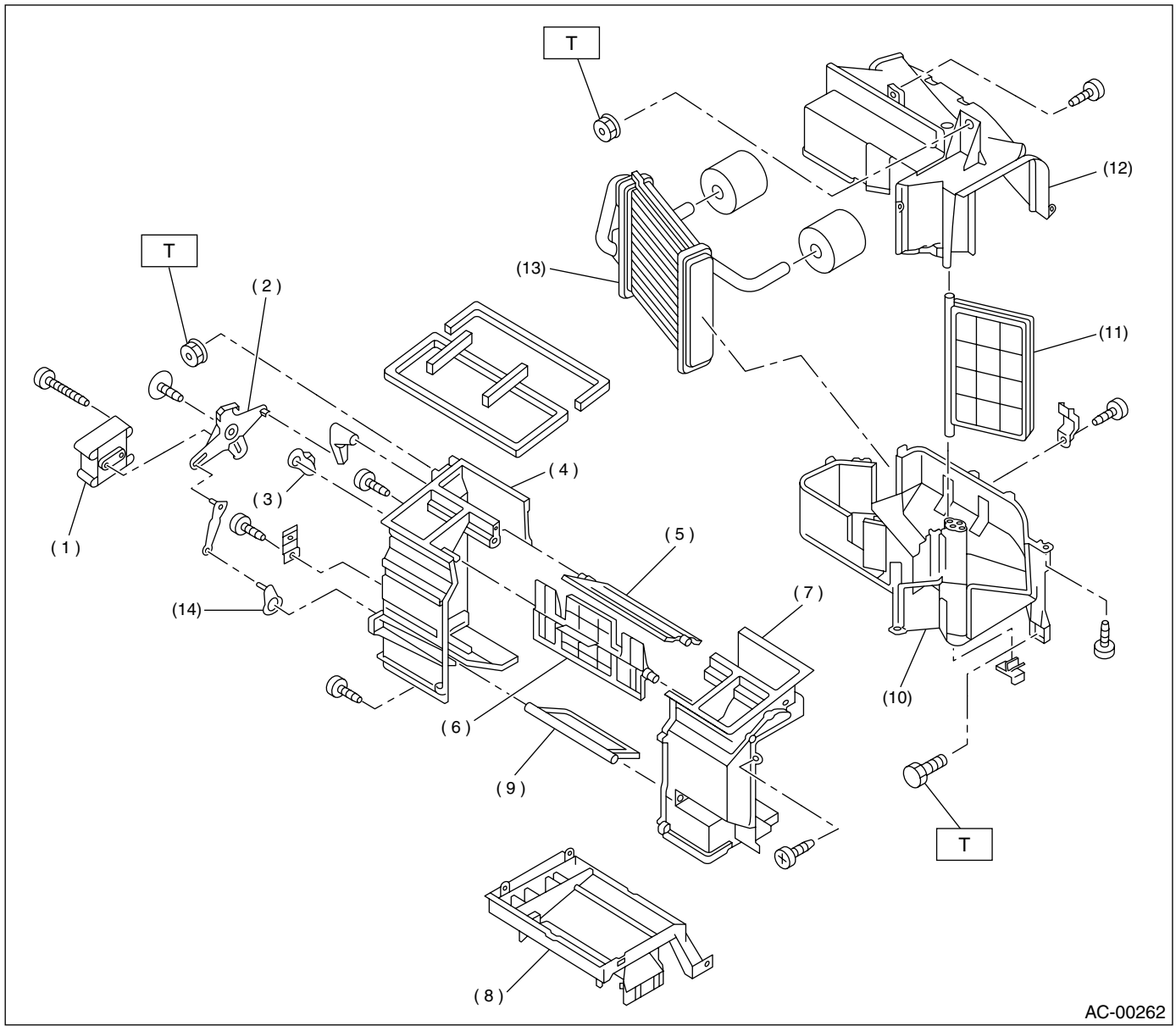
Item			Specifications
Type of air conditioner			Reheat air-mix type
Cooling capacity			5.2 kW (4,471 kcal/h, 17,741 BTU/h)
Refrigerant			HFC-134a (CH_2FCF_3) [0.65±0.05 kg (1.43±0.11 lb)]
Compressor		Type	5-vane rotary, fix volume (DKV-14G)
		Discharge	140 cm^3 (8.54 cu in)/rev
		Max. permissible speed	7,000 rpm
Magnet clutch		Type	Dry, single-disc type
		Power consumption	45 W
		Type of belt	V-Ribbed 4 PK
		Pulley dia. (effective dia.)	125 mm (4.92 in)
		Pulley ratio	1.064
Condenser		Type	Corrugated fin (Multi-flow)
		Core face area	0.21 m^2 (2.26 sq ft)
		Core thickness	24 mm (0.94 in)
		Radiation area	6.52 m^2 (70 sq ft)
Receiver drier		Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve		Type	External equalizing
Evaporator		Type	Single tank
		Dimensions (W × H × T)	235 × 224 × 60 mm (9.25 × 8.82 × 2.36 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	220 W at 12 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Idling speed (A/C ON)		MPFI model	850±100 rpm
Triple switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm^2, 25.60±3.56 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kg/cm^2, 29.86±4.41 psi)
	High-pressure switch operating pressure	ON → OFF	2,940±200 kPa (29.98±2.03 kg/cm^2, 426.32±28.87 psi)
		DIFF	590±200 kPa (6.02±2.03 kg/cm^2, 85.6±28.87 psi)
	Middle-pressure switch operating pressure	ON → OFF	1,370±120 kPa (13.97±1.22 kg/cm^2, 198.65±17.35 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kg/cm^2, 256.81±14.50 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			 AC-00082

4. A/C SYSTEM (6 CYLINDER)

Item			Specifications
Type of air conditioner			Reheat air-mix type
Cooling capacity			5.2 kW (4,471 kcal/h, 17,741 BTU/h)
Refrigerant			HFC-134a (CH_2FCF_3) [0.65±0.05 kg (1.43±0.11 lb)]
Compressor		Type	5-vane rotary, fix volume (DKV-14G)
		Discharge	140 cm^3 (8.54 cu in)/rev
		Max. permissible speed	7,000 rpm
Magnet clutch		Type	Dry, single-disc type
		Power consumption	38 W
		Type of belt	V-Ribbed 6 PK
		Pulley dia. (effective dia.)	125 mm (4.92 in)
		Pulley ratio	1.064
Condenser		Type	Corrugated fin (Multi-flow)
		Core face area	0.22 m^2 (2.37 sq ft)
		Core thickness	24 mm (0.94 in)
		Radiation area	6.52 m^2 (70 sq ft)
Receiver drier		Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve		Type	External equalizing
Evaporator		Type	Single tank
		Dimensions (W × H × T)	235 × 224 × 60 mm (9.25 × 8.82 × 2.36 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	220 W at 12 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.60 in)
Idling speed (A/C ON)		MPFI model	850±100 rpm
Triple switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm^2, 25.60±3.56 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kg/cm^2, 29.86±4.41 psi)
	High-pressure switch operating pressure	ON → OFF	2,940±200 kPa (29.98±2.03 kg/cm^2, 426.32±28.87 psi)
		DIFF	590±200 kPa (6.02±2.03 kg/cm^2, 85.6±28.87 psi)
	Middle-pressure switch operating pressure	ON → OFF	1,370±120 kPa (13.97±1.22 kg/cm^2, 198.65±17.35 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kg/cm^2, 256.81±14.50 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			 AC-00082

B: COMPONENT

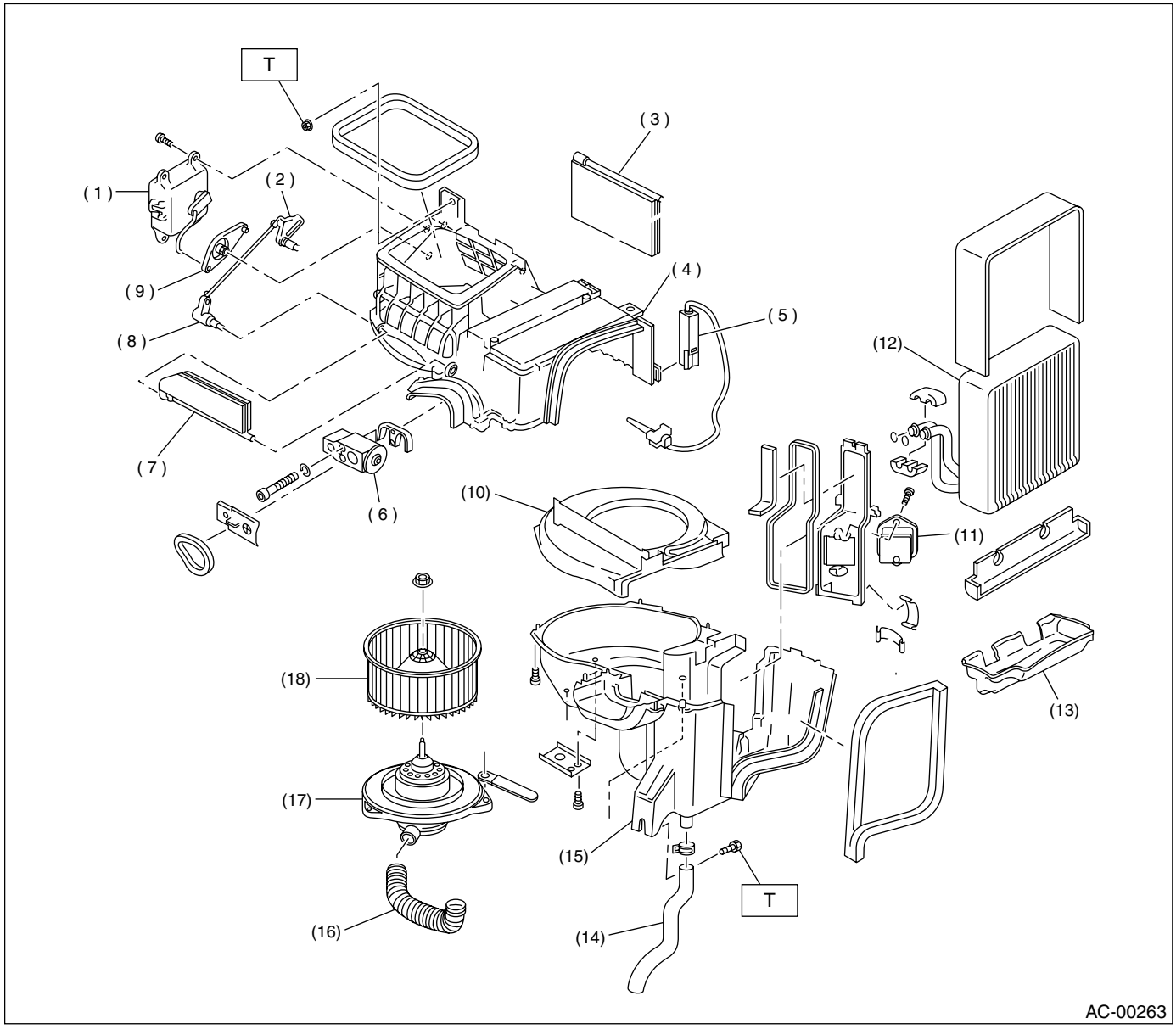
1. HEATER UNIT



(1) Vent door actuator
(2) Side link
(3) Vent door lever
(4) Case A
(5) DEF door
(6) Vent door
(7) Case B
(8) Foot duct
(9) Foot door
(10) Case D
(11) Mix door
(12) Case C
(13) Heater core
(14) Foot door lever

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.35 (0.750, 5.421)

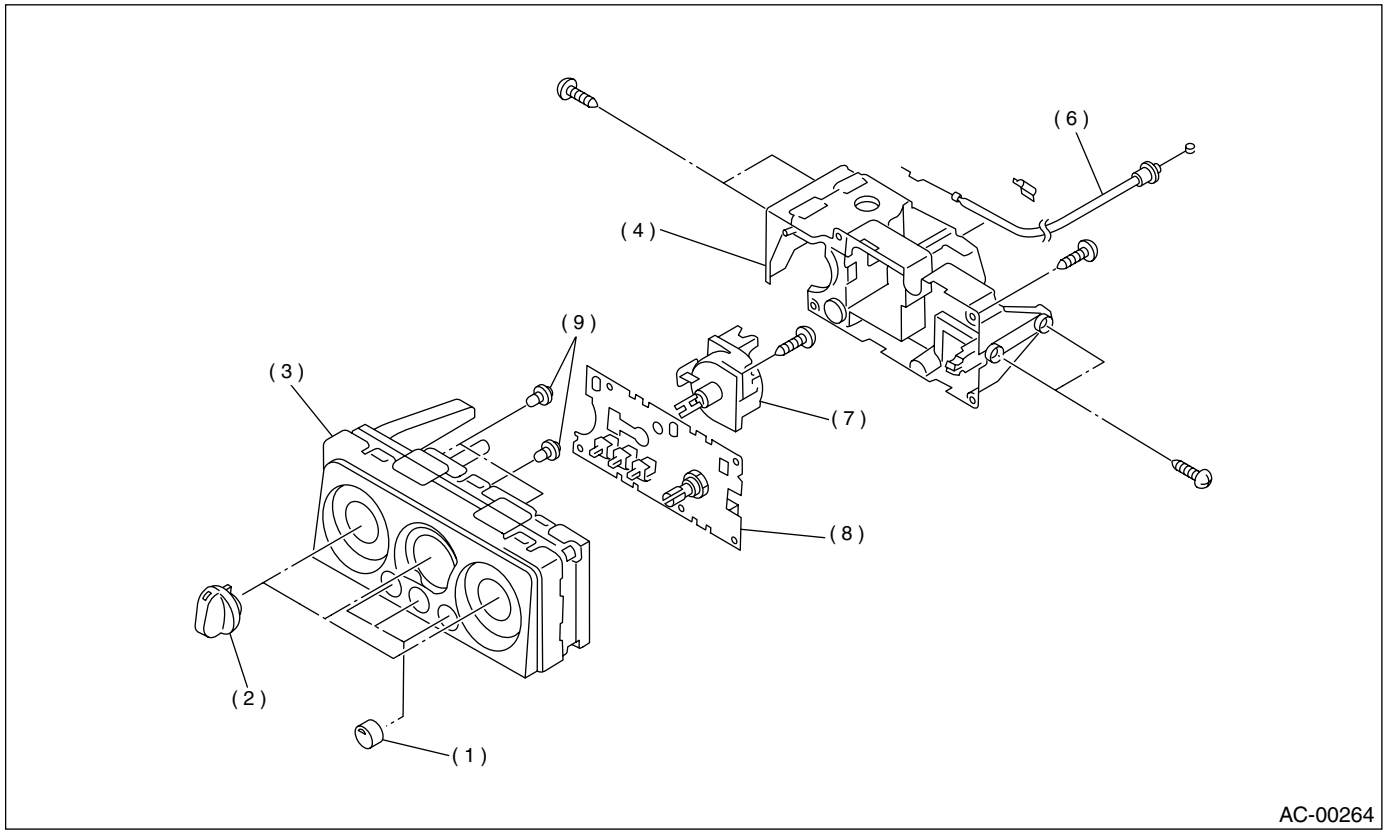
2. INTAKE UNIT WITH EVAPORATOR



(1) Intake door actuator
(2) Lever (A)
(3) Door (A)
(4) Intake unit case upper
(5) Thermistor (With A/C model)
(6) Expansion valve (With A/C model)
(7) Door (B)
(8) Lever (B)
(9) Lever (C)
(10) Blower plate
(11) Resistor
(12) Evaporator (With A/C model)
(13) Evaporator case (With A/C model)
(14) Drain hose
(15) Intake unit case lower
(16) Aspirator pipe
(17) Blower motor
(18) Fan

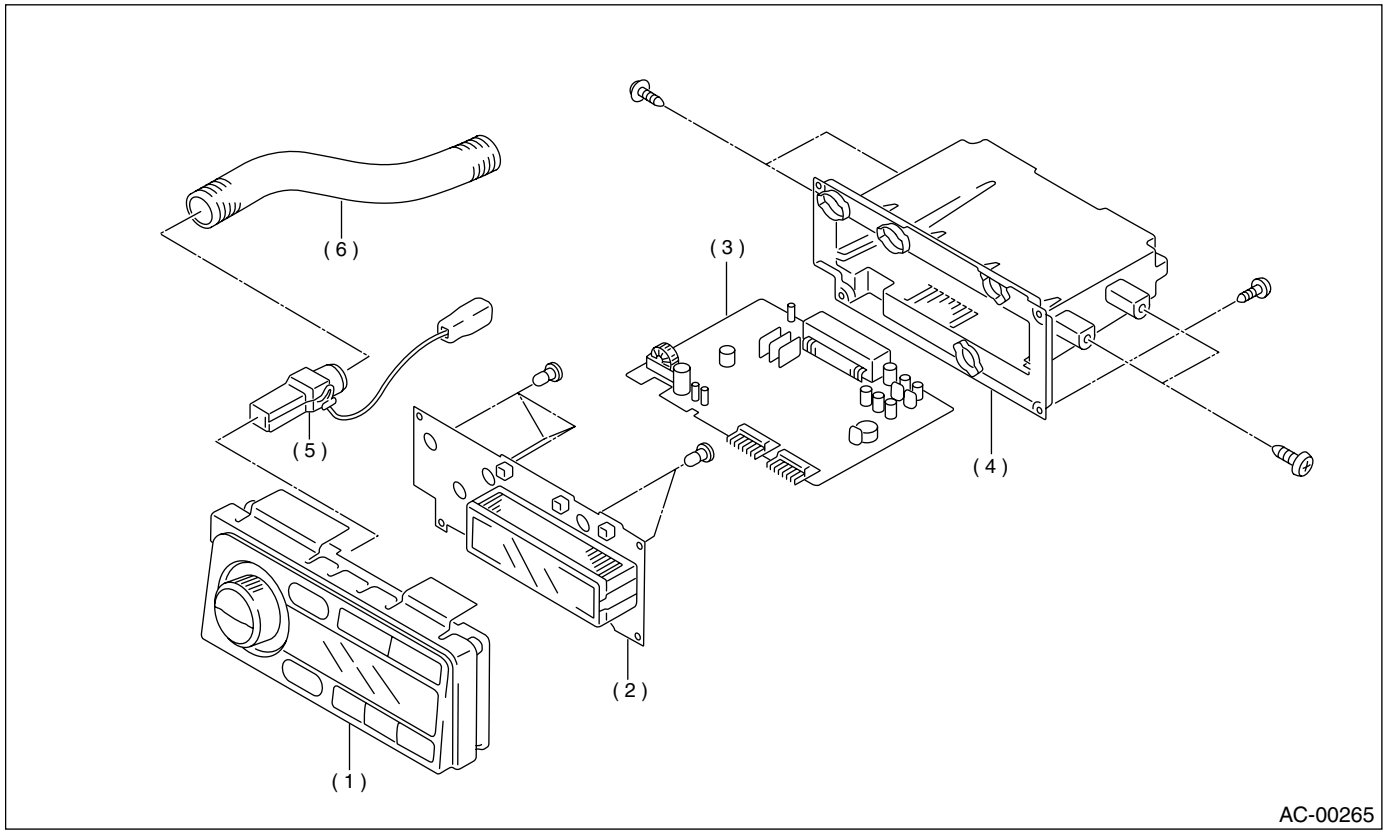
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

3. CONTROL UNIT (MANUAL A/C)



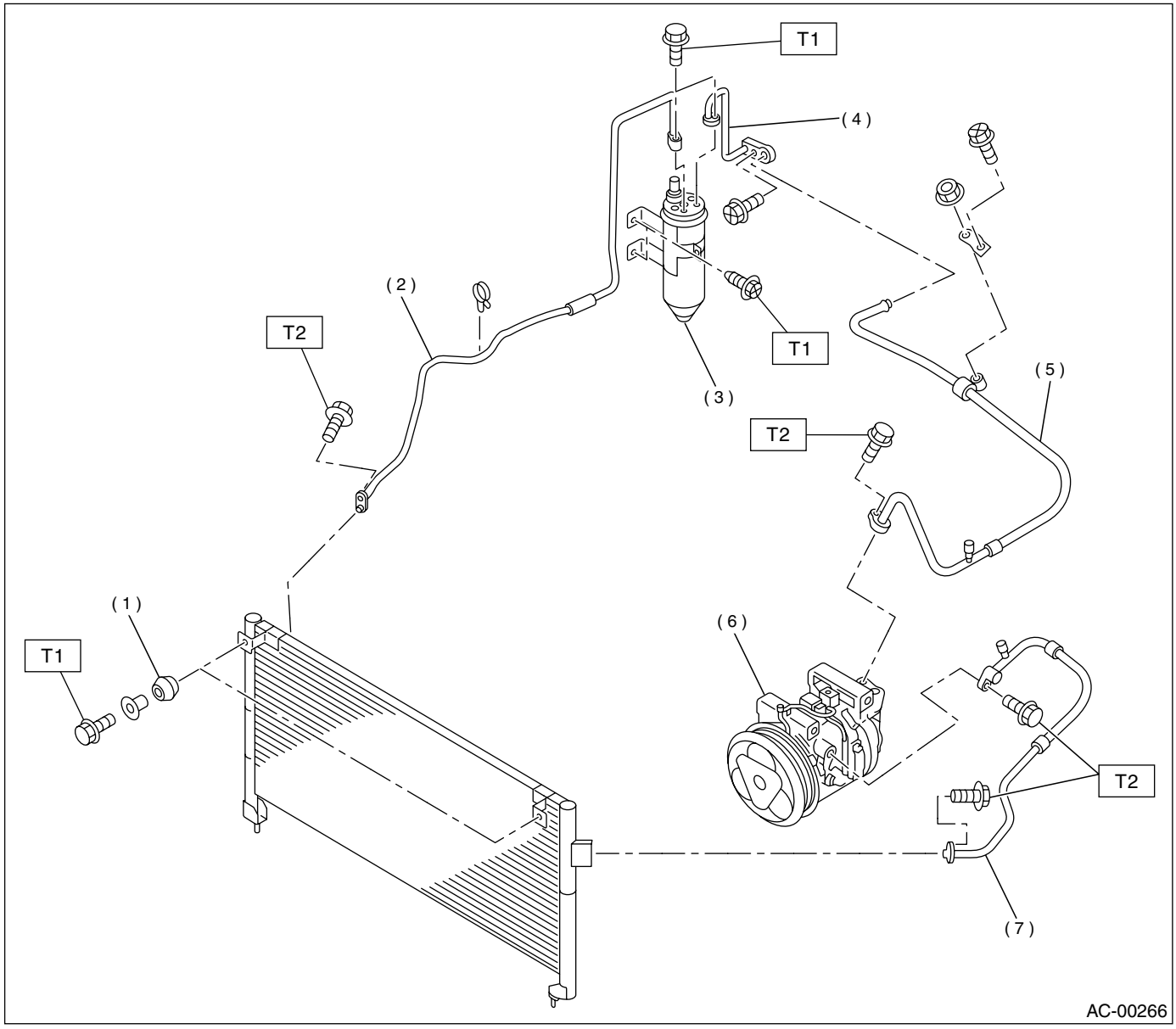
(1) Switch
(2) Dial knob
(3) Panel ASSY
(4) Base unit
(5) Cover
(6) Temperature control cable
(7) Fan switch ASSY
(8) Circuit ASSY
(9) Bulb

4. CONTROL UNIT (AUTO A/C)



(1) Control panel
(2) Circuit ASSY
(3) Control unit
(4) Case
(5) Incar sensor
(6) Aspirator hose

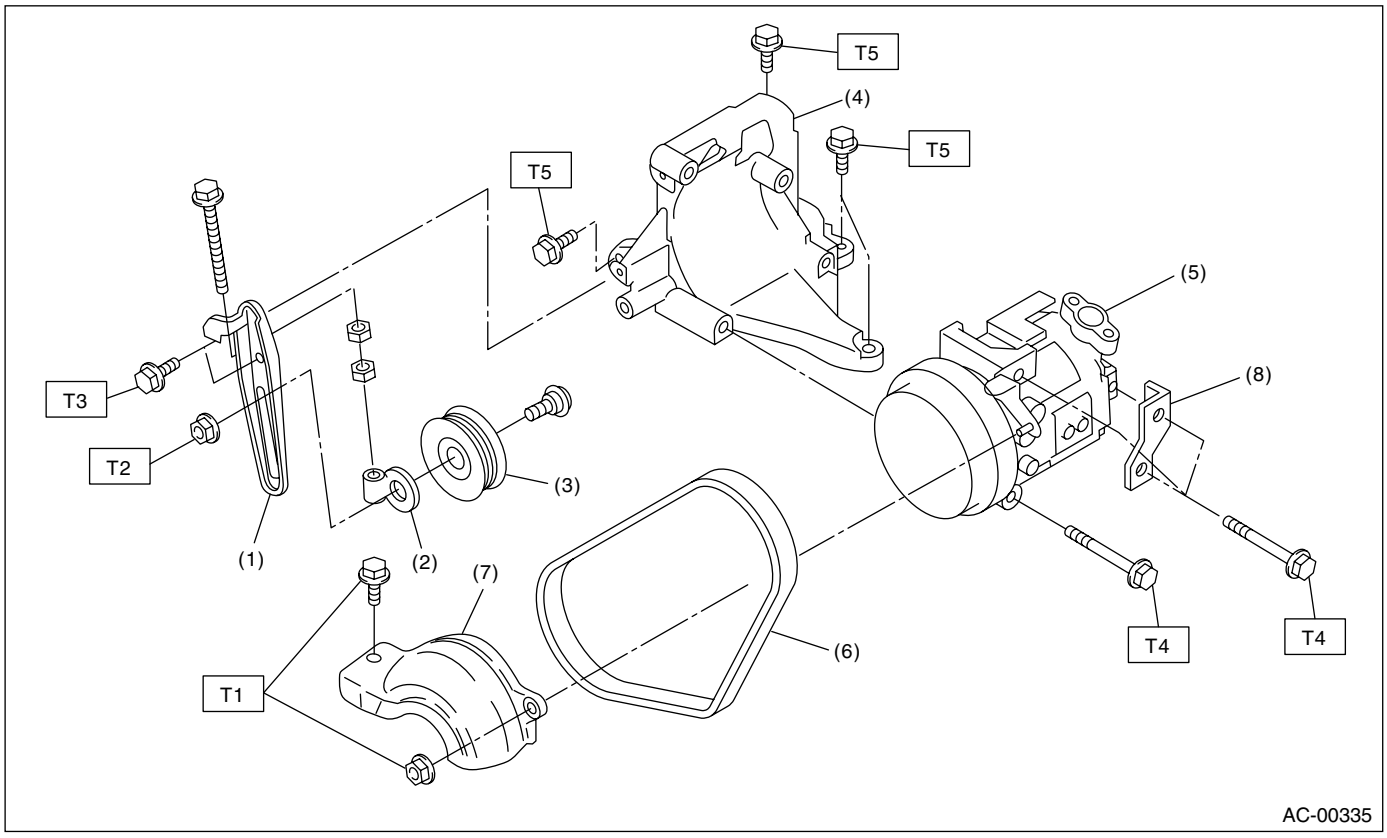
5. AIR CONDITIONING UNIT



(1) Condenser
(2) Pipe (Condenser — Receiver drier)
(3) Receiver drier
(4) Pipe (Receiver drier — Cooling unit)
(5) Hose (Low-pressure)
(6) Compressor
(7) Hose (High-pressure)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 15 (1.5, 10.8)

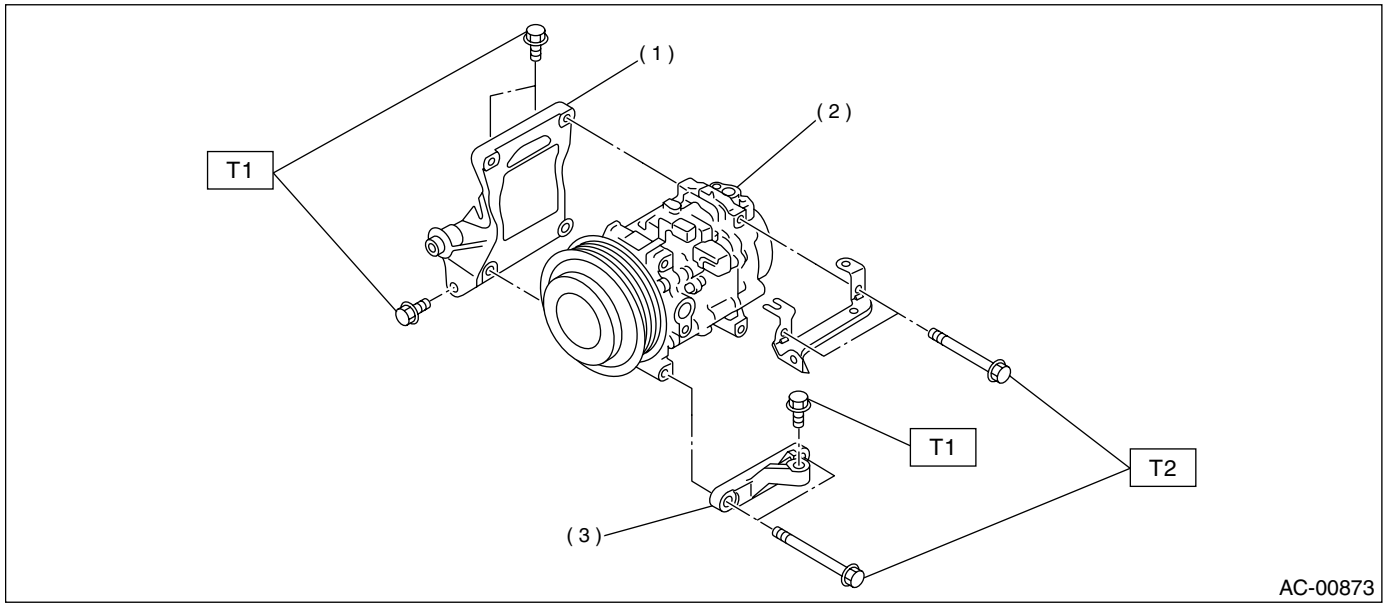
6. COMPRESSOR (4 CYLINDER)



(1) Idler pulley bracket
(2) Idler pulley adjuster
(3) Idler pulley
(4) Compressor bracket
(5) Compressor
(6) V-belt
(7) Compressor belt cover (Non-TURBO model)
(8) Compressor stay

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 22.6 (2.3, 16.6)
T3: 23.0 (2.35, 17.0)
T4: 28.9 (2.95, 21.3)
T5: 35 (3.6, 26)

7. COMPRESSOR (6 CYLINDER)



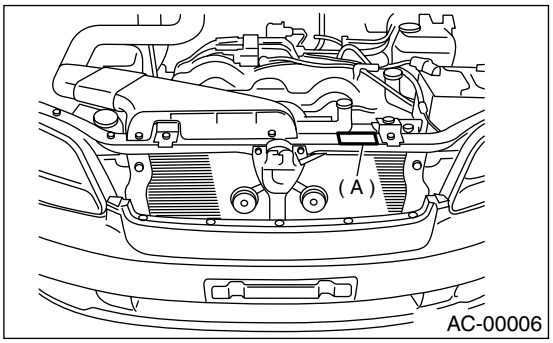
(1) Compressor bracket main
(2) Compressor
(3) Compressor bracket sub

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24)
T2: 28.9 (2.95, 21.3)

C: CAUTION

1. HFC-134A A/C SYSTEM

• Unlike the old conventional HFC-12 system components, the cooling system components for the HFC-134a system such as the refrigerant and compressor oil are incompatible.
• Vehicles with the HFC-134a system can be identified by the label “A” attached to the vehicle.
Before maintenance, check which A/C system is installed in the vehicle.



2. COMPRESSOR OIL

• HFC-134a compressor oil has no compatibility with that for R12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use ZXL200PG.
• Do not mix multiple compressor oils.
If HFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.
On the other hand, if HFC-134a compressor oil is used in a HFC-12 A/C system, the durability of the A/C system will be lowered.
• HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

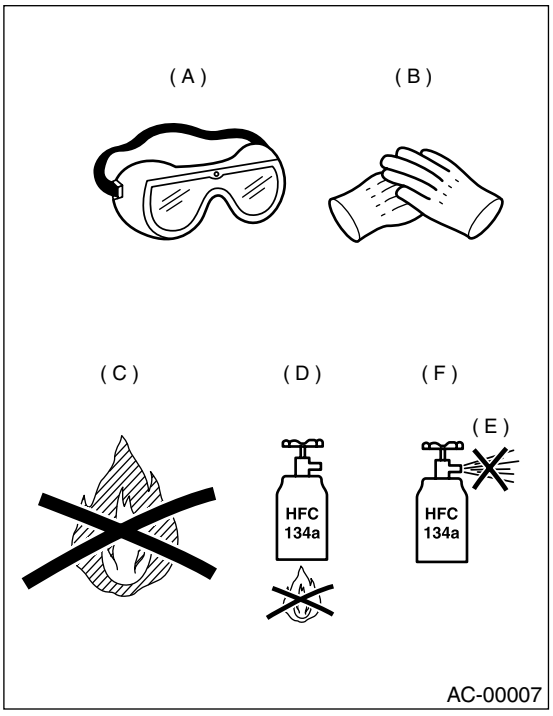
3. REFRIGERANT

• The HFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant, also, cannot be used in the HFC-12 A/C system.
• If an incorrect or no refrigerant is used, poor lubrication will result and the compressor itself may be damaged.

4. HANDLING OF REFRIGERANT

• The refrigerant boils at approx. –30°C (–22°F). When handling it, be sure to wear safety goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite.
If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
• Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in 40°C (104°F) max.
• Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
• When the engine is running, do not open the high-pressure valve of the manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
• The refrigerant is non-toxic and harmless under normal operating circumstance, but it may change to phosgene (a noxious fume) under open flames or high temperatures (caused by a cigarette or heater).
• Provide good ventilation and do not work in a closed area.

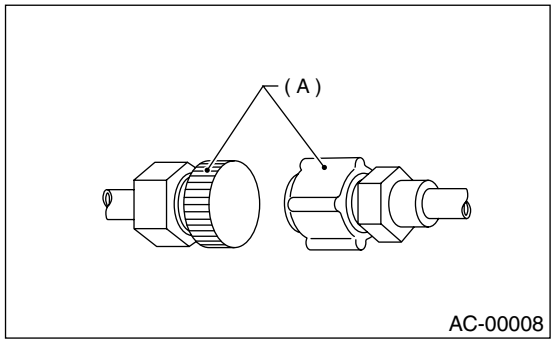
• In order to avoid destroying the ozone layer, prevent HFC-134a from being released into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



(A) Goggles
(B) Gloves
(C) Avoid open flame
(D) No direct heat on container
(E) Do not discharge
(F) Loosen

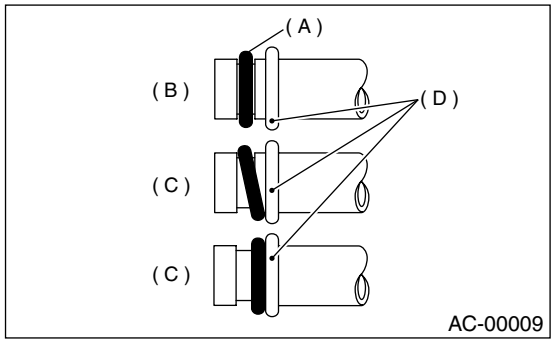
5. O-RING CONNECTIONS

• Use new O-rings.
• In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop towels.
• Apply the compressor oil to the O-rings to avoid sticking, then install them.
• Use a torque wrench to tighten the O-ring fittings: Over-tightening will damage the O-ring and tube end distortion.
• If the operation is interrupted before completing a pipe connection, recap the tubes, components, and fittings with a plug or tape to prevent contamination from entering.



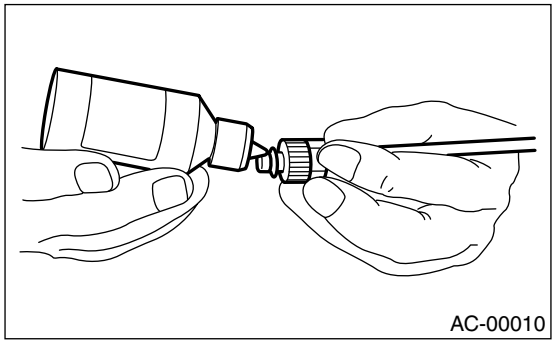
(A) Seal

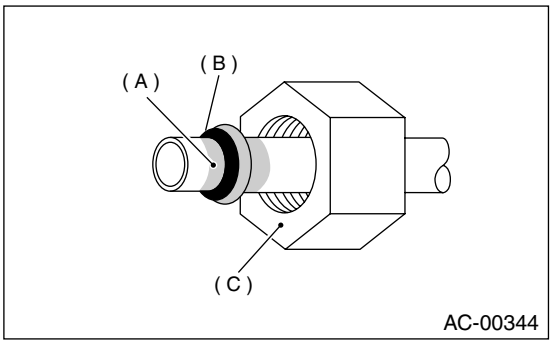
• Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
• Install the O-rings at right angle to the tube bead.



(A) O-ring
(B) OK
(C) NG
(D) Bead

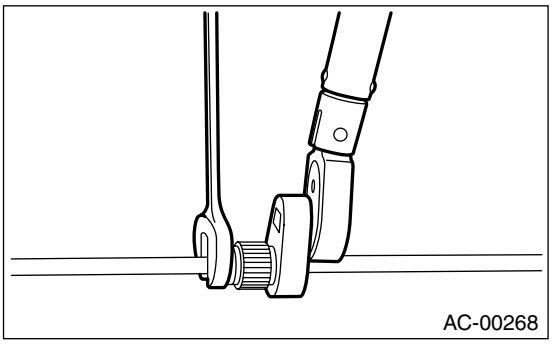
• Use the oil specified in the service manual to lubricate the O-rings.
Apply the oil to the top and sides of the O-rings before installation.
Apply the oil to the O-rings and tube limb.





(A) Apply refrigerant oil
(B) O-ring
(C) Do not apply refrigerant oil to the threads.

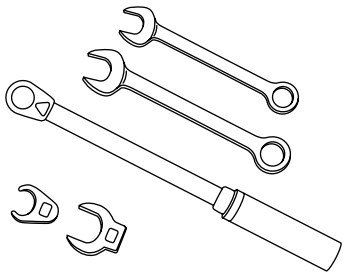
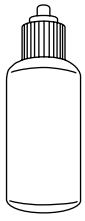
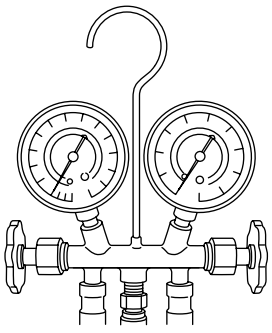
• When connecting hoses or pipes, use 2 wrenches (a torque wrench for tightening). While securing one side with a wrench, tighten the other side to the specified torque with a torque wrench.
If only one wrench is used to tighten, the tightening torque will be excessive or insufficient. This may cause a pipe distortion or gas leak, resulting in damage to hoses and pipes.
• After tightening, using a clean shop towel to remove excess oil from the connections and any oil which may have run on the vehicle body or other parts.
• If any leakage is suspected after tightening, do not retighten the connections, Disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

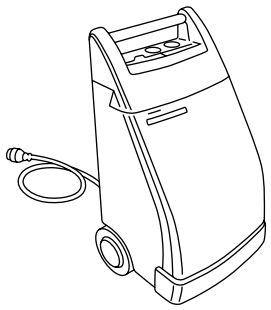
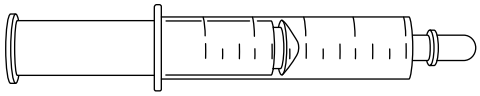
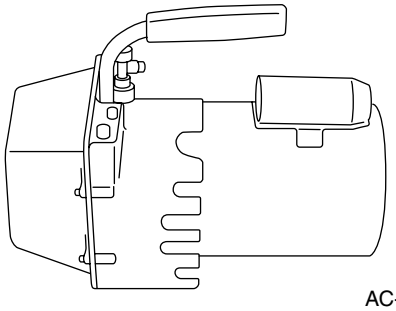
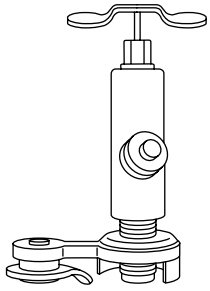
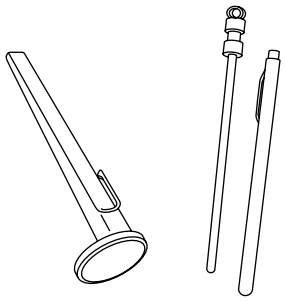


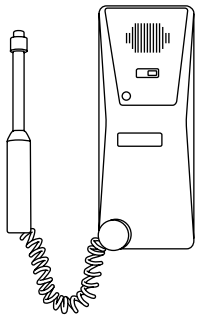
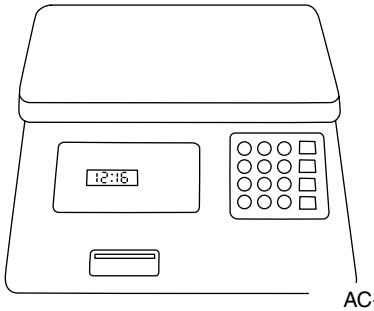
D: PREPARATION TOOL

CAUTION:
When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Tools and Equipment	Description
Wrench Various **WRENCHES** will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kg-m, 5 to 30 ft-lb) torque wrench with various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.	 AC-00347
Applicator bottle A small **APPLICATOR BOTTLE** is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.	 AC-00348
Manifold gauge set A **MANIFOLD GAUGE SET** (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.	 AC-00349

Tools and Equipment	Description
Refrigerant recovery system A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.	 AC-00350
Syringe A graduated plastic **SYRINGE** will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.	 AC-00351
Vacuum pump A **VACUUM PUMP** (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.	 AC-00352
Can tap A **CAN TAP** for the 397 g (14 oz) can is available from an auto supply store.	 AC-00353
Thermometer Pocket **THERMOMETERS** are available from either industrial hardware store or commercial refrigeration supply houses.	 AC-00354

Tools and Equipment	Description
Electronic leak detector An **ELECTRONIC LEAK DETECTOR** can be obtained from either a specialty tool supply or an A/C equipment supplier.	 AC-00355
Weight scale A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.	 AC-00356

2. Refrigerant Pressure with Manifold Gauge Set

A: OPERATION

1) Place the vehicle in the shade and draftless condition.
2) Connect the manifold gauge set.
3) Open the front windows and close all doors.
4) Open the hood.
5) Increase engine speed to 1,500 rpm.
6) Turn ON the A/C switch.
7) Turn the temperature control switch to MAX COOL.
8) Put in RECIRC position.
9) Turn the blower control switch to HI.
10) Read the gauge.

Standard:

Low pressure: 127 — 196 kPa (1.3 — 2.0 kg/cm^2, 18 — 28 psi)
High pressure: 1,471 — 1,667 kPa (15 — 17 kg/cm^2, 213 — 242 psi)
Ambient temperature: 30 — 35 °C (86 — 95 °F)

B: INSPECTION

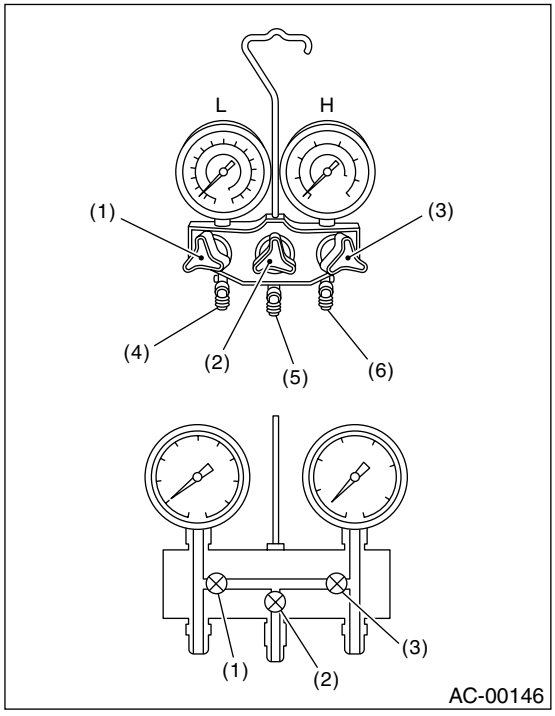
Symptom	Probable cause	Repair order
High-pressure side is unusually high.	• Defective condenser fan motor • Clogged condenser fan • Too much refrigerant • Air inside the system • Defective receiver dryer	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer.
High-pressure side is unusually low.	• Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture	• Replace the compressor. • Check for leaks. • Replace the expansion valve.
Low-pressure side is unusually high.	• Defective compressor • Defective expansion valve • Too much refrigerant	• Replace the compressor. • Replace the expansion valve. • Discharge refigerant.
Low-pressure side is unusually low.	• Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture • Saturated receiver dryer	• Check for leaks. • Replace the expansion valve • Replace the receiver dryer.

3. Refrigerant Recovery Procedure

A: OPERATION

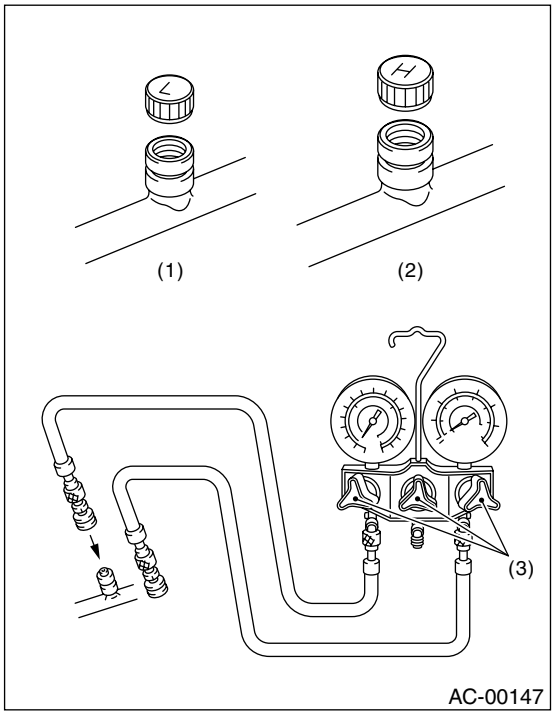
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
• When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
• Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

1) Perform the compressor oil return operation. <Ref. to AC-26, OPERATION, Compressor Oil.>
2) Stop the engine.
3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



L: Low-pressure gauge
H: High-pressure gauge
(1) Low-pressure valve
(2) Vacuum pump valve
(3) High-pressure valve
(4) For low-pressure
(5) For vacuum pump
(6) For high-pressure

4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



(1) Low service port
(2) High service port
(3) Close

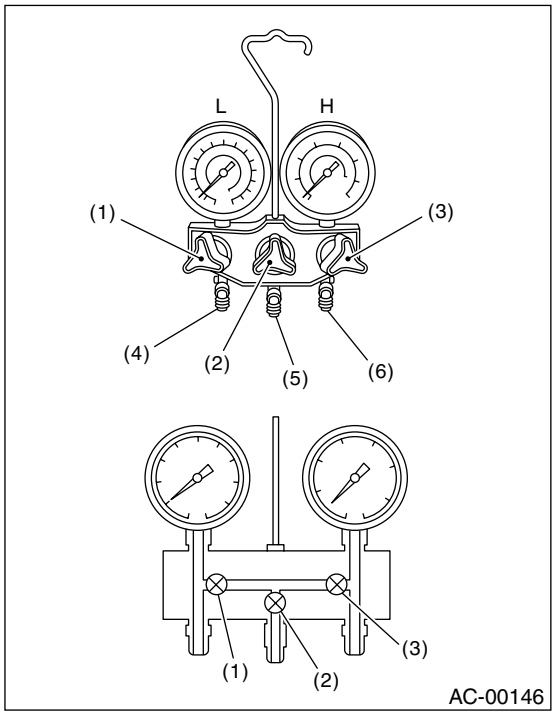
5) Connect the center hose to the refrigerant recovery system.
6) Follow the operation manual to activate the refrigerant recovery system.

4. Refrigerant Charging Procedure

A: OPERATION

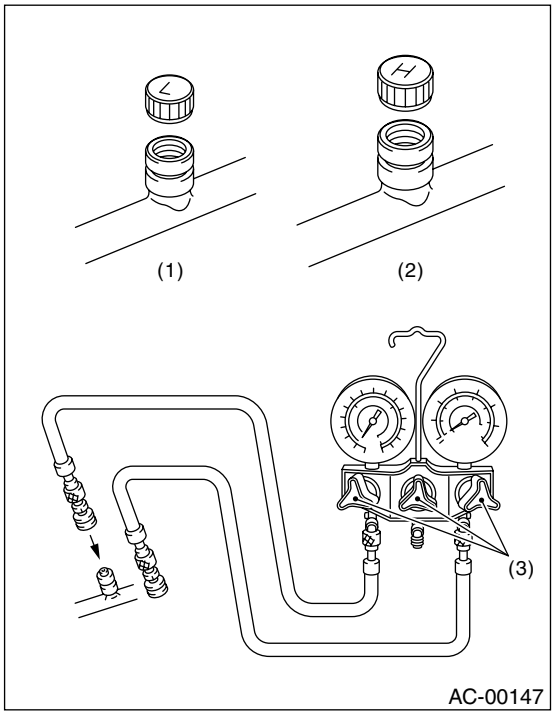
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• If air is mixed in refrigeration cycle, poor cooling may result, and also if moisture is mixed in refrigeration cycle, clogging (freezing) or rust may result.
Before charging the refrigerant, evacuate the system using vacuum pump to remove air and moisture in the system. Moisture can be evaporated and removed easily even at normal temperature, if the system is evacuated using vacuum pump.

1) Close all valves of manifold gauge.



L: Low-pressure gauge
H: High-pressure gauge
(1) Low-pressure valve
(2) Vacuum pump valve
(3) High-pressure valve
(4) For low-pressure
(5) For vacuum pump
(6) For high-pressure

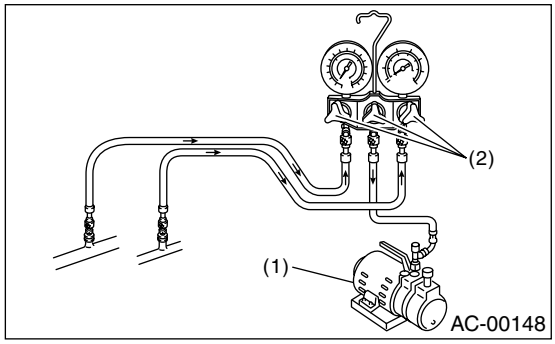
2) Install the low-/high-pressure hoses to corresponding service ports on vehicle.



(1) Low service port
(2) High service port
(3) Close

CAUTION:
Be sure that the hoses are securely connected.

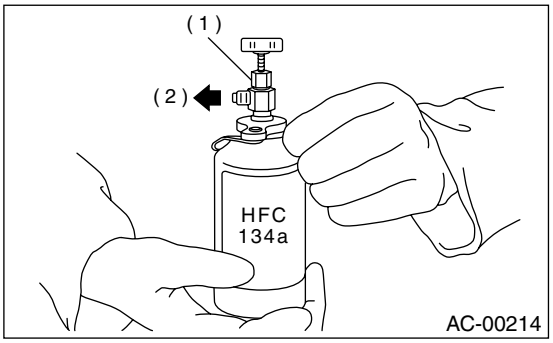
3) Connect the center hose of manifold gauge with vacuum pump.
4) Activate the vacuum pump and then open the valves on low-/high-pressure sides.



(1) Vacuum pump
(2) Open

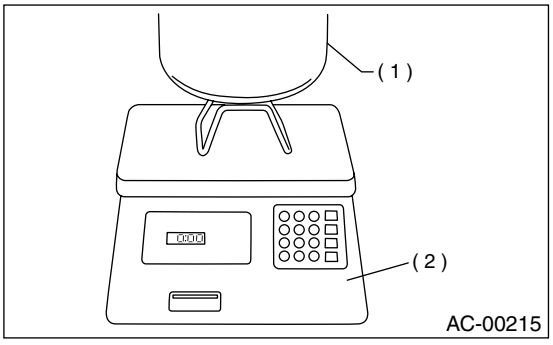
CAUTION:
Be sure to evacuate the system using vacuum pump.

5) After at least 5 minutes of evacuation, if the low-pressure gauge reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on center hose to stop the vacuum pump.
6) Leave it at least 5 to 10 minutes after closing the valves on low-/high-pressure sides, and then check the low-pressure gauge reading for any changes. When the gauge reading changes, this is a sign of leakage. Check the pipe or hose connector points, and repair if necessary. Repeat the procedure from 1) after repairing the faulty part.
7) If there are no leaks, further evacuate the system 20 to 30 minutes.
8) Close all valves and stop the vacuum pump.
9) Following the can tap operation manual instructions, install it to refrigerant can.



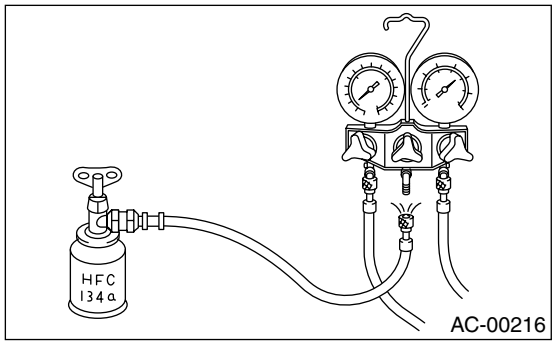
(1) Tap valve
(2) Connect to center hose

10) Disconnect the vacuum pump from center hose, and connect the hose to tap valve.
11) When a refrigerant recovery container is used, measure the refrigerant amount in use using a weighting scale before connecting to center hose.

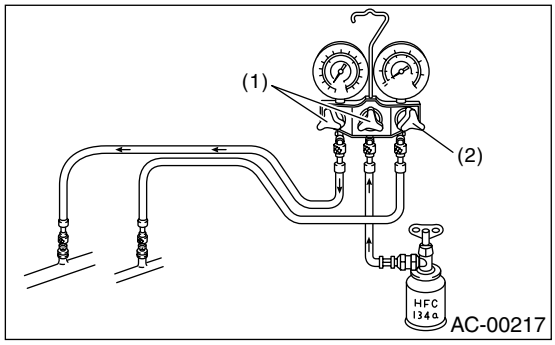


(1) Refrigerant recovery container
(2) Weighting scale

12) Open the valve on HFC-134a source.
13) Loosen the center hose connection on manifold gauge (if applicable, press a purge valve on manifold gauge) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.



14) Make sure that the high-pressure valve of manifold gauge is closed, and then open the low-pressure side valve only to charge the refrigerant.



(1) Open
(2) Close

CAUTION:
Do not open the high-pressure valve. Be sure to open the low-pressure valve.

15) Close the low-pressure valve when the low-pressure gauge reading reaches 200 kPa (1,500 mmHg, 59.1 inHg).
16) Using a leak tester, check the system for refrigerant leaks.
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.
18) If the HFC-134a source is empty, close the low-pressure valve and then close the valve on can tap before replacing the empty source. Restart charging operation after replacing the HFC-134a source with a new one and purging.
19) Close the low-pressure valve if the charge rate of refrigerant becomes worse.
20) Confirm that both the low-/high-pressure valves are closed. Start the engine with A/C switch OFF.

21) Quickly repeat A/C switch ON-OFF cycles a few times to prevent initial compressor damage.
22) Set up the vehicle to the following status:
- A/C switch ON
- Engine running at 1,500 rpm
- Blower speed setting to “Hi”
- Temperature setting to “MAX COOL”
- Air inlet setting to “RECIRC”
- Window open

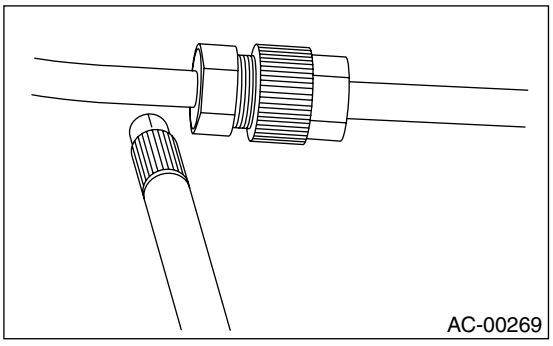
23) Open the low-pressure valve and charge the specified amount of refrigerant.
24) Close all valves and disconnect the hoses from service port after charging the refrigerant.
25) Install the cap to service port.

5. Refrigerant Leak Check

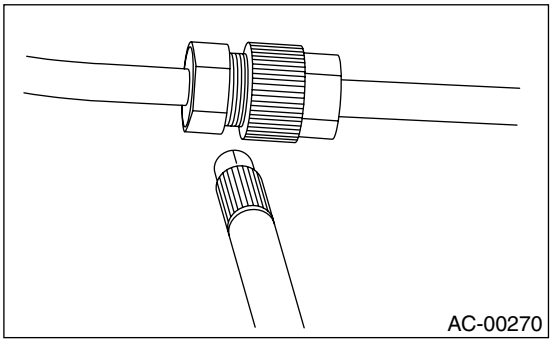
A: INSPECTION

1) Operate the A/C system for approx. 10 minutes, and confirm that the high-side pressure shows at least 690 kPa (7.03 kg/cm^2, 100 psi). Then stop the engine to start the leak test.
2) Starting from the connection between the high-pressure tube and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.

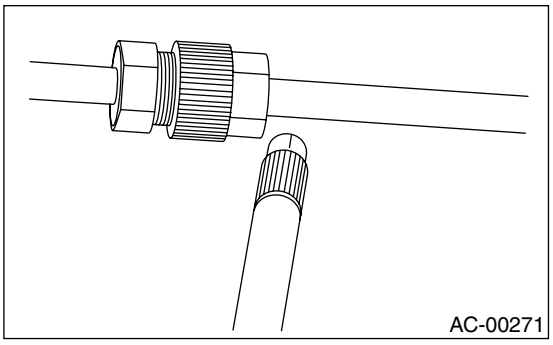
- Connection between the tube and tube fitting



- Connection between 2 parts

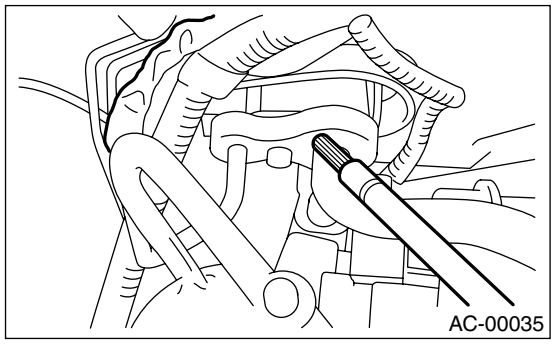


- Connection between the tube and nut



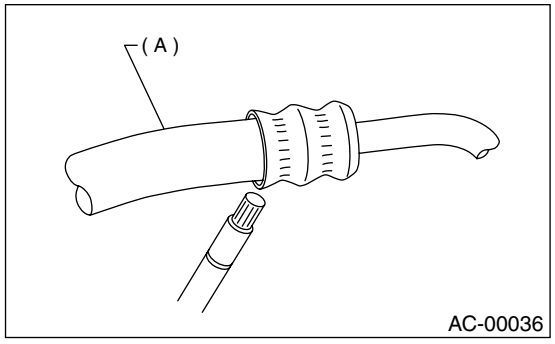
3) Check the joint between the pressure switch (dual switch) and receiver dryer.
4) Check the connections between the condenser and tubes, and welded joints on the condenser.
The leak tester may detect the oil on the condenser fins as a leak.
5) Check the joint between the compressor and hoses.
6) Check the machined area of compressor and other joints on the compressor.
7) Check the thermal limiter (if equipped) on the compressor housing.
8) Check the compressor shaft seal at the area near the center of compressor clutch pulley.
Some shaft seals show a slight amount of leakage about 10 g (0.35 oz) per year. This is not a problem.
9) Starting from the connection between the low-pressure tube and evaporator, check the system for leakage along the high-pressure side through the compressor. The following items must be checked thoroughly.

- Connection between the tube and tube fitting
- Connection between 2 parts
- Connection between the tube and nut



10) Visually check the rubber area of the flexible hose for cracks.
Check the entire length of the flexible hose, especially the connection with the metal hose end.

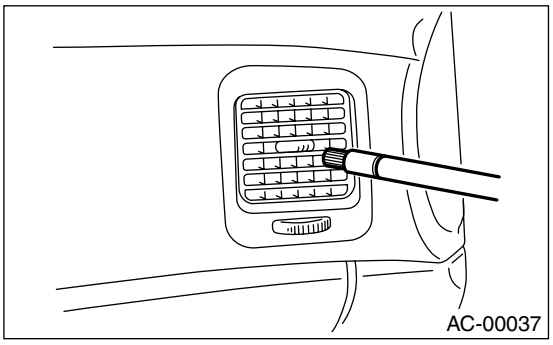
CAUTION:
Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.



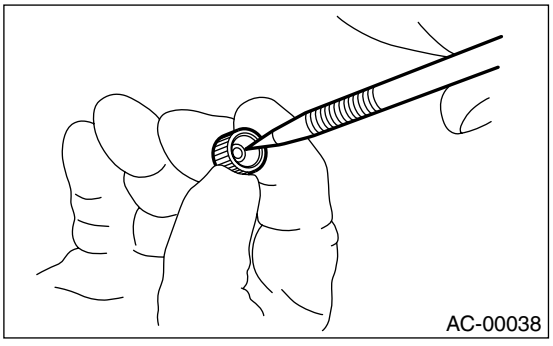
(A) Flexible hose

11) Disconnect the drain hose from the evaporator case, and check the hose end for at least 10 seconds.
After the test is finished, reconnect the drain hose.

12) Turn the ignition key to ON position, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



13) Check the valve in the service port.
14) Visually check the rubber seal in the service port cap.



6. Compressor Oil

A: OPERATION

NOTE:
Before making repairs, conduct the oil return operation to return the compressor oil in circulation with the refrigerant to the compressor.

1) Increase engine speed to 1,500 rpm.
2) Turn ON the A/C switch.
3) Turn the temperature control switch to MAX COOL.
4) Put in RECIRC position.
5) Turn the blower control switch to HI.
6) Leave in this condition for 10 minutes.

B: REPLACEMENT

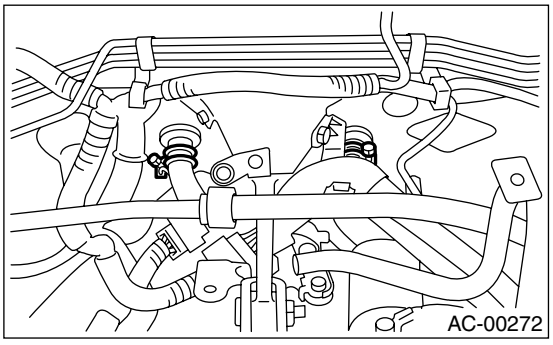
NOTE:
• If a component is replaced, add an appropriate amount of compressor oil.
• When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	114 m ℓ (3.9 US fl oz, 4.0 Imp fl oz)
Receiver drier	5 m ℓ (0.2 US fl oz, 0.2 Imp fl oz)
Condenser	2 m ℓ (0.07 US fl oz, 0.07 Imp fl oz)
Hose	1 m ℓ (0.03 US fl oz, 0.04 Imp fl oz)

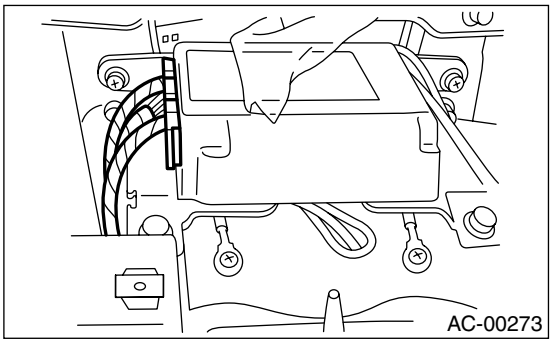
7. Heater Unit

A: REMOVAL

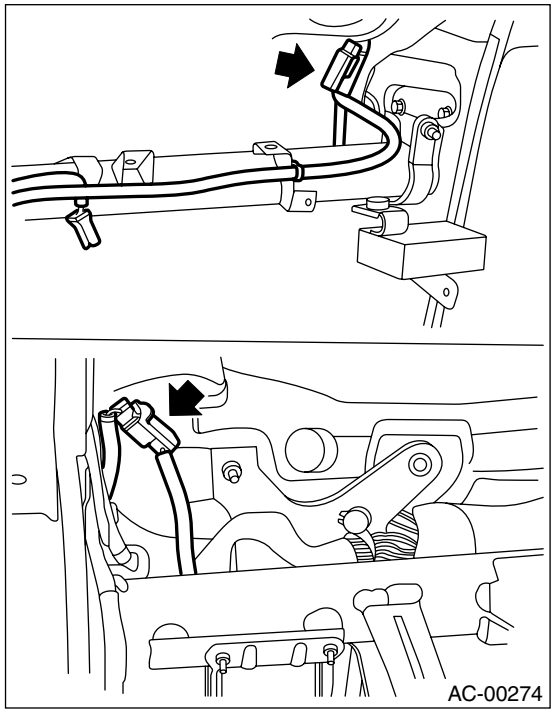
1) Disconnect ground cable from battery.
2) Pull out LLC.
3) Remove air cleaner case.
4) Release heater hose clamps in engine compartment to remove the hoses.


AC-00272

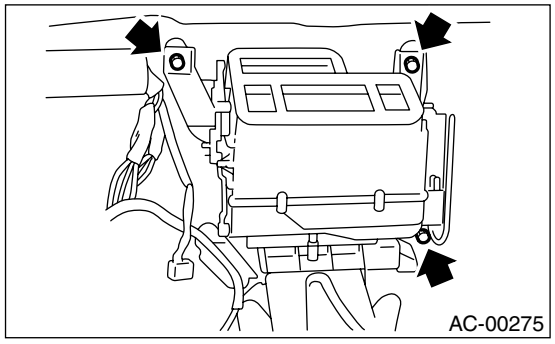
5) Remove A/C unit. <Ref. to AC-36, Intake Unit.>
6) Using a Torx® wrench, remove airbag control unit.


AC-00273

7) Disconnect connector of airbag main harness near steering support beam.


AC-00274

8) Loosen bolts and nuts of support beam to remove support beam.
9) Disconnect servo connector.
10) Loosen bolts and nuts of heater unit to remove heater unit.


AC-00275

B: INSTALLATION

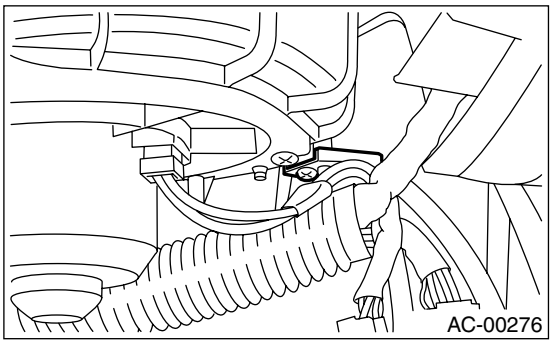
Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT of General Description
<Ref. to AC-6, HEATER UNIT, COMPONENT, General Description.>

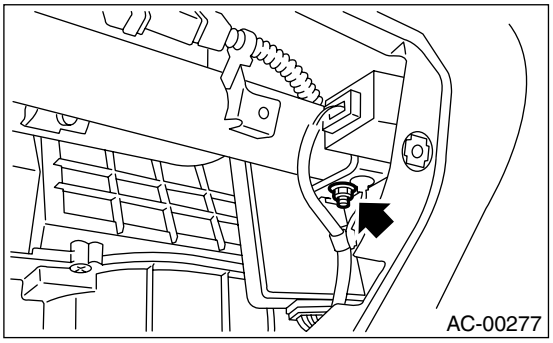
8. Blower Motor Assembly

A: REMOVAL

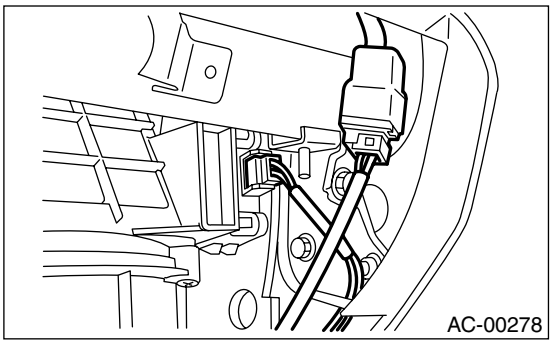
1) Disconnect ground cable from battery.
2) Remove glove box. <Ref. to EI-42, REMOVAL, Glove Box.>
3) Remove mounting bolts of harness stay.



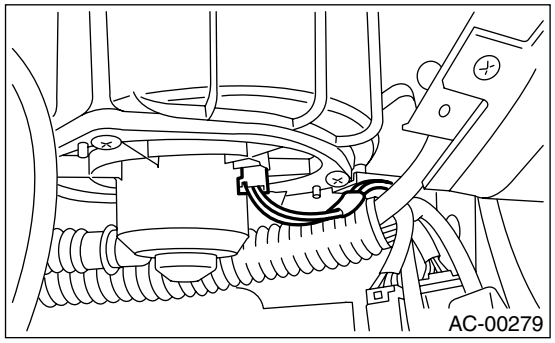
4) Remove nuts of keyless unit stay and cruise unit stay.



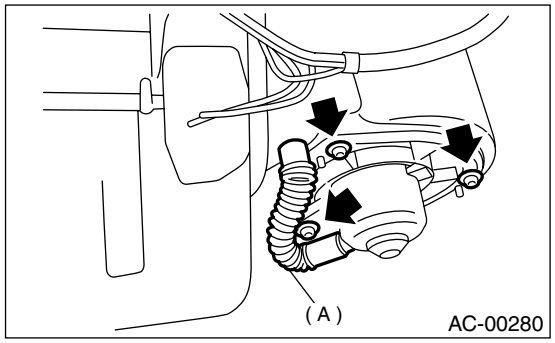
5) Disconnect connector of sunroof.
6) Disconnect servo connector.



7) Disconnect motor connector.



8) Remove 3 screws.
9) Disconnect aspirator pipe (A) and remove blower motor.

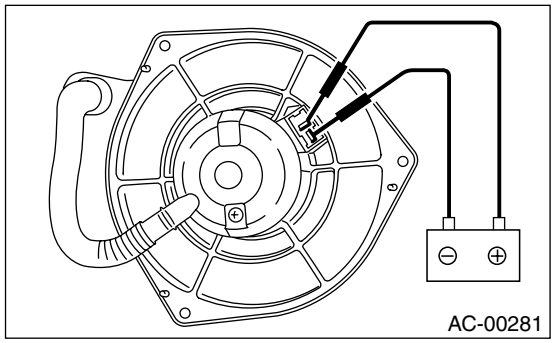


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

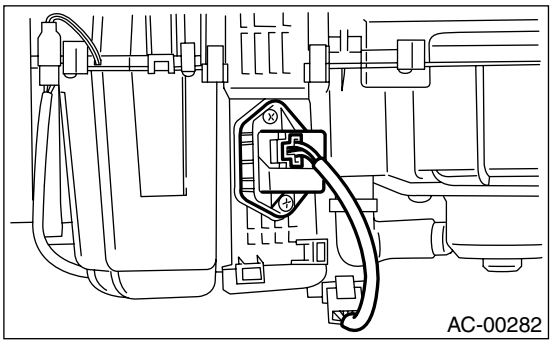
Connect motor connector terminal 1 from the battery to the positive (+) lead and terminal 2 to the negative (–) lead. Make sure the motor runs smoothly.



9. Heater Blower Resistor

A: REMOVAL

1) Remove glove box. <Ref. to EI-42, REMOVAL, Glove Box.>
2) Disconnect power transistor connector.
3) Loosen 2 screws to remove power transistor.

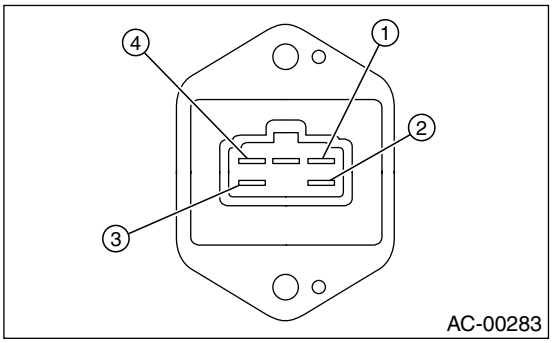


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. MANUAL A/C



Measure switch resistance.

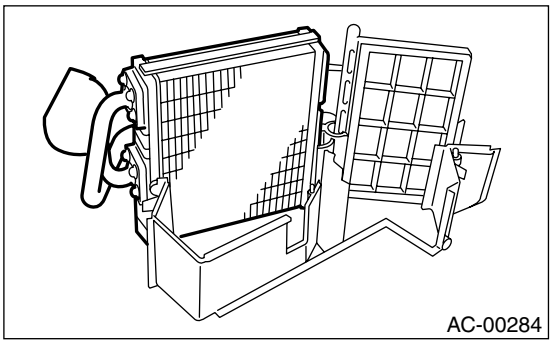
Terminal No.	Condition	Standard
4 and 3	Constant	Approx. 0.46 Ω
3 and 2	Constant	Approx. 0.85 Ω
2 and 1	Constant	Approx. 1.77 Ω

If NG, replace the blower resistor.

10.Heater Core

A: REMOVAL

1) Remove heater unit. <Ref. to AC-27, REMOVAL, Heater Unit.>
2) Remove screws to separate heater unit case.
3) Remove heater core.



B: INSTALLATION

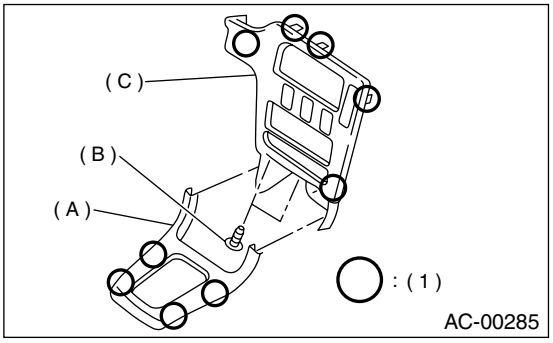
Install in the reverse order of removal.

11.Control Unit

A: REMOVAL

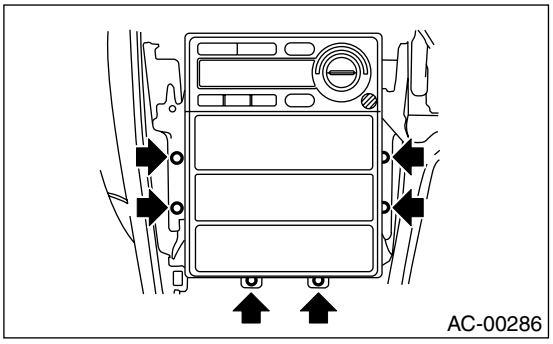
1. AUTO A/C

1) Disconnect ground cable from battery.
2) Remove front cover (A).
3) Loosen 2 screws (B) to remove center panel (C).



(1) Hook pawl

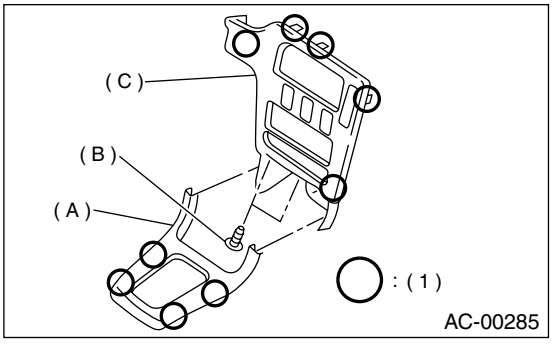
4) Loosen screws to pull control unit slightly out of center console.



5) Disconnect connector from antenna cable to remove control unit.

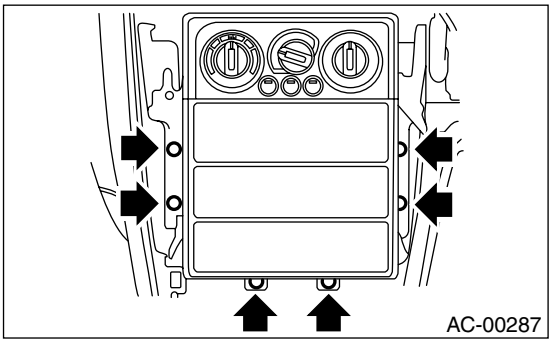
2. MANUAL A/C

1) Disconnect ground cable from battery.
2) Remove front cover (A).
3) Loosen 2 screws (B) to remove center panel (C).



(1) Hook pawl

4) Set temperature control switch to “FULL HOT”, and disconnect temperature control cable from heater unit.
5) Loosen screws to pull control unit slightly out of center console.



6) Disconnect connector from antenna cable to remove control unit.

B: INSTALLATION

1. AUTO A/C

Install in the reverse order of removal.

2. MANUAL A/C

1) Install in the reverse order of removal.
2) Before installation, set temperature control switch to “FULL HOT”.

12.Compressor

A: INSPECTION

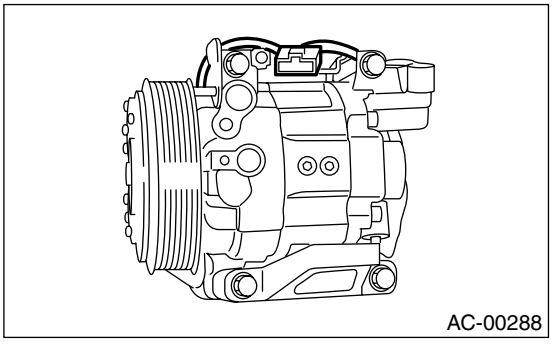
1. MAGNETIC CLUTCH CLEARANCE

1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:
0.45±0.15 mm (0.0177±0.0059 in)

2. MAGNETIC CLUTCH OPERATION

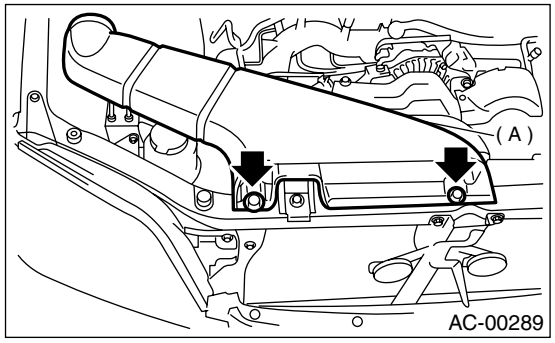
1) Disconnect the compressor connector.
2) Connect the No. 3 terminal of the compressor connector from the battery to the positive (+) lead. Ground the negative (–) lead to the body.


AC-00288

3) Make sure the magnet clutch engages.
If NG, replace the compressor.

B: REMOVAL

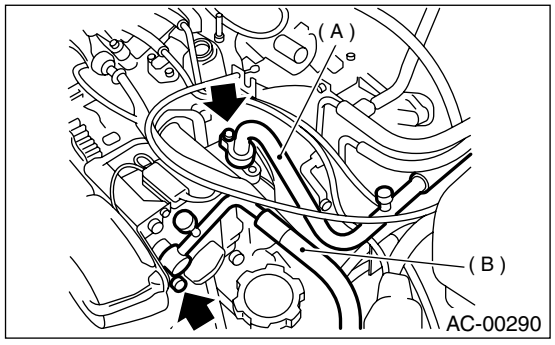
1) Perform oil return operation. <Ref. to AC-26, OPERATION, Compressor Oil.>
2) Turn A/C switch OFF and stop the engine.
3) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect ground cable from battery.
5) Remove duct (A).



AC-00289

6) Disconnect low-pressure hose (A) and high-pressure hose (B).

CAUTION:
Be careful not to lose O-rings on hose. Immediately seal hose with a plug or vinyl tape to prevent the entry of contamination.

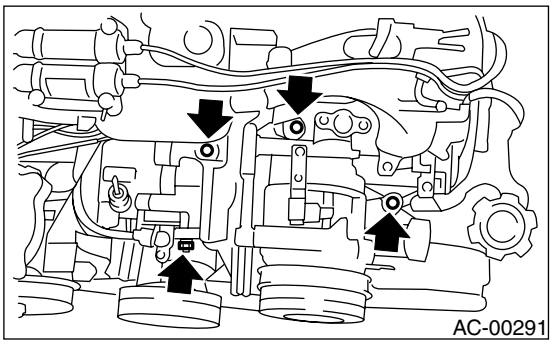


AC-00290

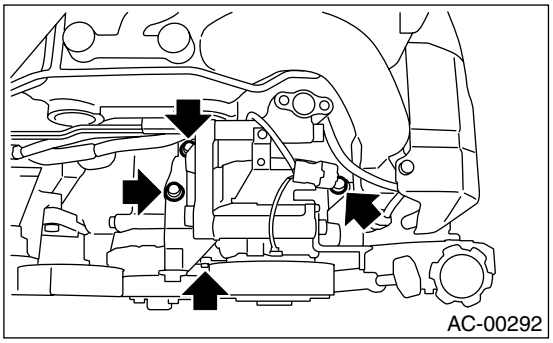
7) Remove V-belt. <Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
8) Remove generator. <Ref. to SC(H6DO)-14, REMOVAL, Generator.>
9) Disconnect compressor harness from body harness.

10) Remove bolts from compressor bracket.

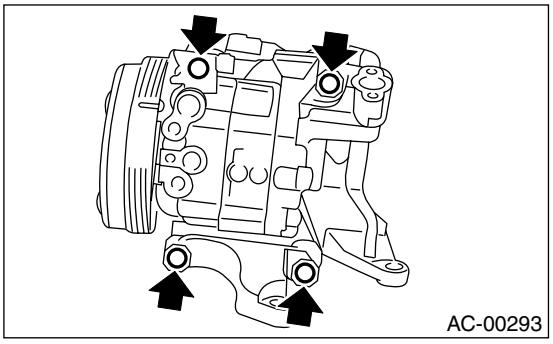
4 CYLINDERS:



6 CYLINDERS:



11) Loosen bolts to remove compressor from bracket.



C: INSTALLATION

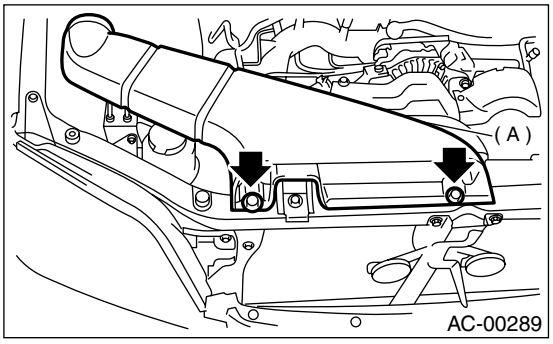
1) Install in the reverse order of removal.
2) Replace O-rings on low-/high-pressure hoses with new ones, then apply compressor oil.
3) When replacing compressor, adjust amount of compressor oil. <Ref. to AC-26, Compressor Oil.>
4) Charge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT of General Description
<Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>

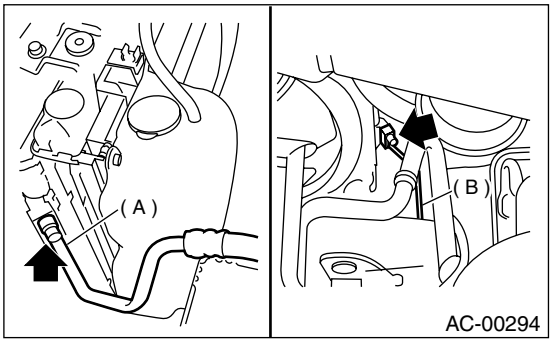
13.Condenser

A: REMOVAL

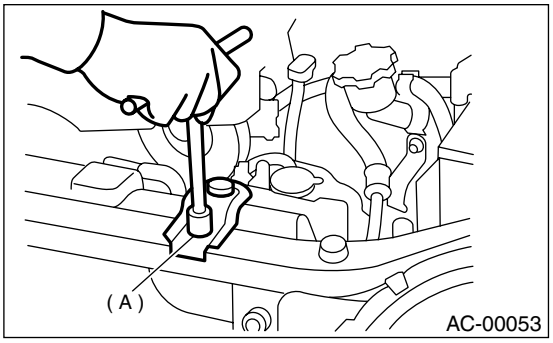
1) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, OPERATION, Refrigerant Recovery Procedure.>
2) Disconnect ground cable from battery.
3) Remove duct (A).



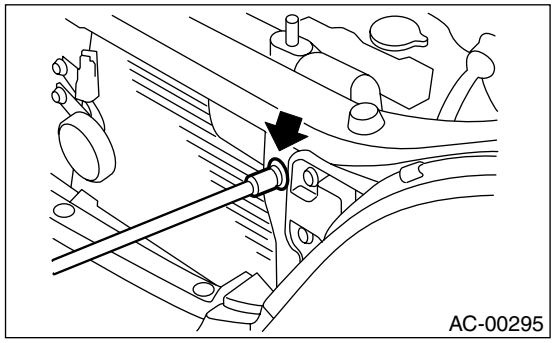
4) Disconnect high-pressure hose (A) and low-pressure hose (B) from condenser.



5) Remove radiator bracket (A).



6) Remove 2 bolts. While lifting condenser, pull it out through the space between the radiator and the radiator panel.

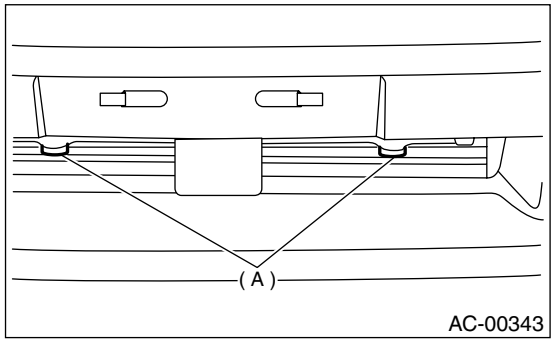


CAUTION:
Be careful not to damage condenser fins. If a damaged fin is found, repair it using a thin screwdriver.
If condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-26, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Replace O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser has been fitted into holes on radiator panel.



2) Charge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>

C: INSPECTION

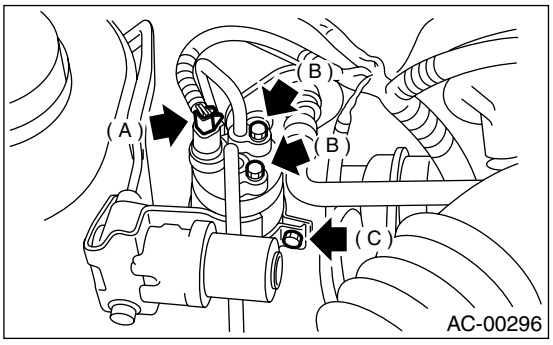
1) Confirm that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
2) Confirm that no oil leaks from condenser. If a failure is found, replace condenser with a new one.

Tightening torque:
Refer to COMPONENT of General Description
<Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>

14.Receiver Drier

A: REMOVAL

1) Disconnect ground cable from battery.
2) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, OPERATION, Refrigerant Recovery Procedure.>
3) Disconnect pressure switch harness (A).
4) Disconnect pipe (B).
5) Loosen mounting bolts (C) to remove receiver dryer.



CAUTION:
The receiver drier contains a desiccant. After disconnecting receiver drier, plug it to avoid moisture.
If receiver drier is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-26, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Replace O-rings with new ones, and apply compressor oil.

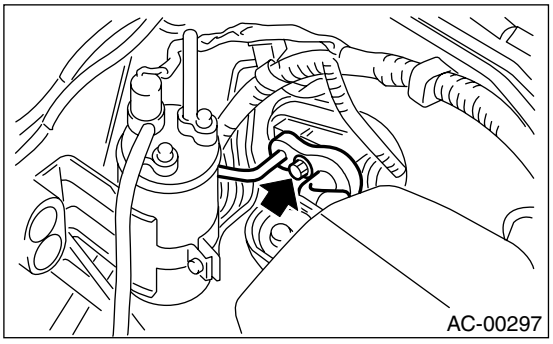
2) Charge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT of General Description
<Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>

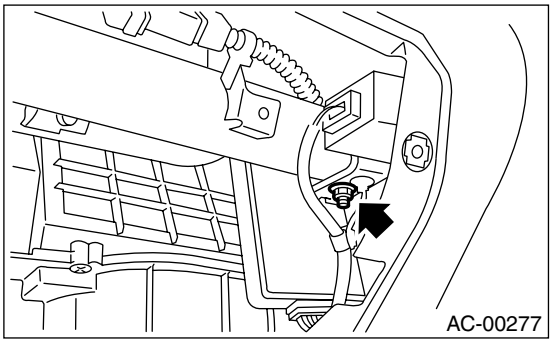
15.Intake Unit

A: REMOVAL

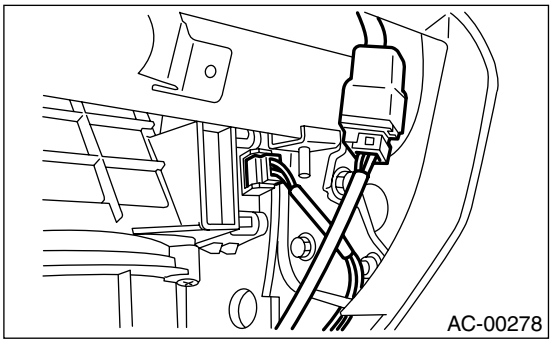
1) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, OPERATION, Refrigerant Recovery Procedure.>
2) Disconnect ground cable from battery.
3) Remove bolts securing expansion valve and pipe in engine compartment.


AC-00297

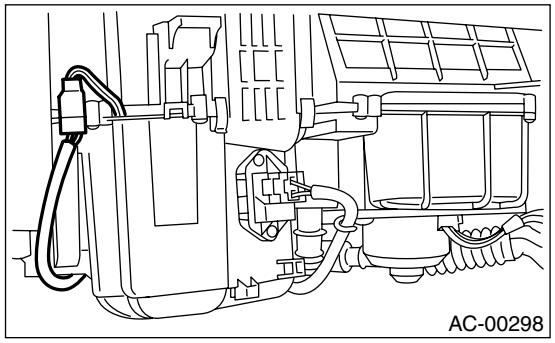
4) Remove instrument panel. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
5) Remove keyless unit and cruise unit.


AC-00277

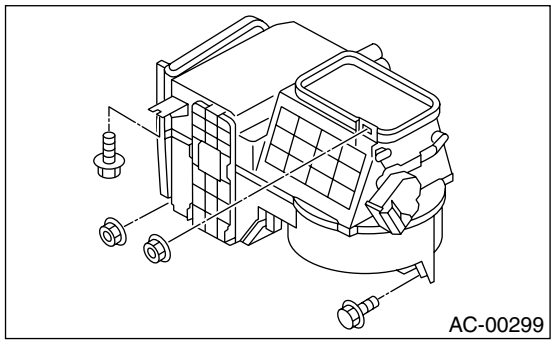
6) Disconnect sunroof connector.
7) Disconnect servo motor connector.


AC-00278

8) Disconnect blower power transistor connector.
9) Disconnect blower motor connector.
10) Disconnect evaporator sensor connector.


AC-00298

11) Remove bolts and nuts on the intake unit.


AC-00299

12) Disconnect drain hose.
13) Remove the intake unit.

B: INSTALLATION

1) Install in the reverse order of removal.

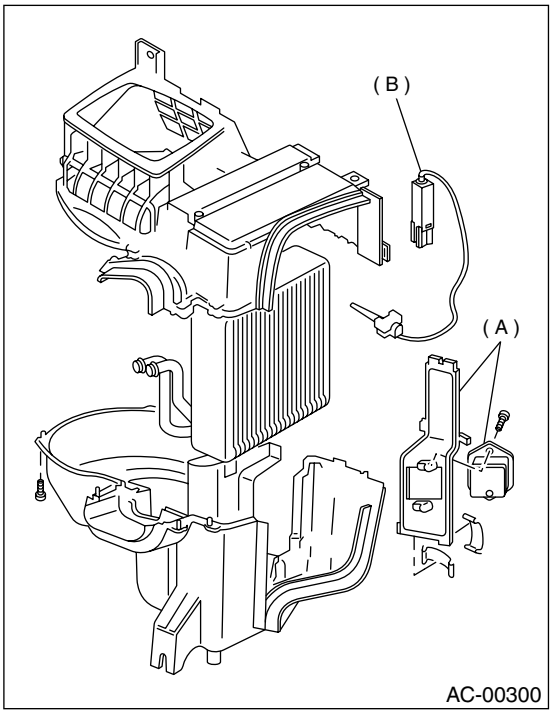
CAUTION:
Replace O-rings with new ones, and apply compressor oil.

Tightening torque:
Refer to COMPONENT of General Description
<Ref. to AC-7, INTAKE UNIT WITH EVAPORATOR, COMPONENT, General Description.>

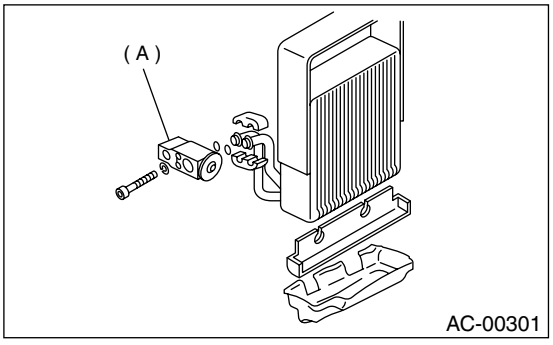
2) Charge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>

C: DISASSEMBLY

1) Remove resistor (A) and thermistor (B) from intake unit case.
2) Remove screws and clips to separate intake unit.



3) Remove expansion valve (A) from evaporator.



CAUTION:
If evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-26, REPLACEMENT, Compressor Oil.>

D: ASSEMBLY

Assemble in the reverse order of disassembly.

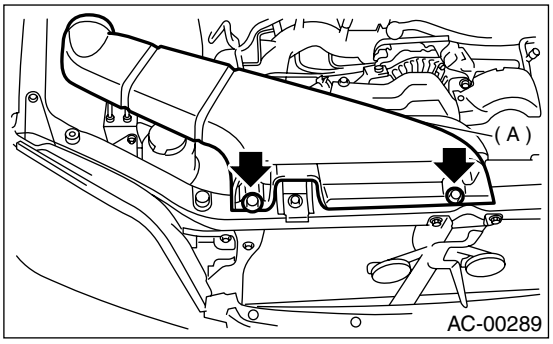
CAUTION:
Replace O-rings with new ones, and then apply compressor oil.

16.Flexible Hose

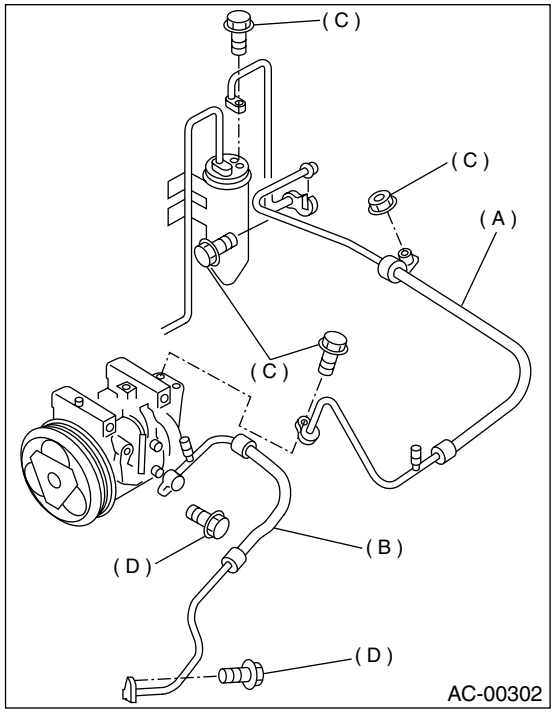
A: REMOVAL

CAUTION:
• When disconnecting/connecting hoses, do not apply excessive force them. Confirm that no torsion and excessive tension exist after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

1) Disconnect ground cable from battery.
2) Using refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, OPERATION, Refrigerant Recovery Procedure.>
3) Remove duct (A).



4) Remove hose attaching bolts (C).
5) Disconnect hose from evaporator unit.
6) Disconnect hose from compressor.
7) Remove low-pressure hose (A) from the vehicle.
8) Remove hose attaching bolts (D).
9) Disconnect hose from compressor.
10) Disconnect hose from condenser.
11) Disconnect high-pressure hose (B) from the vehicle.



B: INSTALLATION

CAUTION:
When disconnecting/connecting hoses, do not apply an excessive force them. Confirm that no torsion and excessive tension exist after installing. Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Charging Procedure.>

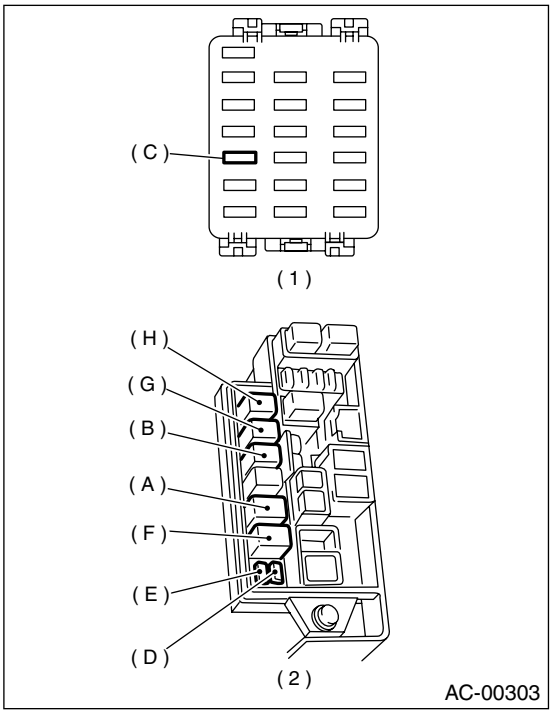
Tightening torque:
Refer to COMPONENT of General Description
<Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

NOTE:
If cracking, damage, or swelling is found on a hose, replace it with a new one.

17.Relay and Fuse

A: LOCATION

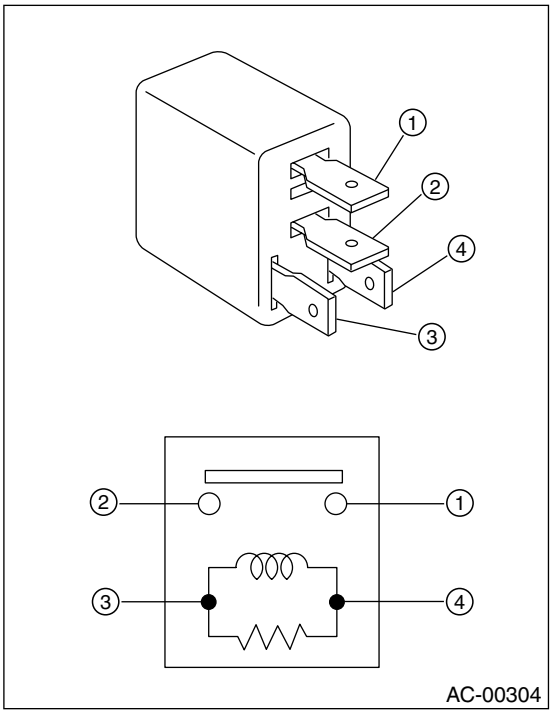


(1) Joint box
(2) Main fuse box

	4 cylinder non-TURBO engine model	4 cylinder TURBO engine model	6 cylinder engine model
Main fan relay	F	F	—
Sub fan relay	B	B	—
Fan mode relay	—	H	—
A/C relay	A	A	A
Main fan relay 1	—	—	F
Sub fan relay 1	—	—	G
Main fan relay 2	—	—	B
Sub fan relay 2	—	—	H
A/C fuse	C	C	C
Main fan fuse	E (20 A)	E (30 A)	E (30 A)
Sub fan fuse	D (20 A)	D (30 A)	D (30 A)

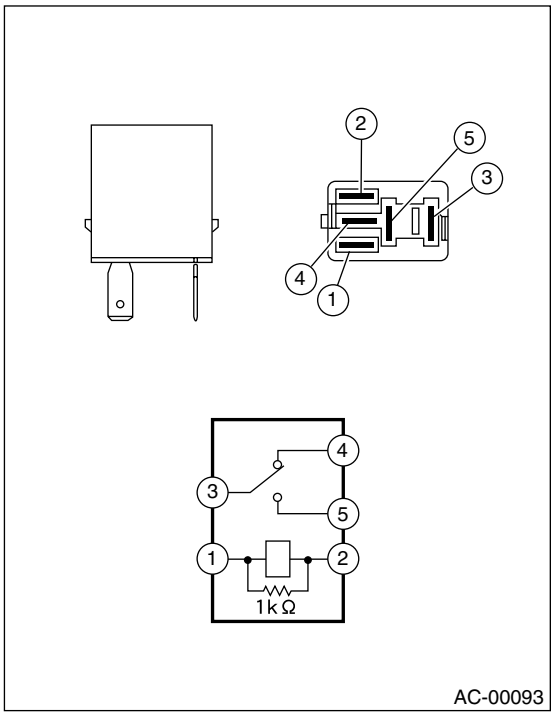
B: INSPECTION

1. 4-TERMINAL TYPE



(3) — (4): Continuity exists.
(1) — (2): No continuity
While applying battery voltage to the terminal between (3) and (4), check continuity between (1) and (2).
If no continuity exists, replace the relay with a new one.

2. 5-TERMINAL TYPE

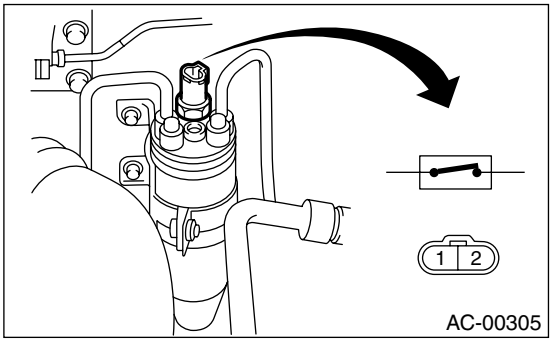


(1) — (2): Continuity exists.
(3) — (4): Continuity exists.
(3) — (5): No continuity
While applying battery voltage to the terminal between (1) and (2), check continuity between (3) and (5).
If no continuity exists, replace the relay with a new one.

18.Pressure Switch (Dual Switch)

A: INSPECTION

1) Connect the manifold gauge to the service valve on the high-pressure side.
2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.

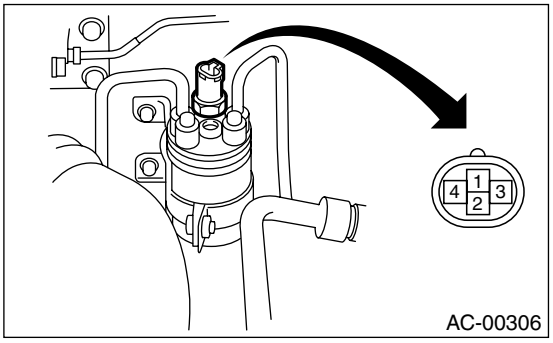


	Tester connection	Operation	Specified condition kPa (kg/cm^2, psi)
High and low pressure switch	1 — 2	Turns OFF.	Increasing to 2,942±196 (30±2, 427±28)
			Decreasing to 177±25 (1.8±0.25, 25.6±3.6)
		Turns ON.	Increasing to 216 (2.2, 31) or less
			Decreasing to 2,354±196 (24±2, 341±28)

19.Pressure Switch (Triple Switch)

A: INSPECTION

1) Connect the manifold gauge to the service manifold on the high-pressure side.
2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.

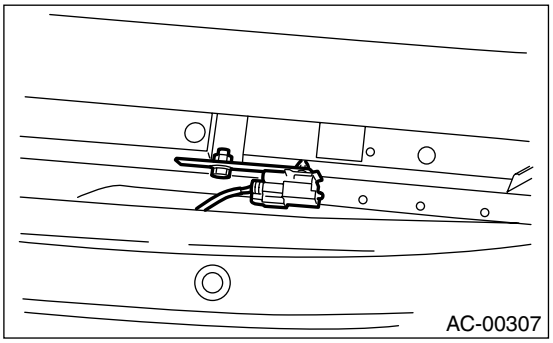


	Tester connection	Operation	Specified condition kPa (kg/cm^2, psi)
High and low pressure switch	1 — 2	Turns OFF.	Increasing to 2,940±196 (29.98±2.00, 426±28)
			Decreasing to 177±20 (1.8±0.2, 26±3)
		Turns ON.	Increasing to 216 or less (2.2, 31)
			Decreasing to 2,350±196 (23.97±2.00, 341±28)
Middle pressure switch	3 — 4	Turns OFF.	1,370±120 (13.97±1.22, 199±17)
		Turns ON.	1,770±100 (18.05±1.02, 257±15)

20.Ambient Sensor (Auto A/C)

A: REMOVAL

1) Open front hood.
2) Disconnect ground cable from battery.
3) Disconnect ambient sensor connector.
4) Remove ambient sensor from radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

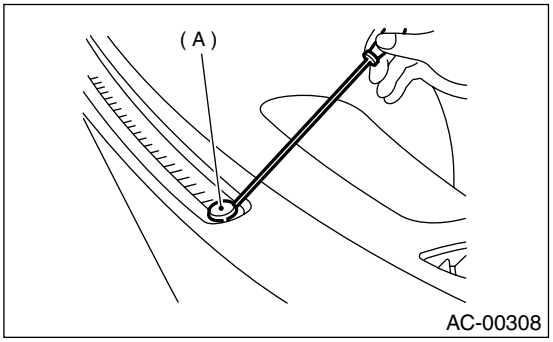
C: INSPECTION

<Ref. to AC-24, DTC 21 OR –21 (AMBIENT SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

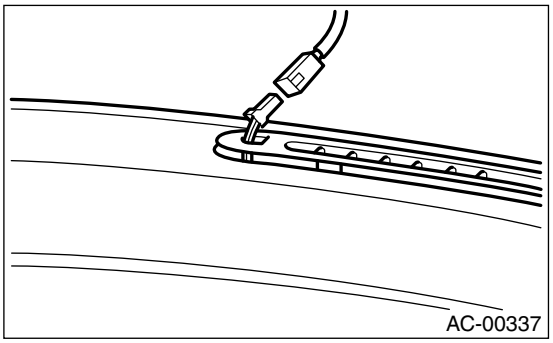
21.Sunload Sensor (Auto A/C)

A: REMOVAL

1) Disconnect ground cable from battery.
2) Insert a screwdriver to remove sunload sensor.



3) Disconnect sunload sensor connector.



CAUTION:
Be careful not to damage sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

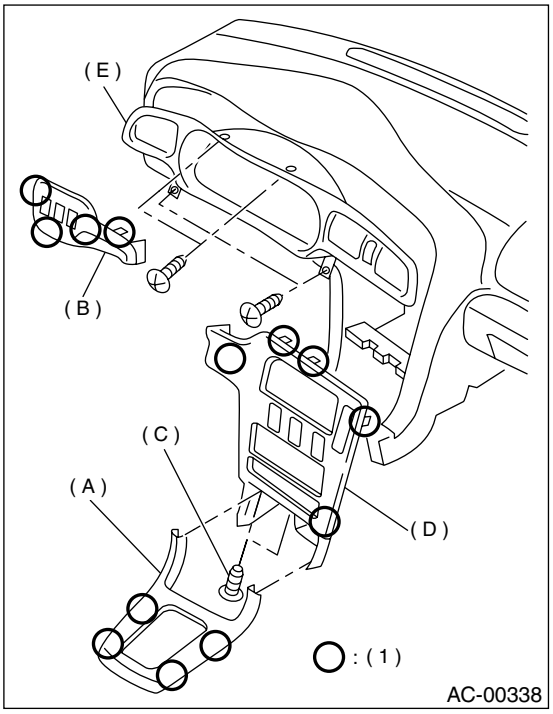
<Ref. to AC-30, DTC 25 OR –25 (SUNLOAD SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

22.Air Vent Grille

A: REMOVAL

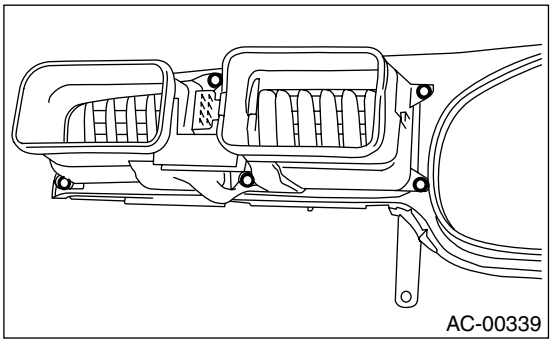
1. AIR VENT GRILLE DRIVER SIDE

1) Disconnect ground cable from battery.
2) Set tilt steering to the lowest position.
3) Disconnect each harness connector to remove front cover (A) and switch panel (B).
4) Loosen screw (C) to remove center panel (D).
5) Remove meter visor (E).



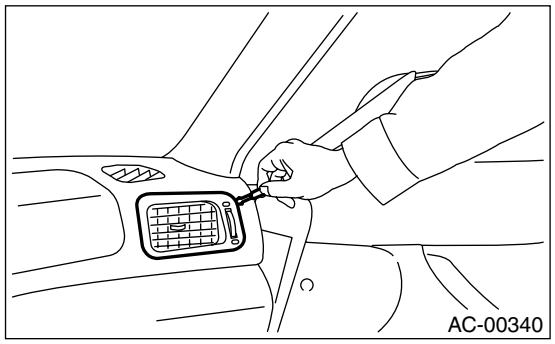
(1) Hook pawl

6) Loosen screws to remove grille.



2. AIR VENT GRILLE PASSENGER SIDE

1) Remove grille using screwdriver.



CAUTION:
Wrap screwdriver with vinyl tape to prevent damage to interior parts.

B: INSTALLATION

Install in the reverse order of removal.

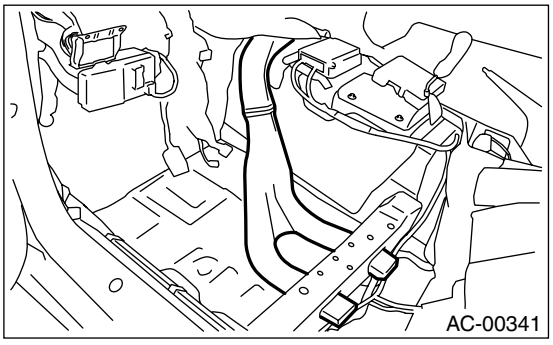
C: INSPECTION

The direction and amount of air should be adjusted smoothly.
The adjustment should be kept in each position.

23.Heater Duct

A: REMOVAL

1) Remove heater unit. <Ref. to AC-27, REMOVAL, Heater Unit.>
2) Remove front seat. <Ref. to SE-8, REMOVAL, Front Seat.>
3) Remove front side sill cover.
4) Pull off floor mat to remove heater duct.



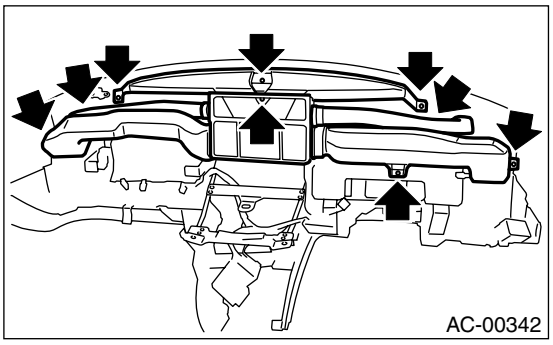
B: INSTALLATION

Install in the reverse order of removal.

24.Heater Vent Duct

A: REMOVAL

1) Remove instrument panel. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
2) Remove 9 screws.
3) Remove heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

25.General Diagnostics

A: INSPECTION

Symptom		Repair order
Blower motor	Doesn't move.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resistor
		Blower switch
		Wire harness
	Strange noise.	Blower motor
Compressor	Doesn't move.	Refrigerant
		Fuse
		Air conditioning relay
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
	Strange noise	V-Belt
		Magnet clutch
		Compressor
Cold air not emitted.		Refrigerant
		V-Belt
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
		Heater duct
		Heater vent duct
Warm air not emitted.		Engine coolant
		Blower switch
		Heater core
Temperature of air from vents does not change.		Engine coolant
		Mode actuator
		Wire harness
Unable to switch blow vents.		Mode actuator
		Air flow switch
		Wire harness
Unable to switch suction vents.		Air inlet select switch
		FRESH/RECIRC actuator
		Wire harness

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC

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5.	Self-Diagnosis Procedure	9
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7.	List of Diagnostic Trouble Code (DTC)	22
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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**START INSPECTIONS.** 1) Perform pre-inspection. 2) Perform self-diagnosis. <Ref. to AC-9, OPERATION, Self-Diagnosis Procedure.>	Dose self-diagnosis operate?	Go to step **2.**	<Ref. to AC-12, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure.>
2	**CHECK DTC.** Check DTC.	Is DTC indicated?	<Ref. to AC-24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK BLOWER MOTOR OPERATION.** 1) Turn blower switch ON. 2) Check blower motor operation.	Is blower motor rotated?	Go to step **4.**	<Ref. to AC-14, BLOWER MOTOR DOES NOT ROTATE, Diagnostics for A/C System Failure.>
4	**CHECK FRESH/RECIRC MODE.** Change FRESH/RECIRC mode by pushing mode switch.	Is FRESH/RECIRC mode changed?	Go to step **5.**	<Ref. to AC-20, FRESH/RECIRC DOES NOT CHANGE, Diagnostics for A/C System Failure.>
5	**CHECK COMPARTMENT TEMPERATURE.** 1) Turn A/C switch ON. 2) Set temperature at 18°C (65°F) (MAX COOL). 3) Check compartment temperature changes.	Is the compartment temperature changed?	Go to step **6.**	<Ref. to AC-16, COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM “SET” TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure.>
6	**CHECK A/C SYSTEM RESPONSE.** Change the temperature setting, and check response of A/C system.	Dose A/C system respond quickly?	A/C system is OK.	<Ref. to AC-16, COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM “SET” TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Failure.>

2. General Description

A: CAUTION

1) Never connect the battery in reverse polarity.
• The auto A/C control module may be destroyed instantly.
2) Do not disconnect the battery terminals while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as A/C control module.
3) Before disconnecting the connectors of each sensor and the A/C control module, be sure to turn off the ignition switch.
• Otherwise, the Auto A/C control module may be damaged.
4) Every auto A/C-related part is a precision part. Do not drop them.
5) Airbag system wiring harness is routed near the A/C control panel (A/C control module) and junction box.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage Airbag system wiring harness when servicing the A/C control panel (A/C control module) and junction box.

B: INSPECTION

Before performing diagnosis, check the following items which might affect engine problems.

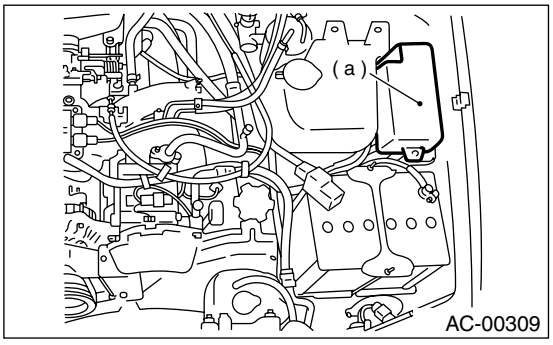
1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the fuses for A/C, heater and other fuses.

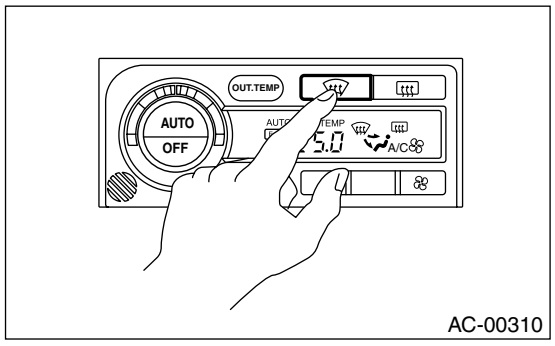


(a) Main fuse box

3) Check the condition of the harnesses and harness connectors connection.

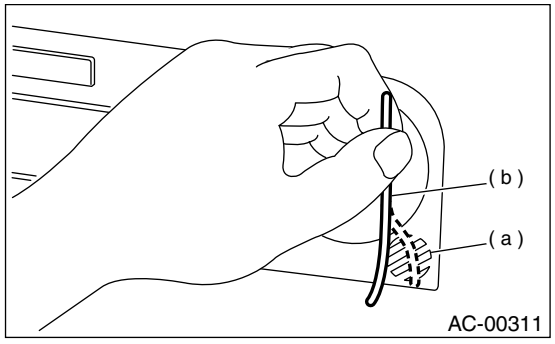
2. ASPIRATOR HOSE

1) Turn ignition switch to ON.
2) Push “DEF” switch and then blower fan switch to turn the blower fan to maximum speed.

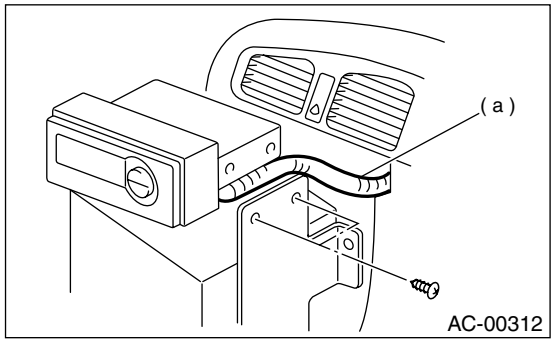


3) Firmly hold a thin thread (b) in front of the in-vehicle sensor suction port (a) for the auto A/C control unit and check that the thread moves towards the port indicating that air is being sucked into the port.

NOTE:
• Ensure the thread does not get sucked into the port.

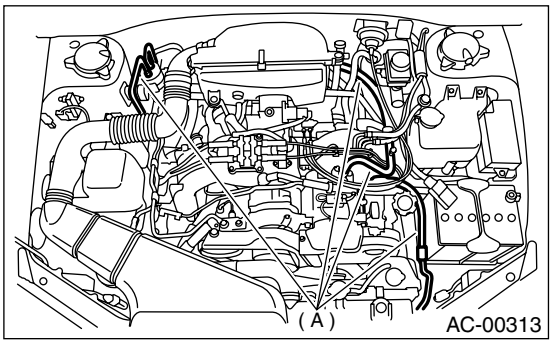


4) If the thread does not move at all, remove the auto A/C control unit <Ref. to AC-31, REMOVAL, Control Unit.> and check for improper connection of the aspirator hose (a) and auto A/C control unit and secure as necessary.



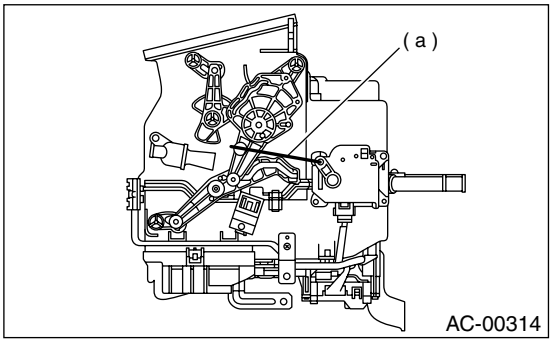
3. REFRIGERANT LINE

Check contact for refrigerant line (A).



4. CONTROL LINKAGE

1) Check state of mode door control rod and linkage.
2) Check state of air mix door control rod and linkage.
3) Check state of intake door control rod and linkage.



(a) Control rod

5. CONTROL SWITCHES

Start and warm up engine completely.
1) Inspection using switches.

No.	Point to check	Switch operation	Judgement standard
1	OFF switch	OFF switch “ON”	“SET” temperature display go out. • Air flow → OFF • Outlet → HEAT • Inlet → FRESH • Compressor → OFF
2	AUTO switch	A. AUTO switch “ON” B. Temp. control dial 18°C (65°F) (Max. Cold)	a. AUTO switch display illuminates. b. • Outlet air → Cool • Air flow → HI (AUTO) • Outlet → VENT • Inlet → AUTO • Compressor → AUTO
		C. TEMP control dial is gradually set from 18°C (65°F) to 32°C (85°F).	c. Air and air outlet mode change as follows: • Outlet air: cool → hot • Air flow: AUTO • Outlet: VENT → BI-LEVEL → HEAT • Inlet: AUTO
		D. Temp. control dial 32°C (85°F) (Max. Hot)	d. Outlet air → Hot • Air flow → HI (AUTO) • Outlet → HEAT • Inlet → FRESH (AUTO) • Compressor → AUTO
3	DEF switch	A. DEF switch “ON” B. Temp. control dial 18 — 32°C (65 — 85°F)	a. DEF switch display illuminates. b. • Outlet air temperature (AUTO control) • Air flow (AUTO control) • Outlet → DEF • Inlet → FRESH • Compressor → ON
4	FRESH/RECIRC switch	FRESH/RECIRC switch “ON”	Changes from RECIRC → FRESH, or FRESH → RECIRC.
5	MODE switch	MODE switch “ON”	Outlet changes from VENT → BI-LEVEL → HEAT → DEF/HEAT each time MODE switch is pushed.
6	FAN switch	FAN switch “ON”	Fan speed changes from LO → M1 → M2 → HI each time FAN switch is pushed.
7	OUT-TEMP switch	OUT-TEMP switch “ON”	Ambient temperature flashes on “set” temperature display, and “set” temperature appears.

2) Compressor operation inspection

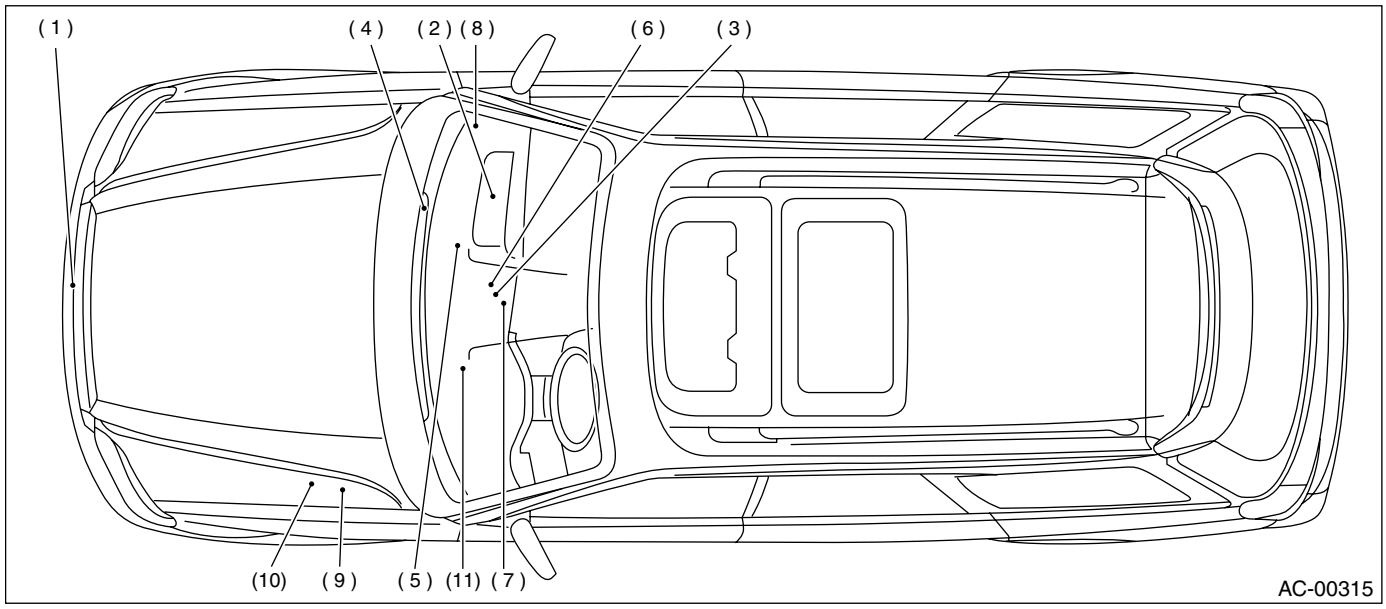
No.	Point to check	Switch operation	Judgement standard	Remarks
1	Compressor	A. AUTO switch “ON” B. A/C switch “ON” C. DEF switch “ON”	a. Compressor ON b. Compressor ON c. Compressor ON	Compressor turns OFF several seconds after AUTO switch is turned ON.

3) Illumination control inspection

No.	Point to check	Switch operation	Judgement standard	Remarks
1	Illumination	Lighting switch “ON”	Illumination light illuminates and both switch light and “set” temperature display dim.	Green lights remain on although OFF and OUT-TEMP switches remain ON.
		Press OFF switch longer than 1 second.	Dimming of illumination is canceled.	

3. Electrical Components Location

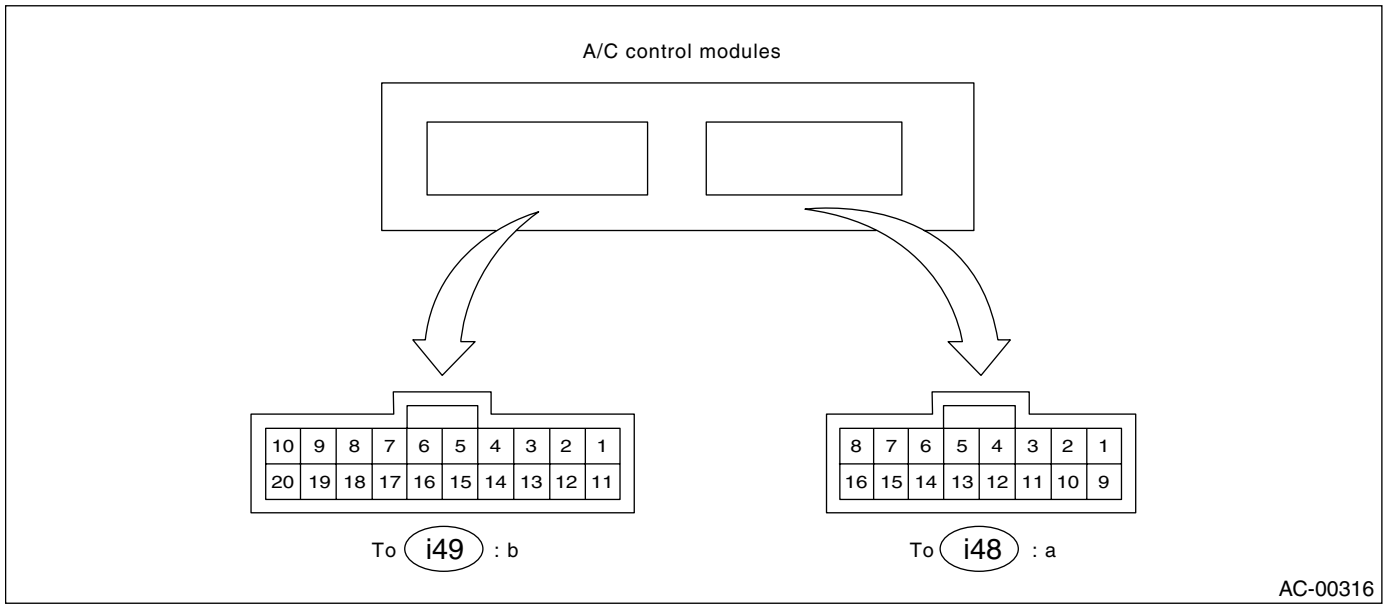
A: LOCATION



(1) Ambient sensor
(2) Blower motor
(3) In-vehicle sensor
(4) Sunload sensor
(5) Evaporator sensor
(6) Auto A/C control module
(7) Air mix door actuator
(8) Intake door actuator
(9) A/C relay
(10) A/C fuse
(11) Mode door actuator

4. A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



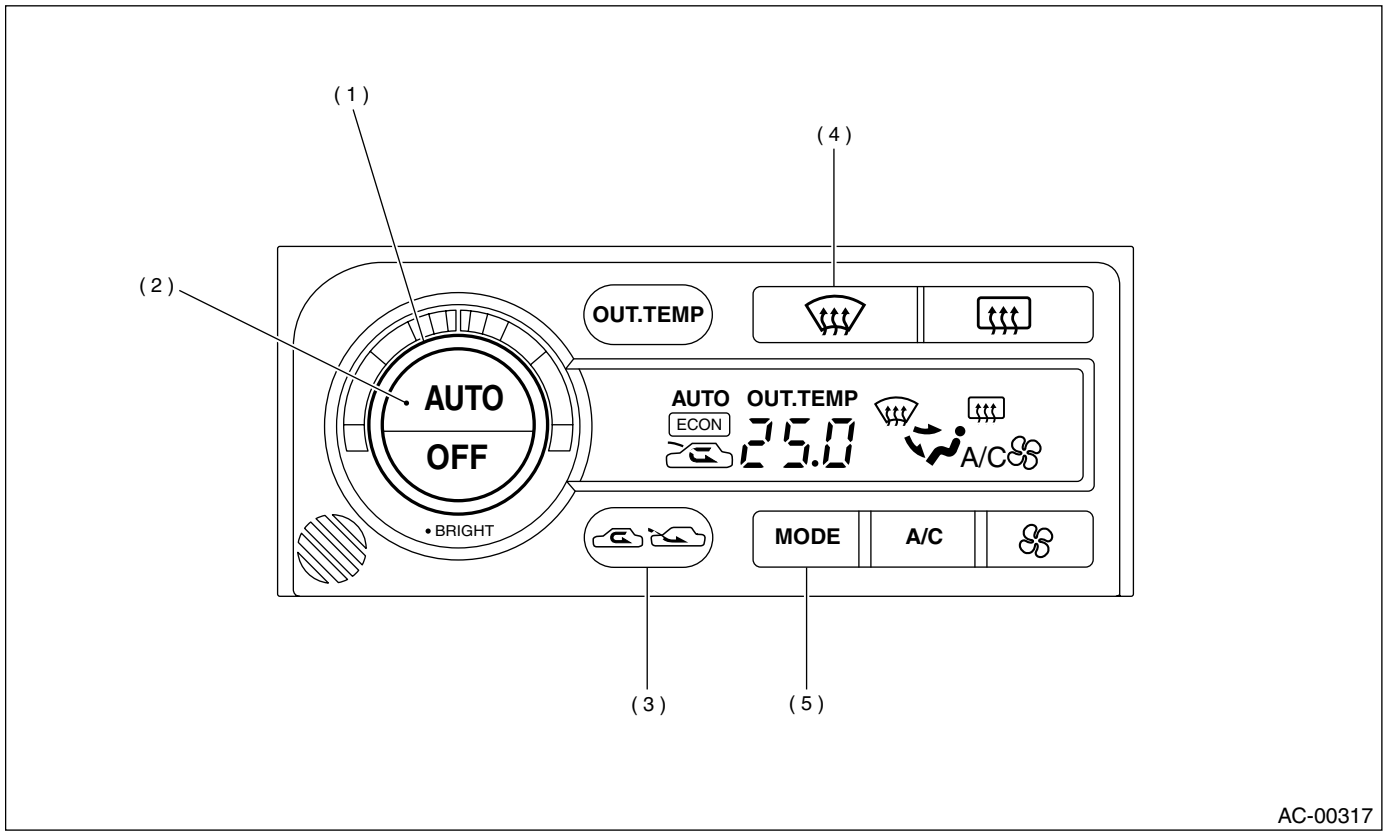
Content	Connector & Terminal No.	Signal (V)
BATT voltage (Memory back-up)	b1—b12	BATT voltage, 13 — 14 (engine running)
IGN power supply	a8—b12	Battery voltage (ignition switch ON), 13 — 14 (engine running)
ACC power supply (OFF: ignition in START or diagnosis system reset)	b2—b12	BATT voltage, 0 (engine cranking), BATT voltage (during engine starts)
A/C control module ground circuit	b12—body ground	0 (ignition switch ON) — circuit constantly grounded
Sensor ground circuit	b17—body ground	0 (ignition switch ON) — circuit constantly grounded
Ambient sensor	b6—b17	Approx. 3.3 (disconnect connector, and ignition switch ON)
Evaporator sensor	b7—b17	
Thermometer	b15—b12	
Sunload sensor	b16—b17	Approx. 4.2 (disconnect connector, and ignition switch ON)
Air mix door actuator	a4—a3	BATT voltage (AUTO mode) positive “+” at terminal “a4” and negative “–” at “a3” [temperature set at 18°C (65°F)]; negative “–” at terminal “a4” and positive “+” at “a3” [temperature set at 32°C (90°F)]
Air mix door actuator P.B.R.	a12—b17	Approx. 0.5 [temperature set at 18°C (65°F) in AUTO mode] Approx. 4.5 [temperature set at 32°C (90°F) in AUTO mode]
Mode actuator VENT	a5—b17	BATT voltage (ignition switch ON in MANUAL mode); positive “+” at terminal “a5” and negative “–” at “b17” (VENT); negative “–” at “a5” and positive “+” at “b17” (DEF)
Mode actuator DEF	a6—b17	BATT voltage (ignition switch ON in MANUAL mode) Approx. 4.5 (VENT); approx. 0.5 (DEF)
Intake door actuator FRS voltage	a7—a15	BATT voltage (CIRC switch OFF)
Intake door actuator CIRC voltage	a15—a7	BATT voltage (CIRC switch ON)
Blower fan relay	b14—body ground	BATT voltage (ignition switch ON)
A/C relay	b3—b12	0 (ignition and A/C switches ON) BATT voltage (A/C switch OFF)
Illumination control signal	b10—b20	BATT voltage (ignition and lighting switches ON)
Rear defogger	a13—b12	0 (IGN ON, R Def SW ON)

B: SCHEMATIC

<Ref. to WI-54, SCHEMATIC, Air Conditioning System.>

5. Self-Diagnosis Procedure

A: OPERATION



(1) Temperature control dial
(2) AUTO switch
(3) FRESH/RECIRC switch
(4) DEF switch
(5) MODE switch

	Step	Check	Yes	No
1	**SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE.** 1) Turn ignition switch to OFF. 2) While pushing “AUTO” and “FRESH/RECIRC” switches, start the engine.	Can it be moved to the self-diagnosis mode?	Go to step **2.**	<Ref. to AC-12, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Failure.>
2	**CHECK INDICATOR.** 1) Turn temperature control dial clockwise by one click. 2) Make sure that all characters illuminate on the display.	Does each character illuminate?	Go to step **3.**	Go to step **7.**
3	**CHECK EACH SENSOR AND EACH POTENTIOMETER.** 1) Turn temperature control dial clockwise by one click. 2) If system has the trouble for each sensor and/or each potentiometer, DTC is indicated on indicator. 3) If system has no trouble, DTC “20” is indicated on indicator. NOTE: When the sunload sensor is checked inside the passenger compartment or in the shade, DTC “25” may appear on the indicator. Always check the sunload sensor in a place where it senses direct sunlight.	Is the DTC “20” indicated on indicator?	Go to step **4.**	Perform diagnosis procedure according to the displayed DTC. <Ref. to AC-22, DTC FOR SENSOR AND POTENTIOMETER, LIST, List of Diagnostic Trouble Code (DTC).>
4	**CHECK DOOR MOTOR POSITION SWITCH.** 1) Turn temperature control dial clockwise by one click. 2) If system has the trouble for each door position switch, DTC is indicated on indicator. 3) If system has no trouble, DTC “30” is indicated on indicator.	Is the DTC “30” indicated on indicator?	Go to step **5.**	Perform diagnosis procedure for mode door actuator. <Ref. to AC-34, DTC 31, 32, 33, 34 OR 35 (MODE DOOR ACTUATOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
5	**CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH.** 1) Turn temperature control dial clockwise by one click. 2) Select operating mode by pushing every “DEF” switch. 3) Check the operation for each mode. •Air inlet: •Air outlet: •Air mix door: •Blower fan: •A/C compressor:	Does each mode displayed match the operating mode table? <Ref. to AC-11, OPERATING MODE TABLE, OPERATION, Self-Diagnosis Procedure.>	Go to step **6.**	Go to step **7.**

	Step	Check	Yes	No
6	**CHECK INDICATED VALUE OF EACH SENSOR.** 1) Turn temperature control dial clockwise by one click. 2) Each time the “DEF” switch is pressed, the value indicated on the display changes to correspond with the ambient sensor, in-vehicle sensor and intake sensor, in that order. 3) Make sure there is no big difference between the temperature indicated on the display and the measured temperature.	Is a proper input signal value displayed in each sensor?	End	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

1. OPERATING MODE TABLE

Mode display	41	42	43	44	45	46	47	48
Air inlet	REC	REC	REC	FRE	FRE	FRE	FRE	FRE
Air outlet	VENT	VENT	B/L	B/L	B/L	HEAT	D/H	DEF
Air mix door	FULL COOL	FULL COOL	FULL COOL	FULL HOT	FULL HOT	FULL HOT	FULL HOT	FULL HOT
Blower fan	5V	5V	Power supply voltage	8.5V	8.5V	8.5V	8.5V	Power supply voltage
A/C compressor	ON	ON	ON	OFF	OFF	OFF	ON	ON

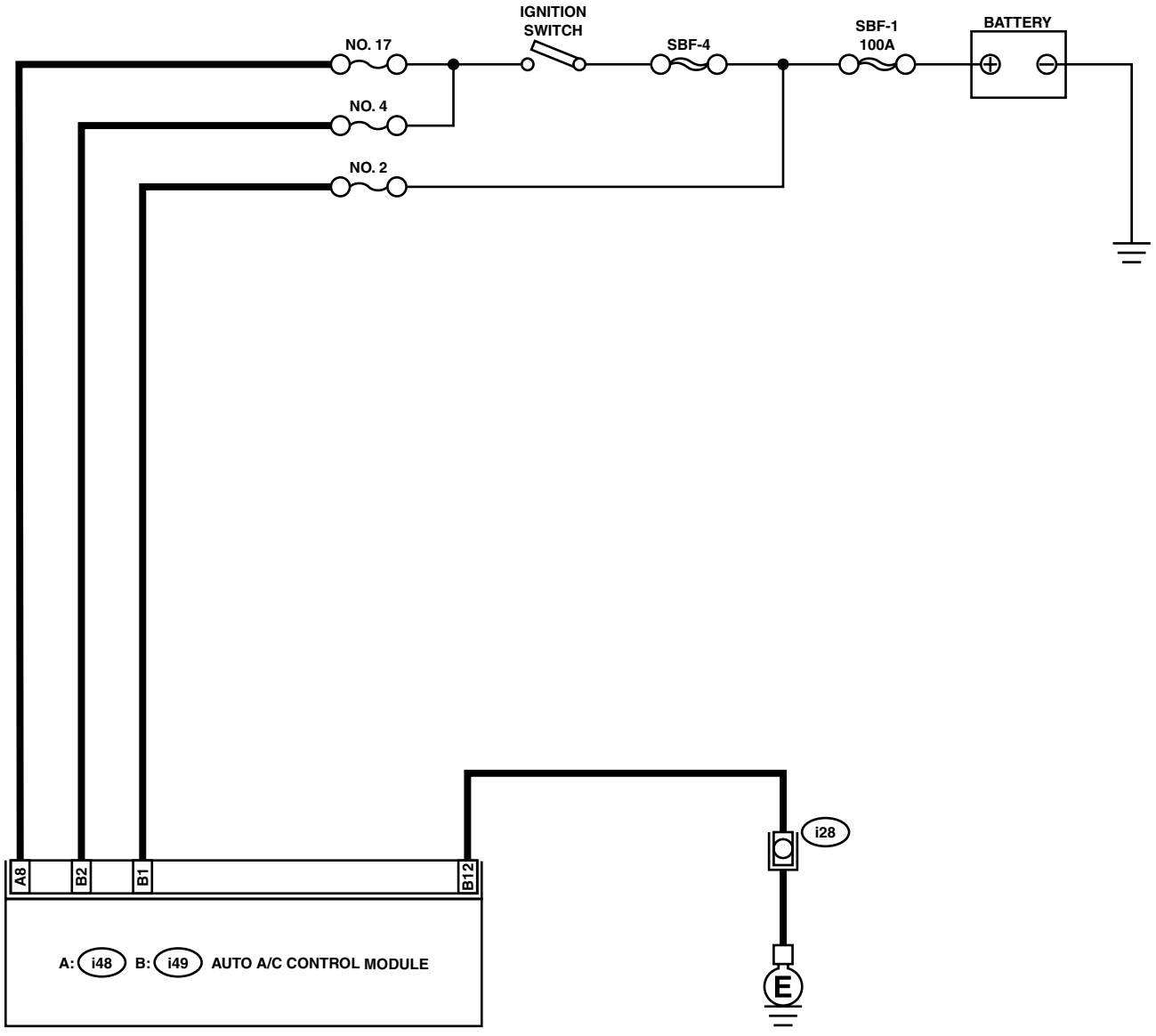
6. Diagnostics for A/C System Failure

A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- "Set" temperature is not indicated on display, switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:



AC-00318

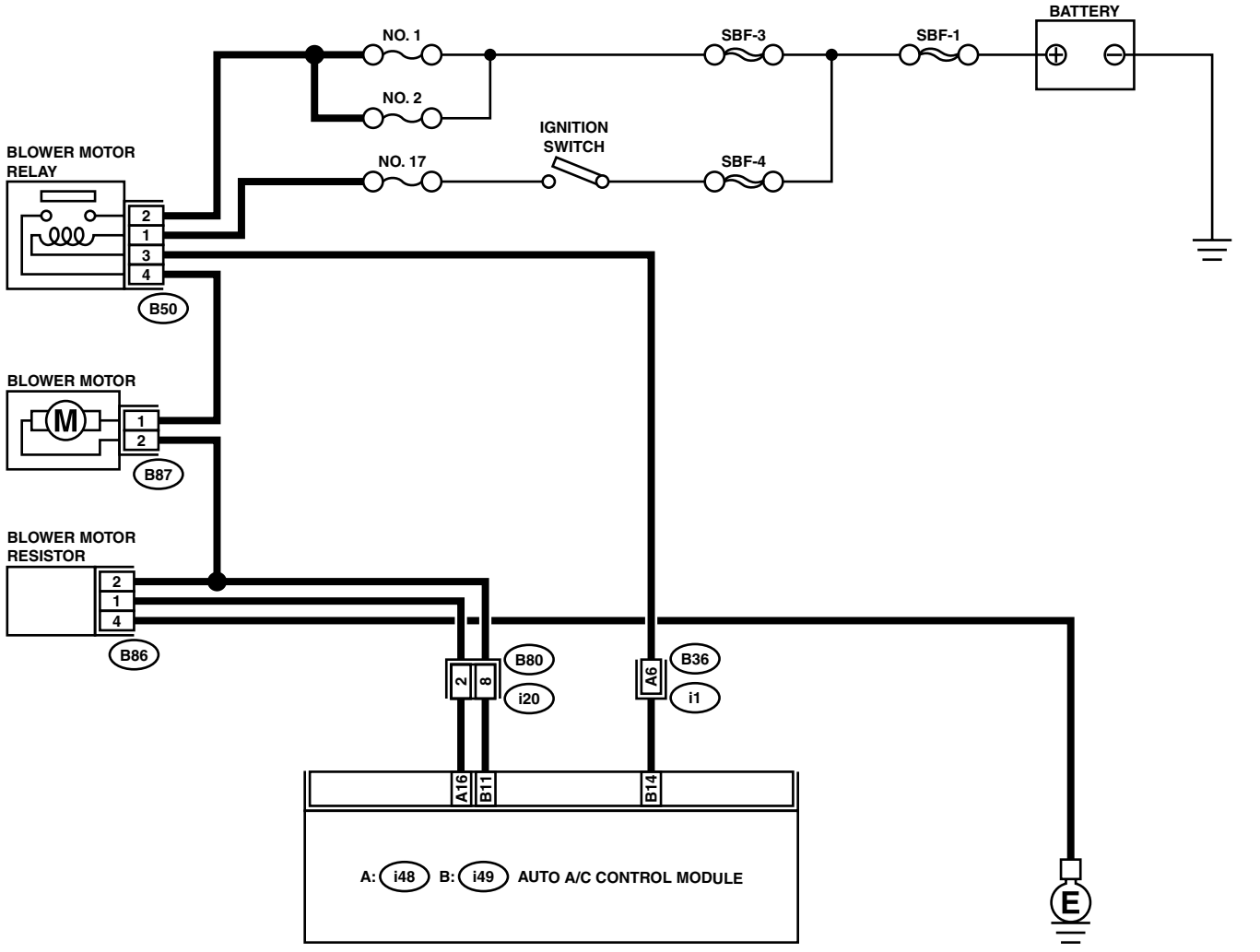
	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuse No. 2 from main fuse box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step **2.**
2	**CHECK FUSE.** 1) Turn ignition switch to OFF. 2) Remove fuses No. 4 and No. 17 from fuse & relay box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step **3.**
3	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** 1) Disconnect A/C control module connector. 2) Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to OFF. ***Connector & terminal*** ***(i49) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Repair harness for power supply line.
4	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ACC. ***Connector & terminal*** ***(i49) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **5.**	Repair harness for power supply line.
5	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** Measure voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ON. ***Connector & terminal*** ***(i48) No. 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **6.**	Repair harness for power supply line.
6	**CHECK A/C CONTROL MODULE GROUND CIRCUIT.** Measure resistance of harness between A/C control module and chassis ground. ***Connector & terminal*** ***(i49) No. 12 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair harness for ground line.
7	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

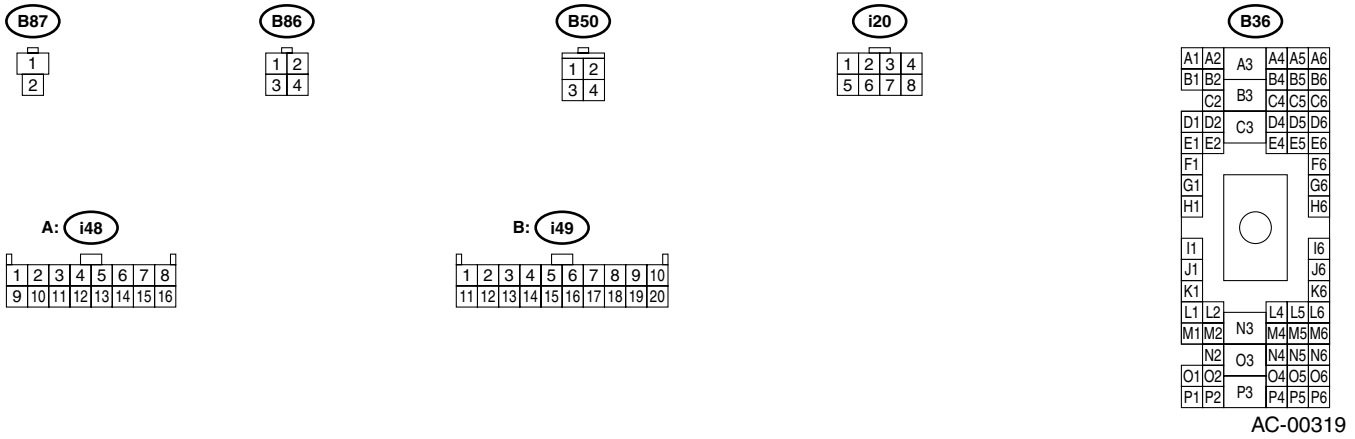
B: BLOWER MOTOR DOES NOT ROTATE

TROUBLE SYMPTOM:

- Blower motor does not rotate.
- Blower motor does not rotate in “HI”.

WIRING DIAGRAM:



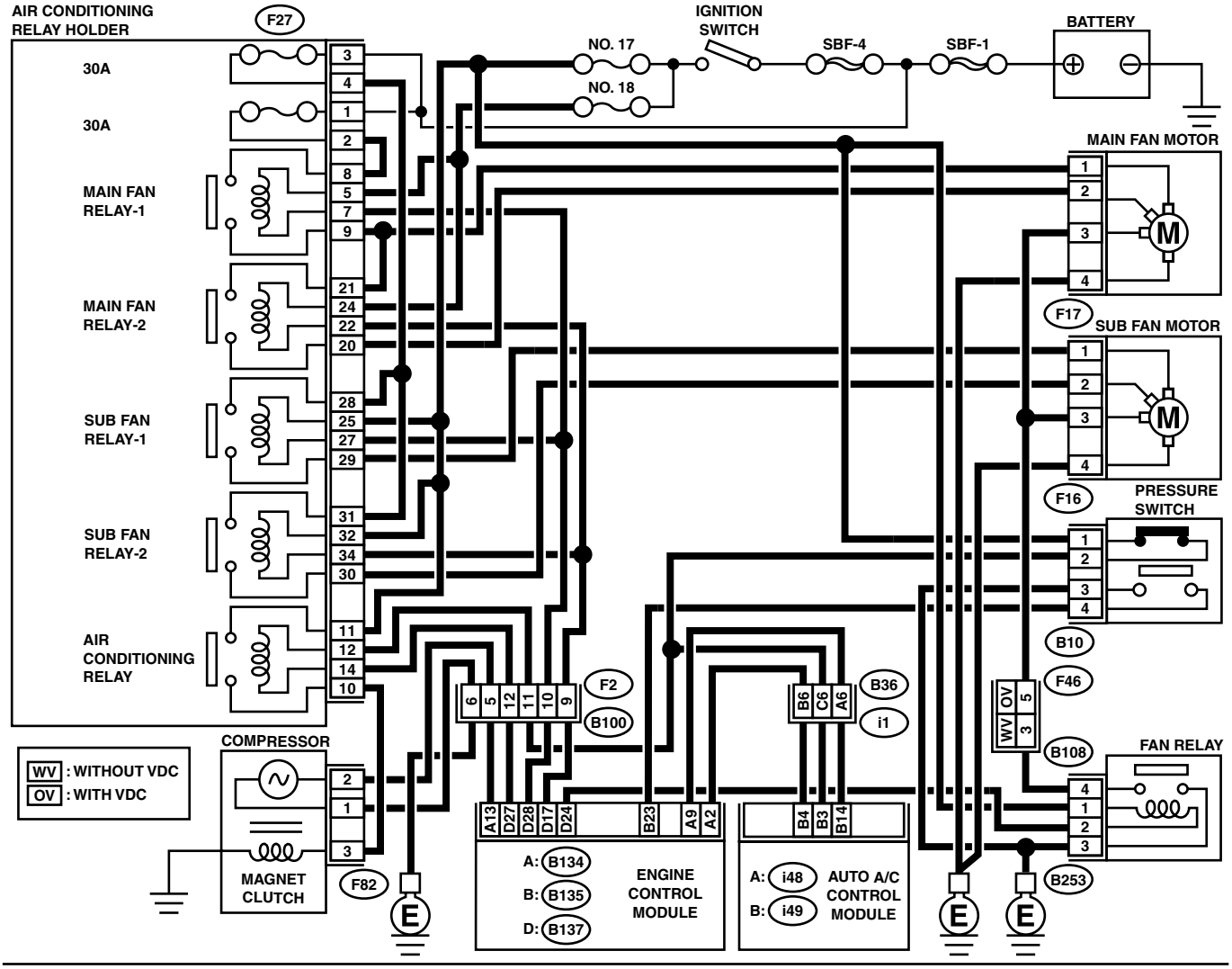


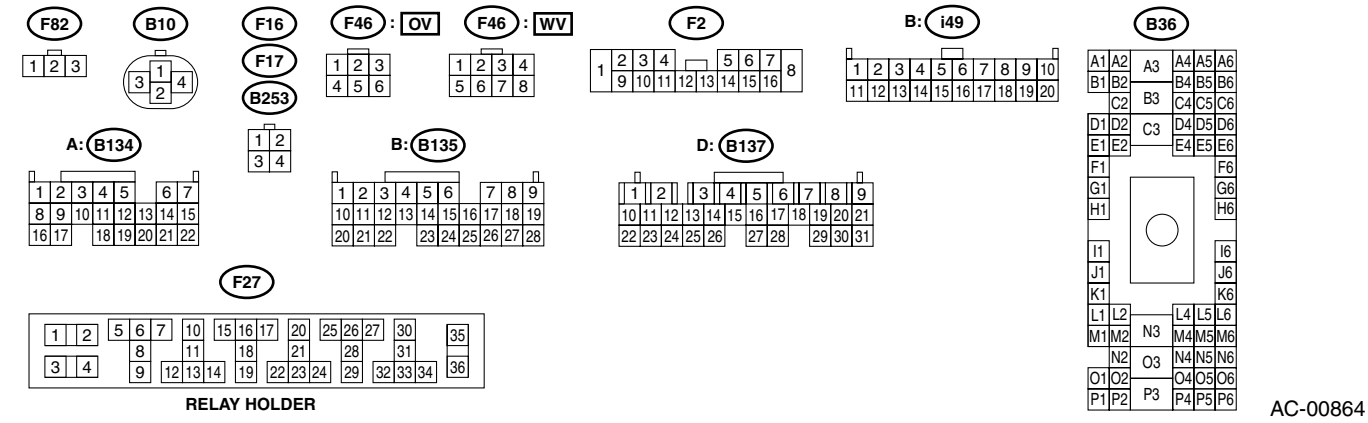
AC-00319

	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Remove No. 1, No. 2 and No. 17 fuses in fuse & relay box. 2) Check condition of fuses.	Is the fuse blown out?	Replace fuse.	Go to step **2.**
2	**CHECK POWER SUPPLY TO BLOWER FAN MOTOR.** 1) Turn ignition switch to ON. 2) Turn blower switch to ON. 3) Measure voltage between blower fan motor and chassis ground. ***Connector & terminal*** ***(B87) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair harness for blower fan motor power supply line.
3	**CHECK BLOWER FAN MOTOR RELAY.** 1) Turn ignition switch to OFF. 2) Remove blower fan motor relay. 3) Connect terminals as follows: Positive terminal (+) of battery to terminal No. 1 of blower fan motor relay Negative terminal (–) of battery to terminal No. 3 of blower fan motor relay 4) Measure resistance between No. 2 and No. 4 terminals. ***Terminals:*** ***No. 2 — No. 4***	Is the measured value less than 1 Ω?	Go to step **4.**	Replace blower fan motor relay.
4	**CHECK BLOWER FAN MOTOR.** 1) Disconnect connector from blower fan motor. 2) Connect terminals as follows: Positive terminal (+) of battery to terminal No. 1 of blower fan motor relay Negative terminal (–) of battery to terminal No. 2 of blower fan motor relay 3) Make sure that blower fan motor is operated.	Does the blower fan motor operate?	Go to step **5.**	Replace blower fan motor.
5	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

C: COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY

WIRING DIAGRAM:





AC-00864

	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the main fan fuse and sub fan fuse in main fuse box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **2.**
2	**CHECK THE POWER SUPPLY TO PRESSURE SWITCH.** 1) Disconnect the connector from pressure switch. 2) Turn the ignition switch to OFF. 3) Measure the resistance between harness connector and chassis ground. ***Connector & terminal*** ***(B10) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Repair the harness for pressure switch power supply circuit.
3	**CHECK THE HARNESS BETWEEN PRESSURE SWITCH AND A/C RELAY HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the A/C relay in main fuse box. 3) Measure the resistance between A/C relay and pressure switch connector. ***Connector & terminal*** ***(F27) No. 12 — (B10) No. 2:***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair the harness between A/C relay and pressure switch.
4	**CHECK THE PRESSURE SWITCH.** Measure the resistance between pressure switch terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Replace the pressure switch.
5	**CHECK THE A/C CUT SIGNAL CIRCUIT.** 1) Disconnect the connector from A/C control module. 2) Measure the resistance between A/C control module and pressure switch connector. ***Connector & terminal*** ***(i49) No. 3 — (B10) No. 2:***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair the harness between A/C control module and pressure switch.
6	**CHECK THE A/C ON SIGNAL CIRCUIT.** 1) Disconnect the connector from engine control module. 2) Measure the resistance between engine control module and A/C control module connector. ***Connector & terminal*** ***(B134) No. 2 — (i49) No. 4:***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair the harness between A/C control module and engine control module.
7	**CHECK A/C RELAY.** 1) Remove the A/C relay in main fuse box. 2) Check the A/C relay. <Ref. to AC-40, INSPECTION, Relay and Fuse.>	Is the operation of the relay OK?	Go to step **8.**	Replace the A/C relay.
8	**CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR.** 1) Turn the ignition switch to OFF, and then connect the A/C relay connector and all removed connectors. 2) Start the engine, and turn A/C switch to ON. 3) Set the temperature control dial to maximum cold position. 4) Measure the voltage between magnet clutch harness connector and chassis ground. ***Connector & terminal*** ***(F82) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10.5 V (at normal temperature)?	Go to step **9.**	Repair the harness for power supply line of A/C compressor.

	Step	Check	Yes	No
9	**CHECK OPERATION OF MAIN FAN MOTOR.** 1) Start the engine and turn the A/C switch to ON. 2) Check the operation of main fan motor.	Does the main fan motor operate?	Go to step **14.**	Go to step **10.**
10	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between main fan motor harness connector and chassis ground. ***Connector & terminal*** ***Turbo engine model:*** ***(F17) No. 1, 2, 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **11.**	Repair the harness for main fan motor power supply circuit.
11	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Measure the resistance between main fan motor harness connector and chassis ground. ***Connector & terminal*** ***(F17) No. 4 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **12.**	Repair the harness for main fan motor ground circuit.
12	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminals No. 1, 2 and 3, and ground (–) terminal to terminal No. 4 of main fan motor connector to make sure that main fan motor rotate.	Does the main fan rotate?	Go to step **13.**	Replace the main fan motor.
13	**CHECK POOR CONTACT IN MAIN FAN MOTOR CONNECTOR.** Check poor contact in main fan motor harness connector.	Is there poor contact in connector?	Go to step **14.**	Repair the poor contact in main fan motor connector.
14	**CHECK OPERATION OF SUB FAN MOTOR.** 1) Start the engine and turn the A/C switch to ON. 2) Check the operation of sub fan motor.	Does the sub fan motor operate normally?	Go to step **19.**	Go to step **15.**

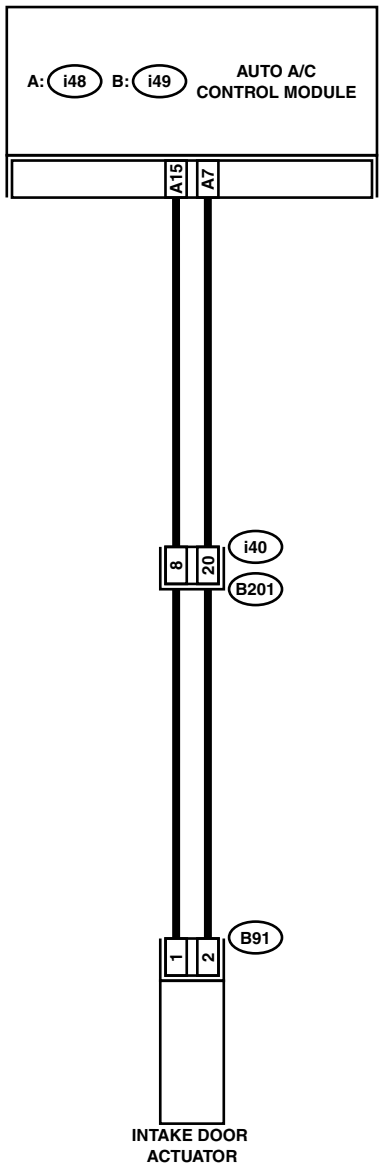
	Step	Check	Yes	No
15	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between sub fan motor harness connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1, 2, 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **16.**	Repair the harness for sub fan motor power supply circuit.
16	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** Measure the resistance between sub fan motor harness connector and chassis ground. ***Connector & terminal*** ***(F16) No. 4 — Chassis ground:***	Is the measured value less than 1 Ω?	Go to step **17.**	Repair the harness for sub fan motor ground circuit.
17	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminals No. 1, 2 and 3, and ground (–) terminal to terminal No. 4 of sub fan motor connector to make sure that sub fan motor rotate.	Does the sub fan motor rotate?	Go to step **18.**	Replace the sub fan motor.
18	**CHECK POOR CONTACT IN SUB FAN MOTOR CONNECTOR.** Check poor contact in sub fan motor connector.	Is there poor contact in connector?	Go to step **19.**	Repair the poor contact in sub fan motor connector.
19	**CHECK POOR CONTACT IN AUTO A/C CONTROL MODULE CONNECTOR.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Replace the auto A/C control module.	Repair the connector.

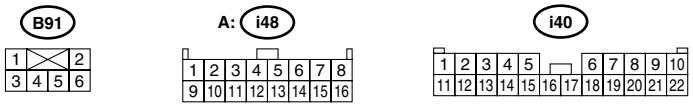
D: FRESH/RECIRC DOES NOT CHANGE

TROUBLE SYMPTOM:

FRESH/RECIRC mode door does not change.

WIRING DIAGRAM:





AC-00320

	Step	Check	Yes	No
1	**CHECK SWITCH OPERATION.** Make sure that the mode selection on display is changed when pushing the “FRESH/ RECIRC” switch.	Does the mode selection change?	Go to step **7.**	Go to step **2.**
2	**CHECK FUSE.** 1) Remove No. 17 fuse in fuse & relay box. 2) Check condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step **3.**
3	**CHECK SIGNAL VOLTAGE.** 1) Change display to RECIRC by pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. ***Connector & terminal*** ***(i48) No. 15 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Repair short circuit in harness between A/C control module and intake door actuator.
4	**CHECK SIGNAL VOLTAGE.** 1) Change display to FRESH with pushing FRESH/RECIRC switch. 2) Measure voltage between A/C control module and chassis ground. ***Connector & terminal*** ***(i48) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **5.**	Repair short circuit in harness between A/C control module and intake door actuator.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from A/C control module and intake door motor. 3) Measure resistance of harness between A/C control module and intake door actuator. ***Connector & terminal:*** ***(i48) No. 15 — (B91) No. 1***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between A/C control module and intake door actuator.
6	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR.** Measure resistance of harness between A/C control module and intake door actuator. ***Connector & terminal:*** ***(i48) No. 7 — (B91) No. 2***	Is the measured value less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between A/C control module and intake door actuator.
7	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

7. List of Diagnostic Trouble Code (DTC)

A: LIST

1. DTC FOR SENSOR AND POTENTIOMETER

DTC	Trouble Unit	Contents
20	No Trouble	—
21	Ambient sensor	Open
–21		Short
22	In-vehicle sensor	Open
–22		Short
24	Evaporator sensor	Open
–24		Short
25	Sunload sensor	Open
–25		Short
26	Air mix door motor	Open
–26		Short

2. DTC FOR MODE DOOR POSITION SWITCH

DTC	30	31	32	33	34	35
Faulty Door	No Trouble	VENT	B/L	HEAT	D/H	DEF

MEMO:

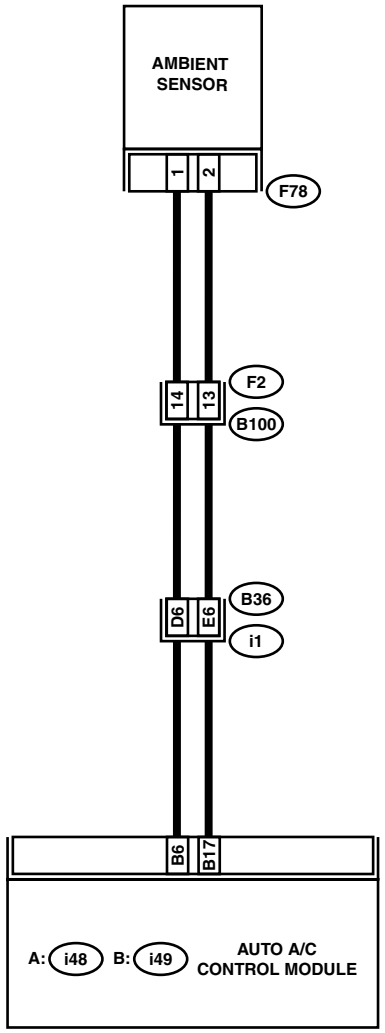
8. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

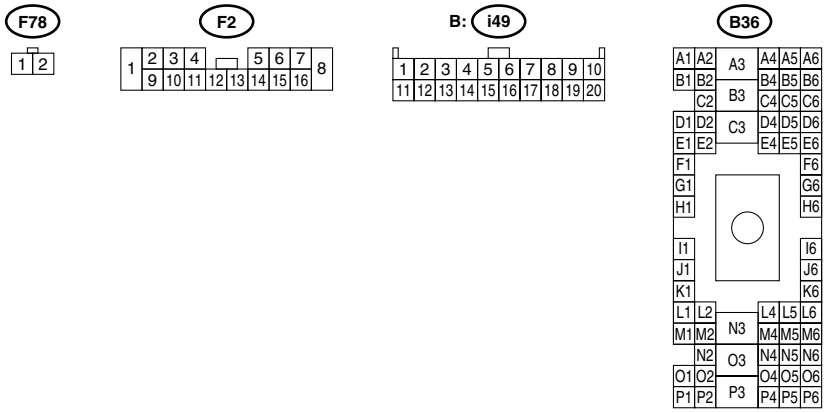
A: DTC 21 OR –21 (AMBIENT SENSOR)

TROUBLE SYMPTOM:

Fan speed, outlets and inlets are not switched when AUTO or ECON switch is ON.

WIRING DIAGRAM:





AC-00322

	Step	Check	Yes	No
1	**CHECK AMBIENT SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ambient sensor. 3) Measure resistance between connector terminals of ambient sensor. ***Terminals:*** ***No. 1 — No. 2***	Is the measured value approx. 2.2 kΩ at 25°C (77°F)?	Go to step **2.**	Replace ambient sensor.
2	**CHECK INPUT SIGNALS FOR AMBIENT SENSOR.** 1) Turn ignition ON. 2) Measure voltage between ambient sensor harness connector terminals. ***Connector & terminal:*** ***(F78) No. 1 (+) — No. 2 (–):***	Is the measured value approx. 4.5 V?	Go to step **6.**	Go to step **3.**
3	**CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.** 1) Turn ignition switch to OFF. 2) Pull out A/C control panel. 3) Disconnect connector from ambient sensor. 4) Turn ignition switch to ON. 5) Measure voltage between connector terminals of A/C control module. ***Connector & terminal:*** ***(i49) No. 6 (+)— No. 17 (–):***	Is the measured value approx. 4.5 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and ambient sensor. ***Connector & terminal:*** ***(F78) No. 1 — (i49) No. 6***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness between A/C control module and ambient sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR.** Measure resistance of harness between A/C control module and ambient sensor. ***Connector & terminal:*** ***(F78) No. 2 — (i49) No. 17***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness between A/C control module and ambient sensor.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

B: DTC 22 OR –22 (IN-VEHICLE SENSOR)

TROUBLE SYMPTOM:

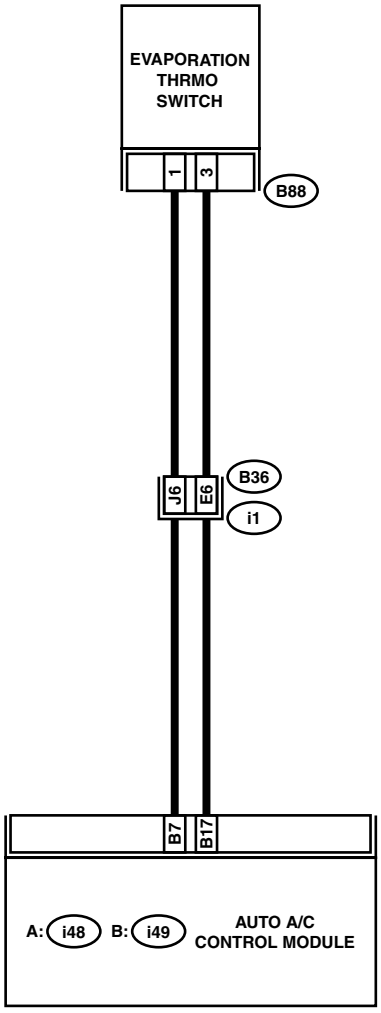
When turning AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.

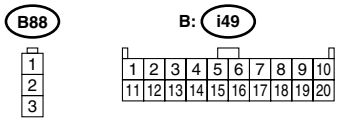
If DTC 22 or –22 appears on the display, replace the A/C control module. The in-vehicle sensor is built into the A/C control module and cannot be replaced as a single unit.

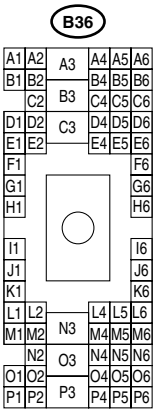
MEMO:

C: DTC 24 OR –24 (EVAPORATOR SENSOR)

WIRING DIAGRAM:







AC-00323

	Step	Check	Yes	No
1	**CHECK EVAPORATOR SENSOR.** 1) Turn ignition switch to OFF. 2) Remove glove box. 3) Disconnect connector from evaporator sensor. 4) Measure resistance between connector terminals of evaporator sensor. ***Terminals:*** ***No. 1 — No. 3***	Is the measured value approx. 1.8 to 2.0 kΩ at 20°C (68°F)?	Go to step **2.**	Replace evaporator sensor.
2	**CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR.** 1) Turn ignition switch to "ON". 2) Measure voltage between evaporator sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B88) No. 1 (+) — Chassis ground (–):***	Is the measured value approx. 4.5 V?	Go to step **3.**	Replace evaporator sensor.
3	**CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.** 1) Turn ignition switch to OFF. 2) Pull out A/C control module. 3) Turn ignition switch to ON. 4) Measure voltage between A/C control module connector terminals. ***Connector & terminal:*** ***(i49) No. 7 (+) — No. 17 (–):***	Is the measured value approx. 4.5 V?	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and evaporator sensor. ***Connector & terminal:*** ***(B88) No. 1 — (i49) No. 7***	Is the measured value less than 1 Ω?	Go to step **5.**	Repair harness between A/C control module and evaporator sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.** Measure resistance of harness between A/C control module and evaporator sensor. ***Connector & terminal:*** ***(B88) No. 3 — (i49) No. 17***	Is the measured value less than 1 Ω?	Go to step **6.**	Repair harness between A/C control module and evaporator sensor.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

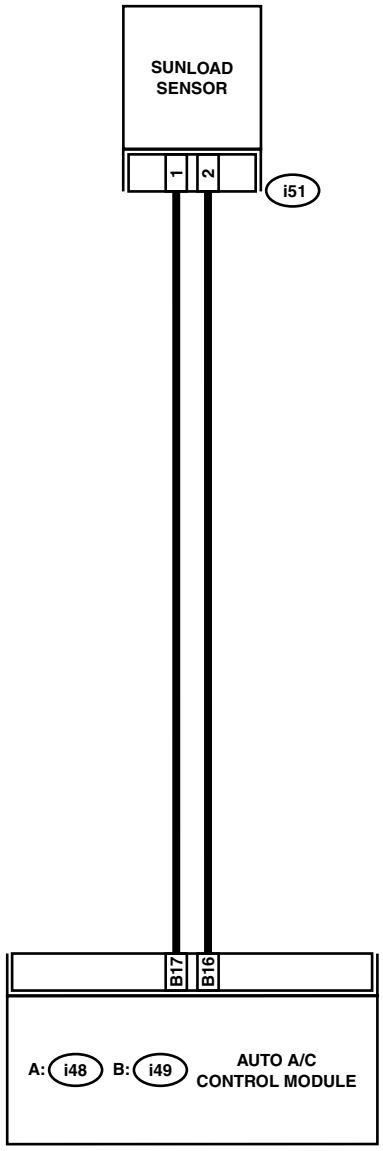
D: DTC 25 OR –25 (SUNLOAD SENSOR)

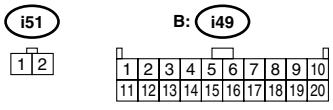
TROUBLE SYMPTOM:

- Sensor identified that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identified that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:
When the sunload sensor is checked inside the passenger compartment or in the shade, DTC “25” may appear on the indicator. Always check the sunload sensor in a place where it senses direct sunlight.

WIRING DIAGRAM:





AC-00324

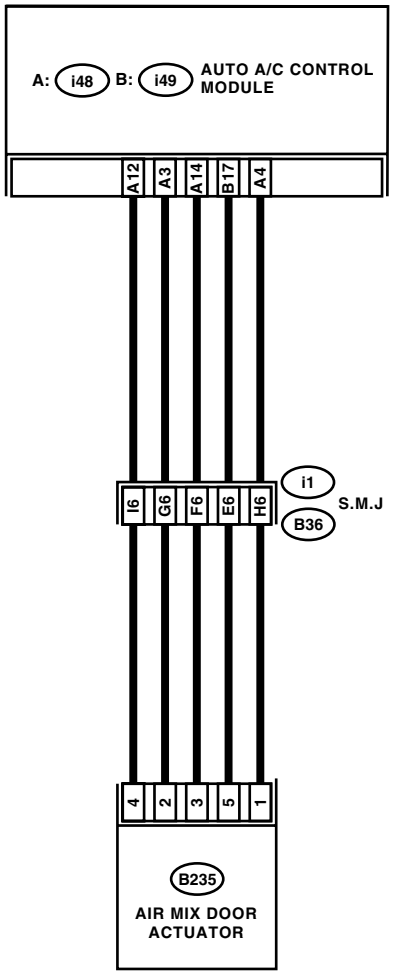
	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE TO SUNLOAD SENSOR.** 1) Turn ignition switch to OFF. 2) Remove sunload sensor. <Ref. to AC-44, REMOVAL, Sunload Sensor (Auto A/C).> 3) Turn ignition switch to ON. 4) Measure input voltage to sunload sensor. ***Connector & terminal:*** ***(i51) No. 2 (+) — No. 1 (–):***	Is the measured value approx. 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect connectors from A/C control module. 3) Measure resistance of harness between A/C control module and sunload sensor. ***Connector & terminal:*** ***(i51) No. 2 — (i49) No. 16***	Is the measured value less than 1 Ω?	Go to step **3.**	Repair harness between A/C control module and sunload sensor.
3	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR.** Measure resistance of harness between A/C control module and sunload sensor. ***Connector & terminal:*** ***(i51) No. 1 — (i49) No. 17***	Is the measured value less than 1 Ω?	Go to step **4.**	Repair harness between A/C control module and sunload sensor.
4	**CHECK VOLTAGE OF INPUT SIGNAL TO A/C CONTROL MODULE.** 1) Connect connectors to A/C control module and sunload sensor. 2) Turn ignition switch to ON. 3) Measure voltage between A/C control module connectors. ***Connector & terminal:*** ***(i49) No. 16 (+) — No. 17 (–):***	Is the measured value approx. 2.5 V?	Go to step **5.**	Replace sunload sensor.
5	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Replace A/C control module.	Repair connector.

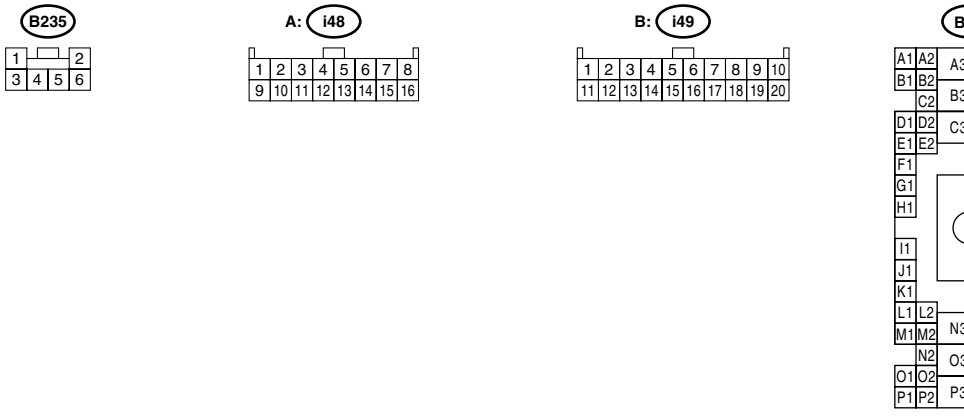
E: DTC 26 OR –26 (AIR MIX DOOR ACTUATOR)

TROUBLE SYMPTOM:

Outlet air temperature is not changed.

WIRING DIAGRAM:





AC-00937

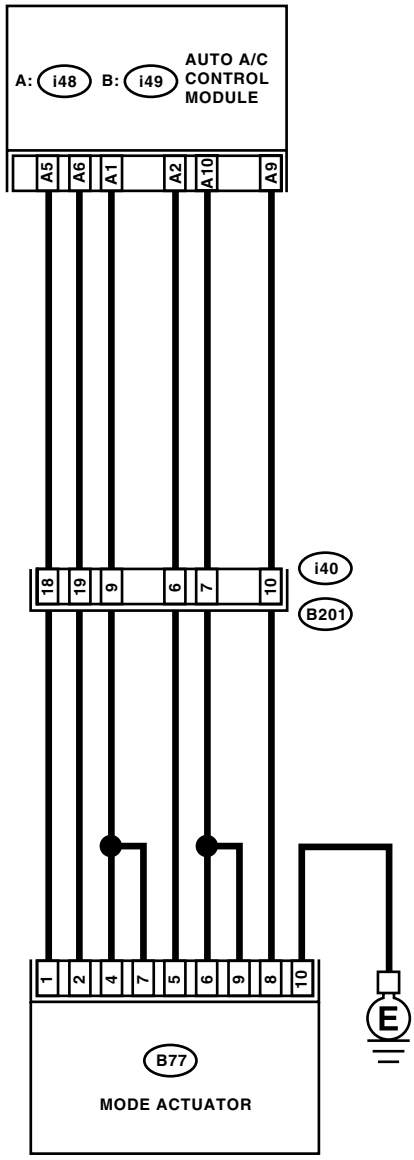
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO AIR MIX DOOR ACTUATOR PBR.** 1) Turn the ignition switch to OFF. 2) Disconnect the air mix door actuator connector. 3) Turn the ignition switch and AUTO switch to ON. 4) Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(i48) No. 14 (+) — (i49) No. 17 (–):***	Is the voltage approx. 5 V?	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY TO AIR MIX DOOR ACTUATOR.** Measure the voltage between auto A/C control module connector terminal and chassis ground when setting temprature control dial to FULL COOL. ***Connector & terminal*** ***(i48) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 7 V (At normal temperature)?	Go to step **3.**	Replace the auto A/C control module.
3	**CHECK POWER SUPPLY TO AIR MIX DOOR ACTUATOR.** Measure the voltage between auto A/C control module connector terminal and chassis ground when setting temprature control dial to FULL HOT. ***Connector & terminal*** ***(i48) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 7 V (At normal temperature)?	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR.** 1) Turn the A/C and ignition switch to OFF. 2) Disconnect the auto A/C control module connector. 3) Measure the resistance between auto A/C control module and air mix door actuator connector . ***Connector & terminal*** ***(B235) No. 1 — (i48) No. 4:*** ***(B235) No. 2 — (i48) No. 3:*** ***(B235) No. 3 — (i48) No. 14:*** ***(B235) No. 4 — (i48) No. 12:*** ***(B235) No. 5 — (i49) No. 17:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between auto A/C control module and air mix door actuator.
5	**CHECK AIR MIX DOOR ACTUATOR PBR SIGNAL.** 1) Connect the auto A/C control module and air mix door actuator connector. 2) Turn the ignition switch and AUTO switch to ON. 3) Change the set temprature between FULL COOL and FULL HOT, check voltage between auto A/C control module connector terminals. ***Connector & terminal*** ***(i48) No. 12 — (i49) No. 17 (–):***	Is the voltage 0.5 V (FULL COOL) — 4.5 V (FULL HOT)?	Go to step **6.**	Replace the air mix door actuator.
6	**CHECK POOR CONTACT.** Check poor contact in the auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

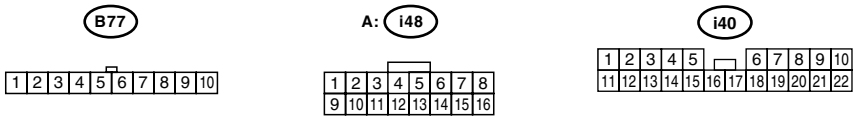
F: DTC 31, 32, 33, 34 OR 35 (MODE DOOR ACTUATOR)

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:





AC-00331

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1) Turn the ignition switch to ON. 2) Press the mode switch to VENT position. 3) Press the DEF switch and measure the voltage between auto A/C control module and chassis ground when VENT is changed to DEF position. ***Connector & terminal*** ***(i48) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 12 V?	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** 1) Press the mode switch to VENT position. 2) Press the DEF switch and measure the voltage between mode door actuator harness connector and chassis ground when VENT is changed to DEF position. ***Connector & terminal*** ***(B77) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 7 V (at normal temperature)?	Go to step **3.**	Repair the harness between auto A/C control module and mode door actuator.
3	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1) Press the DEF switch. 2) Press the mode switch to VENT position and measure the voltage between auto A/C control module and chassis ground when DEF is changed to VENT position. ***Connector & terminal*** ***(i48) No. 5 (+) — Chassis ground (–):***	Is the measured value more than 12 V?	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** 1) Press the DEF switch. 2) Press the mode switch to VENT position and measure the voltage between mode door actuator harness connector and chassis ground when DEF is changed to VENT position. ***Connector & terminal*** ***(B77) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 7 V?	Go to step **5.**	Repair the harness between auto A/C control module and mode door actuator.
5	**CHECK ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Connect the battery positive (+) terminal to terminal No. 1 and ground (–) terminal to terminal No. 2 of mode door actuator to make sure that actuator operates. 4) Connect the battery positive (+) terminal to terminal No. 2 and ground (–) terminal to terminal No. 1 of mode door actuator to make sure that actuator operates.	Does the motor operate normally?	Go to step **6.**	Replace the mode door actuator.
6	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn the ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 2 (+) — Chassis ground (–):***	Is the measured value 5 V at HEAT, D/H, DEF and 0 V at VENT, BI-LEVEL?	Go to step **9.**	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 5 (+) — Chassis ground (–):***	Is the measured value 5 V?	Go to step **9.**	Go to step **8.**
8	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 2 — (B77) No. 5:***	Is the measured value less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
9	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn ignition switch to ON. 2) Press the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 10 (+) — Chassis ground (–):***	Is the measured value 5 V at VENT, D/H and 0 V at HEAT, BI-LEVEL, DEF?	Go to step **12.**	Go to step **10.**
10	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 6, 9 (+) — Chassis ground (–):***	Is the measured value 5 V?	Go to step **12.**	Go to step **11.**
11	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 10 — (B77) No. 6, 9:***	Is the measured value less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.

	Step	Check	Yes	No
12	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 1 (+) — Chassis ground (–):***	Is the measured value 5 V at BI-LEVEL, DEF and 0 V at VENT, HEAT, D/H?	Go to step **15.**	Go to step **13.**
13	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 4, 7 (+) — Chassis ground (–):***	Is the measured value 5 V?	Go to step **15.**	Go to step **14.**
14	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 1 — (B77) No. 4, 7:***	Is the measured value less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
15	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn ignition switch to ON. 2) Press the mode switch and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 9 (+) — Chassis ground (–):***	Is the measured value 5 V at VENT, BI-LEVEL, HEAT and 0 V at D/H, DEF?	Go to step **19.**	Go to step **16.**
16	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 8 (+) — Chassis ground (–):***	Is the measured value 5 V?	Go to step **18.**	Go to step **17.**

	Step	Check	Yes	No
17	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 9 — (B77) No. 8:***	Is the measured value less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
18	**CHECK ACTUATOR GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Measure the resistance of harness between mode door actuator and chassis ground. ***Connector & terminal*** ***(B77) No. 10 — Chassis ground:***	Is the measured value less than 1 Ω?	Replace the mode door actuator.	Repair the harness between auto A/C control module and mode door actuator.
19	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the poor contact in auto A/C control module.	Repair the connector.

9. Symptom Related Diagnostic

A: GENERAL DIAGNOSTICS TABLE

Symptom / Component parts	A/C system fails to operate when IG SW is turned "ON".	Burned-out fuse.	Previous mode immediately before resetting operation is not retained in memory.	No indication appears on display.	Illumination does not dim at night.	Blower motor does not rotate or rotates erroneously.	A/C does not change from "Fresh" to "Recirc" or vise versa.	Air vents cannot be switched.	Compartment temperature does not increase (No hot air is discharged).	Compartment temperature does not decrease (No cool air is discharged).	Compartment temperature is higher than or lower than the set value.	Compartment temperature does not quickly respond to the set value.	Condenser fan does not operate during A/C operation.
Fuses (M/B No. 5, F/B No. 17)	○	○	○	○	○	○							
Poor connector contacts	○	○	○	○	○	○	○	○	○	○			
Ground	○		○	○		○							
A/C control module	○		○	○	○	○	○	○	○	○	○		
Air mix servo motor and potentiometer (including links)									○	○	○	○	
Air vent select servo motor and potentiometer (including links)								○					
Fresh-Recirc select servo motor and potentiometer (including links)							○						
Blower fan motor						○							
Power transistor & fuse						○							
Blower fan relay						○							
A/C relay										○			
Magnet clutch										○			
Radiator fan motors (Main and sub)													○
Radiator fan relays (Main and sub)													○
Sensors (In-vehicle, ambient, water temperature, evaporator, sunload, etc.)									○	○	○	○	
In-vehicle sensor aspirator duct											○		

AC-00325

MEMO:

AIRBAG SYSTEM

AB

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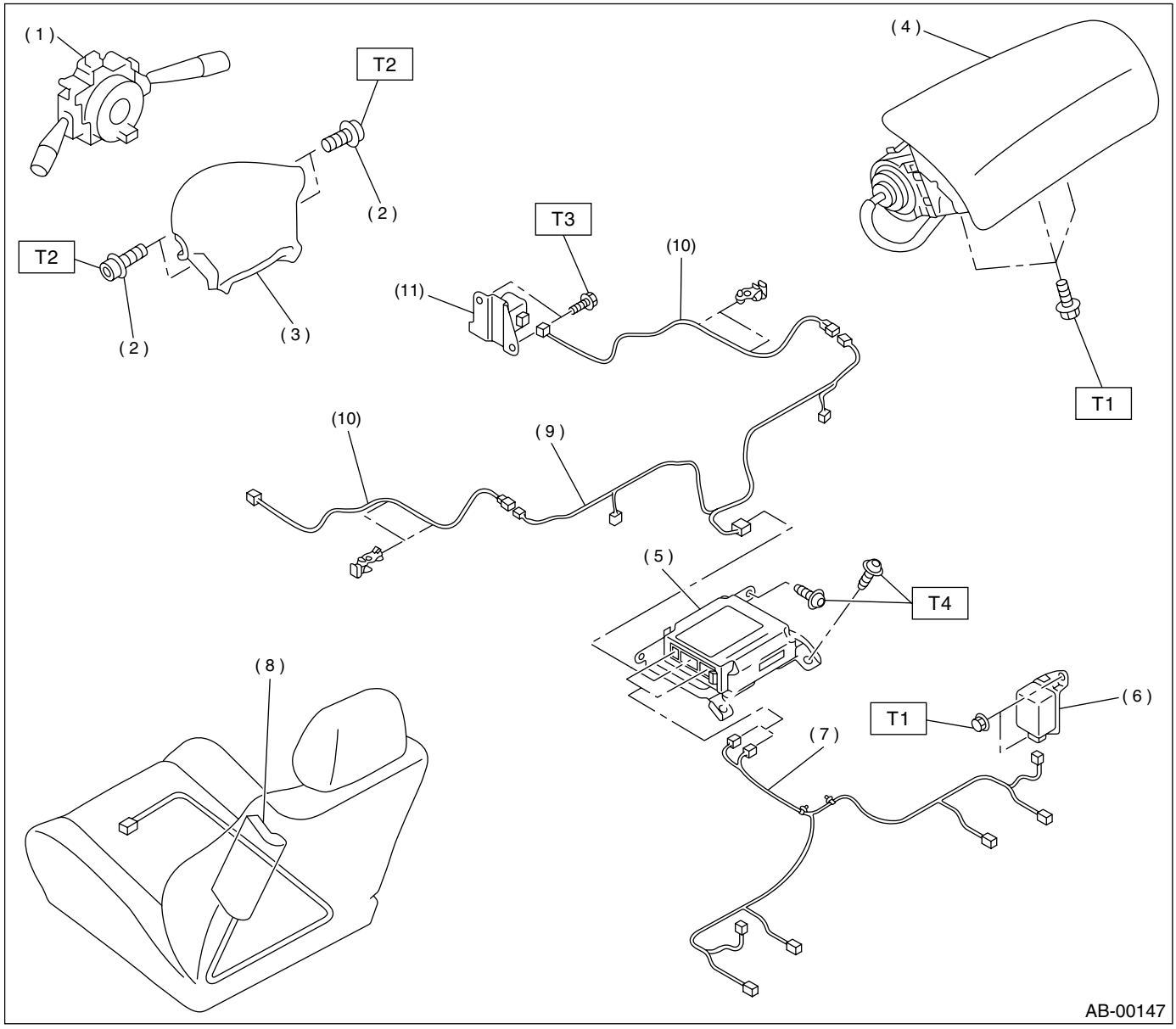
13.	Front Sub Sensor Harness	22

1. General Description

A: COMPONENT

1. SRS AIRBAG

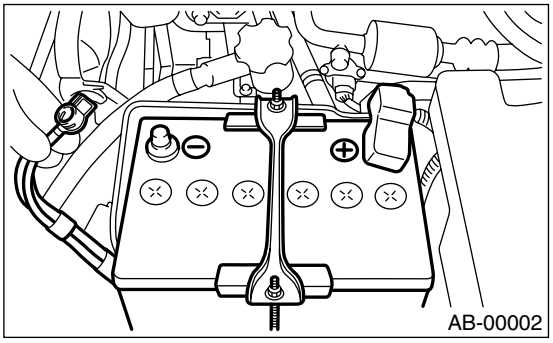


(1) Combination switch ASSY with roll connector
(2) TORX® bolt T30
(3) Airbag module ASSY (Driver)
(4) Airbag module ASSY (Passenger)
(5) Airbag control module
(6) Side airbag sensor
(7) Side airbag harness
(8) Side airbag module
(9) Airbag main harness
(10) Front sub sensor harness
(11) Front sub sensor

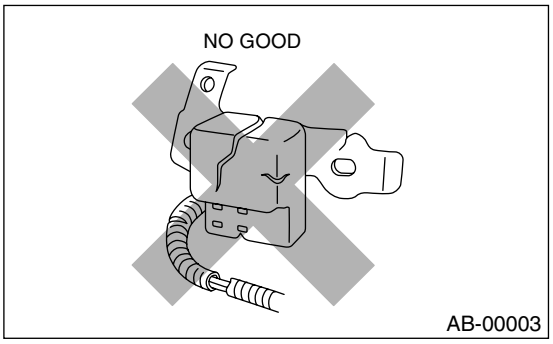
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 10 (1.0, 7.2)
T3: 20 (2.0, 14.5)
T4: 25 (2.5, 18.1)

B: CAUTION

• When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.

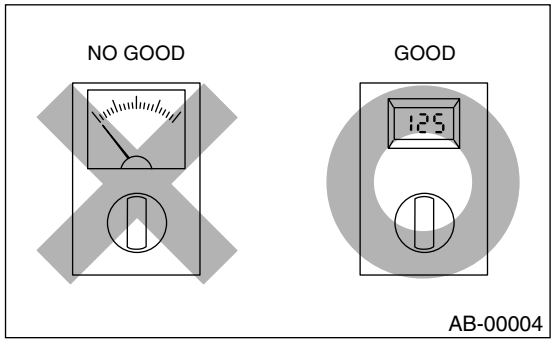


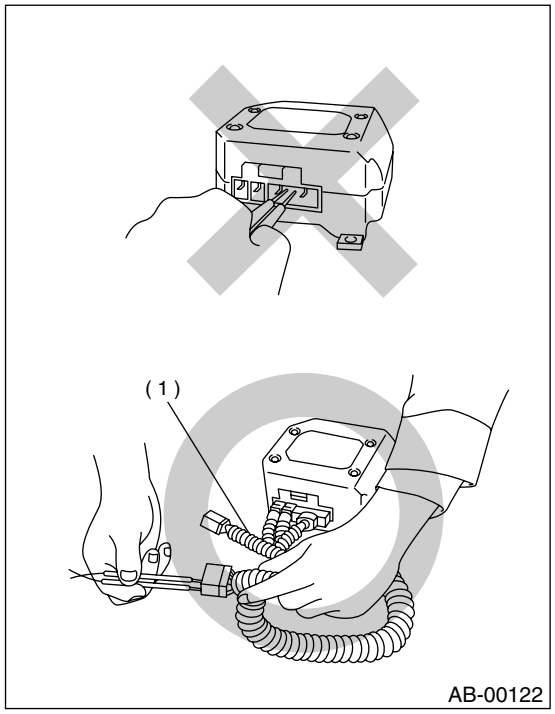
• If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



• When checking the system, be sure to use a digital circuit tester.
Use of an analog circuit tester may cause the airbag to activate erroneously.

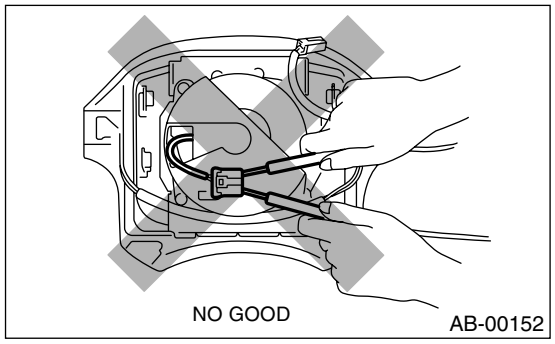
• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



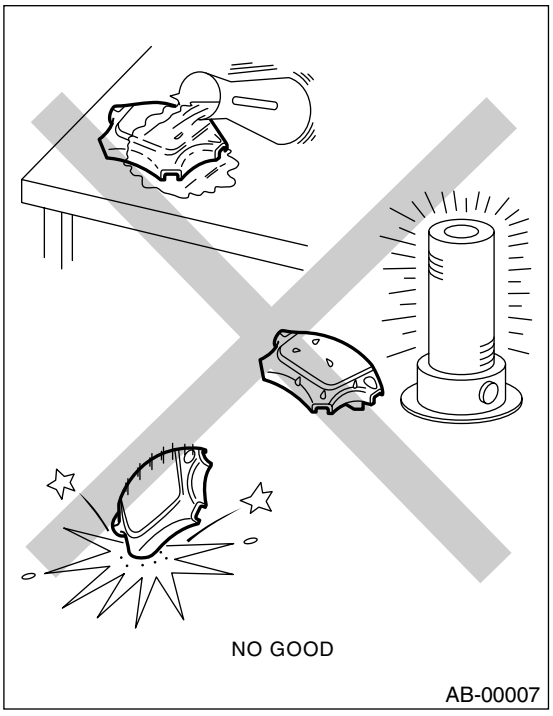


(1) Test harness

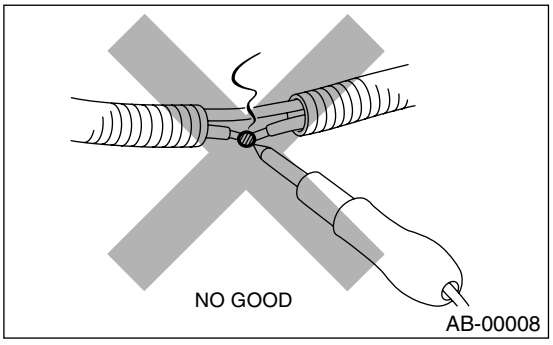
• Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



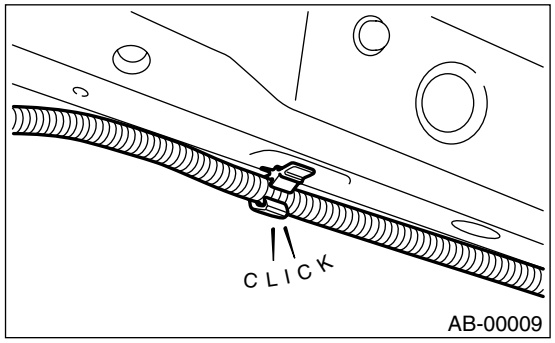
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



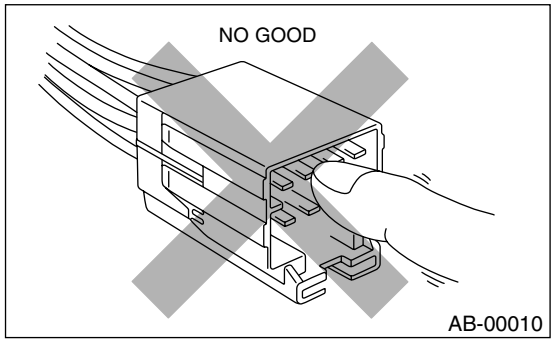
• If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



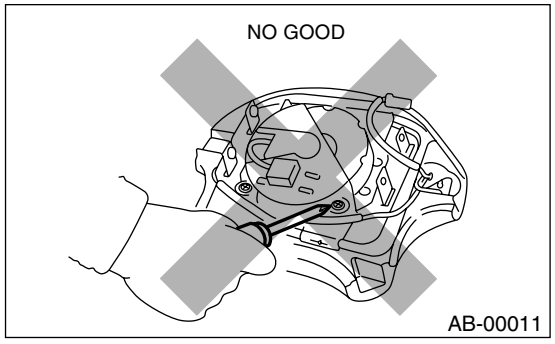
• Install the wire harness securely with the specified clips to avoid interference or tongled up with other parts.



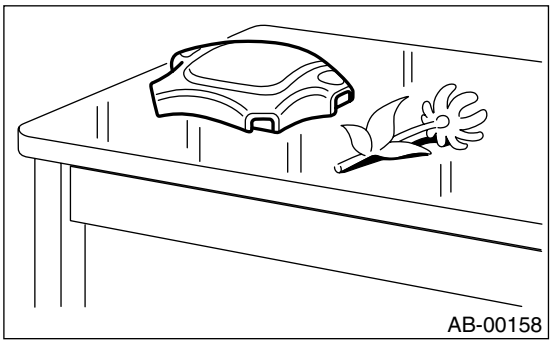
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



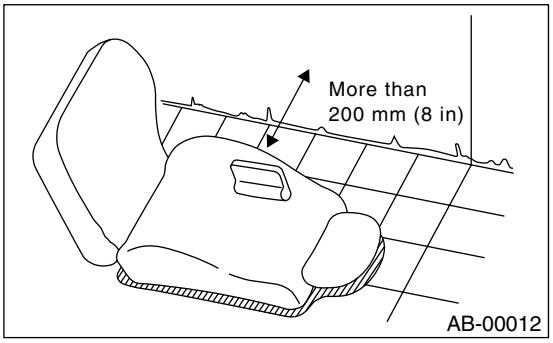
• Either of the airbag parts, or pretensioner must not be disassembled.



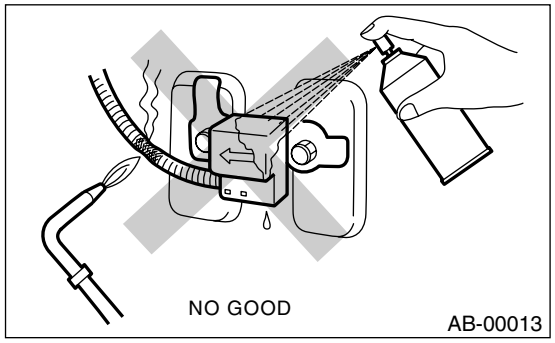
• After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



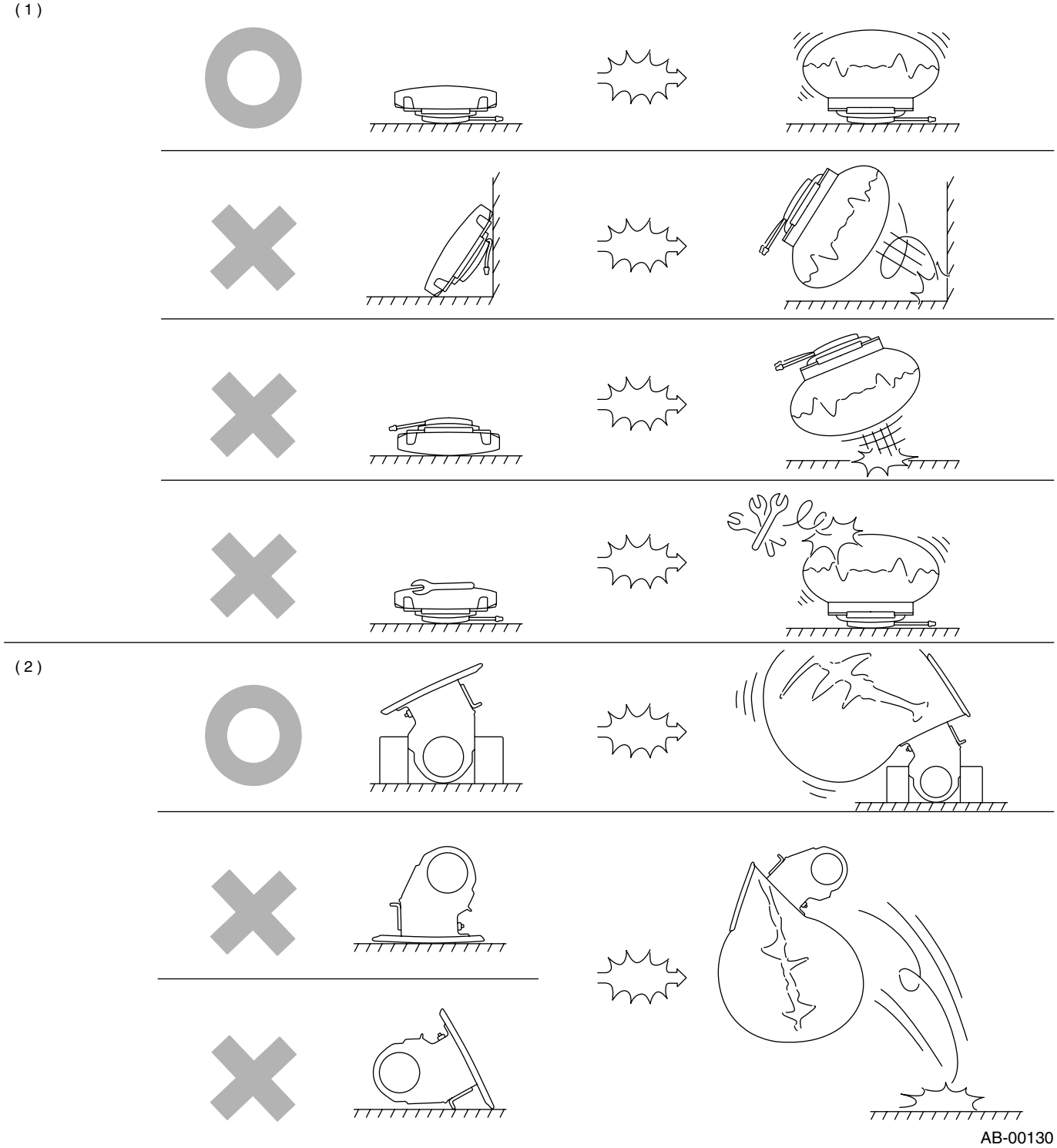
• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



• Do not use the airbag or pretensioner parts from other vehicles. Always replace defective parts with new parts.
• Never re-use a deployed airbag or pretensioner.
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove parts and take utmost care not to apply paint or the flame of the welding burner directly to the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove parts and take utmost care not to apply paint or the flame of the welding burner directly to the side airbag sensors and wire harness of the airbag system.



• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver side

(2) Passenger side

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of drivers airbag module

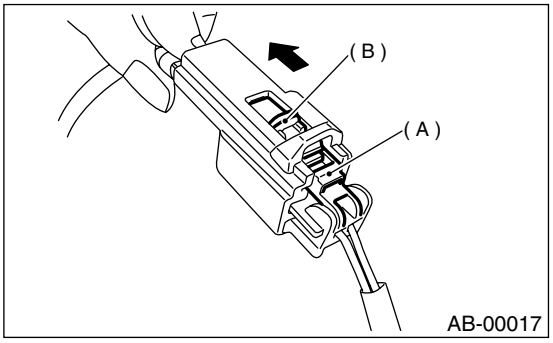
2. Airbag Connector

A: OPERATION

1. DRIVER'S AIRBAG, SIDE AIRBAG, FRONT SUB SENSOR HARNESS TO AIRBAG MAIN HARNESS AND PRETENSIONER

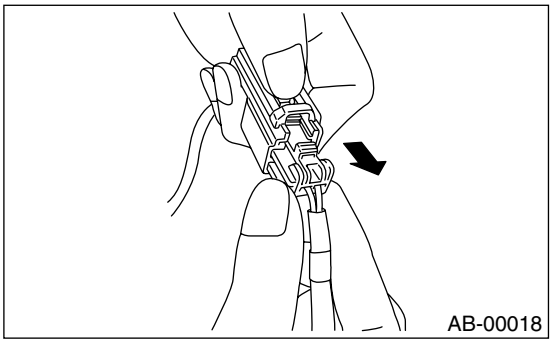
• How to disconnect:

1) Push lock arm (A).
2) With lock arm (A) pushed in, move slide lock (B) in the direction of the arrow.



3) With slide lock (B) pulled, remove lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

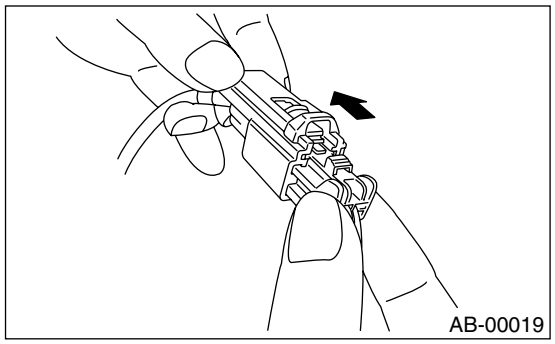
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



• How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

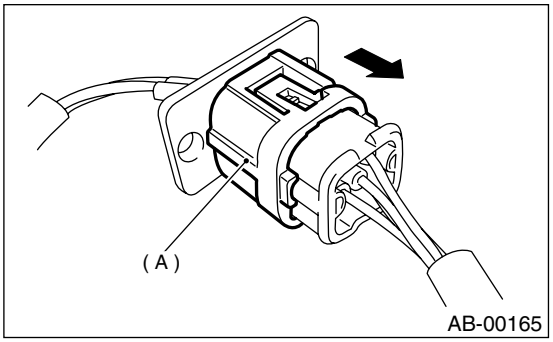


2. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

• How to disconnect:

1) Holding outer part (A), pull it in the direction of the arrow.

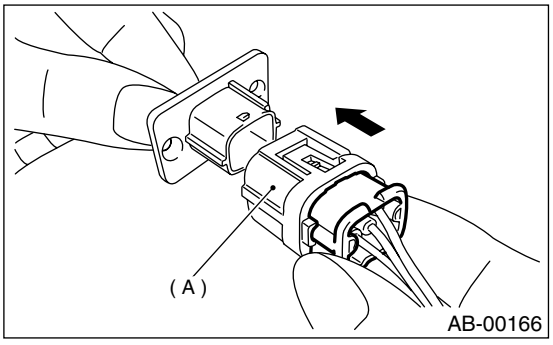
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



• How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

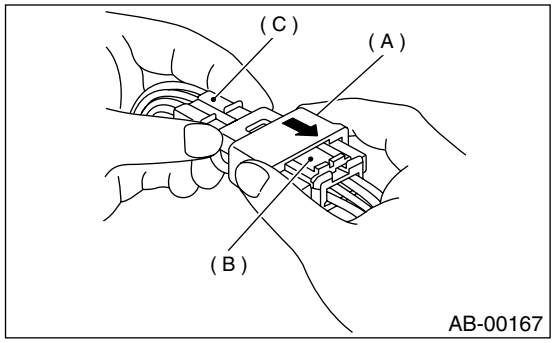


3. PASSENGER'S AIRBAG

• How to disconnect:

Holding male connector (C) in one hand, use your other hand to pull slide lock (A) in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the slide lock and not the male connector or wire.

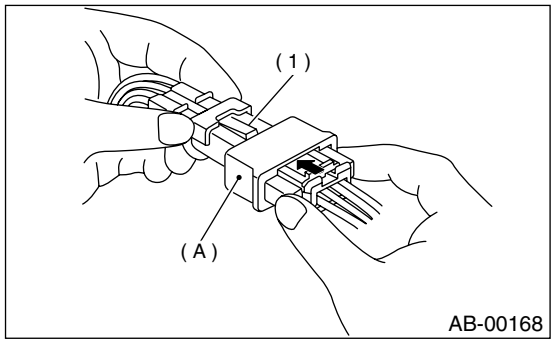


• How to connect:

1) Insert male connector (C) over female connector socket (B), and push slide lock (A) into the male connector tabs.

CAUTION:
Do not hold onto the slide lock.

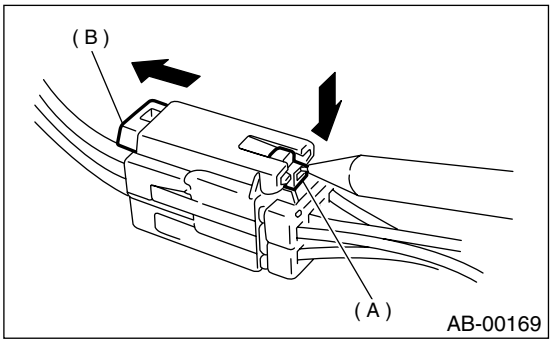
2) If the female connector socket (B) is pushed, slide lock (A) will go past slide lock hook and connect.



(1) Hook

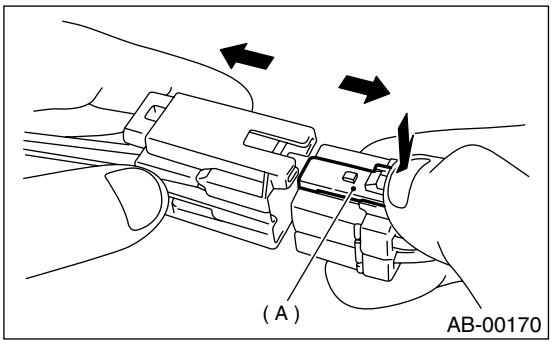
4. AIRBAG MAIN HARNESS TO BODY HARNESS CONNECTOR

1) How to disconnect:
(1) Push lock arm (A) to let green lever (B) pop out.



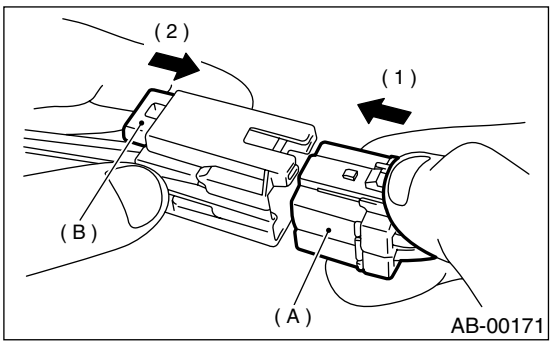
(2) Then separate the connector halves by pulling them apart while pressing lever (A).

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



2) How to connect:
(1) Insert the (A) connector half into the other until a “click” is heard.
(2) Push in green lever (B) until a “click” is heard.
This engages the double lock mechanism.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. Inspection Locations After a Collision

A: INSPECTION

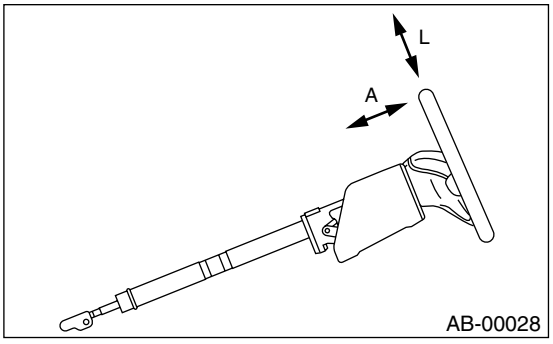
If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following system parts.

1. AIRBAG MODULE (DRIVER)

1) Check for the following, and replace damaged parts with new parts.
- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- Mounting bracket is cracked or deformed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.
- The clearance between the driver's airbag module and steering wheel is not constant.
- Free play of the steering wheel is over specifications in axial and radial directions.

Specifications:
Height deflection A
Less than 6 mm (0.24 in)
O.D. deflection L
Less than 7 mm (0.28 in) [Excluding steering offset 5 mm (0.20 in)]



2. AIRBAG MODULE (PASSENGER)

Check for the following, and replace damaged parts with new parts.
- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- Mounting bracket is cracked or deformed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

3. AIRBAG MODULE (SIDE)

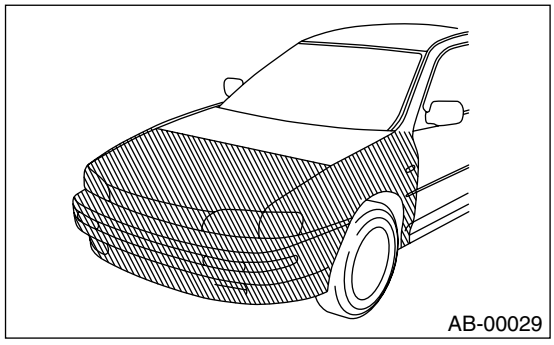
Check for the following, and replace damaged parts with new parts.
- Front seat is damaged or deformed.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

4. AIRBAG CONTROL MODULE

Check for the following, and replace damaged parts with new parts.
- Control module is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or deformed.
- Airbag is deployed.
- Side airbag is deployed.

5. FRONT SUB SENSOR

If the front section of vehicle as shown in the figure is damaged:



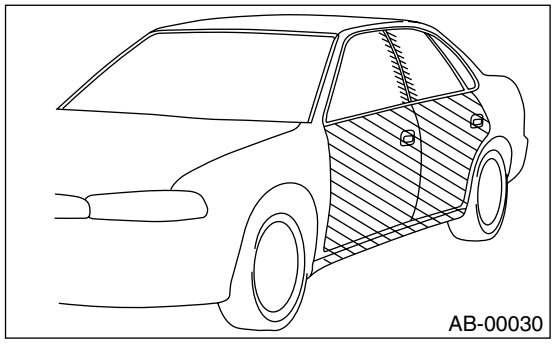
Check for the following, and replace damaged parts with new parts.
- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

6. FRONT SUB SENSOR HARNESS

Check for the following, and replace damaged parts with new parts.
- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

7. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.
- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Side airbag is deployed. (operating side)

8. SIDE AIRBAG SENSOR HARNESS

Check for the following, and replace damaged parts with new parts.
- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

9. MAIN HARNESS

Check for the following, and replace damaged parts with new parts.
- Harness is open, lead wire is exposed, and corrugated tube is noticeably cracked.
- Connector is scratched or cracked.

10.ROLL CONNECTOR

Check for the following, and replace damaged parts with new parts.
- Combination switch or steering roll connector is cracked or deformed.

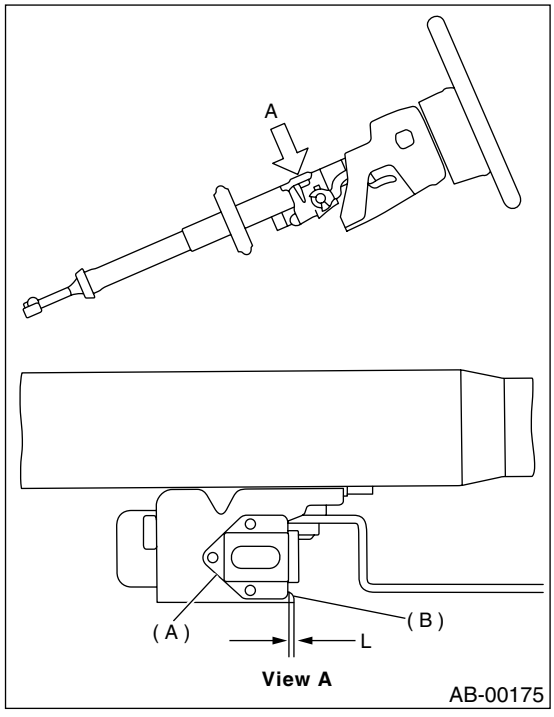
11.STEERING SHAFT

Check for the following, and replace damaged parts with new parts.
The clearance between capsule (A) and tip of column bracket (B) on steering column upper side should be within specifications.

Specifications:

Clearance between capsule and tip of column bracket L

More than 1.3 mm (0.051 in)



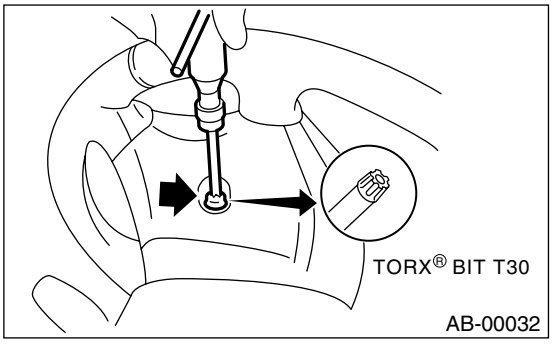
If necessary, replace them with new parts.

4. Driver's Airbag Module

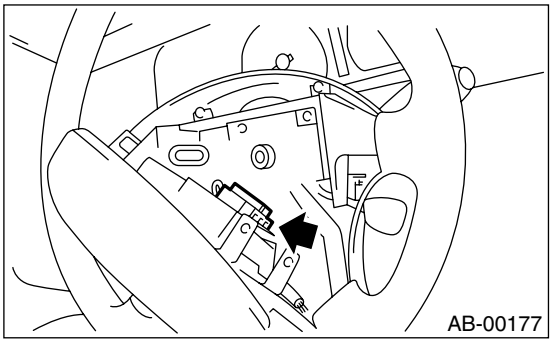
A: REMOVAL

CAUTION:
Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

1) Position front wheels straight ahead. (After moving a vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
2) Turn ignition switch OFF.
3) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
4) Using TORX® BIT T30, remove two TORX® bolts on side of steering wheel.



5) Disconnect airbag connector on back of airbag module, and then remove airbag module.



6) Refer to "CAUTION" for handling of a removed airbag module. **<Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>**

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

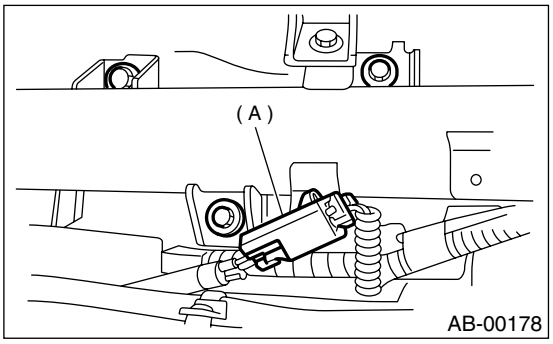
Check for the following, and replace damaged parts with new parts.
• Airbag module, harness, connector, and mounting bracket are damaged.

5. Passenger's Airbag Module

A: REMOVAL

CAUTION:
Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Open the glove box lid. Pull out two stopper pins and lower the globe box. <Ref. to EI-42, REMOVAL, Glove Box.>
4) Disconnect airbag connector (A), and then detach airbag connector from support beam bracket.
5) Remove three bolts, and then carefully remove airbag module.



6) Refer to "CAUTION" for handling of a removed airbag module. **<Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>**

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

Check for the following, and replace damaged parts with new parts.
• Airbag module, harness, connector, and mounting bracket are damaged.

6. Side Airbag Module

A: REMOVAL

CAUTION:
• Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>
• The side airbag module cannot be detached from the front seat assembly.
• When replacing side airbag module, replace front seat assembly.
<Ref. to SE-8, REMOVAL, Front Seat.>

B: INSTALLATION

<Ref. to SE-9, INSTALLATION, Front Seat.>

C: INSPECTION

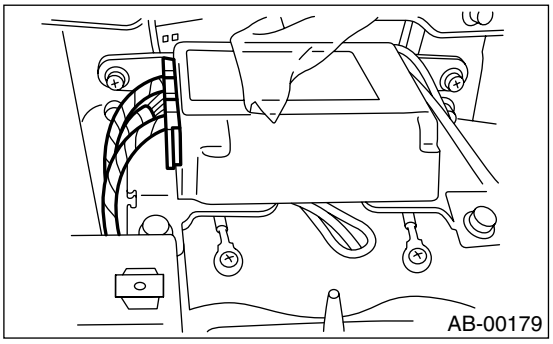
CAUTION:
Refer to "CAUTION" in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

Check for the following, and replace damaged parts with new parts.
• Front seat is deformed or damaged.
• Harness and/or connector is cracked, deformed or open.
• Lead wire is exposed.

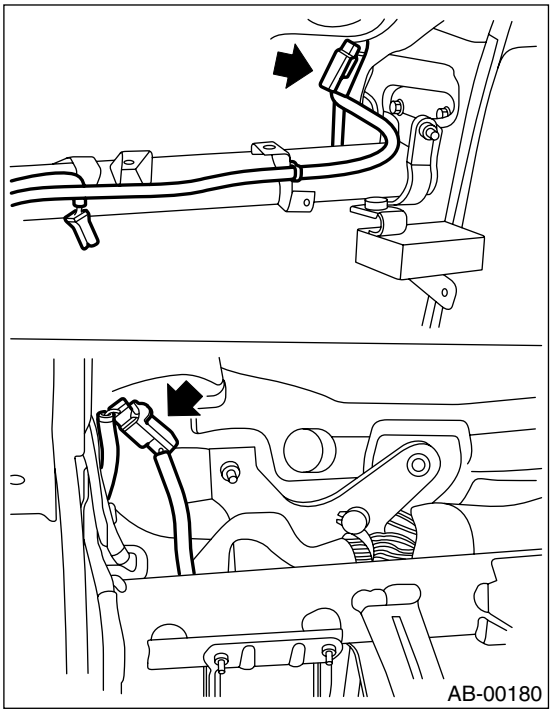
7. Main Harness

A: REMOVAL

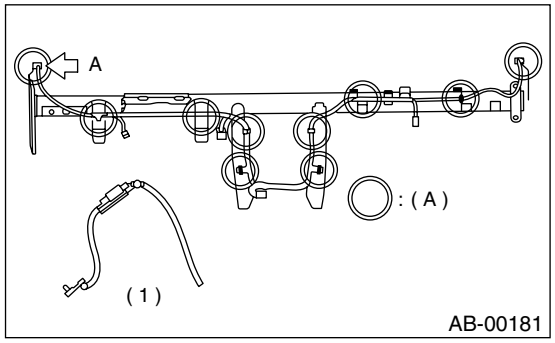
1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery and wait for at least 20 seconds before starting work.
3) Remove instrument panel. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
4) Disconnect connector from airbag control module.



5) Disconnect front sub sensor connector (blue) from airbag main harness.



6) Detach clips (A) from steering support beam, and remove main harness.



(1) View A

B: INSTALLATION

Install in the reverse order of removal.

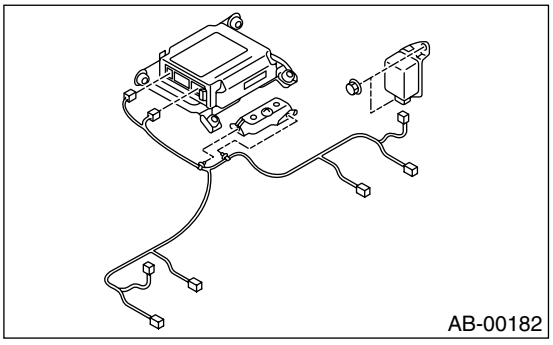
C: INSPECTION

Check for the following, and replace damaged parts with new parts.
- Harness and/or connector is damaged.

8. Side Airbag Harness

A: REMOVAL

1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove front seat. <Ref. to SE-8, REMOVAL, Front Seat.>
4) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
5) Roll up floor mat, and then disconnect two 12-pin yellow connectors from airbag control module.
6) Disconnect connector from side airbag sensor. <Ref. to AB-19, REMOVAL, Side Airbag Sensor.>
7) Detach clips, and then remove side airbag harness.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

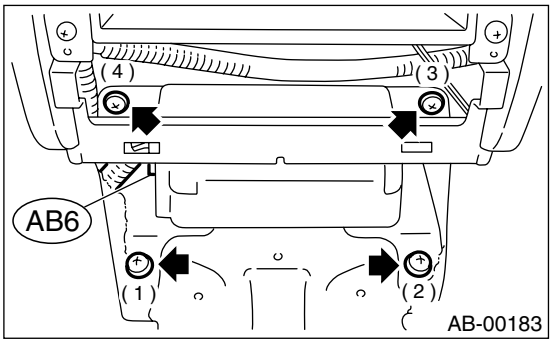
Check for the following, and replace damaged parts with new parts.
- Harness and/or connector is damaged.

9. Airbag Control Module

A: REMOVAL

CAUTION:
• Do not disassemble the airbag control module.
• If the airbag control module is deformed or if water damage is suspected, replace the airbag control module with a new genuine part.
• Do not drop the airbag control module.
• After removal, keep the airbag control module on a dry, clean surface away from moisture, heat, and dust.

1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
4) Disconnect connector from airbag control module.
5) Remove four airbag control module mounting bolts in the order shown in the figure.



B: INSTALLATION

CAUTION:
Use new mounting bolts during re-assembly.
Install in the reverse order of removal.

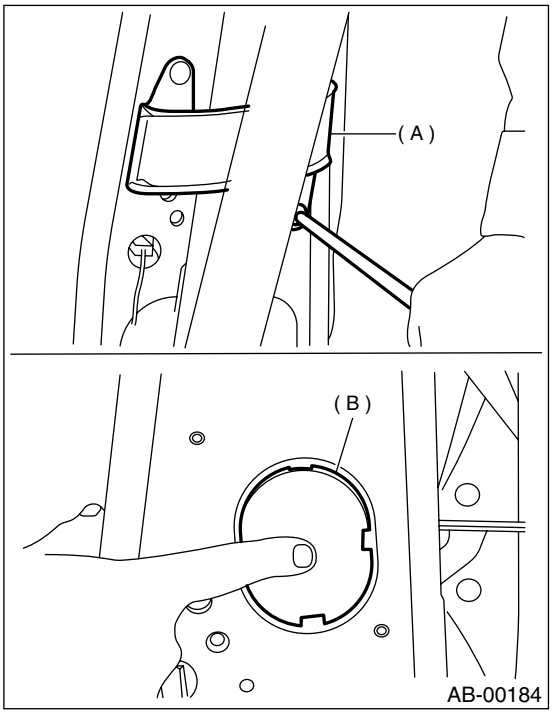
C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Control module, connector, and mounting bracket are damaged.
• Airbag is deployed.
• Side airbag is deployed.

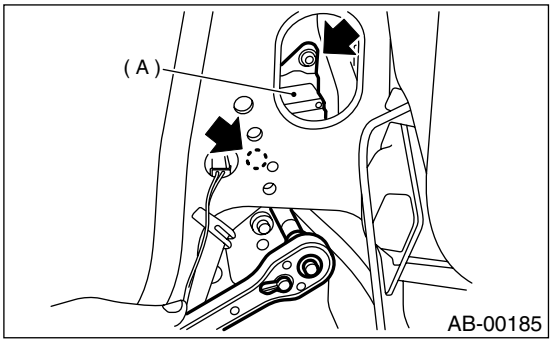
10.Side Airbag Sensor

A: REMOVAL

1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
4) Remove Outer Belt (FRONT). <Ref. to SB-8, REMOVAL, Front Seat Belt.>
5) Remove bracket (A), and then remove cap (B).



6) Remove two mounting nuts, and then detach side airbag sensor (A).



B: INSTALLATION

CAUTION:
Use new mounting nuts during re-assembly.
Install in the reverse order of removal.

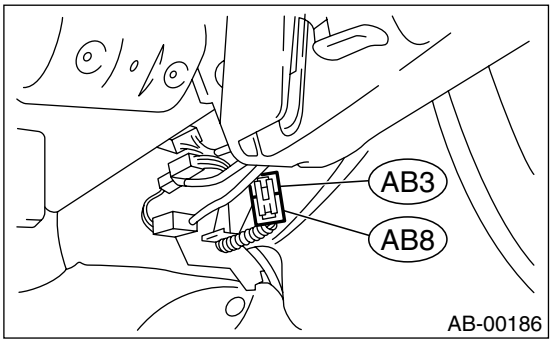
C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Bracket connector for side airbag sensor is damaged.

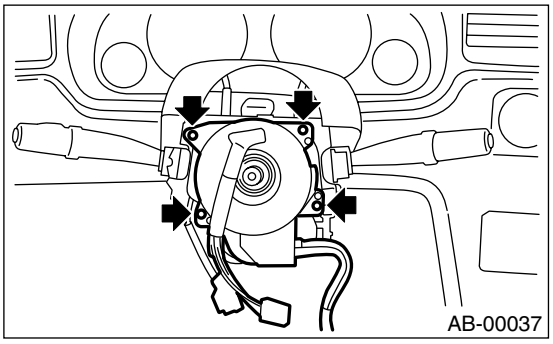
11.Roll Connector

A: REMOVAL

1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove instrument panel lower cover.
4) Disconnect airbag connector (AB3) and (AB8) below steering column.



5) Remove driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.>
6) Remove steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
7) Remove steering column cover.
8) Remove screws, and then remove roll connector.



B: INSTALLATION

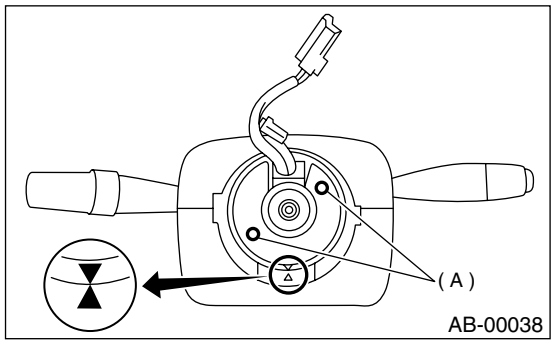
Install in the reverse order of removal.

C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

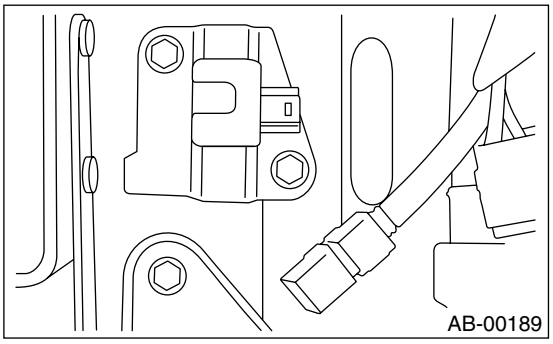
1) Check that front wheels are positioned in straight ahead direction.
2) Turn roll connector pin (A) clockwise until it stops.
3) Turn roll connector pin (A) counterclockwise approximately 2.65 turns until "▲" marks are aligned.



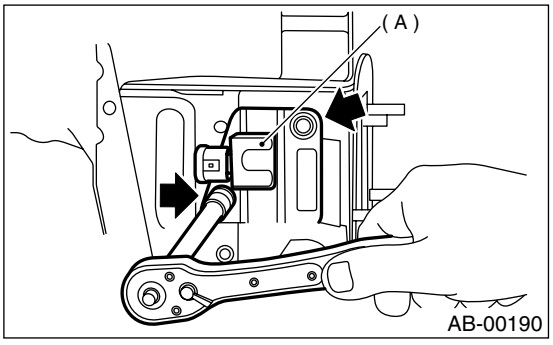
12.Front Sub Sensor

A: REMOVAL

1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove front bumper. <Ref. to EI-21, REMOVAL, Front Bumper.>
4) Disconnect connector from front sub sensor.



5) Remove front sub sensor (A).



B: INSTALLATION

Install in the reverse order of removal.

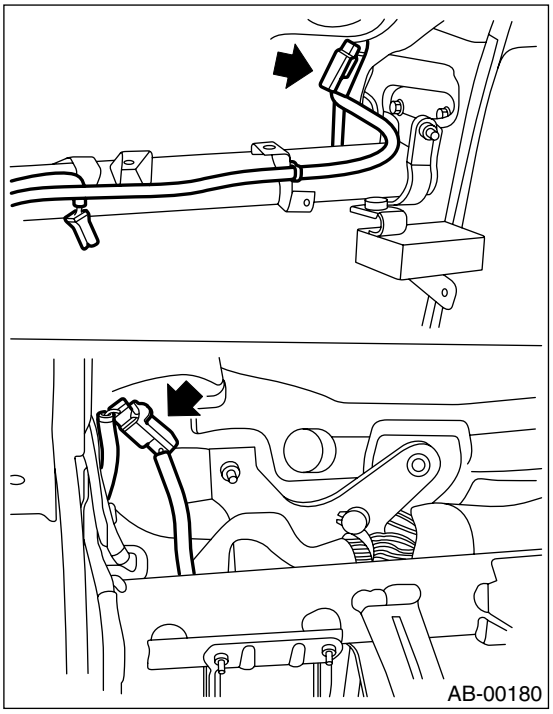
C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Front sub sensor, mounting bracket, and connector are damaged.

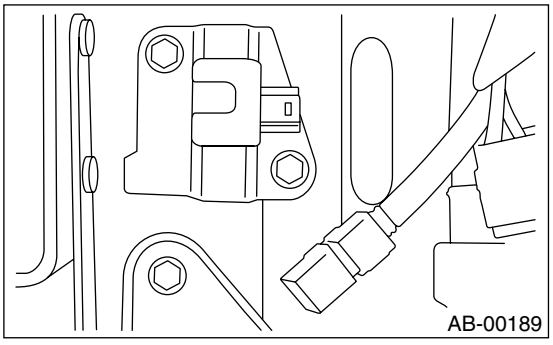
13.Front Sub Sensor Harness

A: REMOVAL

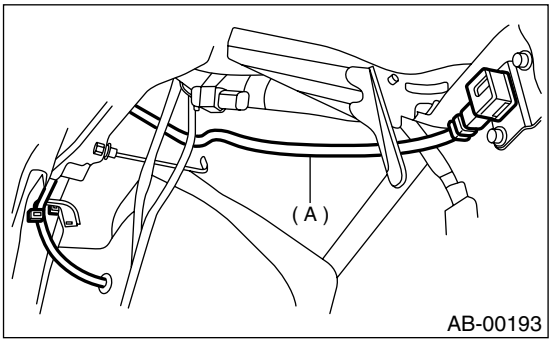
1) Turn ignition switch OFF.
2) Disconnect the ground cable from the battery, and wait for at least 20 seconds before starting work.
3) Remove instrument panel. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
4) Disconnect front sub sensor connector (blue) from airbag main harness.



5) Remove front bumper. <Ref. to EI-21, REMOVAL, Front Bumper.>
6) Disconnect connector from front sub sensor.



7) Remove wiring harness clips.
8) Remove grommet, and then detach front sub sensor harness (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for the following, and replace damaged parts.

- Harness and/or connector is damaged.

AIRBAG SYSTEM (DIAGNOSTICS)

AB

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**Read DTC.** <Ref. to AB-20, Read Diagnostic Trouble Code (DTC).>	Is the normal code being detected?	Finish the diagnosis.	Go to step **2.**
2	**Read DTC.** <Ref. to AB-20, Read Diagnostic Trouble Code (DTC).>	Is the DTC being detected?	Go to step **3.**	Go to “Airbag Warning Light Failure”.<Ref. to AB-24, Airbag Warning Light Failure.>
3	**Perform the diagnosis.** 1) Judge the possible cause from “List of Diagnostic Trouble Code (DTC)” <Ref. to AB-28, List of Diagnostic Trouble Code (DTC).>. 2) Inspect using “Diagnostic Chart with Diagnostic Trouble Code (DTC)”. 3) Repair the cause of the trouble. 4) Perform the clear memory mode. <Ref. to AB-22, Clear Memory Mode.> 5) Perform the inspection mode. <Ref. to AB-21, Inspection Mode.> 6) Read DTC.	Is the DTC being detected?	Perform the procedure 1) to 5) in step 3 again.	Finish the diagnosis.

2. Check List for Interview

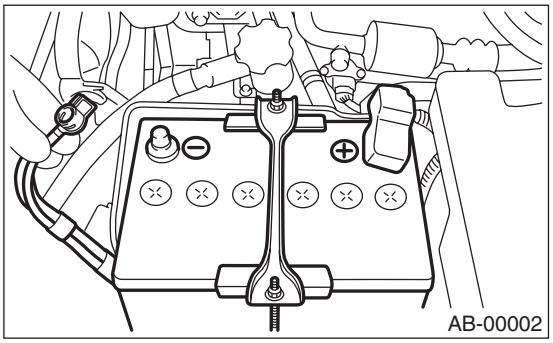
A: CHECK

Customer's Name		Inspector's Name	
Date Vehicle Brought In	/ /	Registration No.	
Odometer Reading	km Miles	Vin No.	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Other:		
Temperature	°C (°F)		
Road Condition	❑ Level road ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Vehicle Operation	❑ Starting ❑ Idling ❑ Driving (❑ Constant Speed ❑ Acceleration ❑ Deceleration ❑ Steering wheel turn ❑ Other:)		
Details of Problem			
Check Airbag Warning Light	❑ Remains ON ❑ Remains OFF		
Check DTC	❑ Normal Code ❑ Trouble Code: (Code:)		

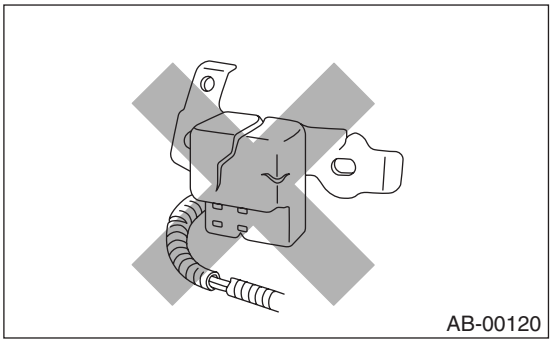
3. General Description

A: CAUTION

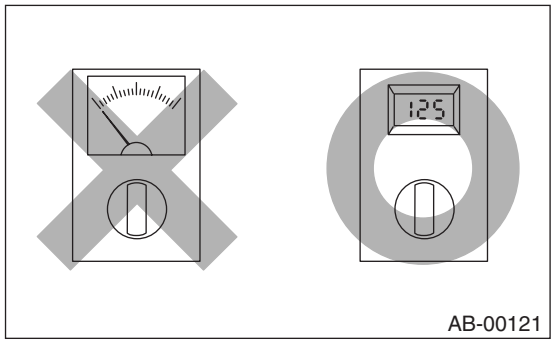
• When servicing a vehicle, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



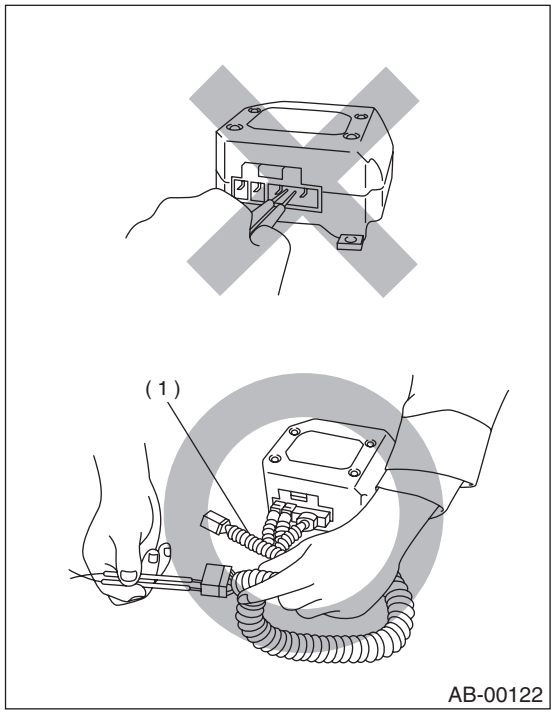
• If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
• If sensors, airbag module, airbag control module pretensioner, and harness are deformed or damaged, replace them with new genuine parts.
• Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.



• When checking the system, be sure to use a digital circuit tester.
Use of an analog circuit tester may cause the airbag to activate erroneously.



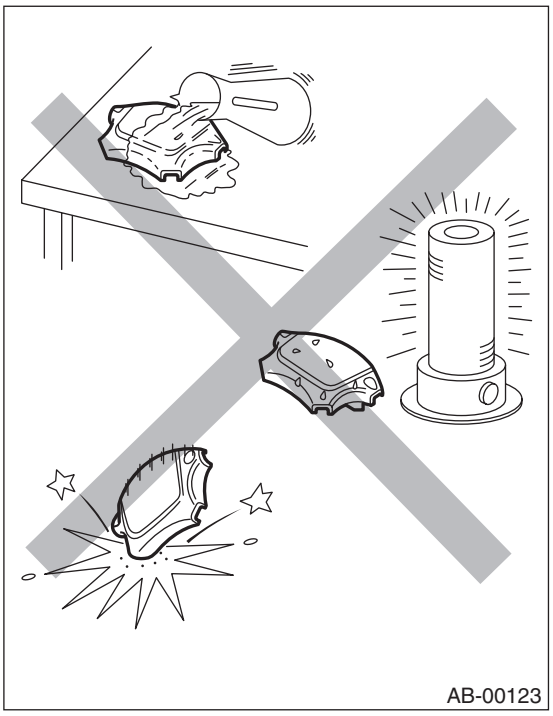
• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



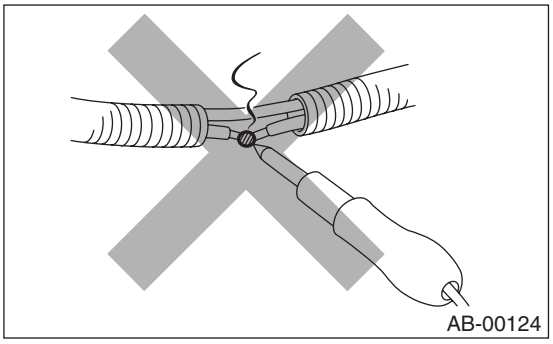
(1) Test harness

• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the in-

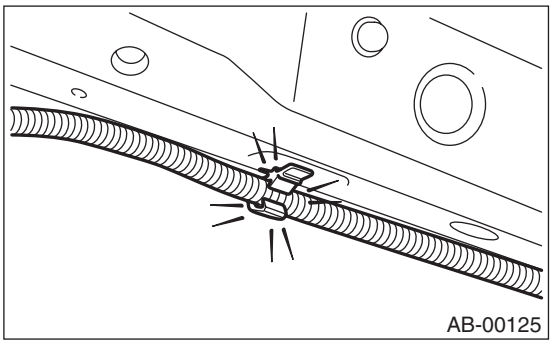
ternal parts may be damaged and reliability greatly lowered.


AB-00123

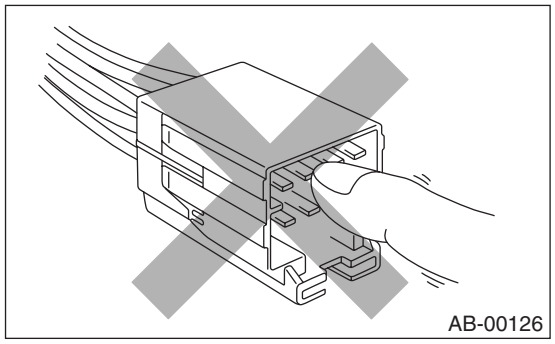
• If any damage, opening or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.


AB-00124

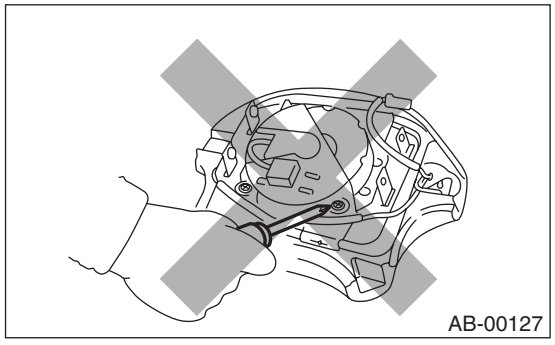
• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.


AB-00125

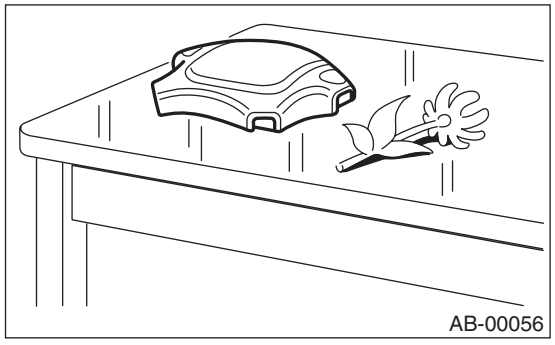
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.


AB-00126

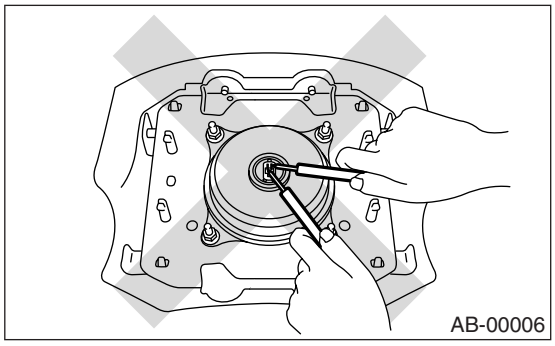
• The airbag module (driver, passenger, and side, pretensioner) must not be disassembled.
• The airbag module cannot be used again once inflated.


AB-00127

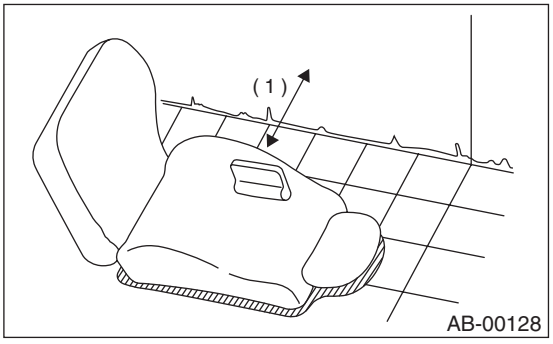
• After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.


AB-00056

• Do not check continuity of the airbag module (driver, passenger, and side, pretensioner).

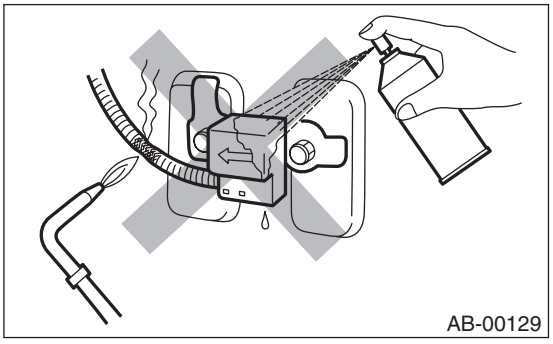


• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.

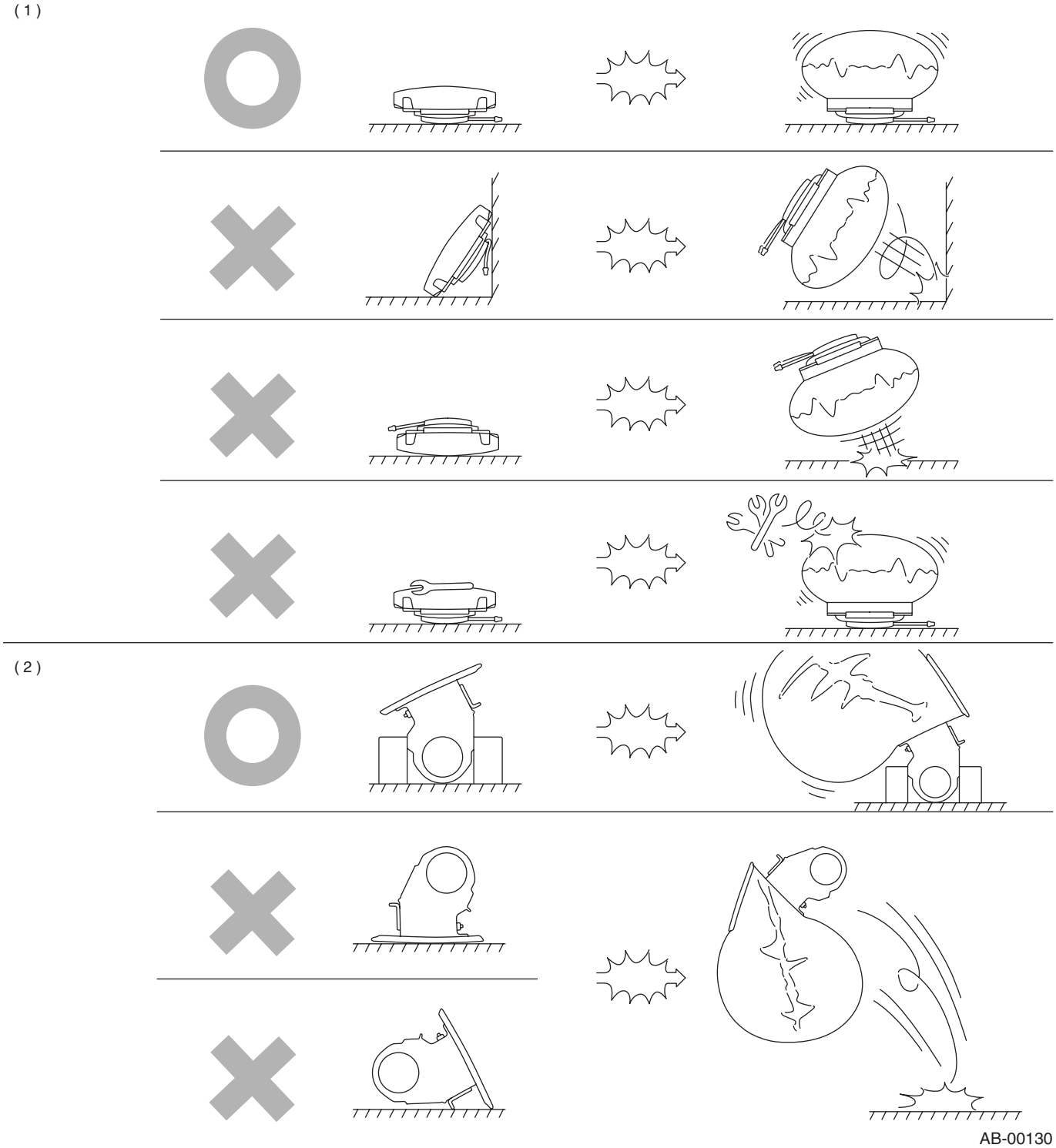


(1) More than 200 mm (8 in)

• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver side (2) Passenger side

• Do not discard undeployed airbag modules. They could easily cause a serious accident if accidentally deployed.
• Do not damage the airbag module or drop it.

B: INSPECTION

Before diagnosing, check the following items that might be related to the engine problem:

1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

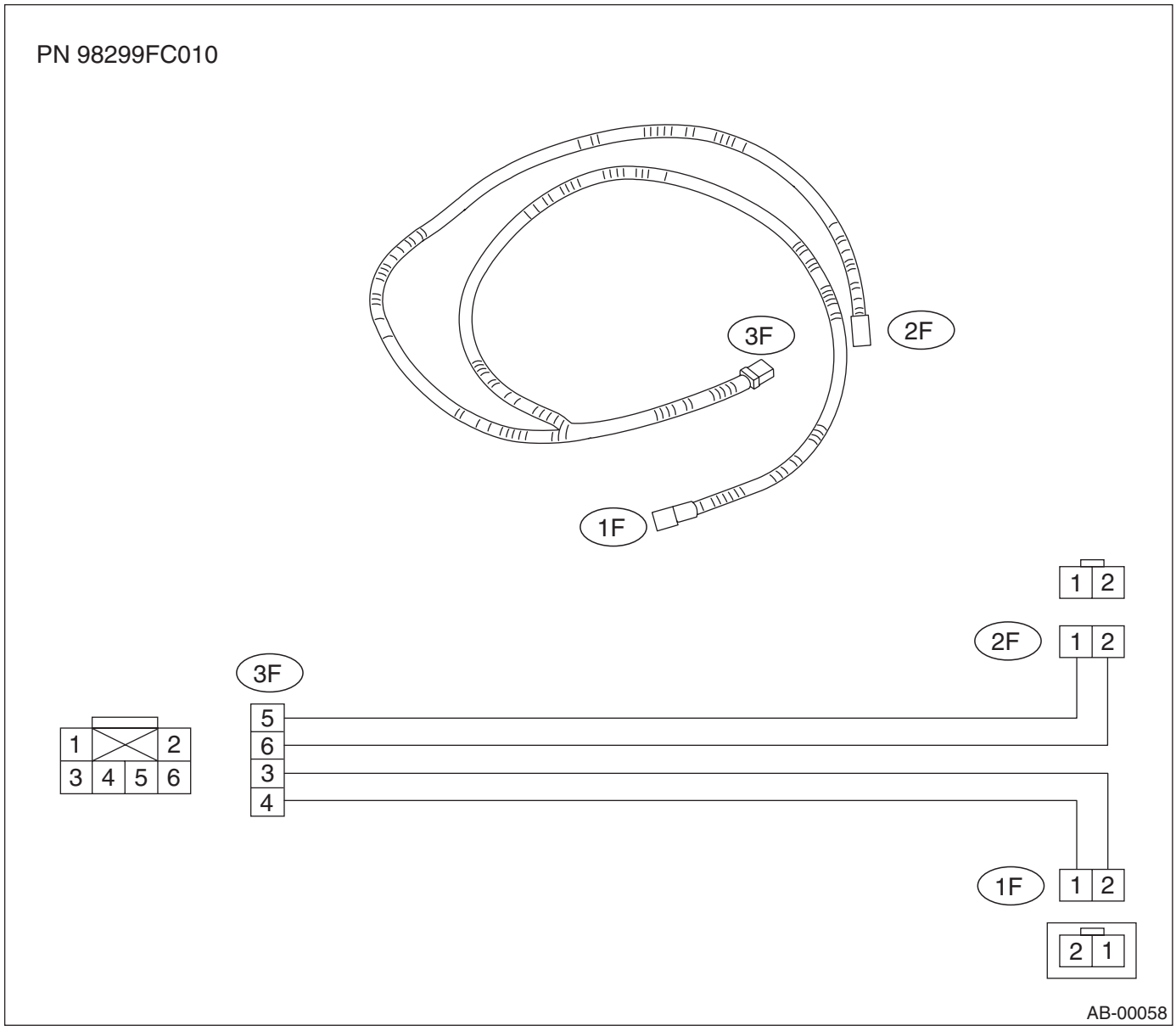
Specific gravity: Above 1.260

C: PREPARATION TOOL

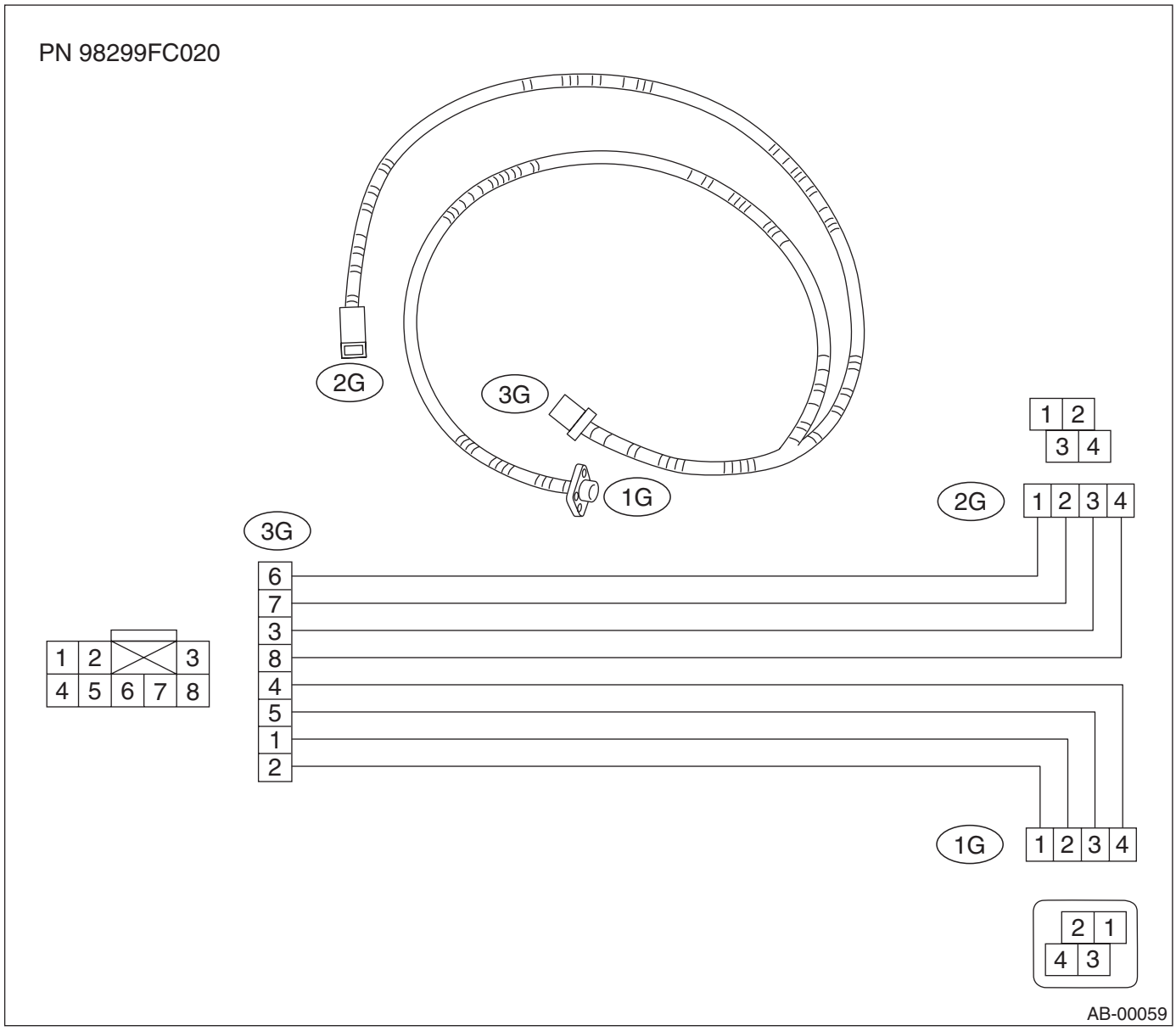
CAUTION:
Be sure to use specified test harness F, G, H, K and I or I2 when measuring voltage, resistance, etc. of AIRBAG system component parts.

1. TEST HARNESS F

PN 98299FC010

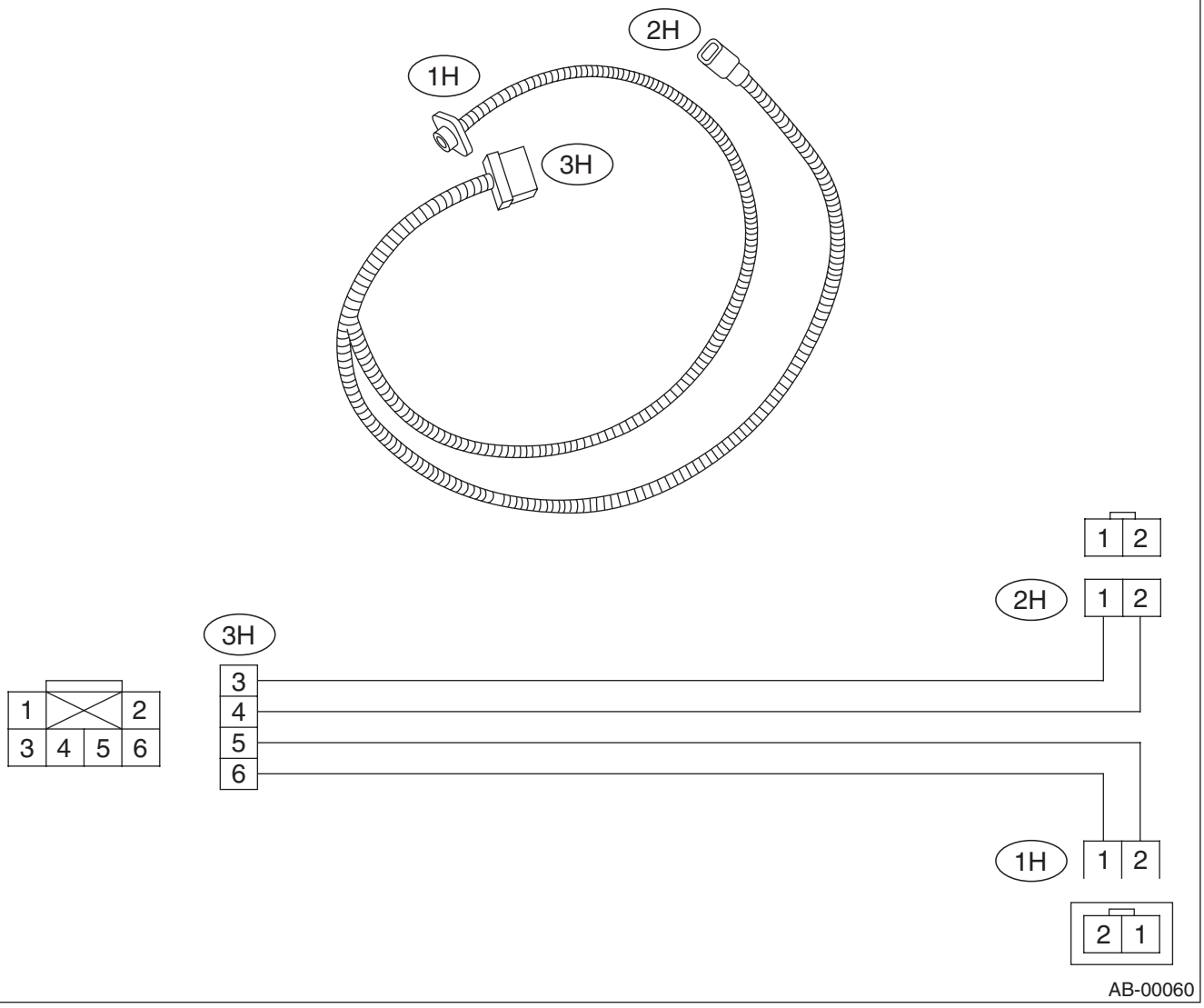


2. TEST HARNESS G



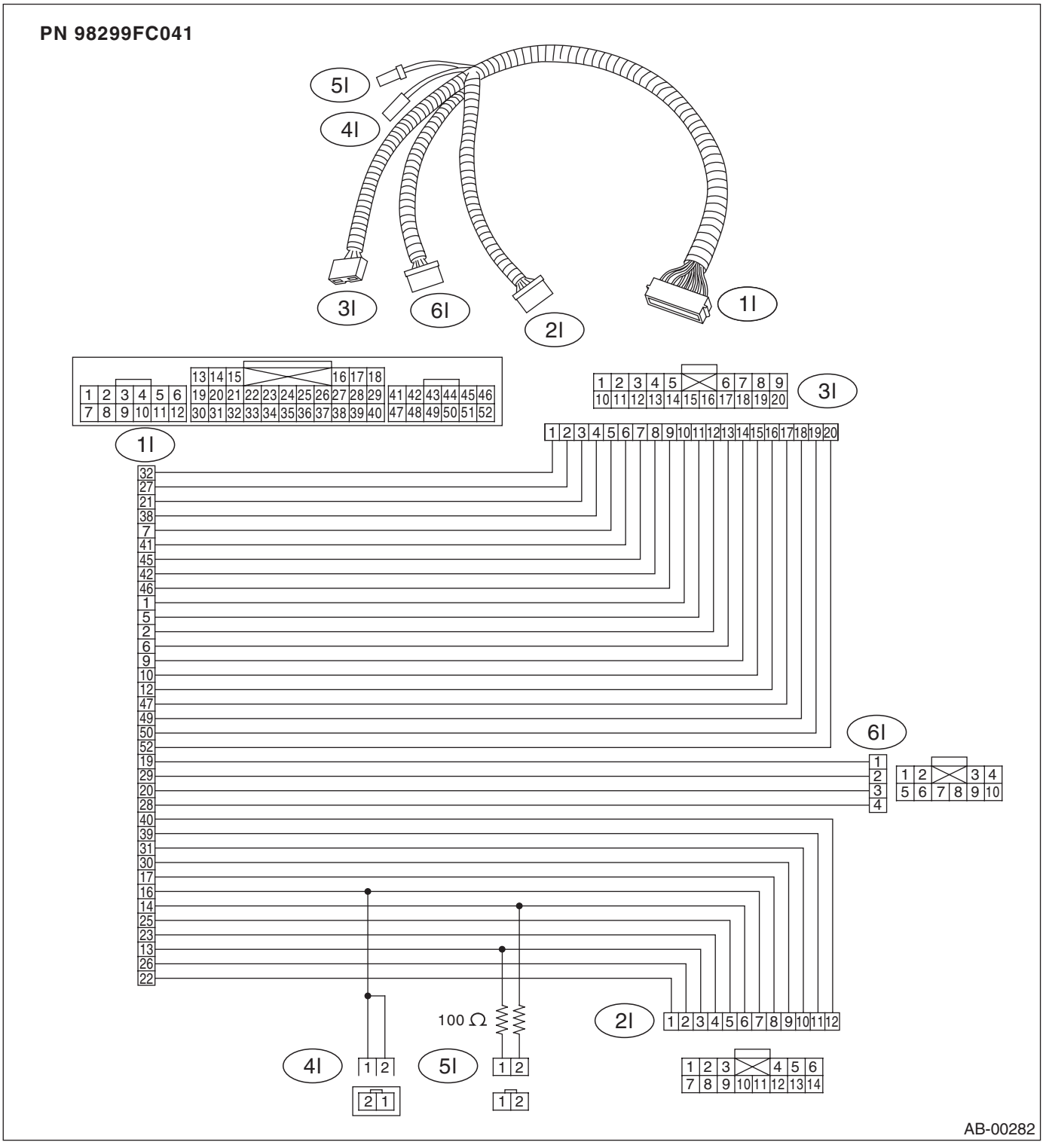
3. TEST HARNESS H

PN 98299FA030



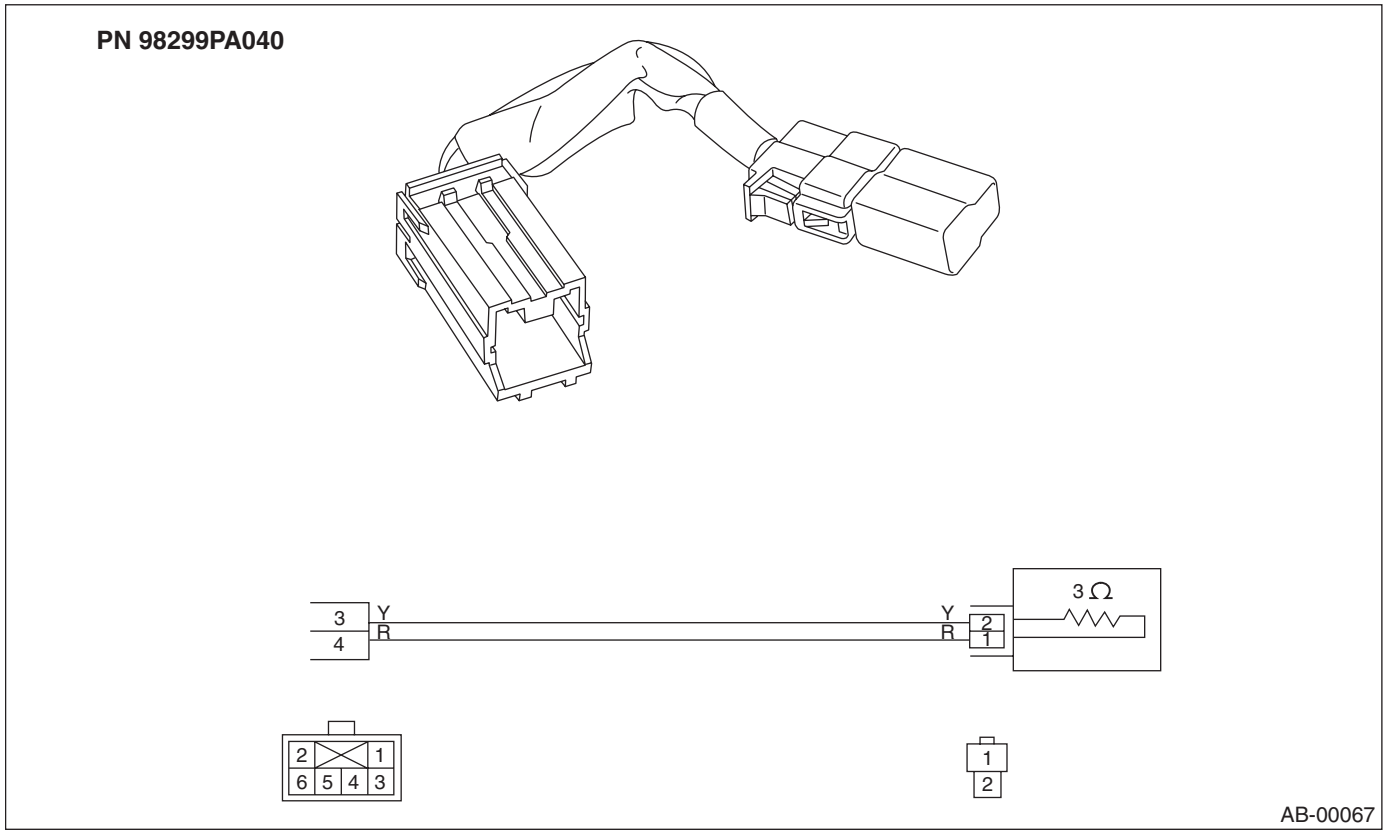
4. TEST HARNESS I2

PN 98299FC041

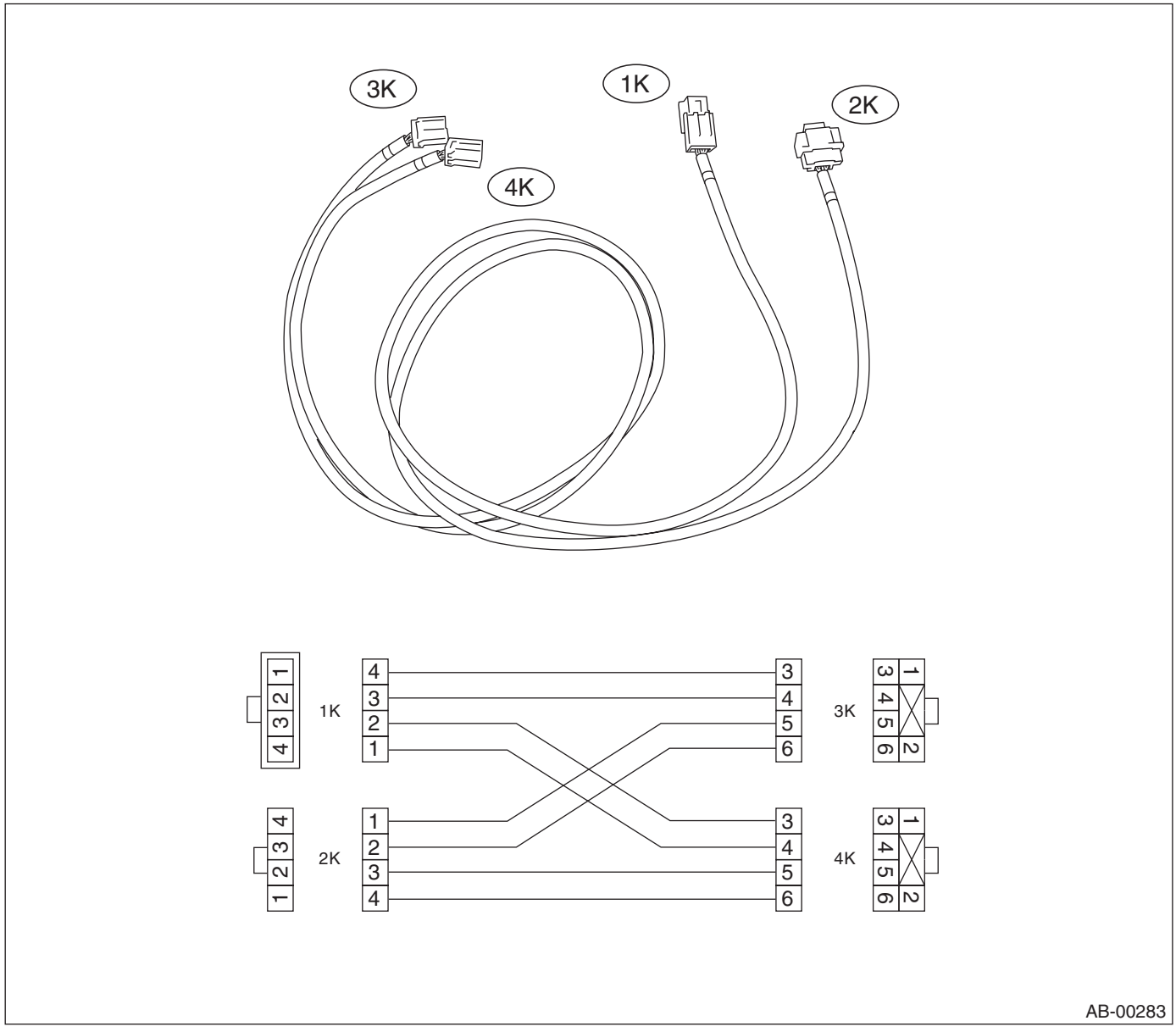


5. AIRBAG RESISTOR

The airbag resistor is used during diagnostics. The airbag resistor has the same resistance as the airbag module and thus provides safety when used instead of the airbag module. It also makes it possible to finish, diagnostics in less time.

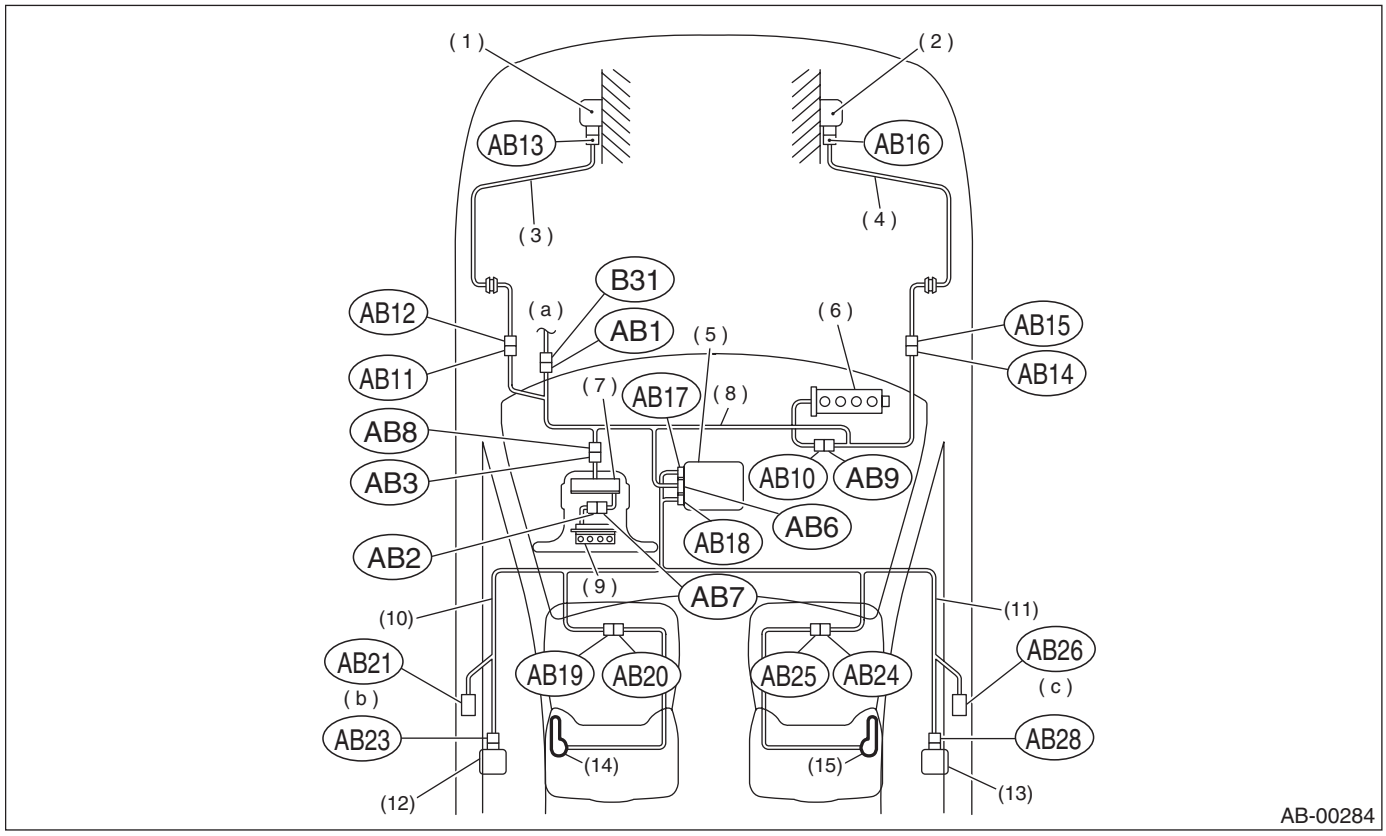


6. TEST HARNESS K



4. Electrical Components Location

A: LOCATION



(1) Front sub sensor (LH)
(2) Front sub sensor (RH)
(3) Front sub sensor harness (LH)
(4) Front sub sensor harness (RH)
(5) Airbag control module with safety sensor and electric sensor
(6) Inflator (Passenger)
(7) Roll connector
(8) Airbag main harness
(9) Inflator (Driver)
(10) Side airbag harness (LH)
(11) Side airbag harness (RH)
(12) Side airbag sensor (LH)
(13) Side airbag sensor (RH)
(14) Side airbag inflator (LH)
(15) Side airbag inflator (RH)
(a) To body harness
(b) To seal belt pretensioner (LH)
(c) To seal belt pretensioner (RH)

Connector No.	(AB1)	(AB2)	(AB3)	(AB6)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	12	2	2	28	2	2	4	4	2	2	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Yellow	Blue
Male/ Female	Male	Male	Male	Female	Female	Female	Female	Male	Male	Female	Female	Male

Connector No.	(AB15)	(AB16)	(AB17)	(AB18)	(AB19)	(AB20)	(AB21)	(AB23)	(AB24)	(AB25)	(AB26)	(AB28)
Pole	2	2	12	12	2	2	2	4	2	2	2	4
Color	Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/ Female	Female	Female	Female	Female	Female	Male	Female	Female	Female	Male	Female	Female

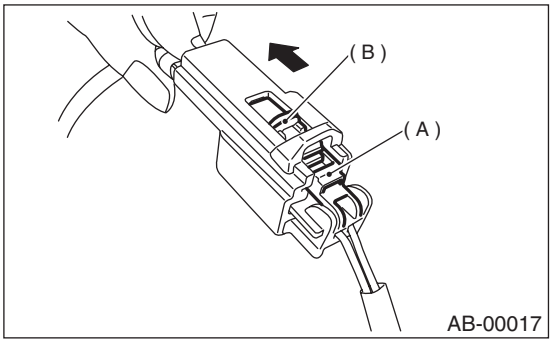
5. Airbag Connector

A: OPERATION

1. DRIVER'S AIRBAG (AIRBAG MAIN HARNESS AND ROLL CONNECTOR), SIDE AIRBAG, FRONT SUB SENSOR HARNESS TO AIRBAG MAIN HARNESS AND PRETENSIONER

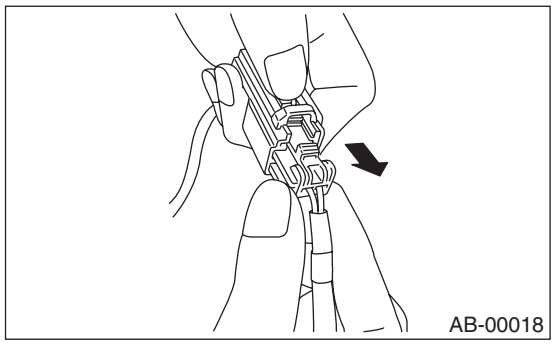
• How to disconnect:

1) Push lock arm (A).
2) With lock arm (A) pushed in, move slide lock (B) in the direction of the arrow.



3) With slide lock (B) pulled, remove lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

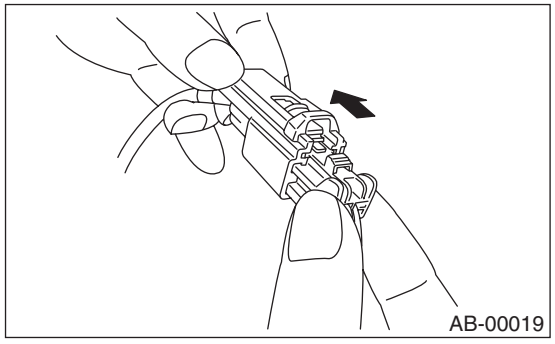
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



• How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

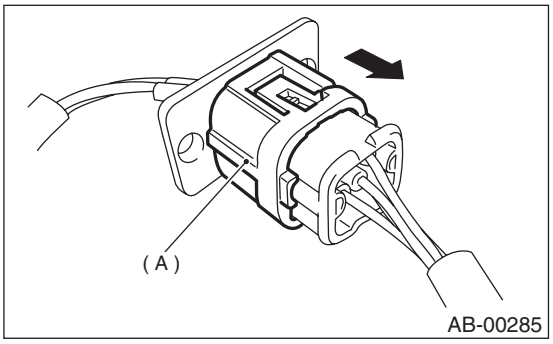


2. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

• How to disconnect:

1) Holding outer part (A), pull it in the direction of the arrow.

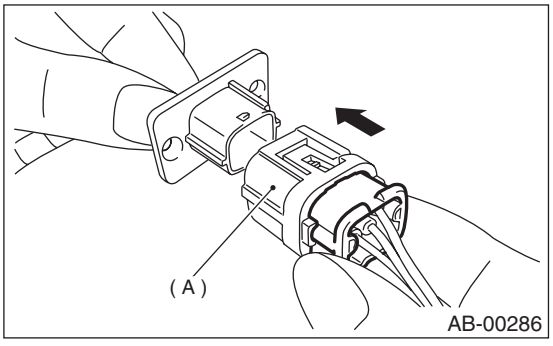
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



• How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

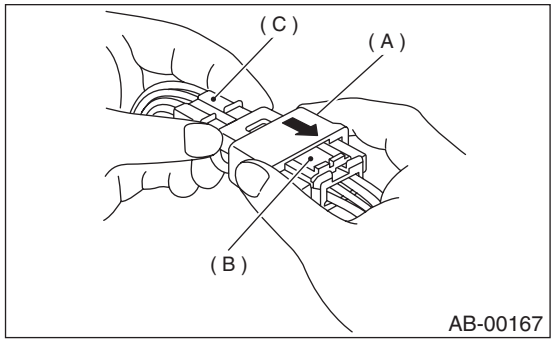


3. PASSENGER'S AIRBAG

• How to disconnect:

Holding female connector (C) in one hand, use your other hand to pull slide lock (A) in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the slide lock and not the male connector or wire.

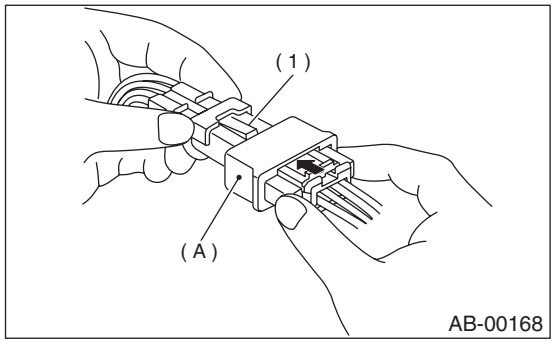


• How to connect:

1) Insert female connector (C) over male connector socket (B), and push slide lock (A) into the female connector tabs.

CAUTION:
Do not hold onto the slide lock.

2) If the male connector socket is pushed too hard, slide lock (A) will go past slide lock (A) tabs and connect.

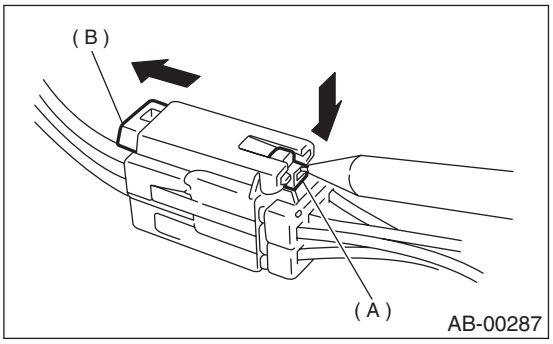


(1) Hook

4. AIRBAG MAIN HARNESS TO BODY HARNESS CONNECTOR

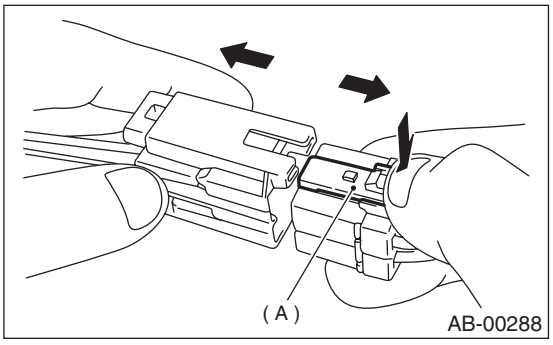
• How to disconnect:

1) Push lock arm (A) to let green lever (B) pop out.



2) Then separate the connector halves by pulling them apart while pressing lever (A).

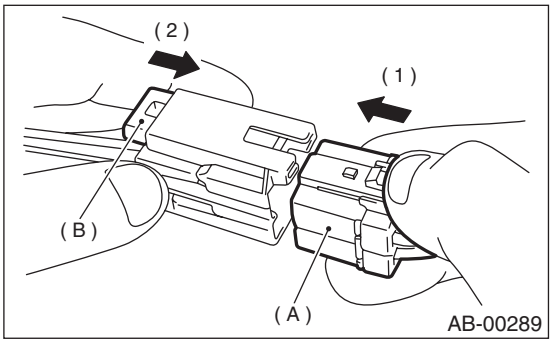
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



• How to connect:

1) Insert the (A) connector half into the other until a “click” is heard.
2) Push in green lever (B) until a “click” is heard. This engages the double lock mechanism.

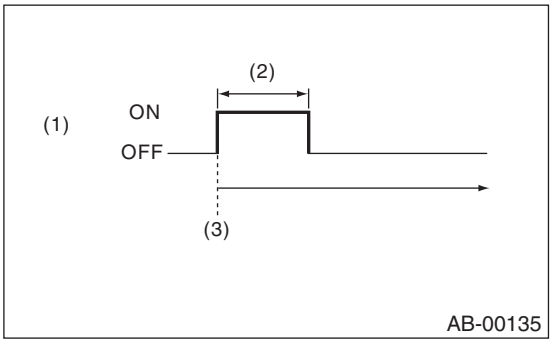
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



6. Airbag Warning Light Illumination Pattern

A: INSPECTION

Keep the ignition switch ON, and confirm that the airbag warning light remains off approximately 6 seconds after being turned on.

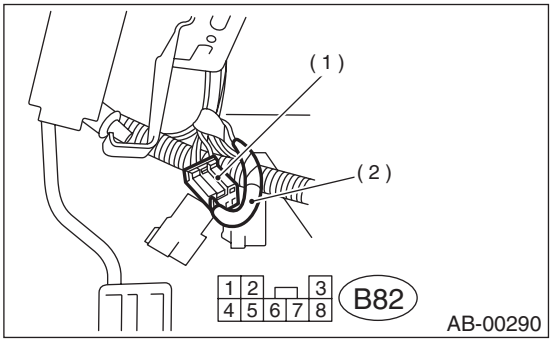


(1) Airbag warning light
(2) Approx. 6 seconds
(3) Ignition switch ON

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

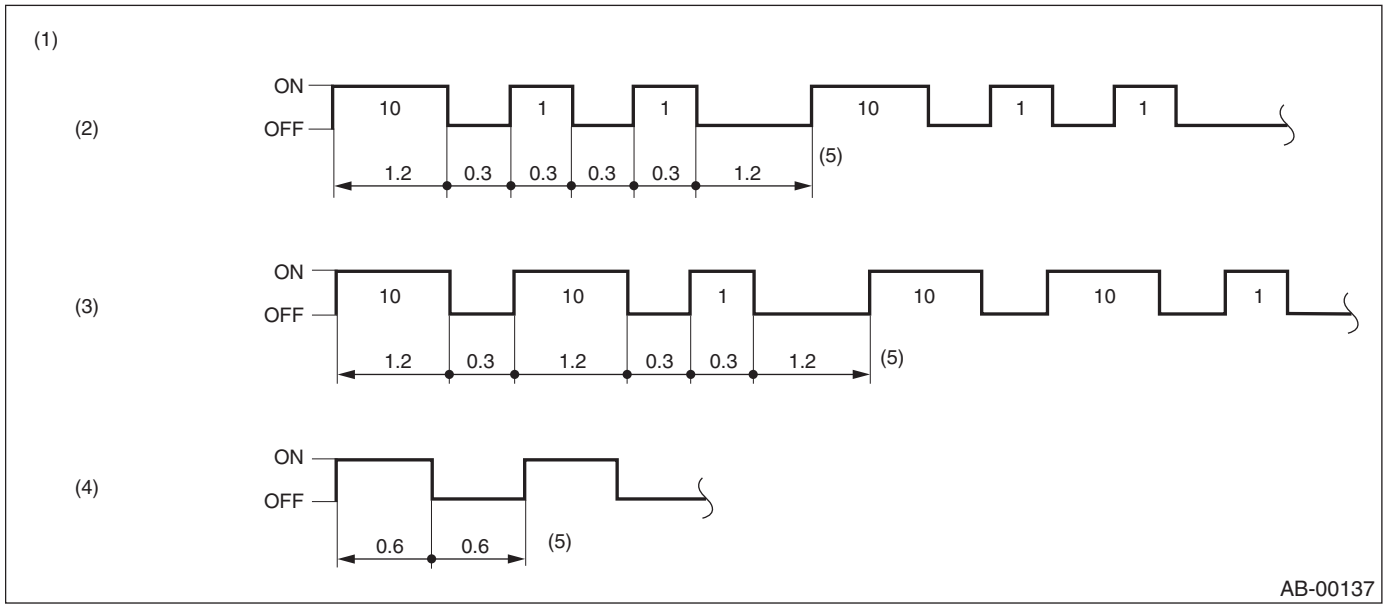
1) Turn the ignition switch ON.
2) Connect the diagnosis terminal to diagnosis connector terminal No. 2 in the driver's seat lower cover area.



(1) Diagnosis connector
(2) Diagnosis terminal

3) Read DTC by identifying the way the air bag warning light flashes.
The airbag warning light flashes a DTC corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.3 sec on) indicates a “one”.

NOTE:
• “List of Diagnostic Trouble Code (DTC)” <Ref. to AB-28, List of Diagnostic Trouble Code (DTC).>
• “Airbag Warning Light Failure” <Ref. to AB-24, Airbag Warning Light Failure.>



(1) Example
(2) Flashing code 12
(3) Flashing code 21
(4) Flashing normal code
(5) Sec.

4) Turn the ignition switch OFF, and disconnect the diagnosis terminal from the diagnosis connector terminal No. 2.
5) Wind tape around the diagnosis terminal and return it to its original position.

8. Inspection Mode

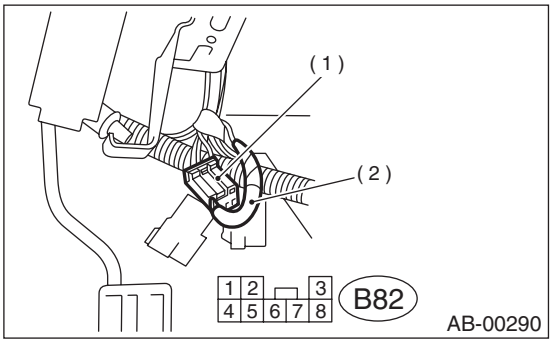
A: OPERATION

Recreate the circumstance by referring to the conditions described in the checklist.

9. Clear Memory Mode

A: OPERATION

1) Turn the ignition switch ON.
2) Connect the diagnosis terminal to diagnosis connector terminal No. 2 in the driver's seat lower cover area.



3) While the warning light flashes, connect another diagnosis terminal to diagnosis connector terminal No. 3.
4) Once the memory is erased, the warning light returns to the normal flash rate (0.6 sec on). The failure to recover the normal flash rate indicates that trouble parts still remain. Having repaired such parts, erase the memory again and confirm that the normal flash rate has returned.
5) When the memory has been cleared, disconnect the diagnosis terminal from the diagnosis connector.
6) Wind tape around the diagnosis terminal and return it to its original position.

MEMO:

10.Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON.

DIAGNOSIS:

- Airbag warning light is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.
- (AB6) is not connected properly to airbag control module.

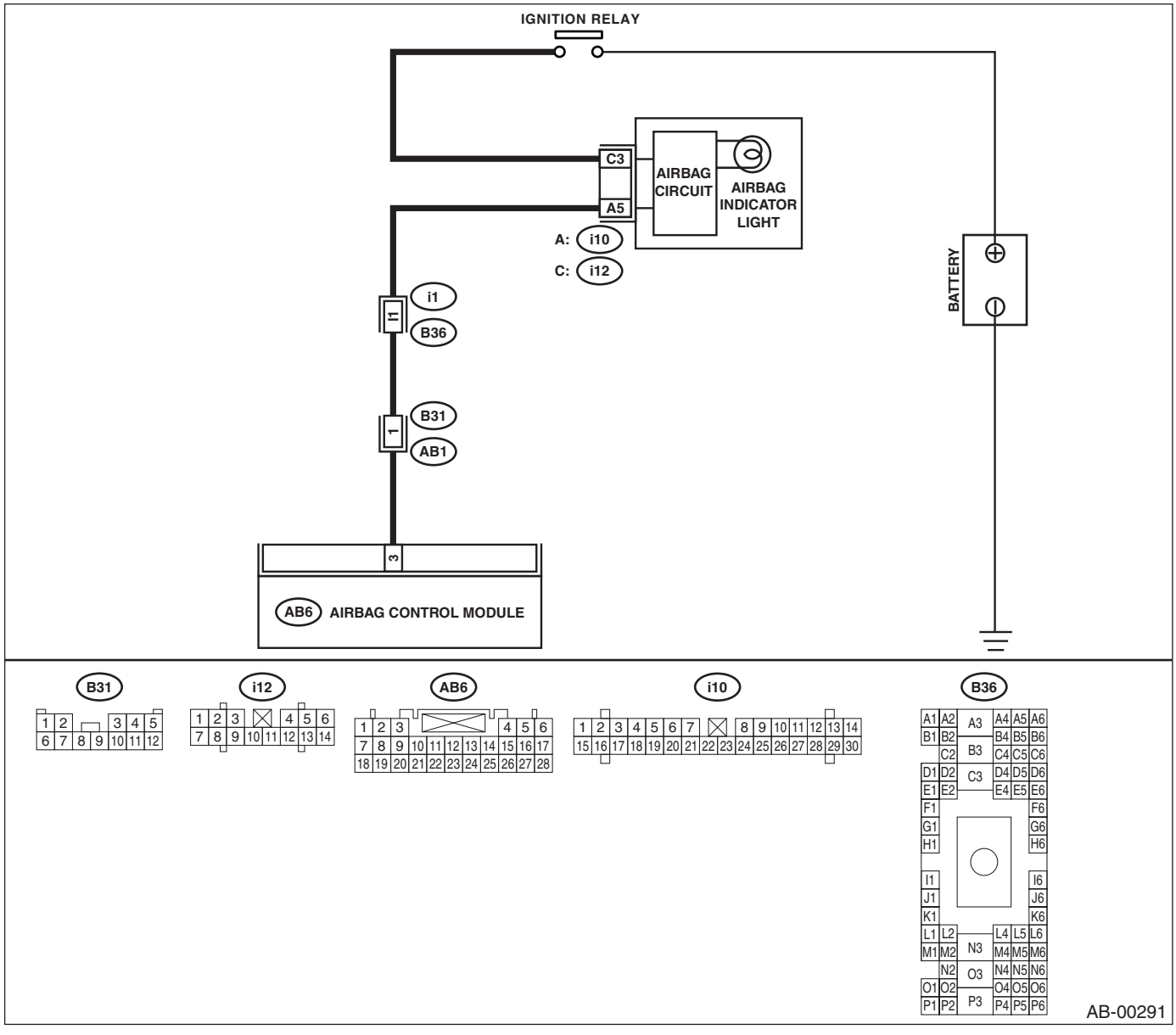
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove side sill cover. (Driver's side) 3) Confirm that firm contact is secured between connectors (AB1) and (B31).	Is the poor contact in connectors (AB1) and (B31)?	Repair the body harness or replace airbag main harness. <Ref. to AB-16, Main Harness.>	Go to step **2.**
2	**CHECK POOR CONTACT.** Confirm that firm contact is secured between the air bag control module and the connector (AB6). <Ref. to AB-18, Airbag Control Module.>	Is the poor contact in connector (AB6)?	Replace airbag main harness. <Ref. to AB-16, Main Harness.> Or replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect connectors (AB3) and (AB8). 4) Pull out the two stopper pins and lower the glove box and disconnect connectors (AB10) and (AB9). 5) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 6) Connect the battery ground cable and turn the ignition switch ON. 7) Connect connectors (4I) and (5I) in test harness I2. NOTE: After problem has been eliminated, disconnect connectors (4I) and (5I).	Is the airbag warning light turned off?	Go to step **4.**	Replace airbag main harness. <Ref. to AB-16, Main Harness.> Or replace combination meter printed circuit. <Ref. to IDI-13, Combination Meter Assembly.> Or repair the body harness.
4	**CHECK AIRBAG MAIN HARNESS.** 1) Connect the connector (AB1) to (B31). 2) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 3) Measure the resistance between connector (2I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 9 — Chassis ground:*** ***(2I) No. 10 — Chassis ground:***	Is the measured value less than 10 Ω?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-16, Main Harness.> Or repair the body harness.

B: AIRBAG WARNING LIGHT REMAINS OFF.

DIAGNOSIS:

- Fuse No. 5 (in fuse box) is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

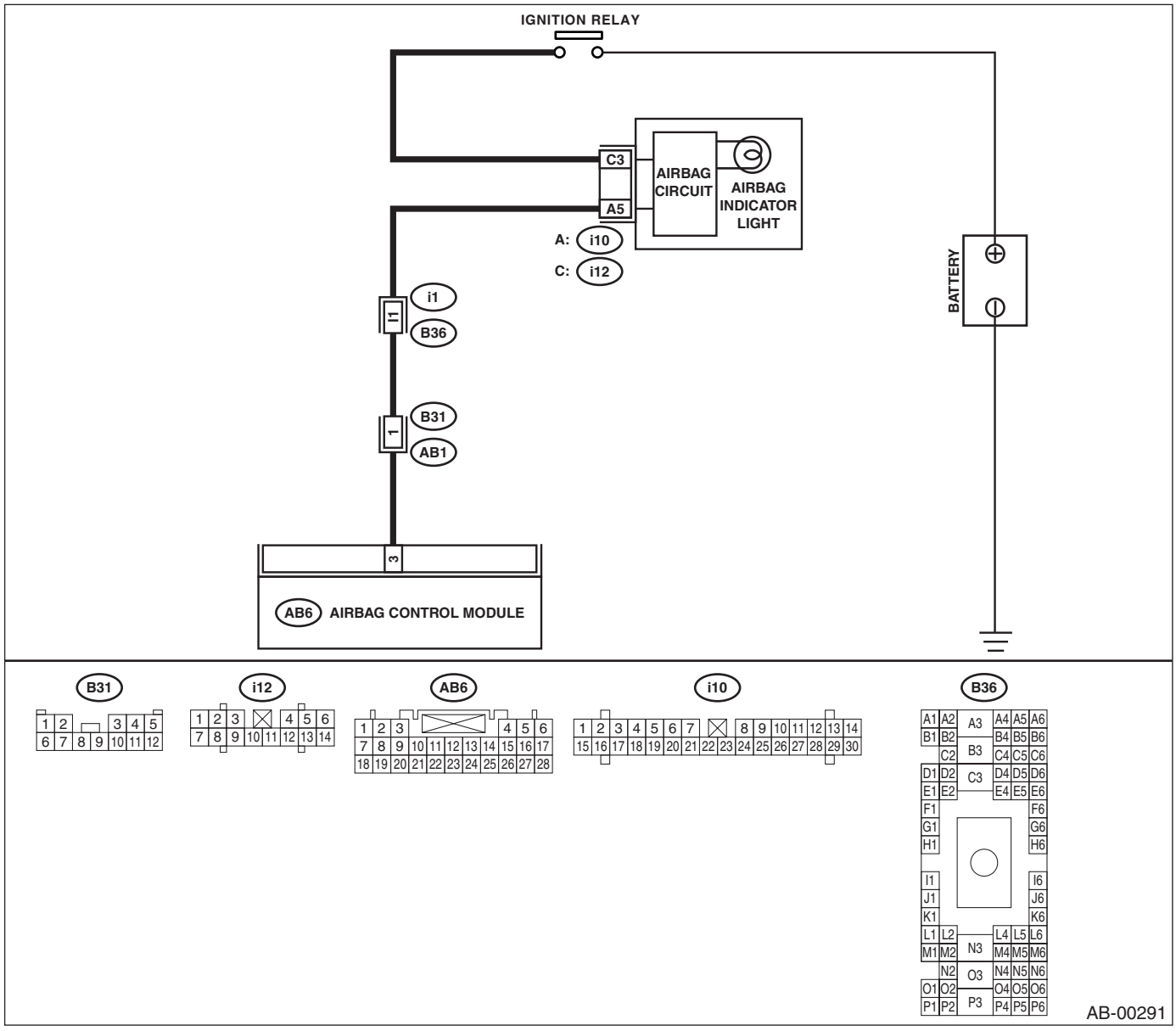
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



AIRBAG WARNING LIGHT FAILURE

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch ON, and confirm that warning lights equipped in the combination meter are turned on.	Do warning lights not for the airbag turn on?	Go to step **2.**	Repair combination meter power supply. <Ref. to IDI-4, Combination Meter System.>
2	**CHECK FUSE NO. 5 (IN MAIN FUSE BOX).** Remove fuse No. 5 and perform visual inspection.	Is fuse No. 5 (in main fuse box) blown?	Replace fuse No. 5. If fuse No. 5 blows again, go to step 3.	Go to step **3.**
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB1) from (B31). 3) Connect the battery ground cable and turn the ignition switch ON.	Is the airbag warning light turned on?	Go to step **4.**	Replace airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-13, Combination Meter Assembly.> Or repair the body harness.
4	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connector (AB6) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect the battery ground cable and turn the ignition switch ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-18, Airbag Control Module.>

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Memory function	Contents of diagnosis	Index No.
11	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (driver) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB-32, DTC 11, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
12	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-34, DTC 12, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
15	Provided.	• Airbag main harness circuit (driver) is shorted to power supply. • Airbag module harness (driver) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB-36, DTC 15, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
16	Provided.	• Airbag main harness circuit (passenger) is shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-38, DTC 16, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
21	Provided.	Airbag control module is faulty.	<Ref. to AB-39, DTC 21, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB-40, DTC 22, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
23	Not provided.	(AB6), (AB17) and (AB18) are not connected properly to airbag control module.	<Ref. to AB-41, DTC 23, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
24	Not provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB-42, DTC 24, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
25	Provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB-44, DTC 25, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
31	Provided.	• Front sub-sensor harness (RH) circuit is shorted. • Front sub-sensor harness (RH) circuit is open. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-46, DTC 31, Diagnostic Chart with Diagnostic Trouble Code (DTC).>

DTC	Memory function	Contents of diagnosis	Index No.
32	Provided.	• Front sub-sensor harness (LH) circuit is shorted. • Front sub-sensor harness (LH) circuit is open. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-50, DTC 32, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
41	Provided.	• Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-54, DTC 41, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
42	Provided.	• Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-56, DTC 42, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
45	Provided.	• Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB-58, DTC 45, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
46	Provided.	• Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB-60, DTC 46, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
51	Provided.	• Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB-62, DTC 51, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
52	Provided.	• Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB-64, DTC 52, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB-65, DTC 53, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB-65, DTC 54, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
55	Provided.	Side airbag module is inflated.	<Ref. to AB-65, DTC 55, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
61	Provided.	• Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty.	<Ref. to AB-66, DTC 61, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
62	Provided.	• Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty.	<Ref. to AB-68, DTC 62, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
65	Provided.	• Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB-70, DTC 65, Diagnostic Chart with Diagnostic Trouble Code (DTC).>

DTC	Memory function	Contents of diagnosis	Index No.
66	Provided.	• Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB-72, DTC 66, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
72	Provided.	• Airbag harness is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB-74, DTC 72, Diagnostic Chart with Diagnostic Trouble Code (DTC).>
76	Provided.	• Airbag harness (passenger) is shorted or shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. Passenger's airbag module is faulty.	<Ref. to AB-76, DTC 76, Diagnostic Chart with Diagnostic Trouble Code (DTC).>

MEMO:

12.Diagnostic Chart with Diagnostic Trouble Code (DTC)

A: DTC 11

DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

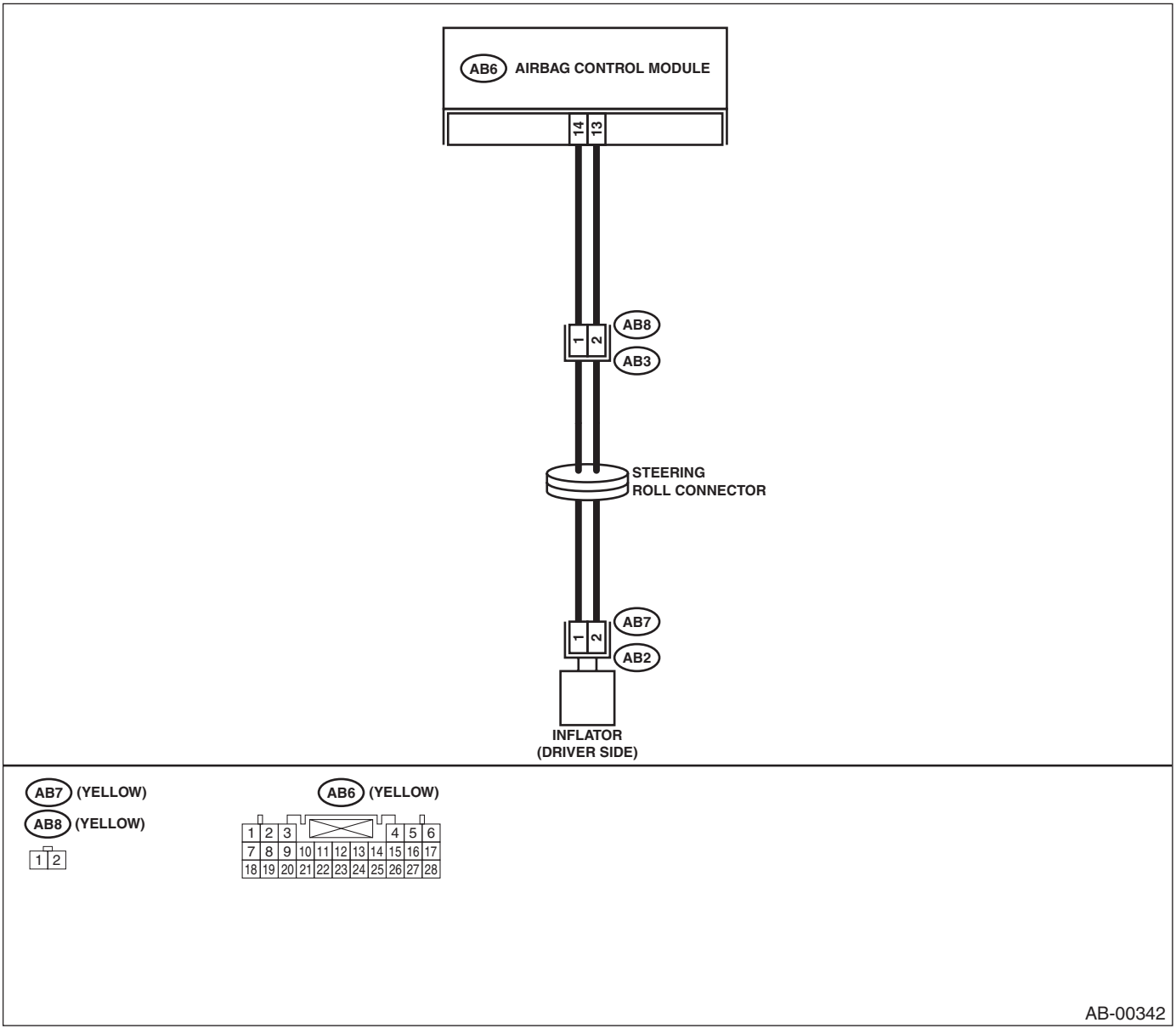
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll controller, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.> 3) Connect the connector (1F) in test harness F to connector (AB7). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 second. 2) Disconnect the test harness from the connector (AB7). 3) Remove the lower cover panel, disconnect the connector (AB3) from (AB8) and connect the connector (1F) in test harness F to connector (AB8). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, <Ref. to AB-<Ref. to AB-14, Passenger's Airbag Module.>, REMOVAL, Passenger's Airbag Module.> and disconnect connectors (AB10) and (AB9). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I2 and the connector (3F) in test harness F. ***Connector & terminal*** ***(2I) No. 1 — (3F) No. 4:*** ***(2I) No. 4 — (3F) No. 3:***	Is the measured value less than 10 Ω?	Go to step **4.**	Replace airbag main harness. <Ref. to AB-16, Main Harness.>
4	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2I) in test harness I2. ***Connector & terminal*** ***(2I) No. 1 — No. 4:*** ***(2I) No. 4 — Chassis ground:*** ***(2I) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-16, Main Harness.>

B: DTC 12

DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

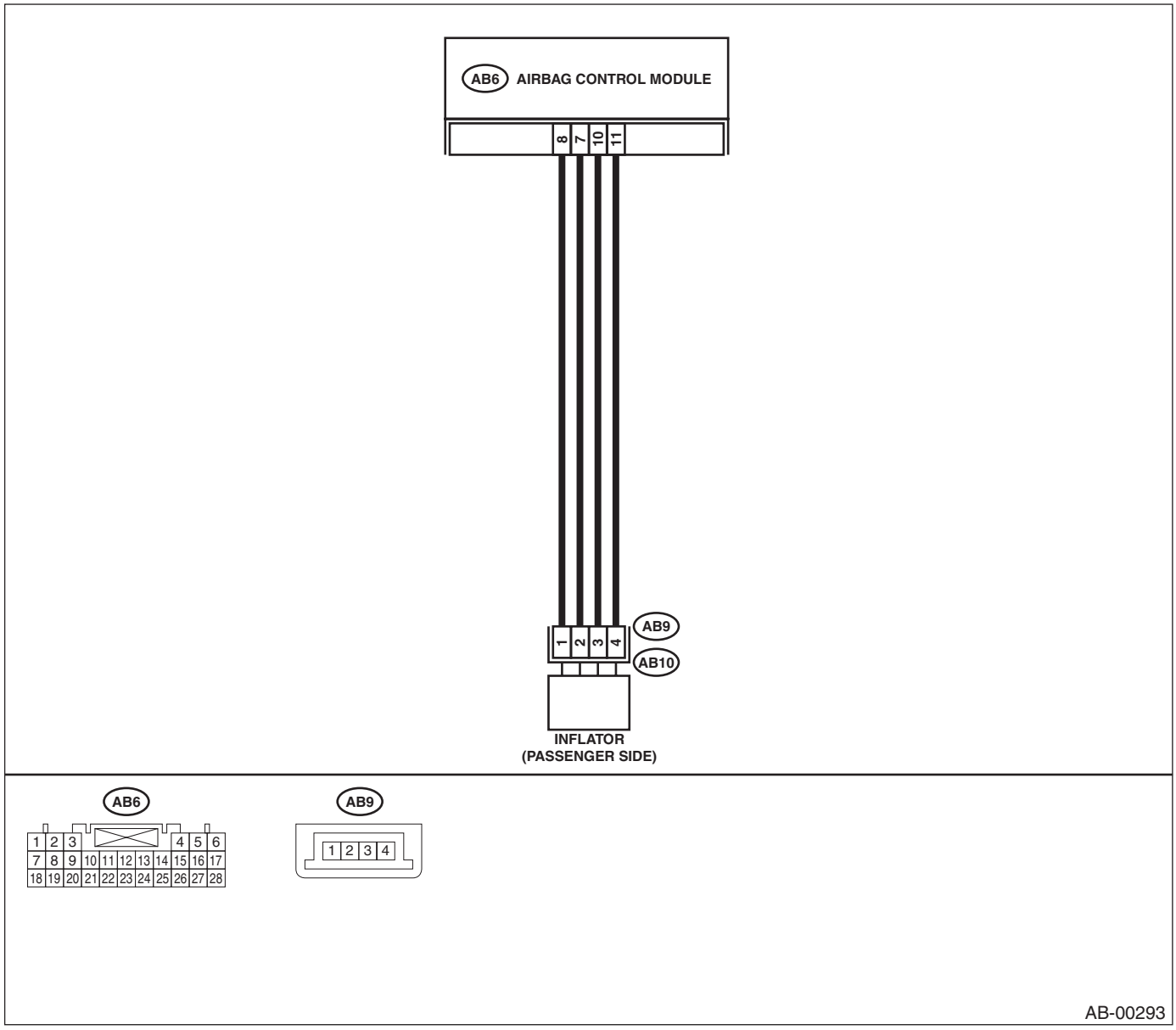
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Pull out the two stopper pins and lower the glove box. 3) Disconnect the connector (AB10) from (AB9). 4) Connect the connector (1K) in test harness K to connector (AB9). 5) Connect two airbag resistors to connectors (3K) and (4K) in test harness K. 6) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-14, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (3K) and (4K) in test harness K. 3) Remove lower cover and disconnect the connector (AB3) from (AB8). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I2 and the connector (3K) in test harness K. ***Connector & terminal*** ***(2I) No. 2 — (3K) No. 4:*** ***(2I) No. 5 — (3K) No. 3:***	Is the measured value less than 10 Ω?	Go to step **3.**	Replace airbag main harness. <Ref. to AB-16, Main Harness.>
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2I) in test harness I2. ***Connector & terminal*** ***(2I) No. 2 — No. 5:*** ***(2I) No. 2 — Chassis ground:*** ***(2I) No. 5 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-16, Main Harness.>

C: DTC 15

DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

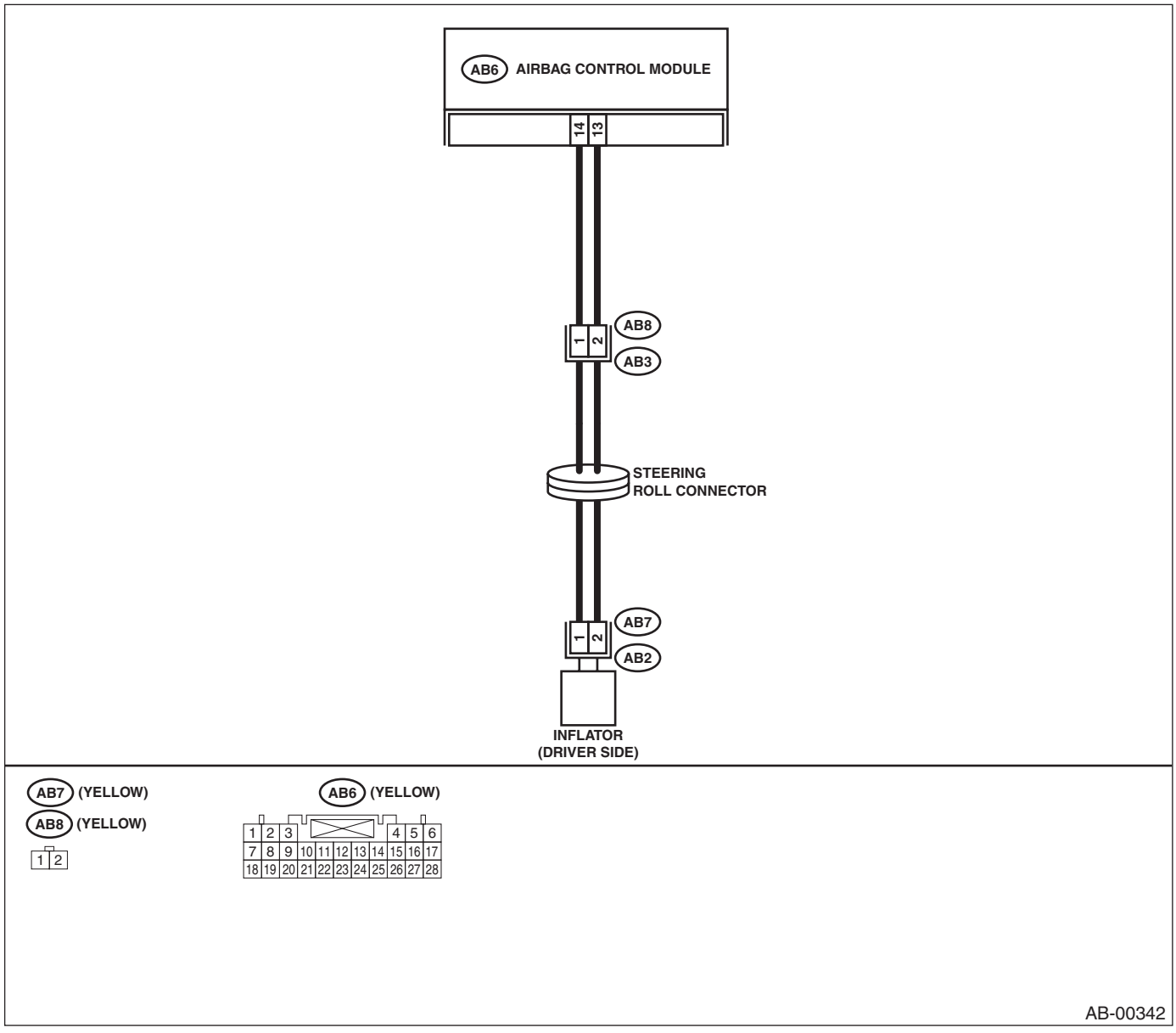
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.> 3) Connect the connector (AB7) to connector (1F) in test harness F. 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness from the connector (AB7). 3) Remove the lower cover panel and disconnect the connector (AB3) from (AB8). 4) Connect the connector (1F) in test harness F to connector (AB8). 5) Connect the airbag resistor to connector (3F) in test harness F. 6) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Pull out the two stopper pins and lower the glove box, and disconnect connectors (AB10) and (AB9). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 5) Connect the battery ground cable and turn the ignition switch ON. (Engine OFF) 6) Measure the voltage between connector (2I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 4 (+) — Chassis ground (–):*** ***(2I) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-16, Main Harness.>

D: DTC 16

DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

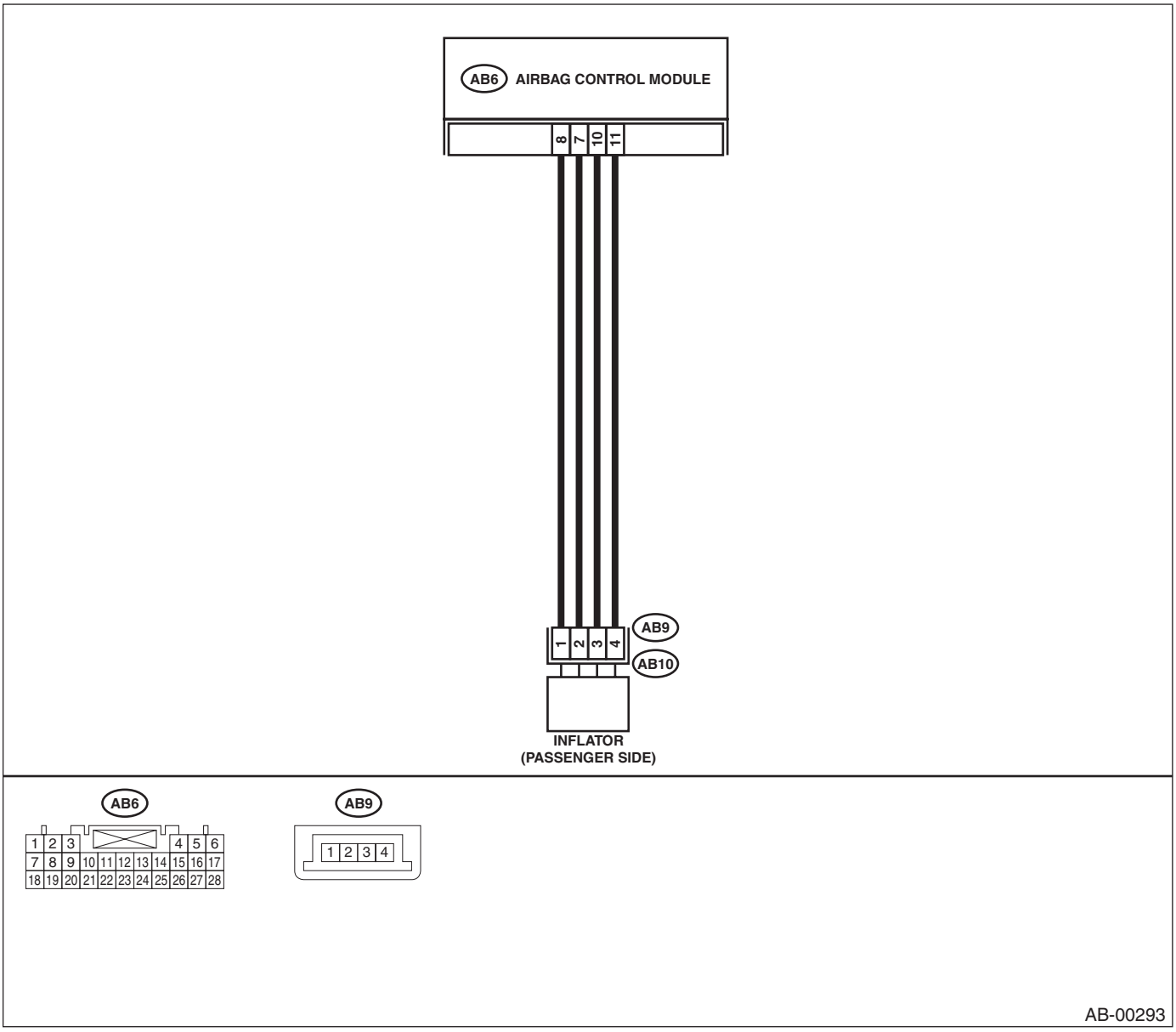
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Pull out the two stopper pins and lower the glove box. 3) Disconnect the connector (AB10) from (AB9) 4) Connect the connector (1K) in test harness K to connector (AB9). 5) Connect two airbag resistors to connectors (3K) and (4K) in test harness K. 6) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-14, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (3K) and (4K) in test harness K. 3) Remove the lower cover and disconnect the connector (AB3) from (AB8). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 5) Measure the voltage between connector (2I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 2 — Chassis ground:*** ***(2I) No. 5 — Chassis ground:***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace airbag main harness. <Ref. to AB-16, Main Harness.>

E: DTC 21

DIAGNOSIS:

- Airbag control module is faulty.

CAUTION:

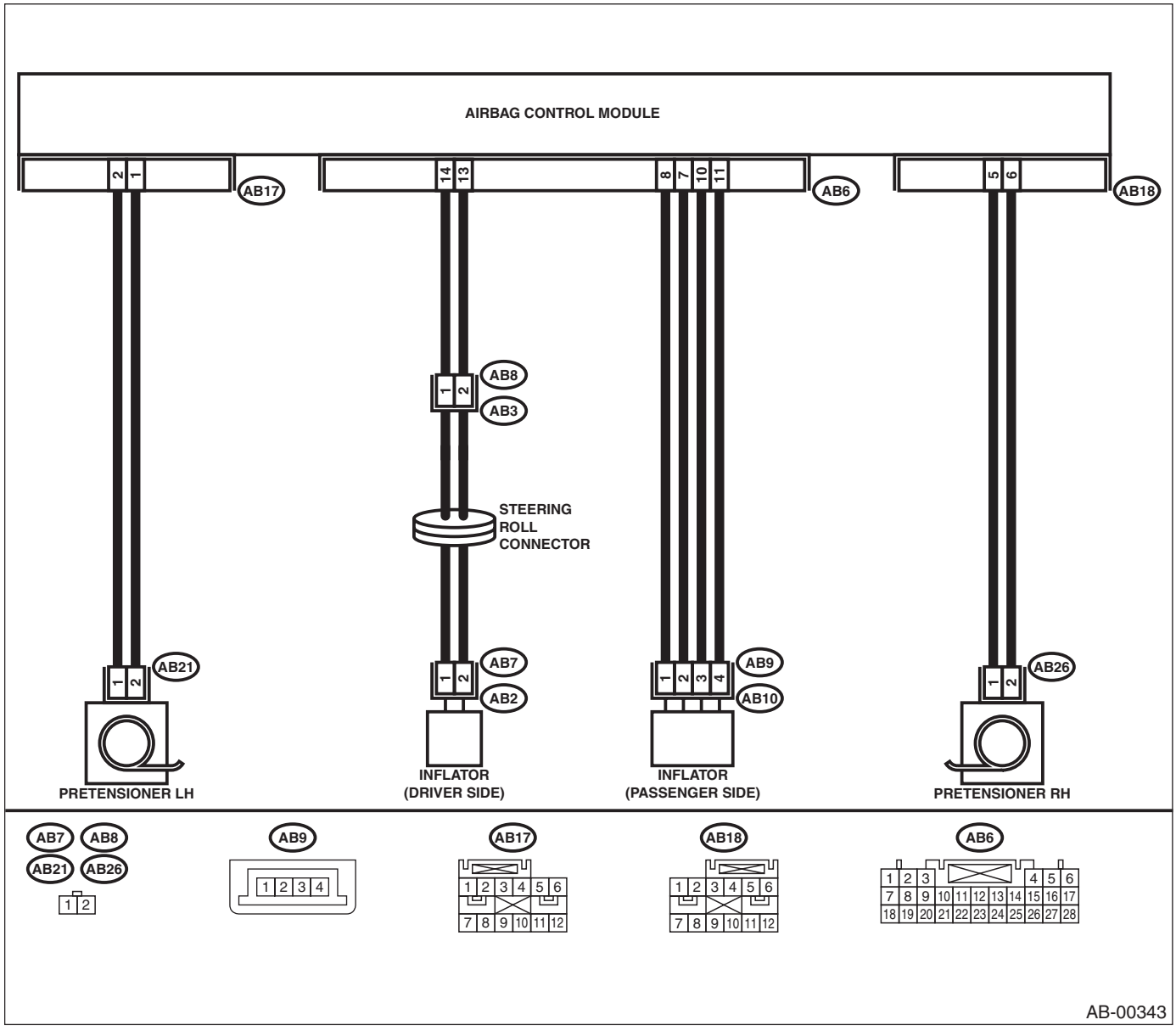
• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

	Step	Check	Yes	No
1	**CHECK IF DTC 21 IS INDICATED.** Read Diagnostic Trouble Code. <Ref. to AB-20, Read Diagnostic Trouble Code (DTC).>	Is airbag warning light trouble code 21 indicated?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Perform clear memory. <Ref. to AB-22, Clear Memory Mode.>

F: DTC 22

WIRING DIAGRAM:



This code is indicated when the front airbag and the pretensioner are in operation.
Once this code is indicated, memory is not erasable; therefore change the following parts.

- Airbag control module. <Ref. to AB-18, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-14, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-21, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-8, Front Seat Belt.>

G: DTC 23

DIAGNOSIS:

(AB6), (AB17) and (AB18) are not connected properly to airbag control module.

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB6), (AB17) and (AB18).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB6), (AB17) and (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Does if rust or damage appear on the harness connector and the control module connector?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> Replace airbag main harness. <Ref. to AB-16, Main Harness.> Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>	Go to step **2.**
2	**CHECK POOR CONTACT IN CONNECTORS (AB6), (AB17) and (AB18).** 1) Ensure that connectors are firmly reconnected. 2) Connect the battery ground cable and turn the ignition switch ON.	Does the air bag warning light operate properly?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>

H: DTC 24

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No, 11 (in joint box) is blown.
- Body harness circuit is open.

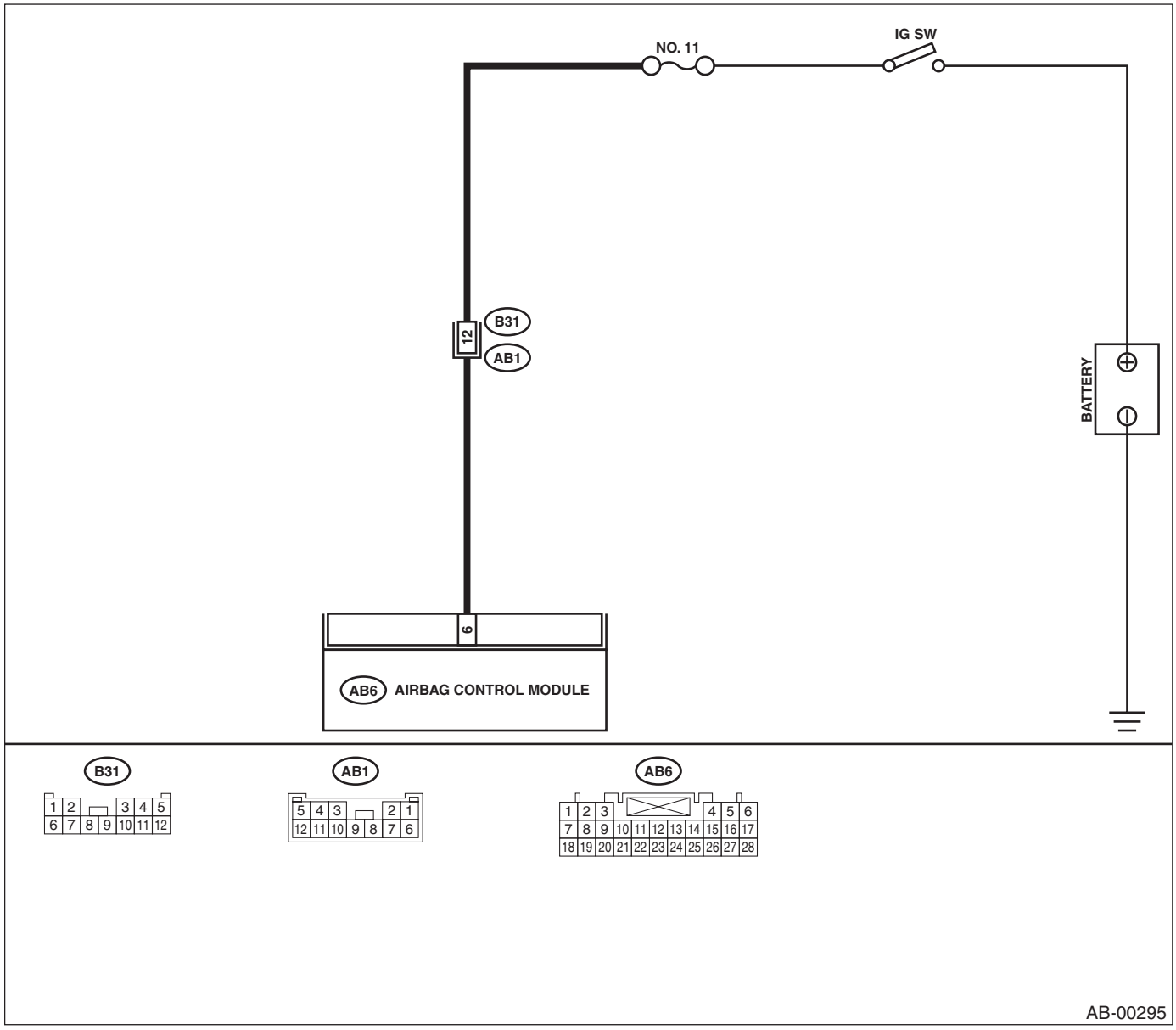
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUSE No. 11 (IN JOINT BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove fuse No. 11 (in joint box) and perform visual inspection.	Is fuse No.11 blown?	Replace fuse No. 11. If fuse No. 11 blows again, repair the body harness.	Go to step **2.**
2	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 3) Connect the connector (1I) in test harness I2 to connector (AB6). 4) Connect the battery ground cable and turn the ignition switch ON. 5) Measure the voltage between connector (2I) in test harness I2 and chassis ground. ***Connector & terminal*** ***(2I) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **3.**
3	**CHECK BODY MAIN HARNESS.** 1) While checking control module, turn the ignition switch OFF and disconnect the battery ground cable. Wait more than 20 seconds before operation. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Measure the voltage between the connector (B31) and the chassis ground. ***Connector & terminal*** ***(B31) No. 12 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace airbag main harness. <Ref. to AB-16, Main Harness.>	Repair the body harness.

I: DTC 25

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

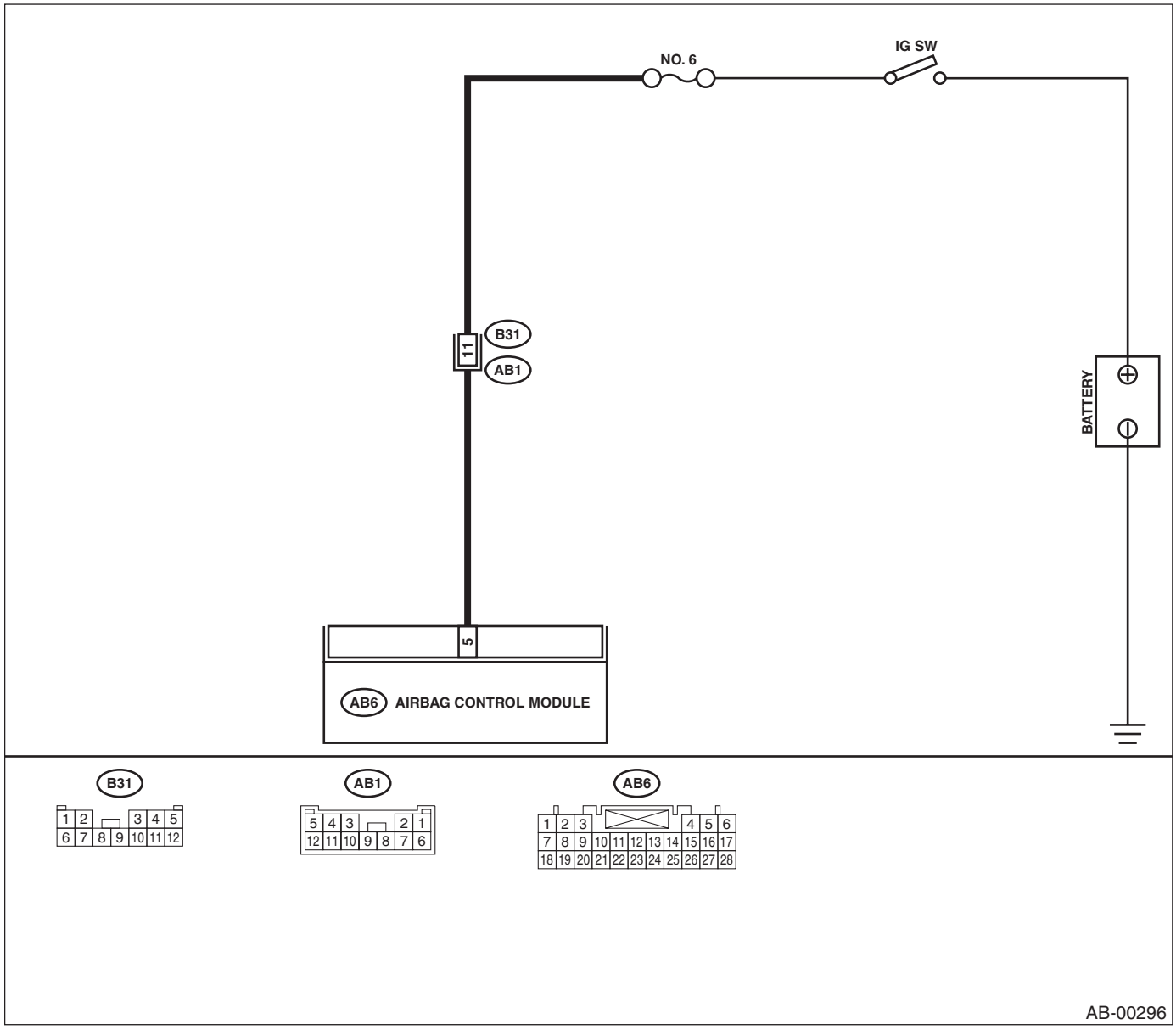
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUSE NO. 6 (IN JOINT BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove No. 6 fuse (in joint box) and perform visual inspection.	Is fuse No. 6 blown?	Replace fuse No. 6. If fuse No. 6 is blown again, repair the body harness.	Go to step **2.**
2	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from airbag control module. <Ref. to AB-18, Airbag Control Module.> 3) Connect the connector (1I) in test harness I2 to connector (AB6). 4) Connect the battery ground cable, and turn the ignition switch ON. 5) Measure the voltage between the connector (2I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(2I) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) While checking control module, turn the ignition switch OFF and disconnect the battery ground cable. Wait more than 20 seconds before operation. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Measure the voltage between the connector (B31) and the chassis ground. ***Connector & terminal*** ***(B31) No. 11 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Replace the airbag main harness. <Ref. to AB-16, Main Harness.>	Repair the body harness.

J: DTC 31

DIAGNOSIS:

- Front sub-sensor harness (RH) circuit is shorted.
- Front sub-sensor harness (RH) circuit is open.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

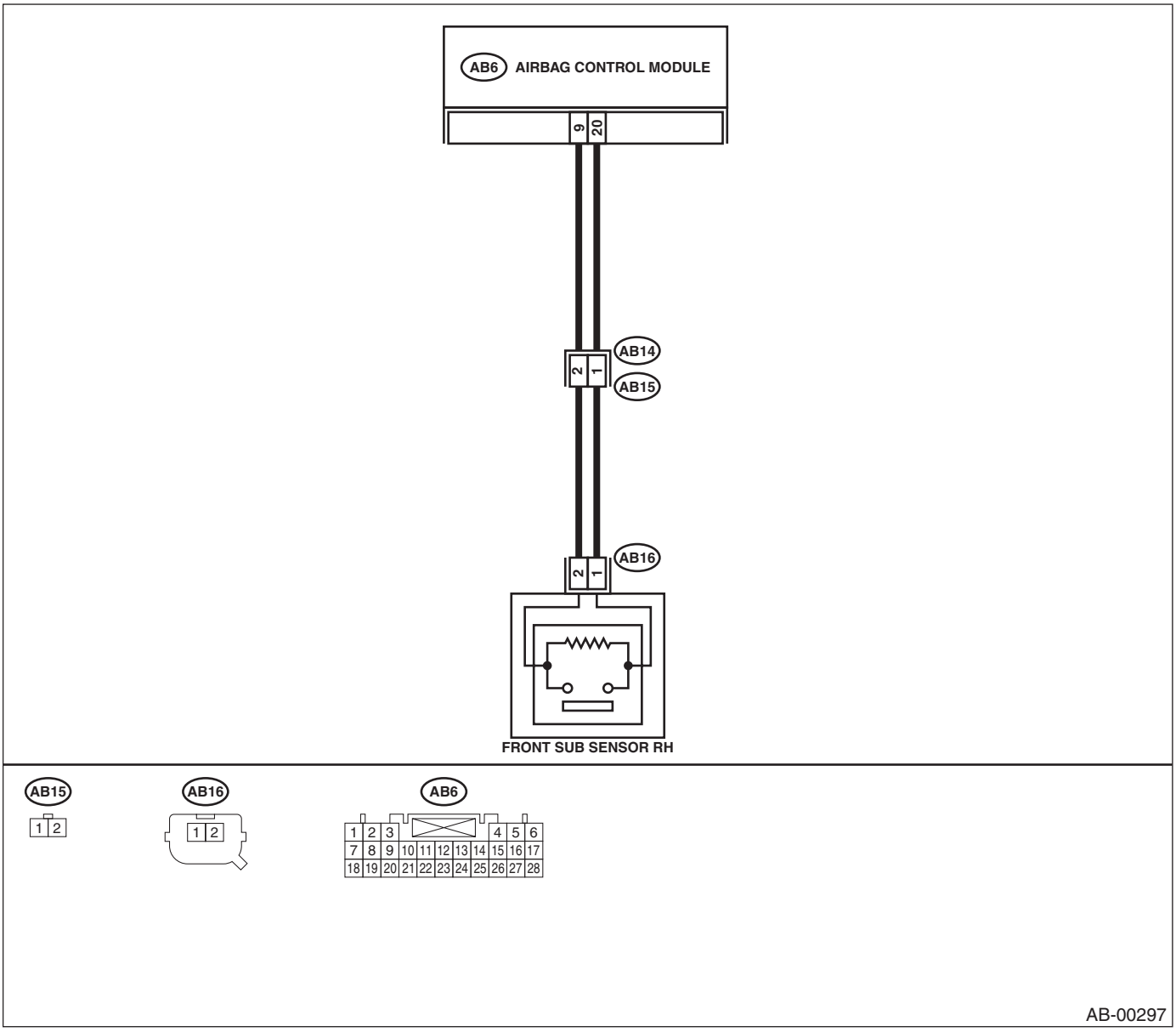
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. <Ref. to AB-18, Airbag Control Module.> 3) Measure the resistance of the connector (3I) in test harness I2. ***Connector & terminal*** ***(3I) No. 2 — No. 4:***	Is the measured value within 750 Ω to 1 KΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 2 — Chassis ground:*** ***(3I) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** 1) Disconnect connector (AB16) from the front sub-sensor. <Ref. to AB-21, Front Sub Sensor.> 2) Connect connector (IH) in test harness H to connector (AB16). 3) Measure the resistance between connector (3I) in test harness I2 and connector (3H) in test harness H. ***Connector & terminal*** ***(3I) No. 2 — (3H) No. 5:*** ***(3I) No. 4 — (3H) No. 6:***	Is the measured value less than 10 Ω?	Go to step **4.**	Go to step **5.**
4	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 2 — Chassis ground:*** ***(3I) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS** 1) Remove the instrument panel. <Ref. to EI-46, Instrument Panel Assembly.> 2) Disconnect connector (AB15) from (AB14), and connect connector (2F) in test harness F to connector (AB14). 3) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. ***Connector & terminal*** ***(3I) No. 2 — (3F) No. 6:*** ***(3I) No. 4 — (3F) No. 5:***	Is the measured value less than 10 Ω?	Go to step **6.**	Replace airbag main harness. <Ref. to AB-16, Main Harness.>
6	**CHECK AIRBAG MAIN HARNESS** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 2 — Chassis ground:*** ***(3I) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Replace airbag main harness. <Ref. to AB-16, Main Harness.>

Step		Check	Yes	No
7	**CHECK FRONT SUB-SENSOR HARNESS (RH).** 1) Connect connector (1F) in test harness F to the connector (AB15). 2) Measure the resistance between connector (3H) in test harness H and connector (3F) in the test harness F. ***Connector & terminal*** ***(3F) No. 3 — (3H) No. 5:*** ***(3F) No. 4 — (3H) No. 6:***	Is the measured value less than 10 Ω?	Go to step **8.**	Replace the front sub-sensor harness (RH) <Ref. to AB-22, Front Sub Sensor Harness.>
8	**CHECK FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Replace the front sub-sensor harness (RH) <Ref. to AB-22, Front Sub Sensor Harness.>
9	**CHECK FRONT SUB-SENSOR (RH).** 1) Connect connector (2H) in test harness H to front sub-sensor (RH). 2) Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:***	Is the measured value within 750 Ω to 1 KΩ?	Go to step **10.**	Replace the front sub-sensor (RH) <Ref. to AB-21, Front Sub Sensor.>
10	**CHECK FRONT SUB-SENSOR (RH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (RH) <Ref. to AB-21, Front Sub Sensor.>

MEMO:

K: DTC 32

DIAGNOSIS:

- Front sub-sensor harness (LH) circuit is shorted.
- Front sub-sensor harness (LH) circuit is open.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

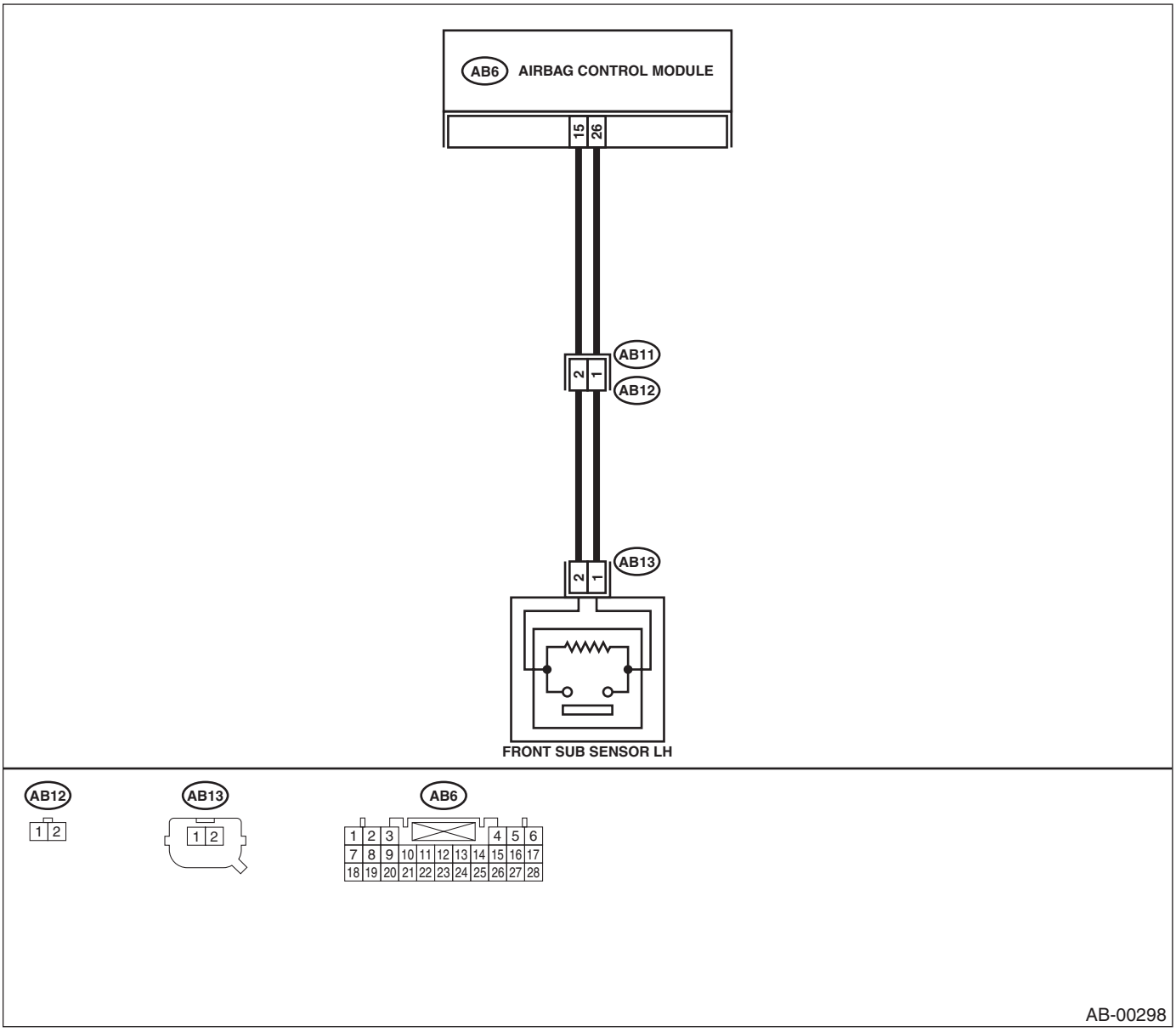
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB6) from the air-bag control module, and connect connector (1I) in the test harness I2 to connector (AB6). <Ref. to AB-18, Airbag Control Module.> 3) Measure the resistance of the connector (3I) in the test harness I2. ***Connector & terminal*** ***(3I) No. 1 — No. 3:***	Is the measured value within 750 Ω to 1 KΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 1 — Chassis ground:*** ***(3I) No. 3 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** 1) Disconnect the connector (AB13) from the front sub-sensor. <Ref. to AB-21, Front Sub Sensor.> 2) Connect connector (1H) in test harness H to connector (AB13). 3) Measure the resistance between connector (3I) in test harness I2 and connector (3H) in test harness H. ***Connector & terminal*** ***(3I) No. 3 — (3H) No. 5:*** ***(3I) No. 1 — (3H) No. 6:***	Is the measured value less than 10 Ω?	Go to step **4.**	Go to step **5.**
4	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 3 — Chassis ground:*** ***(3I) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1) Remove the instrument panel. <Ref. to EI-46, Instrument Panel Assembly.> 2) Disconnect connector (AB11) from (AB12), and connect connector (2F) in test harness F to (AB11). 3) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. ***Connector & terminal*** ***(3I) No. 3 — (3F) No. 6:*** ***(3I) No. 1 — (3F) No. 5:***	Is the measured value less than 10 Ω?	Go to step **6.**	Replace the airbag main harness. <Ref. to AB-16, Main Harness.>
6	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance between connector (3I) in the test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 3 — Chassis ground:*** ***(3I) No. 1 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **7.**	Replace the airbag main harness. <Ref. to AB-16, Main Harness.>

Step		Check	Yes	No
7	**CHECK FRONT SUB-SENSOR HARNESS (LH).** 1) Connect connector (1F) in test harness F to connector (AB12). 2) Measure the resistance between connector (3H) in test harness H and connector (3F) in test harness F. ***Connector & terminal*** ***(3F) No. 3 — (3H) No. 5:*** ***(3F) No. 4 — (3H) No. 6:***	Is the measured value less than 10 Ω?	Go to step **8.**	Replace the front sub-sensor harness (LH). <Ref. to AB-16, Main Harness.>
8	**CHECK FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **9.**	Replace the front sub-sensor harness (LH). <Ref. to AB-16, Main Harness.>
9	**CHECK FRONT SUB-SENSOR (LH).** 1) Connect connector (2H) in test harness H to front sub-sensor (LH). 2) Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:***	Is the measured value within 750 Ω to 1 KΩ?	Go to step **10.**	Replace the front sub-sensor (LH). <Ref. to AB-21, Front Sub Sensor.>
10	**CHECK FRONT SUB-SENSOR (LH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-21, Front Sub Sensor.>

MEMO:

L: DTC 41

DIAGNOSIS:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

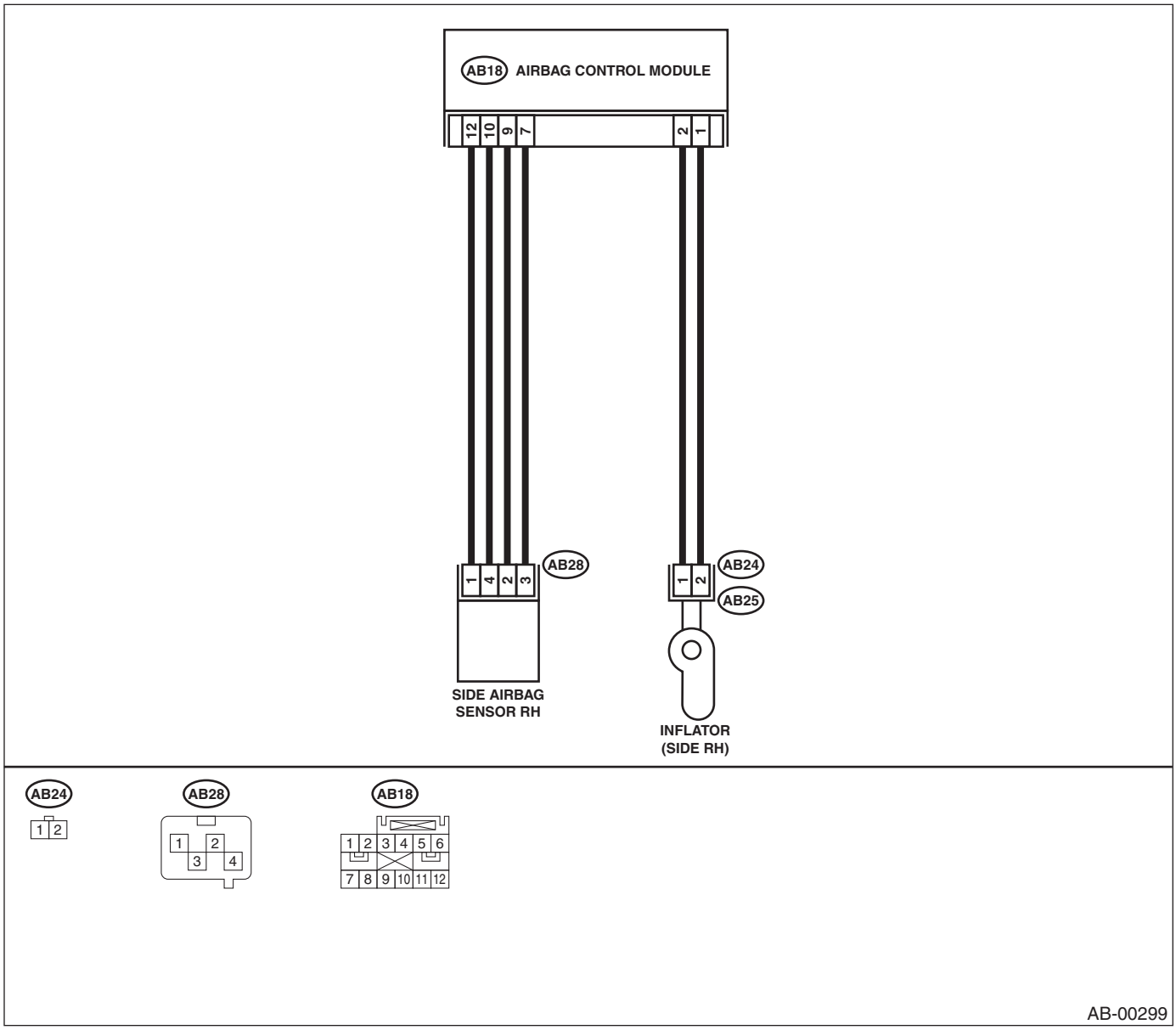
• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect connector (AB25) from (AB24), and connect connector (1F) in test harness F to (AB24). 4) Connect air bag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace side airbag module (RH). <Ref. to AB-15, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from test harness. 3) Disconnect the connector (AB18) from air bag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB18). 5) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. ***Connector & terminal*** ***(3I) No. 7 — (3F) No. 4:*** ***(3I) No. 9 — (3F) No. 3:***	Is the measured value less than 10 Ω?	Go to step **3.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3F) in test harness F. ***Connector & terminal*** ***(3F) No. 3 — No. 4:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

M: DTC 42

DIAGNOSIS:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

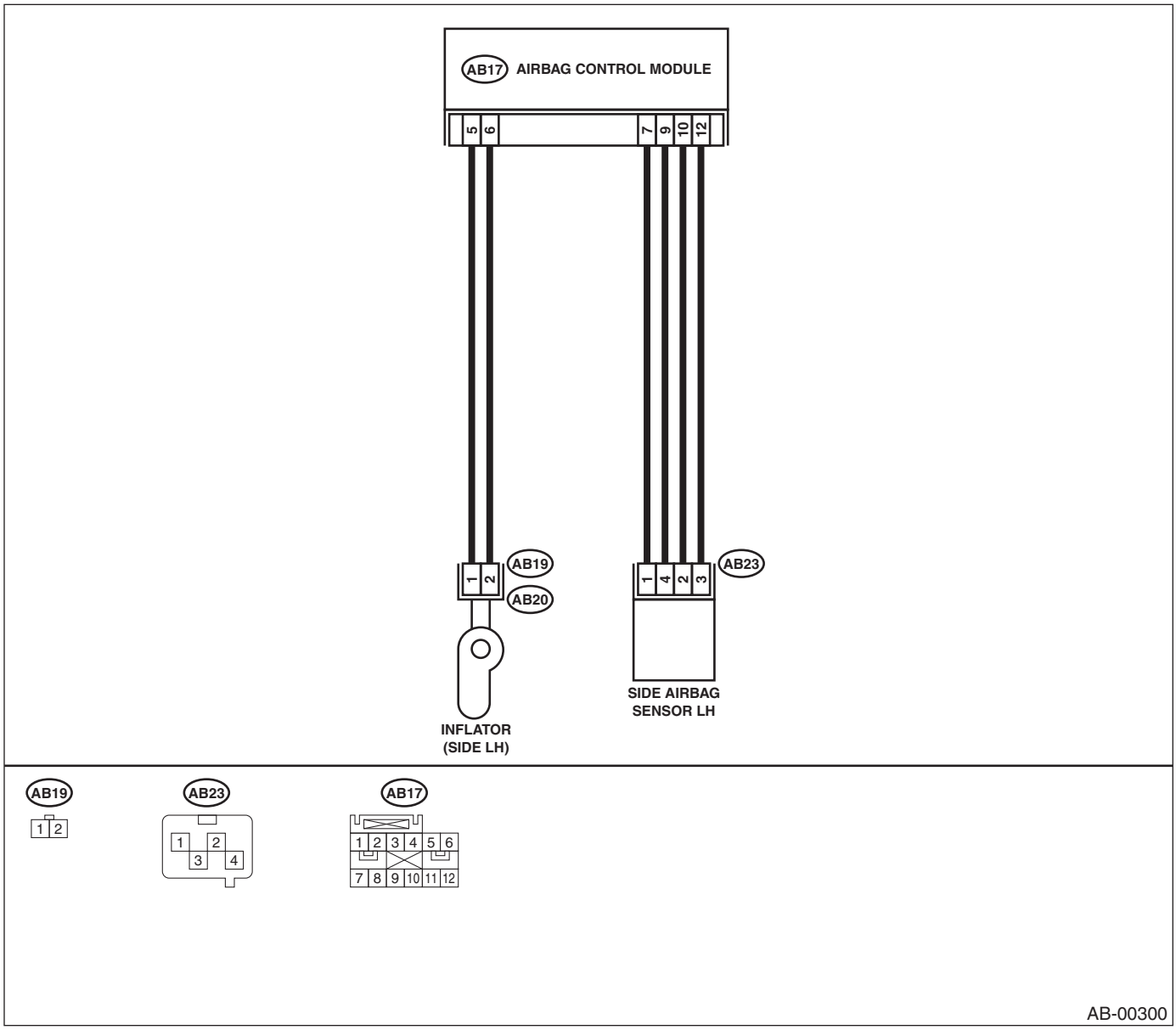
• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect connector (AB20) from (AB19), and connect connector (1F) in test harness F to (AB19). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON.	Does the air bag warning light operate properly?	Replace side airbag module (LH). <Ref. to AB-15, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from the test harness. 3) Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB17). 5) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. ***Connector & terminal*** ***(3I) No. 10 — (3F) No. 3:*** ***(3I) No. 12 — (3F) No. 4:***	Is the measured value less than 10 Ω?	Go to step **3.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3F) in test harness F. ***Connector & terminal*** ***(3F) No. 3 — No. 4:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

N: DTC 45

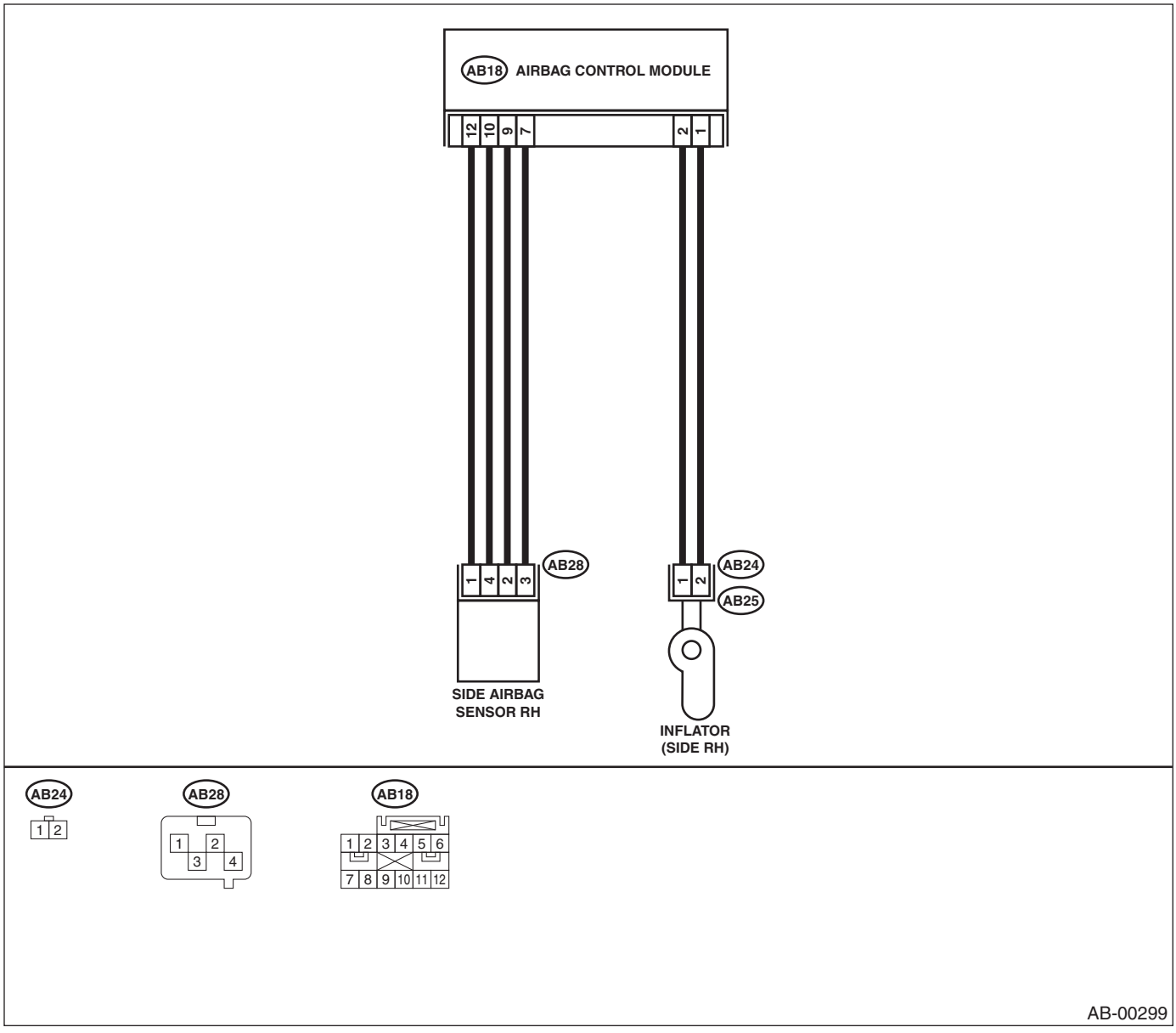
DIAGNOSIS:

- Side airbag harness (RH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SE-8, Front Seat.> 3) Disconnect the connector (AB25) from (AB24), and connect connector (1F) in test harness F to (AB24). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON.	Does air bag warning light operate properly?	Replace side airbag module (RH). <Ref. to AB-15, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from the test harness. 3) Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB18). 5) Connect the battery ground cable, and turn the ignition switch ON. 6) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 7 (+) — Chassis ground (–):*** ***(3I) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

O: DTC 46

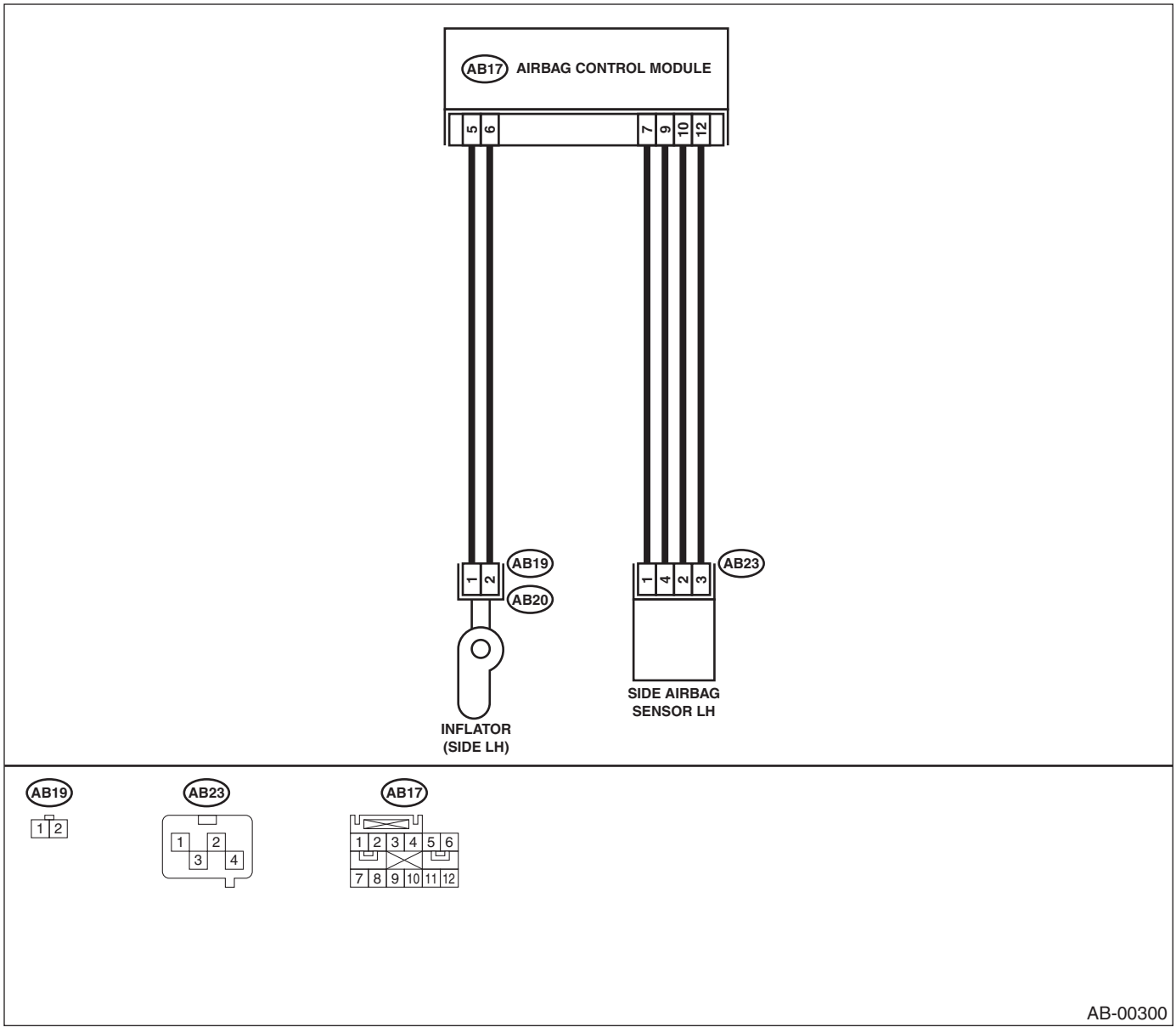
DIAGNOSIS:

- Side airbag harness (LH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB21) from the seat belt pretensioner (LH). <Ref. to SE-8, Front Seat.> 3) Disconnect connector (AB20) from (AB19), and connect connector (1F) in test harness F to (AB19). 4) Connect airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does air bag warning light operate properly?	Replace side airbag module (LH). <Ref. to AB-15, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect airbag resistor from the test harness. 3) Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect connector (1I) in test harness I2 to connector (AB17). 5) Connect the battery ground cable, and turn the ignition switch ON. 6) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 10 (+) — Chassis ground (–):*** ***(3I) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

P: DTC 51

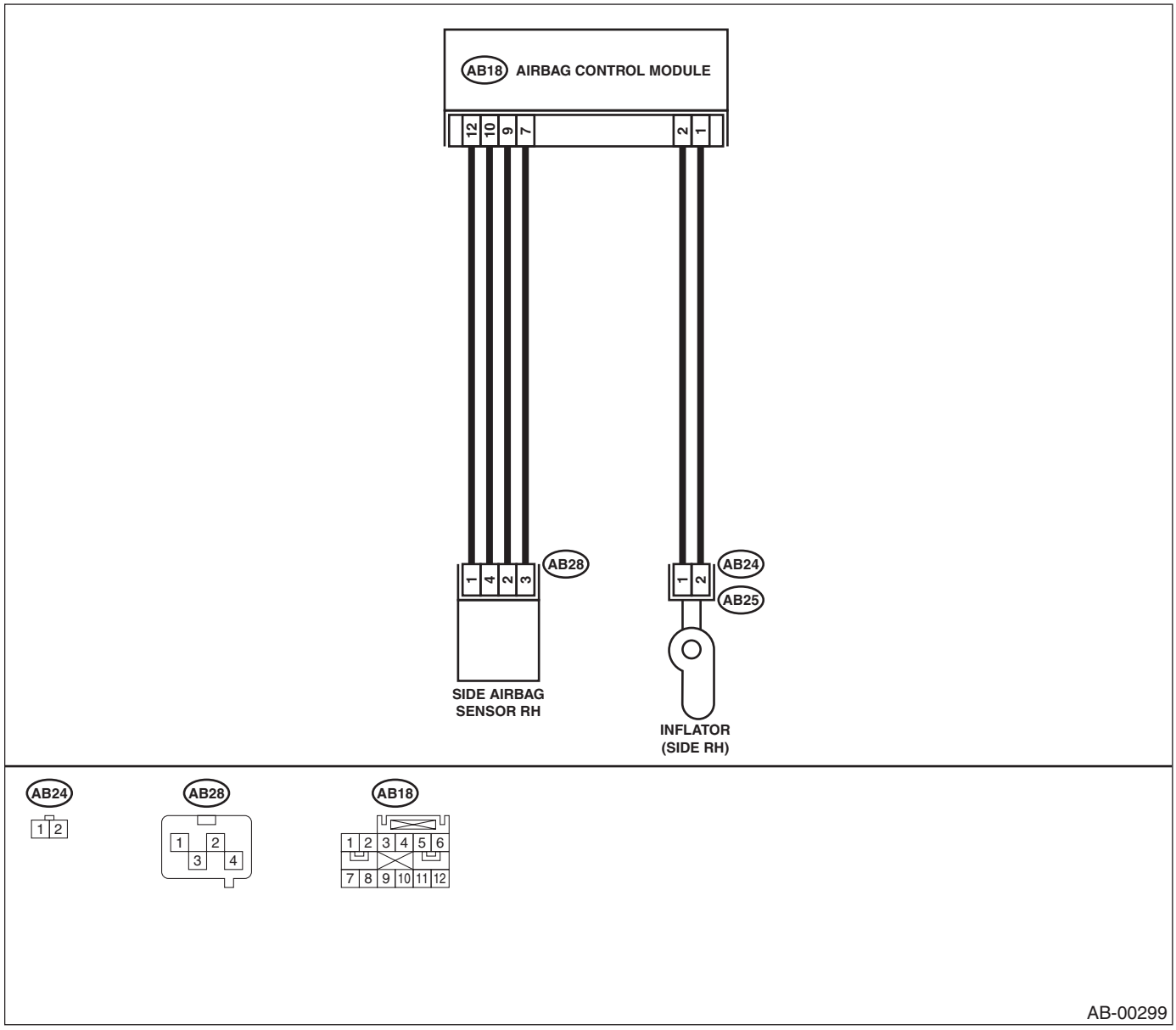
DIAGNOSIS:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect connector (AB25) from (AB24). 4) Disconnect connector (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect connector (1I) in test harness I2 to the connector (AB18). 6) Disconnect connector (AB28) from the side airbag sensor (RH), and connect connector (1G) in test harness G to connector (AB28). 7) Measure the resistance between connector (3I) in test harness I2 and connector (3G) in test harness G. ***Connector & terminal*** ***(3I) No. 17 — (3G) No. 2:*** ***(3I) No. 18 — (3G) No. 4:*** ***(3I) No. 19 — (3G) No. 1:*** ***(3I) No. 20 — (3G) No. 5:***	Is the measured value less than 10 Ω?	Go to step **2.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
2	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 17 — Chassis ground:*** ***(3I) No. 18 — Chassis ground:*** ***(3I) No. 19 — Chassis ground:*** ***(3I) No. 20 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace side airbag sensor (RH). <Ref. to AB-19, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

Q: DTC 52

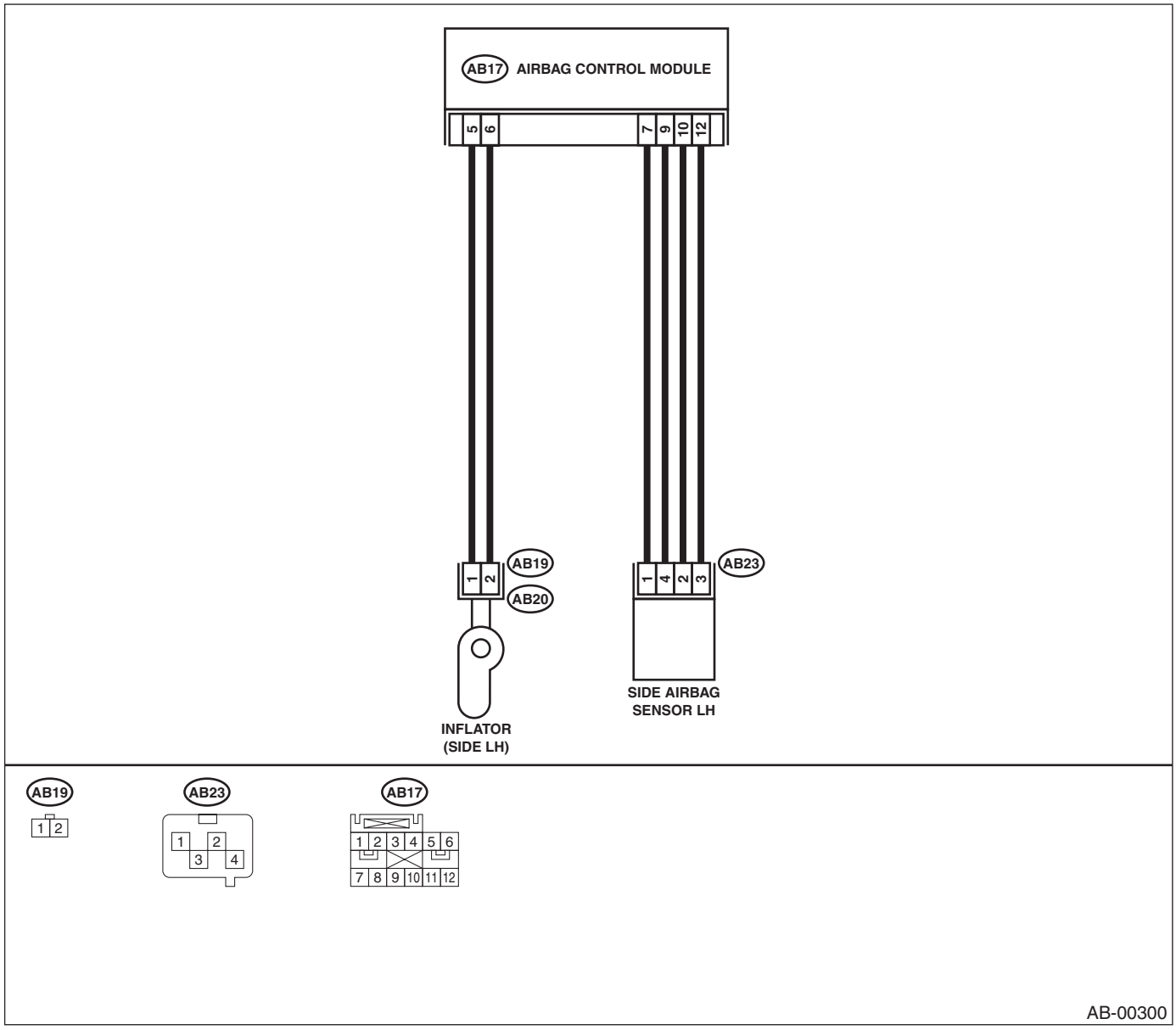
DIAGNOSIS:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect connector (AB20) from (AB19). 4) Disconnect connector (AB17) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect connector (1I) in test harness I2 to connector (AB17). 6) Disconnect connector (AB23) from the side airbag sensor (LH), and connect connector (1G) in test harness G to connector (AB23). 7) Measure the resistance between connector (3I) in test harness I2 and connector (3G) in test harness G. ***Connector & terminal*** ***(3I) No. 5 — (3G) No. 5:*** ***(3I) No. 14 — (3G) No. 1:*** ***(3I) No. 15 — (3G) No. 4:*** ***(3I) No. 16 — (3G) No. 2:***	Is the measured value less than 10 Ω?	Go to step **2.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
2	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 5 — Chassis ground:*** ***(3I) No. 14 — Chassis ground:*** ***(3I) No. 15 — Chassis ground:*** ***(3I) No. 16 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace side airbag sensor (LH). <Ref. to AB-19, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

R: DTC 53

DIAGNOSIS:

- Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).
<Ref. to AB-19, Side Airbag Sensor.>

S: DTC 54

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).
<Ref. to AB-19, Side Airbag Sensor.>

T: DTC 55

This code is displayed when the side airbag is deployed.
When this code is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module. <Ref. to AB-18, Airbag Control Module.>
- Front seat with side airbag module. (Operating side) <Ref. to SE-8, Front Seat.>
- Side airbag sensor. (Operating side) <Ref. to AB-19, Side Airbag Sensor.>

U: DTC 61

DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

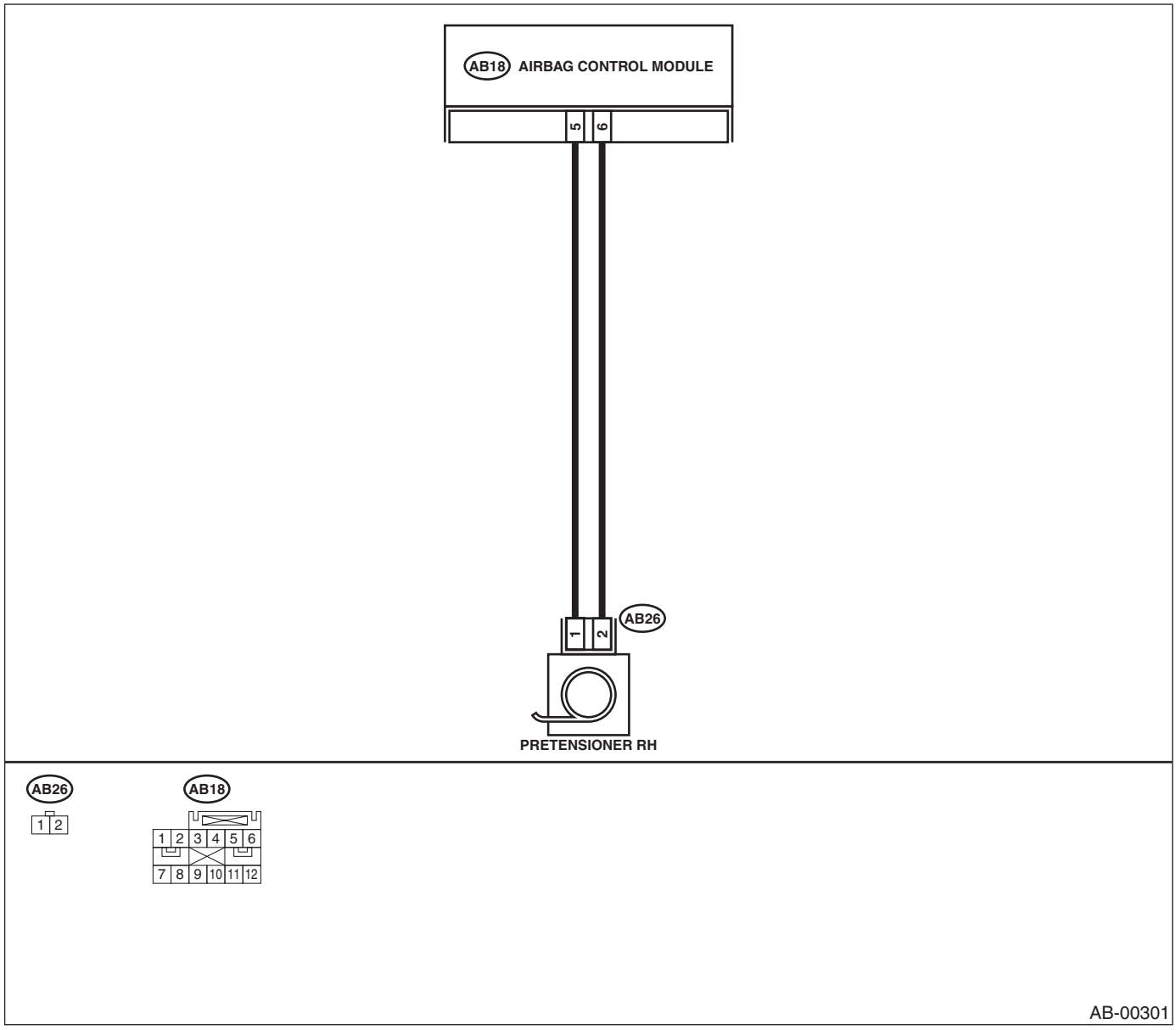
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB26). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB25) from (AB24). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to connector (AB18). 6) Measure the resistance between connector (3I) in test harness I2 and connector (3F) in test harness F. ***Connector & terminal*** ***(3I) No. 8 — (3F) No. 4:*** ***(3I) No. 6 — (3F) No. 3:***	Is the measured value less than 10 Ω?	Go to step **3.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3I) in test harness I2. ***Connector & terminal*** ***(3I) No. 6 — No. 8:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 6 — Chassis ground:*** ***(3I) No. 8 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

V: DTC 62

DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

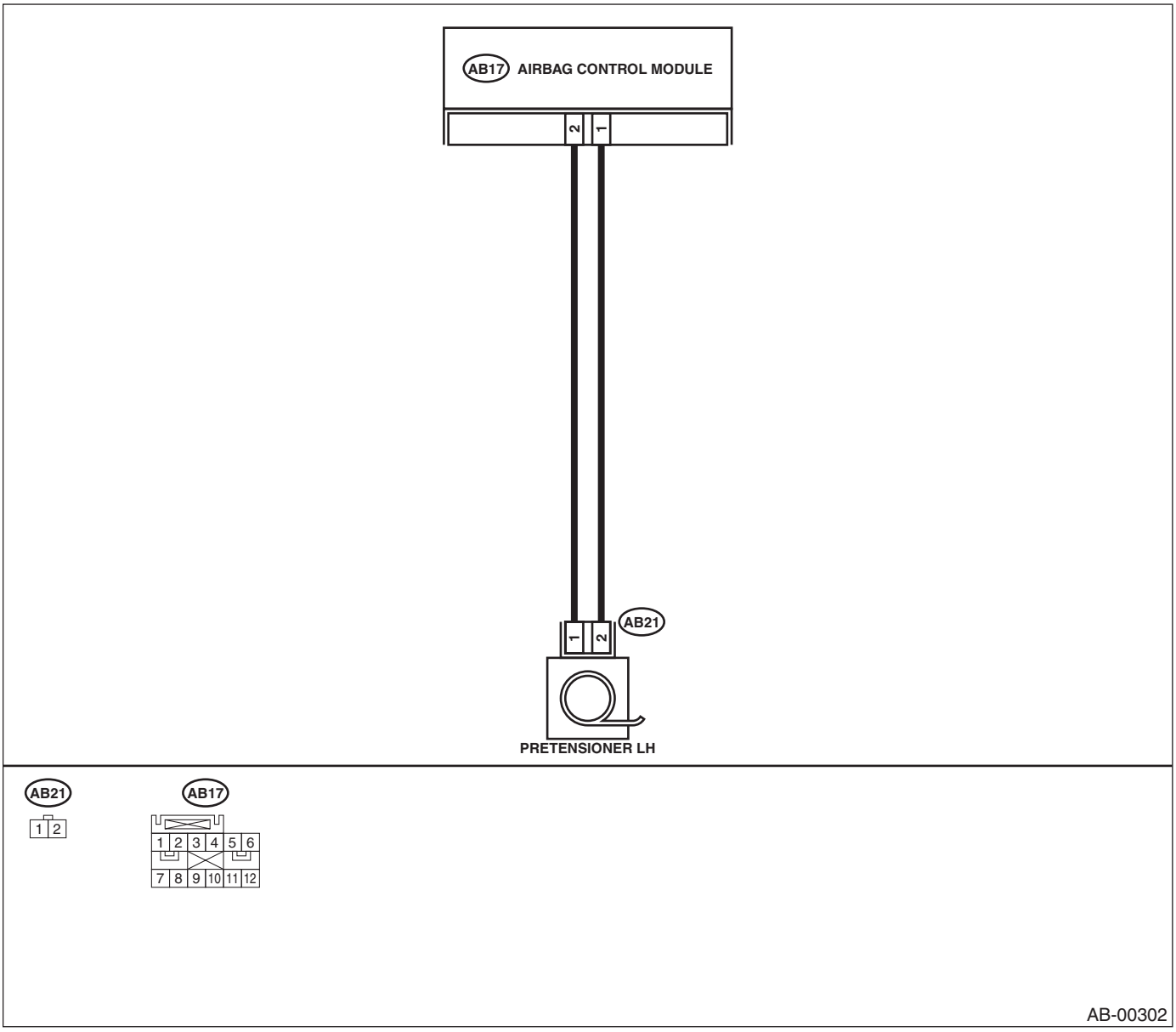
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the stabled pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB21). 4) Connect the airbag resistor to the connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB20) from (AB19). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to the connector (AB17). 6) Measure the resistance between connector (3I) in test harness I2 and the connector (3F) in test harness F. ***Connector & terminal*** ***(3I) No. 11 — (3F) No. 4:*** ***(3I) No. 13 — (3F) No. 3:***	Is the measured value less than 10 Ω?	Go to step **3.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3I) in test harness I2. ***Connector & terminal*** ***(3I) No. 11 — No. 13:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between the connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 11 — Chassis ground:*** ***(3I) No. 13 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

W: DTC 65

DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

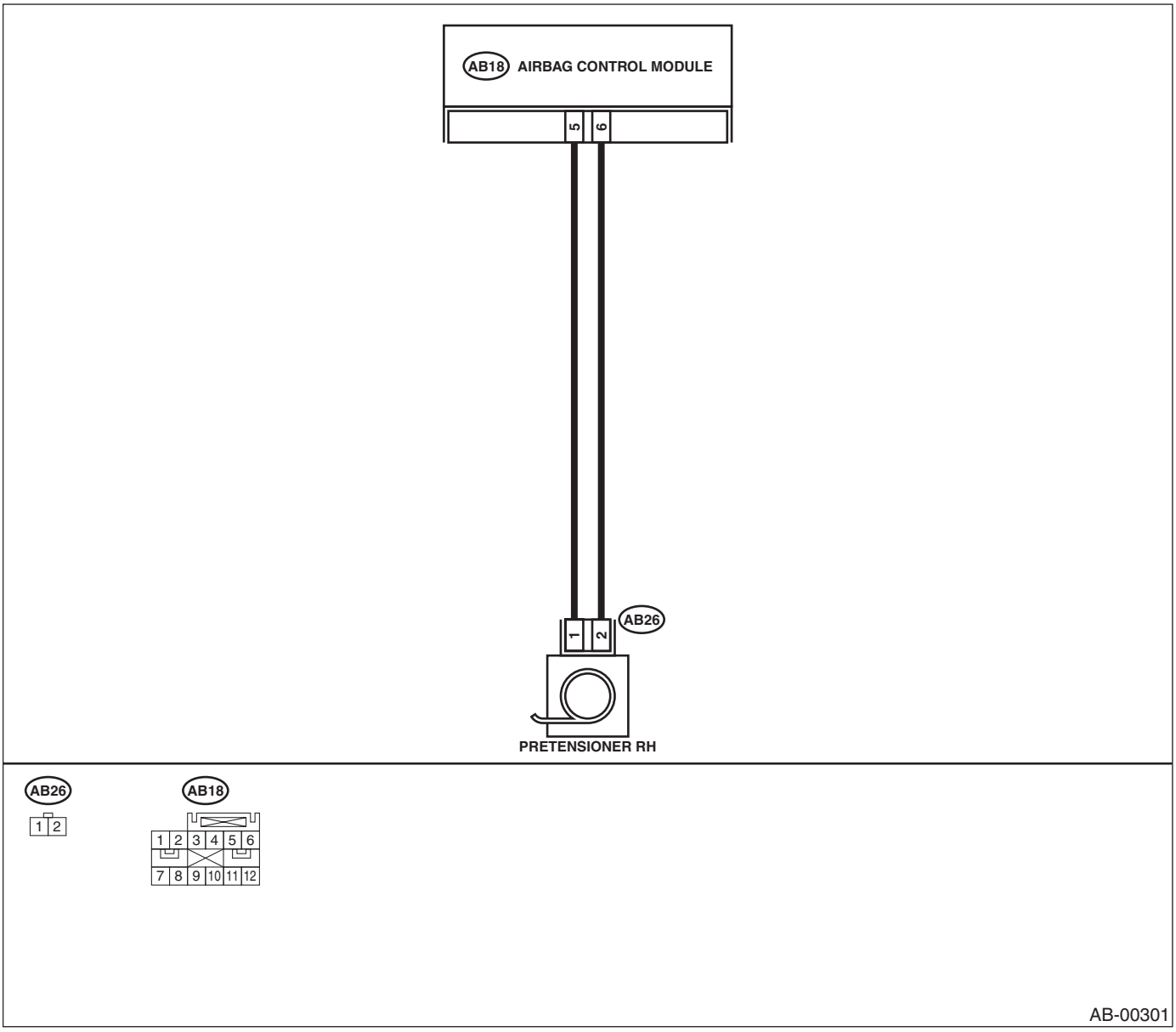
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB26). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB25) from (AB24). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to the connector (AB18). 6) Connect the battery ground cable and turn the ignition switch ON. 7) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 6 (+) — Chassis ground (–):*** ***(3I) No. 8 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

X: DTC 66

DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

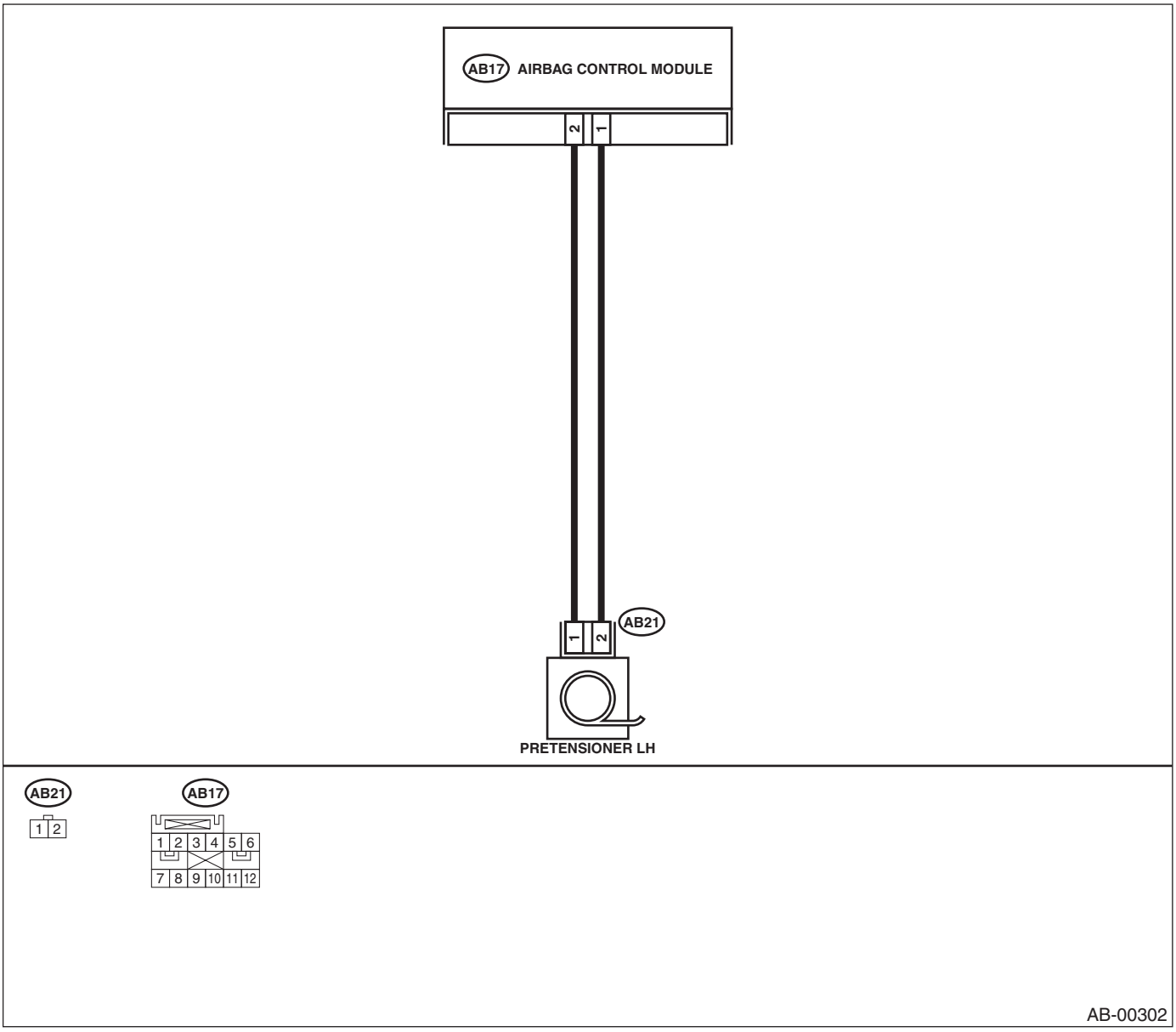
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB21) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB21). 4) Connect the airbag resistor to the connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace seat belt pre-tensioned (LH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB20) from (AB19). 4) Disconnect the connectors (AB17) and (AB18) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1I) in test harness I2 to the connector (AB17). 6) Connect the battery ground cable and turn the ignition switch ON. 7) Measure the voltage between connector (3I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(3I) No. 11 (+) — Chassis ground (–):*** ***(3I) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace side airbag harness. <Ref. to AB-17, Side Airbag Harness.>

Y: DTC 72

DIAGNOSIS:

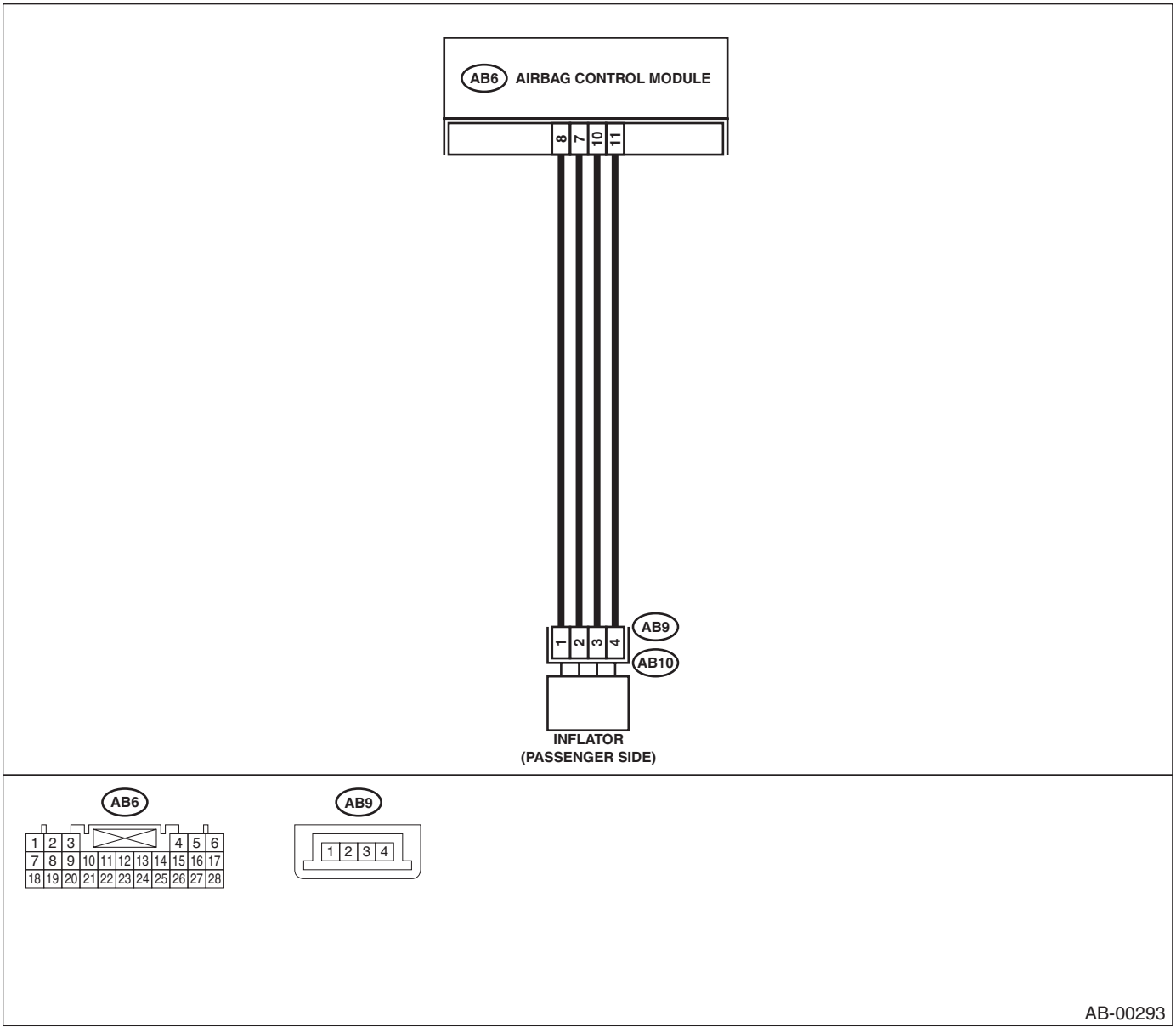
- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Pull out the two stopper pins and lower the glove box. 3) Disconnect the connector passenger's airbag module from (AB9). 4) Connect the connector (1K) in test harness K to connector (AB9). 5) Connect two airbag resistors to connectors (3K) and (4K) in test harness K. 6) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the passenger's airbag module. <Ref. to AB-14, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (3K) and (4K) in test harness K. 3) Remove the lower cover and disconnect the connector (AB3) from (AB8). 4) Disconnect the connector (AB6) from the air bag control module, and connect the connector (1I) in test harness I2. 5) Measure the resistance between connector (6I) in test harness I2 and the connector (4K) in test harness K. ***Connector & terminal*** ***(6I) No. 2 — (4K) No. 3:*** ***(6I) No. 4 — (4K) No. 4:***	Is the measured value less than 10 Ω?	Go to step **3.**	Replace the airbag main harness. <Ref. to AB-16, Main Harness.>
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (6I) in test harness I2. ***Connector & terminal*** ***(6I) No. 2 — No. 4:*** ***(6I) No. 2 — Chassis ground:*** ***(6I) No. 4 — Chassis ground:***	Is the measured value more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness. <Ref. to AB-16, Main Harness.>

Z: DTC 76

DIAGNOSIS:

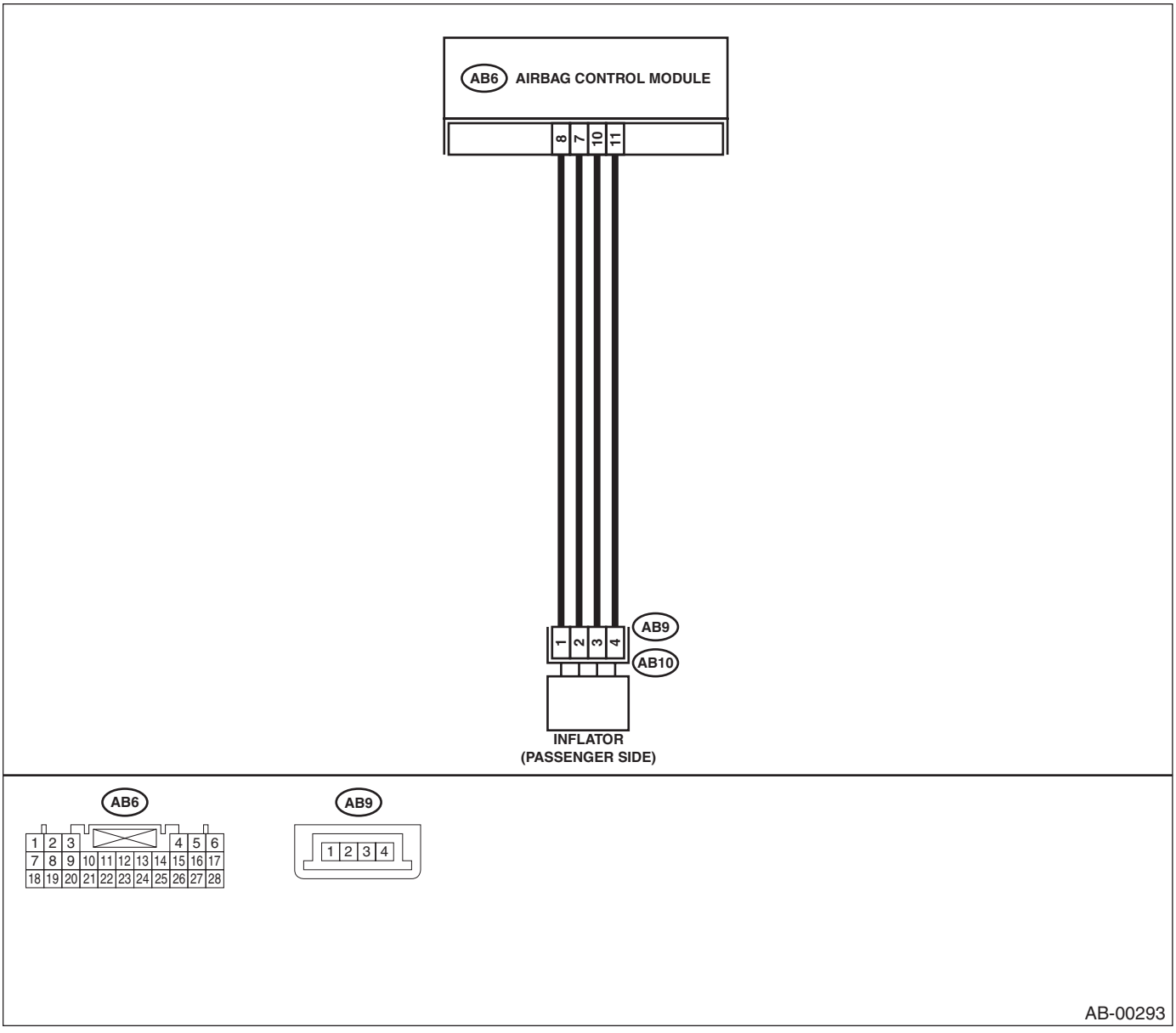
- Airbag main harness (Passenger) circuit is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Pull out the two stopper pins and lower the glove box. 3) Disconnect the connector (AB9) from passenger's airbag module. 4) Connect the connector (1K) in test harness K to connector (AB9). 5) Connect two airbag resistors to connectors (3K) and (4K) in test harness K. 6) Connect the battery ground cable and turn the ignition switch ON.	Does the airbag warning light operate properly?	Replace the passenger's airbag module. <Ref. to AB-14, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (3K) and (4K) in test harness K. 3) Remove the lower cover and disconnect the connector (AB3) from (AB8). 4) Disconnect the connector (AB6) from the airbag control module, and connect the connector (1I) in test harness I2. 5) Measure the voltage between connector (6I) in test harness I2 and the chassis ground. ***Connector & terminal*** ***(6I) No. 2 (+) — Chassis ground (–):*** ***(6I) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness. <Ref. to AB-16, Main Harness.>

MEMO:

SEAT BELT SYSTEM

SB

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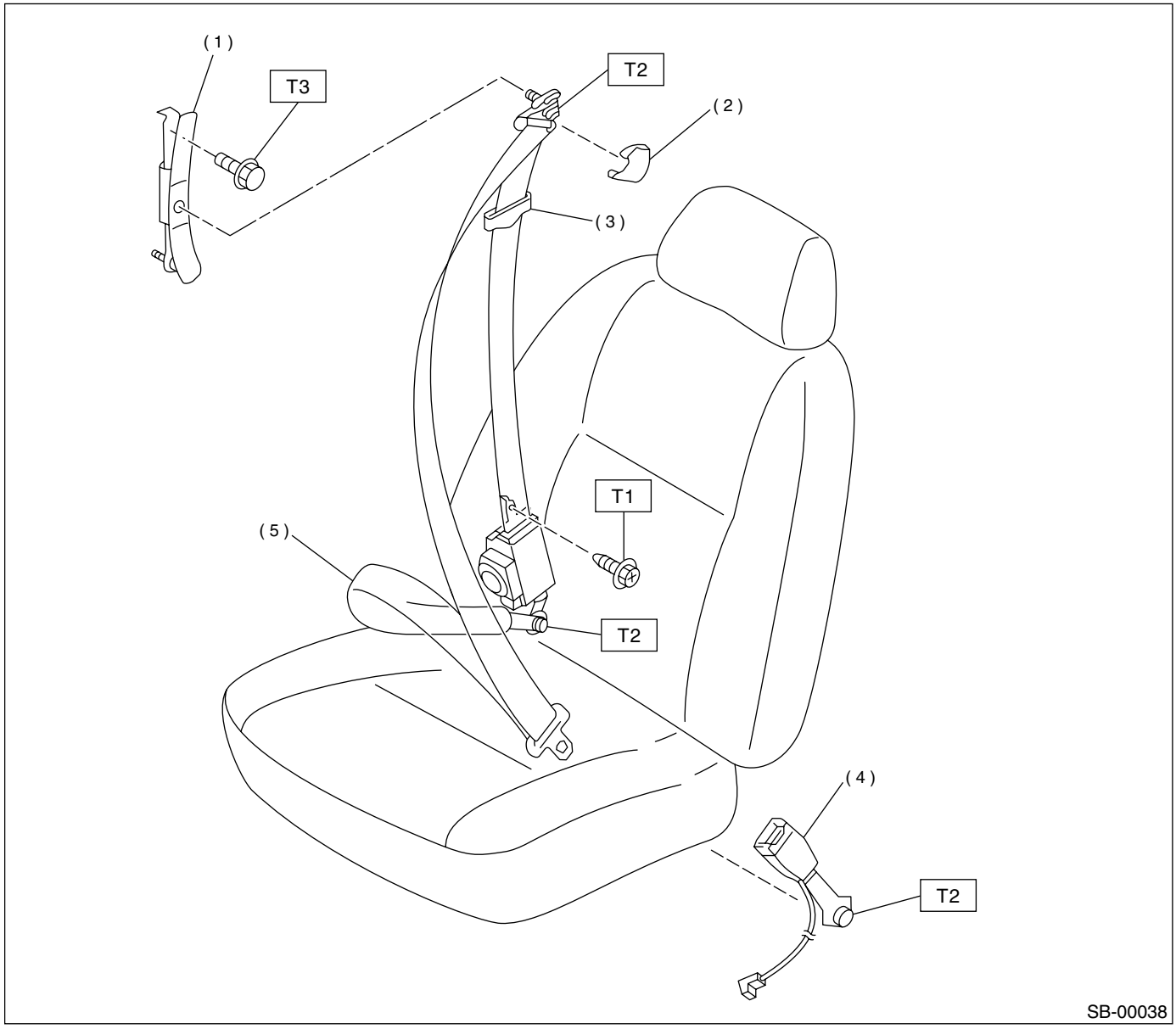
2. Inspection Locations After a Collision 7
3. Front Seat Belt 8
4. Rear Seat Belt....10

1. General Description

A: COMPONENT

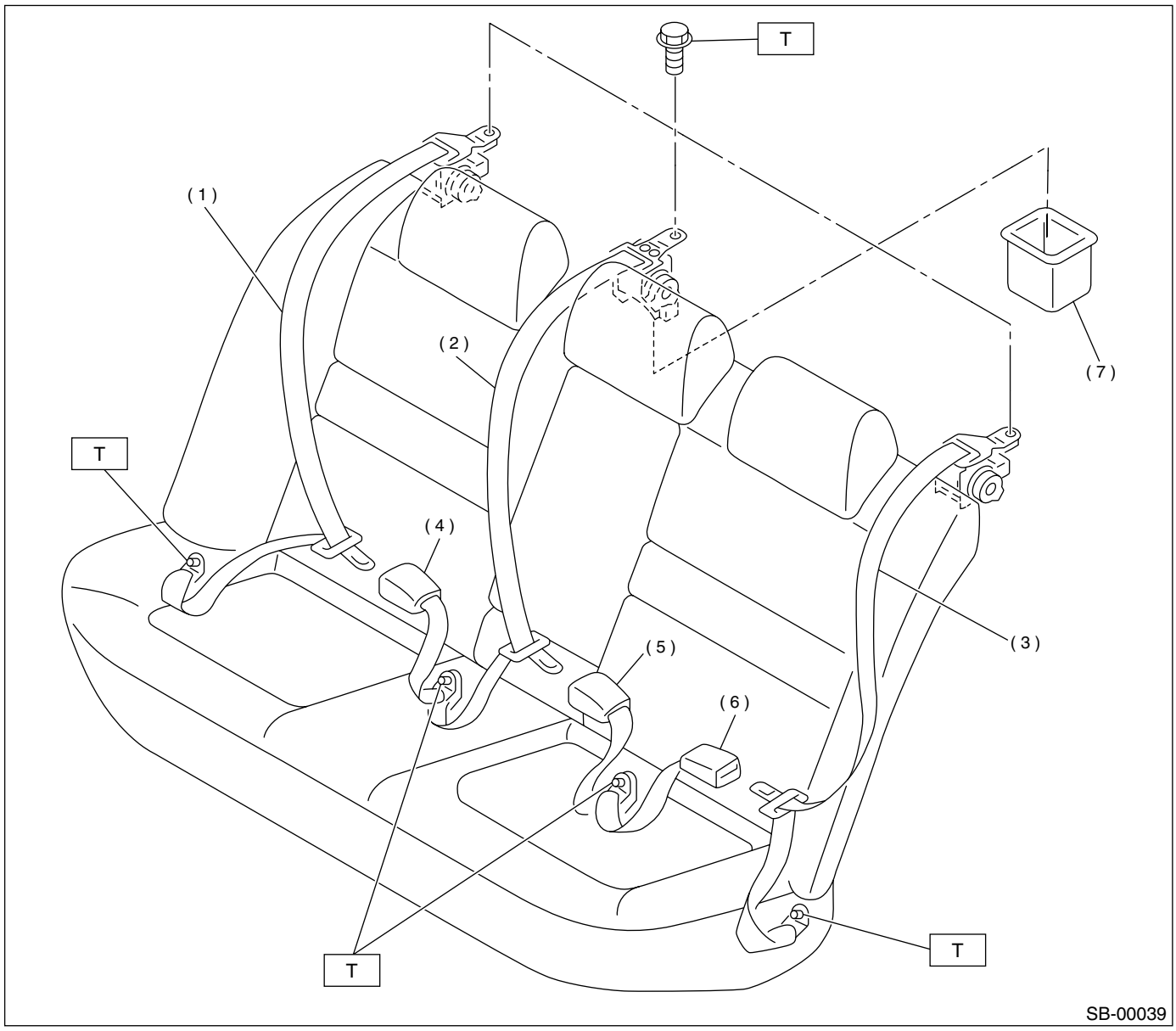
1. FRONT SEAT BELT



(1) Adjuster anchor ASSY
(2) Anchor cover
(3) Webbing guide
(4) Inner belt ASSY
(5) Outer belt ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 30 (3.1, 22)
T3: 53 (5.4, 39)

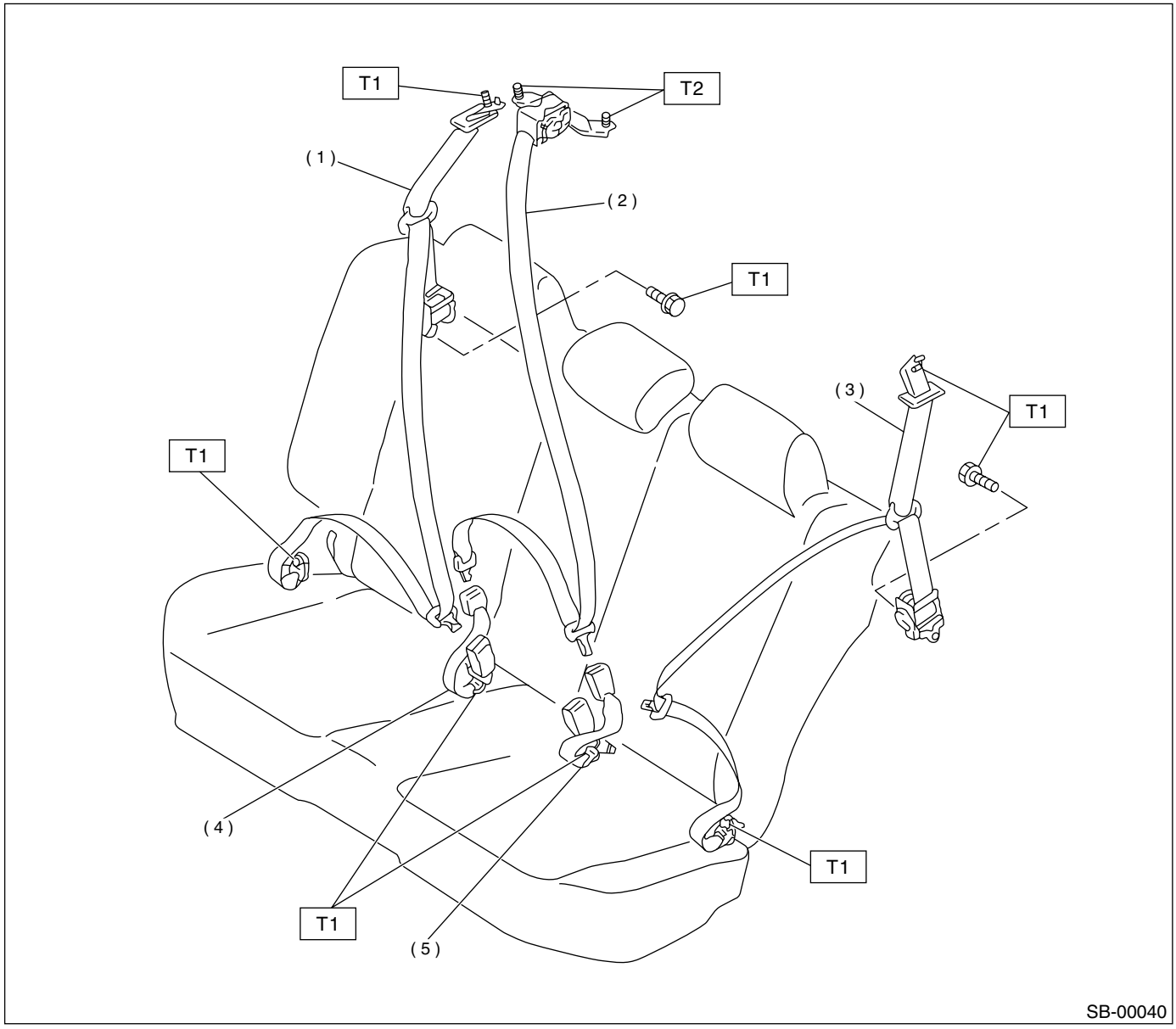
2. REAR SEAT BELT (SEDAN BODY)



(1) Outer seat belt RH
(2) Outer seat belt CENTER
(3) Outer seat belt LH
(4) Inner seat belt RH
(5) Inner seat belt CENTER
(6) Inner seat belt LH
(7) Case center ELR

Tightening torque: N·m (kgf-m, ft-lb)
T: 30 (3.1, 22)

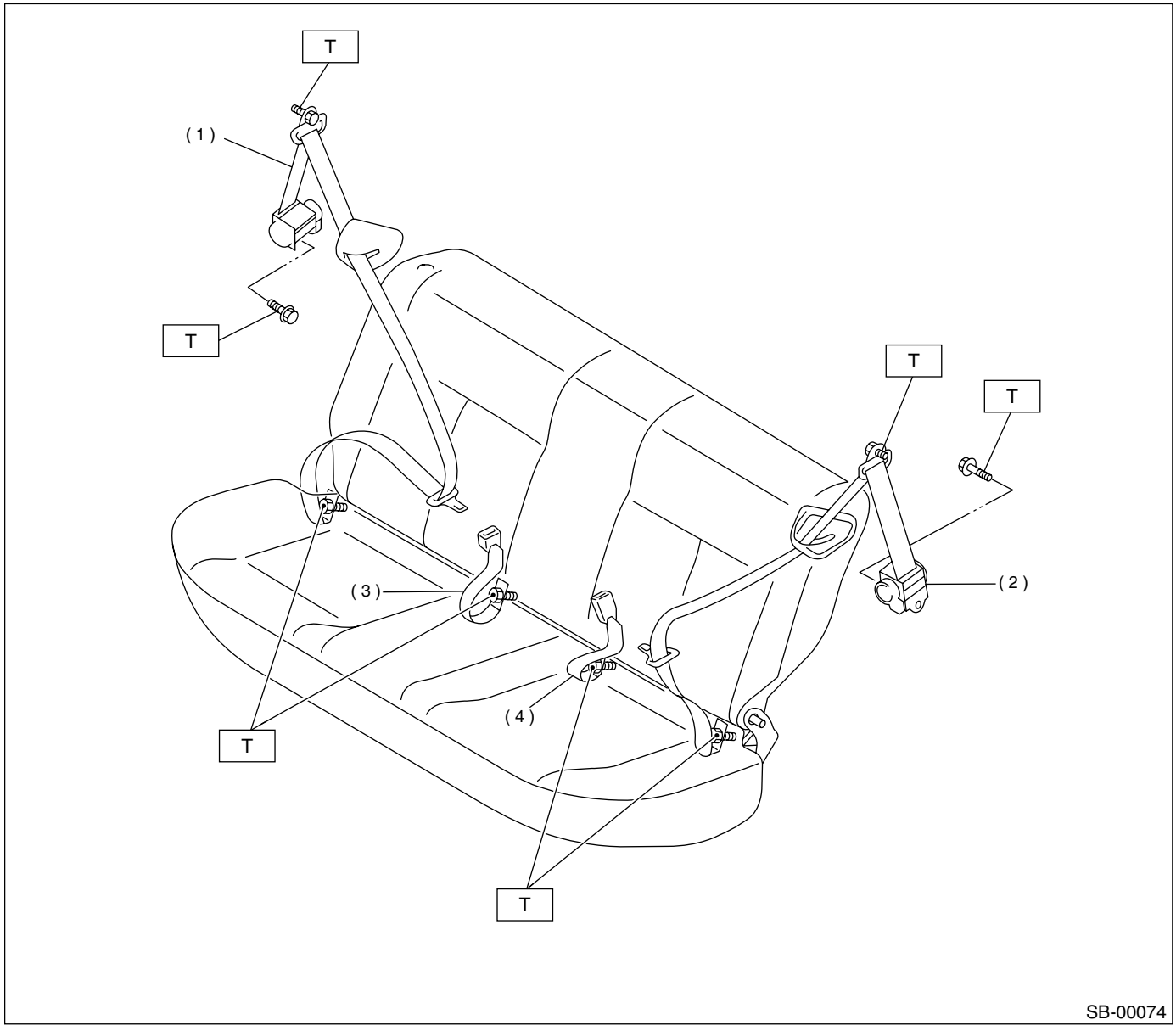
3. REAR SEAT BELT (WAGON BODY)



(1) Outer seat belt RH
(2) Outer seat belt CENTER
(3) Outer seat belt LH
(4) Inner seat belt RH
(5) Inner seat belt LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22)
T2: 53 (5.4, 39)

4. REAR SEAT BELT (PICKUP)



(1) Outer seat belt RH
(2) Outer seat belt LH
(3) Inner seat belt RH
(4) Inner seast belt LH

Tightening torque: N·m (kgf-m, ft-lb)
T: 30 (3.1, 22)

B: CAUTION

• Before starting, turn the ignition switch OFF, disconnect the battery ground cable and wait for 20 seconds or more.
• The pretension system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting
• Do not drop or apply any impact to the pretensioner.
• If oil, grease, or water gets on the pretensioner, wipe it off immediately with a dry cloth.
• Do not expose the pretensioner to high temperature or flame.
• Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.
• Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked, or deformed, replace it with a new one.
• Do not use the airbag or pretensioner parts from other vehicles. Always replace parts with new parts
• When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
• Do not re-use a seat belt with a deployed pretensioner again.
• If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

2. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and then replace with new parts if necessary.

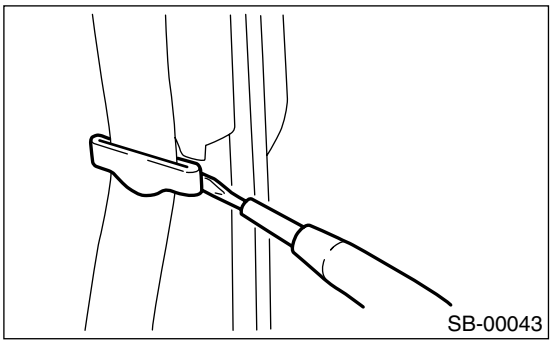
- Center pillar lower garnish is discolored or cracked.
- Wire harness and/or connector is damaged.

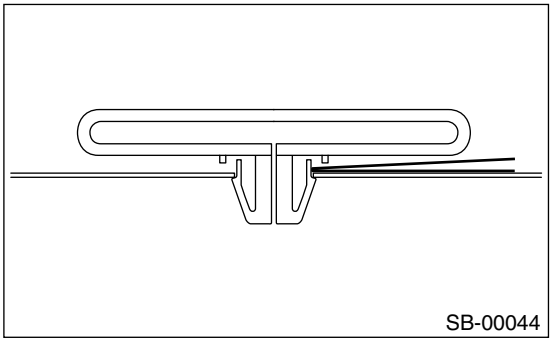
3. Front Seat Belt

A: REMOVAL

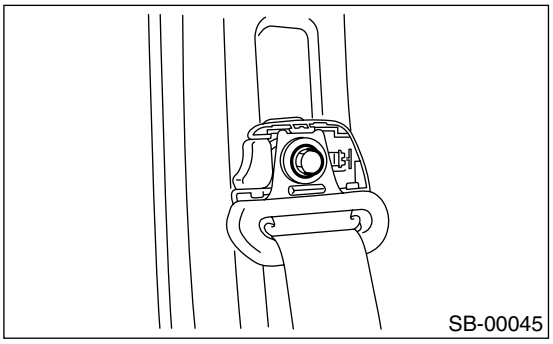
1. OUTER BELT (FRONT)

1) Fold backrest all the way forward, and then move front seat all the way forward.
2) Turn ignition switch OFF, disconnect ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
4) Remove webbing guide.

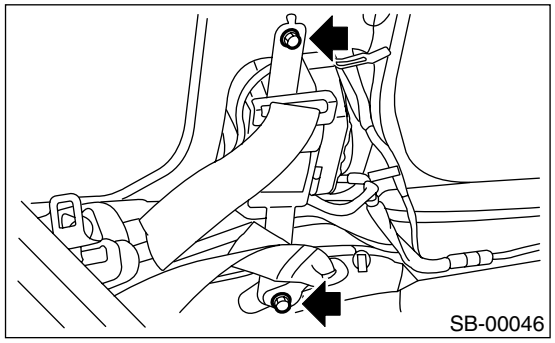

SB-00043


SB-00044

5) Remove anchor cover. Loosen shoulder anchor bolt, and then detach shoulder anchor from center pillar.


SB-00045

6) Turn over the floor mat to remove bolt.

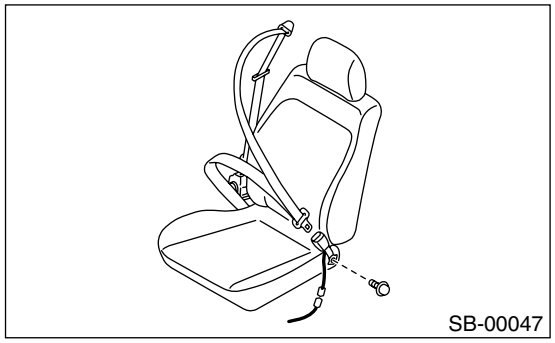

SB-00046

7) Disconnect yellow connector of pretensioner harness, and remove outer belt (front).

CAUTION:
• Do not drop or apply any impat to pretensioner.
• Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

2. INNER BELT (FRONT)

1) Disconnect connector.
2) Remove anchor bolt, and then detach inner belt.


SB-00047

B: INSTALLATION

1. OUTER BELT (FRONT)

Install in the reverse order of removal.

CAUTION:
• The parts on left and right are not identical. Before installation, make sure that the correct part is used.
• Be careful not to twist belts during installation.

2. INNER BELT (FRONT)

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description, <Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>.

C: INSPECTION

1. OUTER BELT (FRONT)

Check for the following, and replace with new parts if necessary.
• Pretensioner is cracked or deformed.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. INNER BELT (FRONT)

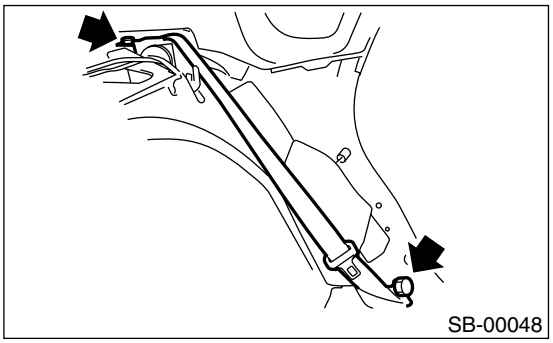
Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

4. Rear Seat Belt

A: REMOVAL

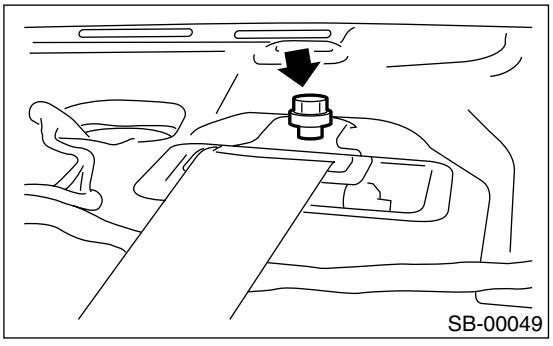
1. OUTER BELT SIDE (SEDAN BODY)

1) Remove rear shelf trim. <Ref. to EI-58, REMOVAL, Rear Shelf Trim.>
2) Remove side sill rear upper cover. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
3) Remove bolts, then detach outer belt side.


SB-00048

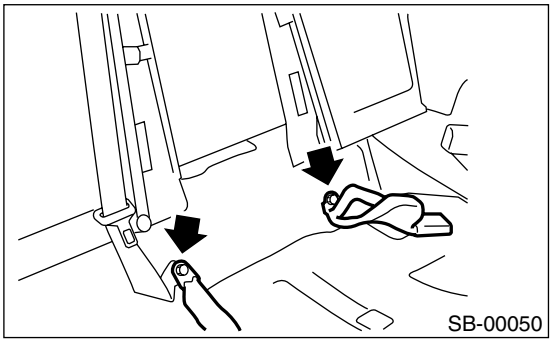
2. OUTER BELT CENTER (SEDAN BODY)

1) Remove rear shelf trim. <Ref. to EI-58, REMOVAL, Rear Shelf Trim.>
2) Remove bolt, and then detach outer belt center.


SB-00049

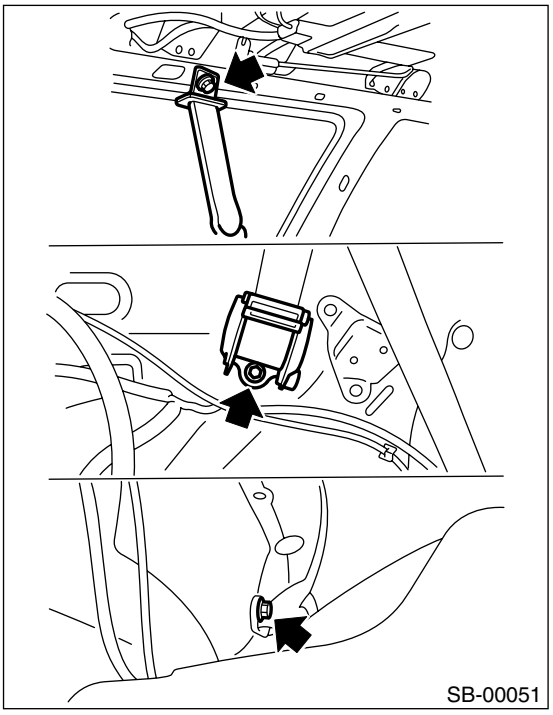
3. INNER BELT (SEDAN BODY)

1) Remove the rear cushion. <Ref. to SE-18, REMOVAL, Rear Seat.>
2) Remove bolts, and then detach inner belt.


SB-00050

4. OUTER BELT SIDE (WAGON BODY)

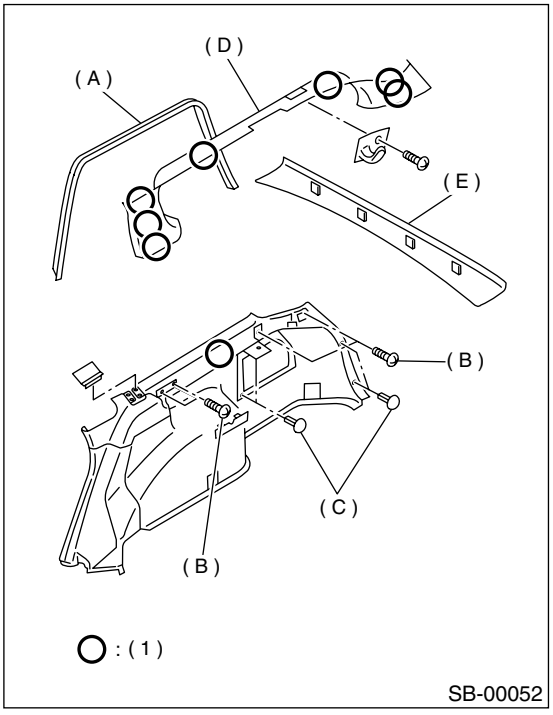
1) Remove rear quarter trim. <Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
2) Remove rear quarter upper trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>
3) Remove bolt and nut, and then detach outer belt side.


SB-00051

5. OUTER BELT CENTER (WAGON BODY)

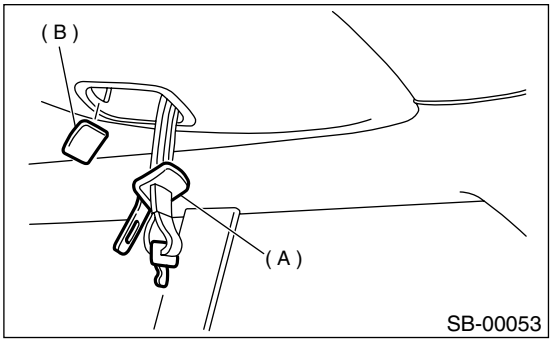
CAUTION:
When removing clip, use great care not to damage the roof trim.

1) Remove luggage room light. <Ref. to LI-30, REMOVAL, Luggage Room Light.>
2) Remove rear mole (A) of right side.
3) Remove screws (B) and clips (C) of rear quarter lower trim shown in the figure.
4) Remove rear quarter upper trim (D) of right side.
5) Remove rear rail trim (E).

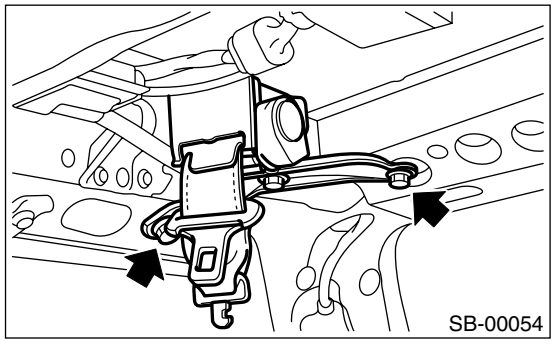


(1) Hook pawl

6) Remove cover (B) while detaching snap lock carefully. Put the outer belt center tongue (A) out to the other side of the trim through the hole.

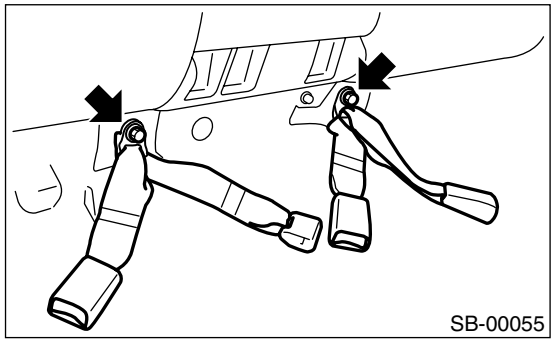


7) Remove clips and hang down rear end of roof trim.
8) Disconnect harness and connector, and then remove outer belt center assembly.



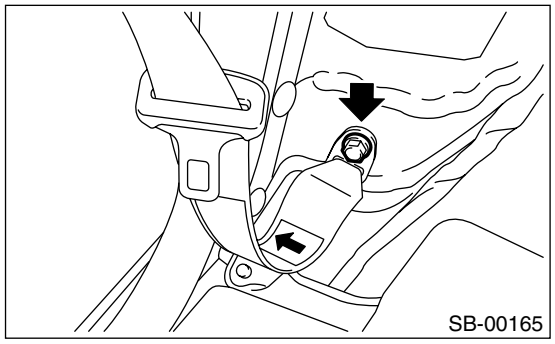
6. INNER BELT (WAGON BODY)

1) Raise the rear cushion.
2) Remove bolt, and then detach inner belt.

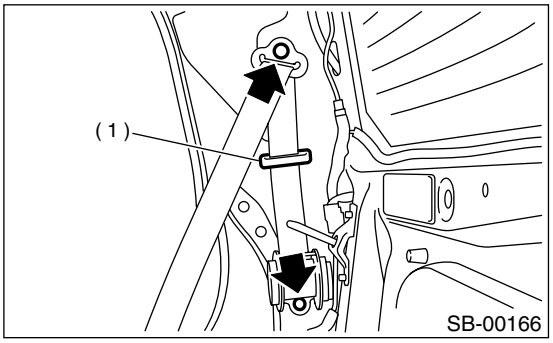


7. OUTER BELT SIDE (PICKUP BODY)

1) Remove rear pillar trim. <Ref. to EI-69, REMOVAL, Rear Pillar Trim.>
2) Remove lower anchor bolt.



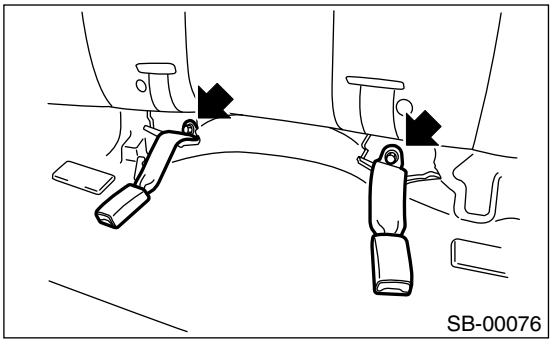
3) Remove webbing guide bolts, and then detach outer belt side.



(1) Webbing guide

8. INNER BELT (PICKUP BODY)

1) Pull up rear cushion.
2) Remove bolts, and then detach inner belt.



B: INSTALLATION

1. OUTER BELT SIDE (SEDAN BODY)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that seat belts are not twisted.
• After installation, make sure that seat belts can be smoothly extended and wound.

2. OUTER BELT CENTER (SEDAN BODY)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that seat belts are not twisted.
• After installation, make sure that seat belts can be smoothly extended and wound.

3. INNER BELT (SEDAN BODY)

Install in the reverse order of removal.

CAUTION:
During installation, make sure that seat belts are not twisted.

4. OUTER BELT SIDE (WAGON BODY)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that seat belts are not twisted.
• After installation, make sure that seat belts can be smoothly extended and wound.

5. OUTER BELT CENTER (WAGON BODY)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that seat belts are not twisted.
• After installation, make sure that seat belts are smoothly extended and wound.

6. INNER BELT (WAGON BODY)

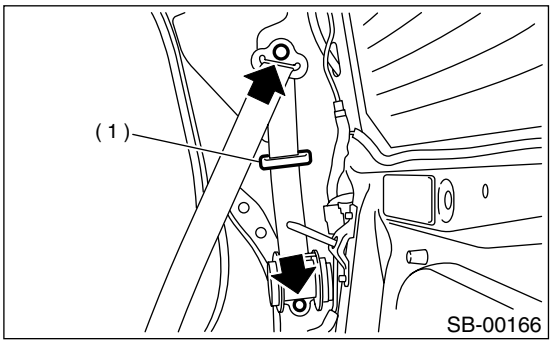
Install in the reverse order of removal.

CAUTION:
During installation, make sure that seat belts are not twisted.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SB-3, REAR SEAT BELT (SEDAN BODY), COMPONENT, General Description.> or <Ref. to SB-4, REAR SEAT BELT (WAGON BODY), COMPONENT, General Description.>

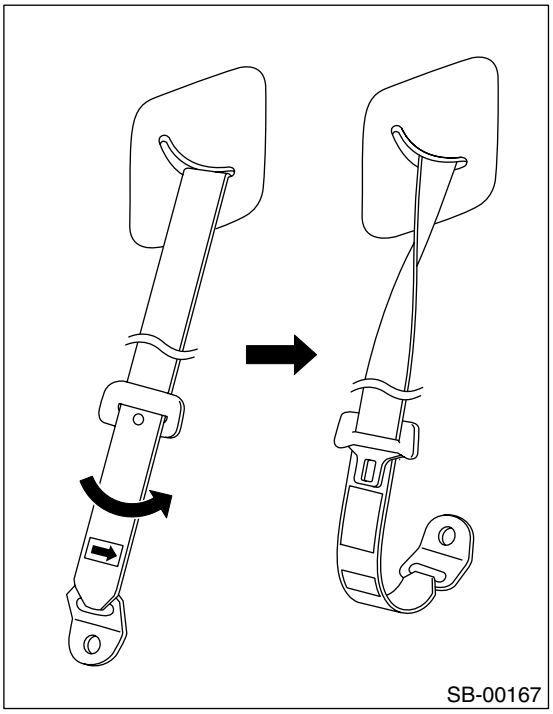
7. OUTER BELT SIDE (PICKUP BODY)

1) Install webbing guide and bolts.

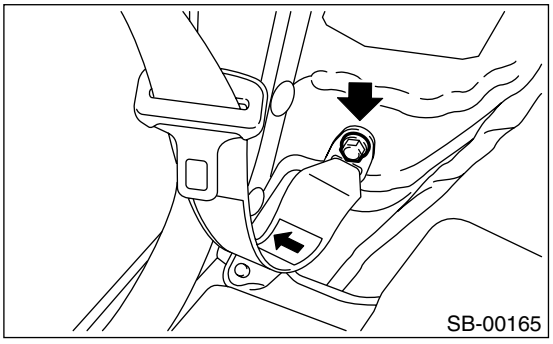


(1) Webbing guide

2) Twist seat belt in the direction indicated by the arrow on the seat belt label.



3) Install lower anchor bolt.



CAUTION:
After installation, make sure that seat belts are smoothly extended and wound.

8. INNER BELT (PICKUP BODY)

Install in the reverse order of removal.

CAUTION:
During installation, make sure that seat belts are not twisted.

C: INSPECTION

1. OUTER BELT SIDE (SEDAN BODY)

Check for the following, and replace with new parts if necessary.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. OUTER BELT CENTER (SEDAN BODY)

Check for the following, and replace with new parts if necessary.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

3. INNER BELT (SEDAN BODY)

Check for the following, and replace with new parts if necessary.
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

4. OUTER BELT SIDE (WAGON BODY)

Check for the following, and replace with new parts if necessary.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

5. OUTER BELT CENTER (WAGON BODY)

Check for the following, and replace with new parts if necessary.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

6. INNER BELT (WAGON BODY)

Check for the following, and replace with new parts if necessary.
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

7. OUTER BELT SIDE (PICKUP BODY)

Check for the following, and replace with new parts if necessary.
- Outer belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

8. INNER BELT (PICKUP BODY)

Check for the following, and replace with new parts if necessary.
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

MEMO:

LIGHTING SYSTEM

LI

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1. General Description

A: SPECIFICATIONS

Headlight		12 V — 55 W (Low) 12 V — 60 W (High)	GT, OUTBACK, PICKUP
		12 V — 55/65 W (Low/High)	Except PICKUP
Front turn signal light, side turn signal light, parking light		12 V — 27/8 W	—
Front fog light		12 V — 51 W	OUTBACK, PICKUP
		12 V — 55 W	Except PICKUP
Rear combination light	Tail/Stop/Turn signal light	12 V — 21/5 W	PICKUP
	Tail/Stop light	12 V — 27/8 W	Except PICKUP
	Turn signal light	12 V — 21 W	Except PICKUP
	Back-up light	12 V — 21 W	PICKUP
		12 V — 27 W	Except PICKUP
Rear finisher light	Tail/Stop light	12 V — 27/8 W	Except PICKUP
	Tail light	12 V — 5 W	PICKUP
	Back-up light	12 V — 27 W	Except PICKUP
License plate light		12 V — 5 W	—
High-mounted stop light		12 V — 16 W	SEDAN
		12 V — 13 W	Except PICKUP
Room light		12 V — 8 W	—
Spot light		12 V — 8 W	—
Door step light		12 V — 3.4 W	—
Luggage room light		12 V — 13 W	WAGON
Trunk room light		12 V — 5 W	SEDAN
Glove box light		12 V — 1.4 W	—
Cargo light		12 V — 13 W	PICKUP

B: PRECAUTIONS

• Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

WARNING:
• Airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: SCHEMATIC

1. HEADLIGHT 2-LIGHT MODEL

<Ref. to WI-228, 2-LIGHT MODEL, SCHEMATIC, Headlight System.>

2. HEADLIGHT 4-LIGHT MODEL

<Ref. to WI-229, 4-LIGHT MODEL, SCHEMATIC, Headlight System.>

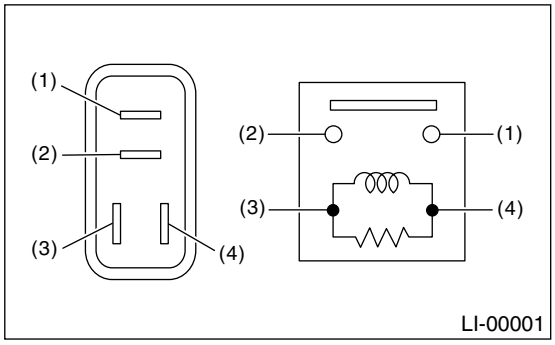
3. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-218, SCHEMATIC, Clearance Light and Illumination Light System.>

B: INSPECTION

1. HEADLIGHT RELAY

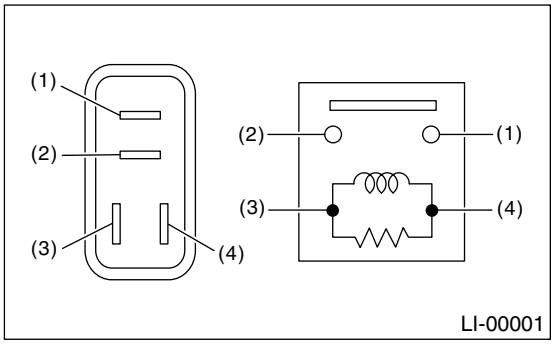
Measure headlight relay resistance between terminals while connecting terminal No. 4 to battery positive terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

2. TAIL AND ILLUMINATION RELAY

Measure tail and illumination relay resistance between terminals while connecting terminal No. 4 to battery positive terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

3. Front Fog Light System

A: SCHEMATIC

1. FRONT FOG LIGHT 4 CYLINDER ENGINE MODEL

<Ref. to WI-224, SCHEMATIC, Front Fog Light System.>

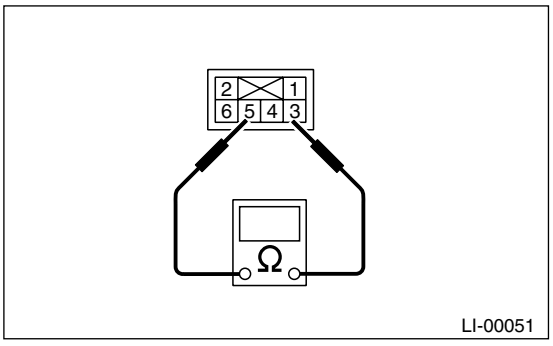
2. FRONT FOG LIGHT 6 CYLINDER ENGINE MODEL

<Ref. to WI-226, 6-CYLINDER ENGINE, SCHEMATIC, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

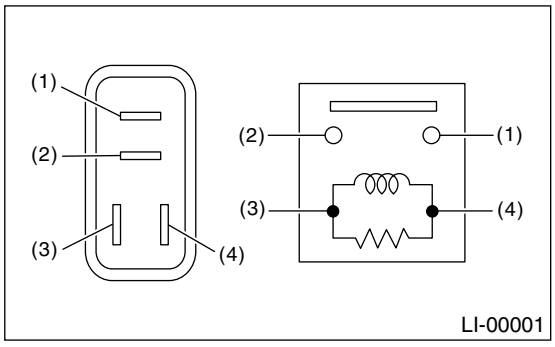
Measure front fog light switch resistance.



Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	3 and 5	Less than 1 Ω

2. FRONT FOG LIGHT RELAY

Measure front fog light relay resistance between terminals while connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

4. Turn Signal and Hazard Light System

A: SCHEMATIC

1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-246, SCHEMATIC, Turn Signal Light and Hazard Light System.>

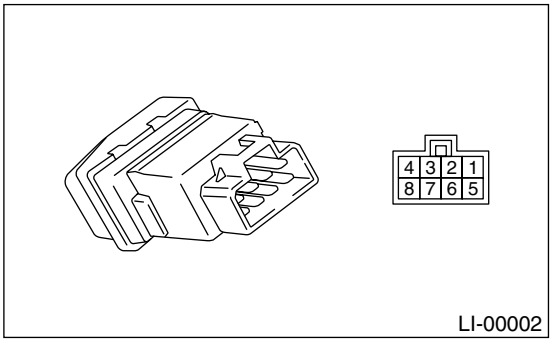
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-10, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

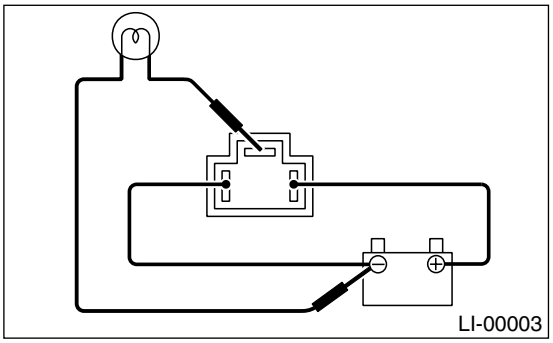
Measure hazard switch resistance.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1 Ω
ON	1, 3 and 4	Less than 1 Ω
	7 and 8	Less than 1 Ω

3. TURN SIGNAL & HAZARD MODULE

Connect battery and turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



5. Back-up Light System

A: SCHEMATIC

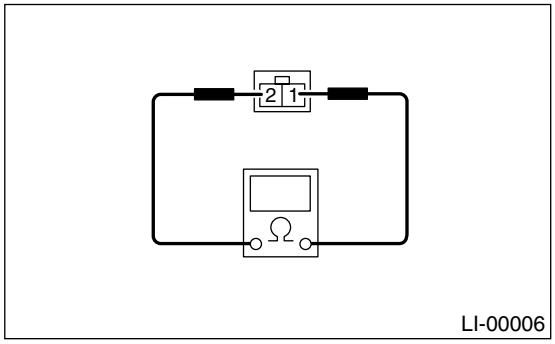
1. BACK-UP LIGHT

<Ref. to WI-214, SCHEMATIC, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (M/T)

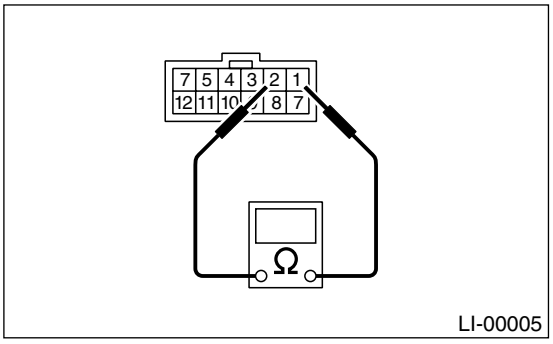
Measure back-up light switch resistance.



Switch position	Terminal No.	Standard
When shift lever is set in reverse position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

2. INHIBITOR SWITCH (A/T)

Measure inhibitor switch resistance.



Switch position	Terminal No.	Standard
When select lever is set in “R” position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

6. Stop Light System

A: SCHEMATIC

1. STOP LIGHT SEDAN MODEL

<Ref. to WI-242, SEDAN MODEL, SCHEMATIC, Stop Light System.>

2. STOP LIGHT WAGON MODEL

<Ref. to WI-243, WAGON MODEL, SCHEMATIC, Stop Light System.>

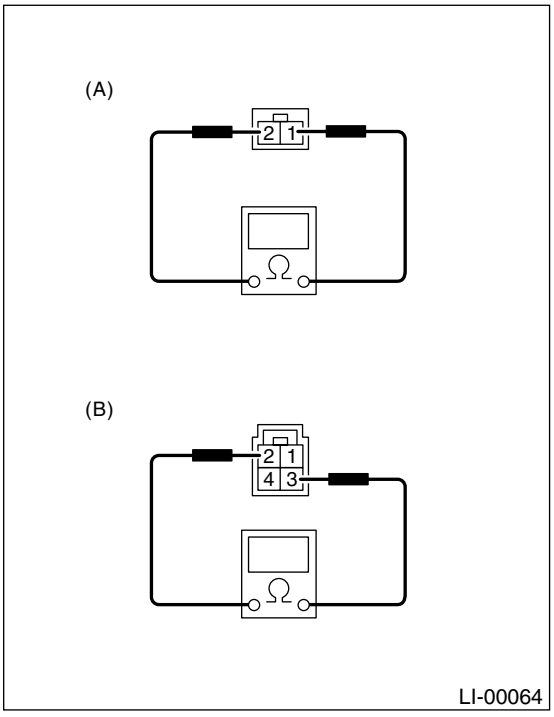
3. STOP LIGHT (PICKUP MODEL)

<Ref. to WI-244, PICK-UP MODEL, SCHEMATIC, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure stop light switch resistance.



(A) Without cruise control
(B) With cruise control

Switch position	Terminal No.	Standard
When brake pedal is depressed	1 and 2: Without cruise control 2 and 3: With cruise control	Less than 1 Ω
When brake pedal is released		More than 1 MΩ

7. Interior Light System

A: SCHEMATIC

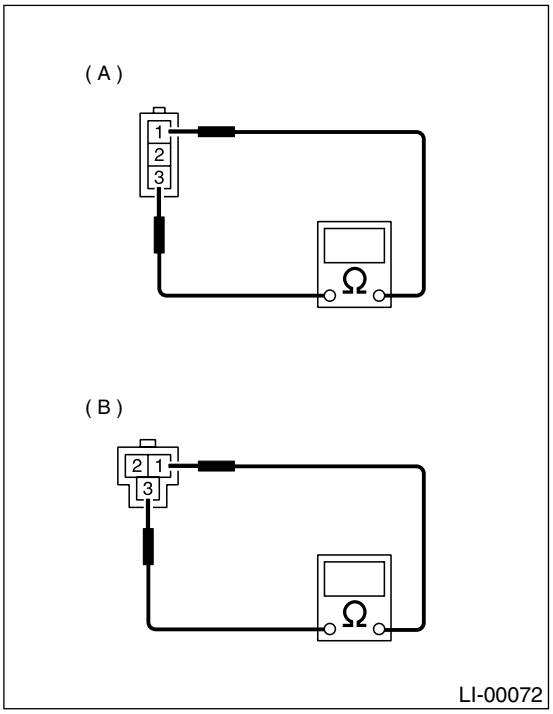
1. INTERIOR LIGHT

<Ref. to WI-232, SCHEMATIC, In Compartment Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure door switch resistance.



(A) Front door switch
(B) Rear door switch

Switch position	Terminal No.	Standard
When door is open	1 and 3	Less than 1 Ω
When door is closed		More than 1 MΩ

2. REAR GATE LATCH SWITCH

Measure rear gate latch switch.

Switch position	Terminal No.	Standard
When rear gate is open	1 and 2	Less than 1 Ω
When rear gate is closed		More than 1 MΩ

3. TRUNK ROOM LIGHT SWITCH

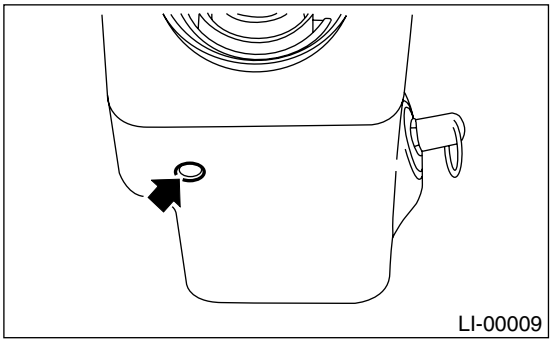
Measure trunk room light switch.

Switch position	Terminal No.	Standard
When trunk lid is open	1 and 2	Less than 1 Ω
When trunk lid is closed		More than 1 MΩ

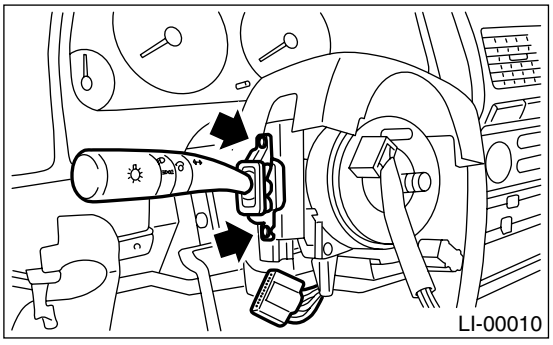
8. Combination Switch (Light)

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove instrument panel lower cover. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
3) Remove screws which secure upper column cover to lower column cover.



4) Disconnect connector from combination switch.
5) Remove screws which secure switch and remove switch.

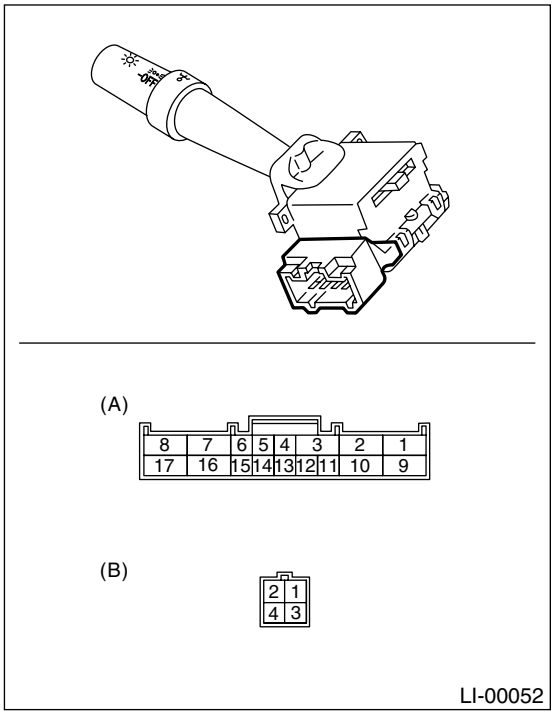


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure combination switch resistance.



(A) Lighting and turn signal switch connector
(B) Parking switch conector

1. LIGHTING SWITCH

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
Tail	14 and 16	Less than 1 Ω
Head	13, 14 and 16	Less than 1 Ω

2. DIMMER AND PASSING SWITCH

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1 Ω
Low beam	16 and 17	Less than 1 Ω
High beam	7 and 16	Less than 1 Ω

3. TURN SIGNAL SWITCH

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1 Ω
Neutral	—	More than 1 MΩ
Right	2 and 3	Less than 1 Ω

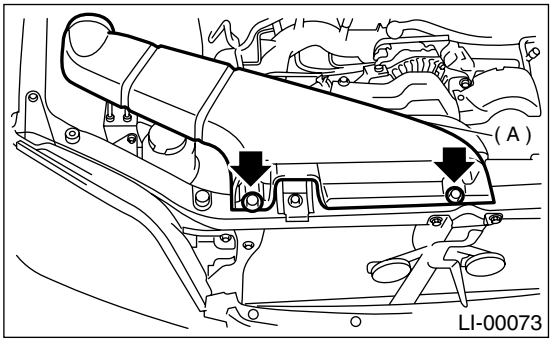
4. PARKING SWITCH

Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1 Ω
ON	1 and 4	Less than 1 Ω

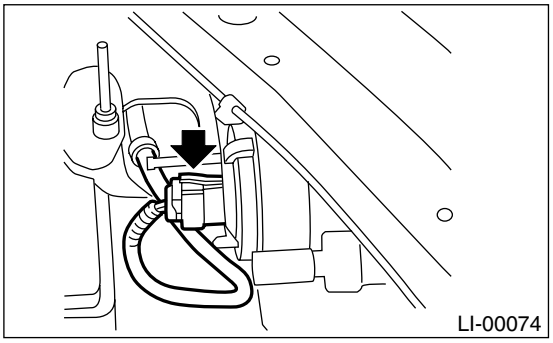
9. Headlight Assembly

A: REMOVAL

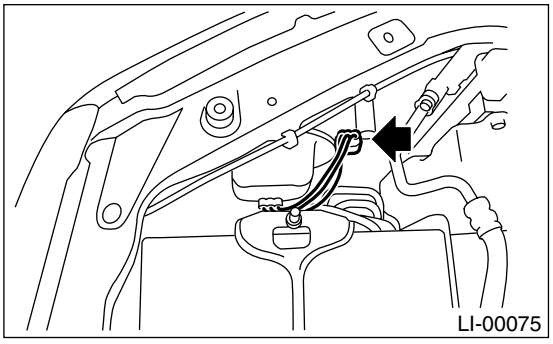
1) Disconnect ground cable from battery.
2) Remove duct (A) (when right side headlight is removed).



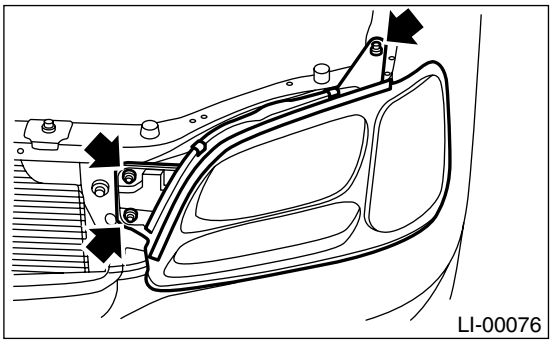
3) Disconnect headlight harness connector
Single-bulb type



Dual-bulb type



4) Remove three bolts and disconnect connectors, and then detach headlight assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: ADJUSTMENT

1. HEADLIGHT AIMING

NOTE:
As this headlight is the “VISUAL AIMING TYPE”, it is possible to adjust aiming only in the vertical direction. It cannot be adjusted in the horizontal direction.

CAUTION:
Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than two minutes.

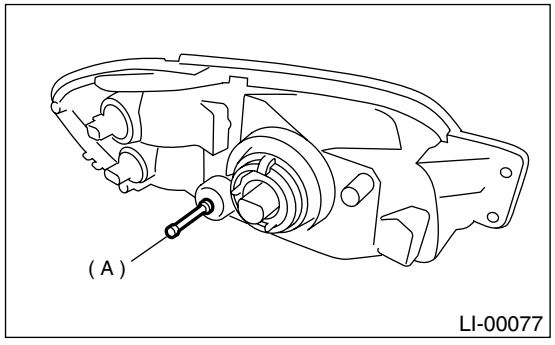
NOTE:
Before checking the headlight aiming, be sure of the following:

- The area around the headlight has not sustained any accident, damage or other type of deformation.
- Vehicle is parked on level ground.
- The inflation pressure of tires is correct.
- Vehicle's gas tank is fully charged.
- Bounce the vehicle several times to normalize the suspension.
- Make certain that someone is seated in the driver's seat.

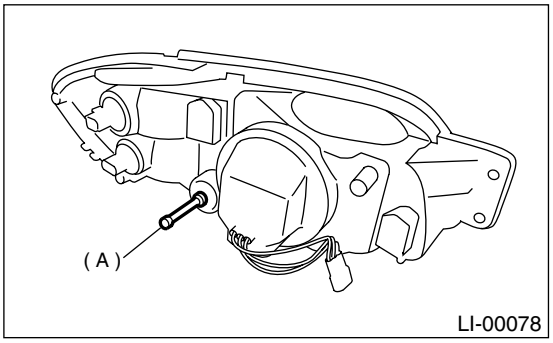
Turn the headlights on and then adjust the low beam pattern to the following positions on the screen.

NOTE:
Adjust the headlight aiming by turning the adjusting screw (A).

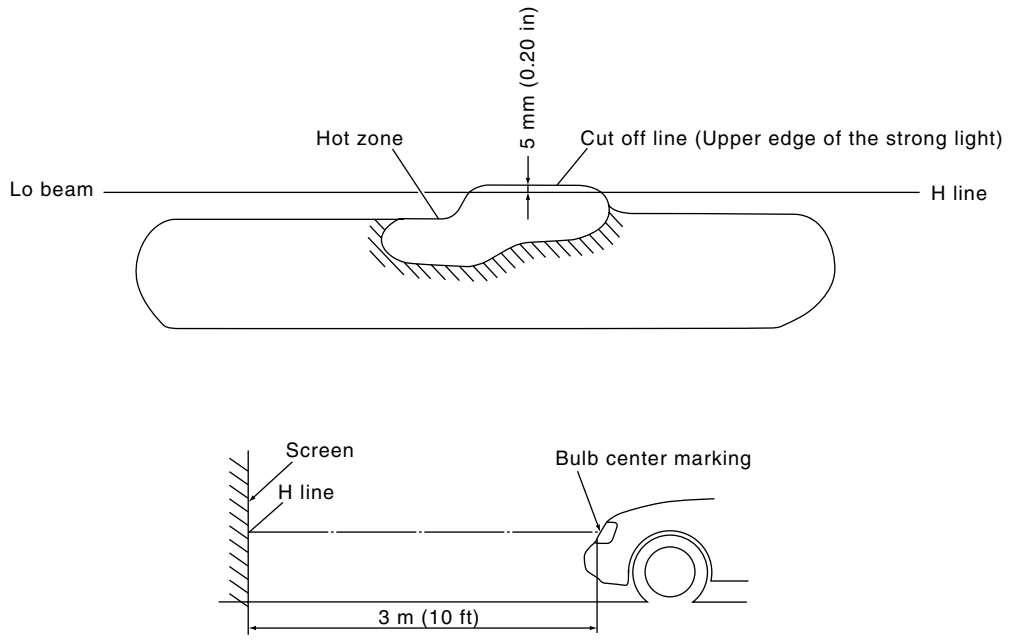
Single-bulb type



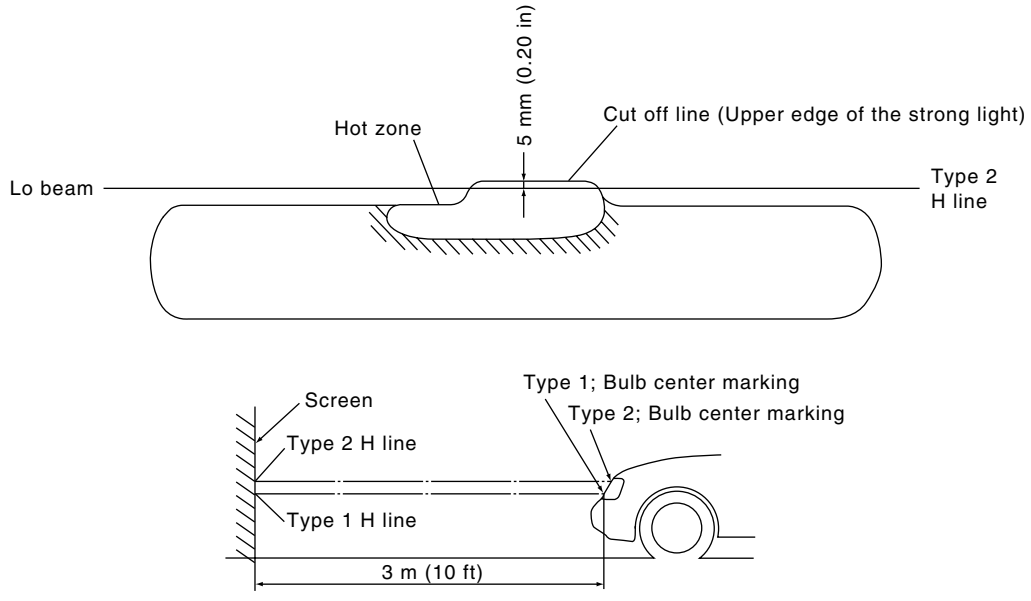
Dual-bulb type



Single-bulb headlight



Dual-bulb headlight



LI-00079

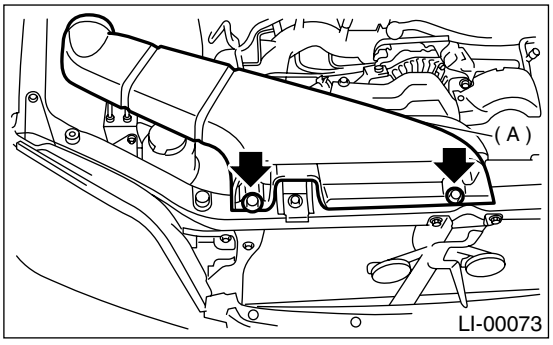
10.Headlight Bulb

A: REMOVAL

CAUTION:
• Because the halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
• Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its the performance.

1. SINGLE-BULB TYPE

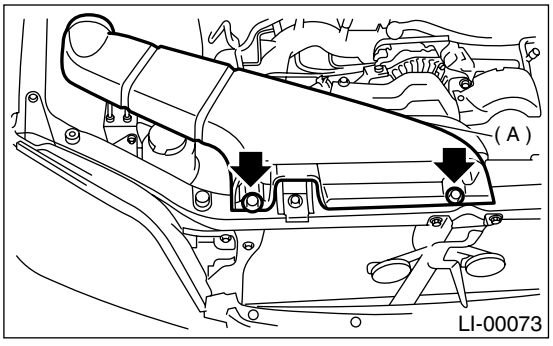
1) Disconnect ground cable from battery.
2) Remove duct (A) (when right side headlight is removed).



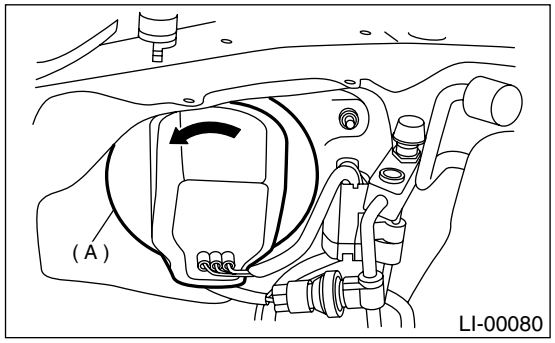
3) Disconnect harness connector.
4) Remove rubber cover.
5) Push to remove spring retainer, and then detach the headlight bulb.

2. DUAL-BULB TYPE

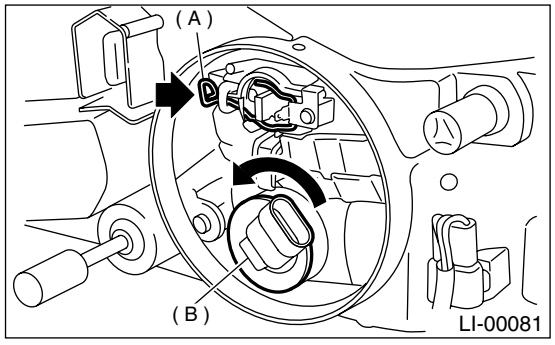
1) Disconnect ground cable from battery.
2) Remove duct (A) (when right side headlight is removed).



3) Remove back cover (A).



4) Disconnect harness connector.
5) Push to remove spring retainer (A) (low beam) or turn bulb assembly (B) counterclockwise (high beam), and then detach headlight bulb.



B: INSTALLATION

Install in the reverse order of removal.

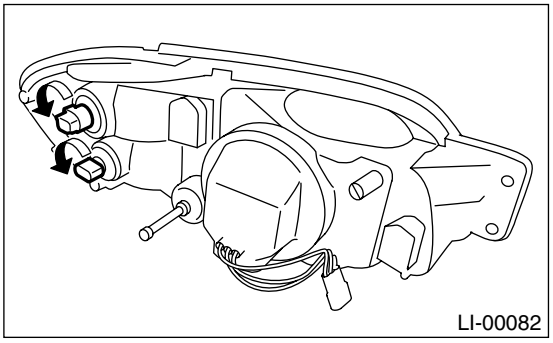
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

11.Front Turn Signal Light Bulb

A: REMOVAL

1) Remove headlight assembly. <Ref. to LI-11, REMOVAL, Headlight Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

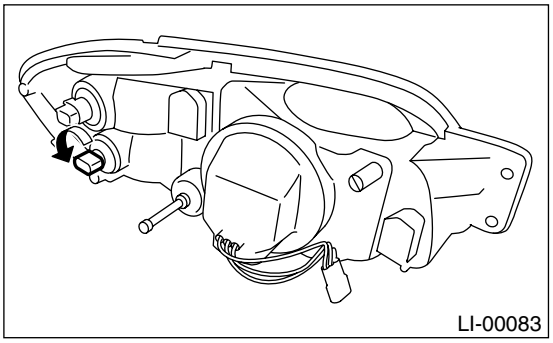
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

12. Parking /Side Marker Light Bulb

A: REMOVAL

1) Remove headlight assembly. <Ref. to LI-11, REMOVAL, Headlight Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

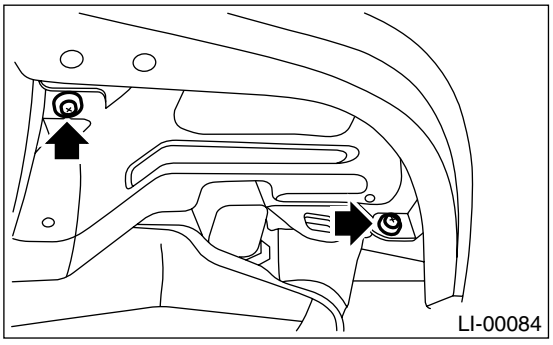
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

13.Front Fog Light Assembly

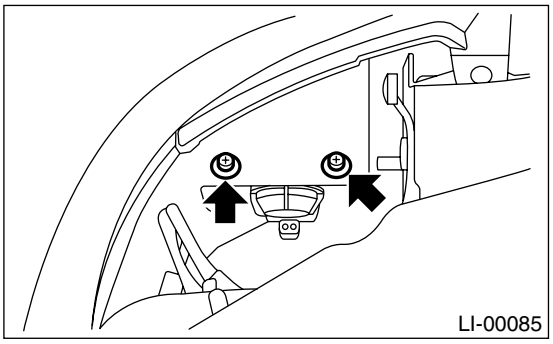
A: REMOVAL

1. EXCEPT OUTBACK

1) Disconnect ground cable from battery.
2) Remove two clips and lower the mudguard.

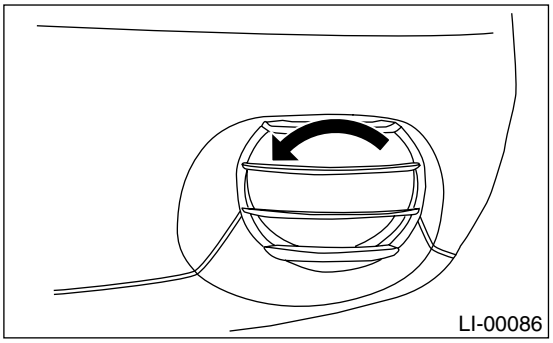


3) Disconnect harness connector.
4) Remove mounting bolts, and then detach fog light assembly.

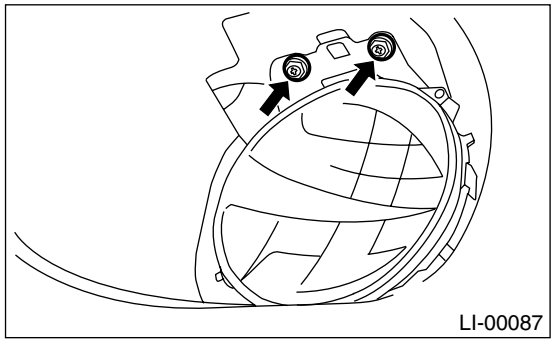


2. OUTBACK

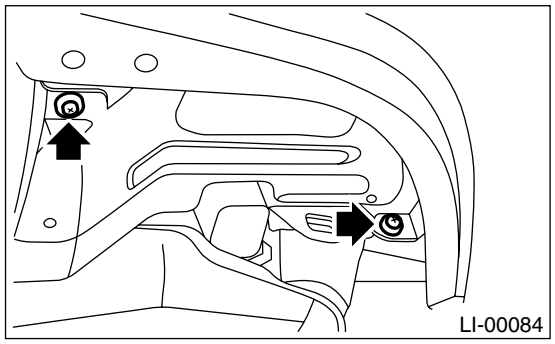
1) Disconnect ground cable from battery.
2) Turn stone guard counterclockwise, and then remove it.



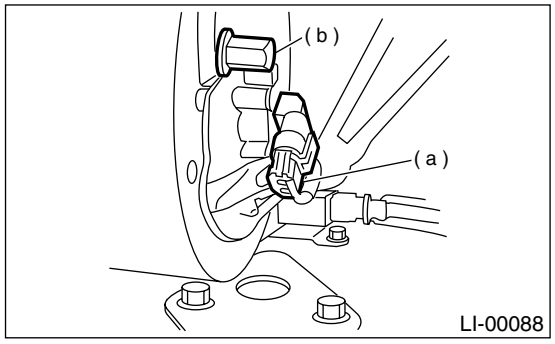
3) Remove mounting bolts.



4) Remove two clips and lower the mudguard.



5) Disconnect harness connector (a).
6) Remove nut (b) then detach fog light assembly.



B: INSTALLATION

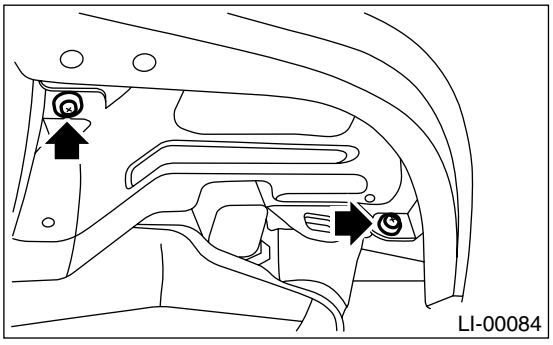
Install in the reverse order of removal.

14.Front Fog Light Bulb

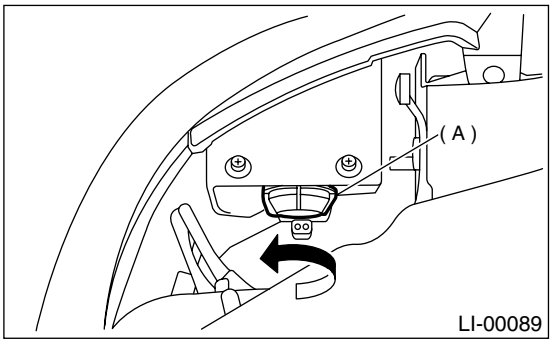
A: REMOVAL

1. EXCEPT OUTBACK

1) Disconnect ground cable from battery.
2) Remove the two clips and lower the mudguard.



3) Disconnect harness connector.
4) Remove back cover (A).



5) Remove spring retainer then detach fog light bulb.

2. OUTBACK

1) Remove fog light assembly. <Ref. to LI-17, OUTBACK, REMOVAL, Front Fog Light Assembly.>
2) Disconnect harness connector.
3) Turn the bulb assembly counterclockwise, and then remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

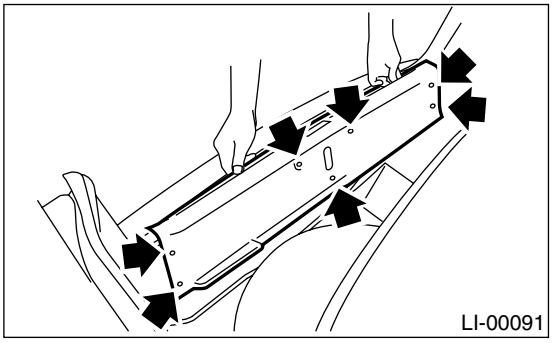
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-3, PRECAUTIONS, General Description.>
3) If NG, replace the bulb with a new one.

15.Rear Combination Light Assembly

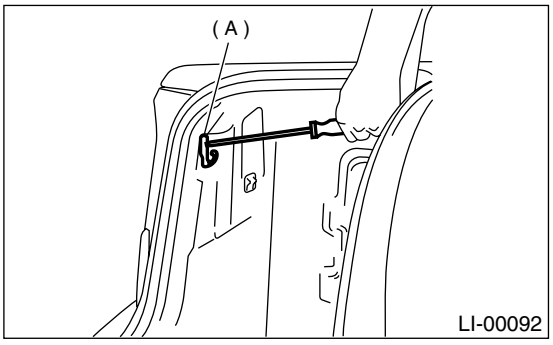
A: REMOVAL

1. SEDAN

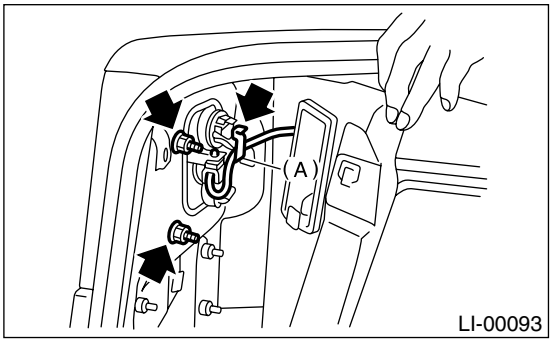
1) Disconnect ground cable from battery.
2) Remove clips and then detach trunk rear trim.



3) Remove hook (A) and then turn over the trunk side trim of rear portion.



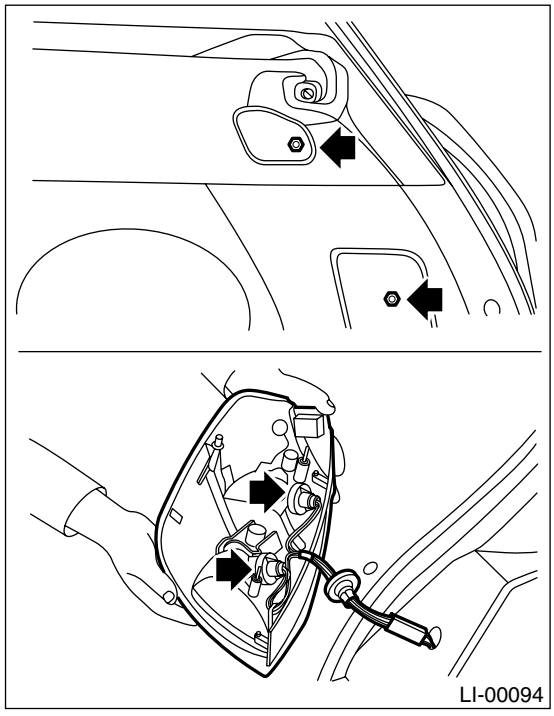
4) Remove harness clip (A).
5) Remove three nuts and then detach rear combination light while disconnecting connector.



2. WAGON

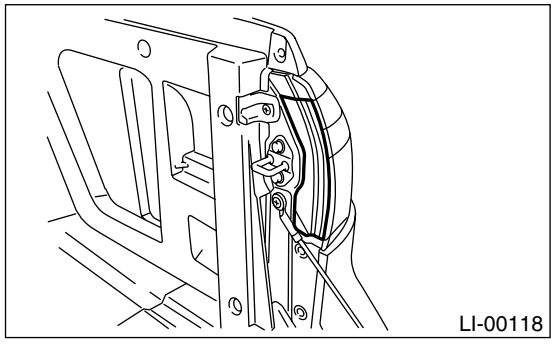
1) Disconnect ground cable from battery.
2) Remove two rear quarter trim covers.
3) Remove two nuts and then remove rear combination light while disconnecting connector.

NOTE:
Before removing the nuts, apply a few turns of butyl tape to the tip of the service tool. This prevents the nuts from falling during removal.

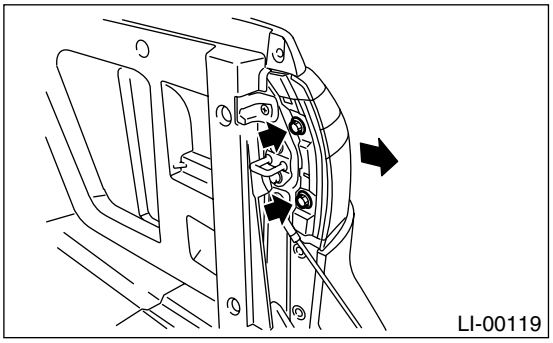


3. PICKUP

1) Disconnect ground cable from battery.
2) Open tail gate.
3) Remove bolt cover.



4) Remove bolt and detach rear combination light assembly by pulling to the rear.



B: INSTALLATION

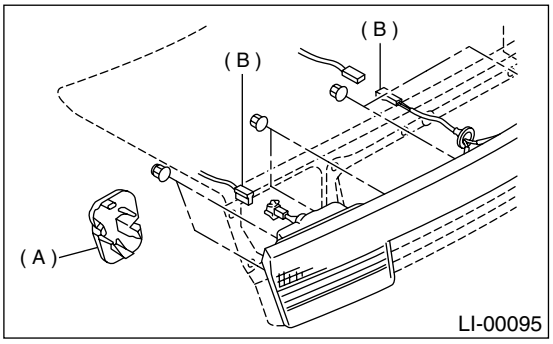
Install in the reverse order of removal.

16.Rear Finisher Light Assembly

A: REMOVAL

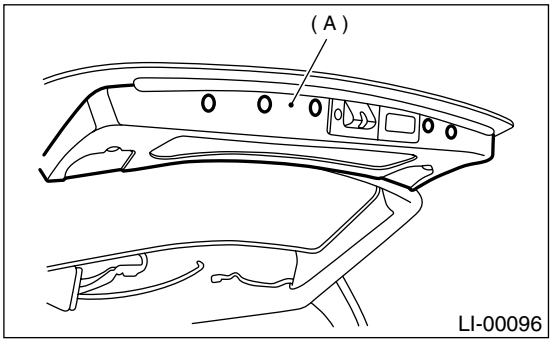
1. SEDAN

1) Disconnect ground cable from battery.
2) Open the trunk lid.
3) Remove cover (A).
4) Disconnect connector (B) from rear finisher light.
5) Remove ten nuts and then detach rear finisher light from trunk lid.

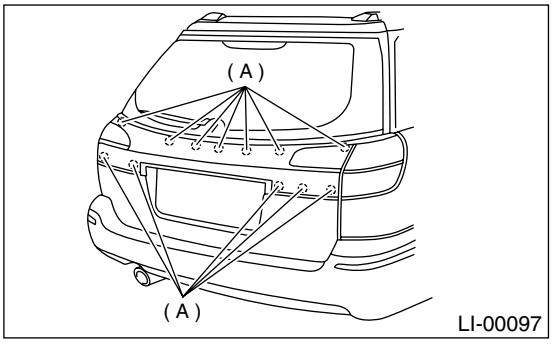


2. WAGON

1) Disconnect ground cable from battery.
2) Remove rear gate trim (A). <Ref. to EI-57, REMOVAL, Rear Gate Trim.>

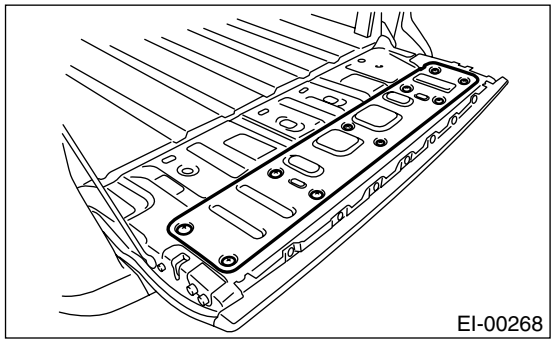


3) Disconnect connector from rear finisher light.
4) Remove nuts (A) and then remove rear finisher light from rear gate.

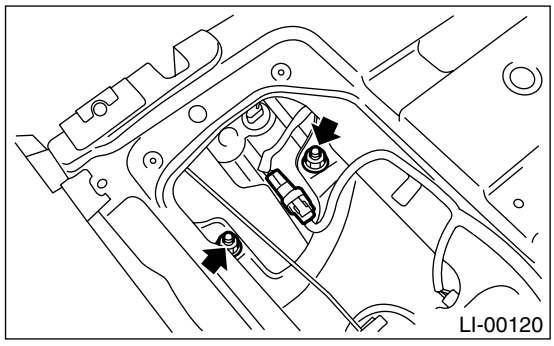


3. PICKUP

1) Disconnect ground cable from battery.
2) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
3) Remove tail gate cover.



4) Separate connector. Remove nuts and detach rear finisher light.



B: INSTALLATION

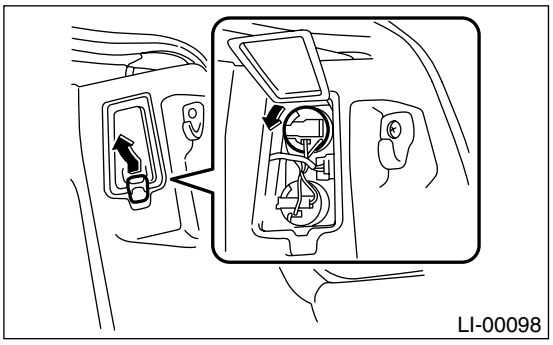
Install in the reverse order of removal.

17.Brake/Tail Light Bulb

A: REMOVAL

1. SEDAN (COMBINATION LIGHT)

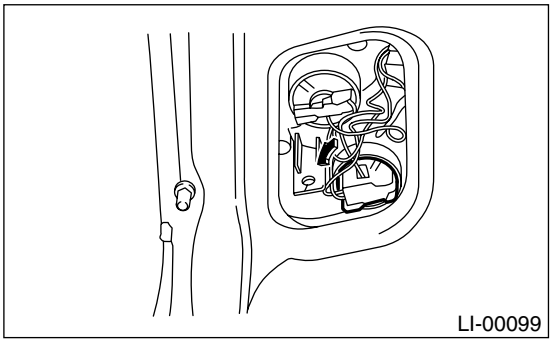
1) Open trunk lid and remove cover.



2) Turn the socket and remove the bulb.

2. SEDAN (FINISHER LIGHT)

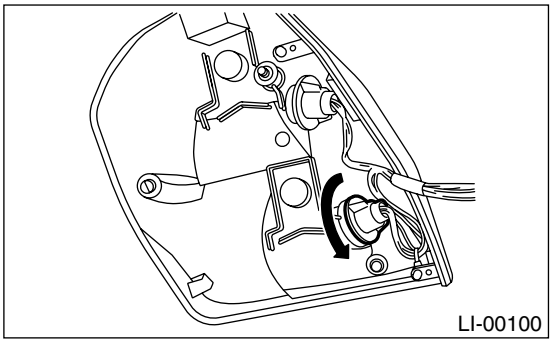
1) Open trunk lid and remove cover.



2) Turn the socket and remove the bulb.

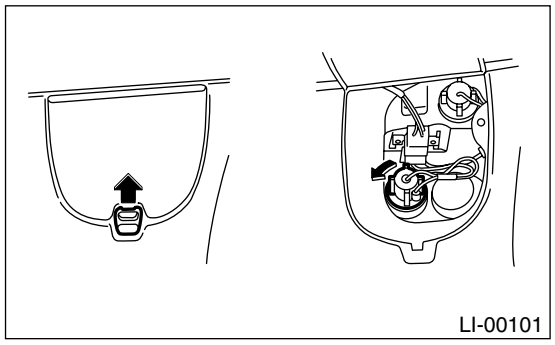
3. WAGON (COMBINATION LIGHT)

1) Remove rear combination light assembly. <Ref. to LI-19, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



4. WAGON (FINISHER LIGHT)

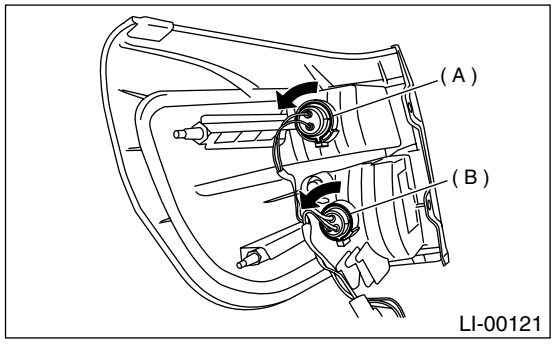
1) Open rear gate lower trim cover.



2) Turn the socket and remove the bulb.

5. PICKUP (COMBINATION LIGHT)

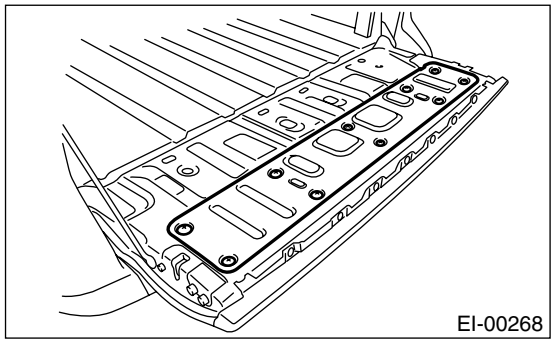
1) Remove combination light assembly. <Ref. to LI-19, PICKUP, REMOVAL, Rear Combination Light Assembly.>
2) Rotate the socket and remove the bulb.



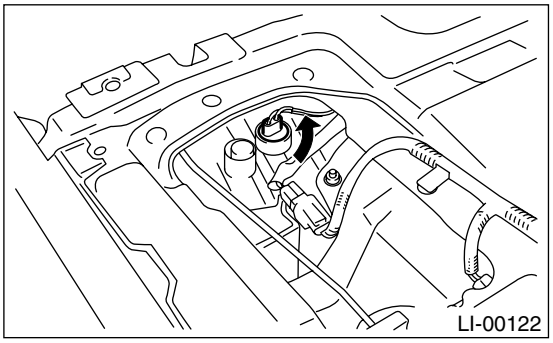
(A) Back-up light bulb
(B) Brake/ Tail/ Rear turn signal light bulb

6. PICKUP (FINISHER LIGHT)

1) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
2) Remove tail gate cover.



3) Rotate the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

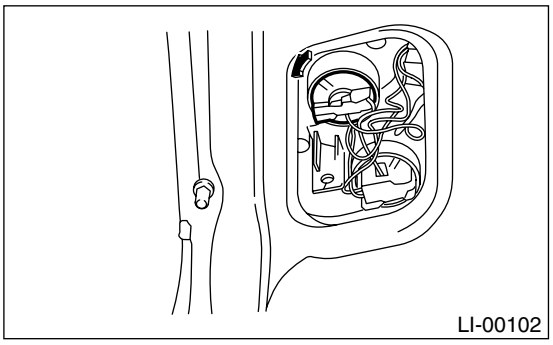
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If the requirement is not satisfied, replace it with a new one.

18.Back-up Light Bulb

A: REMOVAL

1. SEDAN

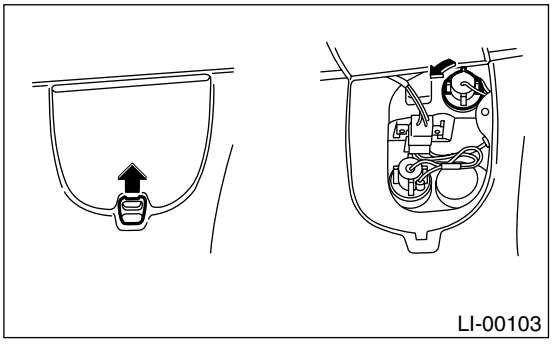
1) Open trunk lid and remove cover.



2) Turn the socket and remove the bulb.

2. WAGON

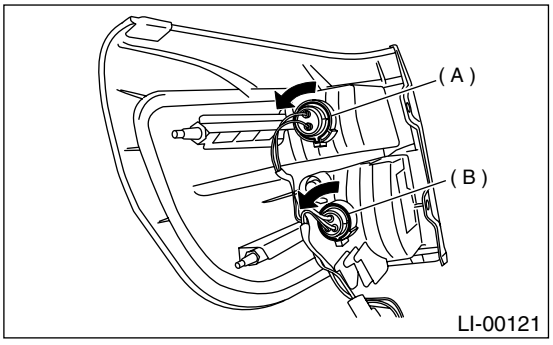
1) Open rear gate lower trim cover.



2) Turn the socket and remove the bulb.

3. PICKUP

1) Remove combination light assembly. <Ref. to LI-19, PICKUP, REMOVAL, Rear Combination Light Assembly.>
2) Rotate socket and remove bulb.



(A) Back-up light bulb
(B) Brake / Tail / Rear turn signal light bulb

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

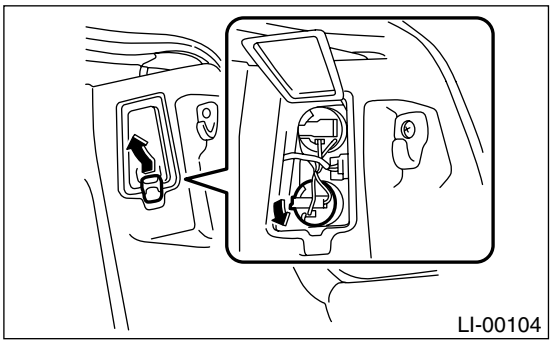
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If the requirement is not satisfied, replace it with a new one.

19.Rear Turn Signal Light Bulb

A: REMOVAL

1. SEDAN

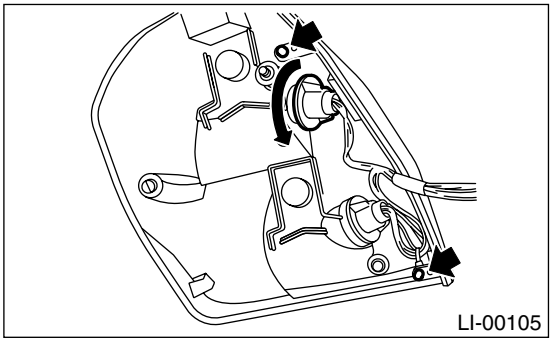
1) Open trunk lid and remove cover.



2) Turn the socket and remove the bulb.

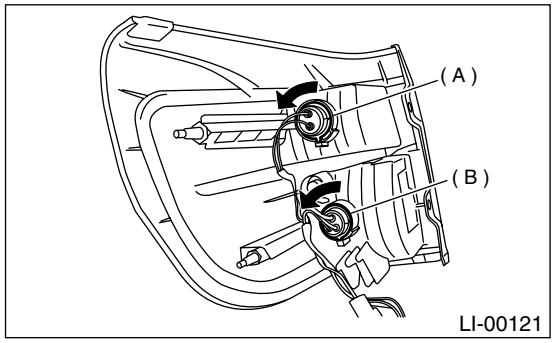
2. WAGON

1) Remove rear combination light assembly. <Ref. to LI-19, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Remove the light cover mounting screws then detach the cover.
3) Turn the socket and remove the bulb.



3. PICKUP

1) Remove combination light assembly. <Ref. to LI-19, PICKUP, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



(A) Back-up light bulb
(B) Brake / Tail / Rear / Turn signal light bulb

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

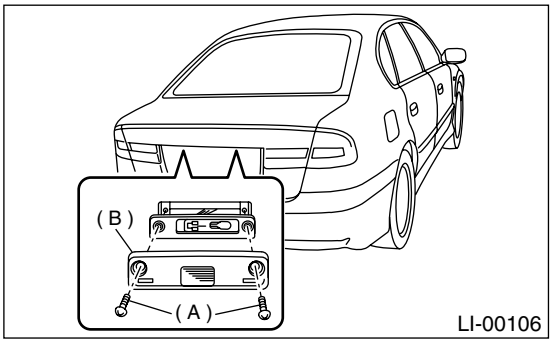
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If the requirement is not satisfied, replace it with a new one.

20.License Plate Light

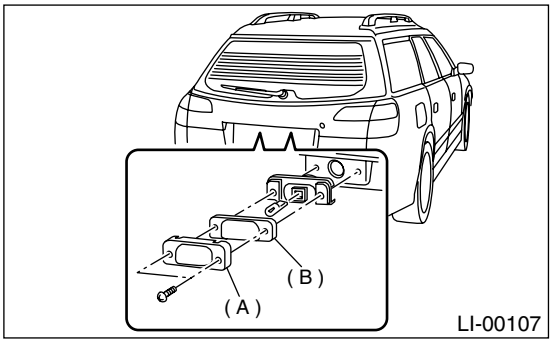
A: REMOVAL

1. SEDAN AND WAGON

1) Remove license plate light mounting screw (A) and then remove the lens (B)
SEDAN



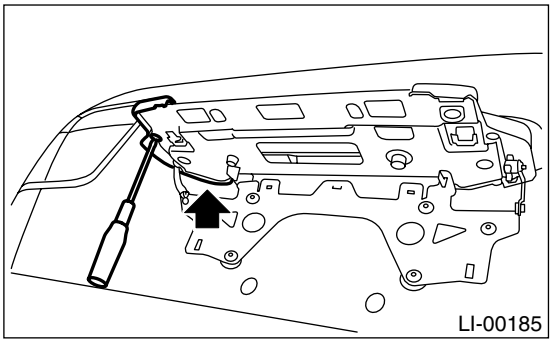
WAGON



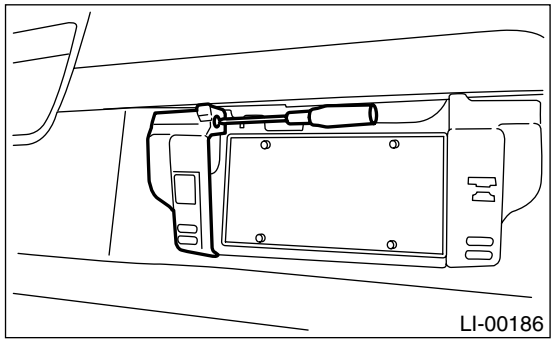
2) Remove the bulb.

2. PICKUP

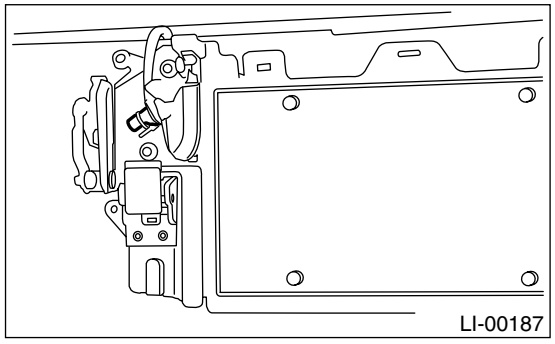
1) Lift up license plate bracket and remove rear bolts.



2) Back off license plate bracket and remove bolts.



3) Remove cover. Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

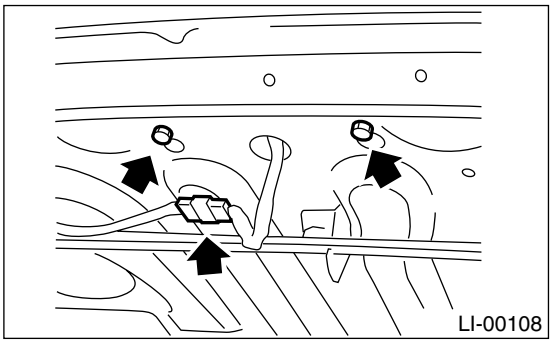
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

21.High-mounted Stop Light

A: REMOVAL

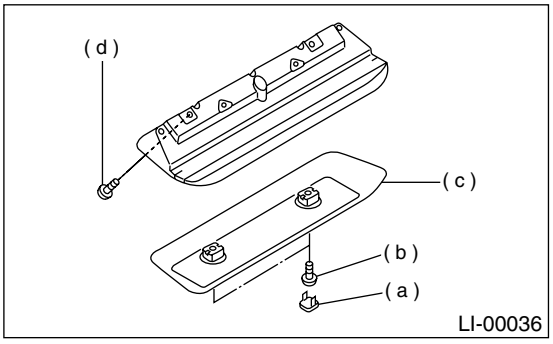
1. SEDAN

1) Disconnect ground cable from battery.
2) Disconnect connector of high-mounted stop light from body harness.
3) Remove bolts, then detach high-mounted stop light assembly.



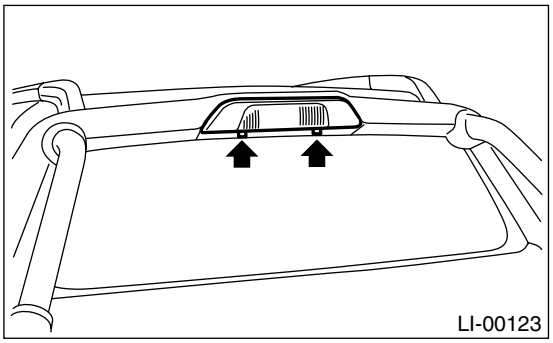
2. WAGON

1) Disconnect ground cable from battery.
2) Remove cap (a) by prying on the edge with a screwdriver.
3) Remove screws (b) and then detach cover (c).
4) Remove screws (d) and then detach high-mounted stop light while disconnecting connector.

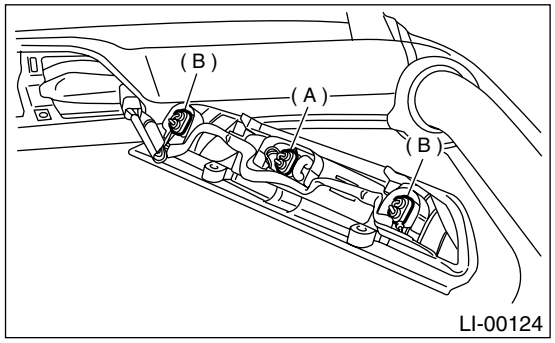


3. PICKUP

1) Disconnect ground cable from battery.
2) Remove bolts, then detach high-mounted stop light assembly.



3) Turn the socket and remove the bulb.



(A) High-mounted stop lamp
(B) Cargo light bulb

B: INSTALLATION

Install in the reverse order of removal.

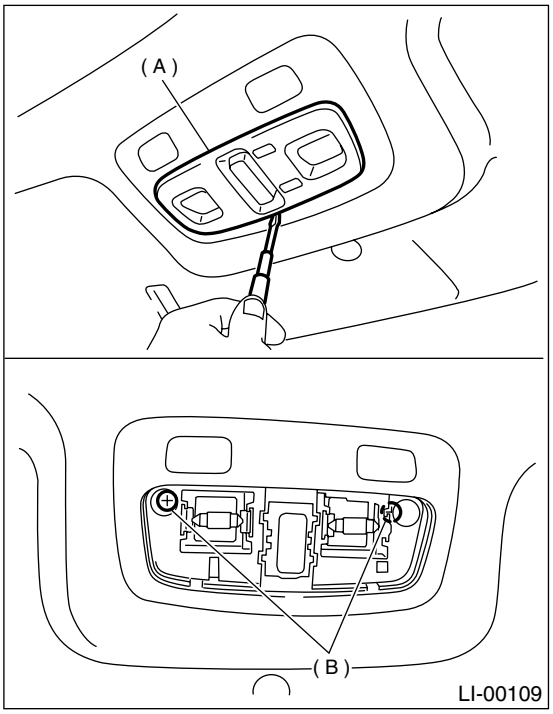
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If the requirement is not satisfied, replace it with a new one.

22.Spot Light

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove lens (A) and spot light mounting screw (B).



3) Disconnect harness connectors and remove spot light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. SPOT LIGHT SWITCH

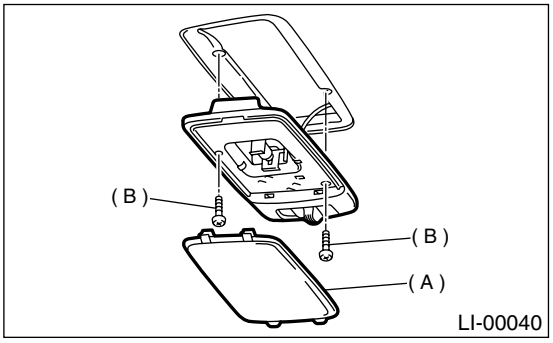
Measure spot light resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 2	18±5.4 Ω

23.Room Light

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove lens (A) and room light mounting screws (B).



3) Disconnect harness connectors and remove the light.

B: INSTALLATION

Install in the reverse order of removal.

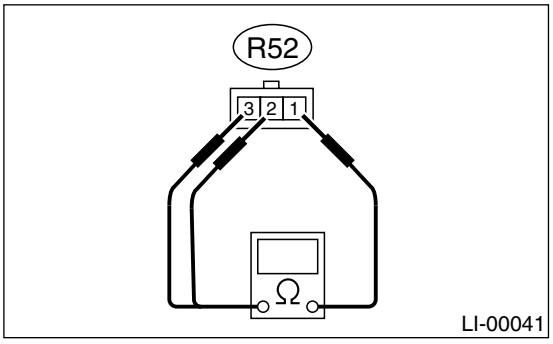
C: INSPECTION

1. ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. ROOM LIGHT SWITCH

Measure room light switch resistance.

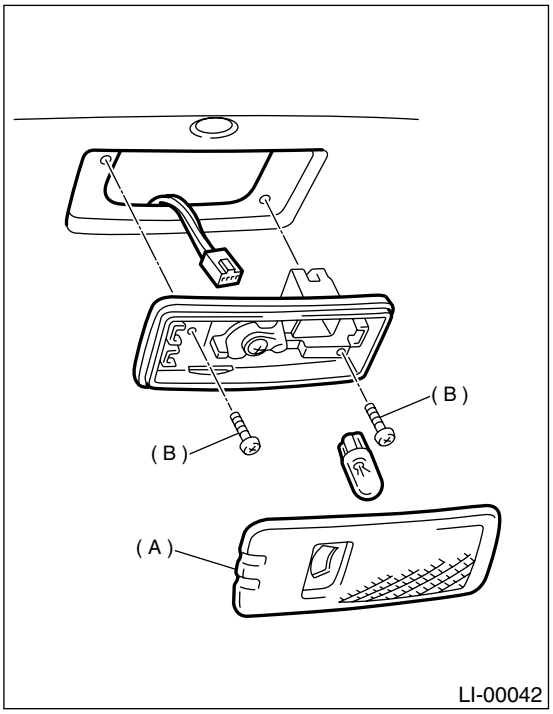


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

24.Luggage Room Light

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove lens (A) and luggage room light mounting screws (B).



3) Disconnect harness connectors and remove luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

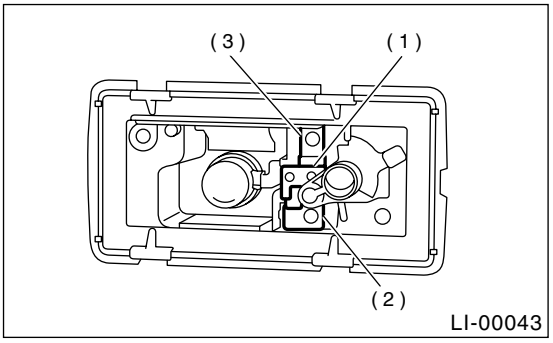
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. LUGGAGE ROOM LIGHT SWITCH

Measure luggage room light resistance.

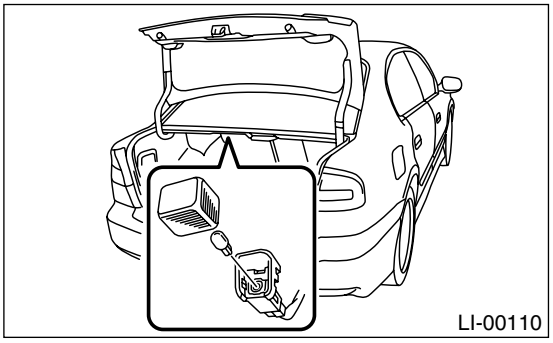


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

25.Trunk Room Light

A: REMOVAL

1) Disconnect ground cable from battery.
2) Disconnect harness connectors and remove trunk room light.



B: INSTALLATION

Install in the reverse order of removal.

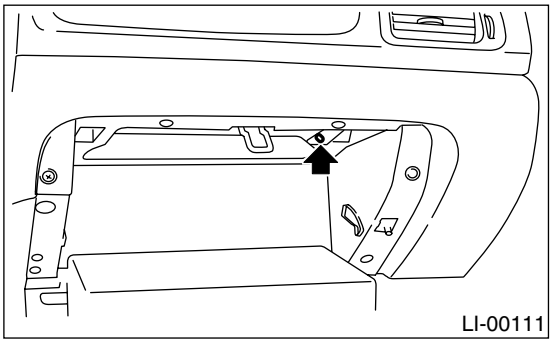
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

26.Glove Box Light

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove glove box. <Ref. to EI-42, REMOVAL, Glove Box.>
3) Disconnect harness connector.
4) Remove glove box light.



B: INSTALLATION

Install in the reverse order of removal.

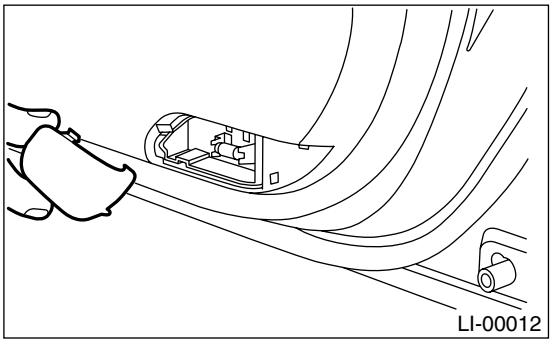
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

27.Door Step Light

A: REMOVAL

Remove the lens then detach the bulb.



B: INSTALLATION

Install in the reverse order of removal.

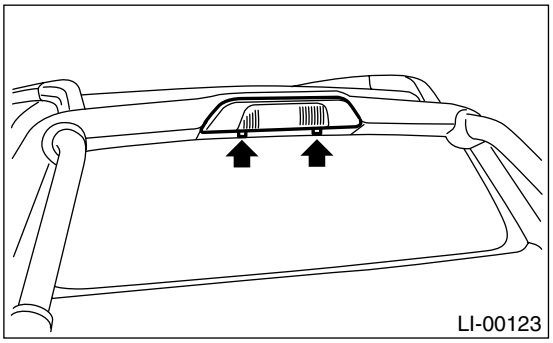
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

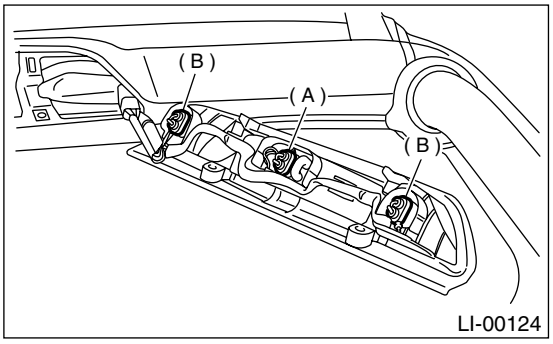
28.Cargo Light System

A: REMOVAL

1) Remove bolts and remove high-mounted stop light.



2) Turn the socket and remove the bulb.



(A) High-mounted stop light bulb
(B) Cargo light bulb

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. CARGO LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If the requirement is not satisfied, replace it with a new one.

2. CARGO LIGHT SWITCH

Measure resistance of cargo light switch.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	3 and 5	1.5±0.5 Ω

WIPER AND WASHER SYSTEMS

WW

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7.	Front Wiper Motor and Link	12
8.	Front Washer Nozzle	13
9.	Rear Wiper Arm	14
10.	Rear Wiper Motor	15
11.	Rear Washer Nozzle	16
12.	Wiper Control Relay	17

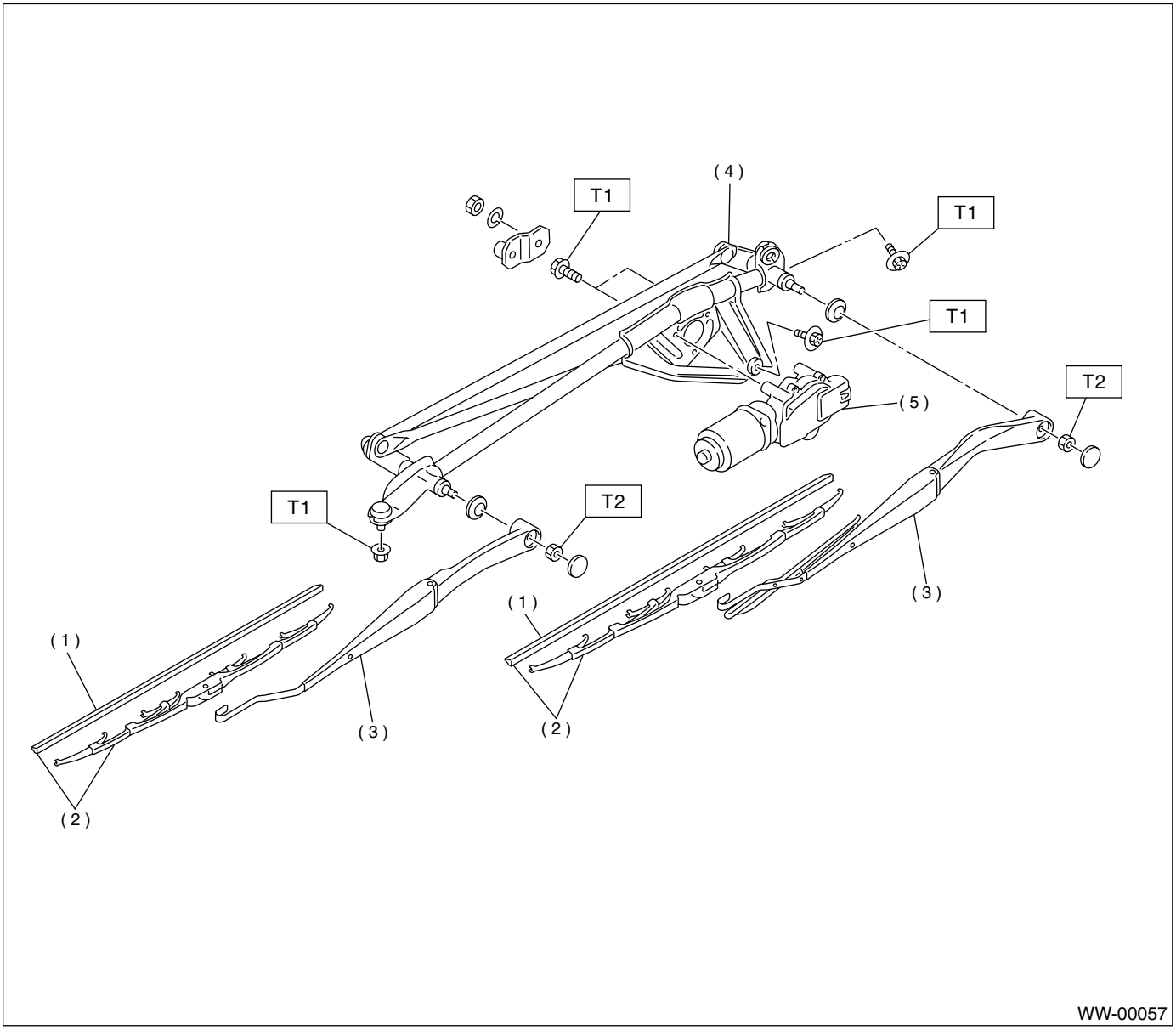
1. General Description

A: SPECIFICATIONS

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 W or less
Front washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

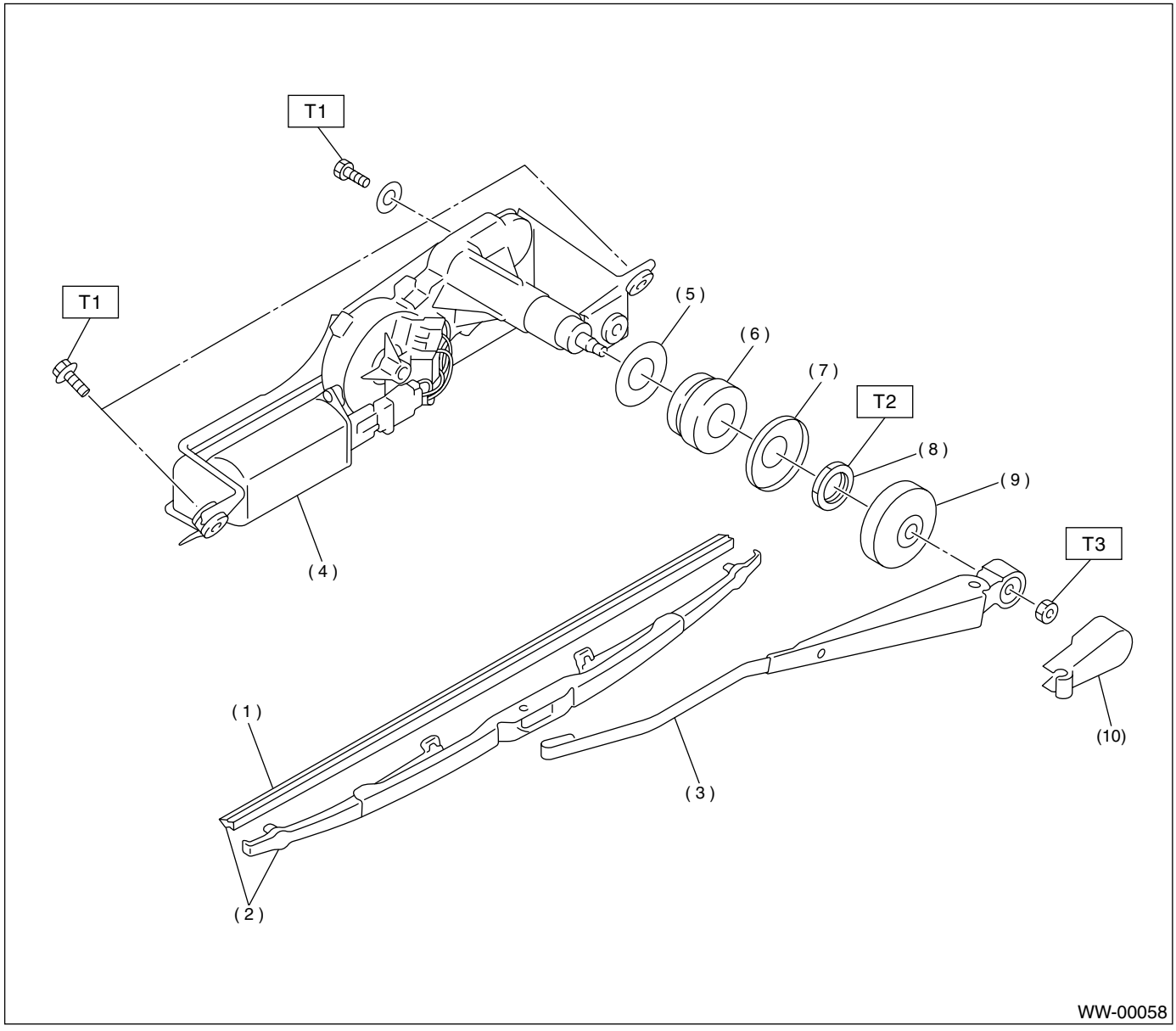
1. FRONT WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper link
(5) Wiper motor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 20 (2.0, 14.5)

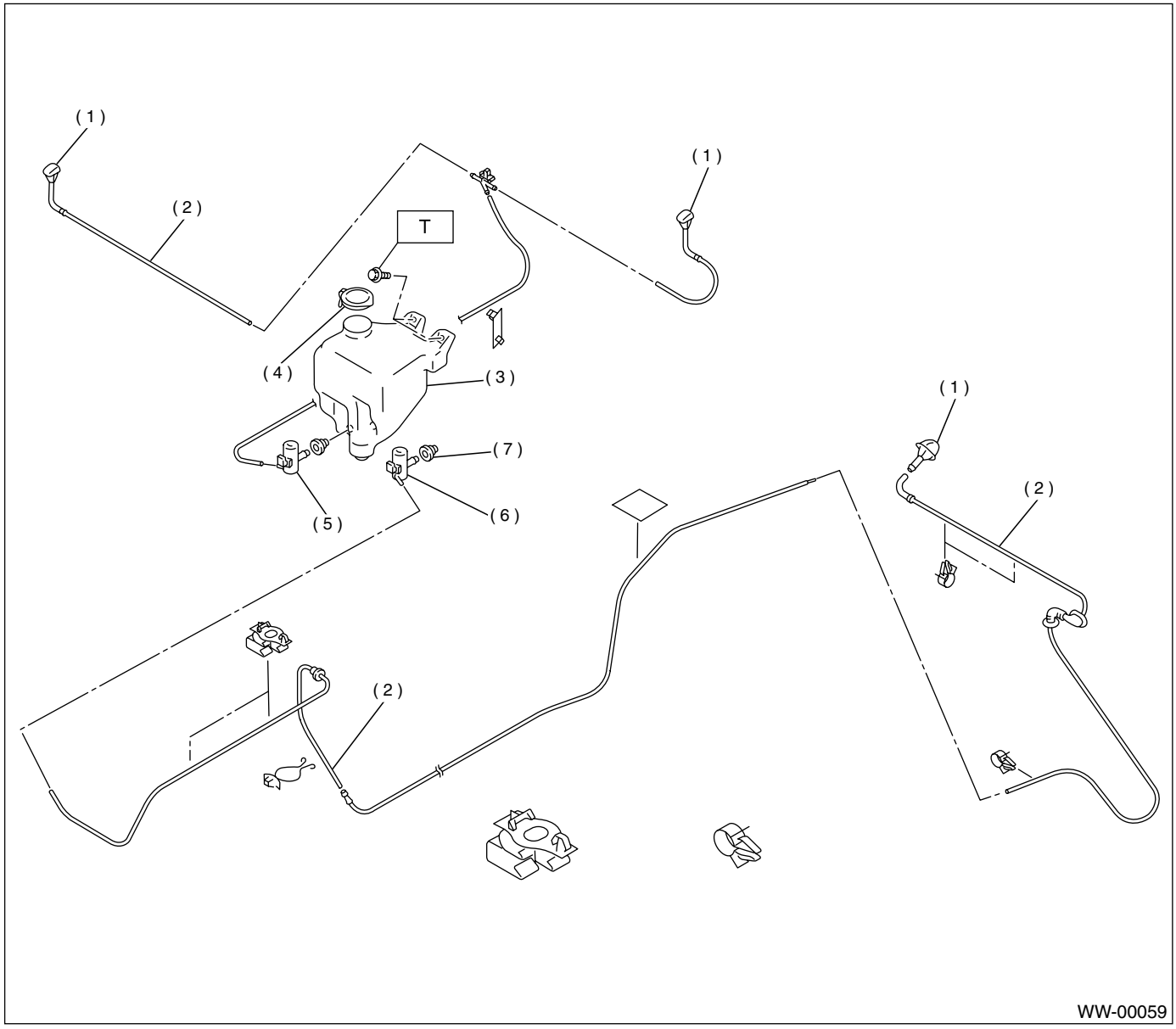
2. REAR WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper motor
(5) Spacer A
(6) Cushion
(7) Spacer B
(8) Nut
(9) Cap
(10) Wiper arm cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.9 (0.6, 4.3)
T2: 7.4 (0.75, 5.4)
T3: 7.8 (0.8, 5.8)

3. WASHER TANK



(1) Washer nozzle
(2) Washer hose
(3) Washer tank
(4) Washer tank cap
(5) Front washer motor
(6) Rear washer motor
(7) Grommet

Tightening torque: N·m (kgf-m, ft-lb)
T: 5.9 (0.6, 4.3)

C: CAUTION

• Reconnect connectors and hoses securely.
After reconnecting, confirm that each function operates normally.
• Be careful that wire harnesses of airbag system pass near electrical parts and switches.
• Wire harnesses and connectors of all airbag system are yellow color. Do not use a tester on these circuits.
• Care must be taken when installing the piping hose so that no bending, jamming, etc. are caused.
• If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

2. Wiper and Washer System

A: SCHEMATIC

1. WIPER AND WASHER (FRONT)

<Ref. to WI-296, Wiper and Washer System (Front).>

2. WIPER AND WASHER (REAR)

<Ref. to WI-297, Wiper and Washer System (Rear).>

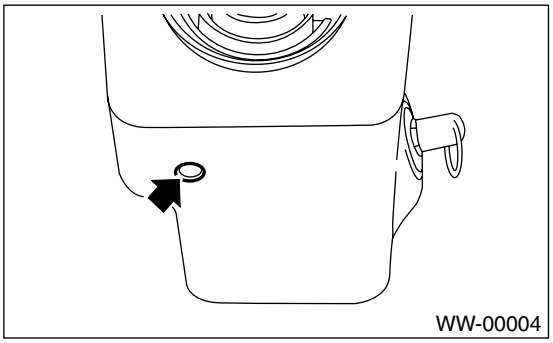
B: INSPECTION

Symptom	Repair order
Wiper and washers do not operate.	(1) Wiper fuse (F/B No. 14, 15) (2) Combination switch (3) Wiper motor (4) Wiring harness
Wipers do not operate in LO or HI.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Wipers do not operate in INT.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Washer motor does not operate.	(1) Washer switch (2) Washer motor (3) Wiring harness
Wipers do not operate when washer switch is ON.	(1) Washer motor (2) Wiring harness
Washer fluid spray does not spurt normally.	(1) Washer motor (2) Washer hose and nozzle

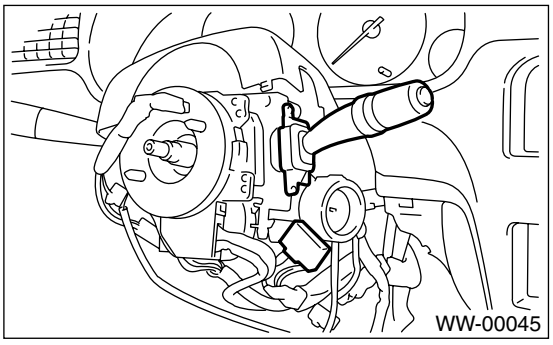
3. Combination Switch (Wiper)

A: REMOVAL

1) Remove screw to remove a steering column cover.



2) Disconnect harness connectors from combination switches.
3) Remove screw to remove combination switch.

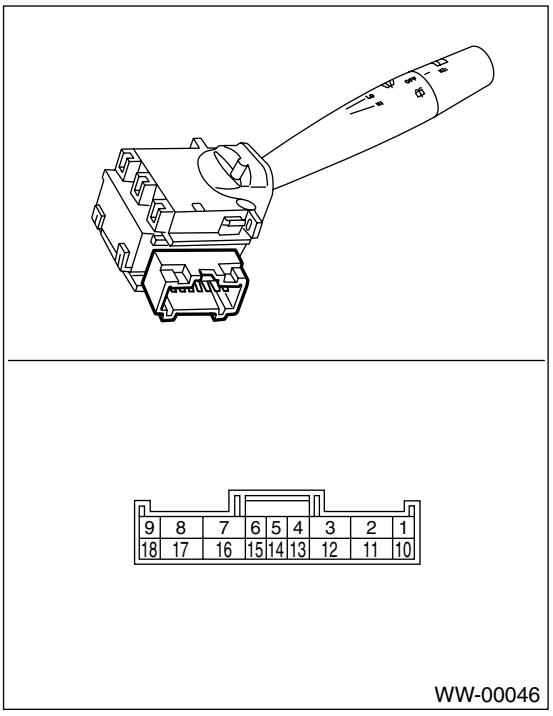


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

• Inspect the continuity between each connector terminal.

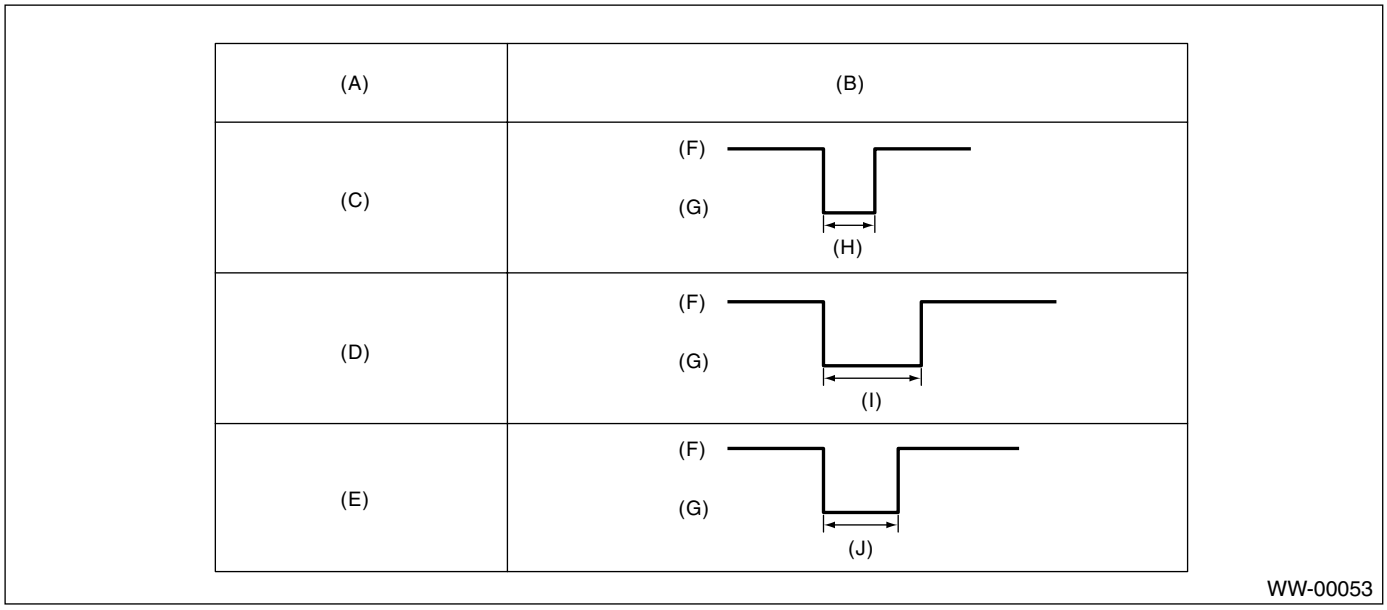


	Switch position	Terminal No.	Standard
FRONT	OFF	7 and 16 7 and 17 8 and 17 2 and 11	More than 1 Ω
	INT	7 and 16	Less than 1 Ω
	LO	7 and 17	Less than 1 Ω
	HI	8 and 17	Less than 1 Ω
	Washer ON	2 and 11	Less than 1 Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω
	OFF	2 and 10 10 and 12 2 and 12	More than 1 MΩ
	ON	2 and 10	Less than 1 Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω

If continuity is not as specified, replace the switch.

- Intermittent operation inspection

1) Turn the wiper switch to INT.
2) Adjust the intermittent control switch to MAX.
3) Apply battery voltage to switch terminals 17 and 2, and inspect the voltage of terminals 7 and 2. (Measure the voltage from after the second time the wiper stops.)



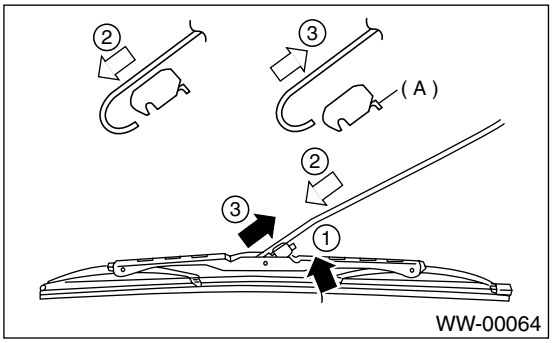
(A) Switch position
(B) Voltage
(C) MIN.
(D) MAX.
(E) Non-variable
(F) 12 V
(G) 0 V
(H) Approx. 2 sec.
(I) 16 ± 6 sec.
(J) 3 ± 1 sec.

If operation is not as specified, replace the switch.

4. Wiper Blade

A: REMOVAL

While pushing locking clip (A) up, pull out blade from arm to arrow direction.

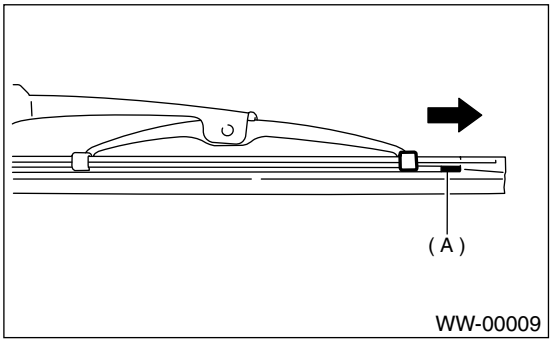


B: INSTALLATION

1) Install in the reverse order of removal.
2) Confirm that clip was locked securely.

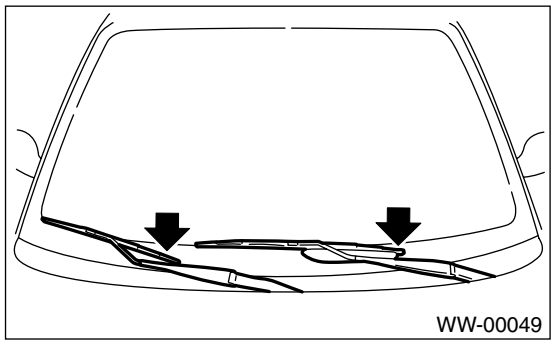
C: DISASSEMBLY

Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.

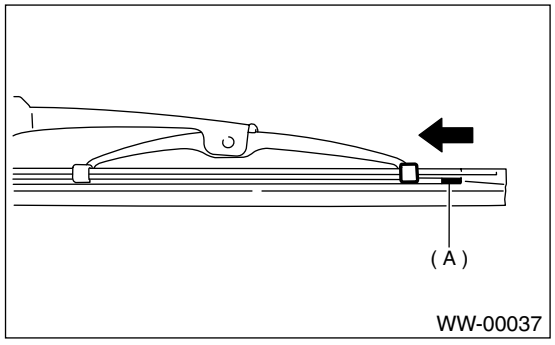


D: ASSEMBLY

1) Insert the wiper rubber onto the blade so that the stopper is in the position shown (at the bottom of the wiper arm).



2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



E: INSPECTION

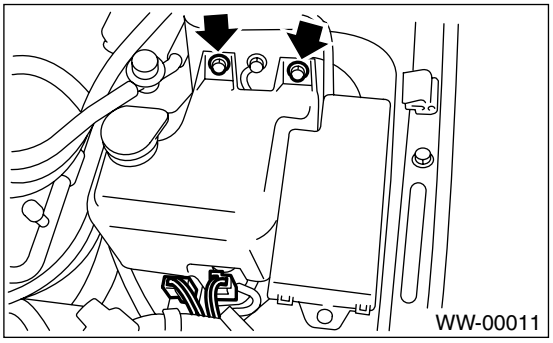
1) When the wiper does not perform well, inspect the following:
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace with a new part if damage is found.

5. Washer Tank and Motor

A: REMOVAL

1) Open front hood.
2) Remove the 2 bolts, hose and connector and then remove the tank.



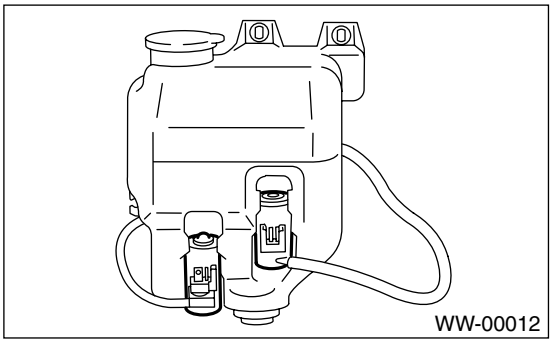
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

C: DISASSEMBLY

Remove washer motor from tank.

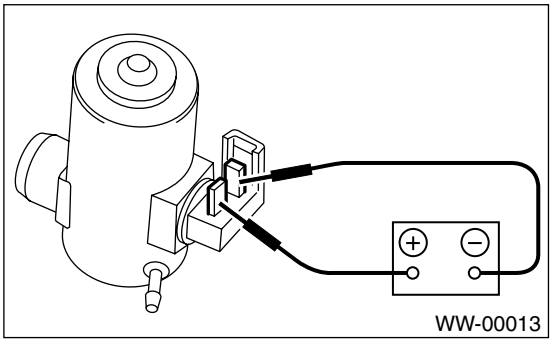


D: ASSEMBLY

1) Assemble in the reverse order of disassembly.
2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

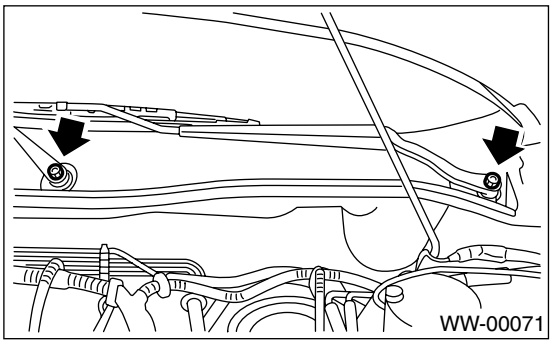
Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



6. Front Wiper Arm

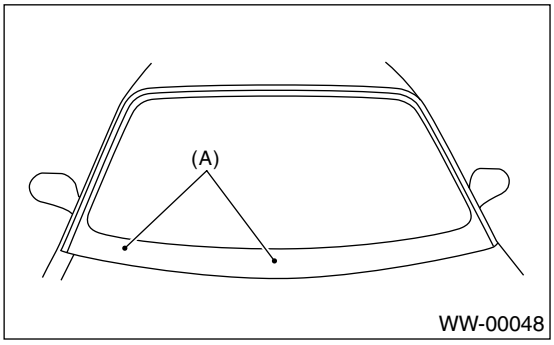
A: REMOVAL

1) Open front hood.
2) Remove cap.
3) Remove nut to remove arm.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Operate wiper once.
3) Align wiper blade to ceramic print point mark (A) of front window pane.

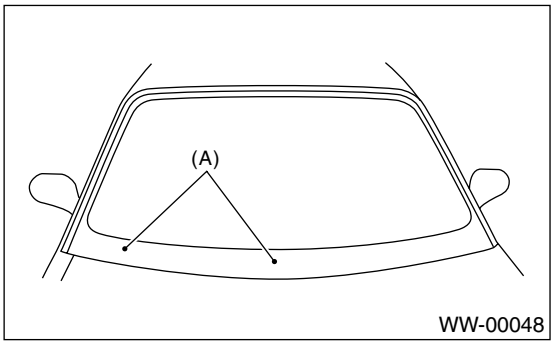


Tightening torque:

Refer to COMPONENT in General Description. <Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

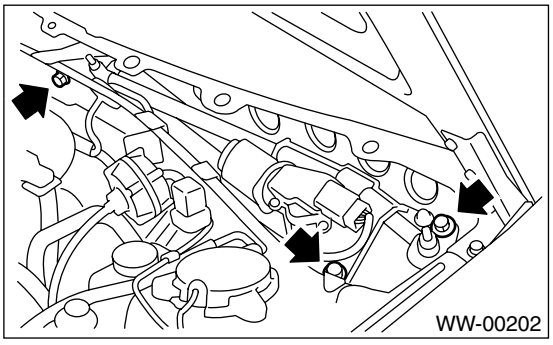
Operate wiper once. Align wiper blade to ceramic print point mark (A) of front window pane.



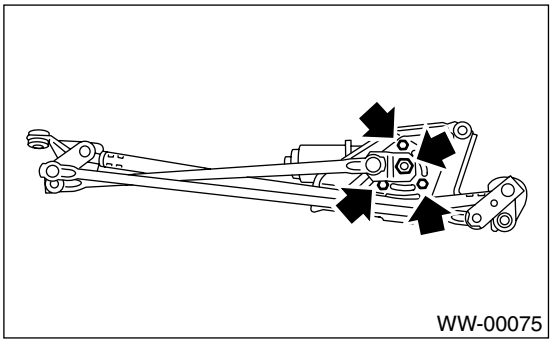
7. Front Wiper Motor and Link

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove cowl panel. <Ref. to EI-35, REMOVAL, Cowl Panel.>
3) Disconnect connector of motor.
4) Remove bolts and nuts to remove wiper link.



5) Remove bolts and nuts to remove motor.



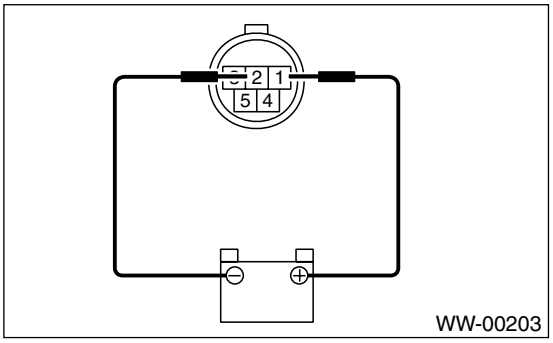
B: INSTALLATION

Install in the reverse order of removal.

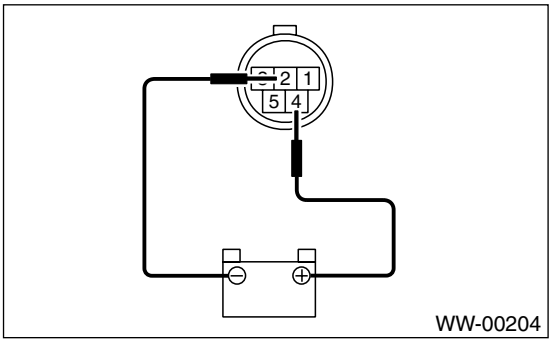
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

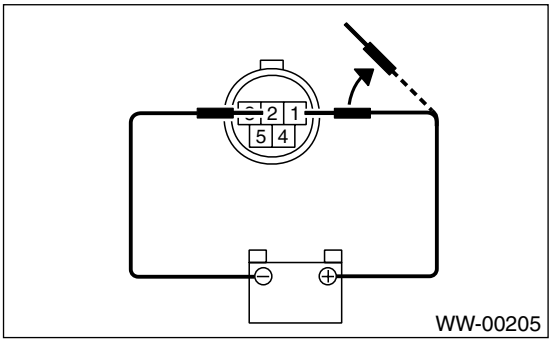
1) When battery is connected to terminal of connectors, confirm that motor operates at low speed.



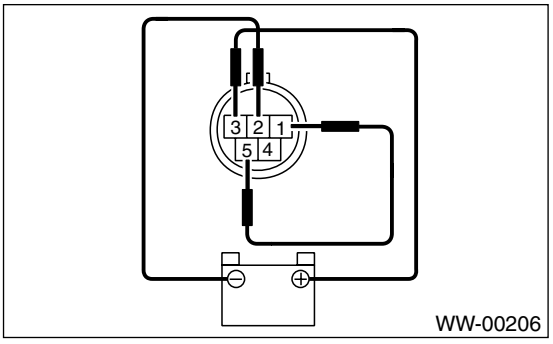
2) When battery is connected to terminal of connectors, confirm that motor operates at high speed.



3) Connect battery to terminals of connector, and remove terminal connection with motor rotated at low speed, and stop wiper motor through operation.



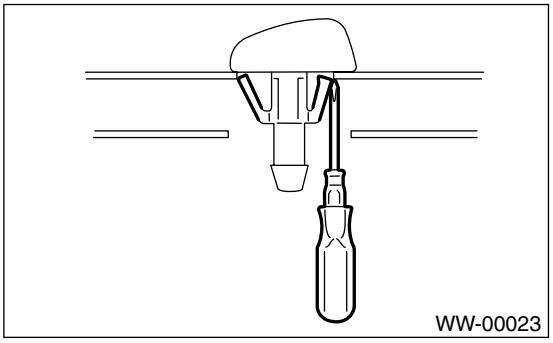
4) Connect battery and confirm that motor stops at automatic stop position after motor operates at low speed again.



8. Front Washer Nozzle

A: REMOVAL

1) Remove the washer hose from the washer nozzle.
2) Open the clips on the underside of the front hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-13, ADJUSTMENT, Front Washer Nozzle.>

C: INSPECTION

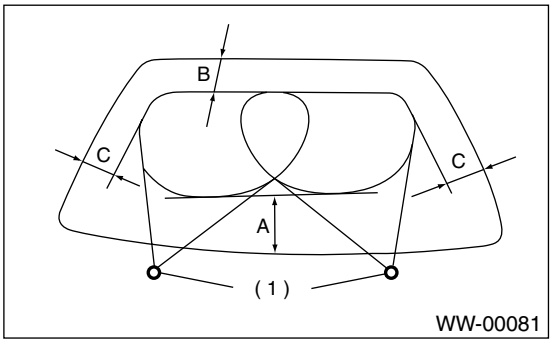
- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

1) Turn wiper switch to OFF position.
2) When vehicle stops, adjust washer injection position as shown in the figure.

Injection position:

A: 300 mm (11.81 in)
B: 100 mm (3.94 in)
C: 200 mm (7.87 in)

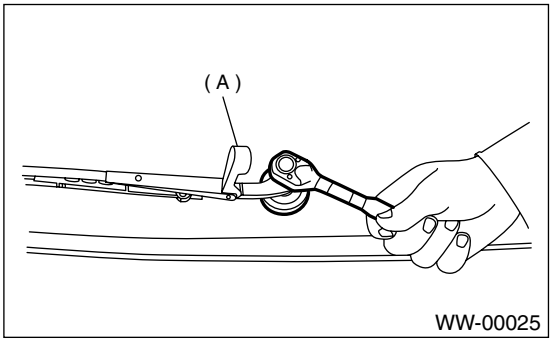


(1) Nozzle

9. Rear Wiper Arm

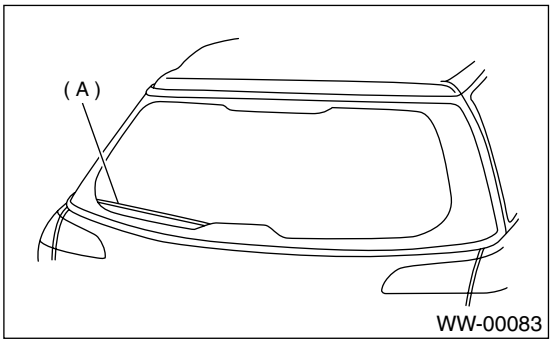
A: REMOVAL

1) Raise wiper arm cover (A).
2) Remove nut to remove wiper arm.



B: INSTALLATION

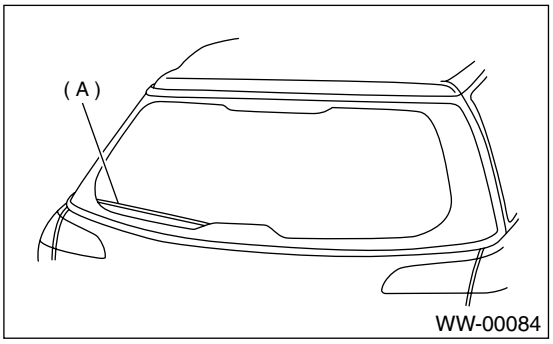
1) Install in the reverse order of removal.
2) Operate rear wiper once.
3) Align blade to rear defogger heat wire (A).



Tightening torque:
Refer to COMPONENT in General Description. <Ref. to WW-2, FRONT WIPER, COMPONENT, GENERAL DESCRIPTION.>

C: ADJUSTMENT

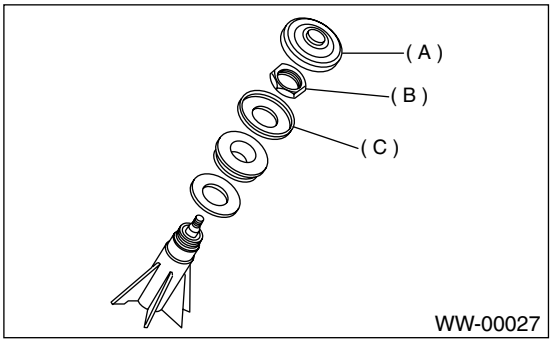
1) Operate rear wiper once.
2) Align blade to rear defogger heat wire (A).



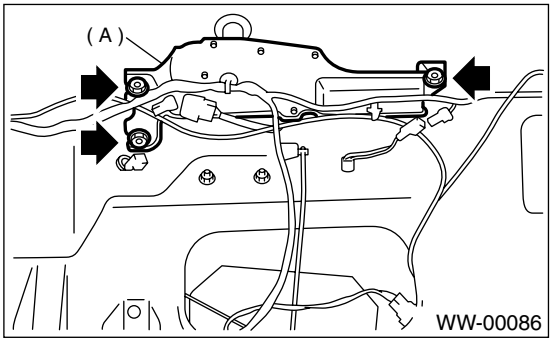
10.Rear Wiper Motor

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove rear wiper arm.
3) Remove cap (A), nut (B), and spacer (C) from rear wiper shaft.

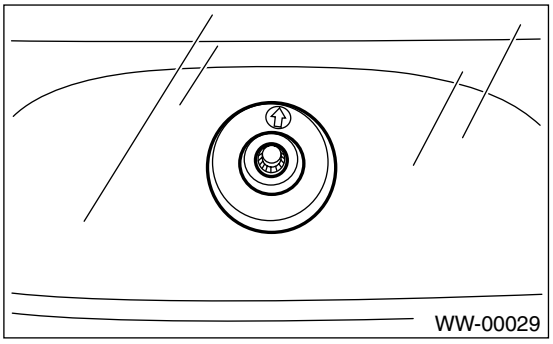


4) Remove rear gate lower trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
5) Unclip clip of harness and disconnect connector of wiper motor.
6) Remove bolts to remove wiper motor assembly (A).



B: INSTALLATION

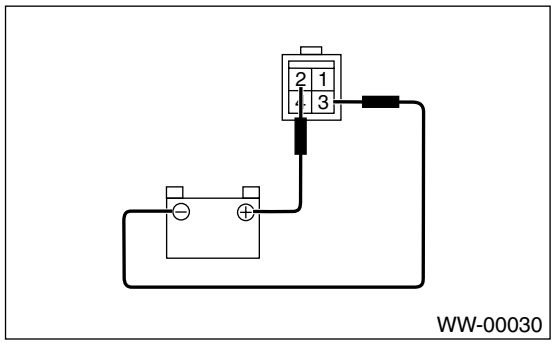
1) Install in the reverse order of removal.
2) Install rear wiper cushion with the arrow mark facing up, as shown in the figure.



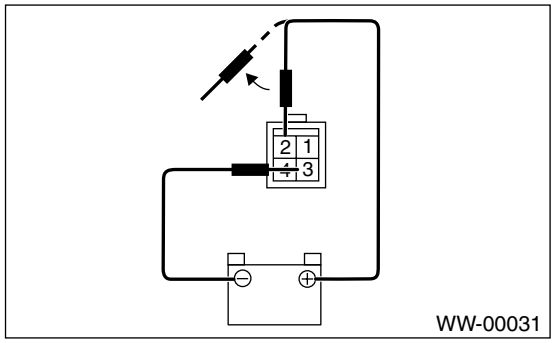
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

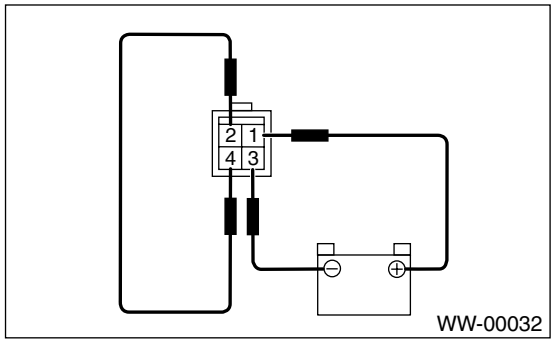
1) Connect battery to wiper motor connector and confirm that wiper motor operates.



2) Connect battery to terminal of connector and remove terminal connections with motor rotated, and stop wiper motor through operation.



3) Connect battery and confirm that motor stops at automatic stop position after motor operates at low speed again.



11.Rear Washer Nozzle

A: REMOVAL

1) Remove the high-mount stop light. <Ref. to LI-27, REMOVAL, High-mounted Stop Light.>
2) Remove the washer hose from the washer nozzle.
3) Open the clips on the underside of the rear gate with a thin screwdriver or other tool, and remove the washer nozzle.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-16, ADJUSTMENT, Rear Washer Nozzle.>

C: INSPECTION

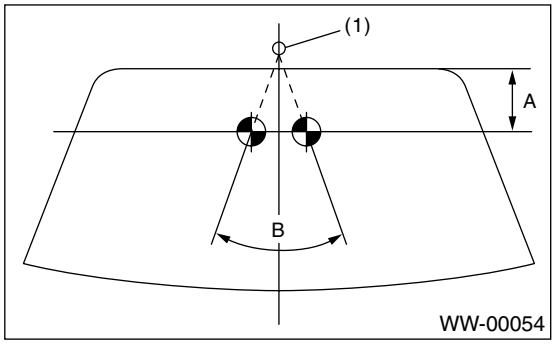
- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

1) Turn wiper switch to OFF position.
2) When vehicle stops, adjust washer injection position as shown in the figure.

Injection position:

A: 60 mm (2.36 in)
B: 42°



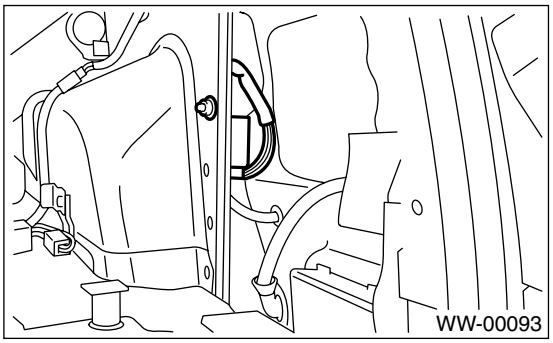
(1) Nozzle

12.Wiper Control Relay

A: REMOVAL

1. WAGON

1) Remove right quarter lower trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
2) Remove quarter pocket.
3) Remove nut to remove wiper control relay.



B: INSTALLATION

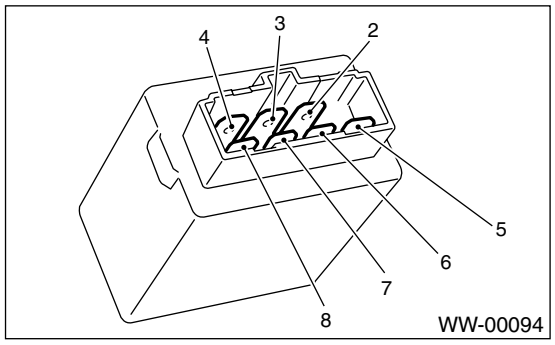
1. WAGON

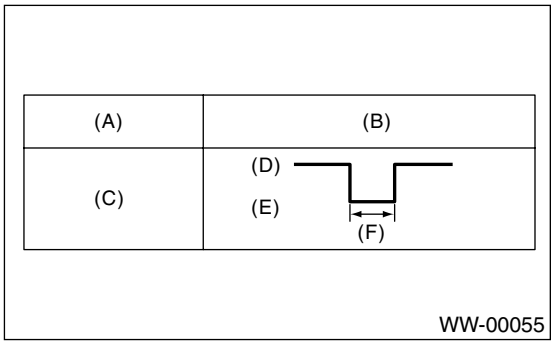
Install in the reverse order of removal.

C: INSPECTION

1. WAGON

1) Apply battery voltage to the rear terminals 8 and 2, and then inspect the voltage of 6 and 2. (Measure the voltage from after the second time the wiper stops.)





(A) Switch position
(B) Voltage
(C) ON
(D) 12 V
(E) 0 V
(F) 9 ± 2 sec.

If operation is not as specified, replace the switch.

MEMO:

ENTERTAINMENT

ET

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13.	Front Accessory Power Socket	14

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Heat wire repairing agent (DUPONT NO. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: SCHEMATIC

1. AUDIO SYSTEM

<Ref. to WI-108, SCHEMATIC, Audio System.>

B: INSPECTION

Symptom	Repair order
Display does not illuminate and no sound from speakers.	(1) Check fuse and power supply for radio. (2) Check radio ground. (3) Remove radio for repair.
No sound from specitic speaker.	(1) Check speaker. (2) Check output circuit between radio and speaker.
Radio generates noise with engine running.	(1) Check radio ground. (2) Check generator. (3) Check ignition coil. (4) Remove radio for repair.
Weak signal or noisy sound when receiving AM and FM.	(1) Check antenna. (2) Check antenna amplifier. (3) Check radio ground. (4) Remove radio for repair.

3. Front Accessory Power Socket System

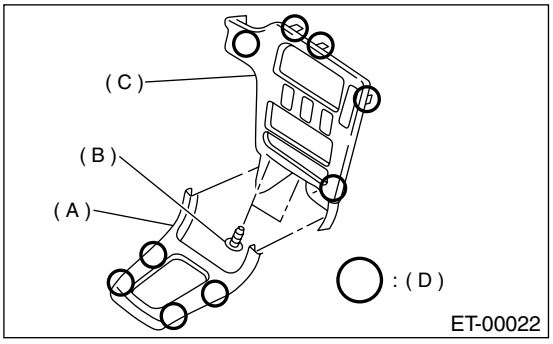
A: SCHEMATIC

<Ref. to WI-208, SCHEMATIC, Front Accessory Power Supply System.>

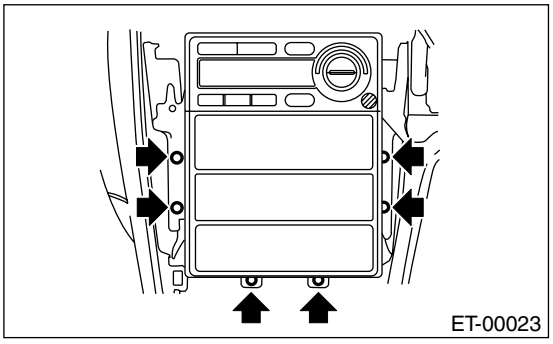
4. Radio

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove hook (D) and then remove front cover (A).
3) Remove two screws (B), then remove center panel (C) while disconnecting connector from front cover (A).



4) Remove fitting screws, and slightly pull radio out from center console.



5) Remove harness connectors and antenna feeder cord and then detach A/C control unit.

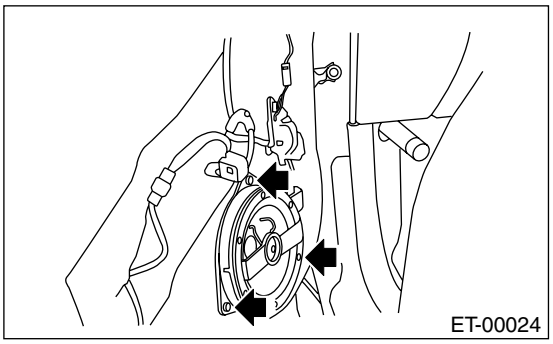
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove front door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
3) Remove front speaker mounting screws.



4) Disconnect harness connector and remove front speaker.

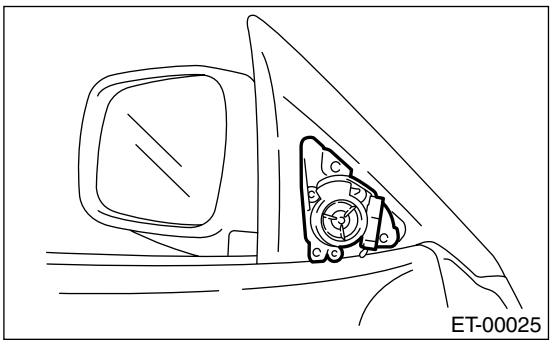
B: INSTALLATION

Install in the reverse order of removal.

6. Front Tweeter

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove gusset cover.



3) Disconnect harness connector and remove tweeter.

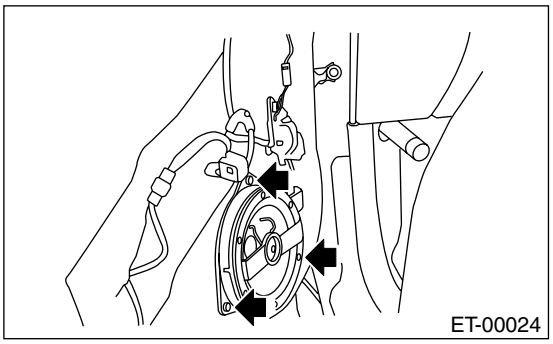
B: INSTALLATION

Install in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
3) Remove rear speaker mounting screws.



4) Disconnect harness connector and remove rear speaker.

B: INSTALLATION

Install in the reverse order of removal.

8. Rear Tweeter

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
3) Remove tweeter mounting screws.
4) Disconnect harness connector and remove tweeter.

B: INSTALLATION

Install in the reverse order of removal.

9. Woofer

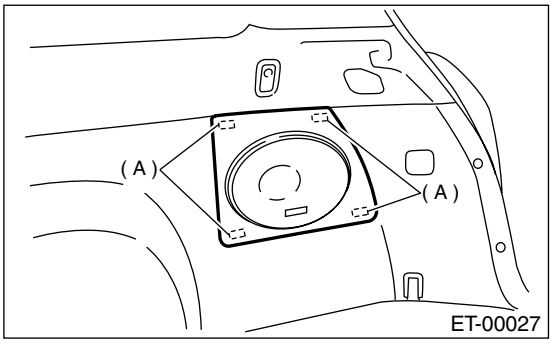
A: REMOVAL

1. SEDAN

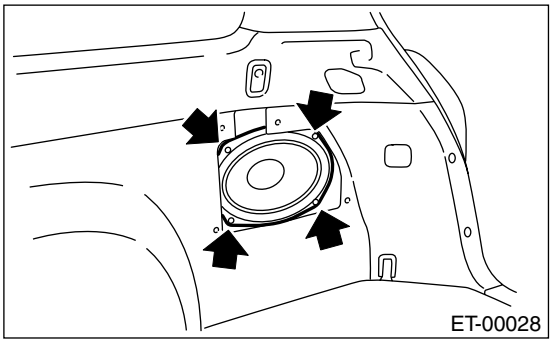
1) Disconnect ground cable from battery.
2) Remove rear shelf trim. <Ref. to EI-58, Removal, Rear Shelf Trim.>
3) Remove woofer mounting screws.
4) Disconnect harness connector, and then remove woofer.

2. WAGON

1) Disconnect ground cable from battery.
2) Remove hook (A) and then remove trim of woofer.



3) Remove woofer mounting screws.



4) Disconnect harness connector, and then remove woofer.

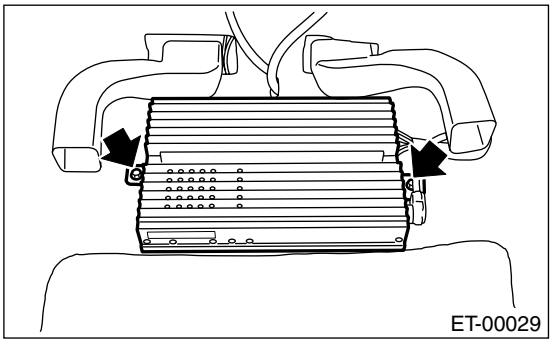
B: INSTALLATION

Install in the reverse order of removal.

10.Speaker Amplifier

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove passenger's seat. <Ref. to SE-8, REMOVAL, Front Seat.>
3) Disconnect harness connector.
4) Remove mounting nuts, and then detach speaker amplifier.



B: INSTALLATION

Install in the reverse order of removal.

11.Antenna

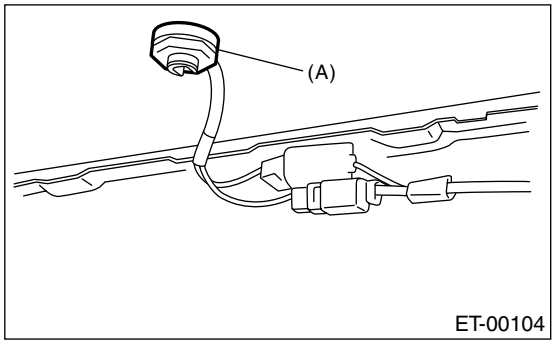
A: REMOVAL

1. PILLAR ANTENNA

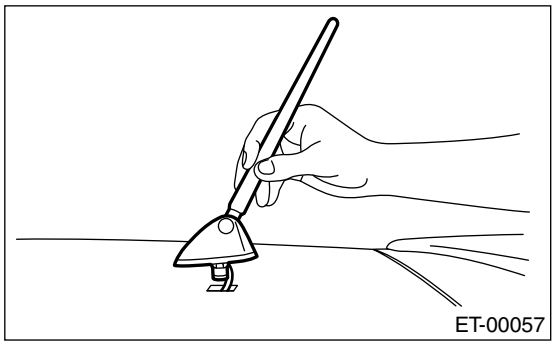
1) Remove the mounting screws and detach the antenna.
2) Remove the antenna plug.

2. ROOF ANTENNA

1) Remove the roof trim.
<Ref. to EI-55, WAGON, REMOVAL, Roof Trim.>
2) Disconnect the harness connector, and remove the nut (A).



3) Pull the antenna out from roof.



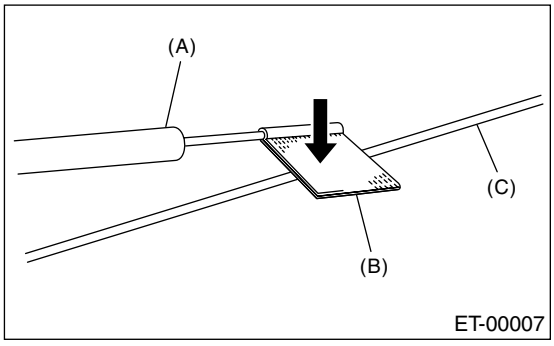
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

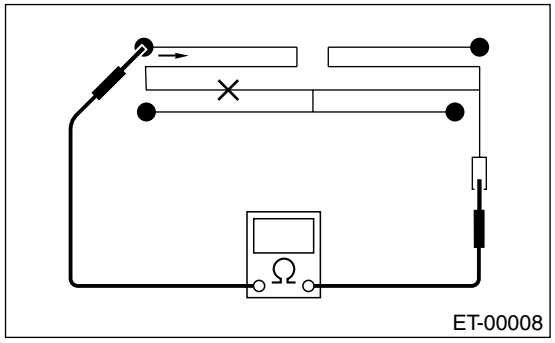
Measure resistance between antenna terminal and each antenna wire.
If an antenna wire is OK, resistance will be less than 1 Ω. If an antenna wire is broken, resistance will be more than 1 MΩ.

NOTE:
When checking the continuity, wind a piece of aluminum foil around the tip of tester probe, and then press the aluminum foil against wire with your finger.



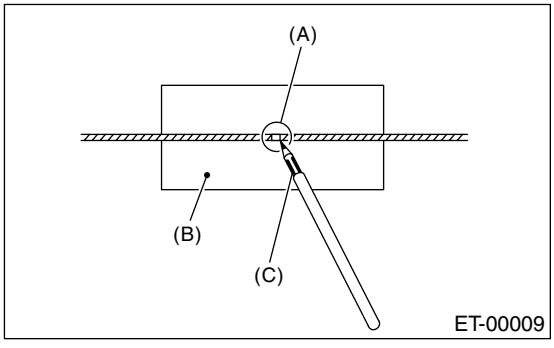
(A) Tester probe
(B) Aluminum foil
(C) Antenna wire

To locate the broken point, move the probe along the antenna wire.



D: REPAIR

1) Clean antenna wire and the surrounding area with a cloth dampened by alcohol.
2) Paste a thin masking film (B) on glass along the broken wire.
3) Deposit heat wire repair agent (C) (DUPONT NO. 4817) on the broken portion (A) with a drawing pen.



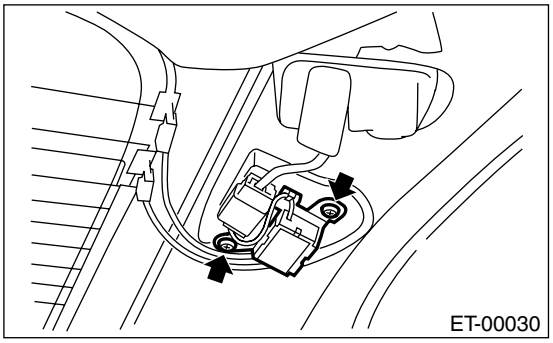
4) Dry out the heat wire repair agent portion.
5) After repair has been completed, measure resistance in the repaired wire.

12.Antenna Amplifier

A: REMOVAL

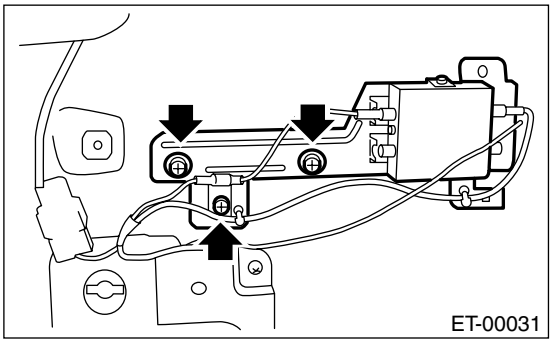
1. SEDAN

1) Disconnect ground cable from battery.
2) Remove rear pillar upper trim. <Ref. to EI-52, SEDAN, REMOVAL, Rear Quarter Trim.>
3) Disconnect harness connector and terminal.
4) Remove mounting screw and detach antenna amplifier.



2. WAGON

1) Disconnect ground cable from battery.
2) Remove rear quarter lower trim. <Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
3) Disconnect harness connector and terminal.
4) Remove mounting screw and detach antenna amplifier.



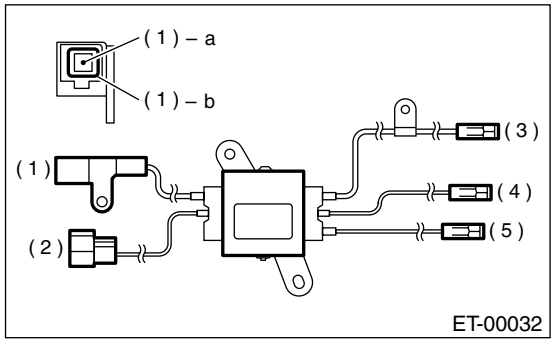
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SEDAN

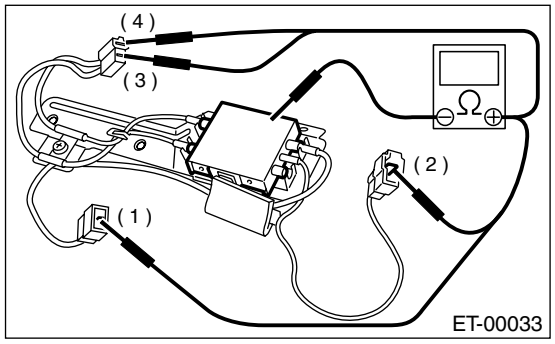
Measure antenna amplifier resistance.



Terminal No.	Standard
1–a and Amplifier body	More than 100 kΩ
1–b and Amplifier body	Less than 1 Ω
2 and Amplifier body	More than 100 kΩ
3 and Amplifier body	More than 100 kΩ
4 and Amplifier body	More than 100 kΩ
5 and Amplifier body	More than 100 kΩ
1 and 3	Less than 1 Ω

2. WAGON

Measure antenna amplifier resistance.

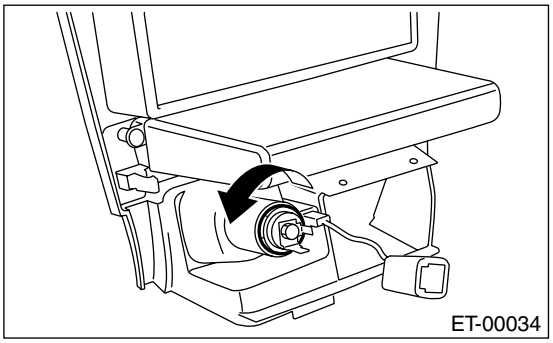


Terminal No.	Standard
1 and Amplifier body	More than 100 kΩ
2 and Amplifier body	More than 100 kΩ
3 and Amplifier body	More than 100 kΩ
4 and Amplifier body	More than 100 kΩ

13.Front Accessory Power Socket

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove center panel. <Ref. to ET-5, REMOVAL, Radio.>
3) Disconnect harness connectors and remove front accessory power socket.



B: INSTALLATION

Install in the reverse order of removal.

COMMUNICATION SYSTEM

COM

Page

1. General Description 2
2. Horn System 3
3. Horn 4
4. Horn Switch....5

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise in dicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: SCHEMATIC

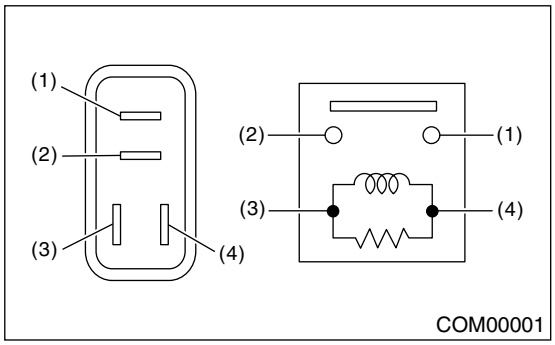
1. HORN

<Ref. to WI-209, SCHEMATIC, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure horn relay resistance between terminals (indicated in table below) while connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.

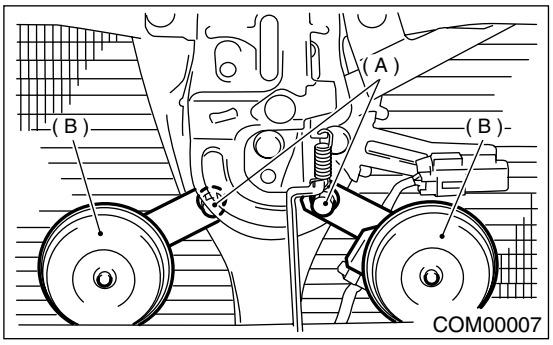


Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

3. Horn

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove horn bracket mounting bolt (A).
3) Disconnect harness connector and remove horn assembly (B).

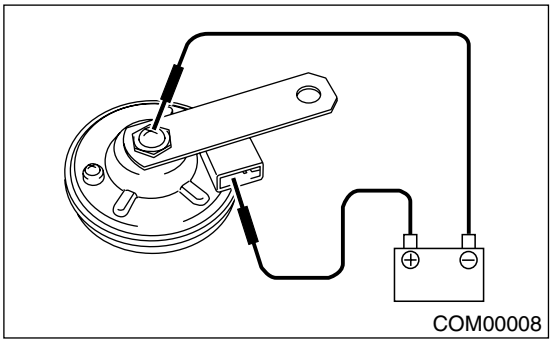


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supply between horn terminal and case ground, check that the horn sounds properly.

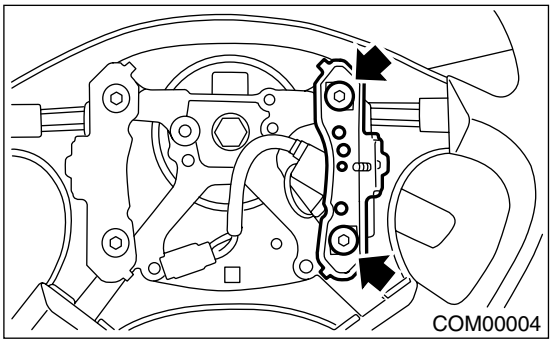


4. Horn Switch

A: REMOVAL

WARNING:
Before servicing, be sure to read the notes in the AB section for proper handling of the driver airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Disconnect negative cable from battery.
2) Remove the driver's airbag module. <Ref. to AB-13, Driver's Airbag Module.>
3) Remove horn switch from steering wheel.

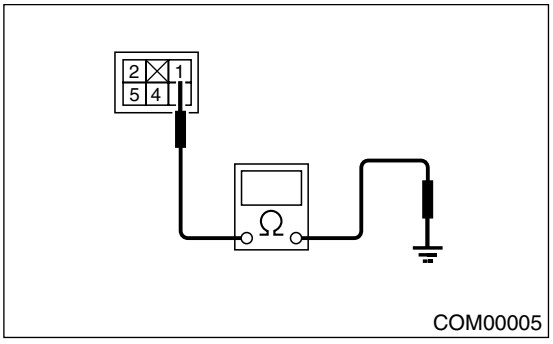


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure horn switch resistance.



Switch position	Terminal No.	Standard
When horn switch is pushed.	1 and Body ground	Less than 1 Ω
When horn switch is not pushed.		More than 1 MΩ

MEMO:

GLASS/WINDOWS/MIRRORS

GW

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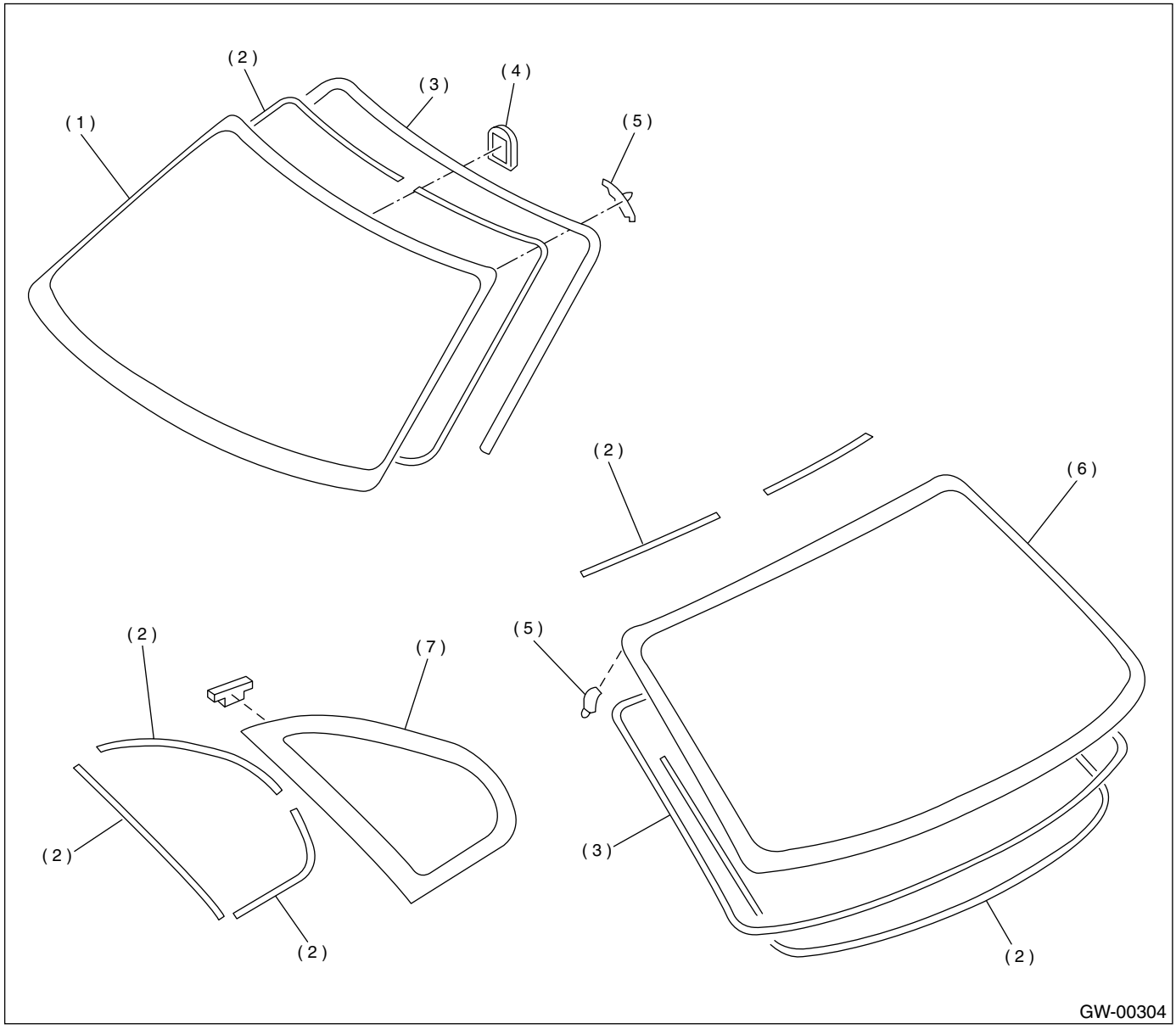
1. General Description

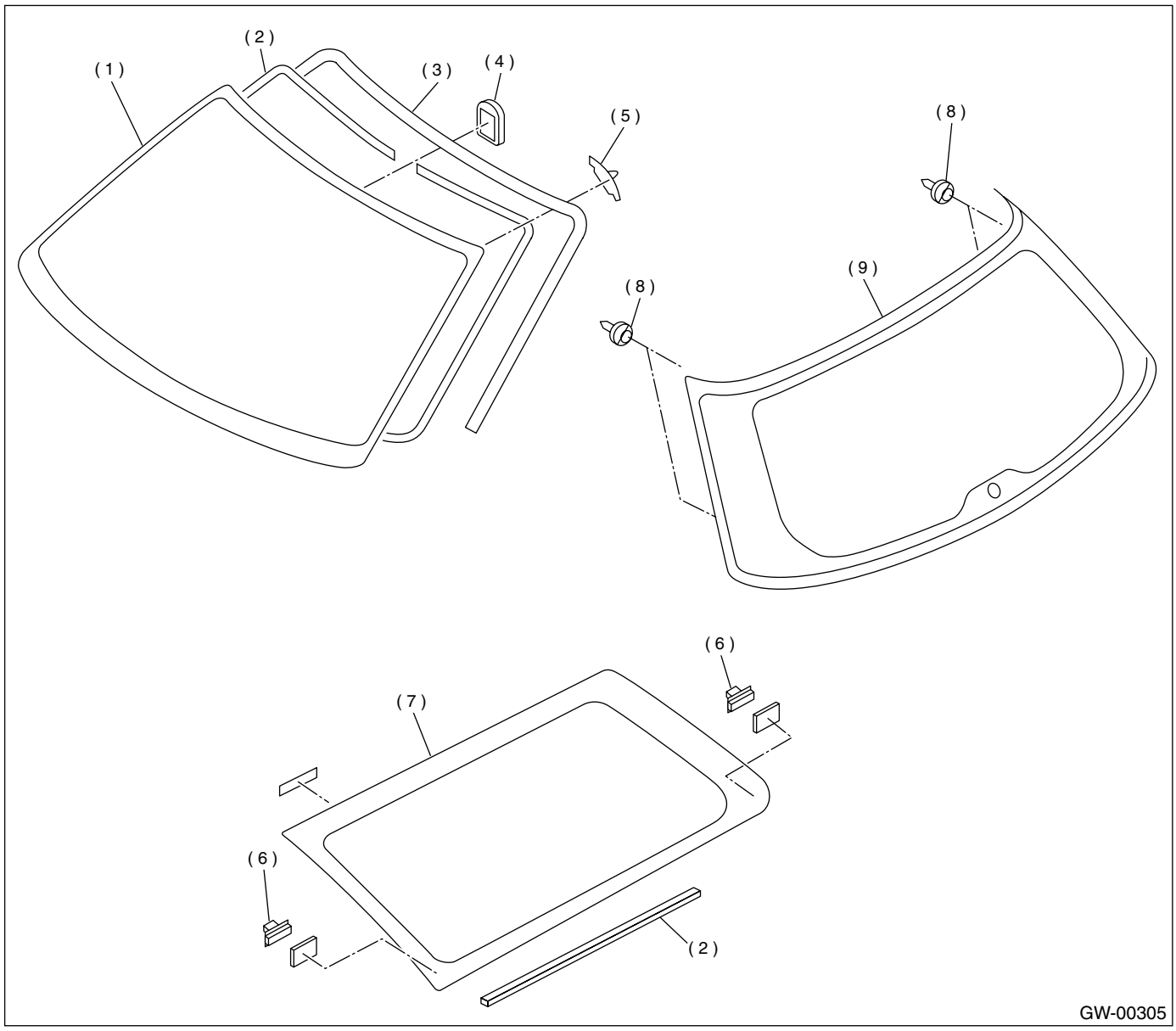
A: COMPONENT

1. FIXED GLASS (SEDAN)



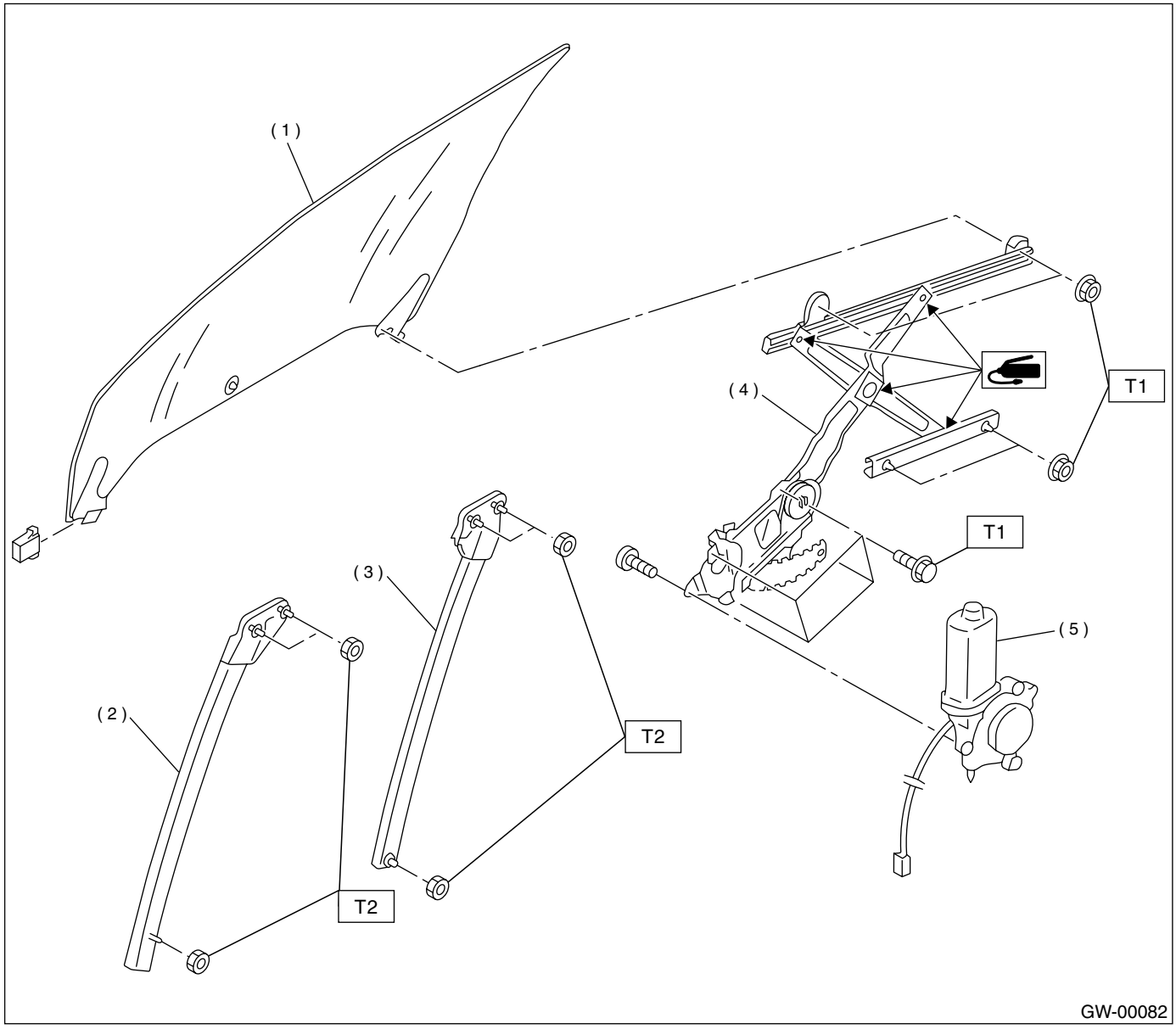
(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Rear window glass
(7) 6 light glass

2. FIXED GLASS (WAGON)



(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Fastener
(7) Rear quarter glass
(8) Locate pin
(9) Glass

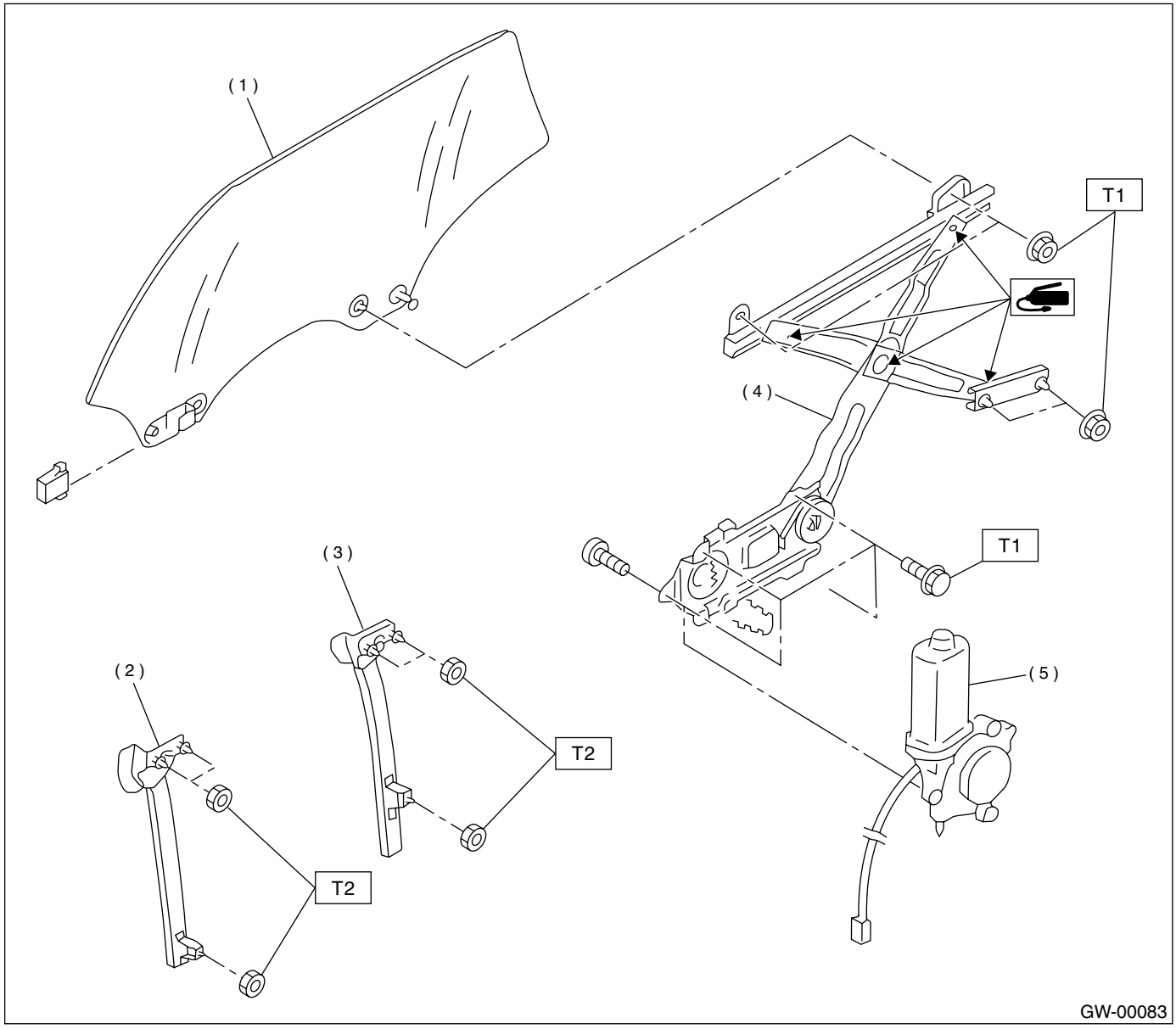
3. FRONT DOOR GLASS



(1) Glass
(2) Door sash (Front)
(3) Door sash (Rear)
(4) Regulator ASSY
(5) Motor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1*: *7.35 (0.75, 5.4)
T2*: *14 (1.4, 10.1)

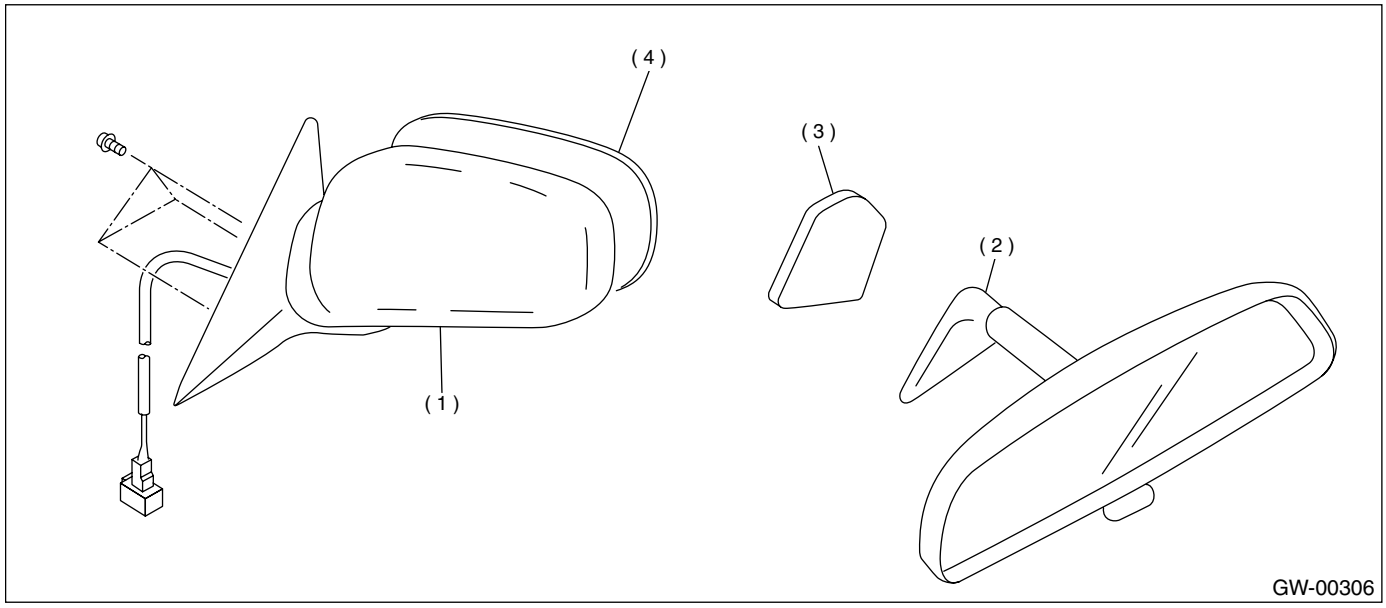
4. REAR DOOR GLASS



(1) Glass
(2) Door sash (Front)
(3) Door sash (Rear)
(4) Regulator ASSY
(5) Motor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.35 (0.75, 5.4)
T2: 14 (1.4, 10.1)

5. MIRRORS



(1) Outer mirror
(2) Inner rearview mirror
(3) Mount
(4) Mirror

B: CAUTION

- When electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to the glass.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for checking voltage and continuity.
Piano Wire	Used for window glass removal.
Windshield Knife	Used for window glass removal.

2. Power Window System

A: SCHEMATIC

<Ref. to WI-262, Power Window System.>

B: INSPECTION

Symptom	Repair order
All power windows does not operate.	(1) Fuse (SBF-6) (F/B No. 18) (2) Power window circuit breaker (3) Power window relay (4) Wiring harness
One window does not operate.	(1) Power window main switch (2) Power window sub switch (3) Power window motor (4) Wiring harness
“Window Lock” does not operate.	(1) Power window main switch

3. Rear Window Defogger System

A: SCHEMATIC

<Ref. to WI-271, SCHEMATIC, Rear Window Defogger System.>

B: INSPECTION

Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (2) Rear defogger relay (3) Defogger switch (4) Rear defogger condenser (5) Deffogger wire (6) Wiring harness

4. Windshield Wiper Deicer System

A: SCHEMATIC

<Ref. to WI-298, Wiper Deicer System.>

B: INSPECTION

Symptom	Repair order
Wiper deicer does not operate.	(1) Fuse (F/B No. 18, 19) (2) Wiper deicer relay (3) Wiper deicer switch (4) Wiring harness

5. Remote Control Mirror System

A: SCHEMATIC

<Ref. to WI-273, Remote Controlled Rearview Mirror System.>

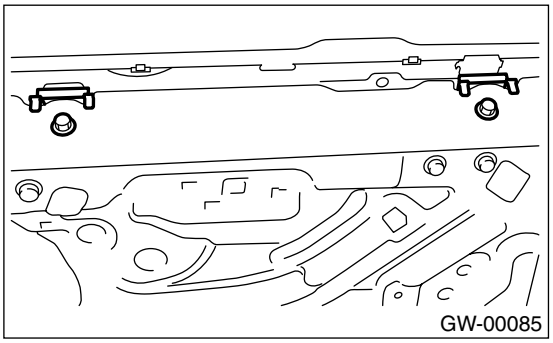
B: INSPECTION

Symptom	Repair order
All function does not operate.	(1) Fuse (F/B No. 4) (2) Mirror switch (3) Wiring harness
One side of the mirror motor does not operate.	(1) Mirror switch (2) Mirror motor (3) Wiring harness
Mirror heater does not operate.	(1) Mirror switch (2) Mirror heater (3) Wiring harness

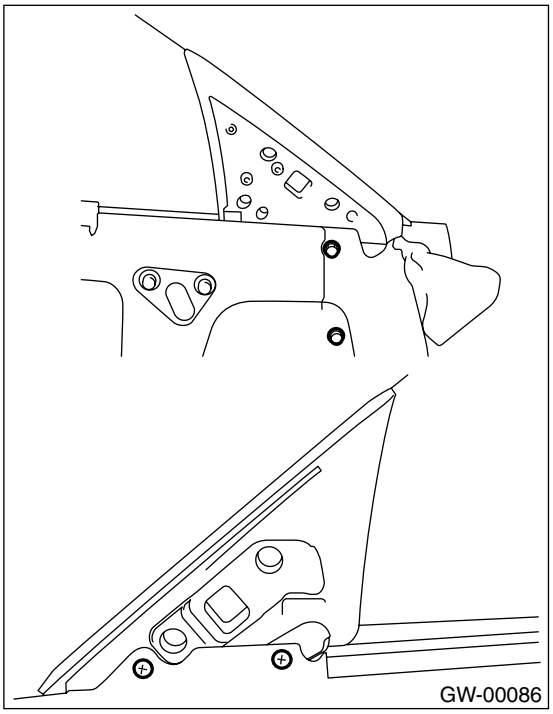
6. Front Door Glass

A: REMOVAL

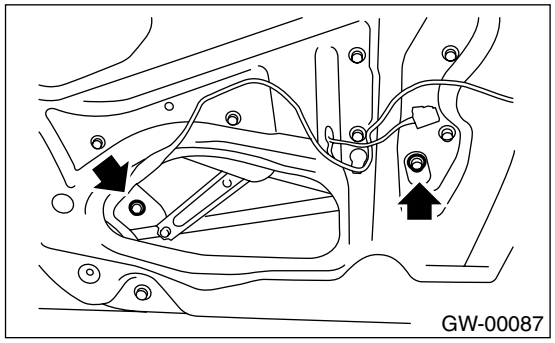
1) Remove door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
2) Remove sealing cover. <Ref. to EB-15, REMOVAL, Front Sealing Cover.>
3) Remove outer weatherstrip.
4) Remove inner stabilizer.


GW-00085

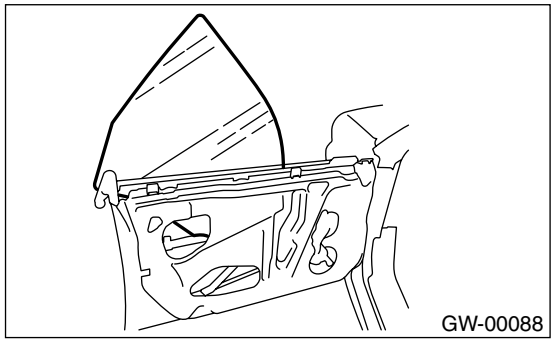
5) Remove outer mirror. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
6) Remove gusset.


GW-00086

7) Operate the power window switch to move glass to the position shown in the figure, and then remove the two nuts from service holes.


GW-00087

8) Take out glass door panel upward.


GW-00088

CAUTION:
• Do not turn regulator in the closing direction after removal of the glass. Otherwise gear may be disengaged.
• Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure that glass stay is placed securely in sash.

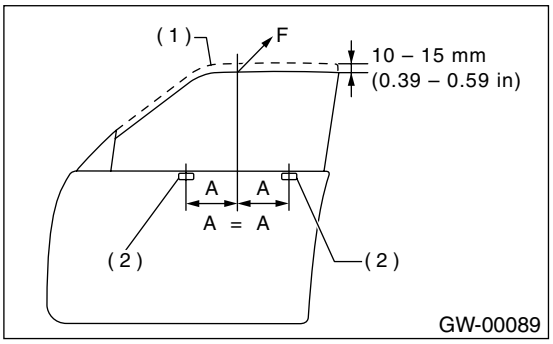
2) Adjust front door glass. <Ref. to GW-13, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EB-4, FRONT DOOR PANEL, COMPONENT, General Description.>and <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

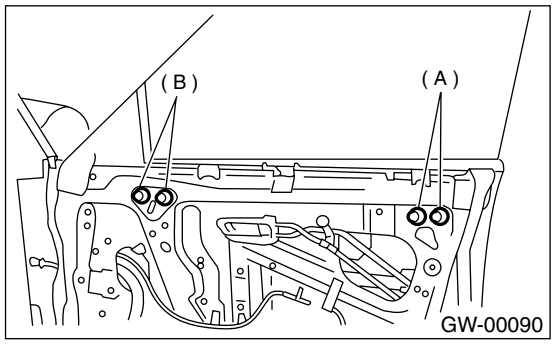
NOTE:
Before adjustment, ensure that all adjusting bolts of stabilizer, upper stopper, and sash are loose and door glass is raised so that it is in contact with weatherstrip.

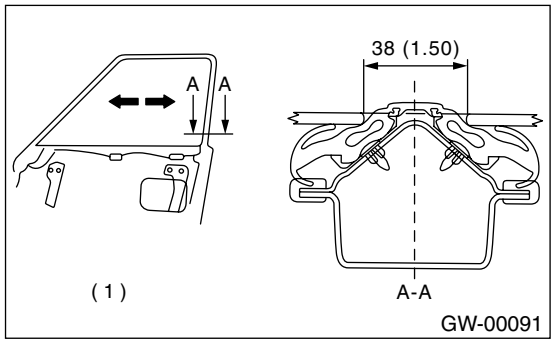
1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.
2) Temporarily tighten regulator B-channel in a position slightly lower than midpoint of slotted hole.
3) Lower door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 45±5 N (4.59±0.51 kgf, 10.1±1.1 lb) (F) to upper edge of glass above midpoint of two outer stabilizers, press inner stabilizer at 10±5 N (1.02±0.51 kgf, 2.2±1.1 lb) until it just touches the glass, then secure it.



(1) Full close
(2) Stabilizer

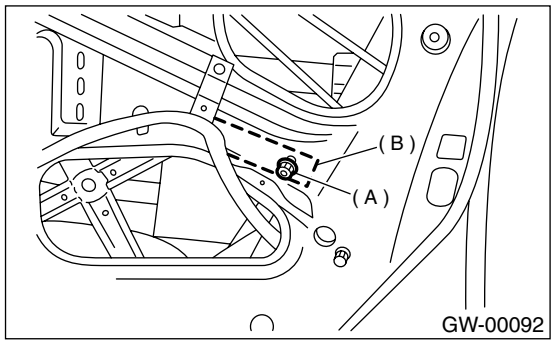
4) For adjustment of clearance between front and rear glasses, loosen nuts (A), and move glass sash back and forth until clearance becomes the value shown.



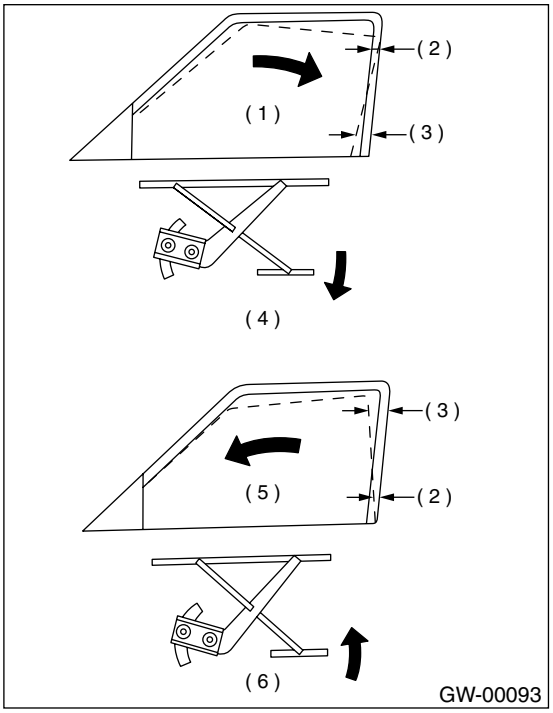


(1) Unit: mm (in)

5) For adjustment of upper and lower ends of center pillar, loosen adjusting nut (A) of B-channel (B).

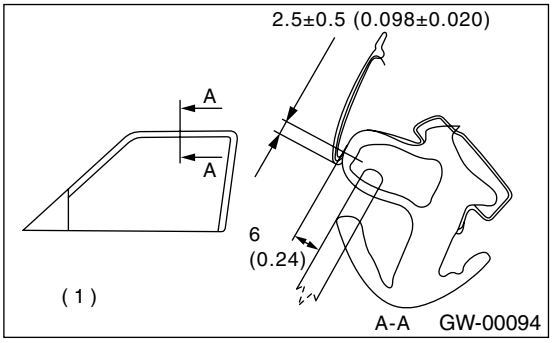


6) Adjust so that upper and lower ends of center pillar are the same size.



(1) Glass tilts too far rearward
(2) Narrow
(3) Wide
(4) Lower B channel
(5) Glass tilts too far forward
(6) Raise B channel

7) For glass stroke adjustment, close door, raise glass until positional relationship between glass and weatherstrip becomes as shown. And secure the glass so that upper stopper lightly touches the glass holder.

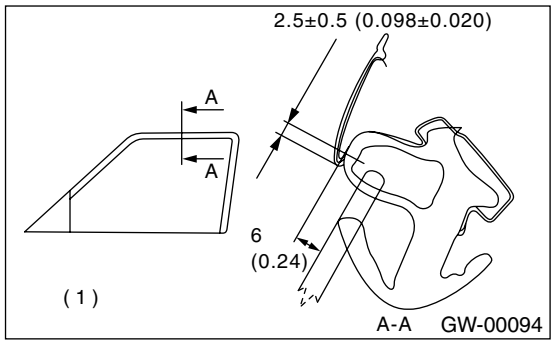


(1) Unit: mm (in)

8) After stabilizer adjustment, carry out glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

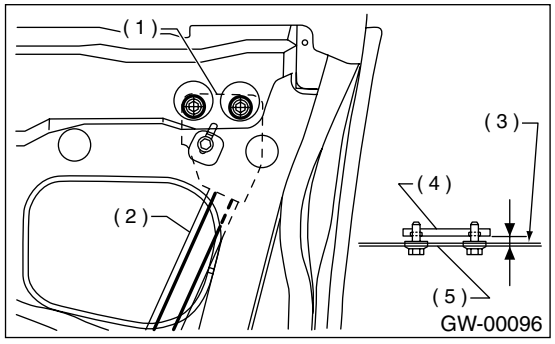
NOTE:
If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

9) Make the same adjustment of two adjusting bolts of rear sash.



(1) Unit: mm (in)

CAUTION:
Do not tilt sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.

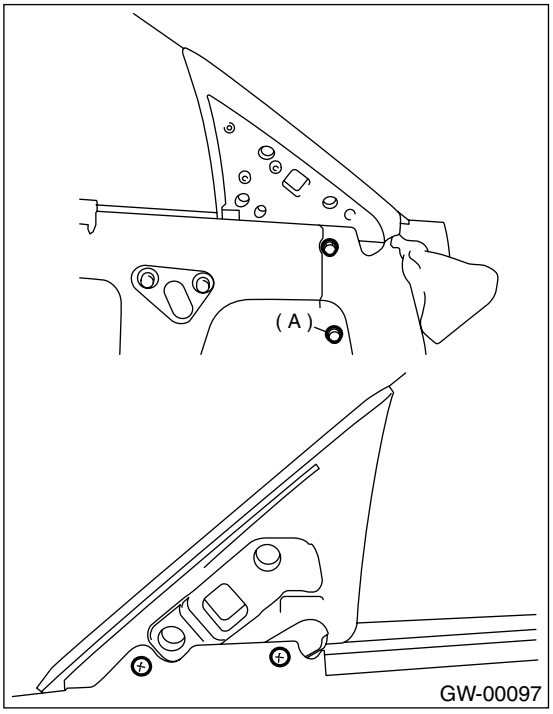


(1) Sash bracket
(2) Rear sash
(3) Adjust a line parallel
(4) Sash
(5) Inner panel

10) Make adjustment of front sash in the same manner as that of rear sash.

CAUTION:
Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in application of excessive load to regulator.

11) After adjustments, tighten nuts.
12) After adjustment of glass, if there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting bolt (A) in lower fitting part of gusset to prevent generation of wind noise.
13) During adjustments, loosen other three clamping bolts.

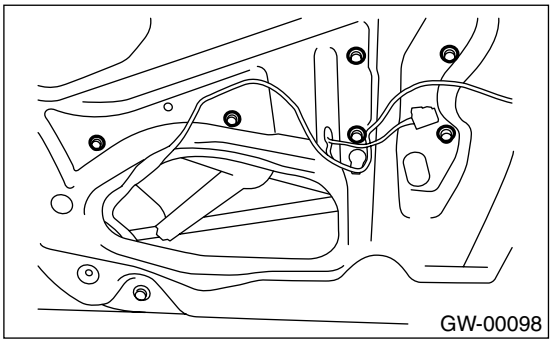


14) After adjustment, tighten bolts and nuts.

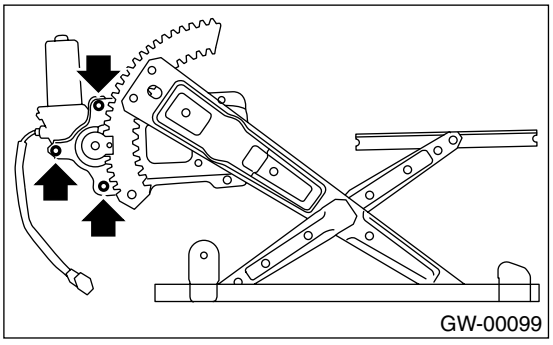
7. Front Regulator and Motor Assembly

A: REMOVAL

1) Remove door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
2) Remove sealing cover. <Ref. to EB-15, REMOVAL, Front Sealing Cover.>
3) Remove inner remote. <Ref. to SL-33, REMOVAL, Front Inner Remote.>
4) Remove door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
5) Disconnect electrical connector.
6) Loosen four bolts and two nuts to pull out regulator assembly.


GW-00098

7) Loosen screws to remove motor assembly.


GW-00099

B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust front door glass. <Ref. to GW-13, Adjustment.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to EB-4, FRONT DOOR PANEL, COMPONENT, General Description.> and <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.>

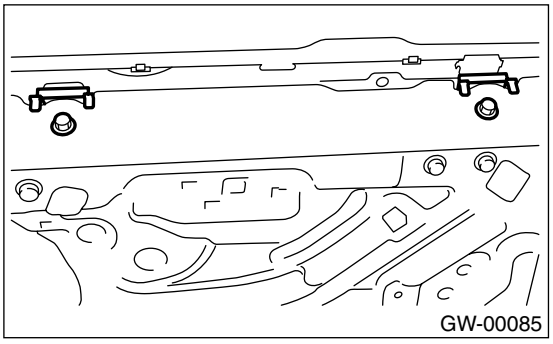
C: INSPECTION

1) Make sure that power window motor rotates properly when battery voltage is applied to terminals of motor connector.
2) Change polarity of battery connections to terminals to ensure that motor rotates in reverse direction.

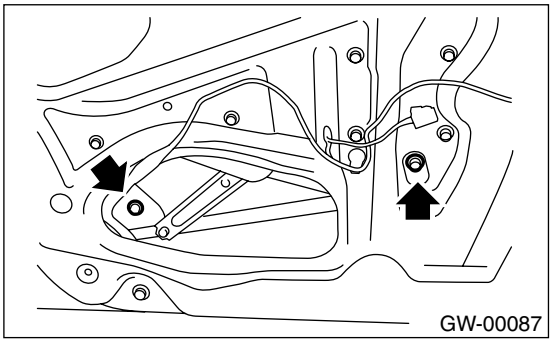
8. Rear Door Glass

A: REMOVAL

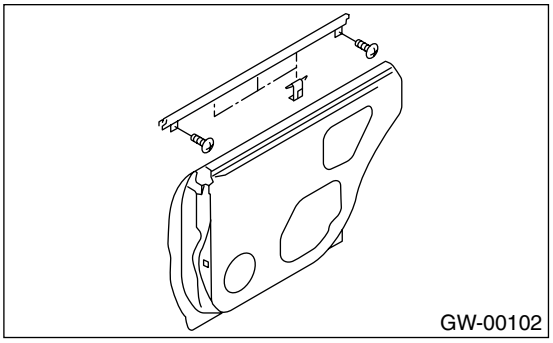
1) Remove door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
2) Remove sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove stabilizer.


GW-00085

4) Operate power window switch to move glass as shown in the figure, and remove two nuts.


GW-00087

5) Loosen two screws to remove weatherstrip.


GW-00102

6) Pull out glass.

CAUTION:
Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure that glass stay is placed securely in sash.

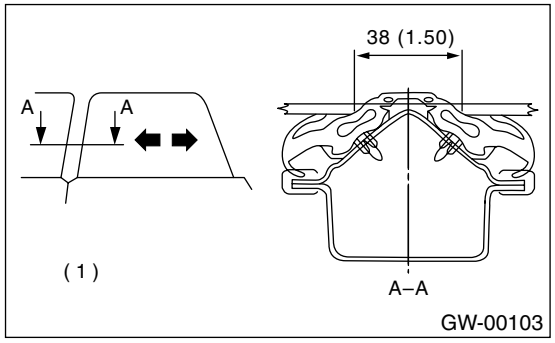
2) Adjust rear door glass. <Ref. to GW-17, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EB-5, REAR DOOR PANEL, COMPONENT, General Description.> and <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

NOTE:
Rear door glass, as a rule, should be adjusted in the same manner as front glass, although they are different in dimension. Special notes for rear glass are given below.

1) Adjust glass position using the following dimensions as a guide line.

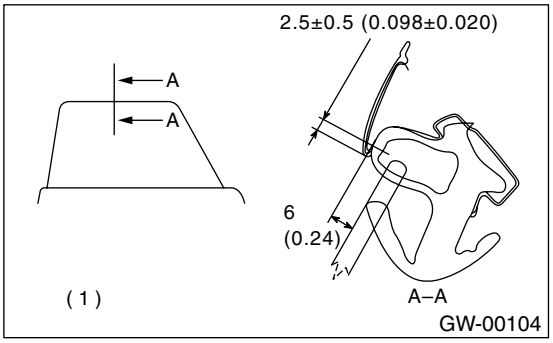


GW-00103

(1) Unit: mm (in)

CAUTION:
• If dimensions are smaller than the given dimensions, glass may get caught in weatherstrip during lifting/lowering operation. In the worst case, it may cause glass not to be opened fully.
• After adjustment, move glass up and down to check whether it is caught.

2) Adjust crimp of glass using the following dimensions as a guide line.



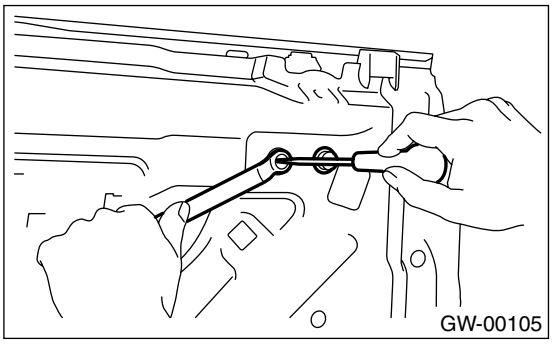
(1) Unit: mm (in)

CAUTION:
• If crimp of rear glass is higher than necessary, glass may get caught in weatherstrip of center pillar corner, resulting in early wear of weatherstrip. Be careful when adjusting.
• After adjustment, move glass up and down to check whether it is caught.

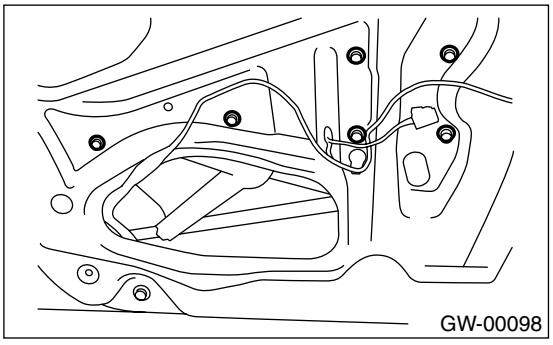
9. Rear Regulator and Motor Assembly

A: REMOVAL

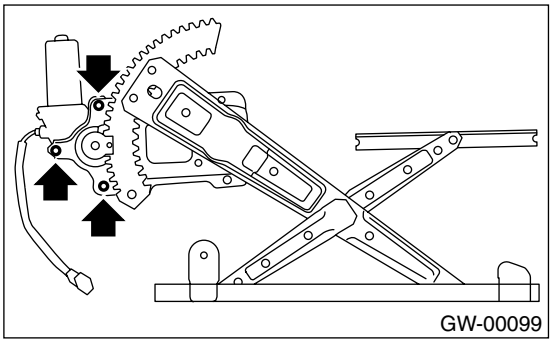
1) Remove door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
2) Remove sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove door glass. <Ref. to GW-17, REMOVAL, Rear Door Glass.>
4) Secure bolts using screwdriver to remove front sash adjusting nut.


GW-00105

5) Remove front sash.
6) Disconnect electrical connector.
7) Loosen four bolts and two nuts to remove regulator assembly.


GW-00098

8) Loosen screws to remove motor assembly.


GW-00099

B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust rear door glass. <Ref. to GW-17, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EB-5, REAR DOOR PANEL, COMPONENT, General Description.> and <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

1) Make sure that power window motor rotates properly when battery voltage is applied to terminals of motor connector.
2) Change polarity of battery connections to terminals to ensure that motor rotates in reverse direction.

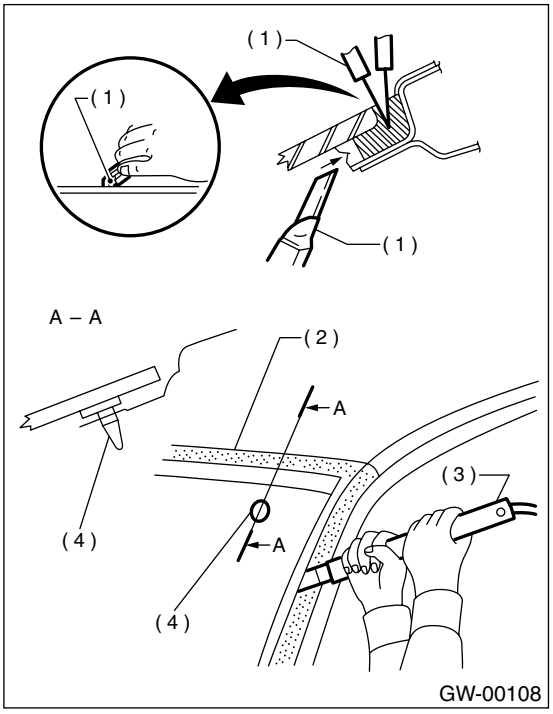
10.Windshield Glass

A: REMOVAL

1. USING WINDSHIELD KNIFE

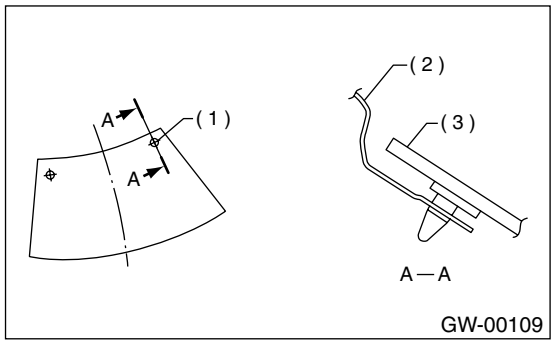
1) Remove cowl panel. <Ref. to EI-35, REMOVAL, Cowl Panel.>
2) Remove front molding.
3) Tape body side of the circumference of windshield glass for protection.
4) Apply sufficient amount of soapy water to adhesive layer.
5) Insert windshield knife into the adhesive layer.
6) While holding the knife edge and windshield glass edge at a right angle, move windshield knife in parallel to windshield glass edge along face and edge of windshield glass to cut the adhesive layer.

CAUTION:
• Do not twist windshield knife.
• Cutting of adhesive layer shall be started with wider gap between windshield glass and body.



(1) Putty knife
(2) Protective tape
(3) Windshield knife
(4) Matching pin

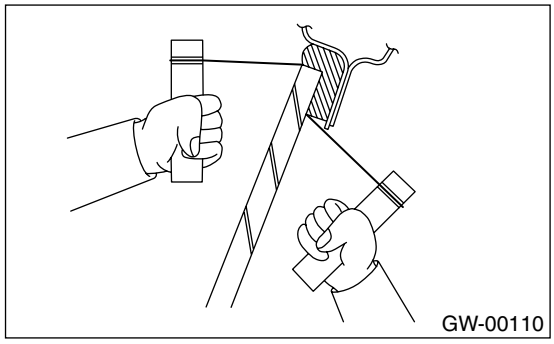
NOTE:
Because matching pins are bonded to the corners of glass, use piano wire to cut the pin.



(1) Matching pin
(2) Body panel
(3) Glass

2. USING PIANO WIRE

1) Remove cowl panel. <Ref. to EI-35, REMOVAL, Cowl Panel.>
2) Remove front molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Make a hole in adhesive layer using drill or knife.
5) Pass piano wire through the hole, and attach securely both the wire ends to pieces of wood.



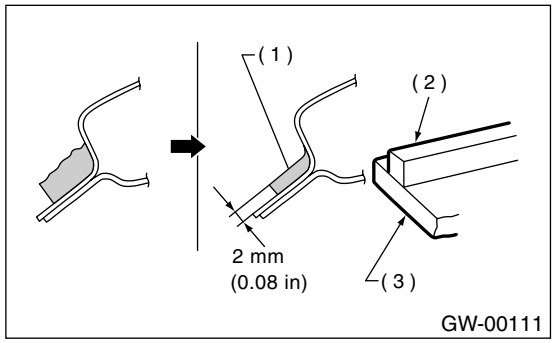
6) Pull the wire ends alternately to cut off the adhesive layer.

CAUTION:
• Do not tightly pull the piano wire against the windshield glass edge.
• Be careful not to damage interior and exterior parts.
• When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.
• Do not cross piano wires. Otherwise they may be cut.

B: INSTALLATION

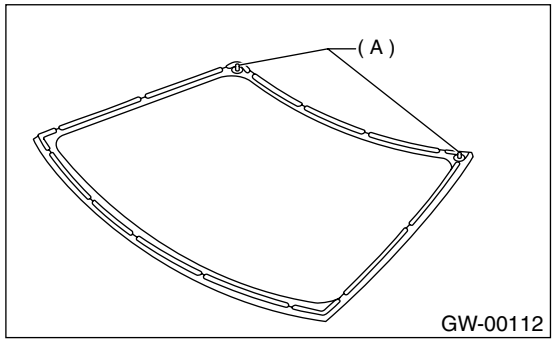
1) Clean external circumference of windshield glass with alcohol or white gasoline.
2) Remove adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.

CAUTION:
Be careful not to damage the body and paint surface.



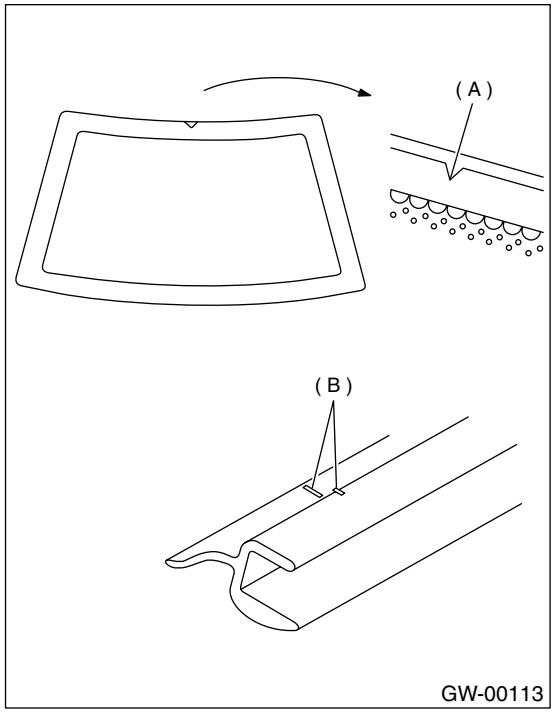
(1) Adhesive
(2) Dam rubber
(3) Glass

3) Clean body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirts from body face.
4) Place glass on body.
5) Adjust glass position to make uniform clearance between body and glass in four corners.
6) Place matching pins (A) and body on glass.



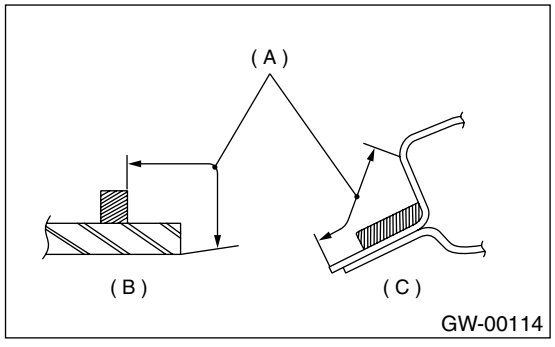
7) Remove glass from body.

8) Fit molding mark (B) to notch (A) of ceramic print.

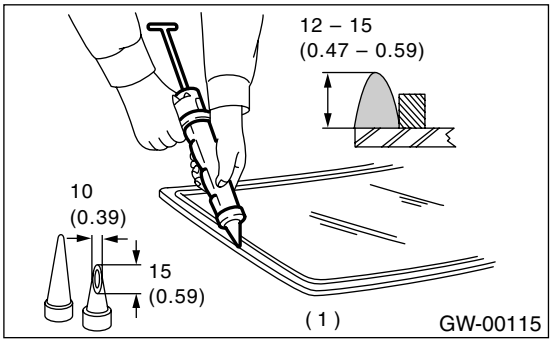


9) Apply primer to adhesive layer (A) of glass (B) using sponge.
10) Apply primer to adhesive layer (A) of body (C).

CAUTION:
• Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
• Let primer dry for about ten minutes before installing the glass.
• Do not touch surface coated with primer.

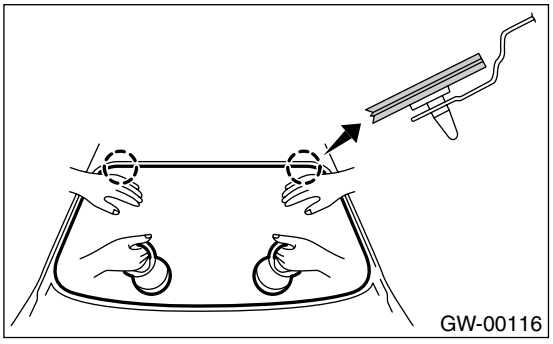


11) Cut off cartridge nozzle tip and set it in sealant gun as shown.



(1) Unit: mm (in)

12) Apply adhesive to glass end surface as shown.
13) Fit matching pins using suction rubber cup to install windshield glass.



14) Lightly press windshield glass for tight fit.
15) Make adhesive surface flush using spatula.

CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
• Move vehicle slowly.

16) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

17) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

CAUTION:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

18) Install cowl panel. <Ref. to EI-35, INSTALLATION, Cowl Panel.>

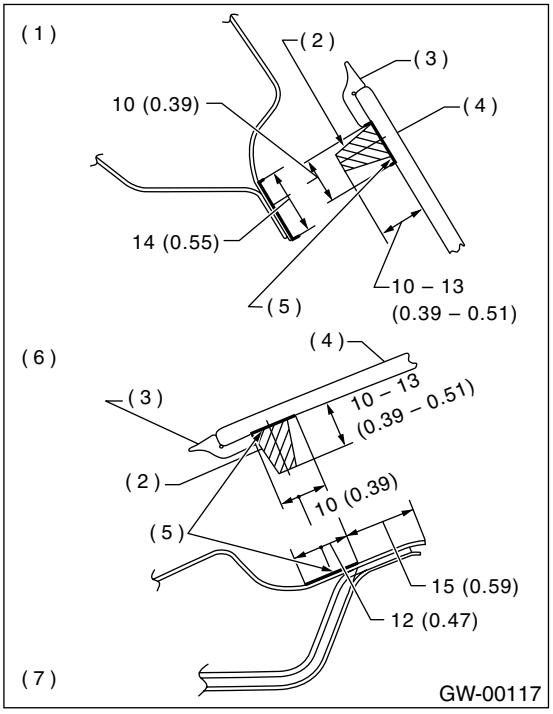
11.Rear Gate Glass

A: REMOVAL

1) Remove real wiper motor. <Ref. to WW-15, REMOVAL, Rear Wiper Motor.>
2) Remove electrical connector from rear defogger terminal.
3) Remove glass in the same procedure as for windshield glass. <Ref. to GW-20, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Apply adhesive evenly to the glass attachment area.
2) Insert the glass clip pin into the rear gate hole, and after pushing on the area around the clip pin to secure it, push lightly all around the area to seal it.
3) About one hour after installation, conduct a leak test.



(1) Upper side
(2) Adhesive
(3) Strip rubber
(4) Glass
(5) Primer
(6) Left and right side
(7) Unit: mm (in)

CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
• Move vehicle slowly.

4) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

CAUTION:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

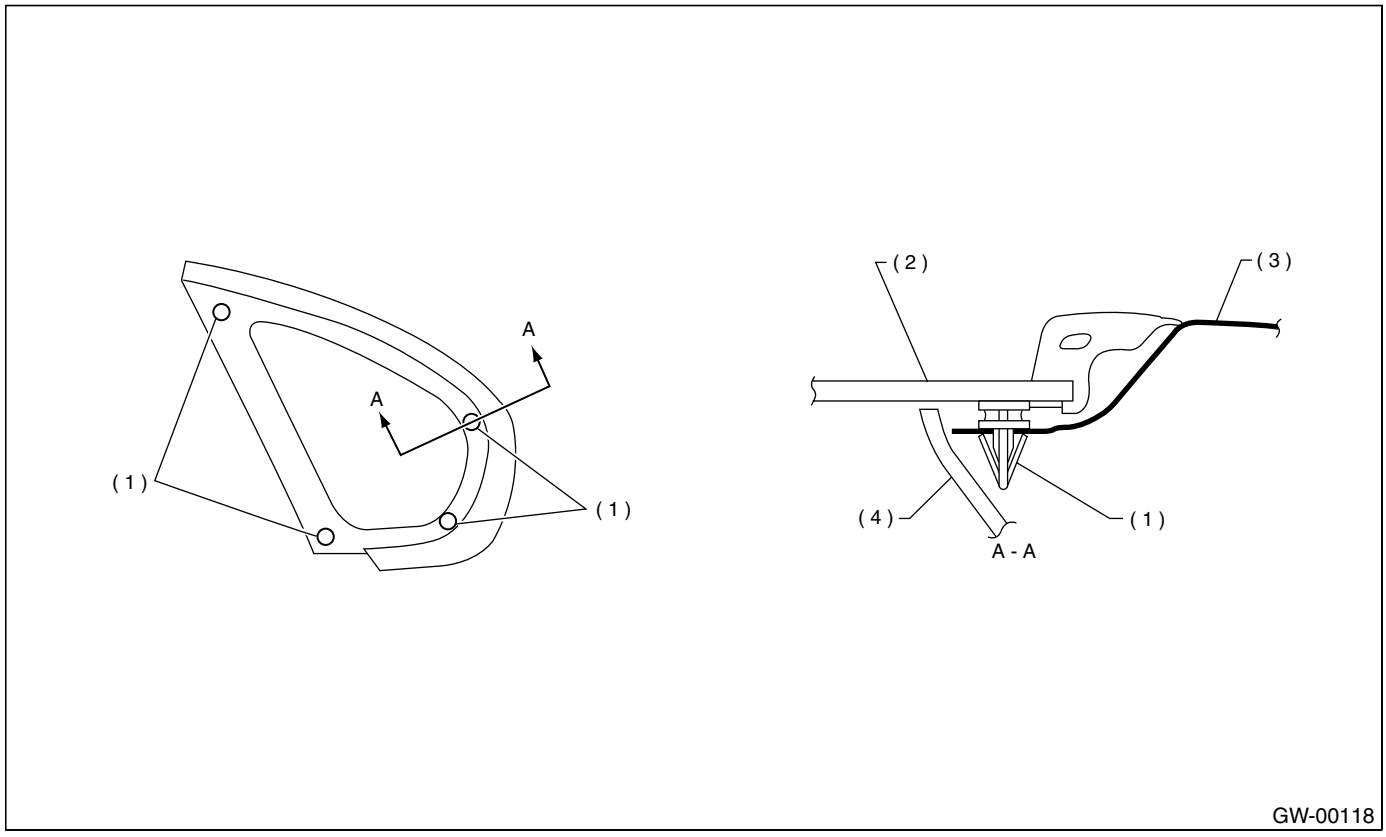
5) Connect rear defogger terminals.
6) Install rear wiper. <Ref. to WW-15, INSTALLATION, Rear Wiper Motor.>

12.Rear Quarter Glass

A: REMOVAL

1. SEDAN

Remove glass in the same procedure as for windshield glass. <Ref. to GW-20, REMOVAL, Windshield Glass.>



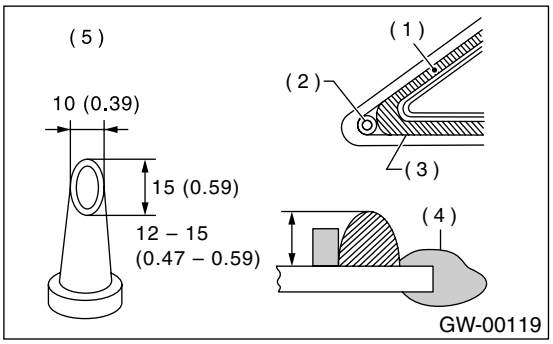
(1) Matching pin
(2) Rear quarter glass
(3) Body panel
(4) Trim panel

2. WAGON

Remove glass in the same procedure as for windshield glass. <Ref. to GW-20, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Cut off nozzle tip as shown in the figure.



(1) Dam rubber
(2) Matching pin
(3) Adhesive
(4) Molding
(5) Unit: mm (in)

2) Install glass in the same procedure as for windshield glass. <Ref. to GW-21, INSTALLATION, Windshield Glass.>

CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close it carefully.
• Move vehicle slowly.

3) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

4) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

CAUTION:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

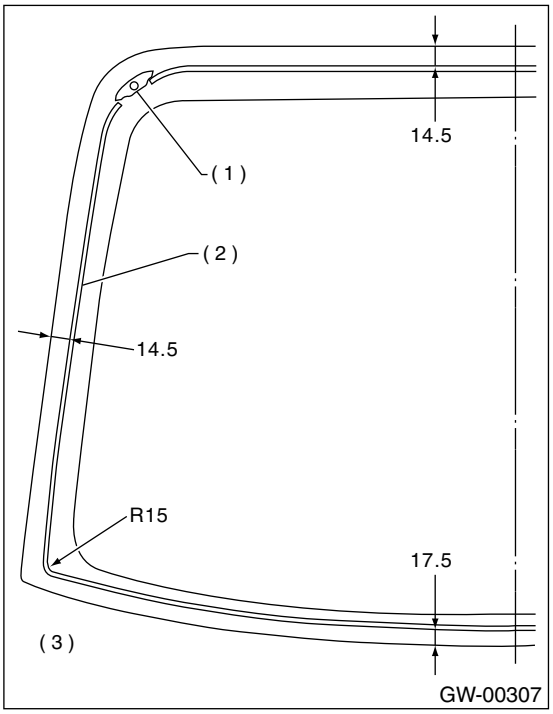
13.Rear Window Glass

A: REMOVAL

1) Disconnect electrical connectors from rear defogger terminals.
2) Remove glass in the same procedure as for windshield glass. <Ref. to GW-20, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Bond dam rubber and matching pin.



(1) Matching pin
(2) Dam rubber
(3) Unit: mm (in)

2) Install glass in the same procedure as for windshield glass. <Ref. to GW-21, INSTALLATION, Windshield Glass.>
3) Connect rear defogger terminals.

CAUTION:
• When door is opened/closed after glass is bonded, always lower door glass and then open/close door carefully.
• Move vehicle slowly.

4) After completion of all work, allow vehicle to stand for about 24 hours.

NOTE:
For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

5) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

CAUTION:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

14.Roof Window Glass

A: REMOVAL

<Ref. to SR-7, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-7, INSTALLATION, Sunroof Lid.>

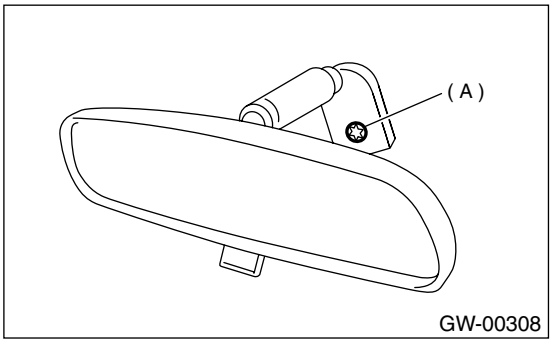
C: ADJUSTMENT

<Ref. to SR-8, ADJUSTMENT, Sunroof Lid.>

15.Inner Rearview Mirror

A: REMOVAL

Loosen TORX screw (A) and remove the inner rearview mirror.



(1) TORX screw

CAUTION:
Be careful not to damage the mirror surface.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

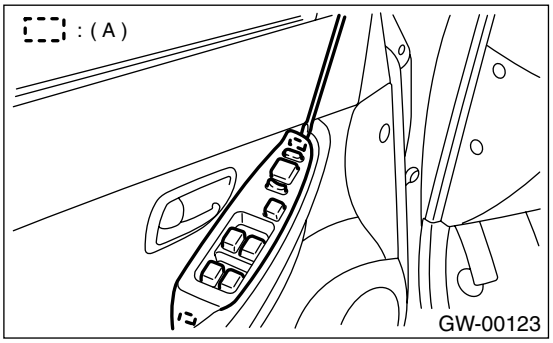
Do not let mirror be damaged.

16.Power Window Control Switch

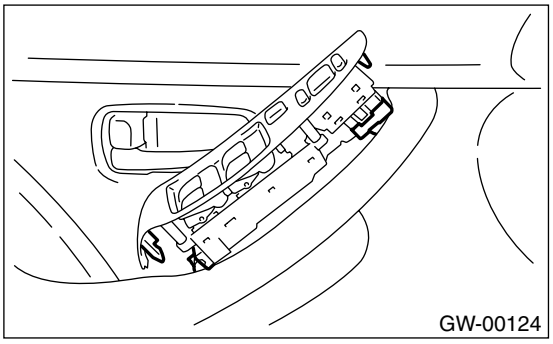
A: REMOVAL

1. MAIN SWITCH

1) Remove two hooks (A) of switch panel to remove power window main switch.

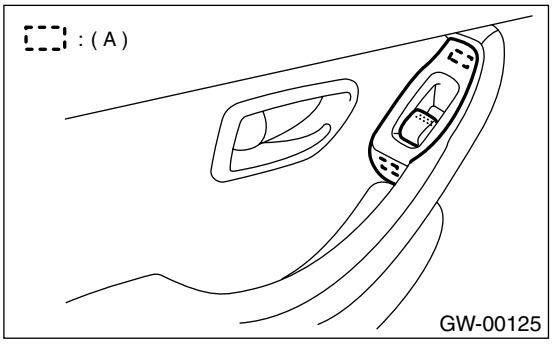


2) Disconnect electrical connectors from power window main switch and mirror switch.



2. SUB-SWITCH

Remove two hooks (A) of switch panel to remove power window sub-switch and disconnect electrical connector.



B: INSTALLATION

1. MAIN SWITCH

Install in the reverse order of removal.

2. SUB-SWITCH

Install in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH

Measure switch resistance.

Driver's switch:

Switch position	Terminal No.	Standard
UP	3 and 9, 7 and 1	Less than 1 Ω
OFF	3 and 7 and 1	Less than 1 Ω
DOWN	7 and 9, 3 and 1	Less than 1 Ω
AUTO DOWN	7 and 9, 3 and 1	Less than 1 Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	9 and 5, 1 and 4	Less than 1 Ω
OFF	1 and 5 and 4	Less than 1 Ω
DOWN	9 and 4, 1 and 5	Less than 1 Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	9 and 13, 1 and 8	Less than 1 Ω
OFF	1 and 13 and 8	Less than 1 Ω
DOWN	9 and 8, 1 and 13	Less than 1 Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	9 and 16, 1 and 14	Less than 1 Ω
OFF	1 and 16 and 14	Less than 1 Ω
DOWN	9 and 14, 1 and 16	Less than 1 Ω

If defective, replace the main switch.

2. SUB-SWITCH

Measure switch resistance.

Front passenger's door switch and rear door switch:

Switch position	Terminal No.	Standard
UP	5 and 1, 6 and 2	Less than 1 Ω
OFF	4 and 1, 6 and 2	Less than 1 Ω
DOWN	5 and 2, 4 and 1	Less than 1 Ω

If defective, replace the sub-switch.

17.Rear Window Defogger Switch

A: REMOVAL

<Ref. to AC-31, REMOVAL, Control Unit.>

B: INSTALLATION

<Ref. to AC-31, INSTALLATION, Control Unit.>

C: INSPECTION

Check continuity between connectors at the back of heater control unit.

1. AUTO A/C

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	(i48) 13 and (i49) 12	Less than 1 Ω

2. MANUAL A/C

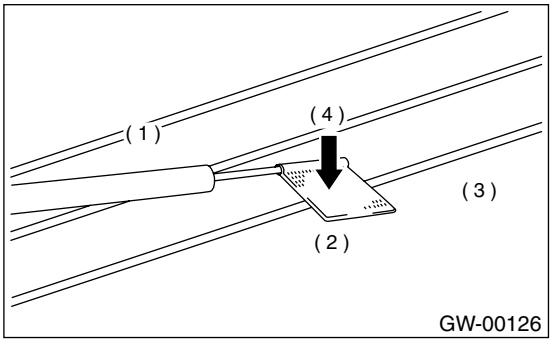
Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
OFF	(i17) 14 and (i17) 10	Less than 1 Ω

18.Rear Window Defogger

A: INSPECTION

CAUTION:
When wiping stain on glass off with cloth, use a dry and soft cloth and move it in the direction of the heat wire extension to avoid damage to the heat wire.

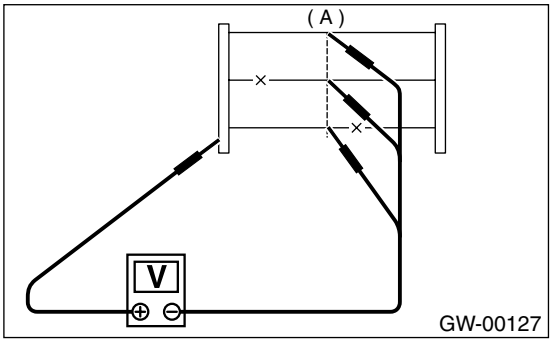
1) Turn ignition switch to ON.
2) Turn defogger switch to ON.
3) Wrap tips of tester pins with aluminum foil to avoid damage to heat wire.



(1) Tester probe
(2) Tin foil
(3) Heat wire
(4) PRESS

4) Measure voltage at wire center (A) with DC voltmeter.

Standard voltage:
Approx. 6 volts



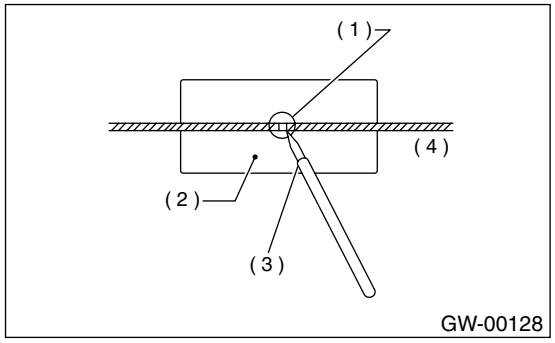
Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

NOTE:
• If the measured value is 12 volts, heat wire is open between wire center and positive (+) end.
• If zero volt, heat wire is open between wire center and ground.

5) Apply positive lead of voltmeter to positive terminal of voltmeter, and then move negative lead along the wire up to the negative terminal end. If voltage changes from zero to several volts during movement of lead, heat wire is open at the voltage change point.

B: REPAIR

1) Clean broken portion with alcohol or white gasoline.
2) Mask both side of wire with thin film.
3) Apply conductive silver composition (DUPONT No. 4817) to broken portion.



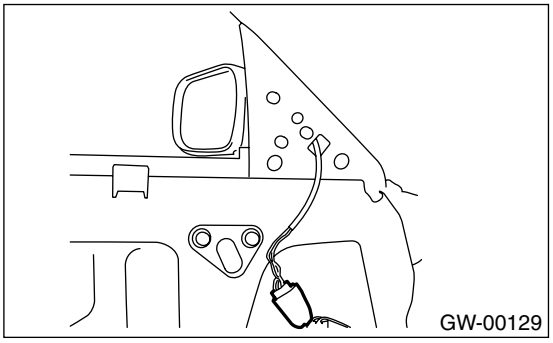
(1) Broken portion
(2) Masking thin film
(3) Conductive silver composition
(4) Broken wire

4) After repair, check wire.

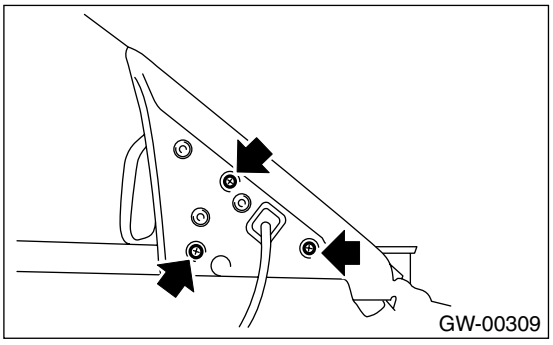
19.Outer Mirror Assembly

A: REMOVAL

1) Remove door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
2) Pull off sealing cover to disconnect mirror harness connector.



3) Remove screws to remove mirror assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check to ensure that rearview mirror moves properly when battery voltage is applied to terminals.

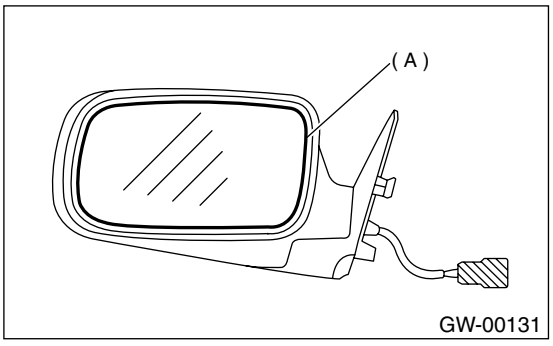
Switch position	Terminal No.
OFF	—
UP	1 (+) and 3 (–)
DOWN	3 (+) and 1 (–)
LEFT	2 (+) and 3 (–)
RIGHT	3 (+) and 2 (–)

If defective, replace the mirror.

20.Outer Mirror

A: REPLACEMENT

1) Remove the door mirror assembly. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
2) Warm the area around the mirror holder (A) with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
3) Use a flat-bladed screwdriver without sharp edges to lift the mirror out of the mirror holder (A). (Also remove the connector from the back of mirrors with heaters.)



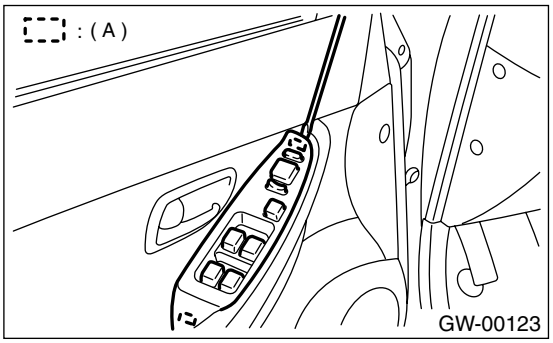
4) Warm the area around the mirror holder (A) with a hair drier until the edges of the mirror holder (A) become soft (about 2 or 3 minutes with a 1,000 W drier.)
5) Remove the backing of the new two-sided tape, and push the mirror in to install it.

CAUTION:
Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

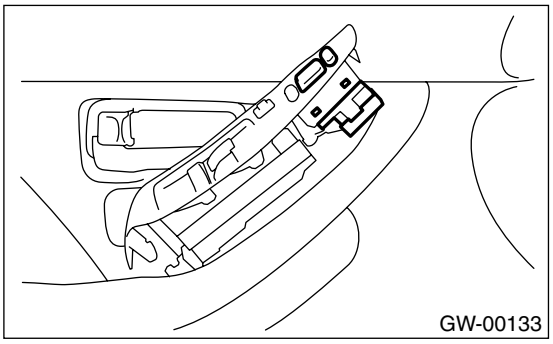
21.Remote Control Mirror Switch

A: REMOVAL

1) Remove power window main switch panel.



2) Remove four hook (A) to remove remote control mirror switch.

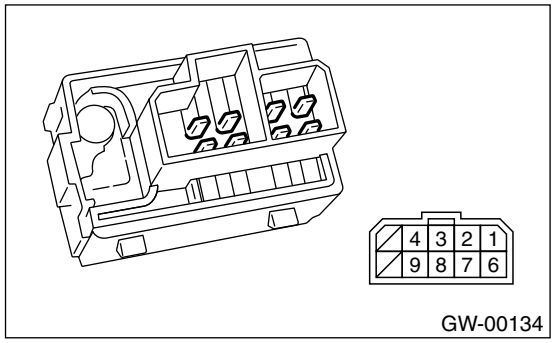


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Move rearview mirror switch to each position and check continuity between terminals.



Change over switch left position:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	7 and 4, 2 and 1	Less than 1 Ω
DOWN	7 and 2, 4 and 1	Less than 1 Ω
LEFT	9 and 4, 2 and 1	Less than 1 Ω
RIGHT	9 and 2, 4 and 1	Less than 1 Ω

Change over switch right position:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	6 and 4, 2 and 1	Less than 1 Ω
DOWN	6 and 2, 4 and 1	Less than 1 Ω
LEFT	8 and 4, 2 and 1	Less than 1 Ω
RIGHT	8 and 2, 4 and 1	Less than 1 Ω

If defective, replace the switch.

22.Wiper Deicer

A: INSPECTION

Refer to INSPECTION under Rear Window Defogger. <Ref. to GW-32, INSPECTION, Rear Window Defogger.>

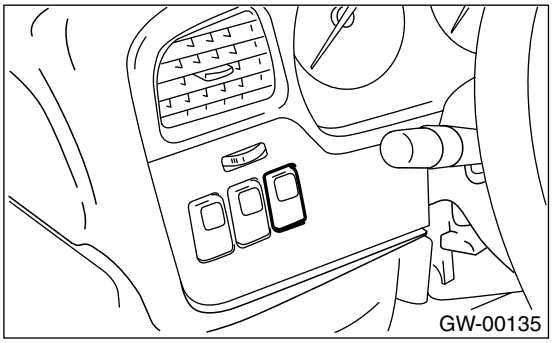
B: REPAIR

Refer to REPAIR under Rear Window Defogger. <Ref. to GW-32, REPAIR, Rear Window Defogger.>

23.Wiper Deicer Switch

A: REMOVAL

Remove driver side switch panel, and then remove wiper deicer switch.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Move wiper deicer switch to each position and check continuity between terminals.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	3 and 5	Less than 1 Ω

If defective, replace the switch.

MEMO:

BODY STRUCTURE

BS

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1. General Description 2
2. Datum Points 3
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1. General Description

A: PREPARATION TOOL

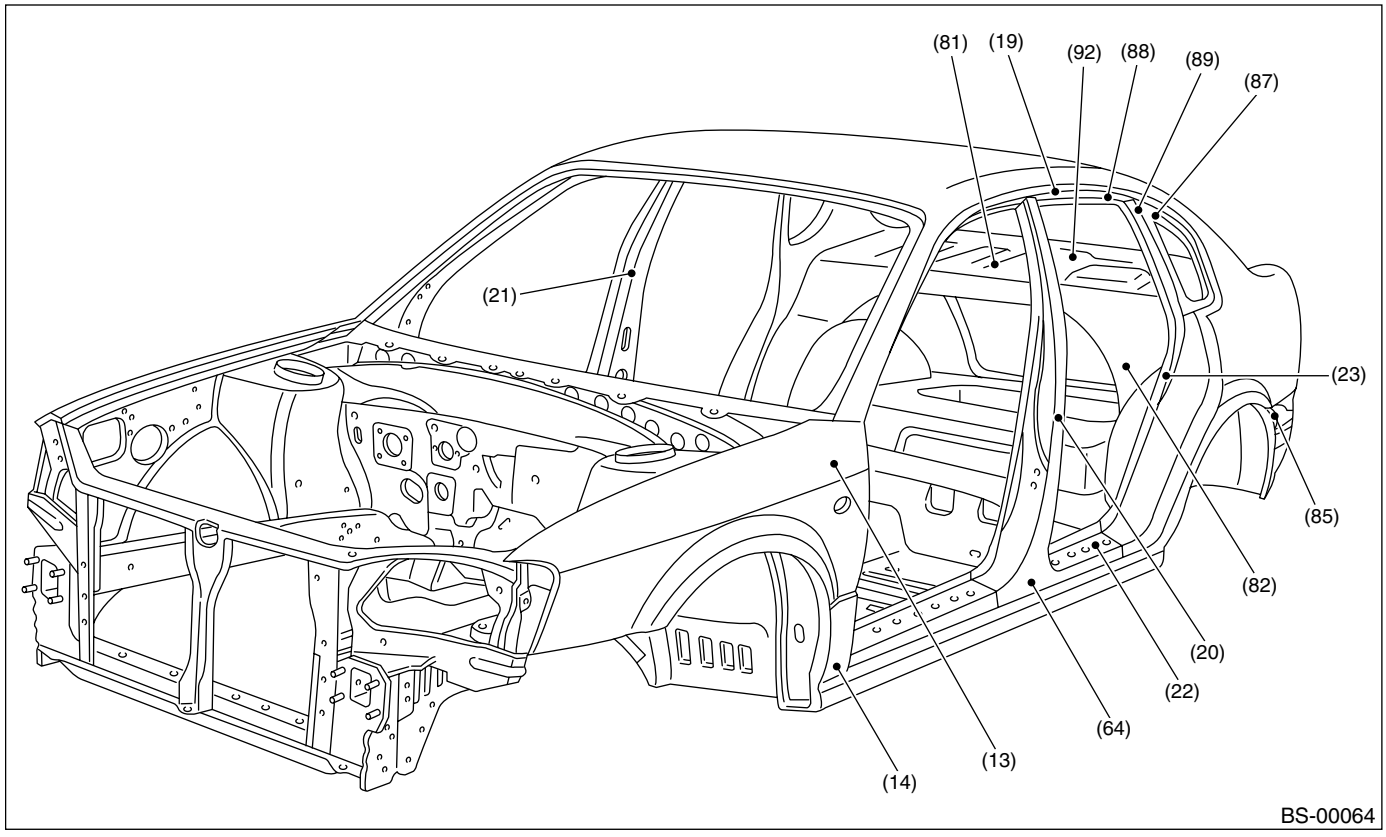
TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension

2. Datum Points

A: LOCATION

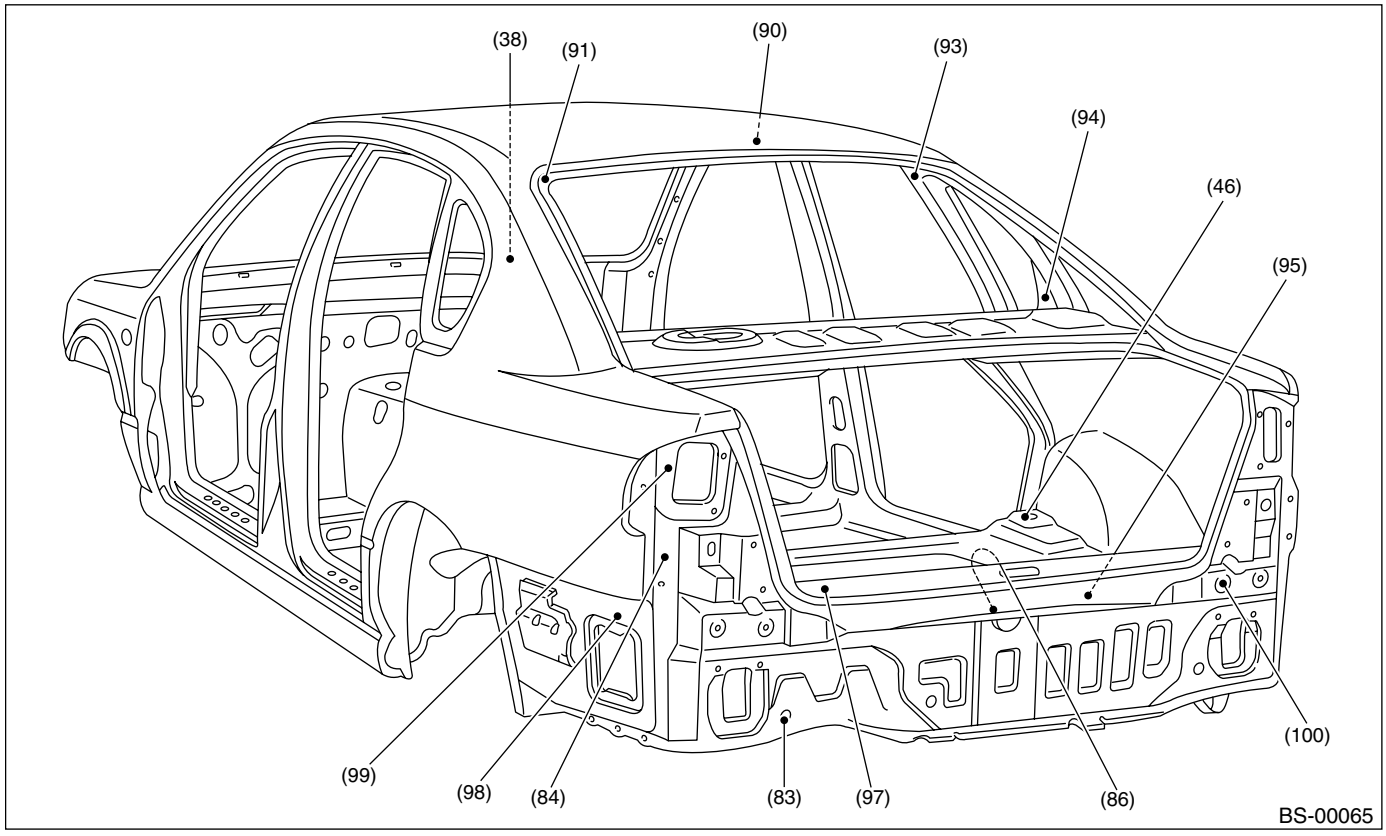
NOTE:
- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.

1. ROOM SECTION



(13) Front fener attaching hole at front pillar center portion M6
(14) Front fender attaching hole at front pillar lower portion M6
(19) Retainer attaching hole at side rail outer 3.2 mm (0.126 in) dia.
(20) Center pillar outer hole 14 mm (0.55 in) dia.
(21) Front seat belt adjust plate attaching hole M10
(22) Side sill outer hole 20 mm (0.79 in) dia.
(23) Rear quarter outer door switch attaching hole 20 mm (0.79 in) dia.
(64) Center pillar (LWR) gauge hole 16 mm (0.63 in) dia.
(81) Panel rear center (UPR) gauge hole 8 mm (0.31 in) dia.
(82) Bulk head rear trim clip hole 7 mm (0.28 in) dia.
(85) Rear quarter outer gauge hole 20 mm (0.79 in) dia.
(87) Six light glass attaching hole 6.2 mm (0.244 in) dia.
(88) Retainer attaching square hole at side rail outer 8 × 8 mm (0.31 × 0.31 in)
(89) Retainer attaching square hole at rear quarter outer 8 × 8 mm (0.31 × 0.31 in)
(92) Rear panel center hole (UPR) 6 mm (0.24 in) dia.

2. REAR SECTION



(38) Front panel instrument panel attaching hole 18 × 36 mm (0.71 × 1.42 in) dia. oblong hole

(46) Rear/front shock absorber floor side attaching hole 13 mm (0.51 in) dia.

(83) Rear skirt outer burring hole 20 mm (0.79 in) dia.

(84) Rear extension attaching hole 6.2 mm (0.244 in) dia.

(86) Reinforce striker trim attaching hole 7 mm (0.28 in) dia.

(90) Rear rale roof trim attaching hole 8 mm (0.31 in) dia.

(91) Rear glass attaching hole
RH: 6.5 mm (0.256 in) dia.
LH: (6.5 × 10 mm (0.256 × 0.394 in) oval

(93) Rear panel inner trim attaching hole (UPR) 8 mm (0.31 in) dia.

(94) Rear panel inner trim attaching hole (LWR) 8 mm (0.31 in) dia.

(95) Rear bumper attaching hole 12.5 × 17 mm (0.492 × 0.669 in) dia. oblong hole

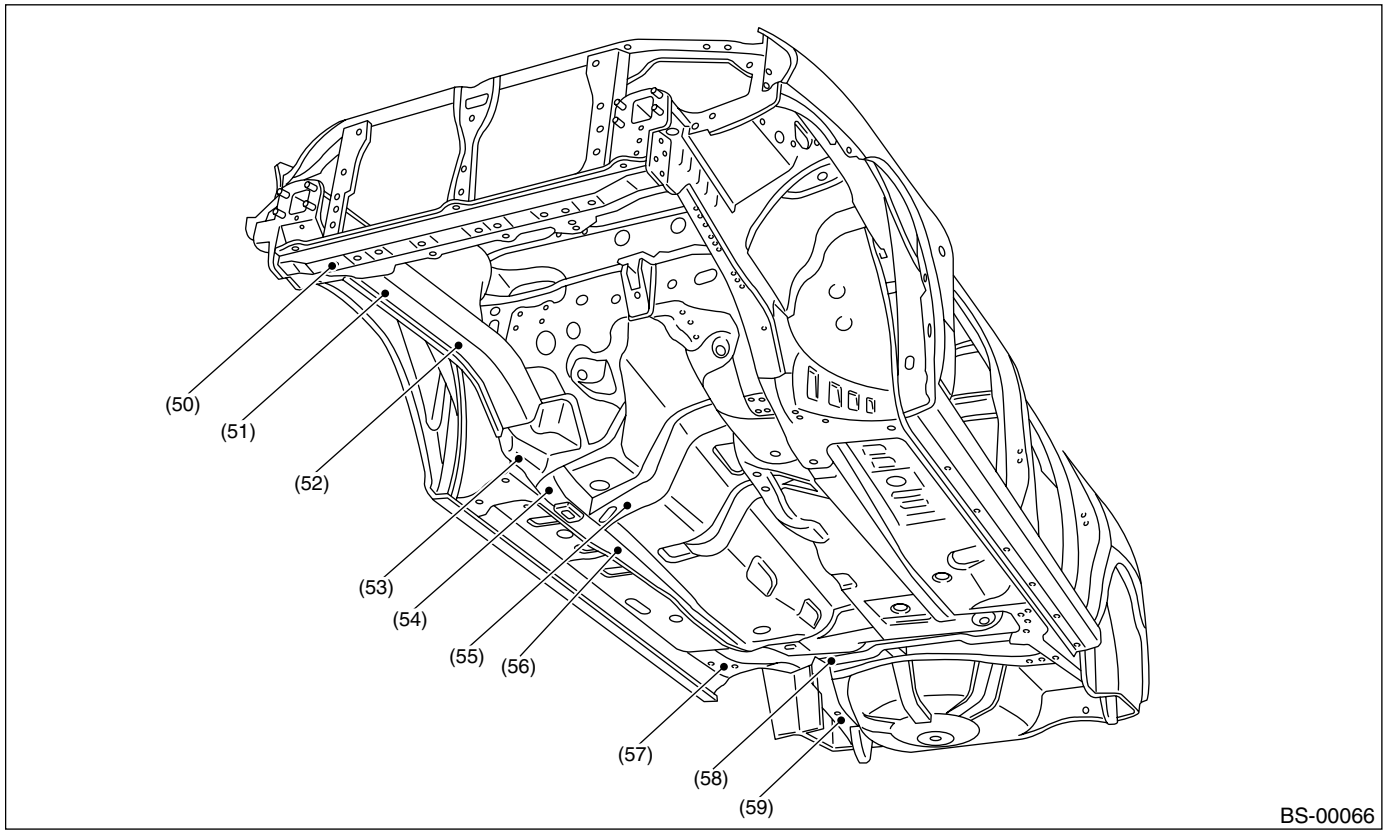
(97) Trunk trim attaching hole at rear skirt 7 mm (0.28 in) dia.

(98) Rear bumper slider attaching hole 6.2 mm (0.244 in) dia.

(99) Rear combination light mounting hole 8 mm (0.31 in) dia.

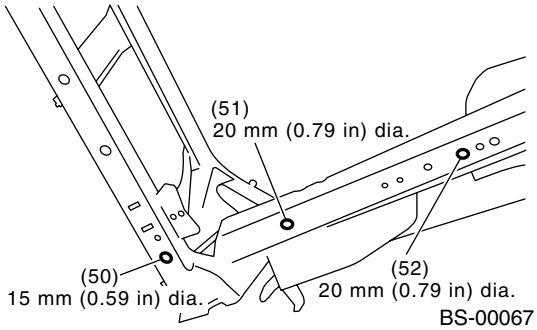
(100) Rear bumper beam attaching hole 8.2 mm (0.323 in) dia.
RH: 8.2 mm (0.323 in)
LH: 8.2 × 12 mm (0.323 × 0.472 in) oval

3. UNDERBODY SECTION

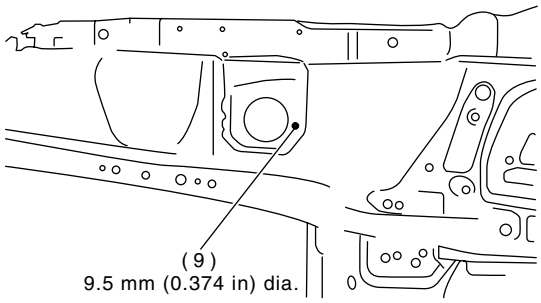


(50) Radiator panel (LWR) frame gauge hole 15 mm (0.59 in) dia.
(51) Front side frame (Ft) gauge hole 20 mm (0.79 in) dia.
(52) Front side frame (Ft) gauge hole 20 mm (0.79 in) dia.
(53) Front suspension bracket COMPL securing nut (M14)
(54) Front side frame (Rr) gauge hole 20 mm (0.79 in) dia.
(55) Crossmember front floor gauge hole M10
(56) Front side frame (Rr) gauge hole 18 mm (0.71 in) dia.
(57) Frame rear floor side gauge hole 25 mm (0.98 in) dia.
(58) Reinforcement crossmember B hole RH: 15 mm (0.59 in) dia., LH: 12 mm (0.47 in) dia.
(59) Frame rear floor side gauge hole 30 mm (1.18 in) dia.

DATUM POINTS



BS-00067



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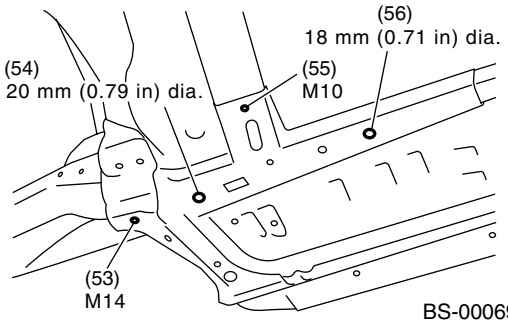

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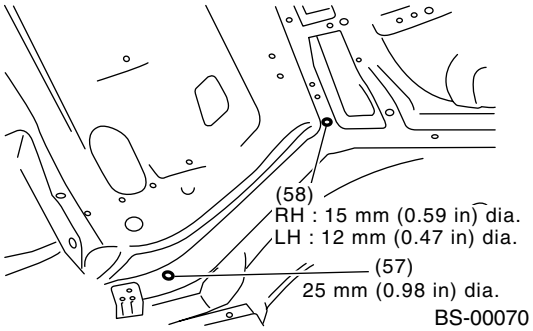

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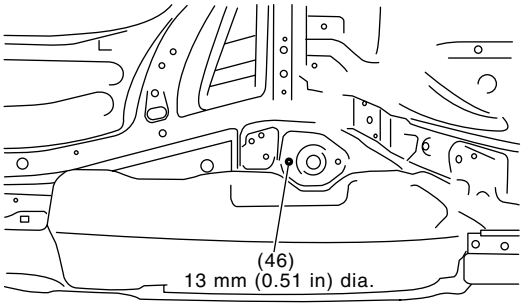

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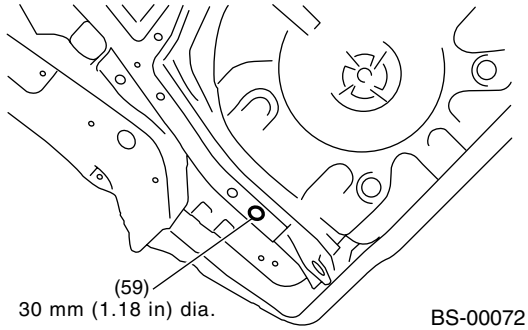

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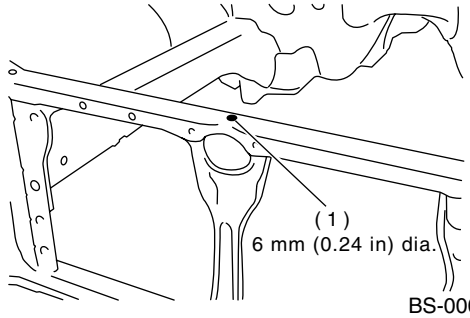

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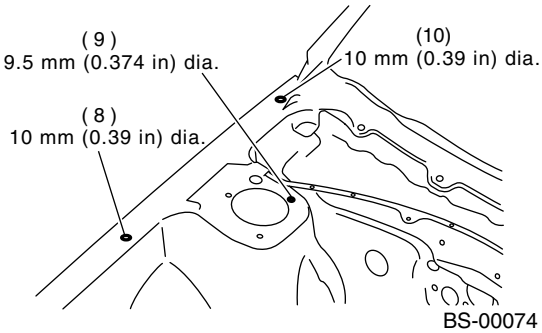
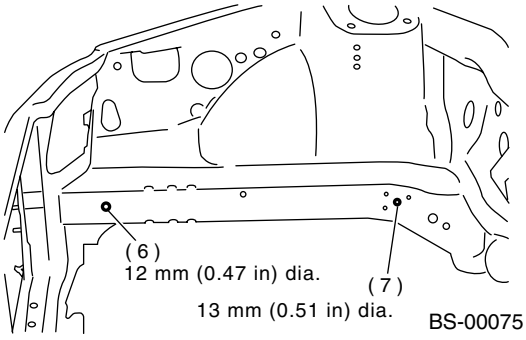


BS-00074

DATUM POINTS



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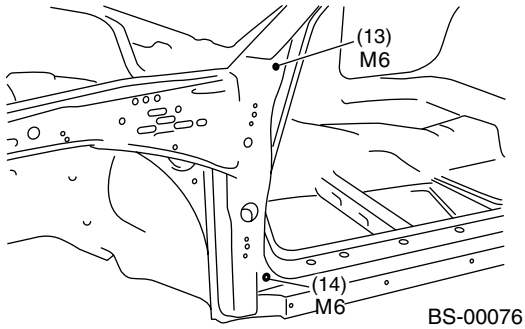

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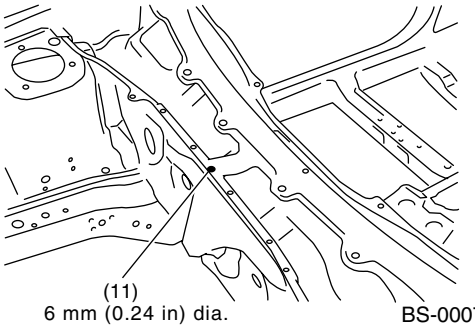

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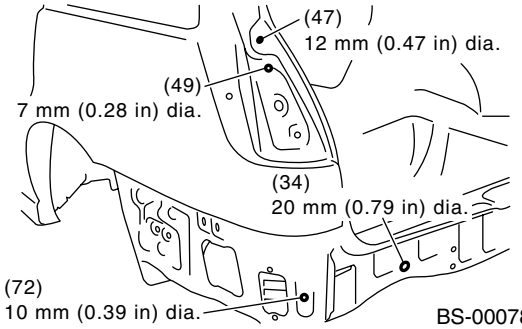

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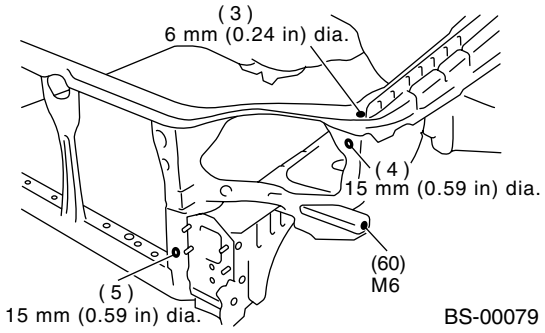

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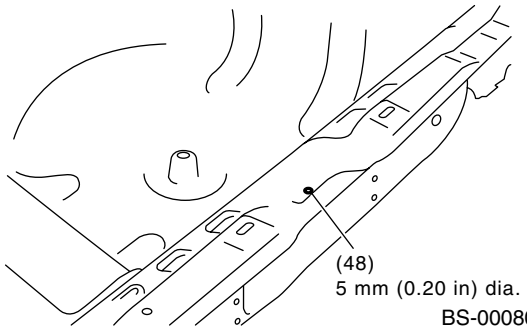

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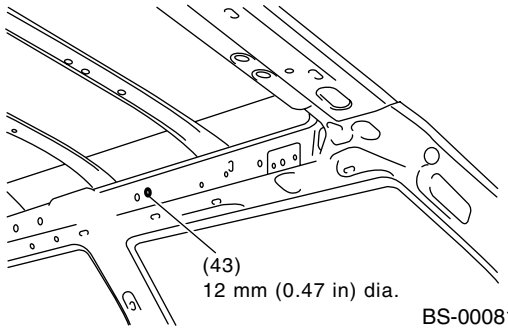

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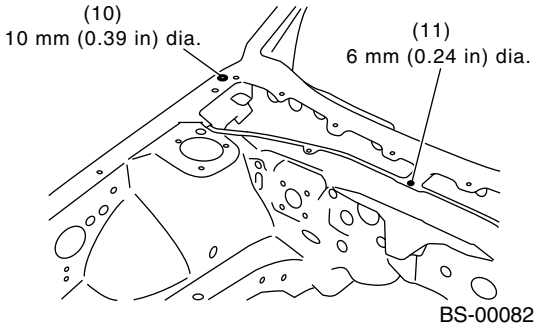
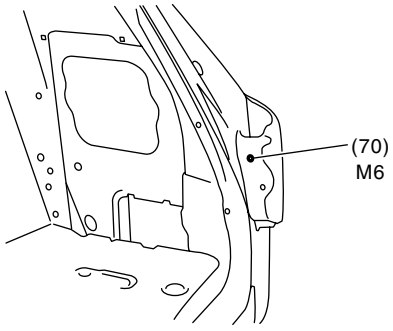


BS-00082

DATUM POINTS



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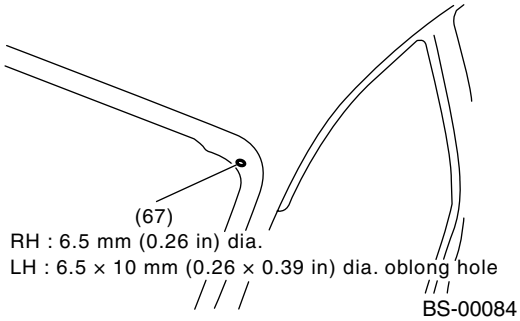

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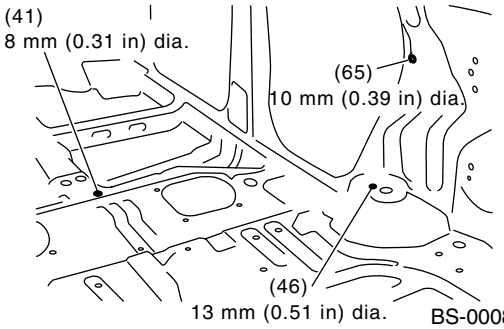

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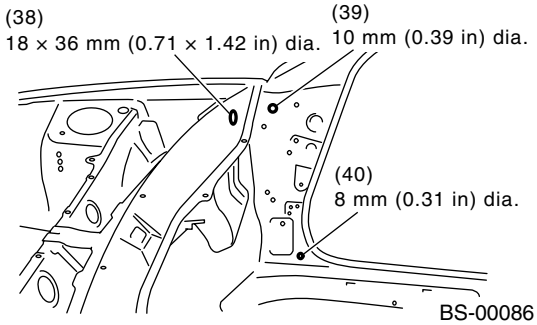

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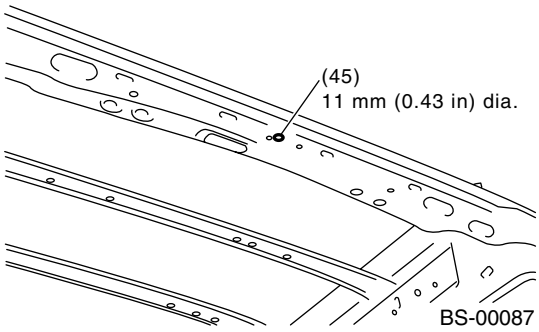
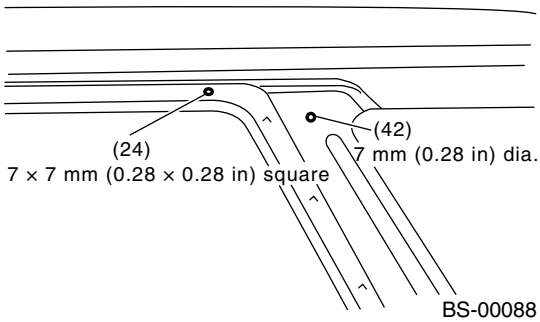


BS-00087



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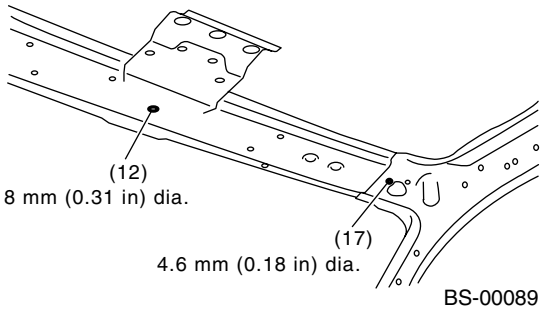

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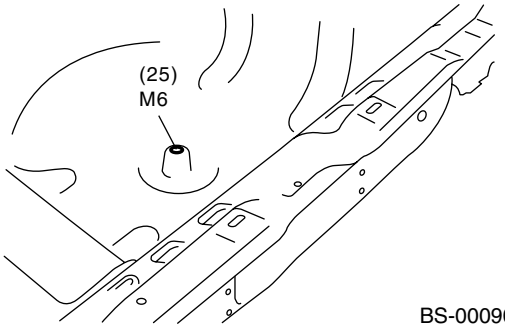
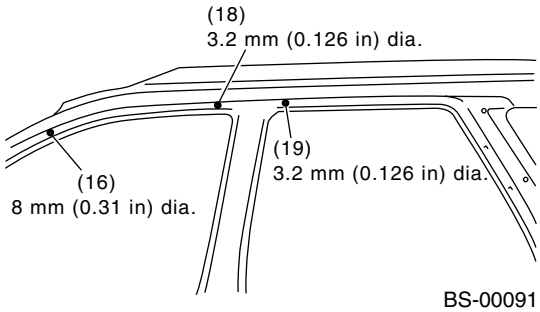


BS-00090

DATUM POINTS



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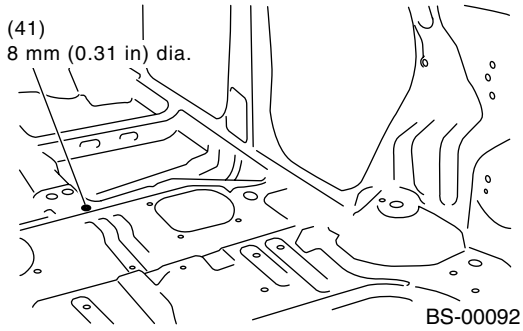

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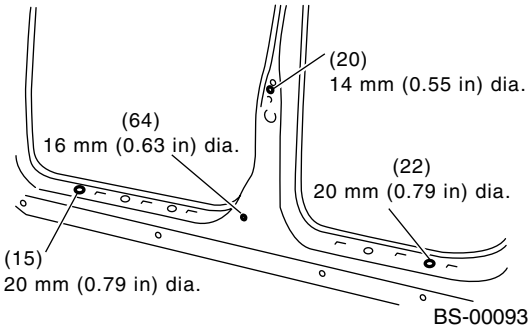

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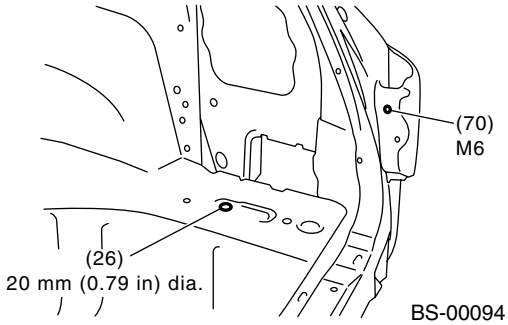
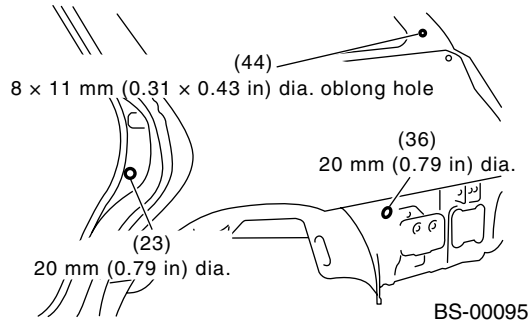
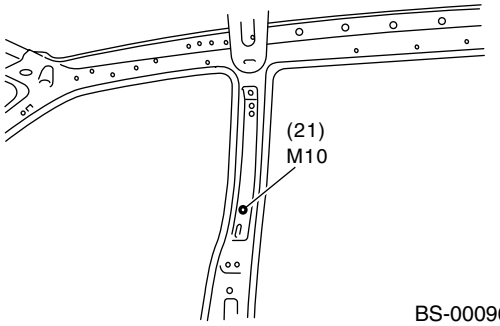


BS-00094



BS-00095



BS-00096

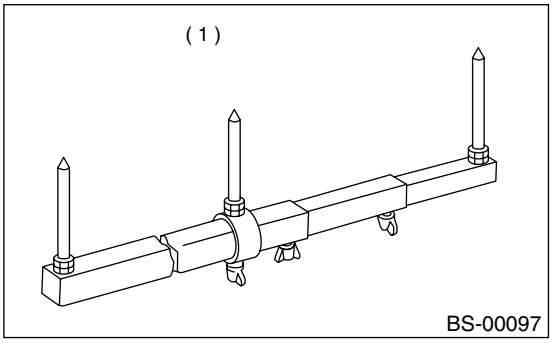
3. Datum Dimensions

A: MEASUREMENT

Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

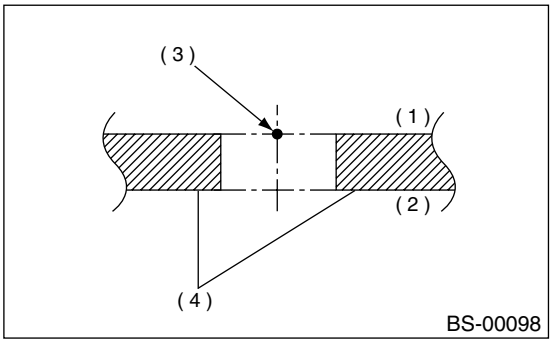
NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes “RH” and “LH” indicate right-hand and left-hand.



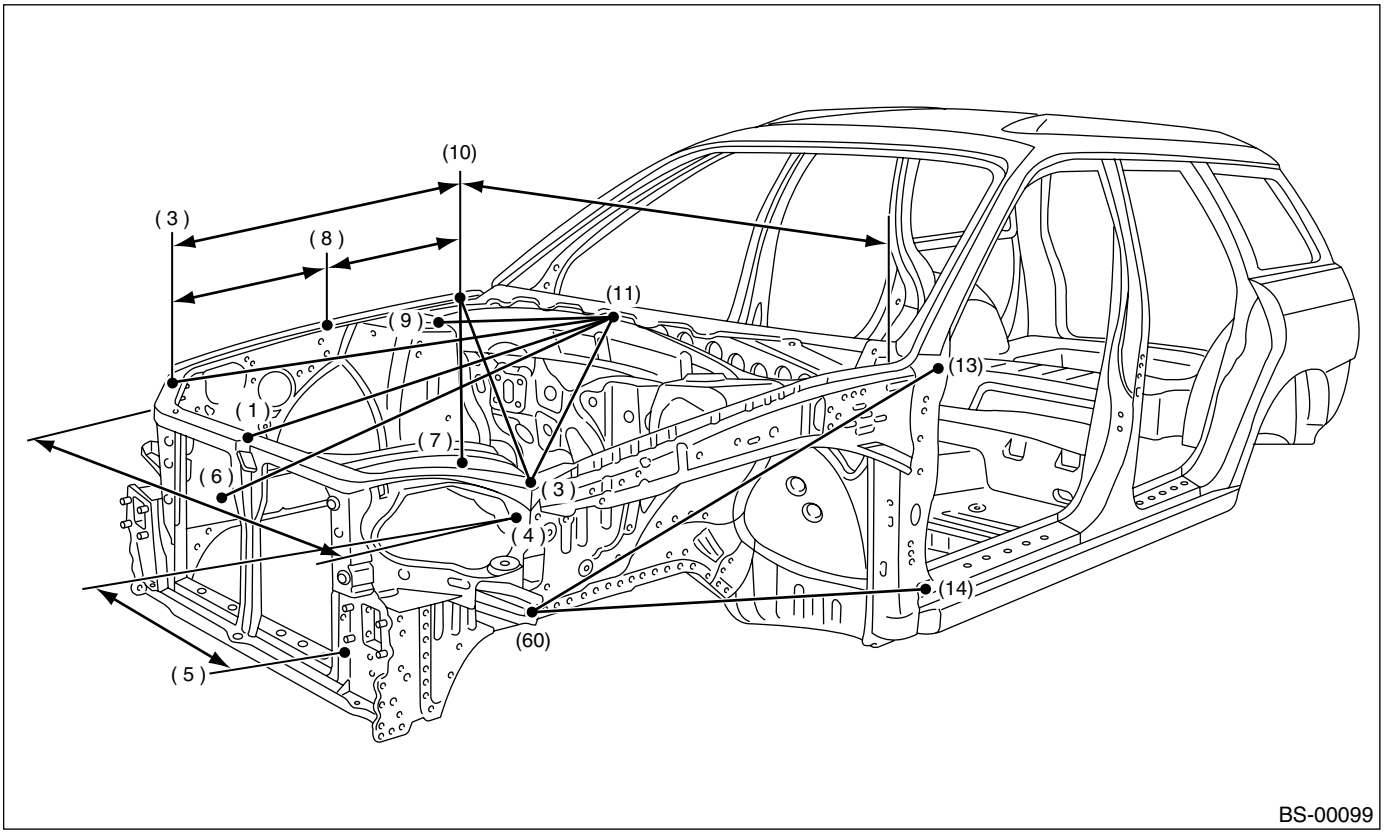
(1) Tram tracking gauge

- Measure at the center of the circle around the outside of the body panel.



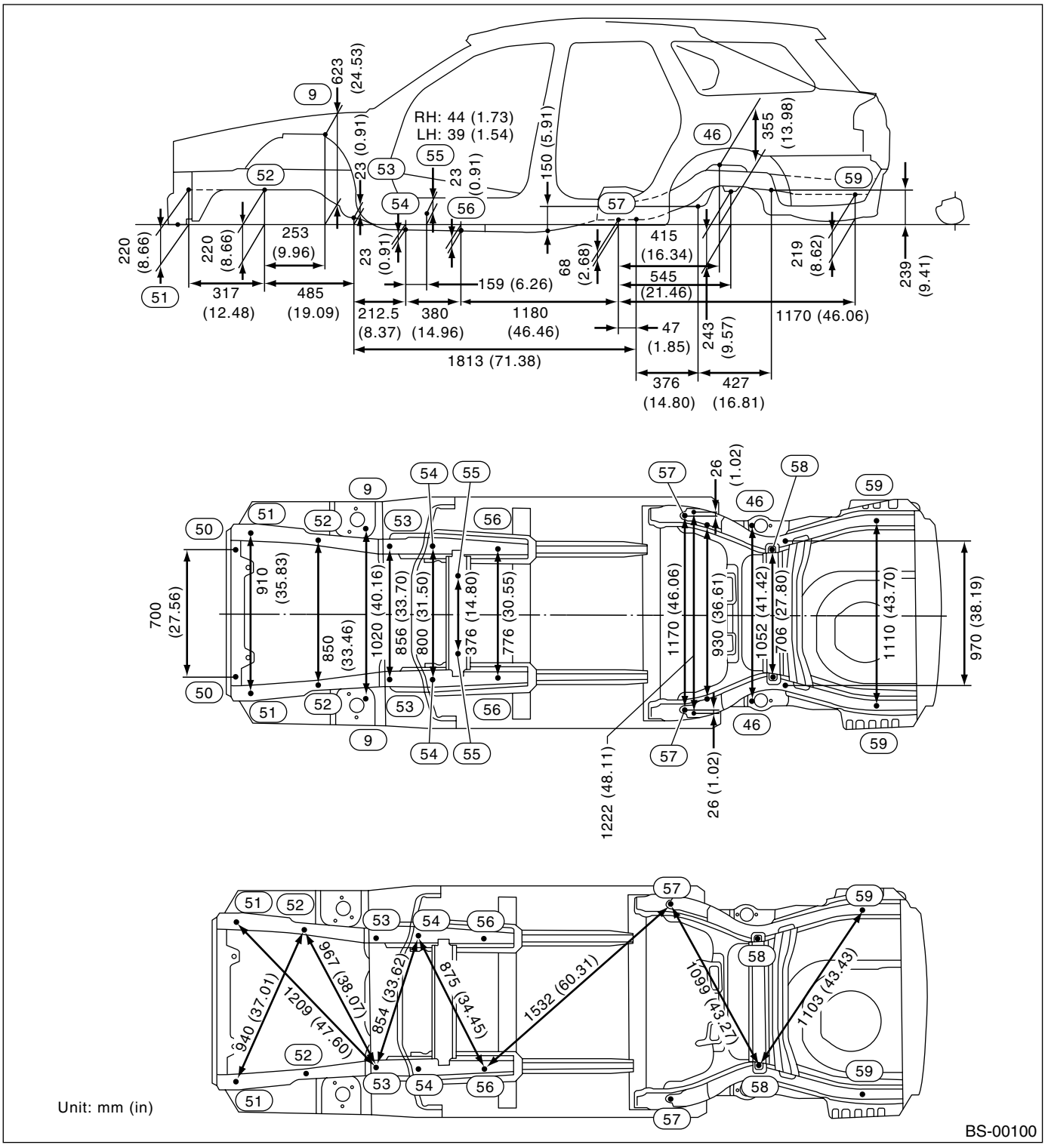
(1) Outside
(2) Inside
(3) Datum point
(4) Body panel

1. FRONT STRUCTURE



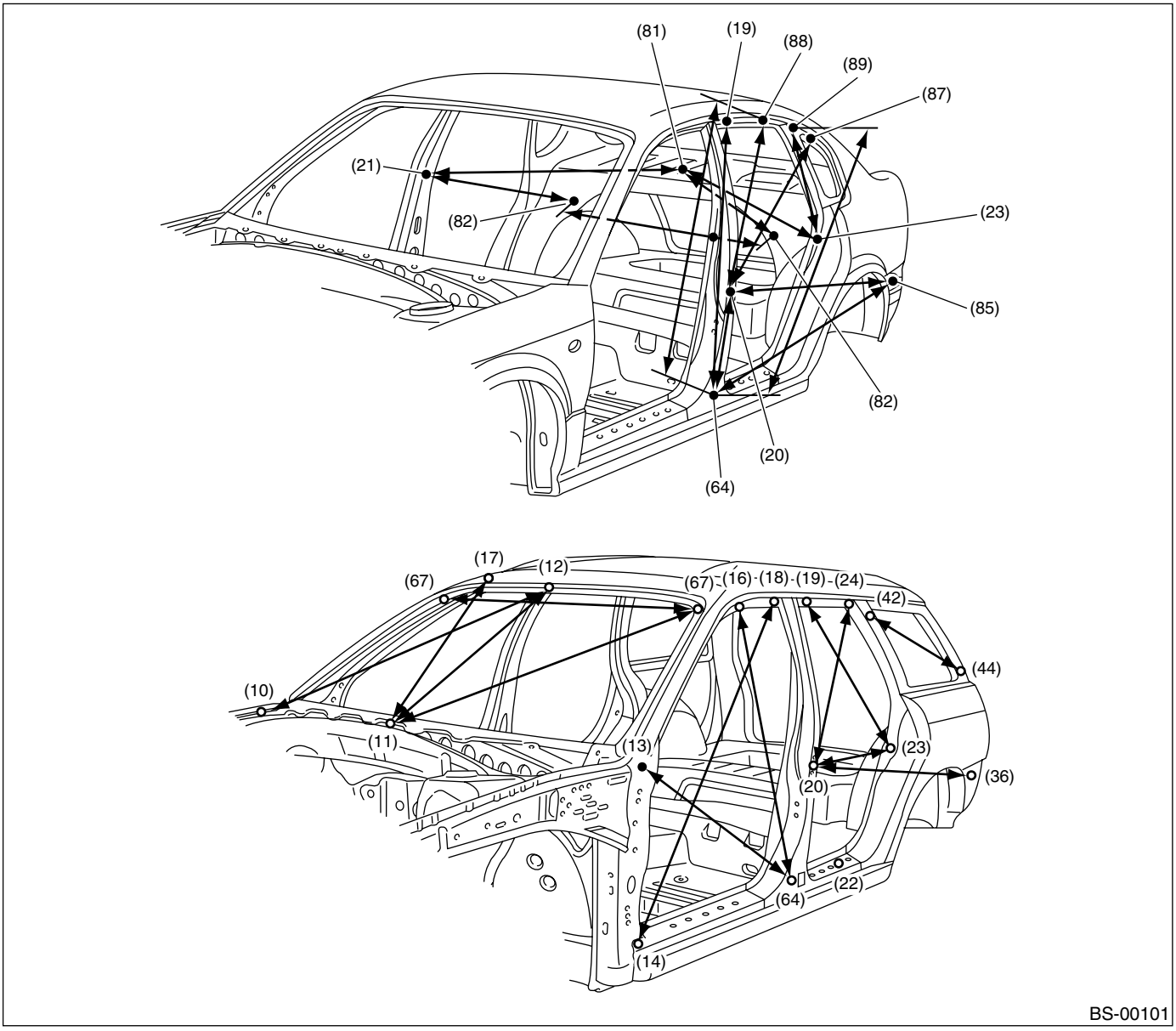
Point to point	Dimension	Point to point	Dimension
(11) to (1)	888 (34.96)	(4) RH to (4) LH	1,320 (51.97)
(11) to (9) RH	519 (20.43)	(5) RH to (4) LH	1,073 (42.24)
(11) to (9) LH	519 (20.43)	(5) LH to (4) RH	1,073 (42.24)
(11) to (6) RH	950 (37.40)	(60) RH to (13) RH	1,179 (46.42)
(11) to (6) LH	950 (37.40)	(60) LH to (13) LH	1,179 (46.42)
(11) to (3) RH	1,008 (39.68)	(60) RH to (14) RH	1,135 (44.68)
(11) to (3) LH	1,008 (39.68)	(60) LH to (14) LH	1,135 (44.68)
(10) RH to (3) RH	897 (35.31)	(10) RH to (3) LH	1,679 (66.10)
(10) RH to (8) RH	504 (19.84)	(10) LH to (3) RH	1,679 (66.10)
(10) LH to (8) LH	504 (19.84)	(8) RH to (8) LH	1,398 (55.04)
(9) RH to (9) LH	1,020 (40.16)	(8) RH to (10) LH	1,519 (59.80)
(6) RH to (6) LH	740 (29.13)	(8) LH to (10) RH	1,519 (59.80)
(6) RH to (10) LH	1,522 (59.92)	(3) RH to (8) LH	1,439 (56.65)
(6) LH to (10) RH	1,522 (59.92)	(3) LH to (8) RH	1,439 (56.65)
(8) RH to (3) RH	395 (15.55)	(7) RH to (7) LH	870 (34.25)
(8) LH to (3) LH	395 (15.55)	(7) RH to (6) LH	943 (37.13)
(10) RH to (10) LH	1,470 (57.87)	(7) LH to (6) RH	943 (37.13)
(3) RH to (3) LH	1,370 (53.94)	(7) RH to (10) LH	1,322 (52.05)
(5) RH to (5) LH	720 (28.35)	(7) LH to (10) RH	1,322 (52.05)
Unit: mm (in)			

2. CENTER STRUCTURE



MEMO:

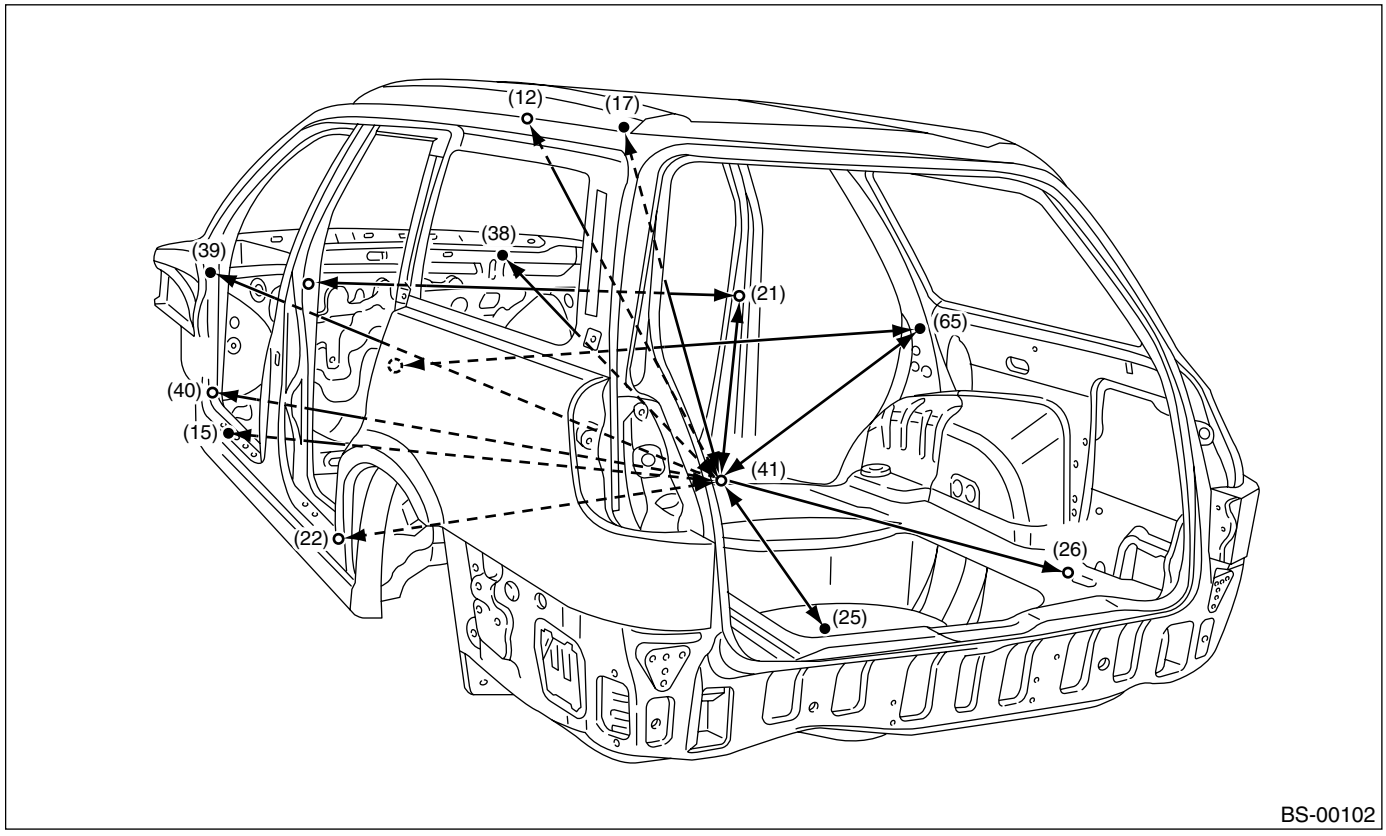
3. WINDSHIELD AND DOORS



DATUM DIMENSIONS

Point to point	Dimension	Point to point	Dimension
(14) RH to (18) RH	1,425 (56.10)	(12) to (10) RH	1,136 (44.72)
(14) LH to (18) LH	1,425 (56.10)	(12) to (10) LH	1,136 (44.72)
(13) RH to (64) RH	1,030 (40.55)	(11) to (17) RH	1,130 (44.49)
(13) LH to (64) LH	1,030 (40.55)	(11) to (17) LH	1,130 (44.49)
(16) RH to (64) RH	966 (38.03)	(81) to (82) RH	611 (24.06)
(16) LH to (64) LH	966 (38.03)	(81) to (82) LH	611 (24.06)
(20) RH to (23) RH	864 (34.02)	(81) to (21) RH	1,309 (51.54)
(20) LH to (23) LH	864 (34.02)	(81) to (21) LH	1,309 (51.54)
(20) RH to (24) RH	860 (33.86)	(81) to (23) RH	812 (31.97)
(20) LH to (24) LH	860 (33.86)	(81) to (23) LH	812 (31.97)
(19) RH to (23) RH	899 (35.39)	(82) LH to (21) LH	1,019 (40.12)
(19) LH to (23) LH	899 (35.39)	(82) RH to (21) LH	1,606 (63.23)
(20) RH to (36) RH	1,548 (60.94)	(82) RH to (82) LH	1,140 (44.88)
(20) LH to (36) LH	1,548 (60.94)	(85) LH to (20) LH	1,548 (60.94)
(42) RH to (44) RH	1,037 (40.83)	(85) LH to (64) LH	1,650 (64.96)
(42) LH to (44) LH	1,037 (40.83)	(19) LH to (64) LH	1,029 (40.51)
(11) to (12)	989 (38.94)	(20) LH to (87) LH	911 (35.87)
(67) RH to (67) LH	1,100 (43.31)	(20) LH to (88) LH	842 (33.15)
(11) to (67) RH	1,119 (44.06)	(20) LH to (64) LH	399 (15.71)
(11) to (67) LH	1,119 (44.06)	(23) LH to (89) LH	552 (21.73)
(12) to (67) RH	551 (21.69)	(88) LH to (64) LH	1,192 (46.93)
(12) to (67) LH	551 (21.69)	(89) LH to (64) LH	1,204 (47.40)
Unit: mm (in)			

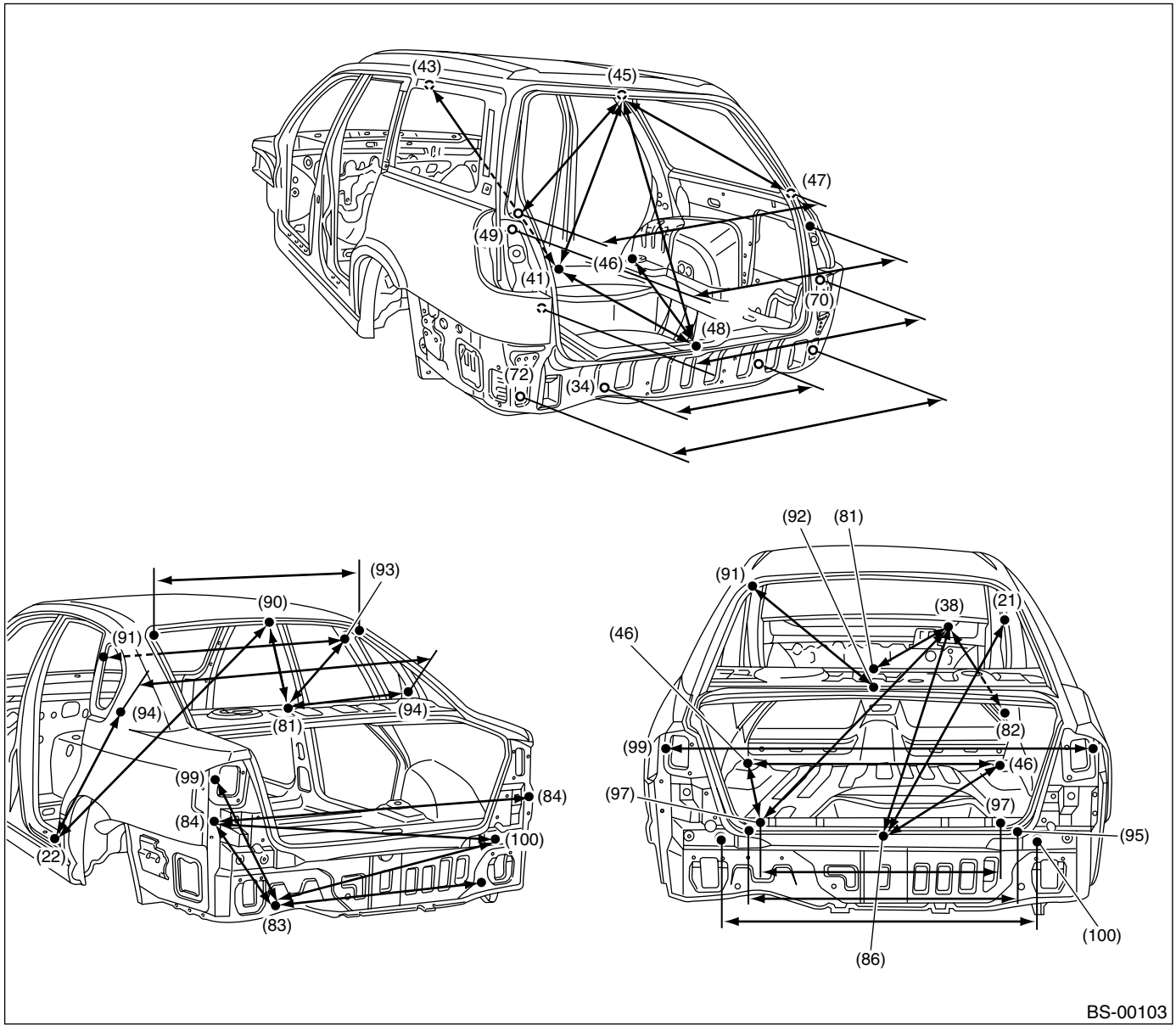
4. COMPARTMENT



Point to point	Dimension	Point to point	Dimension
(21) RH to (21) LH	1,351 (53.19)	(41) to (22) LH	738 (29.06)
(15) RH to (15) LH	1,455 (57.28)	(41) to (26) RH	1,459 (57.44)
(22) RH to (22) LH	1,455 (57.28)	(41) to (26) LH	1,459 (57.44)
(39) RH to (39) LH	1,385 (54.53)	(41) to (25)	1,290 (50.79)
(40) RH to (40) LH	1,392 (54.80)	(41) to (12)	1,228 (48.35)
(41) to (38)	1,639 (64.53)	(41) to (21) RH	940 (37.01)
(41) to (39) RH	1,642 (64.65)	(41) to (21) LH	940 (37.01)
(41) to (39) LH	1,642 (64.65)	(41) to (17) RH	1,261 (49.65)
(41) to (40) RH	1,531 (60.28)	(41) to (17) LH	1,261 (49.65)
(41) to (40) LH	1,531 (60.28)	(65) RH to (65) LH	1,307 (51.46)
(41) to (15) RH	1,342 (52.83)	(41) to (65) RH	969 (38.15)
(41) to (15) LH	1,342 (52.83)	(41) to (65) LH	969 (38.15)
(41) to (22) RH	738 (29.06)		Unit: mm (in)

MEMO:

5. TRUNK LID AND REAR GATE



DATUM DIMENSIONS

Point to point	Dimension	Point to point	Dimension
(45) to (48)	974 (38.35)	(84) RH to (84) LH	1,410 (55.51)
(45) to (47) RH	797 (31.38)	(100) RH to (84) LH	1,226 (48.27)
(45) to (47) LH	797 (31.38)	(86) to (21) RH	2,073 (81.61)
(47) RH to (47) LH	1,289 (50.75)	(86) to (21) LH	2,086 (82.13)
(49) RH to (49) LH	1,313 (51.69)	(86) to (38)	3,143 (123.74)
(34) RH to (34) LH	700 (27.56)	(86) to (46) RH	1,121 (44.13)
(41) to (45)	1,482 (58.35)	(86) to (46) LH	1,140 (44.88)
(41) to (43) RH	1,206 (47.48)	(86) to (96)	558 (21.97)
(41) to (43) LH	1,199 (47.20)	(90) to (22) RH	1,319 (51.93)
(41) to (48)	1,663 (65.47)	(90) to (22) LH	1,319 (51.93)
(48) to (46) RH	1,191 (46.89)	(22) RH to (94) LH	1,710 (67.32)
(48) to (46) LH	1,191 (46.89)	(22) LH to (94) RH	1,710 (67.32)
(70) RH to (70) LH	1,215 (47.83)	(38) to (97) RH	3,100 (122.05)
(72) RH to (72) LH	1,320 (51.97)	(38) to (97) LH	3,227 (127.05)
(81) to (38)	2,351 (92.56)	(92) to (91) RH	776 (30.55)
(81) to (90)	444 (17.48)	(92) to (91) LH	776 (30.55)
(81) to (93) RH	719 (28.31)	(91) RH to (91) LH	976 (38.43)
(81) to (93) LH	719 (28.31)	(46) LH to (97) LH	1,008 (39.68)
(81) to (94) RH	632 (24.88)	(46) LH to (97) RH	1,374 (54.09)
(81) to (94) LH	632 (24.88)	(46) LH to (46) RH	1,052 (41.42)
(38) to (82) RH	2,178 (85.75)	(93) RH to (93) LH	1,099 (43.27)
(38) to (82) LH	2,419 (95.24)	(94) RH to (94) LH	1,257 (49.49)
(83) RH to (83) LH	930 (36.61)	(95) RH to (95) LH	1,115 (43.90)
(84) RH to (83) LH	1,216 (47.87)	(97) RH to (97) LH	830 (32.68)
(99) RH to (83) LH	1,246 (49.06)	(99) RH to (99) LH	1,370 (53.94)
(100) RH to (83) LH	991 (39.02)	(100) RH to (100) LH	1,020 (40.16)
Unit: mm (in)			

MEMO:

INSTRUMENTATION/DRIVER INFO

IDI

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1.	General Description	2
2.	Combination Meter System	4
3.	Combination Meter Assembly	13
4.	Speedometer	15
5.	Tachometer	16
6.	Fuel Gauge	17
7.	Water Temperature Gauge	18
8.	Ambient Sensor	19

1. General Description

A: SPECIFICATIONS

Combination meter	Speedometer	Electric pulse type
	Temperature gauge	Cross coil type
	Fuel gauge	Cross coil type
	Tachometer	Electric pulse type
	Turn signal indicator light	12 V — 1.4 W
	Charge warning light	12 V — 1.4 W
	Oil pressure warning light	12 V — 1.4 W
	ABS warning light	12 V — 1.4 W
	CHECK ENGINE warning light (Malfunction indicator light)	12 V — 1.4 W
	HI-beam indicator light	12 V — 1.4 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	12 V — 1.4 W
	FWD indicator light	12 V — 1.4 W
	AIRBAG warning light	12 V — 1.4 W
	Meter illumination light	12 V — 3.4 W
	AT OIL TEMP. warning light	12 V — 1.4 W
	Security indicator light	LED
	VDC warning light	12 V — 1.4 W
	VDC function indicator light	12 V — 3 W
	VDC OFF indicator light	12 V — 1.4 W
	Low fuel warning light	12 V — 1.4 W
	Cargo light indicator light	LED
	Switch back gate indicator light	LED
	AT select lever position indicator light	12 V — 100 mA
	SPORT shift indicator	LED
	Cruise set indicator light	12 V — 1.4 W
	LCD back light	12 V — 1.4 W

B: CAUTION

- Be careful not to damage meters and instrument panel.
- Be careful not to damage meter glasses.
- Make sure that electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Combination Meter System

A: SCHEMATIC

1. COMBINATION METER

<Ref. to WI-115, SCHEMATIC, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-258, SCHEMATIC, Outside Temperature Display System.>

B: INSPECTION

CAUTION:
• When measuring voltage and resistance of the ECM, TCM, or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).

1. SYMPTOM CHART

Symptom	Repair order	Reference
Combination meter assembly does not operate.	(1) Power supply (2) Ground circuit	<Ref. to IDI-5, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	(1) (MT) Vehicle speed sensor (AT) Transmission control module (2) Harness (3) Speedometer	MT: <Ref. to IDI-6, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT: <Ref. to IDI-7, CHECK TRANSMISSION CONTROL MODULE, INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) Engine control module (2) Harness (3) Tachometer	<Ref. to IDI-8, CHECK ENGINE CONTROL MODULE, INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	(1) Fuel level sensor (2) Harness (3) Fuel gauge	<Ref. to IDI-9, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Water temperature gauge does not operate.	(1) Engine coolant temperature sensor (2) Harness (3) Water temperature gauge	<Ref. to IDI-11, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	(1) Ambient sensor (2) Harness (3) Combination meter	<Ref. to IDI-12, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1) Remove combination meter. <Ref. to IDI-13, REMOVAL, Combination Meter Assembly.> 2) Disconnect combination meter harness connector. 3) Turn ignition switch to ON. 4) Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Check harness for open or short between ignition relay and combination meter.
2	**CHECK POWER SUPPLY FOR COMBINATION METER.** Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Check harness for open or short between fuse and combination meter.
3	**CHECK GROUND CIRCUIT OF COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Measure resistance of harness between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 20 (+) — Chassis ground (–):***	Is the measured value less than 10 Ω?	Go to step **4.**	Repair wiring harness.
4	**CHECK GROUND CIRCUIT OF COMBINATION METER.** Measure resistance of harness between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 16 (+) — Chassis ground (–):***	Is the measured value less than 10 Ω?	Replace combination meter.	Repair wiring harness.

3. CHECK VEHICLE SPEED SENSOR

	Step	Check	Yes	No
1	**CHECK VEHICLE SPEED SENSOR.** 1) Lift-up the vehicle and support it with safety stands. 2) Remove the combination meter with harness connector. 3) Drive the vehicle at a speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to get caught in the running wheels.** 4) Measure voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 1 V or more than 5 V?	Check speedometer. <Ref. to IDI-15, REMOVAL, Speedometer.>	Go to step **2.**
2	**CHECK VEHICLE SPEED SENSOR POWER SUPPLY.** 1) Turn ignition switch to OFF. 2) Disconnect vehicle speed sensor harness connector. 3) Turn ignition switch to ON. 4) Measure voltage between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Engine ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Check harness for open or short between ignition relay and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn ignition switch to OFF. 2) Measure resistance between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the measured value less than 10 Ω?	Go to step **4.**	Repair wiring harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.** 1) Disconnect connector from combination meter. 2) Measure resistance between vehicle speed sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(B17) No. 1 — (i10) No. 13:***	Is the measured value less than 10 Ω?	Replace vehicle speed sensor.	Repair wiring harness.

4. CHECK TRANSMISSION CONTROL MODULE

Step		Check	Yes	No
1	**CHECK TRANSMISSION CONTROL MODULE SIGNAL.** 1) Lift-up the vehicle and support it with safety stands. 2) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to get caught in the running wheels.** 3) Measure voltage between transmission control module connector and chassis ground. ***Connector & terminal*** ***H4 with TURBO:*** ***(B56) No. 1 (+) — Chassis ground (–):*** ***H6 with VDC:*** ***(B56) No. 17 (+) — Chassis ground (–):*** ***H6 without VDC:*** ***(B55) No. 13 (+) — Chassis ground (–):*** ***H4 NA U5 with SPORTS SHIFT:*** ***(B56) No. 17 (+) — Chassis ground (–):*** ***H4 NA U5 without SPORTS SHIFT:*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***With SPORTS SHIFT except for H4 NA U5:*** ***(B56) No. 17 (+) — Chassis ground (–):*** ***Without SPORTS SHIFT except for H4 NA U5:*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the measured value less than 1 V or more than 5 V?	Go to step **2.**	Check transmission control module. <Ref. to 4AT(H4SO)-2, Basic Diagnostic Procedure.> or <Ref. to 4AT(H4DOTC)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN TRANSMISSION CONTROL MODULE AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from transmission control module and combination meter. 3) Measure resistance between transmission control module harness connector and combination meter harness connector. ***Connector & terminal*** ***H4 with TURBO:*** ***(B56) No. 1 — (i10) No. 13:*** ***H6 with VDC:*** ***(B56) No. 17 — (i10) No. 13:*** ***H6 without VDC:*** ***(B55) No. 13 — (i10) No. 13:*** ***H4 NA U5 with SPORTS SHIFT:*** ***(B56) No. 17 — (i10) No. 13:*** ***H4 NA U5 without SPORTS SHIFT:*** ***(B55) No. 8 — (i10) No. 13:*** ***With SPORTS SHIFT except for H4 NA U5:*** ***(B56) No. 17 — (i10) No. 13:*** ***Without SPORTS SHIFT except for H4 NA U5:*** ***(B55) No. 13 — (i10) No. 13:***	Is the measured value less than 10 Ω?	Check speed meter. <Ref. to IDI-15, REMOVAL, Speedometer.>	Repair wiring harness.

5. CHECK ENGINE CONTROL MODULE

	Step	Check	Yes	No
1	**CHECK ENGINE CONTROL MODULE SIGNAL.** 1) Start the engine. 2) Measure voltage between engine control module connector and engine ground. ***Connector & terminal*** ***H4 with TURBO:*** ***(B134) No. 23 (+) — Engine ground (–):*** ***H6 model:*** ***(B136) No. 9 (+) — Engine ground (–):*** ***H4 NA U5 model:*** ***(B137) No. 9 (+) — Engine ground (–):*** ***H4 NA model (Except U5 model):*** ***(B134) No. 10 (+) — Engine ground (–):***	Is the measured value within 0 V to 14 V?	Go to step **2.**	Check engine control module. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4SOU5)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ENGINE CONTROL MODULE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine control module and combination meter. 3) Measure resistance between engine control module harness connector and combination meter harness connector. ***Connector & terminal*** ***H4 with TURBO:*** ***(B134) No. 23 — (i11) No. 7:*** ***H6 model:*** ***(B136) No. 9 — (i11) No. 7:*** ***H4 NA U5 model:*** ***(B137) No. 9 — (i11) No. 7:*** ***H4 NA model (Except U5 model):*** ***(B134) No. 10 — (i11) No. 7:***	Is the measured value less than 10 Ω?	Check tachometer. <Ref. to IDI-16, REMOVAL, Tachometer.>	Repair wiring harness.

6. CHECK FUEL LEVEL SENSOR

	Step	Check	Yes	No
1	**CHECK ENGINE MODEL.**	Is the engine with TURBO?	Go to step **7.**	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel level sensor. <Ref. to FU(H4SO)-68, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(H4SO U5)-72, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(H6DO)-70, REMOVAL, Fuel Level Sensor.> 2) Measure the resistance between the fuel level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 3 — No. 6***	Is the measured value 0.5 to 2.5 Ω at FULL or 52.5 to 54.5 Ω at EMPTY?	Go to step **3.**	Replace the fuel level sensor.
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-69, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(H4SO U5)-73, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(H6DO)-71, REMOVAL, Fuel Sub Level Sensor.> 2) Measure the resistance between the fuel sub level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 1 — No. 2***	Is the measured value 0.5 to 2.5 Ω at FULL or 39.5 to 41.5 Ω at EMPTY?	Go to step **4.**	Replace the fuel sub level sensor.
4	**CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.** 1) Disconnect the connector from the combination meter. 2) Measure the resistance between the fuel sub level sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(R59) No. 1 — (i10) No. 3:***	Is the measured value less than 10 Ω?	Go to step **5.**	Repair wiring harness.
5	**CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.** Measure the resistance between the fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. ***Connector & terminal*** ***(R58) No. 6 — (R59) No. 2:***	Is the measured value less than 10 Ω?	Go to step **6.**	Repair wiring harness.
6	**CHECK FUEL LEVEL SENSOR GROUND CIRCUIT.** Measure the resistance between the fuel level sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(R58) No. 3 — Chassis ground:***	Is the measured value less than 10 Ω?	Check the fuel gauge. <Ref. to IDI-17, REMOVAL, Fuel Gauge.>	Repair wiring harness.

	Step	Check	Yes	No
7	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel level sensor. <Ref. to FU(H4DOTC)-70, REMOVAL, Fuel Level Sensor.> 2) Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 50 to 52 Ω (EMPTY)?	Go to step **8.**	Replace the fuel level sensor.
8	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-71, REMOVAL, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 42 to 44 Ω (EMPTY)?	Go to step **9.**	Replace the fuel sub level sensor.
9	**CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.** 1) Disconnect the connector from combination meter. 2) Measure the resistance between fuel sub level sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(R58) No. 2 — (i10) No. 3:***	Is the resistance less than 10 Ω?	Go to step **10.**	Repair the wiring harness.
10	**CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.** Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. ***Connector & terminal*** ***(R58) No. 3 — (R59) No.2:***	Is the resistance less than 10 Ω?	Go to step **11.**	Repair the wiring harness.
11	**CHECK FUEL LEVEL SUB SENSOR GROUND CIRCUIT.** Measure the resistance between fuel level sub sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Check the fuel gauge. <Ref. to IDI-17, Removal.>	Repair the wiring harness.

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Check engine coolant temperature sensor. <Ref. to EN(H4SO)-2, Basic Diagnostic Procedure.>, or <Ref. to EN(H4SO U5)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>	Is engine coolant temperature sensor OK?	Go to step **2.**	Replace engine coolant temperature sensor.
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER.** 1) Turn ignition switch to OFF. 2) Disconnect connector from engine coolant temperature sensor and combination meter. 3) Measure resistance between engine coolant temperature sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***Normal meter:*** ***(E8) No. 3 — (i12) No. 8:***	Is the measured value less than 10 Ω?	Go to step **3.**	Repair wiring harness.
3	**CHECK WATER TEMPERATURE GAUGE GROUND CIRCUIT.** Measure resistance between combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i12) No. 9 — Chassis ground:***	Is the measured value less than 10 Ω?	Check water temperature gauge. <Ref. to IDI-18, REMOVAL, Water Temperature Gauge.>	Repair wiring harness.

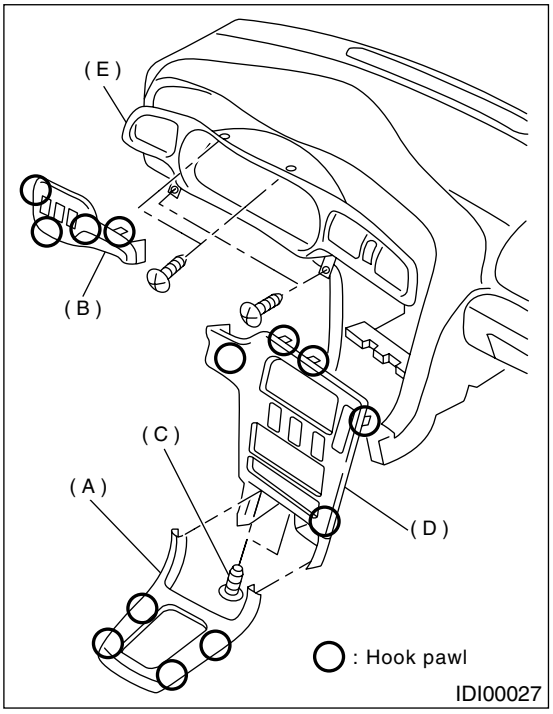
8. CHECK OUTSIDE TEMPERATURE INDICATOR

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AMBIENT SENSOR.** 1) Turn ignition switch OFF. 2) Disconnect connector from ambient sensor. 3) Turn ignition switch ON. 4) Measure voltage between ambient sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(F78) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 4 V?	Go to step **2.**	Check harness for open or short between ambient sensor and combination meter.
2	**CHECK AMBIENT SENSOR.** 1) Turn ignition switch OFF. 2) Remove ambient sensor. 3) Check ambient sensor. <Ref. to IDI-19, INSPECTION, Ambient Sensor.>	Is the ambient sensor OK?	Go to step **3.**	Replace the ambient sensor.
3	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1) Disconnect connector from combination meter. 2) Measure resistance between ambient sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(F78) No. 2 — (i10) No. 22:***	Is the measured value less than 10 Ω?	Go to step **4.**	Repair wiring harness.
4	**CHECK OUTSIDE TEMPERATURE INDICATOR.** 1) Connect combination meter harness connector. 2) Connect a resistor (1.7 kΩ) between terminals of ambient sensor harness connector. 3) Turn ignition switch ON and check the outside temperature indicator display.	Is the outside temperature indicator indicating 25°C (77°F)?	Outside temperature indicator is OK.	Replace combination meter printed circuit.

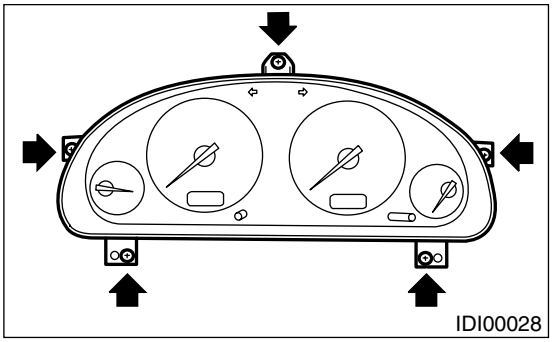
3. Combination Meter Assembly

A: REMOVAL

1) Disconnect ground cable from battery.
2) Set tilt steering at the lowest position.
3) Disconnect each electrical connector to remove front cover (A) and switch panel (B).
4) Loosen screws (C) to remove center panel (D).
5) Remove meter visor (E).



6) Remove screws of combination meter to pull out the meter toward you.
7) Remove connector in the upper area of combination meter to remove meter.



CAUTION:
• Be careful not to damage meter or instrument panel.
• Pay particular attention to avoid damaging the meter glass.

B: INSTALLATION

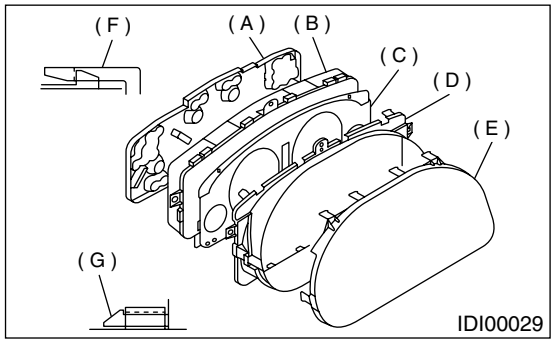
Install in the reverse order of removal.

CAUTION:
• Make sure that electrical connector is connected securely.
• Make sure that each meter operates normally.

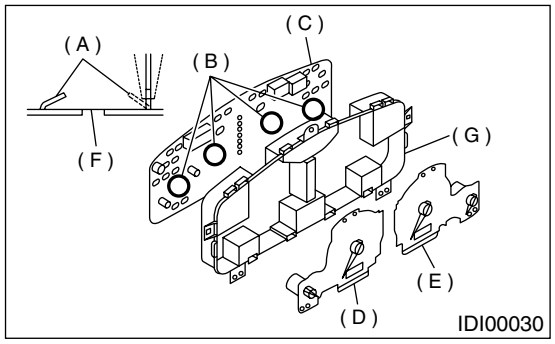
C: DISASSEMBLY

CAUTION:
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

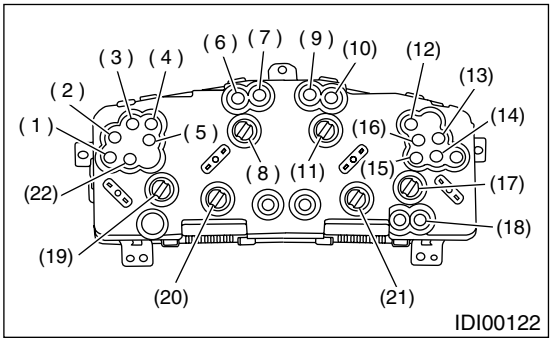
1) Disengage claw (F) to remove case (B) from back cover (A).
2) Disengage claw (G) to remove meter glass (E), reflector (D), and window plate (C) from inner case.



3) Pull up claw (A) in portion (B) of printed circuit (C) with combination pliers. Push out speedometer assembly (D) and tachometer assembly (E) using hole (F).
4) Pull up claw in the center of printed circuit (C), and remove printed circuit from case (G).



1. BULB REPLACEMENT



(1) FWD
(2) AT OIL TEMP
(3) Oil pressure
(4) Check engine
(5) Charge
(6) HI-beam
(7) Turn RH
(8) Tachometer
(9) Turn LH
(10) Brake
(11) Speedometer
(12) VDC function
(13) Airbag
(14) ABS
(15) VDC OFF
(16) VDC
(17) Speedometer and fuel gauge
(18) Low fuel
(19) Tachometer and water temperature gauge
(20) LCD
(21) LCD
(22) Curise set

D: ASSEMBLY

Assemble in the reverse order of disassembly.

4. Speedometer

A: REMOVAL

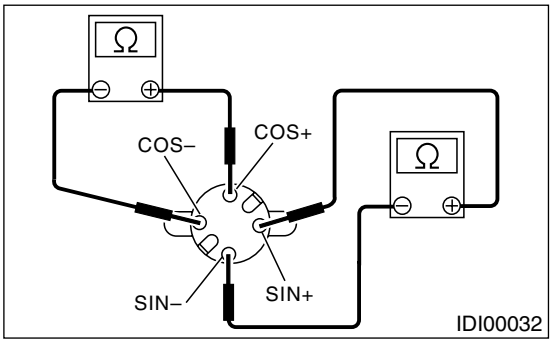
Disassemble combination meter, and then remove speedometer and fuel gauge assembly. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure speedometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN–	200±8 Ω
Terminals COS+ and COS–	200±8 Ω

If NG, replace speedometer and fuel gauge assembly.
If OK, replace combination meter printed circuit.

5. Tachometer

A: REMOVAL

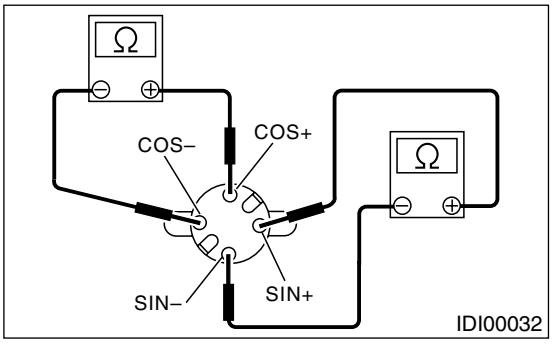
Disassemble combination meter, and then remove tachometer and water temperature gauge assembly. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure tachometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN–	200±8 Ω
Terminals COS+ and COS–	200±8 Ω

If NG, replace tachometer and water temperature gauge assembly.
If OK, replace combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

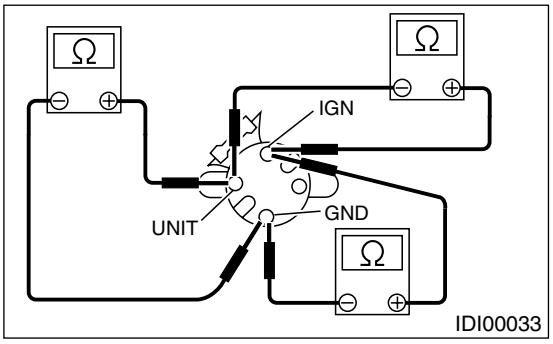
Disassemble combination meter, and then remove speedometer and fuel gauge assembly. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure fuel gauge resistance.



Terminal	Resistance
Terminals IGN and GND	170±10 Ω
Terminals IGN and UNIT	35±10 Ω
Terminals UNIT and GND	136±10 Ω

If NG, replace speedometer and fuel gauge assembly.
If OK, replace combination meter printed circuit.

7. Water Temperature Gauge

A: REMOVAL

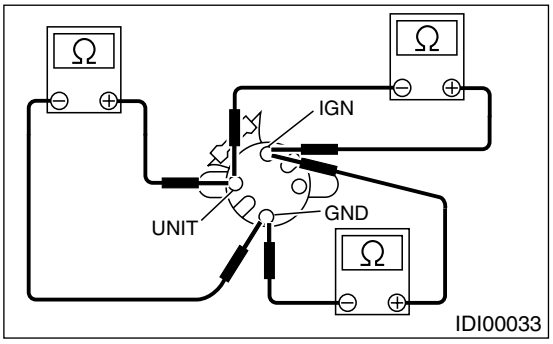
Disassemble combination meter, and then remove tachometer and water temperature gauge assembly. <Ref. to IDI-13, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure water temperature gauge resistance.



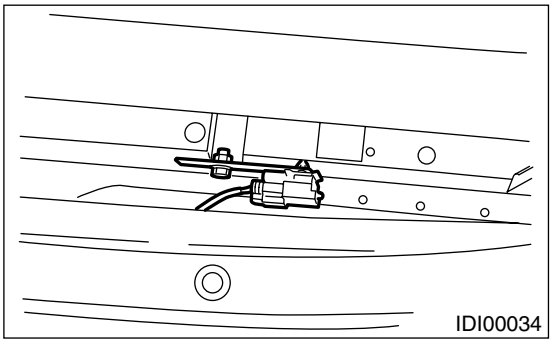
Terminal	Resistance
Terminals IGN and GND	208±10 Ω
Terminals IGN and UNIT	56±10 Ω
Terminals UNIT and GND	264±10 Ω

If NG, replace tachometer and water temperature gauge assembly.
If OK, replace combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

1) Open front hood.
2) Disconnect ground cable from battery.
3) Disconnect ambient sensor connector.
4) Remove ambient sensor from radiator lower panel.

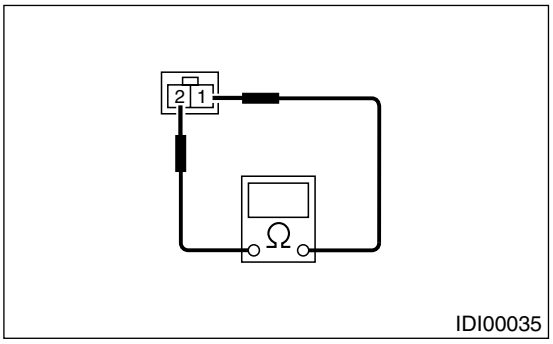


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure ambient sensor resistance.



Terminal No.	Resistance
1 and 2	1.7 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

MEMO:

SEATS

SE

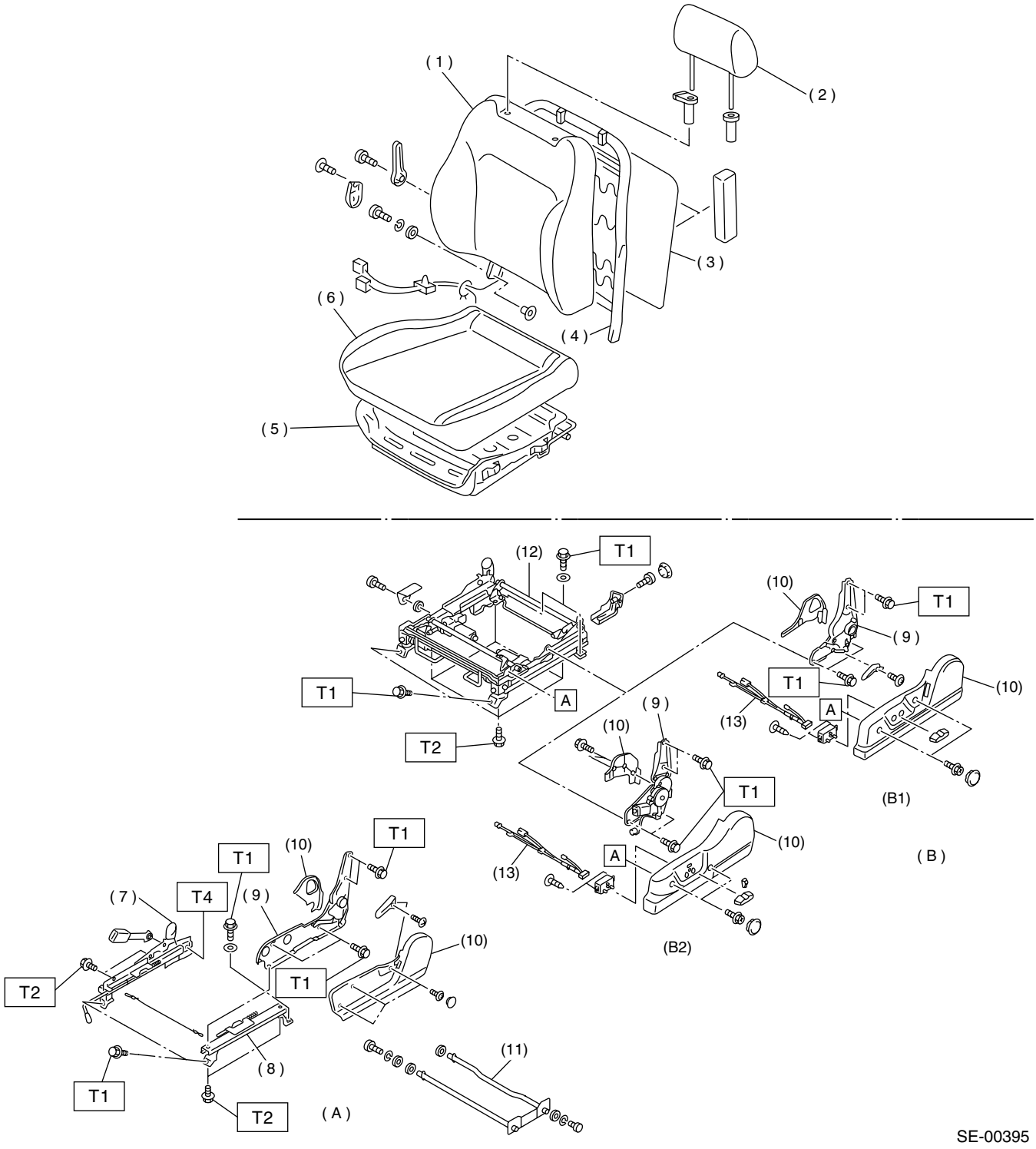
Page

1. General Description 2
2. Front Seat 8
3. Rear Seat 18

1. General Description

A: COMPONENT

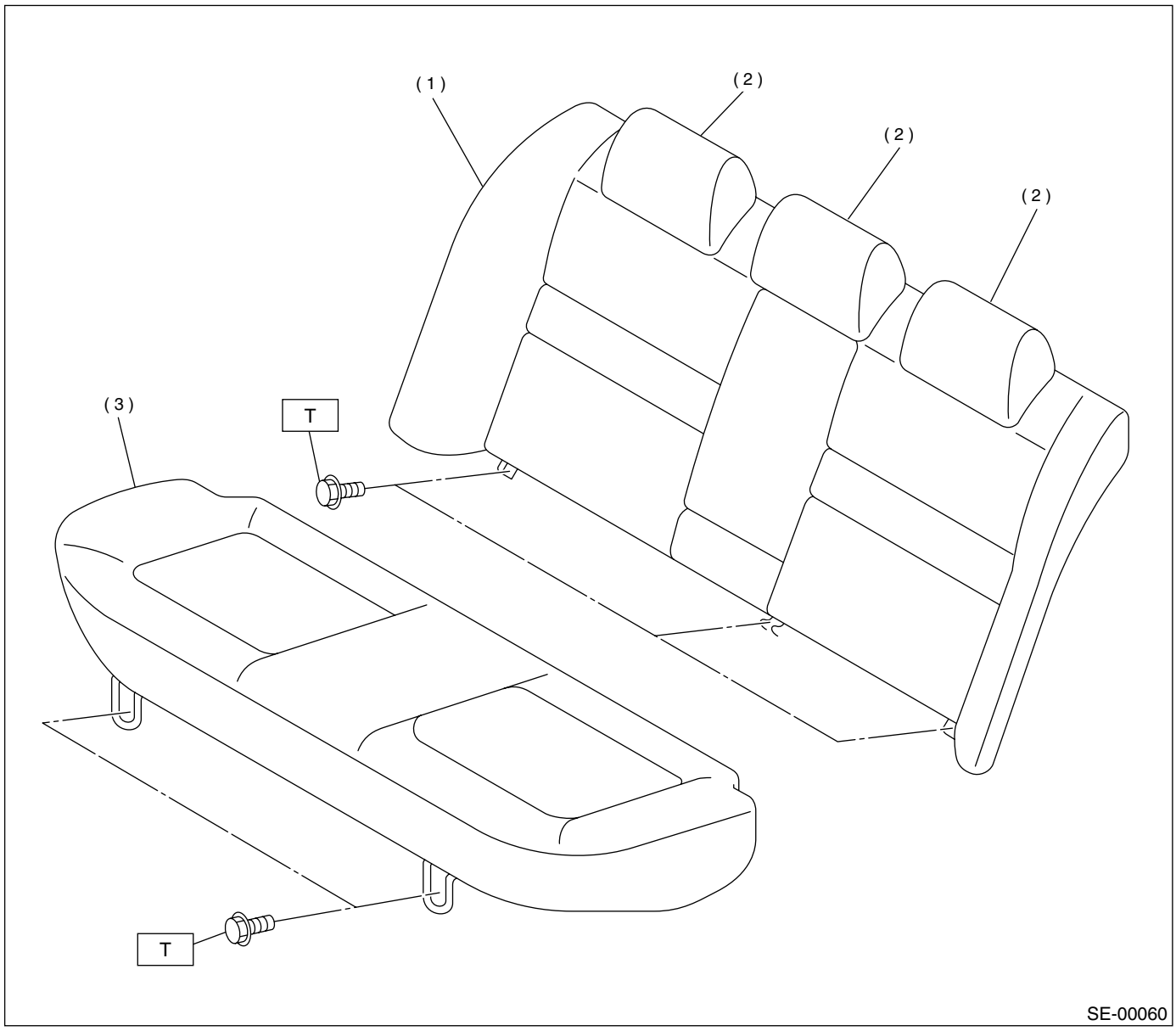
1. FRONT SEAT



(1) Seat back pad
(2) Headrest
(3) Seat back board
(4) Seat back frame ASSY
(5) Seat cushion frame ASSY
(6) Seat cushion pad
(7) Slide rail inner ASSY
(8) Slide rail outer ASSY
(9) Hinge ASSY
(10) Hinge cover
(11) Rod
(12) Slide and unit ASSY
(13) Power seat harness
(A) Standard seat
(B) Power seat
(B1) 6 way power seat
(B2) 8 way power seat

Tightening troque: N·m (kgf-m, ft-lb)
T1: 53 (5.4, 39)
T2: 18 (1.8, 13)
T3: 6 (0.6, 4.3)
T4: 30 (3.1, 22)

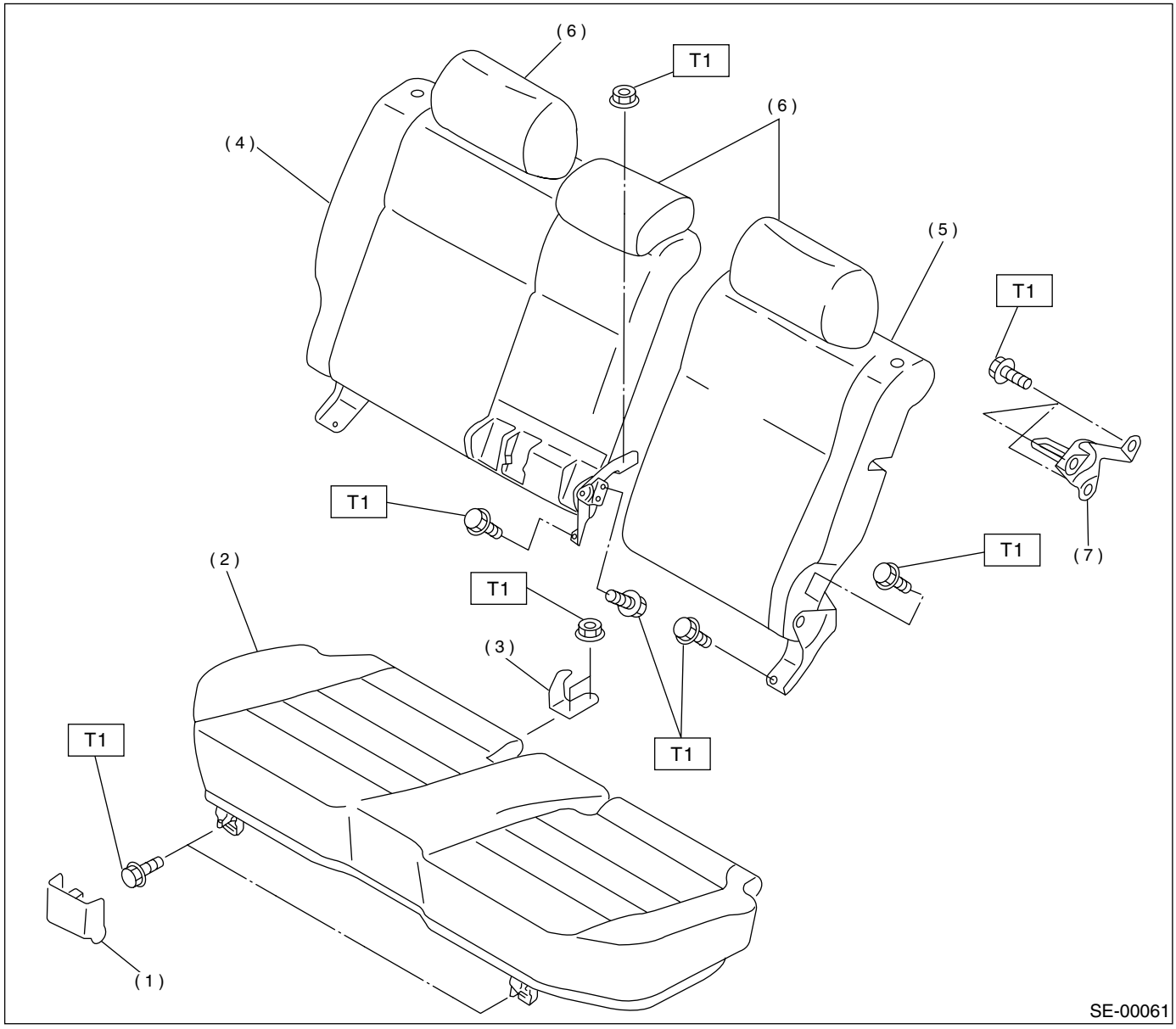
2. REAR SEAT (SEDAN)



(1) Backrest
(2) Headrest
(3) Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T: 24.5 (2.50, 18.1)

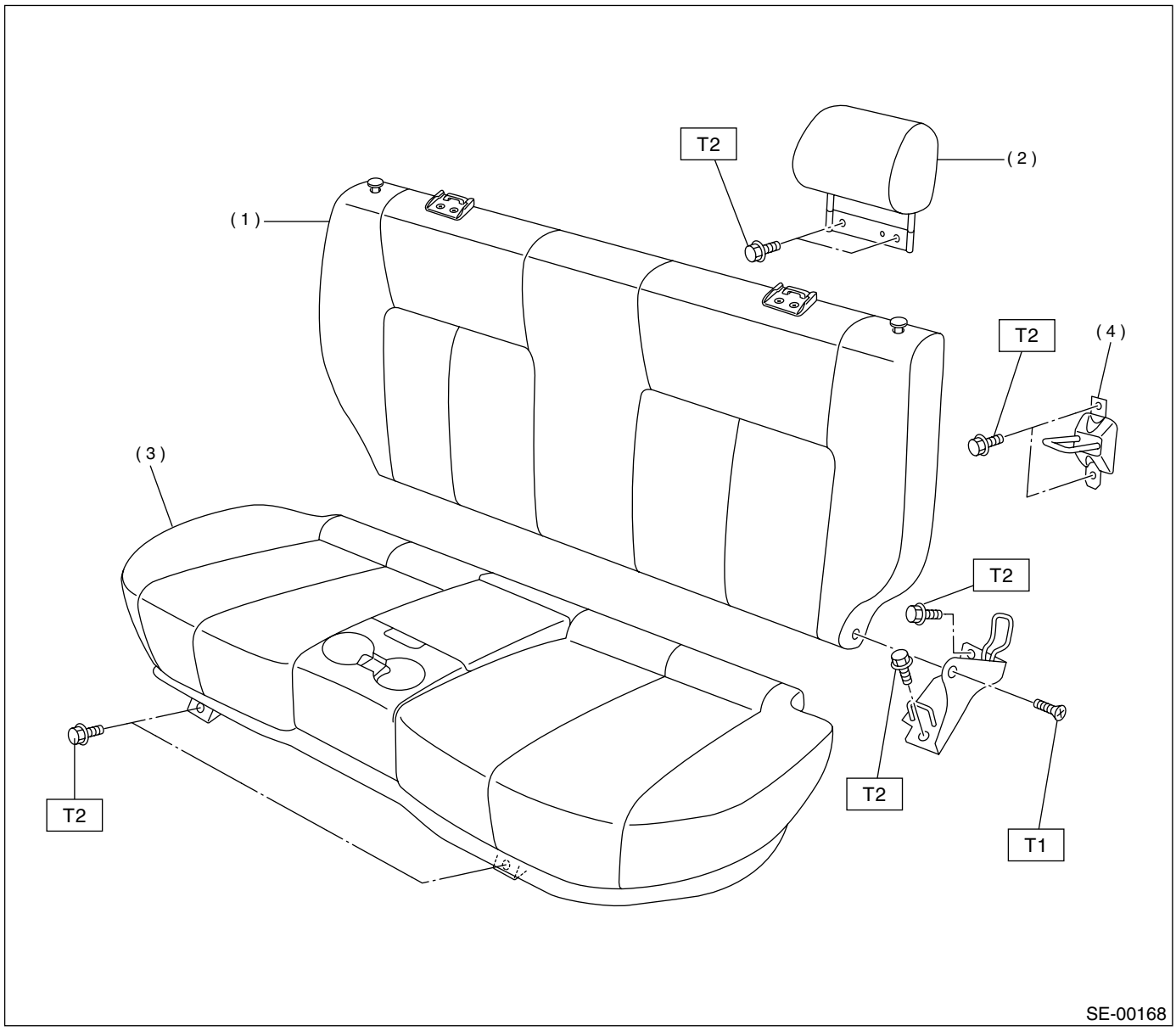
3. REAR SEAT (WAGON)



(1) Cover
(2) Cushion
(3) Hook
(4) Backrest RH
(5) Backrest LH
(6) Headrest
(7) Striker

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.50, 18.1)

4. REAR SEAT (PICKUP)



(1) Backrest
(2) Headrest
(3) Cushion
(4) Striker

Tightening torque: N·m (kgf-m, ft-lb)
T1: 9.8 (1.0, 7.2)
T2: 24.5 (2.5, 18.1)

B: CAUTION

• Take care not to contaminate or damage seat surface.
• While loading to or unloading to vehicle, take care not to contact body.

C: PREPARATION TOOL

1. GENERAL TOOL

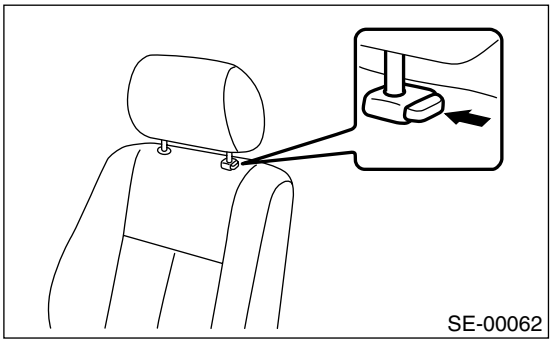
TOOL NAME	REMARKS
Long Nose Pliers	Used for removing and installing hog ring

2. Front Seat

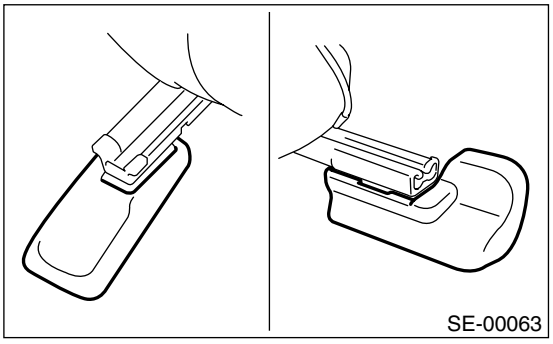
A: REMOVAL

1. STANDARD SEAT

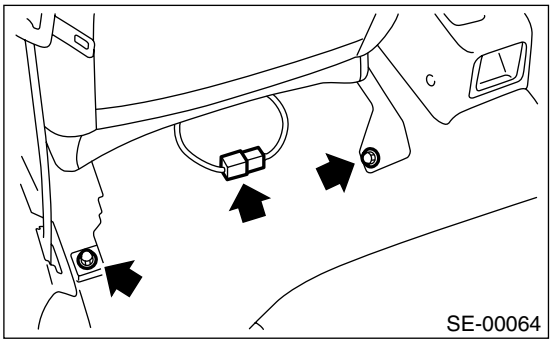
1) Disconnect ground cable from battery.
2) While pressing headrest lock button, remove headrest.



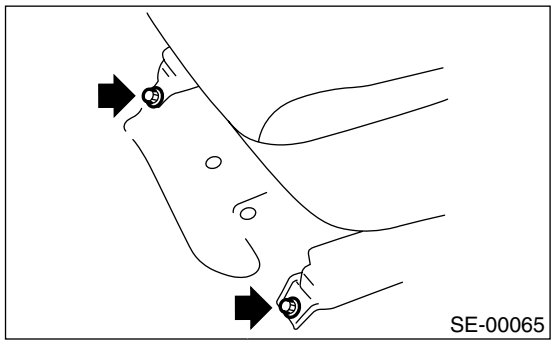
3) Tilt forward backrest.
4) Move seat to full front end.
5) Remove bolt cover at rear end of slide rail.



6) Disconnect side airbag connector under the seat. (Side airbag equipped vehicle)
7) Disconnect connectors of seat heater and seat belt warning. (Seat heater equipped vehicle)
8) Remove two bolts at rear side of seat rail.



9) Move seat to full rear end.
10) Remove two bolts at front side of seat rail.

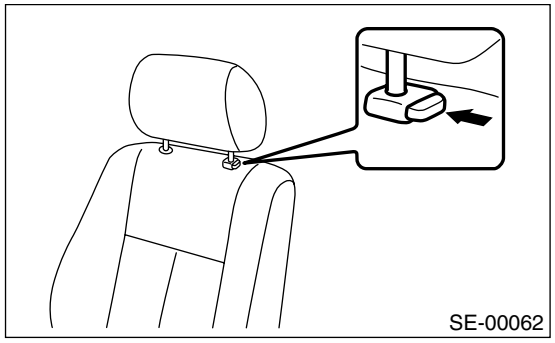


11) Remove front seat from vehicle.

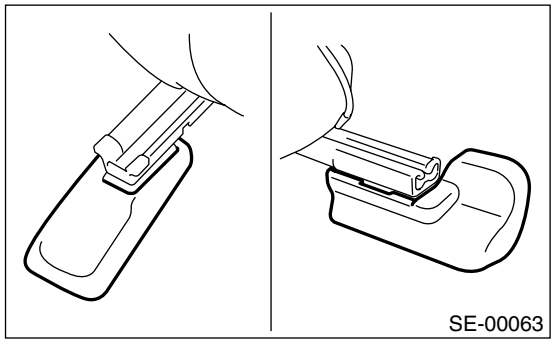
CAUTION:
When removing seat form vehicle, take care not to damage body, seat, or trim.

2. POWER SEAT

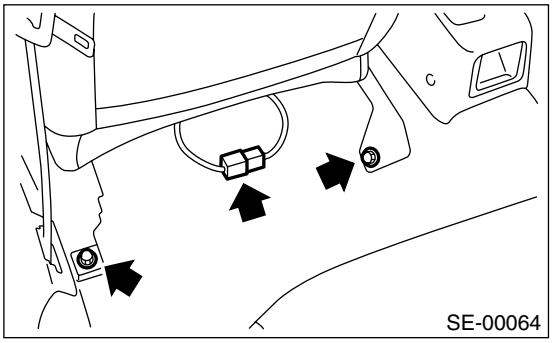
1) While pressing headrest lock button, remove headrest.



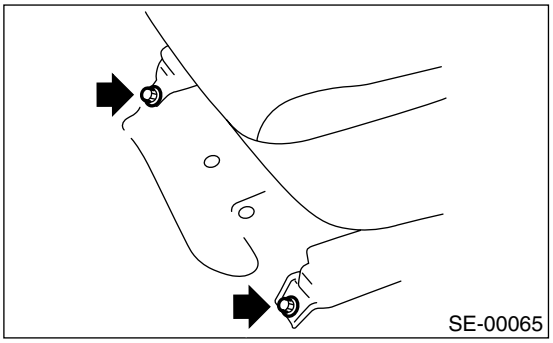
2) Tilt forward backrest.
3) Move seat to full front end.
4) Remove bolt cover at rear end of slide rail.



5) Remove two bolts at rear side of seat rail.



6) Move seat to full rear end.
7) Remove two bolts at front side of seat rail.

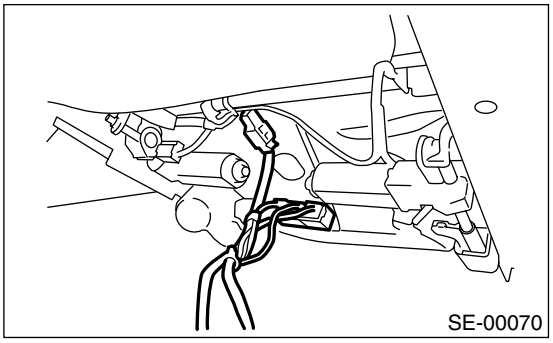


8) Disconnect ground cable from battery.

CAUTION:
• Wait for 20 seconds or more after disconnecting the battery.

CAUTION:
• The airbag system has a backup power source. The airbag might deploy if you do not wait for 20 seconds or more before starting.

9) Disconnect side airbag connector under the seat. (Side airbag equipped vehicle)
10) Disconnect connectors of seat heater and seat belt warning. (Seat heater equipped vehicle)



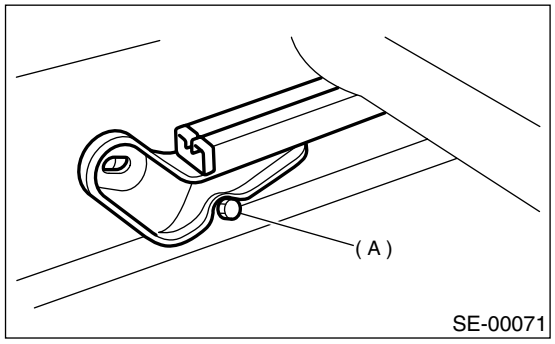
11) Remove front seat from vehicle.

CAUTION:
When removing seat form vehicle, take care not to damage body, seat, or trim.

B: INSTALLATION

1. STANDARD SEAT

1) Install in the reverse order of removal.
2) Place slide rail rear inner on location bolts (A).

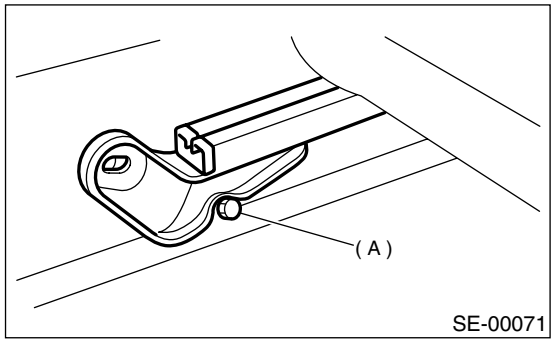


3) Tighten the four bolts of slide rail.

CAUTION:
Confirm that seat can move smoothly and be locked securely at any position.

2. POWER SEAT

1) Install in the reverse order of removal.
2) Place slide rail rear inner on location bolts (A).



3) Tighten the four bolts of slide rail.

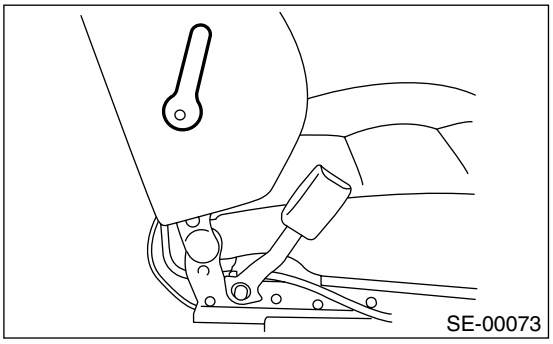
CAUTION:
Confirm that seat can move smoothly.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

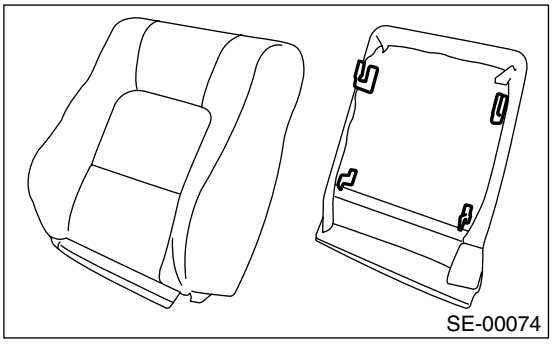
C: DISASSEMBLY

1. STANDARD SEAT

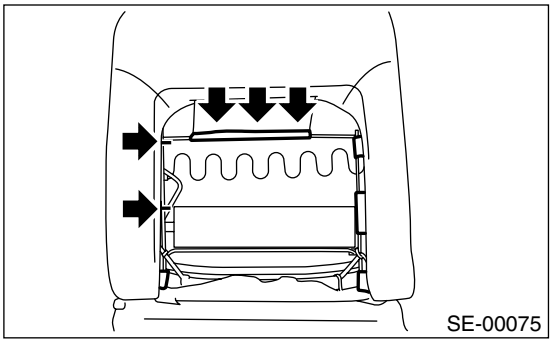
1) Remove seats from vehicle. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove lumber lever cover.


SE-00073

3) Remove hook at bottom, and then remove seat back board.

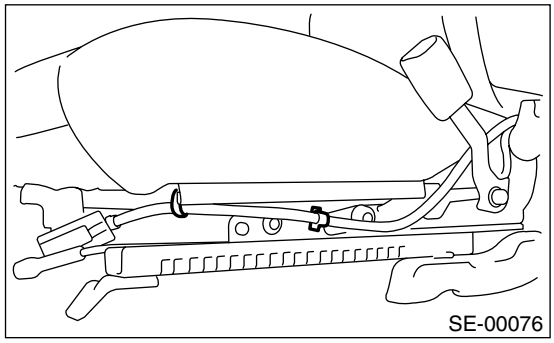

SE-00074

4) Remove hook on back side of seat, and remove hog rings using a plier.

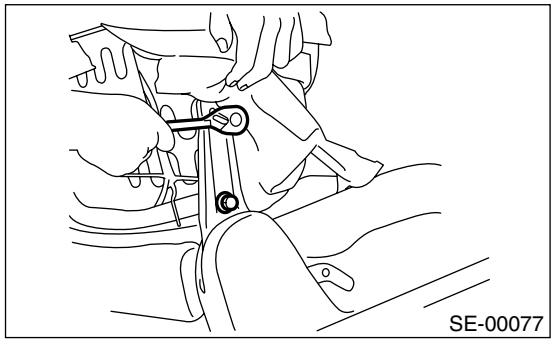

SE-00075

5) Remove clamp of side airbag wire harness. (Side airbag equipped vehicle)

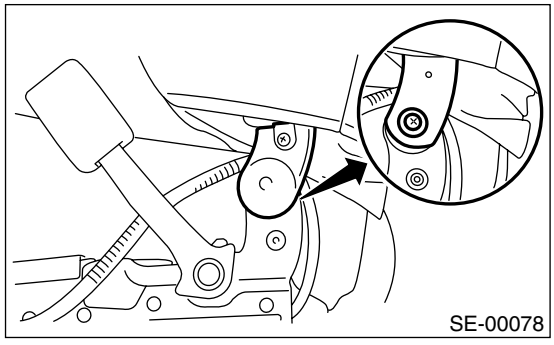
6) Remove clamp of seat heater wire harness. (Seat heater equipped vehicle)


SE-00076

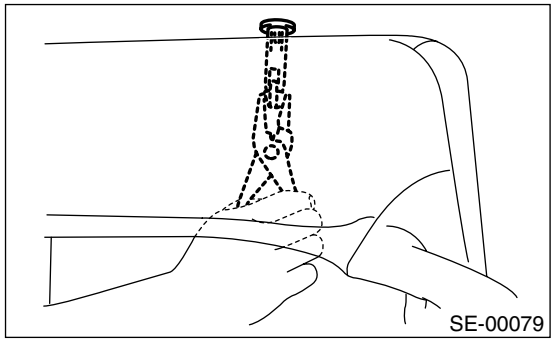
7) Turn cover and cushion, and remove the two bolts from hinge.


SE-00077

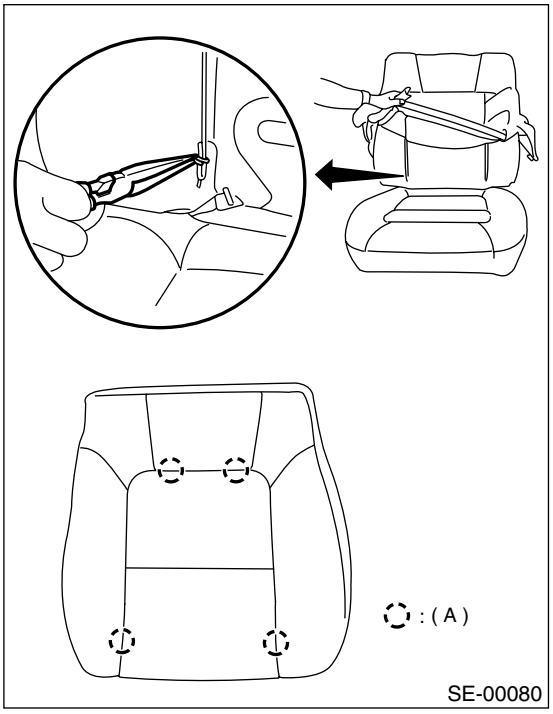
8) Remove hinge screw cover and screws, and remove seat back from hinge.


SE-00078

9) While picking up tip with a plier, remove headrest lock bushing.


SE-00079

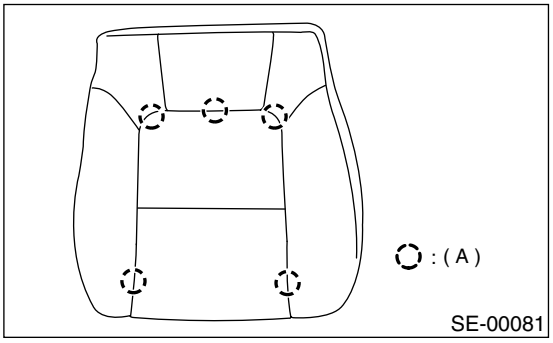
10) Remove hog ring (A) on front face of seat.



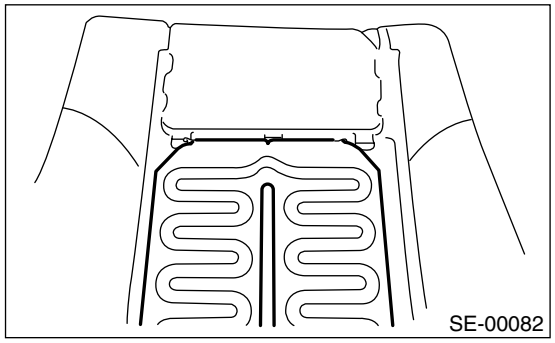
Side airbag equipped vehicle:

NOTE:
Backrest portion of side airbag equipped vehicle cannot be disassembled. When disposing of it, refer to the following.

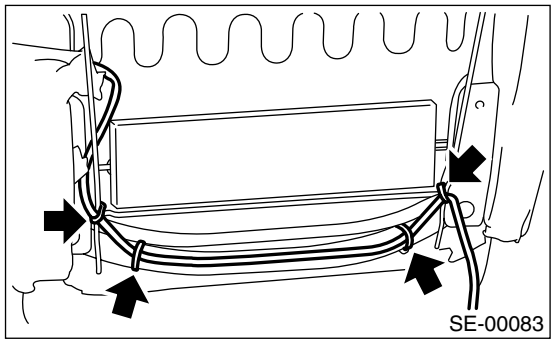
CAUTION:
Do not reuse disassembled parts, because they do not ensure proper side airbag performance. When replacing it, replace with a complete backrest assembly.



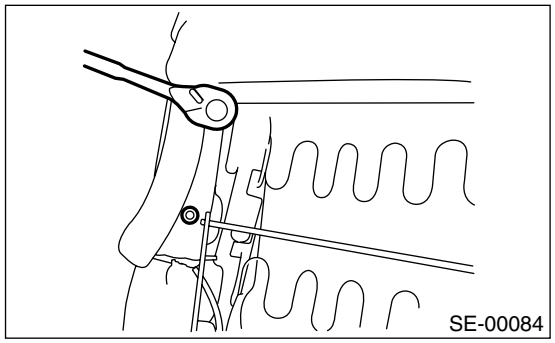
11) Remove hog rings, and then remove seat heater. (Seat heater equipped vehicle)



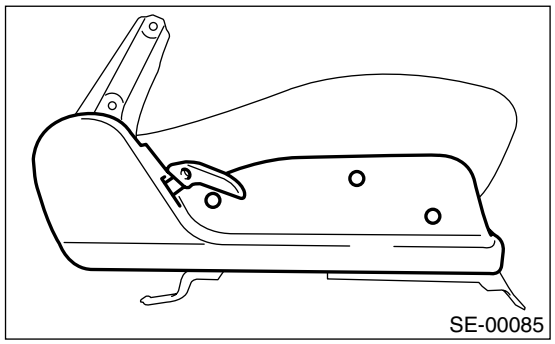
12) Remove seat cover.
13) Remove backrest pad.
14) Remove clamp of airbag wire harness on back side of seat. (Side airbag equipped vehicle)



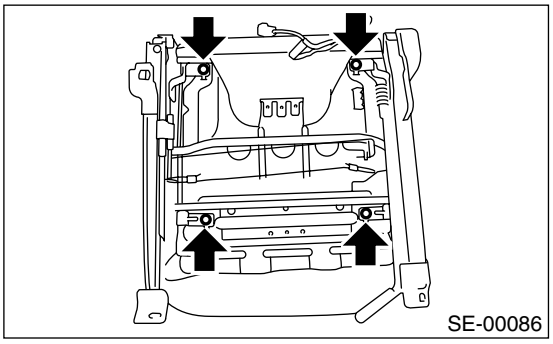
15) Remove the two cap nuts, and then remove side airbag module assembly. (Side airbag equipped vehicle)



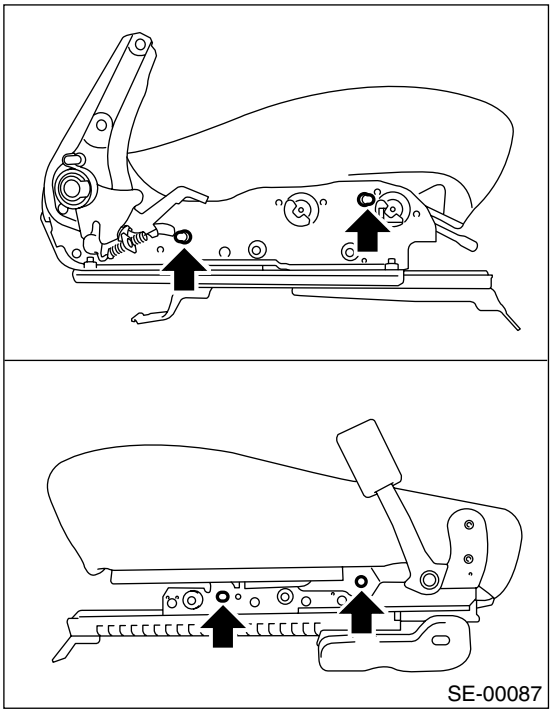
16) Remove reclining cover and hinge cover. (Non-tilt type vehicle)



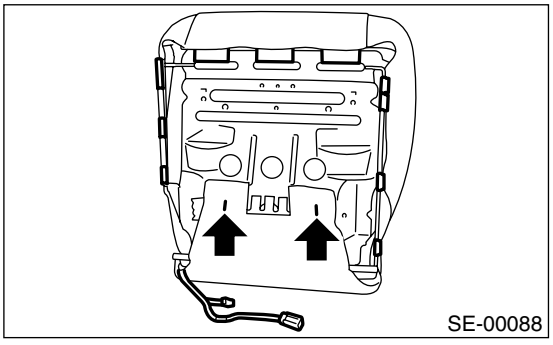
17) Remove the 4 bolts of seat hinge assembly, and then remove seat cushion.
Tilt type vehicle:


SE-00086

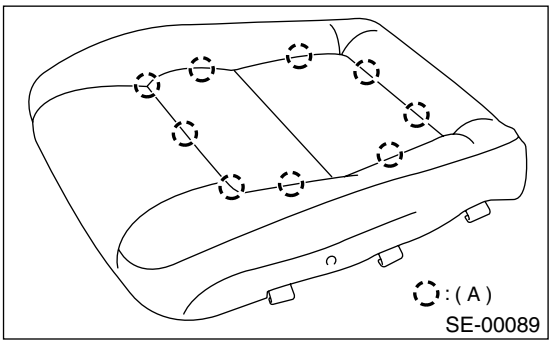
Non-tilt type vehicle:


SE-00087

18) Remove hook clips on back side of seat cushion, and remove wire rings.
19) Remove clamp of seat heater wire harness. (Seat heater equipped vehicle)

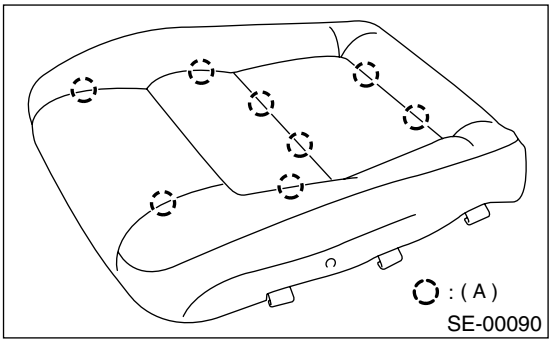

SE-00088

20) Remove hog rings (A).
Tilt type vehicle:



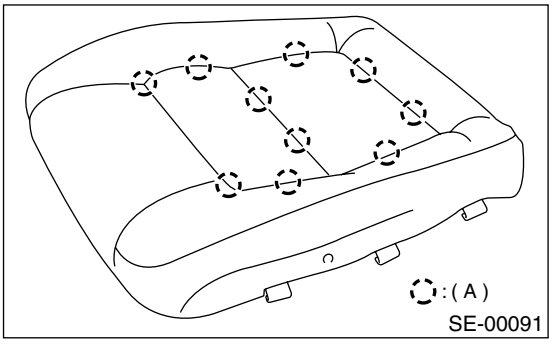
SE-00089

Non-tilt type vehicle:



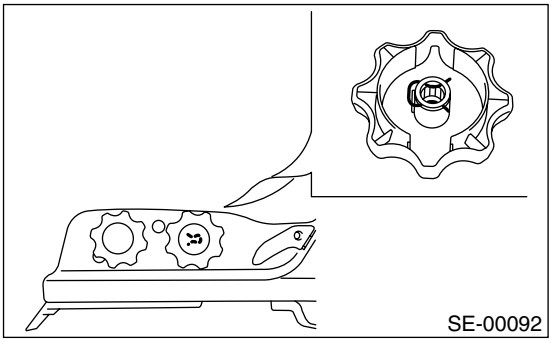
SE-00090

Leather type vehicle:

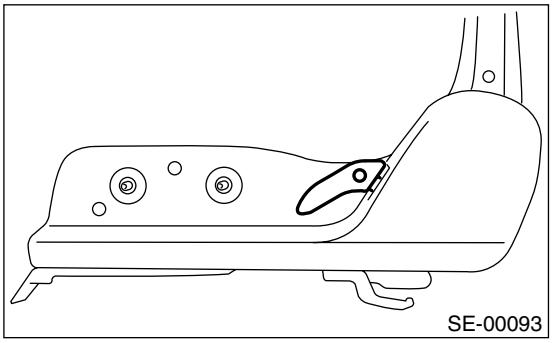


SE-00091

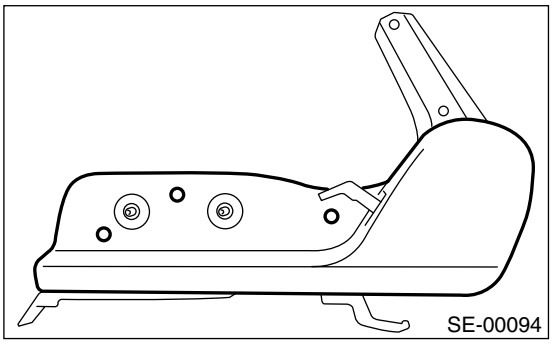
21) Remove cushion cover.
22) Remove cushion pad.
23) Remove clip pins, and remove seat lifter lever.


SE-00092

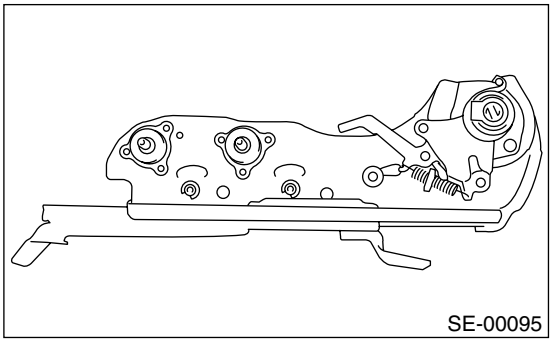
24) Remove reclining lever cover.



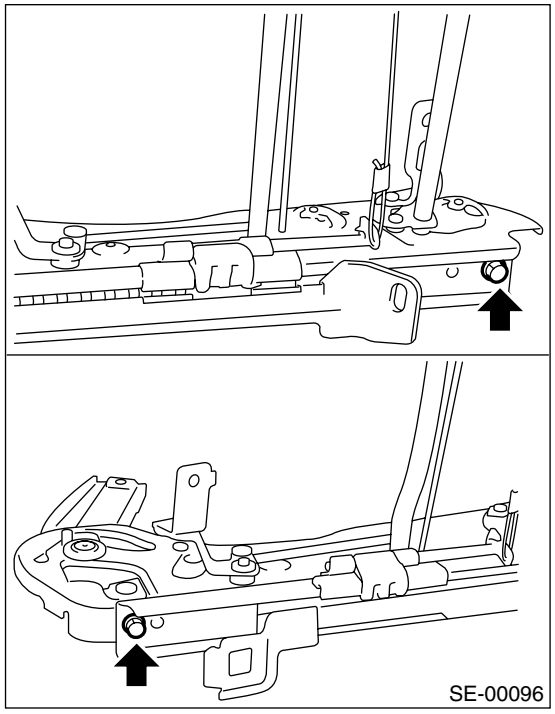
25) Remove hinge cover cap and screws.



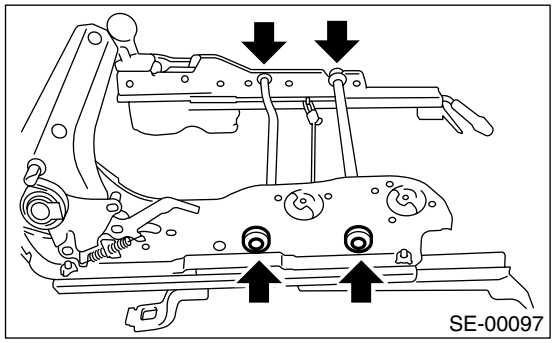
26) Remove seat hinge cover and hinge spring cover.



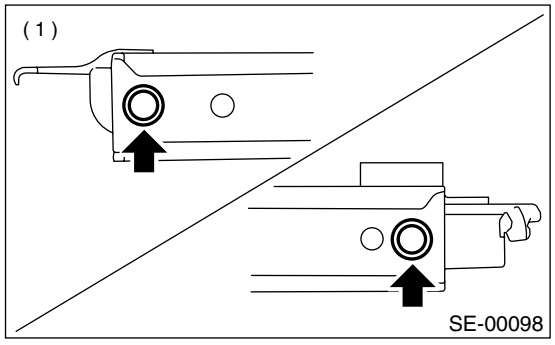
27) Remove 2 bolts, and then remove slide rail.



28) Remove 4 screws, and then remove hinge. (Non-tilt type vehicle)



29) Remove 2 bolts, and then remove slide rail. (Non-tilt type vehicle)

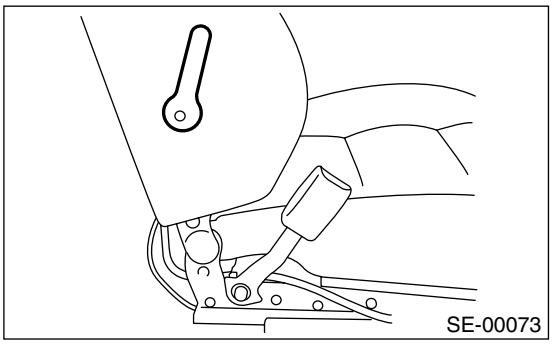


(1) Lower side of seat rail

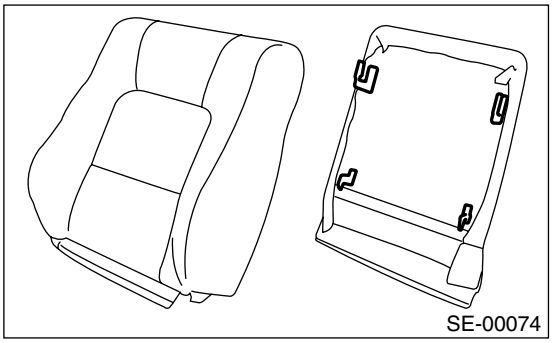
30) Remove connecting wire.

2. POWER SEAT

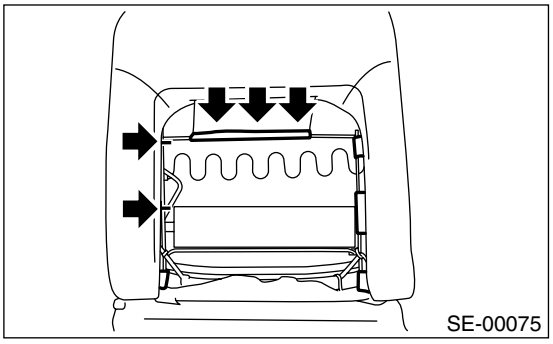
1) Remove seats from vehicle. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove lumber lever cover.


SE-00073

3) Remove hook at bottom, and then remove seat back board.

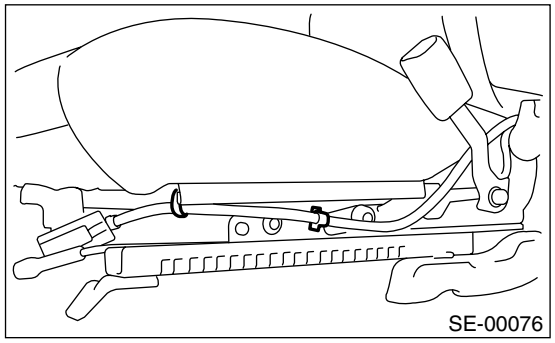

SE-00074

4) Remove hook on back side of seat, and remove wire rings using a plier.

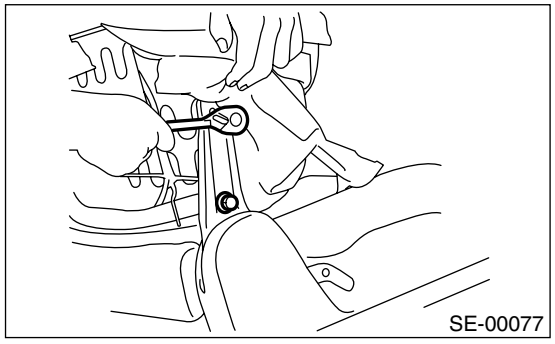

SE-00075

5) Remove clamp of side airbag wire harness. (Side airbag equipped vehicle)

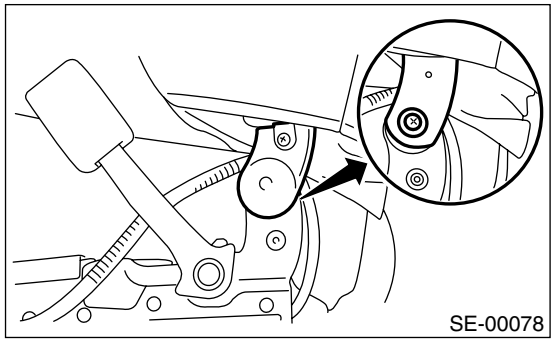
6) Remove clamp of seat heater wire harness. (Seat heater equipped vehicle)


SE-00076

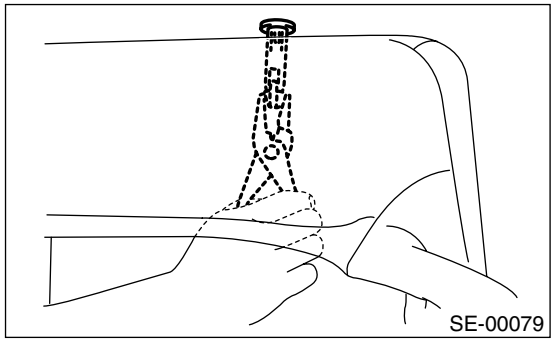
7) Turn cover and cushion, and remove the two bolts from hinge.


SE-00077

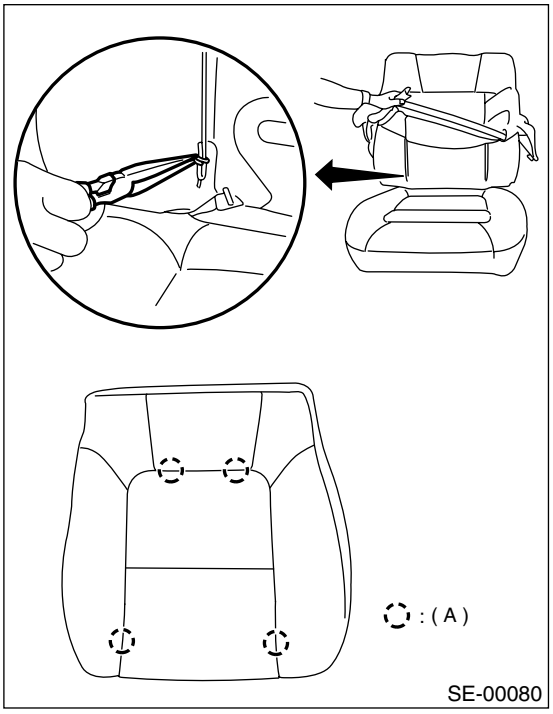
8) Remove hinge screw cover and screws, and remove seat back from hinge.


SE-00078

9) While picking up tip with a plier, remove headrest lock bushing.


SE-00079

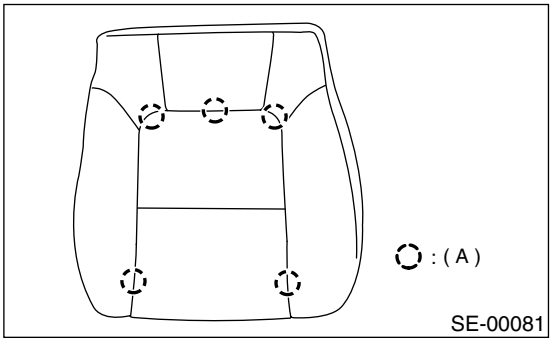
10) Remove hog ring (A) on front face of seat.



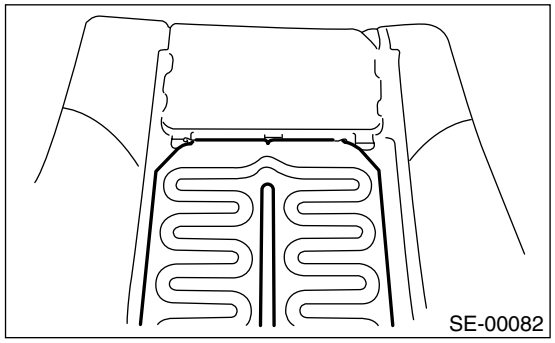
Side airbag equipped vehicle:

NOTE:
Backrest portion of side airbag equipped vehicle cannot be disassembled. When disposing of it, refer to the following.

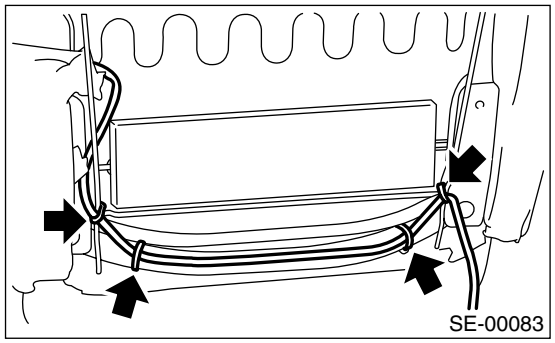
CAUTION:
Do not reuse disassembled parts, because they do not ensure proper side airbag performance. When replacing it, replace with a complete backrest assembly.



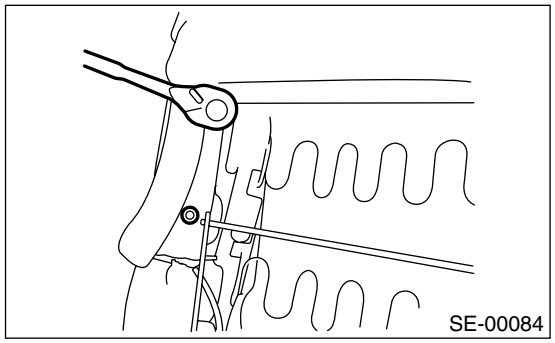
11) Remove wire rings, and then remove seat heater. (Seat heater equipped vehicle)



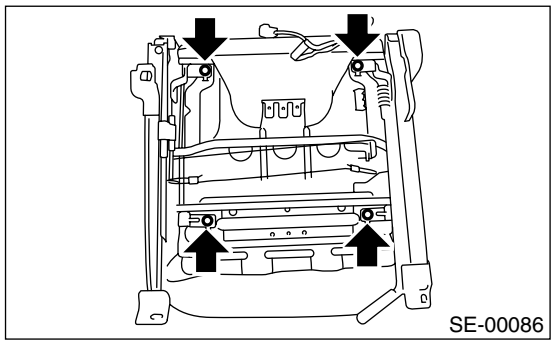
12) Remove seat cover.
13) Remove backrest pad.
14) Remove clamp of airbag wire harness on back side of seat. (Side airbag equipped vehicle)



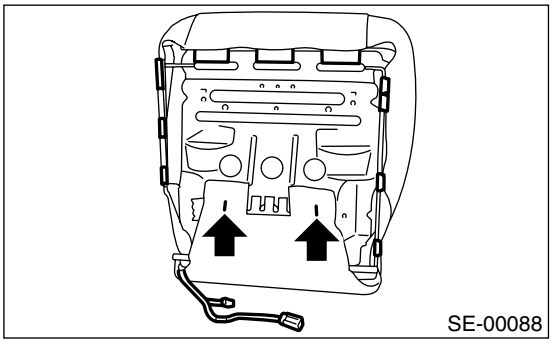
15) Remove the two cap nuts, and then remove side airbag module assembly. (Side airbag equipped vehicle)



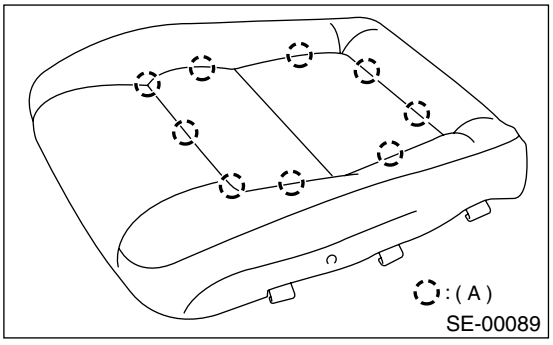
16) Remove the 4 bolts of seat hinge assembly, and then remove seat cushion.



17) Remove hook clips on back side of seat cushion, and remove wire rings.
18) Remove clamp of seat heater wire harness. (Seat heater equipped vehicle)

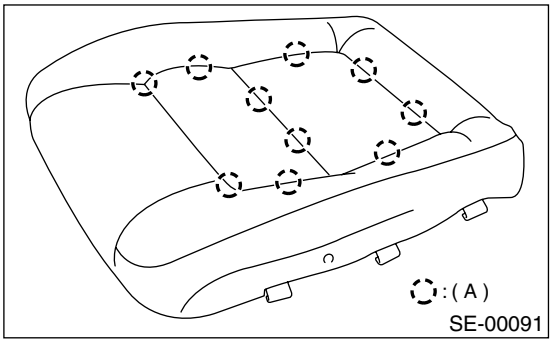

SE-00088

19) Remove hog rings (A).



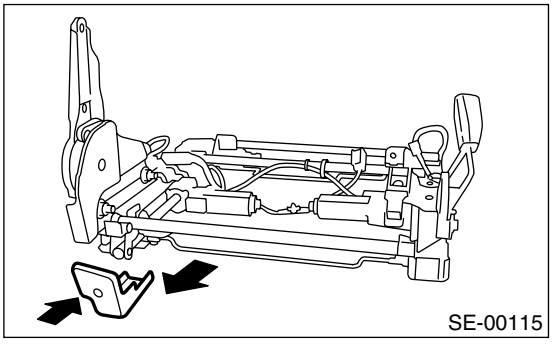
SE-00089

Leather type vehicle:

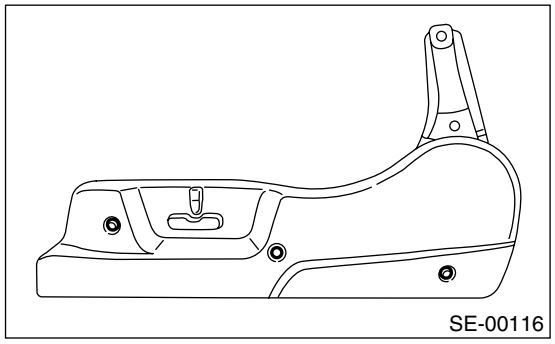


SE-00091

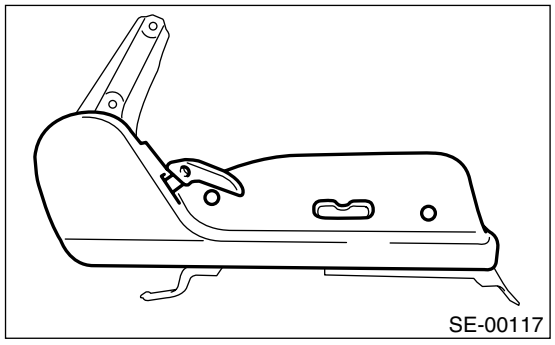
20) Remove cushion cover.
21) Remove cushion pad.
22) Remove the screw and then remove the cover.


SE-00115

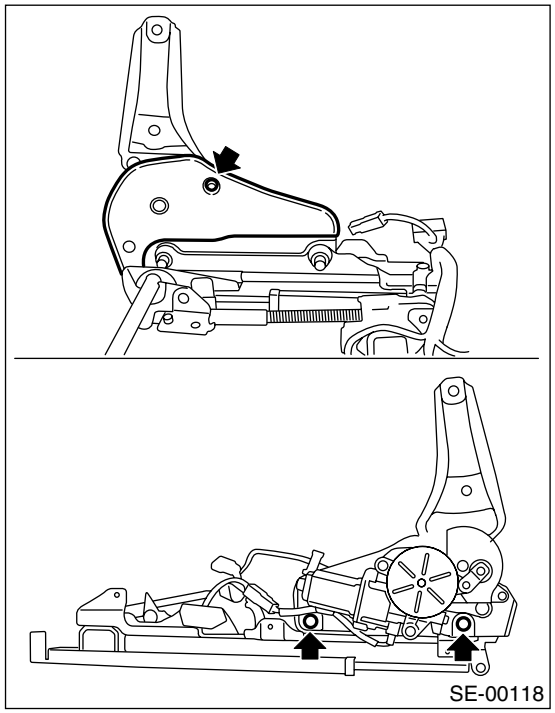
23) 8-way power seat:
Remove the screw, disconnect the seat switch connector on the underside of the cover, and remove the hinge cover.


SE-00116

6-way power seat:
Remove the reclining lever cover and screw, disconnect the seat switch connector on the underside of the cover, and remove the hinge cover.


SE-00117

24) Remove the cover on the underside of the seat hinge, remove the two bolts, and remove the seat hinge.


SE-00118

D: ASSEMBLY

1. STANDARD SEAT

1) Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

2) Attach seat cover end hole to hinge inner. (Only non-tilt type standard seat)

2. POWER SEAT

1) Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.
- Make sure the connector is firmly connected.
- Make sure the wire harness is not pinched.

2) Attach seat cover end hole to hinge inner. (Only non-tilt type standard seat)

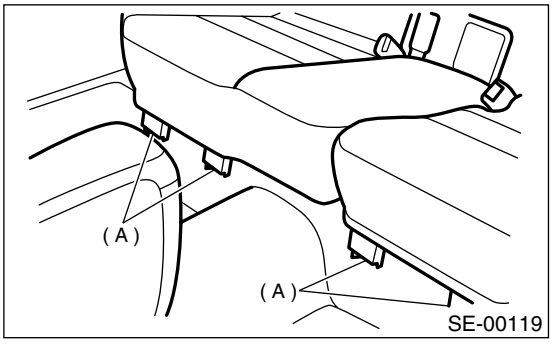
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

3. Rear Seat

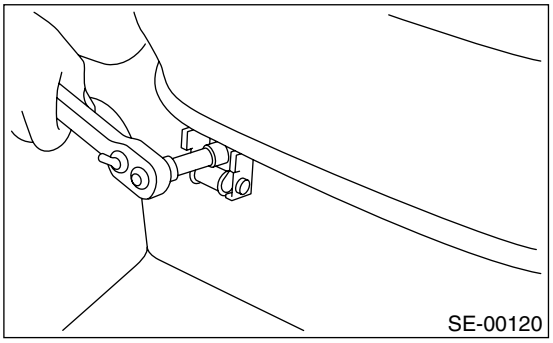
A: REMOVAL

1. WAGON

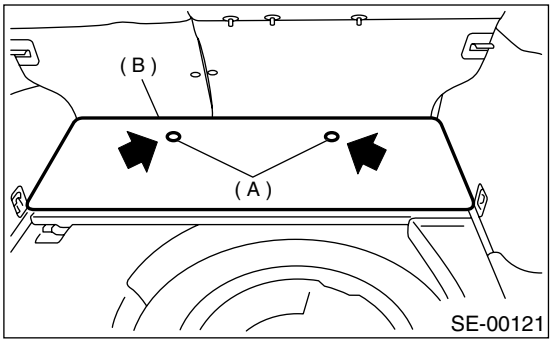
1) Raise the cushion, and then remove bolt covers (A).



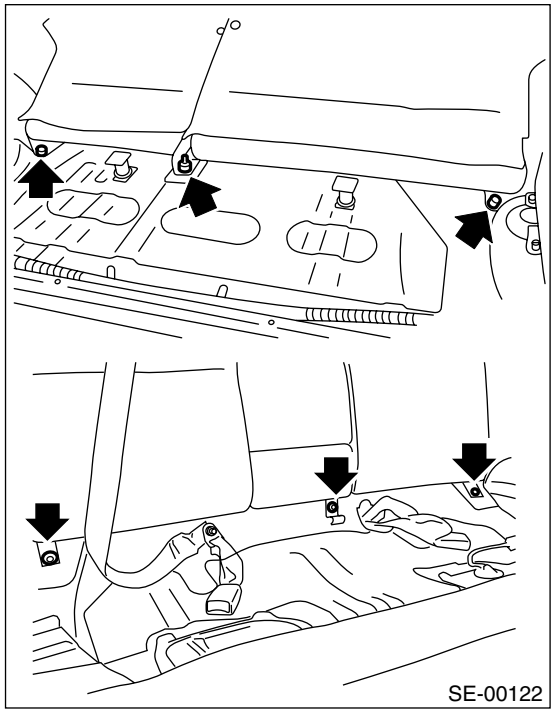
2) Remove bolts, and then remove rear seat cushion.



3) Remove headrest.
4) Remove clips (A), and then remove rear floor front mat (B).



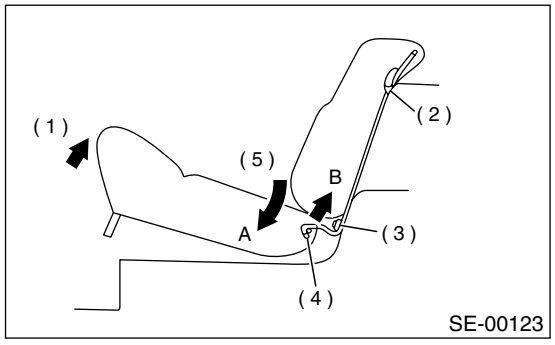
5) Remove bolts and nuts of bracket hinge.



6) Remove rear seat backrest.

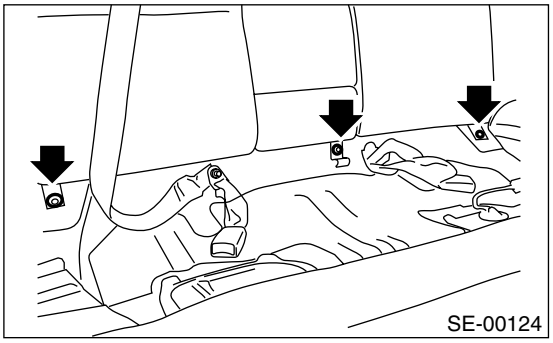
2. SEDAN

1) Slightly raise front of cushion while pushing down on cushion in the direction of “A”. With cushion held in that position, move it forward until it is unhooked.



(1) Raise
(2) Hook
(3) Attaching bolt
(4) Hook
(5) Push

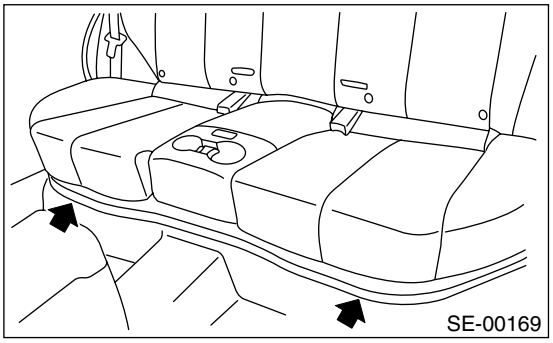
2) Remove bolts securing lower portion of backrest and then open the center trunk through lid.



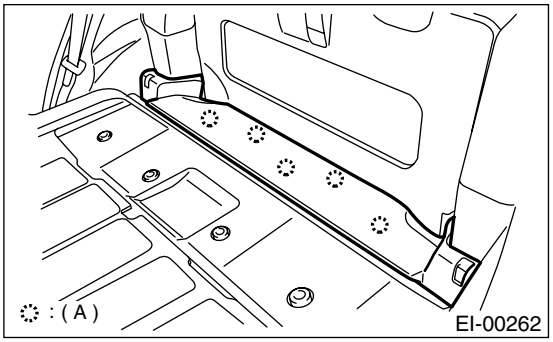
3) Lift rear seat backrest and then remove it.

3. PICKUP

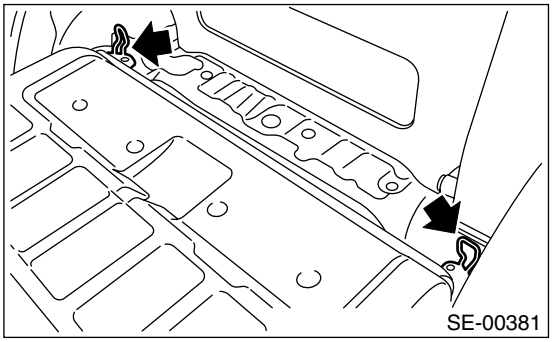
1) Remove bolts and remove seat cushion.



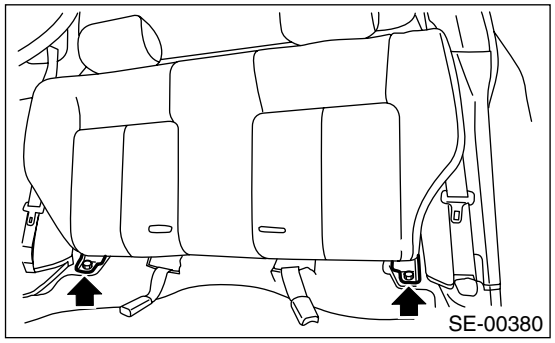
2) Remove floor trim panel.



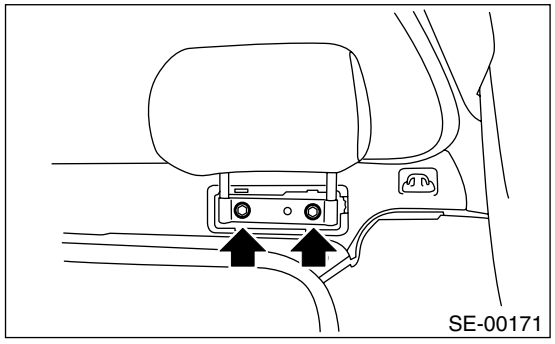
3) Remove rear bolt of bracket hinge.



4) Remove front side bolt of bracket hinge.



5) Remove rear bulk head trim cover. Remove bolt and remove backrest.



B: INSTALLATION

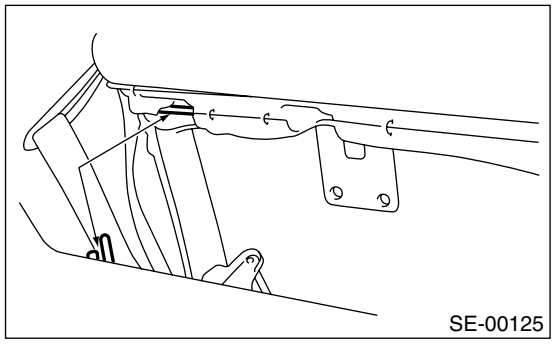
1. WAGON

1) Install in the reverse order of removal.

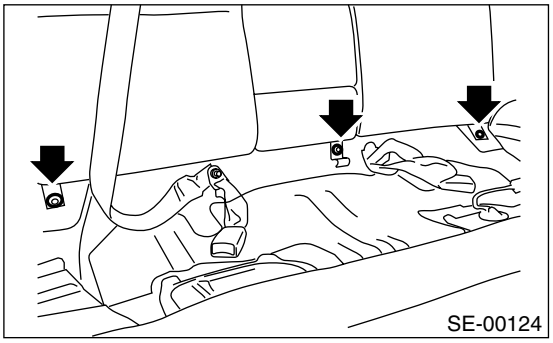
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to SE-5, REAR SEAT (WAGON), COMPONENT, General Description.>

2. SEDAN

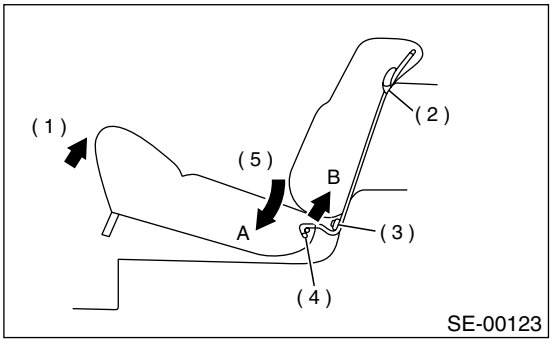
1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



2) Tighten the bolt and install the backrest.



3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.



(1) Raise
(2) Hook
(3) Attaching bolt
(4) Hook
(5) Push

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to SE-4, REAR SEAT (SEDAN), COMPONENT, General Description.>

3. PICKUP

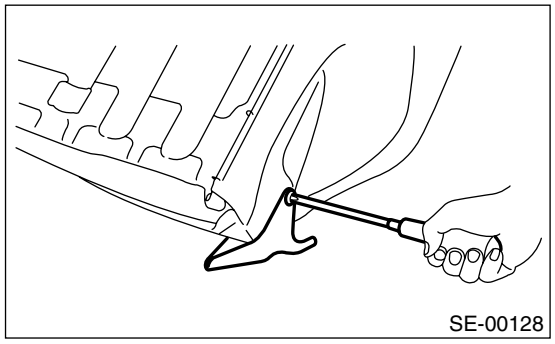
Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to SE-6, REAR SEAT (PICKUP), COMPONENT, General Description.>

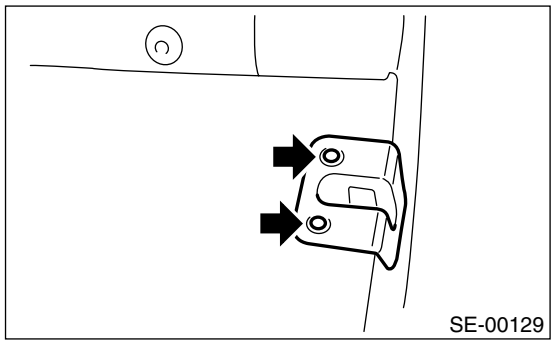
C: DISASSEMBLY

1. WAGON

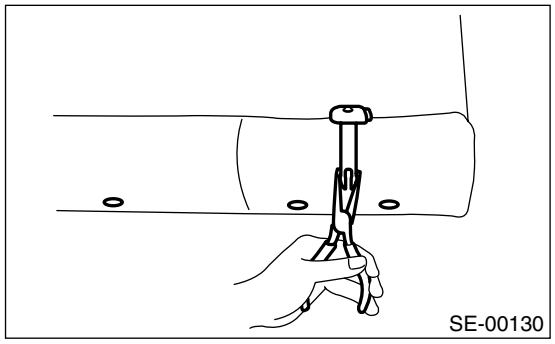
1) Remove rear seat. <Ref. to SE-18, REMOVAL, Rear Seat.>
2) Remove bolts, and then remove bracket hinge.



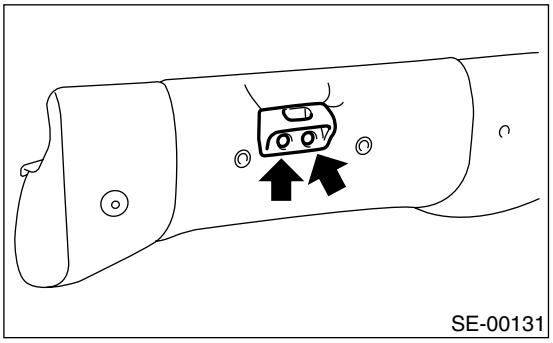
3) Remove rear backrest lock cover.



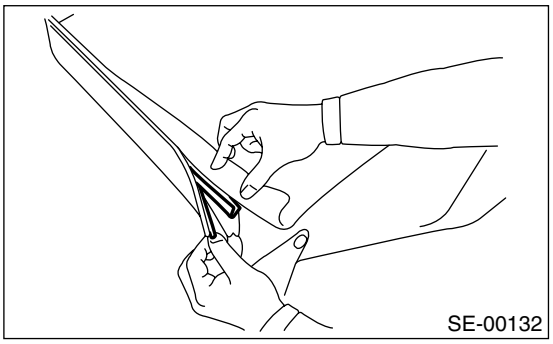
4) While turning counterclockwise rear backrest knob, remove it.
5) While picking up tip with pliers, remove headrest lock bushings.



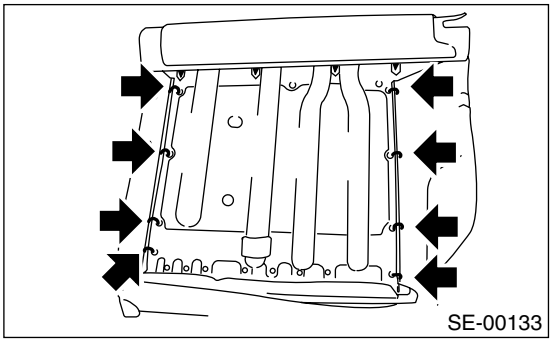
6) Remove backrest hook.



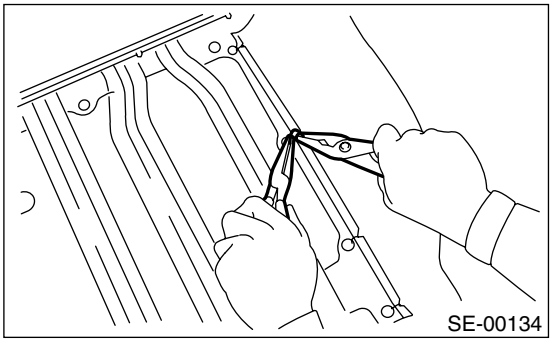
7) Remove hook at bottom.



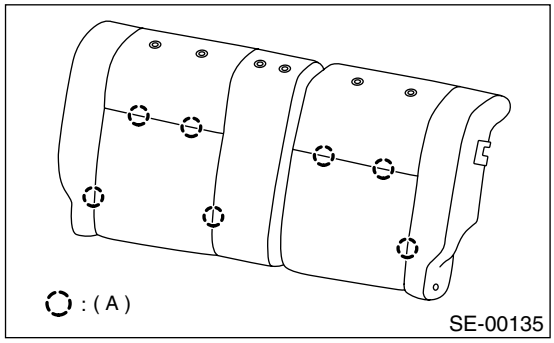
8) Remove 4 pawls.



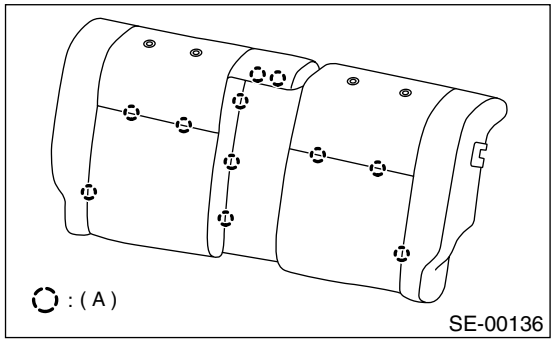
9) Remove 8 hog rings.



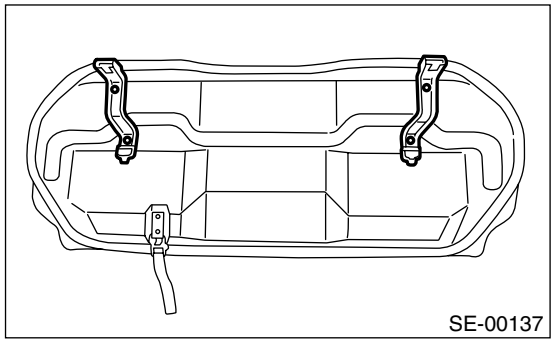
10) Remove the hog rings (A) on front side of cushion pad.



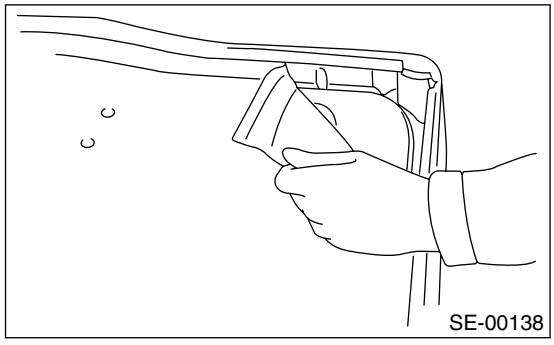
Armrest-equipped vehicle:



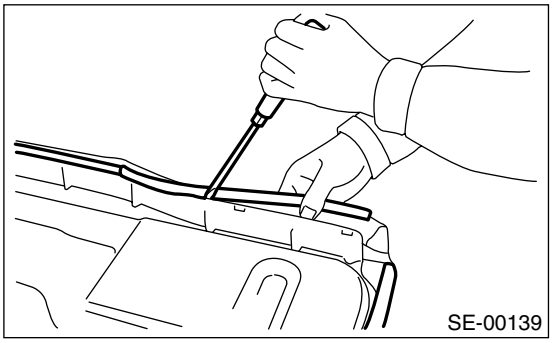
11) Remove cover. When disassembly of rear seat cushion is required, proceed to the following steps.
12) Remove bolts, and then remove cushion hinge.



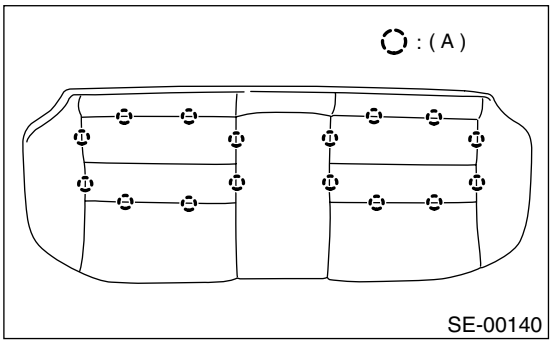
13) Remove rear cushion mat.



14) Remove hook, and then remove frame.

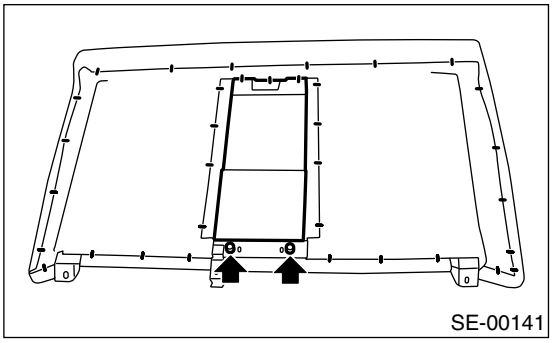


15) Remove hog rings (A), and then remove cover.

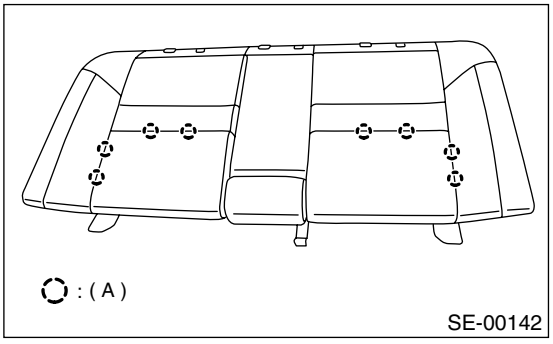


2. SEDAN

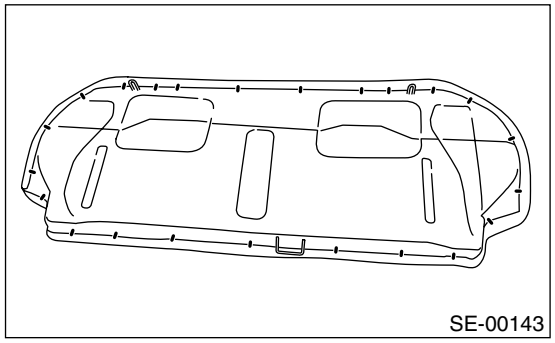
1) Remove the rear seat from the vehicle. <Ref. to SE-18, REMOVAL, Rear Seat.>
2) Remove the hog rings from around the seat backrest.
3) Remove the two nuts and remove the armrest assembly.



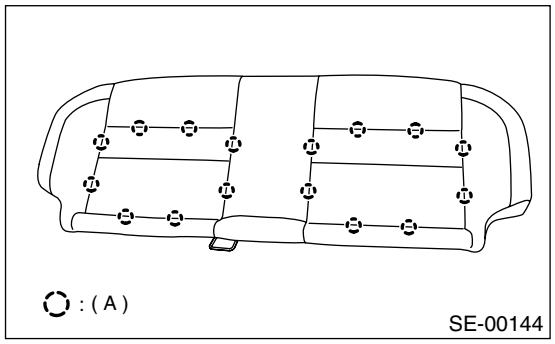
4) Remove the hog rings (A), and then remove the seat cover.



5) Remove the hog rings around the seat cushion.

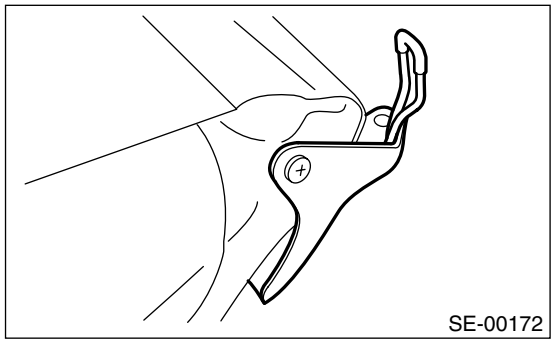


6) Remove the hog rings (A), and then remove the seat cover

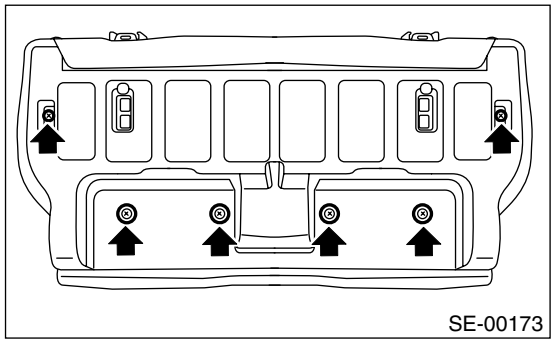


3. PICKUP

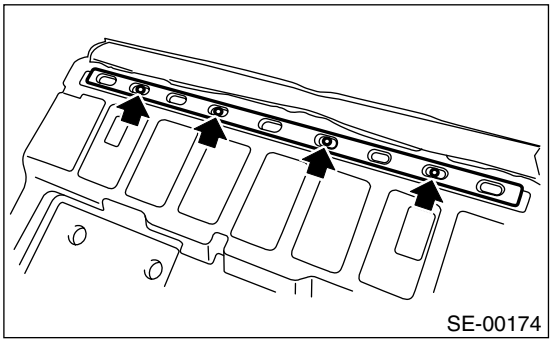
1) Remove rear seat. <Ref. to SE-19, PICKUP, REMOVAL, Rear Seat.>
2) Remove bolts and detach bracket hinge.



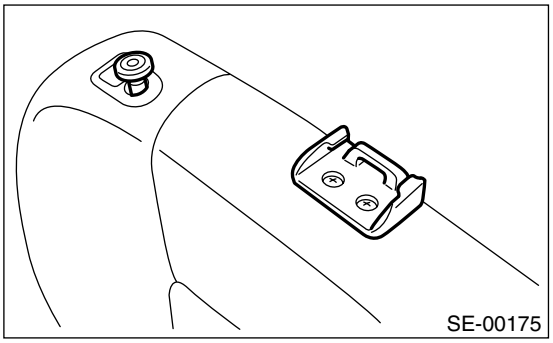
3) Remove seat back screws.



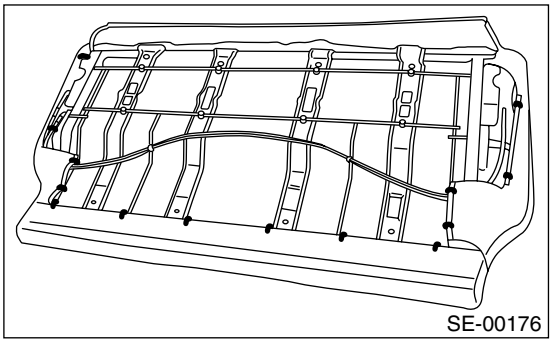
4) Turn over seat upper cover, and remove plate.



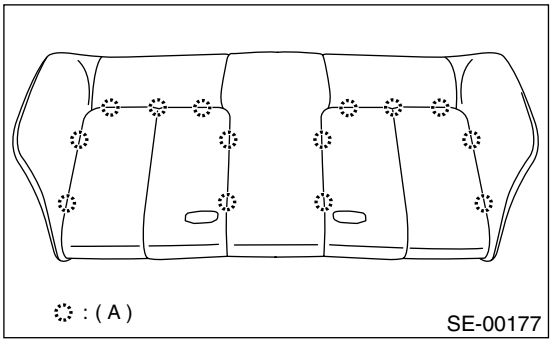
5) Remove seat back.
6) Remove rotating rear back release knob counterclockwise. Remove backrest hook.



7) Remove hog ring.

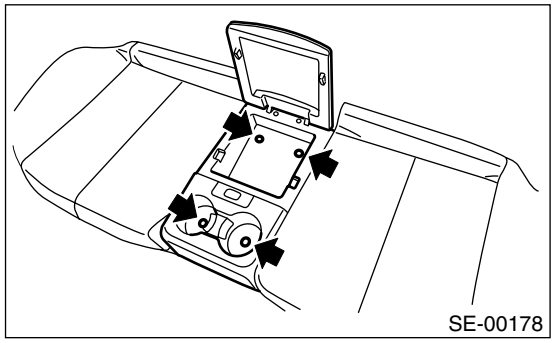


8) Remove hog ring and detach cover.

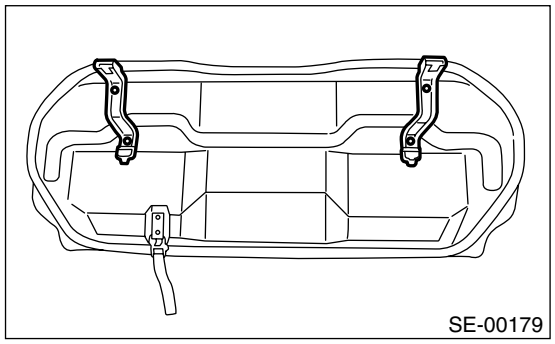


(A) Hog ring

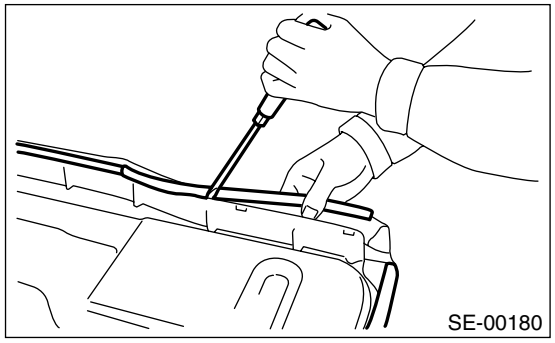
9) Remove rear seat console box.



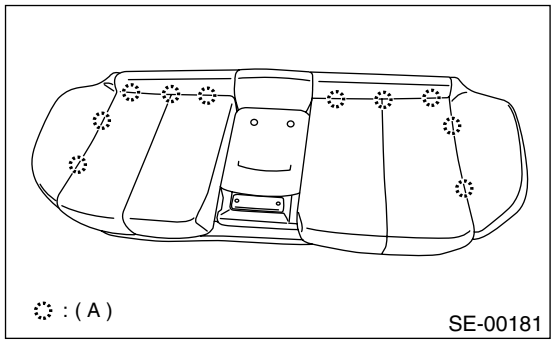
10) Remove bolts and detach cushion hinge.



11) Remove hook and frame.



12) Remove hog rings and detach cover.



(1) Hog ring

D: ASSEMBLY

1. WAGON

1) Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

2. SEDAN

1) Assemble in the reverse order of disassembly.

NOTE:
- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

3. PICKUP

Install in the reverse order of removal.

NOTE:
- Do not contaminate or damage cover.
- While installing hog rings, prevent seat from getting wrinkled.

SECURITY AND LOCKS

SL

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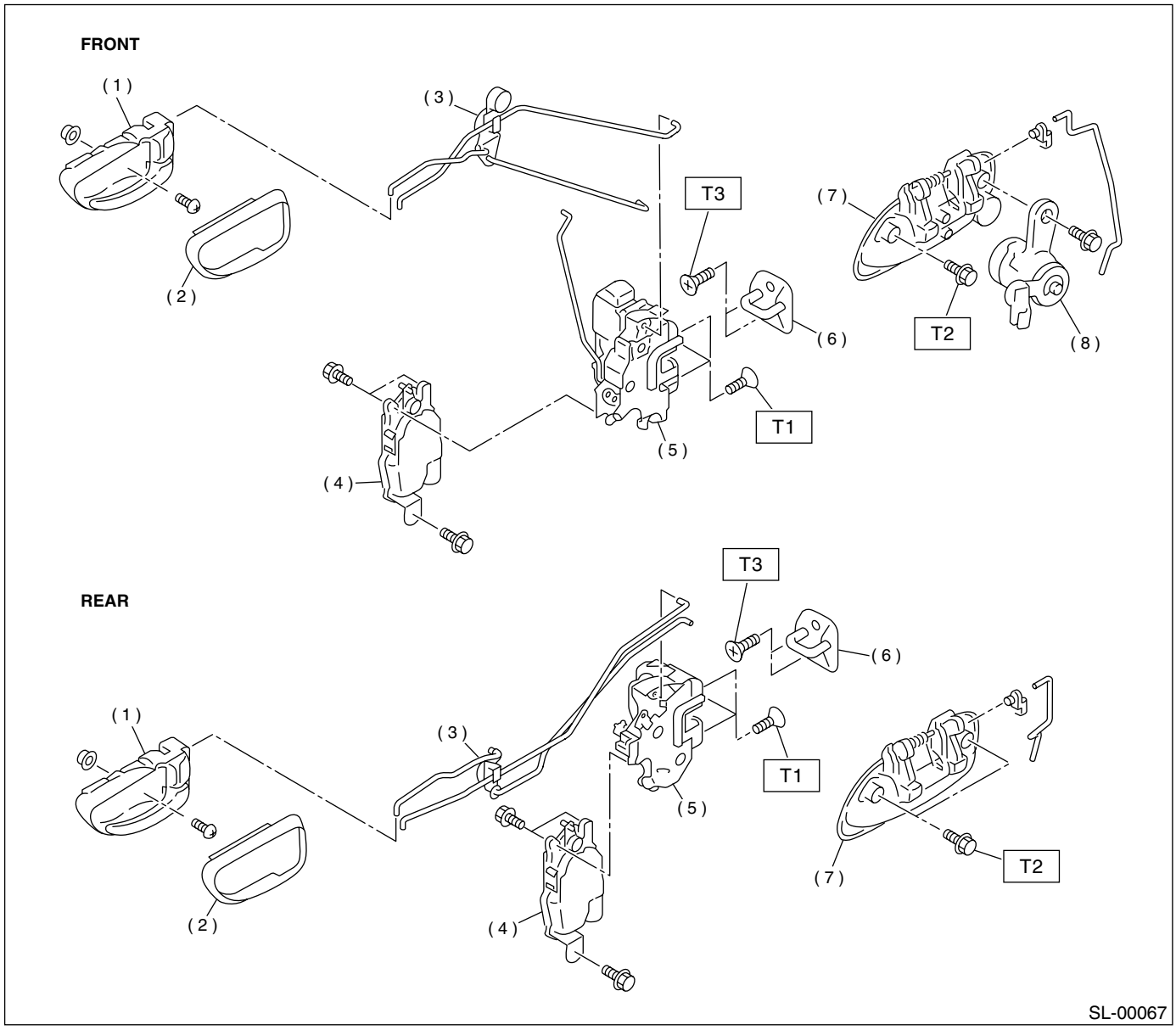
1. General Description

A: SPECIFICATIONS

B: COMPONENT

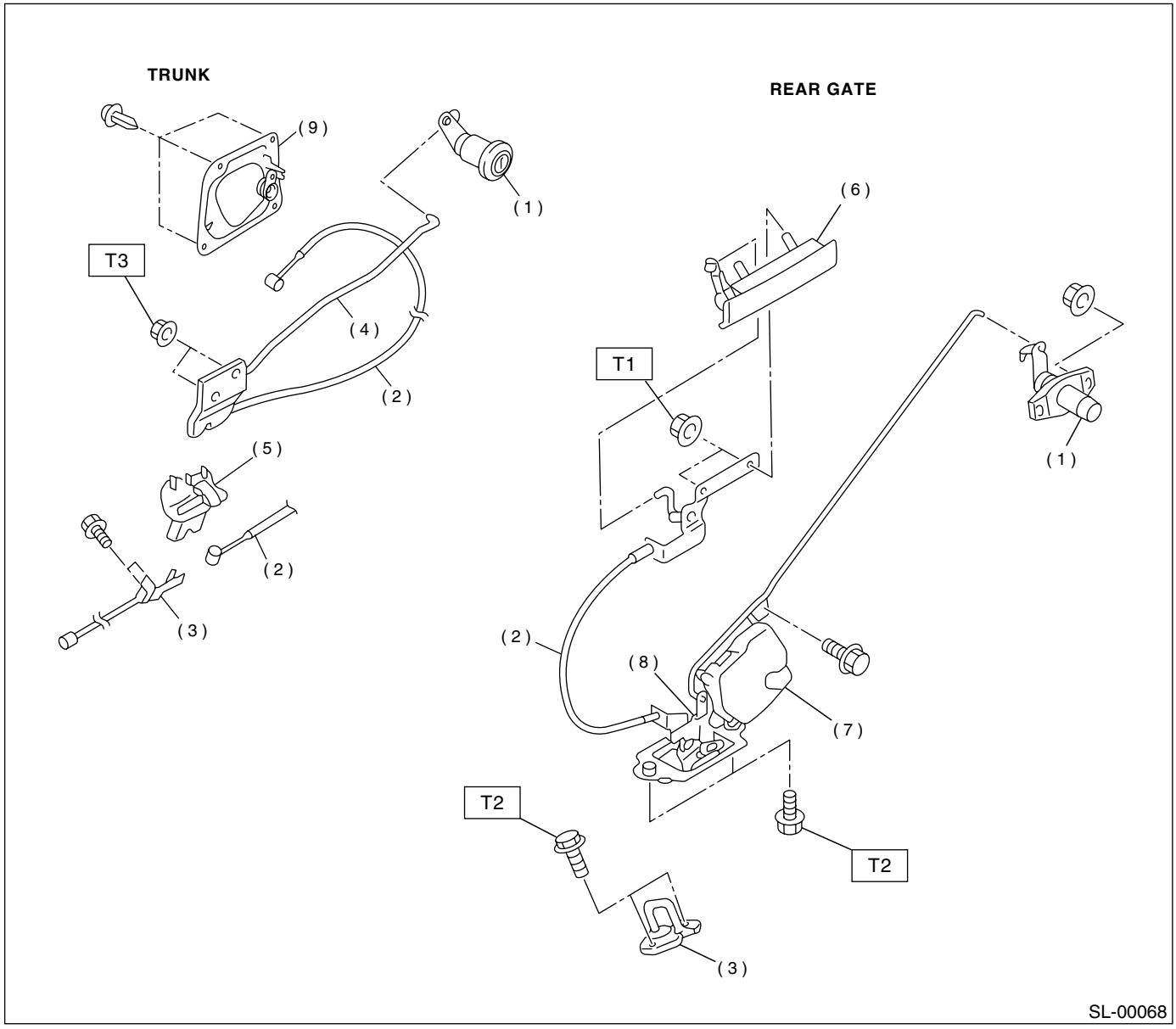
1. DOOR LOCK ASSEMBLY



(1) Inner remote ASSY
(2) Inner remote cover
(3) Bell crank
(4) Auto-door lock actuator
(5) Door latch
(6) Striker
(7) Door outer handle
(8) Key cylinder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 7.35 (0.75, 5.4)
T3: 18.0 (1.8, 13.0)

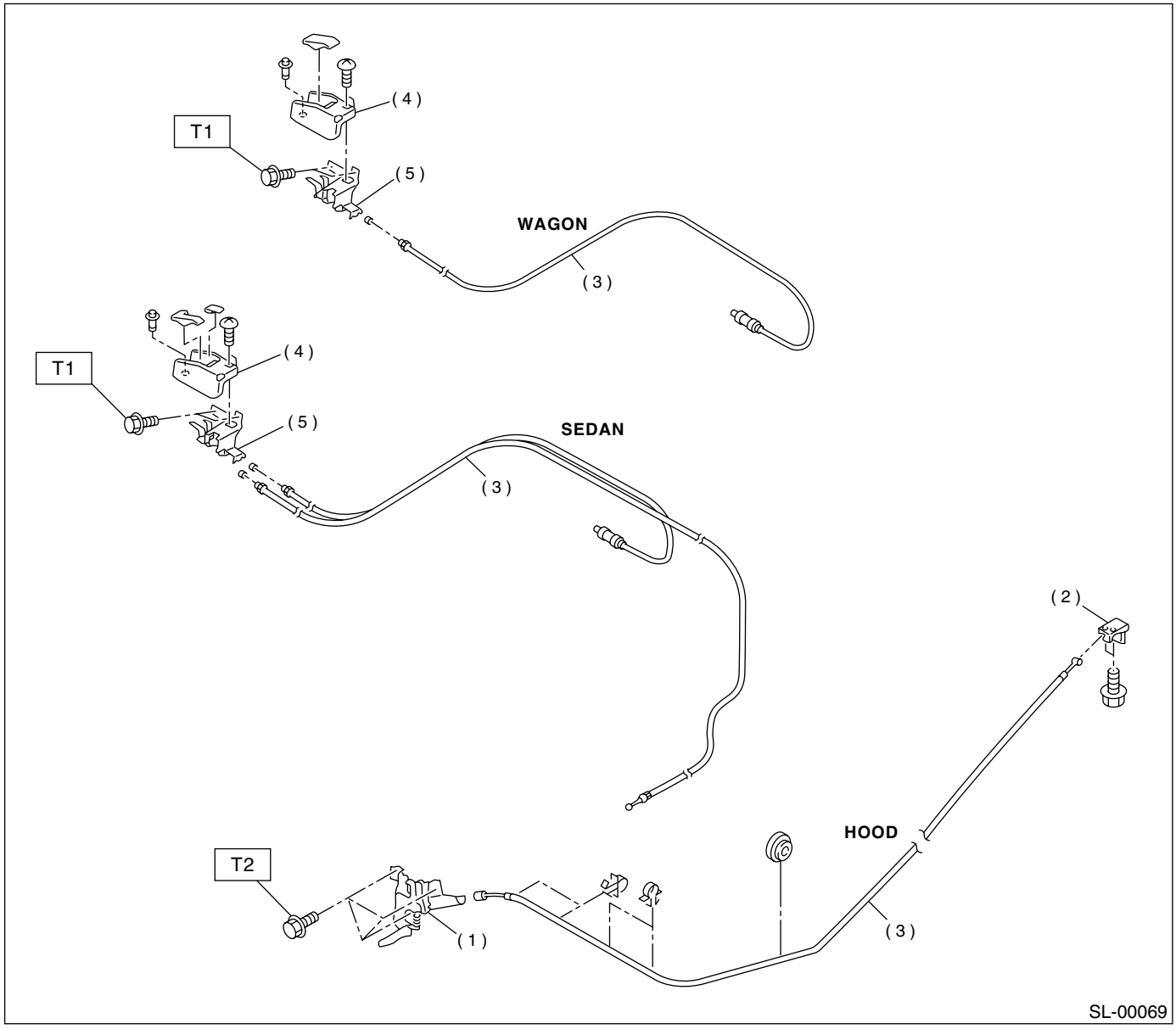
2. TRUNK LID AND REAR GATE LOCK



(1) Key cylinder
(2) Cable
(3) Striker
(4) Trunk lid lock ASSY
(5) Trunk lid lock cover
(6) Rear gate outer handle
(7) Rear gate actuator
(8) Rear gate latch
(9) Trunk lid release handle

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.5, 18.1)
T3: 18 (1.8, 13.0)

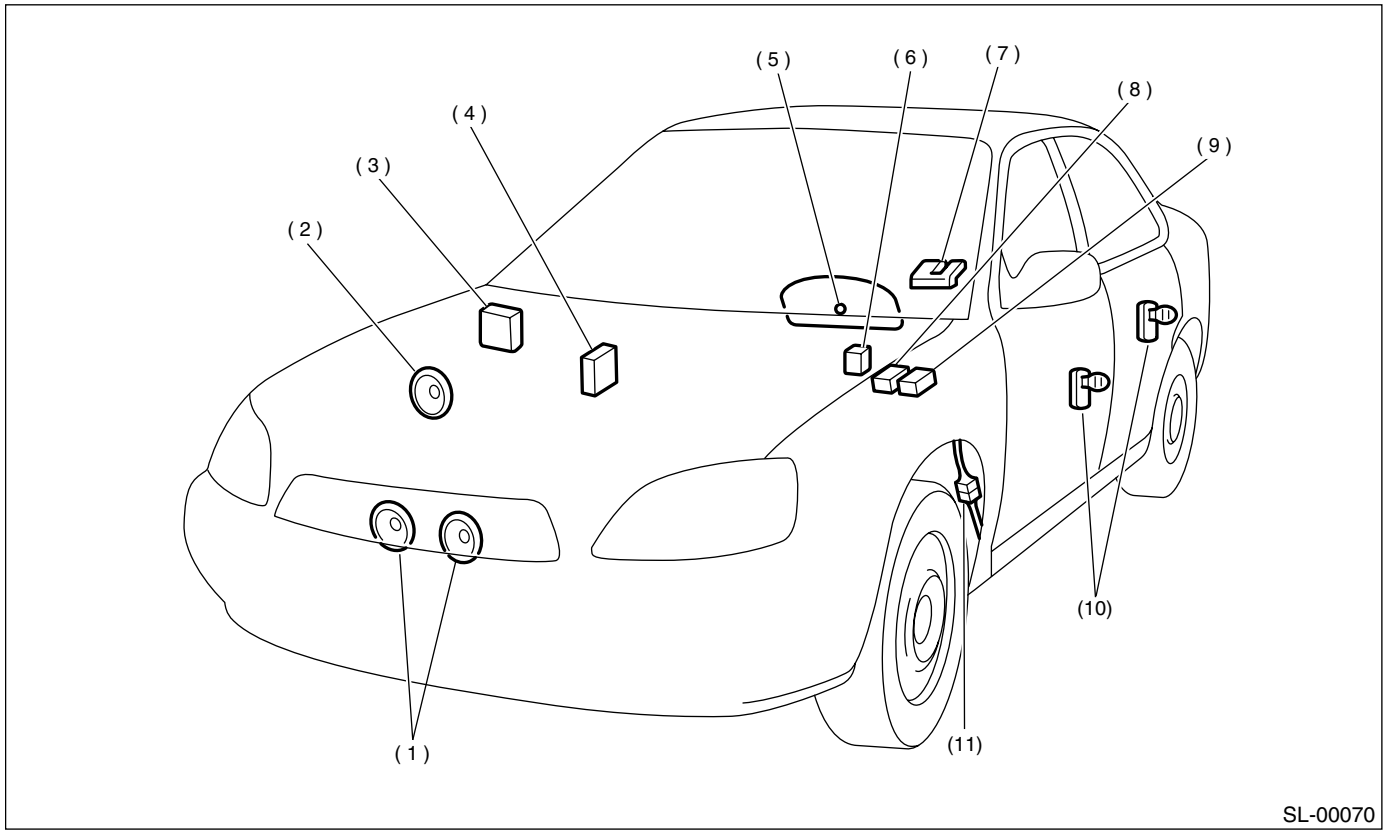
3. HOOD LOCK AND REMOTE OPENERS



(1) Hood lock ASSY
(2) Lever ASSY
(3) Cable
(4) Cover
(5) Pull handle ASSY

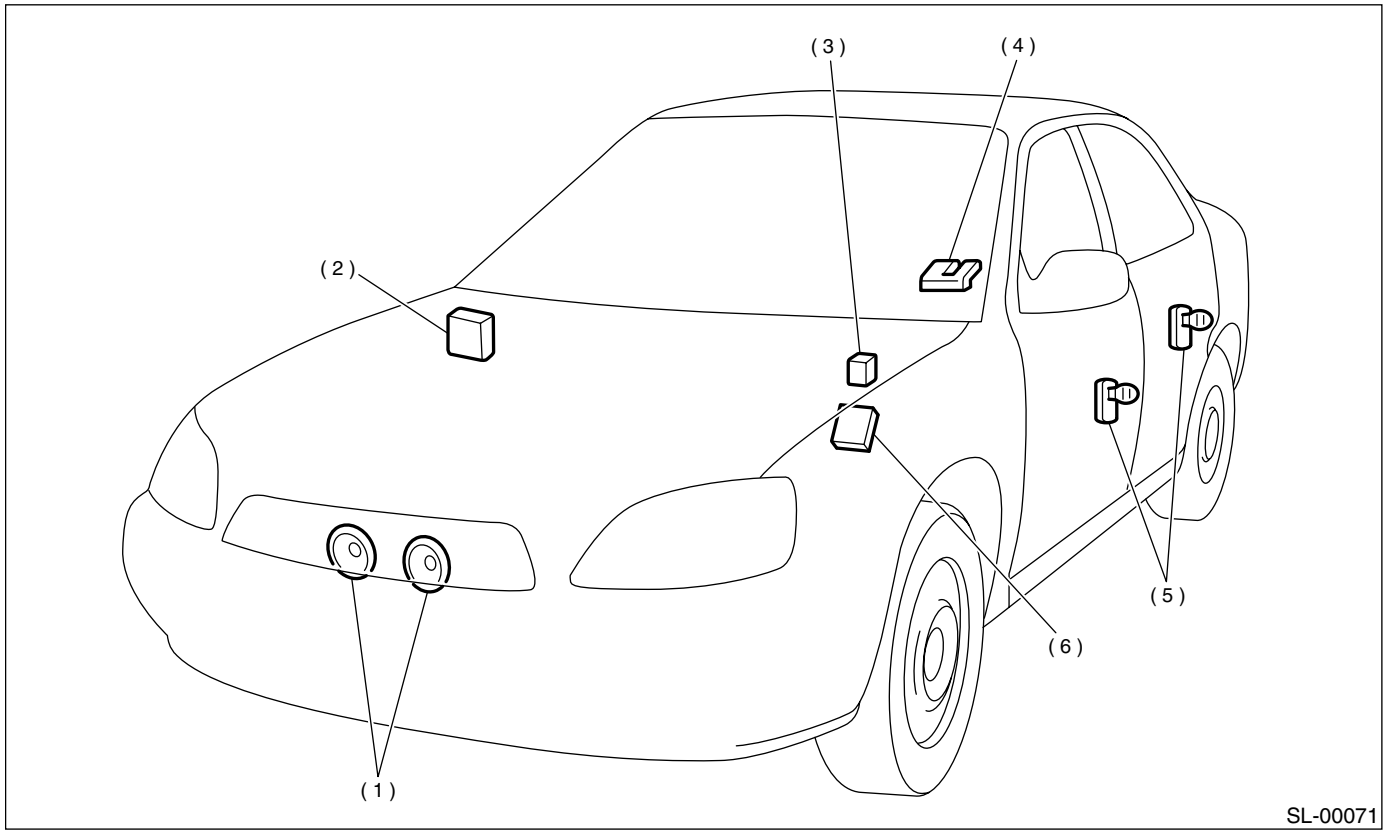
Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 32 (3.3, 23.9)

4. SECURITY SYSTEM



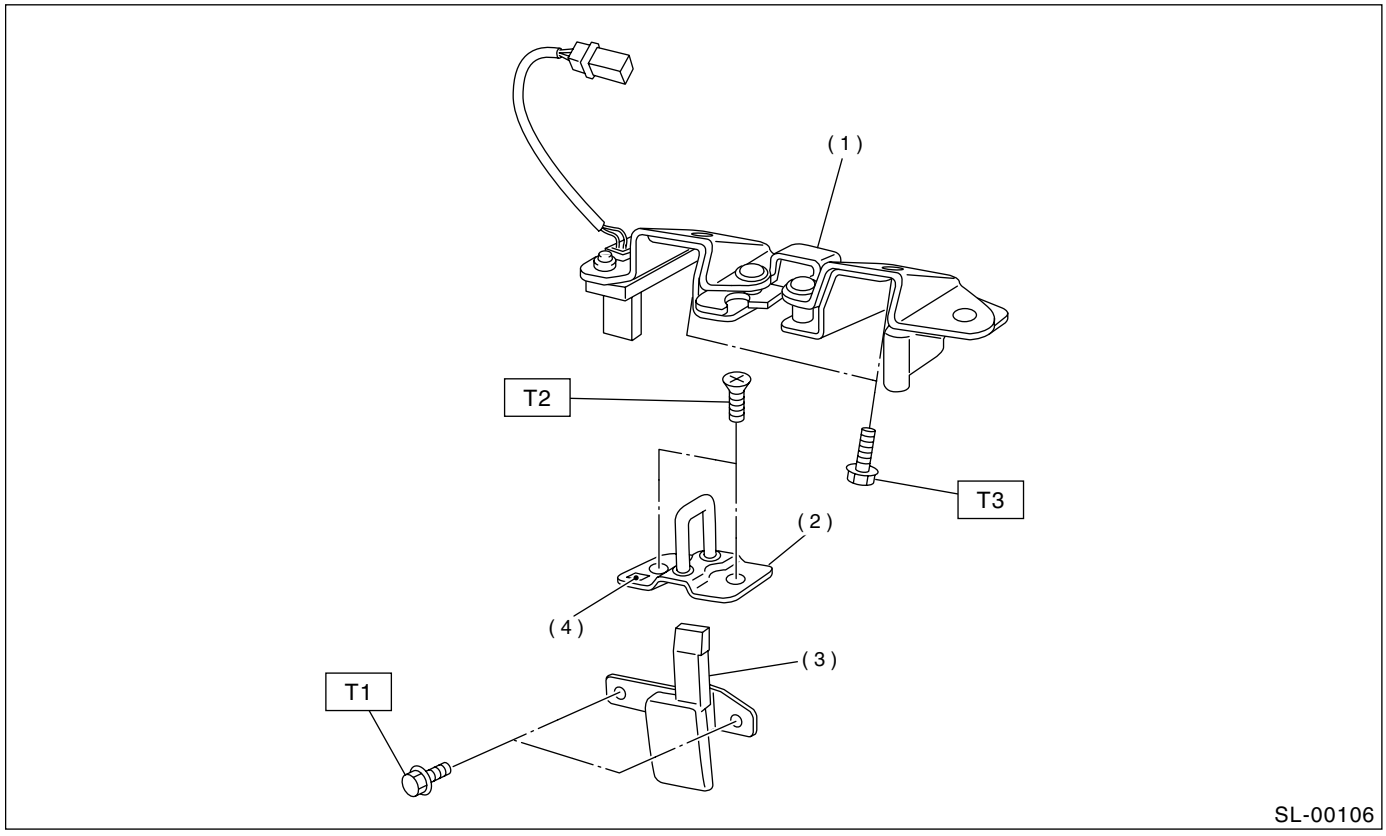
(1) Horn
(2) Security horn
(3) Keyless entry control module
(4) Security control module
(5) Security indicator light (in combination meter)
(6) Horn relay (in main fuse box)
(7) Trunk room light switch (Sedan), rear gate latch switch (Wagon)
(8) Interrupt relay
(9) Security horn relay
(10) Door switch
(11) Passive arm connector

5. KEYLESS ENTRY SYSTEM



(1) Horn
(2) Keyless entry control module
(3) Horn relay
(4) Rear gate latch switch (Wagon)/ Trunk room right switch (Sedan)
(5) Door switch
(6) Integrated module

6. SWITCH BACK GATE LOCK

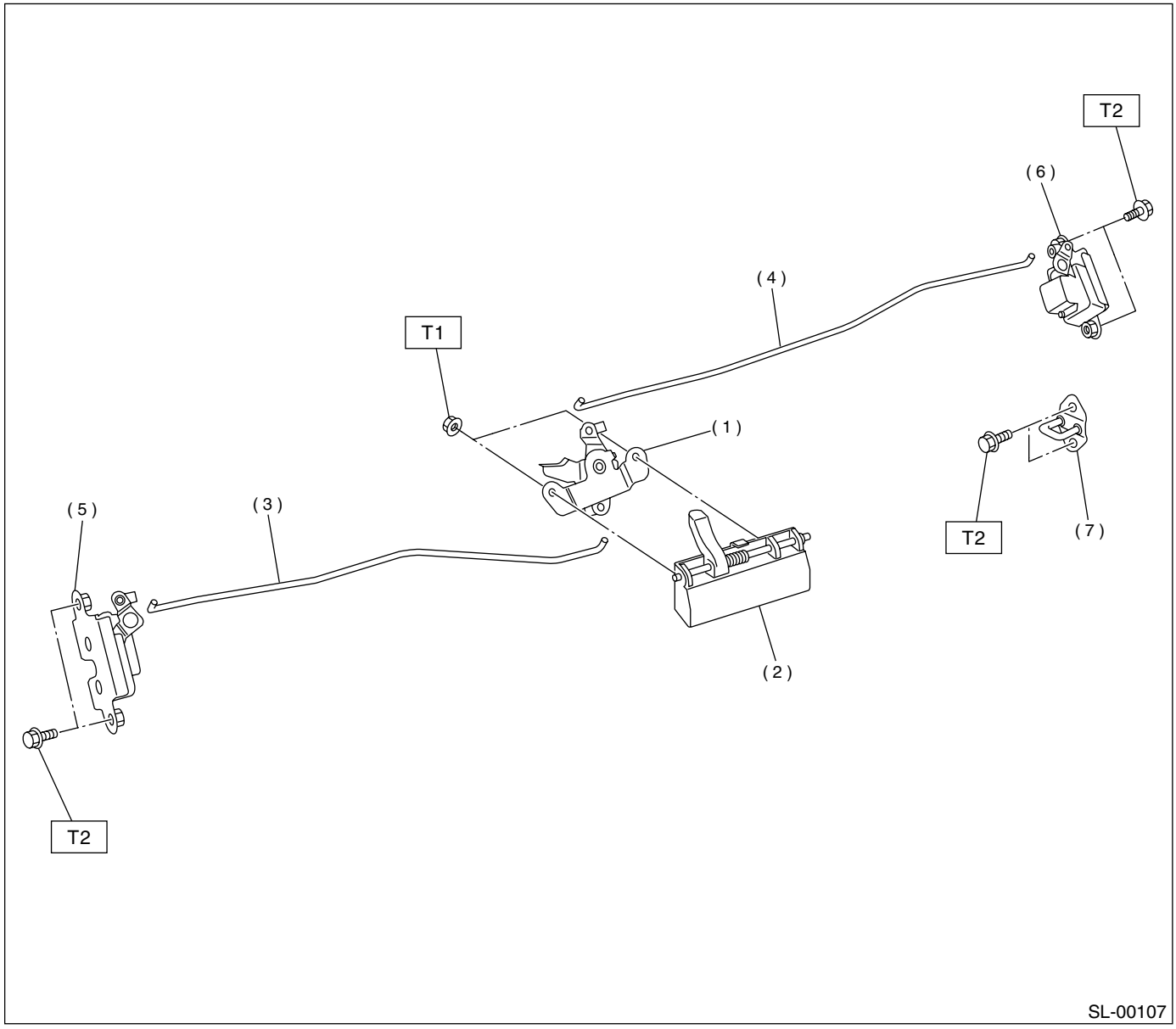


(1) Swtich back gate latch
(2) Striker
(3) Switch back gate release handle
(4) Marking

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 18 (1.8 13.0)
T3: 27.5 (2.80, 20.3)

NOTE:
When installing striker, mount with marked portion facing the vehicle front.

7. TAIL GATE LOCK



(1) Link ASSY
(2) Tail gate outer handle
(3) Rod (LH)
(4) Rod (RH)
(5) Tail gate latch (LH)
(6) Tail gate latch (RH)
(7) Striker

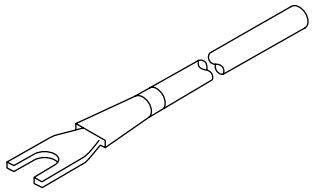
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.5, 18.1)

C: CAUTION

• Before disassembling or reassembling parts, always disconnect battery ground cable. When repairing radio, control module, etc. which are provided with memory functions, record memory contents before disconnecting battery ground cable. Otherwise, these contents are cancelled upon disconnection.
• Reassemble parts in reverse order of disassembly procedure unless otherwise indicated.
• Adjust parts to specifications contained in this manual if so designated.
• Connect connectors and hoses securely during reassembly.
• After reassembly, ensure all functional parts operate smoothly.
• Airbag system wiring harness is routed near the electrical parts and switch.
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system wiring harness when servicing the ignition key cylinder.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925580000	925580000	PULLER	Used for removing trim clip.

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Drill	Used for replacing ignition key lock.

2. Door Lock Control System

A: SCHEMATIC

1. DOOR LOCK CONTROL

<Ref. to WI-140, SCHEMATIC, Door Lock System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-10, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for the integrated module.	<Ref. to SL-11, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-11, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-12, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The door lock switch does not operate.	Check the door lock switch and the circuit.	<Ref. to SL-11, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and the circuit.	<Ref. to SL-12, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box) and No. 3 (in the fuse & relay box).	In the fuse blown out?	Check the power supply and ground circuit. <Ref. to SL-11, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>	Replace the fuse with a new one.

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the integrated module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B281) No. 1, 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Check the harness for open circuits or shorts between the integrated module and the fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B281) No. 4, 13 — Chassis ground:***	Is the measured value less than 10 Ω?	The power supply and ground circuit is OK.	Repair the harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK DOOR LOCK SWITCH CIRCUIT.** 1) Disconnect the integrated module harness connector. 2) Measure the resistance between the harness connector terminal and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***(B280) No. 12 — Chassis ground:***	Is the measured value less than 10 Ω?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR LOCK SWITCH CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground when the door lock switch is moved to UNLOCK. ***Connector & terminal*** ***(B280) No. 11 — Chassis ground:***	Is the measured value less than 10 Ω?	The door lock switch is OK.	Go to step **3.**
3	**CHECK DOOR LOCK SWITCH.** 1) Disconnect the door lock switch harness connector. 2) Measure the resistance between the door lock switch terminals when moving the door lock switch to LOCK. ***Connector & terminal*** ***Driver's side:*** ***(D7) No. 1 — No. 2*** ***Passenger's side:*** ***(D62) No. 2 — No. 5***	Is the measured value less than 1 Ω?	Go to step **4.**	Replace the door lock switch.
4	**CHECK DOOR LOCK SWITCH.** Measure the resistance between the door lock switch terminals when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***Driver's side:*** ***(D7) No. 1 — No. 6*** ***Passenger's side:*** ***(D62) No. 1 — No. 5***	Is the measured value less than 1 Ω?	Check the harness for open circuits or shorts between the integrated module and the door lock switch.	Replace the door lock switch.

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of integrated module and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***(B281) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Replace the integrated module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of integrated module and chassis ground when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***(B281) No. 7, 8 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Replace the integrated module.
3	**CHECK DOOR LOCK ACTUATOR.** Check the door lock actuator. Front door lock actuator: <Ref. to SL-36, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-40, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-43, Rear Gate Latch Lock Actuator.>	Is the door lock actuator OK?	Check the harness for open circuits or shorts between the integrated module and the door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

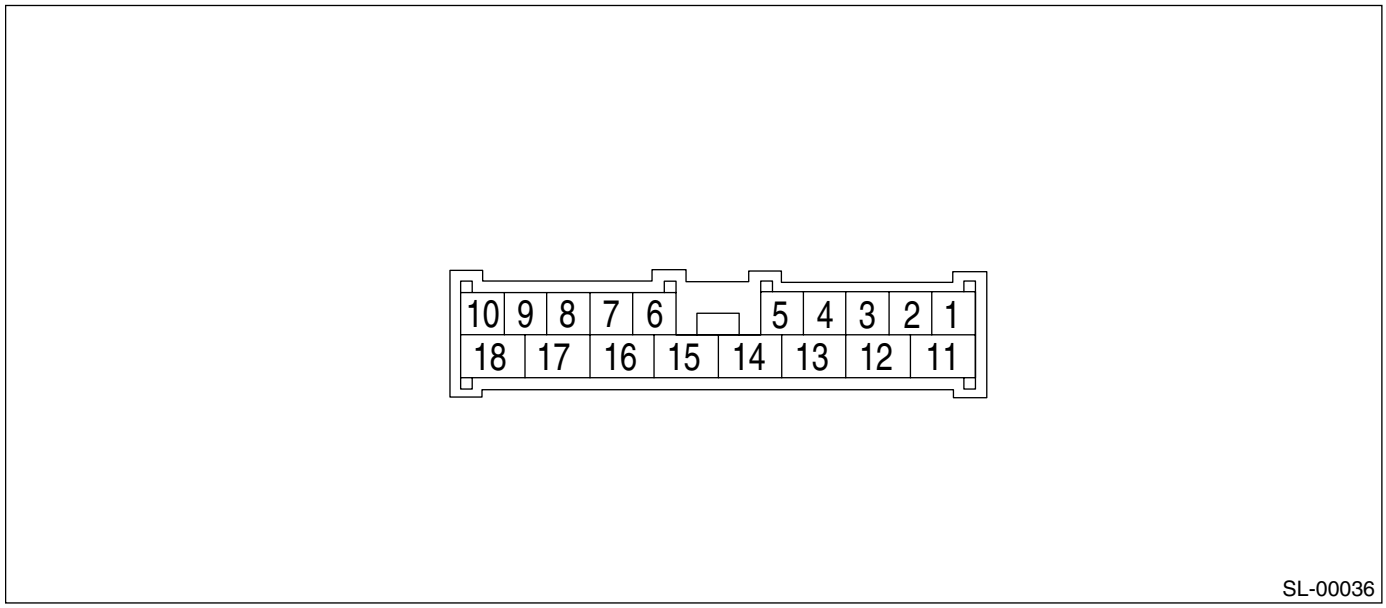
A: SCHEMATIC

1. KEYLESS ENTRY

<Ref. to WI-210, SCHEMATIC, Keyless Entry System.>

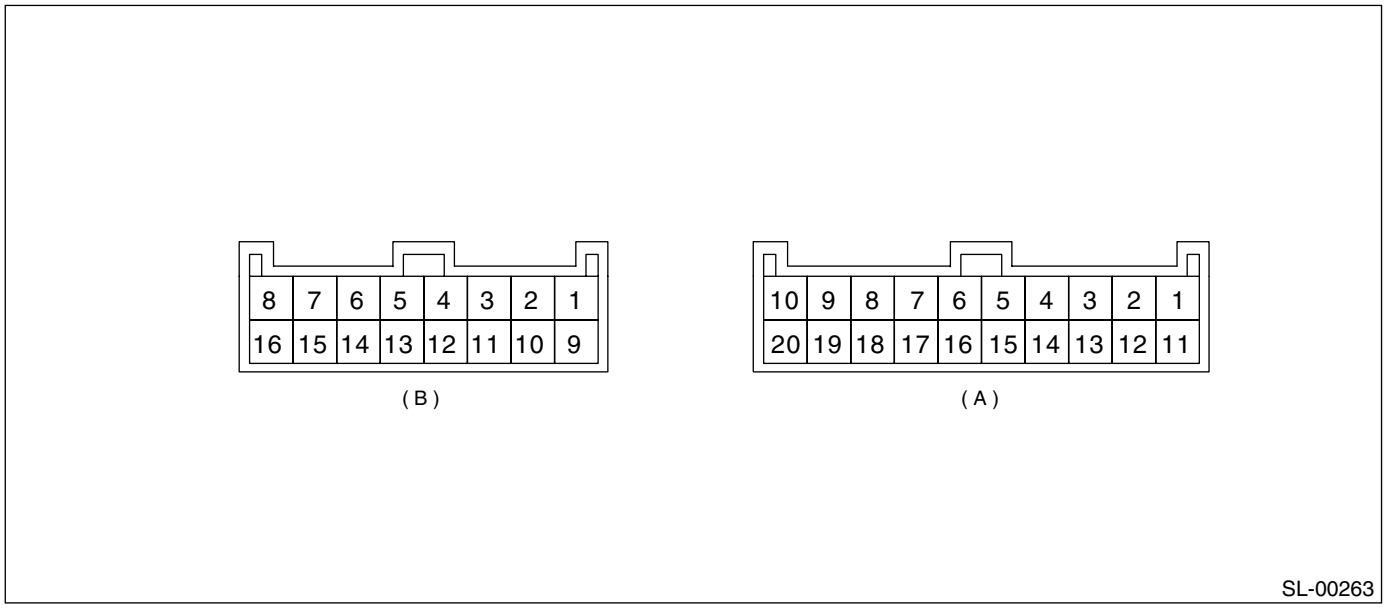
B: ELECTRICAL SPECIFICATION

1. KEYLESS ENTRY CONTROL MODULE



Content	Terminal No.	Measuring condition
Integrated module	1 (OUTPUT)	0 V is present when pressing the transmitter LOCK/ARM button.
Integrated module	2 (OUTPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM button.
Security control module	3	—
Security control module	4	—
Door lock switch	5 (INPUT)	0 V is present when operating the door lock switch.
Ignition switch (ON)	6 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Key warning switch	7 (INPUT)	Battery voltage is present when inserting the key into the ignition switch.
Door unlock switch	8 (INPUT)	0 V is present when operating the door lock switch.
Trunk room light switch (Sedan), rear gate latch switch (Wagon)	9 (INPUT)	0 V is present when trunk lid or rear gate is open.
Door switch	10 (INPUT)	0 V is present when any door is open.
Ground	11	0 V is constantly present.
Turn signal light (Left)	12 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.
Horn relay	13 (OUTPUT)	0 V is present when pressing the transmitter LOCK/ARM button three times within 5 seconds.
Power supply	14	Battery voltage is constantly present.
Power supply (Back-up)	15	Battery voltage is constantly present when back-up fuse is energized.
Keyless buzzer	16 (OUTPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.
Security control module	17	—
Turn signal light (Right)	18 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.

2. INTEGRATED MODULE



Content	Terminal No.	Measuring condition
Ignition switch illumination	A2 (OUTPUT)	0 V is present when ignition switch is OFF, and when door is opened and then closed.
Door switch (Except driver's door)	A7 (INPUT)	0 V is present when any door is open (Except driver's door).
Door switch (Driver's door)	A8 (INPUT)	0 V is present when driver's door is open.
Door unlock switch	A11 (INPUT)	0 V is present when operating the door lock switch.
Door lock switch	A12 (INPUT)	0 V is present when operating the door lock switch.
Keyless entry control module	A13 (INPUT)	0 V is present when pressing the transmitter LOCK/ARM button.
Keyless entry control module	A14 (INPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM button.
Ignition switch (ON)	A19 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Key warning switch	A20 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Power supply	B1	Battery voltage is constantly present.
Power supply	B2	Battery voltage is constantly present.
Ground	B4	0 V is constantly present.
Room light	B5 (OUTPUT)	0 V is present when all doors are closed and keys are removed, and when pressing the transmitter UNLOCK/DISARM button.
Door and rear gate lock actuator	B6 (OUTPUT)	Battery voltage is present when all doors are closed and keys are removed, and when pressing the transmitter LOCK/ARM button.
Door and rear gate lock actuator (Except driver side)	B7 (OUTPUT)	Battery voltage is present when all doors are closed and keys are removed, and when pressing the transmitter UNLOCK/DISARM button two times.
Door lock actuator (Driver side)	B8 (OUTPUT)	Battery voltage is present when all doors are closed and keys are removed, and when pressing the transmitter UNLOCK/DISARM button one time.
Ground	B13	0 V is constantly present.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of the keyless entry system operate.	1. Check the transmitter battery and function.	<Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-18, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-18, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-54, Keyless Entry Control Module.>
The transmitter cannot be programmed.	1. Check the transmitter battery and function.	<Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch circuit.	<Ref. to SL-19, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the key warning switch.	<Ref. to SL-20, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	5. Check the door switch.	<Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	6. Check the output signal to integrated module.	<Ref. to SL-21, CHECK OUTPUT SIGNAL TO INTEGRATED MODULE, INSPECTION, Keyless Entry System.>
	7. Replace the keyless entry control module.	<Ref. to SL-54, Keyless Entry Control Module.>
The door lock or unlock does not operate. NOTE: If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-10, INSPECTION, Door Lock Control System.>	1. Check the transmitter battery and function.	<Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-20, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the output signal to integrated module.	<Ref. to SL-21, CHECK OUTPUT SIGNAL TO INTEGRATED MODULE, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-54, Keyless Entry Control Module.>
The panic alarm does not operate.	1. Check the transmitter battery and function.	<Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the horn operation.	<Ref. to SL-22, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-54, Keyless Entry Control Module.>

Symptom	Repair order		Reference
The buzzer chirp and hazard light do not operate.	1. Check the buzzer chirp setting.		<Ref. to SL-18, CHECK BUZZER CHIRP SETTING, INSPECTION, Keyless Entry System.>
	2. Check the buzzer and hazard light operation.	Buzzer	<Ref. to SL-23, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
		Hazard light	<Ref. to SL-22, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Check the output signal to integrated module.		<Ref. to SL-21, CHECK OUTPUT SIGNAL TO INTEGRATED MODULE, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.		<Ref. to SL-54, Keyless Entry Control Module.>
The room light does not turn on.	1. Check the operation of room light.	Room light (Make sure that room light switch is set with door in engaged position.)	<Ref. to SL-21, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Replace the keyless entry control module.		<Ref. to SL-54, Keyless Entry Control Module.>
The door ajar warning does not operate.	1. Check the door switch.		<Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	2. Check the buzzer operation.		<Ref. to SL-23, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.		<Ref. to SL-54, Keyless Entry Control Module.>

2. CHECK TRANSMITTER BATTERY AND FUNCTION

	Step	Check	Yes	No
1	**CHECK TRANSMITTER BATTERY.** 1) Remove the battery from the transmitter. <Ref. to SL-56, REMOVAL, Keyless Transmitter.> 2) Check the battery voltage. <Ref. to SL-56, INSPECTION, Keyless Transmitter.>	Is the measured value more than 2 V?	Go to step **2.**	Replace the transmitter battery.
2	**CHECK LED OF TRANSMITTER.** 1) Press the LOCK/ARM or UNLOCK/DISARM button six times to synchronize with the keyless entry control module. 2) Press the LOCK/ARM button.	Does the LED blink one time?	Go to step **3.**	Replace the transmitter. <Ref. to SL-56, REPLACEMENT, Keyless Transmitter.>
3	**CHECK LED OF TRANSMITTER.** Keep the LOCK/ARM button pressed.	Does the LED blink one time, and then turn on?	Go to step **4.**	Replace the transmitter. <Ref. to SL-56, REPLACEMENT, Keyless Transmitter.>
4	**CHECK LED OF TRANSMITTER.** Press the UNLOCK/DISARM button.	Does the LED blink one time?	Go to step **5.**	Replace the transmitter. <Ref. to SL-56, REPLACEMENT, Keyless Transmitter.>
5	**CHECK LED OF TRANSMITTER.** Keep the UNLOCK/DISARM button pressed.	Does the LED blink two times?	Transmitter is OK.	Replace the transmitter. <Ref. to SL-56, REPLACEMENT, Keyless Transmitter.>

3. CHECK BUZZER CHIRP SETTING

	Step	Check	Yes	No
1	**CHECK BUZZER CHIRP SETTING.** 1) Check the current setting of the buzzer chirp. 2) Remove the key from the ignition switch. 3) Close all doors and the rear gate. 4) Press the LOCK/ARM or UNLOCK/DISARM button.	Does the buzzer signal chirp?	Buzzer chirp function is OK.	Go to step **2.**
2	**CHECK BUZZER CHIRP SETTING.** 1) Press the UNLOCK/DISARM button once. 2) Press both the LOCK/ARM and UNLOCK/DISARM buttons for more than 2 seconds. 3) Press the LOCK/ARM or UNLOCK/DISARM button.	Does the buzzer signal chirp?	Buzzer chirp function is OK.	Check the transmitter function. <Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>

4. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box) and No. 3 (in the fuse and relay box).	Is the fuse blown out?	Check the power supply and ground circuit. <Ref. to SL-18, CHECK POWER SUPPLY AND GROUND CIRCUIT, Keyless Entry System.>	Replace the fuse with a new one.

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 14, No. 15 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Check the harness for open circuits and shorts between the keyless entry control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 11 — Chassis ground:***	Is the measured value less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK IGNITION SWITCH CIRCUIT

Step		Check	Yes	No
1	**CHECK IGNITION SWITCH SIGNAL.** 1) Disconnect the keyless entry control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Ignition switch circuit is OK.	Check the harness for open circuits and shorts between the keyless entry control module and ignition relay.

7. CHECK DOOR SWITCH

Step		Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear side door:*** ***(B176) No. 10 (+) — Chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B176) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 1.5 V when each door, rear gate or trunk lid is opened?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear side door:*** ***(B176) No. 10 (+) — Chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B176) No. 9 (+) — Chassis ground (–):***	Does the measured value more than 10 V when all doors and rear gate or trunk lid is closed?	The door switch is OK.	Go to step **3.**
3	**CHECK DOOR SWITCH.** 1) Disconnect the door switch harness connector. 2) Measure the resistance between the door switch terminals. ***Terminal*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch or trunk room light switch No. 1 — No. 2:***	Is the measured value more than 1 MΩ when the door switch is depressed?	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between the door switch terminals. ***Terminal*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch or trunk room light switch No. 1 — No. 2:***	Is the measured value less than 1 Ω when the door switch is released?	Check the harness for open circuits and shorts between the integrated module and door switch.	Replace the door switch.

8. CHECK KEY WARNING SWITCH

Step		Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box).	Is the fuse blown out?	Go to step **2.**	Replace the fuse with a new one.
2	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Disconnect the keyless entry control module harness connector. 2) Insert the key into the ignition switch. (LOCK position) 3) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Remove the key from the ignition switch. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 7 (+) — Chassis ground (–):***	Is the measured value less than 1.5 V?	Key warning switch is OK.	Go to step **4.**
4	**CHECK KEY WARNING SWITCH.** 1) Disconnect the key warning switch harness connector. 2) Insert the key into the ignition switch. (LOCK position) 3) Measure the resistance between the key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the measured value less than 1 Ω?	Go to step **5.**	Replace the key warning switch.
5	**CHECK KEY WARNING SWITCH.** 1) Remove the key from the ignition switch. 2) Measure the resistance between the key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the measured value more than 1 MΩ?	**Check the following:** • Harness for open circuits and shorts between the key warning switch and fuse • Harness for open circuits and shorts between the keyless entry control module and key warning switch	Replace the key warning switch.

9. CHECK ROOM LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK ROOM LIGHT OPERATION.** Make sure the room light illuminates when the room light switch is turned ON.	Does the room light illuminate?	Go to step **2.**	Check the room light circuit.
2	**CHECK HARNESS BETWEEN ROOM LIGHT AND INTEGRATED MODULE.** 1) Disconnect the integrated module harness connector and room light harness connector. 2) Measure the resistance between the integrated module harness connector terminal and the room light harness connector terminal. ***Connector & terminal*** ***(B281) No. 5 — (R52) No. 2:***	Is the measured value less than 10 Ω?	The room light operation circuit is OK.	Check the harness for open circuits and/or shorts between the integrated module and room light.

10.CHECK OUTPUT SIGNAL TO INTEGRATED MODULE

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when UNLOCK/DISARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 1.5 V?	Go to step **2.**	Replace the keyless entry control module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when LOCK/ARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 1.5 V?	Go to step **3.**	Replace the keyless entry control module.
3	**CHECK HARNESS BETWEEN KEYLESS ENTRY CONTROL MODULE AND INTEGRATED MODULE.** 1) Disconnect the keyless entry control module harness connector and integrated module harness connector. 2) Measure the resistance between the keyless entry control module harness connector terminal and integrated module harness connector terminal. ***Connector & terminal*** ***(B176) No. 2 — (B280) No. 14:*** ***(B176) No. 1 — (B280) No. 13:***	Is the measured value less than 10 Ω?	Replace the integrated module.	Check the harness for open circuit or shorts between the keyless entry control module and integrated module.

11.CHECK HORN OPERATION

	Step	Check	Yes	No
1	**CHECK HORN OPERATION.** Make sure the horn sounds when the horn switch is pushed.	Does the horn sound?	Go to step **2.**	Check the horn circuit.
2	**CHECK HORN OPERATION.** 1) Disconnect the keyless entry control module harness connector. 2) Ground the harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B176) No. 13 — Chassis ground:***	Does the horn sound?	Replace the keyless entry control module.	Check the harness for open circuits and/or shorts between the keyless entry control module and horn relay.

12.CHECK HAZARD LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK HAZARD LIGHT OPERATION.** Make sure the hazard light blinks when hazard switch is turned ON.	Does the hazard light blink?	Go to step **2.**	Check the hazard light circuit.
2	**CHECK OUTPUT SIGNAL.** 1) Remove the key from ignition switch. 2) Close all doors and rear gate or trunk lid. 3) Measure the voltage between keyless entry control module harness connector terminal and chassis ground when LOCK/ARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 12, 18 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Check the harness for open or short between keyless entry control module and turn signal lights.	Replace the keyless entry control module.

13.CHECK KEYLESS BUZZER

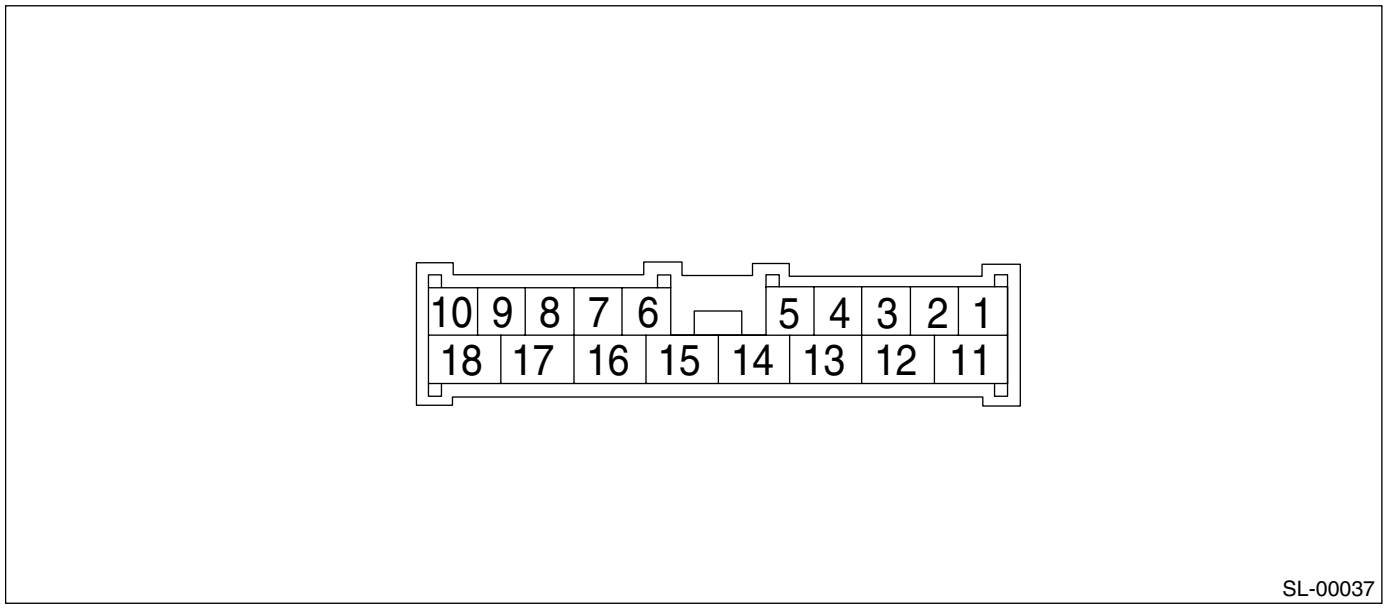
	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and check the fuse No. 3 (located in fuse and relay box).	Is the fuse blown out?	Go to step **2.**	Replace the fuse with a new one.
2	**CHECK KEYLESS BUZZER POWER SUPPLY.** 1) Disconnect the connector from keyless buzzer. 2) Measure the voltage between keyless buzzer harness connector and chassis ground. ***Connector & terminal*** ***(D70) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse and keyless buzzer.
3	**CHECK HARNESS BETWEEN KEYLESS BUZZER AND KEYLESS ENTRY CONTROL MODULE.** 1) Disconnect the connector from keyless entry control module. 2) Measure the resistance between keyless buzzer and keyless entry control module. ***Connector & terminal*** ***(D70) No. 1 (+) — (B176) No. 16:***	Is the measured value less than 10 Ω?	Go to step **4.**	Repair the harness between keyless buzzer and keyless entry control module.
4	**CHECK KEYLESS BUZZER.** Make sure that the buzzer sounds when connecting battery positive terminal to No. 2 terminal of keyless buzzer connector and battery ground terminal to No. 1 terminal of keyless buzzer connector.	Does the buzzer sound?	Replace the keyless entry control module.	Replace the keyless buzzer.

4. Security System

A: SCHEMATIC

<Ref. to WI-276, SCHEMATIC, Security System.>

B: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring condition
Empty	1	—
Ignition switch (ON)	2 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Passive arm	3	—
Rear gate latch switch	4 (INPUT)	0 V is present when rear gate is open.
Door switch	5 (INPUT)	0 V is present when any door is open.
Empty	6	—
Keyless entry control module	7	—
Keyless entry control module	8	—
Security indicator light	9 (OUTPUT)	0 V is present when activating the alarm operation.
Keyless entry control module	10	—
Power supply (Back-up)	13	Battery voltage is constantly present.
Ground	14	0 V is constantly present.
Interrupt relay	15 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Security horn relay	16 (INPUT)	Battery voltage is present when activating the alarm operation.
Security horn	17 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Security horn relay	18 (INPUT)	Battery voltage is present when activating the alarm operation.

C: INSPECTION

1. BASIC DIAGNOSTIC PROCEDURE

	Step	Check	Yes	No
1	**CHECK SECURITY SYSTEM SET OPERATION.** 1) Before starting this diagnosis, open all windows. 2) Remove the key from ignition key cylinder, and then close all doors and rear gate. 3) Press the LOCK/ARM button of transmitter.	Can the security system be set?	Go to step **2.**	Go to symptom 1. <Ref. to SL-26, SYMPTOM CHART, INSPECTION, Security System.>
2	**CHECK SECURITY INDICATOR LIGHT AND HAZARD LIGHT BLINKING.** Check the security indicator light and hazard light blinking.	Do the security indicator light and hazard light blink?	Go to step **3.**	Go to symptom 2. <Ref. to SL-26, SYMPTOM CHART, INSPECTION, Security System.>
3	**CHECK SECURITY ALARM OPERATION.** 1) Unlock all doors using the door lock switch on front door. 2) Open any door, rear gate or trunk lid.	Does the security alarm operate when any door, rear gate or trunk lid is opened?	Go to step **4.**	Go to symptom 3. <Ref. to SL-26, SYMPTOM CHART, INSPECTION, Security System.>
4	**CHECK SECURITY ALARM OPERATION.** Check the security alarm operation.	Does all security alarm (horn, hazard light and security indicator light) operate? And is the starter motor deactivated?	Go to step **5.**	Go to symptom 4. <Ref. to SL-26, SYMPTOM CHART, INSPECTION, Security System.>
5	**CHECK SECURITY ALARM CANCEL OPERATION.** Press the UNLOCK/DISARM button of transmitter.	Do all security alarm (horn and hazard light) stop? And is the starter motor activated?	Go to step **6.**	Go to symptom 5. <Ref. to SL-26, SYMPTOM CHART, INSPECTION, Security System.>
6	**CHECK BATTERY DISCONNECT PROTECTION.** Make sure that the system operates properly if the battery cable is disconnected temporarily. <Ref. to SL-26, CHECK BATTERY DISCONNECT PROTECTION, INSPECTION, Security System.>	Does the system operate properly if the battery cable is disconnected temporarily?	Go to step **7.**	Replace the security control module.
7	**PERFORM IMPACT SENSITIVITY TEST.** Perform the impact sensitivity test. <Ref. to SL-50, IMPACT SENSITIVITY TEST, INSPECTION, Security Control Module.>	Is the impact sensitivity properly set?	Press the UNLOCK/DISARM button of transmitter, and finish the diagnosis.	Adjust the impact sensitivity.<Ref. to SL-50, IMPACT SENSITIVITY, ADJUSTMENT, Security Control Module.>

2. CHECK BATTERY DISCONNECT PROTECTION

1) Remove the key from the ignition switch.
2) Close all the doors, rear gate and trunk lid.
3) Open the front hood.
4) Press the LOCK/ARM button of the transmitter.
5) Disconnect the ground cable from the battery.
6) Reconnect the cable to the battery.
7) Check that the security indicator light blinks after reconnecting the battery cable.

If NG, replace the security control module.

3. SYMPTOM CHART

Symptom			Repair order	Reference
1	Security system cannot be set.		1. Check the transmitter function.	<Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
			2. Check the fuse.	<Ref. to SL-27, CHECK FUSE, INSPECTION, Security System.>
			3. Check the security control module power supply and ground circuit.	<Ref. to SL-27, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>
			4. Check the door switch.	<Ref. to SL-27, CHECK DOOR SWITCH, INSPECTION, Security System.>
			5. Replace the security control module.	<Ref. to SL-50, Security Control Module.>
2	Security system can be set, but the security indicator light or hazard light does not blink.	Security indicator light	Check the security indicator light circuit.	<Ref. to SL-29, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Hazard light	Check the hazard light operation.	<Ref. to SL-31, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
3	Security system does not alarm when one of the door is opened.		Check the door switch.	<Ref. to SL-27, CHECK DOOR SWITCH, INSPECTION, Security System.>
4	Security alarm does not activate.	All functions	Check the door switch.	<Ref. to SL-27, CHECK DOOR SWITCH, INSPECTION, Security System.>
		Security indicator light	Check the security indicator light circuit.	<Ref. to SL-29, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Security horn	Check the security horn.	<Ref. to SL-29, CHECK SECURITY HORN, INSPECTION, Security System.>
		Hazard light	Check the hazard light operation.	<Ref. to SL-31, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
		Starter motor deactivation	Check the interrupt relay circuit.	<Ref. to SL-31, CHECK INTERRUPT RELAY CIRCUIT, INSPECTION, Security System.>
5	Security system cannot be canceled.	Transmitter	Check the transmitter function.	<Ref. to SL-17, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
		Ignition switch	Check the ignition switch circuit.	<Ref. to SL-32, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.>

4. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in main fuse box).	Is the fuse blown out?	Check the power supply and ground circuit. <Ref. to SL-27, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>	Replace the fuse with a new one.

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the security control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 13 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **2.**	Check the harness for open circuits and shorts between the security control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 14 — Chassis ground:***	Is the measured value less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the security control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear door:*** ***(B93) No. 5 (+) — Chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B93) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 1.5 V when each door, rear gate or trunk lid is opened?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the security control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear door:*** ***(B93) No. 5 (+) — Chassis ground (–):*** ***Rear gate or trunk lid:*** ***(B93) No. 4 (+) — Chassis ground (–):***	Does the measured value exceed the 10 V when all doors and rear gate or trunk lid is closed?	The door switch is OK.	Go to step **3.**

Step	Check	Yes	No
3 **CHECK DOOR SWITCH.** 1) Disconnect the door switch harness connector. 2) Measure the resistance between the door switch terminals. ***Terminal*** ***Door switch:*** ***No. 1 — No. 3:*** ***Rear gate latch switch or trunk room light:*** ***No. 1 — No. 2:***	Is the measured value more than 1 MΩ when door switch is pushed?	Go to step **4.**	Replace the door switch.
4 **CHECK DOOR SWITCH.** Measure the resistance between the door switch terminals. ***Terminal*** ***Door switch:*** ***No. 1 — No. 3:*** ***Rear gate latch switch or trunk room light switch:*** ***No. 1 — No. 2:***	Is the measured value less than 1Ω when door switch is released?	Check the harness for open circuits and shorts between the security control module and door switch.	Replace the door switch.

7. CHECK SECURITY INDICATOR LIGHT CIRCUIT

	Step	Check	Yes	No
1	**CHECK SECURITY INDICATOR LIGHT.** 1) Disconnect the security control module harness connector. 2) Ground the harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B93) No. 9 — Chassis ground:***	Does the security indicator light illuminate?	Replace the security control module.	Go to step **2.**
2	**CHECK POWER SUPPLY FOR SECURITY INDICATOR LIGHT.** 1) Disconnect the connector from the combination meter. 2) Measure the voltage between the combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i12) No. 7 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the combination meter and the fuse.
3	**CHECK SECURITY INDICATOR LIGHT CIRCUIT.** Measure the resistance between the combination meter harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(i12) No. 1 — (B93) No. 9:***	Is the measured value less than 10 Ω?	Replace the combination meter printed circuit.	Check the harness for open circuits and shorts between the combination meter and security control module.

8. CHECK SECURITY HORN

	Step	Check	Yes	No
1	**CHECK SECURITY HORN RELAY.** Remove and check the security horn relay. <Ref. to SL-52, Security Horn Relay.>	Is the security horn relay OK?	Go to step **2.**	Replace the security horn relay.
2	**CHECK POWER SUPPLY FOR SECURITY HORN RELAY.** Measure the voltage between the security horn relay harness connector terminal and chassis ground. ***Connector & terminal*** ***Without OnStar models*** ***(B243) No. 1 (+) — Chassis ground (–):*** ***With OnStar models*** ***(B243) No. 3 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the security horn relay and horn relay.
3	**CHECK POWER SUPPLY FOR SECURITY HORN RELAY.** Measure the voltage between the security horn relay harness connector terminal and chassis ground. ***Connector & terminal*** ***Without OnStar models*** ***(B243) No. 2 (+) — Chassis ground (–):*** ***With OnStar models*** ***(B243) No. 1 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Go to step **4.**	Check the harness for open circuits and shorts between the security horn relay and the fuse.

	Step	Check	Yes	No
4	**CHECK HARNESS BETWEEN SECURITY HORN RELAY AND SECURITY CONTROL MODULE.** 1) Disconnect the security control module harness connector. 2) Measure the resistance between the security horn relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***Without OnStar models*** ***(B243) No. 3 — (B93) No. 18:*** ***With OnStar models*** ***(B243) No. 4 — (B93) No. 18:***	Is the measured value less than 10 Ω?	Go to step **5.**	Check the harness for open circuits and shorts between the security horn relay and security control module.
5	**CHECK HARNESS BETWEEN SECURITY HORN RELAY AND SECURITY CONTROL MODULE.** Measure the resistance between the security horn relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***Without OnStar models*** ***(B243) No. 4 — (B93) No. 16:*** ***With OnStar models*** ***(B243) No. 2 — (B93) No. 16:***	1Is the measured value less than 10 Ω?	Go to step **6.**	Check the harness for open circuits and shorts between the security horn relay and security control module.
6	**CHECK HARNESS BETWEEN SECURITY CONTROL MODULE AND SECURITY HORN.** 1) Disconnect the security horn harness connector. 2) Measure the resistance between the security control module harness connector terminal and security horn harness connector terminal. ***Connector & terminal*** ***(B93) No. 17 — (B204) No. 1:***	Is the measured value less than 10 Ω?	Go to step **7.**	Check the harness for open circuits and shorts between the security control module and security horn.
7	**CHECK SECURITY HORN.** Remove and check the security horn. <Ref. to SL-51, Security Horn.>	Is the security horn OK?	Replace the security control module.	Replace the security horn.

9. CHECK HAZARD LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK SECURITY CONTROL MODULE OUTPUT SIGNAL.** 1) Remove the key from the ignition switch. 2) Open the driver's window, and then close all doors and rear gate. 3) Lock all doors with the transmitter or door lock switch to arm the security system. 4) Unlock all doors with the door lock switch. 5) Measure the voltage between the security control module harness connector terminal and chassis ground when any door is open. ***Connector & terminal*** ***(B93) No. 10 (+) — Chassis ground (-):***	Is the measured value within 1 to 4 V?	Go to step **2.**	Replace the security control module.
2	**CHECK HARNESS BETWEEN SECURITY CONTROL MODULE AND KEYLESS ENTRY CONTROL MODULE.** 1) Disconnect the security control module harness connector and keyless entry control module harness connector. 2) Measure the resistance between the security control module harness connector terminal and keyless entry control module harness connector terminal. ***Connector & terminal*** ***(B93) No. 10 — (B176) No. 3:***	Is the measured value less than 10 W?	Check the hazard light output of keyless entry control module.<Ref. to SL-22, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>	Check the harness for open circuit and shorts between the security control module and keyless entry control module.

10.CHECK INTERRUPT RELAY CIRCUIT

	Step	Check	Yes	No
1	**CHECK INTERRUPT RELAY.** Remove and check the interrupt relay. <Ref. to SL-53, Interrupt Relay.>	Is the interrupt relay OK?	Go to step **2.**	Replace the interrupt relay.
2	**CHECK POWER SUPPLY FOR INTERRUPT RELAY.** Measure the voltage between the interrupt relay harness connector terminal and chassis ground. ***Connector & terminal*** ***Without On Star:*** ***(B59) No. 1 (+) — Chassis ground (–):*** ***With On Star:*** ***(B59) No. 4 (+) — Chassis ground (–):***	Is the measured value more than 10 V when ignition switch is turned to START?	Go to step **3.**	Check the harness for open circuits and shorts between the interrupt relay and ignition switch.
3	**CHECK HARNESS BETWEEN INTERRUPT RELAY AND SECURITY CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the security control module harness connector. 3) Measure the resistance between the interrupt relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***Without On Star:*** ***(B59) No. 4 — (B93) No. 15:*** ***With On Star:*** ***(B59) No. 2 — (B93) No. 15:***	Is the measured value less than 10 Ω?	Replace the security control module.	Check the harness for open circuits and shorts between the interrupt relay and security control module.

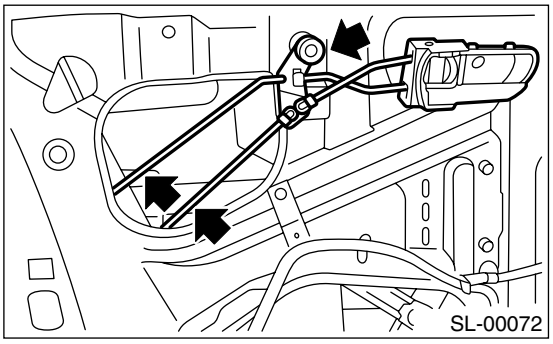
11.CHECK IGNITION SWITCH CIRCUIT

Step		Check	Yes	No
1	**CHECK IGNITION SWITCH SIGNAL.** 1) Disconnect the security control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 2 (+) — Chassis ground (–):***	Is the measured value more than 10 V?	Ignition switch circuit is OK.	Check the harness for open circuits and shorts between the security control module and ignition switch.

5. Front Inner Remote

A: REMOVAL

1) Remove the door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-15, REMOVAL, Front Sealing Cover.>
3) Remove the two rod joints.
4) Remove the screw, and detach the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

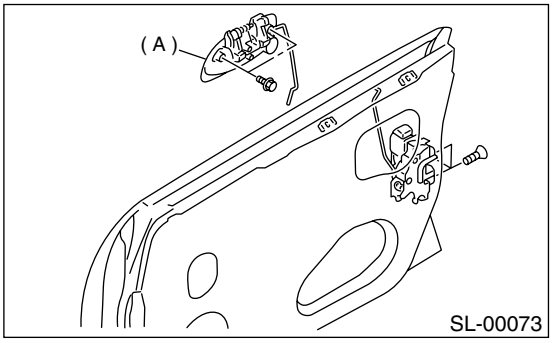
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

6. Front Outer Handle

A: REMOVAL

1) Remove the front door latch assembly. <Ref. to SL-35, REMOVAL, Front Door Latch Assembly.>
2) Remove the two bolts. Remove the front outer handle (A).



CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

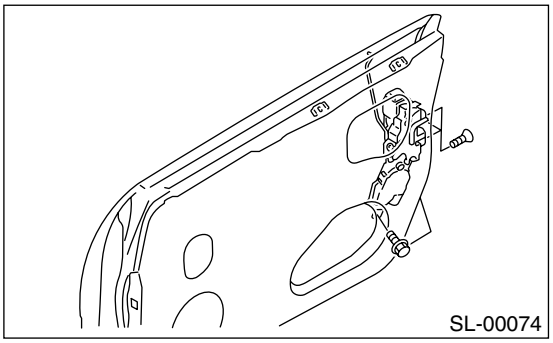
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

7. Front Door Latch Assembly

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove the front door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
3) Remove the sealing cover. <Ref. to EB-15, REMOVAL, Front Sealing Cover.>
4) Remove the front inner remote. <Ref. to SL-33, REMOVAL, Front Inner Remote.>
5) Remove the front door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
6) Remove three nuts, and detach the front door sash (Rear).
7) Remove the three screws and bolt.



8) Disconnect the connector. Remove the front door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

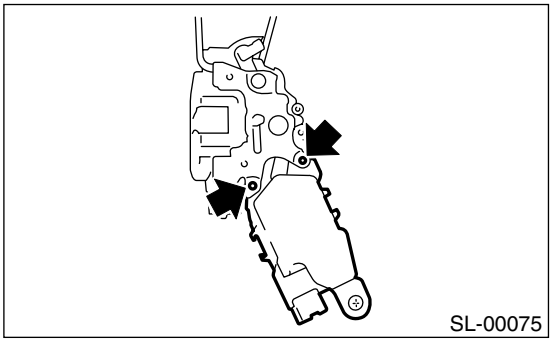
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

8. Front Door Lock Actuator

A: REMOVAL

1) Remove the front door latch assembly. <Ref. to SL-35, REMOVAL, Front Door Latch Assembly.>
2) Remove the bolt. Remove the front door lock actuator.



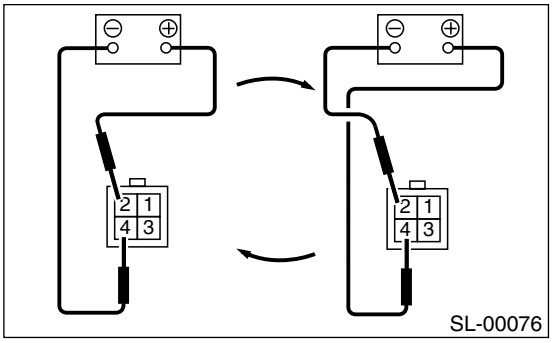
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to the door lock actuator terminals.



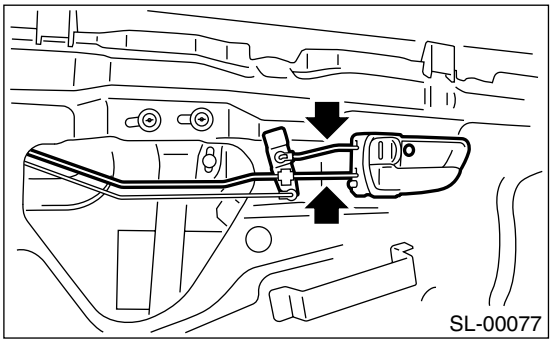
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

If NG, replace the door lock actuator.

9. Rear Inner Remote

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove the two rod joints.
4) Remove the screw, and detach the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

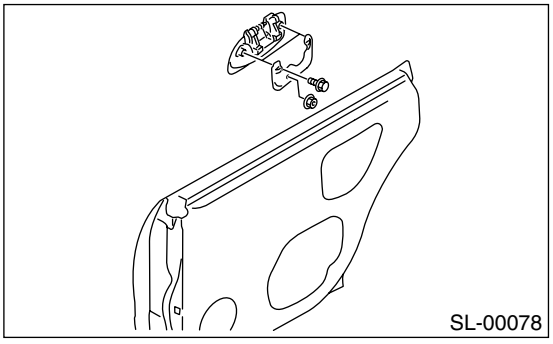
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.
3) Make sure the child safety lock on rear doors work properly, when applicable.

10.Rear Outer Handle

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove the rear inner remote. <Ref. to SL-37, REMOVAL, Rear Inner Remote.>
4) Remove the rear door latch assembly. <Ref. to SL-39, REMOVAL, Rear Door Latch Assembly.>
5) Remove the two bolts and nut. Remove the rear outer handle.



CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

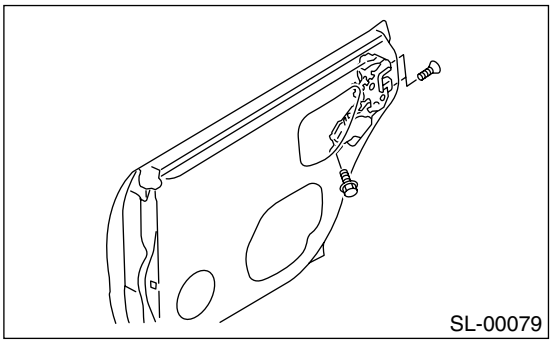
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

11.Rear Door Latch Assembly

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
3) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
4) Remove the rear inner remote. <Ref. to SL-37, REMOVAL, Rear Inner Remote.>
5) Remove the three screws and bolt.



6) Disconnect the connector. Remove the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

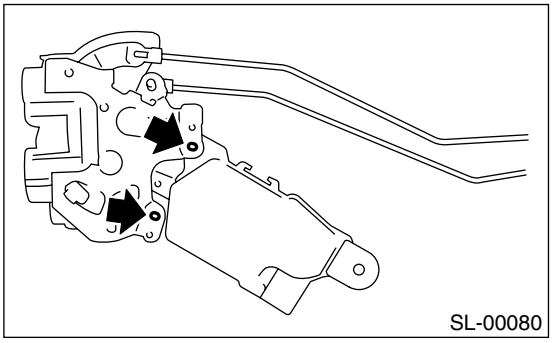
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

12.Rear Door Lock Actuator

A: REMOVAL

1) Remove the rear door latch assembly. <Ref. to SL-39, REMOVAL, Rear Door Latch Assembly.>
2) Remove the bolt. Remove the rear door lock actuator.



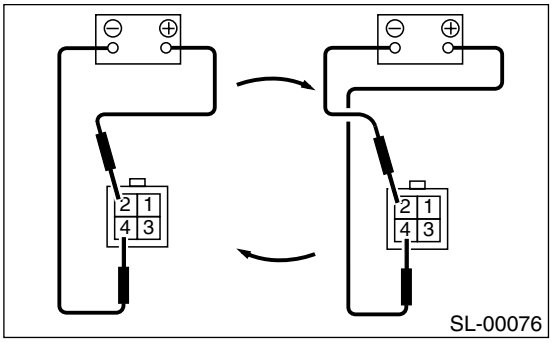
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to the door lock actuator terminals.



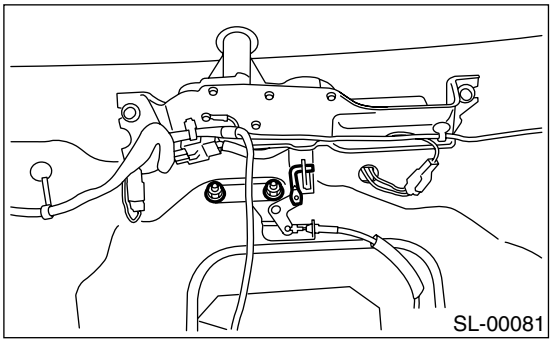
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

If NG, replace the door lock actuator.

13.Rear Gate Outer Handle

A: REMOVAL

1) Remove the rear gate trim (lower). <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
2) Remove the rear gate latch rod.
3) Remove the nut holding the rear gate outer handle, and then remove the rear gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

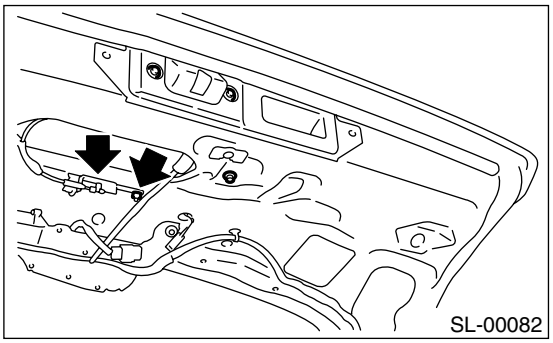
C: INSPECTION

1) Inspect the rod for deformation.
2) Make sure the lever and rod move smoothly.

14.Rear Gate Latch Assembly

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove the rear gate trim (lower). <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
3) Remove the rear gate key cylinder rod.
4) Remove the rear gate outer handle. <Ref. to SL-41, REMOVAL, Rear Gate Outer Handle.>
5) Remove the three bolts.



6) Remove the two connectors and pull out the latch.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

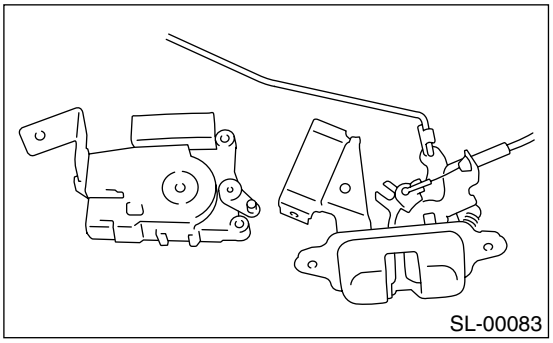
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

15.Rear Gate Latch Lock Actuator

A: REMOVAL

1) Remove the rear gate latch assembly. <Ref. to SL-42, REMOVAL, Rear Gate Latch Assembly.>
2) Remove the rear gate lock actuator.



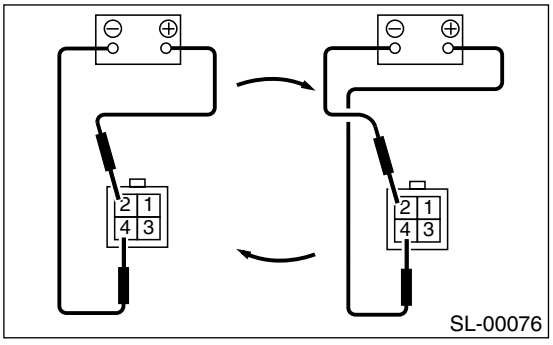
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to the door lock actuator terminals.



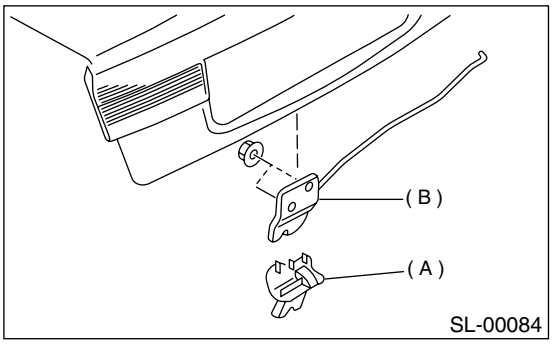
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

16.Trunk Lid Lock Assembly

A: REMOVAL

1) Remove the trunk lid key cylinder rod.
2) Remove the lock assembly cover (A).
3) Remove the nut while holding the lock assembly. Remove the lock assembly (B).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Apply grease to parts that rub.
- Make sure the lock works properly after installation.

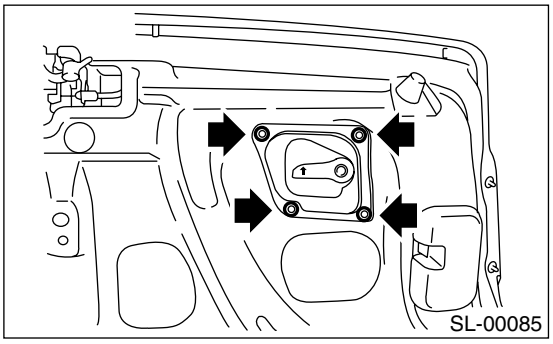
C: INSPECTION

1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

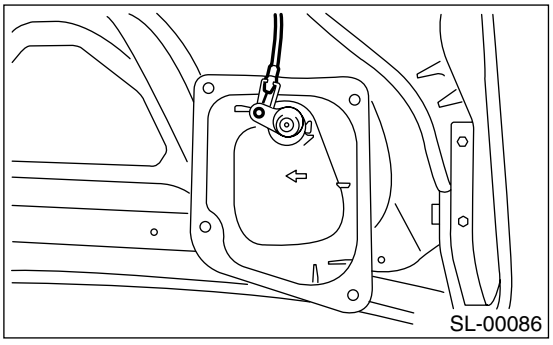
17.Trunk Lid Release Handle

A: REMOVAL

1) Remove the four clips.



2) Remove the cable from trunk lid release handle.



B: INSTALLATION

Install in the reverse order of removal.

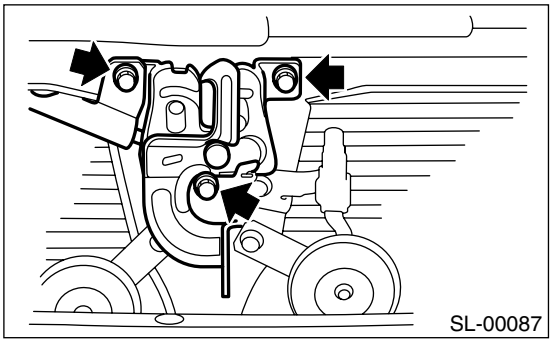
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever works smoothly.

18.Front Hood Lock Assembly

A: REMOVAL

1) Open the hood.
2) Remove the bolt. Remove the hood lock assembly.
3) Remove the release cable from the lock assembly.



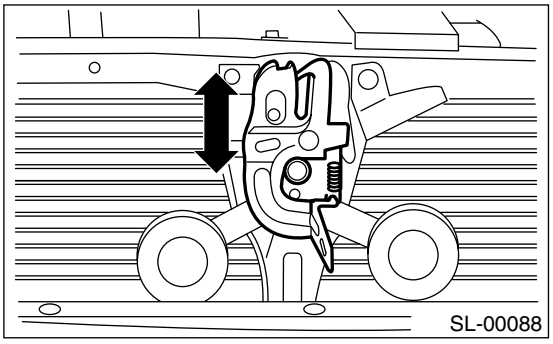
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt. Adjust the lock assembly while moving it up and down.



D: INSPECTION

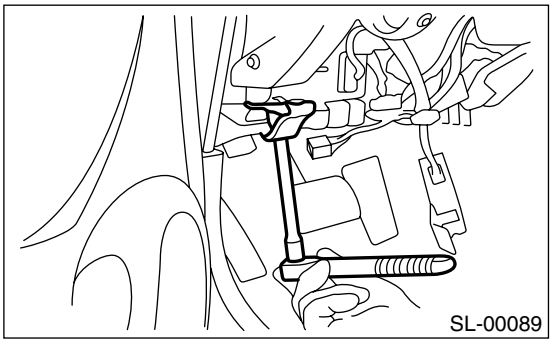
1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

19.Remote Openers

A: REMOVAL

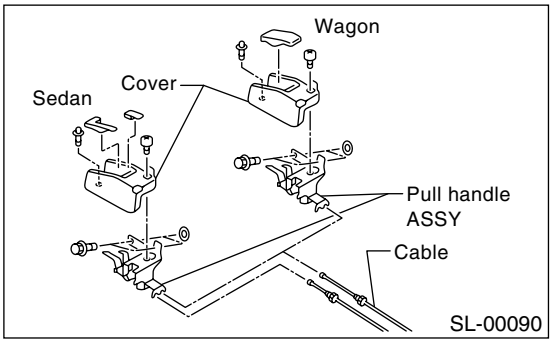
1. HOOD OPENER

1) Remove the release cable from the hood lock.
2) Remove the bolt. Remove the opener lever.

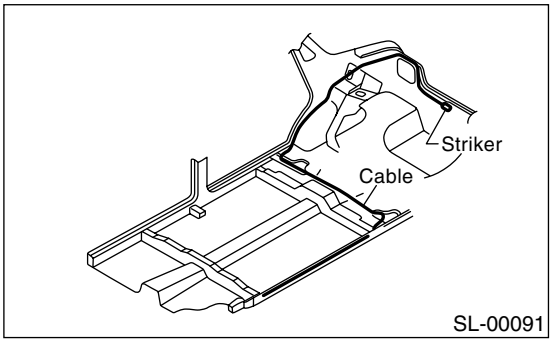


2. TRUNK LID OPENER

1) Remove the front seat. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove the center pillar lower trim and side sill cover on the passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
3) Remove the bolt. Remove the opener pull handle.

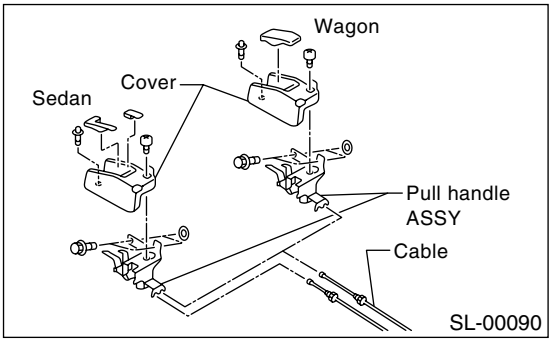


4) Remove the cable from the opener pull handle.
5) Remove the striker from the trunk lid.
6) Remove the cable from the striker.

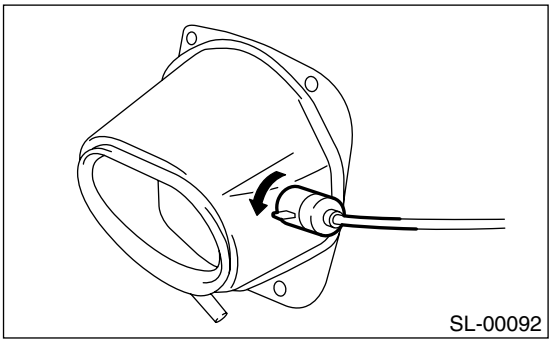


3. FUEL FLAP OPENER

1) Remove the rear seat. <Ref. to SE-18, REMOVAL, Rear Seat.>
2) Remove the center pillar lower trim and side sill cover on the passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
3) Remove the bolt. Remove the opener pull handle.



4) Remove the cable from the opener pull handle.
5) Remove the right rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
6) Rotate the fuel lock inside the quarter panel to left and remove.



B: INSTALLATION

1. HOOD OPENER

Install in the reverse order of removal.

2. TRUNK LID OPENER

Install in the reverse order of removal.

3. FUEL FLAP OPENER

Install in the reverse order of removal.

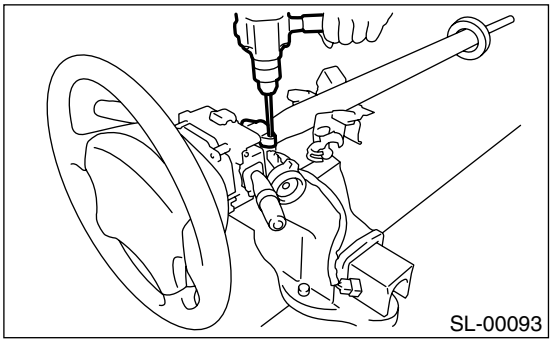
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

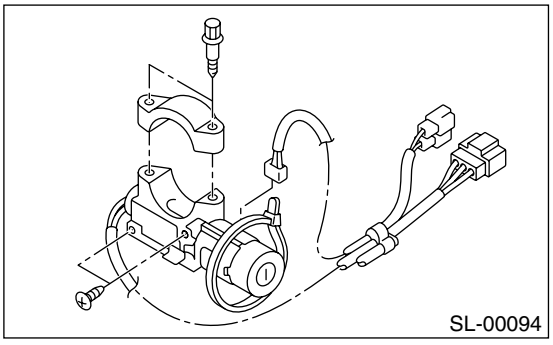
20.Ignition Key Lock

A: REPLACEMENT

1) Disconnect ground cable from battery.
2) Remove the steering column. <Ref. to PS-21, REMOVAL, Tilt Steering Column.>
3) Secure the steering column in a vise. Remove the bolt with a drill.



4) Remove the ignition key lock.
5) Use a new torn bolt. Tighten the torn bolt to the end of the thread.



B: INSPECTION

1) Remove the instrument panel lower cover.
2) Remove the lower column cover.
3) Unfasten the hold-down clip which secures the harness and disconnect the connector of the ignition switch from the body harness.
4) Turn the ignition key plate to each position and check the continuity between the terminals of the ignition connector.

Switch position	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

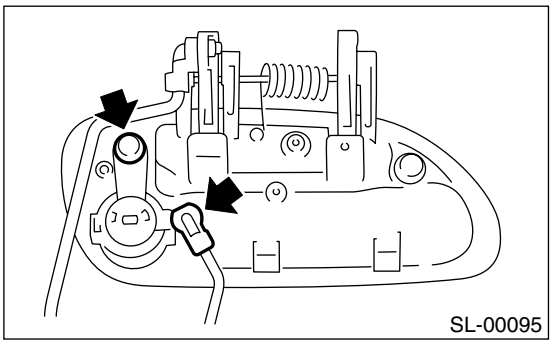
If continuity dose not exist, replace the ignition switch.

21.Key Lock Cylinders

A: REPLACEMENT

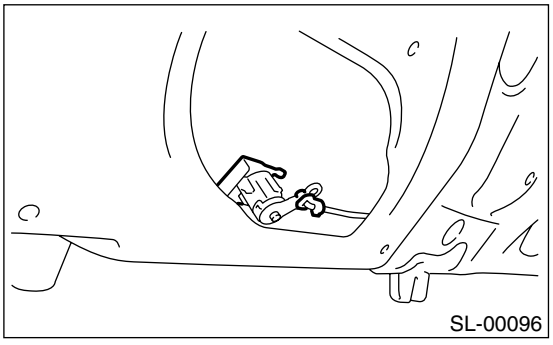
1. FRONT DOOR

1) Remove the front outer handle. <Ref. to SL-34, REMOVAL, Front Outer Handle.>
2) Remove the rod clamp. Replace the key cylinder.


SL-00095

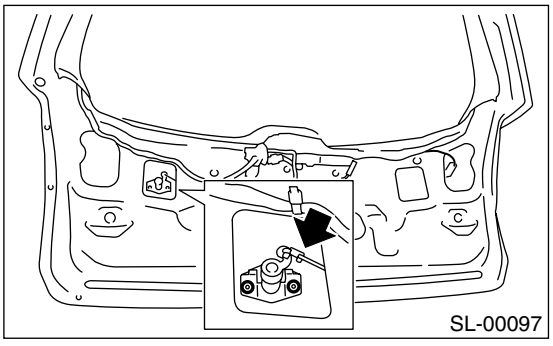
2. TRUNK LID

1) Remove the trunk trim. <Ref. to EI-59, REMOVAL, Trunk Trim.>
2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.


SL-00096

3. REAR GATE

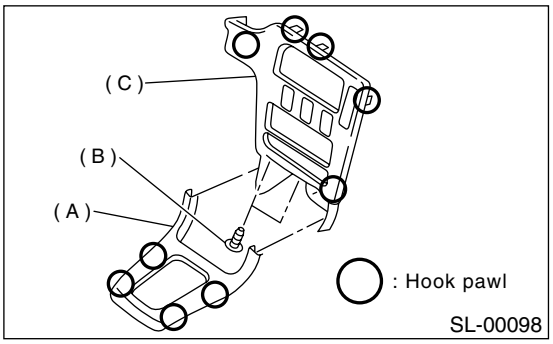
1) Remove the rear gate lower trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
2) Remove the rod clamp. Remove the nut. Replace the key cylinder.


SL-00097

22.Security Control Module

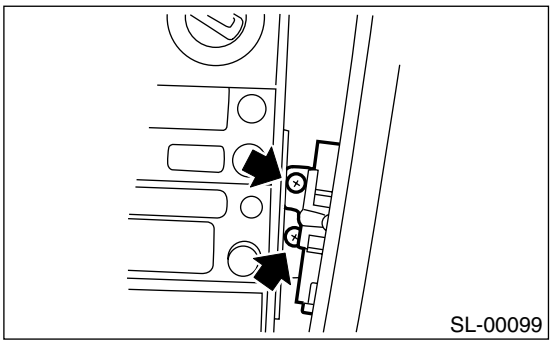
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove front cover (A).
3) Remove screws (B) and then detach center panel (C) while disconnecting connector.



4) Remove two screws.

NOTE:
Before removing the screw, apply a few turns of butyl tape to the tip of the service tool. This prevents the screw from falling during removal.



5) Remove radio and security control module together while disconnecting connector. <Ref. to ET-5, REMOVAL, Radio.>

B: INSTALLATION

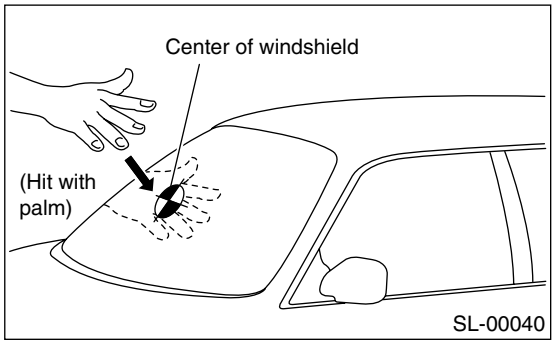
Install in the reverse order of removal.

NOTE:
To install the security control module, tighten the bolts securely so that the bolts do not come loose.

C: INSPECTION

1. IMPACT SENSITIVITY TEST

1) Remove the key from the ignition switch.
2) Close all windows.
3) Close all doors and the rear gate.
4) Cover the hood with a blanket.
5) Press the LOCK/ARM button of the transmitter.
6) Confirm that the security indicator light blinks every 2 seconds.
7) Hit the center of the windshield with your palm and make sure the alarm operates.



If NG, adjust the impact sensitivity. <Ref. to SL-50, ADJUSTMENT, Security Control Module.>

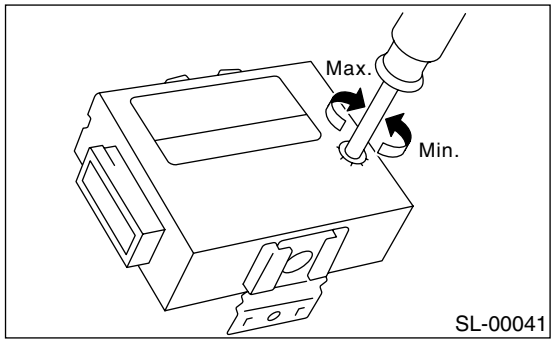
D: ADJUSTMENT

1. IMPACT SENSITIVITY

NOTE:
Before adjustment, make sure the security control module has been securely installed on the bracket.

1) Remove the security control module. <Ref. to SL-50, REMOVAL, Security Control Module.>
2) Adjust the sensitivity adjust screw in the security control module.

NOTE:
After adjusting, be sure to plug the adjust screw hole.

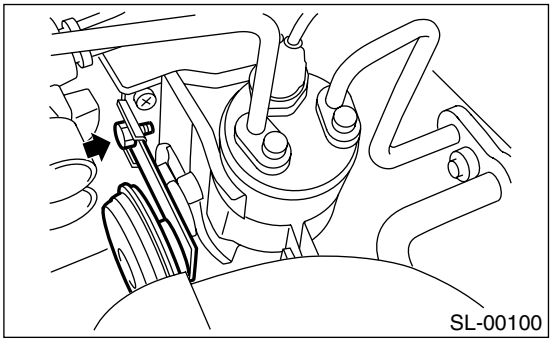


3) Install the security control module.
4) Perform the impact sensitivity test.

23.Security Horn

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the nuts and then detach the security horn while disconnecting the connector.

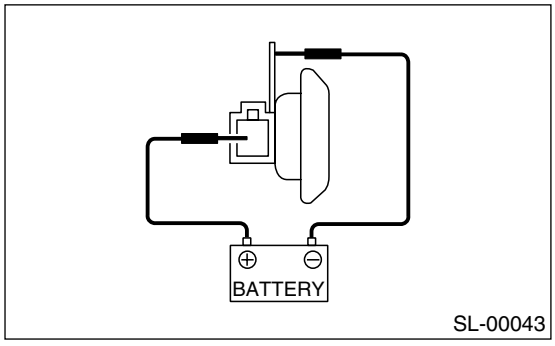


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Connect the battery to the security horn terminal and case ground and make sure the horn sounds properly.

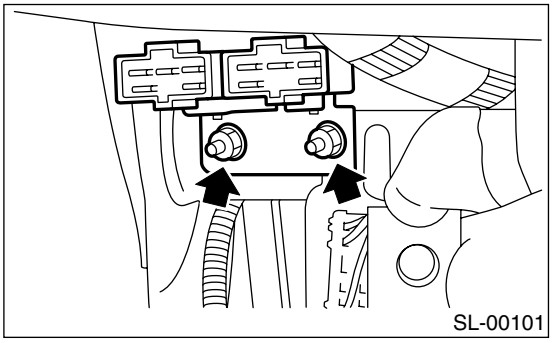


If NG, replace the security horn.

24.Security Horn Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the mounting bolt and detach the security horn relay (near the fuse box).



B: INSTALLATION

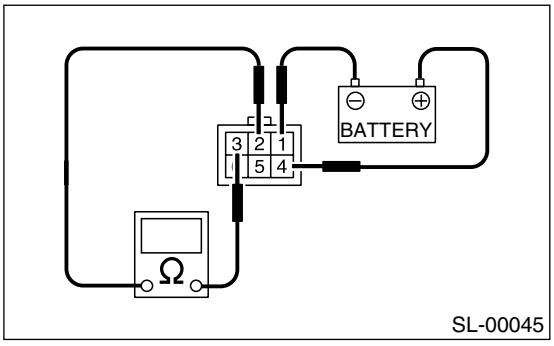
Install in the reverse order of removal.

C: INSPECTION

Measure the security horn relay resistance between terminals (indicated in the table below) when connecting terminal No. 1 (without OnStar (R)) or No. 3 (with OnStar (R)) to battery positive terminal and terminal No. 4 (without OnStar (R)) or No. 2 (with OnStar (R)) to battery ground terminal.

Without OnStar (R):

Current	Terminal No.	Standard
Flow	2 — 3	Less than 1 Ω
No flow		More than 1 MΩ



With OnStar (R):

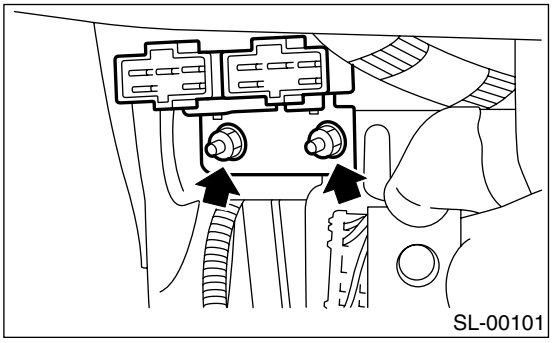
Current	Terminal No.	Standard
Flow	1 — 4	Less than 1 Ω
No flow		More than 1 MΩ

If the measured value is out of specifications indicated in table, replace security horn relay.
If NG, replace door lock actuator.

25.Interrupt Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the mounting nuts and detach the interrupt relay (near the fuse box).



B: INSTALLATION

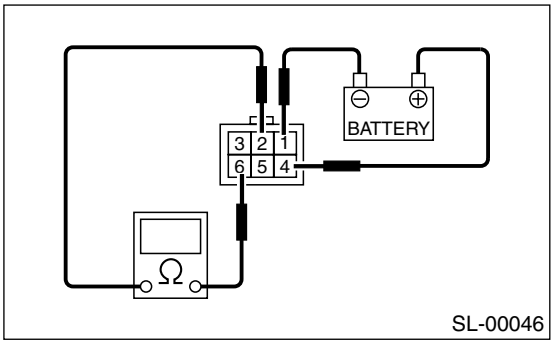
Install in the reverse order of removal.

C: INSPECTION

Measure the interrupt relay resistance between terminals (indicated in the table below) when connecting terminal No. 1 (without OnStar (R)) or No. 4 (with OnStar (R)) to battery positive terminal and terminal No. 4 (without OnStar (R)) or No. 2 (with OnStar (R)) to battery ground terminal.

Without OnStar (R):

Current	Terminal No.	Standard
Flow	2 — 6	More than 1 MΩ
No flow		Less than 1 Ω



With OnStar (R):

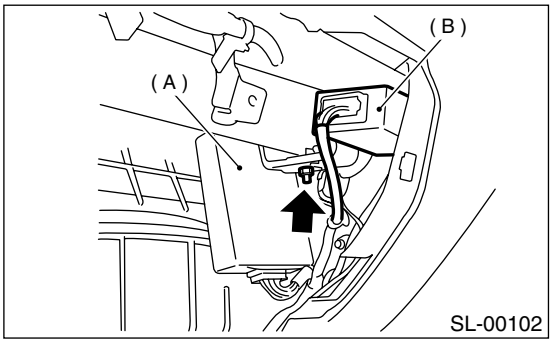
Current	Terminal No.	Standard
Flow	1 — 3	More than 1 MΩ
No flow		Less than 1 Ω

If the measured value is out of specifications indicated in table, replace security horn relay.

26.Keyless Entry Control Module

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove glove box. <Ref. to EI-42, REMOVAL, Glove Box.>
3) Remove nut, then remove keyless entry control module (B) and the other electrical control module (A) while disconnecting connector.



4) Disconnect keyless entry control module and the other control module.

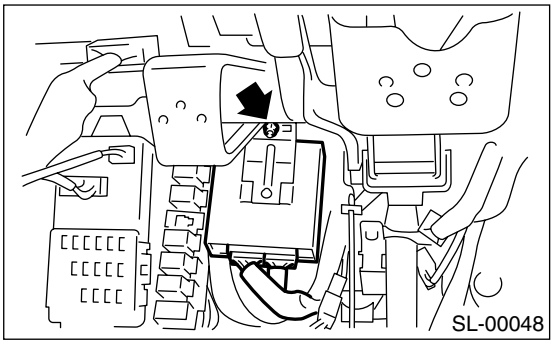
B: INSTALLATION

Install in the reverse order of removal.

27.Integrated Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-46, REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, then remove the integrated module while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

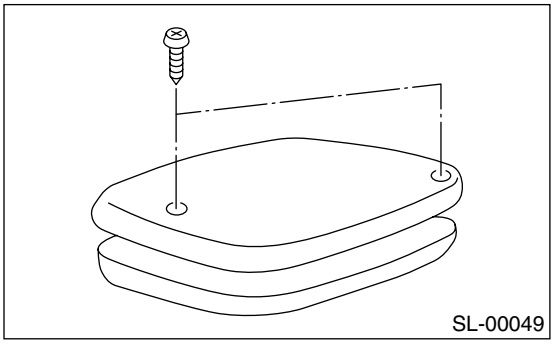
28.Keyless Transmitter

A: REMOVAL

1. TRANSMITTER BATTERY

Remove the battery from transmitter.

NOTE:
To prevent static electricity damage to transmitter printed circuit board, touch the steel area of building with hand to discharge the static electricity carried on body or clothes before disassembling transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

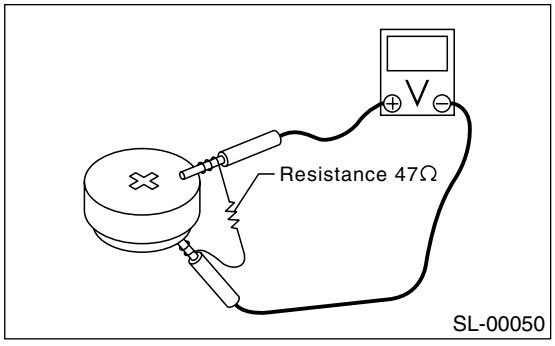
Install in the reverse order of removal.

C: INSPECTION

1. TRANSMITTER BATTERY

Measure the voltage between battery (+) terminal and (–) terminal.

NOTE:
• Battery discharge occurs during measurement. Complete the measurement within 5 seconds.
• During battery voltage measurement, voltage falls more than 1.8 volts in 3 seconds period.



Tester connection		Standard
(+)	(–)	
Battery (+) terminal	Battery (–) terminal	2.5 — 3.0 V

If NG, replace the battery. (Use CR1620 or equivalent.)

D: REPLACEMENT

1. TRANSMITTER REGISTRATION

NOTE:
• A maximum of four transmitters can be registered for each individual vehicle.
• When replacing or adding the transmitter (key), registration is also necessary.
• Finish the operation from step 1) through 4) within 45 seconds.

1) Sit on the driver's seat and close all doors and rear gate.
2) Open the driver's door.
3) Close the driver's door.
4) Turn the ignition switch from ON to LOCK ten times within 15 seconds.

NOTE:
Do not start the engine at this time.

5) The horn chirps one time to indicate that the system has entered in the programming mode.
6) Open the driver's door.
7) Close the driver's door.
8) Press any button on the transmitter that you wish to program into the system.
9) Horn will chirp two times to indicate that the transmitter has been programmed.

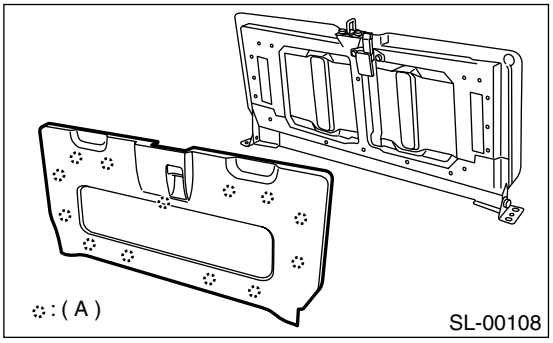
NOTE:
Repeat steps 6) through 9) for an additional transmitter.

10) Remove the ignition key from the ignition switch.
11) The horn will chirp three times to indicate that the system has exited the programming mode.
12) Check the keyless entry system properly operates by operating each transmitter.

29.Switch Back Gate Handle

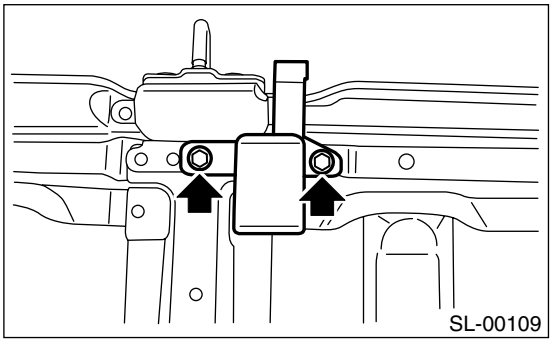
A: REMOVAL

1) Remove switch back gate. <Ref. to EB-23, REMOVAL, Switch Back Gate.>
2) Remove switch back gate inner cover.



(A) Clip

3) Remove bolts and detach switch back gate handle.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:
After installing, make sure that switch back gate operates smoothly.

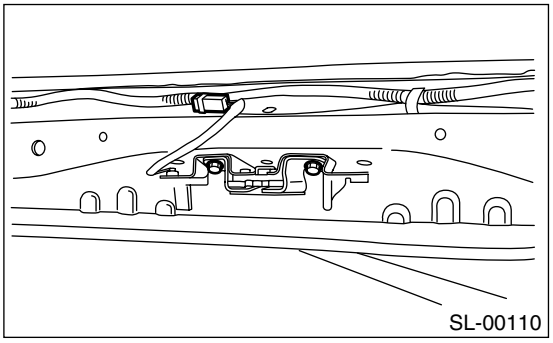
C: INSPECTION

Make sure that lever operates smoothly.

30.Switch Back Gate Latch

A: REMOVAL

1) Remove rear bulk head trim. <Ref. to EI-71, REMOVAL, Rear Bulkhead Trim.>
2) Remove connector. Remove bolts and switch back gate latch.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
27.5 N·m (2.80 kgf-m, 20.3 ft-lb)

NOTE:
After installing, make sure that lock operates smoothly.

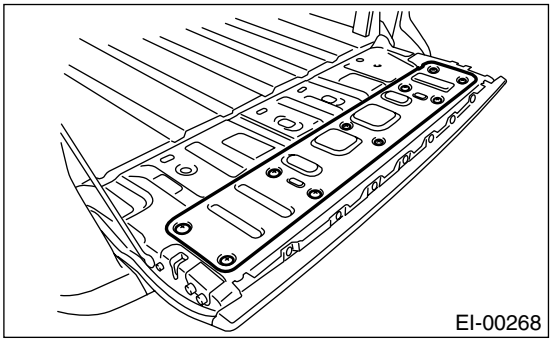
C: INSPECTION

Make sure that lever works smoothly.

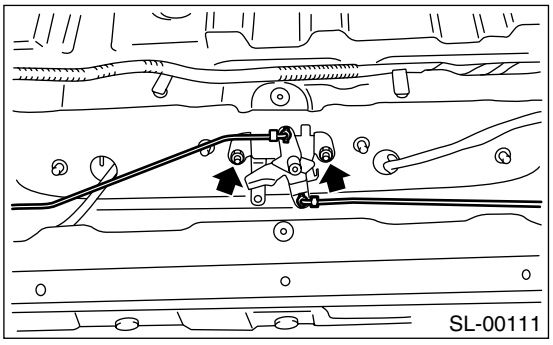
31.Tail Gate Outer Handle

A: REMOVAL

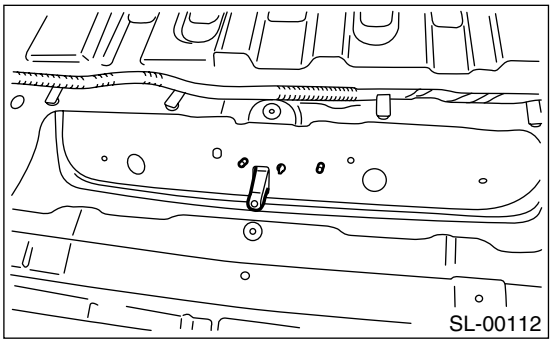
1) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
2) Remove tail gate cover.



3) Remove rod clamp. Remove nuts and detach lock handle.



4) Remove tail gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:
After installing, make sure that outer handle works properly.

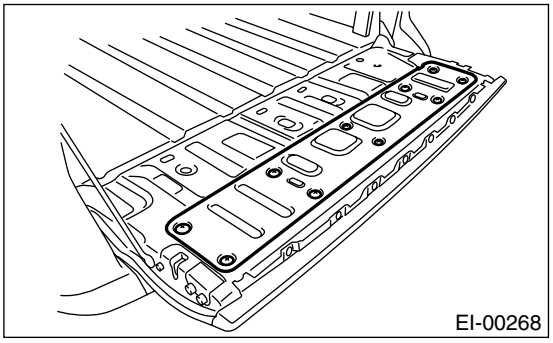
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

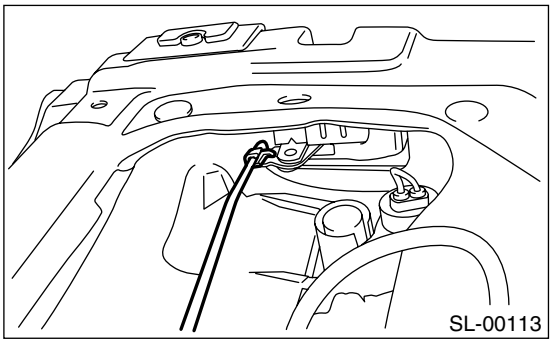
32.Tail Gate Latch Assembly

A: REMOVAL

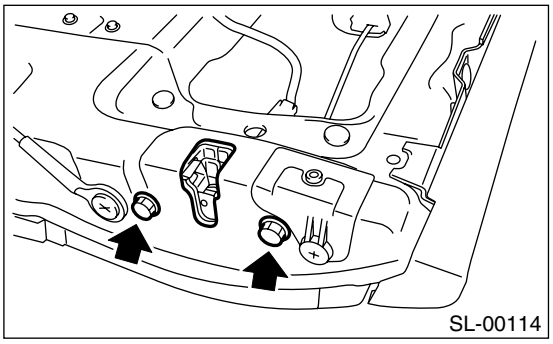
1) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
2) Remove tail gate cover.



3) Remove rod clamp.



4) Remove bolts and tail gate latch.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

NOTE:
After installing, make sure the lock operates properly.

C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

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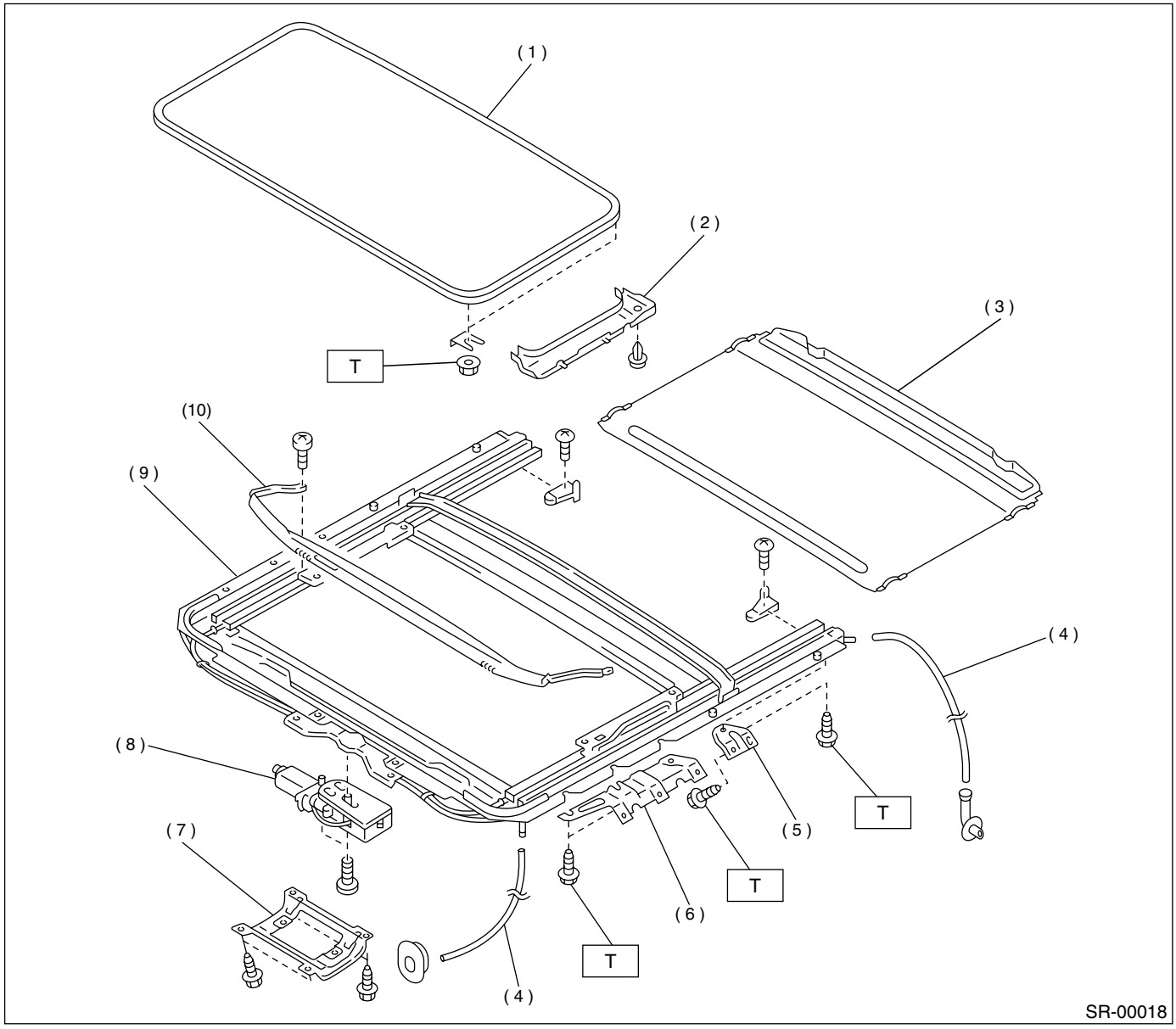
1.	General Description	2
2.	Sunroof Control System	6
3.	Sunroof Lid	7
4.	Sunroof Assembly	9
5.	Sunroof Motor	13
6.	Sunroof Switch	16

1. General Description

A: COMPONENT

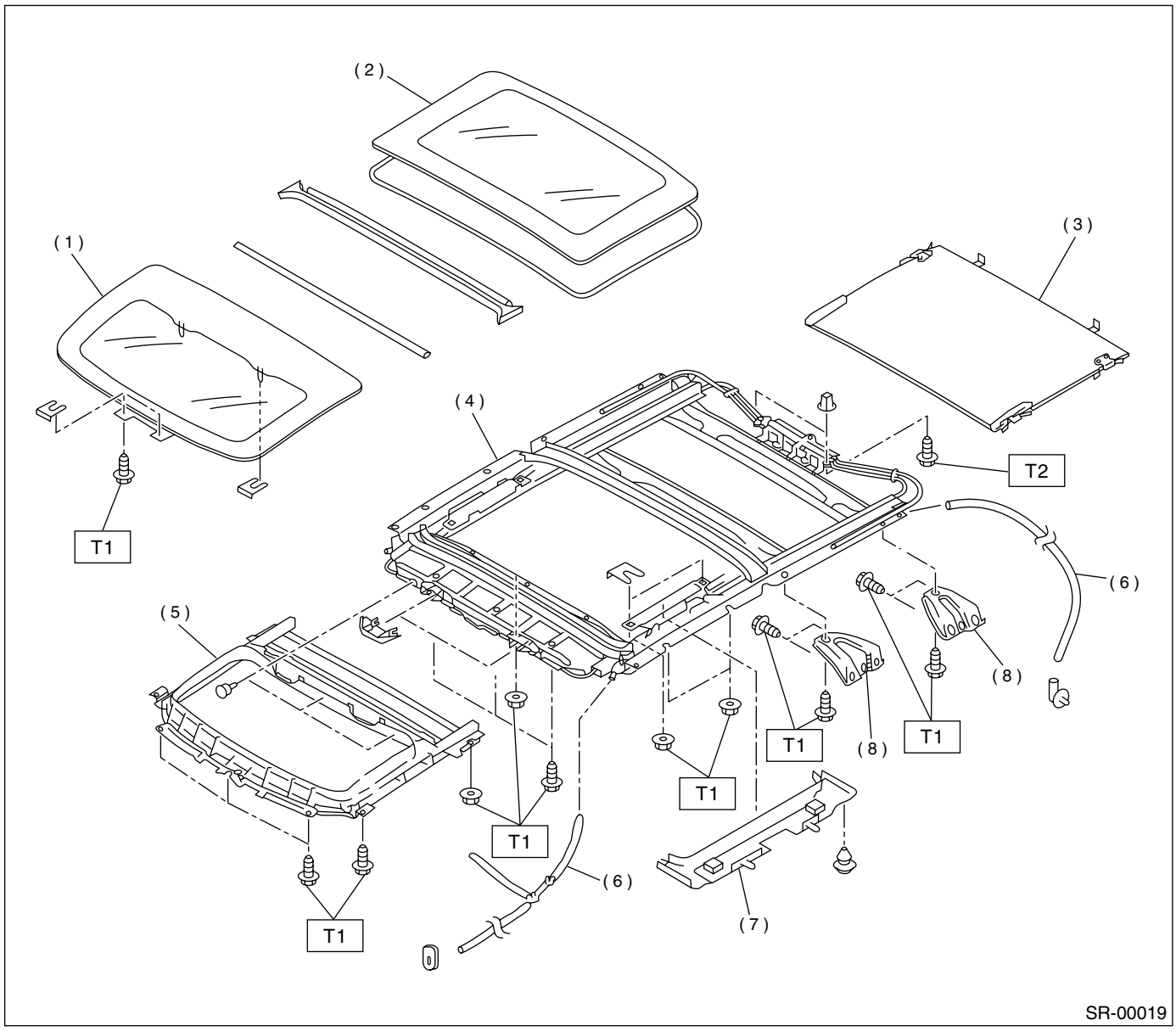
1. SEDAN



(1) Glass lid
(2) Guide rail cover
(3) Sunshade
(4) Drain tube
(5) Sunroof bracket (Rear)
(6) Sunroof bracket (Front)
(7) Motor cover
(8) Motor ASSY
(9) Frame ASSY
(10) Deflector

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

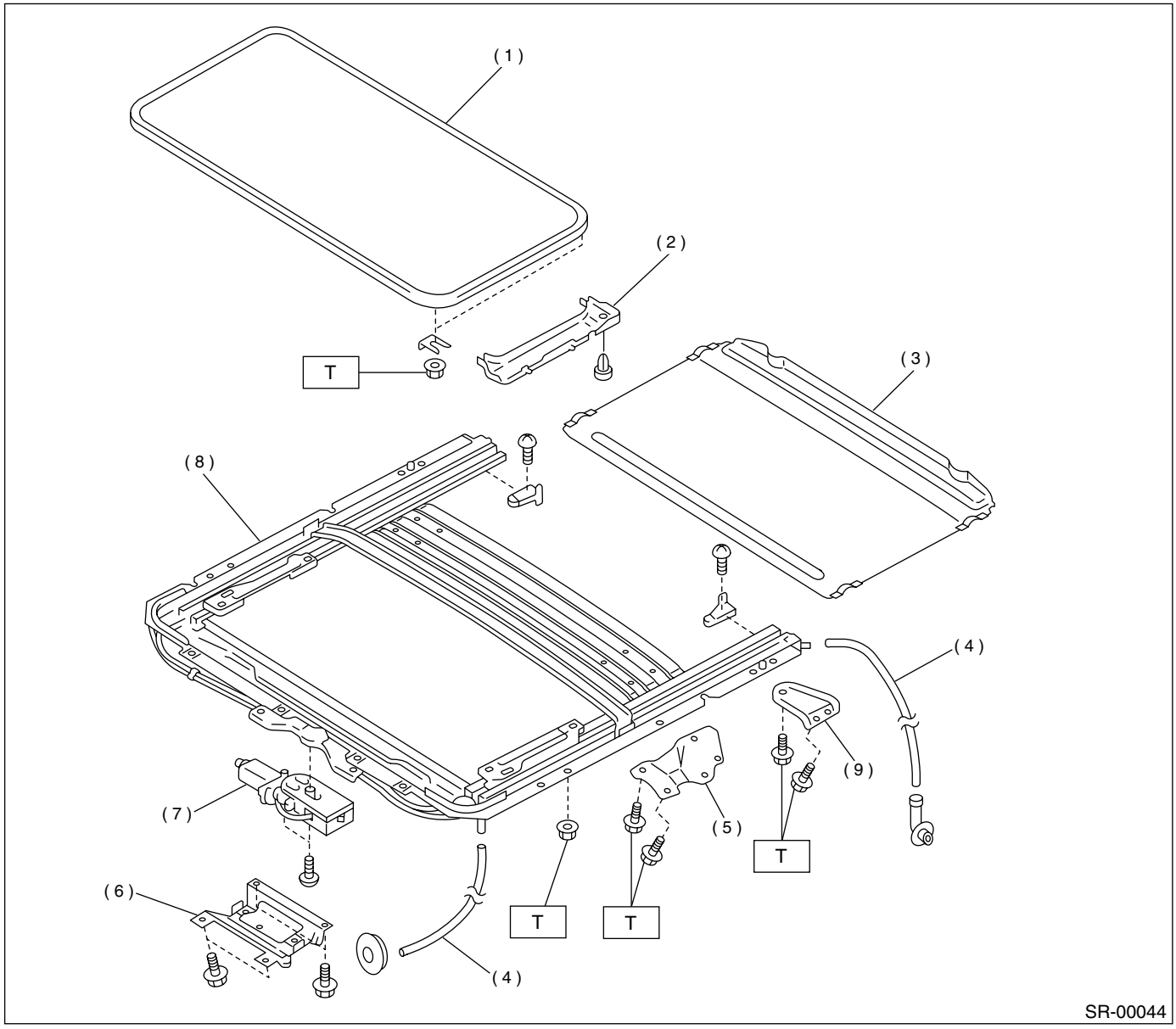
2. WAGON



(1) Glass lid (Front)
(2) Glass lid (Rear)
(3) Sunshade
(4) Frame ASSY (Rear)
(5) Frame ASSY (Front)
(6) Drain tube
(7) Cover
(8) Sunroof bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 1.5 (0.15, 1.1)

3. PICKUP



(1) Glass lid
(2) Guide rail cover
(3) Sunshade
(4) Drain tube
(5) Sunroof bracket (Front)
(6) Motor cover
(7) Motor ASSY
(8) Frame ASSY
(9) Sunroof bracket (Rear)

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect connectors and hoses securely during reassembly.
• After reassembly, make sure all functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Sunroof Control System

A: SCHEMATIC

1. SUNROOF

<Ref. to WI-288, SCHEMATIC, Sunroof System.>

B: INSPECTION

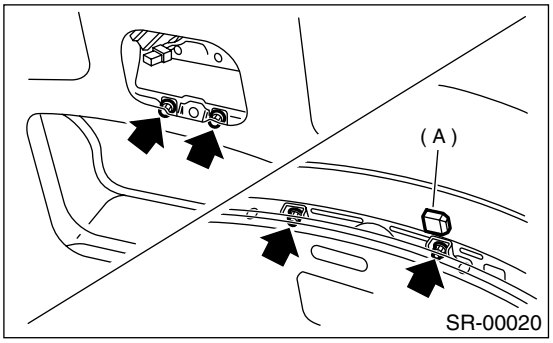
Symptom	Checking order
Water leaks.	(1) Check roof panel and sunroof lid for improper or poor sealing. (2) Check drain tube for clogging on bend. (3) Check sunroof frame seal and body for improper fit.
Booming noise	(1) Check sunroof lid and roof panel for improper clearance. (2) Check sunshade and roof trim for improper clearance.
Abnormal motor noise	(1) Check motor for looseness. (2) Check gears and bearings for wear. (3) Check cables for wear. (4) Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	(1) Check guide rail for foreign particles. (2) Check guide rail for improper installation. (3) Check parts for mutual interference. (4) Check cable slider for improper clinching. (5) Check cable for improper installation. (6) Check clutch adjustment nut for improper tightness.
Motor does not rotate or rotates improperly.	(1) Check fuse for blow-out. (2) Check switch for improper function. (3) Check motor for incorrect terminal voltage. (4) Check relay for improper operation. (5) Check poor grounding system. (6) Check harness for open or short and terminals for poor connections. (7) Check limit switch for improper operation.

3. Sunroof Lid

A: REMOVAL

1. WAGON (FRONT)

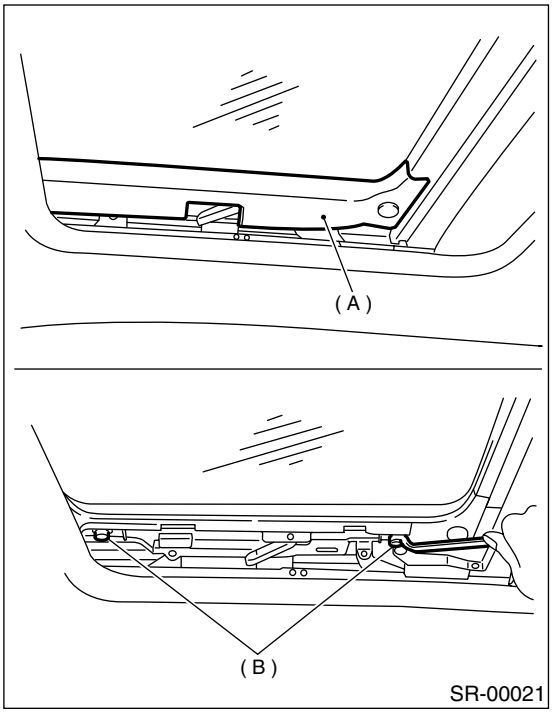
1) Tilt-up the front sunroof (most upper position).
2) Remove sunroof switch. <Ref. to SR-16, REMOVAL, Sunroof Switch.>
3) Remove two mounting bolts.
4) Detach covers (A) then remove two nuts from tilt-up assembly.



5) Remove the sunroof lid carefully.

2. SEDAN AND WAGON (REAR)

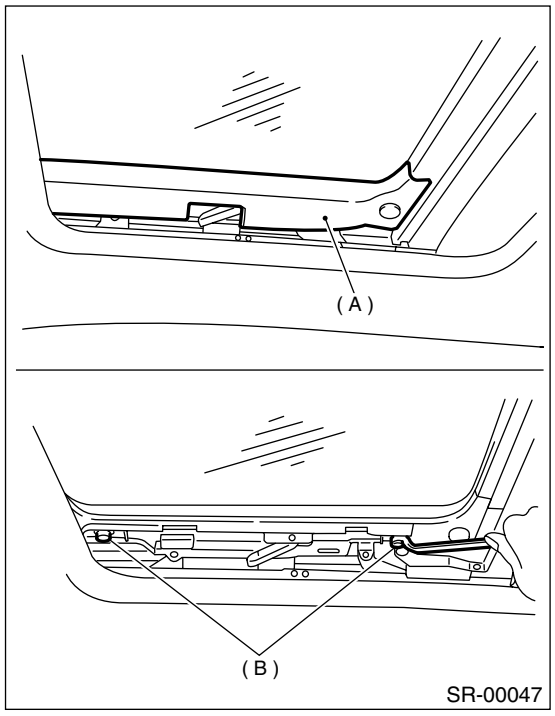
1) Completely close rear sunroof lid and open sunshade.
2) Remove covers (A) then remove nuts (B).



3) Remove the sunroof lid carefully.

3. PICKUP

1) Completely close rear sunroof lid and open sunshade.
2) Remove covers (A) then remove nuts (B).



3) Remove the sunroof lid carefully.

B: INSTALLATION

Install in the reverse order of removal.

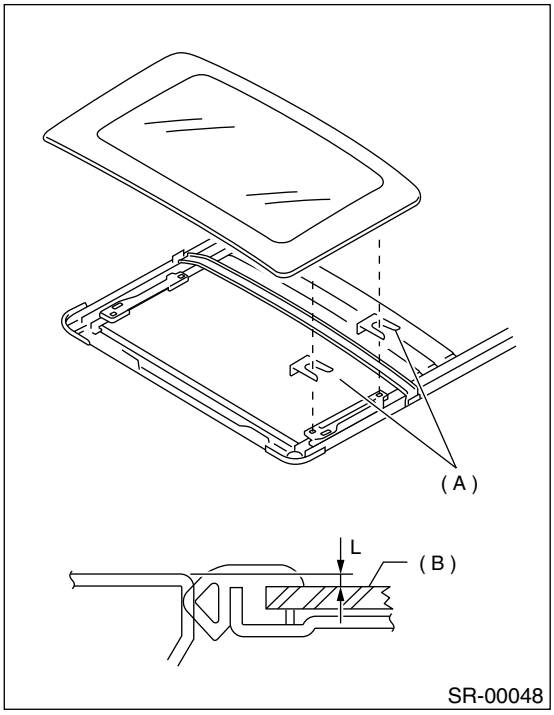
C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen sunroof lid mounting nut. Adjust height between sunroof lid and lid bracket by number of shims being inserted into the space.
Number of shims:
Standard : 1 piece
Max. : 3 pieces [1 piece (standard) + 2 pieces (addition)]
Min. : zero piece

Difference in height between sunroof lid and roof panel: L

L: 2.0±0.5 mm (0.079±0.020 in)

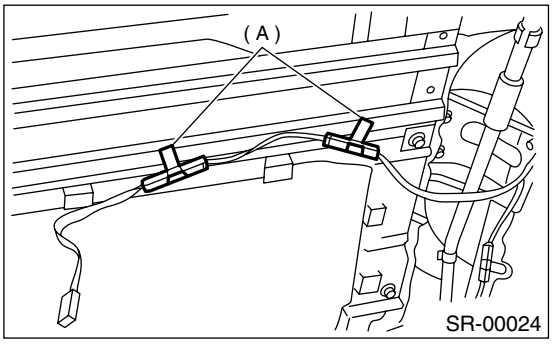


4. Sunroof Assembly

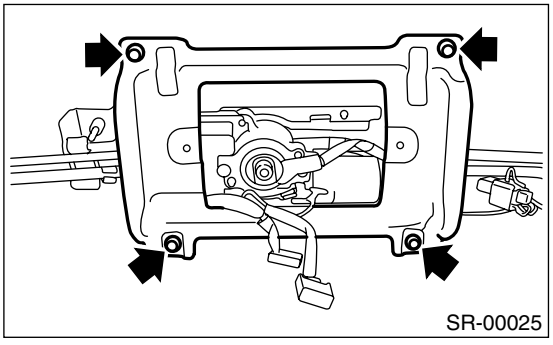
A: REMOVAL

1. SEDAN

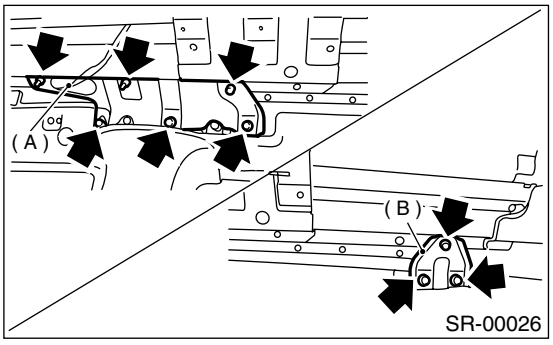
1) Disconnect ground cable from battery.
2) Remove roof trim. <Ref. to EI-54, SEDAN, REMOVAL, Roof Trim.>
3) Remove sunroof lid. <Ref. to SR-7, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
4) Disconnect drain tubes from sunroof frame.
5) Remove room lamp harness clip (A).



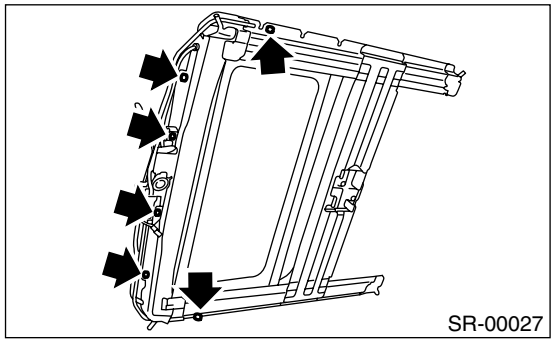
6) Disconnect sunroof harness connector.
7) Remove motor cover.



8) Remove sunroof brackets front (A) and rear (B).

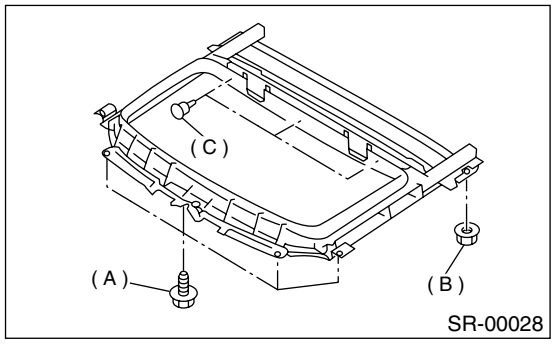


9) Remove nuts then detach the sunroof frame.



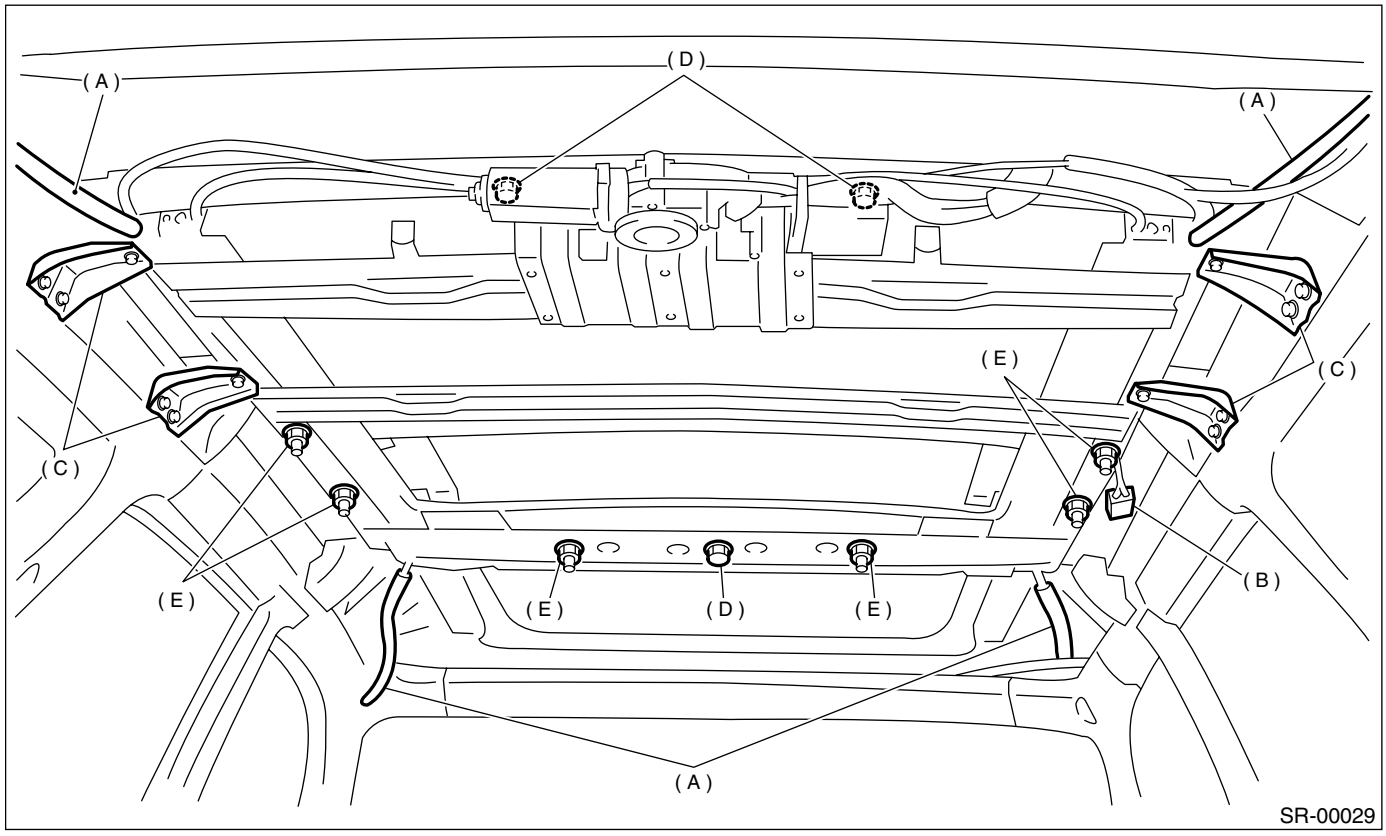
2. WAGON (FRONT)

1) Disconnect ground cable from battery.
2) Remove roof trim. <Ref. to EI-55, WAGON, REMOVAL, Roof Trim.>
3) Remove front sunroof lid. <Ref. to SR-7, WAGON (FRONT), REMOVAL, Sunroof Lid.>
4) Remove room lamp harness clip.
5) Remove bolts (A), nuts (B) and clips (C) then detach the sunroof frame.



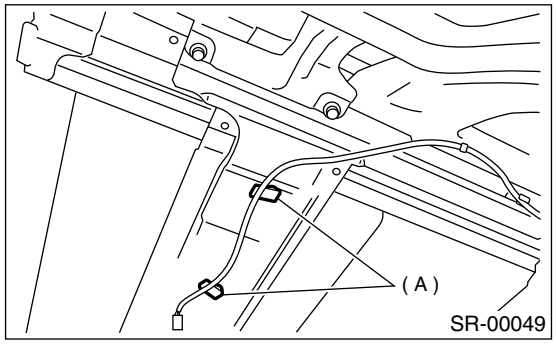
3. WAGON (REAR)

1) Disconnect ground cable from battery.
2) Remove roof trim. <Ref. to EI-55, WAGON, REMOVAL, Roof Trim.>
3) Remove rear sunroof lid. <Ref. to SR-7, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
4) Disconnect drain tubes (A) from rear sunroof frame.
5) Disconnect sunroof harness connector (B).
6) Remove sunroof brackets (C).
7) Remove bolts (D) and nuts (E) then detach the sunroof frame.

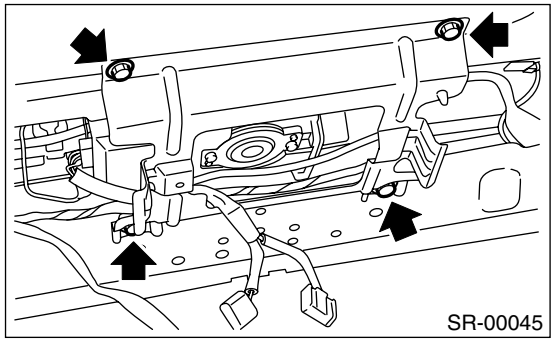


4. PICKUP

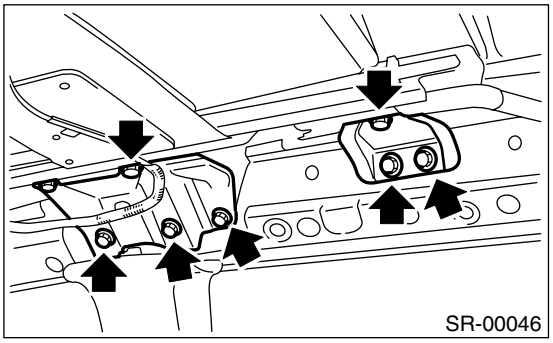
1) Disconnect ground cable from battery.
2) Remove roof trim. <Ref. to EI-54, REMOVAL, Roof Trim.>
3) Remove sunroof lid. <Ref. to SR-7, REMOVAL, Sunroof Lid.>
4) Disconnect drain tube from sunroof frame.
5) Remove room lamp harness clip (A).



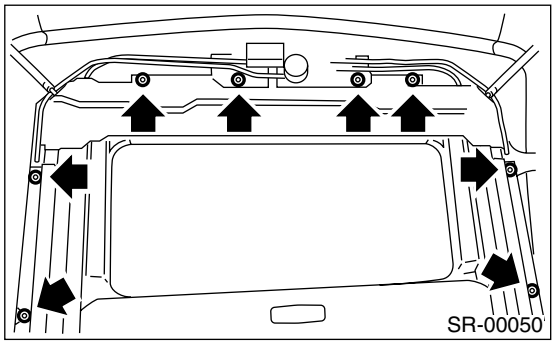
6) Disconnect sunroof harness connector.
7) Remove motor cover.



8) Remove sunroof brackets.



9) Remove nuts then detach the sunroof frame.



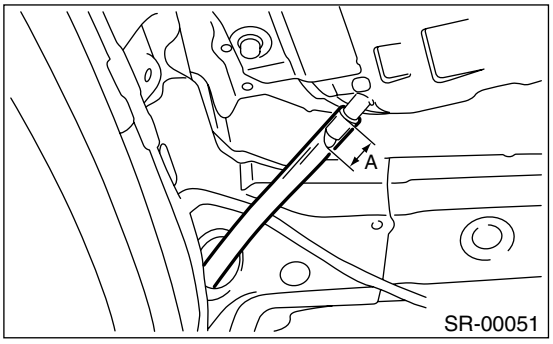
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be careful not to snag the harness.

NOTE:
- Make sure to connect harness connector.
- When installing drain tube, insert it securely onto drain pipe.

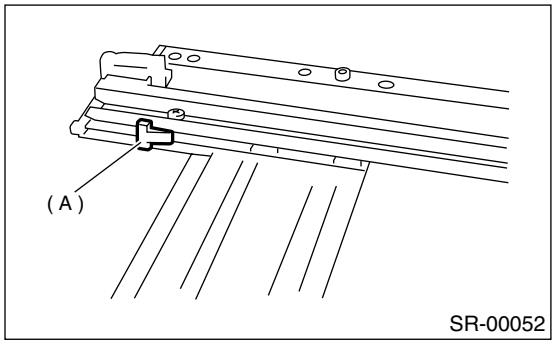
Length A:
15 mm (0.59 in) or more



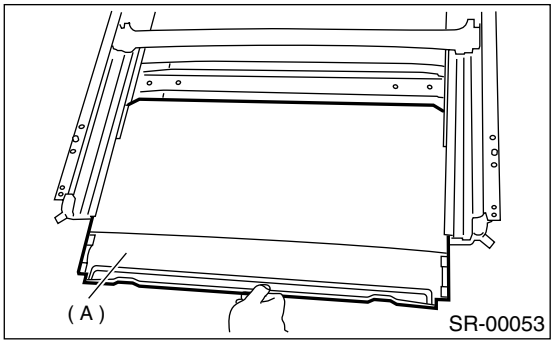
C: DISASSEMBLY

1. SEDAN AND WAGON (FRONT)

1) Remove sunroof frame.
2) Remove rail stoppers (A).

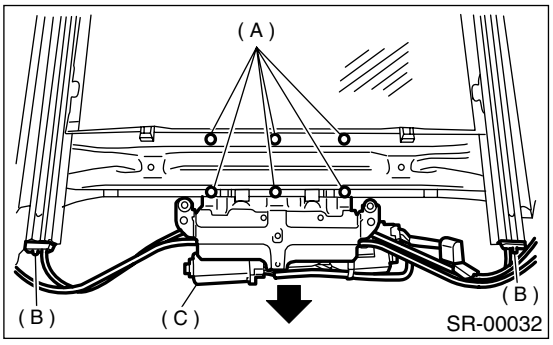


3) Pull out the sunshade (A) from sunroof frame.

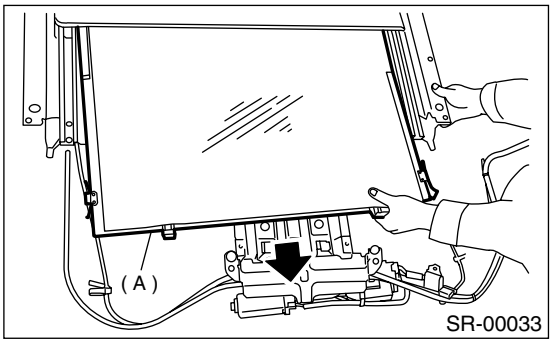


2. WAGON (REAR)

1) Remove rear sunroof frame.
2) Remove sunroof motor bracket mounting screws (A).
3) Remove rail stoppers (B) then pull the motor assembly (C) in the direction shown in the figure.

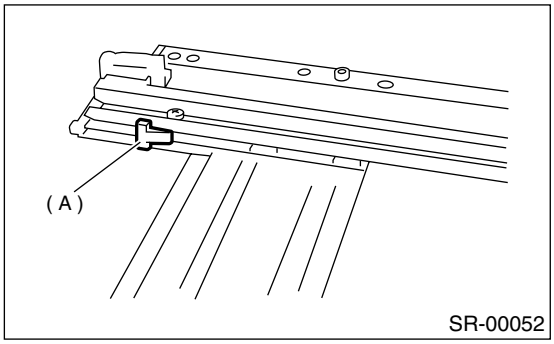


4) Pull out the sunshade (A) from sunroof frame.

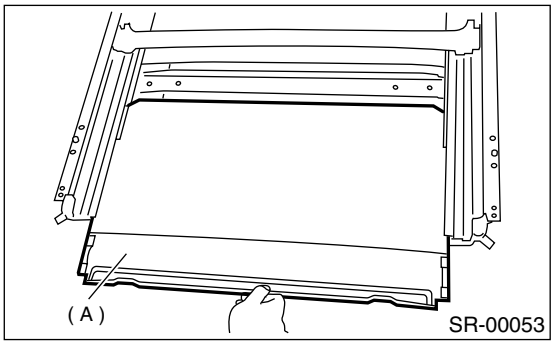


3. PICKUP

1) Remove sunroof frame.
2) Remove rail stoppers (A).



3) Pull out the sunshade (A) from sunroof frame.



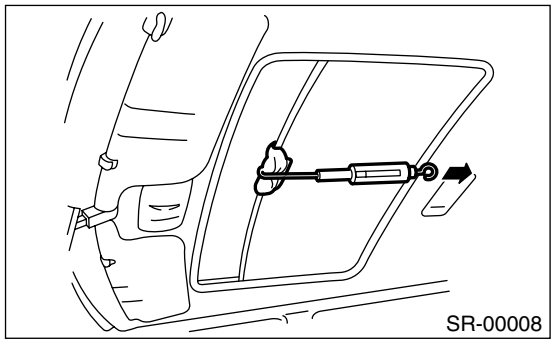
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1. CHECK FOR MOVEMENT OF SUNSHADE

1) Place a cloth on sunshade edge, and attach a spring scale.



2) Pull spring scale backward, and measure the load to move the sunshade.

Load to move rear sunshade:
Less than 24.5±4.9 N (2.5±0.5 kgf, 5.5±1.1 lb)

NOTE:
Considerable load is required to start pulling spring scale, so take a scale reading when it moves smoothly.

3) If the measured value is more than the specified value, check sunroof lid, sunshade and guide rail assembly for improper installation.

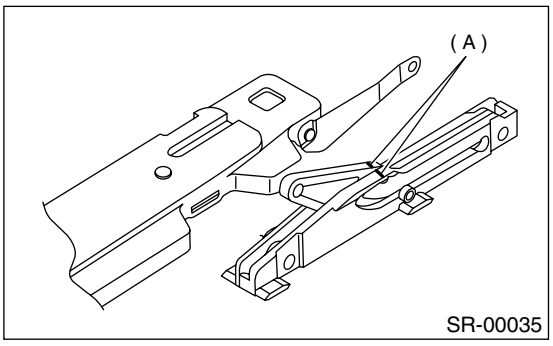
5. Sunroof Motor

A: REMOVAL

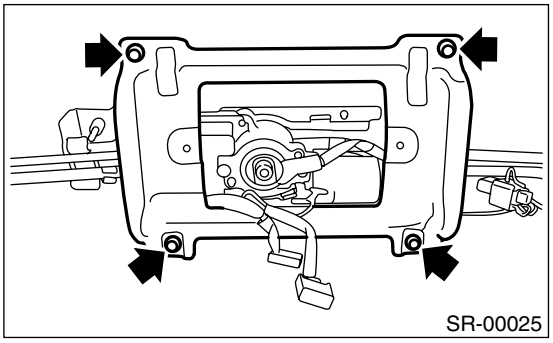
CAUTION:
When removing clip, use great care not to damage the roof trim.

1. SEDAN

1) Completely close the sunroof.
2) Disconnect ground cable from battery.
3) Remove sunroof lid. <Ref. to SR-7, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
4) Confirm the matching mark (A) of sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)



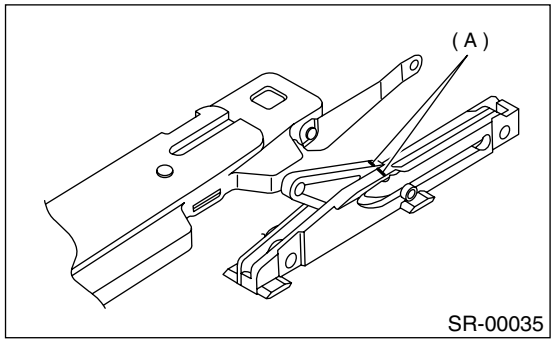
5) Remove roof trim. <Ref. to EI-54, SEDAN, REMOVAL, Roof Trim.>
6) Remove motor cover.



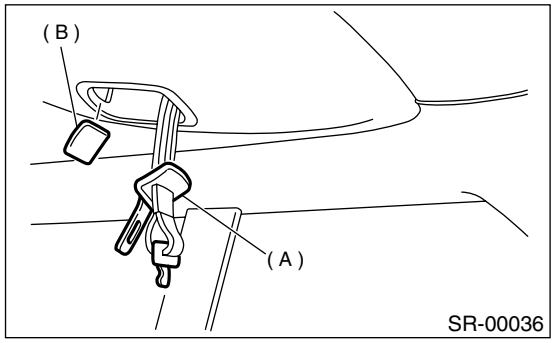
7) Disconnect harness connector and remove sunroof motor mounting screw.

2. WAGON

1) Completely close the front and rear sunroof, then tilt-up the front sunroof to the most upper position.
2) Disconnect ground cable from battery.
3) Remove rear sunroof lid. <Ref. to SR-7, SEDAN AND WAGON (REAR), REMOVAL, Sunroof Lid.>
4) Confirm the matching mark (A) of rear sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)

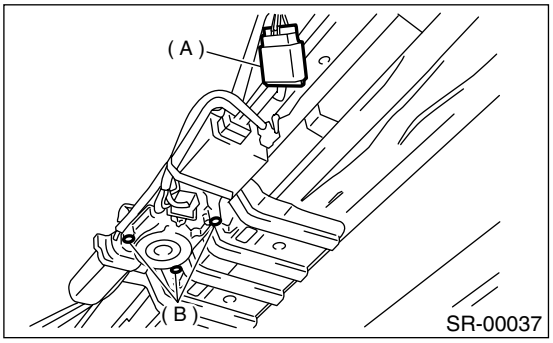


5) Remove luggage room light. <Ref. to LI-30, REMOVAL, Luggage Room Light.>
6) Remove rear assist grips.
7) Remove rear quarter trim. <Ref. to EI-52, WAGON, REMOVAL, Rear Quarter Trim.>
8) Remove cover (B) while detaching snap lock carefully. Put the rear center seat belt tongue (A) out to the other side of the trim through the hole.



9) Remove clips and hang down rear end of roof trim.

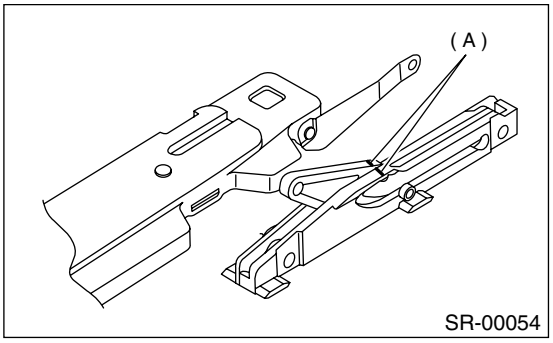
10) Disconnect harness connector (A) and remove sunroof motor mounting screw (B).



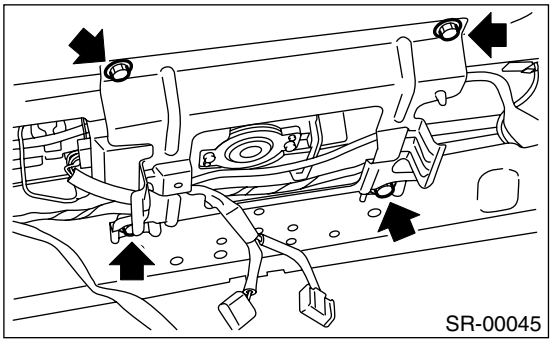
3. PICKUP

CAUTION:
When removing clip, use great care not to damage the roof trim.

1) Completely close the sunroof.
2) Disconnect ground cable from batteryf.
3) Remove sunroof lid. <Ref. to SR-7, REMOVAL, Sunroof Lid.>
4) Confirm the matching mark (A) of rear sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)



5) Remove roof trim. <Ref. to EI-54, REMOVAL, Roof Trim.>
6) Remove motor cover.

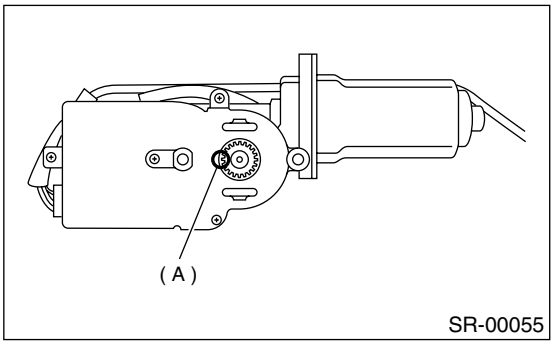


7) Disconnect harness connector and remove sunroof motor mounting screw.

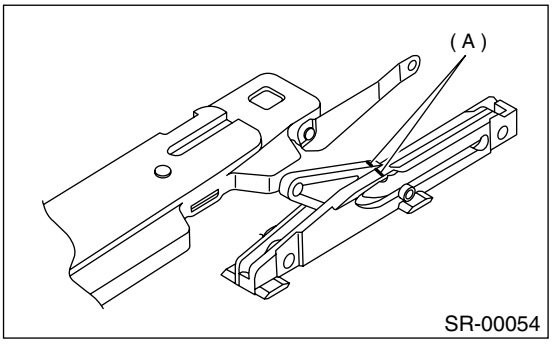
B: INSTALLATION

CAUTION:
• Never rotate the sunroof motor while removed.
• Be careful not to move the sunroof cable when installing sunroof motor.

1) Check the matching mark (A) of sunroof motor.



2) Confirm the matching mark (A) of sunroof bracket link.



3) Install sunroof motor.
4) After installing the motor, reconfirm the matching marks of motor side and sunroof bracket link side.
5) Connect sunroof motor harness connector and then connect battery ground cable.
6) Check the sunroof operation in order as shown in the table.

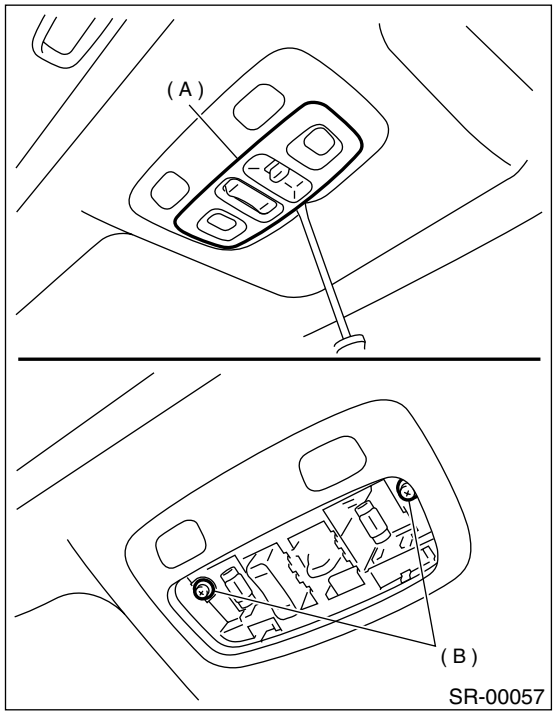
Operation	Switch position
Completely close sunroof.	Closed
Tilt-up sunroof to most upper position.	Tilt up
Completely lower sunroof.	Tilt down
Open sunroof to near the completely open position.	Open
Completely open sunroof.	Open
Close sunroof 150 mm (5.91 in) away from completely closed position.	Closed
Completely close sunroof.	Closed

7) Install sunroof lid and trim in the reverse order of removal.

6. Sunroof Switch

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove spot light lens (A) and sunroof switch mounting screw (B).



3) Disconnect harness connectors and remove sunroof switch.

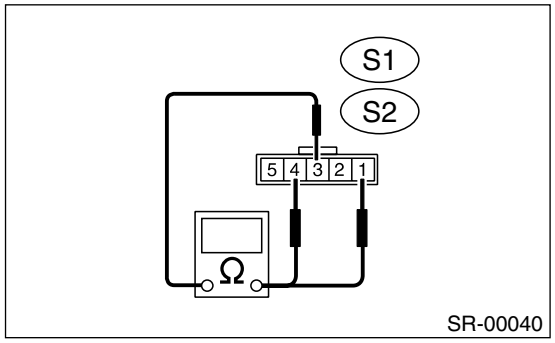
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SEDAN

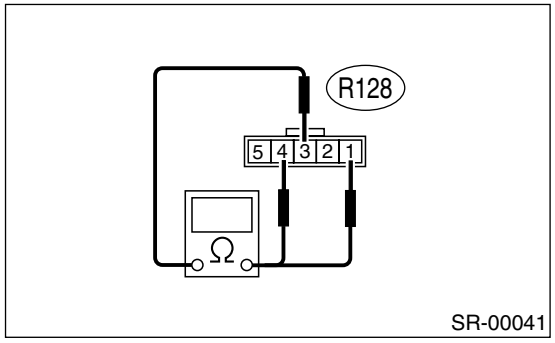
Measure sunroof switch resistance.



Switch position	Terminal No.	Standard
Open	S1: 3 and 4	Less than 1 Ω
Close	S1: 1 and 3	Less than 1 Ω
Tilt-up	S2: 3 and 4	Less than 1 Ω
Tilt-down	S2: 1 and 3	Less than 1 Ω

2. WAGON

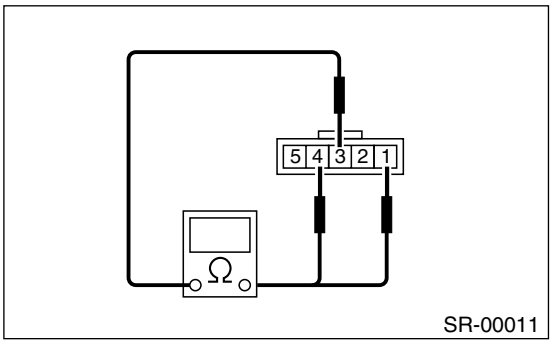
Measure sunroof switch resistance.



Switch position	Terminal No.	Standard
Open	3 and 4	Less than 1 Ω
Close	1 and 3	Less than 1 Ω

3. PICKUP

Measure sunroof switch resistance.



Switch position	Terminal No.	Specified condition
Open	3 and 4	Less than 1 Ω
Close	1 and 3	Less than 1 Ω
Tilt up	3 and 4	Less than 1 Ω
Tilt down	1 and 3	Less than 1 Ω

MEMO:

EXTERIOR/INTERIOR TRIM

EI

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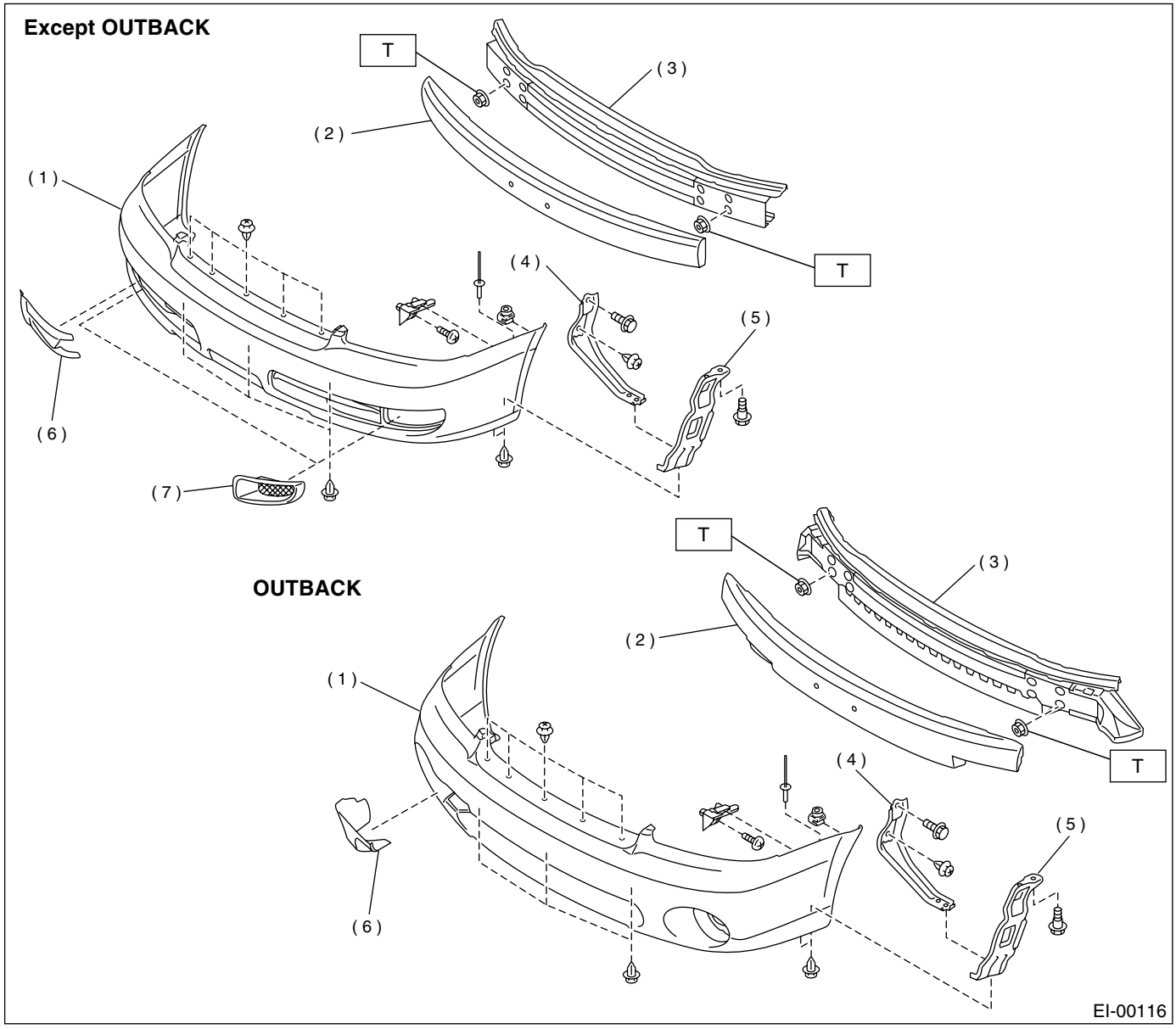
1. General Description

A: COMPONENT

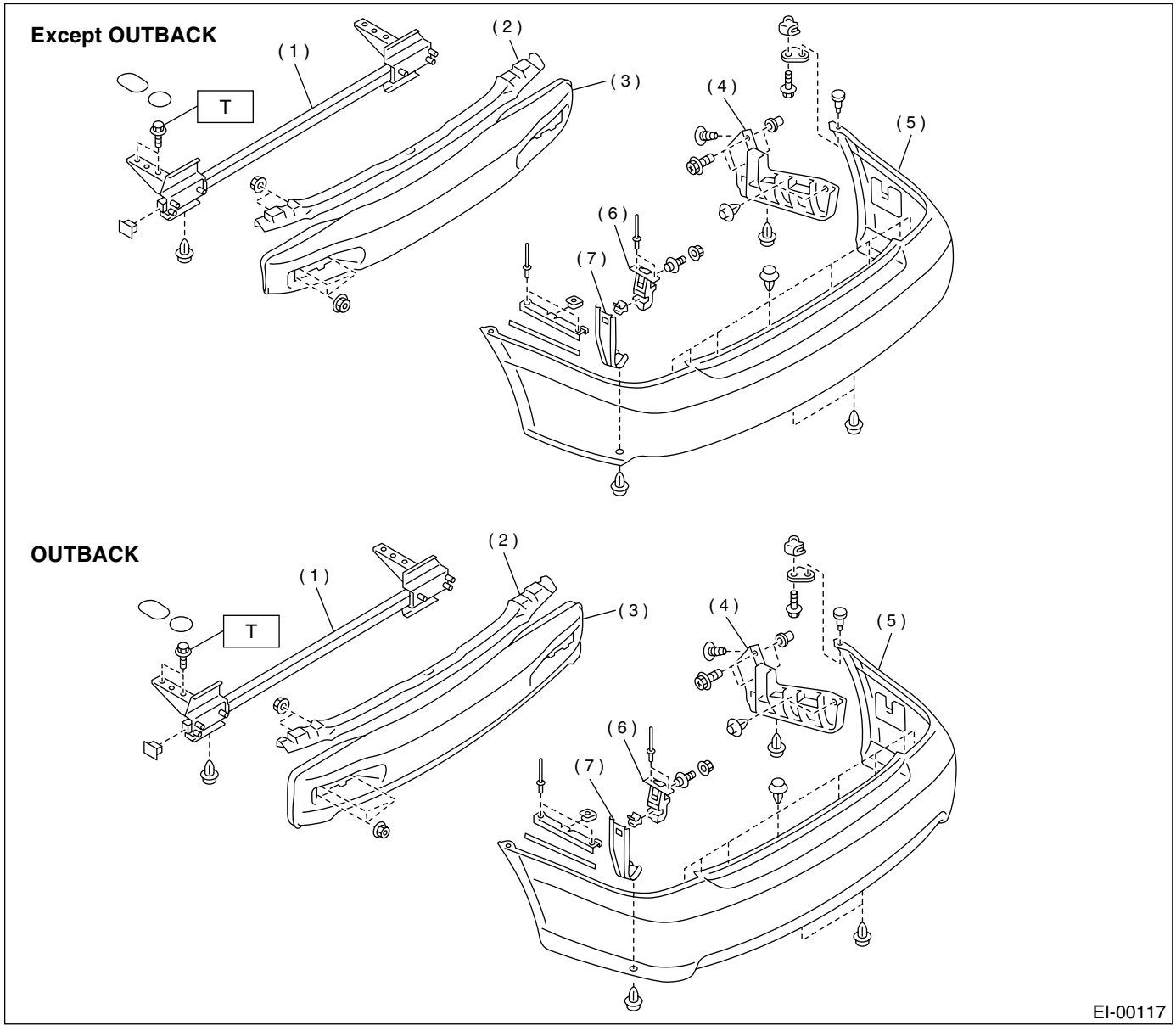
1. FRONT BUMPER



(1) Bumper face
(2) Bumper energy absorber
(3) Bumper beam
(4) Side stay
(5) Side bracket
(6) Cover (Tie down hook)
(7) Cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 33 (3.4, 25)

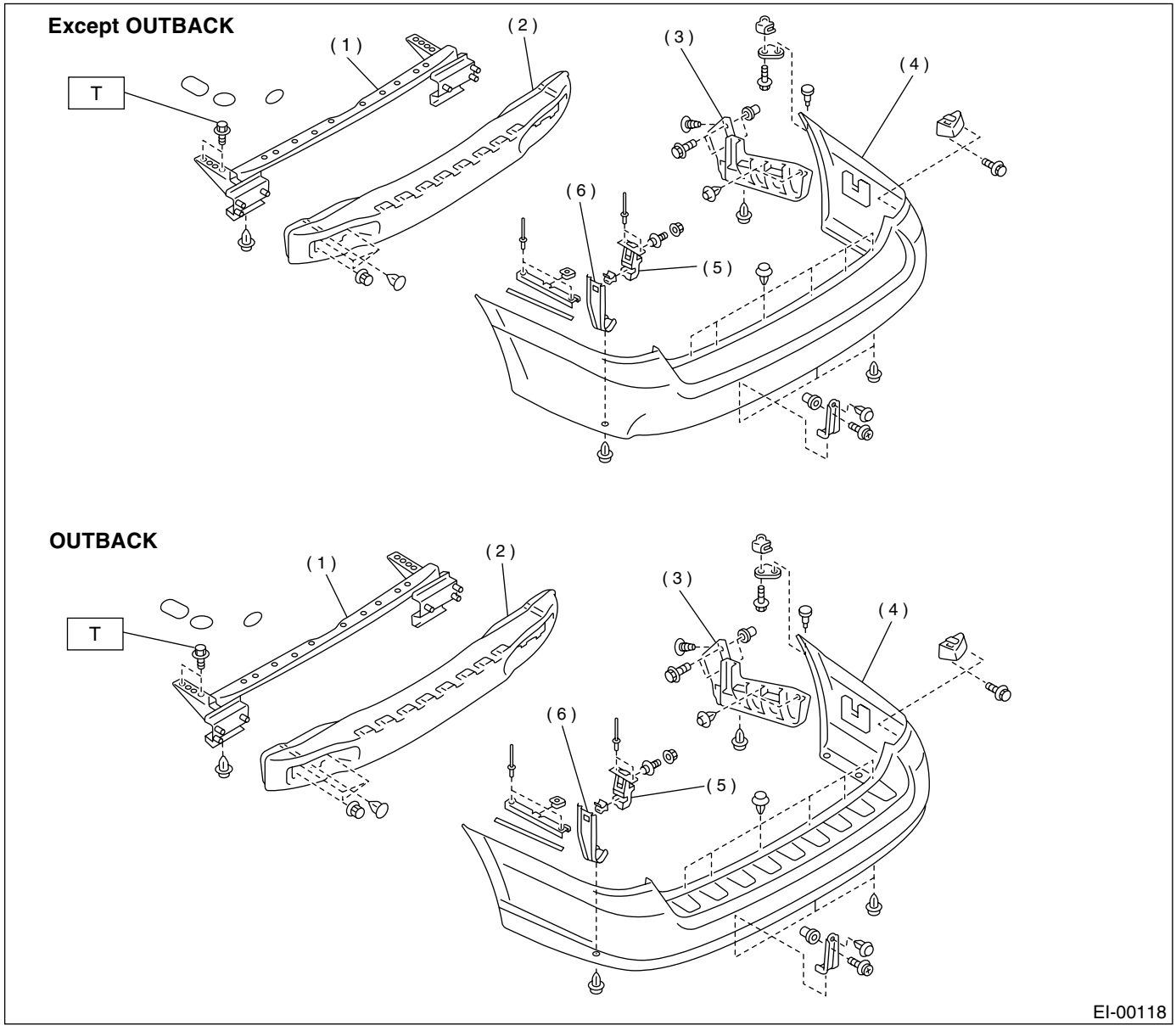
2. REAR BUMPER (SEDAN)



(1) Bumper beam
(2) Upper beam
(3) Resin beam
(4) Side bracket
(5) Bumper face
(6) Hook
(7) Side stay

Tightening torque: N·m (kgf-m, ft-lb)
T: 95 (9.7, 70)

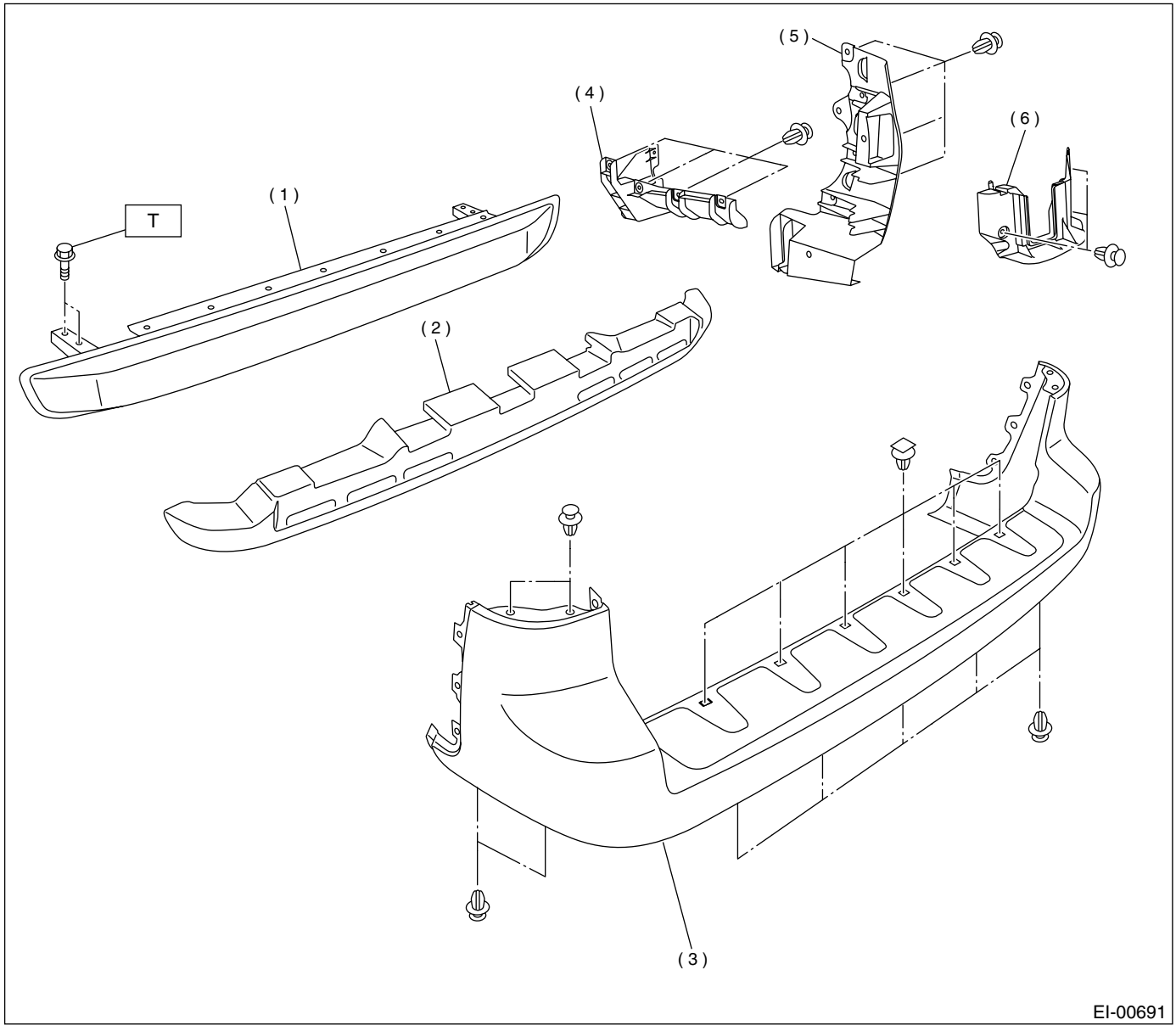
3. REAR BUMPER (WAGON)



(1) Bumper beam
(2) Resin beam
(3) Side bracket
(4) Bumper face
(5) Hook
(6) Side stay

Tightening torque: N·m (kgf-m, ft-lb)
T: 95 (9.7, 70)

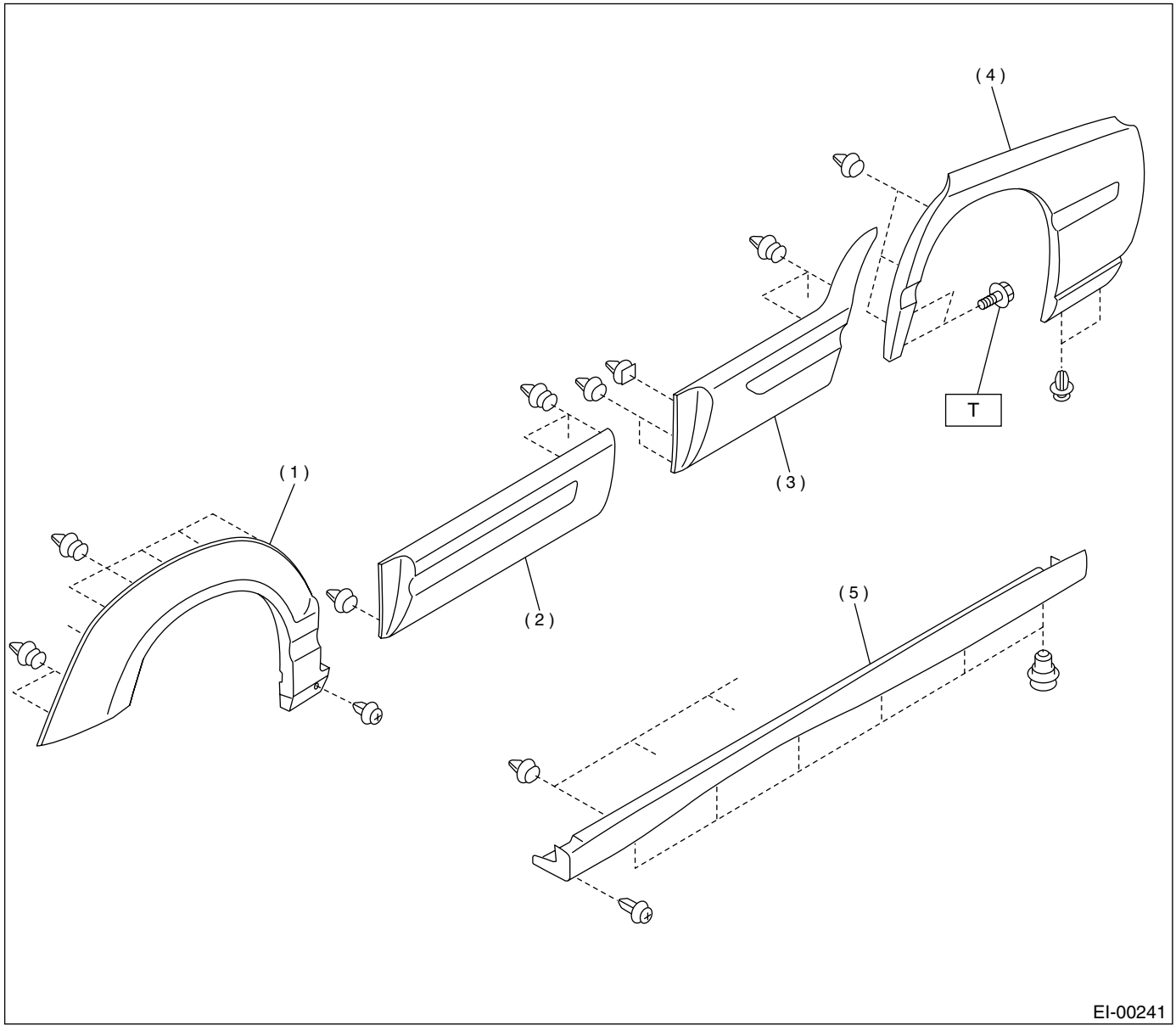
4. REAR BUMPER (PICKUP)



(1) Bumper beam
(2) Bumper energy absorber
(3) Bumper face
(4) Side lower cover
(5) Side bracket
(6) Lower cover

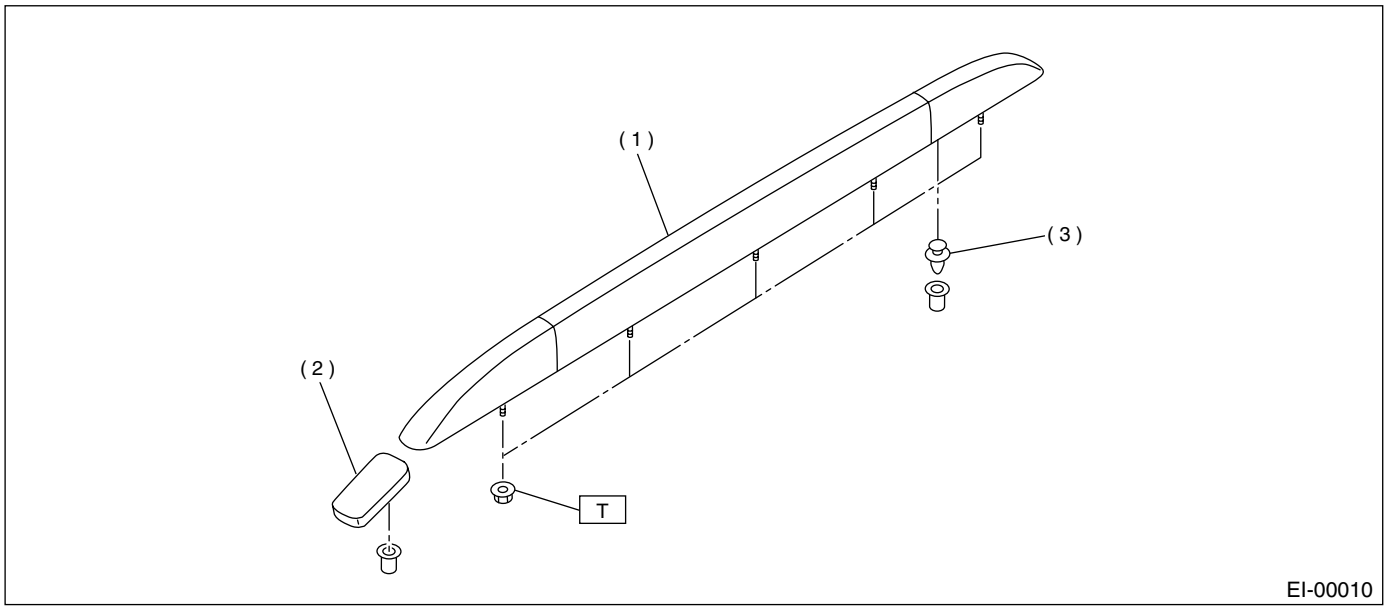
Tightening torque: N·m (kgf-m, ft-lb)
T: 95 (9.7, 70)

5. SIDE PROTECTOR



(1) Side garnish (Front fender)
(2) Side garnish (Front door)
(3) Side garnish (Rear door)
(4) Side garnish (Rear quarter)
(5) Side garnish (Side sill)

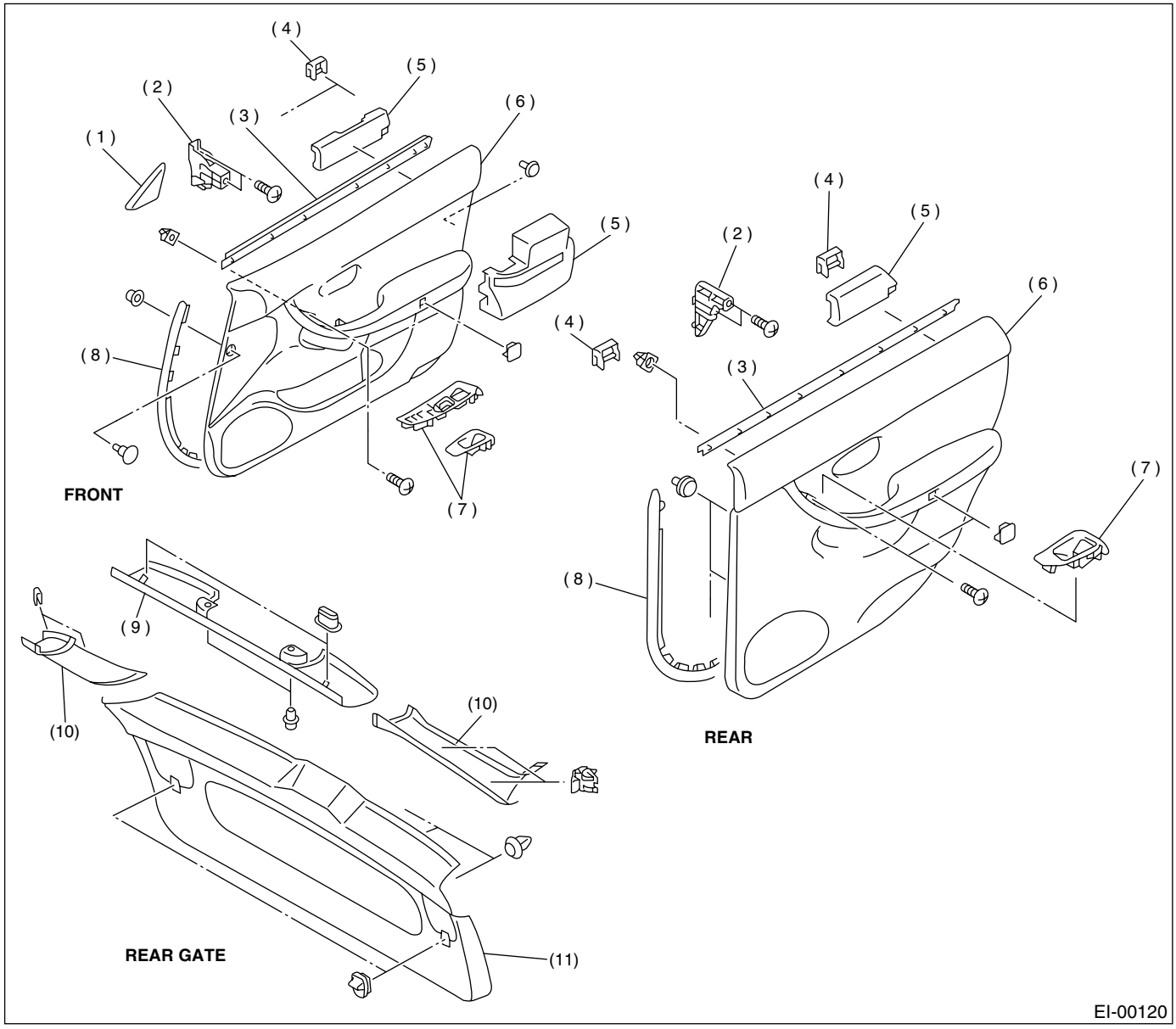
6. ROOF RAIL



(1) Roof rail
(2) Roof molding
(3) Clip

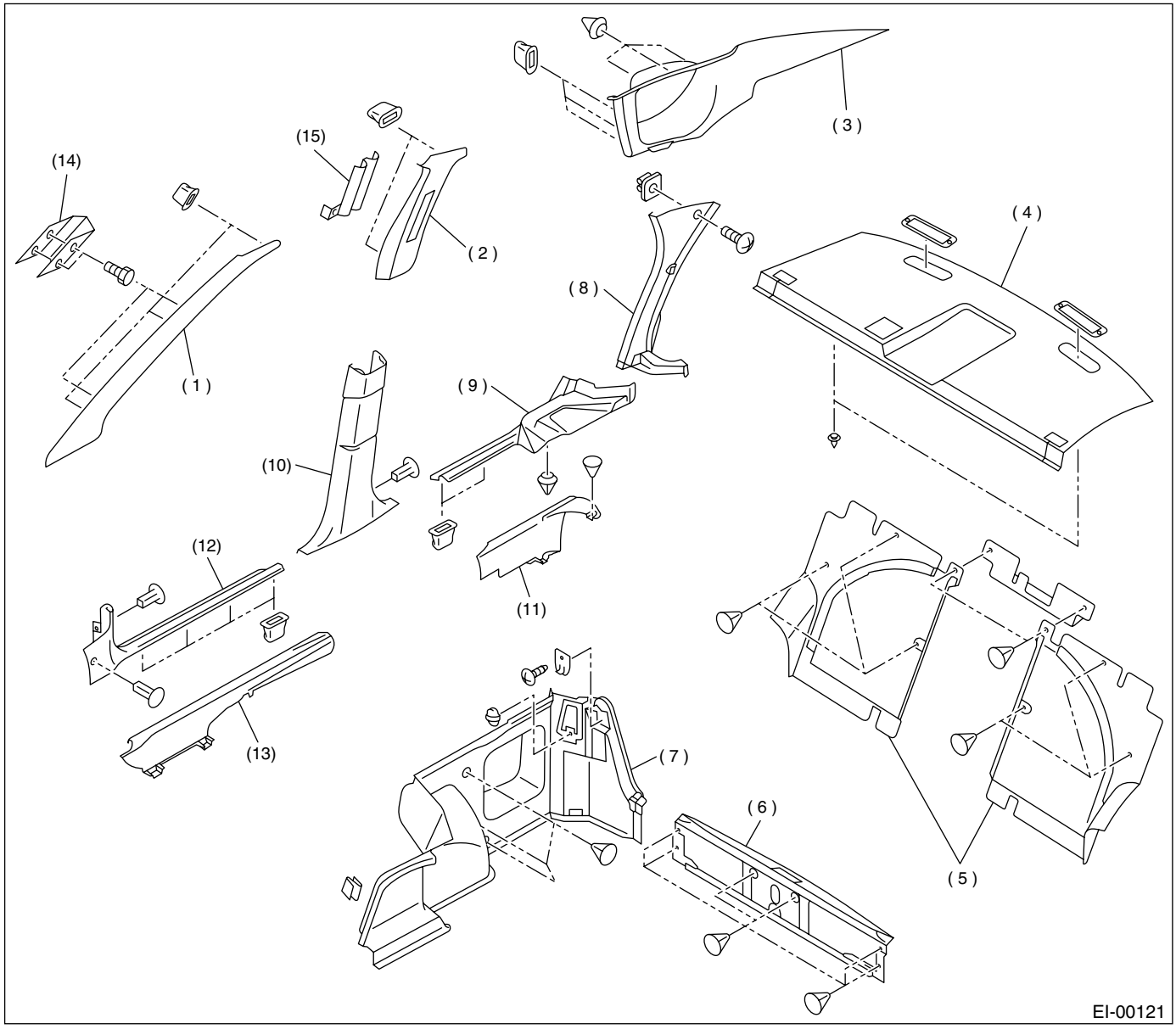
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.53)

7. DOOR TRIM



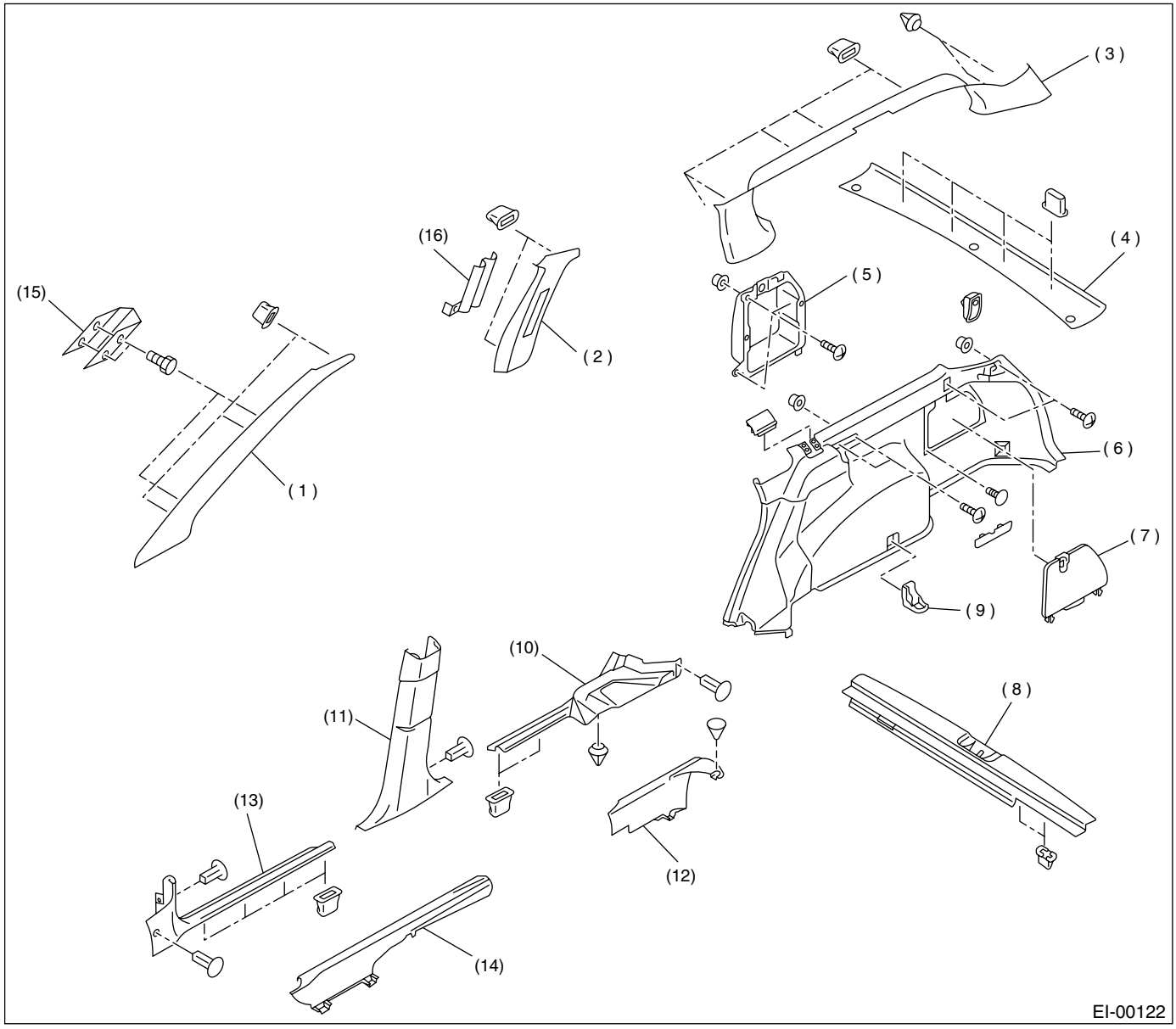
(1) Gusset cover
(2) Bracket
(3) Weatherstrip upper
(4) Clip
(5) Pad
(6) Trim panel
(7) Power window switch cover
(8) Weatherstrip lower
(9) Upper trim
(10) Side trim
(11) Lower trim

8. INNER TRIM (SEDAN)



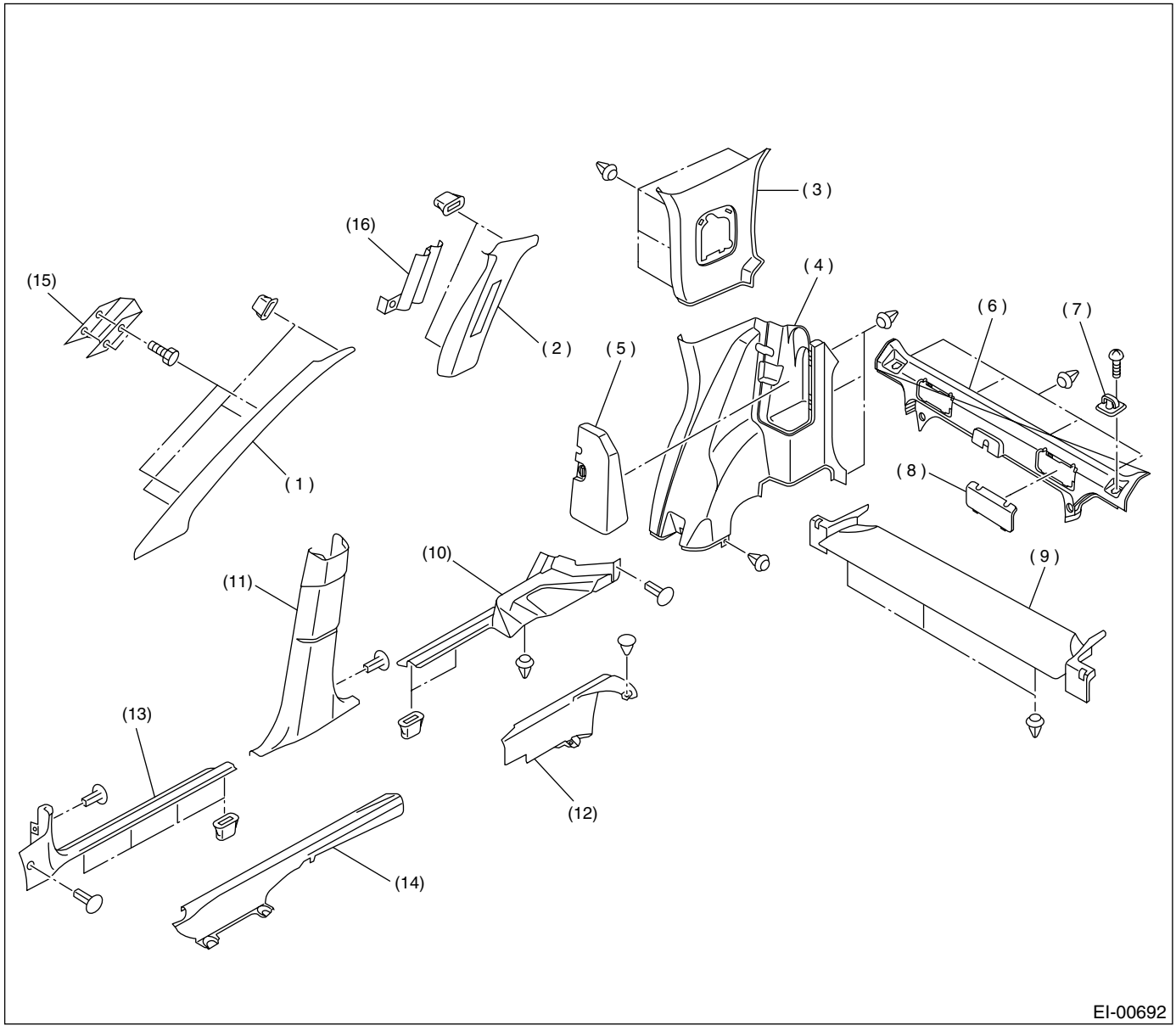
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear shelf trim
(5) Rear bulk trim
(6) Trunk rear trim
(7) Trunk side trim
(8) Rear pillar lower trim
(9) Side sill rear upper cover
(10) Center pillar lower trim
(11) Side sill rear lower cover
(12) Front pillar lower trim
(13) Side sill front lower cover
(14) Pad stopper A pillar
(15) Pad B pillar upper

9. INNER TRIM (WAGON)



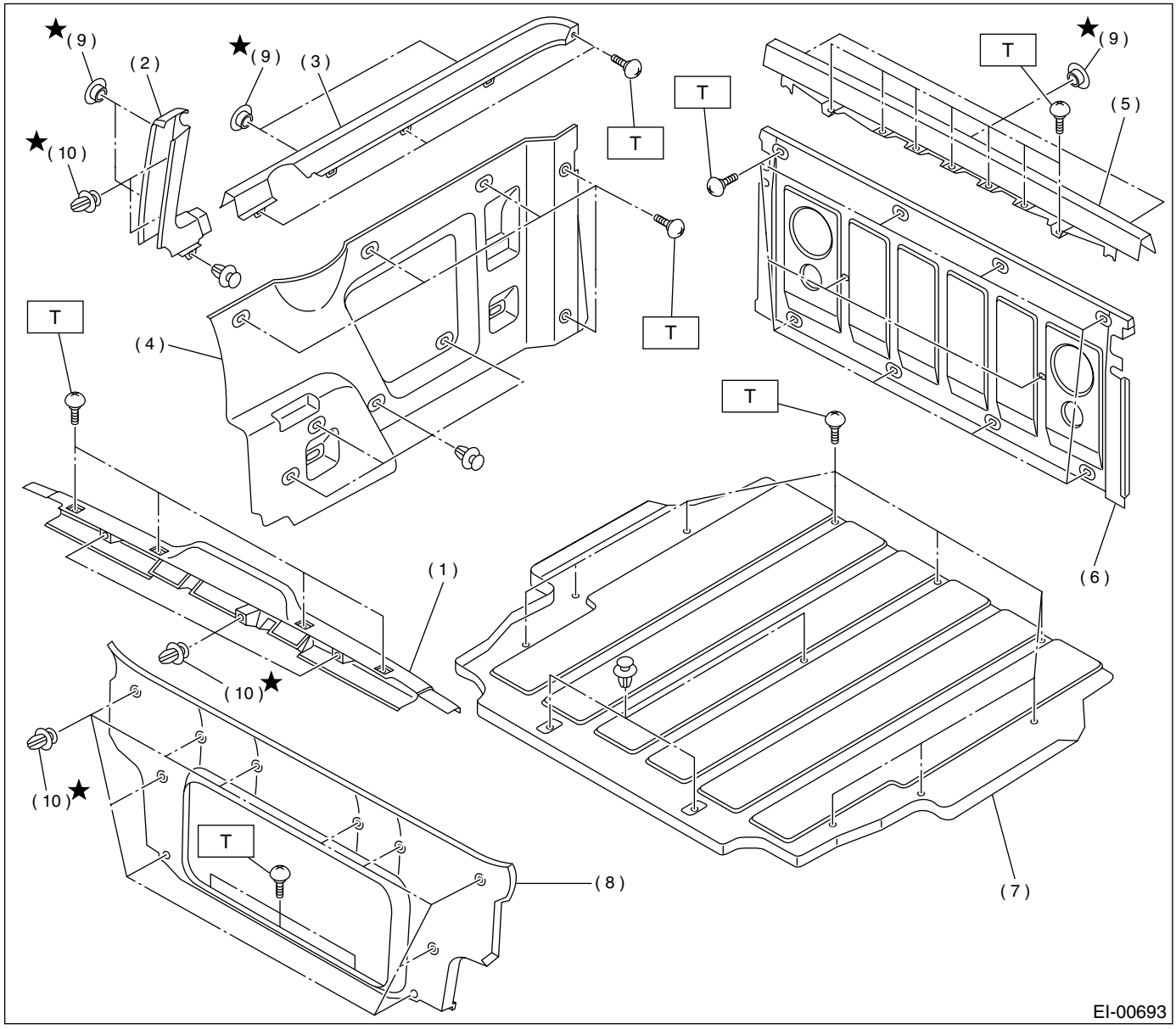
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear rail trim
(5) Pocket
(6) Rear quarter lower trim
(7) Lid
(8) Rear skirt trim
(9) Hook
(10) Side sill rear upper cover
(11) Center pillar lower trim
(12) Side sill rear lower cover
(13) Front pillar lower trim
(14) Side sill front lower cover
(15) Pad stopper A pillar
(16) Pad B pillar upper

10.INNER TRIM (PICKUP)



(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear pillar lower trim
(5) Lid
(6) Rear bulk head trim
(7) Hook
(8) Cover
(9) Floor trim panel
(10) Side sill rear upper cover
(11) Center pillar lower trim
(12) Side sill rear lower cover
(13) Front pillar lower trim
(14) Side sill front lower cover
(15) Pad stopper A pillar
(16) Pad B pillar upper

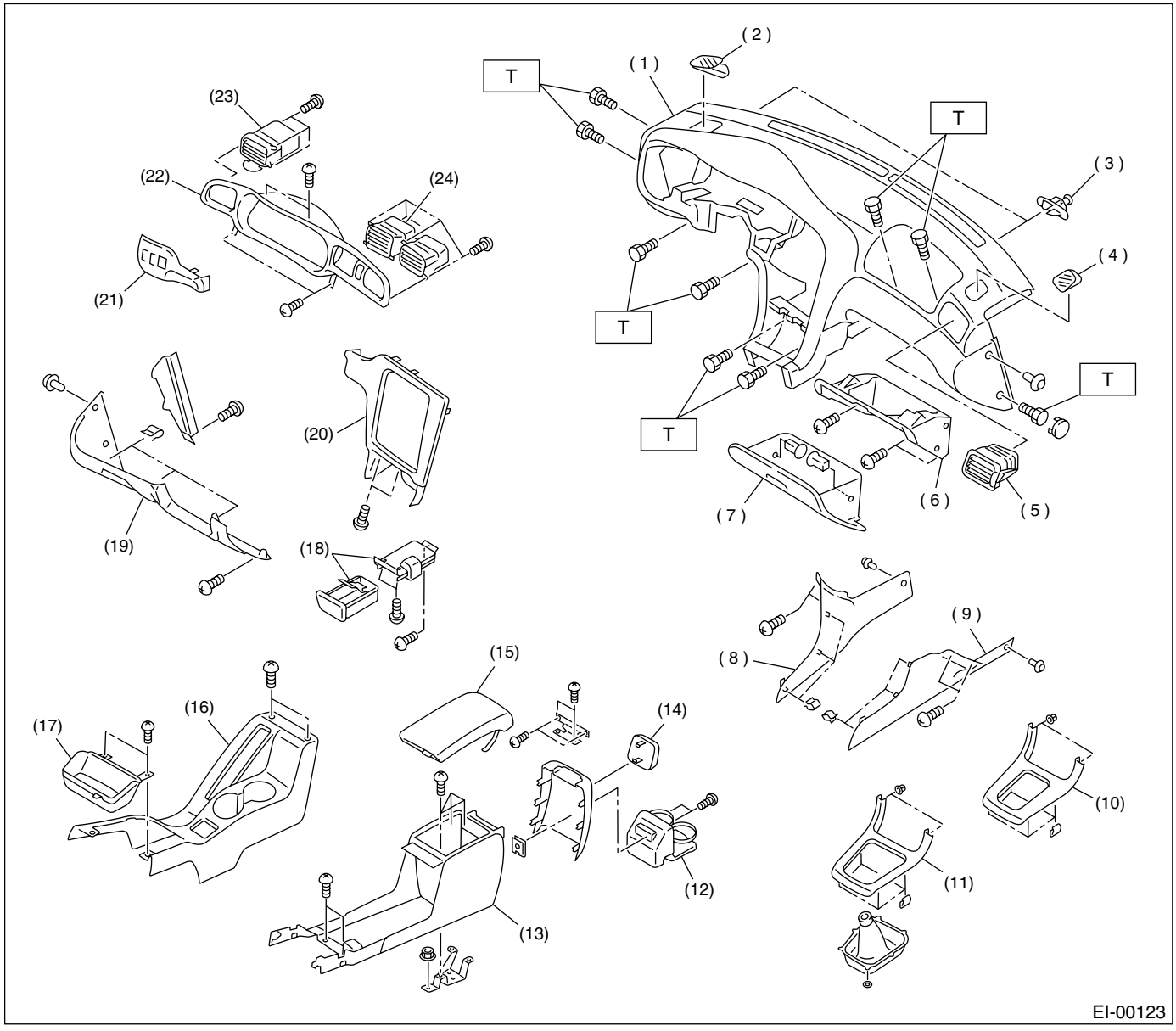
11.CARGO BED TRIM



(1) Cargo bed upper molding
(2) Cargo bed C pillar molding
(3) Cargo bed side molding
(4) Cargo bed side tray
(5) Tail gate molding
(6) Tail gate tray
(7) Cargo bed floor tray
(8) Back panel tray
(9) Clip
(10) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.53)

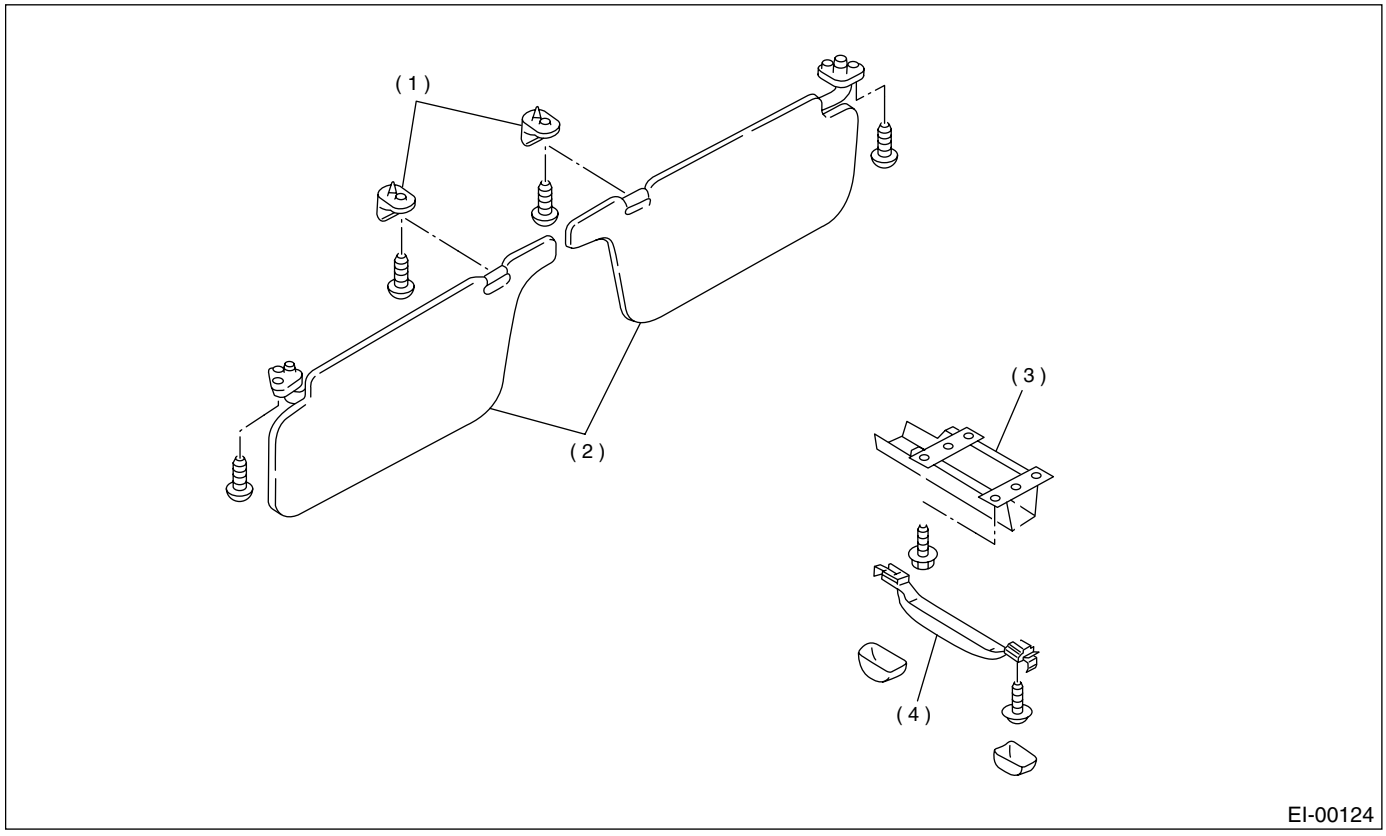
12.INSTRUMENT PANEL



(1) Pad & frame
(2) Grille side (D)
(3) Hook
(4) Grille side (P)
(5) Grille vent (P)
(6) Glove box panel
(7) Glove box lid
(8) Center panel side (D)
(9) Center panel side (P)
(10) Front cover (AT)
(11) Front cover (MT)
(12) Rear cup holder
(13) Console box
(14) Cap
(15) Console lid
(16) Console cover
(17) Tray
(18) Ash tray
(19) Lower cover
(20) Center panel
(21) Switch panel
(22) Meter visor
(23) Grille vent (D)
(24) Grille center

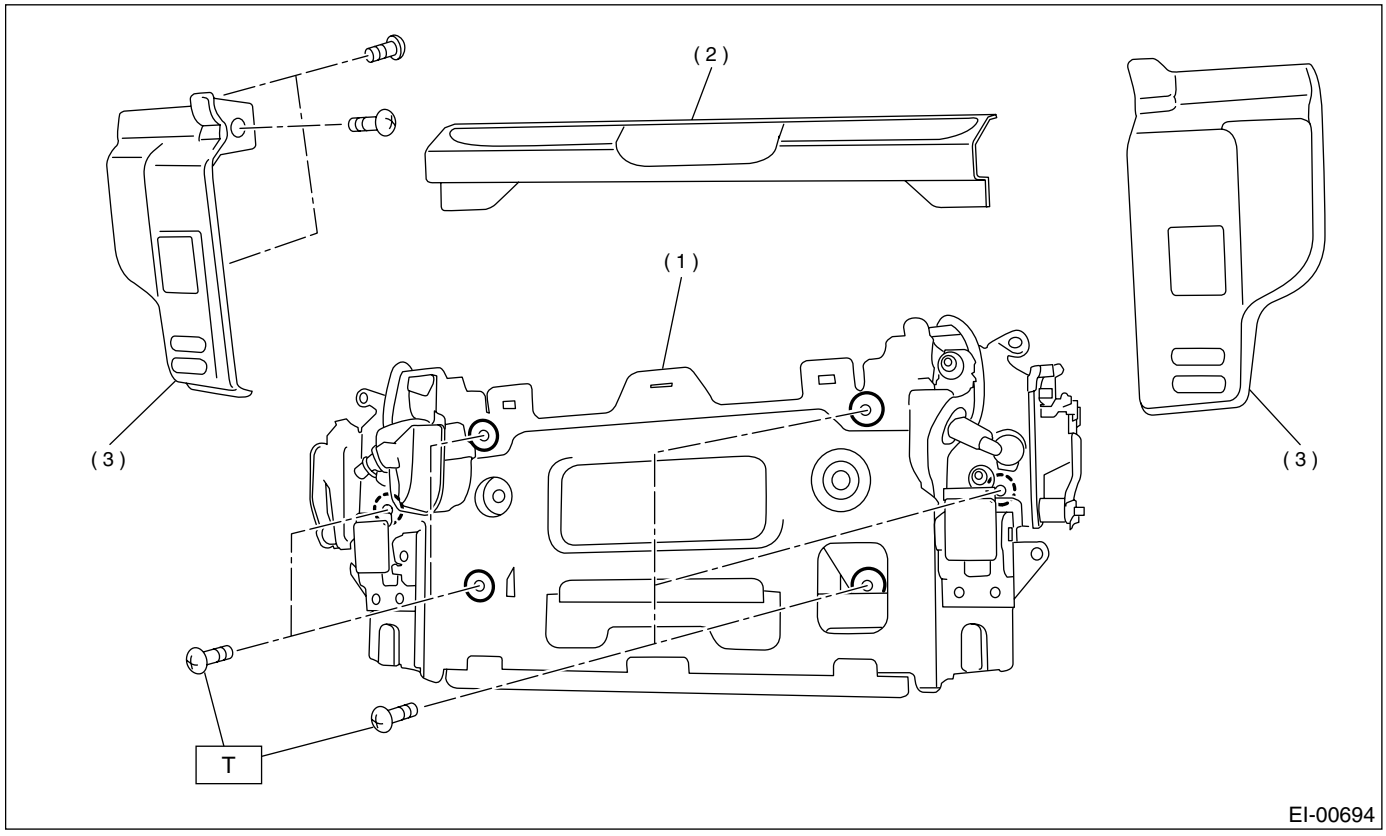
Tightening torque: N·m (kgf-m, ft-lb)
T: 7 (0.7, 5.1)

13.INNER ACCESSORIES



(1) Hook
(2) Sun visor
(3) Pad side rail
(4) Assist grip

14.LICENSE PLATE BRACKET



(1) License plate bracket
(2) Upper cover
(3) Side cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.53)

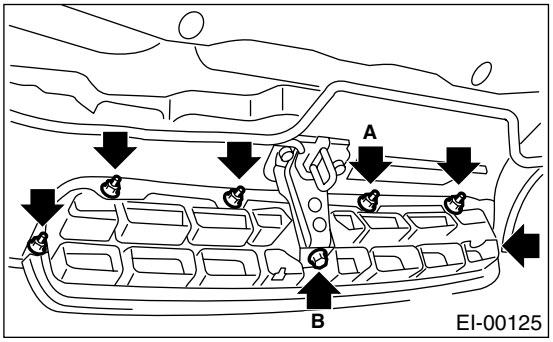
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.
Adhesive remover	Used for removal of side protector.
Primer	Used for installation of side protector.
Infrared lamp	Used for disassembly/assembly of side protector.
Tow-sided tape	Used for installation of side protector.
TORX® T30	Used for disassembly/assembly of crossbar, removal/installation of cargo bed.
TORX® T25	Used for removal/installation of cargo bed.

2. Front Grille

A: REMOVAL

1) Open hood.
2) Remove bolts and nuts to remove front grill.



B: INSTALLATION

Install in the reverse order of removal.

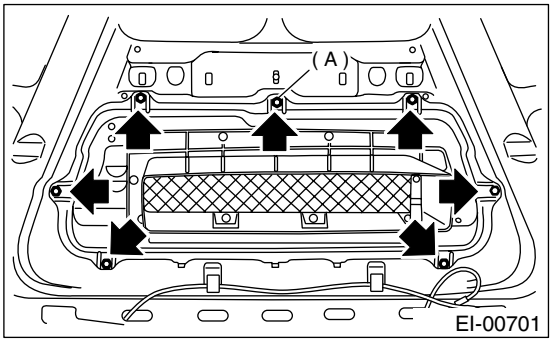
Tightening torque:

A: 4.4±1.5 N·m (0.4±0.1 kgf-m, 3.2±1.0 ft-lb)
B: 7.0±2.0 N·m (0.7±0.2 kgf-m, 5.1±1.4 ft-lb)

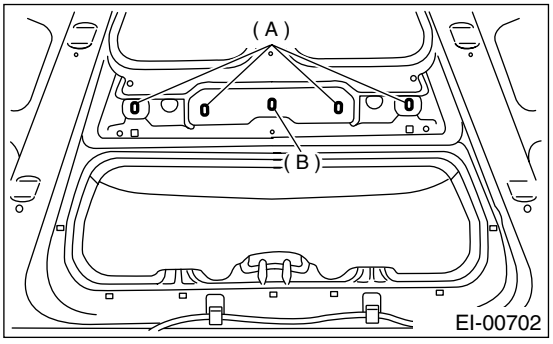
3. Hood Grille

A: REMOVAL

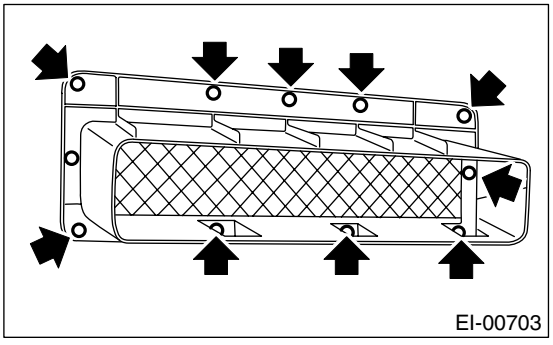
1) Remove hood insulator.
2) Remove six bolts and clip (A) to remove hood duct.



3) Loosen the nut (B), remove four clips (A), and then remove hood grille.



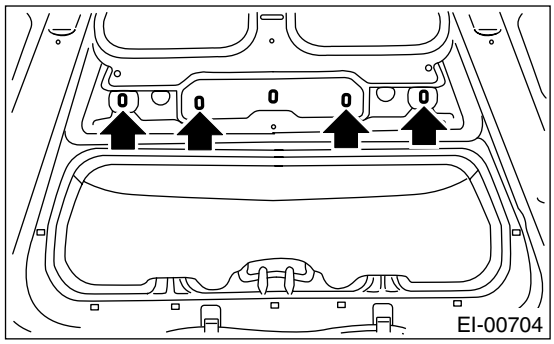
4) Remove eleven clips to remove air duct.



B: INSTALLATION

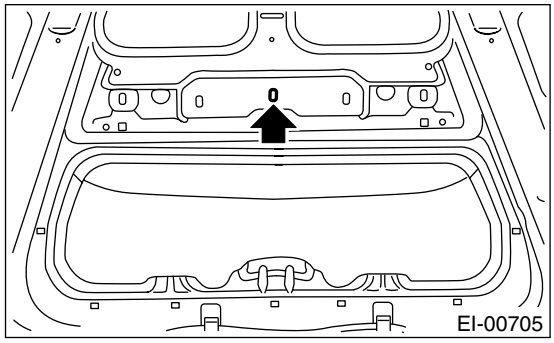
1) Engage four clips of hood grille to front hood panel.

CAUTION:
Make sure that the anchor portion of each clip is firmly engaged.

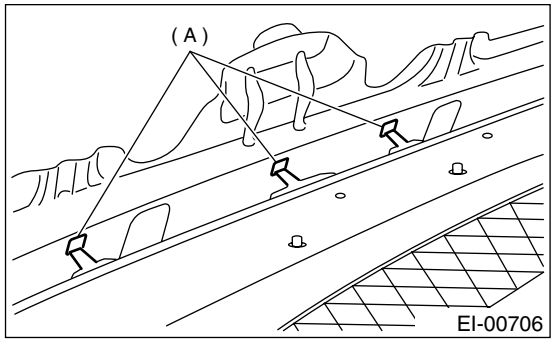


2) Install a nut.

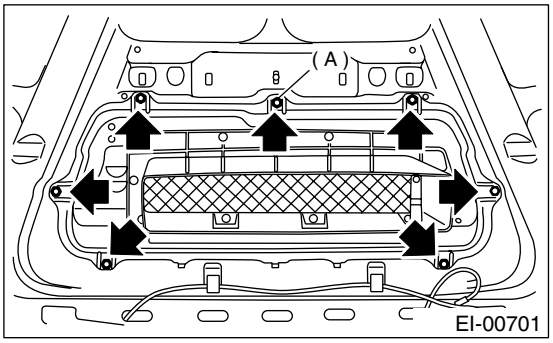
Tightening torque:
4.5 N·m (0.46 kgf-m, 3.32 ft-lb)



3) Catch three hooks (A) of hood duct to hood holes.



4) Install hood duct with clip (A) and seven bolts.



5) Install the hood insulator with new clips.

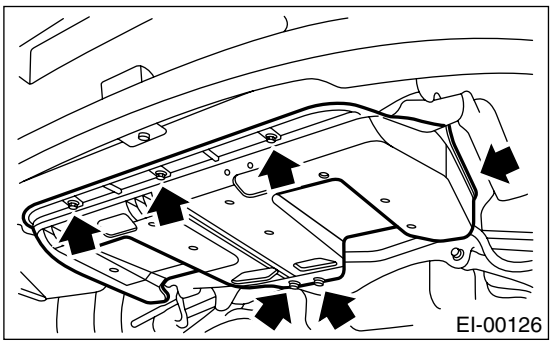
C: INSPECTION

Make sure that clips are firmly engaged.
Make sure that there is no abnormal gap at whole periphery of hood grille.
Make sure that there is no damage on hood grille.

4. Front Under Cover

A: REMOVAL

1) Lift-up the vehicle.
2) Remove bolts and clips to remove under cover.



B: INSTALLATION

Install in the reverse order of removal.

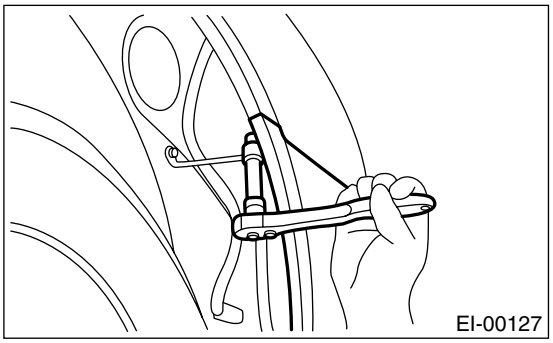
Tightening torque:
18 N·m (1.84 kgf-m, 13.3 ft-lb)

5. Front Bumper

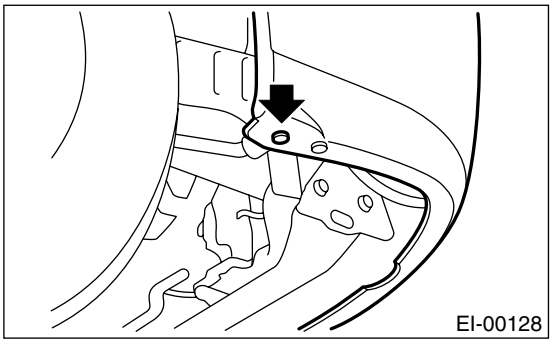
A: REMOVAL

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.
• To avoid damage to bumper, lay removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

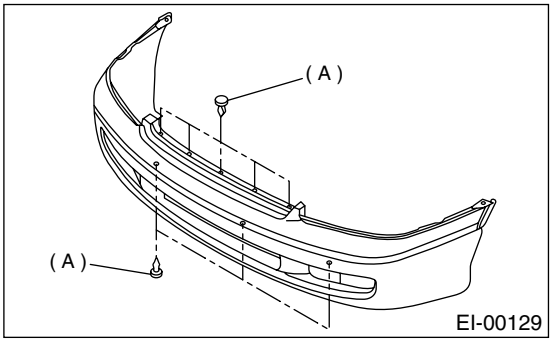
1) Open hood.
2) Disconnect ground cable from battery.
3) Pull off front side of front mat guard to remove bolts.



4) Remove clip at bottom of bumper.

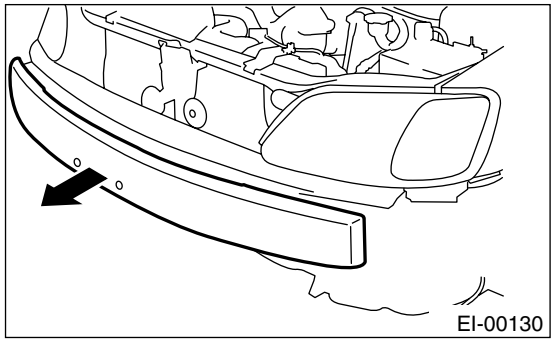


5) Remove clip (A), and pull out bumper slightly.
6) Disconnect harness connector of fog light to remove bumper.

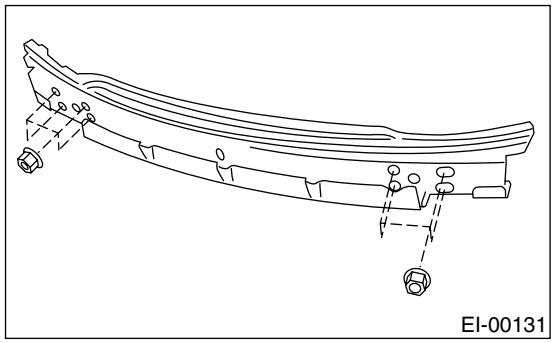


7) Remove Bumper energy absorber form from bumper beam.

CAUTION:
E/A FOAM is easy to brak. Do not apply excessive force to it during removal.



8) Remove bumper beam.



B: INSTALLATION

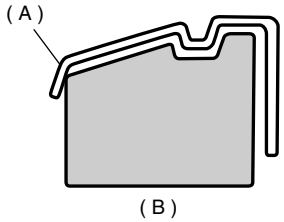
Install in the reverse order of removal.

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EI-2, FRONT BUMPER, COMPONENT, General Description.>

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set bumper (A) on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible (B).	 EI-00132
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. • Paint in use (for each color): Solid paint Hardener PB Thinner T-301 • Mixing ratio: Main agent vs. hardener = 4:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 35 — 45μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use section (block) paint for top coat. • Paint in use (for each color): Metallic paint Hardener PB Thinner T-306 • Mixing ratio: Main agent vs. hardener = 10 : 1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 15 — 20μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [10 min. or more at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals. • Paint in use: Metallic paint Hardener PB Thinner T-301 • Mixing ratio: Clear vs. hardener = 6 : 1 • Viscosity: 14 — 16 sec/20°C (68°F) • Film thickness: 25 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Paint check.	
11	Masking removal	Remove masking in process No. 2.	

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

NOTE:
All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

• Minor damage causing only a change in the lustre of the bumper due to a light touch

Almost restorable.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the area to be repaired using water.</td></tr>
<tr><td>2</td><td>Sanding</td><td colspan="2">Grind the repairing area with #500 sand paper in a “feathering” motion.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.</td><td rowspan="2">Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the “(3)” section, depending on the degree and nature of damage.</td></tr>
<tr><td>Polish the waxed area with a clean cloth after 5 to 10 minutes.</td></tr>
</table>

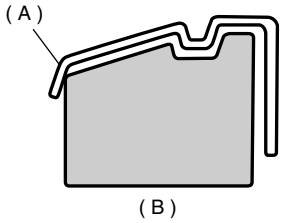
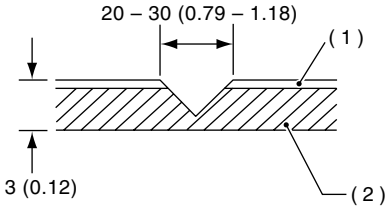
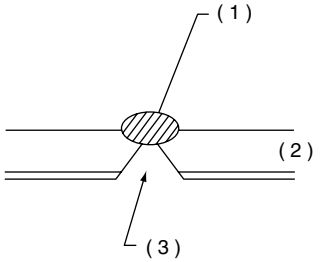
• Deep damage caused by scratching fences, etc.

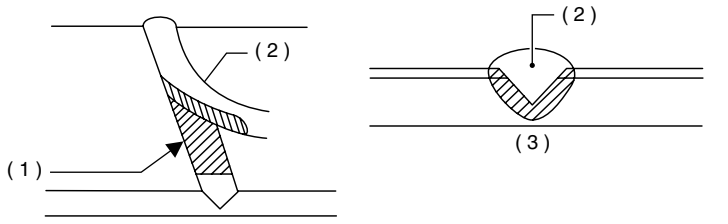
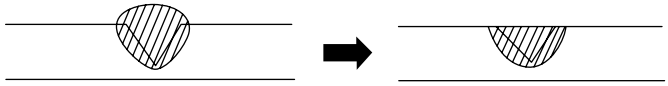
A dent cannot be repaired but a whitened or swelled part can be removed.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean damaged area with water.</td></tr>
<tr><td>2</td><td>Removal of damaged area</td><td colspan="2">Cut off protruding area, if any, due to collision, using a putty knife.</td></tr>
<tr><td>3</td><td>Sanding</td><td colspan="2">Grind the affected area with #100 to #500 sand paper.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Same as Process No. 3 in the “(1)” section.</td><td>Perform Process No. 12 and subsequent operations in the “(3)” section.</td></tr>
</table>

• Deep damage such as a break or hole that requires filling

Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)
Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove bumper as required.	
2	Part removal	Remove parts built into bumper as required.	
3	Bumper placement	Place bumper (A) on a paint worktable as required. It is recommended that contour of worktable accommodate internal shape of bumper (B).	 EI-00132
4	Surface preparation	Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol).	
5	Cutting	If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or “vee-out” the affected area using a knife or grinder.	Unit: mm (in)  EI-00134 (1) Paint surface (2) PP base surface
6	Sanding (I)	Grind beveled surface with sand paper (#40 to #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Process No. 4.	
8	Temporary welding	Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent. Temporarily spot-weld the side, using a PP welding rod and heater gun.	 EI-00135 (1) Welded spot (Use heater gun and PP welding rod) (2) PP base surface (3) Beveled section NOTE: • Do not melt welding rod until it flows out. This results in reduced strength. • Leave the welded spot unattended until it cools completely.

Process No.	Process name	Job contents
9	Welding	Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.
		 EI-00136 (1) Melt hatched area (2) Welding rod (3) Section NOTE: • Melt the sections indicated by hatched area. • Do not melt welding rod until it flows out, in order to provide strength. • Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot. • Leave the welded spot unattended until it cools completely.
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.
		 EI-00042
		Sand the welded spot smooth with #240 sand paper.
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent
12	Cleaning/ degreasing	Completely clean the entire coated area, using solvent similar to that used in Process No. 4.
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/ 364 PP Primer NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm^2, 36 to 50 psi) with a spray gun.
14	Leave unattended.	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth dampended with alcohol. (Do not use thinner since the coated area tends to melt.)
15	Primer surfacer coating	Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes. Recommended surfacer: • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixing ratio: 2 : 1 (UPS 300: No. 303) • Viscosity: 12 — 14 sec/20°C (68°F) • Coated film thickness: 40 — 50μ
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.

Process No.	Process name	Job contents	
18	Cleaning/ degreasing	Same as Process No. 12.	
19	Top coat (I)	Solid color	Metallic color
		Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 40 — 50μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 10 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
22	Drying	Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes. NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
23	Inspection	Carefully check the condition of the repaired area.	
24	Masking removal	Remove masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install parts on bumper in reverse order of removal.	
26	Bumper installation	Install bumper.	

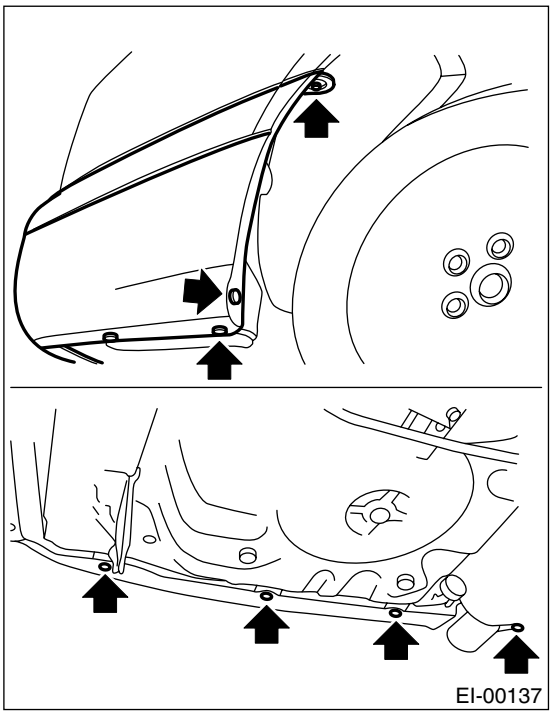
6. Rear Bumper

A: REMOVAL

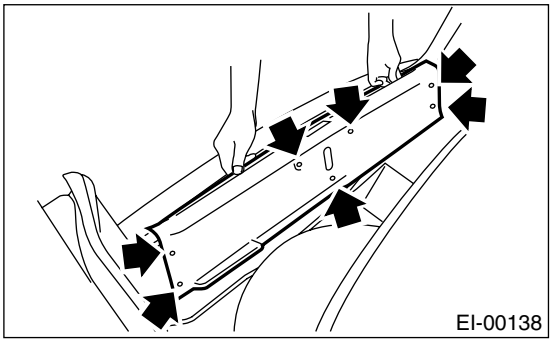
1. SEDAN

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.
• To avoid damage to bumper, lay removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

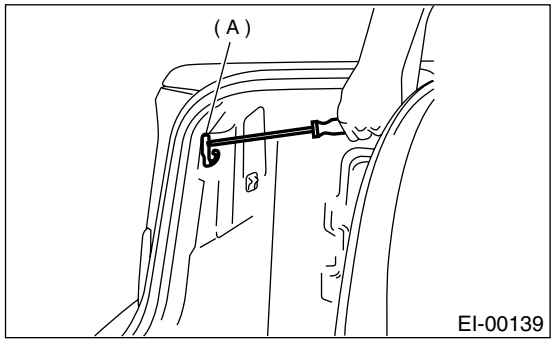
1) Lift-up the vehicle.
2) Remove bolts and clips.



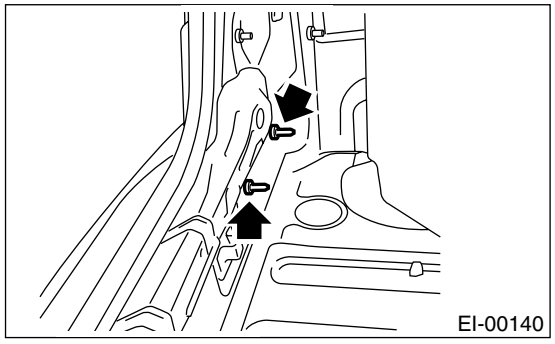
3) Loosen clips to remove trunk rear trim.



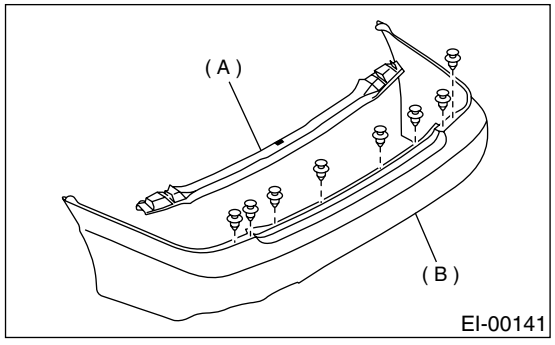
4) Remove hook (A) to pull off rear side of trunk side trim.



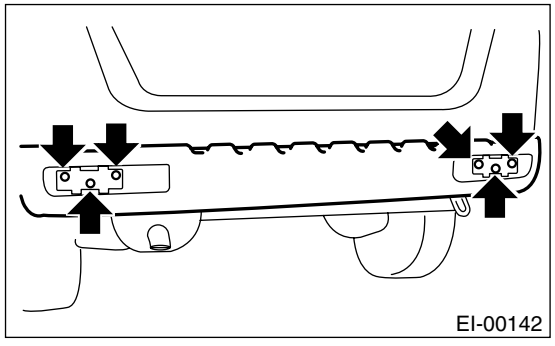
5) Remove two nuts from each side to remove rear bumper.



6) Loosen clips to remove upper beam (A) from bumper face.



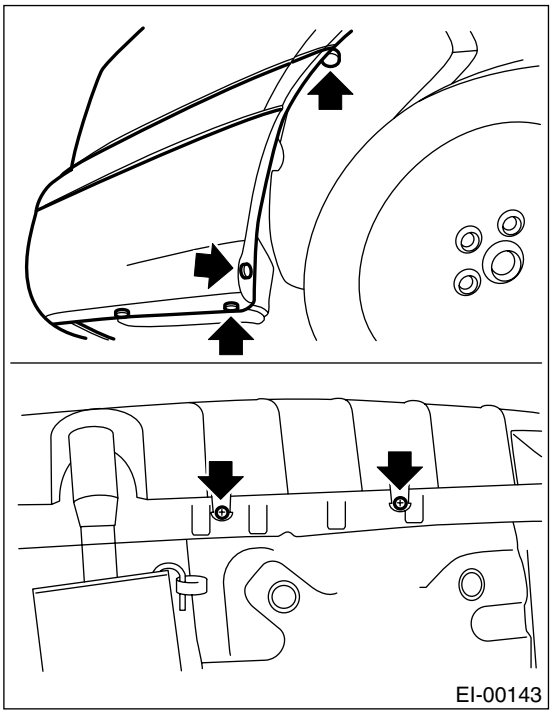
7) Remove resin beam.



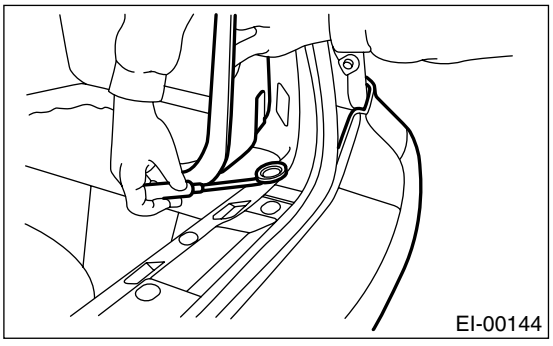
2. WAGON

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.
• To avoid damage to bumper, lay removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

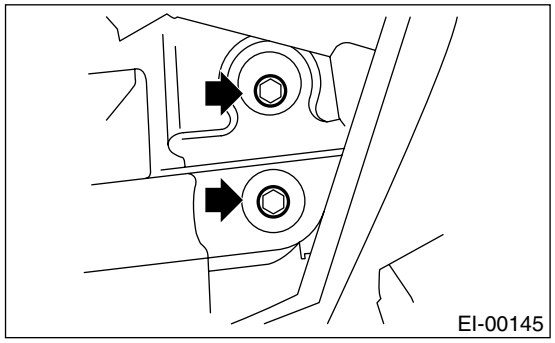
1) Lift-up the vehicle.
2) Remove trailer hitch. <Ref. to EI-39, REMOVAL, Trailer Hitch.>
3) Remove bolts and clips.


EI-00143

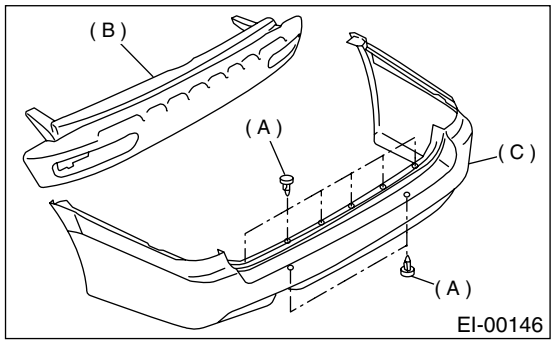
4) Remove rear floor box. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
5) Pull off rear end of rear quarter lower trim to remove cap.


EI-00144

6) Remove bolts to remove rear bumper.

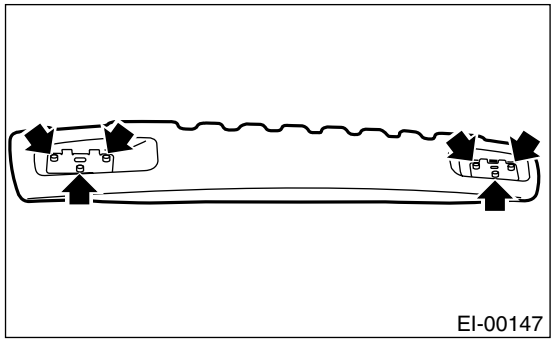

EI-00145

7) Remove clip (A) to remove bumper beam (B) from rear bumper face (C).



EI-00146

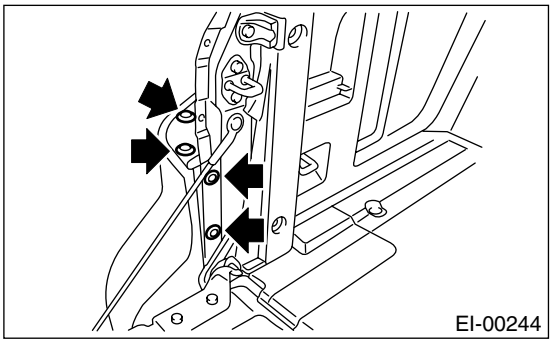
8) Remove resin beam from bumper beam.


EI-00147

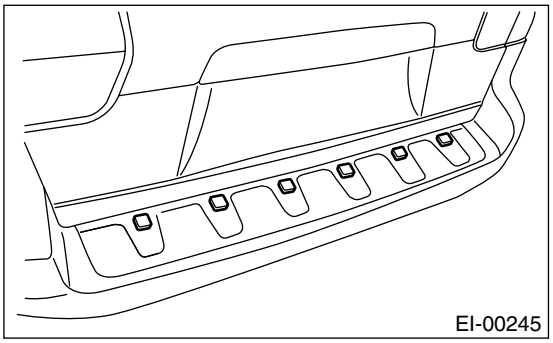
3. PICKUP

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.
• To avoid damage to bumper, lay removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

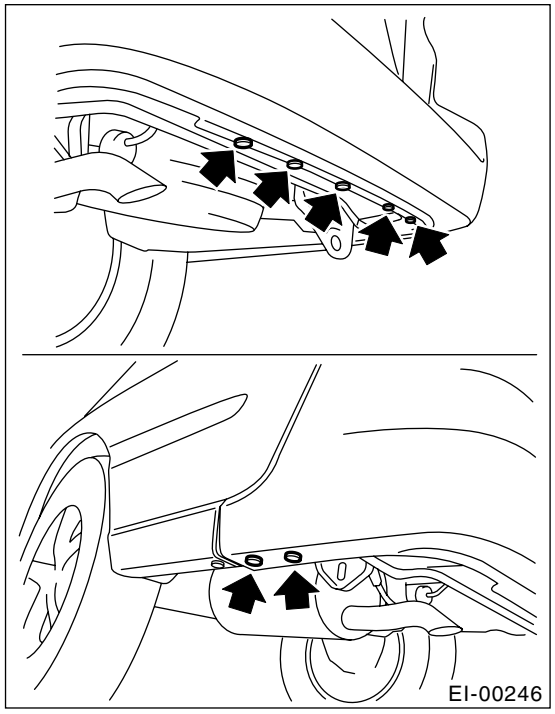
1) Remove rear combination light. <Ref. to LI-19, PICKUP, REMOVAL, Rear Combination Light Assembly.>
2) Remove clip.


EI-00244

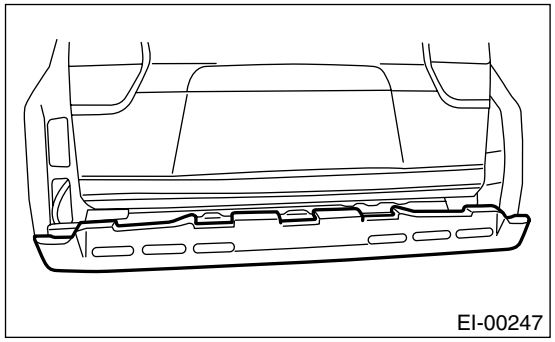
3) Remove clip.


EI-00245

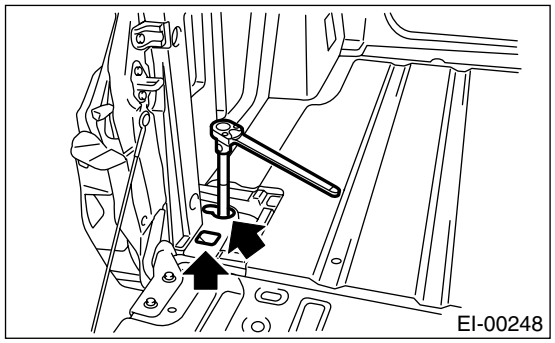
4) Remove clip.


EI-00246

5) Remove bumper face.
6) Remove Bumper energy absorber.


EI-00247

7) Remove bolt and bumper beam.

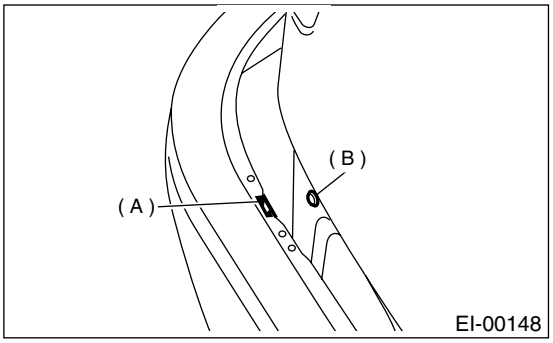

EI-00248

B: INSTALLATION

1. SEDAN

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.

1) Install in the reverse order of removal.
2) Fit slider (A) to guide pin (B) securely.

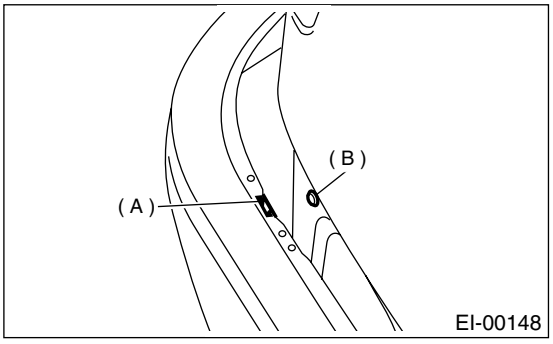


Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EI-3, REAR BUMPER (SEDAN), COMPONENT, General Description.>

2. WAGON

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.

1) Install in the reverse order of removal.
2) Fit slider (A) to guide pin (B) securely.

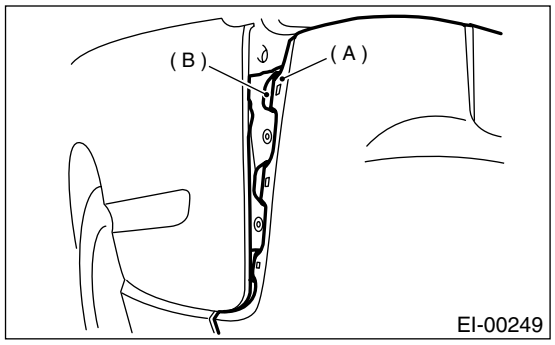


Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EI-4, REAR BUMPER (WAGON), COMPONENT, General Description.>

3. PICKUP

CAUTION:
• Handle bumper carefully to avoid damage to bumper face.
• Do not damage body during removal or installation of bumper.

1) Install in the reverse order of removal.
2) Securely fix bumper edge portion (A) to side bracket (B).



Tightening torque:
Bumper beam; 95 N·m (9.7 kgf-m, 70 ft-lb)

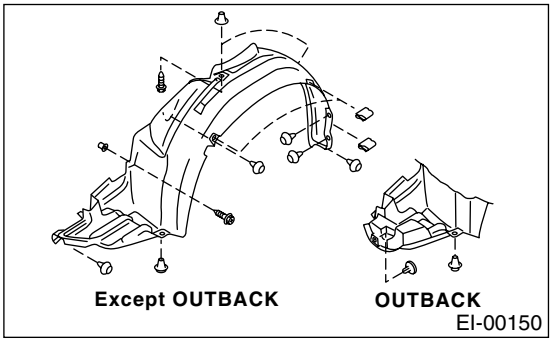
C: REPAIR

Refer to front bumper repair. <Ref. to EI-21, REMOVAL, Front Bumper.>

7. Mud Guard

A: REMOVAL

1) Jack-up the vehicle.
2) Remove screws and clips to remove mud guard.



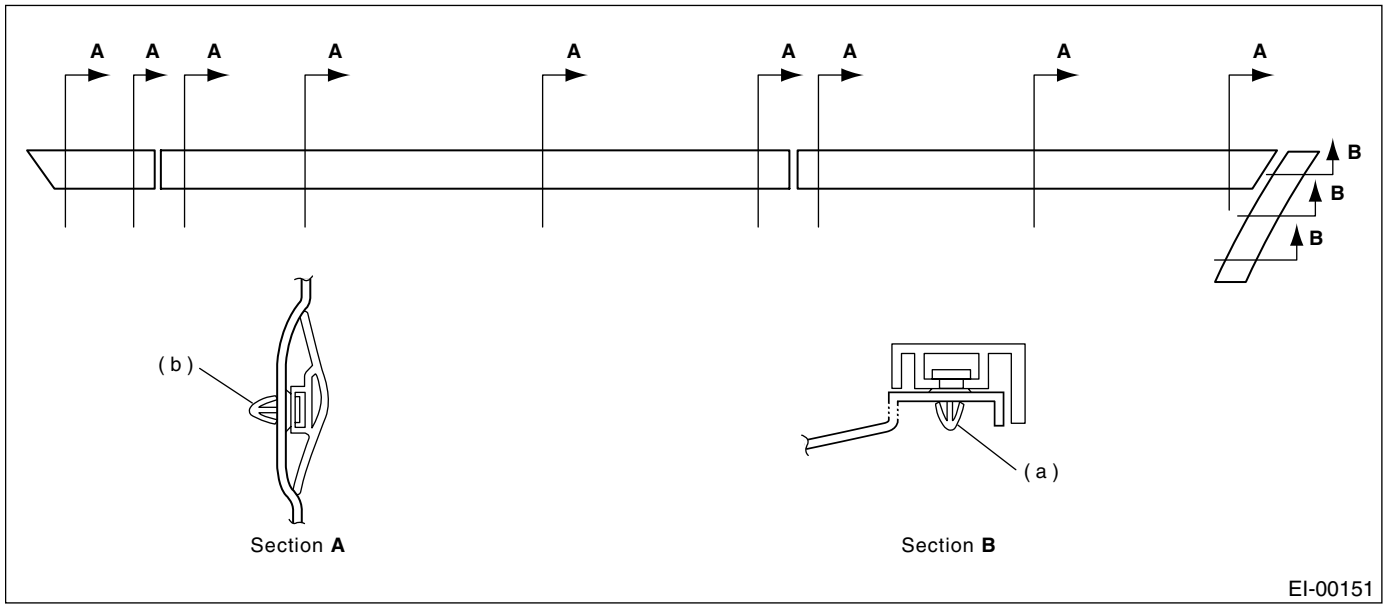
B: INSTALLATION

Insert hook into body, and tighten it with screw and clip.

8. Protector

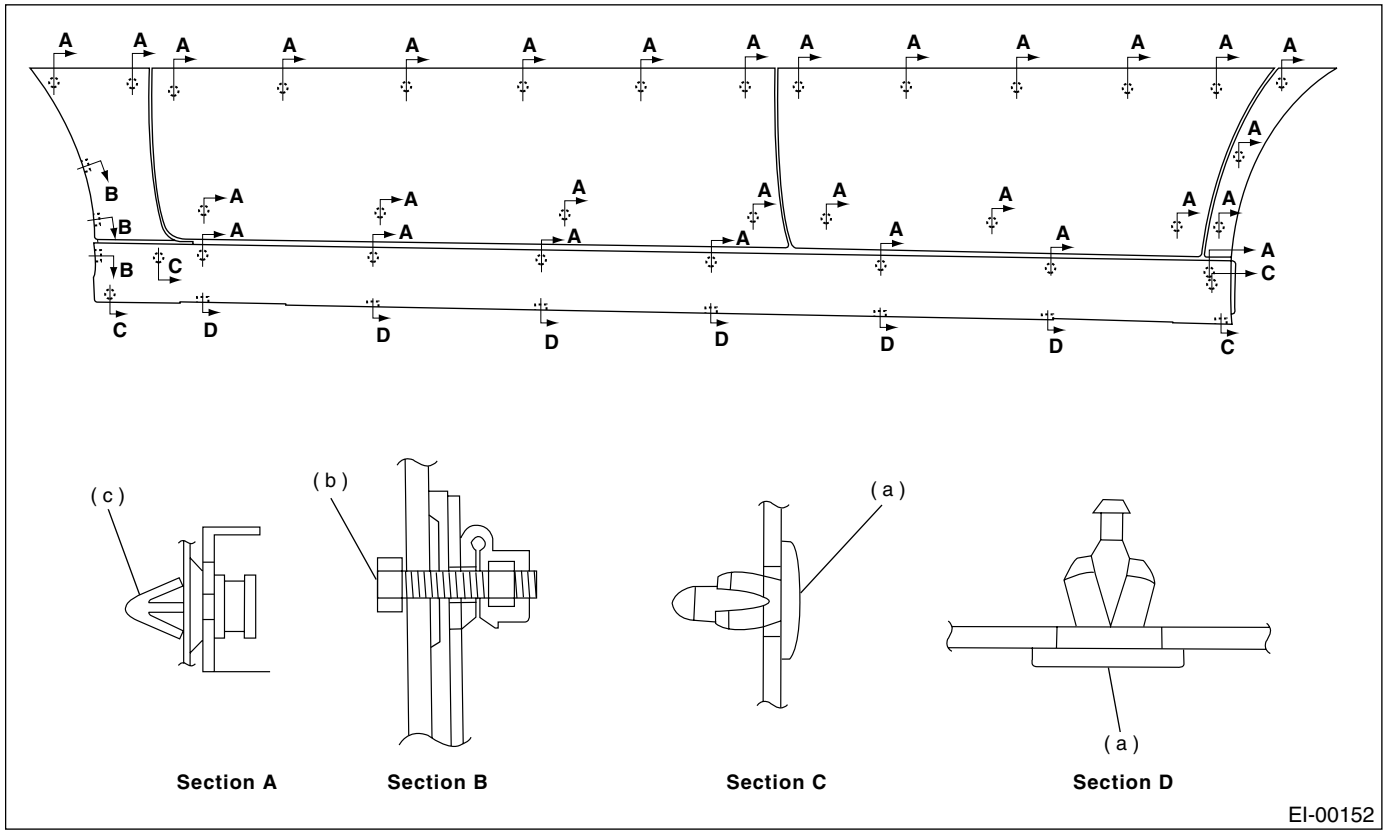
A: REMOVAL

LEGACY:



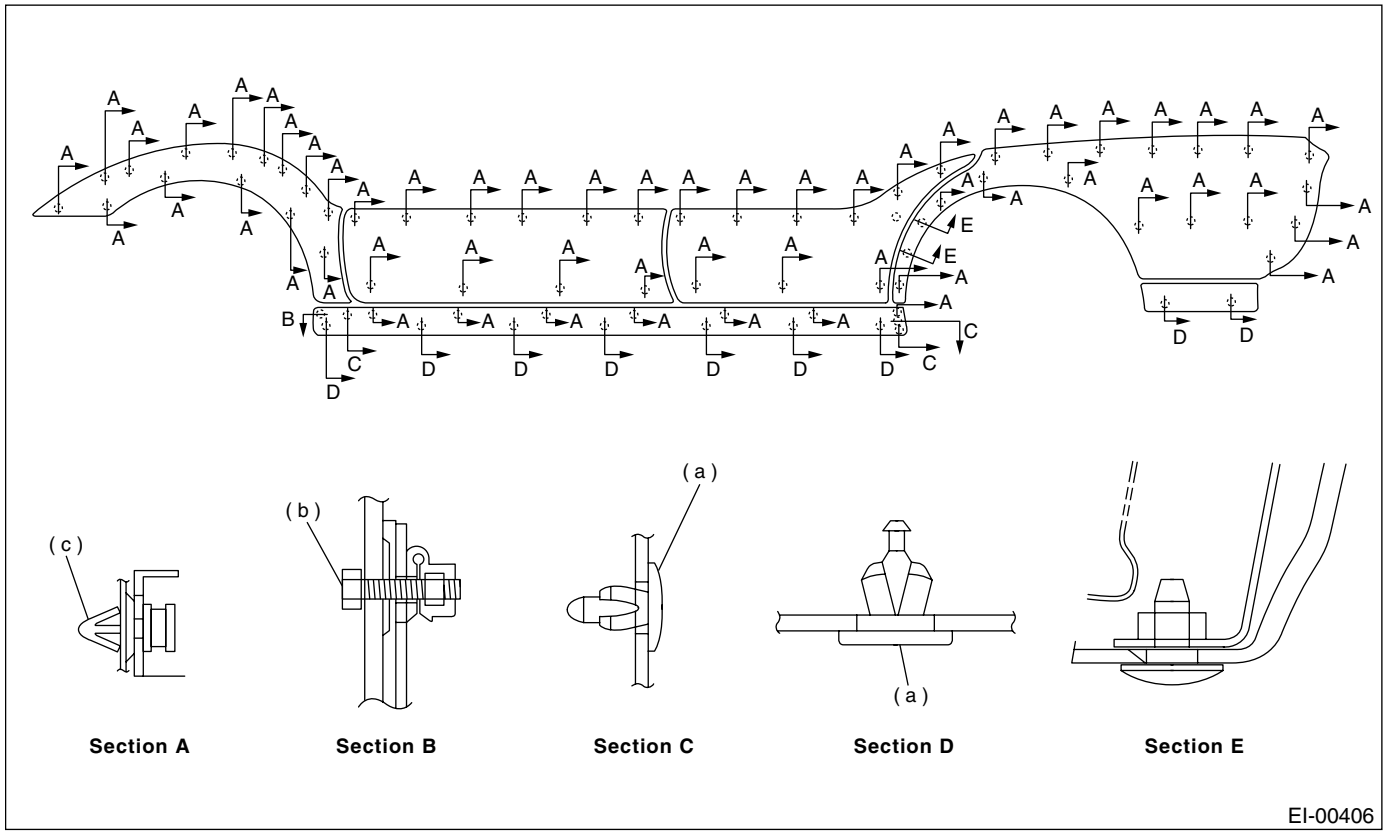
NOTE:
Paying attention to the position of clip (b).

OUTBACK:
Remove clip (a) and bolt (b).

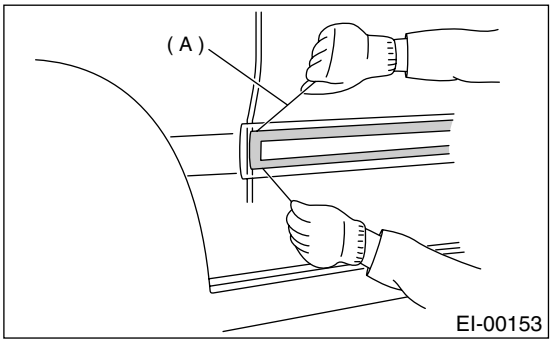


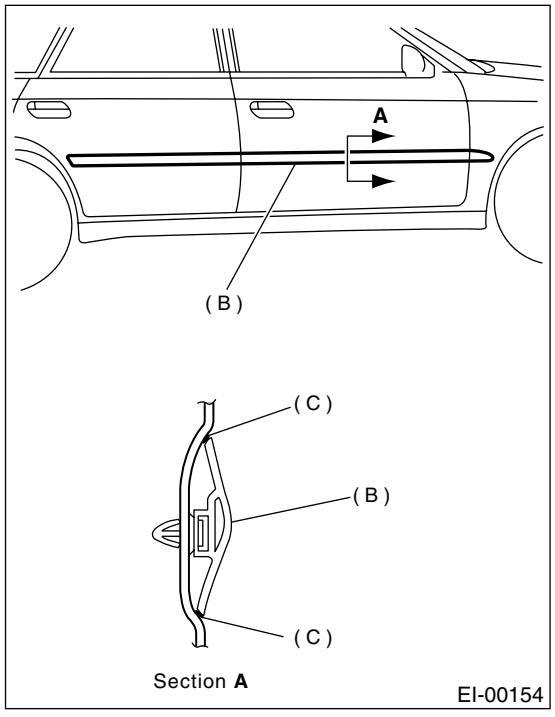
NOTE:
Paying attention to the position of clip (c).

PICKUP:



1) Attach masking tape to outer perimeter of side protector. (If original side protector is re-installed, tape the entire protector.)
2) Insert fishing line [0.8 mm (0.031 in) dia.] (A) between side protector (B) and vehicle body. Cut (pull the line) through two-sided tape (C) along side protector on the body. Using a puller, remove clips from vehicle body while pulling side protector towards yourself as required.





NOTE:
• To increase adhesive remover strength, leave two-sided tape on body and side protector.
• If two-sided tape is too thick, use a putty knife to cut it thin so that adhesive remover is ready for use.
• If two-sided tape is hard to remove, heat to approximately 40°C (104°F).

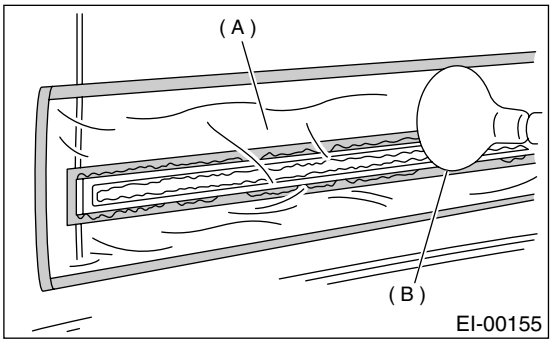
3) Apply an even coat of adhesive remover to the two-sided tape.

Recommended adhesive remover:
SUMITOMO 3M4000 or equivalent

CAUTION:
Do not apply adhesive remover to lacquer base coated body panels.

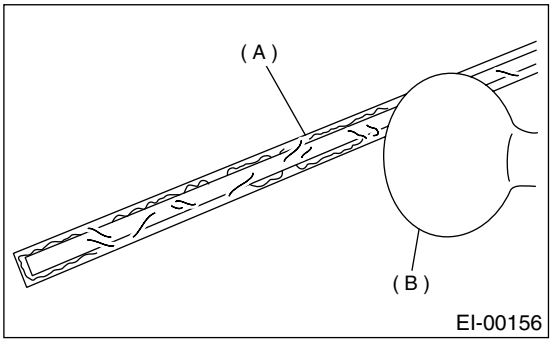
4) Attach plastic wrap (A) to adhesive remover coated areas and heat to 40 to 60°C (104 to 140°F) for 5 to 10 minutes using an infrared lamp (B).

CAUTION:
Do not overheat until plastic wrap is somewhat white.



5) Using a plastic spatula, remove traces of two-sided tape from body panel.
6) Remove masking tape and clean traces of two-sided tape using a cloth dampened with white gasoline.
7) Similarly, clean traces of adhesive from two-sided tape on side protector.

CAUTION:
Make sure side protector is clean and free of adhesive remover. Clean if necessary.



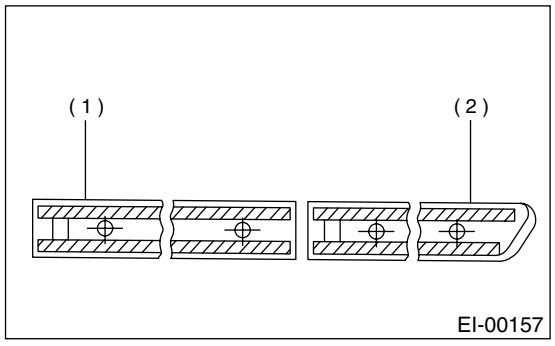
B: INSTALLATION

1) Apply primer to original side protector (if used), and attach two-sided tape to side protectors as shown.

Two-sided tape:
Thickness; 1.2 mm (0.047 in)
Width; 5 mm (0.20 in)

Recommended primer:
SUMITOMO 3MK-500 or equivalent

Recommended two-sided tape:
SUMITOMO 3M4210 or equivalent



(1) Front door part
(2) Rear door part

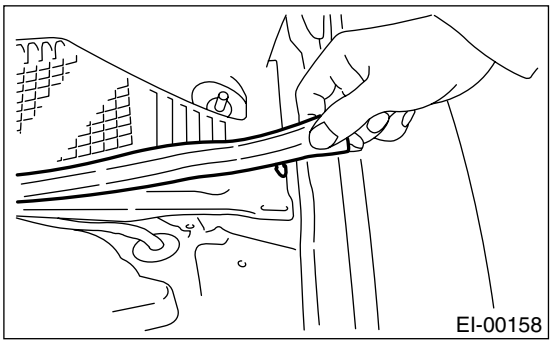
2) Using an infrared lamp, heat body panel to 40 to 60°C (104 to 140°F) and rear surface of side protector to 20 to 30°C (68 to 86°F).
3) Remove tack paper from two-sided paper. While aligning clips with holes in body panel, attach two-sided tape to side protector and body panel with a force of more than 49 N (5 kgf, 11 lb) with roller. Do not allow air to enter mating surface of the two.

CAUTION:
• To maintain adhesive power, do not wash the vehicle for 24 hours after tape application.
• Push clip in securely using hands.
(To prevent deformation, do not use excessive force.)

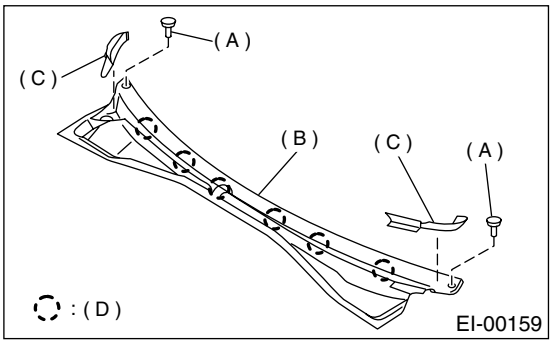
9. Cowl Panel

A: REMOVAL

1) Open hood.
2) Remove wiper arm. <Ref. to WW-11, REMOVAL, Front Wiper Arm.>
3) Remove front panel seal.



4) Remove clips (A) and cowl side panel (C). Loosen clips (D) on six positions, and remove cowl side panel (B).



B: INSTALLATION

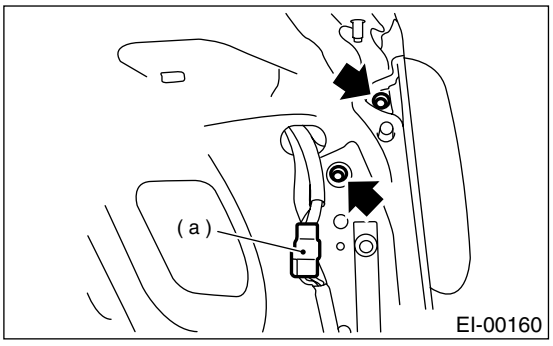
Install in the reverse order of removal.

10.Spoiler

A: REMOVAL

1) Open trunk lid.
2) Remove electrical connector (a) of high-mounted stop light.
3) Remove mounting nut of rear spoiler to remove rear spoiler.

CAUTION:
• When removing nut, do not drop it into trunk lid.
• Pay attention to avoid damage during removal or installation.



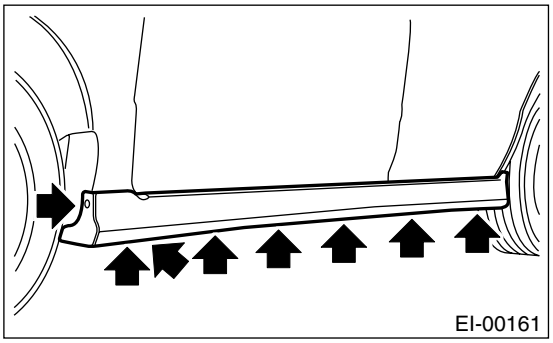
B: INSTALLATION

1) Install in the reverse order of removal.
2) Clean mounting surfaces of trunk lid and spoiler before installation.

11.Side Sill Spoiler

A: REMOVAL

Remove clips (1 on front, 6 on lower, 1 on side), remove side spoiler.



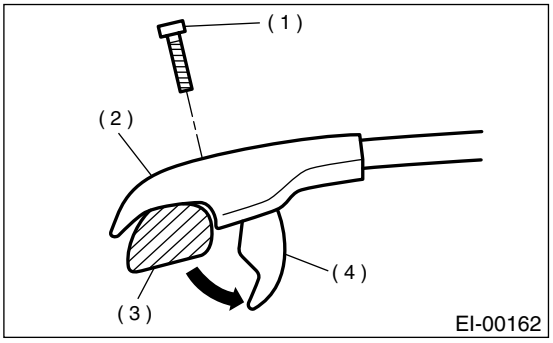
B: INSTALLATION

Install in the reverse order of removal.

12.Crossbar

A: REMOVAL

1) Remove TORX® bolt T30 from each cross end support.
2) Rotate lower clamp of each end support about 90 degrees downward to remove crossbar.



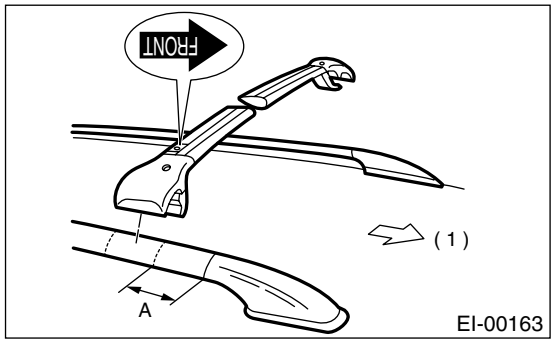
(1) TORX® bolt T30
(2) End support
(3) Roof rail
(4) Lower clamp

CAUTION:
Do not damage roof panel during removal or installation.

B: INSTALLATION

1) Rotate lower clamp of each end support about 90 degrees downward.
2) Set crossbar so that front direction arrow on the right top face of crossbar points in the direction of vehicle front, and place crossbar end support at position 152.4 mm (6.00 in) back from joint of front roof rail support and roof rail.

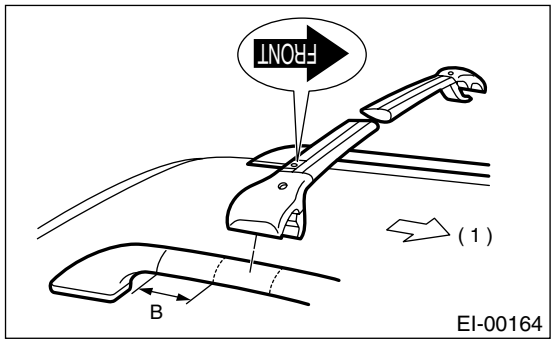
Length A:
152.4 mm (6.00 in)



(1) Front of vehicle

3) Set crossbar so that front direction arrow on the right top face of crossbar points in the direction of vehicle front, and place crossbar end support at position 152.4 mm (6.00 in) back from joint of rear roof rail support and roof rail.

Length B:
152.4 mm (6.00 in)



(1) Front of vehicle

4) Tighten end support and lower clamp using TORX® bolt T30.

13.Trailer Hitch

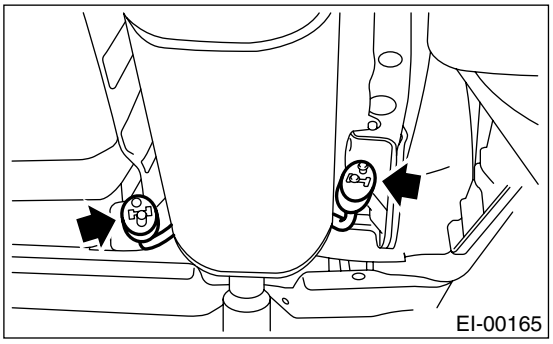
A: REMOVAL

CAUTION:
Because trailer hitch is heavy, two people are required to remove it.

1) Lift-up the vehicle.
2) Remove rubber cushion from body.

NOTE:
If rubber cushion is hard to remove, apply SUBARU CRC.

SUBARU CRC (Part No. 004301003)

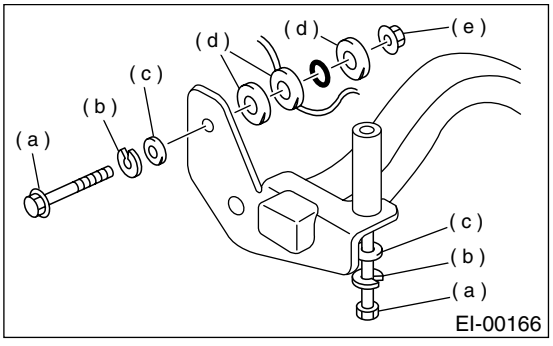


3) Remove strap (a).
4) Remove bolts. Remove trailer hitch while lowering muffler.

B: INSTALLATION

CAUTION:
Because trailer hitch is heavy, two people are required to remove it.

1) Install in the reverse order of removal.
2) For installation method of bolt, see the figure.



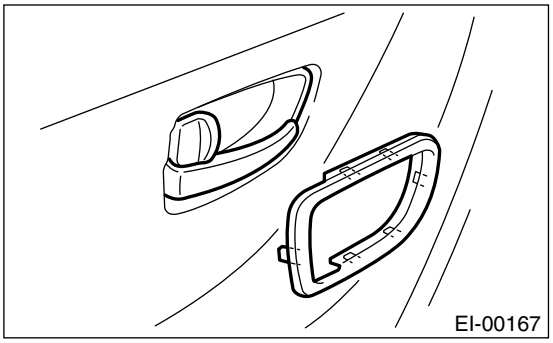
(a) Bolt
(b) Spring washer
(c) Flat washer
(d) Plate
(e) Nut

14.Front Door Trim

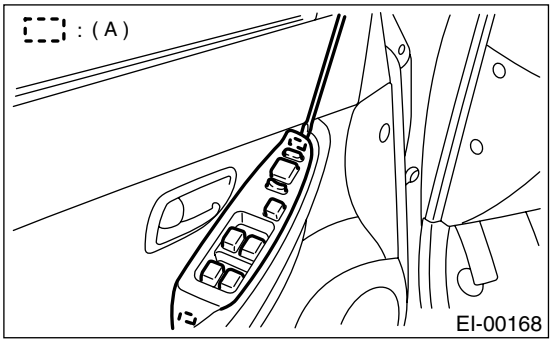
A: REMOVAL

CAUTION:
Do not apply excessive force to clip. Otherwise the clip may be broken.

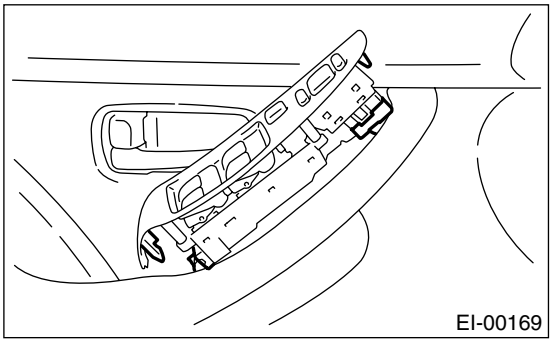
1) Pull up inner remote cover toward you to remove upper hook. Pull down it to remove lower claw. Remove inner remote cover.



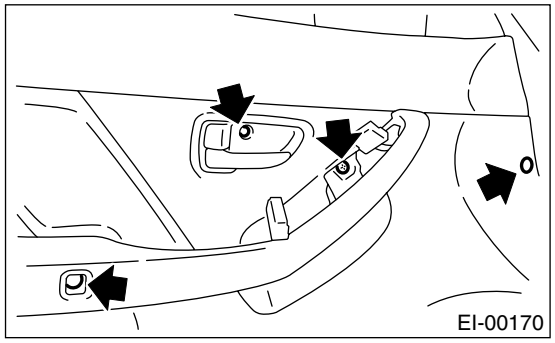
2) Remove two hook (A) of switch panel to remove power window main switch.



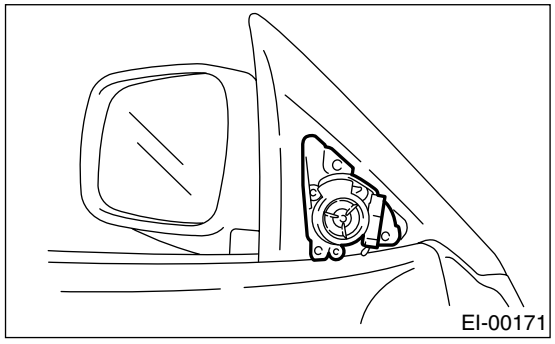
3) Disconnect electrical connectors from power window main switch and mirror switch.



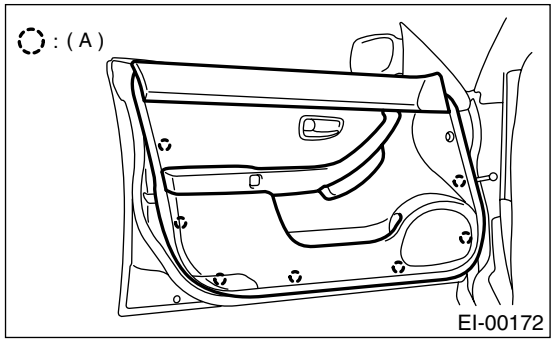
4) Remove three screws and clips.



5) Remove gusset cover. Disconnect electrical connectors to remove speaker.



6) Remove seven clips (A) of trim panel using clip remover to remove trim panel.



B: INSTALLATION

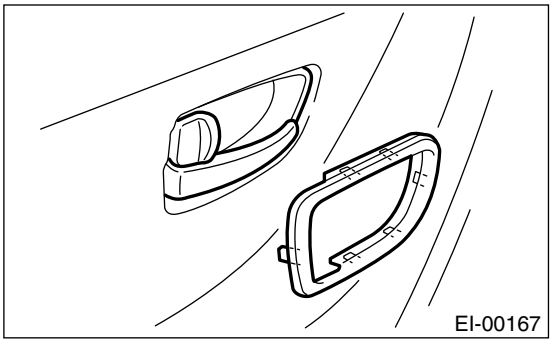
Install in the reverse order of removal.

15.Rear Door Trim

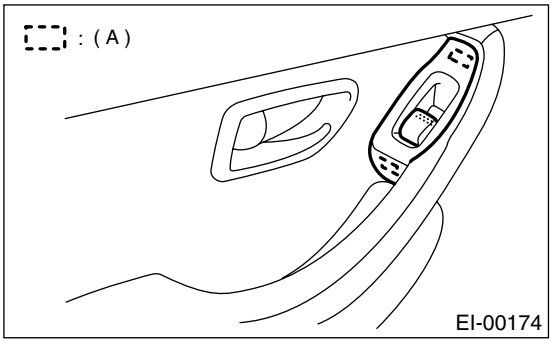
A: REMOVAL

CAUTION:
Do not apply excessive force to clip. Otherwise the clip may be broken.

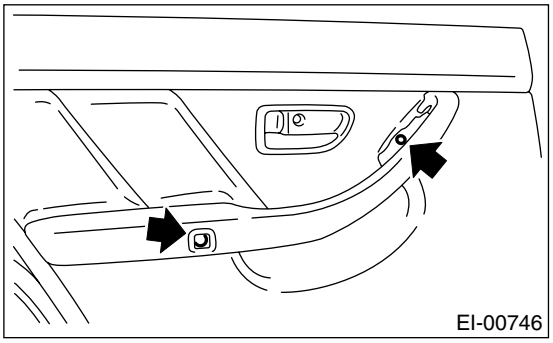
1) Pull up inner remote cover toward you to remove upper hook. Pull down it to remove lower claw. Remove inner remote cover.



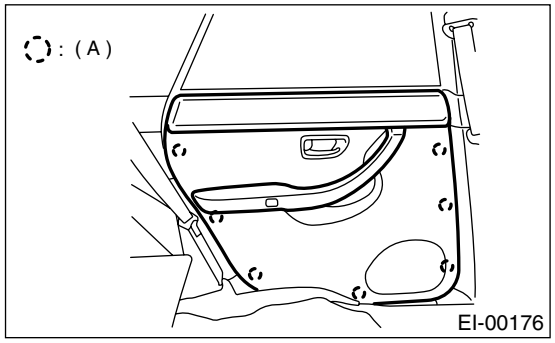
2) Remove two hook (A) of switch panel to remove power window sub switch and disconnect electrical connector.



3) Remove two screws and clips.



4) Remove seven clips (A) of trim panel using clip remover to remove trim panel.



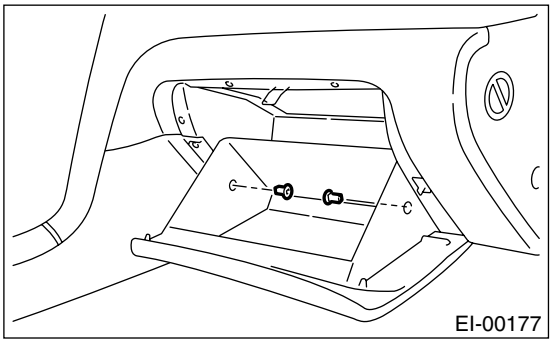
B: INSTALLATION

Install in the reverse order of removal.

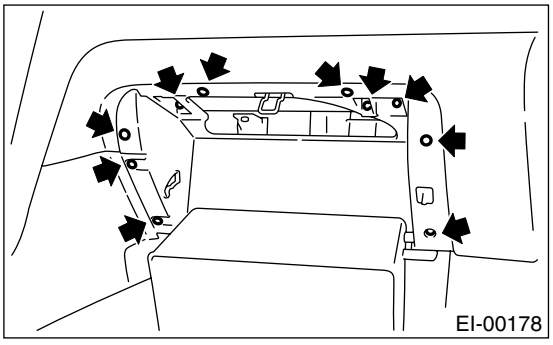
16.Glove Box

A: REMOVAL

1) Remove stoppers.



2) Removal screws to remove glove box.



B: INSTALLATION

Install in the reverse order of removal.

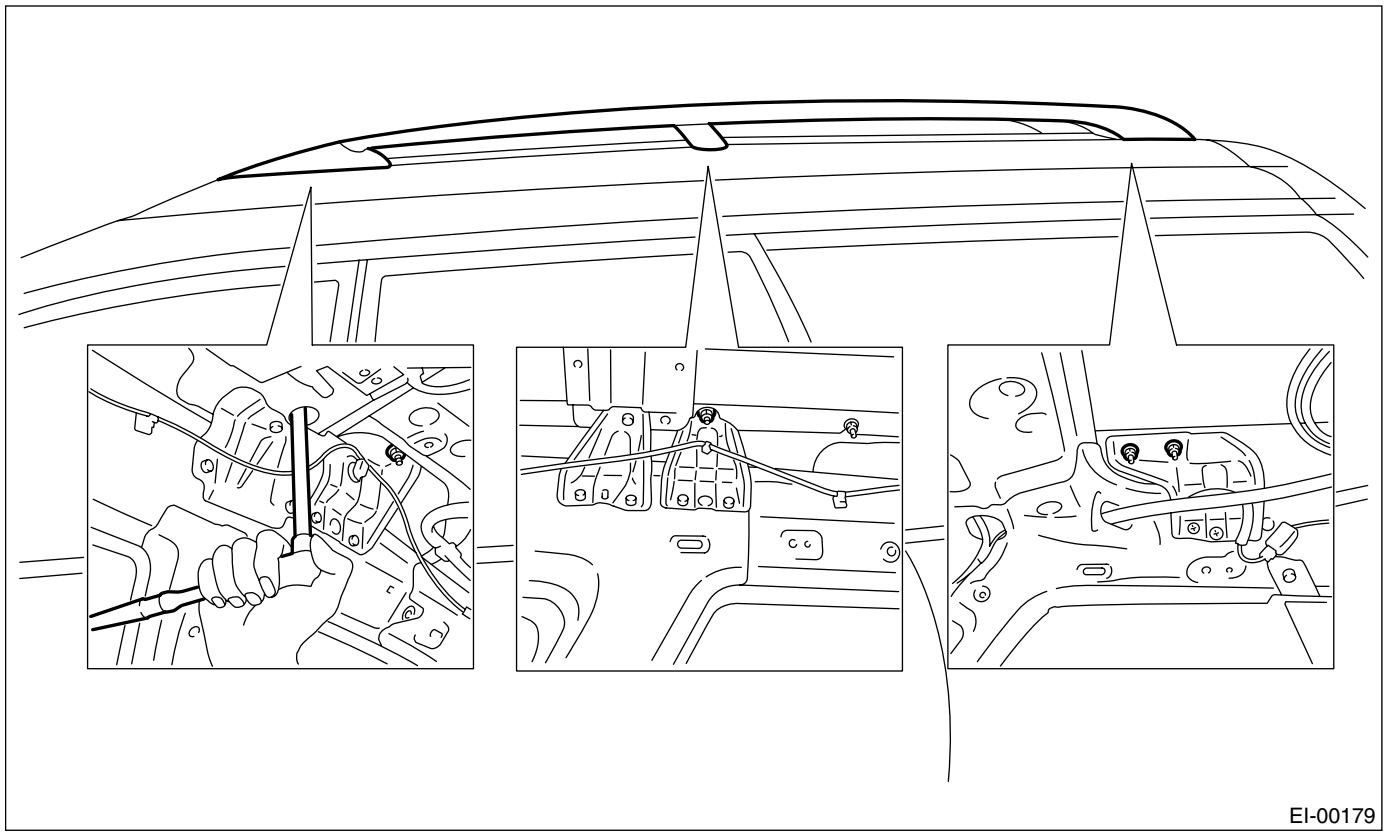
17.Roof Rail

A: REMOVAL

CAUTION:
When removing roof rail, use great care not to damage body panel by stud bolt.

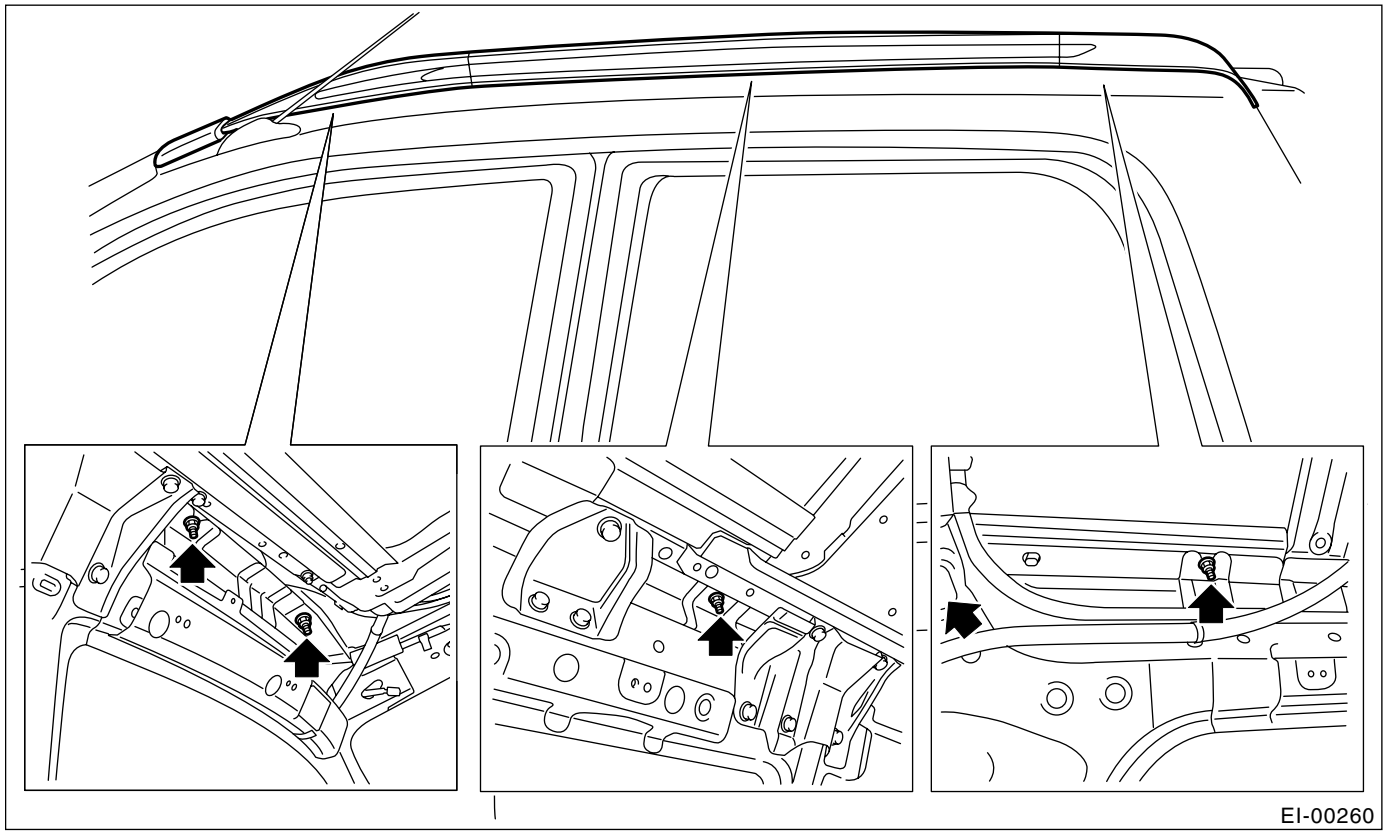
1. WAGON

1) Remove roof trim. <Ref. to EI-54, REMOVAL, Roof Trim.>
2) Remove five mounting nuts and then detach roof rail carefully.



2. PICKUP

1) Remove cargo bed upper molding. <Ref. to EI-66, REMOVAL, Cargo Bed Upper Molding.>
2) Remove roof trim. <Ref. to EI-56, PICKUP, REMOVAL, Roof Trim.>
3) Remove five nuts and roof rail.
4) Remove roof molding.



B: INSTALLATION

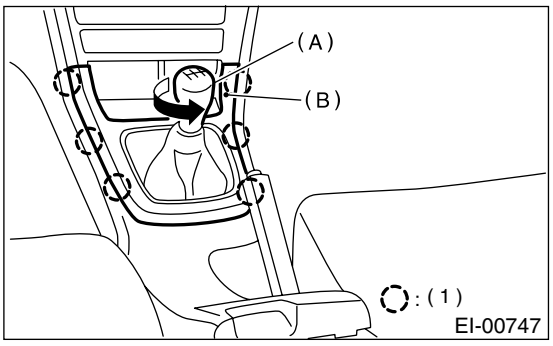
Install in the reverse order of removal.

CAUTION:
Be careful not to scratch body panels with roof rail stud bolts when installing them.

18.Console Box

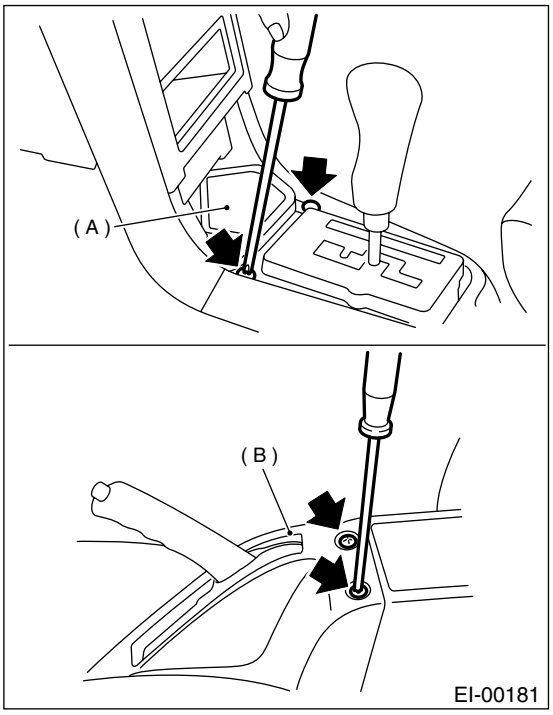
A: REMOVAL

1) Remove shift knob (A) (MT model) and front cover (B).

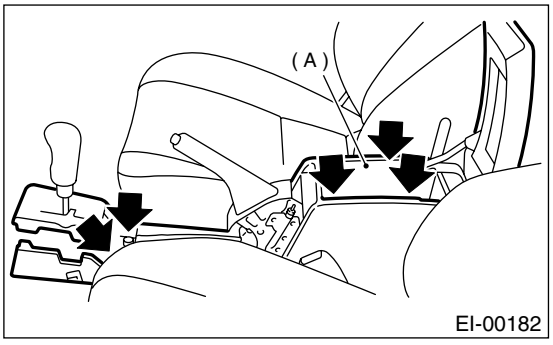


(1) Hook pawl

2) Remove tray (A) and console cover (B).



3) Remove console box (A).



B: INSTALLATION

Install in the reverse order of removal.

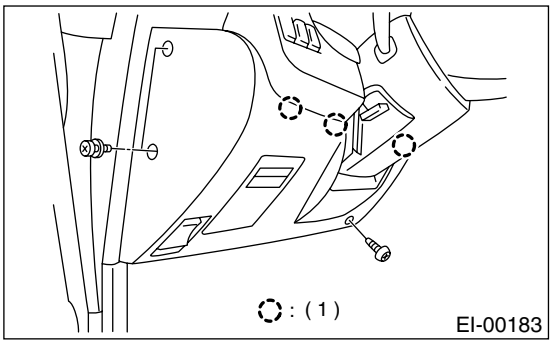
19.Instrument Panel Assembly

A: REMOVAL

Airbag system wiring harness is routed near the combination meter.

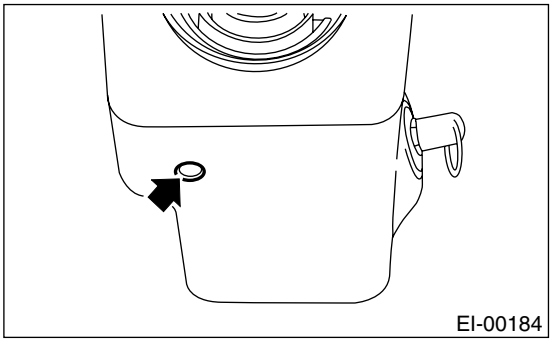
WARNING:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system harness when servicing the instrument panel.

1) Disconnect ground cable from battery.
2) Remove lower cover.



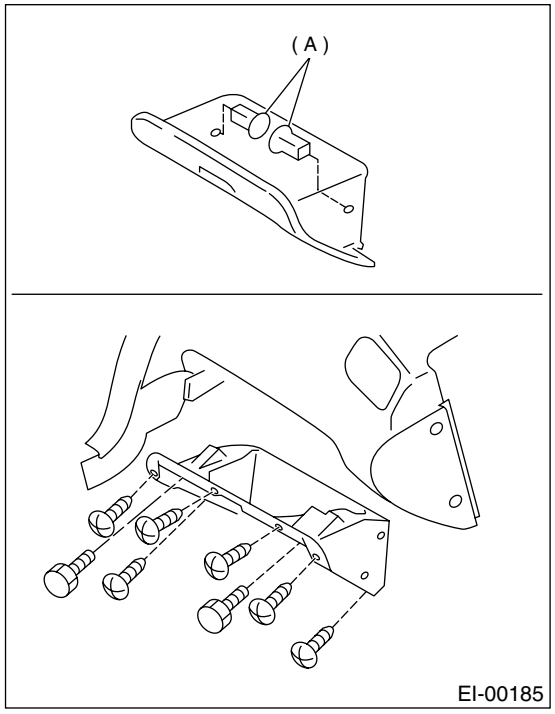
(1) Hook pawl

3) Remove lower column cover and disconnect harness connectors to steering column.

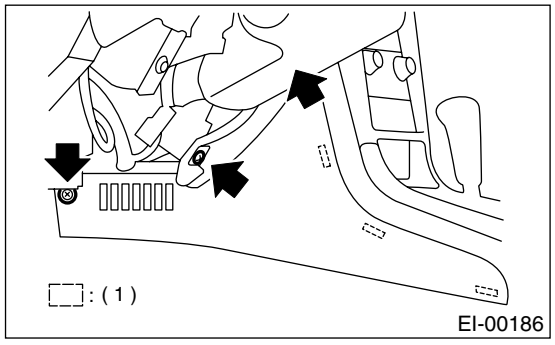


4) Remove steering column assembly (with steering wheel). <Ref. to PS-21, REMOVAL, Tilt Steering Column.>

5) Remove stopper (A) then remove glove box.

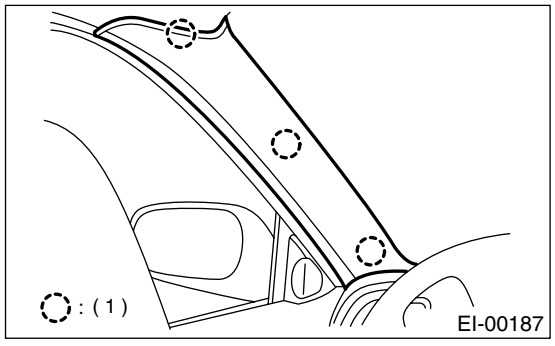


6) Remove side panel of both sides.



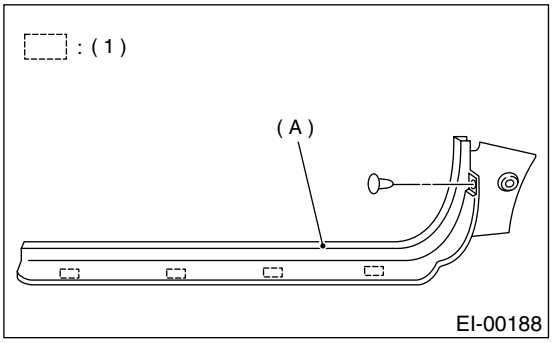
(1) Hook pawl

7) Remove passenger's airbag module. <Ref. to AB-14, REMOVAL, Passenger's Airbag Module.>
8) Remove console box. <Ref. to EI-45, REMOVAL, Console Box.>
9) Remove front pillar upper trim of both sides.



(1) Hook pawl

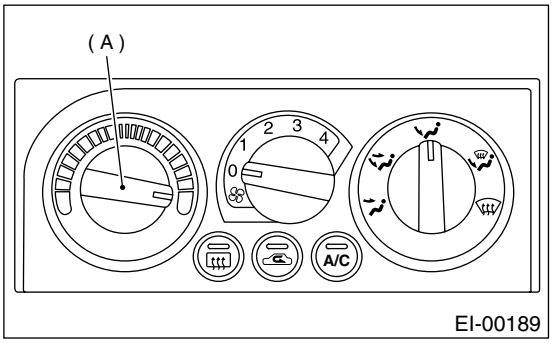
10) Remove front pillar lower trim (A) of passenger side.



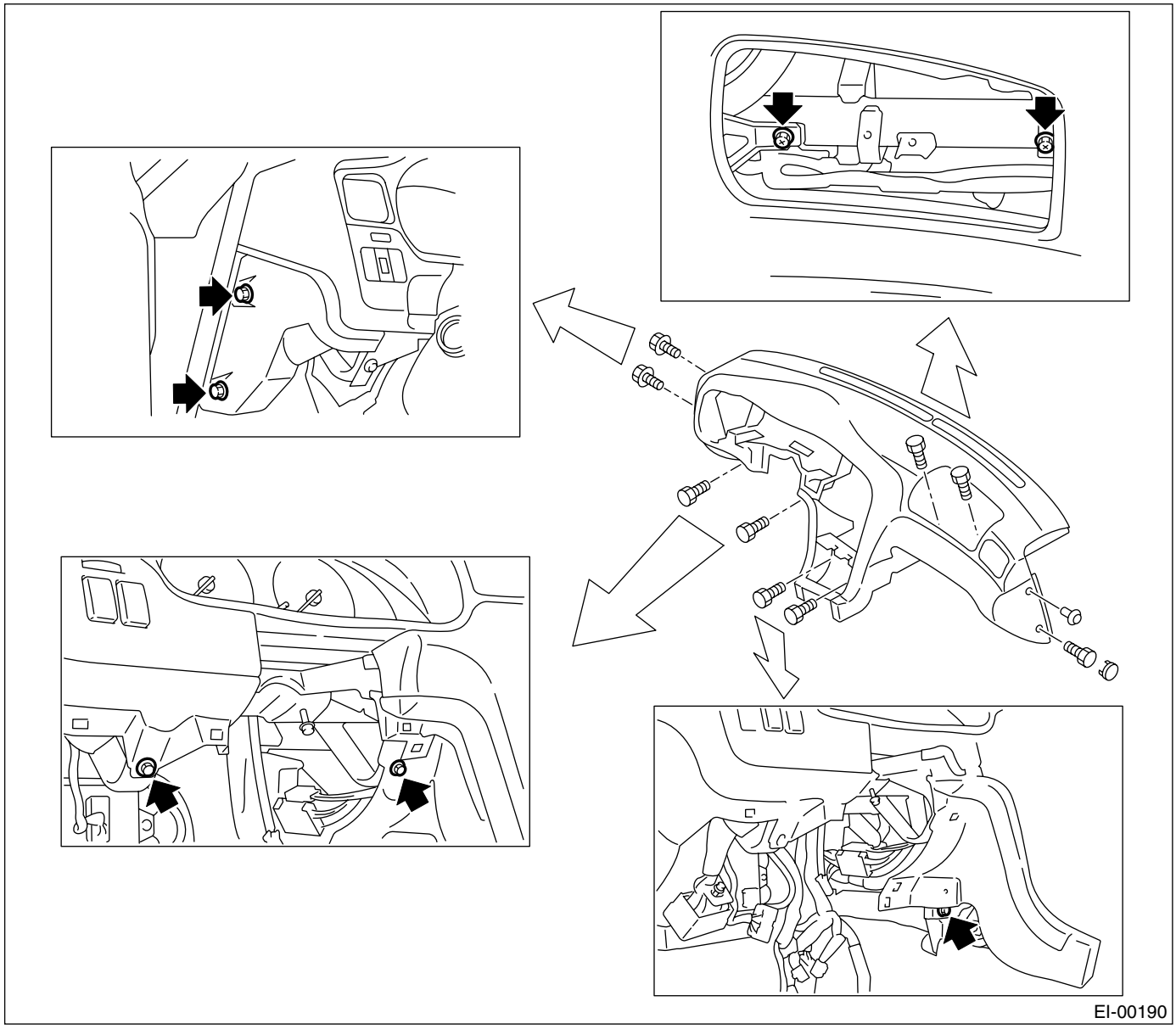
(1) Hook pawl

11) Set temperature control switch (A) to “FULL HOT” and then disconnect temperature control cable from bottom of heater unit. (Manual A/C equipped model)

NOTE:
Do not move the switch and link when installing.



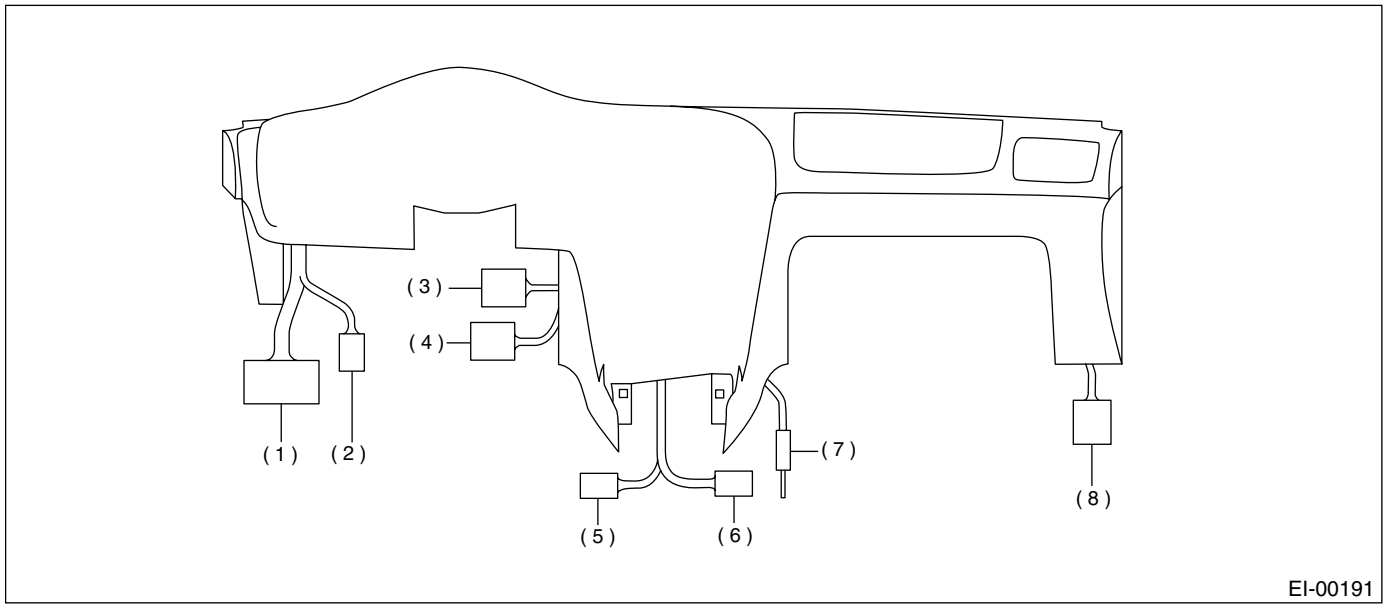
12) Remove instrument panel mounting bolts.



13) Disconnect harness connectors and remove instrument panel ASSY carefully.

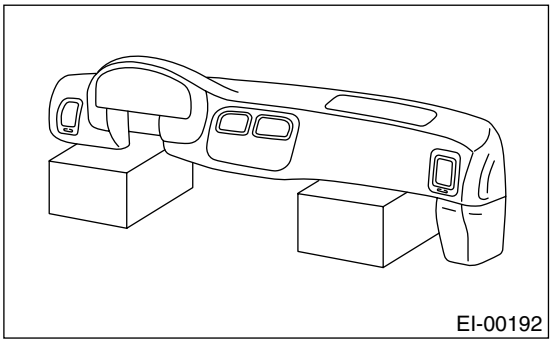
CAUTION:
Do not pull the harness when disconnecting the connector.

NOTE:
If necessary, make matching marks for easy reassembly.



(1) SMJ/White
(2) 2P/Blue
(3) 10P/White
(4) 8P/White
(5) 1P/Black
(6) 1P/Black
(7) Antenna feeder
(8) 16P/Blue

CAUTION:
• Take care not to scratch the instrument panel and related parts.
• When storing the removed instrument panel, place it standing up on the floor.

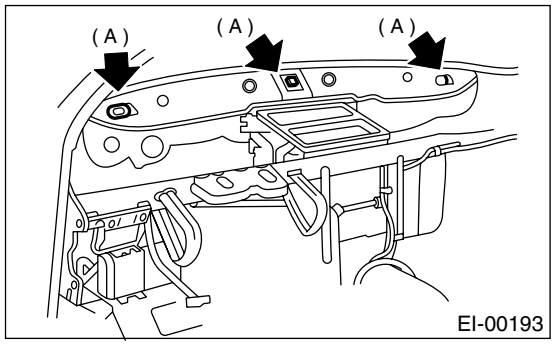


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
• Be careful not to snag the harness.
• Make sure to connect harness connector.
• Take care not to scratch the instrument panel and related parts.

NOTE:
When setting the instrument panel into position, push the three hooks into grommet (A) on the body panel.

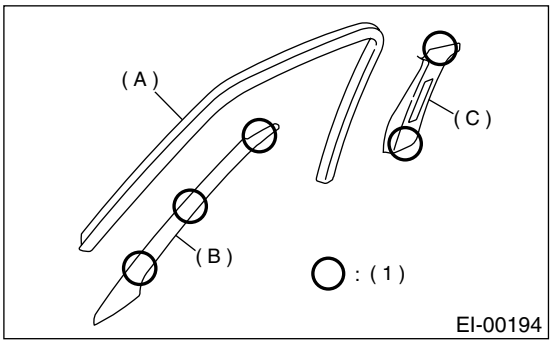


Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EI-13, INSTRUMENT PANEL, COMPONENT, General Description.>

20.Upper Inner Trim

A: REMOVAL

1) Remove front mole (A).
2) Remove front pillar upper trim (B).
3) Detach front seat belt shoulder anchor, then remove center pillar upper trim (C).



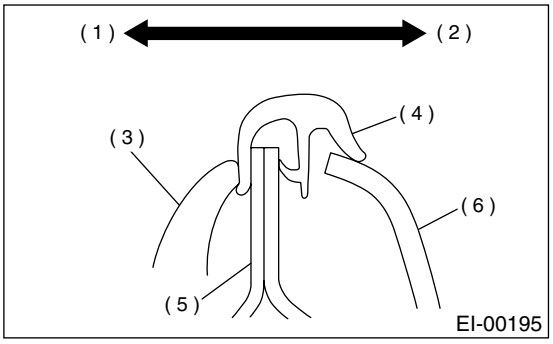
(1) Hook pawl

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:
When installing center pillar upper trim and front pillar upper trim, be sure to set front mole as shown in figure.

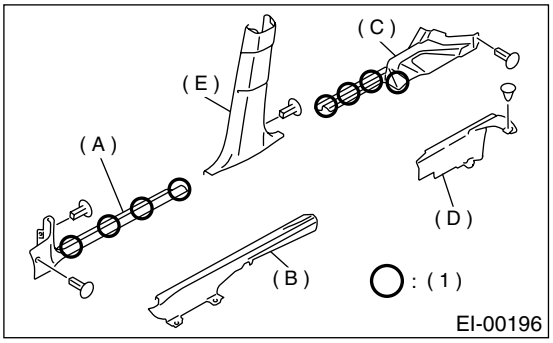


(1) Outside
(2) Inside
(3) Weatherstrip
(4) Mole
(5) Body
(6) Trim

21.Lower Inner Trim

A: REMOVAL

1) Remove front pillar lower trim (A).
2) Remove side sill front lower cover (B).
3) For sedan: Remove rear seat cushion <Ref. to SE-18, SEDAN, REMOVAL, Rear Seat.>, then remove side sill rear upper cover (C).
For wagon: Rise rear seat cushion, then remove side sill rear upper cover (C).
4) Remove side sill rear lower cover (D).
5) Remove center pillar lower trim (E).



(1) Hook pawl

B: INSTALLATION

Install in the reverse order of removal.

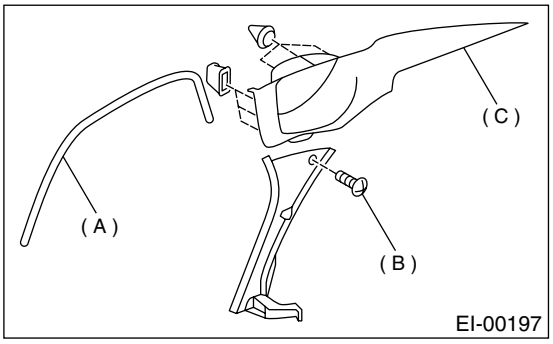
CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

22.Rear Quarter Trim

A: REMOVAL

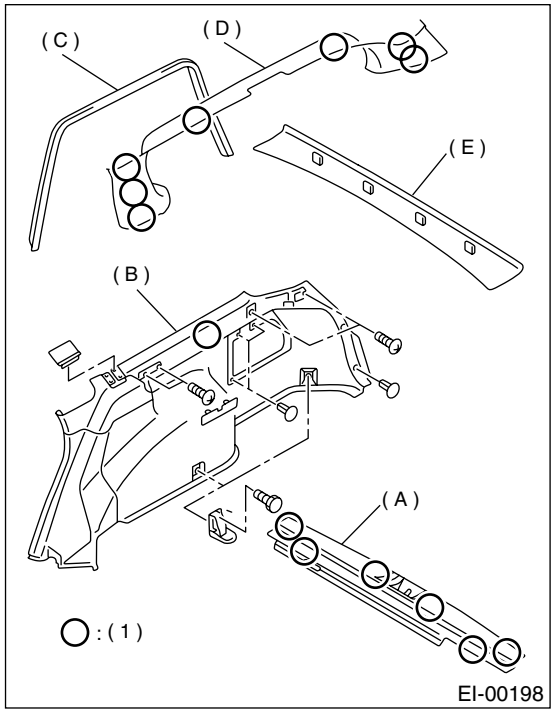
1. SEDAN

1) Remove rear mole (A).
2) Remove rear shelf trim. <Ref. to EI-58, REMOVAL, Rear Shelf Trim.>
3) Remove side sill rear upper cover. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
4) Remove rear pillar lower trim (B).
5) Remove rear pillar upper trim (C).



2. WAGON

1) Remove side sill rear upper cover. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
2) Remove luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
3) Remove rear skirt trim (A).
4) Remove rear quarter lower trim mounting volts, screws and clips, then remove the trim (B).
5) Remove rear mole (C).
6) Remove rear quarter upper trim mounting screw, then remove the trim (D).
7) Remove rear rail trim (E).



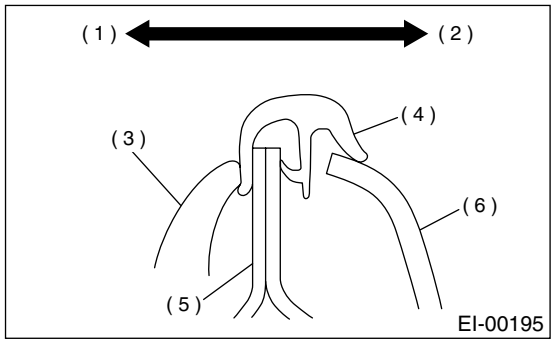
(1) Hook pawl

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:
When installing rear quarter upper trim, be sure to set rear mole as shown in the figure.

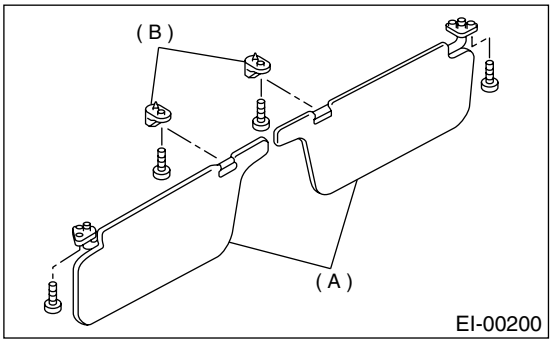


(1) Outside
(2) Inside
(3) Weatherstrip
(4) Mole
(5) Body
(6) Trim

23.Sun Visor

A: REMOVAL

Remove mounting screws then detach sun visor (A) and hook (B).



B: INSTALLATION

Install in the reverse order of removal.

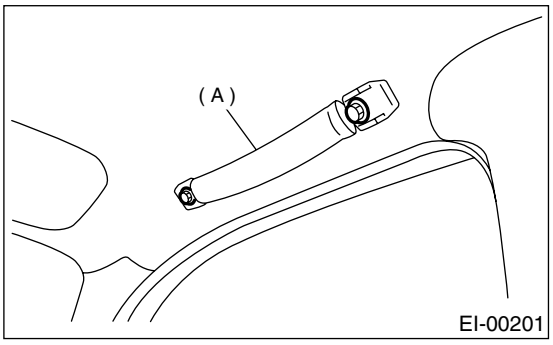
24.Roof Trim

A: REMOVAL

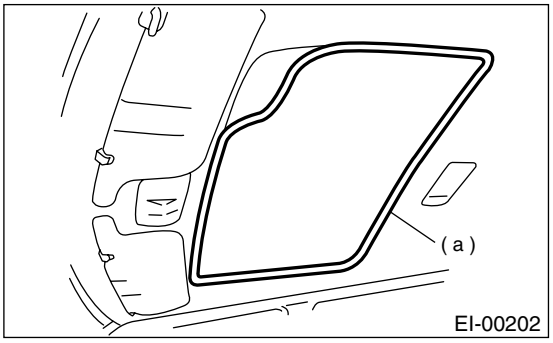
CAUTION:
When removing clip, use great care not to damage the roof trim.

1. SEDAN

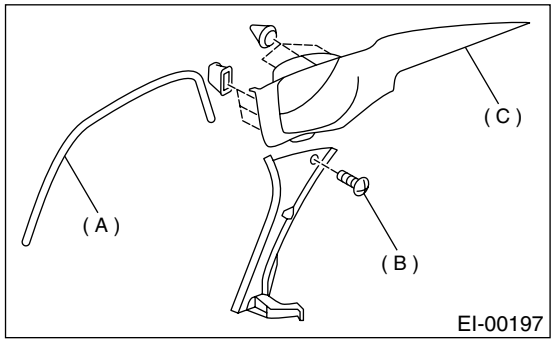
1) Disconnect ground cable from battery.
2) Remove sunroof switch. (Sunroof equipped model) <Ref. to SR-16, REMOVAL, Sunroof Switch.>
3) Remove room light. <Ref. to LI-29, REMOVAL, Room Light.>
4) Remove sun visor and hook of both sides. <Ref. to EI-53, REMOVAL, Sun Visor.>
5) Remove assist grips (A).



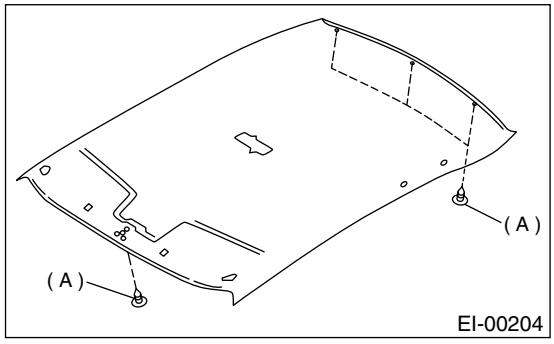
6) Remove sunroof garnish (A).



7) Remove upper inner trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>
8) Remove rear window mole (A) of both sides.
9) Remove screw (B) of rear quarter lower trim shown in the figure.
10) Remove rear quarter upper trim (C) of both sides.

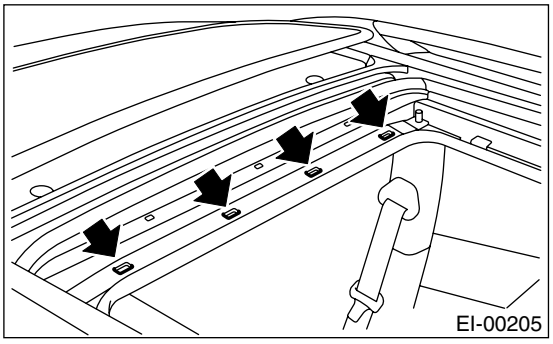


11) Remove clips, and then remove roof trim.

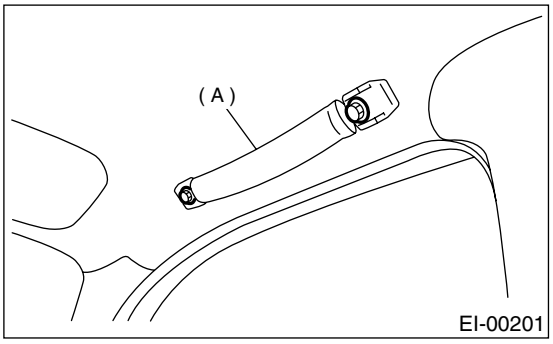


2. WAGON

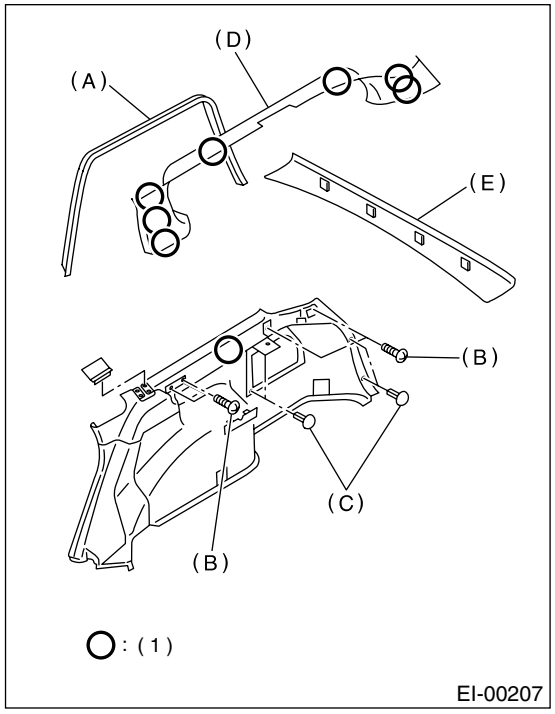
1) Open the rear sunroof, and then remove four clips. (Sunroof equipped model)



2) Disconnect ground cable from battery.
3) Remove sunroof switch. (Sunroof equipped model) <Ref. to SR-16, REMOVAL, Sunroof Switch.>
4) Remove room light and luggage room light. <Ref. to LI-29, REMOVAL, Room Light.> and <Ref. to LI-30, REMOVAL, Luggage Room Light.>
5) Remove sun visor and hook of both sides. <Ref. to EI-53, REMOVAL, Sun Visor.>
6) Remove assist grips (A).

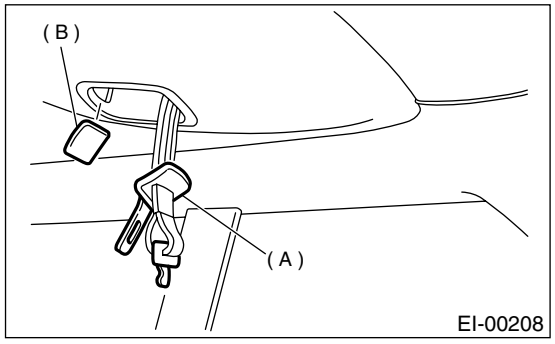


7) Remove upper inner trim. <Ref. to EI-50, REMOVAL, Upper Inner Trim.>
8) Remove rear window mole of both sides (A).
9) Remove screws (B) and clips (C) of rear quarter lower trim shown in the figure.
10) Remove rear quarter upper trim (D) of both sides.
11) Remove rear rail trim (E).

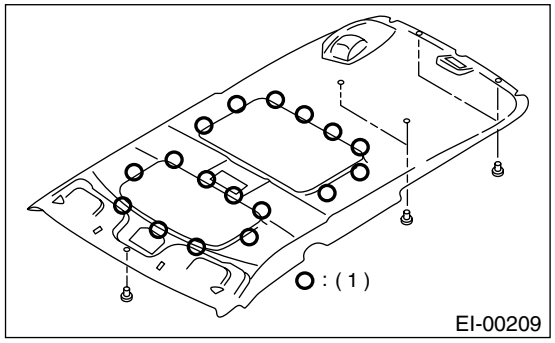


(1) Hook pawl

12) Remove cover (B) while detaching snap lock carefully. Put the rear center seat belt tongue (A) out to the other side of the trim through the hole.



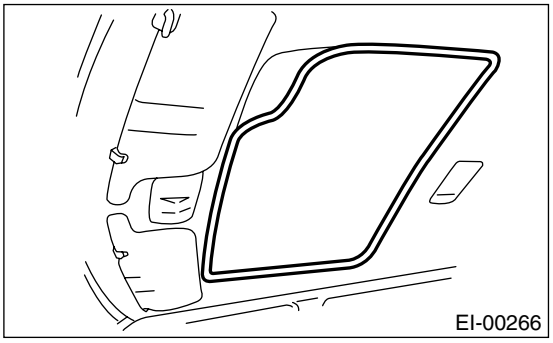
13) Remove clips and then remove roof trim.



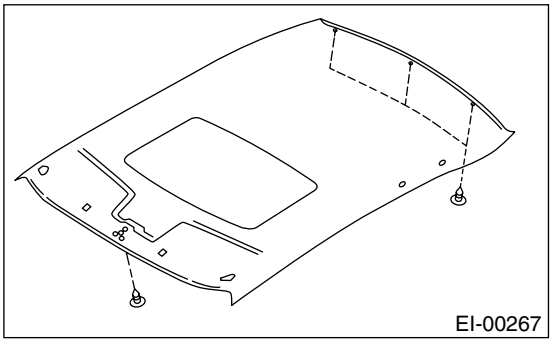
(1) Snap lock

3. PICKUP

1) Disconnect ground cable from battery.
2) Remove sunroof switch. <Ref. to SR-16, REMOVAL, Sunroof Switch.>
3) Remove room light. <Ref. to LI-29, REMOVAL, Room Light.>
4) Remove sun visor and hook. <Ref. to EI-53, REMOVAL, Sun Visor.>
5) Remove assist grip.
6) Remove sunroof garnish.


EI-00266

7) Remove rear pillar upper trim. <Ref. to EI-69, PICKUP, REMOVAL, Rear Pillar Trim.>
8) Remove clip and roof trim.


EI-00267

B: INSTALLATION

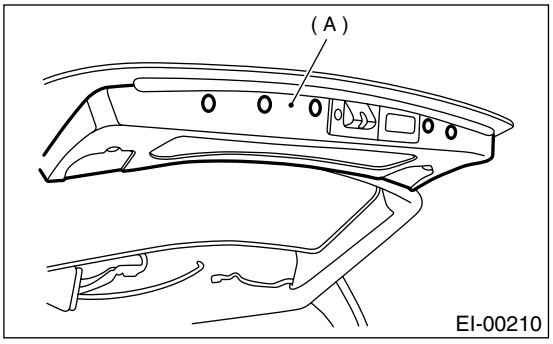
Install in the reverse order of removal.

25.Rear Gate Trim

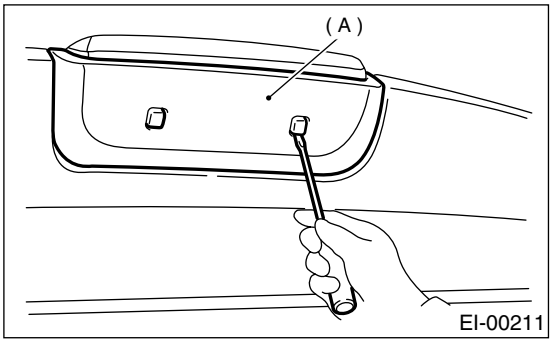
A: REMOVAL

CAUTION:
Be careful not to damage clips or their holes.

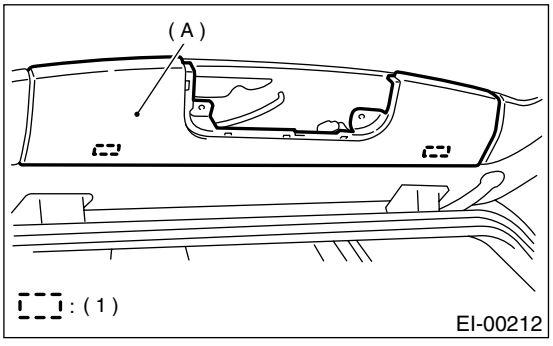
1) Remove clips and detach rear gate lower trim (A).



2) Remove caps and screws, and then detach high-mounted stop light cover (A).



3) Remove rear gate upper trim (A).



(1) Hook pawl

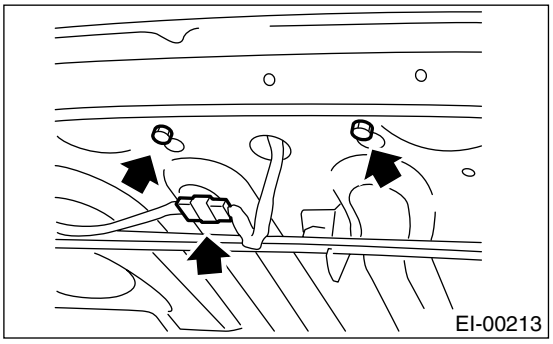
B: INSTALLATION

Install in the reverse order of removal.

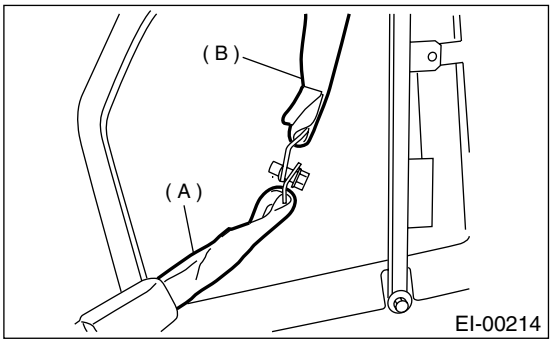
26.Rear Shelf Trim

A: REMOVAL

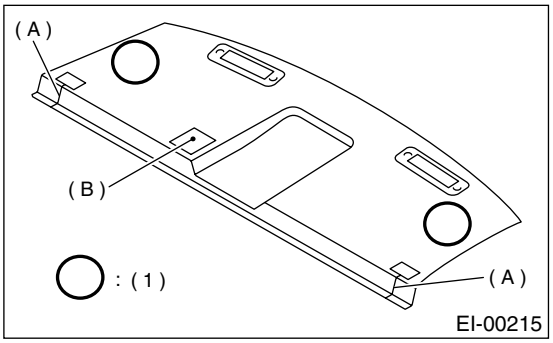
1) Remove high-mounted stop light.



2) Remove rear seat backrest. <Ref. to SE-18, REMOVAL, Rear Seat.>
3) Remove inner seat belt RH, then disconnect inner seat belt RH (A) and outer seat belt center (B).



4) Detach rear shelf trim through each rear outer seat belt from slits (A) and hole (B) of rear shelf trim.



(1) Clip

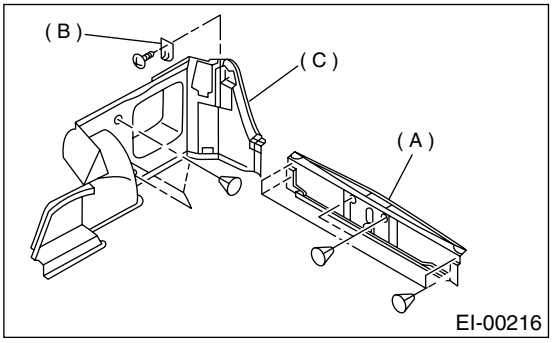
B: INSTALLATION

Install in the reverse order of removal.

27.Trunk Trim

A: REMOVAL

1) Remove clips, and then detach trunk rear trim (A).
2) Remove luggage hook (B) and clips, then detach trunk side trim (C).



B: INSTALLATION

Install in the reverse order of removal.

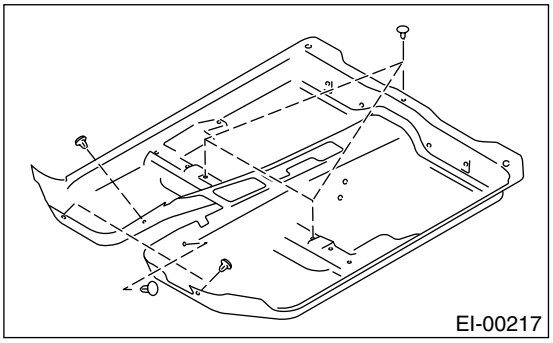
28.Floor Mat

A: REMOVAL

1) Remove front seats. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove rear seat cushion. <Ref. to SE-18, REMOVAL, Rear Seat.>
3) Remove console box. <Ref. to EI-45, Console Box.>
4) Remove front pillar lower trim, side sill rear upper cover and center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
5) Remove clips from floor mat.

NOTE:
When pulling out edge, do not pull mat alone; pull mat together with edge. Ply off two steel clips on side sill front cover and one on side sill rear cover using screwdriver.

6) Remove mat hook.
7) Remove mat from toe board area.
8) Remove mat from rear heater duct.
9) Roll mat, and then take it out of opened rear door.


EI-00217

B: INSTALLATION

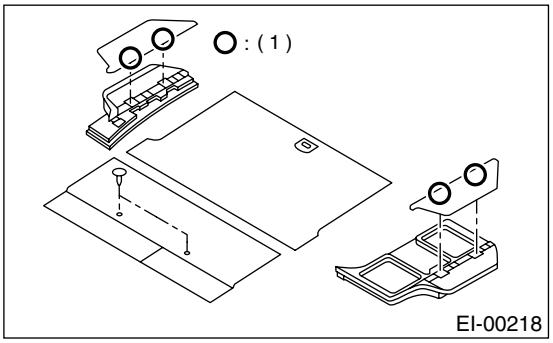
Install in the reverse order of removal.

NOTE:
- Secure mat firmly with hook and Velcro tape.
- Insert mat edge firmly into the groove of side sill cover.

29.Luggage Floor Mat

A: REMOVAL

Remove clips, then detach rear floor mats and boxes.



(1) Clips

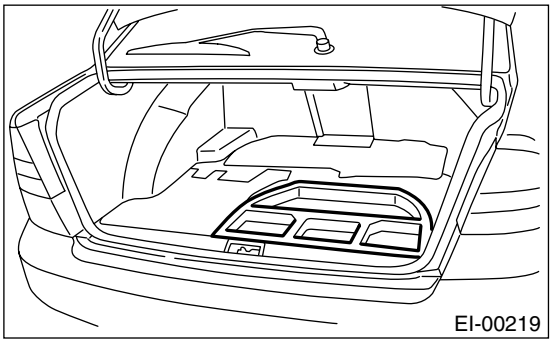
B: INSTALLATION

Install in the reverse order of removal.

30.Trunk Room Mat

A: REMOVAL

Draw out trunk room mat.



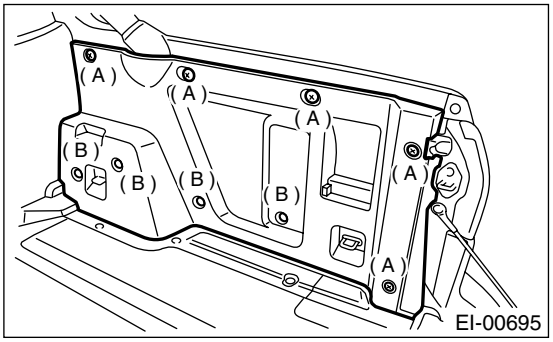
B: INSTALLATION

Install in the reverse order of removal.

31.Cargo Bed Side Tray

A: REMOVAL

1) Open tail gate.
2) Remove bolt using TORX® bit T30. Remove clip.



(A) Bolt
(B) Clip

B: INSTALLATION

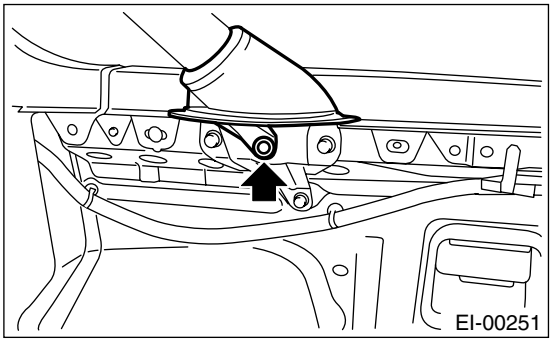
Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

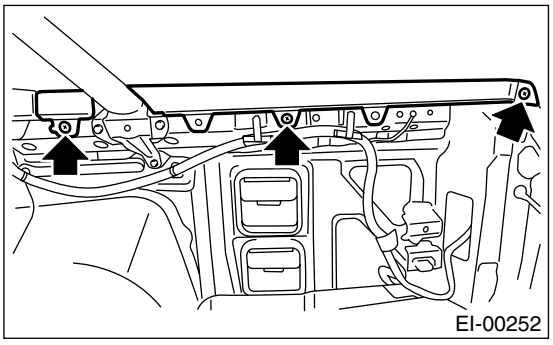
32.Cargo Bed Side Molding

A: REMOVAL

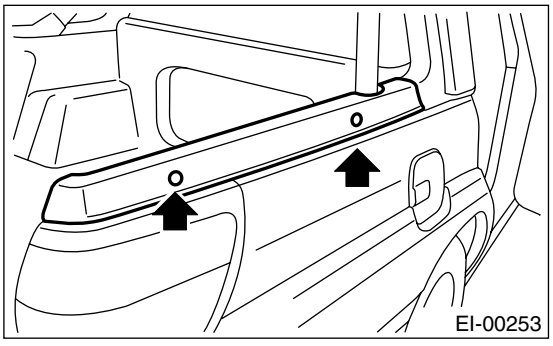
1) Remove cargo bed side tray. <Ref. to EI-63, REMOVAL, Cargo Bed Side Tray.>
2) Using TORX® bit T25, remove bolt to remove luggage pipe lower cover.



3) Remove bolt using TORX® bit T25.



4) Remove clip and cargo bed side molding.



B: INSTALLATION

Install in the reverse order of removal.

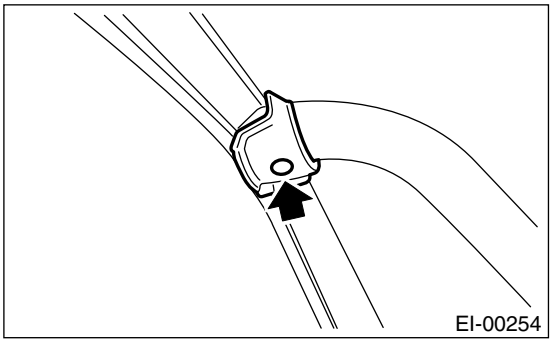
NOTE:
Do not reuse the removed clips; use new ones.

Tightening torque:
Cargo bed side molding;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Luggage pipe lower cover;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side tray;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

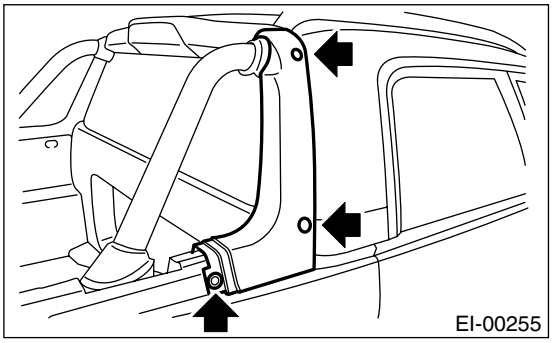
33.Cargo Bed C Pillar Molding

A: REMOVAL

1) Remove cargo bed side tray. <Ref. to EI-63, REMOVAL, Cargo Bed Side Tray.>
2) Remove cargo bed side molding. <Ref. to EI-64, REMOVAL, Cargo Bed Side Molding.>
3) Remove clip and luggage pipe upper cover.



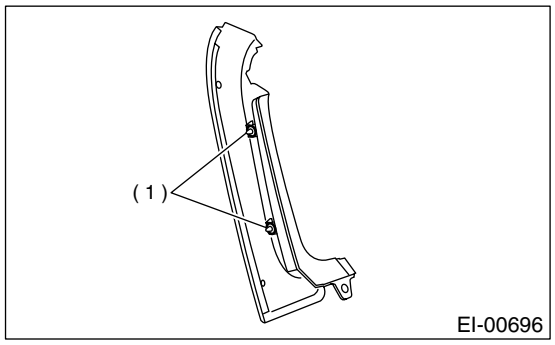
4) Remove clip and cargo bed C pillar molding.



NOTE:
Do not reuse the removed clips; use new ones.

B: INSTALLATION

1) Replace all clips on the reverse of cargo bed C pillar molding with new ones.



(1) Clip

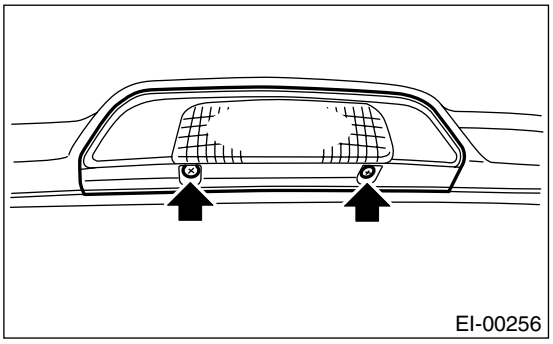
2) Install in the reverse order of removal.

Tightening torque:
Cargo bed side molding;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side tray;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

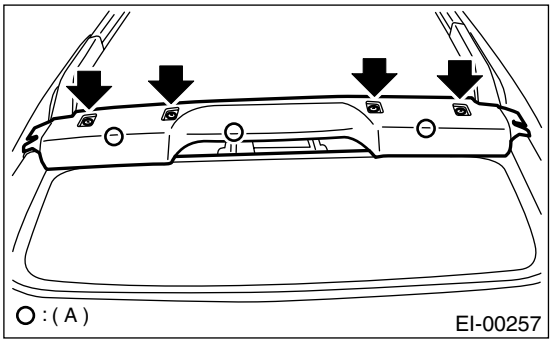
34.Cargo Bed Upper Molding

A: REMOVAL

1) Remove cargo bed side tray. <Ref. to EI-63, REMOVAL, Cargo Bed Side Tray.>
2) Remove cargo bed side molding. <Ref. to EI-64, REMOVAL, Cargo Bed Side Molding.>
3) Remove cargo bed C pillar molding. <Ref. to EI-65, REMOVAL, Cargo Bed C Pillar Molding.>
4) Remove high-mounted stop light.


EI-00256

5) Remove cap and bolt using TORX® bit T25.



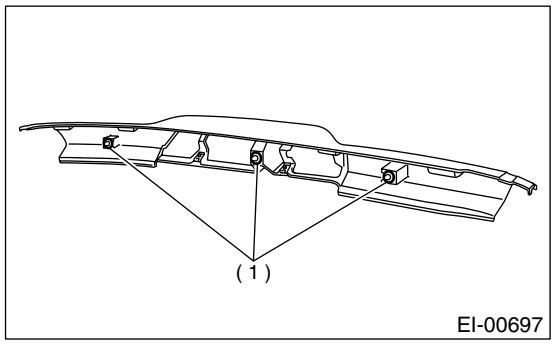
EI-00257

(A) Clip

NOTE:
Do not reuse the removed clips; use new ones.

B: INSTALLATION

1) Replace all clips on the reverse of cargo bed upper molding with new ones.



EI-00697

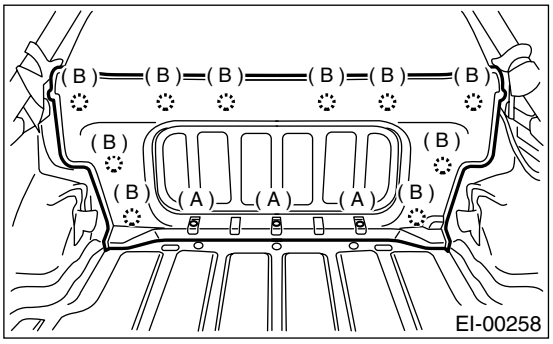
2) Install in the reverse order of removal.

Tightening torque:
Cargo bed upper molding;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side molding;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side tray;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

35.Back Panel Tray

A: REMOVAL

1) Remove cargo bed side tray. <Ref. to EI-63, REMOVAL, Cargo Bed Side Tray.>
2) Remove cargo bed side molding. <Ref. to EI-64, REMOVAL, Cargo Bed Side Molding.>
3) Remove cargo bed C pillar molding. <Ref. to EI-65, REMOVAL, Cargo Bed C Pillar Molding.>
4) Remove screw and back panel tray.

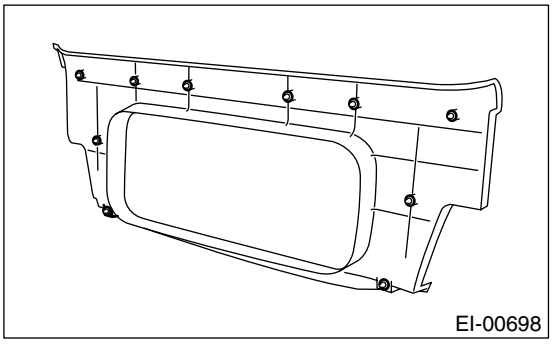


(A) Screw
(B) Clip

NOTE:
Do not reuse the removed clips; use new ones.

B: INSTALLATION

1) Replace all clips on the reverse of back panel tray with new ones.



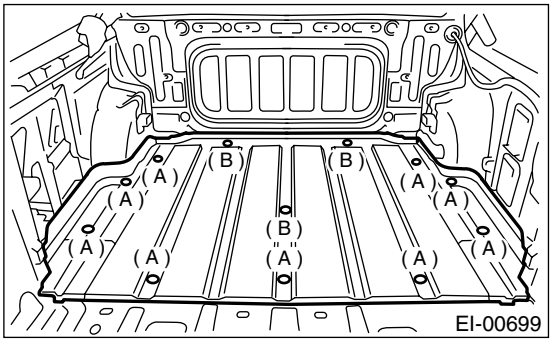
2) Install in the reverse order of removal.

Tightening torque:
Cargo bed side molding;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side tray;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

36.Cargo Bed Floor Tray

A: REMOVAL

1) Remove cargo bed side tray. <Ref. to EI-63, REMOVAL, Cargo Bed Side Tray.>
2) Remove cargo bed side molding. <Ref. to EI-64, REMOVAL, Cargo Bed Side Molding.>
3) Remove cargo bed C pillar molding. <Ref. to EI-65, REMOVAL, Cargo Bed C Pillar Molding.>
4) Remove back panel tray. <Ref. to EI-67, REMOVAL, Back Panel Tray.>
5) Remove bolt using TORX® bit T25. Remove clip.



(A) Bolt
(B) Clip

B: INSTALLATION

Install in the reverse order of removal.

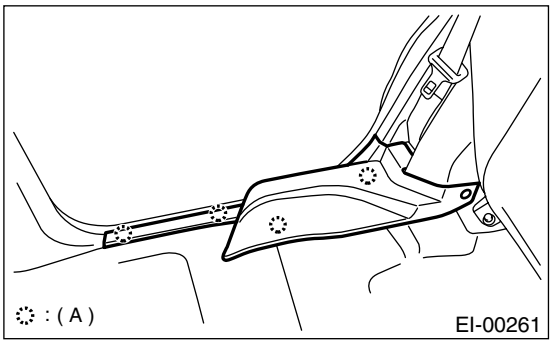
Tightening torque:
Cargo bed floor tray;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side molding;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)
Cargo bed side tray;
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

37.Rear Pillar Trim

A: REMOVAL

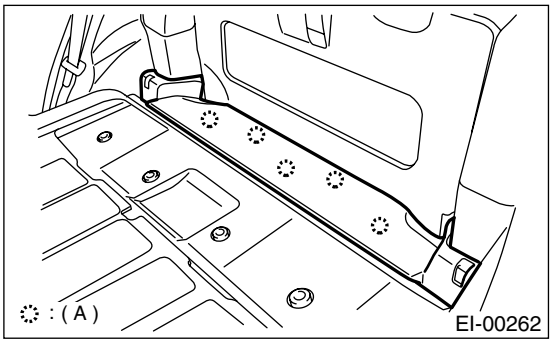
1. PICKUP

1) Remove side sill rear upper cover.



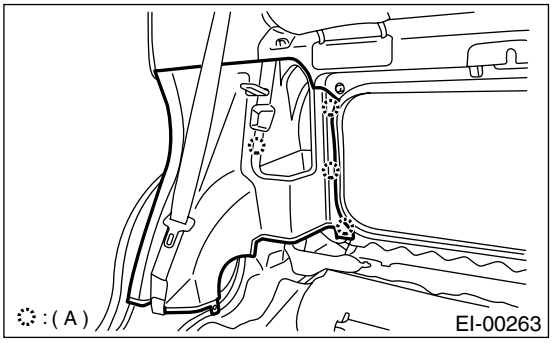
(A) Clip

2) Fold rear seat backrest.
3) Remove floor trim panel.



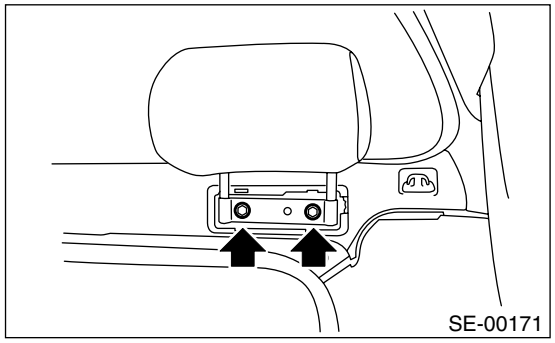
(A) Clip

4) Remove rear pillar lower trim.

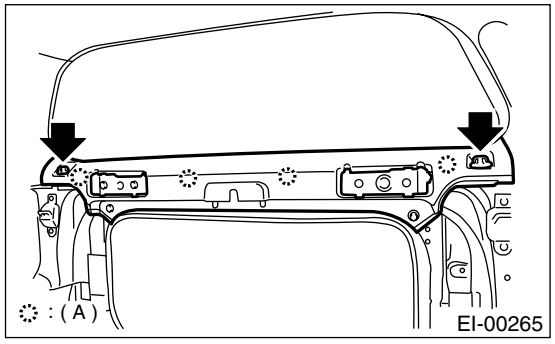


(A) Clip

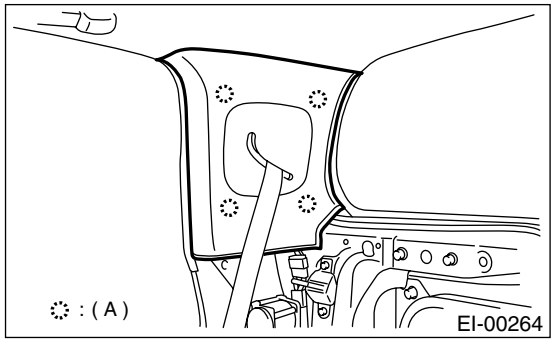
5) Remove rear seat pillow.



6) Remove cargo net hook and remove rear bulkhead trim.



7) Remove rear pillar upper trim.



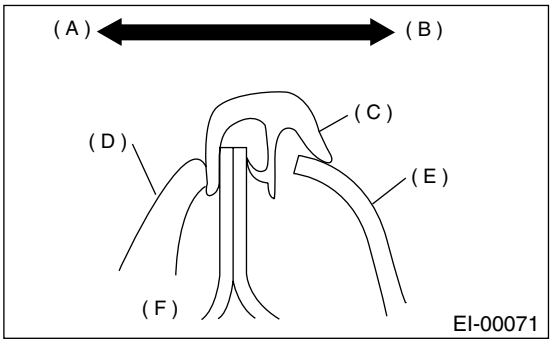
(A) Clip

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Make sure that trim panel claw is aligned with body flange.

NOTE:
When installing upper trim, make sure to install molding as shown in the figure.

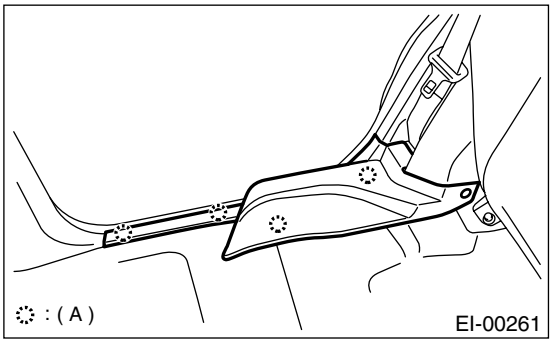


(A) Outside
(B) Inside
(C) Molding
(D) Weatherstrip
(E) Trim
(F) Body panel

38.Rear Bulkhead Trim

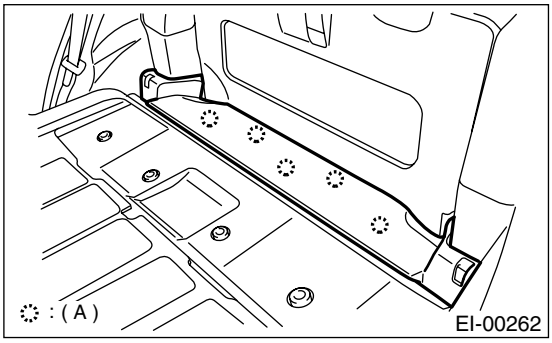
A: REMOVAL

1) Remove side sill rear upper cover.



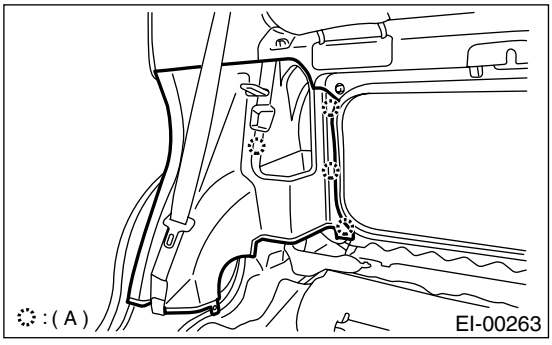
(A) Clip

2) Fold rear seat backrest.
3) Remove floor trim panel.



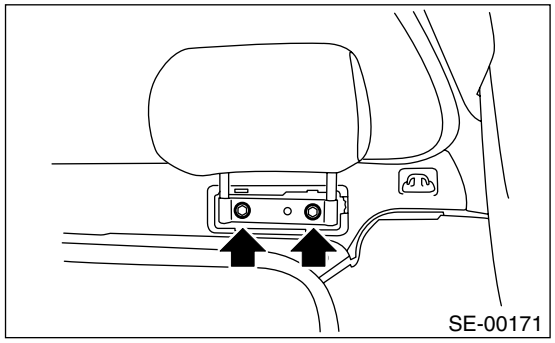
(A) Clip

4) Remove rear pillar lower trim.

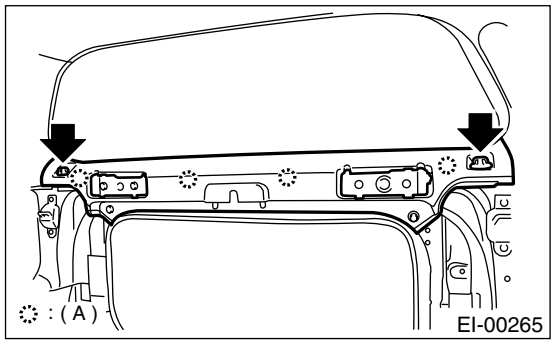


(A) Clip

5) Remove rear seat pillar.



6) Remove cargo net hook and rear bulkhead trim.



(A) Clip

B: INSTALLATION

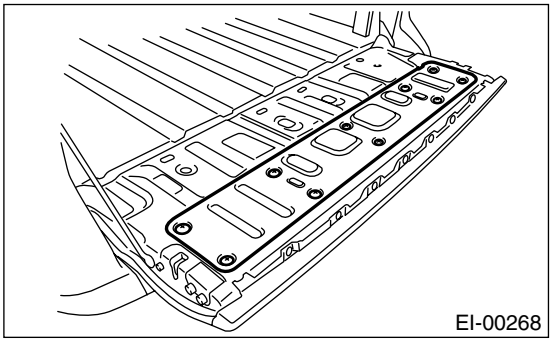
Install in the reverse order of removal.

CAUTION:
Make sure that trim panel claw is securely installed on body panel.

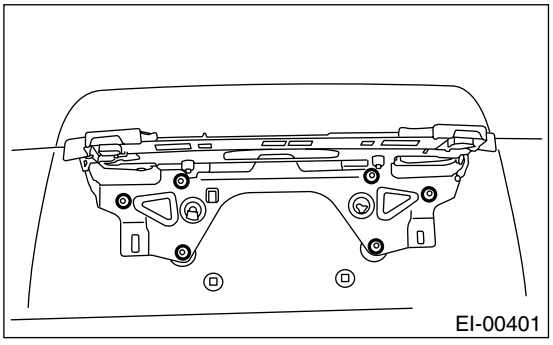
39.Tail Gate Garnish

A: REMOVAL

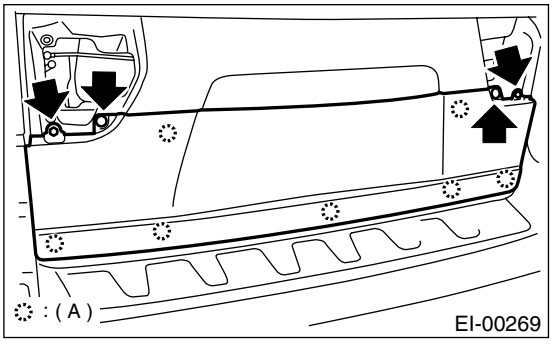
1) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
2) Remove tail gate cover.



3) Remove rear finisher light. <Ref. to LI-21, PICK-UP, REMOVAL, Rear Finisher Light Assembly.>
4) Remove license plate bracket using TORX® bit T25.



5) Remove clip and bolt and detach tail gate garnish.



(A) Clip

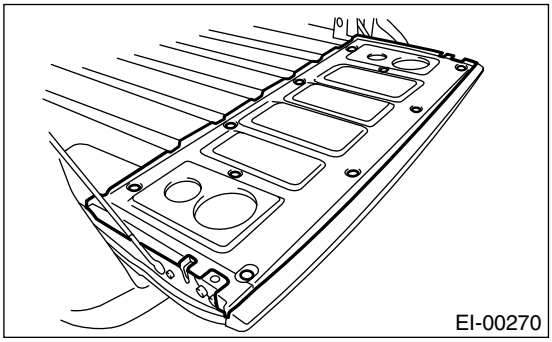
B: INSTALLATION

Install in the reverse order of removal.

40.Tail Gate Tray

A: REMOVAL

1) Open tail gate.
2) Remove bolt using TORX® bit T25.



B: INSTALLATION

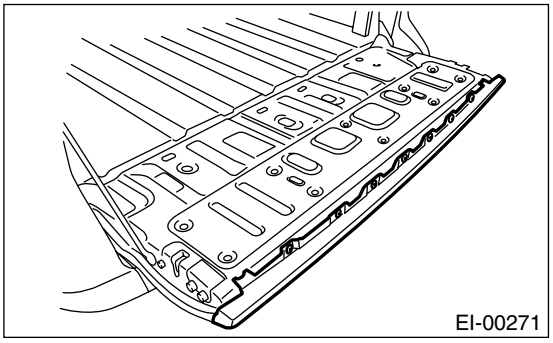
Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

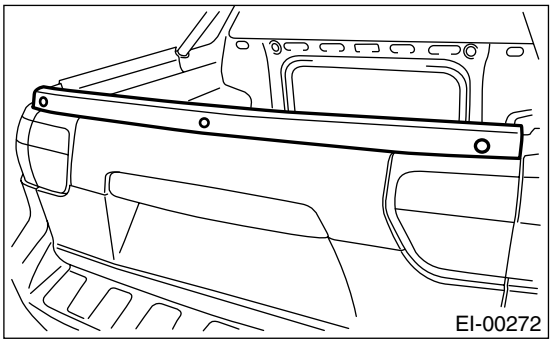
41.Tail Gate Molding

A: REMOVAL

1) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
2) Remove bolt using TORX® bit T25.



3) Remove clip and tail gate molding.



B: INSTALLATION

Install in the reverse order of removal.

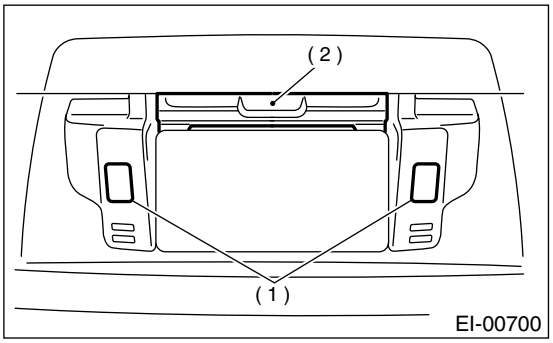
NOTE:
Do not reuse the removed clips; use new ones.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

42.License Plate Bracket

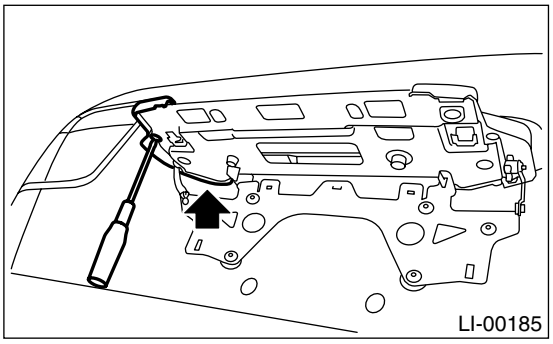
A: REMOVAL

1) Push release button to release the lock. Remove upper cover.

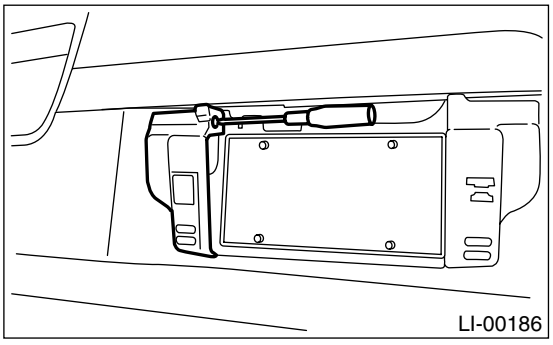


(1) Rease button
(2) Upper cover

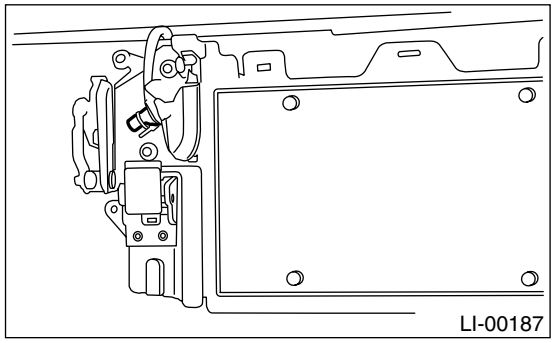
2) Lift up license plate bracket and remove bolts on the reverse



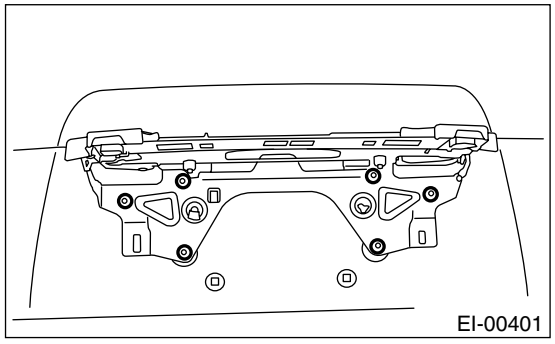
3) Return license plate bracket to its original position and remove bolts.



4) Remove side cover by turning socket.



5) Lift up license plate bracket. Remove bolts using TORX® bit T25.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

MEMO:

EXTERIOR BODY PANELS

EB

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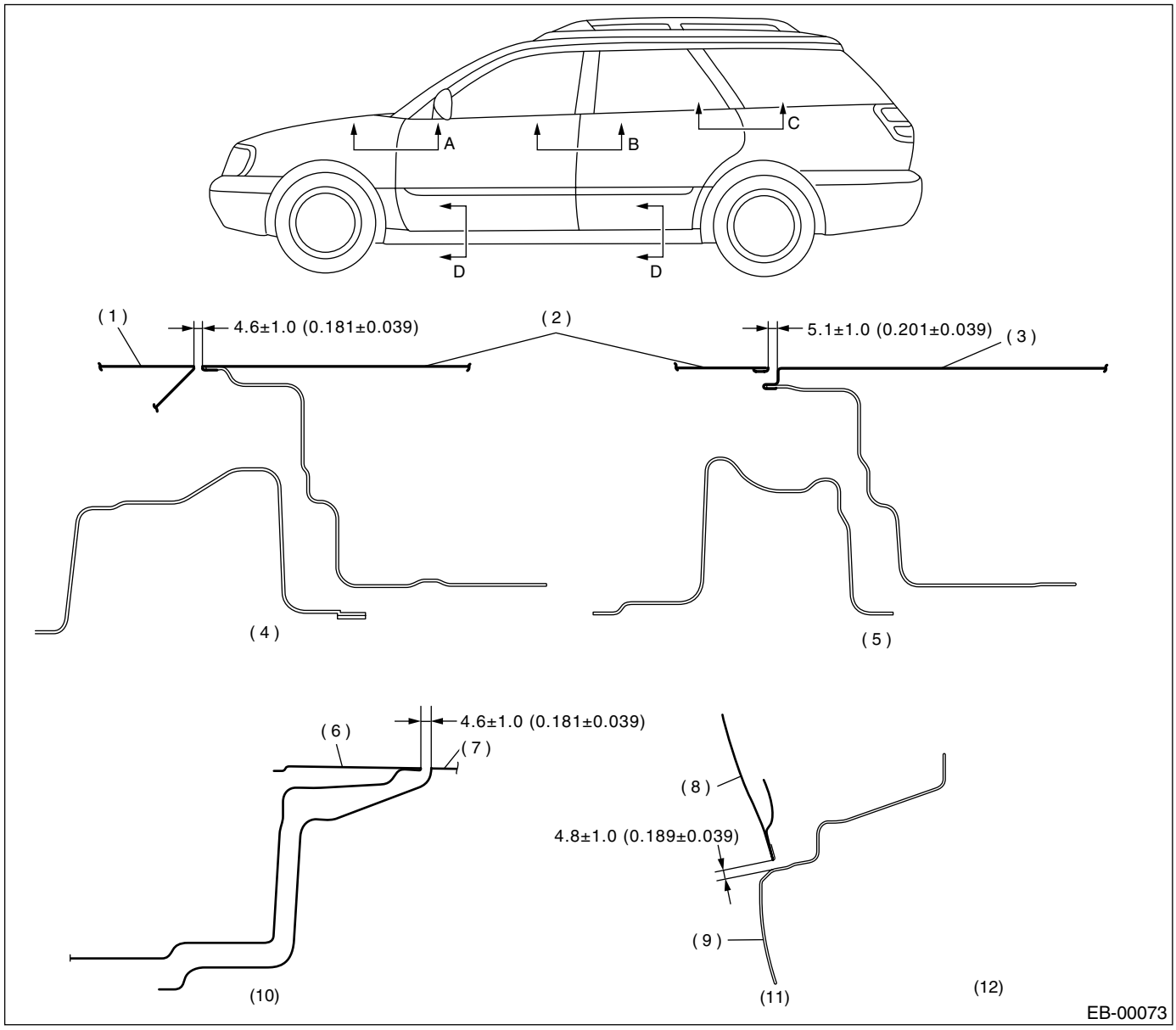
1. General Description

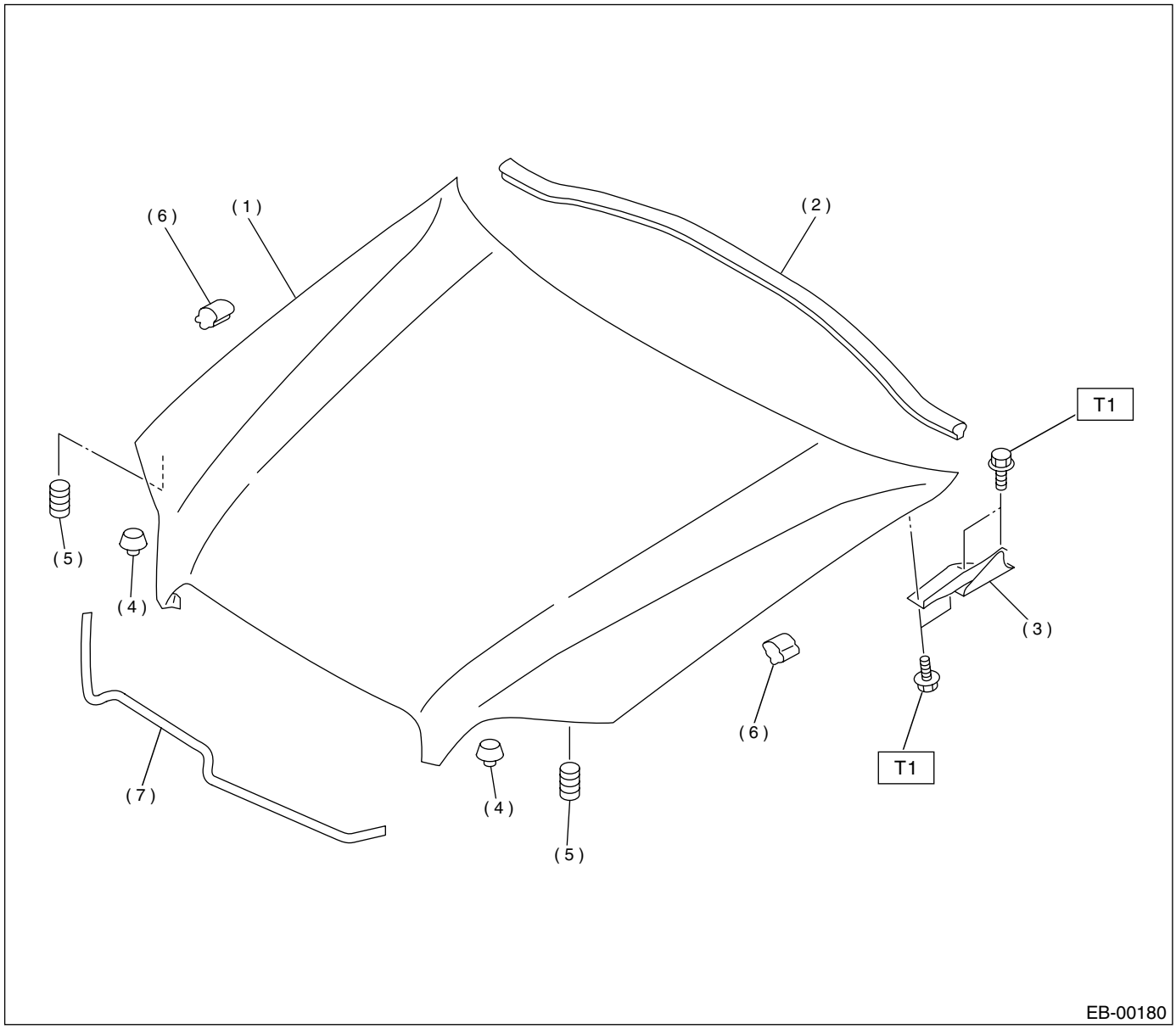
A: SPECIFICATIONS



(1) Front fender
(2) Front door outer
(3) Rear door outer
(4) Section A
(5) Section B
(6) Rear door outer
(7) Rear quarter outer
(8) Door panel
(9) Side sill
(10) Section C
(11) Section D
(12) Unit: mm (in)

B: COMPONENT

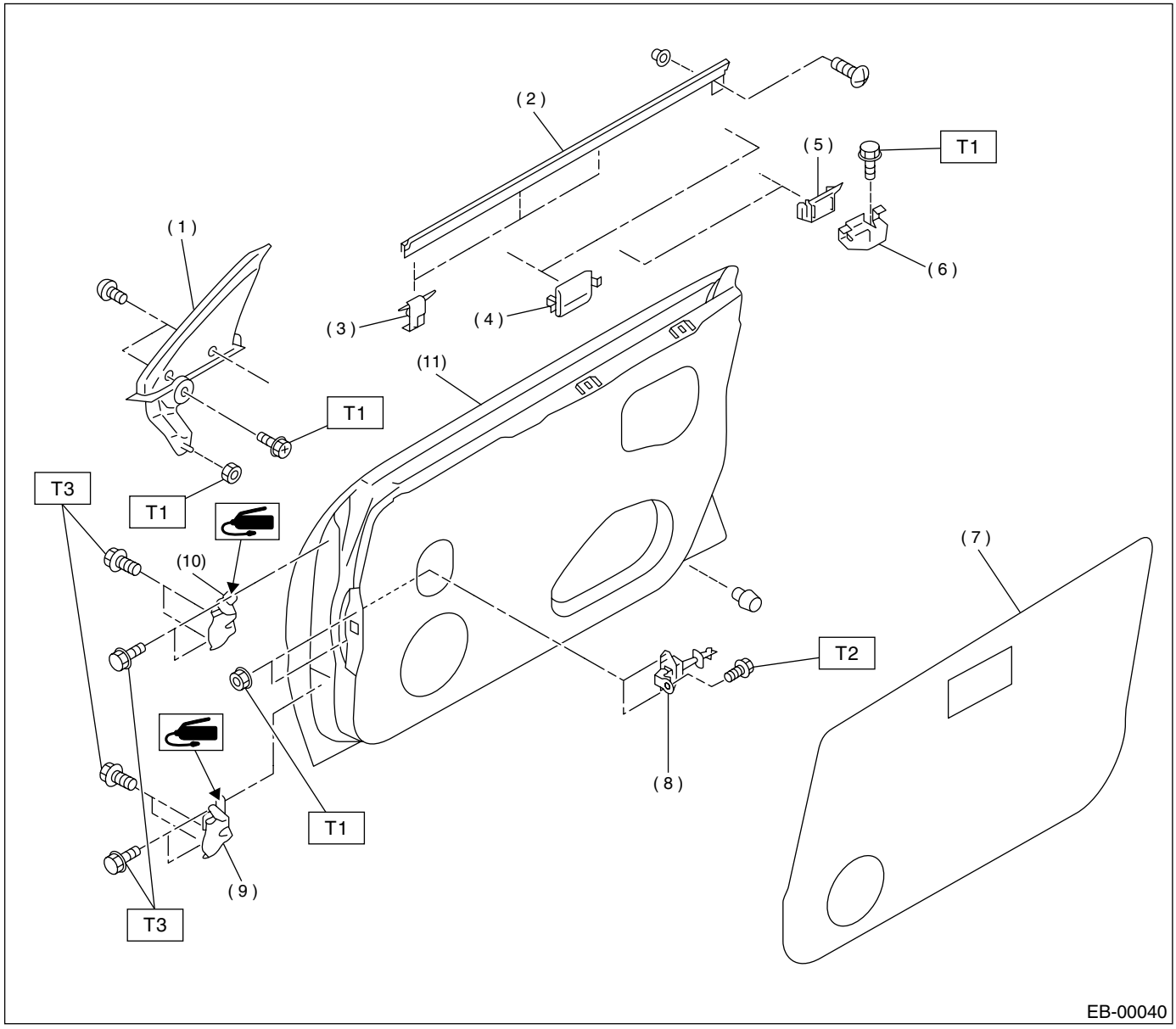
1. FRONT HOOD



(1) Front hood
(2) Seal (Front hood)
(3) Hinge
(4) Buffer C
(5) Buffer A
(6) Buffer B
(7) Seal ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18.1)

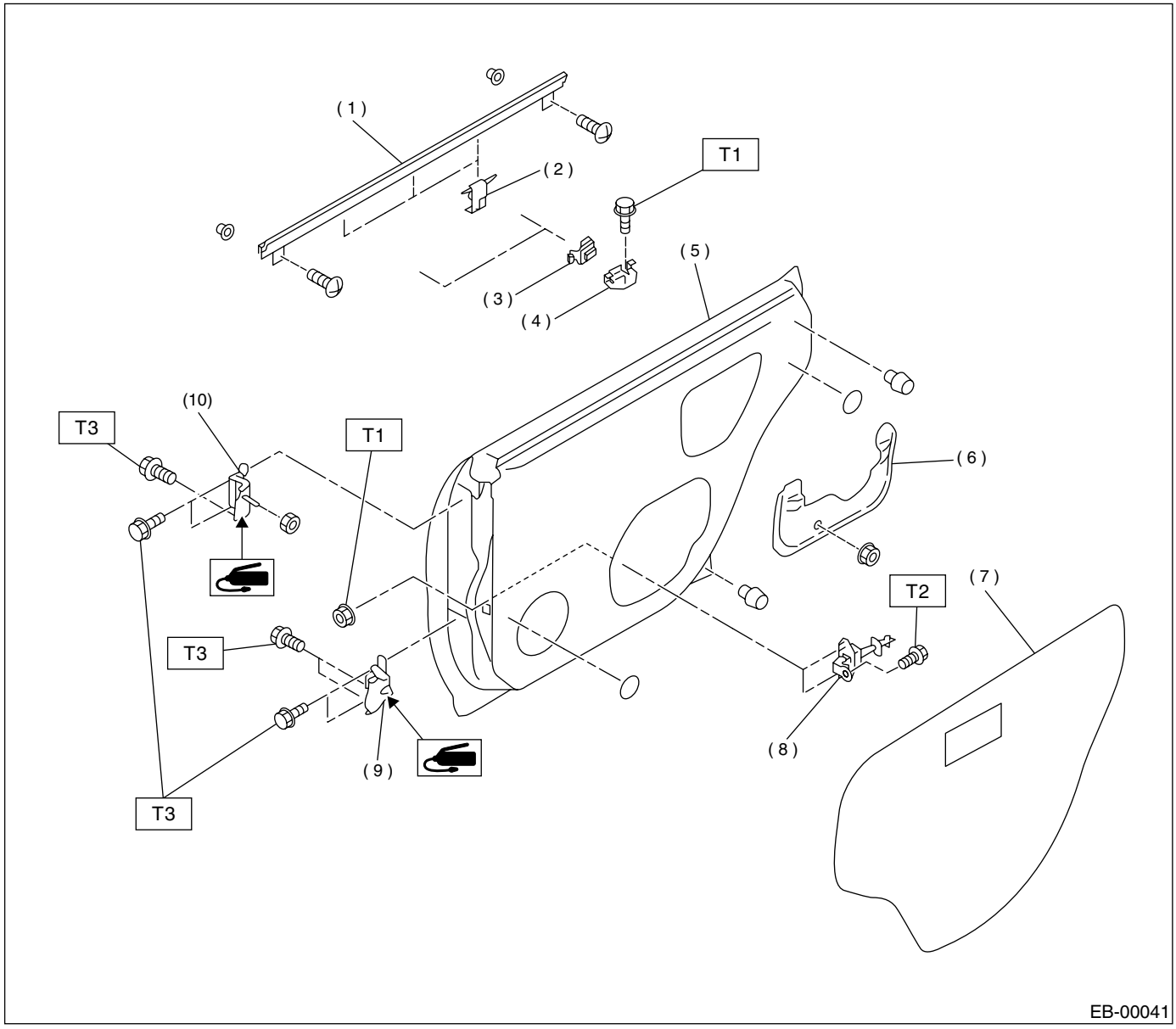
2. FRONT DOOR PANEL



(1) Gusset
(2) Weatherstrip (Outer)
(3) Clip (Weatherstrip, outer)
(4) Stabilizer (Lifter)
(5) Stabilizer (Outer)
(6) Stabilizer (Inner)
(7) Sealing cover
(8) Checker
(9) Lower hinge
(10) Upper hinge
(11) Door panel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.35 (0.75, 5.4)
T2: 18 (1.8, 13)
T3: 30 (3.1, 22.4)

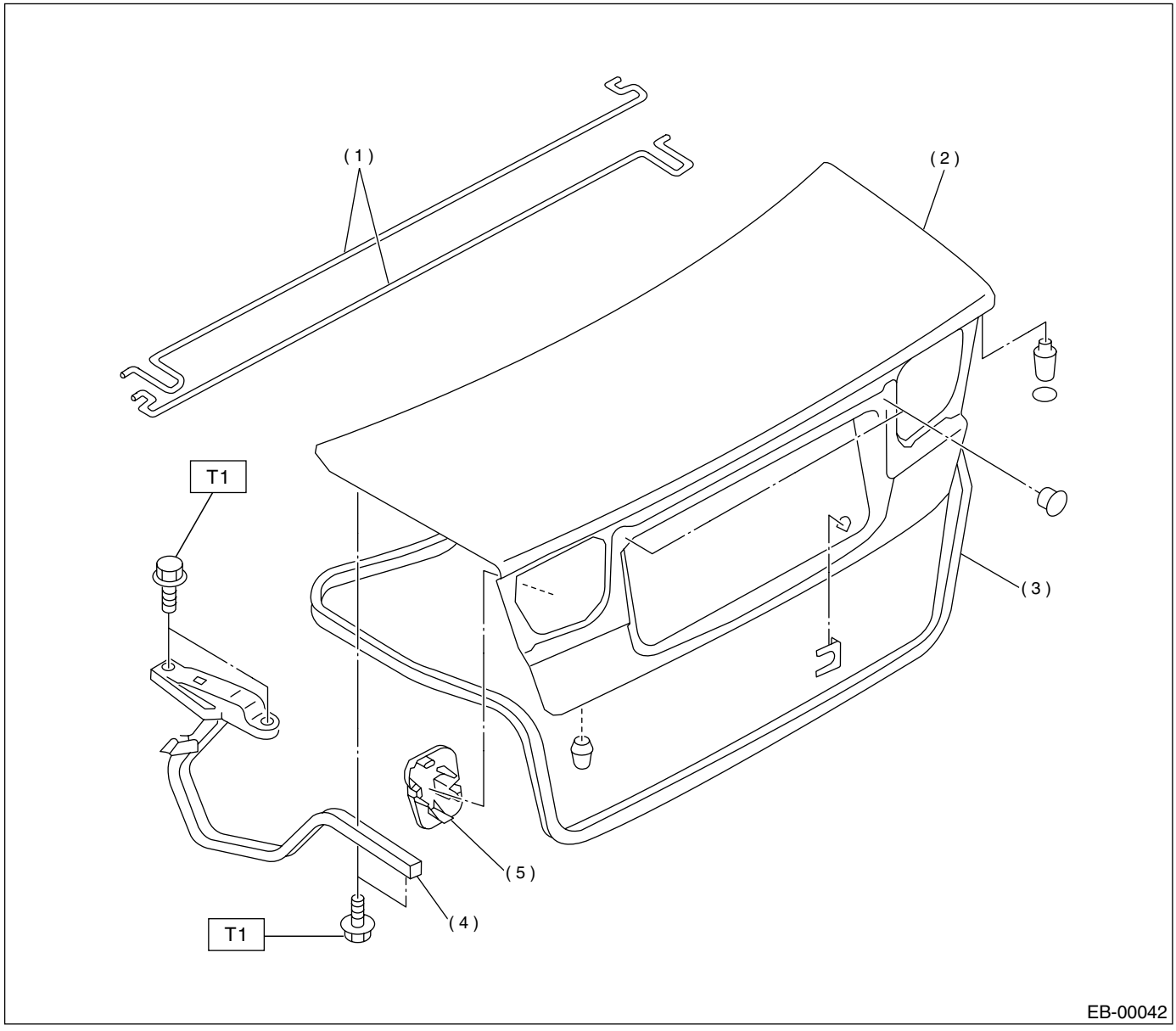
3. REAR DOOR PANEL



(1) Weatherstrip (Outer)
(2) Clip (Weatherstrip, outer)
(3) Stabilizer (Outer)
(4) Stabilizer (Inner)
(5) Door panel
(6) Bracket
(7) Sealing cover
(8) Checker
(9) Lower hinge
(10) Upper hinge

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.35 (0.75, 5.4)
T2: 18 (1.8, 13)
T3: 30 (3.1, 22.4)

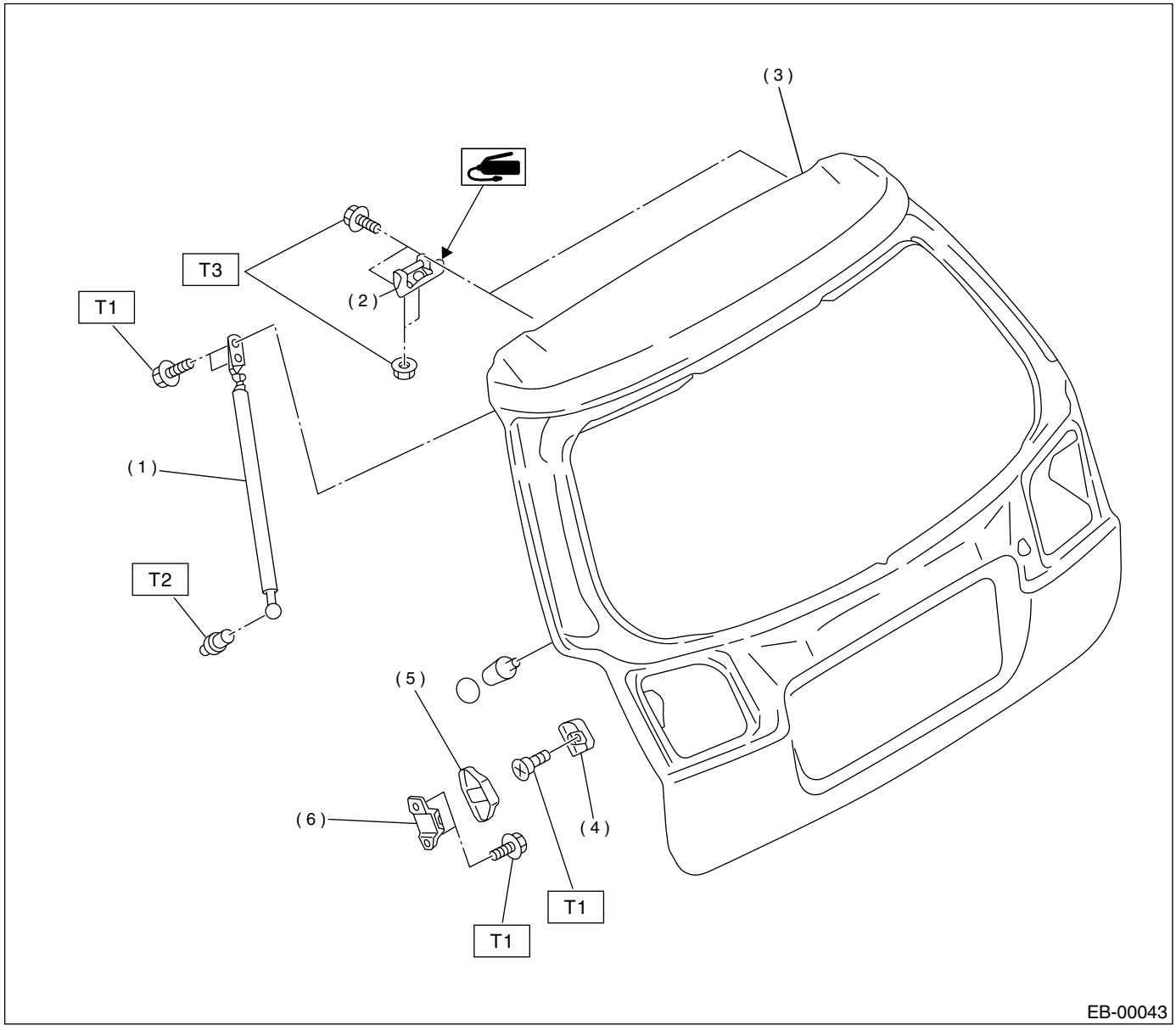
4. TRUNK LID PANEL



(1) Torsion bar
(2) Trunk lid
(3) Weatherstrip
(4) Hinge ASSY
(5) Cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13)

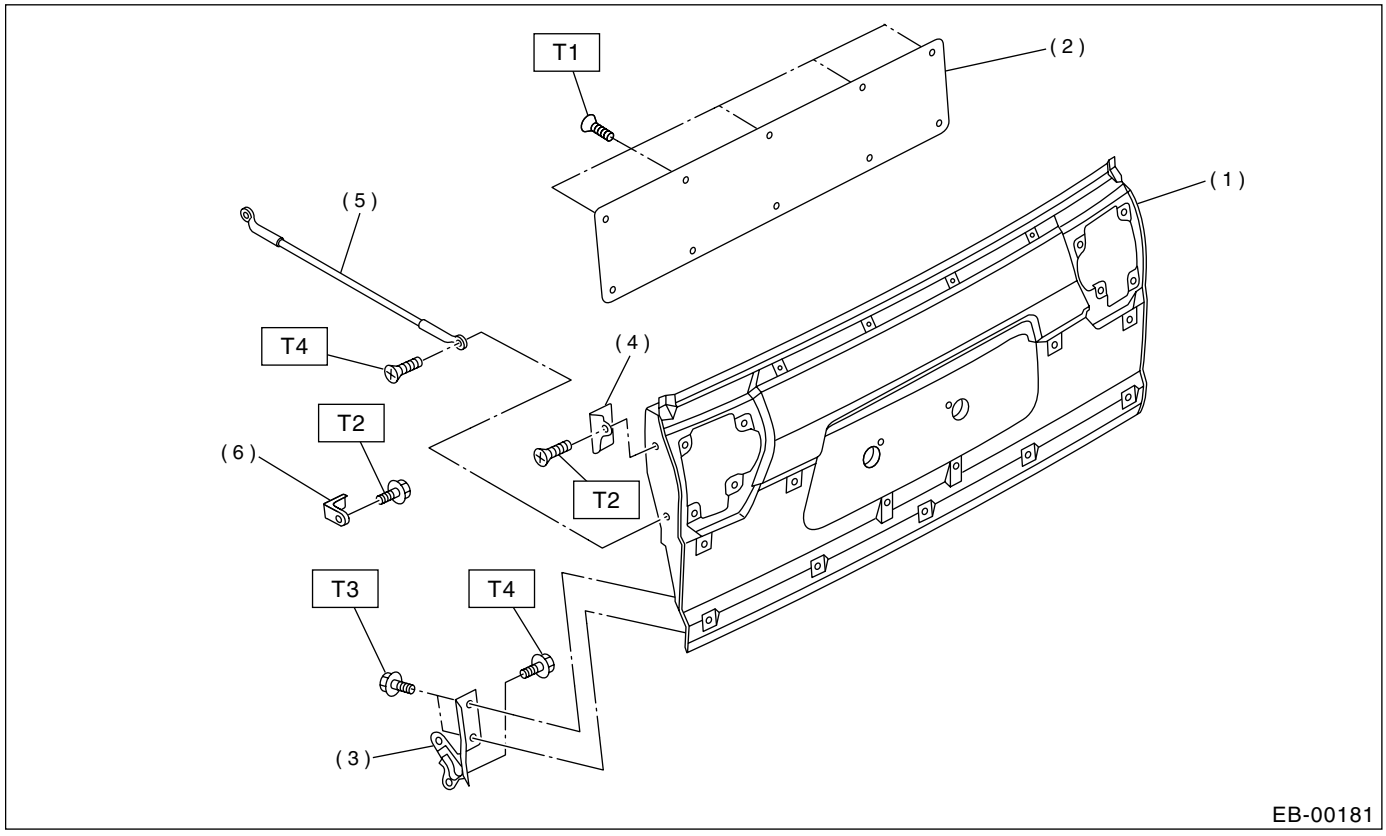
5. REAR GATE PANEL



(1) Gas stay
(2) Hinge
(3) Rear gate
(4) Buffer (Rear gate)
(5) Buffer cover
(6) Buffer (Back door)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.4, 10.1)
T3: 25 (2.5, 18.1)

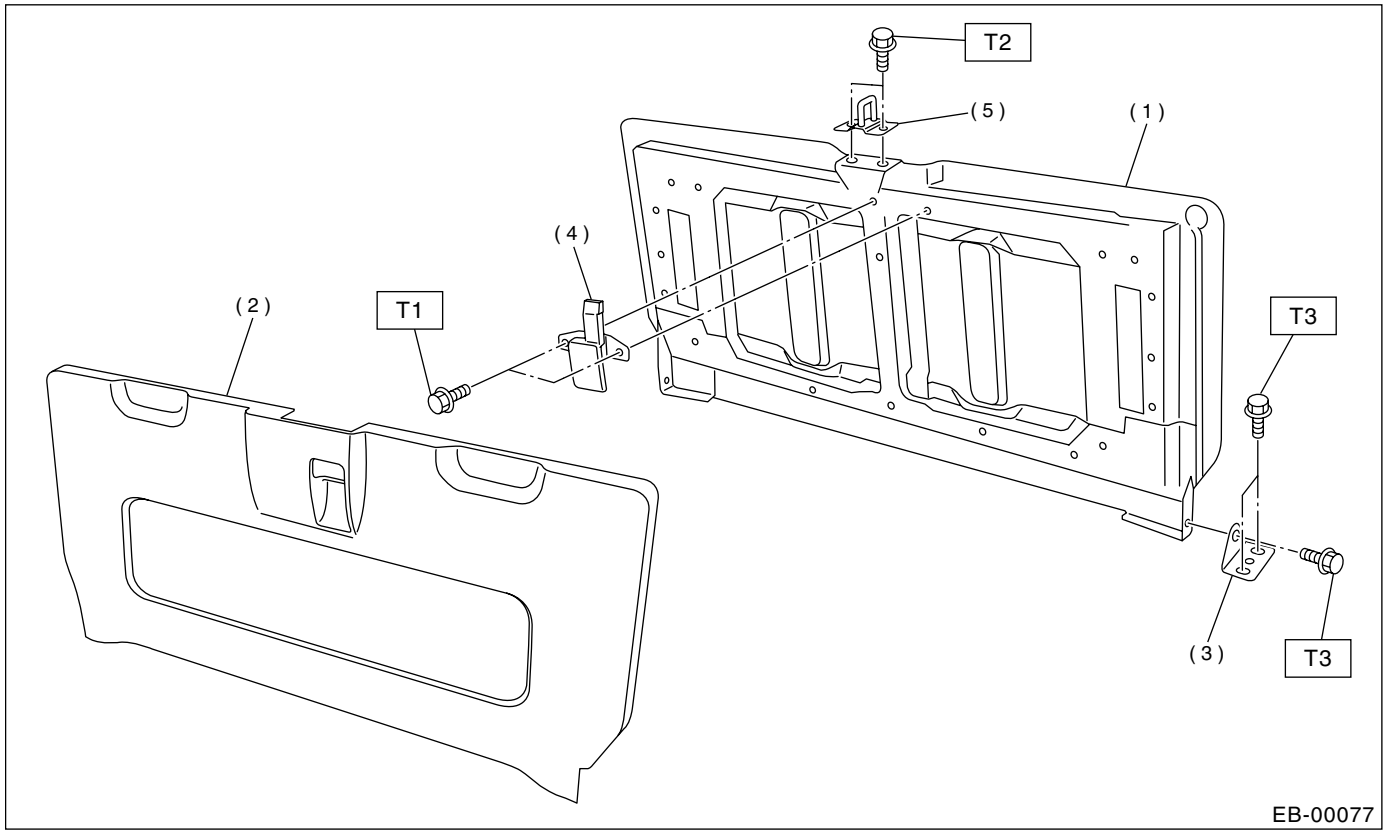
6. TAIL GATE PANEL



(1) Tail gate
(2) Tail gate cover
(3) Hinge
(4) Protector
(5) Tail gate cable
(6) Buffer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 2 (0.2, 1.4)
T2: 7.5 (0.76, 5.5)
T3: 25 (2.5, 18.1)
T4: 30 (3.1, 22.4)

7. SWITCH BACK GATE

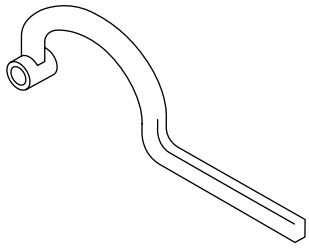
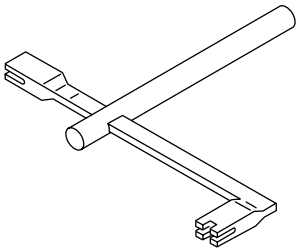


(1) Switch back gate
(2) Cover
(3) Hinge
(4) Release lever
(5) Striker

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 18 (1.8, 13)
T3: 27.5 (2.80, 20.3)

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925610000	925610000	WRENCH	Used for removing and installing door hinge.
 ST-927780000	927780000	REMOVER	Used for removing and installing trunk torsion bar.

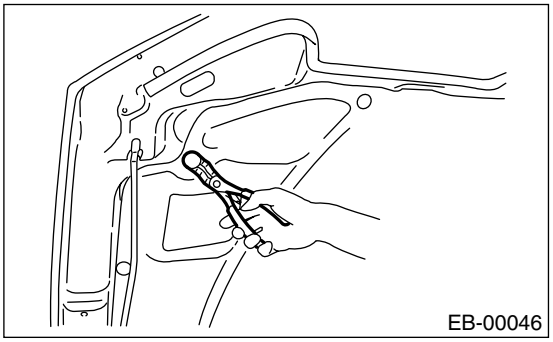
2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

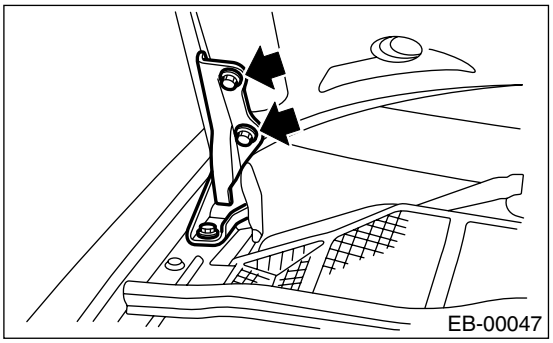
2. Front Hood

A: REMOVAL

1) Open front hood to remove washer nozzles.
2) Release clips to remove hood insulator.



3) Remove bolts to disconnect hood from hinges.



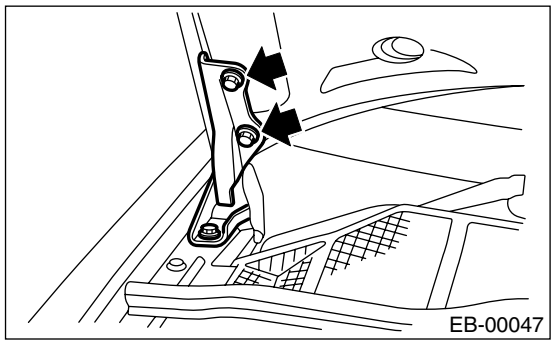
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust clearance between hood and fender. Clearance must be equal at both sides.

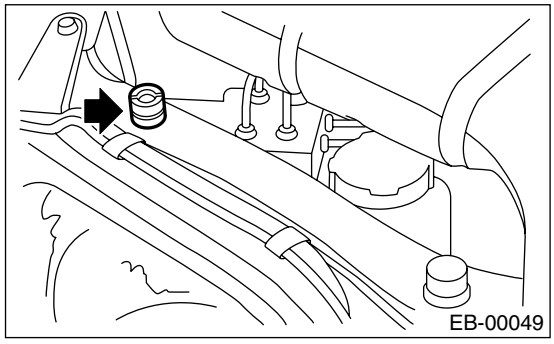
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

C: ADJUSTMENT

1) Use hinge mounting holes to align front hood longitudinally and laterally.



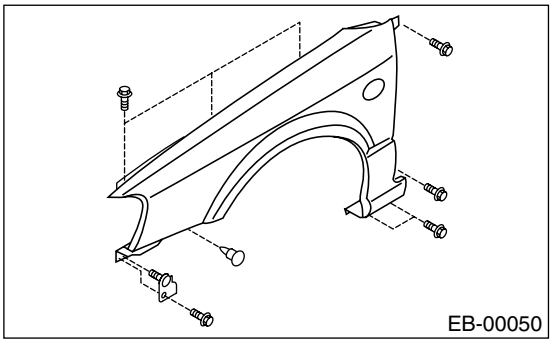
2) Adjust height at front end of hood.
<Ref. to SL-46, ADJUSTMENT, Front Hood Lock Assembly.>
3) Rotate hood buffer to adjust lateral height.



3. Fender Panel

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove side sill spoilers. <Ref. to EI-37, REMOVAL, Side Sill Spoiler.> (If fitted)
3) Remove side protectors and fender protectors. (OUTBACK)
4) Remove front bumper face. <Ref. to EI-21, REMOVAL, Front Bumper.>
5) Remove headlights. <Ref. to LI-11, REMOVAL, Headlight Assembly.>
6) Remove mud guard. <Ref. to EI-31, REMOVAL, Mud Guard.>
7) Remove bolts and clips to remove front fender.



B: INSTALLATION

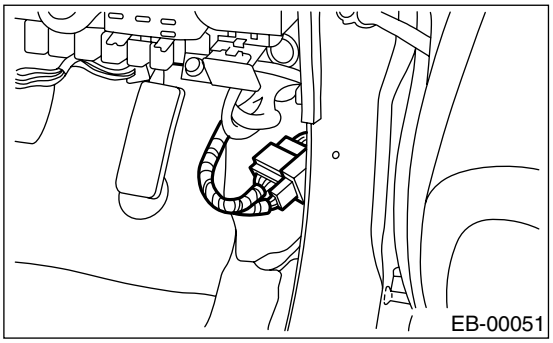
1) Install in the reverse order of removal.
2) When fender panel is installed, clearance between fender panel and hood or front fender must be equal.

Tightening torque:
7.35 N·m (0.75 kgf-m, 5.4 ft-lb)

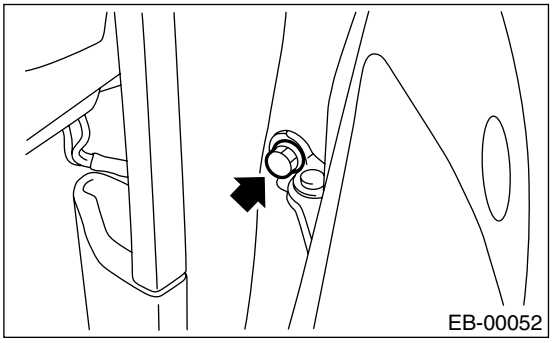
4. Front Door Panel

A: REMOVAL

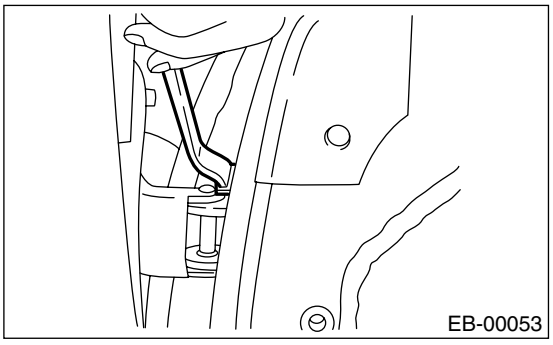
1) Disconnect ground cable from battery.
2) Remove front door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
3) Remove outer mirror assembly. <Ref. to GW-33, REMOVAL, Outer Mirror Assembly.>
4) Remove front door regulator and motor. <Ref. to GW-16, REMOVAL, Front Regulator and Motor Assembly.>
5) Remove front door latch assembly. <Ref. to SL-35, REMOVAL, Front Door Latch Assembly.>
6) Remove front outer handle. <Ref. to SL-34, REMOVAL, Front Outer Handle.>
7) Remove front pillar lower trim to disconnect connector from body harness.


EB-00051

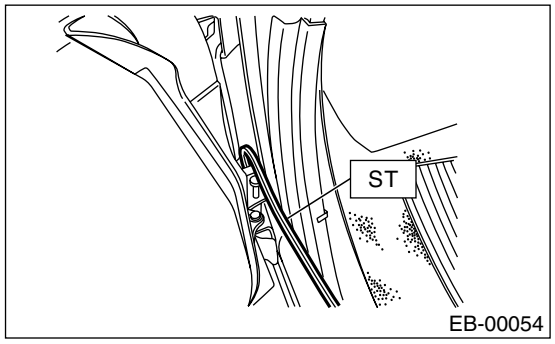
8) Put wooden block on jack and place jack under door. Support door with a jack to protect it from damage.
9) Remove checker bolts.


EB-00052

10) Remove door-side bolts for upper and lower hinges to remove door.


EB-00053

11) Using special tool, remove body-side bolts for upper and lower hinges, and remove door hinges.
ST 925610000 DOOR HINGE WRENCH



EB-00054

CAUTION:
• During removal and installation of doors, do not damage body.
• Doors are heavy. Be careful not to drop and damage them.

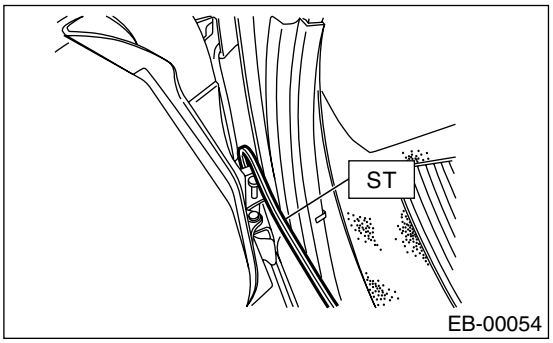
B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to sliding area of door hinges.

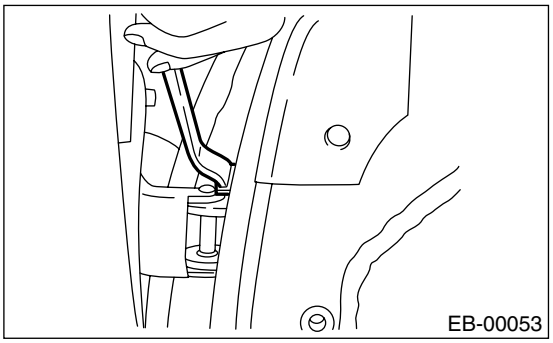
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EB-4, FRONT DOOR PANEL, COMPONENT, General Description.>

C: ADJUSTMENT

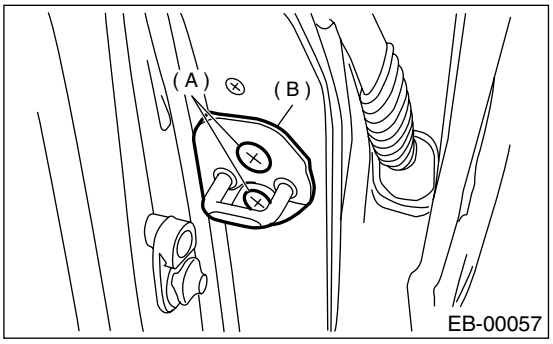
1) Using special tool, loosen body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.
ST 925610000 DOOR HINGE WRENCH



2) Loosen door-side bolts of upper and lower hinges to align the position of front door panel vertically and laterally at the front end.



3) Loosen screw (A) and tap striker (B) using plastic hammer to adjust striker.



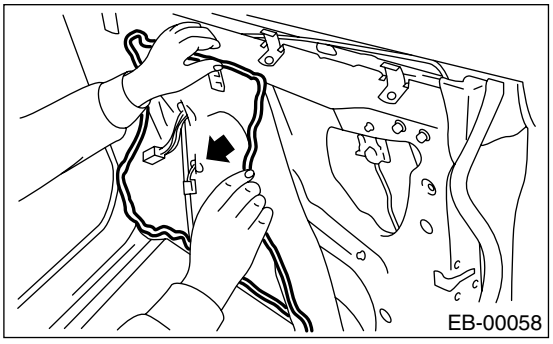
CAUTION:
Do not use impact wrench. Welding area on striker nut plate is easily broken.

5. Front Sealing Cover

A: REMOVAL

1) Remove front door trim. <Ref. to EI-40, REMOVAL, Front Door Trim.>
2) Remove front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>

CAUTION:
• Carefully remove butyl tape. Excessive force will easily break the cover.
• If cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing sealing cover, use butyl tape.
3) Press sealer-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

CAUTION:
• Apply a uniform bead of butyl tape.
• Attach sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

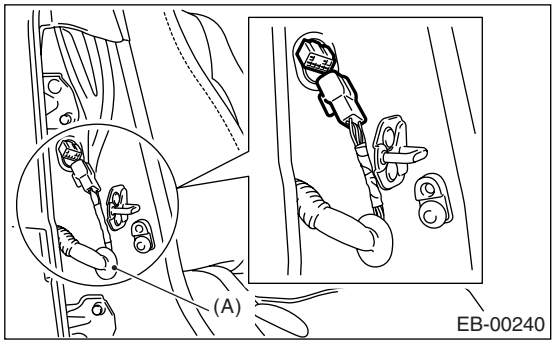
C: INSPECTION

If sealing cover is damaged, replace it with a new one.

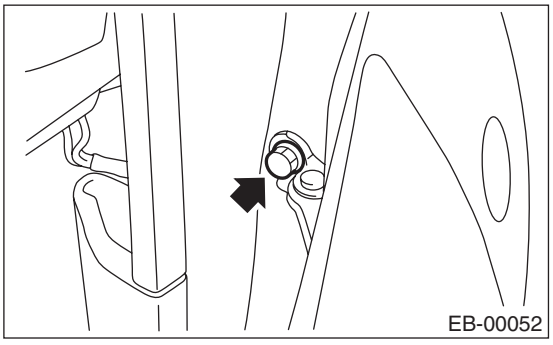
6. Rear Door Panel

A: REMOVAL

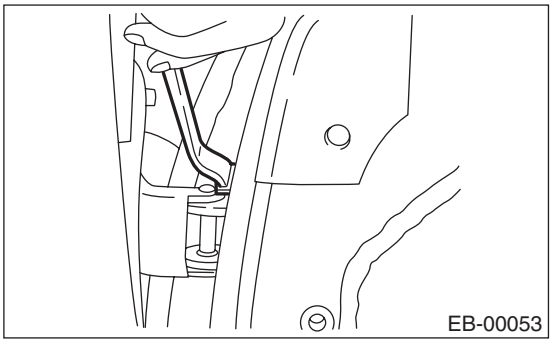
1) Disconnect ground cable from battery.
2) Remove rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
3) Remove rear door regulator and motor assembly. <Ref. to GW-19, REMOVAL, Rear Regulator and Motor Assembly.>
4) Remove rear door latch. <Ref. to SL-39, REMOVAL, Rear Door Latch Assembly.>
5) Remove rear outer handle. <Ref. to SL-38, REMOVAL, Rear Outer Handle.>
6) Remove rubber duct (A) connection from center pillar. Pull out and disconnect door harness connector.



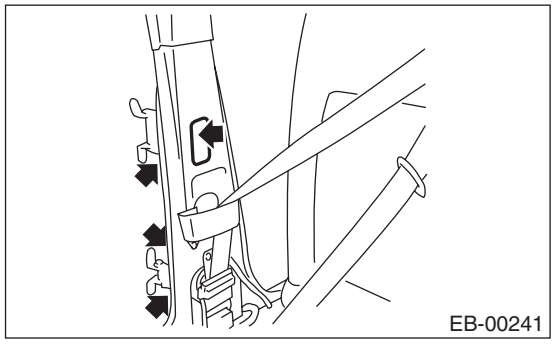
7) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.
8) Remove checker bolts.



9) Remove door-side bolts for upper and lower hinges to remove door.



10) Remove center pillar lower trim. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
11) Remove body-side bolts and nuts for upper and lower hinges, and remove door hinges.



CAUTION:
• During removal and installation of doors, do not damage body.
• Doors are heavy. Be careful not to drop and damage them.

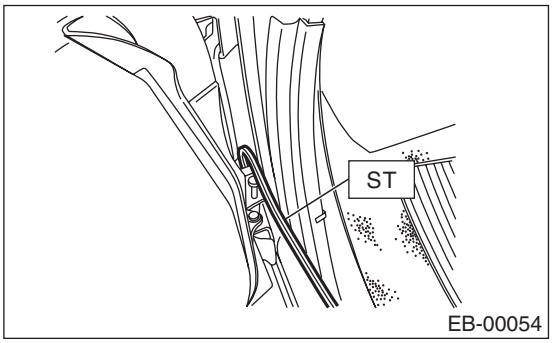
B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to sliding area of door hinges.

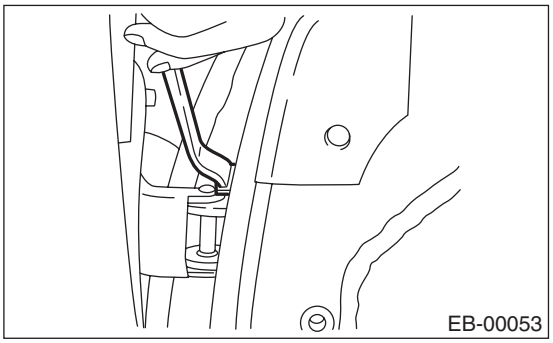
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EB-5, REAR DOOR PANEL, COMPONENT, General Description.>

C: ADJUSTMENT

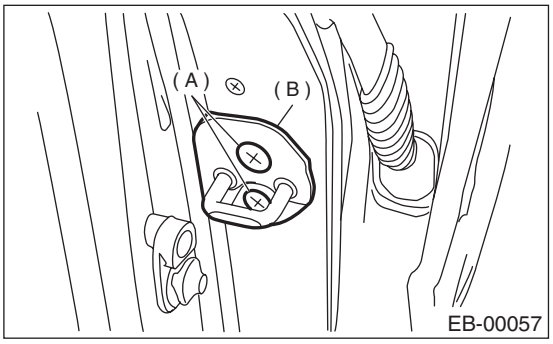
1) Using special tool, loosen body-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.
ST 925610000 WRENCH



2) Loosen door-side bolts of upper and lower hinges to align the position of rear door panel vertically and laterally at front-end.



3) Loosen screw (A) and tap striker (B) using plastic hammer to adjust striker.



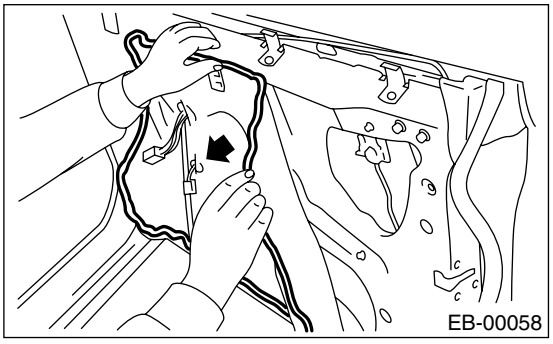
CAUTION:
Do not use an impact wrench. The welding area on the striker nut plate is easily broken.

7. Rear Sealing Cover

A: REMOVAL

1) Remove rear door trim. <Ref. to EI-41, REMOVAL, Rear Door Trim.>
2) Remove rear speaker. <Ref. to ET-8, REMOVAL, Rear Speaker.>

CAUTION:
• Carefully remove butyl tape. Excessive force will easily break the cover.
• If cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing sealing cover, use butyl tape.
3) Press sealer-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

CAUTION:
• Apply an uniform bead of butyl tape.
• Attach sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

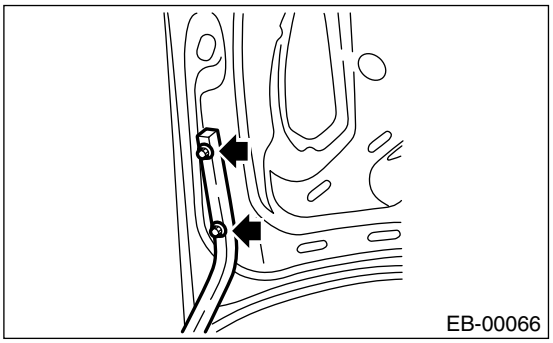
If sealing cover gets damaged, replace it with a new one.

8. Trunk Lid Panel

A: REMOVAL

1. TRUNK LID

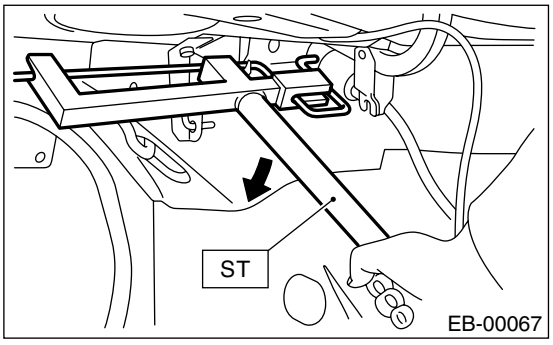
1) Open trunk lid.
2) Disconnect trunk lid connector.
3) Loosen trunk lid mounting bolts to remove trunk lid from hinges.



2. TORSION BAR

1) Open trunk lid.
2) Using special tool, remove torsion bar from hinge link.
ST 927780000 REMOVER

CAUTION:
During removal and installation, carefully handle torsion bar. It will generate reactive force.



3) Remove right/left torsion bars.

CAUTION:
After the torsion bar is removed, the trunk lid will slam shut. Be careful not to get hit by the trunk lid.

B: INSTALLATION

1. TRUNK LID

1) Install in the reverse order of removal.
2) Install trunk lid with uniform clearance.

2. TORSION BAR

1) Install in the reverse order of removal.
2) Apply grease to rotating area of hinges and mating surface of torsion bar.

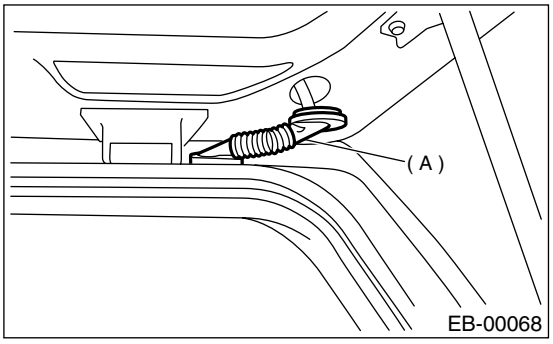
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

9. Rear Gate Panel

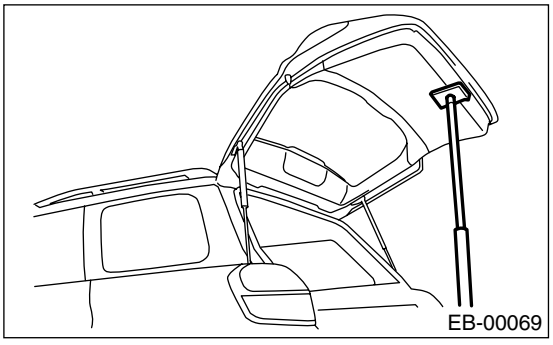
A: REMOVAL

1. REAR GATE PANEL

1) Open rear gate.
2) Remove rear gate outer handle. <Ref. to SL-41, REMOVAL, Rear Gate Outer Handle.>
3) Remove rear gate latch assembly. <Ref. to SL-42, REMOVAL, Rear Gate Latch Assembly.>
4) Remove rear gate trim. <Ref. to EI-57, REMOVAL, Rear Gate Trim.>
5) Remove rear gate key lock cylinders. <Ref. to SL-49, REAR GATE, REPLACEMENT, Key Lock Cylinders.>
6) Remove rear finisher light assembly. <Ref. to LI-21, REMOVAL, Rear Finisher Light Assembly.>
7) Remove rear wiper. <Ref. to WW-15, REMOVAL, Rear Wiper Motor.>
8) Disconnect connectors of rear wiper, rear defogger, and other lighting devices.
9) Disconnect washer hose.
10) Remove rubber duct (A) connection, and pull out harness and washer hose from rear gate.



11) Using a support, support the rear gate while removing gas stay mounting bolts.

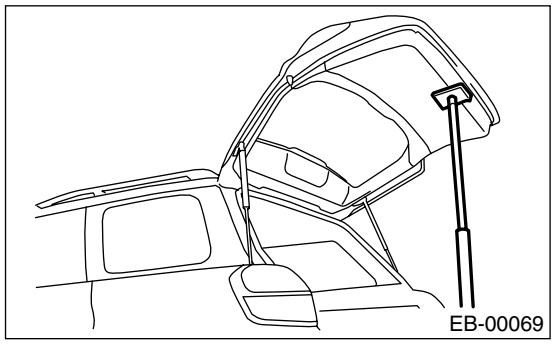


CAUTION:
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between body and gate.

12) Loosen rear gate bolts to remove rear gate.

2. GAS STAY

1) Open rear gate. Using a jack to support the rear gate.



CAUTION:
• After gas stay is removed, rear gate cannot stay open. Supporting the rear gate with a jack, remove the bolts.
• Do not damage piston rods and oil seals.
• Never disassemble cylinders: They contain gas.

2) Loosen bolts to remove gas stay from rear gate.

B: INSTALLATION

1. REAR GATE PANEL

1) Install in the reverse order of removal.
2) Install rear gate panel with uniform clearance to body.

CAUTION:
Do not damage painted surfaces of body and rear gate.

2. GAS STAY

Install in the reverse order of removal.

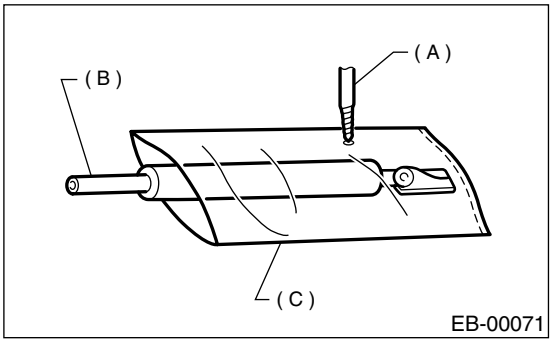
CAUTION:
• Do not confuse right and left sides of gas stay.
• After supporting rear gate with a jack, start operation.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to EB-7, REAR GATE PANEL, COMPONENT, General Description.>

C: DISPOSAL

1. GAS STAY

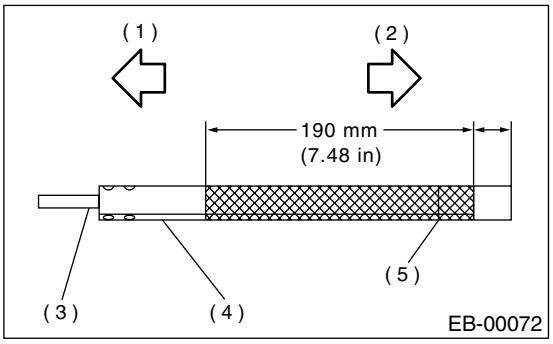
1) Place the gas stay (B) in a vinyl sack (C) before drilling hole with a drill (A).



CAUTION:
Prevent the vinyl case from being caught by drill cutting edge

2) Lift body side slightly with piston rods fully extended, and secure body side on vise stand.
Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from door side, and bleed gas stay completely.

CAUTION:
Gas is colorless, odorless, and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.

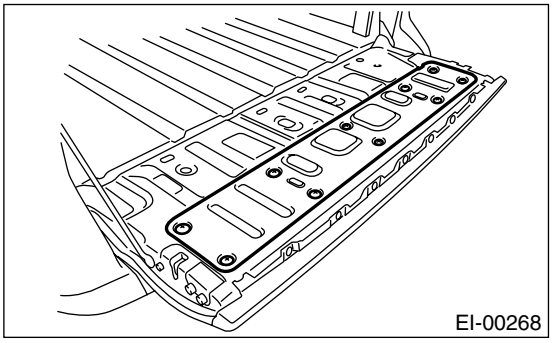


(1) Body side
(2) Door side
(3) Piston rod
(4) Cylinder
(5) Portion to be drilled

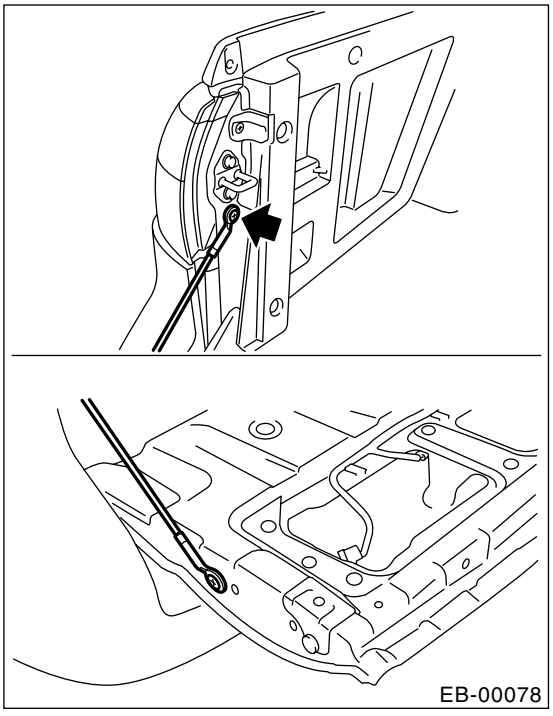
10.Tail Gate Panel

A: REMOVAL

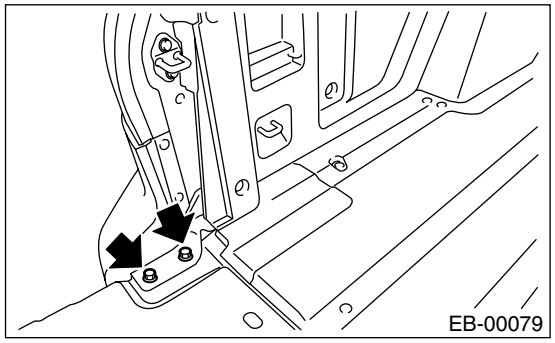
1) Remove tail gate tray. <Ref. to EI-73, REMOVAL, Tail Gate Tray.>
2) Remove tail gate cover.



3) Remove rear finisher right. <Ref. to LI-21, PICK-UP, REMOVAL, Rear Finisher Light Assembly.>
4) Remove tail gate garnish. <Ref. to EI-72, REMOVAL, Tail Gate Garnish.>
5) Remove tail gate latch. <Ref. to SL-60, REMOVAL, Tail Gate Latch Assembly.>
6) Remove tail gate outer handle. <Ref. to SL-59, REMOVAL, Tail Gate Outer Handle.>
7) Remove wire harness.
8) Remove tail gate cable.



9) Remove bolts and detach tail gate.



B: INSTALLATION

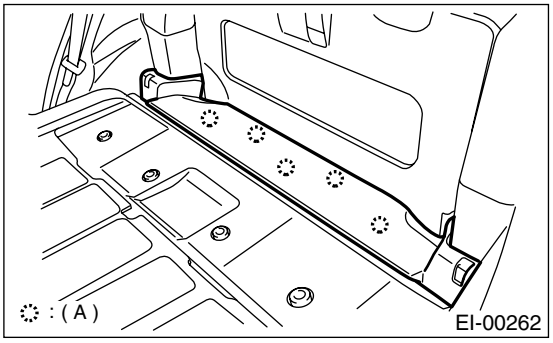
Install in the reverse order of removal.

Tightening torque:
25 N·m (2.6 kgf-m, 18 ft-lb)

11.Switch Back Gate

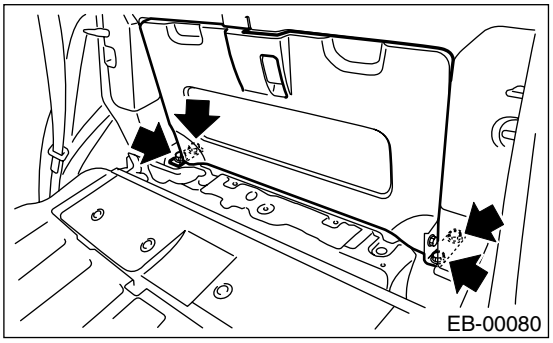
A: REMOVAL

1) Pull up rear seat cushion, put down rear seat backrest.
2) Remove floor trim panel.



(A) Clip

3) Remove bolts, and detach switch back gate.

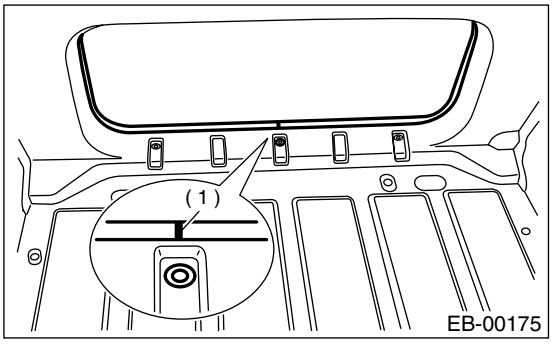


4) Remove weatherstrip.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Mount weatherstrip by aligning silver line mark with back panel tray center bolt.

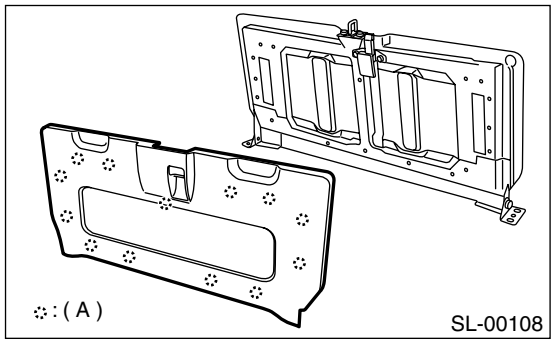


(1) White line mark

Tightening torque:
27.5 N·m (2.80 kgf-m, 20.3 ft-lb)

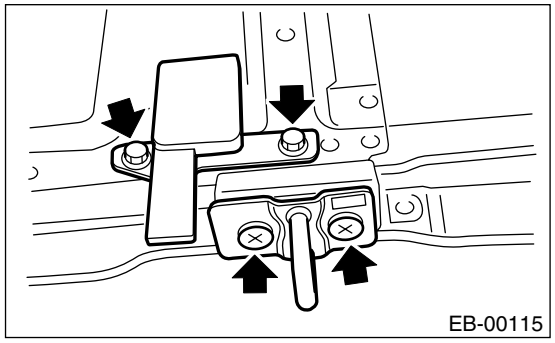
C: DISASSEMBLY

1) Remove switch back gate. <Ref. to EB-23, REMOVAL, Switch Back Gate.>
2) Remove switch back gate inner cover.



(A) Clip

3) Remove switch back gate handle and striker.

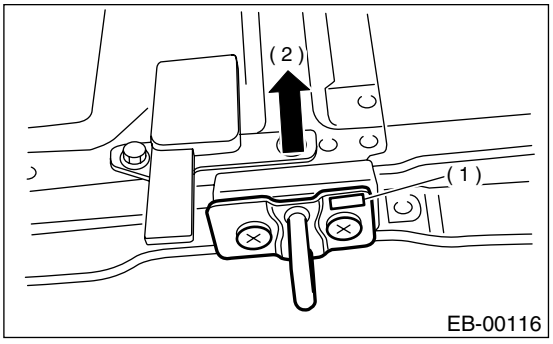


D: ASSEMBLY

Install in the reverse order of removal.

NOTE:

• Install striker with marked portion facing vehicle front.



(1) Marking
(2) Vehicle front

• There are left/right indicating marks on the switch back gate hinge. When installing, do not mistake the direction.

	Marking
RH	65R
LH	65L

Tightening torque:
Release lever:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Striker:
18 N·m (1.8 kgf-m, 13 ft-lb)

CRUISE CONTROL SYSTEM

CC

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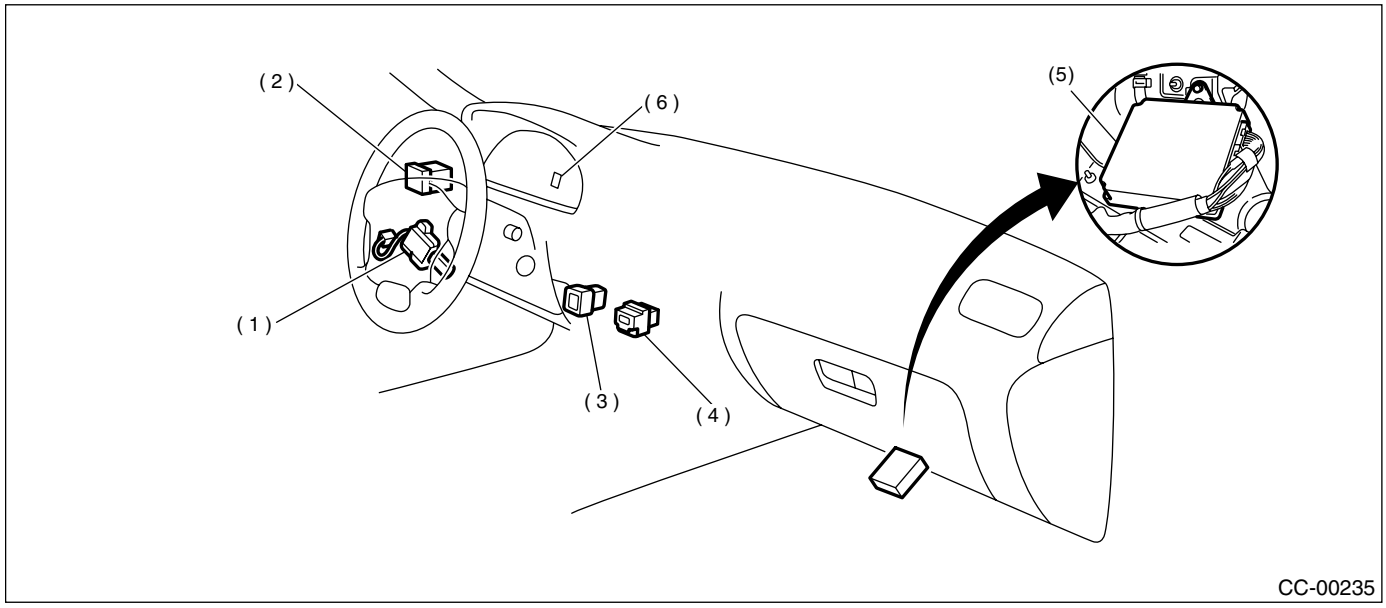
1. General Description 2
2. Actuator 5
3. Cruise Control Module 6
4. Cruise Control Main Switch 7
5. Cruise Control Command Switch 8
6. Stop and Brake Switch 9
7. Clutch Switch 10
8. Inhibitor Switch 11

1. General Description

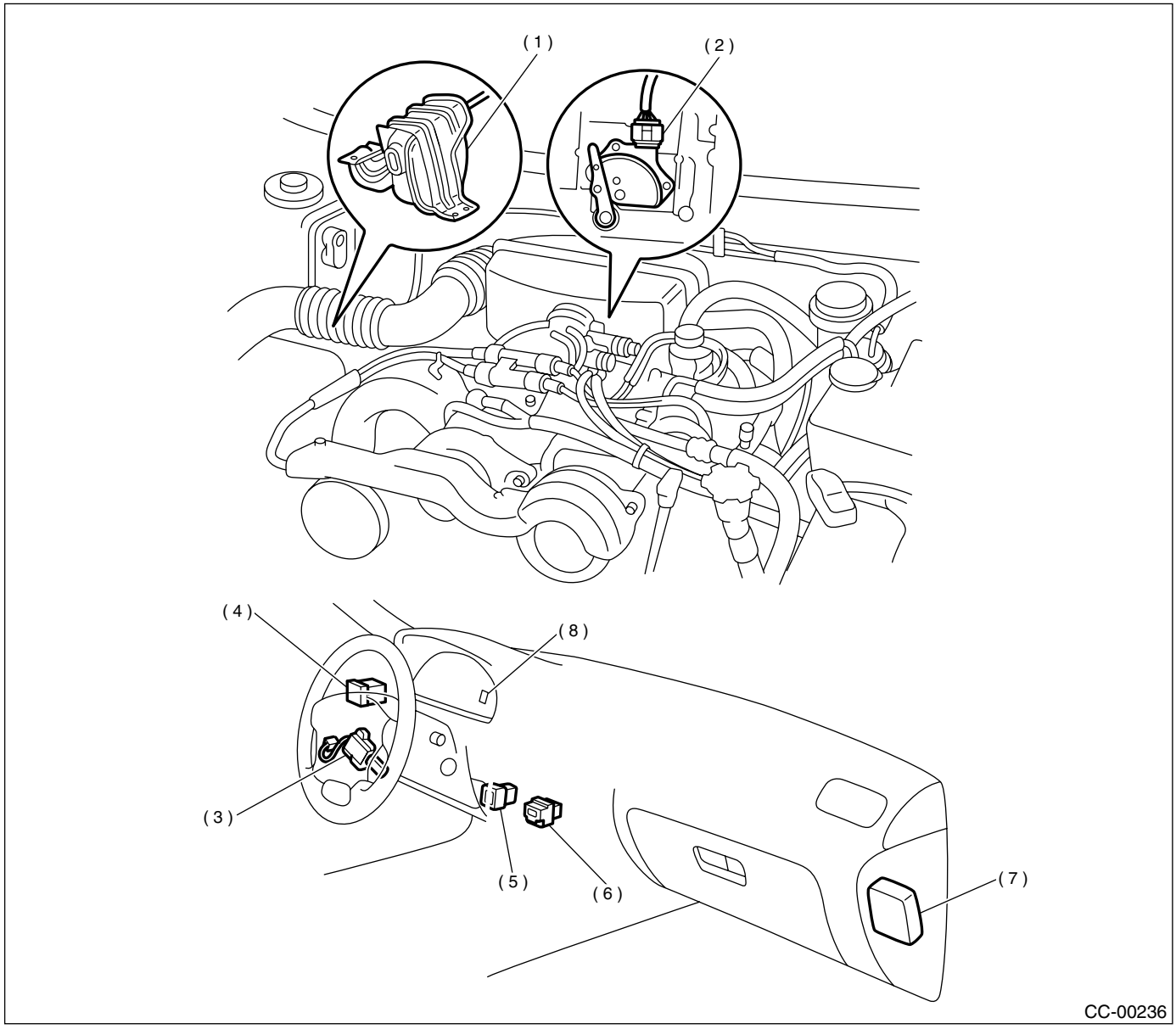
A: COMPONENT

1. MODEL WITH ELECTRONIC CONTROL THROTTLE



(1) Cruise control command switch
(2) Cruise control main switch
(3) Clutch switch (MT)
(4) Stop and brake switch
(5) Engine control module
(6) Cruise set indicator light

2. MODEL WITHOUT ELECTRONIC CONTROL THROTTLE



(1) Actuator
(2) Inhibitor switch (AT)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT)
(6) Stop and brake switch
(7) Cruise control module
(8) Cruise set indicator light

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, make note of the memory before disconnecting the battery ground cable. All memory will be erased.
• Reassemble parts in the reverse order of disassembly unless otherwise indicated.
• Adjust parts to specifications specified in this manual.
• Connect connectors and hoses securely during reassembly.
• After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

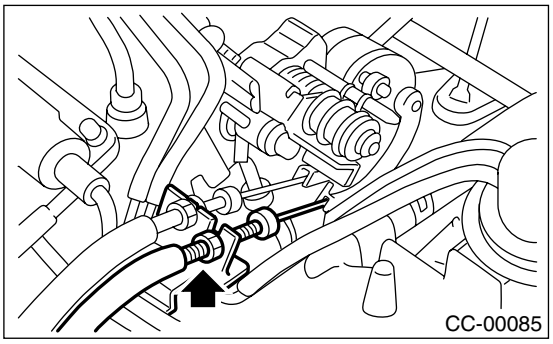
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Actuator

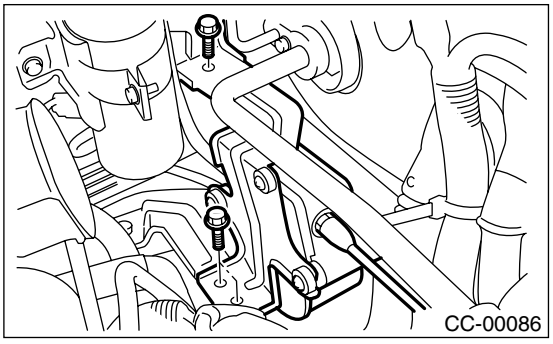
A: REMOVAL

CAUTION:
• Be careful not to apply excessive load to the wire cable when adjusting and/or installing; otherwise, the actuator may be deformed or damaged.
• Do not bend cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
• When installing cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

1) Disconnect ground cable from battery.
2) Remove clip bands from cruise control cable.
3) Loosen nut which secures cruise control cable end to throttle cam and then remove cable from throttle cam.


CC-00085

4) Remove actuator attaching bolts.
5) Remove actuator while disconnecting connector.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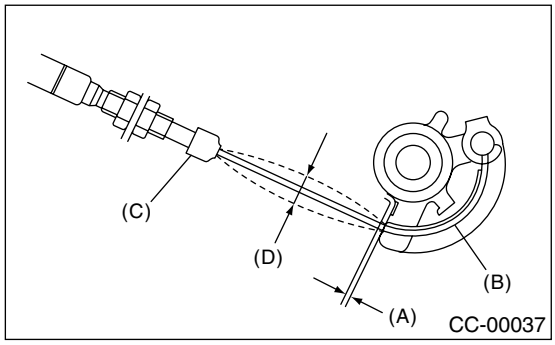
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Actuator
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Cable end nut
12 N·m (1,2 kgf-m, 8.7 ft-lb)

NOTE:
(A): Must be adjusted when cable end outer is fixed in place, so that gap between throttle cam and lever is 0 — 1 mm (0 — 0.04 in), or inner cable deflection (D) is 1 — 8 mm (0.039 — 0.315 in) with specified range of throttle cable play.
(Must be attached while throttle cam is being pulled by wire cable.)
(B): Must be coated evenly on cam end inner connection.
(C): Cover must be inserted securely, until tip of cable touches cover stopper.



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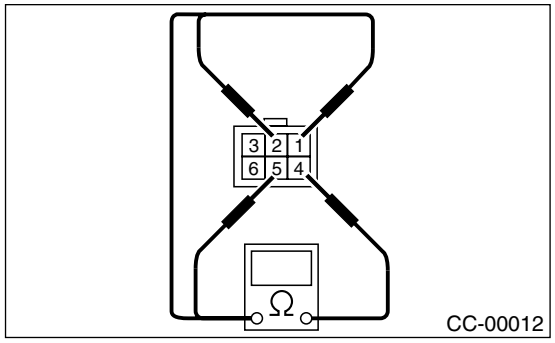
C: INSPECTION

Measure cruise control actuator resistance.



CC-00012

Terminal No.	Standard
4 and 1	Approx. 5Ω
4 and 2	Approx. 5Ω
4 and 5	Approx. 5Ω
3 and 6	Approx. 39Ω

If NG, replace cruise control actuator.

3. Cruise Control Module

A: NOTE

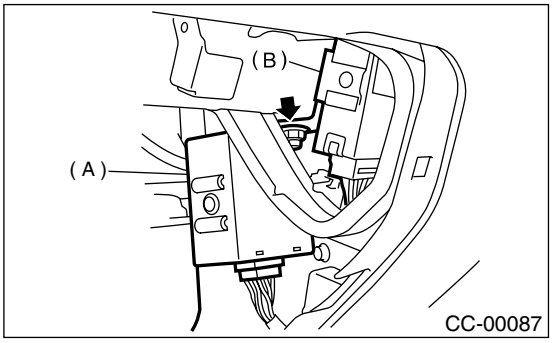
1. MODEL WITH ELECTRONIC CONTROL THROTTLE

Cruise control system is controlled by Engine Control Module (ECM).

B: REMOVAL

1. MODEL WITHOUT ELECTRONIC CONTROL THROTTLE

1) Disconnect ground cable from battery.
2) Remove glove box. <Ref. to EI-42, REMOVAL, Glove Box.>
3) Remove nut, then remove cruise control module (A) and the other electrical control module (B) while disconnecting connector.



4) Disconnect cruise control module and the other electrical control module.

2. MODEL WITH ELECTRONIC CONTROL THROTTLE

<Ref. to FU(H4DOTC)-43, REMOVAL, Engine Control Module (ECM).> or <Ref. to FU(H4SO U5)-49, REMOVAL, Engine Control Module.>

C: INSTALLATION

1. MODEL WITHOUT ELECTRONIC CONTROL THROTTLE

Install is in the reverse order of removal.

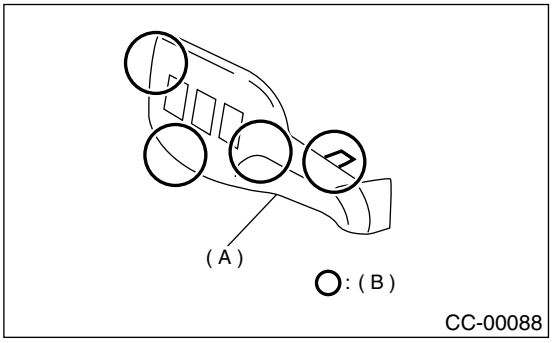
2. MODEL WITH ELECTRONIC CONTROL THROTTLE

<Ref. to FU(H4DOTC)-43, INSTALLATION, Engine Control Module (ECM).> or <Ref. to FU(H4SO U5)-49, INSTALLATION, Engine Control Module.>

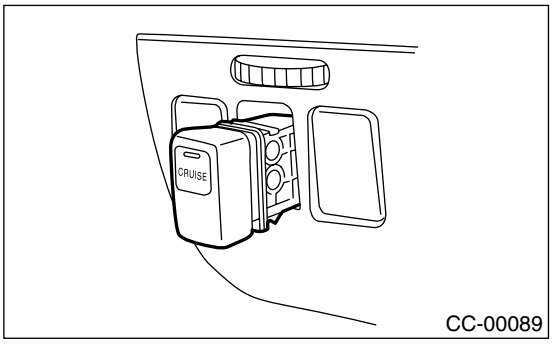
4. Cruise Control Main Switch

A: REMOVAL

1) Disconnect ground cable from battery.
2) Remove hook (B) and then remove switch panel (A) while disconnecting connector.



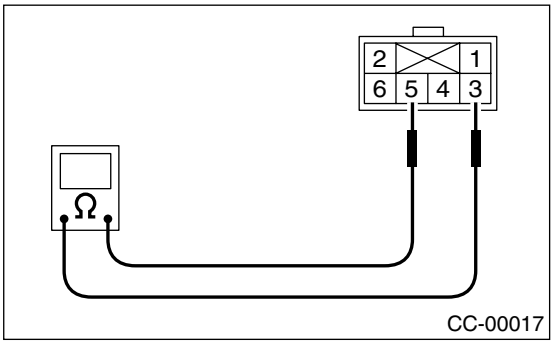
3) Remove main switch by pushing it outward.



B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION



Switch position	Terminal No.	Standard
OFF (Released)	3 and 5	More than 1 MΩ
ON (Pushed)	3 and 5	Less than 1 Ω

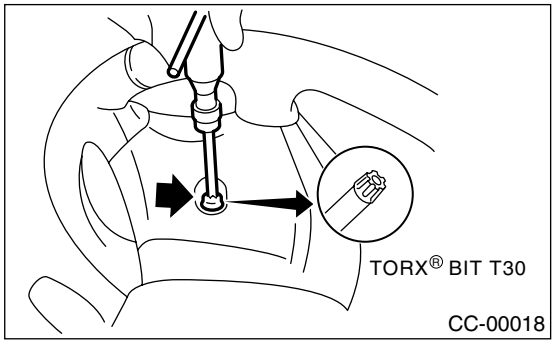
If NG, replace cruise control main switch.

5. Cruise Control Command Switch

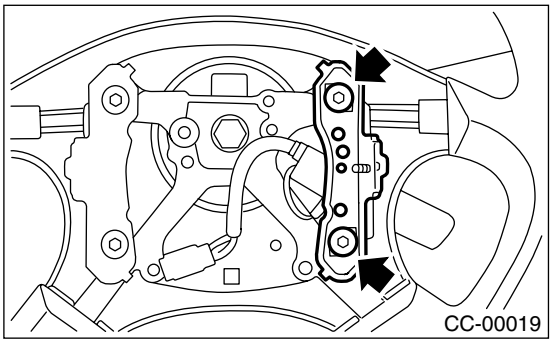
A: REMOVAL

WARNING:
Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, GENERAL DESCRIPTION.>

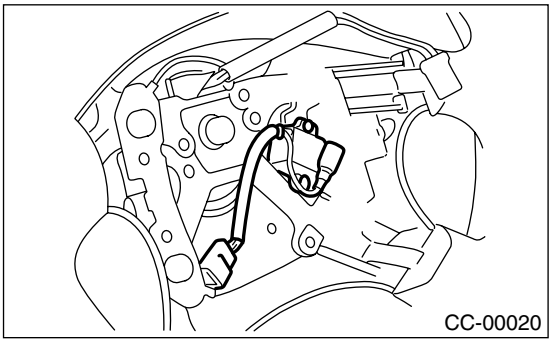
1) Set front wheels in straight ahead position.
2) Turn ignition switch OFF.
3) Disconnect ground cable from battery and wait for at least 20 seconds before starting work.
4) Using TORX® BIT T30 (Tamper resistant type), loosen two TORX® bolts which secure driver's airbag module.



5) Disconnect airbag module connector on back of airbag module.
6) Remove horn switch from steering wheel as shown.



7) Disconnect horn and cruise control command switch connector, then remove cruise control command switch.

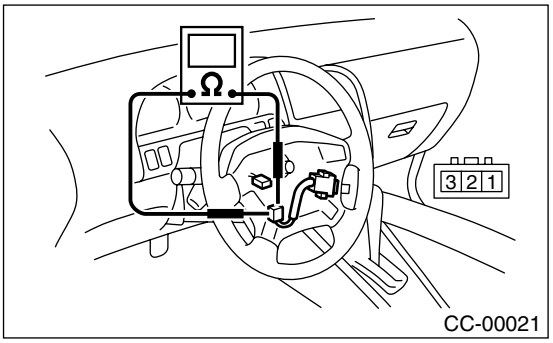


B: INSTALLATION

Install is in the reverse order of removal.

C: INSPECTION

Measure cruise control command switch resistance.



Check continuity between cruise control command switch terminals.

Switch	Position	Terminal No.	Standard
CANCEL	ON	1 (+) and 2 (–)	Less than 1 Ω
	ON	1 (+) and 3 (–)	Less than 1 Ω
SET/ COAST	OFF	1 and 2	More than 1 MΩ
	ON	1 and 2	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 3	More than 1 MΩ
	ON	1 and 3	Less than 1 Ω

If NG, replace cruise control command switch.

6. Stop and Brake Switch

A: REMOVAL

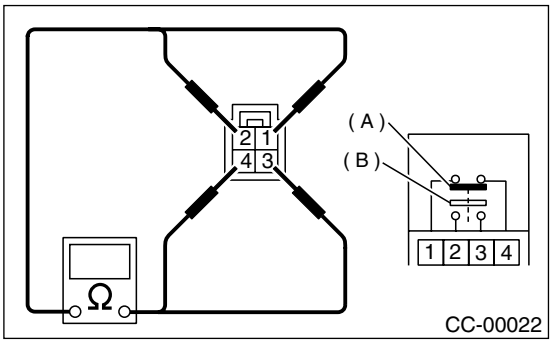
1) Disconnect ground cable from battery.
2) Disconnect connector from stop and brake switch, and then remove the switch. <Ref. to BR-42, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 MΩ
Stop light	Released	2 and 3	More than 1 MΩ
	Depressed	2 and 3	Less than 1 Ω

If NG, replace stop and brake switch.

7. Clutch Switch

A: REMOVAL

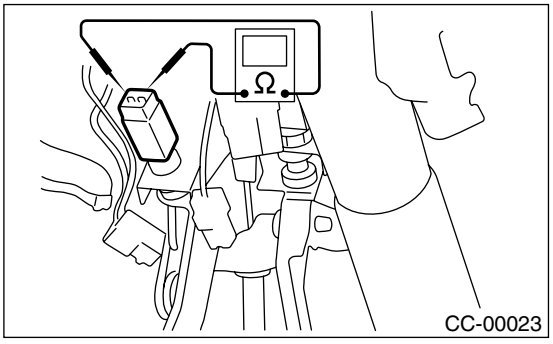
1) Disconnect ground cable from battery.
2) Disconnect the connector from the clutch switch, and then remove the switch. <Ref. to CL-28, REMOVAL, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure clutch switch resistance.



Switch	Pedal	Terminal No.	Standard
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 MΩ

If NG, replace the clutch switch.

8. Inhibitor Switch

A: REMOVAL

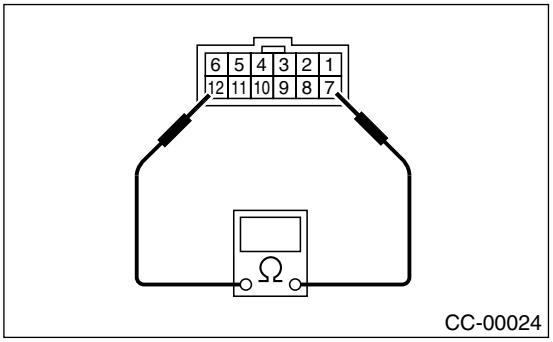
1) Disconnect ground cable from battery.
2) Disconnect connector from inhibitor switch, and then remove the switch. <Ref. to 4AT-52, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Installation is in the reverse order of removal.

C: INSPECTION

Measure inhibitor switch resistance.



Selector lever position	Terminal No.	Standard
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Except P and N		More than 1 MΩ

If NG, replace inhibitor switch.

MEMO:

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC(H4SO)

		Page
1.	Basic Diagnostic Procedure	2
2.	General Description	4
3.	Electrical Components Location	6
4.	Cruise Control Module I/O Signal	8
5.	Subaru Select Monitor	10
6.	Diagnostics Chart with Symptom	12
7.	List of Diagnostic Trouble Code (DTC)	28
8.	Diagnostics Chart with Trouble Code	29

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**START DIAGNOSIS.** 1) Perform pre-inspection. <Ref. to CC(H4SO)-5, INSPECTION, General Description.> 2) Check cruise control main switch operation.	Is cruise control main switch turned ON?	Go to step **2.**	Go to symptom 1. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
2	**PREPARE SUBARU SELECT MONITOR.**	Is the Subaru select monitor available?	Go to step **3.**	Go to step **4.**
3	**PERFORM CRUISE CANCEL CONDITIONS DIAGNOSIS.** Perform cruise cancel conditions diagnosis. <Ref. to CC(H4SO)-10, Subaru Select Monitor.>	Is trouble code indicated?	Go to "List of Diagnostic Trouble Code (DTC)". <Ref. to CC(H4SO)-28, List of Diagnostic Trouble Code (DTC).>	Go to step **4.**
4	**CHECK CRUISE CONTROL SET OPERATION.** Check cruise control set operation.	Can cruise control be set while driving at 40 km/h (25 MPH)?	Go to step **5.**	Go to symptom 2. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
5	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure vehicle speed is held within set speed.	Is vehicle speed held within set speed ±3 km/h (±2 MPH) ?	Go to step **6.**	Go to symptom 3. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
6	**CHECK RESUME/ACCEL OPERATION.** Check RESUME/ACCEL operation.	Does vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **7.**	Go to symptom 4. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
7	**CHECK SET/COAST OPERATION.** Check SET/COAST operation.	Does vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **8.**	Go to symptom 5. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
8	**CHECK CANCEL OPERATION.** Check CANCEL operation.	Is cruise control released after CANCEL switch has been pressed?	Go to step **9.**	Go to symptom 6. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>

	Step	Check	Yes	No
9	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check cruise control release operation.	Is cruise control released after brake pedal has been depressed?	Go to step **10.**	Go to symptom 7. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>
10	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check cruise control release operation.	Is cruise control released after clutch pedal has been depressed? (MT)	Finish the diagnostics.	Go to symptom 8. <Ref. to CC(H4SO)-12, SYMPTOM CHART, Diagnostics Chart with Symptom.>

2. General Description

A: CAUTION

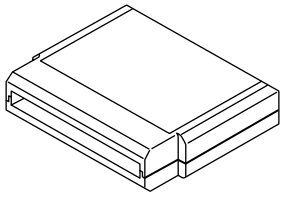
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the cruise control module and cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage airbag system wiring harness when servicing the cruise control module and cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

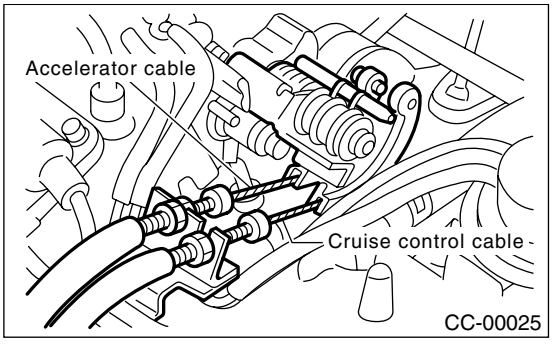
1. BATTERY

Measure battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

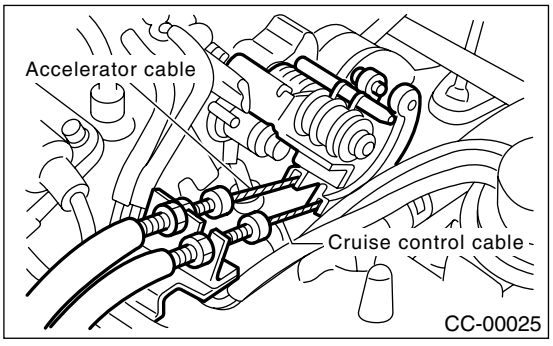
Specific gravity:
Above 1.260

2. CRUISE CONTROL CABLE



Check the cruise control cable installation.
If NG, install the cable securely.

3. ACCELERATOR CABLE

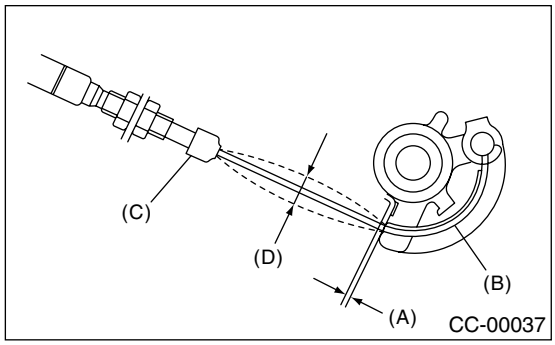


Check movement of the accelerator cable when the cruise control throttle is moved by hand.
If NG, check throttle cam.

4. THROTTLE CAM

Check that the throttle cam moves smoothly.
If NG, repair throttle cam.

5. CABLE FREE PLAY



Check that the clearance (A) between throttle cam (B) and lever or cable deflection (D) is within specifications.

Throttle cam-to-lever clearance:
0 — 1 mm (0 — 0.04 in)

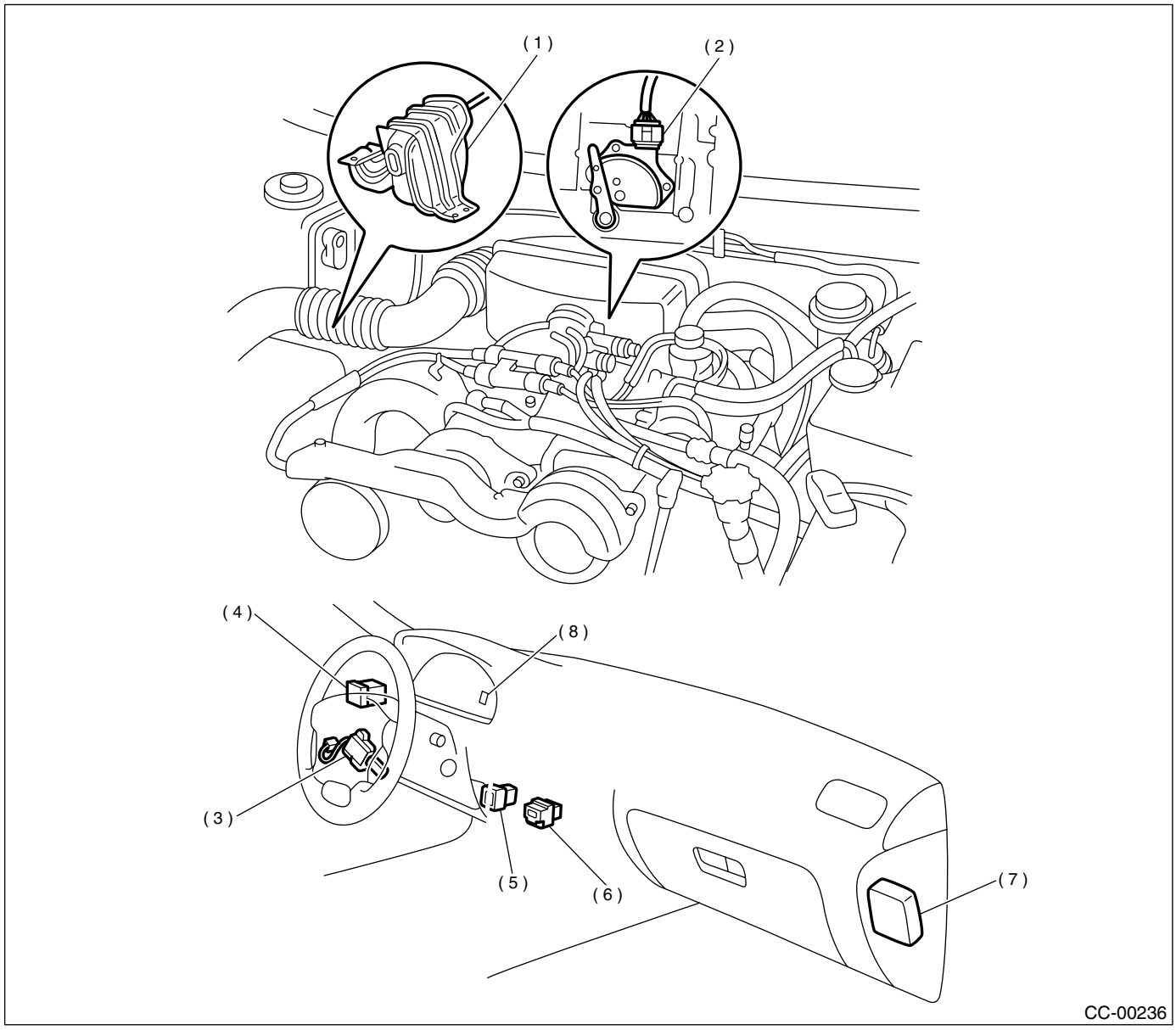
Inner cable deflection:
1 — 8 mm (0.04 — 0.31 in)

If NG, adjust the clearance or the deflection with the adjust nut.

NOTE:
Check that the cap (C) is positioned in the groove.

3. Electrical Components Location

A: LOCATION

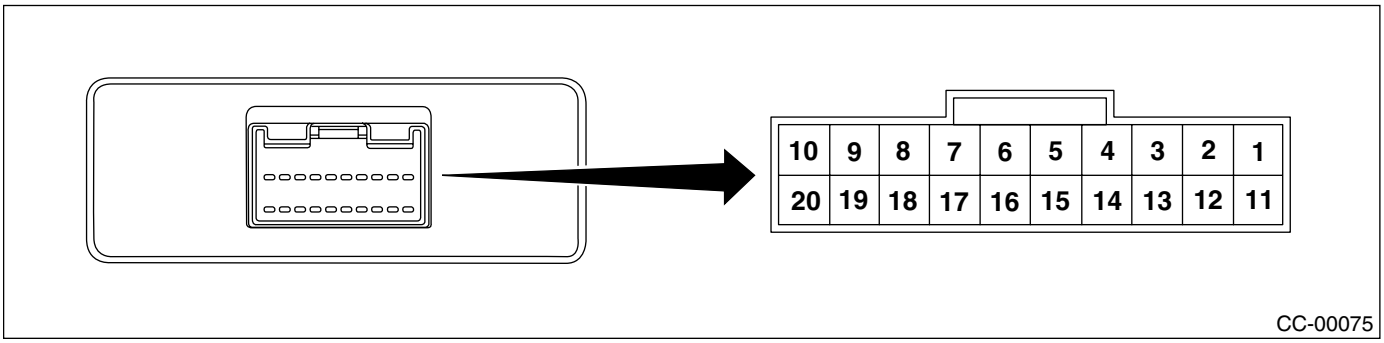


(1) Actuator
(2) Inhibitor switch (AT)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT)
(6) Stop and brake switch
(7) Cruise control module
(8) Cruise set indicator light

MEMO:

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Cruise Control Indicator Light	1	• Battery voltage is present when main switch is turned OFF. • "0" volt is present when main switch is turned ON.
Inhibitor switch (AT)	4	• Battery voltage is present when selector lever is other than "P" or "N" position. • "0" volt is present when selector lever is set to "P" or "N" position.
Cruise set indicator light	3	• "0" volt is present when cruise control is setted (cruise control is operating). • Battery voltage is present when cruise control is not setted (cruise contorol is not operating).
Motor B	5	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
Ground	6	—
Motor A	7	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
RESUME/ACCEL switch	9	• Battery voltage is present when command switch is turned to RESUME/ACCEL position. • "0" volt is present when command switch is released.
SET/COAST switch	10	• Battery voltage is present when command switch is turned to SET/COAST position. • "0" volt is present when command switch is released.
Main power supply	11	• Battery voltage is present when main switch is turned ON. • "0" volt is present when main switch is turned OFF.
Ignition switch	12	• Battery voltage is present when ignition switch is turned ON. • "0" volt is present when ignition switch is turned OFF.
Motor C	13	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
Motor clutch	14	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when vehicle is stopped.
Cruise control main switch	15	• Battery voltage is present during pressing the main switch. • "0" volt is present when main switch is released.
Brake switch	16	Leave clutch pedal released (MT), while cruise control main switch is turned ON. Then check that; • Battery voltage is present when brake pedal is released. • "0" volt is present when brake pedal is depressed. Additionally only in MT vehicle, keep the cruise control main switch to ON and leave brake pedal released. Then check that; • Battery voltage is present when clutch pedal is released. • "0" volt is present when clutch pedal is depressed.
Data link connector	17	—

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Data link connector	18	—
Vehicle speed sensor (MT) TCM (AT)	19	Lift-up the vehicle until all four wheels are raised off ground, and then rotate any wheel manually. Approx. “5” and “0” volt pulse signals are alternately input to cruise control module.
Stop light switch	20	Turn ignition switch to OFF. Then check that; • Battery voltage is present when brake pedal is depressed. • “0” volt is present when brake pedal is released.
NOTE: Voltage at terminals 5, 7, 13 and 14 cannot be checked unless vehicle is driving by cruise control operation.		

B: SCHEMATIC

<Ref. to WI-126, SCHEMATIC, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

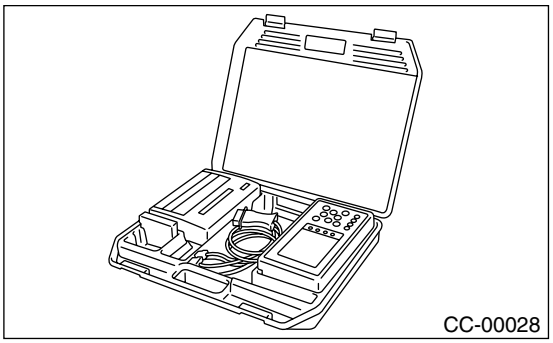
The on-board diagnosis function of the cruise control system uses an external Subaru Select Monitor.
The on-board diagnosis function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnosis
(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control module memory stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

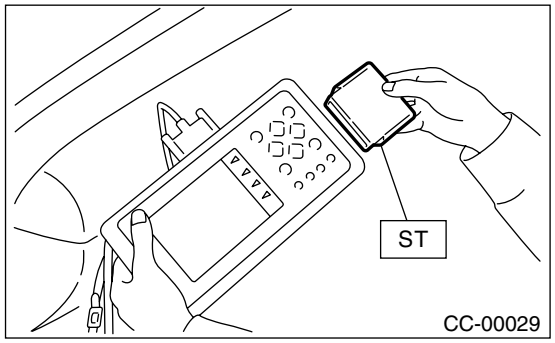
2) Real-time diagnosis
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare Subaru Select Monitor kit.

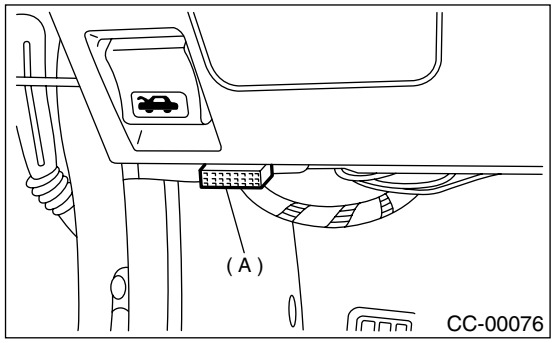

CC-00028

2) Connect diagnosis cable to Subaru Select Monitor.
3) Insert cartridge into Subaru Select Monitor. <Ref. to CC(H4SO)-4, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



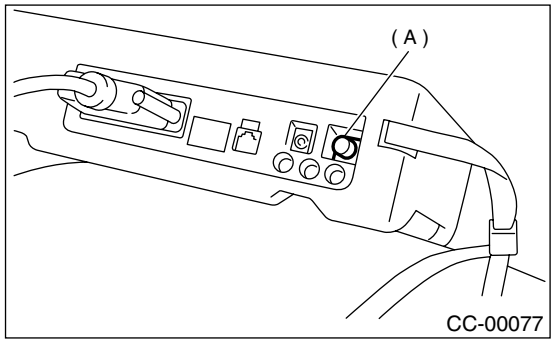
CC-00029

4) Connect Subaru Select Monitor to data link connector.
(1) Data link connector (A) is located in the lower portion of the instrument panel (on the driver's side).



CC-00076

(2) Connect diagnosis cable to data link connector.
5) Start engine and turn cruise control main switch to ON.
6) Turn Subaru Select Monitor switch (A) to ON.



CC-00077

7) On the «Main Menu» display screen, select the {All System Diagnosis} and press the [YES] key.

NOTE:
The diagnostic trouble code (DTC) is also shown in the {Each System Check} mode. This mode is called up on the «Cruise Control Diagnosis» display screen by selecting the item {Cancel Code(s) Display}.

8) Drive vehicle at least 40 km/h (25 MPH) with cruise speed set.
9) If cruise speed is canceled itself (without doing any cancel operations), a diagnostic trouble code (DTC) will appear on select monitor display.

CAUTION:
• A diagnostic trouble code (DTC) will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in vehicle to assist in diagnosis during driving.

NOTE:
Diagnostic trouble code (DTC) will be cleared by turning ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

1) Connect select monitor.
2) Turn ignition switch and cruise control main switch to ON.
3) Turn Subaru Select Monitor switch to ON.
4) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
5) On the «System Selection Menu» display screen, select the {Cruise Control} and press the [YES] key.
6) Press the [YES] key after displayed the information of engine type.
7) On the «Cruise Control Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON or OFF.)
• Turn ON/OFF the “SET/COAST” switch.
• Turn ON/OFF the “RESUME/ACCEL” switch.
• Depress/release the clutch pedal. (MT)
• Set the selector lever to P or N. (AT)

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to CC(H4SO)-28, List of Diagnostic Trouble Code (DTC).>

6. Diagnostics Chart with Symptom

A: SYMPTOM CHART

Symptom		Repair area	Reference
1	Cruise control main switch is not turned ON.	(1) Check power supply.	<Ref. to CC(H4SO)-14, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>
		(2) Check cruise control main switch.	<Ref. to CC(H4SO)-16, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics Chart with Symptom.>
2	Cruise set indicator light is not illuminated.	(1) Check cruise set indicator light.	<Ref. to CC(H4SO)-18, CHECK CRUISE SET INDICATOR LIGHT, Diagnostics Chart with Symptom.>
3	Cruise control cannot be set.	(1) Check SET/COAST switch.	<Ref. to CC(H4SO)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check stop light switch and brake switch.	<Ref. to CC(H4SO)-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(3) Check clutch switch (MT).	<Ref. to CC(H4SO)-24, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(4) Check inhibitor switch (AT).	<Ref. to CC(H4SO)-26, CHECK INHIBITOR SWITCH (AT), Diagnostics Chart with Symptom.>
		(5) Check vehicle speed sensor.	<Ref. to CC(H4SO)-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(6) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(7) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
4	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	(1) Check vehicle speed sensor.	<Ref. to CC(H4SO)-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(2) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
5	Vehicle speed does not increase or does not return to set speed after RESUME/ACCEL switch has been pressed.	(1) Check RESUME/ACCEL switch.	<Ref. to CC(H4SO)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
6	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check SET/COAST switch.	<Ref. to CC(H4SO)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
7	Cruise control is not released after CANCEL switch has been pressed.	(1) Check CANCEL switch.	<Ref. to CC(H4SO)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
8	Cruise control is not released after brake pedal has been depressed.	(1) Check stop light switch and brake switch.	<Ref. to CC(H4SO)-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

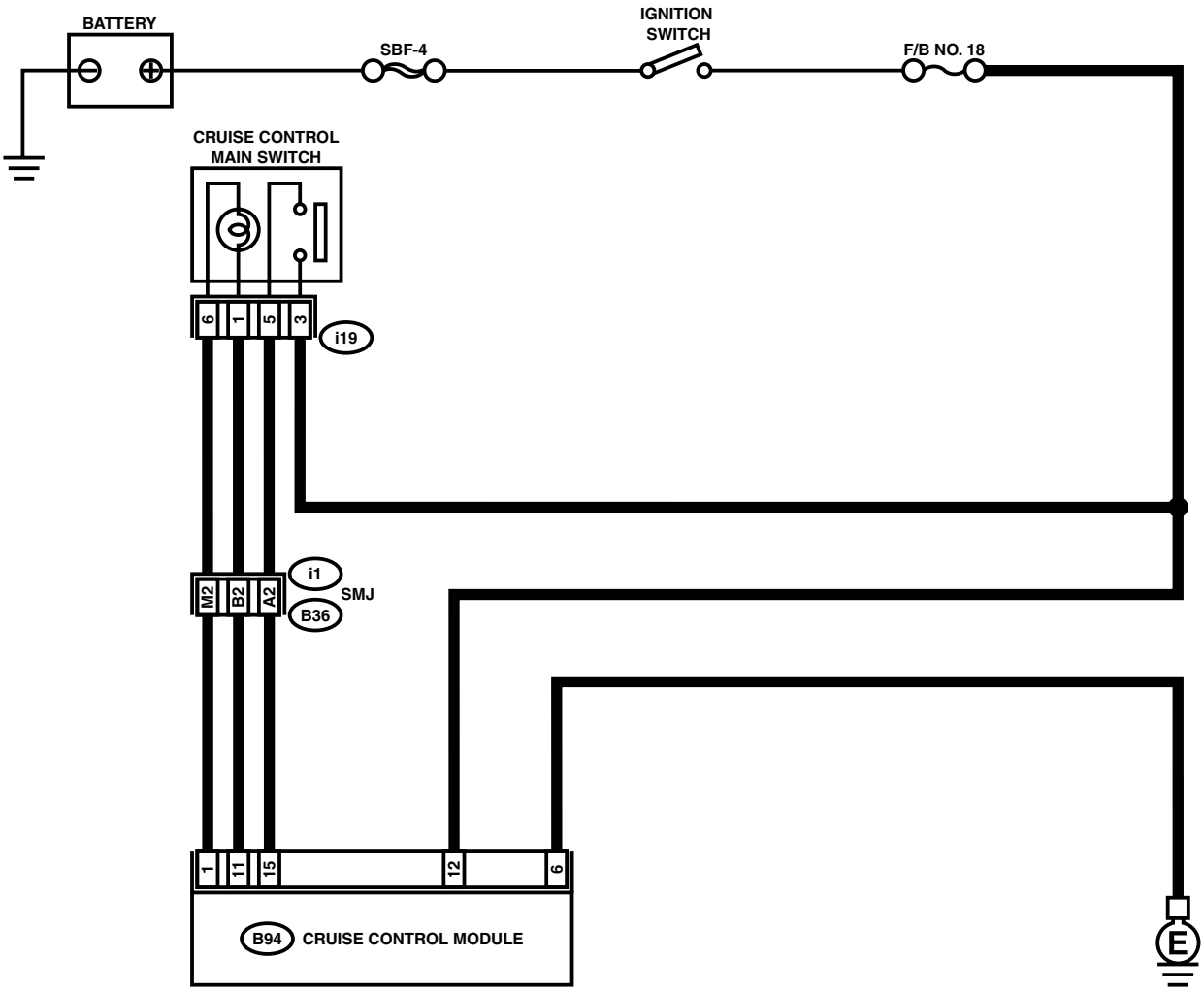
Symptom		Repair area	Reference
9	Cruise control is not released after clutch pedal has been depressed (MT).	(1) Check clutch switch.	<Ref. to CC(H4SO)-24, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(2) Check motor drive system.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check motor clutch drive system.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

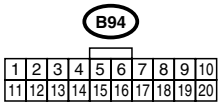
B: CHECK POWER SUPPLY

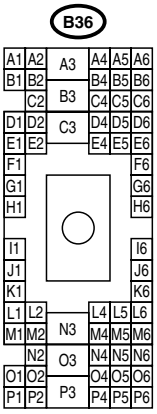
TROUBLE SYMPTOM:

Cruise control cannot be set, and indicator does not come on. (When main switch is pressed.)

WIRING DIAGRAM:







CC-00078

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Turn ignition switch ON. 4) Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	• Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control module and fuse & relay box.
2	**CHECK GROUND CIRCUIT.** 1) Turn ignition switch OFF. 2) Measure resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 6 — Chassis ground:***	Is the measured value less than 10 Ω?	Power supply and ground circuit are OK.	Repair harness.

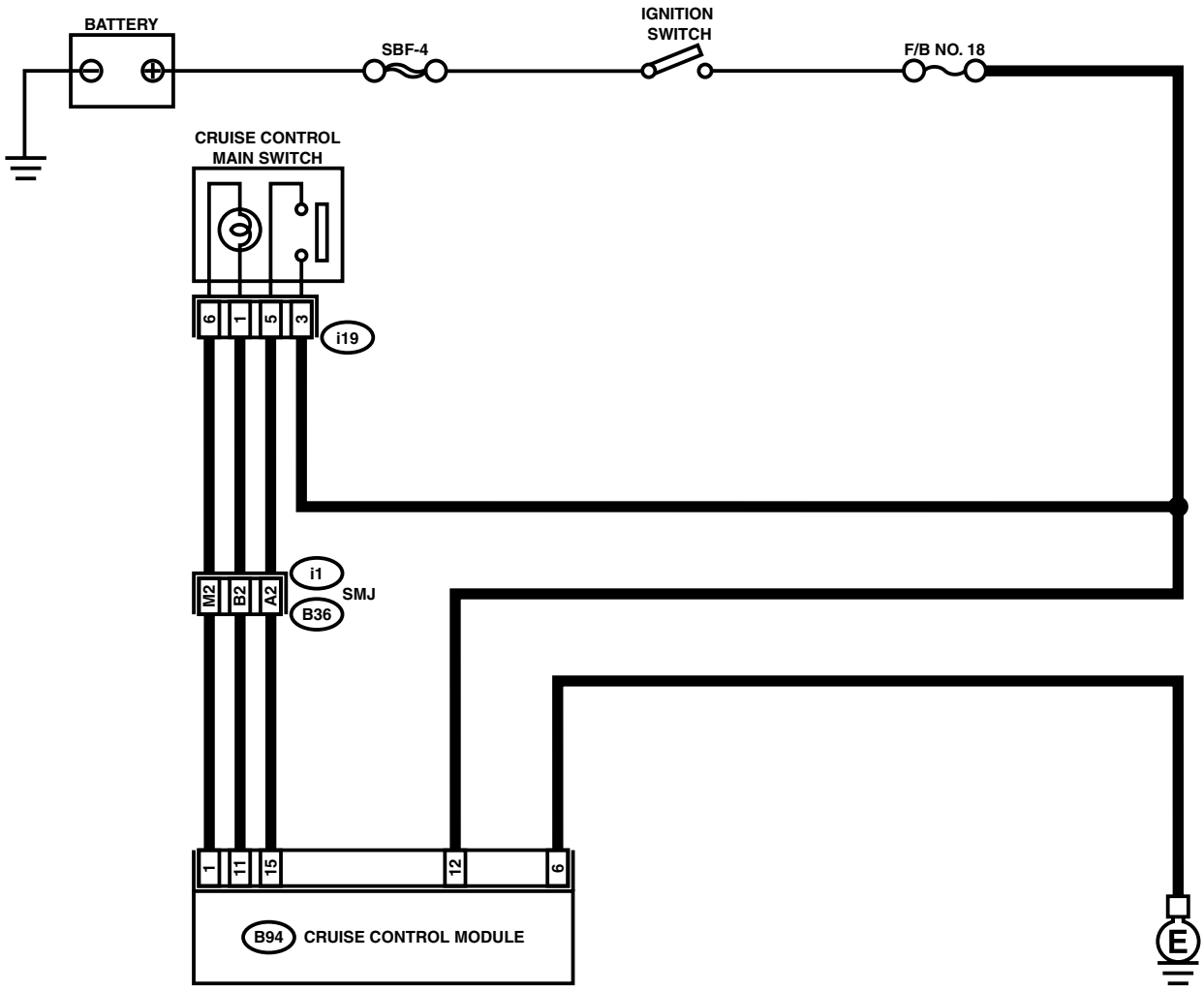
C: CHECK CRUISE CONTROL MAIN SWITCH

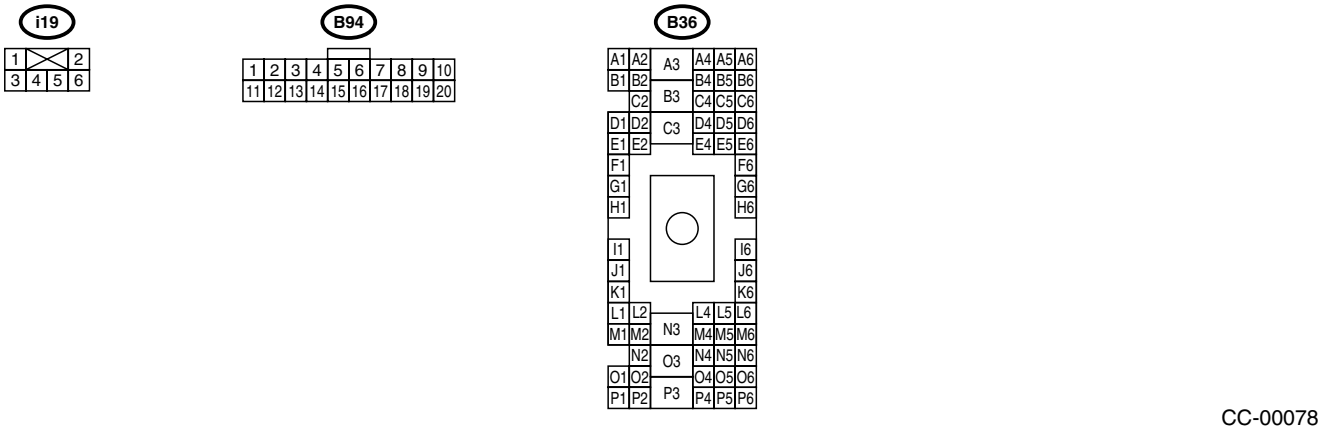
TROUBLE SYMPTOM:

Cruise control main switch is not turned ON and cruise control cannot be set.

NOTE:
When the main relay (built-in cruise control module) operates, the main switch circuit is in normal condition.
The main relay operation can be checked by hearing the operation sounds.
This operation sounds will be heard when ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:





CC-00078

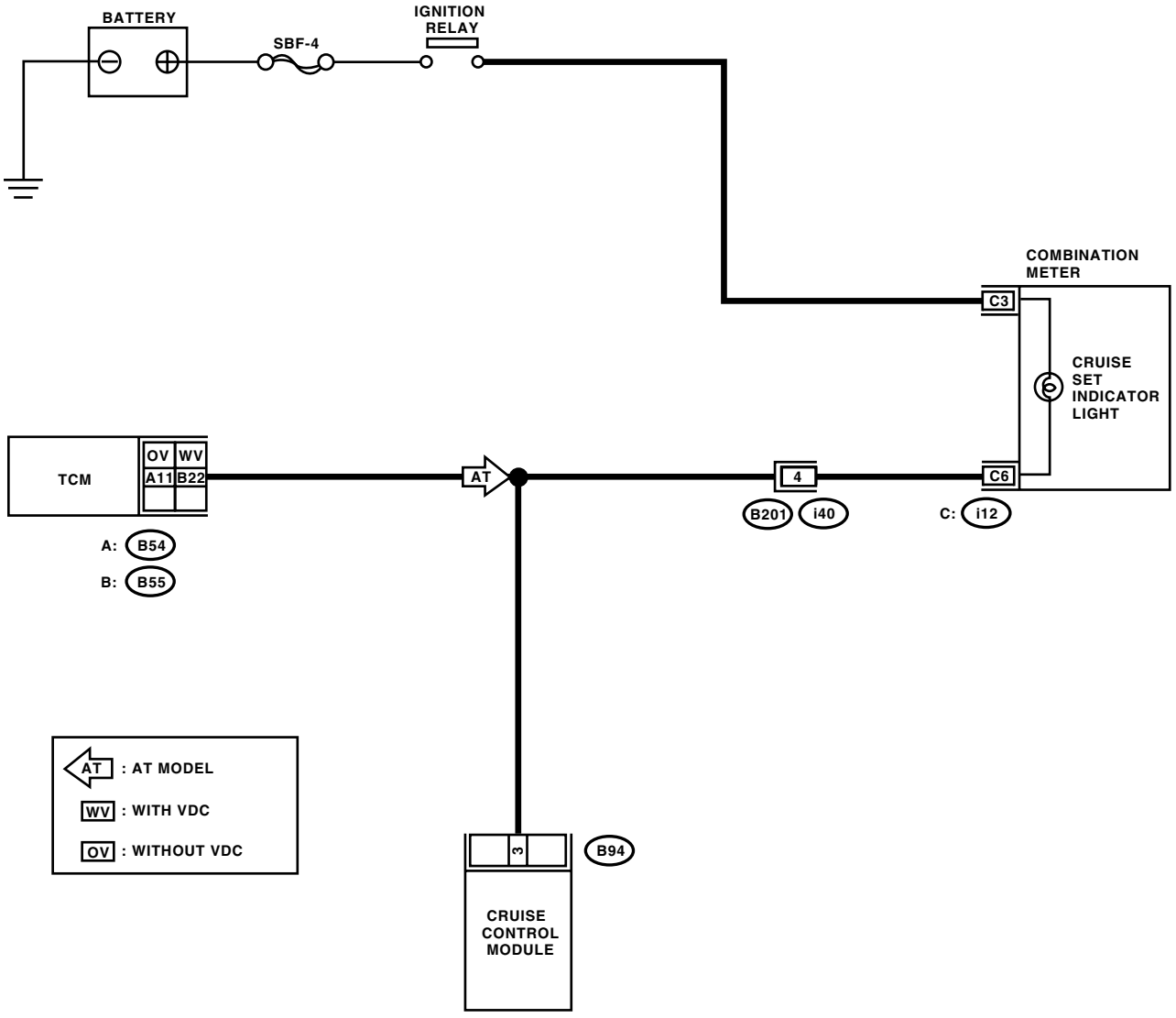
	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn ignition switch OFF. 2) Disconnect cruise control main switch harness connector. 3) Turn ignition switch ON. 4) Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i19) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	• Check fuse No. 18 (in fuse & relay box). • Check harness for open or short between cruise control main switch and fuse & relay box.
2	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Measure resistance between cruise control module harness connector terminal and cruise control main switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 15 — (i19) No. 5:*** ***(B94) No. 1 — (i19) No. 6:*** ***(B94) No. 11 — (i19) No. 1:***	Is the measured value less than 10 Ω?	Go to step **3.**	Repair harness.
3	**CHECK CRUISE CONTROL MAIN SWITCH.** Remove and check cruise control main switch. <Ref. to CC-7, Cruise Control Main Switch.>	Is cruise control main switch OK?	Replace cruise control module.	Replace cruise control main switch.

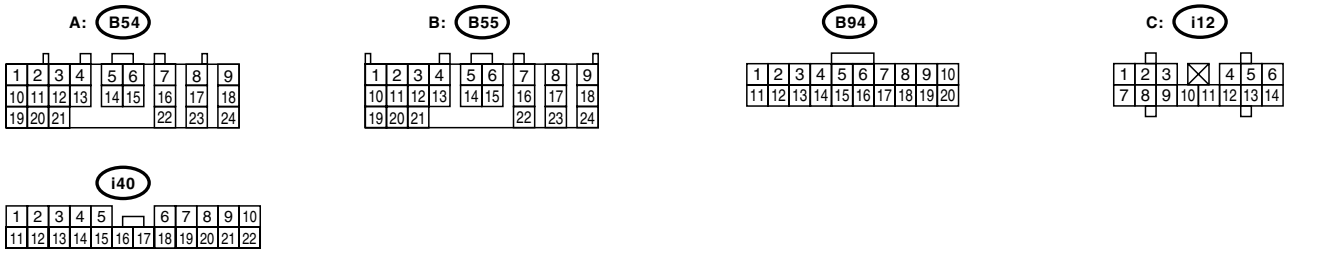
D: CHECK CRUISE SET INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control cannot be set, but cruise set indicator light dose not illuminate.

WIRING DIAGRAM:





CC-00237

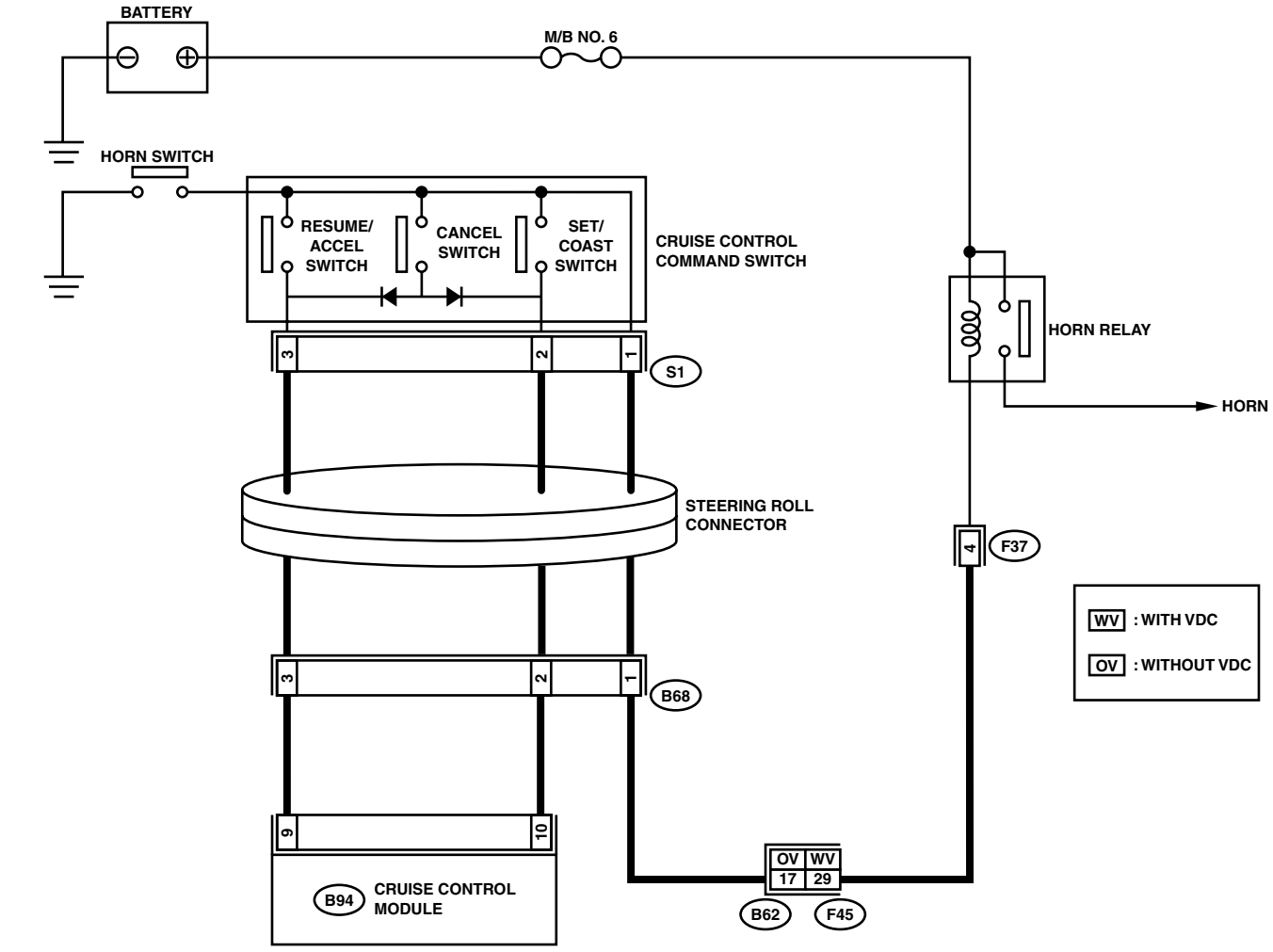
	Step	Check	Yes	No
1	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between combination meter and ignition relay.
2	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(i12) No. 61 — (B94) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** Ground the cruise control module harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B94) No. 3 — Chassis ground:***	Does the cruise set indicator light illuminate?	Replace the cruise control module.	Check the cruise set indicator light bulb in combination meter, and replace it if malfunction occurred. No malfunction found, replace the printed circuit of combination meter.

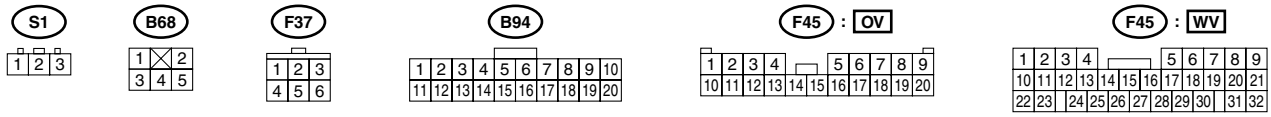
E: CHECK CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00079

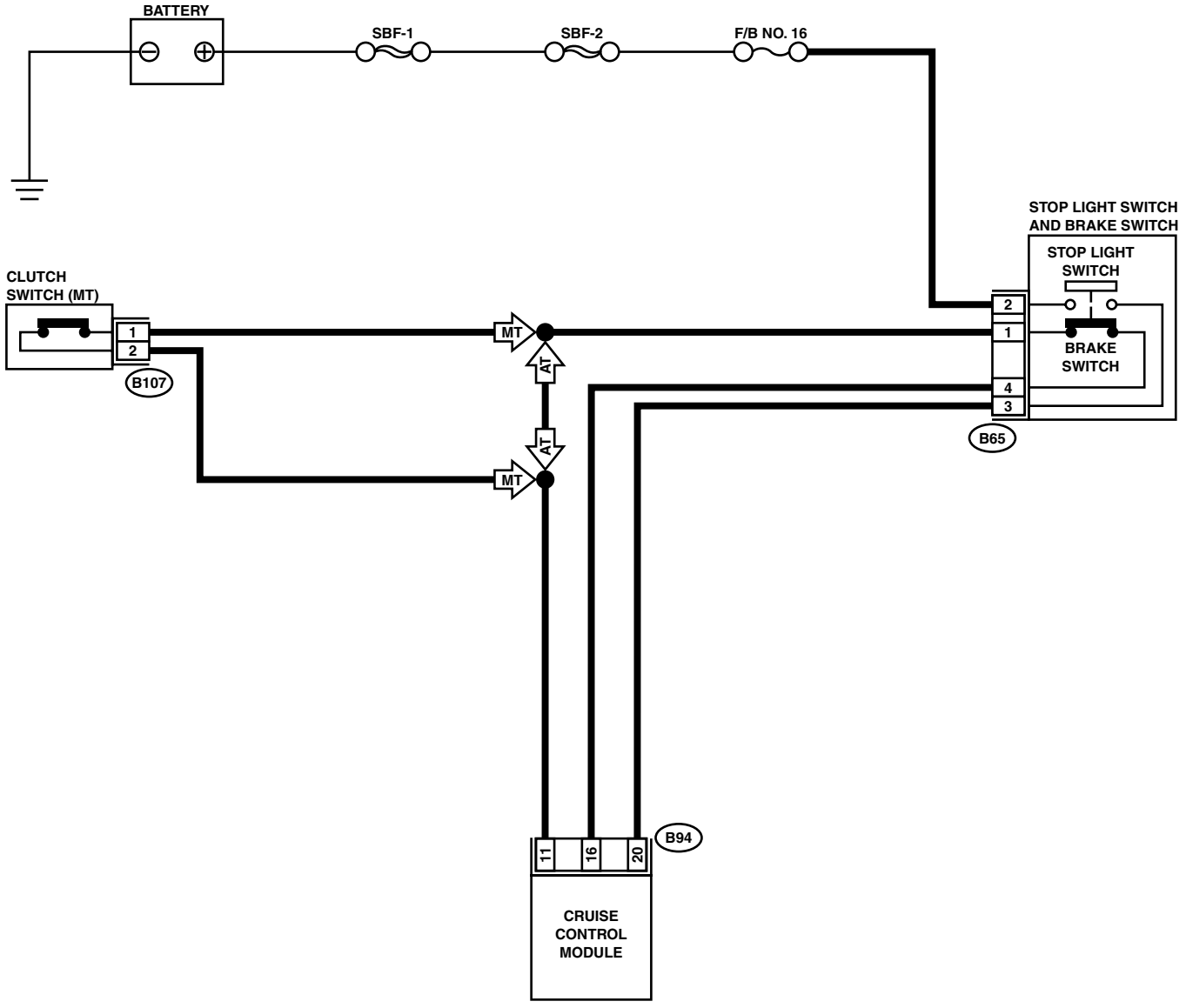
	Step	Check	Yes	No
1	**CHECK SET/COAST SWITCH CIRCUIT.** 1) Turn ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Measure voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 0 V, when SET/COAST switch is not pressed? Is the measured value less than 10 V, when SET/COAST switch is not pressed?	Go to step **2.**	Go to step **4.**
2	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 9 (+) — Chassis ground (–):***	Is the measured value less than 0 V, when RESUME/ACCEL switch is not pressed? Is the measured value less than 10 V, when RESUME/ACCEL switch is not pressed?	Go to step **3.**	Go to step **4.**
3	**CHECK CANCEL SWITCH CIRCUIT.** Measure voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 9 (+) — Chassis ground (–):*** ***(B94) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 0 V, when CANCEL switch is not pressed? Is the measured value less than 10 V, when CANCEL switch is not pressed?	Cruise control command switch circuit is OK.	Go to step **4.**
4	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check horn operation.	Does horn sound?	Go to step **5.**	• Check fuse No. 6 (in main fuse box). • Check horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check harness for open or short between cruise control command switch and fuse & relay box.
5	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check cruise control command switch. <Ref. to CC-8, Cruise Control Command Switch.>	Is cruise control command switch OK?	Check harness between cruise control command switch and cruise control module.	Replace cruise control command switch.

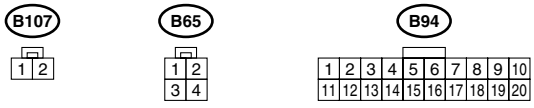
F: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00080

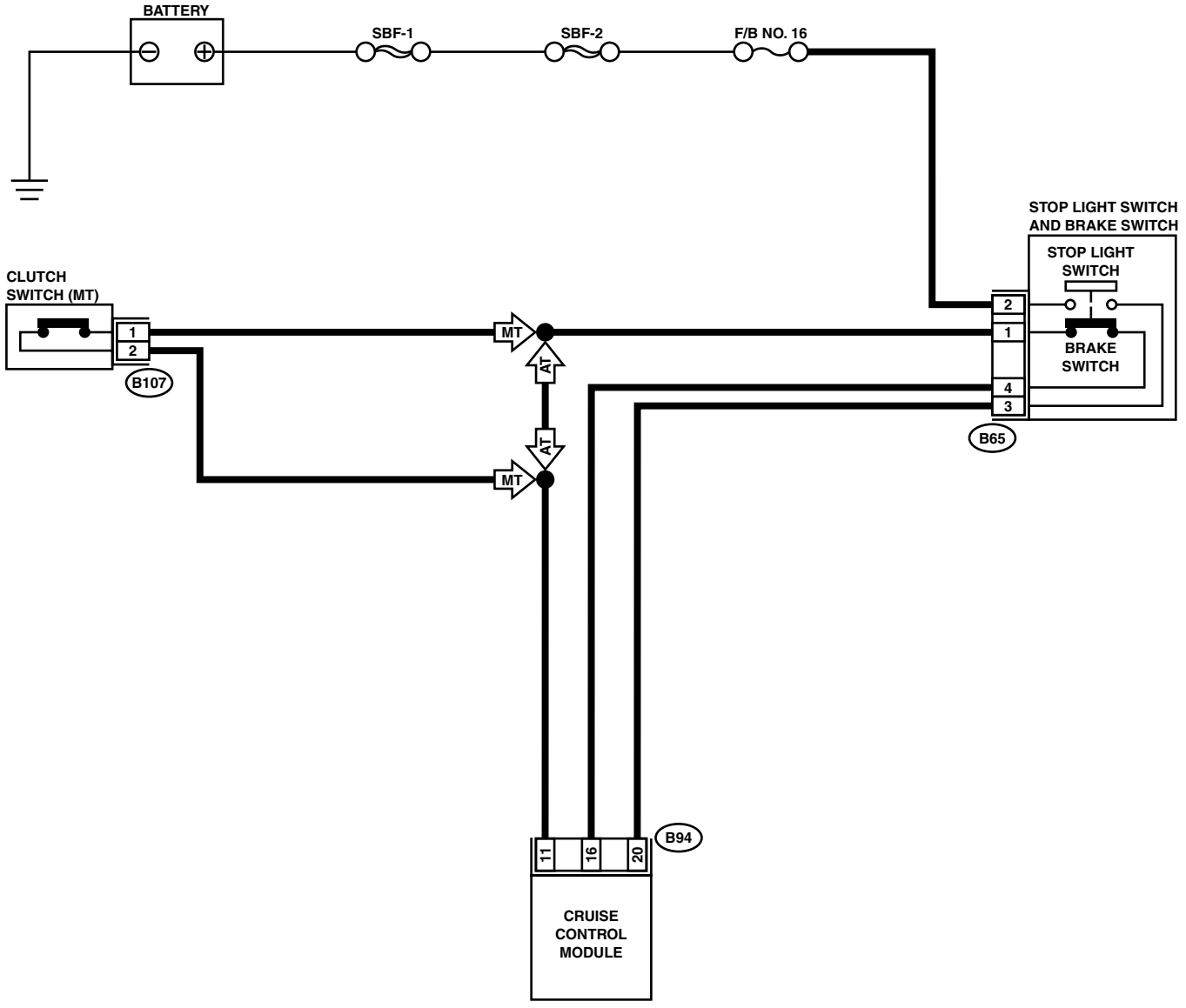
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn ignition switch OFF. 2) Disconnect stop light switch and brake switch harness connector. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	• Check fuse No. 16 (in fuse & relay box). • Check harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 1 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **3.**	• Check harness for open or short between stop light/brake switch and cruise control module (AT). • Check clutch switch and the circuit (MT).
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn cruise control main switch and ignition switch OFF. 2) Disconnect cruise control module harness connector. 3) Measure resistance between cruise control module harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 20 — (B65) No. 3:*** ***(B94) No. 16 — (B65) No. 4:***	Is the measured value less than 10 Ω?	Go to step **4.**	Repair harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check stop light switch and brake switch. <Ref. to CC-9, Stop and Brake Switch.>	Are stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace stop light switch and brake switch.

G: CHECK CLUTCH SWITCH (MT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00080

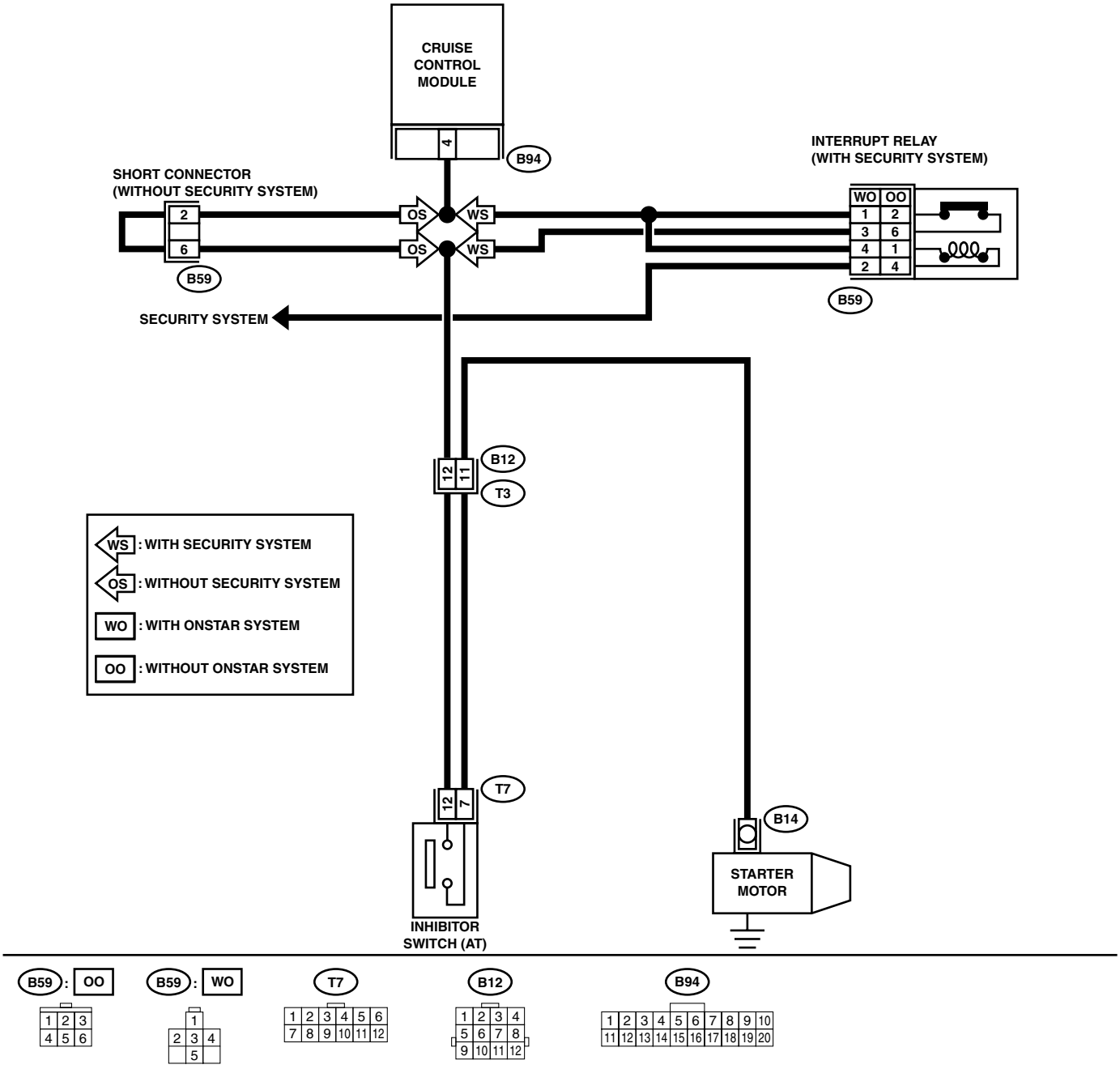
	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn ignition switch OFF. 2) Disconnect clutch switch harness connector. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 2 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	Check harness for open or short between clutch switch and cruise control module.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn cruise control main switch and ignition switch OFF. 2) Disconnect stop light switch and brake switch harness connector. 3) Measure resistance between clutch switch harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B107) No. 1 — (B65) No. 1:***	Is the measured value less than 10 Ω?	Go to step **3.**	Repair harness.
3	**CHECK CLUTCH SWITCH.** Remove and check clutch switch. <Ref. to CC-10, Clutch Switch.>	Is clutch switch OK?	Clutch switch circuit is OK.	Replace clutch switch.

H: CHECK INHIBITOR SWITCH (AT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00081

	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn ignition switch OFF. 2) Disconnect inhibitor switch harness connector. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	Check harness for open or short between inhibitor switch and cruise control module.
2	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn cruise control main switch and ignition switch OFF. 2) Disconnect starter motor harness connector. 3) Measure resistance between inhibitor switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 7 — (B14) No. 1:***	Is the measured value less than 10 Ω?	Go to step **3.**	Repair harness.
3	**CHECK INHIBITOR SWITCH.** Remove and check inhibitor switch. <Ref. to CC-11, Inhibitor Switch.>	Is inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace inhibitor switch.

7. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Reference
21	Inner relay is seized.	Cruise control module inner relay is seized when main switch is OFF.	<Ref. to CC(H4SO)-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC(H4SO)-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
24	Cruise control module is abnormal.	Two vehicle speed values stored in cruise control module memory are not the same.	<Ref. to CC(H4SO)-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC(H4SO)-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC(H4SO)-33, DTC 28 WIRING HARNESS OPENED., Diagnostics Chart with Trouble Code.>
35	Motor drive system is abnormal.	• Motor output circuit is open or shorted. • Motor drive circuit is open or shorted.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
36	Trouble of motor turning speed	Motor turning speed is low.	<Ref. to CC(H4SO)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
37	Motor clutch drive system is abnormal.	• Motor clutch output circuit is open or shorted. • Motor clutch drive circuit is open or shorted.	<Ref. to CC(H4SO)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC(H4SO)-38, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY., Diagnostics Chart with Trouble Code.>
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC(H4SO)-38, DTC 39 MOTOR IS OVERLOADED., Diagnostics Chart with Trouble Code.>
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC(H4SO)-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>

8. Diagnostics Chart with Trouble Code

A: DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM

DIAGNOSIS:

- Poor welding of built-in relay of cruise control module.
- Failure of built-in CPU RAM of cruise control module.

TROUBLE SYMPTOM:

- Cruise control is canceled and memorized cruise speed is also canceled.
- Once cruise control is canceled, cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:
Check input/output signal and vehicle speed signal with select monitor. When signals are in good condition, failure is in cruise control module. (Check power supply and ground conditions of cruise control module.)

B: DTC 22 VEHICLE SPEED SENSOR

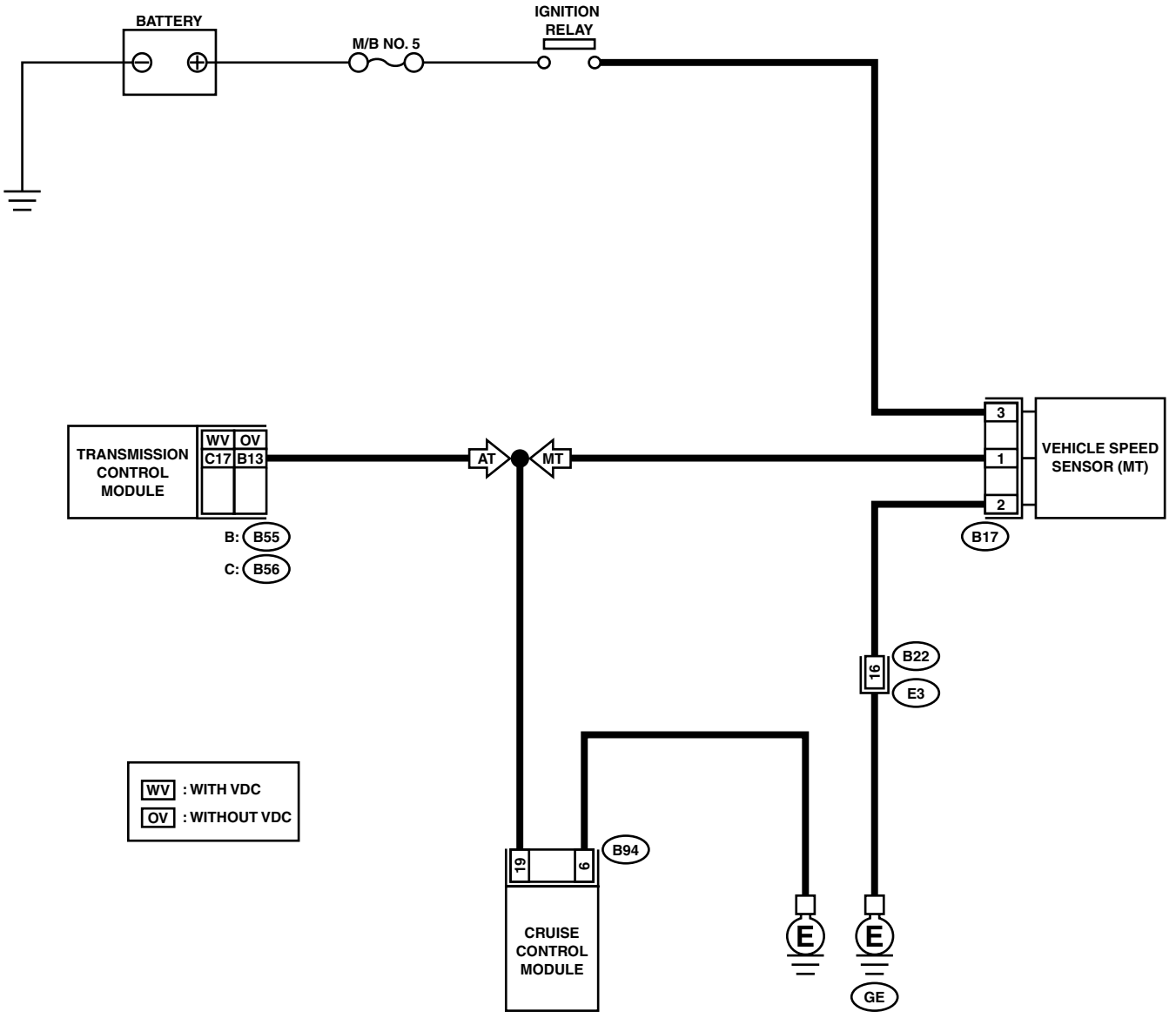
DIAGNOSIS:

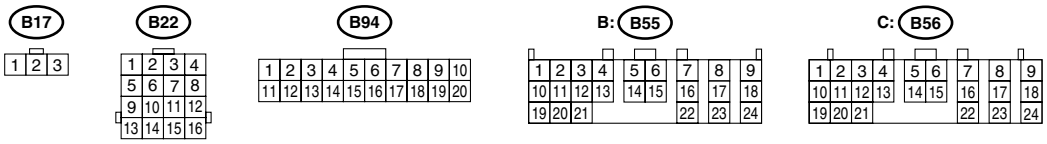
Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00082

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type MT?	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect harness connector from vehicle speed sensor. 3) Turn ignition switch to ON. 4) Measure voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **3.**	Check harness for open or short between ignition relay and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR.** 1) Turn ignition switch to OFF. 2) Disconnect harness connector from cruise control module. 3) Measure resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. ***Connector & terminal*** ***(B17) No. 1 — (B94) No. 19:***	Is the measured value less than 10 Ω?	Go to step **4.**	Repair harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** Measure resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 (+) — Engine ground (–):***	Is the measured value less than 10 Ω?	Go to step **5.**	Repair harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1) Connect harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure voltage between cruise control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 19 (+) — Chassis ground (–):***	Is the measured value less than 0V or more than 5 V?	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Replace vehicle speed sensor.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.** 1) Turn ignition switch to OFF. 2) Disconnect harness connector from transmission control module and cruise control module. 3) Measure resistance between cruise control module harness connector terminal and transmission control module harness connector terminal. ***Connector & terminal*** ***Without VDC:*** ***(B94) No. 19 — (B55) No. 13:*** ***With VDC:*** ***(B94) No. 19 — (B56) No. 17:***	Is the measured value less than 10 Ω?	Go to step **7.**	Repair harness.
7	**CHECK TRANSMISSION CONTROL MODULE.** 1) Connect harness connector to transmission control module. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to be caught by the running wheels.** 4) Measure voltage between transmission control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Without VDC:*** ***(B55) No. 13 (+) — Chassis ground (–):*** ***With VDC:*** ***(B56) No. 17 (+) — Chassis ground (–):***	Is the measured value less than 0V or more than 5 V?	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Replace transmission control module. <Ref. to 4AT-79, Transmission Control Module (TCM).>

C: DTC 28 WIRING HARNESS OPENED.

	Step	Check	Yes	No
1	**CHECK BATTERY.** Measure battery specific gravity of electrolyte.	Is the measured battery spesific qravity more than 1.250?	Go to step **2.**	Charge or replace battery. Go to step **2.**
2	**CHECK FUSES, CONNECTORS AND HARNESSES.** Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.	Is there any malfuncton of main fuse, fuse, harness, connector and grounding?	End of inspection.	Repair or replace faulty parts.

D: DTC 35 AND 36 ACTUATOR MOTOR

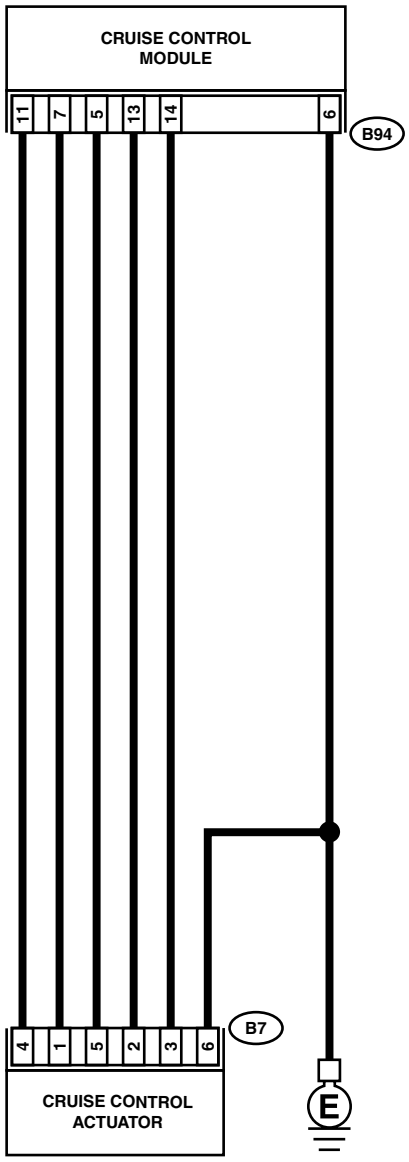
DIAGNOSIS:

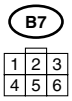
Open or poor contact of cruise control actuator motor.

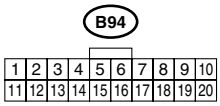
TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:







CC-00083

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn ignition switch OFF. 2) Disconnect harness connector from cruise control actuator. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	Check harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn ignition switch and cruise control main switch OFF. 2) Measure resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is the measured value less than 10 Ω?	Go to step **3.**	Repair harness.
3	**MEASURE RESISTANCE OF ACTUATOR.** Measure resistance of cruise control actuator motor. ***Terminals*** ***No. 4 — No. 1:*** ***No. 4 — No. 2:*** ***No. 4 — No. 5:***	Is the measured value approximately 5 Ω?	Go to step **4.**	Replace cruise control actuator. <Ref. to CC-5, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1) Disconnect harness connector from cruise control module. 2) Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 1 — (B94) No. 7:***	Is the measured value less than 10 Ω?	Go to step **5.**	Repair harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 5 — (B94) No. 5:***	Is the measured value less than 10 Ω?	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Repair harness.

E: DTC 37 ACTUATOR MOTOR CLUTCH

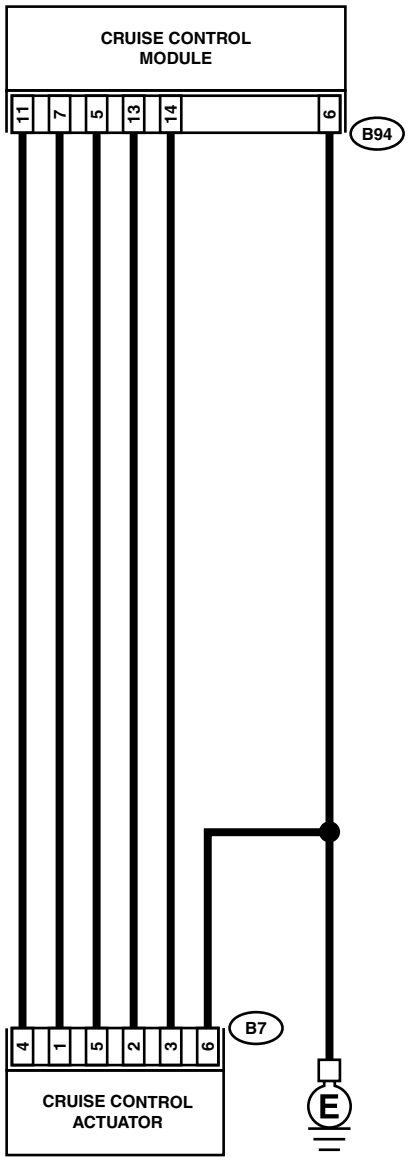
DIAGNOSIS:

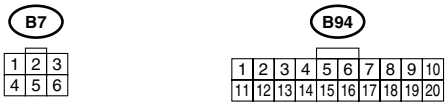
Open or poor contact of cruise control actuator motor clutch.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00083

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn ignition switch OFF. 2) Disconnect harness connector from cruise control actuator. 3) Turn ignition switch ON. 4) Turn cruise control main switch ON. 5) Measure voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (–):***	Is the measured value less than 10 V?	Go to step **2.**	Check harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn ignition switch and cruise control main switch OFF. 2) Measure resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is the measured value less than 10 Ω?	Go to step **3.**	Repair harness.
3	**MEASURE RESISTANCE OF ACTUATOR CLUTCH.** Measure resistance of cruise control actuator clutch. ***Terminals*** ***No. 3 — No. 6:***	Is the measured value approximately 39 Ω?	Go to step **4.**	Replace cruise control actuator. <Ref. to CC-5, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1) Disconnect harness connector from cruise control module. 2) Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 2 — (B94) No. 13:***	Is the measured value less than 10 Ω?	Go to step **5.**	Repair harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 3 — (B94) No. 14:***	Is the measured value less than 10 Ω?	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Repair harness.

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY.

	Step	Check	Yes	No
1	**CHECK ACTUATOR MOTOR.** 1) Turn ignition switch to OFF. 2) Disconnect harness connector from cruise control actuator. 3) Remove cruise control actuator from mounting bracket. 4) Pull cable by hand to check for looseness or status of inner gear engagement.	Are foreign particles caught in inner gear or does inner gear engage and disengage improperly?	Replace cruise control actuator. <Ref. to CC-5, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC(H4SO)-5, CABLE FREE PLAY, INSPECTION, General Description.>

G: DTC 39 Motor Is Overloaded.

	Step	Check	Yes	No
1	**CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR.** 1) Connect Subaru Select Monitor to data link connector. 2) Try to drive the vehicle while operating the cruise control system. 3) Measure the operation current to the cruise control actuator motor.	Is the current valve less than 10 A?	Replace cruise control module. <Ref. to CC-6, Cruise Control Module.>	Check the power supply circuit. <Ref. to CC(H4SO)-14, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>

CRUISE CONTROL SYSTEM (DIAGNOSTICS) CC(H4SO U5)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for H4SOHC U5 model are described in CC(H4DOTC) section. <Ref. to CC(H4DOTC)-2, Basic Diagnostic Procedure.>

CRUISE CONTROL SYSTEM (DIAGNOSTICS) CC(H4DOTC)

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8. Diagnostic Procedure with DTC 18

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK MALFUNCTION INDICATOR LIGHT.** Check the malfunction indicator light illuminates.	Does the malfunction indicator light illuminate?	Go to step **5.**	Go to step **2.**
2	**CHECK CRUISE INDICATOR LIGHT.** Check the cruise indicator light blinks.	Does the cruise indicator light blink?	Go to step **5.**	Go to step **3.**
3	**CHECK CRUISE CONTROL MAIN SWITCH OPERATION.** Check the cruise control main switch operation. (Check the cruise indicator light illuminates.)	Is the cruise control main switch set to on? (Does the cruise indicator light illuminate?)	Go to step **4.**	Go to symptom 1. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control set operation.	Can the cruise control be set while driving at 40 km/h (25 MPH)?	Go to step **6.**	Go to step **5.**
5	**PERFORM CRUISE CONTROL CANCEL CONDITION DIAGNOSIS.** Perform the cruise control cancel condition diagnosis.	Are any DTC indicated?	Go to “List of DTC”. <Ref. to CC(H4DOTC)-16, List of DTC.>	Go to symptom 2. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
6	**CHECK CRUISE SET INDICATOR LIGHT.** Check the cruise set indicator light illuminates.	Does the cruise set indicator light illuminate?	Go to step **7.**	Go to symptom 3. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
7	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure the vehicle speed is held within set speed.	Is the vehicle speed held within set speed ±3 km/h (±2 MPH)?	Go to step **8.**	Go to symptom 4. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
8	**CHECK RESUME/ACCEL OPERATION.** Check the RESUME/ACCEL switch operation.	Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **9.**	Go to symptom 5. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
9	**CHECK SET/COAST OPERATION.** Check the SET/COAST switch operation.	Does the vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **10.**	Go to symptom 6. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>

	Step	Check	Yes	No
10	**CHECK CANCEL OPERATION.** Check the CANCEL switch operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step **11.**	Go to symptom 7. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
11	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after brake pedal has been depressed?	Go to step **12.**	Go to symptom 8. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
12	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after clutch pedal has been depressed?	Go to step **13.**	Go to symptom 9. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
13	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after shifting to neutral position?	Finish the diagnosis.	Go to symptom 10. <Ref. to CC(H4DOTC)-11, SYMPTOM CHART, Diagnostic Procedure with Symptom.>

2. General Description

A: CAUTION

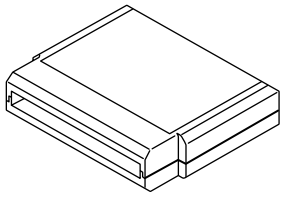
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit T ester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

1. BATTERY

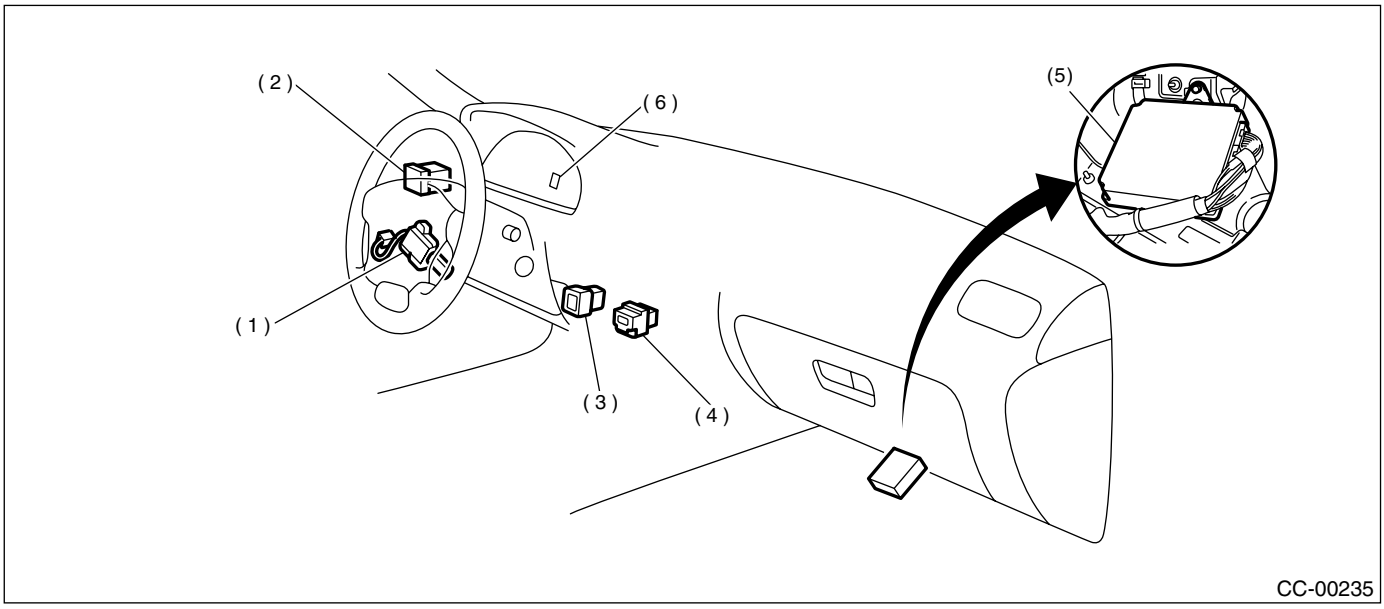
Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

Specific gravity:
Above 1.260

3. Electrical Components Location

A: LOCATION

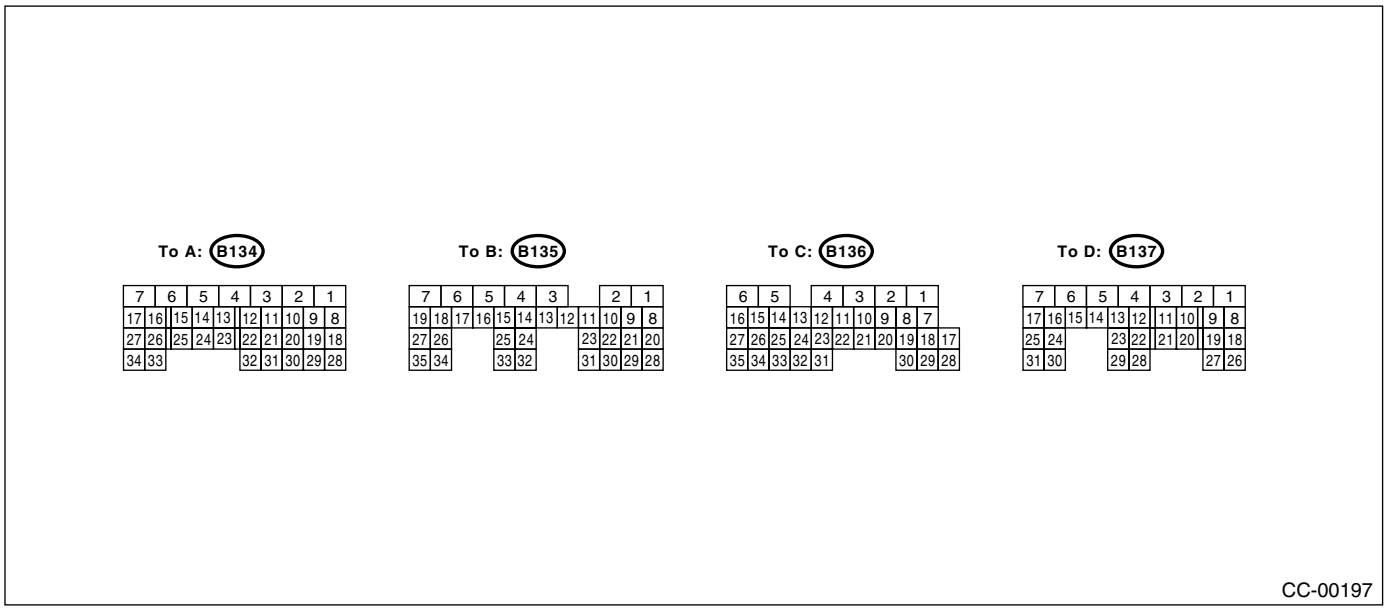


(1) Engine control module (ECM)
(2) Cruise control command switch
(3) Clutch switch
(4) Stop light and brake switch
(5) Cruise set indicator light

4. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION

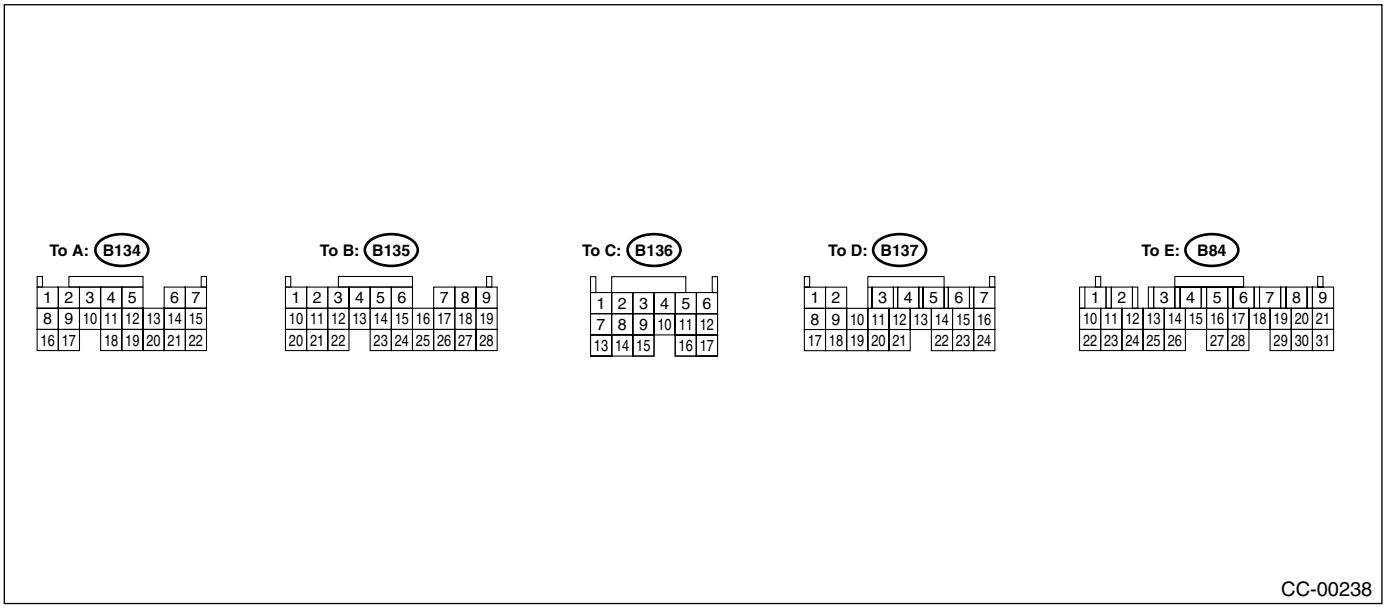
1. TURBO MODEL



Content		Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Clutch switch		A1	• Battery voltage is present when the clutch pedal is released. • “0” volt is present when the clutch pedal is depressed.
Cruise set indicator light		A16	(Press the main switch and drive the vehicle at 40 km/h (25 MPH) or more.) • Battery voltage is present when the set switch is turned to OFF. • “0” volt is present when the set switch is turned to ON.
Cruise indicator light		A15	• Battery voltage is present when the main switch is turned to OFF. • “0” volt is present when the main switch is turned to ON.
Main power supply	VB (CONTROL 1) VB (CONTROL 2)	B6 B5	• Battery voltage is present when the main power supply is turned to ON. • “0” volt is present when the main power supply is turned to OFF.
Vehicle speed signal		B27	Lift-up the vehicle until all four wheels are raised off the ground, and then rotate any wheel manually. Approx. “5 V” and “0 V” pulse signals are alternately input to ECM.
SET/COAST switch		C11	• Battery voltage is present when the command switch is turned to SET/COAST position. • “0” volt is present when the command switch is released.
RESUME/ACCEL switch		C10	• Battery voltage is present when the command switch is turned to RESUME/ACCEL position. • “0” volt is present when the command switch is released.
Brake switch 1 (Brake switch)		C9	• Battery voltage is present when the brake pedal is released. • “0” volt is present when the brake pedal is depressed.
Brake switch 2 (Stop light switch)		C8	• Battery voltage is present when the brake pedal is depressed. • “0” volt is present when the brake pedal is released.
Main switch		C7	• Battery voltage is present while the main switch is depressed or is turned to ON. • “0” volt is present when the main switch is turned to OFF.
Ground	GND (CONTROL 1) GND (CONTROL 2)	D2 D1	—
Ignition switch		D15	• Battery voltage is present with the ignition switch is turned to ON. • “0” volt is present when the ignition switch is turned to OFF.

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Neutral switch	D9	• Battery voltage is present when the shift lever is in anywhere except neutral position. • "0" volt is present when the shift lever is in neutral position.

2. SOHC U5 MODEL



Content		Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Clutch switch		A12	• Battery voltage is present when the clutch pedal is released. • "0" volt is present when the clutch pedal is depressed.
Cruise set indicator light		E27	(Press the main switch and drive the vehicle at 40 km/h (25 MPH) or more.) • Battery voltage is present when the set switch is turned to OFF. • "0" volt is present when the set switch is turned to ON.
Cruise indicator light		E15	• Battery voltage is present when the main switch is turned to OFF. • "0" volt is present when the main switch is turned to ON.
Main power supply	VB (CONTROL 1) VB (CONTROL 2)	E10	• Battery voltage is present when the main power supply is turned to ON. • "0" volt is present when the main power supply is turned to OFF.
Vehicle speed signal		A14	Lift-up the vehicle until all four wheels are raised off the ground, and then rotate any wheel manually. Approx. "5 V" and "0 V" pulse signals are alternately input to ECM.
SET/COAST switch		E14	• Battery voltage is present when the command switch is turned to SET/COAST position. • "0" volt is present when the command switch is released.
RESUME/ACCEL switch		E26	• Battery voltage is present when the command switch is turned to RESUME/ACCEL position. • "0" volt is present when the command switch is released.
Brake switch 1 (Brake switch)		E25	• Battery voltage is present when the brake pedal is released. • "0" volt is present when the brake pedal is depressed.
Brake switch 2 (Stop light switch)		E24	• Battery voltage is present when the brake pedal is depressed. • "0" volt is present when the brake pedal is released.
Main switch		E13	• Battery voltage is present while the main switch is depressed or is turned to ON. • "0" volt is present when the main switch is turned to OFF.
Ground	GND (CONTROL 1) GND (CONTROL 2)	A7 D1	—
Ignition switch		A13	• Battery voltage is present with the ignition switch is turned to ON. • "0" volt is present when the ignition switch is turned to OFF.

B: SCHEMATIC

<Ref. to WI-126, SCHEMATIC, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

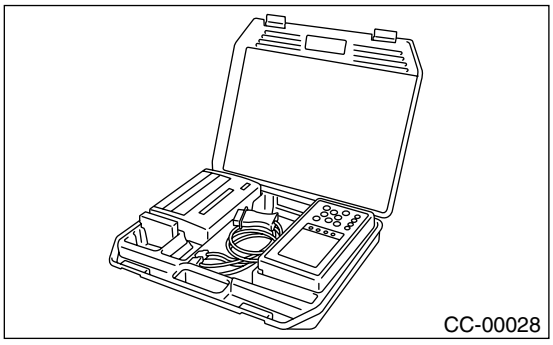
The on-board diagnosis function of the cruise control system uses the Subaru Select Monitor.
The on-board diagnosis function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnosis:
(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control memory of ECM stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

2) Real-time diagnosis:
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

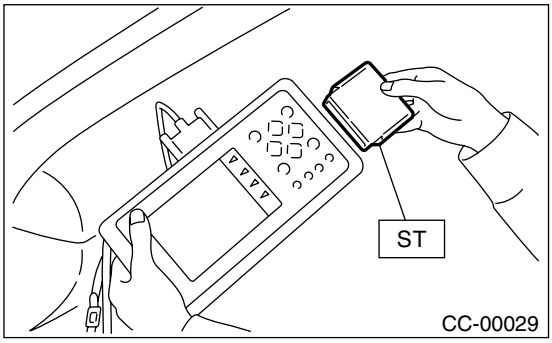
2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare the Subaru Select Monitor kit.


CC-00028

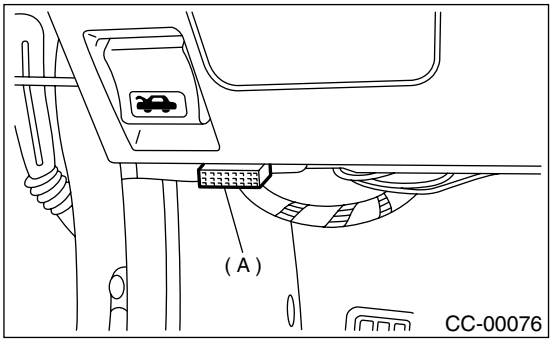
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC(H4DOTC)-4, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



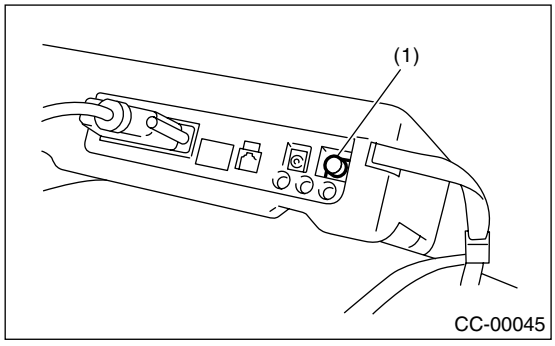
CC-00029

4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



CC-00076

(2) Connect the diagnosis cable to data link connector.
5) Start the engine and turn the cruise control main switch to ON.
6) Turn the Subaru Select Monitor switch to ON.



CC-00045

(1) Power switch

7) On the Main Menu display screen, select the {2. Each System Diagnosis} and press [YES] key.
Select the {Engine} on the System Selection display screen and press [YES] key. Press [YES] key after the engine type displayed.
8) Drive the vehicle at least 40 km/h (25 MPH) with cruise speed set.

9) If the cruise speed is canceled itself (without doing any cancel operations), a DTC will appear on select monitor display after {Check Cancel Code(s) Display} is selected on the Engine Diagnosis display screen and [YES] key is pressed.

CAUTION:
• A DTC will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in the vehicle to assist in diagnosis during driving.

NOTE:
DTC will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

1) Connect the select monitor.
2) Turn the ignition switch and cruise control main switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) On the Main Menu display screen, select the {2. Each System Check} and press [YES] key.
5) On the System Selection display screen, select the {Engine} and press [YES] key.
6) Press the [YES] key after the model name of engine displayed.
7) On the Engine Diagnosis display screen, select the {Current Data Display & Save} and press [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON.)
• Turn ON the “SET/COAST” switch.
• Turn ON the “RESUME/ACCEL” switch.
• Turn ON the “CANCEL” switch. (The “SET/COAST” and “RESUME/ACCEL” switch are turned ON at same time.)
• Depress/release the clutch pedal.
• Set the shift lever to except for neutral position.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the List of DTC. <Ref. to CC(H4DOTC)-16, List of DTC.>

6. Diagnostic Procedure with Symptom

A: SYMPTOM CHART

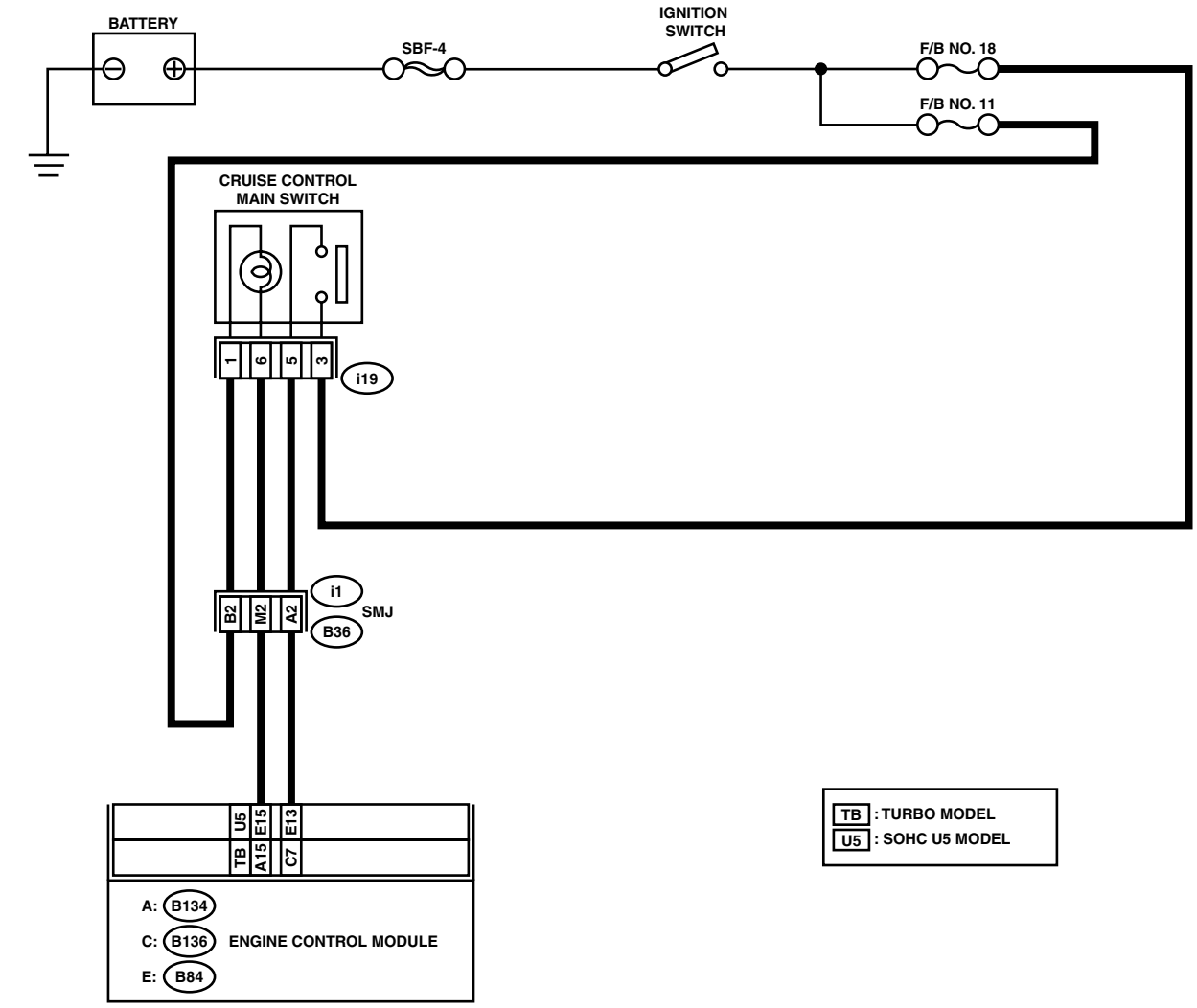
Symptom		Repair area	Reference
1	Cruise control main switch is not turned to ON. (Cruise indicator light does not illuminate)	(1) Check the cruise indicator light.	<Ref. to CC(H4DOTC)-12, CHECK CRUISE INDICATOR LIGHT, Diagnostic Procedure with Symptom.>
		(2) Check the cruise control command switch.	<Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
2	Cruise control cannot be set.	(1) Check the cruise control command switch	<Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
		(2) Check the stop light switch and brake switch.	<Ref. to CC(H4DOTC)-22, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
		(3) Check the clutch switch.	<Ref. to CC(H4DOTC)-24, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with DTC.>
		(4) Check the neutral switch.	<Ref. to CC(H4DOTC)-26, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with DTC.>
		(5) Check the vehicle speed sensor.	<Ref. to CC(H4DOTC)-30, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
3	Cruise set indicator light does not illuminate.	Check the cruise set indicator light.	<Ref. to CC(H4DOTC)-14, CHECK CRUISE SET INDICATOR LIGHT, Diagnostic Procedure with Symptom.>
4	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	Check the vehicle speed sensor.	<Ref. to CC(H4DOTC)-30, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
5	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	Check the RESUME/ACCEL switch.	<Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
6	Vehicle speed does not decrease after SET/COAST switch has been pressed.	Check the SET/COAST switch.	<Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
7	Cruise control is not released after CANCEL switch has been pressed.	Check the CANCEL switch.	<Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
8	Cruise control is not released after the brake pedal has been depressed.	Check the stop light switch and brake switch.	<Ref. to CC(H4DOTC)-22, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
9	Cruise control is not released after the clutch pedal has been depressed.	Check the clutch switch.	<Ref. to CC(H4DOTC)-24, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with DTC.>
10	Cruise control is not released after shifting to neutral position.	Check the neutral switch.	<Ref. to CC(H4DOTC)-26, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with DTC.>

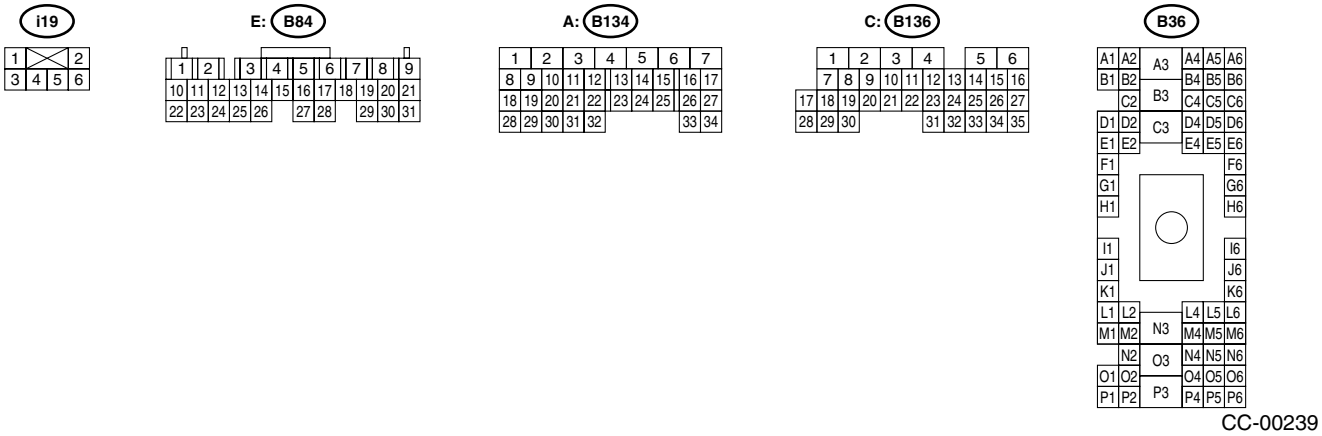
B: CHECK CRUISE INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise indicator light does not illuminate.

WIRING DIAGRAM:





CC-00239

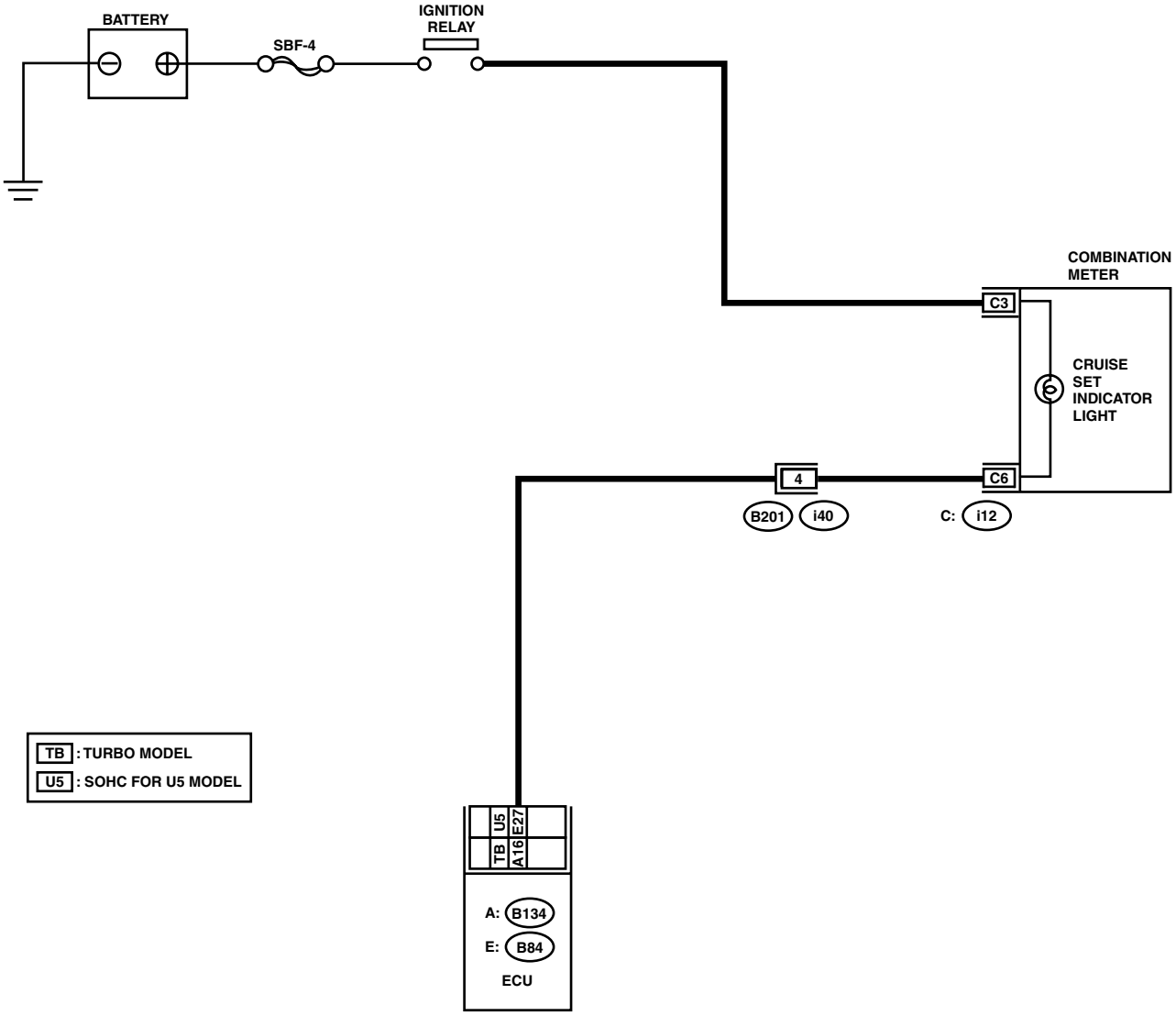
	Step	Check	Yes	No
1	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i19) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 11 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***TURBO model*** ***(B134) No. 15 — (i19) No. 6:*** ***SOHC U5 model*** ***(B84) No. 15 — (i19) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** Ground the ECM harness connector terminal with a suitable wire. ***Connector & terminal*** ***TURBO model*** ***(B134) No. 15 — Chassis ground:*** ***SOHC U5 model*** ***(B84) No. 15 — Chassis ground:***	Does the cruise indicator light illuminate?	Check the poor contact of ECM connector.	Replace the meter main assembly.

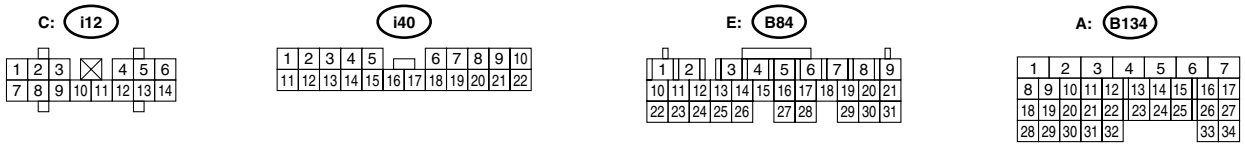
C: CHECK CRUISE SET INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise set indicator light does not illuminate.

WIRING DIAGRAM:





CC-00240

	Step	Check	Yes	No
1	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i12) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between combination meter and ignition relay.
2	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***TURBO model*** ***(i12) No. 6 — (B134) No. 16:*** ***SOHC U5 model*** ***(i12) No. 6 — (B84) No. 27:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** Ground the ECM harness connector terminal with a suitable wire. ***Connector & terminal*** ***TURBO model*** ***(B134) No. 16 — Chassis ground:*** ***SOHC U5 model*** ***(B84) No. 27 — Chassis ground:***	Does the cruise set indicator light illuminate?	Check the poor contact of ECM connector.	Replace the meter main assembly.

7. List of DTC

A: LIST

DTC	Item	Contents of diagnosis	Reference
11	Main switch	Cruise control is released after the main switch of cruise control command switch is turned to OFF.	This DTC is indicated without operating the main switch. <Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
12	Stop and brake switch	Cruise control is released after the stop light switch or brake switch is turned to ON.	This DTC is indicated without depressing the brake pedal. <Ref. to CC(H4DOTC)-22, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
13	Clutch switch	Cruise control is released after the clutch switch is turned to ON.	This DTC is indicated without depressing the clutch pedal. <Ref. to CC(H4DOTC)-24, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with DTC.>
14	Neutral switch	Cruise control is released after the neutral switch is turned to ON.	This DTC is indicated without shifting to neutral position. <Ref. to CC(H4DOTC)-26, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with DTC.>
15	Cancel switch	Cruise control is released after the cancel switch is turned to ON.	This DTC is indicated without operating the cancel switch. <Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
16	Ignition switch	Cruise control is released after the ignition switch is turned to OFF.	This DTC is indicated without operating the ignition switch. <Ref. to CC(H4DOTC)-28, **DTC 16 IGNITION SWITCH**, Diagnostic Procedure with DTC.>
21	Cruise control switch is abnormal when the ignition switch is turned to ON.	Each switch of cruise control command switch has already been ON when the ignition switch is turned to ON.	This DTC is indicated without operating the command switch. <Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>

DTC	Item	Contents of diagnosis	Reference
22	Vehicle speed variation is abnormal.	Abnormality of vehicle speed variation is detected.	<Ref. to CC(H4DOTC)-30, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
23	Engine-related sensor is abnormal.	Abnormality related to engine is detected.	<Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>
24	Cruise control-related switch is abnormal.	Abnormality of command switch is detected. (Open circuit is detected when continuing to be ON for an extremely long time [approx. two minutes].)	This DTC is indicated with normal operation. <Ref. to CC(H4DOTC)-18, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
25	Brake switch input circuit is abnormal.	Abnormality of brake switch input circuit in ECM is detected.	<Ref. to CC(H4DOTC)-22, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
26	Engine speed signal.	• Abnormal increase of engine speed is detected. • Gear is shifted to neutral, 1st or reverse position.	Cruise with more than 2nd shift position.
32	Out of vehicle speed range of cruise control operation.	• Vehicle speed becomes under the control limit during cruise driving. • Set operation is conducted out of vehicle speed range for setting • RESUME operation is conducted without vehicle speed memory.	This DTC is also indicated when increasing the speed to the cruise set available vehicle speed and conducting the set operation again. <Ref. to CC(H4DOTC)-30, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
33	Prohibition of WAIT after acceleration operation.	Vehicle speed becomes over the control limit during cruise driving.	This DTC is indicated when running at the high speed which is not suitable for cruise control. In this case, conduct the cruise set operation again after decreasing the speed to the cruise set available vehicle speed.
34	Prohibition when accelerator position is continued to be large.	Vehicle is driven at the higher speed than set vehicle speed for an extremely long time (approx. 10 minutes) during cruise driving.	This DTC is indicated when running for a long time at the higher speed than cruise set available vehicle speed by accelerator operation. In this case, release the cruise set.
35	Prohibition when vehicle speed feedback is impossible.	During cruise driving, set vehicle speed cannot be maintained for some reasons such as sharp upslope, parking brake and engine output abnormal decrease.	This DTC is indicated when the driving condition is not suitable for cruise control. Conduct the cruise set operation again after clearing the estimated reasons.

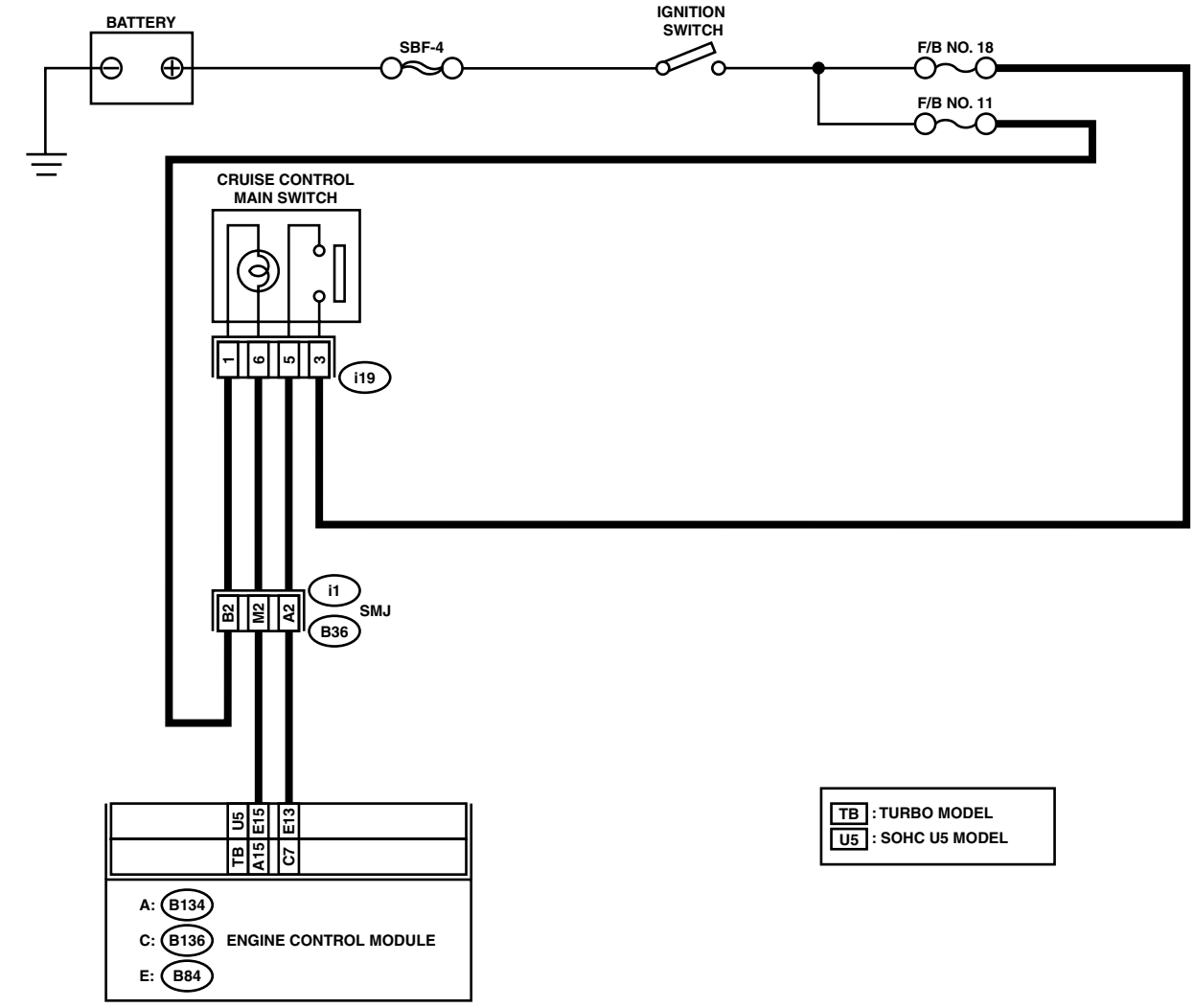
8. Diagnostic Procedure with DTC

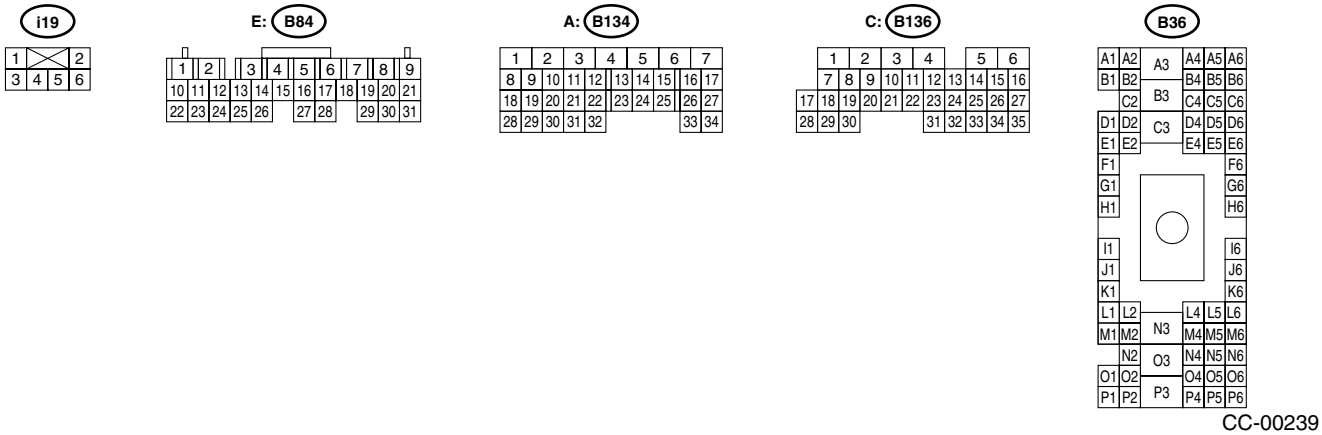
A: DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

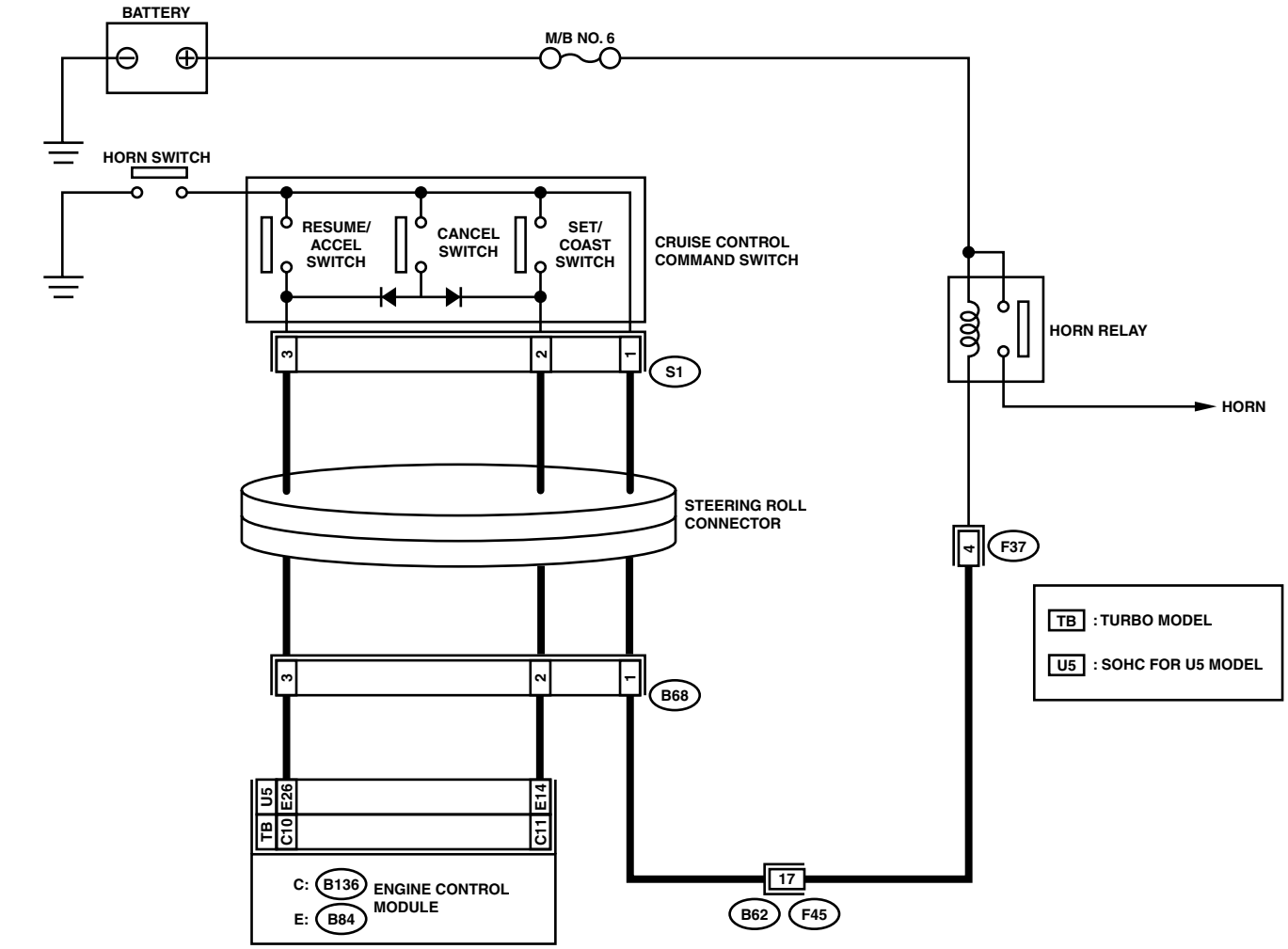
WIRING DIAGRAM (MAIN SWITCH):

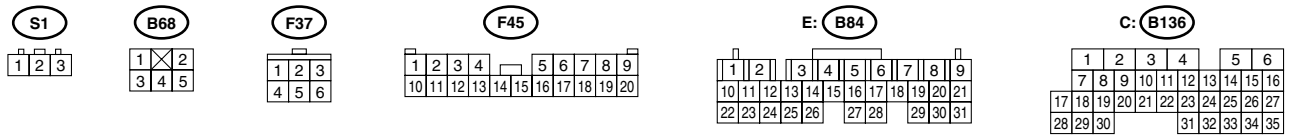




CC-00239

WIRING DIAGRAM (COMMAND SWITCH):





CC-00241

	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground when the main switch is pressed and is not pressed. ***Connector & terminal*** ***TURBO model*** ***(B136) No. 7 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B84) No. 13 (+) — Chassis ground (–):***	Is the voltage 0 V when the main switch is not pressed? Is the voltage more than 10 V when the main switch is pressed?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control command switch and fuse & relay box. If no malfunction is found after checking above, Go to step **6.**
2	**CHECK SET/COAST SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***TURBO model*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B84) No. 14 (+) — Chassis ground (–):***	Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?	Go to step **3.**	Go to step **5.**
3	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***TURBO model*** ***(B136) No. 10 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B84) No. 26 (+) — Chassis ground (–):***	Is the voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 10 V when RESUME/ACCEL switch is pressed?	Go to step **4.**	Go to step **5.**
4	**CHECK CANCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***TURBO model*** ***(B136) No. 10 (+) — Chassis ground (–):*** ***(B136) No. 11 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B84) No. 26 (+) — Chassis ground (–):*** ***(B84) No. 14 (+) — Chassis ground (–):***	Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step **5.**

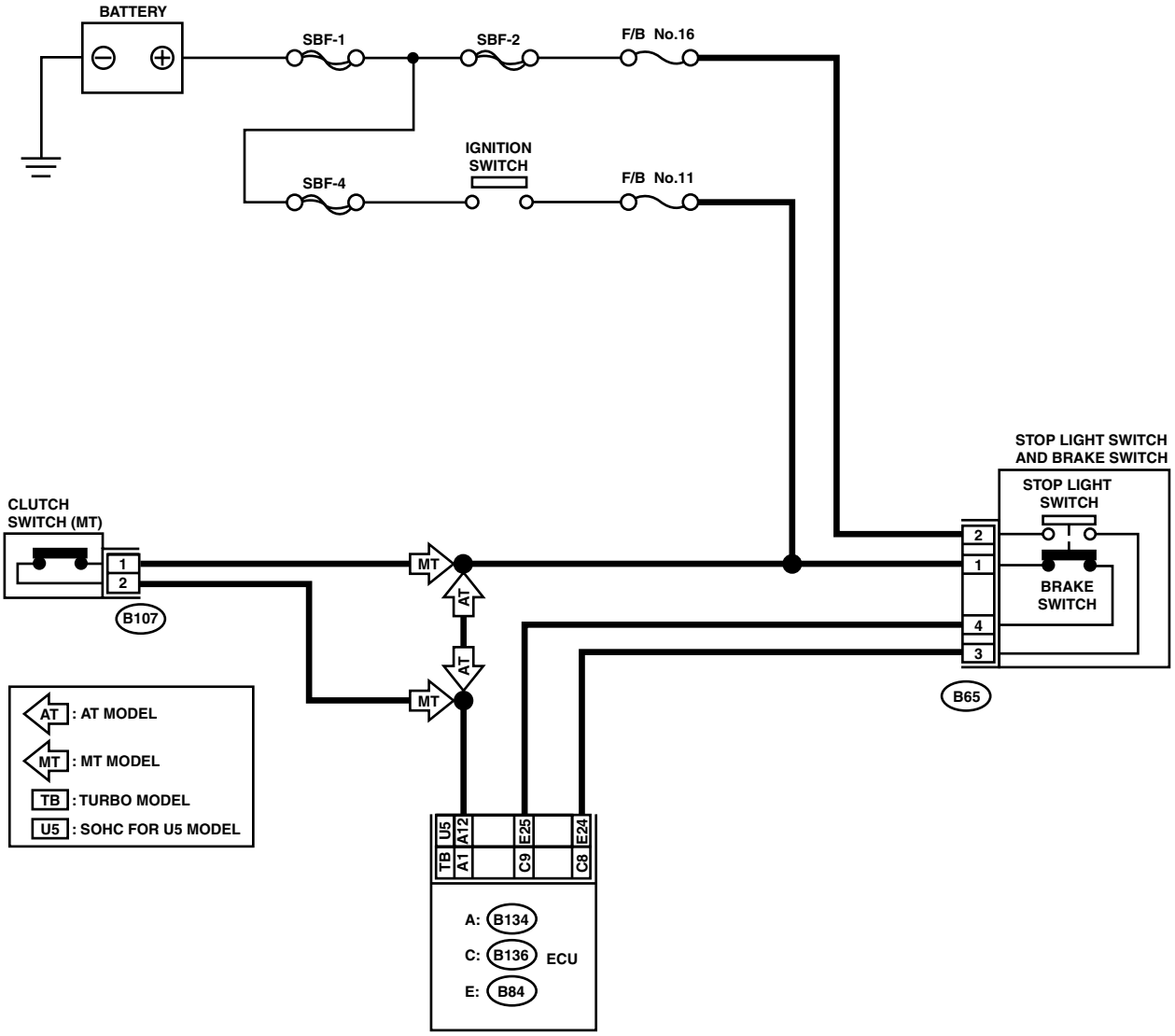
	Step	Check	Yes	No
5	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check the horn operation.	Does the horn sound?	Go to step **6.**	• Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.
6	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check the cruise control command switch. <Ref. to CC-8, Cruise Control Command Switch.>	Is the cruise control command switch OK?	Check the harness between cruise control command switch and ECM.	Replace the cruise control command switch.

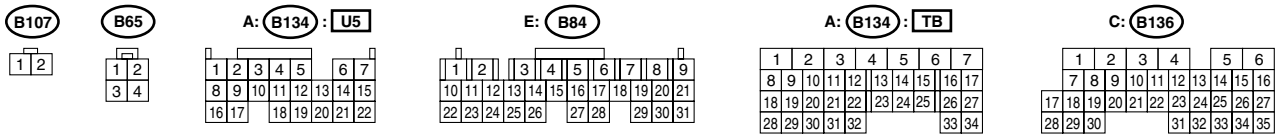
B: DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:





CC-00242

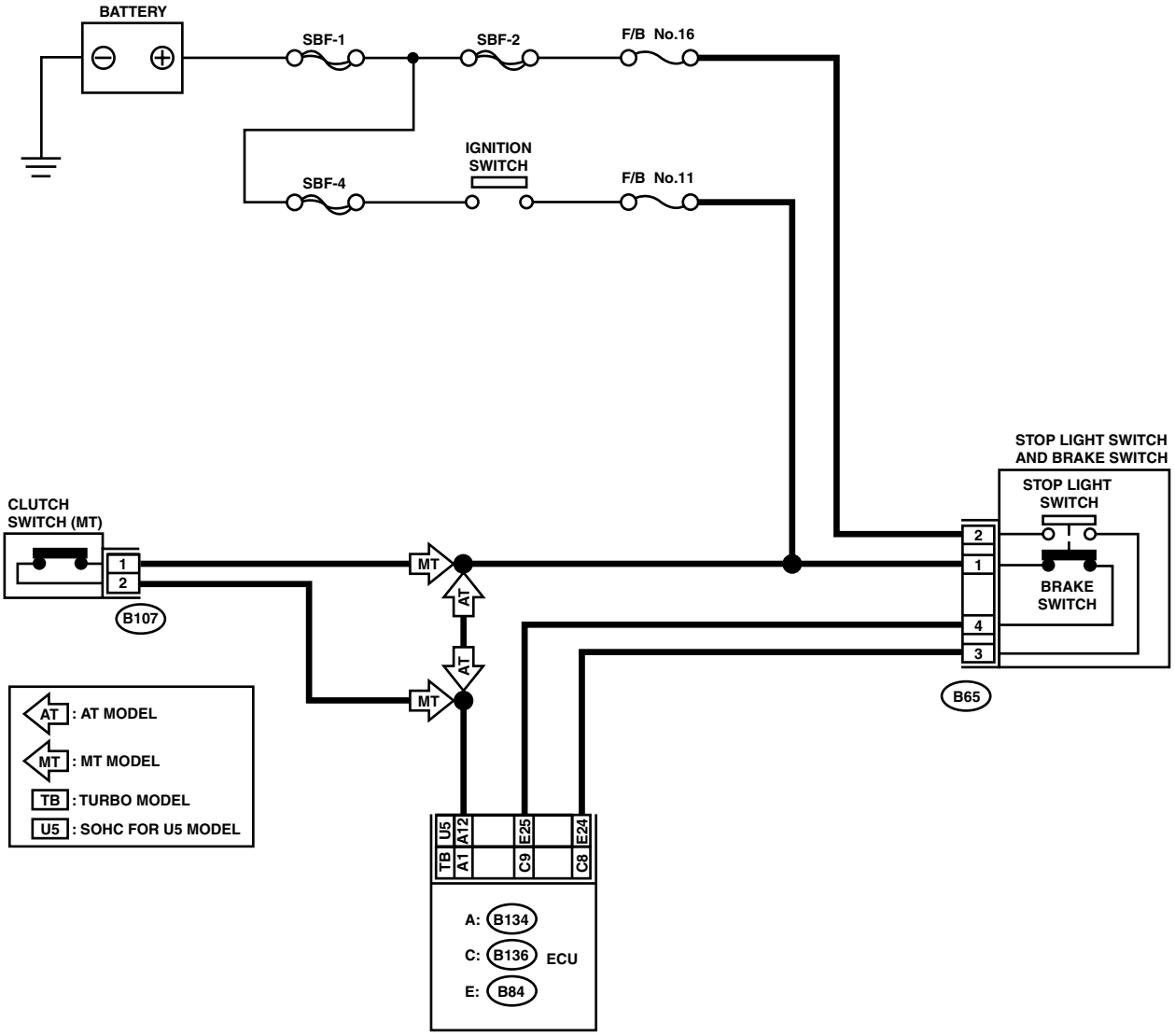
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	• Check the fuse No. 11 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box. • Check the clutch switch and circuit.
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***TURBO model*** ***(B136) No. 8 — (B65) No. 3:*** ***(B136) No. 9 — (B65) No. 4:*** ***SOHC U5 model*** ***(B84) No. 24 — (B65) No. 3:*** ***(B84) No. 25 — (B65) No. 4:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check the stop light switch and brake switch. <Ref. to CC-9, Stop and Brake Switch.>	Are the stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

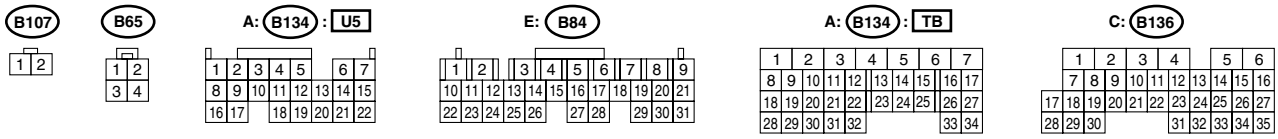
C: DTC 13 CLUTCH SWITCH

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:





CC-00242

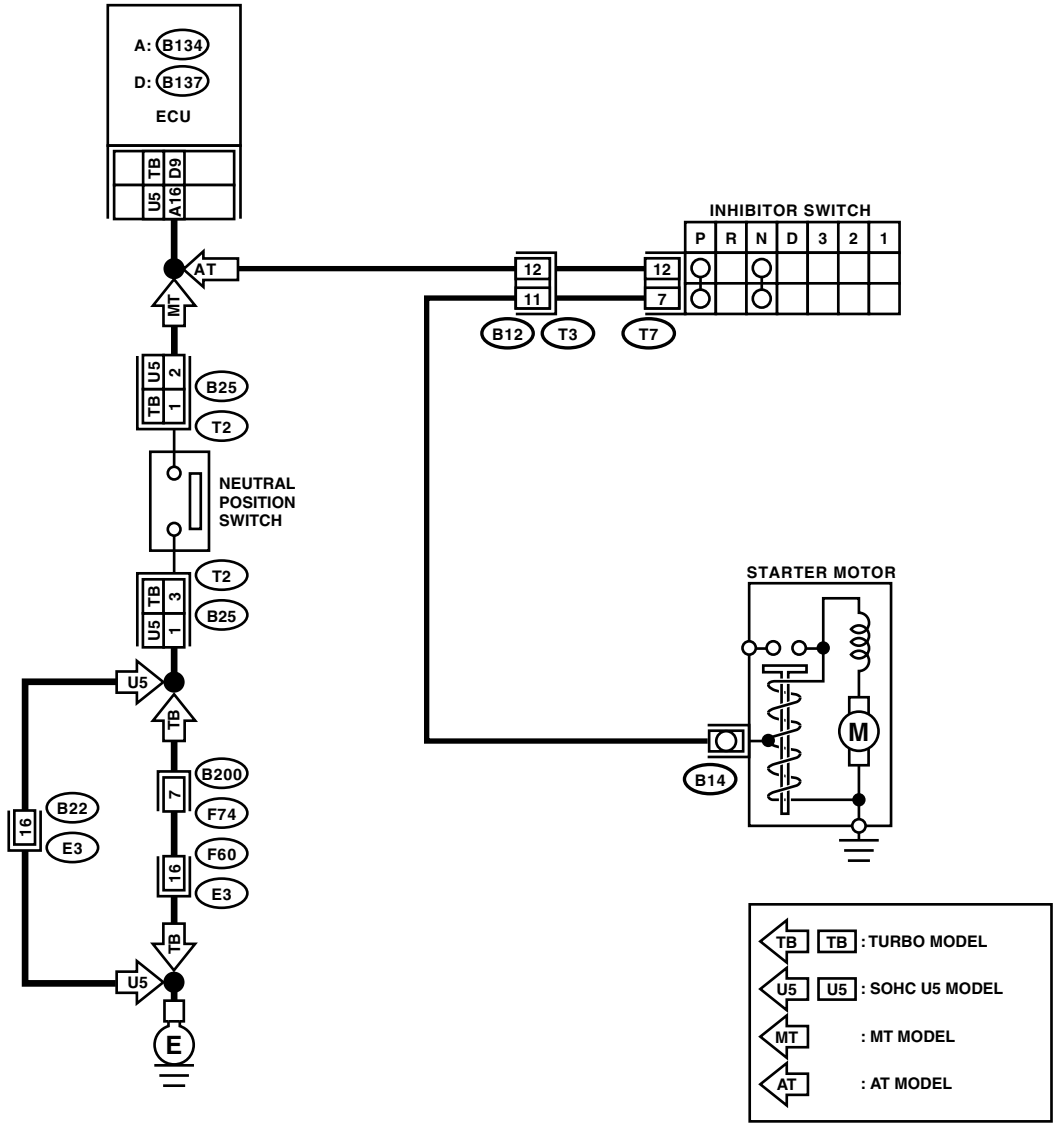
	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 11 (fuse & relay box). • Check the harness for open or short between clutch switch and fuse & relay box.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between clutch switch harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***TURBO model*** ***(B107) No. 2 — (B134) No. 1:*** ***SOHC U5 model*** ***(B107) No. 2 — (B134) No. 12:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CLUTCH SWITCH.** Remove and check the clutch switch. <Ref. to CC-10, Clutch Switch.>	Is the clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

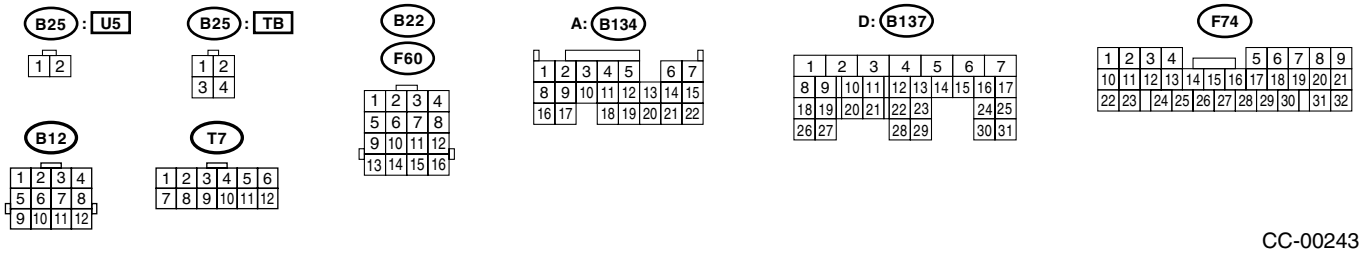
D: DTC 14 NEUTRAL POSITION SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00243

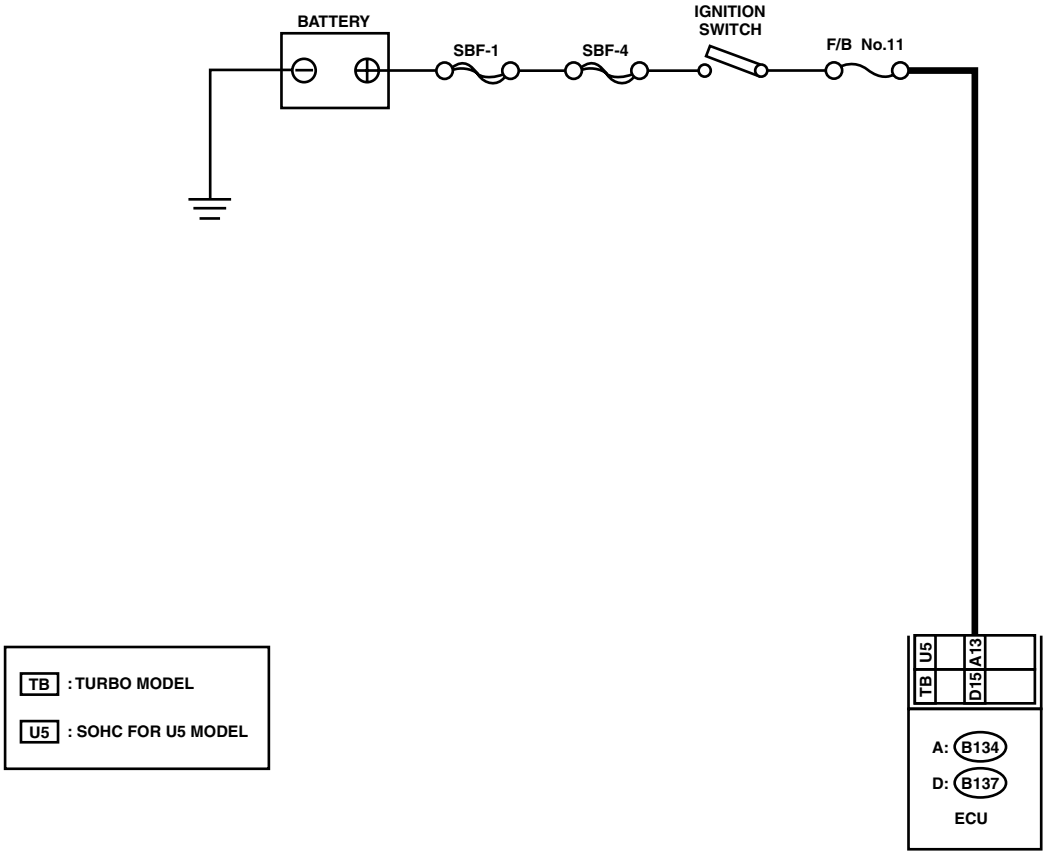
	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **5.**
2	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between inhibitor switch and ECM.
3	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the starter motor harness connector. 3) Measure the resistance between inhibitor switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 7 — (B14) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK INHIBITOR SWITCH.** Remove and check the inhibitor switch.	Is the inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace the inhibitor switch.
5	**CHECK NEUTRAL POSITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the neutral position switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***TURBO model*** ***(B25) No. 1 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B25) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Check the harness for open or short between neutral position switch and ECM.
6	**CHECK NEUTRAL POSITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between neutral position switch harness connector terminal and chassis ground. ***Connector & terminal*** ***TURBO model*** ***(B25) No. 3 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B25) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the harness.
7	**CHECK NEUTRAL POSITION SWITCH.** Remove and check the neutral position switch. <Ref. to 5MT-39, Switches and Harness.>	Is the neutral position switch OK?	Neutral position switch circuit is OK.	Replace the neutral position switch.

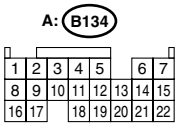
E: DTC 16 IGNITION SWITCH

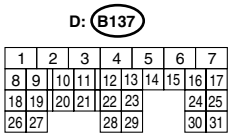
TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:







CC-00244

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***TURBO model*** ***(B137) No. 15 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Check the poor contact of ECM connector.	• Check the fuse No. 11 (fuse & relay box). • Check the harness for open or short between ignition switch and ECM.

F: DTC 22 AND 32 VEHICLE SPEED SENSOR

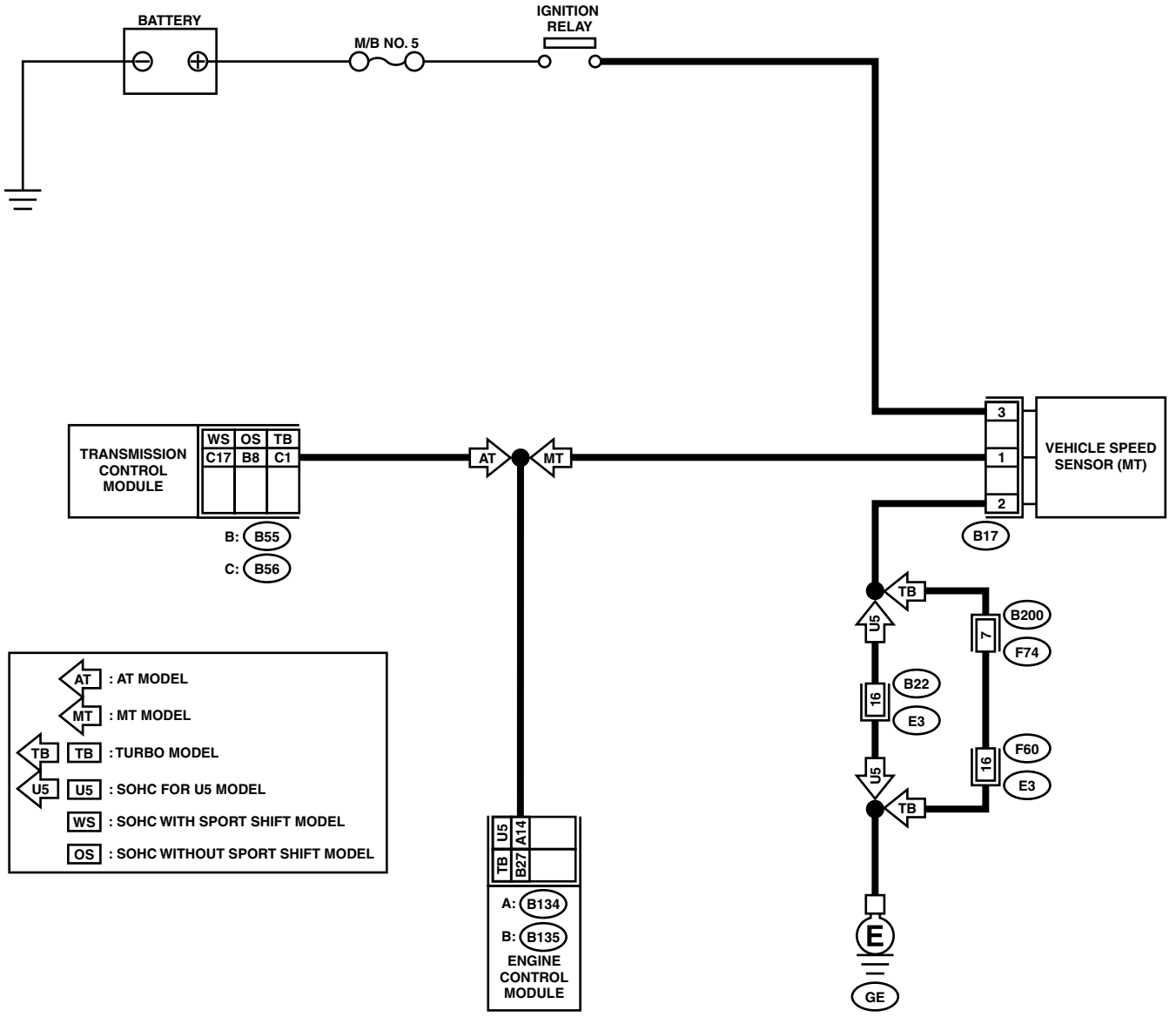
DIAGNOSIS:

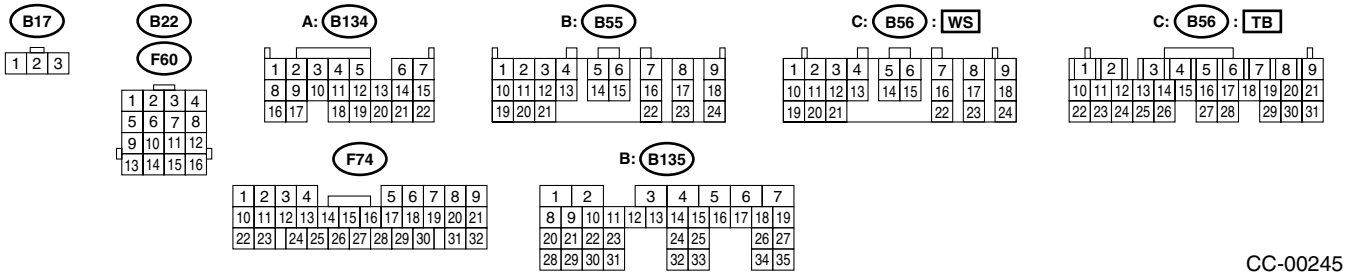
Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00245

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type MT?	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):***	Is the measured valve more than 10 V?	Go to step **3.**	Check the harness for open or short between ignition relay and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control module. 3) Measure the resistance between vehicle speed sensor harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***TURBO model*** ***(B17) No. 1 — (B135) No. 27:*** ***SOHC U5 model*** ***(B17) No. 1 — (B134) No. 14:***	Is the measured valve less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the measured valve less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1) Connect the harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure the voltage between ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***TURBO model*** ***(B135) No. 27 (+) — Chassis ground (–):*** ***SOHC U5 model*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the measured valve less than 1 V or more than 5 V?	Check the poor contact in ECM connector.	Replace the vehicle speed sensor.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from transmission control module and ECM. 3) Measure the resistance between ECM harness connector terminal and transmission control module harness connector terminal. ***Connector & terminal*** ***TURBO model*** ***(B135) No. 27 — (B56) No. 1:*** ***With SPORT shift (SOHC U5 model)*** ***(B134) No. 14 — (B56) No. 17:*** ***Without SPORT shift (SOHC U5 model)*** ***(B134) No. 14 — (B55) No. 8:***	Is the measured valve less than 10 Ω?	Go to step **7.**	Repair the harness.
7	**CHECK TRANSMISSION CONTROL MODULE.** 1) Connect the harness connector to transmission control module. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to be caught by the running wheels.** 4) Measure the voltage between transmission control module harness connector terminal and chassis ground. ***Connector & terminal*** ***TURBO model*** ***(B56) No. 1 (+) — Chassis ground (–):*** ***With SPORT shift (SOHC U5 model)*** ***(B56) No. 17 (+) — Chassis ground (–):*** ***Without SPORT shift (SOHC U5 model)*** ***(B55) No. 8 (+) — Chassis ground (–):***	Is the measured valve less than 1 V or more than 5 V?	Check the poor contact in ECM connector.	Replace the transmission control module.

CRUISE CONTROL SYSTEM (DIAGNOSTICS) CC(H6DO)

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1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for H6DO model are described in CC(H4SO) section. <Ref. to CC(H4SO)-2, Basic Diagnostic Procedure.>

ONSTAR (R)

OS

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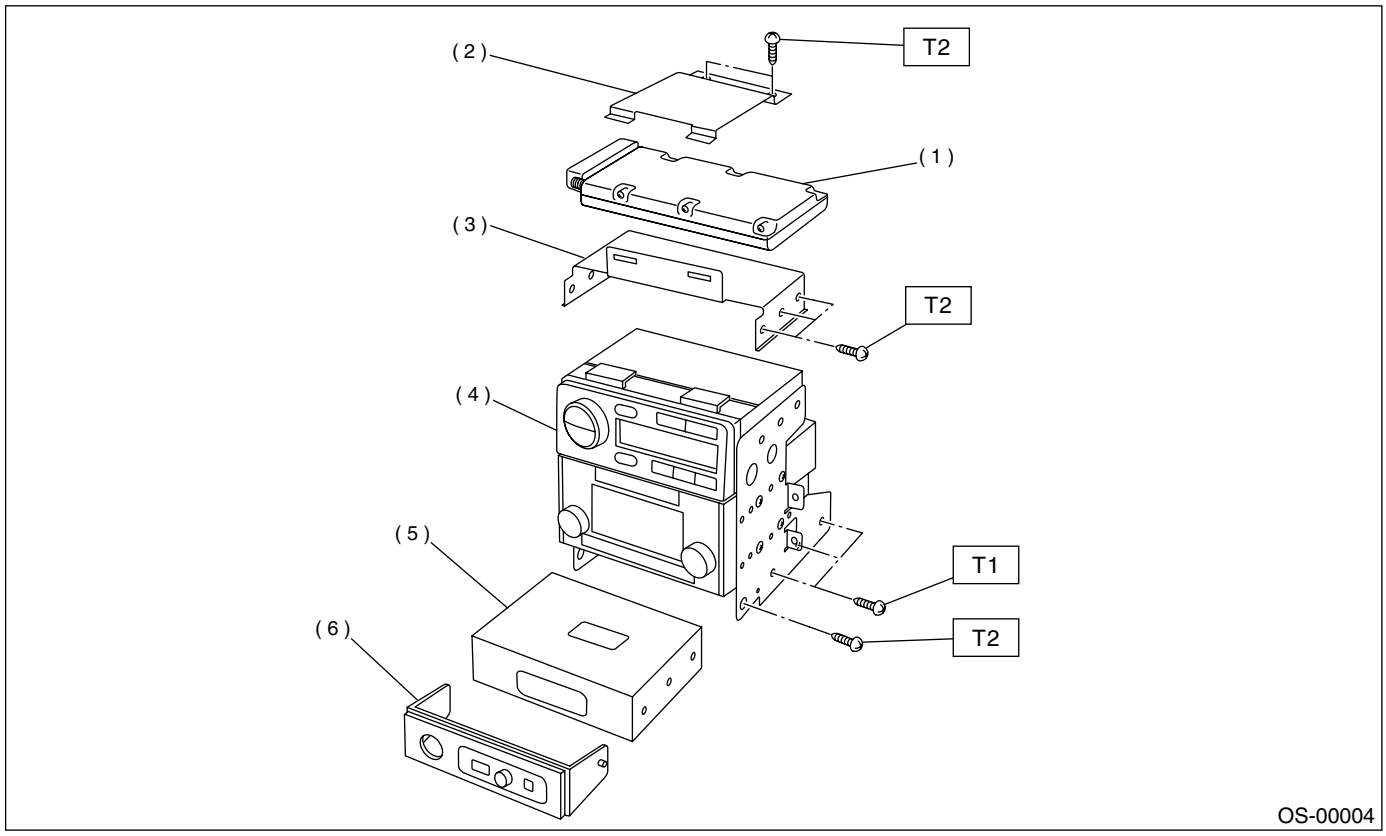
2. Vehicle Interface Unit VIU 4
3. Vehicle Communication Unit VCU 5
4. Button Assembly 6
5. Microphone 7
6. Antenna 8

1. General Description

A: COMPONENT



(1) Vehicle communication unit (VCU)
(2) VCU Bracket (upper)
(3) VCU Bracket (lower)
(4) Audio body
(5) Vehicle interface unit (VIU)
(6) Button ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 2.2 (0.22, 1.6)
T2: 4.6 (0.47, 3.4)

B: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

C: PREPARATION TOOL

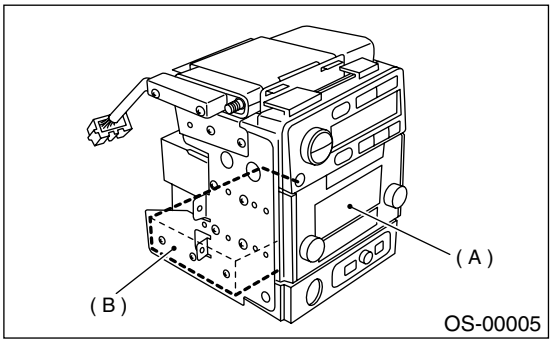
1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Vehicle Interface Unit VIU

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove meter visor. <Ref. to IDI-13, REMOVAL, Combination Meter Assembly.>
3) Remove audio body. <Ref. to ET-5, REMOVAL, Radio.>
4) Remove VIU from the audio body.



(A) Audio body
(B) VIU

B: INSTALLATION

Install in the reverse order of removal.

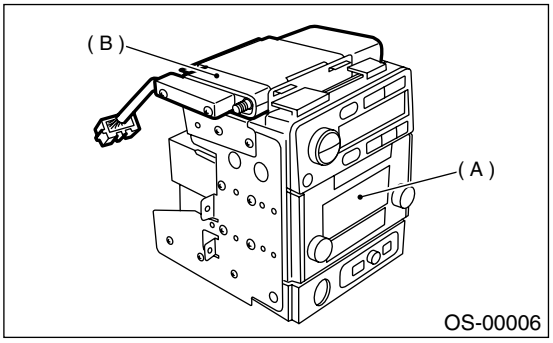
Tightening torque:
2.2 N·m (0.22 kgf-m, 1.6 ft-lb)

NOTE:
When changing VIU, consult the OnStar (R) call center and request setup.

3. Vehicle Communication Unit VCU

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove meter visor. <Ref. to IDI-13, REMOVAL, Combination Meter Assembly.>
3) Remove audio body. <Ref. to ET-5, REMOVAL, Radio.>
4) Remove VCU from the audio body.



(A) Audio body
(B) VCU

B: INSTALLATION

Install in the reverse order of removal.

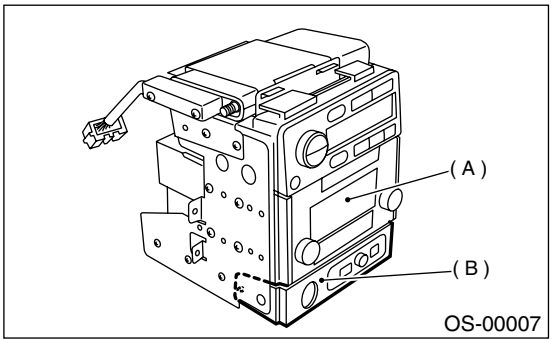
Tightening torque:
4.6 N·m (0.47 kgf-m, 3.4 ft-lb)

NOTE:
When changing VCU, consult the OnStar (R) call center and request setup.

4. Button Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove meter visor. <Ref. to IDI-13, REMOVAL, Combination Meter Assembly.>
3) Remove audio body. <Ref. to ET-5, REMOVAL, Radio.>
4) Remove button assembly from the audio body.



(A) Audio body
(B) Button ASSY

B: INSTALLATION

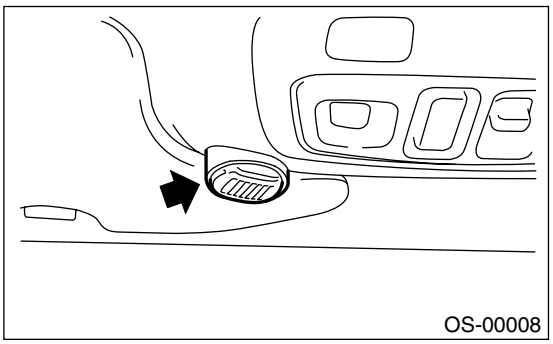
Install in the reverse order of removal.

Tightening torque:
4.6 N·m (0.47 kgf-m, 3.4 ft-lb)

5. Microphone

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove microphone.



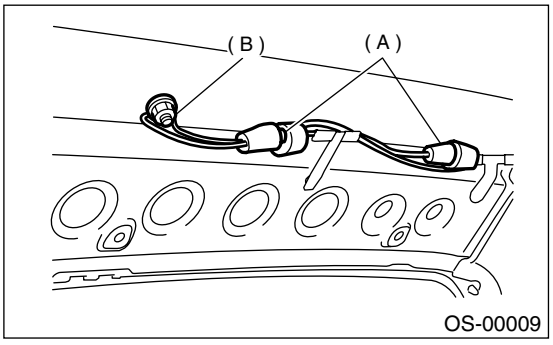
B: INSTALLATION

Install in the reverse order of removal.

6. Antenna

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove roof trim. <Ref. to EI-54, REMOVAL, Roof Trim.>
3) Disconnect connector.
4) Remove nut fixing antenna.



(A) Connector
(B) Antenna fixing nut

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

ONSTAR (R) (DIAGNOSTICS)

OS

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1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
To check harness for broken wires or short circuits, shake it while holding it or the connector.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Before performing diagnosis, inspect unit which might influence OnStar (R) problem. <Ref. to OS-3, INSPECTION, General Description.>	Is unit that might influence the problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK OnStar (R) LED.** 1) Make sure the red LED of OnStar (R) comes on when ignition switch is ON?	Does the red LED come on?	Go to step **3.**	Go to step **4.**
3	**CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC).** 1) Calling up the diagnostic trouble code (DTC). <Ref. to OS-10, OPERATION, Read Diagnostic Trouble Code (DTC).> 2) Record all DTCs. Confirm the meaning of DTC using the list of DTC. <Ref. to OS-17, LIST, List of Diagnostic Trouble Code (DTC).> 3) Proceed with the diagnosis corresponding to the diagnostic trouble code (DTC). <Ref. to OS-18, Diagnostics Chart with Trouble Code.> Confirm repair by activating system.	Is repair work completed?	System is OK.	Go to step **1.**
4	**PERFORM DIAGNOSIS ACCORDING TO THE SYMPTOM.** Perform diagnostic procedure according to the symptom. <Ref. to OS-33, Diagnosis for Each Symptom.> Confirm repair by activating system.	Is repair work completed?	System is OK.	Go to step **1.**

2. General Description

A: CAUTION

When the inspection procedure must be performed pressing each OnStar (R) button, call the OnStar (R) call center first.
When VIU and VCU are replaced, contact to the OnStar (R) call center to ask for set-up.

B: INSPECTION

Before performing diagnostics, check the following items which might affect OnStar (R) problems.

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V or more

Specific gravity: Above 1.260

2. AIRBAG

Inspect that airbag system is normal. <Ref. to AB-2, Basic Diagnostic Procedure.>

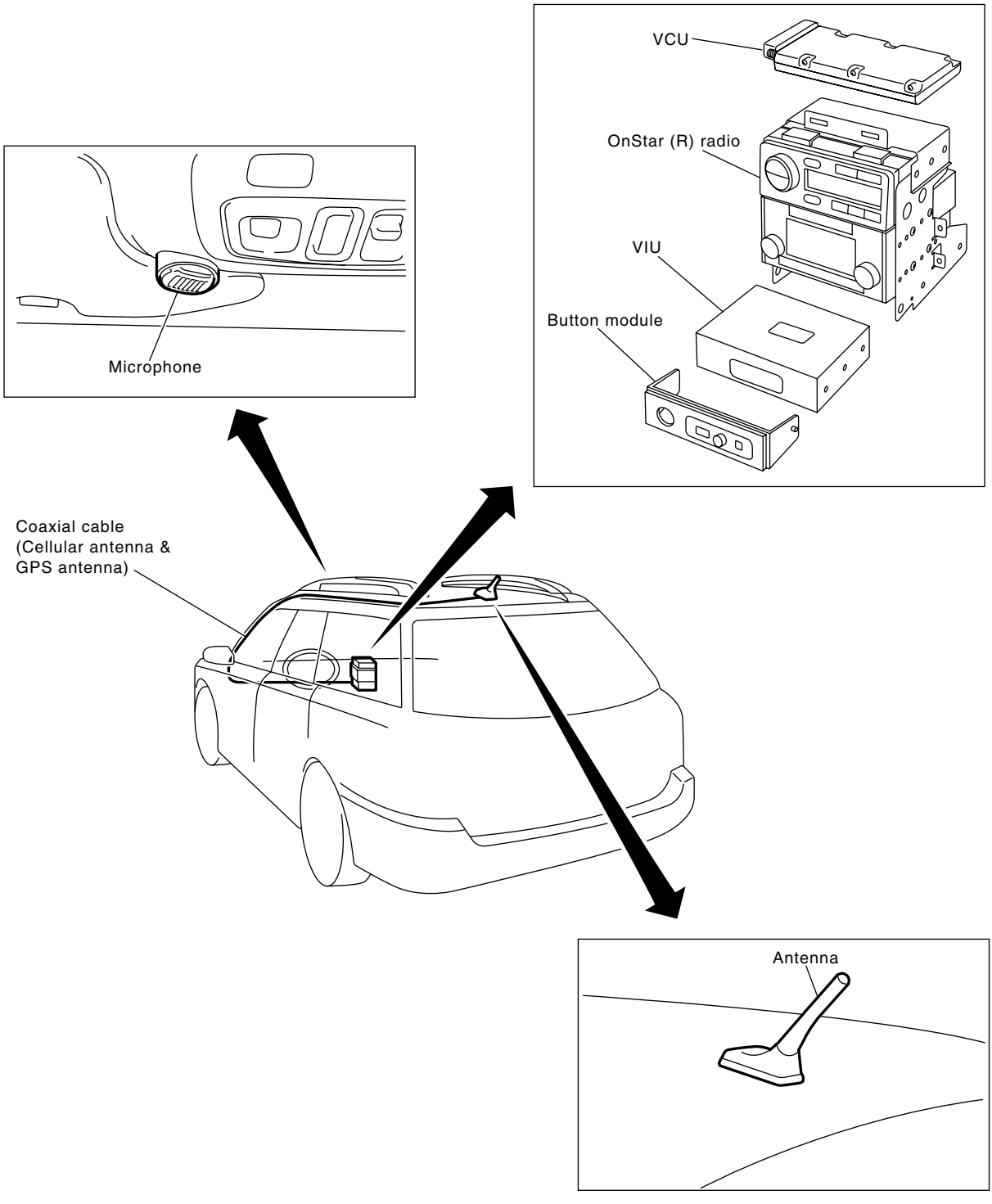
C: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

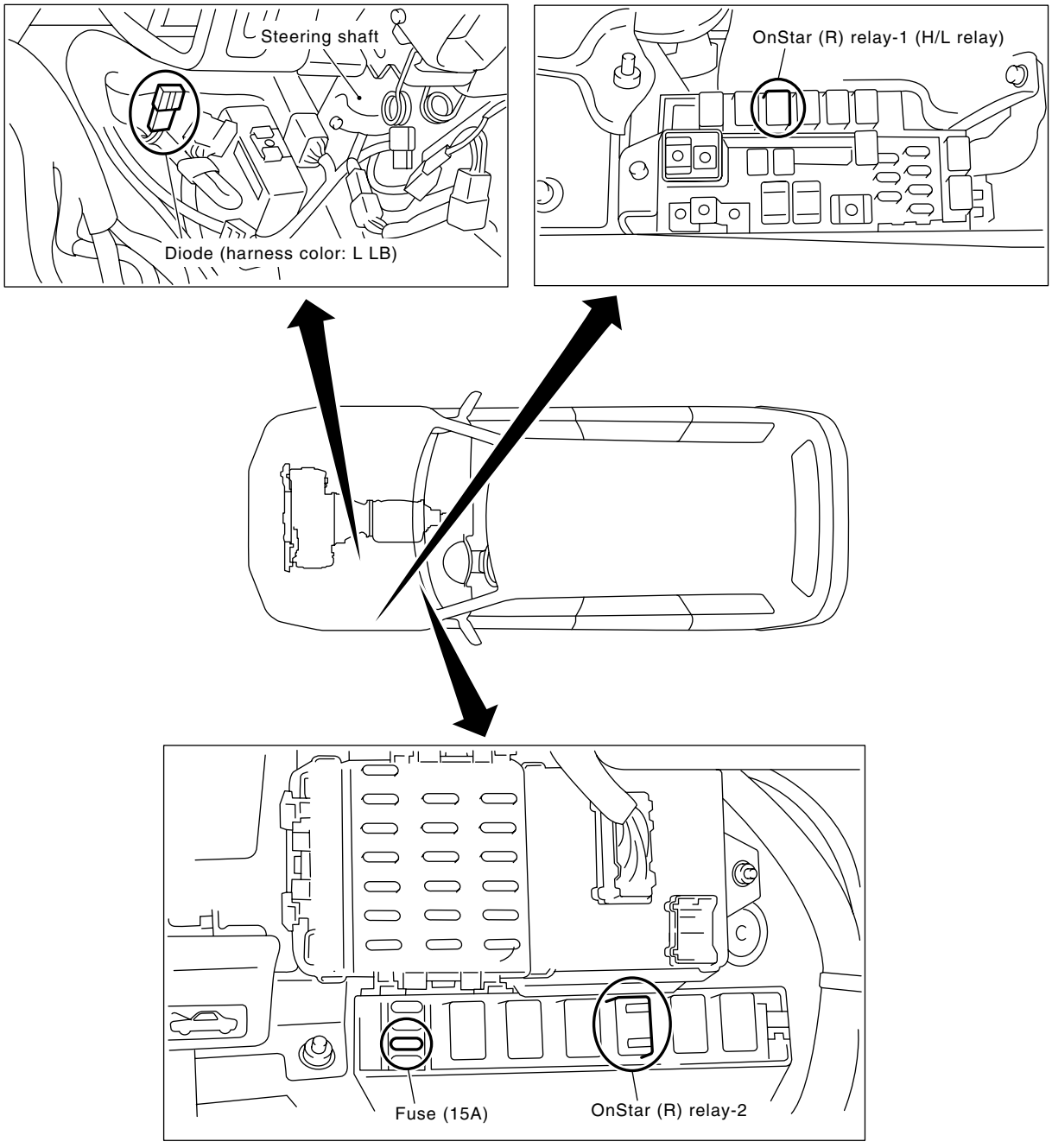
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

3. Electrical Components Location

A: LOCATION



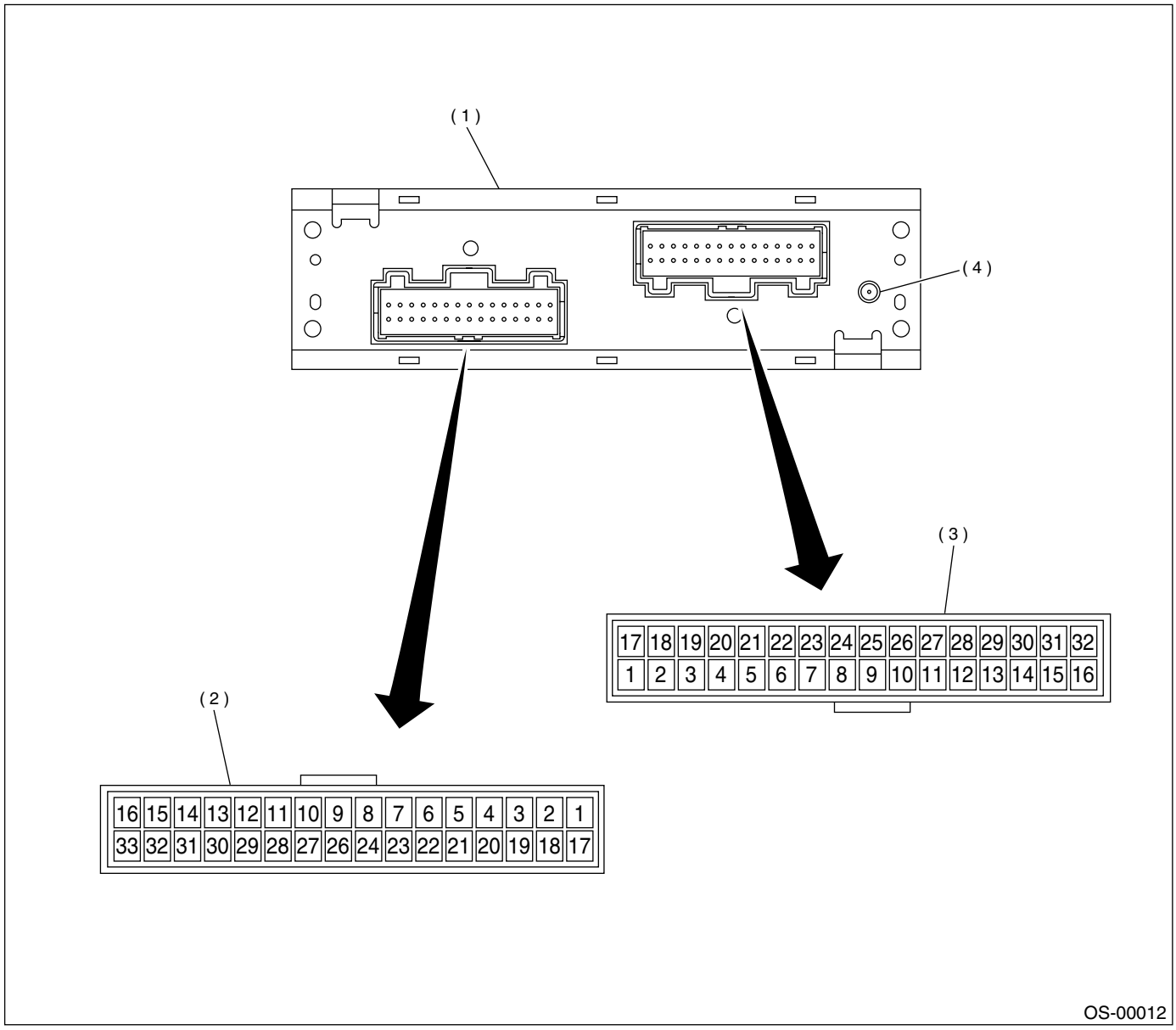
OS-00010


Steering shaft
Diode (harness color: L LB)
OnStar (R) relay-1 (H/L relay)
Fuse (15A)
OnStar (R) relay-2

OS-00011

4. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

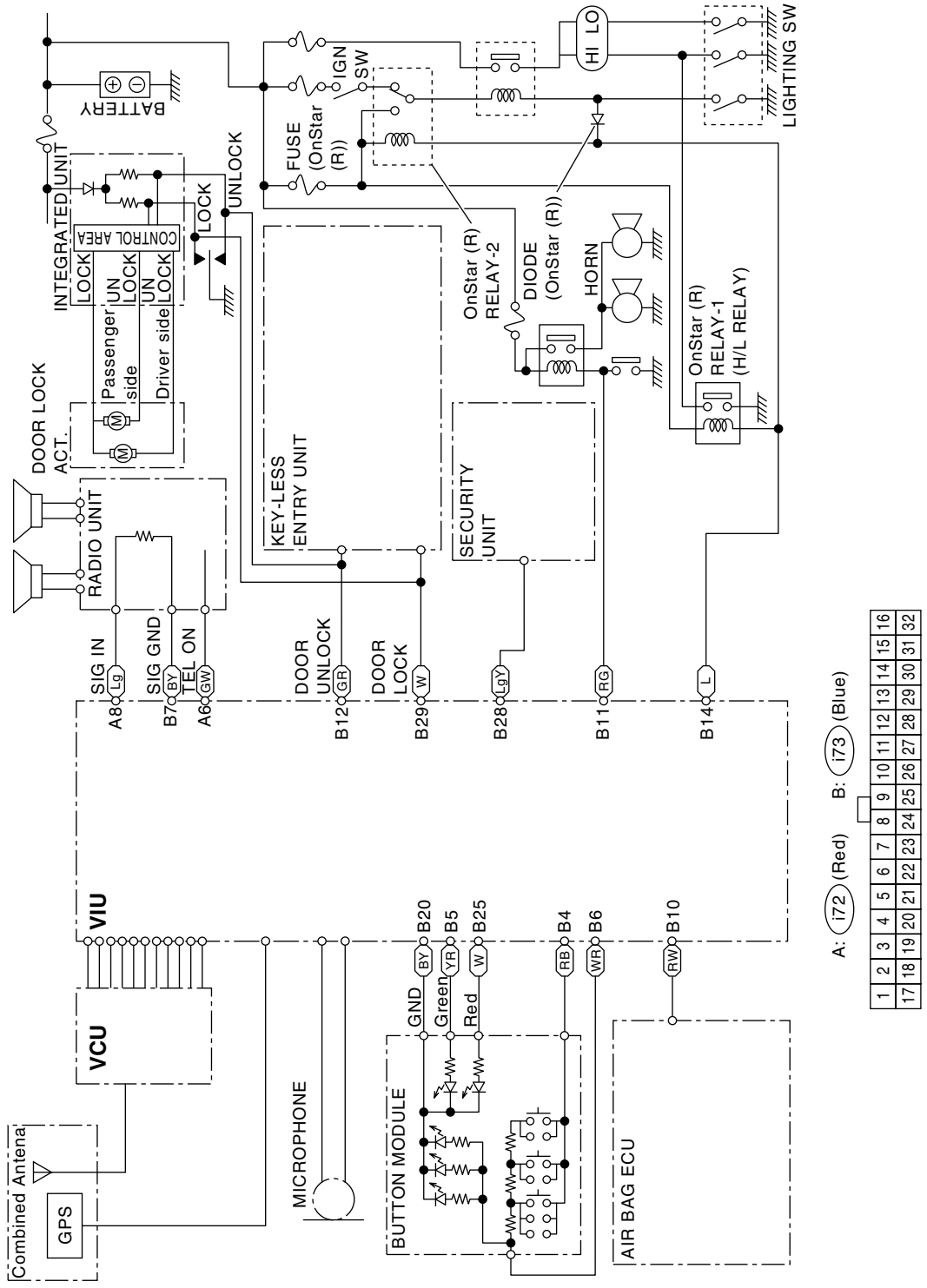


(1) VIU
(2) Connect to i73 (Blue) connector
(3) Connect to i72 (Red) connector
(4) GPS antenna connector

CONTROL MODULE I/O SIGNAL

Contents		Connector No.	Terminal No.	Input/Output signal
Power supply	Power	i73	16	9 — 16 V
	Power	i73	32	9 — 16 V
	GND	i73	1	0 V
	GND	i73	17	0 V
	ACC	i73	27	OnStar (R) activates, when the value is greater than 5.5 V
	IGN	i73	22	OnStar (R) activates, when the value is greater than 5.5 V
VCU I/O	Audio ground	i72	10	0 V
	Audio signal	i72	11	4.5 V when switch is ON
	Audio signal	i72	12	Battery voltage when switch is ON
	Microphone GND	i72	13	0 V when switch is ON
	Microphone input siganal	i72	14	Signal
	Power	i72	16	Battery voltage when switch is ON
	3 wire signal data bus	i72	27	Signal
	3 wire signal data bus	i72	28	Signal
	3 wire signal data bus	i72	29	Signal
Vehicle discrete interface	Door unlock signal	i73	12	At actuation of door unlock Battery voltage
	Door lock signal	i73	29	At actuation of door lock Battery voltage
	Horn signal	i73	11	0V at actuation of horn Battery voltage at no actuation of horn
	Security signal	i73	28	Signal (5 V)
	Headlight signal	i73	14	0V at actuation of headlight Battery voltage at no actuation of headlight
	Low reference of transceiver	i72	30	0 V
	IGN signal	i72	31	Battery voltage when switch is ON
User interface	Mike signal & power supply	i72	25	Signal
	Mike return	i72	26	0 V
	Key pad signal	i73	4	2.14V at pressing emergency button 1.27V at pressing OnStar (R) button 1.27V at pressing call answer/end button
	LED Green	i73	5	3V when LED illuminates
	LED Red	i73	25	2.5V when LED illuminates
	Key pad low reference	i73	20	0 V
	Key pad power supply	i73	6	Battery voltage
Audio output interface	Audio	i72	8	Signal
	Audio GND	i73	7	0 V
	TEL ON signal	i72	6	Battery voltage when switch is ON

B: SCHEMATIC

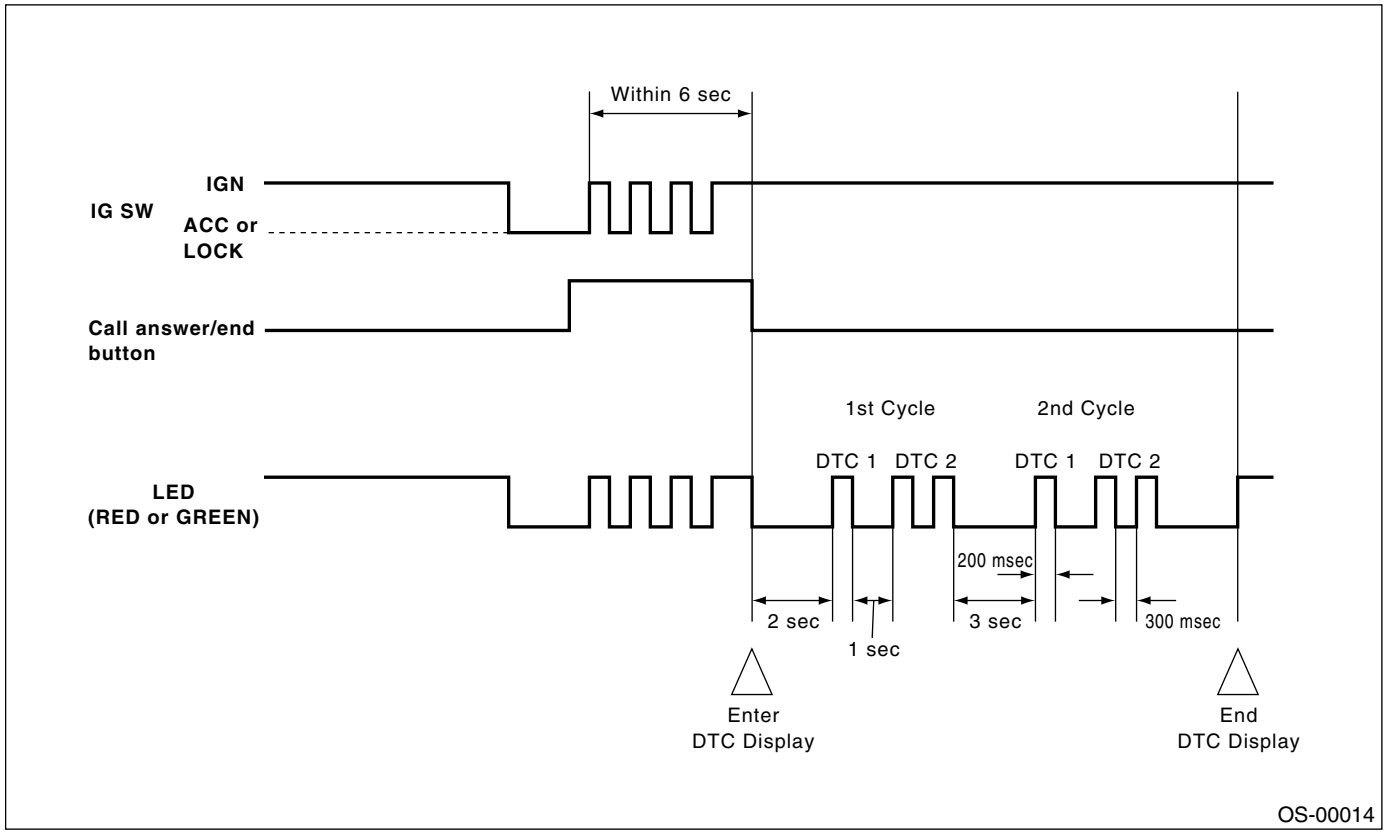


OS-00013

5. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) Turn ignition switch to OFF.
2) Perform the following job steps within 6 seconds.
3) Change the ignition switch from ON to OFF 3 times with pressing call answer/end button.
4) Turn ignition to ON at the 4th switching action.
5) When the call answer/end button is released, LED will blink to indicate DTC.



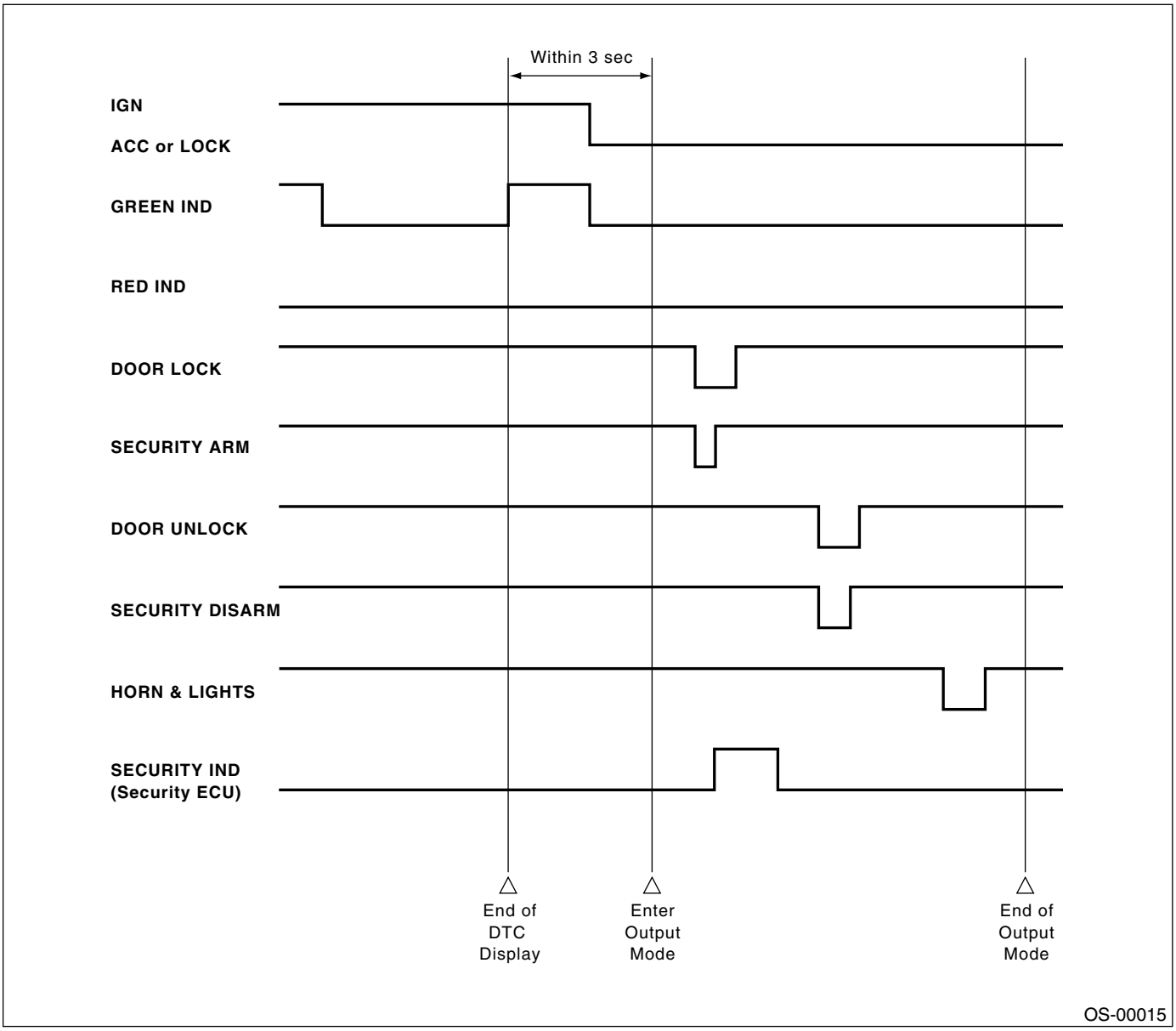
NOTE:
- Current DTC will be indicated by the red LED.
- Former DTC will be indicated by the green LED.
- Current DTC will be indicated first, and then former DTC will be indicated.
- DTC will be displayed in order of numerical sequence from smallest.
- DTC will be indicated in 2 times.

6. Output Mode

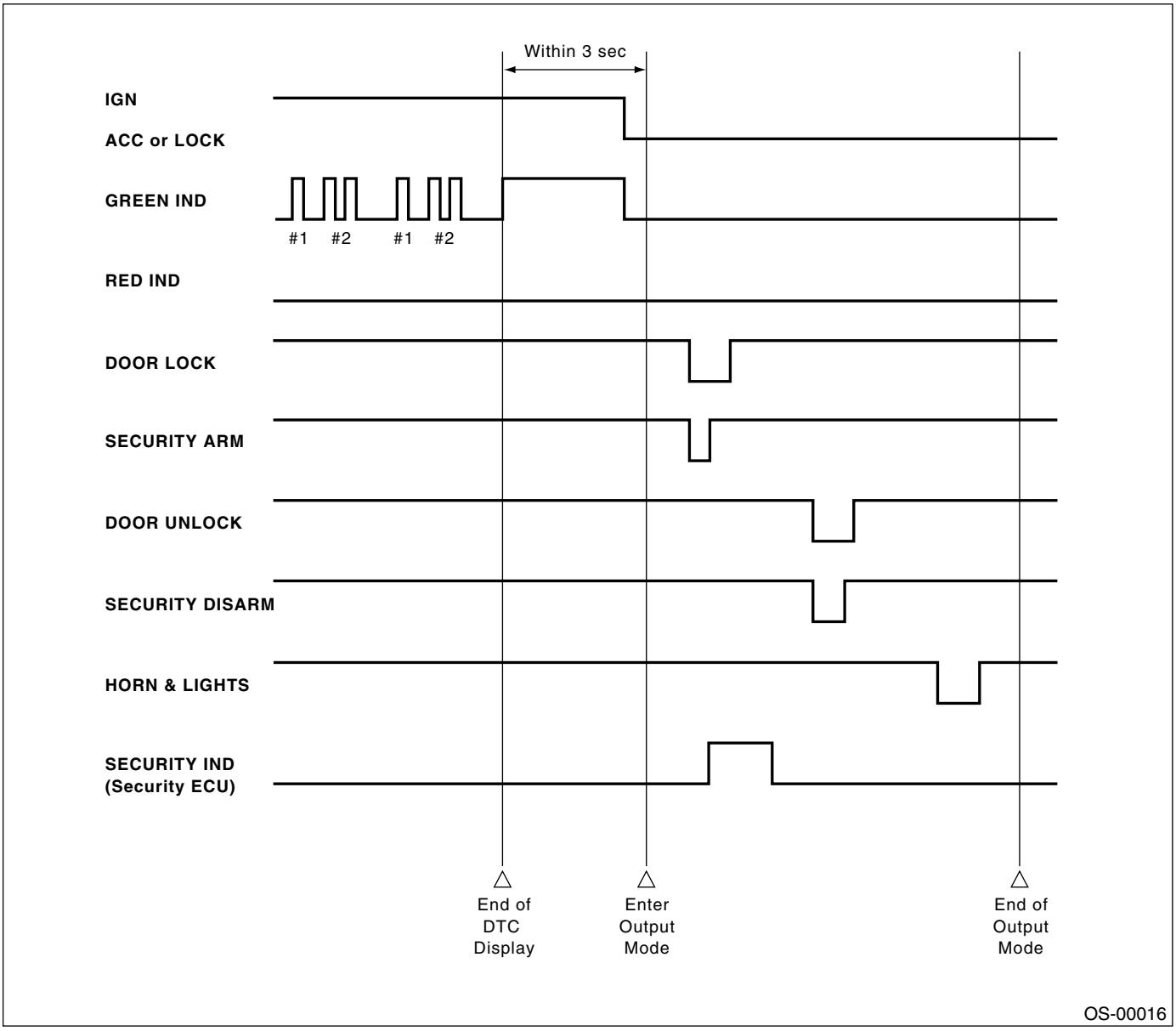
A: OPERATION

NOTE:
Output mode activates lock and unlock of door, security, horn and headlight.

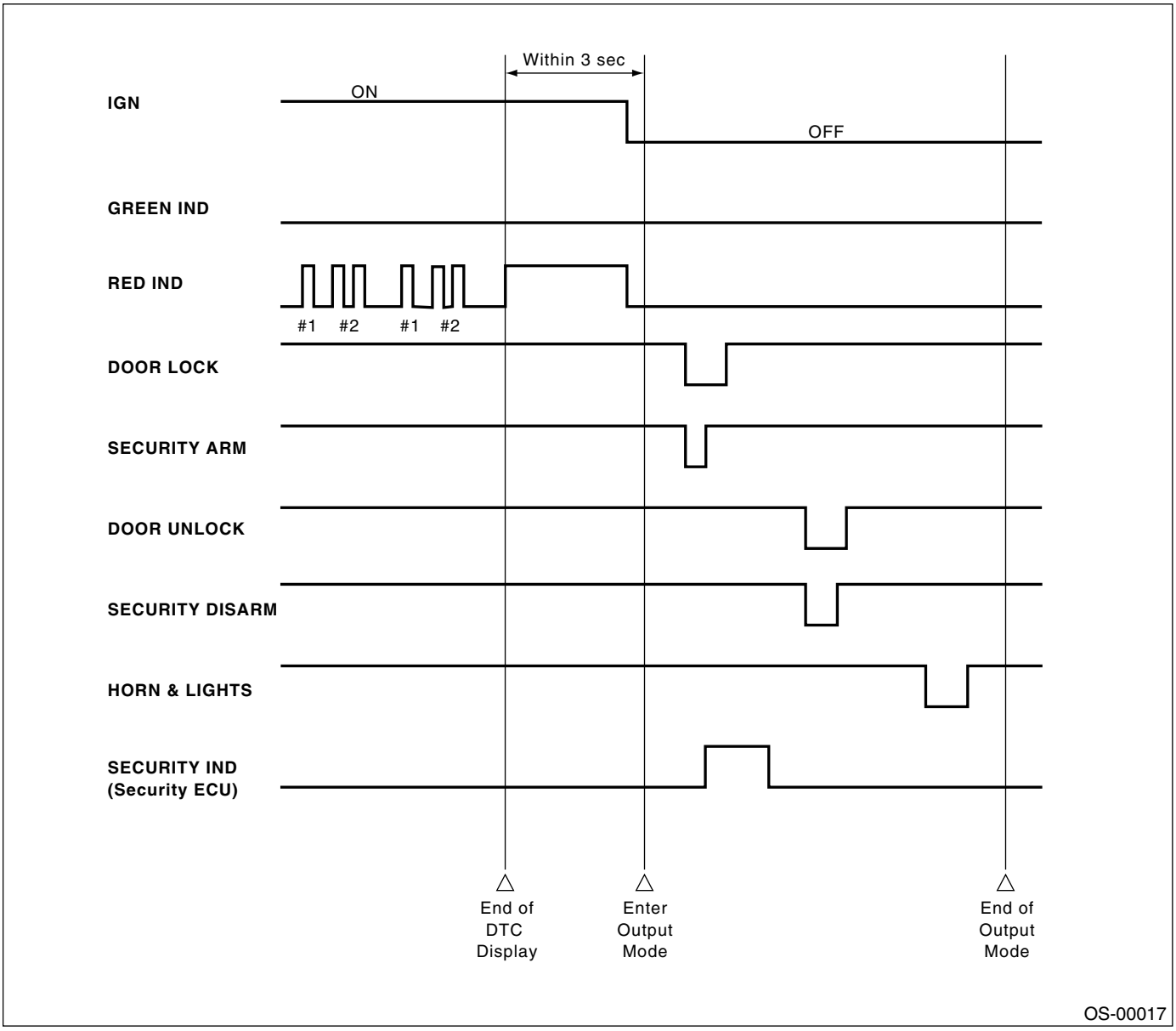
1) Within 3 seconds after reading DTC, turn the ignition to OFF.
- When no DTC is stored



- When DTC of former trouble is stored



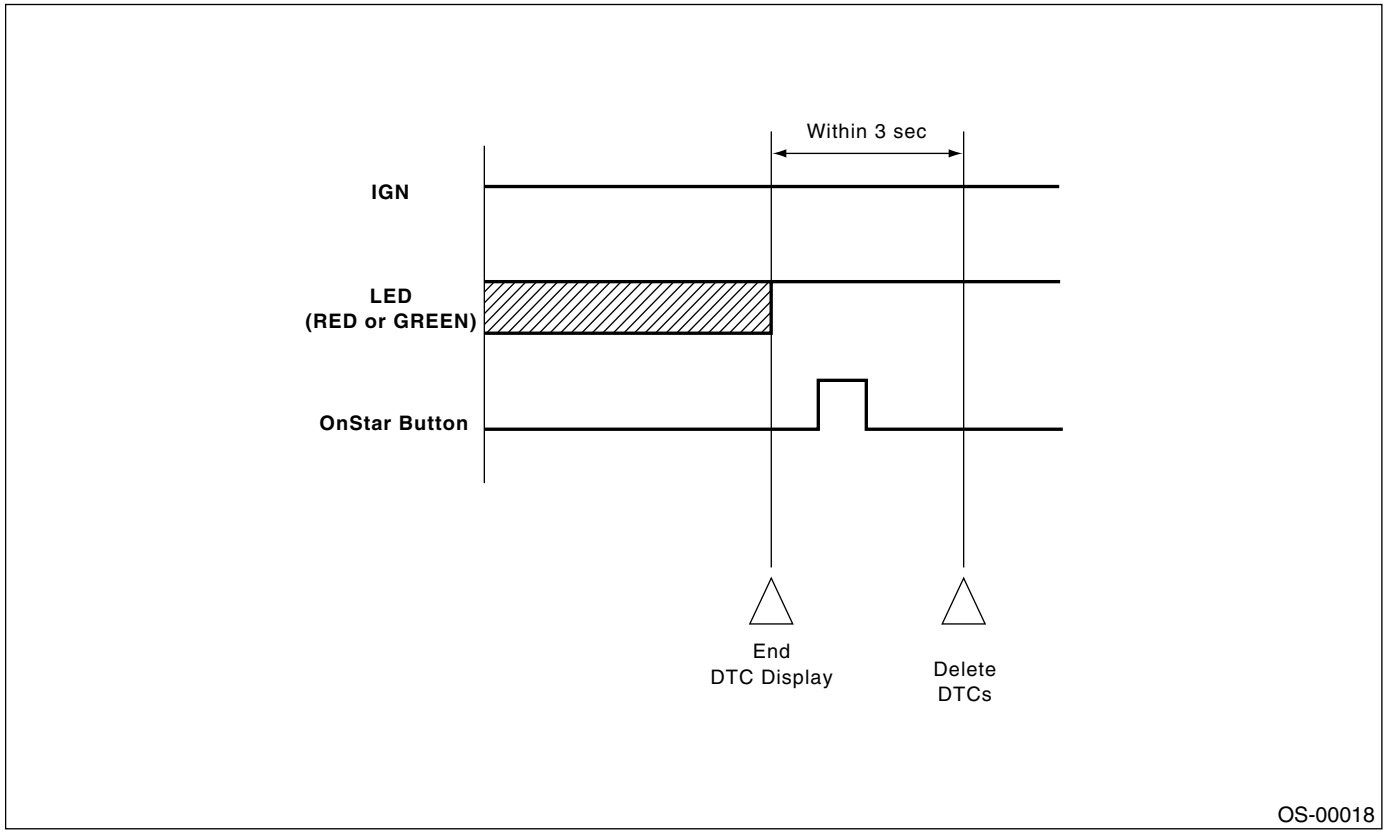
- When DTC of current trouble is stored



7. Clear Memory Mode

A: OPERATION

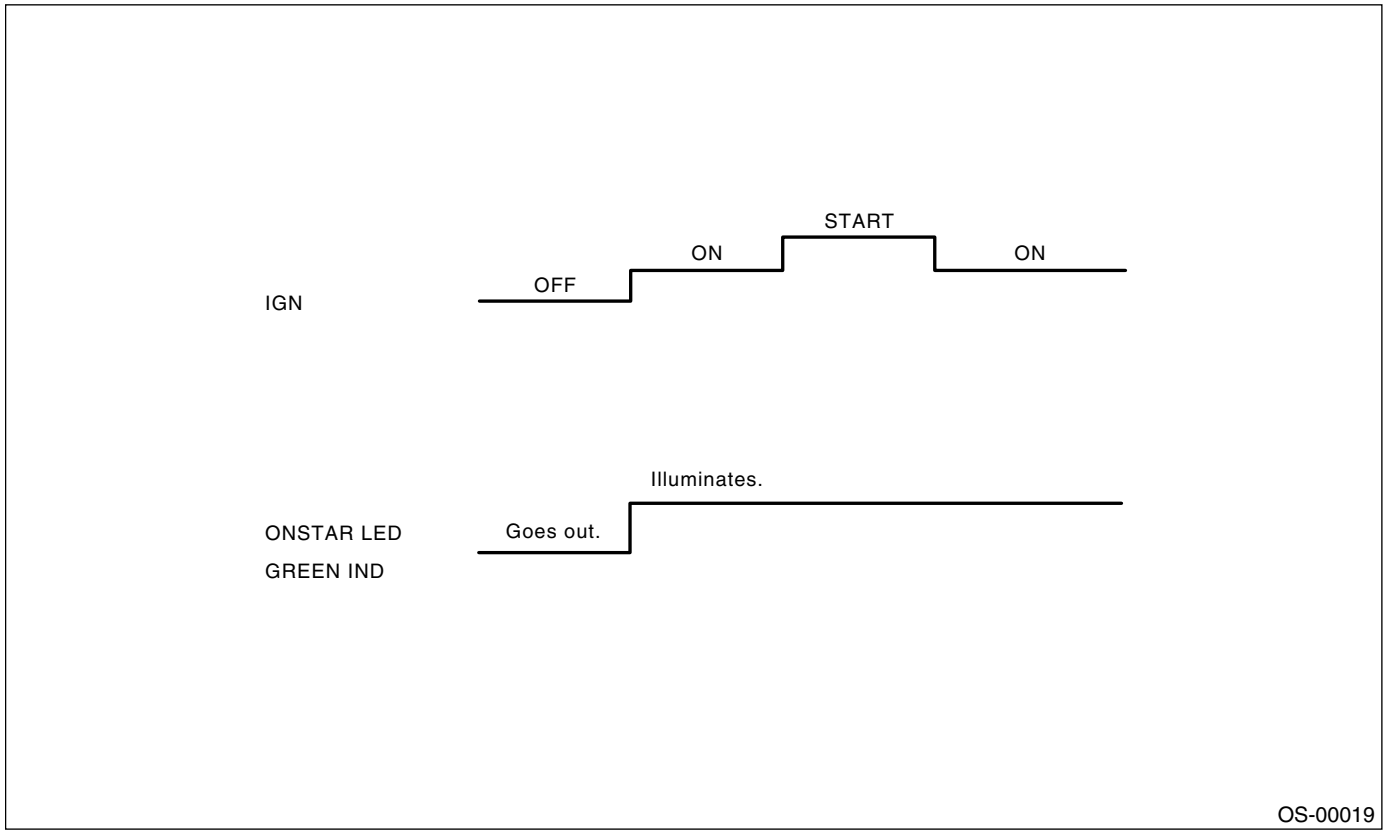
1) Within 3 seconds after reading DTC, turn the OnStar (R) button On and OFF.



8. OnStar (R) LED Illumination Pattern

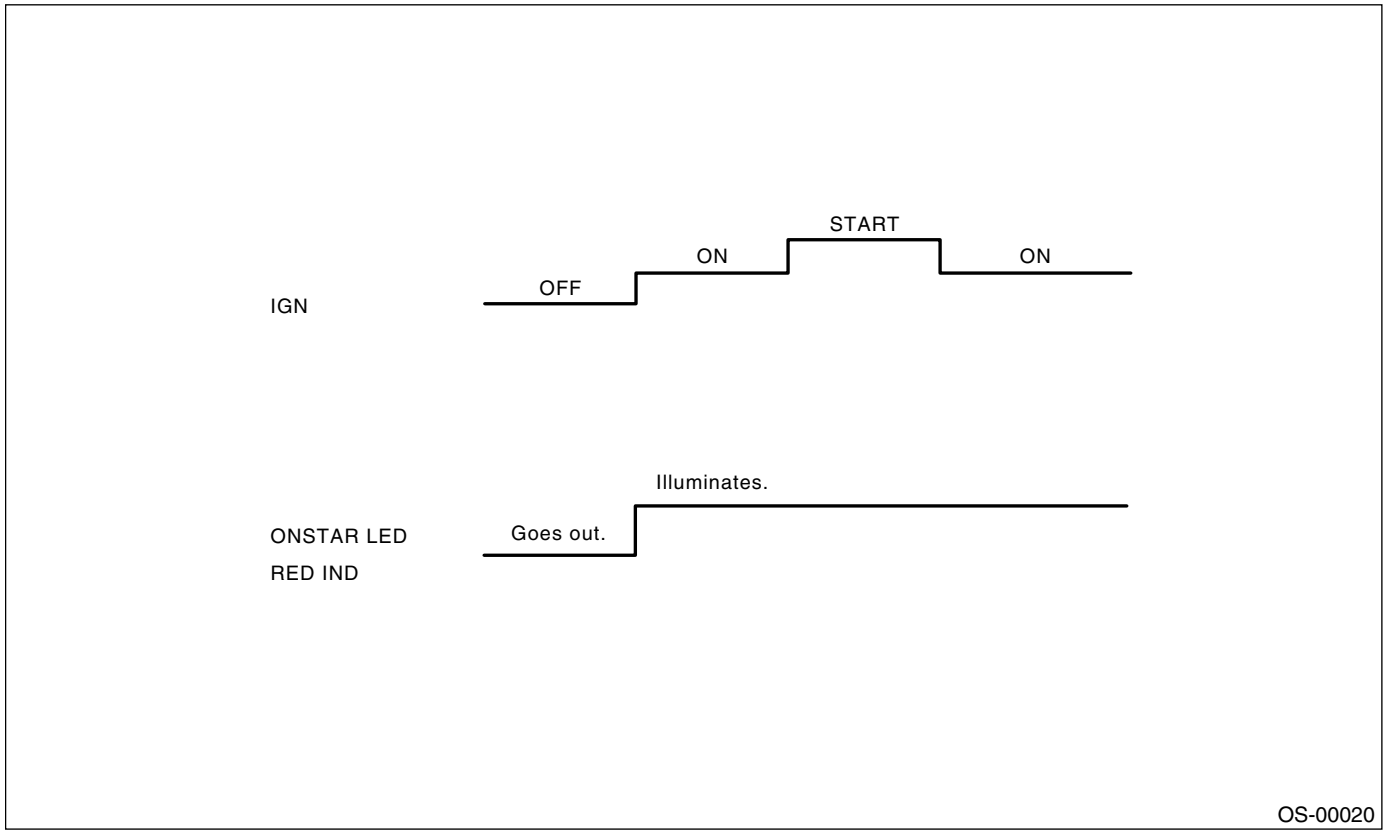
A: INSPECTION

1. LED ILLUMINATES GREEN.



1) There is some trouble in electrical system, when OnStar (R) LED does not come on.
2) Repair OnStar (R) LED circuit or diagnostic circuit, when OnStar (R) LED remains always OFF. <Ref. to OS-48, OnStar (R) LED DOES NOT OPERATE., Diagnosis for Each Symptom.>

2. LED ILLUMINATES RED.



When OnStar (R) LED illuminates in red, it means some trouble exist in OnStar (R) system. In such a case, read DTC and repair. <Ref. to OS-10, OPERATION, Read Diagnostic Trouble Code (DTC).>

9. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Content of diagnosis	LED indicator pattern	Index No.
0	EEPROM checksum error	No flash	<Ref. to OS-18, DTC 0 — EEPROM CHECKSUM ERROR —, Diagnostics Chart with Trouble Code.>
1	GPS signal error	1 flash	<Ref. to OS-20, DTC 1 — GPS SIGNAL ERROR —, Diagnostics Chart with Trouble Code.>
2	Loss of VCU communication with VIU	2 flashes	<Ref. to OS-22, DTC 2 — LOSS OF VCU COMMUNICATION WITH VIU —, Diagnostics Chart with Trouble Code.>
3	SRS Signal fault	3 flashes	<Ref. to OS-26, DTC 3 — SRS SIGNAL FAULT —, Diagnostics Chart with Trouble Code.>
4	Fault communication between GPS and microprocessor	4 flashes	<Ref. to OS-28, DTC 4 — GPS MICRO-PROCESSOR COMMUNICATION FAULT —, Diagnostics Chart with Trouble Code.>
5	Button assembly malfunction	5 flashes	<Ref. to OS-30, DTC 5 — BUTTON ASSEMBLY MALFUNCTION —, Diagnostics Chart with Trouble Code.>

CAUTION:
When DTC 4, which deactivates button module, VIU will not enter to DTC display mode.

10.Diagnostics Chart with Trouble Code

A: DTC 0 — EEPROM CHECKSUM ERROR —

DIAGNOSIS:
Trouble of EEPROM Checksum
SYMPTOM:

- Red LED illuminates
- OnStar (R) does not operate.

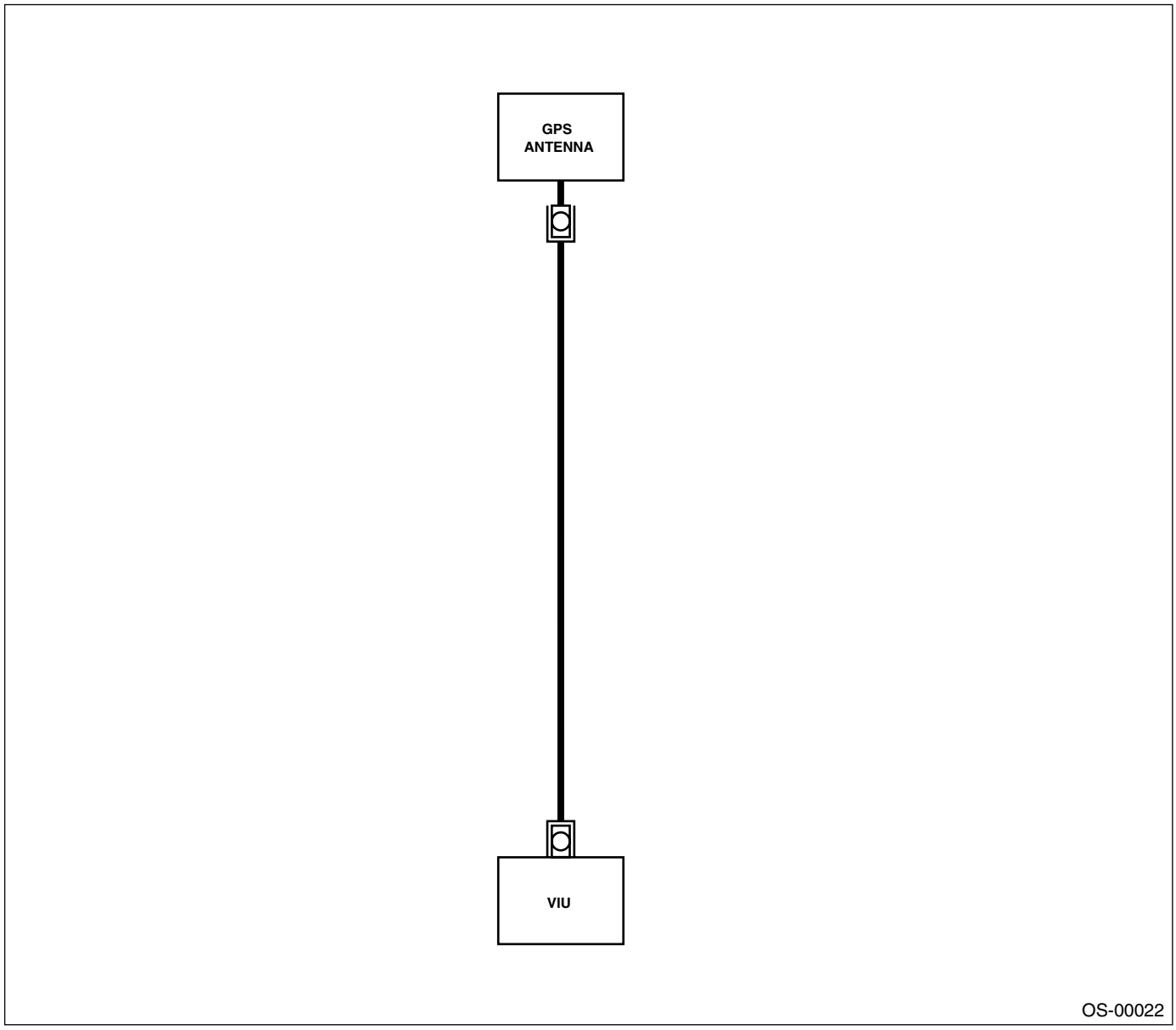
	Step	Check	Yes	No
1	**DTC 5 Check button assembly for malfunction.** <Ref. to OS-30, DTC 5 — BUTTON ASSEMBLY MALFUNCTION —, Diagnostics Chart with Trouble Code.> Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	REFERENCE: Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>

MEMO:

B: DTC 1 — GPS SIGNAL ERROR —

DIAGNOSIS:
Trouble of GPS Signal
SYMPTOM:

- Red LED illuminates
- OnStar (R) does not operate.

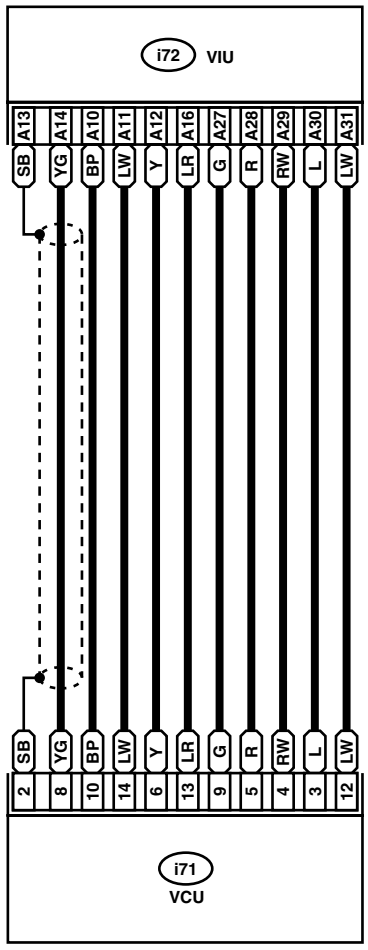


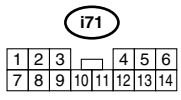
	Step	Check	Yes	No
1	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect GPS antenna connector from VIU. 3) Disconnect connector from GPS antenna. 4) Measure resistance between GPS antenna cables.	Is the measured value less than the 0.5 Ω?	Go to step **2.**	Repair open harness.
2	**CHECK HARNESS.** Measure resistance of GPS antenna cable.	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short of GPS antenna cable.
3	**CHECK HARNESS.** Turn ignition switch to ON. Measure voltage between GPS antenna cable and chassis ground. Does the measured value exceed the specified value?	Is the measured value less than 1 V?	Go to step **4.**	Repair battery short of GPS antenna cable.
4	**CHECK GPS ANTENNA.** 1) Replace GPS antenna. <Ref. to OS-8, Antenna.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	REFERENCE: Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>

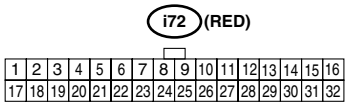
C: DTC 2 — LOSS OF VCU COMMUNICATION WITH VIU —

DIAGNOSIS:
Communication error between VIU and VCU
SYMPTOM:

- Red LED illuminates
- OnStar (R) does not operate.







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	Step	Check	Yes	No
1	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect VCU connector. 4) Measure resistance between VIU connector and VCU connector. ***Connector & Terminal*** ***(i72) No. 10 — (i71) No. 10:*** ***(i72) No. 11 — (i71) No. 14:*** ***(i72) No. 12 — (i71) No. 6:*** ***(i72) No. 13 — (i71) No. 2:*** ***(i72) No. 14 — (i71) No. 8:*** ***(i72) No. 16 — (i71) No. 13:*** ***(i72) No. 27 — (i71) No. 9:*** ***(i72) No. 28 — (i71) No. 5:*** ***(i72) No. 29 — (i71) No. 4:*** ***(i72) No. 30 — (i71) No. 3:*** ***(i72) No. 31 — (i71) No. 12:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair open harness.
2	**CHECK HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 10 — Chassis ground:*** ***(i72) No. 11 — Chassis ground:*** ***(i72) No. 12 — Chassis ground:*** ***(i72) No. 13 — Chassis ground:*** ***(i72) No. 14 — Chassis ground:*** ***(i72) No. 16 — Chassis ground:*** ***(i72) No. 27 — Chassis ground:*** ***(i72) No. 28 — Chassis ground:*** ***(i72) No. 29 — Chassis ground:*** ***(i72) No. 30 — Chassis ground:*** ***(i72) No. 31 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short of harness.
3	**CHECK HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 10 (+) — Chassis ground (–):*** ***(i72) No. 11 (+) — Chassis ground (–):*** ***(i72) No. 12 (+) — Chassis ground (–):*** ***(i72) No. 13 (+) — Chassis ground (–):*** ***(i72) No. 14 (+) — Chassis ground (–):*** ***(i72) No. 16 (+) — Chassis ground (–):*** ***(i72) No. 27 (+) — Chassis ground (–):*** ***(i72) No. 28 (+) — Chassis ground (–):*** ***(i72) No. 29 (+) — Chassis ground (–):*** ***(i72) No. 30 (+) — Chassis ground (–):*** ***(i72) No. 31 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Repair battery short of harness.
4	**CHECK VOLTAGE OF POWER SUPPLY.** 1) Turn ignition switch to OFF. 2) Connect connector of VIU and VCU. 3) Turn the ignition switch to ON. 4) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 10 (+) — Chassis ground (–):***	Is the measured value 0 V?	Go to step **5.**	Go to step **11.**

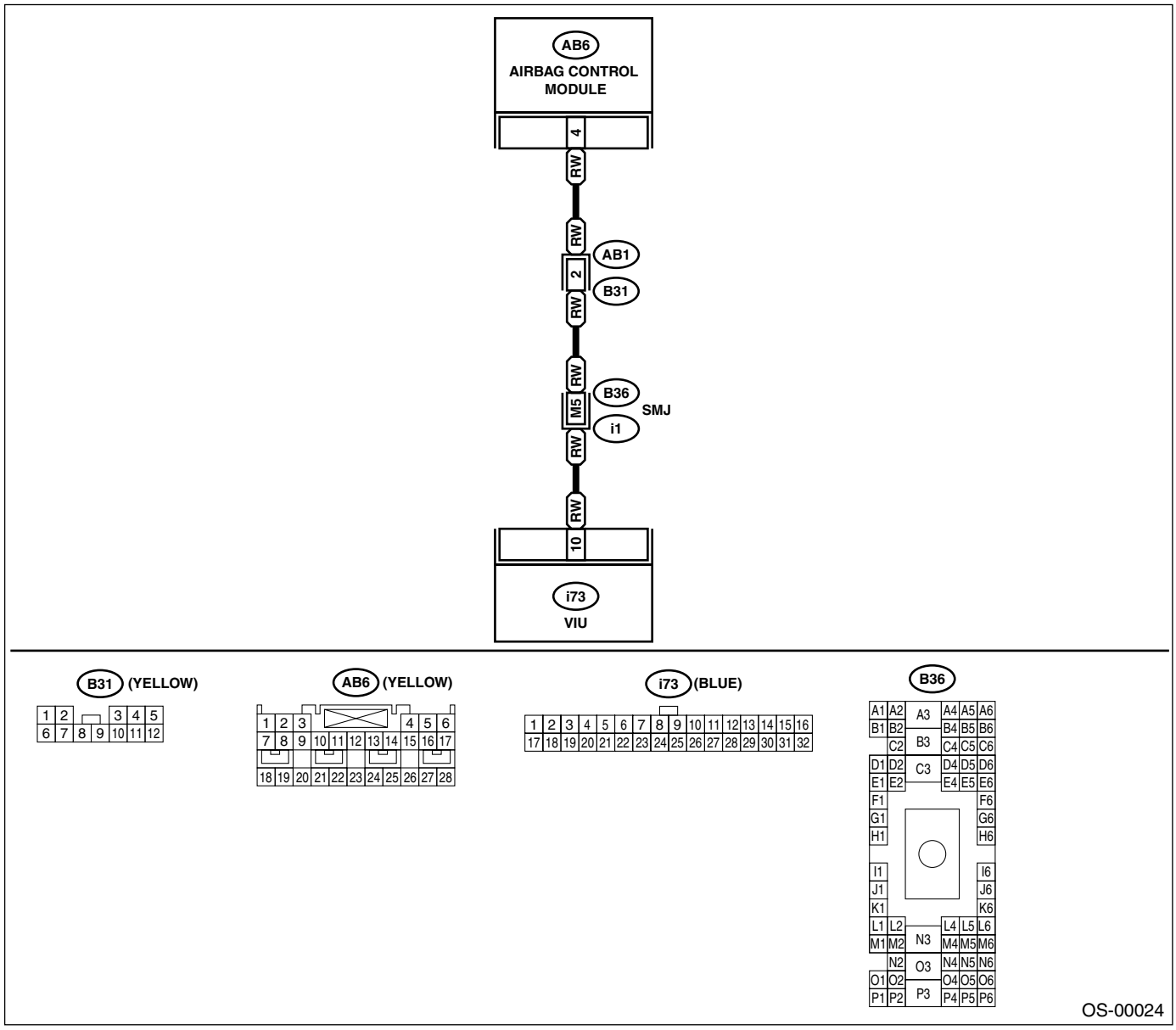
Step		Check	Yes	No
5	**CHECK VOLTAGE OF POWER SUPPLY.** Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 11 (+) — Chassis ground (–):***	Is the measured value 3.0 to 5.0 V?	Go to step **6.**	Go to step **11.**
6	**CHECK VOLTAGE OF POWER SUPPLY.** Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 12 (+) — Chassis ground (–):***	Is the measured value 9 to 16 V?	Go to step **7.**	Go to step **11.**
7	**CHECK VOLTAGE OF POWER SUPPLY.** Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 16 (+) — Chassis ground (–):***	Is the measured value 9 to 16 V?	Go to step **8.**	Go to step **11.**
8	**CHECK VOLTAGE OF POWER SUPPLY.** Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 31 (+) — Chassis ground (–):***	Is the measured value 9 to 16 V?	Go to step **9.**	Go to step **11.**
9	**CHECK VCU HARNESS CONNECTOR.** Check if there is any poor contact in VCU harness connector.	Is there any poor contact in connector?	Go to step **10.**	Repair poor contact in connector.
10	**CHECK VCU.** IMPORTANT Perform OnStar (R) setup procedure. Replace VCU. <Ref. to OS-5, Vehicle Communication Unit VCU.>	Was the trouble repaired?	System is OK.	Go to step **11.**
11	**CHECK VIU HARNESS CONNECTOR.** Check if there is any poor contact in VIU harness connector.	Is there any poor contact in connector?	Go to step **12.**	Repair poor contact in connector.
12	**CHECK VIU.** IMPORTANT Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>	Was the trouble repaired?	System is OK.	Go to step **1.**

MEMO:

D: DTC 3 — SRS SIGNAL FAULT —

DIAGNOSIS:
Communication error between VIU and SRS.
SYMPTOM:

- Red LED illuminates
- OnStar (R) does not operate.



	Step	Check	Yes	No
1	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect SRS connector. 4) Measure resistance between VIU connector and SRS connector. ***Connector & Terminal*** ***(i73) No. 10 — (AB6) No. 4:***	Is the measured value less than the 0.5 Ω?	Go to step **2.**	Repair open harness.
2	**CHECK HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 10 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **3.**	Repair ground short of harness.
3	**CHECK HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 10 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Repair battery short of harness.
4	**CHECK VOLTAGE OF POWER SUPPLY.** 1) Turn ignition switch to OFF. 2) Connect VIU connector. 3) Turn the ignition switch to ON. 4) Measure resistance between SRS connector and chassis ground. ***Connector & Terminal*** ***(AB6) No. 4 (+) — Chassis ground (–):***	Is the measured value 9 to 16 V?	Go to step **5.**	Go to step **6.**
5	**CHECK AIRBAG CONTROL MODULE.** 1) Replace airbag control module. <Ref. to AB-18, Airbag Control Module.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **6.**
6	**CHECK VIU.** REFERENCE: Perform OnStar (R) setup procedure. 1) Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

E: DTC 4 — GPS MICRO-PROCESSOR COMMUNICATION FAULT —

DIAGNOSIS:
Trouble of GPS micro-processor in VIU
SYMPTOM:

- Red LED illuminates
- OnStar (R) does not operate.

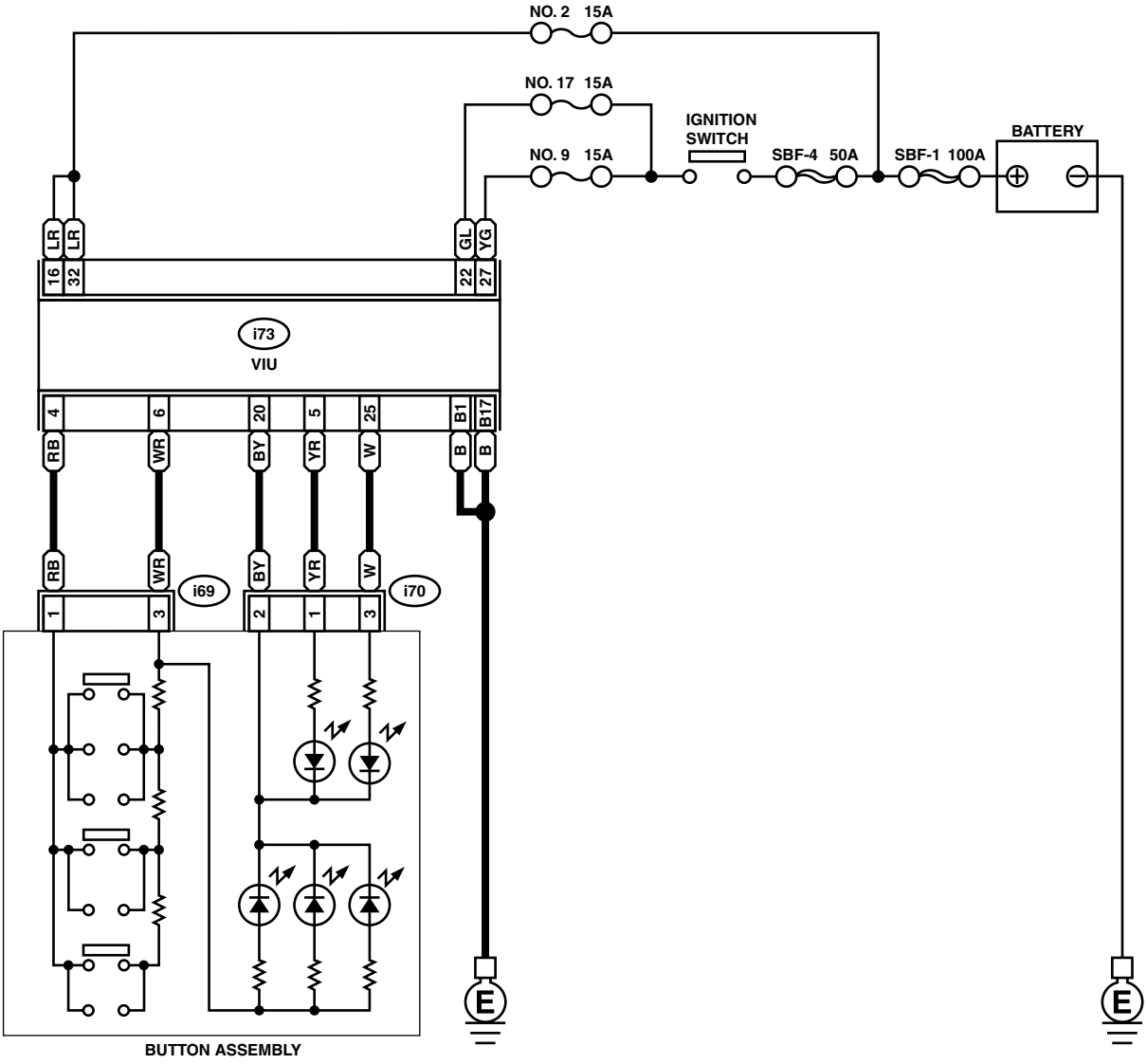
	Step	Check	Yes	No
1	**CHECK VIU.** REFERENCE: Perform OnStar (R) setup procedure. 1) Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Repair trouble.

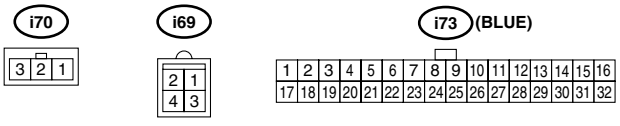
MEMO:

F: DTC 5 — BUTTON ASSEMBLY MALFUNCTION —

DIAGNOSIS:
Communication error of button assembly
SYMPTOM:

- Red LED illuminates
- OnStar (R) does not operate.





OS-00025

	Step	Check	Yes	No
1	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect button assembly connector. 4) Measure resistance between VIU connector and button assembly connector. ***Connector & Terminal*** ***(i73) No. 4 — (i69) No. 1:*** ***(i73) No. 6 — (i69) No. 3:*** ***(i73) No. 20 — (i70) No. 2:*** ***(i73) No. 5 — (i70) No. 1:*** ***(i73) No. 25 — (i70) No. 3:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair open harness.
2	**CHECK HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 4 — Chassis ground:*** ***(i73) No. 6 — Chassis ground:*** ***(i73) No. 20 — Chassis ground:*** ***(i73) No. 5 — Chassis ground:*** ***(i73) No. 25 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **2.**	Repair ground short of harness.
3	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 4 (+) — Chassis ground (–):*** ***(i73) No. 6 (+) — Chassis ground (–):*** ***(i73) No. 20 (+) — Chassis ground (–):*** ***(i73) No. 5 (+) — Chassis ground (–):*** ***(i73) No. 25 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **4.**	Repair battery short of harness.
4	**CHECK VOLTAGE OF POWER SUPPLY.** 1) Turn ignition switch to OFF. 2) Connect VIU connector. 3) Turn the ignition switch to ON. 4) Measure voltage between button assembly connector and chassis ground. ***Connector & Terminal*** ***(i69) No. 3 (+) — Chassis ground (–):***	Is the measured value within the 10 to 13 V?	Go to step **5.**	REFERENCE: Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>
5	**CHECK EMERGENCY BUTTON.** Measure resistance between terminals of button assembly. ***Terminal*** ***No. 1 — No. 3:***	Is the measured value 1.5 KΩ by pressing emergency button?	Go to step **6.**	Replace button assembly. <Ref. to OS-6, Button Assembly.>
6	**OnStar (R) CHECK BUTTON.** Measure resistance between terminals of button assembly. ***Terminal*** ***No. 1 — No. 3:***	Is the measured value 3.0 KΩ by pressing OnStar (R) button?	Go to step **7.**	Replace button assembly. <Ref. to OS-6, Button Assembly.>
7	**CHECK CALL ANSWER/END BUTTON.** Measure resistance between terminals of button assembly. ***Terminal*** ***No. 1 — No. 3:***	Is the measured value 13.0 KΩ by pressing call answer/end button?	Go to step **8.**	Replace button assembly. <Ref. to OS-6, Button Assembly.>
8	**System check** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **9.**

Step		Check	Yes	No
9	**CHECK BUTTON ASSEMBLY.** 1) Replace button assembly. <Ref. to OS-6, Button Assembly.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **10.**
10	**CHECK VIU.** REFERENCE: Perform OnStar (R) setup procedure. 1) Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

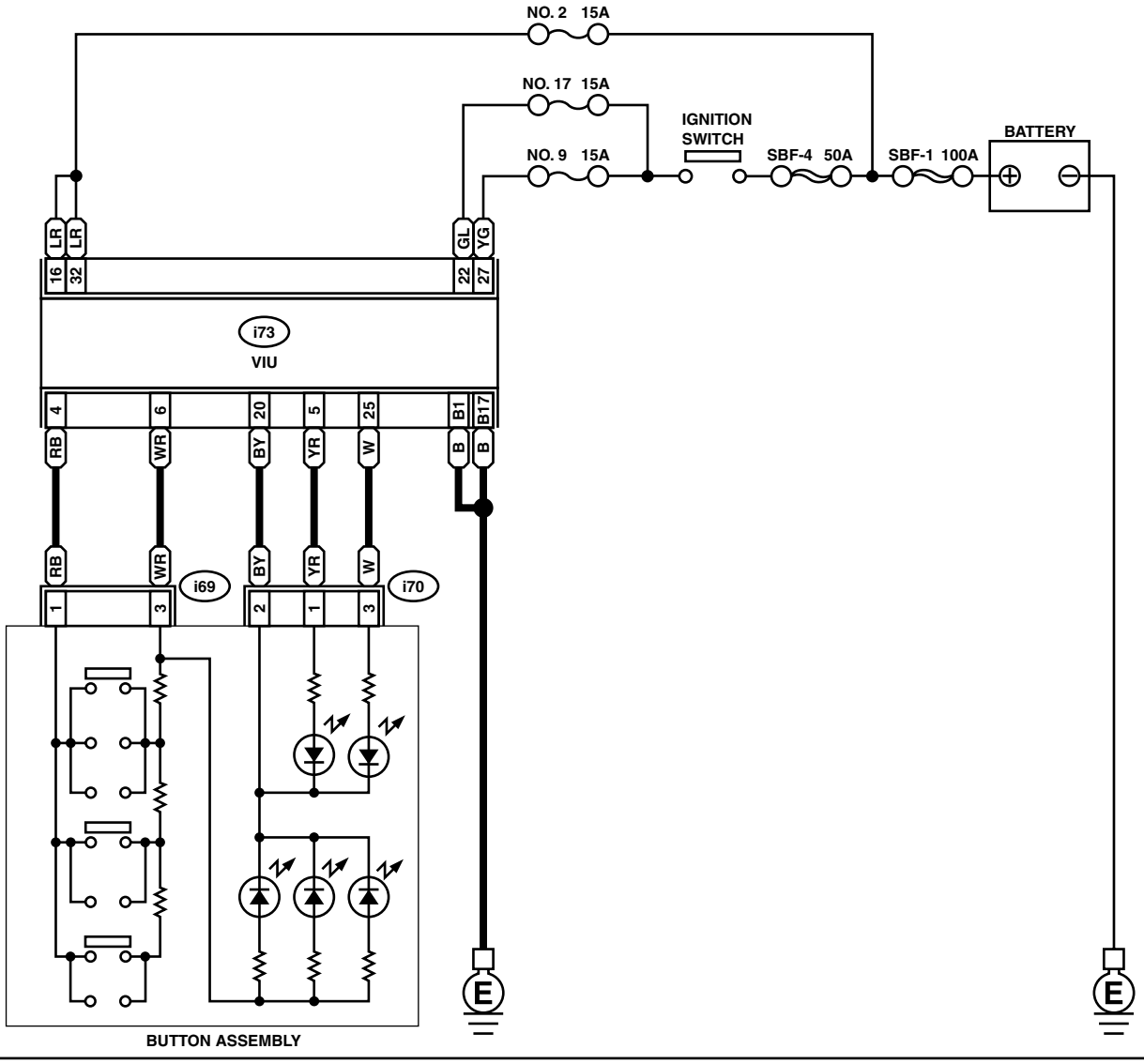
11.Diagnosis for Each Symptom

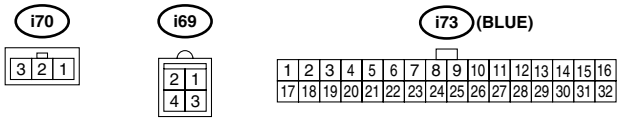
A: LIST

Content of diagnosis	Index No.
One or more OnStar (R) buttons do not operate.	<Ref. to OS-34, ONE OR MORE OnStar (R) BUTTONS DO NOT OPERATE., Diagnosis for Each Symptom.>
Contact to OnStar (R) call center is impossible.	<Ref. to OS-38, CONTACT TO OnStar (R) CALL CENTER IS IMPOSSIBLE., Diagnosis for Each Symptom.>
OnStar (R) call center cannot setup OnStar (R) system.	<Ref. to OS-42, OnStar (R) CALL CENTER CANNOT SETUP OnStar (R) SYSTEM., Diagnosis for Each Symptom.>
OnStar (R) audio does not operate.	<Ref. to OS-44, OnStar (R) AUDIO DOES NOT OPERATE., Diagnosis for Each Symptom.>
OnStar (R) button LED does not operate.	<Ref. to OS-48, OnStar (R) LED DOES NOT OPERATE., Diagnosis for Each Symptom.>

B: ONE OR MORE ONSTAR (R) BUTTONS DO NOT OPERATE.

DEFINITION: OnStar (R) does not operate by pressing button.





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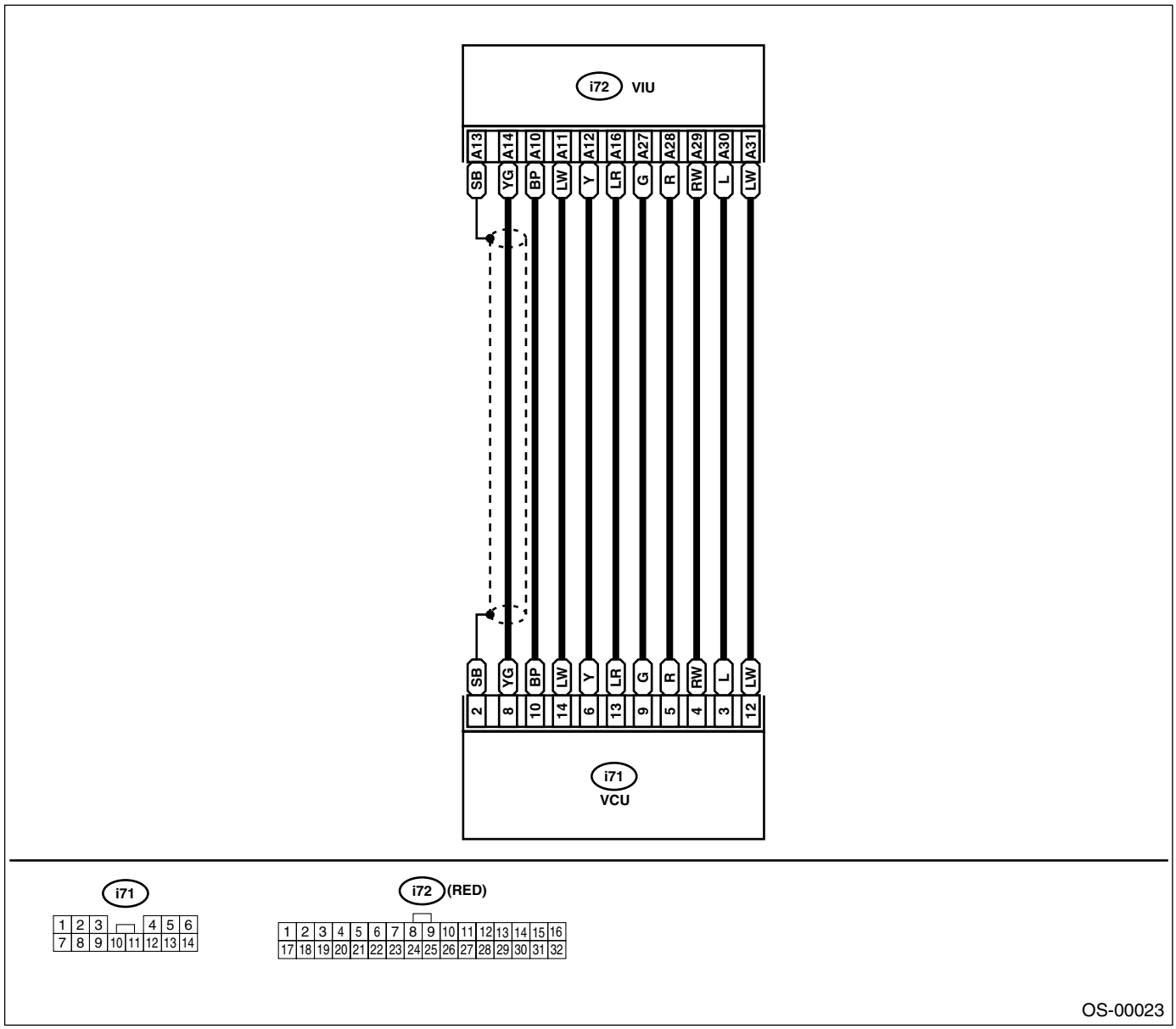
	Step	Check	Yes	No
1	**CHECK BUTTON ASSEMBLY.** IMPORTANT Before pressing button, call OnStar (R) call center to notify the inspection. 1) Turn ignition switch to ON (do not let the engine run). 2) Press each OnStar (R) button.	Does the LED illuminate in green?	Go to step **3.**	Go to step **2.**
2	**CHECK BUTTON.**	Does any button malfunction intermittently?	Go to step **7.**	Poor contact of connection/Repair poor contact.
3	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect button assembly connector. 4) Measure resistance between VIU connector and button assembly connector. ***Connector & Terminal*** ***(i73) No. 4 — (i69) No. 1:*** ***(i73) No. 6 — (i69) No. 3:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Repair open harness.
4	**CHECK HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 4 (+) — Chassis ground (–):*** ***(i73) No. 6 (+) — Chassis ground (–):***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short of harness.
5	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 4 (+) — Chassis ground (–):*** ***(i73) No. 6 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **6.**	Repair battery short of harness.
6	**CHECK VOLTAGE OF POWER SUPPLY.** 1) Turn ignition switch to OFF. 2) Connect VIU connector. 3) Turn the ignition switch to ON. 4) Measure voltage between button assembly connector and chassis ground. ***Connector & Terminal*** ***(i69) No. 3 (+) — Chassis ground (–):***	Is the measured value within 9 to 16 V?	Go to step **7.**	REFERENCE: Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>
7	**CHECK EMERGENCY BUTTON.** Measure resistance between terminals of button assembly. ***Terminal*** ***No. 1 —No. 3:***	Is the measured value 3.0 KΩ by pressing emergency button?	Go to step **8.**	Replace button assembly. <Ref. to OS-6, Button Assembly.>
8	**CHECK OnStar (R) BUTTON.** Measure resistance between terminals of button assembly. ***Terminal*** ***No. 1 — No. 3:***	Is the measured value 13.0 KΩ by pressing OnStar (R) button?	Go to step **9.**	Replace button assembly. <Ref. to OS-6, Button Assembly.>
9	**CHECK CALL ANSWER/END BUTTON.** Measure resistance between terminals of button assembly. ***Terminal*** ***No. 1 — No. 3:***	Is the measured value 470 Ω by pressing call answer/end button?	Go to step **10.**	Replace button assembly. <Ref. to OS-6, Button Assembly.>
10	**CHECK POOR CONNECTION OF BUTTON ASSEMBL.** Check, if there is any poor contact in harness connector of button assembly.	Was the condition confirmed or repaired?	Go to step **12.**	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK IF THERE IS ANY POOR CONTACT IN VIU HARNESS CONNECTOR.**	Was the condition confirmed or repaired?	Go to step **12.**	Go to step **13.**
12	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **13.**
13	**CHECK BUTTON ASSEMBLY.** 1) Replace button assembly. <Ref. to OS-6, Button Assembly.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **14.**
14	**CHECK VIU.** REFERENCE: Perform OnStar (R) setup procedure. 1) Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.> 2) Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

MEMO:

C: CONTACT TO ONSTAR (R) CALL CENTER IS IMPOSSIBLE.

DEFINITION: When OnStar (R) call button is pressed, audio prompt “Connected to OnStar (R)” or “Impossible to connect to OnStar (R)” will be announced and connection is not performed.



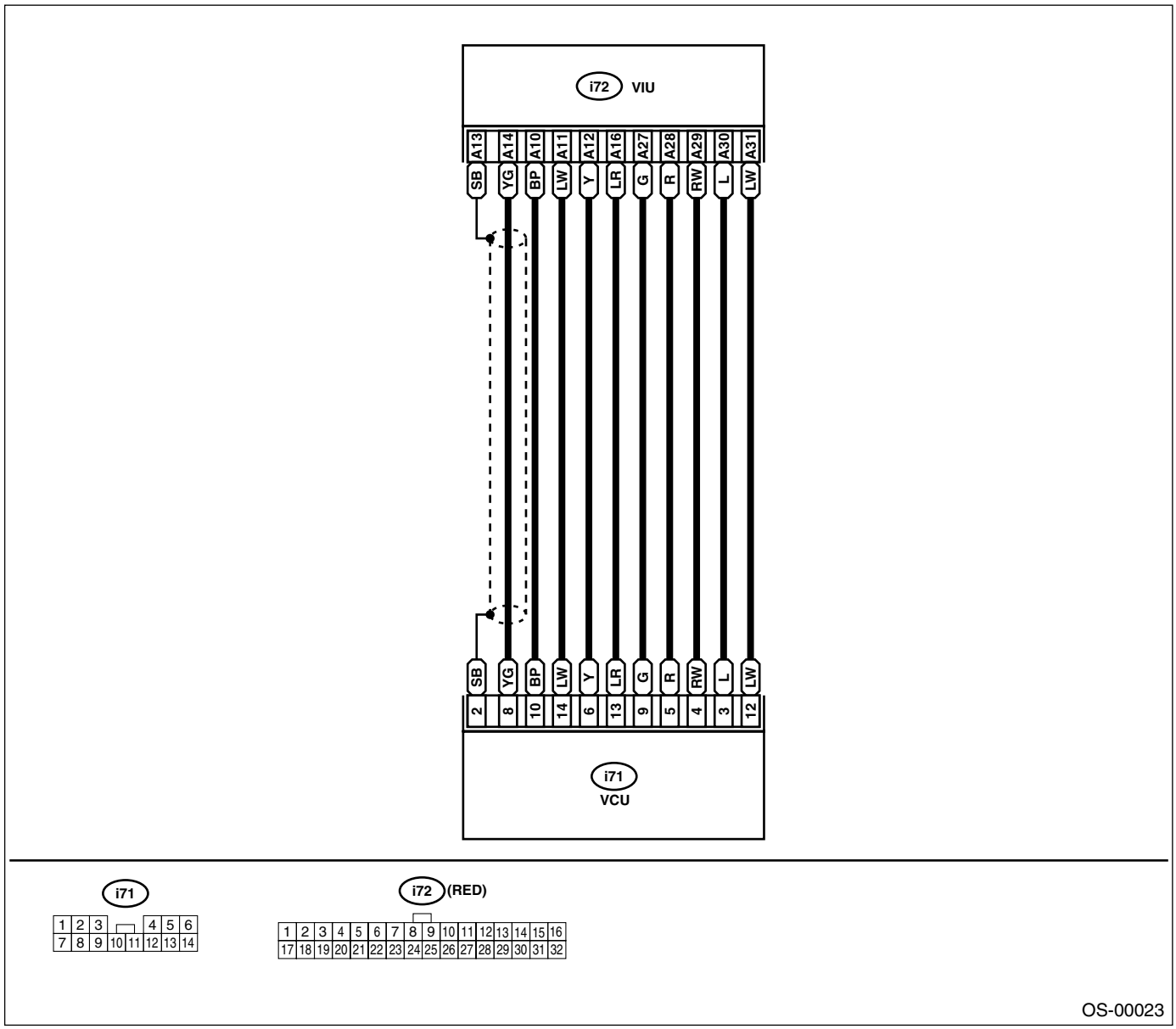
	Step	Check	Yes	No
1	**CHECK FOR CONNECTION TO OnStar (R) Call Center.** 1) Turn ignition to ON (do not let the engine run). 2) Press OnStar (R) button.	Is connection to OnStar (R) call center completed?	Repair temporary poor connection of wiring.	Go to step **2.**
2	**CHECK OnStar (R) SERIAL DATA RETURN CIRCUIT.** 1) Turn ignition switch to OFF. 2) Disconnect connection from vehicle communication unit (VCU). 3) Turn ignition switch to ON (do not let the engine run). 4) Measure resistance between OnStar (R) serial data return circuit and ground. ***Connector & Terminal*** ***(i71) No. 9 (+) — Chassis ground (–):***	Is the measured value approx. 5 V?	Go to step **3.**	Go to step **6.**
3	**CHECK OnStar (R) SERIAL DATA (–) CIRCUIT.** Measure voltage between OnStar (R) serial data (–) circuit and ground. ***Connector & Terminal*** ***(i71) No. 5 (+) — Chassis ground (–):***	Is the measured value approx. 0.17 V?	Go to step **4.**	Go to step **9.**
4	**CHECK CIRCUIT BETWEEN OnStar (R) SERIAL DATA (–) CIRCUIT AND TRANSCEIVER LOW REFEFERENCE CIRCUIT.** Measure voltage between OnStar (R) serial data (–) circuit and transceiver low reference circuit. ***Connector & Terminal*** ***(i71) No. 5 (+) — (i71) No. 3 (–):***	Is the measured value approx. 5 V?	Go to step **5.**	Go to step **15.**
5	**CHECK OnStar (R) SERIAL DATA (+) CIRCUIT.** Measure voltage between OnStar (R) serial data (+) circuit and ground. ***Connector & Terminal*** ***(i71) No. 4 (+) — Chassis ground (–):***	Is the measured value approx. 0.17 V?	Go to step **18.**	Go to step **12.**
6	**CHECK SERIAL DATA RETURN HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect VCU connector. 4) Measure resistance between VIU connector and VCU connector. ***Connector & Terminal*** ***(i72) No. 27 — (i71) No. 9:***	Is the measured value less than the 0.5 Ω?	Go to step **7.**	Repair open harness.
7	**CHECK SERIAL DATA RETURN HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 27 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **8.**	Repair ground short of harness.
8	**CHECK SERIAL DATA RETURN HARNESS.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 27 (+) — Chassis ground (–):***	Is the measured value less than 1 V?	Go to step **19.**	Repair battery short of harness.

Step		Check	Yes	No
9	**CHECK HARNESS (–).** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect VCU connector. 4) Measure resistance between VIU connector and VCU connector. ***Connector & Terminal*** ***(i72) No. 28 — (i71) No. 5:***	Is the measured value less than 0.5 Ω?	Go to step **10.**	Repair open harness.
10	**CHECK HARNESS (–).** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 28 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **11.**	Repair ground short of harness.
11	**CHECK HARNESS (–).** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 28 (+) — Chassis ground (–):***	Is the measurede value less than 1 V?	Go to step **19.**	Repair battery short of harness.
12	**CHECK SERIAL DATA (+) HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect VCU connector. 4) Measure resistance between VIU connector and VCU connector. ***Connector & Terminal*** ***(i72) No. 29 — (i71) No. 4:***	Is the measured value less than 0.5 Ω?	Go to step **13.**	Repair open harness.
13	**CHECK SERIAL DATA (+) HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 29 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **14.**	Repair ground short of harness.
14	**CHECK SERIAL DATA (+) HARNESS.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 29 (+) — Chassis ground (–):***	Is the measurede value less than 1 V?	Go to step **19.**	Repair battery short of harness.
15	**CHECK TRANSCEIVER LOW REFERENCE HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect VCU connector. 4) Measure resistance between VIU connector and VCU connector. ***Connector & Terminal*** ***(i72) No. 30 — (i71) No. 3:***	Is the measured value less than 0.5 Ω?	Go to step **16.**	Repair open harness.
16	**CHECK TRANSCEIVER LOW REFERENCE HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 30 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **17.**	Repair ground short of harness.

	Step	Check	Yes	No
17	**CHECK TRANSEAVER LOW REFERENCE HARNESS.** 1) Turn ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 30 (+) — Chassis ground (–):***	Is the measurede value less than 1 V?	Go to step **19.**	Repair battery short of harness.
18	**CHECK VCU HARNESS CONNECTOR.** Check if there is any poor contact in VCU harness connector.	Is there any poor contact in connector?	Go to step **20.**	Repair poor contact in connector.
19	**CHECK VIU HARNESS CONNECTOR.** Check if there is any poor contact in VIU harness connector.	Is there any poor contact in connector?	Go to step **21.**	Repair poor contact in connector.
20	**CHECK VCU.** IMPORTANT Perform OnStar (R) setup procedure. Replace VCU. <Ref. to OS-5, Vehicle Communication Unit VCU.>	—	Go to step **22.**	—
21	**CHECK VIU.** IMPORTANT Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>	—	Go to step **22.**	—
22	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

D: ONSTAR (R) CALL CENTER CANNOT SETUP ONSTAR (R) SYSTEM.

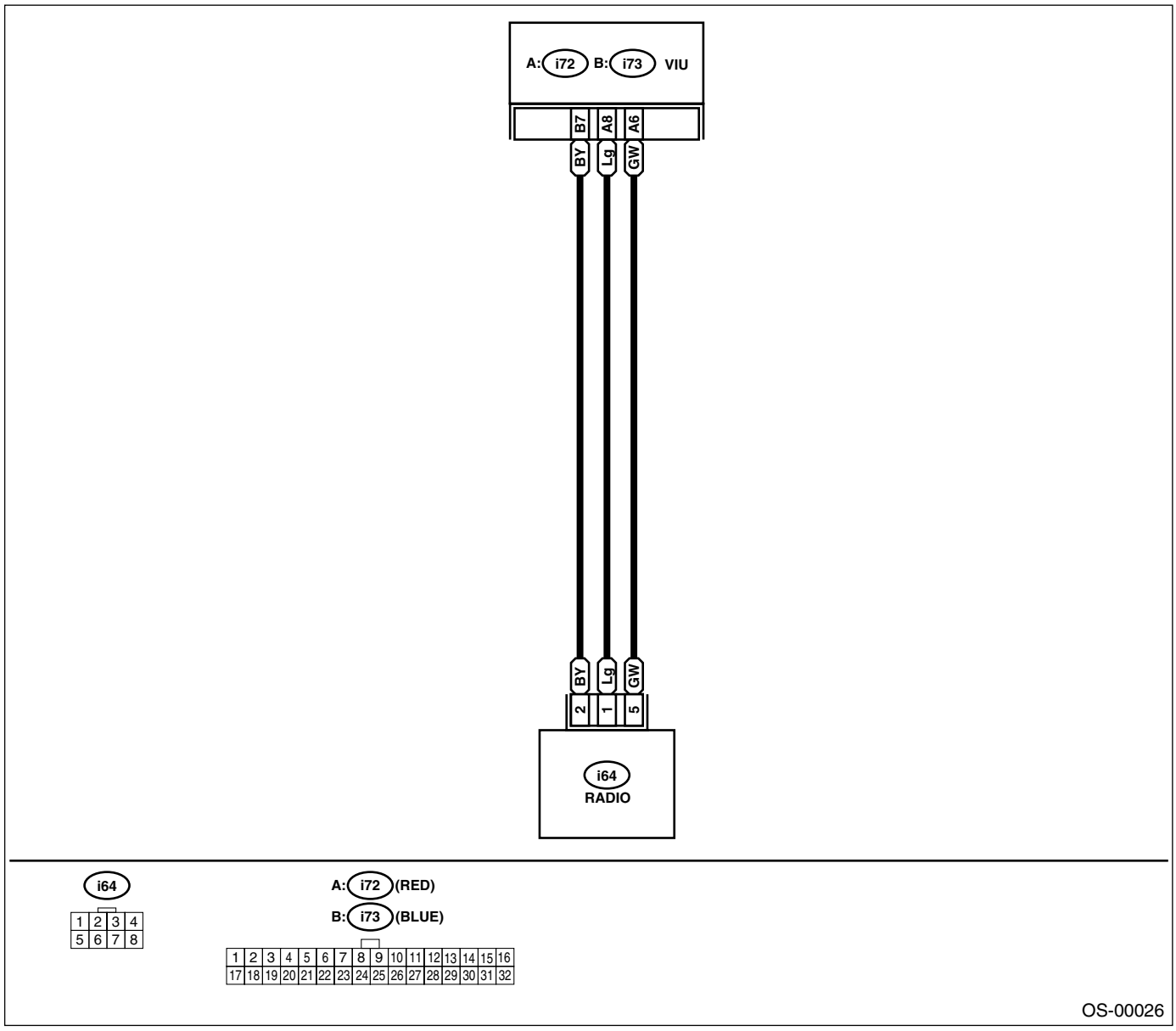
DEFINITION: OnStar (R) Operator notifies to receiver that the required setup of the OnStar (R) system is impossible.



	Step	Check	Yes	No
1	**CHECK IGNITION ON SIGNAL CIRCUIT.** 1) Turn ignition switch to OFF. 2) Disconnect connection from VCU. 3) Turn ignition switch to ON (do not let the engine run). 4) Measure voltage between ignition ON signal circuit and ground. ***Connector & Terminal*** ***(i72) No. 31 (+) — Chassis ground (–):***	Is the measured value 9 to 16 V?	Go to step **4.**	Go to step **2.**
2	**CHECK IGNITION ON SIGNAL HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect VCU connector. 4) Measure resistance between VIU connector and VCU connector. ***Connector & Terminal*** ***(i72) No. 31 — (i71) No. 12:***	Is the measured value less than 0.5 Ω?	Go to step **3.**	Repair open harness.
3	**CHECK IGNITION ON SIGNAL HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 31 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short of harness.
4	**CHECK VCU HARNESS CONNECTOR.** Check if there is any poor contact in VCU harness connector.	Is there any poor contact in connector?	Go to step **6.**	Repair poor contact in connector.
5	**CHECK VIU HARNESS CONNECTOR.** Check if there is any poor contact in VIU harness connector.	Is there any poor contact in connector?	Go to step **7.**	Repair poor contact in connector.
6	**CHECK VCU.** IMPORTANT Perform OnStar (R) setup procedure. Replace VCU. <Ref. to OS-5, Vehicle Communication Unit VCU.>	—	Go to step **8.**	—
7	**CHECK VIU.** IMPORTANT Perform OnStar (R) setup procedure. Replace VIU. <Ref. to OS-4, Vehicle Interface Unit VIU.>	—	Go to step **8.**	—
8	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

E: ONSTAR (R) AUDIO DOES NOT OPERATE.

DEFINITION: Audio system display does not change into “Call”, even if all buttons are pressed.



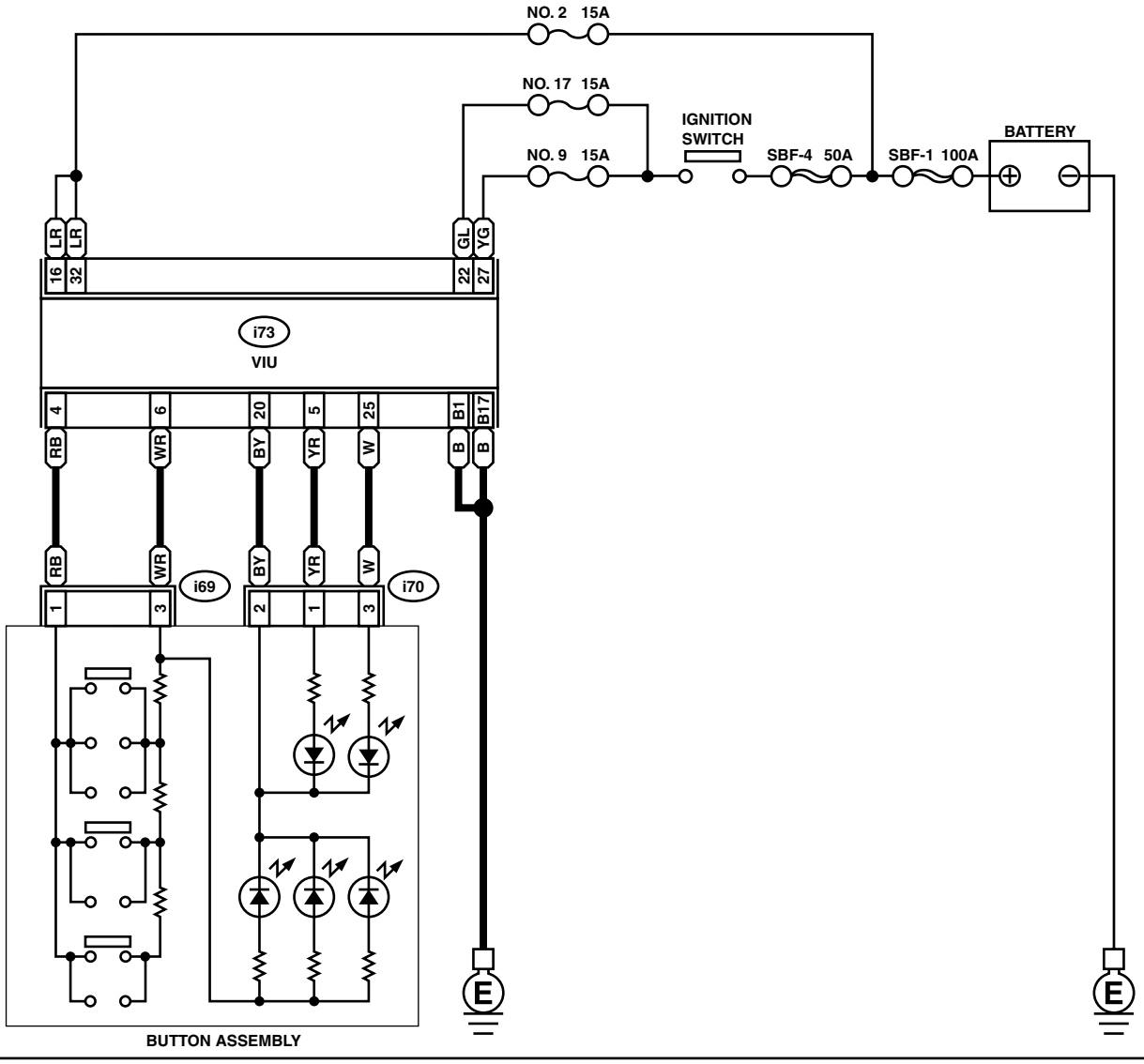
	Step	Check	Yes	No
1	**CHECK LED.** IMPORTANT Before pressing button, call OnStar (R) call center to notify the inspection. 1) Turn ignition to ON (do not let the engine run).	Does LED illuminate, when all of buttons are pressed one to another?	Go to step **2.**	Perform inspection of One or more OnStar (R) button does not operate. <Ref. to OS-34, ONE OR MORE OnStar (R) BUTTONS DO NOT OPERATE., Diagnosis for Each Symptom.>
2	**CHECK AUDIO SYSTEM** 1) Turn ignition to ON (do not let the engine run). 2) Turn radio ON. 3) Set the volume to comfortable level. 4) Activate all bottons	Does the audio system display “Call”?	Go to step **11.**	Go to step **3.**
3	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect audio connector. 4) Measure resistance between VIU connector and audio connector. ***Connector & Terminal*** ***(i72) No. 6 — (i69) No. 5:*** ***(i72) No. 8 — (i69) No. 1:*** ***(i73) No. 7 — (i69) No. 2:***	Is the measured value less than 0.5 Ω?	Go to step **4.**	Repair open harness.
4	**CHECK HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 6 — Chassis ground:*** ***(i72) No. 8 — Chassis ground:*** ***(i73) No. 7 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **5.**	Repair ground short of harness.
5	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i72) No. 6 (+) — Chassis ground (–):*** ***(i72) No. 8 (+) — Chassis ground (–):*** ***(i73) No. 7 (+) — Chassis ground (–):***	Is the measurede value less than 1 V?	Go to step **6.**	Repair battery short of harness.
6	**CHECK VIU HARNESS CONNECTOR.** Check if there is any poor contact in VIU harness connector.	Is there any poor contact in connector?	Go to step **7.**	Repair connector.
7	**CHECK VIU.** IMPORTANT Perform OnStar (R) setup procedure. Replace vehicle interface unit (VIU). <Ref. to OS-4, Vehicle Interface Unit VIU.>	—	Go to step **8.**	—
8	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **8.**
9	**CHECK AUDIO HARNESS CONNECTOR.** Check if there is any poor contact in audio harness connector.	Is there any poor contact in connector?	Go to step **9.**	Repair connector.
10	**CHECK AUDIO.** Replace audio. <Ref. to ET-3, Radio System.>	—	Go to step **11.**	—

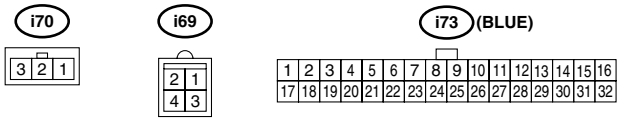
Step		Check	Yes	No
11	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

MEMO:

F: ONSTAR (R) LED DOES NOT OPERATE.

DEFINITION: When ignition switch is turned to ON, OnStar (R) green LED does not illuminate.





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	Step	Check	Yes	No
1	**CHECK LED SIGNAL.** 1) Turn ignition switch to OFF. 2) Disconnect connection from button assembly connector. 3) Turn ignition switch to ON (do not let the engine run). 4) Measure voltage of key pad green LED signal circuit. ***Connector & Terminal*** ***(i73) No. 5 (+) — Chassis ground:*** ***(i73) No. 25 (+) — Chassis ground (–):***	Is the measured value within 7 to 9 V?	Go to step **10.**	Go to step **2.**
2	**CHECK HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect VIU connector. 3) Disconnect button assembly connector. 4) Measure resistance between VIU connector and button assembly connector. ***Connector & Terminal*** ***(i73) No. 5 — (i70) No. 1:*** ***(i73) No. 20 — (i70) No. 2:*** ***(i73) No. 25 — (i70) No. 3:***	Is the measured value less than 0.5 Ω?	Go to step **2.**	Repair open harness.
3	**CHECK HARNESS.** Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 5 — Chassis ground:*** ***(i73) No. 20 — Chassis ground:*** ***(i73) No. 25 — Chassis ground:***	Is the measured value more than 1 MΩ?	Go to step **4.**	Repair ground short of harness.
4	**CHECK LED SIGNAL HARNESS.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 5 (+) — Chassis ground (–):*** ***(i73) No. 25 (+) — Chassis ground (–):***	Is the measurede value less than 1 V	Go to step **5.**	Repair battery short of harness. Replace button assembly. <Ref. to OS-6, Button Assembly.>
5	**CHECK VIU POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure voltage between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 16 (+) — Chassis ground (–):*** ***(i73) No. 32 (+) — Chassis ground (–):*** ***(i73) No. 22 (+) — Chassis ground (–)*** ***(i73) No. 27 (+) — Chassis ground (–):***	Is the measured value more than 9 V?	Go to step **6.**	Check fuse or repair open circuit in harness.
6	**CHECK VIU GROUND.** 1) Turn ignition switch to OFF. 2) Measure resistance between VIU connector and chassis ground. ***Connector & Terminal*** ***(i73) No. 1 — Chassis ground:*** ***(i73) No. 7 — Chassis ground:***	Is the measured value less than 0.5 Ω?	Go to step **7.**	Repair open circuit in harness.
7	**CHECK BUTTON ASSEMBLY HARNESS CONNECTOR.** Check if there is any poor contact in button assembly connector.	Is there any poor contact in connector?	Go to step **8.**	Repair poor contact in connector.
8	**CHECK BUTTON ASSEMBLY.** Replace button assembly. <Ref. to OS-6, Button Assembly.>	Is repair work completed?	Go to step **9.**	—

Step		Check	Yes	No
9	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **8.**
10	**CHECK VIU HARNESS CONNECTOR.** Check if there is any poor contact in VIU harness connector.	Is there any poor contact in connector?	Go to step **11.**	Repair poor contact in connector.
11	**CHECK VCU.** IMPORTANT Perform setup procedure of OnStar (R). Replace vehicle interface unit (VIU). <Ref. to OS-4, Vehicle Interface Unit VIU.>	—	Go to step **12.**	—
12	**CHECK SYSTEM.** Run the system and confirm the result of repair.	Was the trouble repaired?	System is OK.	Go to step **1.**

WIRING SYSTEM

WI

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1. Basic Diagnostics Procedure

A: BASIC PROCEDURES

1. GENERAL

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check system's circuit. Then check the switch, relay, fuse, ground, etc.

4. LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

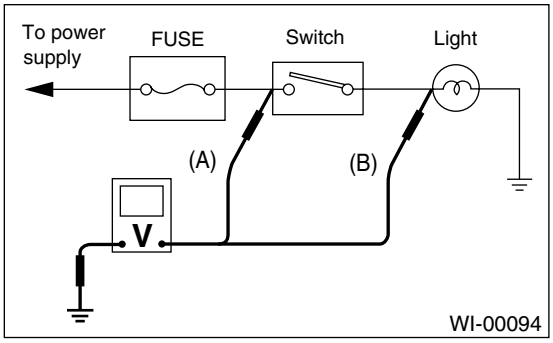
5. CONFIRMATION OF SYSTEM OPERATION

After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

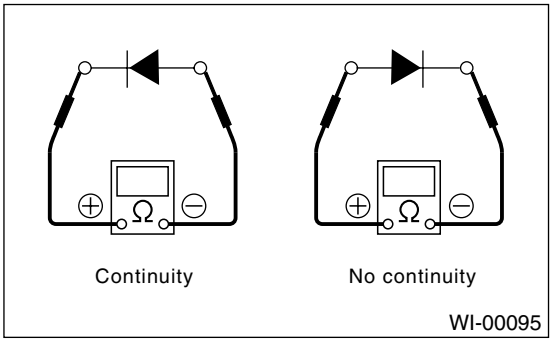
1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.



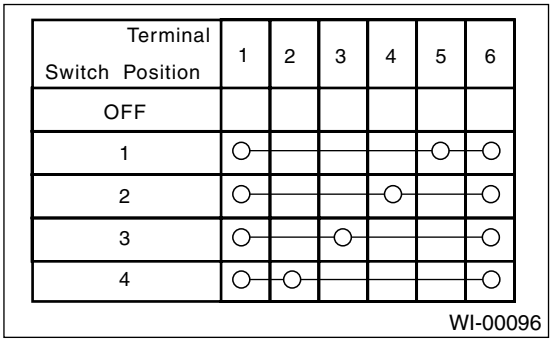
4) With test set-up held as it is, turn the switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
5) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down malfunction.

2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery cable or connector so there is no voltage between check points.
Contact the two leads of an ohmmeter to each of the check points.
If the circuit has diodes, reverse the two leads and check again.
2) Use an ohmmeter to check for the diode continuity. When contacting the negative lead to diode positive side and positive lead to negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.



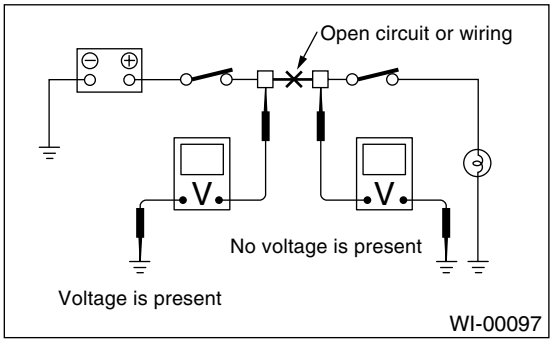
3) Symbol "❍ — ❍" indicates that continuity exists between two points or terminals. For example, when a switch position is "3", continuity exists among terminals 1, 3 and 6, as shown in table below.



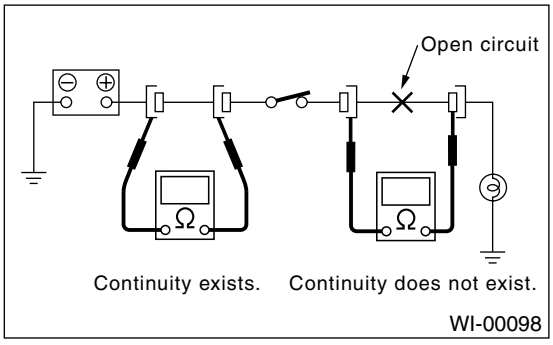
Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○

3. HOW TO DETERMINE AN OPEN CIRCUIT

1) Voltmeter Method:
An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and previous connector is open.

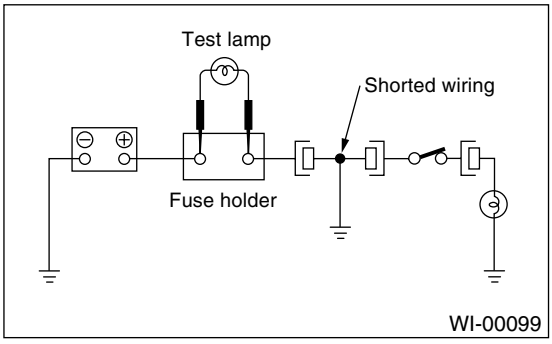


2) Ohmmeter method:
Disconnect all connectors affected, and check the continuity in wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.

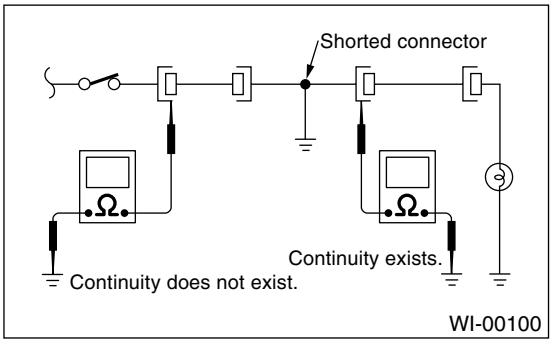


4. HOW TO DETERMINE A SHORT CIRCUIT

1) Test lamp method:
Connect a test lamp (rated at approx. 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and next connector (farther from the power supply) is shorted.



2) Ohmmeter method:
Disconnect all affected connectors, and check the continuity between each connector and ground. When the ohmmeter indicates continuity between a particular connector and ground, that the connector is shorted.

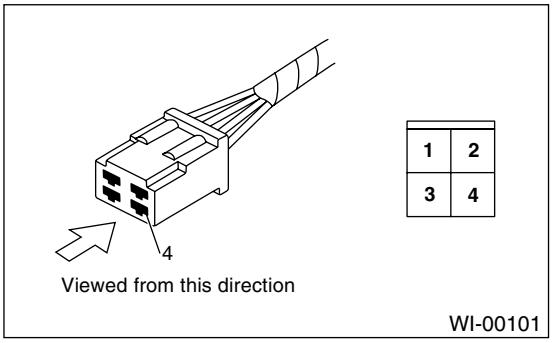


C: HOW TO READ WIRING DIAGRAMS

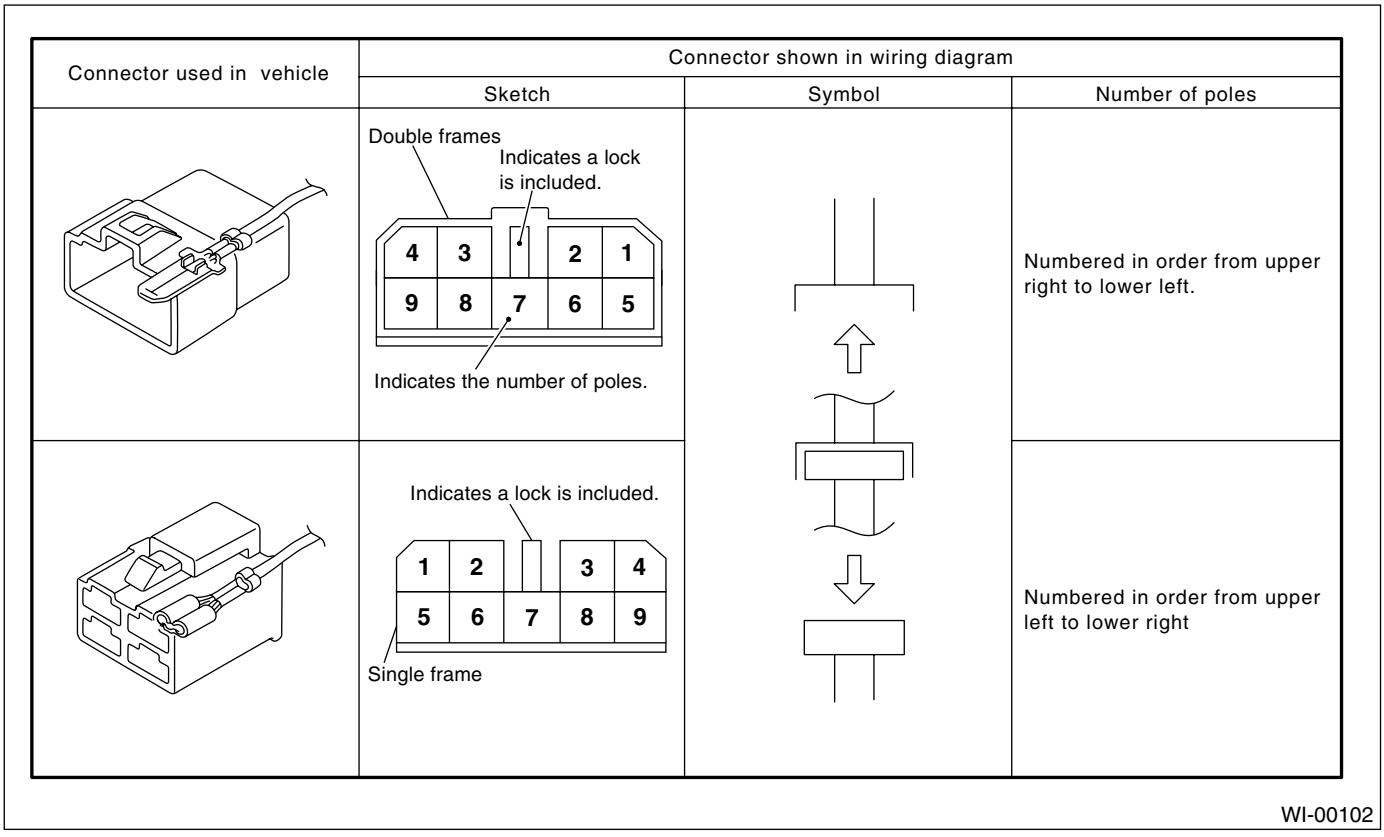
1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which electric current flows from battery.
Sketches and codes are used in the diagrams. They should read as follows:

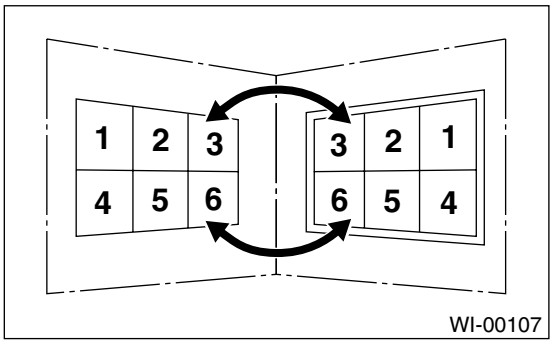
- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from front.



- The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which connector has. For example, the sketch of connector shown in the figure indicates the connector has 9 poles.

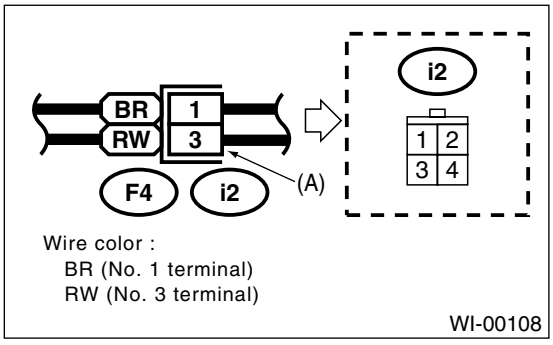


• When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of other. When these two connectors are connected as a unit, the poles which have the same number are joined.

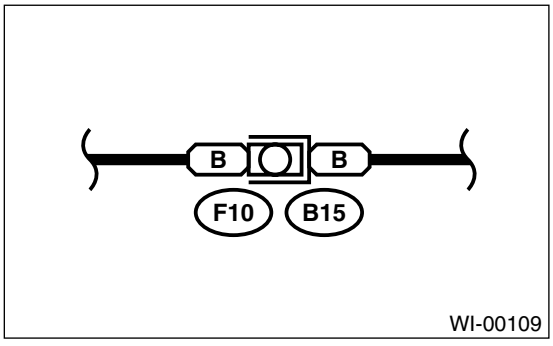


• Electrical wiring harness:
The connectors are numbered along with the number of poles, external colors, and mating connections in accompanying list.
• The sketch of each connector in the wiring diagram usually shows (A) side of the connector. The relationship between wire color, terminal number and connector is described in figure.

NOTE:
A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

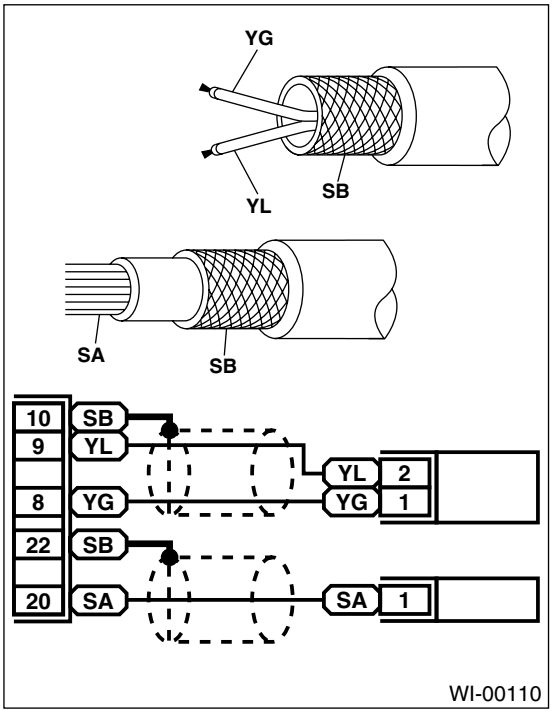


• In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

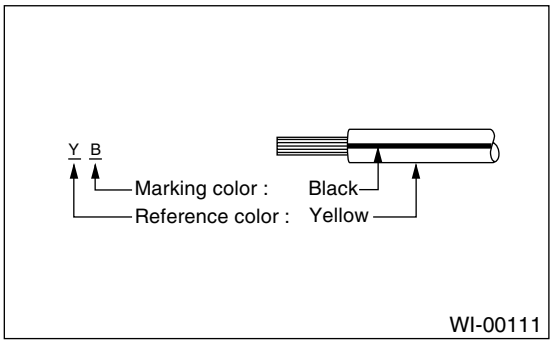


• The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



• The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and stripe marking by its second letter.



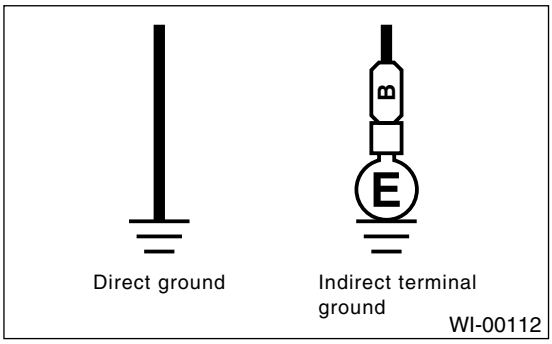
• The table lists the nominal sectional areas and allowable currents of wires.

CAUTION:
When replacing or repairing a wire, be sure to use the same size and type of wire which was originally used.

NOTE:
• The allowable current in the table indicates tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
• The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

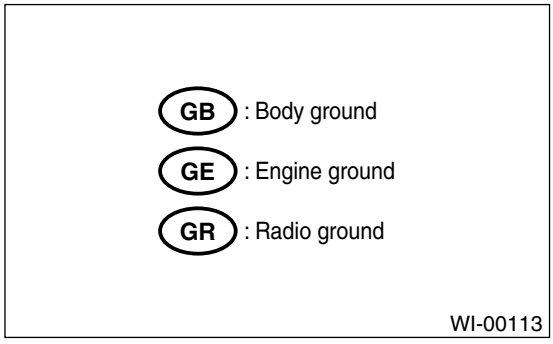
Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

• Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



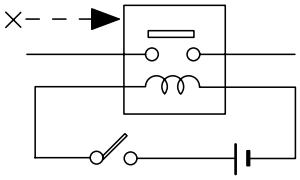
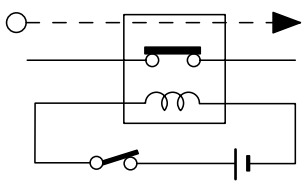
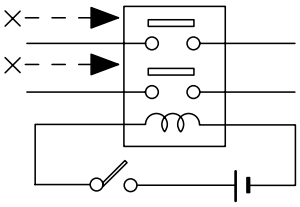
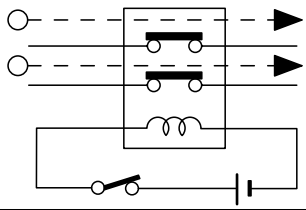
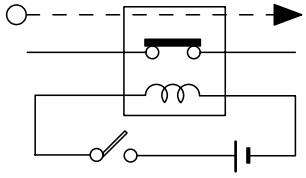
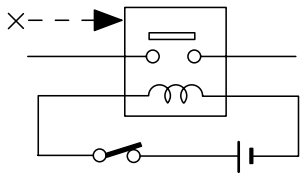
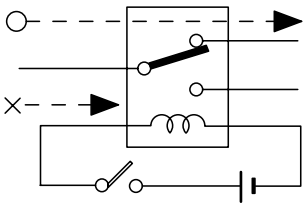
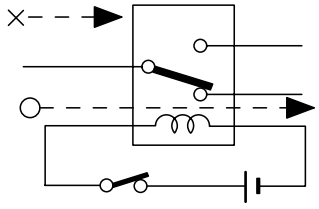
• The ground points shown in the wiring diagram refer to the following:

NOTE:
All wiring harnesses are provided with a ground point which should be securely connected.



- Relays are classified as normally-open or normally-closed.

The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when energizing circuit is OFF.

Relay type		Energizing circuit OFF	Energizing circuit ON
Normally-open type	4-pole		
	6-pole		
Normally-closed type	4-pole		
Mixed type	6-pole		

Key to symbols:

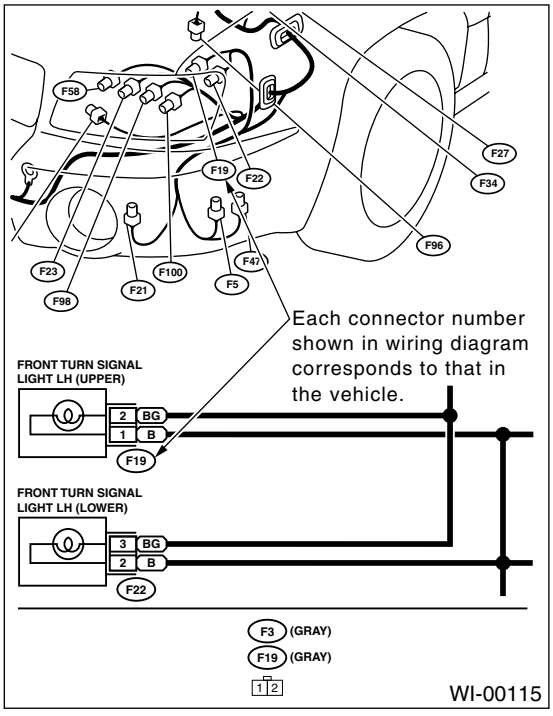
○ ⟶ : Current flows.

× ⟶ : Current does not flow.

WI-00114

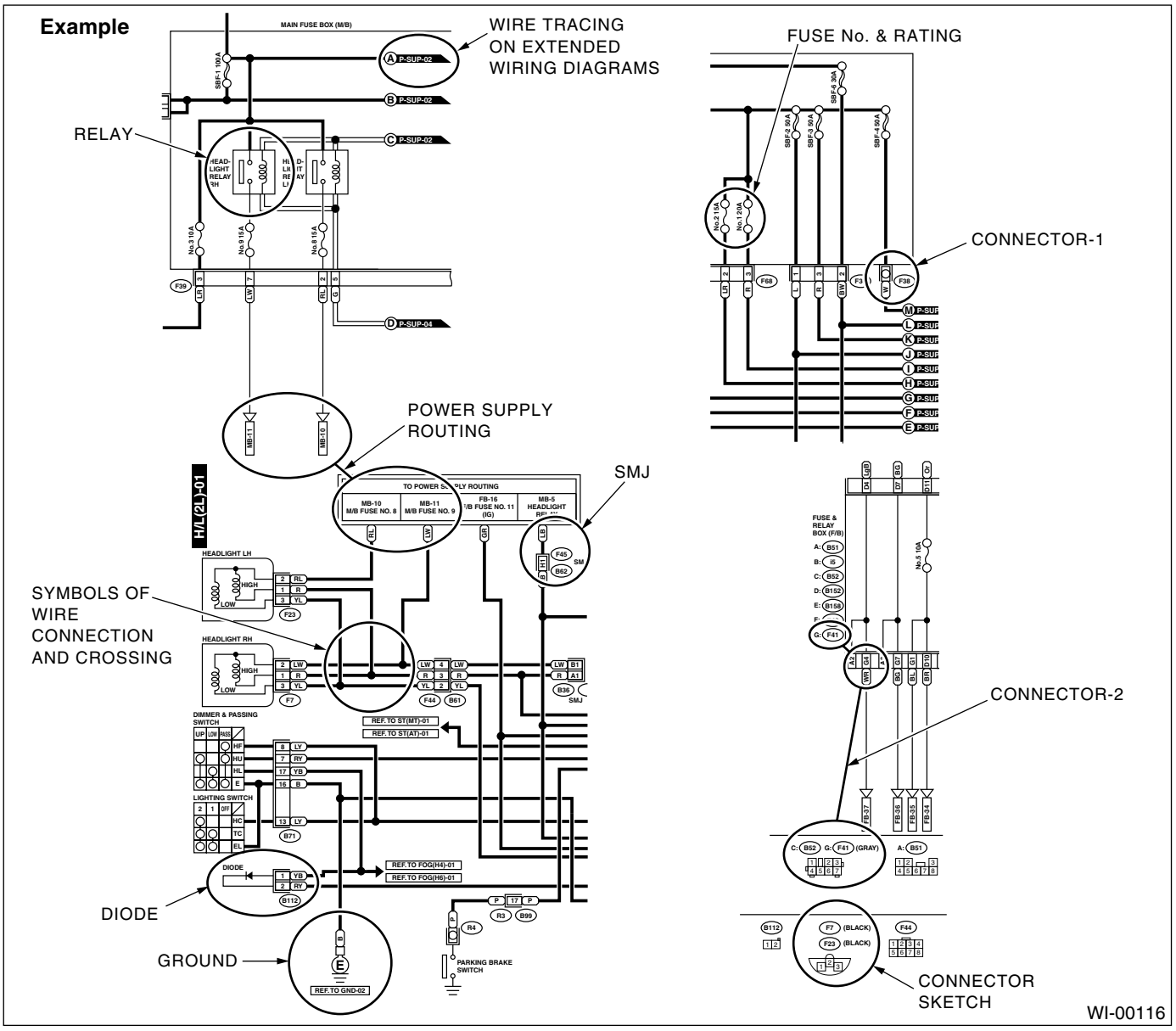
• Each connector number shown in the wiring diagram corresponds to that in wiring harness. The location of each connector in actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Door cord LH & RH, Rear door cord LH & RH, Rear gate cord
i	Instrument panel wiring harness
R	Rear wiring harness, Fuel tank cord, Roof cord, Trunk lid cord
AB	Airbag wiring harness



D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR-1

The sketch of the connector indicates one-pole types.

3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

4. FUSE NO. & RATING

The “FUSE No. & RATING” corresponds with that used in fuse box (main fuse box, fuse and joint box).

5. CONNECTOR-2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number “G4” refers to No. 4 terminal of connector (G: F41) shown in the connector sketch.

6. CONNECTOR SKETCH

• Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
• When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

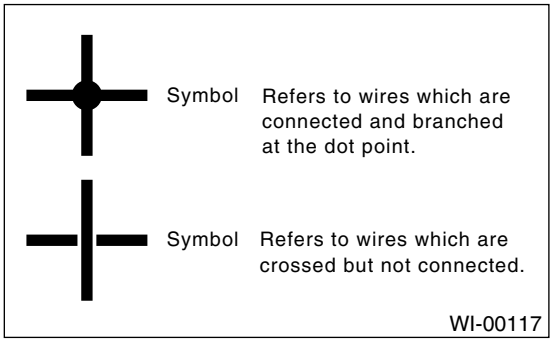
8. DIODE

A symbol is used to indicate a diode.

9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the next.
A ←→ A, B ←→ B

10.SYMBOLS OF WIRE CONNECTION AND CROSSING



11.POWER SUPPLY ROUTING

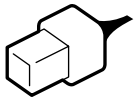
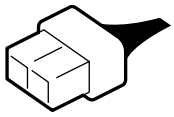
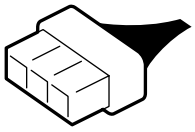
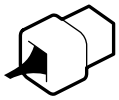
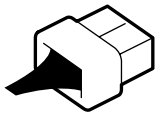
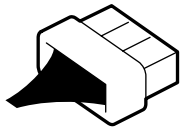
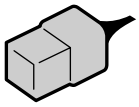
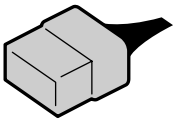
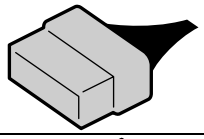
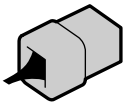
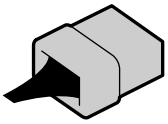
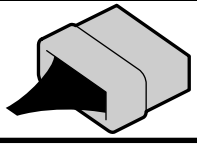
A symbol is used to indicate the power supply in each wiring diagram.
“MB-5”, “MB-6”, etc., which are used as power-supply symbols throughout the text, correspond with those shown in POWER SUPPLY ROUTING in the wiring diagram.
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

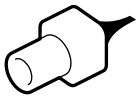
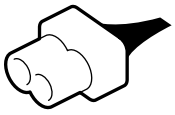
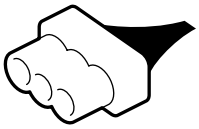
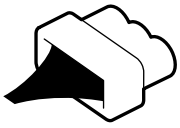
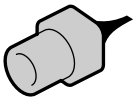
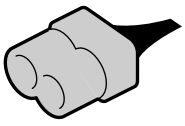
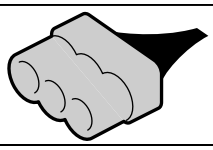
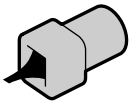
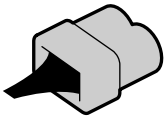
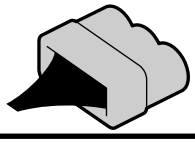
12.CLASSIFICATION BY SPECIFICATION

When the wiring diagrams differ according to vehicle specifications, the specification difference is described by using abbreviations.

E: CONNECTOR SYMBOL IN WIRING HARNESS

Main symbols of connector (in wiring harness) are indicated in below.

Standard type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
Standard type: Male		
		
		

Water proof type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
Water proof type: Male		
		
		

WI-02445

F: ABBREVIATION IN WIRING DIAGRAMS

Abbreviation	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
A/B	Air Bag
A/F	Air Fuel
ATF	Automatic Transmission Fluid
AVCS	Active Valve Control System
AWD	All Wheel Drive
B	Battery
CPC	Canister Purge Control
D	Drive Range
DN	Down
E	Ground
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
ETC	Electric Throttle Valve Control
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm^2
FPC	Fuel Pump Control
FWD	Front Wheel Drive
H/L	Head Light
I/F	Interface
IG	Ignition
Illumi	Illumination
INT	Intermittent
L/C	Low Clutch
LDC	Liquid Crystal Display
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
MT	Manual Transmission
N	Neutral
OP	Optional Parts
P	Parking Range
PASS	Passing
R	Reverse Range
RH	Right Hand
SBF	Slow Blow Fuse
SMJ	Super Multiple Junction
ST	Starter
SW	Switch
TGV	Tumble Generator Valve

Abbreviation	Full name
UP	Up
WASH	Washer

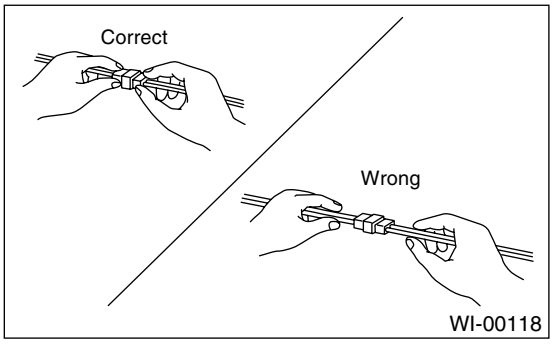
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

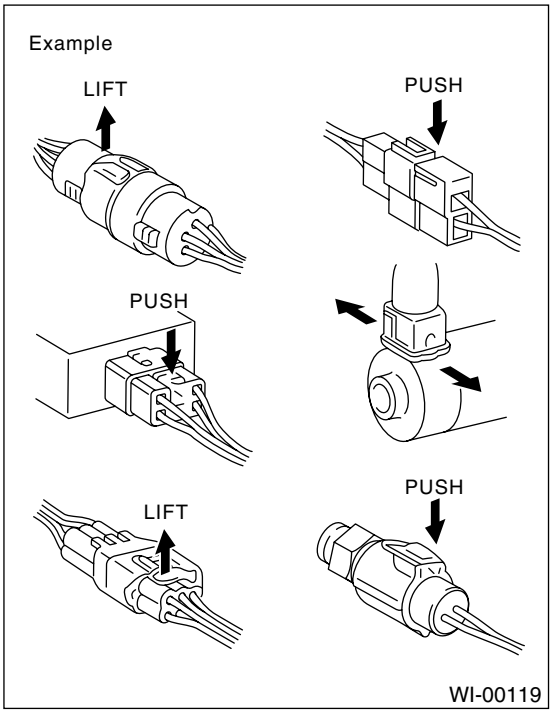
1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
2) The parking brake must always be applied during working. Also, in automatic transmission models, keep the select lever set to P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

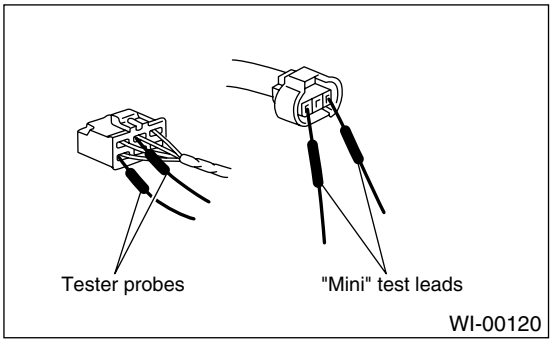
1) The battery cable must be disconnected from battery's (–) terminal, and the ignition switch must be set to OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with body end parts or edges and bolts or screws.
3) When installing the parts, be careful not to catch them on the wiring harness.
4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.
To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring the voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads.
To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage terminals.



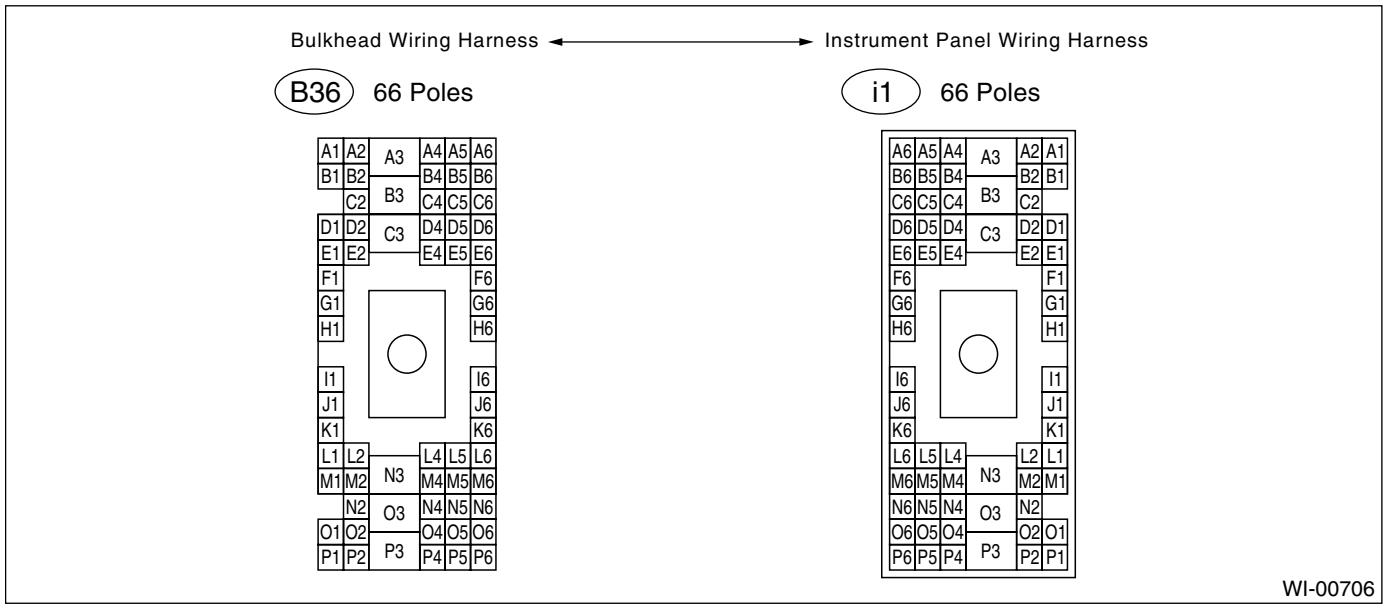
7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

3. Super Multiple Junction (SMJ)

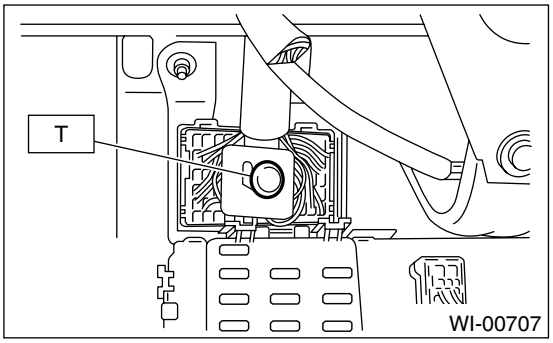
A: HOW TO USE SUPER MULTIPLE JUNCTION (SMJ)

The “SMJ” indicated in wiring diagrams is shown in a simplified form.

B: TERMINAL ARRANGEMENT



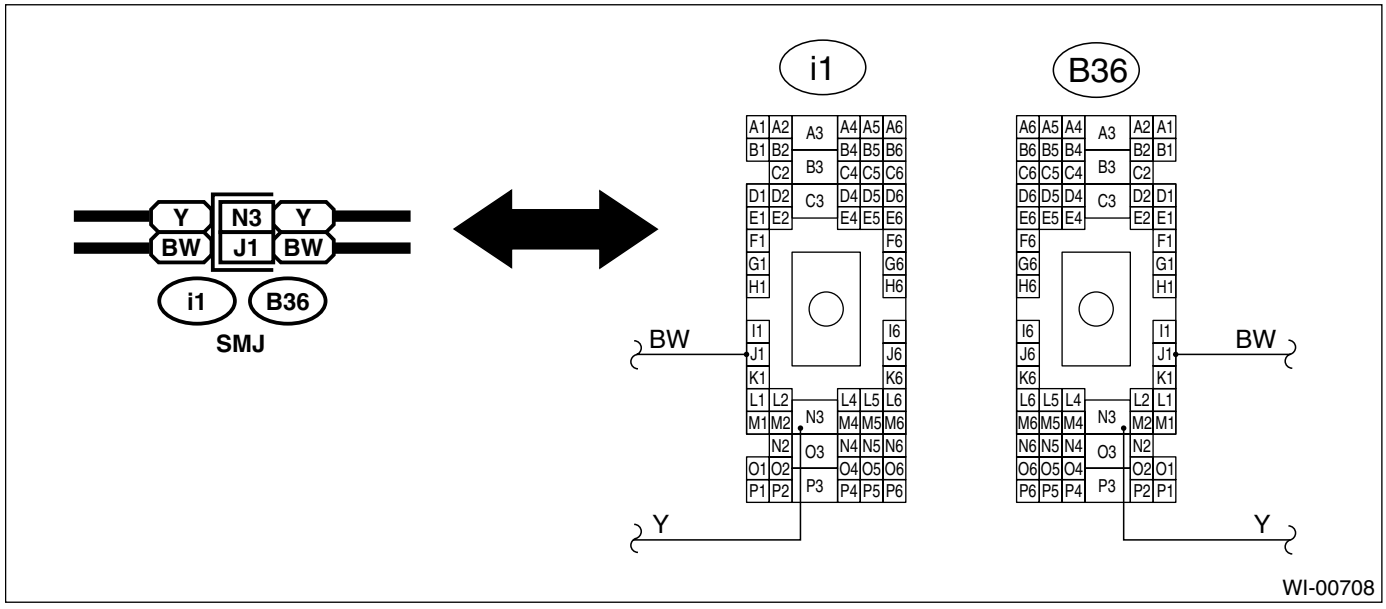
C: INSTALLATION



Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

NOTE:
• Align the cutout portion of one connector with that of other before tightening the connecting bolt.
• Do not tighten the bolt excessively since this may deform the connectors.

D: EXPLANATION OF SMJ SHOWN IN THE WIRING DIAGRAM



MEMO:

4. Power Supply Routing

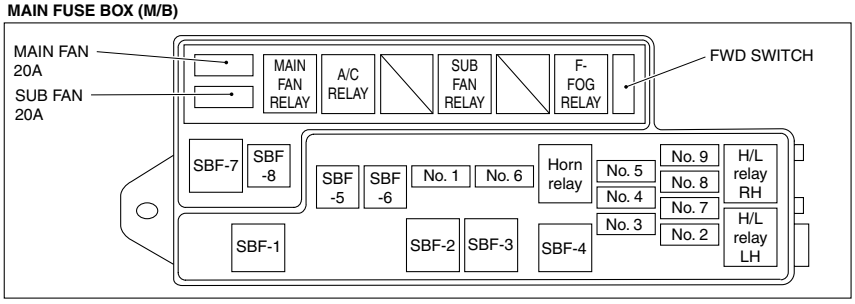
A: SCHEMATIC

1. 4- ENGINE

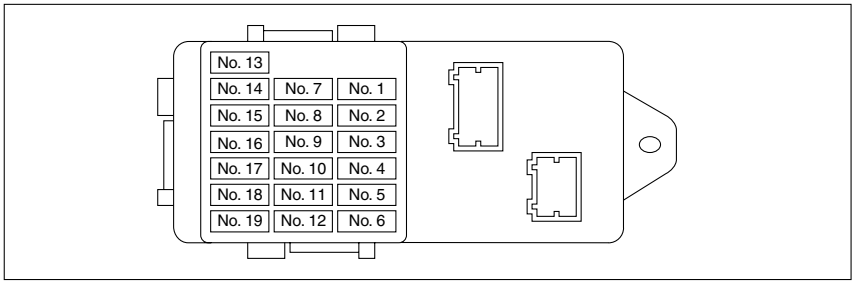
P-SUP(H4)-01

P-SUP(H4)-01

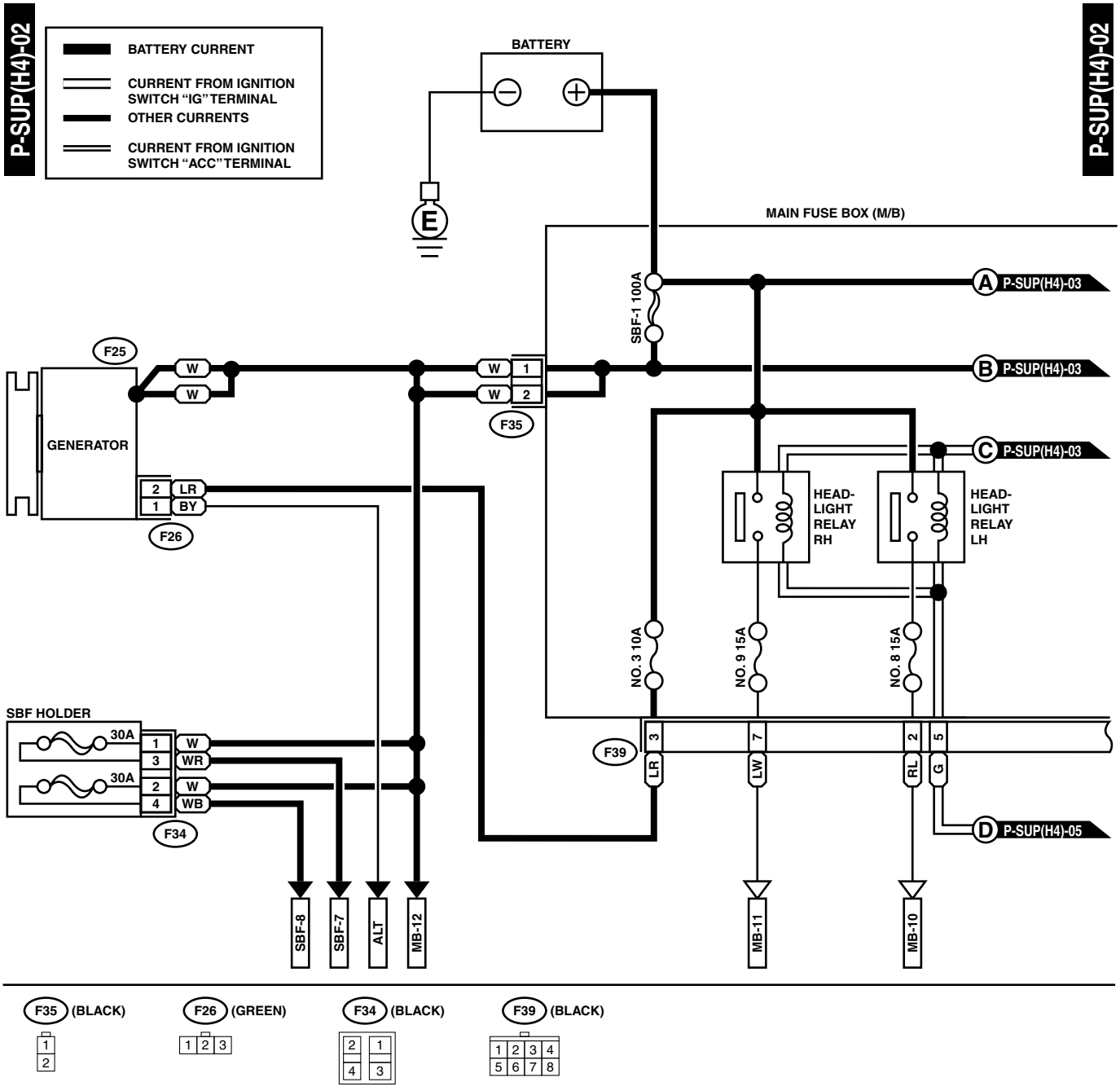
MAIN FUSE BOX (M/B)



FUSE & RELAY BOX (F/B)

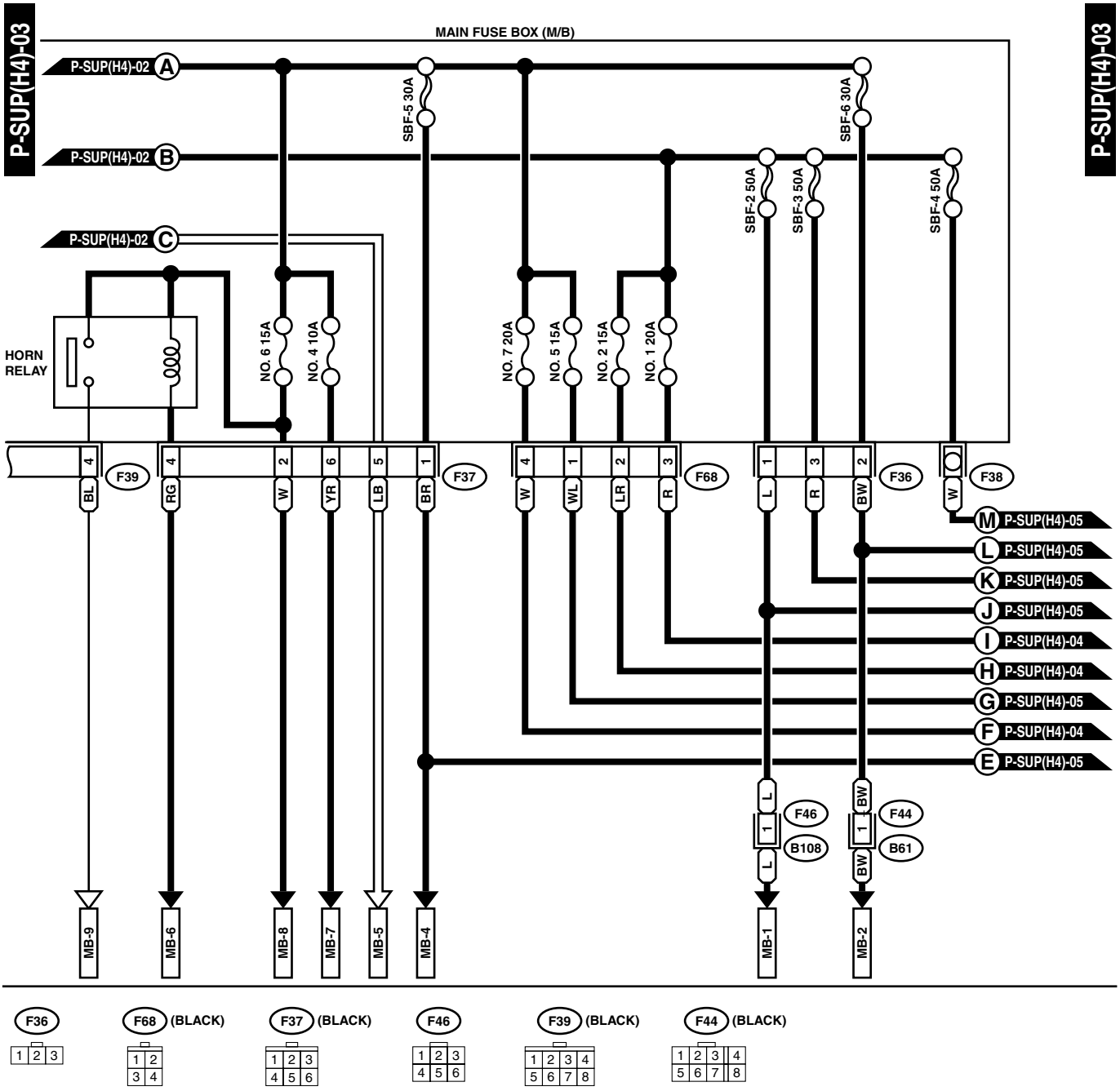


WI-00504

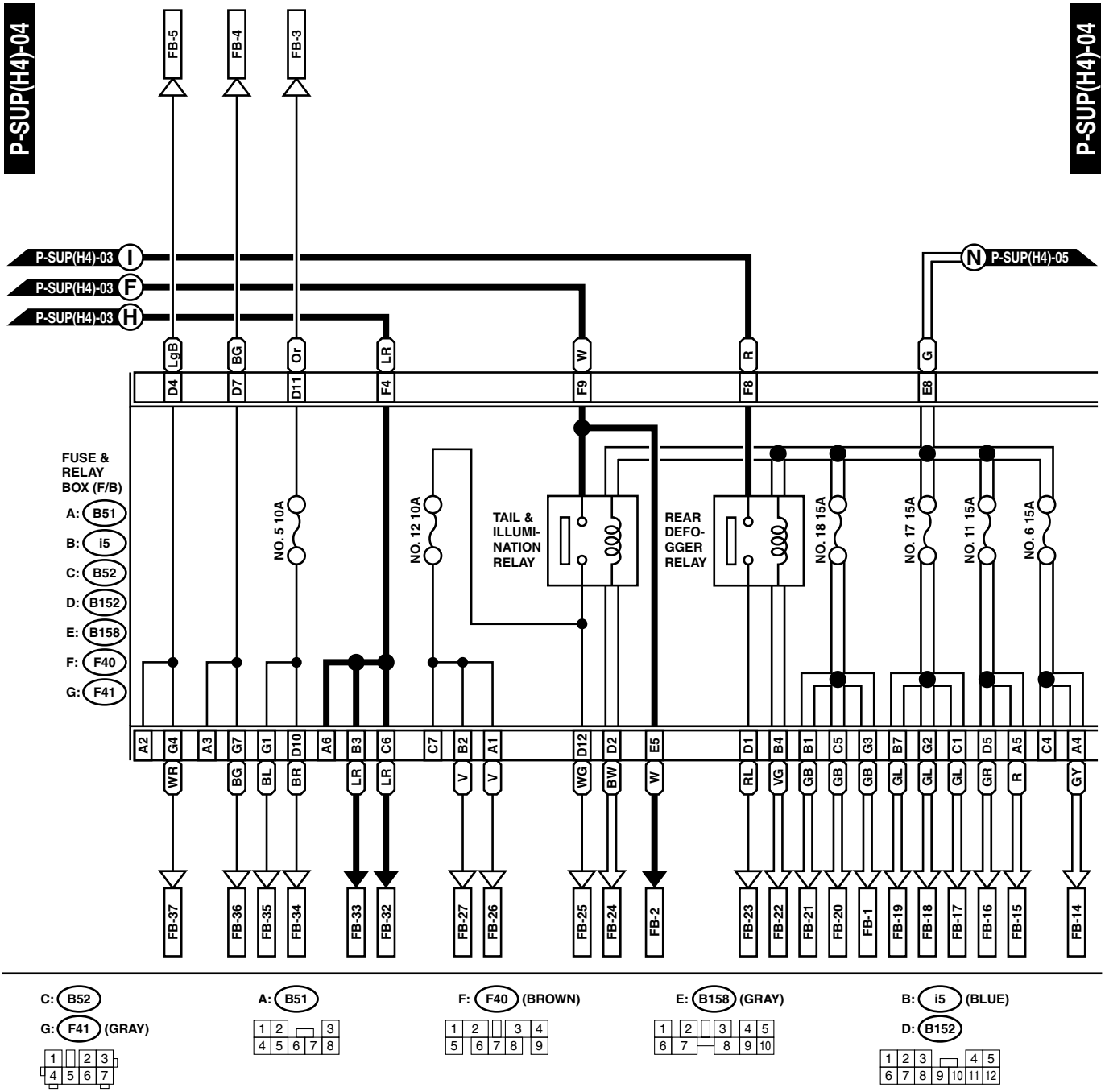

P-SUP(H4)-02
BATTERY CURRENT
CURRENT FROM IGNITION SWITCH "IG" TERMINAL
OTHER CURRENTS
CURRENT FROM IGNITION SWITCH "ACC" TERMINAL
BATTERY
E
MAIN FUSE BOX (M/B)
SBF-1 100A
A P-SUP(H4)-03
B P-SUP(H4)-03
C P-SUP(H4)-03
F25
W
W
GENERATOR
2 LR
1 BY
F26
W 1
W 2
F35
HEAD-LIGHT RELAY RH
HEAD-LIGHT RELAY LH
NO. 3 10A
NO. 9 15A
NO. 8 15A
SBF HOLDER
30A
1 W
3 WR
30A
2 W
4 WB
F34
F39
3 LR
7 LW
2 RL
5 G
D P-SUP(H4)-05
SBF-8
SBF-7
ALT
MB-12
MB-11
MB-10
F35 (BLACK)
F26 (GREEN)
F34 (BLACK)
F39 (BLACK)

WI-03453

POWER SUPPLY ROUTING



WI-00506



C: B52
G: F41 (GRAY)

A: B51

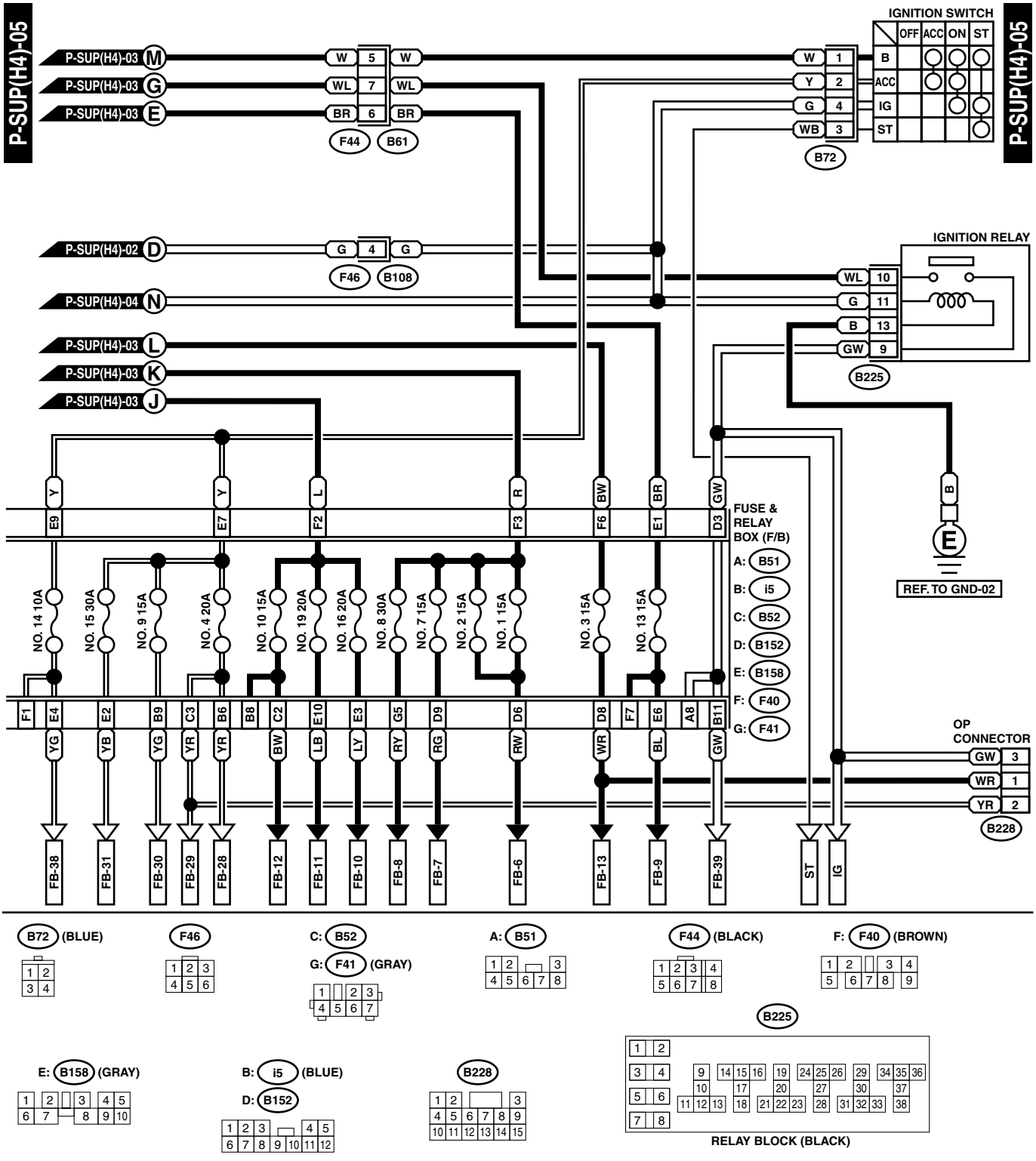
F: F40 (BROWN)

E: B158 (GRAY)

B: i5 (BLUE)
D: B152

WI-03454

POWER SUPPLY ROUTING



WI-03455

No.	Load
MB-1	Cargo Light Fuse (Seat heater/rear accessory power supply relay)
MB-2	Power window circuit breaker
MB-4	Data link connector Engine control module Main relay
MB-5	Cruise control sub switch Day time running light control module OP connector
MB-6	Horn switch Keyless entry control module Security horn relay SPORT shift switch
MB-7	Transmission control module (AT)
MB-8	Hazard switch Keyless entry control module Key warning switch Stop & turn module (Pick-up)
MB-9	Horn
MB-10	Headlight LH
MB-11	Combination meter Headlight RH
MB-12	A/C relay holder SBF holder
SBF-7	ABS control module
SBF-8	Oxygen sensor heater relay
ALT	Combination meter OP connector
IG	Check connector Ignition relay-2 Keyless entry control module OP connector Security control module Vehicle speed sensor (MT)
ST	Cruise control module Engine control module (AT) Inhibitor switch (AT) Interrupt relay Starter interlock relay
FB-1	ABS control module Main fan relay
FB-2	Parking switch Security control module
FB-3	Parking switch Security control module
FB-4	Combination meter Combination switch (Lighting) Hazard switch Keyless entry control module Rear combination light Stop & turn module (Pick-up) Trailer connector (Wagon)

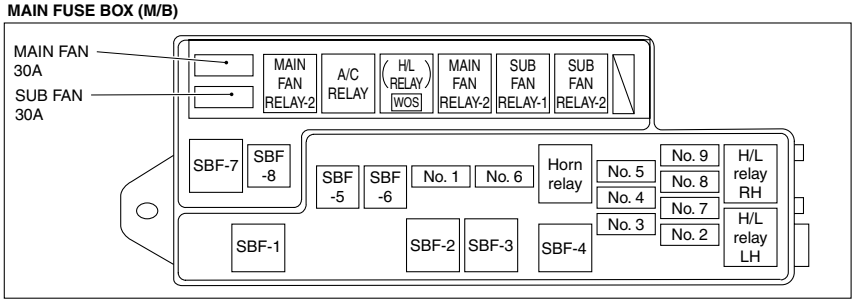
No.	Load
FB-5	Combination meter Combination switch (Lighting) Keyless entry control module Rear combination light Stop & turn module (Pick-up) Trailer connector (Wagon)
FB-6	Blower motor relay
FB-7	Front fog light relay
FB-8	ABS control module
FB-9	Fuel pump relay
FB-10	Stop light switch
FB-11	SPORT light relay (Pick-up) Wiper deicer relay
FB-12	Trailer connector (Wagon) (Pick-up)
FB-13	Integrated module Keyless buzzer Keyless entry control module OP connector
FB-14	Airbag control module
FB-15	Airbag control module
FB-16	Daytime running light control module Daytime running light relay Engine control module Fuel pump relay Ignition coil and ignitor Integrated module Transmission control module
FB-17	A/C pressure switch Blower motor relay
FB-18	A/C relay Sub fan relay
FB-19	Auto A/C control module Manual A/C control module
FB-20	Back-up light switch (MT) Cruise control module Inhibitor switch (AT) Power window relay
FB-21	Cruise control main switch
FB-22	Auto A/C control module Engine control module Manual A/C control module
FB-23	Choke coil Rear defogger Rear defogger condenser
FB-24	Combination switch (Lighting) Engine control module OP connector
FB-25	Parking switch
FB-26	AT select lever illumination light Integrated module OP connector Power window main switch Seat heater switch

No.	Load
FB-27	Audio Auto A/C control module Ashtray illumination light SPORT light switch CD illumination light Cigar lighter illumination light Front fog switch Globe box light Hazard switch Manual A/C control module VDC OFF switch Wiper deicer switch
FB-28	Auto A/C control module Front accessory power supply socket Multiple power socket relay (Option)
FB-29	Compass mirror Integrated module Mirror heater LH Mirror heater RH OP connector Rear accessory power supply relay Remote control rearview mirror switch Vanity mirror illumination light
FB-30	Audio
FB-31	Combination switch (Washer) Front washer motor Front wiper motor
FB-32	Combination meter Integrated module Key illumination light Key warning and step light diode Luggage room light Room light Security control module Security horn relay Stop light Step light Trunk room light
FB-33	Audio Auto A/C control module Combination meter
FB-34	License plate light LH License plate light RH Rear combination light LH Rear combination light RH Rear finisher light LH Rear finisher light RH Trailer connector (Wagon) (Pick-up)
FB-35	Front clearance light LH Front clearance light RH
FB-36	Front turn signal light LH (Up, Lo)
FB-37	Front turn signal light RH (Up, Lo)
FB-38	Rear washer motor Rear wiper intermittent module Rear wiper motor
FB-39	Combination meter Hazard switch

2. 6-CYLINDER

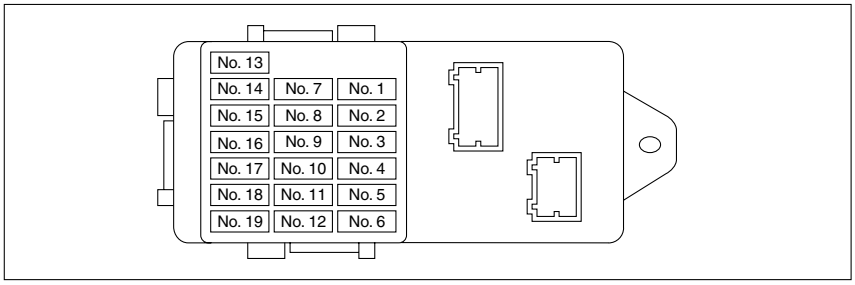
P-SUP(H6)-01

MAIN FUSE BOX (M/B)



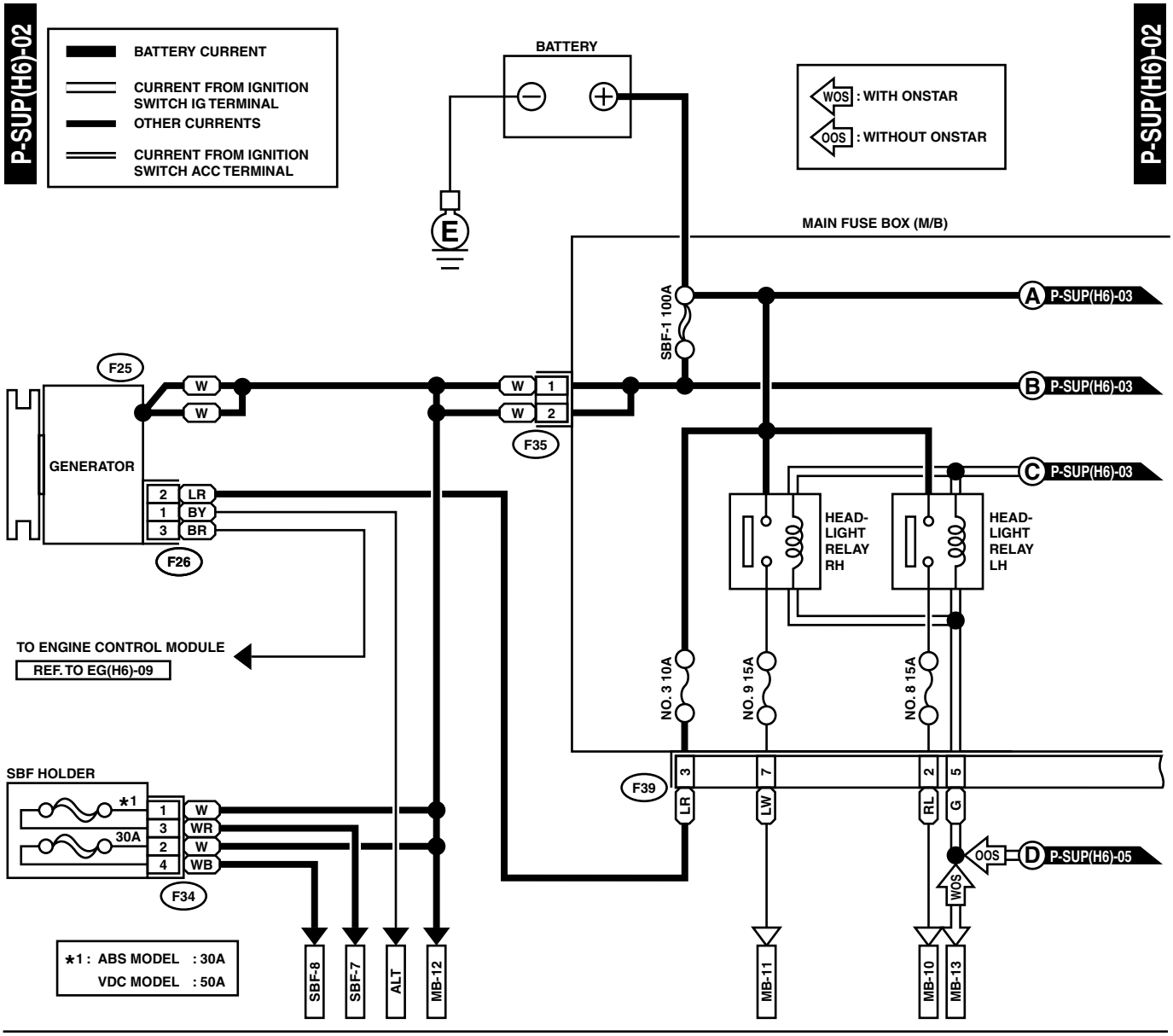
WOS : WITH ONSTAR MODEL

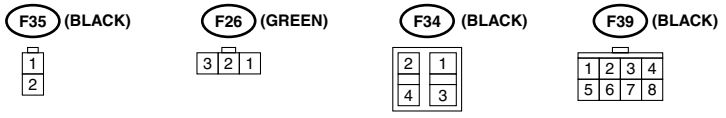
FUSE & RELAY BOX (F/B)



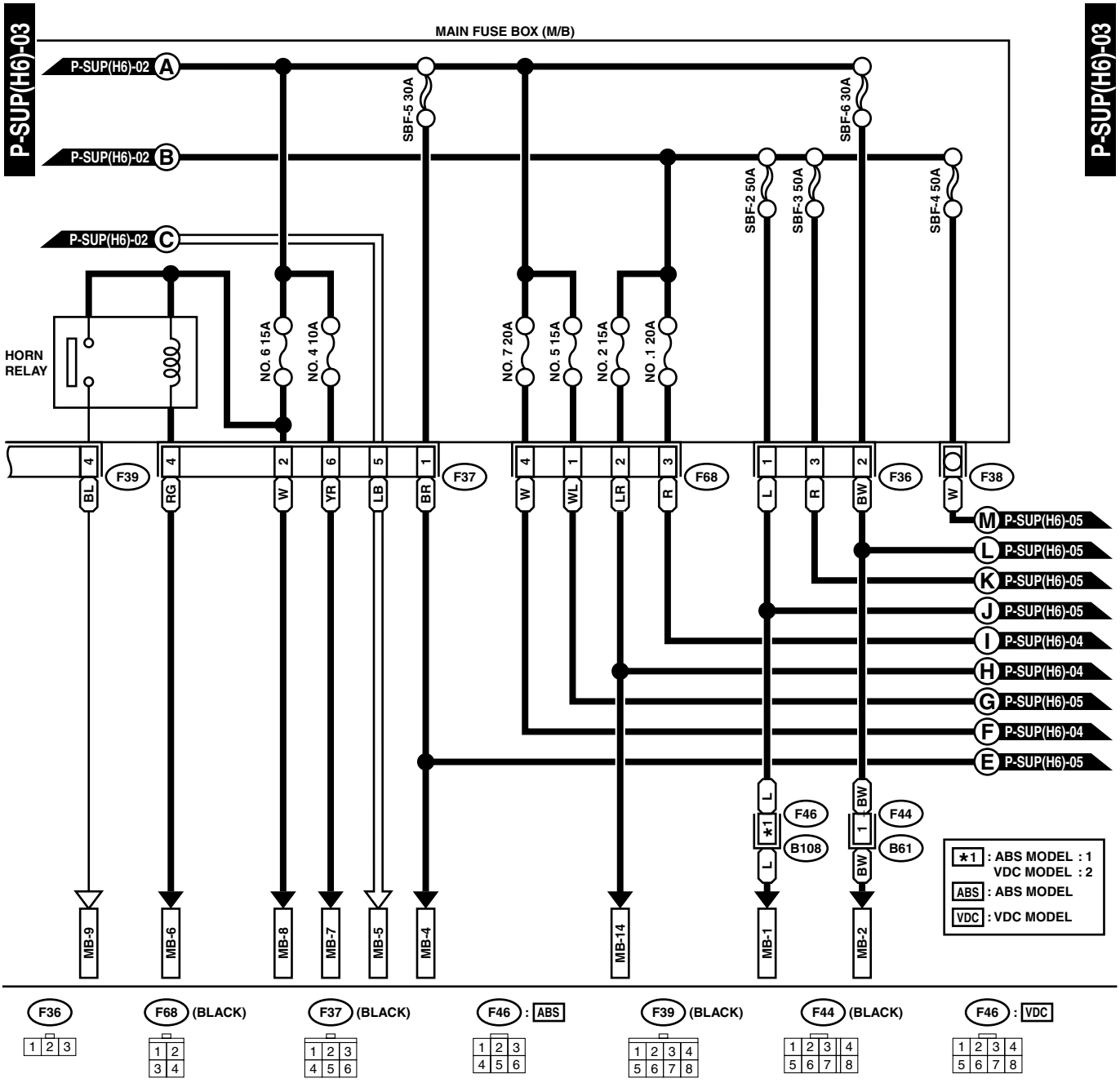
WI-00509

POWER SUPPLY ROUTING



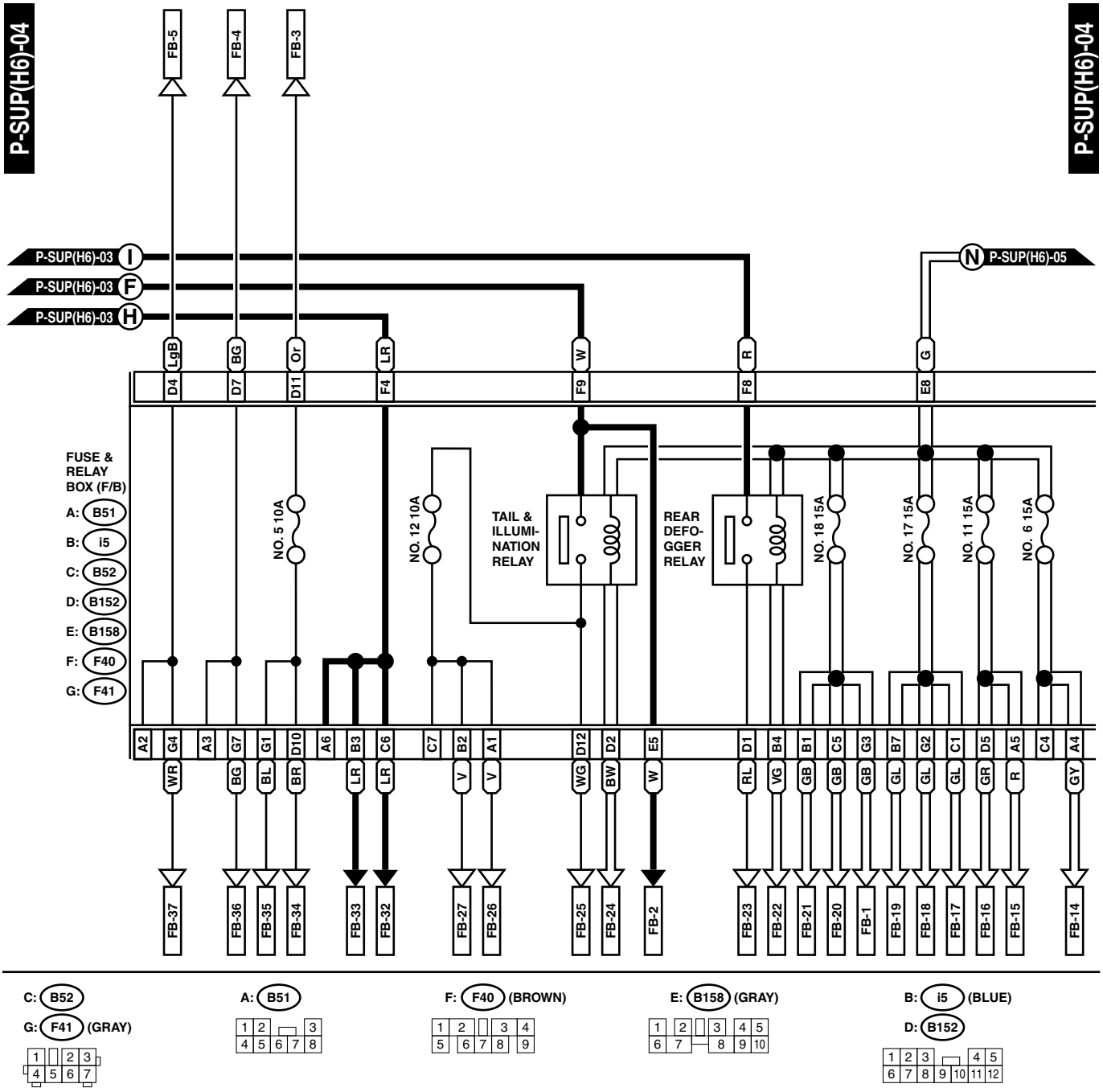


WI-00510

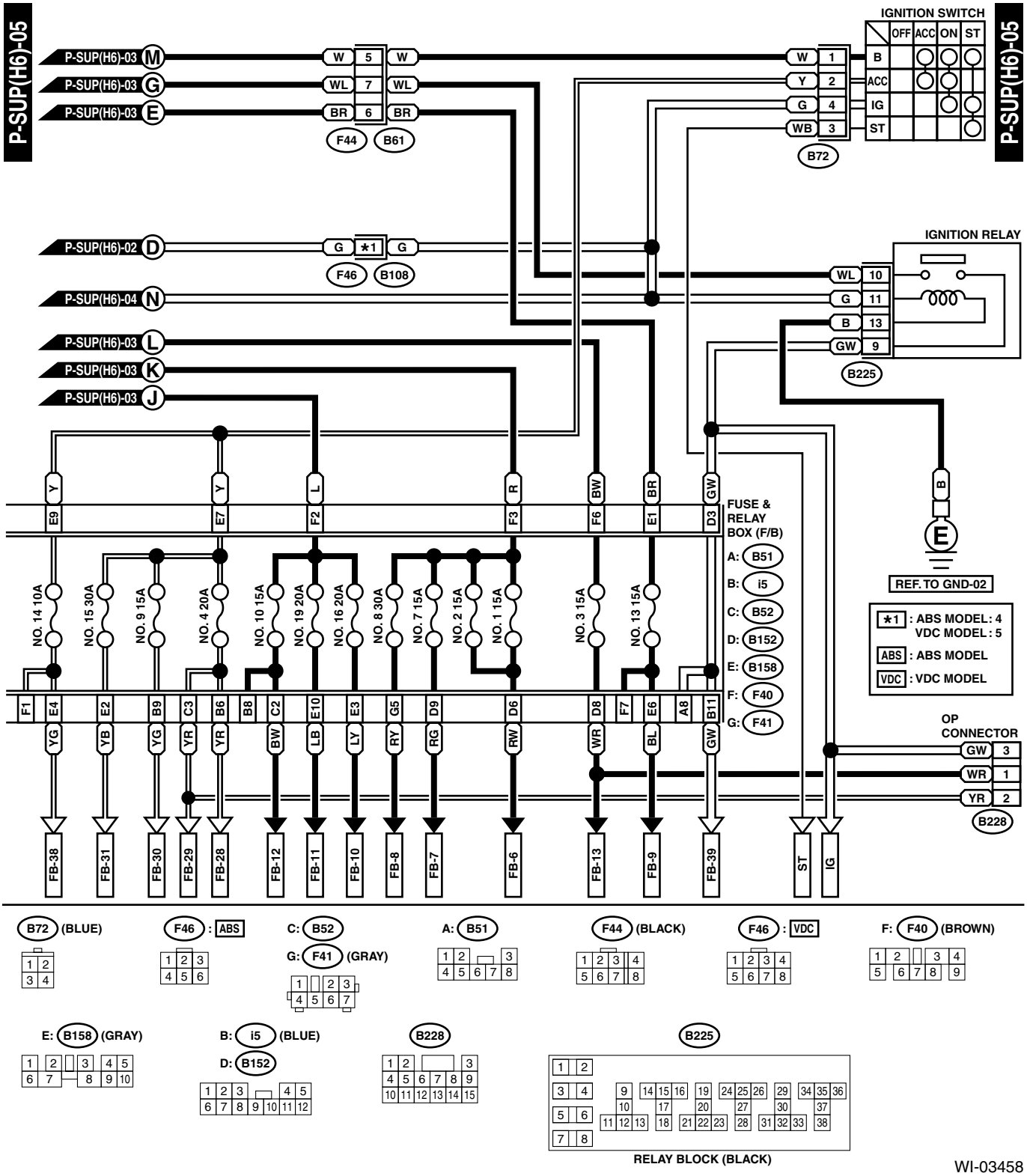

P-SUP(H6)-03
MAIN FUSE BOX (M/B)
P-SUP(H6)-02 A
P-SUP(H6)-02 B
P-SUP(H6)-02 C
SBF-5 30A
SBF-6 30A
SBF-2 50A
SBF-3 50A
SBF-4 50A
HORN RELAY
NO. 6 15A
NO. 4 10A
NO. 7 20A
NO. 5 15A
NO. 2 15A
NO. 1 20A
F39
F37
F68
F36
F38
BL
RG
W
YR
LB
BR
WL
LR
R
L
BW
M P-SUP(H6)-05
L P-SUP(H6)-05
K P-SUP(H6)-05
J P-SUP(H6)-05
I P-SUP(H6)-04
H P-SUP(H6)-04
G P-SUP(H6)-05
F P-SUP(H6)-04
E P-SUP(H6)-05
F46
B108
F44
B61
*1 : ABS MODEL : 1
VDC MODEL : 2
ABS : ABS MODEL
VDC : VDC MODEL
MB-9
MB-6
MB-8
MB-7
MB-5
MB-4
MB-14
MB-1
MB-2
F36
F68 (BLACK)
F37 (BLACK)
F46 : ABS
F39 (BLACK)
F44 (BLACK)
F46 : VDC

WI-03456

POWER SUPPLY ROUTING



WI-03457


P-SUP(H6)-05
P-SUP(H6)-03 M
P-SUP(H6)-03 G
P-SUP(H6)-03 E
W 5 W
WL 7 WL
BR 6 BR
F44
B61
IGNITION SWITCH
OFF ACC ON ST
B
ACC
IG
ST
W 1
Y 2
G 4
WB 3
B72
P-SUP(H6)-02 D
G *1 G
F46
B108
P-SUP(H6)-04 N
P-SUP(H6)-03 L
P-SUP(H6)-03 K
P-SUP(H6)-03 J
IGNITION RELAY
WL 10
G 11
B 13
GW 9
B225
Y E9
Y E7
L F2
R F3
BW F6
BR E1
GW D3
B E
REF. TO GND-02
FUSE & RELAY BOX (F/B)
A: B51
B: i5
C: B52
D: B152
E: B158
F: F40
G: F41
NO. 14 10A
NO. 15 30A
NO. 9 15A
NO. 4 20A
NO. 10 15A
NO. 19 20A
NO. 16 20A
NO. 8 30A
NO. 7 15A
NO. 2 15A
NO. 1 15A
NO. 3 15A
NO. 13 15A
F1 E4 YG
E2 YB
B9 YG
C3 YR
B6 YR
B8 C2 BW
E10 LB
E3 LY
G5 RY
D9 RG
D6 RW
D8 WR
F7 E6 BL
A8 B11 GW
*1 : ABS MODEL: 4
VDC MODEL: 5
ABS : ABS MODEL
VDC : VDC MODEL
OP CONNECTOR
GW 3
WR 1
YR 2
B228
FB-38
FB-31
FB-30
FB-29
FB-28
FB-12
FB-11
FB-10
FB-8
FB-7
FB-6
FB-13
FB-9
FB-39
ST
IG
B72 (BLUE)
F46 : ABS
C: B52
G: F41 (GRAY)
A: B51
F44 (BLACK)
F46 : VDC
F: F40 (BROWN)
E: B158 (GRAY)
B: i5 (BLUE)
D: B152
B228
B225
RELAY BLOCK (BLACK)

WI-03458

No.	Load
MB-1	Relay block
MB-2	Power window circuit breaker
MB-4	Data link connector Engine control module Main relay
MB-5	Daytime running light control module Daytime running light diode OP connector Cruise control sub switch
MB-6	Horn switch Keyless entry control module Security horn relay Vehicle interface module
MB-7	Transmission control module
MB-8	Hazard switch Keyless entry control module Key warning switch
MB-9	Horn
MB-10	Headlight LH
MB-11	Combination meter Headlight RH
MB-12	A/C relay holder SBF holder
MB-13	Onstar relay-2
MB-14	Onstar relay-1
SBF-7	ABS control module Relay box (VDC)
SBF-8	Relay block
ALT	Combination meter OP connector
IG	Check connector Ignition relay-2 Keyless entry control module OP connector Security control module
ST	Engine control module Interrupt relay (OnStar) Key switch
FB-1	ABS control module Main fan relay-1 Main fan relay-2 VDC control module
FB-2	Parking switch Security control module
FB-3	Parking switch
FB-4	Combination meter Combination switch (Lighting) Hazard switch Keyless entry control module Rear combination light LH Trailer connector (Wagon)
FB-5	Combination meter Combination switch (Lighting) Hazard switch Keyless entry control module Rear combination light RH Trailer connector (Wagon)

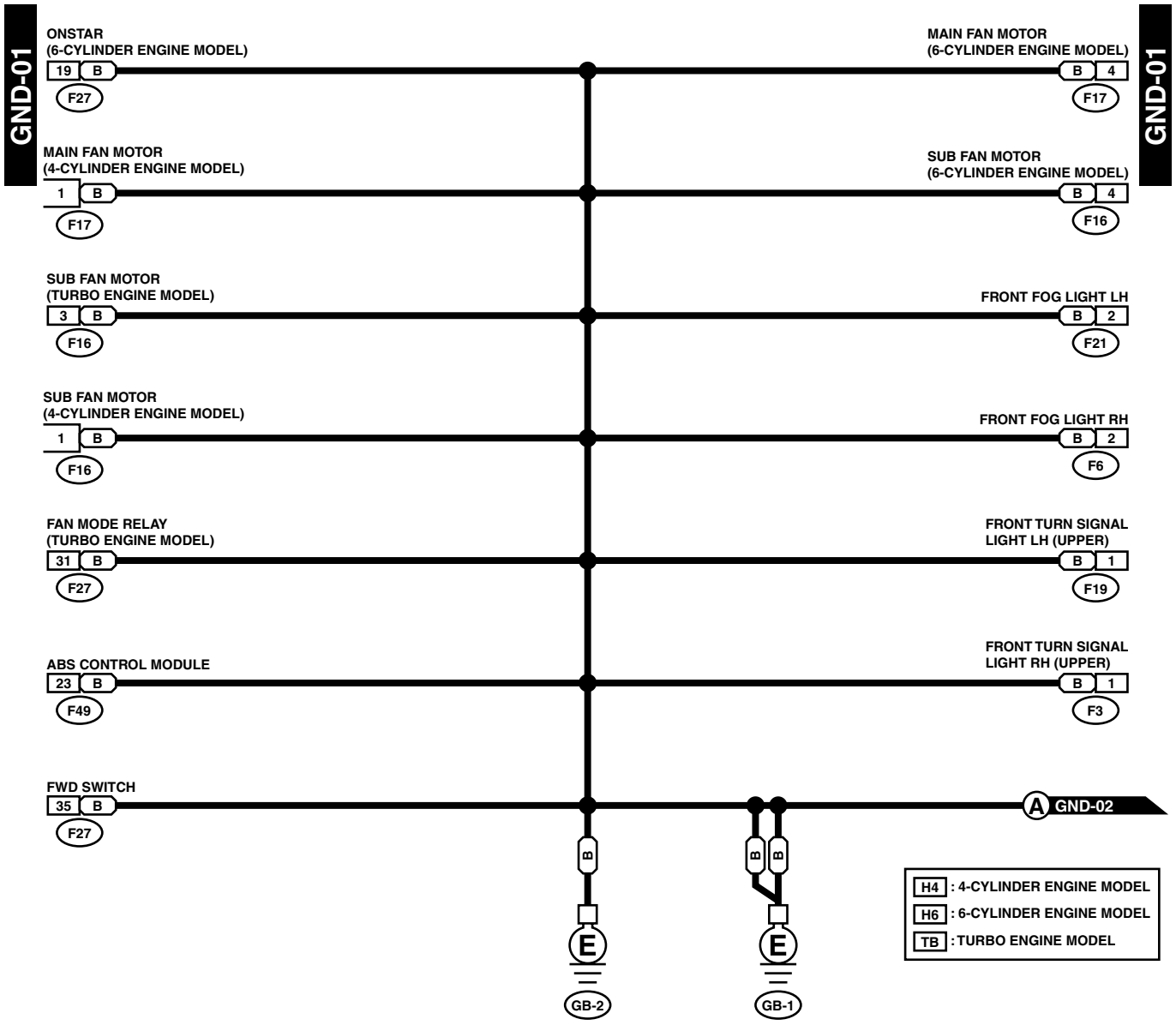
No.	Load
FB-6	Blower motor relay
FB-7	Front fog light relay
FB-8	ABS control module Relay box (VDC)
FB-9	Fuel pump relay
FB-10	Stop light switch
FB-11	Wiper deicer relay
FB-12	Trailer connector (Wagon)
FB-13	Integrated module Keyless buzzer Keyless entry control module OP connector
FB-14	Airbag control module
FB-15	Airbag control module
FB-16	Daytime running light control module Daytime running light relay Engine control module Fuel pump relay Ignition coil No. 1— 6 Integrated module Transmission control module
FB-17	A/C pressure switch Blower motor relay Fan relay
FB-18	A/C relay Sub fan relay-1 Sub fan relay-2
FB-19	Auto A/C control module Vehicle interface module
FB-20	Cruise control module Inhibitor switch (AT) Power window relay Wiper deicer relay
FB-21	Cruise control main switch
FB-22	Auto A/C control module Engine control module
FB-23	Rear defogger Rear defogger condenser
FB-24	Combination switch (Lighting) Engine control module OP connector
FB-25	Parking switch
FB-26	AT select lever illumination light Integrated module Seat heater switch OP connector Power window main switch

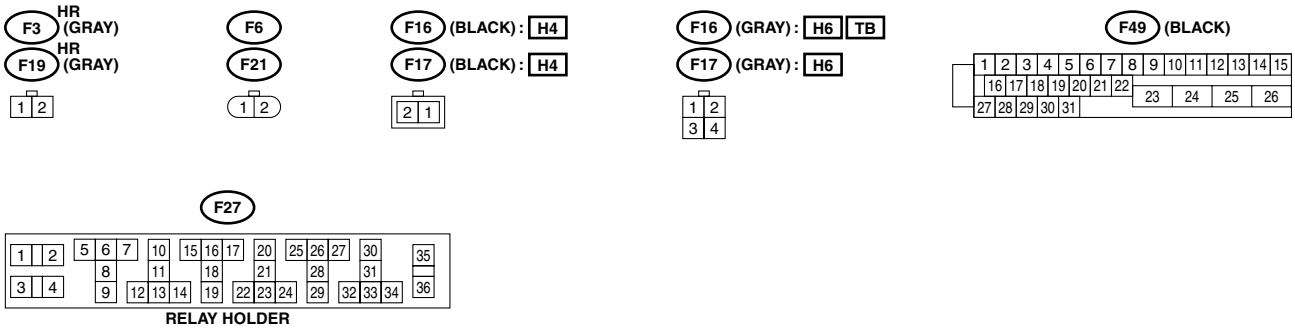
No.	Load
FB-27	Audio Auto A/C control module Ashtray illumination light Cigar lighter illumination light Combination meter Cruise control main switch Front fog light switch Glove box light Mode control panel Manual A/C control module VDC OFF switch Wiper deicer switch
FB-28	Auto A/C control module Front accessory power supply relay Multiple power socket relay (Option)
FB-29	Compass mirror Integrated module Mirror heater LH Mirror heater RH OP connector Remote control rearview mirror switch Rear accessory power supply relay Vanity mirror illumination light
FB-30	Audio Vehicle interface module
FB-31	Combination switch (Wiper) Front washer motor Front wiper motor
FB-32	Auto A/C control module Combination meter Key switch illumination light Integrated module Luggage room light Onstar relay-2 Room light Security control module Security horn relay Spot light Step light Trunk room light
FB-33	Audio Auto A/C control module Combination meter Vehicle interface module
FB-34	License plate light LH License plate light RH Rear finisher light LH Rear finisher light RH Rear combination light LH Rear combination light RH Trailer connector (Wagon)
FB-35	Front clearance light LH Front clearance light RH
FB-36	Front turn signal light LH (Up, Lo)
FB-37	Front turn signal light RH (Up, Lo)
FB-38	Rear washer motor Rear wiper intermittent module Rear wiper motor

No.	Load
FB-39	Combination meter Hazard switch

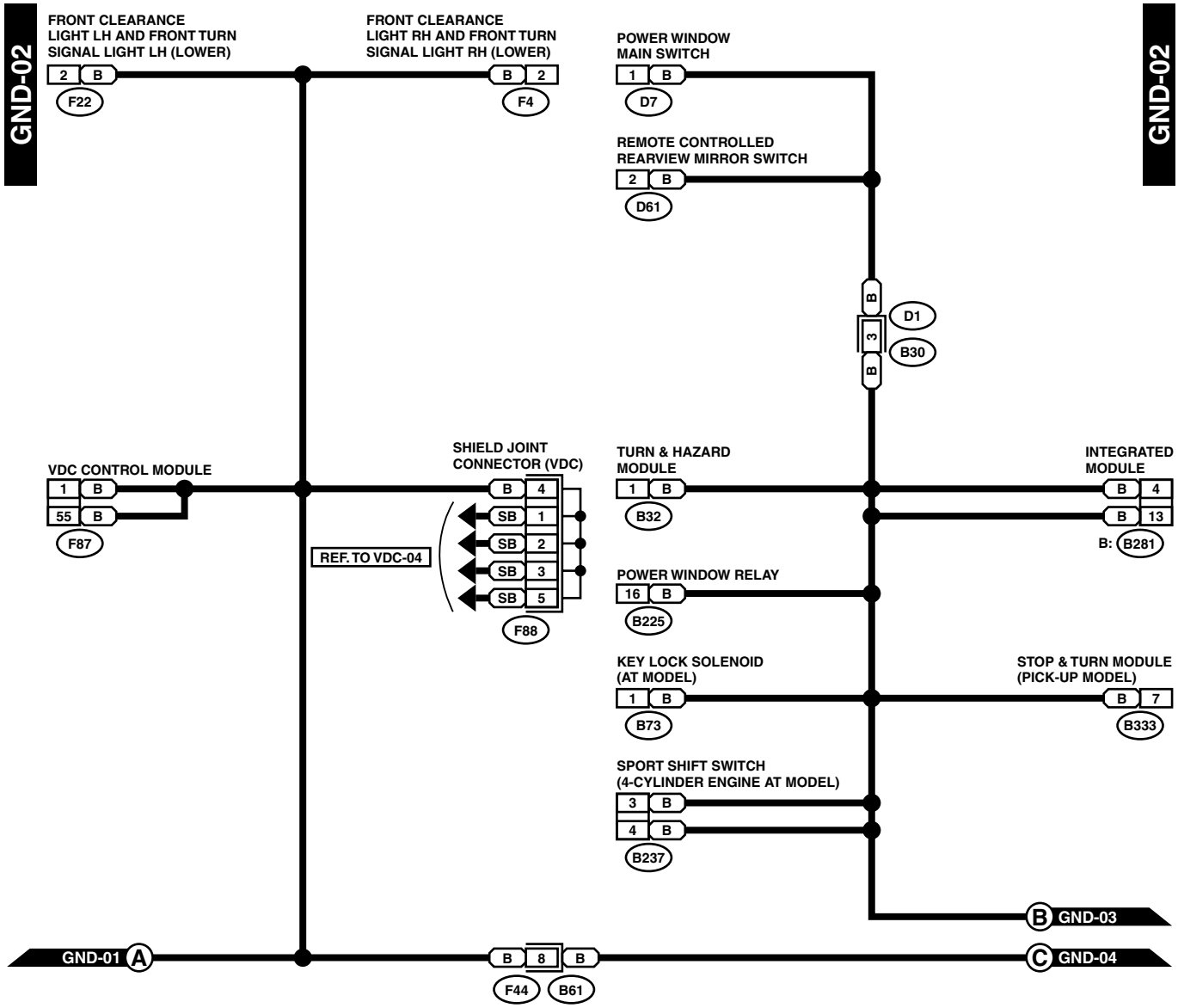
5. Ground Distribution

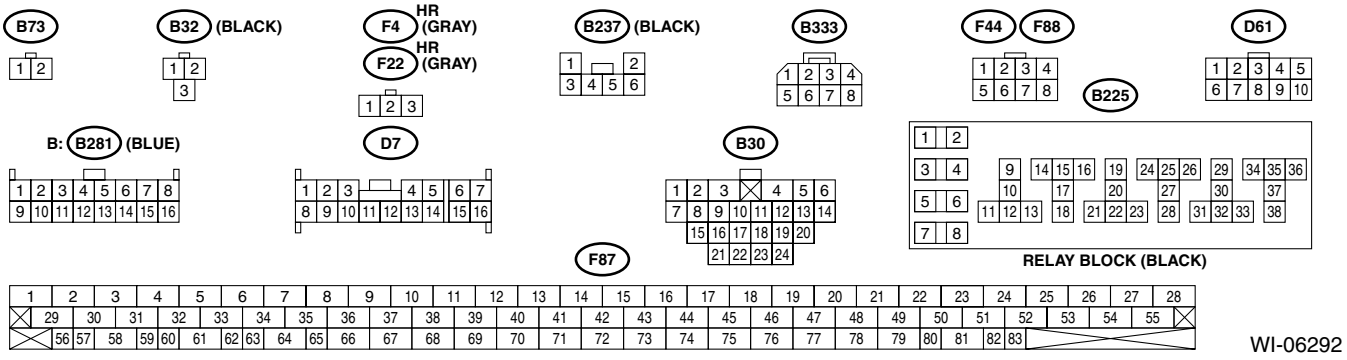
A: SCHEMATIC





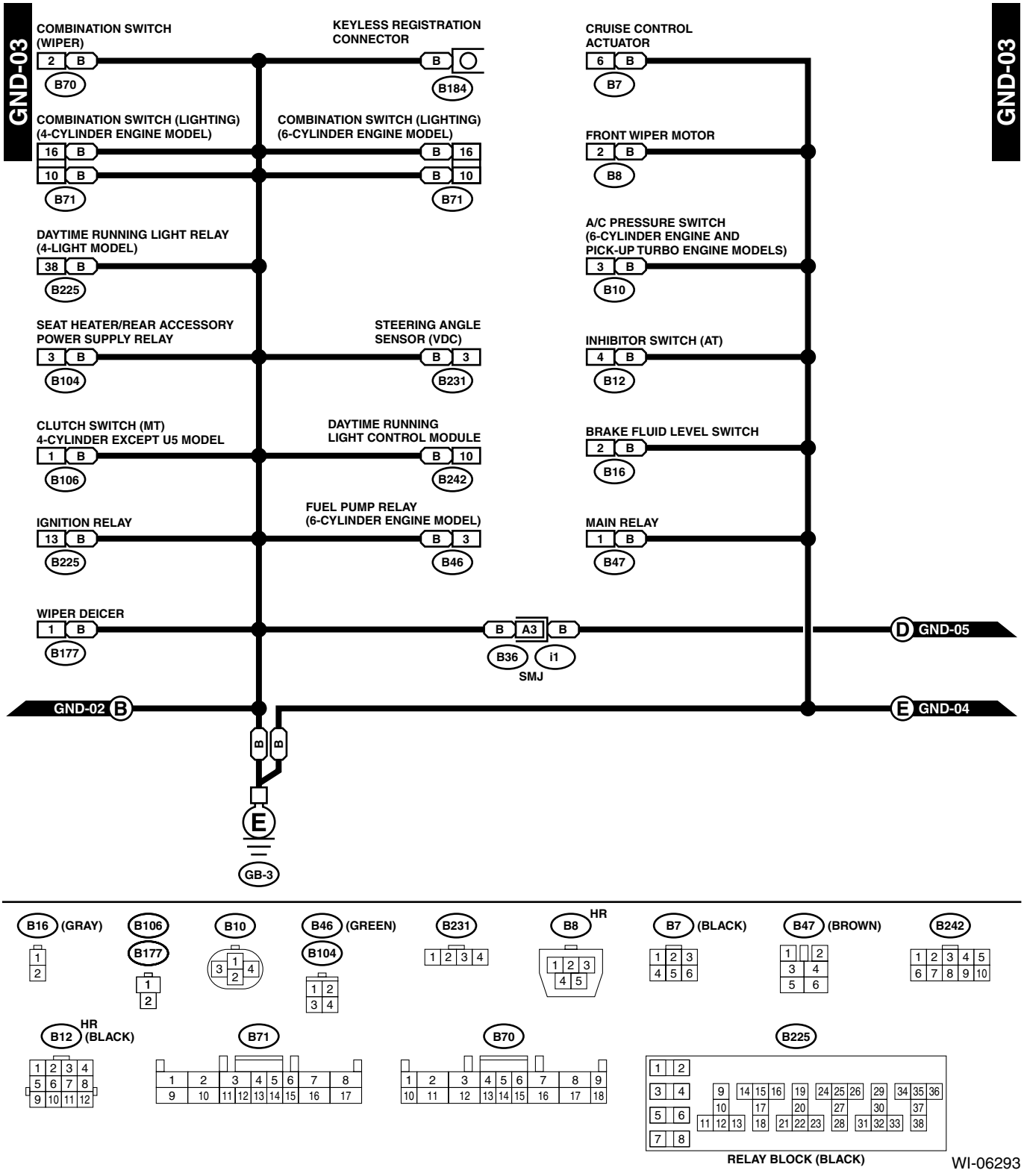
WI-06291


GND-02
FRONT CLEARANCE LIGHT LH AND FRONT TURN SIGNAL LIGHT LH (LOWER)
2 B
F22
FRONT CLEARANCE LIGHT RH AND FRONT TURN SIGNAL LIGHT RH (LOWER)
B 2
F4
POWER WINDOW MAIN SWITCH
1 B
D7
REMOTE CONTROLLED REARVIEW MIRROR SWITCH
2 B
D61
B
3
B
D1
B30
GND-02
VDC CONTROL MODULE
1 B
55 B
F87
SHIELD JOINT CONNECTOR (VDC)
B 4
SB 1
SB 2
SB 3
SB 5
F88
REF. TO VDC-04
TURN & HAZARD MODULE
1 B
B32
INTEGRATED MODULE
B 4
B 13
B: B281
POWER WINDOW RELAY
16 B
B225
KEY LOCK SOLENOID (AT MODEL)
1 B
B73
STOP & TURN MODULE (PICK-UP MODEL)
B 7
B333
SPORT SHIFT SWITCH (4-CYLINDER ENGINE AT MODEL)
3 B
4 B
B237
B GND-03
GND-01 A
B 8 B
F44 B61
C GND-04

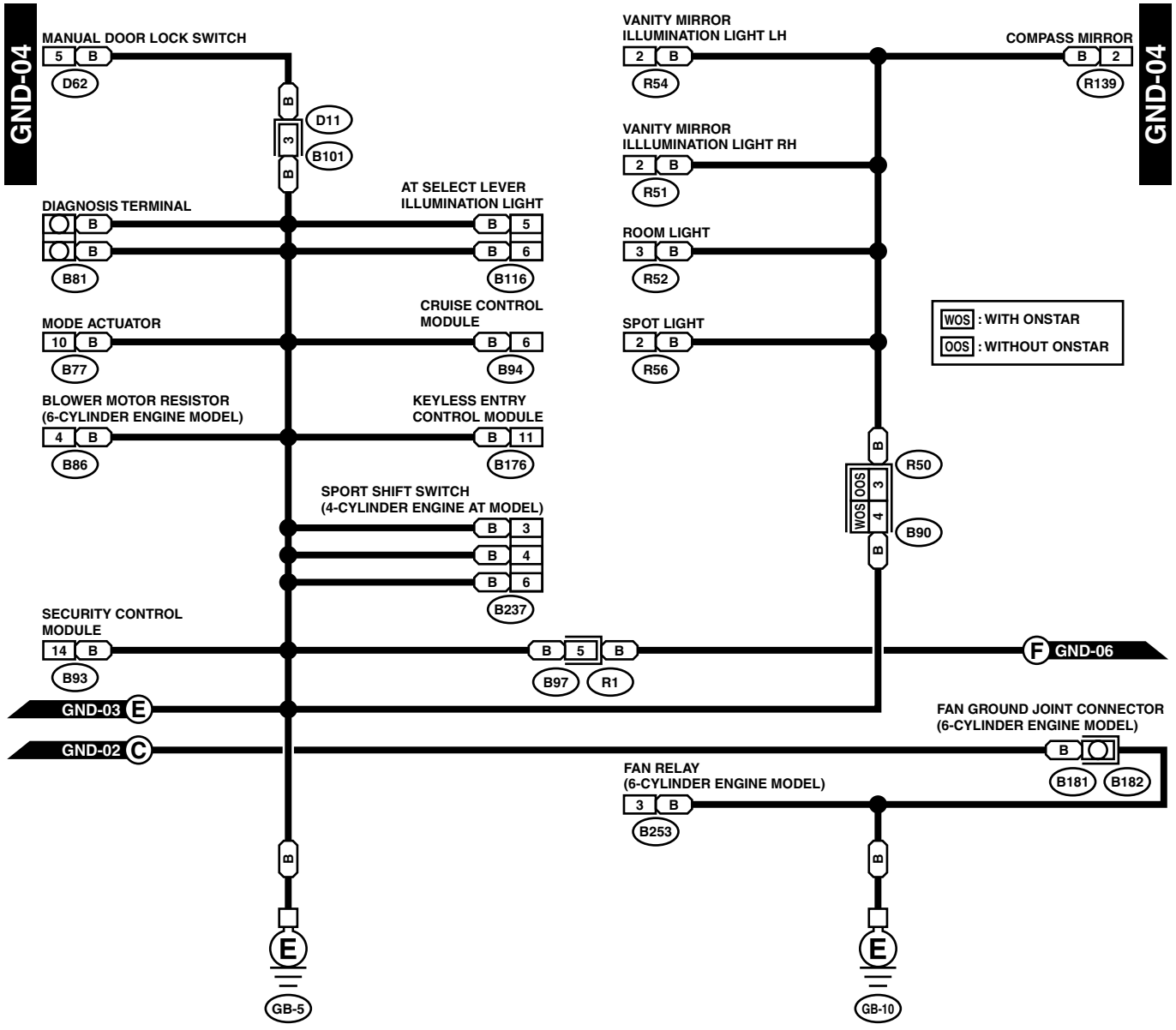

B73
B32 (BLACK)
F4 HR (GRAY)
F22 HR (GRAY)
B237 (BLACK)
B333
F44 F88
D61
B225
B: B281 (BLUE)
D7
B30
F87
RELAY BLOCK (BLACK)

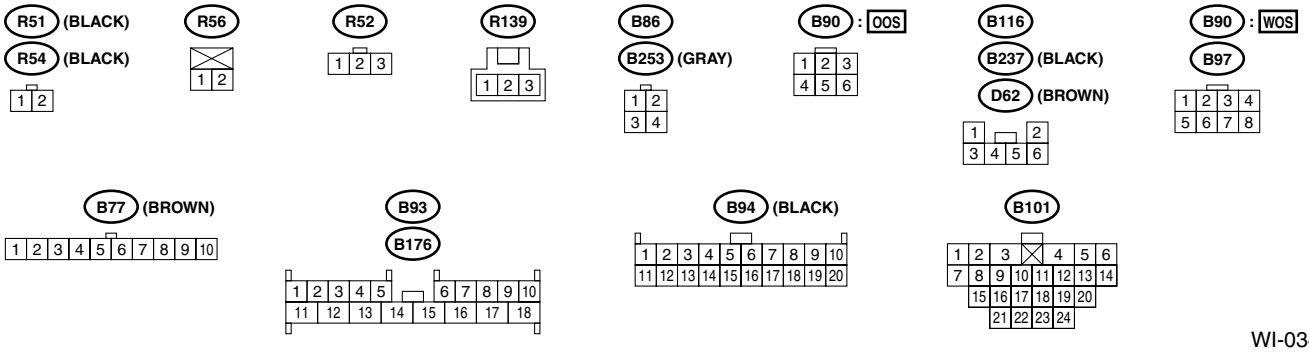
WI-06292

GROUND DISTRIBUTION



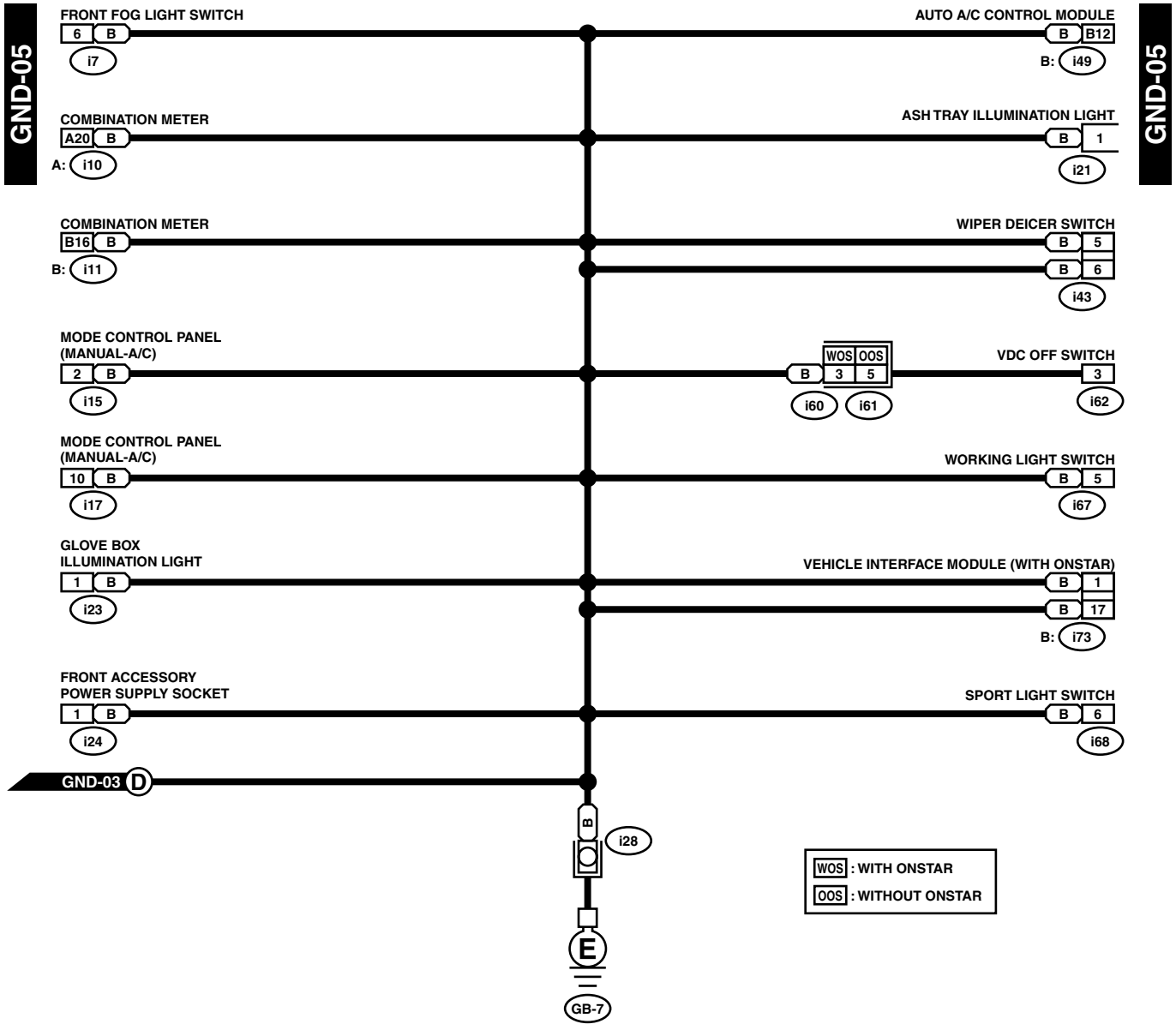
WI-06293

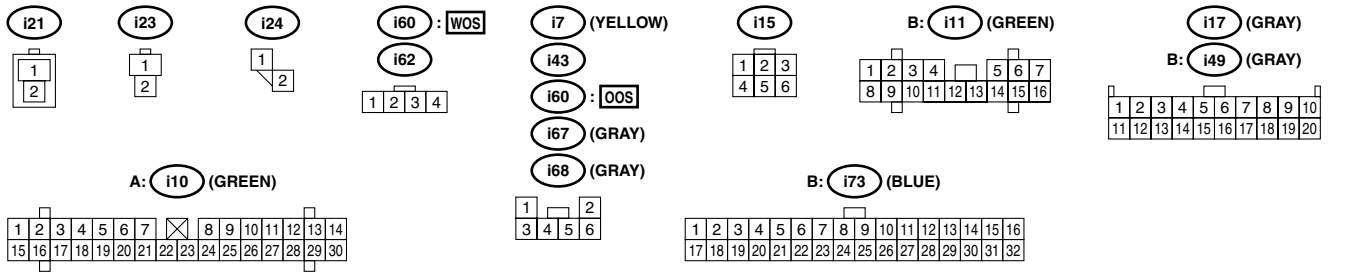

GND-04
MANUAL DOOR LOCK SWITCH
5 B
D62
B
D11
3
B101
B
DIAGNOSIS TERMINAL
B
B
B81
AT SELECT LEVER ILLUMINATION LIGHT
B 5
B 6
B116
MODE ACTUATOR
10 B
B77
CRUISE CONTROL MODULE
B 6
B94
BLOWER MOTOR RESISTOR (6-CYLINDER ENGINE MODEL)
4 B
B86
KEYLESS ENTRY CONTROL MODULE
B 11
B176
SPORT SHIFT SWITCH (4-CYLINDER ENGINE AT MODEL)
B 3
B 4
B 6
B237
SECURITY CONTROL MODULE
14 B
B93
B 5 B
B97
R1
GND-03 E
GND-02 C
VANITY MIRROR ILLUMINATION LIGHT LH
2 B
R54
VANITY MIRROR ILLLUMINATION LIGHT RH
2 B
R51
ROOM LIGHT
3 B
R52
SPOT LIGHT
2 B
R56
COMPASS MIRROR
B 2
R139
GND-04
WOS : WITH ONSTAR
OOS : WITHOUT ONSTAR
B
R50
OOS 3
WOS 4
B90
F GND-06
FAN GROUND JOINT CONNECTOR (6-CYLINDER ENGINE MODEL)
B
B181
B182
FAN RELAY (6-CYLINDER ENGINE MODEL)
3 B
B253
E
GB-5
E
GB-10


R51 (BLACK)
R54 (BLACK)
R56
R52
R139
B86
B253 (GRAY)
B90 : OOS
B116
B237 (BLACK)
D62 (BROWN)
B90 : WOS
B97
B77 (BROWN)
B93
B176
B94 (BLACK)
B101

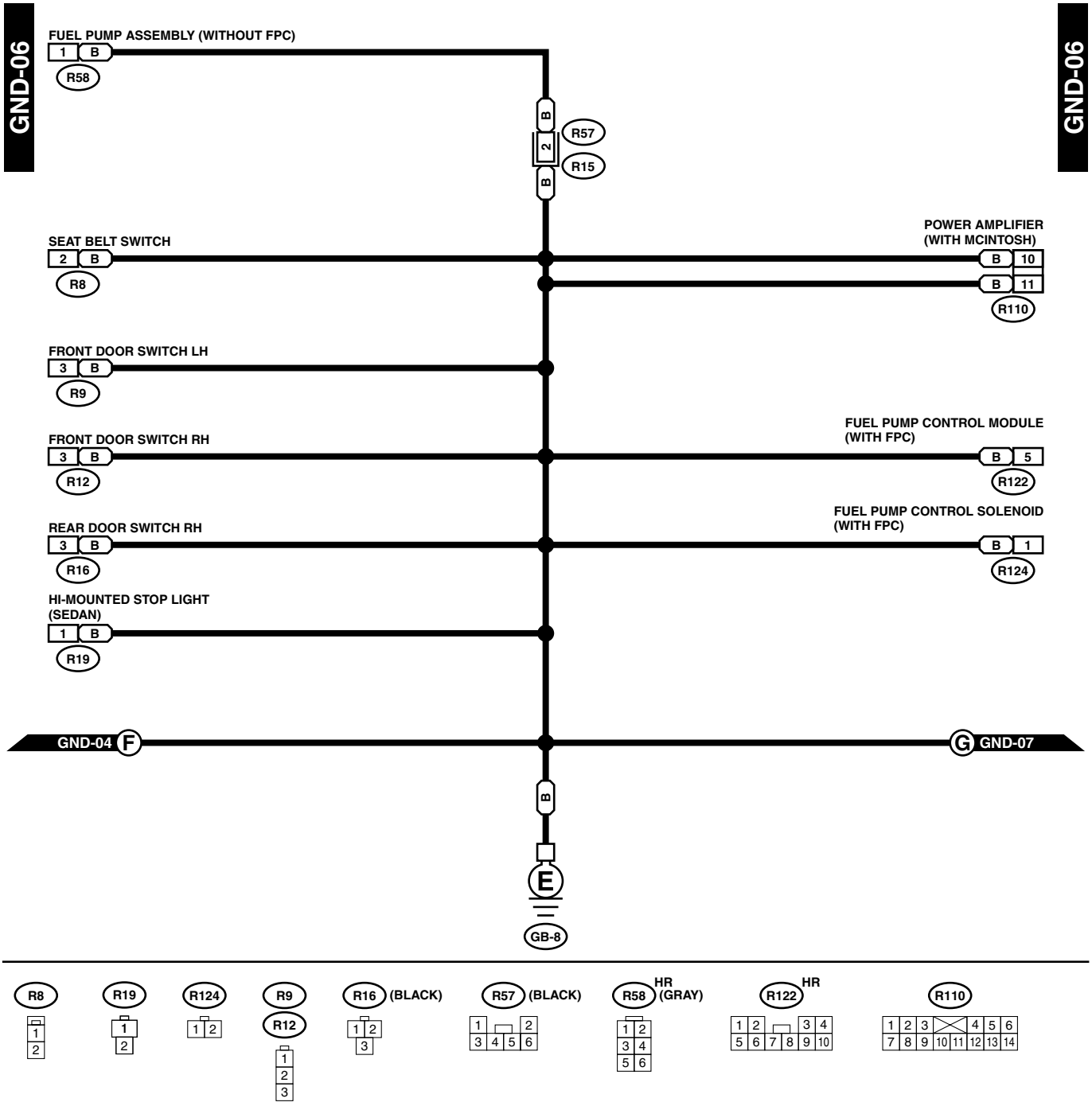
WI-03462

GROUND DISTRIBUTION





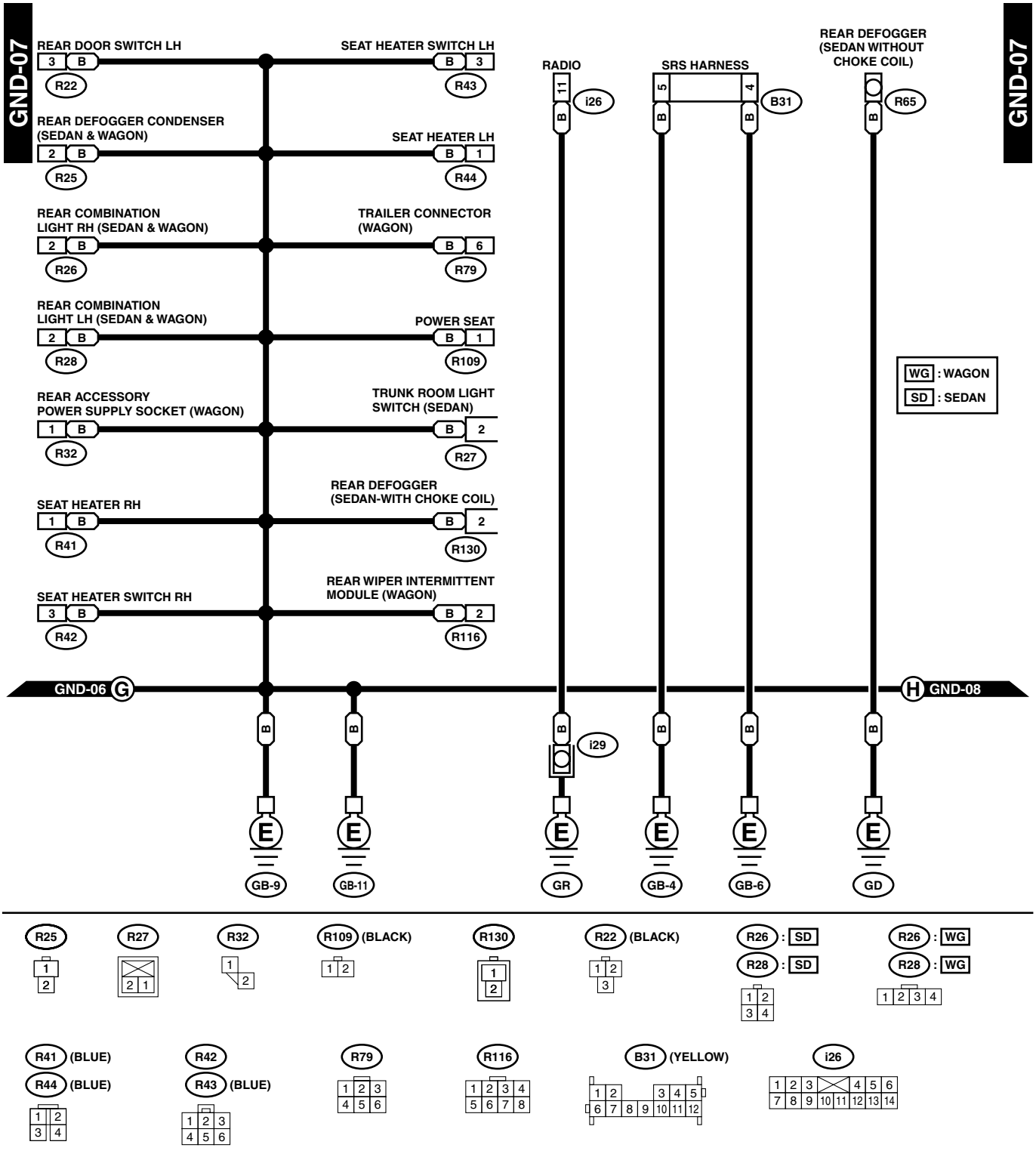
WI-03463


GND-06
GND-06
FUEL PUMP ASSEMBLY (WITHOUT FPC)
1 B
R58
B
2
B
R57
R15
SEAT BELT SWITCH
2 B
R8
POWER AMPLIFIER
(WITH MCINTOSH)
B 10
B 11
R110
FRONT DOOR SWITCH LH
3 B
R9
FUEL PUMP CONTROL MODULE
(WITH FPC)
FRONT DOOR SWITCH RH
3 B
R12
B 5
R122
FUEL PUMP CONTROL SOLENOID
(WITH FPC)
REAR DOOR SWITCH RH
3 B
R16
B 1
R124
HI-MOUNTED STOP LIGHT
(SEDAN)
1 B
R19
GND-04 F
G GND-07
B
E
GB-8

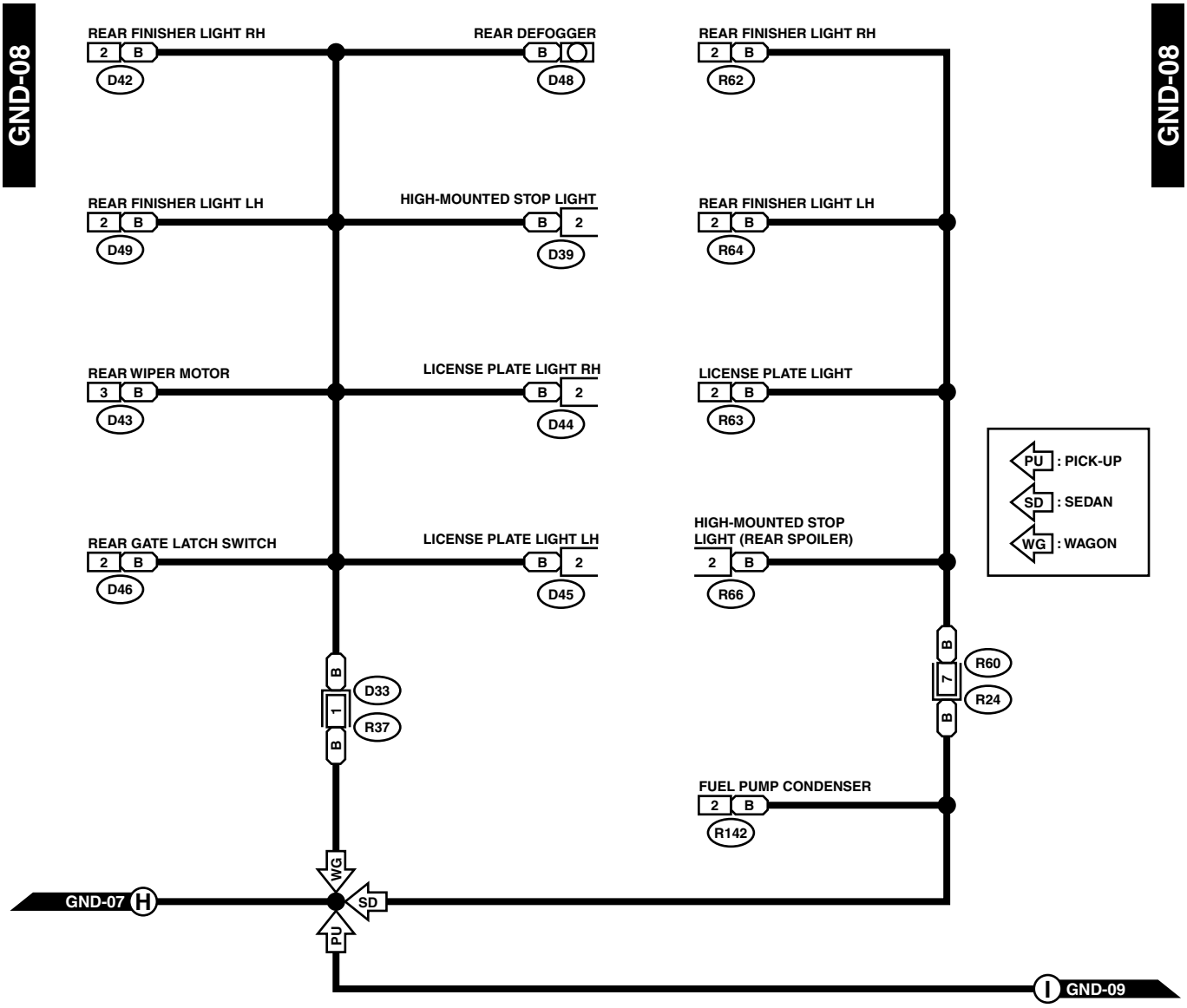
R8
R19
R124
R9
R12
R16 (BLACK)
R57 (BLACK)
R58 HR (GRAY)
R122 HR
R110

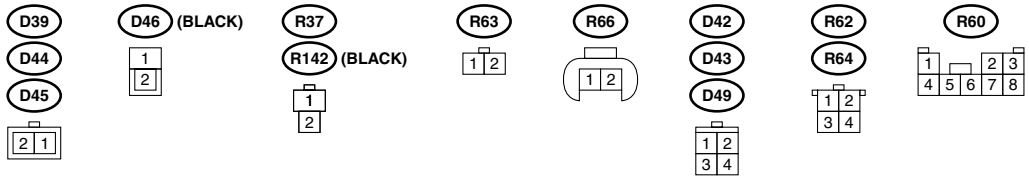
WI-06294

GROUND DISTRIBUTION



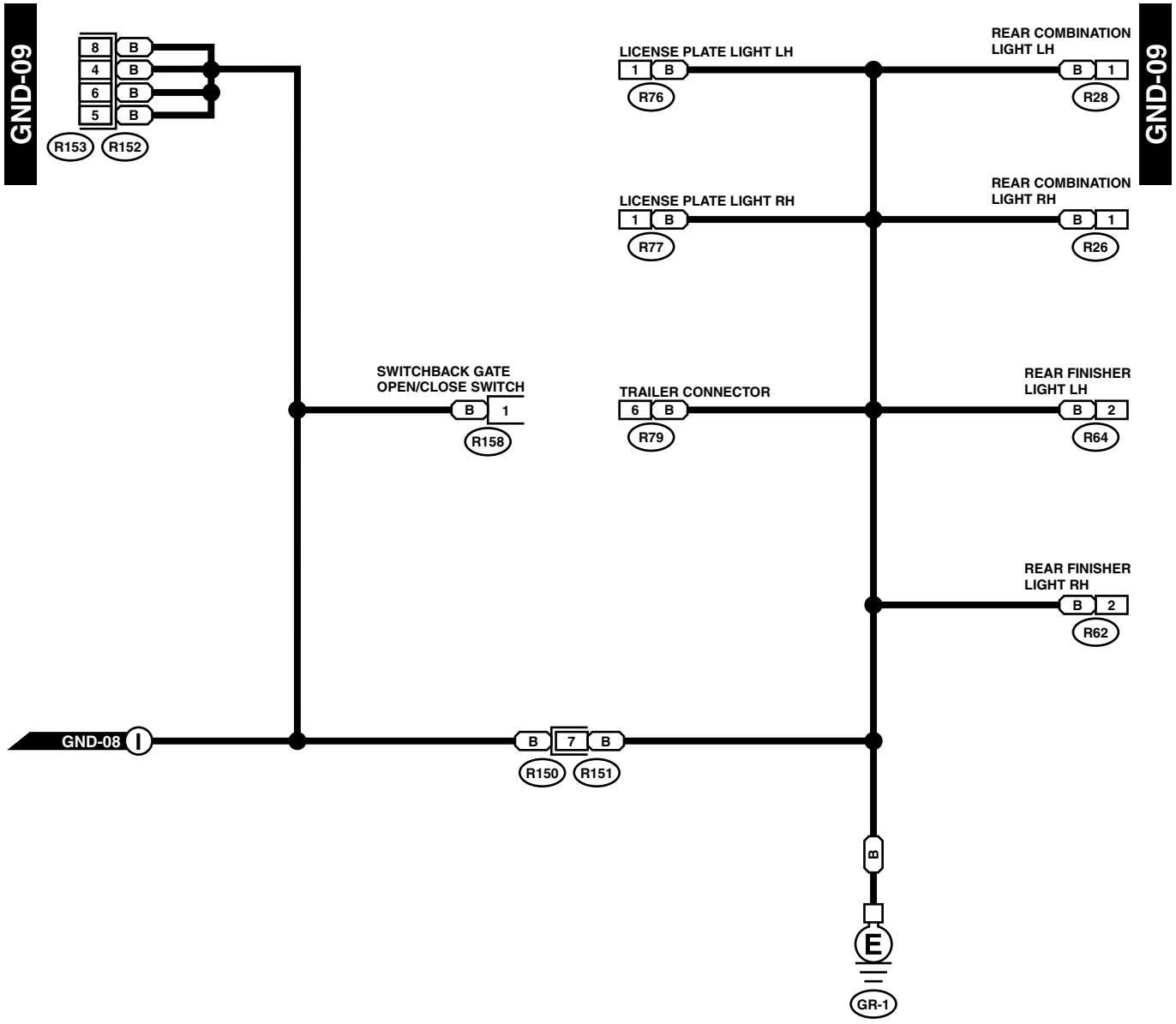
WI-03464

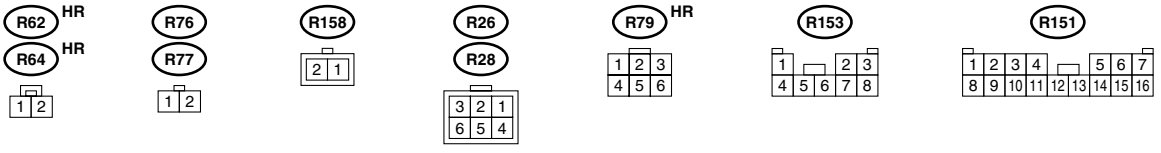

GND-08
GND-08
REAR FINISHER LIGHT RH
2 B
D42
REAR DEFOGGER
B
D48
REAR FINISHER LIGHT RH
2 B
R62
REAR FINISHER LIGHT LH
2 B
D49
HIGH-MOUNTED STOP LIGHT
B 2
D39
REAR FINISHER LIGHT LH
2 B
R64
REAR WIPER MOTOR
3 B
D43
LICENSE PLATE LIGHT RH
B 2
D44
LICENSE PLATE LIGHT
2 B
R63
REAR GATE LATCH SWITCH
2 B
D46
LICENSE PLATE LIGHT LH
B 2
D45
HIGH-MOUNTED STOP LIGHT (REAR SPOILER)
2 B
R66
PU : PICK-UP
SD : SEDAN
WG : WAGON
B
1
D33
R37
B
B
7
R60
R24
B
FUEL PUMP CONDENSER
2 B
R142
WG
SD
PU
GND-07 H
I GND-09


D39
D44
D45
2 1
D46 (BLACK)
1
2
R37
R142 (BLACK)
1
2
R63
1 2
R66
1 2
D42
D43
D49
1 2
3 4
R62
R64
1 2
3 4
R60
1 2 3
4 5 6 7 8

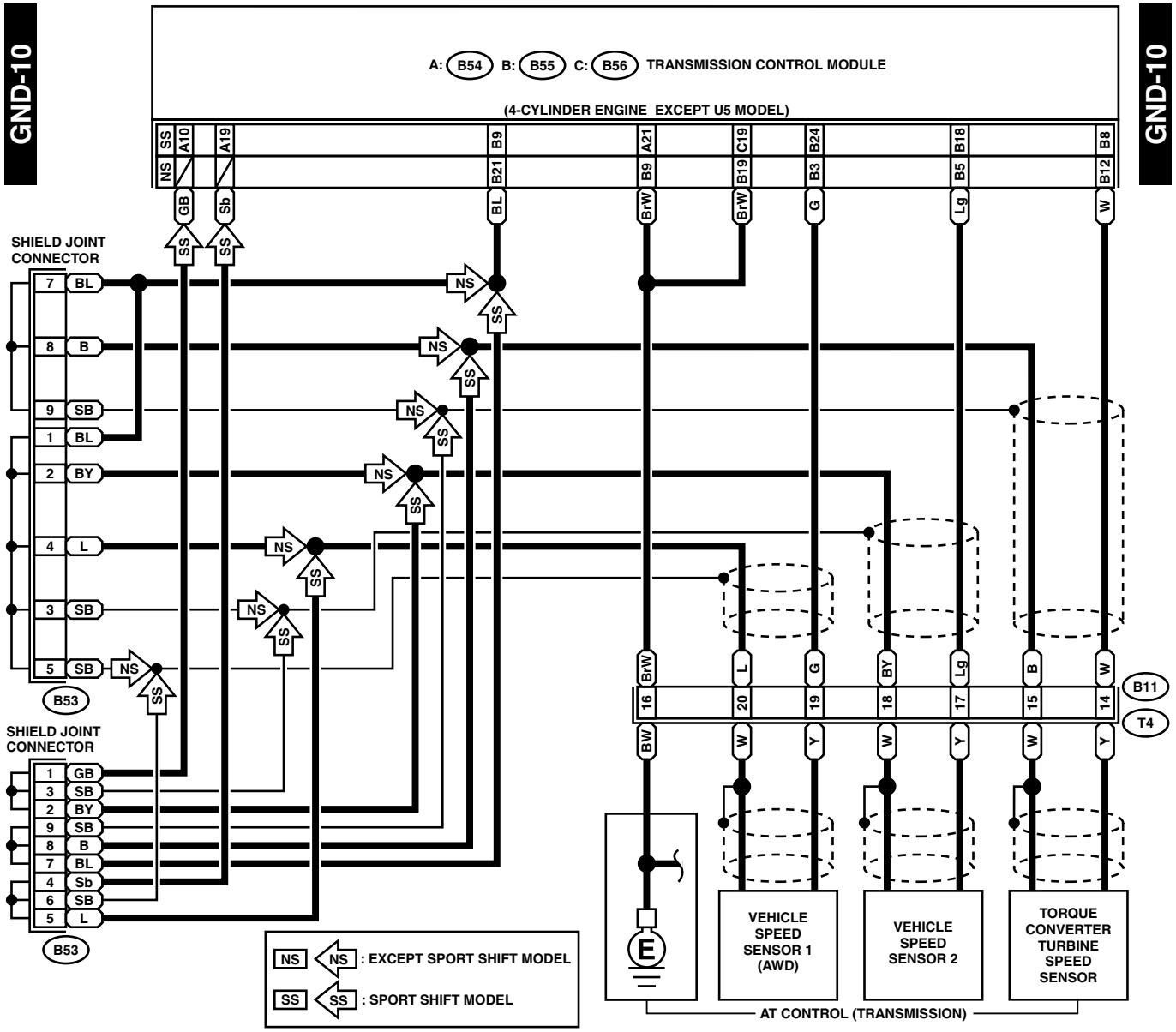
WI-00521

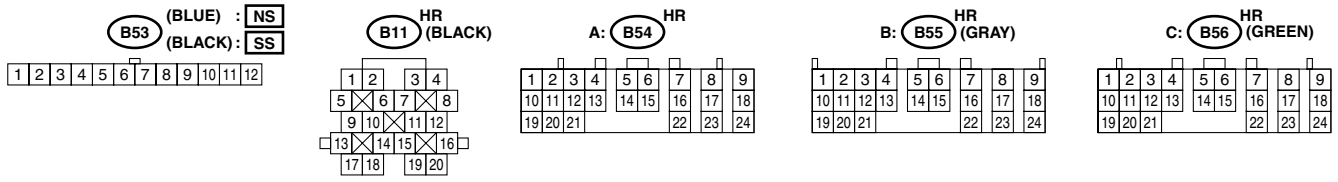
GROUND DISTRIBUTION



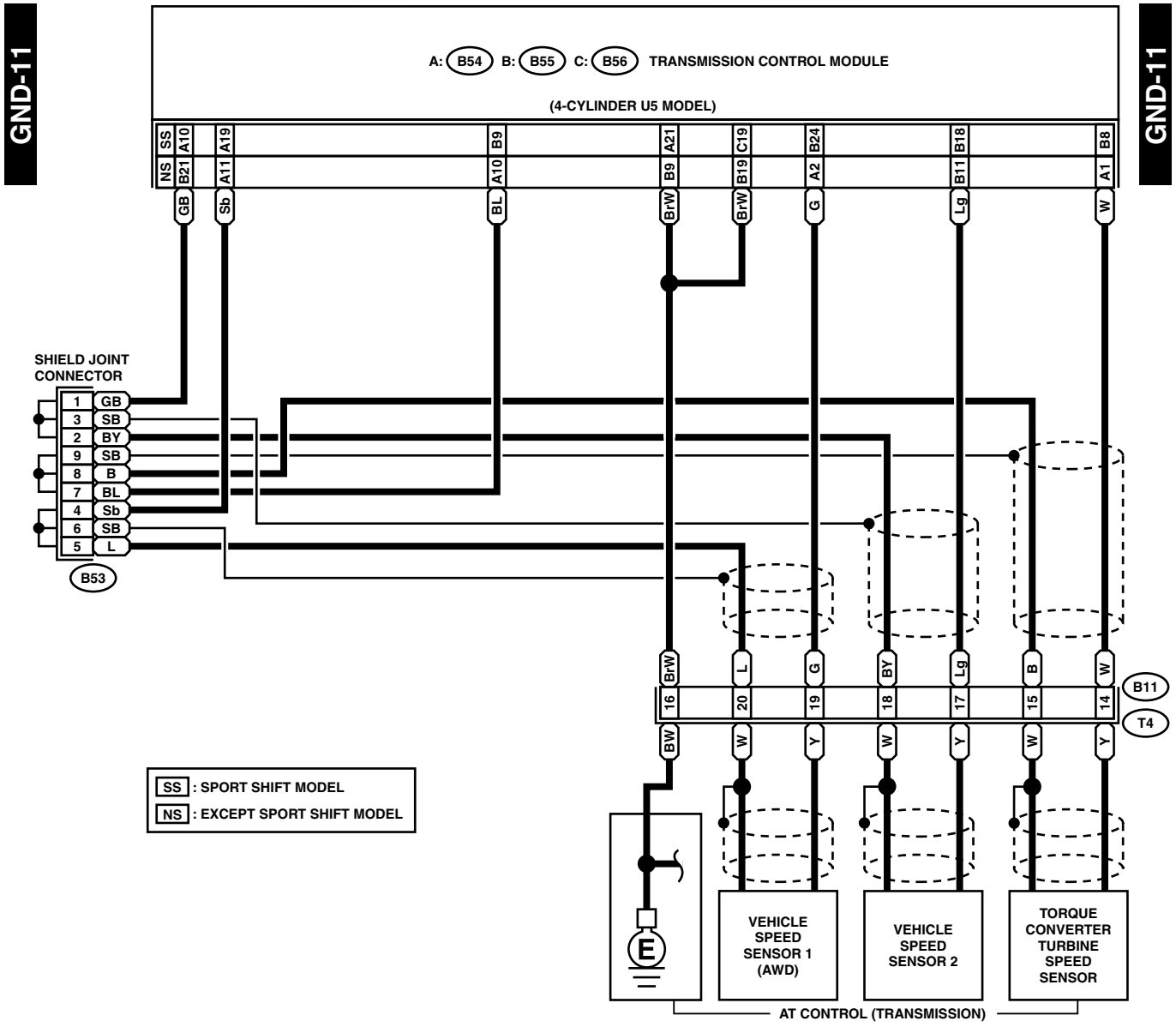


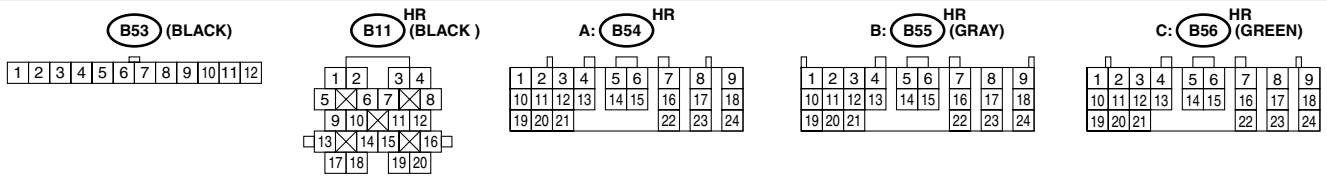
WI-06295


GND-10
GND-10
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
(4-CYLINDER ENGINE EXCEPT U5 MODEL)
SHIELD JOINT CONNECTOR
B53
SHIELD JOINT CONNECTOR
B53
B11
T4
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT CONTROL (TRANSMISSION)
NS : EXCEPT SPORT SHIFT MODEL
SS : SPORT SHIFT MODEL


B53 (BLUE) : NS
(BLACK) : SS
B11 HR (BLACK)
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)

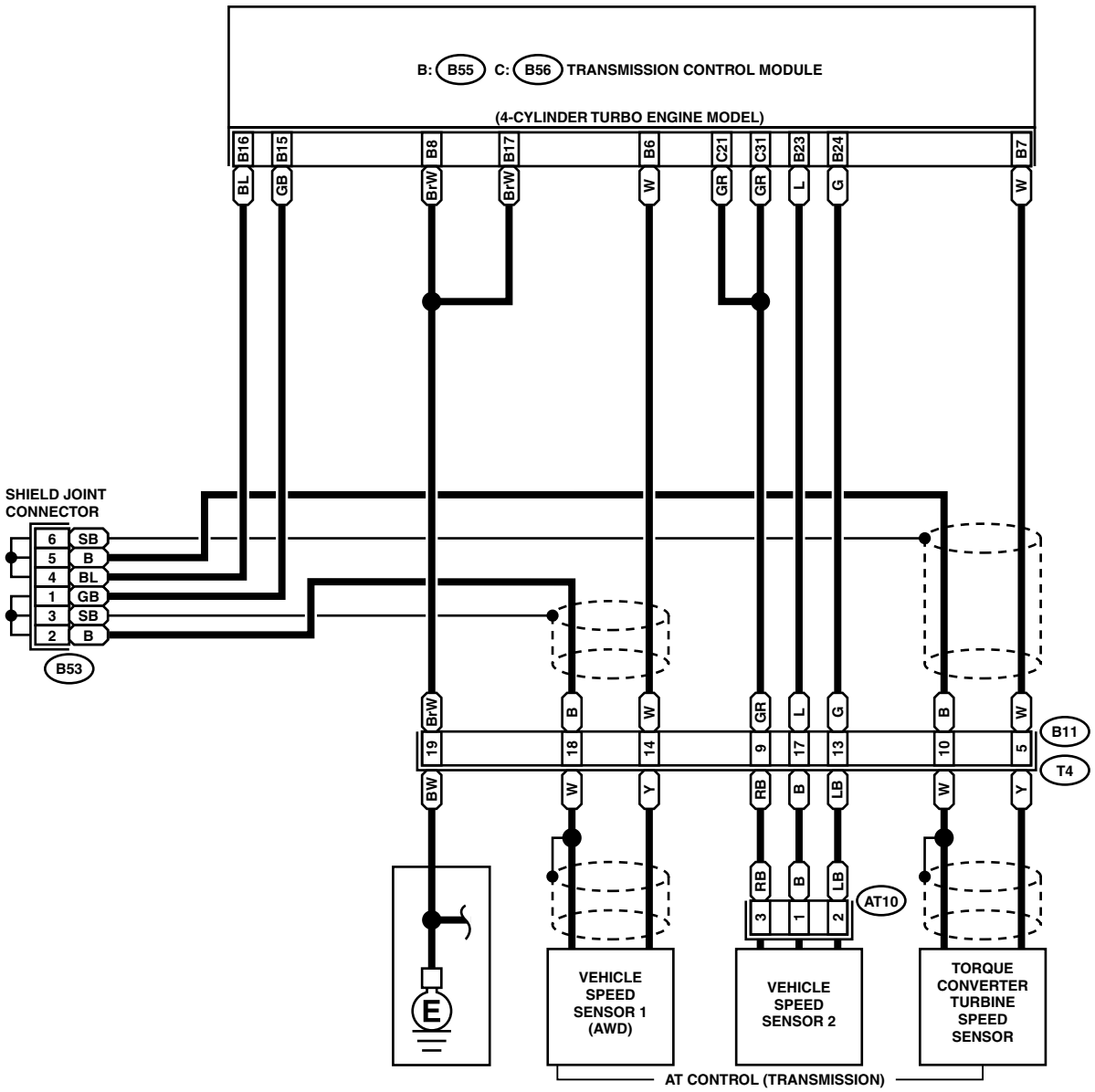
WI-06296

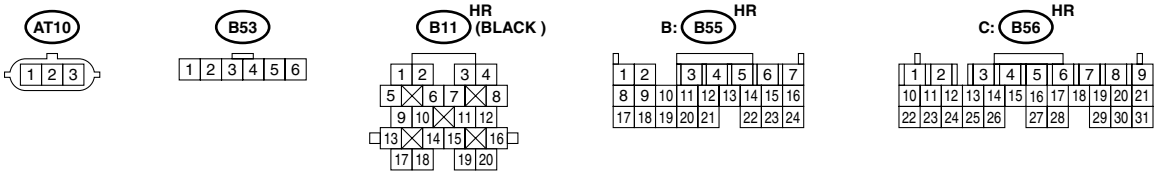

GND-11
GND-11
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
(4-CYLINDER U5 MODEL)
SS
NS
A10
B21
A19
A11
B9
A10
A21
B9
C19
B19
B24
A2
B18
B11
B8
A1
GB
Sb
BL
BrW
BrW
G
Lg
W
SHIELD JOINT CONNECTOR
1 GB
3 SB
2 BY
9 SB
8 B
7 BL
4 Sb
6 SB
5 L
B53
BrW
L
G
BY
Lg
B
W
16
20
19
18
17
15
14
B11
T4
BW
W
Y
W
Y
W
Y
SS : SPORT SHIFT MODEL
NS : EXCEPT SPORT SHIFT MODEL
E
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT CONTROL (TRANSMISSION)


B53 (BLACK)
HR
B11 (BLACK)
HR
A: B54
HR
B: B55 (GRAY)
HR
C: B56 (GREEN)

WI-06297

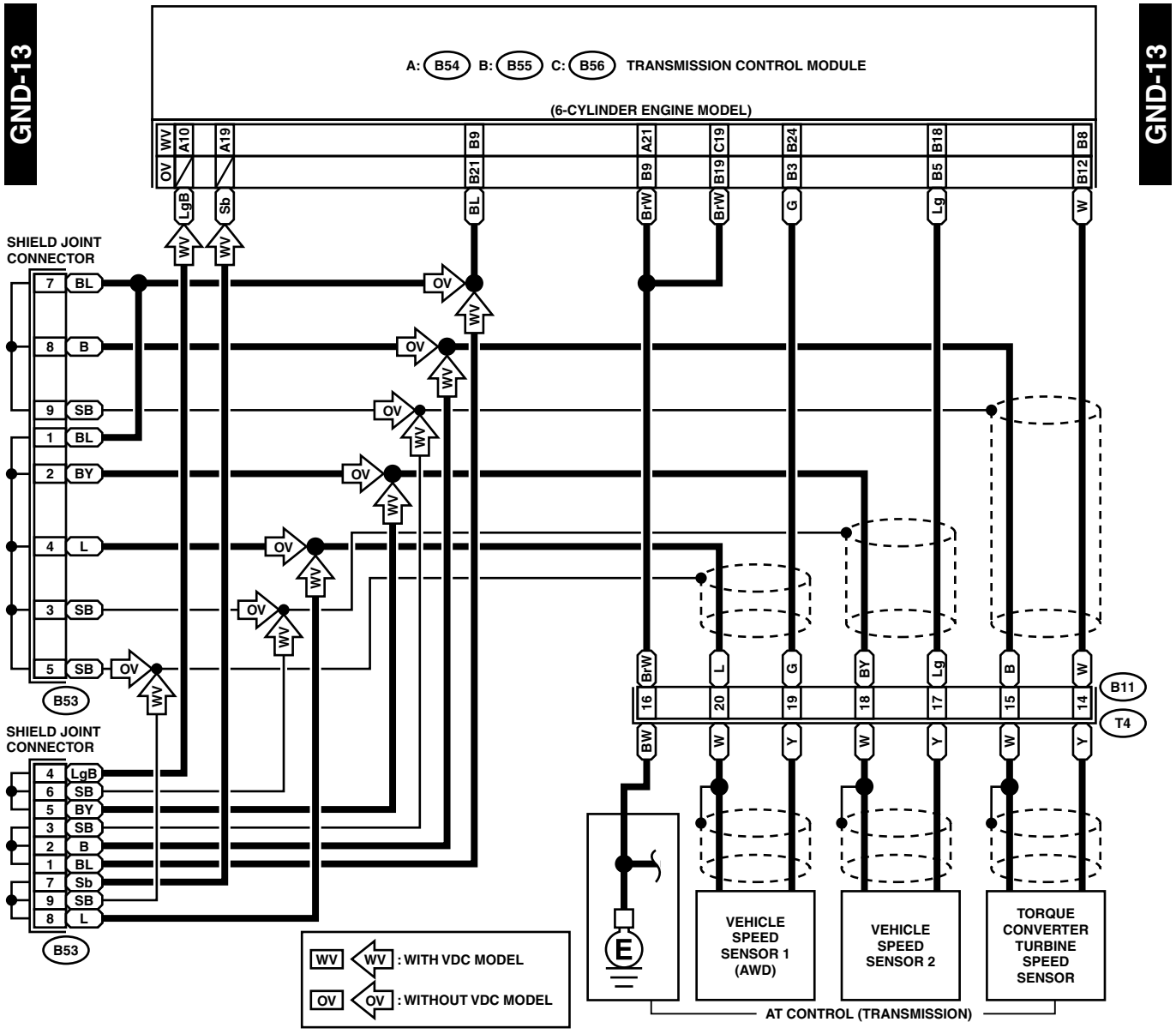
GND-12

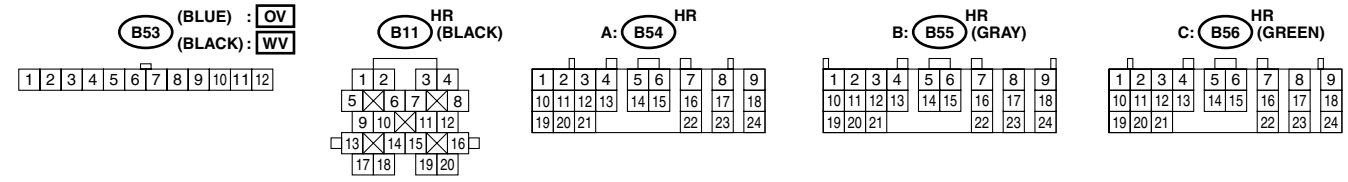




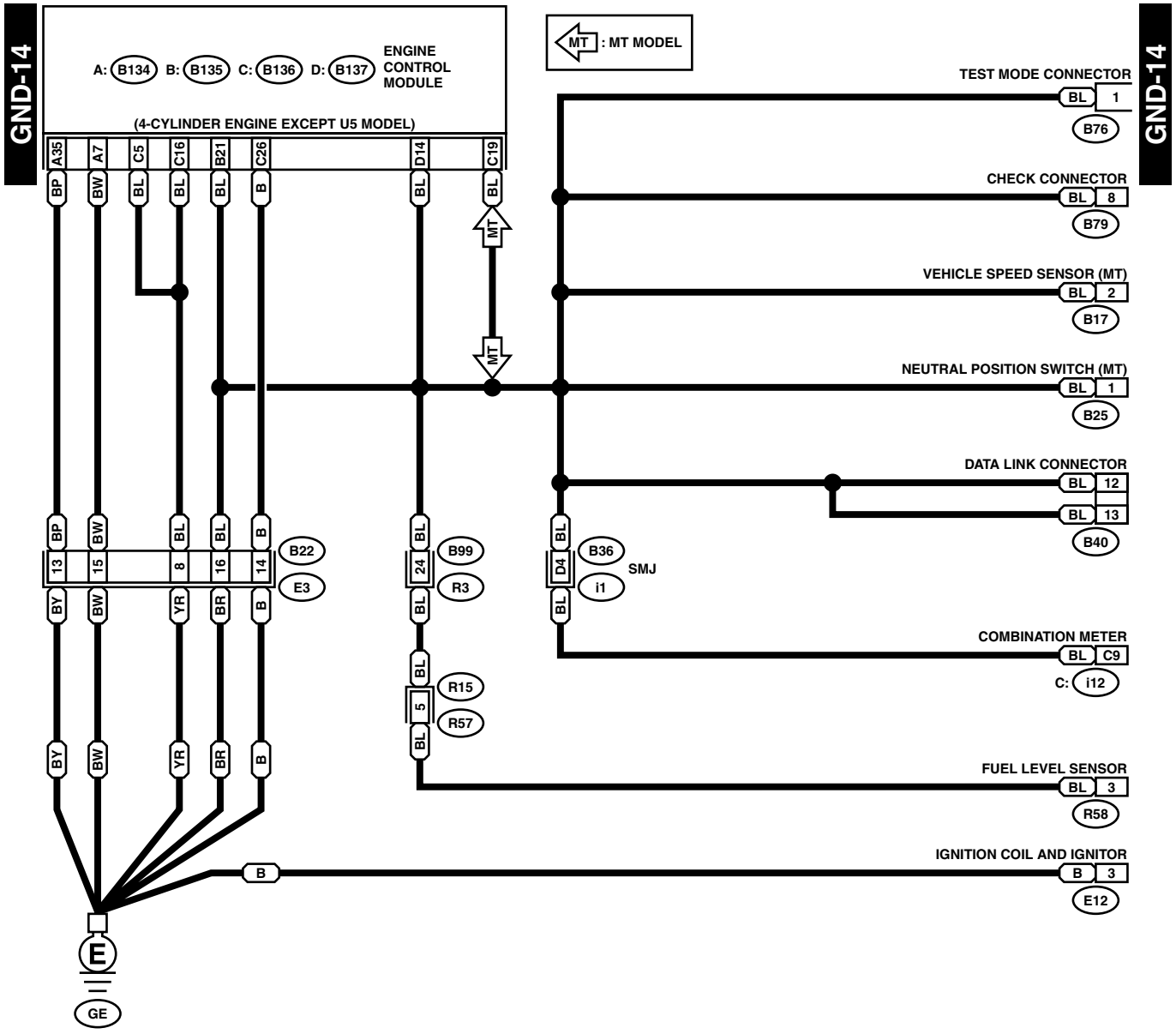
WI-06298

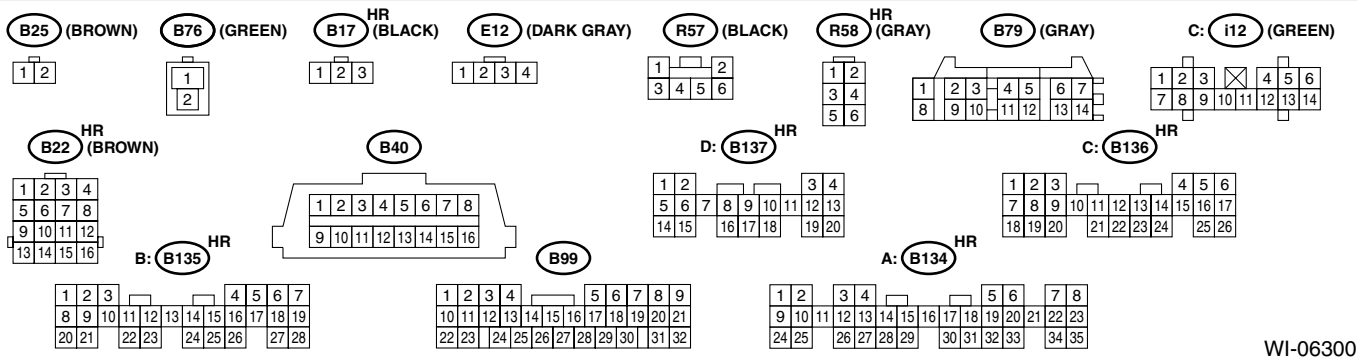
GROUND DISTRIBUTION



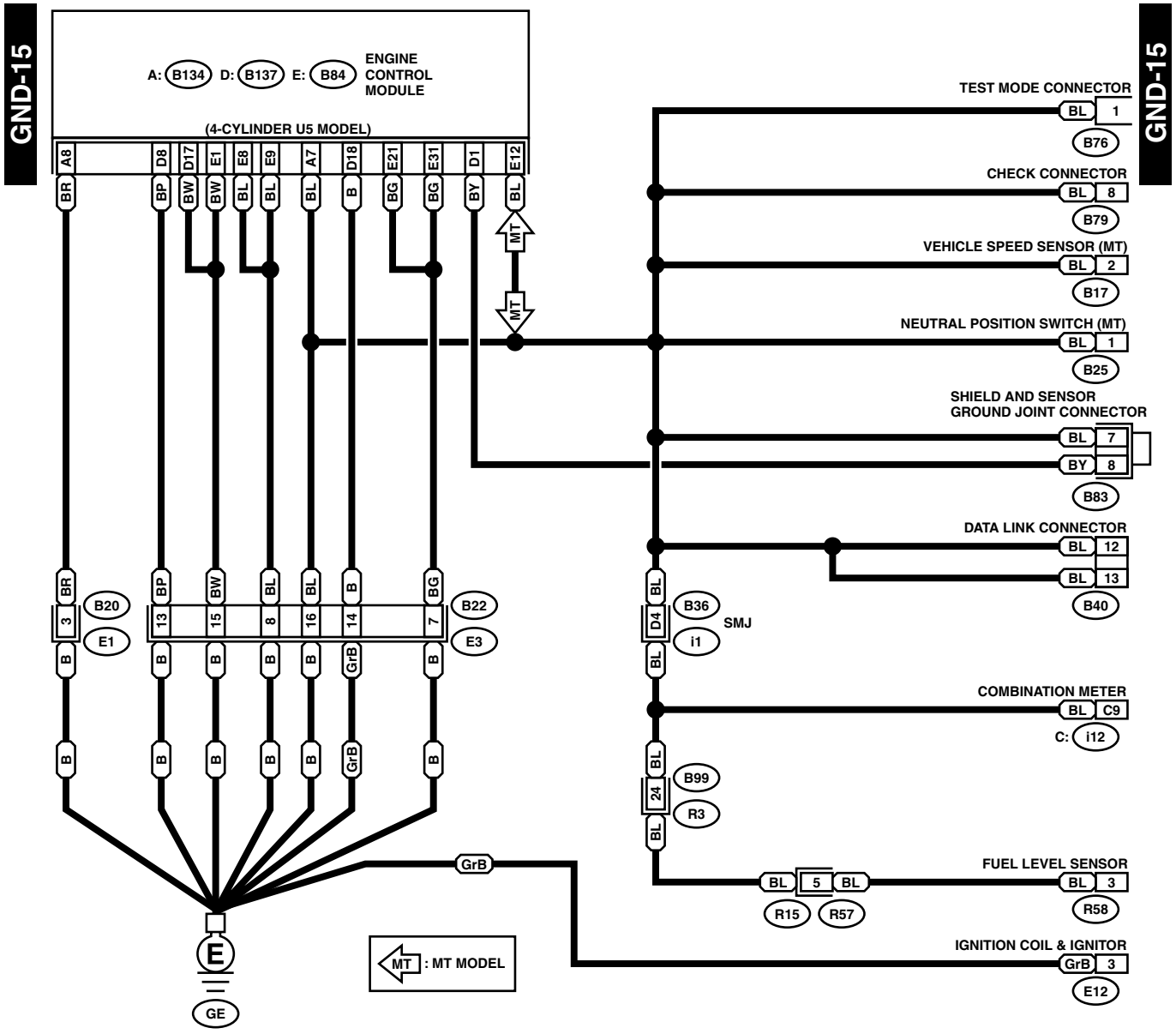


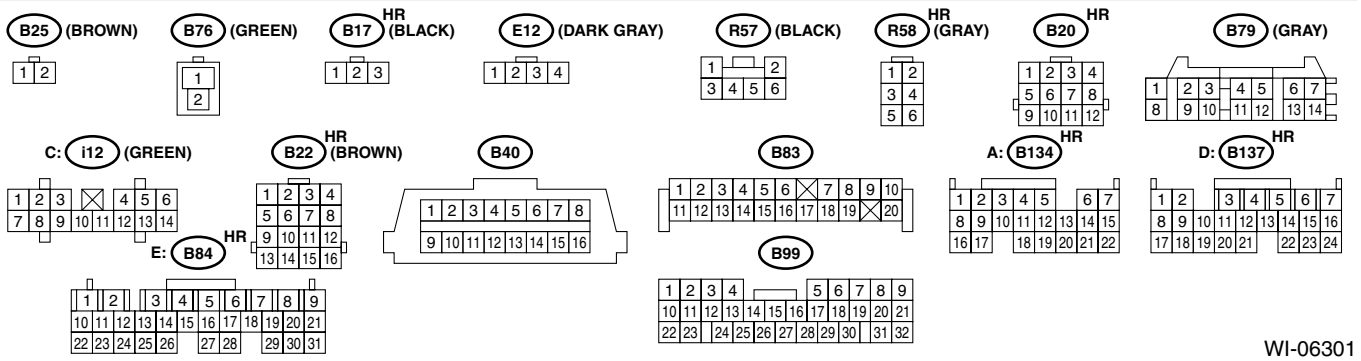
WI-06299


GND-14
A: B134 B: B135 C: B136 D: B137
ENGINE CONTROL MODULE
(4-CYLINDER ENGINE EXCEPT U5 MODEL)
MT : MT MODEL
TEST MODE CONNECTOR
CHECK CONNECTOR
VEHICLE SPEED SENSOR (MT)
NEUTRAL POSITION SWITCH (MT)
DATA LINK CONNECTOR
COMBINATION METER
FUEL LEVEL SENSOR
IGNITION COIL AND IGNITOR
SMJ
E
GE

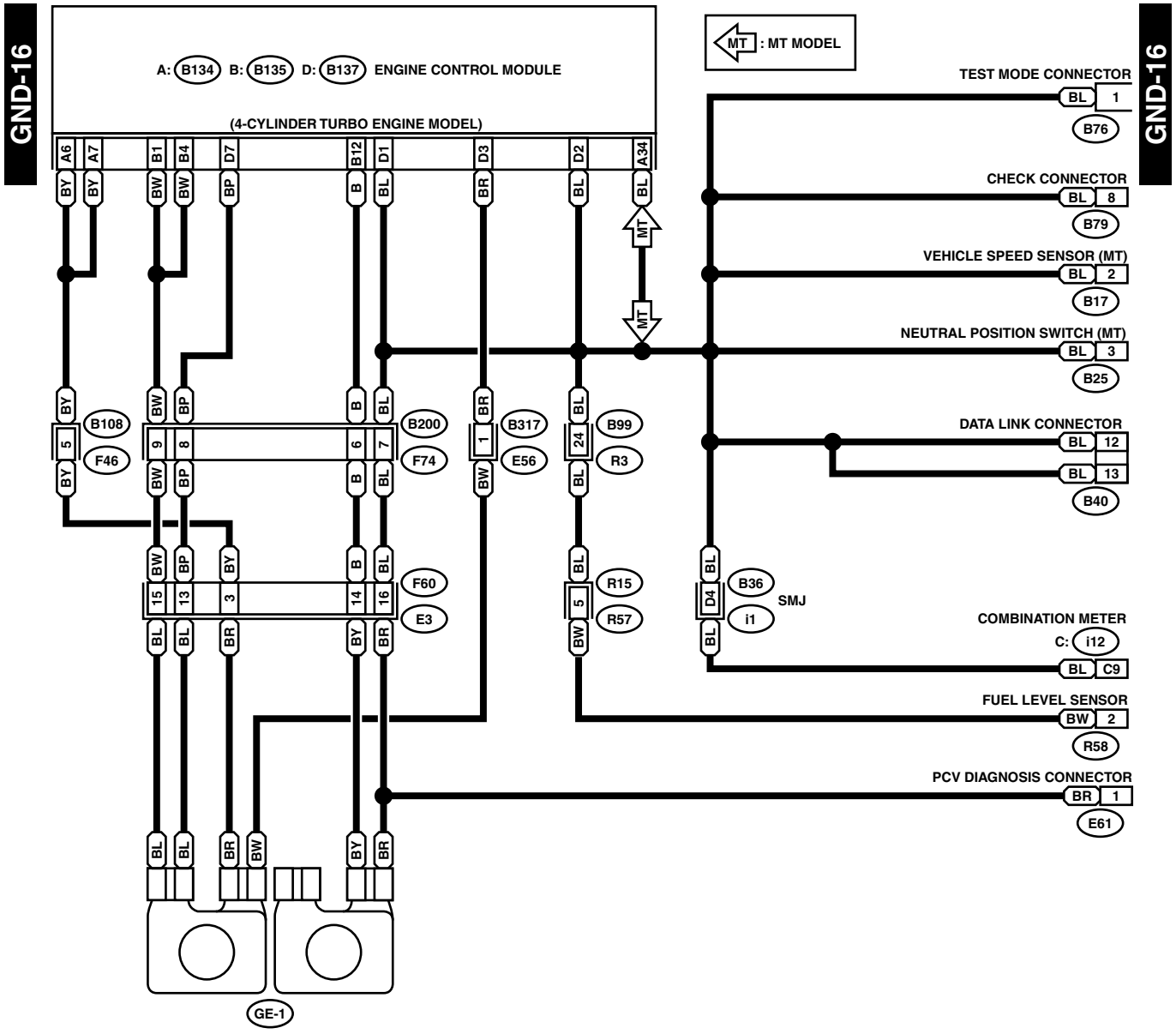

B25 (BROWN)
B76 (GREEN)
B17 HR (BLACK)
E12 (DARK GRAY)
R57 (BLACK)
R58 HR (GRAY)
B79 (GRAY)
C: i12 (GREEN)
B22 HR (BROWN)
B40
D: B137 HR
C: B136 HR
B: B135 HR
B99
A: B134 HR

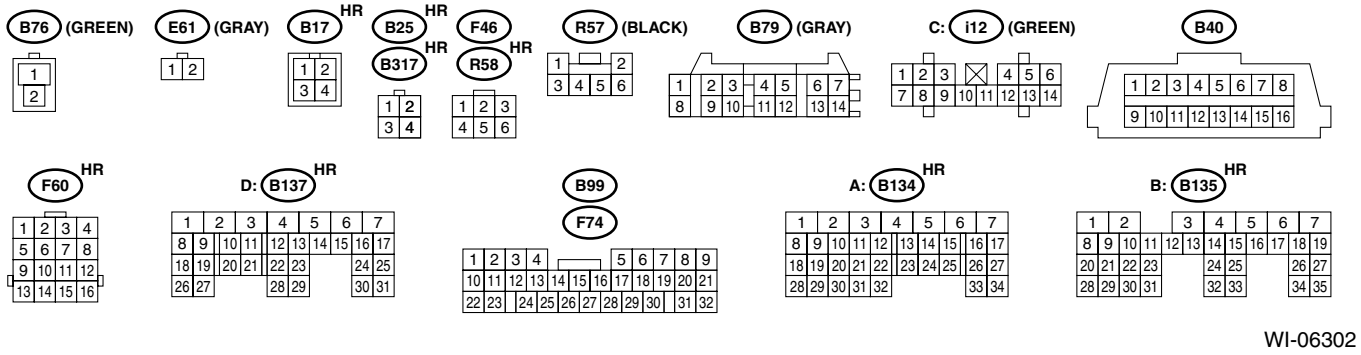
WI-06300


GND-15
A: B134 D: B137 E: B84
ENGINE CONTROL MODULE
(4-CYLINDER U5 MODEL)
A8 D8 D17 E1 E8 E9 A7 D18 E21 E31 D1 E12
BR BP BW BW BL BL BL B BG BG BY BL
MT
MT
TEST MODE CONNECTOR
BL 1
B76
CHECK CONNECTOR
BL 8
B79
VEHICLE SPEED SENSOR (MT)
BL 2
B17
NEUTRAL POSITION SWITCH (MT)
BL 1
B25
SHIELD AND SENSOR GROUND JOINT CONNECTOR
BL 7
BY 8
B83
DATA LINK CONNECTOR
BL 12
BL 13
B40
GND-15
BR BP BW BL BL B BG
B20 3
E1
13 15 8 16 14 7
B22
E3
B BL
D4
B36
SMJ
i1
COMBINATION METER
BL C9
C: i12
B99
24
R3
FUEL LEVEL SENSOR
BL 3
R58
BL 5 BL
R15 R57
GrB
IGNITION COIL & IGNITOR
GrB 3
E12
E
GE
MT : MT MODEL

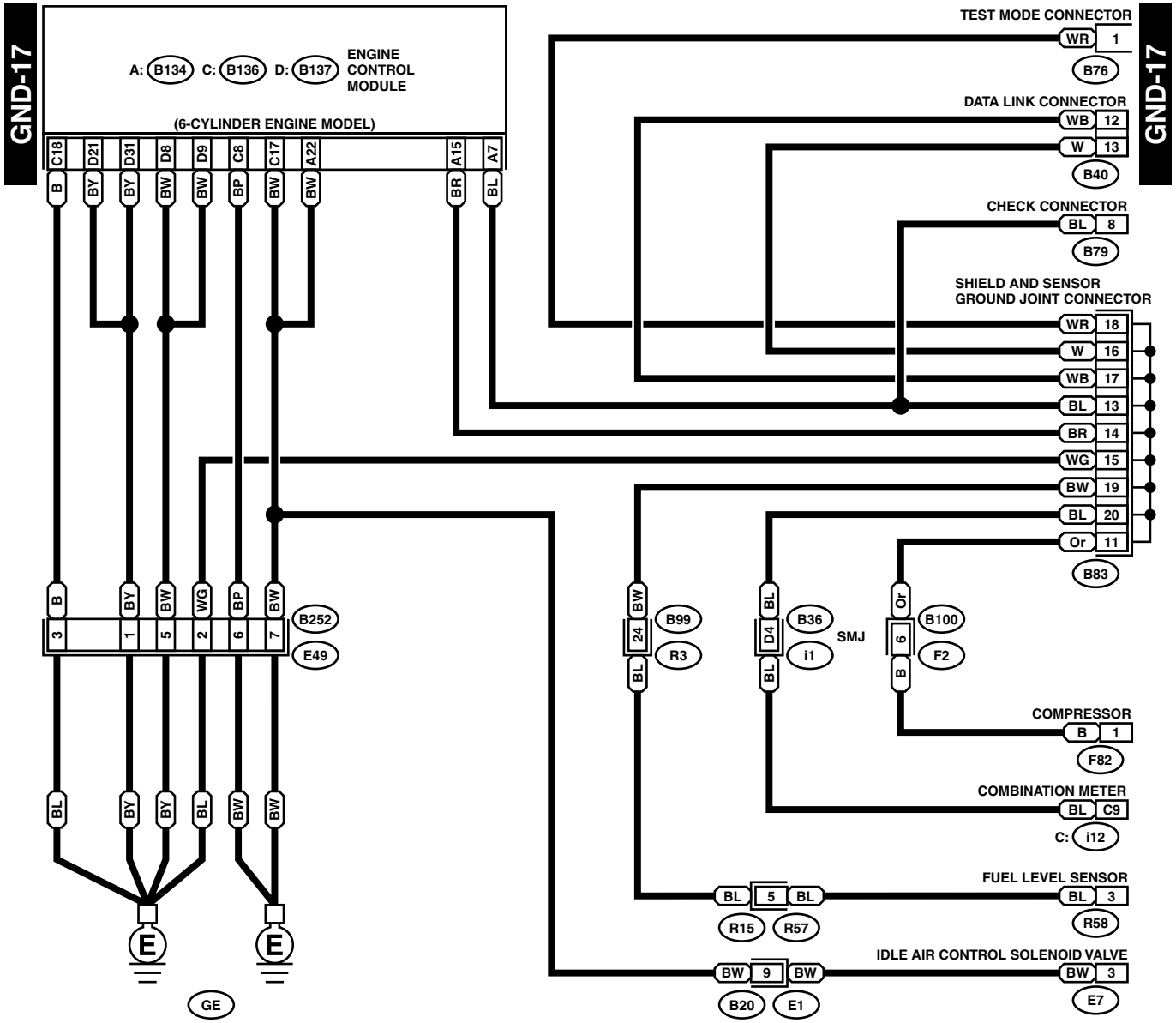

B25 (BROWN)
B76 (GREEN)
HR B17 (BLACK)
E12 (DARK GRAY)
R57 (BLACK)
HR R58 (GRAY)
HR B20
B79 (GRAY)
C: i12 (GREEN)
HR B22 (BROWN)
B40
B83
B99
HR A: B134
HR D: B137
E: B84 HR

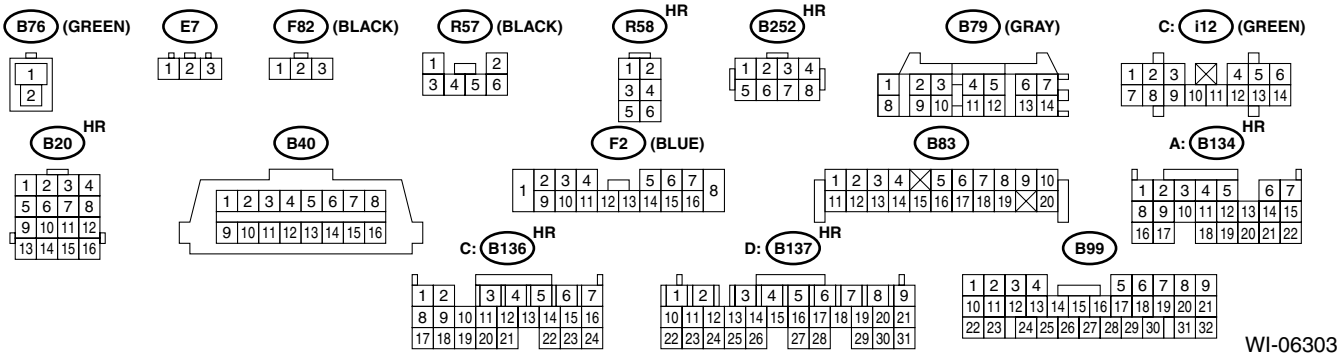
WI-06301


GND-16
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
(4-CYLINDER TURBO ENGINE MODEL)
MT : MT MODEL
TEST MODE CONNECTOR
CHECK CONNECTOR
VEHICLE SPEED SENSOR (MT)
NEUTRAL POSITION SWITCH (MT)
DATA LINK CONNECTOR
COMBINATION METER
FUEL LEVEL SENSOR
PCV DIAGNOSIS CONNECTOR
SMJ
GE-1


B76 (GREEN)
E61 (GRAY)
B17
B25
F46
B317
R58
R57 (BLACK)
B79 (GRAY)
C: i12 (GREEN)
B40
F60
D: B137
B99
F74
A: B134
B: B135

WI-06302


GND-17
A: B134 C: B136 D: B137
ENGINE CONTROL MODULE
(6-CYLINDER ENGINE MODEL)
C18 D21 D31 D8 D9 C8 C17 A22 A15 A7
B BY BY BW BW BP BW BW BR BL
TEST MODE CONNECTOR
WR 1
B76
DATA LINK CONNECTOR
WB 12
W 13
B40
CHECK CONNECTOR
BL 8
B79
SHIELD AND SENSOR GROUND JOINT CONNECTOR
WR 18
W 16
WB 17
BL 13
BR 14
WG 15
BW 19
BL 20
Or 11
B83
B252
E49
B99
R3
B36
i1
SMJ
B100
F2
COMPRESSOR
B 1
F82
COMBINATION METER
BL C9
C: i12
FUEL LEVEL SENSOR
BL 3
R58
BL 5 BL
R15 R57
IDLE AIR CONTROL SOLENOID VALVE
BW 3
E7
BW 9 BW
B20 E1
GE

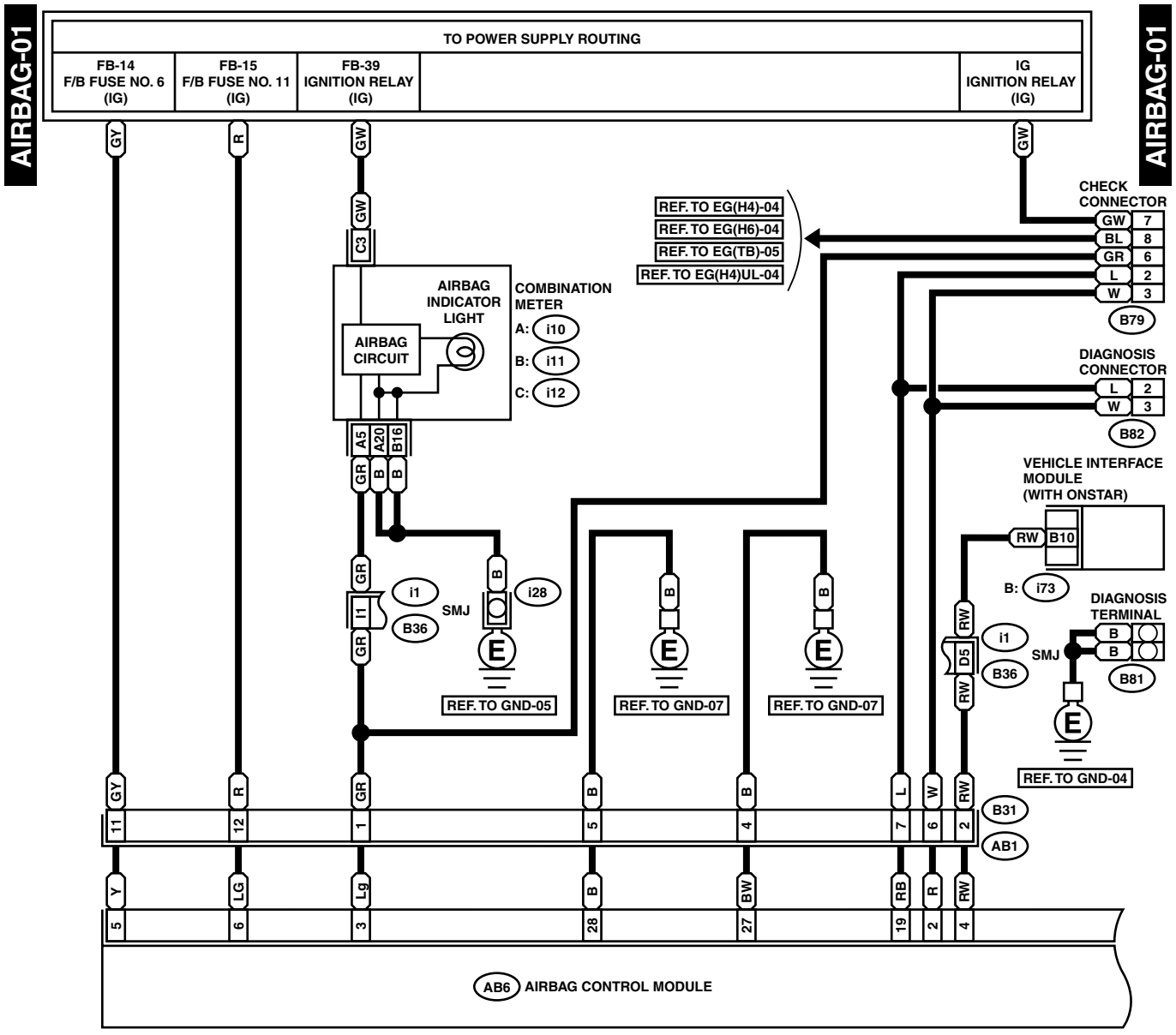

B76 (GREEN)
E7
F82 (BLACK)
R57 (BLACK)
R58 HR
B252 HR
B79 (GRAY)
C: i12 (GREEN)
B20 HR
B40
F2 (BLUE)
B83
A: B134 HR
C: B136 HR
D: B137 HR
B99

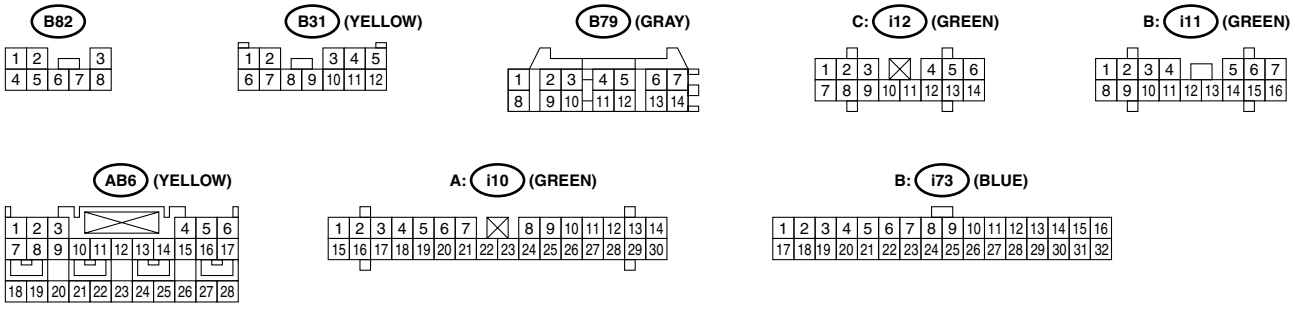
WI-06303

MEMO:

6. Airbag System

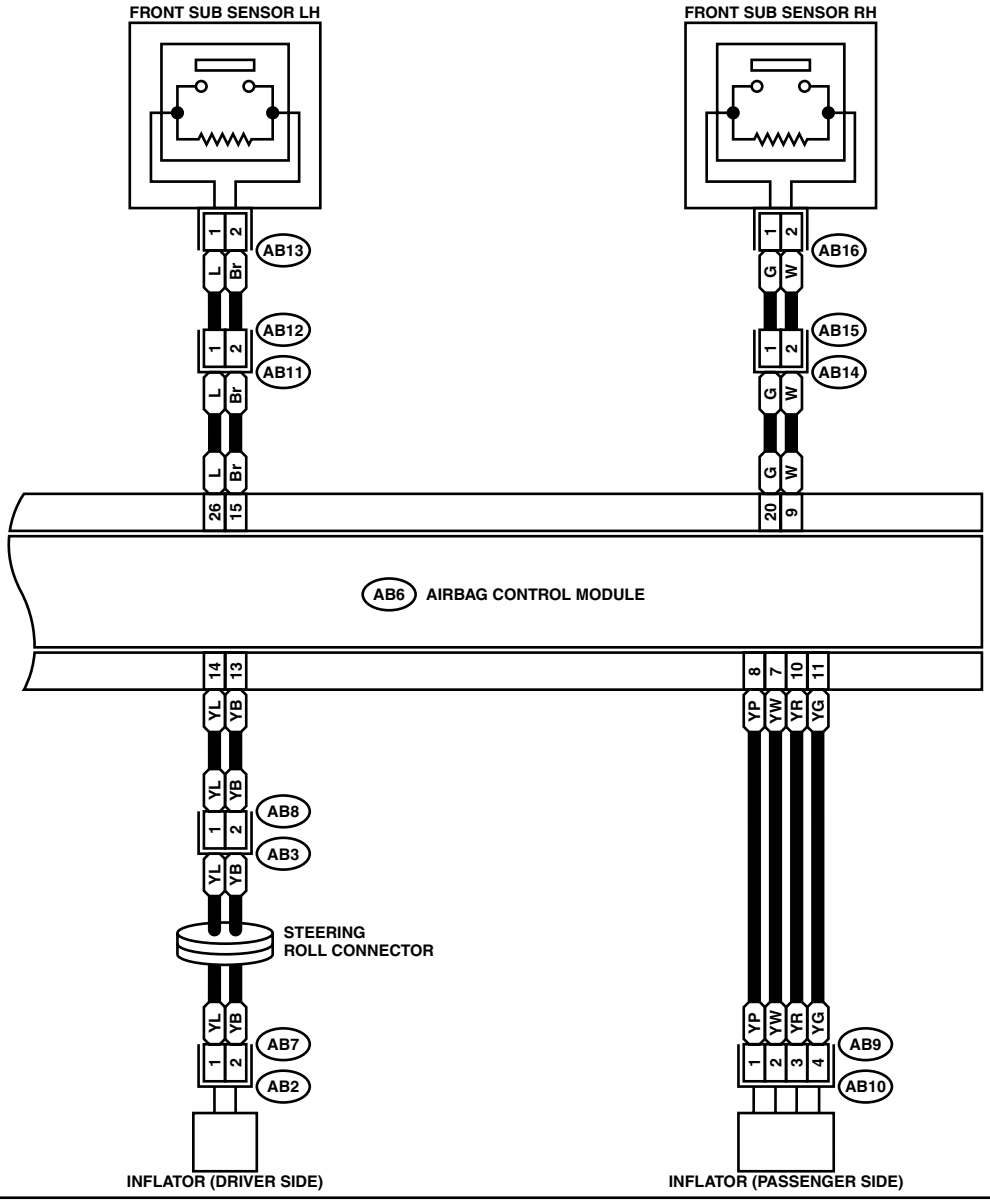
A: SCHEMATIC





WI-03469

AIRBAG-02



AB7 (YELLOW)
AB8 (YELLOW)
AB12 (BLUE)
AB15 (BLUE)

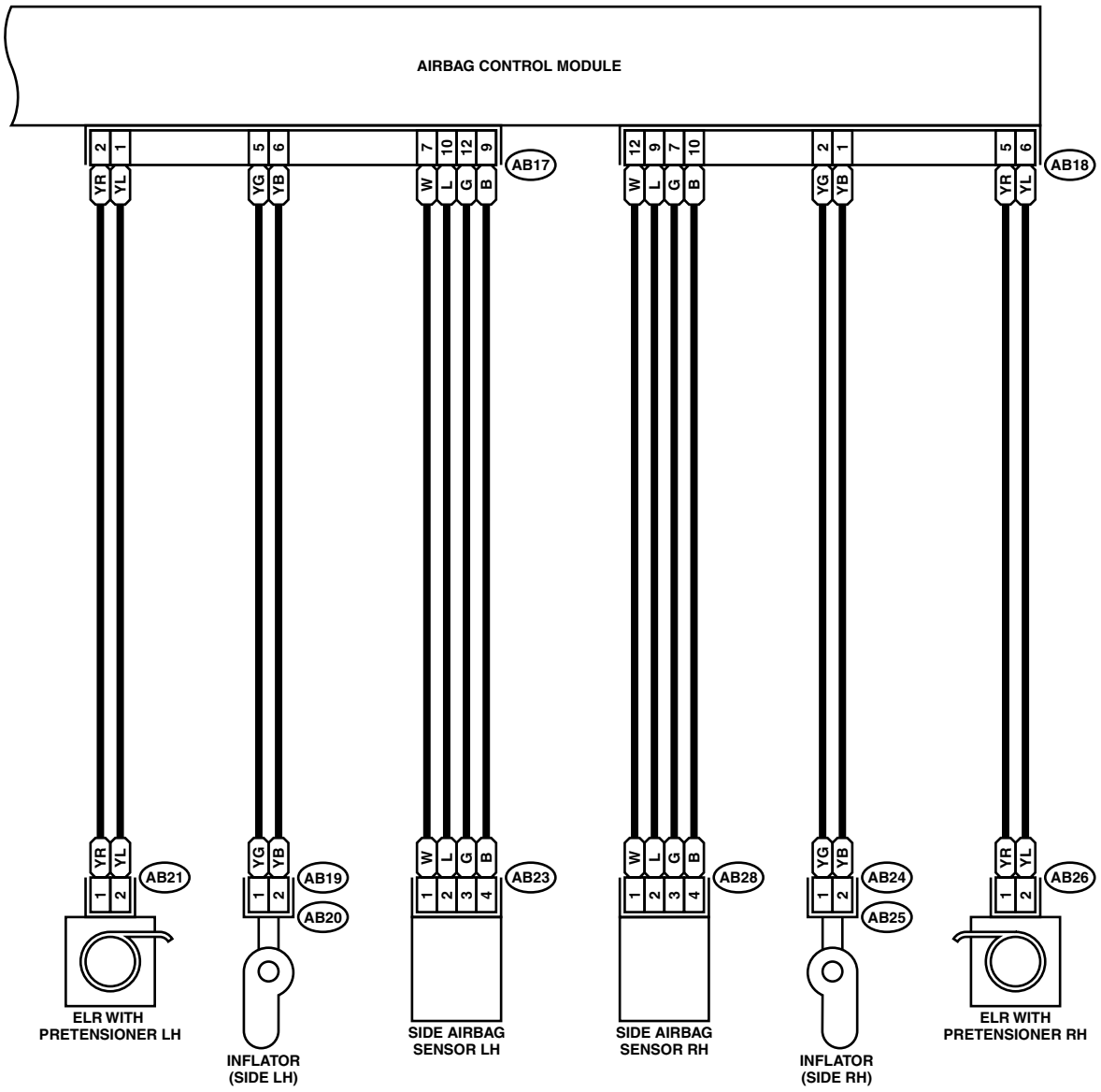
AB13 (YELLOW)
AB16 (YELLOW)

AB9 (YELLOW)

AB6 (YELLOW)

WI-00530

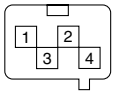
AIRBAG-03



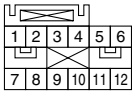
AIRBAG-03

A19 (YELLOW)
AB21 (YELLOW)
AB24 (YELLOW)
AB26 (YELLOW)

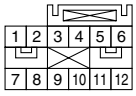
AB23 (YELLOW)
AB28 (YELLOW)



AB17 (YELLOW)



AB18 (YELLOW)



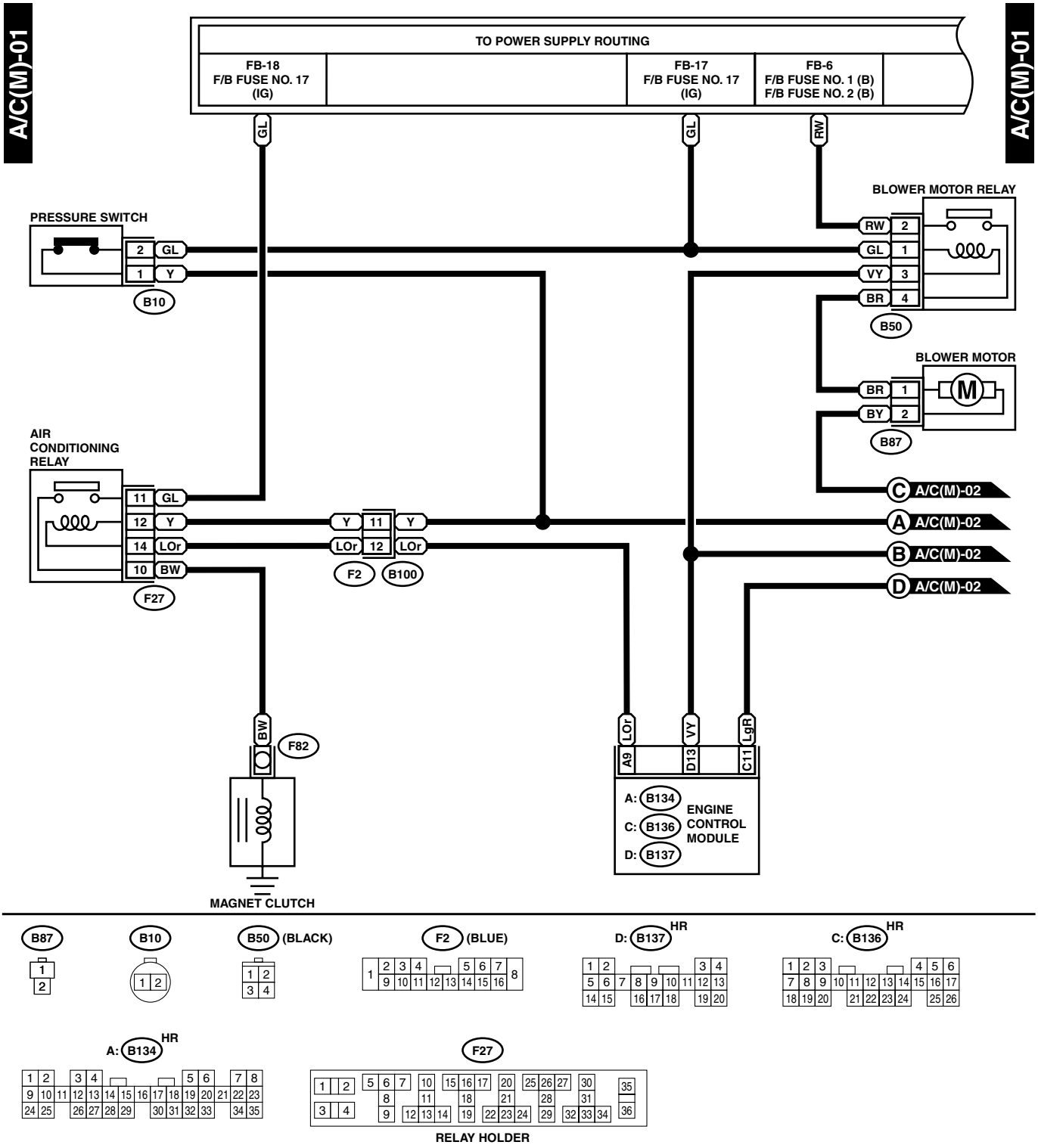
WI-00531

MEMO:

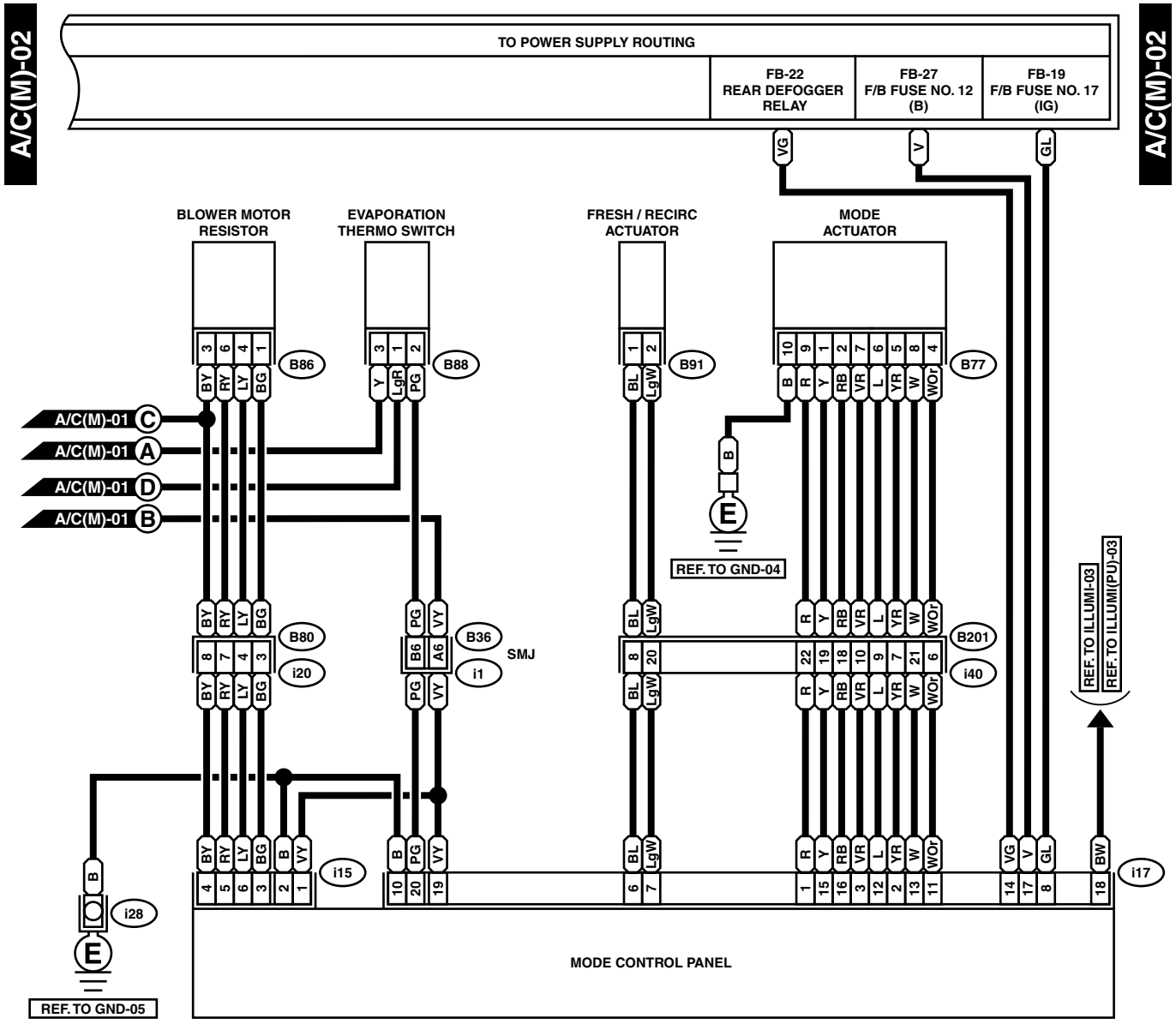
7. Air Conditioning System

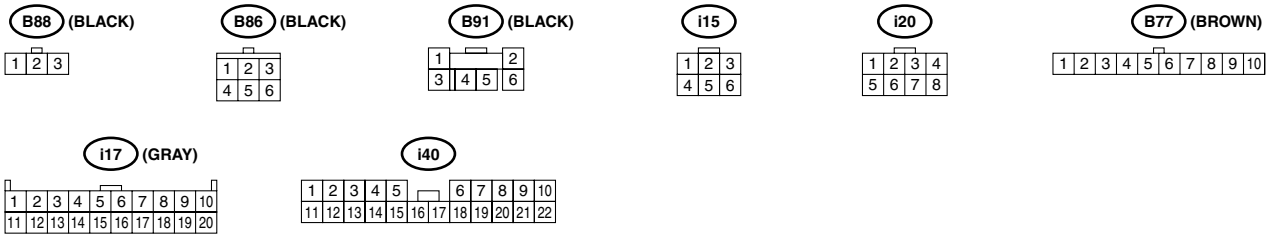
A: SCHEMATIC

1. EXCEPT U5 MODEL WITH MANUAL A/C



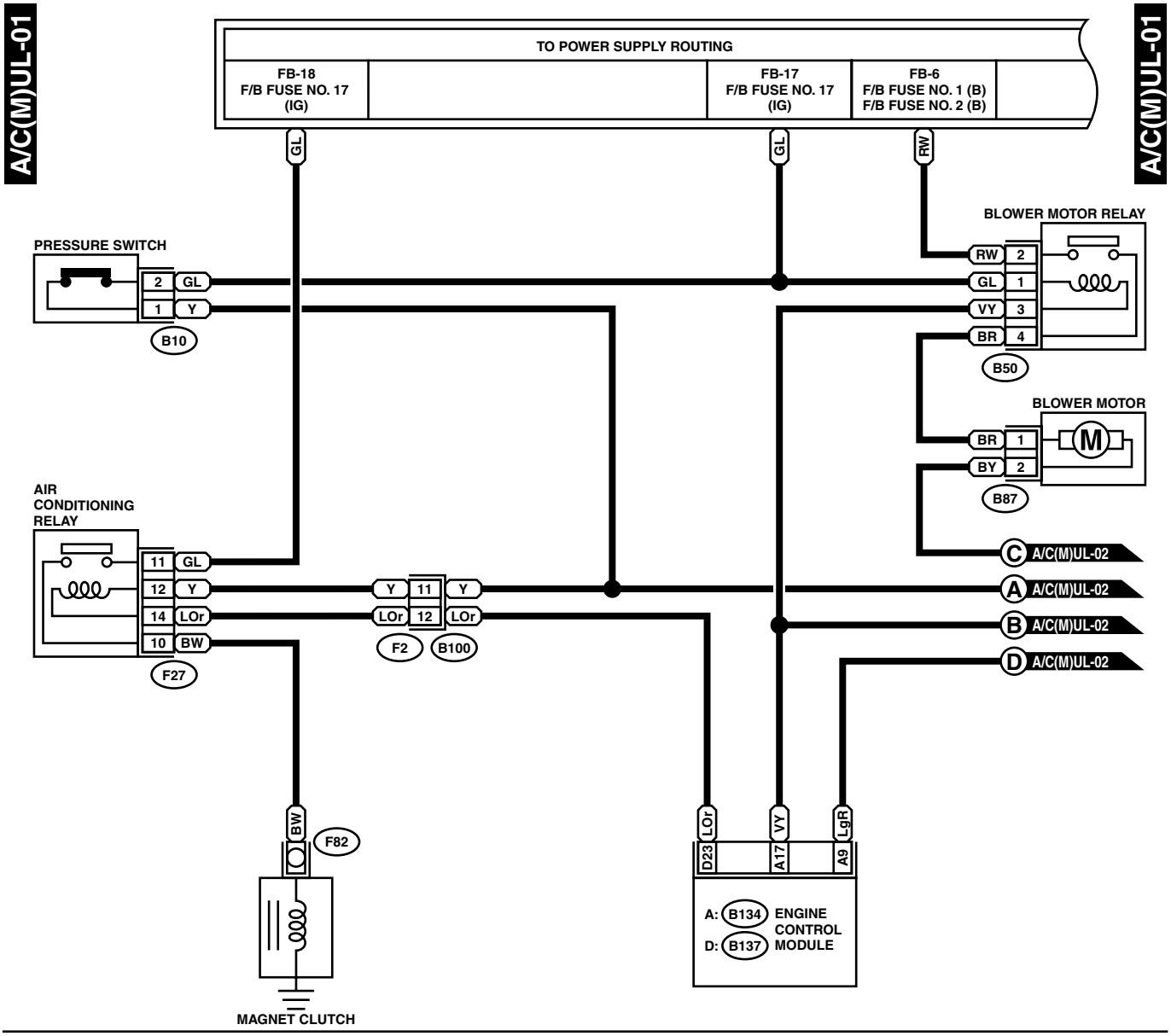
WI-06304


A/C(M)-02
A/C(M)-02
TO POWER SUPPLY ROUTING
FB-22
REAR DEFOGGER
RELAY
FB-27
F/B FUSE NO. 12
(B)
FB-19
F/B FUSE NO. 17
(IG)
VG
V
GL
BLOWER MOTOR
RESISTOR
EVAPORATION
THERMO SWITCH
FRESH / RECIRC
ACTUATOR
MODE
ACTUATOR
B86
B88
B91
B77
A/C(M)-01 C
A/C(M)-01 A
A/C(M)-01 D
A/C(M)-01 B
REF. TO GND-04
REF. TO ILLUMI-03
REF. TO ILLUMI(PU)-03
B80
i20
B36
i1
SMJ
B201
i40
i15
i17
i28
REF. TO GND-05
MODE CONTROL PANEL

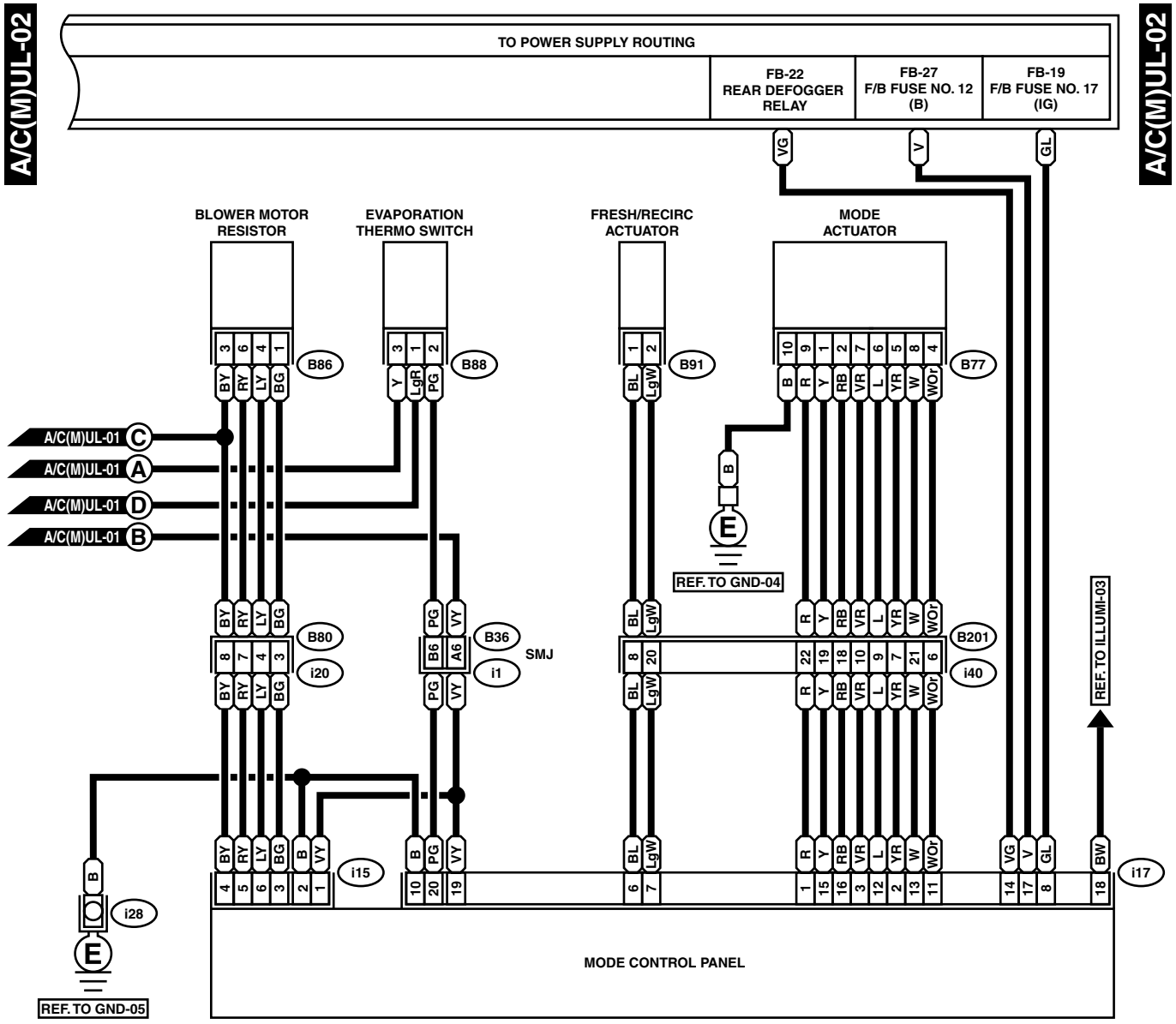

B88 (BLACK)
B86 (BLACK)
B91 (BLACK)
i15
i20
B77 (BROWN)
i17 (GRAY)
i40

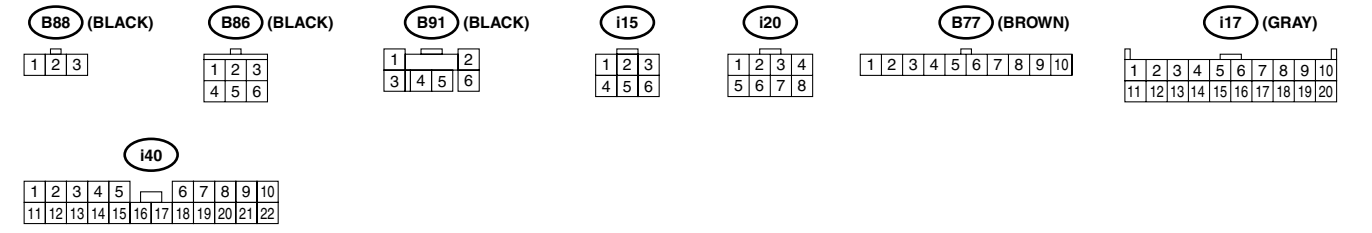
WI-03471

2. U5 MODEL WITH MANUAL A/C



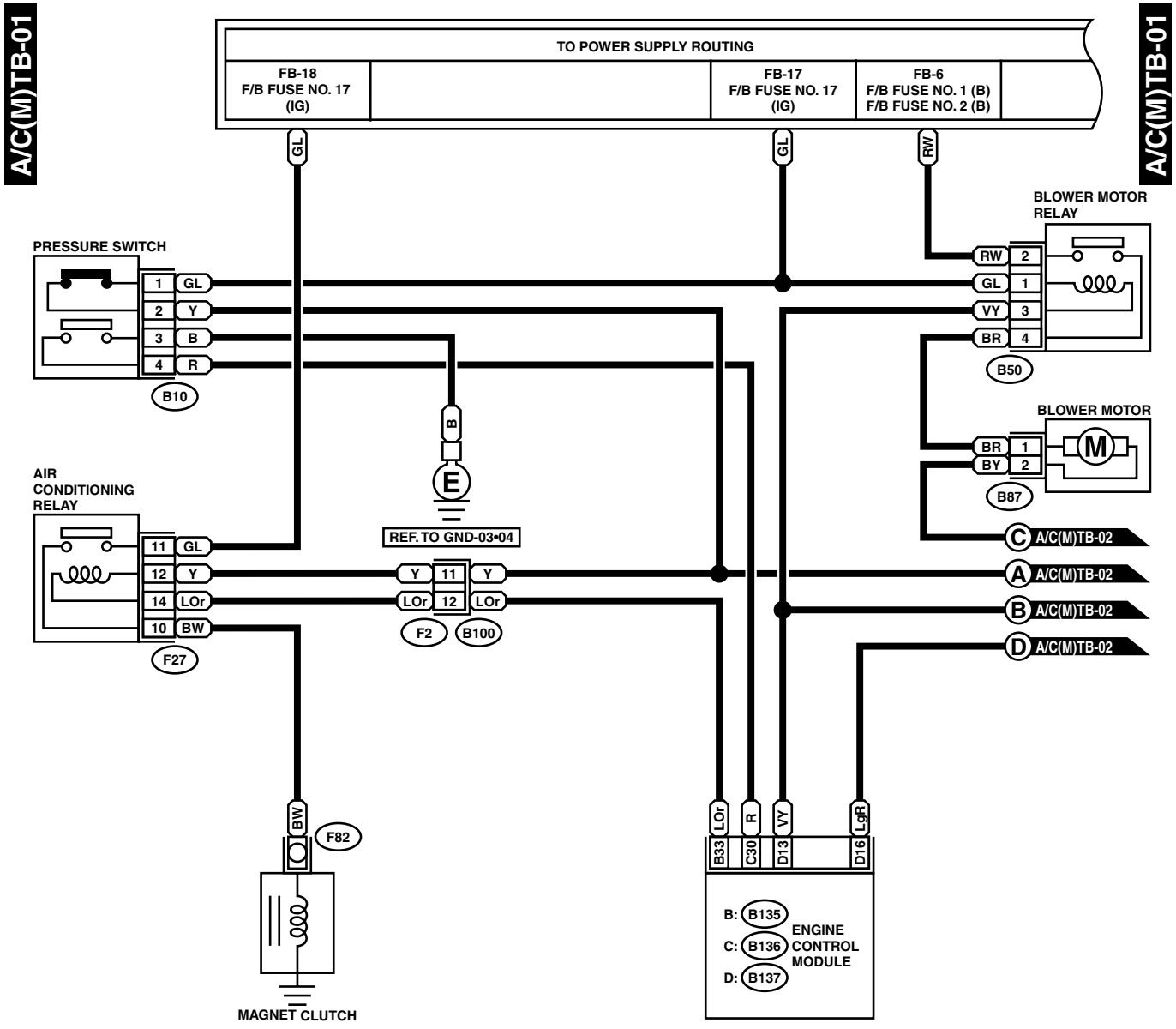
WI-06305

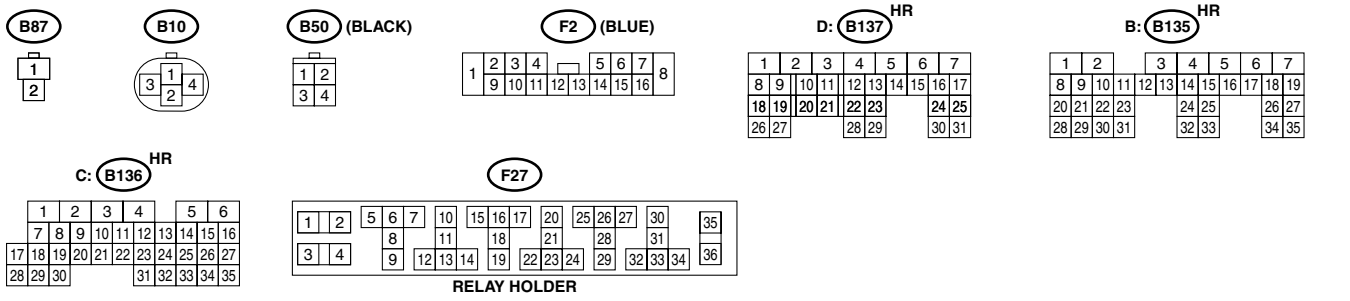

A/C(M)UL-02
A/C(M)UL-02
TO POWER SUPPLY ROUTING
FB-22
REAR DEFOGGER
RELAY
FB-27
F/B FUSE NO. 12
(B)
FB-19
F/B FUSE NO. 17
(IG)
VG
V
GL
BLOWER MOTOR
RESISTOR
EVAPORATION
THERMO SWITCH
FRESH/RECIRC
ACTUATOR
MODE
ACTUATOR
B86
B88
B91
B77
A/C(M)UL-01 C
A/C(M)UL-01 A
A/C(M)UL-01 D
A/C(M)UL-01 B
REF. TO GND-04
B80
i20
B36
i1
SMJ
B201
i40
REF. TO ILLUMI-03
i15
i17
i28
REF. TO GND-05
MODE CONTROL PANEL


B88 (BLACK)
B86 (BLACK)
B91 (BLACK)
i15
i20
B77 (BROWN)
i17 (GRAY)
i40

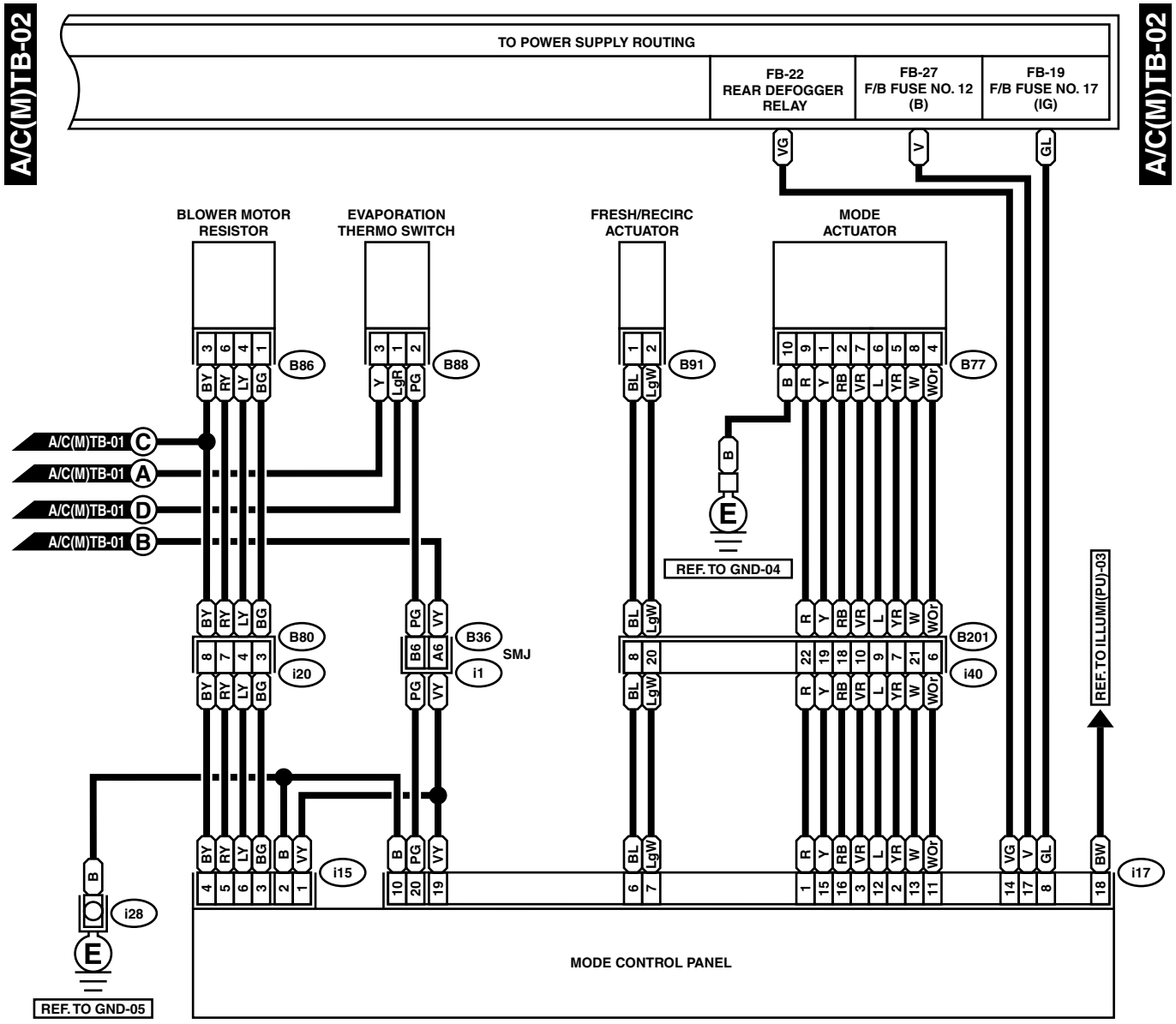
WI-03127

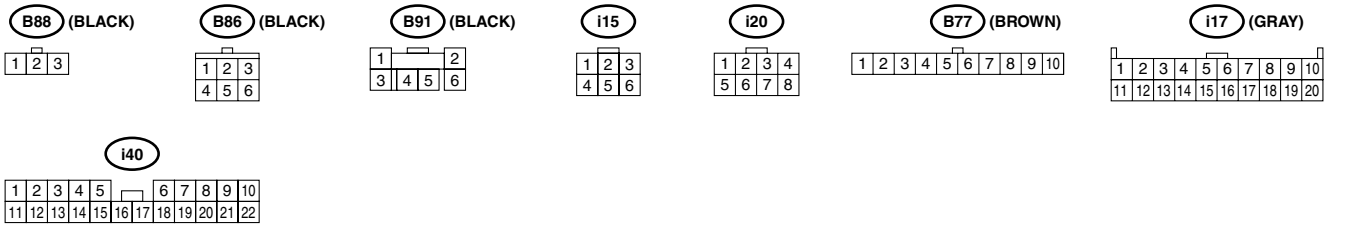
3. TURBO ENGINE WITH A/C





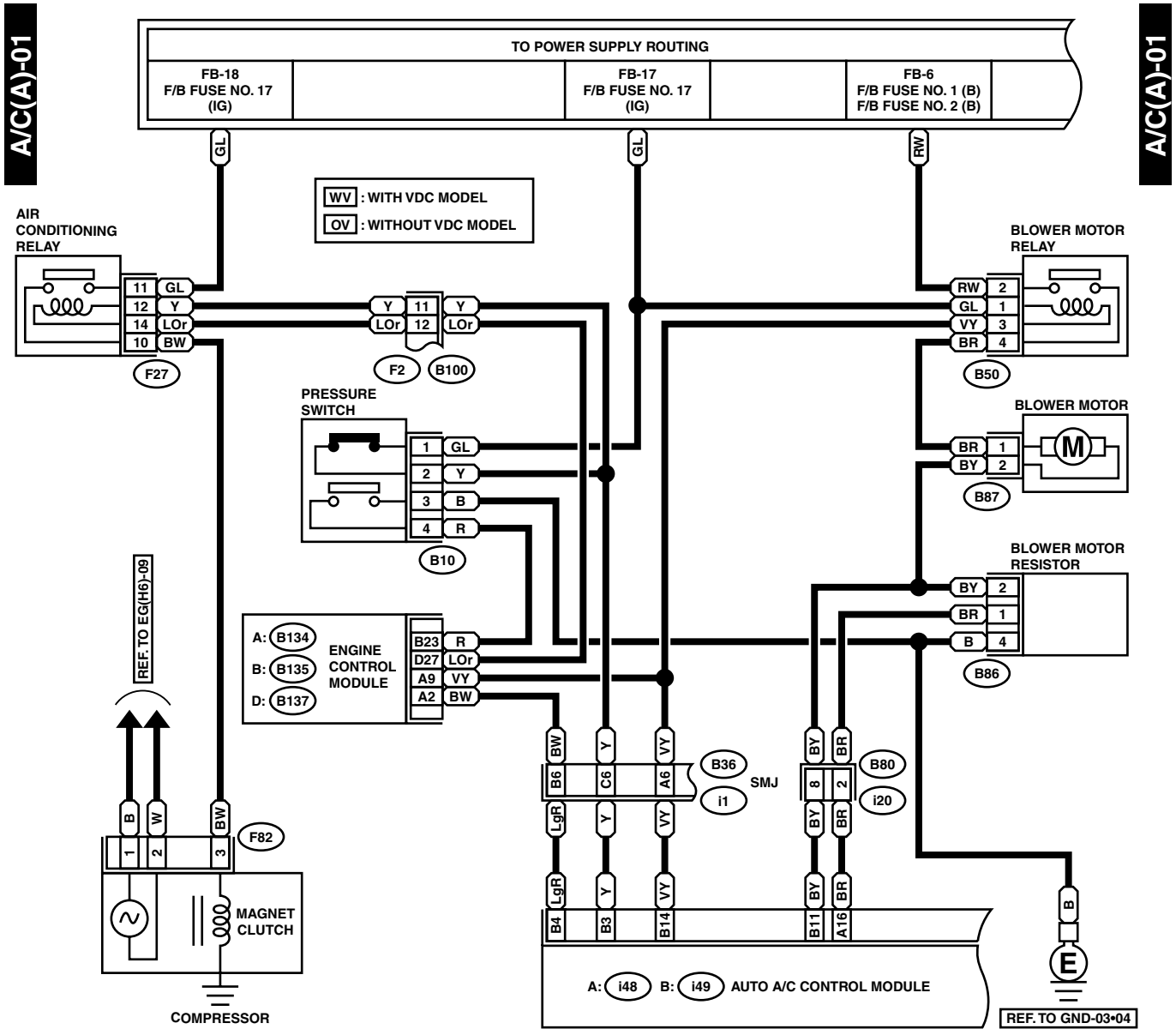
WI-06306

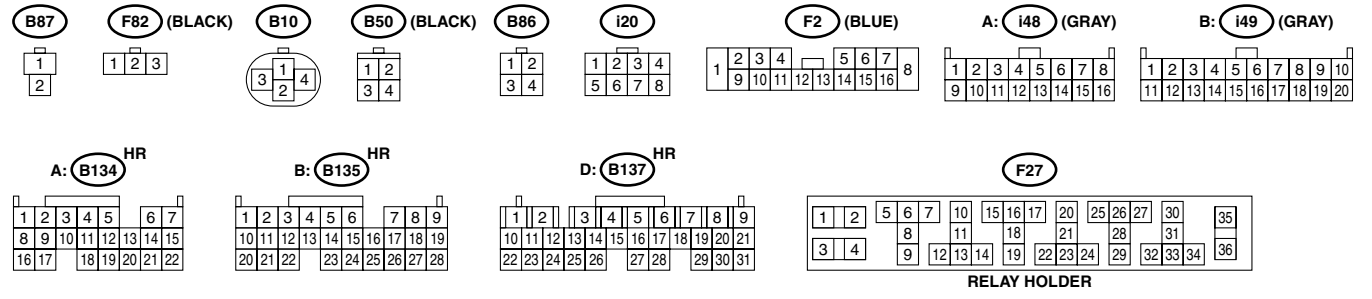

A/C(M)TB-02
A/C(M)TB-02
TO POWER SUPPLY ROUTING
FB-22
REAR DEFOGGER
RELAY
FB-27
F/B FUSE NO. 12
(B)
FB-19
F/B FUSE NO. 17
(IG)
VG
V
GL
BLOWER MOTOR
RESISTOR
EVAPORATION
THERMO SWITCH
FRESH/RECIRC
ACTUATOR
MODE
ACTUATOR
B86
B88
B91
B77
A/C(M)TB-01 C
A/C(M)TB-01 A
A/C(M)TB-01 D
A/C(M)TB-01 B
REF. TO GND-04
B80
i20
B36
i1
SMJ
B201
i40
REF.TO ILLUMI(PU)-03
i15
i17
i28
REF. TO GND-05
MODE CONTROL PANEL


B88 (BLACK)
B86 (BLACK)
B91 (BLACK)
i15
i20
B77 (BROWN)
i17 (GRAY)
i40

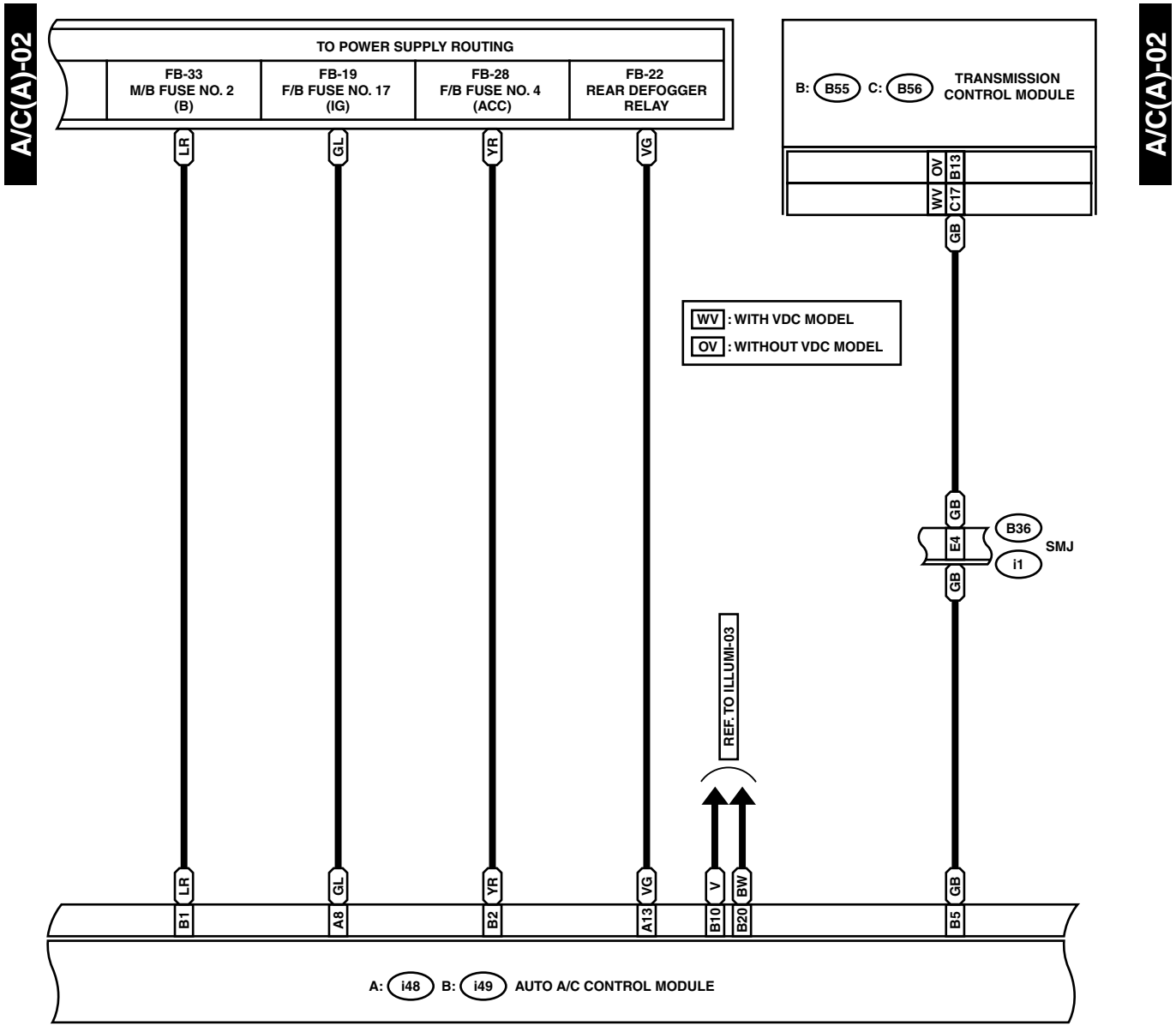
WI-03128

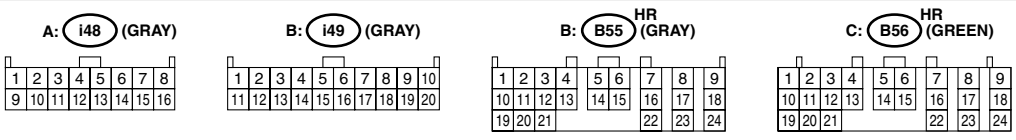
4. WITH AUTO A/C



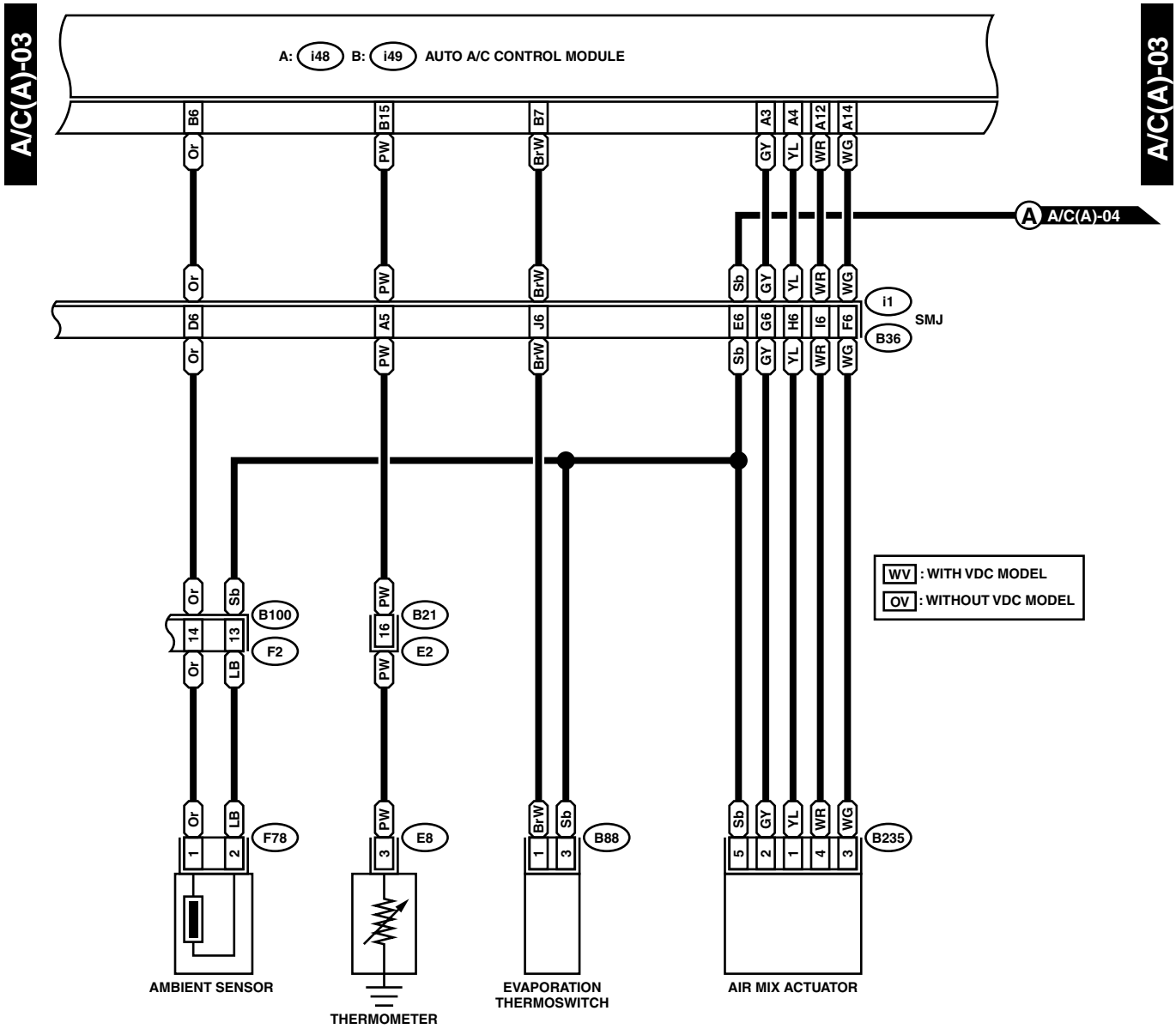


WI-06307

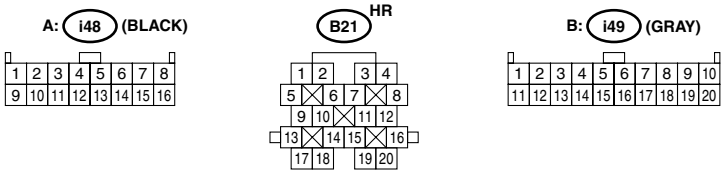

A/C(A)-02
TO POWER SUPPLY ROUTING
FB-33
M/B FUSE NO. 2
(B)
FB-19
F/B FUSE NO. 17
(IG)
FB-28
F/B FUSE NO. 4
(ACC)
FB-22
REAR DEFOGGER
RELAY
B: B55 C: B56
TRANSMISSION
CONTROL MODULE
A/C(A)-02
LR
GL
YR
VG
OV
B13
WV
C17
GB
WV : WITH VDC MODEL
OV : WITHOUT VDC MODEL
GB
B36
E4
SMJ
i1
GB
REF. TO ILLUMI-03
LR
GL
YR
VG
V
BW
GB
B1
A8
B2
A13
B10
B20
B5
A: i48 B: i49 AUTO A/C CONTROL MODULE


A: i48 (GRAY)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B: i49 (GRAY)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
B: B55 HR (GRAY)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24
C: B56 HR (GREEN)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24

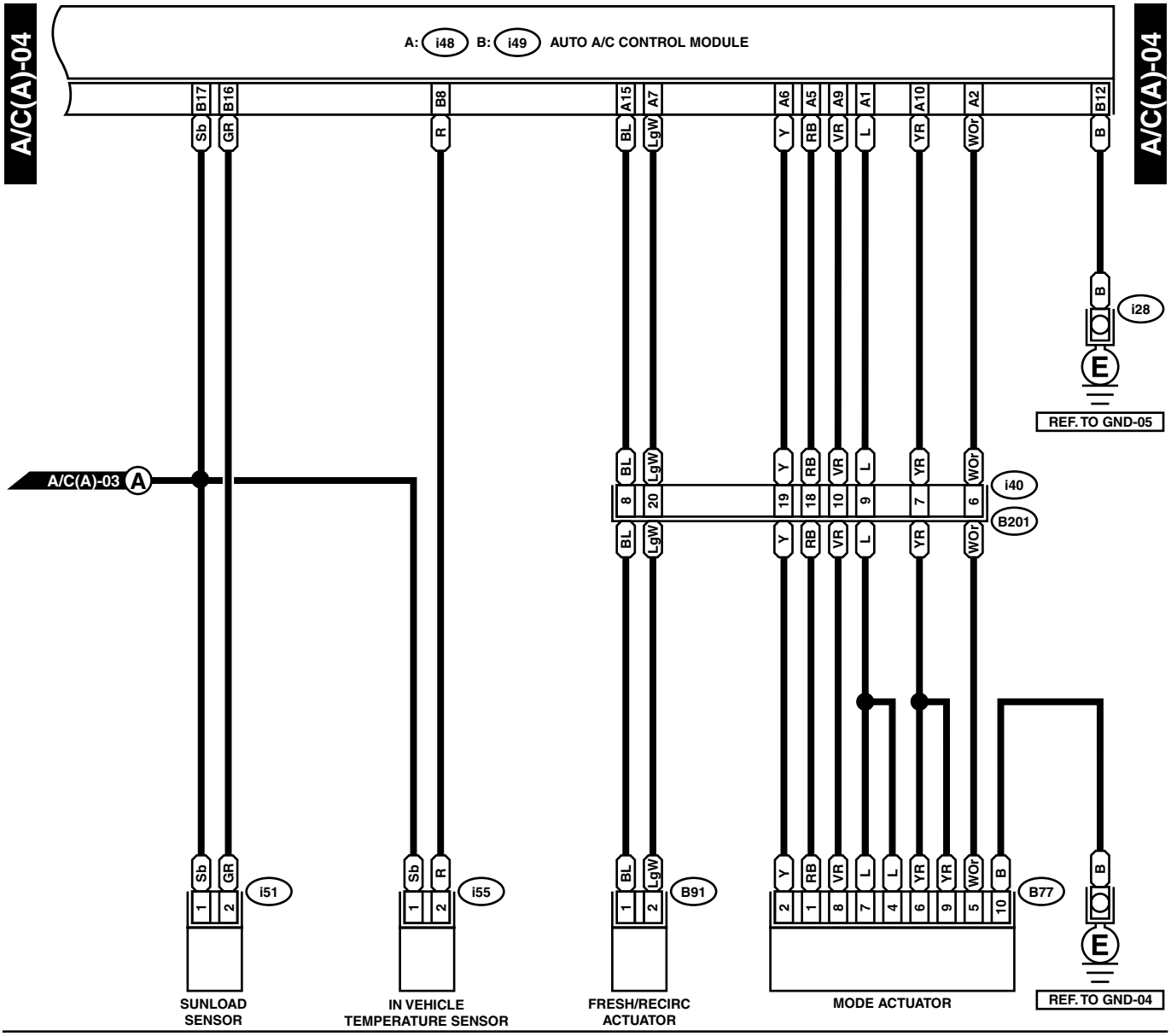
WI-06308

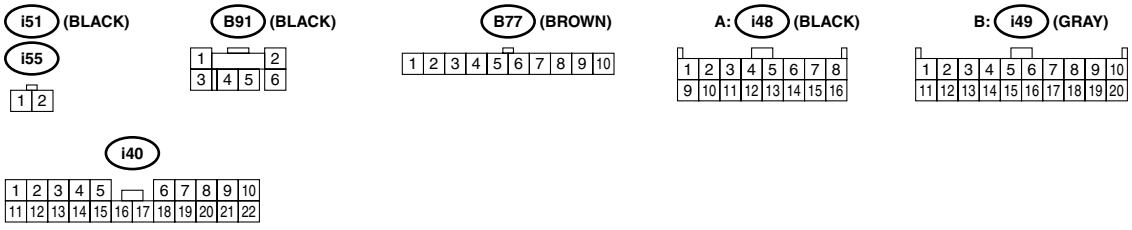

A/C(A)-03
A/C(A)-03
A: i48 B: i49 AUTO A/C CONTROL MODULE
B6 B15 B7 A3 A4 A12 A14
Or PW BrW GY YL WR WG
A A/C(A)-04
Sb GY YL WR WG
i1
SMJ
D6 A5 J6 E6 G6 H6 I6 F6
B36
Sb GY YL WR WG
WV : WITH VDC MODEL
OV : WITHOUT VDC MODEL
Or Sb
B100
14 13
F2
Or LB
PW
B21
16
E2
PW
Or LB
F78
1 2
PW
E8
3
BrW Sb
B88
1 3
Sb GY YL WR WG
B235
5 2 1 4 3
AMBIENT SENSOR
THERMOMETER
EVAPORATION THERMOSWITCH
AIR MIX ACTUATOR

F78 (BLACK)
1 2
B88
1
2
3
E8 (LIGHT GRAY)
1 2
3
B235 (BLACK)
1 2
3 4 5 6
F2 (BLUE)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16


A: i48 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B21 HR
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B: i49 (GRAY)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

WI-06309

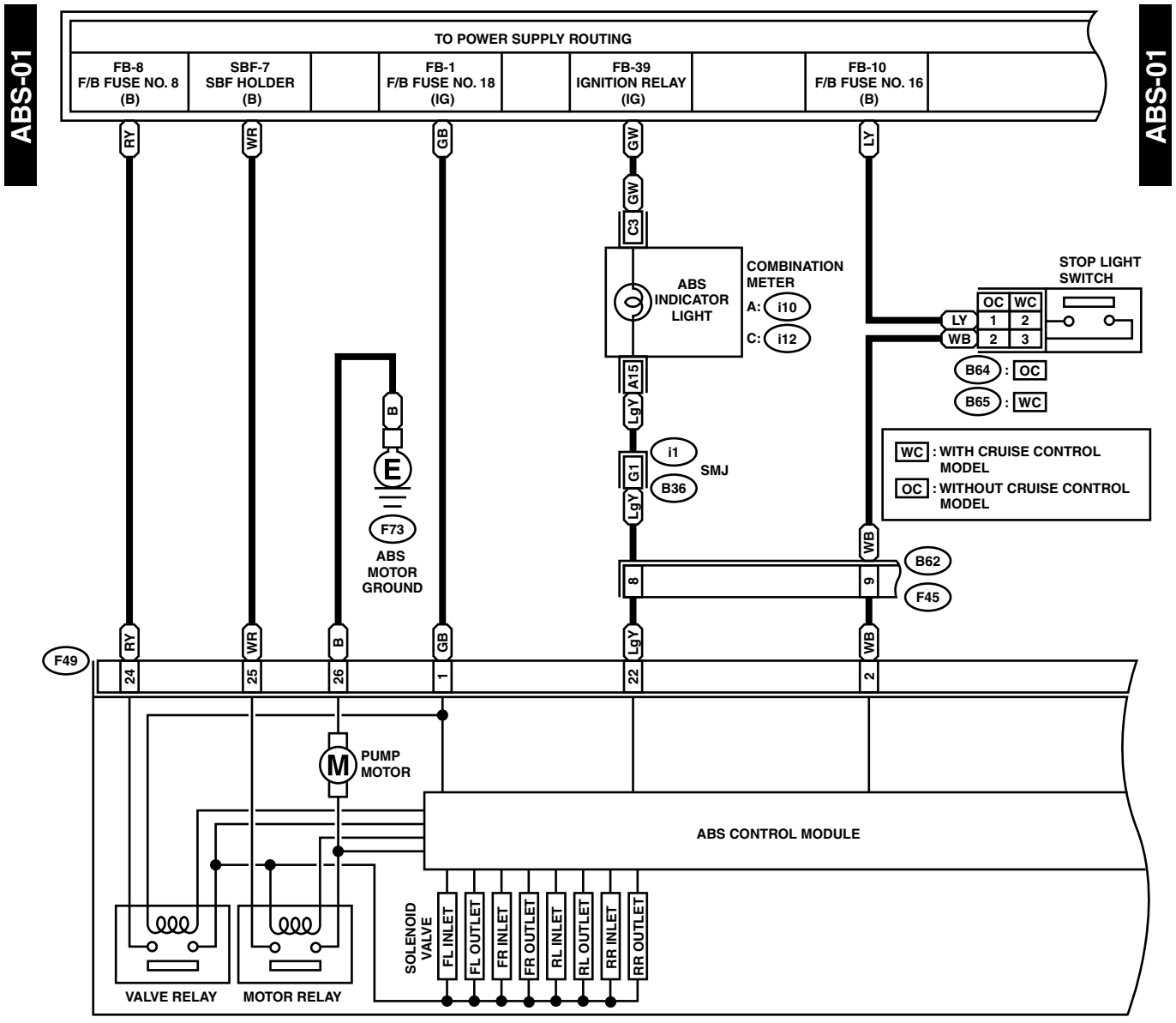

A/C(A)-04
A/C(A)-04
A: i48 B: i49 AUTO A/C CONTROL MODULE
B17 B16 B8 A15 A7 A6 A5 A9 A1 A10 A2 B12
Sb GR R BL LgW Y RB VR L YR WOr B
i28
REF. TO GND-05
A/C(A)-03 A
i40
B201
i51
i55
B91
B77
SUNLOAD SENSOR
IN VEHICLE TEMPERATURE SENSOR
FRESH/RECIRC ACTUATOR
MODE ACTUATOR
REF. TO GND-04

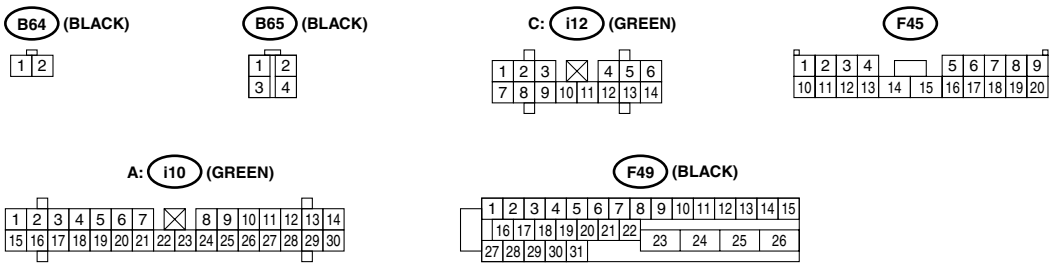

i51 (BLACK)
i55
B91 (BLACK)
B77 (BROWN)
A: i48 (BLACK)
B: i49 (GRAY)
i40

WI-00537

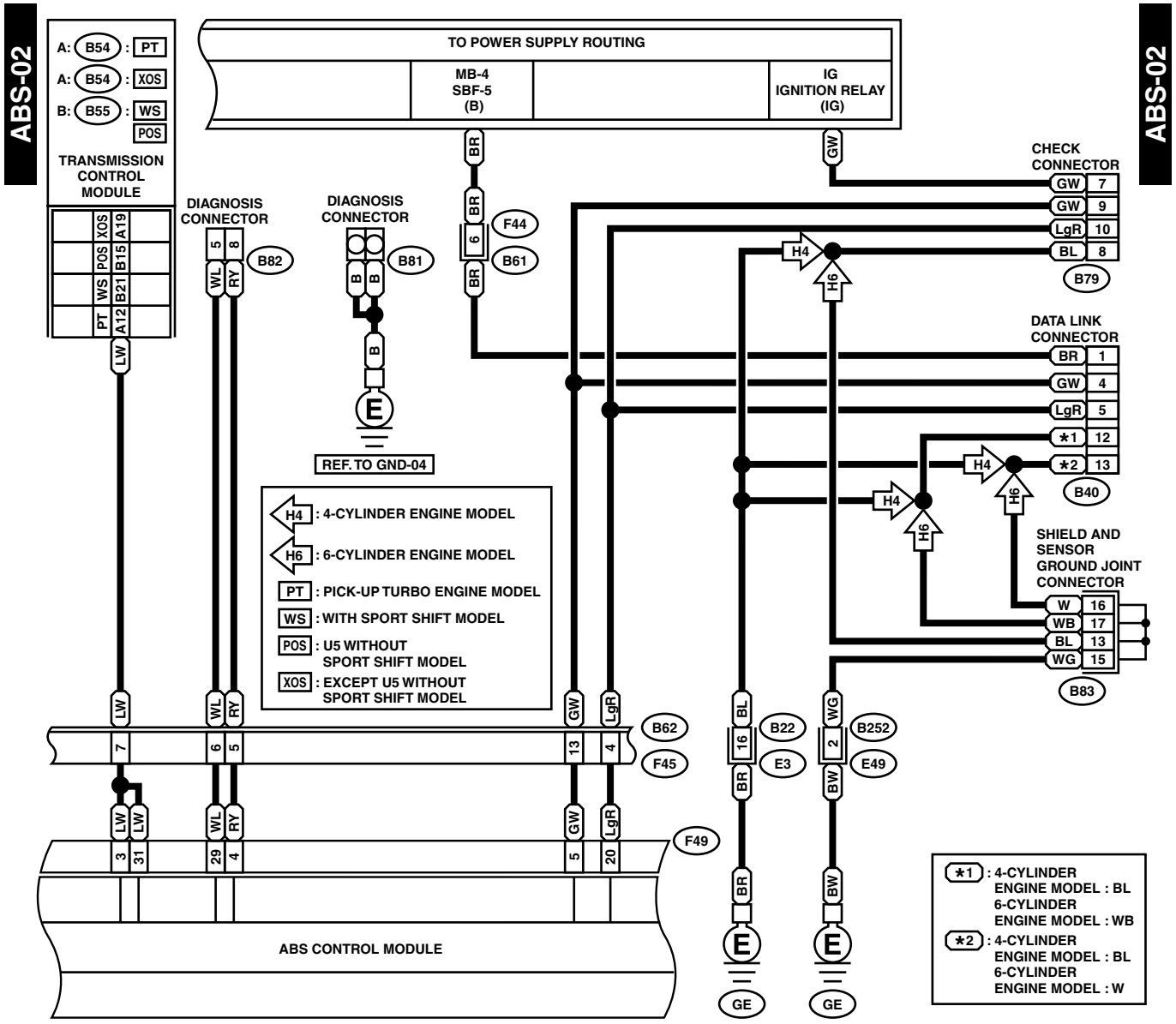
8. Anti-lock Brake System

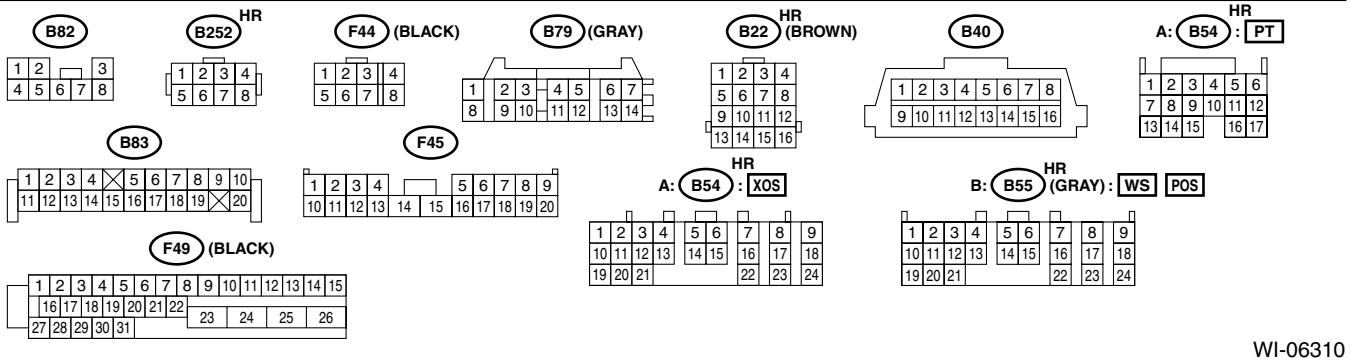
A: SCHEMATIC





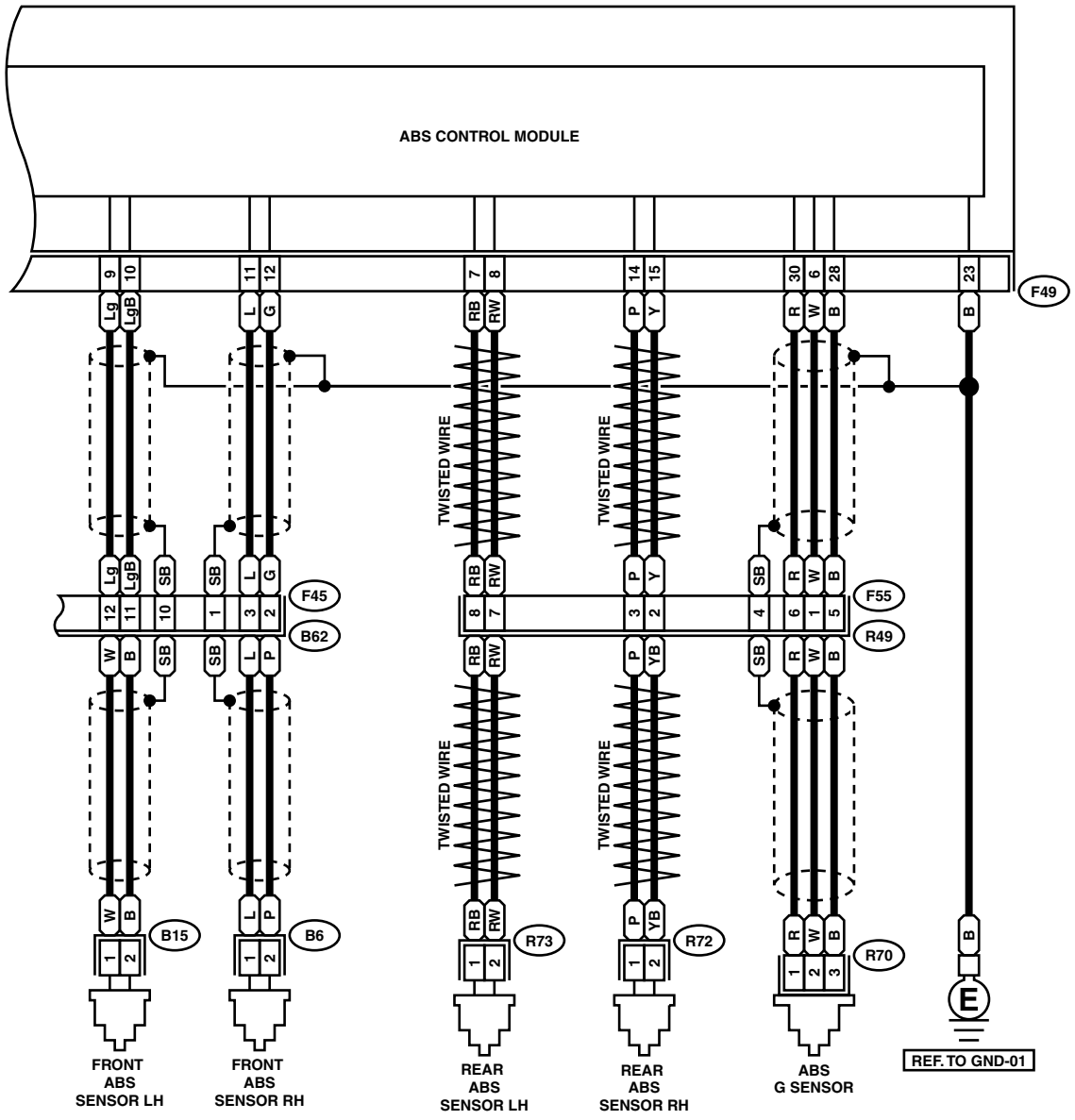
WI-00538


ABS-02
ABS-02
A: B54 : PT
A: B54 : XOS
B: B55 : WS
POS
TRANSMISSION CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-4 SBF-5 (B)
IG IGNITION RELAY (IG)
CHECK CONNECTOR
DIAGNOSIS CONNECTOR
B82
DIAGNOSIS CONNECTOR
B81
F44
B61
B79
DATA LINK CONNECTOR
B40
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B83
REF. TO GND-04
H4 : 4-CYLINDER ENGINE MODEL
H6 : 6-CYLINDER ENGINE MODEL
PT : PICK-UP TURBO ENGINE MODEL
WS : WITH SPORT SHIFT MODEL
POS : U5 WITHOUT SPORT SHIFT MODEL
XOS : EXCEPT U5 WITHOUT SPORT SHIFT MODEL
B62
F45
F49
B22
E3
B252
E49
ABS CONTROL MODULE
GE
GE
*1 : 4-CYLINDER ENGINE MODEL : BL 6-CYLINDER ENGINE MODEL : WB
*2 : 4-CYLINDER ENGINE MODEL : BL 6-CYLINDER ENGINE MODEL : W


B82
B252 HR
F44 (BLACK)
B79 (GRAY)
B22 HR (BROWN)
B40
A: B54 : PT HR
B83
F45
A: B54 : XOS HR
B: B55 (GRAY) : WS POS HR
F49 (BLACK)

WI-06310

ABS-03

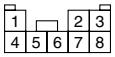


ABS-03

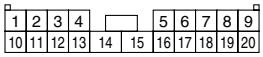
B6 : (✱1)
B15 : (✱1)
R72 (GRAY)
R73 (GRAY)

R70 HR (BLACK)

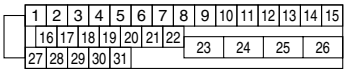
F55



F45



F49 (BLACK)



(✱1) : OUT BACK, PICK-UP & 6-CYLINDER ENGINE MODEL : (BROWN)
OTHER MODELS : (GRAY)

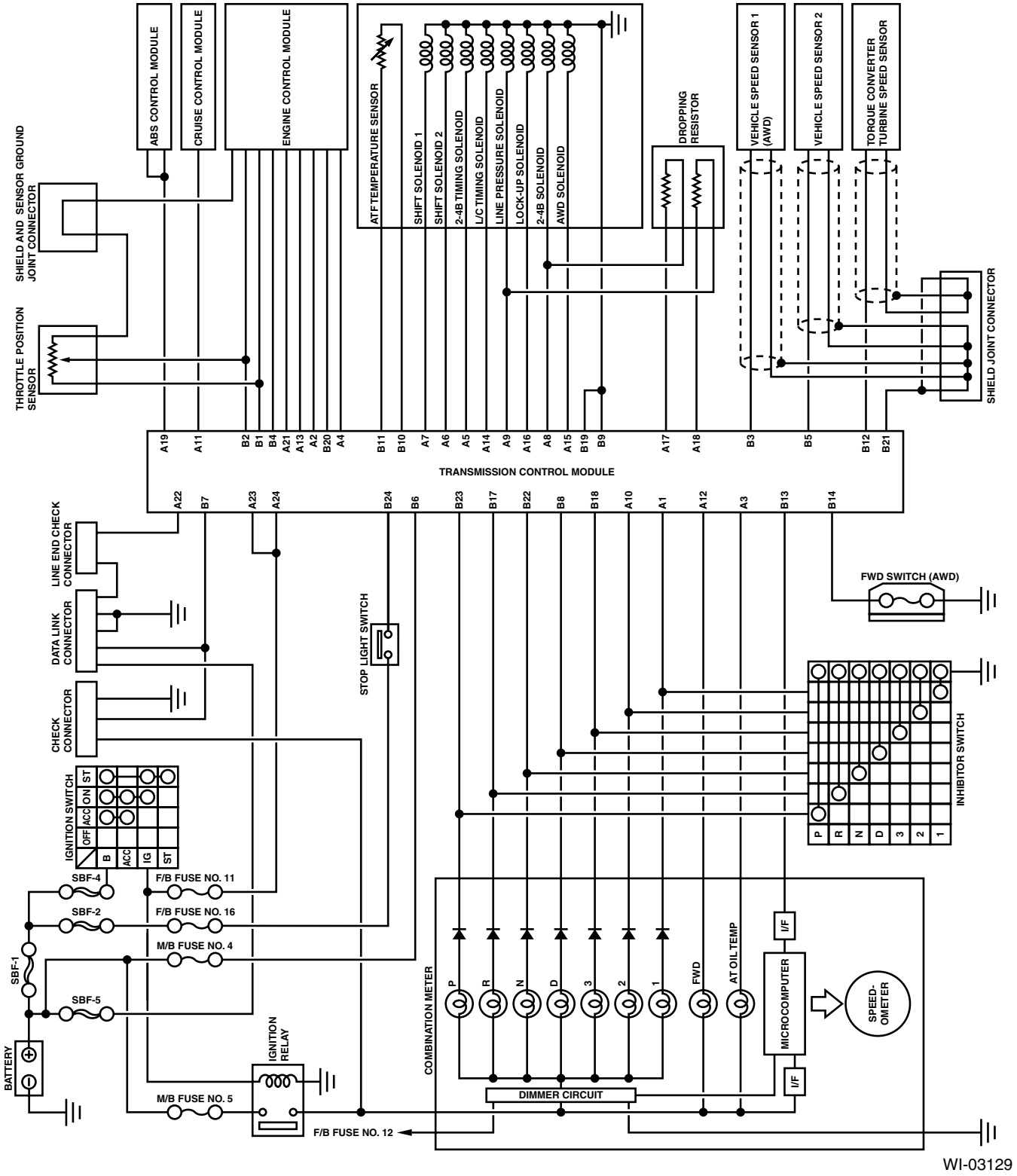
WI-06311

MEMO:

9. AT Control System

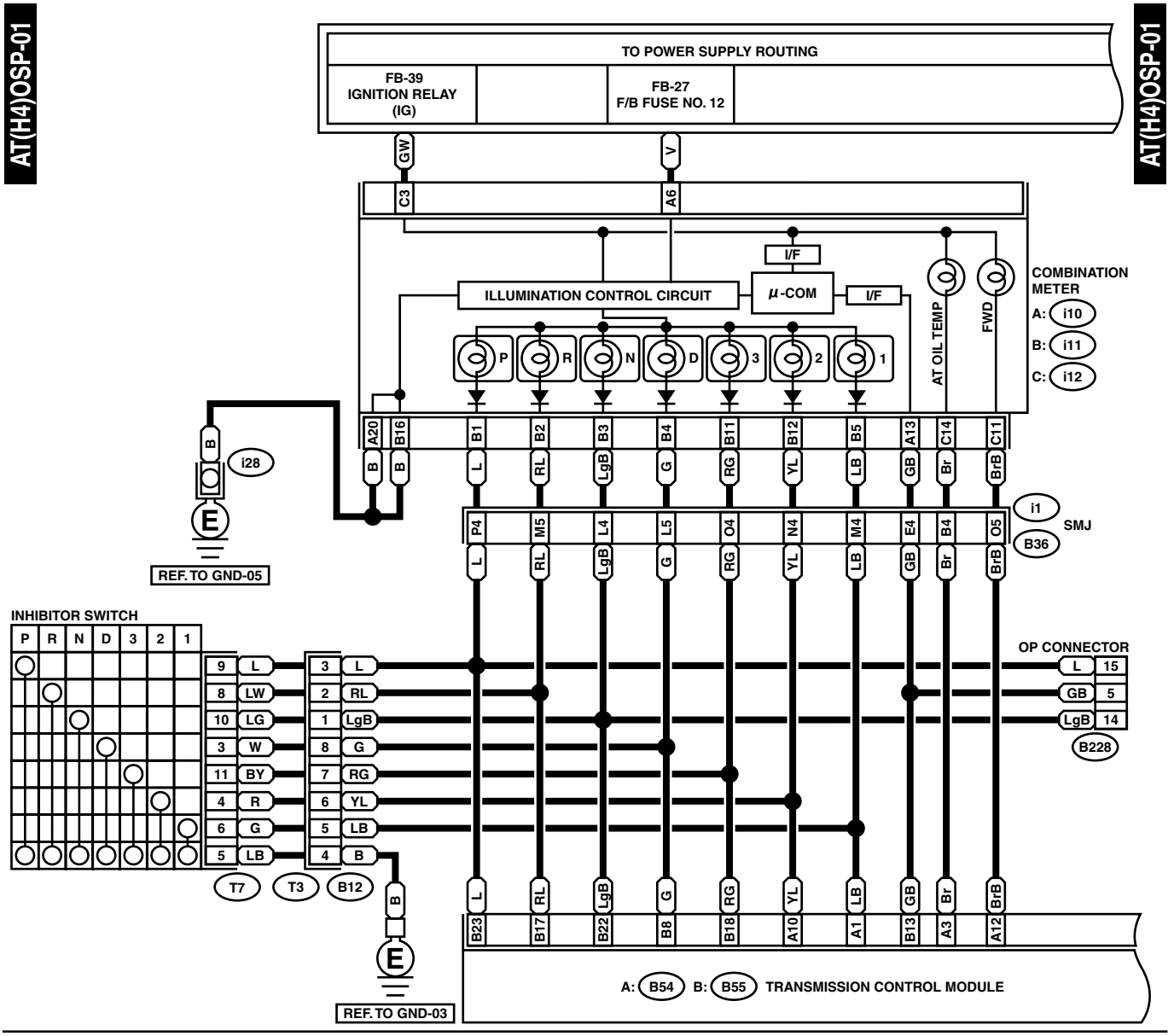
A: SCHEMATIC

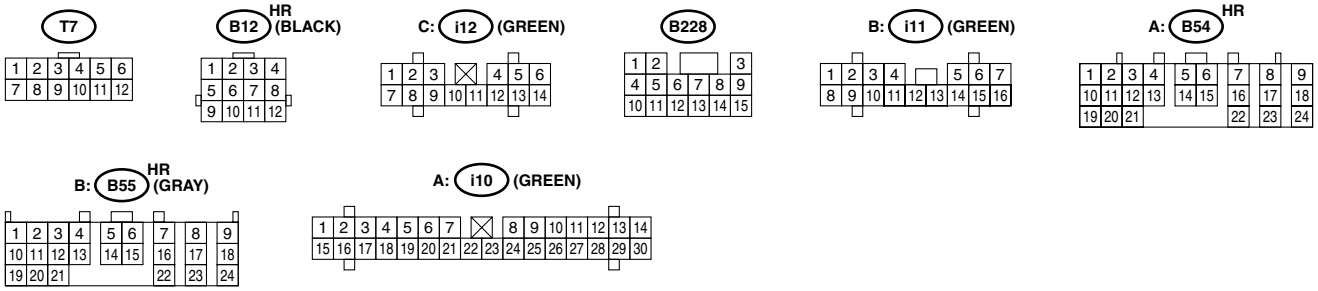
1. 4-CYLINDER ENGINE WITHOUT SPORT SHIFT (EXCEPT U5 MODEL)



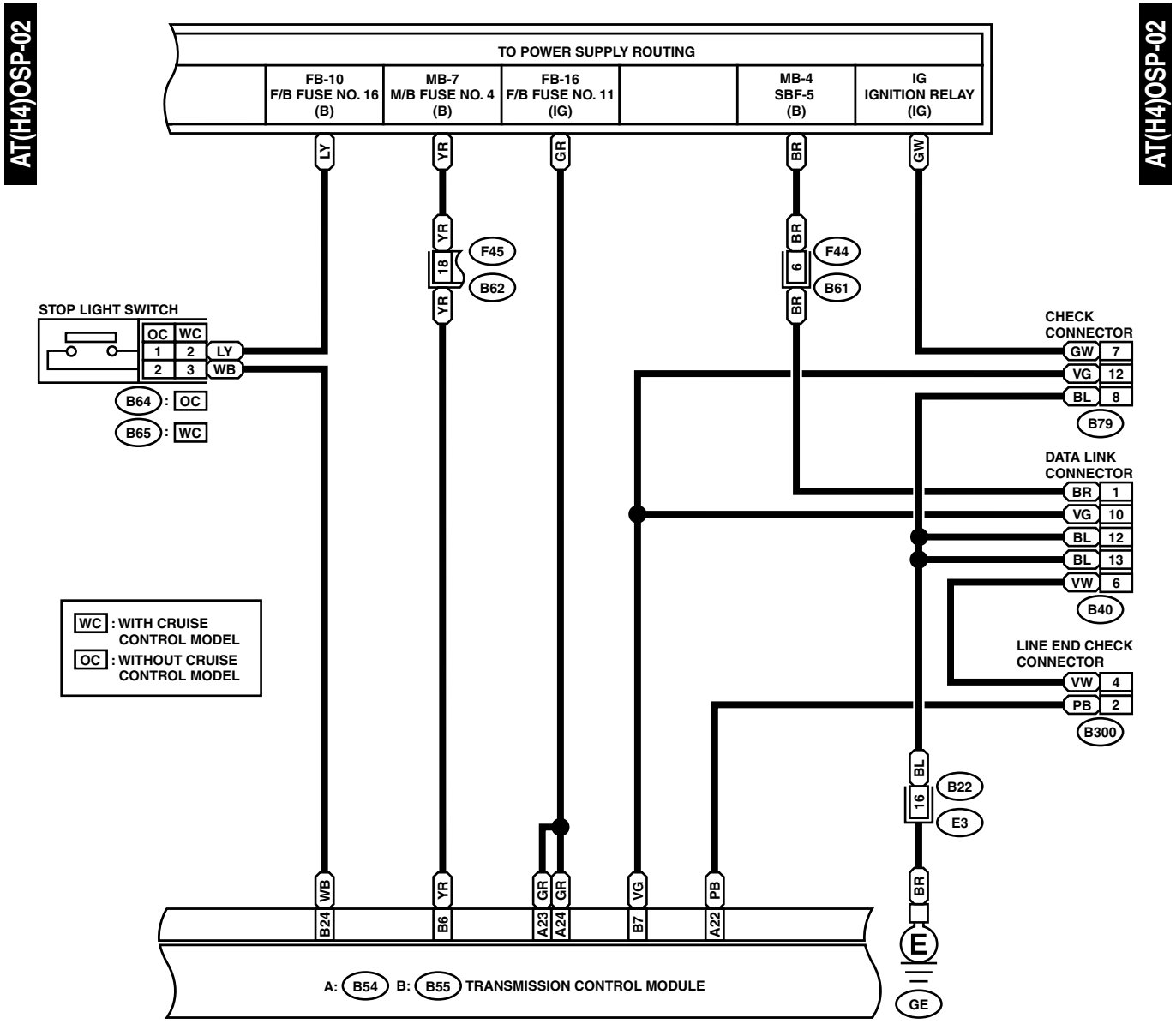
WI-03129

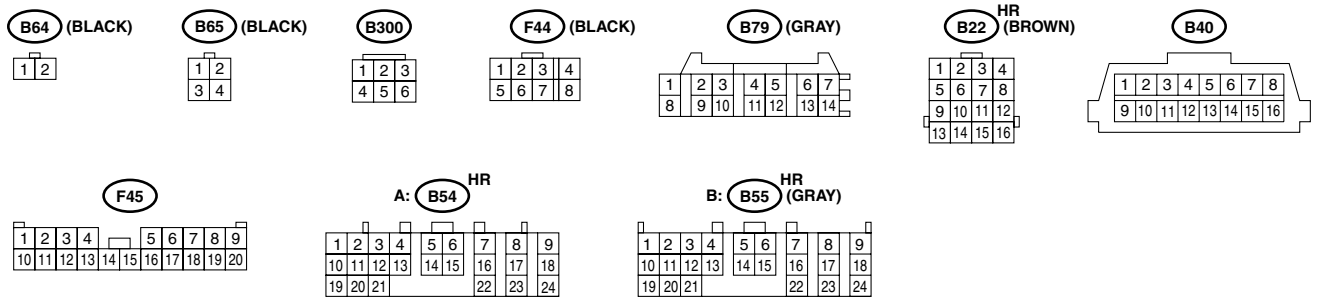
AT(H4)OSP-01



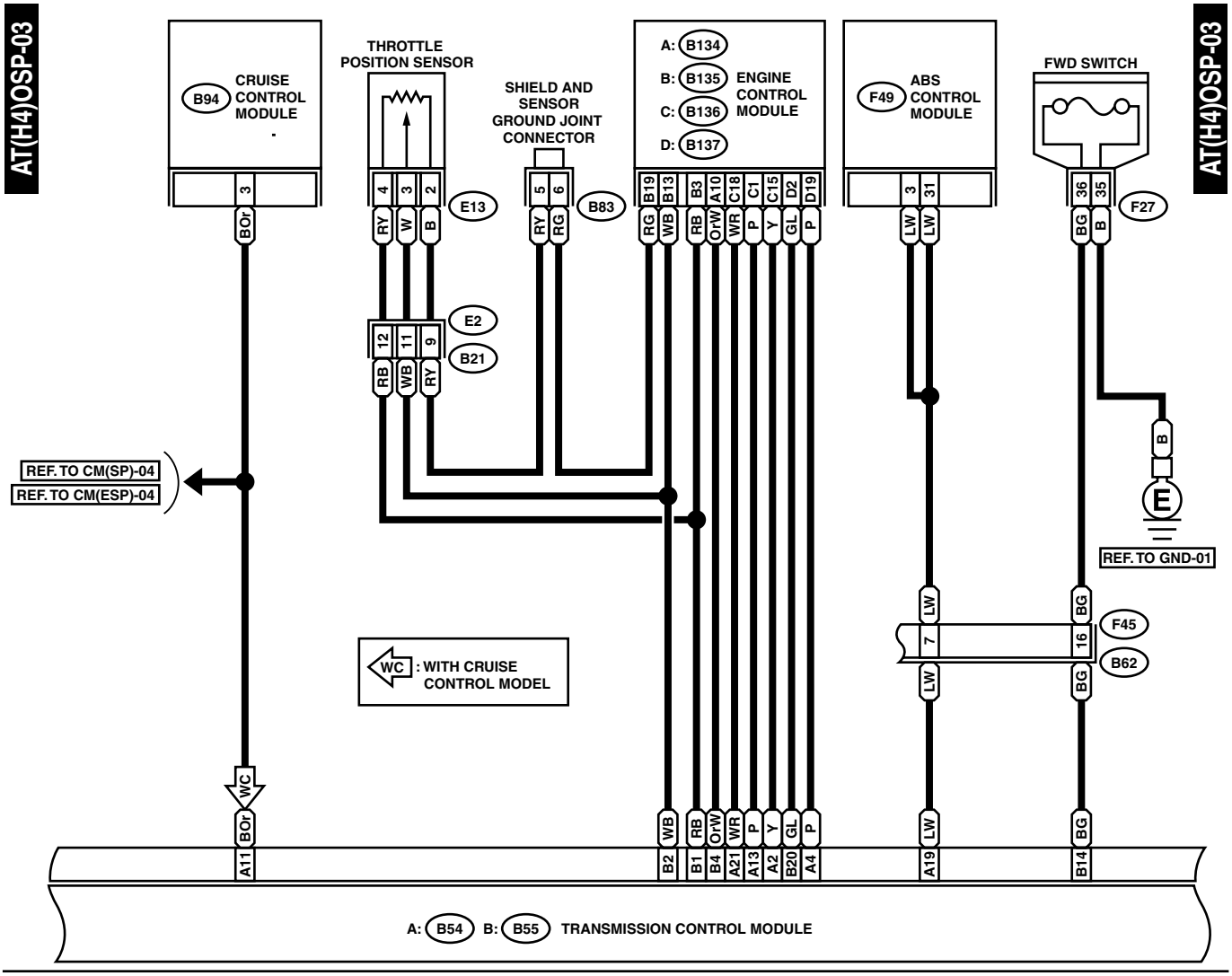


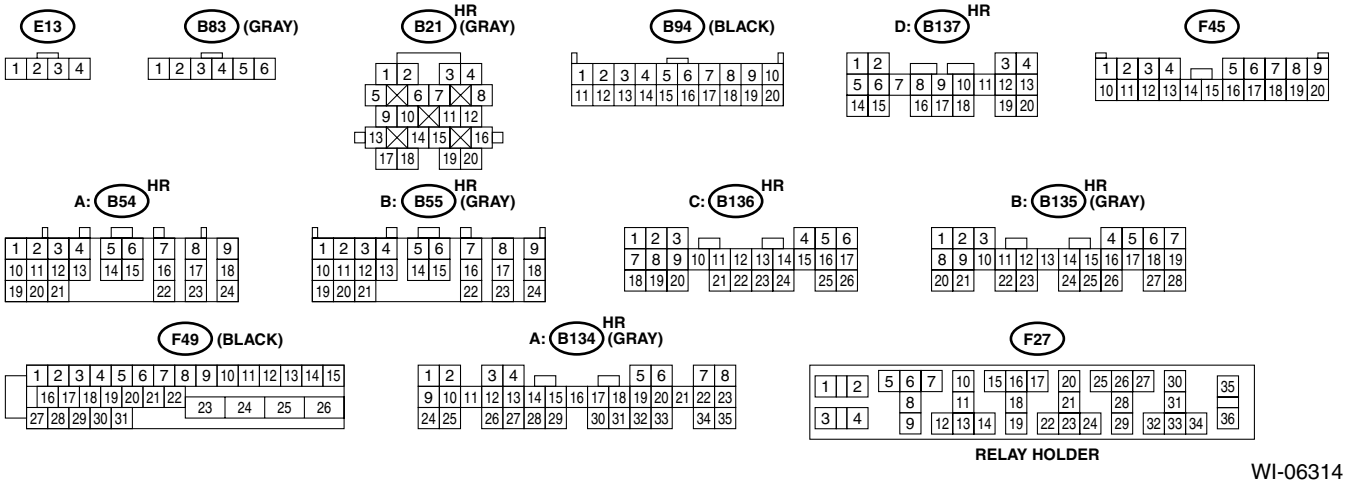
WI-06312


AT(H4)OSP-02
AT(H4)OSP-02
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
GR
BR
GW
F45
B62
F44
B61
STOP LIGHT SWITCH
OC
WC
LY
WB
B64 : OC
B65 : WC
CHECK CONNECTOR
GW 7
VG 12
BL 8
B79
DATA LINK CONNECTOR
BR 1
VG 10
BL 12
BL 13
VW 6
B40
LINE END CHECK CONNECTOR
VW 4
PB 2
B300
WC : WITH CRUISE CONTROL MODEL
OC : WITHOUT CRUISE CONTROL MODEL
B22
E3
WB
YR
GR
VG
PB
BR
B24
B6
A23
A24
B7
A22
A: B54 B: B55 TRANSMISSION CONTROL MODULE
GE

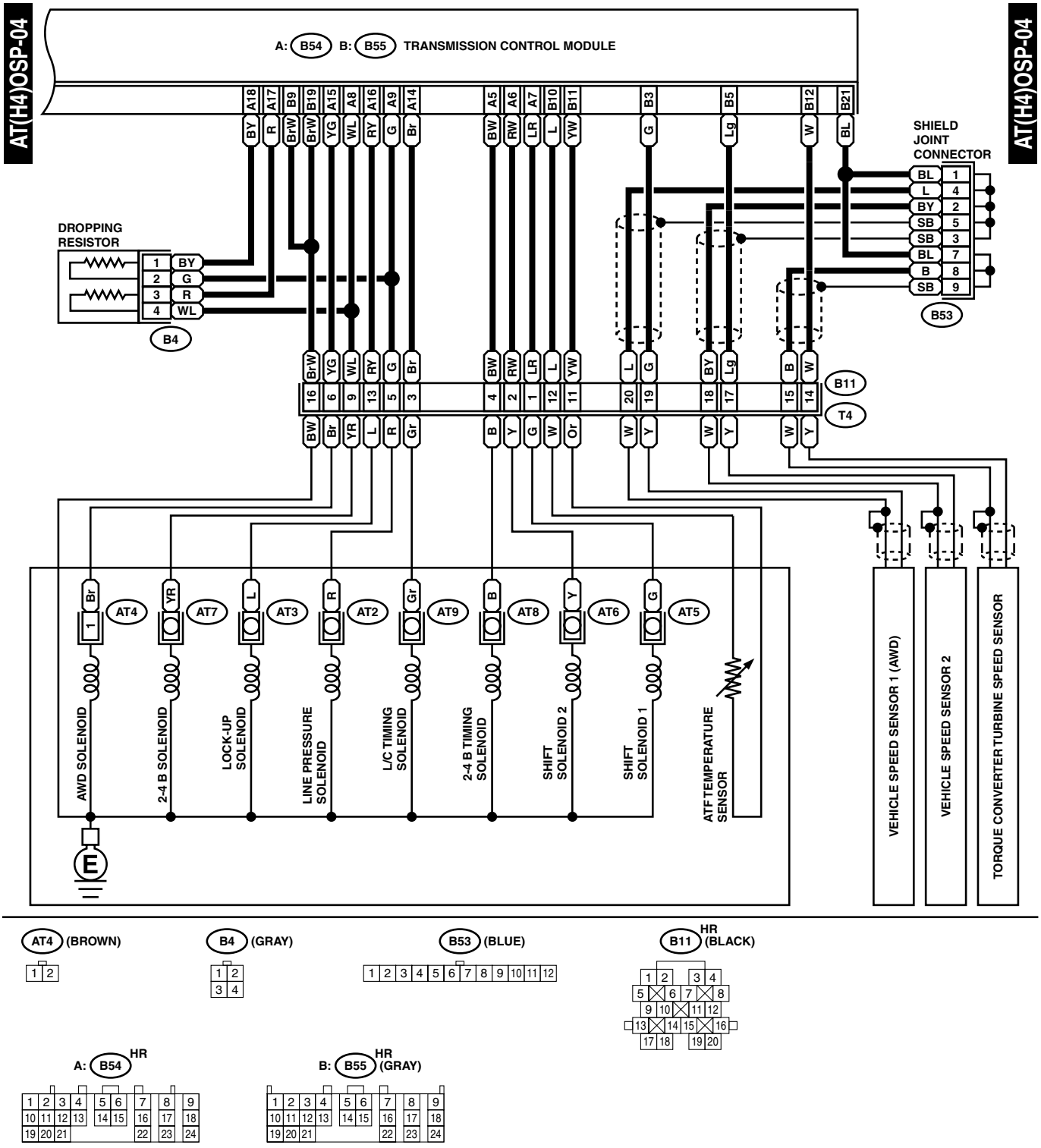

B64 (BLACK)
B65 (BLACK)
B300
F44 (BLACK)
B79 (GRAY)
B22 HR (BROWN)
B40
F45
A: B54 HR
B: B55 HR (GRAY)

WI-06313


AT(H4)OSP-03
AT(H4)OSP-03
B94 CRUISE CONTROL MODULE
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134
B: B135
C: B136
D: B137
ENGINE CONTROL MODULE
F49 ABS CONTROL MODULE
FWD SWITCH
E13
B83
E2
B21
F27
F45
B62
REF. TO CM(SP)-04
REF. TO CM(ESP)-04
REF. TO GND-01
WC : WITH CRUISE CONTROL MODEL
A: B54 B: B55 TRANSMISSION CONTROL MODULE

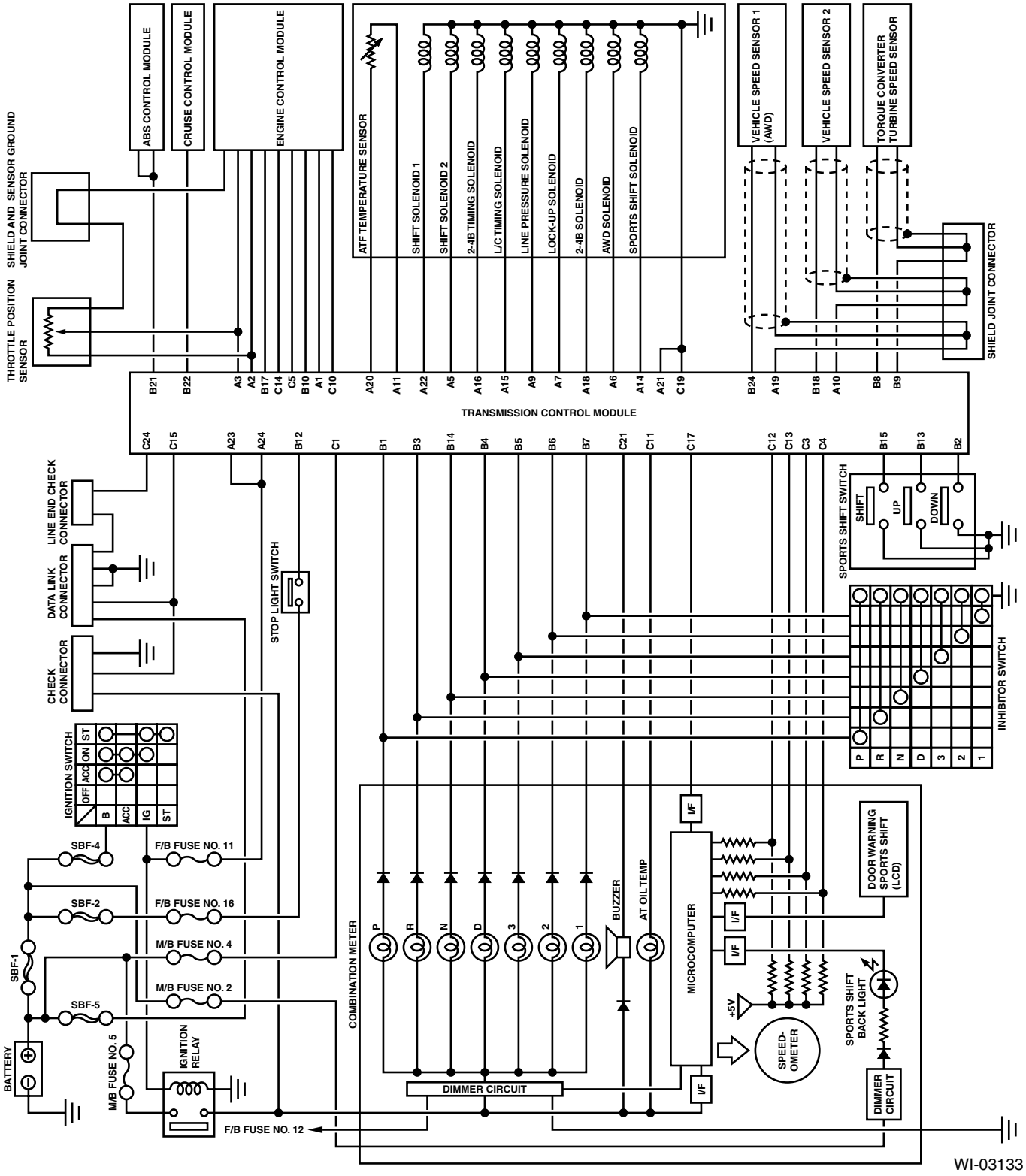

E13
B83 (GRAY)
B21 HR (GRAY)
B94 (BLACK)
D: B137 HR
F45
A: B54 HR
B: B55 HR (GRAY)
C: B136 HR
B: B135 HR (GRAY)
F49 (BLACK)
A: B134 HR (GRAY)
F27
RELAY HOLDER

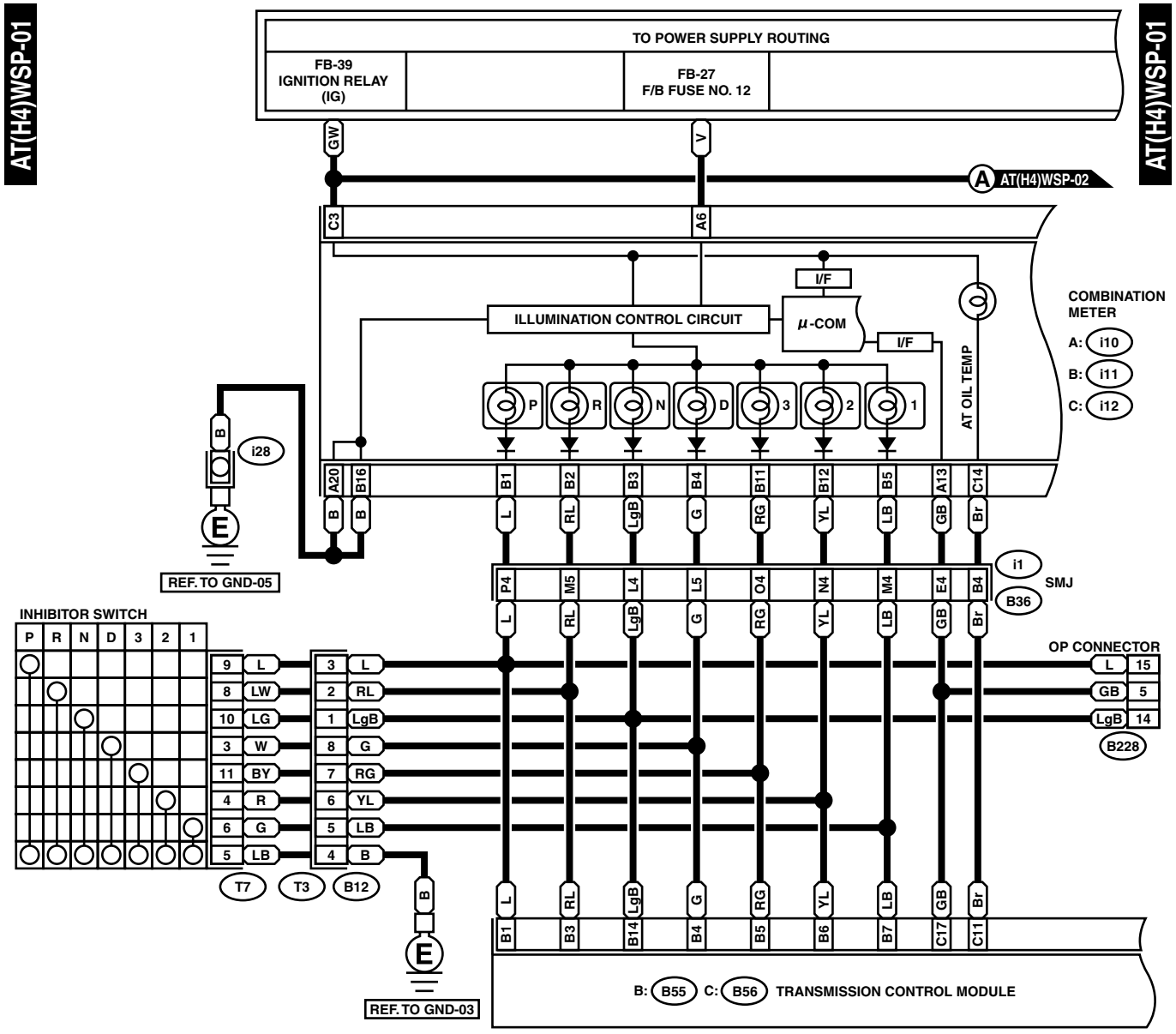
WI-06314

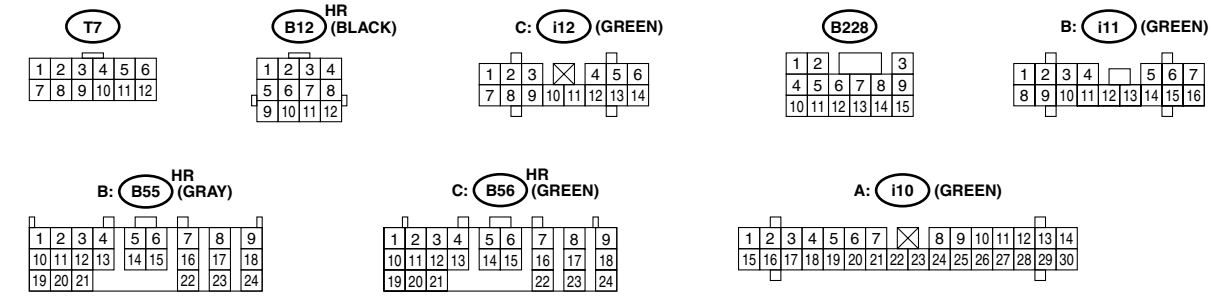

AT(H4)OSP-04
AT(H4)OSP-04
A: B54 B: B55 TRANSMISSION CONTROL MODULE
A18 A17 B9 B19 A15 A8 A16 A9 A14 A5 A6 A7 B10 B11 B3 B5 B12 B21
BY R BrW BrW YG WL RY G Br BW RW LR L YW G Lg W BL
SHIELD JOINT CONNECTOR
BL 1
L 4
BY 2
SB 5
SB 3
BL 7
B 8
SB 9
B53
DROPPING RESISTOR
1 BY
2 G
3 R
4 WL
B4
BrW YG WL RY G Br BW RW LR L YW L G BY Lg B W
16 6 9 13 5 3 4 2 1 12 11 20 19 18 17 15 14
B11
T4
BW Br YR L R Gr B Y G W Or W Y W Y W Y
AT4 AT7 AT3 AT2 AT9 AT8 AT6 AT5
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT4 (BROWN)
B4 (GRAY)
B53 (BLUE)
B11 HR (BLACK)
A: B54 HR
B: B55 HR (GRAY)

WI-06315

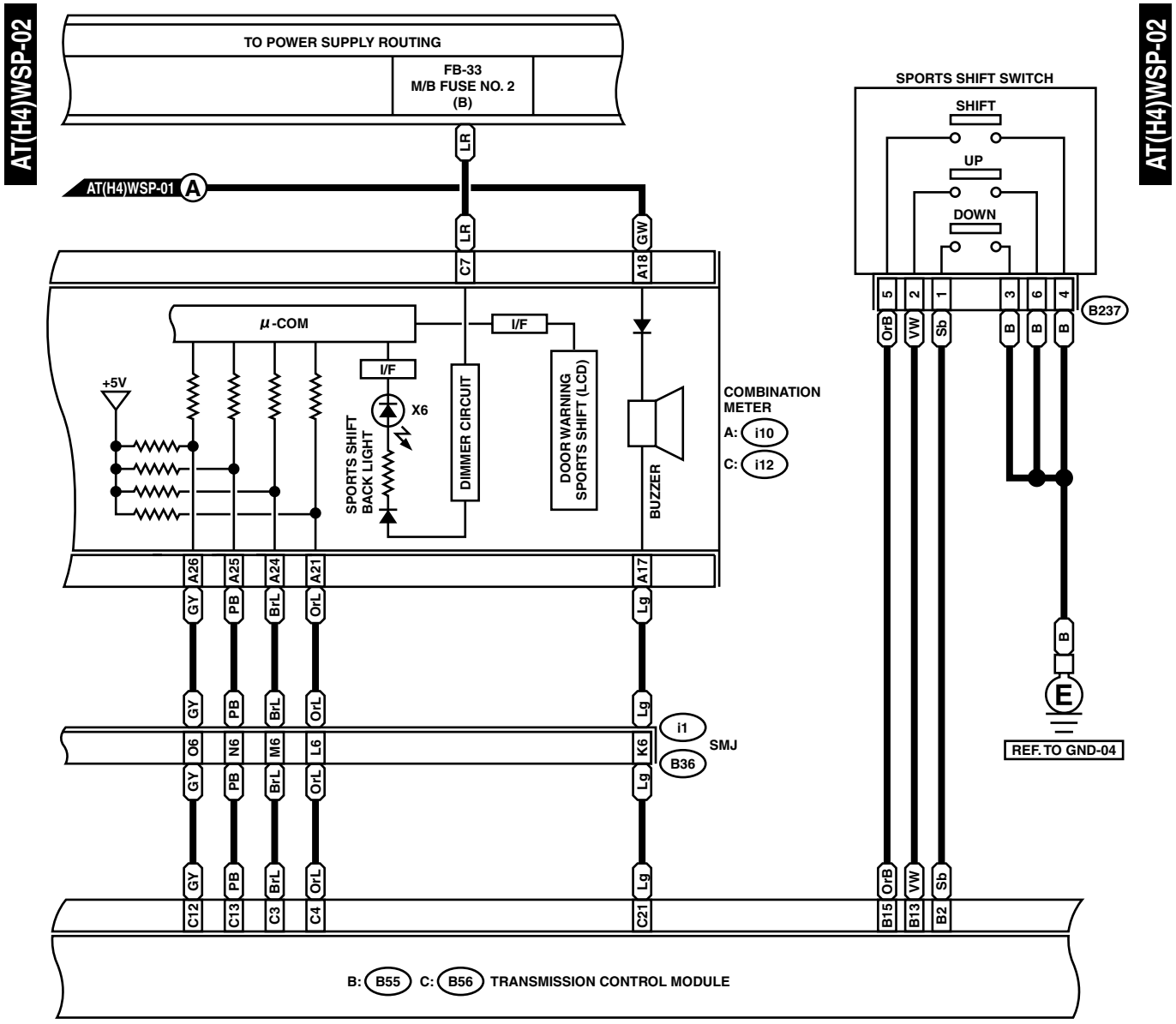
2. 4-CYLINDER ENGINE WITH SPORT SHIFT (EXCEPT U5 MODEL)




AT(H4)WSP-01
AT(H4)WSP-01
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
FB-27
F/B FUSE NO. 12
GW
V
A AT(H4)WSP-02
C3
A6
I/F
ILLUMINATION CONTROL CIRCUIT
μ-COM
I/F
AT OIL TEMP
COMBINATION METER
A: i10
B: i11
C: i12
P
R
N
D
3
2
1
i28
B
E
REF. TO GND-05
A20
B16
B1
B2
B3
B4
B11
B12
B5
A13
C14
L
RL
LgB
G
RG
YL
LB
GB
Br
i1
SMJ
B36
P4
M5
L4
L5
O4
N4
M4
E4
B4
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 L
2 RL
1 LgB
8 G
7 RG
6 YL
5 LB
4 B
T7
T3
B12
OP CONNECTOR
L 15
GB 5
LgB 14
B228
B1
B3
B14
B4
B5
B6
B7
C17
C11
B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND-03

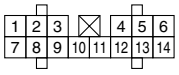

T7
B12 HR (BLACK)
C: i12 (GREEN)
B228
B: i11 (GREEN)
B: B55 HR (GRAY)
C: B56 HR (GREEN)
A: i10 (GREEN)

WI-06316

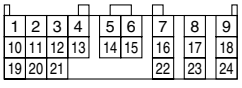


B237 (BLACK)

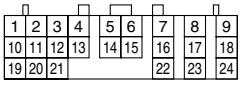
C: i12 (GREEN)



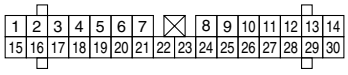
B: B55 HR (GRAY)



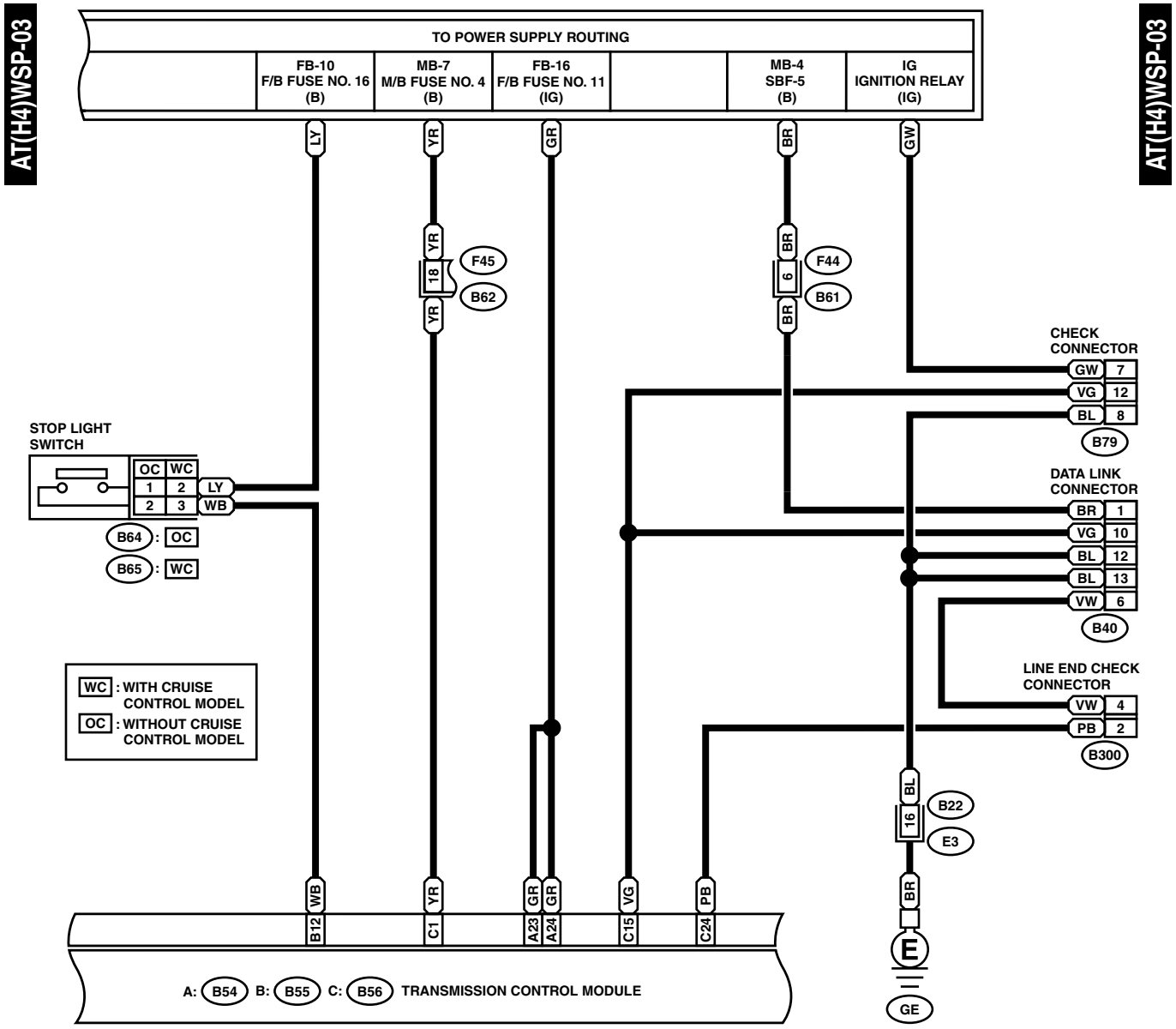
C: B56 HR (GREEN)

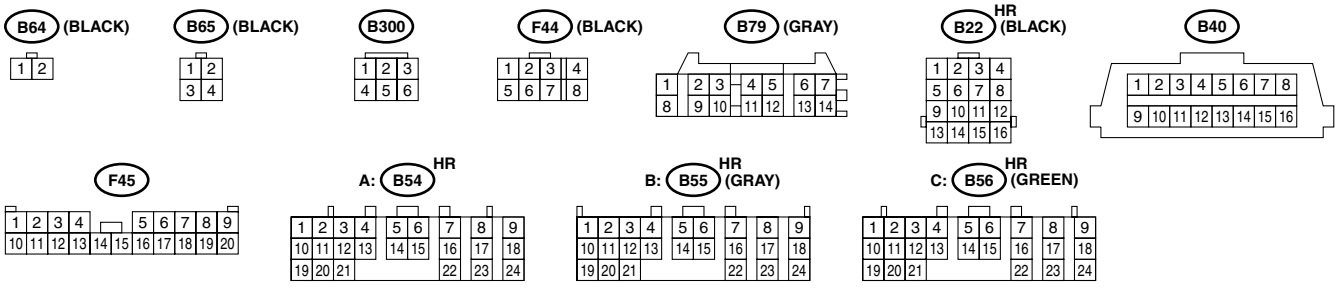


A: i10 (GREEN)

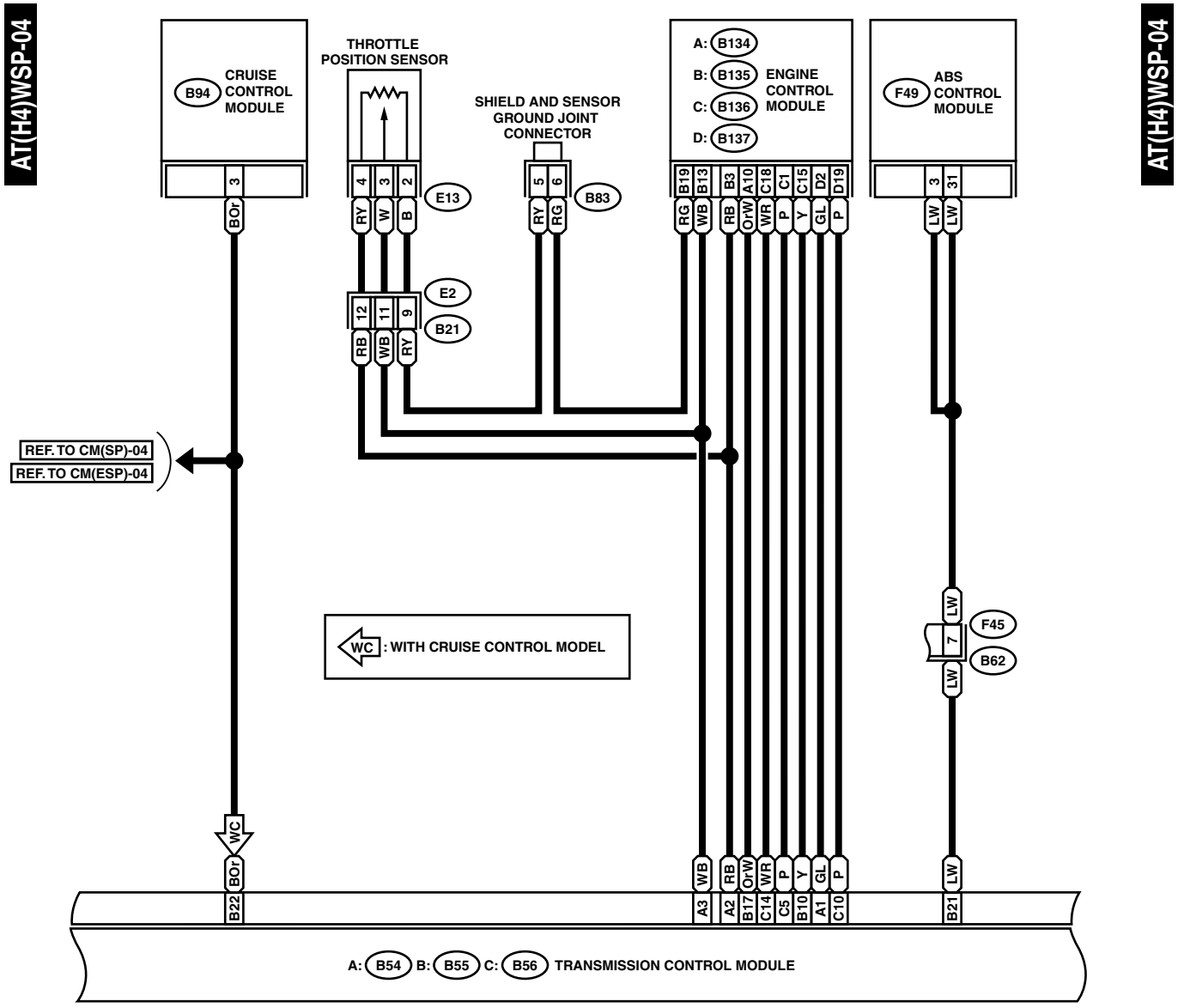


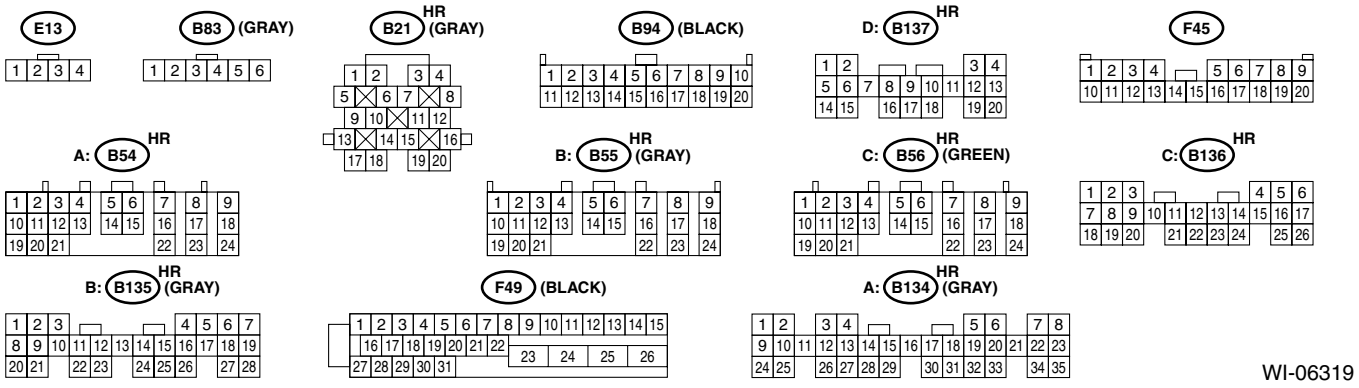
WI-06317


AT(H4)WSP-03
AT(H4)WSP-03
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
GR
BR
GW
F45
B62
F44
B61
CHECK CONNECTOR
GW 7
VG 12
BL 8
B79
STOP LIGHT SWITCH
OC WC
1 2 LY
2 3 WB
B64 : OC
B65 : WC
DATA LINK CONNECTOR
BR 1
VG 10
BL 12
BL 13
VW 6
B40
WC : WITH CRUISE CONTROL MODEL
OC : WITHOUT CRUISE CONTROL MODEL
LINE END CHECK CONNECTOR
VW 4
PB 2
B300
BL
B22
E3
WB
YR
GR
GR
VG
PB
BR
B12
C1
A23
A24
C15
C24
E
GE
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE

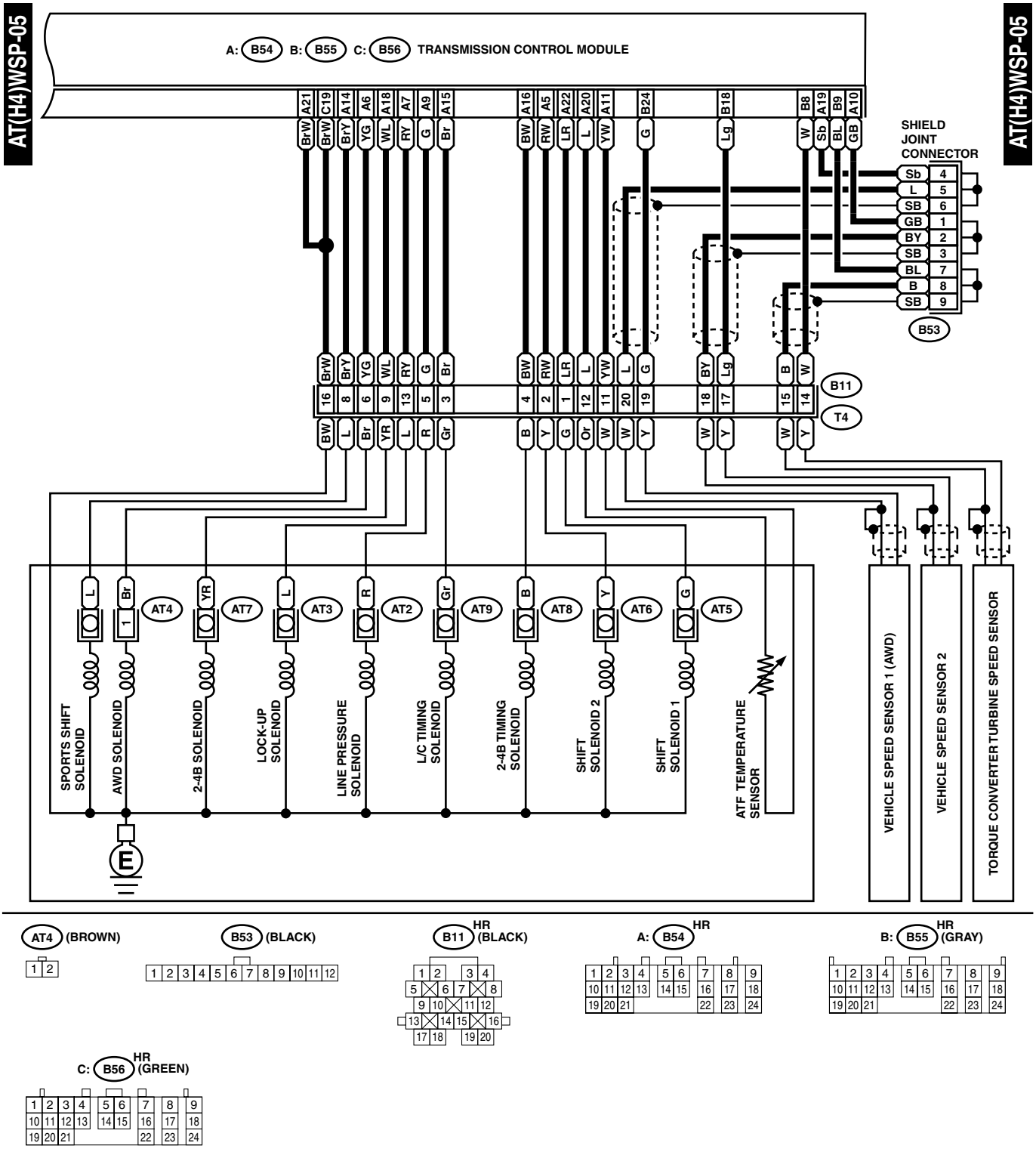

B64 (BLACK)
B65 (BLACK)
B300
F44 (BLACK)
B79 (GRAY)
B22 HR (BLACK)
B40
F45
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)

WI-06318


AT(H4)WSP-04
AT(H4)WSP-04
CRUISE CONTROL MODULE
B94
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134
B: B135
C: B136
D: B137
ENGINE CONTROL MODULE
F49
ABS CONTROL MODULE
E13
B83
E2
B21
REF. TO CM(SP)-04
REF. TO CM(ESP)-04
WC : WITH CRUISE CONTROL MODEL
F45
B62
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE

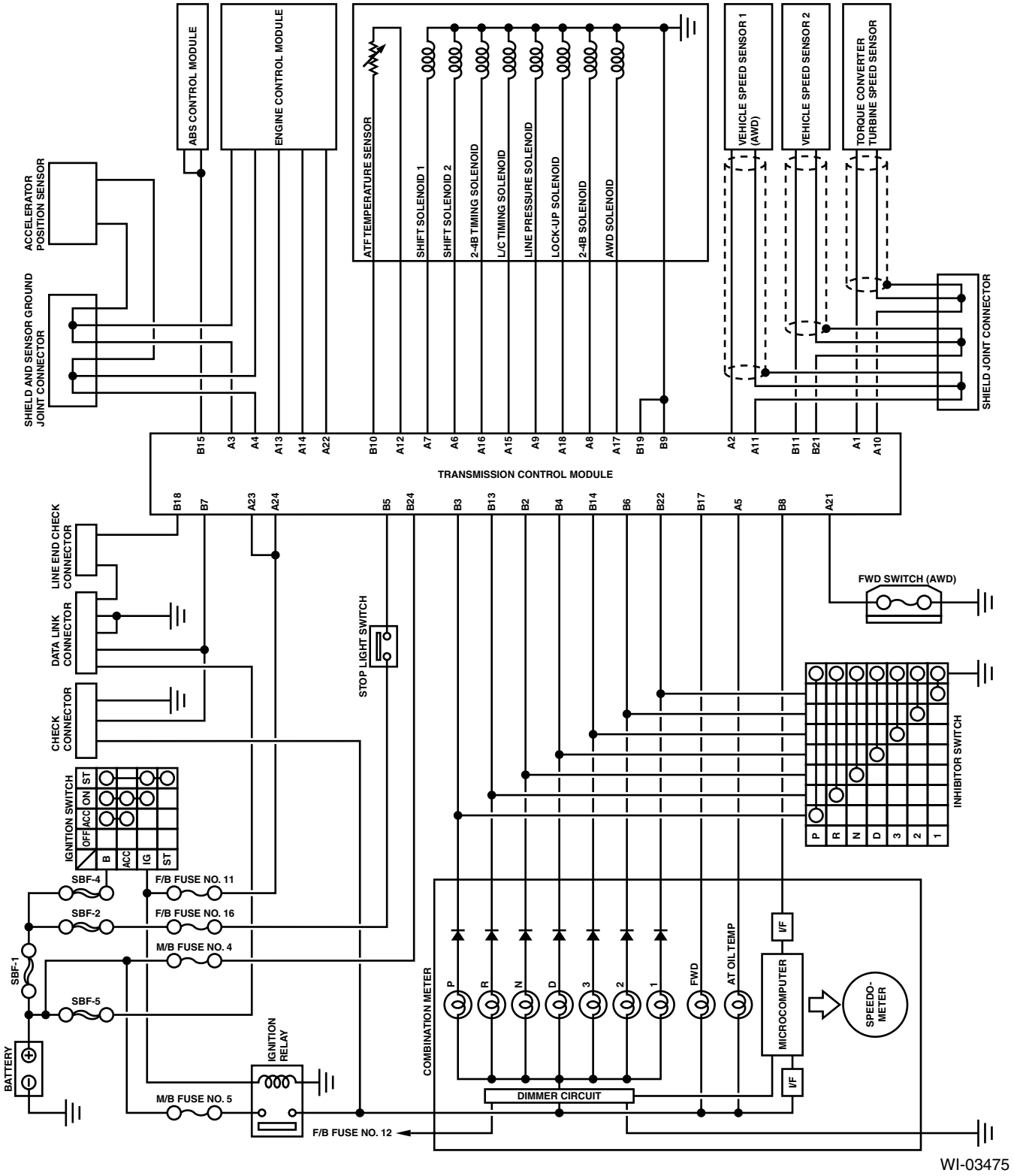

E13
B83 (GRAY)
B21 HR (GRAY)
B94 (BLACK)
D: B137 HR
F45
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)
C: B136 HR
B: B135 HR (GRAY)
F49 (BLACK)
A: B134 HR (GRAY)

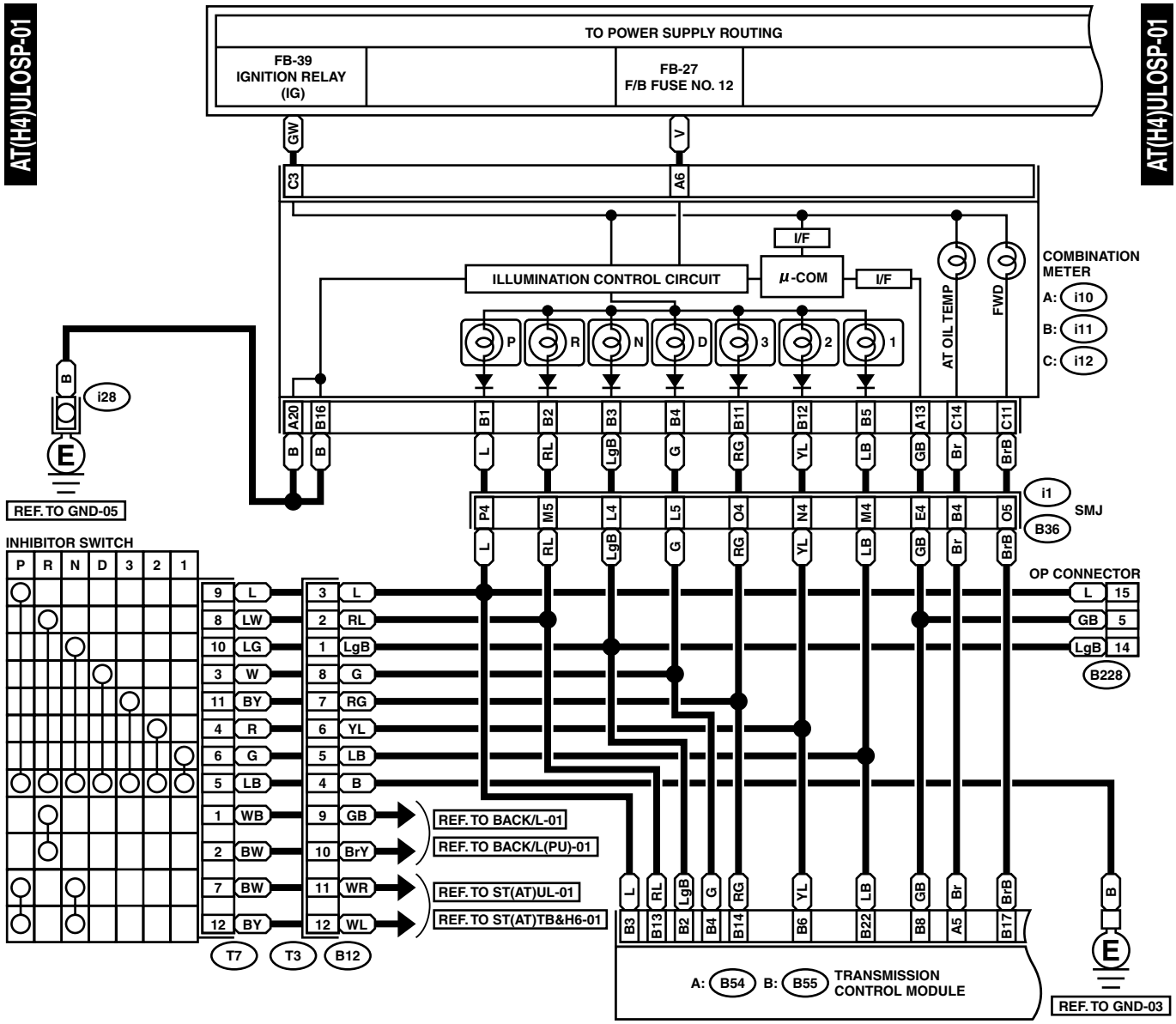
WI-06319

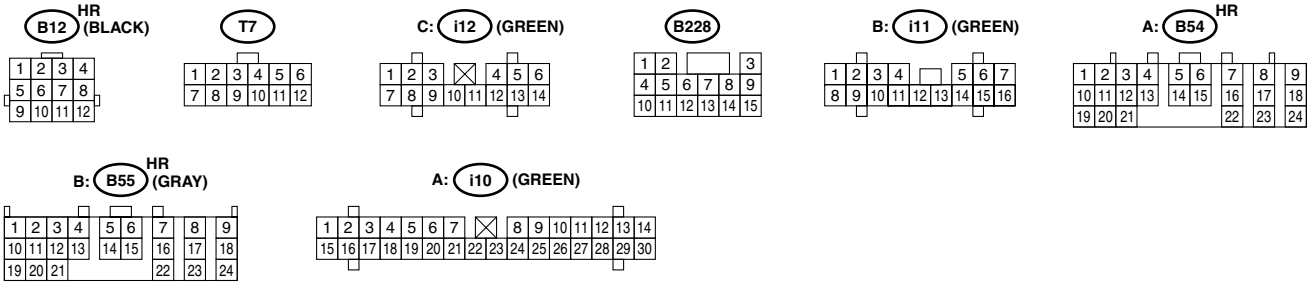

AT(H4)WSP-05
AT(H4)WSP-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B53
B11
T4
SPORTS SHIFT SOLENOID
AWD SOLENOID
2-4B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT4 (BROWN)
B53 (BLACK)
B11 HR (BLACK)
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)

WI-06320

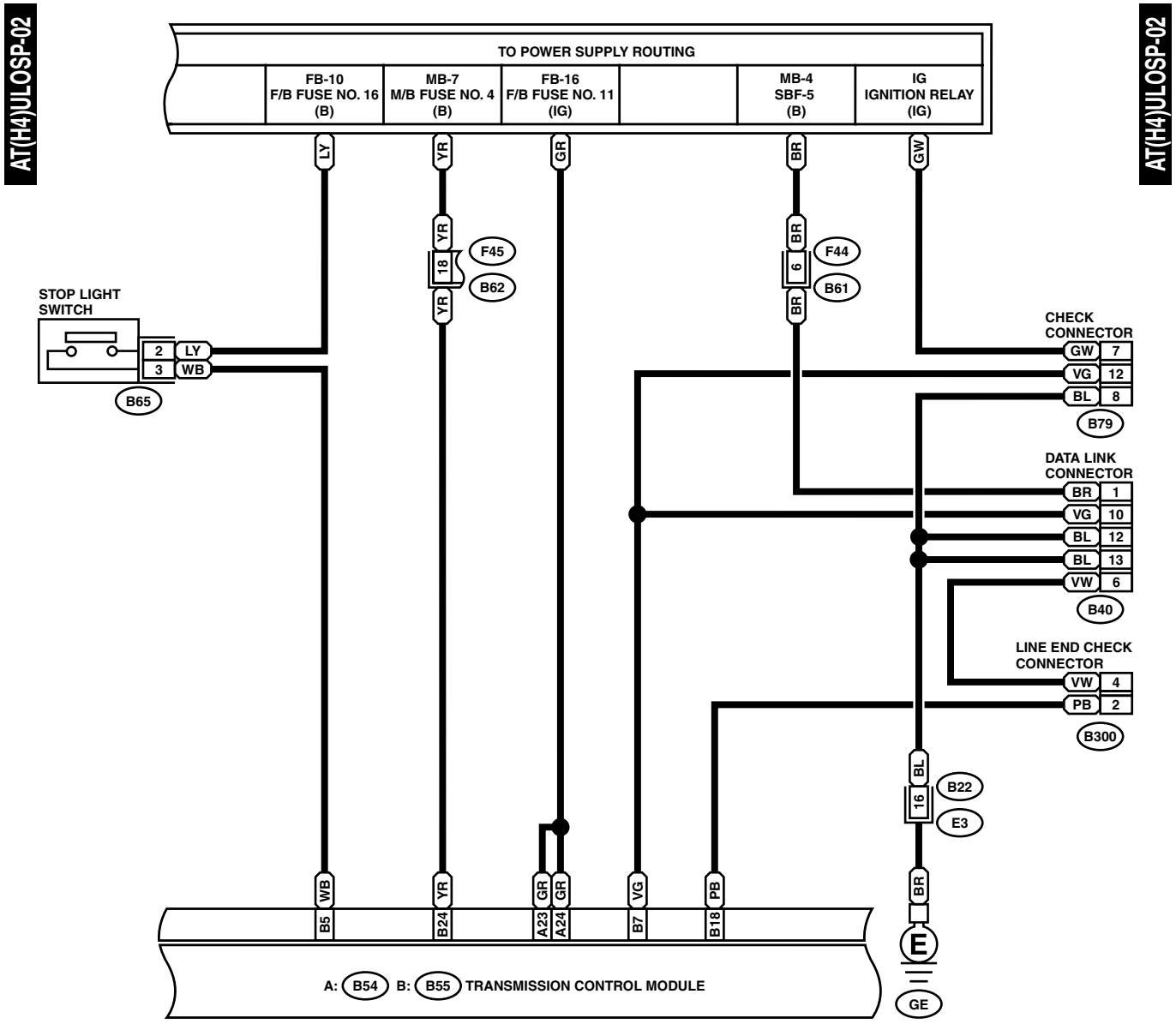
3. 4-CYLINDER ENGINE WITHOUT SPORT SHIFT (U5 MODEL)

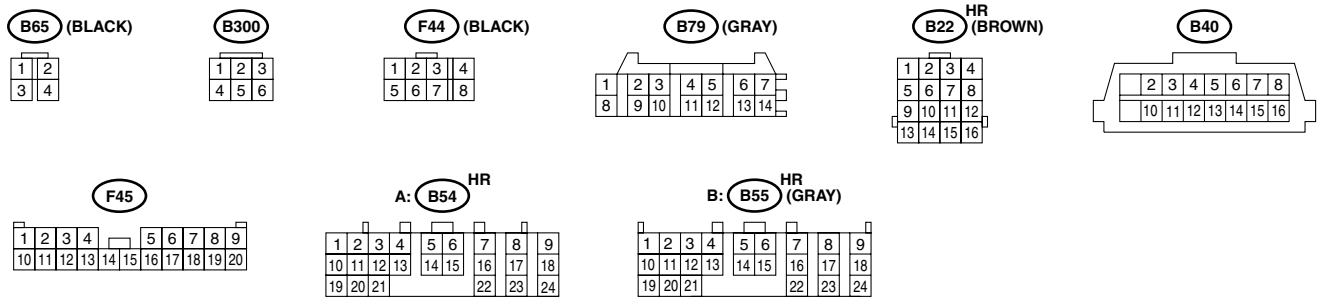



AT(H4)ULOSP-01
AT(H4)ULOSP-01
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
FB-27
F/B FUSE NO. 12
GW
V
C3
A6
I/F
ILLUMINATION CONTROL CIRCUIT
μ-COM
I/F
COMBINATION METER
A: i10
B: i11
C: i12
AT OIL TEMP
FWD
P
R
N
D
3
2
1
i28
B
E
REF. TO GND-05
A20
B16
B1
B2
B3
B4
B11
B12
B5
A13
C14
C11
L
RL
LgB
G
RG
YL
LB
GB
Br
BrB
i1
SMJ
B36
P4
M5
L4
L5
O4
N4
M4
E4
B4
O5
OP CONNECTOR
L 15
GB 5
LgB 14
B228
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
1 WB
2 BW
7 BW
12 BY
3 L
2 RL
1 LgB
8 G
7 RG
6 YL
5 LB
4 B
9 GB
10 BrY
11 WR
12 WL
REF. TO BACK/L-01
REF. TO BACK/L(PU)-01
REF. TO ST(AT)UL-01
REF. TO ST(AT)TB&H6-01
T7
T3
B12
B3
B13
B2
B4
B14
B6
B22
B8
A5
B17
A: B54
B: B55
TRANSMISSION CONTROL MODULE
REF. TO GND-03

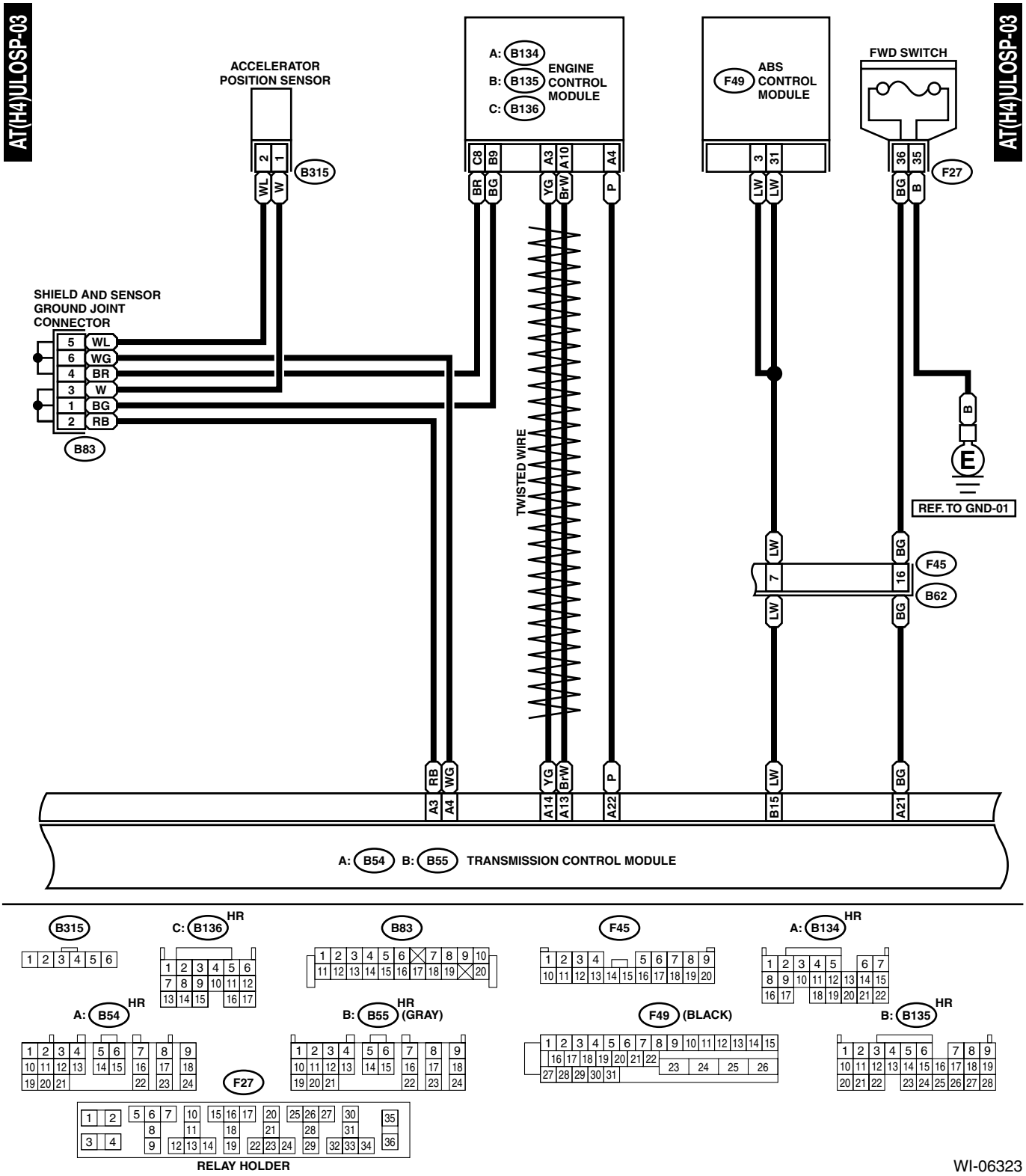

B12 HR (BLACK)
T7
C: i12 (GREEN)
B228
B: i11 (GREEN)
A: B54 HR
B: B55 HR (GRAY)
A: i10 (GREEN)

WI-06321

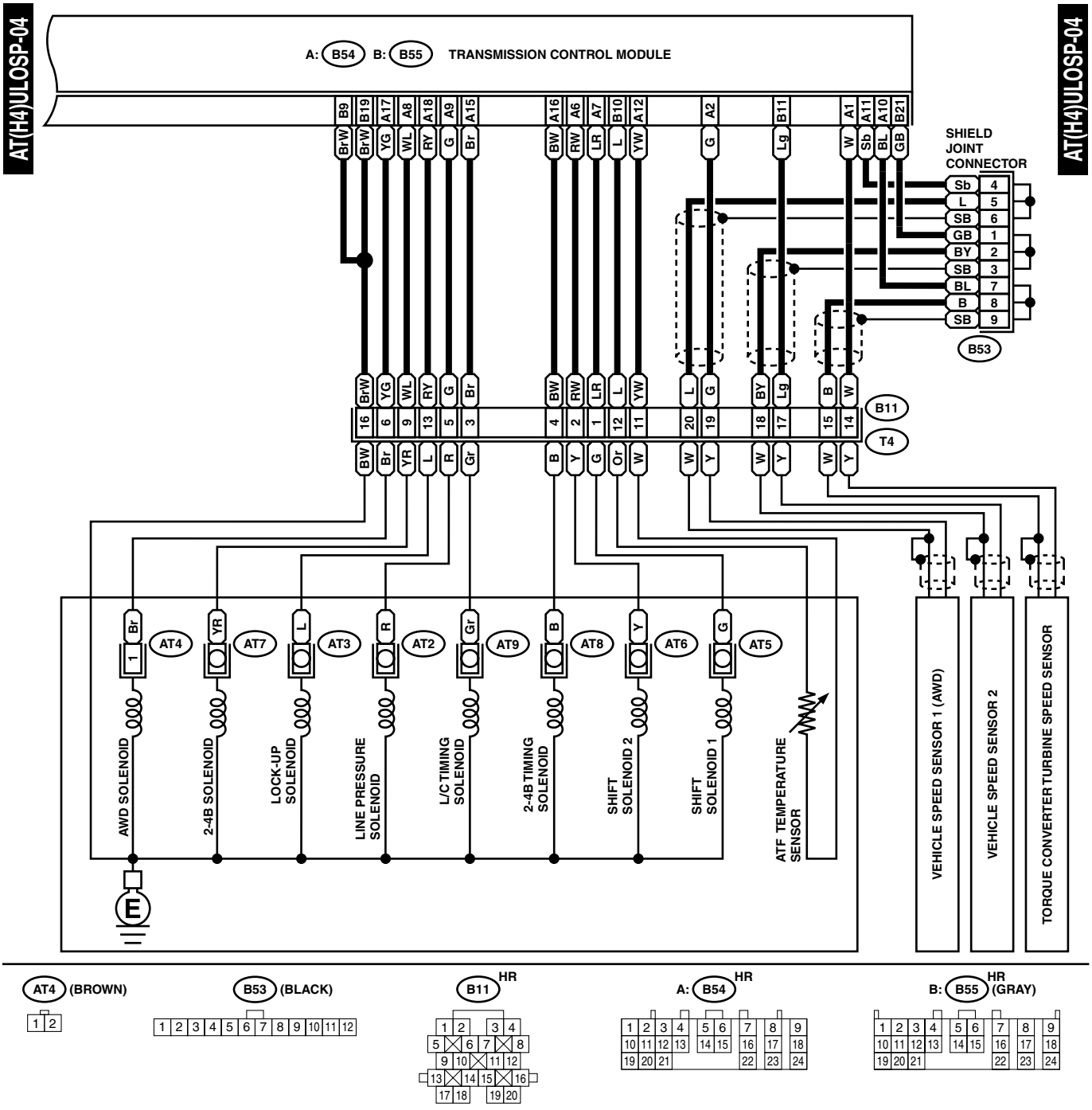

AT(H4)ULOSP-02
AT(H4)ULOSP-02
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
GR
BR
GW
F45
B62
F44
B61
STOP LIGHT
SWITCH
2
3
LY
WB
B65
CHECK
CONNECTOR
GW 7
VG 12
BL 8
B79
DATA LINK
CONNECTOR
BR 1
VG 10
BL 12
BL 13
VW 6
B40
LINE END CHECK
CONNECTOR
VW 4
PB 2
B300
B22
E3
B5
B24
A23
A24
B7
B18
A: B54 B: B55 TRANSMISSION CONTROL MODULE
GE


B65 (BLACK)
B300
F44 (BLACK)
B79 (GRAY)
HR
B22 (BROWN)
B40
F45
A: B54
HR
B: B55
HR
(GRAY)

WI-06322

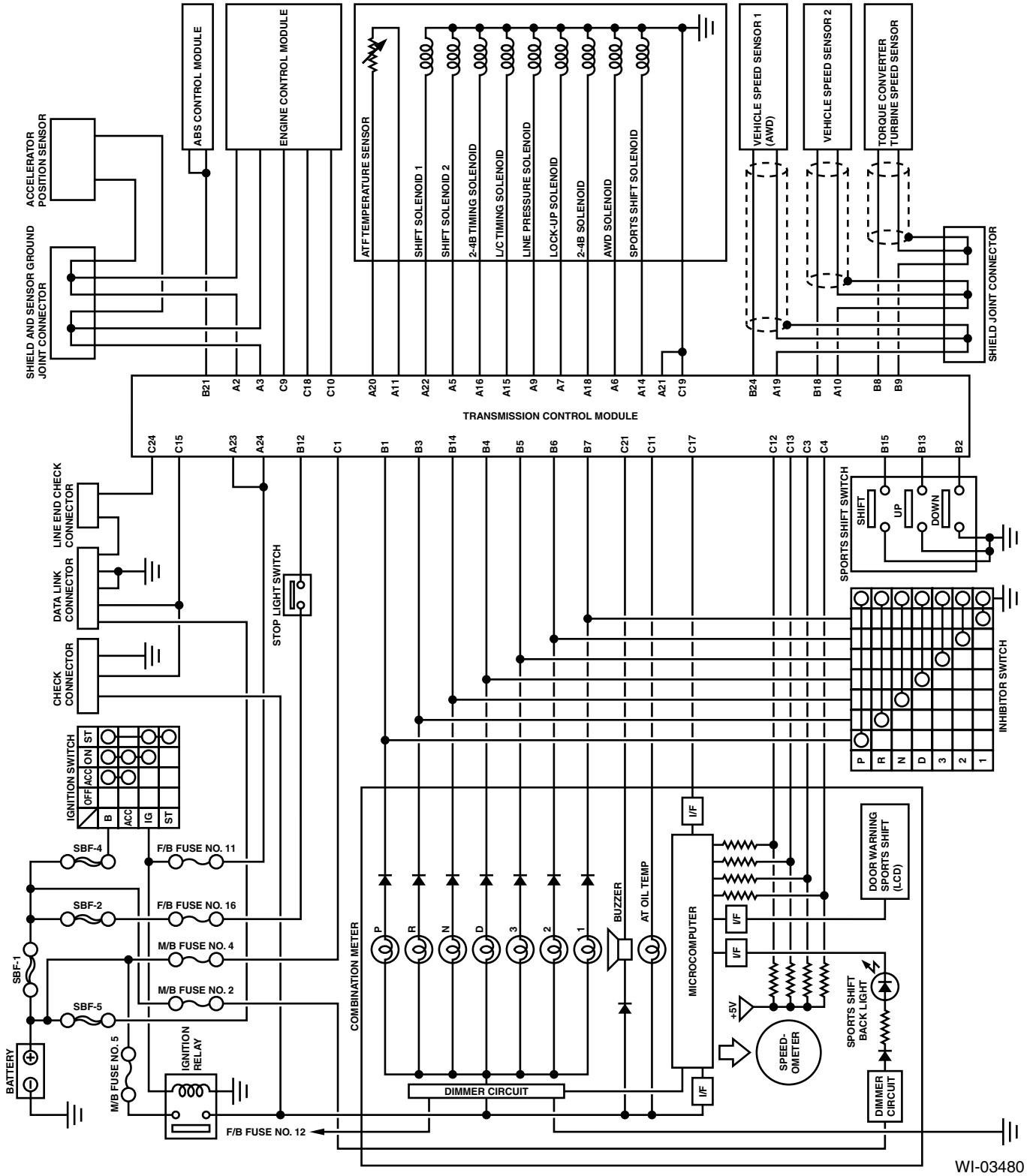

AT(H4)ULOSP-03
AT(H4)ULOSP-03
ACCELERATOR POSITION SENSOR
B315
2
1
WL
W
A: B134
B: B135
C: B136
ENGINE CONTROL MODULE
C8
B9
A3
A10
A4
BR
BG
YG
BrW
P
F49
ABS CONTROL MODULE
3
31
LW
LW
FWD SWITCH
36
35
F27
BG
B
SHIELD AND SENSOR GROUND JOINT CONNECTOR
5 WL
6 WG
4 BR
3 W
1 BG
2 RB
B83
TWISTED WIRE
B
E
REF. TO GND-01
LW
7
BG
16
F45
B62
RB
WG
A3
A4
A14
A13
A22
B15
A21
A: B54
B: B55
TRANSMISSION CONTROL MODULE
B315
C: B136
HR
B83
F45
A: B134
HR
A: B54
HR
B: B55
HR
(GRAY)
F49
(BLACK)
B: B135
HR
F27
RELAY HOLDER

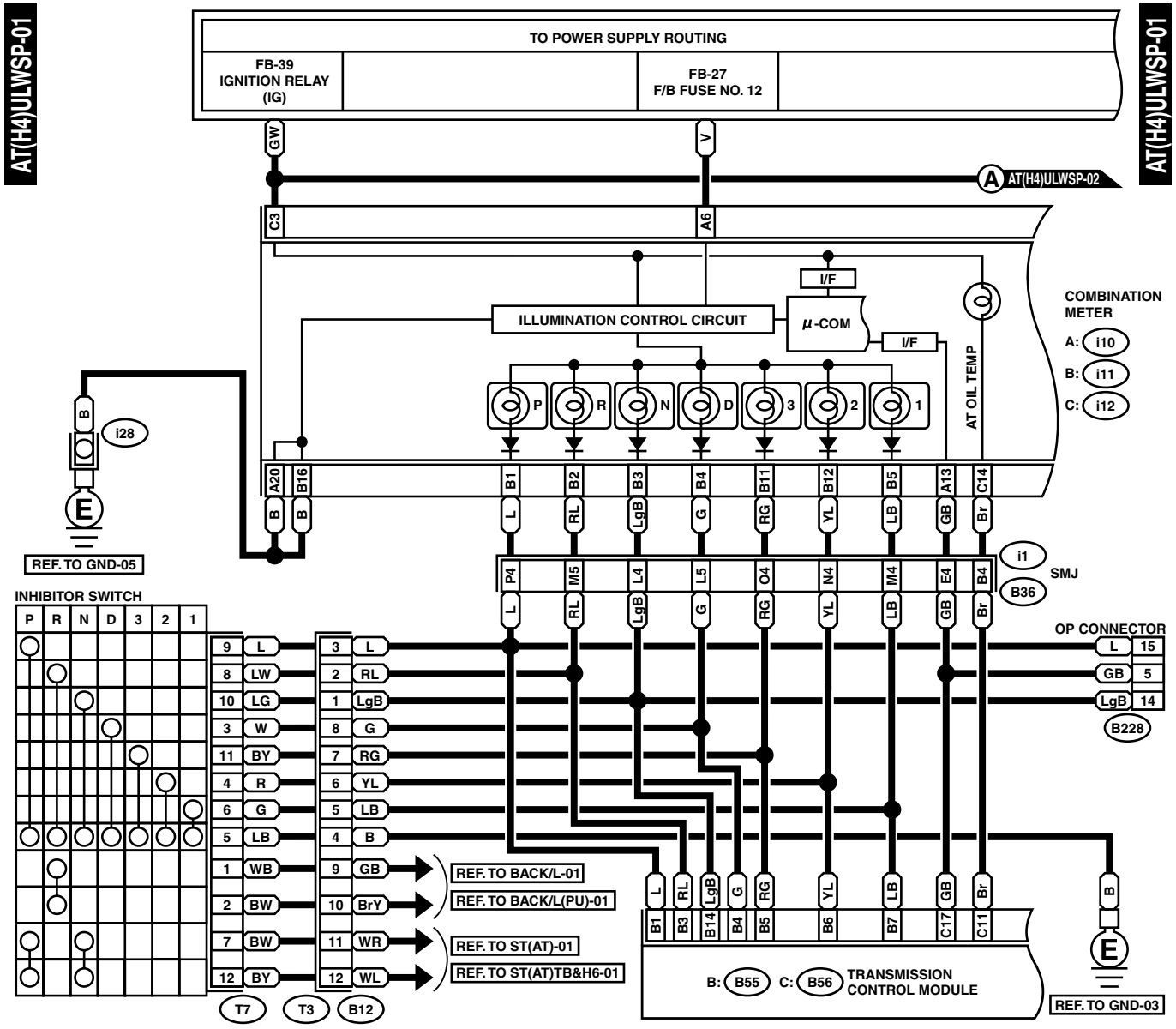
WI-06323

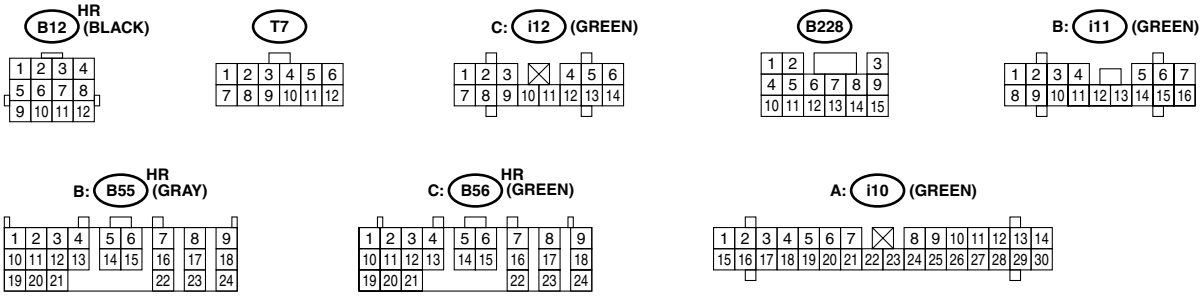

AT(H4)ULOSP-04
AT(H4)ULOSP-04
A: B54 B: B55 TRANSMISSION CONTROL MODULE
B9 B19 A17 A8 A18 A9 A15 A16 A6 A7 B10 A12 A2 B11 A1 A11 A10 B21
BrW BrW YG WL RY G Br BW RW LR L YW G Lg W Sb BL GB
SHIELD JOINT CONNECTOR
Sb 4
L 5
SB 6
GB 1
BY 2
SB 3
BL 7
B 8
SB 9
B53
BrW YG WL RY G Br BW RW LR L YW L G BY Lg B W
16 6 9 13 5 3 4 2 1 12 11 20 19 18 17 15 14
B11
T4
BW Br YR L R Gr B Y G Or W W Y W Y W Y
AT4 AT7 AT3 AT2 AT9 AT8 AT6 AT5
AWD SOLENOID
2-4B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT4 (BROWN)
B53 (BLACK)
B11 HR
A: B54 HR
B: B55 HR (GRAY)

WI-06324

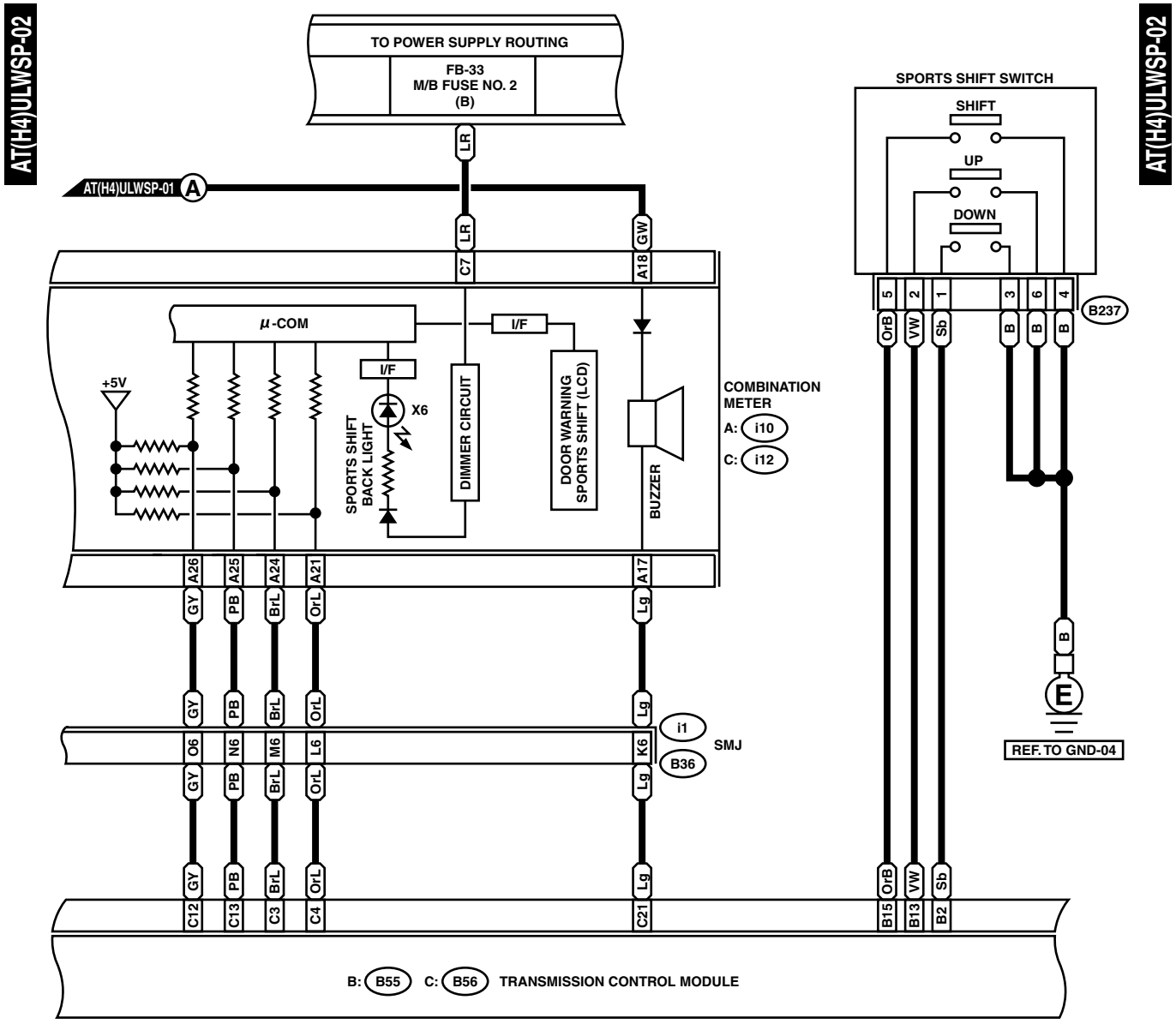
4. 4-CYLINDER ENGINE WITH SPORT SHIFT (U5 MODEL)

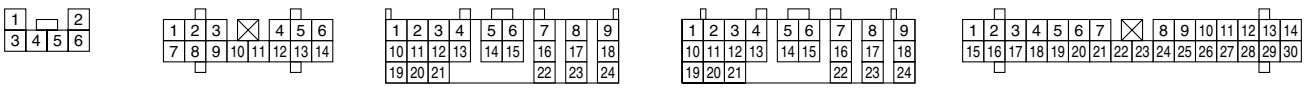



AT(H4)ULWSP-01
AT(H4)ULWSP-01
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
FB-27
F/B FUSE NO. 12
GW
V
A AT(H4)ULWSP-02
C3
A6
I/F
ILLUMINATION CONTROL CIRCUIT
μ-COM
I/F
AT OIL TEMP
COMBINATION METER
A: i10
B: i11
C: i12
P
R
N
D
3
2
1
i28
B
E
REF. TO GND-05
A20
B16
B1
B2
B3
B4
B11
B12
B5
A13
C14
L
RL
LgB
G
RG
YL
LB
GB
Br
i1
SMJ
B36
P4
M5
L4
L5
O4
N4
M4
E4
B4
OP CONNECTOR
L 15
GB 5
LgB 14
B228
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
1 WB
2 BW
7 BW
12 BY
3 L
2 RL
1 LgB
8 G
7 RG
6 YL
5 LB
4 B
9 GB
10 BrY
11 WR
12 WL
REF. TO BACK/L-01
REF. TO BACK/L(PU)-01
REF. TO ST(AT)-01
REF. TO ST(AT)TB&H6-01
T7
T3
B12
B1
B3
B14
B4
B5
B6
B7
C17
C11
B: B55 C: B56 TRANSMISSION CONTROL MODULE
B
E
REF. TO GND-03

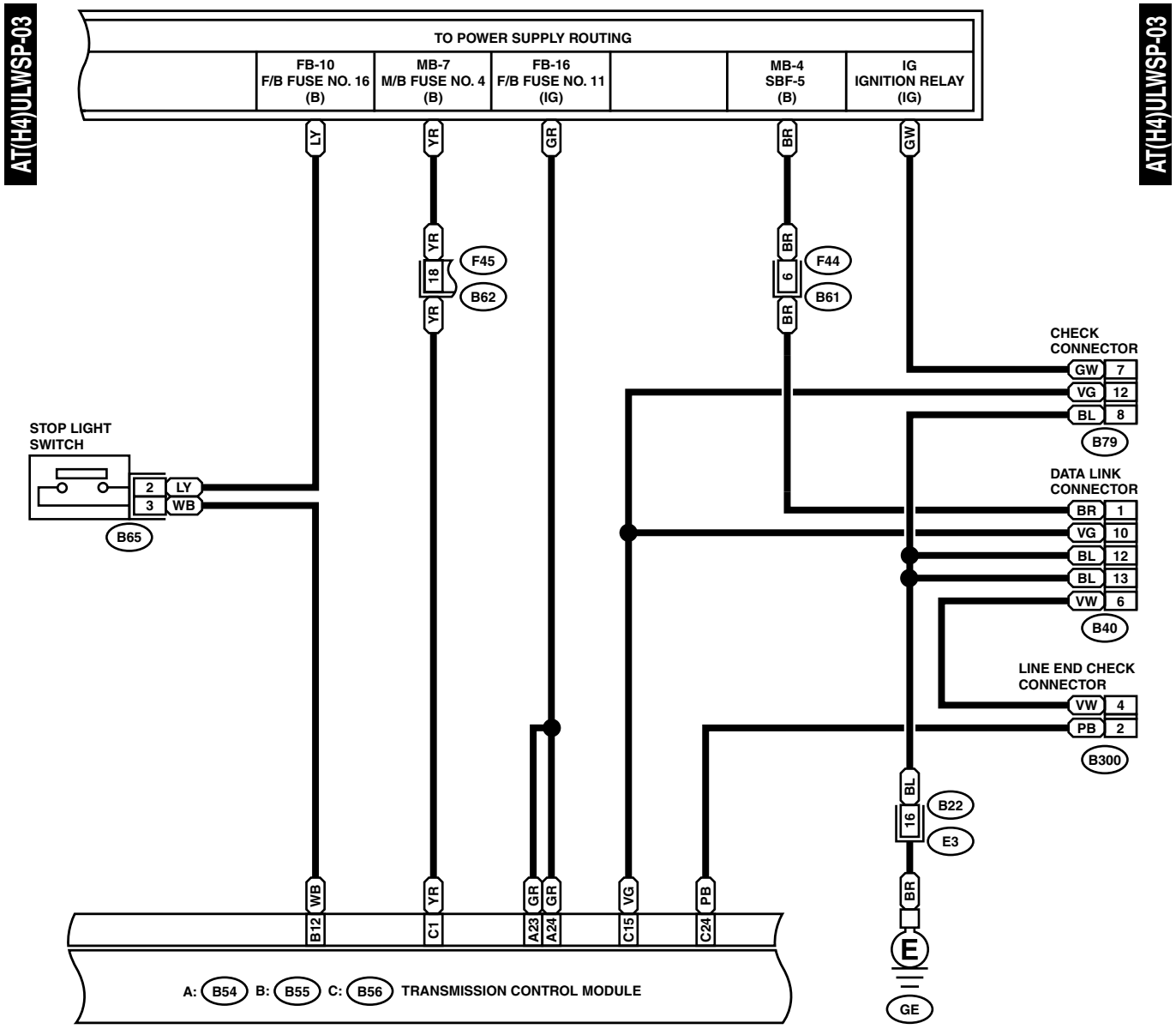

B12 HR (BLACK)
T7
C: i12 (GREEN)
B228
B: i11 (GREEN)
B: B55 HR (GRAY)
C: B56 HR (GREEN)
A: i10 (GREEN)

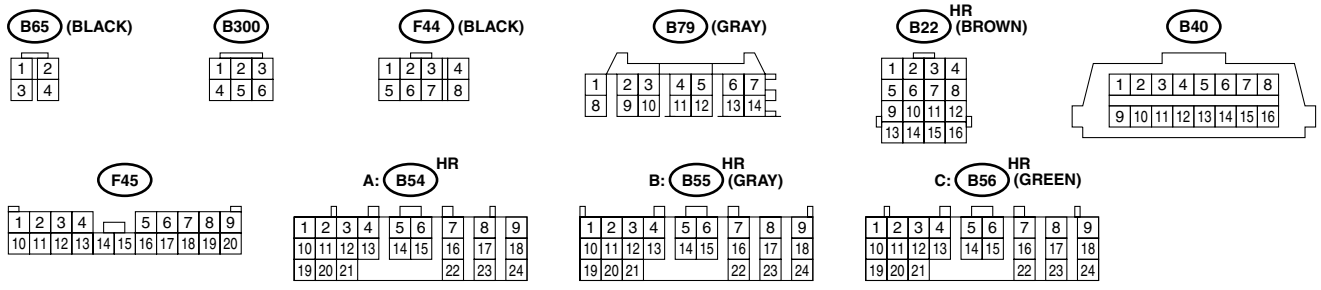
WI-06325


AT(H4)ULWSP-02
AT(H4)ULWSP-02
TO POWER SUPPLY ROUTING
FB-33
M/B FUSE NO. 2
(B)
LR
AT(H4)ULWSP-01 A
LR
GW
C7
A18
SPORTS SHIFT SWITCH
SHIFT
UP
DOWN
5
2
1
3
6
4
B237
OrB
VW
Sb
B
B
B
μ-COM
I/F
I/F
+5V
X6
SPORTS SHIFT BACK LIGHT
DIMMER CIRCUIT
DOOR WARNING SPORTS SHIFT (LCD)
BUZZER
COMBINATION METER
A: i10
C: i12
A26
A25
A24
A21
A17
GY
PB
BrL
OrL
Lg
B
E
REF. TO GND-04
i1
SMJ
B36
O6
N6
M6
L6
K6
C12
C13
C3
C4
C21
B15
B13
B2
B: B55 C: B56 TRANSMISSION CONTROL MODULE

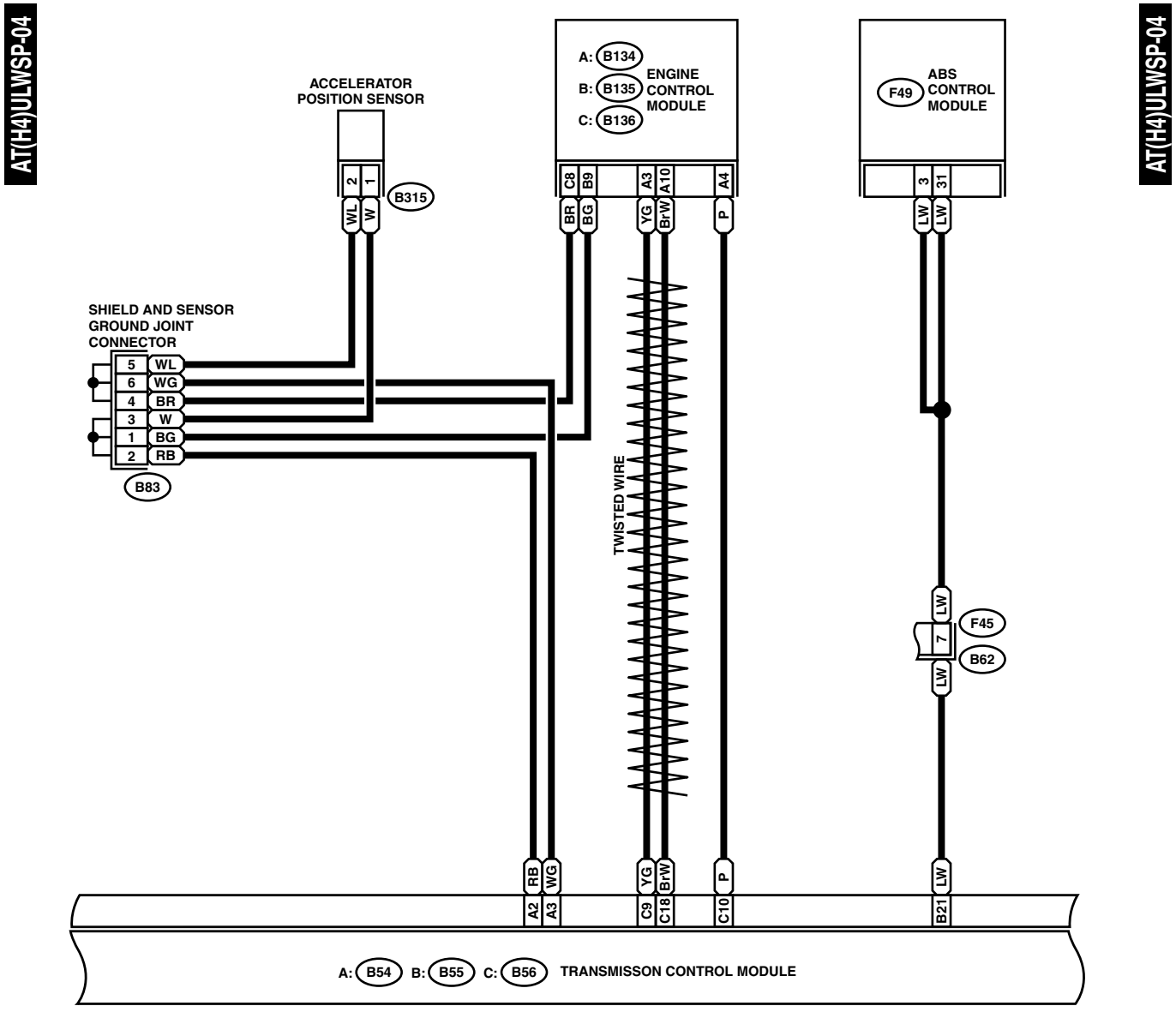

B237 (BLACK)
C: i12 (GREEN)
B: B55 HR (GRAY)
C: B56 HR (GREEN)
A: i10 (GREEN)

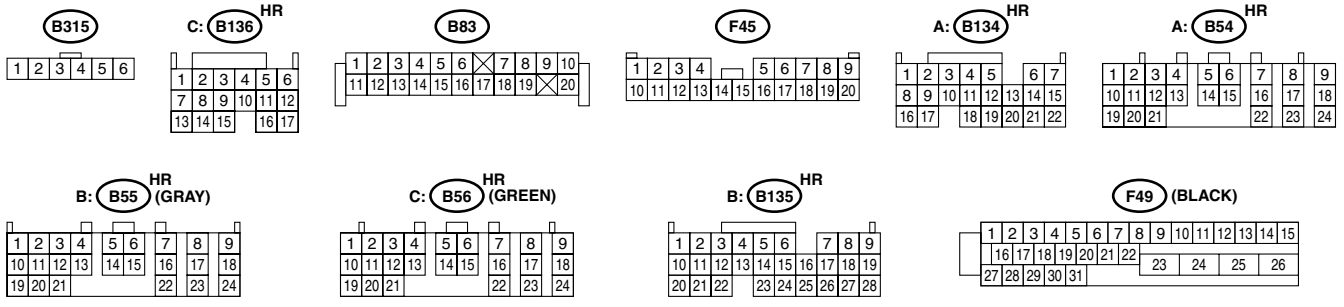
WI-06326


AT(H4)ULWSP-03
AT(H4)ULWSP-03
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
GR
BR
GW
F45
B62
F44
B61
CHECK CONNECTOR
GW 7
VG 12
BL 8
B79
STOP LIGHT SWITCH
2 LY
3 WB
B65
DATA LINK CONNECTOR
BR 1
VG 10
BL 12
BL 13
VW 6
B40
LINE END CHECK CONNECTOR
VW 4
PB 2
B300
B22
E3
E
GE
WB
YR
GR
GR
VG
PB
B12
C1
A23
A24
C15
C24
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE

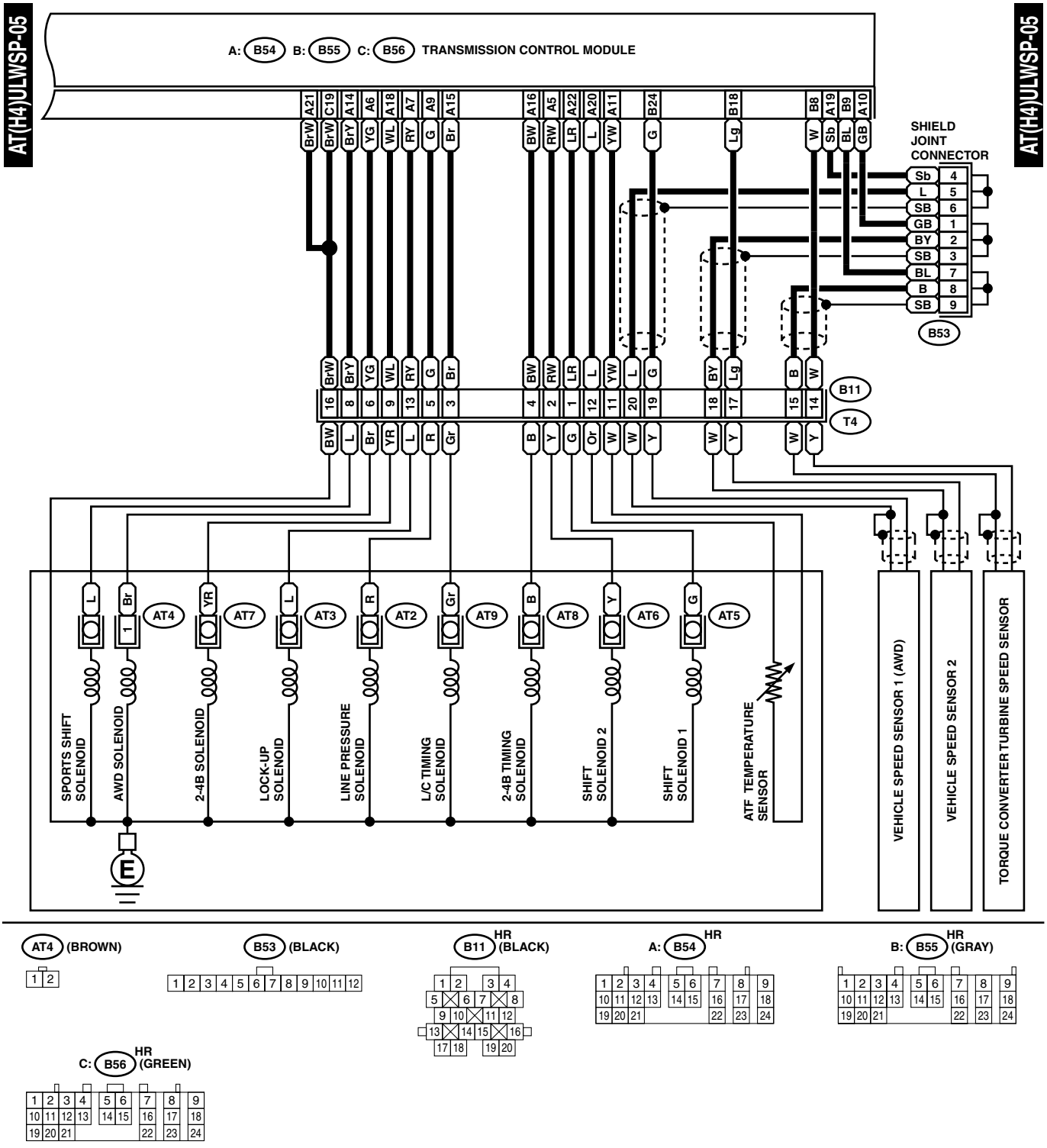

B65 (BLACK)
B300
F44 (BLACK)
B79 (GRAY)
B22 HR (BROWN)
B40
F45
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)

WI-06327


AT(H4)ULWSP-04
AT(H4)ULWSP-04
ACCELERATOR POSITION SENSOR
B315
WL
W
A: B134
B: B135
C: B136
ENGINE CONTROL MODULE
C8 B9 A3 A10 A4
BR BG YG BrW P
F49
ABS CONTROL MODULE
3 31
LW LW
SHIELD AND SENSOR GROUND JOINT CONNECTOR
5 WL
6 WG
4 BR
3 W
1 BG
2 RB
B83
TWISTED WIRE
LW
F45
7
B62
LW
RB WG YG BrW P LW
A2 A3 C9 C18 C10 B21
A: B54 B: B55 C: B56 TRANSMISSON CONTROL MODULE

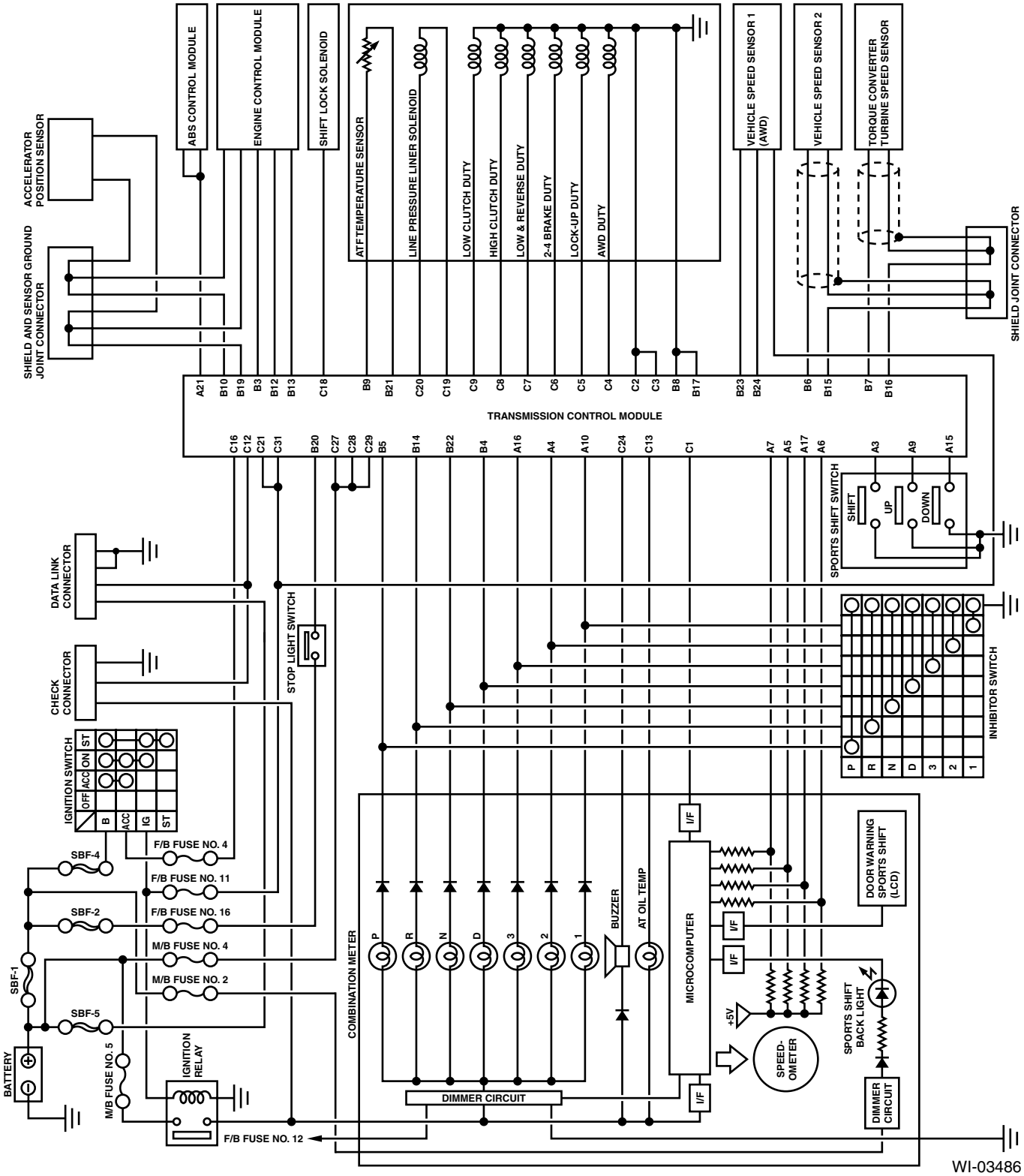

B315
C: B136 HR
B83
F45
A: B134 HR
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)
B: B135 HR
F49 (BLACK)

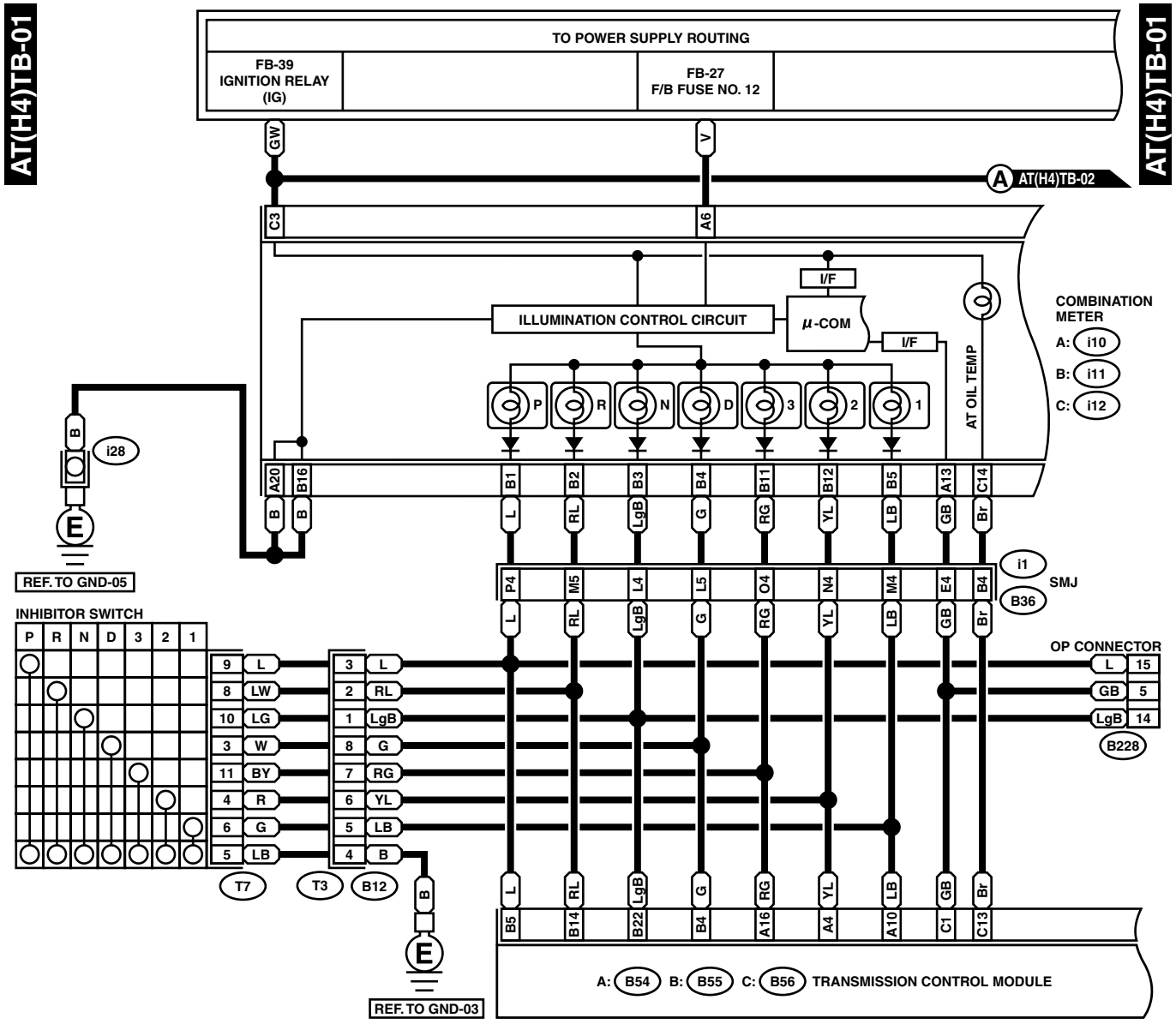
WI-06328

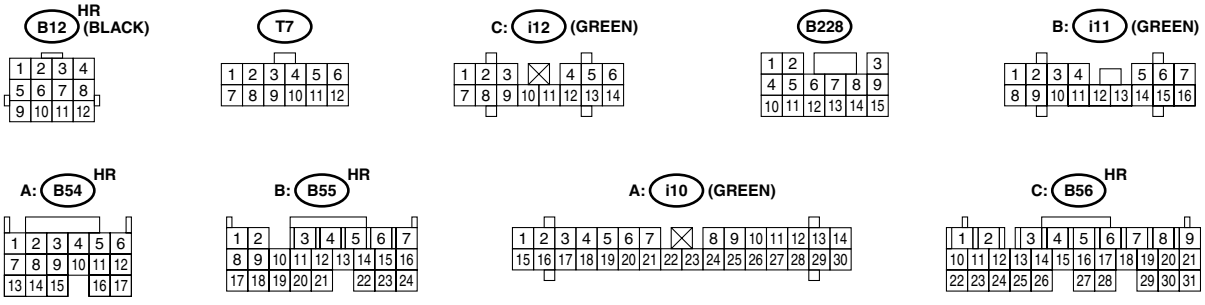

AT(H4)ULWSP-05
AT(H4)ULWSP-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B53
B11
T4
SPORTS SHIFT SOLENOID
AWD SOLENOID
2-4B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT4 (BROWN)
B53 (BLACK)
B11 HR (BLACK)
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)

WI-06329

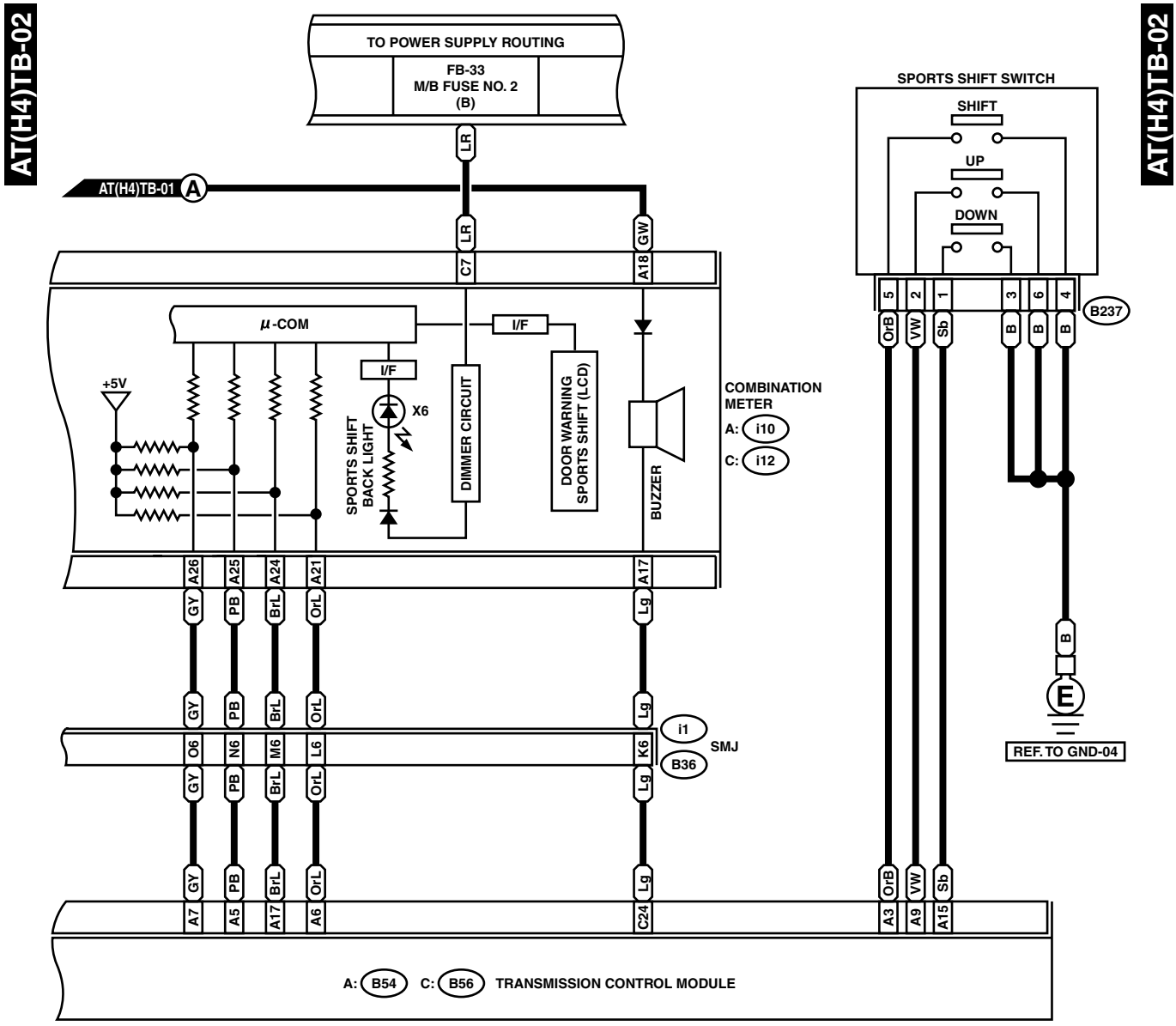
5. 4-CYLINDER TURBO ENGINE

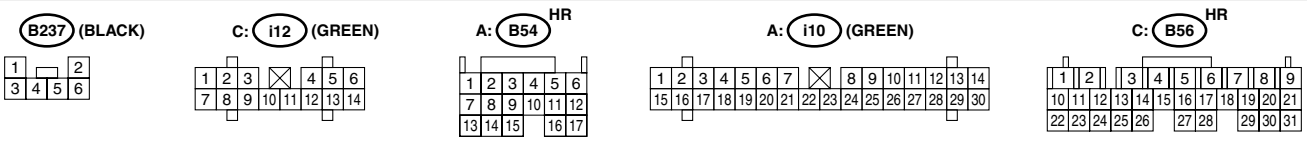



AT(H4)TB-01
AT(H4)TB-01
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
FB-27
F/B FUSE NO. 12
GW
V
A AT(H4)TB-02
C3
A6
I/F
ILLUMINATION CONTROL CIRCUIT
μ-COM
I/F
AT OIL TEMP
COMBINATION METER
A: i10
B: i11
C: i12
P
R
N
D
3
2
1
i28
B
E
REF. TO GND-05
A20
B16
B1
B2
B3
B4
B11
B12
B5
A13
C14
L
RL
LgB
G
RG
YL
LB
GB
Br
i1
SMJ
B36
P4
M5
L4
L5
O4
N4
M4
E4
B4
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 L
2 RL
1 LgB
8 G
7 RG
6 YL
5 LB
4 B
T7
T3
B12
OP CONNECTOR
L 15
GB 5
LgB 14
B228
B5
B14
B22
B4
A16
A4
A10
C1
C13
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND-03

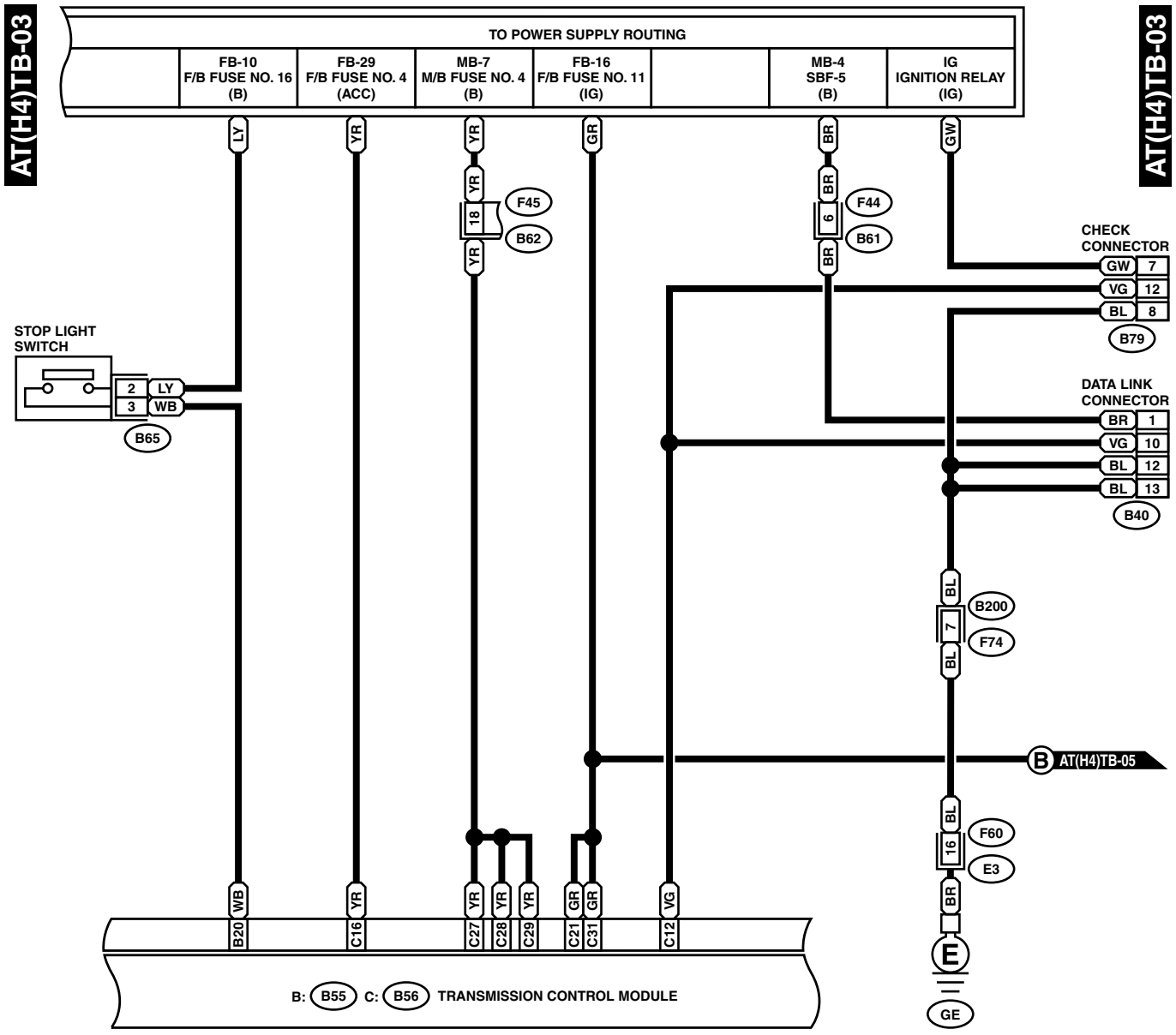

B12 HR (BLACK)
T7
C: i12 (GREEN)
B228
B: i11 (GREEN)
A: B54 HR
B: B55 HR
A: i10 (GREEN)
C: B56 HR

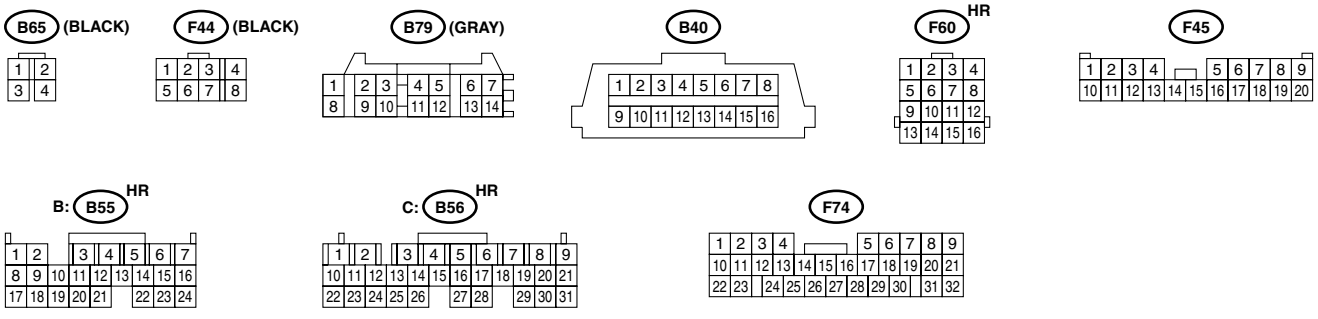
WI-06330


AT(H4)TB-02
AT(H4)TB-02
TO POWER SUPPLY ROUTING
FB-33
M/B FUSE NO. 2
(B)
LR
AT(H4)TB-01 A
LR
GW
C7
A18
SPORTS SHIFT SWITCH
SHIFT
UP
DOWN
5
2
1
3
6
4
B237
OrB
VW
Sb
B
B
B
μ-COM
I/F
I/F
+5V
X6
SPORTS SHIFT BACK LIGHT
DIMMER CIRCUIT
DOOR WARNING SPORTS SHIFT (LCD)
BUZZER
COMBINATION METER
A: i10
C: i12
A26
A25
A24
A21
A17
GY
PB
BrL
OrL
Lg
B
GY
PB
BrL
OrL
Lg
i1
O6
N6
M6
L6
K6
SMJ
B36
GY
PB
BrL
OrL
Lg
GY
PB
BrL
OrL
Lg
OrB
VW
Sb
A7
A5
A17
A6
C24
A3
A9
A15
REF. TO GND-04
A: B54 C: B56 TRANSMISSION CONTROL MODULE

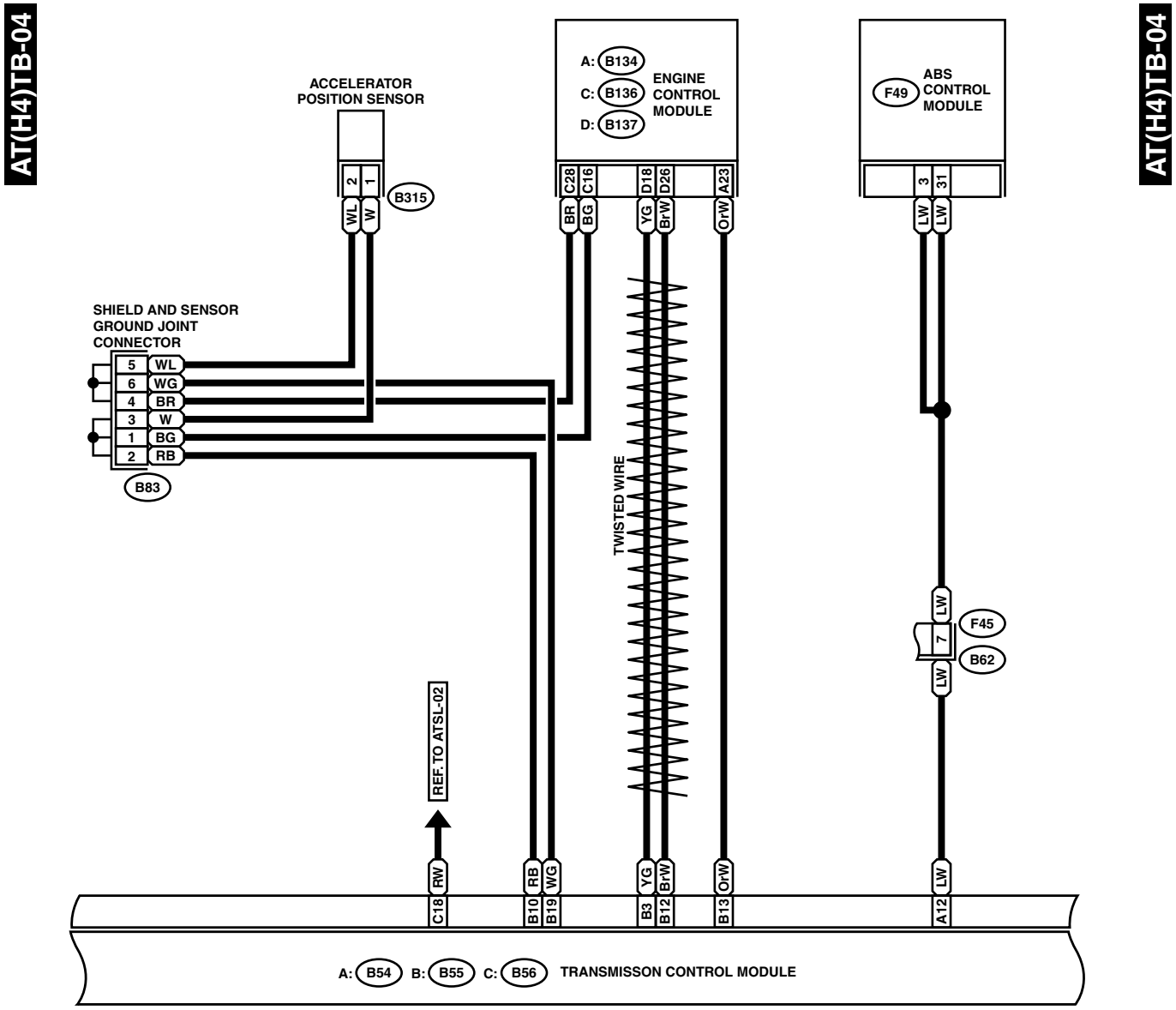

B237 (BLACK)
C: i12 (GREEN)
A: B54 HR
A: i10 (GREEN)
C: B56 HR

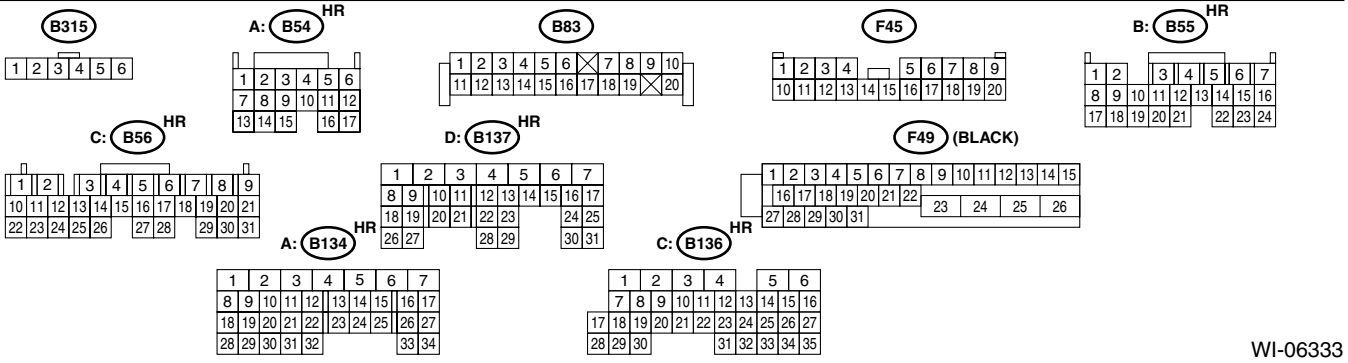
WI-06331


AT(H4)TB-03
AT(H4)TB-03
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
FB-29
F/B FUSE NO. 4
(ACC)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
YR
GR
BR
GW
YR
18
F45
B62
BR
6
F44
B61
CHECK
CONNECTOR
GW 7
VG 12
BL 8
B79
STOP LIGHT
SWITCH
2 LY
3 WB
B65
DATA LINK
CONNECTOR
BR 1
VG 10
BL 12
BL 13
B40
BL
B200
7
F74
BL
B AT(H4)TB-05
BL
16
F60
E3
BR
E
GE
WB
YR
YR
YR
GR
GR
VG
B20
C16
C27
C28
C29
C21
C31
C12
B: B55 C: B56 TRANSMISSION CONTROL MODULE

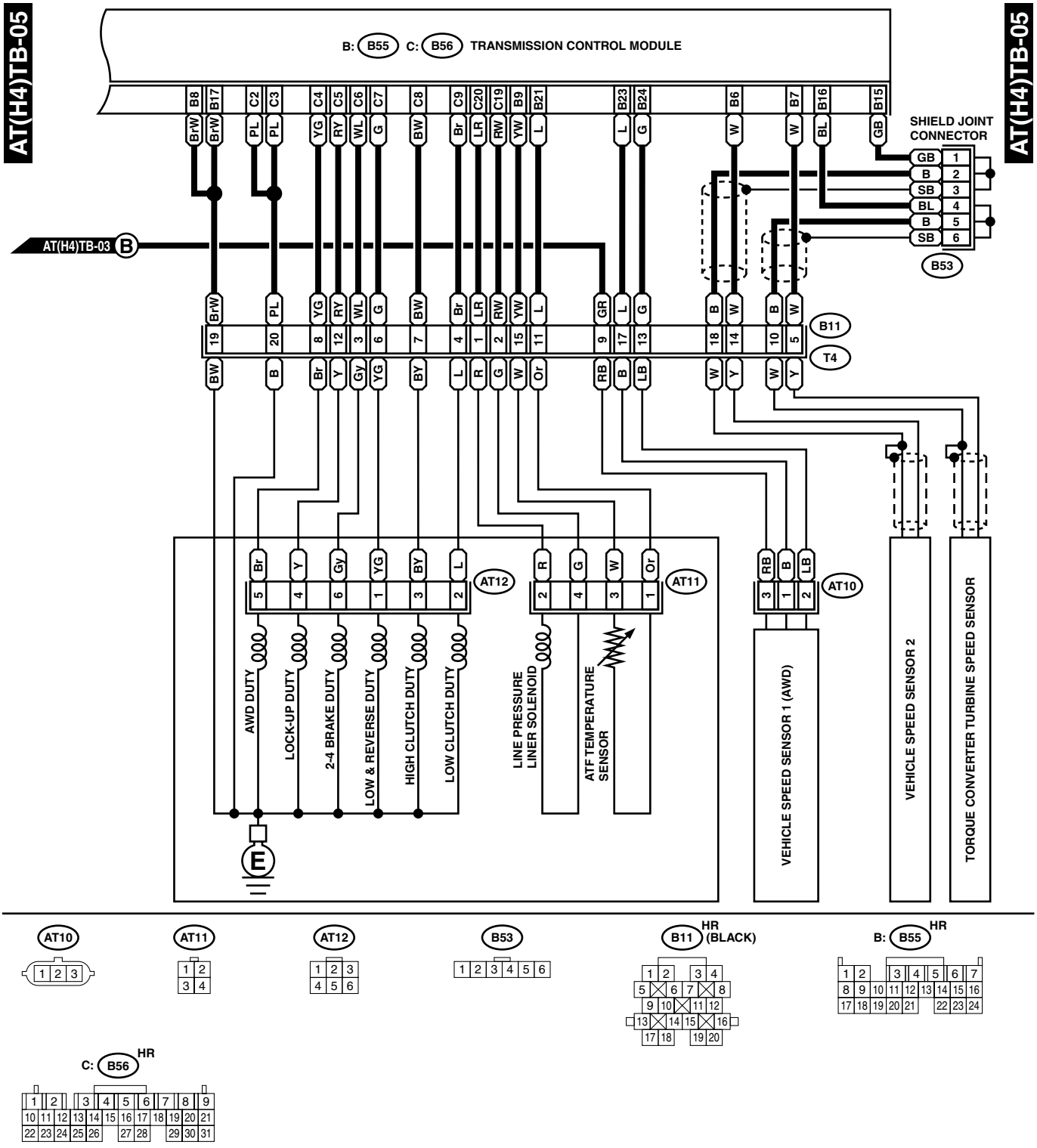

B65 (BLACK)
F44 (BLACK)
B79 (GRAY)
B40
F60 HR
F45
B: B55 HR
C: B56 HR
F74

WI-06332


AT(H4)TB-04
AT(H4)TB-04
ACCELERATOR POSITION SENSOR
2
1
B315
WL
W
A: B134
C: B136
D: B137
ENGINE CONTROL MODULE
C28
C16
D18
D26
A23
BR
BG
YG
BrW
OrW
F49
ABS CONTROL MODULE
3
31
LW
LW
SHIELD AND SENSOR GROUND JOINT CONNECTOR
5 WL
6 WG
4 BR
3 W
1 BG
2 RB
B83
TWISTED WIRE
LW
7
F45
B62
LW
REF. TO ATSL-02
RW
RB
WG
YG
BrW
OrW
LW
C18
B10
B19
B3
B12
B13
A12
A: B54
B: B55
C: B56
TRANSMISSON CONTROL MODULE

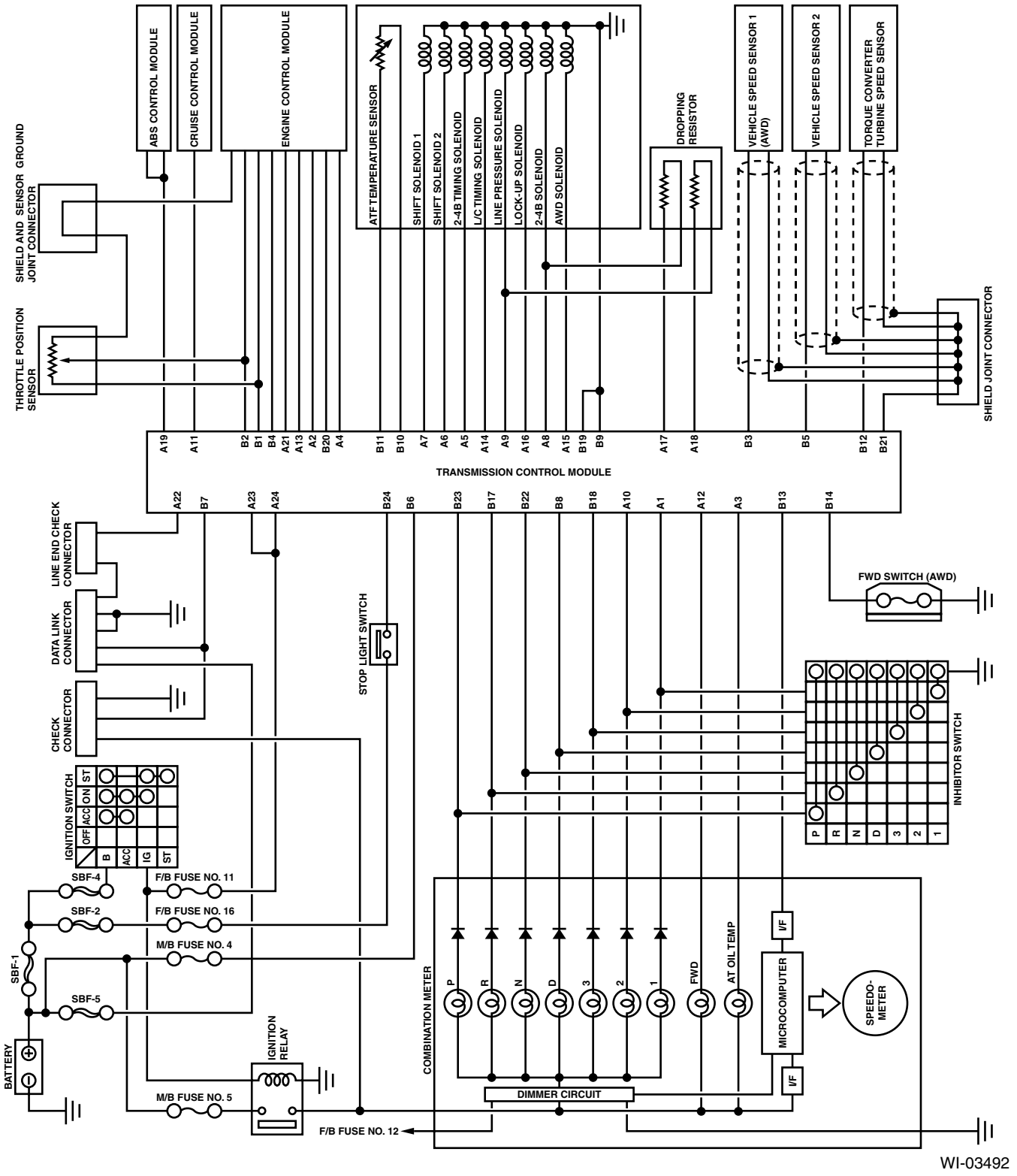

B315
A: B54 HR
B83
F45
B: B55 HR
C: B56 HR
D: B137 HR
F49 (BLACK)
A: B134 HR
C: B136 HR

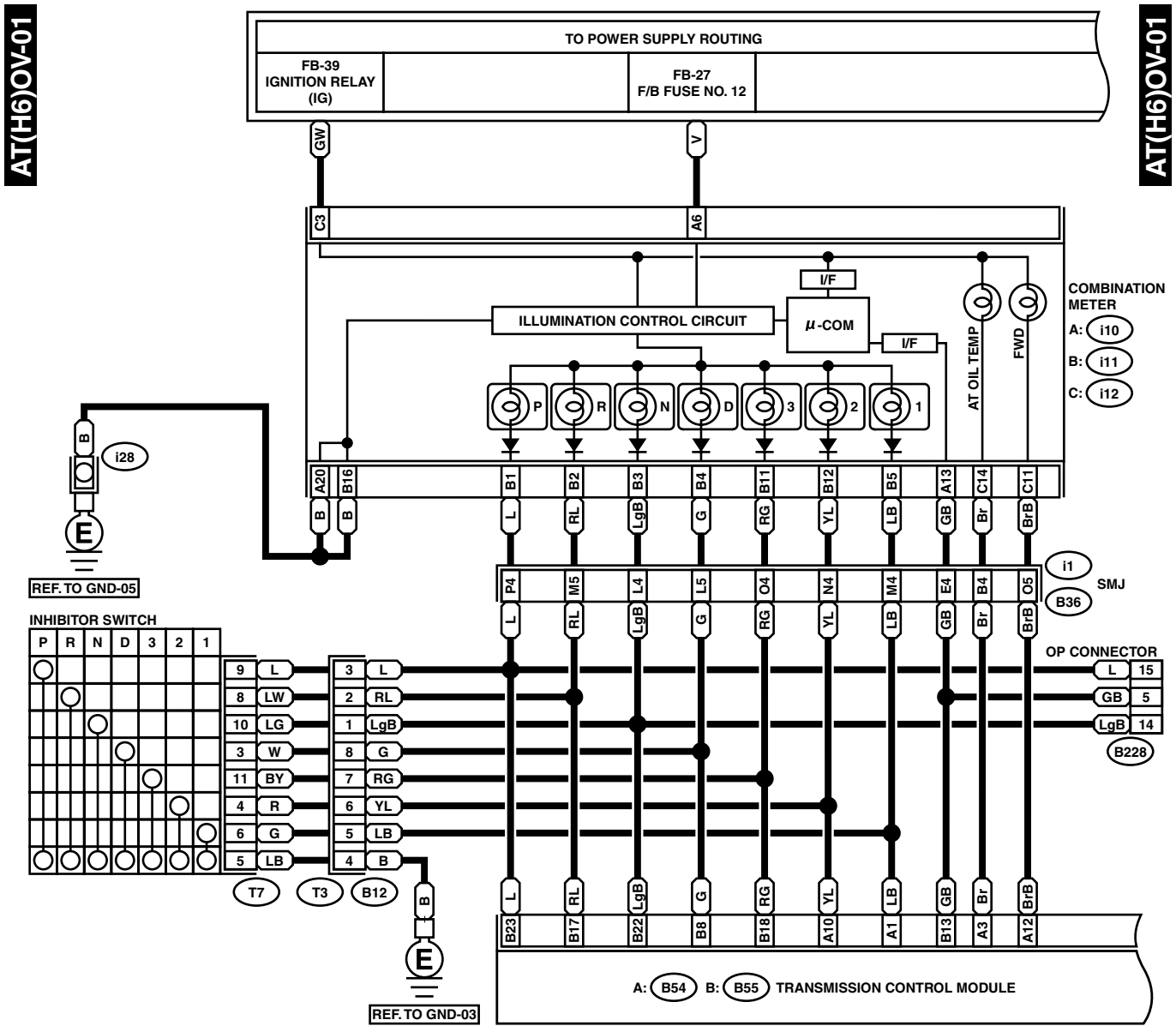
WI-06333

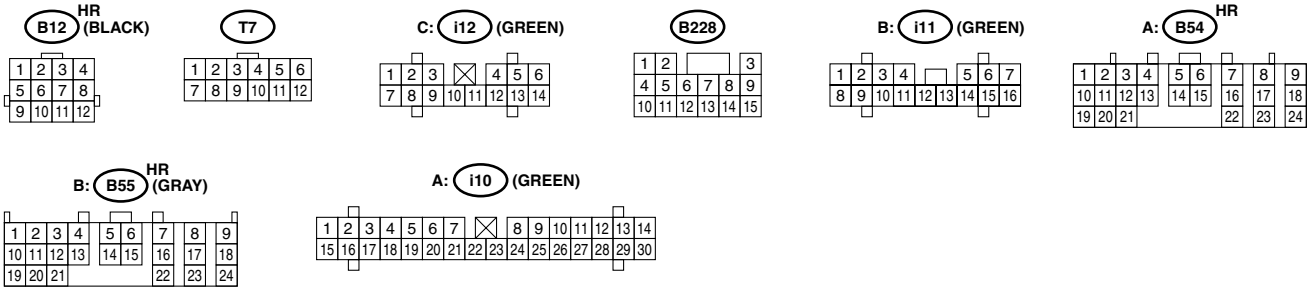

AT(H4)TB-05
AT(H4)TB-05
B: B55 C: B56 TRANSMISSION CONTROL MODULE
B8 B17 C2 C3 C4 C5 C6 C7 C8 C9 C20 C19 B9 B21 B23 B24 B6 B7 B16 B15
BrW BrW PL PL YG RY WL G BW Br LR RW YW L L G W W BL GB
SHIELD JOINT CONNECTOR
GB 1
B 2
SB 3
BL 4
B 5
SB 6
B53
AT(H4)TB-03 B
BrW PL YG RY WL G BW Br LR RW YW L GR L G B W B W
19 20 8 12 3 6 7 4 1 2 15 11 9 17 13 18 14 10 5
B11
T4
BW B Br Y Gy YG BY L R G W Or RB B LB W Y W Y
AT12
5 4 6 1 3 2
Br Y Gy YG BY L
AT11
2 4 3 1
R G W Or
AT10
3 1 2
RB B LB
AWD DUTY
LOCK-UP DUTY
2-4 BRAKE DUTY
LOW & REVERSE DUTY
HIGH CLUTCH DUTY
LOW CLUTCH DUTY
LINE PRESSURE LINER SOLENOID
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT10
1 2 3
AT11
1 2
3 4
AT12
1 2 3
4 5 6
B53
1 2 3 4 5 6
B11 HR (BLACK)
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B: B55 HR
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
C: B56 HR
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31

WI-06334

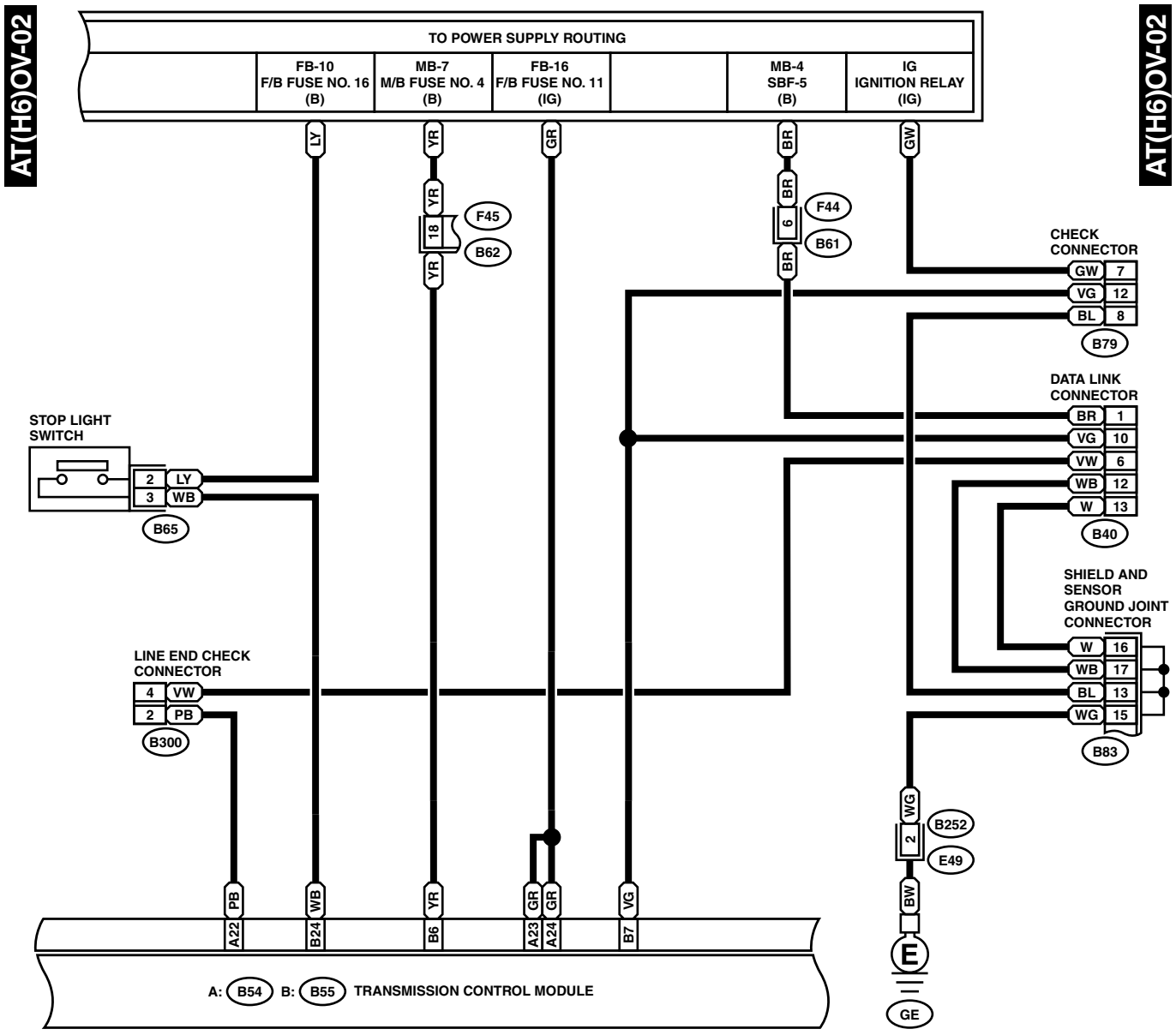
6. EXCEPT 6-CYLINDER ENGINE WITH VDC SYSTEM

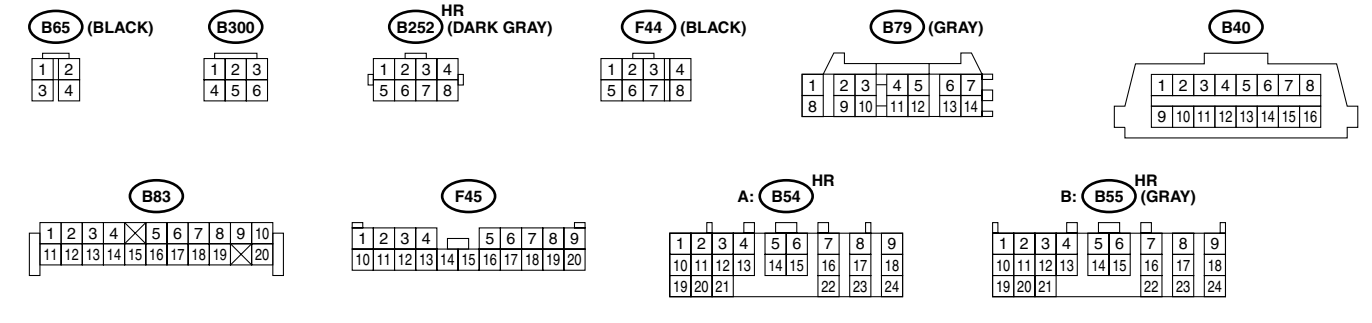



AT(H6)OV-01
AT(H6)OV-01
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
FB-27
F/B FUSE NO. 12
GW
V
C3
A6
I/F
ILLUMINATION CONTROL CIRCUIT
μ-COM
I/F
AT OIL TEMP
FWD
COMBINATION METER
A: i10
B: i11
C: i12
P
R
N
D
3
2
1
i28
B
E
REF. TO GND-05
A20
B16
B1
B2
B3
B4
B11
B12
B5
A13
C14
C11
L
RL
LgB
G
RG
YL
LB
GB
Br
BrB
i1
SMJ
B36
P4
M5
L4
L5
O4
N4
M4
E4
B4
O5
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 L
2 RL
1 LgB
8 G
7 RG
6 YL
5 LB
4 B
T7
T3
B12
OP CONNECTOR
L 15
GB 5
LgB 14
B228
B23
B17
B22
B8
B18
A10
A1
B13
A3
A12
A: B54 B: B55 TRANSMISSION CONTROL MODULE
REF. TO GND-03

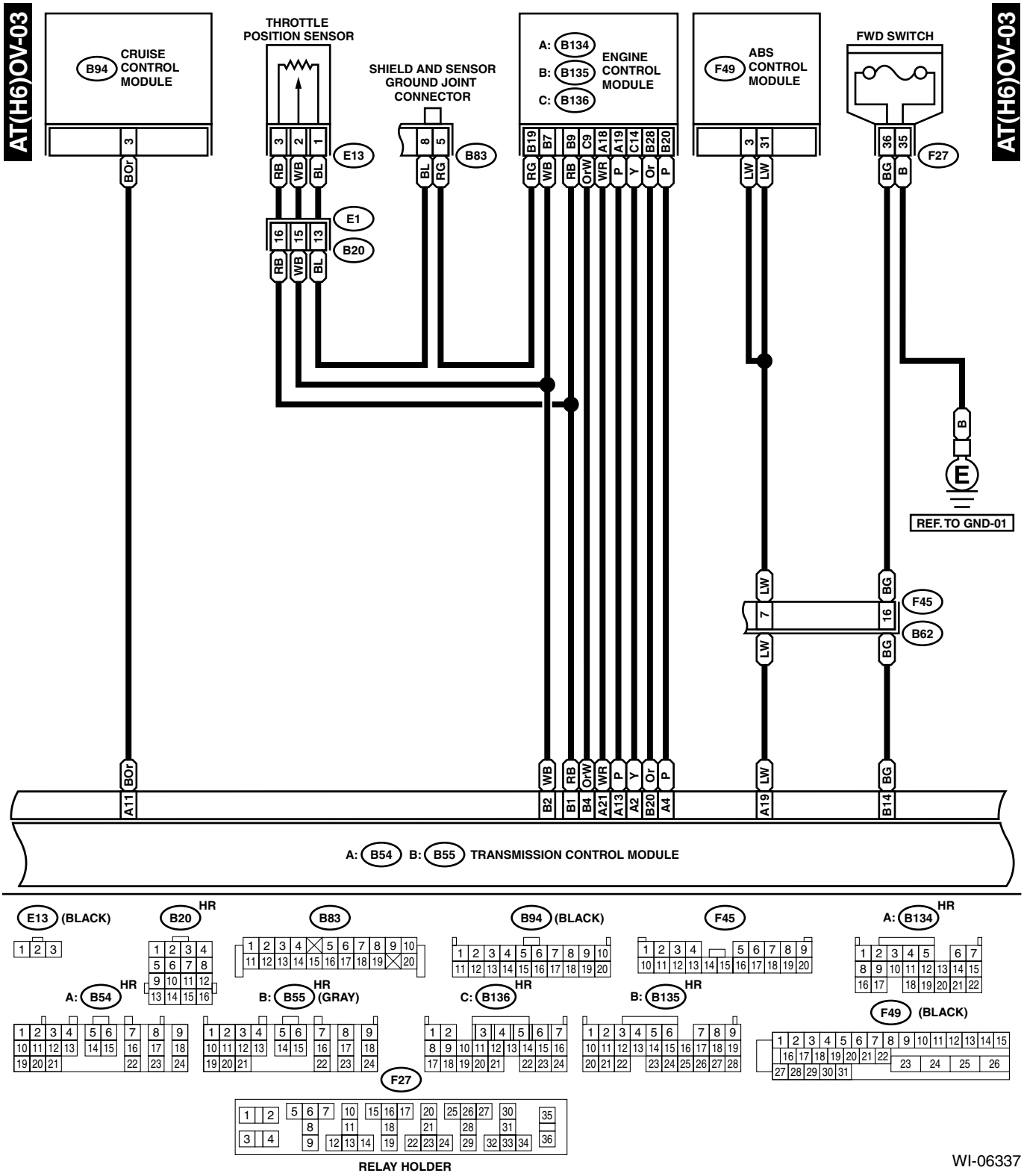

B12 HR (BLACK)
T7
C: i12 (GREEN)
B228
B: i11 (GREEN)
A: B54 HR
B: B55 HR (GRAY)
A: i10 (GREEN)

WI-06335

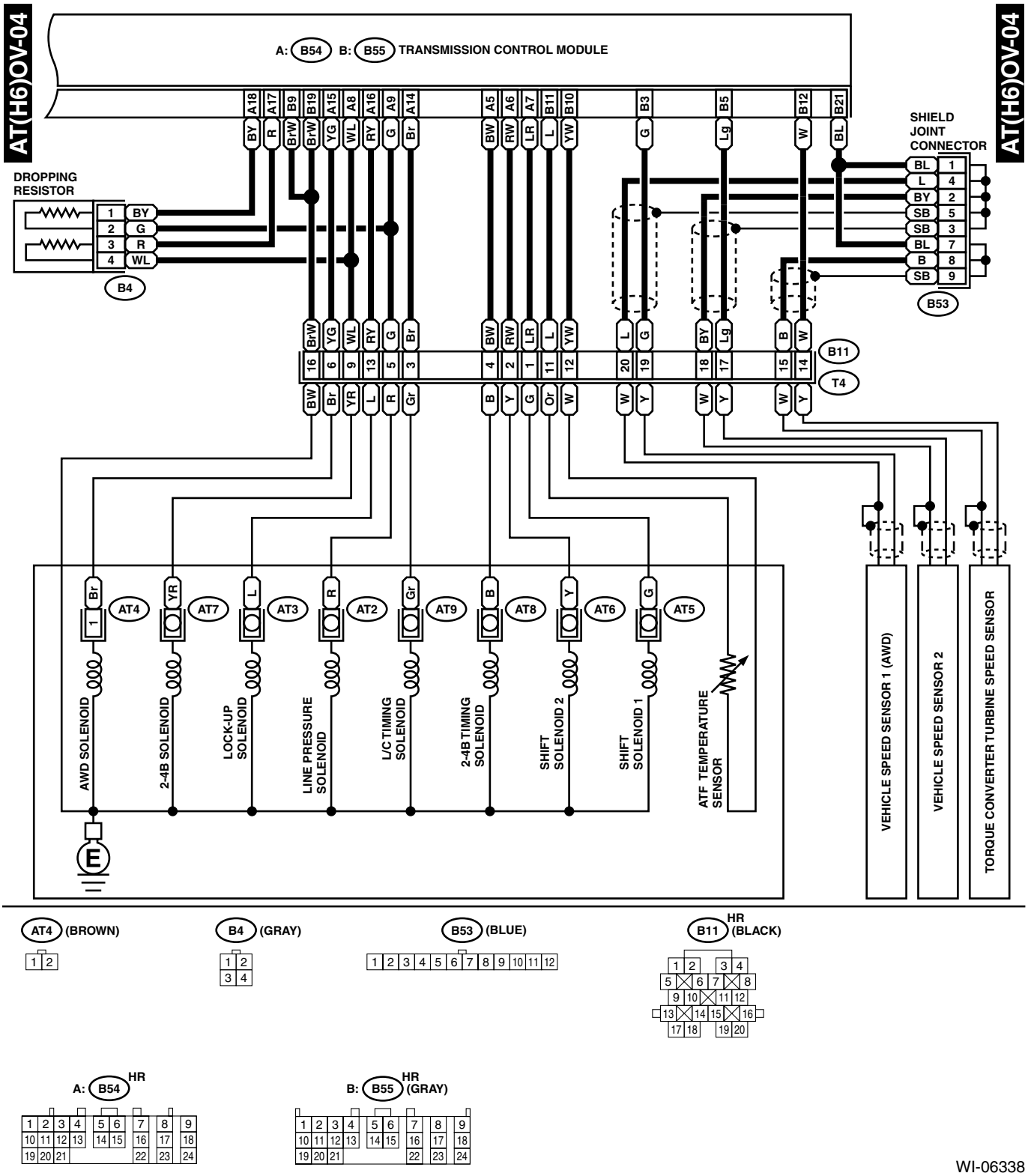

AT(H6)OV-02
AT(H6)OV-02
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
GR
BR
GW
F45
B62
F44
B61
CHECK CONNECTOR
GW 7
VG 12
BL 8
B79
DATA LINK CONNECTOR
BR 1
VG 10
VW 6
WB 12
W 13
B40
STOP LIGHT SWITCH
2 LY
3 WB
B65
SHIELD AND SENSOR GROUND JOINT CONNECTOR
W 16
WB 17
BL 13
WG 15
B83
LINE END CHECK CONNECTOR
4 VW
2 PB
B300
WG
B252
E49
BW
E
GE
PB
WB
YR
GR
GR
VG
A22
B24
B6
A23
A24
B7
A: B54 B: B55 TRANSMISSION CONTROL MODULE


B65 (BLACK)
B300
B252 HR (DARK GRAY)
F44 (BLACK)
B79 (GRAY)
B40
B83
F45
A: B54 HR
B: B55 HR (GRAY)

WI-06336

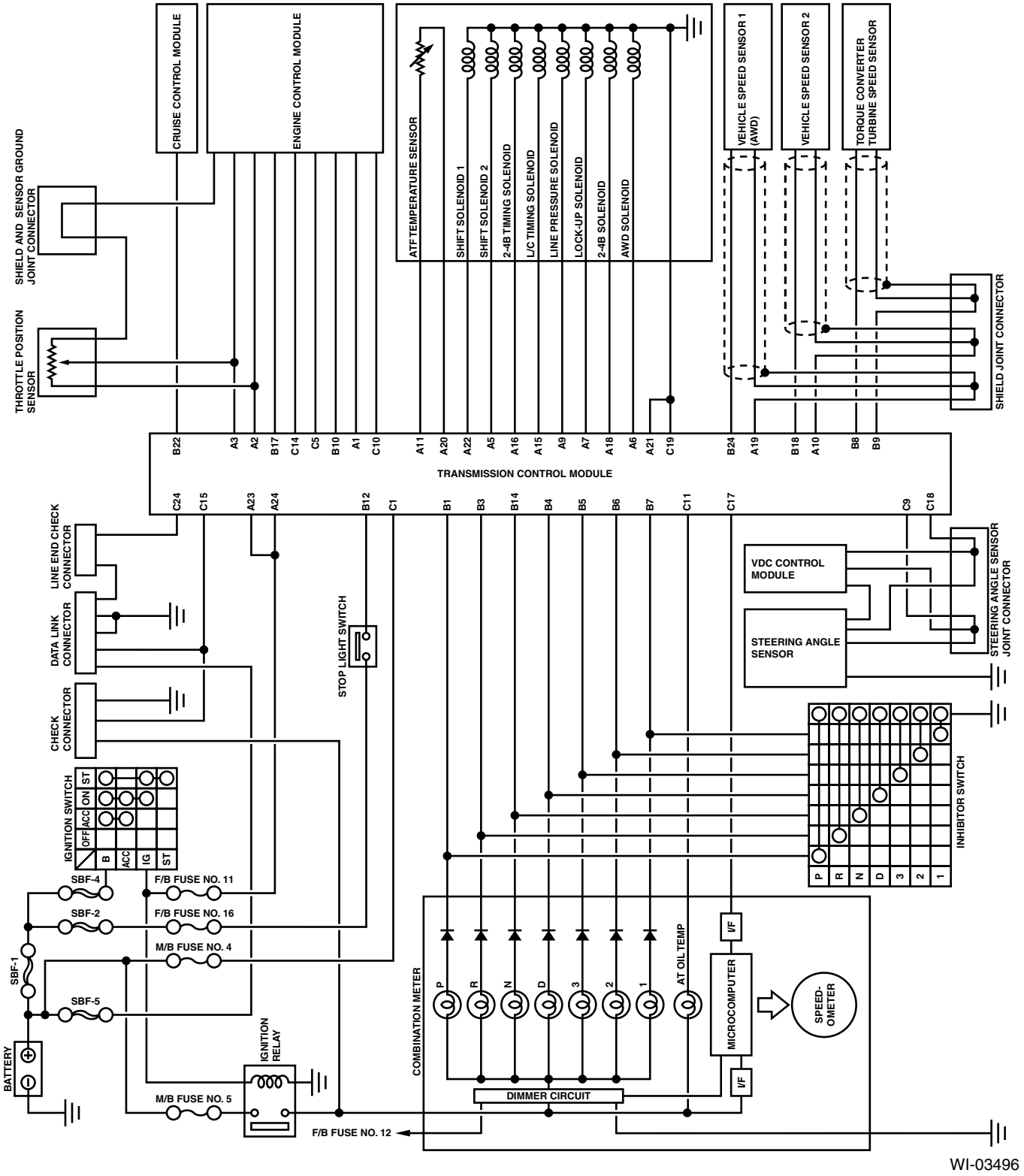

AT(H6)OV-03
CRUISE CONTROL MODULE
B94
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134
B: B135
C: B136
ENGINE CONTROL MODULE
F49
ABS CONTROL MODULE
FWD SWITCH
E13
B83
E1
B20
F27
B
E
REF. TO GND-01
F45
B62
A: B54 B: B55 TRANSMISSION CONTROL MODULE
E13 (BLACK)
B20 HR
B83
B94 (BLACK)
F45
A: B134 HR
A: B54 HR
B: B55 HR (GRAY)
C: B136 HR
B: B135 HR
F49 (BLACK)
F27
RELAY HOLDER

WI-06337

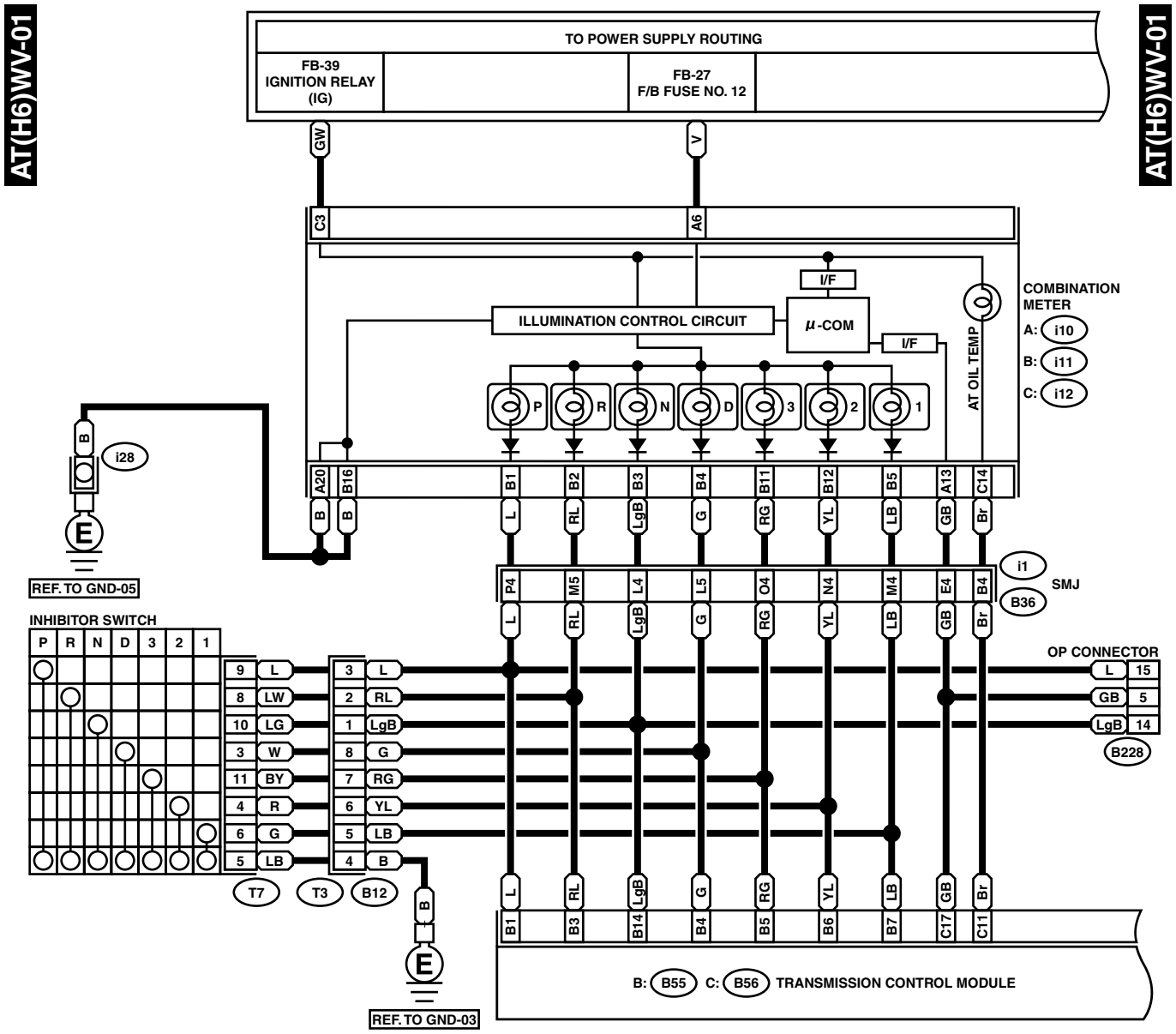

AT(H6)OV-04
AT(H6)OV-04
A: B54 B: B55 TRANSMISSION CONTROL MODULE
A18 A17 B9 B19 A15 A8 A16 A9 A14 A5 A6 A7 B11 B10 B3 B5 B12 B21
BY R BrW BrW YG WL RY G Br BW RW LR L YW G Lg W BL
SHIELD JOINT CONNECTOR
BL 1
L 4
BY 2
SB 5
SB 3
BL 7
B 8
SB 9
B53
DROPPING RESISTOR
1 BY
2 G
3 R
4 WL
B4
BrW YG WL RY G Br BW RW LR L YW L G BY Lg B W
16 6 9 13 5 3 4 2 1 11 12 20 19 18 17 15 14
B11
T4
BW Br YR L R Gr B Y G Or W W Y W Y W Y
Br 1 AT4
YR AT7
L AT3
R AT2
Gr AT9
B AT8
Y AT6
G AT5
AWD SOLENOID
2-4B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
E
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT4 (BROWN)
1 2
B4 (GRAY)
1 2
3 4
B53 (BLUE)
1 2 3 4 5 6 7 8 9 10 11 12
B11 HR (BLACK)
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
A: B54 HR
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24
B: B55 HR (GRAY)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24

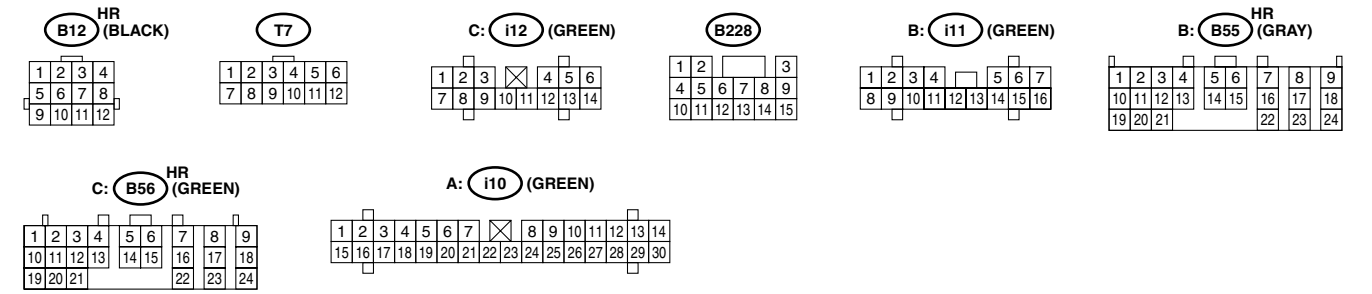
WI-06338

7. 6-CYLINDER ENGINE WITH VDC SYSTEM

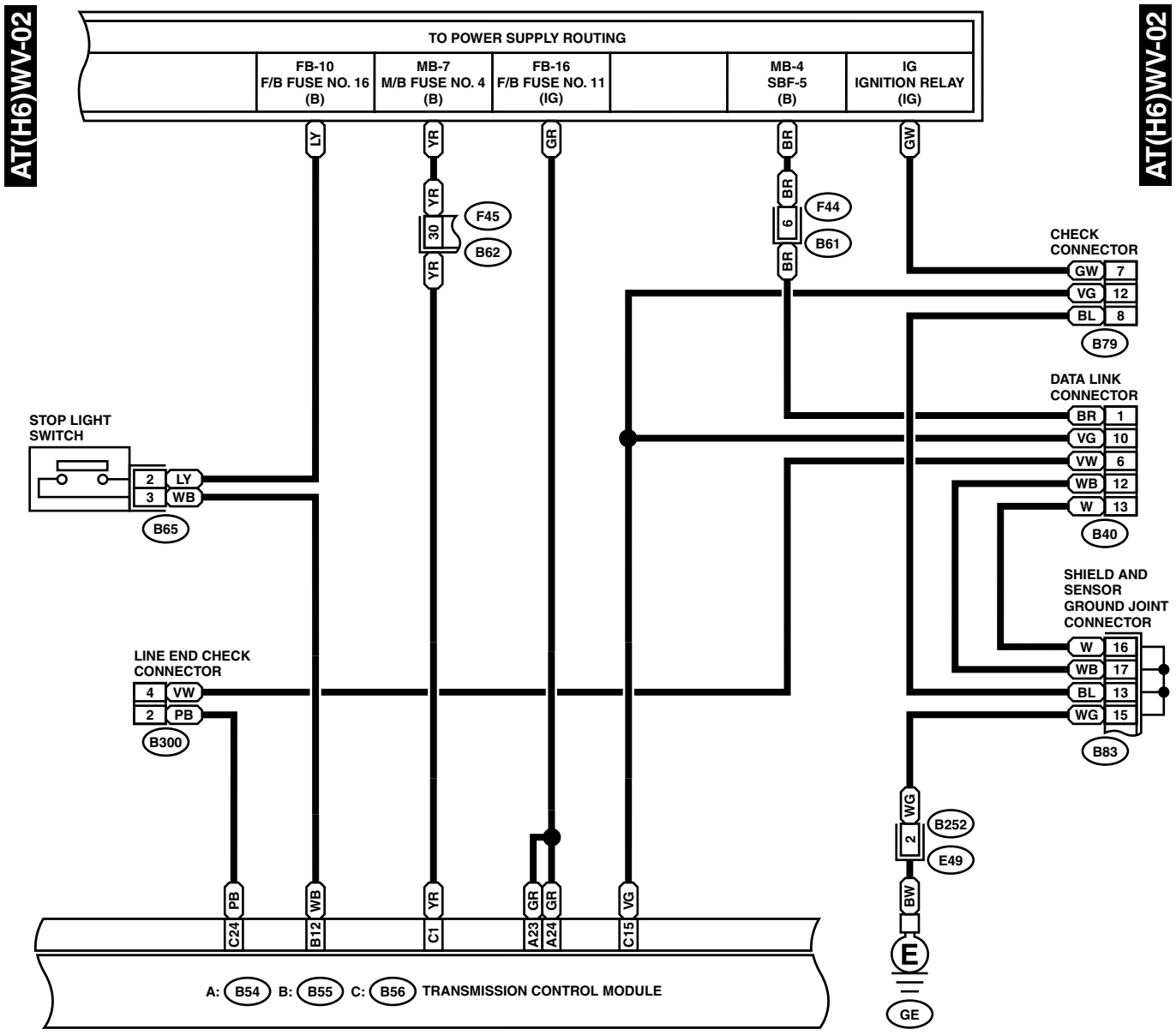


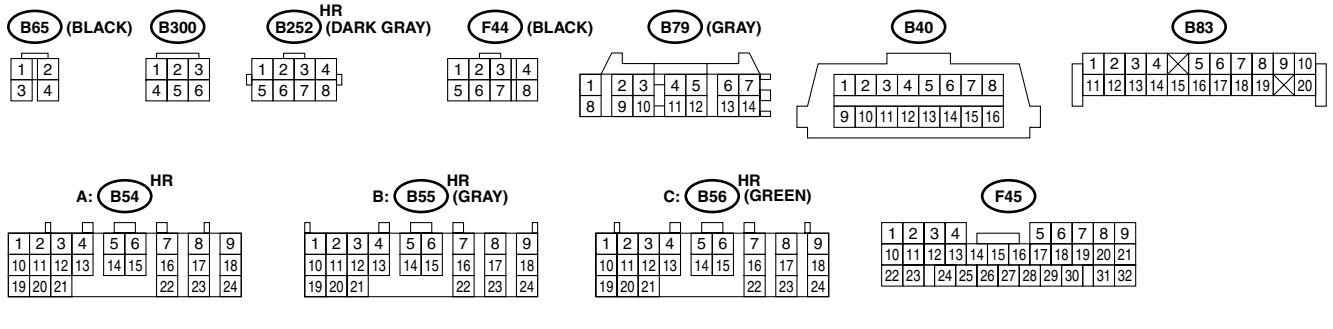
WI-03496


AT(H6)WV-01
AT(H6)WV-01
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
FB-27
F/B FUSE NO. 12
GW
V
C3
A6
I/F
ILLUMINATION CONTROL CIRCUIT
μ-COM
I/F
AT OIL TEMP
COMBINATION METER
A: i10
B: i11
C: i12
P
R
N
D
3
2
1
B
i28
E
REF. TO GND-05
A20
B16
B1
B2
B3
B4
B11
B12
B5
A13
C14
L
RL
LgB
G
RG
YL
LB
GB
Br
i1
SMJ
B36
P4
M5
L4
L5
O4
N4
M4
E4
B4
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 L
2 RL
1 LgB
8 G
7 RG
6 YL
5 LB
4 B
T7
T3
B12
OP CONNECTOR
L 15
GB 5
LgB 14
B228
B1
B3
B14
B4
B5
B6
B7
C17
C11
B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND-03

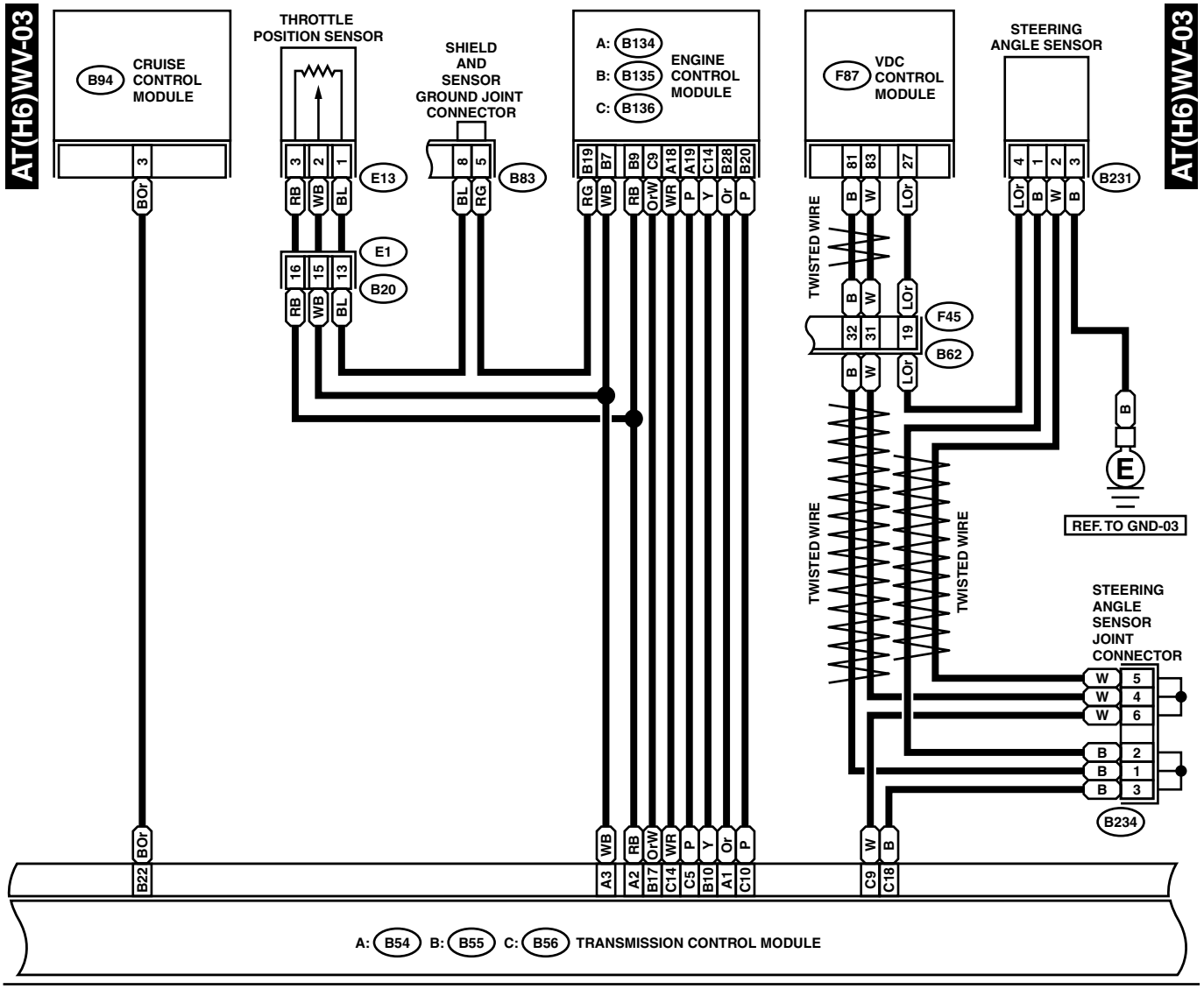

B12 HR (BLACK)
T7
C: i12 (GREEN)
B228
B: i11 (GREEN)
B: B55 HR (GRAY)
C: B56 HR (GREEN)
A: i10 (GREEN)

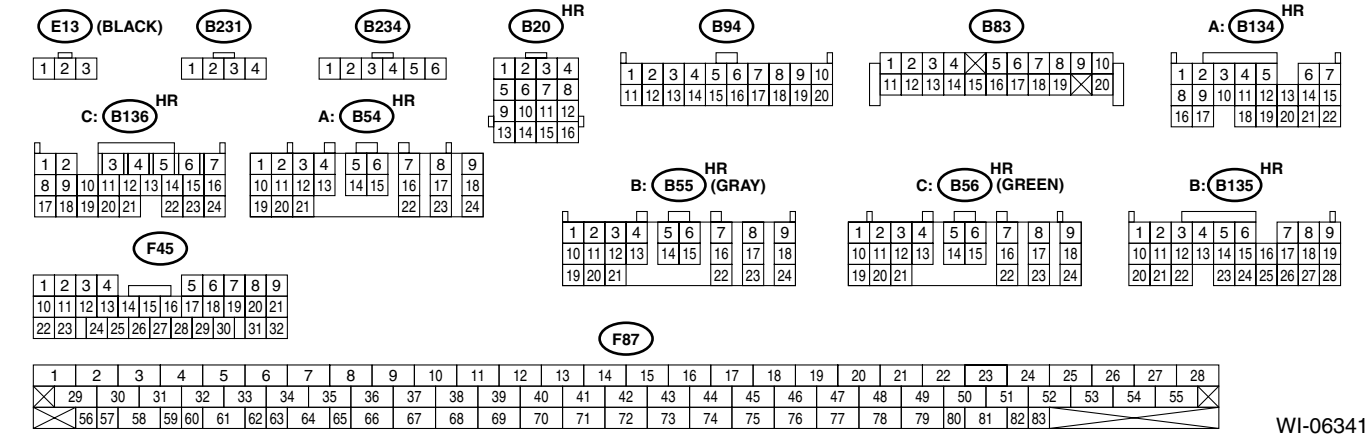
WI-06339


AT(H6)WV-02
AT(H6)WV-02
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-7
M/B FUSE NO. 4
(B)
FB-16
F/B FUSE NO. 11
(IG)
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
LY
YR
GR
BR
GW
F45
B62
F44
B61
CHECK CONNECTOR
B79
DATA LINK CONNECTOR
B40
STOP LIGHT SWITCH
B65
LINE END CHECK CONNECTOR
B300
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B83
B252
E49
GE
PB
WB
YR
GR
VG
BW
C24
B12
C1
A23
A24
C15
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE

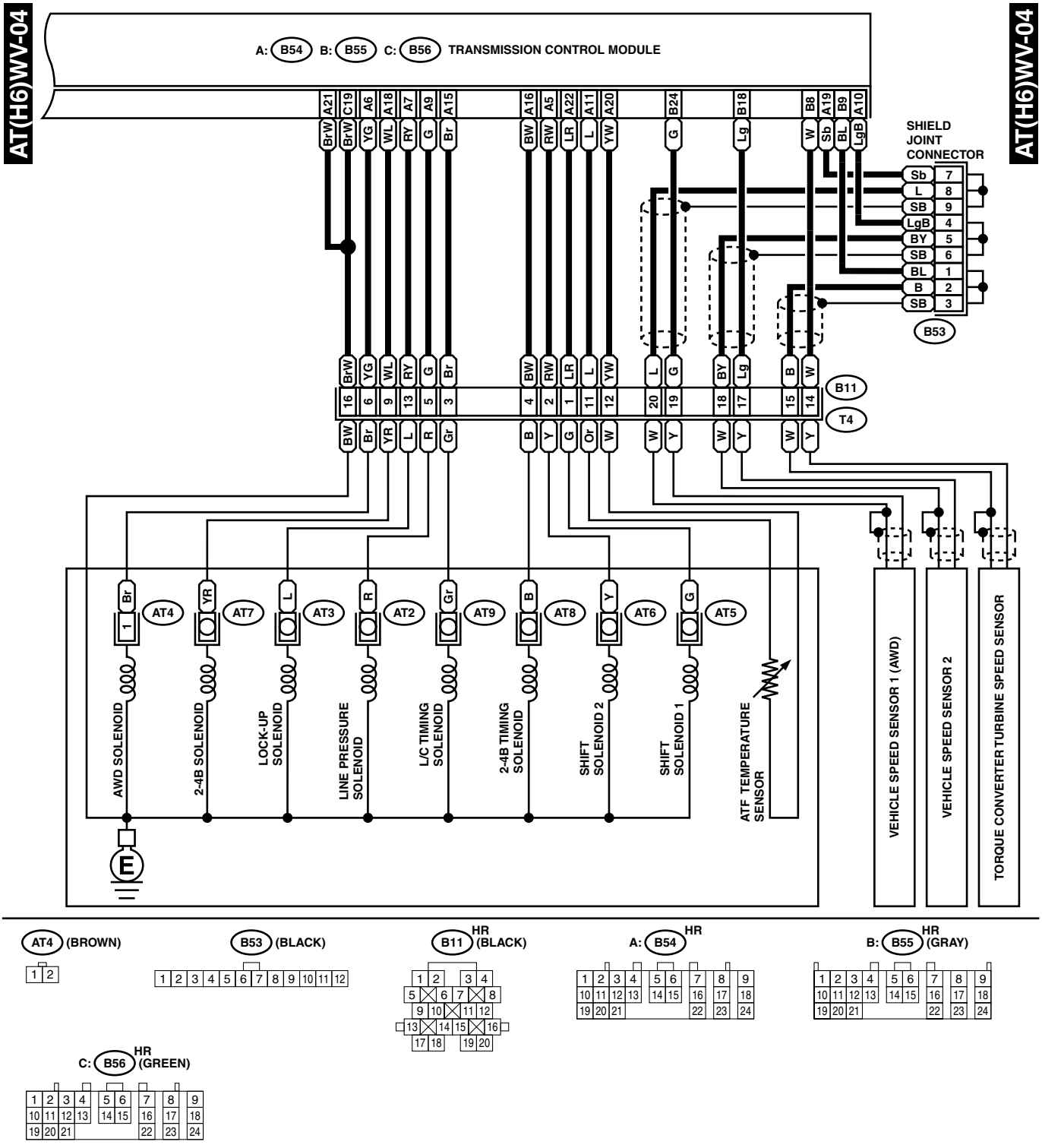

B65 (BLACK)
B300
HR
B252 (DARK GRAY)
F44 (BLACK)
B79 (GRAY)
B40
B83
HR
A: B54
HR
B: B55 (GRAY)
HR
C: B56 (GREEN)
F45

WI-06340


AT(H6)WV-03
AT(H6)WV-03
B94
CRUISE CONTROL MODULE
THROTTLE POSITION SENSOR
E13
E1
B20
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B83
A: B134
B: B135
C: B136
ENGINE CONTROL MODULE
F87
VDC CONTROL MODULE
STEERING ANGLE SENSOR
B231
TWISTED WIRE
F45
B62
REF. TO GND-03
STEERING ANGLE SENSOR JOINT CONNECTOR
B234
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE


E13 (BLACK)
B231
B234
B20
HR
B94
B83
A: B134
C: B136
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
B: B135
F45
F87

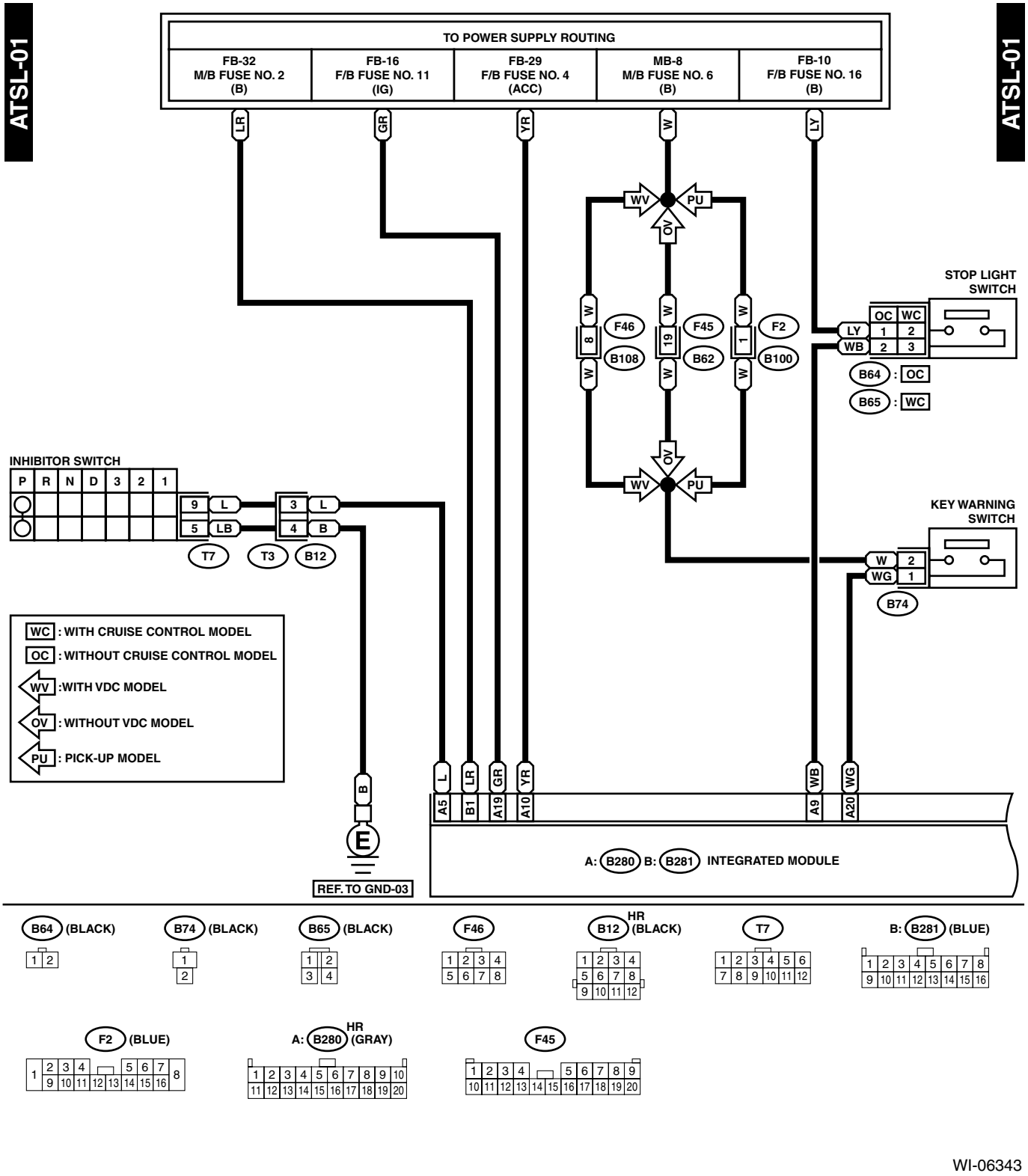
WI-06341


AT(H6)WV-04
AT(H6)WV-04
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
A21 C19 A6 A18 A7 A9 A15 A16 A5 A22 A11 A20 B24 B18 B8 A19 B9 A10
BrW BrW YG WL RY G Br BW RW LR L YW G Lg W Sb BL LgB
SHIELD JOINT CONNECTOR
Sb 7
L 8
SB 9
LgB 4
BY 5
SB 6
BL 1
B 2
SB 3
B53
BrW YG WL RY G Br BW RW LR L YW L G BY Lg B W
16 6 9 13 5 3 4 2 1 11 12 20 19 18 17 15 14
B11
T4
BW Br YR L R Gr B Y G Or W W Y W Y W Y
Br YR L R Gr B Y G
AT4 AT7 AT3 AT2 AT9 AT8 AT6 AT5
AWD SOLENOID
2-4B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT4 (BROWN)
B53 (BLACK)
HR B11 (BLACK)
HR A: B54
HR B: B55 (GRAY)
HR C: B56 (GREEN)

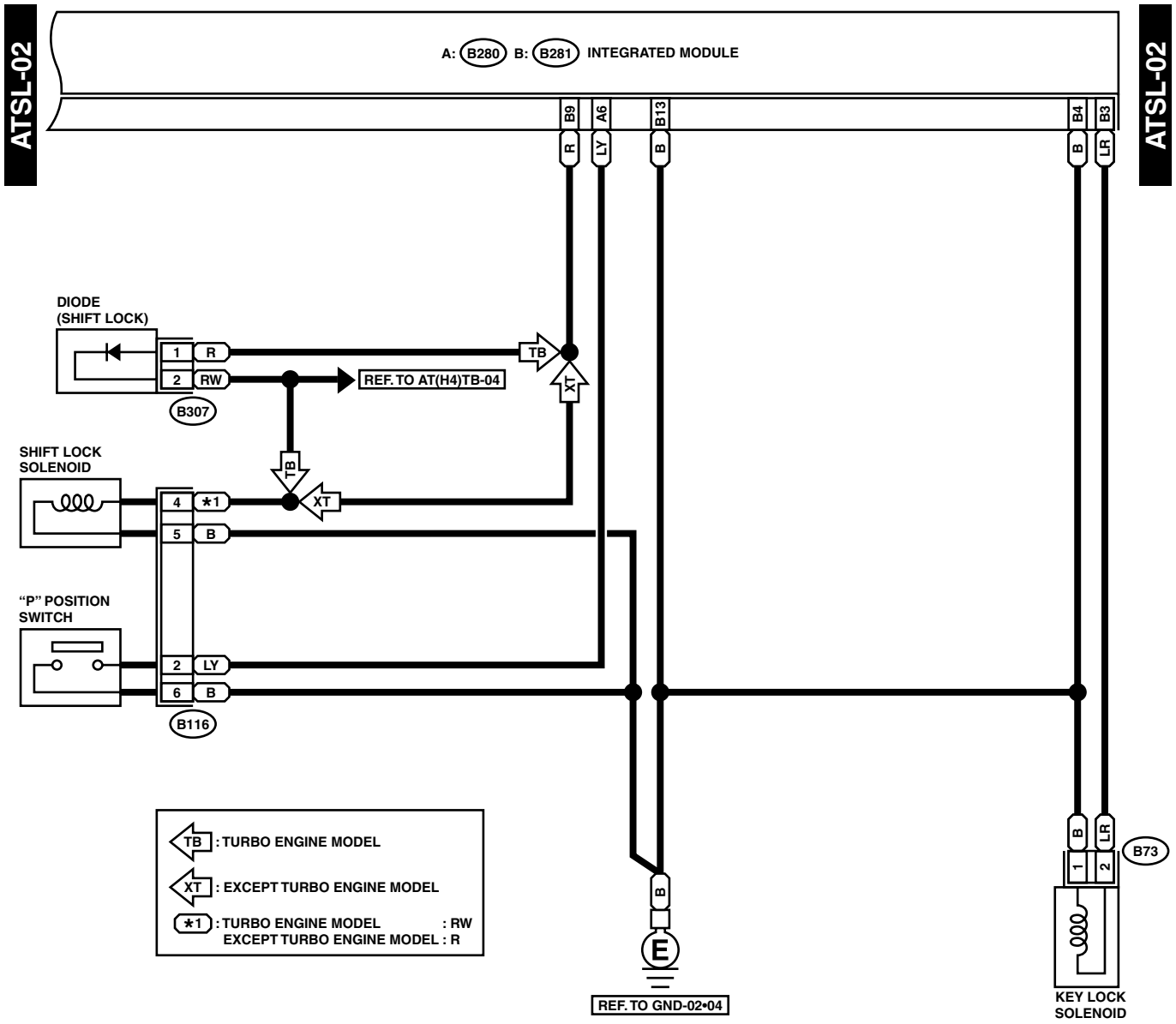
WI-06342

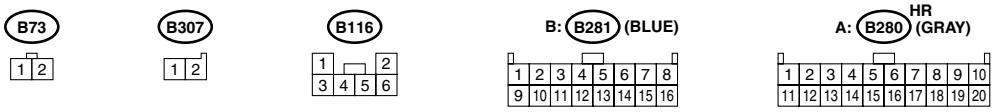
10.AT Shift Lock Control System

A: SCHEMATIC



WI-06343


ATSL-02
ATSL-02
A: B280 B: B281 INTEGRATED MODULE
B9
A6
B13
B4
B3
R
LY
B
B
LR
DIODE
(SHIFT LOCK)
1 R
2 RW
B307
REF. TO AT(H4)TB-04
TB
XT
SHIFT LOCK
SOLENOID
4 *1
5 B
"P" POSITION
SWITCH
2 LY
6 B
B116
TB : TURBO ENGINE MODEL
XT : EXCEPT TURBO ENGINE MODEL
*1 : TURBO ENGINE MODEL : RW
EXCEPT TURBO ENGINE MODEL : R
E
REF. TO GND-02•04
B
B
LR
1
2
B73
KEY LOCK
SOLENOID

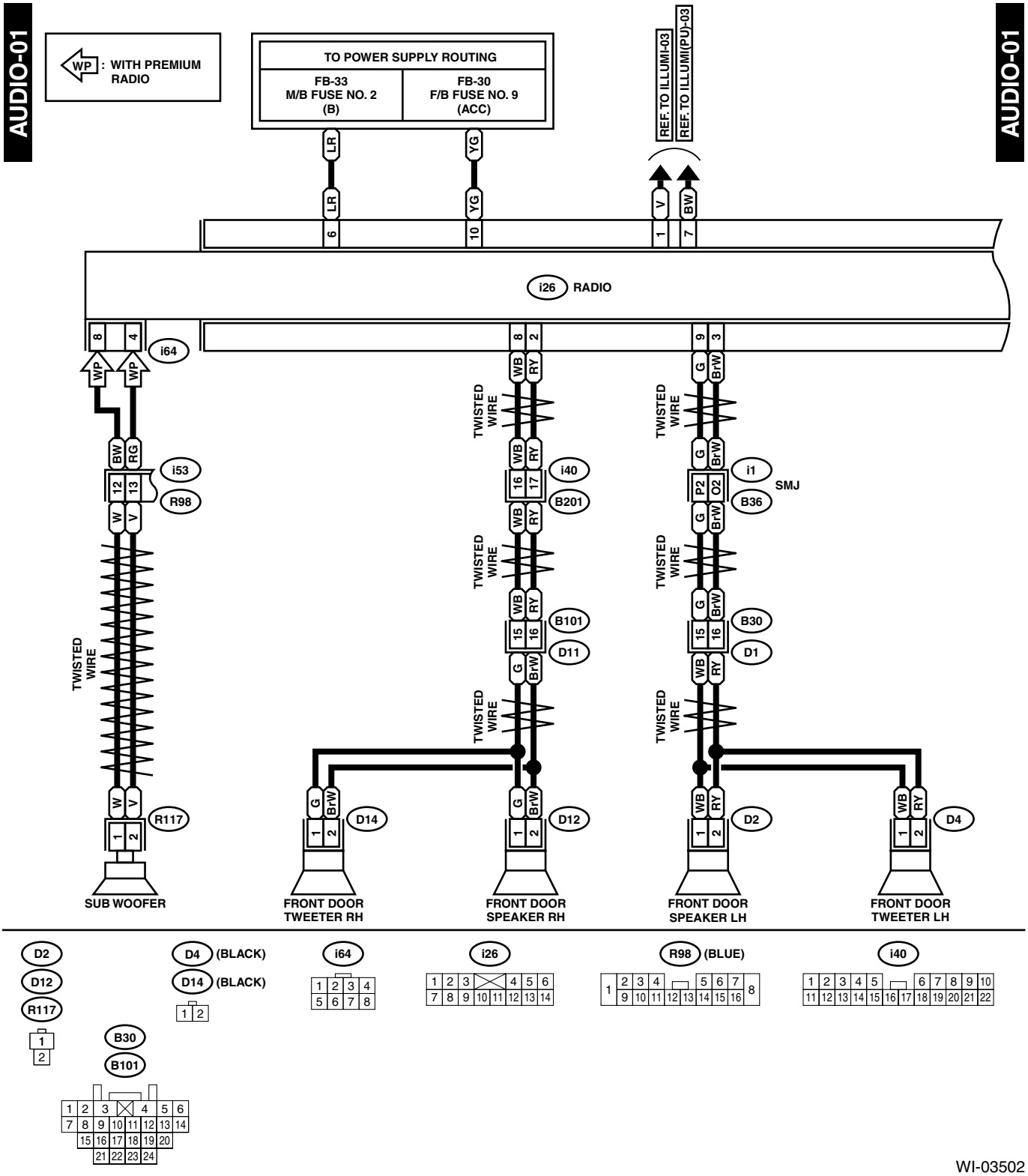

B73
1 2
B307
1 2
B116
1 2
3 4 5 6
B: B281 (BLUE)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
A: B280 HR (GRAY)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

WI-06344

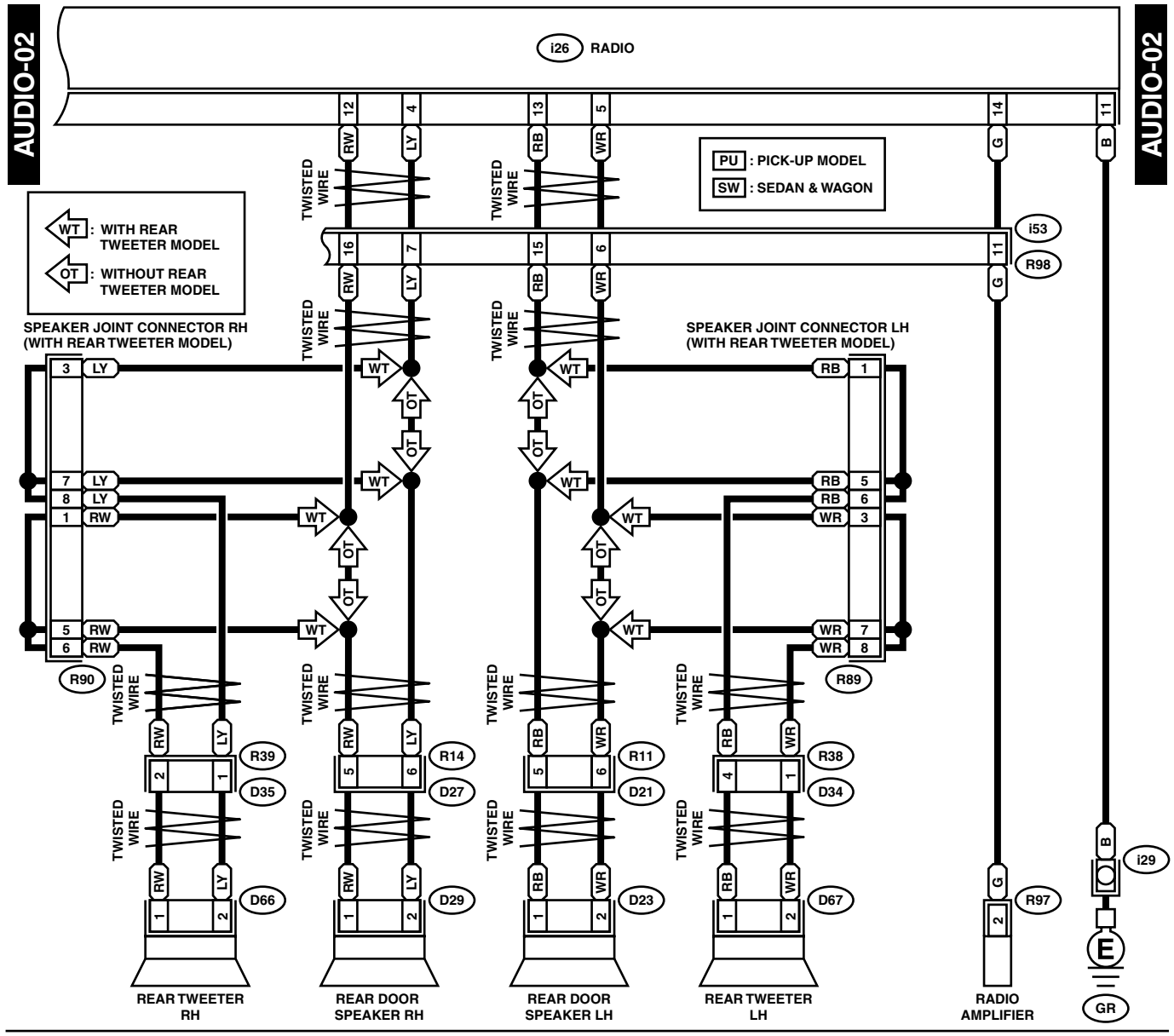
11.Audio System

A: SCHEMATIC

1. WITHOUT MCINTOSH AUDIO SYSTEM

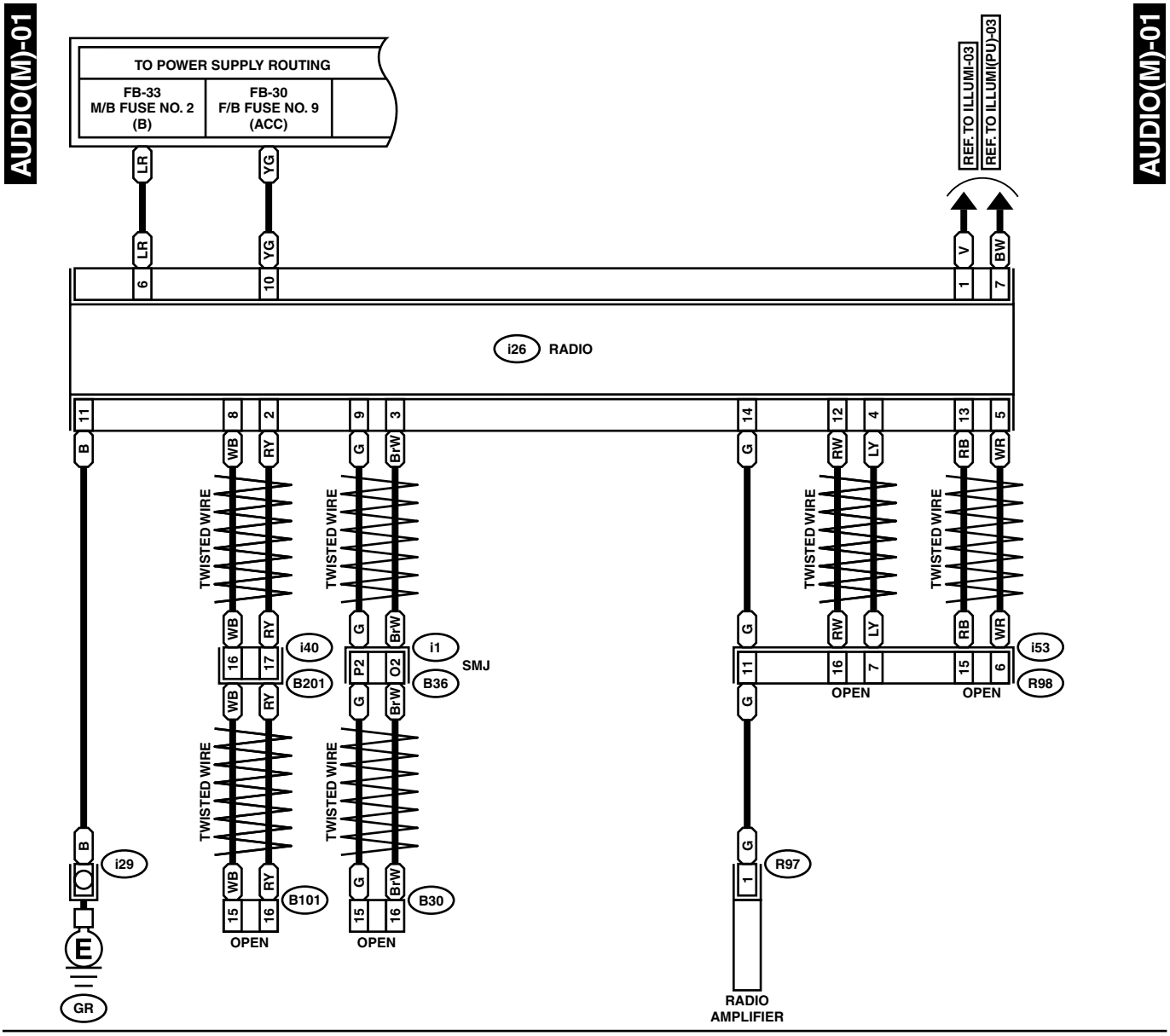


WI-03502

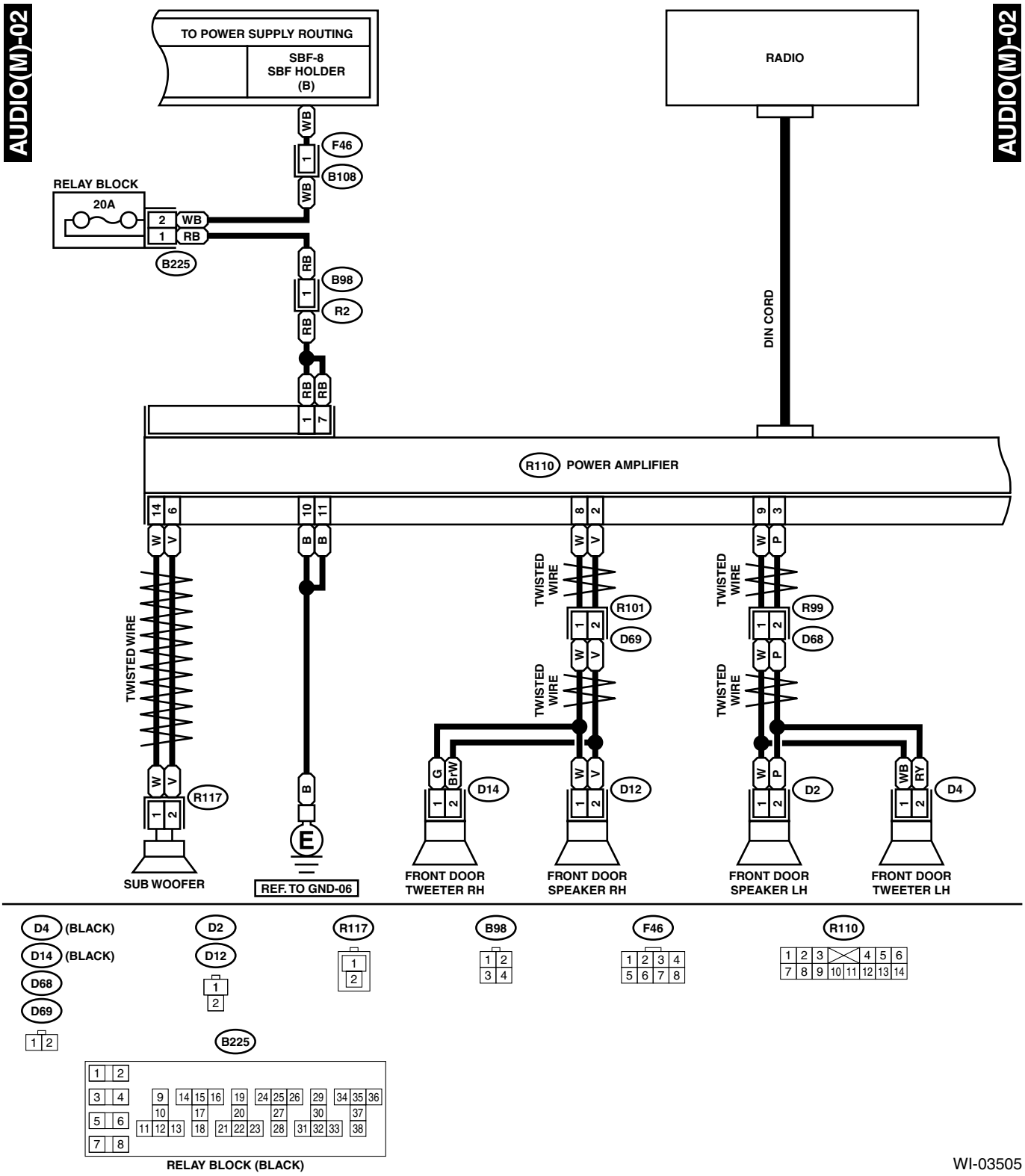

AUDIO-02
AUDIO-02
i26 RADIO
PU : PICK-UP MODEL
SW : SEDAN & WAGON
WT : WITH REAR TWEETER MODEL
OT : WITHOUT REAR TWEETER MODEL
TWISTED WIRE
i53
R98
SPEAKER JOINT CONNECTOR RH (WITH REAR TWEETER MODEL)
SPEAKER JOINT CONNECTOR LH (WITH REAR TWEETER MODEL)
R90
R89
R39
D35
R14
D27
R11
D21
R38
D34
D66
D29
D23
D67
R97
i29
REAR TWEETER RH
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
REAR TWEETER LH
RADIO AMPLIFIER
GR
D66 (BLACK)
D67 (BLACK)
D23 (BLACK)
D29 (BLACK)
R97 : PU
R97 : SW
D34
R11
R14
D35 (BLACK)
R89
R90
i26
R98 (BLUE)

WI-03503

2. WITH MCINTOSH AUDIO SYSTEM

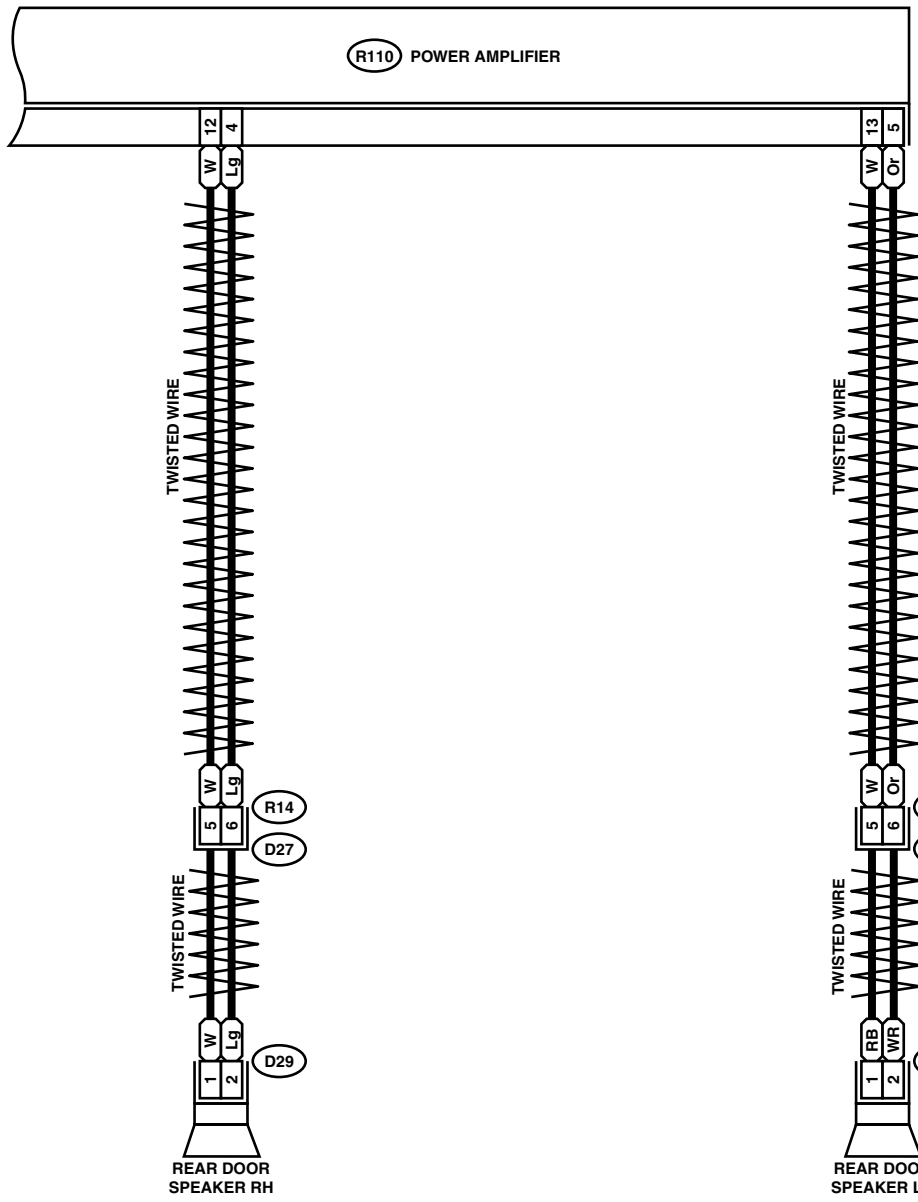


WI-03504

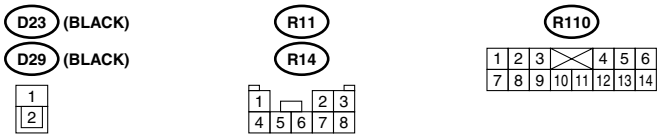

AUDIO(M)-02
AUDIO(M)-02
TO POWER SUPPLY ROUTING
SBF-8
SBF HOLDER
(B)
RADIO
DIN CORD
F46
B108
RELAY BLOCK
20A
B225
B98
R2
R110 POWER AMPLIFIER
TWISTED WIRE
R117
SUB WOOFER
REF. TO GND-06
R101
D69
R99
D68
D14
D12
D2
D4
FRONT DOOR TWEETER RH
FRONT DOOR SPEAKER RH
FRONT DOOR SPEAKER LH
FRONT DOOR TWEETER LH
D4 (BLACK)
D14 (BLACK)
D68
D69
D2
D12
R117
B98
F46
R110
B225
RELAY BLOCK (BLACK)

WI-03505

AUDIO(M)-03



AUDIO(M)-03

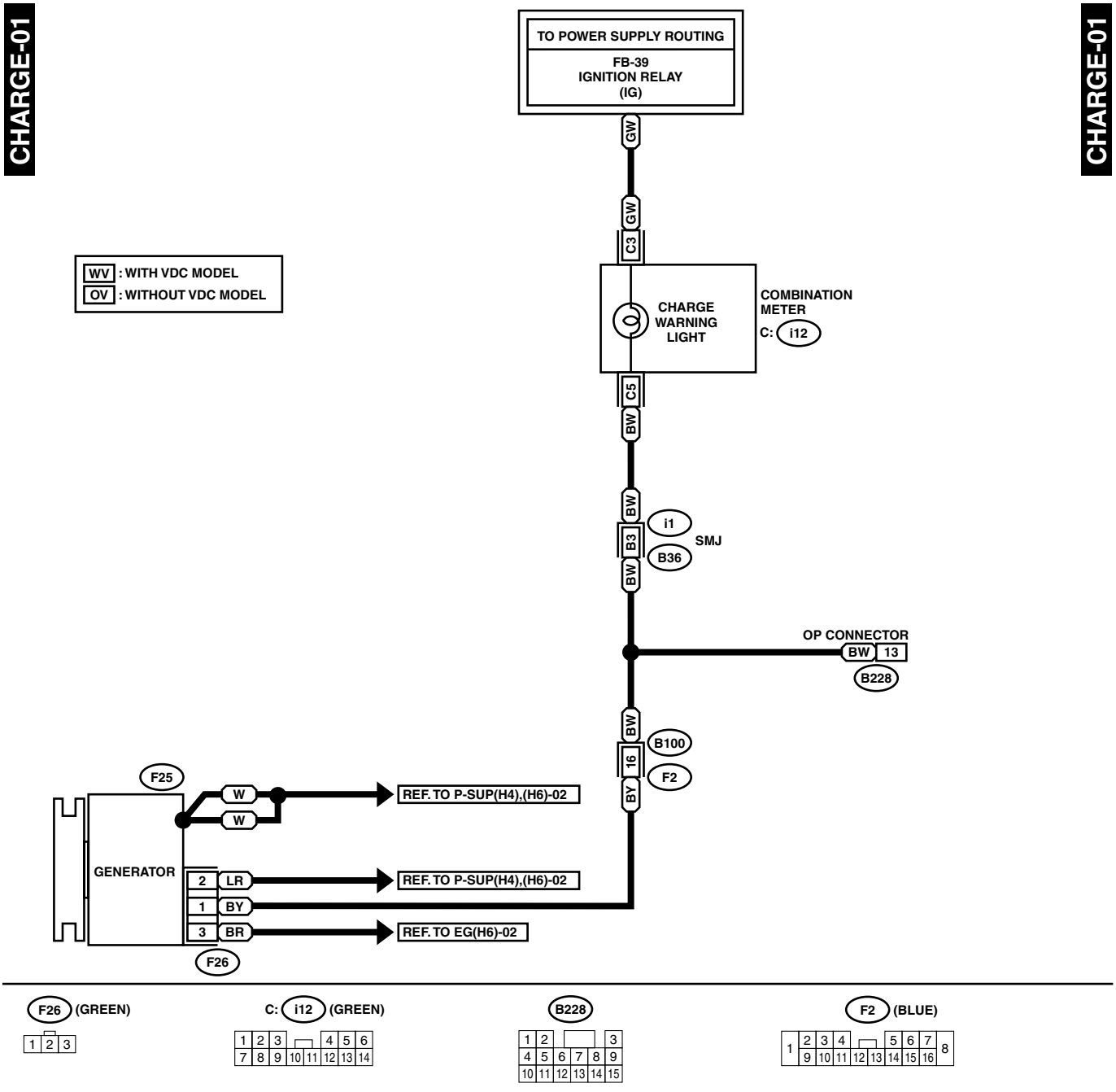


WI-00573

MEMO:

12.Charging System

A: SCHEMATIC



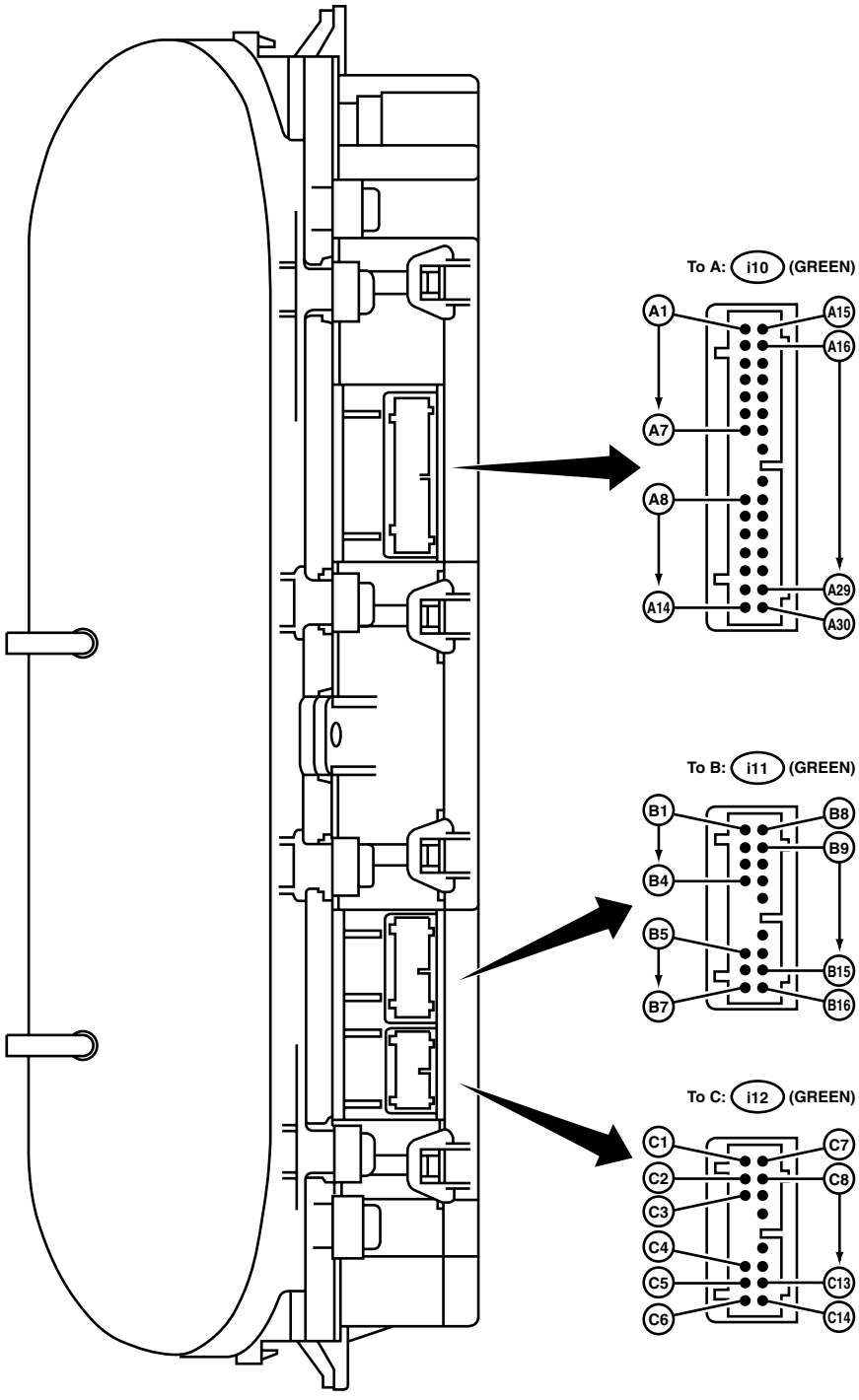
WI-00574

13.Combination Meter

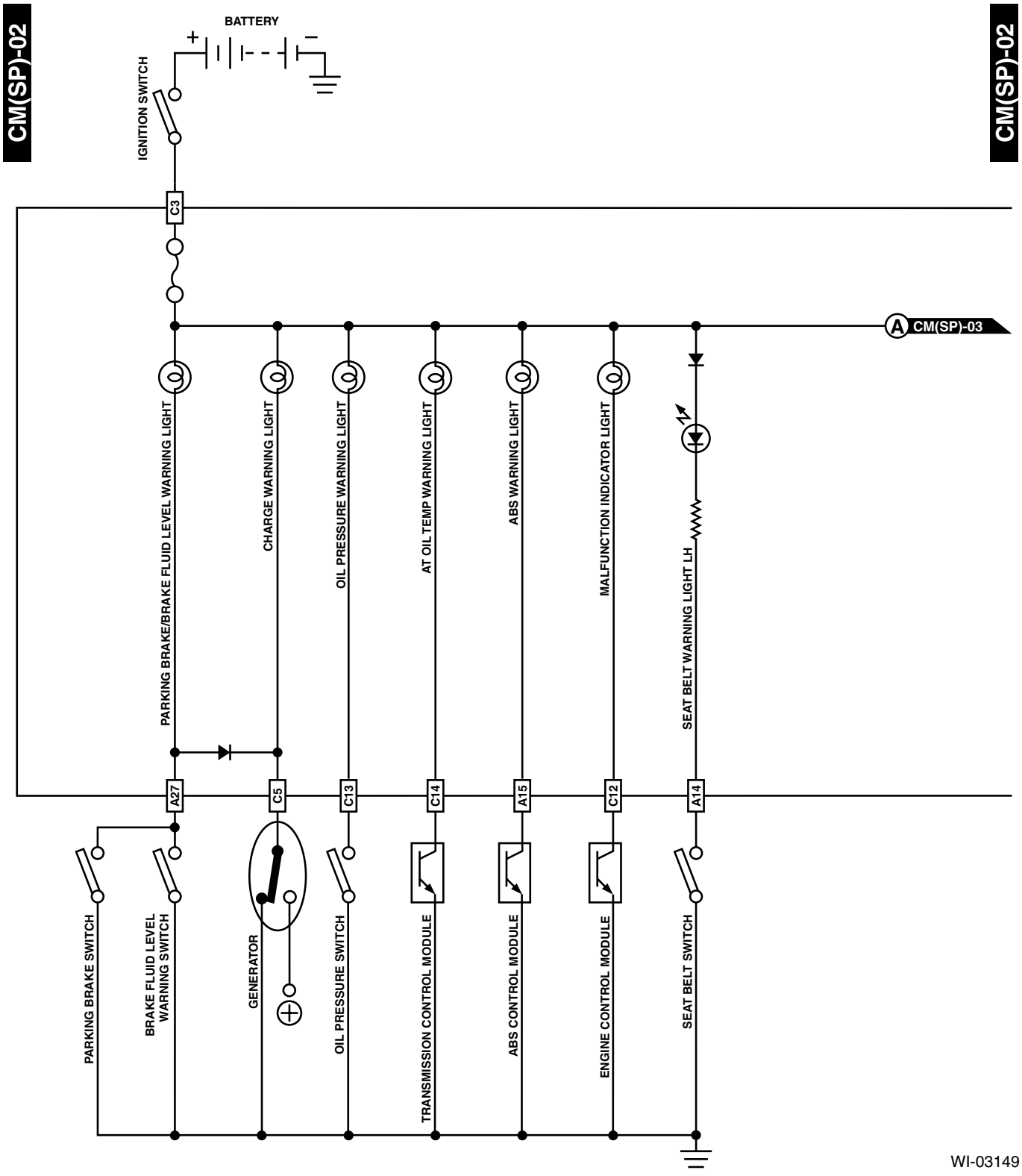
A: SCHEMATIC

1. WITH SPORT SHIFT

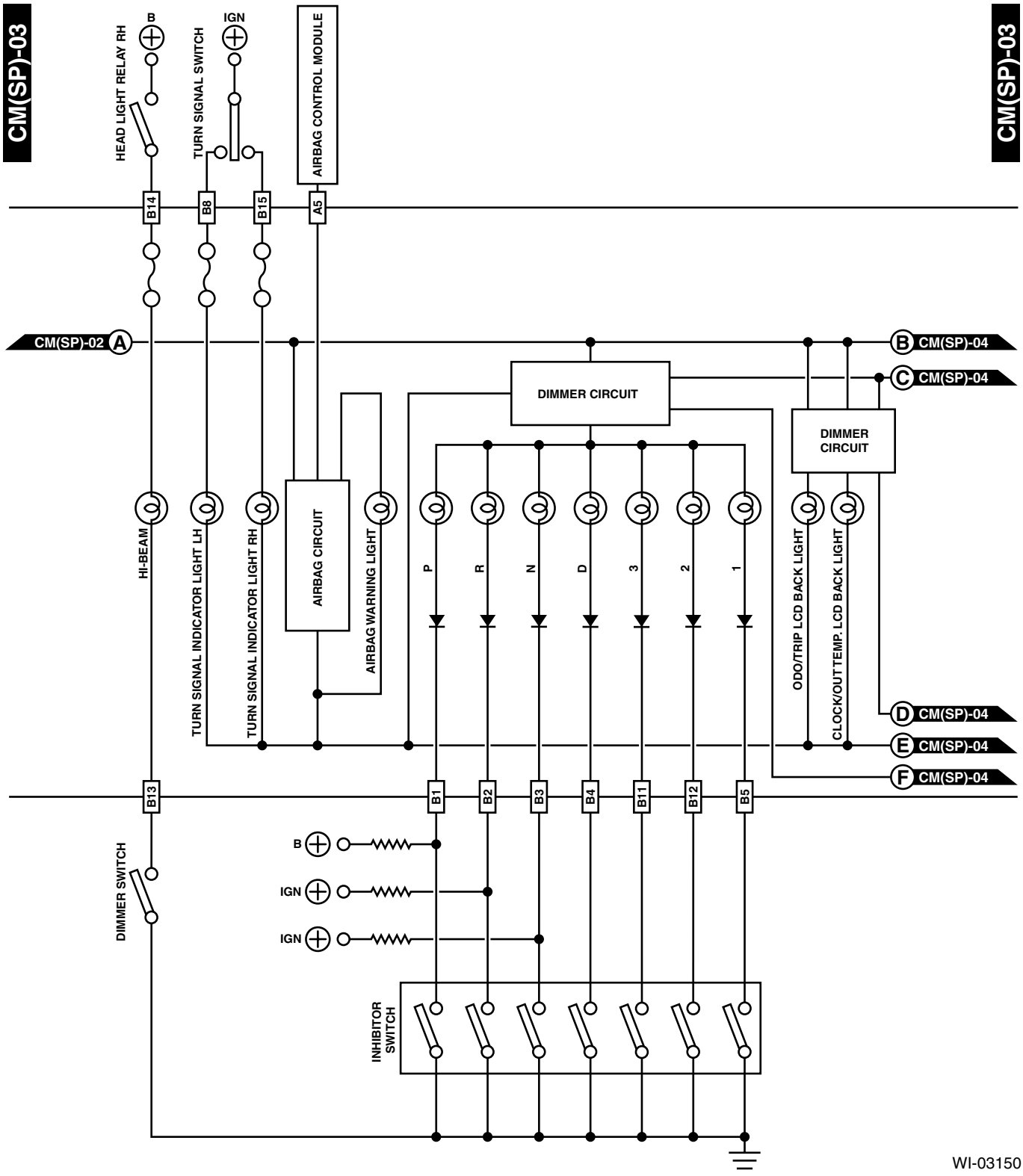
CM(SP)-01



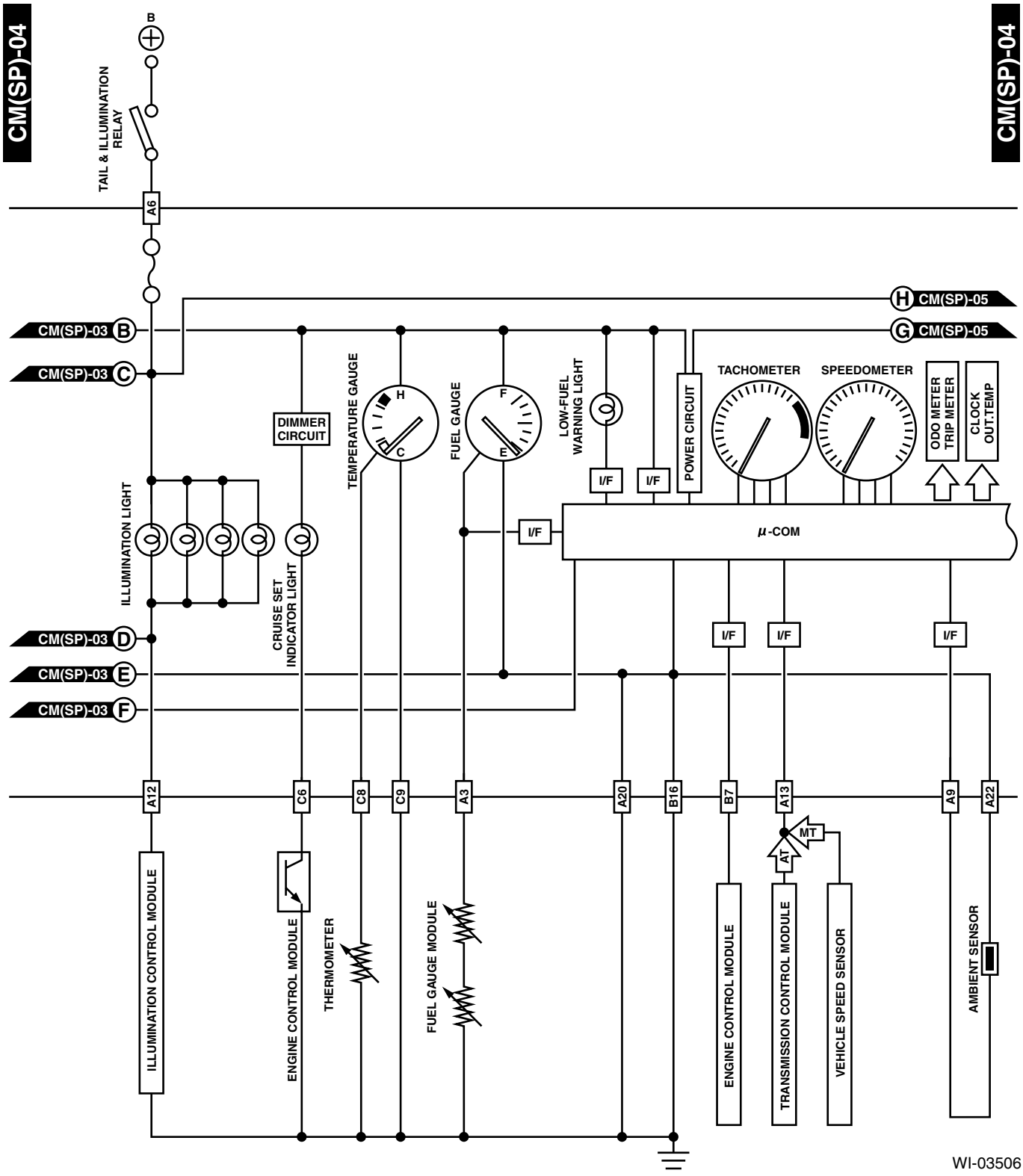
WI-00575

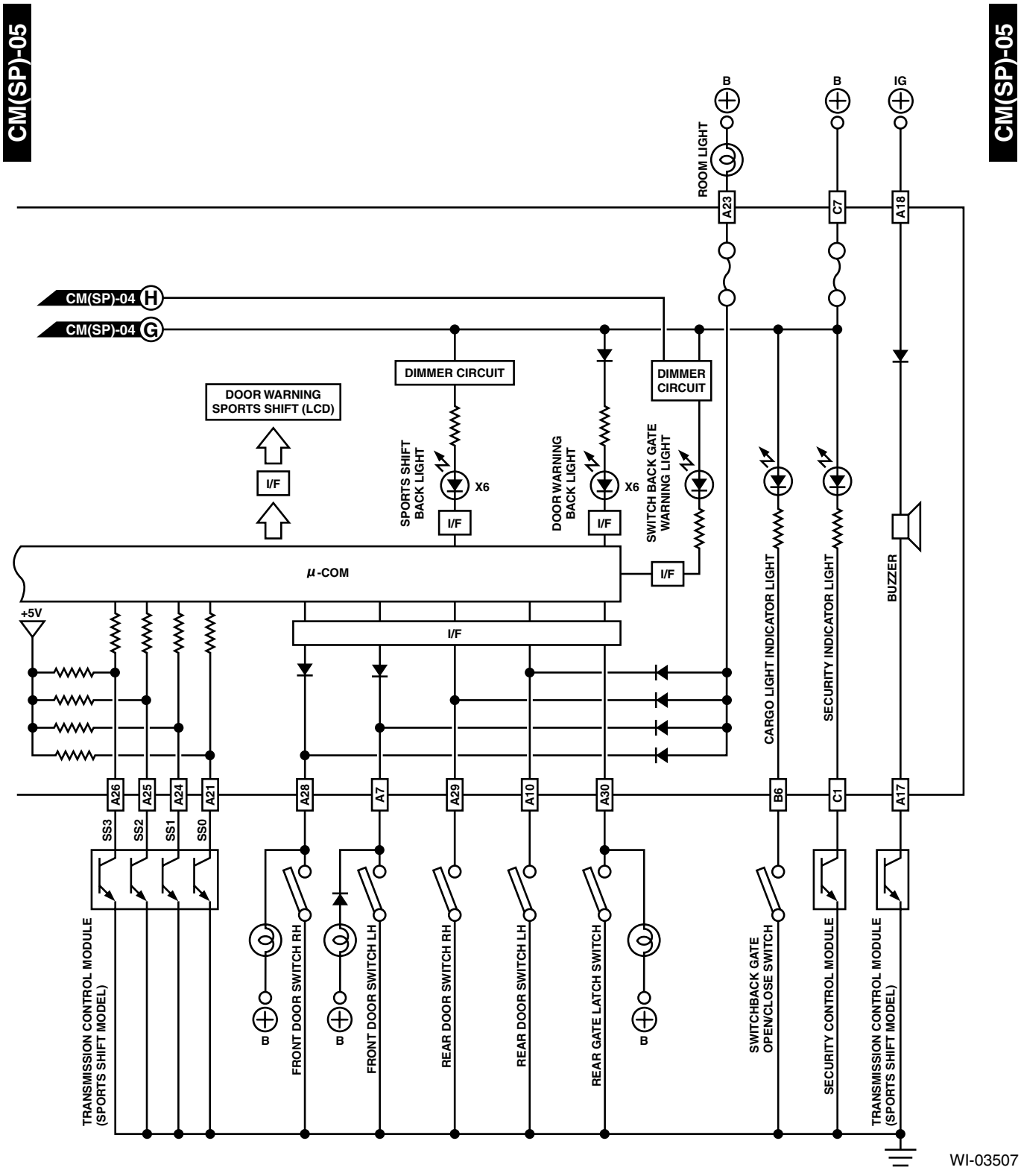

CM(SP)-02
CM(SP)-02
BATTERY
+
−
IGNITION SWITCH
C3
A CM(SP)-03
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
AT OIL TEMP WARNING LIGHT
ABS WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
SEAT BELT WARNING LIGHT LH
A27
C5
C13
C14
A15
C12
A14
PARKING BRAKE SWITCH
BRAKE FLUID LEVEL WARNING SWITCH
GENERATOR
OIL PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
ABS CONTROL MODULE
ENGINE CONTROL MODULE
SEAT BELT SWITCH

WI-03149


CM(SP)-03
CM(SP)-03
HEAD LIGHT RELAY RH
B
IGN
TURN SIGNAL SWITCH
AIRBAG CONTROL MODULE
B14
B8
B15
A5
CM(SP)-02 A
B CM(SP)-04
C CM(SP)-04
DIMMER CIRCUIT
DIMMER CIRCUIT
HI-BEAM
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
AIRBAG CIRCUIT
AIRBAG WARNING LIGHT
P
R
N
D
3
2
1
ODO/TRIP LCD BACK LIGHT
CLOCK/OUT TEMP. LCD BACK LIGHT
D CM(SP)-04
E CM(SP)-04
F CM(SP)-04
B13
B1
B2
B3
B4
B11
B12
B5
DIMMER SWITCH
B
IGN
IGN
INHIBITOR SWITCH

WI-03150


CM(SP)-04
CM(SP)-04
B
TAIL & ILLUMINATION RELAY
A6
H CM(SP)-05
G CM(SP)-05
CM(SP)-03 B
CM(SP)-03 C
DIMMER CIRCUIT
TEMPERATURE GAUGE
FUEL GAUGE
LOW-FUEL WARNING LIGHT
POWER CIRCUIT
TACHOMETER
SPEEDOMETER
ODO METER TRIP METER
CLOCK OUT.TEMP
ILLUMINATION LIGHT
CRUISE SET INDICATOR LIGHT
I/F
μ-COM
CM(SP)-03 D
CM(SP)-03 E
CM(SP)-03 F
A12
C6
C8
C9
A3
A20
B16
B7
A13
A9
A22
MT
AT
ILLUMINATION CONTROL MODULE
ENGINE CONTROL MODULE
THERMOMETER
FUEL GAUGE MODULE
ENGINE CONTROL MODULE
TRANSMISSION CONTROL MODULE
VEHICLE SPEED SENSOR
AMBIENT SENSOR
WI-03506

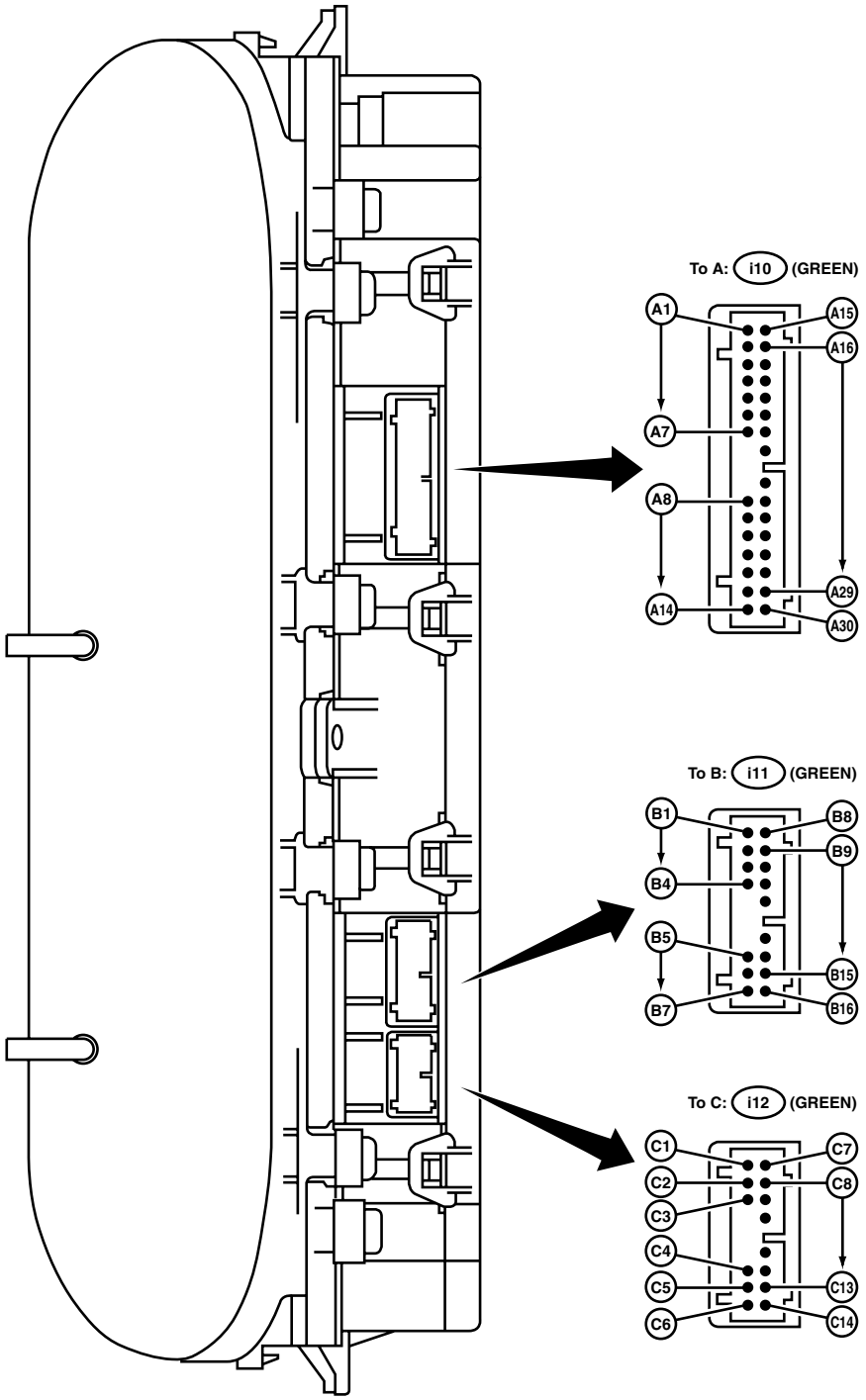

CM(SP)-05
CM(SP)-05
B
B
IG
ROOM LIGHT
A23
C7
A18
CM(SP)-04 H
CM(SP)-04 G
DIMMER CIRCUIT
DIMMER CIRCUIT
DOOR WARNING SPORTS SHIFT (LCD)
I/F
SPORTS SHIFT BACK LIGHT
X6
I/F
DOOR WARNING BACK LIGHT
X6
I/F
SWITCH BACK GATE WARNING LIGHT
I/F
CARGO LIGHT INDICATOR LIGHT
SECURITY INDICATOR LIGHT
BUZZER
μ-COM
+5V
I/F
A26
A25
A24
A21
A28
A7
A29
A10
A30
B6
C1
A17
SS3
SS2
SS1
SS0
TRANSMISSION CONTROL MODULE (SPORTS SHIFT MODEL)
B
FRONT DOOR SWITCH RH
B
FRONT DOOR SWITCH LH
REAR DOOR SWITCH RH
REAR DOOR SWITCH LH
REAR GATE LATCH SWITCH
B
SWITCHBACK GATE OPEN/CLOSE SWITCH
SECURITY CONTROL MODULE
TRANSMISSION CONTROL MODULE (SPORTS SHIFT MODEL)

WI-03507

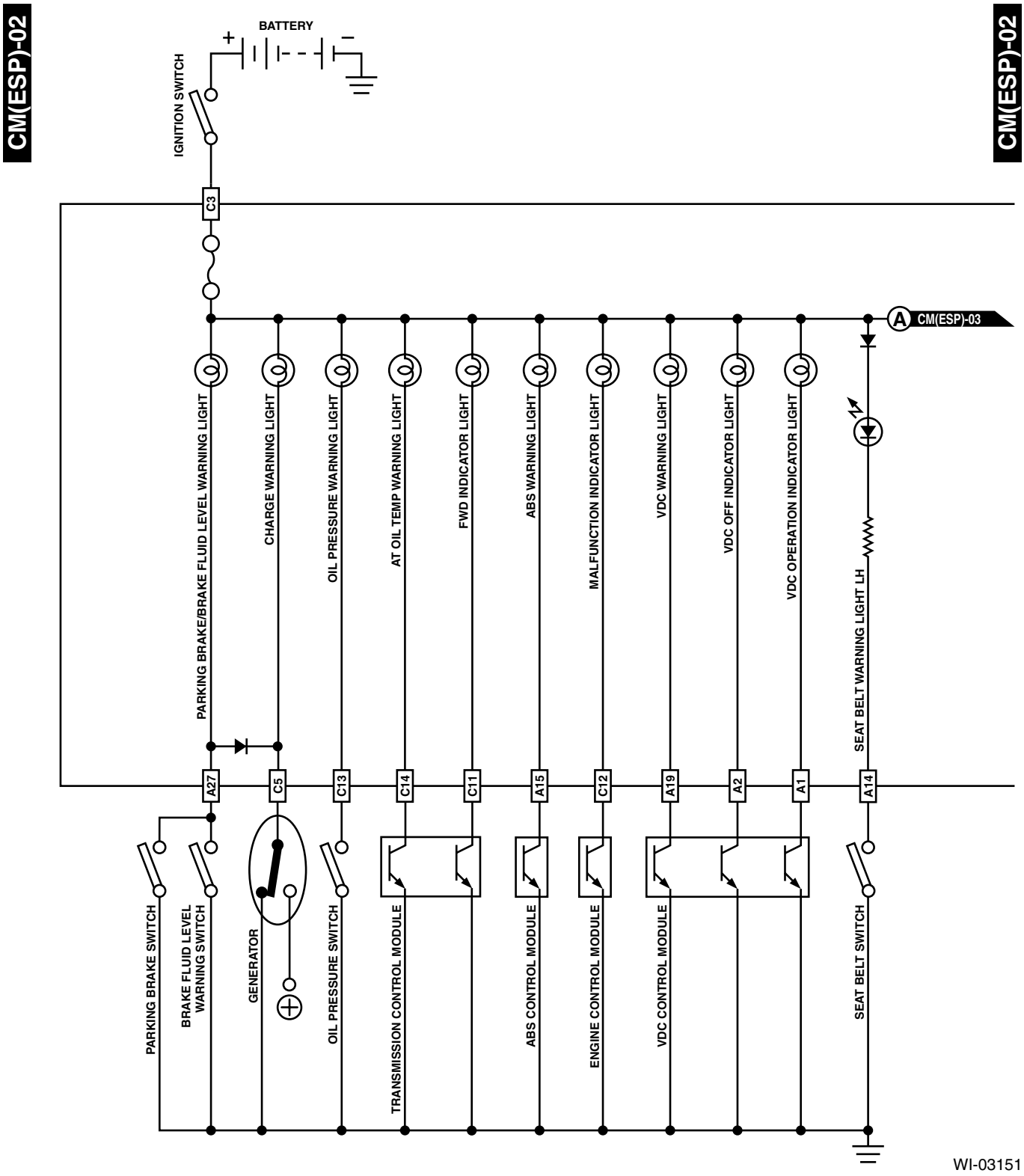
2. WITHOUT SPORT SHIFT

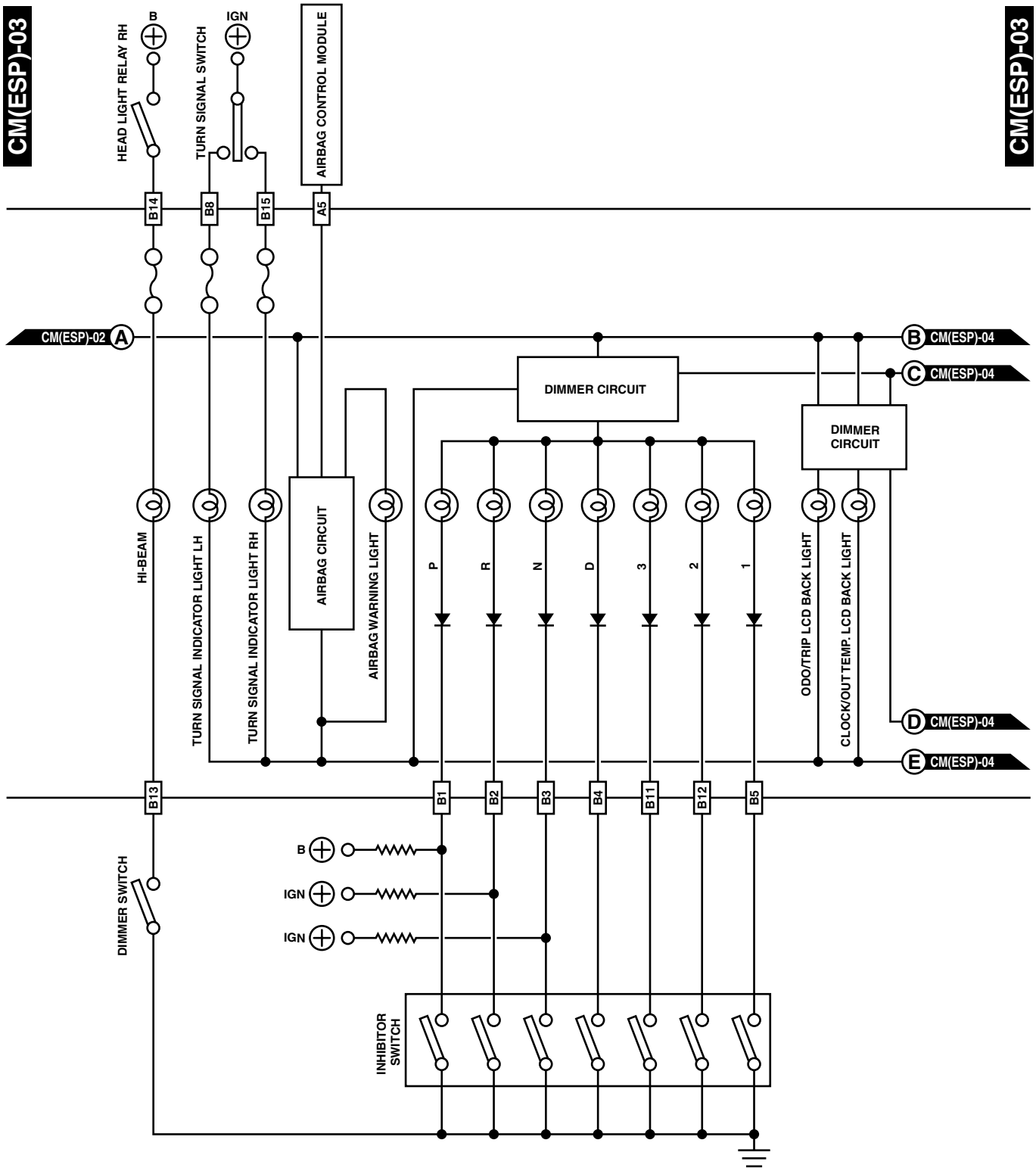
CM(ESP)-01

CM(ESP)-01

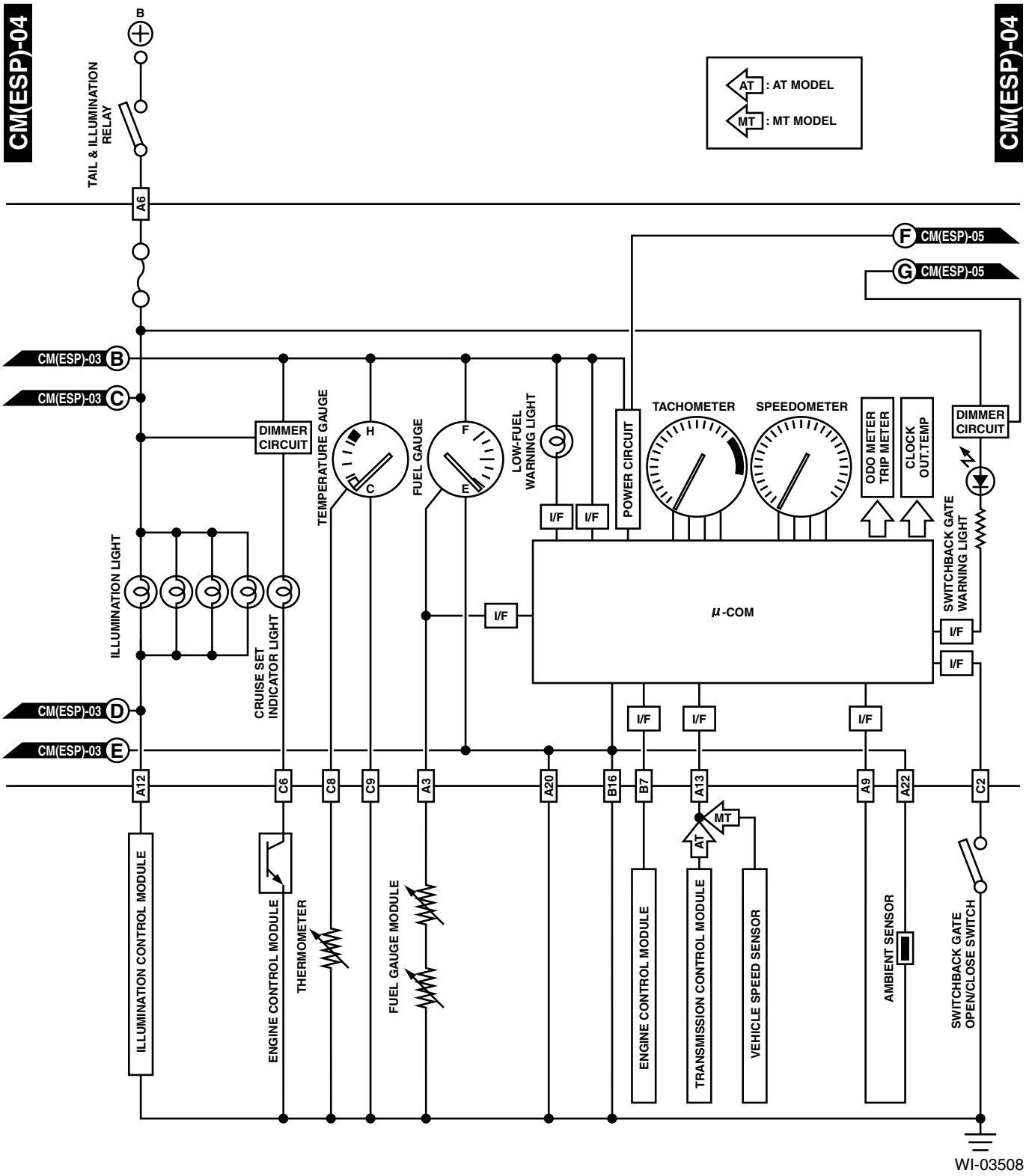


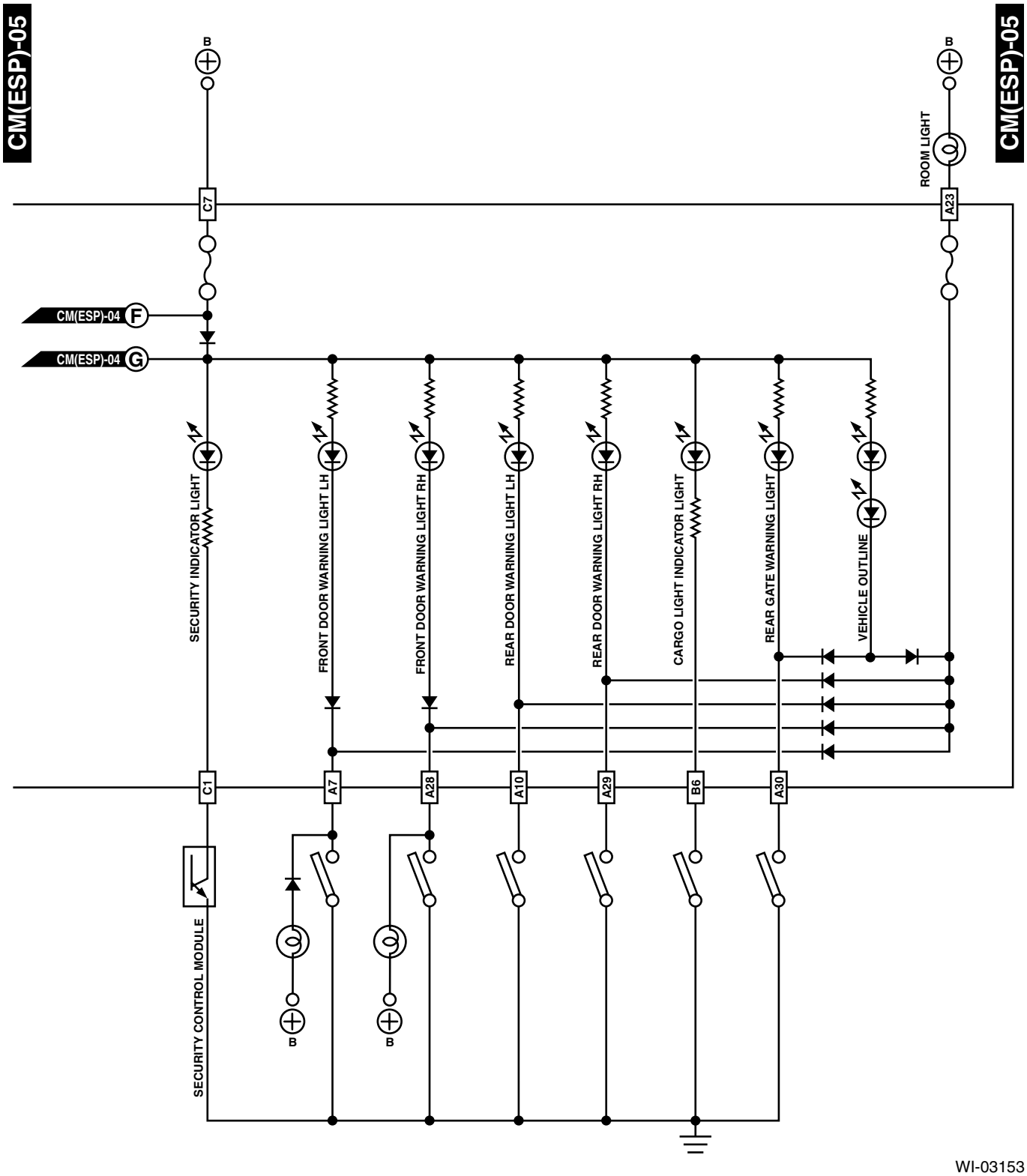
WI-00580


CM(ESP)-02
CM(ESP)-02
BATTERY
+
−
IGNITION SWITCH
C3
A CM(ESP)-03
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
AT OIL TEMP WARNING LIGHT
FWD INDICATOR LIGHT
ABS WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
VDC WARNING LIGHT
VDC OFF INDICATOR LIGHT
VDC OPERATION INDICATOR LIGHT
SEAT BELT WARNING LIGHT LH
A27
C5
C13
C14
C11
A15
C12
A19
A2
A1
A14
PARKING BRAKE SWITCH
BRAKE FLUID LEVEL WARNING SWITCH
GENERATOR
OIL PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
ABS CONTROL MODULE
ENGINE CONTROL MODULE
VDC CONTROL MODULE
SEAT BELT SWITCH
WI-03151


CM(ESP)-03
CM(ESP)-03
B
IGN
HEAD LIGHT RELAY RH
TURN SIGNAL SWITCH
AIRBAG CONTROL MODULE
B14
B8
B15
A5
CM(ESP)-02 A
B CM(ESP)-04
C CM(ESP)-04
DIMMER CIRCUIT
DIMMER CIRCUIT
HI-BEAM
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
AIRBAG CIRCUIT
AIRBAG WARNING LIGHT
P
R
N
D
3
2
1
ODO/TRIP LCD BACK LIGHT
CLOCK/OUT TEMP. LCD BACK LIGHT
D CM(ESP)-04
E CM(ESP)-04
B13
B1
B2
B3
B4
B11
B12
B5
B
IGN
IGN
DIMMER SWITCH
INHIBITOR SWITCH

WI-03152


CM(ESP)-04
CM(ESP)-04
B
TAIL & ILLUMINATION RELAY
A6
AT : AT MODEL
MT : MT MODEL
F CM(ESP)-05
G CM(ESP)-05
CM(ESP)-03 B
CM(ESP)-03 C
CM(ESP)-03 D
CM(ESP)-03 E
DIMMER CIRCUIT
TEMPERATURE GAUGE
FUEL GAUGE
LOW-FUEL WARNING LIGHT
POWER CIRCUIT
TACHOMETER
SPEEDOMETER
ODO METER TRIP METER
CLOCK OUT.TEMP
DIMMER CIRCUIT
ILLUMINATION LIGHT
CRUISE SET INDICATOR LIGHT
I/F
μ-COM
SWITCHBACK GATE WARNING LIGHT
A12
C6
C8
C9
A3
A20
B16
B7
A13
A9
A22
C2
ILLUMINATION CONTROL MODULE
ENGINE CONTROL MODULE
THERMOMETER
FUEL GAUGE MODULE
ENGINE CONTROL MODULE
TRANSMISSION CONTROL MODULE
VEHICLE SPEED SENSOR
AMBIENT SENSOR
SWITCHBACK GATE OPEN/CLOSE SWITCH
WI-03508


CM(ESP)-05
CM(ESP)-05
B
B
ROOM LIGHT
C7
A23
CM(ESP)-04 F
CM(ESP)-04 G
SECURITY INDICATOR LIGHT
FRONT DOOR WARNING LIGHT LH
FRONT DOOR WARNING LIGHT RH
REAR DOOR WARNING LIGHT LH
REAR DOOR WARNING LIGHT RH
CARGO LIGHT INDICATOR LIGHT
REAR GATE WARNING LIGHT
VEHICLE OUTLINE
C1
A7
A28
A10
A29
B6
A30
SECURITY CONTROL MODULE
B
B

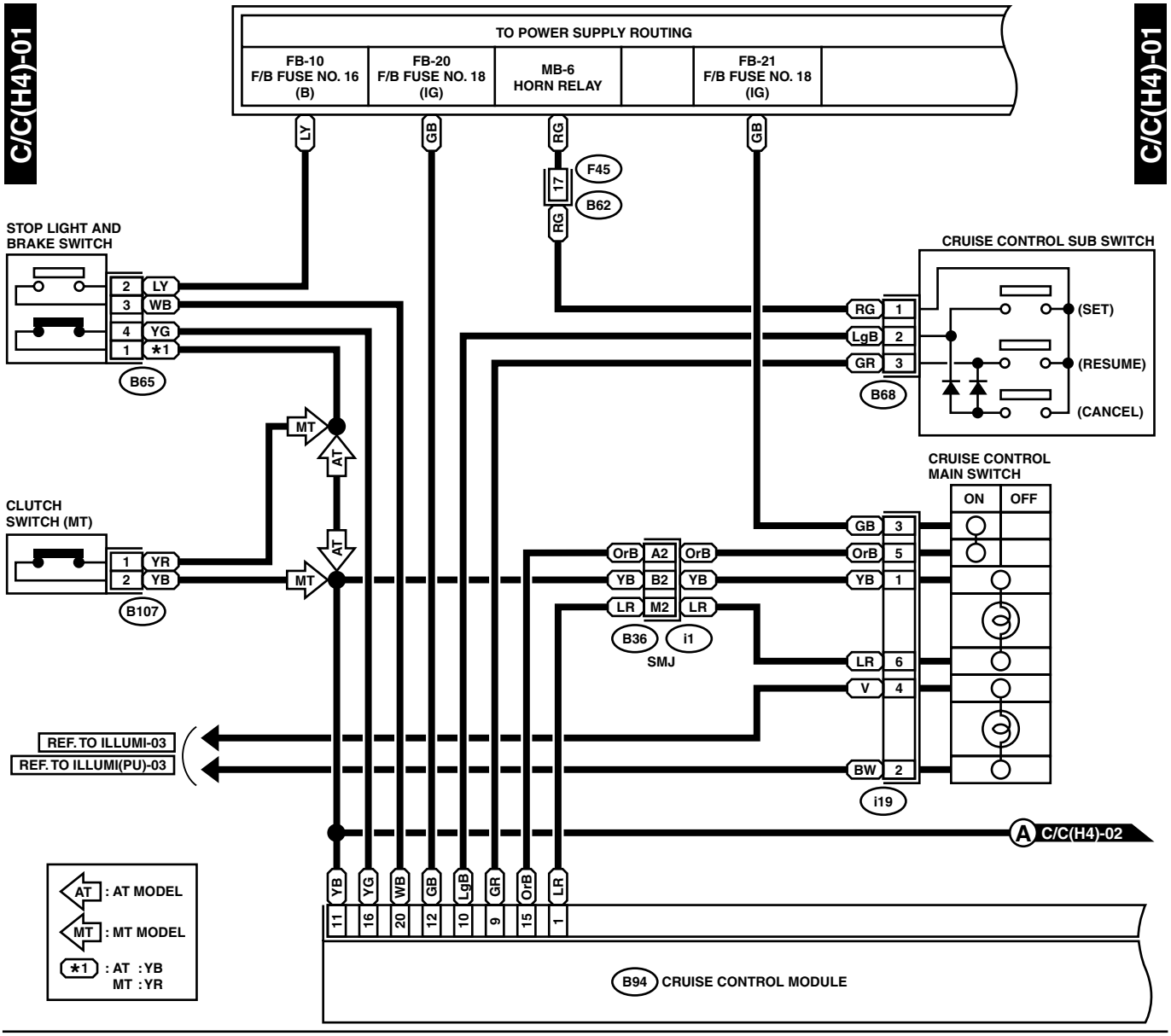
WI-03153

MEMO:

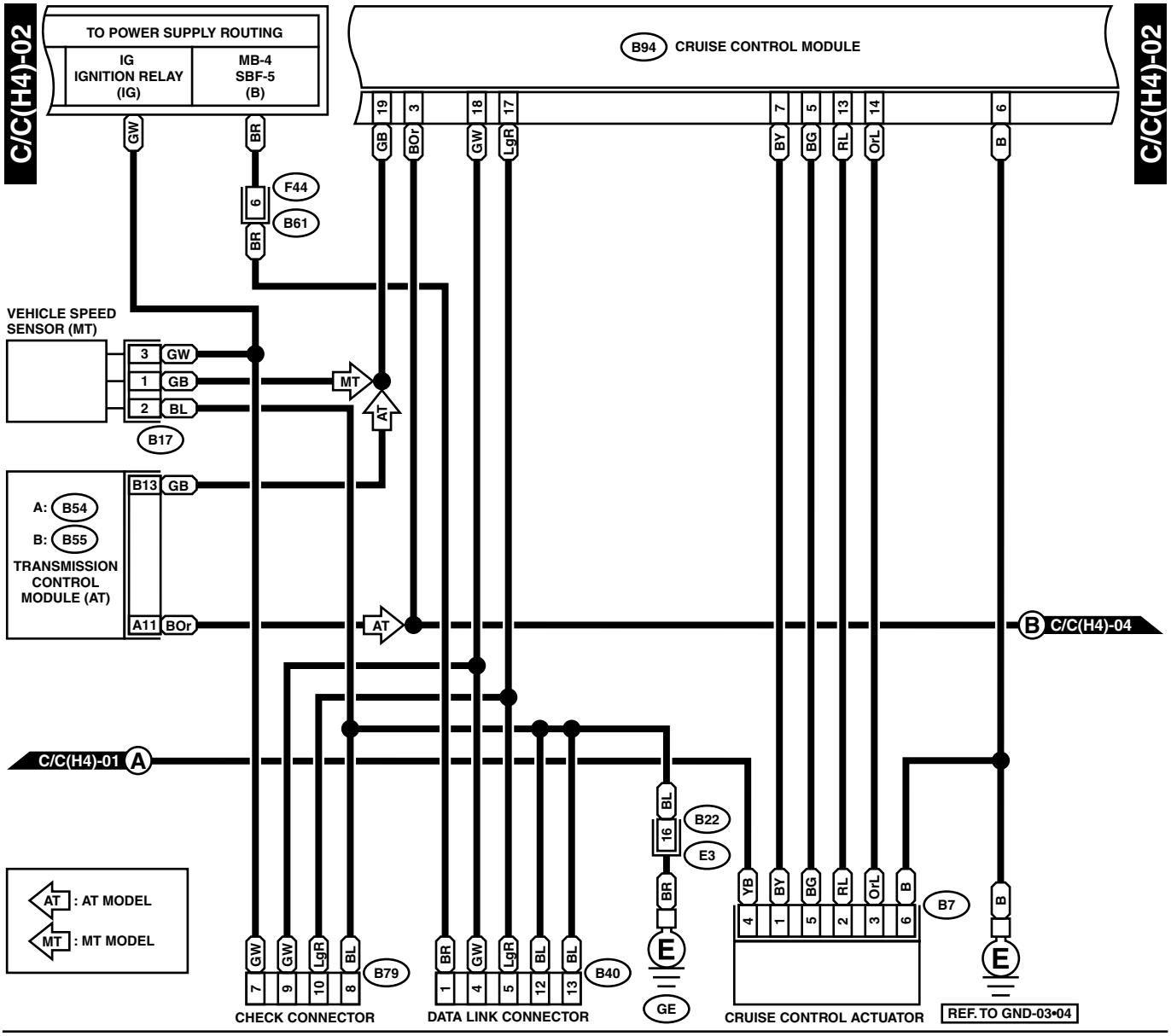
14.Cruise Control System

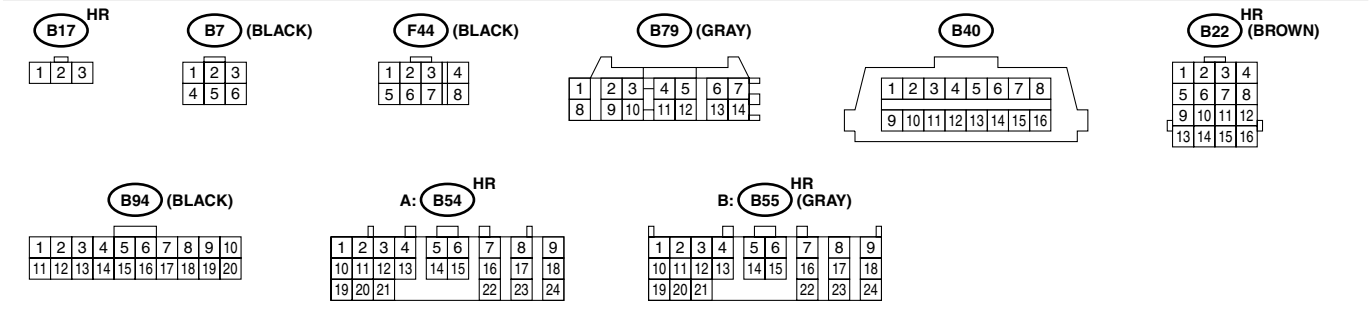
A: SCHEMATIC

1. EXCEPT 4-CYLINDER ENGINE U5 MODEL

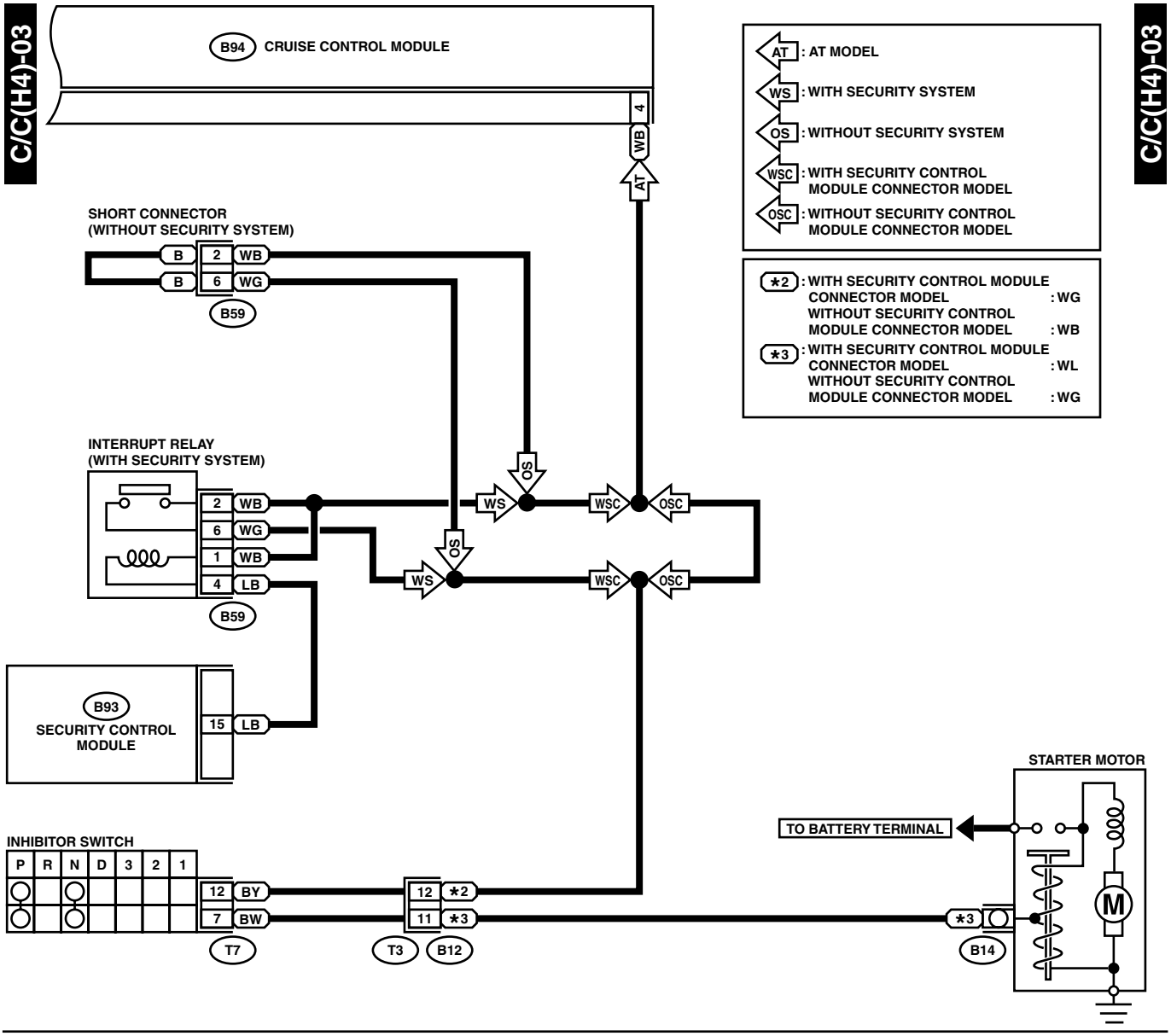


WI-03139

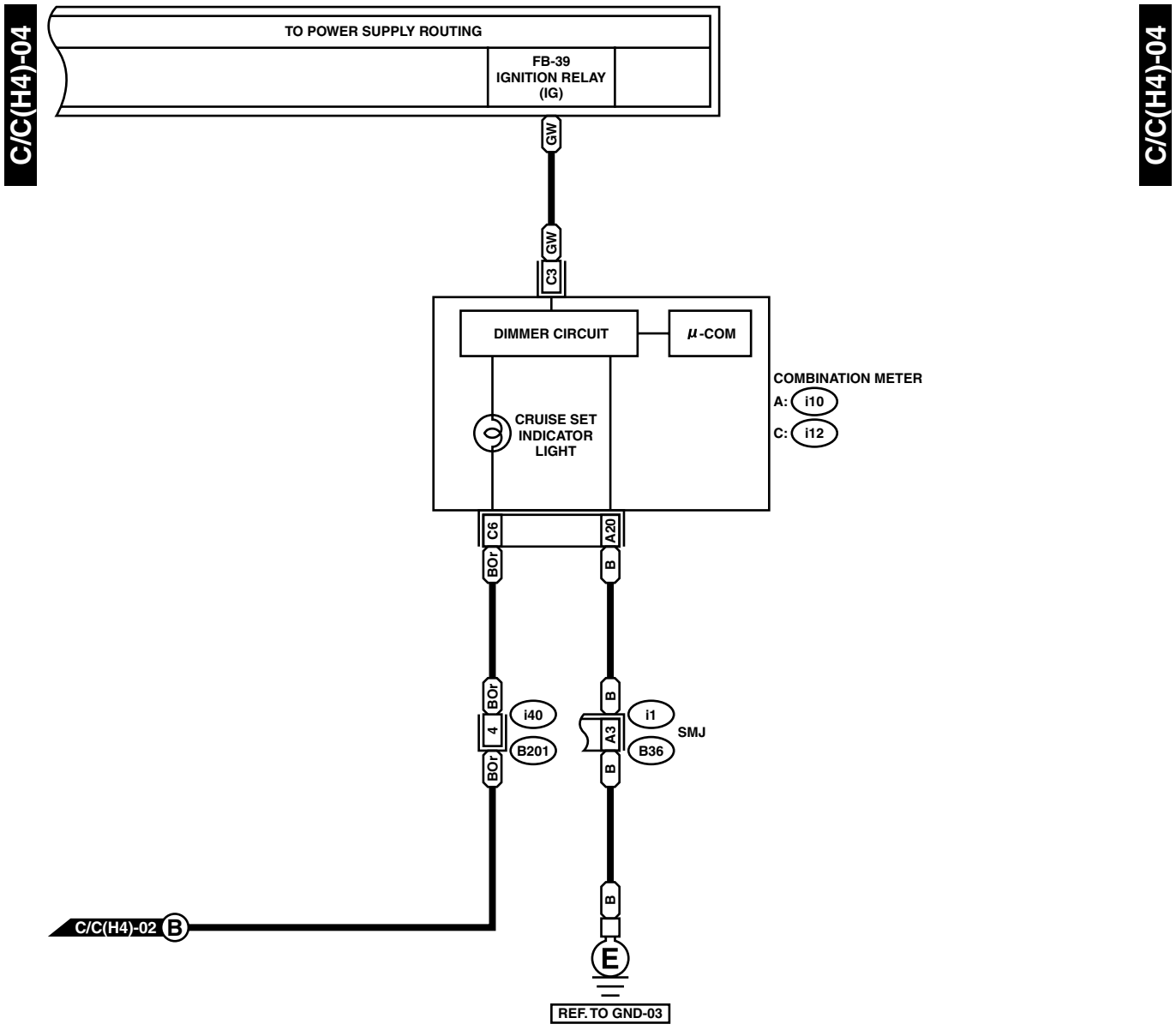

C/C(H4)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-4
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(H4)-02
GW
BR
F44
B61
VEHICLE SPEED
SENSOR (MT)
B17
MT
AT
B13 GB
A: B54
B: B55
TRANSMISSION
CONTROL
MODULE (AT)
A11 BOr
B C/C(H4)-04
C/C(H4)-01 A
B22
E3
B7
B79
B40
E
GE
CHECK CONNECTOR
DATA LINK CONNECTOR
CRUISE CONTROL ACTUATOR
REF. TO GND-03•04
AT : AT MODEL
MT : MT MODEL

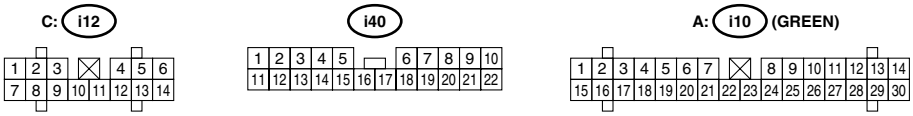

B17 HR
B7 (BLACK)
F44 (BLACK)
B79 (GRAY)
B40
B22 HR (BROWN)
B94 (BLACK)
A: B54 HR
B: B55 HR (GRAY)

WI-06345


C/C(H4)-03
B94 CRUISE CONTROL MODULE
4
WB
AT
AT : AT MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
WSC : WITH SECURITY CONTROL MODULE CONNECTOR MODEL
OSC : WITHOUT SECURITY CONTROL MODULE CONNECTOR MODEL
*2 : WITH SECURITY CONTROL MODULE CONNECTOR MODEL : WG
WITHOUT SECURITY CONTROL MODULE CONNECTOR MODEL : WB
*3 : WITH SECURITY CONTROL MODULE CONNECTOR MODEL : WL
WITHOUT SECURITY CONTROL MODULE CONNECTOR MODEL : WG
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
B 2 WB
B 6 WG
B59
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
2 WB
6 WG
1 WB
4 LB
B59
OS
WS
WSC
OSC
B93
SECURITY CONTROL MODULE
15 LB
STARTER MOTOR
TO BATTERY TERMINAL
M
INHIBITOR SWITCH
P R N D 3 2 1
12 BY
7 BW
T7
12 *2
11 *3
T3
B12
*3
B14
C/C(H4)-03
B59
B12 HR (BLACK)
T7
B93
B94 (BLACK)

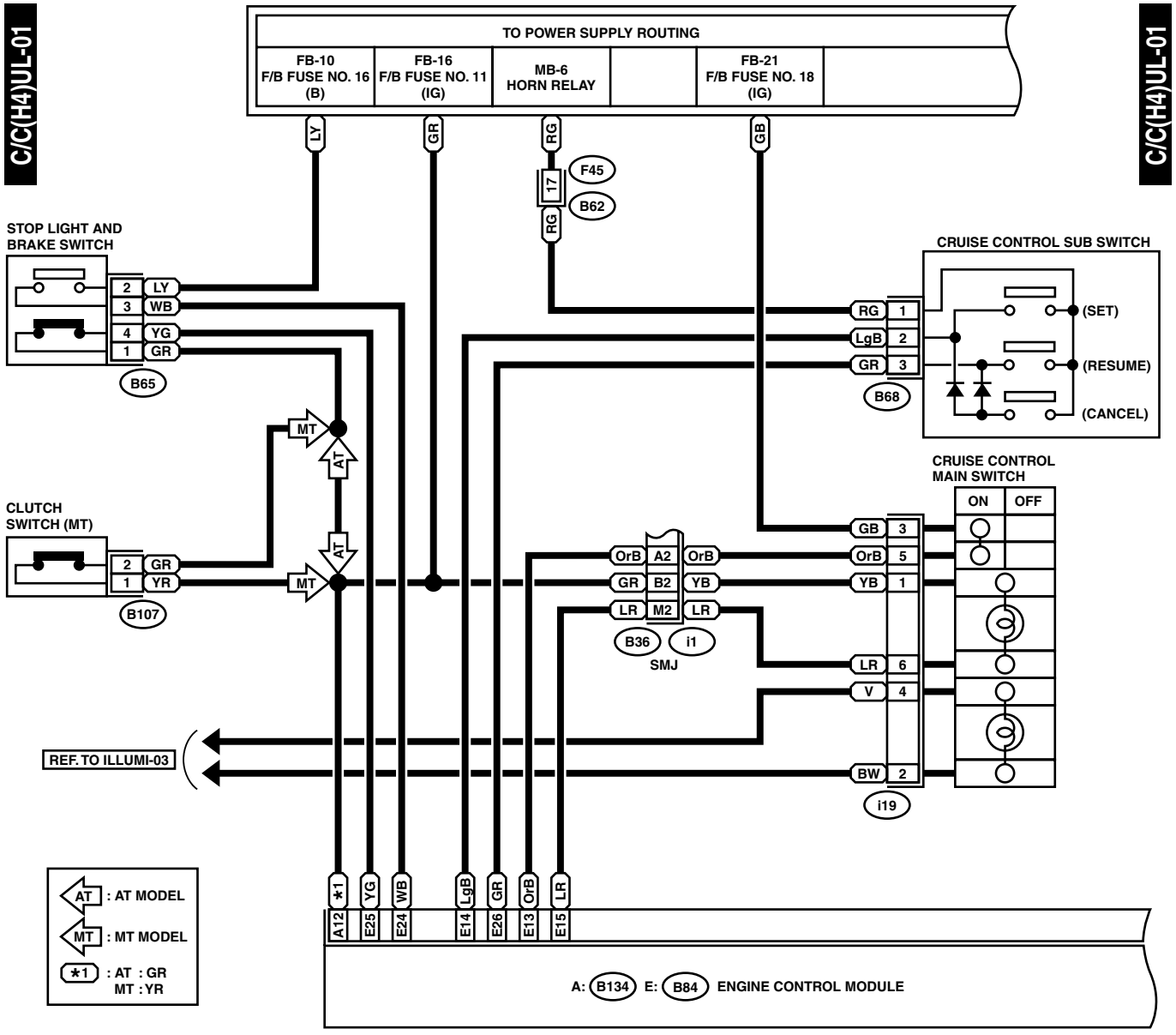
WI-06346

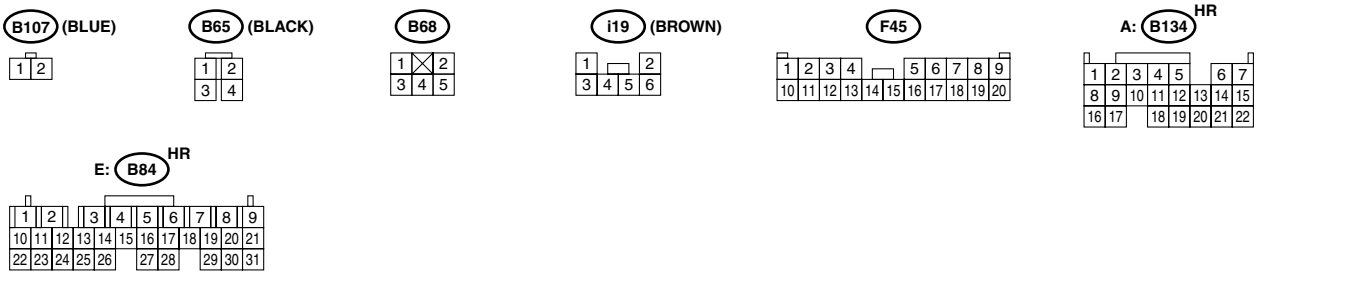

C/C(H4)-04
C/C(H4)-04
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
GW
GW
C3
DIMMER CIRCUIT
μ-COM
COMBINATION METER
A: i10
C: i12
CRUISE SET
INDICATOR
LIGHT
C6
A20
BOr
B
BOr
B
i40
4
B201
BOr
B
i1
A3
B36
B
SMJ
B
E
REF. TO GND-03
C/C(H4)-02 B


C: i12
1 2 3 4 5 6
7 8 9 10 11 12 13 14
i40
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22
A: i10 (GREEN)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

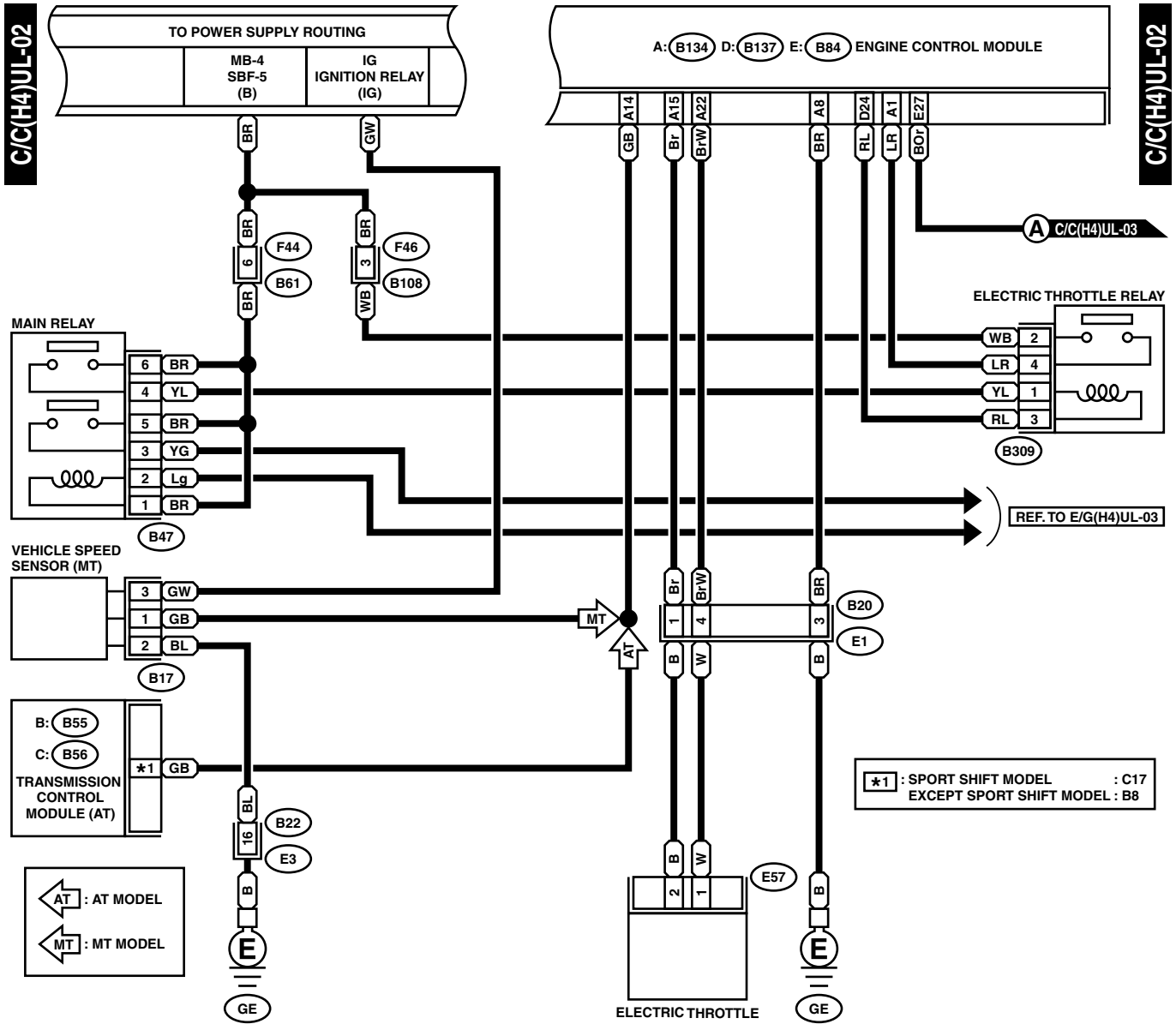
WI-03142

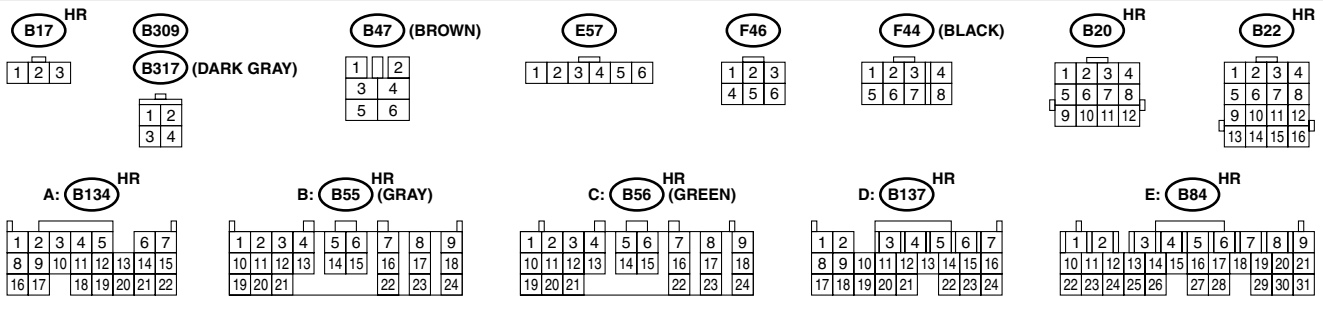
2. 4-CYLINDER ENGINE U5 MODEL



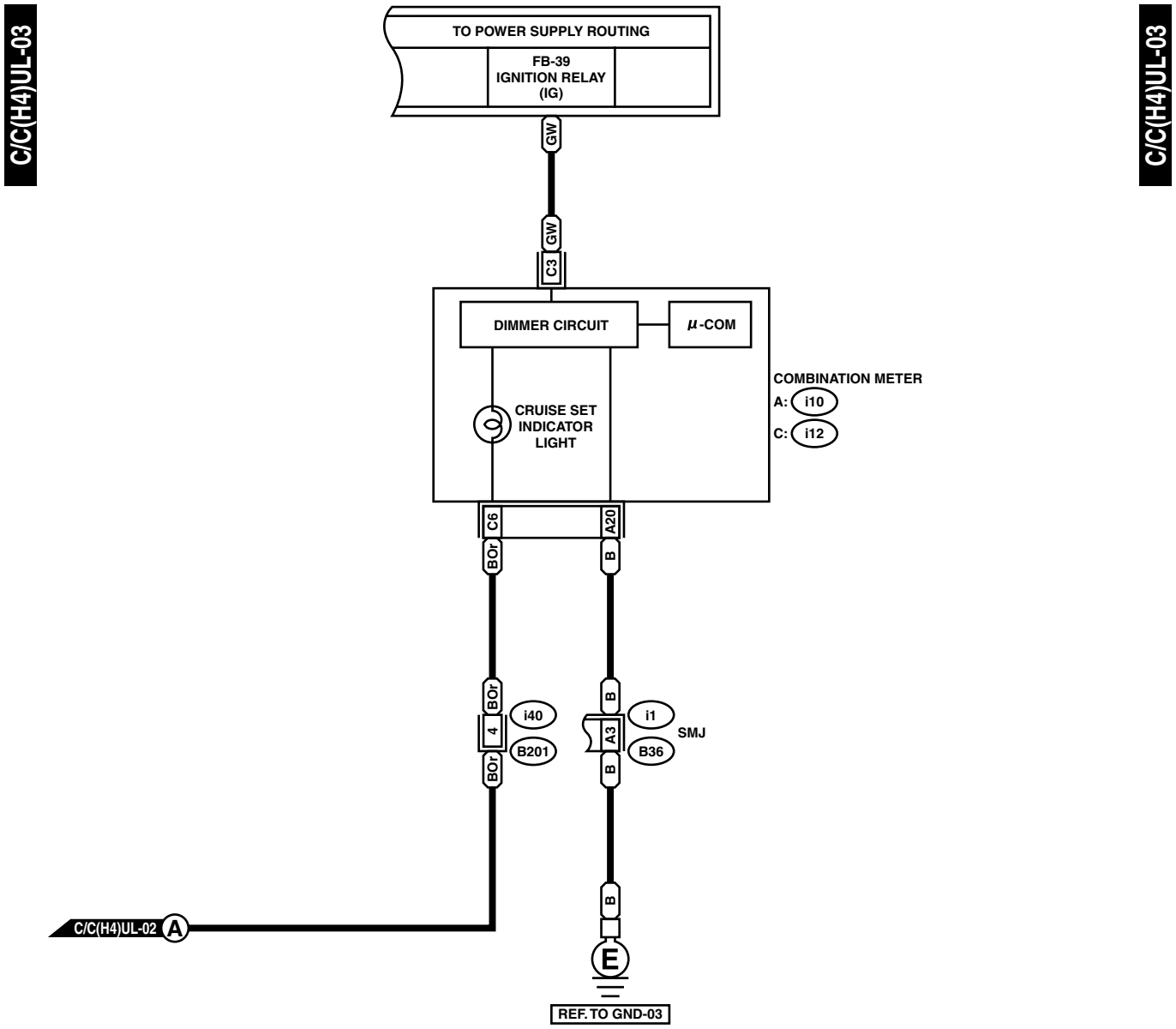


WI-06347

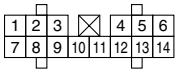

C/C(H4)UL-02
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
A: B134 D: B137 E: B84 ENGINE CONTROL MODULE
A14
A15
A22
A8
D24
A1
E27
GB
Br
BrW
BR
RL
LR
BOr
A C/C(H4)UL-03
F44
B61
F46
B108
WB
ELECTRIC THROTTLE RELAY
MAIN RELAY
WB 2
LR 4
YL 1
RL 3
B309
6 BR
4 YL
5 BR
3 YG
2 Lg
1 BR
B47
REF. TO E/G(H4)UL-03
VEHICLE SPEED SENSOR (MT)
3 GW
1 GB
2 BL
B17
MT
AT
B20
E1
B: B55
C: B56
TRANSMISSION CONTROL MODULE (AT)
*1 GB
*1 : SPORT SHIFT MODEL : C17
EXCEPT SPORT SHIFT MODEL : B8
16 BL
B22
E3
AT : AT MODEL
MT : MT MODEL
E57
ELECTRIC THROTTLE
GE


B17 HR
B309
B317 (DARK GRAY)
B47 (BROWN)
E57
F46
F44 (BLACK)
B20 HR
B22 HR
A: B134 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)
D: B137 HR
E: B84 HR

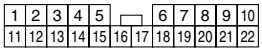
WI-06348



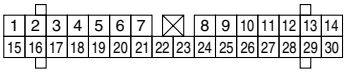
C: i12 (GREEN)



i40

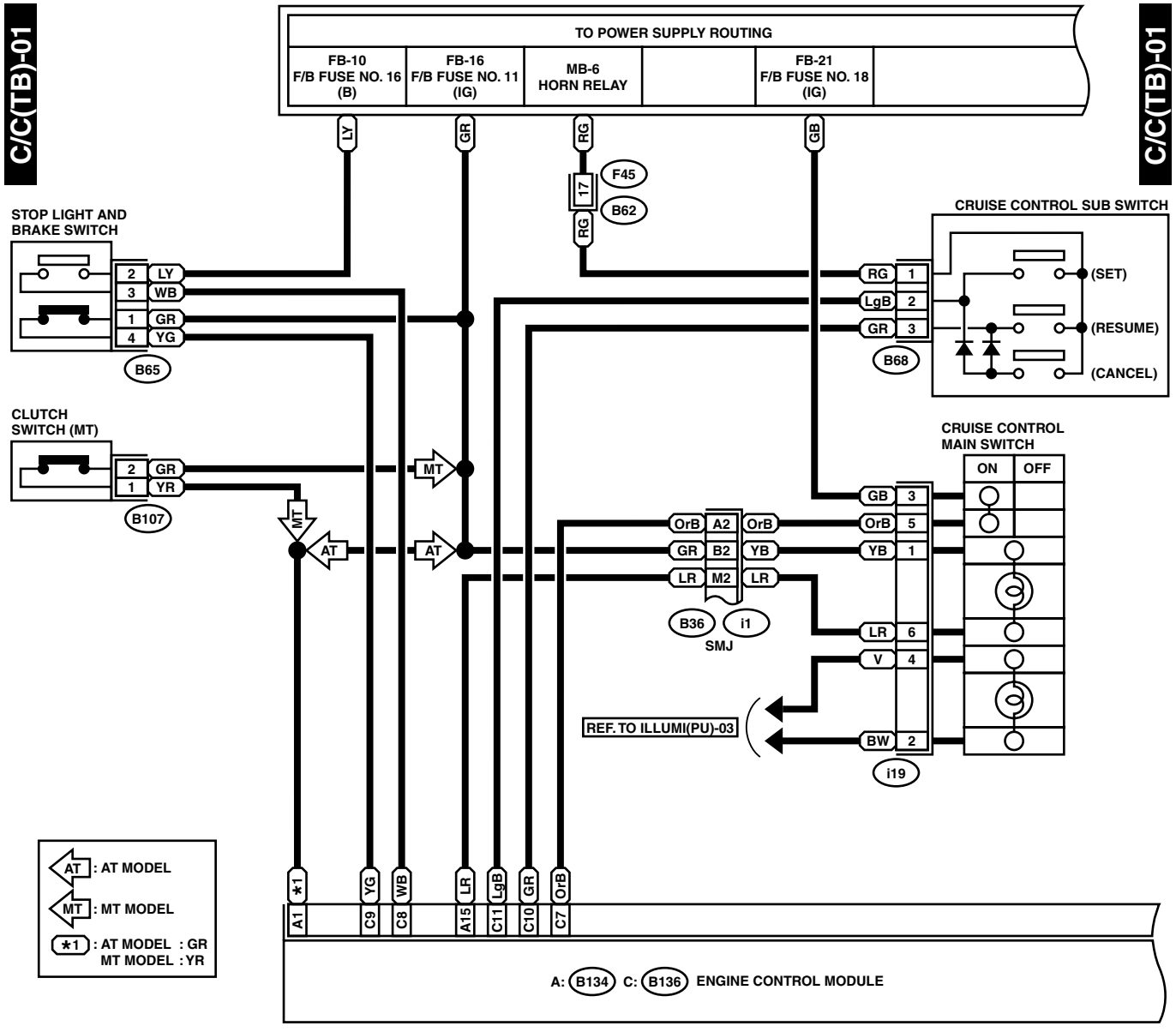


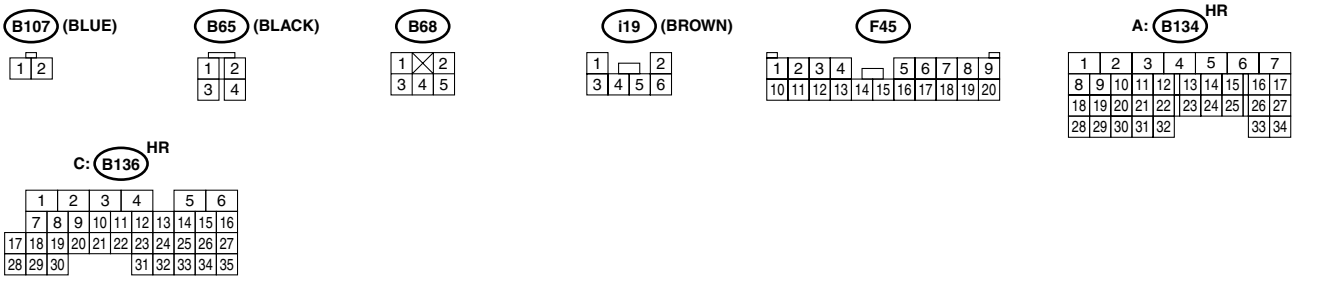
A: i10 (GREEN)



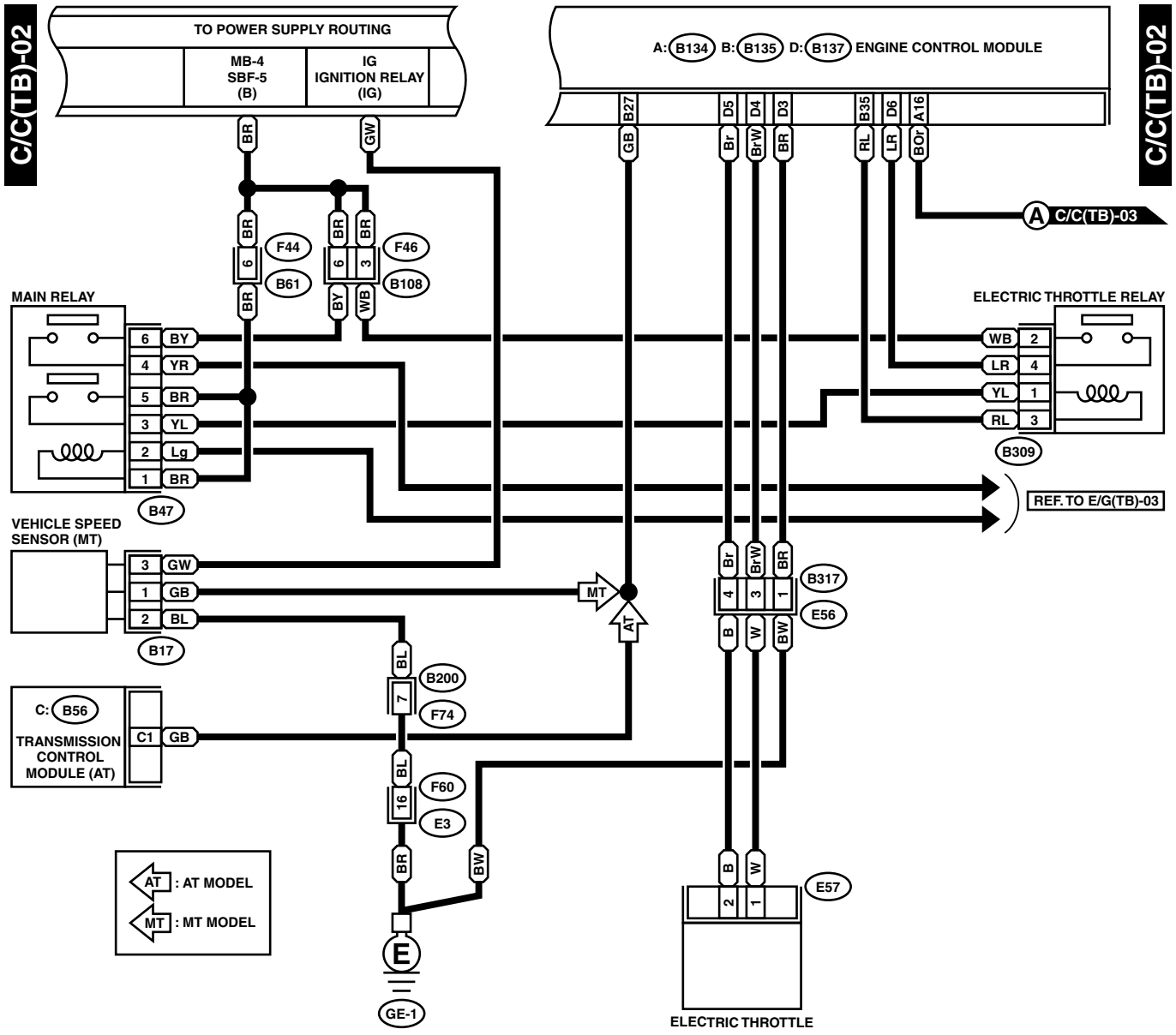
WI-03511

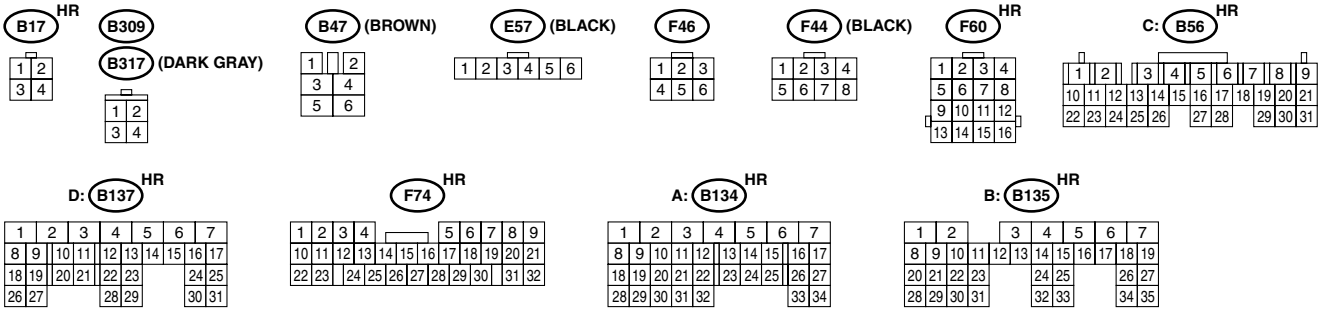
3. 4-CYLINDER TURBO ENGINE





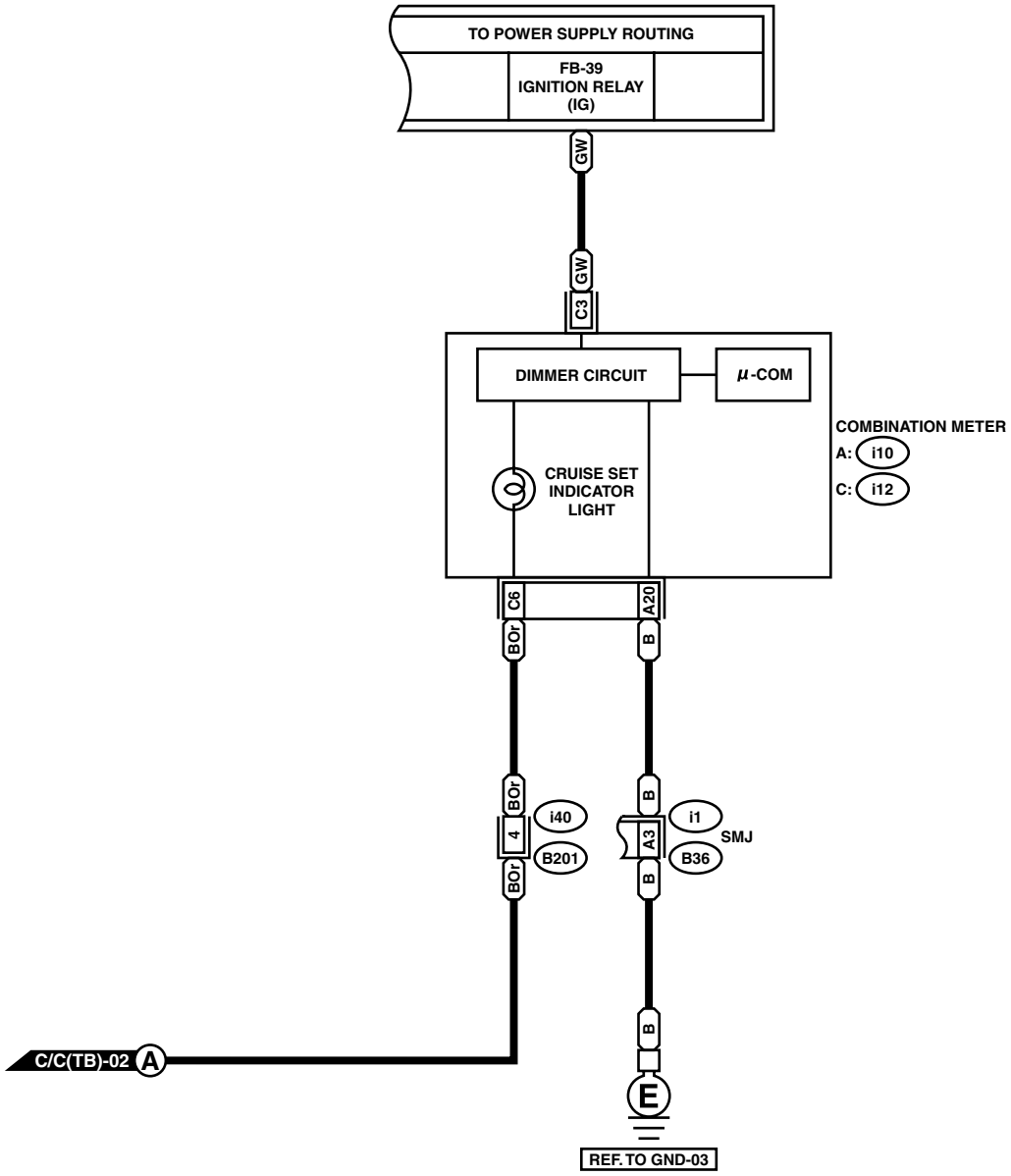
WI-06349


C/C(TB)-02
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
IG
IGNITION RELAY
(IG)
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
C/C(TB)-02
A C/C(TB)-03
F44
B61
F46
B108
MAIN RELAY
ELECTRIC THROTTLE RELAY
B309
REF. TO E/G(TB)-03
B47
VEHICLE SPEED SENSOR (MT)
B17
B317
E56
B200
F74
C: B56
TRANSMISSION CONTROL MODULE (AT)
F60
E3
GE-1
AT : AT MODEL
MT : MT MODEL
E57
ELECTRIC THROTTLE


B17 HR
B309
B317 (DARK GRAY)
B47 (BROWN)
E57 (BLACK)
F46
F44 (BLACK)
F60 HR
C: B56 HR
D: B137 HR
F74 HR
A: B134 HR
B: B135 HR

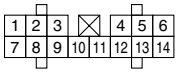
WI-06350

C/C(TB)-03

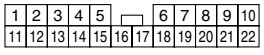


C/C(TB)-03

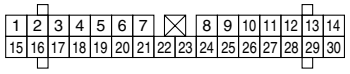
C: i12 (GREEN)



i40

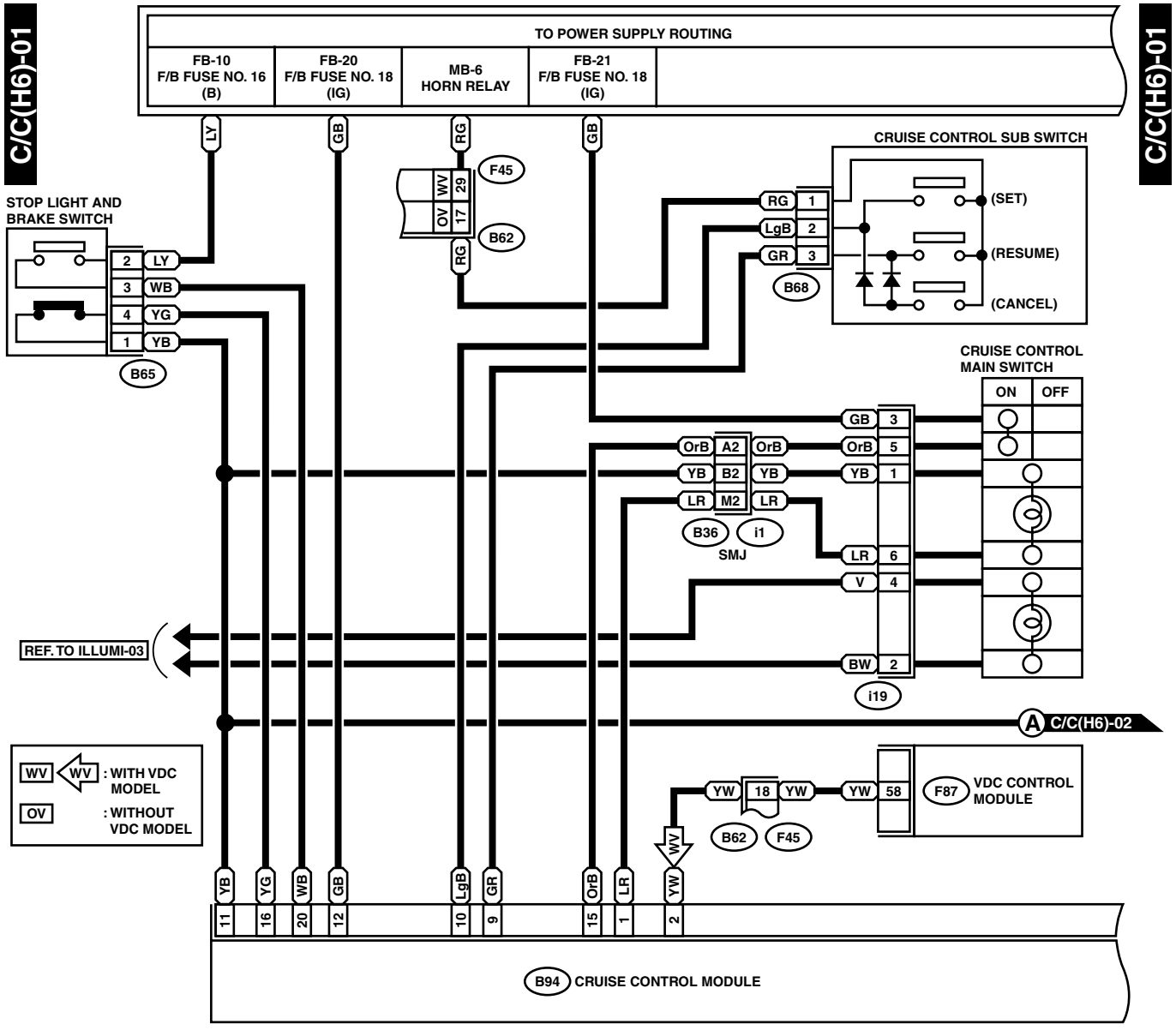


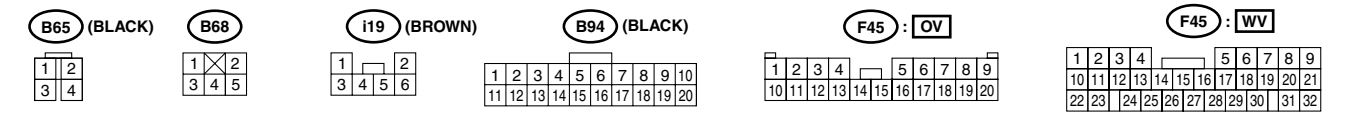
A: i10 (GREEN)

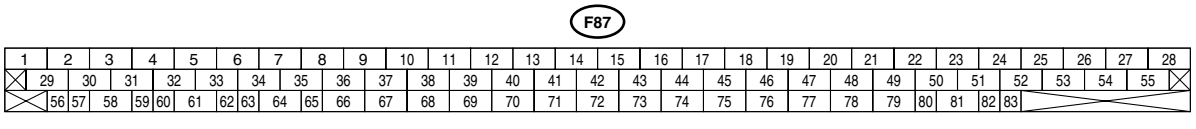


WI-03514

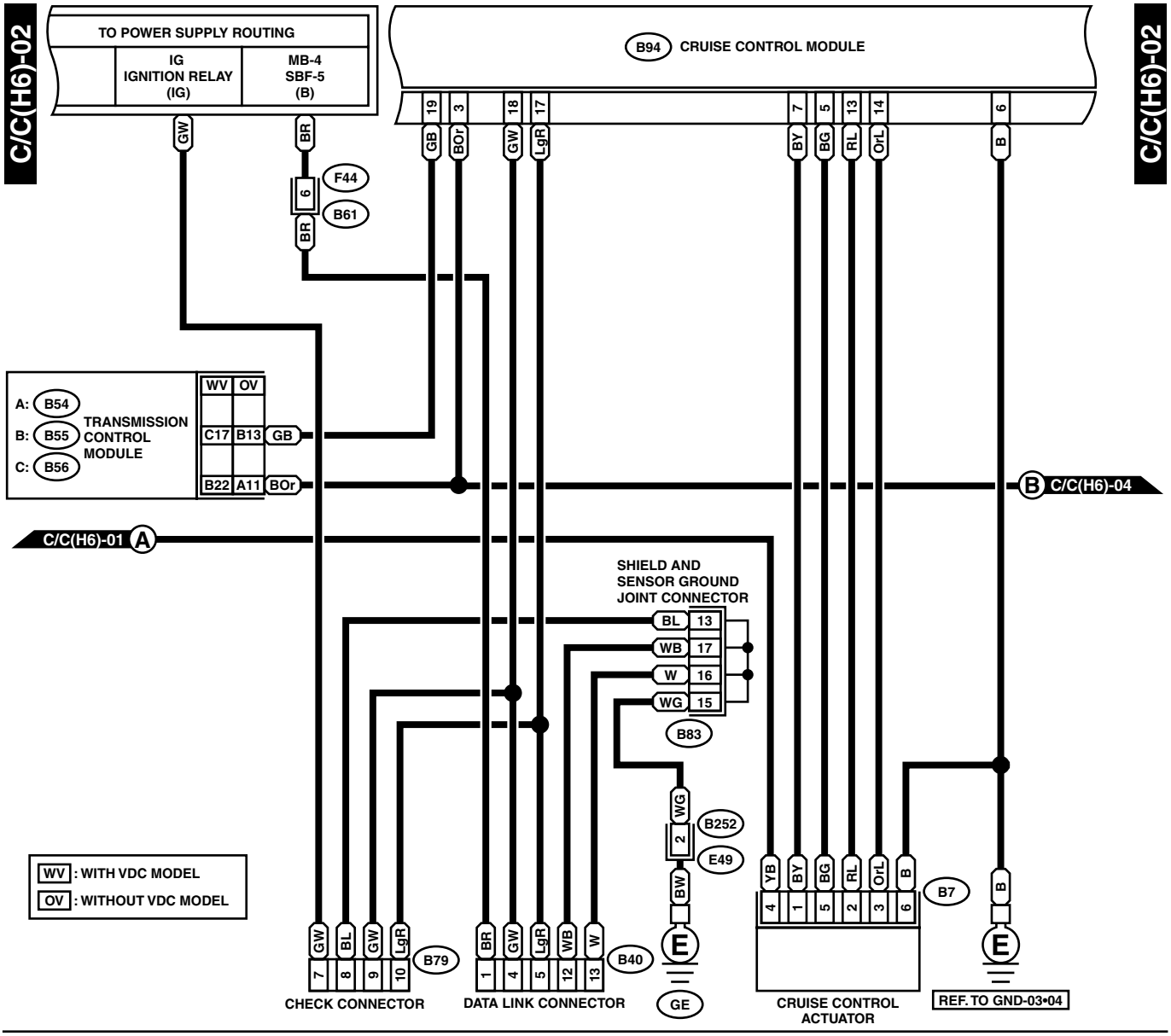
4. 6-CYLINDER ENGINE

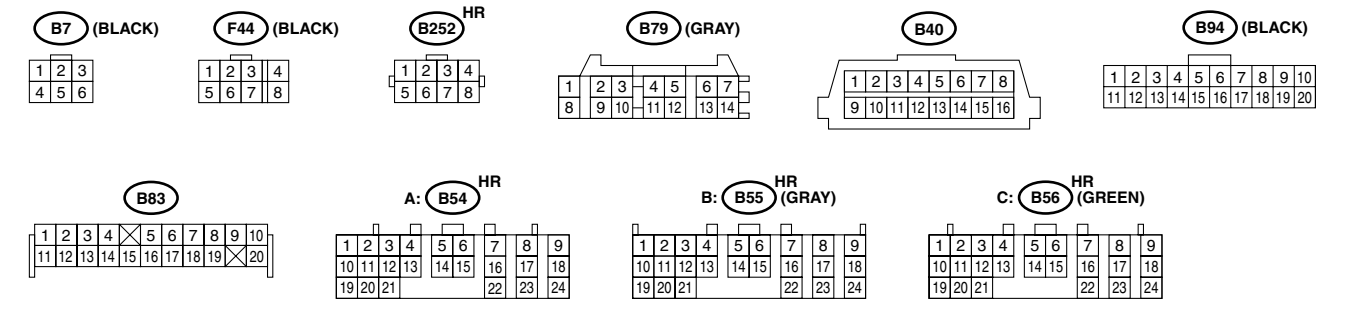




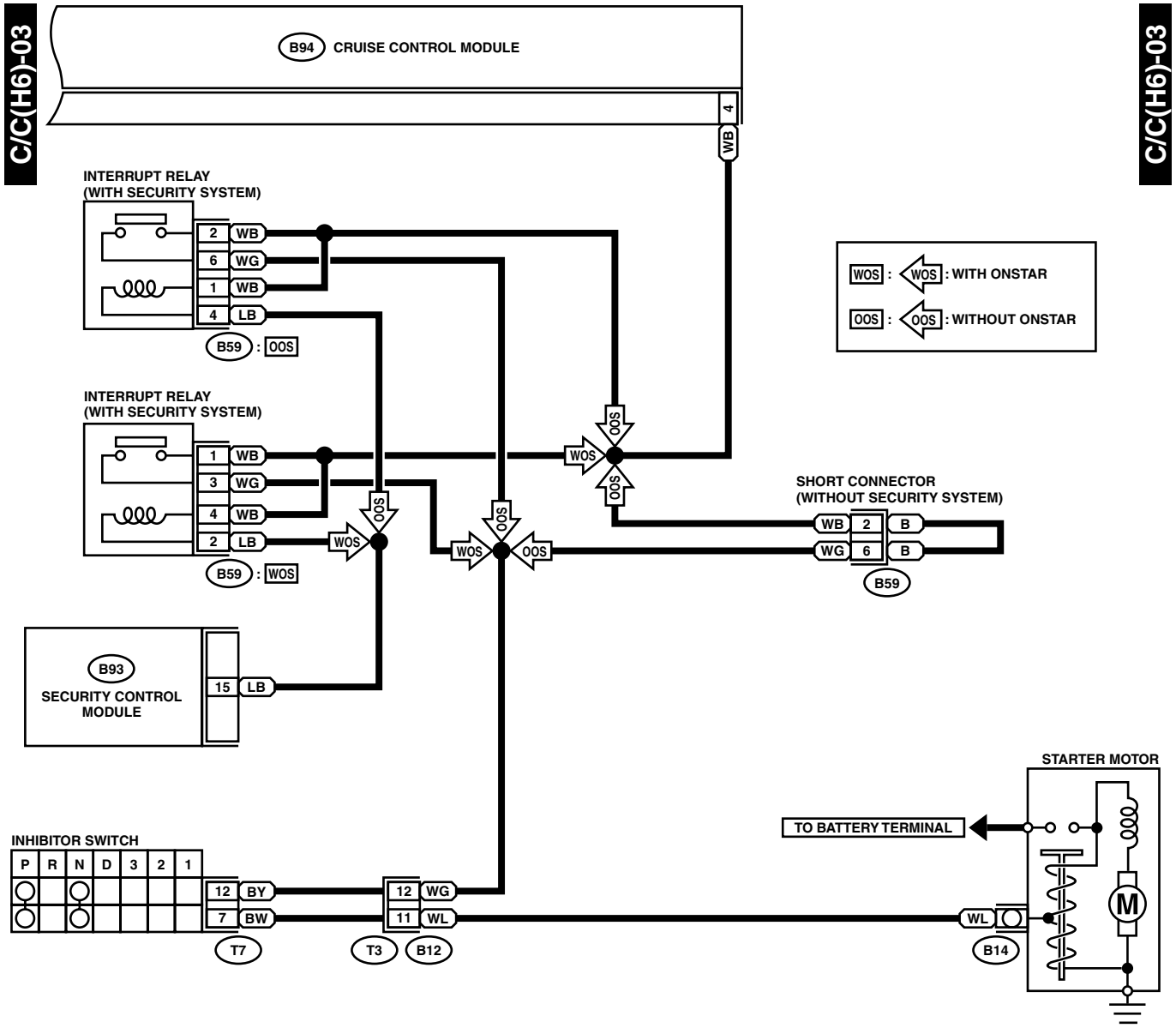


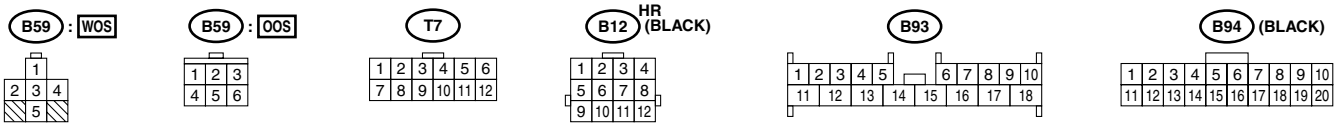
WI-03515


C/C(H6)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-4
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(H6)-02
GW
BR
F44
B61
A: B54
B: B55
C: B56
TRANSMISSION CONTROL MODULE
WV
OV
C17
B13
GB
B22
A11
BOr
B C/C(H6)-04
C/C(H6)-01 A
SHIELD AND SENSOR GROUND JOINT CONNECTOR
BL
WB
W
WG
B83
B252
E49
B79
B40
GE
CHECK CONNECTOR
DATA LINK CONNECTOR
B7
CRUISE CONTROL ACTUATOR
REF. TO GND-03•04
WV : WITH VDC MODEL
OV : WITHOUT VDC MODEL

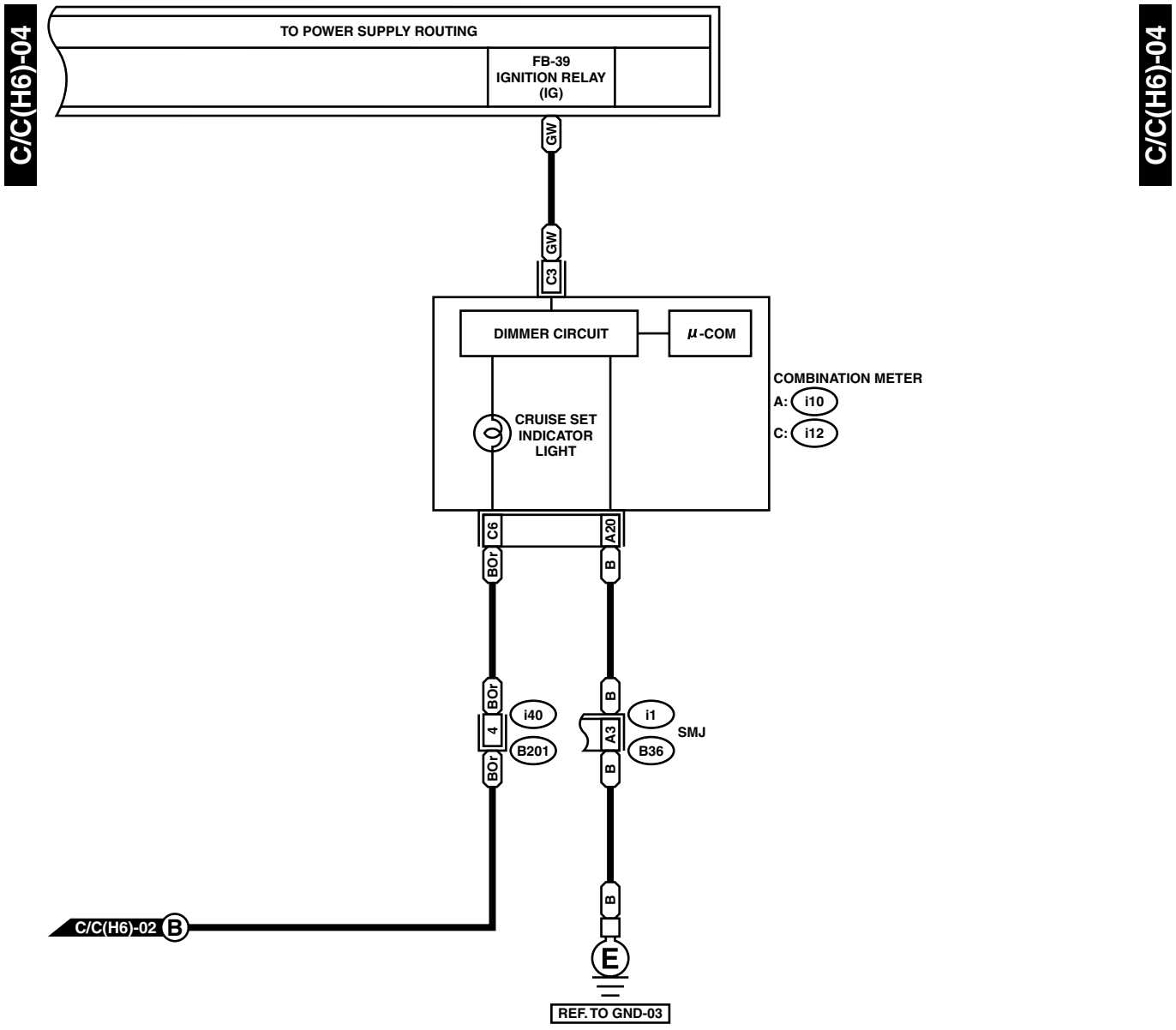

B7 (BLACK)
F44 (BLACK)
B252 HR
B79 (GRAY)
B40
B94 (BLACK)
B83
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)

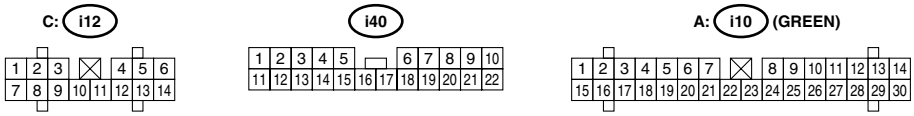
WI-06351


C/C(H6)-03
C/C(H6)-03
B94 CRUISE CONTROL MODULE
4
WB
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
2 WB
6 WG
1 WB
4 LB
B59 : OOS
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
1 WB
3 WG
4 WB
2 LB
B59 : WOS
WOS : WOS : WITH ONSTAR
OOS : OOS : WITHOUT ONSTAR
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
WB 2 B
WG 6 B
B59
B93
SECURITY CONTROL
MODULE
15 LB
STARTER MOTOR
TO BATTERY TERMINAL
M
INHIBITOR SWITCH
P R N D 3 2 1
12 BY
7 BW
T7
12 WG
11 WL
T3
B12
WL
B14


B59 : WOS
B59 : OOS
T7
B12 HR (BLACK)
B93
B94 (BLACK)

WI-06352

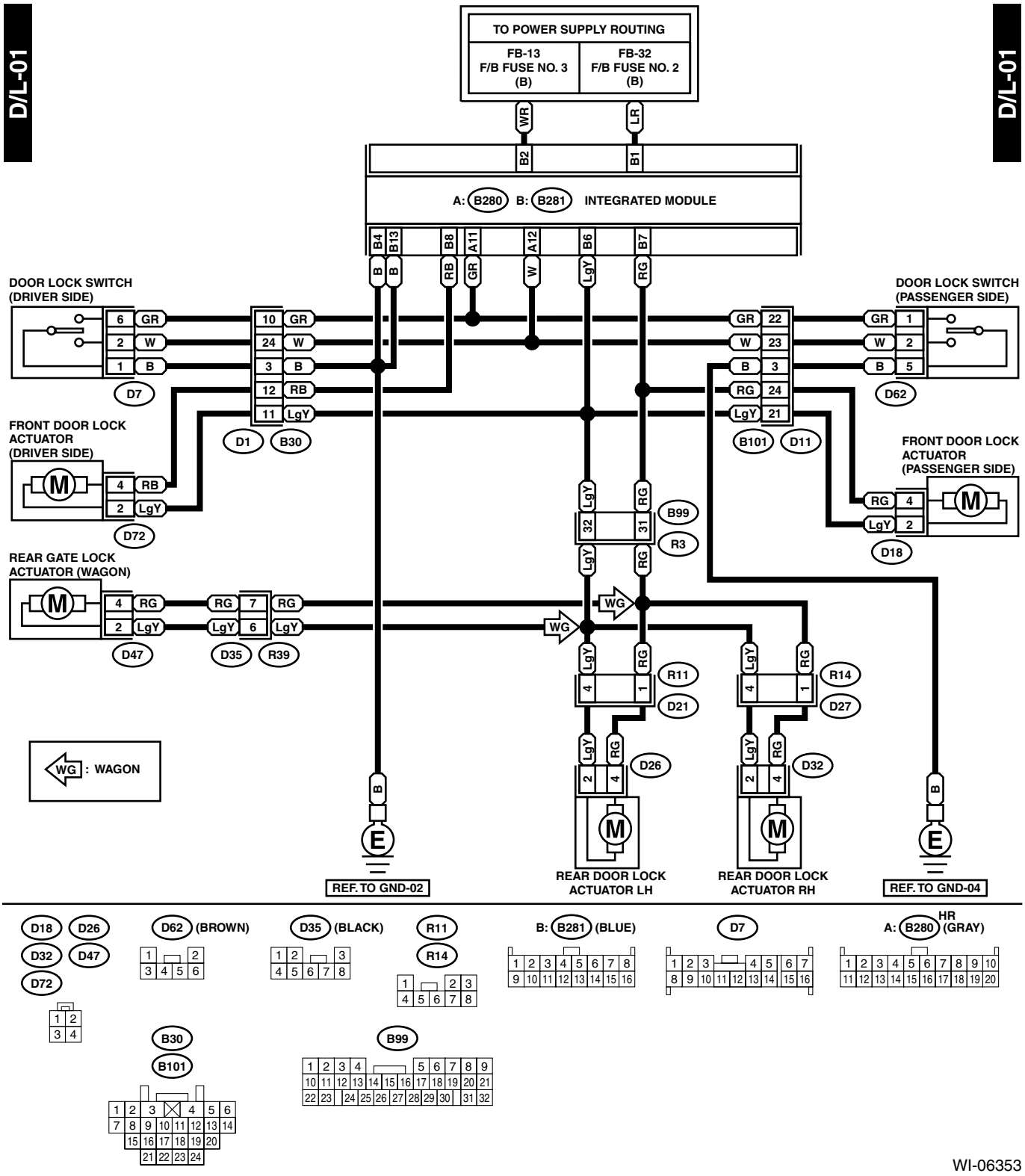

C/C(H6)-04
C/C(H6)-04
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
GW
GW
C3
DIMMER CIRCUIT
μ-COM
COMBINATION METER
A: i10
C: i12
CRUISE SET
INDICATOR
LIGHT
C6
A20
BOr
B
BOr
B
i40
4
B201
BOr
B
i1
A3
B36
SMJ
B
C/C(H6)-02 B
E
REF. TO GND-03


C: i12
1 2 3 4 5 6
7 8 9 10 11 12 13 14
i40
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22
A: i10 (GREEN)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

WI-03144

15.Door Lock System

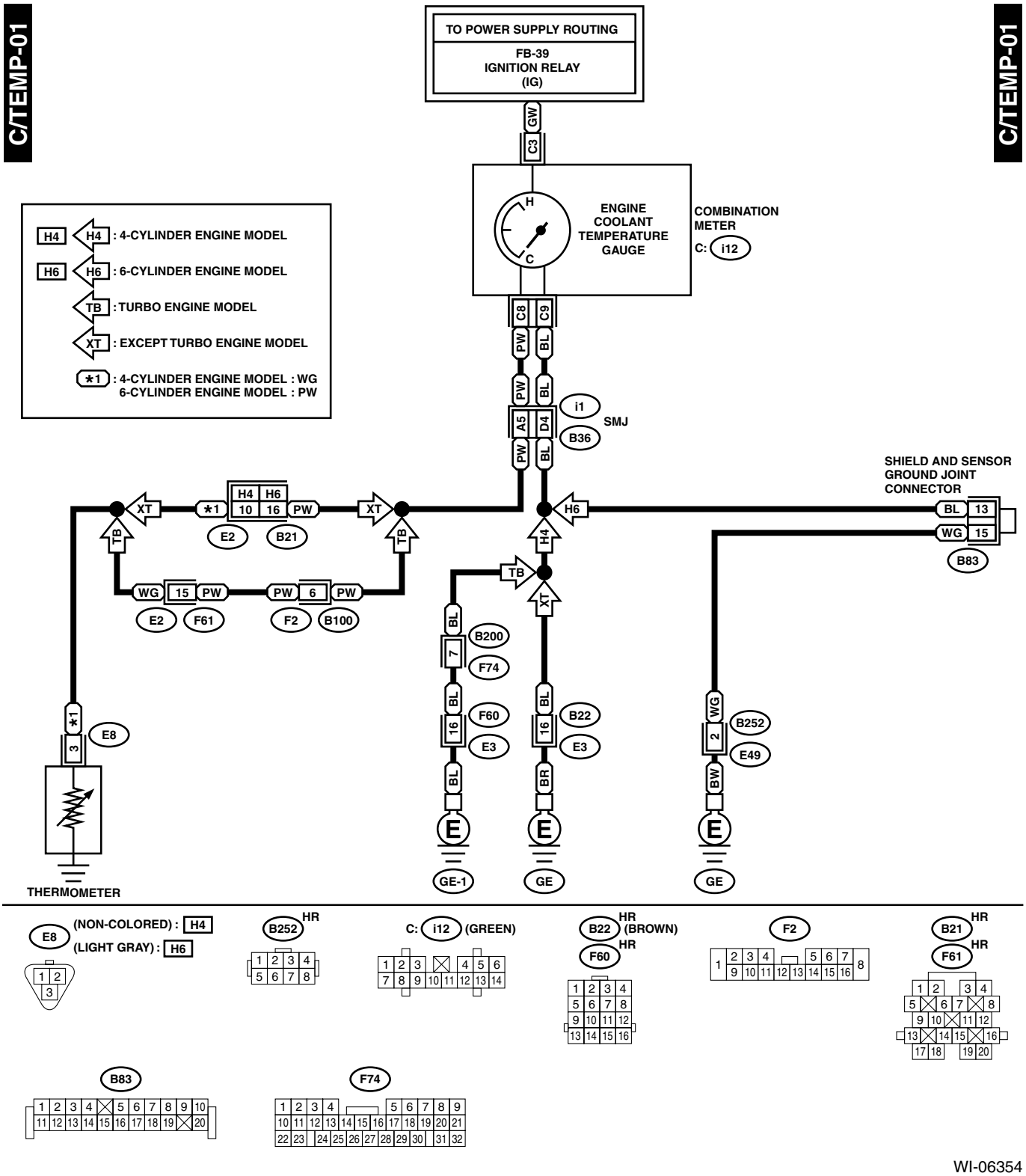
A: SCHEMATIC



WI-06353

16.Engine Coolant Temperature Gauge System

A: SCHEMATIC

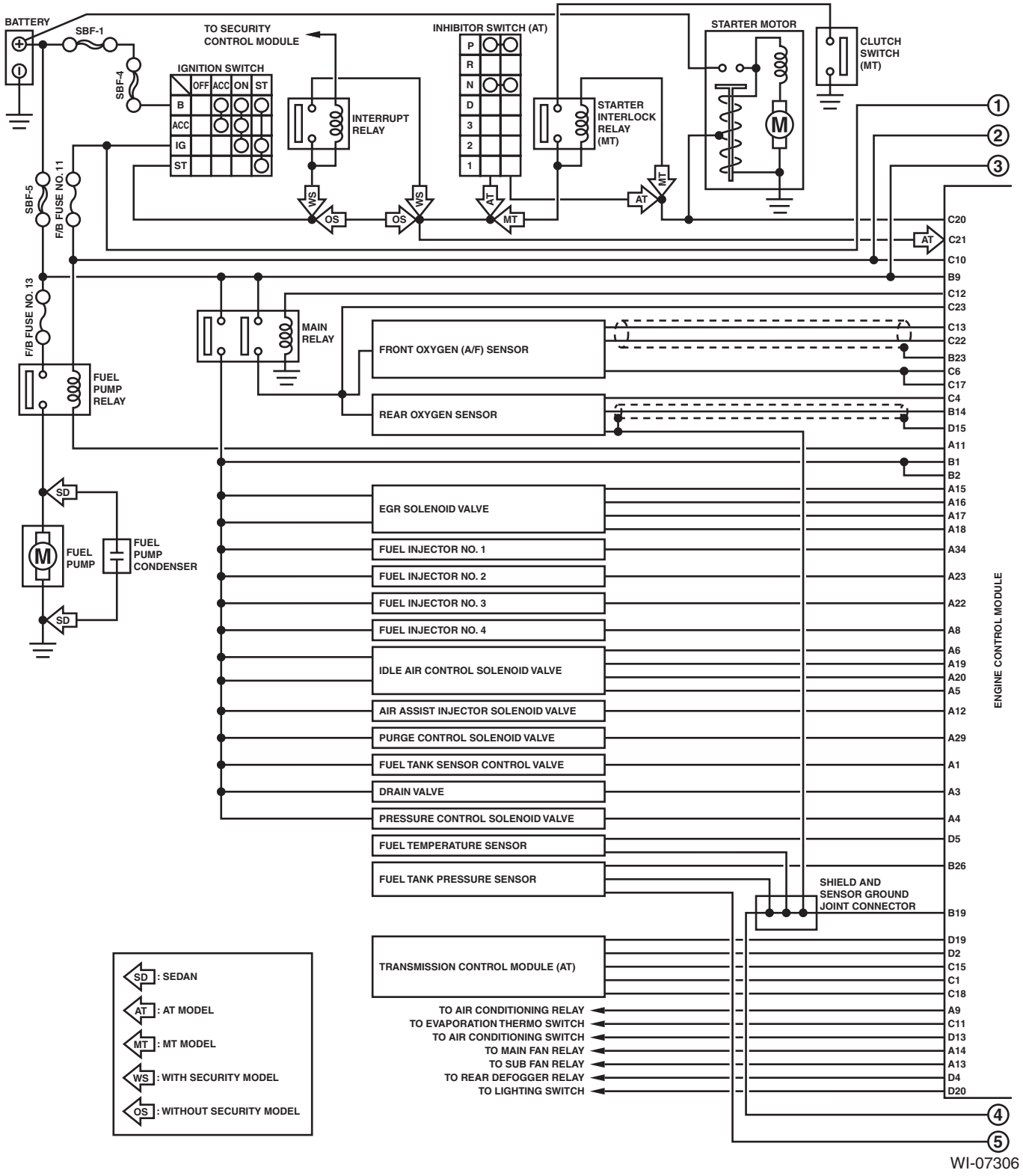


WI-06354

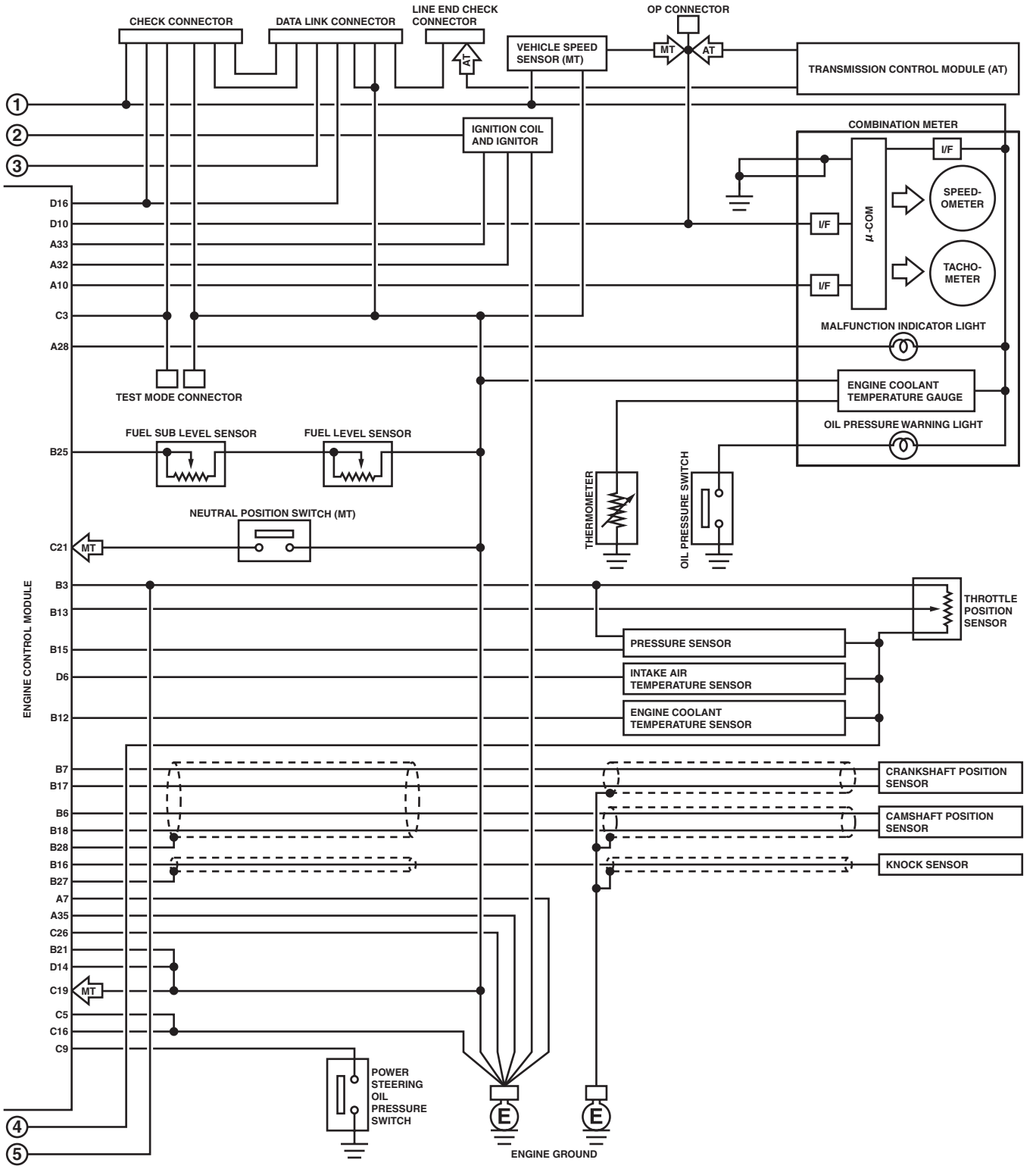
17.Engine Electrical System

A: SCHEMATIC

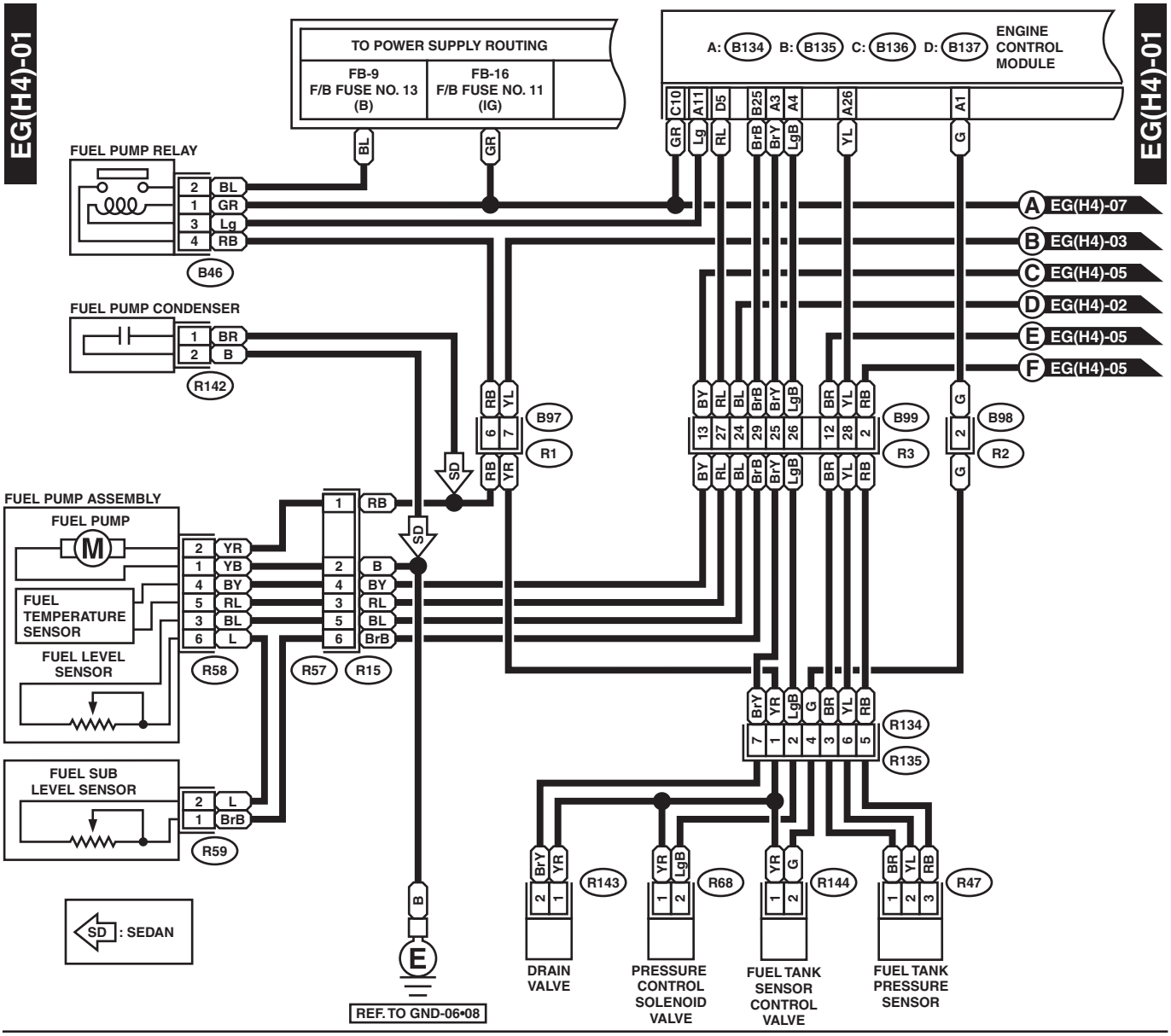
1. EXCEPT 4-CYLINDER ENGINE U5 MODEL



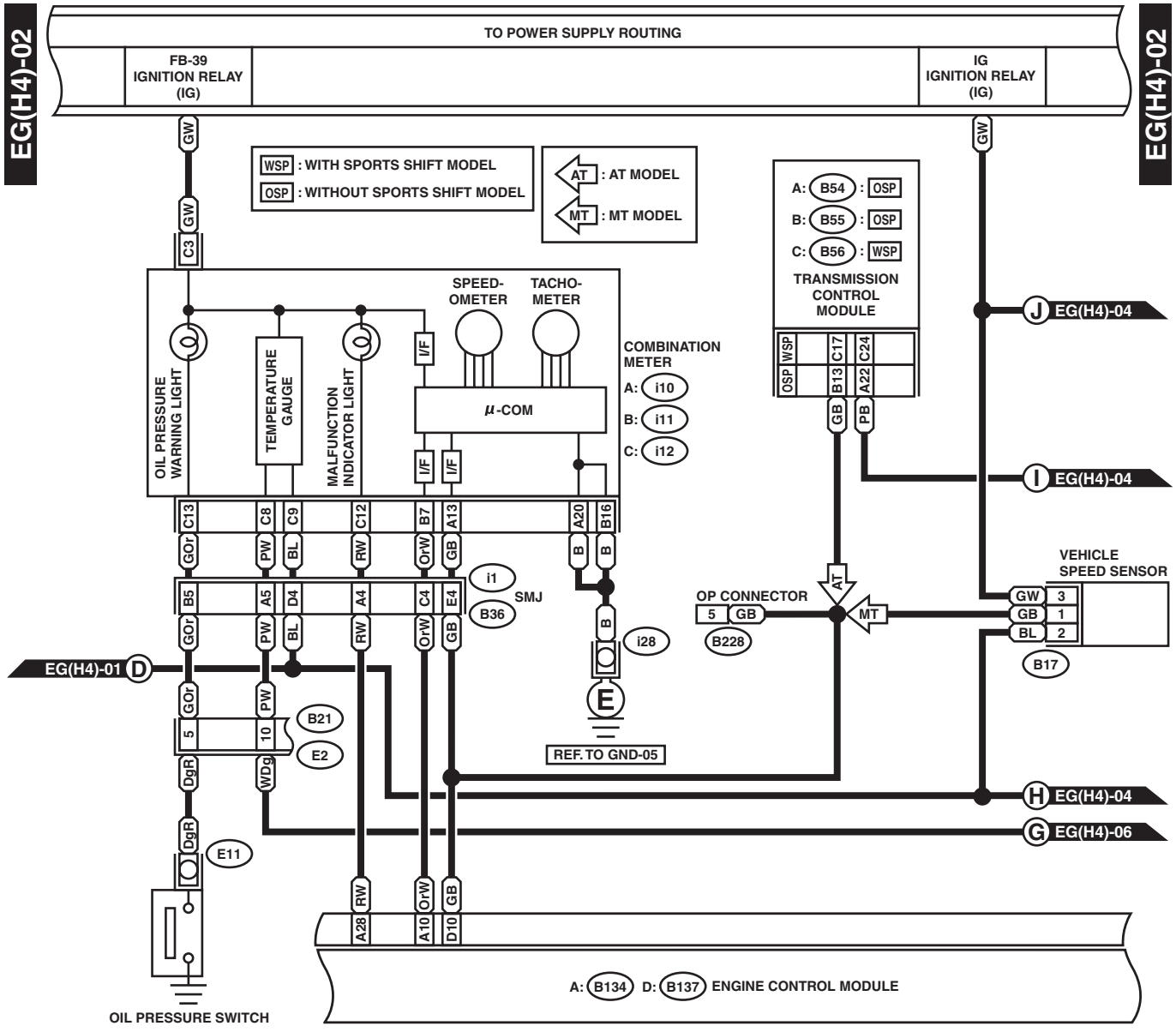
WI-07306

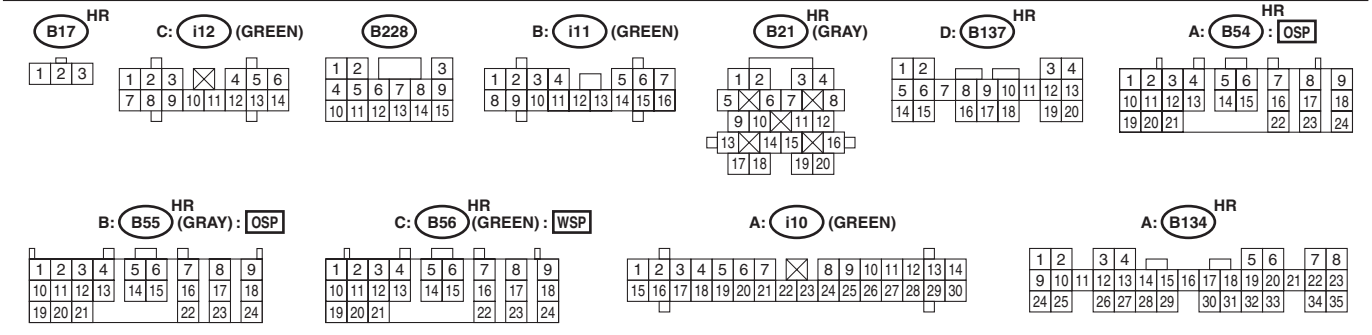

CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
OP CONNECTOR
VEHICLE SPEED SENSOR (MT)
MT
AT
TRANSMISSION CONTROL MODULE (AT)
IGNITION COIL AND IGNITOR
COMBINATION METER
I/F
SPEED-OMETER
TACHO-METER
μ-COM
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
TEST MODE CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
THERMOMETER
OIL PRESSURE SWITCH
ENGINE CONTROL MODULE
THROTTLE POSITION SENSOR
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE GROUND
D16
D10
A33
A32
A10
C3
A28
B25
C21
B3
B13
B15
D6
B12
B7
B17
B6
B18
B28
B16
B27
A7
A35
C26
B21
D14
C19
C5
C16
C9
1
2
3
4
5
E

WI-03519

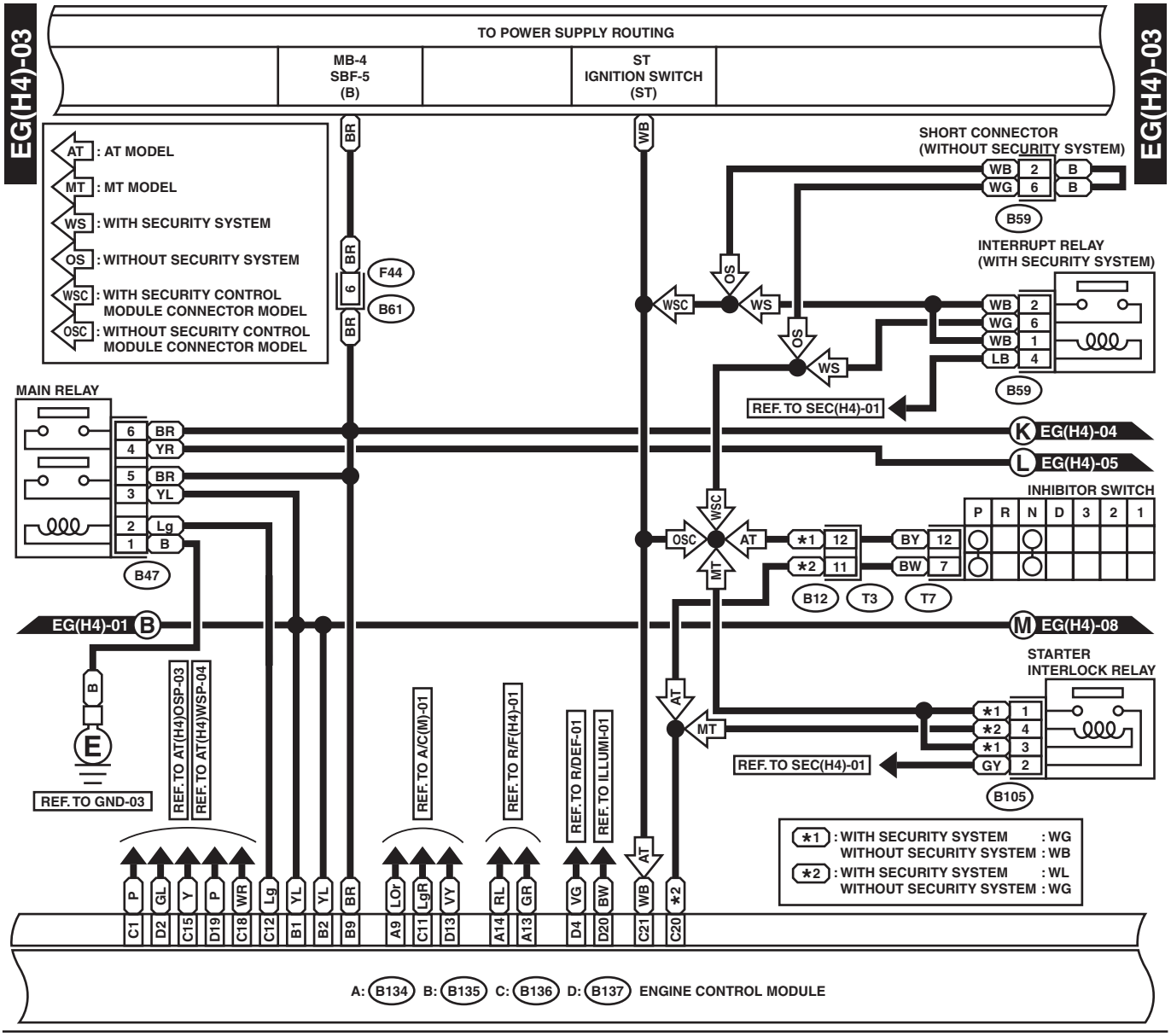

EG(H4)-01
TO POWER SUPPLY ROUTING
FB-9
F/B FUSE NO. 13
(B)
FB-16
F/B FUSE NO. 11
(IG)
A: B134 B: B135 C: B136 D: B137
ENGINE CONTROL MODULE
C10 A11 D5 B25 A3 A4 A26 A1
GR Lg RL BrB BrY LgB YL G
FUEL PUMP RELAY
2 BL
1 GR
3 Lg
4 RB
B46
FUEL PUMP CONDENSER
1 BR
2 B
R142
A EG(H4)-07
B EG(H4)-03
C EG(H4)-05
D EG(H4)-02
E EG(H4)-05
F EG(H4)-05
RB YL
6 7
B97
R1
BY RL BL BrB BrY LgB BR YL RB
13 27 24 29 25 26 12 28 2
B99
R3
G
2
B98
R2
SD
FUEL PUMP ASSEMBLY
FUEL PUMP
M
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
2 YR
1 YB
4 BY
5 RL
3 BL
6 L
R58
1 RB
2 B
4 BY
3 RL
5 BL
6 BrB
R57
R15
FUEL SUB LEVEL SENSOR
2 L
1 BrB
R59
BrY YR LgB G BR YL RB
7 1 2 4 3 6 5
R134
R135
B
E
REF. TO GND-06•08
SD : SEDAN
BrY YR
2 1
R143
DRAIN VALVE
YR LgB
1 2
R68
PRESSURE CONTROL SOLENOID VALVE
YR G
1 2
R144
FUEL TANK SENSOR CONTROL VALVE
BR YL RB
1 2 3
R47
FUEL TANK PRESSURE SENSOR
B98 (BLACK)
HR
R59
HR
R68
1 2
R142 (BLACK)
1
2
HR
R143
HR
R144
1 2
HR
R47 (BLACK)
1 2 3
B46 (GREEN)
1 2
3 4
R57 (BLACK)
1 2
3 4 5 6
HR
R58
1 2
3 4
5 6
B97
HR
R134 (GRAY)
1 2 3 4
5 6 7 8
D: B137
HR
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
C: B136
HR
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
B: B135
HR
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
B99
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32
A: B134
HR
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

WI-06355

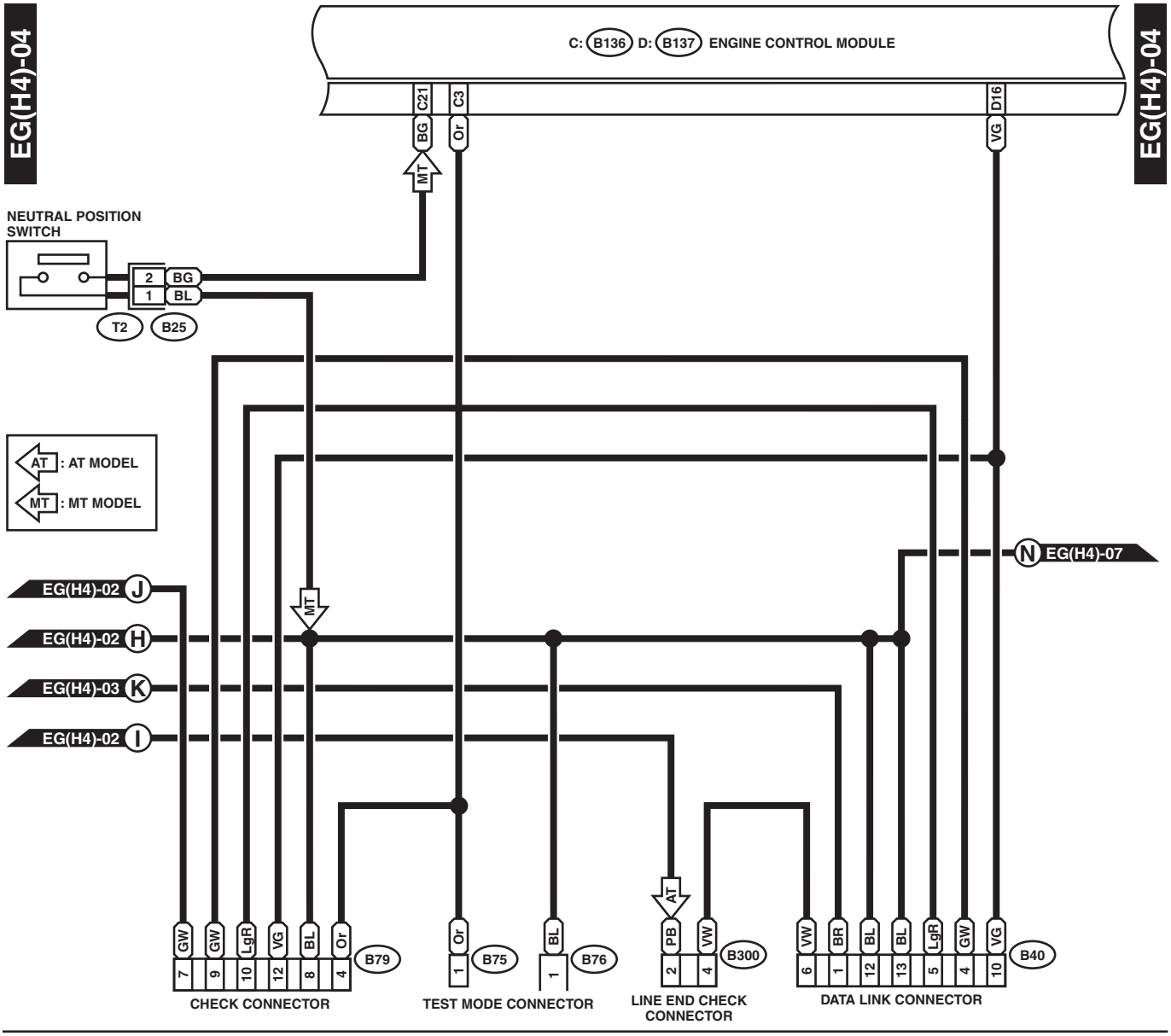

EG(H4)-02
TO POWER SUPPLY ROUTING
FB-39 IGNITION RELAY (IG)
IG IGNITION RELAY (IG)
GW
C3
WSP : WITH SPORTS SHIFT MODEL
OSP : WITHOUT SPORTS SHIFT MODEL
AT : AT MODEL
MT : MT MODEL
A: B54 : OSP
B: B55 : OSP
C: B56 : WSP
TRANSMISSION CONTROL MODULE
SPEED-OMETER
TACHO-METER
COMBINATION METER
A: i10
B: i11
C: i12
OIL PRESSURE WARNING LIGHT
TEMPERATURE GAUGE
MALFUNCTION INDICATOR LIGHT
I/F
μ-COM
J EG(H4)-04
I EG(H4)-04
GB
PB
VEHICLE SPEED SENSOR
OP CONNECTOR
B228
B17
i1
SMJ
B36
i28
EG(H4)-01 D
B21
E2
E
REF. TO GND-05
H EG(H4)-04
G EG(H4)-06
E11
OIL PRESSURE SWITCH
A: B134 D: B137 ENGINE CONTROL MODULE

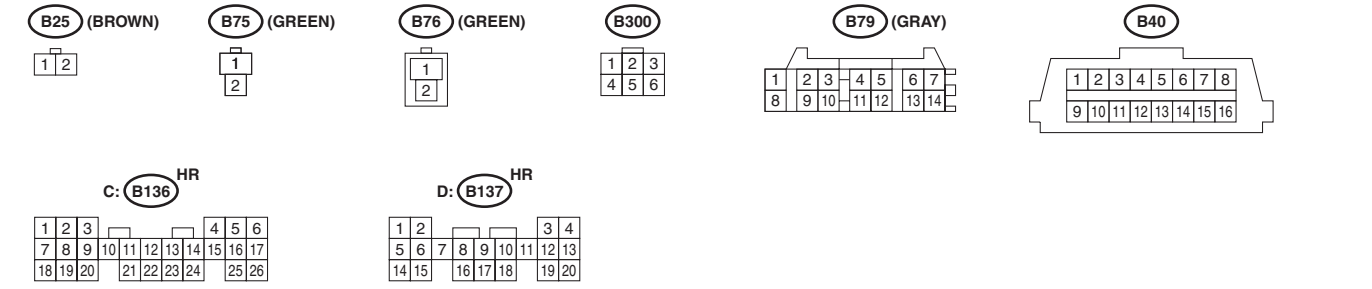

B17 HR
C: i12 (GREEN)
B228
B: i11 (GREEN)
B21 HR (GRAY)
D: B137 HR
A: B54 : OSP HR
B: B55 (GRAY) : OSP HR
C: B56 (GREEN) : WSP HR
A: i10 (GREEN)
A: B134 HR

WI-06356

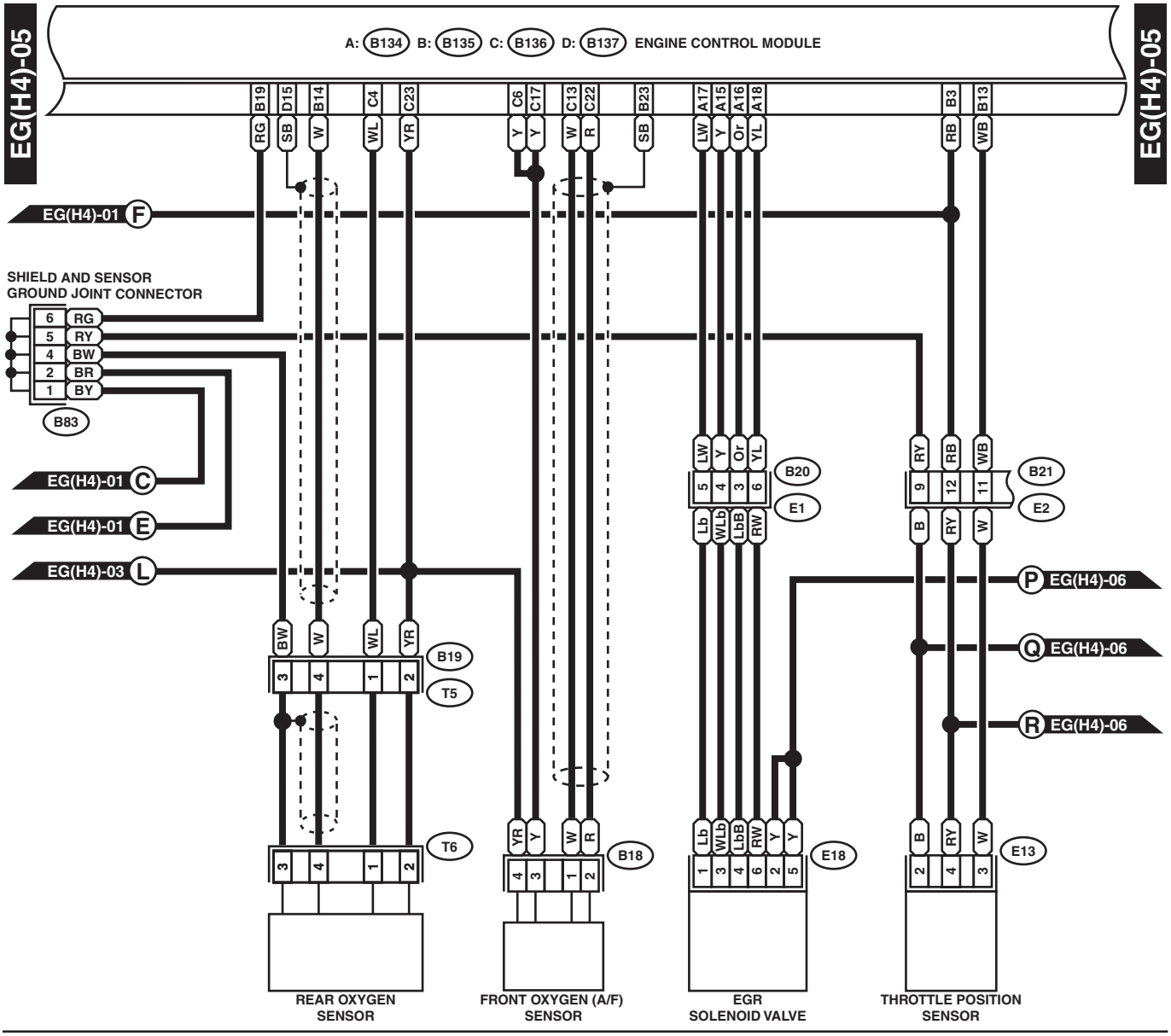

EG(H4)-03
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
WSC : WITH SECURITY CONTROL MODULE CONNECTOR MODEL
OSC : WITHOUT SECURITY CONTROL MODULE CONNECTOR MODEL
SHORT CONNECTOR (WITHOUT SECURITY SYSTEM)
INTERRUPT RELAY (WITH SECURITY SYSTEM)
MAIN RELAY
REF. TO SEC(H4)-01
EG(H4)-04
EG(H4)-05
INHIBITOR SWITCH
EG(H4)-01
EG(H4)-08
STARTER INTERLOCK RELAY
REF. TO GND-03
REF. TO AT(H4)OSP-03
REF. TO AT(H4)WSP-04
REF. TO A/C(M)-01
REF. TO R/F(H4)-01
REF. TO R/DEF-01
REF. TO ILLUMI-01
*1 : WITH SECURITY SYSTEM : WG
WITHOUT SECURITY SYSTEM : WB
*2 : WITH SECURITY SYSTEM : WL
WITHOUT SECURITY SYSTEM : WG
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
B105
B47 (BROWN)
B59
F44 (BLACK)
B12 HR (BLACK)
T7
D: B137 HR
C: B136 HR
B: B135 HR
A: B134 HR

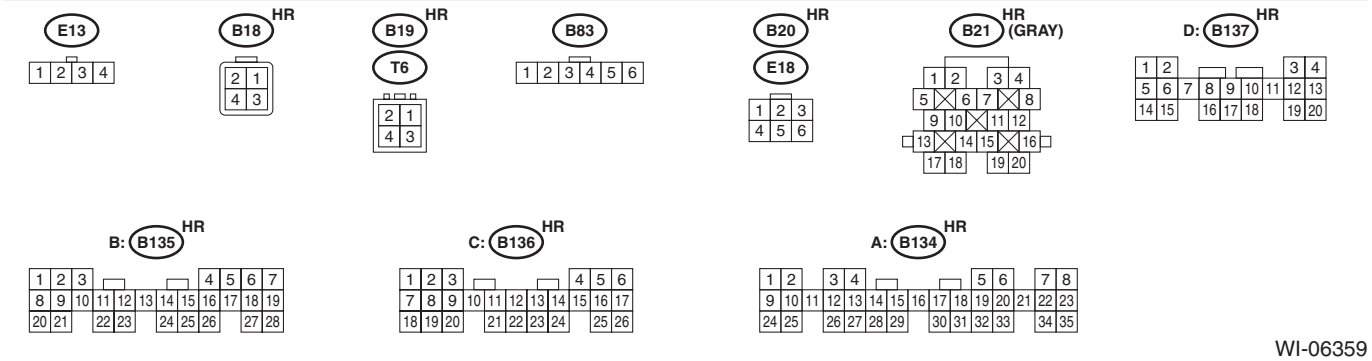
WI-06357


EG(H4)-04
EG(H4)-04
C: B136 D: B137 ENGINE CONTROL MODULE
C21
C3
D16
BG
Or
VG
MT
NEUTRAL POSITION SWITCH
2 BG
1 BL
T2
B25
AT : AT MODEL
MT : MT MODEL
N EG(H4)-07
EG(H4)-02 J
EG(H4)-02 H
EG(H4)-03 K
EG(H4)-02 I
GW GW LgR VG BL Or
7 9 10 12 8 4
B79
CHECK CONNECTOR
Or
1
B75
TEST MODE CONNECTOR
BL
1
B76
PB VW
2 4
B300
LINE END CHECK CONNECTOR
VW BR BL BL LgR GW VG
6 1 12 13 5 4 10
B40
DATA LINK CONNECTOR

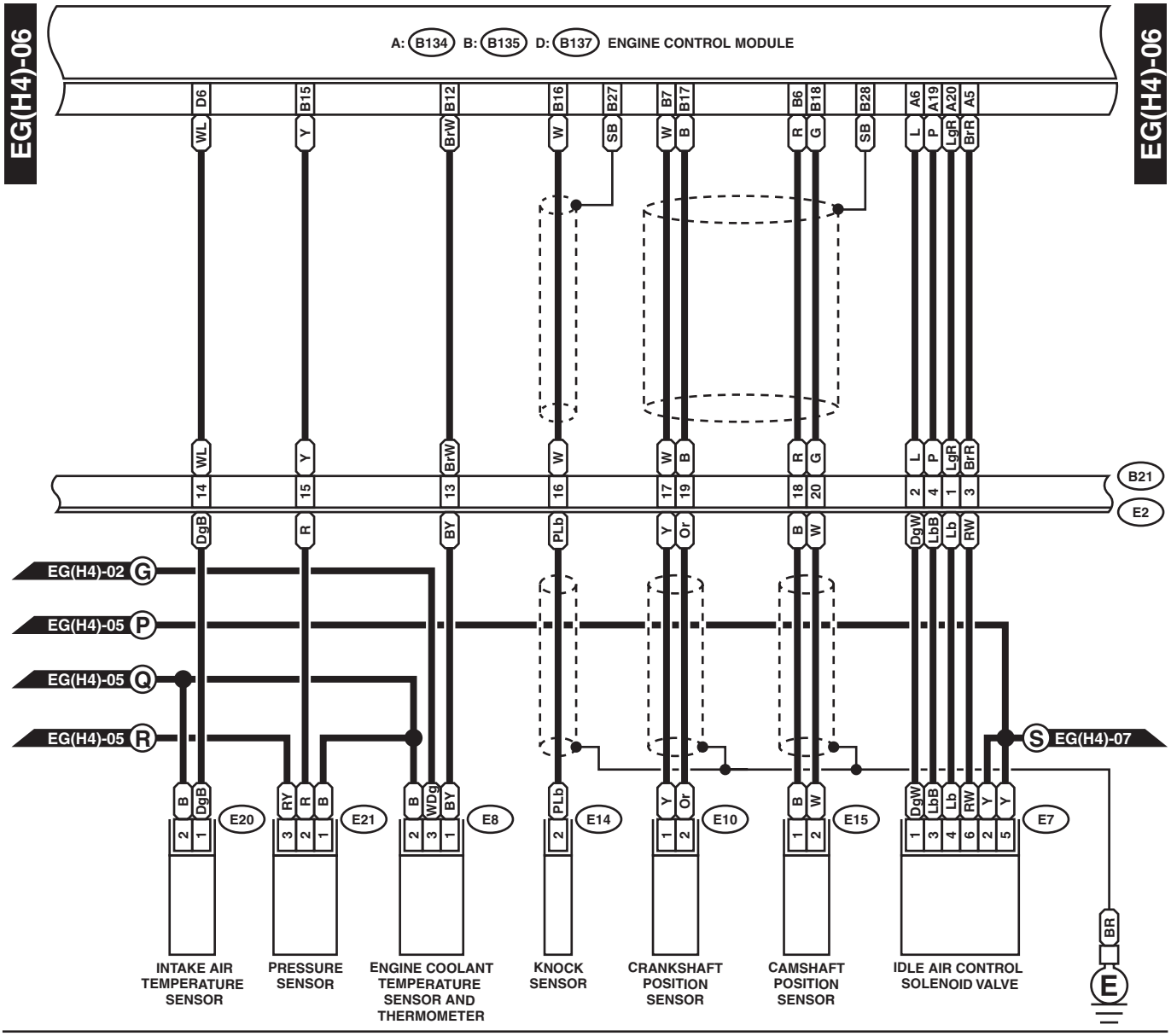

B25 (BROWN)
1 2
B75 (GREEN)
1
2
B76 (GREEN)
1
2
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
C: B136 HR
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
D: B137 HR
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20

WI-06358

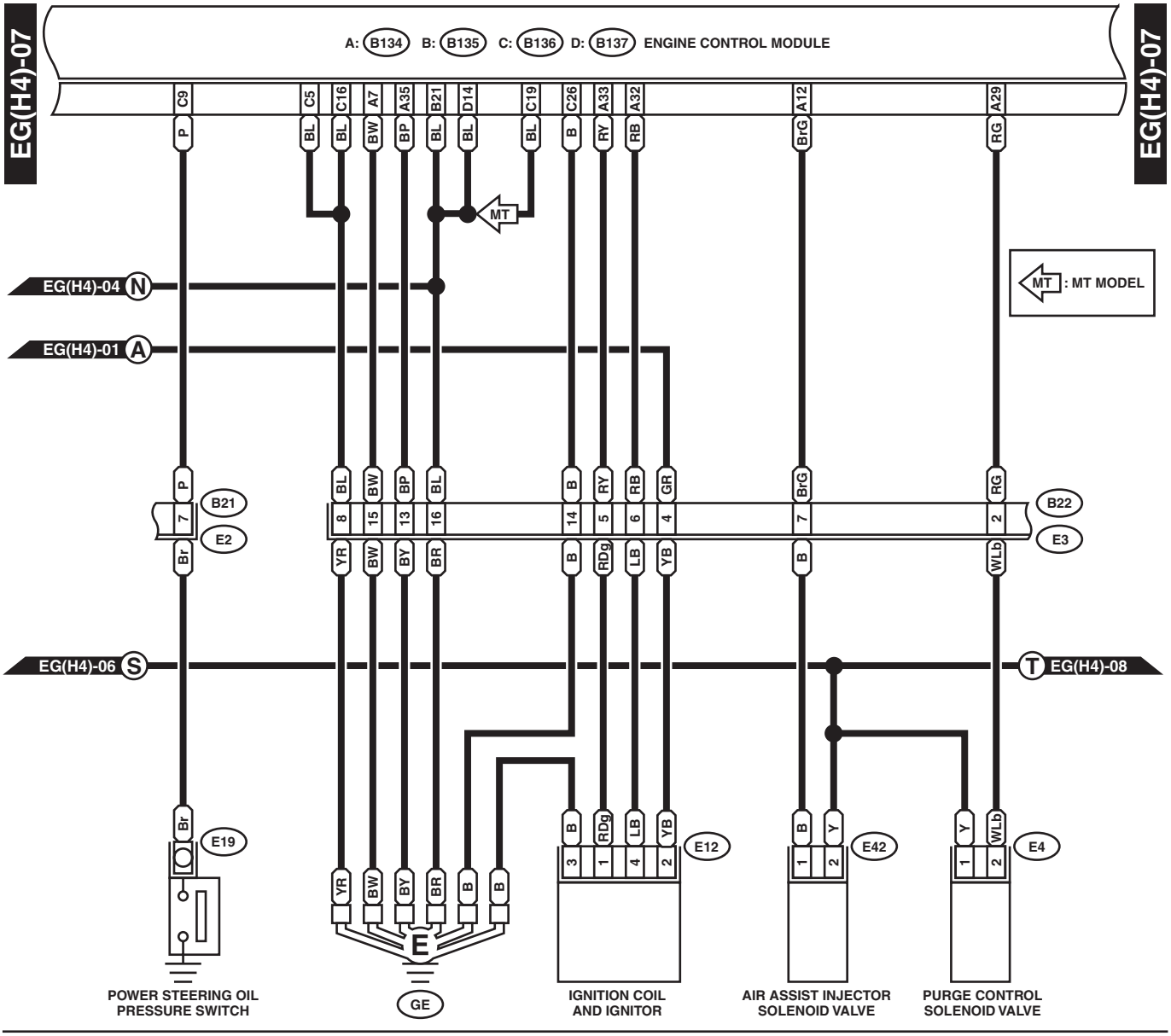

EG(H4)-05
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
B19 D15 B14 C4 C23 C6 C17 C13 C22 B23 A17 A15 A16 A18 B3 B13
RG SB W WL YR Y Y W R SB LW Y Or YL RB WB
EG(H4)-01 F
SHIELD AND SENSOR GROUND JOINT CONNECTOR
6 RG
5 RY
4 BW
2 BR
1 BY
B83
EG(H4)-01 C
EG(H4)-01 E
EG(H4)-03 L
B20
E1
B21
E2
Lb WLb LbB RW
B
RY W
EG(H4)-06 P
EG(H4)-06 Q
EG(H4)-06 R
BW W WL YR
B19
T5
T6
YR Y W R
B18
E18
E13
REAR OXYGEN SENSOR
FRONT OXYGEN (A/F) SENSOR
EGR SOLENOID VALVE
THROTTLE POSITION SENSOR

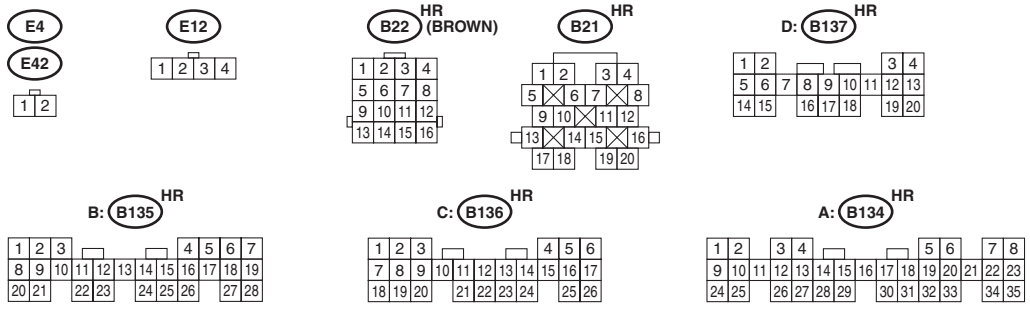

E13
B18 HR
B19 HR
T6
B83
B20 HR
E18
B21 HR (GRAY)
D: B137 HR
B: B135 HR
C: B136 HR
A: B134 HR

WI-06359

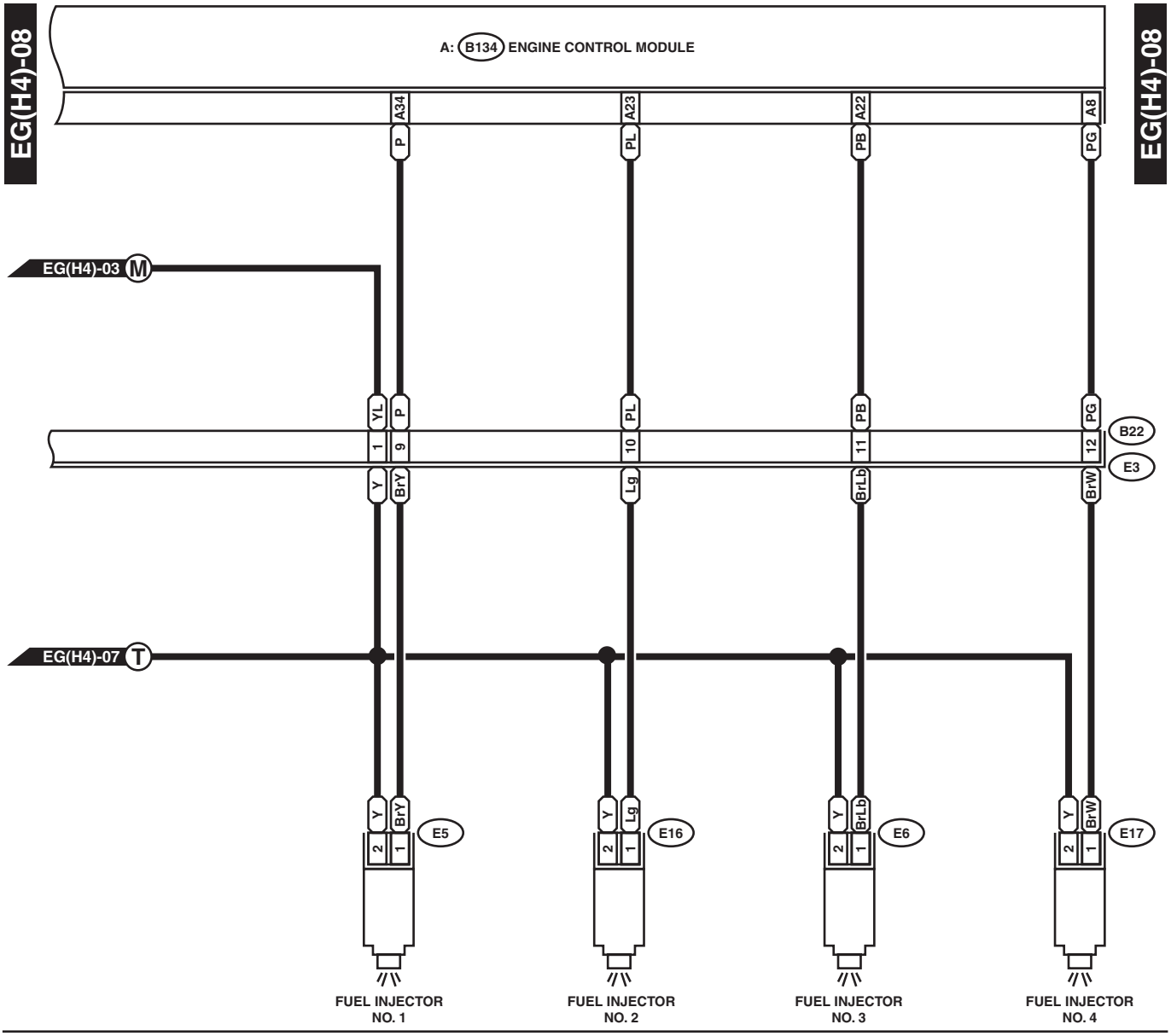

EG(H4)-06
EG(H4)-06
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
D6 B15 B12 B16 B27 B7 B17 B6 B18 B28 A6 A19 A20 A5
WL Y BrW W SB W B R G SB L P LgR BrR
14 15 13 16 17 19 18 20 2 4 1 3
B21
E2
DgB R BY PLb Y Or B W DgW LbB Lb RW
EG(H4)-02 G
EG(H4)-05 P
EG(H4)-05 Q
EG(H4)-05 R
S EG(H4)-07
B DgB E20
RY R B E21
B WDg BY E8
PLb E14
Y Or E10
B W E15
DgW LbB Lb RW Y Y E7
2 1
3 2 1
2 3 1
2
1 2
1 2
6 4 2 5
BR
E
INTAKE AIR TEMPERATURE SENSOR
PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE
E10
E14
E15
E20
E8
E21
E7
B21 HR (GRAY)
D: B137 HR
B: B135 HR
A: B134 HR

WI-06360


EG(H4)-07
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
C9 C5 C16 A7 A35 B21 D14 C19 C26 A33 A32 A12 A29
P BL BL BW BP BL BL BL B RY RB BrG RG
MT
MT : MT MODEL
EG(H4)-04 N
EG(H4)-01 A
B21 E2 B22 E3
EG(H4)-06 S
T EG(H4)-08
E19
E12
E42
E4
POWER STEERING OIL PRESSURE SWITCH
GE
IGNITION COIL AND IGNITOR
AIR ASSIST INJECTOR SOLENOID VALVE
PURGE CONTROL SOLENOID VALVE

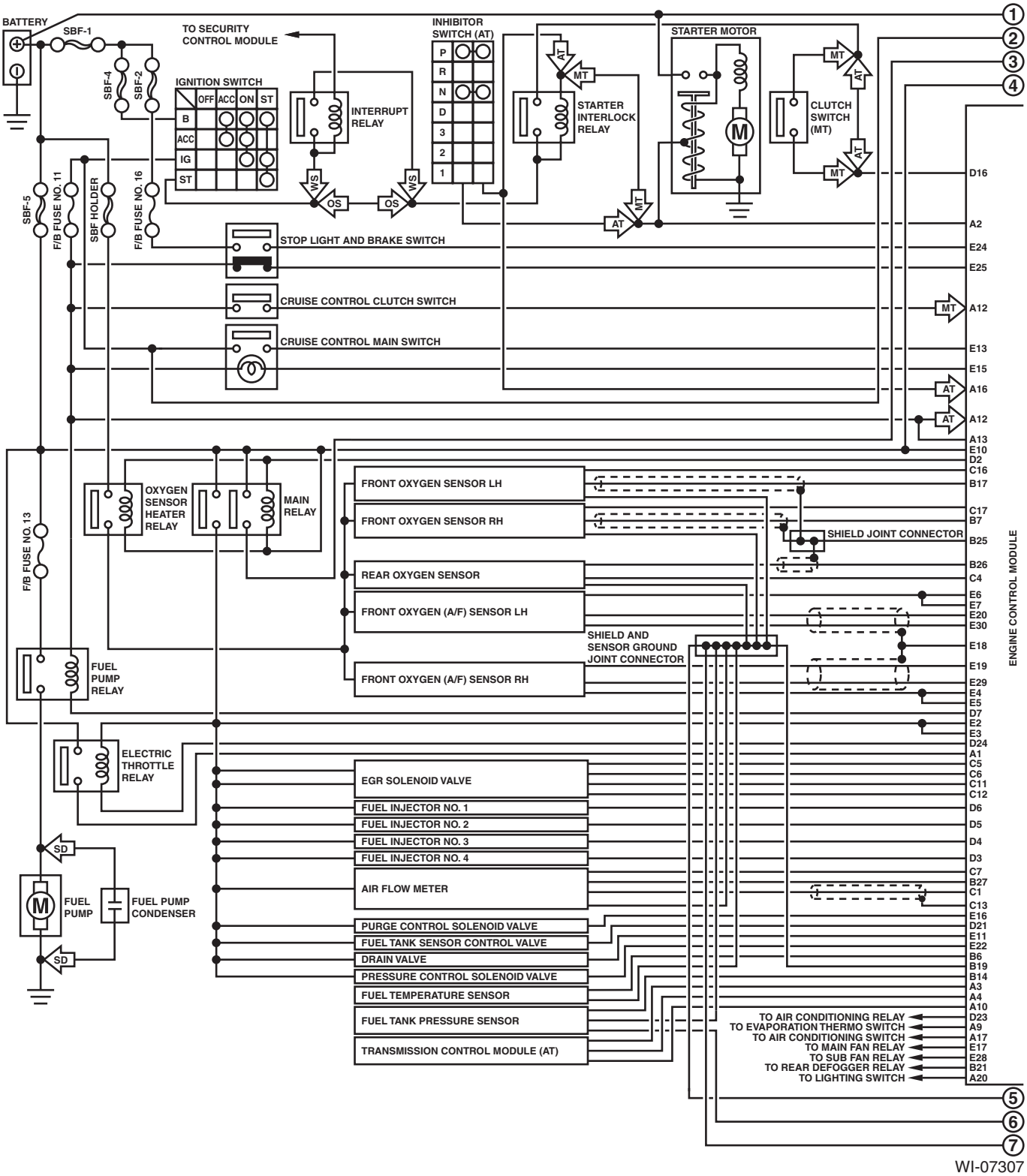

E4
E42
E12
B22 HR (BROWN)
B21 HR
D: B137 HR
B: B135 HR
C: B136 HR
A: B134 HR

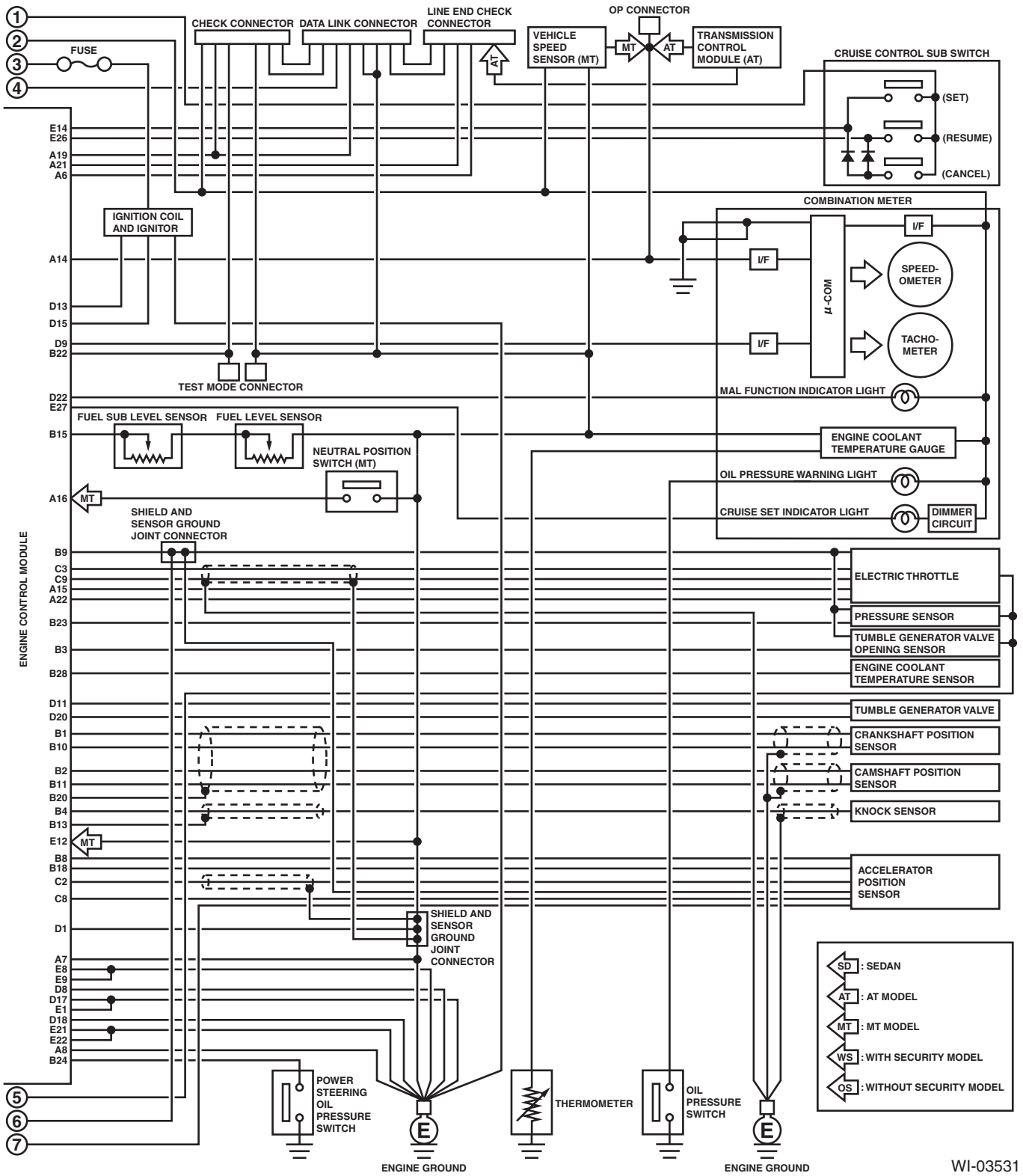
WI-06361

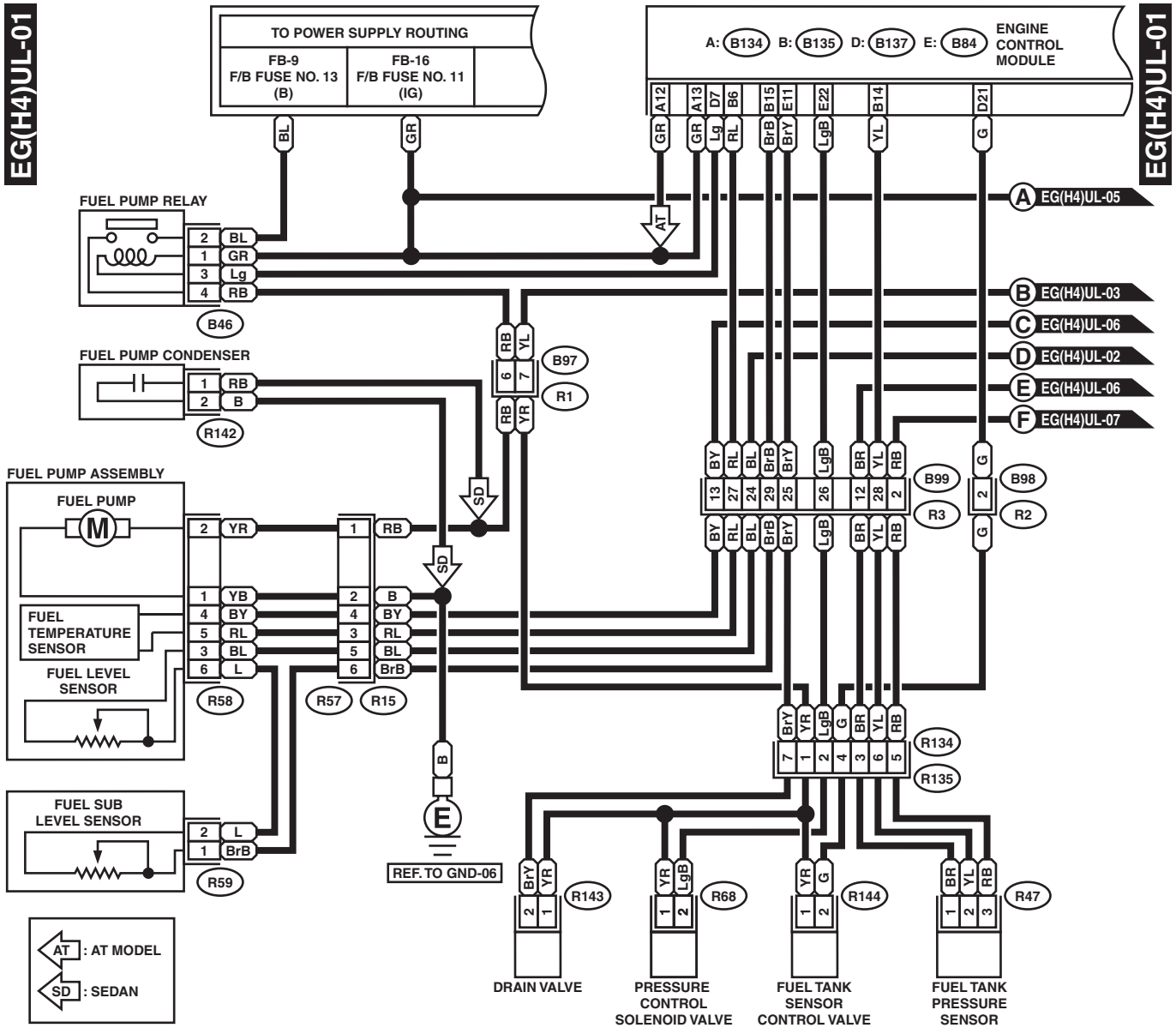

EG(H4)-08
EG(H4)-08
A: B134 ENGINE CONTROL MODULE
A34
A23
A22
A8
P
PL
PB
PG
EG(H4)-03 M
EG(H4)-07 T
YL
P
PL
PB
PG
B22
E3
1
9
10
11
12
Y
BrY
Lg
BrLb
BrW
E5
E16
E6
E17
2
1
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
E5
E6
E16
E17
B22 HR (BROWN)
A: B134 HR

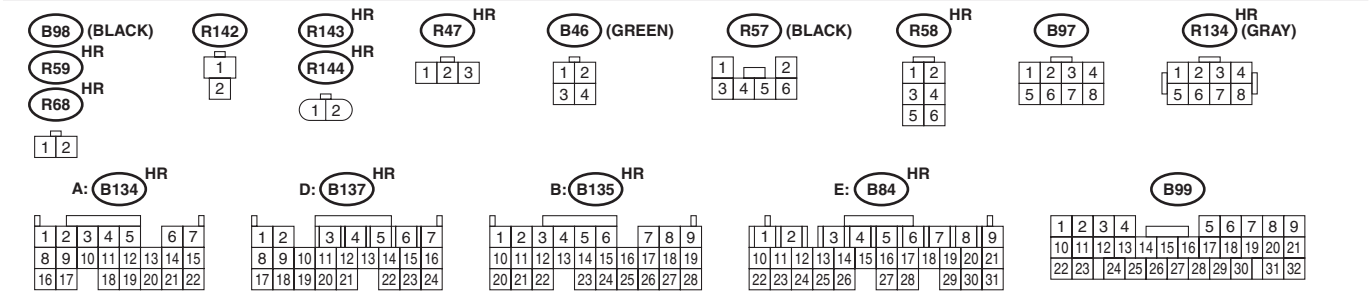
WI-06362

2. 4-CYLINDER ENGINE U5 MODEL

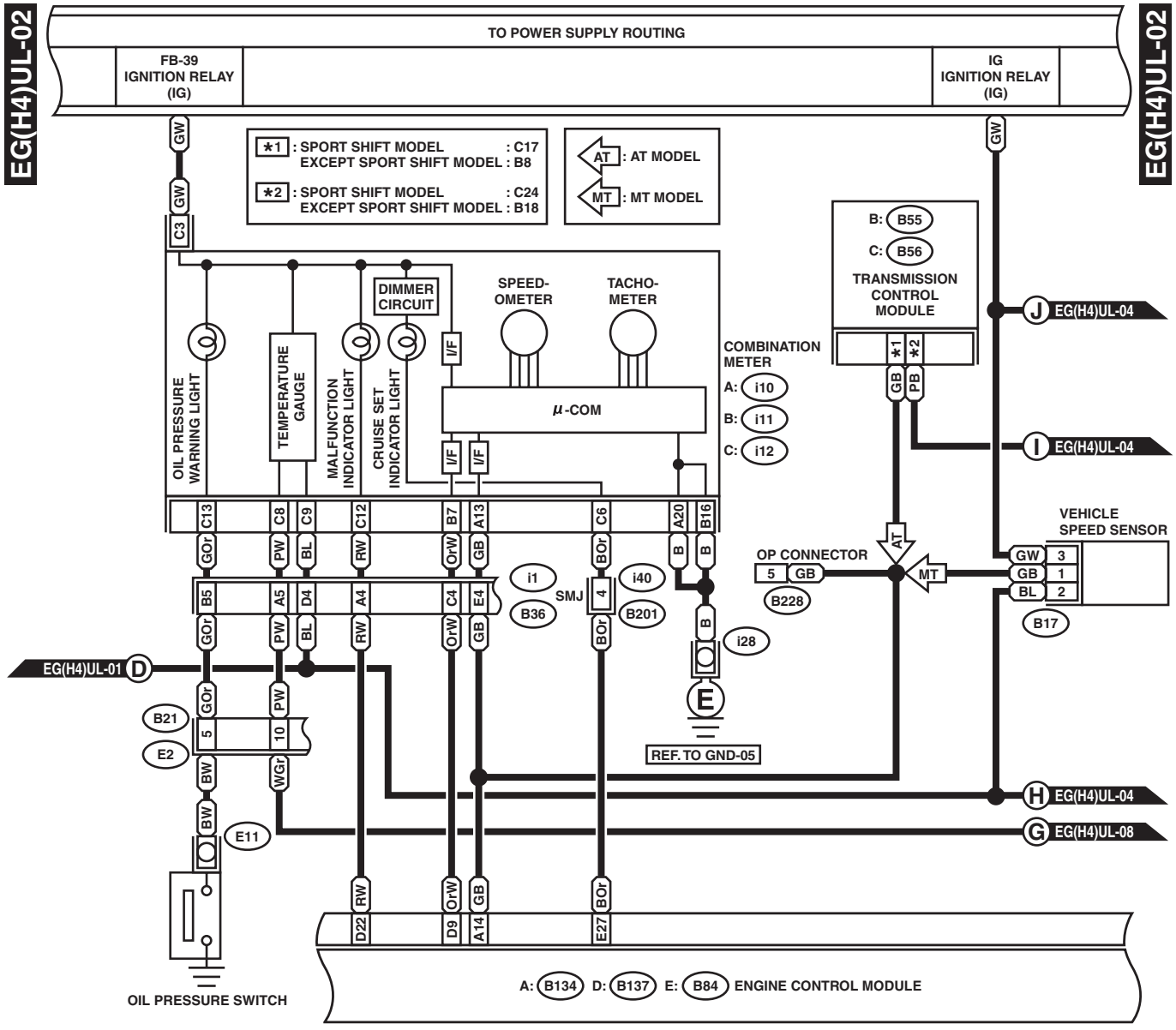


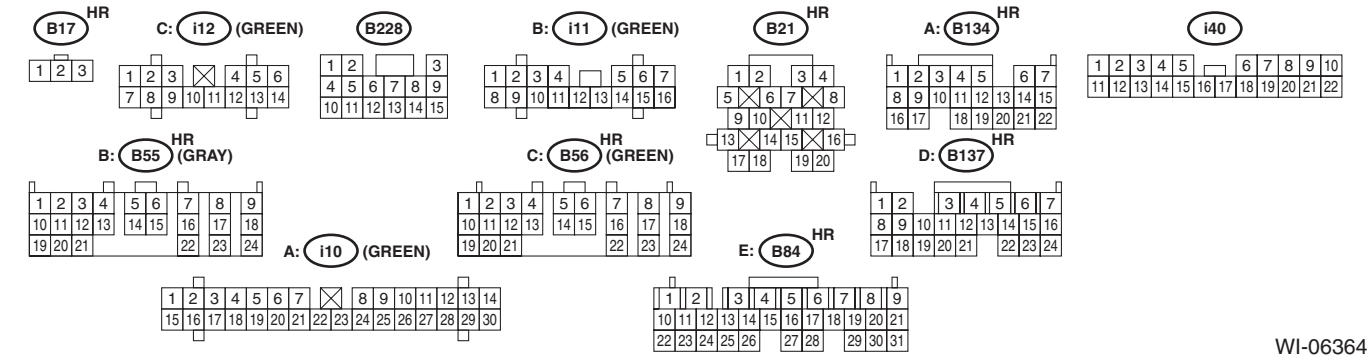

CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
OP CONNECTOR
VEHICLE SPEED SENSOR (MT)
TRANSMISSION CONTROL MODULE (AT)
FUSE
CRUISE CONTROL SUB SWITCH
(SET)
(RESUME)
(CANCEL)
COMBINATION METER
IGNITION COIL AND IGNITOR
SPEED-OMETER
TACHO-METER
TEST MODE CONNECTOR
MAL FUNCTION INDICATOR LIGHT
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
CRUISE SET INDICATOR LIGHT
DIMMER CIRCUIT
SHIELD AND SENSOR GROUND JOINT CONNECTOR
ENGINE CONTROL MODULE
ELECTRIC THROTTLE
PRESSURE SENSOR
TUMBLE GENERATOR VALVE OPENING SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
TUMBLE GENERATOR VALVE
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
ACCELERATOR POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
SD : SEDAN
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY MODEL
OS : WITHOUT SECURITY MODEL
POWER STEERING OIL PRESSURE SWITCH
THERMOMETER
OIL PRESSURE SWITCH
ENGINE GROUND
ENGINE GROUND
WI-03531


EG(H4)UL-01
TO POWER SUPPLY ROUTING
FB-9 F/B FUSE NO. 13 (B)
FB-16 F/B FUSE NO. 11 (IG)
A: B134 B: B135 D: B137 E: B84 ENGINE CONTROL MODULE
FUEL PUMP RELAY
FUEL PUMP CONDENSER
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
FUEL SUB LEVEL SENSOR
REF. TO GND-06
DRAIN VALVE
PRESSURE CONTROL SOLENOID VALVE
FUEL TANK SENSOR CONTROL VALVE
FUEL TANK PRESSURE SENSOR
AT : AT MODEL
SD : SEDAN
EG(H4)UL-05
EG(H4)UL-03
EG(H4)UL-06
EG(H4)UL-02
EG(H4)UL-06
EG(H4)UL-07

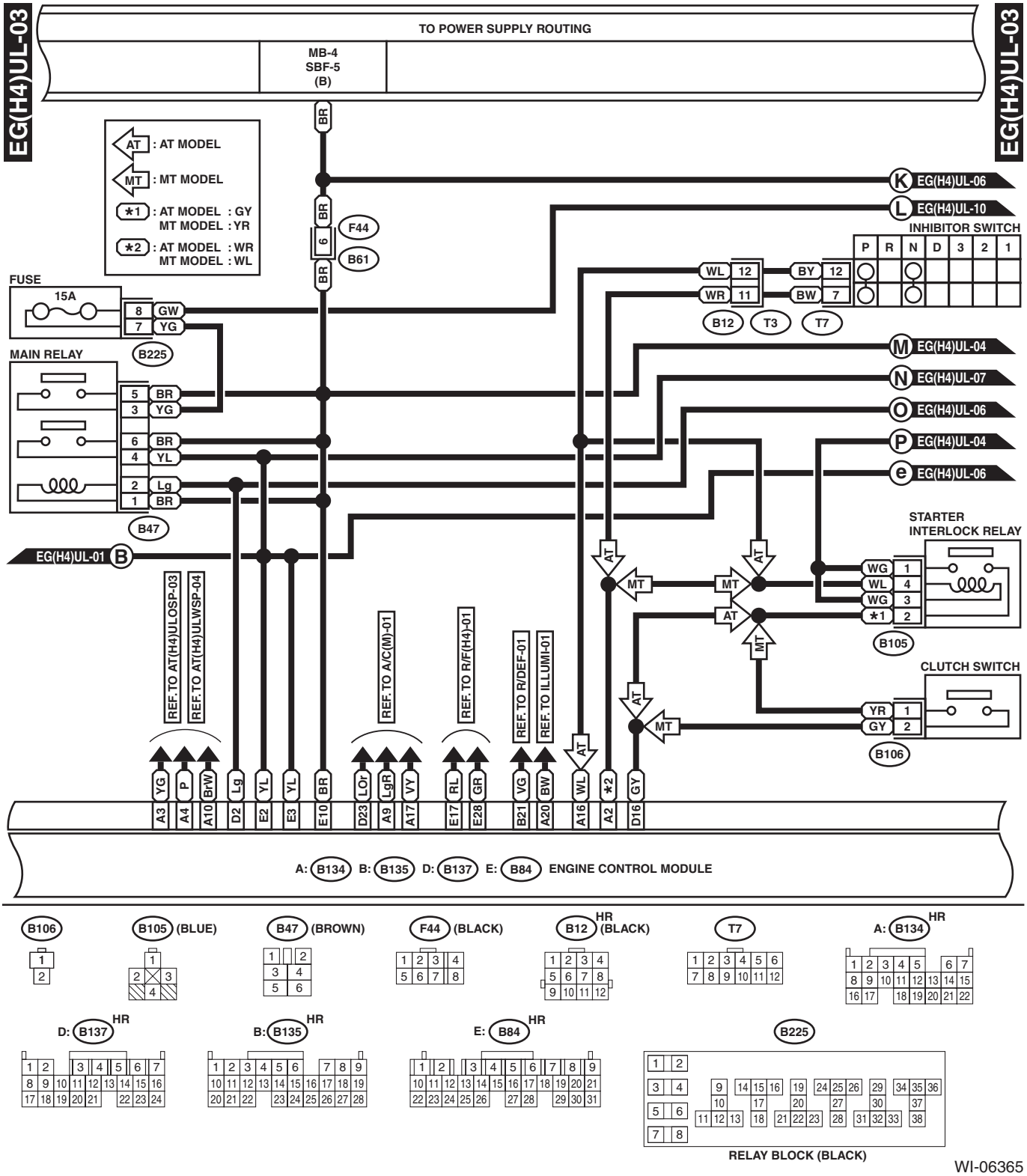

B98 (BLACK)
R59
R68
R142
R143
R144
R47
B46 (GREEN)
R57 (BLACK)
R58
B97
R134 (GRAY)
A: B134
D: B137
B: B135
E: B84
B99

WI-06363

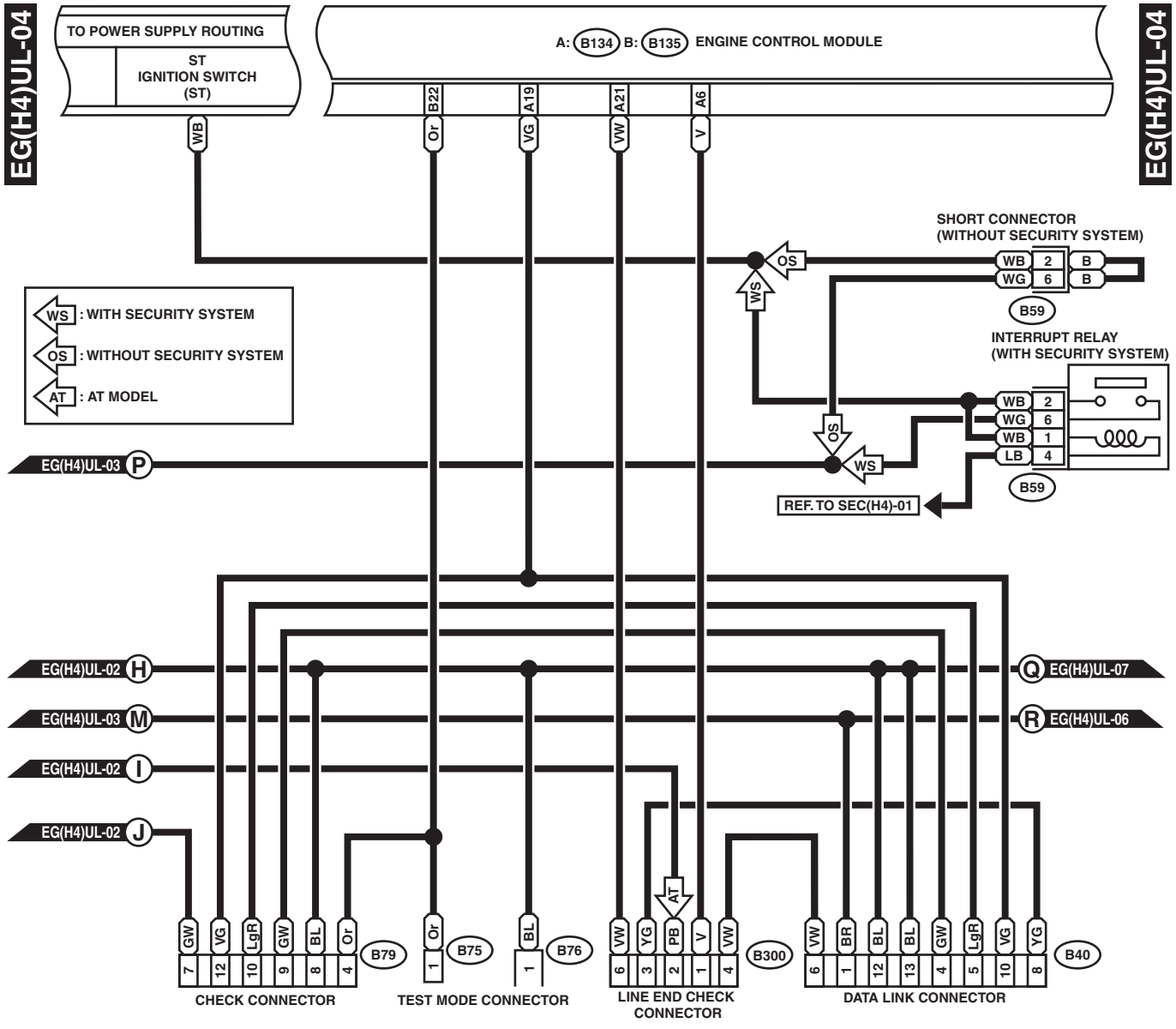

EG(H4)UL-02
EG(H4)UL-02
TO POWER SUPPLY ROUTING
FB-39 IGNITION RELAY (IG)
IG IGNITION RELAY (IG)
*1 : SPORT SHIFT MODEL : C17
EXCEPT SPORT SHIFT MODEL : B8
*2 : SPORT SHIFT MODEL : C24
EXCEPT SPORT SHIFT MODEL : B18
AT : AT MODEL
MT : MT MODEL
DIMMER CIRCUIT
SPEED-OMETER
TACHO-METER
OIL PRESSURE WARNING LIGHT
TEMPERATURE GAUGE
MALFUNCTION INDICATOR LIGHT
CRUISE SET INDICATOR LIGHT
I/F
μ-COM
COMBINATION METER
A: i10
B: i11
C: i12
B: B55
C: B56
TRANSMISSION CONTROL MODULE
J EG(H4)UL-04
I EG(H4)UL-04
VEHICLE SPEED SENSOR
OP CONNECTOR
5 GB
B228
AT
MT
GW 3
GB 1
BL 2
B17
SMJ
i1
B36
i40
B201
i28
REF. TO GND-05
EG(H4)UL-01 D
B21
E2
E11
H EG(H4)UL-04
G EG(H4)UL-08
OIL PRESSURE SWITCH
A: B134 D: B137 E: B84 ENGINE CONTROL MODULE

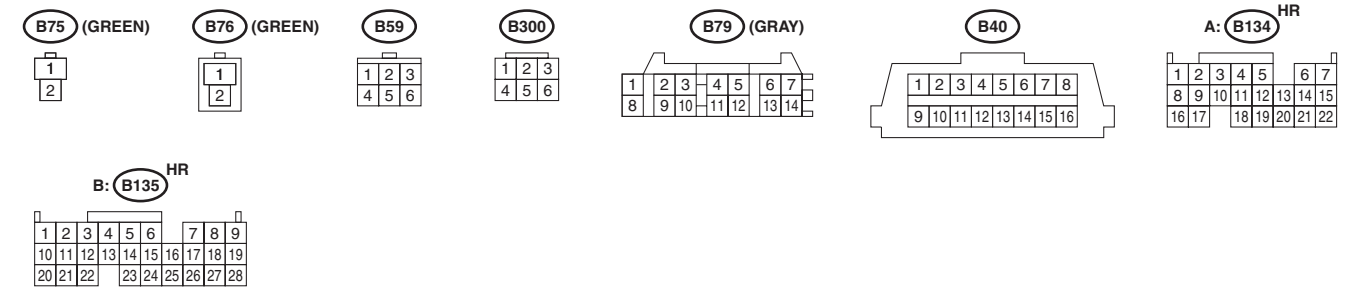

B17 HR
C: i12 (GREEN)
B228
B: i11 (GREEN)
B21 HR
A: B134 HR
i40
B: B55 HR (GRAY)
C: B56 HR (GREEN)
D: B137 HR
A: i10 (GREEN)
E: B84 HR

WI-06364

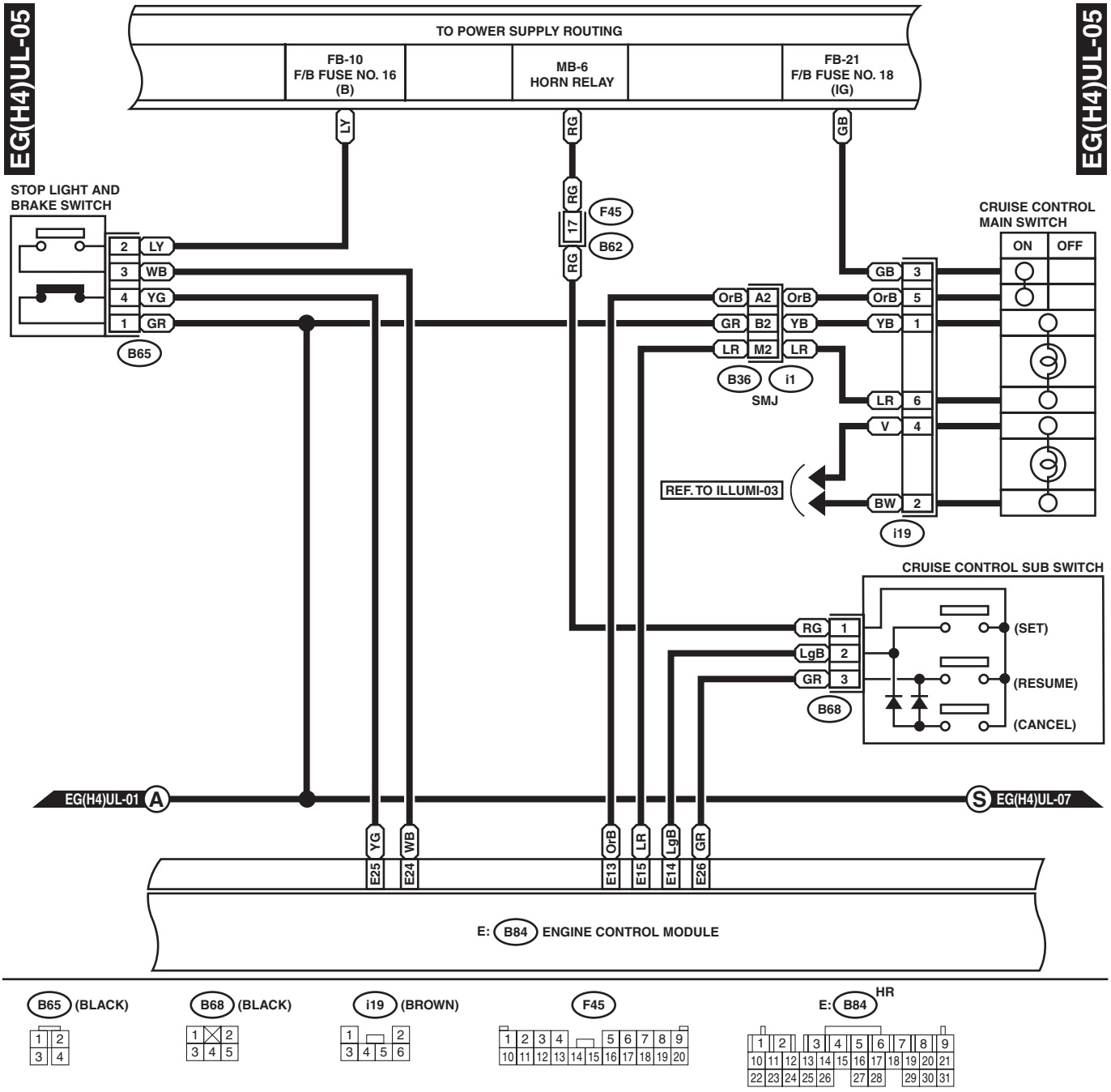

EG(H4)UL-03
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
AT : AT MODEL
MT : MT MODEL
*1 : AT MODEL : GY
MT MODEL : YR
*2 : AT MODEL : WR
MT MODEL : WL
BR
F44
B61
FUSE
15A
8 GW
7 YG
B225
MAIN RELAY
5 BR
3 YG
6 BR
4 YL
2 Lg
1 BR
B47
EG(H4)UL-01 B
K EG(H4)UL-06
L EG(H4)UL-10
INHIBITOR SWITCH
P R N D 3 2 1
WL 12
WR 11
BY 12
BW 7
B12 T3 T7
M EG(H4)UL-04
N EG(H4)UL-07
O EG(H4)UL-06
P EG(H4)UL-04
e EG(H4)UL-06
STARTER
INTERLOCK RELAY
WG 1
WL 4
WG 3
*1 2
B105
CLUTCH SWITCH
YR 1
GY 2
B106
REF. TO AT(H4)ULOSP-03
REF. TO AT(H4)ULWSP-04
REF. TO A/C(M)-01
REF. TO R/F(H4)-01
REF. TO R/DEF-01
REF. TO ILLUMI-01
YG P BrW Lg YL YL BR LOr LgR VY RL GR VG BW WL *2 GY
A3 A4 A10 D2 E2 E3 E10 D23 A9 A17 E17 E28 B21 A20 A16 A2 D16
A: B134 B: B135 D: B137 E: B84 ENGINE CONTROL MODULE
B106
B105 (BLUE)
B47 (BROWN)
F44 (BLACK)
B12 HR (BLACK)
T7
A: B134 HR
D: B137 HR
B: B135 HR
E: B84 HR
B225
RELAY BLOCK (BLACK)

WI-06365

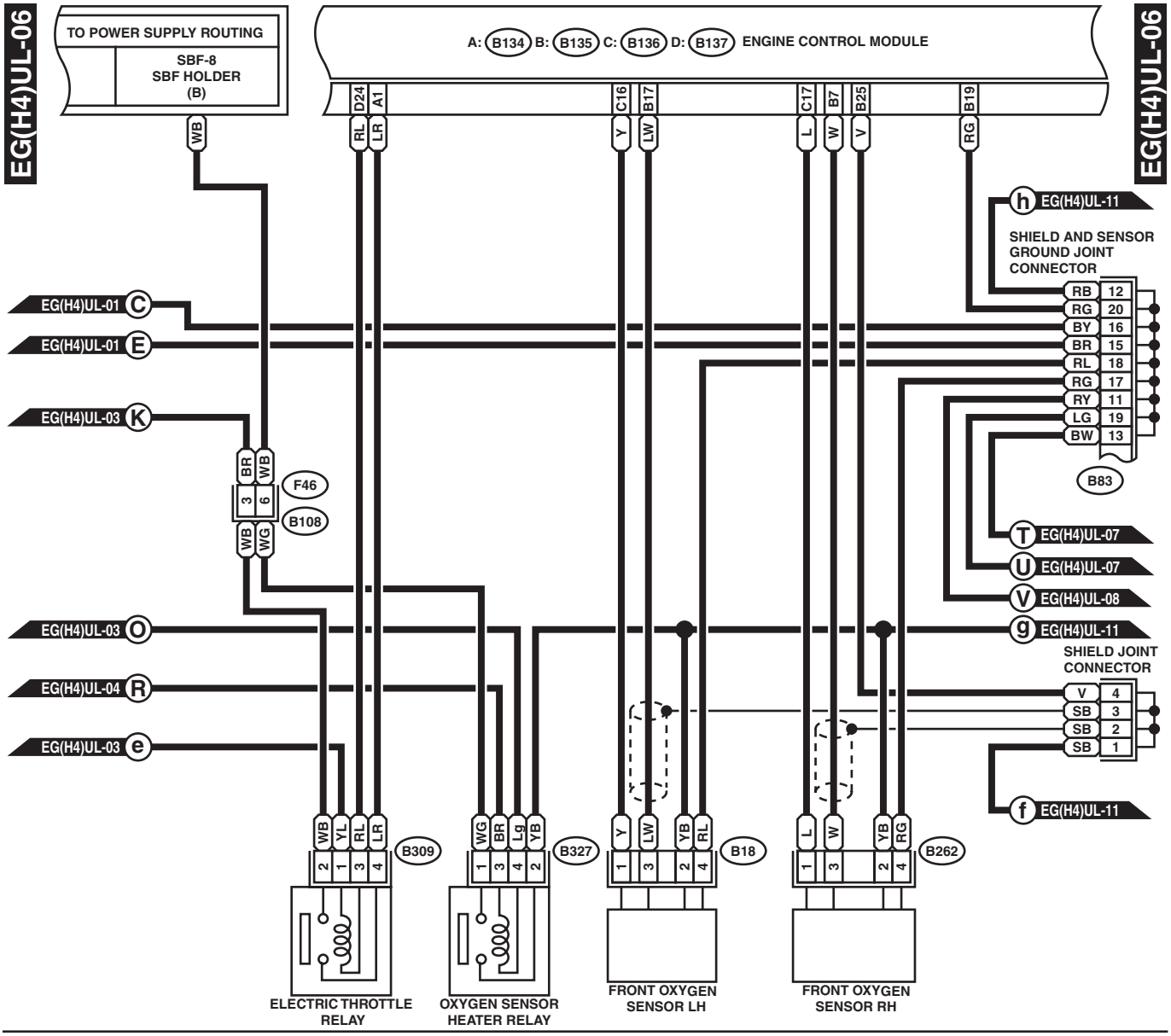

EG(H4)UL-04
TO POWER SUPPLY ROUTING
ST
IGNITION SWITCH
(ST)
WB
A: B134 B: B135 ENGINE CONTROL MODULE
B22
A19
A21
A6
Or
VG
VW
V
EG(H4)UL-04
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
WB 2 B
WG 6 B
B59
OS
WS
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
WB 2
WG 6
WB 1
LB 4
B59
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
AT : AT MODEL
EG(H4)UL-03 P
REF. TO SEC(H4)-01
EG(H4)UL-02 H
EG(H4)UL-03 M
EG(H4)UL-02 I
EG(H4)UL-02 J
Q EG(H4)UL-07
R EG(H4)UL-06
AT
GW VG LgR GW BL Or
7 12 10 9 8 4
B79
CHECK CONNECTOR
Or
1
B75
TEST MODE CONNECTOR
BL
1
B76
VW YG PB V VW
6 3 2 1 4
B300
LINE END CHECK
CONNECTOR
VW BR BL BL GW LgR VG YG
6 1 12 13 4 5 10 8
B40
DATA LINK CONNECTOR

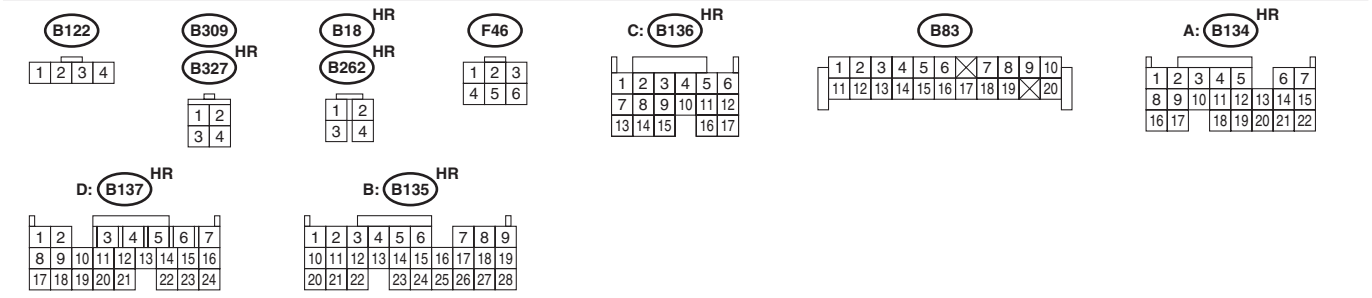

B75 (GREEN)
B76 (GREEN)
B59
B300
B79 (GRAY)
B40
A: B134 HR
B: B135 HR

WI-06366

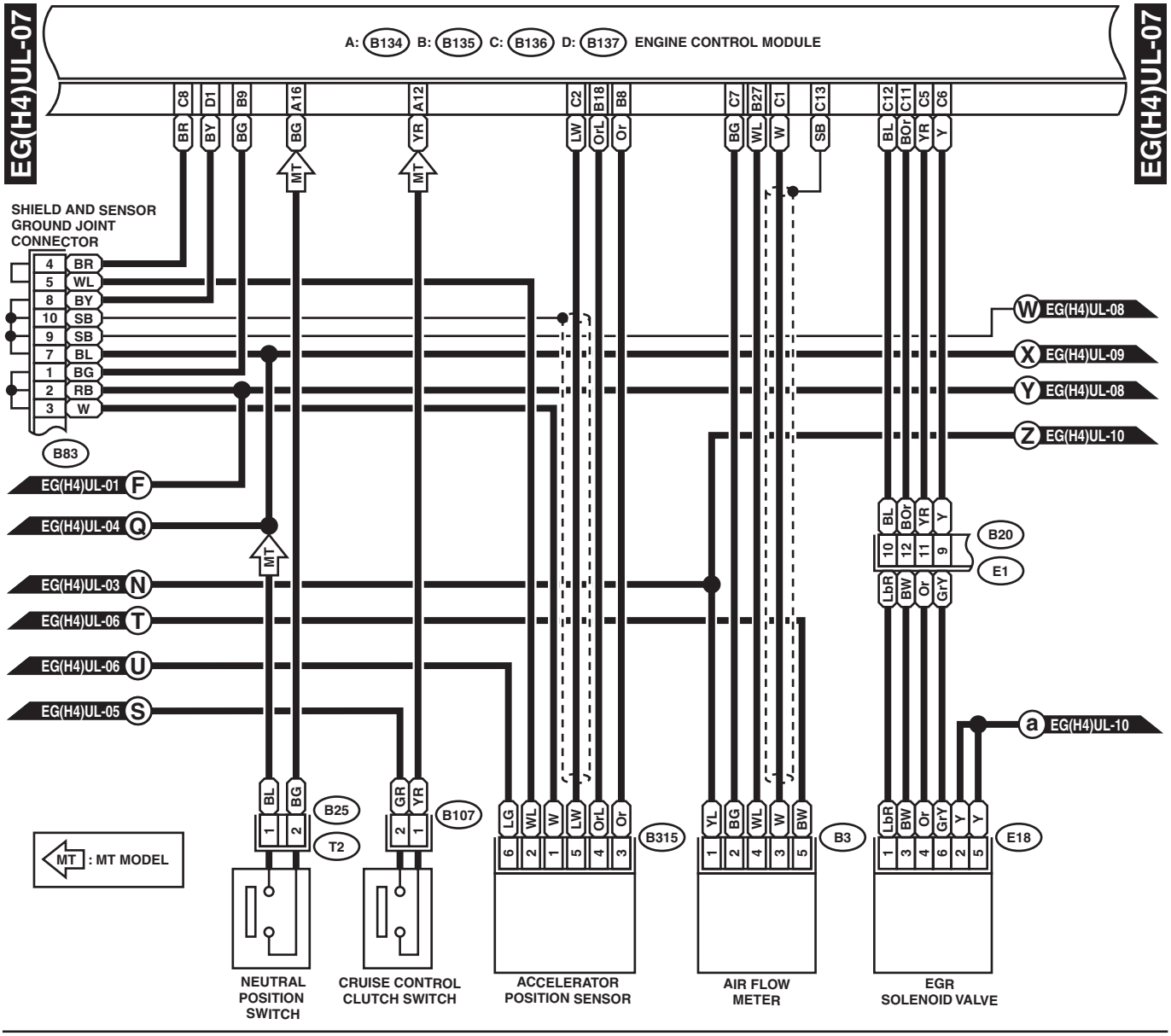

EG(H4)UL-05
EG(H4)UL-05
TO POWER SUPPLY ROUTING
FB-10
F/B FUSE NO. 16
(B)
MB-6
HORN RELAY
FB-21
F/B FUSE NO. 18
(IG)
LY
RG
GB
STOP LIGHT AND
BRAKE SWITCH
2 LY
3 WB
4 YG
1 GR
B65
RG
17
RG
F45
B62
CRUISE CONTROL
MAIN SWITCH
ON
OFF
GB 3
OrB A2 OrB
GR B2 YB
LR M2 LR
B36
i1
SMJ
OrB 5
YB 1
LR 6
V 4
BW 2
i19
REF. TO ILLUMI-03
CRUISE CONTROL SUB SWITCH
RG 1
LgB 2
GR 3
B68
(SET)
(RESUME)
(CANCEL)
EG(H4)UL-01 A
S EG(H4)UL-07
YG
WB
OrB
LR
LgB
GR
E25
E24
E13
E15
E14
E26
E: B84 ENGINE CONTROL MODULE
B65 (BLACK)
B68 (BLACK)
i19 (BROWN)
F45
E: B84
HR

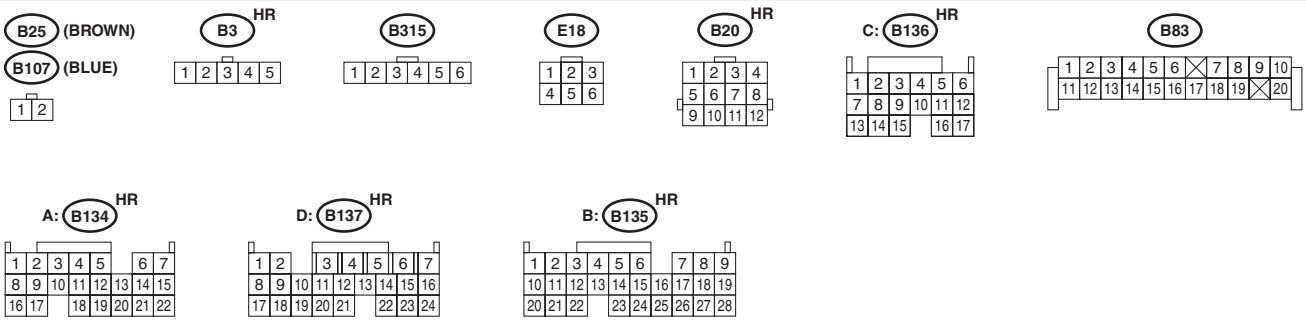
WI-06367


EG(H4)UL-06
TO POWER SUPPLY ROUTING
SBF-8
SBF HOLDER
(B)
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
EG(H4)UL-06
h EG(H4)UL-11
SHIELD AND SENSOR GROUND JOINT CONNECTOR
EG(H4)UL-01 C
EG(H4)UL-01 E
EG(H4)UL-03 K
F46
B108
B83
T EG(H4)UL-07
U EG(H4)UL-07
V EG(H4)UL-08
EG(H4)UL-03 O
g EG(H4)UL-11
SHIELD JOINT CONNECTOR
EG(H4)UL-04 R
EG(H4)UL-03 e
f EG(H4)UL-11
B309
B327
B18
B262
ELECTRIC THROTTLE RELAY
OXYGEN SENSOR HEATER RELAY
FRONT OXYGEN SENSOR LH
FRONT OXYGEN SENSOR RH

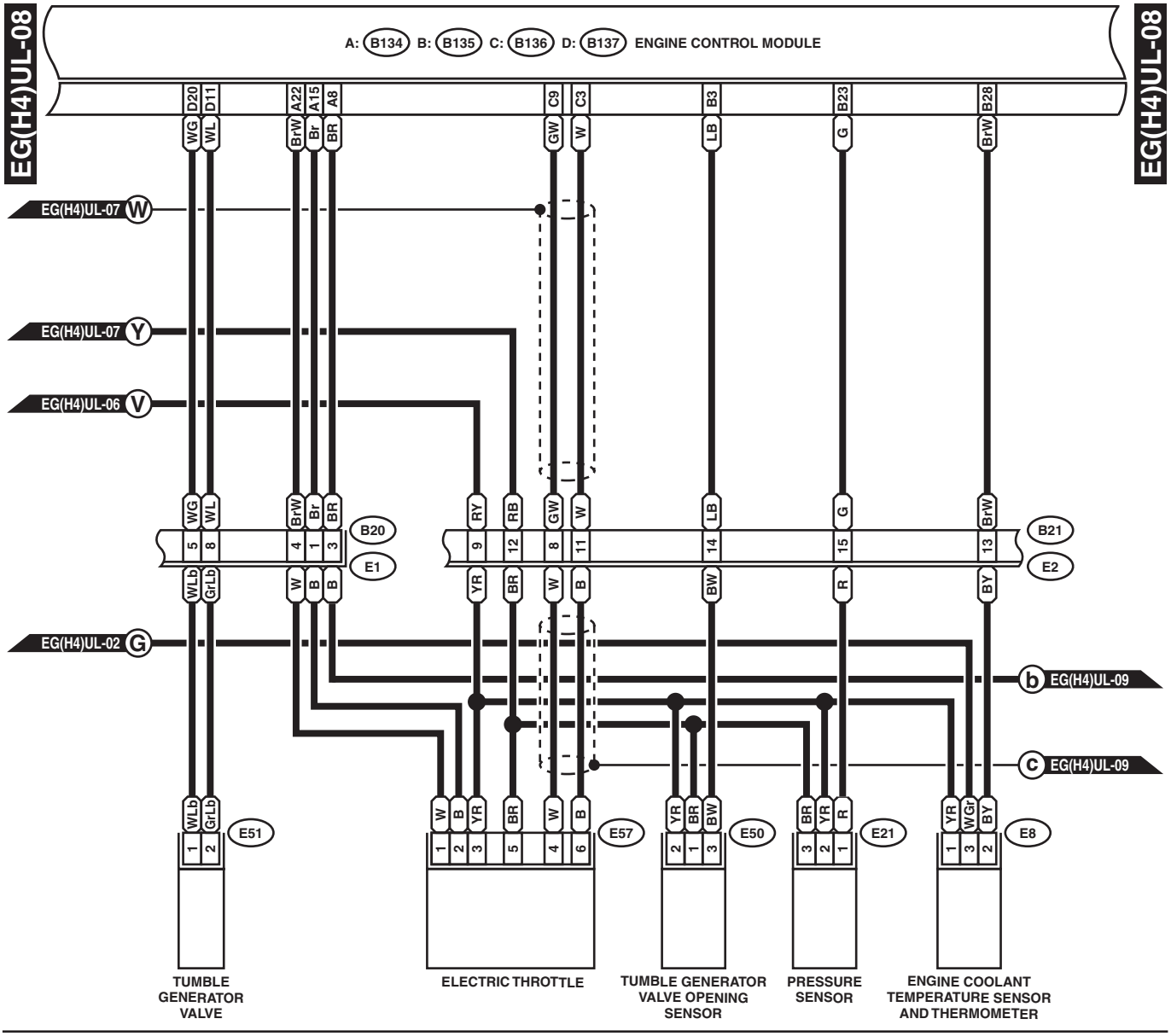

B122
B309
HR
B327
B18
HR
B262
F46
C: B136
HR
B83
A: B134
HR
D: B137
HR
B: B135
HR

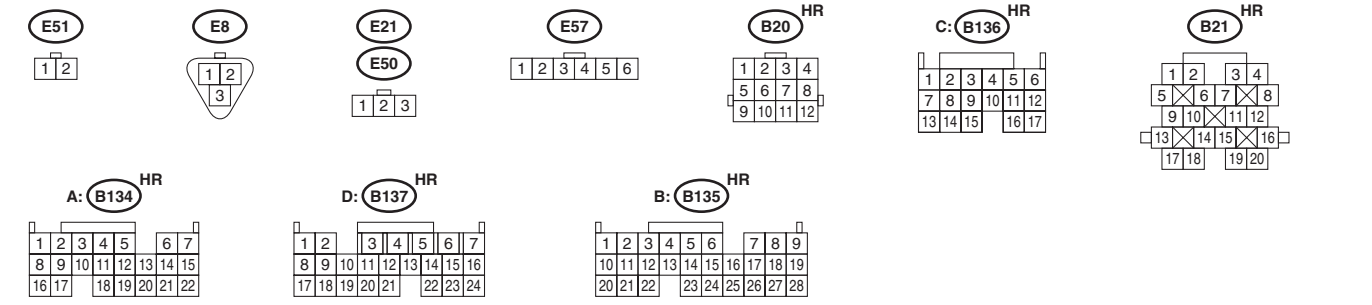
WI-06368


EG(H4)UL-07
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
C8 D1 B9 A16 A12 C2 B18 B8 C7 B27 C1 C13 C12 C11 C5 C6
BR BY BG BG YR LW OrL Or BG WL W SB BL BOr YR Y
MT
SHIELD AND SENSOR GROUND JOINT CONNECTOR
4 BR
5 WL
8 BY
10 SB
9 SB
7 BL
1 BG
2 RB
3 W
B83
EG(H4)UL-01 F
EG(H4)UL-04 Q
EG(H4)UL-03 N
EG(H4)UL-06 T
EG(H4)UL-06 U
EG(H4)UL-05 S
W EG(H4)UL-08
X EG(H4)UL-09
Y EG(H4)UL-08
Z EG(H4)UL-10
a EG(H4)UL-10
B20
E1
BL BOr YR Y
10 12 11 9
LbR BW Or GrY
BL BG
1 2
B25
T2
GR YR
2 1
B107
LG WL W LW OrL Or
6 2 1 5 4 3
B315
YL BG WL W BW
1 2 4 3 5
B3
LbR BW Or GrY Y Y
1 3 4 6 2 5
E18
MT : MT MODEL
NEUTRAL POSITION SWITCH
CRUISE CONTROL CLUTCH SWITCH
ACCELERATOR POSITION SENSOR
AIR FLOW METER
EGR SOLENOID VALVE

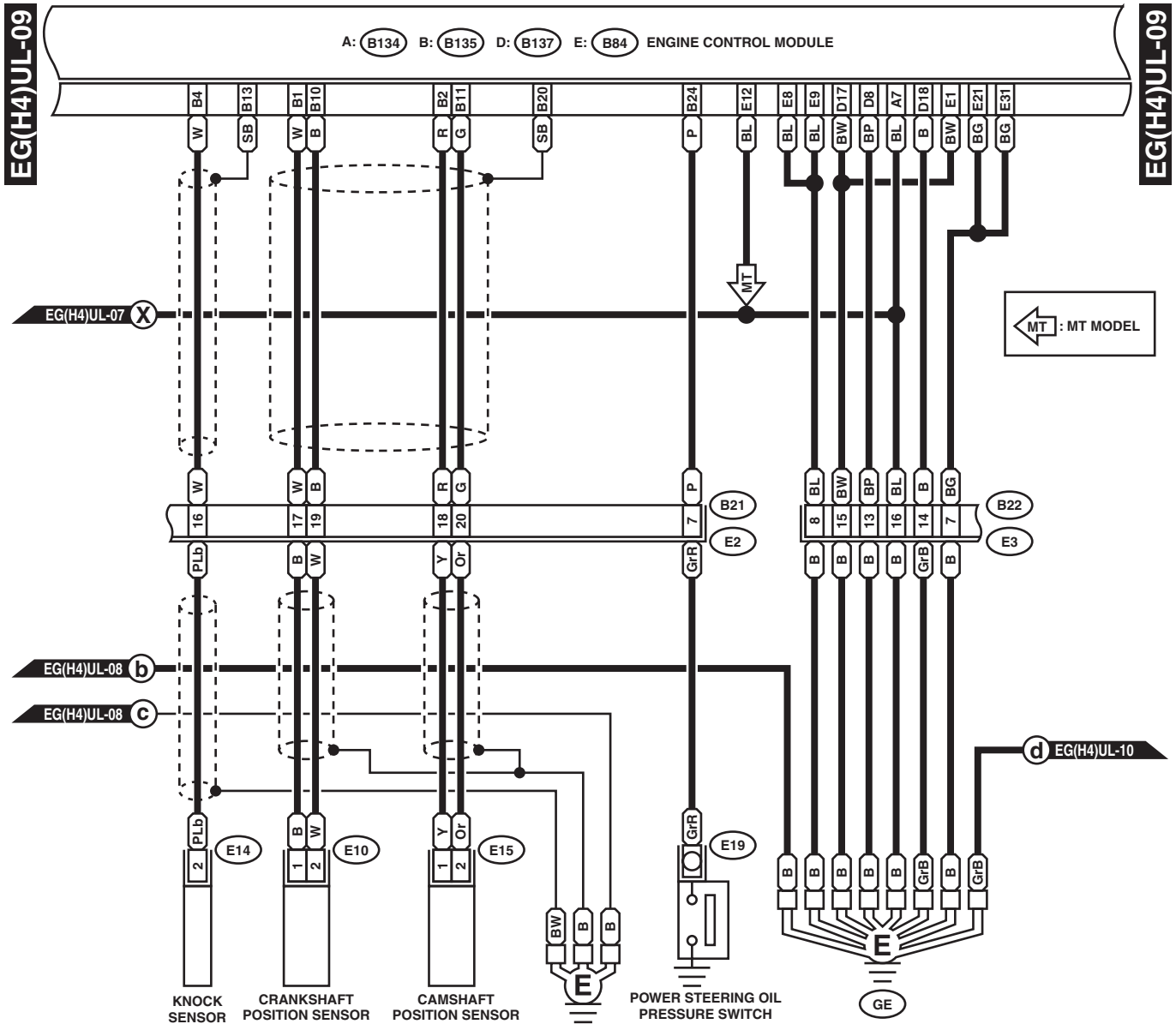

B25 (BROWN)
B107 (BLUE)
1 2
B3 HR
1 2 3 4 5
B315
1 2 3 4 5 6
E18
1 2 3
4 5 6
B20 HR
1 2 3 4
5 6 7 8
9 10 11 12
C: B136 HR
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17
B83
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
A: B134 HR
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15
16 17 18 19 20 21 22
D: B137 HR
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
B: B135 HR
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28

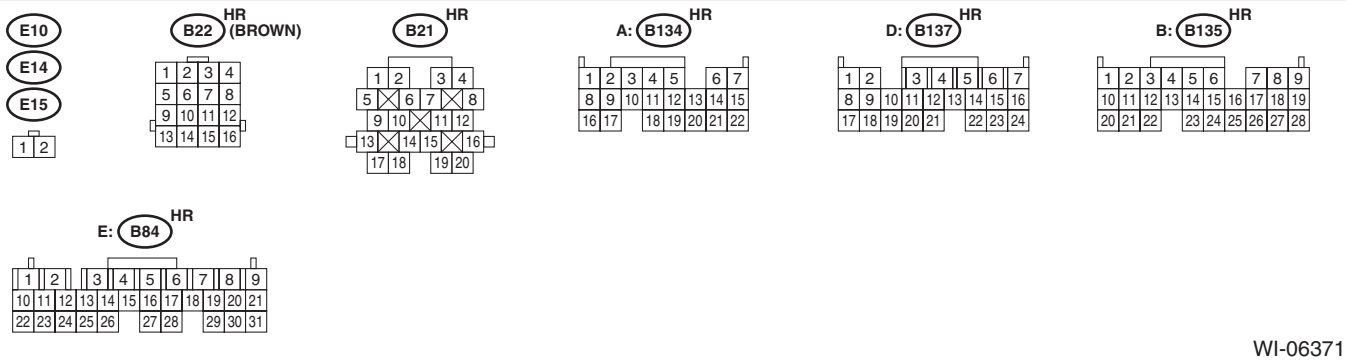
WI-06369


EG(H4)UL-08
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
EG(H4)UL-07 W
EG(H4)UL-07 Y
EG(H4)UL-06 V
EG(H4)UL-02 G
b EG(H4)UL-09
c EG(H4)UL-09
B20
E1
B21
E2
E51
E57
E50
E21
E8
TUMBLE GENERATOR VALVE
ELECTRIC THROTTLE
TUMBLE GENERATOR VALVE OPENING SENSOR
PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER

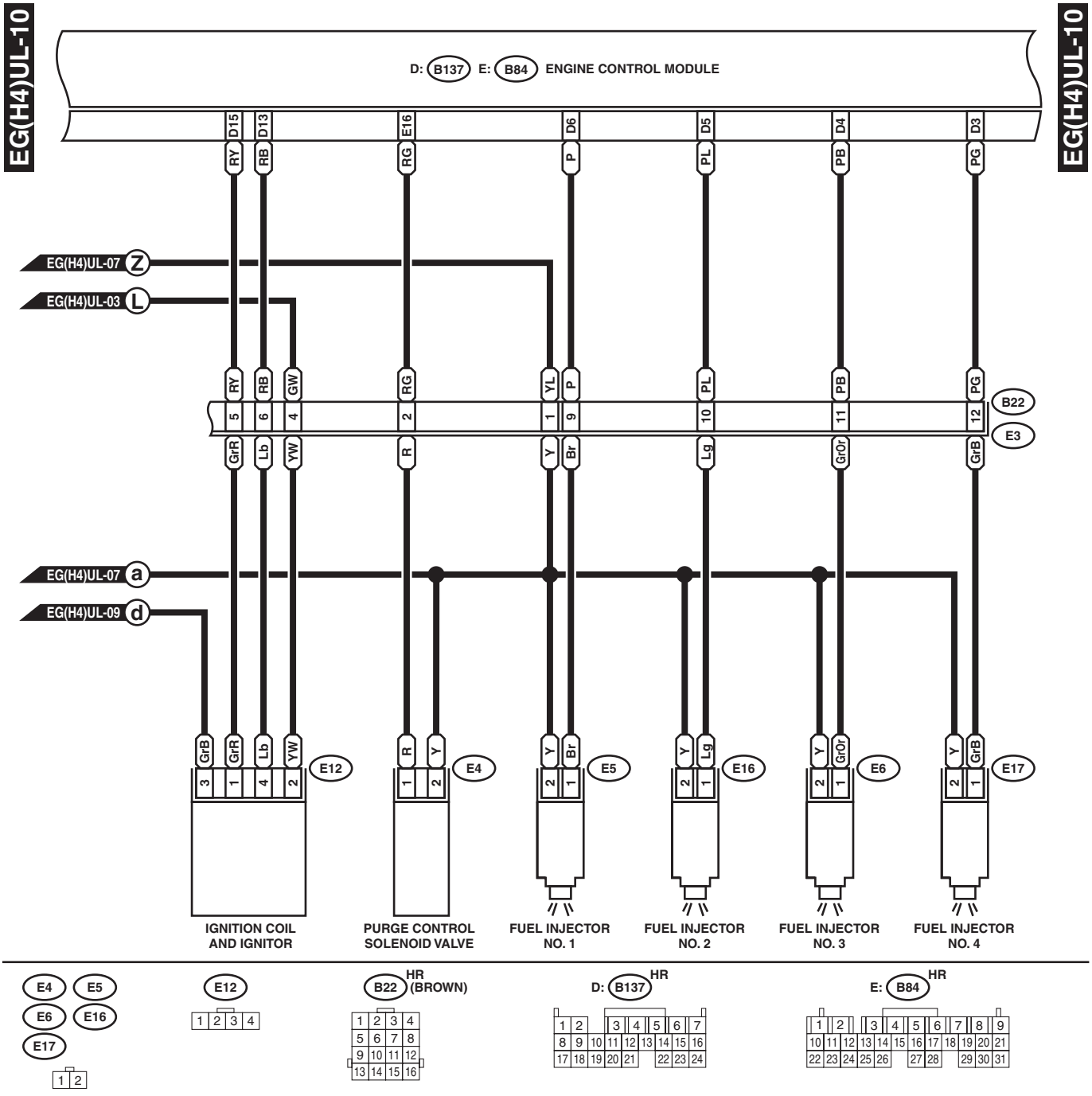

E51
E8
E21
E50
E57
B20 HR
C: B136 HR
B21 HR
A: B134 HR
D: B137 HR
B: B135 HR

WI-06370

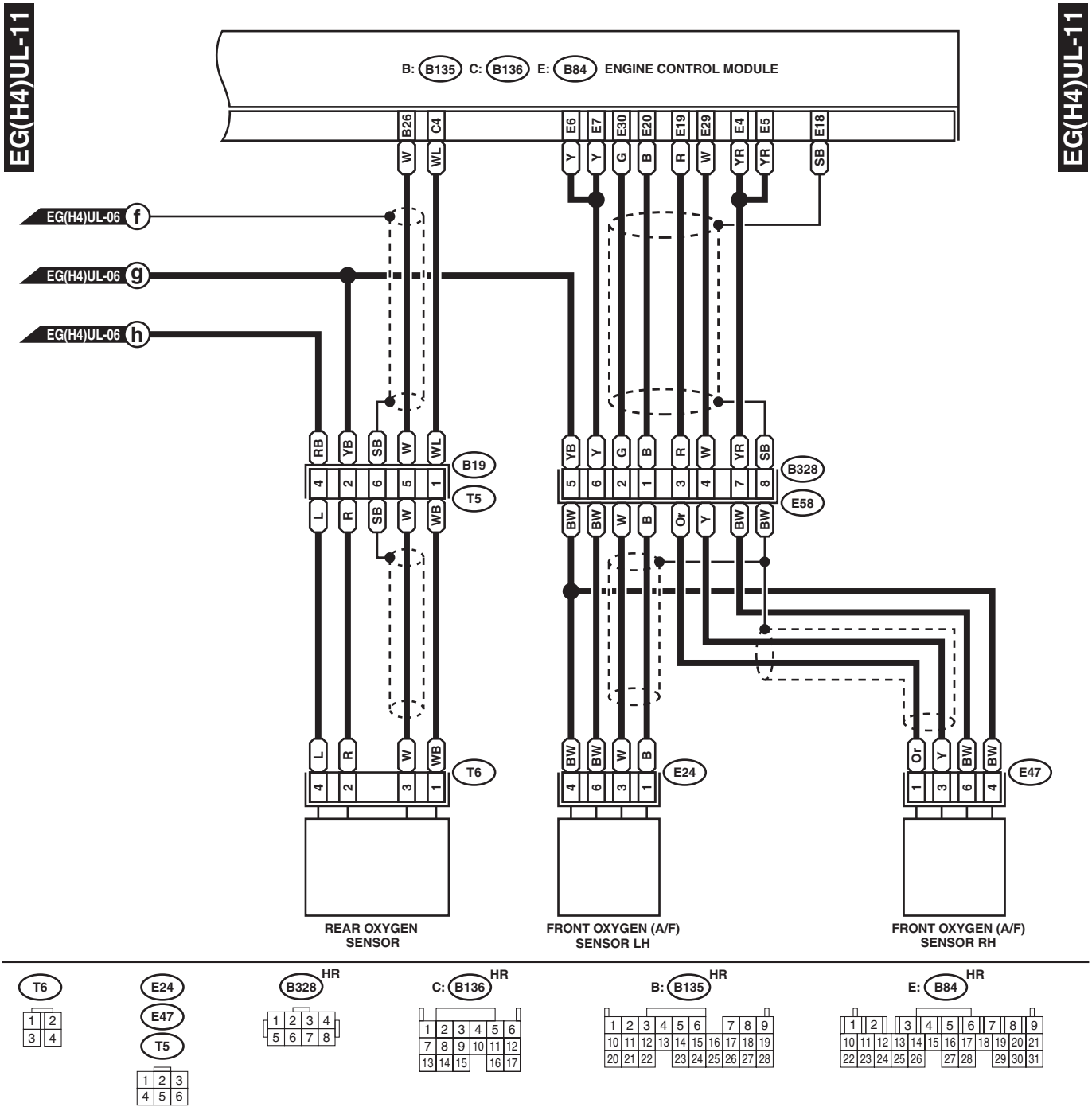

EG(H4)UL-09
A: B134 B: B135 D: B137 E: B84 ENGINE CONTROL MODULE
EG(H4)UL-09
MT
EG(H4)UL-07 X
MT : MT MODEL
B21
E2
B22
E3
EG(H4)UL-08 b
EG(H4)UL-08 c
d EG(H4)UL-10
E14
E10
E15
E19
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
POWER STEERING OIL PRESSURE SWITCH
GE


E10
E14
E15
B22 HR (BROWN)
B21 HR
A: B134 HR
D: B137 HR
B: B135 HR
E: B84 HR

WI-06371


EG(H4)UL-10
EG(H4)UL-10
D: B137 E: B84 ENGINE CONTROL MODULE
D15
D13
E16
D6
D5
D4
D3
RY
RB
RG
P
PL
PB
PG
EG(H4)UL-07 Z
EG(H4)UL-03 L
RY
RB
GW
RG
YL
P
PL
PB
PG
5
6
4
2
1
9
10
11
12
B22
E3
GrR
Lb
YW
R
Y
Br
Lg
GrOr
GrB
EG(H4)UL-07 a
EG(H4)UL-09 d
GrB
GrR
Lb
YW
R
Y
Y
Br
Y
Lg
Y
GrOr
Y
GrB
3
1
4
2
1
2
2
1
2
1
2
1
2
1
E12
E4
E5
E16
E6
E17
IGNITION COIL AND IGNITOR
PURGE CONTROL SOLENOID VALVE
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
E4
E5
E6
E16
E17
E12
HR
B22 (BROWN)
HR
D: B137
HR
E: B84

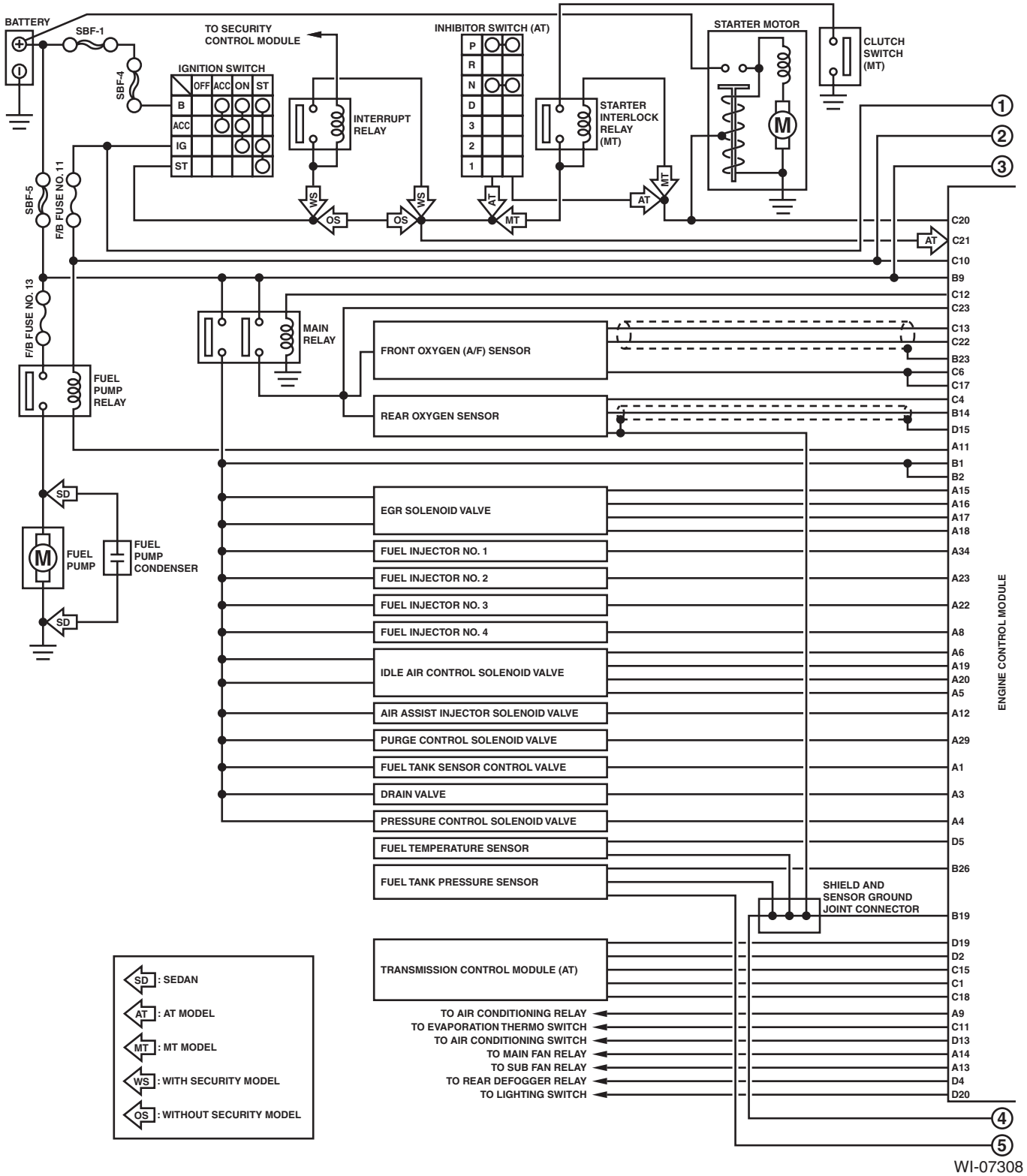
WI-06372

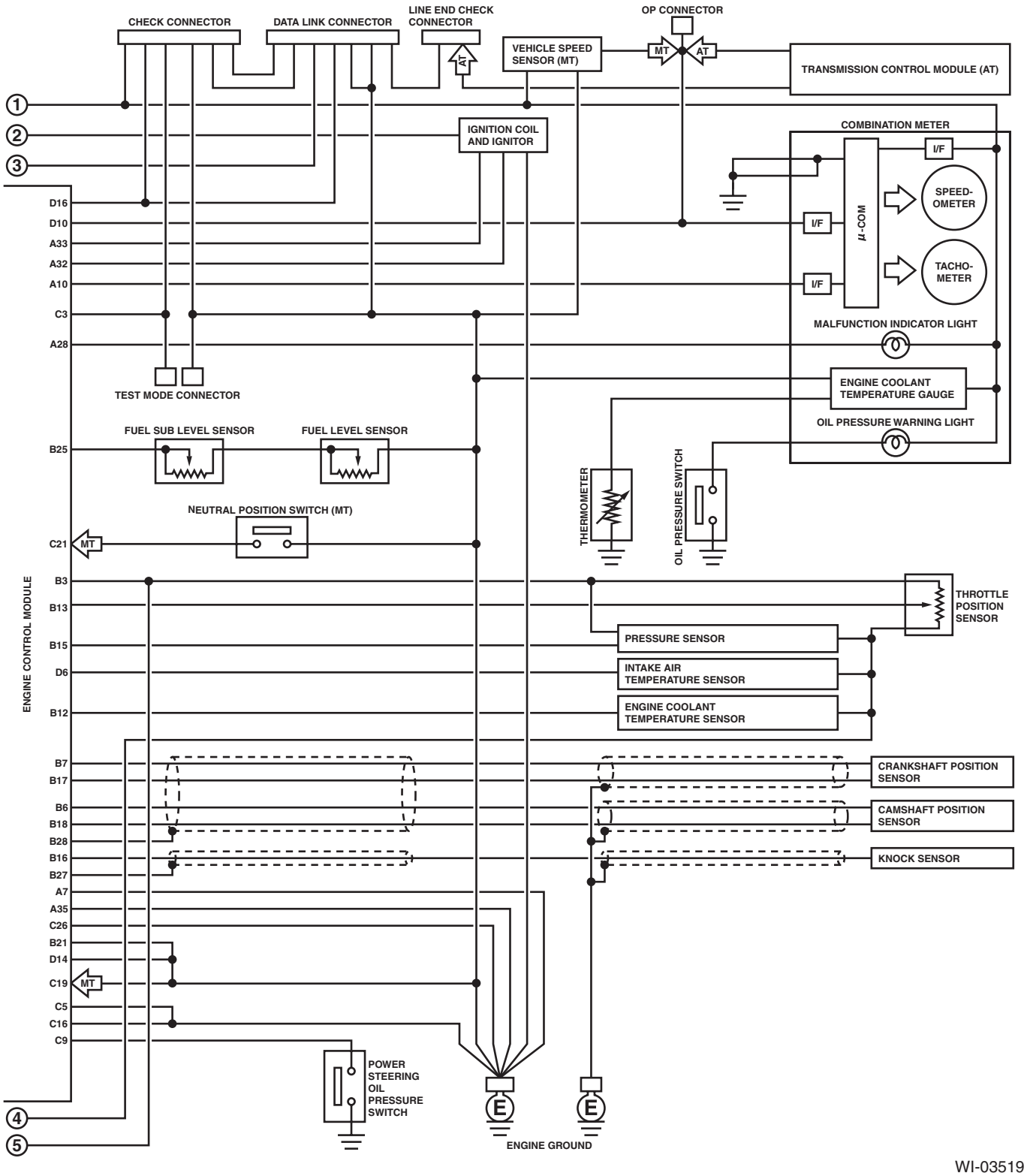

EG(H4)UL-11
EG(H4)UL-11
B: B135 C: B136 E: B84 ENGINE CONTROL MODULE
B26 C4 E6 E7 E30 E20 E19 E29 E4 E5 E18
W WL Y Y G B R W YR YR SB
EG(H4)UL-06 f
EG(H4)UL-06 g
EG(H4)UL-06 h
RB YB SB W WL
B19
4 2 6 5 1
T5
L R SB W WB
YB Y G B R W YR SB
B328
5 6 2 1 3 4 7 8
E58
BW BW W B Or Y BW BW
L R W WB
T6
4 2 3 1
BW BW W B
E24
4 6 3 1
Or Y BW BW
E47
1 3 6 4
REAR OXYGEN SENSOR
FRONT OXYGEN (A/F) SENSOR LH
FRONT OXYGEN (A/F) SENSOR RH
T6
1 2
3 4
E24
E47
T5
1 2 3
4 5 6
B328 HR
1 2 3 4
5 6 7 8
C: B136 HR
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17
B: B135 HR
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
E: B84 HR
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31

WI-06373

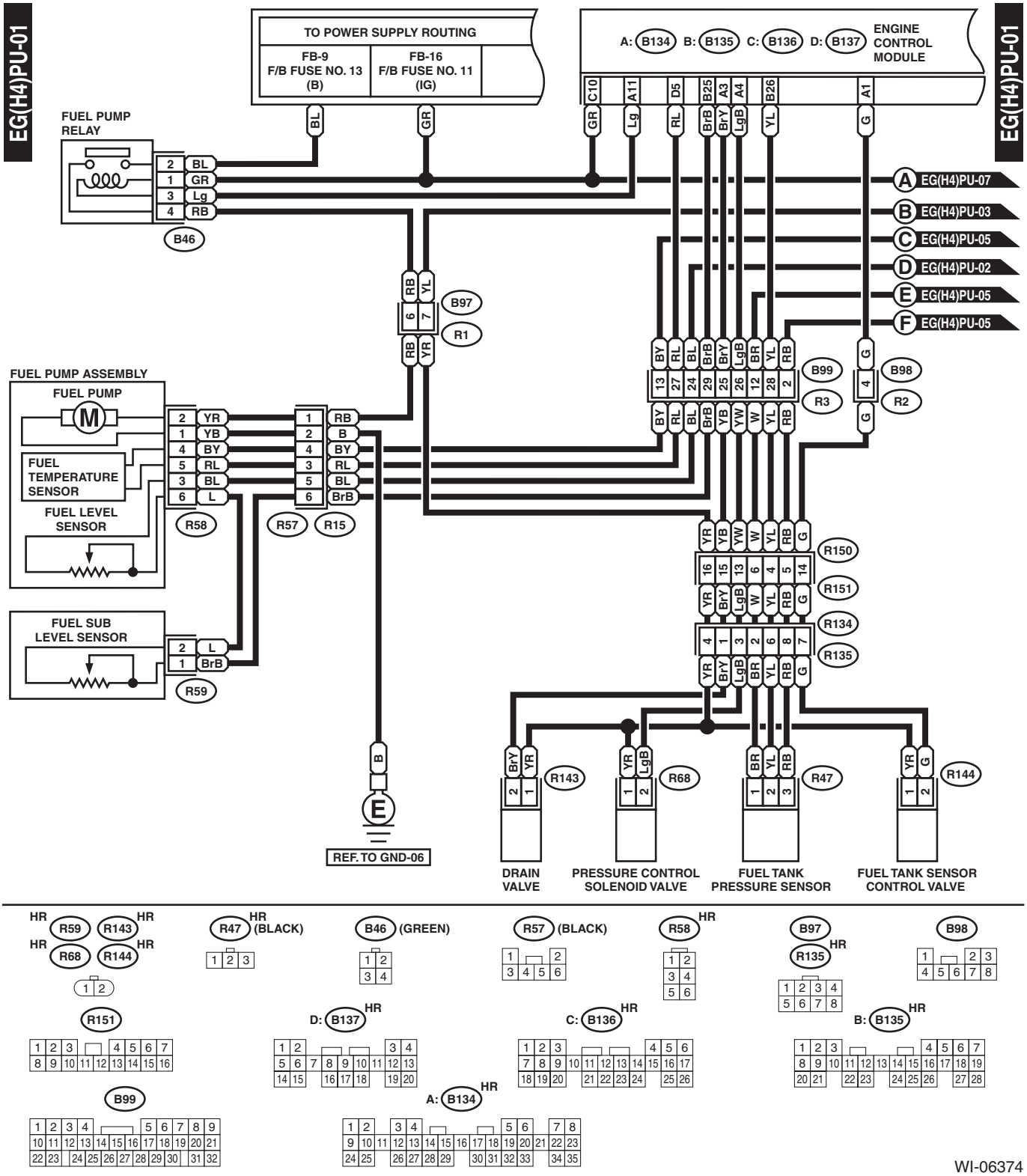
MEMO:

3. PICK-UP (EXCEPT 4-CYLINDER TURBO ENGINE)



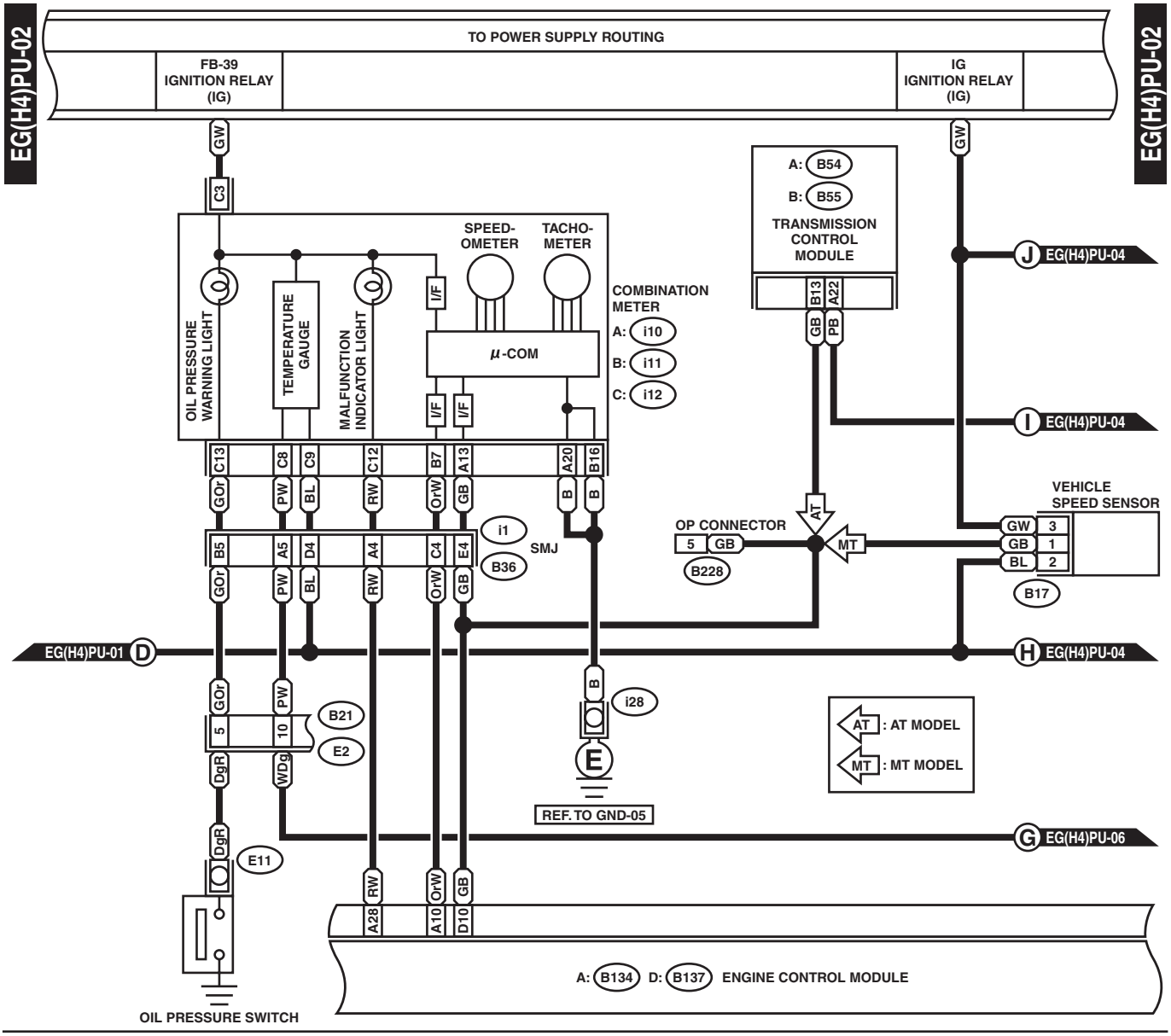

CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
OP CONNECTOR
VEHICLE SPEED SENSOR (MT)
MT
AT
TRANSMISSION CONTROL MODULE (AT)
COMBINATION METER
IGNITION COIL AND IGNITOR
I/F
SPEED-OMETER
TACHO-METER
μ-COM
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
TEST MODE CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
THERMOMETER
OIL PRESSURE SWITCH
ENGINE CONTROL MODULE
THROTTLE POSITION SENSOR
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE GROUND
D16
D10
A33
A32
A10
C3
A28
B25
C21
B3
B13
B15
D6
B12
B7
B17
B6
B18
B28
B16
B27
A7
A35
C26
B21
D14
C19
C5
C16
C9
1
2
3
4
5
E

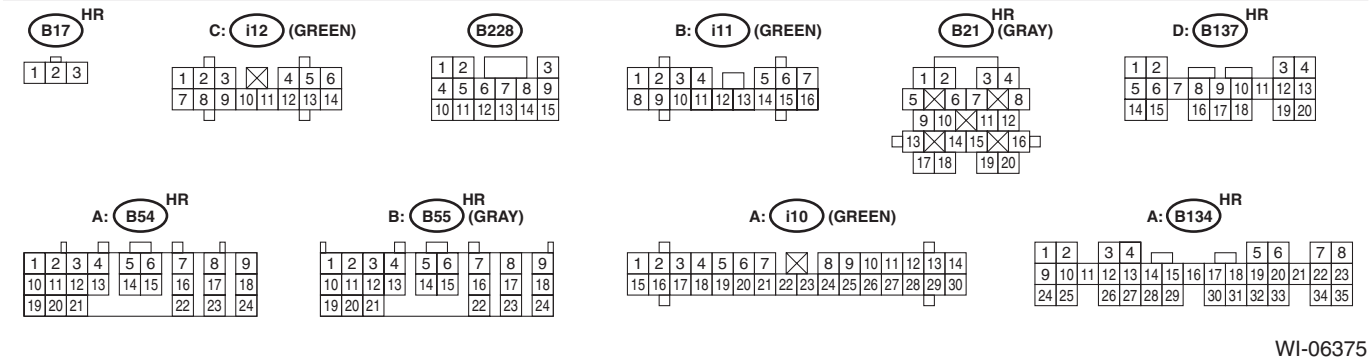
WI-03519


EG(H4)PU-01
TO POWER SUPPLY ROUTING
FB-9 F/B FUSE NO. 13 (B)
FB-16 F/B FUSE NO. 11 (IG)
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
FUEL PUMP RELAY
B46
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
FUEL SUB LEVEL SENSOR
B97
R1
B99
R3
B98
R2
R58
R57
R15
R59
R150
R151
R134
R135
R143
R68
R47
R144
REF. TO GND-06
DRAIN VALVE
PRESSURE CONTROL SOLENOID VALVE
FUEL TANK PRESSURE SENSOR
FUEL TANK SENSOR CONTROL VALVE
EG(H4)PU-07
EG(H4)PU-03
EG(H4)PU-05
EG(H4)PU-02
EG(H4)PU-05
EG(H4)PU-05

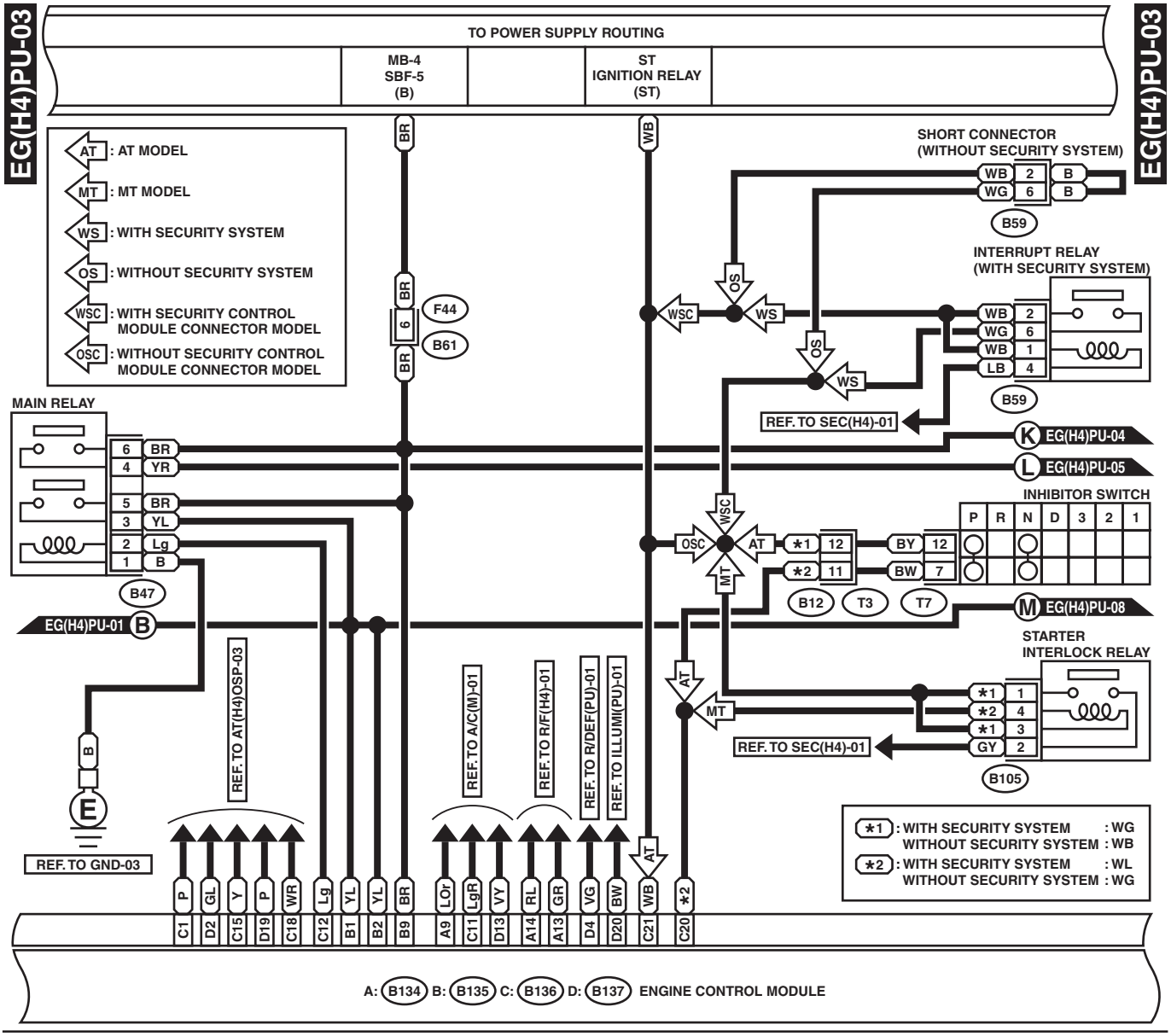
HR R59 R143 HR
HR R68 R144 HR
R47 HR (BLACK)
B46 (GREEN)
R57 (BLACK)
R58 HR
B97 HR R135
B98
R151
D: B137 HR
C: B136 HR
B: B135 HR
B99
A: B134 HR

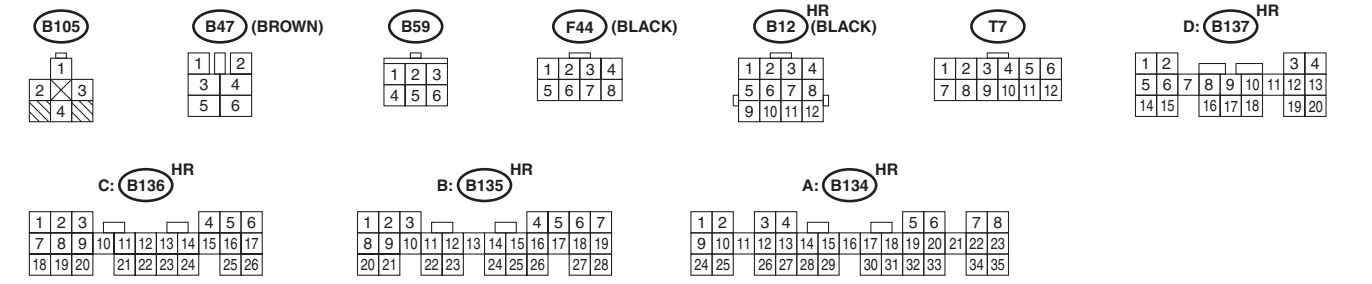
WI-06374


EG(H4)PU-02
TO POWER SUPPLY ROUTING
FB-39 IGNITION RELAY (IG)
IG IGNITION RELAY (IG)
EG(H4)PU-02
GW
C3
SPEED-OMETER
TACHO-METER
COMBINATION METER
A: i10
B: i11
C: i12
OIL PRESSURE WARNING LIGHT
TEMPERATURE GAUGE
MALFUNCTION INDICATOR LIGHT
I/F
μ-COM
A: B54
B: B55
TRANSMISSION CONTROL MODULE
B13
A22
GB
PB
J EG(H4)PU-04
I EG(H4)PU-04
VEHICLE SPEED SENSOR
GW 3
GB 1
BL 2
B17
C13 C8 C9 C12 B7 A13 A20 B16
GOr PW BL RW OrW GB B B
i1
SMJ
B36
B5 A5 D4 A4 C4 E4
OP CONNECTOR
5 GB
B228
AT
MT
EG(H4)PU-01 D
H EG(H4)PU-04
B21
E2
i28
E
REF. TO GND-05
AT : AT MODEL
MT : MT MODEL
DgR WDg
G EG(H4)PU-06
E11
A28 A10 D10
A: B134 D: B137 ENGINE CONTROL MODULE
OIL PRESSURE SWITCH

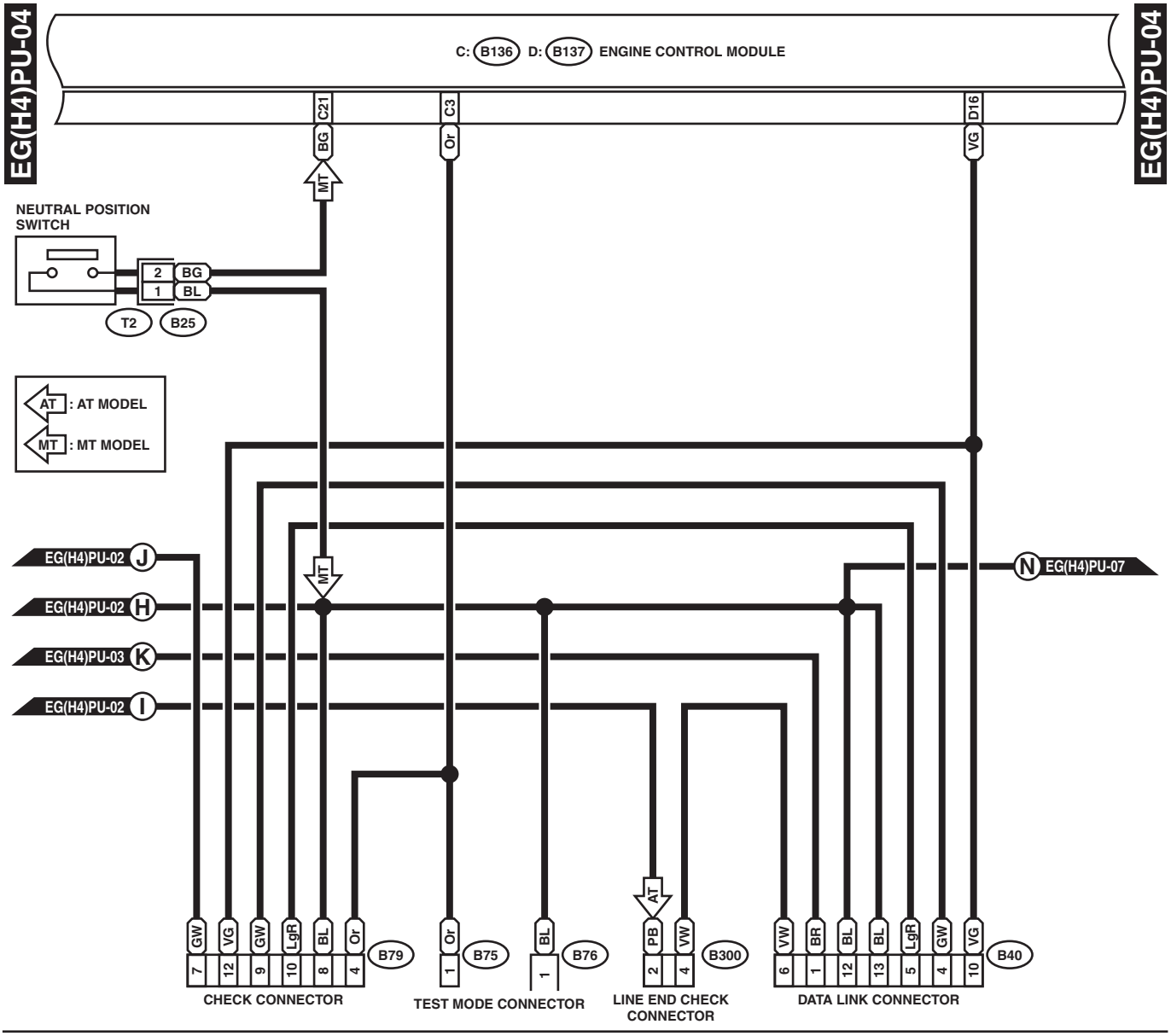

B17 HR
C: i12 (GREEN)
B228
B: i11 (GREEN)
B21 HR (GRAY)
D: B137 HR
A: B54 HR
B: B55 HR (GRAY)
A: i10 (GREEN)
A: B134 HR

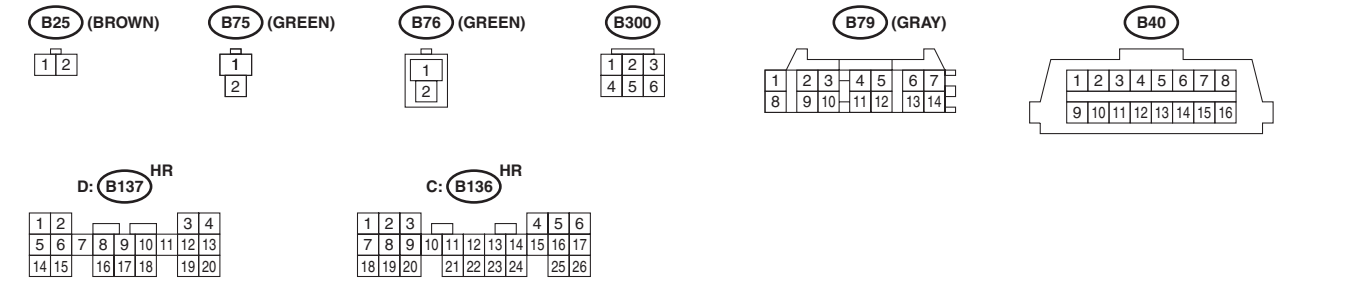
WI-06375


EG(H4)PU-03
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
ST
IGNITION RELAY
(ST)
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
WSC : WITH SECURITY CONTROL MODULE CONNECTOR MODEL
OSC : WITHOUT SECURITY CONTROL MODULE CONNECTOR MODEL
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
MAIN RELAY
INHIBITOR SWITCH
STARTER
INTERLOCK RELAY
REF. TO SEC(H4)-01
REF. TO GND-03
REF. TO AT(H4)OSP-03
REF. TO A/C(M)-01
REF. TO R/F(H4)-01
REF. TO R/DEF(PU)-01
REF. TO ILLUMI(PU)-01
EG(H4)PU-01
EG(H4)PU-04
EG(H4)PU-05
EG(H4)PU-08
*1 : WITH SECURITY SYSTEM : WG
WITHOUT SECURITY SYSTEM : WB
*2 : WITH SECURITY SYSTEM : WL
WITHOUT SECURITY SYSTEM : WG
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE

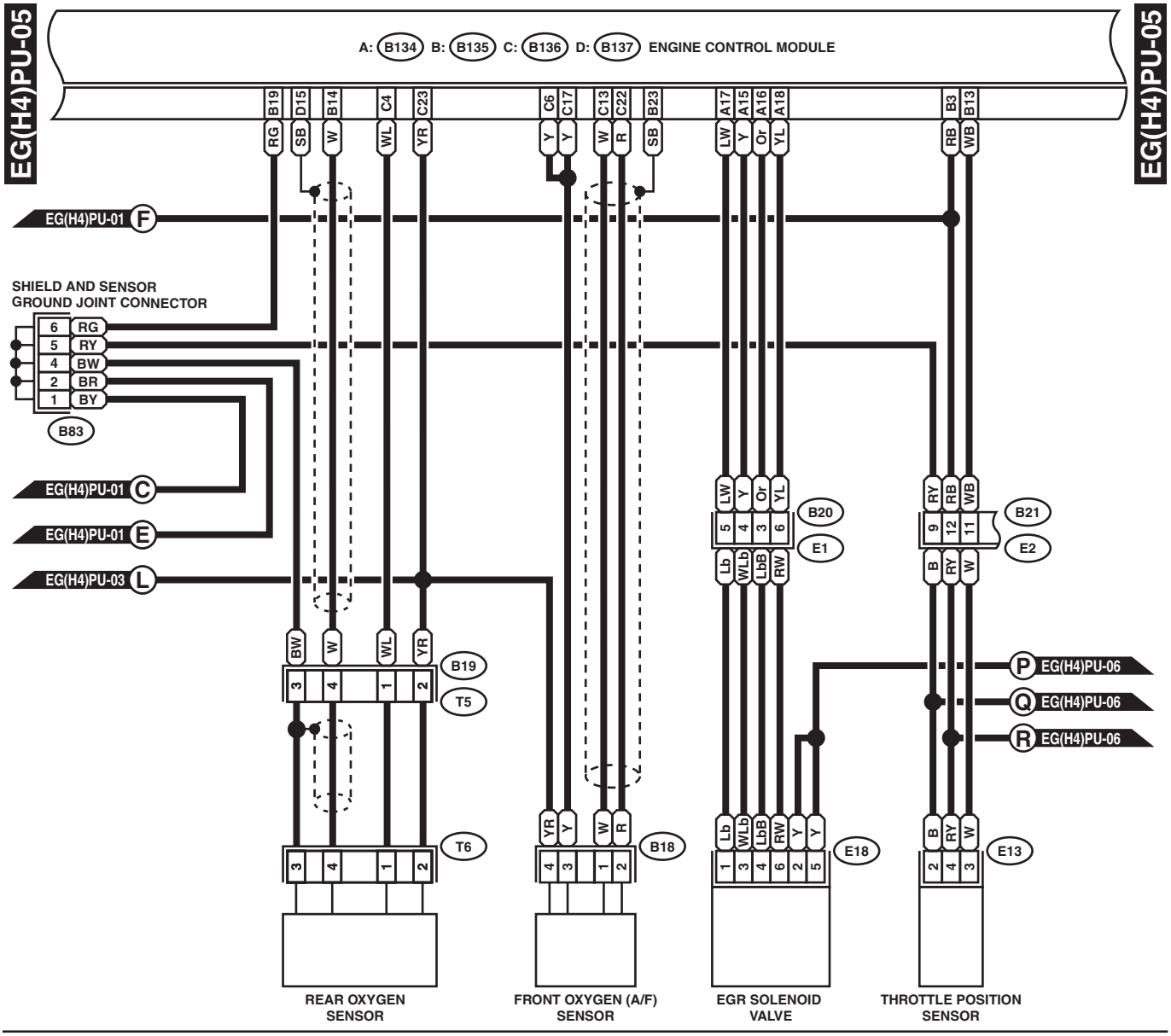

B105
B47 (BROWN)
B59
F44 (BLACK)
B12 HR (BLACK)
T7
D: B137 HR
C: B136 HR
B: B135 HR
A: B134 HR

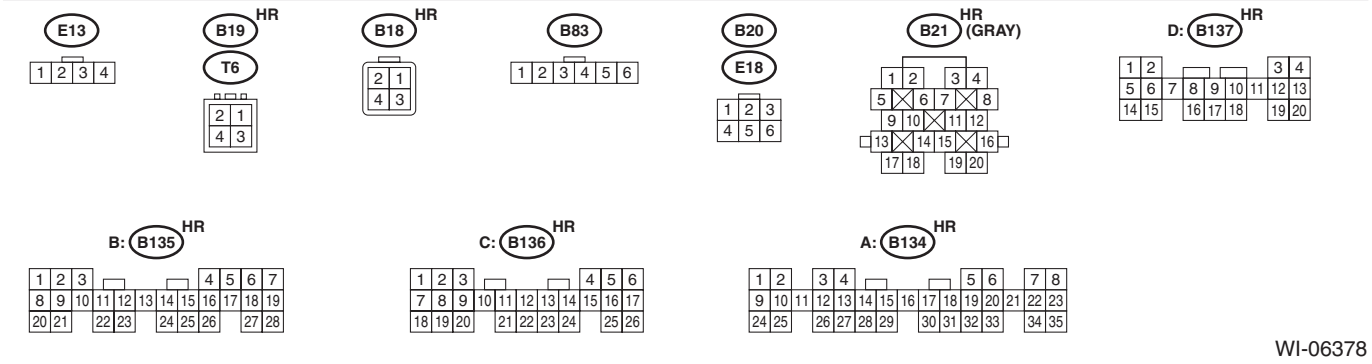
WI-06376


EG(H4)PU-04
EG(H4)PU-04
C: B136 D: B137 ENGINE CONTROL MODULE
C21
C3
D16
BG
Or
VG
MT
NEUTRAL POSITION SWITCH
2 BG
1 BL
T2
B25
AT : AT MODEL
MT : MT MODEL
EG(H4)PU-02 J
EG(H4)PU-02 H
EG(H4)PU-03 K
EG(H4)PU-02 I
N EG(H4)PU-07
AT
GW VG GW LgR BL Or B79
7 12 9 10 8 4
CHECK CONNECTOR
Or B75
1
TEST MODE CONNECTOR
BL B76
1
PB VW B300
2 4
LINE END CHECK CONNECTOR
VW BR BL BL LgR GW VG B40
6 1 12 13 5 4 10
DATA LINK CONNECTOR

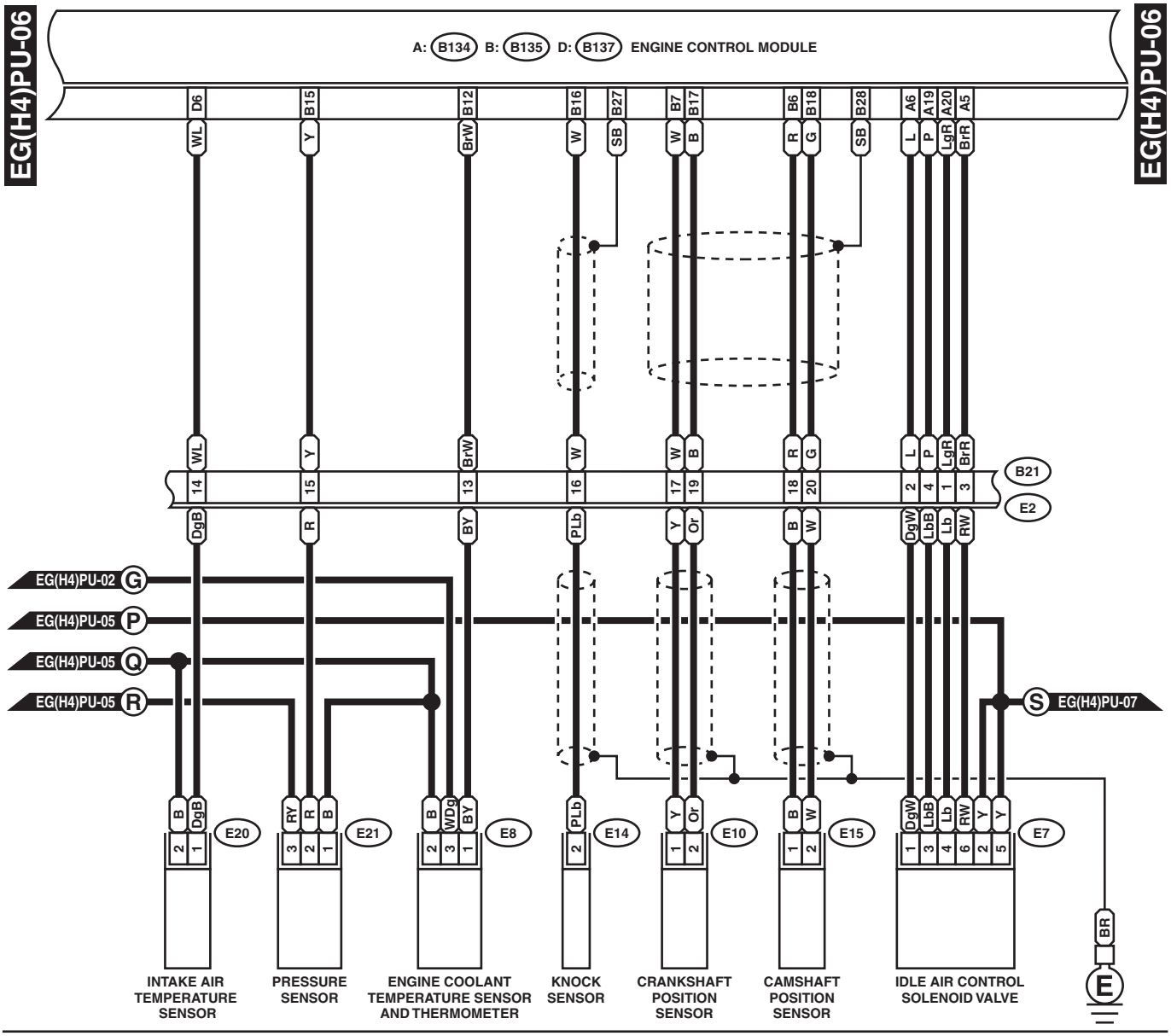

B25 (BROWN)
1 2
B75 (GREEN)
1
2
B76 (GREEN)
1
2
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
D: B137 HR
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
C: B136 HR
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26

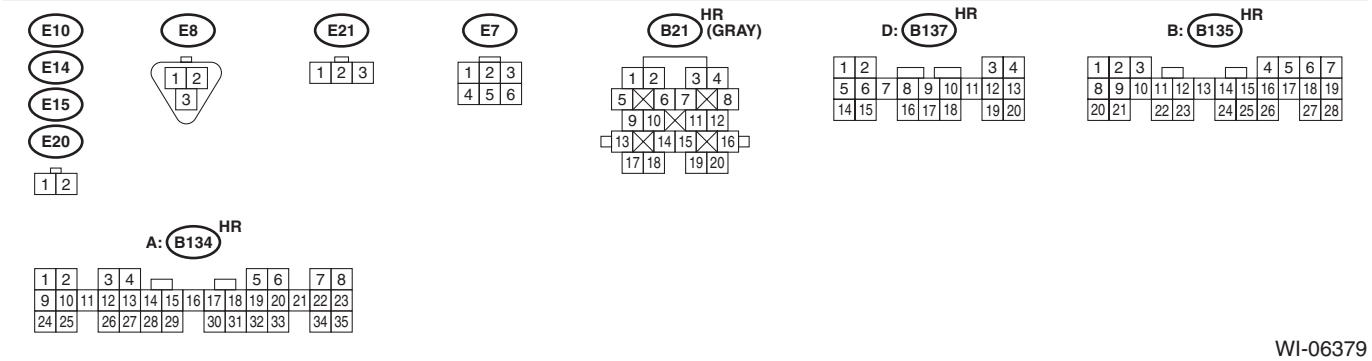
WI-06377


EG(H4)PU-05
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
EG(H4)PU-05
B19 D15 B14 C4 C23 C6 C17 C13 C22 B23 A17 A15 A16 A18 B3 B13
RG SB W WL YR Y Y W R SB LW Y Or YL RB WB
EG(H4)PU-01 F
SHIELD AND SENSOR GROUND JOINT CONNECTOR
6 RG
5 RY
4 BW
2 BR
1 BY
B83
EG(H4)PU-01 C
EG(H4)PU-01 E
EG(H4)PU-03 L
LW Y Or YL
B20
E1
RY RB WB
B21
E2
Lb WLb LbB RW
B B RY W
BW W WL YR
B19
T5
T6
YR Y W R
B18
Lb WLb LbB RW Y Y
E18
B RY W
E13
P EG(H4)PU-06
Q EG(H4)PU-06
R EG(H4)PU-06
REAR OXYGEN SENSOR
FRONT OXYGEN (A/F) SENSOR
EGR SOLENOID VALVE
THROTTLE POSITION SENSOR

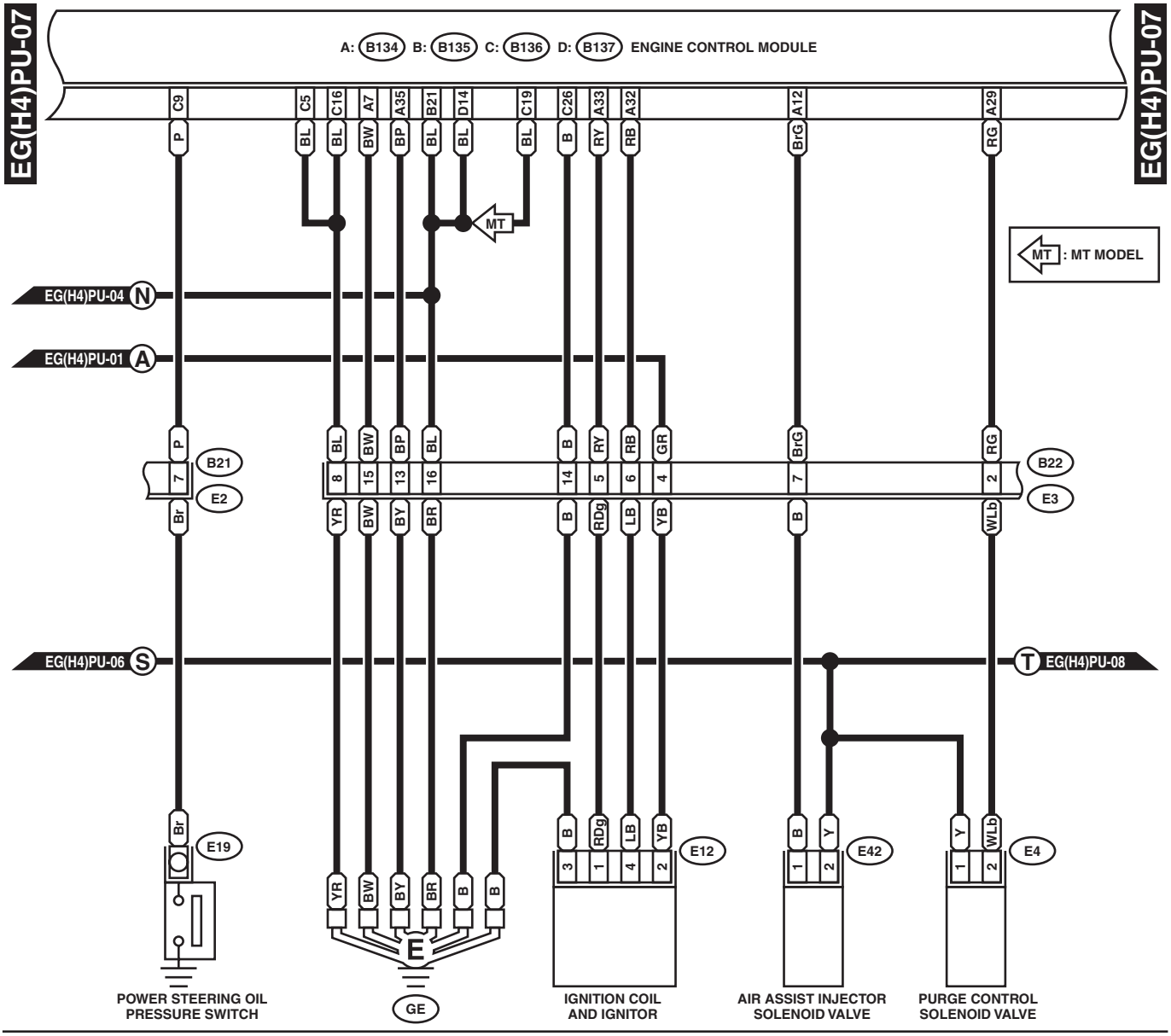

E13
B19 HR
T6
B18 HR
B83
B20
E18
B21 HR (GRAY)
D: B137 HR
B: B135 HR
C: B136 HR
A: B134 HR

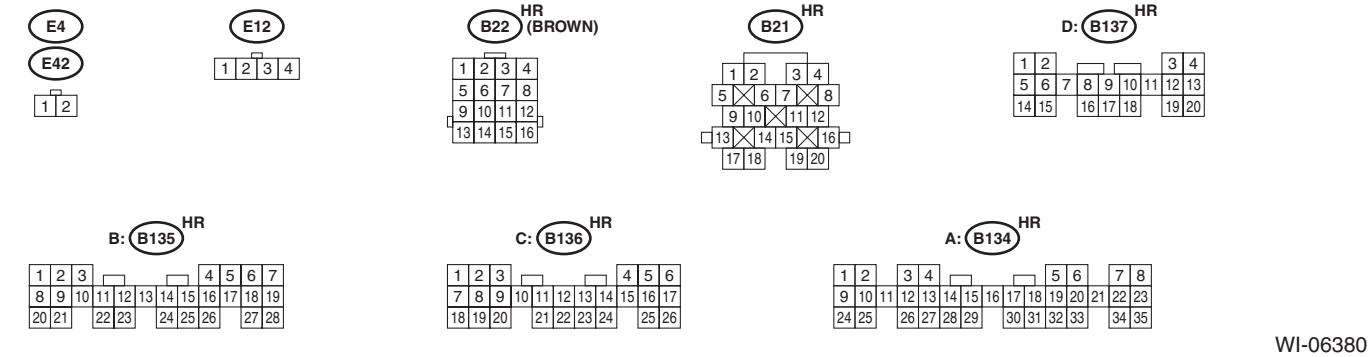
WI-06378


EG(H4)PU-06
EG(H4)PU-06
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
D6 B15 B12 B16 B27 B7 B17 B6 B18 B28 A6 A19 A20 A5
WL Y BrW W SB W B R G SB L P LgR BrR
B21
E2
DgB R BY PLb Y Or B W DgW LbB Lb RW
EG(H4)PU-02 G
EG(H4)PU-05 P
EG(H4)PU-05 Q
EG(H4)PU-05 R
S EG(H4)PU-07
E20 E21 E8 E14 E10 E15 E7
BR
E
INTAKE AIR TEMPERATURE SENSOR
PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE

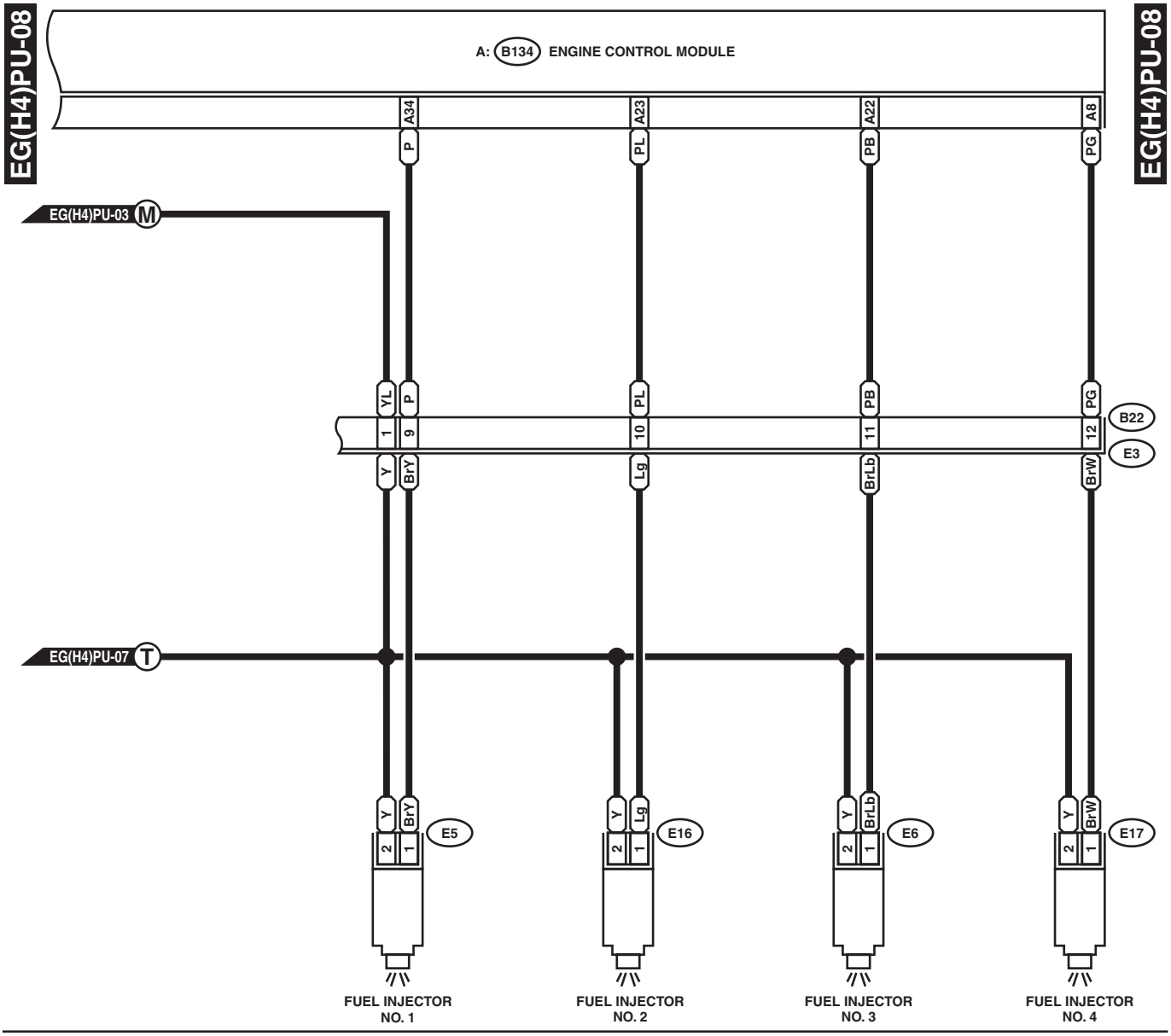

E10
E14
E15
E20
E8
E21
E7
B21 HR (GRAY)
D: B137 HR
B: B135 HR
A: B134 HR

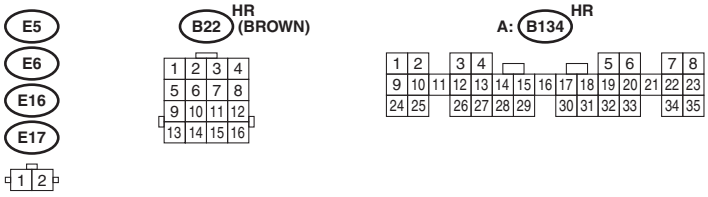
WI-06379


EG(H4)PU-07
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
EG(H4)PU-07
MT
MT : MT MODEL
EG(H4)PU-04 N
EG(H4)PU-01 A
B21
E2
B22
E3
EG(H4)PU-06 S
T EG(H4)PU-08
E19
E12
E42
E4
POWER STEERING OIL PRESSURE SWITCH
GE
IGNITION COIL AND IGNITOR
AIR ASSIST INJECTOR SOLENOID VALVE
PURGE CONTROL SOLENOID VALVE


E4
E42
E12
B22 HR (BROWN)
B21 HR
D: B137 HR
B: B135 HR
C: B136 HR
A: B134 HR

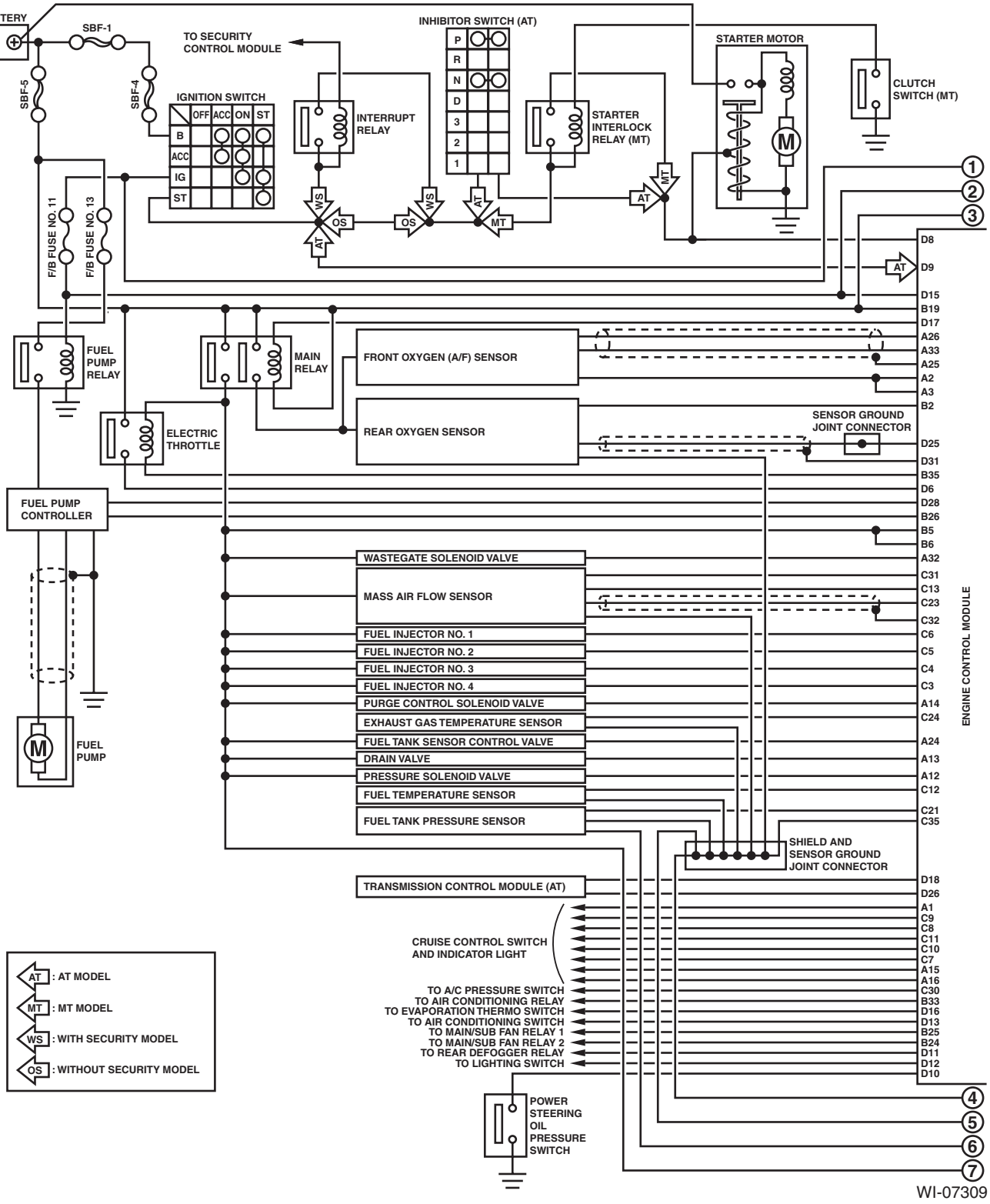
WI-06380

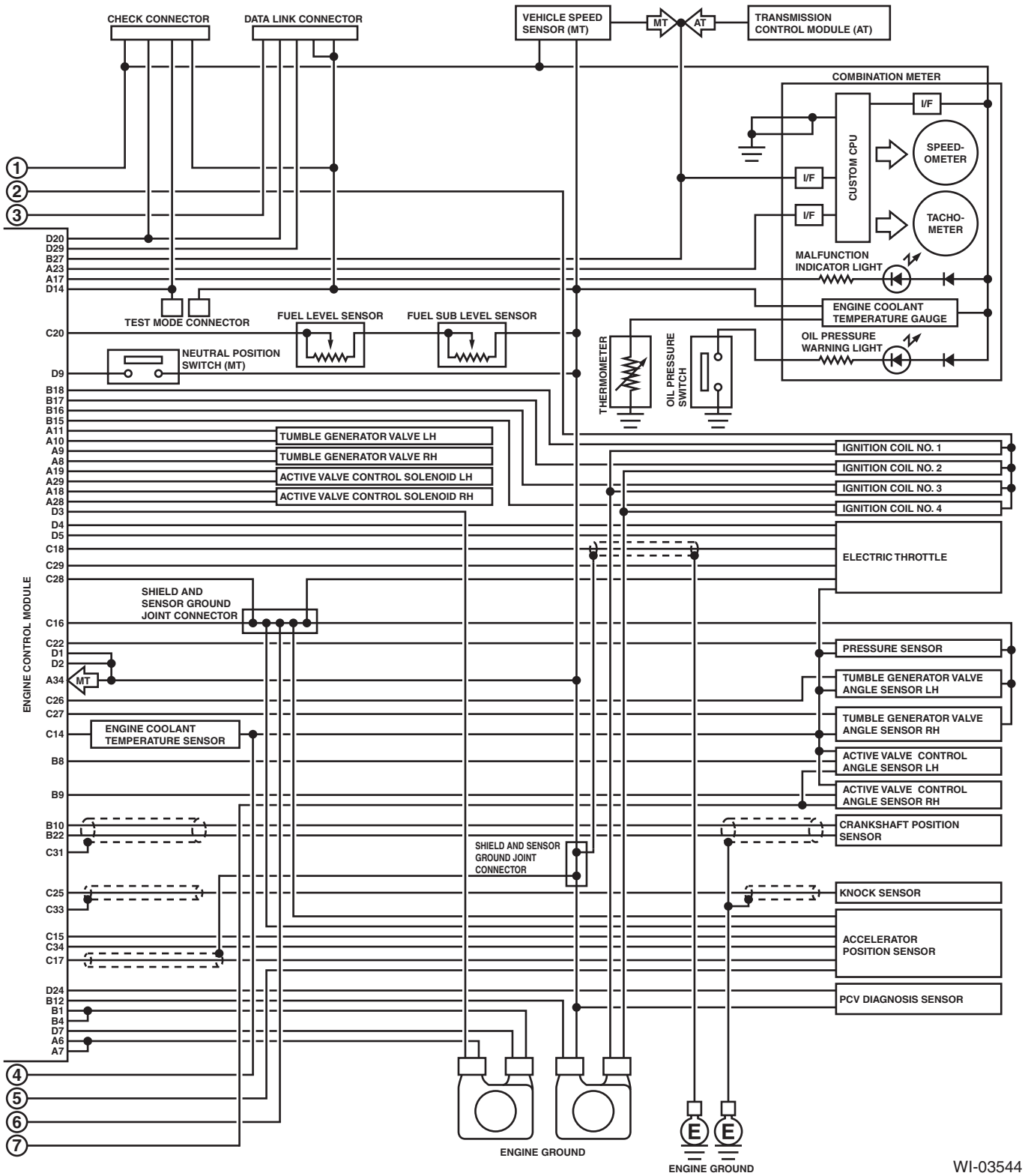

EG(H4)PU-08
EG(H4)PU-08
A: B134 ENGINE CONTROL MODULE
A34
A23
A22
A8
P
PL
PB
PG
EG(H4)PU-03 M
YL
P
PL
PB
PG
1
9
10
11
12
B22
E3
Y
BrY
Lg
BrLb
BrW
EG(H4)PU-07 T
E5
E16
E6
E17
2
1
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4

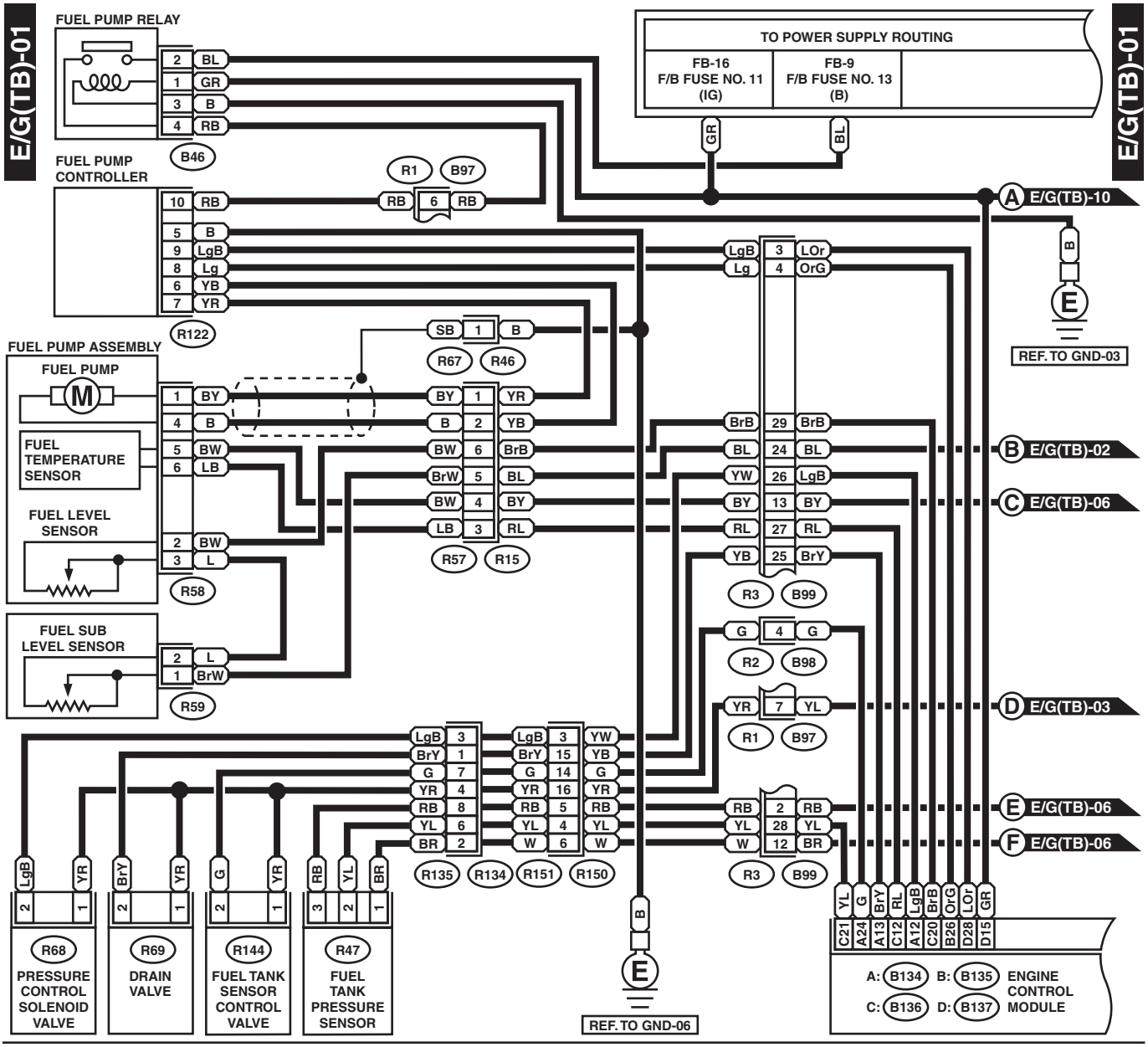

E5
E6
E16
E17
B22 HR (BROWN)
A: B134 HR

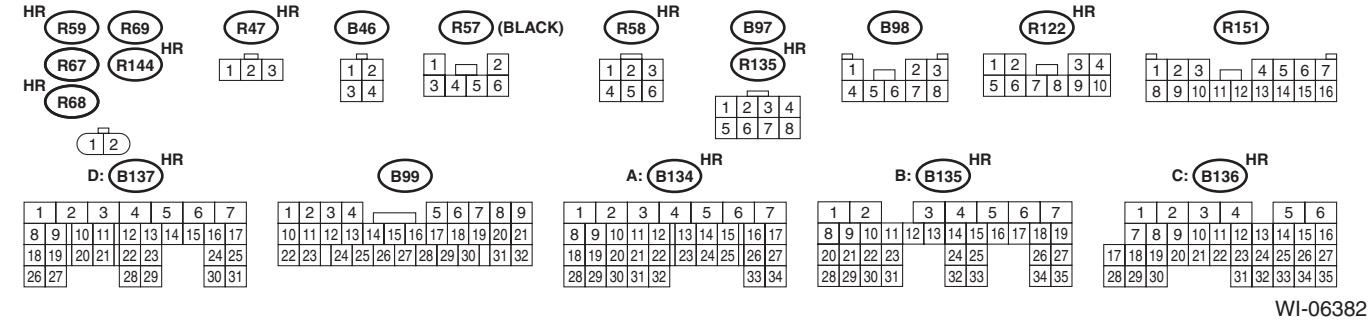
WI-06381

4. PICK-UP (4-CYLINDER TURBO ENGINE)

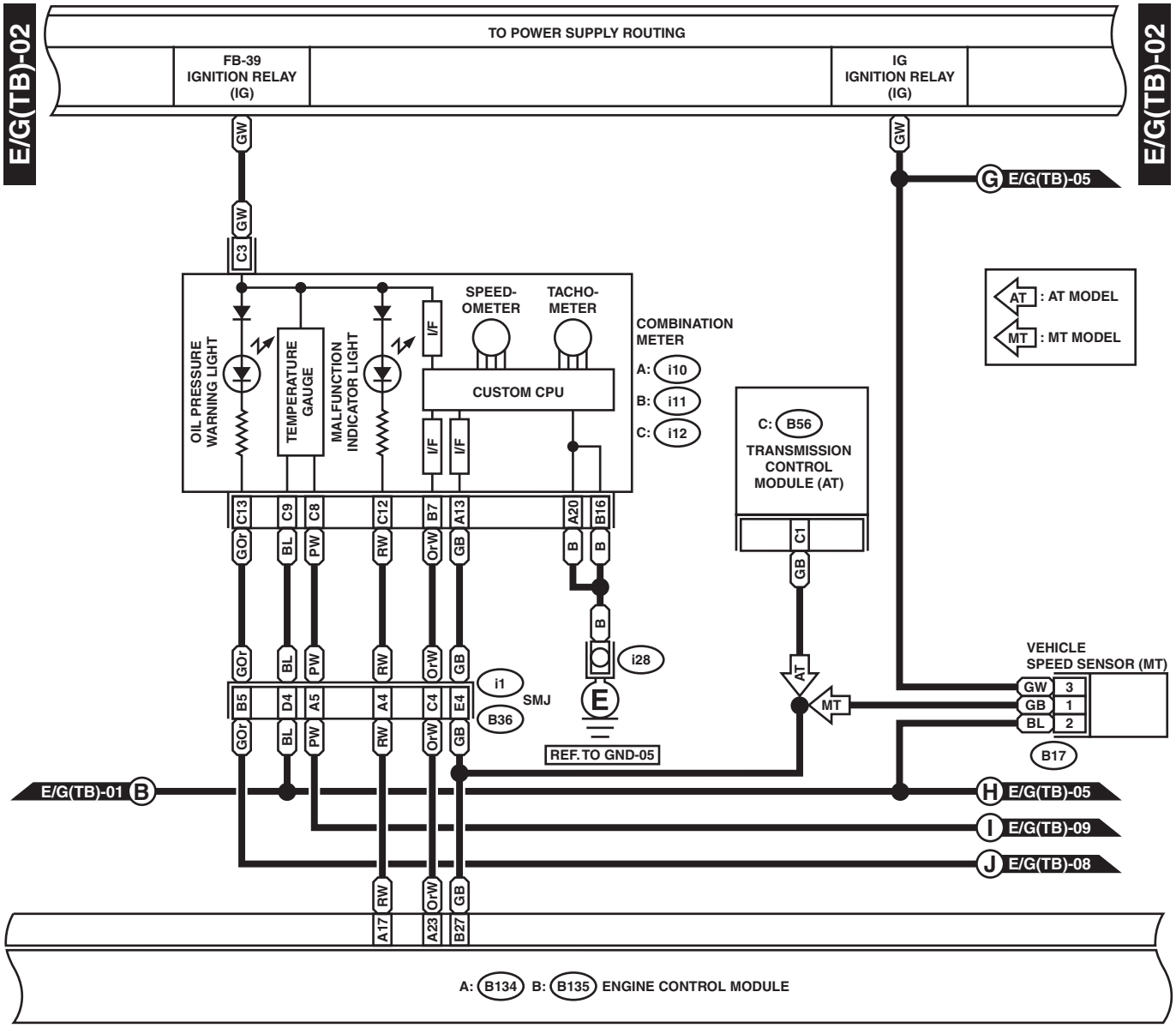


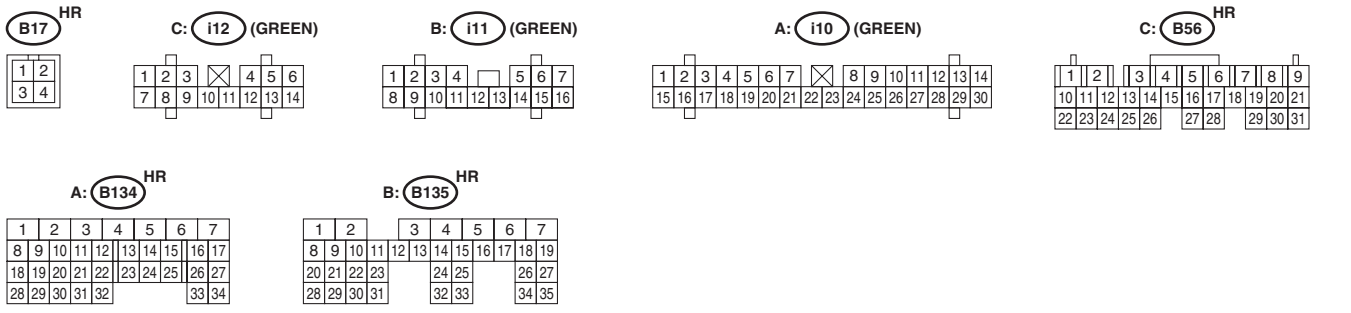

CHECK CONNECTOR
DATA LINK CONNECTOR
VEHICLE SPEED SENSOR (MT)
MT
AT
TRANSMISSION CONTROL MODULE (AT)
COMBINATION METER
I/F
CUSTOM CPU
SPEED-OMETER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
ENGINE CONTROL MODULE
TEST MODE CONNECTOR
FUEL LEVEL SENSOR
FUEL SUB LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
THERMOMETER
OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
ACTIVE VALVE CONTROL SOLENOID LH
ACTIVE VALVE CONTROL SOLENOID RH
IGNITION COIL NO. 1
IGNITION COIL NO. 2
IGNITION COIL NO. 3
IGNITION COIL NO. 4
ELECTRIC THROTTLE
SHIELD AND SENSOR GROUND JOINT CONNECTOR
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
ACTIVE VALVE CONTROL ANGLE SENSOR LH
ACTIVE VALVE CONTROL ANGLE SENSOR RH
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
KNOCK SENSOR
ACCELERATOR POSITION SENSOR
PCV DIAGNOSIS SENSOR
ENGINE GROUND
ENGINE GROUND
WI-03544


E/G(TB)-01
FUEL PUMP RELAY
TO POWER SUPPLY ROUTING
FB-16 F/B FUSE NO. 11 (IG)
FB-9 F/B FUSE NO. 13 (B)
FUEL PUMP CONTROLLER
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
FUEL SUB LEVEL SENSOR
PRESSURE CONTROL SOLENOID VALVE
DRAIN VALVE
FUEL TANK SENSOR CONTROL VALVE
FUEL TANK PRESSURE SENSOR
REF. TO GND-03
REF. TO GND-06
E/G(TB)-10
E/G(TB)-02
E/G(TB)-06
E/G(TB)-03
E/G(TB)-06
E/G(TB)-06
A: B134 B: B135 ENGINE CONTROL MODULE
C: B136 D: B137

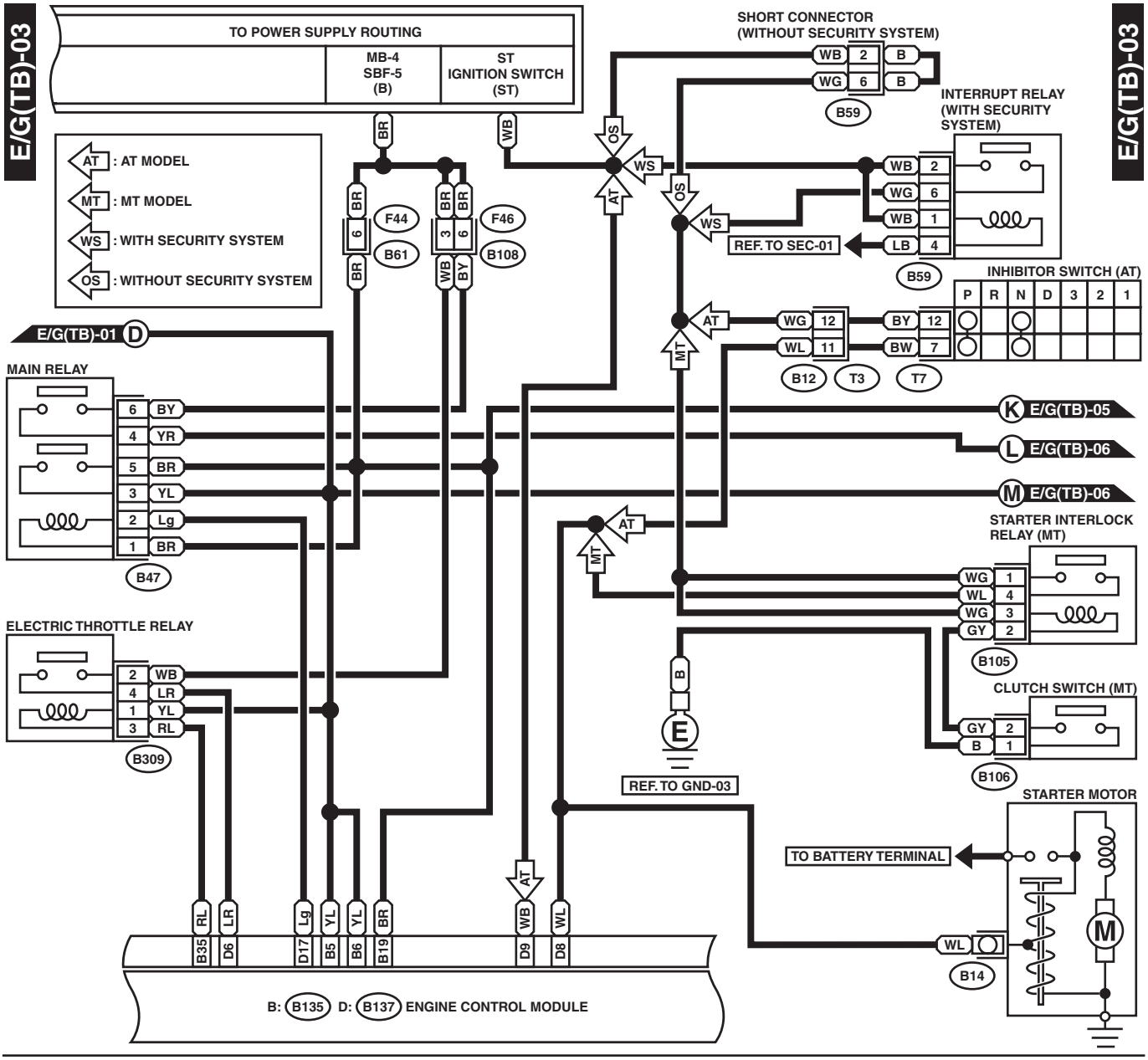

R59
R69
R67
R144
R68
R47
B46
R57 (BLACK)
R58
B97
R135
B98
R122
R151
D: B137
B99
A: B134
B: B135
C: B136

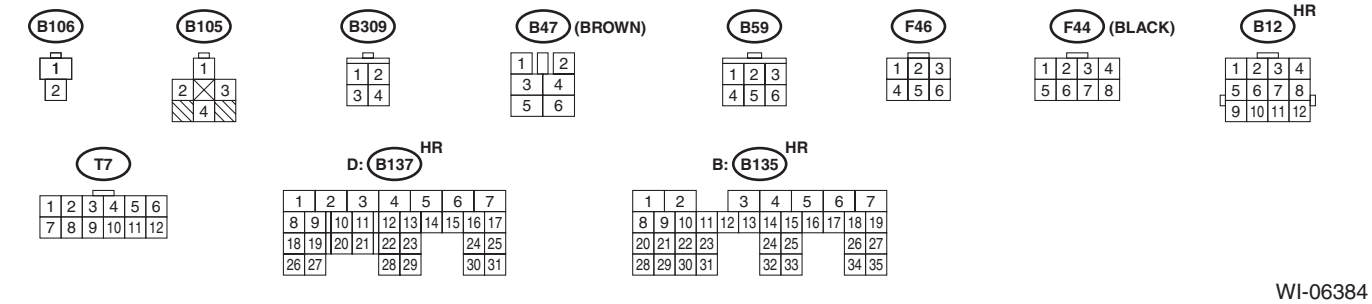
WI-06382


E/G(TB)-02
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
IG
IGNITION RELAY
(IG)
E/G(TB)-02
GW
C3
G E/G(TB)-05
AT : AT MODEL
MT : MT MODEL
SPEED-
OMETER
TACHO-
METER
COMBINATION
METER
A: i10
B: i11
C: i12
I/F
CUSTOM CPU
OIL PRESSURE
WARNING LIGHT
TEMPERATURE
GAUGE
MALFUNCTION
INDICATOR LIGHT
C: B56
TRANSMISSION
CONTROL
MODULE (AT)
C1
C13
C9
C8
C12
B7
A13
A20
B16
GOr
BL
PW
RW
OrW
GB
B
i28
i1
SMJ
B36
B5
D4
A5
A4
C4
E4
REF. TO GND-05
AT
MT
VEHICLE
SPEED SENSOR (MT)
GW 3
GB 1
BL 2
B17
E/G(TB)-01 B
H E/G(TB)-05
I E/G(TB)-09
J E/G(TB)-08
A17
A23
B27
A: B134 B: B135 ENGINE CONTROL MODULE


B17 HR
C: i12 (GREEN)
B: i11 (GREEN)
A: i10 (GREEN)
C: B56 HR
A: B134 HR
B: B135 HR

WI-06383


E/G(TB)-03
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
INTERRUPT RELAY
(WITH SECURITY
SYSTEM)
REF. TO SEC-01
INHIBITOR SWITCH (AT)
P R N D 3 2 1
E/G(TB)-01
MAIN RELAY
STARTER INTERLOCK
RELAY (MT)
CLUTCH SWITCH (MT)
ELECTRIC THROTTLE RELAY
REF. TO GND-03
STARTER MOTOR
TO BATTERY TERMINAL
B: B135 D: B137 ENGINE CONTROL MODULE
E/G(TB)-05
E/G(TB)-06
E/G(TB)-06

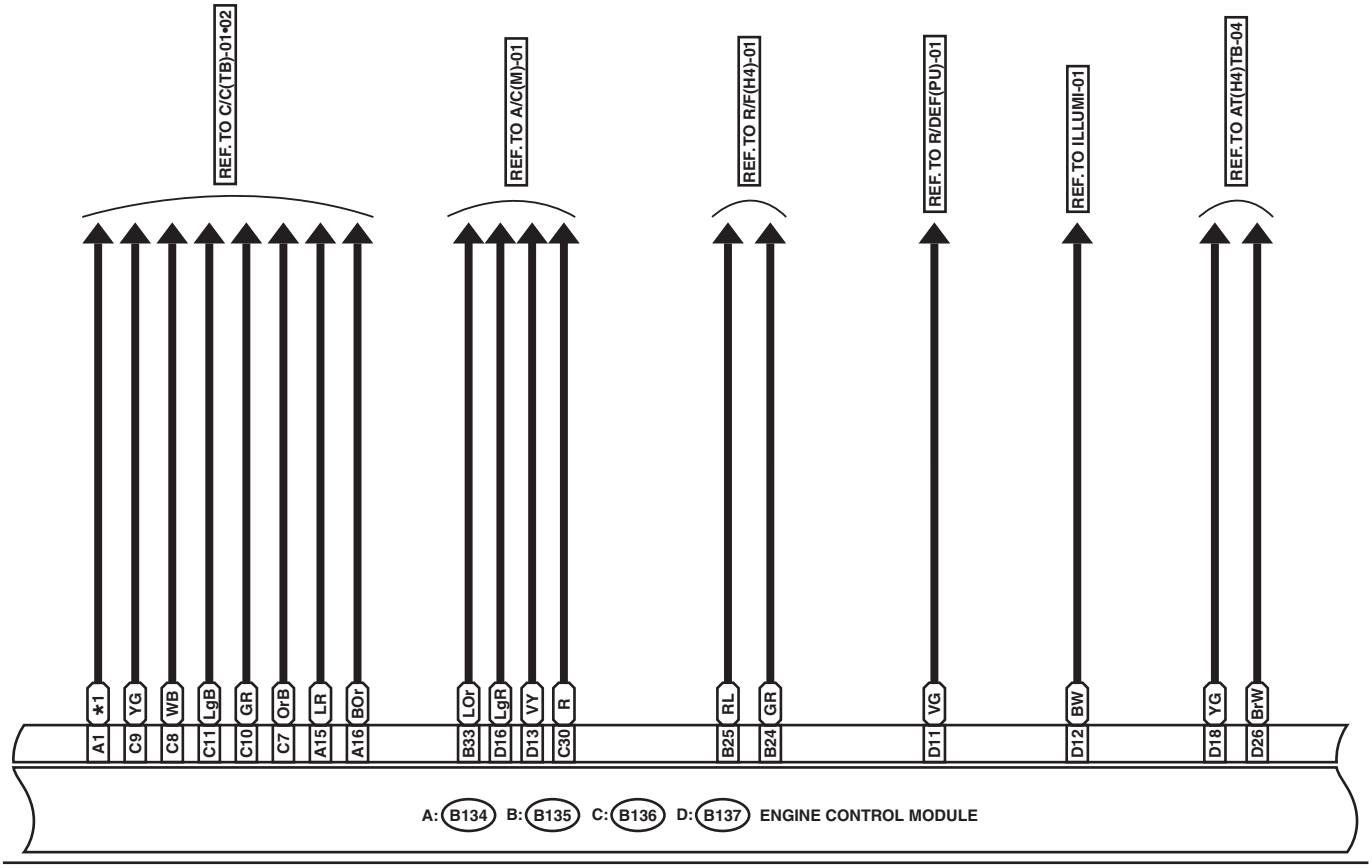

B106
B105
B309
B47 (BROWN)
B59
F46
F44 (BLACK)
B12 HR
T7
D: B137 HR
B: B135 HR

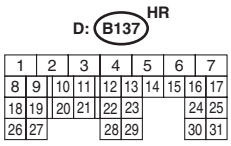
WI-06384

E/G(TB)-04

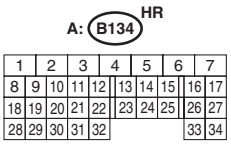
E/G(TB)-04

*1: AT MODEL : GR
MT MODEL : YR

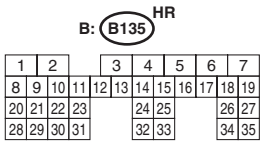




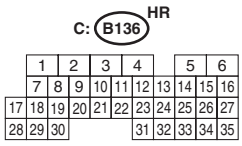
1	2	3	4	5	6	7
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23			24	25
26	27			28	29			30	31



1	2	3	4	5	6	7
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27
28	29	30	31	32				33	34

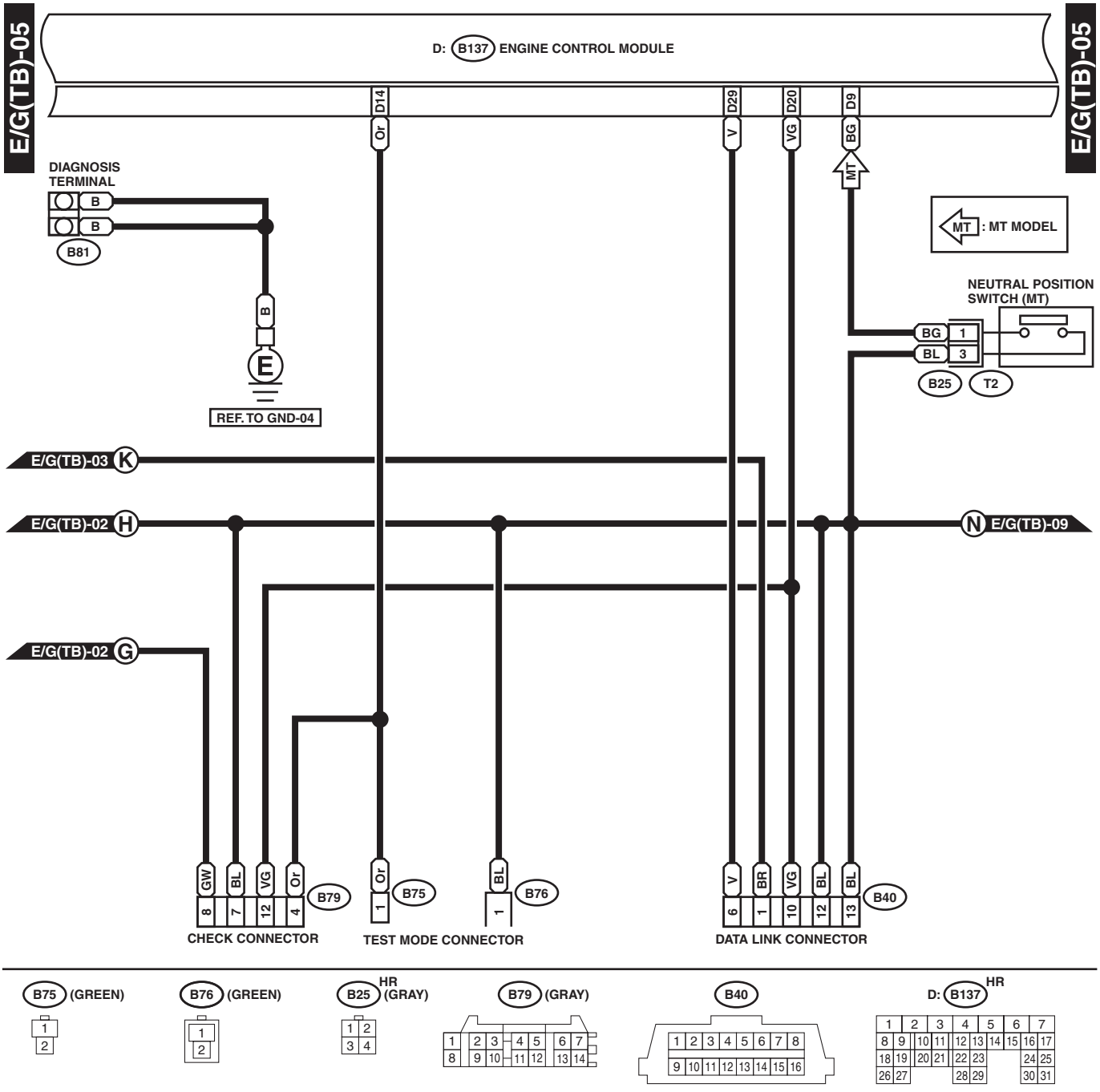


1	2	3	4	5	6	7
8	9	10	11	12	13	14	15	16	17	18	19
20	21	22	23			24	25			26	27
28	29	30	31			32	33			34	35



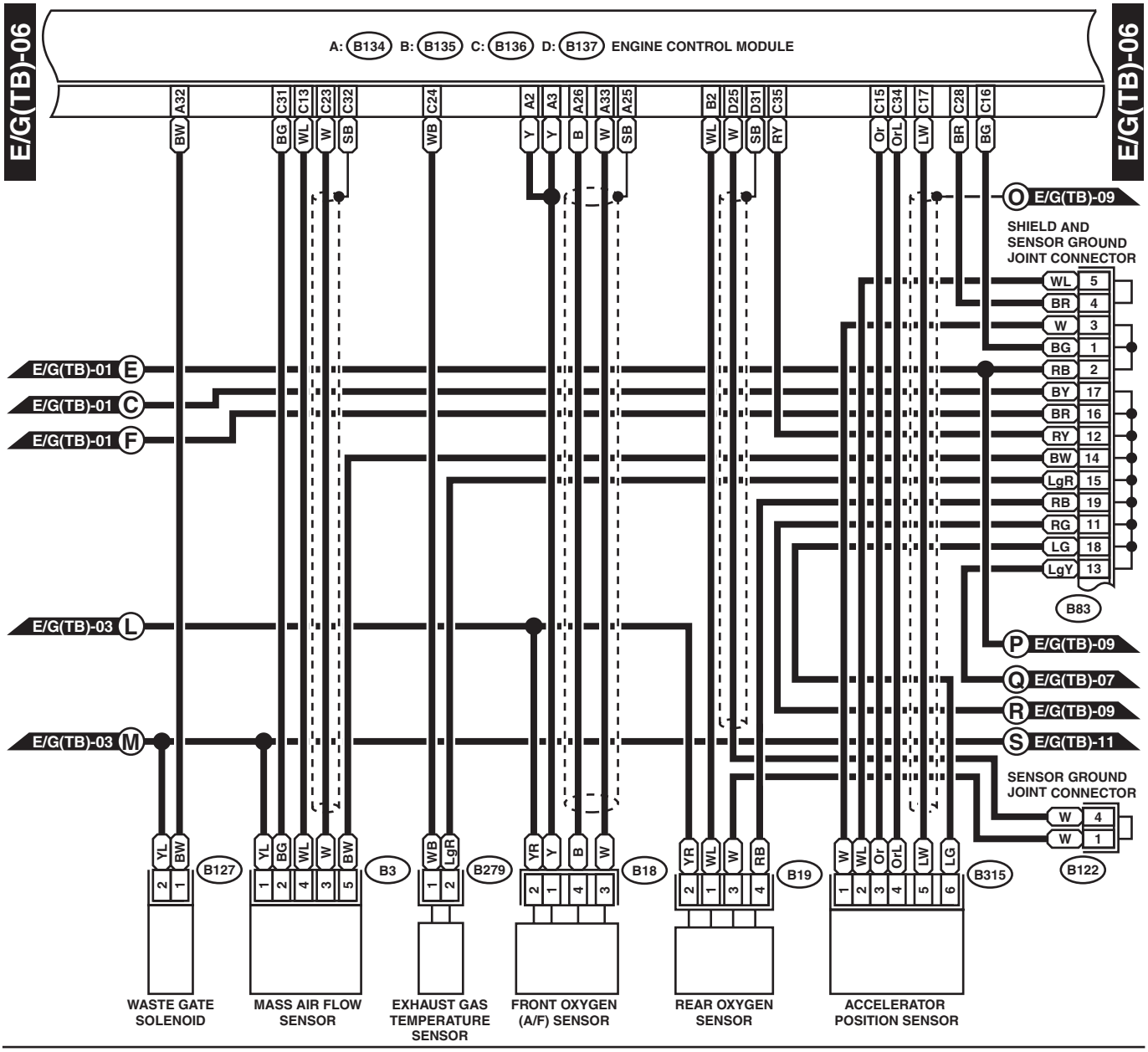
1	2	3	4	5	6
7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27
28	29	30			31	32	33	34	35

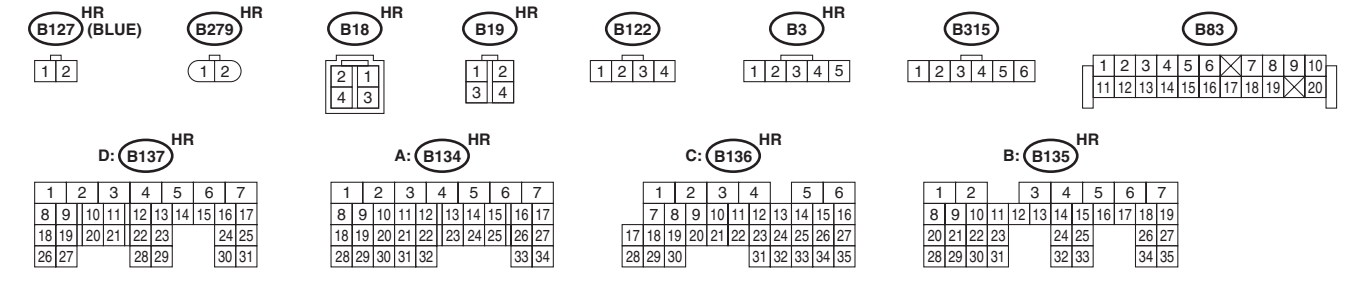
WI-06385


E/G(TB)-05
D: B137 ENGINE CONTROL MODULE
E/G(TB)-05
D14
D29
D20
D9
Or
V
VG
BG
MT
DIAGNOSIS TERMINAL
B
B
B81
B
E
REF. TO GND-04
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT)
BG
1
BL
3
B25
T2
E/G(TB)-03 K
E/G(TB)-02 H
N E/G(TB)-09
E/G(TB)-02 G
GW
BL
VG
Or
B79
8
7
12
4
CHECK CONNECTOR
Or
B75
1
TEST MODE CONNECTOR
BL
B76
1
V
BR
VG
BL
BL
B40
6
1
10
12
13
DATA LINK CONNECTOR

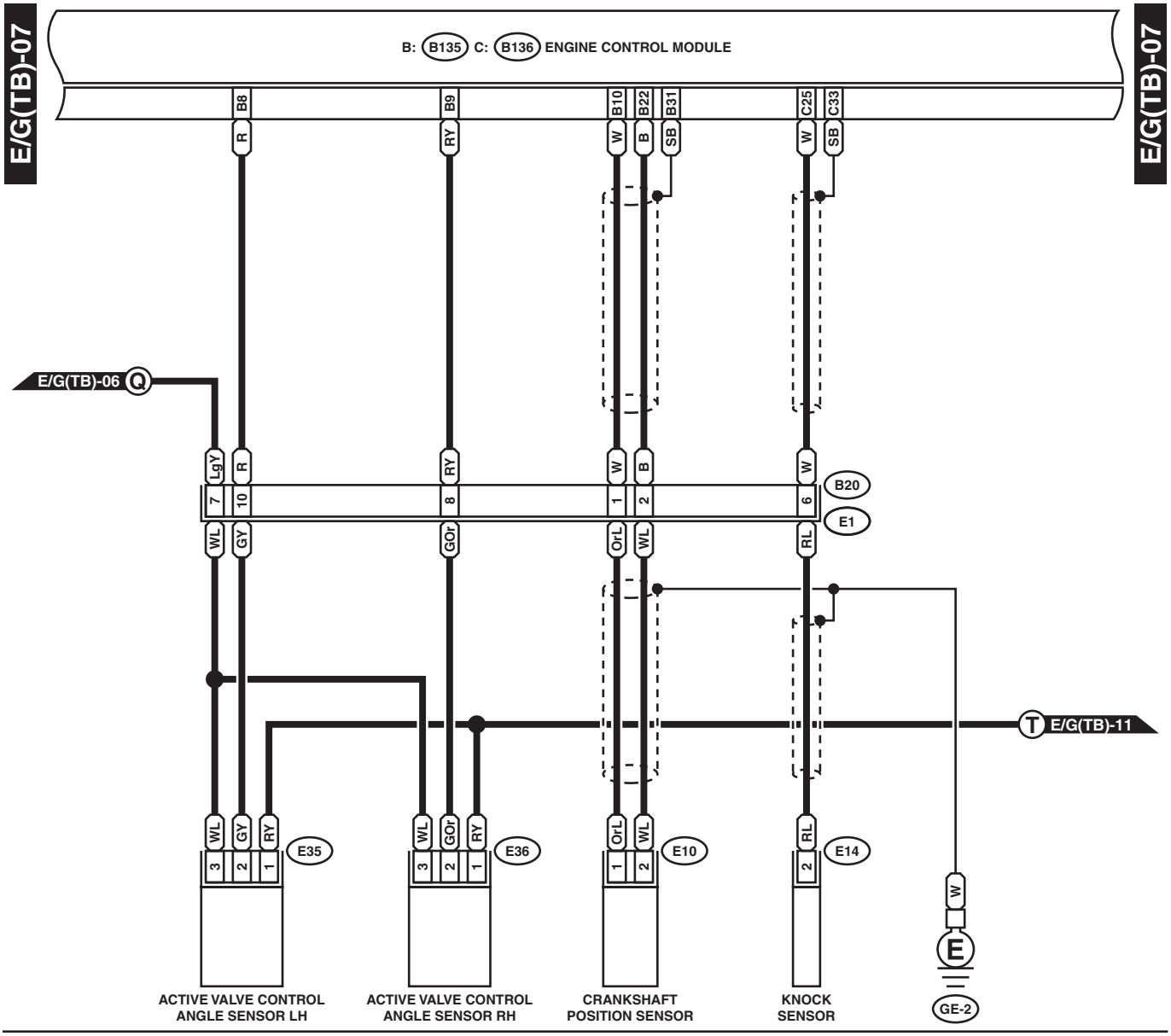
B75 (GREEN)
B76 (GREEN)
B25 HR (GRAY)
B79 (GRAY)
B40
D: B137 HR

WI-06386

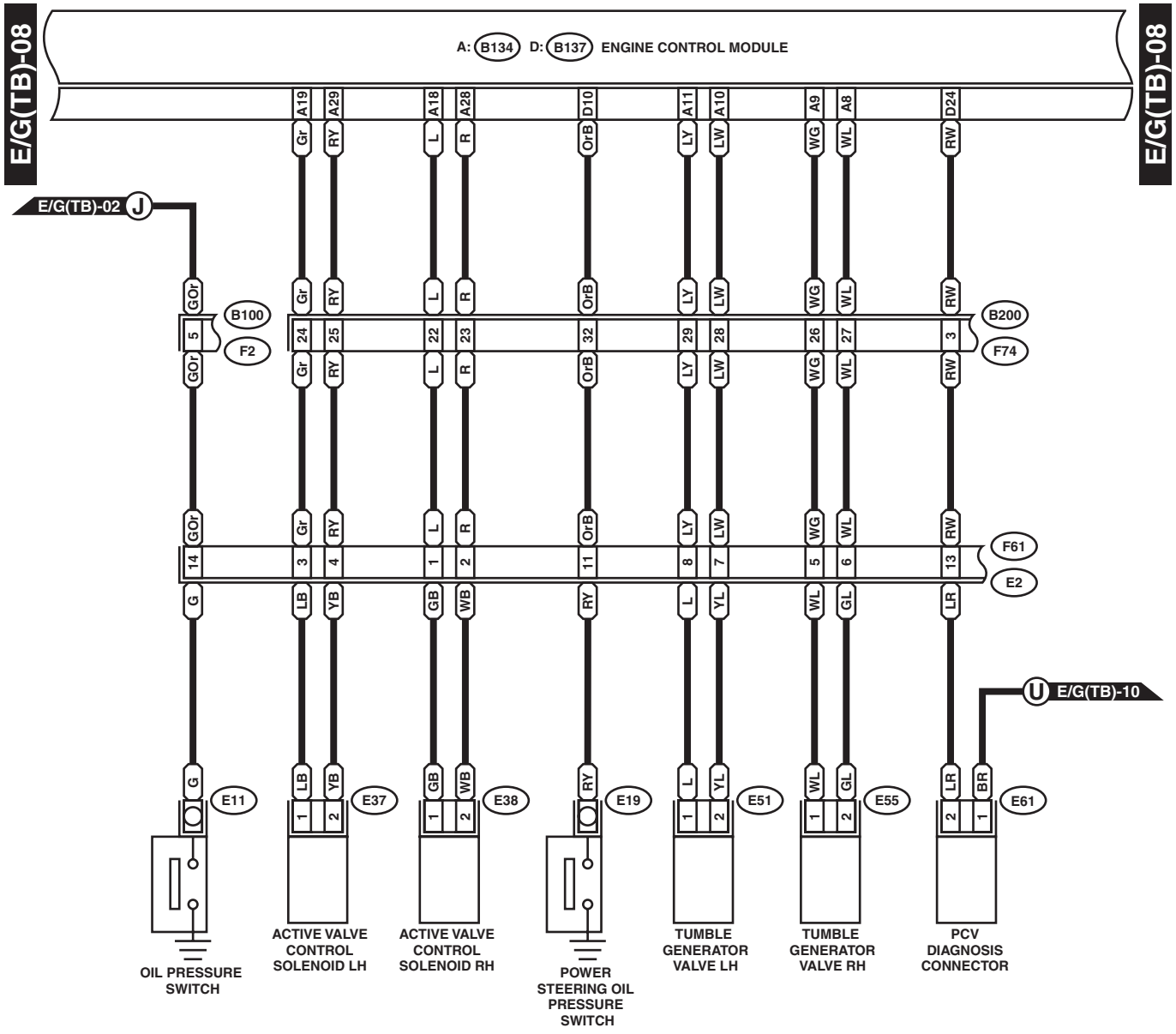

E/G(TB)-06
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(TB)-06
A32 C31 C13 C23 C32 C24 A2 A3 A26 A33 A25 B2 D25 D31 C35 C15 C34 C17 C28 C16
BW BG WL W SB WB Y Y B W SB WL W SB RY Or OrL LW BR BG
E/G(TB)-09
SHIELD AND SENSOR GROUND JOINT CONNECTOR
WL 5
BR 4
W 3
BG 1
RB 2
BY 17
BR 16
RY 12
BW 14
LgR 15
RB 19
RG 11
LG 18
LgY 13
B83
E/G(TB)-01 E
E/G(TB)-01 C
E/G(TB)-01 F
E/G(TB)-03 L
E/G(TB)-03 M
P E/G(TB)-09
Q E/G(TB)-07
R E/G(TB)-09
S E/G(TB)-11
SENSOR GROUND JOINT CONNECTOR
W 4
W 1
B122
YL BW B127
YL BG WL W BW B3
WB LgR B279
YR Y B W B18
YR WL W RB B19
W WL Or OrL LW LG B315
WASTE GATE SOLENOID
MASS AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR
ACCELERATOR POSITION SENSOR

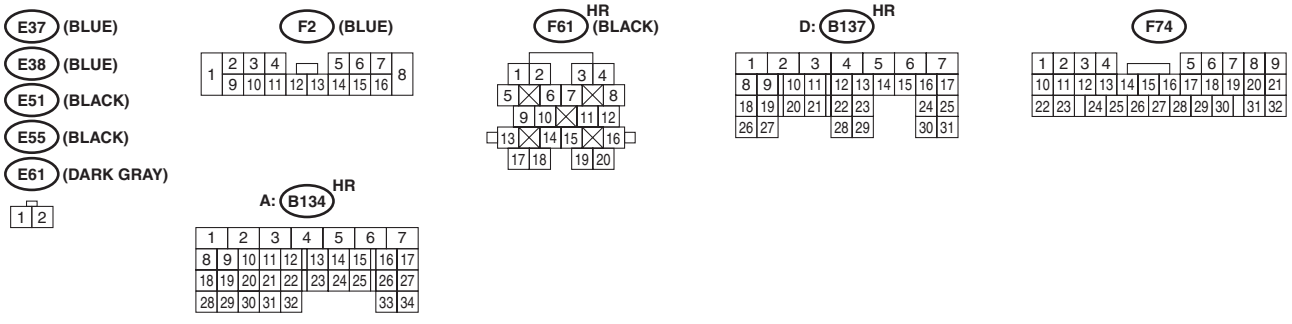

B127 HR (BLUE)
B279 HR
B18 HR
B19 HR
B122
B3 HR
B315
B83
D: B137 HR
A: B134 HR
C: B136 HR
B: B135 HR

WI-06387

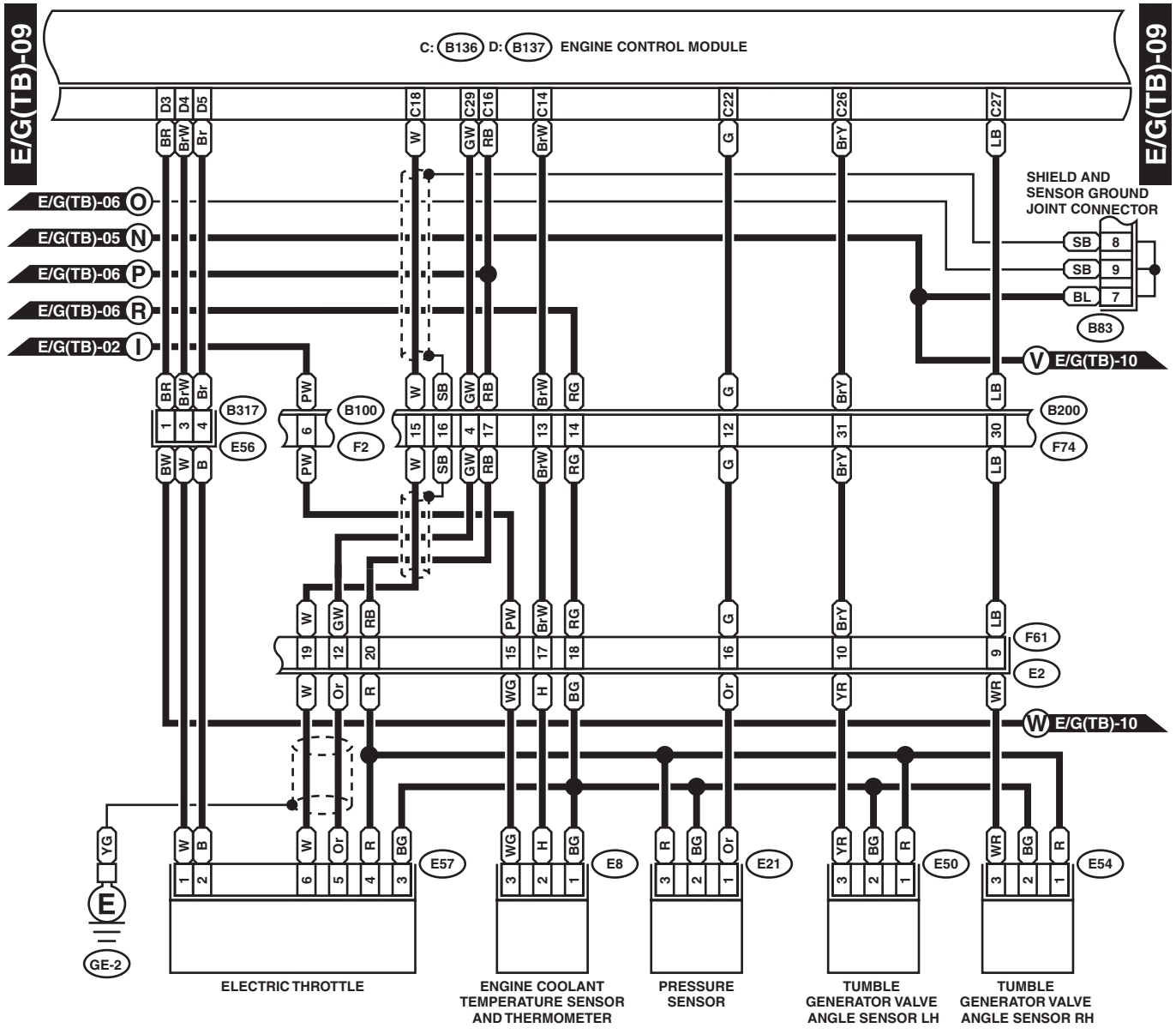

E/G(TB)-07
E/G(TB)-07
B: B135 C: B136 ENGINE CONTROL MODULE
B8
B9
B10
B22
B31
C25
C33
R
RY
W
B
SB
W
SB
E/G(TB)-06 Q
LgY
R
RY
W
B
W
B20
E1
WL
GY
GOr
OrL
WL
RL
T E/G(TB)-11
E35
E36
E10
E14
ACTIVE VALVE CONTROL ANGLE SENSOR LH
ACTIVE VALVE CONTROL ANGLE SENSOR RH
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
W
E
GE-2
E10 (LIGHT GRAY)
E14 (BROWN)
E35 (LIGHT GRAY)
E36 (LIGHT GRAY)
B20 HR (LIGHT GRAY)
B: B135 HR
C: B136 HR

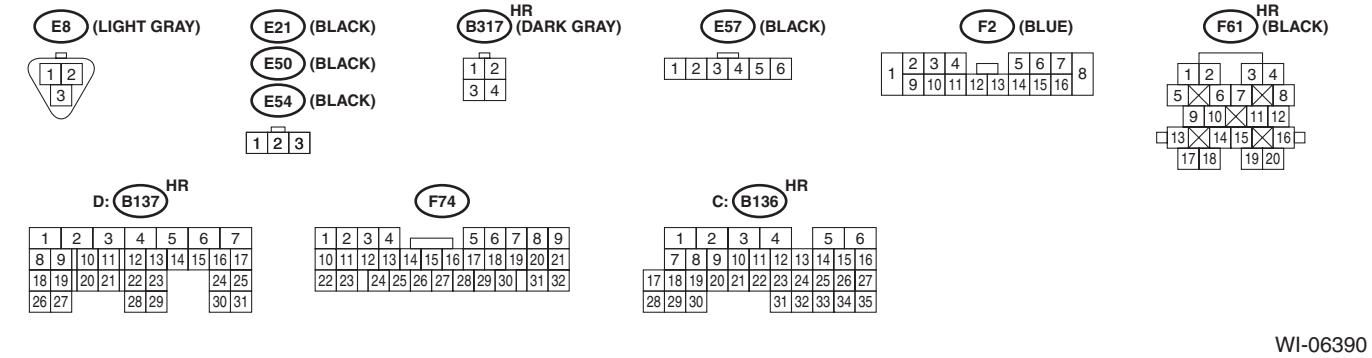
WI-06388


E/G(TB)-08
A: B134 D: B137 ENGINE CONTROL MODULE
E/G(TB)-02 J
B100
F2
B200
F74
F61
E2
U E/G(TB)-10
E11
E37
E38
E19
E51
E55
E61
OIL PRESSURE SWITCH
ACTIVE VALVE CONTROL SOLENOID LH
ACTIVE VALVE CONTROL SOLENOID RH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
PCV DIAGNOSIS CONNECTOR

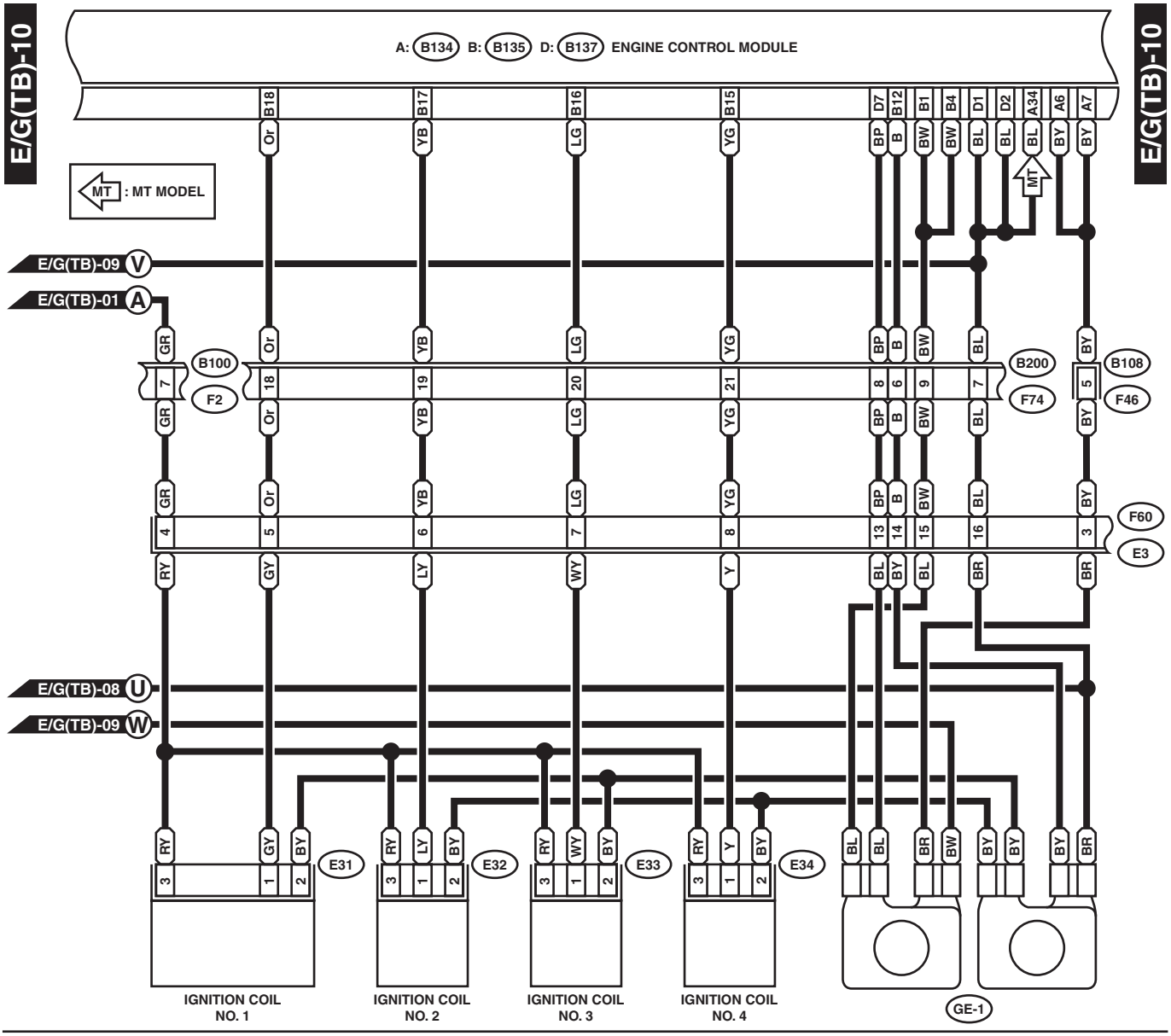

E37 (BLUE)
E38 (BLUE)
E51 (BLACK)
E55 (BLACK)
E61 (DARK GRAY)
F2 (BLUE)
F61 HR (BLACK)
D: B137 HR
F74
A: B134 HR

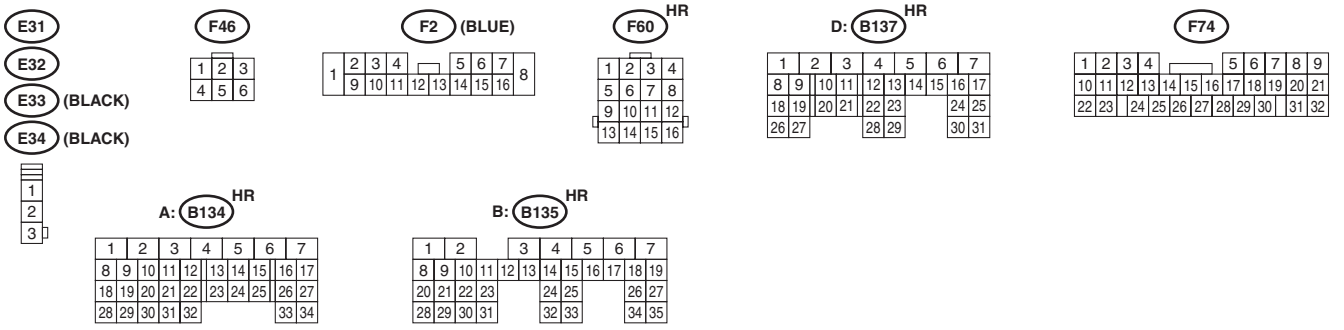
WI-06389


E/G(TB)-09
C: B136 D: B137 ENGINE CONTROL MODULE
E/G(TB)-06 O
E/G(TB)-05 N
E/G(TB)-06 P
E/G(TB)-06 R
E/G(TB)-02 I
SHIELD AND SENSOR GROUND JOINT CONNECTOR
SB 8
SB 9
BL 7
B83
V E/G(TB)-10
B317
E56
B100
F2
B200
F74
F61
E2
W E/G(TB)-10
E57
E8
E21
E50
E54
YG
GE-2
ELECTRIC THROTTLE
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

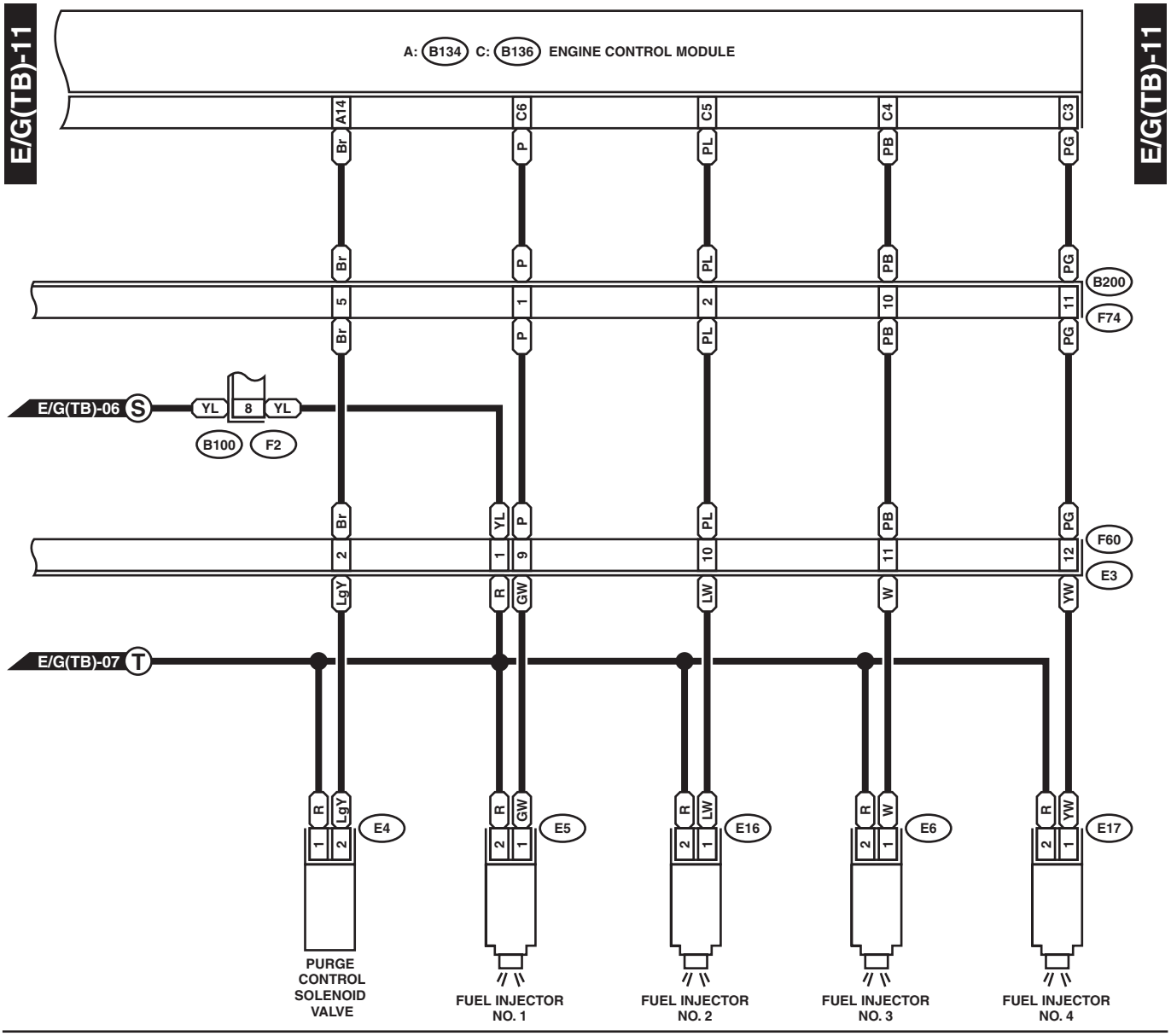

E8 (LIGHT GRAY)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
HR B317 (DARK GRAY)
E57 (BLACK)
F2 (BLUE)
HR F61 (BLACK)
HR D: B137
F74
HR C: B136

WI-06390


E/G(TB)-10
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
MT : MT MODEL
E/G(TB)-09 V
E/G(TB)-01 A
B100
F2
B200
F74
B108
F46
F60
E3
E/G(TB)-08 U
E/G(TB)-09 W
E31
E32
E33
E34
IGNITION COIL NO. 1
IGNITION COIL NO. 2
IGNITION COIL NO. 3
IGNITION COIL NO. 4
GE-1


E31
E32
E33 (BLACK)
E34 (BLACK)
F46
F2 (BLUE)
F60 HR
D: B137 HR
F74
A: B134 HR
B: B135 HR

WI-06391



E4 (BLACK)

E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)

F2 (BLUE)

F60 HR

F74

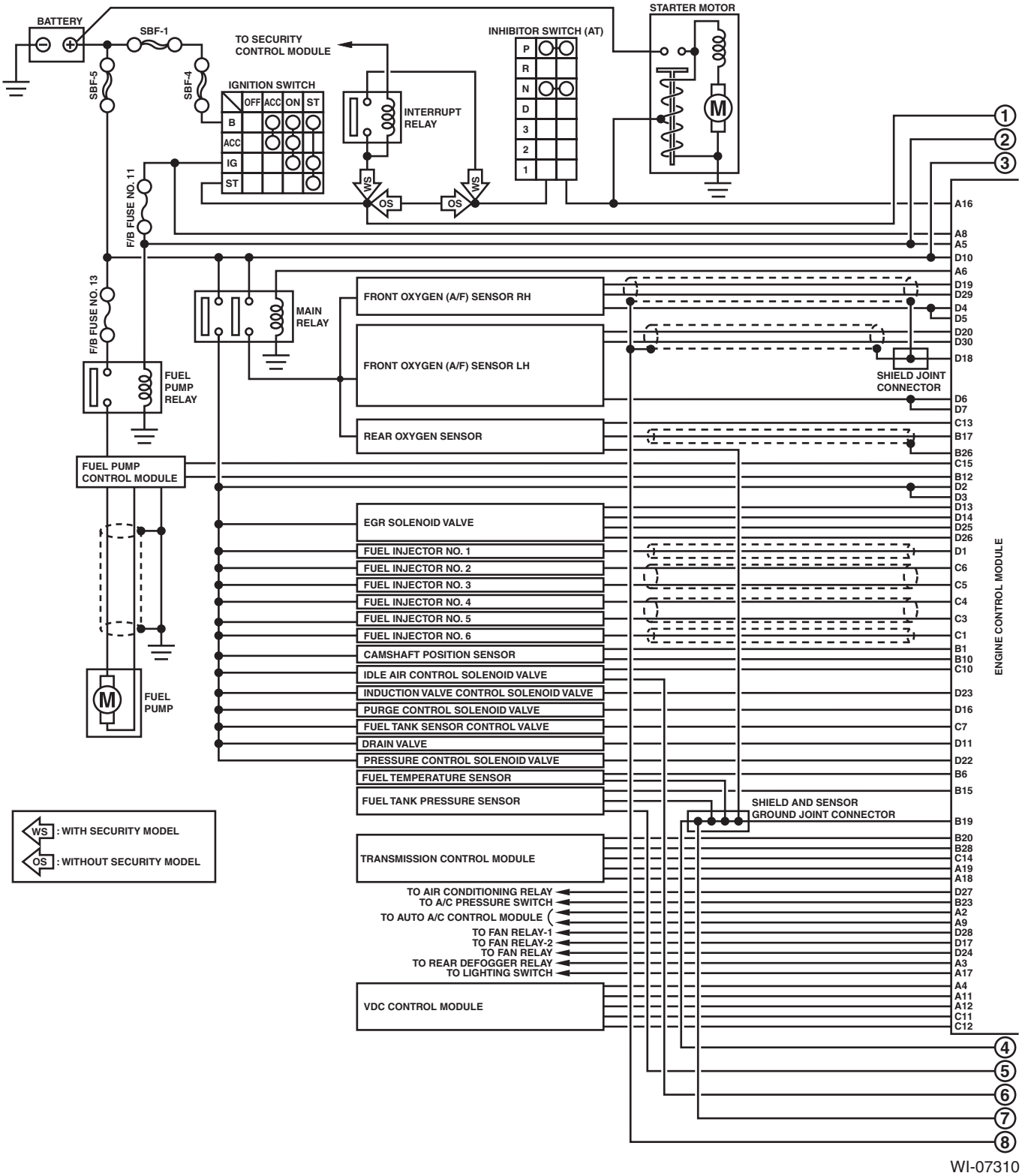
A: B134 HR

C: B136 HR

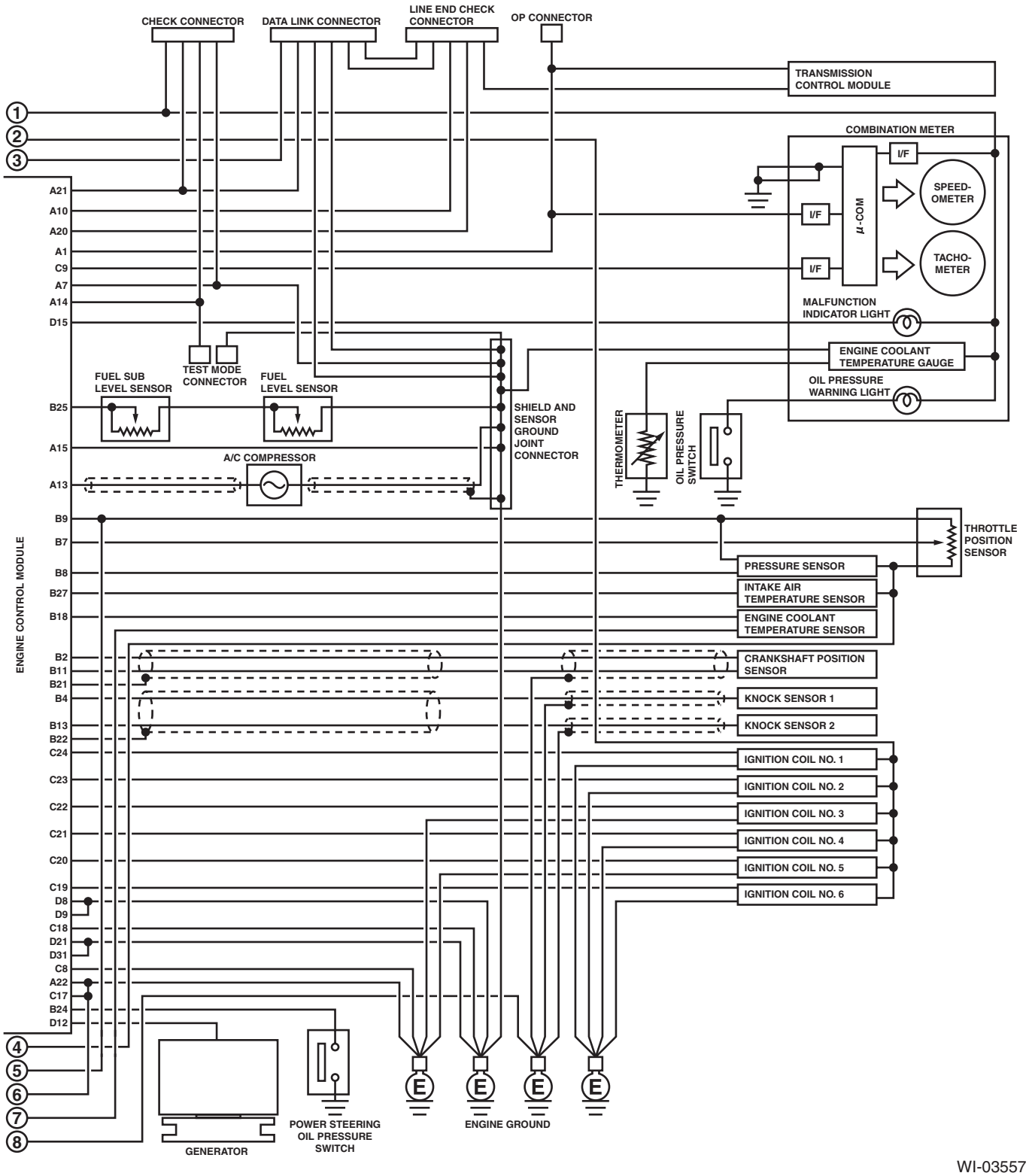
WI-06392

MEMO:

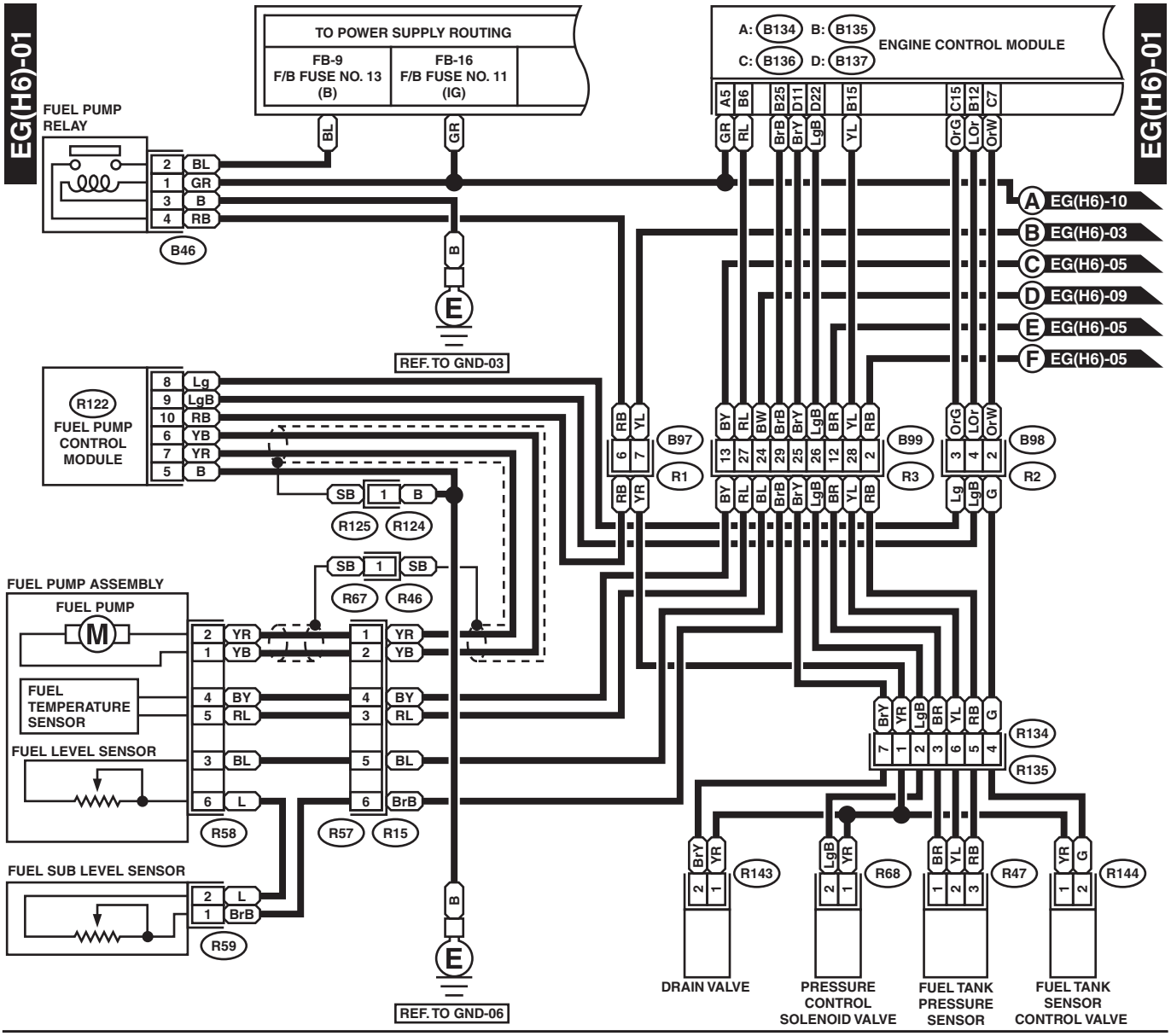
5. 6-CYLINDER ENGINE

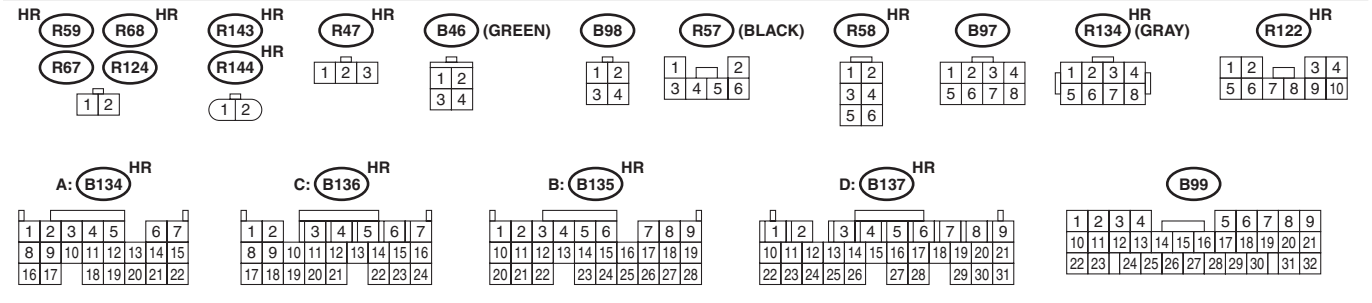


WI-07310

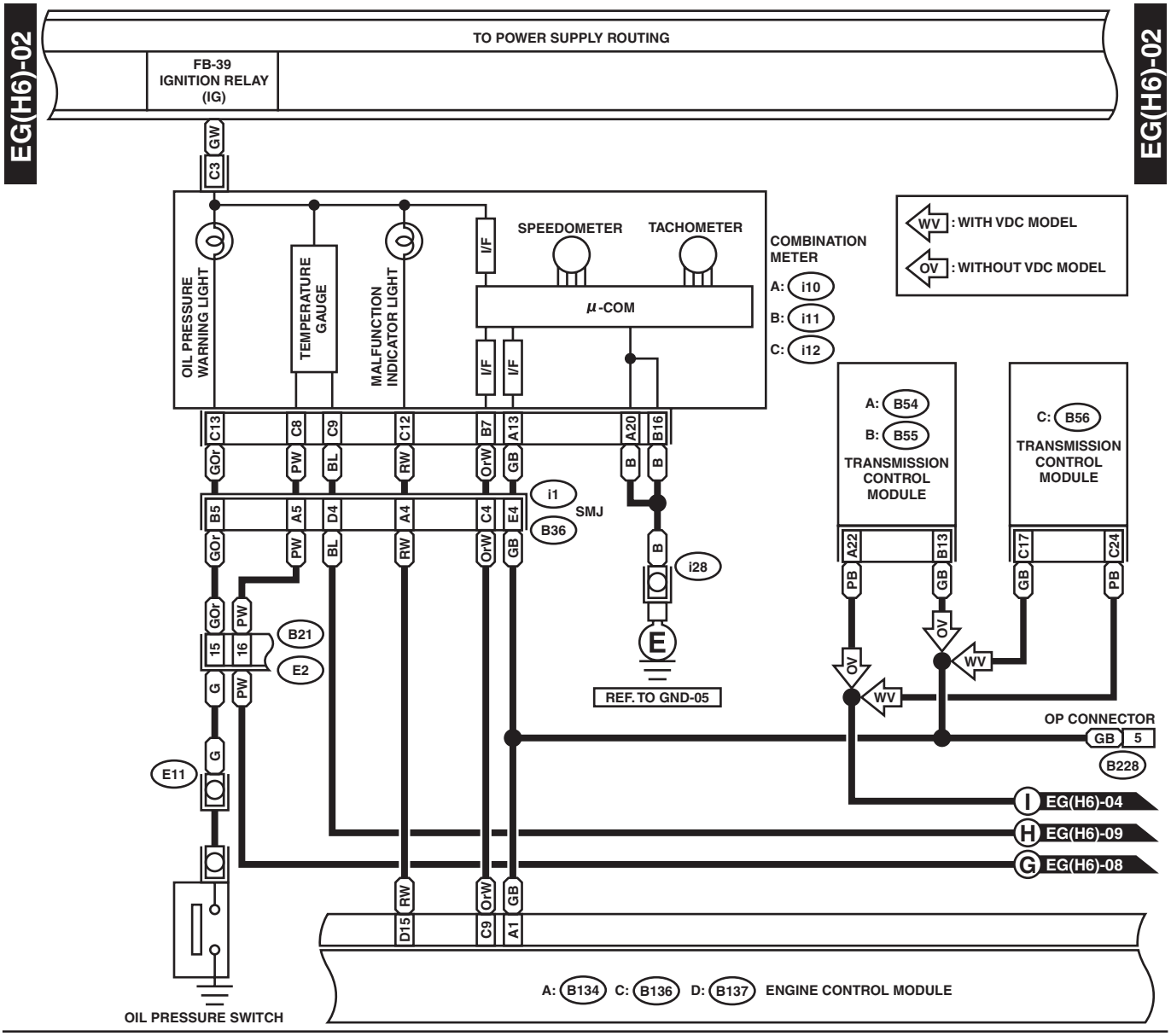

CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
OP CONNECTOR
TRANSMISSION CONTROL MODULE
COMBINATION METER
I/F
SPEED-OMETER
TACHO-METER
μ-COM
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
ENGINE CONTROL MODULE
A21
A10
A20
A1
C9
A7
A14
D15
B25
A15
A13
B9
B7
B8
B27
B18
B2
B11
B21
B4
B13
B22
C24
C23
C22
C21
C20
C19
D8
D9
C18
D21
D31
C8
A22
C17
B24
D12
TEST MODE CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A/C COMPRESSOR
THERMOMETER
OIL PRESSURE SWITCH
THROTTLE POSITION SENSOR
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR 1
KNOCK SENSOR 2
IGNITION COIL NO. 1
IGNITION COIL NO. 2
IGNITION COIL NO. 3
IGNITION COIL NO. 4
IGNITION COIL NO. 5
IGNITION COIL NO. 6
GENERATOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE GROUND
E
1
2
3
4
5
6
7
8

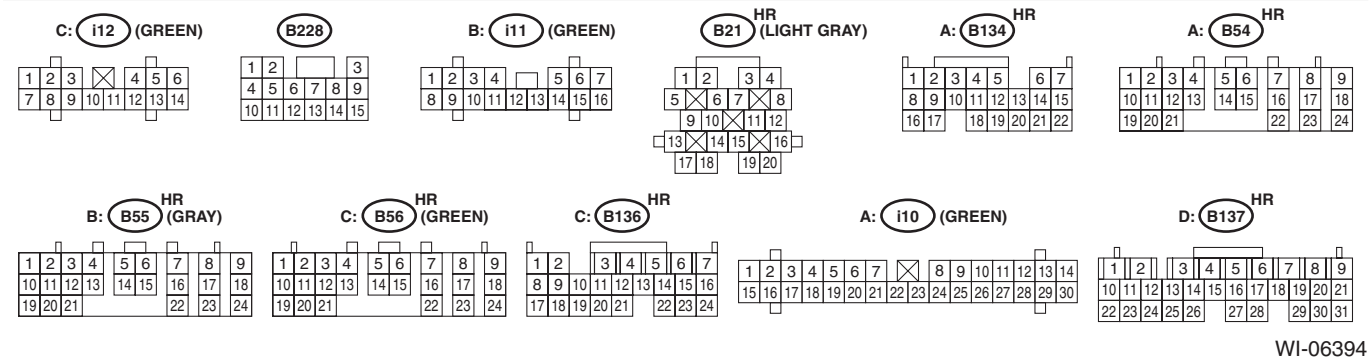
WI-03557


EG(H6)-01
TO POWER SUPPLY ROUTING
FB-9 F/B FUSE NO. 13 (B)
FB-16 F/B FUSE NO. 11 (IG)
A: B134 B: B135
C: B136 D: B137
ENGINE CONTROL MODULE
FUEL PUMP RELAY
B46
REF. TO GND-03
R122 FUEL PUMP CONTROL MODULE
B97
B99
B98
R1
R3
R2
R125
R124
R67
R46
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
R58
R57
R15
FUEL SUB LEVEL SENSOR
R59
REF. TO GND-06
R134
R135
R143
R68
R47
R144
DRAIN VALVE
PRESSURE CONTROL SOLENOID VALVE
FUEL TANK PRESSURE SENSOR
FUEL TANK SENSOR CONTROL VALVE
A: EG(H6)-10
B: EG(H6)-03
C: EG(H6)-05
D: EG(H6)-09
E: EG(H6)-05
F: EG(H6)-05

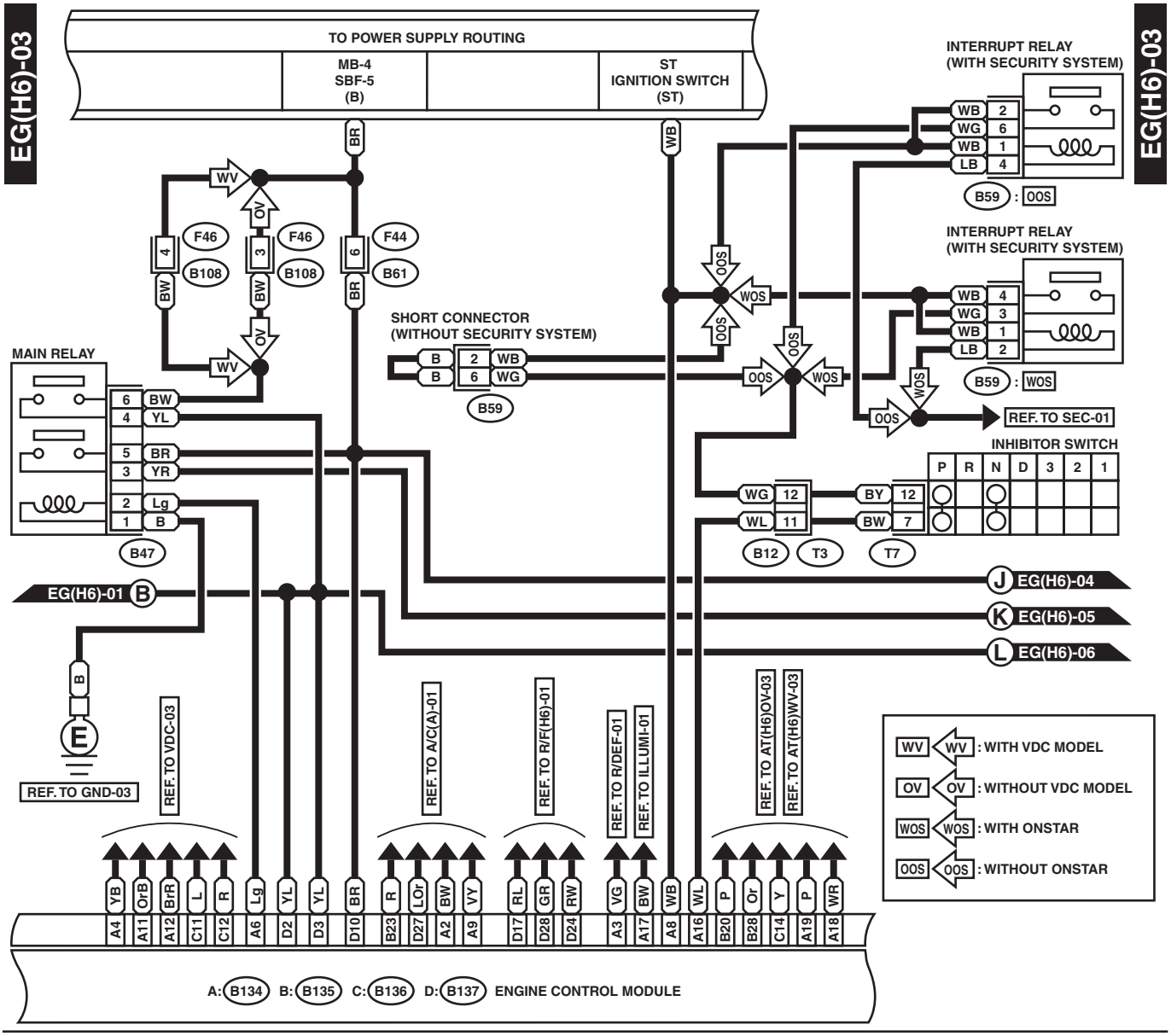

HR R59 R68 R67 R124
HR R143 R144
HR R47
B46 (GREEN)
B98
R57 (BLACK)
HR R58
B97
HR R134 (GRAY)
HR R122
A: B134
C: B136
B: B135
D: B137
B99

WI-06393

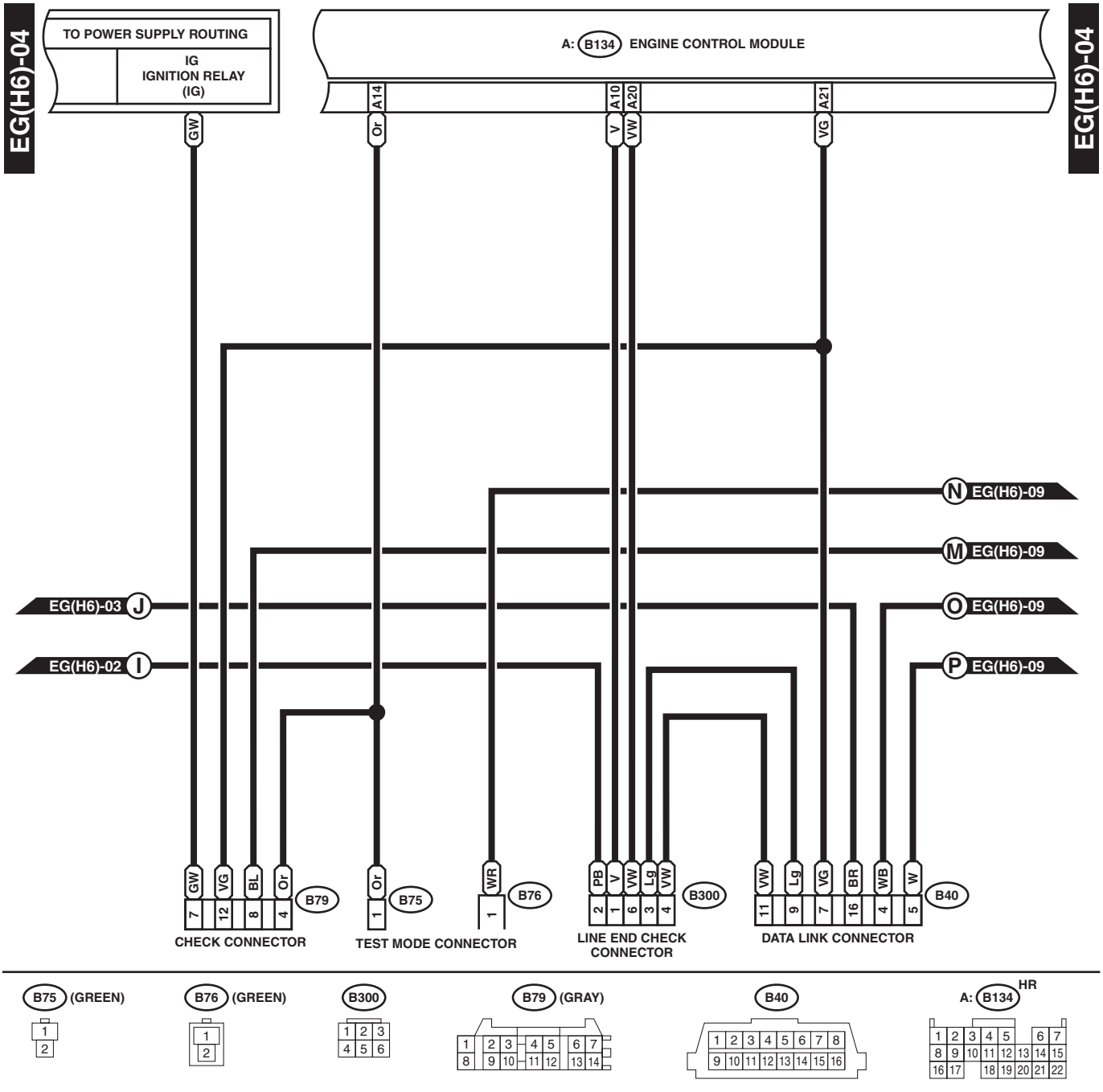

EG(H6)-02
EG(H6)-02
TO POWER SUPPLY ROUTING
FB-39
IGNITION RELAY
(IG)
C3
GW
OIL PRESSURE WARNING LIGHT
TEMPERATURE GAUGE
MALFUNCTION INDICATOR LIGHT
I/F
SPEEDOMETER
TACHOMETER
μ-COM
I/F
I/F
COMBINATION METER
A: i10
B: i11
C: i12
WV: WITH VDC MODEL
OV: WITHOUT VDC MODEL
A: B54
B: B55
TRANSMISSION CONTROL MODULE
C: B56
TRANSMISSION CONTROL MODULE
C13
C8
C9
C12
B7
A13
A20
B16
GOr
PW
BL
RW
OrW
GB
B
B
i1
SMJ
B36
B5
A5
D4
A4
C4
E4
i28
A22
B13
C17
C24
PB
GB
GB
PB
OV
WV
OV
WV
B21
E2
15
16
G
PW
E11
REF. TO GND-05
OP CONNECTOR
GB
5
B228
I EG(H6)-04
H EG(H6)-09
G EG(H6)-08
D15
C9
A1
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE
OIL PRESSURE SWITCH


C: i12 (GREEN)
B228
B: i11 (GREEN)
B21 HR (LIGHT GRAY)
A: B134 HR
A: B54 HR
B: B55 HR (GRAY)
C: B56 HR (GREEN)
C: B136 HR
A: i10 (GREEN)
D: B137 HR

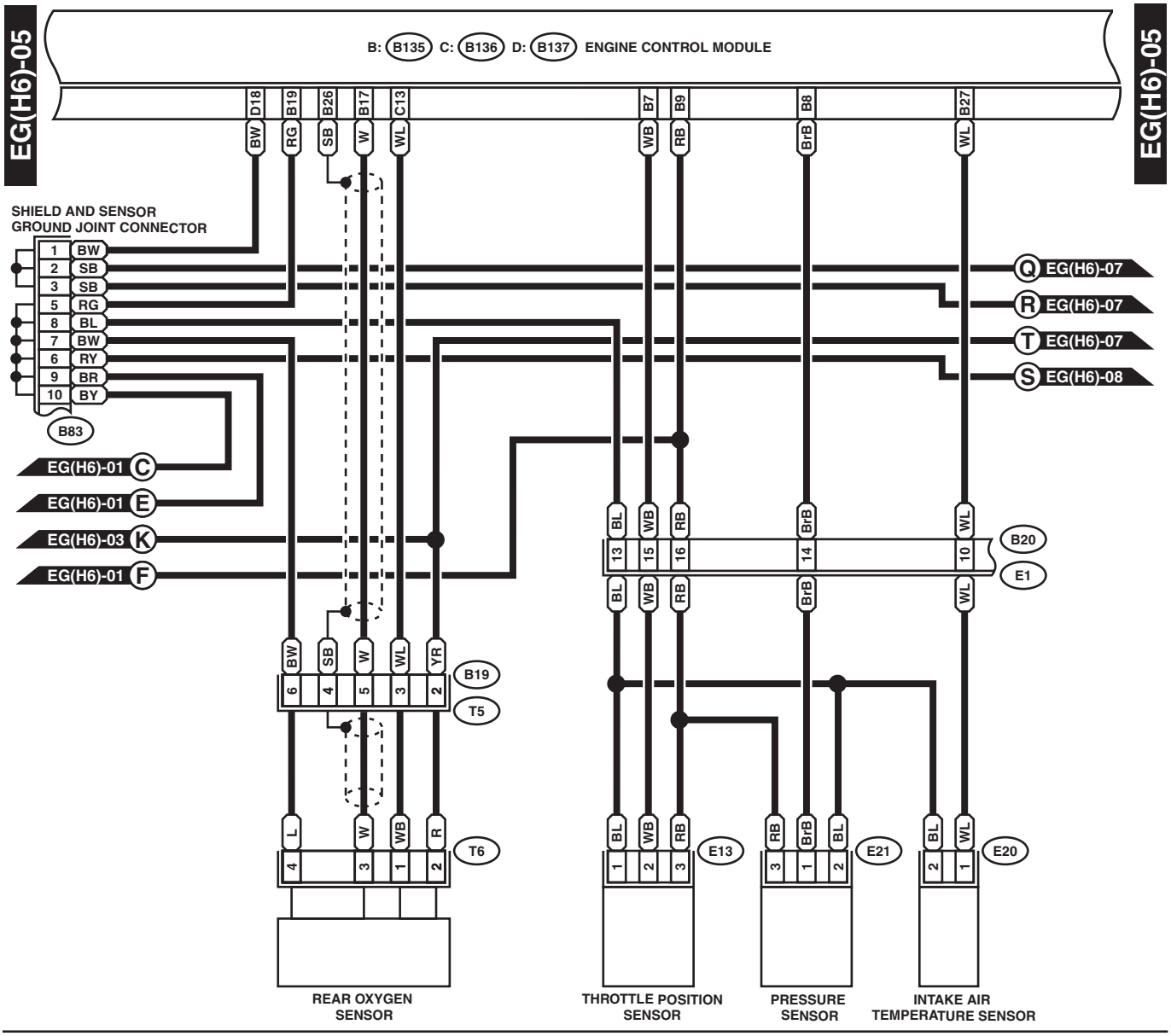
WI-06394

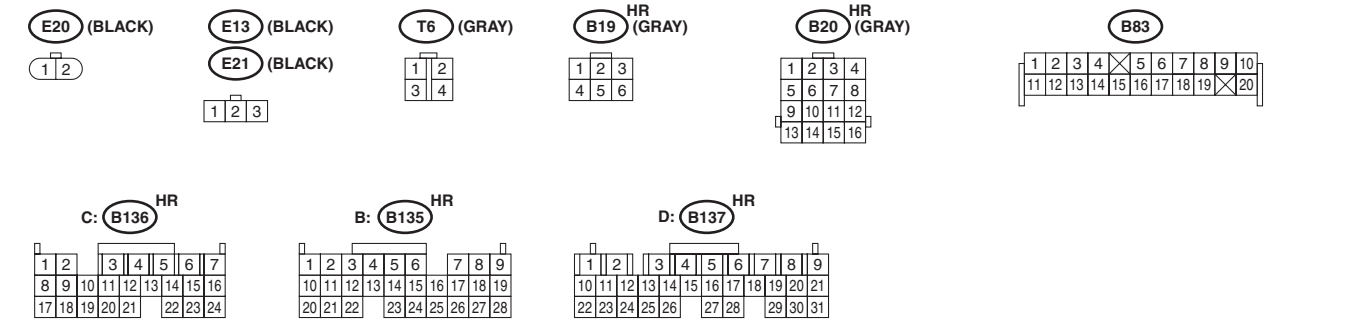

EG(H6)-03
TO POWER SUPPLY ROUTING
MB-4
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
MAIN RELAY
INHIBITOR SWITCH
P R N D 3 2 1
REF. TO SEC-01
REF. TO GND-03
REF. TO VDC-03
REF. TO A/C(A)-01
REF. TO R/F(H6)-01
REF. TO R/DEF-01
REF. TO ILLUMI-01
REF. TO AT(H6)OV-03
REF. TO AT(H6)WV-03
EG(H6)-01
EG(H6)-04
EG(H6)-05
EG(H6)-06
WV : WITH VDC MODEL
OV : WITHOUT VDC MODEL
WOS : WITH ONSTAR
OOS : WITHOUT ONSTAR
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
B47 (BROWN)
B59 : WOS
B59 : OOS
F46 : OV
F44 (BLACK)
F46 : WV
B12 HR (BLACK)
T7
A: B134 HR
C: B136 HR
B: B135 HR
D: B137 HR

WI-06395

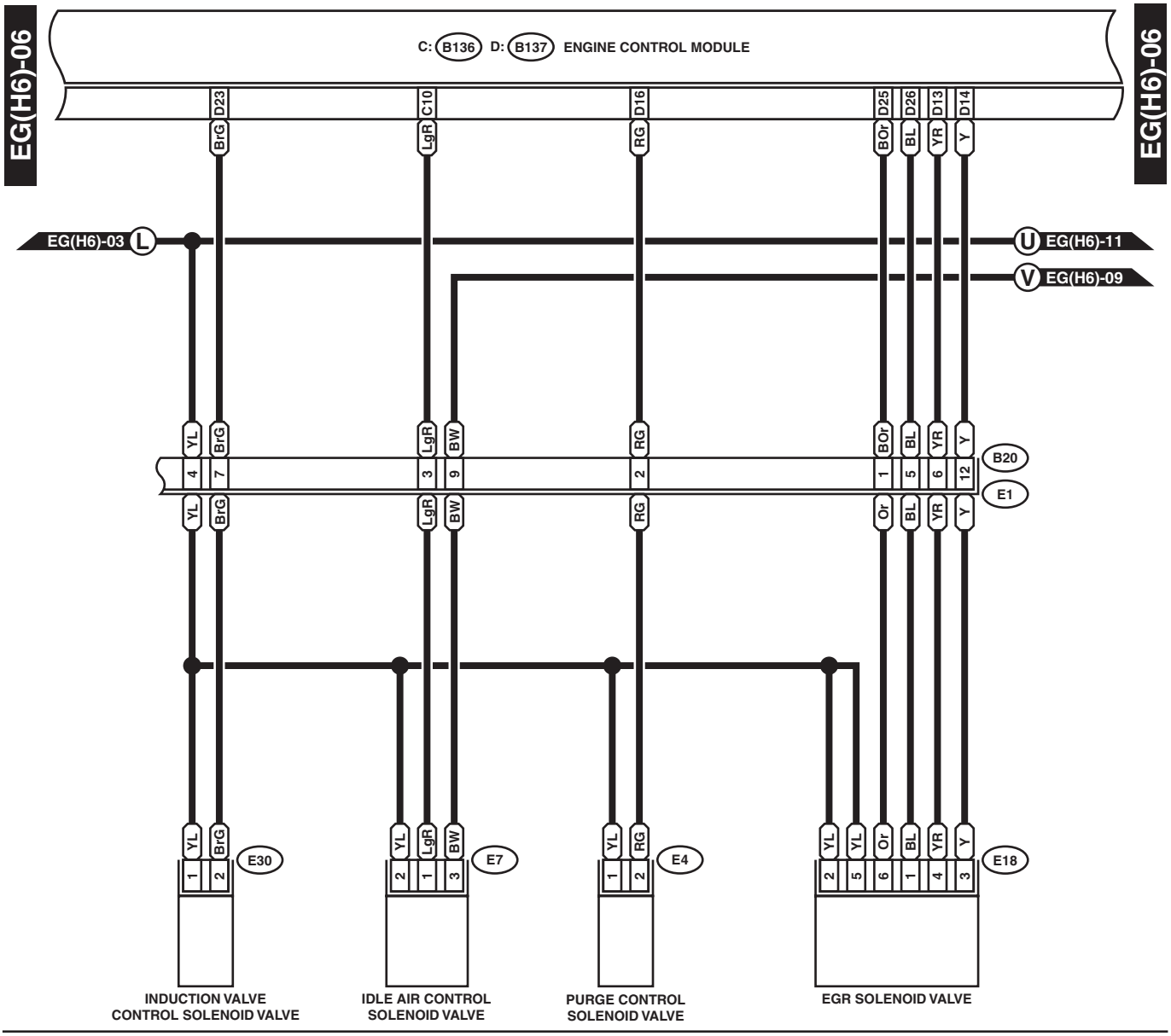

EG(H6)-04
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
A: B134 ENGINE CONTROL MODULE
EG(H6)-04
GW
Or
V
VW
VG
A14
A10
A20
A21
N EG(H6)-09
M EG(H6)-09
O EG(H6)-09
P EG(H6)-09
EG(H6)-03 J
EG(H6)-02 I
GW
VG
BL
Or
B79
7
12
8
4
CHECK CONNECTOR
Or
B75
1
TEST MODE CONNECTOR
WR
B76
1
PB
V
VW
Lg
VW
B300
2
1
6
3
4
LINE END CHECK CONNECTOR
VW
Lg
VG
BR
WB
W
B40
11
9
7
16
4
5
DATA LINK CONNECTOR
B75 (GREEN)
B76 (GREEN)
B300
B79 (GRAY)
B40
A: B134 HR

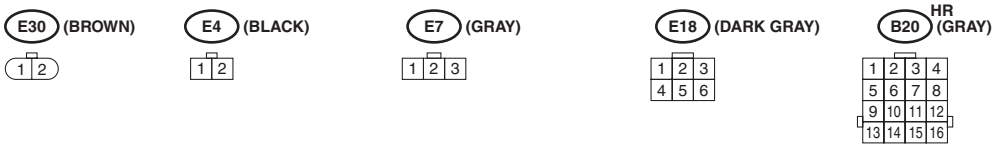
WI-06396

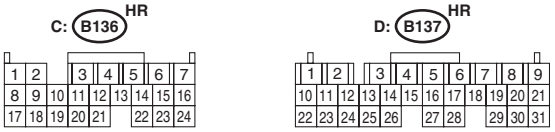

EG(H6)-05
B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
D18 B19 B26 B17 C13 B7 B9 B8 B27
BW RG SB W WL WB RB BrB WL
SHIELD AND SENSOR GROUND JOINT CONNECTOR
1 BW
2 SB
3 SB
5 RG
8 BL
7 BW
6 RY
9 BR
10 BY
B83
EG(H6)-01 C
EG(H6)-01 E
EG(H6)-03 K
EG(H6)-01 F
Q EG(H6)-07
R EG(H6)-07
T EG(H6)-07
S EG(H6)-08
B20
E1
BW SB W WL YR
6 4 5 3 2
B19
T5
L W WB R
4 3 1 2
T6
REAR OXYGEN SENSOR
BL WB RB BrB WL
13 15 16 14 10
1 2 3
E13
THROTTLE POSITION SENSOR
RB BrB BL
3 1 2
E21
PRESSURE SENSOR
BL WL
2 1
E20
INTAKE AIR TEMPERATURE SENSOR


E20 (BLACK)
E13 (BLACK)
E21 (BLACK)
T6 (GRAY)
B19 HR (GRAY)
B20 HR (GRAY)
B83
C: B136 HR
B: B135 HR
D: B137 HR

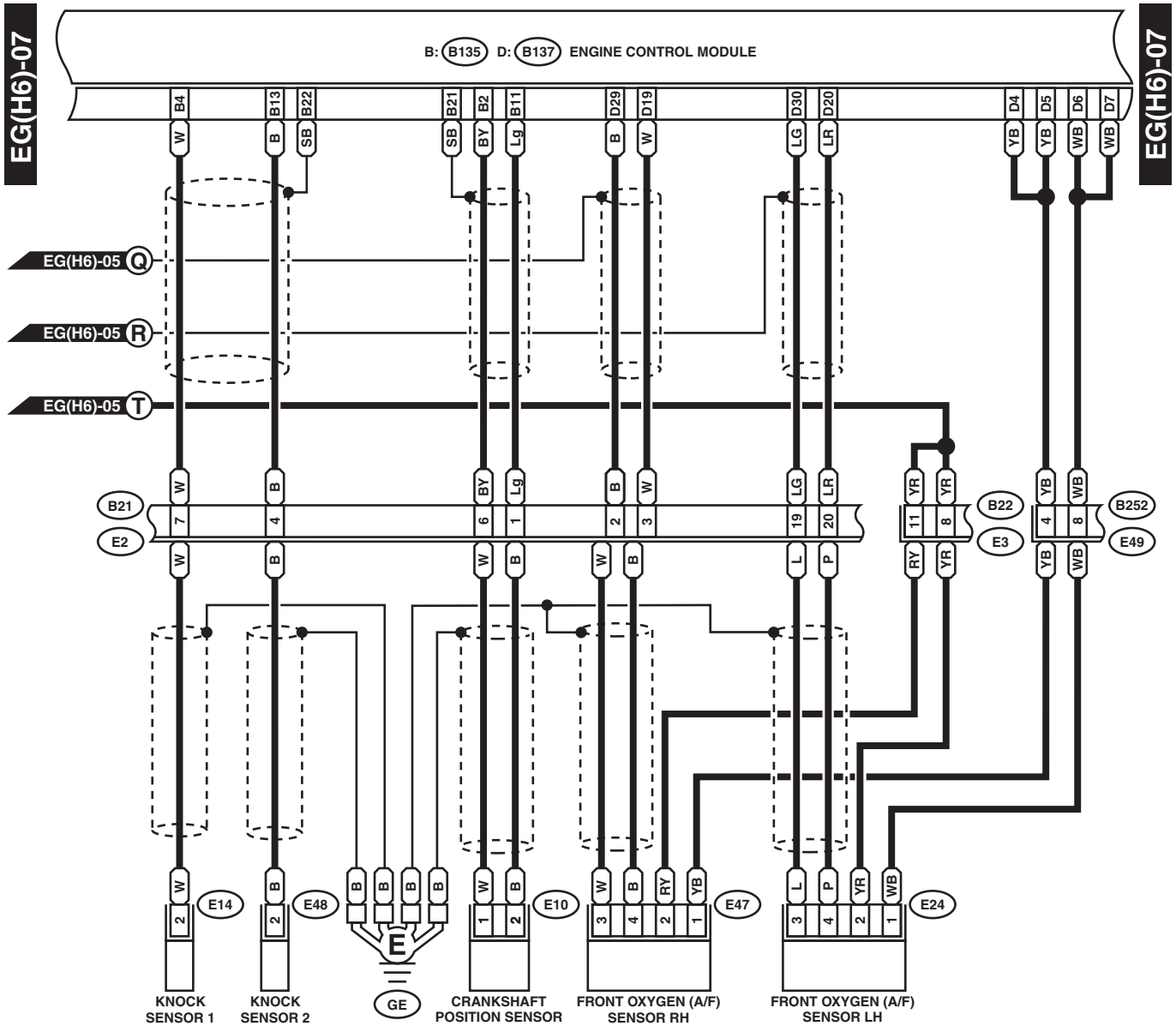
WI-06397

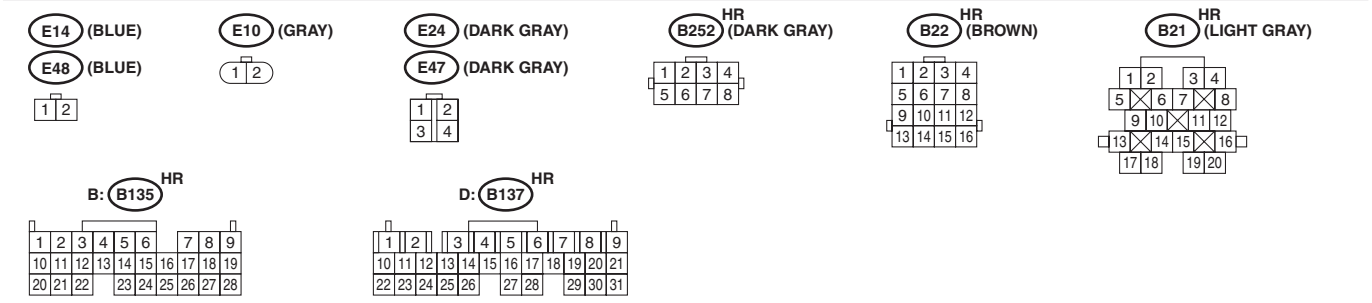

EG(H6)-06
EG(H6)-06
C: B136 D: B137 ENGINE CONTROL MODULE
D23
C10
D16
D25
D26
D13
D14
BrG
LgR
RG
BOr
BL
YR
Y
EG(H6)-03 L
U EG(H6)-11
V EG(H6)-09
YL
BrG
LgR
BW
RG
BOr
BL
YR
Y
4
7
3
9
2
1
5
6
12
B20
E1
Or
E30
E7
E4
E18
INDUCTION VALVE CONTROL SOLENOID VALVE
IDLE AIR CONTROL SOLENOID VALVE
PURGE CONTROL SOLENOID VALVE
EGR SOLENOID VALVE


E30 (BROWN)
E4 (BLACK)
E7 (GRAY)
E18 (DARK GRAY)
B20 HR (GRAY)

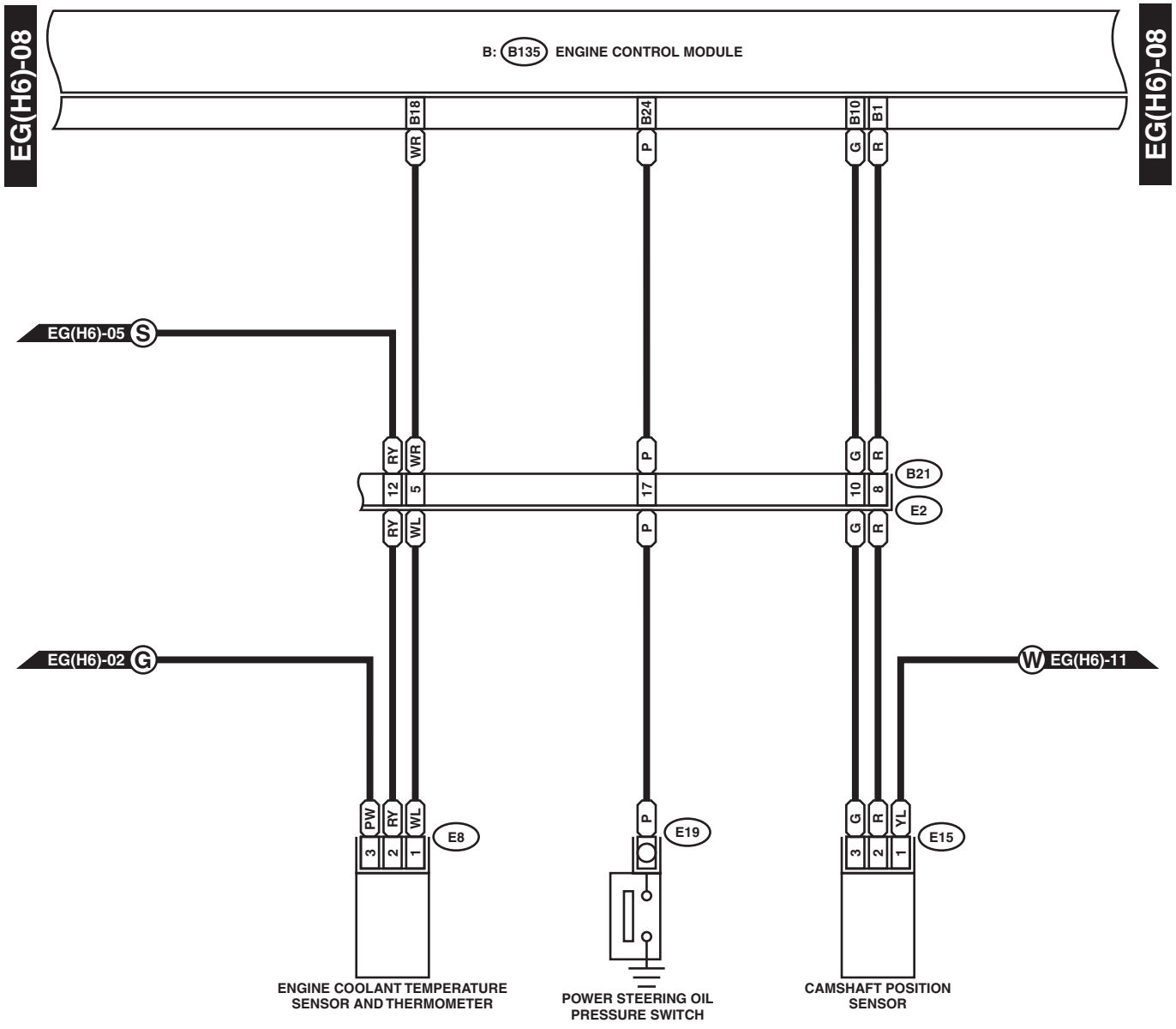

C: B136 HR
D: B137 HR

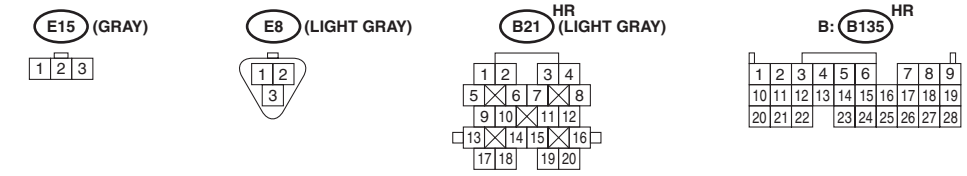
WI-06398


EG(H6)-07
EG(H6)-07
B: B135 D: B137 ENGINE CONTROL MODULE
B4 B13 B22 B21 B2 B11 D29 D19 D30 D20 D4 D5 D6 D7
W B SB SB BY Lg B W LG LR YB YB WB WB
EG(H6)-05 Q
EG(H6)-05 R
EG(H6)-05 T
B21 E2
B22 E3
B252 E49
YR YR YB WB
RY YR YB WB
W B W B W B L P RY YR YB WB
E14 E48 E10 E47 E24
KNOCK SENSOR 1
KNOCK SENSOR 2
GE
CRANKSHAFT POSITION SENSOR
FRONT OXYGEN (A/F) SENSOR RH
FRONT OXYGEN (A/F) SENSOR LH

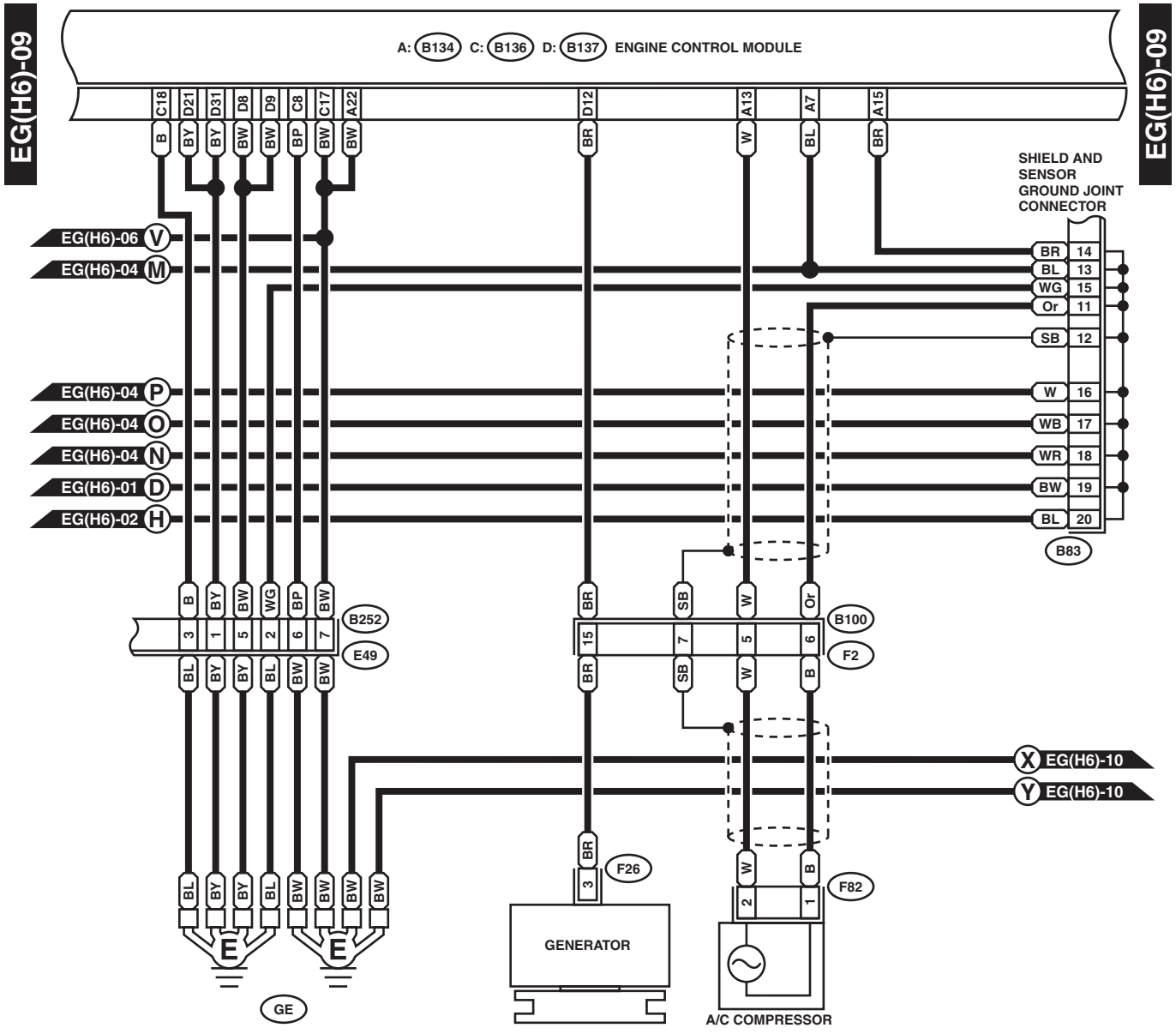

E14 (BLUE)
E48 (BLUE)
E10 (GRAY)
E24 (DARK GRAY)
E47 (DARK GRAY)
B252 HR (DARK GRAY)
B22 HR (BROWN)
B21 HR (LIGHT GRAY)
B: B135 HR
D: B137 HR

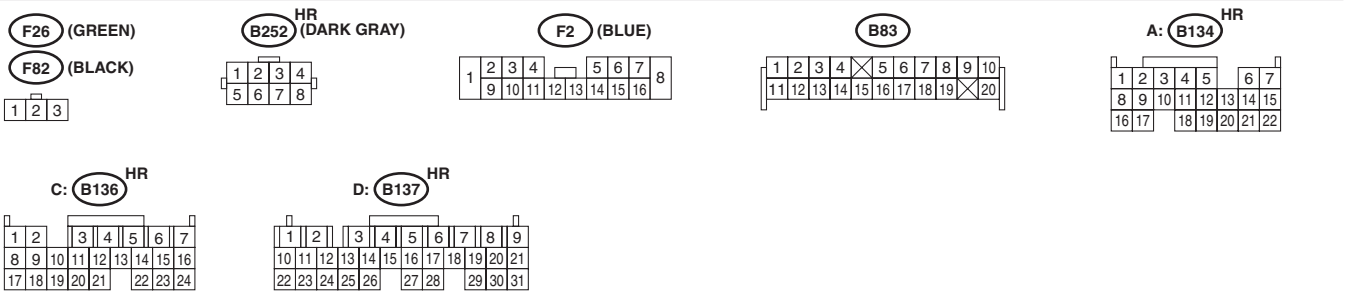
WI-06399


EG(H6)-08
EG(H6)-08
B: B135 ENGINE CONTROL MODULE
B18
B24
B10
B1
WR
P
G
R
EG(H6)-05 S
RY
WR
P
G
R
12
5
17
10
8
B21
E2
RY
WL
P
G
R
EG(H6)-02 G
W EG(H6)-11
PW
RY
WL
P
G
R
YL
E8
E19
E15
3
2
1
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
POWER STEERING OIL PRESSURE SWITCH
CAMSHAFT POSITION SENSOR

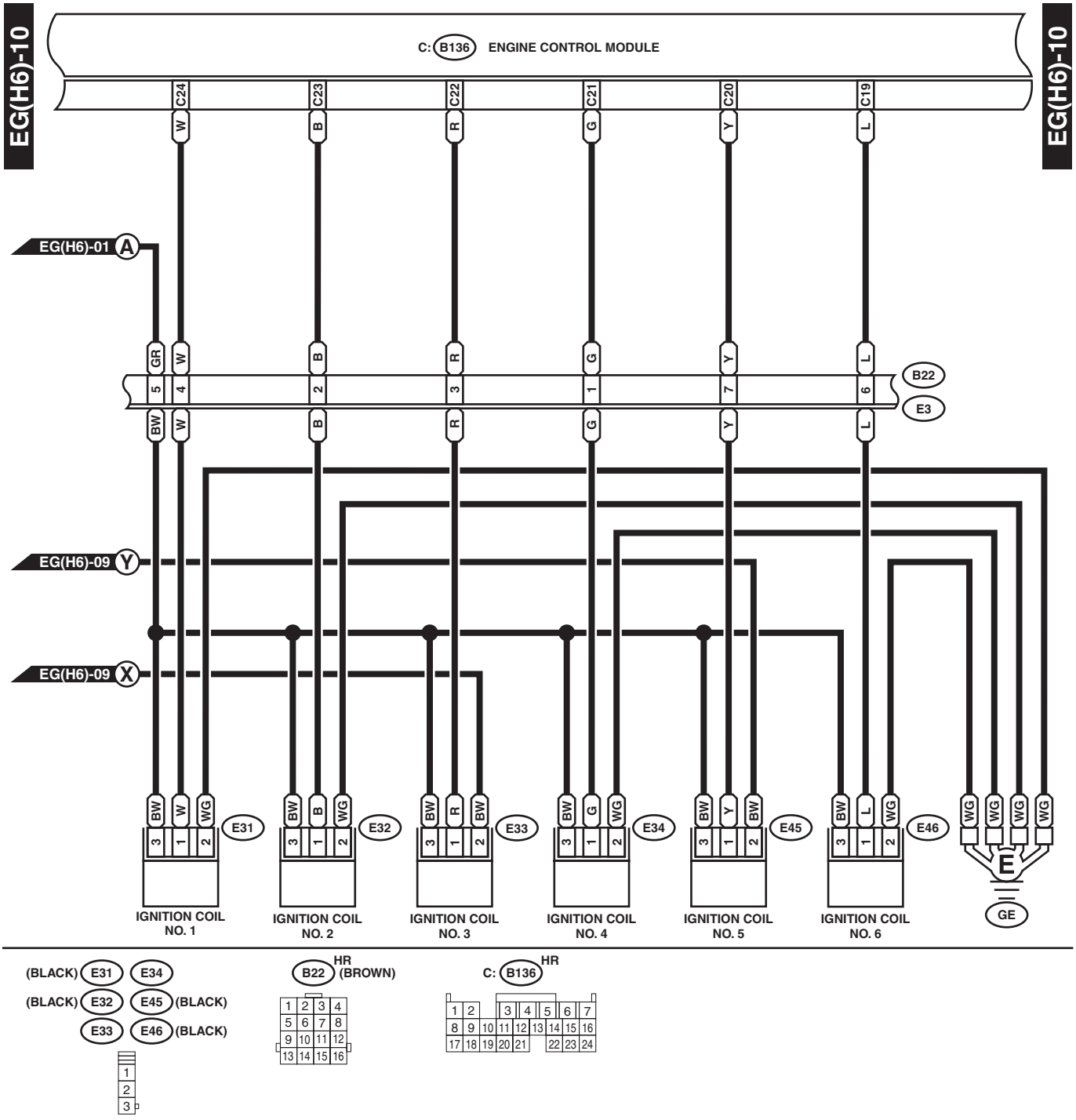

E15 (GRAY)
E8 (LIGHT GRAY)
HR
B21 (LIGHT GRAY)
HR
B: B135

WI-06400

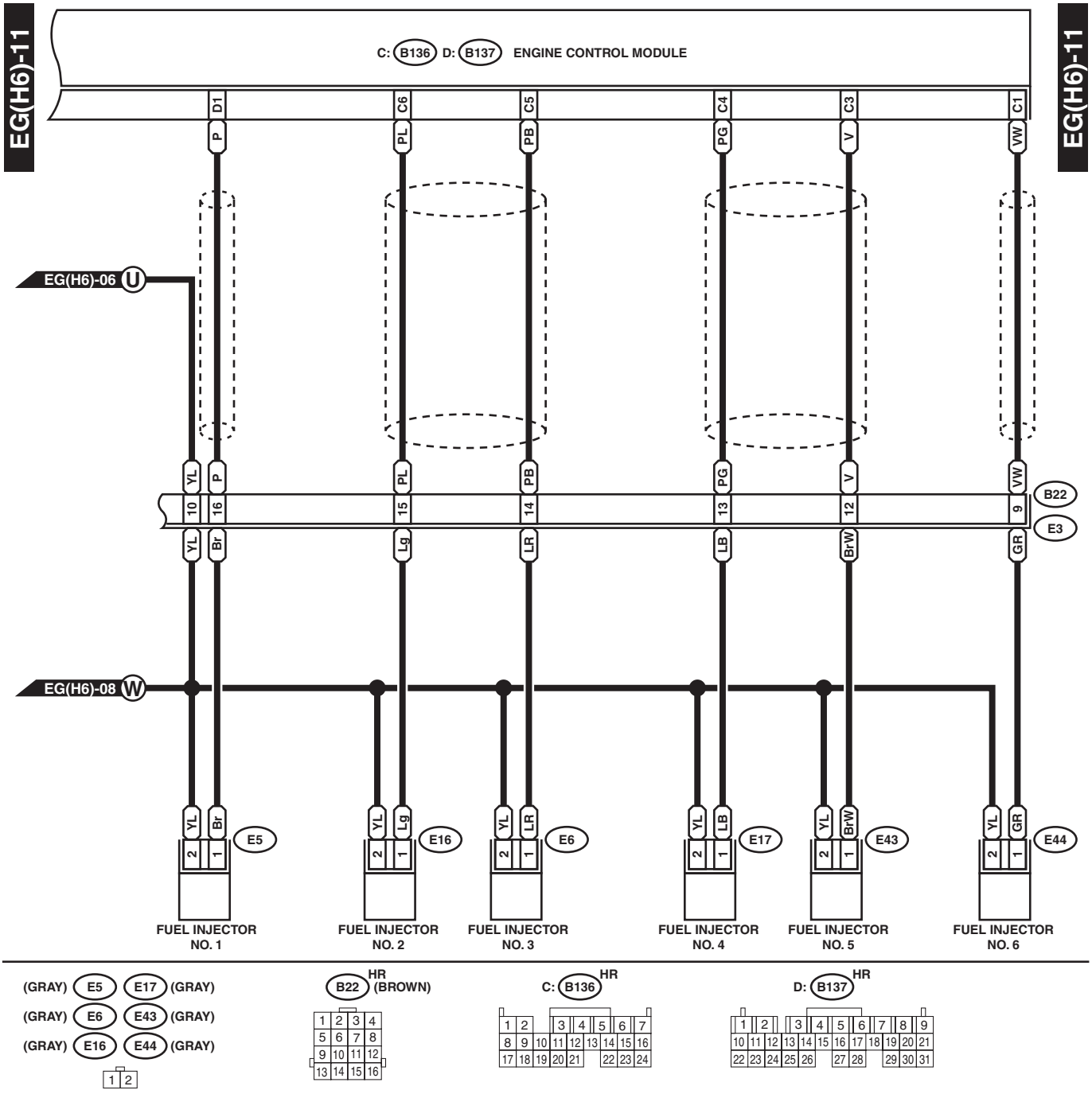

EG(H6)-09
EG(H6)-09
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE
C18 D21 D31 D8 D9 C8 C17 A22 D12 A13 A7 A15
B BY BY BW BW BP BW BW BR W BL BR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
BR 14
BL 13
WG 15
Or 11
SB 12
W 16
WB 17
WR 18
BW 19
BL 20
B83
EG(H6)-06 V
EG(H6)-04 M
EG(H6)-04 P
EG(H6)-04 O
EG(H6)-04 N
EG(H6)-01 D
EG(H6)-02 H
B252
E49
B100
F2
X EG(H6)-10
Y EG(H6)-10
F26
F82
GENERATOR
A/C COMPRESSOR
GE


F26 (GREEN)
F82 (BLACK)
B252 HR (DARK GRAY)
F2 (BLUE)
B83
A: B134 HR
C: B136 HR
D: B137 HR

WI-06401


EG(H6)-10
EG(H6)-10
C: B136 ENGINE CONTROL MODULE
C24
C23
C22
C21
C20
C19
W
B
R
G
Y
L
EG(H6)-01 A
GR
5
4
2
3
1
7
6
B22
E3
BW
EG(H6)-09 Y
EG(H6)-09 X
E31
E32
E33
E34
E45
E46
IGNITION COIL NO. 1
IGNITION COIL NO. 2
IGNITION COIL NO. 3
IGNITION COIL NO. 4
IGNITION COIL NO. 5
IGNITION COIL NO. 6
WG
E
GE
(BLACK) E31 E34
(BLACK) E32 E45 (BLACK)
E33 E46 (BLACK)
HR
B22 (BROWN)
C: B136

WI-06402


EG(H6)-11
EG(H6)-11
C: B136 D: B137 ENGINE CONTROL MODULE
D1
C6
C5
C4
C3
C1
P
PL
PB
PG
V
VW
EG(H6)-06 U
YL
P
PL
PB
PG
V
VW
B22
E3
10
16
15
14
13
12
9
YL
Br
Lg
LR
LB
BrW
GR
EG(H6)-08 W
E5
E16
E6
E17
E43
E44
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
FUEL INJECTOR NO. 5
FUEL INJECTOR NO. 6
(GRAY) E5 E17 (GRAY)
(GRAY) E6 E43 (GRAY)
(GRAY) E16 E44 (GRAY)
B22 HR (BROWN)
C: B136 HR
D: B137 HR

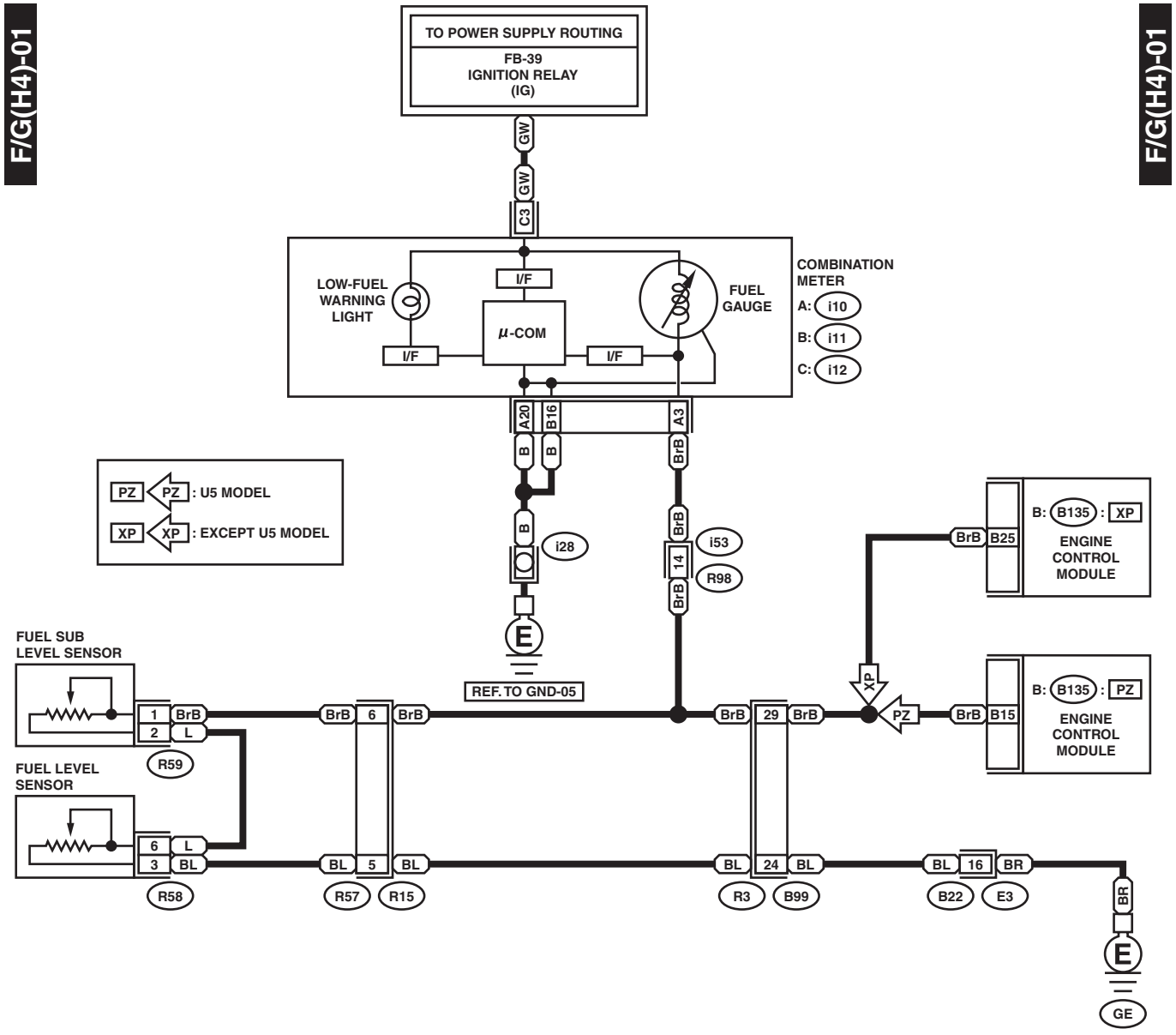
WI-06403

MEMO:

18.Fuel Gauge System

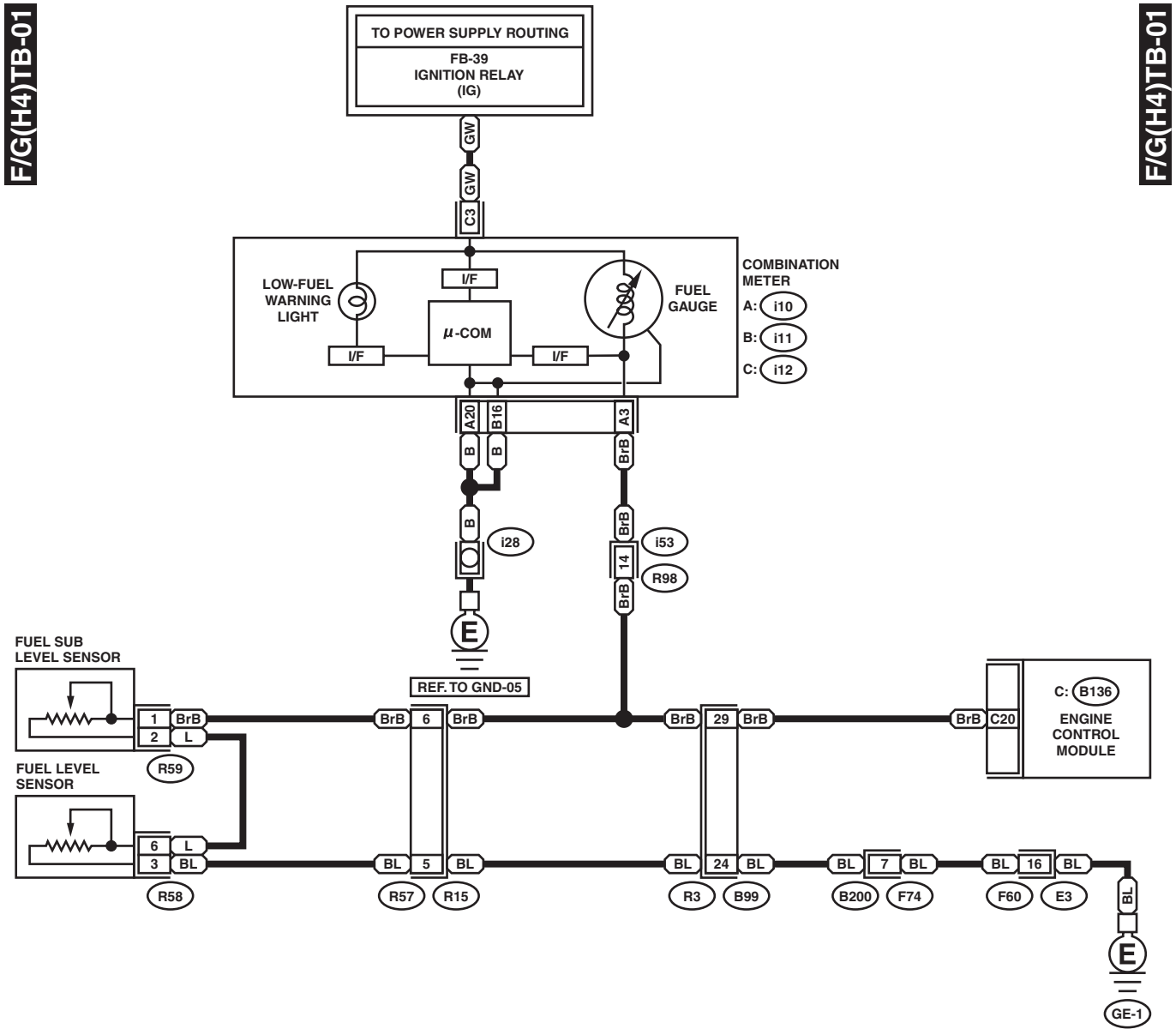
A: SCHEMATIC

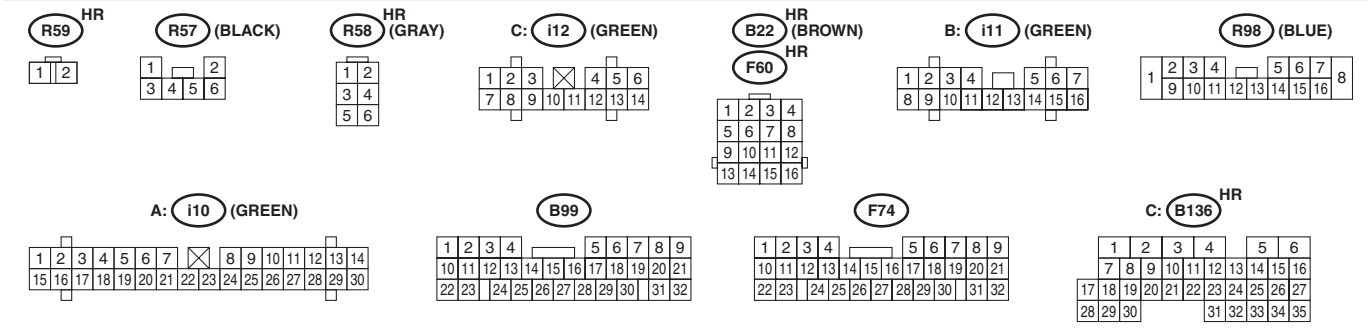
1. EXCEPT 4-CYLINDER TURBO ENGINE



WI-06404

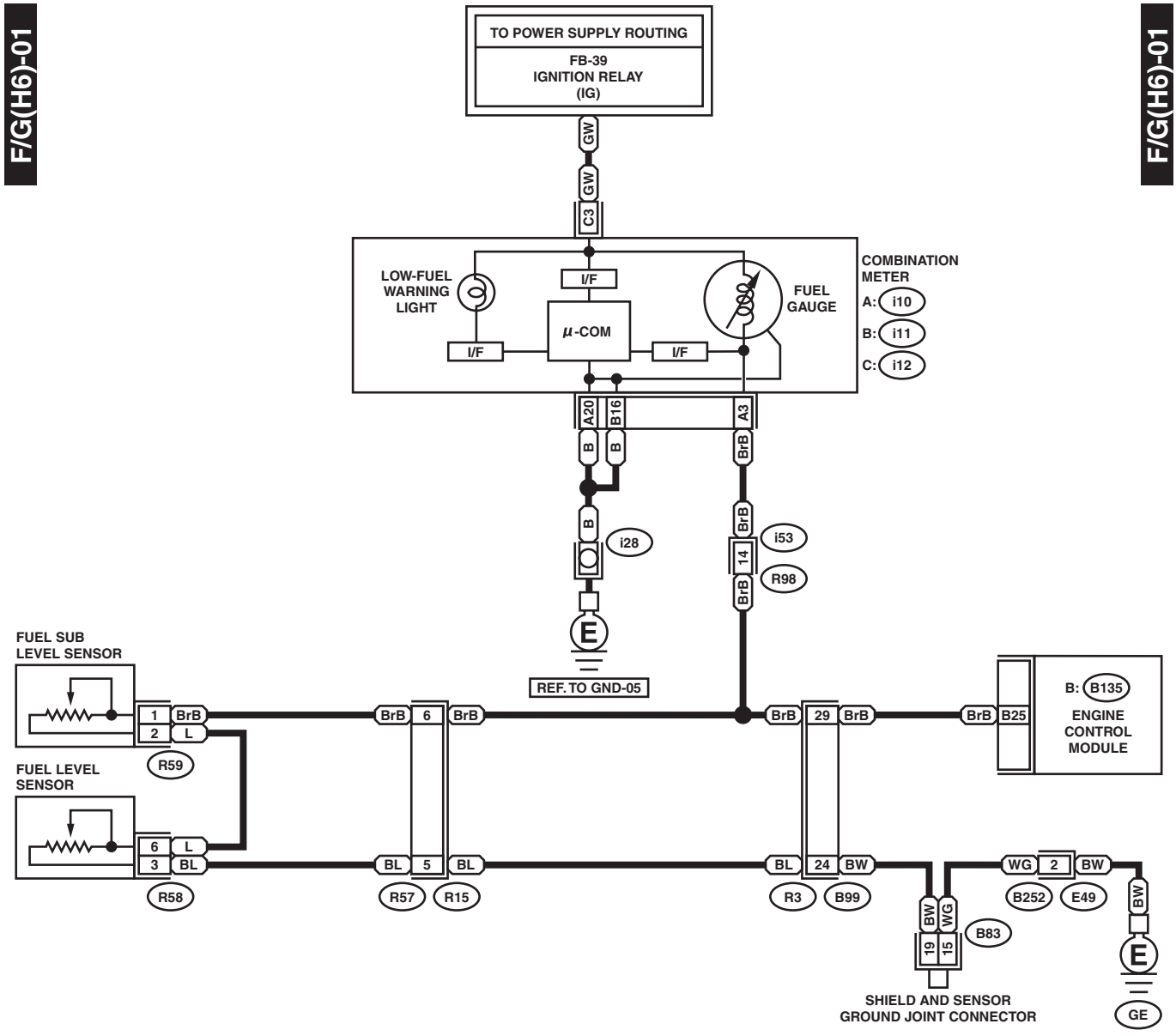
2. 4-CYLINDER TURBO ENGINE





WI-06405

3. 6-CYLINDER ENGINE

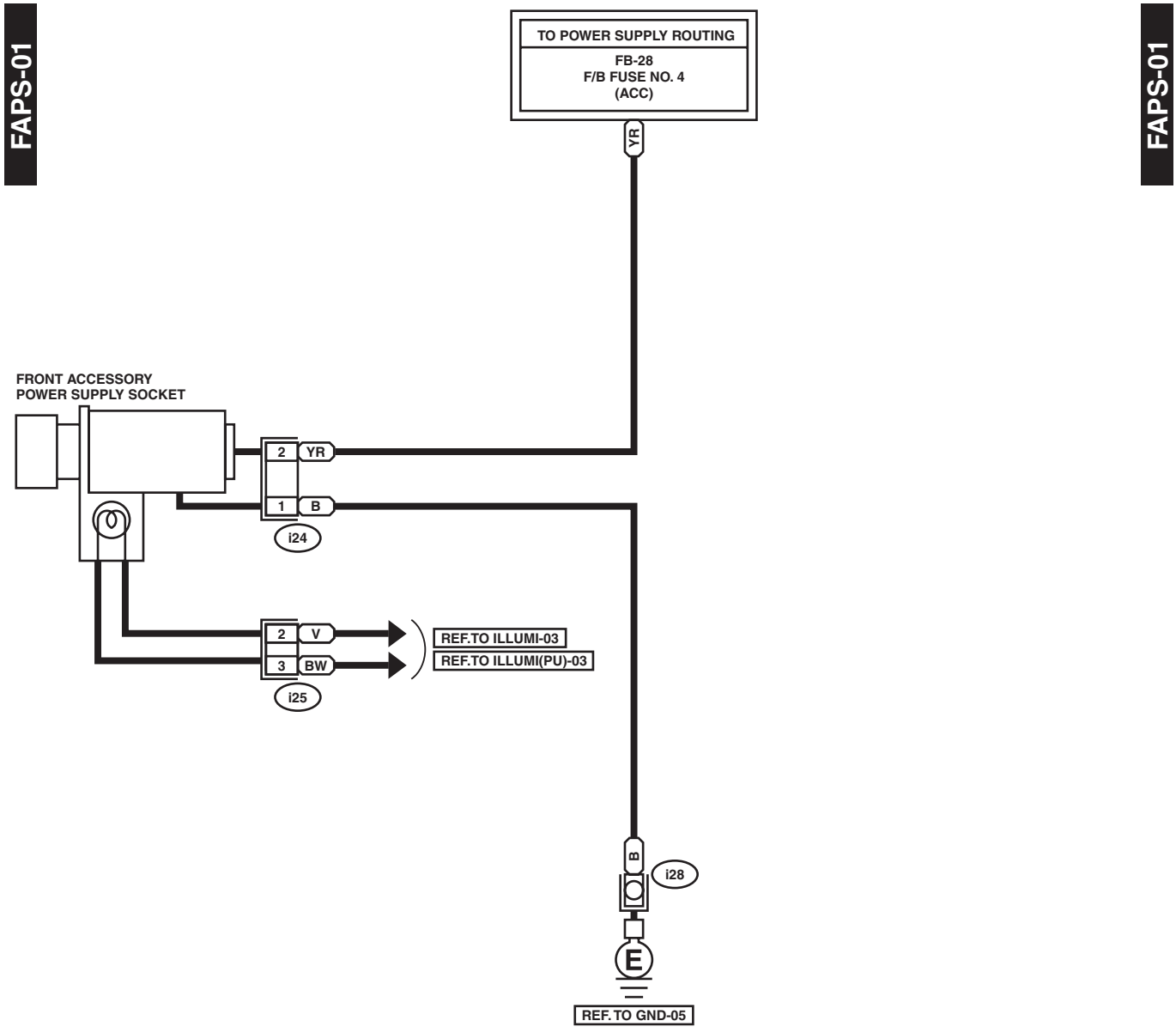


WI-06406

MEMO:

19.Front Accessory Power Supply System

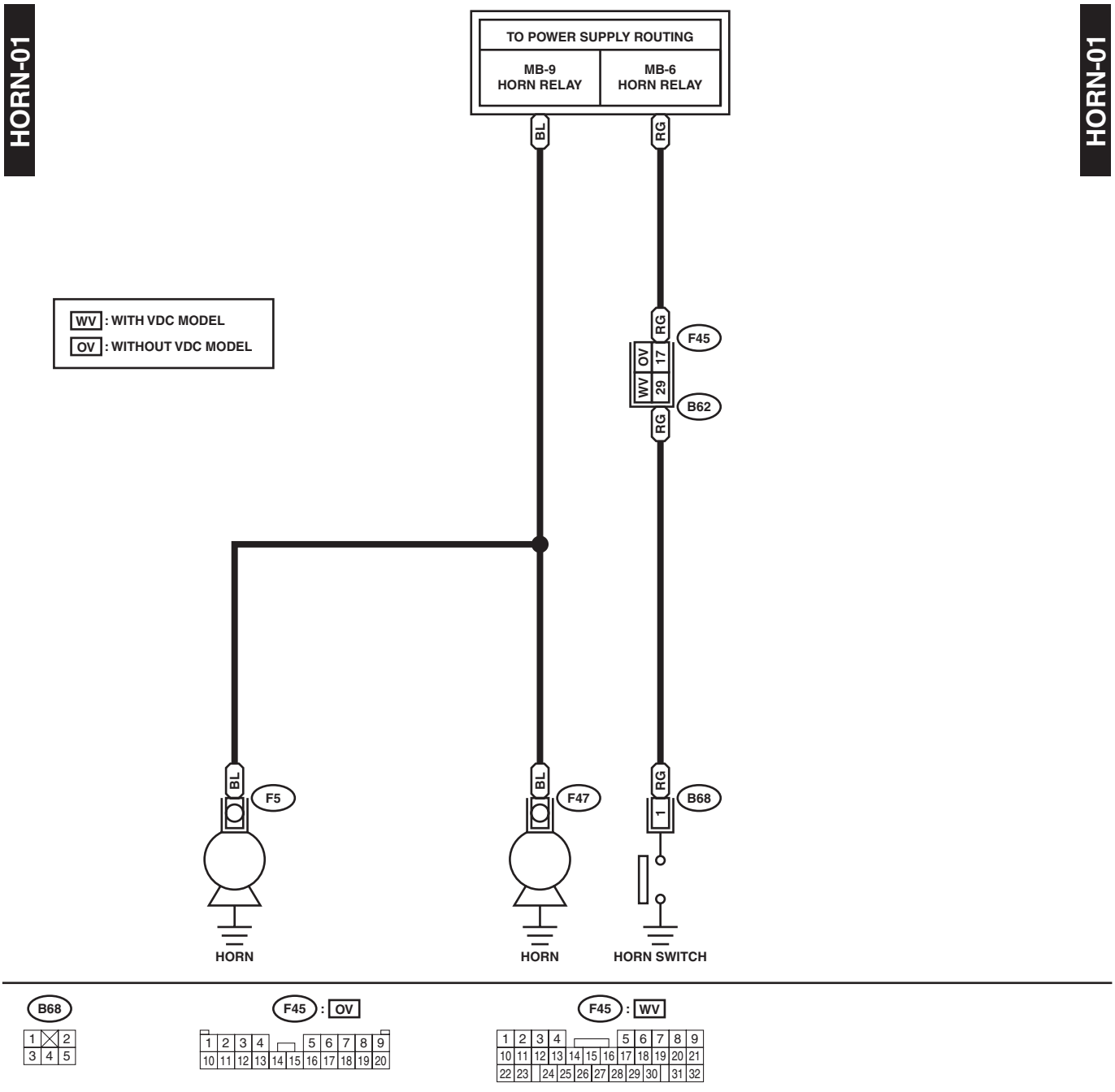
A: SCHEMATIC



WI-00632

20.Horn System

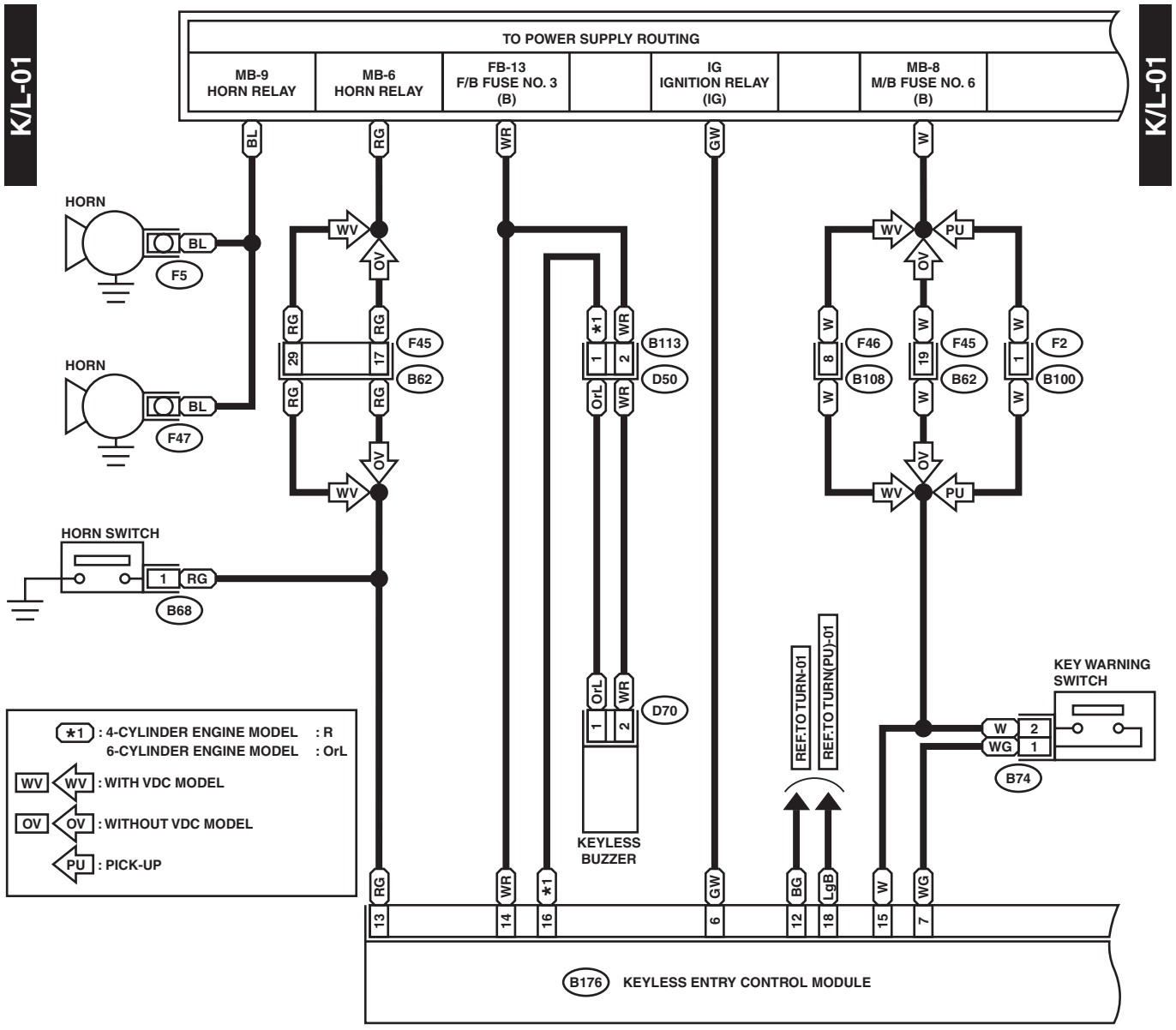
A: SCHEMATIC

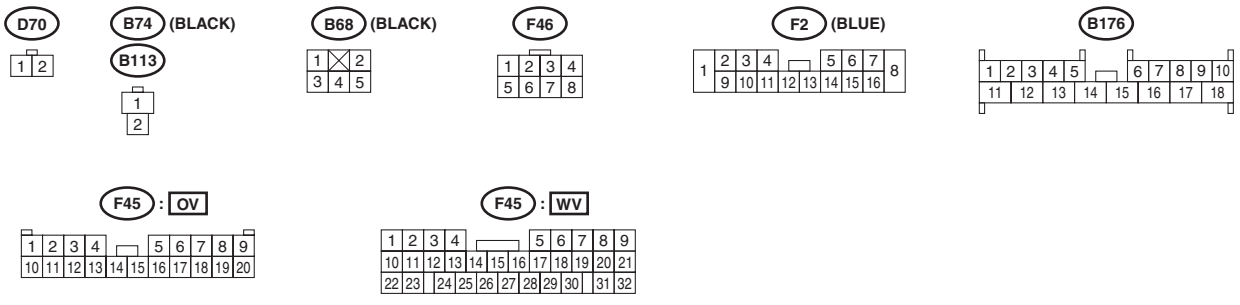


WI-03566

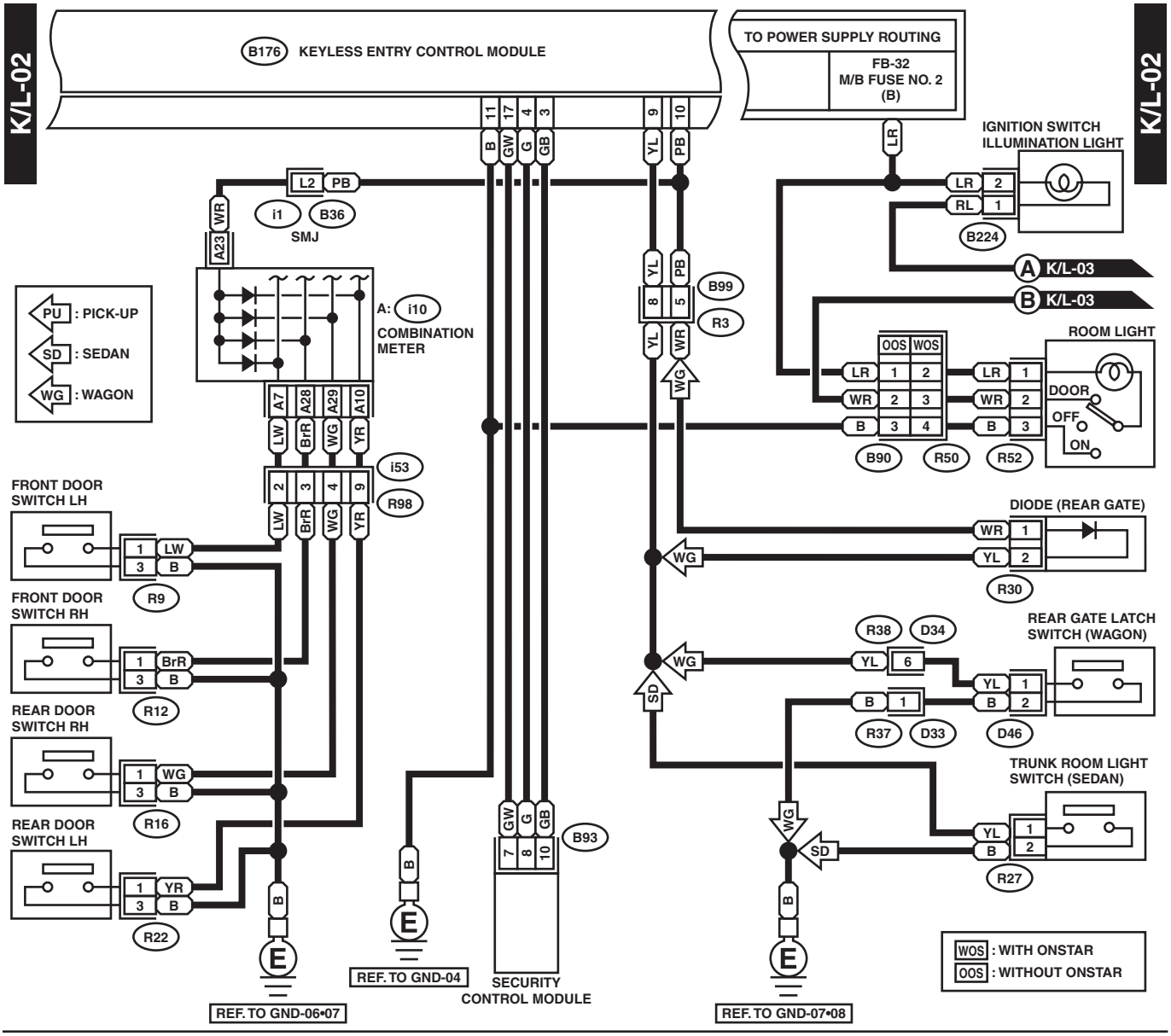
21.Keyless Entry System

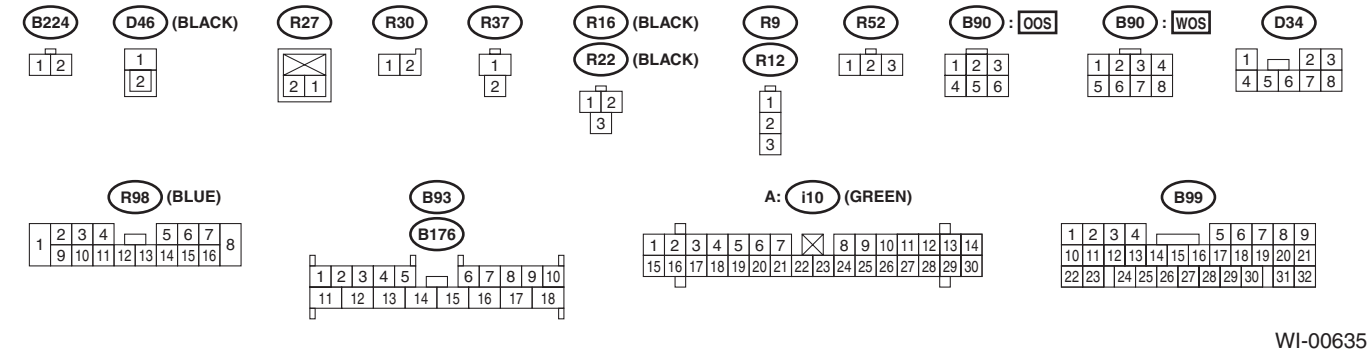
A: SCHEMATIC



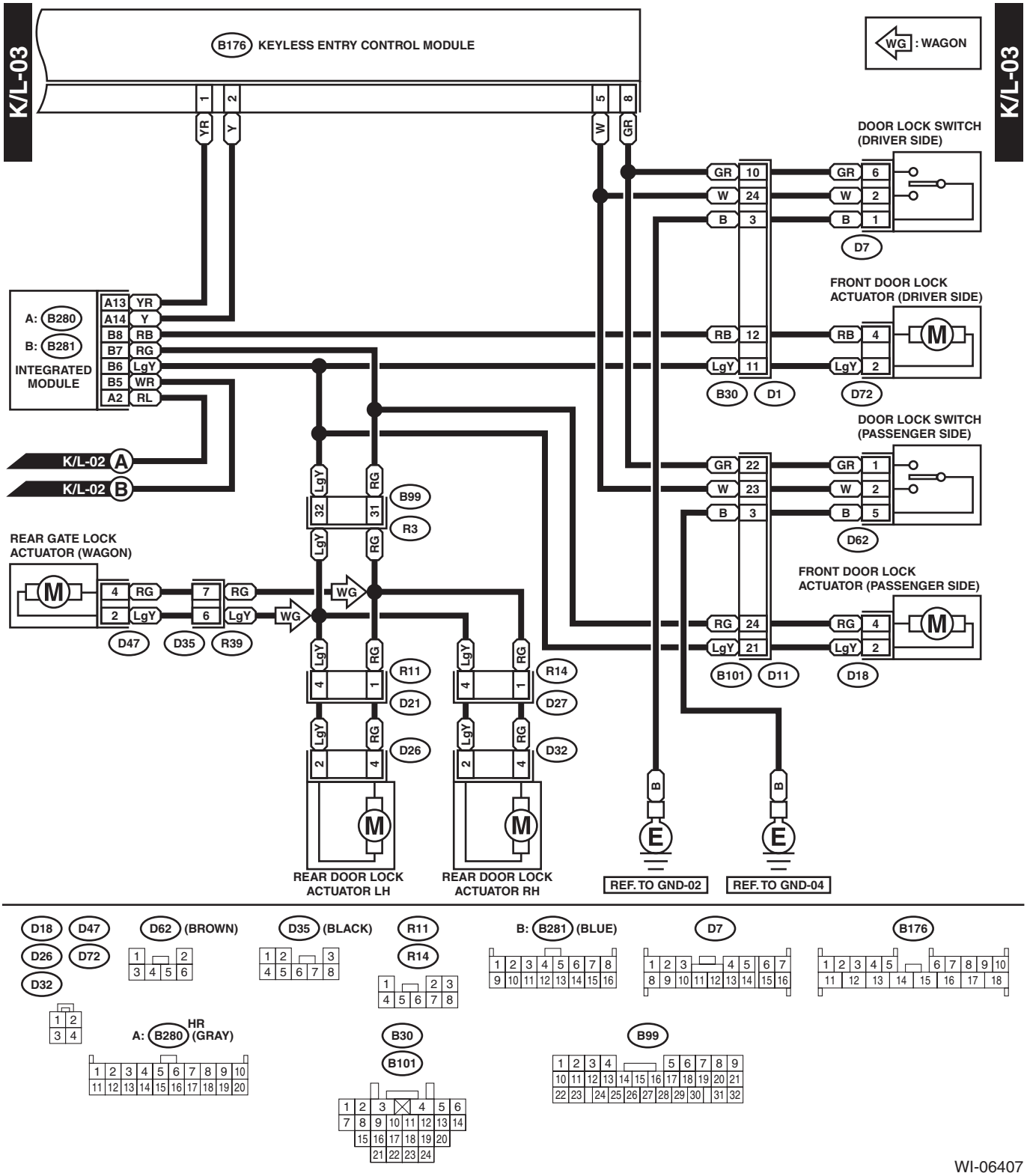


WI-00634


K/L-02
K/L-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
FB-32
M/B FUSE NO. 2
(B)
IGNITION SWITCH
ILLUMINATION LIGHT
SMJ
i1
B36
L2 PB
WR
A23
A: i10
COMBINATION
METER
PU : PICK-UP
SD : SEDAN
WG : WAGON
B99
R3
A: K/L-03
B: K/L-03
ROOM LIGHT
DOOR
OFF
ON
B90
R50
R52
i53
R98
FRONT DOOR
SWITCH LH
R9
FRONT DOOR
SWITCH RH
R12
REAR DOOR
SWITCH RH
R16
REAR DOOR
SWITCH LH
R22
DIODE (REAR GATE)
R30
REAR GATE LATCH
SWITCH (WAGON)
R38
D34
R37
D33
D46
TRUNK ROOM LIGHT
SWITCH (SEDAN)
R27
B93
REF. TO GND-04
REF. TO GND-06•07
REF. TO GND-07•08
SECURITY
CONTROL MODULE
WOS : WITH ONSTAR
OOS : WITHOUT ONSTAR


B224
D46 (BLACK)
R27
R30
R37
R16 (BLACK)
R22 (BLACK)
R9
R12
R52
B90 : OOS
B90 : WOS
D34
R98 (BLUE)
B93
B176
A: i10 (GREEN)
B99

WI-00635


K/L-03
B176 KEYLESS ENTRY CONTROL MODULE
WG : WAGON
K/L-03
DOOR LOCK SWITCH (DRIVER SIDE)
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
DOOR LOCK SWITCH (PASSENGER SIDE)
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
A: B280
B: B281
INTEGRATED MODULE
K/L-02 A
K/L-02 B
REAR GATE LOCK ACTUATOR (WAGON)
REAR DOOR LOCK ACTUATOR LH
REAR DOOR LOCK ACTUATOR RH
REF. TO GND-02
REF. TO GND-04
D7
D72
B30
D1
D62
B101
D11
D18
D47
D35
R39
B99
R3
R11
D21
D26
R14
D27
D32

D18 D47 D26 D72 D32
D62 (BROWN)
D35 (BLACK)
R11 R14
B: B281 (BLUE)
D7
B176
A: B280 HR (GRAY)
B30 B101
B99

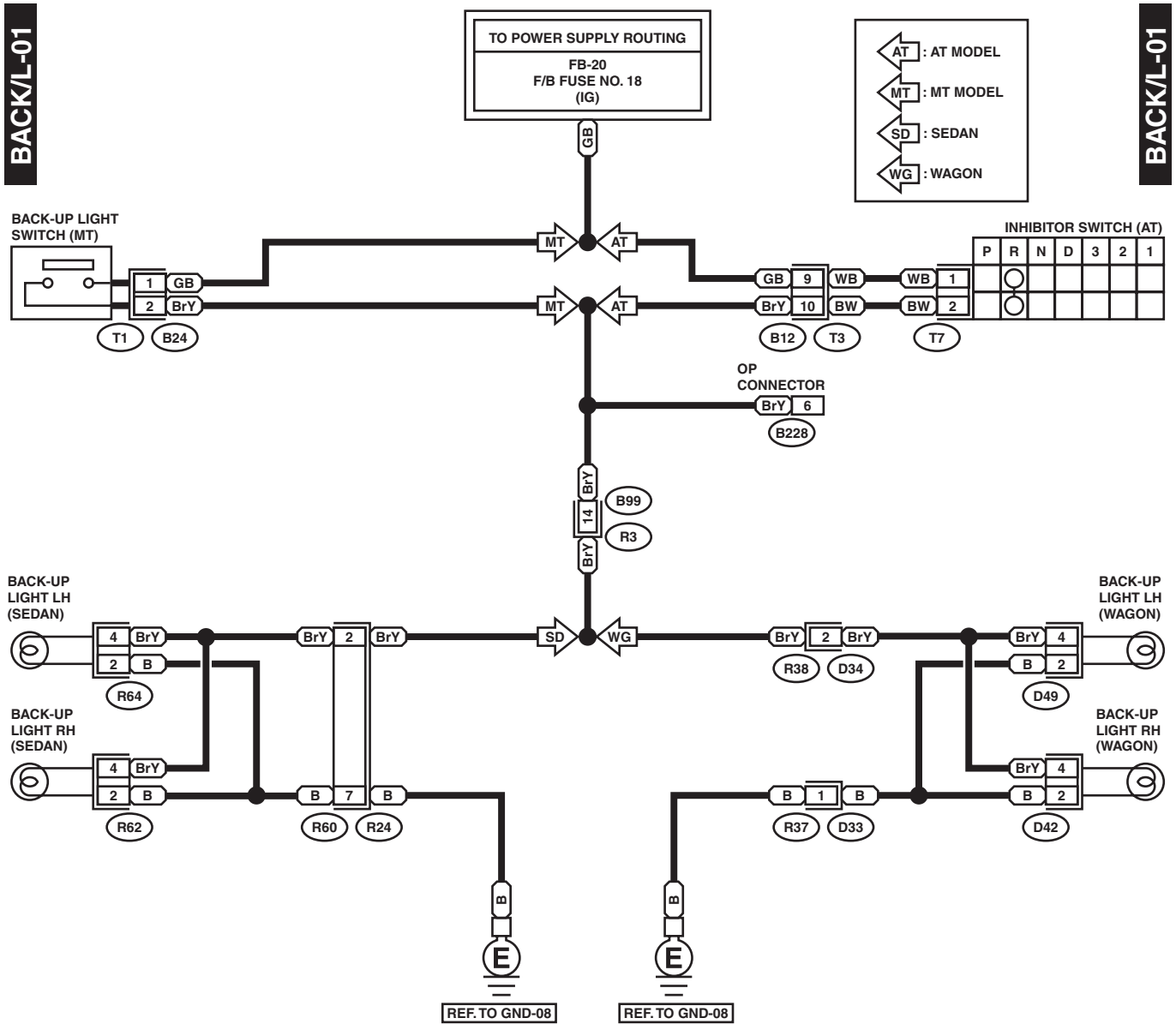
WI-06407

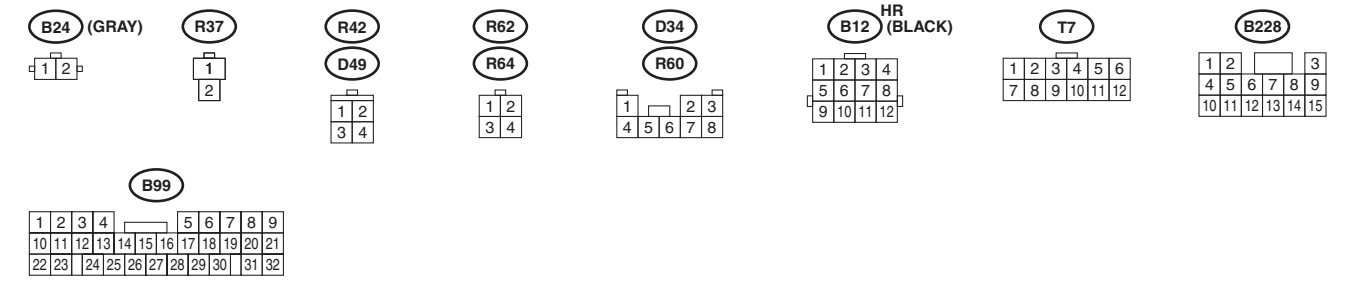
MEMO:

22.Back-up Light System

A: SCHEMATIC

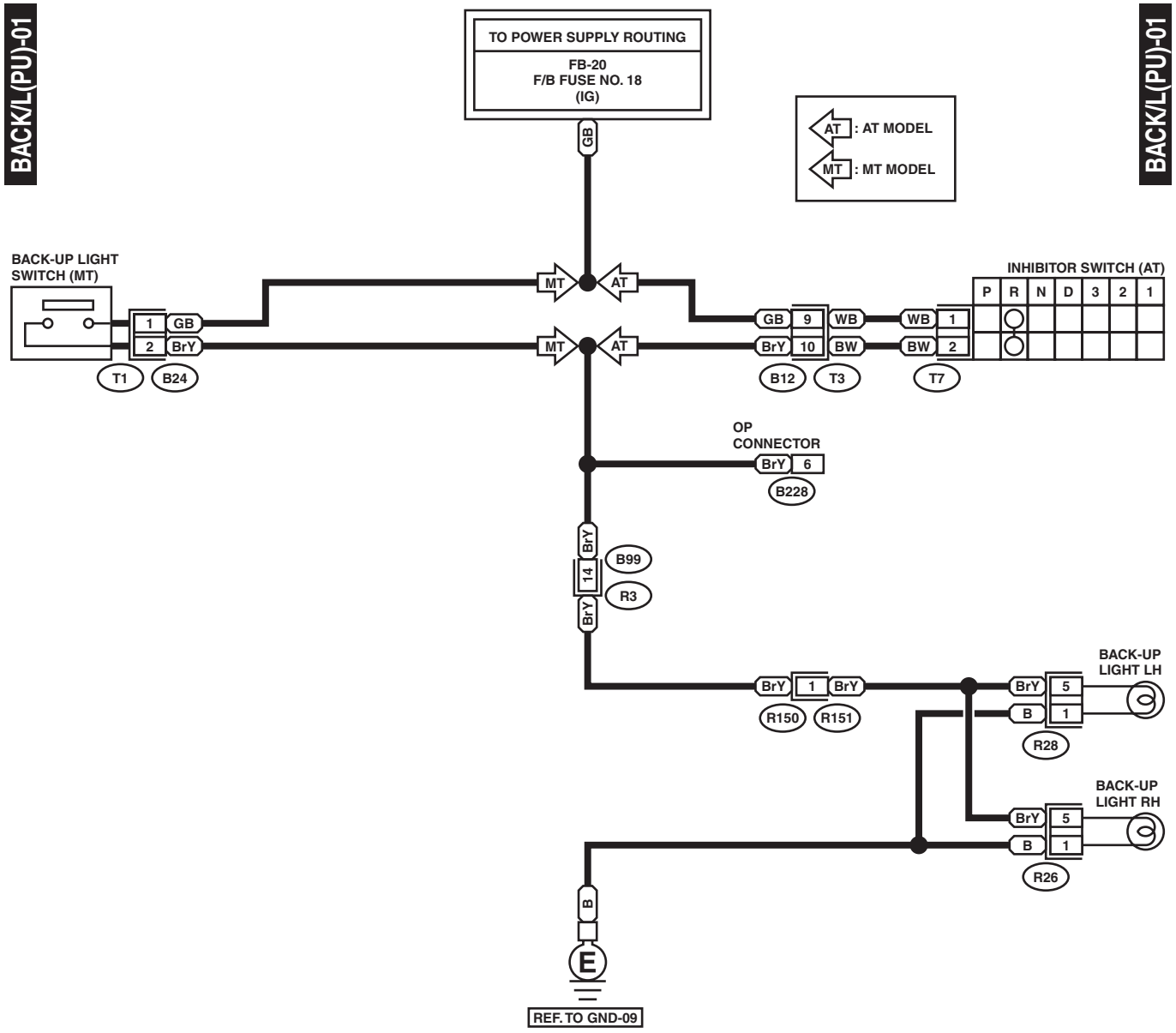
1. SEDAN & WAGON MODEL





WI-06408

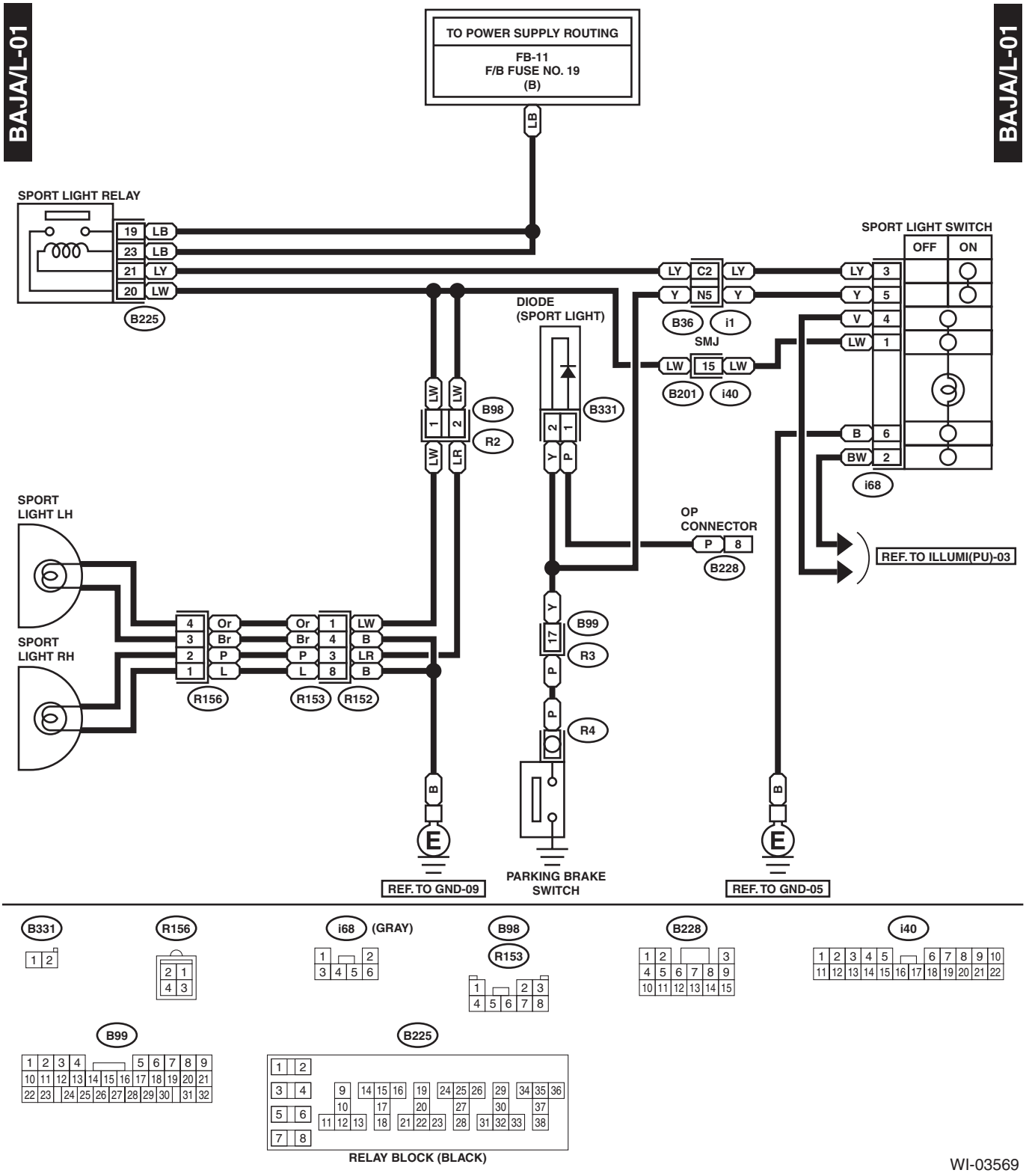
2. PICK-UP MODEL



WI-06409

23.Sport Activity Light System

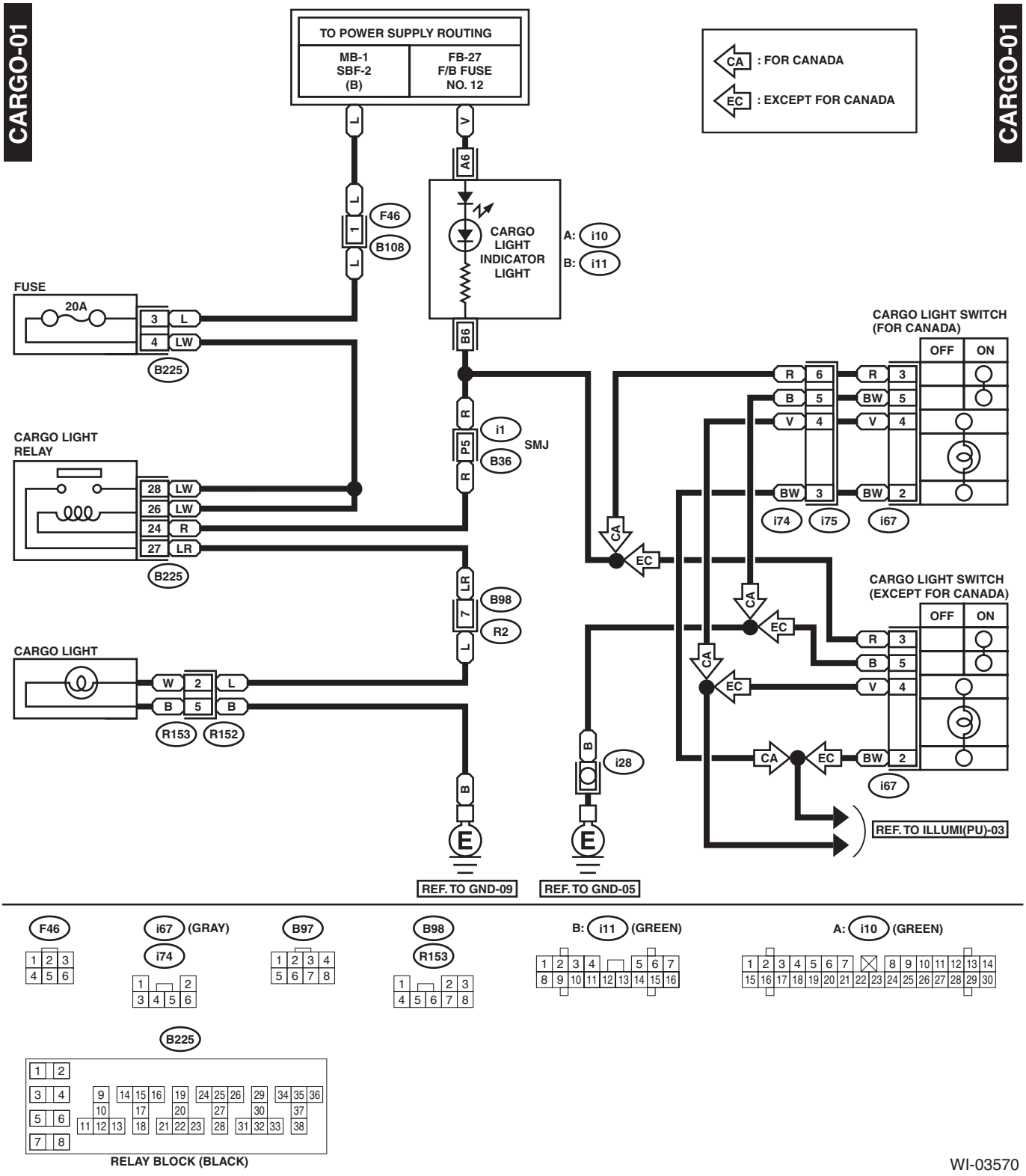
A: SCHEMATIC



WI-03569

24.Cargo Light System

A: SCHEMATIC

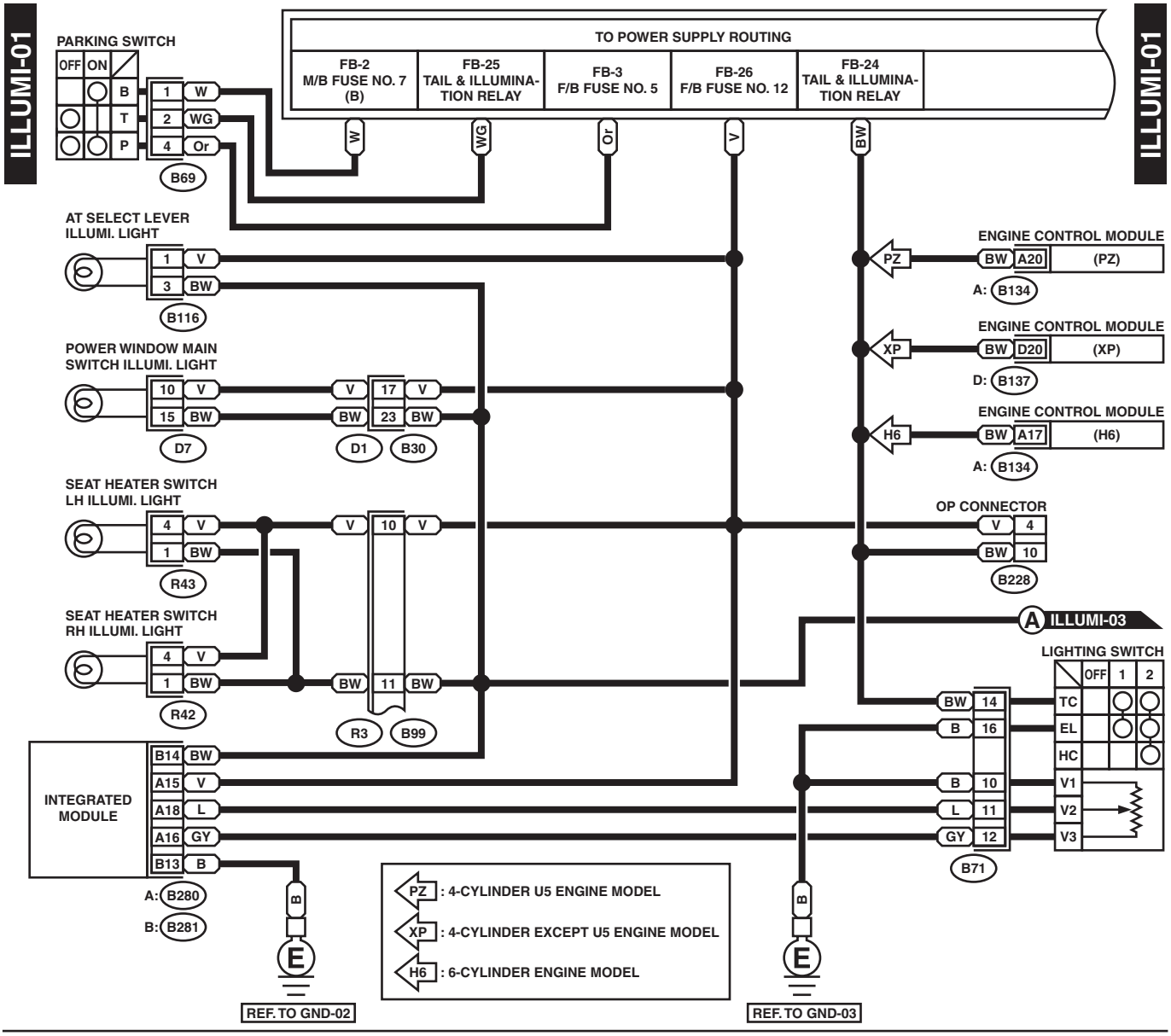


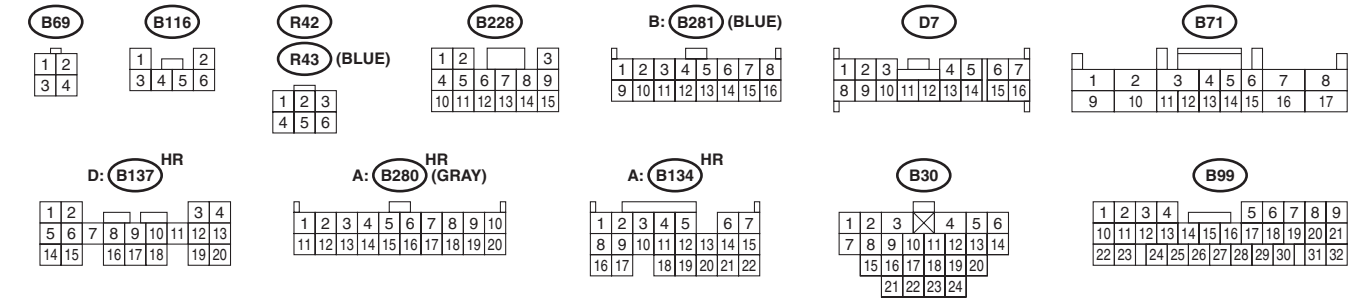
WI-03570

25.Clearance Light and Illumination Light System

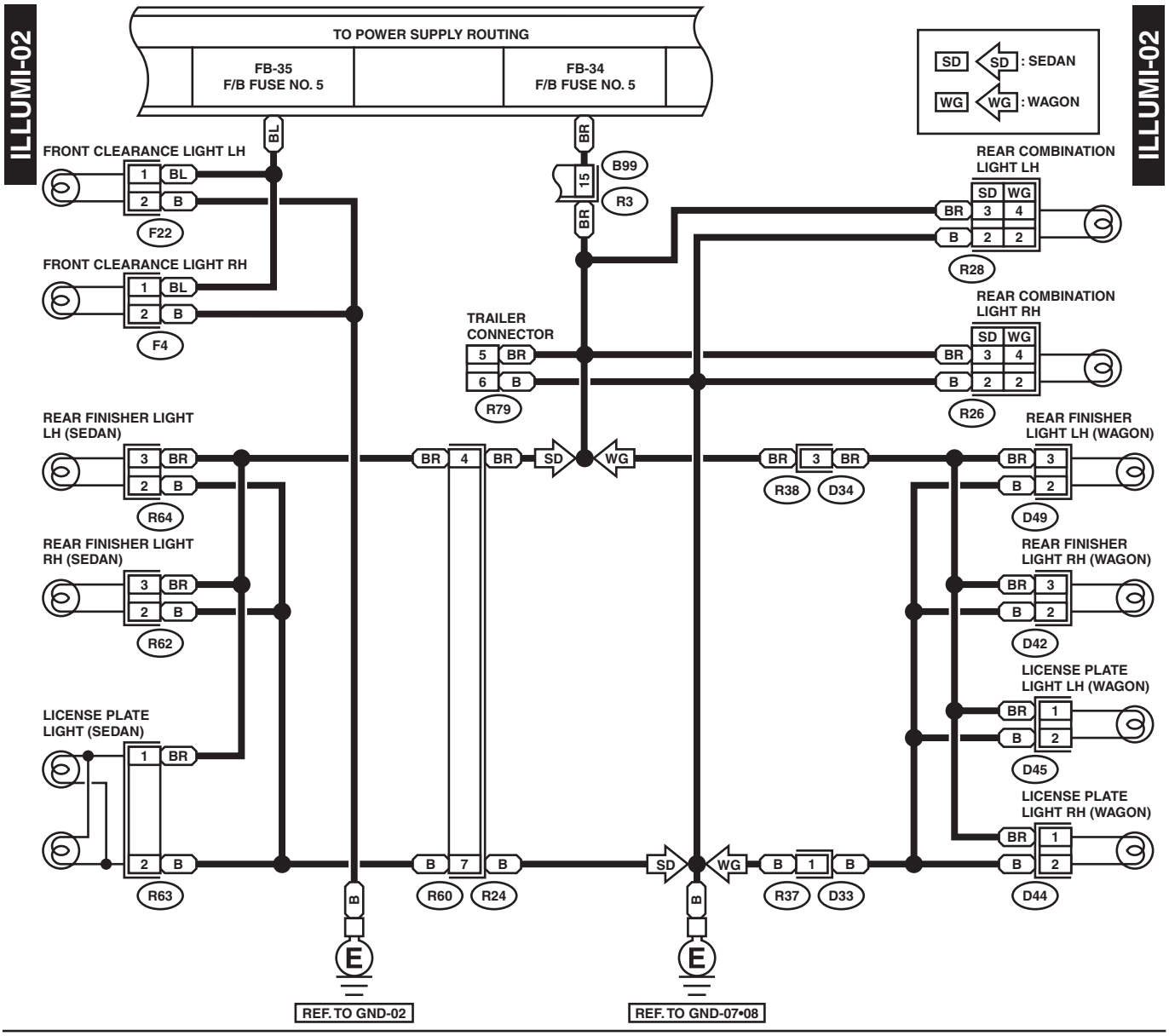
A: SCHEMATIC

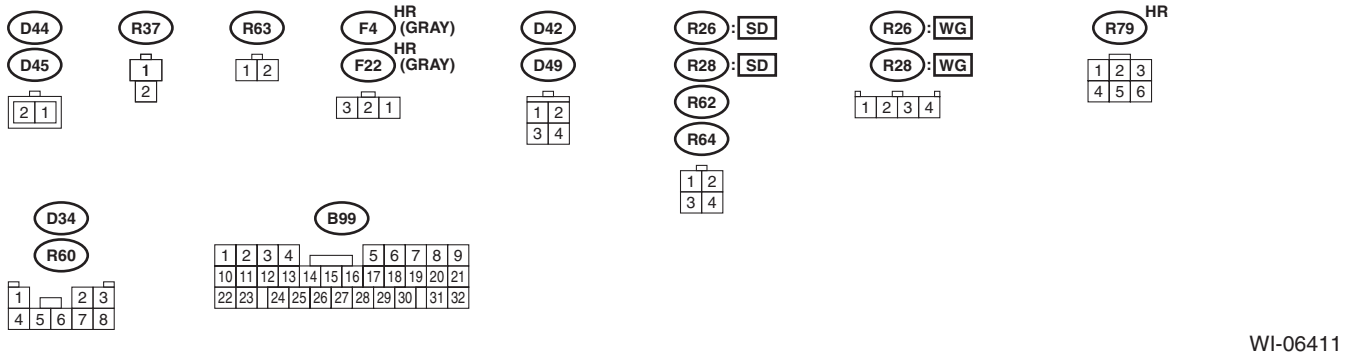
1. SEDAN & WAGON MODEL



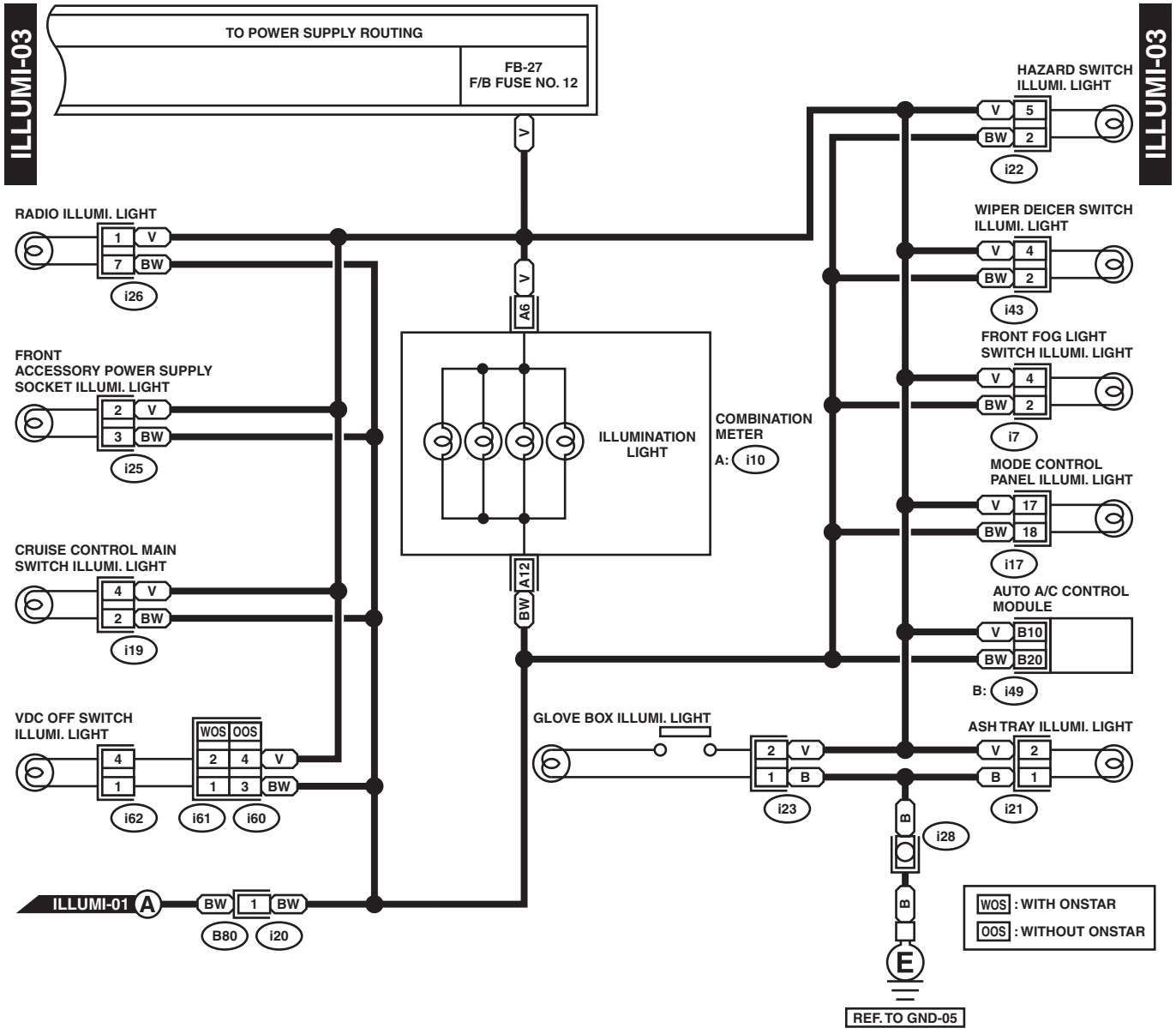


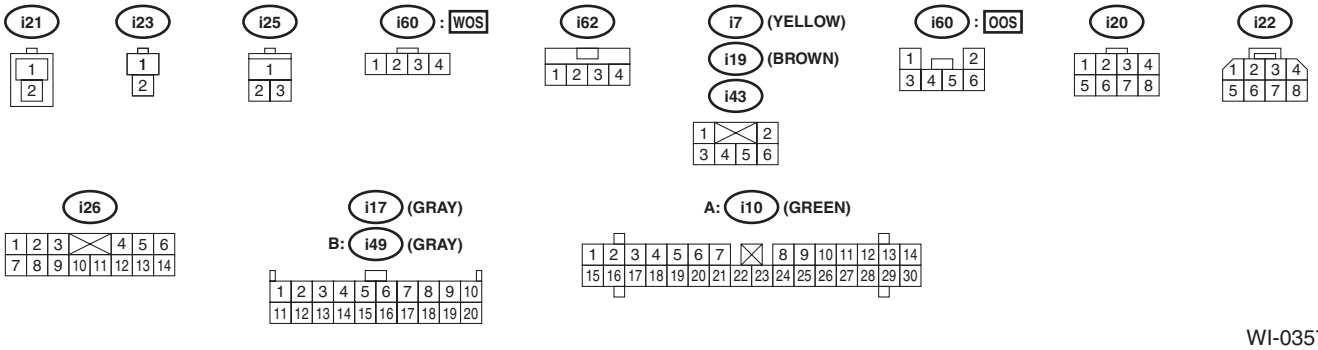
WI-06410


ILLUMI-02
TO POWER SUPPLY ROUTING
FB-35
F/B FUSE NO. 5
FB-34
F/B FUSE NO. 5
SD : SEDAN
WG : WAGON
FRONT CLEARANCE LIGHT LH
FRONT CLEARANCE LIGHT RH
F22
F4
B99
R3
REAR COMBINATION LIGHT LH
REAR COMBINATION LIGHT RH
R28
R26
TRAILER CONNECTOR
R79
REAR FINISHER LIGHT LH (SEDAN)
REAR FINISHER LIGHT RH (SEDAN)
R64
R62
REAR FINISHER LIGHT LH (WAGON)
REAR FINISHER LIGHT RH (WAGON)
D49
D42
R38
D34
LICENSE PLATE LIGHT (SEDAN)
LICENSE PLATE LIGHT LH (WAGON)
LICENSE PLATE LIGHT RH (WAGON)
D45
D44
R63
R60
R24
R37
D33
REF. TO GND-02
REF. TO GND-07•08


D44
D45
R37
R63
F4
HR (GRAY)
F22
HR (GRAY)
D42
D49
R26 : SD
R28 : SD
R62
R64
R26 : WG
R28 : WG
R79
HR
D34
R60
B99

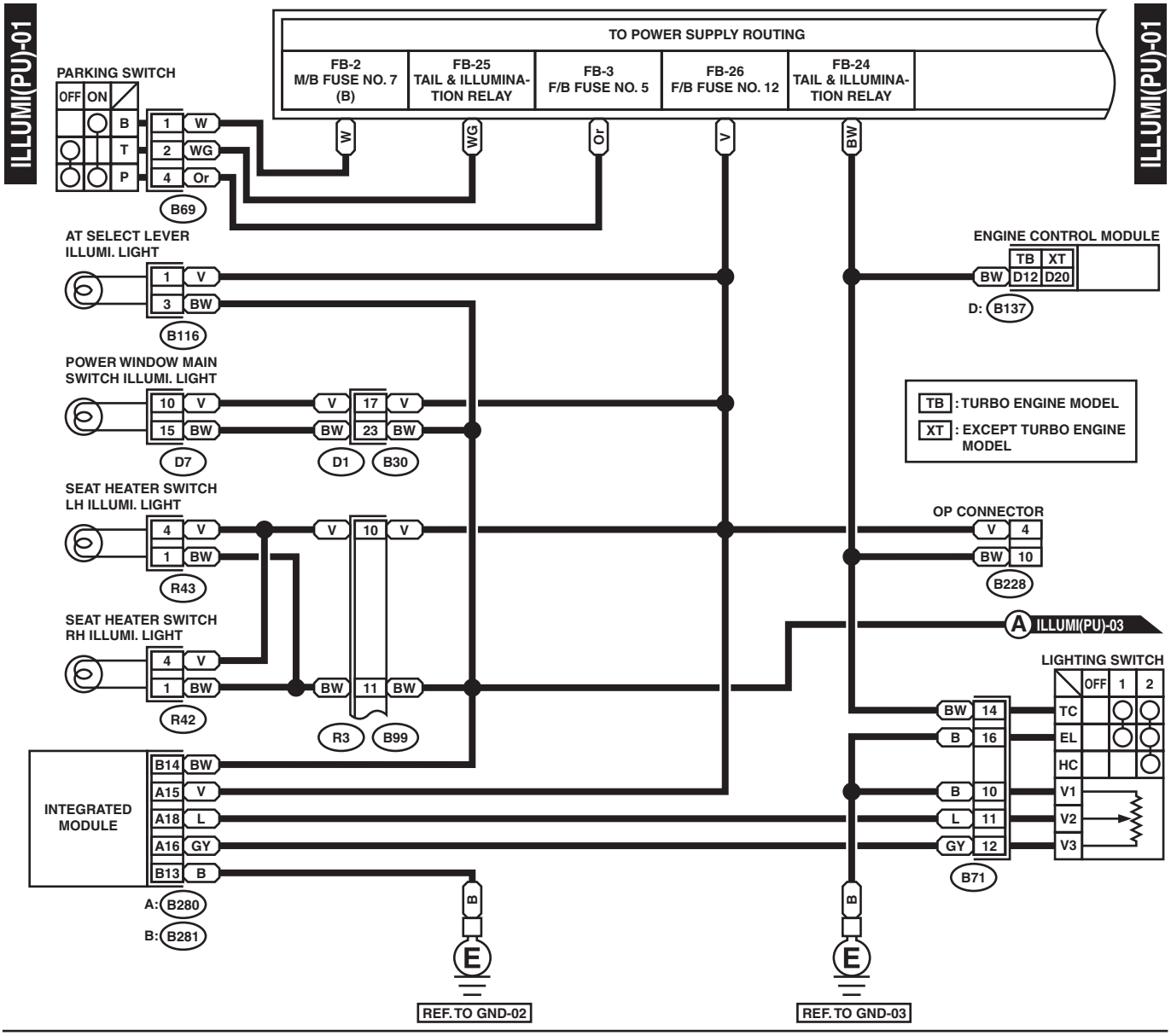
WI-06411

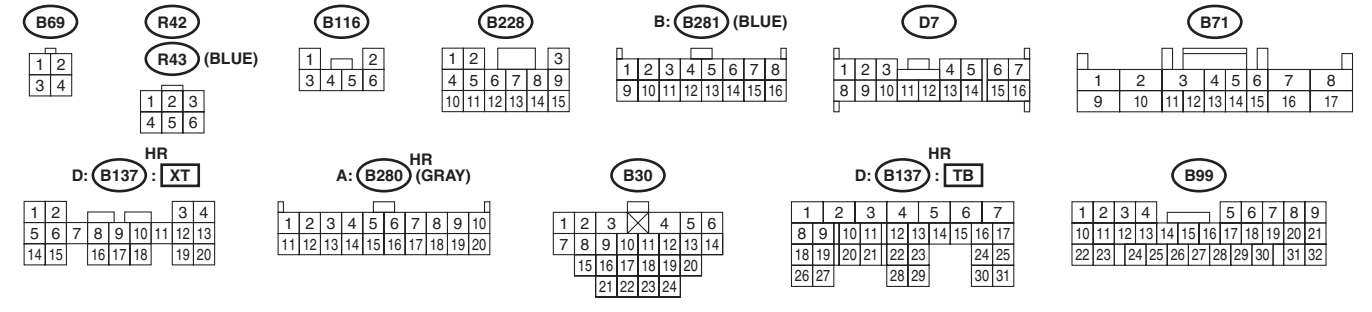

ILLUMI-03
TO POWER SUPPLY ROUTING
FB-27
F/B FUSE NO. 12
V
HAZARD SWITCH
ILLUMI. LIGHT
V 5
BW 2
i22
RADIO ILLUMI. LIGHT
1 V
7 BW
i26
WIPER DEICER SWITCH
ILLUMI. LIGHT
V 4
BW 2
i43
A6
FRONT FOG LIGHT
SWITCH ILLUMI. LIGHT
V 4
BW 2
i7
FRONT
ACCESSORY POWER SUPPLY
SOCKET ILLUMI. LIGHT
2 V
3 BW
i25
ILLUMINATION
LIGHT
COMBINATION
METER
A: i10
MODE CONTROL
PANEL ILLUMI. LIGHT
V 17
BW 18
i17
A12
BW
CRUISE CONTROL MAIN
SWITCH ILLUMI. LIGHT
4 V
2 BW
i19
AUTO A/C CONTROL
MODULE
V B10
BW B20
B: i49
VDC OFF SWITCH
ILLUMI. LIGHT
WOS OOS
4
1
2 4 V
1 3 BW
i62
i61
i60
GLOVE BOX ILLUMI. LIGHT
2 V
1 B
i23
ASH TRAY ILLUMI. LIGHT
V 2
B 1
i21
B
i28
B
E
REF. TO GND-05
ILLUMI-01 A
BW 1 BW
B80
i20
WOS : WITH ONSTAR
OOS : WITHOUT ONSTAR


i21
i23
i25
i60 : WOS
i62
i7 (YELLOW)
i19 (BROWN)
i43
i60 : OOS
i20
i22
i26
i17 (GRAY)
B: i49 (GRAY)
A: i10 (GREEN)

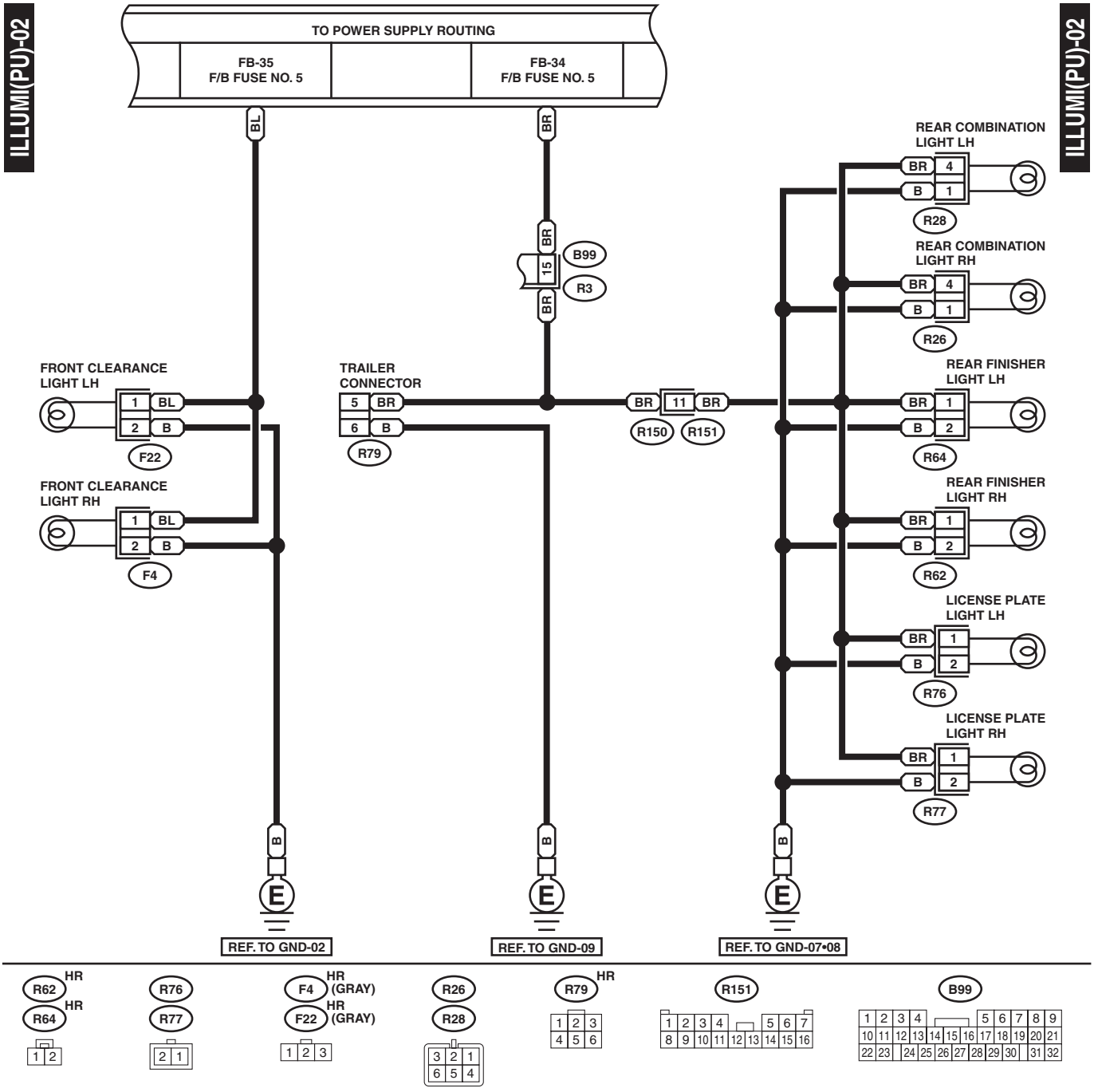
WI-03572

2. PICK-UP MODEL

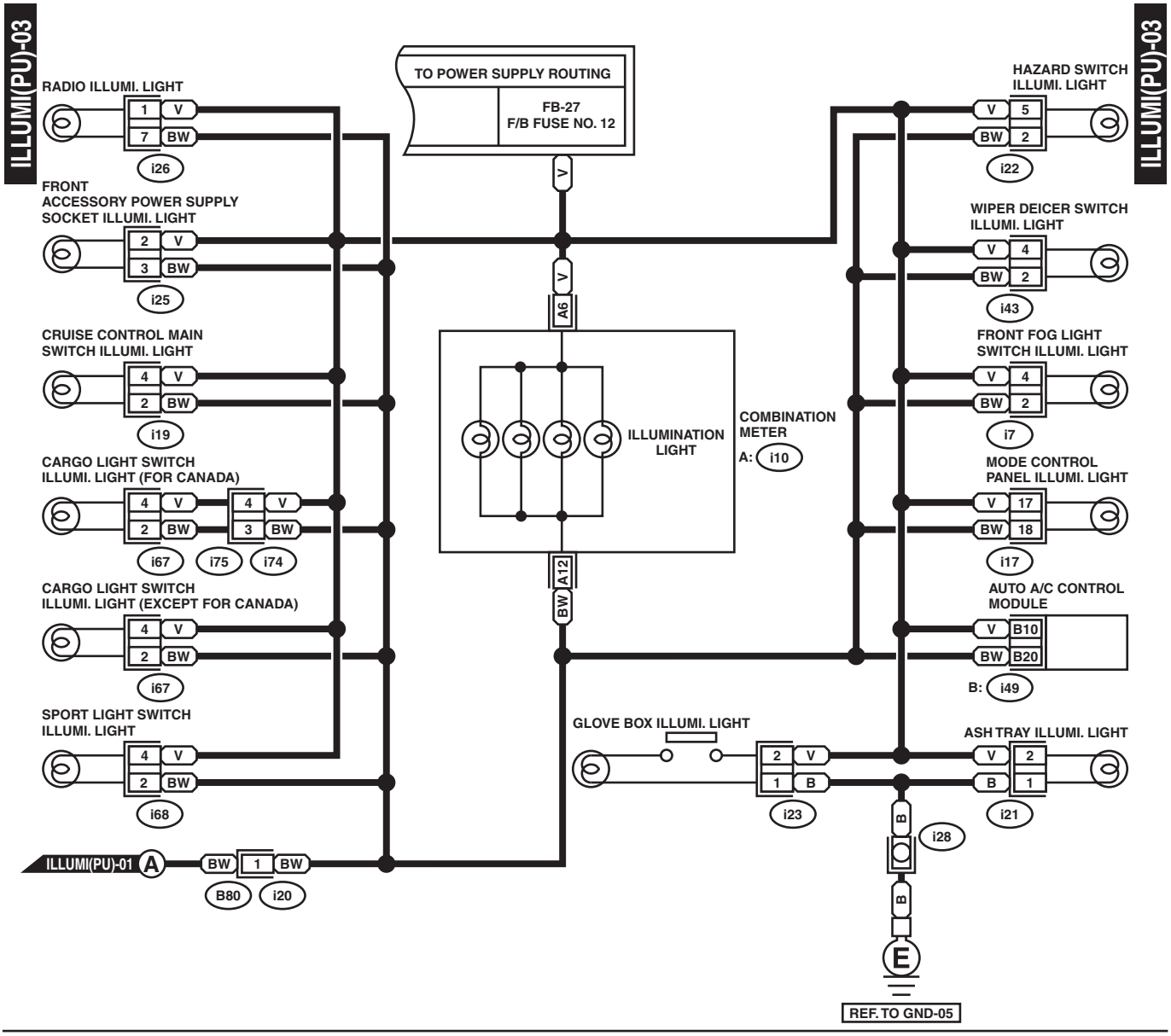


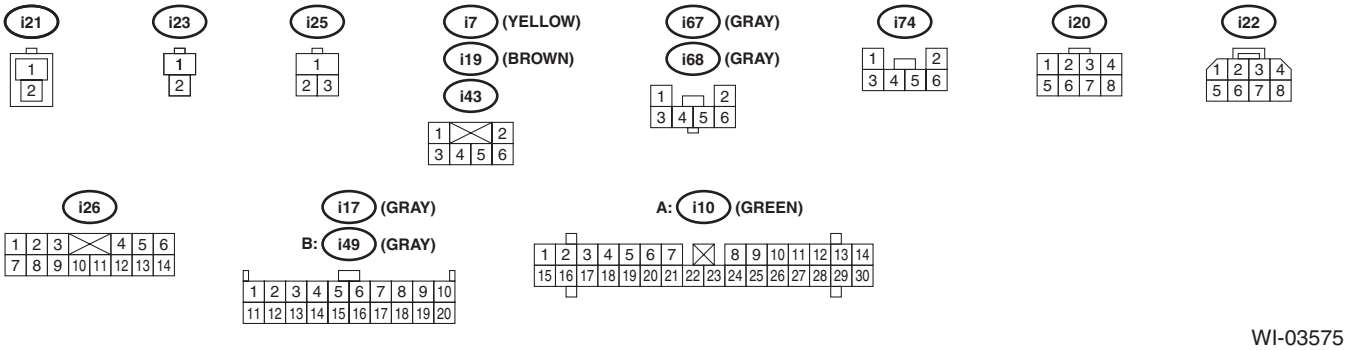


WI-06412


ILLUMI(PU)-02
ILLUMI(PU)-02
TO POWER SUPPLY ROUTING
FB-35
F/B FUSE NO. 5
FB-34
F/B FUSE NO. 5
BL
BR
B99
15
R3
FRONT CLEARANCE
LIGHT LH
1 BL
2 B
F22
FRONT CLEARANCE
LIGHT RH
1 BL
2 B
F4
TRAILER
CONNECTOR
5 BR
6 B
R79
BR 11 BR
R150
R151
REAR COMBINATION
LIGHT LH
BR 4
B 1
R28
REAR COMBINATION
LIGHT RH
BR 4
B 1
R26
REAR FINISHER
LIGHT LH
BR 1
B 2
R64
REAR FINISHER
LIGHT RH
BR 1
B 2
R62
LICENSE PLATE
LIGHT LH
BR 1
B 2
R76
LICENSE PLATE
LIGHT RH
BR 1
B 2
R77
B
E
REF. TO GND-02
REF. TO GND-09
REF. TO GND-07•08
R62 HR
R64 HR
R76
R77
F4 HR (GRAY)
F22 HR (GRAY)
R26
R28
R79 HR
R151
B99

WI-06413


ILLUMI(PU)-03
ILLUMI(PU)-03
TO POWER SUPPLY ROUTING
FB-27
F/B FUSE NO. 12
RADIO ILLUMI. LIGHT
i26
FRONT
ACCESSORY POWER SUPPLY
SOCKET ILLUMI. LIGHT
i25
CRUISE CONTROL MAIN
SWITCH ILLUMI. LIGHT
i19
CARGO LIGHT SWITCH
ILLUMI. LIGHT (FOR CANADA)
i67
i75
i74
CARGO LIGHT SWITCH
ILLUMI. LIGHT (EXCEPT FOR CANADA)
i67
SPORT LIGHT SWITCH
ILLUMI. LIGHT
i68
ILLUMI(PU)-01 A
B80
i20
A6
A12
ILLUMINATION
LIGHT
COMBINATION
METER
A: i10
GLOVE BOX ILLUMI. LIGHT
i23
HAZARD SWITCH
ILLUMI. LIGHT
i22
WIPER DEICER SWITCH
ILLUMI. LIGHT
i43
FRONT FOG LIGHT
SWITCH ILLUMI. LIGHT
i7
MODE CONTROL
PANEL ILLUMI. LIGHT
i17
AUTO A/C CONTROL
MODULE
B: i49
ASH TRAY ILLUMI. LIGHT
i21
i28
E
REF. TO GND-05

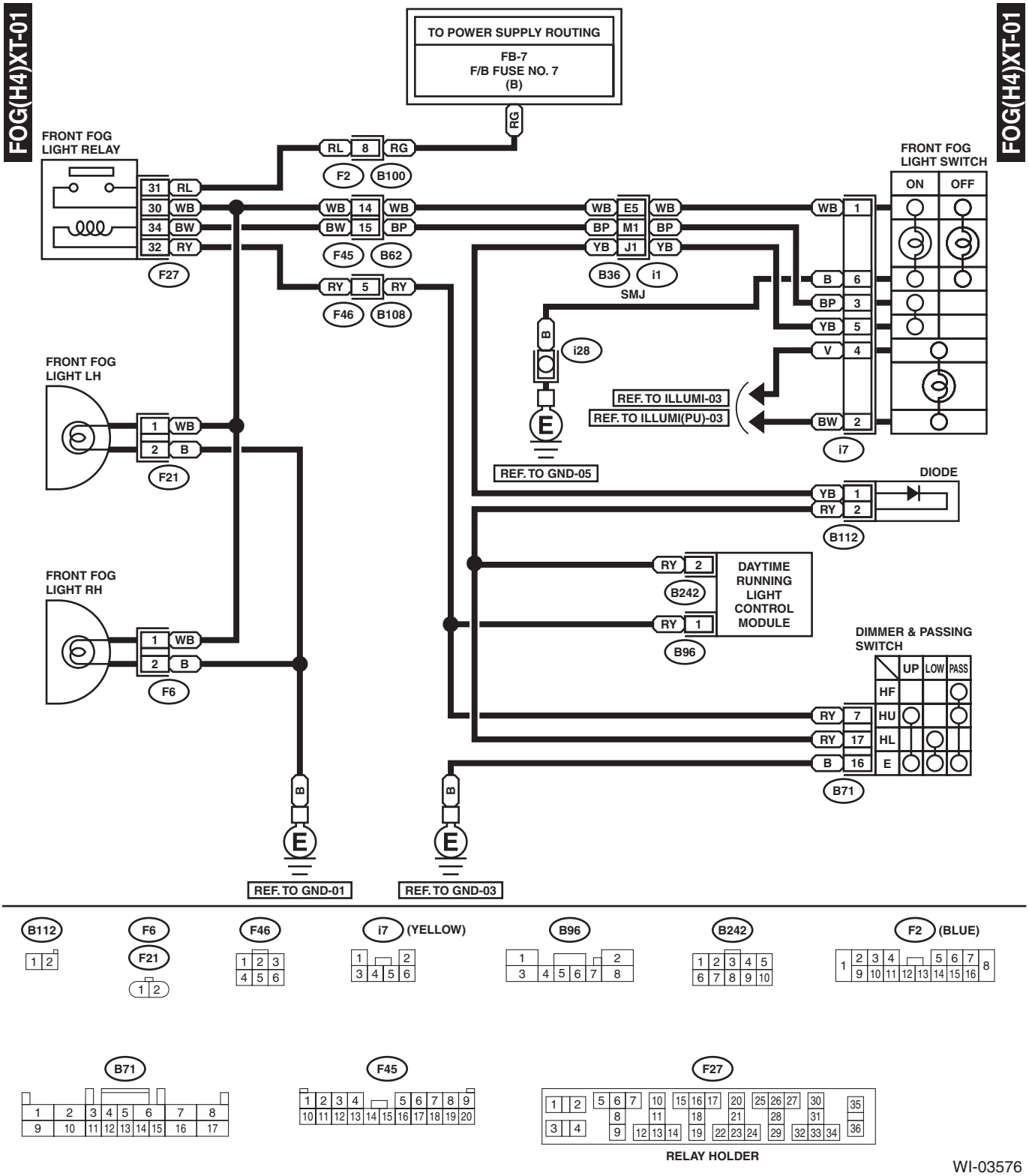

i21
i23
i25
i7 (YELLOW)
i19 (BROWN)
i43
i67 (GRAY)
i68 (GRAY)
i74
i20
i22
i26
i17 (GRAY)
B: i49 (GRAY)
A: i10 (GREEN)

WI-03575

26.Front Fog Light System

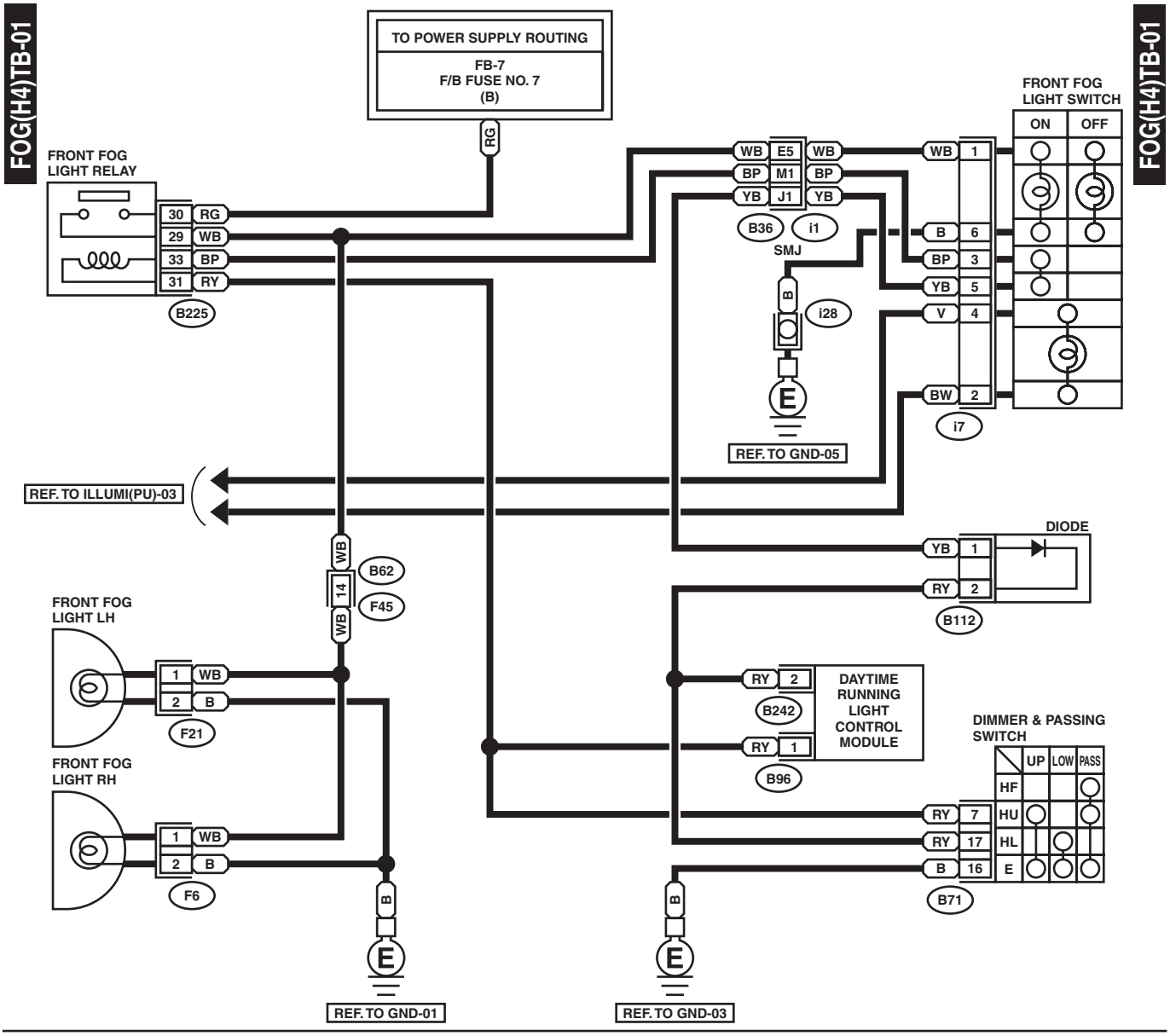
A: SCHEMATIC

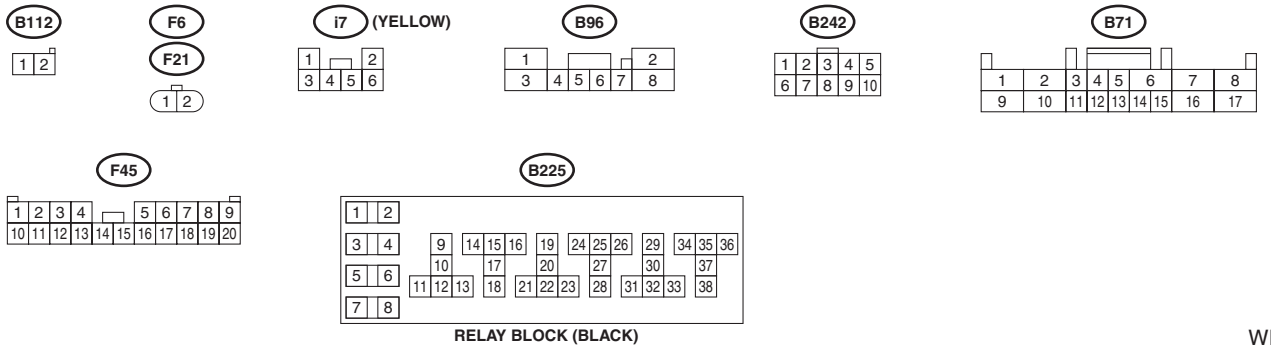
1. EXCEPT 4-CYLINDER TURBO ENGINE



WI-03576

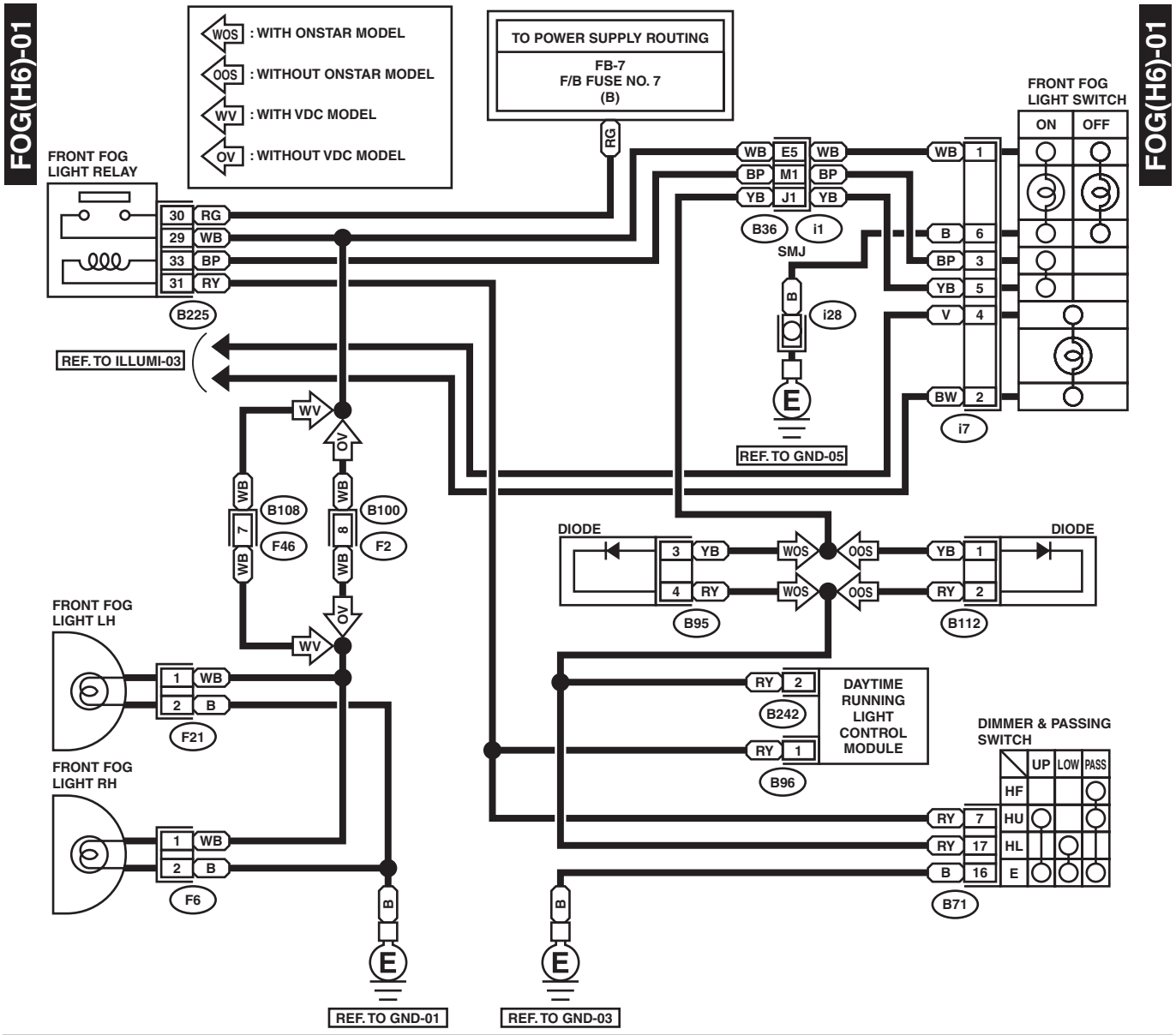
2. 4-CYLINDER TURBO ENGINE

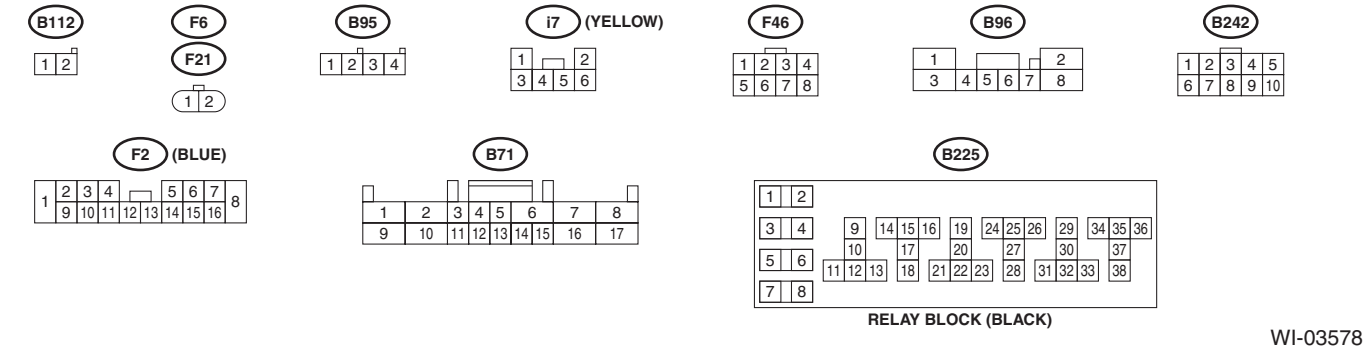




WI-03577

3. 6-CYLINDER ENGINE





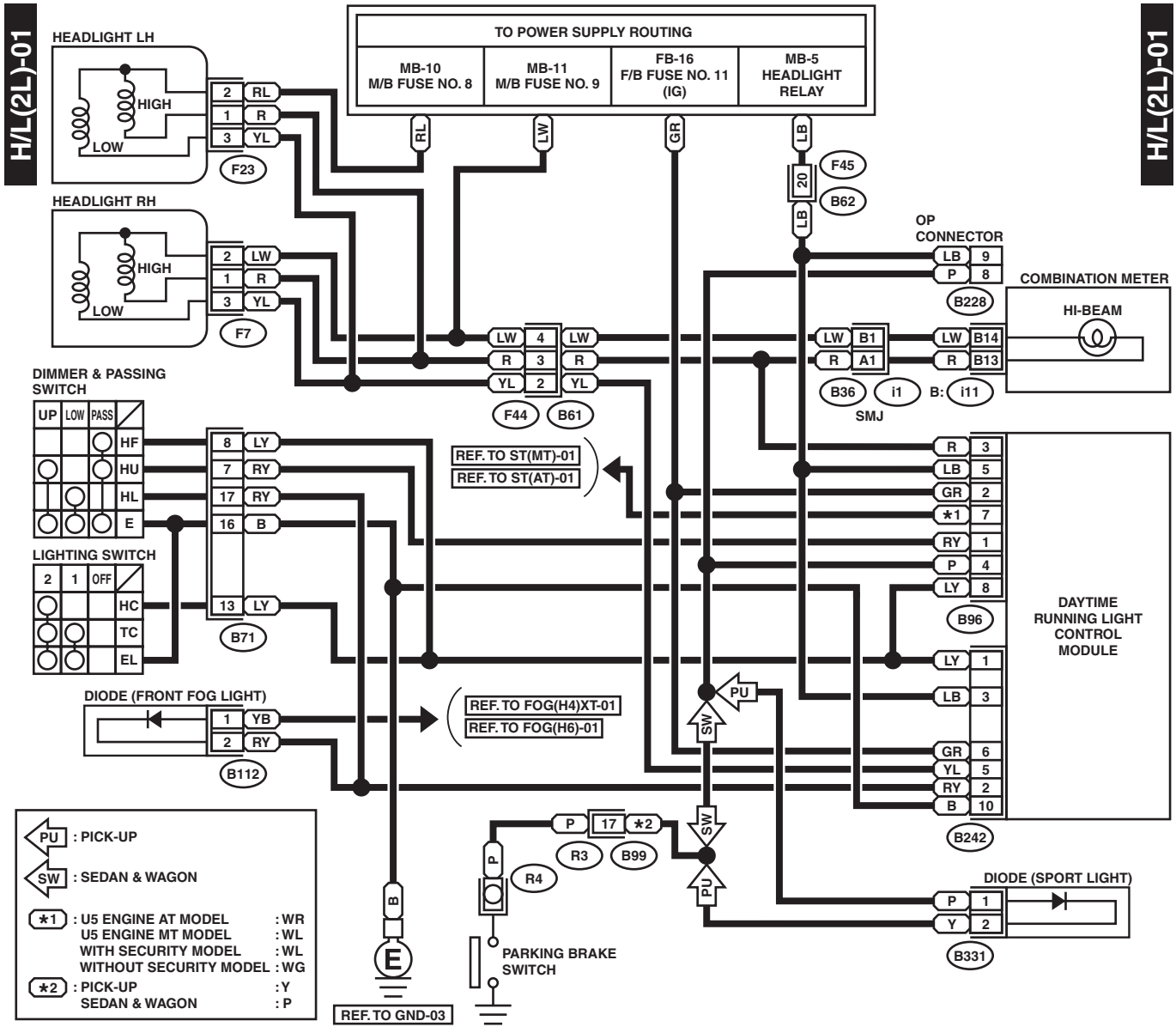
WI-03578

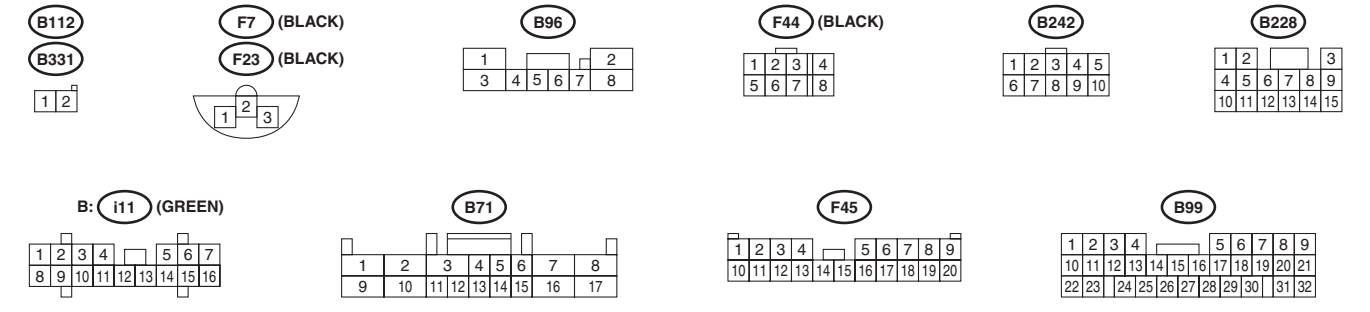
MEMO:

27.Headlight System

A: SCHEMATIC

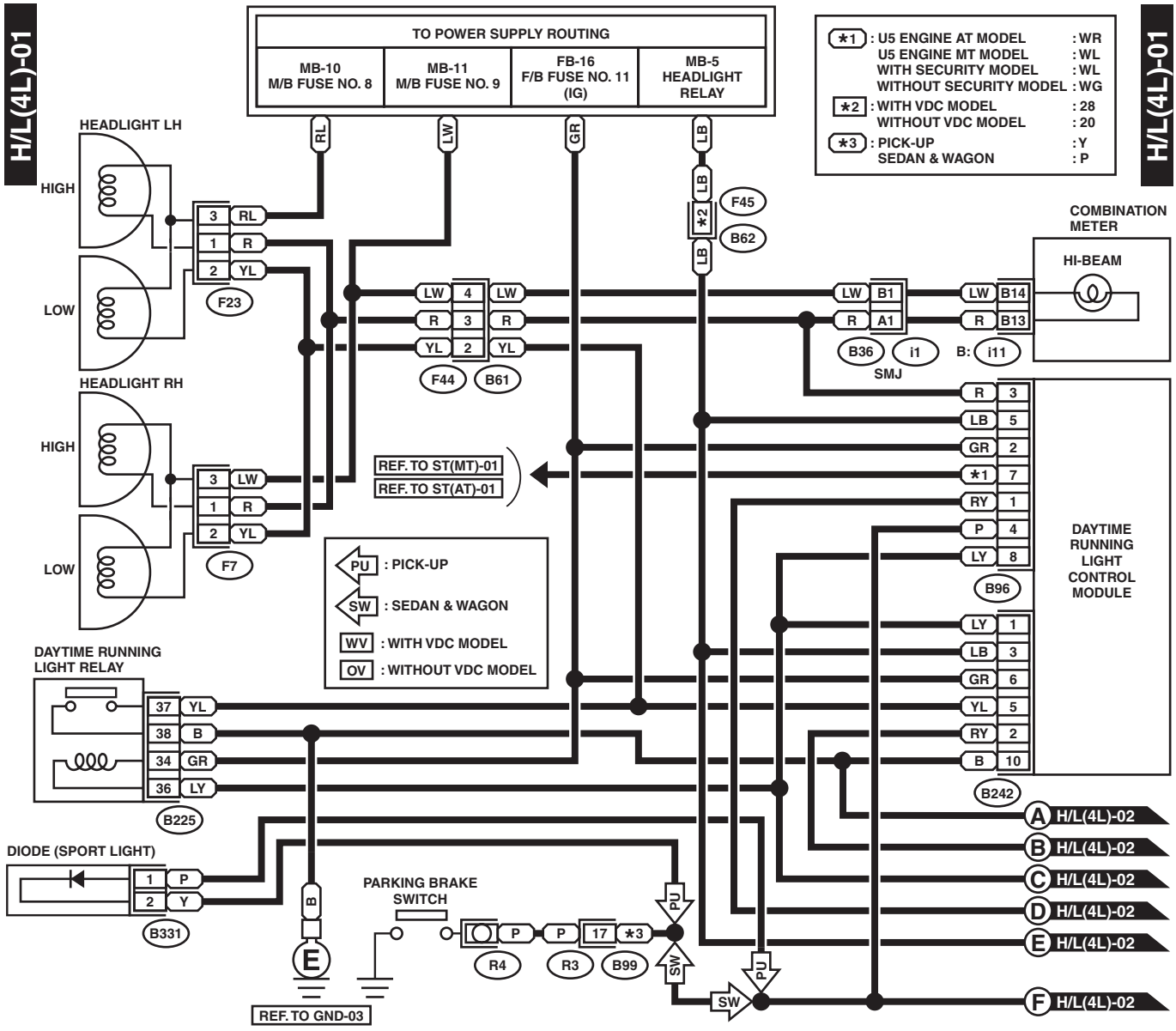
1. 2-LIGHT MODEL



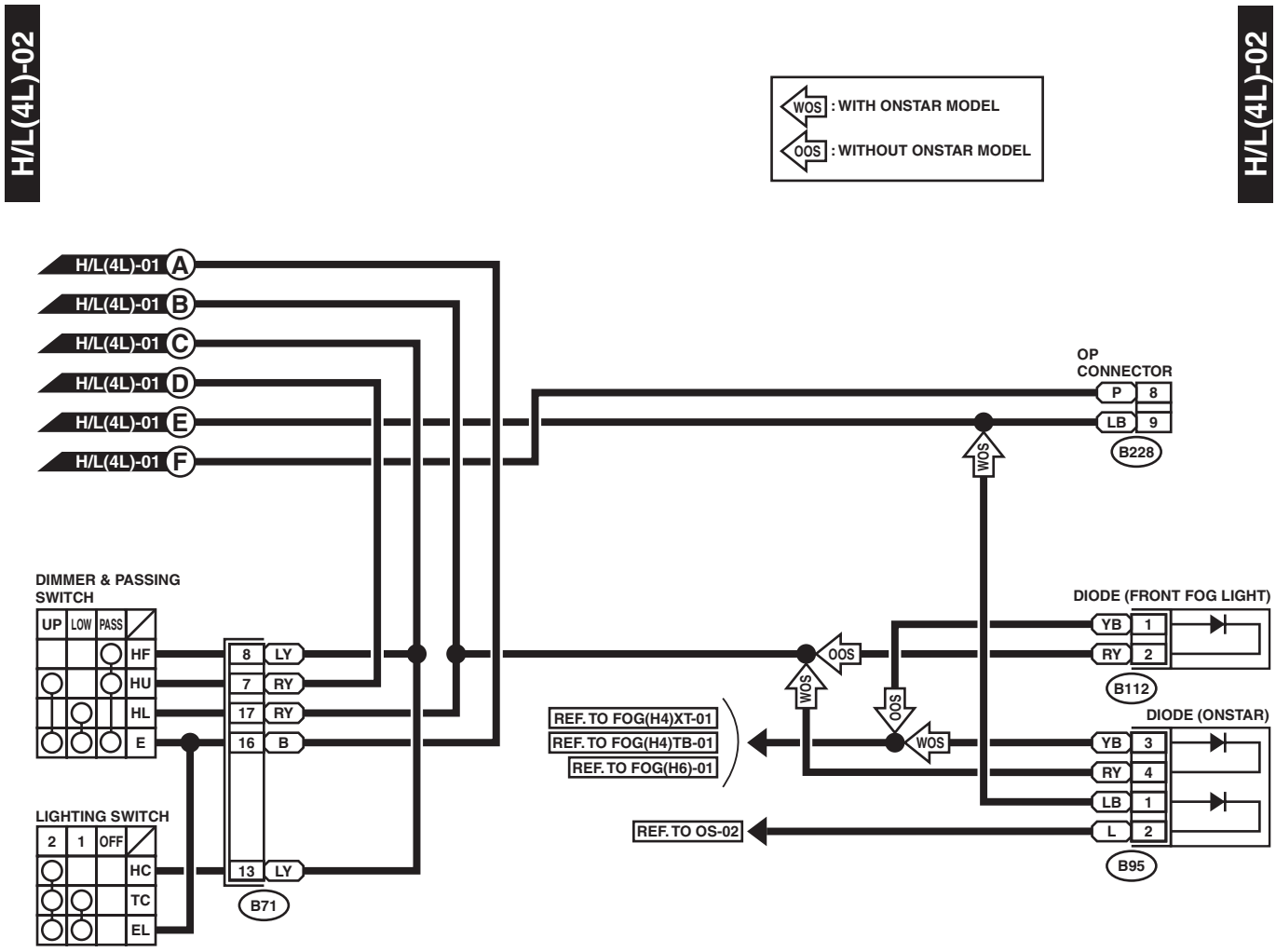


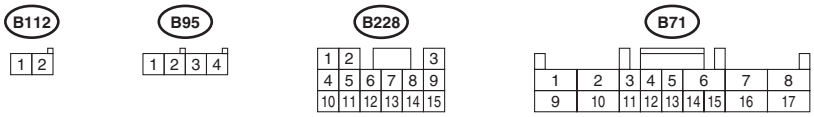
WI-03579

2. 4-LIGHT MODEL



WI-06414


H/L(4L)-02
H/L(4L)-02
WOS : WITH ONSTAR MODEL
OOS : WITHOUT ONSTAR MODEL
H/L(4L)-01 A
H/L(4L)-01 B
H/L(4L)-01 C
H/L(4L)-01 D
H/L(4L)-01 E
H/L(4L)-01 F
OP CONNECTOR
P 8
LB 9
B228
WOS
DIMMER & PASSING SWITCH
UP LOW PASS
HF
HU
HL
E
8 LY
7 RY
17 RY
16 B
LIGHTING SWITCH
2 1 OFF
HC
TC
EL
13 LY
B71
OOS
WOS
DIODE (FRONT FOG LIGHT)
YB 1
RY 2
B112
DIODE (ONSTAR)
YB 3
RY 4
LB 1
L 2
B95
REF. TO FOG(H4)XT-01
REF. TO FOG(H4)TB-01
REF. TO FOG(H6)-01
REF. TO OS-02


B112
1 2
B95
1 2 3 4
B228
1 2 3
4 5 6 7 8 9
10 11 12 13 14 15
B71
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17

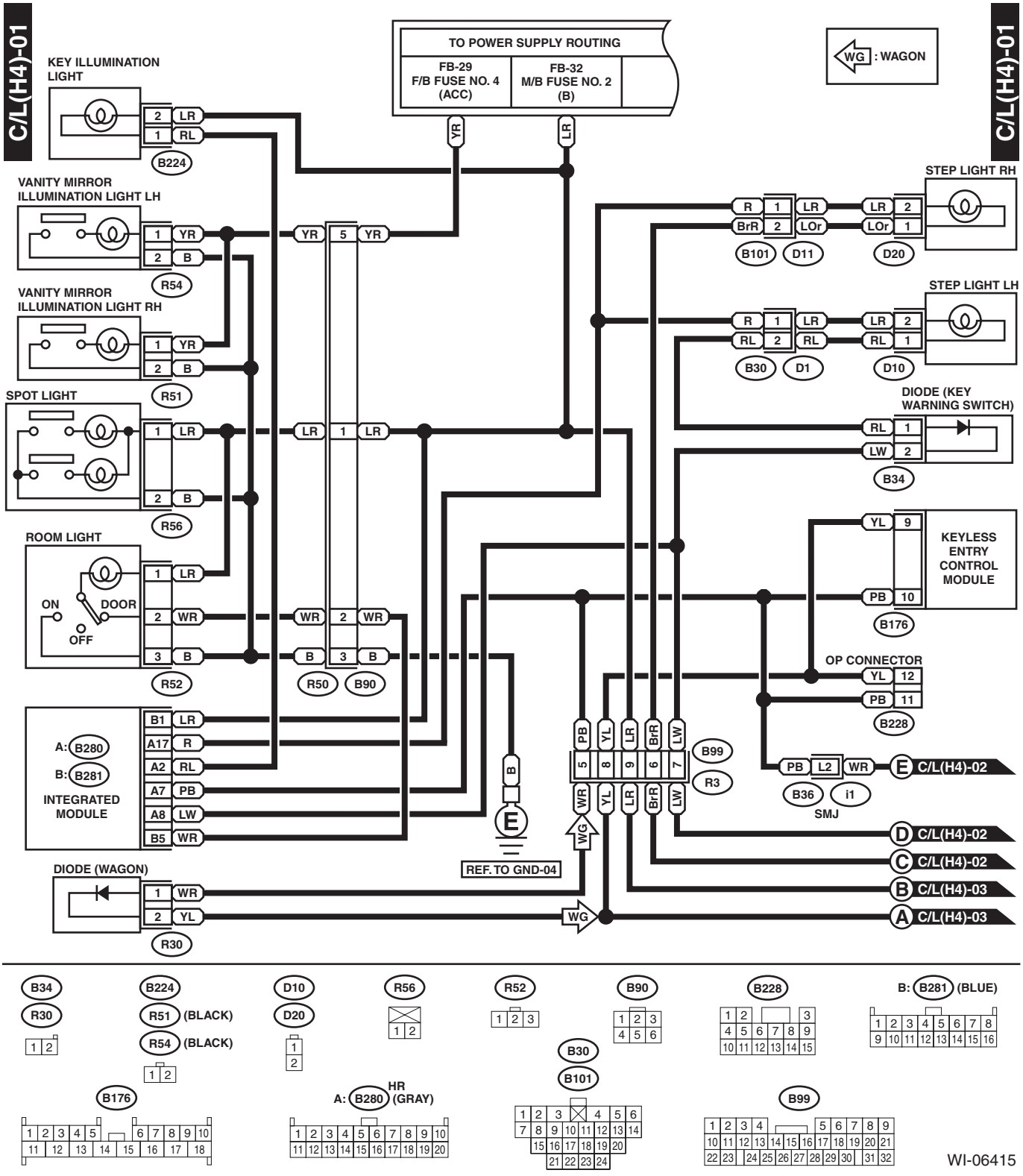
WI-03581

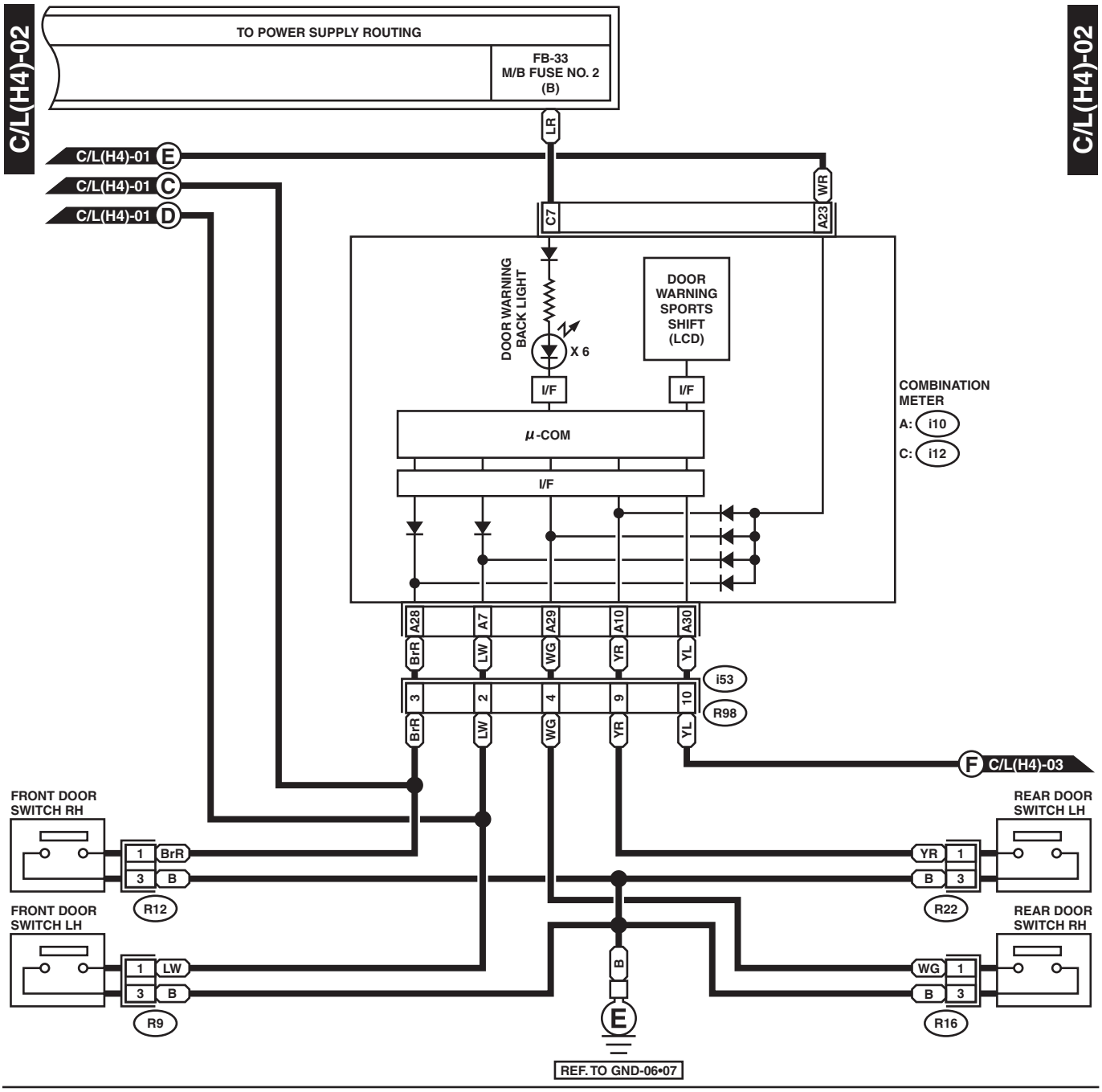
MEMO:

28.In Compartment Light System

A: SCHEMATIC

1. SEDAN & WAGON MODEL

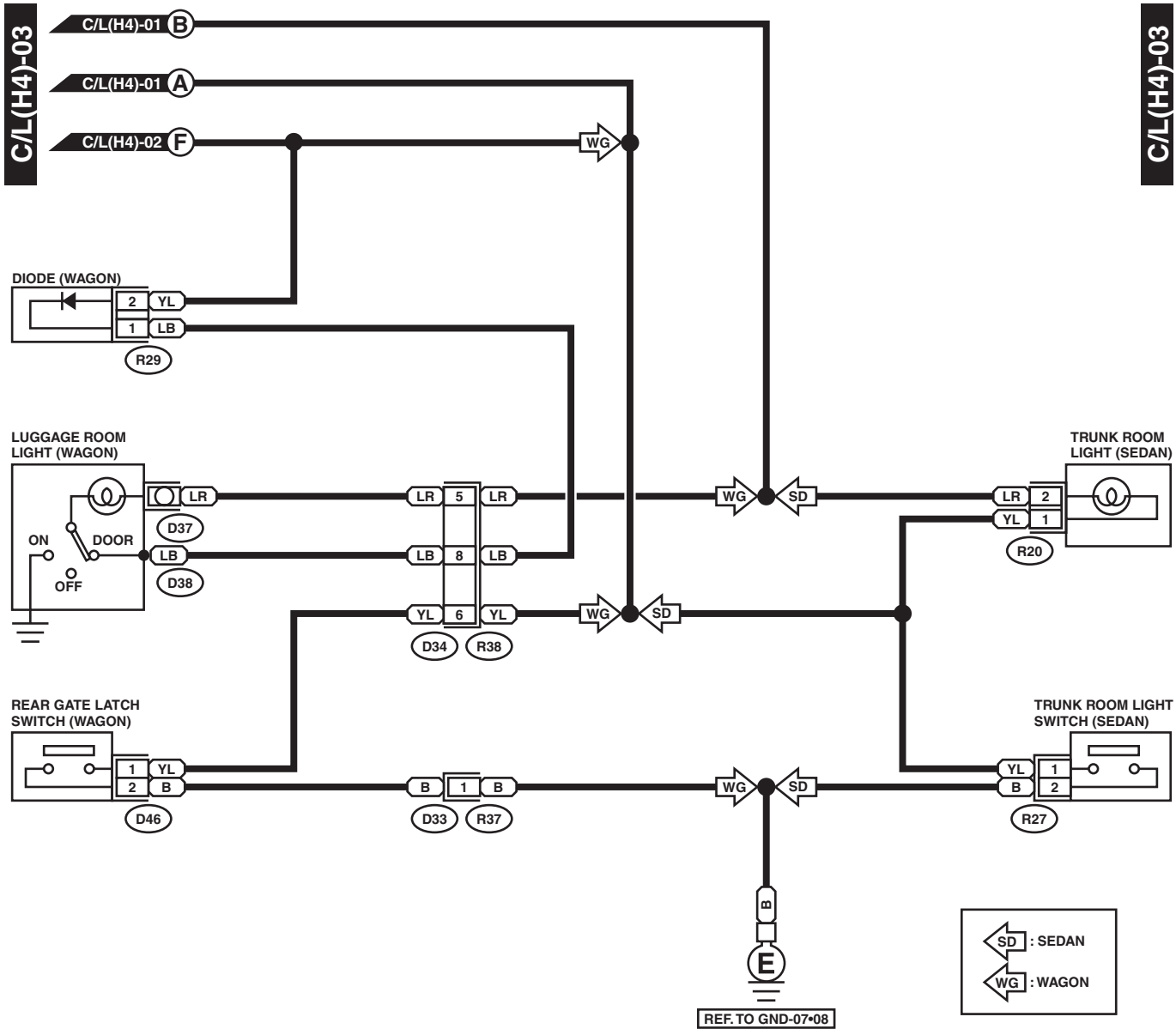


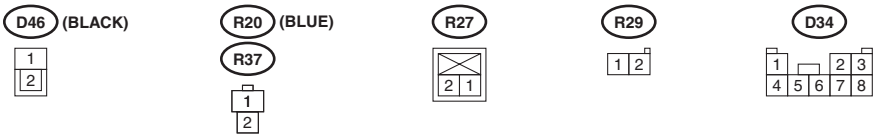


R9
R12
R16 (BLACK)
R22 (BLACK)
C: i12 (GREEN)
R98 (BLUE)
A: i10 (GREEN)

WI-00653

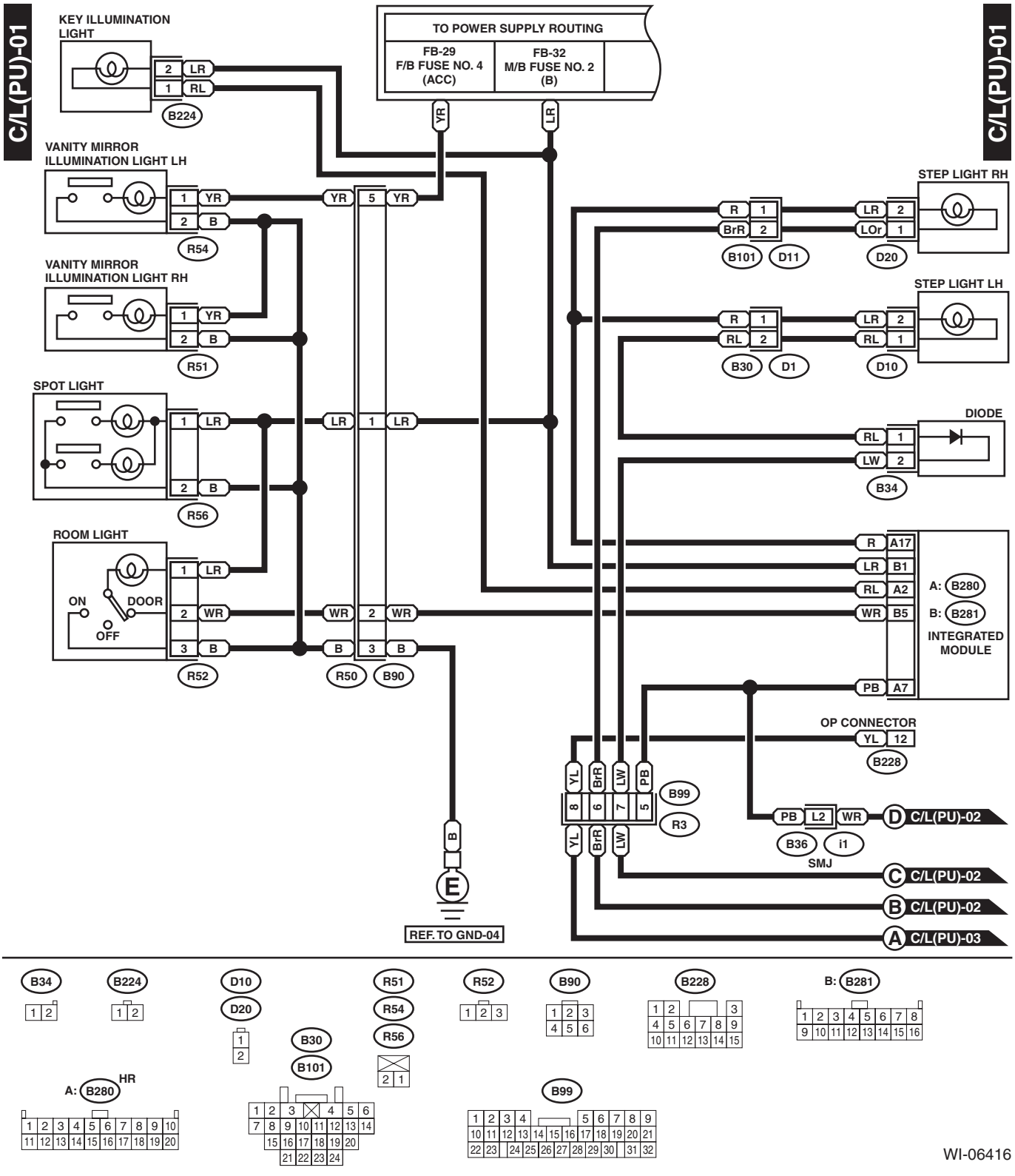
IN COMPARTMENT LIGHT SYSTEM





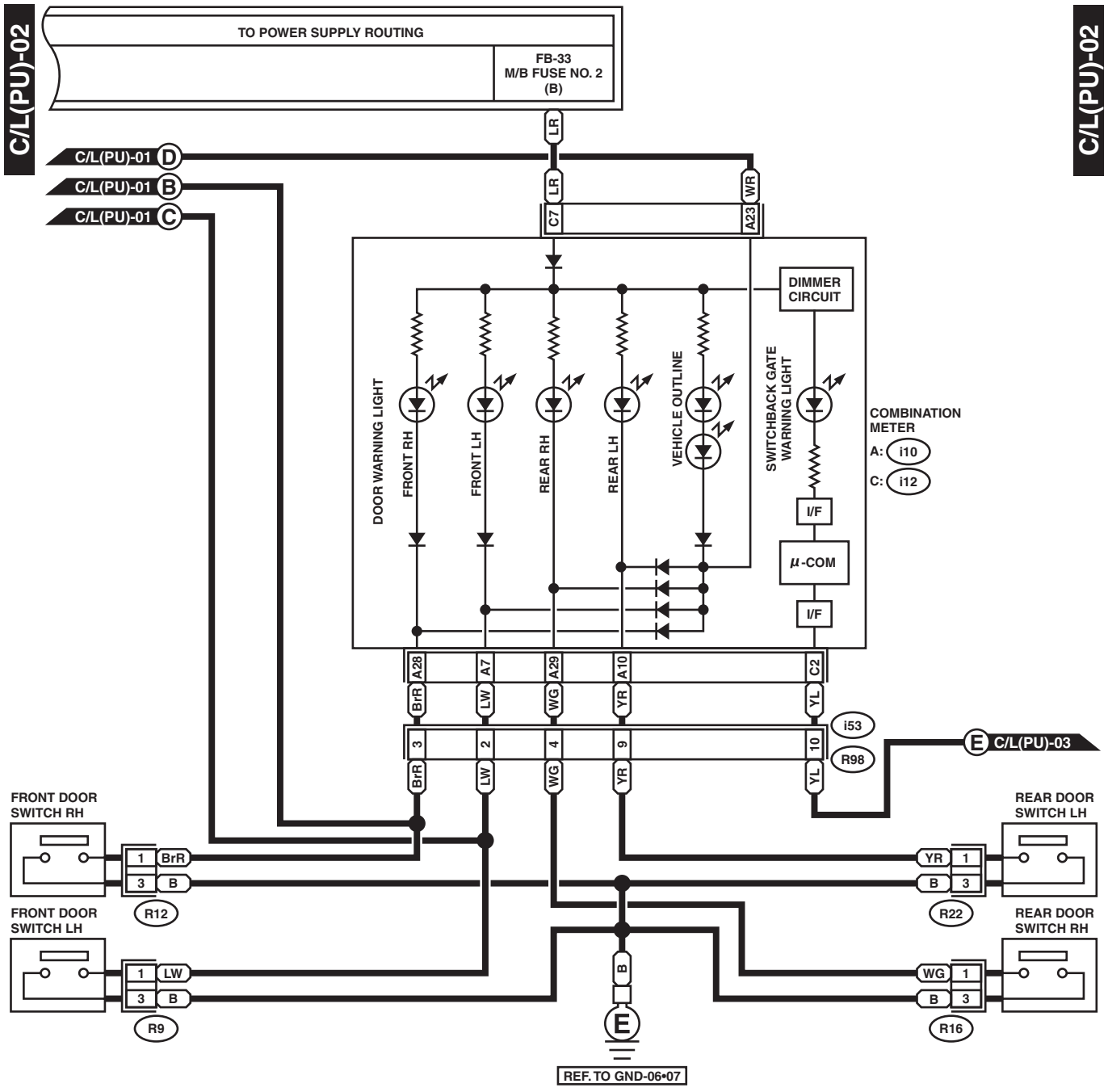
WI-00654

2. PICK-UP MODEL



WI-06416

IN COMPARTMENT LIGHT SYSTEM



R9
R12

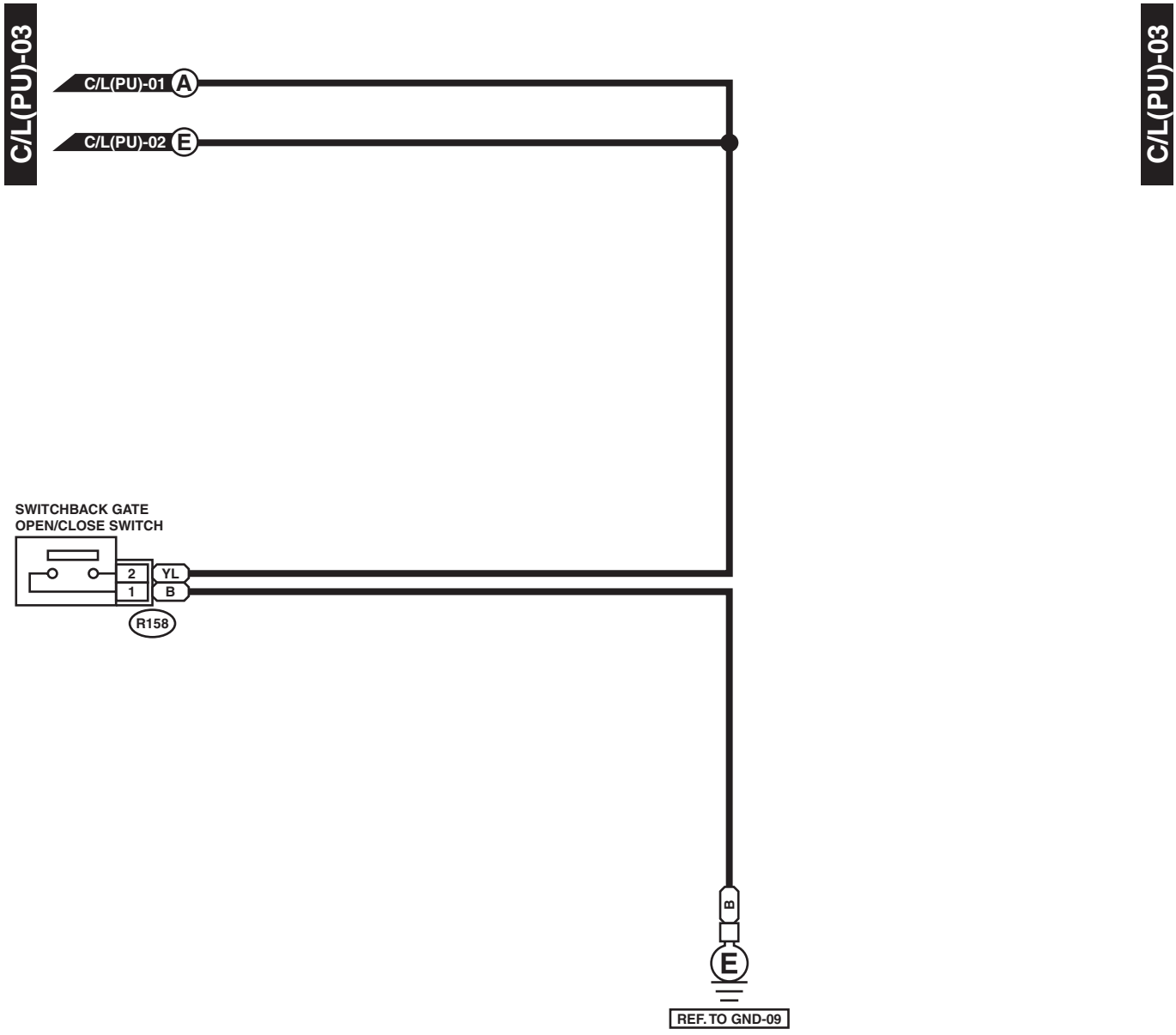
R16 (BLACK)
R22 (BLACK)

C: i12 (GREEN)

R98 (BLUE)

A: i10 (GREEN)

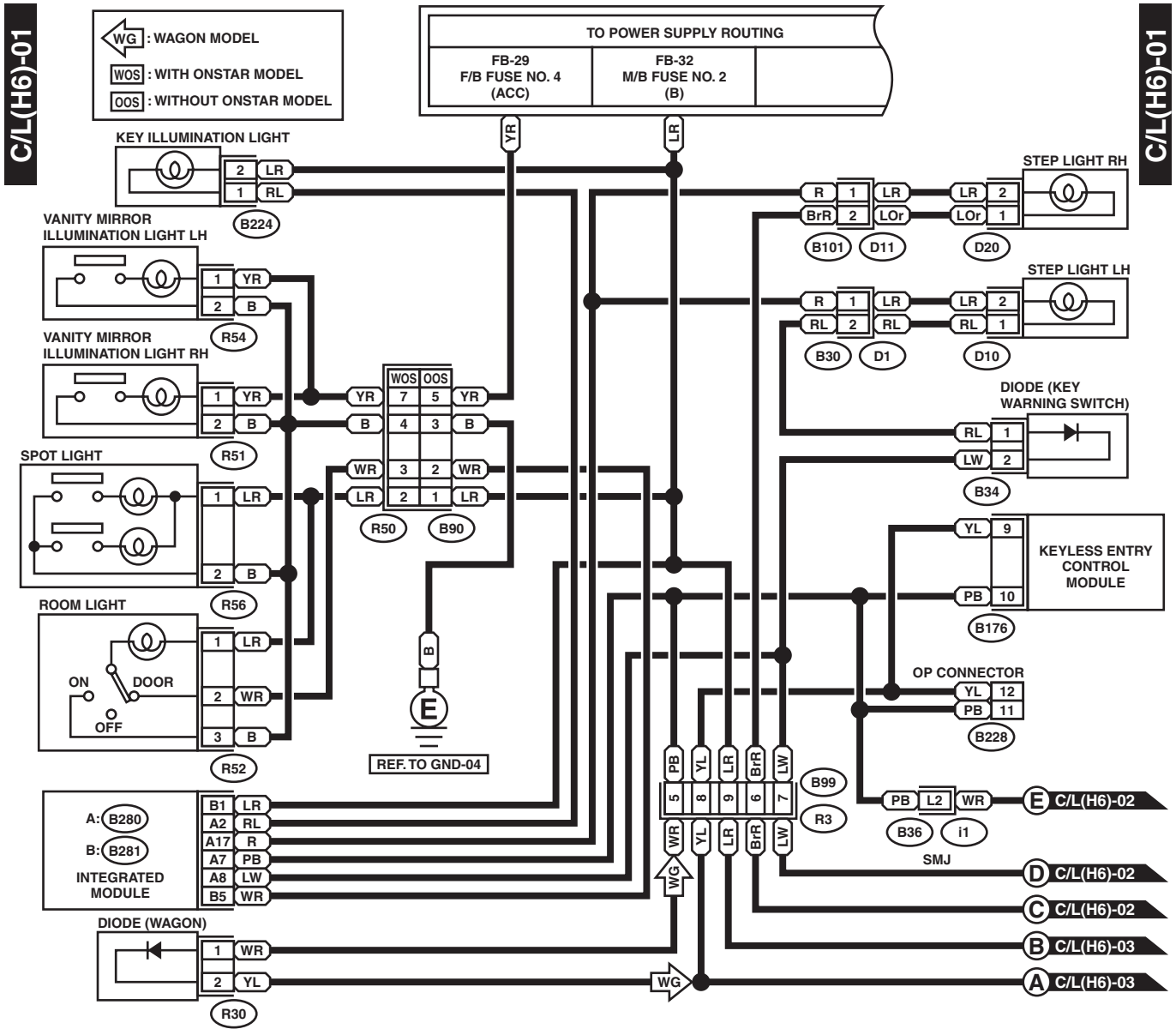
WI-00656

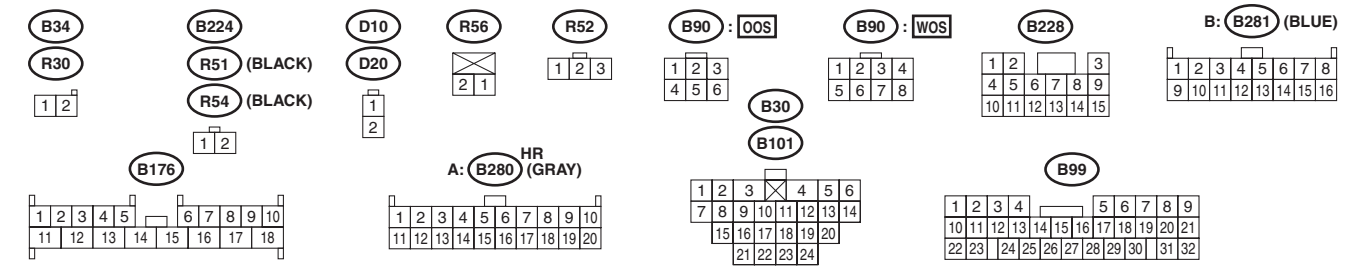

C/L(PU)-03
C/L(PU)-01 A
C/L(PU)-02 E
C/L(PU)-03
SWITCHBACK GATE
OPEN/CLOSE SWITCH
2
1
YL
B
R158
B
E
REF. TO GND-09

R158
2 1

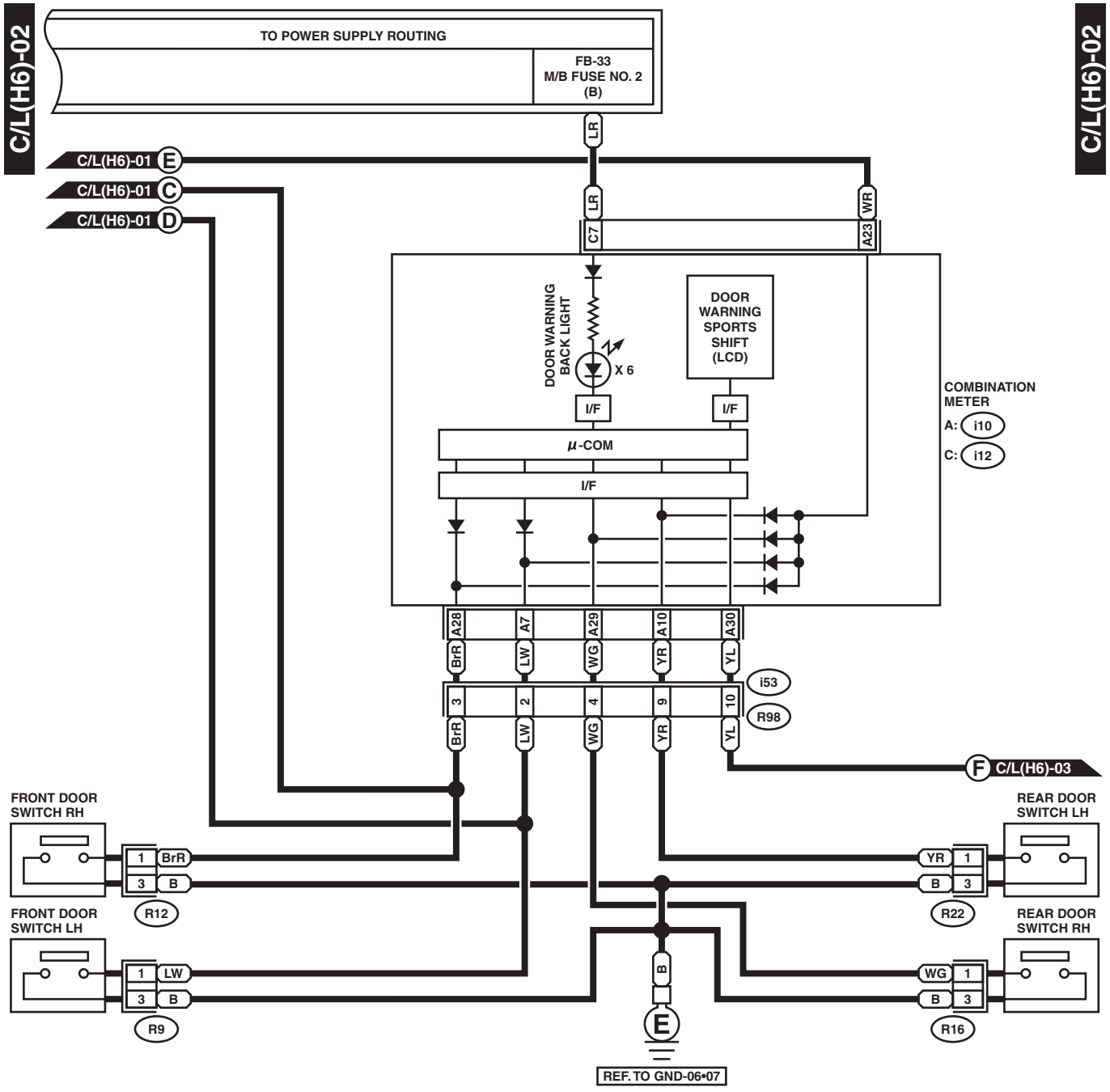
WI-03583

3. 6-CYLINDER ENGINE





WI-06417



R9
R12

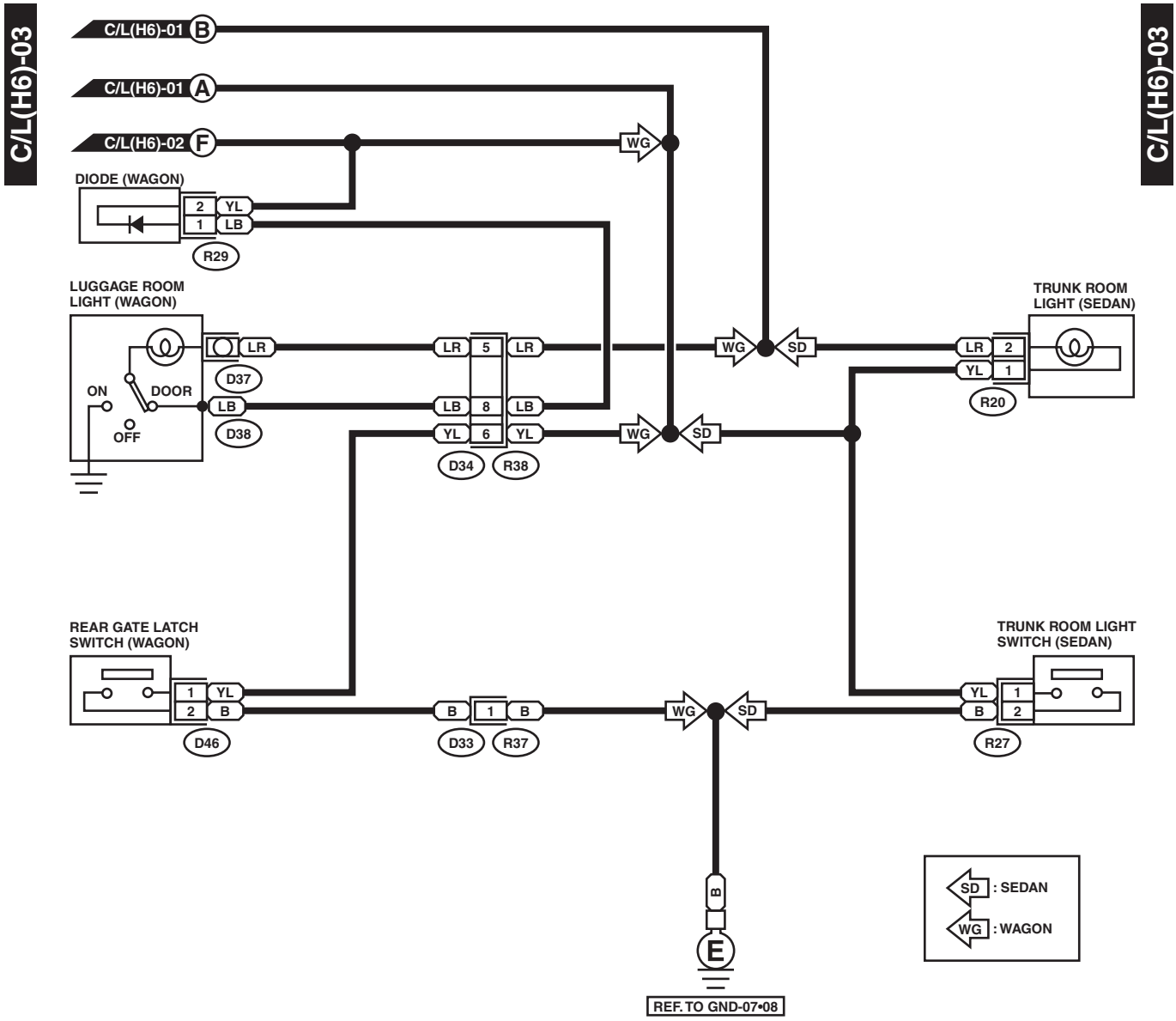
R16 (BLACK)
R22 (BLACK)

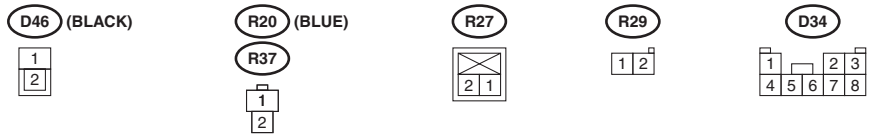
C: i12 (GREEN)

R98 (BLUE)

A: i10 (GREEN)

WI-00659


C/L(H6)-03
C/L(H6)-01 B
C/L(H6)-01 A
C/L(H6)-02 F
WG
DIODE (WAGON)
2 YL
1 LB
R29
LUGGAGE ROOM LIGHT (WAGON)
LR
D37
ON
DOOR
OFF
LB
D38
LR 5 LR
LB 8 LB
YL 6 YL
D34
R38
WG
SD
TRUNK ROOM LIGHT (SEDAN)
LR 2
YL 1
R20
REAR GATE LATCH SWITCH (WAGON)
1 YL
2 B
D46
B 1 B
D33
R37
TRUNK ROOM LIGHT SWITCH (SEDAN)
YL 1
B 2
R27
B
E
REF.TO GND-07•08
SD : SEDAN
WG : WAGON


D46 (BLACK)
1
2
R20 (BLUE)
R37
1
2
R27
2 1
R29
1 2
D34
1 2 3
4 5 6 7 8

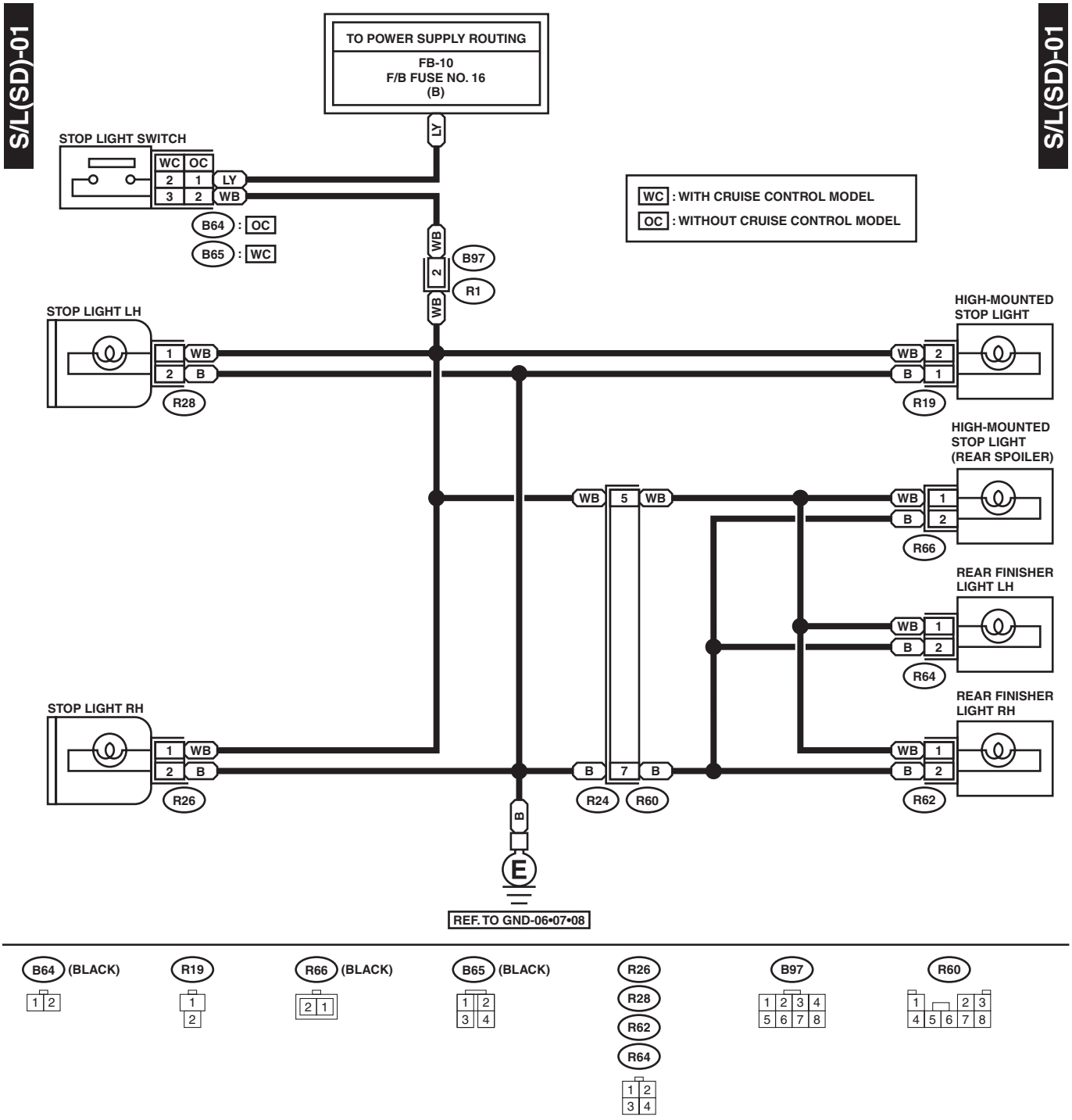
WI-00660

MEMO:

29.Stop Light System

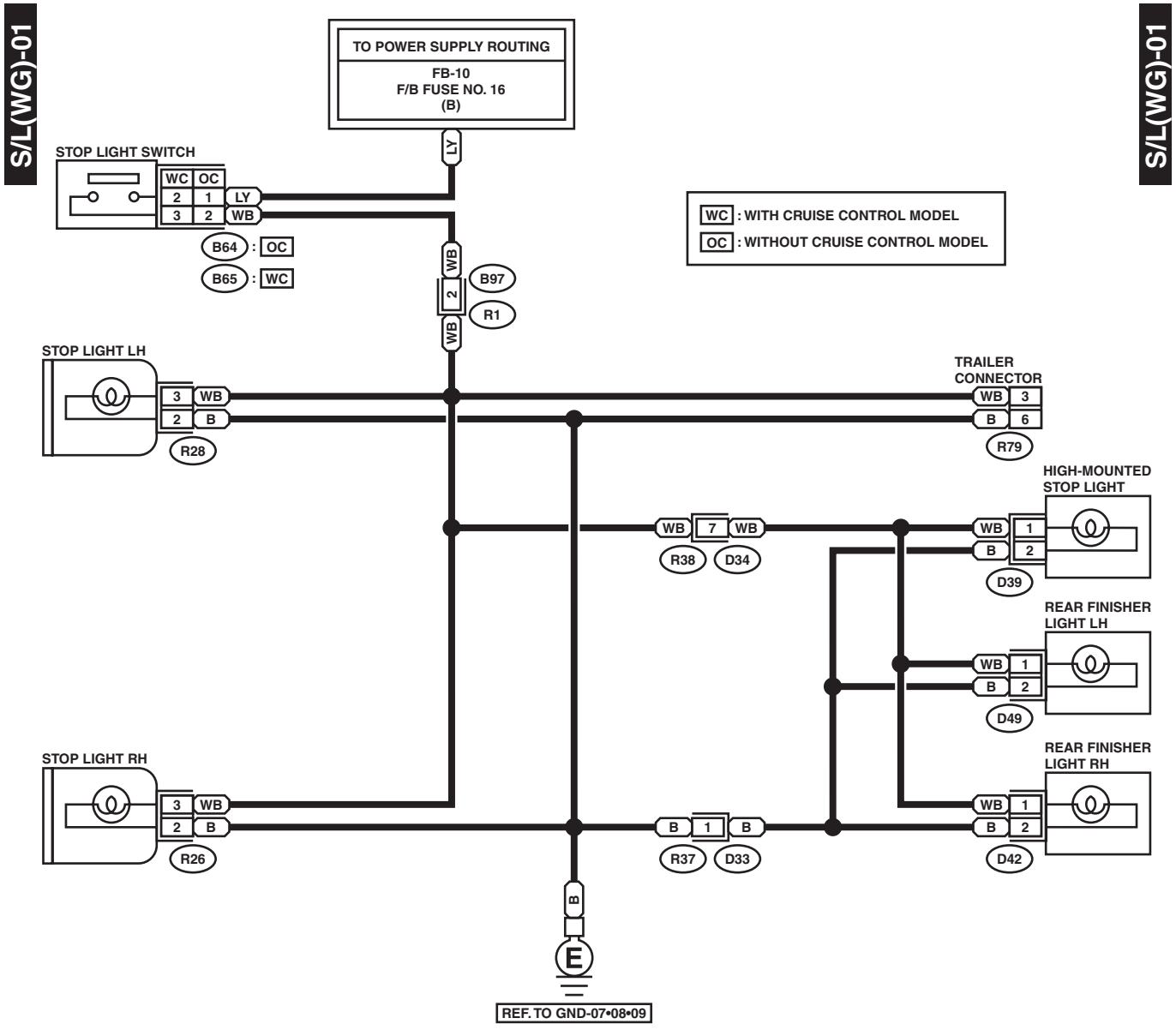
A: SCHEMATIC

1. SEDAN MODEL



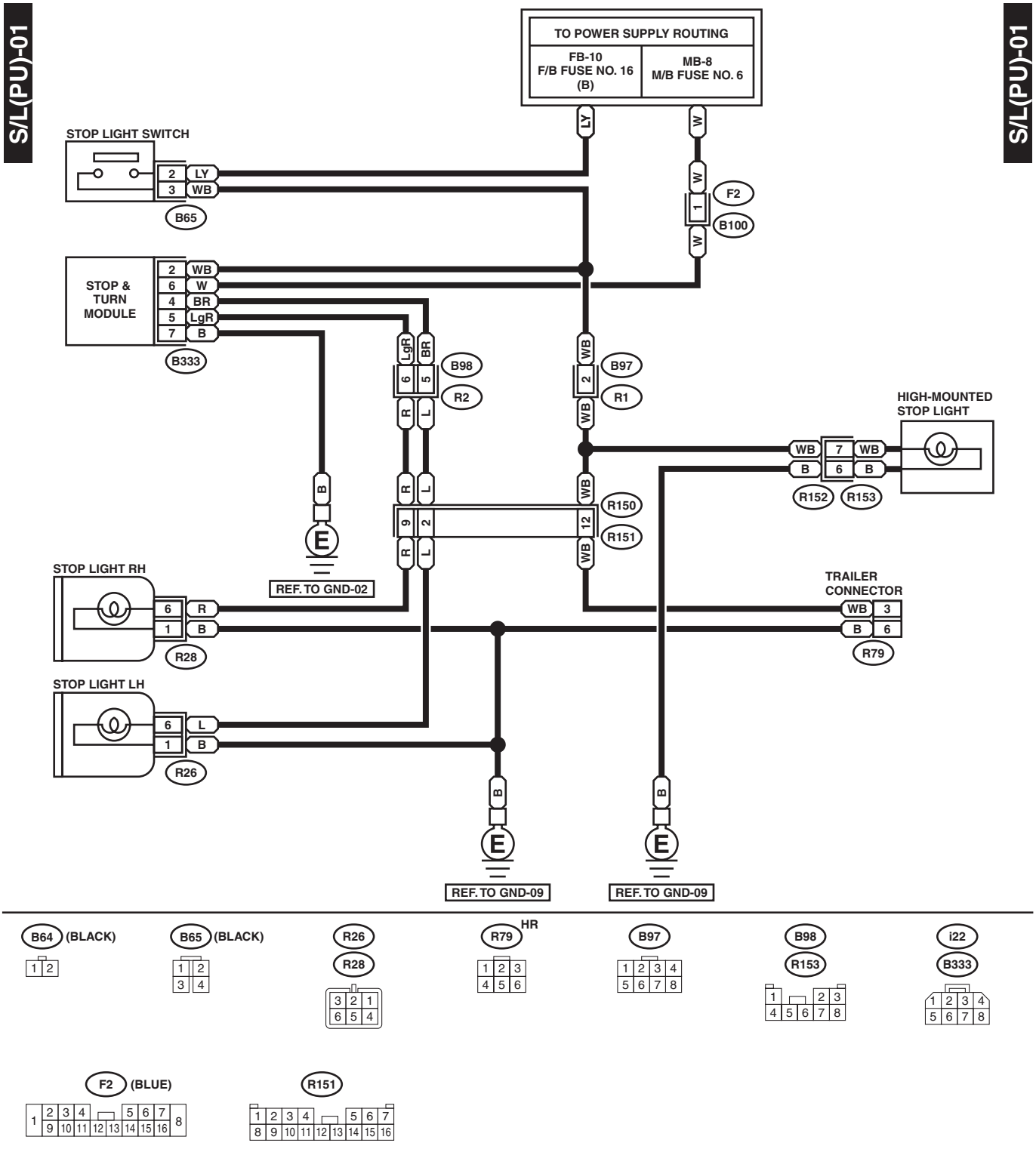
WI-03585

2. WAGON MODEL



WI-06418

3. PICK-UP MODEL



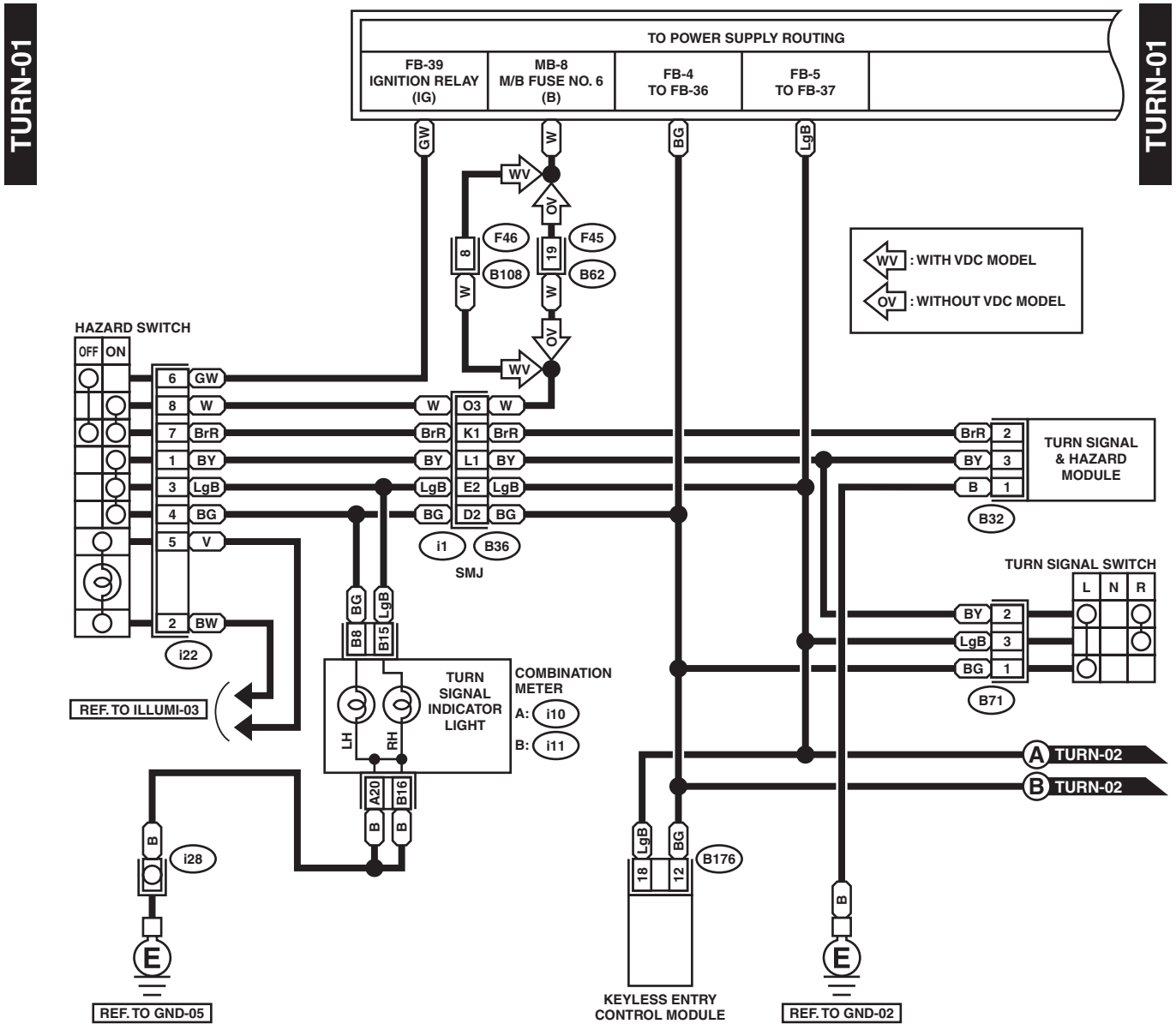
WI-06419

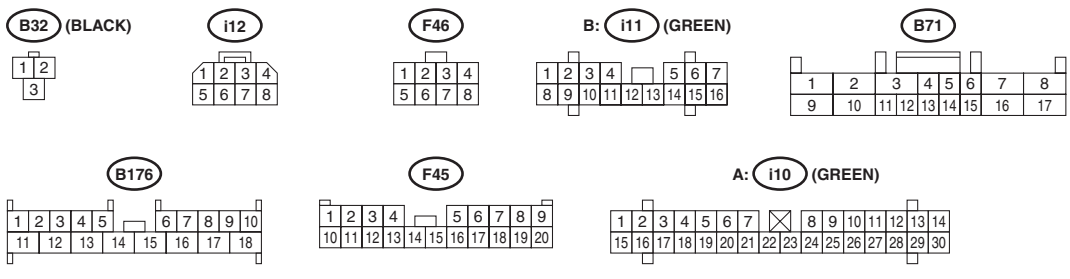
MEMO:

30.Turn Signal Light and Hazard Light System

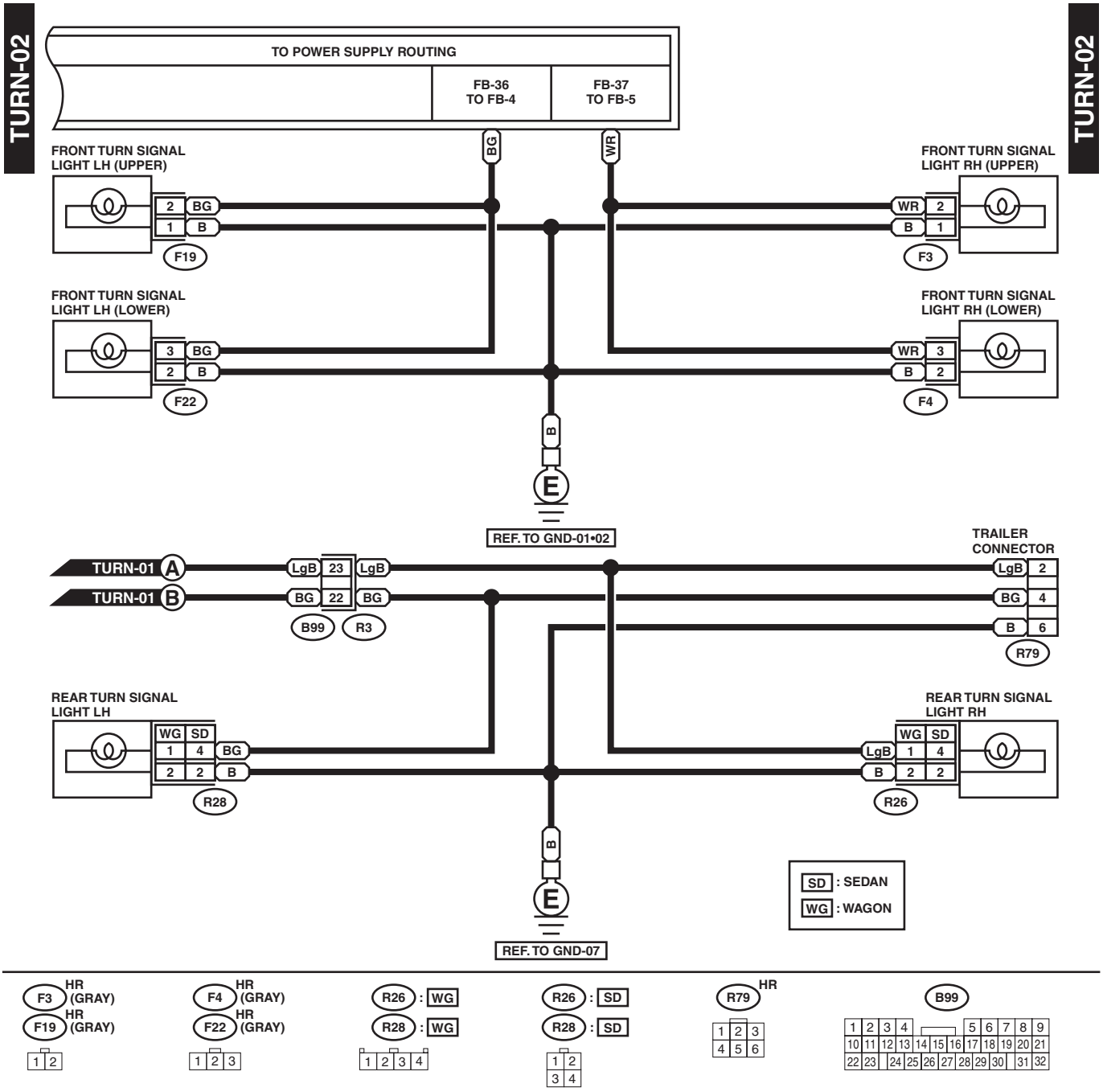
A: SCHEMATIC

1. SEDAN & WAGON MODEL



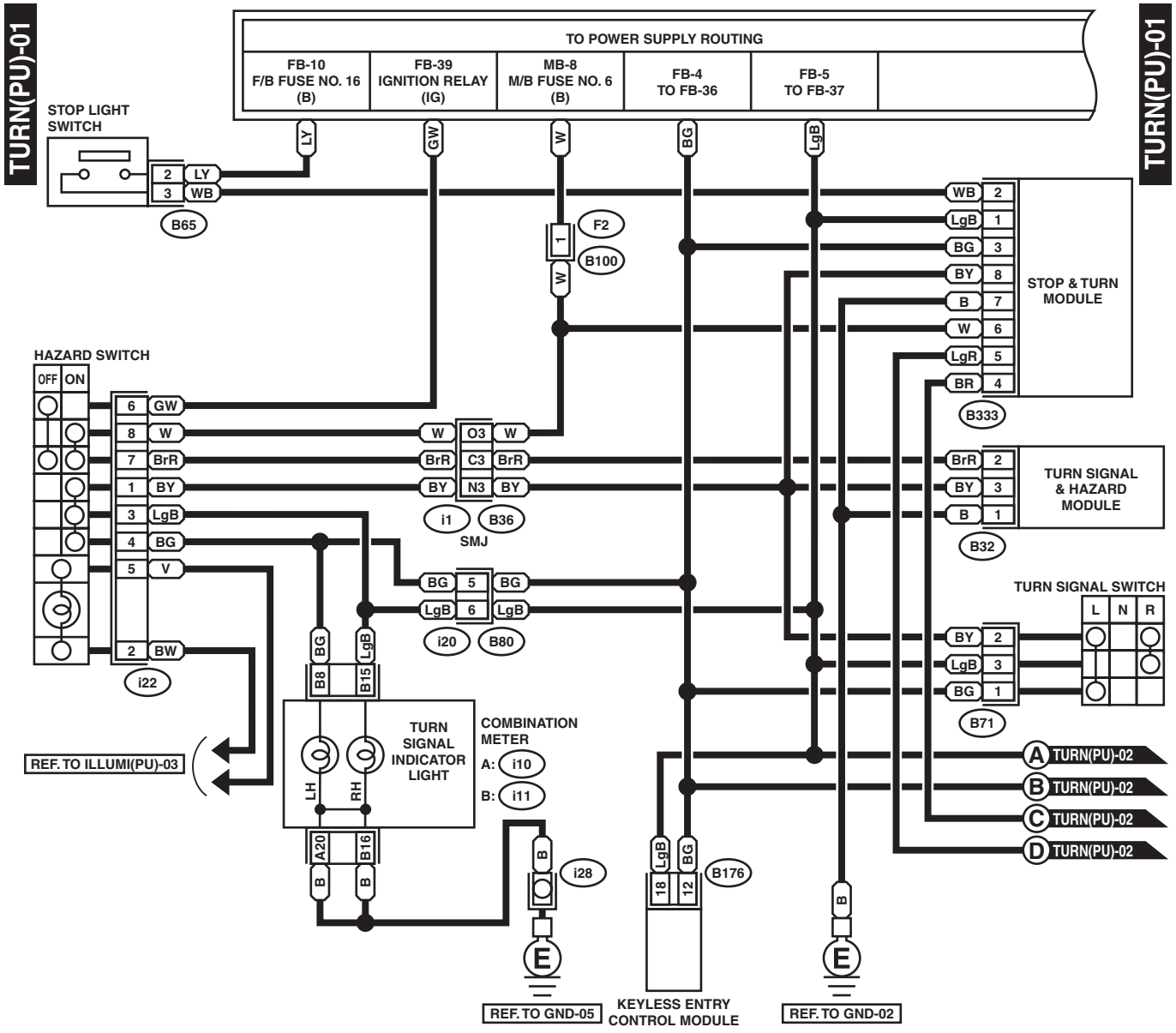


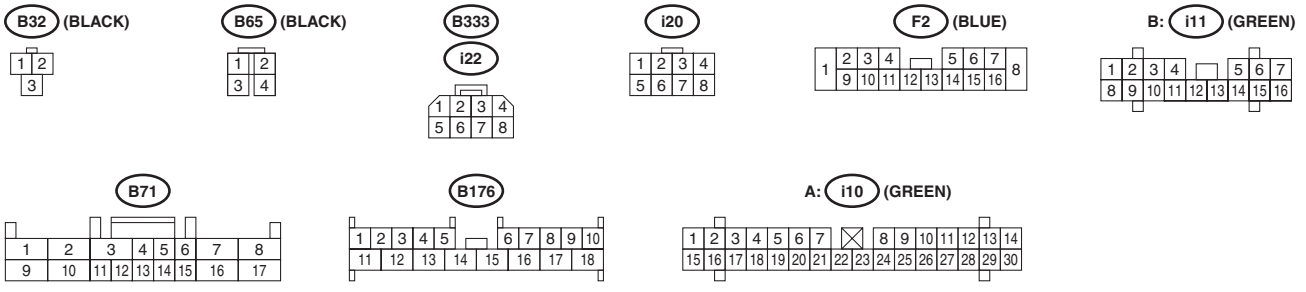
WI-00664


TURN-02
TURN-02
TO POWER SUPPLY ROUTING
FB-36
TO FB-4
FB-37
TO FB-5
BG
WR
FRONT TURN SIGNAL
LIGHT LH (UPPER)
2 BG
1 B
F19
FRONT TURN SIGNAL
LIGHT RH (UPPER)
WR 2
B 1
F3
FRONT TURN SIGNAL
LIGHT LH (LOWER)
3 BG
2 B
F22
FRONT TURN SIGNAL
LIGHT RH (LOWER)
WR 3
B 2
F4
B
E
REF. TO GND-01•02
TRAILER
CONNECTOR
TURN-01 A
TURN-01 B
LgB 23 LgB
BG 22 BG
B99
R3
LgB 2
BG 4
B 6
R79
REAR TURN SIGNAL
LIGHT LH
WG SD
1 4 BG
2 2 B
R28
REAR TURN SIGNAL
LIGHT RH
WG SD
LgB 1 4
B 2 2
R26
B
E
REF. TO GND-07
SD : SEDAN
WG : WAGON
F3 HR (GRAY)
F19 HR (GRAY)
1 2
F4 HR (GRAY)
F22 HR (GRAY)
1 2 3
R26 : WG
R28 : WG
1 2 3 4
R26 : SD
R28 : SD
1 2
3 4
R79 HR
1 2 3
4 5 6
B99
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32

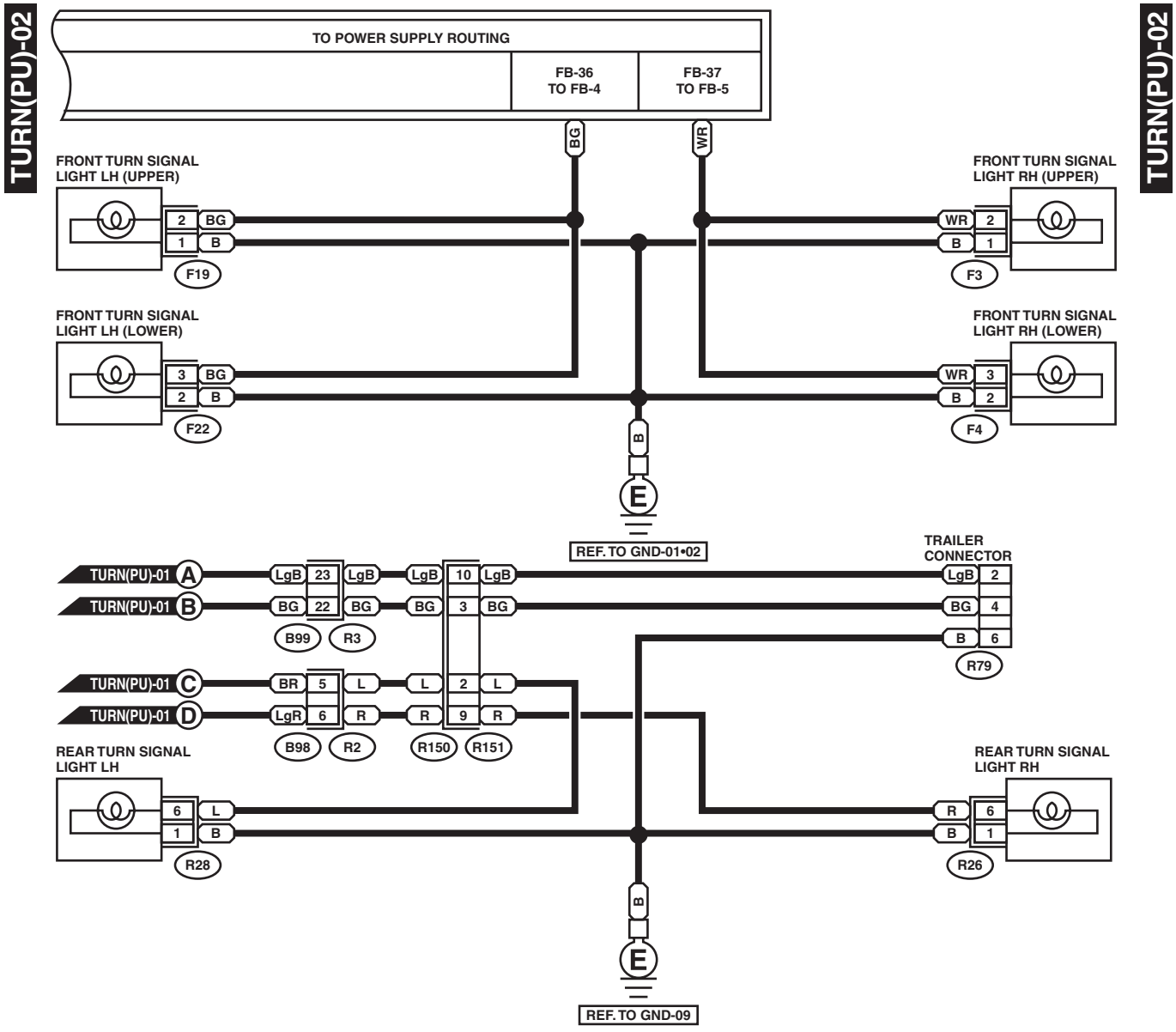
WI-06420

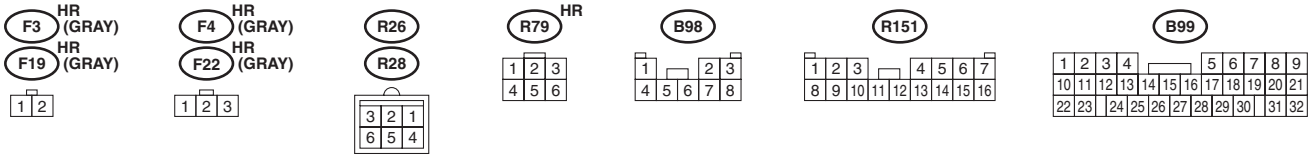
2. PICK-UP MODEL





WI-03589

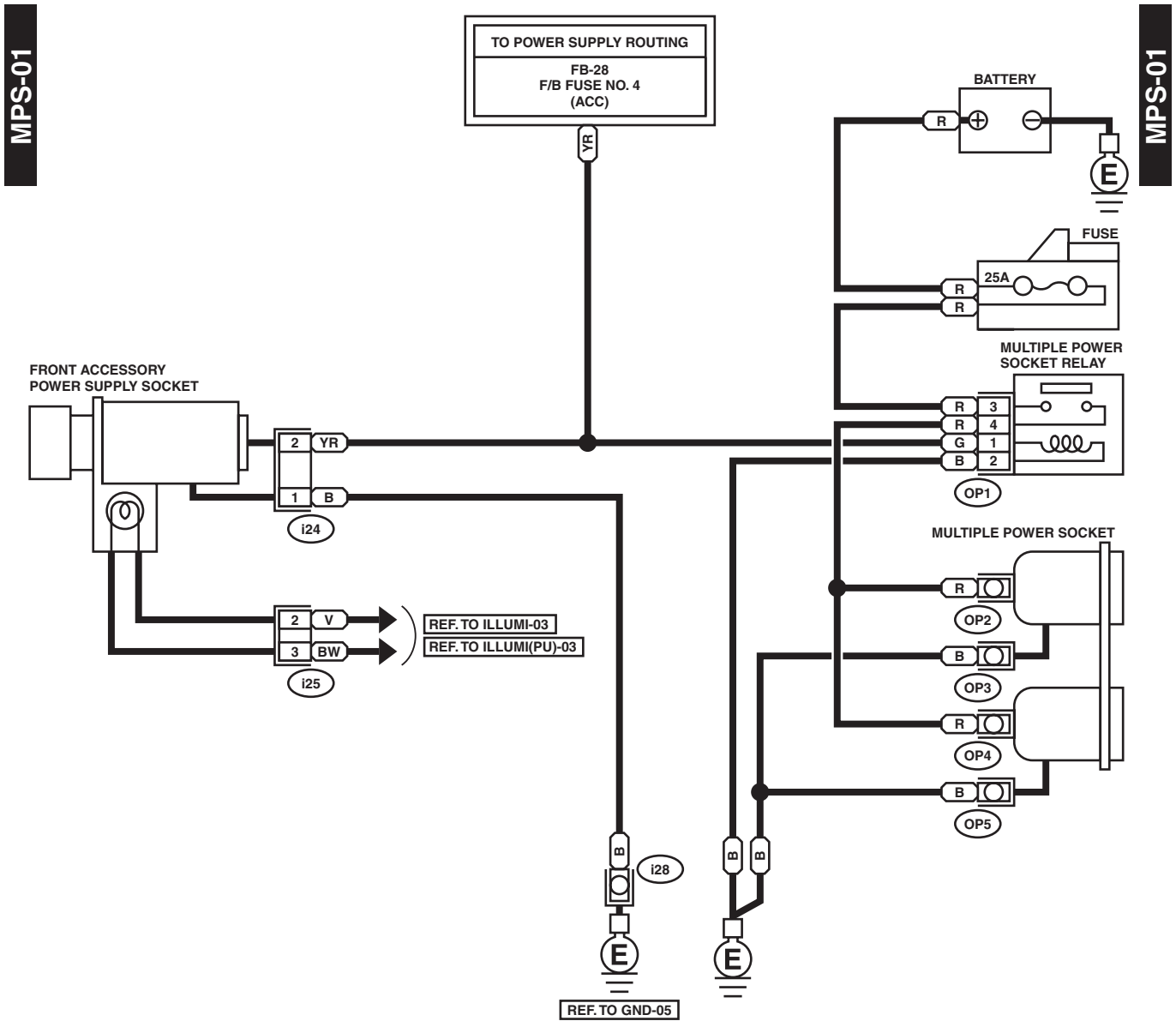

TURN(PU)-02
TO POWER SUPPLY ROUTING
FB-36
TO FB-4
FB-37
TO FB-5
BG
WR
FRONT TURN SIGNAL
LIGHT LH (UPPER)
2 BG
1 B
F19
FRONT TURN SIGNAL
LIGHT RH (UPPER)
WR 2
B 1
F3
FRONT TURN SIGNAL
LIGHT LH (LOWER)
3 BG
2 B
F22
FRONT TURN SIGNAL
LIGHT RH (LOWER)
WR 3
B 2
F4
B
E
REF. TO GND-01•02
TRAILER
CONNECTOR
TURN(PU)-01 A
TURN(PU)-01 B
TURN(PU)-01 C
TURN(PU)-01 D
LgB 23 LgB
LgB 10 LgB
BG 22 BG
BG 3 BG
B99
R3
LgB 2
BG 4
B 6
R79
BR 5 L
L 2 L
LgR 6 R
R 9 R
B98
R2
R150
R151
REAR TURN SIGNAL
LIGHT LH
6 L
1 B
R28
REAR TURN SIGNAL
LIGHT RH
R 6
B 1
R26
B
E
REF. TO GND-09
TURN(PU)-02

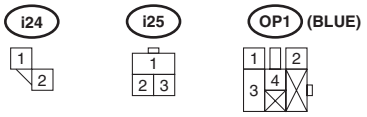

F3 HR (GRAY)
F19 HR (GRAY)
F4 HR (GRAY)
F22 HR (GRAY)
R26
R28
R79 HR
B98
R151
B99

WI-06421

31.Multiple Power Socket System (Option)

A: SCHEMATIC



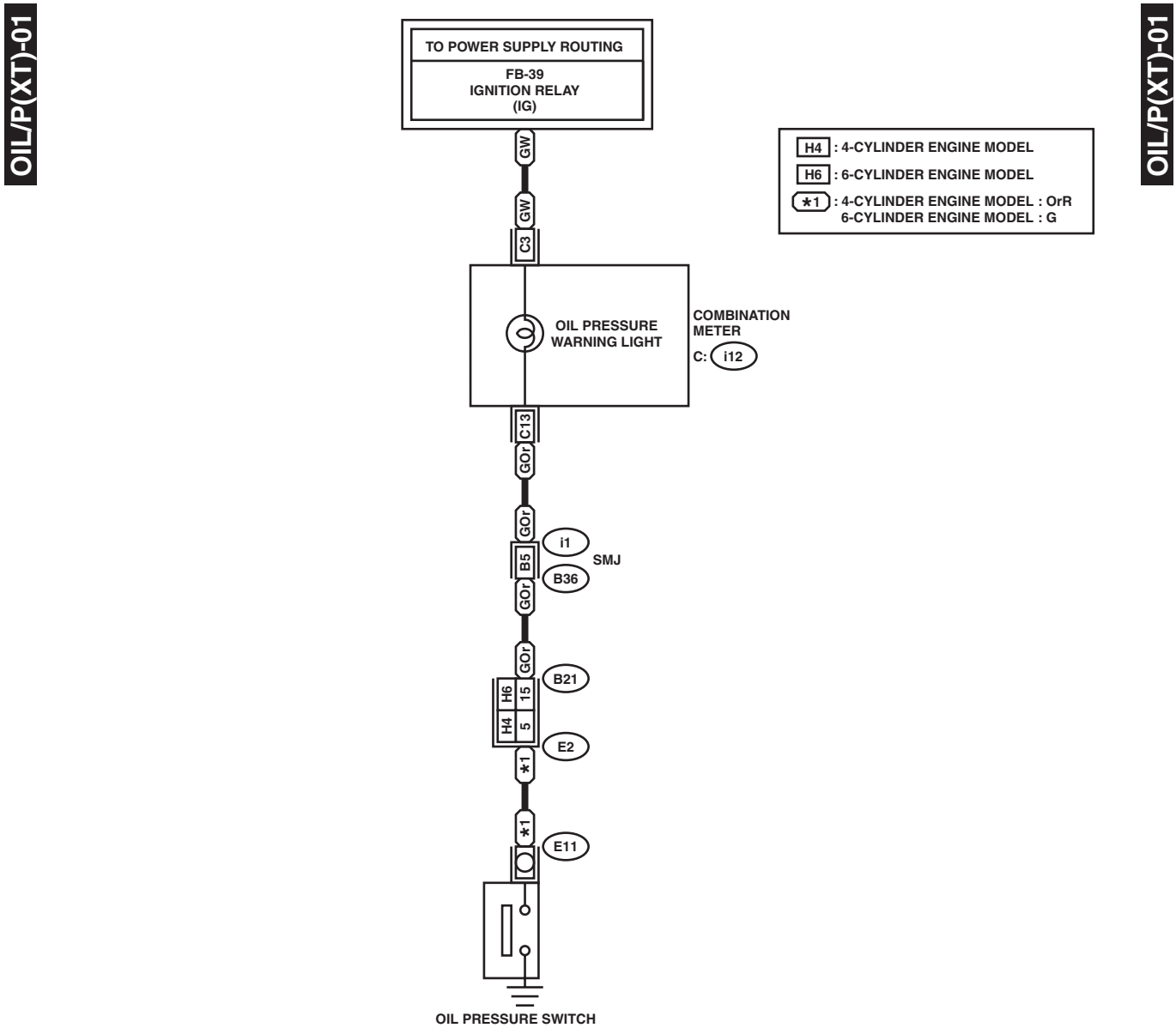


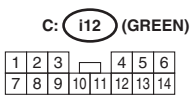
WI-00668

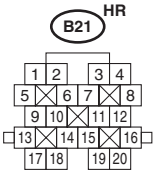
32.Oil Pressure Warning Light System

A: SCHEMATIC

1. EXCEPT TURBO ENGINE



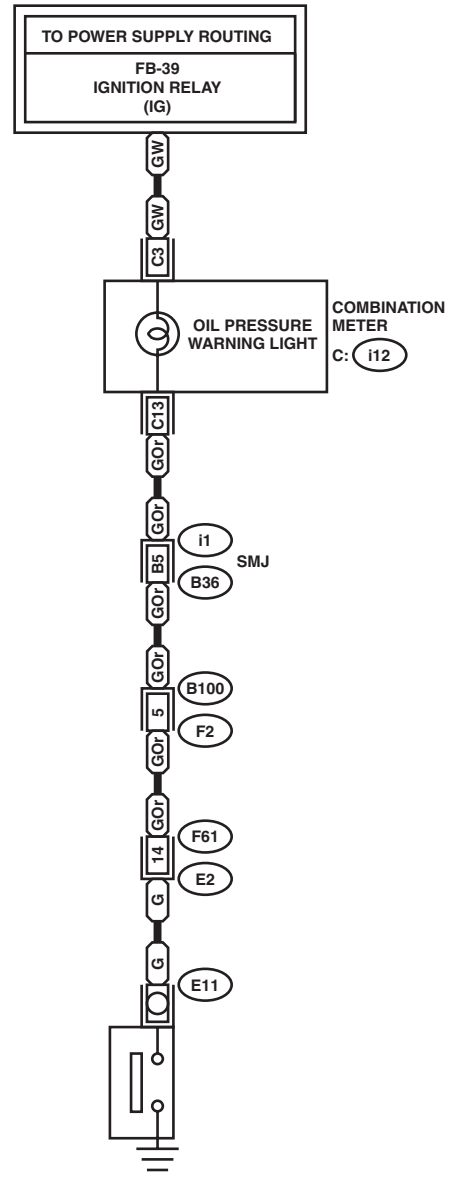


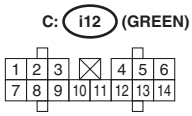


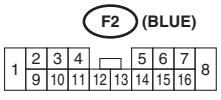
WI-06422

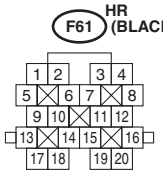
2. TURBO ENGINE

OIL/P(TB)-01







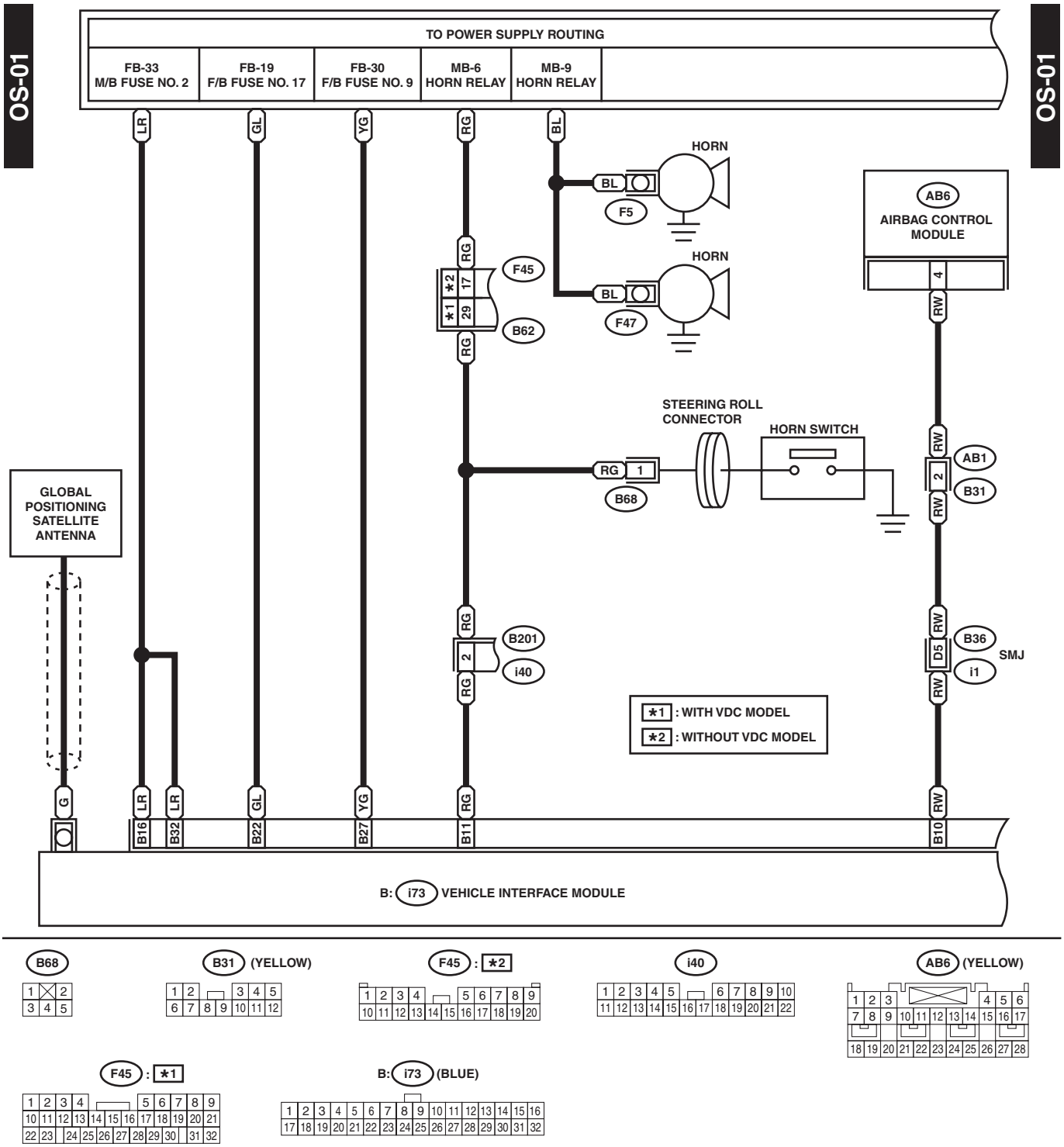


WI-06423

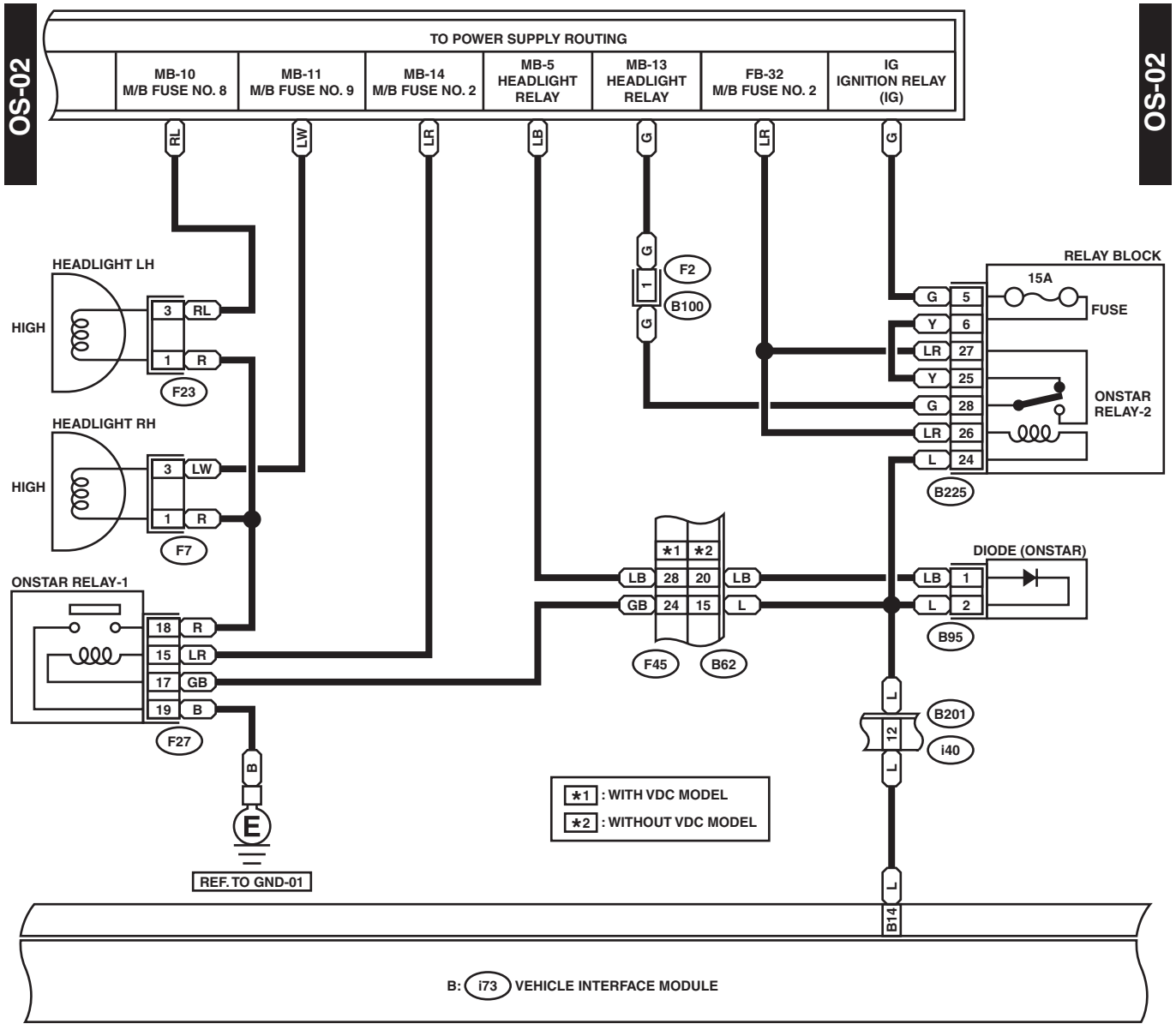
MEMO:

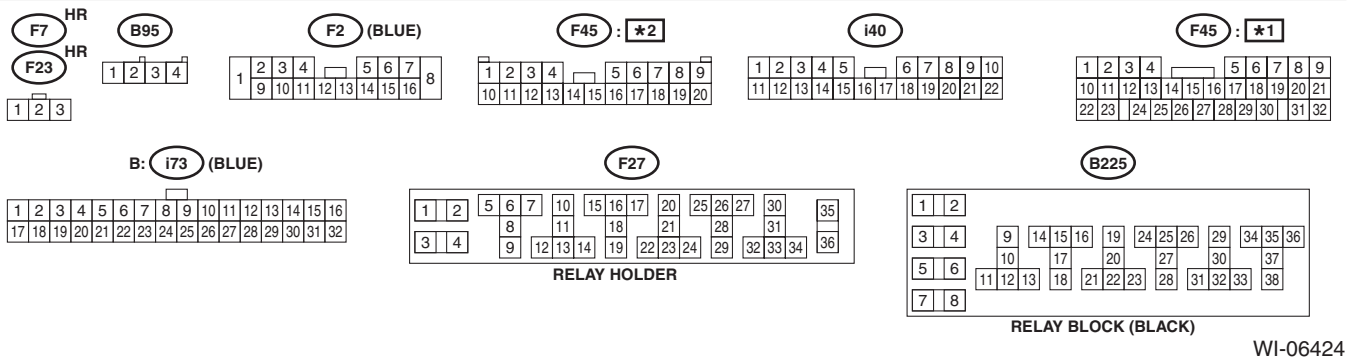
33.OnStar System

A: SCHEMATIC

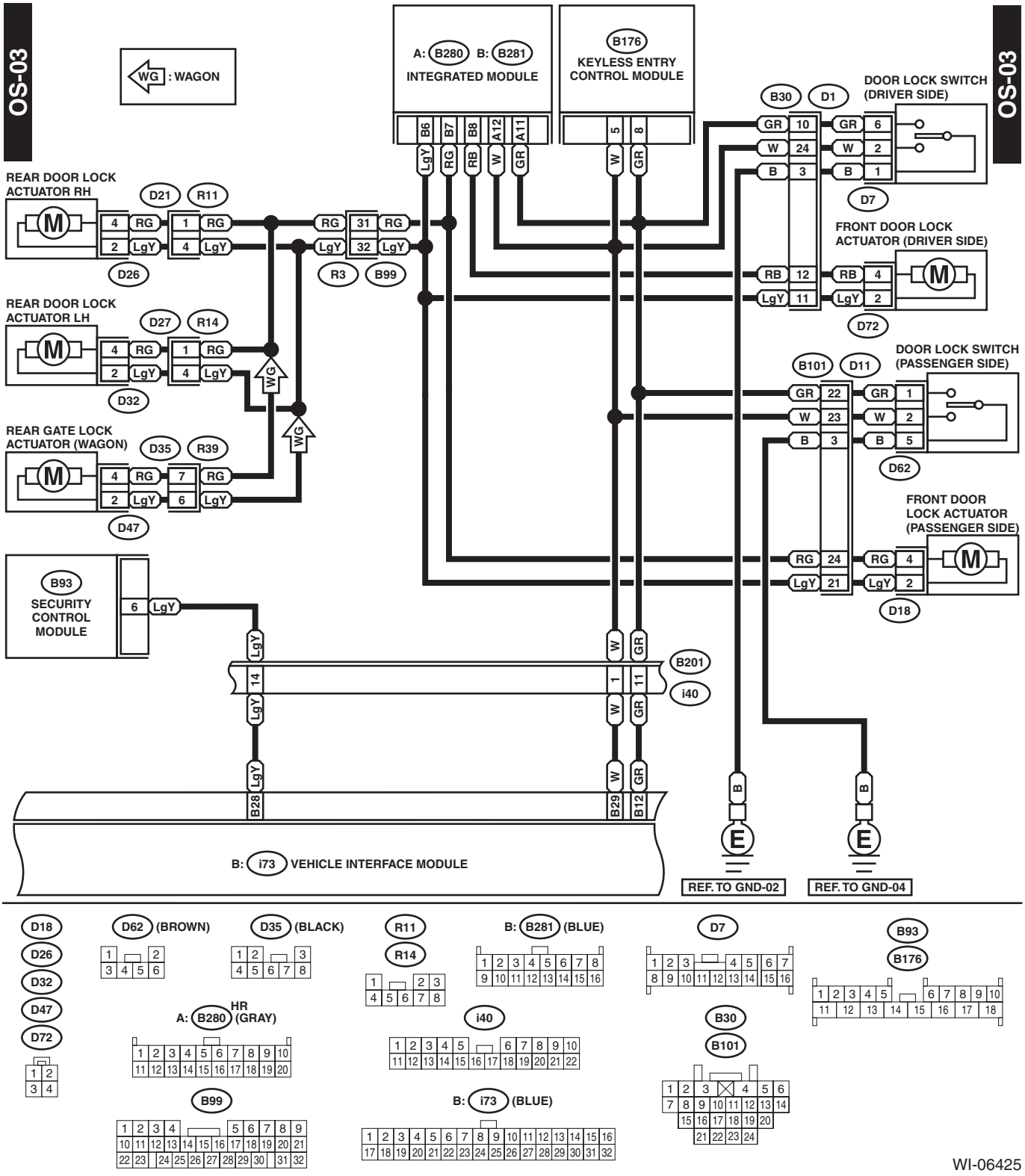


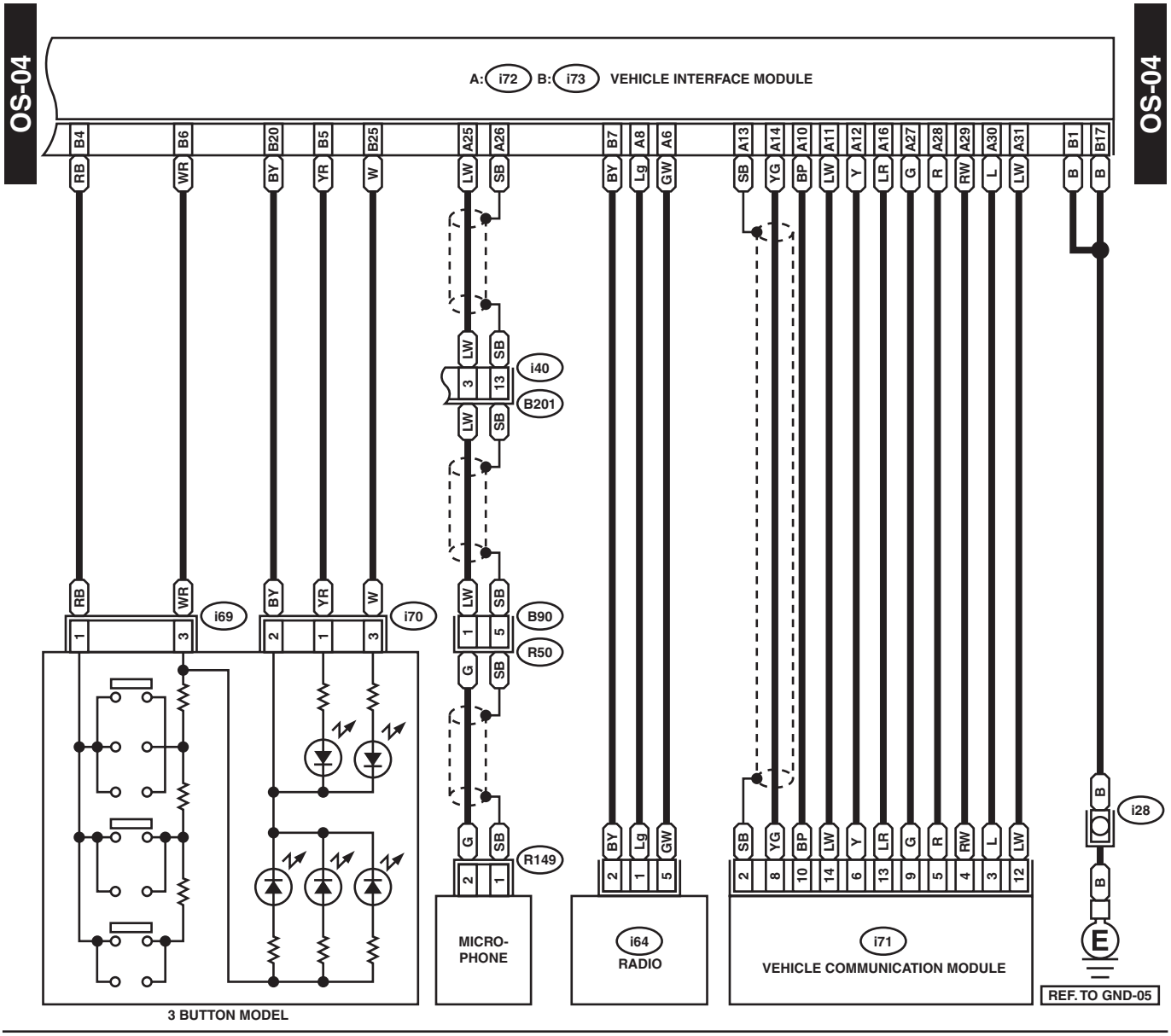
WI-03593

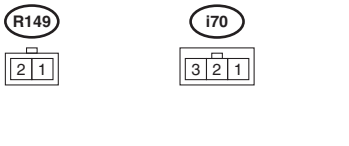

OS-02
OS-02
TO POWER SUPPLY ROUTING
MB-10 M/B FUSE NO. 8
MB-11 M/B FUSE NO. 9
MB-14 M/B FUSE NO. 2
MB-5 HEADLIGHT RELAY
MB-13 HEADLIGHT RELAY
FB-32 M/B FUSE NO. 2
IG IGNITION RELAY (IG)
RL
LW
LR
LB
G
LR
G
HEADLIGHT LH
HIGH
3 RL
1 R
F23
HEADLIGHT RH
HIGH
3 LW
1 R
F7
ONSTAR RELAY-1
18 R
15 LR
17 GB
19 B
F27
B
E
REF. TO GND-01
G
1
G
F2
B100
RELAY BLOCK
15A
FUSE
G 5
Y 6
LR 27
Y 25
G 28
LR 26
L 24
ONSTAR RELAY-2
B225
*1 *2
LB 28 20 LB
GB 24 15 L
F45
B62
DIODE (ONSTAR)
LB 1
L 2
B95
L
12
L
B201
i40
L
B14
*1 : WITH VDC MODEL
*2 : WITHOUT VDC MODEL
B: i73 VEHICLE INTERFACE MODULE

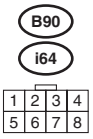

F7 HR
F23 HR
B95
F2 (BLUE)
F45 : *2
i40
F45 : *1
B: i73 (BLUE)
F27
B225
RELAY HOLDER
RELAY BLOCK (BLACK)

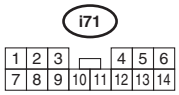
WI-06424

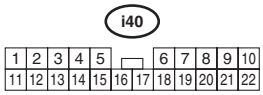

OS-03
WG : WAGON
A: B280 B: B281
INTEGRATED MODULE
B176
KEYLESS ENTRY CONTROL MODULE
DOOR LOCK SWITCH (DRIVER SIDE)
REAR DOOR LOCK ACTUATOR RH
REAR DOOR LOCK ACTUATOR LH
REAR GATE LOCK ACTUATOR (WAGON)
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
DOOR LOCK SWITCH (PASSENGER SIDE)
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
B93
SECURITY CONTROL MODULE
B201
i40
B: i73 VEHICLE INTERFACE MODULE
REF. TO GND-02
REF. TO GND-04
D18
D26
D32
D47
D72
D62 (BROWN)
D35 (BLACK)
R11
R14
B: B281 (BLUE)
D7
B30
B101
B93
B176
A: B280 HR (GRAY)
B99
i40
B: i73 (BLUE)
WI-06425

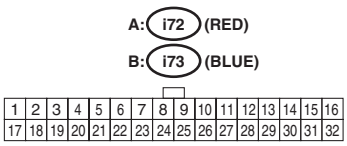

OS-04
OS-04
A: i72 B: i73 VEHICLE INTERFACE MODULE
B4 B6 B20 B5 B25 A25 A26 B7 A8 A6 A13 A14 A10 A11 A12 A16 A27 A28 A29 A30 A31 B1 B17
RB WR BY YR W LW SB BY Lg GW SB YG BP LW Y LR G R RW L LW B B
i40
3 13
B201
i69
i70
B90
R50
R149
MICRO-PHONE
i64
RADIO
i71
VEHICLE COMMUNICATION MODULE
i28
E
REF. TO GND-05
3 BUTTON MODEL


R149
2 1
i70
3 2 1
i69
2 1
4 3


B90
i64
1 2 3 4
5 6 7 8


i71
1 2 3 4 5 6
7 8 9 10 11 12 13 14


i40
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22

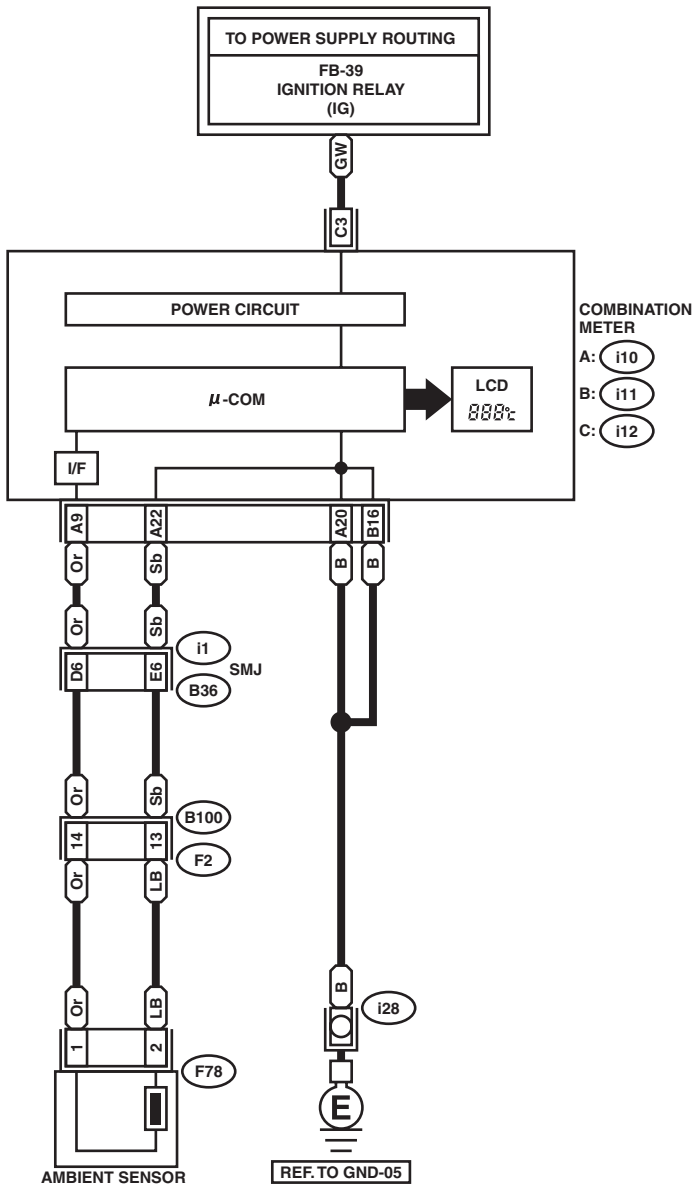

A: i72 (RED)
B: i73 (BLUE)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

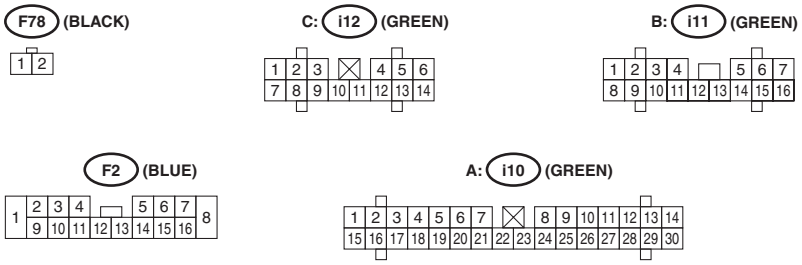
WI-03596

34.Outside Temperature Display System

A: SCHEMATIC

O/TEMP-01

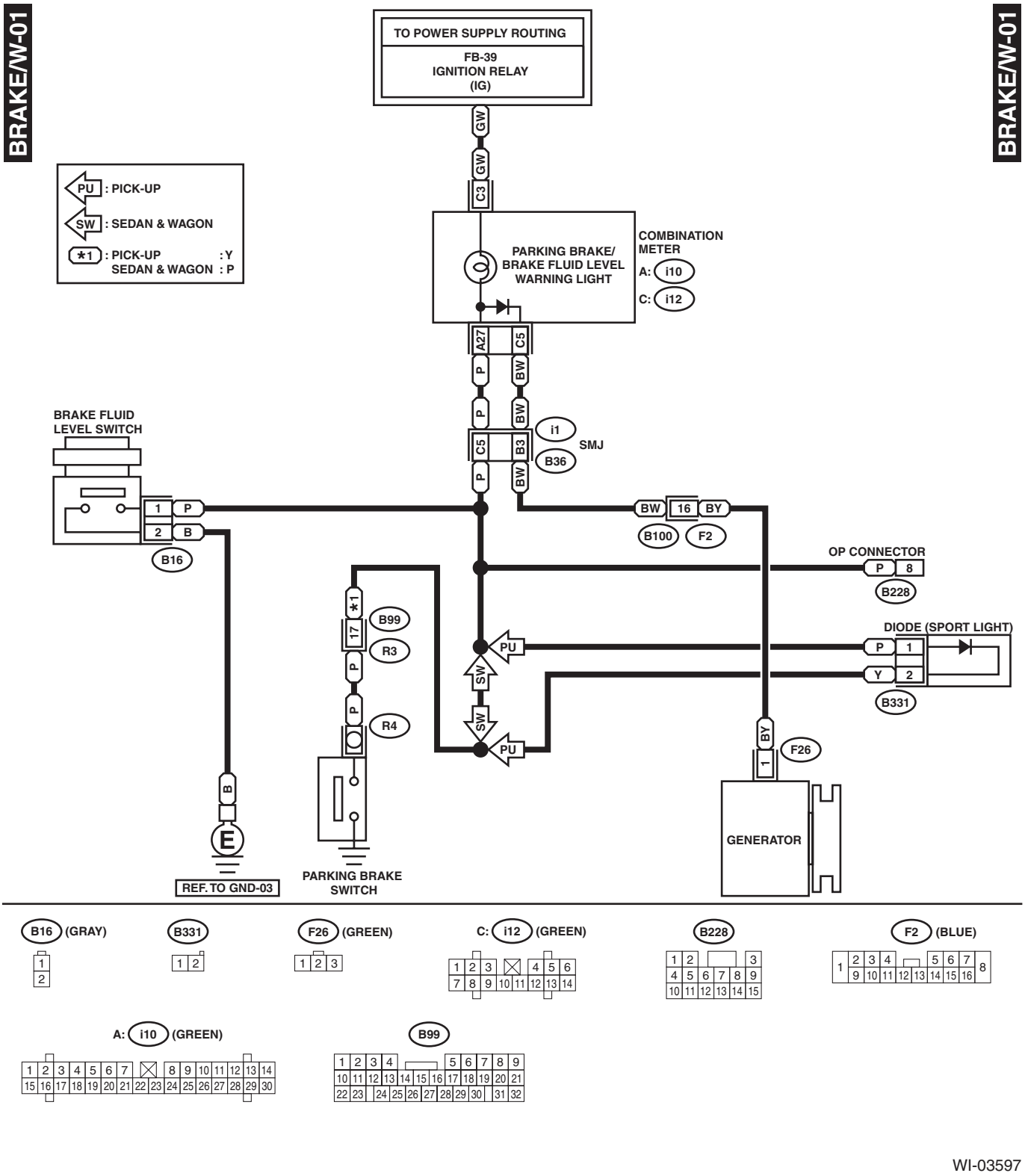




WI-00674

35.Parking Brake and Brake Fluid Level Warning System

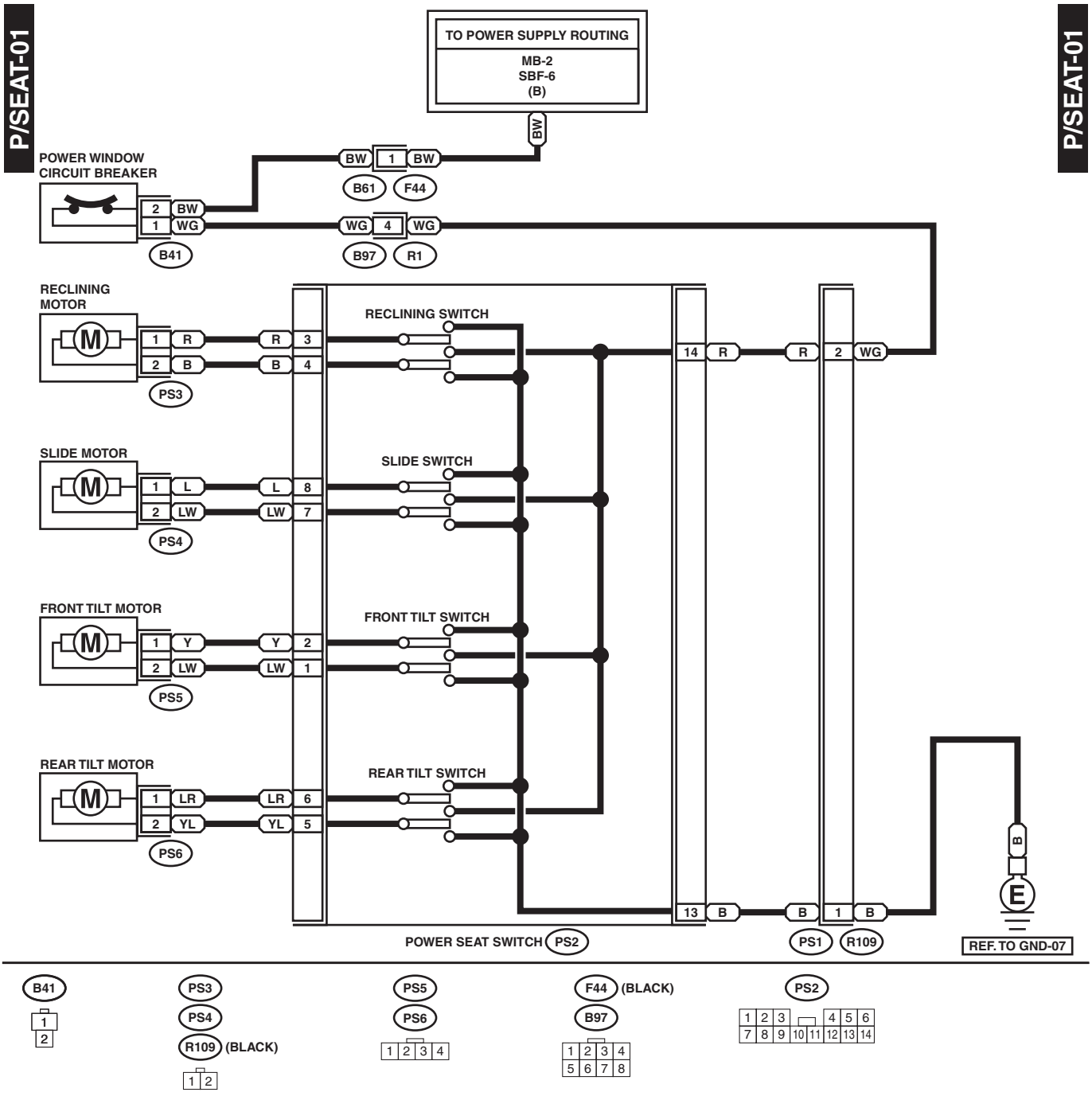
A: SCHEMATIC



WI-03597

36.Power Seat System

A: SCHEMATIC

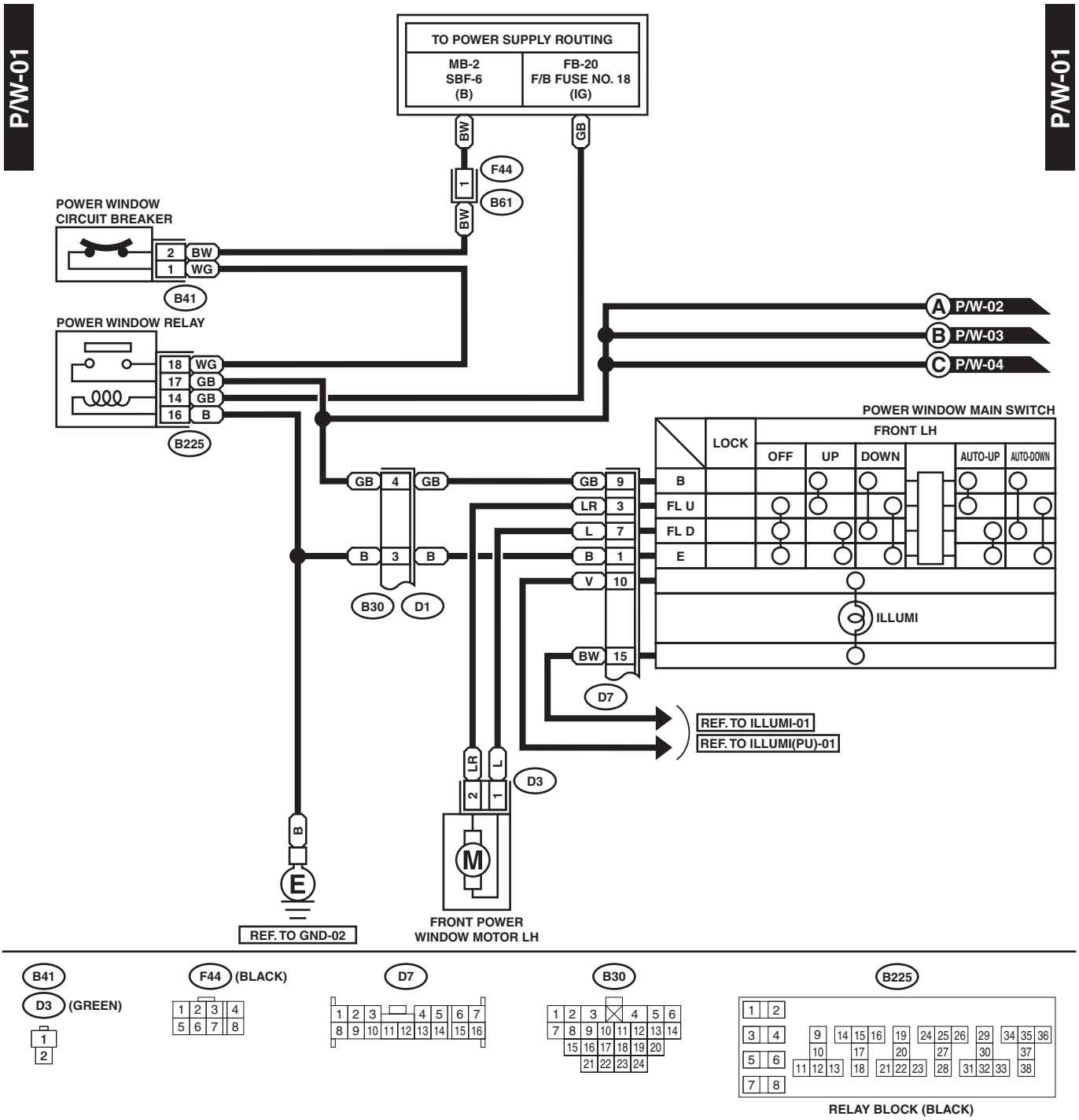


WI-06207

MEMO:

37.Power Window System

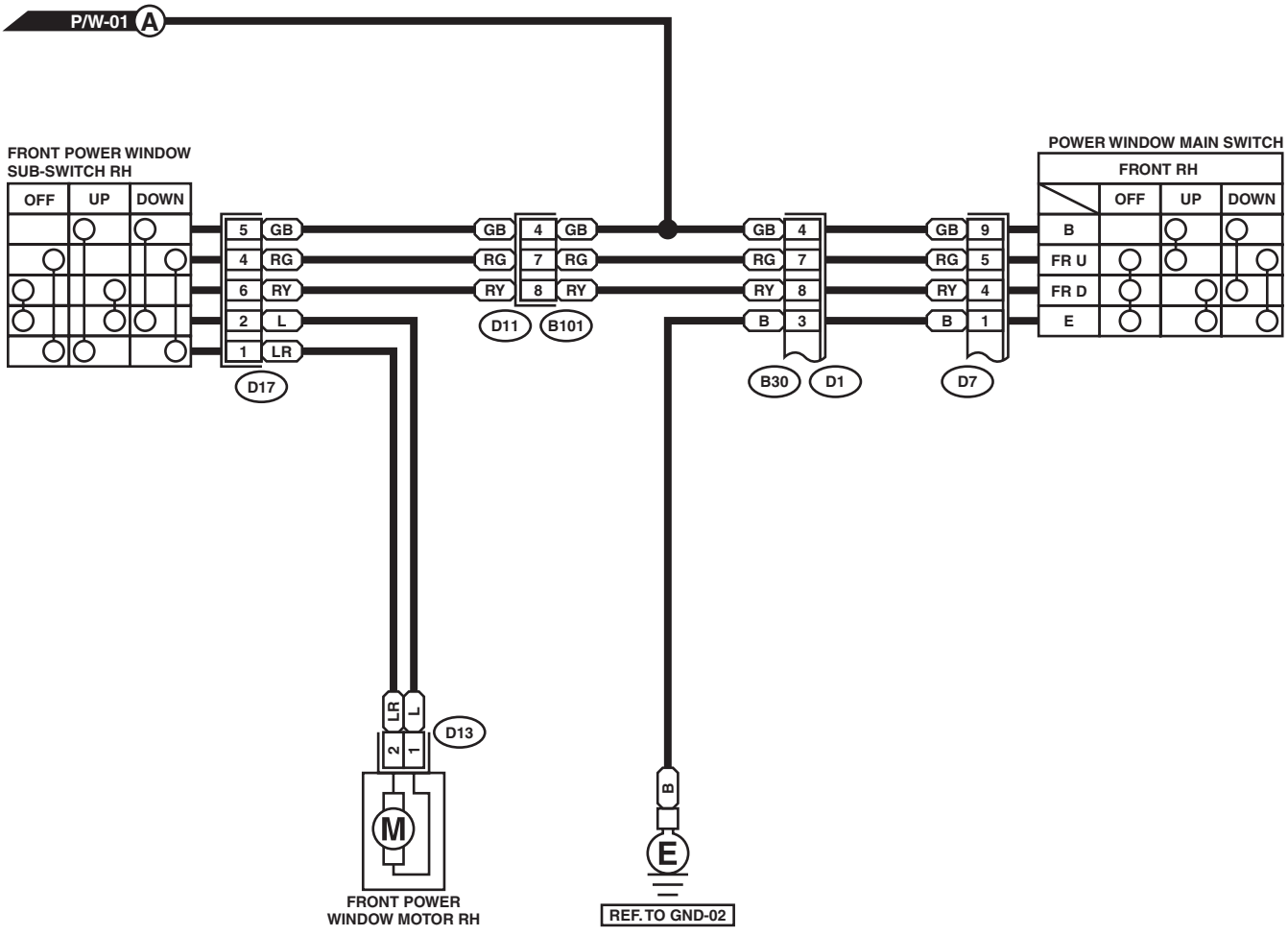
A: SCHEMATIC

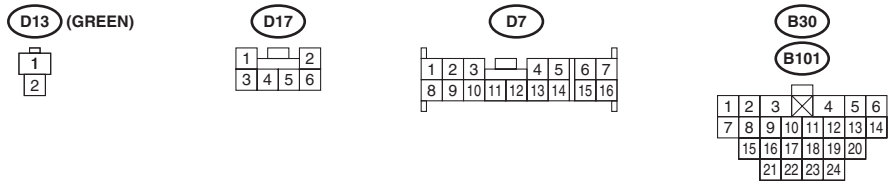


WI-03599

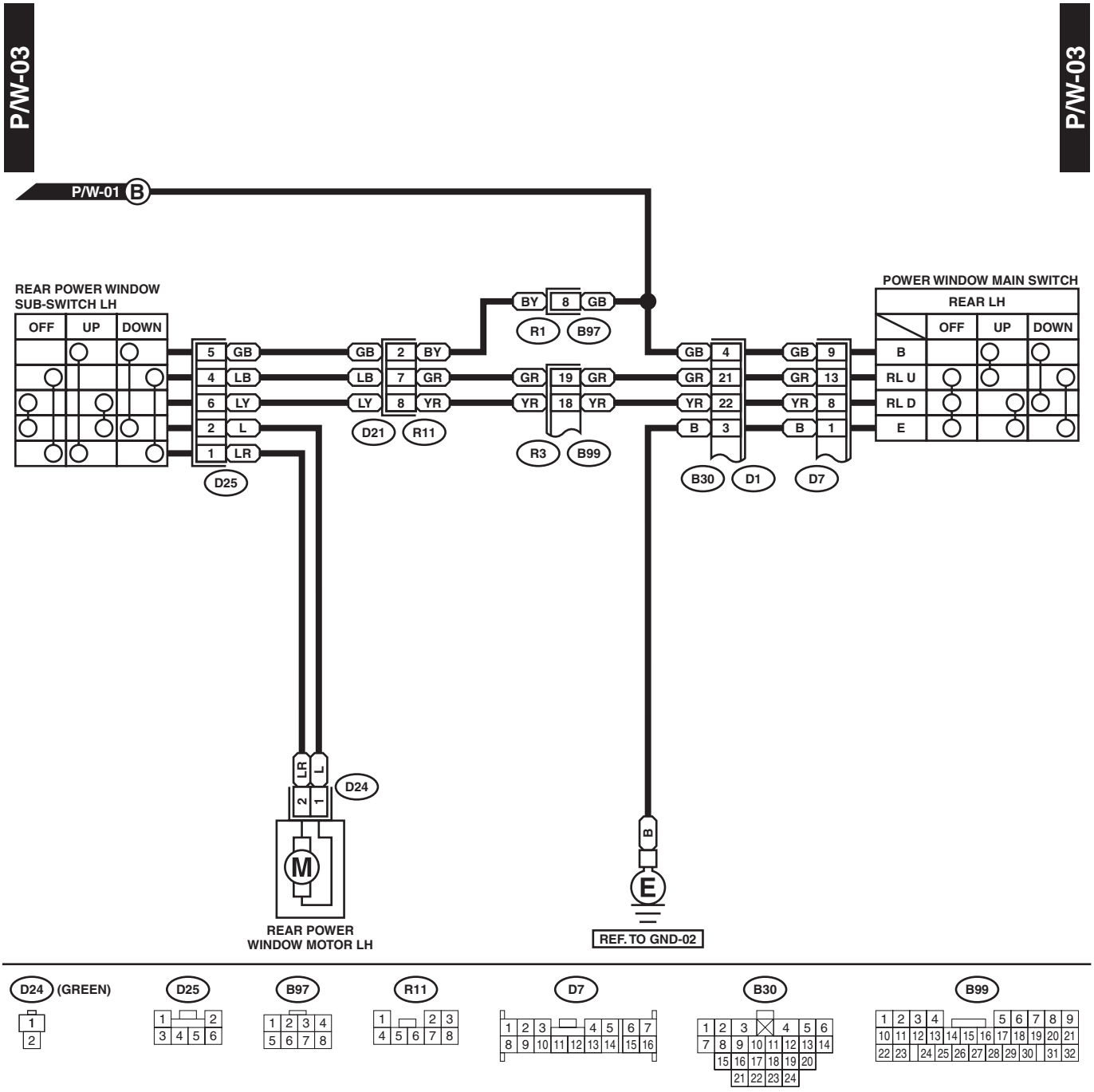
P/W-02

P/W-02





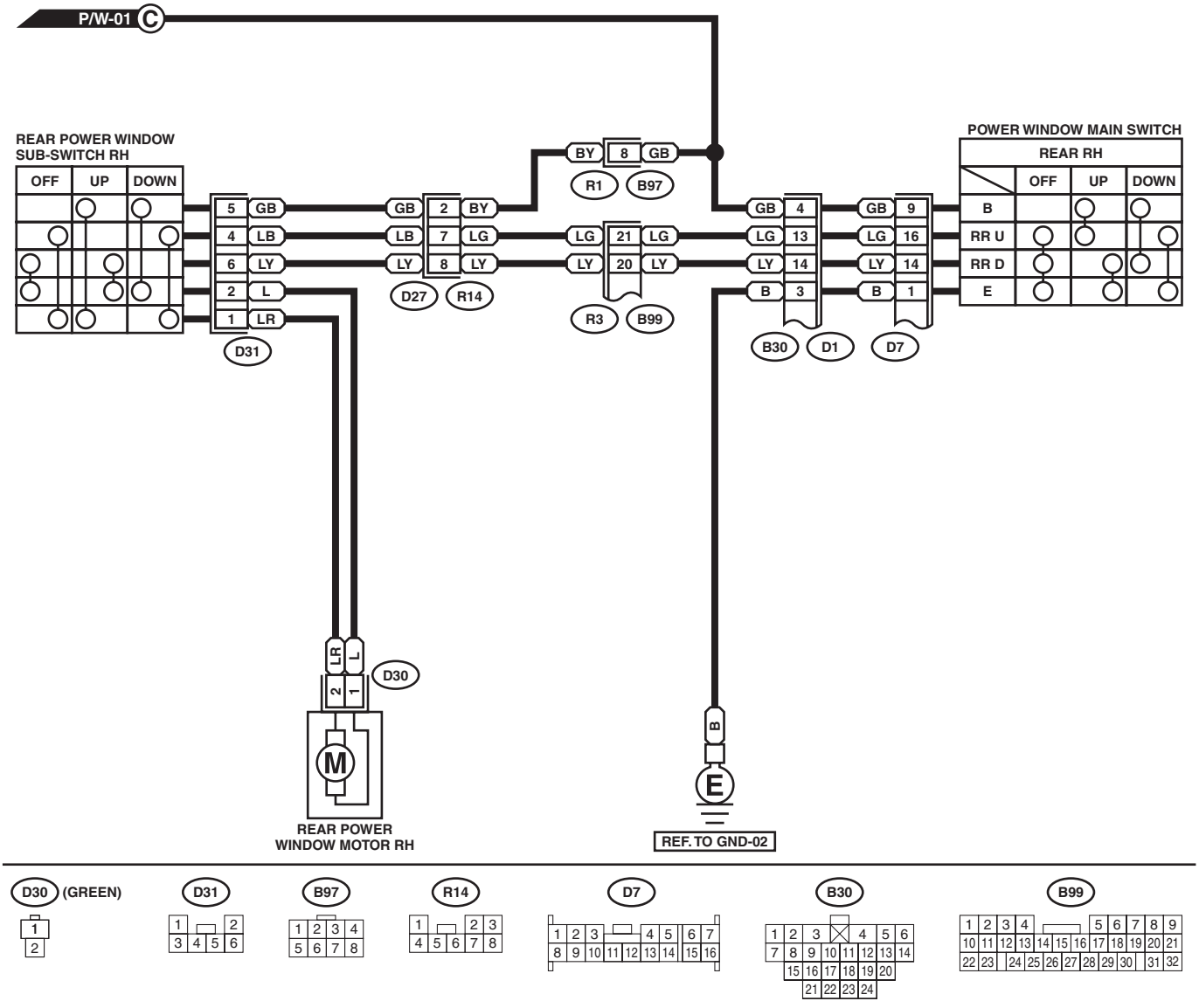
WI-00678


P/W-03
P/W-03
P/W-01 B
REAR POWER WINDOW SUB-SWITCH LH
OFF
UP
DOWN
5 GB
4 LB
6 LY
2 L
1 LR
D25
GB 2 BY
LB 7 GR
LY 8 YR
D21
R11
BY 8 GB
R1
B97
GR 19 GR
YR 18 YR
R3
B99
GB 4
GR 21
YR 22
B 3
B30
D1
GB 9
GR 13
YR 8
B 1
D7
POWER WINDOW MAIN SWITCH
REAR LH
OFF
UP
DOWN
B
RL U
RL D
E
LR
L
2
1
D24
M
REAR POWER WINDOW MOTOR LH
B
E
REF. TO GND-02
D24 (GREEN)
D25
B97
R11
D7
B30
B99

WI-00679

P/W-04

P/W-04

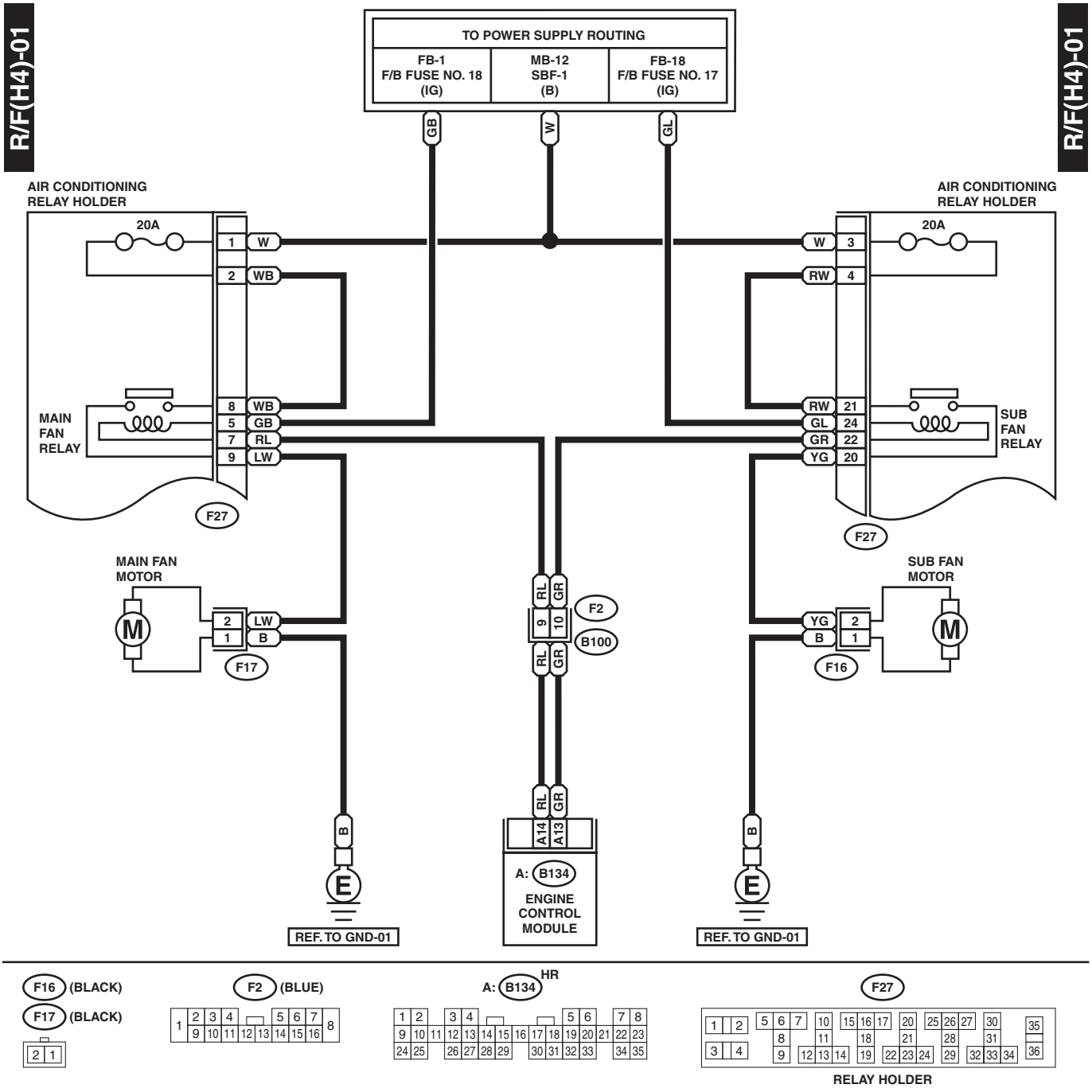


WI-00680

38.Radiator Fan System

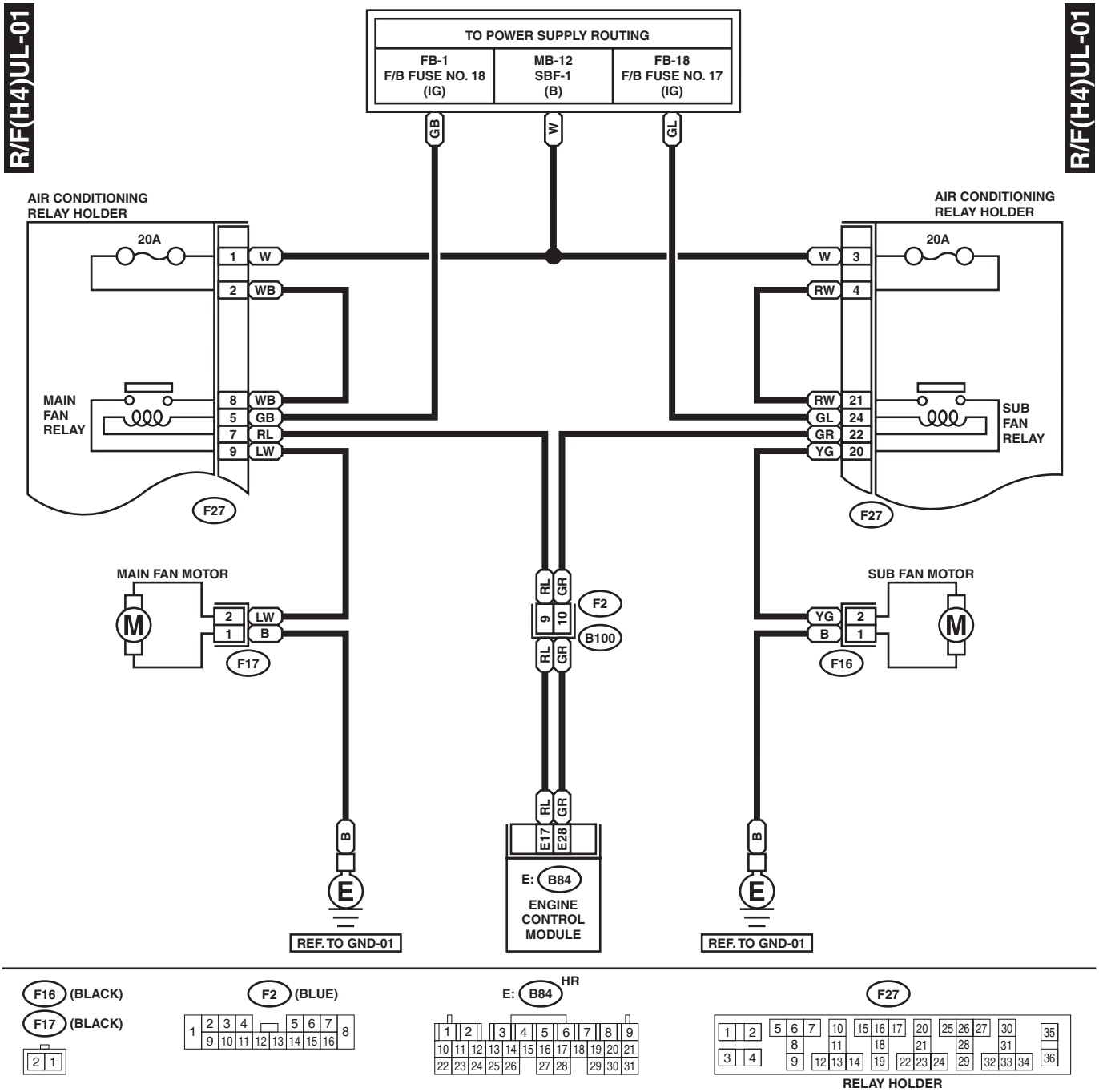
A: SCHEMATIC

1. EXCEPT 4-CYLINDER ENGINE U5 MODEL



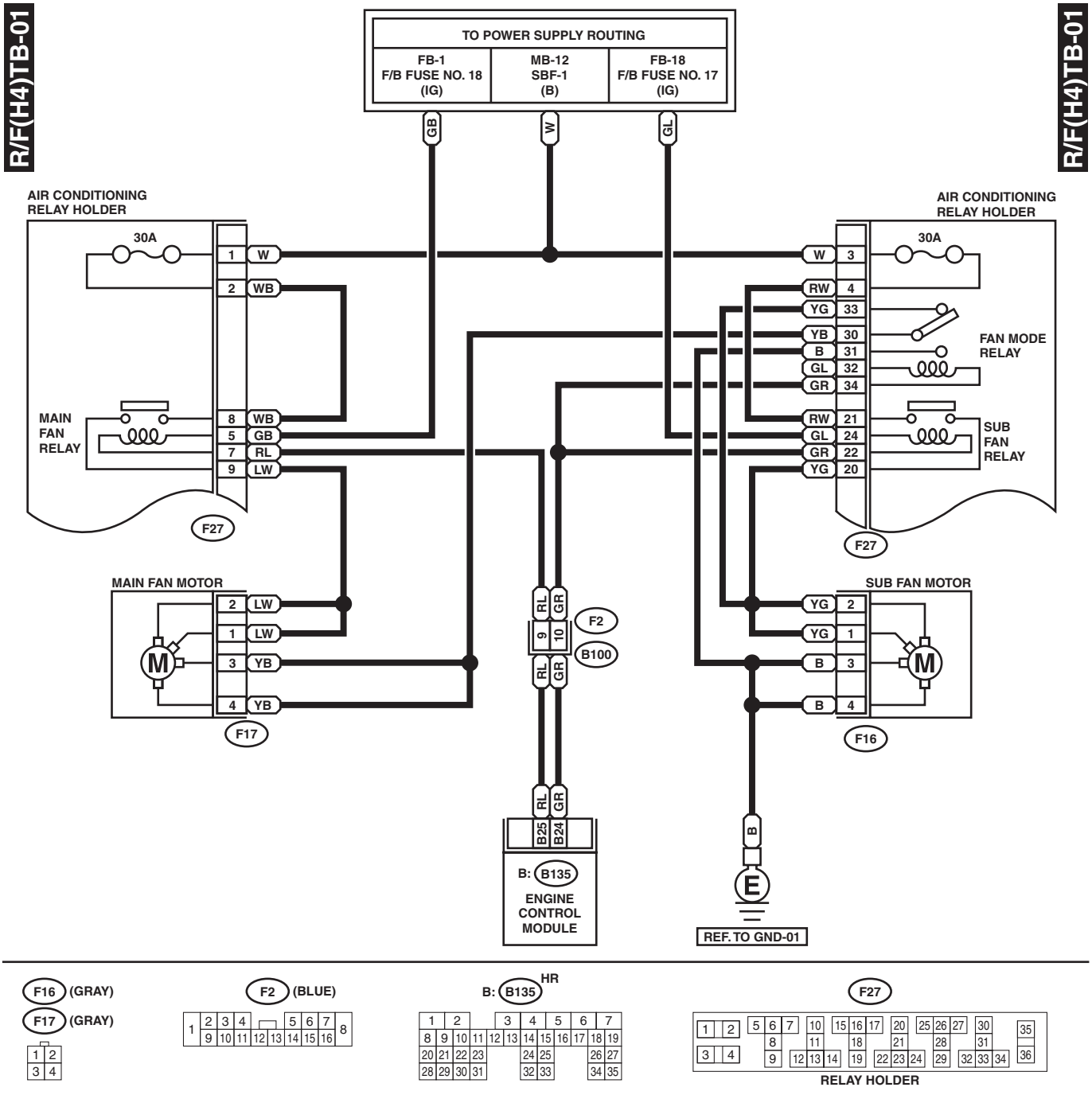
WI-06426

2. 4-CYLINDER ENGINE U5 MODEL



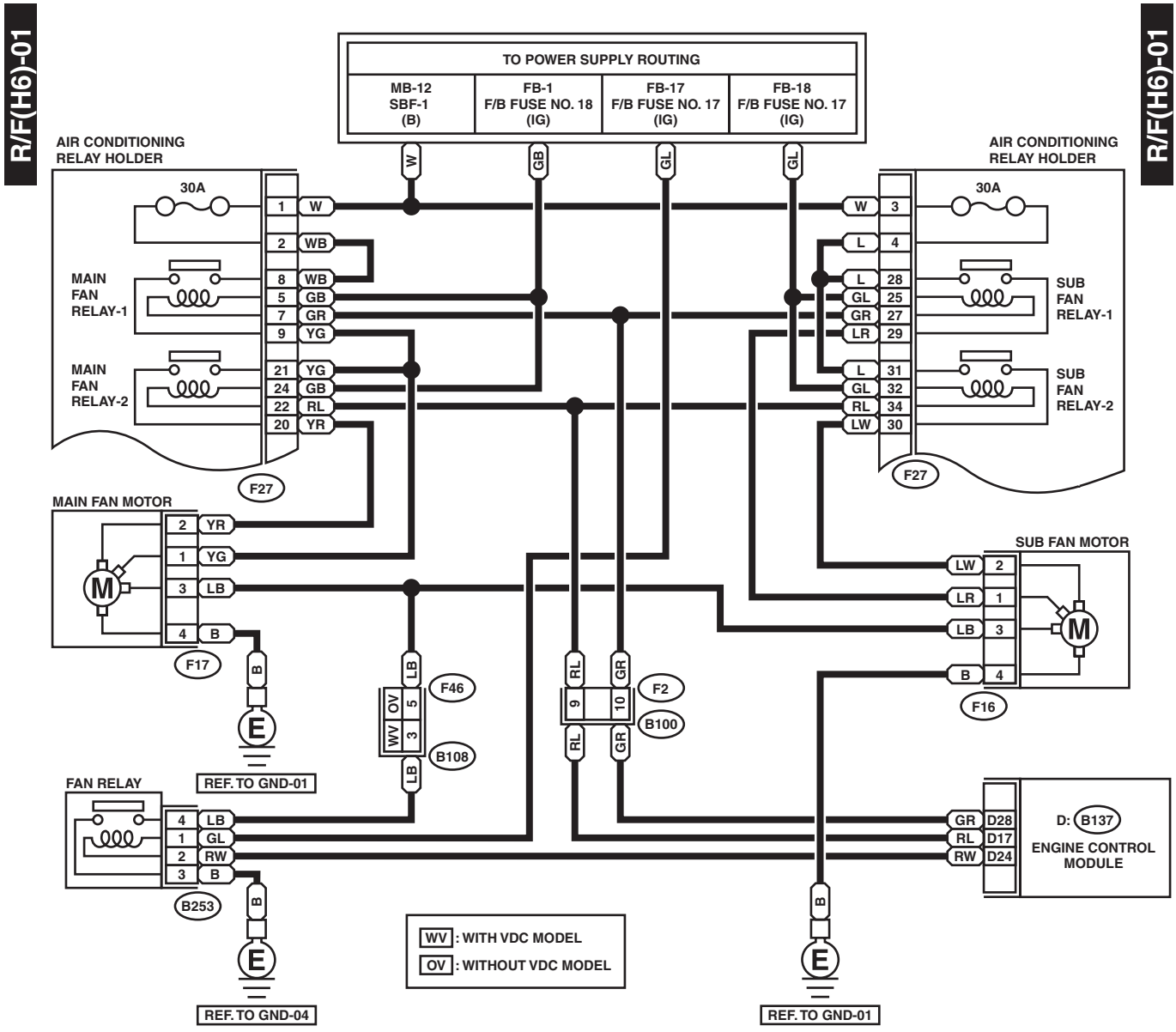
WI-06427

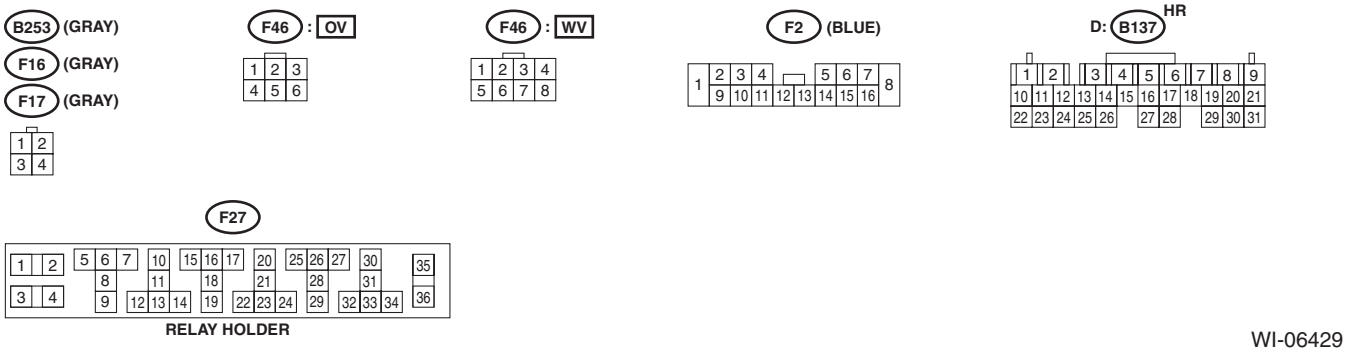
3. 4-CYLINDER TURBO ENGINE



WI-06428

4. 6-CYLINDER ENGINE

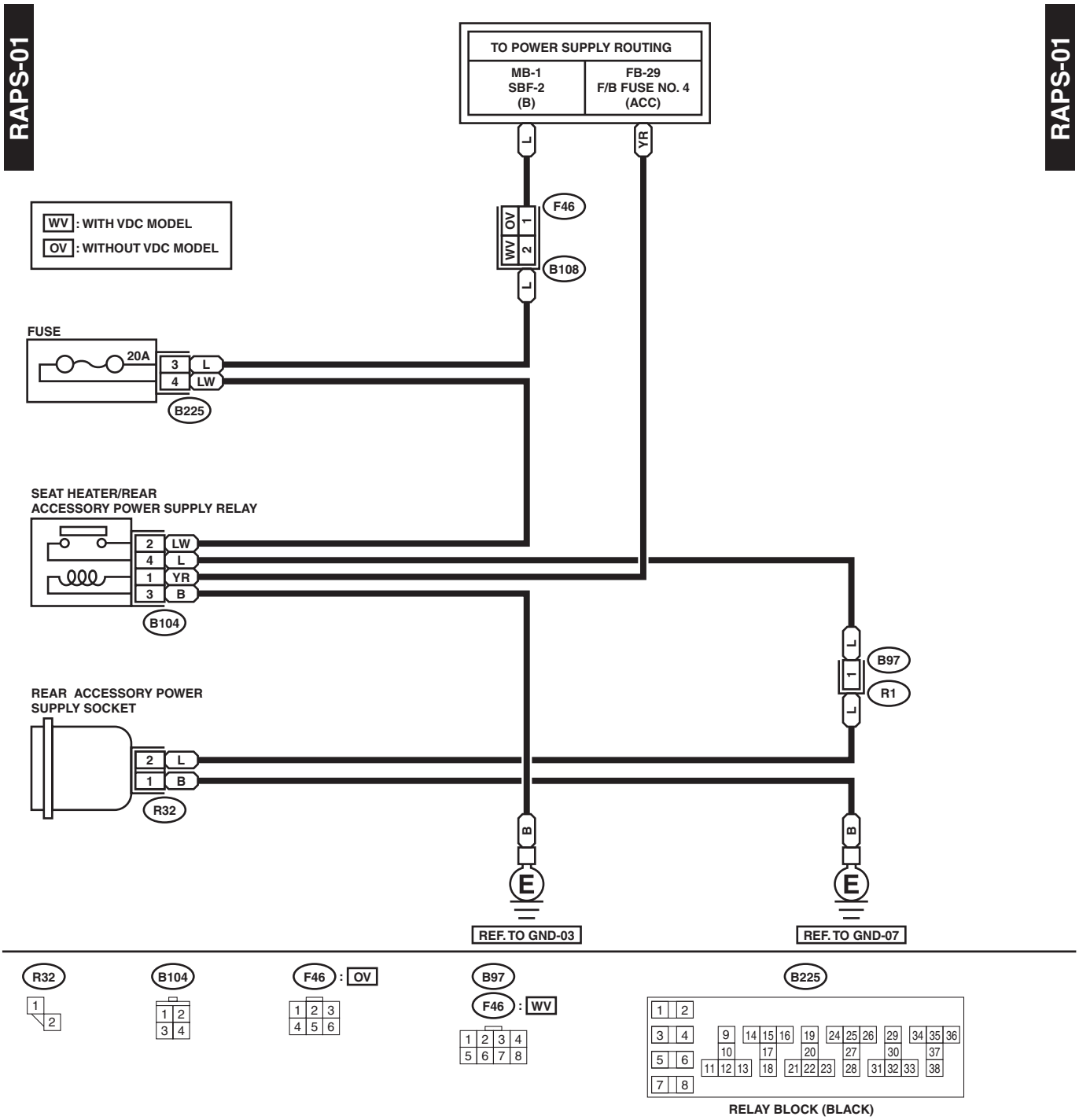




WI-06429

39.Rear Accessory Power Supply System

A: SCHEMATIC

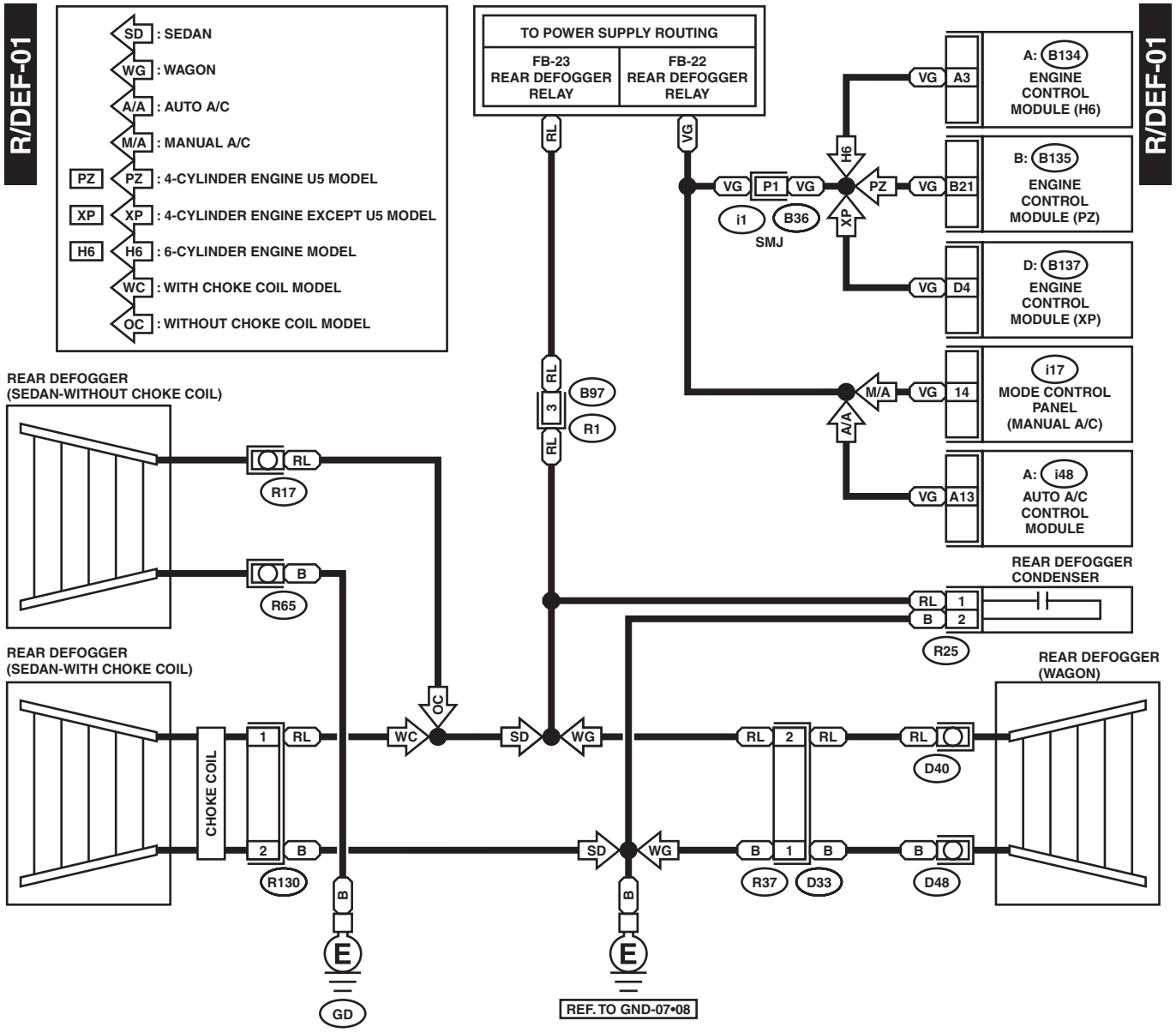


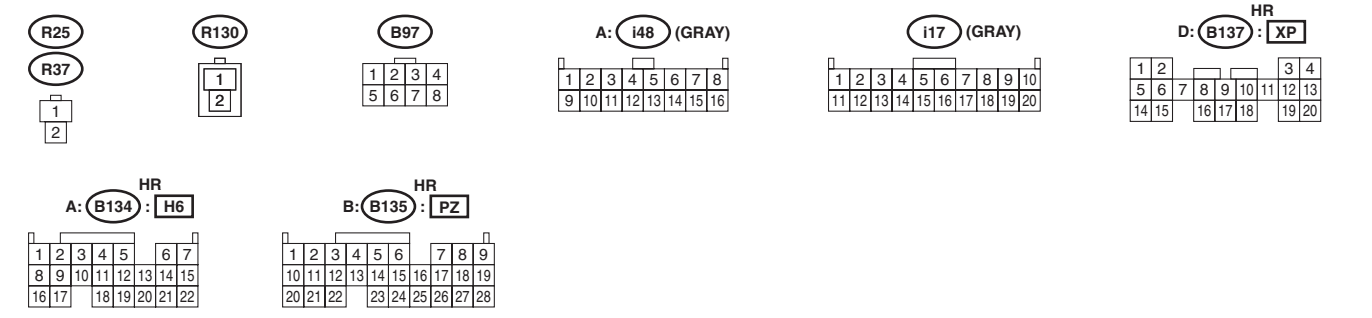
WI-03603

40.Rear Window Defogger System

A: SCHEMATIC

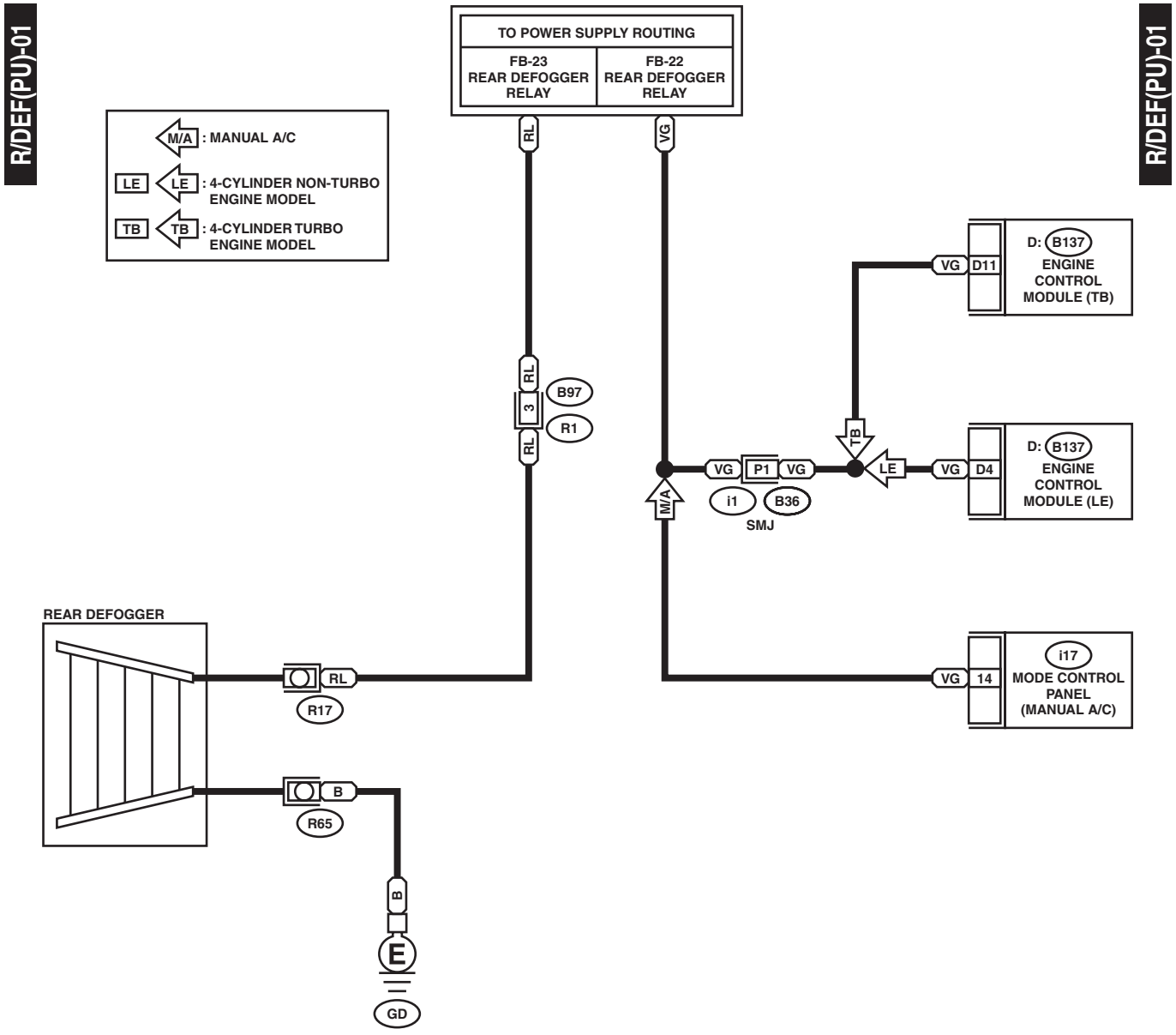
1. SEDAN & WAGON MODEL





WI-06430

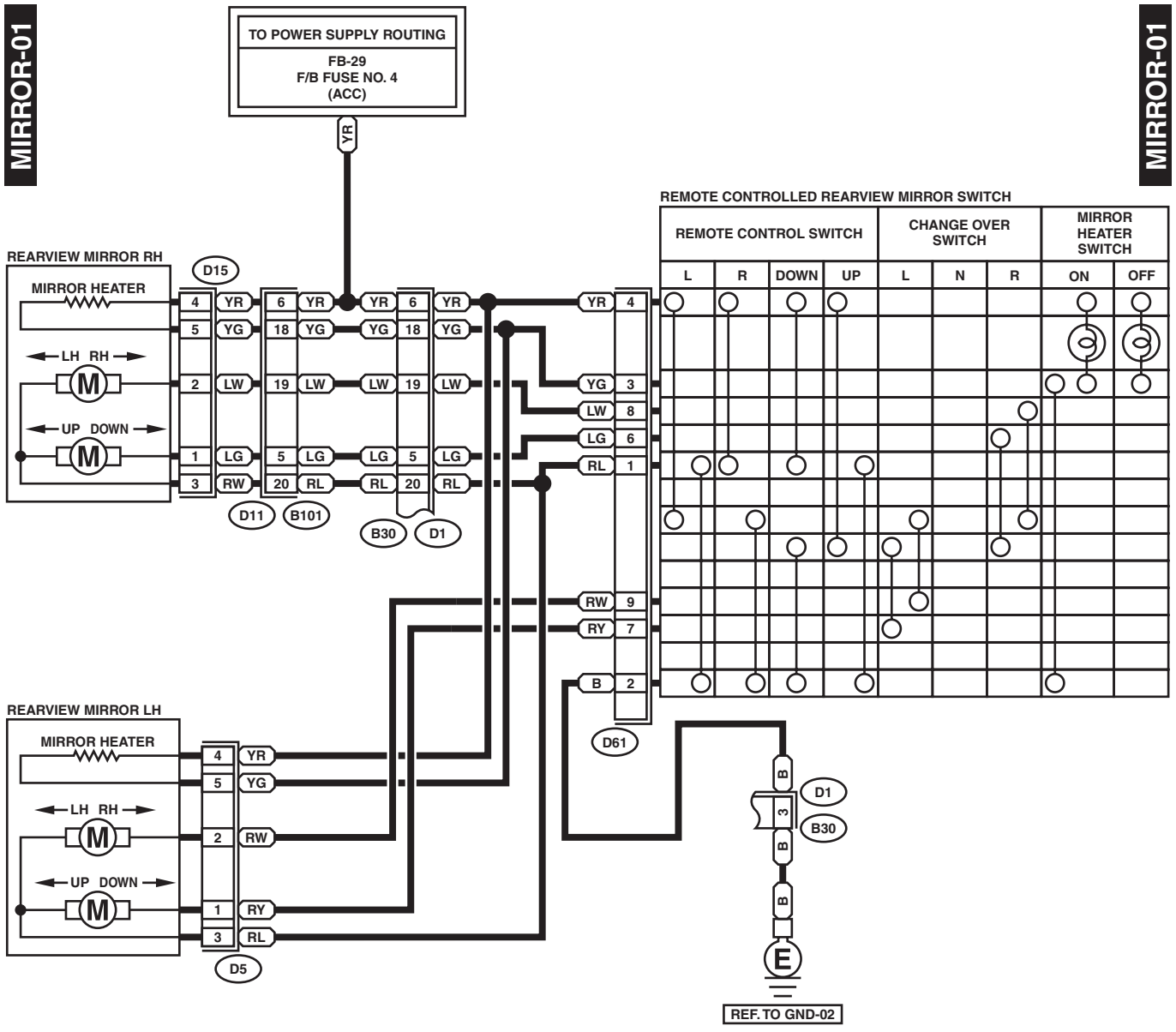
2. PICK-UP MODEL

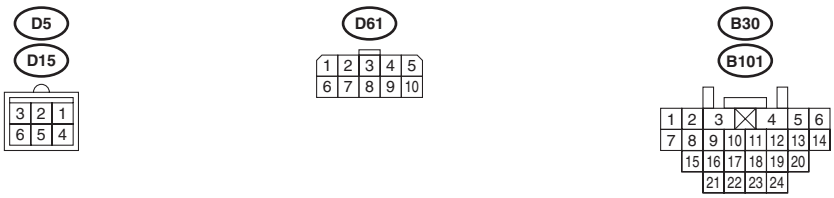


WI-06431

41.Remote Controlled Rearview Mirror System

A: SCHEMATIC

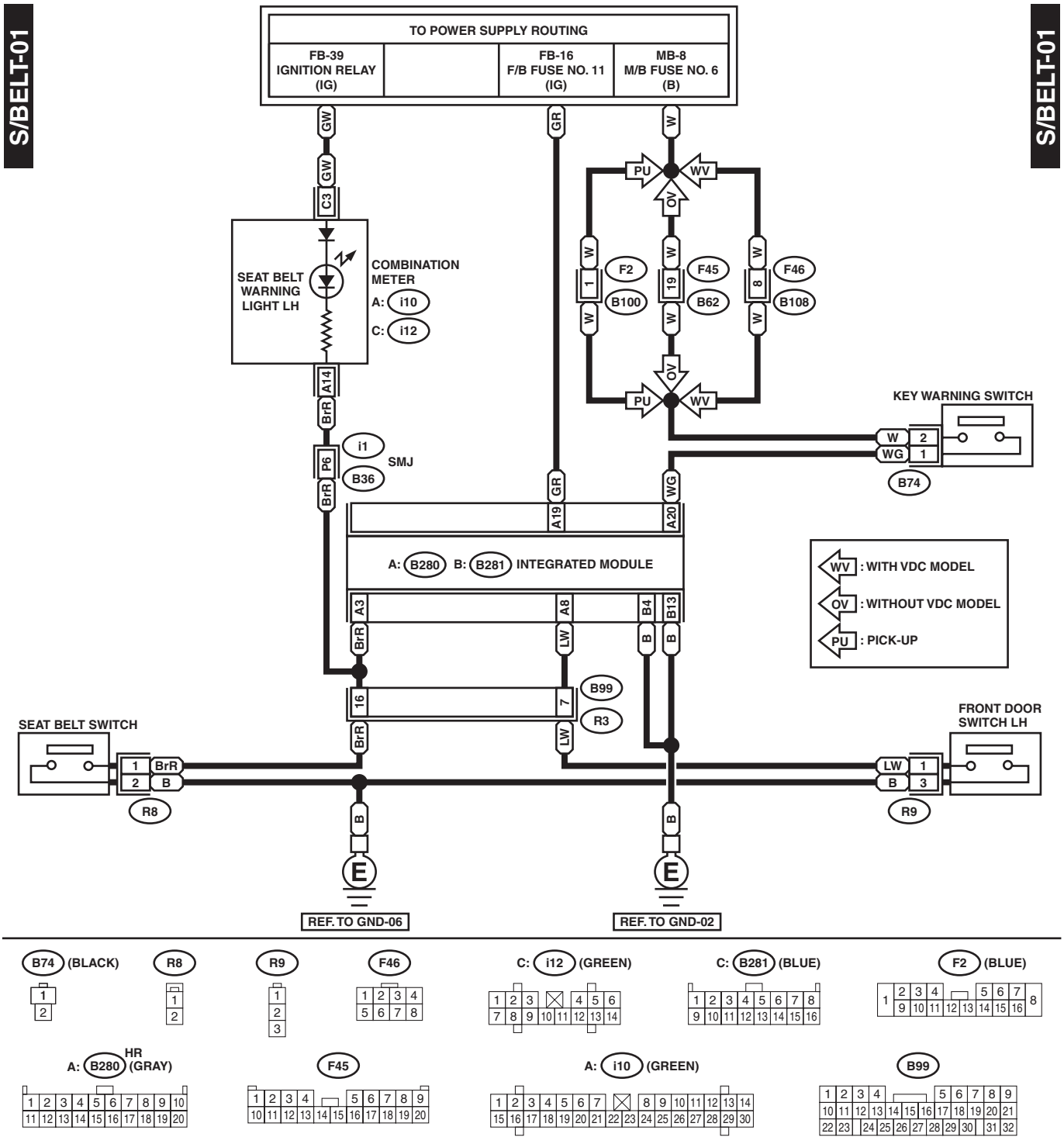




WI-00686

42.Seat Belt Warning System

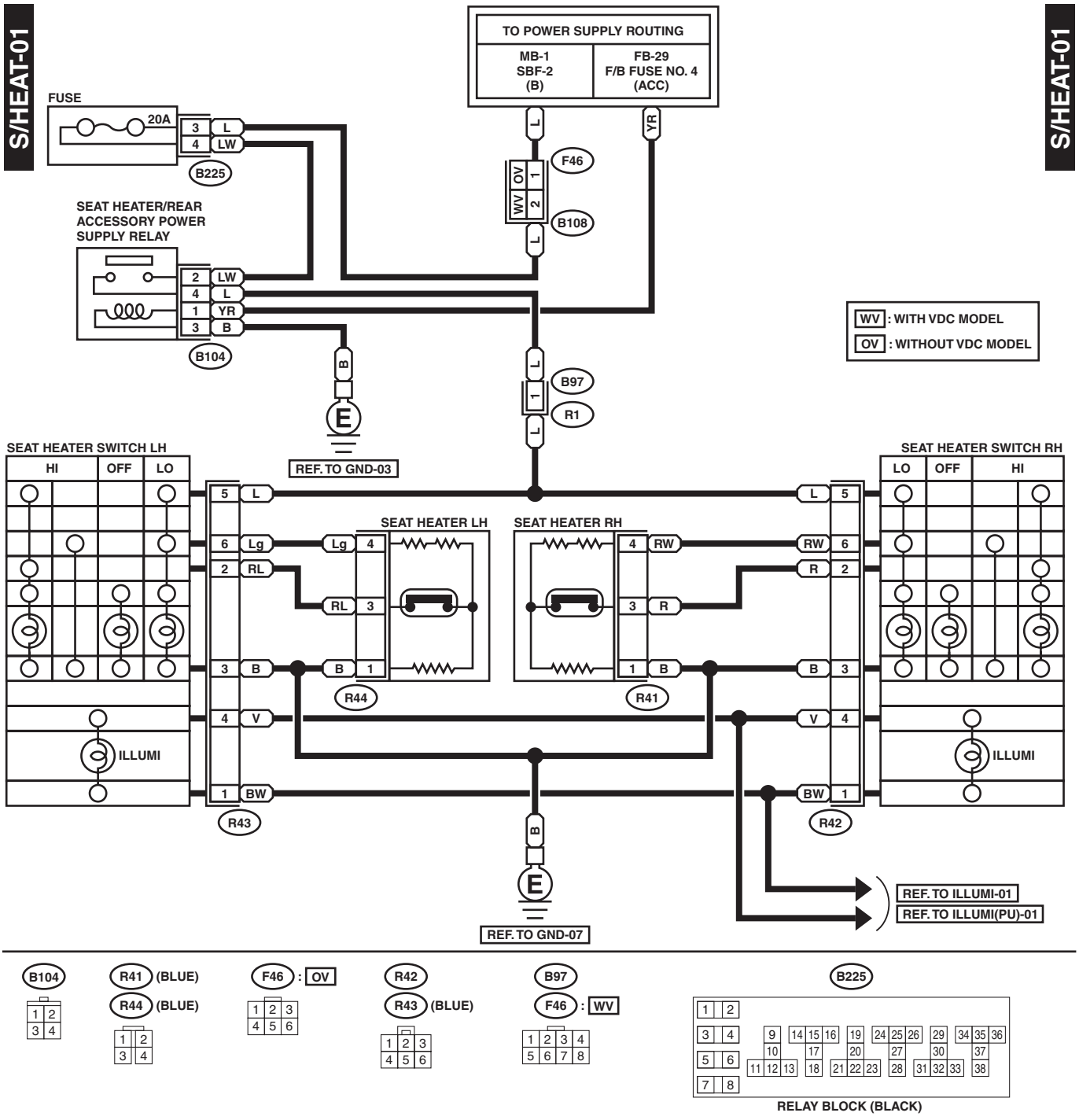
A: SCHEMATIC



WI-06432

43.Seat Heater System

A: SCHEMATIC

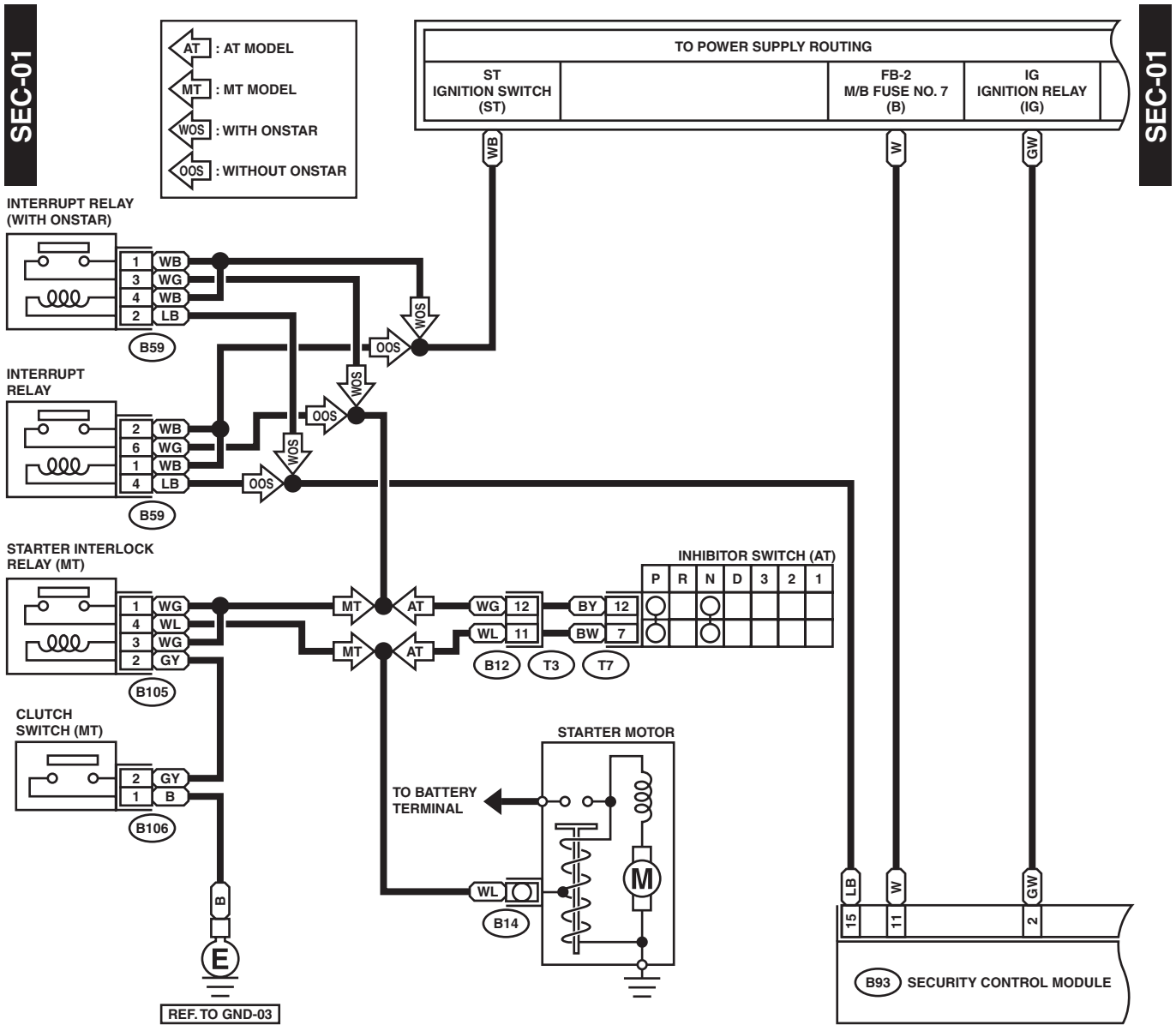


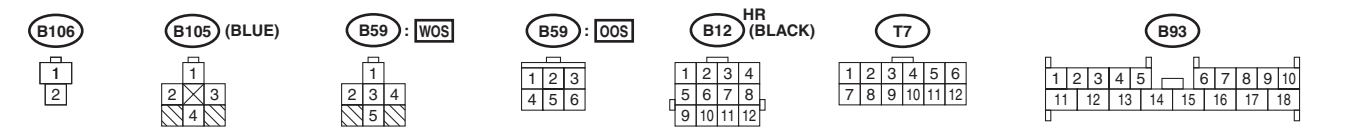
WI-03607

44.Security System

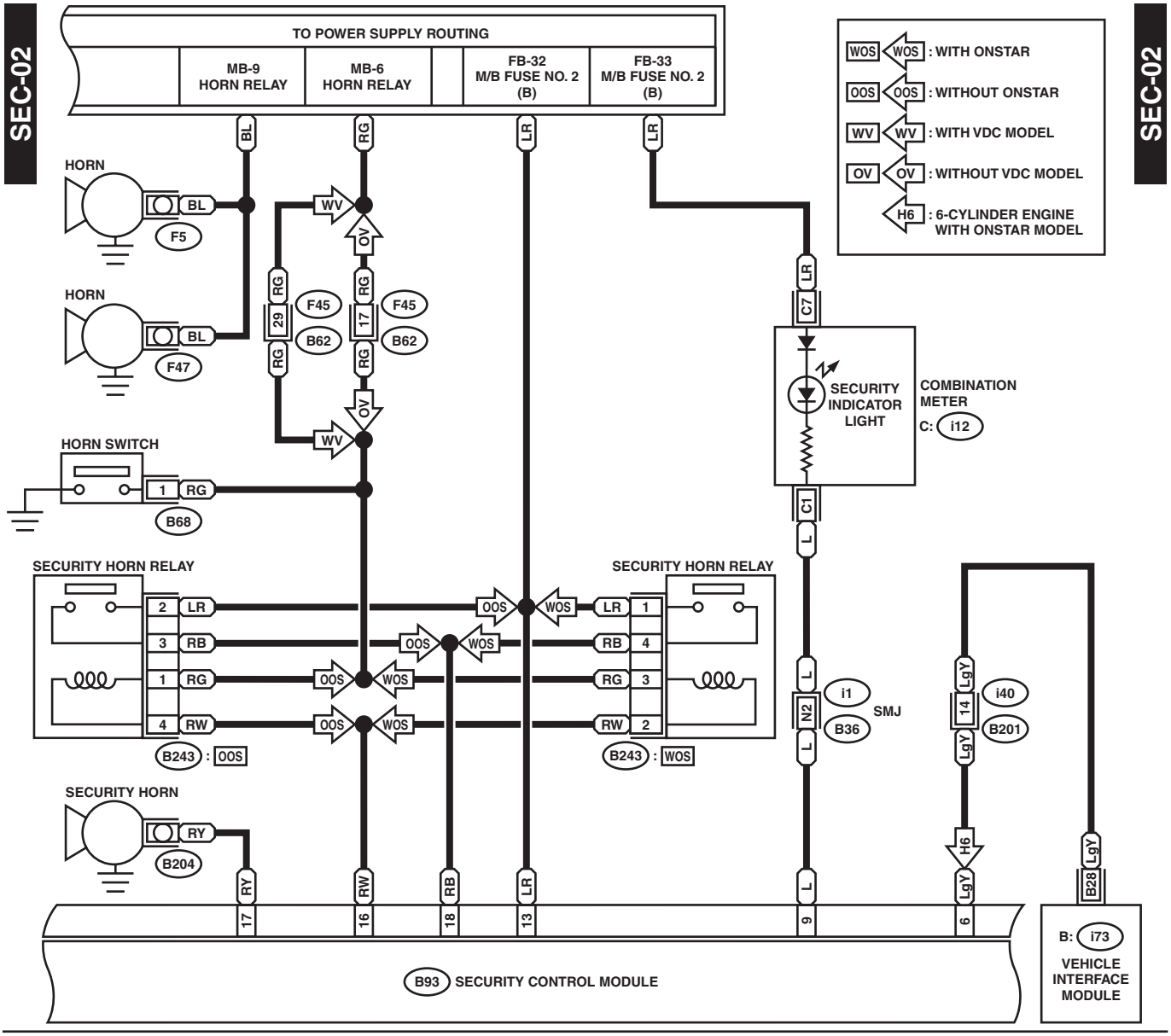
A: SCHEMATIC

1. EXCEPT U5 MODEL

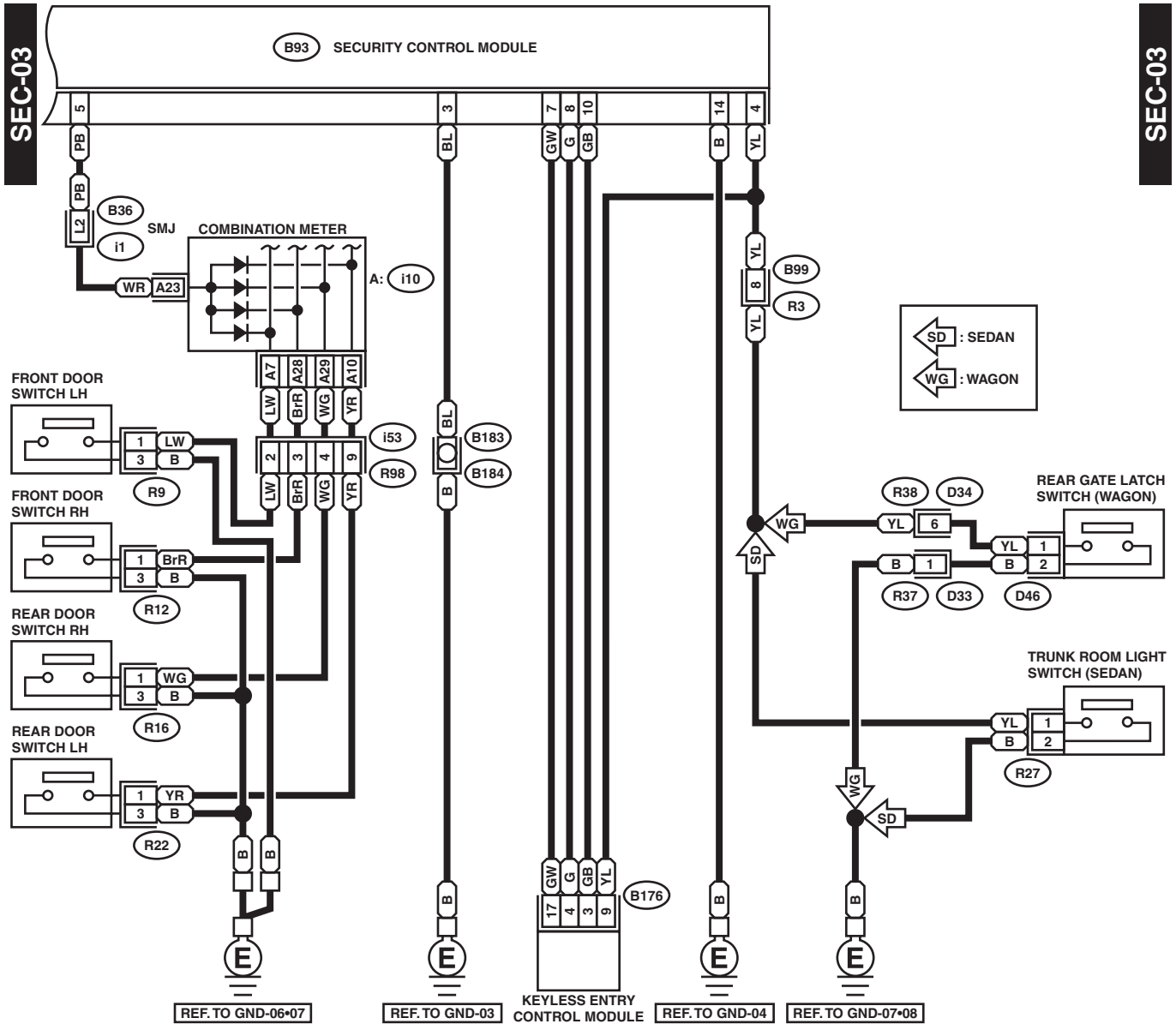


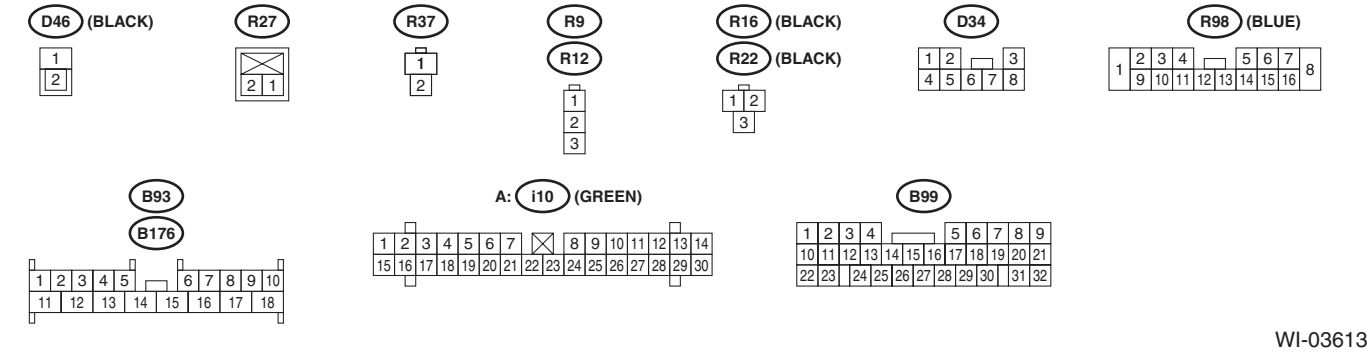


WI-06433


SEC-02
SEC-02
TO POWER SUPPLY ROUTING
MB-9 HORN RELAY
MB-6 HORN RELAY
FB-32 M/B FUSE NO. 2 (B)
FB-33 M/B FUSE NO. 2 (B)
WOS : WITH ONSTAR
OOS : WITHOUT ONSTAR
WV : WITH VDC MODEL
OV : WITHOUT VDC MODEL
H6 : 6-CYLINDER ENGINE WITH ONSTAR MODEL
HORN
F5
F47
HORN SWITCH
B68
SECURITY HORN RELAY
B243 : OOS
B243 : WOS
SECURITY HORN
B204
SECURITY INDICATOR LIGHT
COMBINATION METER
C: i12
SMJ
i1
B36
i40
B201
B28
B: i73
VEHICLE INTERFACE MODULE
B93 SECURITY CONTROL MODULE
B243 : WOS
B68
B243 (BLACK) : OOS
C: i12 (GREEN)
B93
F45 : OV
i40
F45 : WV
B: i73 (BLUE)

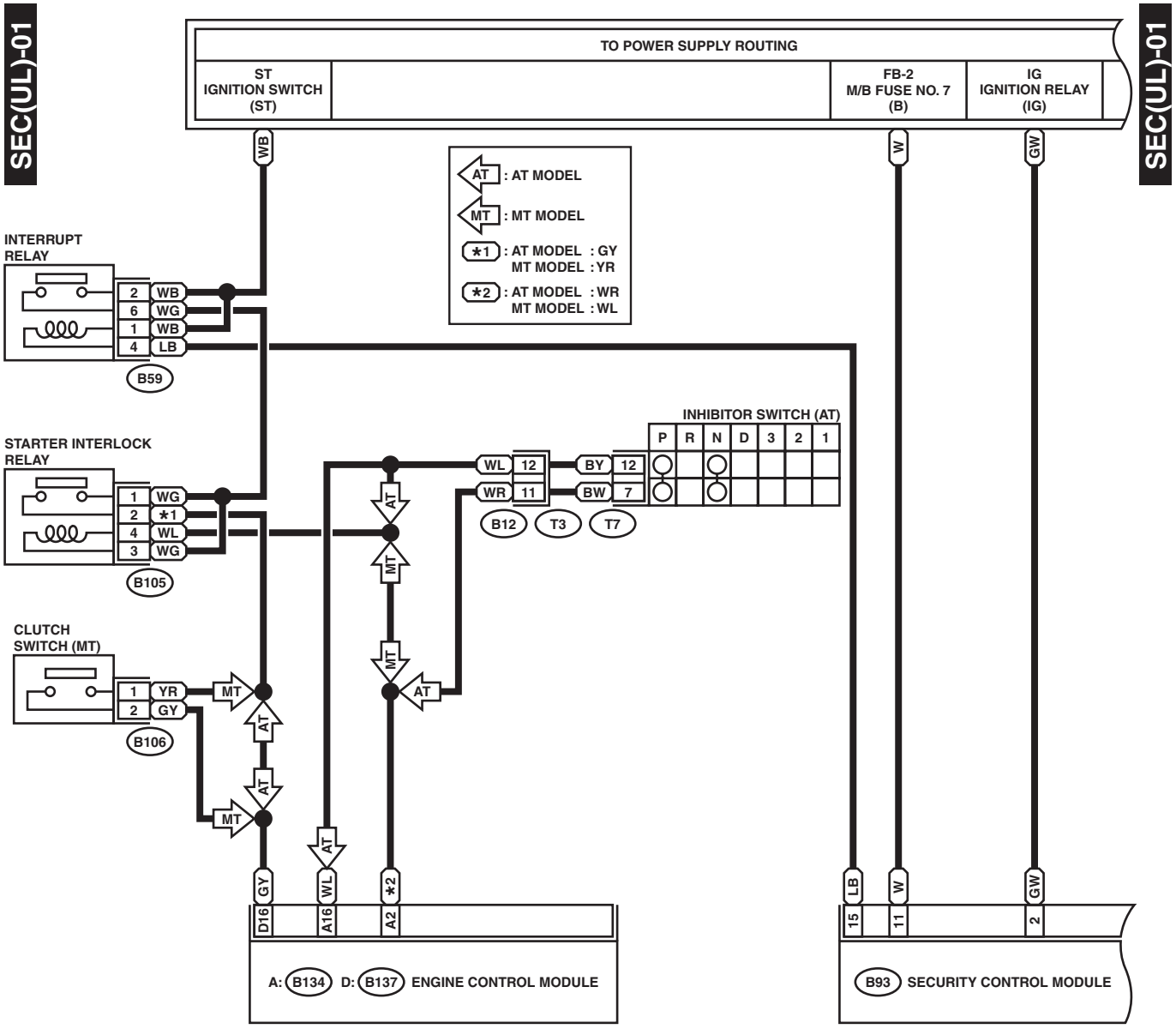
WI-03612


SEC-03
SEC-03
B93 SECURITY CONTROL MODULE
5 3 7 8 10 14 4
PB BL GW G GB B YL
B36
L2
SMJ
i1
COMBINATION METER
A: i10
WR A23
A7 A28 A29 A10
LW BrR WG YR
FRONT DOOR SWITCH LH
FRONT DOOR SWITCH RH
REAR DOOR SWITCH RH
REAR DOOR SWITCH LH
R9
R12
R16
R22
i53
R98
B183
B184
B99
R3
SD : SEDAN
WG : WAGON
R38 D34
REAR GATE LATCH SWITCH (WAGON)
R37 D33 D46
TRUNK ROOM LIGHT SWITCH (SEDAN)
R27
B176
KEYLESS ENTRY CONTROL MODULE
REF. TO GND-06•07
REF. TO GND-03
REF. TO GND-04
REF. TO GND-07•08

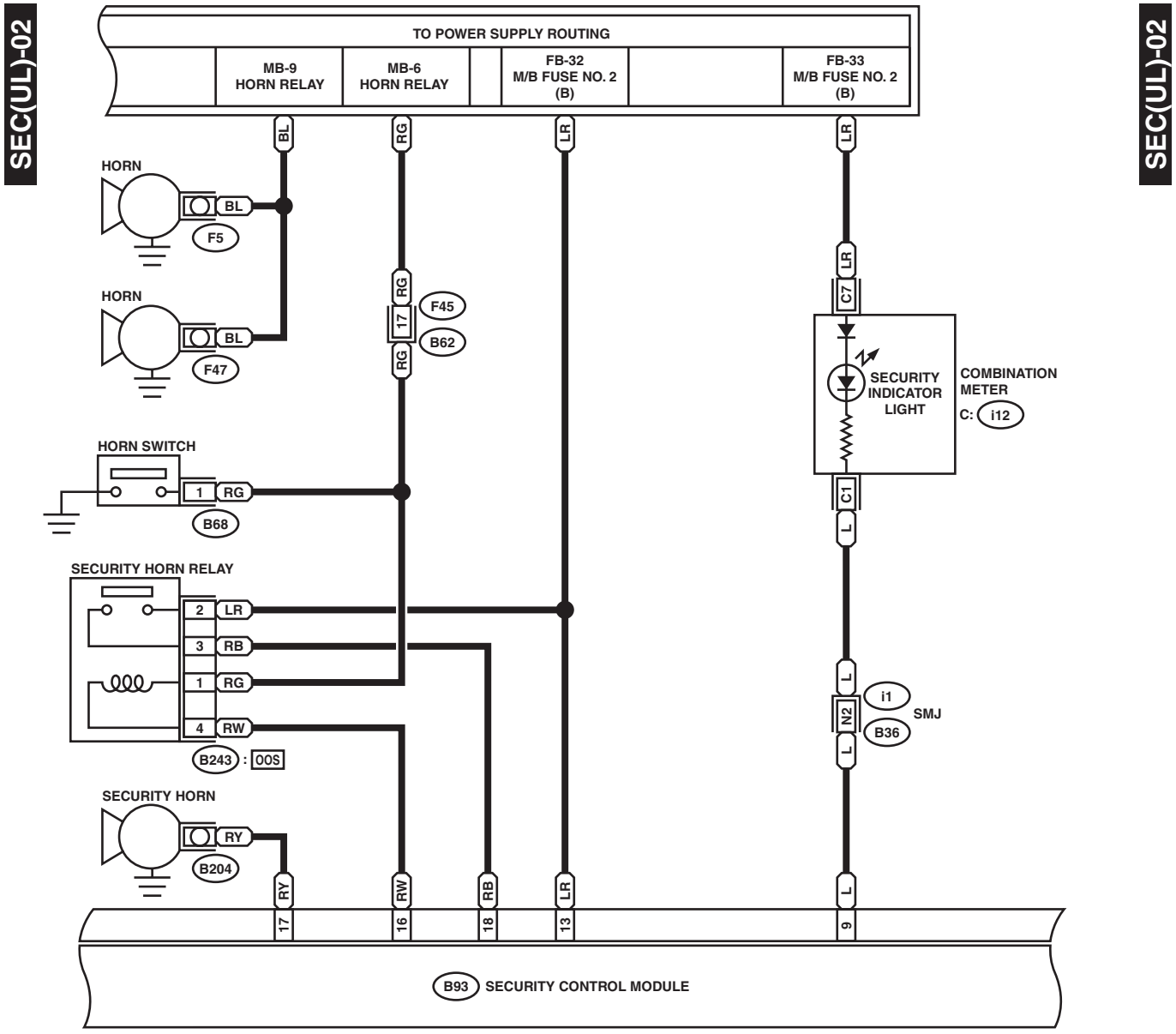

D46 (BLACK)
R27
R37
R9
R12
R16 (BLACK)
R22 (BLACK)
D34
R98 (BLUE)
B93
B176
A: i10 (GREEN)
B99

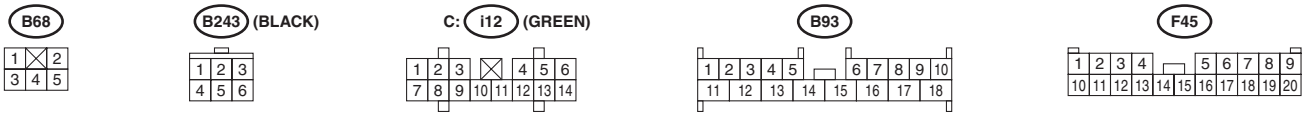
WI-03613

2. U5 MODEL

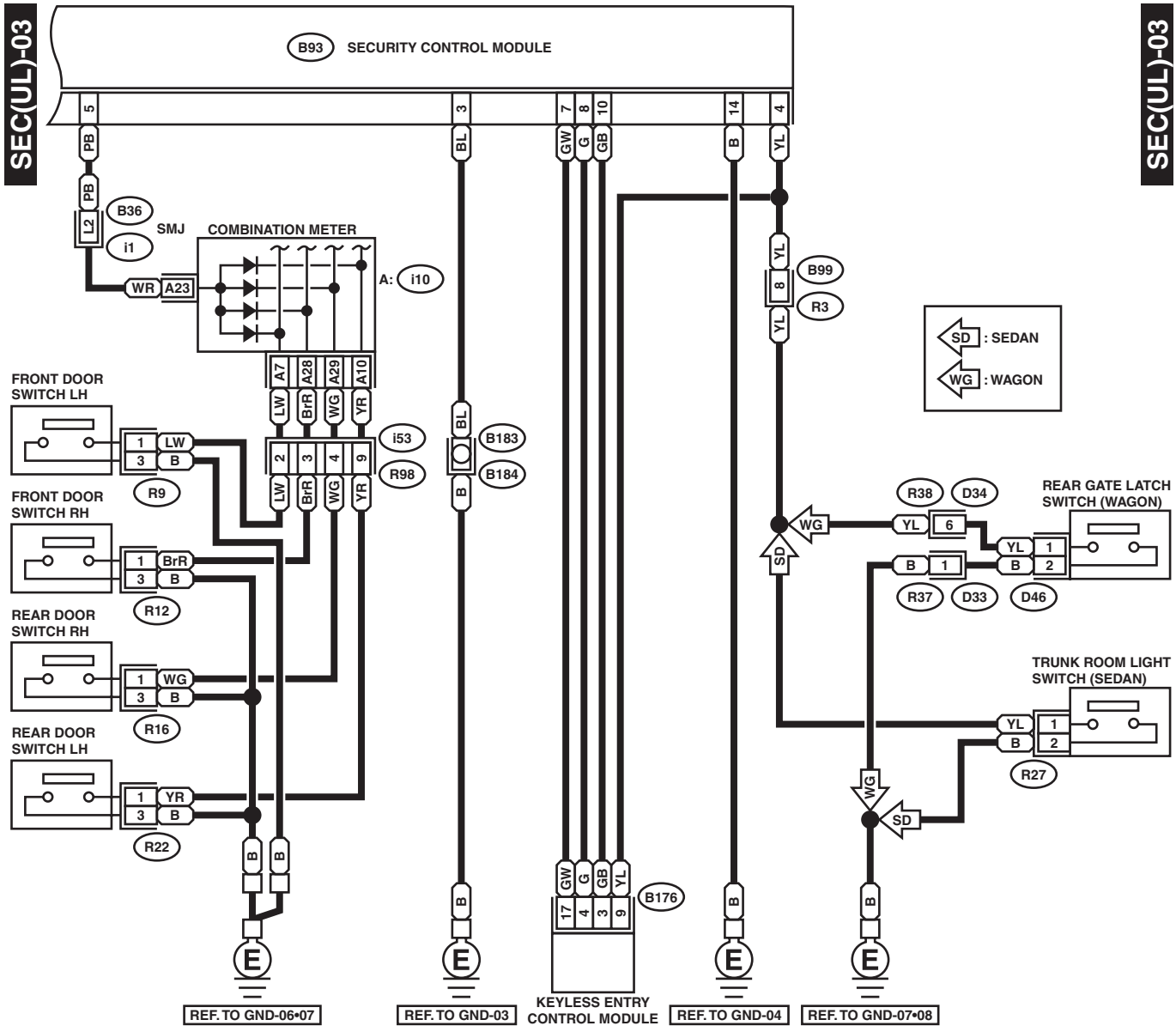


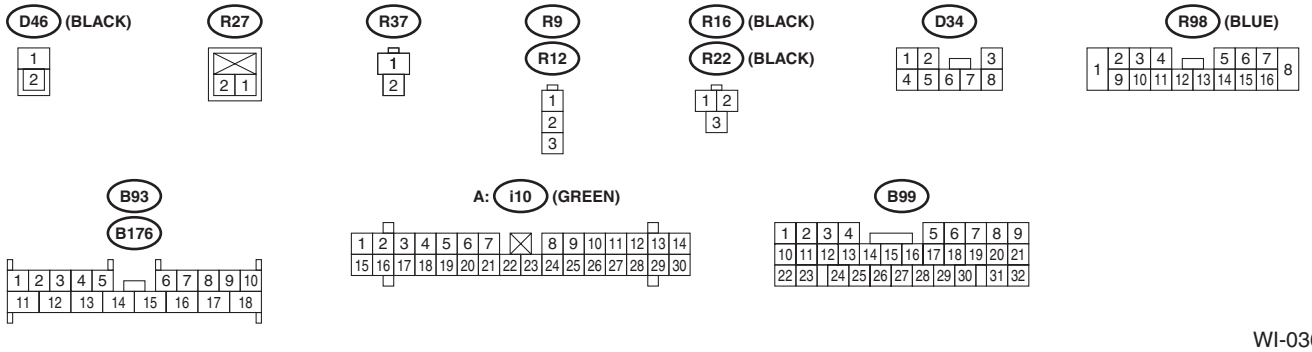
WI-06434


SEC(UL)-02
SEC(UL)-02
TO POWER SUPPLY ROUTING
MB-9 HORN RELAY
MB-6 HORN RELAY
FB-32 M/B FUSE NO. 2 (B)
FB-33 M/B FUSE NO. 2 (B)
HORN
BL
F5
HORN
BL
F47
RG
17
F45
B62
RG
HORN SWITCH
1
RG
B68
SECURITY HORN RELAY
2
LR
3
RB
1
RG
4
RW
B243 : 00S
SECURITY HORN
RY
B204
LR
C7
SECURITY INDICATOR LIGHT
COMBINATION METER
C: i12
C1
L
L
i1
N2
SMJ
B36
L
RY
RW
RB
LR
L
17
16
18
13
9
B93 SECURITY CONTROL MODULE


B68
B243 (BLACK)
C: i12 (GREEN)
B93
F45

WI-03610


SEC(UL)-03
SEC(UL)-03
B93 SECURITY CONTROL MODULE
5 3 7 8 10 14 4
PB BL GW G GB B YL
B36
SMJ
COMBINATION METER
i1
WR A23
A: i10
YL 8 B99
R3
SD : SEDAN
WG : WAGON
A7 A28 A29 A10
LW BrR WG YR
FRONT DOOR SWITCH LH
FRONT DOOR SWITCH RH
REAR DOOR SWITCH RH
REAR DOOR SWITCH LH
1 LW 3 B
R9
1 BrR 3 B
R12
1 WG 3 B
R16
1 YR 3 B
R22
i53
R98
2 3 4 9
B183
B184
BL B
R38 D34
REAR GATE LATCH SWITCH (WAGON)
YL 6
B 1
YL 1
B 2
R37 D33 D46
TRUNK ROOM LIGHT SWITCH (SEDAN)
R27
WG SD
GW G GB YL
17 4 3 9
B176
KEYLESS ENTRY CONTROL MODULE
E
REF. TO GND-06•07
REF. TO GND-03
REF. TO GND-04
REF. TO GND-07•08

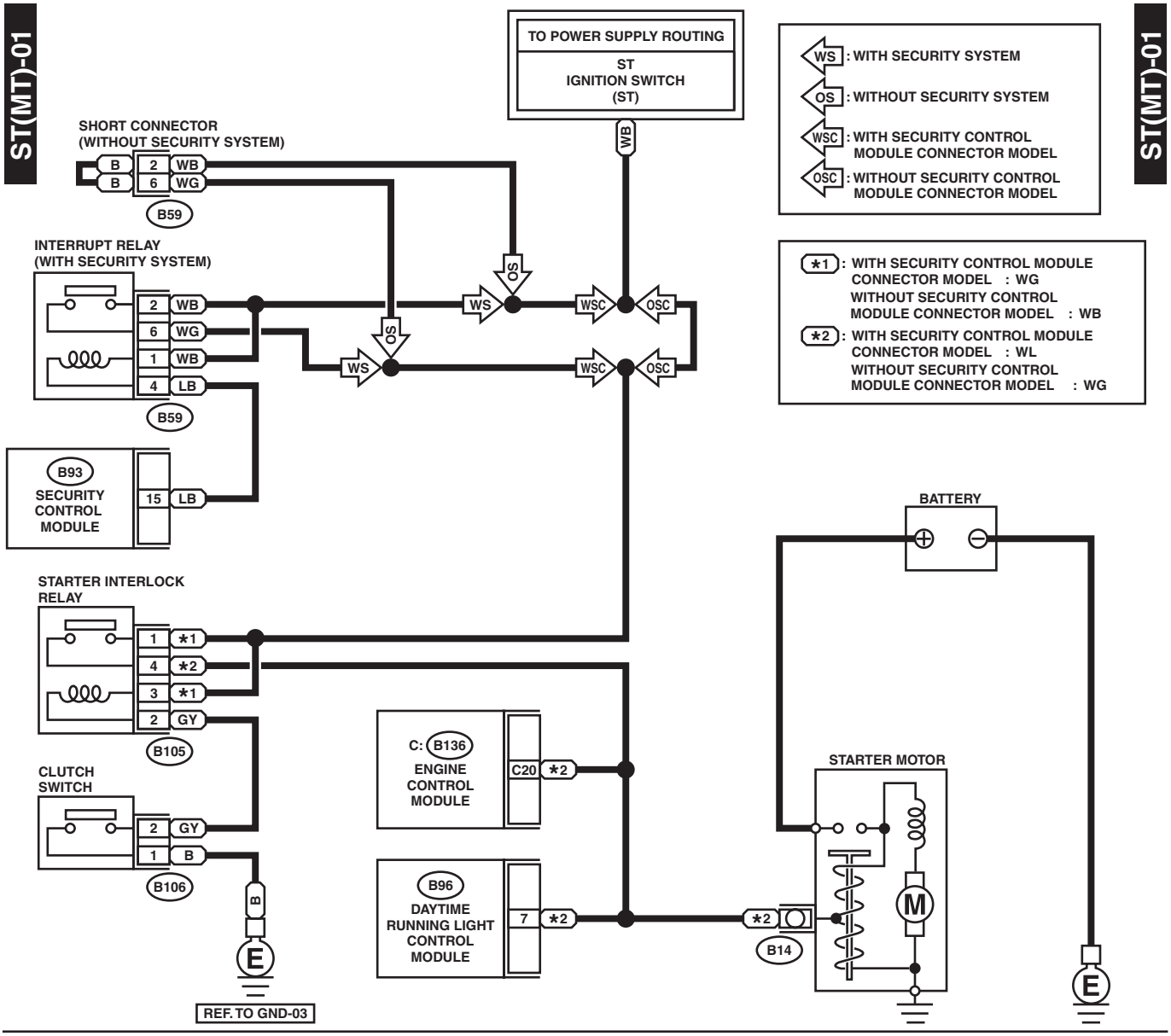

D46 (BLACK)
R27
R37
R9
R12
R16 (BLACK)
R22 (BLACK)
D34
R98 (BLUE)
B93
B176
A: i10 (GREEN)
B99

WI-03611

45.Starter System

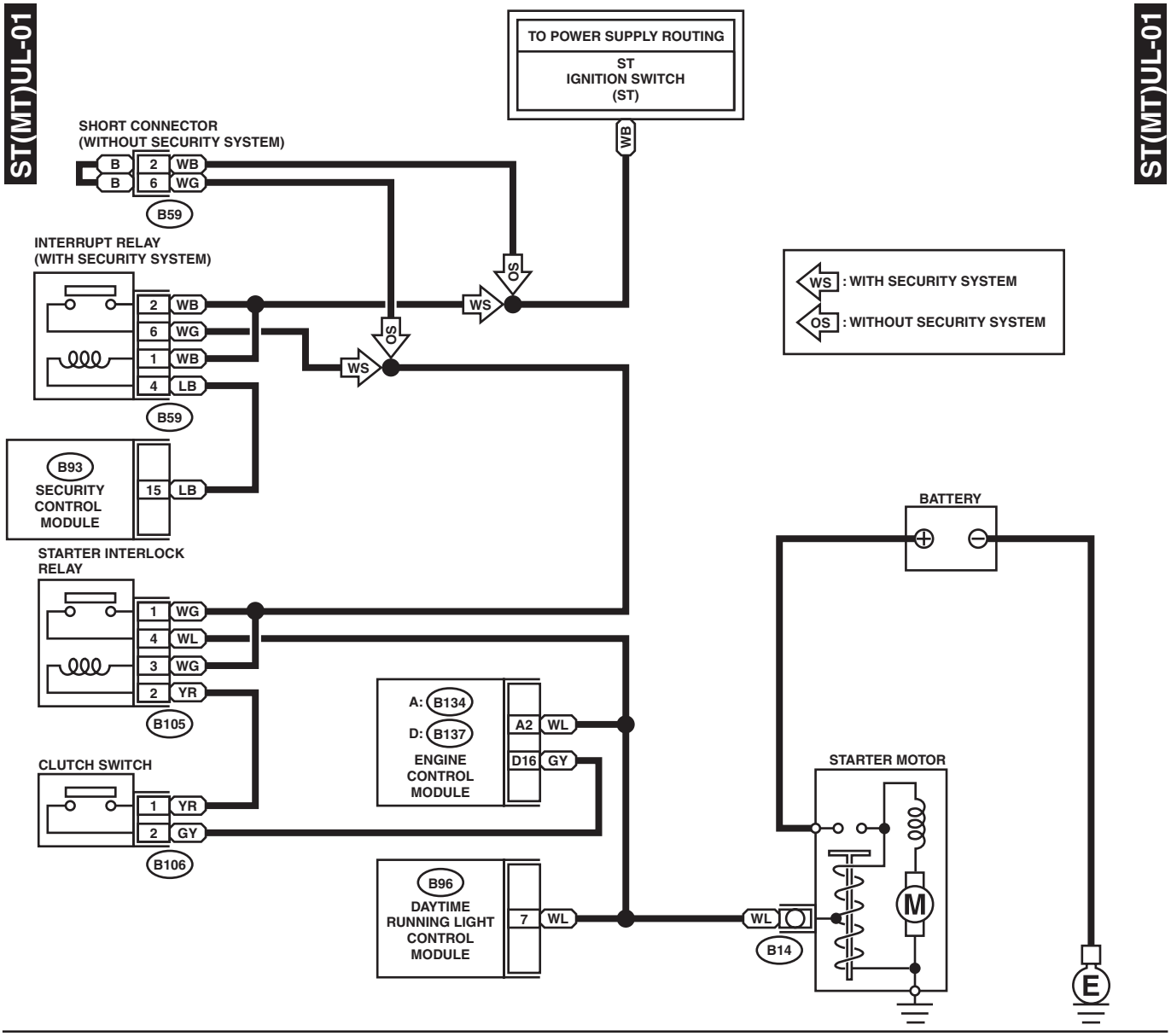
A: SCHEMATIC

1. MT (EXCEPT U5 MODEL)



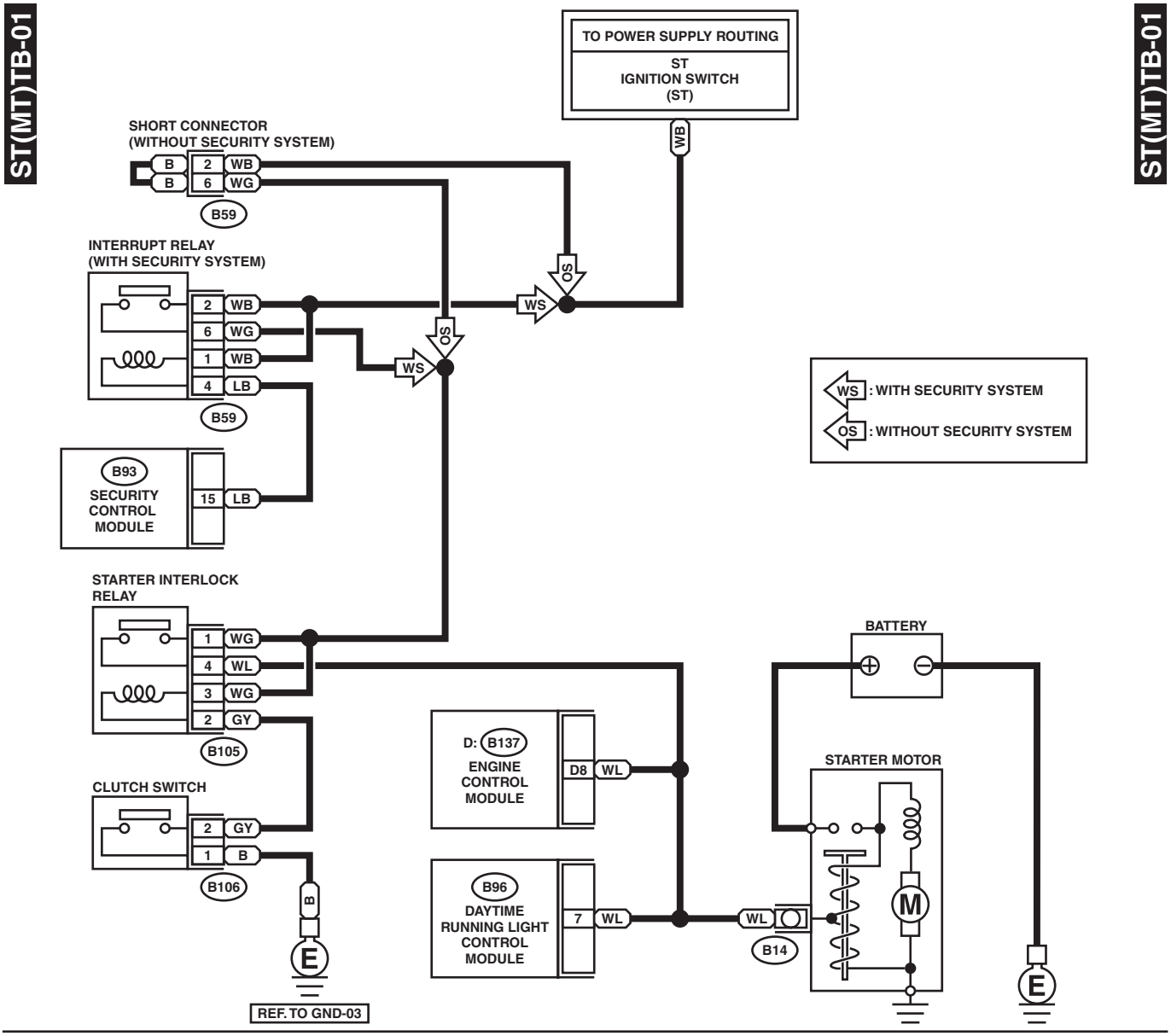
WI-06435

2. MT (U5 MODEL)



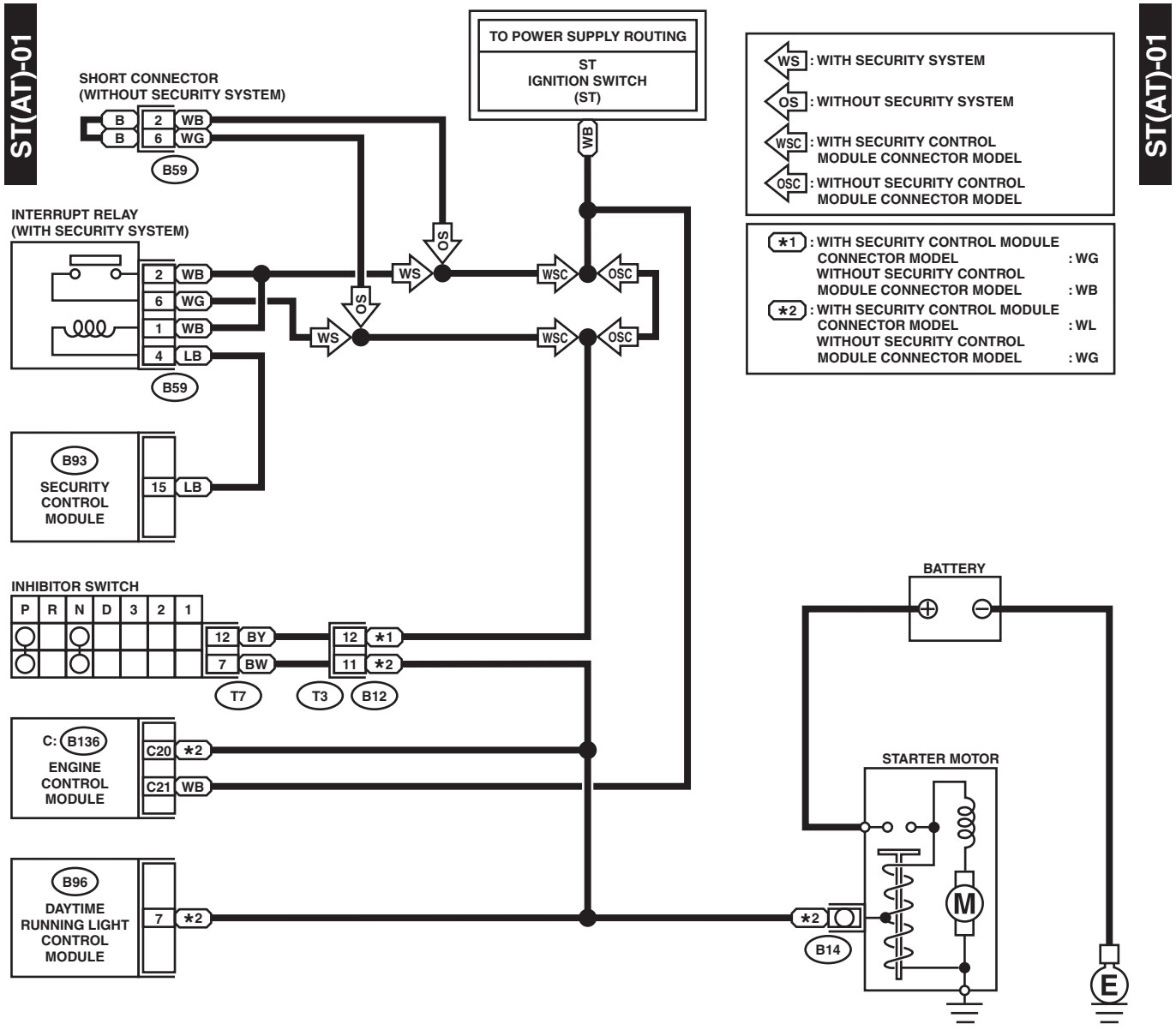
WI-05873

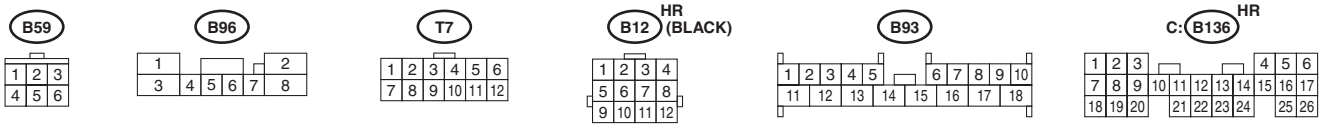
3. MT (TURBO ENGINE)



WI-05874

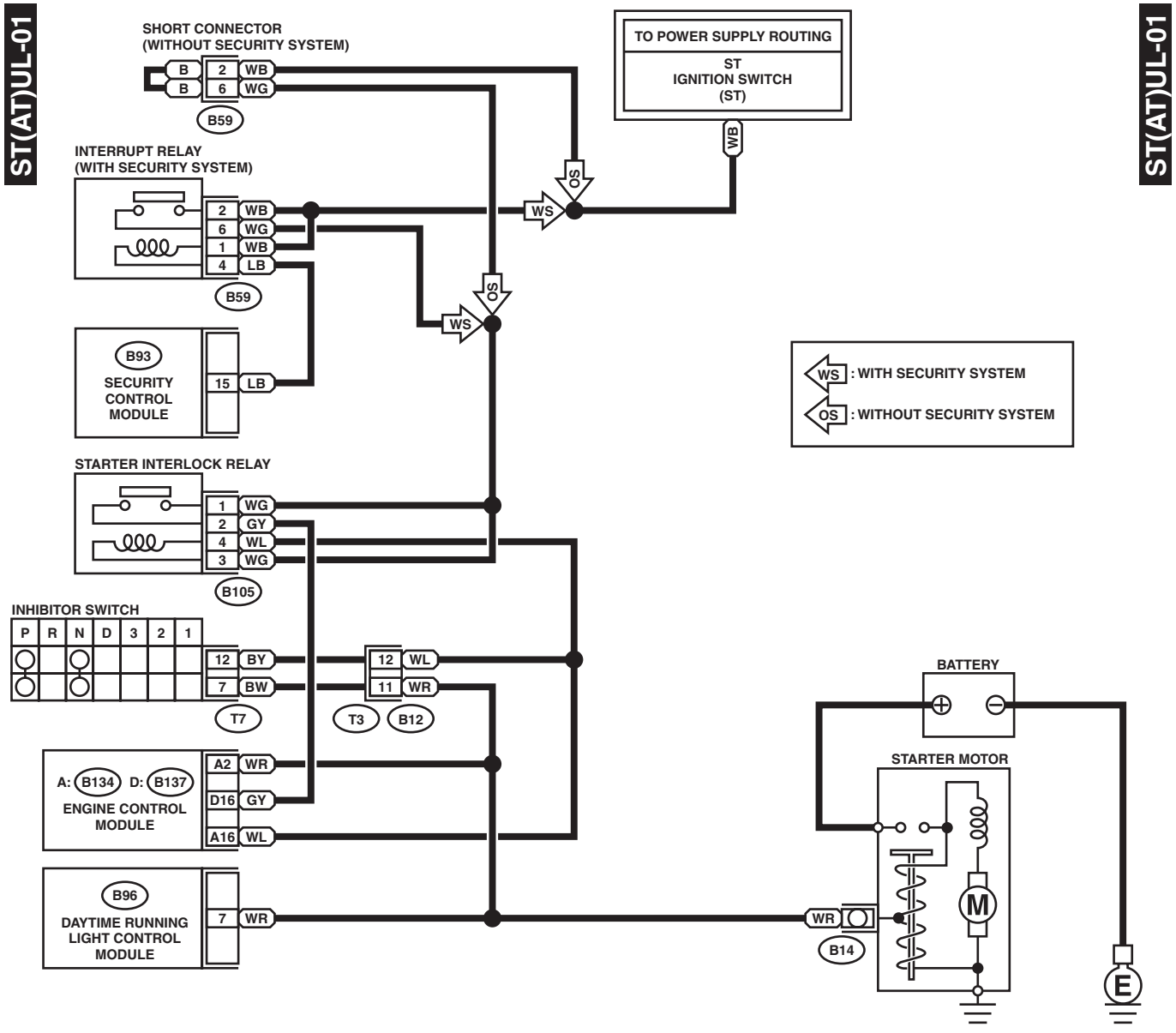
4. AT (EXCEPT 4-CYLINDER ENGINE U5 MODEL)

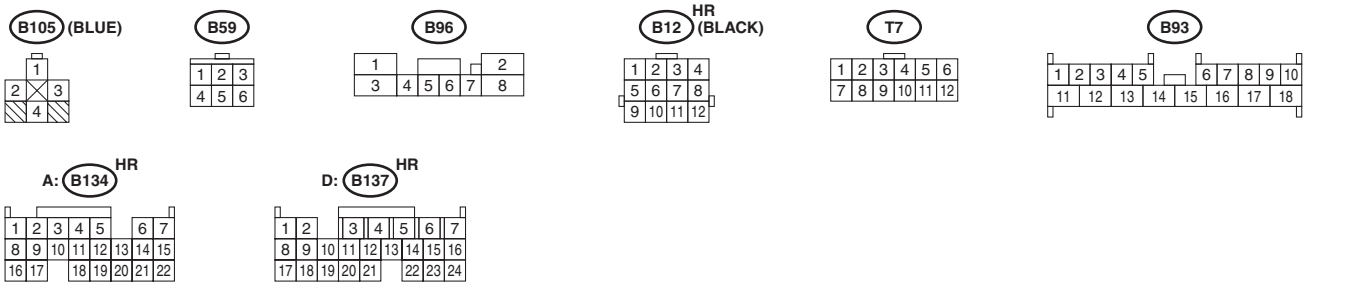




WI-05875

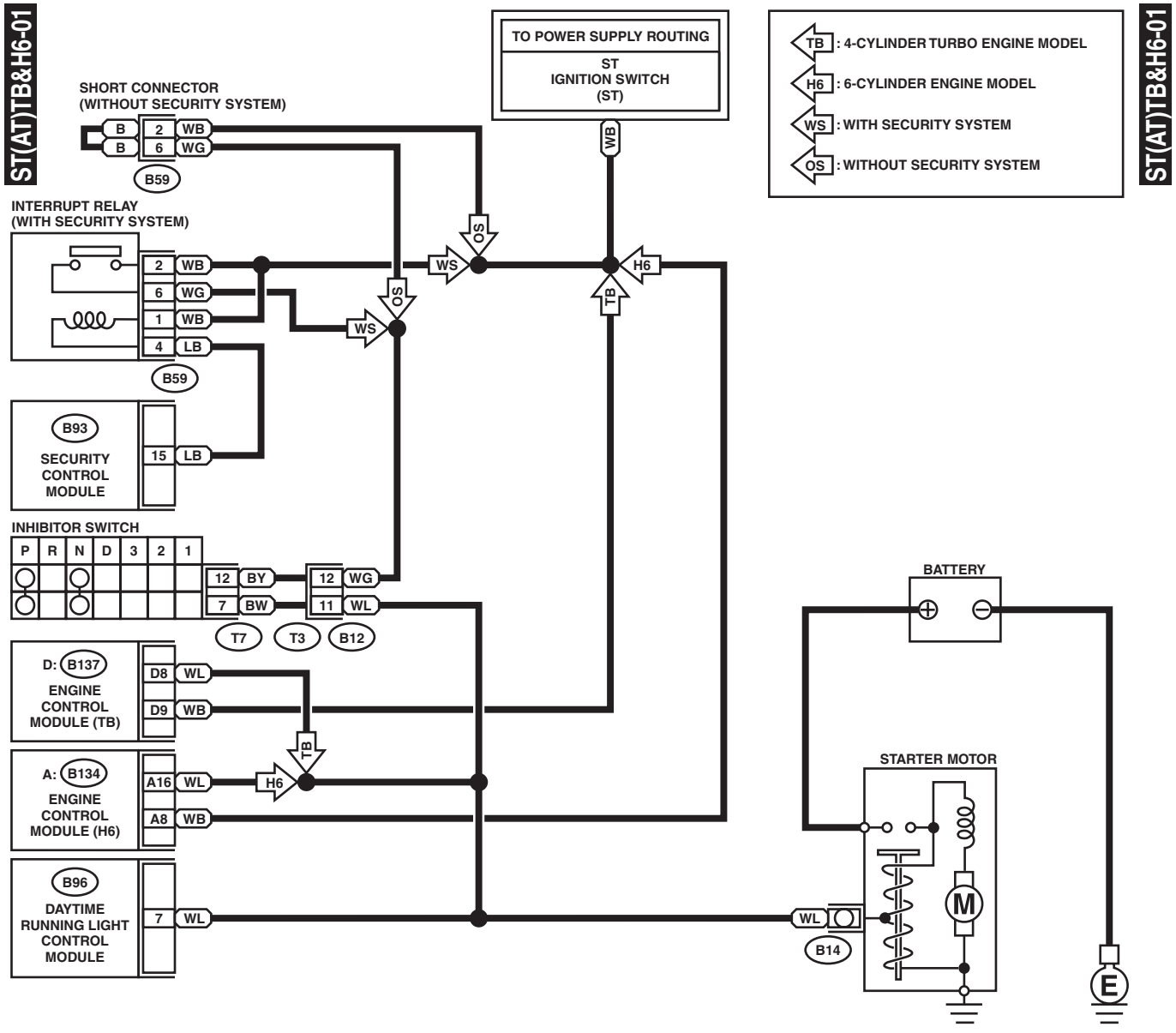
5. AT (4-CYLINDER ENGINE U5 MODEL)

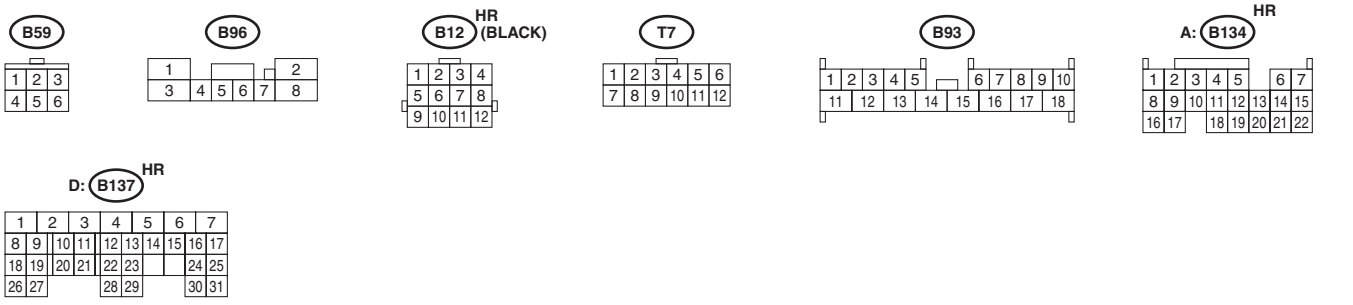




WI-05876

6. AT (6-CYLINDER AND TURBO ENGINE)

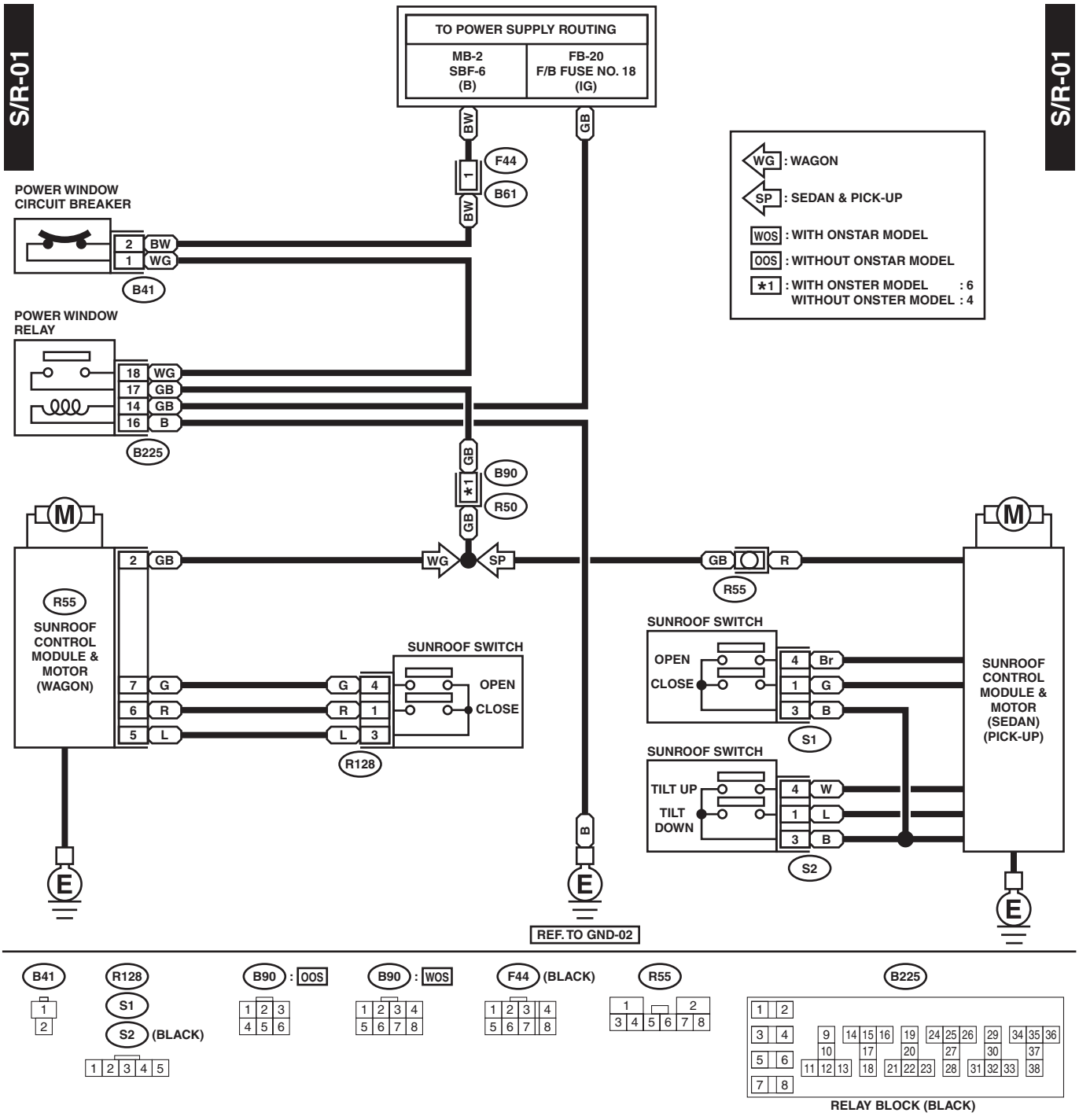




WI-05877

46.Sunroof System

A: SCHEMATIC

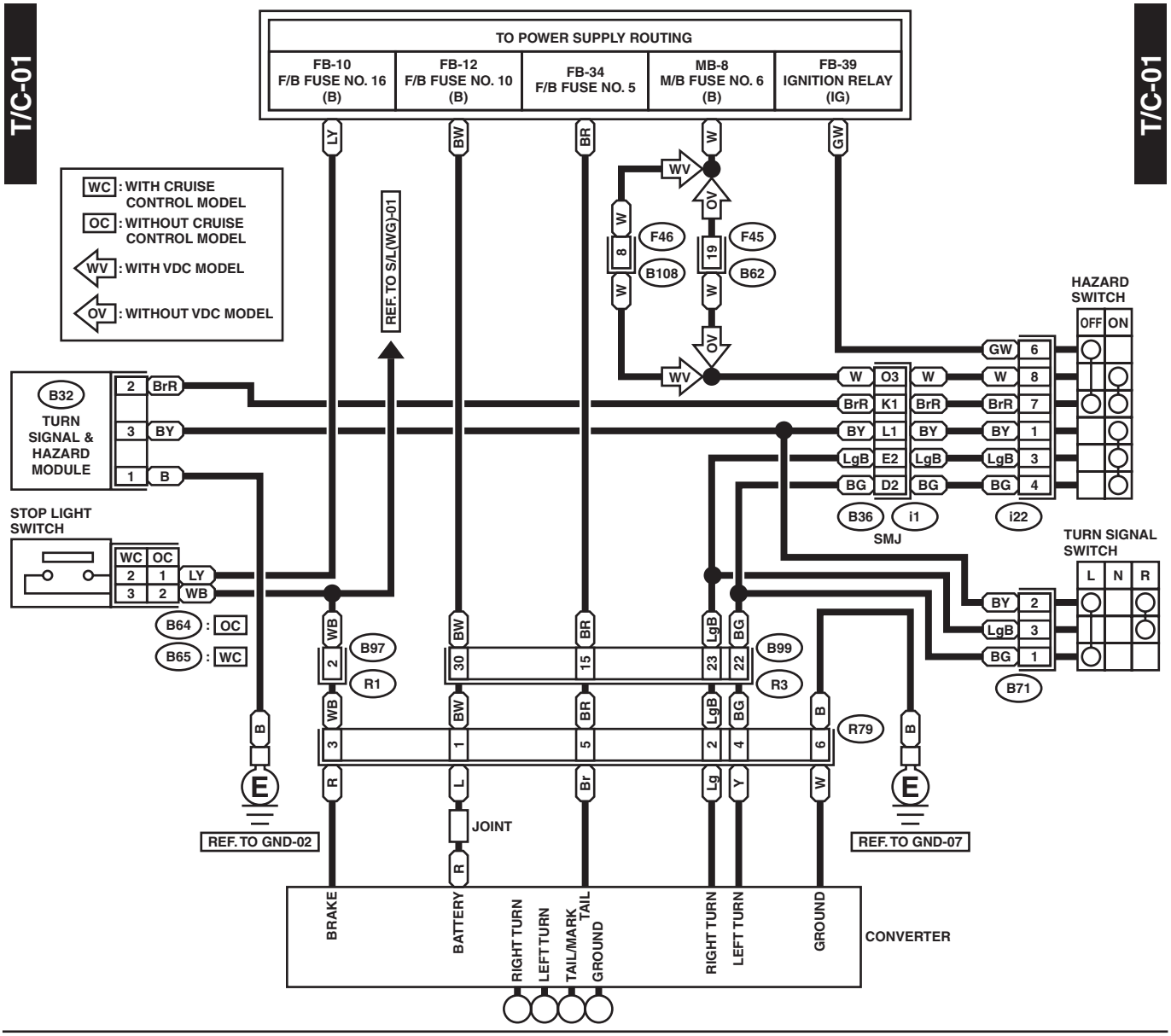


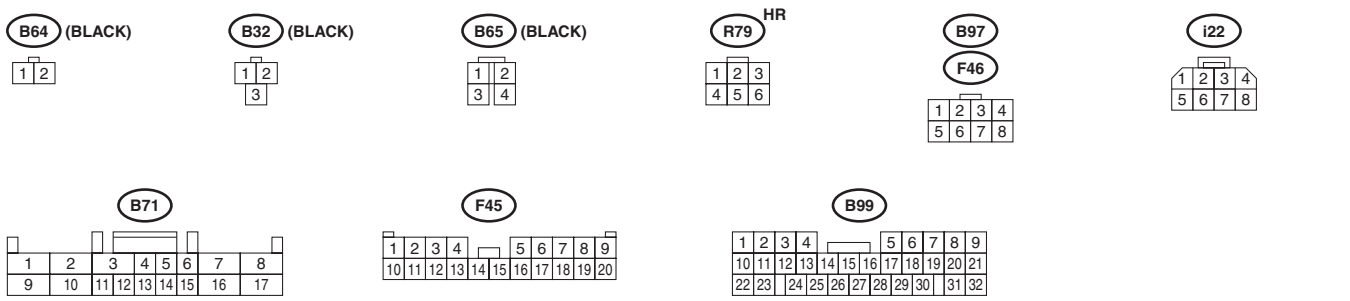
WI-03618

47.Trailer Wire Harness (Option)

A: SCHEMATIC

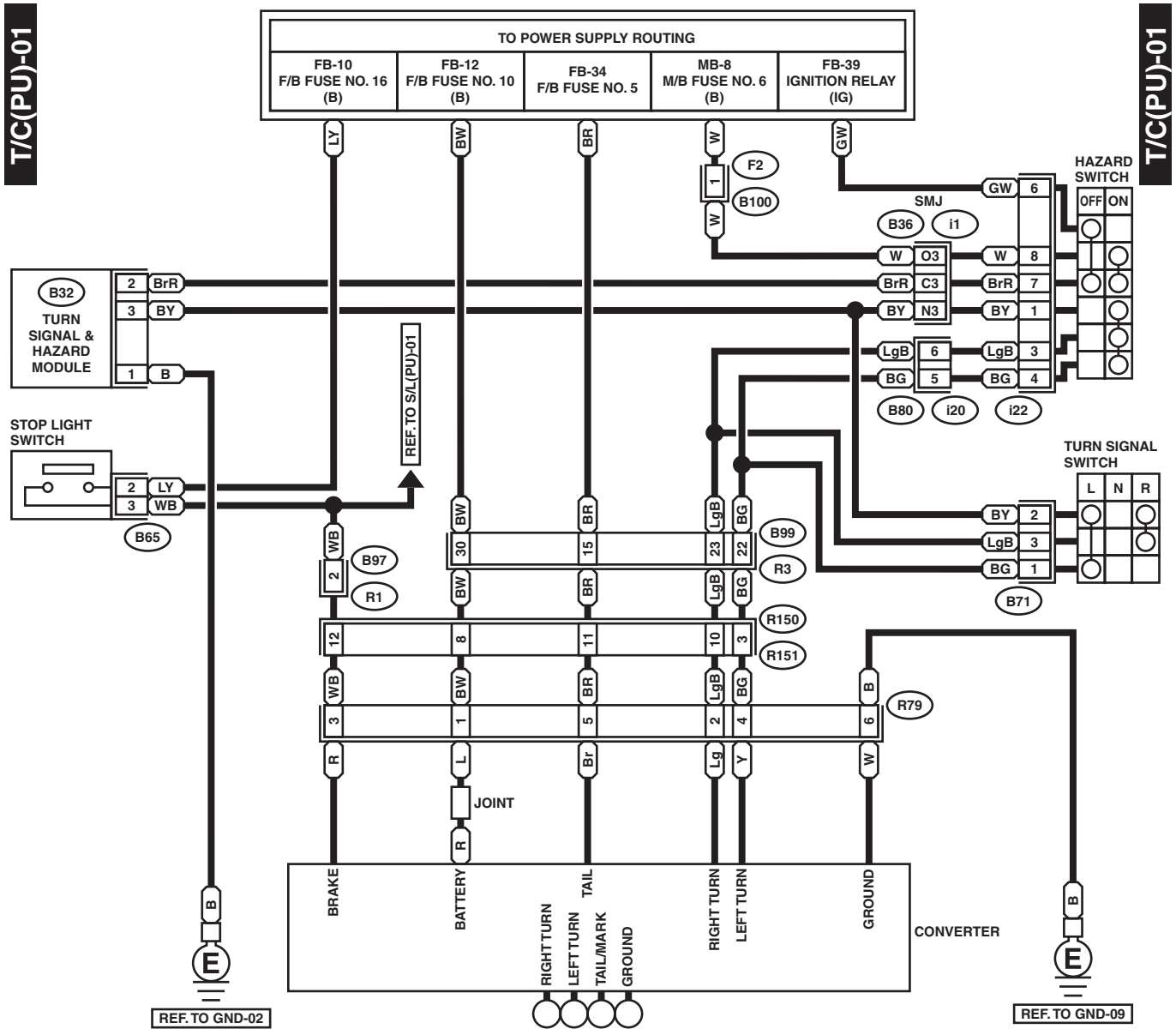
1. SEDAN & WAGON MODEL

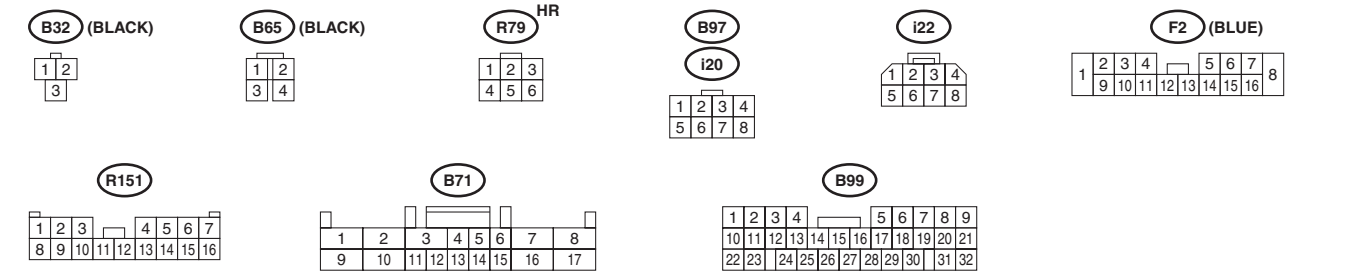




WI-05878

2. PICK-UP MODEL



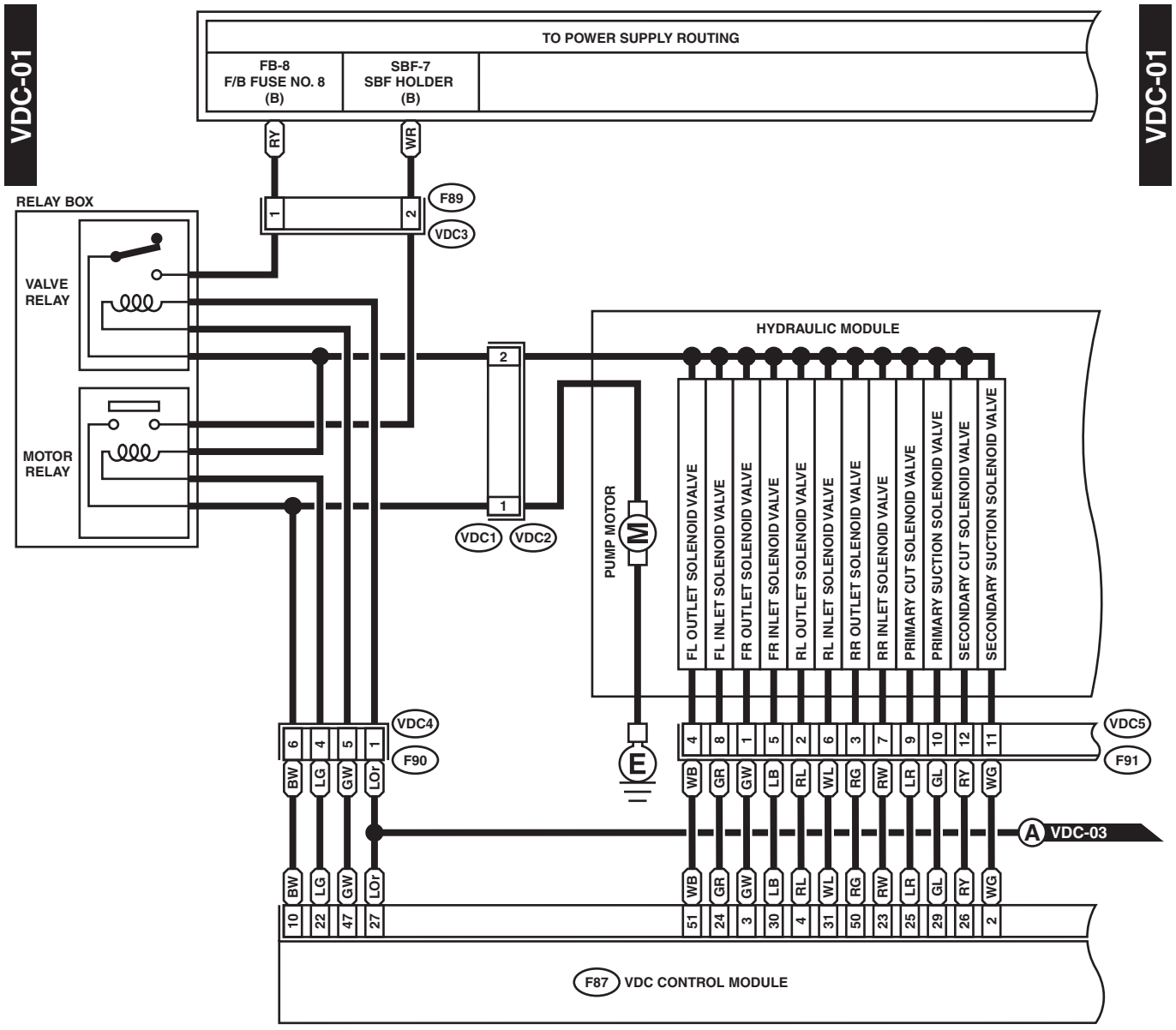


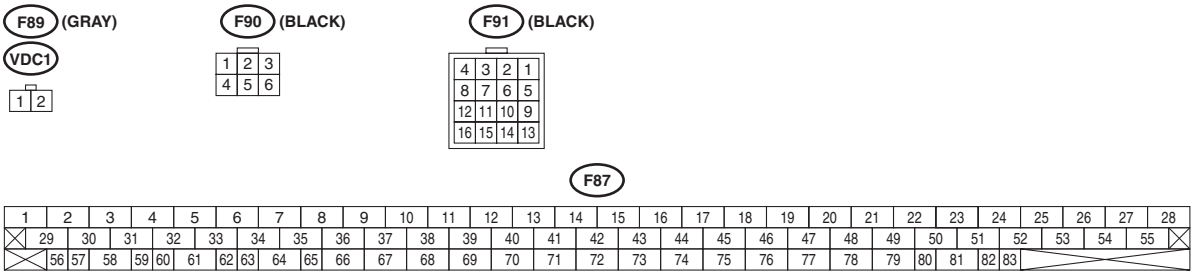
WI-05879

MEMO:

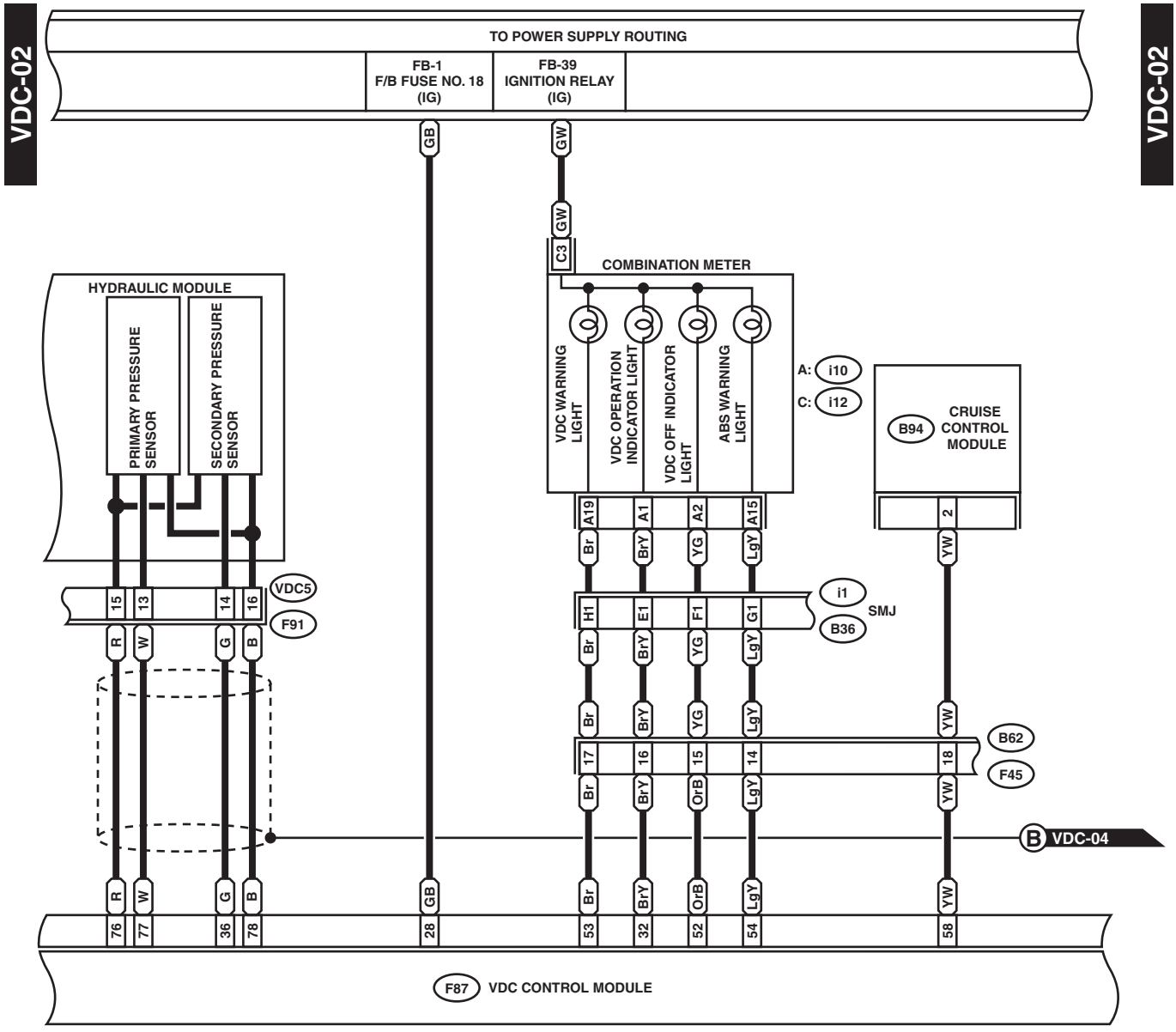
48.Vehicle Dynamic Control System

A: SCHEMATIC





WI-03887



C: i12 (GREEN)

1	2	3		4	5	6							
7	8	9	10	11	12	13	14						

F91 (BLACK)

4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

B94 (BLACK)

1	2	3	4	5	6	7	8	9	10	
11	12	13	14	15	16	17	18	19	20	

A: i10 (GREEN)

1	2	3	4	5	6	7		8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

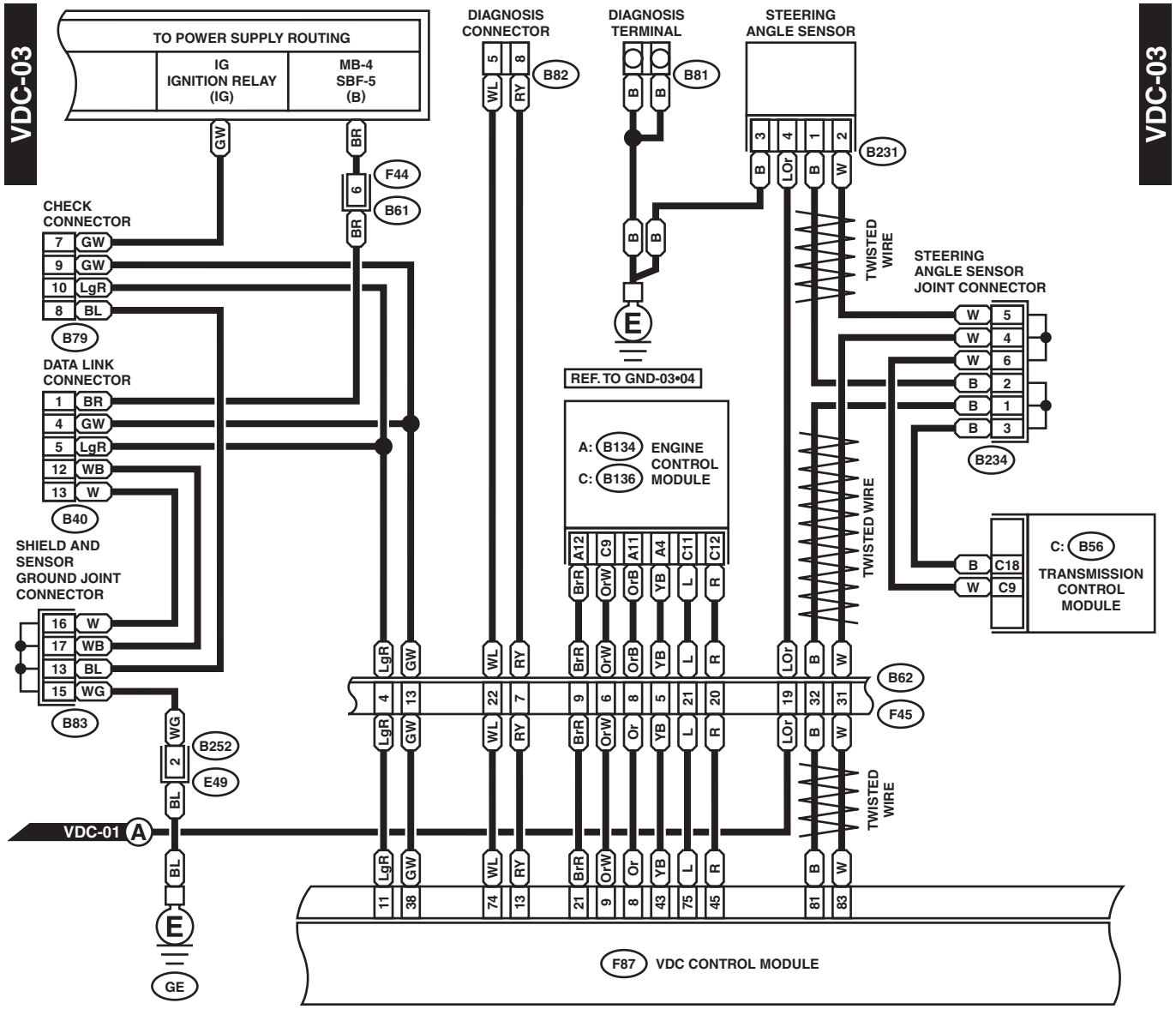
F45

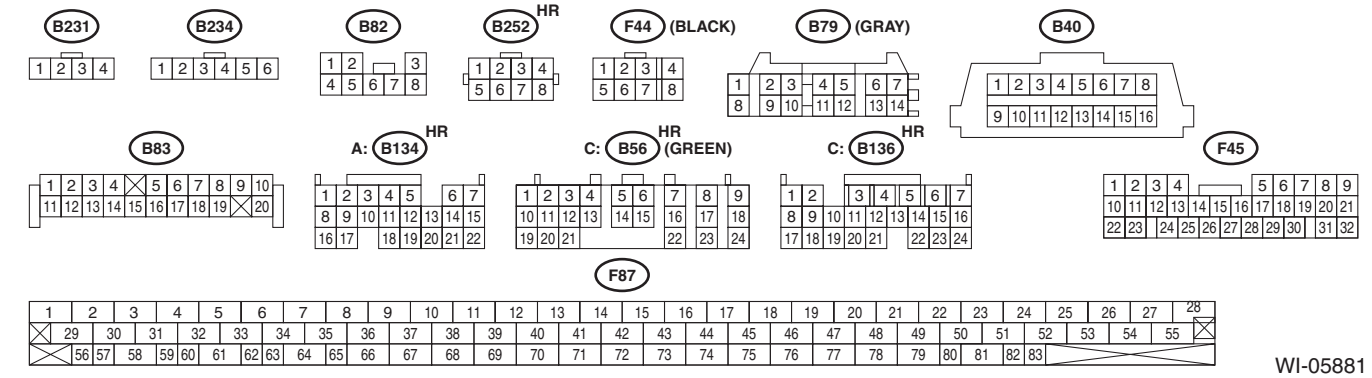
1	2	3	4		5	6	7	8	9
10	11	12	13	14	15	16	17	18	19	20	21
22	23		24	25	26	27	28	29	30		31	32

F87

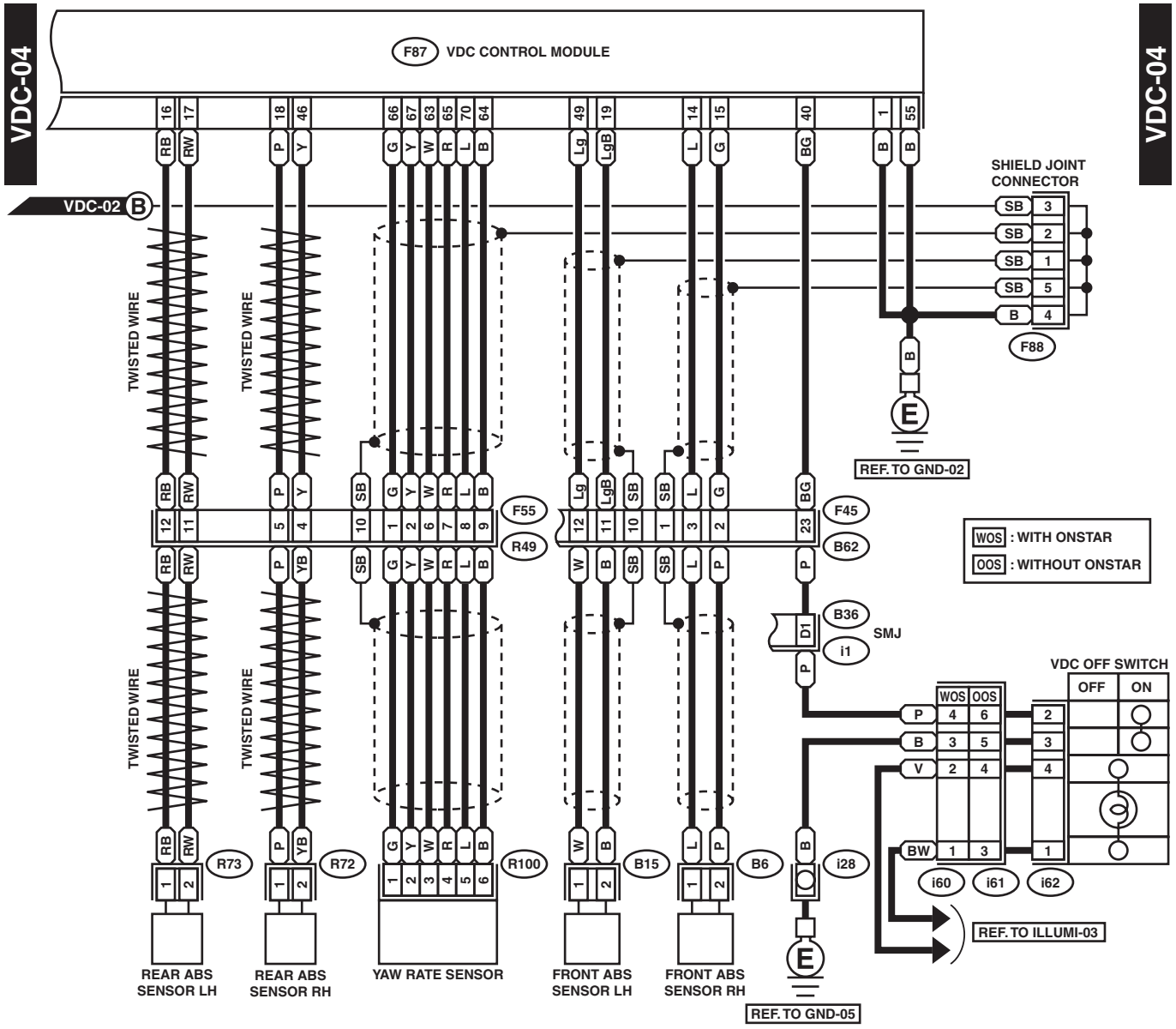
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

WI-03888


VDC-03
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-4
SBF-5
(B)
DIAGNOSIS CONNECTOR
B82
DIAGNOSIS TERMINAL
B81
STEERING ANGLE SENSOR
B231
F44
B61
CHECK CONNECTOR
B79
DATA LINK CONNECTOR
B40
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B83
B252
E49
VDC-01 A
GE
REF. TO GND-03•04
A: B134 ENGINE CONTROL MODULE
C: B136
TWISTED WIRE
STEERING ANGLE SENSOR JOINT CONNECTOR
B234
C: B56 TRANSMISSION CONTROL MODULE
B62
F45
F87 VDC CONTROL MODULE


B231
B234
B82
B252 HR
F44 (BLACK)
B79 (GRAY)
B40
B83
A: B134 HR
C: B56 HR (GREEN)
C: B136 HR
F45
F87

WI-05881

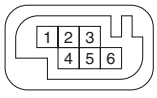


B6 (BROWN)
B15 (BROWN)
R72 (GRAY)
R73 (GRAY)

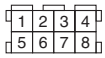
i60 : WOS
i62

i60 : OOS

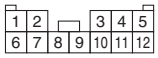
R100 HR



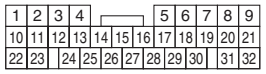
F88



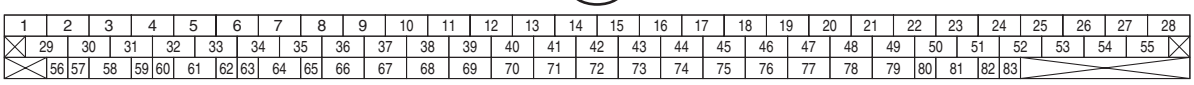
F55



F45



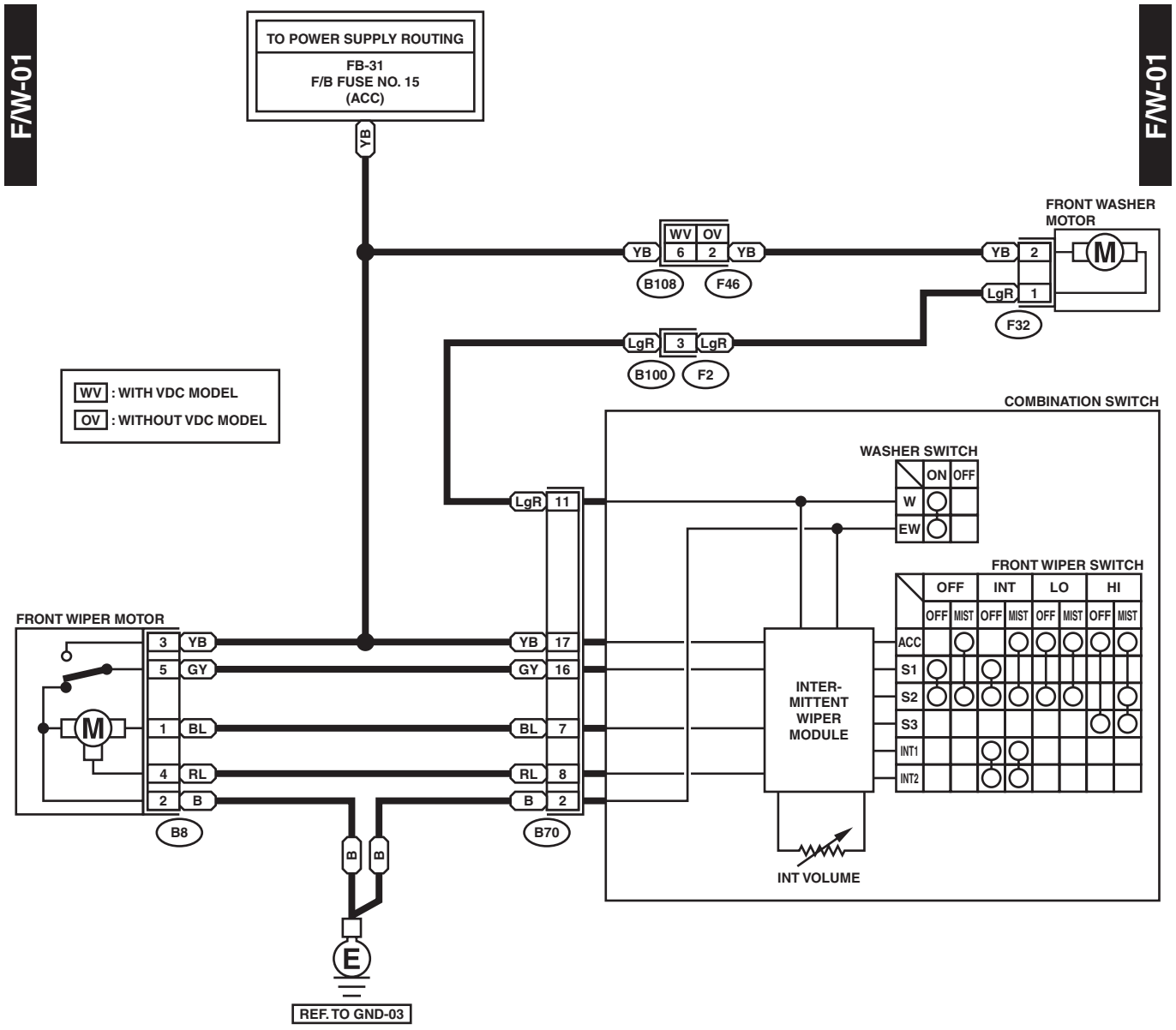
F87

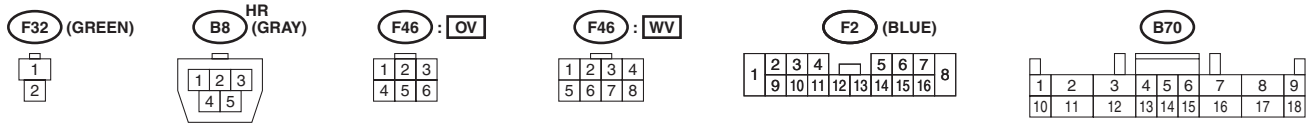


WI-05882

49.Wiper and Washer System (Front)

A: SCHEMATIC

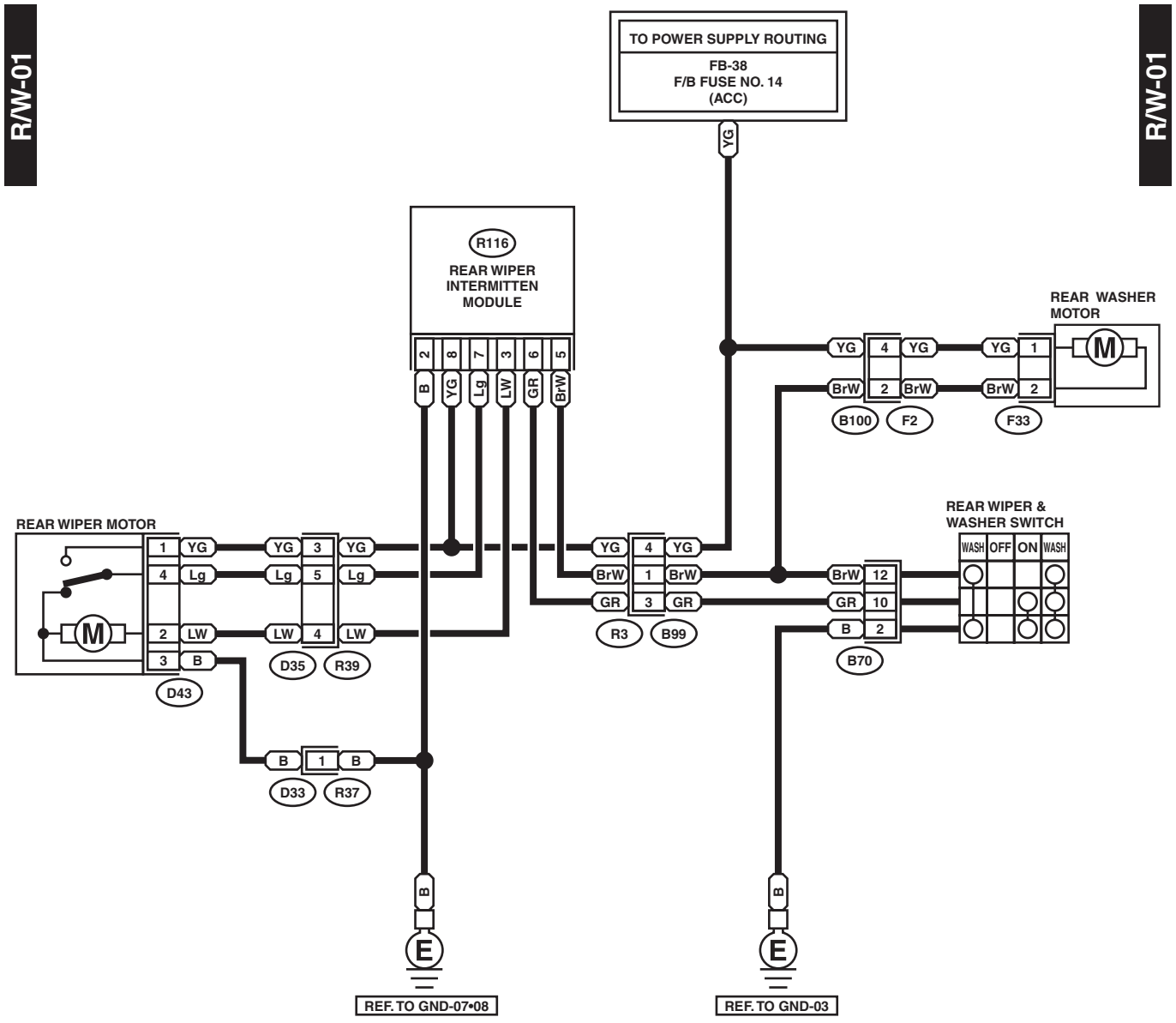




WI-05883

50.Wiper and Washer System (Rear)

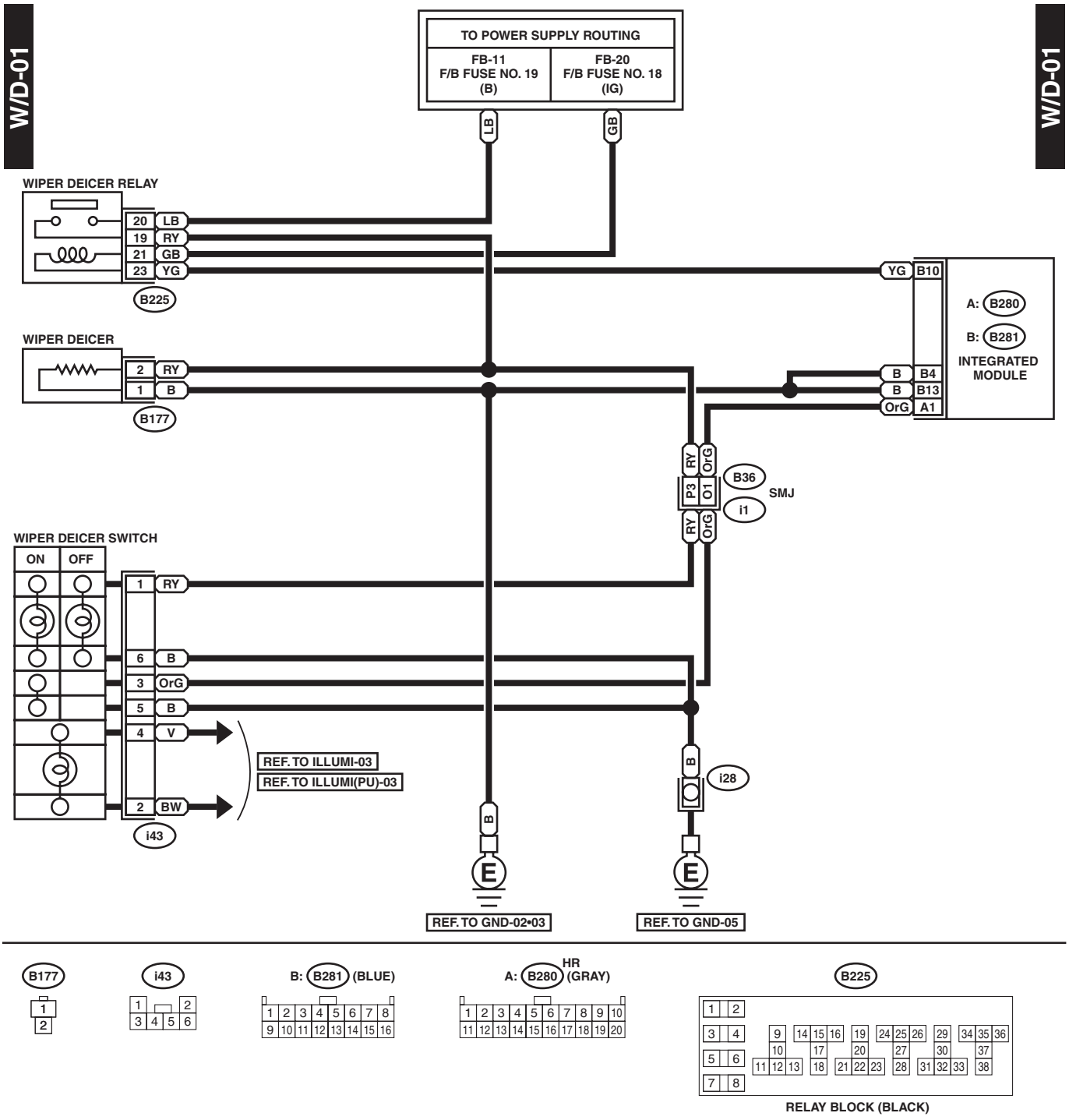
A: SCHEMATIC



WI-03624

51.Wiper Deicer System

A: SCHEMATIC



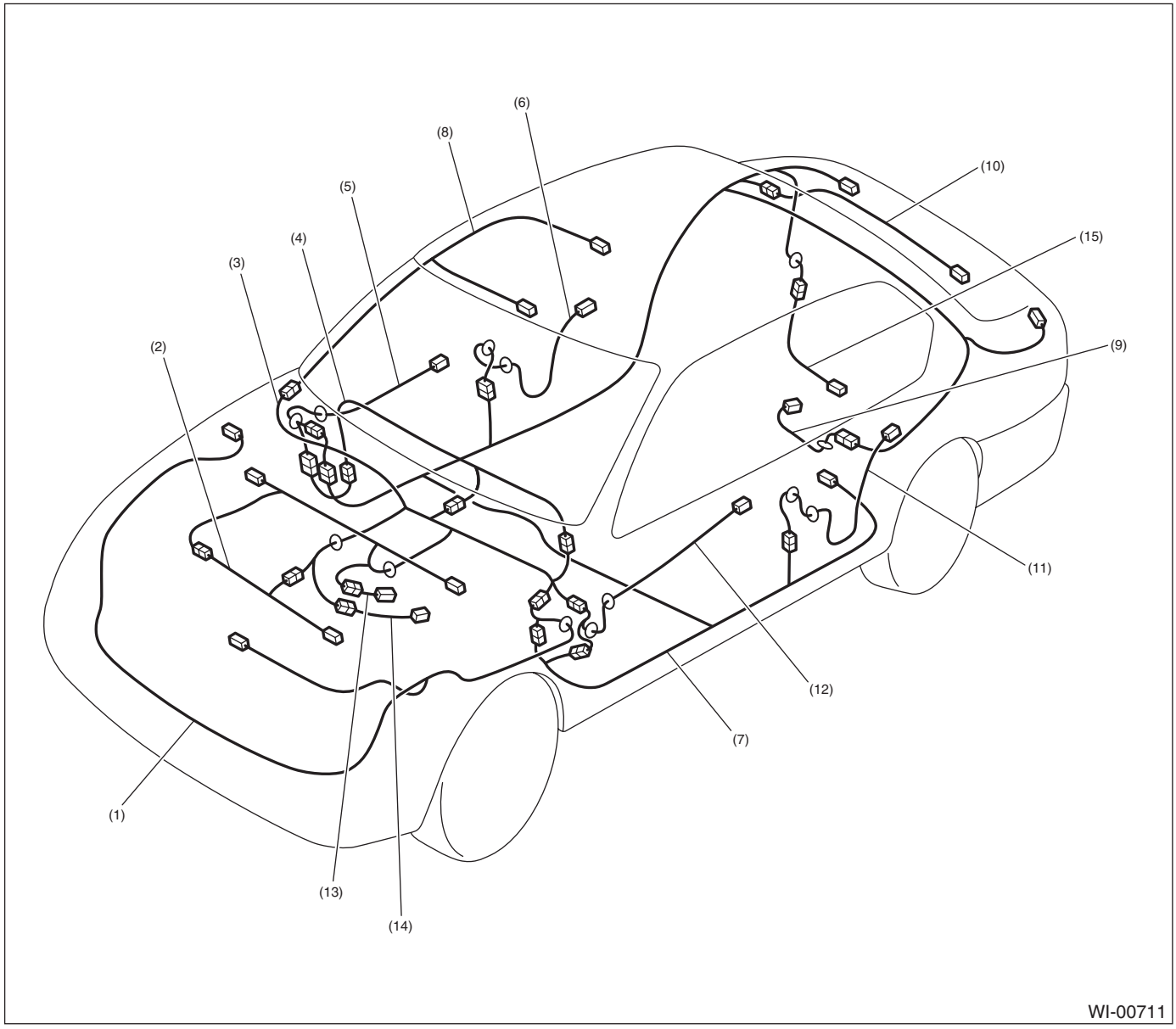
WI-05884

MEMO:

52.Harness Components Location

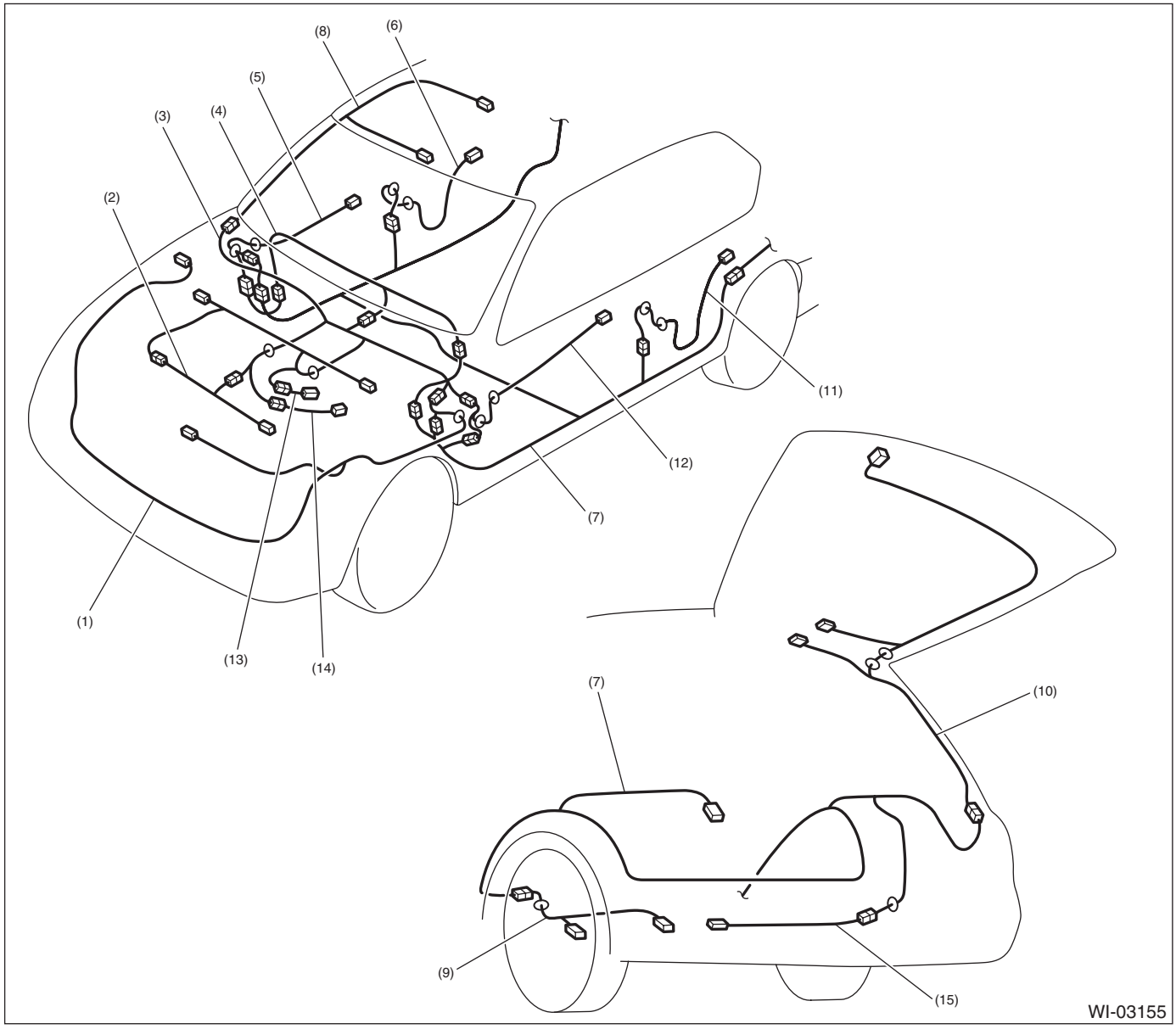
A: LOCATION

1. SEDAN MODEL



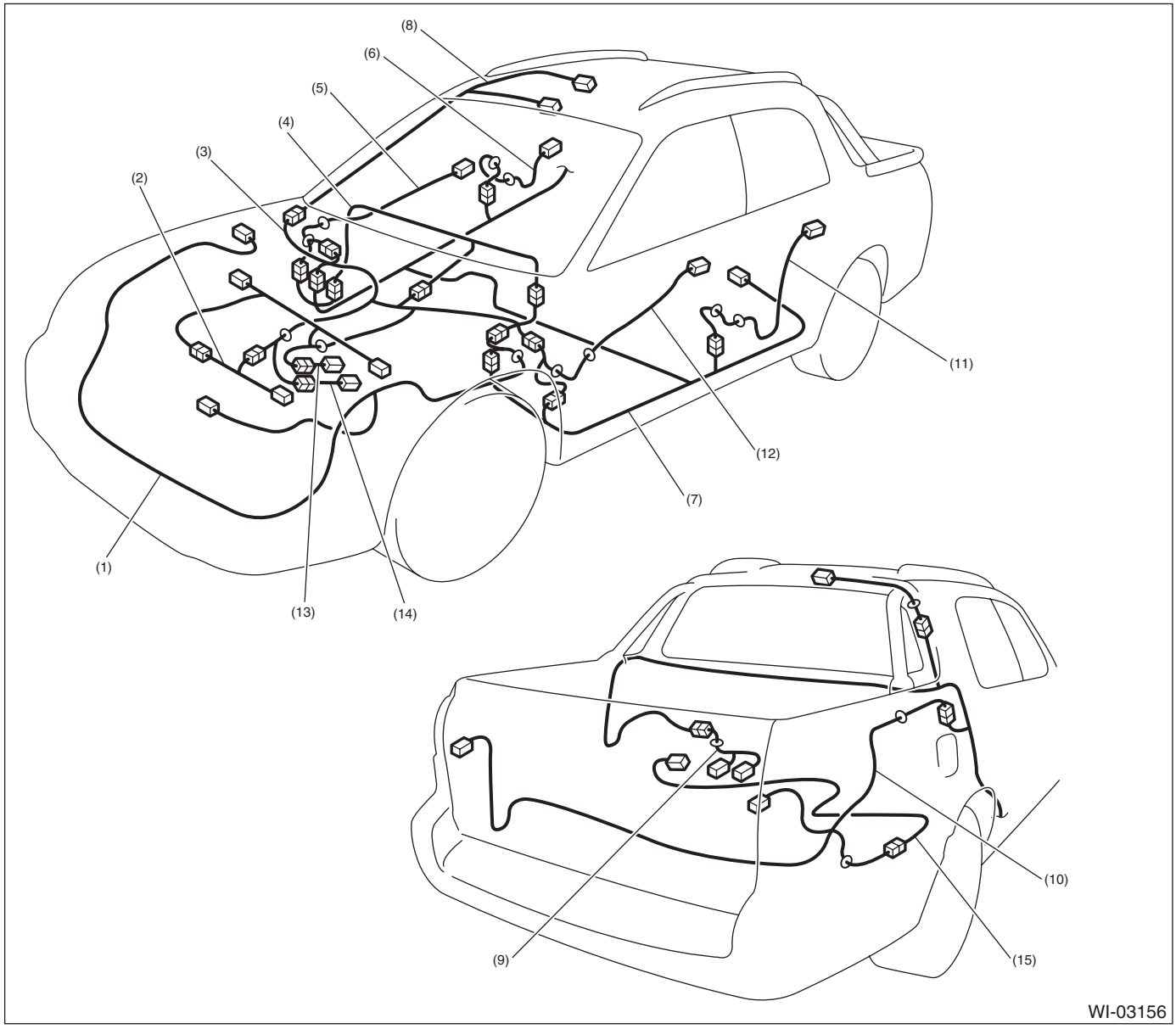
(1) Front wiring harness
(2) Engine wiring harness
(3) Bulkhead wiring harness
(4) Instrument panel wiring harness
(5) Front door cord RH
(6) Rear door cord RH
(7) Rear wiring harness
(8) Roof cord
(9) Fuel tank cord
(10) Trunk lid cord
(11) Rear door cord LH
(12) Front door cord LH
(13) Transmission cord
(14) Rear oxygen sensor cord
(15) On refueling vapor recovery cord

2. WAGON MODEL



(1) Front wiring harness
(2) Engine wiring harness
(3) Bulkhead wiring harness
(4) Instrument panel wiring harness
(5) Front door cord RH
(6) Rear door cord RH
(7) Rear wiring harness
(8) Roof cord
(9) Fuel tank cord
(10) Rear gate cord
(11) Rear door cord LH
(12) Front door cord LH
(13) Transmission cord
(14) Rear oxygen sensor cord
(15) On refueling vapor recovery cord

3. PICK-UP MODEL



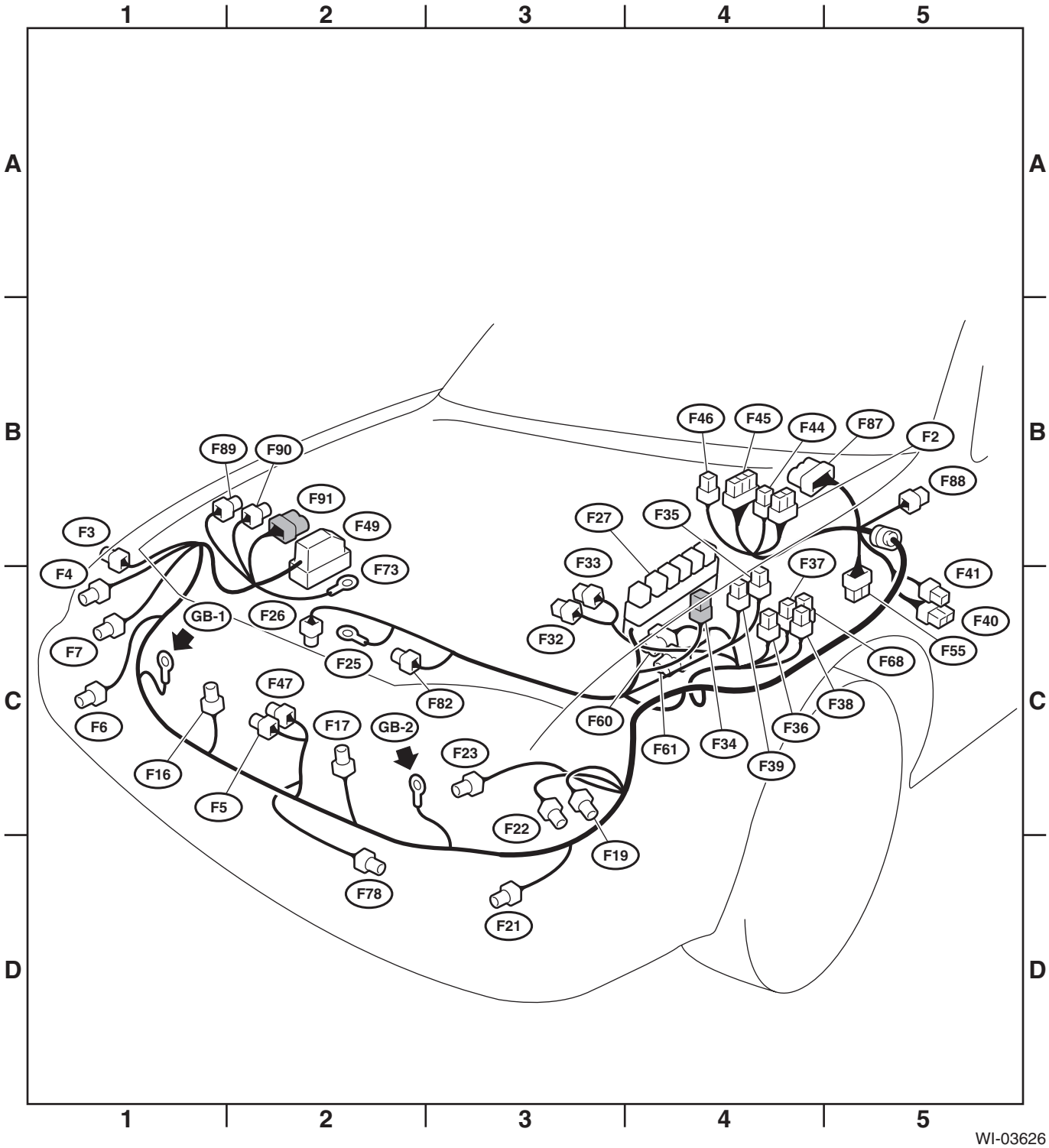
(1) Front wiring harness
(2) Engine wiring harness
(3) Bulkhead wiring harness
(4) Instrument panel wiring harness
(5) Front door cord RH
(6) Rear door cord RH
(7) Rear wiring harness (Front)
(8) Roof cord
(9) Fuel tank cord
(10) Rear wiring harness (Rear)
(11) Rear door cord LH
(12) Front door cord LH
(13) Transmission cord
(14) Rear oxygen sensor cord
(15) On refueling vapor recovery cord

53.Front Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	16	Blue	B-5	B100	Bulkhead wiring harness
F3	2	Gray	C-1		Front turn signal light upper RH
F4	3	Gray	C-1		Front clearance light RH and front turn signal light lower RH
F5	1	Black	C-1		Horn
F6	2	★	C-1		Front fog light RH
F7	3	Black	C-1		Headlight RH (2-lights)
	3	★	C-1		Headlight RH (4-lights)
F16	2	Black	C-1		Sub fan motor (4-cylinder except turbo engine model)
	4	Gray	C-1		Sub fan motor (6-cylinder turbo engine model)
F17	2	Black	C-2		Radiator main fan motor (4-cylinder except turbo engine model)
	4	Gray	C-2		Radiator main fan motor (6-cylinder turbo engine model)
F19	2	Gray	D-3		Front turn signal light upper LH
F21	2	★	D-3		Front fog light LH
F23	3	Black	C-3		Headlight LH (2-lights)
	3	★	C-3		Headlight LH (4-lights)
F25	1	★	C-2		A/C compressor
F26	3	Green	C-2		Alternator
F27	4	Black	B-3		A/C fuse (Relay holder)
	5	Black	B-3		A/C sub fan relay (Relay holder-4-cylinder engine model)
	5	Black	B-3		A/C sub fan relay-1 (Relay holder-6-cylinder engine model)
	5	Black	B-3		A/C sub fan relay-2 (Relay holder-6-cylinder engine model)
	5	Black	B-3		Radiator main fan relay (Realy holder-4-cylinder engine model)
	5	Black	B-3		Radiator main fan relay (Realy holder-6-cylinder engine model)
	5	Black	B-3		Radiator main fan relay-2 (Realy holder-6-cylinder engine model)
	5	Black	B-3		A/C relay (Relay holder)
	5	Black	B-3		Front fog light relay (Relay holder)
	2	Black	B-3		FWD switch (Relay holder-without VDC model)
	5	Black	B-3		Onstar relay-1
	5	Black	B-3		Fan mode relay (Turbo model)
F32	2	Black	C-3		Front washer motor
F33	2	★	B-3		Rear washer motor
F34	4	Black	C-4		SBF holder
F35	2	Black	B-4		Main fuse box (M/B)
F36	3	★	C-4		
F37	6	Black	B-4		
F38	1	Brown	C-5		
F39	8	Black	C-4		
F40	9	Brown	C-5		Fuse and relay box (F/B)
F41	7	Gray	C-5		
F44	8	Black	B-4	B61	Bulkhead wiring harness
F45	20	Gray	B-4	B62	Bulkhead wiring harness (Except VDC model)
	32	Blue	B-4	B62	Bulkhead wiring harness (VDC 6-cylinder engine model)
F46	6	★	B-4	B108	Bulkhead wiring harness (Without VDC model)
	8	★	B-4	B108	Bulkhead wiring harness (VDC 6-cylinder engine model)
F47	1	Black	C-2		Horn
F49	31	Black	B-2		ABS control module

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F55	8	★	C-5	R49	Rear wiring harness (ABS)
	12	★	C-5	R49	Rear wiring harness (VDC)
F60	16	Brown	C-3	E3	Bulkhead wiring harness (Turbo engine model)
F61	20	Black	C-4	E2	
F68	4	Black	C-5		Main fuse box (M/B)
F73	1	★	B-2		ABS motor ground
F78	2	Black	D-2		Ambient sensor
F82	1	Black	C-3		A/C compressor (4-cylinder engine model)
	3	Black	C-3		A/C compressor (6-cylinder engine model)
F87	83	Black	B-5		VDC control module
F88	8	★	B-5		Shield joint connector (VDC)
F89	2	Gray	B-1		Relay box (VDC)
F90	6	Black	B-2		
F91	16	Black	B-2		Hydraulic module (VDC)
★: Non-colored					


1
2
3
4
5
A
B
C
D
F46
F45
F44
F87
F2
F89
F90
F88
F91
F27
F35
F3
F49
F33
F37
F41
F4
F73
F32
F40
GB-1
F26
F55
F7
F25
F68
F47
F82
F38
F6
F60
F17
GB-2
F36
F61
F34
F16
F23
F39
F5
F22
F19
F78
F21
WI-03626

54.Bulkhead Wiring Harness (In Engine Room)

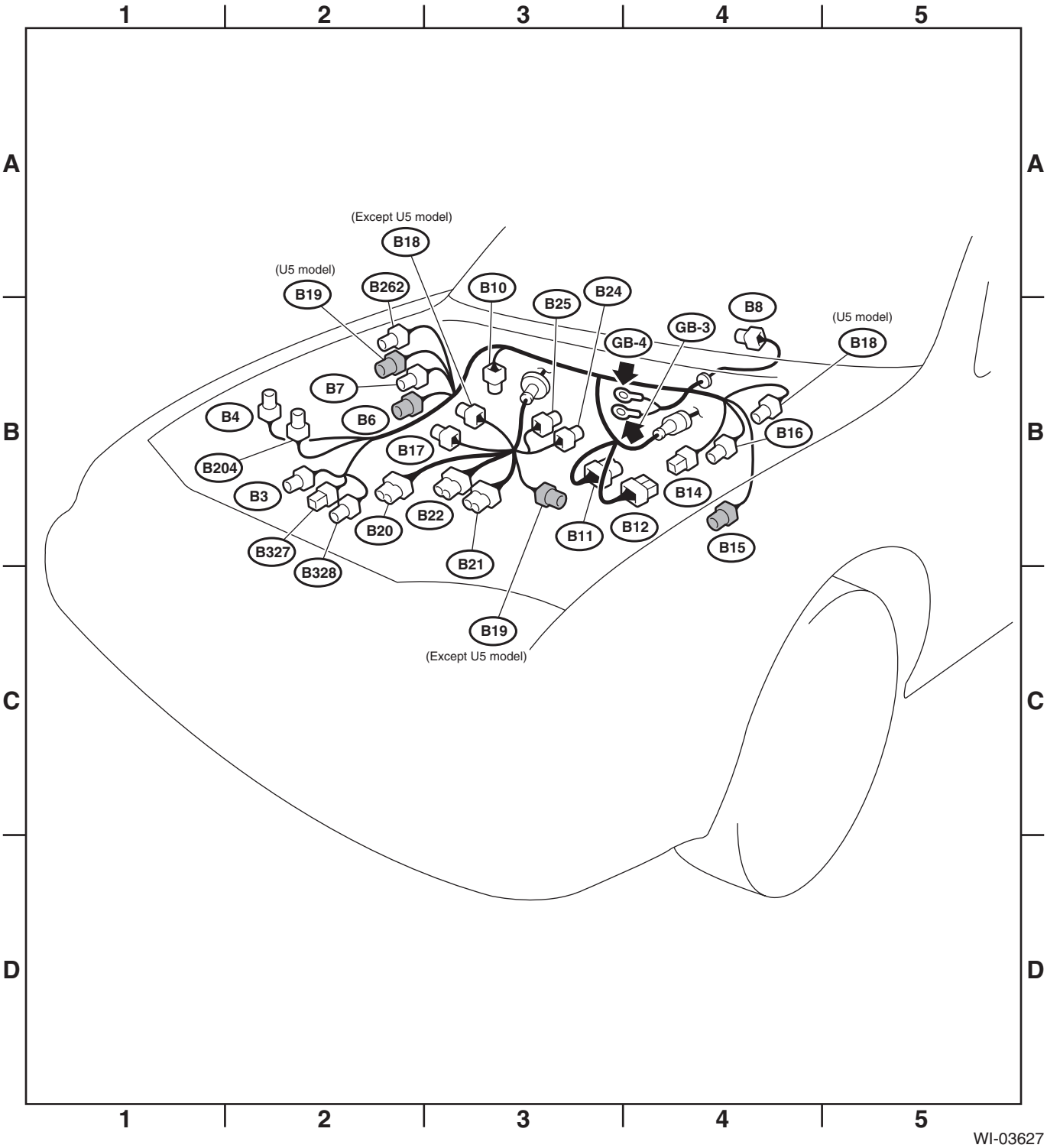
A: LOCATION

1. 4-CYLINDER ENGINE NON-TURBO

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	★	B-2		Mass air flow meter (U5 model)
B4	4	Gray	B-2		AT dropping resistor (Except U5 model)
B6	2	Brown	B-2		ABS front sensor RH (Outback & pick-up model)
	2	Gray	B-2		ABS front sensor RH (Except outback & pick-up model)
B7	6	Black	B-2		Cruise control actuator (Except U5 model)
B8	5	Gray	B-4		Front wiper motor
B10	2	Brown	A-3		A/C pressure switch
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	Black	B-4	T3	
B14	1	Black	B-4		Starter (Magnet)
B15	2	Brown	B-4		ABS front sensor LH (Outback & pick-up model)
	2	Gray	B-4		ABS front sensor LH (Except outback & pick-up model)
B16	2	Gray	B-4		Brake fluid level switch
B17	3	Black	B-2		Vehicle speed sensor (MT)
B18	4	Black	B-3		Front oxygen (A/F) sensor (Except U5 model)
	4	★	B-4		Front oxygen (A/F) sensor LH (U5 model)
B19	6	Gray	B-2	T5	Rear oxygen sensor cord (U5 model)
	4	★	B-3		Rear oxygen sensor cord (Except U5 model)
B20	12	★	B-2	E1	Engine wiring harness
B21	20	Gray	B-3	E2	
B22	16	Brown	B-3	E3	
B24	2	Gray	B-3	T1	Back-up light switch (MT)
B25	2	Brown	B-3	T2	Neutral position switch (MT)
B204	1	Black	B-2		Security horn
B262	4	★	B-2		Front oxygen sensor RH (U5 model)
B327	4	★	B-2		Oxygen sensor heater relay (U5 model)
B328	8	★	B-2	E58	Engine wiring harness (U5 model)
	6	★	B-2		Exhaust gas recirculation valve

★: Non-colored

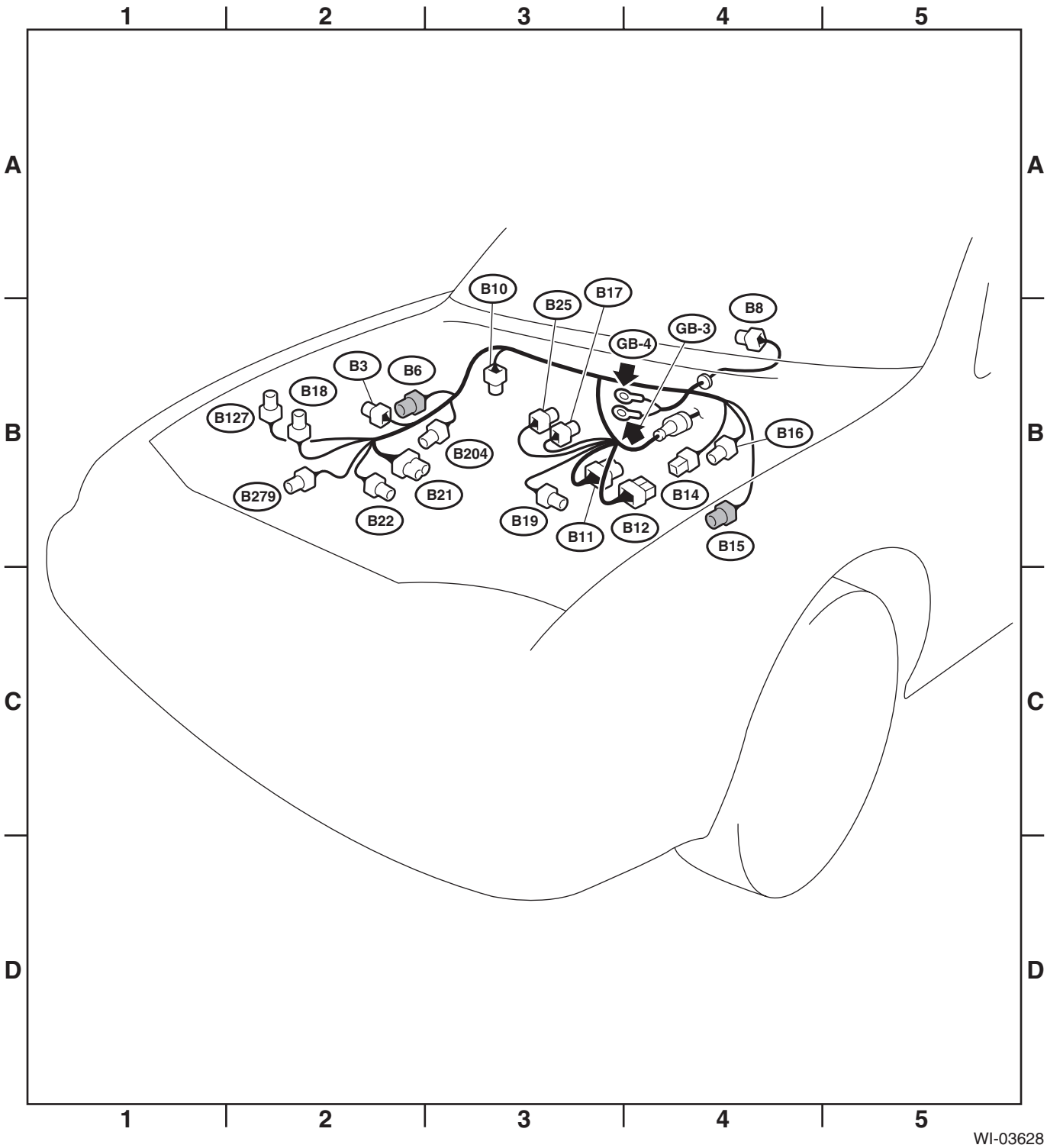
BULKHEAD WIRING HARNESS (IN ENGINE ROOM)



2. 4-CYLINDER TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	★	B-2		Mass air flow meter
B6	2	Brown	B-2		ABS front sensor RH
B8	5	Gray	B-4		Front wiper motor
B10	2	★	A-3		A/C pressure switch
B11	20	★	B-3	T4	Transmission (AT)
B12	12	Black	B-4	T3	
B14	1	Black	B-4		Starter (Magnet)
B15	2	Brown	B-4		ABS front sensor LH
B16	2	Gray	B-4		Brake fluid level switch
B17	3	★	B-2		Vehicle speed sensor (MT)
B18	4	★	B-4		Front oxygen (A/F) sensor
B19	6	★	B-3		Rear oxygen sensor cord
B20	10	★	B-2	E1	Engine wiring harness
B25	4	Gray	B-3	T2	Neutral position switch (MT)
B204	1	Black	B-2		Security horn
B317	4	★	B-2	E56	Engine wiring harness
★: Non-colored					

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

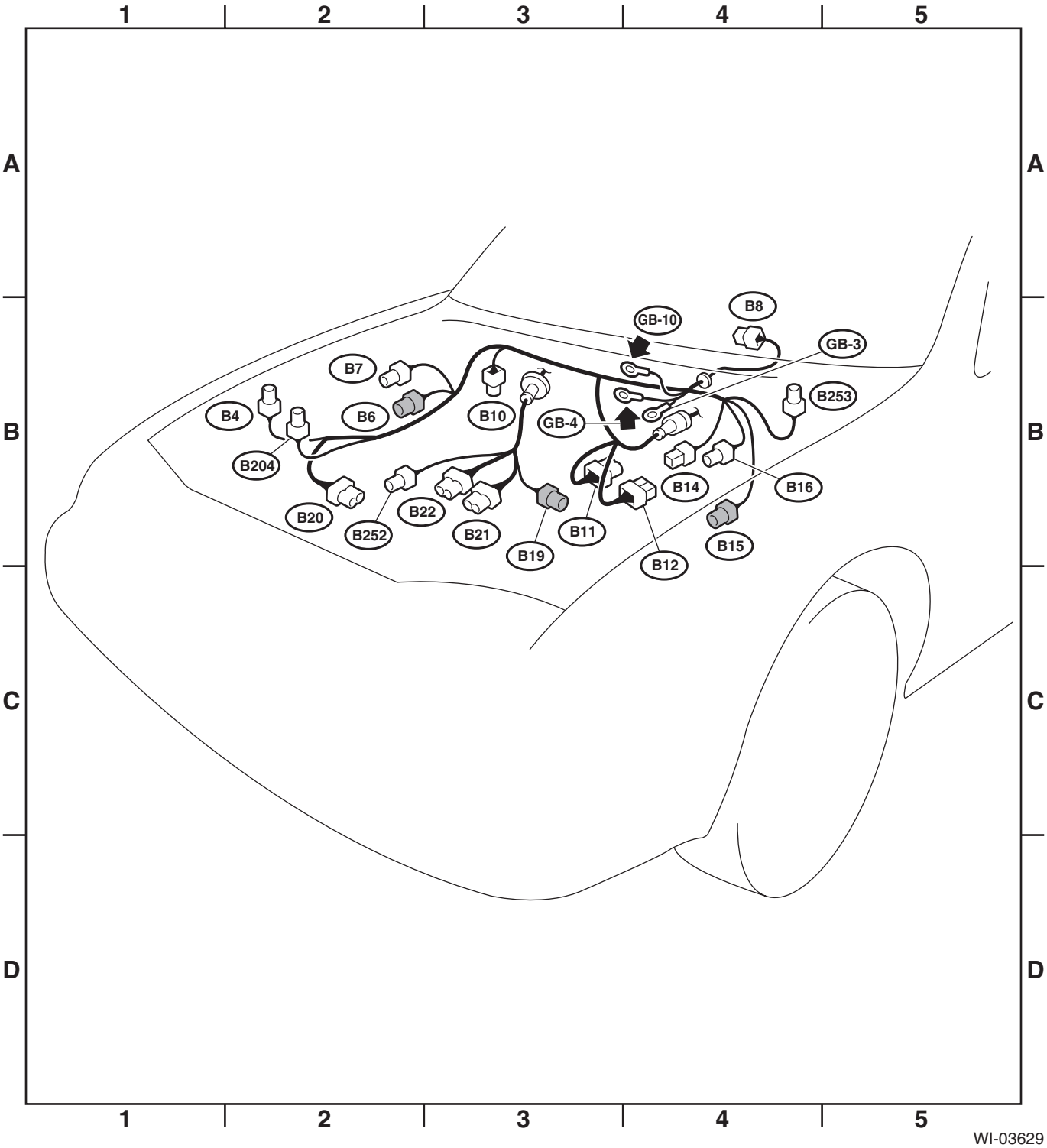


3. 6-CYLINDER ENGINE

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B4	4	Gray	B-2		AT dropping resistor
B6	2	Brown	B-2		ABS front sensor RH
B7	6	Black	B-2		Cruise control actuator
B8	5	Gray	B-4		Front wiper motor
B10	4	★	B-3		A/C pressure switch
B11	20	★	B-3	T4	Transmission (AT)
B12	12	Black	B-4	T3	
B14	1	Black	B-4		Starter (Magnet)
B15	2	Brown	B-4		ABS front sensor LH
B16	2	Gray	B-3		Brake fluid level switch
B19	6	★	B-3	T5	Rear oxygen sensor cord
B20	16	Gray	B-2	E1	Engine wiring harness
B21	20	Light gray	B-3	E2	
B22	16	Brown	B-3	E3	
B204	1	Black	B-2		Security horn
B252	8	Dark gray	B-2	E49	Engine wiring harness
B253	4	Gray	B-5		Fan relay

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)



55.Bulkhead Wiring Harness (In Compartment)

A: LOCATION

1. 4-CYLINDER ENGINE MODEL

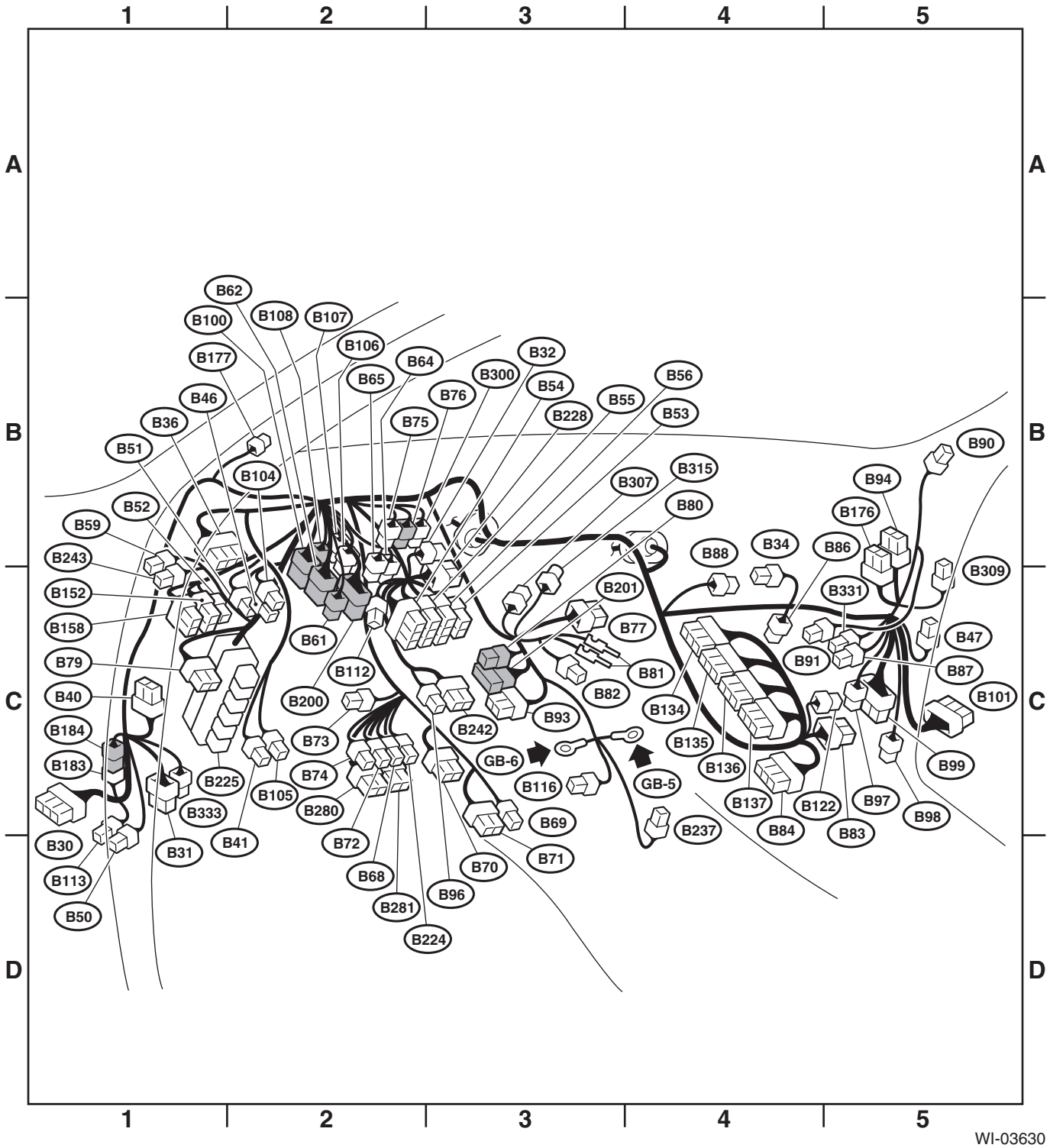
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	24	★	C-1	D1	Front door cord LH
B31	12	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-3		Turn & hazard module
B34	2	Black	B-4		Diode (Key warning)
B36	66	★	B-1	i1	Instrument panel wiring harness (SMJ)
B40	16	★	C-1		Data link connector
B41	2	★	C-1		Power window circuit breaker
B46	4	Green	B-1		Fuel pump relay
B47	6	Brown	C-5		Main relay
B50	4	Black	D-1		Blower relay
B51	8	★	B-1		Fuse & relay box (F/B)
B52	7	★	B-1		
B53	12	Blue	C-3		Shield joint connector (AT normal shift) (Except pick-up turbo model)
	12	Black	C-3		Shield joint connector (AT SPORT shift) (Except pick-up turbo model)
	6	★	C-3		Shield joint connector (Pick-up turbo model)
B54	24	★	C-2		Transmission control module (Except pick-up turbo model)
	17	★	C-2		Transmission control module (Pick-up turbo model)
B55	24	Gray	C-3		Transmission control module (Except pick-up turbo model)
	24	★	C-3		Transmission control module (Pick-up turbo model)
B56	24	Green	C-3		Transmission control module (SPORT shift) (Except pick-up turbo model)
	31	★	C-3		Transmission control module (Pick-up turbo model)
B59	6	★	B-1		Interrupt relay (Security)
B61	8	Black	C-2	F44	Front wiring harness
B62	20	Black	B-2	F45	
B64	2	Black	B-2		Stop light switch
B65	4	Black	B-2		Stop & brake switch (With cruise control)
B68	8	★	D-2		Cruise control sub switch
B69	4	★	D-3		Combination switch
B70	18	★	D-3		
B71	17	★	D-3		
B72	4	Blue	C-2		Ignition switch
B73	2	★	C-2		Key lock solenoid
B74	2	Black	C-2		Key warning switch
B75	2	Green	B-3	B76	Test mode connector
B76	2	Green	B-3	B75	
B77	5	★	C-3		Mode actuator
B79	14	Gray	C-1		Check connector
B80	8	★	C-3	i20	Instrument panel wiring harness
B81	1 × 2	★	C-3		Diagnosis terminal (Ground)
B82	8	★	C-3		Diagnosis connector
B83	22	★	C-5		Shield & sensor ground joint connector (E/G)(U5 model & pick-up turbo model)
	6	Gray	C-5		Shield & sensor ground joint connector (E/G) (Except U5 model & pick-up turbo model)
B84	31	★	C-4		Engine control module (Except pick-up turbo model)
B86	6	Black	C-4		Blower motor resistor
B87	2	★	C-5		Blower motor
B88	3	Black	C-4		Evaporator thermo switch
B90	6	Black	B-5	R50	Roof cord
B91	6	Black	B-5		FRESH/RECIRC actuator
B93	18	★	C-3		Security control module
B94	20	Black	B-5		Cruise control module
B96	8	★	C-2		Daytime running light control module
B97	8	★	C-5	R-1	Rear wiring harness
B98	8	★	C-5	R-2	
	2	Black	C-5	R-2	
B99	32	★	C-5	R-3	
B100	16	Blue	B-1	F-2	Front wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B101	24	★	C-5	D11	Front door cord RH
B104	4	★	B-2		Seat heater/rear accessory power supply relay
B105	4	Black	C-2		Starter interlock relay
B106	2	★	B-2		Clutch switch
B107	2	Blue	B-2		Clutch switch (Cruise control)
B108	6	★	B-2	F46	Front wiring harness
B112	2	★	C-2		Diode (DRL)
B113	2	★	D-1	D50	Front door cord LH
B116	6	Blue	C-3		Select lever illumination light (AT)
B122	8	★	C-4		Shield & sensor ground joint connector
B134	34	★	C-4		Engine control module (Pick-up model)
	22	★	C-4		Engine control module (Except pick-up turbo model)
B135	35	★	C-4		Engine control module (Pick-up model)
	28	★	C-4		Engine control module (Except pick-up turbo model)
B136	35	★	C-4		Engine control module (Pick-up model)
	17	★	C-4		Engine control module (Except pick-up turbo model)
B137	31	★	C-4		Engine control module (Pick-up model)
	24	★	C-4		Engine control module (Except pick-up turbo model)
B152	12	★	C-1		Fuse & relay box (F/B)
B158	10	Glay	C-1		
B176	18	★	B-5		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B183	1	★	C-1	B184	Joint connector (Keyless entry)
B184	1	★	C-1	B183	
B201	22	★	C-3	i40	Instrument panel wiring harness
B224	2	★	D-3		Key switch light

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B225	8	Black	C-1		Fuse (Relay block)
	5	Black	C-1		Wiper deicer relay (Relay block)
	5	Black	C-1		Power window relay (Relay block)
	5	Black	C-1		SPORT light relay (Pick-up) (Relay block)
	5	Black	C-1		Daytime running light relay (Relay block)
	5	Black	C-1		Ignition relay (Relay block)
	5	Black	C-1		Front fog light relay (Relay block)
B228	15	★	B-3		OP connector
B237	6	Black	D-4		SPORT shift switch
B242	10	★	C-3		Daytime running light control module
B243	6	Black	B-1		Security relay
B280	20	Gray	C-2		Integrated module
B281	16	Blue	C-2		
B300	6	★	B-3		Line end check connector (Except pick-up model)
B307	2	★	C-3		Diode (Pick-up turbo model)
B309	4	★	C-5		ETC relay
B315	6	★	C-3		Accelerator pedal position sensor
B331	2	★	C-5		Diode (Baja light) (Pick-up)
B333	8	★	C-1		Stop & turn module (Pick-up)

★: Non-colored

BULKHEAD WIRING HARNESS (IN COMPARTMENT)



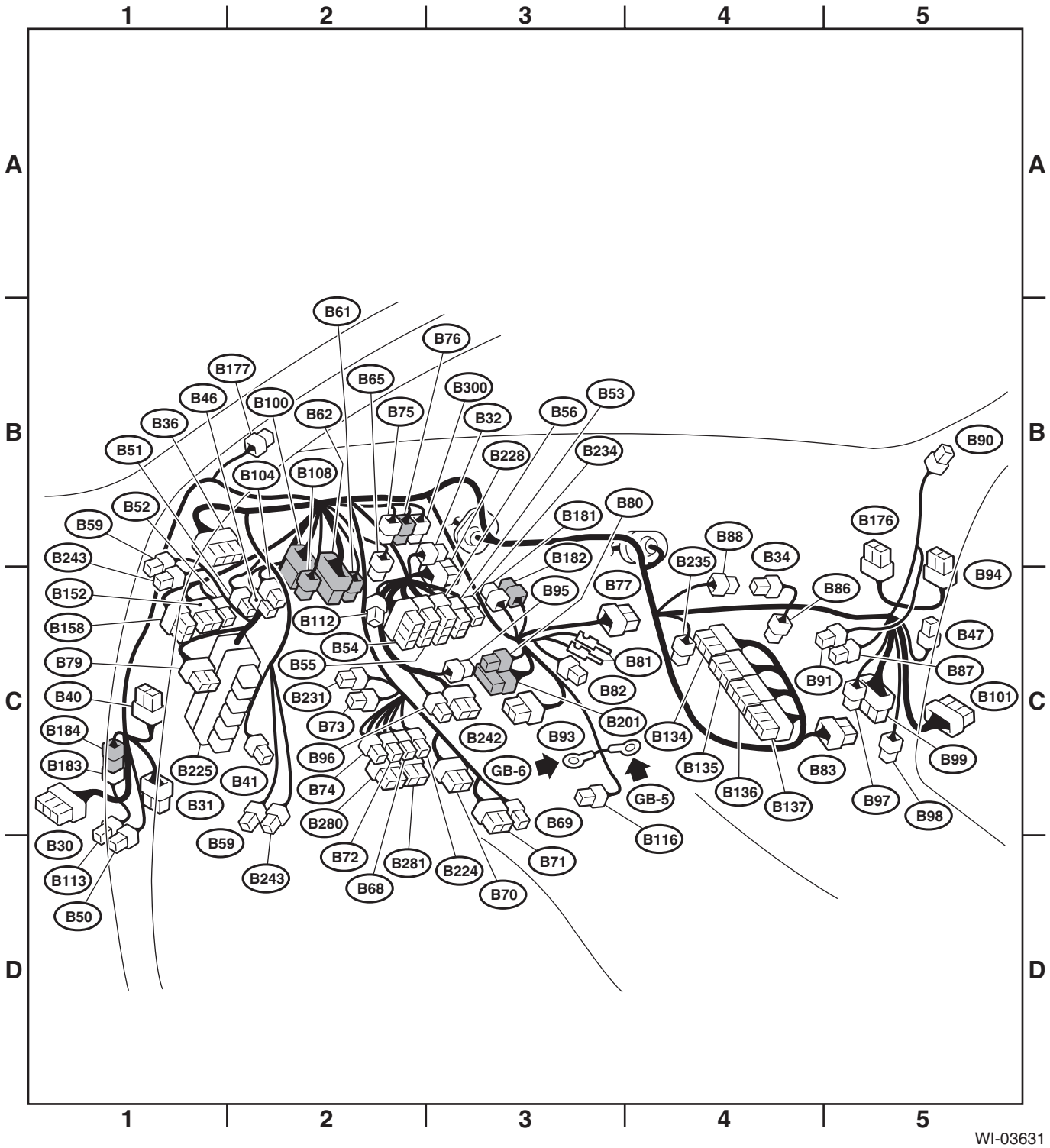
MEMO:

2. 6-CYLINDER ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	24	★	C-1	D1	Front door cord LH
B31	12	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-3		Turn & hazard module
B34	2	Black	B-4		Diode (Key wiring)
B36	66	★	B-1	i1	Instrument panel wiring harness (SMJ)
B40	16	★	C-1		Data link connector
B41	2	★	C-2		Power window circuit breaker
B46	4	Green	B-1		Fuel pump relay
B47	6	Brown	C-5		Main relay
B50	4	Black	D-1		Blower fan relay
B51	8	★	B-1		Fuse & relay box (F/B)
B52	7	★	B-1		
B53	12	Black	C-3		Shield joint connector (AT) (VDC)
B54	24	★	C-2		Transmission control module
B55	24	Gray	C-3		
B56	24	Green	C-3		Transmission control module (VDC)
B59	6	★	B-1		Interrupt relay (Security)
B61	8	Black	C-2	F44	Front wiring harness
B62	20	Black	B-2	F45	Front wiring harness (ABS)
	32	★	B-2	F45	Front wiring harness (VDC)
B65	4	Black	B-2		Stop & brake switch (With cruise control)
B68	8	★	B-2		Cruise control sub switch
B69	4	★	D-3		Combination switch
B70	18	★	D-3		
B71	17	★	D-3		
B72	4	Blue	D-2		Ignition switch
B73	2	★	C-2		Key lock solenoid
B74	2	Black	C-2		Key warning switch
B75	2	Green	B-2	B76	Test mode connector
B76	2	Green	B-3	B75	
B77	10	★	C-3		Mode actuator
B79	14	Gray	C-1		Check connector
B80	8	★	B-3	i20	Instrument panel wiring harness
B81	1 × 2	★	C-4		Diagnosis terminal (Ground)
B82	8	★	C-3		Diagnosis connector
B83	20	★	C-5		Shield & sensor ground joint connector (E/G)
B86	4	★	C-5		Blower motor resistor
B87	2	★	C-5		Blower motor
B88	3	★	B-4		Evaporator thermoswitch
B90	6	★	B-5	R50	Roof cord
	8	★	B-5	R50	Roof cord (With Onstar)
B91	6	Black	C-4		FRESH/RECIRC actuator
B93	18	★	C-3		Security control module
B96	8	★	C-2		Daytime running light control module
B97	8	★	C-5	R1	Rear wiring harness
B98	4	★	C-5	R2	
B99	32	★	C-5	R3	
B100	16	Blue	B-2	F2	Front wiring harness
B101	24	★	C-4	D11	Front door cord RH
B104	4	★	B-2		Seat heater/rear accessory power supply relay
B108	6	★	B-2	F46	Front wiring harness (ABS)
B108	7	★	B-2	F46	Front wiring harness (VDC)
B112	2	Black	C-2		Diode (DRL)
B113	2	★	D-1	D50	Front door cord LH
B116	6	★	C-3		Select lever illumination light (AT)
B134	22	★	C-4		Engine control module
B135	28	★	C-4		
B136	24	★	C-4		
B137	31	★	C-4		
B152	12	★	C-1		Fuse & relay box (F/B)
B158	10	Gray	C-1		Fuse & relay box (F/B)
B176	18	★	B-5		Keyless entry control module
B177	2	★	B-2		Wiper deicer
B181	1	★	C-1		Fan ground joint connector
B182	1	★	C-1		Fan ground joint connector
B183	1	★	C-1	B184	Joint connector (Keyless entry)
B184	1	★	C-1	B183	
B201	22	★	C-3	i40	Instrument panel wiring harness
B224	2	★	D-3		Key switch light

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B225	8	Black	C-1		Fuse (Relay block)
	5	Black	C-1		Power window relay (Relay block)
	5	Black	C-1		Daytime running light relay (Relay block)
	5	Black	C-1		Wiper deicer relay (Relay block)
	5	Black	C-1		Onstar relay (Relay block)
	5	Black	C-1		Ignition relay (Relay block)
	5	Black	C-1		Front fog light relay (Relay block)
B228	15	★	B-3		OP connector
B231	4	★	C-2		Steering angle sensor
B234	6	★	C-3		Joint connector (VDC)
B235	6	Black	B-4		Air mix actuator
B242	10	★	C-3		Daytime running light control module
B243	5	★	D-2		Security relay (With Onstar)
	6	Black	B-1		Security relay (Without Onstar)
B280	20	Gray	C-2		Integrated module
B281	16	Blue	C-2		
B300	6	★	B-3		Line end check connector
★: Non-colored					

BULKHEAD WIRING HARNESS (IN COMPARTMENT)



MEMO:

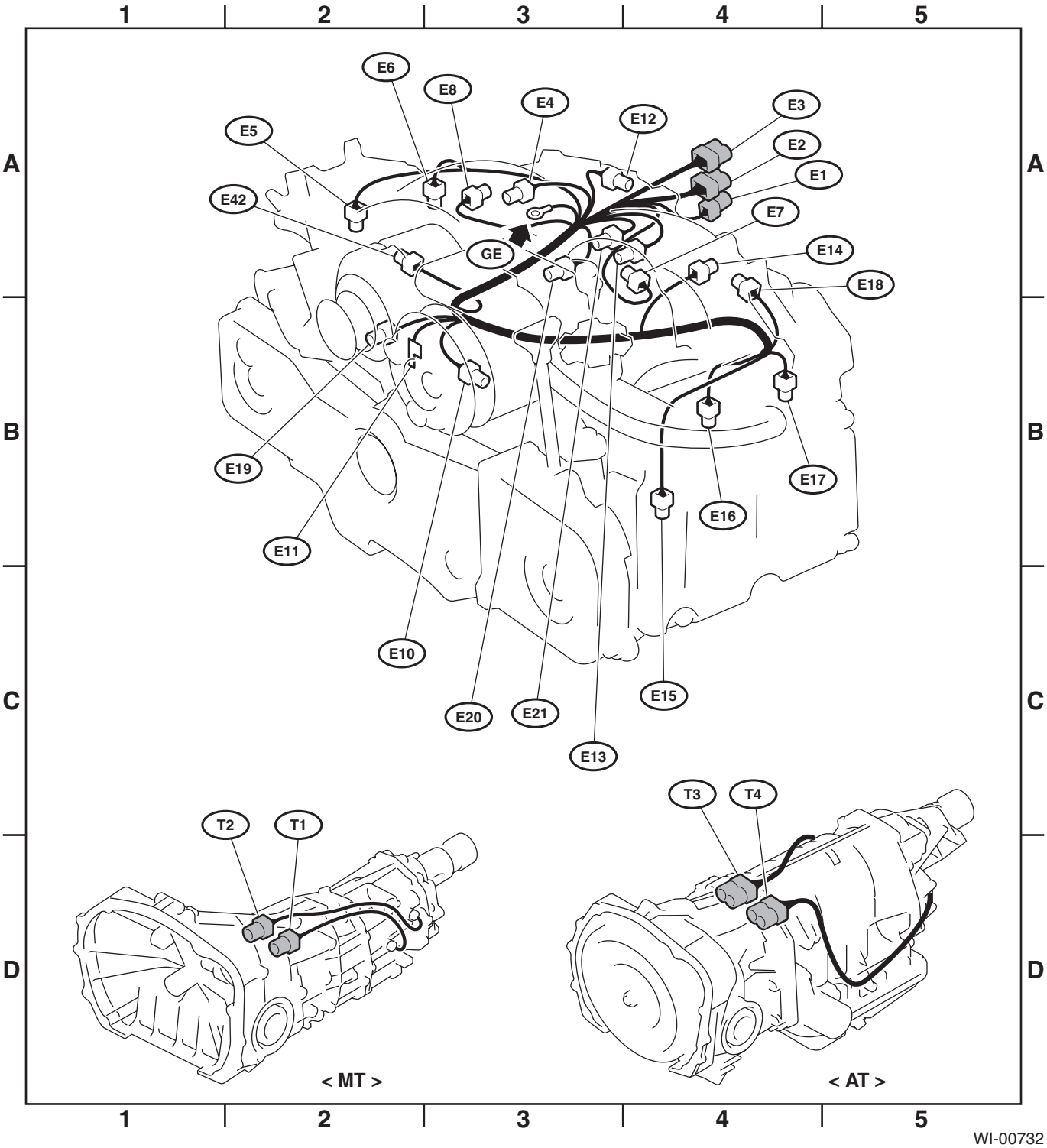
56.Engine Wiring Harness and Transmission Cord

A: LOCATION

1. 4-CYLINDER ENGINE MODEL (EXCEPT U5 MODEL)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	6	★	A-4	B20	Bulkhead wiring harness
E2	20	★	A-4	B21	
E3	16	Brown	A-4	B22	
E4	2	★	A-3		CPC solenoid valve
E5	2	★	A-2		Injector #1
E6	2	★	A-2		Injector #3
E7	6	★	A-4		Idle air control solenoid valve
E8	3	★	A-3		Engine coolant temperature sensor and thermometer
E10	2	★	C-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	★	A-4		Ignition coil and ignitor
E14	2	★	A-5		Knock sensor
E15	2	★	C-4		Camshaft position sensor
E16	2	★	B-4		Injector #2
E17	2	★	B-4		Injector #4
E18	6	★	A-5		EGR solenoid valve
E19	1	★	B-2		Power steering oil pressure switch
E20	2	★	C-3		Intake air temperature sensor
E42	2	★	A-2		Air assist injector solenoid valve
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	★	D-2	B24	Bulkhead wiring harness (MT)
T2	2	★	D-2	B25	
T3	12	★	C-4	B12	Bulkhead wiring harness (AT)
T4	20	Black	C-4	B11	
T7	12	★	D-4		Inhibitor switch
★: Non-colored					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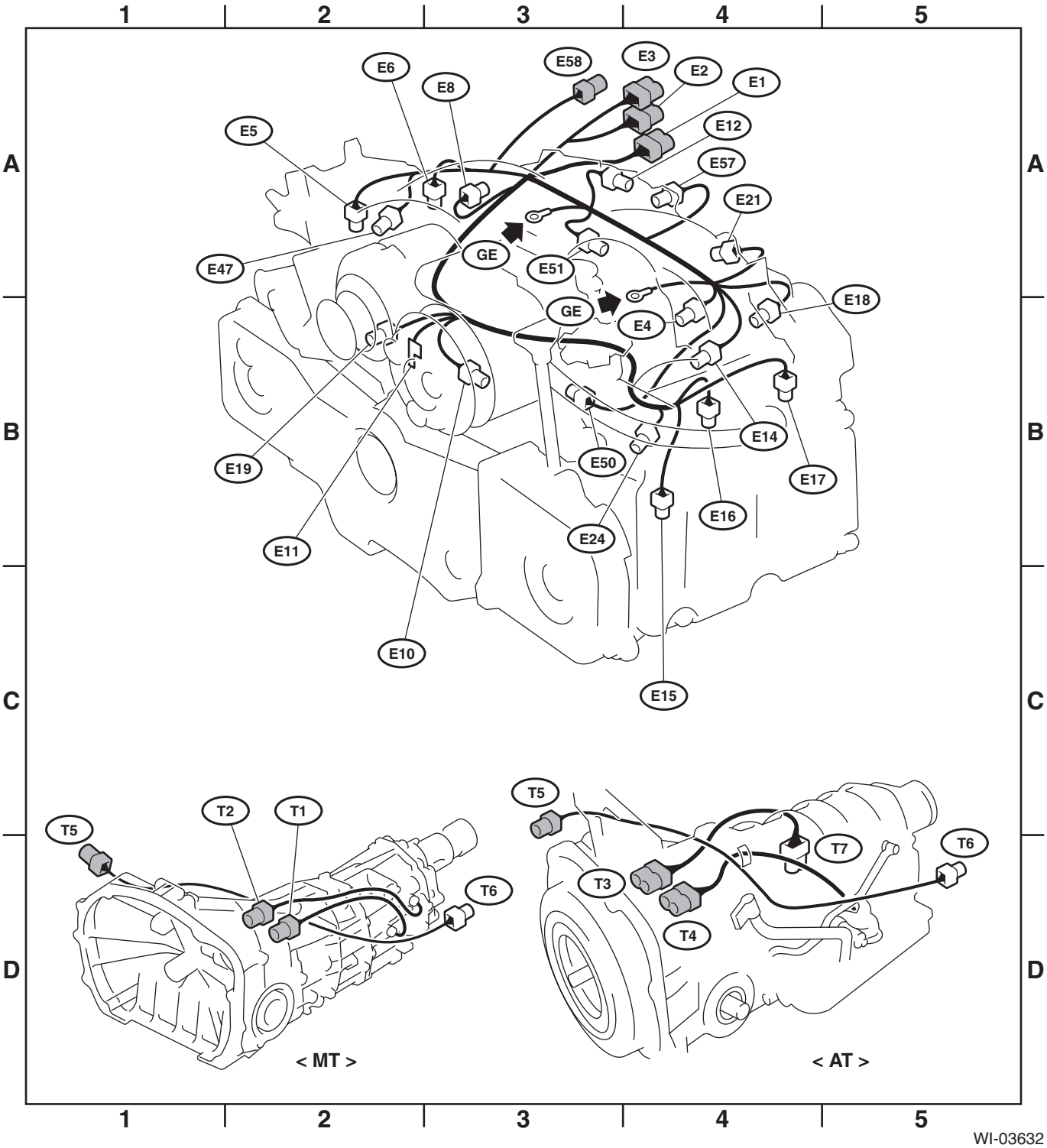
WI-00732

2. 4-CYLINDER ENGINE U5 MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	12	★	A-4	B20	Bulkhead wiring harness
E2	20	★	A-4	B21	
E3	16	Brown	A-4	B22	
E4	2	★	B-4		CPC solenoid valve
E5	2	★	A-2		Fuel injector No. 1
E6	2	★	A-2		Fuel injector No. 3
E8	3	★	A-3		Engine coolant temperature sensor and thermometer
E10	2	★	C-3		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E14	2	★	B-4		Knock sensor
E15	2	★	C-4		Camshaft position sensor
E16	2	★	B-4		Fuel injector No. 2
E17	2	★	B-4		Fuel injector No. 4
E18	6	★	A-5		EGR solenoid valve
E19	1	★	A-4		Power steering oil pressure switch
E24	6	★	B-4		Front oxygen (A/F) sensor LH
E47	6	★	A-2		Front oxygen (A/F) sensor RH
E50	3	★	B-3		Tumble generator valve opening angle sensor
E51	2	★	A-3		Tumble generator valve
E57	6	Black	A-4		Electronic control throttle
E58	6	★	A-3	B328	Bulkhead wiring harness
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	★	D-2	B24	Bulkhead wiring harness (MT model)
T2	2	★	D-2	B25	
T3	12	★	C-4	B12	Bulkhead wiring harness (AT model)
T4	20	Black	C-4	B11	
T5	6	Gray	D-1		Bulkhead wiring harness (MT model)
T5	6	Gray	C-3		Bulkhead wiring harness (AT model)
T6	4	Gray	D-3		Rear oxygen sensor (MT model)
T6	4	Gray	D-5		Rear oxygen sensor (AT model)
T7	12	★	D-4		Inhibitor switch
★: Non-colored					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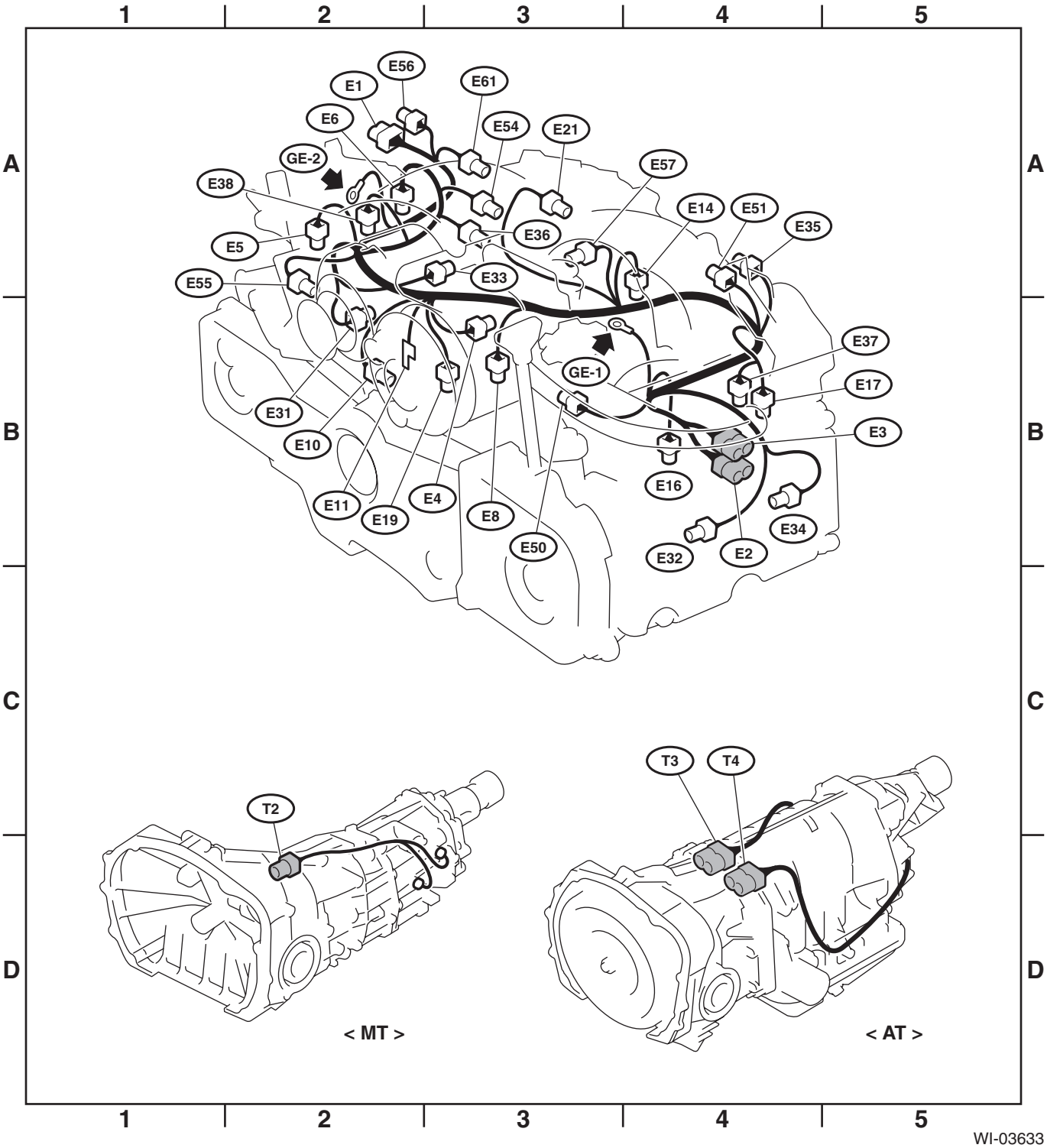
WI-03632

3. TURBO ENGINE

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Gray	A-2	B20	Bulkhead wiring harness
E2	20	Black	B-4	F61	Front wiring harness
E3	16	Brown	B-5	F60	
E4	2	Black	B-3		CPC solenoid valve
E5	2	Light gray	A-2		Fuel injector No. 1
E6	2	Light gray	A-2		Fuel injector No. 3
E8	3	Light gray	B-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E14	2	Brown	A-4		Knock sensor
E16	2	Light gray	B-4		Fuel injector No. 2
E17	2	Light gray	B-5		Fuel injector No. 4
E19	1	★	B-2		Power steering oil pressure switch
E21	3	Black	A-3		Pressure sensor (MT)
E31	3	★	B-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-3		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E35	3	Light gray	A-4		AVSC camshaft position sensor LH
E36	3	Light gray	A-3		AVSC camshaft position sensor RH
E37	2	★	B-5		AVSC solenoid RH
E38	2	★	A-2		AVSC solenoid RH
E50	3	Black	B-3		Tumble generator valve opening angle sensor LH
E51	2	Black	A-4		Tumble generator valve LH
E54	3	Black	A-3		Tumble generator valve opening angle sensor RH
E55	2	Black	A-1		Tumble generator valve RH
E56	4	Dark gray	A-2	B317	Bulkhead wiring harness
E57	6	Black	A-4		Electronic control throttle
E61	2	Dark gray	A-3		PVC diagnosis connector
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T2	4	Gray	D-2	B25	Bulkhead wiring harness (MT model)
T3	12	★	D-5	B12	Bulkhead wiring harness (AT model)
T4	20	Black	D-5	B11	
★: Non-colored					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E50
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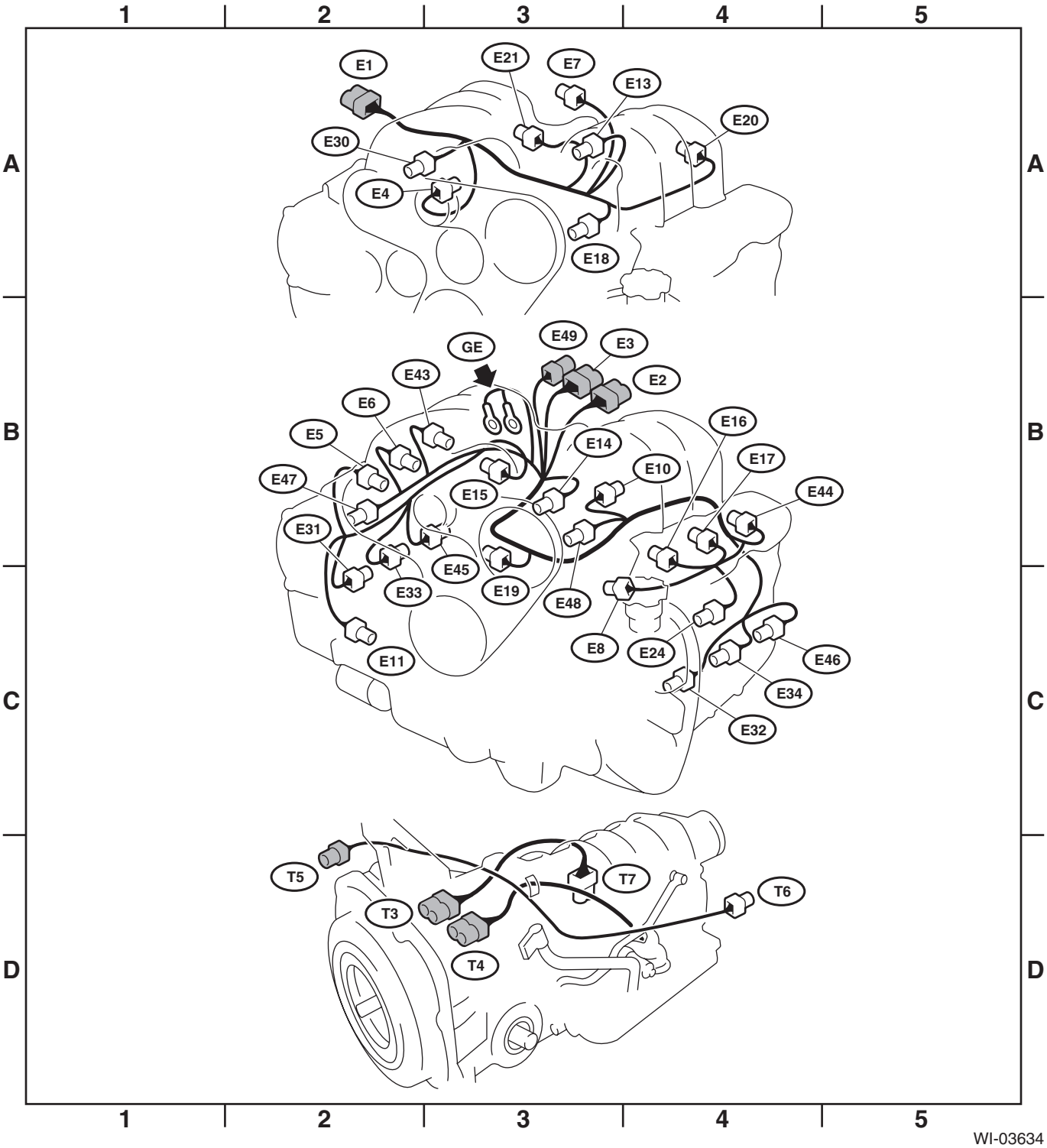
WI-03633

4. 6-CYLINDER ENGINE

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	16	Gray	A-2	B20	Bulkhead wiring harness
E2	20	Light gray	B-4	B21	
E3	16	Brown	B-4	B22	
E4	2	Black	A-2		CPC solenoid valve
E5	2	Gray	B-2		Fuel injector No. 1
E6	2	Gray	B-2		Fuel injector No. 3
E7	3	Gray	A-3		Idle speed control solenoid valve
E8	3	Light gray	C-3		Engine coolant temperature sensor and thermometer
E10	2	Gray	B-4		Crankshaft position sensor
E11	1	★	C-2		Oil pressure switch
E13	3	Black	A-4		Throttle position sensor
E14	2	Blue	B-4		Knock sensor-1
E15	3	Gray	B-3		Camshaft position sensor
E16	2	Gray	B-4		Fuel injector No. 2
E17	2	Gray	B-4		Fuel injector No. 4
E18	6	Dark gray	A-3		EGR solenoid valve
E19	1	★	C-3		Power steering oil pressure switch
E20	2	Black	A-4		Intake air temperature sensor
E21	3	Black	A-3		Pressure sensor
E24	4	Dark gray	C-4		Front oxygen (A/F) sensor LH
E30	2	Brown	A-2		Induction valve control solenoid
E31	3	Black	B-2		Ignition coil No. 1
E32	3	Black	C-4		Ignition coil No. 2
E33	3	★	C-2		Ignition coil No. 3
E34	3	★	C-4		Ignition coil No. 4
E43	2	Gray	B-2		Fuel injector No. 5
E44	2	Gray	B-4		Fuel injector No. 6
E45	3	Black	B-3		Ignition coil No. 5
E46	3	Black	C-4		Ignition coil No. 6
E47	4	Dark gray	B-2		Front oxygen (A/F) sensor RH
E48	2	Blue	C-3		Knock sensor-2
E49	8	Dark gray	B-3	B252	Bulkhead wiring harness
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	Black	D-2	B12	Bulkhead wiring harness
T4	20	Black	D-3	B11	
T5	6	★	D-2	B19	Bulkhead wiring harness
T6	4	★	D-4		Rear oxygen sensor
T7	12	★	D-3		Inhibitor switch
★: Non-colored					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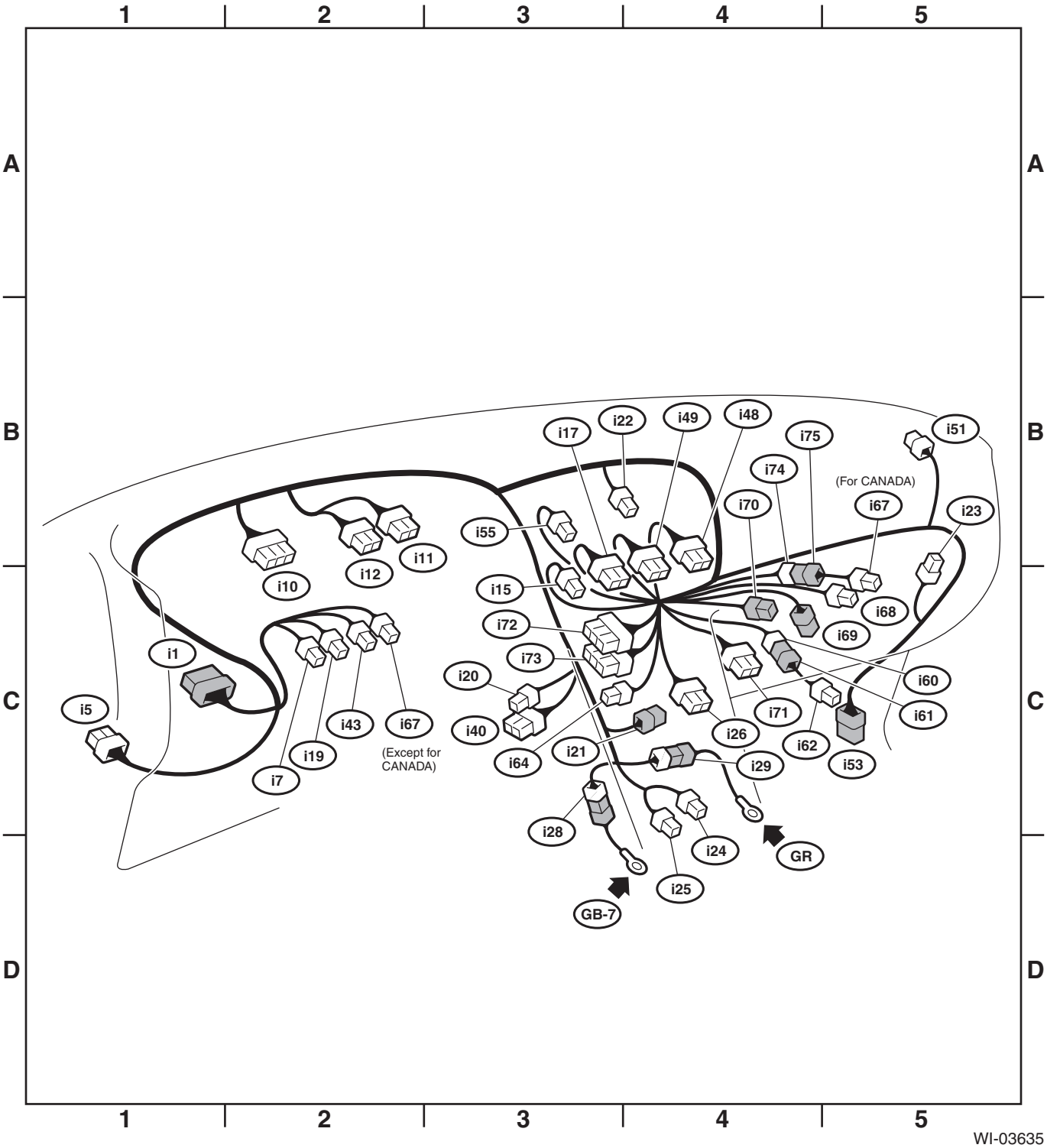
57.Instrument Panel Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	66	★	C-1	B36	Bulkhead wiring harness
i5	12	★	C-1		Fuse & relay box (F/B)
i7	6	Yellow	C-2		Front fog light switch
i10	30	Green	C-2		Combination meter
i11	16	Green	B-2		
i12	14	Green	C-2		
i15	6	★	C-3		Mode control panel (Heater control)
i17	20	Gray	B-3		
i19	6	Brown	C-2		Cruise control main switch
i20	8	★	C-3	B80	Bulkhead wiring harness
i21	2	★	C-3		Ash tray illumination light
i22	8	★	B-3		Hazard switch
i23	2	★	B-5		Glove box illumination light
i24	2	★	D-4		Cigarette lighter
i25	3	★	D-4		Cigarette lighter illumination light
i26	14	★	C-4		Radio
i28	1	Black	C-3		Body ground
i29	1	Black	C-4		Body ground (Radio)
i40	22	★	C-3	B201	Bulkhead wiring harness
i43	6	★	C-2		Wiper deicer switch
i48	16	Gray	B-4		Auto A/C control module
i49	20	Gray	B-4		
i51	2	Black	B-5		Sunload sensor (Auto A/C)
i53	16	Blue	C-5	R98	Rear wiring harness
i55	2	★	B-3		In-vehicle temperature sensor (Auto A/C)
i60	4	★	C-4	i61	VDC OFF switch adapter cord (With Onstar)
i60	6	★	C-4	i61	VDC OFF switch adapter cord
i61	4	★	C-5	i60	VDC OFF switch adapter cord (With Onstar)
i61	6	★	C-5	i60	VDC OFF switch adapter cord
i62	4	★	C-5		VDC OFF switch
i64	8	★	C-3	D83	PREMIUM audio
i67	6	Gray	B-5		Cargo light switch (For CANADA)
i67	6	Gray	C-2		Cargo light switch (Except For CANADA)
i68	6	Gray	C-5		Sport light
i69	4	★	C-5		Onstar switch 1
i70	3	★	B-4		Onstar switch 2
i71	14	★	C-4		Vehicle interface module
i72	32	Red	C-3		
i73	32	Blue	C-3		
i74	6	★	C-4	i75	Cargo light switch adapter cord
i75	6	★	C-4	i74	
★: Non-colored					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i17
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i70
i67
i23
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i20
i60
i5
i71
i61
i43
i67
(Except for CANADA)
i40
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i53
i7
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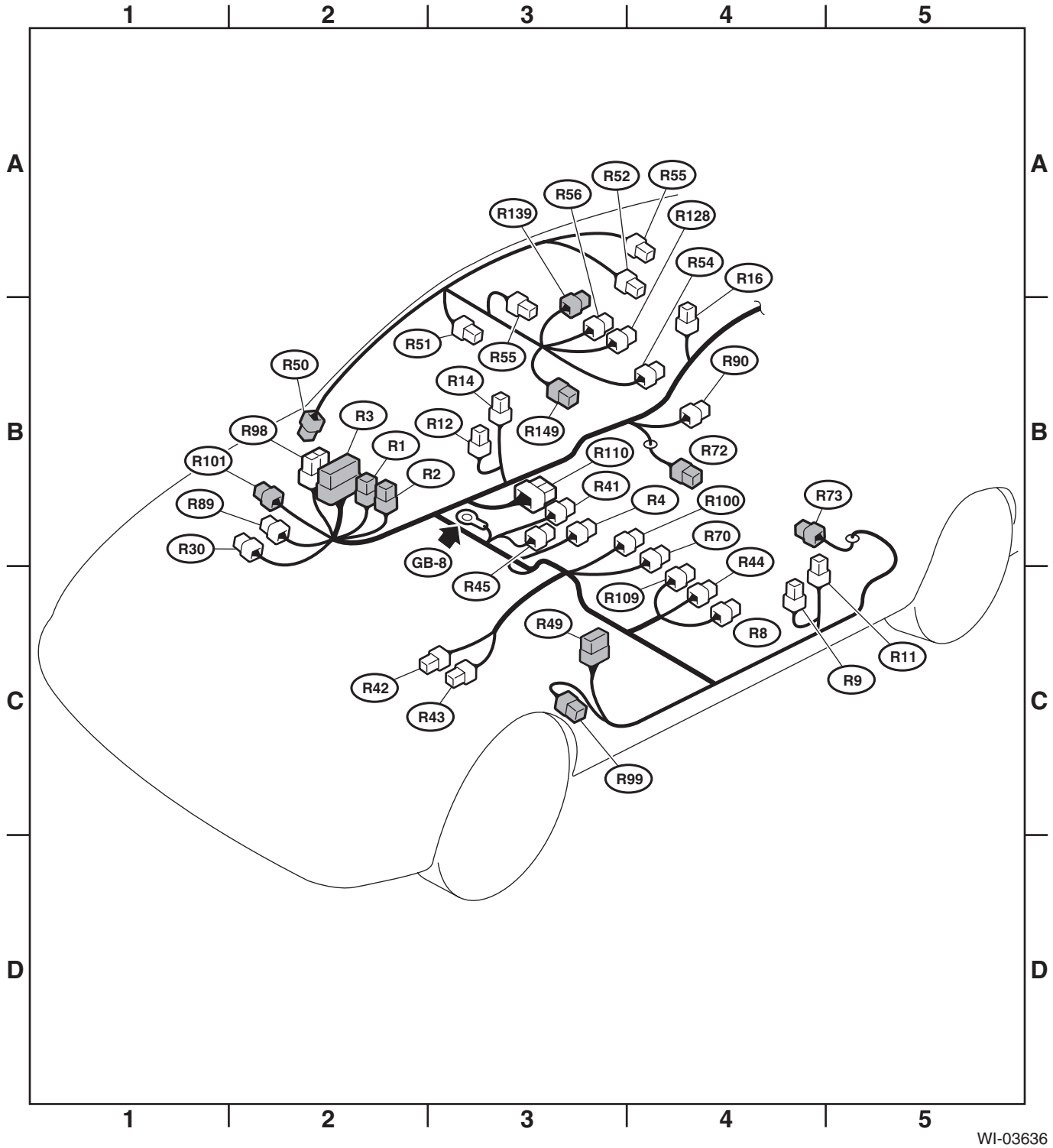
GR
i25
GB-7
WI-03635

58.Rear Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★	B-2	B97	Bulkhead wiring harness
R2	2	Black	B-2	B98	Bulkhead wiring harness
	4	★	B-2	B98	Bulkhead wiring harness (Sedan) (F.P.C.)
	8	★	B-2	B98	Bulkhead wiring harness (Pick-up)
R3	32	★	B-2	B99	Bulkhead wiring harness
R4	1	Black	B-4		Parking brake switch
R8	2	★	C-4		Seat belt switch
R9	3	★	C-4		Front door switch LH
R11	8	★	C-5	D21	Rear door cord LH
R12	3	★	B-3		Front door switch RH
R14	8	★	B-3	D27	Rear door cord RH
R16	3	Black	B-4		Rear door switch RH
R30	2	★	B-2		Diode (Rear gate)
R41	4	Blue	B-3		Seat heater RH
R42	6	★	C-2		Seat heater switch RH
R43	6	Blue	C-2		Seat heater switch LH
R44	4	Blue	C-4		Seat heater LH
R45	1	★	B-3		Diagnosis connector
R48	2	Black	C-2	B123	Bulkhead wiring harness
R49	8	★	C-3	F55	Front wiring harness (ABS)
	12	★	C-3	F55	Front wiring harness (VDC)
R50	6	★	B-2	B90	Bulkhead wiring harness (Without Onstar)
	8	★	B-2	B90	Bulkhead wiring harness (With Onstar)
R51	2	Black	B-2		Vanity mirror illumination light RH
R52	3	★	B-3		Room light
R54	2	Black	B-3		Vanity mirror illumination light LH
R55	1	★	B-2		Sunroof (Sedan) (Pick-up)
	8	★	B-2		Sunroof control module (Wagon)
R56	2	★	B-3		Spot light
R70	3	★	C-4		ABS G sensor
R72	2	Gray	B-4		Rear ABS sensor RH
R73	2	Gray	B-4		Rear ABS sensor LH
R89	8	★	B-2		Speaker joint connector LH (Mcintosh audio)
R90	8	★	B-4		Speaker joint connector RH (Mcintosh audio)
R98	16	Blue	B-2	i53	Instrument panel wiring harness
R99	2	★	C-3	D68	Front door cord LH (Mcintosh audio)
R100	6	★	C-4		Yaw rate sensor (VDC)
R101	2	★	B-2	D69	Front door cord RH (Mcintosh audio)
R109	2	Black	C-4		Power seat motor
R110	14	★	B-3		Power amplifier (Mcintosh audio)
R128	5	★	B-3		Sunroof switch (Wagon)
R139	3	★	B-3		Compass mirror
R149	2	★	B-3		Microphone

★: Non-colored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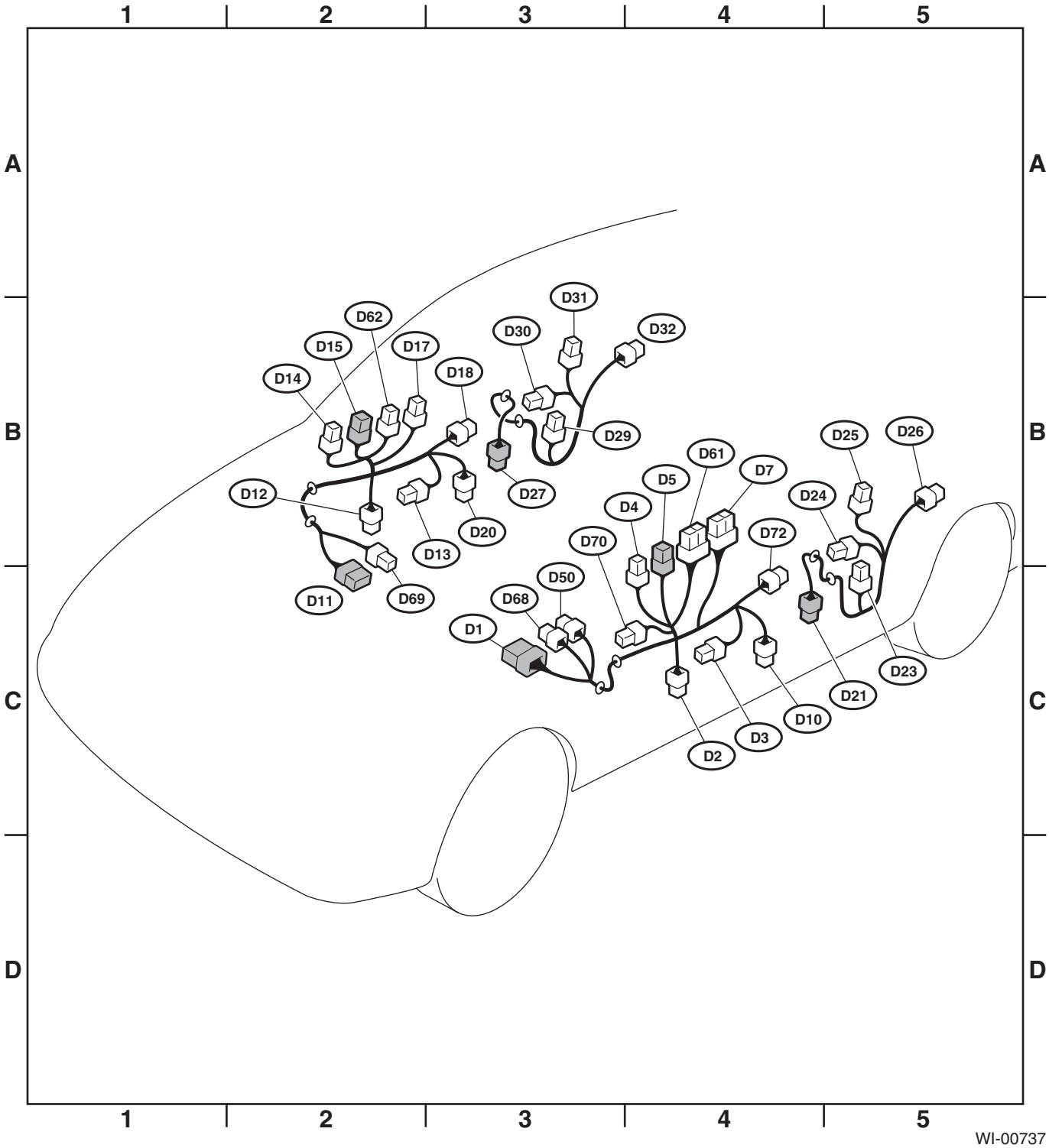
R52
R55
R56
R139
R128
R54
R16
R51
R55
R50
R14
R90
R98
R3
R12
R149
R1
R110
R72
R101
R2
R41
R4
R100
R73
R89
R70
R30
GB-8
R44
R45
R109
R49
R8
R11
R42
R9
R43
R99
WI-03636

59.Door Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	24	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-3		Front door speaker LH
D3	2	Green	C-3		Front power window motor LH
D4	2	Black	C-3		Front door tweeter LH
D5	6	★	C-3		Remote control rearview mirror LH
D7	16	★	C-3		Power window main switch
D10	2	★	C-3		Step light LH
D11	24	★	C-2	B101	Bulkhead wiring harness
D12	2	★	C-2		Front door speaker RH
D13	2	Green	B-2		Front power window motor RH
D14	2	Black	B-2		Front door tweeter RH
D15	6	★	B-2		Remote control rearview mirror RH
D17	6	★	B-2		Front power window sub switch RH
D18	4	★	B-2		Front door lock actuator RH
D20	2	★	B-2		Step light RH
D21	8	★	C-3	R11	Rear wiring harness
D23	2	Black	C-4		Rear door speaker LH
D24	2	Green	C-4		Rear power window motor LH
D25	6	★	B-4		Rear power window sub switch LH
D26	4	★	B-4		Rear door lock actuator LH
D27	8	★	B-2	R14	Rear wiring harness
D29	2	Black	B-2		Rear door speaker RH
D30	2	Green	B-2		Rear power window motor RH
D31	6	★	B-2		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH
D50	2	★	C-3	B113	Bulkhead wiring harness
D61	10	★	C-3		Remote control rearview mirror switch
D62	6	Brown	B-2		Front door lock switch RH
D68	2	★	C-3	R99	Rear wiring harness
D69	2	★	C-2	R101	Rear wiring harness
D70	2	Gray	C-3		Keyless buzzer
D72	4	★	C-3		Front door lock actuator LH
★: Non-colored					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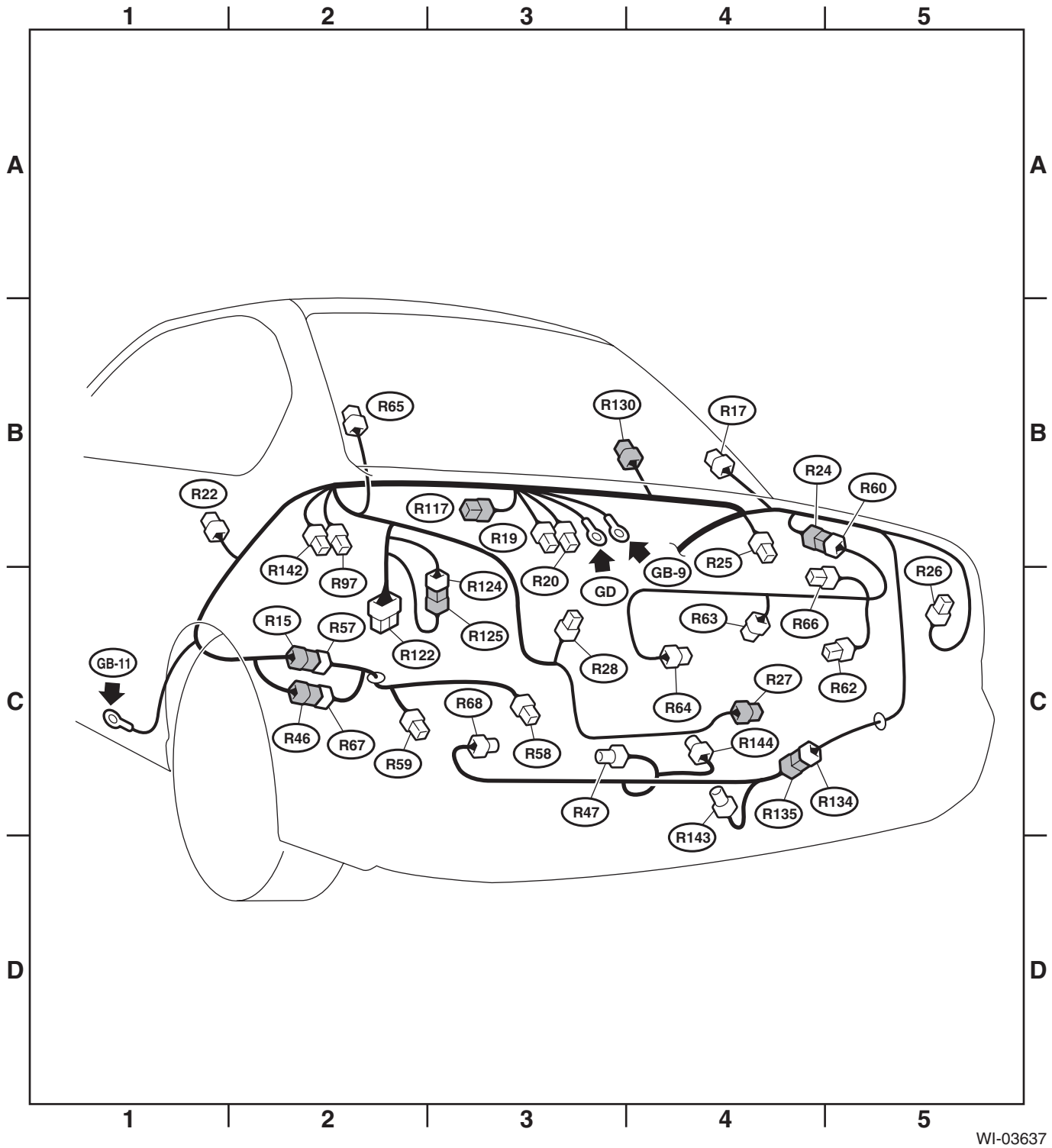
D20
D13
D11
D69
D61
D7
D5
D4
D70
D72
D50
D68
D1
D25
D26
D24
D23
D21
D10
D3
D2
WI-00737

60.Rear Wiring Harness and Trunk Lid Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R15	6	Black	C-2	R57	Fuel tank cord
R17	1	Black	B-4		Rear defogger (Power) (Without choke coil model)
R19	2	★	B-3		High-mounted stop light
R20	2	Blue	B-3		Trunk room light
R22	3	Black	B-1		Rear door switch LH
R24	8	★	B-4	R60	Trunk lid cord
R25	2	★	B-4		Rear defogger condenser
R26	4	★	C-5		Rear combination light LH
R27	2	★	C-4		Trunk room light switch
R28	4	★	C-3		Rear combination light RH
R46	2	★	C-2	R67	Fuel tank cord (With fuel pump control module model)
R47	3	★	C-3		Fuel tank pressure sensor
R57	6	Black	C-2	R15	Rear wiring harness
R58	6	★	C-2		Fuel gauge module & fuel pump assembly
R59	2	★	C-2		Fuel gauge sub module
R60	8	★	B-4	R24	Rear wiring harness
R62	4	★	C-4		Rear finisher light RH
R63	2	★	C-3		License plate light
R64	4	★	C-3		Rear finisher light LH
R65	1	Black	B-2		Rear defogger (Ground) (Without choke coil model)
R66	2	★	B-4		High-mounted stop light (Rear spoiler)
R67	2	★	C-2	R46	Rear wiring harness (With fuel pump control module model)
R68	2	★	C-3		Pressure control solenoid valve
R97	2	★	B-2		Antenna amp.
R117	2	★	B-3		Sub woofer (Mcintosh audio)
R122	10	★	C-2		Fuel pump control module
R124	2	★	C-3	R125	Fuel pump control solenoid
R125	2	★	C-3	R124	
R130	2	★	B-3		Rear defogger (With choke coil model)
R134	8	Gray	C-4	R135	On refueling vapor recovery cord
R135	8	Gray	C-4	R134	Rear wiring harness
R142	2	Black	B-2		Fuel pump condenser
R143	2	★	C-4		Drain valve
R144	2	★	C-4		Fuel tank sensor control valve
★: Non-colored					

REAR WIRING HARNESS AND TRUNK LID CORD



61.Rear Wiring Harness and Rear Gate Cord

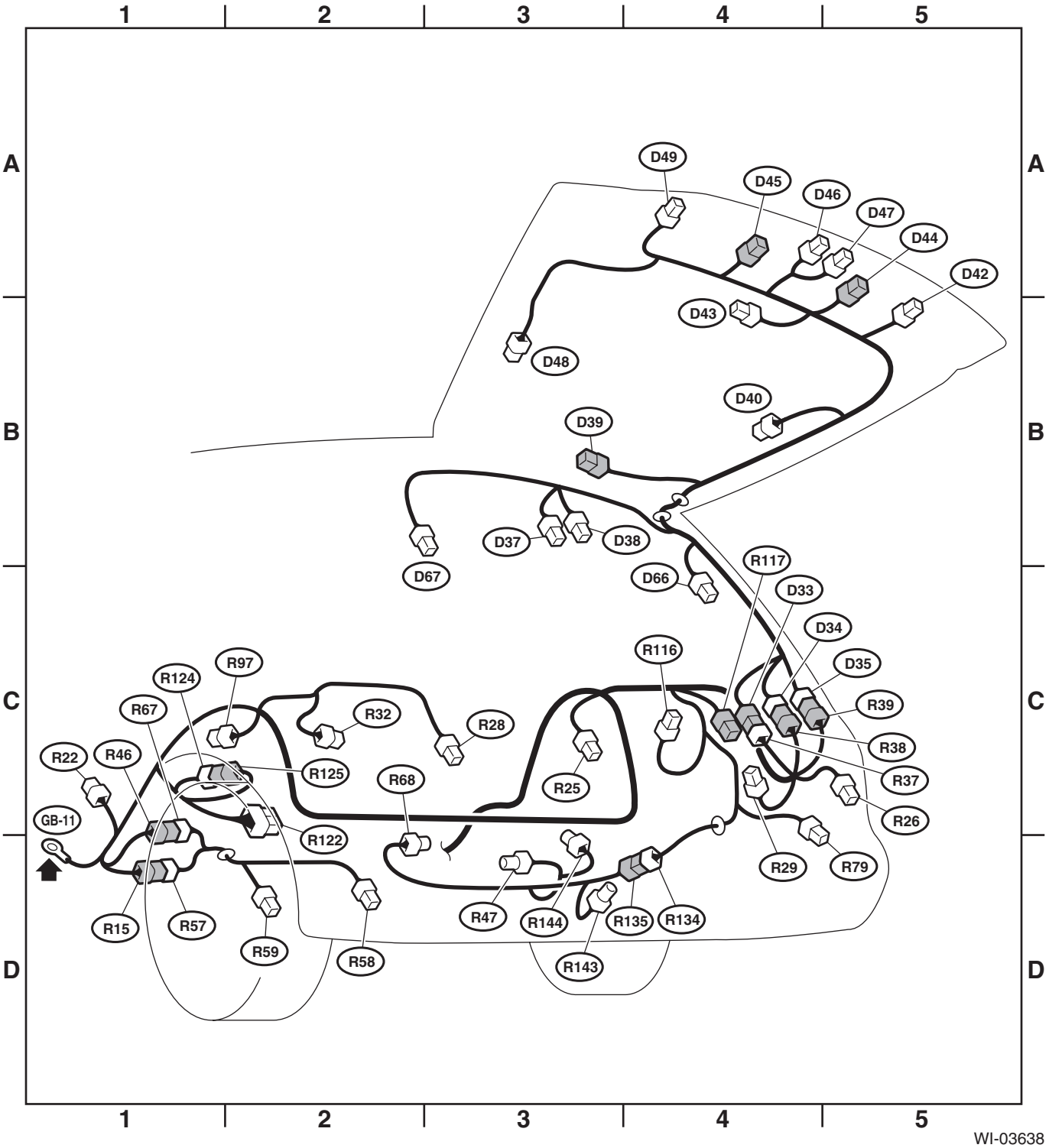
A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R15	6	Black	D-1	R57	Fuel tank cord
R22	3	Black	C-1		Rear door switch LH
R25	2	★	C-3		Rear defogger condenser
R26	4	★	C-5		Rear combination light LH
R28	4	★	C-3		Rear combination light RH
R29	2	★	D-4		Diode (Rear gate)
R32	2	★	C-2		Rear accessory power supply socket
R37	2	★	C-5	D33	Rear gate cord
R38	8	★	C-5	D34	
R39	8	Black	C-5	D35	
R46	2	★	C-1	R67	Fuel tank cord
R47	3	★	D-3		Fuel tank pressure sensor
R57	6	Black	D-1	R15	Rear wiring harness
R58	6	★	D-2		Fuel gauge module & fuel pump assembly
R59	2	★	D-2		Fuel gauge sub module
R67	2	★	C-1	R46	Rear wiring harness (With fuel pump control module model)
R68	2	★	C-2		Pressure control solenoid valve
R79	6	★	D-5		Trailer connector
R97	2	★	C-1		Antenna amp.
R116	8	★	C-4		Rear wiper intermittent module
R117	2	★	C-4		Sub woofer (Mcintosh audio)
R122	10	★	C-2		Fuel pump control module
R124	2	★	C-1	R125	Fuel pump control solenoid
R125	2	★	C-1	R124	
R134	8	Gray	D-4	R135	On refueling vapor recovery cord
R135	8	Gray	D-4	R134	Rear wiring harness
R143	2	★	D-3		Drain valve
R144	2	★	D-3		Fuel tank sensor control valve
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D33	2	★	C-3	R37	Rear wiring harness
D34	5	★	C-3	R38	
D35	5	Black	C-4	R39	
D37	1	★	B-3		Luggage room light (Power)
D38	1	★	B-3		Luggage room light
D39	2	★	B-3		High-mounted stop light
D40	1	★	B-3		Rear defogger (Power)
D42	4	★	B-4		Rear finisher light RH
D43	4	★	B-3		Rear wiper motor
D44	2	★	B-4		License plate light RH
D45	2	★	A-3		License plate light LH
D46	2	Black	A-4		Rear gate latch switch
D47	4	★	B-4		Rear gate lock actuator
D48	1	Black	B-3		Rear defogger (Ground)
D49	4	★	A-3		Rear finisher light LH
D66	2	Black	C-3		Rear tweeter RH
D67	2	Black	B-2		Rear tweeter LH

★: Non-colored

REAR WIRING HARNESS AND REAR GATE CORD



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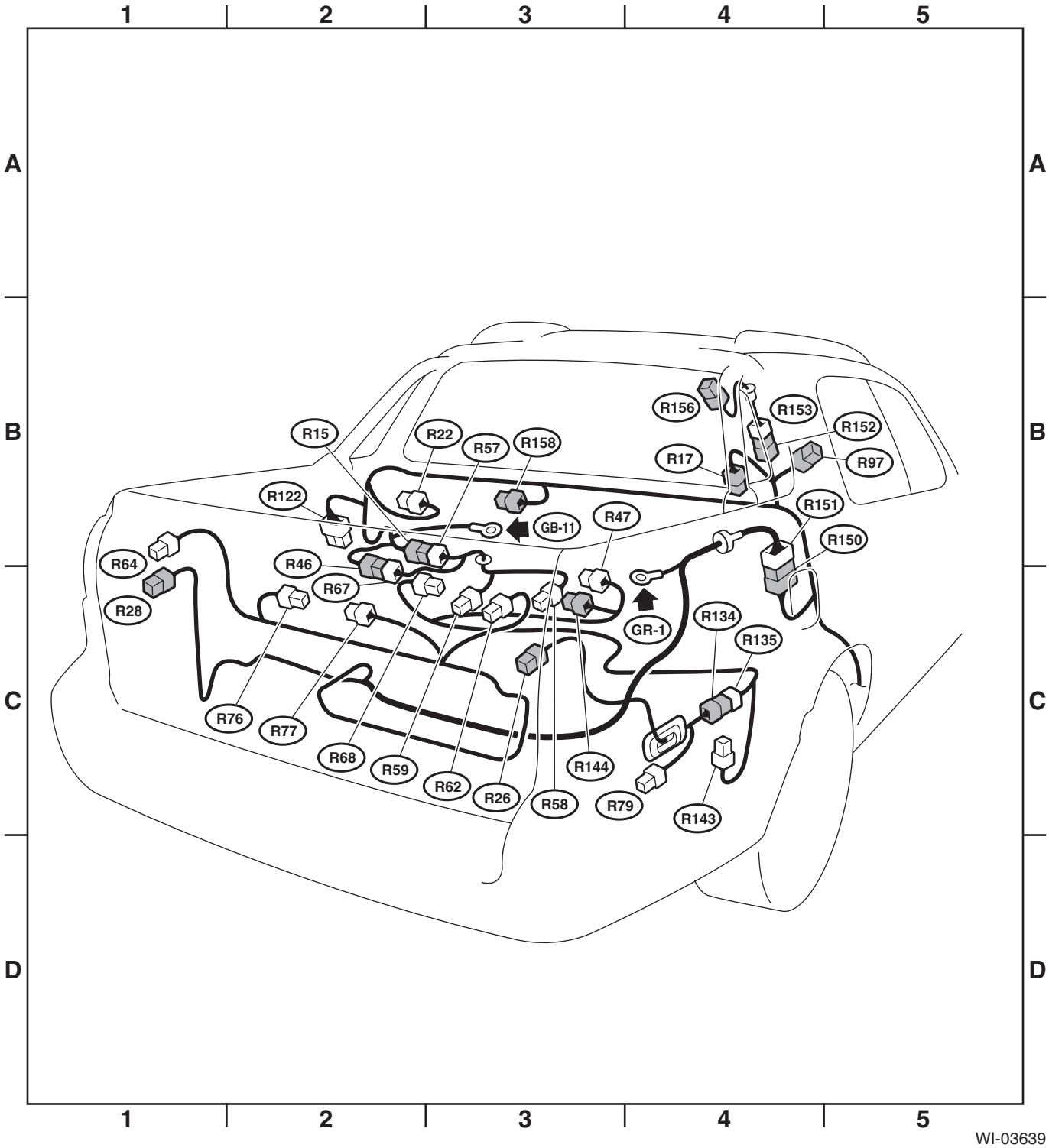
MEMO:

62.Rear Wiring Harness and Rear Tail Gate Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R15	6	Black	B-2	R57	Fuel tank cord
R17	1	★	B-4		Rear defogger (Power) (Without choke coil model)
R22	3	Black	B-3		Rear door switch LH
R26	6	★	C-3		Rear combination light RH
R28	6	★	C-1		Rear combination light LH
R46	2	★	C-2		Fuel tank cord (With fuel pump control module model)
R47	3	★	C-3		Fuel tank pressure sensor
R57	6	★	B-3	R15	Rear wiring harness
R58	6	★	C-3		Fuel gauge module & fuel pump assembly
R59	2	★	C-3		Fuel gauge sub module
R62	2	★	C-3		Rear finisher light RH
R64	2	★	B-1		Rear finisher light LH
R68	2	★	C-3		Pressure control solenoid valve
R76	2	★	C-2		License plate light LH
R77	2	★	C-2		License plate light RH
R79	2	★	C-4		Trailer connector
R97	2	★	B-4		Antenna amp.
R122	10	★	B-2		Fuel pump control module
R134	8	★	C-4	R135	On refueling vapor recovery cord
R135	8	★	C-4	R134	Rear wiring harness
R143	2	★	C-4		Drain valve
R144	2	★	C-4		Fuel tank sensor control valve
R150	16	★	C-4	R151	Rear wiring harness (Rear)
R151	16	★	B-4	R150	Rear wiring harness (Front)
R152	8	★	B-4	R153	Roof light cord
R153	8	★	B-4	R152	Rear wiring harness (Front)
R156	4	★	B-4		SPORT light
R158	2	★	B-3		Switch back gate latch switch
★: Non-colored					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R15
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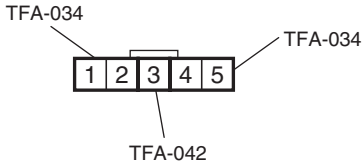
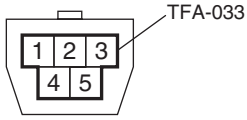
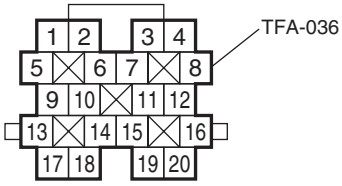
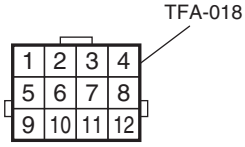
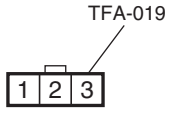
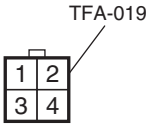
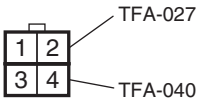
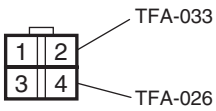
R57
R158
R156
R153
R152
R17
R97
R122
GB-11
R47
R151
R150
R64
R46
R67
R28
GR-1
R134
R135
R76
R77
R68
R59
R62
R26
R58
R144
R79
R143
WI-03639

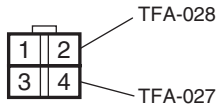
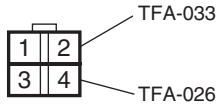
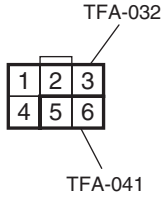
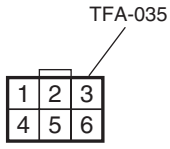
63.Harness Repair Kit

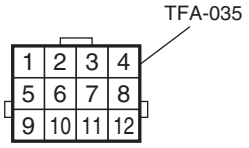
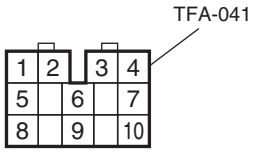
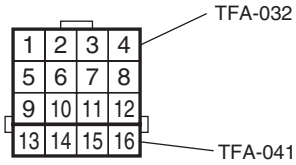
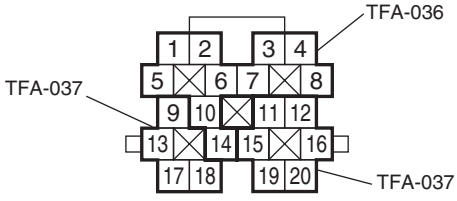
A: SPECIFICATION

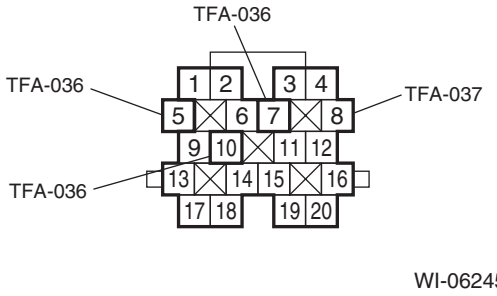
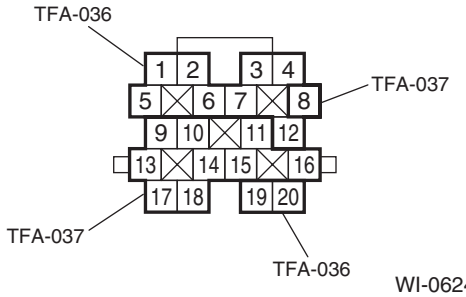
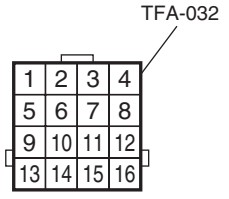
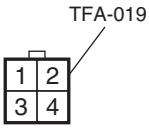
1. ADAPTATION TABLE

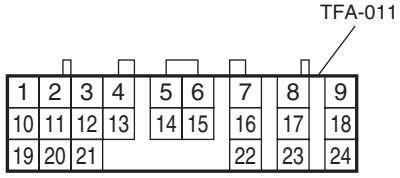
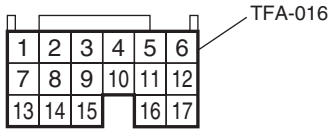
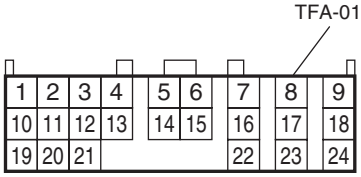
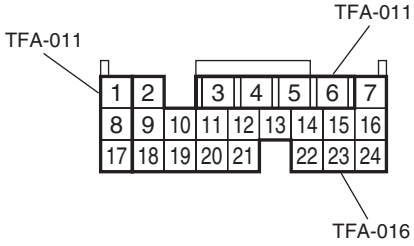
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B3	 WI-06229	1, 2, 4, 5	TFA-034
		3	TFA-042
B8	 WI-06230	All	TFA-033
B11	 WI-06231	All	TFA-036
B12	 WI-06232	All	TFA-018

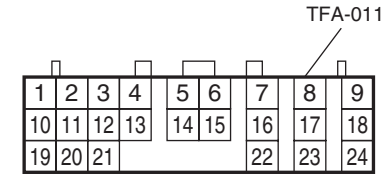
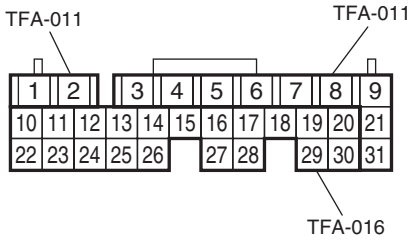
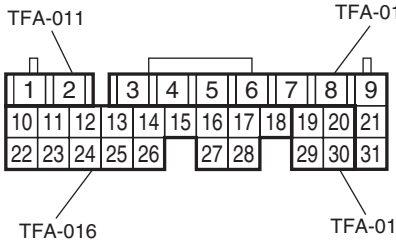
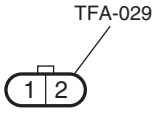
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B17 (4-cylinder non-turbo engine model)	 WI-06233	All	TFA-019
B17 (Turbo engine model)	 WI-06234	All	TFA-019
B18 (Except U5 model)	 WI-06235	1, 2	TFA-027
		3, 4	TFA-040
B18 (U5 model)	 WI-06236	1, 2	TFA-033
		3, 4	TFA-026

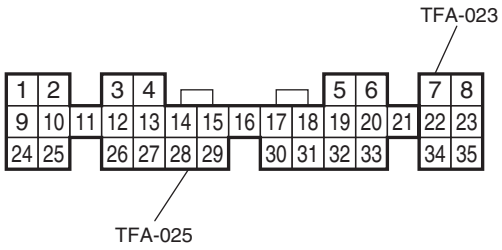
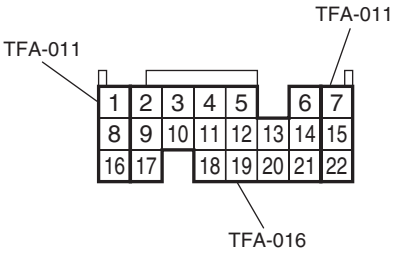
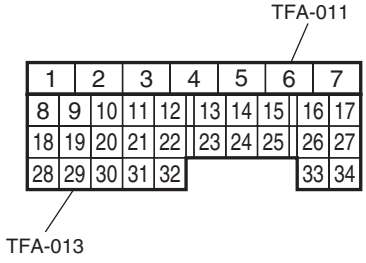
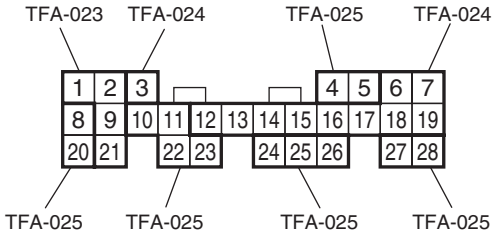
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B19 (Except U5 model)	 WI-06237	1, 2	TFA-028
		3, 4	TFA-027
B19 (Turbo engine model)	 WI-06236	1, 2	TFA-033
		3, 4	TFA-026
B19 (6-cylinder engine model)	 WI-06239	1 - 4	TFA-032
		5, 6	TFA-041
B20 (Except U5 model)	 WI-06240	All	TFA-035

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B20 (U5 model)	 WI-06241	All	TFA-035
B20 (Turbo engine model)	 WI-06242	All	TFA-041
B20 (6-cylinder engine model)	 WI-06243	1 - 12 13 - 16	TFA-032 TFA-041
B21 (Except U5 model)	 WI-06244	1 - 8, 10, 14 9, 11 - 13, 15 - 20	TFA-036 TFA-037

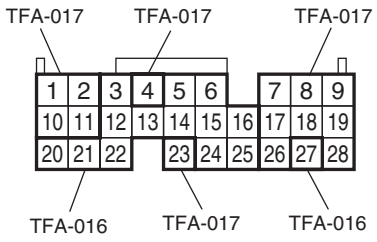
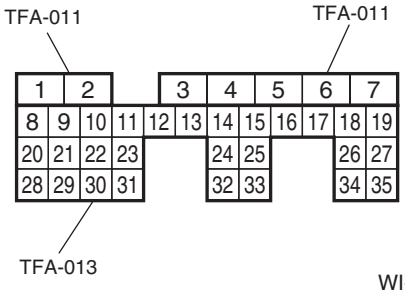
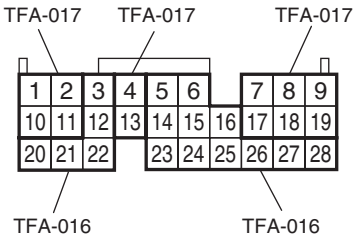
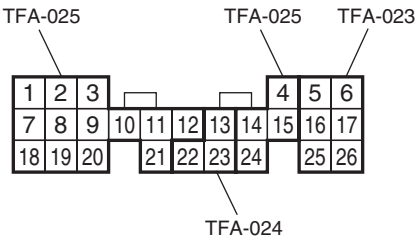
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B21 (U5 model)	 WI-06245	1 - 4, 6, 8, 9, 11 - 20	TFA-037
		5, 7, 10	TFA-036
B21 (6-cylinder engine model)	 WI-06246	1 - 7, 12, 19, 20	TFA-036
		8 - 11, 13 - 18	TFA-037
B22	 WI-06216	All	TFA-032
B25	 WI-06234	All	TFA-019

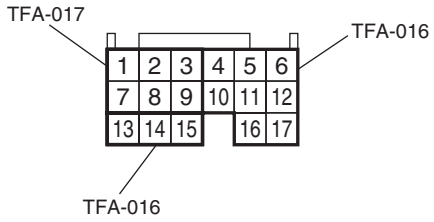
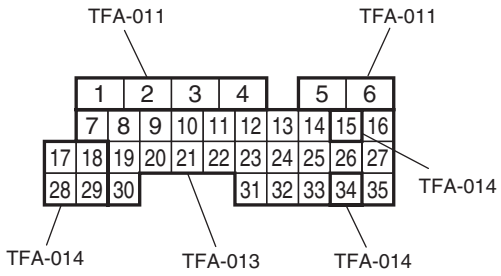
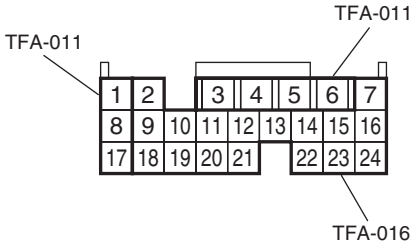
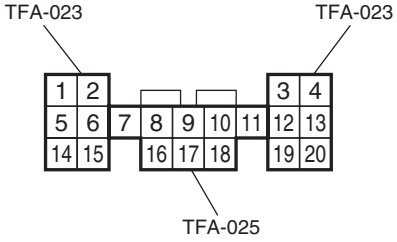
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B54 (Except turbo engine model)	 WI-06250	All	TFA-011
B54 (Turbo engine model)	 WI-06251	All	TFA-016
B55 (Except turbo engine model)	 WI-06252	All	TFA-011
B55 (Turbo engine model)	 WI-06253	1, 3 - 6, 8, 17 2, 7, 9 - 16, 18 - 24	TFA-011 TFA-016

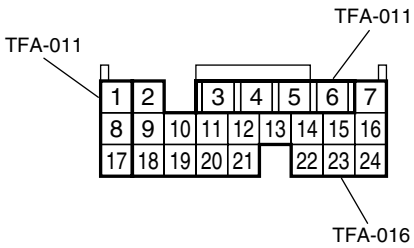
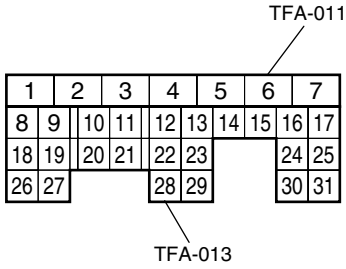
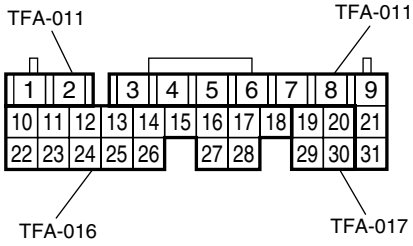
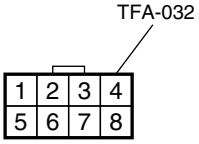
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B56 (Except turbo engine model)	 WI-06254	All	TFA-011
B56 (Turbo engine model)	 WI-06255	1 - 9, 21, 31	TFA-011
		10 - 20, 22 - 30	TFA-016
B84	 WI-06256	1 - 9, 21, 31	TFA-011
		10 - 18, 22 - 28	TFA-016
		19, 20, 29, 30	TFA-017
B127	 WI-06220	All	TFA-029

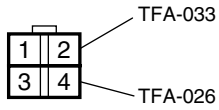
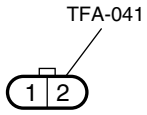
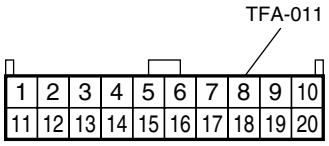
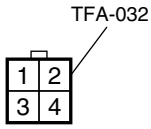
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B134 (Except U5 model)	 WI-06258	7, 8, 22, 23, 34, 35	TFA-023
		1 - 6, 9 - 21, 24 - 33	TFA-025
B134 (U5 model & 6-cylinder engine model)	 WI-06259	1, 7, 8, 15, 16, 22	TFA-011
		2 - 6, 9 - 14, 17 - 21	TFA-016
B134 (Turbo engine model)	 WI-06260	1 - 7	TFA-011
		8 - 34	TFA-013
B135 (Except U5 model)	 WI-06261	1, 2, 9, 21	TFA-023
		3, 6, 7, 12 - 19	TFA-024
		4, 5, 8, 10, 11, 20, 22 - 28	TFA-025

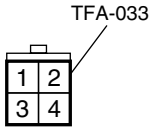
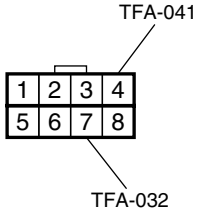
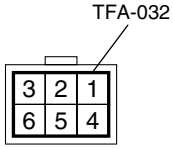
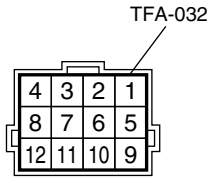
HARNESS REPAIR KIT

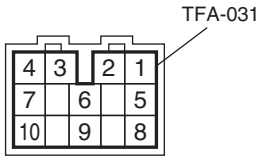
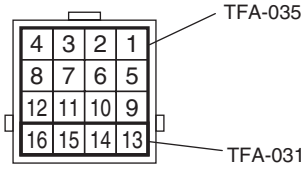
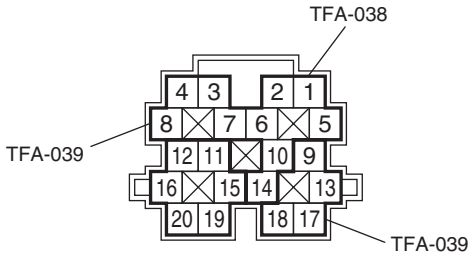
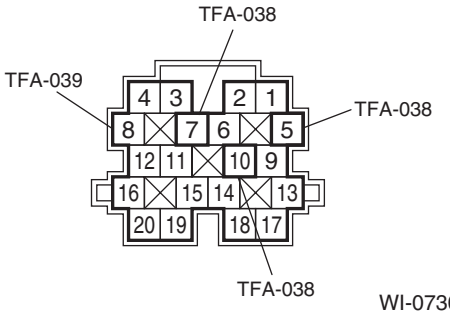
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B135 (U5 model)	 WI-06262	1, 2, 4, 7 - 11, 17 - 19, 23, 26, 28	TFA-017
		3, 5, 6, 12 - 16, 20 - 22, 24, 25, 27	TFA-016
B135 (Turbo engine model)	 WI-06263	1 - 7	TFA-011
		8 - 35	TFA-013
B135 (6-cylinder engine model)	 WI-06264	1, 2, 4, 7 - 11, 13, 17 - 19	TFA-017
		3, 5, 6, 12, 14 - 16, 20 - 28	TFA-016
B136 (Except U5 model)	 WI-06265	1 - 4, 7 - 12, 14, 15, 18 - 21, 24	TFA-025
		5, 6, 16, 17, 25, 26	TFA-023
		13, 22, 23	TFA-024

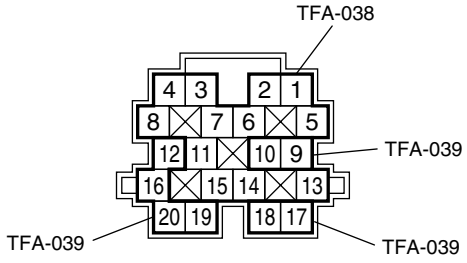
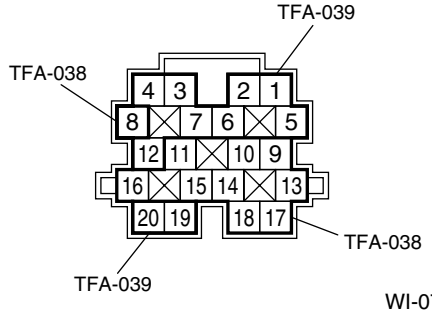
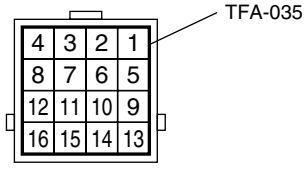
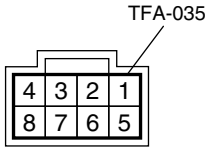
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B136 (U5 model)	 WI-06266	1 - 3, 7 - 9	TFA-017
		4 - 6, 10 - 17	TFA-016
B136 (Turbo engine model)	 WI-06267	1 - 6	TFA-011
		7 - 14, 16, 19 - 27, 30 - 33, 35	TFA-013
		15, 17, 18, 28, 29, 34	TFA-014
B136 (6-cylinder engine model)	 WI-06253	1, 3 - 6, 8, 17	TFA-011
		2, 7, 9 - 16, 18 - 24	TFA-016
B137 (Except U5 model)	 WI-06269	1 - 6, 12 - 15, 19, 20	TFA-023
		7 - 11, 16 - 18	TFA-025

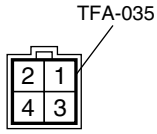
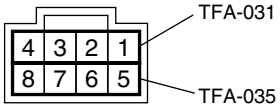
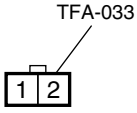
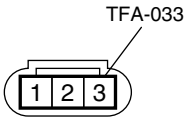
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B137 (U5 model)	 WI-06253	1, 3 - 6, 8, 17	TFA-011
		2, 7, 9 - 16, 18 - 24	TFA-016
B137 (Turbo engine model)	 WI-06271	1 - 7	TFA-011
		8 - 31	TFA-013
B137 (6-cylinder engine model)	 WI-06256	1 - 9, 21, 31	TFA-011
		10 - 18, 22 - 28	TFA-016
		19, 20, 29, 30	TFA-017
B252	 WI-06227	All	TFA-032

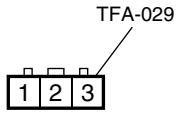
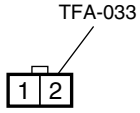
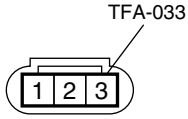
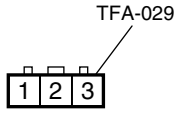
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B262	 WI-06236	1, 2	TFA-033
		3, 4	TFA-026
B279	 WI-06275	All	TFA-041
B280	 WI-06276	All	TFA-011
B317	 WI-06277	All	TFA-032

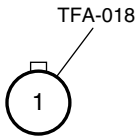
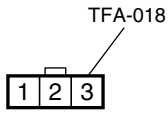
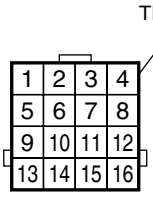
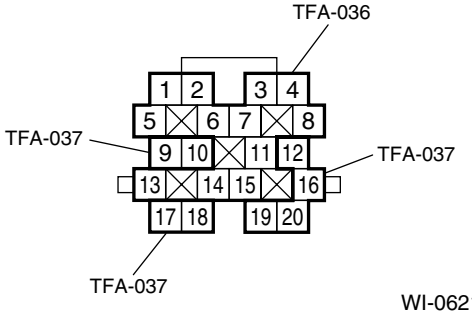
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B327	 WI-06278	All	TFA-033
B328	 WI-06279	1, 2, 3, 4	TFA-041
		5, 6, 7, 8	TFA-032
E1 (Except U5 model)	 WI-07298	All	TFA-032
E1 (U5 model)	 WI-07300	All	TFA-032

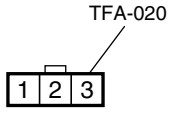
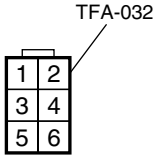
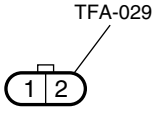
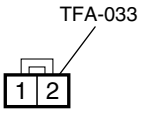
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
E1 (Turbo engine model)	 WI-07303	All	TFA-031
E1 (6-cylinder engine model)	 WI-07292	1 - 12	TFA-035
		13 - 16	TFA-031
E2 (Except U5 model)	 WI-07297	1 - 8, 10, 14	TFA-038
		9, 11 - 13, 15 - 20	TFA-039
E2 (U5 model)	 WI-07301	1- 4, 6, 8, 9, 11 - 20	TFA-039
		5, 7, 10	TFA-038

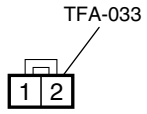
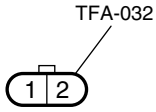
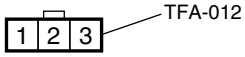
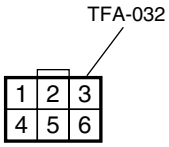
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
E2 (Turbo engine model)	 WI-07296	1 - 8, 11, 13 - 15	TFA-038
		9, 10, 12, 16 - 20	TFA-039
E2 (6-cylinder enginemodel)	 WI-07293	1 - 7, 12, 19, 20	TFA-039
		8 - 11, 13 - 18	TFA-038
E3	 WI-07294	All	TFA-035
E49	 WI-07295	All	TFA-035

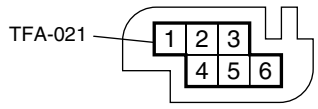
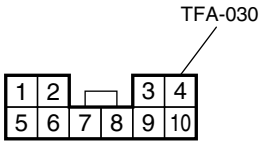
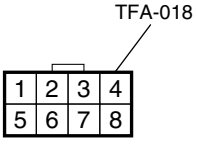
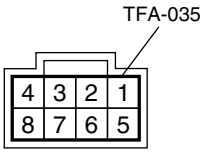
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
E56	 WI-07302	All	TFA-035
E58	 WI-07299	1 - 4	TFA-031
		5 - 8	TFA-035
F3	 WI-06211	All	TFA-033
F4	 WI-06212	All	TFA-033

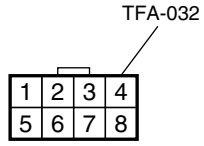
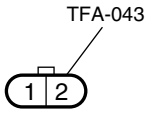
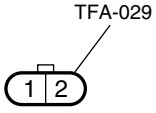
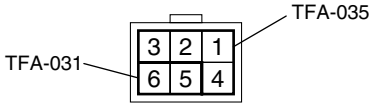
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
F7	 WI-06213	All	TFA-029
F19	 WI-06211	All	TFA-033
F22	 WI-06212	All	TFA-033
F23	 WI-06213	All	TFA-029

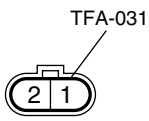
Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
F25 (4-cylinder engine model & turbo engine model)	 WI-06214	All	TFA-018
F25 (6-cylinder engine model)	 WI-06215	All	TFA-018
F60	 WI-06216	All	TFA-032
F61	 WI-06217	1 - 8, 11, 13 - 15 9, 10, 12, 16 - 20	TFA-036 TFA-037

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
R47	 WI-06218	All	TFA-020
R58	 WI-06219	All	TFA-032
R59	 WI-06220	All	TFA-029
R62	 WI-07291	All	TFA-033

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
R64	 WI-07291	All	TFA-033
R68	 WI-06221	All	TFA-032
R70	 WI-04703	All	TFA-012
R79	 WI-06223	All	TFA-032

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
R100	 WI-04700	All	TFA-021
R122	 WI-06224	All	TFA-030
R134 (Sedan & Wagon model)	 WI-06225	All	TFA-018
R134 (Pick-up model)	 WI-06226	All	TFA-035

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
R135 (Pick-up model)	 WI-06227	All	TFA-032
R143	 WI-06228	All	TFA-043
R144	 WI-06220	All	TFA-029
T5 (6-cylinder engine model)	 WI-07304	1 - 4 5, 6	TFA-035 TFA-031

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
Exhaust gas temperature sensor connector	 WI-07305	All	TFA-031